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A Geological Traverse across the Jack Hills Metasedimentary Belt, Western Australia: Isotopic Constraints on the Distribution of Proterozoic Rocks and the Evolution of Hadean Crust

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Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

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Abstract

A ~1010 m traverse across the Jack Hills Metasedimentary Belt was investigated in this study, starting from the BIF at the southern extremity of the belt and terminated at the boundary between amphibolite and granite at the northern extremity. This is the first detailed traverse that includes the fine-grained sediments in the northern part of the Jack Hills belt. The subaqueous deposits at the southern part of the belt give way to terrestrial deposits at the northern part, indicating significant shallowing of the basin. In this study, facies associations indicate a fan delta depositional environment.

A total of 2819 concordant zircon ages were obtained out of ~6308 zircons analysed in this study, and these ages spread from 1618±22 Ma to 4381±5 Ma, with a prominent age peak at 3383 Ma. A total of sixteen (~0.5% of the total analysed) concordant Proterozoic zircon ages were identified from seven samples, ranging from 1618±22 Ma (212 m, JH039B-02) to 2473±20 Ma (514.5 m, JH096-04). The interleaving of Archean-Proterozoic successions, as indicated in previous studies confirm the existence of two different sedimentary associations, one formed in the Archean, the other formed in the Proterozoic. The samples which yielded Proterozoic ages were widely distributed along the belt and there is no relationship between rock-type and young zircon ages. The successions (65-202 m and 229-348 m) dominated by coarse-grained sandstone and conglomerate at the southern part of the traverse were likely deposited in the Archean.

In this study, a total of 1093 zircons with ages from 1642 Ma to 4381 Ma from 46 samples were analysed for Lu-Hf isotopes. The $^{176}Lu/^{177}Hf$ ratios range from 0.000159 (JH152-24) to 0.004203 (JH152-50); and there were seven hundred and thirty-eight grains (67.5%) with $^{176}Lu/^{177}Hf$ ratios ≤0.001, with a prominent peak at ~0.0008. The $^{176}Hf/^{177}Hf$ ratios range from 0.279932 (JH058-055) to 0.281546 (JH039A-22), with a prominent peak at ~0.28035. The $\varepsilon_{Hf(t)}$ values for all zircons range from -22.1 (JH039A-47) to 5.5 (JH034-049), and the majority of the dataset (94.6%) have negative $\varepsilon_{Hf(t)}$ values, with only fifty-nine zircons (5.4%) having positive $\varepsilon_{Hf(t)}$ values that spread from 0.1 to 5.5. The prominent $\varepsilon_{Hf(t)}$ peak is at -4.2, with a secondary peak at -7.6.

The negative $\varepsilon_{Hf(t)}$ values make up 92% of the Hadean population, indicating the Hf isotope data do not favour the existence of a strongly depleted Hadean mantle

contribution, or significant juvenile input into the parental magmas to the Jack Hills detrital zircons as early as ~4.4-4.5 Ga. The best fit of the Jack Hills detrital zircon data involves using the single-stage T_{DM} model age. This implies that the majority of the Hadean zircons likely evolved from a primitive source. The Hf isotope data support the notion of long-lived, mafic dominant Hadean crust, which could only endure on the Earth's surface in the absence of subduction, thus mitigating against Hadean plate tectonics. The peaks of $\varepsilon_{Hf(t)}$ at ~3.2 Ga, 3.4-3.5 Ga, 3.8-3.9 Ga, and 4.0-4.2 Ga in this study are consistent with the 3.3-3.4 Ga, 3.8 Ga and 4.2 Ga peaks in the global dataset. The preferred explanation to these peaks is mixture of juvenile material with extensive crustal reworking involved in burial and remelting.

For zircons with crystallization ages around 2.65 Ga, the potential source could be the 2654±7 Ma monzogranites located immediately south of the Jack Hills belt. For the zircons younger than 2.6 Ga with $\varepsilon_{Hf(t)}$ values ranging from -22.1 to 1.0, the source rocks could potentially be granitoids or even more mafic rocks. Meeberrie gneiss could possibly have been a major source of Jack Hills zircons with ages from 3.3 to 3.7 Ga. The multiple components of the Meeberrie gneiss can explain the large range of $\varepsilon_{Hf(t)}$ values of the Jack Hills zircons. However, the source rock for the >3.8 Ga Jack Hills zircons (N=144) remains unknown.

A weighted mean $^{207}Pb/^{206}Pb$ age of 2652±9 Ma was obtained for metamorphic monazite in a fine-grained mica sandstone sample (JH10085, 459 m) in the centre of the traverse east of Eranondoo Hill. This result confirms that the Archean rocks in the central part of the Jack Hills belt experienced metamorphism at ~2.65 Ga.

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Chapter 1 Introduction

1.1 Location and Access

Jack Hills is the name given to a low range of hills located in the Murchison District of Western Australia, approximately 800 km north of Perth. The Murchison Shire is approximately 50,000 square kilometres in area, and serves 29 stations and a population up to 113.

The study area lies south of Beringarra Station and extends from latitudes 26°10'00.2" S to 26°09'20.3" S and longitudes 116°59'39.3" E to 116°59'19.5" E. Access to the study area is via a graded road that runs from Cue to Beringarra. Outcrops are accessible via tracks branching off the graded road.

1.2 Introduction to the Study Area

The Jack Hills metasedimentary belt consists of weakly metamorphosed sedimentary rocks that include siltstone, sandstone, conglomerate, quartzite, chert, and banded iron formation (BIF), together with thin units of mafic and ultramafic rocks.

Since 1986, the area has been internationally known as the site of the world's oldest minerals. These are detrital zircon grains up to 4404 Ma old (Wilde, 2001). Until 2002, all sedimentary rocks in the Jack Hills belt were thought to have been deposited in the early-middle Mesoarchean, since no zircon younger than ~3.1 Ga had been recorded from the samples. However, concordant late Archean and Paleoproterozoic zircons were discovered in some clastic metasedimentary units with ages ranging from 2736±6 to 1576±22 Ma (Cavosie et al., 2004; Dunn et al., 2005). This either indicates that younger sedimentary units are interleaved with the Archean units, or that all units were deposited in post-Archean time. At present, the full extent of Proterozoic rocks within the belt is unclear, since it is impossible to distinguish them from Archean metasedimentary rocks in the field, due to their lithological similarity and the effects of Proterozoic deformation.

Wilde and Pidgeon (1990) divided the supracrustal rocks of the Jack Hills belt into three informal associations, and the lithological units have recently been divided into four associations by Spaggiari et al. (2007), which includes the known Proterozoic rocks. These are: (i) an association of banded iron formation, chert, quartzite, mafic and ultramafic rocks; (ii) an association of pelitic and semi-pelitic schist, quartzite, and mafic schist; (iii) an association of mature clastic rocks including pebble metaconglomerate; and (iv) an association of Proterozoic metasedimentary rocks.

1.3 Objectives

The primary goal of the doctoral thesis is to establish the distribution and subsequent history of Proterozoic sedimentary rocks in the Jack Hills Metasedimentary Belt, Western Australia. This will be achieved by:

- Mapping a traverse line in detail, through the entire Jack Hills belt, on the east flank of Eranondoo Hill. This will be combined with precise isotopic dating of selected samples in order to constrain the age of deposition of the rocks. This will reveal the spatial distribution of Proterozoic sedimentary rocks and lead to the first estimation of the proportion of Proterozoic sedimentary rocks present in the Jack Hills belt;
- Interpreting the petrogenesis and depositional history of the metasedimentary rocks, including determining their likely provenance and tectonic setting;
- Investigating the detailed characteristics of the four sedimentary associations recognized by Spaggiari (2007) and determining if they reveal differences in age;
- Investigating the source of detrital material preserved within the clastic sedimentary succession;
- Determining the post-depositional and metamorphic history of the Proterozoic sedimentary rocks and the time of shearing by utilizing U-Pb dating of monazite.
- In addition, new insights into the Archean and Hadean zircons will be obtained and evaluated.

1.4 Methodology

Two essential techniques were adopted for achieving the research objectives; fieldwork and analytical techniques.

1.4.1 Fieldwork

A traverse was completed approximately 100 metres to the east of the W74 discovery site on Eronondoo Hill in the central part of the Jack Hills belt (Fig 2.2), with the goal being to construct a detailed sedimentological log in order to determine the distribution of zircon U-Pb ages in different lithologic units.

Two fieldtrips were conducted, in 2010 and 2012, to complete field observations and sample collection from the selected traverse. For the sample list, please refer to Appendix A.

On the first fieldtrip, before the traverse site was determined, geological observations of some previous study areas on the southern side of the belt were made, including the W74 discovery site and the Eriksson and Wilde (2010) traverse line. Then the decision was made to start the traverse from the Banded Iron Formation (BIF) at the southern extremity of the belt, to link the traverse with that of Eriksson and Wilde, and then continue northward to the northern extremity of the belt.

Altogether 157 samples were collected along the traverse line. Eight major rock types were identified: metasiltstone, schist, metasandstone, metaconglomerate, quartzite, chert, BIF, and some mafic and ultramafic rocks. The samples were selected in a south to north sequence, with ninety-two samples collected in 2010 (JH10001 to JH10090) and the remaining samples (JH12091 to JH12155) in 2012.

Samples were collected at ~5 m intervals or wherever lithological changes were observed, and the distance between samples varied from 1m to 58 m, depending on the exposure. Due to lack of outcrop, sampling gaps longer than 5 m were unavoidable in places. However, the traverse was adjusted where possible so that samples were collected either slightly to the west or east of the traverse line, especially north of sample JH12131 because there is no further outcrop. Two samples at the same location were collected when geological boundaries were observed.

GPS locations were recorded for each site, and still and video images were recorded at each site so that a complete record of the traverse was compiled. Magnetic susceptibility readings were collected from each sample in the field (Appendix A).

1.4.2 Analytical Techniques

The sample list for all analyses is in Appendix A.

1.4.2.1 Sample Preparation

Back in the laboratory, all rock samples were cleaned with a wire brush and washed with deionised water. The samples were cut to less than 10 cm in thickness with a diamond saw and then dried in the oven with the temperature at 50°C. Photographs of each sample were then taken.

Before crushing, the magnetic susceptibility was re-measured on each hand specimen to verify the field reading and assist in the comparative description and classification of the samples. The reported values represent the mean of between 5 and 10 measurements using a digital KT-5 hand-held susceptibility meter on hand specimens in different orientations. The majority of measurements were taken against cut surfaces; however, for a limited number of measurements made on uncut surfaces, a small correction for surface unevenness was applied as recommended by the KT-5 manufacturer.

For each rock sample, about 500 g of rock was reduced using a tungsten carbide plate grinder into cm-sized fragments and then ground for 7-13 seconds in a tungsten carbide ring-mill to a coarse powder less than 1 mm in size. The coarse powder was then sieved and washed by stirring it in a large beaker of water, waiting ~10 seconds for the bulk of the powder to settle, and then pouring water plus any suspended size fraction to waste. This process was repeated until most of the suspended size fraction was removed and the water ran clear. The rock powder was dried under an infra-red lamp or in an oven. The dried powder was then poured into a 1000 ml separating funnel containing lithium polytungstate solution (LST; density = 2.85 g/ml), mixed thoroughly with a glass rod and left for at least 15 minutes to ensure complete density separation. The heavy mineral fraction was then taped off into filter paper, washed thoroughly in hot distilled water to removed LST residue and then dried. The light mineral fraction of quartz and feldspar was also washed in filter paper to remove the LST residue and then preserved. The lithium polytungstate solution was recycled by heating in a 1000 ml beaker on a hot plate at a temperature of ~80 °C until the required density was reached. All the separation and evaporation was undertaken in a fume cupboard.

Up to 240 randomly-selected grains of zircon were handpicked under a binocular microscope from the heavy mineral fraction of each sample and placed on double-sided adhesive tape along with fragments of Curtin University standard zircon CZ3 (Pidgeon et al., 1994), BR266 (Stern, 2001) or M257 (Nasdala et al., 2008) and set in 25 mm diameter epoxy discs. Zircons from up to six different rock samples were included within the same mount. The mounts were polished down to expose the grain centres, and then photographed in both transmitted and reflected light, cleaned and gold coated. Prior to ion-microprobe analysis, cathodoluminescence

(CL) images of the mounted zircons were obtained using a Philips PW6886 CL detector on the Phillips XL30 scanning electron microscope (accelerating voltage 12 kV; spot size 6) at Curtin University. Some CL images were collected using a TESCAN VEGA3 SEM housed in the Centre for Microscopy, Characterisation and Analysis at the University of Western Australia.

1.4.2.2 Zircon Sensitive High Resolution Ion Microprobe (SHRIMP) Analysis Procedures

U-Pb-Th data were collected using a Sensitive High Resolution Ion Microprobe (SHRIMP II) at the John de Laeter Centre for Mass Spectrometry at Curtin University. The SHRIMP methodology followed the analytical procedure described by Williams (1998). Secondary ions were passed to the mass spectrometer operating at a mass resolution (M/ΔM at 1%) of ~5000. Each analysis was preceded by a two-minute raster to remove the Au coating and any surface contamination. The peak-hopping data collection routine consisted of four scans through the mass stations, with signals measured by an ion counting electron multiplier. The Pb/U ratios were calibrated using an empirical correlation between Pb^+/U^+ and UO^+/U^+, normalised to the 564 Ma Sri Lankan zircon standard CZ3 (Pidgeon et al., 1994, U=555 ppm), BR266 (Stern, 2001; 559 Ma, U=909 ppm), and M257 (Nasdala et al., 2008; 561 Ma; U=840 ppm). The external 1-sigma error, obtained from multiple analyses of Pb/U on the standard during individual SHRIMP sessions, was added in quadrature to the errors observed in the unknowns. The initial data reduction was achieved using the SQUID 2 add-in for Microsoft Excel (Ludwig, 2003a), and Isoplot (Ludwig, 2003b) was used for further processing.

A significant number of zircon grains showed high concentrations of U and Th and as a result are strongly metamict (they are dark and show no internal structure in CL) and are also commonly discordant.

Although a significant number of zircons show discordance towards the zero intercept on the concordia diagram, there is also evidence of ancient Pb-loss in some grains. To combat this complexity, U-Pb data have been filtered to eliminate the influence of the most discordant analyses and only results with less than 10% discordance are considered in the discussions, unless otherwise specified. The percentage discordance d was calculated as:

$$d = \frac{({}^{207}Pb/{}^{206}Pb\ Age - {}^{238}U/{}^{206}Pb\ Age)}{({}^{207}Pb/{}^{206}Pb\ Age)} \times 100$$

Also, because all the Jack Hills zircons are Precambrian in age, only $^{207}Pb/^{206}Pb$ ages are utilized.

1.4.2.3 Zircon Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS) Analytical Procedures

Zircons from samples JH10001-90 were analysed at the State Key Laboratory of Continental Dynamics, Northwest University, Xi'an, China.

Laser ablation ICP-MS zircon U-Pb analyses were conducted on an Agilent 7500a ICP-MS equipped with a 193 nm laser. During analysis, the spot diameter was 30 µm. Raw count rates for ^{29}Si, ^{204}Pb, ^{206}Pb, ^{207}Pb, ^{208}Pb, ^{232}Th and ^{238}U were collected for age determination. U, Th and Pb concentrations were calibrated by using ^{29}Si as the internal calibrant and NIST 610 as the reference material. The $^{207}Pb/^{206}Pb$ and $^{206}Pb/^{238}U$ ratios were calculated using the GLITTER program, which were then corrected using the Harvard zircon 91500 as external calibrant. According to the method of Ballard et al. (2001), measured $^{207}Pb/^{206}Pb$, $^{206}Pb/^{238}U$ and $^{208}Pb/^{232}Th$ ratios in zircon 91500 were averaged over the course of the analytical session and used to calculate correction factors. The correction factors were then applied to each sample to correct for both instrumental mass bias and depth-dependent elemental and isotopic fractionation. The detailed analytical technique is described in Yuan et al. (2004). The age calculation and plotting of concordia diagrams were made using ISOPLOT (ver 3.0) (Ludwig 2003). The errors quoted in tables and figures are at the 1σ level.

1.4.2.4 Zircon Lutetium-Hafnium Isotope Analyses

Initially, it had been intended to obtain oxygen isotope data on the analysed zircons. However, because the Camera 1280 in Perth was not set-up for this in 2010, it was decided to focus on obtaining lutetium-hafnium isotope analyses. For the samples collected in 2010 (sample list is in Appendix A), zircon Lu-Hf isotope analyses were undertaken at the State Key Laboratory of Continental Dynamics, Northwest University, Xi'an, China. For samples collected in 2012, the analyses were conducted at the Institute of Geology and Geophysics, Chinese Academy of Sciences in Beijing.

Hf isotope analyses in Xi'an were carried out on a Nu Plasma HR MC-ICP-MS (Nu Instruments Ltd., UK), coupled to a GeoLas 2005 excimer ArF laser-ablation. The energy density was 15-20 J/cm^2 and a spot size of 44 µm was used. High-purity argon (99.9995%) and high-purity helium (99.9995%) were used, purified by an inhouse filtration column, which is composed of a 15L 13X molecular sieve that can reduce the gas backgrounds of ^{208}Pb and ^{202}Hg to <100 and <400 counts per second (cps), respectively (Yuan et al., 2008). These backgrounds were measured by ion counters (MC-ICP-MS) and correspond to 0.05 and 0.1 ppt, respectively. The sensitivity in laser ablation mode is 7 to 8 volts per 1 percent of hafnium at 44 μm.

Interference of ^{176}Lu on ^{176}Hf was corrected by measuring the intensity of the interference-free ^{175}Lu isotope and using the recommended $^{176}Lu/^{175}Lu$ ratio of 0.02669 (Debievre and Taylor, 1993) to calculate $^{176}Lu/^{177}Hf$ ratios. Similarly, the interference of ^{176}Yb on ^{176}Hf was corrected by measuring the interference-free ^{172}Yb isotope and using the recommended $^{176}Yb/^{172}Yb$ ratio of 0.5886 (Chu et al., 2002) to calculate $^{176}Hf/^{177}Hf$ ratios. In doing so, a mean $^{173}Yb/^{171}Yb$ ratio for the analysed spot itself was automatically used in the same run to calculate a mean β_{Yb} value (Iizuka and Hirata, 2005), and then the ^{176}Yb signal intensity was calculated from the ^{173}Yb signal intensity and the mean β_{Yb} value.

The Lu-Hf isotopes were measured on the same spots or the same age domains as used for age determinations, guided by the CL images. The measured ages and Hf isotope values of three well-characterized zircon standards 91500 (0.2823240±0.0000053), GJ-1 (0.2820466±0.0000047) and Monastery (0.2827674±0.0000045) using this technique agree with the recommended values (0.282307, 0.282015, 0.282739) to within 2σ. The data were checked for internal variation during analysis and strong shifts in signal were removed.Detailed description of the techinique and analyses of the standard zircons are reported in Yuan et al. (2008).

For samples from JH12091-JH12155, and several samples collected in 2010, in situ zircon Hf isotopic analyses were conducted using a Neptune MC-ICPMS, equipped with a 193 nm laser, at the Institute of Geology and Geophysics in Beijing.

During analyses, a laser repetition rate of 8 HZ at 12-15 J/cm^2 was used and spot sizes were either 44 or 63 μm. For the 2010 samples, a 63 μm spot size was chosen, overlapping the previous Hf spot size within the same age domain, as guided by CL images. To increase the signal intensity, a laser repetition rate of 8 HZ at 12 J/cm^2 was used. For the 2012 samples, a 44 μm spot size was chosen with a laser repetition rate of 8 Hz at 15 J/cm^2. Raw count rates for ^{172}Yb, ^{173}Yb, ^{175}Lu, $^{176}(Hf+Yb+Lu)$, ^{177}Hf, ^{178}Hf, ^{179}Hf, ^{180}Hf and ^{182}W were collected and isobaric interference corrections for ^{176}Lu and ^{176}Yb on ^{176}Hf were determined precisely.

^{176}Lu was calibrated using the ^{175}Lu value and the correction was made to ^{176}Hf. The $^{176}Yb/^{172}Yb$ value of 0.5887 and mean β_{Yb} value obtained during Hf analysis on the same spot were applied for the interference correction of ^{176}Yb on ^{176}Hf (Iizuka and Hirata, 2005). The detailed analytical technique is described in Wu et al. (2006). During analysis, the $^{176}Hf/^{177}Hf$ and $^{176}Lu/^{177}Hf$ ratios of the standard zircons GJ-1 (0.2820136±0.0000033) and Mudtank (0.2825053±0.0000026) agreed well with the commonly accepted $^{176}Hf/^{177}Hf$ ratio of 0.282015±0.000019 (2σ) (Elhlou et al., 2006) and $^{176}Lu/^{177}Hf$ ratio of 0.282507± 0.000006(2σ) (Woodhead and Hergt, 2005).

1.4.2.5 Electron Microprobe Analytical Procedures for Monazite

Doubly-polished thin sections were prepared for all samples and mapped by electron microprobe (EMP). Wavelength-dispersive EMP analyses were performed using an automated JEOL JSM 6400 SEM fitted with three crystal spectrometers at the University of Western Australia. The operating conditions for analyses of monazite and xenotime were 20 kV accelerating voltage, 100nA beam current and a spot size of 3-5 μm. Synthetic phosphates and glasses, and natural minerals were used as standards. Methodology for the analysis of REE followed that of Williams (1996). X-ray element maps were collected using the same instrument and operating conditions. Data reduction used software from Moran Scientific.

1.4.2.6 SHRIMP Mount Preparation for Monazite

Monazite crystals large enough (>10 μm) for ion microprobe analysis were drilled (in ~3 mm plugs) from polished thin sections with a DREMEL 300 hand drill and cast in 25mm epoxy discs. The mounts were cleaned and Au-coated before each analytical session. The monazite standard (GSC2908) was set into a separate mount that was Au-coated with each batch of sample mounts.

1.4.2.7 SHRIMP U-Pb Analytical Procedures for Monazite

The instrument configuration followed established practice for small-spot, in situ analyses of monazite (Fletcher et al., 2000, 2004; Rasmussen et al., 2001). The primary beam diameter was controlled by the use of small Kohler apertures (~30-50 μm). The spot diameter is normally a sixth of the Kohler aperture diameter, but aberrations add several μm, so the operating spatial resolution ranged from ~7 μm to ~12 μm. The post-collector retardation lens was activated to reduce stray ion arrivals, particularly for monazite. This is known to cause mass fractionation of the Pb isotopes (Rasmussen et al., 2008), which varies from session to session depending on retuning of other components of the mass spectrometer between sessions. Consequently, fractionation corrections (“renormalisations”) were applied to all data. Energy filtering was not applied. The mass resolution (M/ΔM at 1% peak height) was ≥5000 in all sessions.

Monazite procedures followed those of Foster et al. (2000) and Rasmussen et al. (2001). Pb/U and Pb/Th calibration, and matrix corrections for U- and Th-induced effects, were based on concurrent measurements of the standard GSC2908. Matrix corrections for REE substitutions were assumed to be negligible; Y was not monitored. GSC2908 (1795 Ma; Stern and Sanborn, 1998) provided the reference data for renormalisation of $^{207}Pb/^{206}Pb$ data for all sessions. The data were reduced using Squid 2 (Ludwig, 2001), with subsequent spreadsheet processing for matrix effects and $^{207}Pb/^{206}Pb$ renormalisation.

1.5 Organization of the Thesis

The thesis is organized into 7 chapters.

Chapter 1 presents an introduction, the objectives and the methodology employed in sample collection, preparation and analysis.

Chapter 2 outlines the geological setting and previous studies of the Jack Hills Metasedimentary Belt.

Chapter 3 presents detailed rock descriptions based on field observations, petrography and thin section analysis.

Chapter 4 presents and evaluates the U-Pb-Th geochronological data using the SHRIMP and LA-ICP-MS techniques.

Chapter 5 presents and evaluates the Lu-Hf isotope data for the Jack Hills zircons.

Chapter 6 introduces the geochronological results from monazite in order to provide evidence for the metamorphic history of the Jack Hills Metasedimentary Belt.

Chapter 7 evaluates the full data set and, together with data previously collected from the area, presents a re-evaluation of the geological history of the Jack Hills Metasedimentary Belt.

Chapter 2 Geological Setting

2.1 The Yilgarn Craton

The Yilgarn Craton (Figure 2.1) is located in south-central Western Australia, occupying an area of over 657,000 km^2 (Trendall, 1990). It is separated from the Pilbara Craton to the north by Proterozoic fold and thrust belts of the Capricorn Orogen and by a series of sedimentary basins. To the south, it is bounded by the Proterozoic Albany-Fraser Orogen, to the west by the Pinjarra Orogen and the sedimentary rocks of the Perth Basin and to the east by Phanerozoic sediments of the Gunbarrel and Eucla basins. The Yilgarn Craton consists mainly of low-grade granite-greenstone terranes characterized by arcuate belts of deformed and metamorphosed volcano-sedimentary rocks. Higher-grade terranes occur in the west and north. The Yilgarn Craton mostly formed between ca. 3.05 and 2.62 Ga (Cassidy et al., 2006), and has remained integral and free of significant disturbance since emplacement of the Widgiemooltha dyke suite at 2420 Ma (Nemchin and Pidgeon, 1998). The craton is characterized by greenshist-amphibolite facies metamorphism in the greenstone sequences, although in the southwest and northwest, granite gneiss and greenstones were recrystallised to granulite facies at 2640 Ma (Nemchin et al., 1994). The oldest components of the craton are ca. 3730-3300 Ma rocks of the Narryer Terrane in the northwest that were metamorphosed to amphibolite- granulite facies at ca. 2700 Ma (Myers, 1990b).

The Geological Survey of Western Australia first subdivided the craton into three provinces, namely the Eastern Goldfields Province, the Murchison Province and the South-western Province (Williams, 1974). This was later modified by Gee et al. (1975, 1979, 1981) into four tectono-stratigraphic provinces, namely: the Murchison, the Eastern Goldfields, and the Southern Cross provinces and the Western Gneiss Terrain. Later, Myers (1995) interpreted the Yilgarn Craton as a remnant continental block formed by the assembly of fault-bounded multiple rafts of sialic crust, each having different geological histories. Myers (1993, 1995), Wilde et al. (1996), Myers and Swager (1997) and Witt et al. (1998) re-evaluated the geological relationships of the juxtaposed crustal units and introduced and applied the terrane accretion model based on studies of the tectono-stratigraphic units between large fault systems, the shape and trend of greenstone belts and new geophysical and geochronological data. The classification scheme proposed by Myers (1997) was widely accepted for more than a decade. From west to east the terranes were (i) West Yilgarn Superterrane consisting of the Narryer Terrane, Murchison Terrane and Southwest composite terrane, (ii) Southern Cross Superterrane and (iii) Eastern Goldfields Superterrane. A further subdivision of the southeastern Yilgarn Craton into a number of terranes, and the terranes into domains, was proposed by Swager et al. (1992) and Swager (1995, 1997), while Wilde et al., (1996) came up with similar divisions in the Southwestern Yilgarn Craton. Despite being formed at different times, each terrane recorded widespread tectonic, thermal and metamorphic episodes from 2780 to 2630 Ma (Myers, 1995). All these activities were interpreted by Myers (1990c) as a direct result of Archean plate tectonic movements joining up diverse crustal blocks to form the craton.

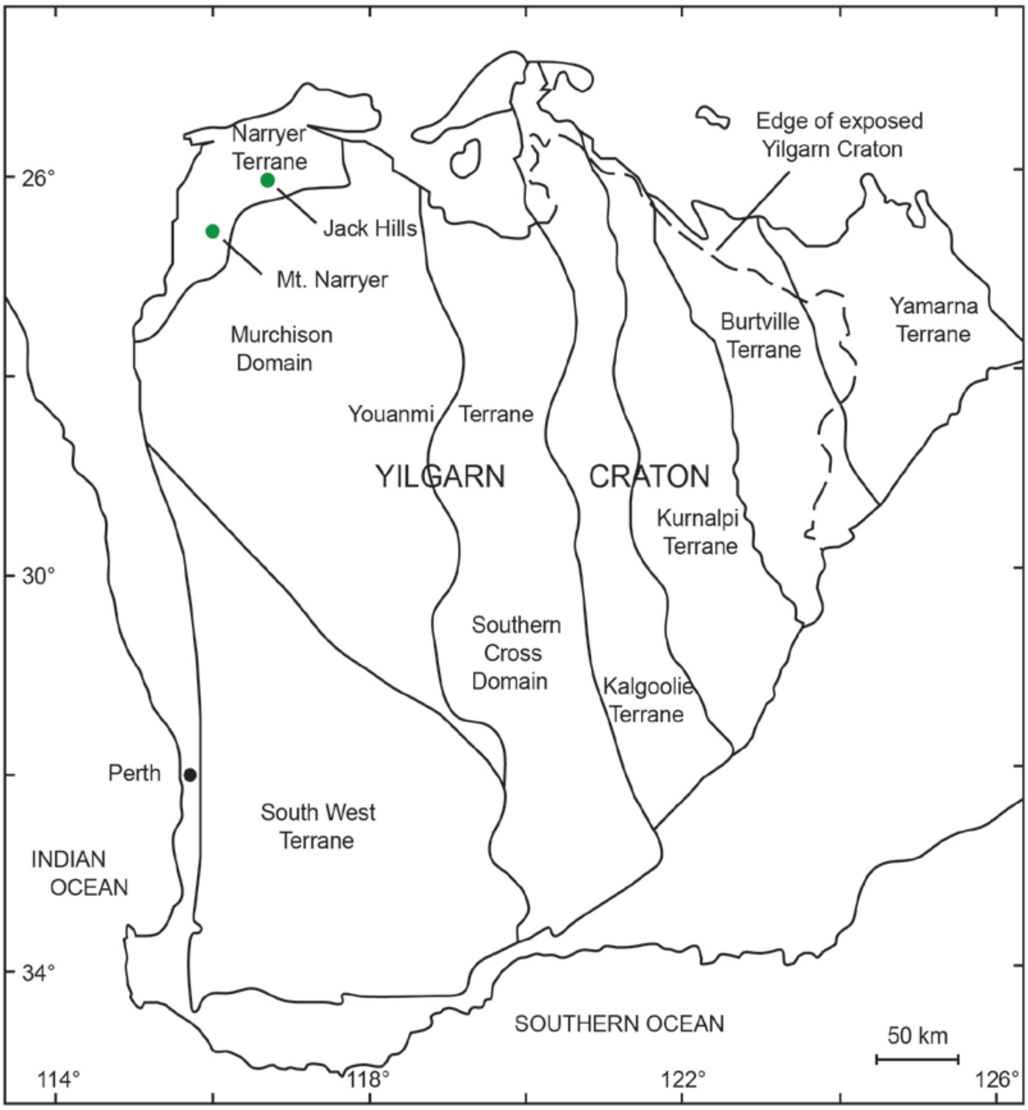


Figure 2.1 Map of the Yilgarn Craton showing the terrane subdivision proposed by Cassidy et al., (2006), with modifications in the northeast corner of the craton proposed by Pawley et al., (2012).

Cassidy et al. (2006) modified the boundaries of the earlier proposed terranes and identified new terranes in the eastern part of the Yilgarn Craton. They divided the Yilgarn Craton into six terranes: (i) Youanmi, (ii) Narryer, (iii) Southwestern, (iv) Kalgoorlie, (v) Kurnalpi, and (vi) Burtville. Pawly et al. (2012) introduced the newest Yamarna Terrane in the eastern part of the previously undivided Burtville Terrane. The latter four terranes are combined to make the Eastern Goldfields Superterrane. This classification scheme amalgamated the Murchison and Southern Cross granite-greenstone terranes of Myers and Swager (1997) and Witt et al. (1998) and classified them as domains within the Youanmi Terrane. The western and northern granite and granitic gneiss-dominated Narryer and South-West terranes were slightly reduced in area to accommodate newly-drawn northern and southern boundaries of the Murchison Domain.

2.2 The Narryer Terrane

The Narryer Terrane occupies an area of ~30,000 km^2 in the northwestern corner of the Archean Yilgarn Craton of Western Australia. It is one of the earliest crustal terranes on Earth, containing rocks with U-Pb zircon ages ranging up to 3730 Ma, the oldest known rocks in Australia, and detrital zircons up to 4404 Ma, the oldest terrestrial material on Earth (Wilde and Spaggiari, 2007).

The western margin of the Narryer Terrane is defined by the Darling Fault, and the northern margin by the Errabiddy Shear Zone, along which the Glenburgh Terrane was accreted to the Yilgarn Craton during the 2005 to 1960 Ma Glenburgh Orogeny (Occhipinti et al., 2004; Occhipinti and Reddy, 2004). The southern margin is the boundary with the Younami Terrane, a major granite-greenstone association in the Yilgarn Craton (Cassidy et al., 2006), and is defined by the Balbalinga and Yalgar faults; the latter interpreted as a major dextral strike-slip fault (Myers, 1990b; 1993). The structural history of this fault is poorly understood, and the boundary is likely to have been reworked and cryptic (Nutman et al., 1993; Spaggiari, 2007a; Spaggiari et al., 2007b).

2.3 Narryer Gneiss Complex

The Narryer Gneiss Complex refers to the >3 Ga rocks present within the Narryer Terrane (Wilde and Spaggiari, 2007). The Narryer Gneiss Complex (Myers, 1988a) is composed of granitoids and granitic gneisses ranging in age from Eo- through to Neoarchean (Kinny et al., 1990; Nutman et al., 1991; Pidgeon and Wilde, 1998). These rocks are locally interlayered with deformed and metamorphosed banded iron formation (BIF), mafic and ultramafic intrusive rocks, and metasedimentary rocks (Williams and Myers, 1987; Myers, 1988a; Kinny et al., 1990).

The early Archean gneisses of the Narryer Terrane have been interpreted as an allochthon that was thrust over ca. 3000 to 2920 Ma granitic crust of the Youanmi Terrane, prior to, or during, the period of late Archean granitic magmatism that stiched the two terranes (Nutman et al., 1993). The deformation that produced the main tectonic grain is believed to have occurred at amphibolite facies between ca. 2750 and 2620 Ma, and to have affected both terranes (Myers, 1990b). The Paleoproterozoic Capricorn Orogeny (1830-1780 Ma) produced intracratonic, predominantly greenschist facies, dextral transpressional reworking of both the northern and southern margins of the Narryer Terrane. These effects are evident in the Errabiddy Shear Zone (Occhipinti and Reddy, 2004), the Jack Hills belt (Spaggiari, 2007a; Spaggiari, 2007b; Spaggiari et al., 2007) and the Yarlarweelor Gneiss Complex in the northern part of the Narryer Terrane. The latter was deformed, metamorphosed and intruded by granites and dykes between approximately 1820 and 1795 Ma (Sheppard et al., 2003). This involved a two-stage process of intrusion during compression, followed by intrusion during dextral strike slip deformation. Deformation related to the Capricorn Orogeny has been interpreted to extend as far south as the northern end of the Mingah Range greenstone belt within the Murchison Domain of the Youanmi Terrane (Spaggiari, 2006). There is evidence that the Yalgar Fault was probably active during the Capricorn Orogeny, but whether the Yalgar Fault is a true terrane boundary is unclear (Wilde and Spaggiari, 2007).

2.4 Mt. Narryer Region

The Mt. Narryer region is dominated by quartzites and metaconglomerates (Wilde and Spaggiari, 2007). Myers and Williams (1985) recognised that most rocks at Mt. Narryer have been metamorphosed to granulite facies and undergone multiple deformation episodes. The rocks are continuously exposed over a distance of 21 km in a north-south direction and are up to 2.5 km wide. They dip steeply to the west and are folded at Mt. Narryer into a synform that plunges steeply to the southeast (Myers and Williams, 1985). Two major suites of granitic gneisses were identified: the older Meeberrie gneiss and the younger Dugel gneiss (De Laeter et al., 1981b). Within the Dugel gneiss, fragments of a layered basic intrusion were recognised and referred to as the Manfred Complex (Myers and Williams, 1985; Williams and Myers, 1987).

2.4.1 Meeberrie Gneiss

The Meeberrie gneiss is composed of alternating bands of quartzo-feldspathic and biotite-rich units. Some components were originally porphyritic, now occurring as deformed augen porphyroclasts, and the whole sequence is dominantly composed of monzogranite. Later work showed that many rocks are really part of the tonalite-trondhjemite-granodiorite (TTG) suite (Nutman et al., 1991; Pidgeon and Wilde, 1998). The early biotite granitoid was intruded by pegmatites and the whole complex brought into layer-parallelism by subsequent deformation. Sm-Nd (T_{CHUR}) model ages of 3630±40 Ma (De Laeter et al., 1981b), and 3710±30 Ma and 3620±40 Ma (De Laeter et al., 1985) were obtained from near Mt. Narryer, whereas zircon cores from the sample giving the 3630±40 Ma Sm-Nd age, obtained from 7.5 km NNE of Mt. Narryer, gave SHRIMP U-Pb ages of 3678±6 Ma (Kinny et al., 1988). The oldest known component of the Meeberrie gneiss is a tonalite collected 3 km south of the Jack Hills, with a SHRIMP U-Pb age of 3731±4 Ma (Nutman et al., 1991): this is the oldest known rock in Australia. Another Meeberrie gneiss sample, collected 1 km east of the above, has a distinctly younger age of 3597±5 Ma, indicating the composite nature of the Meeberrie gneiss. Biotite from two samples of Meeberrie gneiss recorded K-Ar ages of 1887±34 Ma and 1778±32 Ma (Kinny et al., 1990), clearly establishing that younger events have affected the Mt. Narryer area.

A later SHRIMP zircon U-Pb study by Kinny and Nutman (1996), centred around Mt. Narryer, identified three main age populations in the Meeberrie gneiss: at ~3670, 3620 and 3600 Ma, with minor older components at ~3730 Ma and younger components at ~3300 Ma. Kinny and Nutman (1996) showed that the gneiss consisted of multiple components down to centimetre scales and they emphasized the importance of working in low strain zones, where original intrusive relationships may still be preserved: elsewhere, the rocks approach migmatite. A simple age population of ~3620 Ma was also obtained from a gneiss sample at Mt. Murchison by Kinny and Nutman (1996), who emphasised that it was impossible to quote a single age for the Meeberrie gneiss in the Mt. Narryer region; it is a polyphase migmatite with ages ranging from 3730-3300 Ma.

2.4.2 Dugel Gneiss

The Dugel gneiss occupies large areas of the Narryer Gneiss Complex and is dominantly syenogranite, although it ranges to monzogranite in composition. Veins of leucocratic syenogranite cut the Meeberrie gneiss and show a less prominent foliation than the latter, although there are diffuse variations in grain size and some pegmatite veins. Whereas areas of one gneiss type may dominate over the other, they are intimately interdigitated over large areas, with the Dugel gneiss originally intrusive into the monzograntie, and both units now strongly deformed together. Where intrusive into the Meeberrie gneiss, the Dugel gneiss is commonly pegmatitic. Some deformed and metamorphosed mafic lenses have been interpreted as synplutonic dykes intruded contemporaneously with the granitic protolith of the Dugel gneiss at ~3.4 Ga (Myers, 1988a). The gneiss has Sm-Nd (T_{CHUR}) model ages of 3510±50 Ma (de Laeter et al., 1981b), 3520±30 Ma (Fletcher et al., 1983), and 3540±30 Ma (de Laeter et al., 1985). Zircon cores gave a SHRIMP U-Pb upper intercept age of 3381±22 Ma (Kinny et al., 1988); a revised age for this sample (Nutman et al., 1991) is 3375±26 Ma, with rims defining an age of 3284±9 Ma. Although this age is similar to the ~3300 Ma component of the Meeberrie gneiss, the two appear quite distinct in that there is no evidence for anatexis/migmatisation of the Dugel gneisses at ~3300 Ma (Kinny and Nutman, 1996).

2.4.3 Manfred Complex

Dismembered fragments of gabbro, anorthosite and ultramafic rocks form prominent trails within the Dugel gneiss northeast of Mt. Narryer (Myers and Williams, 1985), but are also recorded from the Meeberrie gneiss (Myers, 1988a, b). They range in size from a few centimetres to one kilometre long. Relict igneous textures are locally preserved, especially plagioclase crystals, although most rocks have been recrystallised to an equigranular metamorphic texture. The most characteristic rock type is leucogabbro, with much of the material converted to amphibolites during subsequent metamorphism. Samples of the Manfred Complex gave a Sm-Nd whole-rock isochron age of 3680±70 Ma and a Pb-Pb isochron age of 3689±146 Ma (Fletcher et al., 1988). The Pb-Pb data suggest incorporation of pre-existing felsic material in either the mantle source region or the mafic magma (perhaps from >4 Ga crust) (Wilde and Spaggiari, 2007). A U-Pb zircon age of 3730±6 Ma was obtained for the Manfred Complex anorthosite by Kinny et al. (1988). Hornblendes from leucogabbro and anorthosite units recorded K-Ar ages of 2787±50 Ma and 2667±34 ma (Kinny et al., 1990), whereas plagioclase from the same samples gave ages of 1954±38 Ma and 2066±38 Ma, respectively. An $^{40}Ar/^{39}Ar$ age of 2704±14 Ma on hornblende from the anorthosite sample confirms the K-Ar age and indicates either Neoarchean to Paleoproterozoic resetting, or slow cooling of the terrane (Wilde and Spaggiari, 2007).

2.4.4 Eurada Gneiss

Kinny (1987) was the first to recognise that a younger series of gneisses are also present in the Narryer Gneiss Complex when he identified ~3300 Ma granitoid near Mt. Narryer and ~3480 Ma layered gneisses at Eurada Bore, 20 km northwest of Mt. Narryer. The rocks are commonly tonalitic and show no evidence of partial melting or of reaching granulite facies. Additional samples collected ~20 km west of Mt. Narryer (Nutman et al., 1991) yield weighted mean $^{207}Pb/^{206}Pb$ ages of 3489±5 Ma and 3490±6 Ma; the latter also containing a zircon population with a $^{207}Pb/^{206}Pb$ age of 3439±3 Ma, taken to be the true age of this sample, with the older grains interpreted as being inherited from the protolith or adjacent gneiss. A further sample of Eurada gneiss, taken 5 km west of the above samples, gave a zircon age of 3466±3 Ma, taken to be the age of the igneous protolith. A population of younger grains gave zircon age of 3055±3 Ma, which was interpreted to reflect pegmatite intrusion into the gneiss or else to record a partial melting event (Nutman et al., 1991).

2.2 Jack Hills Metasedimentary Belt

The Jack Hills (Fig 2.2) metasedimentary belt, located along the southern margin of the Narryer Terrane, is approximately 90 km long with a pronounced sigmoidal curvature, typical of a dextral shear zone (Spaggiari, 2007b). The Jack Hills metasedimentary belt is largely in fault contact with Archean granitic gneiss and granitic rocks, but it is also intruded by granite in the south. Northeastern and southwestern parts of the belt are within fault splays off a major east-trending shear zone named the Cargarah Shear Zone (Williams et al. 1983; Spaggiari, 2007).

The Jack Hills was initially considered to be a greenstone belt (Elias, 1982), but was found to consist predominantly of metasedimentary rocks, including both chemical and clastic varieties, enclosed by granitic gneisses (Baxter et al., 1984; Wilde and Pidgeon, 1990). The metamorphic history of the Jack Hills belt is not well known, however the presence of andalusite (Elias, 1983; Cavosie et al., 2004), kyanite (Elias, 1983), and chloritoid (Baxter et al., 1984) suggests the siliclastic rocks experienced greenschist to lower amphibolite facies metamorphism, whereas more extensive sequences of amphibolite to granulite facies metasedimentary rocks occurs at Mt. Narryer (Elias, 1982; Williams et al., 1983; Wilde and Pidgeon, 1990; Cavosie et al., 2004; Dunn et al., 2005; Spaggiari, 2007a).

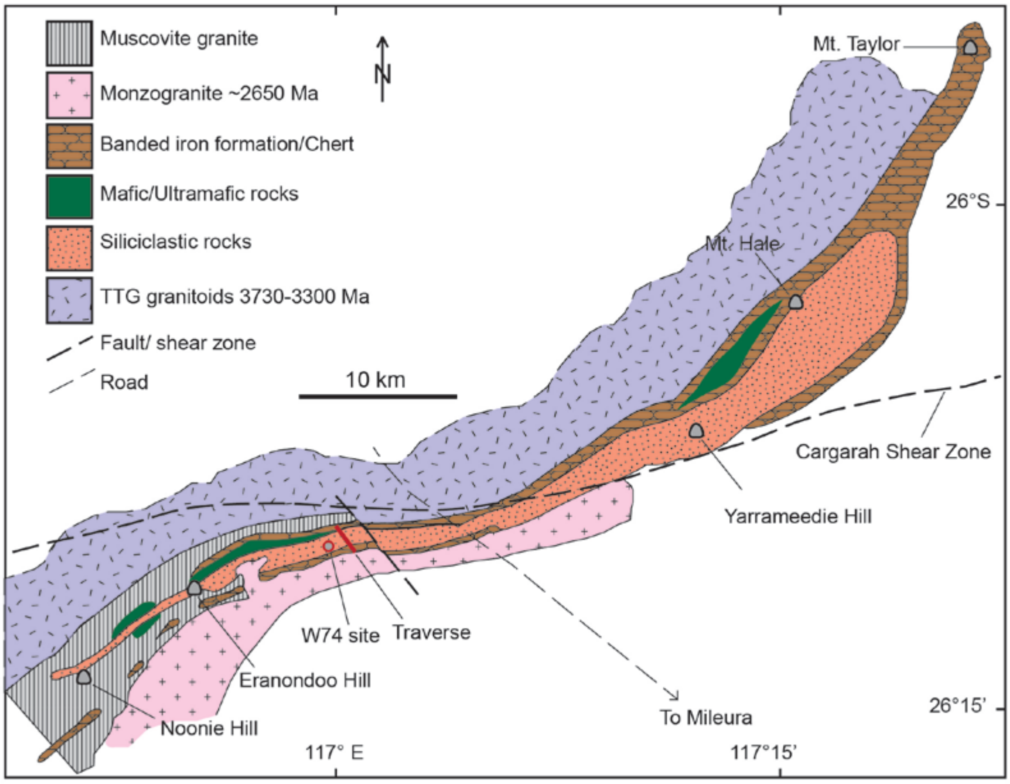


Figure 2.2 Simplified geological map of the Jack Hills metasedimentary belt. Modified from Cavosie et al. (2004); position of Cargarah Shear Zone from Spaggiari et al. (2008).

The dominant lithologies in the Jack Hills belt are BIF, chert, mafic and ultramafic rocks, and siliciclastic rocks that include quartz-mica schist, andalusite schist, quartzite, meta-sandstone, and oligomictic meta-conglomerate (Elias, 1982; Williams et al., 1983; Wilde and Pidgeon, 1990).

Wilde and Pidgeon (1990) divided the supracrustal rocks of the Jack Hills belt into three informal associations: (i) chemical sediment association consisting of BIF, chert, mafic schist (amphibolite) and minor ultramafic intrusions, developed along the margins of the belt; (ii) pelite-semipelite association characterised by quartz-biotite and quartz-chlorite schist, associated with local mafic and ultramafic schists, that were possibly part of a turbidite sequence, located in the central areas of the belt, and (iii) clastic sedimentary rocks comprising conglomerate, sandstone, quartzite, and siltstone, developed away from the belt margins. The latter were interpreted as having been deposited in the medial to distal part of an alluvial fan-delta (Baxter et al., 1986; Wilde and Pidgeon, 1990), and are where the majority of detrital zircons ≥4.0 Ga have been found. Based on the work undertaken in the 1980s, it was not clear whether these associations were all part of the same sedimentary event, or whether they were unrelated successions juxtaposed by deformation, though the latter was favoured (Wilde and Pidgeon, 1990).

The country rocks are biotite-bearing and range from relatively undeformed granites to highly deformed gneisses. Four textural types have been identified during field mapping and all but one are pre- to syn-tectonic, having been variably deformed to granitic gneiss. The main granite types are tonalite-trondhjemite-granodiorite series (TTG), porphyritic granodiorite, monzogranite and muscovite granite (Pidgeon and Wilde, 1998).

Until 2002, all sedimentary rocks in the Jack Hills belt were thought to have been deposited in the Mesoarchean to early Neoarchean, since no zircon younger than ~3.1 Ga had been recorded from the samples (Compston and Pidgeon, 1986; Mojzsis et al., 2001; Peck et al., 2001). However, concordant late Archean and Paleoproterozoic zircons were discovered in some of the clastic metasedimentary units with ages ranging from 2,736 ± 6 to 1,576 ± 22 Ma (Cavosie et al., 2004); Dunn et al. (2005) also reported a detrital zircon grain as young as 1797 ± 21 Ma. These suggest that younger sedimentary units are interleaved with the Archean units or that all sediments were deposited in the Proterozoic. However, the study of Rasmussen et al. (2010) has conclusively shown that some sediments were deposited prior to metamorphism at 2653±5 Ma. At present, the full extent of Proterozoic rocks within the belt is unclear, since it is impossible to distinguish them from Archean metasedimentary rocks in the field, due to their lithological similarity and the effects of Proterozoic deformation.

The lithological units have recently been divided into four informal associations by Spaggiari, to include the known Proterozoic rocks. These are: (i) an association of banded iron formation, chert, quartzite, mafic and ultramafic rocks; (ii) an association of pelitic and semi-pelitic schist, quartzite, and mafic schist; (iii) an association of mature clastic rocks including pebble metaconglomerate; (iv) an association of Proterozoic metasedimentary rocks.

The sedimentary succession at Jack Hills is tectonically disrupted and records a tectonostratigraphy displaced by faults and shear zones related to the Capricorn Orogeny (Crowley et al. 2005; Spaggiari 2007; Spaggiari et al. 2007).Three phases of deformation were recognized by Spaggiari (2007): (1) early recumbent folding probably associated with thrust faulting; (2) east-west-trending dextral shearing that produced the sigmoidal shape of the belt; (3) kink and conjugate-style folding, brittle faulting and fault reactivation.

2.3 Review of Previous Studies of the Jack Hills Belt

Zircon crystals with U-Pb ages up to ~4150 Ma were obtained from Mt Narryer, located ~ 60 km southwest of Jack Hills (Froude et al., 1983), whereas the oldest known rock in Australia (3,731 ± 4 Ma) is the tonalitic gneiss, collected 3 km south of the Jack Hills (Nutman et al., 1991). Compston and Pidgeon (1986) identified detrital zircon with a $^{207}Pb/^{206}Pb$ age of 4,276 ± 6 Ma from the metaconglomerate on Eranondoo Hill (26°11'S, 116°58'E, known as the W74 discovery site, Fig 2.2). Later, a detrital zircon with a $^{207}Pb/^{206}Pb$ age of 4,404 ± 8 Ma (2σ) was reported from the W74 site (Wilde et al., 2001), which is the oldest known terrestrial crystal in the world.

The majority of the detrital zircon ages obtained from conglomerate at the W74 site and adjacent siliciclastic sedimentary successions are between 3.8 Ga and 3.3 Ga (Compston and Pidgeon, 1986; Cavosie et al., 2004; Crowley et al., 2005; Dunn et al., 2005; Pidgeon and Nemchin, 2006). The maximum depositional age of the W74 metaconglomerate, based on the youngest detrital zircon age, was cited as ~3100 Ma (e.g., Compston and Pidgeon, 1986). A 3046±9 Ma grain was reported by Nelson (2000), and a similar age of 3047±21 Ma was later reported as the youngest detrital zircon at the W74 site by Crowley et al. (2005).

Cavosie et al. (2004) undertook two detailed traverses: one extending through the W74 site and another ~900 m to the east. Both Neoarchean and Proterozoic zircons were identified in a quartzite sample (01JH63) in the western transect, with $^{207}Pb/^{206}Pb$ ages of 2736±6, 2590±30, 1973 ± 11, 1752 ± 22, and 1576 ± 22 Ma, whereas the oldest grain in the western transect is from a metaconglemerate, with a $^{207}Pb/^{206}Pb$ age of 4348 ± 3 Ma. In the eastern transect, 2750-2500 Ma zircons form a small population and may correlate with the ca. 2650 Ma granitoids described by Pidgeon and Wilde (1998). The Proterozoic zircons cannot be equated with any known rocks in the Narryer Terrane (Cavosie et al., 2004).

Dunn et al. (2005) obtained numerous concordant Neoarchean grains from a quartz-mica schist (sample JH03), located 350 m southeast of the W74 site. This sample also contained concordant Paleoproterozoic grains with ages ranging from 1950-1790 Ma; the youngest grain recording a $^{207}Pb/^{206}Pb$ age of 1797±21 Ma. A metaconglomerate (sample JH04) from the northern part of the belt near Mt Hale contained a similar range of Neoarchean to Paleoproterozoic ages, with the youngest concordant grain recording an age of 1884±32 Ma (Dunn et al., 2005).

More recent work has focused on the Proterozoic events. Spaggiari et al. (2008), in an $^{40}Ar/^{39}Ar$ study, identified that east-west to NE-SW-trending deformation associated with the Capricorn Orogen continued to 1760-1740 Ma and that a younger event at c. 1170 Ma may be related to the widespread emplacement of mafic dykes in the northern Yilgarn Craton (Wingate et al., 2005).

Wilde (2010) reported that zircons from four rare metavolcanic units from the central part of the Jack Hills belt contain oscillatory zoned magmatic zircon with age populations at ~3.4-3.3 Ga, ~3.1-3.0 Ga, ~2.6 Ga and ~1.9-1.8 Ga, the latter defining a maximum age for the volcanic rocks. The zircons have strong oscillatory zoning consistent with an igneous origin and were interpreted as defining the age of crystallization of the volcanic rocks.

Rasmussen et al. (2010), in a U-Pb study of xenotime and monazite, identified a metamorphic event between 1850 and 1820 Ma and also identified authigenic xenotime with a $^{207}Pb/^{206}Pb$ age of 800±25 Ma, an event previously unrecognized at Jack Hills.

Grange et al. (2010) reported several Proterozoic detrital zircons with ages of ca.1220 Ma from rare heavy mineral bands within quartzite cobbles in conglomerate units (site 152), approximately 1 km west of the W74 site. The zircons show magmatic oscillatory zoning that implies at least two sedimentary cycles within the Proterozoic; requiring erosion of an igneous precursor, incorporation into a clastic sediment, induration and subsequent erosion and transport to be hosted in the conglomerate. The nearest source for rocks of this age is the Bangemall Supergroup in the Collier Basin, ~100 km northeast in the Capricorn Orogen.

Detailed sedimentological observations were made at Jack Hills where, in addition to numerous isolated localities, a 320m long stratigraphic section was measured by Eriksson and Wilde (2010). Facies associations are compatible with a prograding fan delta depositional setting in which alluvial fans were sourced by proximal highlands and were built directly into a lake or sea, characterized by high gradients and high flow velocities.

The main source of ancient zircons for which Jack Hills is internationally known is the Eranondoo Hill site, where a specific conglomerate yields ~12% of zircons with ages >4 Ga, making it the richest source of Hadean material currently known on Earth. The zircon crystals are structurally complex, and a range of ages can commonly be obtained from different domains within a single crystal, attesting to their long and complex history. The presence of 3.3 Ga zircon rims around older cores in several rocks suggests multiple recycling of the earliest magmatic zircons (Cavosie et al., 2004)

Because oscillatory zoning of igneous origin defines pristine magmatic domains in many grains, the original source rocks are widely considered to be plutonic igneous rocks (Cavosie, et al., 2006), possibly TTG. Early studies shared the common interpretation that the >4000 Ma zircons originated in igneous rocks. This conclusion was based primarily on grain morphologies and Th and U abundances and/or ratios. However, inferred magma compositions have been controversial. Froude et al. (1983) identified four >4000 Ma zircons from Mt. Narryer and provided a transmitted light picture of one angular 4110 Ma detrital zircon fragment, and concluded they originated in silica-saturated rocks. Compston and Pidgeon (1986) proposed a mafic source for seventeen 4276-3920 Ma detrital zircons from Jack Hills, as they noted the rounded forms, lack of internal zoning and inclusions, and low average U (100ppm) and Th (50ppm) contents. Kinny et al. (1990) reported that four of the >4000 Ma grains reported by Froude et al. (1983) were later found to have younger ca. 3900 Ma rims, which were interpreted as metamorphic. Myers et al. (1992) concludes the sixteen ~4192-3908 Ma detrital zircons from Jack Hills and Mt. Narryer originated in felsic continental rocks, because their simple internal structures, faint euhedral zoning, 'granitic' polyphase inclusions (including quartz, K-feldspar, biotite, chlorite, amphibole, apatite, and monazite), 'crustal' Sc concentrations (up to 46 ppm in cores; analyses by electron microprobe), and high U (up to 650 ppm). Crowley et al. (2005) concluded that for detrital zircons from three conglomerate samples in the western part of the Jack Hills, 4200-3900 Ma zircon make up 14% of the population, 3800-3600 Ma grains form only 2%, and 3550-3250 Ma zircons are dominant with a significant peak at 3380 Ma. These grains were interpreted as being derived from similar rock types because they are indistinguishable in U concentration (50-200 ppm), internal zoning (both oscillatory and sector zoning within the same grain), and morphology (subequant fragments of grains). A previously proposed evolved granitic source is unlikely because the zircon differs significantly in U concentration, internal zoning, and morphology from zircon in typical Archean granitic rocks, such as the 3730-3300 Ma granitic gneisses that surround the Jack Hills belt. More likely sources were intermediate composition plutonic rocks that were distal or perhaps destroyed or removed from the region during Neoarchean tectonism. In contrast, detrital zircon in quartzites and metaconglomerates at Mount Narryer appears to have been derived from granitoids, based on elongate prismatic morphology, fine oscillatory zoning, relatively high U concentration (100-600 ppm), and xenotime and monazite inclusions. Pidgeon and Nemchin (2006) argued that the Jack Hills zircons appear to be dominated by grains with complex internal structures indicating reconstitution or crystallisation in an unknown, high temperature environment, whereas the Narryer zircons have characteristics that suggest dominantly igneous processes with internal structures consistent with crystallization from a granitic magma. They suggested there might be two separate provenances contributing zircons from different source rocks to the Jack Hills and Narryer sediments or it might indicate separate delivery systems stripping material from different source rocks in the same provenance.

Oxygen isotope data from oscillatory domains in several zircon grains (including the oldest) reveal elevated values ($\delta^{18}O$ up to 7.4‰), indicating that they crystallized from the melting of pre-existing supracrustal material that had undergone interaction with low-temperature liquid water (Wilde et al., 2001; Peck et al., 2001; Moszjsis et al., 2001; Cavosie et al., 2005). Such zircons thus represent the earliest evidence for both continental crust and oceans on Earth. Furthermore, isotopic analyses reveal that some of these zircons have fractionated lithium isotope ratios that are much more variable than those recorded from fresh igneous rocks. Values of $\delta^{7}Li$ below -10‰ are present in zircons as old as ~4300 Ma, suggesting that highly weathered regolith was being sampled by these early magmas (Ushikubo et al., 2009). This provides further evidence that the parent magmas of the ancient zircons incorporated material that was itself derived from the surface weathering and erosion of pre-existing rock in the presence of liquid water, supporting the hypothesis that continental crust and oceans existed at ~4300 Ma, within 250 Ma of the formation of Earth. This requires relatively cool temperatures at the Earth's surface between 4400 and 4325 Ma (Valley et al., 2002; Valley 2005).

Additional studies of lutetium and hafnium isotopes in ancient zircons reveal that the precursor material that gave rise to the melts in which the ancient zircons recrystallized had a history extending back to ~4.5 Ga, extremely close to the age of the Earth itself (Kemp et al., 2010).

Kemp et al. (2010) reported subchondritic $^{176}Hf/^{177}Hf$ of Jack Hills detrital zircons, supporting the contention of previous workers (Amelin et al., 1999; Harrison et al., 2005; Blichert-Toft and Albarede, 2008) that separation of a crustal reservoir from chondritic mantle occurred at or before 4.4 Ga. The simpler, broadly linear Hf isotope evolution reflects the protracted intra-crustal reworking of a long lived source with a narrow compositional range, whose average inferred $^{176}Lu/^{177}Hf$ value is consistent with intermediate to mafic igneous rock. Kemp et al. (2010) suggested that such a crustal protolith formed during the solidification of a terrestrial magma ocean, in analogous fashion to lunar KREEP. Note that an earlier study of Hf isotopes (Harrison et al., 2005) recorded positive ε_{Hf} values for some of the ancient zircons, suggesting extensive return of material to the mantle and even early subduction on Earth; but later studies have failed to substantiate these results.

Collectively, these data point to the early development on Earth of both continental crust and water, and require fairly rapid cooling following accretion, melting, and crystallization of any magma ocean that may have been present. Certain zircon grains, some as old as 4.25 Ga, have also been reported to contain minute inclusions of diamond and graphite (Menneken et al., 2007). The origin of the inclusions was uncertain, but they have characteristics similar to diamonds found in zircon that grew within continental crust undergoing ultrahigh pressure metamorphism in subduction zones, possibly suggesting thick crust on Earth at this time. The carbon isotope signature of the diamonds and graphite is strongly negative (medium $\delta^{13}C$ = -31‰), a feature not inconsistent with derivation from a biogenic source, although it is not unambiguous evidence for life and could be the result of inorganic processes (Nemchin et al., 2008). Recent work (Dobrzhinetskaya et al., 2014) has questioned this result and suggests the diamonds are the result of contamination, although the source of the graphite remains ambiguous.

The presence of a distinct magnetic component at high unblocking temperatures in the Jack Hills metaconglomerate clasts indicates the presence of an ancient magnetizing field (Tarduno et al. 2013).

Chapter 3 Stratigraphy along the Traverse Line

3.1 Description of the Traverse

The traverse was 1010 m long, and 157 rock samples were collected. It started from the BIF at the southern extremity of the belt on the eastern flank of Eranondoo Hill, and terminated at the northern boundary where amphibolite is in contact with granite (Fig 3.1).

All rocks in the Jack Hills belt have been metamorphosed to greenschist or amphibolites facies, and so for convenience the prefix ‘meta’ has been omitted in the description of various rock units. Instead, sedimentary terms are used for the rock classification. Samples collected along the traverse were classified by grain size (Fig 3.2). However, where the rocks have an intense metamorphic fabric, metamorphic rock names are used, including schist, quartzite, and amphibolite.

The rocks along the traverse are classified into several main types, these are: shale, siltstone, schist, sandstone, arenite, conglomerate, quartzite, chert, and mafic and ultramafic rocks. All the rock units are subvertical, and a uniform ~280° foliation is observed in the schist units. Although structural information was recorded, it is difficult to integrate this, since most features were not traced beyond 50 m either side of the traverse line.

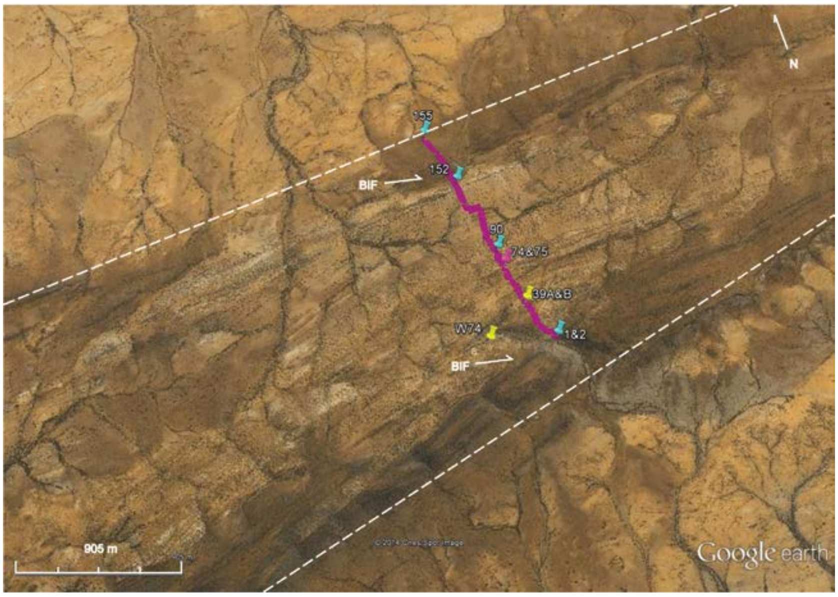


Figure 3.1 Google Earth Image of the Jack Hills Traverse. Dashed line shows the limit of the Jack Hills belt.

The first sample location is where BIF (JH10001) is in sharp contact with siltstone (JH10002) at the southern end of the belt (Fig 3.2). The siltstone is ~8 m thick, and grades into schist. The schist is 45 m in thickness, consisting in total of 28 m of chloritic schist and 17 m of silicious schist (JH10009, 10, 12). The schist is interleaved with a 5 m single layer of matrix-supported conglomerate (JH10005) from 17 to 22 m. Coarse-grained sandstone was present from 57 to 62 m, and is also interleaved with the schist.

To the north of the schist, from 65 to 202 m, the traverse is dominated by coarse-grained clastic sedimentary rocks, including coarse-grained sandstone, quartz arenite, and quartz-pebble conglomerate. A thin layer of quartzite is also present from 170 to 176 m.

In the thick coarse-grained sandstone unit that started at 65 m, there is a synformal fold developed (JH10019), plunging 40° to the west at 280° (measured at 85 m). An intersection lineation is well developed in this area. The bedding of the coarse-grained sandstone is at an angle to the cleavage (Fig 3.3 A). It appears, from the strike of this unit that it may be a continuation of the W74 site.

A 6 m conglomerate band was observed in contact with the coarse-grained sandstone from 94 to 100 m. From 111 to 144 m, two 6 m layers of quartz arenite were observed interbedding with cross-bedded coarse-grained sandstone (Fig 3.3 B). Cross-bedding is well developed on top of the hill (at 105-140 m) and faces upwards at this location. From 144 to 170 m, there is coherent coarse-grained sandstone, and it extends hundreds of metres laterally, in sharp contact with 6 m of quartzite. From 176 to 202 m, there is massive quartz-pebble conglomerate, with individual beds up to 1 m thick; it is weakly foliated and extends hundreds of metres laterally.

From 202 to 212 m, another 10 m of coarse-grained sandstone is present. At 212 m, a sharp contact was observed between the coarse-grained sandstone and schist, with samples JH10039A and JH10039B taken from the same GPS location. This site was thought to be a potential Proterozoic-Archean contact in the field.

The traverse is dominated by schist from 212 to 248 m. It commences with ~30 m thickness of fine-grained schist interleaved with ~7 m of quartzite; some of the schist is crenulated. North of the schist, there is a single ~5 m layer of purple shale (JH10044).

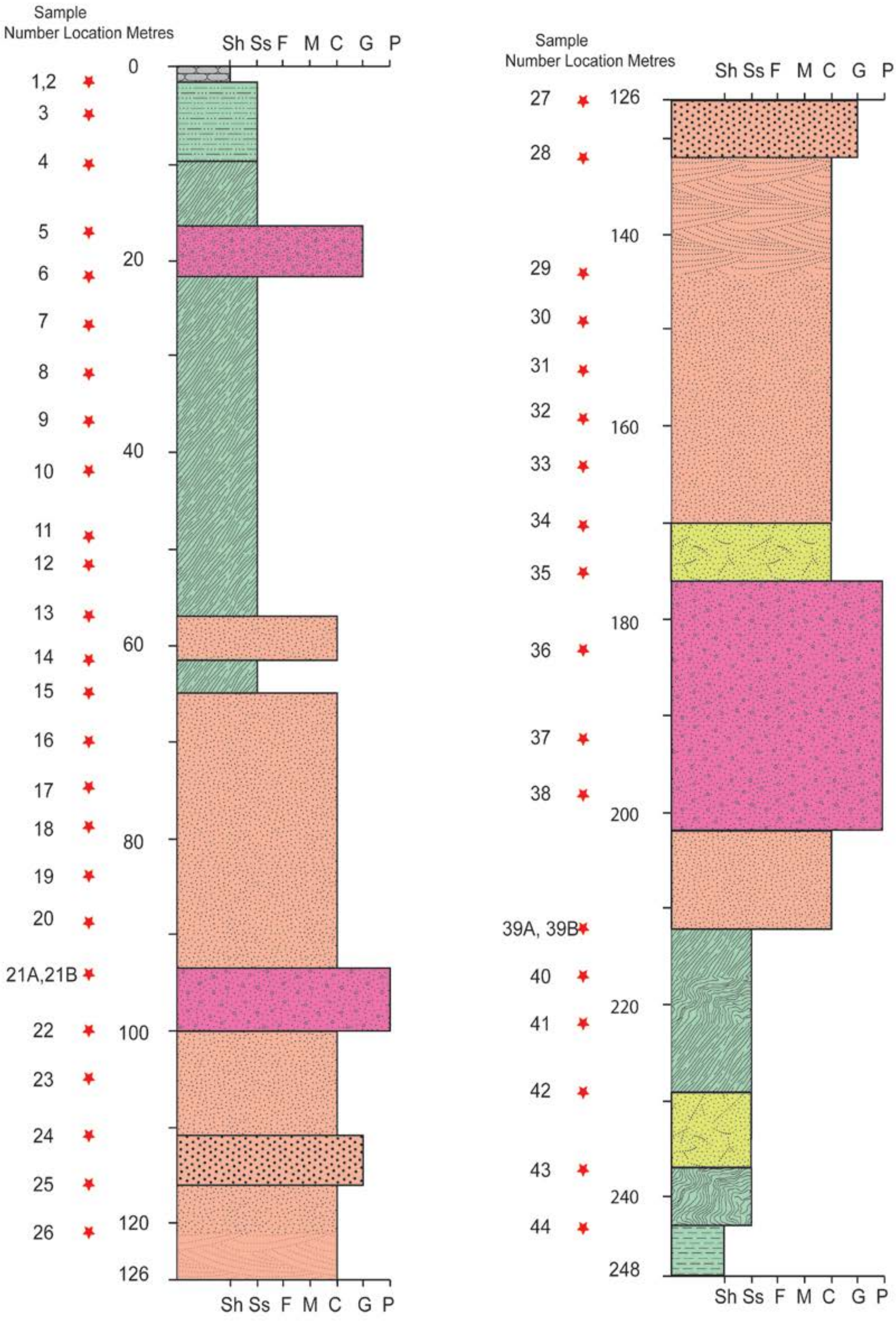


Figure 3.2 Stratigraphic section along the traverse showing location of samples.

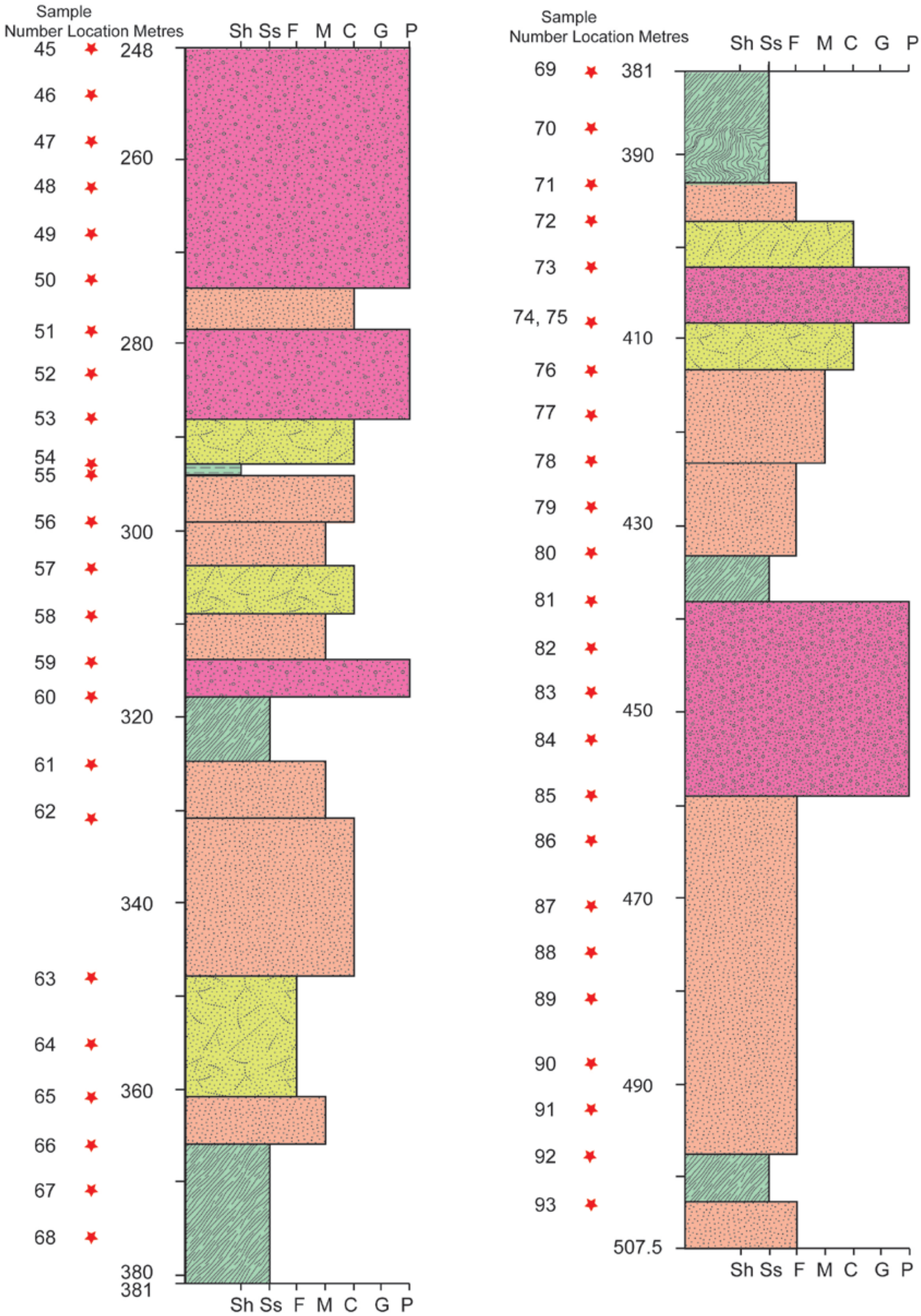


Figure 3.2 continued.

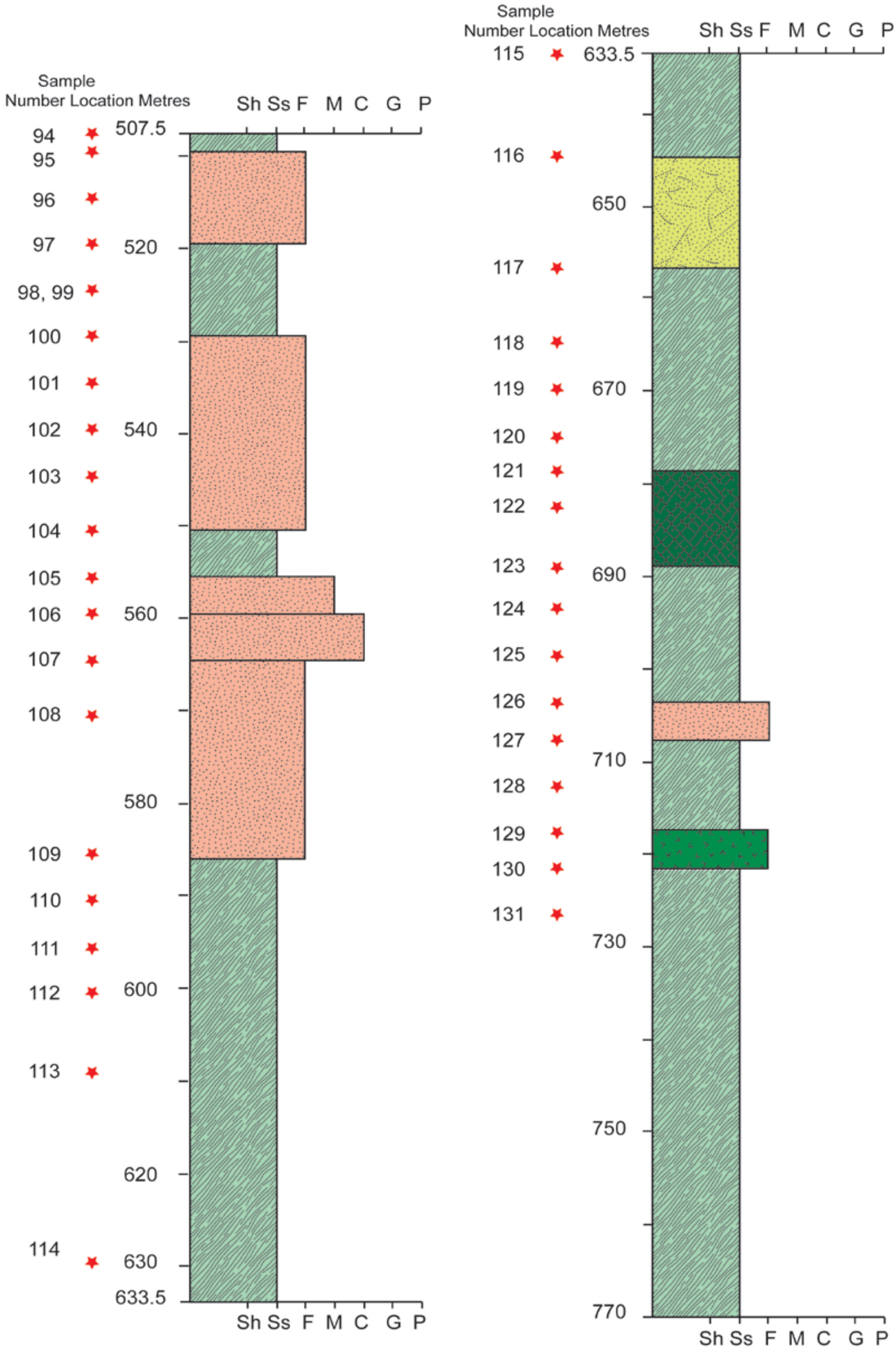


Figure 3.2 continued.

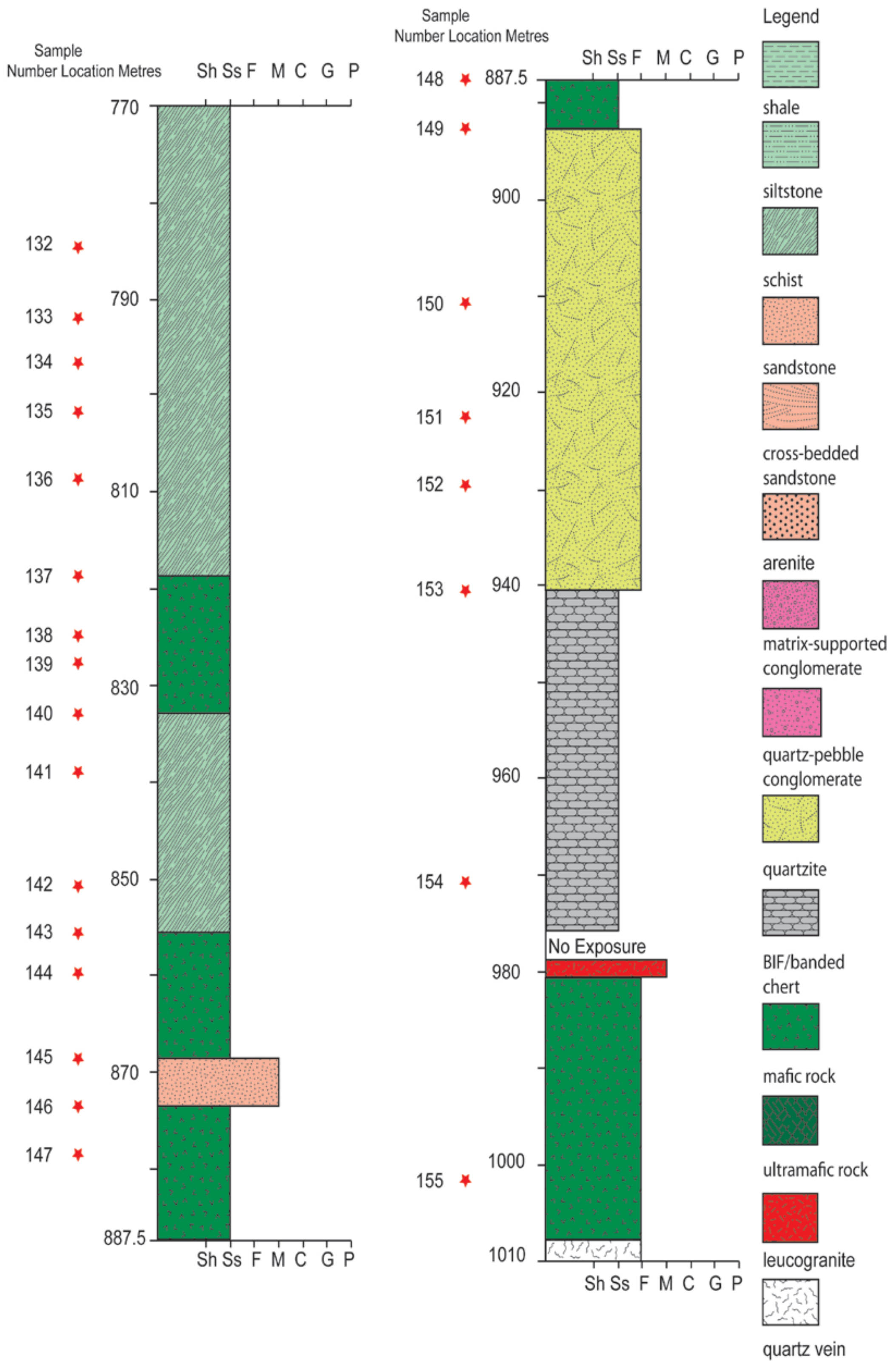


Figure 3.2 continued. Stratigraphic column along the traverse showing location of samples. Sh. shale, Ss. siltstone, F. fine-grained sandstone, M. medium-grained sandstone, C. coarse-grained sandstone, G. gritstone, P. pebble conglomerate. The red asterisks represent sample locations.

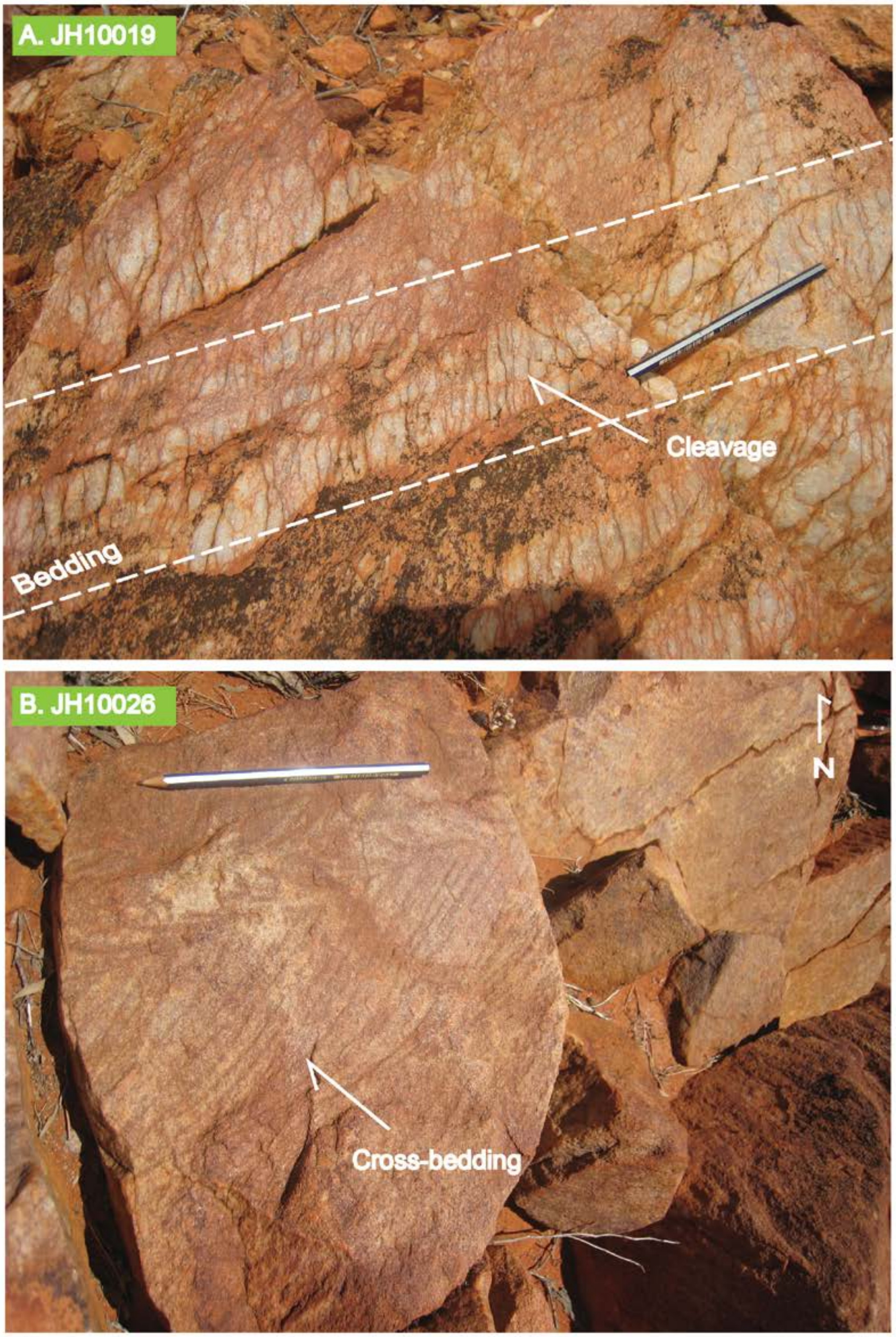


Figure 3.3 Outcrop photographs along the Jack Hills traverse. A. The bedding of the coarse-grained sandstone (JH10019) is at an angle to the cleavage. B. Cross-bedding in coarse-grained sandstone JH10026.

Figure 3.4 Continued. Outcrop photographs along the Jack Hills traverse. C. Contact between coarse-grained sandstone (JH10039A) and schist (JH10039B). D. Outcrop of pebble conglomerate (JH10049).

Figure 3.5 Continued. Outcrop photographs along the Jack Hills traverse. E. Contact between quartzite (JH10072) and matrix-supported conglomerate (JH10073). F. Quartz vein marks the northern boundary of the Jack Hills belt.

The succession from ~248 m to ~325 m (samples JH10045 to 60) is dominated by pebble-conglomerate and medium- to coarse-grained sandstone associated with quartzite; there are also ~1 m thick layers of shale and ~ 5 m of schist. Pebble conglomerate (JH10045 to 49, Fig 3.3 D) up to 25 m thick is in sharp contact with purple shale and coarse-grained sandstone. A single layer of pebble conglomerate is 1 m thick, interbedded with coarse-grained sandstone with graded bedding. Another two layers of conglomerate (JH10051-53 at 278-288 m, JH10059 at 314-318 m) are in sharp contact with quartzite and sandstone.

The succession from 325 to 393 m (samples JH10061-70) consists of medium- to coarse-grained sandstone (at 325-348 m and 361-366 m), interlayered with 13 m of quartzite (at 348-361 m), and schist (at 366-393 m), which is locally crenulated. From 393 to 438 m (samples JH10071-80) is a succession that starts with ~5 m of fine-grained sandstone, followed by 5 m of quartzite and 6 m of matrix-supported conglomerate (Fig 3.3 E). Then there is another 5 m of quartzite associated with 20 m of medium- to fine-grained sandstone, and 5 m of schist. From 438 to 459 m, there is 21 m of matrix-supported conglomerate (JH10081-84). This matrix-supported conglomerate shows a variety of colours, from purple, light grey to greenish grey. The clasts consist of lenticular quartz and sandstone fragments (up to 1 cm in diameter), moderately sorted, and well rounded. The matrix is fine-grained, and ~2 mm laminations are evident in some areas (e.g. JH10081).

From 459-586 m (JH10085-JH12108), there is fine-grained sandstone interleaved with schist. The sandstone is up to ~35 m thick, and the grain-size becomes slightly coarser at 555-564 m (JH12105-106).

From 586 to 892.5 m (JH12109-148), the traverse is dominated by schist. It is interleaved with fine-grained sandstone, quartzite, and mafic and ultramafic rocks. The quartzite occurs from 644.5-656.5 m, and is in sharp contact with the schist. The fine-grained sandstone extends from 704 to 708 m, and appears to grade into the schist. There are four mafic dykes evident which are parallel to the ~280° foliation, these occur at 718-722, 819-833, 855.5-868.5, 873.5-892.5 m, and there is a 5 m thick unit of medium-grained sandstone between the last two mafic dykes from 868.5 to 873.5 m (JH12145). The ultramafic rock occurs from 678.5 to 688.5 m.

From 892.5 to 940.5 m, there is 58 m of quartzite. The quartzite is massive, flaggy, and in sharp contact with mafic dyke. Sample JH12150 is white, extremely pure in composition. There is a consistent lineation evident in sample JH12150 plunging 20°

to the west. Boudinaged quartz veins and kinking were observed in the quartzite 15 m east of the JH12152 location.

From 940.5 to 975.5 m, banded chert and BIF form the last ridge of the Jack Hills belt, in sharp contact with quartzite. To the north of the ridge, there is an area without any outcrop. Further north at ~980 m, amphibolite is in sharp contact with leucogranite. The amphibolite is 27 m in thickness, and cut by a quartz vein. This quartz vein is not continuous, and only extends tens of metres laterally. However, granite occurs to the north of the quartz vein and it thus marks the northern boundary of the Jack Hills belt (Fig 3.3 F). The contact between the quartz vein and the granite is uncertain, but appear to be meshed by a quartz-bearing shear zone.

Overall, coarse-grained sandstone and conglomerate are more abundant along the southern part of the traverse, whereas the northern part is finer-grained and made up mostly of schist and mafic and ultramafic rocks

3.2 Rock Descriptions

Composite rock descriptions are presented in the sequence shale and siltstone, sandstone, conglomerate, schist, quartzite, chert, and mafic and ultramafic rocks. Both hand specimen and thin section images are presented.

3.2.1 Shale and Siltstone

Only two layers of shale occur along the traverse. They only occur in 1 m (JH10054) to 5 m (JH10044) intervals, and thus make up a very minor component of the sedimentary sequence. Both layers have a distinctive purple colour and are weakly foliated. The accessory minerals consist of chromite, detrital zircon (<30 μm, only found in JH10054 by SEM, no grains could be separated), monazite (<10 μm), and barite.

The siltstone occurs as an 8 m thick unit at the southern end of the traverse (JH10002&3). Sample JH10002 (Fig 3.4 A) is light grey, fine-grained, coherent, and the dominant minerals are quartz and muscovite (Fig 3.5 A), the grain size in a lenticular quartz band in the middle of the image (Fig 3.5 A) is up to 200 μm, whereas the grain size of quartz in the matrix is less than 100 μm, and the muscovite and quartz grains are strongly aligned. The accessory minerals consist of chalcopyrite, monazite, barite and iron-oxides. No zircon was observed in the siltstone.

3.2.2 Schist

The schist is mainly deformed siltstone and shale, and reflects zones where fabric development is more intense. It occupies a total of 355 m along the traverse. The schist intervals are up to 100 m thick in the northern part of the traverse, and up to 30 m thick in the southern section. A uniform ~280° foliation is observed in the schist, and crenulation is present in the southern part (e.g. JH10040, JH10043). There are chloritic, silicious and mafic schist varieties, as well as local andalusite-bearing schist.

Chlorite schist is the most common variety, and it extends hundreds of metres laterally, whereas silicious schist occurs locally in a limited area at the southern end of the traverse (JH10009, 10 and 12). Mafic schist is in gradational contact with the mafic rocks at the northern end of the traverse. Muscovite and quartz are the most common minerals in these schists. Sample JH12104 has andalusite porphyroblasts (Fig 3.4 D). The accessory minerals consist of detrital zircon, barite, galena, monazite, and xenotime (only one piece less than 10 μm in diameter found in JH10039B).

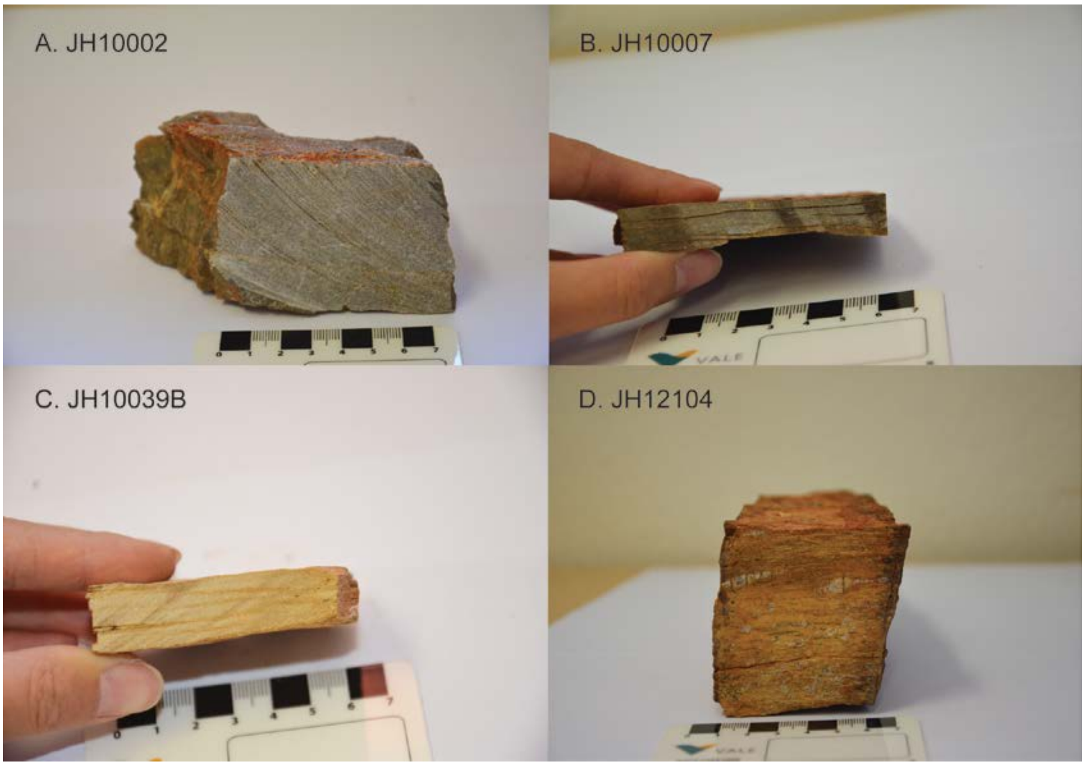


Figure 3.6 Hand specimen images of siltstone and schist. A. siltstone. B-D. schist.

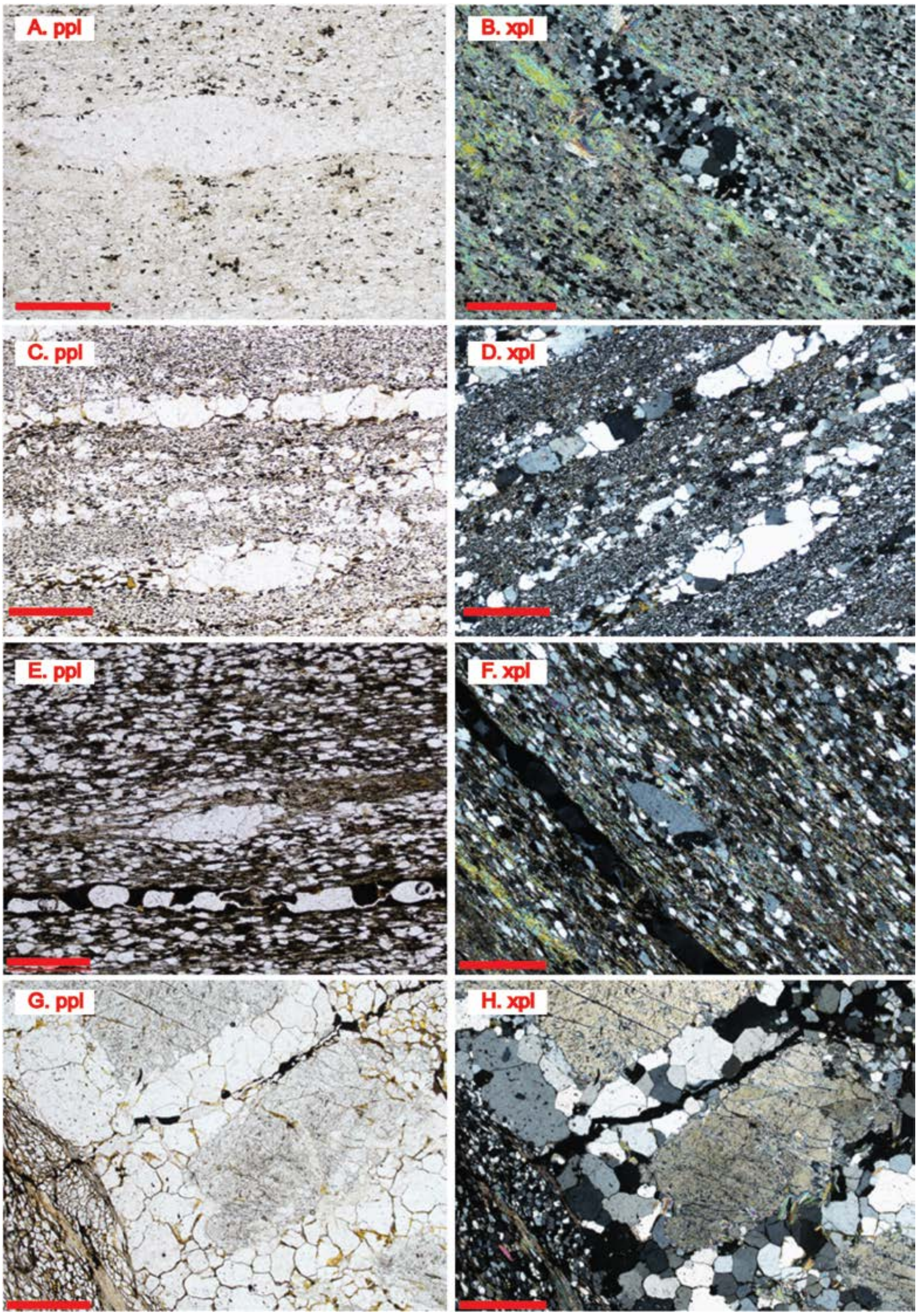


Figure 3.7 Photomicrographs of the siltstone and schist. A-B. JH10002 siltstone, C-D. JH12127 chloritic schist, E-F. JH10007 chloritic schist, G-H. JH12104 andalusite schist. ppl. plane polarized light, xpl. crossed polarized light. The scale bars of A-B and G-H are 1000 μm; the scale bars of C-F are 500 μm. The reason why xpl images are at a 45° angle to the ppl images is to emphasize the interference colour of muscovite in the xpl image.

Sample JH12127 is fine-grained chloritic schist (Fig 3.5 C-D).There are ribbon quartz grains showing later sub-grain formation, and the grain size difference between quartz defines the foliation in this rock. The quartz grains in the lenticular veins are more resistant to recrystallisation, with a grain size up to 300 μm, whereas the quartz in the matrix is less than 50 μm in diameter. This sample could potentially be a low-grade mylonite.

Sample JH10007 (Fig 3.4 B, Fig 3.5 E-F) is a schist dominated by quartz, muscovite and chlorite. The quartz and muscovite grains are strongly aligned, which defined the foliation. The plane polarised light image shows a microboudinage texture in the quartz band. Monazite and pyrite are also evident in this sample.

Sample JH12104 (Fig 3.4 D, Fig 3.5 G-H) is the only andalusite schist present along the traverse and it has porphyroblastic texture. The andalusite porphyroblasts are up to 3 mm in diameter with one dominant cleavage, which is not parallel to the compositional layer defined by quartz grains. There are grain-size variations between the quartz bands, which define the foliation of the rock. The fine-grained quartz layers include muscovite, which is strongly aligned parallel to the quartz grain-size variation, whereas andalusite porphyroblasts grew in the coarse-grained quartz bands, suggesting the coarse-grained quartz bands were richer in aluminium. The muscovite adjacent to the andalusite porphyroblasts is due to later alteration.

3.2.3 Sandstone and Arenite

Sandstone occupies a total thickness of 299.5 m along the traverse. It is classified as fine-, medium-, and coarse-grained sandstone (forming 113.5 m, 40 m, and 135 m), with 11 m of local quartz arenite.

The coarse-grained sandstone at the southern end of the traverse (before sample JH10062) is in sharp contact with schist, conglomerate and quartzite. The coarse-grained sandstone beds are well-developed intermittently from 65-212 m, and extend hundreds of metres laterally. Cross bedding is developed in coarse-grained sandstone (122-144 m) near the southern side of the traverse. The coarse-grained sandstone is orange brown, massive, ferruginous, and consists mainly of quartz grains in a quartz and feldspar-rich matrix (Fig 3.6 D). The quartz grains are moderate to well-rounded and well-sorted, average 2 mm in diameter, and range up to 4 mm in diameter. The matrix is pinkish brown, fine-grained, and displays moderate sorting and rounding (Fig 3.6 D). The coarse-grained sandstone, such as sample JH10062 (Fig 3.7 A-B) consists of quartz grains up to 1 mm, and they are

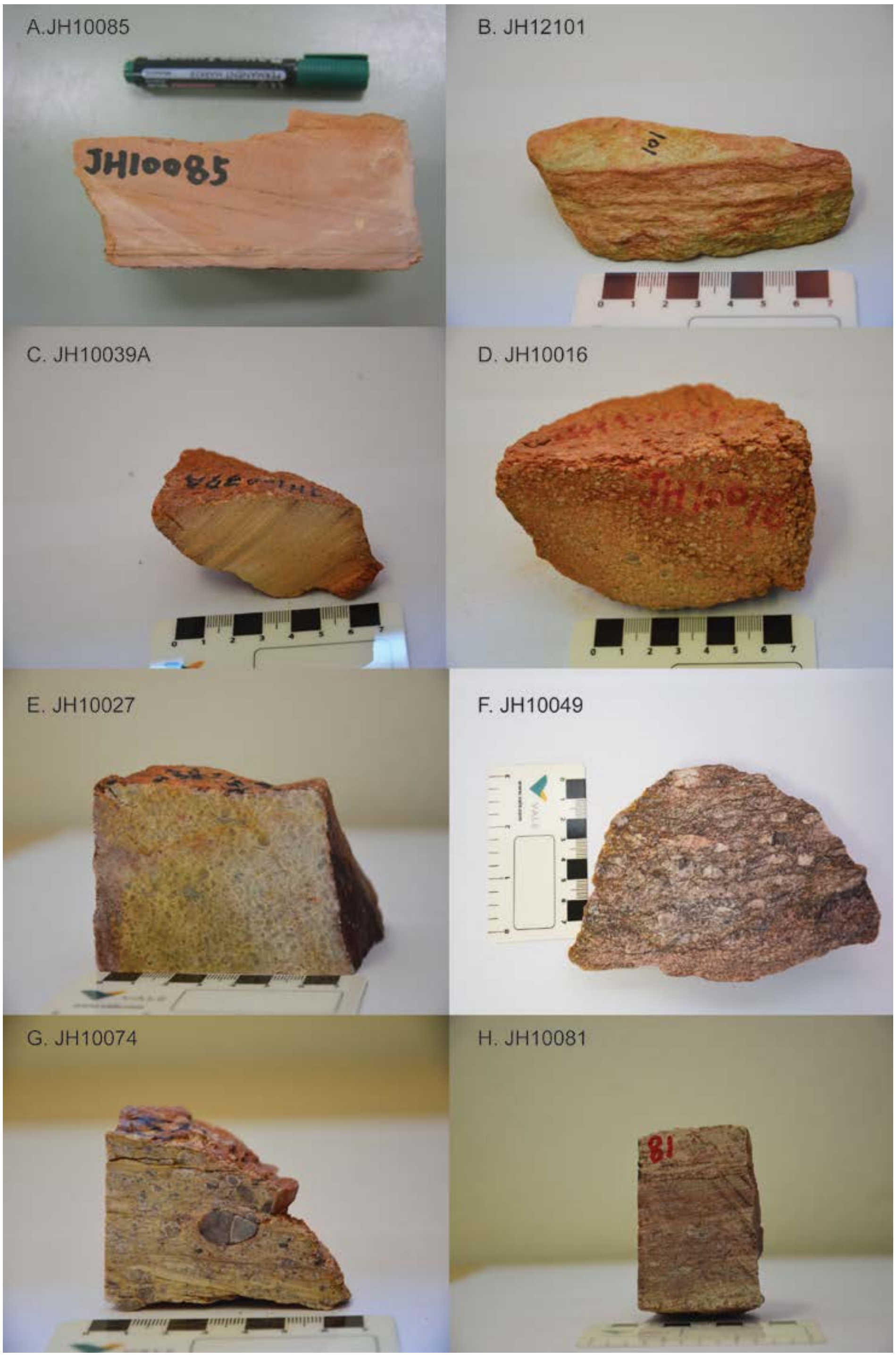


Figure 3.8 Hand specimen images of sandstone and conglomerate. A-B. fine-grained sandstone, C-D. coarse-grained sandstone, E. arenite, F. pebble conglomerate, G-H. matrix-supported conglomerate.

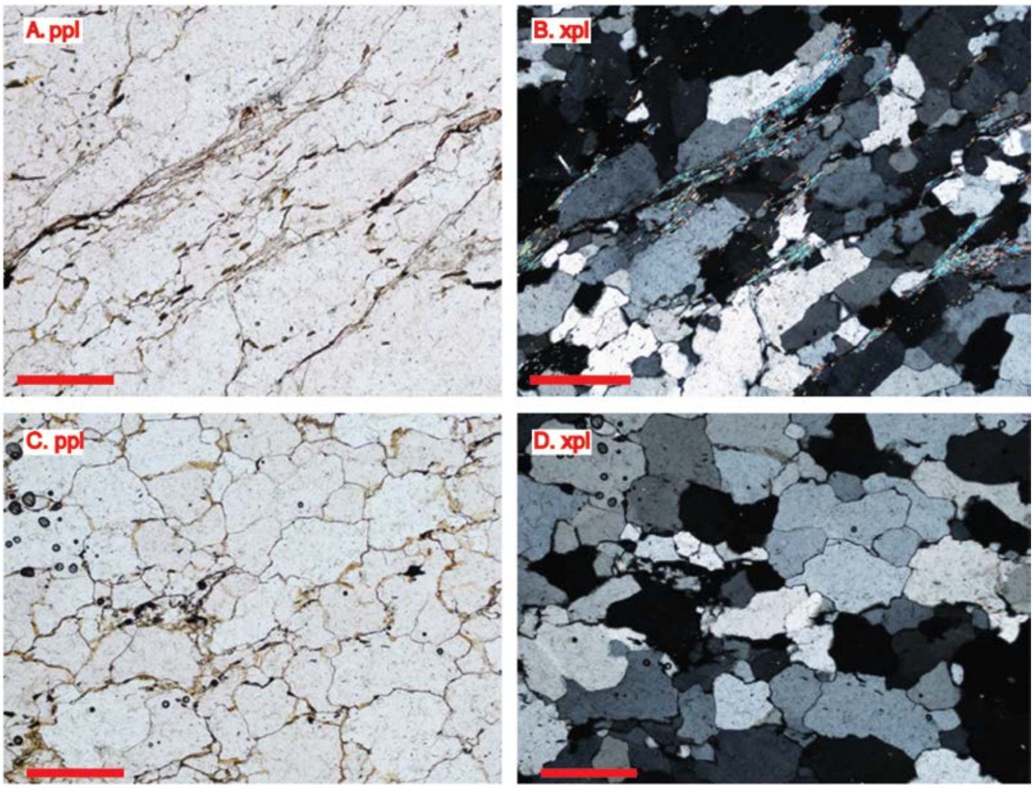


Figure 3.9 Photomicrographs of sandstone and arenite. A-B. JH10062 coarse-grained sandstone, C-D. JH10024 arenite, ppl. plane polarizer. xpl: crossed polarizer. Scale bars for A-B are 1000 μm, for C-D are 500 μm.

elongated and aligned with muscovite.The accessory minerals consist of zircon, monazite, rutile, chromite, pyrite and chalcopyrite.

The fine- and medium-grained sandstone is present mainly at the middle and northern end of the traverse. The thickness of the fine-grained sandstone beds is up to 38.5 m in the middle of the traverse (Fig 3.2, JH10085-91), whereas the thickness of the medium-grained sandstone beds is up to 42 m (Fig 3.2, JH12100-103, 107-109). Sedimentary structures are dominated by horizontal stratification with laminae typically less than 2.0 mm thick in both the fine- and medium-grained sandstone.

The fine- and medium-grained sandstone tend to be associated with each other. They occur in sharp contact with schist, matrix-supported conglomerate and quartzite, and have gradational contacts with coarse-grained sandstone. Fine- and medium-grained sandstone are similar in handspecimen, the only difference is the grain size. The average grain size for fine-graind sandstone is ~200 μm, whereas the average for medium-grained sandstone is ~300 μm. Both rock-types are light cream to pinkish brown in colour, massive, and rich in muscovite and K-feldspar. The matrix is well-sorted and well-rounded; fuchsite is a common mineral (JH12101, Fig 3.6 B). Laminations 1-2 mm thick are evident in some samples (JH10081, Fig 3.6 H). Accessoty minerals include rutile, barite, iron-oxides, galena, and monazite.

The arenite beds typically are less than 6 m thick, tabular, in sharp contact with coarse-grained sandstone at the southern end of the belt, and can be traced laterally for tens of metres. The arenite is light orange to light cream, massive, clast-supported, and with well-sorted and well-rounded quartz grains, ranging from 2 mm up to 5 mm (Fig 3.6 E).

Arenite JH10024 (Fig 3.7 C-D) is dominated by quartz. The grain size is from 200 to 500 µm. The quartz grains are well-sorted and well-rounded and interlocking with each other.

3.2.4 Conglomerate

The conglomerate beds occur up to 103 m in thickness along the traverse. They consist of pebble conglomerate and matrix-supported conglomerate, and both of them occur at the southern end of the traverse.

The pebble conglomerate has a total thickness of 71 m. Individual beds are up to 25 m in thickness (JH10035-38, JH10045-49), interbedded with coarse-grained sandstone, and in sharp contact with quartzite and shale. Conglomerate-sandstone interbeds are prominent at the southern end of the traverse (JH10045-53).

Pebble conglomerate is purple grey, clast-supported, well compacted, and consists of polycrystalline aggregates of interlocking quartz and K-feldspar, that are well-rounded and well-sorted, but flattened and oblate. The average size of the pebbles is 1 cm, but the long axis of the flattened pebble are up to 10 cm. The matrix is fine-grained, well-sorted and well-rounded, consisting exclusively of quartz and minor muscovite. Quartz grains have undergone recrystallization, and the muscovite occurs along the quartz grain boundaries with a slight preferred orientation (Fig 3.8 A-B), which defines a spaced foliation. Accessory minerals are extremely abundant in the matrix, including zircon, chromite, fuchsite, rutile, monazite and magnetite.

The matrix-supported conglomerate is 32 m in total thickness and occurs in three layers along the traverse. There is a 5 m thick unit at the southern extremity of the belt (JH10005), associated with fine-grained schist; another layer is 6 m thick (JH10073-74), in sharp contact with quartzite; the thickest layer is 21 m (JH10081-84), in sharp contact with schist and fine-grained sandstone. The matrix-supported conglomerate extends up to hundreds of metres laterally and forms good marker

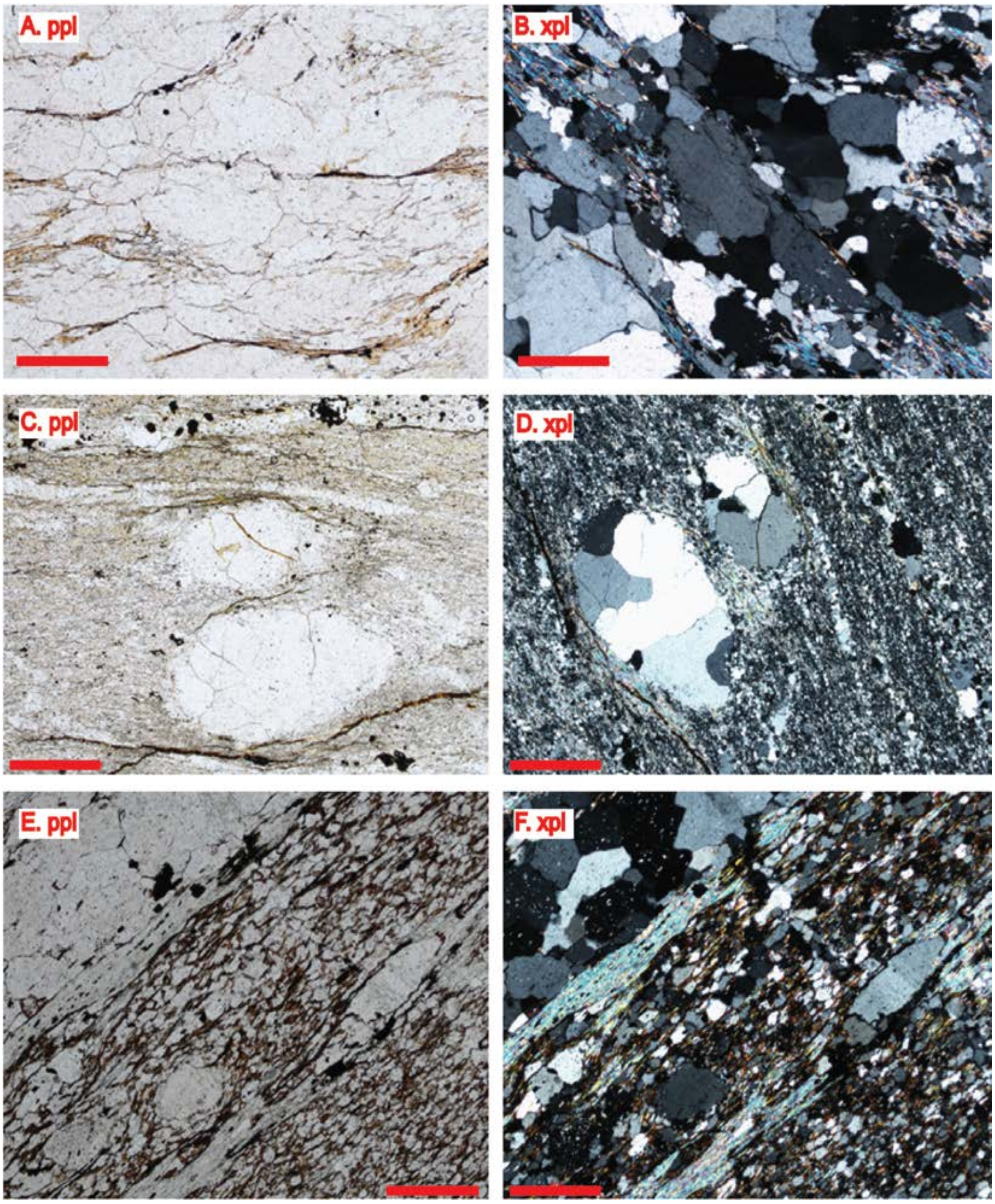


Figure 3.10 Thin section images of conglomerate. A-B. JH10049 pebble conglomerate. C-D. JH10005 matrix-supported conglomerate. E-F. JH10081 matrix-supported conglomerate. ppl: plane polarizer. xpl: crossed polarizer. Scale bars are 500 μm.

horizons. Large cobbles are evident in the middle of the belt (JH10073-74, 81-84), but rocks in the southern part of the belt are devoid of large cobbles (JH10005).

The matrix- supported conglomerate is light pink to purple brown, well compacted, and consists of flattened quartz or sandstone clasts from 1 cm to 20 cm in diameter. The large cobbles were avoided during sampling. The matrix is fine-grained, moderate to well sorted and well rounded, consisting of K-feldspar-rich sandstone fragments (Fig 3.6 H), and there are laminations parallel to the flattened quartz and sandstone clasts, as thick as 2 mm (Fig 3.6 G, H). Fuchsite and zircon are common accessory minerals in sample JH10074, whereas pyrite, iron-oxides, barite, and monazite are common in matrix-supported conglomerate sample JH10081-84.

Matrix-supported conglomerate sample JH10005 (Fig 3.8 C-D) is fine-grained, and dominated by quartz and muscovite. Quartz clasts are flattened, wrapped by fine-grained muscovite, which defines a schistosity. Quartz-dominated bands are up to 0.5 mm in width; the grain-size in different layers varies.

Another matrix-supported conglomerate is sample JH10081 (Fig 3.6 H, Fig 3.8 E-F), which is iron-rich and dominated by quartz and muscovite. Quartz clasts are up to ~1 cm in diameter and are flattened. Muscovite is strongly aligned and defines the foliation. The matrix consists of quartz, feldspar, and sandstone clasts. A spaced foliation can be observed in hand specimen and the colour is pale grey to greyish red, suggesting the presence of the iron oxides; pyrite and barite are also present.

3.2.5 Quartzite

Quartzite occupies a total thickness of 107 m along the traverse. At the southern end, the quartzite is in sharp contact with conglomerate and sandstone, with a thickness up to 13 m (JH10063-64); at the northern extremity of the traverse, the quartzite is in sharp contact with mafic rocks and chert, and occupies a total thickness of 50 m (JH12149-152).

The quartzite varies in colour from light green to white, to light orange brown (Fig 3.9 A-D). It consists of granoblastic interlocking grains of quartz up to 1 mm in diameter (Fig 3.10 A-B). Fuchsite between layers defines a spaced foliation. Accessory mineral include zircon, fuchsite, monazite, and galena.

3.2.6 Chert

Chert (Fig 3.10 C-D) is only present at the northern extremity of the traverse, and is 37 m in thickness, in sharp contact with quartzite and amphibolite. Sample JH12153 (Fig 3.11 A) is a cryptocrystalline banded chert. The bands are up to 0.5 cm thick, and from white, pink to light grey in colour. This rock is massive and coherent, in sharp contact with and quartzite at the northern extremity of the belt. It is also in transitional contact with the BIF at the northern end of the traverse. Sample JH12154 (Fig 3.10 B, 3.11 B) is cryptocrystalline, and is yellowish brown with a light grey quartz band. The different grain size of quartz defines the laminations. There are also some amphiboles in thin section.

Figure 3.11 Hand specimens of quartzite.

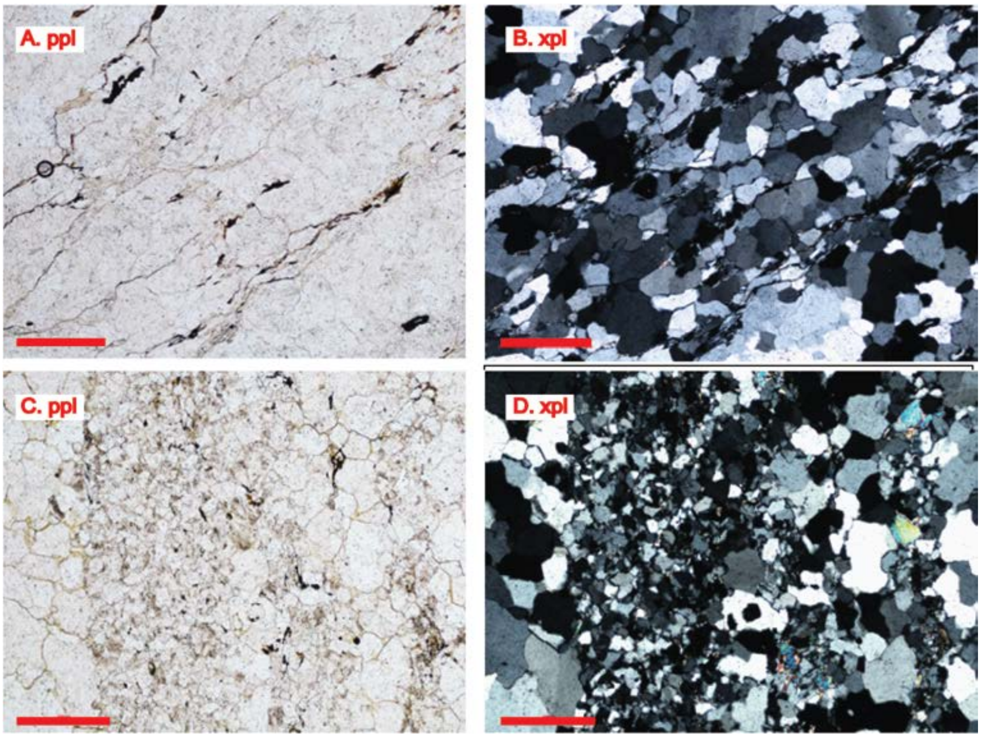


Figure 3.12 Thin Section images of quartzite and chert. A-B. JH12152 quartzite, C-D. JH12154 chert. ppl. plane polarized light, xpl. crossed polarized light. The scale bars are 500 μm.

3.2.7 Mafic and Ultramafic Rocks

Ten samples of mafic and two of ultramafic rock were collected. Mafic rocks make-up a total of 56 m in thickness along the traverse, whereas ultramafic rocks only occupy 10 m.

The mafic rocks are all amphibolite, and they are dark greenish-grey, fine-grained, massive, and consist of amphibole and plagioclase. The ultramafic rocks are dark grey and consist almost entirely of amphibole. The grain-size of the amphiboles varies from ~100 μm (JH12138) up to 1 mm (JH12155). The quartz content of fine-grained sample JH12138 is much higher than in other samples, because of lenticular quartz bands (Fig 3.12 A-B), but these are not an original feature of the rock; they are quartz veins intruded during later deformation. The veins define a spaced foliation.

Figure 3.13 Hand specimens of chert , mafic and ultramafic rocks. A. banded chert, B. chert, C-D. amphibolite, E-F. ultramafic rock.

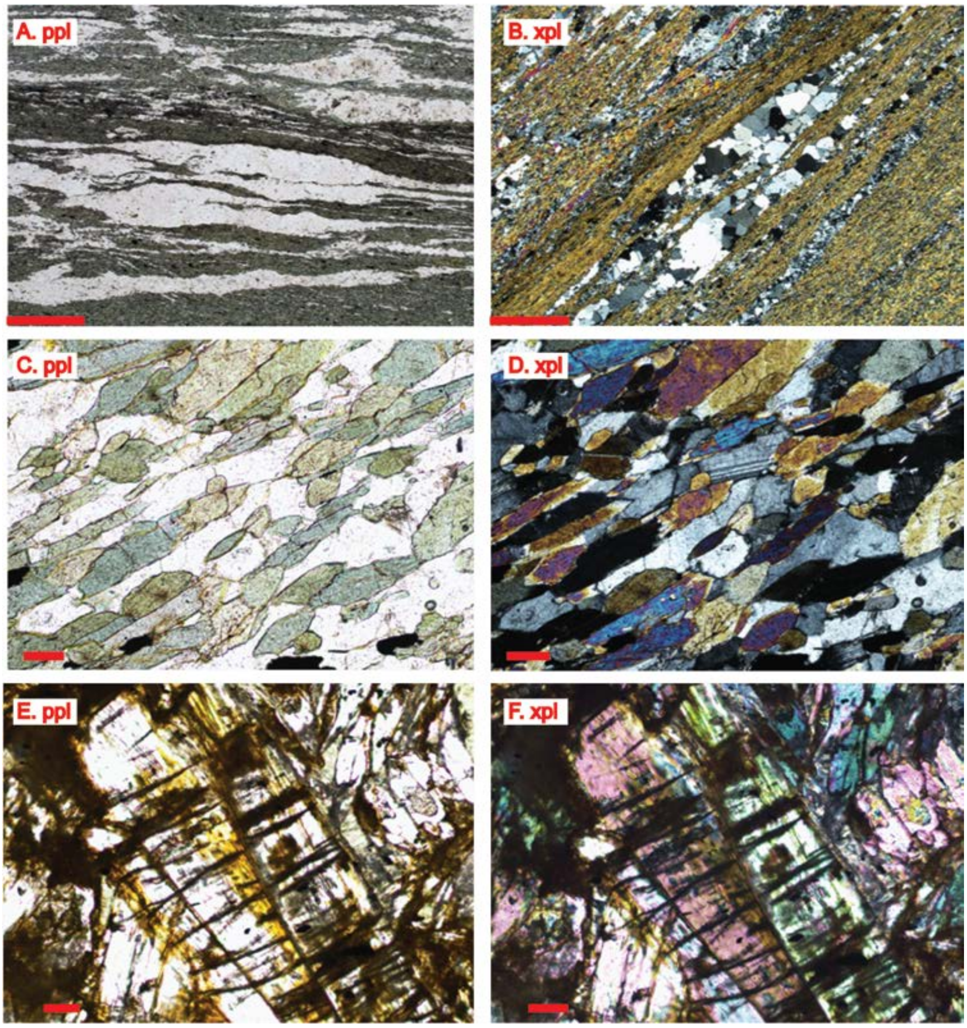


Figure 3.14 Thin section images of mafic and ultramafic rocks. A-B. JH12138 amphibolite, C-D. JH12155 amphibolite, E-F. JH12122 ultramafic rock. ppl. plane polarized light, xpl. crossed polarized light. Scale bars of A-B are 1000 μm. Scale bars of B-F are 100 μm.

Sample JH12138 (Fig 3.11 C, Fig 3.12 A-B) is a representative sample of the fine-grained mafic rocks at the northern end of the Jack Hills belt. It is dark greenish grey, fine-grained, and mainly consists of hornblende and quartz. Most hornblende is <0.1 mm in diameter and has a strong pleochoism (α=pale yellowish green, β=light green, γ=dark green) in plane polarized light, and strongly aligned in the compositional bands. The grain-size of quartz is coarser in the lenticular bands than elsewhere in the thin section, and the lenticular bands define the foliation. No plagioclase was identified in thin section.

Sample JH12155 (Fig 3.11 D, Fig 3.12 C-D) is an amphibolite collected 6 m south of contact with granite at the northern extremity of the belt. It is dominated by hornblende and plagioclase, with the hornblende showing strong pleochoism (α=pale yellowish green, β=light green, γ=dark green). Hornblende makes-up 40% of the rock and is strongly aligned, with grain size varying from 100 to 500 μm. The plagioclase occupies the remaining 60% of the rock; multiple albite twinning is evident.

Sample JH12122 (Fig 3.11F, Fig 3.12 E-F) is an ultramafic rock with decussate texture. Bladed colourless crystals of tremolite-actinolite are ~1 mm in length.

Chapter 4 Zircon U-Pb Geochronological Results

Altogether, 51 samples were analysed for U-Pb geochronology by LA-ICP-MS and SHRIMP II. For most of the samples analysed by ICP-MS, more than 200 grains were selected from each rock; for samples analysed by SHRIMP (Appendix B), all the available grains were analysed. Seven samples (Table 4.1) yielding low amounts of zircon (<30 zircon grains) were also analysed to provide additional age information. A total of more than 5000 zircon grains were analysed by LA-ICP-MS (Appendix C), and another 996 by SHRIMP. Of these 2133 and 686 grains, respectively, yielded concordant $^{207}Pb/^{206}Pb$ ages (within 90% concordance). All the U-Pb ages presented here are older than 1.0 Ga, so the ages quoted are the ^{204}Pb corrected $^{207}Pb/^{206}Pb$ ages. For most zircon grains, only one spot was chosen due to the grain size, however, for samples with fewer zircons (sample JH10007), multiple spots were analysed on large grains where variations in CL image were observed. Even on grains with duplicate analyses, in most cases only one concordant age was obtained.

4.1 Results for Each Rock Type

4.1.1 Siltstone and Schist

No zircon grains were found in any siltstone samples along the traverse, and only four chlorite schist samples contained zircon grains suitable for U-Pb analysis, and these were analysed by SHRIMP II at Curtin University.

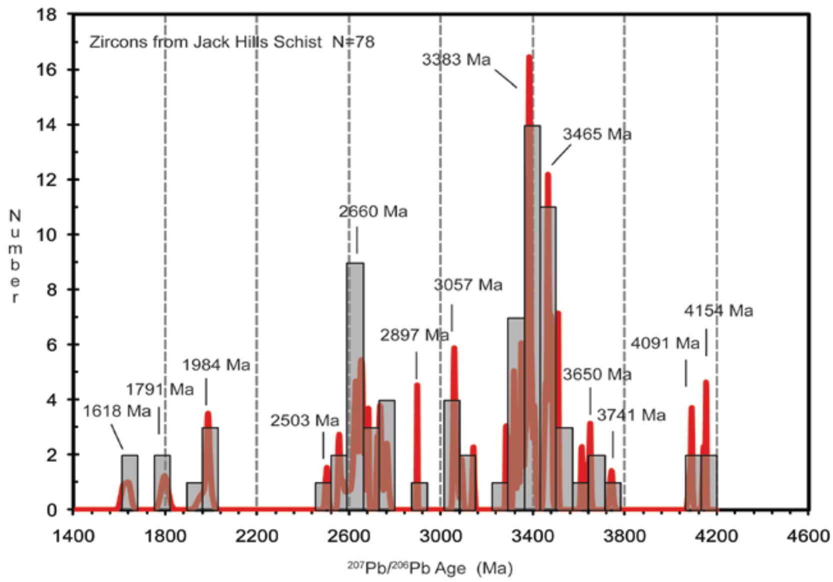


Figure 4.1 Histogram and Gaussian summation probability density plots of detrital zircons for all schist samples along the traverse in the Jack Hills Belt.

Table 4.1 Analytical information and zircon age peaks along the traverse.

Sample No.	Rock Type	Distance along the Traverse (m)	Zircon Number			Instrument	$^{207}Pb/^{206}Pb$ Age (Ma)				Age Peaks (Ma)
			Separated	Analyzed	Concordant		Youngest	1σ	Oldest	1σ	
JH10007	chloritic Schist	27	22	22	18	SHRIMP	1803	27	3505	9	2659
JH10013	sandstone	57	204	204	77	LA-ICP-MS	2651	33	4025	29	3483
JH10014	chloritic schist	62	186	70	40	SHRIMP	1641	21	4143	8	3473
JH10015	sandstone	65	21	4	2	SHRIMP	3382	6	4102	7	None
JH10016	sandstone	70	202	50	45	SHRIMP	3305	8	4381	5	3376
JH10017	sandstone	75	24	5	2	SHRIMP	3430	6	3738	9	None
JH10018	sandstone	79	168	168	29	LA-ICP-MS	3354	31	4127	29	3387
JH10019	sandstone	84	186	186	55	LA-ICP-MS	3271	31	4189	30	3400
JH10020	sandstone	89	182	182	43	LA-ICP-MS	3249	31	4062	29	3400
JH10021A	conglomerate	94	200	98	50	SHRIMP	3287	11	4141	12	3389
JH10021B	conglomerate	94	246	246	159	LA-ICP-MS	3298	31	4274	29	3397
JH10022	sandstone	100	182	182	82	LA-ICP-MS	3236	30	4091	29	3380
JH10023	sandstone	105	112	112	50	LA-ICP-MS	3257	31	4163	29	3374
JH10025	sandstone	116	237	237	170	LA-ICP-MS	3251	31	4346	29	3385
JH10027	quartz arenite	126	201	201	75	LA-ICP-MS	3338	31	4250	29	3400
JH10029	sandstone	144	200	78	44	SHRIMP	3324	20	4183	6	3385
JH10030	sandstone	149	83	10	8	SHRIMP	3354	12	4101	5	None
JH10031	sandstone	154	233	233	88	LA-ICP-MS	3306	31	4256	29	3406
JH10033	sandstone	164	220	220	71	LA-ICP-MS	3205	31	4113	29	3387
JH10034	quartzite	170	212	212	115	LA-ICP-MS	3086	32	4231	29	3426
JH10035	conglomerate	176	200	40	29	SHRIMP	3062	13	3976	6	3387
JH10036	conglomerate	183	210	50	38	SHRIMP	3074	10	4058	7	3389
JH10037	conglomerate	193	250	250	96	LA-ICP-MS	3246	31	4144	29	3386
JH10038	conglomerate	198	202	202	66	LA-ICP-MS	3347	31	4221	29	3435
JH10039A	sandstone	212	186	59	51	SHRIMP	1754	19	4303	12	3391
JH10039B	chloritic schist	212	23	8	4	SHRIMP	1618	22	3510	4	None
JH10042	quartzite	229	208	208	91	LA-ICP-MS	3357	31	4151	29	3412
JH10043	chloritic schist	237	133	28	16	SHRIMP	2596	26	4154	4	3386
JH10045	conglomerate	248	158	158	89	LA-ICP-MS	3080	31	4143	29	3398
JH10046	conglomerate	253	204	204	138	LA-ICP-MS	3305	31	4233	29	3388
JH10047	conglomerate	258	126	126	51	LA-ICP-MS	3060	32	4108	29	3384
JH10048	conglomerate	263	212	212	61	LA-ICP-MS	3315	31	4120	29	3416, 3520
JH10049	conglomerate	268	228	228	93	LA-ICP-MS	3267	32	4191	29	3403
JH10050	sandstone	273	218	31	13	SHRIMP	3279	12	3973	6	3407
JH10051	conglomerate	278	212	212	123	LA-ICP-MS	2657	32	4181	29	3379
JH10052	conglomerate	283	201	61	34	SHRIMP	3337	18	4099	9	3380
JH10053	quartzite	288	240	240	88	LA-ICP-MS	3319	30	4358	28	3410
JH10055	sandstone	294	228	88	67	SHRIMP	3062	5	4239	4	3380
JH10058	sandstone	309	186	186	68	LA-ICP-MS	2766	32	4149	29	3345
JH10059	conglomerate	314	179	179	51	LA-ICP-MS	3374	31	4188	29	3400, 3485
JH10062	sandstone	331	100	100	64	LA-ICP-MS	3115	31	4157	29	3417, 3493
JH10071	sandstone	393	220	30	22	SHRIMP	3329	8	3670	4	3373, 3449, 3472
JH10074	matrix-supported conglomerate	407	202	202	30	LA-ICP-MS	1805	36	4010	29	3415
JH10075	quartzite	408	209	209	10	LA-ICP-MS	3370	31	3649	30	3435
JH10076	sandstone	413	65	13	4	SHRIMP	3123	4	3384	4	None
JH12096	sandstone	514.5	10	4	4	SHRIMP	2472	20	3496	4	None
JH12145	sandstone	868.5	50	24	20	SHRIMP	3129	7	4119	22	3256
JH12149	quartzite	892.5	221	91	64	SHRIMP	3278	7	4031	7	3393, 3473
JH12151	quartzite	922.5	198	65	39	SHRIMP	2622	6	4183	6	3355
JH12152	quartzite	929.5	195	75	69	SHRIMP	1642	25	4192	16	3371
JH12154	chert	970.5	20	5	3	SHRIMP	3515	22	3539	7	3540
Total Number			8615	6308	2819						

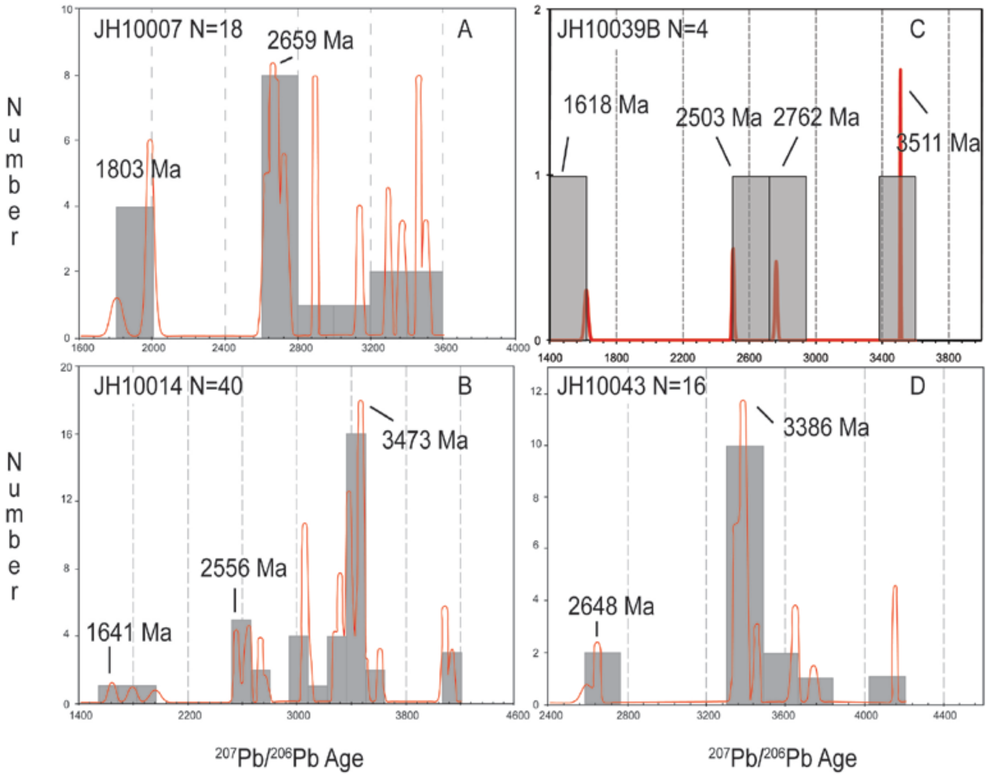


Figure 4.2 Histogram and Gaussian summation probability density plots of detrital zircons in each schist sample along the traverse in the Jack Hills Belt.

There were 78 concordant analyses out of 128 analyses obtained from four schist samples (27 m, JH10007; 61.5 m, JH10014; 212 m, JH10039B; and 242 m, JH10043) along the traverse, with a spread of ages (Fig 4.1) from 1618±22 (JH039B-02) to 4154±4 Ma (JH043-26). The prominent age peak (Fig 4.1) is at 3383 Ma, with a secondary peak at 3465 Ma. Seven grains recording a total of eight Proterozoic ages were obtained from three schist samples JH10007 (27 m), JH10014 (61.5 m) and JH10039B (212 m). These ages were from 1618±22 Ma (JH039B-02) to 1994±22 Ma (JH007-05.2). For the CL features, Th/U ratios and other properties of all Proterozoic grains and some representative grains from schist samples, please refer to Fig. 4.10 and Table 4.2.

At twenty-seven metres along the traverse, eighteen concordant analyses out of twenty-two were obtained from schist sample JH10007 (Fig 4.2 A). Overall, there is a spread of ages from 1803±27 to 3505±9 Ma. There are eleven grains with ages younger than 2.9 Ga. These ages are 1803±27, 1984±18, 1986±11 (JH10007-05.1), 1994±22 (JH10007-05.2), 2621±16, 2630±10, 2657±9, 2659±10, 2671±8, 2684±5, 2723±7 (JH10007-11.2), 2740±11 (JH10007-11.1), and 2897±4 Ma.

At sixty-two metres along the traverse, forty concordant analyses out of seventy were obtained from schist sample JH10014 (Fig 4.2 B). Overall, the analyses reveal a spread of ages from 1641±21 to 4143±8 Ma. There are ten (25%) grains younger than 3.0 Ga, with ages of 1641±21, 1791±27, 1959±34, 2556±8, 2568±18, 2627±13, 2627±13, 2636±12, 2652±8, 2734±7, 2765±16 Ma. There are three grains (7.5%) older than 4.0 Ga, with ages of 4084±13, 4092±6, and 4113±8 Ma. The major peak is at 3473 Ma. No ages are recorded between 3613±8-4084±13 Ma, 3090±10-3284±6 Ma, and 2765±16-3056±7 Ma.

At two hundred and twelve metres along the traverse, only twenty-three zircons were obtained from schist sample JH10039B (Fig 4.2 C). Most of the grains were metamict, and only four analyses were obtained from three zircons. However, the youngest zircon among all the samples was found here with an age of 1618±22 Ma (JH039B-02). Another zircon recorded ages younger than 3 Ga, with ages of 2503±12 (JH039B-05) and 2762±14 Ma (JH039B-06). The oldest zircon age recorded in sample JH10039B was 3511±4 Ma (JH039B-04).

At two hundred and forty-two metres along the traverse, sixteen concordant analyses out of twenty-eight analyses were obtained from schist sample JH10043 (Fig 4.2 D), with a spread of ages from 2596±26 (JH043-02) to 4154±4 Ma (JH043-26). Two zircons (12.5%) were younger than 3 Ga, with ages of 2596±26 and 2648±8 Ma (JH043-03); and 62.5% of zircon ages were from 3349±6 (JH043-06) to 3456±6 Ma (JH043-20), with a peak at ~3386 Ma; three zircons recorded Eoarchean ages from 3641±12 (JH043-15) to 3742±13 Ma (JH043-19). There was only one zircon age (6%) older than 4 Ga in sample JH10043 (4154±4 Ma).

4.1.2 Sandstone

One thousand one hundred and fifty-four concordant analyses out of two thousand six hundred and seven total analyses were obtained from twenty four sandstone samples (Fig 4.3, Fig 4.4) along the traverse. There is a spread of ages from 1754±19 (JH039A-23) to 4381±5 Ma (JH016-49), with a prominent age peak at 3378 Ma, and a secondary age peak at 3478 Ma (Fig 4.3). The sandstone samples were analysed by ICP-MS and SHRIMP. Five Proterozoic grains were identified from two sandstone samples JH10039A (212 m) and JH12096 (514.5 m). These ages were from 1754±19 Ma (JH039A-23) to 2473±20 Ma (JH096-04). For the CL features, Th/U ratios and other properties of all Proterozoic grains and some representative grains from sandstone samples, please refer to Fig. 4.11 and Table

4.3. There were five samples that yielded <10 concordant zircon ages (Table 4.1), and these results are presented together in Fig 4.4 B.

At fifty-seven metres along the traverse, seventy-seven analyses out of two hundred and four were concordant from sample JH10013 (Fig 4.4 A); among these, the age of 2651±33 Ma recorded in grain JH013-161 was the only Neoarchean grain. The ages of two grains (3%) were older than 4.0 Ga, with ages of 4007± 29 Ma (JH013-112) and 4025±29 Ma (JH013-133). Five grains recorded Mesoarchean ages from 3045±32 to 3132±32 Ma. Sixty-nine analyses recorded Paleoarchean ages, ranging from 3295±31 to 3918±30 Ma, with a predominant peak at ~3483 Ma.

At sixty-five metres along the traverse, only two concordant analyses out of a total of four analyses were obtained from sample JH10015 (Fig 4.4 B). These ages were 3383±6 (JH015-02) and 4102±7 Ma (JH015-01).

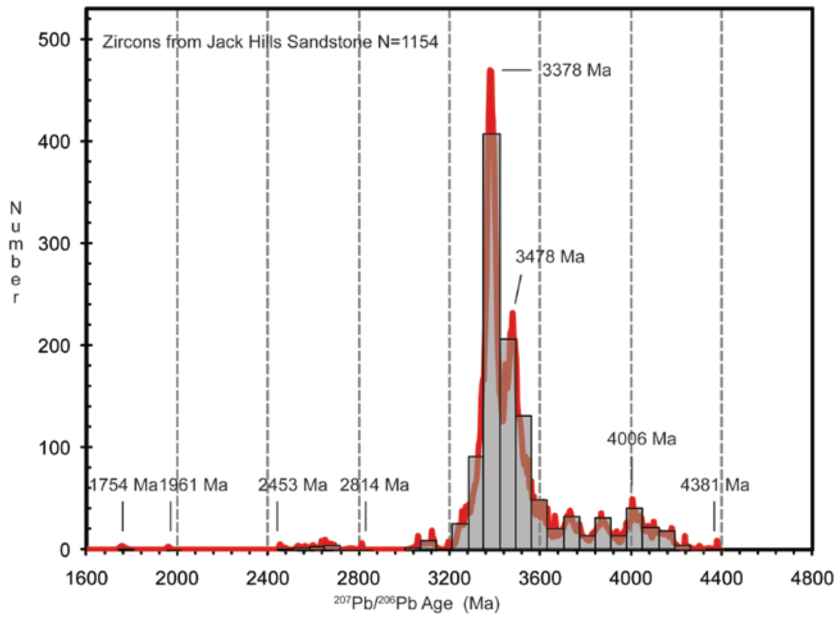


Figure 4.3 Histogram and Gaussian summation probability density plots of detrital zircons for all sandstone samples along the traverse in the Jack Hills Belt.

At seventy metres along the traverse, forty-five concordant analyses were obtained from fifty analyses from sample JH10016 (Fig 4.4 C). Zircon ages ranged from 3306±8 (JH016-41) to 4381±5 Ma (JH016-49). Seventy-six percent of grains were Paleoarchean, ranging from 3306±8 to 3549±7 Ma (JH016-11), with an age peak at 3376 Ma; 11% of grains were Eoarchean with ages between 3714±16 (JH016-24) and 3965±6 Ma (JH016-46); and 13% of grains recorded Hadean ages, ranging between 4007±4 (JH016-36) and 4381±5 Ma (JH016-49): the oldest zircon identified along the Jack Hills traverse.

At seventy-five metres along the traverse, two concordant analyses were obtained out of four from sample JH10017 (Fig 4.4 B). These ages were 3431±6 (JH017-02) and 3738±9 Ma (JH017-01).

At seventy-nine metres along the traverse, twenty-nine concordant analyses were obtained out of one hundred and sixty-eight from sample JH10018 (Fig 4.4 D). Eighty-six percent of zircon ages ranged between 3354±31 (JH018-098) and 3591±30 Ma (JH018-123), with a prominent peak at ~3387 Ma; three grains (10%) recorded ages from 3668±30 (JH018-106) to 3843±29 Ma (JH018-094); and only one grain (3%) was older than 4 Ga, with an age of 4127±29 Ma (JH018-111).

At eighty-four metres along the traverse, fifty-five concordant analyses out of one hundred and eighty-six were obtained from sample JH10019 (Fig 4.4 E), with a prominent age peak at 3400 Ma. There was a spread of ages from 3271±31 (JH019-016) to 4189±30 Ma (JH019-067). Seventy-six percent of zircons had ages ranging from 3271±31 to 3537±30 Ma (JH019-055); 13% of zircons recorded ages ranging from 3632±30 (JH019-162) to 3891±29 Ma (JH019-042); and 11% were older than 4 Ga, with ages from 4015±30 (JH019-099) to 4189±30 Ma (JH019-067).

At eighty-nine metres along the traverse, forty-three concordant analyses were obtained out of one hundred and eighty-two analyses from sample JH10020 (Fig 4.4 F). There was a spread of ages from 3249±31 (JH020-080) to 4062±29 Ma (JH020-084). Seventy-two percent of grains were within the age range from 3249±31 to 3593±30 (JH020-100) Ma, with a prominent age peak at ~3400 Ma; and 23% of grains were within the age range from 3665±30 (JH020-162) to 3986±29 Ma (JH020-109); and only two grains (5%) were older than 4 Ga, with ages of 4037±29 (JH020-114) and 4062±29 Ma.

At one hundred metres along the traverse, eighty-two concordant analyses were obtained out of one hundred and eighty-two analyses from sample JH10022 (Fig 4.4 G). There was a spread of ages from 3236±30 (JH022-113) to 4091±29 Ma (JH022-118). Eighty percent of grains were within the age range of 3236±30 to 3589±30 Ma (JH022-156), with a prominent age peak at ~3380 Ma; 18% of grains were within the age range from 3621±30 (JH022-106) to 3999±29 Ma (JH022-168), with a minor age peak at ~3860 Ma; and there was only one grain (1%) older than 4 Ga, with an age of 4091±29 Ma.

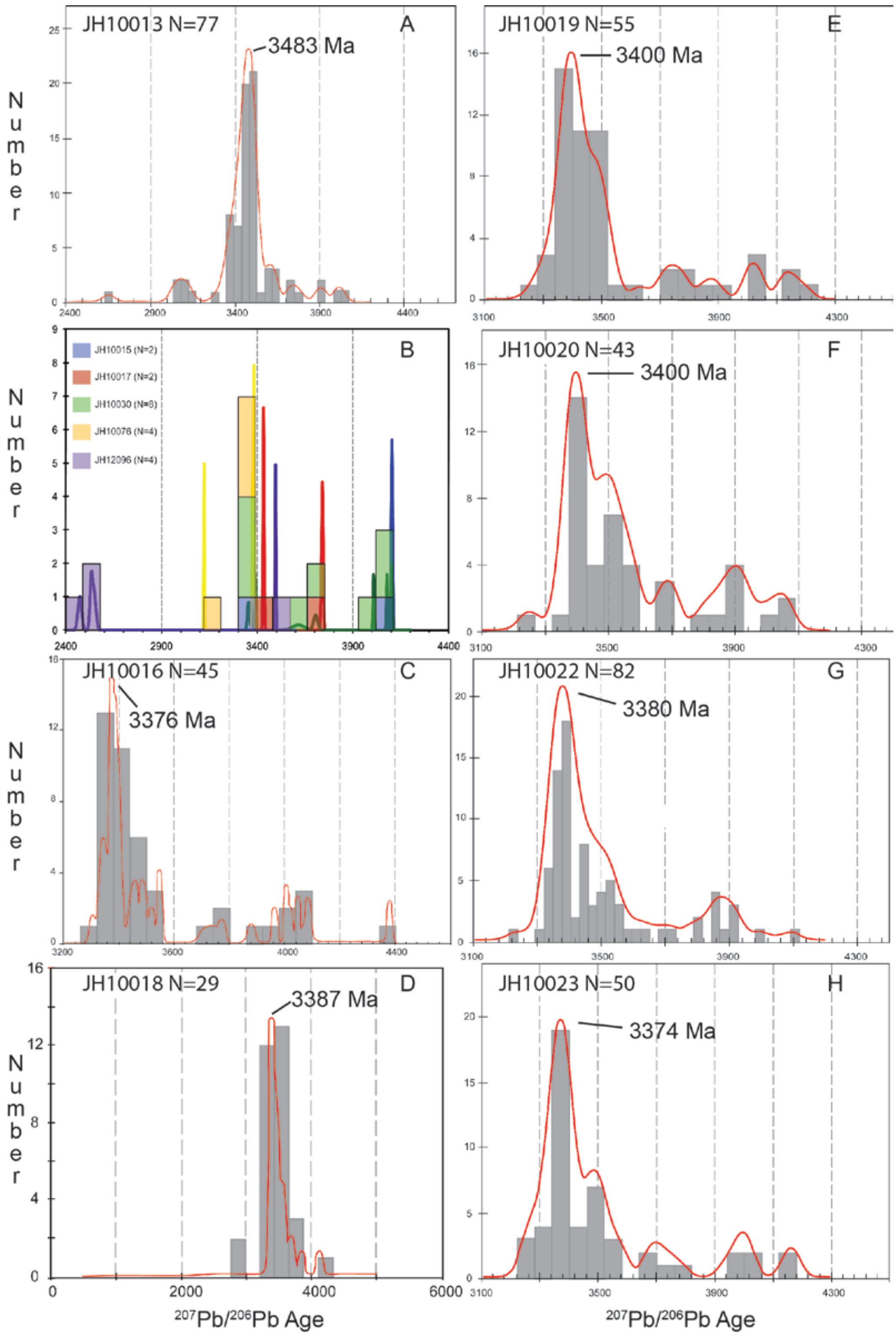
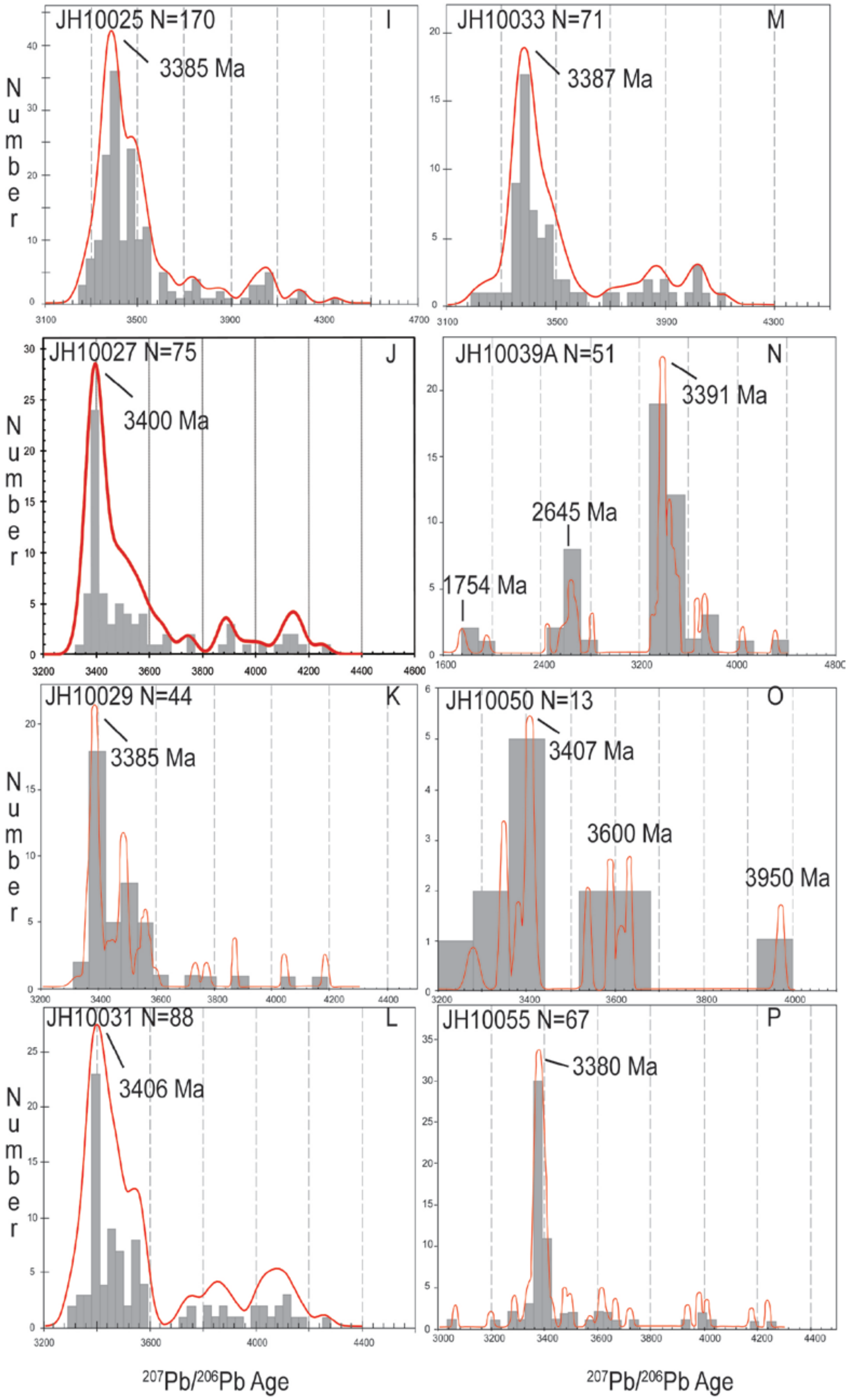


Figure 4.4 Histogram and Gaussian summation probability density plots of detrital zircons in each sandstone sample along the traverse in the Jack Hills Belt.



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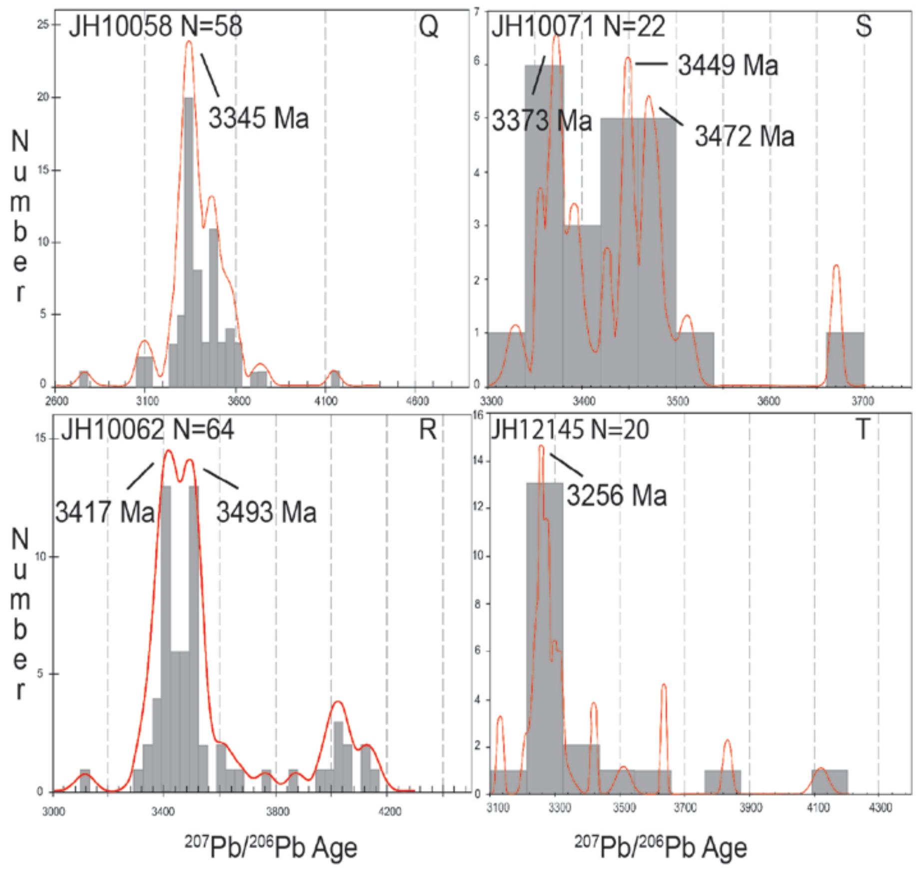

Figure 4.4 Continued.

At one hundred and five metres along the traverse, fifty out of one hundred and twelve zircons were concordant from sample JH10023 (Fig 4.4 H), with a spread of ages from 3257±31 (JH023-039) to 4163±29 Ma (JH023-072). Eighty percent of the zircon ages ranged between 3257±31 (JH023-039) and 3577±30 Ma (JH023-049), with a significant peak at 3374 Ma. There were six grains (3%) with ages between 3682 and 3993 Ma, and only four grains (2%) were older than 4000 Ma, with ages of 4001±30 (JH023-107) and 4163±29 Ma.

At one hundred and sixteen metres along the traverse, one hundred and seventy zircons out of two hundred and thirty-seven zircons were concordant from sample JH10025 (Fig 4.4 I), with a spread of ages between 3251±31 (JH025-166) and 4346±29 Ma (JH025-147). Eighty percent of grains were ranged between 3251 and 3593 Ma (JH025-110), with a prominent peak at ~3385 Ma; 11% recorded ages between 3600±30 (JH025-235) and 3982±30 Ma (JH025-034); and there were 8% of grains with ages between 4000±30 (JH025-122) and 4346±29 Ma.

At one hundred and twenty-six metres along the traverse, arenite sample JH10027 (Fig 4.4 J) yielded seventy-five concordant zircons out of two hundred and one zircons. The ages spread from 3338±31 (JH027-018) to 4250±29 Ma (JH027-090), with 75% of grains ranging between 3338±31 and 3589±30 Ma (JH027-145) with a prominent peak at ~3400 Ma; another 15% ranged between 3604±30 (JH027-185) and 3964±29 Ma (JH027-110); and there were only 10% of grains with ages between 4018±29 (JH027-138) and 4250±29 Ma.

At one hundred and forty-four metres along the traverse, forty-four spots were concordant out of seventy-eight analysis from sample JH10029 (Fig 4.4 K). There was a spread of ages between 3325±20 (JH029-11.2) and 4183±6 Ma (JH029-02.1); 89% of zircon ages were within the range 3325±20 to 3593±10 Ma (JH029-07.1), with a prominent peak at 3385 Ma; only three (7%) Eoarchean grains were identified, with ages of 3733±8 (JH029-49.1), 3772±8 (JH029-52.1), and 3870±4 Ma (JH029-38.1); and only two Hadean grains (4%) were identified, with ages of 4043±6 (JH029-61.1) and 4183±6 Ma.

At one hundred and forty-nine metres along the traverse, eight concordant analyses out of ten were obtained from sample JH10030 (Fig 4.4 B), with a spread of ages from 3355±12 (JH030-08) to 4102±5 Ma (JH030-07). Four Paleoarchean grains were identified, with ages of 3355±12 to 3615±63 Ma (JH030-02); only one Eoarchean grain was identified, with an age of 3705±22 Ma; and three grains with Hadean ages were JH030-06 (4007±6 Ma), JH030-09 (4077±6 Ma), and JH030-07 (4102±5 Ma).

At one hundred and fifty-four metres along the traverse, eighty-eight concordant analyses were obtained out of two hundred and thirty-three analyses from sample JH10031 (Fig 4.4 L), with a spread of ages from 3306±31 (JH031-042) to 4256±29 Ma (JH031-081). Seventy-four percent of grains were within the age range 3306±31 to 3574±30 Ma (JH031-189), with a prominent age peak at ~3406 Ma; 11% of grains recorded ages from 3725±30 (JH031-185) to 3928±30 Ma (JH030-223); and 15% of grains had >4 Ga ages, from 4000±29 (JH031-072) to 4256±29 Ma.

At one hundred and sixty-four metres along the traverse, seventy-one concordant analyses were obtained out of two hundred and twenty from sample JH10033 (Fig 4.4 M). There was a spread of ages from 3205±31 (JH033-038) to 4113±29 Ma (JH033-176). Seventy-six percent of zircon ages were from 3205±31 to 3557±30 Ma (JH033-156), with a prominent age peak at ~3387 Ma; 17% spread from 3605±30

(JH033-128) to 3981±30 Ma (JH033-090); and only five grains (7%) were older than 4 Ga, with ages from 4005±29 (JH033-082) to 4113±29 Ma.

At two hundred and twelve metres along the traverse, fifty-one out of fifty-nine analyses were concordant from sample JH10039A (Fig 4.4 N). Four (8%) Proterozoic grains were identified, with ages of 1754±19 (JH039A-23), 1765±29 (JH039A-22), 1961±15 (JH039A-47), and 2453±9 Ma (JH039A-09); nine (18%) Neoarchean grains were recorded, with ages of 2566±15 Ma (JH039A-36), 2596±27 Ma (JH039A-19), 2600±16 Ma (JH039A-40), 2637±8 Ma (JH039A-54), 2645± Ma (JH039A-41), 2650±11 Ma (JH039A-18), 2657±11 Ma (JH039A-51), 2676±11 Ma (JH039A-20), 2691±9 Ma (JH039A-49). Spot JH039A-55 was the only (2%) Mesoarchean age recorded, with an age of 2814±7 Ma. Sixty-one percent of zircon ages were from 3307±7 (JH039A-10) to 3516±7 Ma (JH039A-21), with a prominent ~3391 Ma age peak; 8% of zircon ages were from 3666±5 (JH039A-34) to 3743±18 Ma (JH039A-25); and only two zircons (4%) were older than 4 Ga, with ages of 4038±10 (JH039A-27) and 4304±12 Ma (JH039A-06).

At two hundred and seventy-three metres along the traverse, thirteen concordant analyses were obtained out of thirty-one analyses from sample JH10050 (Fig 4.4 O). The ages spread from 3279±12 (JH050-24) to 3974±6 Ma (JH050-10), but showed groupings at 3.95 Ga, 3.6 Ga and ~3.4 Ga.

At two hundred and ninety-four metres along the traverse, sixty-seven concordant analyses were obtained out of eighty-eight analyses from sample JH10055 (Fig 4.4 P), with a spread of ages from 3063±5 (JH055-03) to 4239±4 Ma (JH055-10). Two Neoarchean grains (3%) were identified, with ages of 3063±5 and 3196±7 Ma (JH055-74); 79% of grains recorded ages from 3284±10 (JH055-24) to 3571±9 Ma (JH055-87), with a significant age peak at 3380 Ma; 13% of grains recorded ages from 3612±7 (JH055-64) to 3991±8 Ma (JH055-75); and only three grains (4%) were older than 4 Ga, with ages of 4012±4 (JH055-63), 4180±6 (JH055-43), and 4239±4 Ma.

For sandstone sample JH10058 (Fig 4.4 Q) at three hundred and nine metres along the traverse, sixty-eight analyses out of one hundred and eighty-six were concordant, with a spread of ages from 2766±32 (JH058-122) to 4149±29 Ma (JH058-055), with a major age peak at ~3345 Ma. There was no record of ages between 3763±30 (JH058-006) and 4149±29 Ma, and 4149 Ma was the only Hadean age identified here (1%).

At three hundred and thirty-one metres along the traverse, sample JH10062 (Fig 4.4 R) yielded sixty-four concordant analyses out of one hundred analyses, with a spread of ages from 3115±31 (JH062-090) to 4157±29 Ma (JH062-069). One Mesoarchean grain (1%) was identified, with an age of 3115±31 Ma; 75% of grains had ages from 3319±31 (JH062-065) to 3589±31 Ma (JH062-064), with two age peaks at 3417 Ma and 3493 Ma; 11% of grains recorded ages from 3602±31 (JH062-003) to 3997±30 Ma (JH062-013); and eight grains (12.5%) were older than 4 Ga, with ages of 4011±30 (JH062-014) to 4157±29 Ma.

At three hundred and ninety-three metres along the traverse, sample JH10071 (Fig 4.4 S) yielded twenty-two concordant analyses out of thirty analyses, with a spread of ages from 3329±8 (JH071-29) to 3671±4 Ma (JH071-26). Ninety-five percent of grains recorded Paleoarchean ages from 3329±8 to 3512±7 Ma (JH071-06), with several ages grouped at ~3.37 and 3.45-3.47 Ga; and 3671±4 Ma was the only age older than 3.6 Ga identified in this sample.

At four hundred and thirteen and a half metres along the traverse, sample JH10076 (Fig 4.4 B) yielded four concordant analyses out of thirteen, with ages of 3123±4 (JH076-09), 3376±5 (JH076-06), 3382±5 (JH076-04), and 3384±4 Ma (JH076-01).

At five hundred and fourteen and a half metres of the traverse, sample JH12096 (Fig 4.4 B) yielded only ten zircon grains. Most of these were metamict and only four zircons were suitable for geochronological analysis according to transmitted light and CL images. Four concordant ages were obtained to provide at least some age information for the fine-grained succession in the northern segment of the Jack Hills belt. The ages were 2472±20 Ma (JH096-04), 2532±14 Ma (JH096-01), 2548±19 Ma (JH096-02) to 3496±4 Ma (JH096-03). These ages imply that sample JH12096 received material from Proterozoic, Neoarchean, and Paleoarchean sources.

At eight hundred and sixty-eight and a half metres along the traverse, sample JH12145 (Fig 4.4 T) yielded twenty concordant analyses out of twenty-four analyses, with a spread of ages from 3129±7 (JH145-07) to 4119±22 Ma (JH145-08). Only one grain (5%) recorded a Neoarchean age of 3129±7 Ma; 90% of grains recorded ages from 3210±10 (JH145-19) to 3831±10 Ma (JH145-11), with a peak at ~3256 Ma; and only one grain (5%) was older than 4 Ga, with an age of 4119±22 Ma.

4.1.3 Conglomerate

One thousand and eight concordant analyses were obtained out of two thousand four hundred and sixty-eight analyses from fifteen conglomerate samples (Fig 4.5, Fig 4.6) along the traverse. The zircons recorded ages from 1805±36 (JH074-088) to 4274±29 Ma (JH021B-087), with a prominent age peak was at 3383 Ma (Fig 4.5). Proterozoic grains were only found in matrix-supported conglomerate sample JH10074 (408.5 m), and these ages were: 1805±36 Ma (JH074-088) and 2030±35 Ma (JH074-087). For the CL features, Th/U ratios and other properties of Proterozoic grains and some representative grains from conglomerate samples, please refer to Fig. 4.12 and Table 4.4. Conglomerate samples were analysed by ICP-MS and SHRIMP.

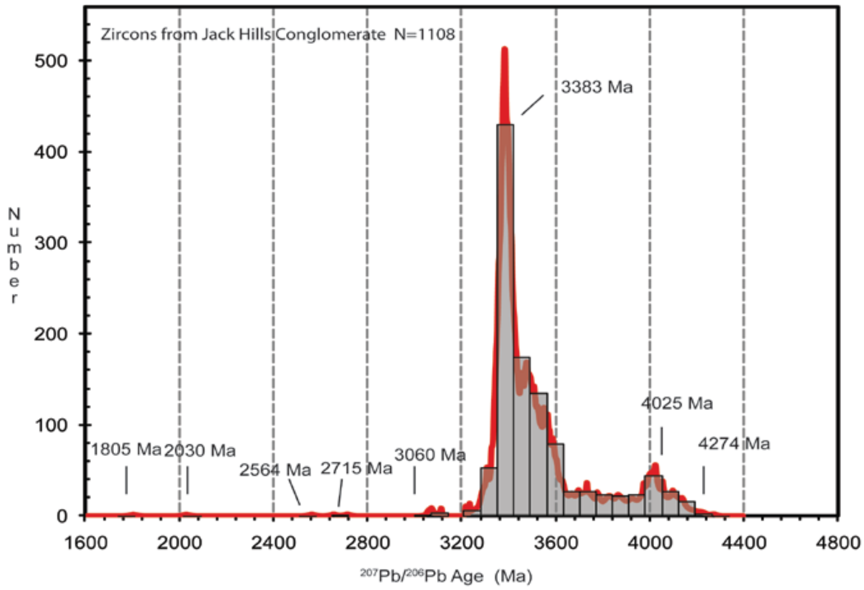

Figure 4.5 Histogram and Gaussian summation probability density plots of detrital zircons for all conglomerate samples along the traverse in the Jack Hills Belt.

At ninety-four metres along the traverse, conglomerate sample JH10021A (Fig 4.6 A) yielded fifty concordant analyses out of ninety-eight, with a spread of ages from 3287±11 (JH021A-76.1) to 4142±12 Ma (JH021A-88.1), and with a prominent age peak at 3389 Ma. Eighty percent of analyses recorded ages from 3287±11 to 3590±5 Ma (JH021A-55.1); 16% of analyses gave ages from 3628±16 (JH021A-38.4) to 3999±10 (JH021A-19.2); and only two grains (4%) were older than 4 Ga, with ages of 4011±10 (JH021A-51.1) and 4142±12 Ma.

At ninety-four metres along the traverse, conglomerate sample JH10021B (Fig 4.6 B) was collected, with one hundred and fifty-nine concordant analyses out of two hundred and forty-six analyses. There was a spread of ages from 3298±31 (JH021B-137) to 4274±29 Ma (JH021B-087). Seventy-nine percent of grains recorded ages from 3298±31 to 3595±30 (JH021B-138), with a prominent age peak at 3397 Ma; 13% of grains recorded ages from 3601±30 (JH021B-150) to 3984±29 Ma (JH021B-238); and 8% of grains were older than 4 Ga, with a spread of ages from 4005±30 (JH021B-147) to 4274±29 Ma, with several grains around ~4.02 Ga.

At one hundred and seventy-six metres along the traverse, sample JH10035 (Fig 4.6 C) yielded twenty-nine concordant analyses out of forty analyses, with a spread of ages from 3063±13 (JH035-12.1) to 3976±6 Ma (JH035-11.1). Only two grains (7%) were younger than 3.2 Ga, with ages of 3063±13 and 3115±7 Ma (JH035-26.1); 83% of analyses had ages from 3236±5 (JH035-07.1) to 3569±5 Ma (JH035-06.1), with a major peak at 3387 Ma; and only three grains (10%) were older than 3.6 Ga, with ages of 3632±10 (JH035-15.1), 3789±15 (JH035-09.1), and 3976±6 Ma.

At one hundred and eighty-three metres along the traverse, sample JH10036 (Fig 4.6 D) yielded thirty-eight concordant analyses out of fifty, with a spread of ages from 3075±10 (JH036-24) to 4059±7 Ma (JH036-26). 3075±10 Ma was the only age (3%) younger than 3.2 Ga; 79% of grains recorded ages from 3220±5 (JH036-13) to 3563±8 Ma (JH036-46), with a major age peak at ~3389 Ma; four zircon ages (10%) were concentrated between 3602±15 (JH036-47) to 3698±9 Ma (JH036-41); and three grains (8%) were older than 4 Ga, with ages of 4022±7 (JH036-49), 4029±7 (JH036-03), and 4059±7 Ma.

At one hundred and ninety-three and a half metres along the traverse, sample JH10037 (Fig 4.6 E) yielded ninety-six concordant analyses out of two hundred and fifty analyses, with a spread of ages from 3246±31 (JH037-040) to 4144±29 Ma (JH037-043). Seventy-eight percent of grains recorded ages from 3246±31 to 3592±30 Ma (JH037-005), with a prominent age peak at ~3386 Ma; 18% of grains had ages from 3601±30 (JH037-088) to 3979±29 Ma (JH037-065), with several ages concentrated around ~3.75 Ga; and only four grains (4%) were older than 4 Ga, with ages of 4007±29 (JH037-112), 4013±29 (JH037-109), 4039±29 (JH037-217), and 4144±29 Ma (JH037-043).

At one hundred and ninety-seven metres along the traverse, sample JH10038 (Fig 4.6 F) yielded sixty-six concordant analyses out of two hundred and two analyses, with a spread of ages from 3347±31 (JH038-141) to 4221±29 Ma (JH038-160). Seventy-one percent of grains had ages from 3347±31 (JH038-141) to 4221±29 Ma (JH038-160), with a prominent age peak at 3435 Ma; 20% of grains recorded ages from 3605±30 (JH038-152) to 3976±29 Ma (JH038-045); and 9% of grains were older than 4 Ga, with ages from 4032±29 (JH038-075) to 4221±29 Ma.

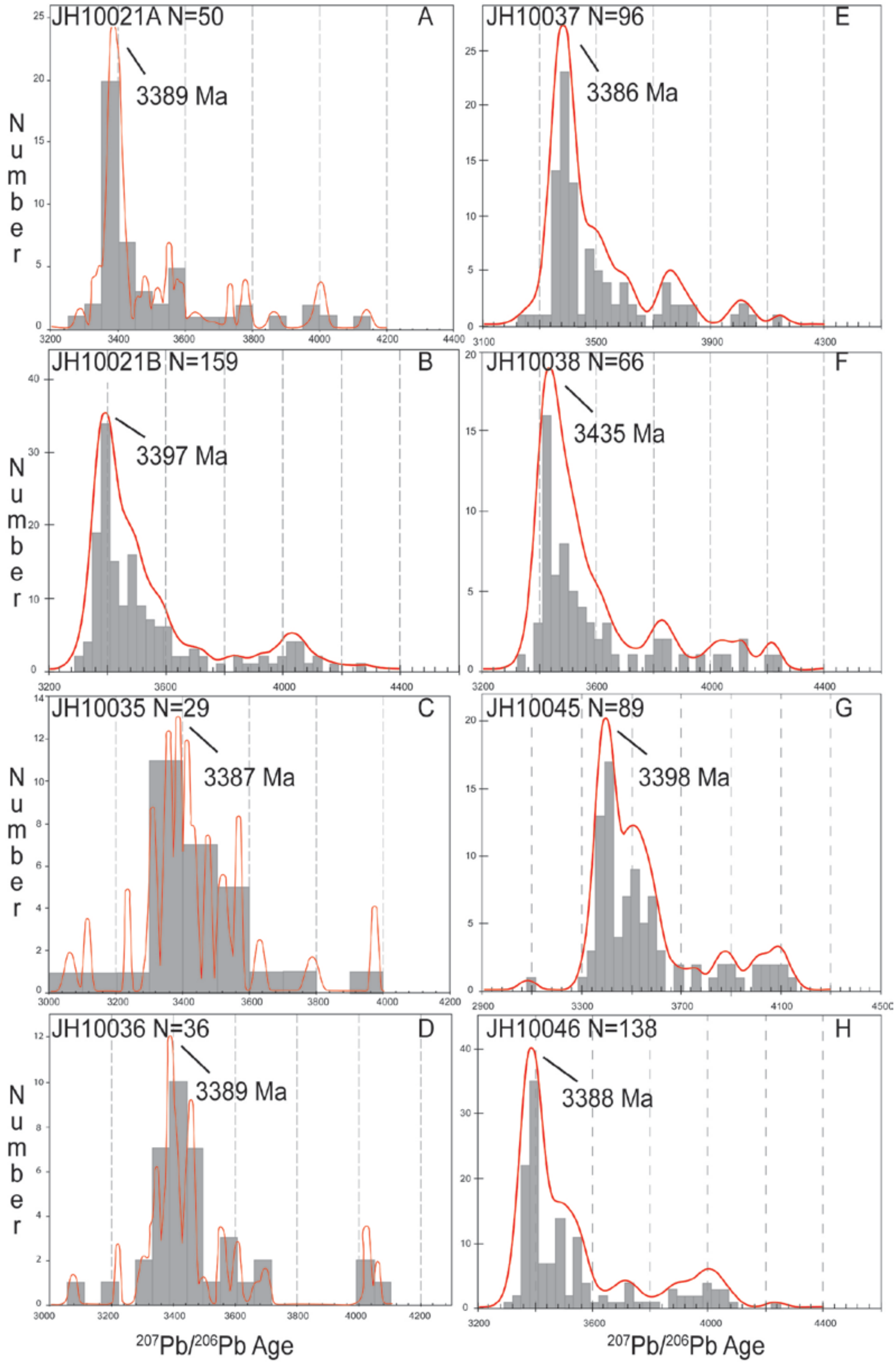

Figure 4.6 Histogram and Gaussian summation probability density plots of detrital zircons in each conglomerate sample along the traverse in the Jack Hills Belt.

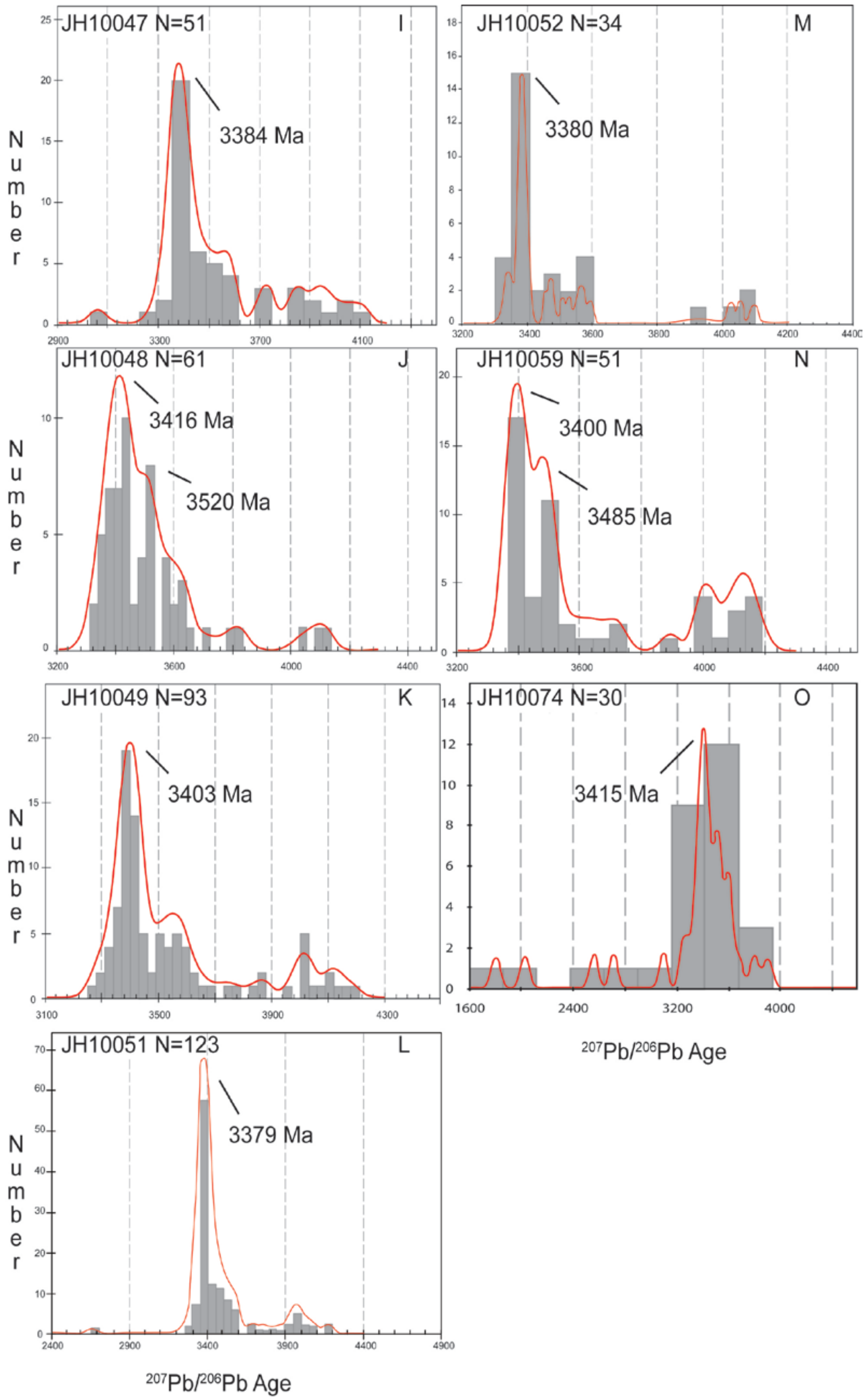

Fig 4.6 continued.

At two hundred and forty-eight metres along the traverse, sample JH10045 (Fig 4.6 G) yielded eighty-nine concordant analyses out of one hundred and fifty-eight analyses, with a spread of ages from 3080±31 (JH045-058) to 4143±29 Ma (JH045-095). 3080±31 Ma was the only (1%) Mesoarchean age identified in this sample; 74% percent of grains had ages from 3306±31 (JH045-083) to 3589±30 Ma (JH045-097), with a peak at ~3398 Ma, and a secondary age peak at ~3510 Ma; and 17% of grains had ages from 3612±30 (JH045-019) to 3998±29 Ma (JH045-041); and 8% of grains were older than 4 Ga, with ages from 4031±29 (JH045-081) to 4143±29 Ma.

At two hundred and fifty-three metres along the traverse, sample JH10046 (Fig 4.6 H) yielded one hundred and thirty-eight concordant analyses out of two hundred and four analyses, with a spread of ages from 3305±31 (JH046-020) to 4233±29 Ma (JH046-183). Seventy-seven percent of grains had ages from 3305±31 to 3596±30 Ma (JH046-049), with a prominent age peak at ~3388 Ma; 17% of grains recorded ages from 3625±30 (JH046-130) to 3998±30 Ma (JH046-006); and 6% of grains were older than 4 Ga, with ages from 4005±30 (JH046-055) to 4233±29 Ma.

At two hundred and fifty-eight metres along the traverse, sample JH10047 (Fig 4.6 I) yielded fifty-one concordant analyses out of one hundred and twenty-six analyses, with a spread of ages from 3060±32 (JH047-088) to 4108±29 Ma (JH047-036). Only one grain (2%) recorded a Mesoarchean age at 3060±32 Ma; 75% had ages from 3288±31 (JH047-029) to 3585±30 Ma (JH047-004), with a prominent age peak at ~3384 Ma; 18% of zircon ages were from 3708±30 (JH047-003) to 3966±29 Ma (JH047-052); and only three zircons (6%) were older than 4 Ga, with ages of 4009±30 (JH047-102), 4059±29 (JH047-063), and 4108±29 Ma.

At two hundred and sixty-three metres along the traverse, sample JH10048 (Fig 4.6 J) yielded sixty-one concordant analyses out of two hundred and twelve analyses, with a spread of ages from 3315±31 (JH048-207) to 4120±29 Ma (JH048-062). Eighty-two percent of zircon ages were from 3315±31 to 3588±30 Ma (JH048-118), with a prominent age peak at ~3416 Ma and a substantial peak at ~3520 Ma; 13% of zircon ages were from 3605±30 (JH048-123) to 3828±30 Ma (JH048-037); and only three zircons (5%) were older than 4 Ga, with ages of 4042±29 (JH048-056), 4093±29 (JH048-005), and 4120±29 Ma.

At two hundred and sixty-eight metres along the traverse, sample JH10049 (Fig 4.6 K) yielded ninety-three concordant analyses out of two hundred and twenty-eight analyses, with a spread of ages from 3267±32 (JH049-151) to 4159±29 Ma (JH049-

167). Seventy-seven percent of zircon ages ranged from 3267±32 to 3596±30 Ma (JH049-199), with a prominent peak at 3403 Ma; 11% of grains recorded ages from 3618±30 (JH049-145) to 3966±29 Ma (JH049-104); and 13% of zircons were older than 4 Ga, with ages from 4000±30 (JH049-059) to 4159±29 Ma, with several zircon ages aggregated at ~4.0 and ~4.1 Ga.

At two hundred and seventy-eight metres along the traverse, sample JH10051 (Fig 4.6 L) yielded one hundred and twenty-three concordant analyses out of a total of two hundred and twelve zircon grains analysed, with a spread of ages from 2657±32 to 4181±29 Ma (JH10051-100). 2657±32 Ma was the only age younger than 3.0 Ga in this sample. Eighty-four percent of zircon ages ranged from 3252±31 (JH051-047) to 3589±30 Ma (JH051-022), with a prominent age peak at 3379 Ma; 11% of grains recorded ages from 3681±30 (JH051-068) to 3989±30 Ma (JH051-073); and there were 5% of zircon ages older than 4 Ga, these were from 4020±29 (JH051-171) to 4181±29 Ma.

At two hundred and eighty-three metres along the traverse, sample JH10052 (Fig 4.6 M) yielded thirty-four concordant analyses out of sixty-one analyses, with a spread of ages from 3338±18 (JH052-58) to 4100±9 Ma (JH052-21). Eighty-eight percent of zircon ages were from 3338±18 to 3595±7 Ma (JH052-49), with a major age peak at ~3380 Ma; only one grain (3%) had an Eoarchean age of 3932±48 Ma (JH052-52); and three grains (9%) were older than 4 Ga, with ages of 4028±8 (JH052-23), 4055±7 (JH052-40), and 4100±9 Ma.

At three hundred and fourteen metres along the traverse, sample JH10059 (Fig 4.6 N) yielded fifty-one concordant analyses out of one hundred and seventy-nine analyses, with a spread of ages from 3374±31 (JH059-014) to 4188±29 Ma (JH059-036). Sixty-seven percent of zircon ages were from 3374±31 to 3585±30 Ma (JH059-092), with a primary peak at ~3400 Ma and a secondary peak at ~3485 Ma; 12% of zircon ages ranged from 3624±30 (JH059-098) to 3997±29 Ma (JH059-080); and twenty-one percent of zircon ages were older than 4 Ga, from 4002±29 (JH059-003) to 4188±29 Ma. This conglomerate sample contained the highest proportion of Hadean zircons in this study.

At four hundred and eight and a half metres along the traverse, two hundred and two grains were analysed from matrix-supported conglomerate sample JH10074 (Fig 4.6 O), however, only thirty grains were concordant. Four grains (13%) younger than 3.0 Ga were present, these had ages of 1805±36 (JH074-088), 2030±35

(JH074-087), 2565±33 (JH074-085), and 2715±32 Ma (JH074-086). Only one grain (3%) was of Mesoarchean age, with an age of 3101±31 Ma (JH074-151); 60% of zircons recorded ages from 3248±28 (JH074-043) to 3597±30 Ma (JH074-163), with a major age peak at ~3415 Ma; 17% of zircon ages ranged from 3606±30 (JH074-163) to 3908±39 Ma (JH074-013); and only one grain (3%) was older than 4 Ga, with an age of 4010±29 Ma.

4.1.4 Quartzite

Four hundred and seventy-six concordant analyses were obtained from seven quartzite samples (Fig 4.7, Fig 4.8) along the traverse (170 m, JH10034; 227 m, JH10042; 288 m, JH10053; 408.5 m, JH10075; 892.5 m, JH12149; 922.5 m, JH12151; 929.5 m, JH12152), with a spread of ages from 1643±25 (JH152-64) to 4358±28 Ma (JH053-146). The prominent age peak is at 3393 Ma, and a secondary peak is at 3471 Ma. The ages of >3.7 Ga zircons show several minor peaks; at 3715 Ma and 4017 Ma. The only ages younger than 3 Ga were 1643±25 Ma (JH152-64) Ma and 2622±6 Ma (JH151-13). For the CL features, Th/U ratios and other properties of Proterozoic grains and some representative grains from quartzite samples, please refer to Fig. 4.13 and Table 4.5. Quartzite samples were analysed by ICP-MS and SHRIMP.

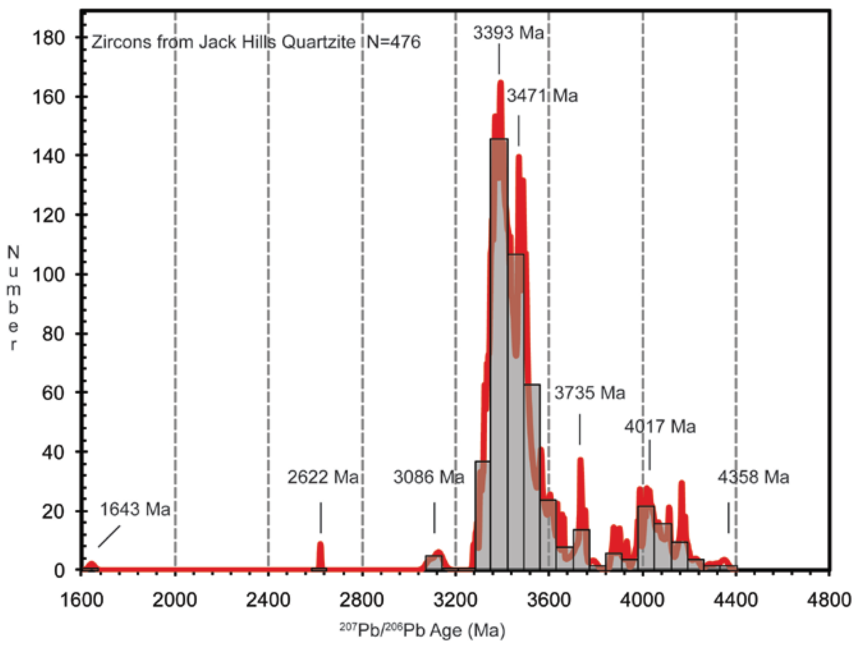

Figure 4.7 Histogram and Gaussian summation probability density plots of detrital zircons for all quartzite samples along the traverse in the Jack Hills Belt.

At one hundred and seventy metres along the traverse, one hundred and fifteen concordant analyses out of two hundred and twelve analyses were obtained from quartzite sample JH10034 (Fig 4.8 A), with a spread of ages from 3086±32 (JH034-043) to 4231±29 Ma (JH034-079). Six (5%) Mesoarchean zircons were recorded, with ages from 3086±32 to 3145±32 Ma (JH034-151); 83% of zircon ages ranged from 3298±31 (JH034-164) to 3592±30 Ma (JH034-121), with a main peak age of ~3426 Ma; 5% of zircon ages were from 3607±30 (JH034-044) to 3720±30 Ma (JH034-096); and 7% of zircons were older than 4 Ga, with ages from 4025±30 (JH034-159) to 4231±29 Ma.

At two hundred and twenty-seven metres along the traverse, ninety-one concordant analyses out of two hundred and eight analyses were obtained from sample JH10042 (Fig 4.8 B), with a spread of ages from 3357±31 (JH042-120) to 4151±29 Ma (JH042-166). Eighty-three percent of zircon ages ranged from 3357±31 to 3573±30 Ma (JH042-147), with a prominent age peak at ~3412 Ma; 7% of grains recorded ages from 3600±30 (JH042-143) to 3733±30 Ma (JH042-149); and 10% of grains were older than 4 Ga, with ages from 4021±30 (JH042-068) to 4151±29 Ma.

At two hundred and eighty-eight metres along the traverse, sample JH10053 (Fig 4.8 C) yielded eighty-eight concordant analyses out of two hundred and forty analyses, with a spread of ages from 3319±30 (JH053-068) to 4358±28 Ma (JH053-146). Sixty-four percent of ages were from 3319±30 to 3596±31 Ma (JH053-239), with a prominent age peak at ~3410 Ma; 19% of ages were from 3606±30 (JH053-200) to 3986±30 Ma (JH053-225); and 17% of zircons were older than 4 Ga, with ages from 4003±30 (JH053-208) to 4358±28 Ma.

At four hundred and eight and a half metres along the traverse, sample JH10075 (Fig 4.8 D) only yielded ten concordant analyses out of two hundred and nine analyses, with a spread of ages from 3370±31 (JH075-034) to 3649±30 Ma (JH075-038), and the age peak is at ~3435 Ma. Ninety percent of zircon ages were Paleoarchean, and 3649±30 Ma was the only Eoarchean age (10%) recorded in this sample.

At eight hundred and ninety-two and a half metres along the traverse, sample JH12149 (Fig 4.8 E) yielded sixty-four concordant analyses out of ninety-one analyses, with a spread of ages from 3278±7 (JH149-91) to 4031±7 Ma (JH149-33). Eighty-six percent of zircon ages were from 3278±7 to 3578±14 Ma (JH149-46), with a primary age peak at ~3470 Ma, and a secondary age peak at ~3390 Ma; 11%

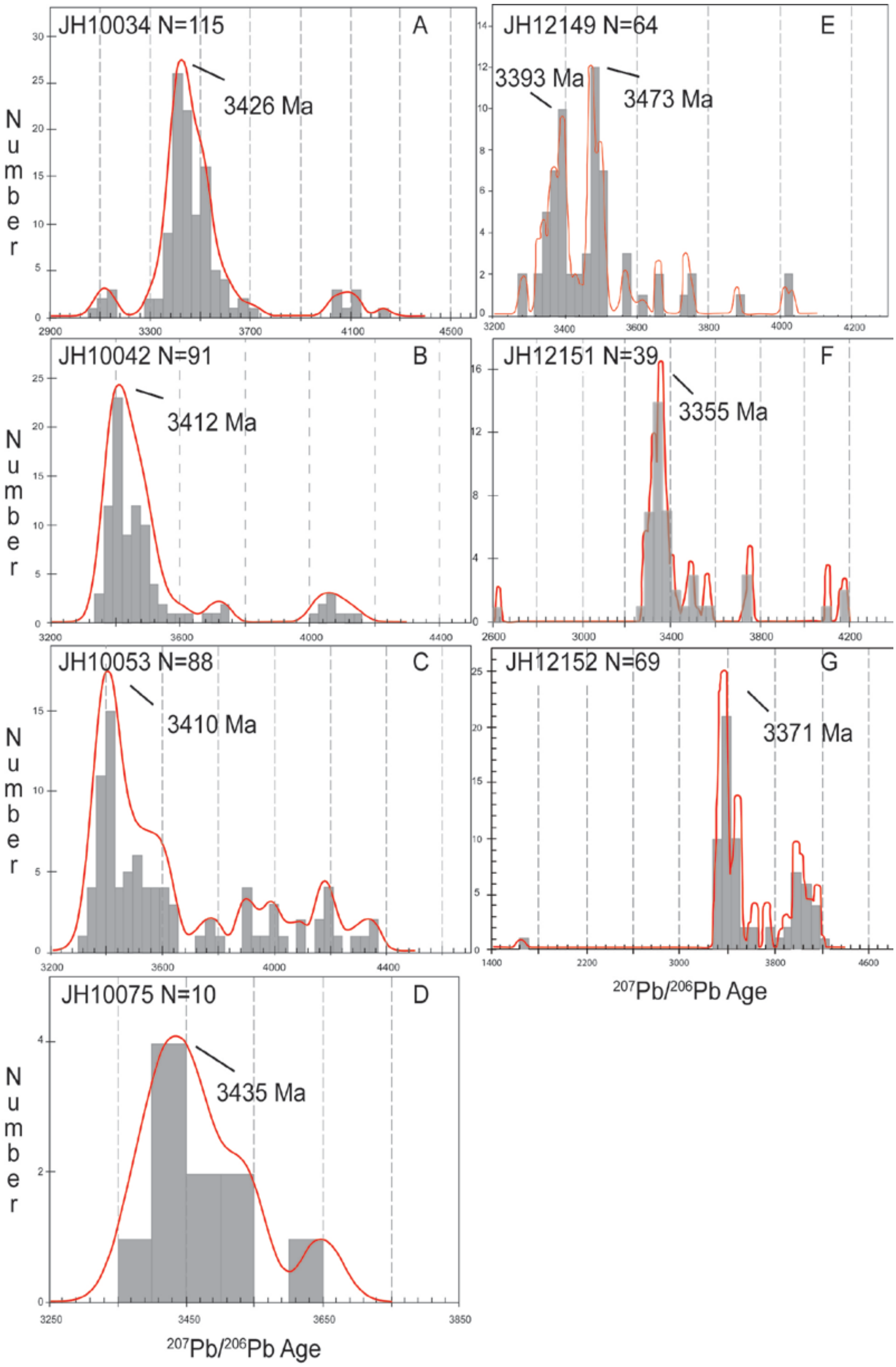

Figure 4.8 Histogram and Gaussian summation probability density plots of detrital zircons in each quartzite sample along the traverse in the Jack Hills Belt.

of zircons recorded ages from 3616±12 (JH149-24) to 3879±6 Ma (JH149-69), and only two zircons (3%) were older than 4 Ga, with ages of 4012±6 (JH149-61) and 4031±7 Ma.

At nine hundred and twenty-two and a half metres along the traverse, sample JH12151 (Fig 4.8 F) yielded thirty-nine concordant analyses out of a total of sixty-five analyses, with a spread of ages from 2623±6 (JH151-13) to 4183±6 Ma (JH151-09). 2623±6 Ma (2%) was the only zircon younger than 3 Ga. Eighty-five percent of zircon ages were from 3293±5 (JH151-30) to 3568±8 Ma (JH151-38), with a prominent age peak at ~3355 Ma; 8% of zircon ages were Eoarchean, with ages of 3738±12 (JH151-29), 3756±5 (JH151-49), and 3758±9 Ma (JH151-16); and only two grains (5%) were older than 4 Ga, with ages of 4168±7 (JH151-14) and 4183±6 Ma.

At nine hundred and twenty-nine and a half metres along the traverse, sixty-nine concordant analyses out of seventy-five analyses were obtained from sample JH12152 (Fig 4.8 G). The youngest grain is JH152-64, with an age of 1642±25 Ma, whereas the oldest grain is JH152-40, with an age of 4192±16 Ma. Sixty-two percent of zircon ages were from 3307±6 (JH152-03) to 3531±24 Ma (JH152-68), with a prominent age peak at ~3371 Ma; 16% of zircon ages were from 3605±8 (JH152-46) to 3991±7 Ma (JH152-10); and 20% of zircons were older than 4 Ga, with ages from 4006±9 (JH152-17) to 4193±16 Ma.

4.1.5 Chert

Sample JH12154 (970.5 m) is a chert (Fig 3.11 B) which yielded less than 20 zircon grains, and only three concordant ages were obtained; with ages of 3515±22 (JH154-04), 3536±13 (JH154-03), and 3540±7 Ma (JH154-05). For the CL feature, Th/U ratios and other properties of these grains, please refer to Fig. 4.9 and Table 4.6.

Figure 4.9 CL and transmitted light images of zircons from the chert sample JH12154. Scale bars for the CL images are all 50 µm.

Figure 4.10 CL and transmitted light images of zircons from the schist units present along the Jack Hills traverse. Scale bars are for the CL image, and are all 50 μm.

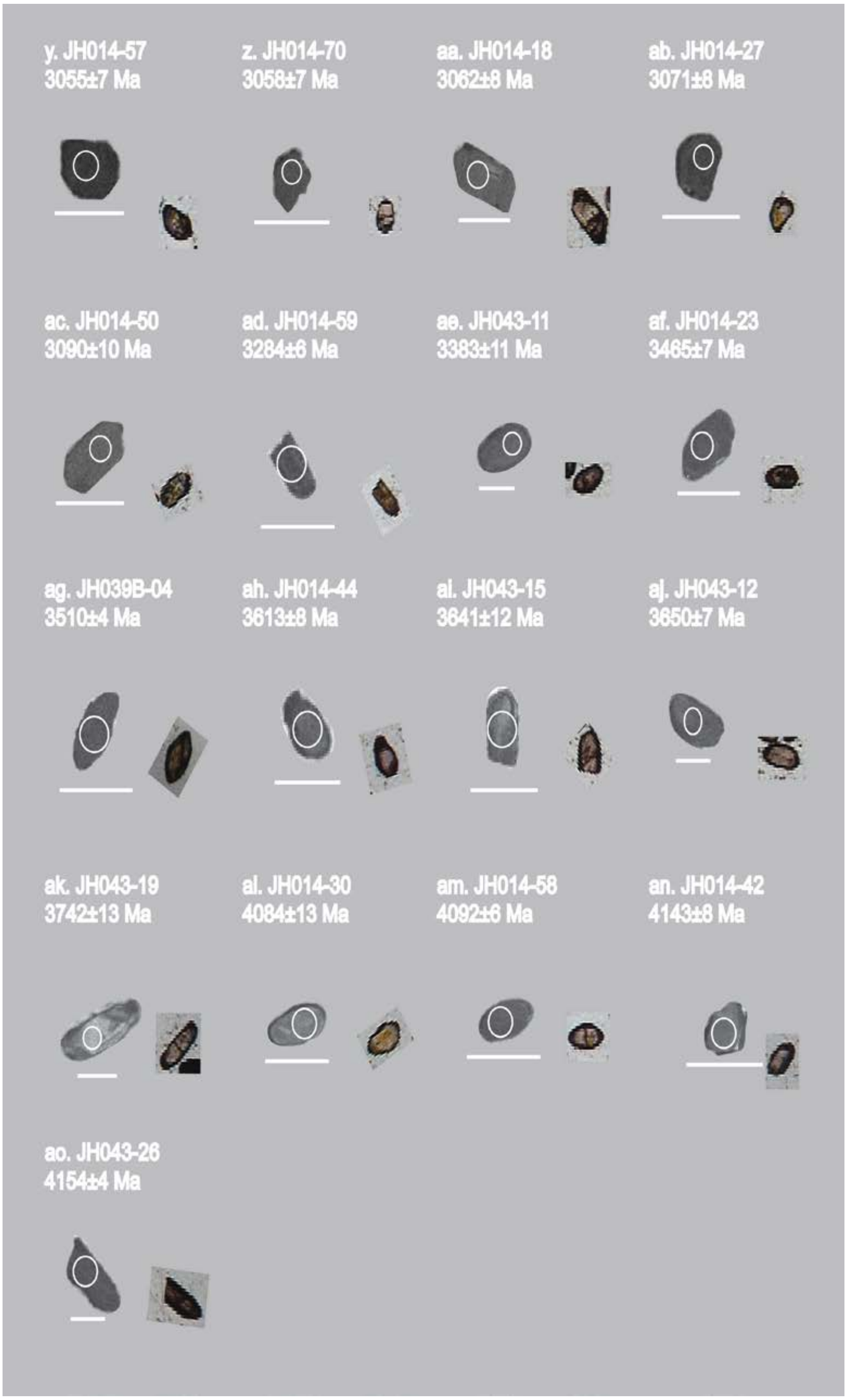

Figure 4.10 continued.

Table 4.2 Zircon properties in schist samples.

Grain No.	Age (Ma)	1σ	Colour	Shape	Length:Width Ratio	CL zoning	Th/U ratio	U content (ppm)	Th content (ppm)
JH039B-02	1618	22	light brown	prism	2.5	planar	0.73	299	212
JH014-08	1642	21	light brown	stubby	2	patchy	1.81	211	371
JH014-53	1792	27	light brown	stubby	1.5	patchy	0.85	109	89
JH007-12.1	1803	27	pale yellow	elongate	2	patchy	0.98	106	100
JH014-51	1959	34	pale yellow	elongate	2	oscillatory	0.94	90	82
JH007-18.1	1985	18	clear	fragment	1.2	planar	0.69	142	95
JH007-05.1	1986	11	light brown	stubby	1.2	sector	0.34	259	85
JH007-05.2	1994	22	light brown	stubby	1.2	sector	0.61	52	30
JH039B-05	2503	12	light brown	stubby	1	rim	0.31	202	59
JH039B-06	2762	14	light brown	stubby	1	core	0.09	205	18
JH014-11	2556	8	dark brown	elongate	2	dark and uniform	0.61	547	322
JH014-47	2568	18	clear	elongate	2.5	patchy	0.73	102	71
JH043-02	2596	26	brown	rounded	1	rim (spot) and core	1.02	49.4	48.9
JH007-02.1	2659	10	yellowish brown	elongate	2.5	patchy (dark)	1.24	243	293
JH007-02.2	2621	16	yellowish brown	elongate	2.5	patchy (light)	1.55	82	124
JH014-63	2627	13	clear	rounded	1	oscillatory	0.81	178	141
JH007-15.1	2630	10	light brown	fragment	1	rim	0.56	144	78
JH007-15.2	3141	8	light brown	fragment	1	core	0.39	191	72
JH014-24	2636	12	light brown	rounded	1	patchy	0.47	184	84
JH043-03	2648	8	light brown	rounded	1	oscillatory	0.40	353	138
JH014-28	2652	8	light brown	fragment	1.5	dark and uniform	1.20	390	452
JH007-09.1	2657	9	light brown	stubby	1	patchy	0.19	229	43
JH007-04.1	2671	8	brown	elongate	2	dark and uniform	0.59	255	146
JH007-06.1	2684	5	yellowish brown	hexagon	1	dark and uniform	0.64	726	449
JH007-11.1	2739	11	yellowish brown	stubby	1	patchy	0.67	132	85
JH007-11.2	2723	7	yellowish brown	stubby	1	patchy	0.48	345	158
JH014-29	2734	7	light brown	elongate	2	dark	0.84	517	419
JH014-05	2765	16	light brown	rounded	1	patchy	0.60	195	114
JH007-07.1	2897	4	light brown	elongate	2	dark	0.52	877	442
JH014-57	3055	7	dark brown	stubby	1.2	dark and uniform	0.71	418	287
JH014-70	3058	7	clear	stubby	1.2	dark	0.68	394	258
JH014-18	3062	8	light brown	tabular	2	patchy	0.80	377	290
JH014-27	3071	8	light brown	stubby	1.1	oscillatory	0.67	299	293
JH014-50	3090	10	light brown	tabular	2	dark and uniform	0.65	228	144
JH014-59	3284	6	brown	fragment	2	patchy	0.78	409	310
JH043-11	3383	11	brown	stubby	1.5	dark and uniform	0.59	143	81
JH014-23	3465	7	brown	stubby	1.5	dark and uniform	0.50	275	133
JH039B-04	3510	4	brown	spindle	2	dark and uniform	0.25	630	154
JH014-44	3613	8	light brown	stubby	1.5	dark and uniform	0.47	148	66
JH043-15	3641	12	light brown	fragment	1.5	patchy	0.05	77.7	3.5
JH043-12	3650	7	light brown	stubby	1.5	dark and uniform	0.73	199	140
JH043-19	3742	13	light brown	elongate	3	patchy	0.56	42	23
JH014-30	4084	13	yellowish brown	stubby	1.5	patchy	0.53	62	32
JH014-58	4092	6	light brown	stubby	1.5	dark and uniform	0.38	217	80
JH014-42	4143	8	light brown	stubby	1	plarnar	0.72	111	77
JH043-26	4154	4	brown	fragment	2.5	dark and uniform	0.55	352	187

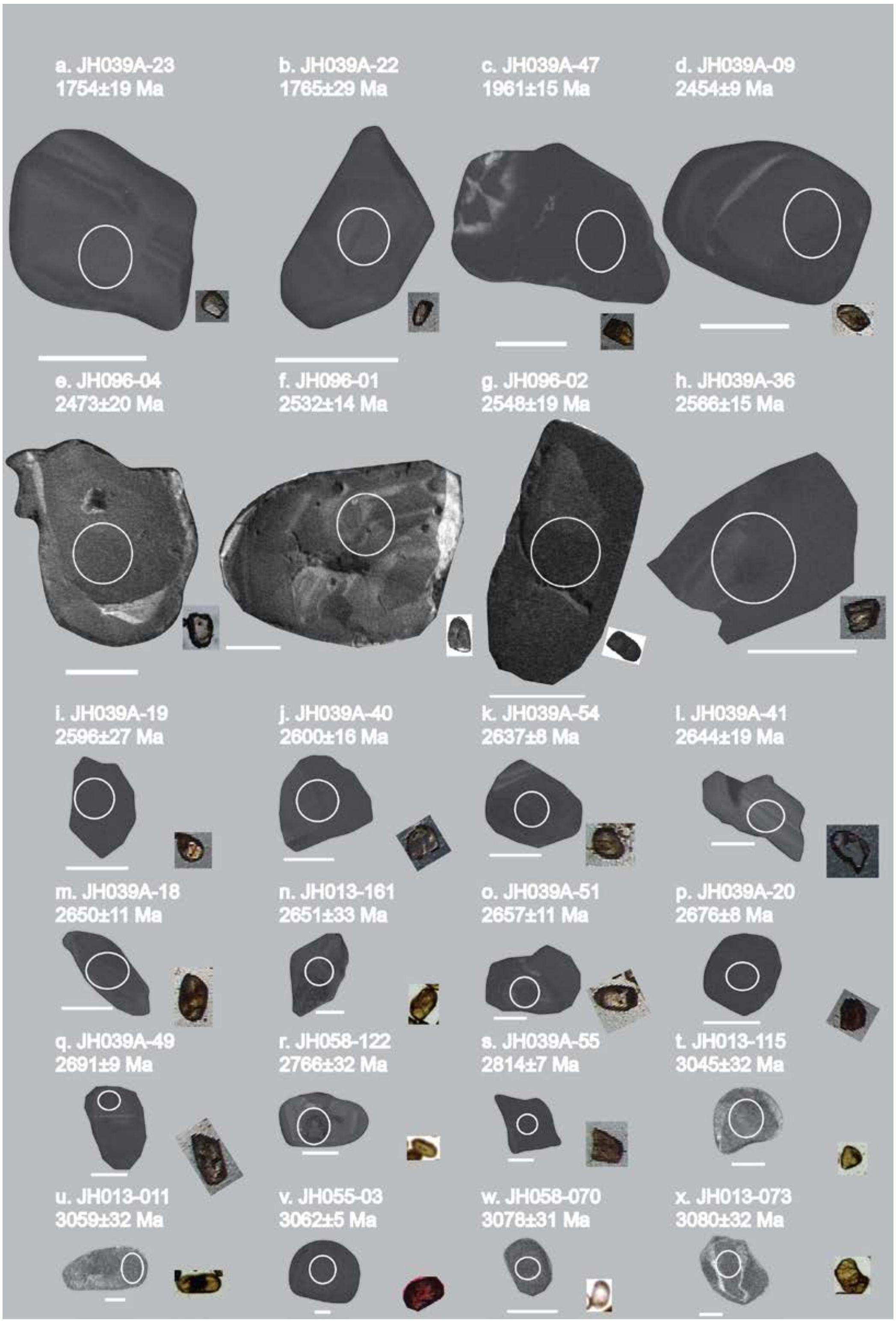

Figure 4.11 CL and transmitted light images of zircons from the sandstone units along the traverse in the Jack Hills Belt. Scale bars for the CL images are all 50 μm.

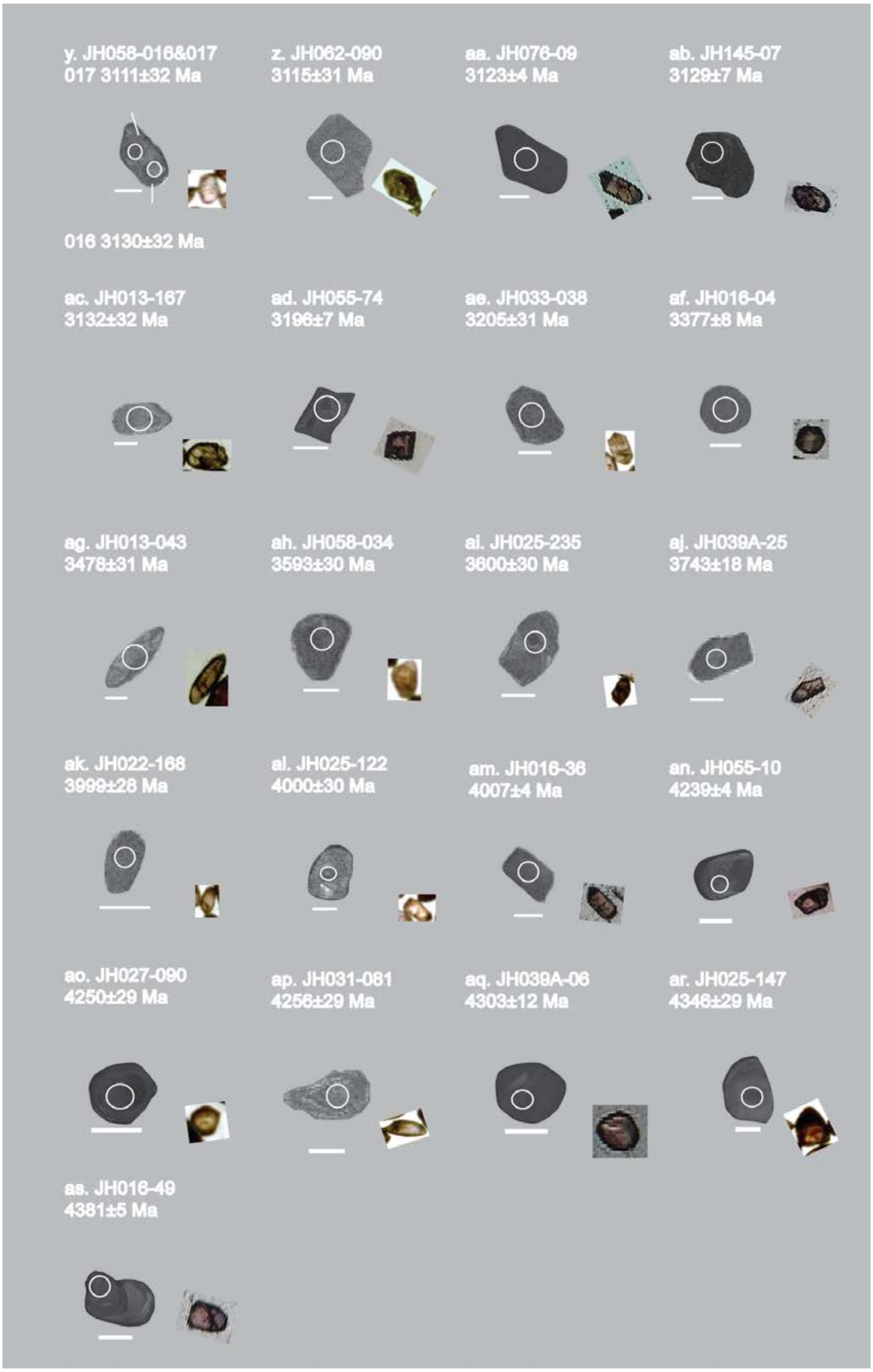

Figure 4.11 continued.

Table 4.3 Zircon properties in sandstone samples.

Grain No.	Age (Ma)	1σ	Colour	Shape	Length:Width Ratio	CL zoning	Th/U ratio	U content (ppm)	Th content (ppm)
JH039A-23	1754	19	clear	stubby	1	patchy	0.19	207	37
JH039A-22	1765	29	light brown	prism	2	dark and uniform	0.34	161	52
JH039A-47	1961	15	yellowish brown	stubby	1.5	patchy	0.12	662	79
JH039A-09	2454	9	light brown	stubby	1.5	planar	1.43	483	668
JH096-04	2473	20	clear	stubby	1.5	planar	0.60	506	292
JH096-01	2532	14	clear	fragment	1	patchy	1.02	118	116
JH096-02	2548	19	clear	elongate	2.5	patchy	0.11	1163	123
JH039A-36	2566	15	light brown	stubby	1	patchy	0.36	245	84
JH039A-19	2596	27	yellowish brown	stubby	1	planar	1.03	103	100
JH039A-40	2600	16	light brown	semi-circle	1	patchy	0.79	122	93
JH039A-54	2637	8	brown	rounded	1	patchy	0.18	437	74
JH039A-41	2644	19	light brown	fragment	1.5	patchy	1.36	85	111
JH039A-18	2650	11	brown	stubby	1.5	patchy	0.33	243	77
JH013-161	2651	33	yellowish brown	tabular	1.5	patchy	0.52	210	110
JH039A-51	2657	11	clear	tabular	1.5	patchy	0.46	217	97
JH039A-20	2676	8	dark brown	stubby	1	dark and uniform	0.35	576	194
JH039A-49	2691	9	light brown	elongate	2	patchy	0.67	321	207
JH058-122	2766	32	yellowish brown	tabular	2	patchy	2.96	211	624
JH039A-55	2814	7	light brown	stubby	1	dark and uniform	0.68	533	348
JH013-115	3045	32	yellowish brown	stubby	1	planar	0.78	119	93
JH013-011	3059	32	yellowish brown	elongate	2.5	patchy	3.46	157	543
JH055-03	3062	5	dark brown	stubby	1.5	dark	0.65	305	191
JH058-070	3078	31	clear	stubby	1.5	dark and uniform	0.72	323	233
JH013-073	3080	32	yellowish brown	stubby	1.2	palanar	0.62	259	160
JH058-016	3130	32	clear	stubby	1.2	patchy	0.53	147	78
JH058-017	3111	32	clear	stubby	1.2	patchy	0.50	143	74
JH062-090	3115	31	yellowish brown	fragment	1.5	dark and uniform	0.72	268	192
JH076-09	3123	4	light brown	elongate	2.5	dark and uniform	0.96	457	423
JH145-07	3129	7	light brown	stubby	1.5	patchy	0.77	197	148
JH013-167	3132	32	light brown	stubby	1.2	patchy	0.65	213	139
JH055-74	3196	7	brown	stubby	1	patchy	0.24	242	55.4
JH033-038	3205	31	light brown	prism	1.2	dark and uniform	0.77	337	260
JH016-04	3377	8	clear	rounded	1	dark and uniform	0.68	150	99
JH013-043	3478	31	yellowish brown	elongate	3	patchy	0.19	191	105
JH058-034	3593	30	brown	stubby	1.2	dark and uniform	0.89	180	160
JH025-235	3600	30	dark brown	fragment	1.2	patchy	0.86	340	294
JH039A-25	3743	18	clear	fragment	1.5	dark and uniform	0.33	170	55
JH022-168	3999	28	light brown	elongate	2	dark and uniform	0.91	290	263
JH016-36	4007	4	light brown	elongate	2	dark and uniform	0.66	295	187
JH025-122	4000	30	brown	elongate	3	patchy	0.52	54	28
JH055-10	4239	4	light brown	stubby	1.5	planar	0.64	131	81
JH027-090	4250	29	yellowish brown	rounded	1	dark	0.78	149	116
JH031-081	4256	29	light brown	elongate	2.5	patchy	0.51	94	48
JH039A-06	4303	12	light brown	rounded	1	patchy	0.38	156	57
JH025-147	4346	29	dark brown	stubby	1.5	dark and uniform	0.84	140	117
JH016-49	4381	5	light brown	stubby	1.5	sector	0.28	149	40

Figure 4.12 CL and transmitted light images of zircons from the conglomerate samples along the traverse in the Jack Hills Belt. Scale bars for the CL images are all 50 μm.

Table 4.4 Zircon properties in conglomerate samples.

Grain No.	Age (Ma)	1σ	Colour	Shape	Length:Width Ratio	CL zoning	Th/U ratio	U content (ppm)	Th content (ppm)
JH074-088	1805	36	clear	rounded	1	patchy	0.33	173	57
JH074-087	2030	35	light yellow	stubby	1	patchy	1.16	253	293
JH074-085	2564	33	clear	elongate	2.5	dark and uniform	0.79	972	764
JH051-071	2657	32	light brown	rounded	1	dark	0.58	565	328
JH074-086	2715	32	clear	elongate	2.5	rim (age) and core	0.72	184	132
JH047-088	3060	32	light brown	fragment	1.2	patchy	1.22	81	99
JH035-12.1	3062	13	brown	stubby	1.2	patchy	1.65	194	311
JH036-24	3074	10	light brown	stubby	1.2	dark	3.74	190	690
JH045-058	3080	31	light tan	rounded	1.2	dark and uniform	3.51	237	832
JH074-151	3101	31	yellowish brown	rounded	1	dark	0.31	461	145
JH035-26.1	3114	7	dark chocolate	elongate	3	dark and uniform	0.78	205	154
JH036-13	3219	5	brown	rounded	1	dark and uniform	1.33	412	532
JH021A-40.1	3383	5	light brown	stubby	1.2	dark	0.53	292	150
JH036-14	3455	6	brown	fragment	2	dark	0.26	268	68
JH074-112	3597	30	yellowish brown	tabular	2	patchy	0.42	370	154
JH021B-150	3601	30	brown	elongate	3	dark and uniform	0.30	385	115
JH021A-06.1	3777	7	light brown	elongate	2.5	patchy	0.74	133	95
JH021A-19.2	3999	10	brown	fragment	2	planar	0.39	53	19
JH049-059	4000	30	light tan	fragment	1.2	planar	0.72	36	26
JH049-058	4017	29	light tan	fragment	1.2	planar	0.99	83	82
JH036-49	4022	7	light brown	tabular	2	dark	0.74	115	83
JH021A-88.1	4141	12	light brown	stubby	1.5	dark	0.60	90	52
JH038-116	4210	29	dark brown	elongate	2	planar	1.14	296	338
JH038-160	4221	29	dark chocolate	stubby	1	dark	1.24	1250	1554
JH046-183	4233	29	light brown	fragment	2	patchy	0.66	147	97
JH021B-087	4274	29	dark brown	elongate	2	patchy	0.56	88	49

Table 4.5 Zircon properties in quartzite samples.

Grain No.	Age (Ma)	1σ	Colour	Shape	Length:Width Ratio	CL zoning	Th/U ratio	U content (ppm)	Th content (ppm)
JH152-64	1643	25	clear	stubby	1	patchy	1.04	115	116
JH151-13	2622	6	light tan	tabular	2	dark and uniform	0.94	548	499
JH034-043	3086	32	light tan	fragment	1	dark	2.81	117	329
JH034-211	3092	31	brown	stubby	1.5	dark and uniform	0.83	368	307
JH034-049	3121	31	clear	elongate	3	dark and uniform	0.77	243	187
JH034-039	3127	31	tan	rounded	1.2	dark and uniform	2.62	264	692
JH034-095	3129	31	clear	elliptic	2	dark and uniform	1.79	373	666
JH034-151	3145	32	tan	stubby	1.5	dark	0.77	273	211
JH149-91	3278	7	brown	elongate	2.5	patchy	1.27	151	186
JH149-55	3393	6	brown	stubby	1.5	patchy	0.89	252	217
JH149-81	3471	4	brown	stubby	1.5	dark	0.36	460	159
JH053-239	3596	31	brown	stubby	1.2	dark	0.53	275	145
JH042-143	3600	30	light tan	elongate	2.5	dark	1.05	157	165
JH149-16	3735	4	light brown	stubby	1.5	planar	0.82	360	282
JH152-10	3991	7	light brown	stubby	1.5	dark	1.01	302	296
JH053-208	4003	30	clear	rounded	1	planar	0.23	53	12
JH152-34	4019	4	light brown	stubby	1	patchy	0.66	252	162
JH152-75	4115	6	clear	fragment	1.2	patchy	0.36	175	61
JH151-09	4182	6	brown	elliptic	1.5	dark and uniform	0.69	171	115
JH053-50	4201	29	light brown	stubby	1.5	patchy	0.10	169	17
JH034-079	4231	29	dark brown	rounded	1.5	patchy	0.62	141	87
JH053-030	4231	29	dark brown	tabular	2	patchy	1.49	299	445
JH053-087	4285	28	light brown	elongate	2.5	patchy	1.31	177	231
JH053-144	4317	28	light brown	elongate	2	planar	1.53	601	917
JH053-159	4346	28	dark brown	elongate	2	planar	0.48	387	186
JH053-146	4358	28	dark brown	elonagate	2	planar	1.71	584	996

Table 4.6 Zircon properties in chert sample.

Grain No.	Age (Ma)	1σ	Colour	Shape	Length:Width Ratio	CL zoning	Th/U ratio	U content (ppm)	Th content (ppm)
JH154-04	3515	22	light brown	stubby	2	patchy	0.97	125	117
JH154-03	3536	13	brown	stubby	1.2	patchy	1.07	253	262
JH154-05	3540	7	light brown	prism	2	planar	0.51	125	62

Figure 4.13 CL and transmitted light images of zircons from the quartzite samples along the traverse in the Jack Hills Belt. Scale bars for the CL images are all 50 μm.

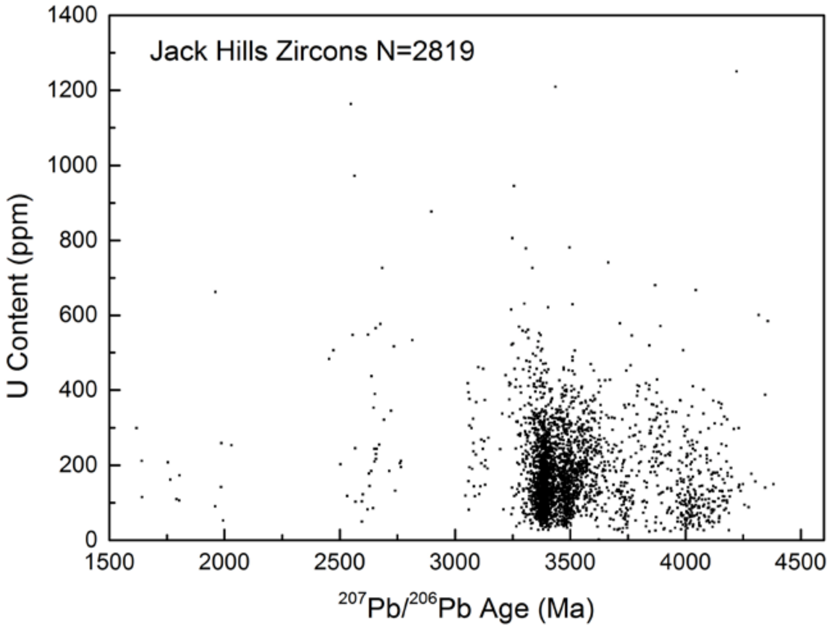

Figure 4.14 Plot of uranium content vs. age for Jack Hills zircons.

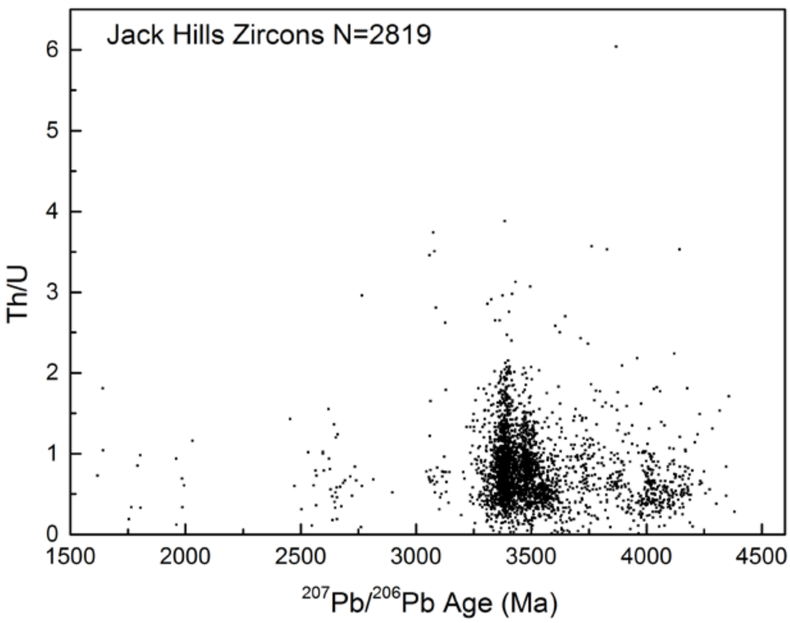

Figure 4.15 Plot of Th/U ratio vs. age for Jack Hills zircons.

4.1.6 Uranium and Thorium Ratios and CL Features of the Jack Hills Zircons

The representative individual grains from each rock type are presented in Figs 4.9-4.13, including all the Proterozoic, Neoarchean and >4.3 Ga Hadean grains, and representative >2.8 Ga Archean and Hadean grains, due to the large quantity of data. For the uranium and thorium content and zircon properties for these grains refer to Table 4.2-4.6. The full dataset is in Appendices B-C.

Uranium (Fig 4.14) and thorium concentrations of zircon grains range from 2 ppm (JH038-080) to 1250 ppm (JH038-160), and 1 ppm (JH051-098) to 4106 ppm (JH046-141), respectively, and the Th/U ratio (Fig 4.15) ranges from 0.01 (JH051-098) to 6.04 (JH046-141). Only 25 analyses out of a total of 2819 have Th/U ratios less than 0.10, and these 25 grains are scattered in 18 samples. It is unknown if these zircons with <0.10 Th/U ratios are of metamorphic origin, but their low number indicates that metamorphic zircon (Rubatto, 2002) was not a significant contributor to the zircon population, However, the large proportion (99%) of zircons with Th/U ratio >0.10 attests that the majority of Jack Hills zircons are of magmatic origin.

In this study, zircons show features ranging from oscillatory zoning (JH014-51, 1959 Ma, Th/U=0.94, Fig 4.7 e), sector zoning (JH016-49, 4381 Ma, Th/U=0.28, Fig 4.11 as; JH007-05.1&2, 1994&1986 Ma, Th/U=0.34&0.61 Fig 4.7 g) and planar zoning (JH039B-02, 1618 Ma, Th/U=0.73, Fig 4.7 a), which are interpreted as being of magmatic origin. A number of grains show irregular patchy zoning that is commonly linked to recrystallization-reprecipitation reactions as a result of interaction with a melt or fluid (Nemchin et al., 2006). Some grains show areas where original structure has become diffuse (JH039A-06, 4303 Ma, Th/U=0.38, Fig 4.11 aq) or completely replaced by homogeneous dark material (JH038-160, 4221 Ma, Th/U=1.24) in CL images. These features are consistent with formation of the grains in magmatic rocks that have subsequently undergone high-grade metamorphism, most likely in the Narryer Terrane of which the Jack Hiils belt is part.

4.3 Evaluation of all the Jack Hills Zircon U-Pb Age Populations

4.3.1 Predominant Peak

A total of 2819 concordant zircon ages (Fig 4.15) were obtained from a total of 6308 zircons analysed in this study, and these ages range from 1618±22 Ma to 4381±5 Ma. A total of fifty-four (2%) zircon ages were younger than 3.0 Ga, and another 1% zircon ages were between 3.0 and 3.2 Ga. A total of 2159 (76%) zircon ages were between 3.2 Ga to 3.6 Ga, and with a prominent age peak at 3383 Ma. A total of three hundred and fifty-four analyses (13%) recorded ages from 3.6 Ga to 4.0 Ga. There were 221 zircons (8%) in the age range between 4.0 and 4.1 Ga, with a significant age peak at 4009 Ma. The 3383 Ma age peak agrees well with the 3380 Ma age peak identified in three metaconglomerate layers in the western part of the Jack Hills (Crowley et al., 2005).

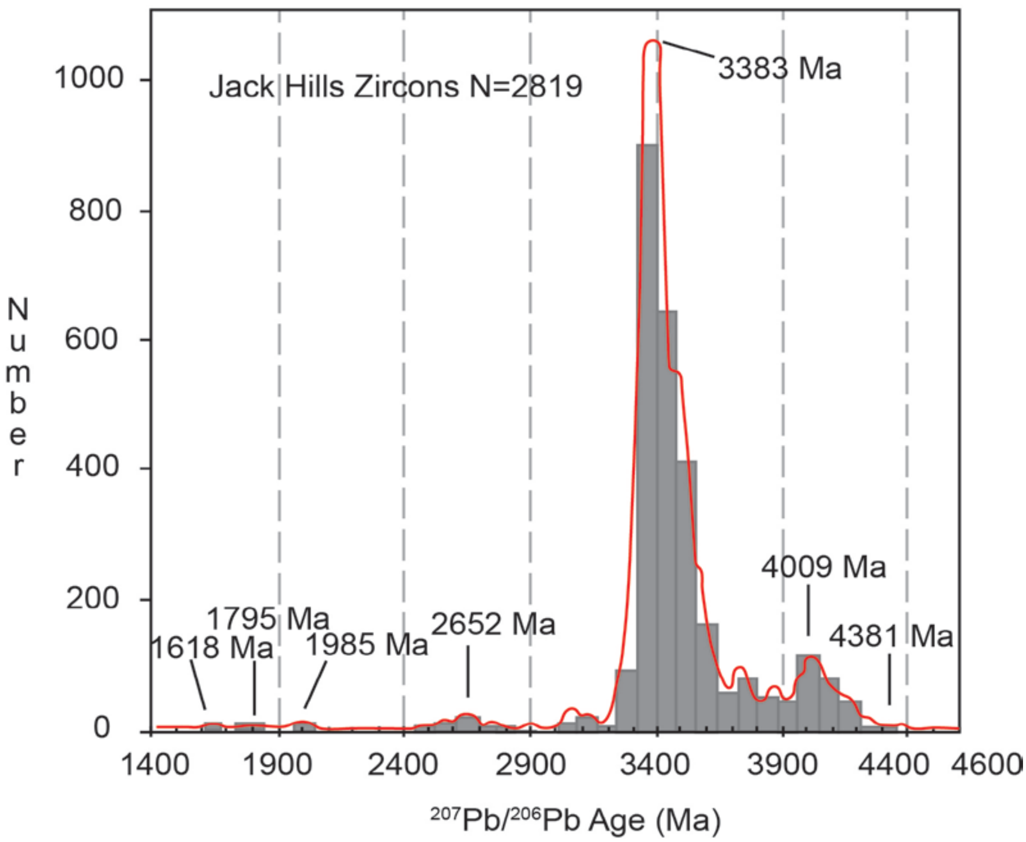

Figure 4.16 Histogram and Gaussian summation probability density plots of all detrital zircons along the traverse of the Jack Hills Belt.

4.3.2 Age Population of Younger Zircons along the Traverse (1600-3000 Ma)

A total of fifty-four concordant zircon U-Pb ages were younger than 3.0 Ga, and these ages were distributed at ~1.6 Ga, ~1.7-1.8 Ga, ~2.0 Ga, and 2.4-2.9 Ga, whereas only the 2.4-2.9 Ga age peak was defined by a large number of zircons (Fig 4.16).

4.3.2.1 Proterozoic Age distribution (1600-2500 Ma)

There were fifteen zircons younger than 2.5 Ga identified from seven samples among two thousand eight hundred and nineteen concordant analyses, which means only 0.5% of the zircon grains record Proterozoic ages. The age peaks are ~1.6 Ga, 1.65 Ga, 1.8 Ga, 1.98 Ga and 2.45 Ga (Fig 4.16).

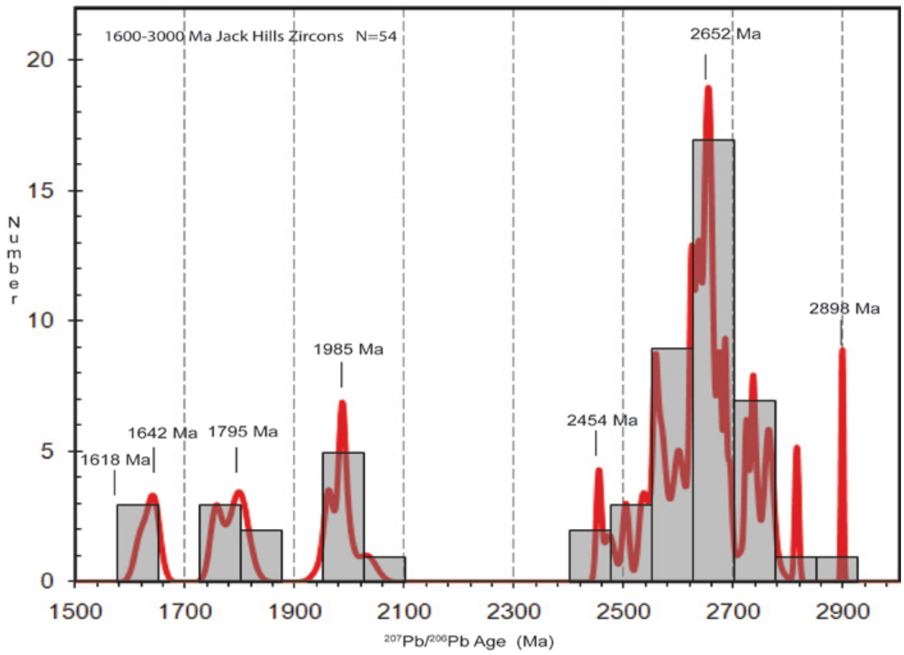

Figure 4.17 Histogram and Gaussian summation probability density plots of detrital zircons (1600-3000 Ma) along the traverse of the Jack Hills Belt.

Seven grains recording a total of eight Proterozoic ages were obtained from three schist samples (Fig 4.10, Table 4.2) JH10007 (27 m), JH10014 (61.5 m) and JH10039B (212 m). These ages were: 1618±22 Ma (JH039B-02), 1642±21 Ma (JH014-08), 1792±27 Ma (JH014-53), 1803±27 Ma (JH007-12.1), 1959±34 Ma (JH014-51), 1985±18 Ma (JH007-18.1), 1986±11 Ma (JH007-05. 1), and 1994±22 Ma (JH007-05.2). Five grains were from two sandstone samples JH10039A (212 m) and JH12096 (514.5 m). These ages were: 1754±19 Ma (JH039A-23), 1765±29 Ma (JH039A-22), 1961±15 Ma (JH039A-47), 2454±9 Ma (JH039A-09), and 2473±20 Ma (JH096-04). Only the matrix-supported conglomerate sample JH10074 (408.5 m) yielded two Proterozoic grains among one thousand one hundred and eight concordant analyses from fifteen conglomerates. These ages were: 1805±36 Ma (JH074-088) and 2030±35 Ma (JH074-087). One Proterozoic zircon was present in quartzite sample JH12152 (929.5 m) with an age of 1642±25 Ma (JH152-64).

4.3.2.2 Neoarchean Zircons (2500-2800 Ma)

A total of thirty-four analyses were identified as Neoarchean grains from eleven samples, including schists, sandstones, conglomerates and a quartzite.

Nineteen Neoarchean analyses were identified in four schist samples (JH10007, 27m; JH10014, 61.5 m; JH10039B, 212 m; JH10043, 242 m). These ages were from 2621±16 Ma (JH007-02.2) to 2762±14 Ma (JH039B-06), with a distinctive age peak at ~2660 Ma. Four sandstone samples (JH1013, 57 m; JH10039A, 212 m; JH10058, 309 m; and JH12096, 514.5 m) contain a total of thirteen Neoarchean zircons. These were from 2651±33 Ma (JH013-161) to 2548±19 Ma (JH12096-02). Two conglomerates (JH10051, 278.5 m; JH10074, 408.5 m) contained a total of three Neoarchean zircons. These were: 2657±32 Ma (JH051-071); 2564±33 Ma (JH074-085), 2715±32 Ma (JH074-086). Only one zircon (JH151-13) with an age of 2623±6 Ma was identified as Neoarchean from quartzite sample JH12151 (922.5 m) out of seven quartzite samples that yielded zircons along the traverse.4.3.2.3 Younger Mesoarchean Zircons (2800-3000 Ma)

Only two grains recorded ages between 2.8 to 3.0 Ga, and these ages were 2815±7 Ma (JH039A-55, 212 m) and 2898±4 Ma (JH007-07.1, 27 m), obtained from a schist and sandstone, respectively. No grains were found with ages from 2898±4 to 3045±32 Ma.

4.3.3 Age population between 3000-4000 Ma

4.3.3.1 Older Mesoarchean Zircons (3000-3200 Ma)

Compared to the main ~3.4 Ga age peak (Fig 4.15), the ~3.0-3.1 Ga age range is less common. There were only thirty-two zircons from fourteen samples that recorded Mesoarchean ages ranging from 3045±32 Ma (JH013-115, 57 m) to 3196±7 Ma (JH055-74, 294 m), with minor age peaks at 3054 Ma and 3121 Ma (Fig 4.17).

Six grains from two schist samples (JH10007, 27 m; JH10014, 61.5 m) record Mesoarchean ages older than 3000 Ma; from 3055±7 Ma (JH014-57) to 3141±8 Ma (JH007-15.2). Fourteen zircons from seven sandstone samples (JH10013, 57 m; JH10039A, 212 m; JH10055, 294 m; JH10058, 309 m; JH10062, 331 m; JH10076, 413.5 m; and JH12145, 868.5 m) record Mesoarchean ages older than 3000 Ma; from 3045±32 Ma (JH013-115) to 3196±7 Ma (JH055-74). Six analyses from five conglomerate samples (JH10035, 176 m; JH10036, 182 m; JH10045, 248 m; JH10047, 258 m; JH10074, 408.5 m) record Mesoarchean ages older than 3000 Ma, from 3060±32 Ma (JH047-088) to 3114±7 Ma (JH035-26.1). Six zircons from quartzite sample JH10034 (170 m) reveal Mesoarchean ages older than 3000 Ma, from 3086±32 Ma (JH034-043) to 3145±32 Ma (JH034-151).

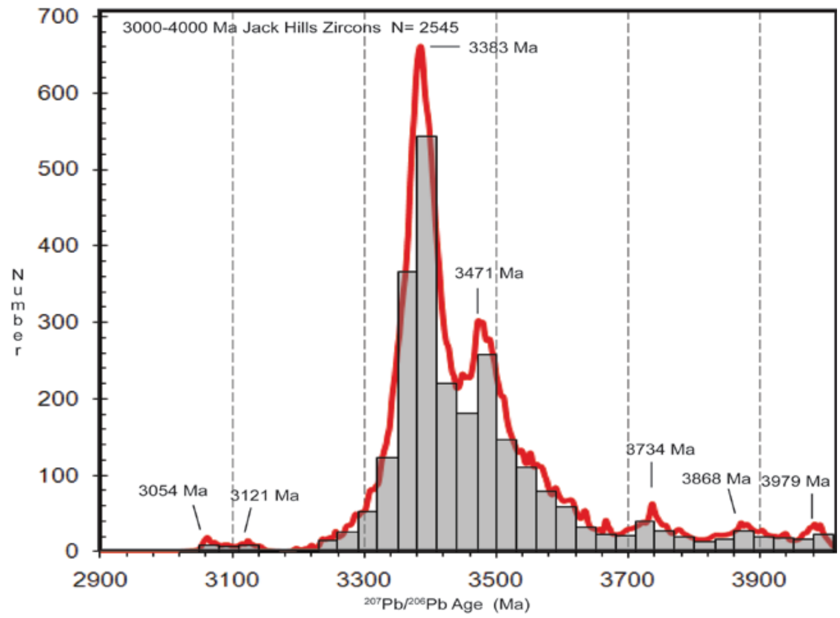

Figure 4.18 Histogram and Gaussian summation probability density plots of detrital zircons (3000-4000 Ma) along the traverse of the Jack Hills Belt.

4.3.3.2 Paleoarchean Zircons (3200-3600 Ma)

A total of two thousand one hundred and fifty-nine zircon grains recorded ages between 3200 Ma to 3600 Ma. The age record is quite continuous from 3205±31 (JH033-038) to 3597±30 Ma (JH074-112), with a prominent age peak at 3383 Ma, and a substantial age peak at 3471 Ma; and there are still a considerable amount of zircons that record ages up to 3596 Ma (Fig 4.17). These ages were found in all fifty-one samples (for the location of each sample refers to Table 4.1).

Thirty-six analyses obtained from four schist samples record ages between 3286±6 (JH014-59) to 3510±4 Ma (JH039B-04). A total of eight hundred and ninety-four analyses from twenty-four sandstone samples record ages from 3205±31 (JH033-038) to 3593±30 Ma (JH058-034. Eight hundred and fifty-nine analyses from fifteen conglomerate samples record ages between 3219±5 (JH036-13) and 3597±30 Ma (JH074-112). Three hundred and sixty-seven analyses from seven quartzite samples record ages from 3278±7 (JH149-91) to 3596±31 Ma (JH053-239). All data are in Appendices 2 and 3.

4.3.3.3 Eoarchean Zircons (3600-4000 Ma)

A total of three hundred and fifty-four zircon grains recorded ages from 3600 Ma to 4000 Ma. These grains were obtained from forty-five samples along the traverse. Schist samples JH10007 (27 m) and JH10039B (212 m); sandstone samples JH10015 (65 m), JH10076 (413.5 m), and JH12096 (514.5 m); and chert sample

JH12154 (970.5 m) did not yield any Eoarchean zircon ages, possibly in part due to the limited numbers of zircons obtained from them (Table 4.1).

Four analyses from two schist samples (JH10014, 61.5 m; JH10043, 242 m) record U-Pb ages between 3613±8 (JH014-44) and 3742±13 Ma (JH043-19). One hundred and forty-four analyses obtained from twenty-one sandstone samples record zircon U-Pb ages from 3600±30 (JH025-235) to 3999±29 Ma (JH022-168). One hundred and fifty-five analyses obtained from fifteen conglomerate samples record U-Pb ages from 3601±30 (JH021B-150) to 3999±10 Ma (JH021A-19.2). All fifteen conglomerate samples along the traverse contain Eoarchean zircons. Fifty-one analyses obtained from seven quartzite samples record zircon U-Pb ages from 3600±30 (JH042-143) to 3991±7 Ma (JH152-10). All data are in the Appendices 2 and 3.

4.3.4 Hadean Zircons (>4000 Ma)

A total of two hundred and twenty-one Hadean zircon grains, with the oldest being 4381±5 Ma (JH016-49), were identified along the traverse. A total of one hundred and thirty-one (59%) Hadean zircons are within the age range 4.0-4.1 Ga, and seventy-two (32%) are within the age range 4.1-4.2 Ga. The number of grains with Hadean ages decreases gradually towards ~4.4 Ga. There are also three ~20-30 Ma age gaps, at 4256-4274 Ma, 4317-4346 Ma, and 4358-4381 Ma (Fig 4.18).

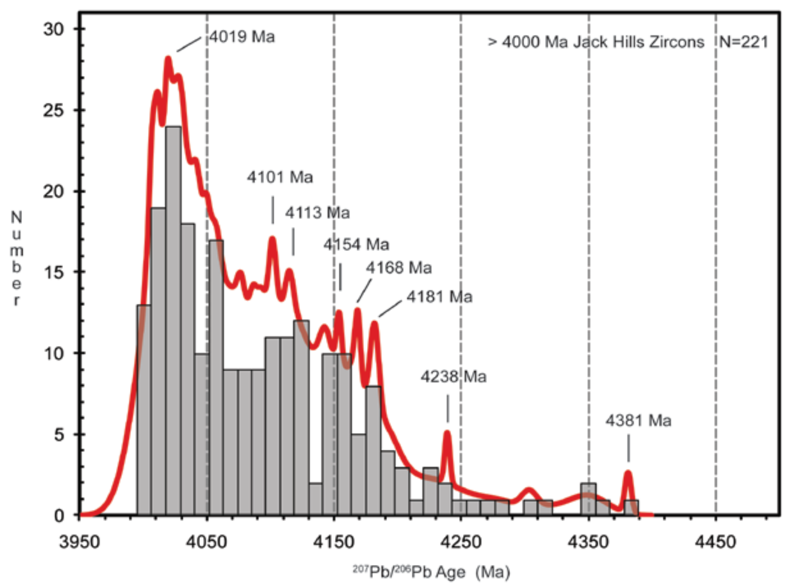

Figure 4.19 Histogram and Gaussian summation probability density plots of detrital zircons (>4000 Ma) along the traverse in the Jack Hills Belt.

A total of four (1.8%) Hadean zircons were found in two schist samples (JH10014, 61.5 m; JH10043, 242 m), with a spread of ages from 4084±13 Ma (JH014-30) to 4154±4 Ma (JH043-26); eighty-three Hadean zircons (37%) were found in nineteen sandstone samples, with a spread of ages from 4000±30 (JH025-122) to 4381±5 Ma (JH016-49), although five sandstone samples did not yield any Hadean grains. Eighty-four (38%) Hadean zircons were found in fourteen conglomerate samples, with a spread of ages from 4000±30 Ma (JH049-059) to 4274±29 Ma (JH021B-087), and only conglomerate sample JH10035 (176 m) did not yield any Hadean zircon. Fifty-one (21%) Hadean zircons were found in quartzite samples, with a spread of ages from 4003±30 Ma (JH053-208) to 4358±28 Ma (JH053-146), and only quartzite sample JH10075 (408.5 m) did not yield any Hadean grains.

Six >4.3 Ga zircons have only been found in sandstone and quartzite samples, three of them were in sandstone samples (4381± 5 Ma (JH016-49), 4346±29 Ma (JH025-147), and 4303±12 Ma (JH039A-06)); the other three in a single quartzite sample JH10053, with ages of 4358±28 Ma (JH053-146), 4346±28 Ma (JH053-159), and 4317±28 Ma (JH053-144).

4.4 Depositional Age of the Jack Hills belt

One early view was that the Jack Hills belt was deposited prior to 3.0 Ga, because no zircon younger than 3.0 Ga was identified in these studies (Compston and Pidgeon, 1986; Mojzsis et al., 2001; Peck et al., 2001).

However, Cavosie et al. (2004) and Dunn et al. (2005) identified several concordant Late Archean and Paleoproterozoic zircons in metasedimentary rocks (schist, conglomerate and quartzite). A sample of metaconglomerate (01JH47) from the eastern transect of Cavosie et al. (2004) contained two magmatic grains with ages of 2724±7 and 2504±6 Ma. Along their western transect on Eranondoo Hill, which includes the W74 site, Cavosie et al. (2004) describe a quartzite sample (01JH63) that contains not only concordant Late Archean grains with ages of 2736±6, 2620±10, and 2590±30 Ma, but two concordant Paleoproterozoic grains (1973±11 and 1752±22 Ma), and a single concordant grain with a Mesoproterozoic age of 1576±22 Ma. Dunn et al. (2005) obtained many concordant Late Archean grains in a fine-grained quartz-mica schist that is considered to be within the same sedimentary succession as the W74 conglomerate. In addition, the sample also contained concordant Paleoproterozoic grains, the youngest recorded a $^{207}Pb/^{206}Pb$ age of 1797±21 Ma, and other Proterozoic ages ranged from 1944 to 1981 Ma. Dunn et al. (2005) also reported a metaconglomerate from the northeastern part of the belt (site JH04) that contains a similar range of ages to the quartz-mica schist, with the youngest concordant grain being 1884±32 Ma.

Wilde (2010) reported four felsic volcanic rocks from the central part of the belt that contain zircon populations at ~3.3-3.4, ~3.0-3.1, ~2.6 and ~1.8-1.9 Ga. The youngest discrete group of zircon grains, with ages ranging from ~1775 to ~1970 Ma, show strong oscillatory zoning and average Th/U ratios of 0.76, features consistent with an igneous origin. The youngest ages were interpreted as defining the crystallisation of the volcanic rocks.

Several Proterozoic detrital zircons, with the youngest age of 1220± 42 Ma, were separated from a rare heavy mineral band within a quartzite cobble located in a conglomerate sample, ~1 km west of the W74 site. These are the youngest grains so far reported from sedimentary rocks at Jack Hills. The grains show magmatic oscillatory zoning that implies at least two sedimentary cycles within the Proterozoic; requiring erosion of an igneous precursor, incorporation into a clastic sediment, induration and subsequent erosion and transport to be hosted in the conglomerate (Grange et al., 2010).

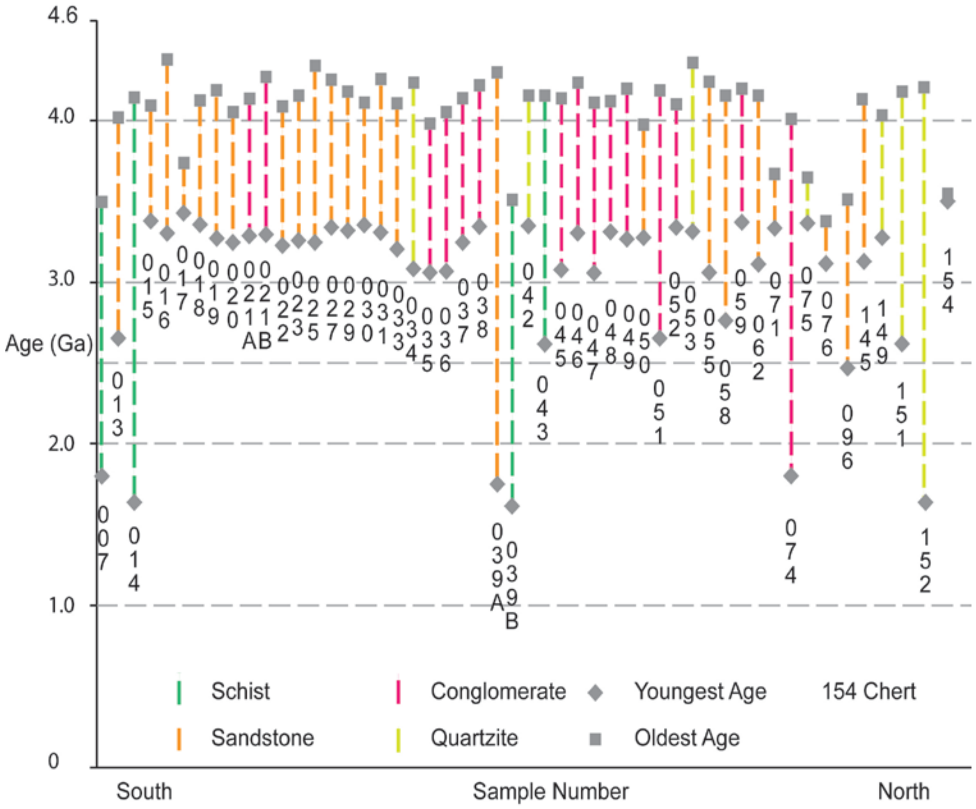

Figure 4.20 The youngest and oldest ages in each the analysed samples along the traverse.

The results from the volcanic units and the detrital zircons in the clastic sedimentary rock units indicate that the belt cannot be entirely Archean in age.

The wide spread of Proterozoic detrital zircon from seven samples (Fig 4.19) in this study confirm that the Jack Hills metasedimentary belt does contain post-Archean components, and the Proterozoic rocks are interdigitated with >3 Ga rocks. There is no relationship between rock type and the young zircon grains observed.

There is a possibility that much of the material currently exposed in the Jack Hills belt formed in the Proterozoic, especially the fine-grained metasedimentary rocks, which unfortunately yielded few or no zircons. This study confirms the previous result that at least part of the Jack Hills belt is younger than 3 Ga.

However, it is correct that the majority of the metasedimentary rocks appear to have been deposited in the Archean. A recent monazite and xenotime study shows that a banded iron formation near Mount Hale must be older than ~3.0 Ga and that the W74 conglomerate was deposited prior to 2.6 Ga (Rasmussen et al., 2010).

4.5 Provenance of the Jack Hills Zircons

Previous studies have identified several detrital zircon populations in the Narryer Terrane, including Hadean >4300, 4200, and 4150 Ma (Maas et al., 1992; Peck et al., 2001) and Archean >3800, 3750-3600, 3500-3300, and 3100-3050 Ma (Nutman et al., 1991). All of these age peaks were evident along the traverse (Fig 4.5), however, for the >3.8 Ga zircon grains, no rocks with similar ages have been found in Western Australia, and no rocks on Earth match the ages >4030 Ma (Bowring and Williams, 1999). Many of the old zircons are sub-euhedral or sub-rounded, which suggests they have experienced distal transportation from the source area or they have been involved in more than one sedimentary cycle (Grange et al., 2010).

For the ~3.3-3.75 Ga age range that is prominent in rocks along the traverse, the potential source may be the TTG granitoid suite surrounding the Jack Hills belt (Pidgeon and Wilde, 1998), since ages in this range are common in the Narryer Terrane.

Because there is a spread of ages from ~2.4 Ga to 2.9 Ga, there is the possibility that many of these Neoarchean grains had a common source. The potential source for these with ages of ~2.6 Ga is the 2.6 Ga granitoids that are widespread across the Yilgarn Craton (Cassidy et al., 2006) and which also occur at the southern side of the Jack Hills belt (Pidgeon and Wilde, 1998). Indeed, Nelson et al. (2002)

identified two 4.3 Ga grains in 2.6 Ga granitoids on the south side of Mt Narryer, approximately 50 km to the southwest.

The <2030 Ma Proterozoic age record (Fig 4.16) agrees well with the the Glenburgh Orogen (2005-1960 Ma; Occhipinti et al., 2004), Capricorn Orogen (1830-1780 Ma; Sheppard et al., 2003), and Mangaroon Orogen (1680-1620 Ma; Sheppard et al., 2005), to the north of the Jack Hills, marking the collision zone between the Yilgarn and Pilbara cratons (Cawood et al. 2004, Tyler et al., 1990). The three youngest grains (1618±22 Ma, JH039B-02; 1642±21 Ma, JH014-08; 1643±25 Ma, JH152-64) along the traverse are in the age range of the Mangaroon Orogeny. Four ~1.7-1.8 Ga grains (1792±27 Ma, JH014-53; 1803±27 Ma, JH007-12.1; 1805±36 Ma, JH074-88) possibly record the influence of the Capricorn Orogeny. Another four grains (1959±34 Ma, JH014-51; 1961±15 Ma, JH039A-47; 1985±18 Ma, JH007-18.1; 1986±11 Ma and 1994±22 Ma, JH007-05) are consistent with events in the Glenburgh Orogeny.

Grains from fine-grained sandstone JH10039A have ages of 1754±19 Ma (JH039A-23) and 1765±29 Ma (JH039A-22) that may be related to dextral transpressive shearing at Jack Hills defined by biotite and muscovite Ar-Ar ages clustering between 1900 and 1700 Ma and associated with the Capricorn Orogen (Spaggiari et al., 2008).

As stated above, the Glenburgh, Capricorn and Mangaroon orogenies are related to the collision between the Pilbara and Yilgran cratons to the north of Narryer Terrane. The agreement of the age record between the Jack Hills belt and these three orogenies sugests that the sedimentary protolith lay to the north of the Narryer Terrane, hence sedimentation was from north to south, at least in part.

Chapter 5. Lu-Hf isotope Data

5.1 Strategy for Collection of Lu-Hf Isotope Data

A total of 1093 zircons from 46 samples (Table 5.1) were analysed for Lu-Hf isotopes. The results were collected in two separate campaigns; one at the State Key Laboratory of Continental Dynamics, Northwest University, China (Analytical Session 1 in Table 5.1); the other at the Institute of Geology and Geophysics, Chinese Academy of Sciences in Beijing, China (Analytical Session 2 in Table 5.1).

For analytical session 1, only zircon grains with >90% concordance from 27 samples were analysed. Because the Lu-Hf isotope results were scattered, six of these samples were re-analysed in analytical session 2 (Table 5.1). In addition, random grains with 'normal ε_{Hf} values' were also re-analysed in analytical session 2 in order to test the reproducibility between laboratories. Zircons from an additional 19 samples were analysed in session 2, and also consisted only of grains with ≥90% concordance. Additional criteria were also applied when choosing these zircon grains, including avoiding overgrowths, fractures, and inclusions so that multiple domains with multistage crystallization histories were not included.

By way of example, Lu-Hf results from analytical session 2 for sandstone sample JH10018 and conglomerate sample JH10059 (314 m) were found to be consistent with analytical session 1, so the result from analytical session 1 was accepted. The number of samples that had recorded positive ε_{Hf} values were significantly reduced in analytical session 2; e.g. for sandstone sample JH10027 (126 m), conglomerate samples JH10038 (197 m), JH10045 (248 m), JH10048 (263 m), and JH10074 (408.5 m); so the results obtained from analytical session 2 were accepted given the greater control on site location. However, there are still twelve spots from quartzite sample JH10053 (287.5 m) that recorded anomalously high $\varepsilon_{Hf(t)}$, so these zircons were re-analyzed by SHRIMP to check to see if their ages were correct. These data are presented in Table 5.2. The original analytical record of quartzite sample JH10053 is presented in Appendix F. This will be discussed in more detail in section 5.4.1.

Based on comparitive data for analytical session 1 and 2, all the Lu-Hf isotopic data from analytical session 1 that are considered reliable are presented in Appendix D; all those from analytical session 2 are shown in Appendix E. Data from both analytical sessions are presented in Appendix F for the six samples that were analysed twice. Standards information from both analytical sessions are presented in Appendix G and H.

Table 5.1 Sample List for Lu-Hf Isotope Analysis.

Sample	Rock Type	Location (m)	Analyses	Lowest $\varepsilon_{Hf(t)}$	Highest $\varepsilon_{Hf(t)}$	Minimum T_{DM} (Ma)	Maximun T_{DM} (Ma)	Analytical Session	Accepted Data
JH10013	sandstone	57	32	-14.7	-2.6	3411	4566	1	1
JH10014	schist	61.5	17	-14.7	1.0	2407	4340	2	2
JH10015	sandstone	65	1	-4.1	-4.1	4373	4373	2	2
JH10016	sandstone	70	15	-12.4	1.6	3774	4409	2	2
JH10017	sandstone	75	1	-6.3	-6.0	4132	4132	2	2
JH10018	sandstone	79	19	-16.3	-2.1	3816	4501	1,2	1
JH10019	sandstone	84	20	-15.7	-2.5	3735	4420	1	1
JH10020	sandstone	89	26	-13.8	0.7	3645	4410	1	1
JH10021B	conglomerate	94	49	-11.9	-0.6	3541	4580	1	1
JH10022	sandstone	100	35	-14.3	3.2	3594	4538	1	1
JH10023	sandstone	105	23	-17.6	-2.2	3835	4441	1	1
JH10025	sandstone	116	74	-15.0	0.3	3574	4502	1	1
JH10027	sandstone	126	37	-13.6	2.3	3630	4511	1,2	2
JH10030	sandstone	149	3	-6.3	-1.3	4248	4372	2	2
JH10031	sandstone	154	30	-16.6	-0.4	3674	4543	1	1
JH10033	sandstone	164	35	-14.2	-2.0	3650	4515	1	1
JH10034	quartzite	170	35	-11.6	5.6	3152	4459	1,2	2
JH10036	conglomerate	182	7	-8.6	-3.8	3483	4361	2	2
JH10037	conglomerate	192.5	32	-17.3	-1.8	3757	4562	1	1
JH10038	conglomerate	197	17	-11.5	2.4	3699	4306	1,2	2
JH10039A	sandstone	212	22	-22.1	-0.3	2442	4409	2	2
JH10039B	schist	212	3	-11.3	-3.5	3040	3828	2	2
JH10042	quartzite	227	40	-14.5	-0.5	3601	4517	1	1
JH10045	conglomerate	248	27	-11.5	2.5	3233	4304	1,2	2
JH10046	conglomerate	253	69	-16.2	-0.6	3599	4543	1	1
JH10047	conglomerate	258	33	-14.0	-2.8	3504	4428	1	1
JH10048	conglomerate	263	15	-12.0	2.0	3714	4303	1,2	2
JH10049	conglomerate	268	34	-11.0	3.2	3574	4370	1,2	2
JH10050	sandstone	273	8	-13.0	2.5	3472	4280	2	2
JH10051	conglomerate	278.5	66	-14.1	0.6	3178	4595	1	1
JH10052	conglomerate	283	11	-7.9	-1.3	3769	4412	2	2
JH10053	quartzite	287.5	44	-9.6	5.6	3538	4357	1,2	2
JH10055	sandstone	294	12	-8.9	-0.5	3339	4413	2	2
JH10058	sandstone	309	23	-9.7	1.8	3266	4515	1,2	2
JH10059	conglomerate	314	30	-13.3	0.0	3801	4490	1,2	1
JH10062	sandstone	331	28	-14.7	0.9	3389	4496	1	1
JH10071	sandstone	393	6	-7.3	-1.1	3691	3957	2	2
JH10074	conglomerate	408.5	20	-10.7	1.5	2374	3992	1,2	2
JH10075	quartzite	408.5	10	-6.0	-1.4	3724	3917	1,2	2
JH10076	sandstone	413.5	3	-8.0	-5.9	3814	3905	2	2
JH12096	sandstone	514.5	3	-13.5	-9.8	3219	3346	2	2
JH12145	sandstone	868.5	11	-15.0	-2.2	3552	4390	2	2
JH12149	quartzite	892.5	20	-9.6	-1.6	3757	4227	2	2
JH12151	quartzite	922.5	16	-12.2	2.2	3318	4369	2	2
JH12152	quartzite	929.5	28	-10.2	-1.5	2413	4420	2	2
JH12154	chert	970.5	3	-3.9	-2.6	3821	3850	2	2
SUM			1093						

5.2 Lu-Hf Isotopic Calculations

$\varepsilon_{Hf(t)}$ is the deviation of the sample's $^{176}Hf/^{177}Hf$ ratio from the concurrent chondritic uniform reservoir ratio in parts per 10,000 ($\varepsilon_{Hf(t)}$ = 10,000 × {[($^{176}Hf/^{177}Hf)_S$-($^{176}Lu/^{177}Hf)_S$ × ($e^{\lambda t}$-1)]/[($^{176}Hf/^{177}Hf)_{CHUR,\ present}$-($^{176}Lu/^{177}Hf)_{CHUR}$ × ($e^{\lambda t}$-1)]-1}, t=crystallization age). $\varepsilon_{Hf(t)}$ is used to describe the deviation of zircon $^{176}Hf/^{177}Hf$ from the chondritic-meteorite evolution line (CHUR) at the time of crystallization (Blichert-Toft and Albarede, 1997; Belousova et al., 2010; Faure and Mensing, 2004). Positive $\varepsilon_{Hf(t)}$ values in zircon are indicative of juvenile crustal sources, whereas negative values are indicative of crustal reworking (e.g., Condie et al., 2005; Kinny and Maas, 2003).

All $\varepsilon_{Hf(t)}$ values were computed with the chondritic uniform reservoir (CHUR) parameters of $^{176}Lu/^{177}Hf$ = 0.0338±1, $^{176}Hf/^{177}Hf$ =0.282793±11, 2σ (Iizuka et al., 2015). The model depleted mantle curve (MORB-DM) was derived by back-calculating the isotope composition of $^{176}Hf/^{177}Hf$ = 0.283251 (Nowell et al., 1998), and $^{176}Lu/^{177}Hf$ = 0.0384 (Griffin et al., 2000). The isotope trajectories of putative upper continental crust (UCC, $^{176}Lu/^{177}Hf$ =0.008; Rudnick and Gao, 2003), mafic crust ($^{176}Lu/^{177}Hf$=0.022; Amelin, 1999) are shown for reference in the various plots, assuming silicate Earth differentiation at ~4.5 Ga (Bennett et al., 2007). Initial Hf-isotope ratios ($^{176}Hf/^{177}Hf_i$) were calculated for each zircon using the ^{176}Lu decay constant ($1.867\times10^{-}11\ yr^{-1}$) of Söderlund et al. (2004), measured $^{176}Hf/^{177}Hf$ ratios, and LA-ICP-MS or SHRIMP U-Pb ages as determined from the same domain on the same zircon grain.

T_{DM} model ages, calculated using the measured $^{176}Hf/^{177}Hf$ of the zircon, can only give a minimum age for the source material of the magma from which the zircon crystallised (Griffin et al., 2004). Two-stage model ages T_{DM2} also have been calculated using different $^{176}Lu/^{177}Hf$ ratios for comparison, including 0.005 for the TTG reservoir (Blichert-Toft and Albarède, 2008), 0.008 for the upper continental crust (UCC, Rudnick and Gao, 2003), 0.015 for average continental crust (Griffin et al., 2000), and 0.022 for mafic crust (Amelin, 1999). The equations for T_{DM} and T_{DM2} are as follows:

$$T_{DM}=1/\lambda \times \ln\{1+[(^{176}Hf/^{177}Hf)_S-(^{176}Hf/^{177}Hf)_{DM}]/[(^{176}Lu/^{177}Hf)_S-(^{176}Lu/^{177}Hf)_{DM}]\},$$

$$T_{DM2}=T_{DM}-(T_{DM}-t)\times((f_c-f_s)/(f_c-f_{DM})),\ f_{Lu/Hf}=(^{176}Lu/^{177}Hf)_S/(^{176}Lu/^{177}Hf)_{CHUR}-1$$

t=crystallization age of zircon, f_c can be calculated with different $^{176}Lu/^{177}Hf$ ratios for the different reservoirs.

5.3 Lu-Hf Isotope Results for Jack Hills Zircons

5.3.1 Lu-Hf Isotope Ratios

One thousand and ninty-three zircons were analyzed for Lu-Hf isotopes, the data was checked for variation in $^{176}Lu/^{177}Hf$ and $^{176}Yb/^{177}Hf$ ratios, and there is no correlation between initial $^{176}Hf/^{177}Hf$ and $^{176}Lu/^{177}Hf$ (Fig 5.1 A), this indicate that samples with high Lu/Hf, and thus high corrections for mass 176 interferences, are indistinguishable. The $^{176}Yb/^{177}Hf$ ratios were all less than 0.14 (JH018-159), and no no correlation between initial $^{176}Hf/^{177}Hf$ and $^{176}Yb/^{177}Hf$ (Fig 5.1 B), so avoiding any potential for uncorrected isobaric interferences.

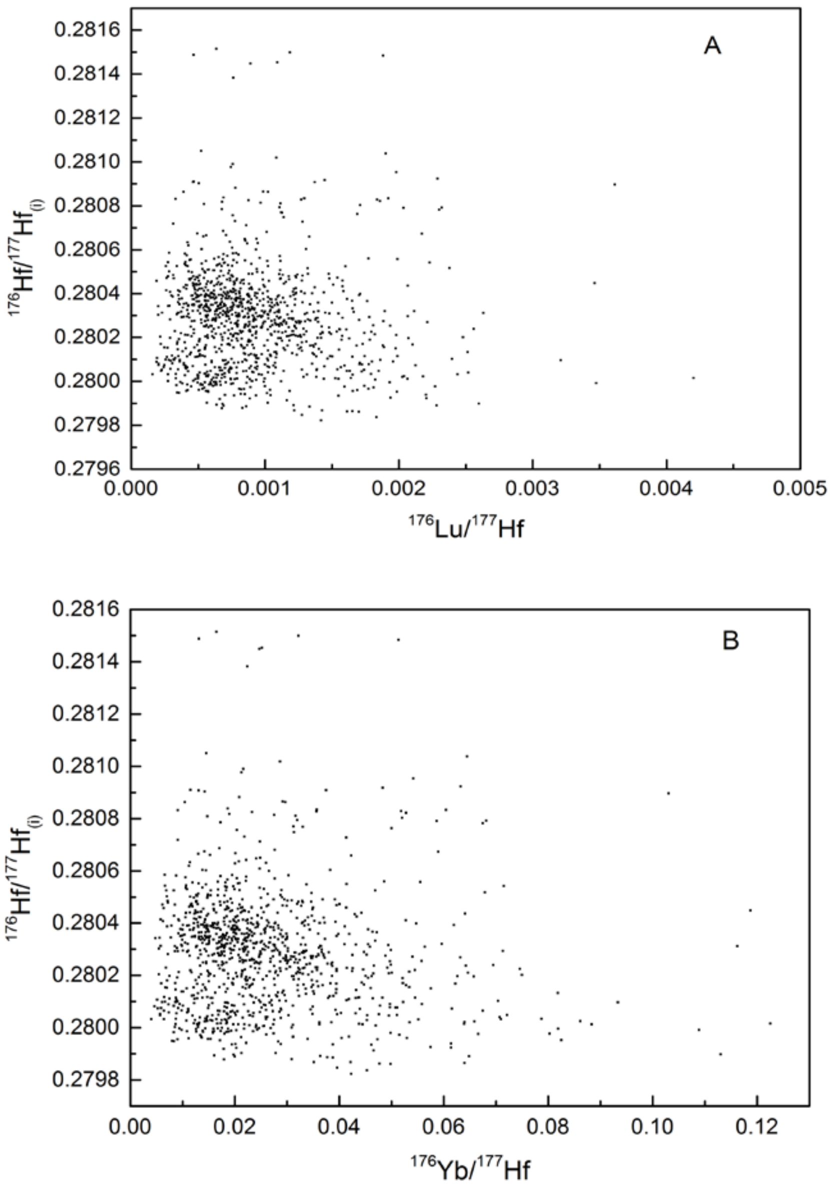

Figure 5.1 A. Plot of initial $^{176}Hf/^{177}Hf$ versus $^{176}Lu/^{177}Hf$ ratios for all Jack Hills zircons (N=1093). B. Plot of initial $^{176}Hf/^{177}Hf$ versus 176Yb/177Hf ratios for all Jack Hills zircons (N=1093).

The zircon U-Pb ages ranged from 1642 Ma (JH014-08) to 4381 Ma (JH016-49). The $^{176}Lu/^{177}Hf$ ratios (Fig 5.2) range from 0.000159 (JH152-24) to 0.004203 (JH152-50); and there were 738 grains (67.5%) with $^{176}Lu/^{177}Hf$ ratios ≤ 0.001, with a prominent peak at ~0.0008. Thirty-five grains (3.4%) had $^{176}Lu/^{177}Hf$ ratios > 0.002. The $^{176}Hf/^{177}Hf$ ratios range from 0.279932 (JH058-055) to 0.281546 (JH039A-22), with a prominent peak at ~0.28035 (Fig 5.3) and substantial peaks at ~0.2800 and ~0.2804.

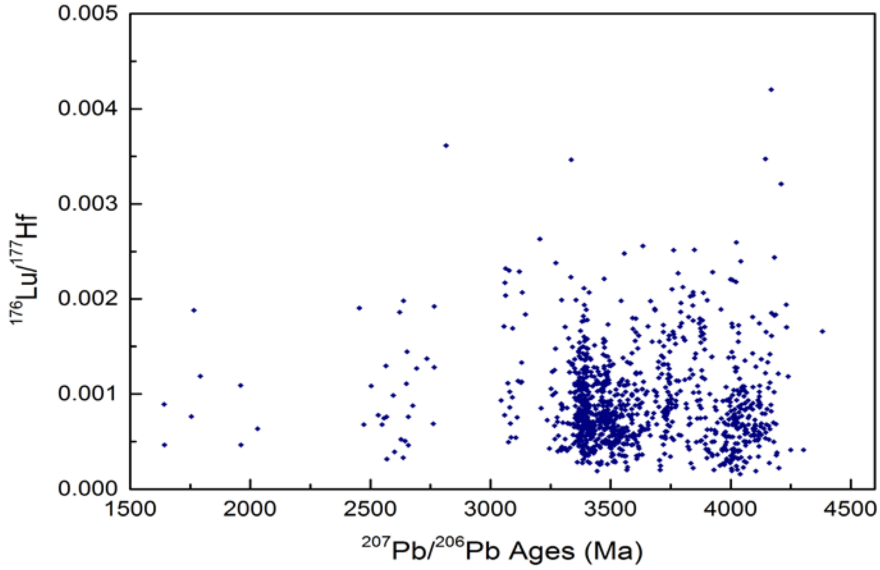

Figure 5.2 Plot of $^{176}Lu/^{177}Hf$ ratios versus $^{207}Pb/^{206}Pb$ ages for Jack Hills zircons (N=1093).

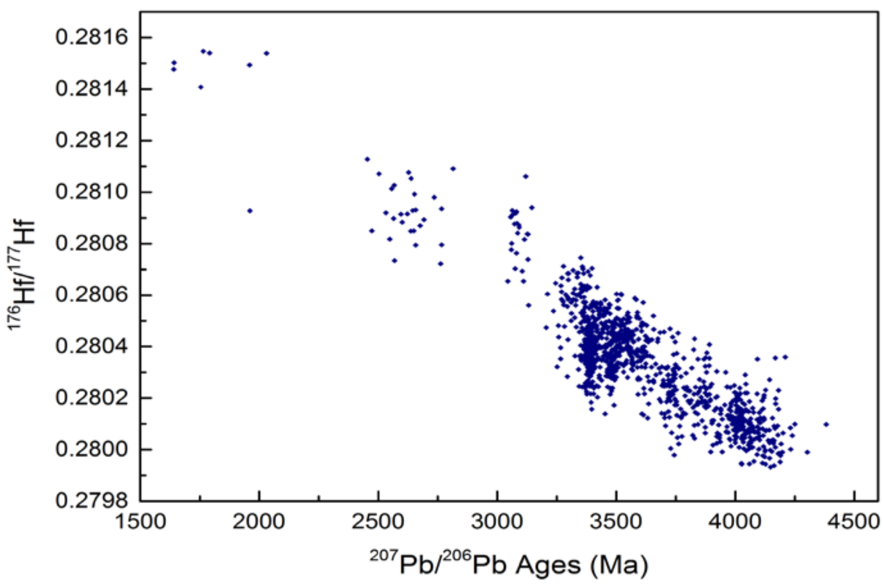

Figure 5.3 Plot of measured $^{176}Hf/^{177}Hf$ versus $^{207}Pb/^{206}Pb$ ages for Jack Hills zircons (N=1093).

For the zircons with U-Pb ages younger than 3 Ga, a total of thirty-five zircons with crystallization ages from 1642 Ma (JH014-08) to 2815 Ma (JH039A-55) were analyzed for Lu-Hf isotopes. The $^{176}Lu/^{177}Hf$ ratios (Fig 5.2) were from 0.000315 (JH014-47) to 0.003615 (JH039A-55), with a prominent peak at ~0.0006, and there was only one grain with a $^{176}Lu/^{177}Hf$ ratio higher than 0.0002 (JH039A-55). The $^{177}Hf/^{177}Hf$ ratios (Fig 5.3) ranged from 0.280723 (JH039B-06) to 0.281546 (JH039A-22), with a major peak at ~0.2809, and substantial peaks at ~0.2808, ~0.2811 and ~0.2815, and there was no record between ~0.2812 and 0.2813.

For the zircons with U-Pb ages between 3 Ga to 4 Ga, a total of eight hundred and seventy-four zircons with crystallization ages from 3045 Ma (JH013-115) to 3999 Ma (JH031-072) were analyzed for Lu-Hf isotopes. The $^{176}Lu/^{177}Hf$ ratios ranged from 0.00019 (JH042-002) to 0.000778 (JH058-101), with a prominent peak at 0.0007 (Fig 5.2) and a substantial peak at ~0.0010. The $^{177}Hf/^{177}Hf$ ratios ranged from 0.279979 (JH037-175) to 0.281061 (JH034-049), with a prominent peak at ~0.2804 (Fig 5.3).

For the Hadean zircons, one hundred and eighty-four grains were analyzed, and the crystallization ages spread from 4000 Ma (JH025-122) to 4381 Ma (JH016-49). The $^{176}Lu/^{177}Hf$ ratios ranged from 0.000159 (JH152-24) to 0.000682 (JH152-50), with a major peak at 0.0006 (Fig 5.2). The $^{177}Hf/^{177}Hf$ ratios ranged from 0.279932 (JH058-055) to 0.280359 (JH038-116), with a prominent peak at ~0.2801 (Fig 5.3).

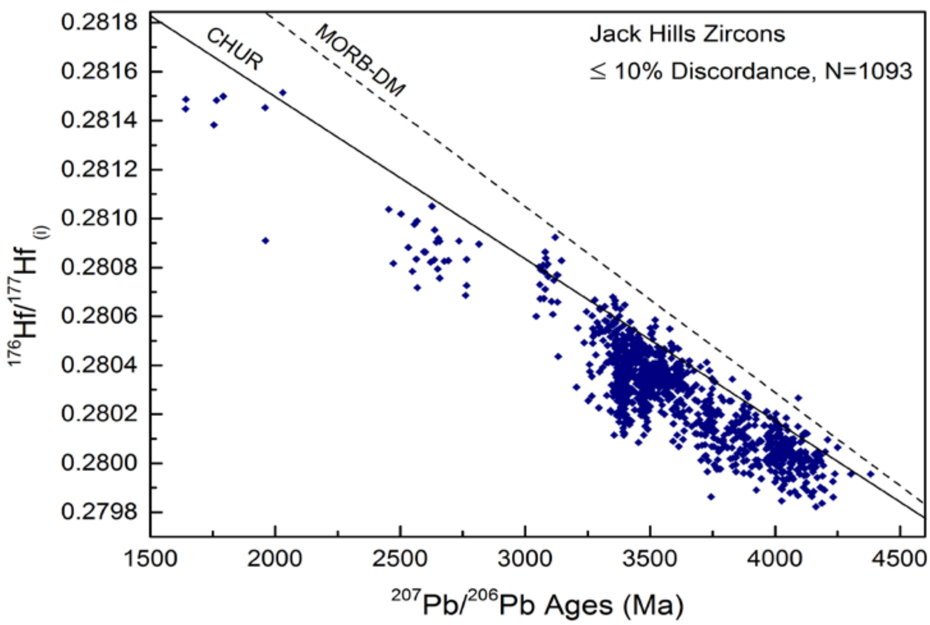

Figure 5.4 Plot of initial $^{176}Hf/^{177}Hf$ ratios versus $^{207}Pb/^{206}Pb$ ages for Jack Hills zircons.

5.3.2 $\varepsilon_{Hf(t)}$ Values of the Lu-Hf Analyses

The initial $^{176}Hf/^{177}Hf$ ratios (Fig 5.4) ranged from 0.27982 (JH051-006) to 0.28151 (JH074-087), and the $\varepsilon_{Hf(t)}$ values were calculated accordingly. The $\varepsilon_{Hf(t)}$ values calculated with Iizuka et al. (2015) are generally 0.2-0.3 units higher than the one calculated with Bouvier et al. (2008). The $\varepsilon_{Hf(t)}$ values (Fig 5.5 A) for all zircons range between -22.1 (JH039A-47) and 5.6 (JH034-049), with the majority of the dataset (94.3%) having zero or negative $\varepsilon_{Hf(t)}$ values. Only 63 zircons (5.7%) have positive $\varepsilon_{Hf(t)}$ values, ranging from 0.1 to 5.6. Only two analyses with positive $\varepsilon_{Hf(t)}$ values exceeded 5.0, and these were 5.6 (JH053-028) and 5.6 (JH034-049).

For the zircons younger than 3.0 Ga in this study, the $\varepsilon_{Hf(t)}$ values ranged from -22.1 (JH039A-47) to 1.0 (JH074-087), , and the $\varepsilon_{Hf(t)}$ value of 1.0 was the only positive $\varepsilon_{Hf(t)}$ value (3%) among all the <3.0 Ga zircons in this study. For the zircons with U-Pb ages from 3.0 Ga to 4.0 Ga, the $\varepsilon_{Hf(t)}$ values ranged from -17.6 (JH023-001) to 5.6 (JH034-049). There were forty-seven zircons (5%) with positive $\varepsilon_{Hf(t)}$ values from 0.1 (JH058-120) to 5.6 (JH034-049), with peaks at -4.5 and -8. For the Hadean zircons, the $\varepsilon_{Hf(t)}$ values range from -11.0 (JH013-133) to 5.6 (JH053-028), and with an average $\varepsilon_{Hf(t)}$ value of -3.4. Only fifteen (8%) Hadean grains had positive $\varepsilon_{Hf(t)}$ values, ranging from 0.3 (JH053-180) to 5.6 (JH053-028), whereas one hundred and sixty-nine zircons (92%) had negative $\varepsilon_{Hf(t)}$ values from -11.0 (JH013-133) to -0.3 (JH016-19).

Fig 5.5 A shows how widely distributed the $\varepsilon_{Hf(t)}$ values are in this study, The Lu-Hf isotope data from this study are broadly consistent with previous studies (Fig 5.5 B), however, the great deviation of the $\varepsilon_{Hf(t)}$ values suggests the Jack Hills detrital zircons come from multiple sources.

Although there are 63 analyses (5.7%) with positive $\varepsilon_{Hf(t)}$ values from 0.1 (JH053-114) to 5.6 (JH034-049) in this study, with crystallization ages from 2030 Ma (JH074-087, $\varepsilon_{Hf(t)}$=1.0) to 4381 Ma (JH016-49, $\varepsilon_{Hf(t)}$=1.6), there is no evidence indicating that juvenile magma from depleted mantle contributed to the Jack Hills dataset as early as ~4.4-4.5 Ga. There are 94.3% of the Jack Hills detrital zircons that have negative $\varepsilon_{Hf(t)}$ values, with a prominent $\varepsilon_{Hf(t)}$ peak at -4.2 and a secondary peak at -7.5, with the age range from ~1.6 Ga to 4.3 Ga. The majority of the unradiogenic $\varepsilon_{Hf(t)}$ correspond well with the previous studies (Amelin et al., 1999; Bell et al., 2011, 2014; Blichert-Toft and Albarede, 2008; Harrison et al., 2008; Kemp et al., 2010), but the previous datasets do not contain any information for the zircons younger than 2.6 Ga.

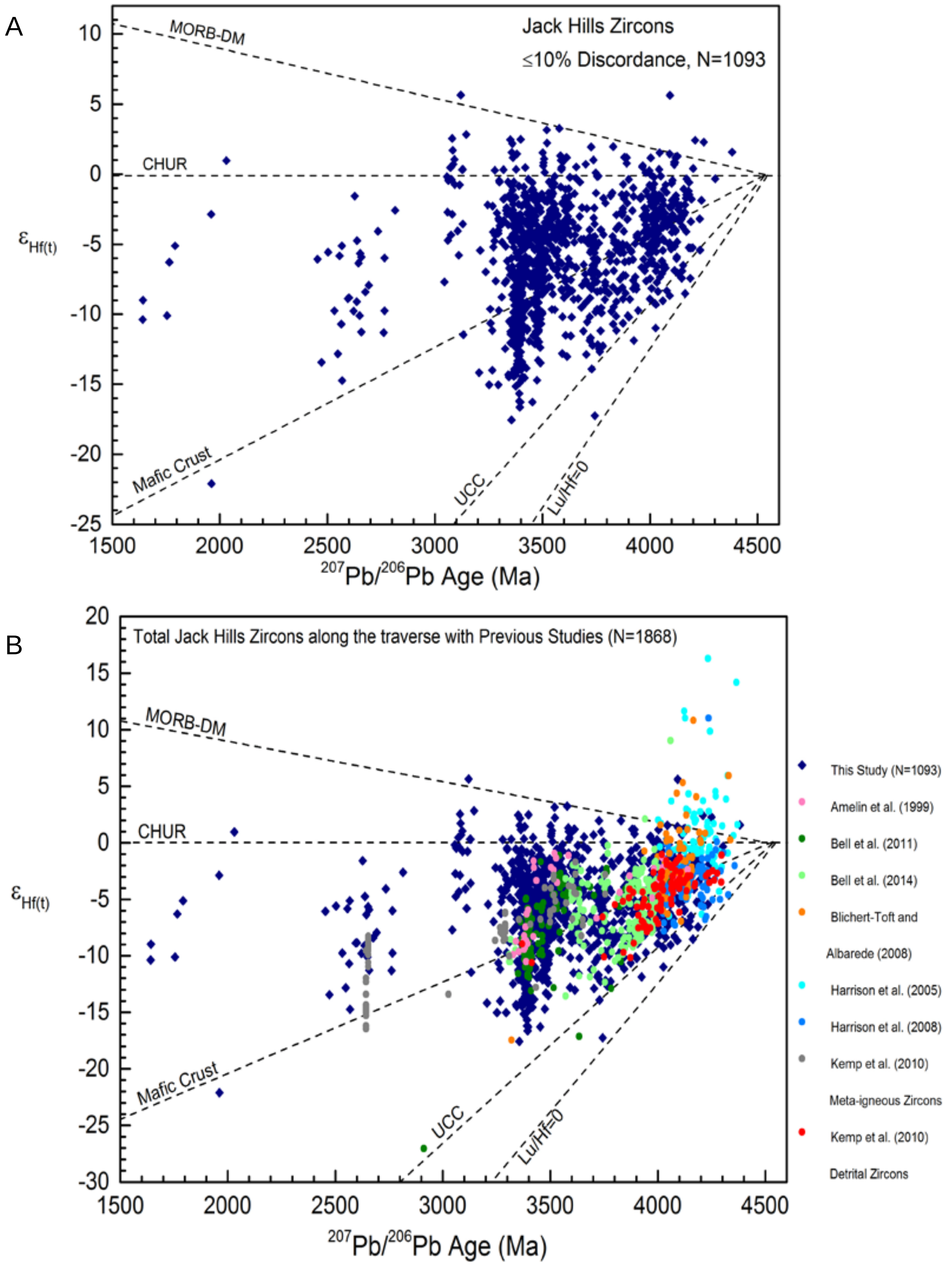

Figure 5.5 A. Hf isotope evolution plots for the Jack Hills zircons in this study. B. The current data compared with previously published datasets (Amelin et al. 1999; Blichert-Toft and Albarède 2008; Harrison et al. 2005, 2008; Kemp et al. 2010; Bell et al., 2011, 2014). All the data were normalized to the CHUR values of Iizuka et al., (2015). The isotope trajectories of putative upper continental crust ($^{176}Lu/^{177}Hf$=0.008; Rudnick and Gao, 2003), mafic crust ($^{176}Lu/^{177}Hf$=0.022), and MORB-DM ($^{176}Lu/^{177}Hf$=0.0384; Griffin et al., 2000) are shown for reference, assuming silicate Earth differentiation at ~4.5 Ga (Bennett et al., 2007).

Kemp et al. (2010) reported 96 detrital zircons (Fig 5.5 B) from Jack Hills and 77 meta-igneous zircon analyses from seven samples (Fig 5.5 B) from the Narryer Gneiss Complex, including tonalite (W29), trondjemite (W63), granodiorite (W35, W65), porphyritic granite (W61), and monzogranite (W62, W34). In the above study, the $\varepsilon_{Hf(t)}$ values of Jack Hills detrital zircons range from -10.6 (jh14-159.2) to -1.0 (jh17-44.1), with ages ranging from 3369 Ma (jh14-206.2) to 4296 Ma (jh17-18.1). The meta-igneous zircons all have negative $\varepsilon_{Hf(t)}$ values (-16.5 to -1.7), and most have more radiogenic $^{176}Hf/^{177}Hf$ compared to the Jack Hills detrital zircons of similar ages. As such, they define a broad band that plots above the detrital zircon data array in the $\varepsilon_{Hf(t)}$ versus crystallization age diagram (Kemp et al., 2010).

For zircons with crystallization ages around 2.65 Ga (2.4-2.7 Ga), the potential source could be the 2654±7 Ma monzogranites located immediately south of the Jack Hills belt (Pidgeon and Wilde, 1998). The average $\varepsilon_{Hf(t)}$ value of -8.3 corresponds well with the average $\varepsilon_{Hf(t)}$ value of -7.9 for zircons from monzogranite sample W62 (Kemp et al., 2010). For the zircons younger than 2.6 Ga with an $\varepsilon_{Hf(t)}$ value range from -22.1 to 1.0, there is no igneous Hf isotope record in previous studies for comparison. The source rocks could potentially be granitoids or even more mafic rocks, but further work is needed to establish this.

For the 730 zircons with crystallization ages between 3.0 Ga-3.75 Ga, 95% of the Lu-Hf isotope data have negative $\varepsilon_{Hf(t)}$ values from -17.6 (JH023-001) to -0.2 (JH049-099), which is broadly consistent with meta-igneous zircon $\varepsilon_{Hf(t)}$ values from -16.5 to -1.7 identifed by Kemp et al. (2010) (Fig 5.5 B). The $\varepsilon_{Hf(t)}$ peak value of ~-7.6 corresponds well with the $\varepsilon_{Hf(t)}$ value range (-12.1 to -1.2) in trondjemite sample (W63), which records U-Pb ages from 3027 Ma to 3756 Ma. The peak $\varepsilon_{Hf(t)}$ value of -4.3 (Fig 5.5 B) corresponds well with the $\varepsilon_{Hf(t)}$ values from the following samples; these are $\varepsilon_{Hf(t)}$ values from -5.1 to -1.2 in tonalite sample W29, with U-Pb ages from 3500 Ma to 3617 Ma; $\varepsilon_{Hf(t)}$ values from -5.1 to -3.1 in porphyritic granodiorite sample W65, with U-Pb ages from 3408 Ma to 3574 Ma; and $\varepsilon_{Hf(t)}$ values from -4.1 to -1.5 in granodiorite sample W35, with a U-Pb age of 3516 Ma. The average $\varepsilon_{Hf(t)}$ value of -6.8 corresponds well with the $\varepsilon_{Hf(t)}$ values ranging from -6.5 to -4.6 in porphyritic granite sample W61, with a U-Pb age of 3290 Ma.

The fact that the $\varepsilon_{Hf(t)}$ values overlap the $\varepsilon_{Hf(t)}$ values from TTG in the adjacent Narryer Gneiss Complex suggests the Meeberrie gneiss possibly contributed most to the Jack Hills detrital zircon suite, with ages from 3.3 to 3.7 Ga. Meeberrie gneiss in the Mt. Narryer region is a polyphase migmatite with ages ranging from 3730-3300 Ma, and with the main age populations of ~3670, 3620, and 3600 Ma, with minor older commponents of ~3730 Ma and younger components at ~3300 Ma (Kinny and Nutman, 1996; Wilde and Spaggiari, 2007). Kinny and Nutman (1996) showed that the gneisses consist of multiple components on the centimetre scale, and Meeberrie gneiss was considered to be dominantly composed of monzogranite. However, later work has shown that many rocks are really part of the TTG suite (Nutman et al., 1991; Pidgeon and Wilde, 1998). The multiple components of the Meeberrie gneiss can explain the large range of the $\varepsilon_{Hf(t)}$ values of the Jack Hills zircons. However, the source rock for the >3.8 Ga Jack Hills zircons remains unknown, because the oldest known rock in the Meeberrie gneiss, also in Australia, is a tonalite collected 3 km south of the Jack Hills, with a SHRIMP U-Pb age of 3731±4 Ma (Nutman et al., 1991).

For zircons older than 4 Ga, there is no strong evidence of juvenile input in Fig 5.5 A. Instead, negative $\varepsilon_{Hf(t)}$ values are the rule, making up 92% of the population. Grain JH039A-06 (4304 Ma) is the oldest zircon with a negative $\varepsilon_{Hf(t)}$ value (-0.3). The $\varepsilon_{Hf(t)}$ values of the Hadean zircons range from -11.0 (JH013-133, 4025 Ma) to 5.6 (JH053-028, 4093 Ma), with an average $\varepsilon_{Hf(t)}$ value of -3.9. The existence of strongly unradiogenic hafnium in Early Archean and Hadean zircons implies that enriched crustal reservoirs existed on Earth by 4.3 billion years ago and persisted for 200 million years or more (Scherer et al., 2001). Grain JH053-28 (4093 Ma, $\varepsilon_{Hf(t)}$=5.6) was re-tested for U-Pb age by SHRIMP after the ICP-MS analyses, and they were consistent, indicating that some positive $\varepsilon_{Hf(t)}$ values for Jack Hills Hadean zircons with homogeneous U-Pb ages do exist.

Harrison et al. (2005) reported a large range of ε_{Hf} values, from -9 to +15 (Harrison et al., 2005, Fig 5.5 B), which was interpreted as supporting a major differentiation of the silicate Earth at ~4.5 Ga (Caro et al., 2003; Boyet and Carlson, 2005). They went on to propose extensive recycling into the mantle and invoked plate tectonics as the mechanism (Harrison et al., 2005). Indeed, they favoured derivation of many of the ancient zircons from evolved S-type granite (Harrison et al., 2005). Valley et al. (2006) highlighted the large uncertainties in the proposal that plate tectonics and S-type granites existed 4.5 billion years ago, and made the more moderate proposal that some crust formed by 4.4 Ga and oceans formed by 4.2 Ga. In this study, there are positive $\varepsilon_{Hf(t)}$ values up to 5.6 (JH053-028) recorded in Hadean zircon, which does not preclude depleted mantle-derived magmatism. However, the Hf isotope data do not favour the existence of a strongly depleted Hadean mantle, because negative $\varepsilon_{Hf(t)}$ values make up 92% of the Hadean population. This is different from the earlier data in Fig 5.5 B.

In this study, the $\varepsilon_{Hf(t)}$ mostly range between the depleted mantle and the upper continental evolution line at ~3.2 Ga, 3.4-3.5 Ga, 3.8-3.9 Ga, and 4.0-4.2 Ga (Fig 5.5 A), suggesting that the parent rocks of these detrital zircons were partly derived from the depleted mantle and partly from the addition of the older crustal rocks. However, the mixing mechanism of the crust and mantle magmas in early Earth history is uncertain (Geng et al., 2012). During the period from 4.5 Ga to ca 3.4 Ga, some workers consider that the Earth's crust was essentially stagnant and dominantly mafic in composition (Griffin et al., 2014), and the global dataset do not require real crustal reworking, in the sense of burial and remelting, to have occurred prior to ca 3.5 Ga (Griffin et al., 2014). Alternatively, other workers consider that plate tectonics operated in the Hadean (Harrison et al., 2005). The peaks of $\varepsilon_{Hf(t)}$ at ~3.2 Ga, 3.4-3.5 Ga, 3.8-3.9 Ga, and 4.0-4.2 Ga in this study are consistent with the 3.3-3.4 Ga, 3.8 Ga and 4.2 Ga peaks in the global dataset (Griffin et al., 2014). The preferred explanation to these peaks is mixture of juvenile material with extensive crustal reworking involved in burial and remelting.

There is no evidence from the Hadean Hf isotope record of Jack Hills zircons indicating the operation of subduction or other manifestations of plate tectonics, the same conclusion has been reached from other recent studies (Valley et al., 2006; Kemp et al., 2010; Griffin et al., 2014). However, it is likely that some of the younger grains (<3.4 Ga) evolved from a more fractionated source related to modern plate tectonics.

5.4 Discussion

5.4.1 Zircon Intra-grain Age Variation

A total of twelve zircons from session 1 with positive $\varepsilon_{Hf(t)}$ values ranging from 1.4 to 17.8 were reanalysed by SHRIMP to check their ages. Another two random grains with negative $\varepsilon_{Hf(t)}$ values were also re-analysed by SHRIMP, in order to check if the ICP-MS ages agree well with the SHRIMP ages. The sampling strategy was to choose the same domain, as recorded in the CL image, which was analysed by ICP-MS. However, due to the large ablation volume of the ICP-MS sites, some SHRIMP spots had to be located in an adjacent area which was not in the same

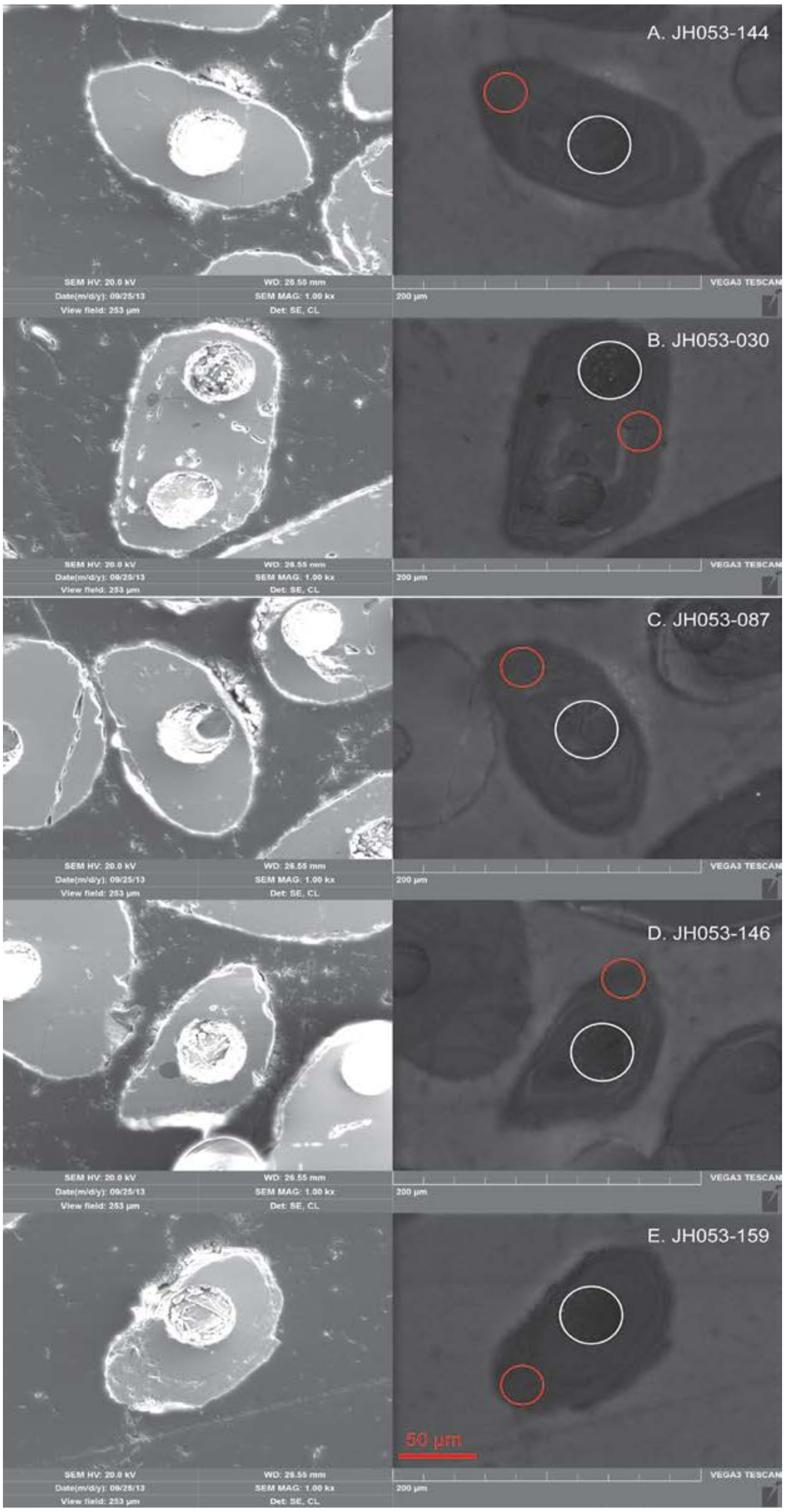

Figure 5.6 Secondary electron images (left) and CL images (right) of selected zircons from quartzite sample JH10053. Red circles represent the SHRIMP spots and white circles represent the ICP-MS spots (drawn to scale).

Table 5.2 Comparison between ICP-MS age and SHRIMP age for selected Lu-Hf analyses.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	T_{DM}	T_{DM}^{c}	$f_{Lu/Hf}$
ICP-MS Data															
JH053-028	4087	29	-2	0.0298125	0.000142	0.001073	7.2E-06	0.280352	4E-05	-86.3	5.5	1.3	4005	3957	-0.97
JH053-030	4231	29	5	0.0288162	0.000357	0.001017	1.1E-05	0.280349	4E-05	-86.4	9.0	1.5	4002	3867	-0.97
JH053-037	4176	29	5	0.0125355	0.000558	0.000486	2.1E-05	0.280471	3E-05	-82.1	13.5	1.2	3789	3551	-0.99
JH053-049	3891	29	9	0.0471328	0.000401	0.00156	6.2E-06	0.280512	3E-05	-80.7	5.3	1.0	3840	3811	-0.95
JH053-061	3381	31	-2	0.0259542	0.000379	0.000945	1.2E-05	0.280692	4E-05	-74.3	1.4	1.3	3538	3631	-0.97
JH053-063	3726	30	2	0.0215528	0.000151	0.000781	3.9E-06	0.280469	4E-05	-82.2	1.9	1.3	3820	3877	-0.98
JH053-087	4285	28	2	0.0244277	0.000475	0.000898	1.7E-05	0.280486	7E-05	-81.6	15.5	2.4	3808	3524	-0.97
JH053-122	3914	29	2	0.0419222	0.000256	0.0015	8.7E-06	0.280455	5E-05	-82.7	3.9	1.6	3911	3909	-0.96
JH053-144	4317	28	-3	0.0298598	0.000371	0.001051	1.2E-05	0.280541	5E-05	-79.6	17.8	1.6	3750	3415	-0.97
JH053-146	4358	28	7	0.0237172	0.000194	0.000873	6.8E-06	0.280416	3E-05	-84.0	14.8	1.2	3899	3625	-0.97
JH053-159	4346	28	-9	0.0253732	9.93E-05	0.000889	2.7E-06	0.280254	3E-05	-89.8	8.7	1.2	4115	3978	-0.97
JH053-166	3798	29	1	0.0159718	0.000102	0.000601	4.3E-06	0.280496	4E-05	-81.2	5.1	1.3	3767	3749	-0.98
JH053-204	3925	30	6	0.0071584	5.09E-05	0.000313	1.6E-06	0.280505	3E-05	-80.9	9.2	1.2	3727	3605	-0.99
JH053-225	3986	30	5	0.0223743	8E-05	0.000823	4.1E-06	0.280414	3E-05	-84.1	6.0	1.1	3897	3844	-0.98
SHRIMP Data															
Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	T_{DM}	T_{DM}^{c}	$f_{Lu/Hf}$
JH053-028	4093	12	-2	0.0298125	0.000142	0.001073	7.2E-06	0.280352	4E-05	-86.3	5.6	1.3	4005	3954	-0.97
JH053-037	3399	5	-3	0.0125355	0.000558	0.000486	2.1E-05	0.280471	3E-05	-82.1	-5.0	1.2	3789	4028	-0.99
JH053-049	3218	3	+11	0.0471328	0.000401	0.00156	6.2E-06	0.280512	3E-05	-80.7	-10.1	1.0	3840	4193	-0.95
JH053-061	3370	11	-0	0.0259542	0.000379	0.000945	1.2E-05	0.280692	4E-05	-74.3	1.2	1.3	3538	3637	-0.97
JH053-063	3552	4	+38	0.0215528	0.000151	0.000781	3.9E-06	0.280469	4E-05	-82.2	-2.2	1.3	3820	3982	-0.98
JH053-087	3392	4	+1	0.0244277	0.000475	0.000898	1.7E-05	0.280486	7E-05	-81.6	-5.5	2.4	3808	4057	-0.97
JH053-122	3385	5	-0	0.0419222	0.000256	0.0015	8.7E-06	0.280455	5E-05	-82.7	-8.2	1.6	3911	4211	-0.96
JH053-144	3304	4	+12	0.0298598	0.000371	0.001051	1.2E-05	0.280541	5E-05	-79.6	-6.0	1.6	3750	4013	-0.97
JH053-146	3396	4	-1	0.0237172	0.000194	0.000873	6.8E-06	0.280416	3E-05	-84.0	-7.9	1.2	3899	4200	-0.97
JH053-159	4045	6	-0	0.0253732	9.93E-05	0.000889	2.7E-06	0.280254	3E-05	-89.8	1.5	1.2	4115	4157	-0.97
JH053-166	3555	4	-1	0.0159718	0.000102	0.000601	4.3E-06	0.280496	4E-05	-81.2	-0.7	1.3	3767	3896	-0.98
JH053-204	3386	5	+0	0.0071584	5.09E-05	0.000313	1.6E-06	0.280505	3E-05	-80.9	-3.7	1.2	3727	3939	-0.99
JH053-225	3372	5	-0	0.0223743	8E-05	0.000823	4.1E-06	0.280414	3E-05	-84.1	-8.4	1.1	3897	4212	-0.98

domain as indicated by CL image, because there was not enough material left in the same CL zone. Table 5.2 presents the data with positive $\varepsilon_{Hf(t)}$ values up to 17.8 for quartzite sample JH10053, and this was used to compare the intra-grain age difference, and how the age difference can influence the $\varepsilon_{Hf(t)}$ values.

For grain JH053-144 (Fig 5.6 A), the CL image is dark, with weak zoning, and the ICP-MS spot was placed in the core and recorded a concordant age of 4317±28 Ma. The SHRIMP spot was placed on the rim with a discordant age of 3304±4 Ma; the $\varepsilon_{Hf(t)}$ value changed dramatically from 17.8 in the core to -6.0 on the rim. For grains JH053-049 and JH053-063, because the SHRIMP ages were not concordant, these above three were eliminated from further discussion. Grain JH053-030 (Fig 5.6 B) has a pitted surface and is dark and irregularly zoned in CL image. Although the ICP-MS age is concordant (4231±29 Ma), the SHRIMP analysis tripped due to high counts in the thorium peak, and so no data could be collected for comparison.

For grains JH053-037, 087, 122, 146, 159, 166, 204 and 225, the $\varepsilon_{Hf(t)}$ values were sensitive to the U-Pb crystallization ages “t” in the calculation. Grain JH053-087 (Fig 5.6 C) is dark with patchy zoning in the CL image, and the ICP-MS age for the dark core is 4285±28 Ma, whereas the SHRIMP age for the rim is 3392±4 Ma, and the

$\varepsilon_{Hf(t)}$ value dropped from 15.5 to -5.5. Grain JH053-146 (Fig 5.6 D) is dark with oscillatory zoning in the CL image, and the ICP-MS age for the core is 4358±28 Ma, whereas the SHRIMP age for the rim is 3396±4 Ma, and the $\varepsilon_{Hf(t)}$ value changed from 14.8 to -7.9. Grain JH053-159 (Fig 5.6 E) is dark with weak zoning in the CL image. The ICP-MS age for the core is 4346±28 Ma, whereas the SHRIMP age for the rim is 4045±6 Ma, and the $\varepsilon_{Hf(t)}$ value changed from 8.7 to 1.5.

However, for certain grains like JH053-028, with weak oscillatory zoning visible in the CL image, the positive $\varepsilon_{Hf(t)}$ value above the MORB-DM evolution line appears to be real. The ICP-MS age for this grain was 4087±29 Ma, whereas the SHRIMP age was 4093±12 Ma, which is the same within error. The $\varepsilon_{Hf(t)}$ value changed only slightly from 5.5 to 5.6 (Table 5.2). This grain provides evidence that at least some $\varepsilon_{Hf(t)}$ values above the MORB-DM mantle line are present at Jack Hills. For grain JH053-061, the new SHRIMP age of 3370±11 Ma agrees well with the ICP-MS age of 3381±31 Ma, with a change in $\varepsilon_{Hf(t)}$ value from 1.4 to 1.2. These data show that the $^{207}Pb/^{206}Pb$ ages measured by laser ablation generally agree well with those determined by SHRIMP.

The zircon U-Pb ages need to be well constrained in the same domain, as revealed by CL image, to generate precise $\varepsilon_{Hf(t)}$ values, especially when the larger ICP-MS spots are likely to sample overgrowth or modified domains (Harrison et al., 2008; Blichert-Toft and Albarède, 2008; Kemp et al., 2010). Also, it should be noted that the $^{176}Hf/^{177}Hf$ ratios obtained from different parts of the same grain are usually similar within analytical uncertainty where the age difference between spots is small, although large excursions in $^{176}Hf/^{177}Hf$ do occur in some grains from Jack Hills (Kemp et al., 2010).

5.4.2 Implications for Lu-Hf Model Ages

The single-stage depleted mantle model ages (Fig 5.7) T_{DM} for the 1093 zircon grains range from 2374 Ma (JH074-087) to 4595 Ma (JH051-006), with major peaks at ~4.0 Ga and 4.3 Ga and minor peaks at ~2.5 Ga and 3.3 Ga (Fig 5.8). For the grains younger than 3.0 Ga, the T_{DM} model ages range from 2374 Ma to 3474 Ma (JH039B-06); for the grains with U-Pb ages between 3.0 to 4.0 Ga, the T_{DM} model ages range from 3152 Ma (JH034-049) to 4562 Ma (JH037-175); and for the grains with U-Pb ages older than 4 Ga, the T_{DM} model ages range from 4005 Ma (JH053-028) to 4595 Ma (JH051-006) (Fig 5.7 A). In earlier studies with 413 analyses (Fig 5.7 B), the T_{DM} model ages range from 3684 Ma to 4596 Ma. The T_{DM} model ages

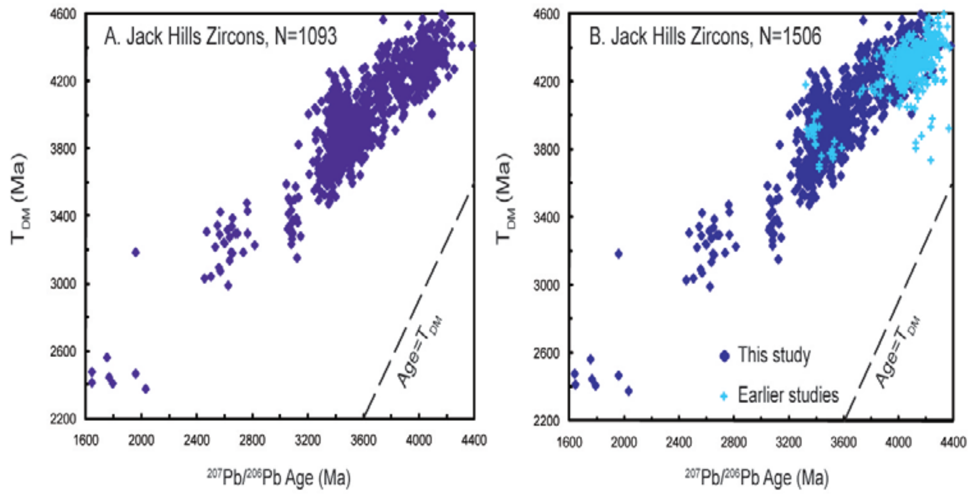

Figure 5.7 A. Depleted mantle model ages of Jack Hills zircons in this study. B. Depleted Mantle model ages of Jack Hills zircons in this study, together with those of earlier studies, including Amelin et al. (1999), Blichert-Toft and Albarède (2008), Harrison et al. (2005), Harrison et al. (2008) and Kemp et al. (2010). The ^{176}Lu/^{177}Hf = 0.0384 for the depleted mantle (Griffin et al., 2000).

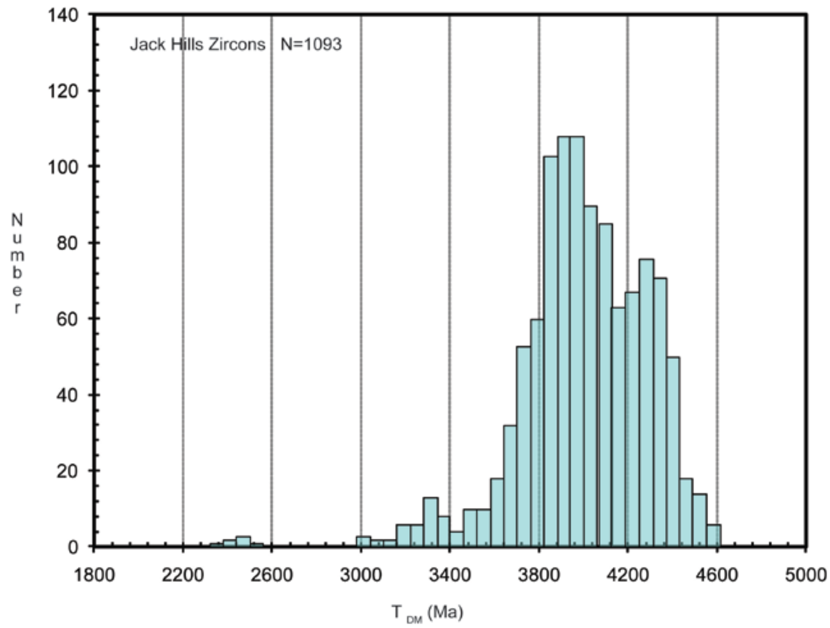

Figure 5.8 Histogram of depleted mantle model ages of all concordant Jack Hills zircons in this study.

obtained in this study are therefore consistent with earlier studies (Fig 5.7 B). However, there are seven Hadean zircons in earlier studies with lower T_{DM} model ages compared with the majority of the dataset, and these seven analyses are the same analyses with the positive $\varepsilon_{Hf(t)}$ values in Fig 5.5 B (Blichert-Toft and Albarède, 2008; Harrison et al., 2005; Harrison et al., 2008).

The two-stage model ages (T_{DM2}) using the TTG model ($^{176}Lu/^{177}Hf$=0.005; Blichert-Toft and Albarède, 2008) range from 2418 Ma to 4645 Ma (Fig 5.9 A&E). For the grains younger than 3.0 Ga, the T_{DM2} model ages range from 2418 Ma (JH074-087) to 3566 Ma (JH039B-06); for the grains with U-Pb ages between 3.0-4.0 Ga, the T_{DM2} model ages range from 3155 Ma (JH034-049) to 4645 Ma (JH037-175); whereas for the grains with U-Pb ages older than 4.0 Ga, the T_{DM2} model ages range from 3995 Ma (JH053-028) to 4641 Ma (JH051-006). There are four grains (0.4%) with T_{DM2} model ages older than 4.6 Ga in this study, and there are five analyses (1.2%) with T_{DM2} model ages older than 4.6 Ga in previous studies (Fig 5.9 B), ranging from 3673 Ma to 4620 Ma.

The two-stage model ages (T_{DM2}) using the upper continental crustal model ($^{176}Lu/^{177}Hf$=0.008; Rudnick and Gao, 2003) range from 2457 Ma to 4734 Ma (Fig 5.9 B&F), with a major peak at ~4.1 Ga and substantial peaks at ~3.9 Ga and 4.3 Ga and a small peak at ~2.5 Ga (Fig 5.10). For the grains younger than 3.0 Ga, the T_{DM2} model ages range from 2457 Ma (JH074-087) to 3646 Ma (JH039B-06); for the grains with U-Pb ages between 3.0-4.0 Ga, the T_{DM2} model ages range from 3158 Ma (JH034-049) to 4734 Ma (JH037-175); and for the grains with U-Pb ages older than 4.0 Ga, the T_{DM2} model ages range from 3986 Ma (JH053-028) to 4688 Ma (JH051-006). There are fourteen grains (1.3%) with T_{DM2} model ages older than 4.6 Ga in this study, and there are nine analyses (2.2%) with T_{DM2} model ages older than 4.6 Ga in previous studies (Fig 5.9 F), ranging from 3617 Ma to 4657 Ma.

The two-stage model ages (T_{DM2}) using the average continental crust model ($^{176}Lu/^{177}Hf$=0.015; Griffin et al., 2000) range from 2584 Ma to 5031 Ma (Fig 5.9 C&G), with a major peak at 4.4 Ga and a significant age peak at ~4.05 Ga. For the grains younger than 3.0 Ga, the T_{DM2} model ages range from 2584 Ma (JH074-087) to 3965 Ma (JH014-47); for the grains with U-Pb ages between 3.0-4.0 Ga, the T_{DM2} model ages range from 3169 Ma (JH034-049) to 5031 Ma (JH037-175); and for the grains with U-Pb ages older than 4.0 Ga, the T_{DM2} model ages range from 3953 Ma (JH053-028) to 4883 Ma (JH013-133) (Fig 5.9 C). There are eighty-eight grains (8.1%) with T_{DM2} model ages older than 4.6 Ga in this study, and there are

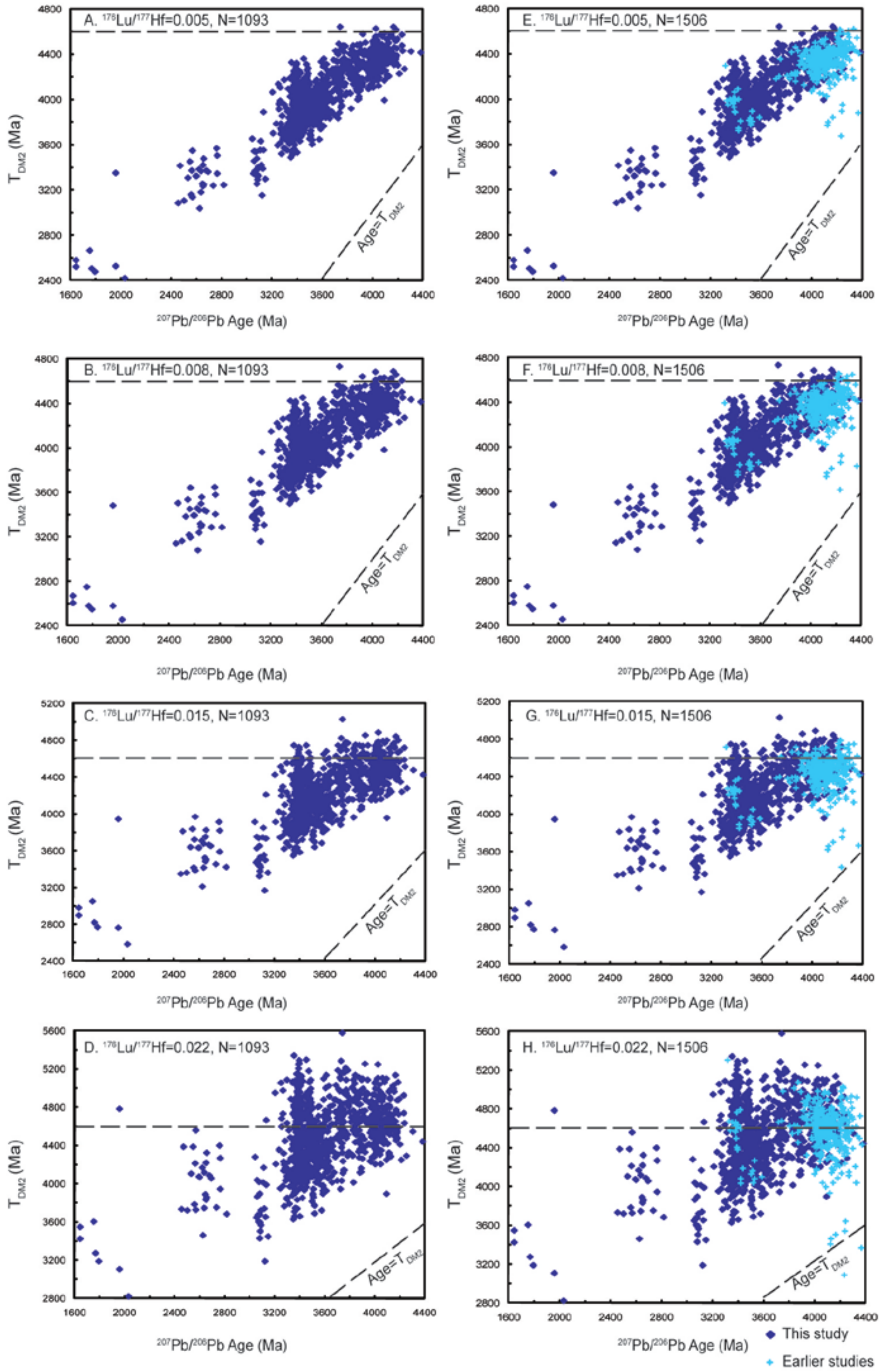

Figure 5.9 Comparison of two-stage model ages of Jack Hills zircons. Earlier studies include Amelin et al. (1999), Blichert-Toft and Albarède (2008), Harrison et al. (2005), Harrison et al. (2008) and Kemp et al. (2010). The T_{DM2} two-stage model ages were calculated with $^{176}Lu/^{177}Hf$ = 0.005 (TTG reservoir; Blichert-Toft and Albarède, 2008), 0.008 (Upper Continental Crust; Rudnick and Gao, 2003), 0.015 (Average Continental Crust; Griffin et al., 2000), and 0.022 (Mafic Crust; Amelin et al., 1999) in Fig 5.9 A and E; B and F; C and G; and D and H; respectively. The horizontal dashed line represents the age of the Earth.

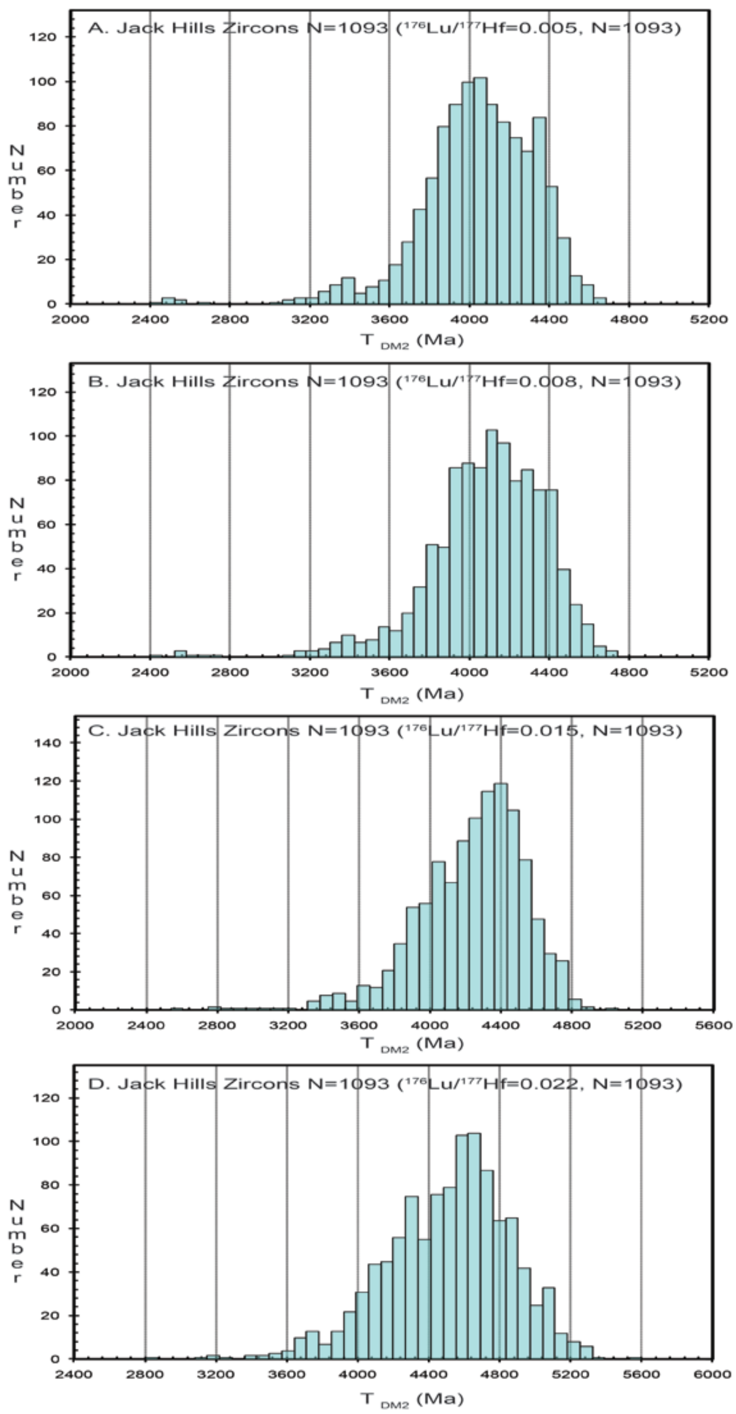

Figure 5.10 Histograms of two-stage model ages of Jack Hills zircons using different $^{176}Lu/^{177}Hf$ ratios. The T_{DM2} two-stage model ages were calculated with $^{176}Lu/^{177}Hf$ = 0.005 (TTG reservoir; Blichert-Toft and Albarède, 2008), 0.008 (Upper Continental Crust; Rudnick and Gao, 2003), 0.015 (Average Continental Crust; Griffin et al., 2000), and 0.022 (Mafic Crust; Amelin et al., 1999) in Fig 5.10 A, B, C and D, respectively.

forty-eight analyses (11.6%) with T_{DM2} model ages older than 4.6 Ga in previous studies (Fig 5.9 G), ranging from 3433 Ma to 4788 Ma.

The two-stage model ages (T_{DM2}) using the mafic crust model ($^{176}Lu/^{177}Hf$=0.022; Amelin et al., 1999) range from 2821 Ma to 5581 Ma (Fig 5.9 D&H), with major age peaks at ~4.6 Ga and 4.3 Ga, and a minor peak at ~3.75 Ga. For the grains younger than 3.0 Ga, the T_{DM2} model ages range from 2821 Ma (JH074-087) to 4787 Ma (JH039A-47); for the grains with U-Pb ages between 3.0-4.0 Ga, the T_{DM2} model ages range from 3190 Ma (JH034-049) to 5581 Ma (JH037-175); and for the grains with U-Pb ages older than 4.0 Ga, the T_{DM2} model ages range from 3894 Ma (JH053-028) to 5250 Ma (JH013-133). There are 480 grains (43.9%) with T_{DM2} model ages older than 4.6 Ga in this study, and there are 226 analyses (54.7%) with T_{DM2} model ages older than 4.6 Ga in previous studies (Fig 5.9 H), ranging from 3091 Ma to 5308 Ma.

In the four models discussed above, the percentage of >4.6 Ga zircon two–stage model ages rises from 0.4% to 54.7% as the $^{176}Lu/^{177}Hf$ ratio rises from 0.005 (TTG; Blichert-Toft and Albarède, 2008) to 0.022 (mafic crust; Amelin et al., 1999). These unrealistic >4.6 Ga T_{DM2} model ages indicate that an evolution model based on a two-stage model age cannot adequately explain the Jack Hills detrital zircon population. Although the lower $^{176}Lu/^{177}Hf$ ratios (such as 0.005 or 0.008) yield lower T_{DM2} than the higher $^{176}Lu/^{177}Hf$ ratios (such as 0.022), it does not mean the TTG model or the upper continental crust model fit all the Jack Hills detrital zircons, because the composition of the primitive mantle or crust at this time remains unknown. Also, it can not preclude the possibility that at least part of the Jack Hills zircon suite comes from mafic crust (Kemp et al., 2010). What it does show is that the best fit of the data involves using the single-stage T_{DM} model age. This implies that the majority of the Hadean zircons likely evolved from a primitive source. However, as noted above, it is likely that some of the younger grains evolved from a more fractionated source and that the Jack Hills detrital population is a sample of multiple sources.

Chapter 6 Monazite Geochronology

6.1 SHRIMP U-Th-Pb Geochronology

A total of fifty-seven samples were examined for monazite, because they were considered devoid of zircon based on conventional heavy liquid separation techniques. Monazite ages will provide additional information to constrain the age of rocks along the traverse, and will help to identify metamorphic events in the Jack Hills belt. Among these fifty-seven samples, forty-three samples contain monazite (Appendix A). However, only seven samples contain monazite grains larger than 10 μm. These grains were marked, and drilled out by a DREMEL 300 hand drill and cast in 25mm epoxy discs, and analysed by SHRIMP, for detailed methodology see Chapter 1.4.2.5-7. Only three monazite grains from two samples (coarse-grained sandstone (JH10015, 65 m) and fine-grained sandstone (JH10085, 459 m)), yielded data with <1% of common ^{206}Pb and >95% concordance. The data with more than 1% of common ^{206}Pb or more than 5% discordant were considered questionable for geochronology, because the high common ^{206}Pb content (>1%) or discordance suggest the U-Th-Pb system has been disturbed by later metamorphic events or weathering. All data are shown in Table 6.1. Altogether four samples will be discussed in this chapter, because some data with high common ^{206}Pb can provide additional age information, although these results must be treated with caution.

6.1.1 Monazite from Coarse-grained Sandstone Sample JH10015 (65 m)

Only one monazite grain enclosed in a quartz grain was identified in the coarse-grained sandstone JH10015 (65 m) near the southern end of the traverse. Four spots were run on the same monazite grain (10C, Table 6.1), but only spot 10C-1.4 had <1% common ^{206}Pb and >95% concordance. This recorded a ^{207}Pb/^{206}Pb age of 3422±10 Ma (grain 10C-1.4, 3% discordance) that is interpreted to represent the age of the monazite. The uranium concentration of monazite 10C (Fig 6.1 A) is 1166 ppm, and the thorium concentration is 9896 ppm, with a Th/U ratio of 8.8. Since the thorium concentration is approaching 1%, the high thorium concentration is suggestive of an igneous origin (Rosenblum and Fleischer, 1995). Because the 3422±10 Ma age of monazite was older than the youngest detrital zircon age of 3383±6 Ma (JH015-02) in coarse-grained sandstone sample JH10015, it is likely this monazite grain formed as an inclusion in a quartz grain in either an igneous rock or a high grade metamorphic rock, which was then weathered, and deposited in the coarse-grained sandstone. Hence, the preferred interpretation for this

Table 6.1 Monazite geochronology data.

Grain-spot	U (ppm)	Th (ppm)	Th/U	4f206 (%)	4f208 (%)	207*/206*	± 1sd	206*/238	± 1sd	207*/235	± 1sd	208*/232	± 1sd	%Disc.	206* Age(Ma)	± 1sd
10C-1.4	1166	9896	8.8	0.273	0.249	0.2908	0.0001	0.6783	0.0003	27.197	0.003	0.1772	0.0027	3	3422	10
10E-1.1	615	929	1.5	0.040	0.232	0.1794	0.0010	0.5143	0.0088	12.723	0.229	0.1399	0.0028	-1	2648	9
10E-1.2	788	363	0.5	-0.005	-0.106	0.1809	0.0010	0.5248	0.0094	13.089	0.244	0.1352	0.0030	-2	2661	9
10E-2.4	1252	1494	1.2	0.050	0.363	0.1798	0.0009	0.5175	0.0085	12.833	0.220	0.1442	0.0026	-1	2651	8
>1% common ^{206}Pb or >10% discordant																
10C-1.1	326	8764	27.8	4.249	1.156	0.2367	0.0001	0.5554	0.0004	18.128	0.004	0.1587	0.0027	10	3098	13
10C-1.2	422	8849	21.7	2.185	0.824	0.2741	0.0002	0.6161	0.0004	23.282	0.004	0.1599	0.0027	9	3329	30
10C-1.3	470	3971	8.7	9.986	6.347	0.2076	0.0004	0.4284	0.0005	12.262	0.006	0.1681	0.0027	24	2887	60
10D-1.1	2212	6997	3.2	15.606	32.551	0.1122	0.0115	0.3452	0.0094	5.342	0.558	0.0949	0.0032	-4	1836	185
10D-1.2	2195	18460	8.4	1.810	1.664	0.1122	0.0008	0.3420	0.0052	5.292	0.089	0.0998	0.0017	-3	1836	13
10D-1.3	1742	19321	11.1	2.068	1.446	0.1156	0.0011	0.3259	0.0059	5.197	0.108	0.0956	0.0017	4	1890	18
10E-1.3	668	1866	2.8	2.224	7.690	0.1840	0.0062	0.4991	0.0104	12.664	0.494	0.1168	0.0029	3	2690	55
10E-1.4	392	5667	14.5	5.839	3.732	0.1808	0.0037	0.5118	0.0083	12.759	0.330	0.1342	0.0068	0	2660	34
10E-1.5	466	8161	17.5	1.695	0.873	0.1823	0.0027	0.5295	0.0084	13.307	0.285	0.1397	0.0027	-2	2674	24
10E-2.1	868	13029	15.0	10.667	6.926	0.1780	0.0123	0.4584	0.0089	11.250	0.797	0.1171	0.0025	8	2634	115
10E-2.2	352	24784	70.5	7.587	0.841	0.1219	0.0098	0.3443	0.0066	5.786	0.471	0.1074	0.0018	4	1984	143
10E-2.3	702	9249	13.2	10.392	8.787	0.1761	0.0057	0.4012	0.0066	9.740	0.349	0.0885	0.0021	17	2616	54
10E-2.5	779	12071	15.5	3.452	2.053	0.1776	0.0017	0.5020	0.0084	12.290	0.237	0.1307	0.0024	0	2630	16
10H-1.1	340	10554	32.1	24.010	4.456	0.1169	0.0037	0.3301	0.0006	5.320	0.038	0.1460	0.0027	4	1909	673
10H-1.2	767	12128	16.3	11.876	3.824	0.1244	0.0007	0.2984	0.0018	5.119	0.019	0.1296	0.0027	19	2020	117
10I-1.2	23	2591	117.1	53.430	5.695	0.1689	0.0103	0.3534	0.0020	8.232	0.105	0.1200	0.0027	27	2547	1730

monazite grain is that it is of detrital (igneous) origin, and the coarse-grained sandstone sample (JH10015, 65 m) at the southern end of the Jack Hills belt was deposited after ~3.4 Ga.

6.1.2 Monazite from Fine-grained Sandstone Sample JH10085 (459 m)

Two monazite grains were analysed by SHRIMP from an orange, fine-grained micaceous sandstone sample (JH10085, 459 m), and both of them were spongy, intergrown with the quartz and muscovite matrix, and interpreted to be metamorphic in origin.

Five SHRIMP analyses were run on monazite grain 10E1 (Fig 6.1 B, Table 6.1). However, only spots 10E-1.1 and 10E-1.2 yielded results with less than 1% common ^{206}Pb and more than 95% concordance; with ages of 2648±9 Ma (-1% discordant) and 2661±9 Ma (-2% discordant), respectively. Grain 10E-1.1 has a uranium content of 615 ppm and thorium content of 929 ppm, with a Th/U ratio of 1.5. Grain 10E-1.2 has a uranium concentration of 788 ppm and thorium concentration of 363 ppm, with a Th/U ratio of 0.5 (Table 6.1).

There were also five SHRIMP analyses located on monazite grain 10E2 (Fig 6.1 C, Table 6.1), and only spot 10E-2.4 yielded a ^{207}Pb/^{206}Pb age of 2651±8 Ma (-1% discordant) which contained less than 1% common ^{206}Pb and <5% discordance. The uranium concentration of spot 10E-2.4 is 1252 ppm, the thorium concentration is 1494 ppm, with a Th/U ratio of 1.2 (Table 6.1).

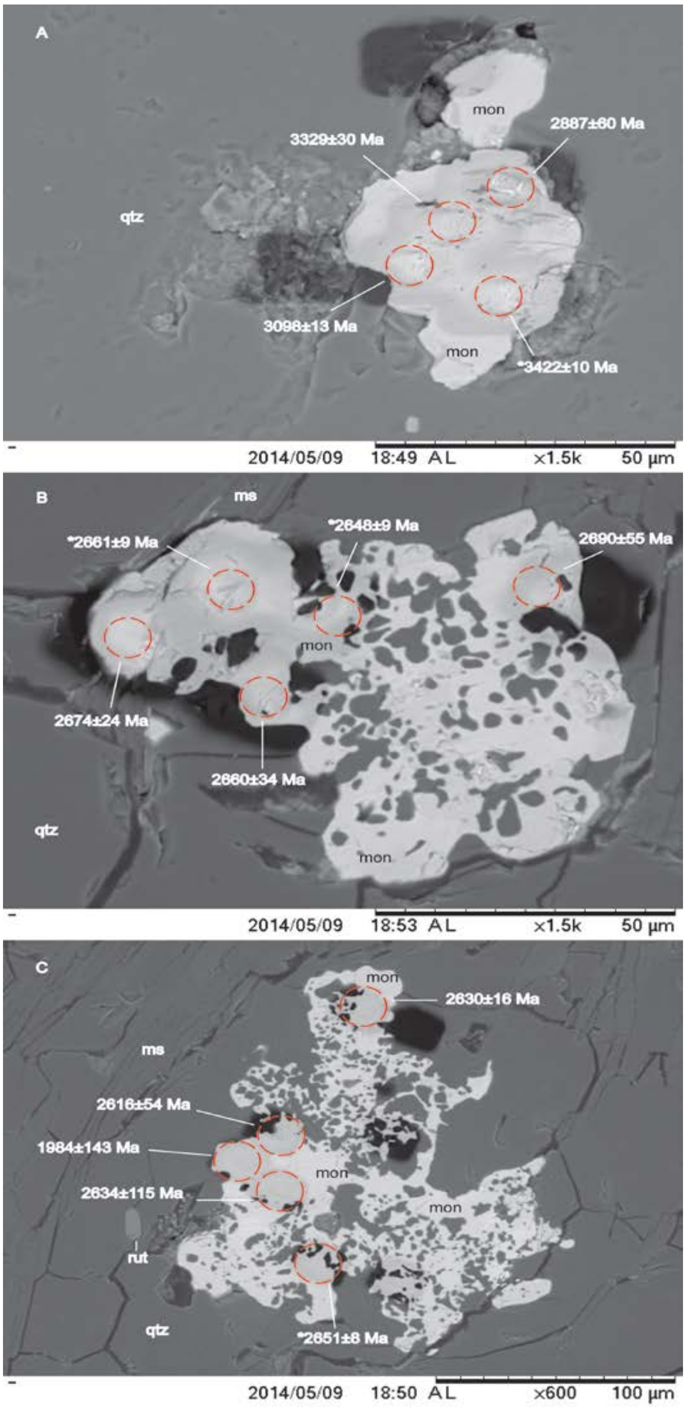

Figure 6.1 BSE images of monazite along the traverse in the Jack Hills belt. A. Detrital monazite (mon) in a quartz (qtz) grain from a coarse-grained sandstone sample (JH10015, 65 m). B&C. Metamorphic monazite intergrown with quartz and muscovite (ms) from a matrix-supported conglomerate sample (JH10085, 459 m). Rut: rutile. The SHRIMP pits (red circles) are marked along with their $^{207}Pb/^{206}Pb$ ages (1σ).

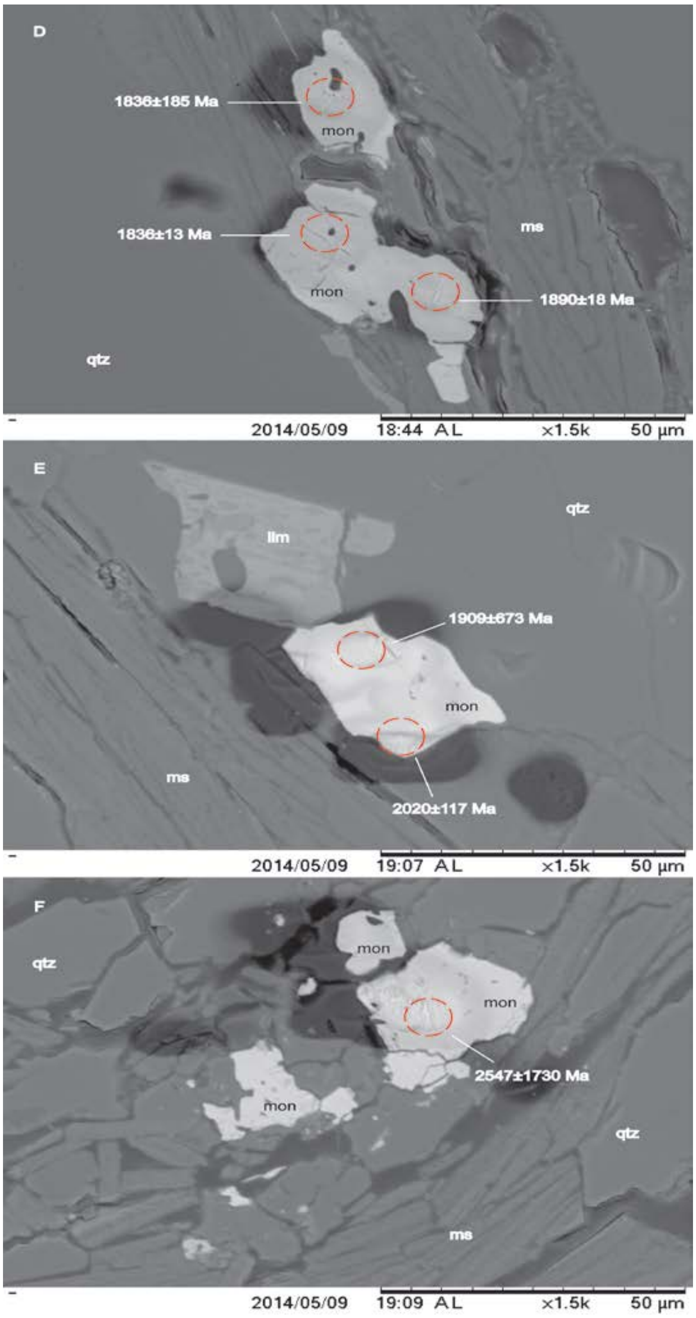

Fig 6.1 continued. BSE images of monazite along the traverse in the Jack Hills belt. D. E. Monazite grains grow along the quartz (qtz) and muscovite (ms) in a matrix-supported conglomerate sample (JH10082, 443 m). Ilm: ilmenite F. Monazite intergrown with quartz and muscovite from a coarse-grained sandstone sample (JH10016, 70 m). The SHRIMP pits (red circles) are marked along with their $^{207}Pb/^{206}Pb$ ages (1σ). The dark rectangular shadows are the raster areas for the SHRIMP analyses, whereas the original monazite grains are all uniform in the BSE images. Only analyses marked with asterisks gave concordant ages.

The $^{207}Pb/^{206}Pb$ weighted mean age of 2652±9 Ma (MSWD=0.86) for both monazite grains is consistent with the 2653±5 Ma age of metamorphic monazite in the muscovite matrix identified in the W74 conglomerate, which hosts abundant Hadean zircon grains (Rasmussen et al., 2010). These two monazite grains from the fine-grained micaceous sandstone sample (JH10085, 459 m) indicate that the central part of the Jack Hills belt experienced metamorphism at ~2.65 Ga.

6.1.3 Monazite from Matrix-supported Conglomerate Sample JH10082 (443 m)

Two monazite grains were identified from a matrix-supported conglomerate sample (JH10082, 443 m) in the centre of the traverse.

Monazite grain 10D (Fig 6.1 D) is an elongate grain that is aligned with the muscovite matrix. Three SHRIMP analyses were located on this grain, with $^{207}Pb/^{206}Pb$ ages of 1836±13 Ma, 1836±185 Ma, and 1890±18 Ma (Table 6.1). Even though the $^{207}Pb/^{206}Pb$ ages from these three grains are >95% concordance, none of them had less than 1% common ^{206}Pb. Grain 10D-1.1 has 15% common ^{206}Pb, and grains 10D-1.2 and 1.3 have ~2% common ^{206}Pb.

Although the error is large, the weighted mean $^{207}Pb/^{206}Pb$ age of 1855 Ma corresponds well with the 1858±6 Ma age identified from a metamorphic monazite in garnet-bearing quartz-mica schist from the middle of the belt east of Yarrameedie Hill (Rasmussen et al., 2010). The ~1.86 Ga age is broadly consistent with white mica and biotite $^{40}Ar/^{39}Ar$ data from the Jack Hills belt (Spaggiari et al., 2008). This suggests the ~1.86 Ga monazite was related to the east-trending, dextral, transpressive shearing along the Cargarah Shear Zone (Spaggiari et al., 2008).

Monazite grain 10H (Fig 6.1 E) is a euhedral grain associated with ilmenite, and intergrown with muscovite and quartz. Two analyses were located on grain 10H, but both of them had >10% common ^{206}Pb, with $^{207}Pb/^{206}Pb$ ages of 1909±673 Ma and 2020±117 Ma, respectively. Even though the age of 1909±673 Ma recorded 96% concordance, because of the high common ^{206}Pb these ages may have been disturbed by the later ~1.8 Ga metamorphic event (Rasmussen et al., 2010) or affected by weathering.

6.1.4 Monazite Grain from Coarse-grained Sandstone Sample (JH10016, 70 m)

A $^{207}Pb/^{206}Pb$ age of 2547±1730 Ma was obtained from a monazite fragment (Grain I in Table 6.1, Fig 6.1 F) intergrown with quartz and muscovite in a coarse-grained sandstone sample (JH10016, 70 m) near the southern end of the traverse. Because this monazite grain is intergrown with muscovite and quartz in the matrix, it is highly likely that it is of metamorphic origin. The high common ^{206}Pb content (53.4%) and high discordance (27%) of this grain suggest the 2547 Ma age was possibly disturbed during younger metamorphic events or by weathering.

6.2 Discussion

Iizuka et al. (2010) reported in situ U-Pb isotopic dating and geochemical analyses of ~500 monazites from Mt Narryer and Jack Hills belt. The Jack Hills samples were two metaconglomerates (EH26 and EH27) collected from Eranondoo Hill. The sample EH26 yielded three monazite grains with anhedral shapes plotting on concordia with ages at ca. 3.4 and 2.7 Ga, whereas the sample EH27 yielded seven homogeneous grains range from 3.6-2.5 Ga, one oscillatory-zoned and two mosaic grains with ages at ~3.3-3.2 Ga. In the Jack Hills belt, metamorphic monazite growth was minor, suggesting the absence of high-grade metamorphism in the sequence (Iizuka et al., 2010). Iizuka et al. (2010) also identified metamorphic monazite ages of ~3.3-3.2 and 2.7-2.6 Ga as well as detrital monazite ages as old as ~3.6 Ga in the Mt. Narryer metasediments. The detrital monazites provide evidence for the derivation of Mt. Narryer sediments from ca. 3.6 and 3.3 Ga granites, likely corresponding to Meeberrie and Dugel granitic gneisses in the Narryer Gneiss Complex (Iizuka et al., 2010).

Rasmussen et al. (2010) reported detrital monazite and xenotime ages between 3.3 and 3.1 Ga, metamorphic monazite age of 2653±5 Ma as well as authigenic xenotime age of 800±25 Ma in the quartz-pebble conglomerate (W74 site) at Eranondoo Hill in the Jack Hills belt. Metamorphic monazite from andalusite-bearing quartz-muscovite schist from the centre of the belt was also affected by ~2.65 Ga metamorphism, but the main period of monazite growth occurred at ~1.86 Ga (Rasmussen et al., 2010).

In this study, three ages (~3.42 Ga, 2.65 Ga and ~1.86 Ga) were obtained from monazite grains from samples of coarse-grained sandstone (JH10015, 65 m), fine-grained sandstone (JH10085, 459 m), and matrix-supported conglomerate (JH10082, 443 m). They were identified at the southern and the central parts of the traverse.

The monazite grain with an age of 3422±10 Ma is interpreted to be a detrital grain, because this grain is enclosed in quartz, and the age of 3422 Ma is older than the youngest zircon age of 3383±6 Ma (JH015-02) identified in the coarse-grained sandstone sample JH10015 (65 m), even though there were only two concordant zircon ages obtained from this sample (the other age is 4102±7 Ma). The monazite age of 3422±10 Ma indicates a metamorphic event in the source rock where this detrital quartz grain originated. The detrital zircon age of 3383±6 Ma also indicates the depositional age of the coarse-grained sandstone sample (JH10015, 65 m) must be younger than ~3.38 Ga. This ~3.4 Ga detrital monazite age is broadly similar to the 3181±17 Ma and 3259±5 Ma detriral monazite ages idenfied in the quartz-pebble conglomerate east of Eranondoo Hill (Rasmussen et al., 2010). A discordant metamorphic monazite age of 2547 Ma (27% discordance) with 53.4% common ^{206}Pb was obtained from the adjacent coarse-grained sandstone sample (JH10016, 70 m) along the traverse, so it is possible that the depositional age for the coarse-grained sandstone package at the southern end of the traverse was older than ~2.6 Ga, but younger than ~3.38 Ga. From field observations, this coarse-grained sandstone package is adjacent to the conglomerate at the southern end of the traverse which is along strike from the conglomerate (W74 site) that hosts abundant Hadean zircon grains. A metamorphic monazite age of 2653±5 Ma was reported to represent the time of low-grade metamorphism and therefore is a direct minimum age for sedimentation (Rasmussen et al., 2010). However, because the age of 2547 Ma is from a grain with high common ^{206}Pb, further work is needed to confirm if the depositional age of this coarse-grained sandstone package is older than ~2.6 Ga.

The monazite ages between 2648±9 Ma to 2661±9 Ma are interpreted to represent the metamorphic age of the fine-grained micaceous sandstone (JH10085, 459 m) in the centre of the traverse, east of Eranondoo Hill. The weighted mean ^{207}Pb/^{206}Pb age of 2652±9 Ma for the metamorphic monazite is consistent with the ~2.65 Ga metamorphic monazite ages recorded from the quartz-pebble conglomerate east of Eranondoo Hill and garnet-bearing quartz-mica schist east of Yarrameedie Hill from the middle of the Jack Hills belt (Rasmussen et al., 2010). Together, these results confirm that the central part of the Jack Hills belt experienced metamorphism at ~2.65 Ga.

Monazite ages between 1836 Ma and 1890 Ma were identified in a matrix-supported conglomerate sample (JH10082, 443 m) in the centre of the traverse. The high common ^{206}Pb (3.2%-11.1%) suggests these ages represent a mixture of younger and older monazite. However, they are broadly consistent with the weighted mean ^{207}Pb/^{206}Pb age of 1858±6 Ma identified in monazite from a garnet-bearing quartz-mica schist east of Yarrameedie Hill (Rasmussen et al., 2010). The ~1.86 Ga metamorphic age likely reflects an episode of deformation and low-grade metamorphism associated with east-trending, dextral, transpressive shearing along the Cargarah Shear Zone (Spaggiari et al., 2008).

Chapter 7 Discussion and Conclusions

The primary goal of the doctoral thesis is to establish the distribution and subsequent history of Proterozoic sedimentary rocks in the Jack Hills Metasedimentary Belt, Western Australia. In this study, a 1010 m traverse line was mapped in detail through the entire Jack Hills Belt on the east flank of Eranondoo Hill, to investigate the detailed characteristics of the four sedimentary associations recognized by Spaggiari (2007) and to determine if they reveal differences in age. Precise ICP-MS and SHRIMP U-Pb isotope results from 51 samples provide the first estimate of the proportion of Proterozoic sedimentary rocks along the Jack Hills belt. These zircon ages provide evidence for the depositional age of the Jack Hills belt, and also help to reveal the source of the detrital material preserved within the clastic sedimentary succession. Lu-Hf isotope isotope results from 46 samples allow an evaluation of composition of the source region of the zircon's host magma, and provide some constraints on Hadean crustal evolution. U-Pb dating of monazite was ultilised to determine the post-depositional and metamorphic history of the Jack Hills belt.

7.1 Sedimentary Successions

Along the traverse, 157 rock samples were collected at approximately 5 m intervals or wherever a lithological change was observed. The southern end of the traverse overlapped the traverse investigated by Eriksson and Wilde (2010), but this study is the first detailed traverse that includes the fine-grained sediments in the northern part of the Jack Hills belt. The traverse started from the BIF at the southern extremity of the belt and terminated at the boundary between amphibolite and granite at the northern extremity. The rocks along the traverse can be classified into several main rock types, these are: shale, siltstone, schist, sandstone, arenite, conglomerate, quartzite, chert, and mafic and ultramafic rocks. Nine sharp contacts between different lithologies were exposed along the traverse line. The schist is siltstone that has been strongly deformed, with a ~280° uniform foliation.

Previous interpretations assigned sedimentary rocks in the west-central Jack Hills belt to a fan-delta setting (Baxter et al., 1984; Pidgeon et al., 1986) possibly related to an intracrantonic rift basin. Kinny et al. (1990) concluded that the sedimentary rocks at Mt. Narryer accumulated along a continental margin whereas Maas and McCulloch (1991) argued that the lithological associations at both Jack Hills and Mt. Narryer favoured a rifted cratonic margin. Eriksson and Wilde (2010) described six facies, which were: 1. pebble conglomerate facies; 2, medium- to coarse-grained

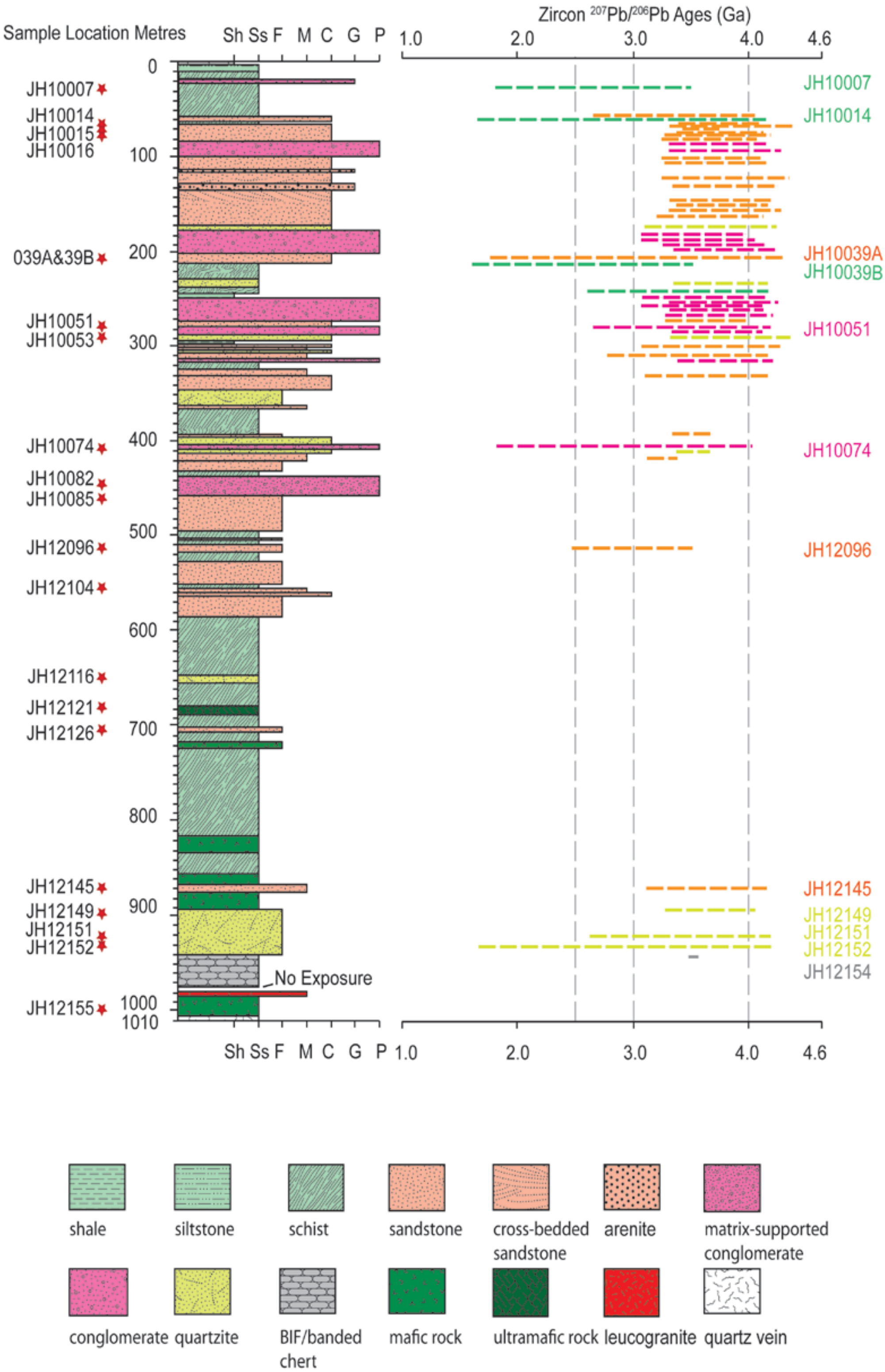

Figure 7.1 Lithological log and zircon $^{207}Pb/^{206}Pb$ age distribution along the traverse through the Jack Hills belt. The red asterisks record the sample locations.

sandstone facies; 3. gritstone facies; 4. quartz arenite facies; 5. fine-grained sandstone-siltstone facies; and 6. mudstone (schist) facies. Four associations of the facies described above are recognised: A=1, 2 and 5; B=2 and 5; C=1 and 2; D=3 and 4. Facies associations A-C are compatible with a fan delta depositional setting in which alluvial fans were sourced by proximal highlands and built directly into a lake or sea and were characterized by high gradients and high flow velocities (McPherson et al. 1987). Facies association D is interpreted to record transgressive tidal reworking of the fan delta (Eriksson and Wilde, 2010).

In this study, all four facies associations are present along the traverse, indicating a fan delta depositional environment.

From 3 m to 65 m (JH10002-JH10014, Fig 7.1), there is a fine-grained succession including siltstone and schist interbedded with a single layer of matrix-supported conglomerate (JH10005). From 65 m to 212 m along the traverse, there is a succession which contains coarse-grained sandstone and quartz-pebble conglomerate interbedded with quartz arenite (JH10024&27 at 111 m and 126 m) and quartzite. From 212 m to 229 m, there is 17 m thick crenulated chloritic schist. From 229 m to 348 m (samples JH10042-JH10062), there is a succession which contains quartz-pebble conglomerate interbedded with medium- to coarse-grained sandstone, quartzite, shale, and chloritic schist. The successions from 3 m to 348 m are consistent with facies association A and D. The facies association A is widely distributed, whereas facies association D is only identified at 111-116 m and 126-132 m, and cross-bedding is observed here. The well-sorted and well-rounded quartz arenite suggests a shallow-water setting in which sediment was reworked into dunes, and the cross-bedding suggests a marine environment influenced by tides (Eriksson and Wilde, 2010). Facies association A is interpreted as a prodelta-delta front succession (Eriksson and Wilde, 2010).

From 348 m to 585.5 m (samples JH10063-JH12108), there is a succession which contains schist, quartzite, fine- to medium-grained sandstone and two layers of matrix-supported conglomerate. This succession is consistent with facies associations B and C, which suggests more distal and more proximal alluvial fan deposits of sheet-flood origin (Eriksson and Wilde, 2010).

From 585.5 m to 970.5 m (samples JH12109-JH12154) along the traverse, the succession is dominated by schist, which is interbedded with thin layers of fine-grained sandstone, quartzite, and mafic and ultramafic rocks. Mafic and ultramafic rocks occupy a total thickness of 56 m and 10 m, respectively. This succession is consistent with facies association B. The dominant facies association changes from A to B, from the southern part to the northern part of the traverse. The transition from facies association A to B records significant shallowing of the basin with subaqueous deposits A replaced by terrestrial deposits B (see also Eriksson and Wilde, 2010).

7.2 Zircon U-Pb Isotopes

All 157 samples were prepared for zircon U-Pb geochronology, but only 51 samples were analysed by LA-ICP-MS and SHRIMP, because the remaining samples did not yield any zircon in the conventional heavy liquid separation process. This could either because the grain-size of the rock was too fine, or because the zircons are less than 10 μm in diameter (present in the doubly polished section) and could have been lost during preparation. A total of 2819 concordant zircon ages were obtained out of a total of ~6308 zircons analysed in this study, and the ages spread from 1618±22 Ma to 4381±5 Ma. A total of fifty-four (2%) zircon ages are younger than 3.0 Ga, and these ages are distributed at ~1.6 Ga, ~1.7-1.8 Ga, ~2.0 Ga, and 2.4-2.9 Ga. Another 1% of zircon ages are between 3.0 and 3.2 Ga, and a total of 2159 (76%) zircon ages are between 3.2 Ga to 3.6 Ga, with a prominent age peak at 3383 Ma, and a substantial age peak at 3471 Ma. A total of three hundred and fifty-four analyses (13%) record ages from 3.6 Ga to 4.0 Ga. There are also 221 zircons (8%) in the age range of 4.0 and 4.1 Ga, with a main age peak at 4009 Ma.

Previous studies have identified several detrital zircon populations in the Narryer Terrane, including >4300, 4200, and 4150 Ma (Compston and Pidgeon, 1986; Wilde et al., 2001) and >3800, 3750-3600, 3500-3300, and 3100-3050 Ma (Nutman et al., 1991). The majority of the detrital zircon ages obtained from conglomerate at the W74 site and adjacent siliciclastic sedimentary successions are between 3.3 Ga and 3.8 Ga (Compston and Pidgeon, 1986; Cavosie et al., 2004; Crowley et al., 2005; Dunn et al., 2005; Pidgeon and Nemchin, 2006). The maximum age of the W74 metaconglomerate based on the youngest detrital zircon age was cited as ~ 3100 Ma (e.g., Compston and Pidgeon, 1986). A 3046±9 Ma grain was reported by Nelson (2000), and a similar age of 3047±21 Ma was later reported as the youngest detrital zircon at the W74 site by Crowley et al. (2005), and also other studies at the W74 site or adjacent areas in Jack Hills (Cavosie et al., 2004; Dunn et al., 2005; Pidgeon and Nemchin, 2006). It appears that ~3.05 Ga is the maximum depositional age of conglomerate at the same stratigraphic section as the W74 site.

However, detrital zircons with ages as young as Proterozoic have been identified. Cavosie et al. (2004) reported a quartzite sample 01JH-63 contains Proterozoic zircons with oscillatory zoning and ages as young as 1576±22 Ma in a 60 m section that contains the W74 site. The presence of Proterozoic zircons in the conglomerate bearing unit was confirmed by Dunn et al. (2005). Two younger zircon grains were identified from conglomerate (01JH47), ~900 m east along strike from the W74 outcrop, which gave individual dates of 2504±6 Ma and 2724±7 Ma. Furthermore, a quartz-mica schist (JH3) near the west transect of Cavosie et al. (2004) was found to contain Proterozoic grains as young as 1797±21 Ma (Dunn et al., 2005). A sample of conglomerate from the eastern part of the belt also yielded zircons as young as 1884±32 Ma (Dunn et al., 2005). Thus, independent studies have demonstrated that the youngest metasedimentary rocks in the Jack Hills are Proterozoic in age.

Wilde (2010) reported four felsic volcanic rocks that contain zircon populations at ~3.3-3.4, ~3.0-3.1, ~2.6 and ~1.8-1.9 Ga. The youngest discrete group of zircon grains, with ages ranging from ~1970 to ~1775 Ma, show strong oscillatory zoning and average Th/U ratios of 0.76, features consistent with an igneous origin. The youngest age was interpreted as defining the crystallisation of the volcanic rocks.

The youngest U-Pb age so far identified at Jack Hills is 1220±42 Ma, obtained from zircons with oscillatory zoning and extracted from rare heavy mineral bands within quartzite pebbles in two separate conglomerate units, approximately 1 km west of the W74 site (Grange et al., 2010). Their location within a quartzite cobble requires that not only is the host siliciclastic sediment younger than ~1.2 Ga, but that is was subsequently converted to quartzite, eroded and then transported to finally reside within the conglomerate unit at Jack Hills.

The $^{40}Ar/^{39}Ar$ results (Spaggiari et al., 2008) indicate that east-trending, dextral, transpressive shearing in the Jack Hills belt was related to the Capricorn Orogeny (1830-1780 Ma), followed by further deformation and/or cooling between 1760 Ma and 1740 Ma. These results confirm that major deformation has affected the northwestern part of the Yilgarn Craton in an intracratonic setting during the Proterozoic. Also, the $^{40}Ar/^{39}Ar$ dating shows a younger, less intense deformation and/ or cooling event at c. 1172 Ma (Spaggiari et al., 2008), that may be related to the widespread emplacement of mafic dykes in the northern Yilgarn Craton (Wingate et al. 2005).

Thus, there were Archean sediments and Proterozoic sediments identified in the Jack Hills belt. The possible interleaving of sedimentary rocks of different age can be caused by tectonic juxapositon with younger rocks being exotic to the rest of the belt (Grange et al., 2010; Wilde, 2010). Wilde. (2010) reported that a possible source for the ~1.2 Ga grains identified by Grange et al. (2010) appears to be from the Bangemall Supergroup, a major depocentre located approximately 100 km north of the Jack Hills, consisting of the Edmund and Collier basins. The Edmund Group is composed of younger sediments - including conglomerates - dated at ~1400-1070 Ma (Martin and Thorne, 2004). It is possible that the Collier Basin might once have extended farther south and that remnants were preserved by tectonic interleaving with earlier Jack Hills sedimentary rocks during multiple episodes of deformation along the Cargarah Shear Zone.

7.2.1 Proterozoic Age Distribution

A total of sixteen (~0.5% of the total concordant grains) concordant Proterozoic zircon ages were identified in seven samples, ranging from 1618±22 Ma (212 m, JH039B-02) to 2473±20 Ma (514.5 m, JH096-04), and with age peaks at ~1.6 Ga, 1.7-1.9 Ga, 2.0-2.1 Ga and ~2.4-2.5 Ga. These samples were widely distributed along the belt and there is no relationship between rock-type and young zircon ages. These Archean-Proterozoic interleaved successions (Fig 7.1) together with previous results (Cavosie et al., 2004; Dunn et al., 2005; Grange et al., 2010; Wilde, 2010) confirm the existence of two different sedimentary associations, one formed in the Archean, the other formed in the Proterozoic.

Proterozoic zircon ages as young as ~1.6 Ga were identified from 3 m to 62 m (sample JH10002-JH10014), which includes siltstone and schist interlayered with matrix-supported conglomerate (JH10005). Schist sample JH10007 (27m) contains Proterozoic zircon with ages as young as 1803±27 Ma, and lacks zircons older than 3505±9 Ma. Schist sample JH10014 (62 m) contains zircon ages from 1641±21 Ma to 4143±8 Ma. The ~1.6 Ga (62 m) and ~1.8 Ga (27 m) zircon ages define the maximum depositional ages for these two locations. At 212 m along the traverse, coarse-grained sandstone sample JH10039A contains zircon ages as young as 1754±19 Ma, and chloritic schist sample JH10039B contains zircon ages as young as 1618±22 Ma, which is the youngest zircon age determined in this study, indicating the maximum depositional age must be younger than 1.6 Ga. From 348 m to 585.5 m (samples JH10063-JH12108), the succession contains schist, quartzite, fine- to medium-grained sandstone and two layers of conglomerate. Many samples are devoid of zircons, so only limited zircon ages could be obtained. Matrix-supported conglomerate sample JH10074 (407 m) contains zircon ages from 1805±36 Ma to 4010±29 Ma. The ~1.8 Ga zircon age indicates the maximum depositional age. Zircon ages as young as 2472±30 Ma identified in fine-grained sandstone sample JH12096 (514.5 m) also indicate Proterozoic units in the central part of the Jack Hills belt. Proterozoic zircon ages were also identified at the northern extremity of the traverse. Quartzite sample JH12152 (929.5 m) contains zircon ages from 1642±25 Ma to 4192±16 Ma, which indicates the maximum depositional age must be younger than ~1640 Ma. Because at the northern part of the traverse (585.5 m to 1010 m), only limited zircons were obtained, further work needs to be undertaken to confirm if the whole of this part of the succession was deposited in the Proterozoic, or even later.

Proterozoic sediments were observed to contain a significantly lower proportion of ancient zircons in previous studies (Cavosie et al., 2004; Dunn et al., 2005; Grange et al., 2010). In this study, the Proterozoic sediments usually contain relatively low proportions (0-4%) of Hadean zircons. However, chloritic schist sample JH10014 and quartzite sample JH12152 contain 7.5% and 20% of Hadean zircons, respectively, and both of them show an age range from ~1.6 Ga to >4.1 Ga (4143 Ma and 4192 Ma, respectively, Fig 7.1). Due to the heterogeneous distribution of ancient zircon in samples with Proterozoic ages, it is possible that the ultimate source of the >4 Ga magmatic zircons was not directly exposed in the Proterozoic and that any such grains were derived from the breakdown of pre-existing sedimentary rocks (Grange et al., 2010). The complex age distribution along the traverse suggests there could be a distal source for some of the ancient zircons, or that there was more than one sedimentary cycle.

The three youngest grains (1618±22 Ma, JH039B-02; 1642±21 Ma, JH014-08; 1643±25 Ma, JH152-64) along the traverse are in the age range of the Mangaroon Orogeny (1680-1620 Ma; Sheppard et al., 2005). Four ~1.7-1.8 Ga grains (1792±27 Ma, JH014-53; 1803±27 Ma, JH007-12.1; 1805±36 Ma, JH074-88) record the possible influence of the Capricorn Orogeny (1830-1780 Ma; Sheppard et al., 2003). Another four grains (1959±34 Ma, JH014-51; 1961±15 Ma, JH039A-47; 1985±18 Ma, JH007-18.1; 1986±11 Ma and 1994±22 Ma, JH007-05) are consistent with events in the Glenburgh Orogeny (2005-1960 Ma; Occhipinti et al., 2004). Grains from fine-grained sandstone JH10039A, have ages of 1754±19 Ma (JH039A-23) and 1765±29 Ma (JH039A-22) that may be related to dextral transpressive shearing at Jack Hills defined by biotite and muscovite ages clustering between 1900 and 1700 Ma and associated with the Capricorn Orogen (Spaggiari et al., 2008). The Glenburgh, Capricorn and Mangaroon orogenies are related to the collision between the Pilbara and Yilgran cratons to the north of Narryer Terrane. The agreement of the age record between the Jack Hills belt and these three orogenies suggests the sedimentary protolith lay to the north of the Narryer Terrane, hence at least part of the sedimentation was from north to south.

7.2.2 Archean Age Distribution

A total of thirty-four (1.3%) zircons were Neoarchean grains collected from eleven samples. These ages ranged from 2503±12 Ma (JH039B-05) to 2766±32 Ma (JH058-122), with a peak at ~2.65 Ga. The potential source of the ~2.6 Ga Neoarchean grains could be the local ~2.65 Ga granitoids rocks, occurring at the southern margin of the Jack Hills belt (Pidgeon and Wilde, 1998).

Only two grains identified in schist sample JH10007 (27 m) and sandstone sample JH10039A (212 m) recorded ages between 2.8 to 3.0 Ga, and these were 2815±7 Ma (JH039A-55, 212 m) and 2898±4 Ma (JH007-07.1, 27 m). Compared to the ~3.4 Ga main age peak (Fig 4.15), the ~3.0-3.1 Ga age range is less common. There are thirty-two zircons from fourteen samples that record Mesoarchean ages between 3045±32 Ma (JH013-115, 57 m) and 3196±7 Ma (JH055-74, 294 m), with minor age peaks at 3054 Ma and 3121 Ma (Fig 4.17). A total of two thousand one hundred and fifty-nine zircon grains (76.3%) recorded ages between 3.2 Ga and 3.6 Ga, with a prominent age peak at 3383 Ma, and a substantial age peak at 3471 Ma. These ages were found in all fifty-one samples dated (Fig 7.1). A total of three hundred and fifty-four analyses (12.6%) recorded ages from 3.6 Ga to 4.0 Ga. These grains were obtained from forty-five samples along the traverse.

For the ~3.3-3.75 Ga age range, the potential sources are likely to be the the surrounding granitoids of the Narryer Terrane, including the Meeberie gneiss, Dugel gneiss, Eurada gneiss, and the Manfred Complex (Cavosie et al., 2004; Wilde and Spaggiari, 2007). The source for the >3.8 Ga zircons remains unknown, because the oldest rock identified in Australia is a tonalite collected 3 km south of the Jack Hills, with a SHRIMP U-Pb age of 3731±4 Ma (Nutman et al., 1991).

There are two successions dominated by coarse-grained sandstone and conglomerate at the southern part of the traverse that were likely deposited in the Archean (Fig 7.1). The ~2.6 Ga and ~3.06 Ga age records in this study are consistent with the metamorphic monazite and xenotime (Rasmussen et al., 2010) which proves they are Archean.

The coarse-grained sandstone and quartz-pebble conglomerate dominated succession from 65 m to 202 m (samples JH10015-JH10038), with all zircon ages older than 3062±13 Ma (JH10035, Fig 7.1) may have been deposited in the Mesoarchean. The other Archean succession extends from 229 m to 348 m (samples JH10042-JH10062). Here, the youngest zircon age is 2596±26 Ma. It is not confirmed whether the whole succession is younger than ~2.6 Ga, because ~2.6-2.7 Ga detrital zircon ages were only identified in three samples, including chloritic schist, conglomerate and coarse-grained sandstone (Fig 7.1, JH10043 at 237 m, JH10051 at 278 m, and JH10058 at 309 m). The rest of the samples in this succession contain zircons that are older than 3060±32 Ma (JH10047, Fig 7.1). The ~2.6-2.7 Ga Neoarchean zircons indicate the maximum depositional age for the three locations (237 m, 278 m, and 309 m) must be younger than ~2.6 Ga. The fact that only three samples in this succession (229-348 m) contain Neoarchean ages suggest the source rocks of the 2.6-2.7 Ga detrital zircons were only exposed in a limited area or that these detrital zircons experienced distal transportation (Dunn et al., 2005).

7.2.3 Hadean Age Distribution

Hadean ages were identified in forty-one samples along the traverse (Fig 4.19). These samples include sandstone, quartzite, conglomerate and schist. There are seventeen zircon grains from eleven samples older than 4.2 Ga. These were found in six sandstone samples (JH10016, 70 m; JH10025, 116 m; JH10027, 126 m; JH10031, 154 m; JH10039A, 212 m; and JH1055, 294 m); three conglomerate samples (JH10021B, 94 m; JH10038, 197 m; JH10046, 253 m); and two quartzite samples (JH10034,170 m; and JH10053, 288 m). Six >4.3 Ga zircons were found in three sandstones (JH10016, 70 m; JH10025, 116 m; JH10039A, 212 m) and one quartzite sample (JH10053, 288 m); their ages ranged from 4303±12 Ma (JH039A-06) to 4381± 5 Ma (JH016-49).

The proportion of Hadean zircon is higher in rocks containing no zircons younger than 3 Ga (up to 21% in conglomerate sample JH10059), and it appears likely that destruction of the initial host(s) of the >4 Ga zircons occurred in the late Paleoarchean-early Mesoarchean and that the zircons were incorporated into sedimentary rocks possibly by the middle Mesoarchean (Grange et al., 2010). Many of the old zircons are sub-euhedral or sub-rounded, which suggests they have experienced considerable transportation from the source area or that they have been involved in more than one sedimentary cycle (Grange et al., 2010). There are no known rocks on Earth older than 4030 Ma (Bowring and Williams, 1999), and the provenance for Hadean zircons in the Jack Hills (and elsewhere) remains unknown.

7.2.4 Uranium and Thorium ratios and CL Features of the Jack Hills Zircons

Uranium and thorium concentrations of zircon grains range from 2 ppm (JH038-080) to 1250 ppm (JH038-160), and 1 ppm (JH051-098) to 4106 ppm (JH046-141), respectively, and the Th/U ratio ranges from 0.01 (JH051-098) to 6.04 (JH046-141). Only 25 analyses out of a total of 2819 have Th/U ratios less than 0.10, and these 25 grains are scattered in 18 samples. It is unknown if these zircons with <0.10 Th/U ratios are of metamorphic origin, but their low number indicates that metamorphic zircon (Rubatto, 2002) was not a significant contributor to the zircon population, However, the large proportion (99%) of zircons with Th/U ratio >0.10 attests that the majority of Jack Hills zircons are of magmatic origin.

7.3 Zircon Lu-Hf Isotopes

Several different views on Hadean crust evolution have resulted from previous studies of the ancient zircons from Jack Hills. Amelin et al. (1999) studied 37 single detrital zircons with ages up to 4.14 Ga from the Jack Hills metaconglomerate, and the generally unradiogenic hafnium isotope composition points to the existance of an older enriched reservoir, which persisted for hundreds of Myr. Harrison et al. (2005) studied 4.01 to 4.37 Ga Jack Hills zircons, and reported a large range of $\varepsilon_{Hf(t)}$ values, from -9 to +15 (Harrison et al., 2005, Fig 5.14 B), which are interpreted as supporting a major differentiation of the silicate Earth at ~4.5 Ga (Caro et al., 2003; Boyet and Carlson, 2005). They went on to propose extensive recycling into the mantle and invoked plate tectonics as the mechanism (Harrison et al., 2005). Indeed, they favoured derivation of the ancient zircon from evolved S-type granite (Harrison et al., 2005). A further 116 laser ablation Lu-Hf measurements on 87 Jack Hills zircons with ion microprobe $^{207}Pb/^{206}Pb$ ages up to 4.36 Ga was interpreted to be indicative of source sequestration in a crustal-type Lu/Hf environment prior to 4.5 Ga (Harrison et al., 2008). A study using the Lu-Hf solution MC-ICP-MS method (Blichert-Toft and Albarède, 2008) on dated zircons with ages from 3.32 Ga to >3.9 Ga, document positive $\varepsilon_{Hf(t)}$ values up to +8, and $^{176}Lu/^{177}Hf$ ratios (<0.01) that fit a TTG source. The parent granitoids of the Jack Hills zircons were interpreted to have formed during a single pulse 4.1±0.1 Ga ago by the remelting of a 4.30-4.36 Ga protolith (Blichert-Toft and Albarède, 2008). Bell et al. (2011) reported 130 laser ablation Lu-Hf analyses that favour early crust formation on Earth at about 4.5 Ga.

Valley et al. (2006) highlight the large uncertainties in the proposal that plate tectonics existed 4.5 billion years ago. Kemp et al. (2010) reported the analysis of 96 detrital zircons from Jack Hills and 77 zircon analyses from seven samples of granitoid (Fig 5.13B) adjacent to Jack Hills. The meta-igneous zircons all have negative $\varepsilon_{Hf(t)}$ values (-14.9 to -1.4), and most have more radiogenic $^{176}Hf/^{177}Hf$ compared to the detrital zircons with similar ages. They define a broad band that plots above the detrital zircon data array in the $\varepsilon_{Hf(t)}$ versus crystallization age diagram (Kemp et al., 2010). The detrital zircons define a subchondritic ε_{Hf}-time array, which is interpreted to be consistent with protracted intra-crustal reworking of an enriched, dominantly mafic protolith that was extracted from primordial mantle at 4.4-4.5 Ga, perhaps during the solidification of a terrestrial magma ocean. There is no evidence for the existence of strongly depleted Hadean mantle, or for juvenile input into the parental magmas to the Jack Hills zircons. Strongly unradiogenic Hf isotope compositions of zircons from several Archaean gneiss terranes, including the Narryer and Acasta gneisses, suggest that Hadean source reservoirs were tapped by granitic magmas throughout the Archean.

Griffin et al. (2014) integrated a worldwide compilation of U/Pb, Hf-isotope data on zircon, to examine patterns of crustal evolution and crust-mantle interaction from 4.5 Ga to 2.4 Ga ago. The data suggest that during the period from 4.5 Ga to ca 3.4 Ga, Earth's crust was essentially stagnant and dominantly mafic in composition. Zircon crystallized mainly from intermediate melts, probably generated both by magmatic differentiation and by impact melting. This quiescent state was broken by pulses of juvenile magmatic activity at ca. 4.2 Ga, 3.8 Ga and 3.3-3.4 Ga, which may represent mantle overturns or plume episodes. Between these pulses, there is evidence of reworking and resetting of U-Pb ages (by impact?) but no further generation of new juvenile crust. There is no evidence of plate-tectonic activity, as described for the Phanerozoic Earth, before ca. 3.4 Ga.

In this study, a total of 1093 zircons with ages from 1642 Ma to 4381 Ma from 46 samples (Table 5.1) were analysed for Lu-Hf isotopes. The $\varepsilon_{Hf(t)}$ values (Fig 5.9) for all zircons range from -22.1 (JH039A-47) to 5.5 (JH034-049), and the majority of the dataset (94.6%) have negative $\varepsilon_{Hf(t)}$ values, with only fifty-nine zircons (5.4%) having positive $\varepsilon_{Hf(t)}$ values that spread from 0.1 to 5.5. The prominent $\varepsilon_{Hf(t)}$ peak is at -4.2, with a secondary peak at -7.6 (Fig 5.9).

7.3.1 Source Rocks of the Jack Hills Detrital Zircons

A total of 35 zircons with crystallization ages from 1642 Ma (JH014-08) to 2815 Ma (JH039A-55) were analyzed for Lu-Hf isotope. There are 97% of <3.0 Ga zircons with negative $\varepsilon_{Hf(t)}$ values from -22.1 to -1.6, indicating there is no evidence for significant juvenile magma input. For zircons with crystallization ages around 2.65 Ga, the Lu-Hf isotope results confirm the potential source can be the 2654±7 Ma monzogranites located immediately south of the Jack Hills belt (Pidgeon and Wilde, 1998). For the zircons younger than 2.6 Ga with $\varepsilon_{Hf(t)}$ values ranging from -22.1 to 1.0, there is no igneous Hf isotope record in previous studies, the source rocks could potentially be granitoids or even more mafic rocks.

For the 730 zircons with crystallization ages between 3.0 Ga-3.75 Ga, 95% of the Lu-Hf isotope data have negative $\varepsilon_{Hf(t)}$ values from -17.7 (JH023-001) to -0.1 (JH038-135), which is broadly consistent with detrital zircon $\varepsilon_{Hf(t)}$ values from -14.9 to -1.4 as determined by Kemp et al. (2010) (Fig 5.13 B). The fact that the $\varepsilon_{Hf(t)}$ values overlap the $\varepsilon_{Hf(t)}$ values from TTG in the Narryer Terrane suggests the Meeberrie gneiss could possibly have been a major source of Jack Hills zircons with ages from 3.3 to 3.7 Ga. The multiple components of the Meeberrie gneiss can explain the large range of $\varepsilon_{Hf(t)}$ values of the Jack Hills zircons.

However, the source rock for the >3.8 Ga Jack Hills zircons (n=144) remains unknown.

7.3.2 Implications for Hadean and Archean Crustal Evolution

A total of 184 Hadean zircons were analyzed, with crystallization ages from 4000 Ma (JH025-122) to 4381 Ma (JH016-49). The $\varepsilon_{Hf(t)}$ values ranged from -11.3 (JH013-133) to 5.3 (JH053-028), with a prominent peak at -3 (Fig 5.12), and with an average $\varepsilon_{Hf(t)}$ value of -3.7. Grain JH053-28 (4093 Ma, $\varepsilon_{Hf(t)}$=5.3) was re-tested for U-Pb age by SHRIMP after the ICP-MS analyses, and the results are consistent, indicating that some positive $\varepsilon_{Hf(t)}$ values for Jack Hills Hadean zircons with homogeneous U-Pb ages do exist. The positive $\varepsilon_{Hf(t)}$ values up to 5.3 (4093 Ma) recorded in the Hadean, indicate mantle-derived magmatism during the Hadean.

However, the negative $\varepsilon_{Hf(t)}$ values make up 92% of the Hadean population in this study, indicating the Hf isotope data do not favour the existence of a strongly depleted Hadean mantle contribution, or significant juvenile input into the parental magmas to the Jack Hills detrital zircons as early as ~4.4-4.5 Ga. Remarkably, this ancient mafic-dominant crustal reservoir appears to have been sampled by magmas throughout the Archaean to ~3.4 Ga (Fig 5.13 A), and there are 95% of 3.0 Ga to 4.0 Ga zircons with negative $\varepsilon_{Hf(t)}$ values from -17.7 to -0.1, with a total number of 874 analysed in this study. The large proportion (92% and 95%) of negative $\varepsilon_{Hf(t)}$ of Hadean and >3.0 Ga Archean zircons in this study is consistent with previous Hadean Hf isotope studies in Jack Hills (Kemp et al., 2010) and those from other Archaean cratons (Amelin et al., 2000; Kemp et al., 2009). The detrital zircons in this study define a subchondritic $\varepsilon_{Hf(t)}$-time array that is consistent with an enriched, dominantly mafic protolith that was extracted from primordial mantle at 4.4-4.5 Ga, perhaps during the solidification of a terrestrial magma ocean (Kemp et al., 2010). The unradiogenic $\varepsilon_{Hf(t)}$ of Hadean zircons is also consistent with the global datset Griffin et al. (2014), reporting that none of the oldest zircons (4.4-4.25 Ga) from Western Australia, Asia and North America have significantly suprachondritic Hf isotopes, which may suggest that the depleted mantle model is not relevant to the earliest Earth, prior to ca 4.25 Ga (Griffin et al., 2014).

The percentage of >4.6 Ga zircon two-stage model ages (T_{DM2}) supports the notion that the depleted mantle model may not be not relevant to the earliest Earth (Griffin et al., 2014), which rises from 0.4% to 54.7% as the $^{176}Lu/^{177}Hf$ ratios rise from 0.005 (TTG; Blichert-Toft and Albarède, 2008) to 0.022 (mafic crust; Amelin et al., 1999). These unrealistic >4.6 Ga T_{DM2} model ages indicate that an evolution model based on two-stage model age cannot adequately explain the Jack Hills detrital zircon population. Although the lower $^{176}Lu/^{177}Hf$ ratios (such as 0.005 or 0.008) yield lower T_{DM2} model ages than the higher $^{176}Lu/^{177}Hf$ ratios (such as 0.022), it does not mean the TTG model or the upper continental crust model fit all the Jack Hills detrital zircons, because the composition of the primitive mantle or crust remains unknown. The zircon two stage hf model ages ($^{176}Lu/^{177}Hf$=0.005) in this study (Fig 5.18 A) do not show the obvious ca. 4.3 Ga peak, suggesting that the parent granites of Jack Hills zircons did not form during a single pulse 4.1±0.1 Ga ago by the remelting of a 4.30-4.36 Ga old protolith such as TTG, as suggested by Blichert-Toft and Albarède (2008). Also, it can not preclude the possibility that at least part of the Jack Hills zircon suite comes from mafic crust (Kemp et al., 2010).

The best fit of the Jack Hills detrital zircon data involves using the single-stage T_{DM} model age. This implies that the majority of the Hadean zircons likely evolved from a primitive source. However, as noted above, it is likely that some of the younger grains evolved from a more fractionated source and that the Jack Hills population sampled multiple sources.

The single-stage depleted mantle model age T_{DM} indicates the minimum time the source magma separated from the mantle. The prominent peak at ~3.4 Ga of crystallisation ages of Jack Hills zircons is ~500 Myrs younger than the ~3.9 Ga peak of T_{DM} model ages, which suggests there may be ~500 Myrs of crustal residence for reworking material in the Archean crust (Fig 7.2). The Hf isotope data reported here from Jack Hills detrital zircons support the notion of long-lived Hadean crust. This long-lived and dominantly mafic protocrust (Kamber et al., 2005; Kemp et al., 2010; Griffin et al., 2014) could only endure on the Earth's surface in the absence of subduction, thus militating against Hadean plate tectonics.

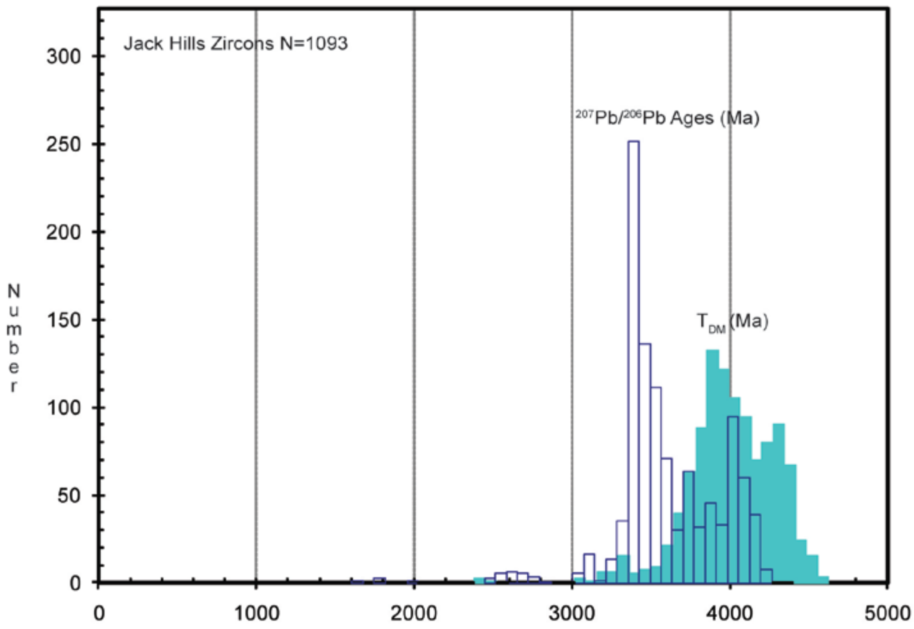

Figure 7.2 Crystallisation age versus T_{DM} model age (Ma). The open histogram represents the crystallisation age; the solid blue colour represents the T_{DM} model age.

7.3.3 Crustal Growth Events

In this study, the $\varepsilon_{Hf(t)}$ mostly range between the depleted mantle and the upper continental evolution line at ~3.2 Ga, 3.4-3.5 Ga, 3.8-3.9 Ga, and 4.0-4.2 Ga (Fig 5.13 A), suggesting that the parent rocks of these detrital zircons were partly derived from the depleted mantle and partly from the addition of the older crustal rocks. However, the mixing mechanism of the crust and mantle magmas in early earth history is uncertain (Geng et al., 2012). During the period from 4.5 Ga to ca 3.4 Ga, some workers consider that the Earth's crust was essentially stagnant and dominantly mafic in composition (Griffin et al., 2014), and the global dataset do not require real crustal reworking, in the sense of burial and remelting, to have occurred prior to ca 3.5 Ga (Griffin et al., 2014). Alternatively, other workers consider that plate tectonics operated in the Hadean (Harrison et al., 2005). The peaks of $\varepsilon_{Hf(t)}$ at ~3.2 Ga, 3.4-3.5 Ga, 3.8-3.9 Ga, and 4.0-4.2 Ga in this study are consistent with the 3.3-3.4 Ga, 3.8 Ga and 4.2 Ga peaks in the global dataset (Griffin et al., 2014). The preferred explanation to these peaks is mixture of juvenile material with extensive crustal reworking involved in burial and remelting.

Both the unradiogenic Hf isotope composition of zircons at Jack Hills, and those from other Archaean cratons (Kemp et al., 2010; Griffin et al., 2014) support the view (Kamber et al., 2005) that the long-lived Hadean crust probably was continually reworked by meteorite bombardment to produce a range of mafic to felsic melts, analogous to those exposed in the Sudbury intrusion (Kemp et al., 2010; Griffin et al., 2014).

A “Late Heavy Bombardment” around 4.0-3.8 Ga has been widely accepted as a mechanism for supplying the Earth with a range of elements (such as PGE) that are overabundant relative to the levels expected after the separation of Earth’s core (Maier et al., 2010). Bottke et al. (2012) argued that the heaviest bombardment would have happened in Hadean time; it would have begun to taper off by ca 4 Ga, but would have remained a prominent feature of the surface environment down to ca 3 Ga, and would have produced large volumes of shallow, relatively felsic melts, especially during the Hadean and early Archean periods. These shallow, relative felsic melts during the early Archean periods are consistent with the multiple components within the 3.3 Ga-3.7 Ga Meeberrie gneiss which is considered to be the major source to the Archaean Jack Hills detrital zircons. Marchi et al. (2014) provide a new bombardment model of the Hadean Earth that has been calibrated using existing lunar and terrestrial data (Walker et al., 2009), indicating that the surface of the Hadean Earth was widely reprocessed by impacts through mixing and burial by impact-generated melt. This model may explain the age distribution of the Hadean zircons and the absence of early terrestrial rocks.

Therefore, there is no evidence from the Hadean Hf isotope record of Jack Hills zircons indicating the presence of subduction or other manifestations of plate tectonics, the same conclusion has been reached from other recent studies (Valley et al., 2006; Kemp et al., 2010; Griffin et al., 2014).

7.4 Metamorphic Event

A recent monazite and xenotime study shows that a banded iron formation near Mount Hale must be older than ~3.0 Ga and that the W74 conglomerate was deposited prior to 2.6 Ga (Rasmussen et al., 2010). The W74 conglomerate also contains authigenic xenotime that gives an age of 800±25 Ma, which suggests that the Jack Hills belt was affected by a previously unrecognised Neoproterozoic event.

A total of 57 samples from samples JH10002 to JH10090 were examined for monazite, because these samples were thought to be devoid of zircon at the early stage of this study. Only seven samples contain monazite larger than 10 μm in diameter. A total of three monazite grains from two samples (coarse-grained sandstone (JH10015, 65 m) and fine-grained sandstone (JH10085, 459 m)), yielded data with <1% of common ^{206}Pb and >95% concordance. Monazite grains in sample JH10015 are detrital in origin, only monazite grains in fine-grained sandstone sample (JH10085, 459 m) yielded reliable metamorphic ages along the traverse.

A weighted mean ^{207}Pb/^{206}Pb age of 2652±9 Ma was obtained for metamorphic monazite in a fine-grained mica sandstone sample (JH10085, 459 m) in the centre of the traverse east of Eranondoo Hill. This metamorphic monazite age is consistent with the ~2.65 Ga metamorphic monazite ages identified from the quartz-pebble conglomerate east of Eranondoo Hill and garnet-bearing quartz-mica schist east of Yarrameedie Hill from the middle of the Jack Hills belt (Rasmussen et al., 2010). Together these results confirm that the central part of the Jack Hills belt experienced metamorphism at ~2.65 Ga, thus the depositional age for these sediments must be older than ~2.65 Ga.

7.5 Conclusions

A detailed ~1010 m traverse line has been mapped on the east flank of Eranondoo Hill across the Jack Hills metasedimentary belt, including shale, siltstone, schist, sandstone, arenite, conglomerate, quartzite, chert, and mafic and ultramafic rocks. Combined CL imaging, U-Pb geochronology (51 samples, N=2819) and Lu-Hf isotope (46 samples, N=1093) study has been carried out in situ on detrital zircons along the traverse. Samples (N=57) which were considered devoid of zircon based on conventional heavy liquid separation techniques were examined for monazite. Combined BSE imaging, SHRIMP U-Th-Pb geochronology has been carried out in seven samples in doubly polished sections on detrital and metamorphic monazite grains which were larger than 10 μm. The main conclusions of this study are summarized as follows:

1. This is the first detailed traverse that includes the fine-grained sediments in the northern part of the Jack Hills belt. The facies associations, in conjuction with literature data, indicate a fan delta depositional environment.

2. The U-Pb geochronology of Jack Hills detrital zircons yielded ages from 1618±22 Ma to 4381±5 Ma, indicating a prominent age peak at 3383 Ma, and substantial age peaks at 3471 Ma and 4025 Ma.

3. A total of sixteen (~0.5%) concordant Proterozoic zircon ages were identified from seven samples, ranging from 1618±22 Ma (212 m, JH039B-02) to 2473±20 Ma (514.5 m, JH096-04). These locations (27m, 61.5 m, 212 m, 408.5 m, 514.5 m and 929.5 m) along the traverse provide new information to the distribution of the Proterozoic rocks in the Jack Hills belt. The samples which yielded Proterozoic ages were widely distributed along the belt and there is no relationship between rock-type and young zircon ages.

4. The Archean-Proterozoic interleaved successions (Fig 7.1) together with previous results confirm the existence of both Archean and Proterozoic sedimentary associations. Both associations are very similar, thus the area experienced the same conditions in the Archean and Proterozoic. According to the youngest detrital zircon ages, the maximum depositional age for the succession dominated by coarse-grained sandstone and conglomerate at the southern part of the traverse (65-205 m, 229-348 m) are likely to be ~3.06 Ga and ~2.6 Ga, respectively.

5. In this study, negative $\varepsilon_{Hf(t)}$ values make up 92% of the Hadean population in this study, indicating the Hf isotope data do not favour the existence of a strongly depleted Hadean mantle contribution, or significant juvenile input into the parental magmas to the Jack Hills detrital zircons as early as ~4.4-4.5 Ga. However, it is likely that some of the <3.8 Ga grains evolved from a more fractionated source and that the Jack Hills population is a sample of multiple sources.

6. For zircons with crystallization ages around 2.65 Ga, the potential source can be the 2654±7 Ma monzogranites located immediately south of the Jack Hills belt. Meeberrie gneiss could possibly have been a major source of Jack Hills zircons with ages from 3.3 to 3.7 Ga. However, the source rock for the >3.8 Ga Jack Hills zircons (n=144) remains unknown.

7. A weighted mean 207Pb/206Pb age of 2652±9 Ma was obtained for metamorphic monazite in a fine-grained mica sandstone sample (JH10085, 459 m) in the centre of the traverse east of Eranondoo Hill. This result confirms that the central part of the Jack Hills belt experienced metamorphism at ~2.65 Ga, thus the depositional age for these sediments must be older than ~2.65 Ga.

References

Amelin, Y., Lee, D.-C., Halliday, A.N., & Pidgeon, R.T. (1999). Nature of the Earth's earliest crust from hafnium isotopes in single detrital zircons. *Nature, 399*(6733), 252-255.

Ballard, J.R., Palin, J.M., Williams, Campbell, I.H., & Faunes, A. (2001). Two ages of porphyry intrusion resolved for the super-giant Chuquicamata copper deposit of northern Chile by ELA-ICP-MS and SHRIMP. *Geology, 29*(5), 383-386.

Baxter, J.L., Wilde, S.A., Pidgeon, R.T., & Fletcher, I.R. (1984). The Jack Hills Metasedimentary Belt: an extension of the Early Archaean Terrane in the Yilgarn Block, Western Australia. *Australian Geol. Conv., Macquarie University, North Ryde*, 56-57.

Baxter, J.L., Wilde, S.A., Pidgeon, R.T., & Collins, L.B. (1986). A video presentation on the geological setting of ancient detrital zircons within the Jack Hills Metamorphic Belt, WA. In: Eighth Australian Geological Convention-Earth Resources in Time and Space. In *Geological Society of Australia Abstracts* (Vol. 15, p. 220).

Bell, E.A., Harrison, T.M., McCulloch, M.T., & Young, E.D. (2011). Early Archean crustal evolution of the Jack Hills Zircon source terrane inferred from Lu-Hf, $^{207}Pb/^{206}Pb$, and $\delta^{18}O$ systematics of Jack Hills zircons. *Geochimica et Cosmochimica Acta 75. 17*(2011): 4816-4829.

Bell, E. A., Harrison, T. M., Kohl, I. E., & Young, E. D. (2014). Eoarchean crustal evolution of the Jack Hills zircon source and loss of Hadean crust. *Geochimica et Cosmochimica Acta, 146*, 27-42.

Belousova, E.A., Kostitsyn, Y.A., Griffin, W.L., Begg, G.C., O'reilly, S.Y., & Pearson, N.J. (2010). The growth of the continental crust: constraints from zircon Hf-isotope data. *Lithos, 119*(3), 457-466.

Bennett, V.C., Brandon, A.D., & Nutman, A.P. (2007). Coupled $^{142}Nd/^{143}Nd$ isotopic evidence for Hadean mantle dynamics. *Science, 318*(5858), 1907-1910.

Blichert-Toft, J., & Albarède, F. (2008). Hafnium isotopes in Jack Hills zircons and the formation of the Hadean crust. *Earth and Planetary Science Letters, 265*(3), 686-702.

Bottke, W.F., Vokrouhlický, D., Minton, D., Nesvorný, D., Morbidelli, A., Brasser, R., Simonson, B., & Levison, H.F. (2012). An Archaean heavy bombardment from a destabilized extension of the asteroid belt. *Nature, 485*(7396), 78-81.

Bouvier, A., Vervoort, J.S., & Patchett, P.J. (2008). The Lu-Hf and Sm-Nd isotopic composition of CHUR: constraints from unequilibrated chondrites and implication for the bulk composition of terrestrial planets. *Earth and Planetary Science Letters, 273*(1), 48-57.

Bowring, S.A., & Williams, I.S. (1999). Priscoan (4.00-4.03 Ga) orthogneisses from northwestern Canada. *Contributions to Mineralogy and Petrology, 134*(1), 3-16.

Boyet, M., & Carlson, R.W. (2005). ^{142}Nd evidence for Early (>4.53 Ga) global differentiation of the silicate Earth. *Science, 309*(5734), 576-581.

Caro, G., Bourdon, B., & Birck, J.L. (2003). ^{146}Sm-^{142}Nd evidence from Isua metamorphosed sediments for early differentiation of the Earth's mantle. *Nature, 423*(6938), 428-432.

Cassidy, K.F., Champion, D.C., McNaughton, N.J., Fletcher, I.R., Whitaker, A.J., Bastrakova, I., & Budd, A.R. (2002). Characterisation and metallogenic significance of Archaean granitoids of the Yilgarn Craton, Western Australia. *Minerals and Energy Research Institute of Western Australia (MERIWA), Report*, (222), 514.

Cassidy, K.F., Champion, D.C., Krapez, B., Barley, M.E., Brown, S.J.A., Blewett, R.S., Groenewald, P.B., & Tyler, I.M. (2006). A revised geological framework for the Yilgarn Craton, Western Australia. *Geological Survey of Western Australia, Record*, 2006/8.

Cavosie, A.J., Wilde, S.A., Liu, D., Weiblen, P.W., & Valley, J.W. (2004). Internal zoning and U-Th-Pb chemistry of Jack Hills detrital zircons: a mineral record of early Archean to Mesoproterozoic (4348-1576 Ma) magmatism. *Precambrian Research, 135*(4), 251-279.

Cavosie, A.J., Valley, J.W., & Wilde, S.A. EIMF (2005). Magmatic $\delta^{18}O$ in 4400-3900 Ma detrital zircons: a record of the alteration and recycling of crust in the Early Archean. *Earth and Planetary Science Letters, 235*, 663-681.

Cavosie, A.J., Valley, J.W., & Wilde, S.A. (2006). Correlated microanalysis of zircon: Trace element, $\delta^{18}O$, and U-Th-Pb isotopic constraints on the igneous origin of complex >3900 Ma detrital grains. *Geochimica et Cosmochimica Acta, 70*(22), 5601-5616.

Cavosie, A.J., Valley, J.W., & Wilde, S.A. (2007). The oldest terrestrial mineral record: A review of 4400 to 4000 Ma detrital zircons from Jack Hills, Western Australia. In: Van Kranendonk, M.J., Smithies, R.H., & Bennett, V.C. (Eds.). *Earth's oldest rocks* (Vol. 15), 91-111, Elsevier.

Cawood, P.A., & Tyler, I.M. (2004). Assembling and reactivating the Proterozoic Capricorn Orogen: lithotectonic elements, orogenies, and significance. *Precambrian Research, 128*(3), 201-218.

Chu, N.C., Taylor, R.N., Chavagnac, V., Nesbitt, R.W., Boella, R.M., Milton, J.A., German, C.R., Bayon, G., & Burton, K. (2002). Hf isotope ratio analysis using multi-collector inductively coupled plasma mass spectrometry: an evaluation of isobaric interference corrections. *Journal of Analytical Atomic Spectrometry, 17*(12), 1567-1574.

Compston, W., & Pidgeon, R.T. (1986). Jack Hills, evidence of more very old detrital zircons in Western Australia. *Nature, 321*(6072), 766-769.

Condie, K.C., Beyer, E., Belousova, E.A., Griffin, W.L., & O'Reilly, S.Y. (2005). U-Pb isotopic ages and Hf isotopic composition of single zircons: the search for juvenile Precambrian continental crust. *Precambrian Research, 139*(1), 42-100.

Crowley, J.L., Myers, J.S., Sylvester, P.J., & Cox, R.A. (2005). Detrital Zircon from the Jack Hills and Mount Narryer, Western Australia: Evidence for Diverse >4.0 Ga Source Rocks. *The Journal of geology, 113*(3), 239-263.

De Bievre, P., & Taylor, P.D.P. (1993). Table of the isotopic compositions of the elements. *International Journal of Mass Spectrometry and Ion Processes, 123*(2), 149-166.

De Laeter, J.R., Fletcher, I.R., Tosman, K.J.R., Williams, I.R., Gee, R.D. & Libby, W.G. (1981a). Early Archaean gneisses from the Yilgarn Block, Western Australia. *Nature, 292*, 322-324.

De Laeter, J.R., Libby, W.G. & Trendall, A.F. (1981b). The older Precambrian geochronology of Western Australia. *Spec. Publ. Geol. Soc. Aust, 7*, 147-157.

De Laeter, J.R., Fletcher, I.R., Bickle, M.J., Myers, J.S., Libby, W.G., & Williams, I.R. (1985). Rb-Sr, Sm-Nd and Pb-Pb geochronology of ancient gneisses from Mt. Narryer, Western Australia. *Australian Journal of Earth Sciences, 32*(4), 349-358.

Dobrzhinetskaya, L., Wirth, R., & Green, H. (2014). Diamonds in Earth's oldest zircons from Jack Hills conglomerate, Australia, are contamination. *Earth and Planetary Science Letters, 387*(2014), 212-218.

Dunn, S.J., Nemchin, A.A., Cawood, P.A., & Pidgeon, R.T. (2005). Provenance record of the Jack Hills metasedimentary belt: Source of the Earth's oldest zircons. *Precambrian Research, 138*(3), 235-254.

Elhlou, S., Belousova, E., Griffin, W.L., Pearson, N.J., & O'Reilly, S.Y. (2006). Trace element and isotopic composition of GJ red zircon standard by laser ablation. *Geochimica et Cosmochimica Acta, 70*(18), A158.

Elias, M. (1982). Belele, WA. Western Australia Geological Survey. 1: 250 000 Geological Series Explanatory Notes, 1st ed., 22.

Elias, M. (1983). Explanatory notes of the Belele geological sheet, Geological Survey of Western Australia, 1-22.

Eriksson, K., & Wilde, S.A. (2010). Palaeoenvironmental analysis of Archaean siliciclastic sedimentary rocks in the west-central Jack Hills belt, Western Australia with new constraints on ages and correlations. *Journal of Geological Society of London, 167*(4), 827-840.

Faure, G., & Mensing, T.M. (2004). Isotopes: Principles and Applications. *Wiley, 897*.

Fisher, C. M., Vervoort, J. D., & Hanchar, J. M. (2014). Guidelines for reporting zircon Hf isotopic data by LA-MC-ICPMS and potential pitfalls in the interpretation of these data. *Chemical Geology, 363*, 125-133.

Fletcher, I.R., Wilde, S.A., Libby, W.G., & Rosman, K.J.R. (1983). Sm-Nd model ages across the margins of the Archaean Yilgarn Block, Western Australia, II; Southwest transect into the Proterozoic Albany-Fraser province. Journal of *Geological Society of Australia, 30*(3-4), 333-340.

Fletcher I.R., Rosman, K.J.R. & Libby, W.G. (1988). Sm-Nd, Pb-Pb and Rb-Sr geochronology of the Manfred Complex, Mount Narryer, Western Australia. Precambrian Research, 38(4), 343-354.

Fletcher, I.R., Rasmussen, B., & McNaughton, N.J. (2000). SHRIMP U-Pb geochronology of authigenic xenotime and its potential for dating sedimentary basins. *Australian Journal of Earth Sciences, 47*(5), 845-859.

Fletcher, I.R., McNaughton, N.J., Aleinikoff, J.A., Rasmussen, B., & Kamo, S.L. (2004). Improved calibration procedures and new standards for U-Pb and Th-Pb dating of Phanerozoic xenotime by ion microprobe. Chemical Geology, 209(3), 295-314.

Foster, G., Kinny, P., Derek, V., Christophe, P., & Nigel, H. (2000). The significance of monazite U-Th-Pb age data in metamorphic assemblages: a combined study of monazite and garnet chronometry. *Earth and Planetary Science Letters, 181*(3), 327-340.

Froude, D.O., Ireland, T.R., Kinny, P.D., Williams, I.S., Compston, W., Williams, I.R., & Myers, J.S. (1983). Ion microprobe identification of 4,100-4,200 Myr-old terrestrial zircons. *Nature, 304*(5927), 616-618.

Gee, R.D. (1975). Regional geology of the Archaean nuclei of the Western Australian Shield. In: Knight, C.L. (Ed). *Economic Geology of Australia and Papua New Guinea, 1,* 43-55.

Gee, R.D. (1979). Structure and tectonic style of the Western Australian Shield. *Tectonophysics, 58*(3), 327-369.

Gee, R.D., Baxter, J.L., Wilde, S.A. & Williams, I.R. (1981). Crustal development in the Archaean Yilgarn Block, Western Australia. *Spec. Publ. Geol. Soc. Aust., 7*, 43-56.

Geng, Y., Du, L., & Ren, L. (2012). Growth and reworking of the early Precambrian continental crust in the North China Craton: constraints from zircon Hf isotopes. *Gondwana Research, 21*(2), 517-529.

Grange, M.L., Wilde, S.A., Nemchin, A.A., & Pidgeon, R.T. (2010). Proterozoic events recorded in quartzite cobbles at Jack Hills, Western Australia: New constraints on sedimentation and source of > 4 Ga zircons. *Earth and Planetary Science Letters, 292*(1), 158-169.

Griffin, W.L., Pearson, N.J., Belousova, E.A., Jackson, S.R., van Achterbergh, E., O'Reilly, S.Y., & Shee, S.R. (2000). The Hf isotope composition of cratonic mantle: LAM-MC-ICPMS analysis of zircon megacrysts in kimberlites. *Geochimica et Cosmochimica Acta, 64*(1), 133-147.

Griffin, W. L., Belousoca, E. A., Shee, S. R., Pearson, N. J. & O'Reilly, S. Y. (2004). Archaean crustal evolution in the northern Yilgarn Craton: U-Pb and Hf-isotope evidence from detrital zircons. *Precambrian Research, 131*(3), 231-282.

Griffin, W.L, Belousova, E.A., O'Neill, C., O'Reilly, S.Y., Malkovets, V., Pearson, N.J., Spetsius, S., & Wilde, S.A. (2014). The world turns over: Hadean-Archean crust-mantle evolution. *Lithos, 189*, 2-15.

Guitreau, M., & Blichert-Toft, J. (2014). Implications of discordant U-Pb ages on Hf isotope studies of detrital zircons. *Chemical Geology, 385*, 17-25.

Harrison, T.M., Blichert-Toft, J., Muller, W., Albarede, F., Holden, P., & Mojzsis, S.J. (2005). Heterogeneous Hadean Hafnium: Evidence of Continental Crust at 4.4 to 4.5 Ga. *Science, 310*(5756), 1947-1950.

Harrison, T.M., Schmitt, A.K., McCulloch, M.T., & Lovera, O.M. (2008). Early (≥ 4.5 Ga) formation of terrestrial crust: Lu-Hf, $\delta^{18}O$, and Ti thermometry results for Hadean zircons. *Earth and Planetary Science Letters, 268*(3), 476-486.

Iizuka, T., & Hirata, T. (2005). Improvements of precision and accuracy in in situ Hf isotope microanalysis of zircon using the laser ablation-MC-ICPMS technique. *Chemical Geology, 220*(1), 121-137.

Iizuka, T., McCulloch, M. T., Komiya, T., Shibuya, T., Ohta, K., Ozawa, H., Sugimura, E., & Collerson, K. D. (2010). Monazite geochronology and geochemistry of meta-sediments in the Narryer Gneiss Complex, Western Australia: constraints on the tectonothermal history and provenance. *Contributions to Mineralogy and Petrology, 160*(6), 803-823.

Iizuka, T., Yamaguchi, T., Hibiya, Y. & Amelin, Y. (2015). Meteorite zircon constraints on the bulk Lu-Hf isotope composition and early differentiation of the Earth. *Proceedings of the National Academy of Sciences, 112*(17), 5331-5336.

Kamber, B.S., Whitehouse, M.J., Bolhar, R., & Moorbath, S. (2005). Volcanic resurfacing and the early terrestrial crust: zircon U-Pb and REE constraints from the Isua Greenstone Belt, southern West Greenland. *Earth and Planetary Science Letters, 240*(2), 276-290.

Kemp, A.I.S., Wilde, S.A., Hawkesworth, C.J., Coath, C.D., Nemchin, A., Pidgeon, R.T., Vervoort, J.D., & DuFrane, S.A. (2010). Hadean crustal evolution revisited: new constraints from Pb-Hf isotope systematic of the Jack Hills zircons. *Earth and Planetary Science Letters, 296*(1), 45-56.

Kemp, A. I., Hickman, A. H., Kirkland, C. L., & Vervoort, J. D. (2015). Hf isotopes in detrital and inherited zircons of the Pilbara Craton provide no evidence for Hadean continents. *Precambrian Research, 261*, 112-126.

Kinny, P.D. (1987). An ion microprobe study of uranium-lead and hafnium isotopes in natural zircon. In: Doctoral dissertation, Australian National University.

Kinny, P.D., Williams, I.S., Froude, D.O., Ireland, T.R., & Compston, W. (1988). Early Archaean zircon ages from orthogneisses and anorthosites at Mount Narryer, Western Australia. *Precambrian Research, 38*(4), 325-341.

Kinny, P.D., Wijbrans, J.R., Froude, D.O., Williams, I.S., & Compston, W. (1990). Age constraints on the geological evolution of the Narryer Gneiss Complex, Western Australia. *Journal of Australian Earth Science, 37*(1), 51-69.

Kinny, P.D., Nutman, A.P. (1996). Zirconology of the Meeberrie gneiss, Yilgarn Craton, Western Australia, an early Archaean migmatite. *Precambrian Research, 78*(1), 165-178.

Kinny, P.D., Maas, R. (2003), Lu-Hf and Sm-Nd Isotope Systems in Zircon. In: Hanchar, J.M., Hoskin, P.W.O. (Eds.), Zircon. *Review of Mineralogy and Geochemistry, 53*(1), 327-341.

Ludwig, K.R. (2001b). Squid 1.02: A User's Manual, Special Publication No.2. *Berkeley Geochronology Centre*, 19.

Ludwig, K.R. (2003a). User's manual for Squid 1.02, Special Publication. *Berkeley Geochronology Centre*, 74.

Ludwig, K.R. (2003b). User's manual for Isoplot 3.00, Special Publication 1a. *Berkeley Geochronology Centre*, 19.

Maier, W.D., Barnes, S.J., Campbell, I.H., Fiorentini, M.L., Peltonen, P., Barnes, S.J., & Smithies, R.H. (2010). Progressive mixing of meteoritic veneer into the early Earth's deep mantle. *Nature, 460*(7255), 620-623.

Marchi, S., Bottke, W.F., Elkins-Tanton, L.T., Bierhaus, M., Wuennemann, K., Morbidelli, A., & Kring, D.A. (2014). Widespread mixing and burial of Earth's Hadean crust by asteroid impacts. *Nature, 511*(7511), 578-582.

Martin, D.McB., Thorne, A.M. (2004). Tectonic setting and basin evolution of the Bangemall Supergroup in the northwestern Capricorn Orogen. *Precambrian Reaserch, 128*(3), 385-409.

Mass, T., Kinny, P.D., Williams, I.S., Froude, D.O., Compston, W. (1992). The Earth's oldest known crust: A geochronological and geochemical study of 3900-4200 Ma old detrital zircons from Mt. Narryer and Jack Hills, Western Australia. *Geochimica et Cosmochimica Acta, 56, 1282-1300.*

McPherson, J.G., Shanmugam, G. & Moiola, R.J. (1987). Fan-deltas and braid deltas: varieties of coarse-grained deltas. *Geological Society of America Bulletin, 99*, 331-240.

Menneken, M., Nemchin, A.A., Geisler, T., Pidgeon, R.T., & Wilde, S.A. (2007). Hadean diamonds in zircon from Jack Hills, Western Australia. *Nature, 448*(7156), 917-920.

Mojzsis, S.J., Harrison, T.M., & Pidgeon, R.T. (2001). Oxygen-isotope evidence from ancient zircons for liquid water at the Earth's surface 4,300 Myr ago. *Nature, 409*(6817), 178-181.

Myers, J.S., Williams, I.R. (1985). Early Precambrian crustal evolution at Mount Narryer, Western Australia. *Precambrian Research, 27*(1), 153-163.

Myers, J.S. (1988a). Early Archaean Gneiss Complex, Yilgarn Craton, Western Australia. *Precambrian Research, 38*(4), 297-307.

Myers, J.S. (1990a). Western Gneiss Terrane. Geology and Mineral Resources of Western Australia: Geological Survey of Western Australia, Memoirs, 3, 13-31.

Myers, J.S. (1990b). Excursion 1: Narryer Gneiss Complex. In: Ho, S.E., Glover, J.E., Myers, J.S., and Muhling, J.R. (Eds.) *Third International Archaean Symposium, Perth, Western Australia, 1990, excursion guidebook* (Vol. 21, pp. 61-95).

Myers, J.S. (1990c). Precambrian tectonic evolution of part of Gondwana, southwestern Australia. *Geology, 18*(6), 537-540.

Myers, J.S. (1992) *Tectonic evolution of the Yilgarn Craton, Western Australia*. In: Glover, J.E., and Ho, S.E. (Eds.) The Archaean: Terrains, processes and metallogeny. Geology Department (Key Centre) and University Extension, University of Western Australia Publication (vol. 22, pp. 265-273).

Myers, J.S. (1993). Precambrian Tectonic History of the West Australia Craton and Adjacent Orogens. *Annual Review of Earth and Planetary Sciences, 21*, 453-485.

Myers, J.S. (1995). The generation and assembly of an Archaean supercontinent: evidence from the Yilgarn craton, Western Australia. *Geological Society of London, Special Publications, 95*(1), 143-154.

Myers, J.S., & Swager, C. (1997). The Yilgarn Craton, Australia. *Oxford Monographs on geology and geophysics, 35*, 640-656.

Myers, J.S. (1997). Preface: Archaean geology of the Eastern Goldfields of Western Australia-regional overview. *Precambrian Research, 83*(1), 1-10.

Nasdala L., Hofmeister W., Norberg N., Mattinson J.M., Corfu F., Dörr W., Kamo S.L., Kennedy A.K., Kronz A., Reiners P.W., Frei D., Kosler J., Wan Y., Götze J., Häger T., Kröner A., & Valley J.W. (2008). Zircon M257- a homogeneous natural reference material for the ion microprobe U-Pb analysis of zircon. *Geostandards and Geoanalytical Research, 32*(3), 247-265.

Nelson, D.R. (2000). *Compilation of geochronology data*. In: Geological Survey of Western Australia Record, No. 2000/2.

Nemchin, A.A., Pidgeon, R.T., & Wilde, S.A. (1994). Timing of Late Archaean granulite facies metamorphism in the southwestern Yilgarn Craton of Western Australia: evidence from U-Pb ages of zircons fro mafic granulites. *Precambrian Research, 68*(3), 307-321.

Nemchin, A.A., & Pidgeon, R.T. (1998). Precise conventional and SHRIMP baddeleyite U-Pb age for the Binneringie Dyke, near Narrogin, Western Australia. *Australian Journal of Earth Sciences, 45*(5), 673-675.

Nemchin, A.A., Pidgeon, R.T., & Whitehouse, M.J. (2006). Re-evaluation of the origin and evolution of > 4.2 Ga zircons from the Jack Hills metasedimentary rocks. *Earth and Planetary Science Letters, 244*(1), 218-233.

Nemchin, A.A., Whitehouse, M.J., Menneken, M., Geisler, T., Pidgeon, R.T., & Wilde, S.A. (2008). A light carbon reservoir recorded in zircon-hosted diamond from the Jack Hills. Nature, 454(7200), 92-95.

Nowell, G.M., Kempton, P.D., Noble, S.R., Fitton, J.G., Saunders, A.D., Mahoney, J.J., & Taylor, R.N. (1998). High precision Hf isotope measurements of MORB and OIB by thermal ionisation mass spectrometry: insights into the depleted mantle. *Chemical Geology, 149*(3), 211-233.

Nutman, A.P., Kinny, P.D., Compston, W., & Williams, I.S. (1991). SHRIMP U-Pb zircon geochronology of the Narryer Gneiss Complex, Western Australia. *Precambrian Research, 52*(3), 275-300.

Nutman, A.P., Bennett, V.C., Kinny, P.D., & Price, R. (1993). Large-scale crustal structure of the northwestern Yilgarn Craton, Western Australia: evidence from Nd isotopic data and zircon geochronology. *Tectonics 12*(4), 971-981.

Occhipinti, S.A., Sheppard, S., Passchier, C., Tyler, I.M., & Nelson, D.R. (2004). Paleoproterozoic crustal accretion and collision in the southern Capricorn Orogen: the Glenburgh Orogeny. *Precambrian Research, 128*(3), 237-255.

Occhipinti, S.A., & Reddy, S.M. (2004). Deformation in a complex crustal-scale shear zone: Errabiddy Shear Zone, Western Australia. *Geological Society of London, Special Publications, 224*(1), 229-248.

Pawley, M.J., Wingate, M.T.D., Kirkland, C.L., Wyche, S., Hall, C.E., Romano, S.S., & Doublier, M.P. (2012). Adding pieces to the puzzle: episodic crustal growth and a new terrane in the northeast Yilgarn Craton, Western Australia. *Australian Journal of Earth Sciences, 59*(5), 603-623.

Peck, W.H., Valley, J.W., Wilde, S.A., & Graham, C.M. (2001). Oxygen isotope ratios and rare earth elements in 3.3 to 4.4 Ga zircons: ion microprobe evidence for high $\delta^{18}O$ continental crust and oceans in the Early Archean. *Geochimica et Cosmochimica Acta, 65*(22), 4215-4229.

Pidgeon R.T., Furfaro D., Kennedy A.K., Nemchin A.A. & Van Bronswijk W. (1994). Calibration of zircon standards for the Curtin SHRIMP II. In *Eighth International Conference on Geochronology Cosmochronology and Isotope Geology: U.S. Geological Survey Circular* (Vol.1107, p. 251).

Pidgeon, R.T., & Wilde, S.A. (1990). The distribution of 3.0 Ga and 2.7 Ga volcanic episodes in the Yilgarn Craton of Western Australia. *Precambrian Research, 48*(3), 309-325.

Pidgeon, R.T., & Wilde, S.A. (1998). The interpretation of complex zircon U-Pb systems in Archaean granitoids and gneisses from the Jack Hills, Narryer Gneiss Terrane, Western Australia. *Precambrian Research, 91*(3), 309-332.

Rasmussen, B., Fletcher, I.R., & McNaughton, N.J. (2001). Dating low-grade metamorphic events by SHRIMP U-Pb analysis of monazite in shales. *Geology, 29*(10), 963-966.

Rasmussen, B., Fletcher, I.R., & Muhling, J.R. (2008). Pb/Pb geochronology, petrography and chemistry of Zr-rich accessory minerals (zirconolite, tranquillityite and baddeleyite) in mare basalt 10047. *Geochimica et Cosmochimica Acta, 72*(23), 5799-5818.

Rasmussen, B., Fletcher, I.R., Muhling, J.R., & Wilde, S.A. 2010. In situ U-Th-Pb geochronology of monazite and xenotime from the Jack Hills belt: Implications for the age of deposition and metamorphism of Hadean zircons. *Precambrian Research, 180*(1), 26-46.

Rubatto, D. (2002). Zircon trace element geochemistry: partitioning with garnet and the link between U-Pb ages and metamorphism. *Chemical Geology, 184*(1), 123-138.

Rudnick, R.L., & Gao, S. (2003). Composition of the continental crust. In: Rudnick, R.L. (Ed.), The Crust. *Treatise on Geochemistry, 3*, 1-64.

Sheppard, S., Occhipinti, S.A., & Tylor, I.M. (2003). The relationship between tectonism and composition of granitoid magmas, Yarlarweelor Gneiss Complex, Western Australia. *Lithos, 66*(1), 133-154.

Sheppard, S., Occhipinti, S.A., & Nelson, D.R. (2005). Intracontinental reworking in the Capricorn Orogen, Western Australia: the 1680-1620 Mangaroon Orogeny. *Australian Journal of Earth Science, 52*(3), 443-460.

Scherer, E., Münker, C. & Mezger, K. (2001). Calibration of the lutetium-hafnium clock. *Science, 293*(5530), 683-687.

Söderlund, U., Patchett, P.J., Vervoort, J.D., & Isachsen, C.E. (2004). The ^{176}Lu decay constant determined by Lu-Hf and U-Pb isotope systematic of Precambrian mafic intrusions. *Earth and Planetary Science Letters, 219*(3), 311-324.

Spaggiari, C.V. (2006). *Interpreted bedrock geology of the northern Murchison Domain, Youanmi Terrane, Yilgarn Craton*. Western Australia Geological Survey, Record 2006/10.

Spaggiari, C.V. (2007a). The Jack Hills greenstone belt, Western Australia: Part 1: Structural and tectonic evolution over >1.5 Ga. *Precambrian Research, 155*(3), 204-228.

Spaggiari, C.V., Pidgeon, R.T., & Wilde, S.A. (2007b). The Jack Hills greenstone belt, Western Australia: Part 2: Lithological relationships and implications for the deposition of ≥ 4.0 Ga detrital zircons. *Precambrian Research, 155*(3), 261-286.

Spaggiari, C.V., Wartho, J.-A., & Wilde, S.A. (2008). Proterozoic deformation in the northwest of the Archean Yilgarn Craton, Western Australia. *Precambrian Research, 162*(3), 354-384.

Stern, R.A. (2001). *A new isotopic and trace-element standard for the ion microprobe: preliminary thermal ionization mass spectrometry (TIMS) U-Pb and electron-microprobe data*. Ressources naturelles Canada.

Stern, R.A., & Sanborn, N. (1998). Monazite U-Pb and Th-Pb geochronology by high-resolution secondary ion mass spectrometry. *Radiogenic age and isotopic studies: Report, 11*, 1-18.

Swager, C.P., Witt, W.K., Griffin, T.J., Ahmat, A.L., Hunter, W.M., McGoldrick, P.J., & Wyche, S. (1992). Late Archaean granite-greenstones of the Kalgoorlie Terrane, Yilgarn Craton, Western Australia. *The Archaean: Terrains, Processes and Metallogeny, 22*, 107-122.

Swager, C.P. (1995). Geology of the late Archaean Kurnalpi-Edjudina greenstone terranes, southeastern Yilgarn Craton. *Geological Survey of Western Australia, Report, 47*, 31.

Swager, C.P. (1997). Tectono-stratigraphy of late Archaean greenstone terranes in the southern Eastern Goldfields, Western Australia. *Precambrian Research, 83*(1), 11-42.

Tarduno, J.A., & Cottrell, R.D. (2013). Signals from the ancient geodynamo: A paleomagnetic field test on the Jack Hills metaconglomerate. *Earth and Planetary Science Letters, 367*, 123-132.

Trendall, A.F. (1990). Yilgarn Craton. *Geological Survey of Western Australia Memoir, 3*, 8-11.

Tyler, I.M., & Thorne, A.M. (1990). The northern margin of the Capricorn Orogen, Western Australia-an example of an early Proterozoic collision zone. *Journal of Structure Geology, 12*(5), 685-701.

Ushikubo, T., Kita, N.T., Cavosie, A.J., Wilde, S.A., Rudnick, R.L., & Valley, J.W. (2008). Lithium in Jack Hills zircons: Evidence for recycling of Earth's earliest crust. *Earth and Planetary Science Letters, 272*(3), 666-676.

Valley, J.W., Peck, W.H., King, E.M., & Wilde, S.A. (2002). A cool early Earth. *Geology, 30*(4), 351-354.

Valley, J.W. (2005). A cool early Earth?. Scientific American, 293(4), 58-65.

Walker, R.J. (2009). High siderophile elements in the Earth, Moon and Mars: update and implications for planetary accretion and differentiation. *Chemie der Erde-Geochemistry, 69*(2), 101-125.

Wilde, S.A. (2010). Proterozoic volcanism in the Jack Hills Belt, Western Australia: some implications and consequences for the World's oldest zircon population. *Precambrian Research, 183*(1), 9-24.

Wilde, S.A., Middleton, M.F., & Evans, B.J. (1996). Terrane accretion in the southwestern Yilgarn Craton: evidence from a deep seismic crustal profile. *Precambrian Research, 78*(1), 179-196.

Wilde, S. A., & Pidgeon, R. T. (1990). Geology of the Jack Hills Metasedimentary Rocks. In *Proceedings of the Third International Archean Symposium on Excursion Guidebook*. University of Western Australia, Perth, WA (pp. 82-89).

Wilde, S.A., Valley, J.W., Peck, W.H., & Graham, C.M. (2001). Evidence from detrital zircons for the existence of continental crust and oceans on the Earth 4.4 Gyr ago. *Nature, 409*(6817), 175-178.

Wilde, S.A., & Spaggiari, C.V. (2007). 6 The Narryer Terrane, Western Australia: A review. In: Earth's Oldest Rocks. Elsevier. *Developments in Precambrian Geology, 15*, 275-304.

Williams, C.T. (1996). Analysis of rare earth minerals. *Rare earth minerals: chemistry, origin and ore deposits, 7*, 327-348.

Williams, I.R. (1974). Structural subdivision of the Eastern Goldfields Province, Yilgarn Block. *Geological Survey of Western Australia Annual Report*, 53-59.

Williams, I.R., & Myers, J.S. (1987). Archaean geology of the mount Narryer region Western Australia (vol. 22). State Printing Division.

Williams, I.S. (1998). U-Th-Pb geochronology by ion microprobe. In: McKibben, M.A., Shanks, W.C., Riley, W.I. (Eds.), Applications of microanalytical techniques to understanding mineralising processes. *Review of Economic Geology, 7*(1), 1-35.

Williams, S.J., Williams, I.R., Hocking, R.M., & Williams, S.J. (1983). Byro, WA. *Western Australia Geological Survey, 1:250 000 Geological Series Explanatory Notes, 1(250*, 000).

Williams, S.J., Williams, I.R., & Hocking, R.M. (1983). Glenburgh, WA: *Western Australia Geological Survey, 1 : 250 000 Geological Explanatory Notes,1*(250, 000).

Wingate, M.T.D., Morris, P.A., Pirajno, F., & Pidgeon, R.T. (2005). Two large igneous provinces in Late Mesoproterozoic Australia. In *Supercontinents and Earth Evolution Symposium* (Vol. 81, p. 151). Geological Society of Australia.

Witt, W.K., & Vanderhor, F. (1998). Diversity within a unified model for Archaean gold mineralization in the Yilgarn Craton of Western Australia: an overview of the late-orogenic, structurally-controlled gold deposits. *Ore Geology Reviews, 13*(1), 29-64.

Woodhead, J.D., Hergt, J.M (2005). A preliminary appraisal of seven natural zircon reference materials for in situ Hf isotope determination. *Geostandards and Geoanalytical Research, 29*(2), 183-195.

Wu, F.Y., Li, X.H., Zheng Y.F., & Gao, S. (2007). Lu-Hf isotopic systematic and their applications in petrology. Acta Petrologica Sinica, 23(2), 185-220.

Wu, F.Y., Yang, Y.H., Xie, L.W., Yang, J.H., & Xu, P. (2006). Hf isotopic compositions of the standard zircons and baddeleyites used in U-Pb geochronology. *Chemical Geology, 234*(1), 105-126.

Yuan, H.L., Gao, S., Liu, X.M., Li, H.M., Günther, D., & Wu, F.Y. (2004). Accurate U-Pb age and trace element determinations of zircon by laser ablation-inductively coupled plasma-mass spectrometry. *Geostandards and Geoanalytical Research, 28*(3), 353-370.

Yuan, H.L., Gao, S., Dai, M.N., Zong, C.L., Günther, D., Fontaine, G.H., Liu, X.M., & Diwu, C.R. (2008). Simultaneous determinations of U-Pb age, Hf isotopes and trace element compositions of zircon by excimer laser-ablation quadrupole and multiple-collector ICP-MS. *Chemical Geology, 247*(1), 100-118.

Appendices

Appendix A Sample list for all kinds of analyses.

Sample Number	Rock Type	Location (m)	Latitude	Longitude	Zircon Analyses	Lu-Hf Analyses	Monazite Geochronology	Magnetic Susceptibility		Thin Section
								Field	Lab	
JH10001	banded iron formation	0	26° 10' 00.2" S	116° 59'39.3" E				12.2	12.2	
JH10002	siltstone	2	26° 10' 00.2" S	116° 59'39.3" E			Y	0.10	0.04	Y
JH10003	siltstone	5	26° 09' 53.9" S	116° 59' 39.4" E			Y	0.1	0.06	
JH10004	chloritic schist	10	26° 09' 59.7" S	116° 59' 39.2" E			Y	0.17	0.16	
JH10005	matrix-supported conglomerate	17	26° 09' 59.6" S	116° 59' 39.1" E			Y	0.06	0.05	Y
JH10006	chloritic schist	22	26° 09' 59.4" S	116° 59' 38.9" E			Y	0.1	0.14	
JH10007	chloritic Schist	27	26° 09' 59.4" S	116° 59' 38.7" E			N	0.25	0.15	Y
JH10008	schist	32	26° 09' 59.3" S	116° 59' 38.6" E			N	0.12	0.1	
JH10009	silicious schist	37	26° 09' 59.0" S	116° 59' 38.4" E			N	0.18	0.18	
JH10010	silicious schist	42	26° 09' 59.7" S	116° 59' 38.3" E			N	0.06	0.05	
JH10011	chloritic schist	49	26° 09' 58.3" S	116° 59' 38.4" E			N	0.18	0.16	
JH10012	silicious Schist	52	26° 09' 58.5" S	116° 59' 38.1" E			Y	0.04	0.05	Y
JH10013	sandstone	57	26° 09' 58.7" S	116° 59' 37.8" E	LA-ICP-MS	Y			0.05	
JH10014	chloritic schist	62	26° 09' 58.5" S	116° 59' 37.7" E	SHRIMP	Y	Y	0.19	0.11	
JH10015	sandstone	65	26° 09' 58.3" S	116° 59' 37.4" E	SHRIMP	Y	Y	0.07	0.06	
JH10016	sandstone	70	26° 09' 58.2" S	116° 59' 87.2" E	SHRIMP	Y	Y	0.02	0.01	
JH10017	sandstone	75	26° 09' 58.1" S	116° 59' 37.1" E	SHRIMP	Y	Y	0.02	0	
JH10018	sandstone	79	26° 09' 57.9" S	116° 59' 36.8" E	LA-ICP-MS	Y		0	0.01	
JH10019	sandstone	84	26° 09' 57.9" S	116° 59' 36.8" E	LA-ICP-MS	Y		0	0	
JH10020	sandstone	89	26° 09' 59.6" S	116° 59' 36.5" E	LA-ICP-MS	Y		0	0.01	
JH10021A	conglomerate	94	26° 09' 57.1" S	116° 59' 35.2" E	SHRIMP			0	0.02	Y
JH10021B	conglomerate	94	26° 09' 57.1" S	116° 59' 35.2" E	LA-ICP-MS	Y		0.1	0.06	
JH10022	sandstone	100	26° 09' 57.3" S	116° 59' 36.1" E	LA-ICP-MS	Y		0	0.01	

Appendix A Continued.

Sample Number	Rock Type	Location (m)	Latitude	Longitude	Zircon Analyses	Lu-Hf Analyses	Monazite Geochronology	Magnetic Susceptibility		Thin Section
								Field	Lab	
JH10023	sandstone	105	26° 09' 57.0" S	116° 59' 36.0" E	LA-ICP-MS	Y		0.01	0.01	
JH10024	quartz arenite	111	26° 09' 56.9" S	116° 59' 36.0" E			N		0.01	Y
JH10025	sandstone	116	26° 09' 56.6" S	116° 59' 35.9" E	LA-ICP-MS	Y		0.49	0.34	
JH10026	sandstone	121	26° 09' 56.5" S	116° 59' 35.9" E				0	0.02	
JH10027	quartz arenite	126	26° 09' 56.3" S	116° 59' 36.0" E	LA-ICP-MS	Y		0.02	0	Y
JH10028	sandstone	132	26° 09' 55.9" S	116° 59' 35.7" E					0	
JH10029	sandstone	144	26° 09' 55.6" S	116° 59' 35.7" E	SHRIMP			0	0	
JH10030	sandstone	149	26° 09' 55.4 " S	116° 59' 35.7" E	SHRIMP	Y	Y	0	0	
JH10031	sandstone	154	26° 09' 55.4" S	116° 59' 35.6" E	LA-ICP-MS	Y		0.01	0.01	
JH10032	sandstone	159	26° 09' 35.0" S	116° 59' 35.6" E					0	
JH10033	sandstone	164	26° 09' 55.9" S	116° 59' 35.4" E	LA-ICP-MS	Y		0.03	0.02	
JH10034	quartzite	170	26° 09' 54.8" S	116° 59' 35.1" E	LA-ICP-MS	Y		0.03	0.07	
JH10035	conglomerate	176	26° 09' 54.4" S	116° 59' 35.4" E	SHRIMP			0.11	0.27	
JH10036	conglomerate	183	26° 09' 54.0" S	116° 59' 35.2" E	SHRIMP	Y	Y		0	
JH10037	conglomerate	193	26° 09' 53.9" S	116° 59' 34.8" E	LA-ICP-MS	Y		0.01	0	
JH10038	conglomerate	198	26° 09' 53.7" S	116° 59' 35.0" E	LA-ICP-MS	Y		0	0	
JH10039A	sandstone	212	26° 09' 53.4" S	116° 59' 34.3" E	SHRIMP	Y	Y	0.01	0.02	
JH10039B	chloritic schist	212	26° 09' 53.4" S	116° 59' 34.3" E	SHRIMP	Y	Y	0.12	0.15	
JH10040	chloritic schist	217	26° 09' 53.2" S	116° 59' 34.4" E			Y	0.15	0.12	
JH10041	cloritic schist	222	26° 09' 53.0" S	116° 59' 34.5" E			N	0.39	0.12	
JH10042	quartzite	229	26° 09' 52.7" S	116° 59' 34.2" E	LA-ICP-MS	Y		0.09	0.09	
JH10043	chloritic schist	237	26° 09' 52.5" S	116° 59' 34.2" E	SHRIMP		Y	0.23	0.23	
JH10044	purple shale	243	26° 09' 52.3" S	116° 59' 34.0" E			Y	0.11	0.15	

Appendix A Continued.

Sample Number	Rock Type	Location (m)	Latitude	Longitude	Zircon Analyses	Lu-Hf Analyses	Monazite Geochronology	Magnetic Susceptibility		Thin Section
								Field	Lab	
JH10045	conglomerate	248	26° 09' 52.1" S	116° 59' 33.9" E	LA-ICP-MS	Y		0.02	0.01	
JH10046	conglomerate	253	26° 09' 51.8" S	116° 59' 33.8" E	LA-ICP-MS	Y		0.03	0.01	
JH10047	conglomerate	258	26° 09' 51.6" S	116° 59' 33.9" E	LA-ICP-MS	Y		0	0.01	
JH10048	conglomerate	263	26° 09' 51.5" S	116° 59' 33.7" E	LA-ICP-MS	Y		0	0.01	
JH10049	conglomerate	268	26° 09' 51.2" S	116° 59' 33.5" E	LA-ICP-MS	Y		0	0.01	Y
JH10050	sandstone	273	26° 09' 51.2" S	116° 59' 33.6" E	SHRIMP	Y	Y		0	
JH10051	conglomerate	278	26° 09' 51.0" S	116° 59' 33.5" E	LA-ICP-MS	Y		0.01	0	
JH10052	conglomerate	283	26° 09' 51.0" S	116° 59' 33.3" E	SHRIMP	Y	Y	0.02	0.01	
JH10053	quartzite	288	26° 09' 50.6" S	116° 59' 33.4" E	LA-ICP-MS	Y		0	0.01	
JH10054	purple shale	293	26° 09' 50.6" S	116° 59' 33.3" E			Y	0.16	0.03	
JH10055	sandstone	294	26° 09' 50.4" S	116° 59' 33.4" E	SHRIMP	Y	Y	0.05	0.02	
JH10056	sandstone	299	26° 09' 50.2" S	116° 59' 33.3" E			Y	0.01	0.02	
JH10057	quartzite	304	26° 09' 50.0" S	116° 59' 33.3" E			Y	0.03	0.01	
JH10058	sandstone	309	26° 09' 49.9" S	116° 59' 33.2" E	LA-ICP-MS	Y		0.04	0.06	
JH10059	conglomerate	314	26° 09' 49.5" S	116° 59' 33.1" E	LA-ICP-MS	Y		0.05	0.02	
JH10060	clorite schist	318	26° 09' 49.6" S	116° 59' 32.9" E			Y	0.18	0.17	
JH10061	sandstone	325	26° 09' 49.3" S	116° 59' 32.6" E			Y	0.02	0.02	
JH10062	sandstone	331	26° 09' 48.7" S	116° 59' 32.1" E	LA-ICP-MS	Y		0.06	0.04	Y
JH10063	quartzite	348	26° 09' 48.5" S	116° 59' 32.0" E			N	0.03	0.03	
JH10064	quartzite	355	26° 09' 48.2" S	116° 59' 31.9" E			Y		0.02	
JH10065	sandstone	361	26° 09' 47.9" S	116° 59' 32.2" E				0.03	0.08	
JH10066	cloritic schist	366	26° 09' 47.8" S	116° 59' 31.9" E			Y	0.09	0.13	
JH10067	schist	371	26° 09' 47.5" S	116° 59' 31.9" E			Y	0.05	0.05	

Appendix A Continued.

Sample Number	Rock Type	Location (m)	Latitude	Longitude	Zircon Analyses	Lu-Hf Analyses	Monazite Geochronology	Magnetic Susceptibility		Thin Section
								Field	Lab	
JH10068	schist	376	26° 09' 47.4" S	116° 59' 32.0" E			Y	0.09	0.07	
JH10069	schist	381	26° 09' 47.1" S	116° 59' 31.7" E			Y	0.17	0.09	
JH10070	crenulated schist	387	26° 09' 46.9" S	116° 59' 31.6" E			Y	0.08	0.07	
JH10071	sandstone	393	26° 09' 46.7" S	116° 59' 31.6" E	SHRIMP	Y	Y	0.01	0.01	
JH10072	quartzite	397	26° 09' 46.5" S	116° 59' 31.5" E			N	0.02	0.01	
JH10073	matrix-supported conglomerate	402	26° 09' 46.4" S	116° 59' 31.4" E			N	0	0.02	
JH10074	matrix-supported conglomerate	407	26° 09' 46.3" S	116° 59' 31.5" E	LA-ICP-MS	Y		0	0.01	
JH10075	quartzite	408	26° 09' 46.3" S	116° 59' 31.5" E	LA-ICP-MS	Y			0.01	Y
JH10076	sandstone	413	26° 09' 46.1" S	116° 59' 33.3" E	SHRIMP	Y	N		0.01	
JH10077	sandstone	418	26° 09' 45.8" S	116° 59' 31.4" E			Y	0.06	0.09	
JH10078	sandstone	423	26° 09' 45.8" S	116° 59' 31.2" E			Y	0.02	0	
JH10079	sandstone	428	26° 09' 45.6" S	116° 59' 31.2" E			N	0.07	0.1	
JH10080	schist	433	26° 09' 45.4" S	116° 59' 31.1" E			Y	0.15	0.14	
JH10081	matrix-supported conglomerate	438	26° 09' 45.1" S	116° 59' 31.1" E			N	0.01	0.03	Y
JH10082	matrix-supported conglomerate	443	26° 09' 45.0" S	116° 59' 30.9" E			Y	0.05	0.03	
JH10083	matrix-supported conglomerate	448	26° 09' 44.9" S	116° 59' 30.7" E			Y	0.07	0.07	
JH10084	matrix-supported conglomerate	453	26° 09' 44.7" S	116° 59' 30.7" E			Y	0	0.02	
JH10085	sandstone	459	26° 09' 44.3" S	116° 59' 30.8" E			Y	0.03	0.05	
JH10086	sandstone	464	26° 09' 44.0" S	116° 59' 30.7" E			Y	0.03	0.02	
JH10087	sandstone	471	26° 09' 43.9" S	116° 59' 30.8" E			Y	0.04	0.03	
JH10088	sandstone	476	26° 09' 43.8" S	116° 59' 30.9" E			N	0.02	0.05	
JH10089	sandstone	480.5	26° 09' 43.5" S	116° 59' 30.8" E			Y	0.02	0.02	
JH10090	sandstone	487.5	26° 09' 43.4" S	116° 59' 30.5" E			Y	0.02	0.04	

Appendix A Continued.

Sample Number	Rock Type	Location (m)	Latitude	Longitude	Zircon Analyses	Lu-Hf Analyses	Monazite Geochronology	Magnetic Susceptibility		Thin Section
								Field	Lab	
JH12091	sandstone	492.5	26° 09' 41.1" S	116° 59' 30.3" E				0.04	0.03	
JH12092	schist	497.5	26° 09' 42.9" S	116° 59' 30.2" E				0.11	0.11	
JH12093	sandstone	502.5	26° 09' 42.7" S	116° 59' 30.1" E				0.02	0.01	
JH12094	schist	507.5	26° 09' 42.7" S	116° 59' 30.1" E				0.03	0	
JH12095	sandstone	509.5	26° 09' 42.6" S	116° 59' 30.1" E				0.03	0.05	
JH12096	sandstone	514.5	26° 09' 42.4" S	116° 59' 30.1" E	SHRIMP	Y		0.03	0.06	Y
JH12097	schist	519.5	26° 09' 42.2" S	116° 59' 30.0" E				0.08	0.1	Y
JH12098	schist	524.5	26° 09' 42.1" S	116° 59' 29.9" E				0.1	0.12	
JH12099	schist	524.5	26° 09' 42.1" S	116° 59' 29.9" E				0.36	0.41	Y
JH12100	sandstone	529.5	26° 09' 41.9" S	116° 59' 29.8" E				0.07	0.07	
JH12101	sandstone	534.5	26° 09' 41.7" S	116° 59' 29.8" E				0.13	0.06	
JH12102	sandstone	539.5	26° 09' 41.6" S	116° 59' 29.7" E				0.1	0.18	
JH12103	sandstone	544.5	26° 09' 41.3" S	116° 59' 29.6" E				0.18	0.17	
JH12104	andalusite schist	550.5	26° 09' 41.2" S	116° 59' 29.6" E				0.16	0.06	Y
JH12105	sandstone	555.5	26° 09' 41.0" S	116° 59' 29.6" E				0.11	0.13	
JH12106	sandstone	559.5	26° 09' 40.8" S	116° 59' 29.5" E				0.16	0.15	
JH12107	sandstone	564.5	26° 09' 40.6" S	116° 59' 29.0" E				0.15	0.1	
JH12108	sandstone	570.5	26° 09' 40.0" S	116° 59' 29.2" E				0.19	0.2	
JH12109	chloritic schist	585.5	26° 09' 39.8" S	116° 59' 29.3" E				0.16	0.12	
JH12110	chloritic schist	590.5	26° 09' 39.6" S	116° 59' 29.3" E				0.2	0.17	
JH12111	chloritic schist	595.5	26° 09' 39.4" S	116° 59' 29.2" E				0.29	0.16	
JH12112	pebble schist	600.5	26° 09' 39.1" S	116° 59' 29.1" E				0.22	0.25	
JH12113	pebble schist	608.5	26° 09' 38.3" S	116° 59' 29.0" E				0.27	0.32	

Appendix A Continued.

Sample Number	Rock Type	Location (m)	Latitude	Longitude	Zircon Analyses	Lu-Hf Analyses	Monazite Geochronology	Magnetic Susceptibility		Thin Section
								Field	Lab	
JH12114	schist	629.5	26° 09' 38.2" S	116° 59' 29.0" E				0.43	0.53	
JH12115	chloritic schist	633.5	26° 09' 37.8" S	116° 59' 29.0" E				0.2	0.22	
JH12116	quartzite	644.5	26° 09' 37.4" S	116° 59' 29.0" E				0.02	0.02	
JH12117	chloritic schist	656.5	26° 09' 37.0" S	116° 59' 29.0" E				0.14	0.11	
JH12118	chloritic schist	664.5	26° 09' 36.8" S	116° 59' 29.0" E				0.27	0.12	
JH12119	chloritic schist	669.5	26° 09' 36.7" S	116° 59' 29.0" E				0.15	0.11	
JH12120	chloritic schist	674.5	26° 09' 36.5" S	116° 59' 28.9" E				0.36	0.29	
JH12121	ultramafic schist	678.5	26° 09' 36.4" S	116° 59' 28.8" E				0.44	0.55	
JH12122	ultramafic schist	682.5	26° 09' 36.2" S	116° 59' 28.9" E				0.55	0.61	Y
JH12123	pebble schist	688.5	26° 09' 36.0" S	116° 59' 28.9" E				0.28	0.05	Y
JH12124	chloritic schist	693.5	26° 09' 35.7" S	116° 59' 29.0" E				0.31	0.07	
JH12125	chloritic schist	698.5	26° 09' 35.6" S	116° 59' 28.9" E				0.17	0.12	
JH12126	sandstone	703.5	26° 09' 35.4" S	116° 59' 28.9" E				0.28	0.18	
JH12127	chloritic schist	707.5	26° 09' 35.2" S	116° 59' 29.0" E				0.28	0.16	Y
JH12128	chloritic schist	712.5	26° 09' 35.1" S	116° 59' 28.8" E				0.34	0.26	
JH12129	mafic rock	717.5	26° 09' 35.0" S	116° 59' 28.6" E				0.09	0.1	
JH12130	mafic schist	721.5	26° 09' 34.8" S	116° 59' 28.7" E				0.22	0.11	
JH12131	schist	726.5	26° 09' 35.1" S	116° 59' 26.4" E				0.28	0.16	
JH12132	schist	784.5	26° 09' 34.9" S	116° 59' 26.3" E				0.14	0.18	
JH12133	mafic schist	791.5	26° 09' 34.7" S	116° 59' 26.2" E				0.21	0.13	
JH12134	schist	796.5	26° 09' 34.5" S	116° 59' 26.2" E				0.24	0.09	
JH12135	schist	801.5	26° 09' 34.4" S	116° 59' 26.2" E				0.31	0.06	Y
JH12136	chloritic schist	808.5	26° 09' 33.9" S	116° 59' 25.9" E				0.31	0.11	

Appendix A Continued.

Sample Number	Rock Type	Location (m)	Latitude	Longitude	Zircon Analyses	Lu-Hf Analyses	Monazite Geochronology	Magnetic Susceptibility		Thin Section
								Field	Lab	
JH12137	mafic rock	818.5	26° 09' 33.8" S	116° 59' 26.0" E				0.5	0.39	
JH12138	mafic rock	824.5	26° 09' 33.7" S	116° 59' 25.9" E				0.39	0.43	Y
JH12139	mafic rock	827.5	26° 09' 33.6" S	116° 59' 25.8" E				0.34	0.25	
JH12140	schist	832.5	26° 09' 33.4" S	116° 59' 25.8" E				0.32	0.17	
JH12141	mafic schist	838.5	26° 09' 33.0" S	116° 59' 25.6" E				0.29	0.13	
JH12142	mafic schist	850.5	26° 09' 32.8" S	116° 59' 25.5" E				0.74	0.16	
JH12143	mafic rock	855.5	26° 09' 32.6" S	116° 59' 25.5" E				0.25	0.25	
JH12144	mafic rock	859.5	26° 09' 32.4" S	116° 59' 25.4" E				0.44	0.37	Y
JH12145	sandstone	868.5	26° 09' 32.2" S	116° 59' 25.3" E	SHRIMP	Y		0.1	0.05	
JH12146	mafic rock	873.5	26° 09' 32.0" S	116° 59' 25.3" E				0.42	0.46	
JH12147	mafic rock	878.5	26° 09' 31.7" S	116° 59' 25.2" E				1.36	0.55	
JH12148	mafic rock	887.5	26° 09' 31.5" S	116° 59' 25.3" E				0.46	0.44	
JH12149	quartzite	892.5	26° 09' 31.0" S	116° 59' 25.0" E	SHRIMP	Y		0.01	0	
JH12150	quartzite	910.5	26° 09' 30.6" S	116° 59' 24.9" E				0.06	0	
JH12151	quartzite	922.5	26° 09' 30.0" S	116° 59' 24.6" E	SHRIMP	Y		0.07	0.01	
JH12152	quartzite	929.5	26° 09' 30.0" S	116° 59' 24.6" E	SHRIMP	Y		0.02	0	Y
JH12153	chert	940.5	26° 09' 28.9" S	116° 59' 24.2" E				9.3	1.25	
JH12154	chert	970.5	26° 09' 24.1" S	116° 59' 22.3" E	SHRIMP	Y		0.01	0.01	Y
JH12155	mafic rock	975.5	26° 09' 20.3" S	116° 59' 19.5" E				0.43	0.48	Y

Appendix B SHRIMP U-Pb zircon ages.

Spot	U ppm	Th ppm	$^{232}Th/^{238}U$	$^{206}Pb^*$ ppm	$^{204}Pb/^{206}Pb$	% $^{206}Pb_c$	$^{207}Pb^*/^{206}Pb^*$	±%	$^{207}Pb^*/^{235}U$	±%	$^{206}Pb^*/^{238}U$	±%	$^{208}Pb/^{232}Th$	% err	Error corr	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH007-01.1	389	501	1.33	218	5E-05	0.10	0.2992	0.3	26.942	1.6	0.6531	1.5	0.1412	1.9	0.98	3466	4	8
JH007-02.1	243	293	1.24	109	4E-05	0.07	0.1808	0.6	13.0158	1.7	0.5222	1.6	0.11511	2.0	0.93	2660	10	-2
JH007-02.2	82	124	1.55	36	2E-04	0.32	0.1766	1.0	12.3139	2.2	0.5058	2.0	0.10923	3.1	0.90	2621	16	-1
JH007-04.1	255	146	0.59	115	1E-05	0.02	0.1820	0.5	13.1755	1.7	0.525	1.6	0.14422	1.9	0.96	2671	8	-2
JH007-05.1	259	85	0.34	79	1E-04	0.23	0.1220	0.6	5.9602	1.6	0.3543	1.5	0.08941	2.3	0.93	1986	11	2
JH007-05.2	52	30	0.61	17	-4E-05	-0.08	0.1226	1.2	6.3316	2.3	0.3747	1.9	0.10584	2.7	0.84	1994	22	-3
JH007-06.1	726	449	0.64	321	1E-05	0.02	0.1834	0.3	12.9865	1.5	0.5135	1.5	0.13418	11.4	0.98	2684	5	1
JH007-07.1	877	442	0.52	427	2E-05	0.03	0.2090	0.2	16.3273	1.5	0.5666	1.5	0.1466	1.8	0.99	2898	4	0
JH007-08.1	86	101	1.21	53	-8E-05	-0.15	0.3069	0.6	30.1592	2.0	0.7128	1.9	0.18562	2.2	0.96	3505	9	1
JH007-09.1	229	43	0.19	100	-6E-05	-0.12	0.1805	0.5	12.5848	1.7	0.5057	1.6	0.14197	2.9	0.95	2657	9	1
JH007-11.1	132	85	0.67	60	-2E-05	-0.04	0.1898	0.7	13.712	1.9	0.5241	1.8	0.11721	2.2	0.94	2740	11	1
JH007-11.2	345	158	0.48	159	-1E-05	-0.03	0.1878	0.4	13.8807	1.6	0.5359	1.6	0.14028	6.6	0.97	2723	7	-2
JH007-12.1	106	100	0.98	28	-1E-04	-0.21	0.1102	1.5	4.6719	2.4	0.3074	1.9	0.09176	7.6	0.79	1803	27	5
JH007-13.1	107	78	0.75	66	-2E-05	-0.03	0.2823	0.6	27.8933	2.1	0.7167	2.0	0.18175	2.3	0.96	3375	9	-4
JH007-14.1	187	99	0.55	102	2E-05	0.04	0.2686	0.4	23.458	1.7	0.6334	1.7	0.06393	3.5	0.97	3298	7	5
JH007-15.1	144	78	0.56	62	4E-05	0.08	0.1775	0.6	12.2475	1.8	0.5003	1.7	0.06345	3.9	0.94	2630	10	1
JH007-15.2	191	72	0.39	98	-1E-05	-0.02	0.2432	0.5	19.9319	1.7	0.5943	1.7	0.16448	2.1	0.96	3141	8	5
JH007-18.1	142	95	0.69	44	-3E-05	-0.05	0.1219	1.0	6.0957	2.1	0.3625	1.8	0.10206	2.3	0.87	1985	18	-1
JH014-02	191	90	0.49	118	1E-05	0.01	0.3009	0.5	29.7202	1.8	0.7164	1.8	0.18692	2.1	0.96	3475	8	0
JH014-05	195	114	0.6	85	4E-04	0.67	0.1927	0.9	13.363	2.0	0.503	1.8	0.13185	3.1	0.88	2765	16	5
JH014-07	561	119	0.22	292	1E-04	0.16	0.2720	0.3	22.6491	1.5	0.6039	1.5	0.09549	3.8	0.98	3318	5	9
JH014-08	211	371	1.81	52	-3E-05	-0.05	0.1010	1.2	3.9878	2.1	0.2865	1.8	0.08275	2.1	0.84	1642	21	1
JH014-11	547	322	0.61	219	9E-05	0.14	0.1699	0.5	10.8934	1.6	0.465	1.5	0.09679	2.0	0.95	2557	8	4
JH014-12	314	267	0.88	191	3E-05	0.05	0.2997	0.4	29.2674	1.7	0.7082	1.6	0.18008	1.8	0.97	3469	6	0

All errors are 1σ. $^{206}Pb_c$: common ^{206}Pb. * A ^{204}Pb corrected Pb value (Ludwig, 2003b).

Appendix B Continued.

Spot	U ppm	Th ppm	$^{232}Th/^{238}U$	$^{206}Pb^{*}$ ppm	$^{204}Pb/^{206}Pb$	% $^{206}Pb_{c}$	$^{207}Pb^{*}/^{206}Pb^{*}$	±%	$^{207}Pb^{*}/^{235}U$	±%	$^{206}Pb^{*}/^{238}U$	±%	$^{208}Pb/^{232}Th$	% err	Error corr	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH014-16	187	112	0.62	110	1E-05	0.02	0.3017	0.5	28.326	1.9	0.681	1.8	0.17763	2.1	0.96	3479	8	4
JH014-18	377	290	0.8	183	2E-04	0.36	0.2315	0.5	17.9625	1.6	0.5628	1.6	0.13763	1.9	0.96	3062	8	6
JH014-20	297	13	0.05	177	1E-05	0.01	0.3026	0.4	28.916	1.7	0.6932	1.6	0.17984	3.7	0.97	3483	6	3
JH014-22	133	54	0.42	75	1E-05	0.02	0.2884	0.6	25.901	2.0	0.6514	1.9	0.16991	2.5	0.95	3409	10	5
JH014-23	275	133	0.5	157	3E-05	0.04	0.2992	0.4	27.4038	1.7	0.6643	1.7	0.16887	2.0	0.97	3466	7	6
JH014-24	184	84	0.47	75	1E-05	0.01	0.1783	0.7	11.6288	2.0	0.4731	1.8	0.12851	2.3	0.93	2637	12	6
JH014-25	274	192	0.73	159	3E-05	0.05	0.2843	0.4	26.3922	1.7	0.6733	1.7	0.1757	1.9	0.97	3387	7	2
JH014-26	227	108	0.49	124	2E-05	0.03	0.2841	0.5	24.7171	1.8	0.631	1.7	0.15833	2.4	0.96	3386	8	7
JH014-27	299	193	0.67	148	2E-05	0.03	0.2328	0.5	18.4902	1.7	0.5759	1.6	0.15268	1.9	0.96	3072	8	5
JH014-28	390	452	1.2	164	1E-05	0.02	0.1799	0.5	12.0982	1.6	0.4877	1.6	0.13106	1.7	0.95	2652	8	4
JH014-29	517	419	0.84	217	3E-05	0.04	0.1891	0.4	12.7049	1.6	0.4873	1.5	0.13542	1.9	0.96	2734	7	7
JH014-30	62	32	0.53	45	1E-05	0.02	0.4497	0.9	51.4231	2.6	0.8293	2.5	0.19598	3.1	0.94	4084	13	5
JH014-32	200	111	0.57	112	2E-05	0.02	0.2848	0.5	25.5217	1.8	0.65	1.8	0.16611	2.1	0.96	3389	8	5
JH014-33	248	196	0.81	136	7E-05	0.11	0.2830	0.5	24.805	1.7	0.6358	1.7	0.15634	1.9	0.96	3379	7	7
JH014-39	63	126	2.06	35	-4E-05	-0.07	0.2996	0.9	26.3891	2.7	0.6389	2.5	0.14958	2.8	0.94	3468	14	9
JH014-40	222	133	0.62	125	3E-05	0.05	0.2808	0.5	25.3092	1.8	0.6536	1.7	0.16267	2.0	0.96	3368	8	4
JH014-42	111	77	0.72	82	1E-05	0.01	0.4679	0.5	55.3452	2.2	0.8579	2.1	0.2208	2.4	0.97	4143	8	4
JH014-44	148	66	0.47	90	1E-05	0.02	0.3292	0.6	32.0577	2.0	0.7063	1.9	0.18463	2.4	0.96	3613	8	5
JH014-46	249	84	0.35	140	2E-05	0.03	0.2753	0.5	24.7679	1.8	0.6526	1.7	0.17078	2.3	0.96	3336	7	3
JH014-47	102	71	0.73	43	6E-05	0.10	0.1711	1.1	11.457	2.5	0.4857	2.2	0.13331	2.8	0.90	2568	18	1
JH014-48	450	497	1.14	243	2E-04	0.24	0.2727	0.6	23.5438	1.6	0.6261	1.5	0.16095	1.8	0.94	3322	9	6
JH014-50	228	144	0.65	111	-3E-05	-0.04	0.2356	0.6	18.4534	1.8	0.5681	1.7	0.15264	2.0	0.95	3090	10	7
JH014-51	90	82	0.94	26	2E-04	0.31	0.1202	1.9	5.5467	3.0	0.3346	2.3	0.07886	3.5	0.77	1959	34	5
JH014-52	147	81	0.57	86	0E+00	0.00	0.2962	0.6	27.7456	2.0	0.6795	1.9	0.16891	2.3	0.96	3450	9	3

Appendix B Continued.

Spot	U ppm	Th ppm	^{232}Th $/^{238}U$	$^{206}Pb^*$ ppm	^{204}Pb $/^{206}Pb$	% $^{206}Pb_c$	$^{207}Pb^*$ $/^{206}Pb^*$	±%	$^{207}Pb^*$ $/^{235}U$	±%	$^{206}Pb^*$ $/^{238}U$	±%	^{208}Pb $/^{232}Th$	% err	Error corr	^{207}Pb $/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH014-53	109	89	0.85	28	-2E-05	-0.03	0.1095	1.5	4.4955	2.6	0.2977	2.1	0.08508	2.7	0.81	1792	27	7
JH014-56	110	109	1.02	62	1E-05	0.02	0.2996	0.7	26.8523	2.2	0.6501	2.1	0.16945	2.4	0.95	3468	11	7
JH014-57	418	287	0.71	214	3E-05	0.05	0.2306	0.4	18.8681	1.6	0.5935	1.6	0.1485	1.8	0.97	3056	7	2
JH014-58	217	80	0.38	161	1E-05	0.02	0.4523	0.4	53.5665	1.8	0.859	1.8	0.21142	2.1	0.98	4093	6	2
JH014-59	409	310	0.78	211	1E-04	0.18	0.2663	0.4	21.9728	1.6	0.5984	1.6	0.14341	1.8	0.97	3284	6	9
JH014-60	165	85	0.53	97	-8E-05	-0.13	0.2879	0.6	27.0405	2.0	0.6811	1.9	0.17807	3.2	0.95	3407	9	2
JH014-61	148	42	0.3	87	2E-05	0.03	0.3018	0.6	28.5437	2.0	0.686	1.9	0.16948	2.6	0.96	3479	9	3
JH014-63	178	141	0.81	71	0E+00	0.00	0.1772	0.8	11.223	2.0	0.4593	1.8	0.12754	2.1	0.92	2627	13	8
JH014-68	121	68	0.58	72	3E-05	0.04	0.3071	0.6	28.9982	2.1	0.6849	2.0	0.17168	2.5	0.95	3506	10	4
JH014-70	394	258	0.68	191	9E-05	0.15	0.2309	0.4	17.8756	1.6	0.5614	1.6	0.14975	1.8	0.96	3059	7	6
JH015-01	110	22	0.21	81	-1E-05	-0.01	0.4552	0.4	53.5646	2.2	0.8535	2.1	0.20044	3.3	0.98	4102	7	3
JH015-02	314	134	0.44	176	4E-05	0.06	0.2836	0.4	25.5303	1.8	0.6529	1.8	0.15924	2.3	0.98	3383	6	4
JH016-01	176	125	0.74	108	3E-05	0.06	0.3025	0.5	29.7757	1.7	0.7138	1.7	0.18151	1.9	0.96	3483	7	0
JH016-02	119	44	0.39	69	4E-05	0.06	0.2766	0.6	25.6223	1.9	0.6718	1.8	0.1748	2.9	0.95	3344	10	1
JH016-04	150	99	0.68	89	2E-05	0.02	0.2825	0.5	26.7483	1.8	0.6866	1.7	0.17417	2.0	0.96	3377	8	0
JH016-06	146	152	1.08	88	1E-05	0.02	0.2837	0.5	27.4379	1.8	0.7015	1.7	0.18089	1.9	0.96	3383	8	-1
JH016-07	359	81	0.23	245	1E-05	0.01	0.3662	0.7	39.9532	1.6	0.7913	1.5	0.19805	1.8	0.91	3776	10	0
JH016-08	504	119	0.24	295	1E-05	0.02	0.2818	0.3	26.4587	1.5	0.681	1.4	0.17314	1.7	0.98	3373	4	1
JH016-09	263	183	0.72	164	2E-05	0.04	0.3098	0.4	31.0152	1.6	0.726	1.6	0.18298	1.7	0.97	3520	6	0
JH016-10	198	139	0.73	148	3E-03	4.46	0.3928	0.8	44.8553	1.9	0.8283	1.7	0.25976	6.9	0.91	3882	11	0
JH016-11	199	126	0.66	122	3E-05	0.05	0.3157	0.4	30.9338	1.7	0.7107	1.6	0.17741	1.9	0.97	3549	7	3
JH016-12	296	108	0.38	185	1E-05	0.01	0.3156	0.3	31.6535	1.5	0.7273	1.5	0.17434	1.8	0.97	3549	5	1
JH016-13	56	65	1.19	34	0E+00	0.00	0.2882	0.9	27.9636	2.5	0.7037	2.4	0.18461	2.7	0.94	3408	14	-1
JH016-14	187	68	0.38	115	4E-05	0.07	0.2824	0.5	27.7683	1.7	0.7131	1.6	0.1739	2.2	0.96	3376	7	-3

Appendix B Continued.

Spot	U ppm	Th ppm	^{232}Th / ^{238}U	$^{206}Pb^*$ ppm	^{204}Pb / ^{206}Pb	% $^{206}Pb_c$	$^{207}Pb^*$ / $^{206}Pb^*$	±%	$^{207}Pb^*$ / ^{235}U	±%	$^{206}Pb^*$ / ^{238}U	±%	^{208}Pb / ^{232}Th	% err	Error corr	^{207}Pb / ^{206}Pb Age (Ma)	1σ	% Dis-cor-dance
JH016-15	114	61	0.56	70	4E-05	0.07	0.2855	0.6	27.8416	1.9	0.7074	1.8	0.18267	2.3	0.95	3393	9	-2
JH016-16	178	99	0.58	106	4E-05	0.06	0.2829	0.5	27.0772	1.7	0.6942	1.7	0.17984	2.0	0.96	3379	7	-1
JH016-17	255	154	0.63	156	1E-05	0.02	0.2845	0.4	27.9141	1.6	0.7115	1.6	0.1831	1.8	0.97	3388	6	-2
JH016-18	248	321	1.34	149	-2E-05	-0.03	0.2862	0.4	27.5173	1.6	0.6972	1.6	0.17955	1.8	0.97	3397	6	0
JH016-19	261	228	0.9	181	1E-04	0.21	0.4394	0.3	48.706	1.6	0.8039	1.6	0.12636	1.9	0.98	4050	5	6
JH016-20	244	131	0.56	166	2E-04	0.25	0.4504	0.4	49.0496	1.6	0.7898	1.6	0.08765	3.1	0.97	4087	6	9
JH016-21	121	86	0.73	70	6E-05	0.10	0.2839	0.6	26.3199	1.9	0.6723	1.8	0.16652	2.2	0.95	3385	10	2
JH016-22	546	191	0.36	326	1E-05	0.01	0.2816	0.3	26.9645	1.4	0.6945	1.4	0.17681	1.6	0.98	3372	4	-1
JH016-23	169	226	1.38	101	-1E-05	-0.02	0.2765	0.5	26.3889	1.8	0.6923	1.7	0.17722	1.8	0.96	3343	8	-1
JH016-24	30	72	2.43	21	2E-04	0.30	0.3517	1.0	38.6149	3.1	0.7964	2.9	0.20031	3.2	0.94	3714	16	-2
JH016-25	33	77	2.36	23	-9E-05	-0.15	0.3592	1.0	39.8897	2.9	0.8055	2.7	0.212	3.0	0.94	3746	15	-2
JH016-26	154	167	1.12	87	9E-05	0.14	0.2956	0.5	26.7857	1.8	0.6572	1.7	0.17342	2.0	0.96	3447	8	6
JH016-27	100	121	1.25	59	4E-05	0.06	0.2772	0.7	26.2883	2.0	0.6879	1.9	0.17815	2.2	0.95	3347	10	-1
JH016-28	84	84	1.03	53	3E-05	0.05	0.3031	0.7	30.4602	2.1	0.7288	2.0	0.18457	2.3	0.95	3486	10	-1
JH016-29	90	9	0.11	69	5E-05	0.08	0.4476	1.2	54.5162	2.3	0.8833	2.0	0.20785	5.1	0.85	4077	18	0
JH016-30	325	248	0.79	191	6E-05	0.09	0.2742	0.6	25.7368	1.6	0.6809	1.5	0.17536	1.7	0.92	3330	10	-1
JH016-31	51	33	0.67	32	8E-05	0.13	0.2848	0.9	28.385	2.5	0.7228	2.4	0.17902	3.1	0.94	3390	14	-3
JH016-33	390	170	0.45	232	-1E-05	-0.02	0.2841	0.3	27.0814	1.5	0.6914	1.5	0.18204	1.7	0.98	3386	5	0
JH016-34	330	250	0.78	192	3E-05	0.04	0.2791	0.4	26.0415	1.5	0.6766	1.5	0.16703	1.7	0.97	3358	6	1
JH016-35	235	340	1.5	129	8E-05	0.12	0.2863	0.4	25.0835	1.6	0.6354	1.6	0.15757	1.7	0.96	3398	7	7
JH016-36	295	187	0.66	215	1E-04	0.17	0.4271	0.3	49.7578	1.6	0.8449	1.5	0.19271	1.8	0.98	4007	4	2
JH016-38	142	47	0.35	87	4E-05	0.06	0.2965	0.6	28.904	1.8	0.7071	1.7	0.18108	2.8	0.95	3452	9	0
JH016-39	197	178	0.94	120	0E+00	0.01	0.2865	0.4	27.9048	1.7	0.7064	1.6	0.18345	1.8	0.96	3399	7	-1
JH016-40	242	71	0.3	145	3E-05	0.04	0.2825	0.4	27.2083	1.6	0.6986	1.6	0.17432	2.0	0.97	3377	6	-1

Appendix B Continued.

Spot	U ppm	Th ppm	$^{232}Th/^{238}U$	$^{206}Pb^*$ ppm	$^{204}Pb/^{206}Pb$	% $^{206}Pb_c$	$^{207}Pb^*/^{206}Pb^*$	±%	$^{207}Pb^*/^{235}U$	±%	$^{206}Pb^*/^{238}U$	±%	$^{208}Pb/^{232}Th$	% err	Error corr	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH016-41	325	340	1.08	173	5E-04	0.75	0.2699	0.5	22.8194	1.6	0.6132	1.5	0.15793	2.3	0.94	3306	8	7
JH016-43	158	167	1.09	97	-1E-05	-0.02	0.3049	0.5	30.0496	1.8	0.7148	1.7	0.18411	1.9	0.96	3495	8	1
JH016-44	323	165	0.53	200	2E-05	0.03	0.2984	0.3	29.6079	1.5	0.7196	1.5	0.18312	1.7	0.98	3462	5	-1
JH016-45	56	52	0.96	33	0E+00	0.00	0.2821	0.8	26.473	2.4	0.6805	2.3	0.17752	2.6	0.94	3375	13	1
JH016-46	148	15	0.11	109	-2E-05	-0.03	0.4152	0.4	48.6955	1.7	0.8506	1.7	0.20559	3.2	0.97	3965	6	0
JH016-47	87	105	1.24	55	4E-05	0.06	0.2880	0.7	28.8097	2.1	0.7255	2.0	0.17878	2.3	0.94	3407	11	-3
JH016-48	196	97	0.51	114	1E-04	0.17	0.2767	0.5	25.6884	1.7	0.6734	1.6	0.17429	2.5	0.96	3344	8	1
JH016-49	149	40	0.28	123	1E-05	0.02	0.5501	0.3	72.9011	1.8	0.9611	1.7	0.2347	2.2	0.98	4381	5	1
JH016-50	149	82	0.57	112	-1E-05	-0.02	0.4307	0.4	51.7891	1.8	0.8721	1.7	0.22165	2.0	0.98	4020	6	-1
JH017-01	154	54	0.36	102	1E-05	0.02	0.3572	0.6	37.9088	2.1	0.7697	2.0	0.18269	2.8	0.96	3738	9	2
JH017-02	257	89	0.36	143	3E-05	0.04	0.2924	0.4	25.974	1.9	0.6442	1.9	0.16549	2.4	0.98	3431	6	7
JH021A-01.1	216	186	0.89	123	-3E-05	-0.06	0.2829	0.4	25.7741	1.7	0.6608	1.7	0.1689	2.0	0.97	3379	7	4
JH021A-02.1	258	409	1.63	148	4E-05	0.07	0.2827	0.4	25.8636	1.7	0.6636	1.6	0.17256	2.0	0.97	3378	6	4
JH021A-03.1	176	48	0.28	104	-2E-05	-0.04	0.2980	0.4	28.1335	1.8	0.6848	1.7	0.17809	2.4	0.97	3460	7	4
JH021A-05.1	209	82	0.41	124	6E-05	0.11	0.2861	0.5	27.2282	1.8	0.6903	1.7	0.17325	2.2	0.96	3396	8	0
JH021A-05.2	144	64	0.46	84	5E-05	0.10	0.2868	0.5	26.6141	1.9	0.6731	1.8	0.16861	3.8	0.96	3400	8	3
JH021A-06.1	133	95	0.74	89	3E-05	0.05	0.3665	0.4	39.5491	1.8	0.7826	1.8	0.20004	2.1	0.97	3777	7	2
JH021A-08.1	92	97	1.09	52	-8E-05	-0.15	0.2856	0.6	25.9123	2.0	0.6581	1.9	0.17197	2.2	0.95	3394	9	5
JH021A-09.1	92	92	1.04	53	-4E-05	-0.08	0.2819	0.6	26.2363	2.0	0.6749	1.9	0.17625	2.3	0.95	3374	10	2
JH021A-09.2	109	178	1.68	65	-2E-05	-0.03	0.2854	0.6	27.046	1.9	0.6874	1.9	0.1755	2.0	0.96	3393	9	1
JH021A-10.1	308	98	0.33	182	2E-05	0.04	0.3163	0.3	29.936	1.6	0.6864	1.6	0.13014	2.6	0.98	3552	5	7
JH021A-12.1	94	72	0.79	57	4E-05	0.08	0.2831	0.6	27.0577	2.0	0.6932	1.9	0.17733	2.4	0.95	3380	9	-1
JH021A-13.1	47	113	2.47	28	4E-05	0.08	0.2857	0.9	27.3867	4.2	0.6953	4.1	0.18188	4.3	0.98	3394	13	0
JH021A-15.1	122	89	0.76	74	7E-05	0.13	0.3088	0.5	30.0127	2.0	0.7048	1.9	0.17367	5.0	0.97	3515	8	3

Appendix B Continued.

Spot	U ppm	Th ppm	$^{232}Th/^{238}U$	$^{206}Pb^*$ ppm	$^{204}Pb/^{206}Pb$	% $^{206}Pb_c$	$^{207}Pb^*/^{206}Pb^*$	±%	$^{207}Pb^*/^{235}U$	±%	$^{206}Pb^*/^{238}U$	±%	$^{208}Pb/^{232}Th$	% err	Error corr	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH021A-16.1	222	121	0.57	133	2E-05	0.03	0.2853	0.4	27.4866	1.7	0.6988	1.6	0.17793	1.9	0.97	3392	6	-1
JH021A-18.1	154	86	0.58	114	0E+00	0.00	0.4229	1.3	50.2011	2.2	0.861	1.7	0.21156	3.5	0.81	3992	19	0
JH021A-19.2	53	19	0.39	39	9E-05	0.17	0.4248	0.6	50.4139	2.4	0.8607	2.3	0.20119	3.8	0.96	3999	10	0
JH021A-20.1	334	150	0.47	208	2E-05	0.04	0.3034	0.6	30.2828	1.7	0.724	1.6	0.18429	1.8	0.94	3487	9	-1
JH021A-21.1	270	423	1.62	163	1E-05	0.03	0.2889	0.4	27.997	1.7	0.7028	1.6	0.18264	1.7	0.97	3412	7	-1
JH021A-23.1	150	157	1.08	91	1E-05	0.02	0.2804	0.5	27.1272	1.8	0.7017	1.7	0.18418	1.9	0.96	3365	7	-2
JH021A-24.1	105	198	1.94	63	0E+00	0.00	0.2835	0.6	27.3235	1.9	0.6989	1.9	0.17938	2.0	0.96	3383	9	-1
JH021A-25.1	264	110	0.43	160	2E-05	0.03	0.2878	0.7	27.9519	1.8	0.7045	1.6	0.179	2.0	0.92	3406	11	-1
JH021A-27.1	98	30	0.32	61	0E+00	0.00	0.2902	0.6	28.728	3.8	0.718	3.8	0.1897	8.3	0.99	3419	9	-3
JH021A-30.1	360	87	0.25	200	1E-04	0.25	0.2740	0.3	24.4443	1.6	0.6471	1.6	0.18217	2.6	0.98	3329	5	4
JH021A-32.2	102	47	0.48	62	0E+00	0.00	0.2828	0.7	27.1477	2.1	0.6962	1.9	0.18081	2.5	0.93	3379	12	-1
JH021A-33.1	338	162	0.5	215	-2E-05	-0.04	0.3177	0.6	32.487	1.7	0.7417	1.6	0.19055	1.8	0.94	3559	9	-1
JH021A-34.1	150	84	0.58	87	3E-05	0.06	0.2837	0.5	26.4841	1.8	0.6771	1.7	0.17607	2.1	0.97	3383	7	2
JH021A-34.2	113	43	0.4	68	3E-05	0.06	0.2864	0.6	27.6492	1.9	0.7002	1.8	0.18173	2.5	0.94	3398	10	-1
JH021A-35.1	261	60	0.24	170	3E-05	0.05	0.3215	0.3	33.5952	1.6	0.7579	1.6	0.1935	2.2	0.98	3577	5	-2
JH021A-36.1	188	121	0.67	112	1E-05	0.02	0.2915	0.4	27.9025	1.8	0.6943	1.7	0.1805	2.0	0.97	3425	7	1
JH021A-38.1	300	51	0.18	192	2E-05	0.05	0.3324	1.0	34.0543	1.9	0.7431	1.6	0.1854	3.1	0.84	3628	16	2
JH021A-40.1	292	150	0.53	171	5E-05	0.09	0.2838	0.3	26.5768	1.6	0.6792	1.6	0.17387	1.8	0.98	3384	5	2
JH021A-41.1	86	88	1.05	51	-2E-05	-0.04	0.2866	0.6	27.1593	2.0	0.6873	1.9	0.17803	2.2	0.95	3399	9	1
JH021A-47.1	272	132	0.5	161	0E+00	0.00	0.2820	0.4	26.7577	1.6	0.6881	1.6	0.17833	1.8	0.98	3374	6	0
JH021A-50.1	92	39	0.44	53	0E+00	0.00	0.2861	0.6	26.3338	2.0	0.6675	1.9	0.17219	2.5	0.95	3397	10	4
JH021A-51.1	141	179	1.31	102	1E-05	0.02	0.4281	0.7	49.3272	1.9	0.8356	1.8	0.20794	1.9	0.94	4011	10	3
JH021A-54.1	214	58	0.28	140	4E-05	0.08	0.3564	0.3	37.3187	1.7	0.7593	1.6	0.19257	2.3	0.98	3735	5	3
JH021A-55.1	344	95	0.29	203	6E-05	0.11	0.3242	0.3	30.6572	1.6	0.6859	1.6	0.16988	2.1	0.98	3590	5	8

Appendix B Continued.

Spot	U ppm	Th ppm	$^{232}Th/^{238}U$	$^{206}Pb^*$ ppm	$^{204}Pb/^{206}Pb$	% $^{206}Pb_c$	$^{207}Pb^*/^{206}Pb^*$	±%	$^{207}Pb^*/^{235}U$	±%	$^{206}Pb^*/^{238}U$	±%	$^{208}Pb/^{232}Th$	% err	Error corr	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH021A-59.1	213	138	0.67	129	0E+00	0.00	0.3017	0.4	29.2566	1.7	0.7032	1.6	0.1828	1.8	0.98	3479	6	2
JH021A-60.1	240	77	0.33	128	2E-04	0.28	0.2764	0.4	23.5211	1.7	0.6171	1.6	0.16336	2.5	0.97	3343	6	9
JH021A-61.1	427	73	0.18	276	2E-05	0.03	0.3422	2.3	35.4519	3.3	0.7513	2.3	0.1875	2.6	0.71	3673	36	2
JH021A-63.1	131	44	0.35	81	-1E-05	-0.01	0.3122	0.8	31.0647	3.1	0.7216	3.2	0.18103	3.7	0.96	3526	11	1
JH021A-64.1	232	44	0.2	159	-4E-05	-0.04	0.3686	0.7	40.3507	3.1	0.7939	3.1	0.20161	3.8	0.97	3785	10	1
JH021A-68.1	455	223	0.51	254	3E-05	0.03	0.2893	0.8	25.9678	3.0	0.6509	3.1	0.16604	3.4	0.97	3404	10	7
JH021A-69.1	308	294	0.98	177	-1E-05	-0.02	0.2898	1.1	26.7912	3.1	0.6706	3.4	0.17372	3.5	0.95	3406	10	4
JH021A-70.1	366	236	0.67	222	-1E-05	-0.01	0.3231	0.9	31.6804	3.1	0.7111	3.3	0.16225	3.5	0.96	3551	10	4
JH021A-72.1	295	122	0.43	166	3E-05	0.03	0.2812	0.8	25.4709	3.2	0.6569	3.3	0.16398	3.7	0.97	3357	11	4
JH021A-76.1	306	222	0.75	164	-3E-05	-0.03	0.2656	1.2	22.7756	3.2	0.6219	3.4	0.1699	4.4	0.93	3287	11	6
JH021A-83.1	248	157	0.65	162	2E-05	0.03	0.3946	1.0	41.7432	3.4	0.7672	3.6	0.17352	3.9	0.96	3865	13	7
JH021A-84.1	210	250	1.23	120	-4E-05	-0.04	0.2822	1.4	25.9508	3.3	0.667	3.7	0.16984	3.7	0.93	3351	12	3
JH021A-88.1	90	52	0.6	66	-6E-05	-0.07	0.4683	1.0	54.5671	3.6	0.845	3.8	0.21143	4.3	0.96	4142	12	6
JH029-01.1	173	171	1.02	101	-3E-05	-0.05	0.2837	0.6	26.4617	1.8	0.6764	1.8	0.17549	2.0	0.95	3384	9	2
JH029-01.2	74	73	1.02	42	6E-05	0.11	0.2836	0.7	25.685	2.2	0.6568	2.1	0.1443	2.6	0.95	3383	11	5
JH029-01.3	129	155	1.24	75	2E-05	0.03	0.2830	0.5	26.2295	1.9	0.6722	1.8	0.17729	2.0	0.96	3379	8	2
JH029-02.1	179	85	0.49	133	-2E-05	-0.05	0.4807	0.4	57.372	1.7	0.8655	1.7	0.21118	2.0	0.97	4183	6	5
JH029-07.1	70	46	0.68	43	0E+00	0.00	0.3249	0.6	31.8596	2.1	0.7111	2.1	0.18416	2.5	0.96	3593	10	5
JH029-09.1	341	42	0.13	202	-2E-05	-0.04	0.2998	0.6	28.471	1.7	0.6887	1.6	0.16965	2.6	0.94	3469	9	3
JH029-11.1	323	107	0.34	186	1E-05	0.02	0.2956	0.6	27.2081	1.7	0.6675	1.6	0.16865	1.9	0.94	3448	9	6
JH029-11.2	461	236	0.53	251	4E-05	0.08	0.2732	1.3	23.8732	2.0	0.6337	1.5	0.11972	2.8	0.77	3325	20	6
JH029-11.3	409	140	0.36	251	0E+00	0.00	0.3161	0.3	31.1205	1.6	0.7141	1.5	0.16996	1.7	0.99	3551	4	3
JH029-13.1	232	434	1.93	135	3E-05	0.05	0.3020	0.4	28.1569	1.7	0.6762	1.6	0.16482	1.9	0.98	3480	5	6
JH029-14.1	61	43	0.72	37	9E-05	0.17	0.2818	1.3	27.1158	2.5	0.6978	2.1	0.17577	2.9	0.85	3373	20	-2

Appendix B Continued.

Spot	U ppm	Th ppm	$^{232}Th/^{238}U$	$^{206}Pb^*$ ppm	$^{204}Pb/^{206}Pb$	% $^{206}Pb_c$	$^{207}Pb^*/^{206}Pb^*$	±%	$^{207}Pb^*/^{235}U$	±%	$^{206}Pb^*/^{238}U$	±%	$^{208}Pb/^{232}Th$	% err	Error corr	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH029-15.1	69	45	0.68	41	1E-04	0.21	0.2950	0.7	28.1108	2.2	0.6911	2.1	0.17222	3.0	0.95	3444	11	2
JH029-15.2	148	221	1.54	89	-2E-05	-0.04	0.2922	0.5	28.0293	1.8	0.6958	1.7	0.17736	1.9	0.97	3429	7	1
JH029-16.1	67	33	0.52	41	3E-05	0.05	0.3081	1.7	29.913	2.7	0.7042	2.1	0.17892	2.7	0.76	3511	27	3
JH029-17.1	177	94	0.55	103	0E+00	0.00	0.2810	0.4	26.1788	1.8	0.6756	1.7	0.17417	2.0	0.97	3369	7	2
JH029-19.1	65	34	0.55	38	0E+00	0.00	0.2856	0.7	27.0889	2.2	0.688	2.1	0.18084	2.7	0.95	3394	11	1
JH029-19.2	102	65	0.66	60	0E+00	0.00	0.2829	0.6	26.8185	2.0	0.6875	1.9	0.17625	2.3	0.96	3379	9	0
JH029-20.1	114	79	0.72	64	-2E-05	-0.03	0.2863	0.6	25.6169	1.9	0.6488	1.8	0.15404	2.2	0.96	3398	9	7
JH029-21.1	81	55	0.7	48	-5E-05	-0.09	0.2876	0.6	27.1305	2.3	0.6843	2.2	0.17615	6.6	0.96	3404	10	2
JH029-22.1	261	211	0.83	158	-1E-05	-0.01	0.3038	0.3	29.4961	1.6	0.7042	1.6	0.17914	1.8	0.98	3490	5	2
JH029-25.1	90	70	0.8	54	2E-05	0.04	0.2807	0.6	26.7551	2.2	0.6912	2.1	0.17382	5.0	0.96	3367	10	-1
JH029-26.1	284	196	0.71	174	-1E-05	-0.01	0.3017	0.7	29.6262	2.1	0.7122	1.9	0.18447	2.2	0.94	3479	11	0
JH029-27.1	262	347	1.37	147	5E-03	9.67	0.2937	2.9	26.431	3.3	0.6526	1.7	0.06542	14.6	0.52	3437	44	7
JH029-27.2	205	68	0.35	127	0E+00	0.00	0.3182	0.4	31.5605	1.7	0.7192	1.6	0.18596	2.0	0.98	3561	6	2
JH029-28.1	261	241	0.95	165	0E+00	0.00	0.3208	0.3	32.358	1.6	0.7317	1.6	0.18255	1.7	0.98	3573	5	1
JH029-29.1	208	182	0.9	129	4E-05	0.08	0.3133	0.4	31.1257	1.7	0.7206	1.6	0.17785	1.8	0.98	3537	6	1
JH029-32.1	471	876	1.92	254	1E-04	0.24	0.2856	0.9	24.7051	2.2	0.6274	2.0	0.12575	2.5	0.91	3394	14	9
JH029-38.1	320	238	0.77	224	0E+00	0.01	0.3898	0.3	43.6296	1.6	0.8119	1.6	0.19454	1.7	0.99	3870	4	1
JH029-39.1	89	129	1.49	53	2E-05	0.05	0.2822	0.7	26.7129	2.1	0.6866	2.0	0.18031	5.2	0.95	3375	10	0
JH029-40.1	176	87	0.52	102	2E-05	0.04	0.2828	0.4	26.1685	1.8	0.6712	1.7	0.17309	2.1	0.97	3378	7	3
JH029-41.1	345	147	0.44	217	1E-05	0.01	0.3182	0.3	32.0614	1.6	0.7309	1.6	0.18707	4.7	0.98	3561	5	1
JH029-42.1	268	185	0.72	153	2E-05	0.04	0.2842	0.4	26.0472	1.6	0.6647	1.6	0.15149	2.7	0.98	3386	6	4
JH029-44.1	187	127	0.7	108	2E-05	0.04	0.2844	0.4	26.1928	1.7	0.6679	1.7	0.1761	1.9	0.97	3387	7	3
JH029-47.1	178	140	0.81	109	3E-05	0.06	0.3026	0.4	29.6463	1.8	0.7105	1.7	0.17677	2.0	0.97	3484	7	1
JH029-47.2	136	68	0.52	77	-2E-05	-0.03	0.3042	0.5	27.5792	1.9	0.6575	1.8	0.13946	4.7	0.96	3492	8	9

Appendix B Continued.

Spot	U ppm	Th ppm	$^{232}Th/^{238}U$	$^{206}Pb^{*}$ ppm	$^{204}Pb/^{206}Pb$	% $^{206}Pb_c$	$^{207}Pb^{*}/^{206}Pb^{*}$	±%	$^{207}Pb^{*}/^{235}U$	±%	$^{206}Pb^{*}/^{238}U$	±%	$^{208}Pb/^{232}Th$	% err	Error corr	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH029-49.1	95	62	0.68	61	4E-05	0.07	0.3560	0.5	36.8973	2.0	0.7517	1.9	0.19333	2.3	0.96	3733	8	4
JH029-51.1	305	258	0.87	179	-1E-05	-0.01	0.2843	0.3	26.7196	1.6	0.6816	1.6	0.1784	2.0	0.98	3387	5	1
JH029-52.1	98	59	0.62	67	2E-04	0.34	0.3654	0.5	39.7579	2.0	0.7892	1.9	0.20642	2.7	0.96	3772	8	1
JH029-55.1	33	27	0.86	19	1E-04	0.23	0.3030	1.1	28.2979	2.9	0.6773	2.7	0.17153	3.7	0.93	3486	16	6
JH029-57.1	66	38	0.6	39	-3E-05	-0.05	0.3029	0.7	28.9849	2.2	0.6941	2.1	0.18252	2.7	0.95	3485	11	3
JH029-58.1	132	67	0.52	78	-2E-05	-0.03	0.2831	0.5	26.7137	1.9	0.6843	1.8	0.17882	4.8	0.96	3380	8	1
JH029-59.2	514	122	0.25	297	0E+00	0.01	0.2792	0.3	25.8513	1.6	0.6716	1.5	0.07	4.1	0.98	3358	5	2
JH029-60.1	65	108	1.72	38	0E+00	0.00	0.2865	0.7	26.9655	2.2	0.6826	2.1	0.17929	2.3	0.95	3399	11	2
JH029-61.1	121	38	0.33	91	0E+00	0.00	0.4373	0.4	52.3738	1.8	0.8685	1.8	0.21869	2.5	0.98	4043	6	0
JH030-02	174	55	0.33	103	1E-05	0.02	0.3296	4.1	31.3231	4.3	0.6893	1.3	0.16899	19.6	0.46	3615	63	8
JH030-03	109	141	1.33	62	1E-04	0.19	0.2822	0.4	25.85	1.5	0.6644	1.4	0.16655	1.7	0.91	3375	6	3
JH030-05	143	229	1.66	82	1E-04	0.18	0.2848	0.4	26.0474	1.4	0.6634	1.3	0.1709	1.5	0.89	3389	6	4
JH030-06	92	49	0.55	66	7E-04	1.26	0.4269	0.4	48.9101	3.2	0.8309	3.2	0.10192	8.7	0.97	4007	6	4
JH030-07	88	30	0.36	66	4E-04	0.70	0.4550	0.4	54.7339	1.5	0.8725	1.5	0.18269	4.0	0.97	4102	5	2
JH030-08	55	57	1.07	32	8E-04	1.40	0.2786	0.8	25.3972	1.9	0.6612	1.8	0.15364	3.0	0.91	3355	12	3
JH030-09	90	37	0.43	67	2E-04	0.31	0.4475	0.4	52.9892	1.6	0.8589	1.5	0.19765	2.5	0.95	4077	6	3
JH030-10	135	35	0.27	83	8E-05	0.15	0.3495	1.5	34.4914	2.0	0.7157	1.4	0.1849	2.5	0.69	3705	22	8
JH035-01.1	169	52	0.32	99	2E-05	0.02	0.2885	0.5	27.112	1.3	0.6815	1.3	0.18567	1.8	0.94	3414	7	2
JH035-02.1	61	9	0.16	35	6E-05	0.08	0.2708	0.7	24.8735	1.9	0.6661	1.8	0.16721	4.6	0.92	3307	11	1
JH035-04.1	140	52	0.38	82	2E-05	0.02	0.2805	0.5	26.1316	1.3	0.6757	1.3	0.16966	1.8	0.93	3356	7	1
JH035-06.1	267	372	1.44	166	3E-05	0.03	0.3581	1.0	37.2975	1.7	0.7554	1.2	0.13065	2.8	0.82	3569	5	3
JH035-07.1	412	532	1.33	211	8E-05	0.10	0.3377	2.1	30.4261	2.9	0.6535	1.1	0.05737	5.4	0.84	3236	5	9
JH035-08.1	224	79	0.37	129	1E-05	0.01	0.2718	0.9	25.1246	2.3	0.6705	2.3	0.17172	2.4	0.93	3310	13	0
JH035-09.1	172	31	0.19	115	0E+00	0.00	0.3695	1.0	39.3108	1.6	0.7717	1.3	0.20055	4.2	0.78	3789	15	4

Appendix B Continued.

Spot	U ppm	Th ppm	$^{232}Th/^{238}U$	$^{206}Pb^*$ ppm	$^{204}Pb/^{206}Pb$	% $^{206}Pb_c$	$^{207}Pb^*/^{206}Pb^*$	±%	$^{207}Pb^*/^{235}U$	±%	$^{206}Pb^*/^{238}U$	±%	$^{208}Pb/^{232}Th$	% err	Error corr	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH035-10.1	77	54	0.72	46	5E-05	0.06	0.2819	0.7	26.6262	1.7	0.685	1.7	0.17182	2.1	0.91	3356	9	0
JH035-11.1	124	25	0.21	88	-3E-05	-0.04	0.4184	0.4	47.785	1.4	0.8282	1.4	0.21049	2.3	0.96	3976	6	3
JH035-12.1	194	311	1.65	98	5E-05	0.07	0.2500	1.2	20.656	1.8	0.5991	1.4	0.14204	1.4	0.76	3063	13	4
JH035-13.1	184	91	0.51	109	4E-05	0.04	0.2877	0.8	27.342	1.4	0.6893	1.3	0.17592	1.6	0.82	3398	13	1
JH035-14.1	94	77	0.85	58	-4E-05	-0.05	0.2959	0.7	29.0928	1.6	0.713	1.6	0.1795	1.9	0.91	3433	9	-1
JH035-15.1	360	26	0.08	231	1E-05	0.01	0.3351	0.6	34.568	1.2	0.7482	1.0	0.13091	3.5	0.85	3632	10	1
JH035-16.1	391	384	1.01	221	4E-05	0.04	0.3298	0.3	31.4779	1.1	0.6922	1.1	0.0869	1.3	0.96	3388	4	5
JH035-17.1	127	83	0.68	79	3E-04	0.34	0.3261	0.5	32.5584	1.4	0.7242	1.4	0.1652	2.1	0.93	3568	7	3
JH035-21.1	81	62	0.79	49	5E-05	0.06	0.2938	0.7	28.4961	1.6	0.7034	1.7	0.18242	2.0	0.91	3433	9	0
JH035-22.1	175	121	0.72	104	-4E-05	-0.04	0.2797	1.1	26.6793	1.6	0.6919	1.3	0.18232	2.5	0.74	3360	16	-1
JH035-23.1	255	113	0.46	160	-2E-05	-0.02	0.3140	0.7	31.6012	1.3	0.7298	1.2	0.18836	1.4	0.85	3538	10	0
JH035-24.1	396	180	0.47	235	0E+00	0.00	0.2893	0.3	27.5177	1.0	0.6899	1.1	0.18168	1.3	0.95	3413	4	1
JH035-25.1	166	87	0.54	101	0E+00	0.00	0.3025	0.5	29.5507	1.3	0.7084	1.3	0.18266	1.6	0.93	3479	6	1
JH035-26.1	205	154	0.78	109	0E+00	0.00	0.2415	0.5	20.5838	1.2	0.6181	1.3	0.1606	1.4	0.91	3115	7	1
JH035-27.1	292	238	0.84	169	2E-05	0.02	0.2816	0.4	26.1351	1.1	0.673	1.2	0.17281	1.3	0.93	3360	5	2
JH035-28.1	207	128	0.64	126	3E-05	0.03	0.3224	0.4	31.9043	1.2	0.7177	1.2	0.13711	1.5	0.94	3512	6	3
JH035-30.1	275	181	0.68	165	-4E-05	-0.05	0.2984	0.6	28.8439	1.2	0.7011	1.2	0.16307	1.4	0.86	3426	9	1
JH035-32.1	195	67	0.36	119	1E-05	0.01	0.3017	0.4	29.4652	1.2	0.7083	1.2	0.18	1.6	0.95	3474	6	1
JH035-35.1	300	387	1.33	161	2E-04	0.20	0.3721	0.6	35.6654	1.3	0.6951	1.1	0.04035	2.7	0.87	3384	6	10
JH035-36.1	307	229	0.77	178	-2E-05	-0.03	0.2846	0.7	26.5584	1.3	0.6767	1.2	0.17611	1.3	0.83	3382	11	2
JH035-38.1	205	65	0.33	128	-3E-05	-0.04	0.3110	0.4	31.0409	1.2	0.7238	1.2	0.18646	1.7	0.95	3524	6	1
JH035-40.1	282	48	0.18	164	0E+00	0.00	0.2711	0.4	25.2313	1.3	0.6751	1.2	0.1759	1.7	0.96	3311	5	-1
JH036-01	109	92	0.87	62	0E+00	0.00	0.2862	0.7	25.9892	2.3	0.6587	2.1	0.17998	2.5	0.95	3397	11	4
JH036-02	81	132	1.68	44	0E+00	0.00	0.2875	0.9	24.8019	2.6	0.6257	2.4	0.16146	2.7	0.93	3404	14	9

Appendix B Continued.

Spot	U ppm	Th ppm	$^{232}Th/^{238}U$	$^{206}Pb^{*}$ ppm	$^{204}Pb/^{206}Pb$	% $^{206}Pb_c$	$^{207}Pb^{*}/^{206}Pb^{*}$	±%	$^{207}Pb^{*}/^{235}U$	±%	$^{206}Pb^{*}/^{238}U$	±%	$^{208}Pb/^{232}Th$	% err	Error corr	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH036-03	265	104	0.41	187	2E-05	0.03	0.4333	0.5	48.9507	1.8	0.8194	1.7	0.20181	2.0	0.96	4029	7	4
JH036-04	139	22	0.17	79	3E-05	0.05	0.2945	0.6	26.6324	2.1	0.6558	2.0	0.15752	4.5	0.95	3442	10	6
JH036-05	80	89	1.15	47	2E-05	0.02	0.2825	0.8	26.348	2.5	0.6765	2.4	0.17667	2.7	0.94	3377	13	1
JH036-07	225	140	0.65	139	0E+00	0.00	0.3278	0.4	32.3168	1.8	0.7151	1.7	0.18383	2.0	0.97	3607	7	4
JH036-08	60	34	0.58	33	1E-04	0.20	0.2776	1.1	24.2918	2.8	0.6346	2.6	0.16376	3.7	0.92	3350	17	6
JH036-11	252	81	0.33	142	1E-05	0.01	0.2844	0.4	25.6048	1.8	0.6529	1.7	0.15084	2.3	0.98	3388	6	5
JH036-12	38	34	0.92	24	8E-05	0.13	0.3416	0.9	34.3239	2.9	0.7288	2.8	0.1771	3.7	0.95	3670	13	4
JH036-13	440	565	1.33	223	2E-05	0.03	0.2556	0.3	20.7696	1.7	0.5893	1.7	0.15061	1.8	0.98	3220	5	8
JH036-14	268	68	0.26	156	3E-05	0.04	0.2972	0.4	27.6596	1.8	0.6749	1.7	0.02207	7.2	0.98	3456	6	4
JH036-15	455	179	0.41	243	4E-05	0.06	0.2682	0.6	22.9207	1.8	0.6197	1.7	0.1261	2.1	0.94	3296	10	6
JH036-16	90	36	0.41	52	0E+00	0.00	0.2819	0.6	25.8953	2.2	0.6663	2.1	0.16584	3.0	0.96	3373	10	2
JH036-17	63	105	1.71	36	4E-05	0.06	0.3052	0.7	27.9976	2.4	0.6653	2.3	0.16351	3.8	0.96	3497	11	6
JH036-18	133	216	1.68	77	3E-05	0.05	0.2882	0.5	26.8631	2.0	0.676	2.0	0.16423	2.4	0.97	3408	8	2
JH036-19	98	22	0.23	52	1E-05	0.01	0.2708	0.6	23.0336	2.2	0.6168	2.1	0.13735	4.2	0.96	3311	10	7
JH036-22	44	37	0.87	25	3E-05	0.05	0.2896	0.9	26.0479	2.8	0.6524	2.6	0.16253	3.4	0.95	3415	14	5
JH036-24	190	690	3.74	94	1E-05	0.02	0.2333	0.6	18.3966	1.9	0.572	1.8	0.14337	2.0	0.95	3075	10	5
JH036-25	303	127	0.43	179	1E-05	0.01	0.3163	0.3	30.04	1.7	0.6888	1.7	0.17001	2.1	0.98	3552	5	5
JH036-26	91	34	0.39	64	4E-05	0.06	0.4421	0.5	49.3824	2.2	0.8102	2.1	0.19176	3.1	0.97	4059	7	6
JH036-27	258	180	0.72	144	1E-05	0.02	0.2969	0.4	26.5101	1.8	0.6477	1.7	0.14361	2.0	0.98	3454	6	7
JH036-29	417	200	0.5	231	1E-05	0.01	0.2767	0.3	24.526	1.7	0.643	1.7	0.15709	1.9	0.98	3344	5	4
JH036-30	43	32	0.78	24	3E-05	0.05	0.2948	0.9	25.9234	2.8	0.6377	2.6	0.16181	3.6	0.95	3443	14	8
JH036-32	63	48	0.79	36	-6E-05	-0.09	0.2865	0.8	26.3668	2.4	0.6675	2.3	0.16133	3.1	0.95	3399	12	3
JH036-34	136	131	1	80	1E-05	0.02	0.2987	0.5	28.1982	2.0	0.6847	1.9	0.17019	2.2	0.97	3464	8	3
JH036-35	283	127	0.47	164	1E-05	0.02	0.2847	0.3	26.4661	1.8	0.6742	1.7	0.16673	2.2	0.98	3389	5	2

Appendix B Continued.

Spot	U ppm	Th ppm	^{232}Th / ^{238}U	$^{206}Pb^*$ ppm	^{204}Pb / ^{206}Pb	% $^{206}Pb_c$	$^{207}Pb^*$ / $^{206}Pb^*$	±%	$^{207}Pb^*$ / ^{235}U	±%	$^{206}Pb^*$ / ^{238}U	±%	^{208}Pb / ^{232}Th	% err	Error corr	^{207}Pb / ^{206}Pb Age (Ma)	1σ	% Dis-cor-dance
JH036-38	63	50	0.83	34	0E+00	0.00	0.2971	0.7	25.989	2.4	0.6345	2.3	0.14358	3.0	0.95	3455	11	9
JH036-39	212	26	0.13	123	0E+00	0.01	0.2986	0.4	27.833	1.8	0.6761	1.8	0.1685	3.0	0.98	3463	6	4
JH036-40	282	480	1.75	157	2E-03	3.18	0.2801	2.6	24.1005	3.2	0.624	1.8	0.07971	9.6	0.57	3364	41	8
JH036-41	72	41	0.59	46	3E-05	0.04	0.3480	0.6	35.6011	2.3	0.742	2.2	0.17949	3.0	0.96	3698	9	3
JH036-42	92	93	1.05	53	2E-05	0.04	0.2876	0.6	26.5786	2.2	0.6703	2.1	0.14478	2.5	0.96	3405	10	3
JH036-44	182	63	0.36	107	3E-05	0.05	0.2845	0.5	26.6301	1.9	0.6788	1.8	0.17334	4.7	0.97	3388	7	1
JH036-45	360	196	0.56	199	1E-05	0.02	0.2743	0.3	24.3257	1.7	0.6432	1.7	0.16362	2.1	0.98	3331	5	4
JH036-46	115	66	0.6	68	-2E-05	-0.03	0.3186	0.5	30.3456	2.1	0.6909	2.0	0.14234	2.7	0.97	3563	8	5
JH036-47	241	10	0.05	165	1E-04	0.23	0.3267	1.0	35.6521	2.0	0.7915	1.8	1.53758	4.2	0.87	3602	15	-4
JH036-48	73	92	1.29	41	2E-05	0.04	0.2867	0.7	25.2592	2.4	0.6389	2.2	0.162	2.7	0.95	3400	11	7
JH036-49	115	83	0.74	82	-2E-05	-0.04	0.4313	0.4	48.8086	2.0	0.8207	2.0	0.18855	2.4	0.98	4022	7	4
JH036-50	293	185	0.65	164	-1E-05	-0.01	0.2774	0.4	24.9655	1.8	0.6526	1.7	0.16129	2.7	0.98	3349	5	3
JH039A-01	236	91	0.4	154	3E-05	0.03	0.3512	1.1	36.5789	2.1	0.7554	1.8	0.18788	3.1	0.87	3712	16	2
JH039A-02	308	42	0.14	185	1E-05	0.02	0.2949	0.4	28.3952	1.8	0.6984	1.8	0.1802	2.6	0.98	3444	6	1
JH039A-03	113	37	0.35	63	0E+00	0.00	0.2812	0.6	25.2066	2.2	0.6502	2.1	0.17211	2.7	0.96	3369	10	4
JH039A-04	160	81	0.53	92	0E+00	-0.01	0.2835	0.5	26.1103	2.1	0.6679	2.0	0.17333	2.3	0.96	3382	8	3
JH039A-06	156	57	0.38	131	1E-05	0.01	0.5217	0.8	69.9156	2.1	0.9721	2.0	0.23157	2.9	0.92	4304	12	-2
JH039A-07	302	281	0.96	165	0E+00	0.00	0.2825	0.4	24.681	1.8	0.6336	1.8	0.14034	1.9	0.98	3377	6	7
JH039A-08	182	168	0.95	107	0E+00	0.00	0.2861	0.5	26.8657	2.0	0.6811	1.9	0.17501	2.1	0.97	3396	8	1
JH039A-09	483	668	1.43	174	7E-05	0.09	0.1598	0.5	9.2127	1.8	0.4181	1.7	0.06935	1.8	0.96	2454	9	9
JH039A-10	255	108	0.44	134	1E-04	0.12	0.2702	0.5	22.6078	1.9	0.6068	1.8	0.0835	2.8	0.97	3307	7	8
JH039A-11	130	125	0.99	78	2E-05	0.03	0.3007	0.6	28.75	2.1	0.6935	2.1	0.18024	2.3	0.96	3474	9	2
JH039A-12	198	123	0.64	119	0E+00	0.00	0.3019	0.5	29.0312	2.0	0.6974	1.9	0.17341	2.2	0.97	3480	7	2
JH039A-13	109	38	0.36	62	4E-05	0.04	0.2828	0.7	25.6044	2.3	0.6566	2.2	0.16565	2.9	0.95	3379	11	4

Appendix B Continued.

Spot	U ppm	Th ppm	$^{232}Th/^{238}U$	$^{206}Pb^*$ ppm	$^{204}Pb/^{206}Pb$	% $^{206}Pb_c$	$^{207}Pb^*/^{206}Pb^*$	±%	$^{207}Pb^*/^{235}U$	±%	$^{206}Pb^*/^{238}U$	±%	$^{208}Pb/^{232}Th$	% err	Error corr	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH039A-14	152	179	1.22	90	-3E-05	-0.04	0.2985	0.6	28.3457	2.1	0.6888	2.0	0.17207	2.2	0.96	3462	9	2
JH039A-15	130	47	0.37	75	2E-05	0.02	0.2847	0.6	26.1901	2.2	0.6672	2.1	0.17646	2.7	0.96	3389	10	3
JH039A-16	188	183	1	109	1E-05	0.01	0.2835	0.5	26.1749	2.0	0.6696	1.9	0.17228	2.1	0.97	3382	8	2
JH039A-17	267	213	0.83	155	3E-05	0.04	0.2841	0.4	26.4626	1.9	0.6755	1.8	0.15967	2.0	0.97	3386	7	2
JH039A-18	243	77	0.33	102	3E-05	0.04	0.1797	0.6	12.0996	2.0	0.4883	1.9	0.13452	2.5	0.94	2650	11	3
JH039A-19	103	100	1	44	3E-04	0.45	0.1740	1.6	11.6471	2.7	0.4856	2.2	0.13055	3.4	0.81	2596	27	2
JH039A-20	576	194	0.35	249	2E-05	0.03	0.1825	0.5	12.6411	1.7	0.5023	1.7	0.13503	1.9	0.96	2676	8	2
JH039A-21	214	86	0.41	133	1E-05	0.02	0.3089	0.4	30.6325	1.9	0.7192	1.9	0.18904	2.6	0.97	3516	7	1
JH039A-22	161	52	0.34	44	4E-05	0.06	0.1080	1.6	4.6808	2.6	0.3144	2.0	0.089	4.3	0.78	1765	29	0
JH039A-23	207	37	0.19	57	0E+00	0.00	0.1073	1.0	4.6866	2.2	0.3167	1.9	0.08883	3.1	0.88	1754	19	-1
JH039A-24	348	359	1.07	194	7E-05	0.08	0.2941	0.4	26.3113	1.8	0.6488	1.8	0.12703	1.9	0.98	3440	6	7
JH039A-25	170	55	0.33	116	5E-05	0.05	0.3584	1.2	39.1521	2.3	0.7923	2.0	0.19667	2.5	0.86	3743	18	0
JH039A-26	324	243	0.78	191	3E-05	0.03	0.2956	0.4	27.8963	1.8	0.6843	1.8	0.17892	1.9	0.98	3448	6	3
JH039A-27	65	31	0.49	47	8E-05	0.09	0.4361	0.7	49.7049	2.6	0.8266	2.5	0.18364	3.3	0.97	4038	10	4
JH039A-28	70	40	0.6	40	-3E-05	-0.03	0.2883	0.8	26.3701	2.6	0.6634	2.5	0.17894	3.1	0.95	3408	13	4
JH039A-29	208	202	1	135	4E-05	0.05	0.3558	0.4	36.8351	1.9	0.7509	1.9	0.15632	2.1	0.98	3732	7	3
JH039A-30	256	221	0.89	148	0E+00	0.00	0.2996	0.5	27.6697	1.9	0.6698	1.8	0.1768	2.0	0.96	3468	8	5
JH039A-31	190	89	0.49	110	2E-05	0.02	0.2863	0.5	26.3836	2.0	0.6684	1.9	0.17444	2.3	0.97	3397	8	3
JH039A-32	417	318	0.79	219	9E-05	0.11	0.2762	0.4	23.2846	1.8	0.6113	1.7	0.10816	2.5	0.98	3342	6	9
JH039A-33	201	194	1	124	4E-05	0.05	0.3078	0.5	30.3765	2.0	0.7157	1.9	0.18096	2.6	0.97	3510	7	1
JH039A-34	326	62	0.2	202	1E-05	0.01	0.3407	0.3	33.7662	1.8	0.7188	1.8	0.1641	2.2	0.98	3666	5	5
JH039A-35	230	210	0.94	130	-2E-05	-0.03	0.2868	0.6	25.8967	1.9	0.6548	1.8	0.16973	2.0	0.95	3401	9	5
JH039A-36	245	84	0.36	96	5E-05	0.07	0.1709	0.9	10.6688	2.0	0.4527	1.8	0.10388	2.5	0.90	2567	15	7
JH039A-37	230	316	1.42	126	2E-04	0.24	0.2930	0.5	25.5936	1.9	0.6335	1.9	0.08366	2.3	0.96	3434	8	9

Appendix B Continued.

Spot	U ppm	Th ppm	^{232}Th $/^{238}U$	$^{206}Pb^*$ ppm	^{204}Pb $/^{206}Pb$	% $^{206}Pb_c$	$^{207}Pb^*$ $/^{206}Pb^*$	±%	$^{207}Pb^*$ $/^{235}U$	±%	$^{206}Pb^*$ $/^{238}U$	±%	^{208}Pb $/^{232}Th$	% err	Error corr	^{207}Pb $/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH039A-38	81	81	1.02	48	5E-05	0.06	0.2805	0.8	26.099	2.5	0.6747	2.4	0.17847	2.7	0.95	3366	12	1
JH039A-40	122	93	0.79	51	4E-05	0.05	0.1744	0.9	11.5639	2.3	0.4809	2.1	0.12763	3.2	0.92	2600	16	3
JH039A-41	85	111	1.36	37	1E-04	0.13	0.1791	1.1	12.3325	2.6	0.4993	2.3	0.13452	2.7	0.90	2645	19	1
JH039A-42	144	91	0.65	86	-2E-05	-0.02	0.3046	0.6	29.2788	2.1	0.6971	2.0	0.17854	2.3	0.96	3494	9	2
JH039A-43	209	257	1.27	114	1E-04	0.12	0.2803	0.5	24.6027	2.0	0.6365	1.9	0.09401	2.4	0.96	3365	8	6
JH039A-47	662	79	0.12	197	4E-04	0.61	0.1203	0.8	5.7161	1.8	0.3445	1.7	0.02721	21.2	0.90	1961	15	3
JH039A-48	156	207	1.37	92	-7E-05	-0.09	0.2832	0.6	26.6459	2.1	0.6824	2.0	0.17324	2.2	0.96	3381	9	1
JH039A-49	321	207	0.67	141	2E-05	0.03	0.1843	0.5	12.9942	1.9	0.5114	1.8	0.13672	2.0	0.96	2692	9	1
JH039A-50	260	89	0.35	147	3E-05	0.03	0.2858	0.4	25.7639	1.9	0.6538	1.8	0.12646	2.5	0.97	3395	7	5
JH039A-51	217	97	0.46	93	4E-05	0.05	0.1805	0.7	12.3454	2.0	0.496	1.9	0.13507	2.3	0.94	2658	11	2
JH039A-52	99	125	1.31	56	4E-05	0.04	0.2846	0.7	25.9337	2.4	0.6609	2.3	0.16832	2.5	0.95	3388	11	4
JH039A-54	437	74	0.18	183	3E-05	0.04	0.1783	0.5	11.9445	1.8	0.4858	1.7	0.13252	2.8	0.96	2637	8	3
JH039A-55	533	348	0.68	246	3E-05	0.04	0.1986	0.4	14.7045	1.7	0.537	1.7	0.13803	1.9	0.97	2815	7	2
JH039A-57	110	69	0.65	63	1E-05	0.01	0.2969	0.7	27.1862	2.4	0.6642	2.3	0.17773	2.7	0.95	3454	11	5
JH039A-58	228	195	0.88	134	3E-05	0.04	0.2863	0.5	27.0482	1.9	0.6852	1.9	0.17433	2.1	0.97	3398	7	1
JH039B-02	299	212	0.73	73	2E-04	0.30	0.0997	1.2	3.9071	2.0	0.2843	1.5	0.08002	2.3	0.79	1618	22	0
JH039B-04	630	154	0.25	352	2E-05	0.04	0.3079	0.3	27.552	1.4	0.649	1.4	0.13552	1.7	0.98	3511	4	9
JH039B-05	202	59	0.31	82	5E-05	0.08	0.1646	0.7	10.6922	1.8	0.4712	1.6	0.09661	2.7	0.92	2503	12	1
JH039B-06	205	18	0.09	91	2E-05	0.03	0.1923	0.8	13.6634	1.8	0.5153	1.6	0.12949	3.6	0.89	2762	14	3
JH043-02	49.4	49	1.02	20.4	1E-04	0.18	0.1740	1.5	11.5244	3.1	0.4804	2.7	0.13493	3.4	0.87	2596	26	3
JH043-03	353	138	0.4	157	-7E-06	-0.01	0.1794	0.5	12.7872	1.8	0.5169	1.7	0.13939	2.2	0.96	2648	8	-1
JH043-05	258	78	0.31	153	3E-05	0.03	0.2834	0.4	26.9622	1.9	0.6899	1.8	0.13123	2.5	0.97	3382	7	0
JH043-06	396	276	0.72	216	1E-04	0.13	0.2775	0.4	24.2288	1.8	0.6333	1.7	0.08038	2.1	0.98	3349	6	6
JH043-07	212	169	0.82	127	2E-05	0.02	0.2849	0.5	27.4396	1.9	0.6985	1.9	0.18129	2.0	0.97	3390	7	-1

Appendix B Continued.

Spot	U ppm	Th ppm	^{232}Th /^{238}U	^{206}Pb* ppm	^{204}Pb /^{206}Pb	% ^{206}Pb$_c$	^{207}Pb* /^{206}Pb*	±%	^{207}Pb* /^{235}U	±%	^{206}Pb* /^{238}U	±%	^{208}Pb /^{232}Th	% err	Error corr	^{207}Pb /^{206}Pb Age (Ma)	1σ	% Dis-cor-dance
JH043-08	182	98	0.56	98.6	1E-05	0.01	0.2838	0.5	24.6784	2.0	0.6307	1.9	0.13077	2.3	0.97	3384	8	7
JH043-11	143	81	0.59	82.3	-3E-05	-0.03	0.2837	0.6	26.2898	2.1	0.6722	2.0	0.1779	2.3	0.96	3383	9	2
JH043-12	199	140	0.73	126	6E-05	0.07	0.3372	0.4	34.2028	1.9	0.7357	1.9	0.074	2.6	0.97	3650	7	3
JH043-15	77.7	3	0.05	48	6E-05	0.07	0.3352	0.8	33.1788	2.5	0.7179	2.3	0.18222	15.2	0.95	3641	12	4
JH043-19	42	23	0.56	29	2E-05	0.03	0.3582	0.8	38.9149	2.7	0.7879	2.5	0.20495	3.7	0.95	3742	13	0
JH043-20	327	342	1.08	189	1E-04	0.17	0.2972	0.4	27.4291	1.5	0.6693	1.5	0.16806	1.6	0.97	3456	6	5
JH043-21	199	236	1.23	113	2E-04	0.36	0.2783	0.6	25.2789	1.7	0.6587	1.6	0.13201	3.7	0.94	3354	9	3
JH043-23	165	69	0.43	101	3E-05	0.04	0.2782	0.5	27.1456	1.7	0.7076	1.7	0.12018	2.3	0.96	3353	8	-3
JH043-25	237	87	0.38	142	5E-05	0.07	0.2860	0.4	27.4334	1.6	0.6957	1.6	0.17054	2.0	0.97	3396	6	0
JH043-26	352	187	0.55	259	6E-05	0.10	0.4714	0.2	55.51	1.5	0.8541	1.5	0.17047	1.8	0.99	4154	4	4
JH043-27	228	64	0.29	130	8E-05	0.13	0.2838	0.4	25.9208	1.6	0.6624	1.6	0.13409	3.4	0.96	3384	7	3
JH050-01	246	214	0.9	142	1E-05	0.01	0.2882	0.4	26.7159	1.9	0.6723	1.9	0.16665	2.1	0.98	3408	6	3
JH050-04	410	22	0.06	251	0E+00	0.00	0.3332	0.3	32.7142	1.8	0.712	1.8	0.17632	3.4	0.99	3632	4	5
JH050-05	90	80	0.92	50	3E-05	0.04	0.2879	0.7	25.8498	2.3	0.6512	2.2	0.16347	2.8	0.96	3406	10	5
JH050-06	331	52	0.16	178	2E-05	0.03	0.2773	0.4	23.8967	1.9	0.625	1.8	0.09273	8.4	0.98	3348	6	7
JH050-09	171	5	0.03	105	2E-05	0.03	0.3293	0.5	32.303	2.0	0.7114	2.0	0.16779	8.6	0.96	3614	8	4
JH050-10	211	57	0.28	151	2E-05	0.03	0.4176	0.4	47.724	2.0	0.8288	1.9	0.19722	2.6	0.98	3974	6	2
JH050-12	296	62	0.22	180	1E-05	0.02	0.3135	0.3	30.6103	1.9	0.7082	1.8	0.16713	2.6	0.98	3538	5	3
JH050-14	234	139	0.62	129	-2E-05	-0.03	0.2878	0.4	25.4792	1.9	0.6421	1.9	0.15367	2.2	0.98	3406	6	7
JH050-18	469	6	0.01	282	4E-05	0.06	0.3240	0.3	31.1857	1.8	0.6981	1.8	0.1117	28.5	0.99	3589	4	5
JH050-24	569	201	0.37	299	1E-04	0.18	0.2654	0.8	22.3058	1.9	0.6096	1.7	0.1119	5.8	0.91	3279	12	7
JH050-26	306	194	0.66	170	3E-05	0.05	0.2833	0.4	25.2896	1.9	0.6473	1.8	0.13464	9.5	0.98	3381	6	5
JH050-27	299	60	0.21	168	3E-05	0.05	0.2777	0.4	24.8863	1.9	0.65	1.8	0.15792	2.7	0.98	3350	6	4
JH050-28	121	141	1.2	70	0E+00	0.00	0.2887	0.6	26.6385	2.2	0.6692	2.1	0.15943	3.2	0.97	3411	9	3

Appendix B Continued.

Spot	U ppm	Th ppm	$^{232}Th/^{238}U$	$^{206}Pb^*$ ppm	$^{204}Pb/^{206}Pb$	% $^{206}Pb_c$	$^{207}Pb^*/^{206}Pb^*$	±%	$^{207}Pb^*/^{235}U$	±%	$^{206}Pb^*/^{238}U$	±%	$^{208}Pb/^{232}Th$	% err	Error corr	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH052-02	307	197.5	0.66	170	0E+00	0.00	0.2842	0.3	25.2709	1.5	0.6449	1.5	0.17873	1.8	0.98	3386	5	7
JH052-03	178	89	0.51	102	5E-05	0.09	0.2863	0.4	26.2814	1.7	0.6659	1.7	0.16933	2.3	0.97	3397	7	4
JH052-04	133	53	0.41	74	2E-04	0.28	0.2829	0.5	25.3224	1.9	0.6493	1.8	0.16089	3.3	0.96	3379	8	6
JH052-05	61	42	0.71	34	5E-04	0.85	0.2770	0.9	24.9592	2.5	0.6535	2.3	0.15165	5.1	0.94	3347	13	4
JH052-06	176	94.96	0.55	101	7E-05	0.13	0.2844	0.4	26.0765	1.8	0.6651	1.7	0.17464	4.2	0.97	3387	7	4
JH052-07	83	39.05	0.48	47	1E-04	0.19	0.2763	1.1	24.9734	2.4	0.6554	2.1	0.16495	3.3	0.89	3343	17	3
JH052-09	479	64.97	0.14	268	2E-05	0.03	0.2816	0.3	25.2838	1.4	0.6512	1.4	0.1171	5.1	0.98	3372	4	5
JH052-10	153	143.9	0.97	89	4E-04	0.64	0.3011	0.6	27.9652	2.0	0.6735	2.0	0.16743	2.5	0.96	3477	9	6
JH052-13	275	84	0.32	152	7E-05	0.12	0.2836	0.4	25.08	1.6	0.6415	1.6	0.14794	3.4	0.97	3383	6	7
JH052-14	196	41	0.21	118	7E-05	0.13	0.3076	0.4	29.6701	1.7	0.6995	1.6	0.16149	3.1	0.98	3509	6	3
JH052-15	60	41	0.71	34	3E-04	0.44	0.2830	0.8	25.7201	2.5	0.6592	2.4	0.16568	3.7	0.95	3380	13	4
JH052-16	194	214	1.14	110	2E-04	0.35	0.2839	0.4	25.7375	1.7	0.6574	1.7	0.16763	2.1	0.97	3385	7	5
JH052-17	287	57	0.2	160	2E-04	0.28	0.2867	0.4	25.5696	1.6	0.6468	1.5	0.10369	4.5	0.97	3400	6	7
JH052-18	342	94	0.28	196	6E-05	0.11	0.2839	0.3	26.1078	1.5	0.6669	1.5	0.1595	2.3	0.98	3385	5	3
JH052-19	194	73	0.39	119	5E-05	0.09	0.3191	0.7	31.3871	1.8	0.7135	1.7	0.18155	2.4	0.92	3565	11	3
JH052-20	179	76	0.43	101	1E-04	0.25	0.2757	0.5	24.8306	1.7	0.6533	1.7	0.16396	2.6	0.97	3339	7	4
JH052-21	53	23	0.44	38	1E-04	0.19	0.4544	0.6	52.031	2.5	0.8304	2.5	0.20389	4.0	0.97	4100	9	7
JH052-22	94	32	0.35	55	1E-04	0.25	0.2840	0.6	26.6402	2.1	0.6804	2.0	0.16483	3.9	0.96	3385	10	1
JH052-23	65	28	0.44	47	1E-04	0.23	0.4330	0.6	49.3825	2.3	0.8272	2.3	0.19536	3.7	0.97	4028	8	5
JH052-24	181	107.2	0.61	110	6E-05	0.10	0.3115	0.4	30.2509	1.7	0.7043	1.7	0.17798	2.2	0.97	3529	6	3
JH052-25	415	134.9	0.34	224	6E-05	0.10	0.2830	0.3	24.4563	1.5	0.6267	1.4	0.1335	2.1	0.98	3380	5	9
JH052-33	93	67	0.74	54	9E-05	0.15	0.2792	0.6	25.8638	2.2	0.672	2.1	0.1735	2.8	0.96	3358	10	2
JH052-36	219	155.3	0.73	119	1E-04	0.22	0.2839	0.4	24.8416	1.9	0.6347	1.8	0.15695	2.3	0.97	3384	7	8
JH052-38	94	80	0.87	56	2E-04	0.29	0.2877	0.6	27.1684	3.4	0.6849	3.3	0.17795	4.4	0.98	3405	10	2

Appendix B Continued.

Spot	U ppm	Th ppm	$^{232}Th/^{238}U$	$^{206}Pb^*$ ppm	$^{204}Pb/^{206}Pb$	% $^{206}Pb_c$	$^{207}Pb^*/^{206}Pb^*$	±%	$^{207}Pb^*/^{235}U$	±%	$^{206}Pb^*/^{238}U$	±%	$^{208}Pb/^{232}Th$	% err	Error corr	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH052-40	89	30.99	0.36	66	2E-05	0.03	0.4411	0.5	52.0383	2.2	0.8557	2.1	0.21304	3.3	0.98	4055	7	2
JH052-44	129	62.32	0.5	77	3E-05	0.06	0.2831	0.5	26.8589	2.0	0.688	1.9	0.17975	2.7	0.96	3380	8	0
JH052-49	144	98	0.7	92	1E-04	0.19	0.3252	0.5	33.4612	1.9	0.7463	1.8	0.19043	2.9	0.97	3595	7	0
JH052-50	323	79	0.25	199	2E-04	0.28	0.3002	0.3	29.6496	1.6	0.7162	1.5	0.17328	3.2	0.98	3472	5	0
JH052-52	226	72	0.33	159	4E-05	0.07	0.4062	3.2	45.6017	5.3	0.8142	4.3	0.18102	5.4	0.80	3932	48	3
JH052-53	117	65	0.57	72	5E-05	0.08	0.3202	0.5	31.5551	2.0	0.7147	1.9	0.1795	3.0	0.97	3571	8	3
JH052-56	87	45.02	0.53	53	6E-05	0.11	0.3170	0.6	30.745	2.2	0.7035	2.1	0.17516	3.1	0.96	3555	9	4
JH052-57	357	111.9	0.32	203	1E-04	0.21	0.2972	0.3	27.0728	1.5	0.6606	1.5	0.14093	2.4	0.98	3456	5	7
JH052-58	46	27.99	0.62	26	9E-04	1.57	0.2753	1.2	25.0578	3.0	0.6601	2.8	0.14155	6.7	0.92	3338	18	2
JH052-59	120	35.03	0.3	72	5E-05	0.09	0.2838	0.5	27.0685	2.0	0.6917	2.0	0.18099	3.6	0.96	3384	8	0
JH055-01	66	10	0.17	37	3E-05	0.06	0.2898	0.6	25.6977	1.9	0.6431	1.8	0.14675	4.2	0.94	3417	10	8
JH055-02	218	141	0.67	127	5E-05	0.09	0.3052	0.3	28.6415	1.3	0.6806	1.3	0.17087	1.7	0.95	3497	5	5
JH055-03	305	191	0.65	150	-2E-05	-0.03	0.2315	0.3	18.165	1.2	0.569	1.2	0.14569	1.5	0.94	3063	5	6
JH055-05	125	51	0.42	70	0E+00	0.00	0.2824	0.8	25.1515	2.4	0.6459	2.3	0.16445	2.7	0.94	3376	12	6
JH055-06	329	71	0.22	185	2E-05	0.04	0.2846	0.3	25.652	1.2	0.6538	1.2	0.16366	1.8	0.97	3388	4	5
JH055-07	156	40	0.26	109	2E-05	0.04	0.4198	0.3	46.6557	1.4	0.806	1.4	0.19374	2.2	0.97	3982	4	6
JH055-08	122	115	0.98	69	5E-05	0.08	0.2828	0.4	25.8065	1.5	0.6617	1.5	0.15265	2.0	0.92	3379	7	4
JH055-10	131	81	0.64	103	-3E-05	-0.06	0.4993	0.3	62.5553	2.4	0.9086	2.4	0.21477	2.7	0.98	4239	4	2
JH055-12	224	252	1.16	126	3E-05	0.06	0.2811	0.3	25.267	1.3	0.6518	1.3	0.16598	1.5	0.92	3369	5	5
JH055-13	127	112	0.91	72	0E+00	0.00	0.2868	0.4	25.949	1.5	0.6563	1.5	0.16949	1.8	0.93	3400	7	6
JH055-14	149	87	0.6	86	3E-05	0.05	0.2825	0.4	26.1469	1.5	0.6713	1.4	0.17419	1.9	0.94	3377	6	2
JH055-15	133	223	1.73	76	-2E-05	-0.04	0.2853	0.4	26.2576	1.5	0.6675	1.5	0.17232	1.7	0.88	3392	7	4
JH055-16	104	94	0.94	60	4E-05	0.07	0.2849	0.6	26.258	1.7	0.6685	1.6	0.17093	2.0	0.90	3390	9	3
JH055-17	119	53	0.46	66	-6E-05	-0.11	0.2747	0.4	24.3284	1.6	0.6423	1.5	0.16842	2.5	0.94	3333	7	5

Appendix B Continued.

Spot	U ppm	Th ppm	$^{232}Th/^{238}U$	$^{206}Pb^{*}$ ppm	$^{204}Pb/^{206}Pb$	% $^{206}Pb_{c}$	$^{207}Pb^{*}/^{206}Pb^{*}$	±%	$^{207}Pb^{*}/^{235}U$	±%	$^{206}Pb^{*}/^{238}U$	±%	$^{208}Pb/^{232}Th$	% err	Error corr	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH055-18	409	385	0.97	226	4E-05	0.07	0.2829	0.2	25.0575	1.8	0.6423	1.8	0.14064	1.9	0.97	3379	4	7
JH055-19	254	7	0.03	162	5E-05	0.09	0.3406	0.3	34.9442	1.4	0.744	1.3	0.05961	23.5	0.98	3666	4	3
JH055-20	211	265	1.29	124	5E-05	0.10	0.3015	0.3	28.2684	1.3	0.6799	1.3	0.17202	1.5	0.92	3478	5	5
JH055-21	165	74	0.46	94	-1E-05	-0.01	0.2840	0.4	25.8442	1.4	0.6599	1.4	0.17021	1.9	0.95	3385	6	4
JH055-23	92	91	1.02	55	2E-04	0.30	0.2915	0.5	27.7165	1.7	0.6895	1.6	0.17182	2.2	0.92	3426	8	2
JH055-24	349	164	0.49	189	3E-05	0.05	0.2663	0.6	23.1037	1.3	0.6292	1.2	0.15063	3.1	0.85	3284	10	5
JH055-25	154	63	0.43	100	4E-05	0.06	0.3532	0.4	36.8148	1.5	0.7559	1.4	0.15046	21.0	0.89	3721	6	3
JH055-26	130	86	0.68	78	4E-05	0.07	0.2835	0.5	27.0448	1.9	0.6918	1.8	0.18095	2.3	0.97	3383	8	0
JH055-27	423	58	0.14	248	2E-05	0.04	0.2812	0.3	26.3627	1.4	0.6798	1.4	0.16084	4.2	0.98	3370	4	1
JH055-29	27	37	1.36	16	1E-04	0.21	0.2797	1.1	26.4525	3.3	0.686	3.1	0.178	3.9	0.95	3361	16	0
JH055-31	126	55	0.45	80	7E-05	0.12	0.3298	0.4	33.5255	1.9	0.7372	1.8	0.19349	2.7	0.97	3616	7	2
JH055-32	92	35	0.39	53	7E-05	0.12	0.2831	0.6	26.2015	2.1	0.6714	2.0	0.17194	4.2	0.96	3380	9	3
JH055-33	176	55	0.32	102	4E-05	0.07	0.2842	0.4	26.3889	1.7	0.6735	1.7	0.17692	2.5	0.97	3386	6	3
JH055-35	345	78	0.23	204	1E-05	0.02	0.2852	0.3	27.0253	1.5	0.6873	1.5	0.18061	2.0	0.98	3391	4	1
JH055-36	61	26	0.44	36	5E-05	0.09	0.2810	0.7	26.1356	2.4	0.6746	2.3	0.16352	3.5	0.96	3369	11	2
JH055-37	193	51	0.27	116	0E+00	0.00	0.2857	0.4	27.4037	1.7	0.6956	1.7	0.18393	2.4	0.97	3395	6	0
JH055-38	118	110	0.96	68	7E-05	0.13	0.2822	0.5	26.0531	1.9	0.6696	1.9	0.15861	2.5	0.96	3375	8	3
JH055-39	127	66	0.53	82	2E-05	0.04	0.3343	1.1	34.659	2.1	0.752	1.8	0.19901	7.7	0.87	3637	16	1
JH055-40	200	58	0.3	116	2E-05	0.03	0.2846	0.4	26.5487	1.7	0.6765	1.6	0.17468	2.4	0.97	3388	6	2
JH055-42	322	147	0.47	189	3E-05	0.06	0.2869	0.3	26.9029	1.5	0.6802	1.5	0.17358	2.0	0.98	3401	5	2
JH055-43	106	58	0.56	81	0E+00	0.00	0.4796	0.4	58.4334	1.9	0.8837	1.9	0.22394	2.4	0.98	4180	6	3
JH055-44	36	26	0.73	23	2E-04	0.30	0.3302	0.9	33.9591	2.9	0.7458	2.8	0.18904	4.1	0.96	3618	13	1
JH055-45	384	225	0.6	219	6E-04	1.07	0.3004	0.3	27.5472	1.5	0.665	1.4	0.14954	2.2	0.98	3473	5	7
JH055-48	307	133	0.45	178	2E-05	0.04	0.2809	0.4	26.1108	1.6	0.6742	1.5	0.16684	2.9	0.97	3368	6	2

Appendix B Continued.

Spot	U ppm	Th ppm	$^{232}Th/^{238}U$	$^{206}Pb^*$ ppm	$^{204}Pb/^{206}Pb$	% $^{206}Pb_c$	$^{207}Pb^*/^{206}Pb^*$	±%	$^{207}Pb^*/^{235}U$	±%	$^{206}Pb^*/^{238}U$	±%	$^{208}Pb/^{232}Th$	% err	Error corr	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH055-50	69	7	0.1	39	1E-04	0.18	0.2730	0.8	24.72	2.4	0.6566	2.2	0.15124	9.8	0.94	3324	13	3
JH055-51	186	203	1.12	129	1E-04	0.24	0.4078	0.3	45.2861	2.7	0.8053	2.7	0.12315	3.1	0.99	3938	5	4
JH055-52	205	78	0.39	116	1E-04	0.19	0.2810	0.4	25.408	1.7	0.6559	1.6	0.16216	2.5	0.97	3368	6	4
JH055-53	44	86	2	26	1E-04	0.20	0.2813	0.8	26.2388	2.8	0.6764	2.6	0.17781	3.1	0.95	3371	13	1
JH055-55	307	284	0.96	170	2E-04	0.30	0.2830	0.3	25.1468	1.6	0.6446	1.5	0.13042	2.0	0.98	3379	5	6
JH055-56	340	101	0.31	190	5E-05	0.10	0.2762	0.3	24.7742	2.2	0.6507	2.2	0.11853	8.7	0.99	3341	5	4
JH055-57	148	123.4	0.86	84	4E-05	0.08	0.2774	0.4	25.1569	1.8	0.6577	1.7	0.17185	2.1	0.97	3348	7	3
JH055-58	107	172.3	1.65	63	4E-05	0.08	0.2835	0.5	26.539	2.0	0.679	1.9	0.17254	2.2	0.97	3382	8	2
JH055-62	152	68	0.46	91	-3E-05	-0.06	0.2867	0.4	27.5287	1.8	0.6965	1.8	0.18194	3.3	0.97	3400	7	0
JH055-63	262	254	1	187	9E-05	0.17	0.4284	0.3	49.0947	1.6	0.8312	1.6	0.18892	2.4	0.98	4012	4	4
JH055-64	136	64	0.48	85	1E-04	0.19	0.3289	0.5	32.8408	2.1	0.7242	2.1	0.16253	3.0	0.97	3612	7	4
JH055-65	207	268	1.33	122	2E-05	0.03	0.2861	0.4	27	1.7	0.6845	1.7	0.17916	3.6	0.97	3397	6	1
JH055-67	393	161	0.42	216	9E-05	0.16	0.2666	0.3	23.533	1.5	0.6402	1.5	0.06487	7.6	0.98	3286	5	4
JH055-68	131	165	1.29	81	-3E-05	-0.05	0.3043	0.5	29.9838	2.0	0.7147	1.9	0.18833	2.2	0.97	3492	8	1
JH055-70	67	61	0.93	40	3E-05	0.05	0.2823	0.7	26.9874	2.5	0.6933	2.4	0.17811	3.0	0.96	3376	11	-1
JH055-72	77	72	0.97	47	2E-04	0.37	0.2850	0.7	27.6165	2.4	0.7029	2.3	0.17682	3.0	0.95	3391	11	-2
JH055-74	242	55	0.24	125	8E-05	0.14	0.2518	0.4	20.819	1.7	0.5996	1.6	0.17915	4.1	0.97	3196	7	7
JH055-75	66	36	0.56	49	9E-05	0.15	0.4225	0.6	49.92	2.4	0.857	2.3	0.21359	3.3	0.97	3991	8	0
JH055-76	197	71	0.37	109	2E-04	0.36	0.2822	0.4	24.964	1.9	0.6415	1.9	0.0849	10.2	0.97	3376	7	7
JH055-79	177	152	0.88	99	3E-05	0.06	0.2823	0.4	25.2165	1.8	0.6479	1.7	0.12475	2.4	0.97	3376	7	6
JH055-80	278	82	0.31	165	2E-05	0.03	0.2873	0.3	27.3975	1.6	0.6916	1.6	0.18016	2.2	0.98	3403	5	1
JH055-81	66	45	0.7	39	0E+00	0.00	0.2810	0.7	26.2087	2.4	0.6765	2.3	0.17265	3.0	0.96	3368	11	1
JH055-82	155	108	0.72	89	3E-05	0.06	0.2846	0.4	26.2321	1.8	0.6684	1.8	0.17124	2.2	0.97	3389	7	3
JH055-83	126	86	0.71	70	7E-05	0.12	0.2819	0.5	25.041	1.9	0.6442	1.8	0.1527	2.4	0.97	3374	8	6

Appendix B Continued.

Spot	U ppm	Th ppm	^{232}Th $/^{238}U$	$^{206}Pb^{*}$ ppm	^{204}Pb $/^{206}Pb$	% $^{206}Pb_{c}$	$^{207}Pb^{*}$ $/^{206}Pb^{*}$	±%	$^{207}Pb^{*}$ $/^{235}U$	±%	$^{206}Pb^{*}$ $/^{238}U$	±%	^{208}Pb $/^{232}Th$	% err	Error corr	^{207}Pb $/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH055-84	66	48	0.74	37	-7E-05	-0.13	0.2893	0.7	25.9077	2.3	0.6494	2.2	0.16995	3.0	0.96	3414	10	7
JH055-85	153	90	0.61	86	0E+00	0.00	0.2810	0.4	25.2568	1.8	0.652	1.8	0.16146	2.2	0.97	3368	7	5
JH055-86	75	116	1.6	43	9E-05	0.16	0.2808	0.6	25.594	2.3	0.6611	2.2	0.16616	2.6	0.96	3367	10	4
JH055-87	113	84	0.77	66	8E-05	0.14	0.3202	0.6	30.0165	2.0	0.6798	1.9	0.09472	2.9	0.95	3571	9	8
JH055-88	295	8	0.03	167	0E+00	0.00	0.2798	0.4	25.4281	1.6	0.659	1.5	0.16381	8.6	0.97	3362	6	4
JH071-01	52	43	0.86	31	2E-04	0.37	0.2965	0.6	28.2991	1.9	0.6922	1.8	0.17236	2.6	0.92	3452	9	2
JH071-02	252	248	1.02	139	1E-04	0.20	0.2822	0.3	24.9148	1.2	0.6403	1.2	0.16653	1.9	0.90	3375	4	7
JH071-03	132	71	0.55	78	7E-05	0.13	0.2998	0.4	28.3814	1.4	0.6867	1.4	0.16906	1.9	0.95	3469	6	4
JH071-05	293	235	0.83	172	-1E-05	-0.01	0.2957	0.2	27.7632	1.2	0.681	1.2	0.16523	12.4	0.90	3448	4	4
JH071-06	113	99	0.9	67	3E-04	0.51	0.3082	0.4	29.0865	1.5	0.6845	1.4	0.09285	2.9	0.93	3512	7	5
JH071-08	309	406	1.36	187	7E-05	0.12	0.3018	0.2	29.2296	1.2	0.7024	1.2	0.17672	1.6	0.90	3480	4	2
JH071-09	184	108	0.61	107	8E-05	0.14	0.2960	0.3	27.6314	1.3	0.6771	1.3	0.16725	1.7	0.95	3449	5	4
JH071-10	240	237	1.02	141	7E-05	0.12	0.2998	0.3	28.1847	1.2	0.6818	1.2	0.17659	2.1	0.90	3469	4	4
JH071-11	247	117	0.49	139	5E-05	0.08	0.2799	0.3	25.2906	1.3	0.6553	1.2	0.16667	2.9	0.93	3363	5	4
JH071-12	309	106	0.36	174	3E-04	0.46	0.2879	1.1	25.9581	1.6	0.6538	1.2	0.04518	17.0	0.76	3407	17	6
JH071-14	259	119	0.48	152	1E-04	0.21	0.2917	0.3	27.544	1.2	0.6849	1.2	0.16252	3.3	0.93	3427	4	2
JH071-15	410	372	0.94	224	7E-05	0.12	0.2809	0.2	24.5525	1.1	0.6338	1.1	0.16505	2.1	0.90	3368	4	8
JH071-17	75	42	0.58	43	4E-04	0.71	0.2856	0.6	26.1584	1.8	0.6644	1.7	0.15472	3.1	0.94	3394	9	4
JH071-19	74	34	0.47	44	2E-04	0.33	0.3038	0.5	28.7971	1.8	0.6875	1.7	0.17092	2.9	0.94	3490	8	4
JH071-20	182	197	1.12	105	1E-04	0.17	0.3008	0.3	27.7572	1.3	0.6692	1.3	0.14414	1.9	0.92	3474	5	6
JH071-21	88	51	0.6	52	2E-04	0.30	0.2960	0.5	27.8745	1.7	0.6829	1.6	0.16782	2.5	0.94	3450	8	3
JH071-22	252	58	0.24	143	2E-05	0.04	0.2818	0.3	25.6543	1.2	0.6602	1.2	0.15047	2.0	0.97	3373	4	4
JH071-25	457	101	0.23	254	6E-05	0.11	0.2786	0.2	24.8005	1.2	0.6457	1.2	0.13006	11.4	0.90	3355	3	5
JH071-26	200	58	0.3	125	7E-05	0.12	0.3417	0.3	34.1194	1.3	0.7241	1.3	0.18076	3.4	0.96	3671	4	6

Appendix B Continued.

Spot	U ppm	Th ppm	$^{232}Th/^{238}U$	$^{206}Pb^*$ ppm	$^{204}Pb/^{206}Pb$	% $^{206}Pb_c$	$^{207}Pb^*/^{206}Pb^*$	±%	$^{207}Pb^*/^{235}U$	±%	$^{206}Pb^*/^{238}U$	±%	$^{208}Pb/^{232}Th$	% err	Error corr	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH071-27	110	118	1.1	64	2E-04	0.28	0.2829	0.5	26.2916	1.6	0.674	1.5	0.16784	1.9	0.92	3379	7	2
JH071-29	82	69	0.86	44	2E-04	0.40	0.2741	0.5	23.5541	1.7	0.6233	1.6	0.15862	2.2	0.92	3329	8	8
JH071-30	213	116	0.56	120	2E-05	0.04	0.2853	0.3	25.8027	1.3	0.6559	1.3	0.15056	1.8	0.95	3392	5	5
JH076-01	265	74	0.29	151	2E-05	0.04	0.2838	0.3	25.9356	1.2	0.6628	1.2	0.17306	1.8	0.97	3384	4	4
JH076-04	196	111	0.59	110	0E+00	0.00	0.2834	0.3	25.5359	1.4	0.6536	1.3	0.16692	2.3	0.93	3382	5	5
JH076-06	252	35	0.15	141	0E+00	0.01	0.2824	0.3	25.3855	1.3	0.6519	1.2	0.16431	3.9	0.96	3376	5	5
JH076-09	457	423	0.96	226	7E-05	0.12	0.2405	0.3	19.1138	1.8	0.5764	1.7	0.13061	1.9	0.97	3123	4	8
JH096-01	118	116	1.02	49	1E-04	0.22	0.1675	0.8	11.2179	1.8	0.4858	1.6	0.11819	2.5	0.89	2533	14	-1
JH096-02	1163	123	0.11	497	0E+00	0.00	0.1690	1.2	11.5955	1.9	0.4975	1.5	0.11708	3.2	0.80	2548	19	-3
JH096-03	781	97	0.13	498	2E-05	0.04	0.3051	0.2	31.2011	1.1	0.7416	1.1	0.1663	2.1	0.98	3497	4	-3
JH096-04	506	292	0.6	205	3E-05	0.06	0.1616	1.2	10.5142	2.1	0.4718	1.7	0.11122	3.7	0.82	2473	20	-1
JH145-01	375	178	0.49	209	3E-05	0.06	0.2583	0.8	23.125	1.4	0.6494	1.2	0.15212	3.0	0.84	3236	12	0
JH145-02	218	144	0.68	122	8E-05	0.14	0.2712	0.4	24.2523	1.4	0.6486	1.3	0.15346	2.4	0.96	3313	6	3
JH145-03	281	126	0.46	156	1E-05	0.02	0.2646	0.4	23.568	1.3	0.6459	1.2	0.14427	2.1	0.95	3275	7	2
JH145-05	69	73	1.1	39	1E-04	0.19	0.2598	0.7	23.4962	2.2	0.6559	2.0	0.147	3.9	0.94	3246	12	0
JH145-06	616	275	0.46	339	3E-05	0.05	0.2595	0.7	22.9175	1.3	0.6405	1.0	0.14704	1.4	0.82	3244	11	2
JH145-07	197	148	0.77	101	8E-05	0.14	0.2414	0.4	19.6814	1.4	0.5913	1.3	0.13603	1.8	0.95	3129	7	5
JH145-08	180	160	0.92	135	4E-05	0.07	0.4603	1.5	55.3562	2.0	0.8723	1.4	0.17951	2.3	0.68	4119	22	2
JH145-09	85	110	1.33	48	0E+00	0.00	0.2608	0.6	23.5406	2.0	0.6546	1.9	0.15275	2.3	0.95	3252	10	0
JH145-10	87	112	1.33	50	4E-05	0.07	0.2671	1.3	24.3215	2.2	0.6604	1.8	0.14978	3.7	0.82	3289	20	1
JH145-11	51	31	0.64	36	-3E-05	-0.05	0.3797	0.6	42.5606	2.4	0.8129	2.3	0.1815	5.2	0.96	3831	10	0
JH145-12	122	50	0.43	70	3E-05	0.05	0.2632	0.6	23.9857	1.7	0.6609	1.6	0.15199	2.6	0.93	3266	10	0
JH145-13	191	210	1.14	112	3E-05	0.05	0.2902	0.4	27.3026	1.4	0.6824	1.4	0.11479	3.2	0.96	3419	6	2
JH145-15	317	252	0.82	177	6E-05	0.11	0.2643	0.3	23.6411	1.2	0.6488	1.2	0.15241	2.0	0.96	3272	5	2

Appendix B Continued.

Spot	U ppm	Th ppm	^{232}Th /^{238}U	^{206}Pb* ppm	^{204}Pb /^{206}Pb	% ^{206}Pb$_c$	^{207}Pb* /^{206}Pb*	±%	^{207}Pb* /^{235}U	±%	^{206}Pb* /^{238}U	±%	^{208}Pb /^{232}Th	% err	Error corr	^{207}Pb /^{206}Pb Age (Ma)	1σ	% Dis- cor- dance
JH145-16	137	87	0.66	77	1E-05	0.02	0.2684	1.5	24.2474	2.2	0.6553	1.5	0.15763	2.1	0.71	3296	24	2
JH145-18	197	152	0.8	117	3E-05	0.06	0.2736	1.7	26.017	2.2	0.6897	1.3	0.15931	2.6	0.62	3327	27	-2
JH145-19	82	55	0.69	46	5E-05	0.08	0.2541	0.7	22.5875	2.0	0.6447	1.9	0.16152	2.9	0.94	3210	10	0
JH145-20	945	126	0.14	485	1E-05	0.01	0.2616	0.2	21.5455	1.0	0.5974	1.0	0.13414	1.6	0.98	3256	3	9
JH145-21	208	274	1.36	120	3E-05	0.05	0.2685	0.4	24.785	1.4	0.6696	1.4	0.15602	2.3	0.96	3297	6	0
JH145-22	381	269	0.73	228	5E-05	0.10	0.3077	1.3	29.5497	1.7	0.6964	1.1	0.12429	1.6	0.65	3510	20	4
JH145-24	230	2	0.01	148	3E-05	0.05	0.3337	0.3	34.4412	1.3	0.7486	1.3	0.144	21.8	0.97	3634	5	1
JH149-01	355	272	0.79	220	3E-05	0.05	0.3050	0.4	30.2843	2.4	0.7202	2.4	0.19375	2.5	0.99	3496	5	0
JH149-02	160	157	1.02	94	6E-05	0.11	0.3006	0.4	28.2961	2.3	0.6827	2.3	0.09986	3.5	0.98	3473	7	4
JH149-03	103	70	0.7	60	-3E-05	-0.05	0.2835	0.6	26.5513	2.5	0.6792	2.4	0.18709	2.6	0.97	3382	9	2
JH149-04	111	136	1.27	67	-6E-05	-0.11	0.3076	0.6	29.9538	2.5	0.7063	2.4	0.19358	2.5	0.97	3509	10	2
JH149-05	318	53	0.17	188	2E-05	0.03	0.2999	0.3	28.4526	2.2	0.6881	2.2	0.18831	4.0	0.99	3470	5	3
JH149-06	161	297	1.91	94	4E-05	0.08	0.2806	0.4	26.4067	2.3	0.6826	2.3	0.18502	2.4	0.98	3366	7	0
JH149-08	212	55	0.27	124	5E-05	0.09	0.2920	0.4	27.338	2.3	0.6791	2.2	0.1884	8.2	0.98	3428	6	3
JH149-09	79	61	0.8	47	1E-04	0.22	0.2878	0.7	27.6782	2.6	0.6975	2.5	0.18698	2.9	0.97	3406	10	0
JH149-11	124	71	0.59	74	5E-05	0.10	0.2831	0.5	26.9109	2.4	0.6894	2.3	0.18682	2.6	0.98	3380	8	0
JH149-12	48	25	0.55	30	9E-05	0.15	0.2956	0.8	29.1793	2.8	0.7158	2.7	0.18862	3.4	0.96	3448	13	-1
JH149-14	35	23	0.69	21	4E-05	0.08	0.2860	1.0	27.9046	3.1	0.7075	2.9	0.19652	3.6	0.95	3396	16	-2
JH149-16	360	284	0.82	239	3E-05	0.05	0.3567	0.3	38.0373	2.2	0.7734	2.2	0.20897	2.2	0.99	3736	4	1
JH149-17	192	90	0.48	119	5E-05	0.09	0.3059	0.4	30.355	2.3	0.7196	2.3	0.193	2.5	0.98	3501	6	0
JH149-18	741	194	0.27	440	3E-05	0.06	0.3404	0.3	32.4159	2.2	0.6908	2.1	0.05501	4.8	0.99	3664	4	10
JH149-19	261	280	1.11	150	2E-05	0.03	0.2850	0.3	26.3613	2.2	0.6707	2.2	0.18333	2.3	0.99	3391	5	3
JH149-20	81	61	0.77	47	5E-05	0.09	0.2881	0.6	26.6073	2.7	0.6698	2.6	0.18529	2.9	0.97	3407	10	4
JH149-21	174	175	1.04	102	-1E-05	-0.02	0.2806	0.4	26.2562	2.3	0.6786	2.3	0.18532	2.4	0.98	3366	7	1

Appendix B Continued.

Spot	U ppm	Th ppm	$^{232}Th/^{238}U$	$^{206}Pb^*$ ppm	$^{204}Pb/^{206}Pb$	% $^{206}Pb_c$	$^{207}Pb^*/^{206}Pb^*$	±%	$^{207}Pb^*/^{235}U$	±%	$^{206}Pb^*/^{238}U$	±%	$^{208}Pb/^{232}Th$	% err	Error corr	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH149-22	235	89	0.39	137	-1E-05	-0.02	0.2763	0.4	25.7979	2.2	0.6771	2.2	0.18232	2.4	0.99	3342	6	0
JH149-24	252	73	0.3	156	6E-05	0.10	0.3298	0.8	32.8199	2.3	0.7217	2.2	0.15364	2.6	0.94	3616	12	4
JH149-25	151	106	0.72	92	4E-05	0.06	0.3040	0.4	29.7269	2.3	0.7092	2.3	0.14076	3.0	0.98	3491	7	1
JH149-26	433	208	0.5	249	2E-05	0.04	0.2734	0.3	25.1977	2.2	0.6685	2.2	0.1819	2.2	0.99	3326	4	1
JH149-27	85	60	0.73	50	5E-05	0.10	0.2755	0.6	25.5234	2.5	0.672	2.4	0.12923	4.3	0.97	3337	10	1
JH149-28	308	156	0.52	185	2E-05	0.03	0.2952	0.6	28.5144	2.3	0.7006	2.2	0.1908	2.3	0.96	3445	10	1
JH149-29	34	21	0.64	21	0E+00	0.00	0.2851	1.0	27.3924	3.1	0.6969	2.9	0.19141	4.4	0.95	3391	15	-1
JH149-30	249	82	0.34	140	4E-05	0.08	0.2669	0.4	24.0212	2.2	0.6529	2.2	0.18275	2.6	0.99	3288	6	2
JH149-31	176	92	0.54	112	4E-05	0.07	0.3012	0.4	30.7556	2.3	0.7406	2.3	0.19561	2.5	0.98	3476	6	-4
JH149-32	64	52	0.83	38	1E-04	0.20	0.2859	0.7	27.0179	2.7	0.6853	2.5	0.18412	3.0	0.96	3396	11	1
JH149-33	87	33	0.39	64	1E-04	0.22	0.4340	0.5	51.1065	2.5	0.8541	2.4	0.21924	3.2	0.98	4031	7	2
JH149-36	333	339	1.05	196	3E-05	0.06	0.2760	0.3	25.9984	2.2	0.6832	2.2	0.18498	2.2	0.99	3340	5	-1
JH149-38	333	16	0.05	218	0E+00	-0.01	0.3387	0.3	35.4826	2.2	0.7597	2.2	0.19396	9.3	0.99	3657	4	0
JH149-39	128	90	0.73	87	-1E-05	-0.02	0.3596	0.5	38.9458	2.4	0.7854	2.3	0.198	2.5	0.98	3748	7	0
JH149-41	71	53	0.78	42	9E-05	0.15	0.2812	0.7	26.5733	2.6	0.6854	2.5	0.18732	2.9	0.96	3370	11	0
JH149-42	294	255	0.89	181	2E-05	0.04	0.3013	0.3	29.6464	2.2	0.7137	2.2	0.193	2.3	0.99	3477	5	0
JH149-43	172	159	0.96	106	1E-05	0.02	0.3040	0.4	30.0729	2.3	0.7174	2.3	0.19545	2.4	0.98	3491	7	0
JH149-45	432	434	1.04	240	4E-05	0.07	0.2815	0.3	25.056	2.3	0.6455	2.3	0.15969	3.1	0.99	3371	5	6
JH149-46	358	72	0.21	215	5E-05	0.08	0.3216	0.9	30.9154	2.4	0.6972	2.2	0.18675	2.5	0.92	3578	14	6
JH149-48	133	56	0.44	82	0E+00	0.00	0.2995	0.5	29.7595	2.4	0.7207	2.3	0.19631	2.6	0.98	3467	7	-1
JH149-51	88	63	0.74	55	5E-05	0.09	0.3010	0.6	29.6377	2.5	0.714	2.4	0.19098	2.7	0.97	3476	9	0
JH149-55	252	217	0.89	152	-1E-05	-0.01	0.2855	0.4	27.5855	2.2	0.7008	2.2	0.19134	2.4	0.99	3393	6	-1
JH149-56	54	54	1.03	31	5E-05	0.10	0.2819	0.8	26.0777	2.7	0.671	2.6	0.18862	3.0	0.96	3373	13	2
JH149-59	228	62	0.28	134	1E-05	0.02	0.2860	0.4	26.9545	2.2	0.6836	2.2	0.19151	2.6	0.99	3396	6	1

Appendix B Continued.

Spot	U ppm	Th ppm	^{232}Th $/^{238}U$	$^{206}Pb^{*}$ ppm	^{204}Pb $/^{206}Pb$	% $^{206}Pb_c$	$^{207}Pb^{*}$ $/^{206}Pb^{*}$	±%	$^{207}Pb^{*}$ $/^{235}U$	±%	$^{206}Pb^{*}$ $/^{238}U$	±%	^{208}Pb $/^{232}Th$	% err	Error corr	^{207}Pb $/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH149-60	44	22	0.51	27	2E-04	0.34	0.2826	0.9	27.4662	2.9	0.7049	2.7	0.18266	4.0	0.95	3378	14	-2
JH149-61	169	101	0.62	116	5E-05	0.09	0.4286	0.4	46.8717	2.3	0.7932	2.3	0.20961	2.5	0.99	4012	6	8
JH149-62	123	142	1.19	76	6E-05	0.10	0.3011	0.5	29.8914	2.4	0.7201	2.3	0.19316	2.5	0.98	3476	8	-1
JH149-63	66	31	0.49	43	1E-04	0.25	0.3200	1.2	33.4332	2.8	0.7578	2.5	0.20022	3.3	0.90	3570	19	-3
JH149-64	260	341	1.35	153	2E-05	0.03	0.2799	0.4	26.4659	2.2	0.6857	2.2	0.1866	2.4	0.99	3362	6	0
JH149-65	82	102	1.29	52	7E-05	0.12	0.3061	0.6	31.2414	2.5	0.7402	2.4	0.19872	2.7	0.97	3502	9	-3
JH149-69	145	65	0.47	107	-1E-05	-0.02	0.3921	0.4	46.1494	2.4	0.8537	2.4	0.23212	2.7	0.99	3879	6	-3
JH149-70	72	45	0.65	50	0E+00	0.00	0.3580	0.6	39.3314	2.6	0.7967	2.5	0.21171	2.8	0.97	3742	9	-1
JH149-72	84	82	1.01	50	1E-04	0.23	0.2763	0.7	26.3259	2.6	0.6911	2.5	0.18506	2.8	0.96	3342	11	-2
JH149-73	176	59	0.35	106	7E-05	0.13	0.3063	0.4	29.5022	2.3	0.6986	2.3	0.18353	2.7	0.98	3502	6	3
JH149-75	261	17	0.07	165	1E-05	0.01	0.3062	0.3	30.981	2.2	0.7339	2.2	0.1897	3.1	0.99	3502	5	-2
JH149-76	218	262	1.24	134	1E-05	0.01	0.3036	0.4	29.8863	2.3	0.7139	2.2	0.19451	2.3	0.99	3489	6	1
JH149-77	80	73	0.94	50	8E-05	0.15	0.3050	1.1	30.4032	2.7	0.7229	2.4	0.19627	2.8	0.91	3496	17	0
JH149-78	139	198	1.47	84	5E-05	0.09	0.2737	0.5	26.4596	2.3	0.7011	2.3	0.19067	2.4	0.98	3327	8	-4
JH149-79	91	88	1	55	2E-05	0.03	0.2849	0.6	27.4597	2.5	0.6991	2.4	0.19084	3.1	0.97	3390	9	-1
JH149-81	460	159	0.36	279	4E-05	0.07	0.3002	0.3	29.2314	2.2	0.7061	2.1	0.06163	2.7	0.99	3471	4	1
JH149-82	267	254	0.98	154	-1E-05	-0.01	0.2790	0.4	25.8073	2.2	0.6708	2.2	0.18191	2.3	0.99	3357	5	2
JH149-84	181	118	0.67	115	-1E-05	-0.03	0.3194	0.4	32.48	2.3	0.7376	2.2	0.20015	2.4	0.98	3567	6	0
JH149-85	213	327	1.58	125	6E-05	0.10	0.2856	0.4	26.9012	2.3	0.683	2.2	0.14262	2.3	0.98	3394	6	1
JH149-87	188	145	0.8	116	3E-05	0.05	0.3001	0.4	29.5806	2.3	0.7149	2.2	0.19405	2.4	0.99	3471	6	0
JH149-89	253	239	0.97	147	4E-05	0.06	0.3029	0.3	28.1385	2.2	0.6738	2.2	0.1744	3.8	0.99	3485	5	6
JH149-90	173	38	0.23	104	1E-05	0.03	0.3007	0.4	28.7984	2.3	0.6946	2.2	0.19296	2.6	0.98	3474	6	3
JH149-91	151	186	1.27	85	5E-05	0.08	0.2652	0.5	23.993	2.3	0.6561	2.3	0.17889	2.4	0.98	3278	7	1
JH151-02	381	70	0.19	217	0E+00	0.01	0.2735	0.3	24.9922	1.6	0.6628	1.6	0.23288	2.2	0.98	3326	5	2

Appendix B Continued.

Spot	U ppm	Th ppm	$^{232}Th/^{238}U$	$^{206}Pb^{*}$ ppm	$^{204}Pb/^{206}Pb$	% $^{206}Pb_{c}$	$^{207}Pb^{*}/^{206}Pb^{*}$	±%	$^{207}Pb^{*}/^{235}U$	±%	$^{206}Pb^{*}/^{238}U$	±%	$^{208}Pb/^{232}Th$	% err	Error corr	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH151-05	455	36	0.08	268	3E-05	0.03	0.2876	0.3	27.1187	1.6	0.6839	1.6	0.18989	2.4	0.98	3405	5	2
JH151-07	225	356	1.63	130	-3E-05	-0.04	0.2785	0.4	25.7283	1.7	0.6701	1.7	0.16853	2.5	0.97	3354	7	2
JH151-09	171	115	0.69	135	4E-05	0.04	0.4806	0.4	60.8026	1.8	0.9176	1.8	0.1773	2.3	0.98	4183	6	0
JH151-11	80	30	0.39	47	7E-05	0.08	0.3022	0.7	28.152	2.2	0.6757	2.0	0.17317	3.3	0.95	3481	11	6
JH151-13	548	499	0.94	236	2E-05	0.02	0.1767	0.4	12.2245	1.6	0.5016	1.6	0.16538	3.1	0.97	2623	6	0
JH151-14	106	63	0.62	80	-1E-05	-0.01	0.4757	0.5	57.4312	2.0	0.8756	1.9	0.18756	1.8	0.97	4168	7	4
JH151-15	491	226	0.48	280	3E-05	0.04	0.2778	0.3	25.4302	1.6	0.6639	1.6	0.237	2.0	0.98	3351	5	3
JH151-16	105	13	0.14	67	6E-05	0.07	0.3618	0.6	37.1088	2.0	0.7438	2.0	0.1816	3.0	0.96	3758	9	6
JH151-19	141	60	0.44	88	1E-05	0.01	0.3177	0.5	31.8513	1.9	0.7272	1.8	0.14279	1.7	0.97	3559	7	1
JH151-21	54	25	0.48	31	-1E-04	-0.12	0.2739	1.1	25.0968	2.5	0.6646	2.3	0.15255	1.8	0.90	3328	17	2
JH151-23	104	50	0.5	63	5E-05	0.06	0.3083	1.0	29.7218	2.2	0.6992	1.9	0.20507	5.0	0.88	3512	16	3
JH151-24	79	133	1.72	46	-7E-05	-0.08	0.2744	0.7	25.3239	2.2	0.6693	2.0	0.19546	2.2	0.94	3331	11	1
JH151-25	72	67	0.97	44	2E-04	0.22	0.2792	0.8	27.3712	2.2	0.711	2.1	0.18589	3.4	0.94	3358	12	-4
JH151-29	55	76	1.44	37	-6E-05	-0.06	0.3572	0.8	38.5043	2.4	0.7817	2.3	0.18538	2.5	0.95	3738	12	1
JH151-30	558	272	0.5	294	4E-05	0.05	0.2678	0.3	22.5816	1.6	0.6116	1.6	0.18144	2.3	0.98	3293	5	8
JH151-31	108	88	0.85	61	8E-05	0.10	0.2853	0.6	25.7814	2.0	0.6553	1.9	0.19158	4.2	0.95	3392	10	5
JH151-32	229	83	0.38	130	2E-05	0.02	0.3038	0.4	27.5229	1.7	0.6571	1.7	0.2099	2.6	0.97	3490	6	9
JH151-33	375	374	1.03	202	7E-05	0.08	0.2786	0.3	24.0598	1.6	0.6263	1.6	0.16457	1.8	0.98	3355	5	8
JH151-35	107	42	0.41	63	6E-05	0.07	0.2903	0.6	27.2109	2.0	0.6799	1.9	0.17625	2.3	0.96	3419	9	3
JH151-36	59	63	1.1	34	2E-04	0.26	0.2809	0.8	26.0035	2.3	0.6715	2.2	0.1713	2.0	0.93	3368	13	2
JH151-37	555	138	0.26	311	1E-05	0.01	0.2704	0.5	24.3093	1.6	0.6521	1.6	0.13446	3.8	0.94	3308	8	3
JH151-38	128	56	0.45	81	6E-05	0.07	0.3195	0.5	32.2866	1.9	0.7328	1.8	0.19087	2.6	0.96	3568	8	1
JH151-39	280	412	1.52	161	4E-05	0.05	0.2780	0.4	25.6125	1.7	0.6681	1.6	0.18407	2.7	0.98	3352	6	2
JH151-40	319	147	0.48	184	0E+00	0.01	0.2764	0.7	25.6212	1.8	0.6723	1.6	0.17919	1.7	0.91	3343	11	1

Appendix B Continued.

Spot	U ppm	Th ppm	$^{232}Th/^{238}U$	$^{206}Pb^{*}$ ppm	$^{204}Pb/^{206}Pb$	% $^{206}Pb_c$	$^{207}Pb^{*}/^{206}Pb^{*}$	±%	$^{207}Pb^{*}/^{235}U$	±%	$^{206}Pb^{*}/^{238}U$	±%	$^{208}Pb/^{232}Th$	% err	Error corr	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH151-42	38	26	0.71	22	-4E-05	-0.05	0.2829	1.0	25.3892	2.6	0.651	2.4	0.20017	2.3	0.93	3379	15	6
JH151-43	117	86	0.76	67	5E-05	0.07	0.2793	0.6	25.646	1.9	0.666	1.8	0.18157	1.7	0.96	3359	9	3
JH151-44	180	63	0.36	105	1E-05	0.01	0.2718	0.4	25.3795	1.8	0.6772	1.7	0.18339	2.0	0.97	3316	7	-1
JH151-45	238	71	0.31	135	4E-05	0.05	0.2700	0.4	24.6134	1.7	0.6611	1.7	0.18125	3.1	0.97	3306	6	1
JH151-47	116	36	0.33	68	4E-05	0.04	0.2748	0.5	25.6453	1.9	0.6768	1.8	0.18462	2.2	0.96	3334	8	0
JH151-48	196	79	0.42	112	2E-05	0.03	0.2797	0.4	25.7296	1.8	0.6673	1.8	0.188	2.0	0.97	3361	7	2
JH151-49	275	318	1.19	177	6E-05	0.06	0.3615	0.3	37.2851	1.7	0.7481	1.6	0.17989	2.1	0.98	3756	5	5
JH151-51	171	112	0.68	99	1E-04	0.13	0.2827	0.5	26.3407	1.8	0.6758	1.7	0.18256	2.2	0.97	3378	7	2
JH151-52	278	193	0.72	157	3E-05	0.03	0.2722	0.4	24.615	1.7	0.6558	1.6	0.16603	1.8	0.98	3319	6	3
JH151-55	121	73	0.62	69	9E-05	0.10	0.2815	0.5	25.6851	1.9	0.6619	1.8	0.18468	2.0	0.96	3371	9	4
JH151-60	78	47	0.62	45	-4E-05	-0.05	0.2814	0.7	25.9673	2.1	0.6694	2.0	0.18095	1.8	0.95	3370	11	3
JH151-61	476	193	0.42	273	1E-05	0.02	0.2730	0.3	25.0973	1.6	0.6666	1.6	0.17853	2.2	0.98	3324	4	1
JH151-64	127	62	0.51	72	5E-05	0.06	0.2775	0.6	25.2863	2.0	0.6608	1.9	0.18498	2.5	0.95	3349	10	3
JH151-65	726	36	0.05	416	1E-05	0.01	0.2751	0.2	25.2725	1.5	0.6664	1.5	0.18269	1.8	0.99	3335	3	2
JH152-01	129	191	1.53	75	1E-05	0.02	0.2802	0.4	25.8753	1.7	0.6697	1.7	0.17381	1.8	0.97	3364	6	2
JH152-02	96	94	1.01	69	0E+00	0.00	0.4199	0.4	48.1493	1.8	0.8317	1.8	0.21143	1.9	0.98	3982	6	3
JH152-03	779	450	0.6	479	1E-05	0.02	0.2702	0.4	26.676	1.6	0.7159	1.6	0.18126	2.2	0.97	3307	6	-7
JH152-04	341	50	0.15	227	0E+00	-0.01	0.3340	0.3	35.6445	1.6	0.774	1.5	0.19599	2.5	0.98	3635	4	-2
JH152-05	123	51	0.43	101	-2E-05	-0.04	0.4373	1.5	57.1045	2.6	0.9471	2.1	0.22942	2.9	0.82	4043	22	-9
JH152-06	185	81	0.45	114	1E-05	0.02	0.3046	0.6	29.9739	1.7	0.7136	1.6	0.18017	2.5	0.93	3494	10	1
JH152-07	266	185	0.72	170	0E+00	0.00	0.3002	0.3	30.705	1.6	0.7418	1.6	0.19375	2.1	0.98	3471	5	-4
JH152-08	164	60	0.38	99	1E-05	0.01	0.2813	0.8	27.088	1.9	0.6985	1.7	0.17728	2.0	0.91	3370	12	-2
JH152-09	1209	841	0.72	731	3E-05	0.05	0.2933	0.2	28.4672	1.4	0.7038	1.4	0.16397	1.6	0.99	3435	3	0
JH152-10	302	296	1.01	241	1E-05	0.02	0.4223	0.4	53.9493	1.8	0.9265	1.7	0.22268	1.9	0.97	3991	7	-8

Appendix B Continued.

Spot	U ppm	Th ppm	^{232}Th / ^{238}U	$^{206}Pb^*$ ppm	^{204}Pb / ^{206}Pb	% $^{206}Pb_c$	$^{207}Pb^*$ / $^{206}Pb^*$	±%	$^{207}Pb^*$ / ^{235}U	±%	$^{206}Pb^*$ / ^{238}U	±%	^{208}Pb / ^{232}Th	% err	Error corr	^{207}Pb / ^{206}Pb Age (Ma)	1σ	% Dis-cor-dance
JH152-11	243	104	0.44	142	1E-05	0.01	0.2742	0.5	25.6721	1.7	0.679	1.6	0.17643	1.8	0.96	3330	7	0
JH152-12	142	112	0.81	84	-3E-05	-0.06	0.2769	0.4	26.024	1.8	0.6815	1.7	0.1766	1.9	0.97	3346	7	0
JH152-13	135	100	0.77	86	8E-05	0.14	0.3034	0.5	30.7865	1.9	0.736	1.8	0.18549	2.2	0.96	3487	8	-3
JH152-14	171	441	2.65	108	-5E-05	-0.10	0.2766	0.8	27.8709	2.2	0.7308	2.0	0.18455	2.3	0.93	3344	12	-7
JH152-15	184	130	0.73	102	0E+00	0.00	0.2742	0.5	24.4368	1.8	0.6463	1.7	0.16894	2.3	0.96	3330	8	4
JH152-16	120	45	0.39	100	-6E-05	-0.10	0.4452	0.7	59.1906	2.3	0.9642	2.2	0.24219	5.1	0.95	4069	11	-10
JH152-17	74	51	0.72	56	5E-05	0.10	0.4267	0.6	51.5851	2.2	0.8767	2.1	0.21664	2.6	0.96	4006	9	-2
JH152-18	67	108	1.66	39	0E+00	0.00	0.2715	0.6	25.1637	2.1	0.6723	2.0	0.17135	2.2	0.96	3314	10	0
JH152-19	396	404	1.05	221	4E-05	0.08	0.3027	0.8	27.1138	1.8	0.6497	1.6	0.15259	1.7	0.90	3484	12	9
JH152-20	101	68	0.69	63	6E-05	0.11	0.3068	0.5	30.5932	1.9	0.7232	1.9	0.18438	2.2	0.97	3505	8	0
JH152-21	183	174	0.98	115	-1E-05	-0.02	0.3036	0.4	30.4838	1.7	0.7281	1.7	0.18439	1.8	0.98	3489	6	-1
JH152-22	424	157	0.38	226	7E-05	0.13	0.2791	0.3	23.7863	1.5	0.6182	1.5	0.14061	1.8	0.98	3358	4	10
JH152-23	256	94	0.38	217	1E-04	0.18	0.4720	1.1	64.3299	2.1	0.9884	1.8	0.22786	2.6	0.86	4156	16	-9
JH152-24	112	39	0.37	80	1E-04	0.19	0.4363	0.6	49.8165	2.1	0.8281	2.1	0.19623	3.2	0.96	4039	8	5
JH152-26	315	271	0.89	193	3E-05	0.04	0.2825	0.5	27.7102	1.8	0.7115	1.7	0.15286	2.1	0.96	3377	8	-3
JH152-27	128	106	0.86	88	-1E-05	-0.02	0.3983	0.4	43.9155	1.9	0.7997	1.8	0.20462	2.7	0.98	3903	6	4
JH152-28	86	23	0.28	67	1E-04	0.25	0.4329	0.6	54.2738	2.3	0.9093	2.2	0.20197	4.4	0.96	4027	9	-5
JH152-29	91	44	0.5	54	0E+00	0.00	0.2780	0.6	26.4011	2.1	0.6888	2.0	0.17724	2.5	0.96	3352	9	-1
JH152-30	154	124	0.83	88	1E-05	0.01	0.2828	0.4	25.8847	1.8	0.6637	1.8	0.16739	1.9	0.97	3379	7	4
JH152-31	85	44	0.54	49	-4E-05	-0.08	0.2834	0.6	26.2071	2.1	0.6707	2.0	0.17928	2.5	0.96	3382	9	3
JH152-32	51	52	1.04	30	-5E-05	-0.09	0.3016	0.7	28.2452	2.5	0.6793	2.4	0.17298	2.7	0.96	3478	11	5
JH152-34	252	162	0.66	179	1E-05	0.02	0.4304	0.3	48.9755	1.7	0.8253	1.6	0.20305	2.3	0.98	4019	4	5
JH152-35	313	122	0.4	181	5E-05	0.09	0.2814	0.3	26.093	1.6	0.6724	1.6	0.16763	1.9	0.98	3371	5	2
JH152-36	62	52	0.87	41	2E-04	0.31	0.3568	0.6	37.4741	2.4	0.7618	2.3	0.18674	2.8	0.96	3736	10	3

Appendix B Continued.

Spot	U ppm	Th ppm	$^{232}Th/^{238}U$	$^{206}Pb^*$ ppm	$^{204}Pb/^{206}Pb$	% $^{206}Pb_c$	$^{207}Pb^*/^{206}Pb^*$	±%	$^{207}Pb^*/^{235}U$	±%	$^{206}Pb^*/^{238}U$	±%	$^{208}Pb/^{232}Th$	% err	Error corr	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Dis-cor-dance
JH152-37	506	90	0.18	370	1E-05	0.02	0.4220	0.3	49.3798	2.4	0.8487	2.4	0.21049	2.9	0.99	3989	4	1
JH152-38	149	142	0.99	96	4E-05	0.06	0.2773	0.9	28.4147	2.5	0.7432	2.3	0.18798	2.8	0.93	3348	14	-9
JH152-39	192	95	0.51	110	4E-05	0.08	0.2779	0.5	25.4854	2.0	0.665	1.9	0.1704	2.3	0.97	3351	8	2
JH152-40	116	55	0.49	88	2E-05	0.03	0.4839	1.1	58.2142	2.2	0.8725	1.9	0.21158	2.3	0.87	4193	16	5
JH152-41	114	52	0.47	81	4E-05	0.07	0.4172	1.3	47.3102	2.4	0.8225	2.0	0.19613	2.5	0.83	3972	20	3
JH152-42	47	20	0.45	33	0E+00	0.00	0.3897	0.7	43.1457	2.7	0.803	2.6	0.19398	4.3	0.96	3870	11	2
JH152-43	265	308	1.2	155	7E-05	0.12	0.2794	0.4	26.1301	1.8	0.6783	1.7	0.17018	1.9	0.97	3360	7	1
JH152-44	87	112	1.34	51	2E-04	0.34	0.2815	0.7	26.457	2.3	0.6816	2.2	0.17159	2.5	0.96	3371	10	1
JH152-45	115	91	0.82	77	4E-05	0.07	0.3572	0.5	38.4456	2.1	0.7807	2.0	0.1945	2.4	0.97	3738	8	1
JH152-46	119	111	0.97	76	-7E-05	-0.13	0.3273	0.5	33.7118	2.1	0.747	2.0	0.19135	2.2	0.97	3605	8	0
JH152-47	102	98	0.99	57	6E-05	0.11	0.2858	0.7	25.5699	2.2	0.6488	2.1	0.16724	2.4	0.94	3395	11	6
JH152-48	52	25	0.5	37	0E+00	0.00	0.4317	0.6	48.8122	2.7	0.8201	2.6	0.20804	3.1	0.97	4023	10	5
JH152-50	329	336	1.05	244	1E-04	0.24	0.4761	0.3	56.4843	1.7	0.8604	1.6	0.18205	1.8	0.99	4169	4	5
JH152-51	167	237	1.47	94	1E-05	0.02	0.2813	0.5	25.3794	1.9	0.6544	1.9	0.16703	2.2	0.97	3370	7	5
JH152-52	217	175	0.83	121	8E-05	0.13	0.2820	0.4	25.1221	1.8	0.6461	1.8	0.16756	2.0	0.97	3374	7	6
JH152-53	234	58	0.26	166	0E+00	0.00	0.4068	0.5	46.3439	1.8	0.8263	1.8	0.18344	2.3	0.97	3934	7	2
JH152-54	127	103	0.84	72	8E-05	0.15	0.2832	0.6	25.5734	2.1	0.6549	2.0	0.15189	2.4	0.96	3381	9	5
JH152-56	163	102	0.65	126	0E+00	0.00	0.4589	1.0	56.662	2.2	0.8955	2.0	0.22064	2.2	0.90	4114	14	0
JH152-58	86	8	0.1	61	5E-05	0.08	0.4409	1.5	50.0569	2.7	0.8233	2.2	0.18788	5.8	0.83	4055	22	6
JH152-59	123	129	1.08	71	2E-04	0.31	0.2757	0.6	25.5089	2.1	0.671	2.0	0.16904	2.5	0.96	3339	10	1
JH152-60	86	79	0.95	53	2E-04	0.32	0.3039	0.9	29.8352	2.7	0.7121	2.5	0.18023	3.3	0.94	3490	14	1
JH152-61	227	75	0.34	141	0E+00	0.00	0.3043	0.4	30.2492	2.6	0.7209	2.5	0.18205	2.8	0.99	3492	6	0
JH152-62	67	38	0.59	51	-3E-05	-0.05	0.4389	0.7	52.981	2.7	0.8755	2.6	0.22558	3.2	0.96	4048	11	0
JH152-63	44	26	0.62	25	8E-05	0.14	0.2743	1.0	24.529	3.0	0.6486	2.8	0.16316	3.7	0.94	3331	15	4

Appendix B Continued.

Spot	U ppm	Th ppm	^{232}Th /^{238}U	^{206}Pb* ppm	^{204}Pb /^{206}Pb	% ^{206}Pb$_c$	^{207}Pb* /^{206}Pb*	±%	^{207}Pb* /^{235}U	±%	^{206}Pb* /^{238}U	±%	^{208}Pb /^{232}Th	% err	Error corr	^{207}Pb /^{206}Pb Age (Ma)	1σ	% Dis-cor-dance
JH152-64	115	116	1.04	29	4E-05	0.06	0.1010	1.3	4.0966	2.5	0.2941	2.1	0.08377	2.5	0.84	1643	25	-1
JH152-65	298	528	1.83	182	3E-05	0.06	0.2770	0.6	27.0228	2.0	0.7076	1.9	0.18429	2.3	0.95	3346	9	-4
JH152-66	83	46	0.57	49	0E+00	0.00	0.3002	1.3	28.4564	2.7	0.6874	2.3	0.17465	2.8	0.87	3471	21	4
JH152-67	79	81	1.06	47	7E-05	0.13	0.2801	0.8	26.4326	2.5	0.6844	2.4	0.17514	3.2	0.95	3364	12	0
JH152-68	110	48	0.45	68	2E-04	0.35	0.3121	1.6	30.8118	2.7	0.716	2.2	0.17061	3.5	0.81	3531	24	2
JH152-69	84	31	0.38	48	1E-04	0.19	0.2836	0.7	26.143	2.4	0.6687	2.3	0.16317	3.5	0.95	3383	11	3
JH152-70	107	95	0.92	59	2E-04	0.28	0.2860	0.8	25.2919	2.4	0.6414	2.3	0.16887	2.9	0.94	3396	13	8
JH152-71	350	324	0.96	203	4E-05	0.07	0.2780	0.3	25.8475	1.7	0.6743	1.6	0.17213	1.8	0.98	3352	5	1
JH152-73	92	54	0.61	54	7E-05	0.12	0.2788	0.7	26.1597	2.4	0.6805	2.3	0.17299	2.9	0.95	3356	11	0
JH152-74	426	33	0.08	243	5E-05	0.10	0.2810	0.4	25.6972	1.7	0.6632	1.6	0.15198	4.1	0.97	3369	6	3
JH152-75	175	61	0.36	132	4E-05	0.08	0.4591	0.4	55.3883	1.9	0.875	1.9	0.21666	2.4	0.98	4115	6	2
JH154-03	253	262	1.07	160	1E-05	0.01	0.3130	0.9	31.8431	1.5	0.7379	1.3	0.16738	1.5	0.83	3536	13	-1
JH154-04	125	117	0.97	82	7E-05	0.12	0.3089	1.4	32.3208	2.3	0.7589	1.8	0.17816	2.3	0.79	3515	22	-5
JH154-05	125	62	0.51	79	1E-05	0.02	0.3138	0.5	31.6481	3.0	0.7315	2.9	0.1781	4.2	0.99	3540	7	0

Appendix C ICP-MS U-Pb zircon ages.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH013-003	560	166	209	0.79	0.2681	0.005	23.5545	0.27	0.63726	0.01	0.17095	0.002	3295	31	3
JH013-004	1223	113	368	0.31	0.3964	0.008	43.1490	0.48	0.78943	0.01	0.21397	0.002	3896	30	3
JH013-005	434	114	139	0.82	0.3318	0.007	33.9999	0.39	0.74312	0.01	0.20033	0.002	3626	31	1
JH013-006	260	42	85	0.49	0.3201	0.007	32.2433	0.38	0.73064	0.01	0.19562	0.002	3570	31	0
JH013-007	902	245	330	0.74	0.2900	0.006	26.0135	0.29	0.6506	0.01	0.18281	0.002	3418	31	5
JH013-009	527	137	186	0.74	0.3049	0.006	28.3292	0.32	0.67381	0.01	0.17495	0.002	3495	31	5
JH013-010	870	314	304	1.03	0.2991	0.006	28.0206	0.32	0.67934	0.01	0.18489	0.002	3466	31	3
JH013-011	370	543	157	3.46	0.2310	0.005	17.8624	0.21	0.56092	0.01	0.15873	0.002	3059	32	6
JH013-012	479	53	165	0.32	0.3046	0.006	28.9666	0.33	0.68976	0.01	0.18982	0.002	3494	31	3
JH013-013	619	190	223	0.85	0.2845	0.006	25.9364	0.3	0.66107	0.01	0.17727	0.002	3388	31	3
JH013-016	387	150	127	1.18	0.3039	0.006	30.4215	0.35	0.72603	0.01	0.19617	0.002	3490	31	-1
JH013-021	242	105	81	1.30	0.3072	0.006	30.0097	0.36	0.70845	0.01	0.18444	0.002	3507	31	1
JH013-026	767	140	282	0.50	0.2960	0.006	26.4184	0.3	0.64737	0.01	0.18824	0.002	3449	31	7
JH013-028	532	187	194	0.96	0.2805	0.006	25.3330	0.29	0.65501	0.01	0.18296	0.002	3366	31	3
JH013-030	395	102	146	0.70	0.3018	0.006	26.7933	0.31	0.64378	0.01	0.18819	0.002	3480	31	8
JH013-036	497	20	171	0.12	0.2952	0.006	28.2811	0.33	0.69475	0.01	0.18514	0.002	3445	31	1
JH013-037	544	20	204	0.10	0.2908	0.006	25.4821	0.29	0.63546	0.01	0.15159	0.002	3422	31	7
JH013-038	896	33	310	0.11	0.3071	0.006	29.2543	0.33	0.69082	0.01	0.18066	0.002	3506	31	3
JH013-042	681	406	256	1.59	0.3000	0.006	26.3045	0.3	0.63581	0.01	0.17442	0.002	3470	31	9
JH013-043	555	36	191	0.19	0.3016	0.006	28.8926	0.33	0.69482	0.01	0.19195	0.002	3478	31	2
JH013-044	1167	97	350	0.28	0.4025	0.008	44.1896	0.5	0.79624	0.01	0.21453	0.002	3918	30	3
JH013-045	439	116	164	0.71	0.3051	0.006	26.8465	0.31	0.63809	0.01	0.14459	0.001	3496	31	9
JH013-048	596	204	206	0.99	0.3038	0.006	28.9717	0.33	0.69153	0.01	0.18183	0.002	3490	31	2

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH013-049	316	165	109	1.51	0.3245	0.007	31.0393	0.36	0.69362	0.01	0.17853	0.002	3591	31	5
JH013-052	198	49	62	0.79	0.3572	0.007	37.8499	0.46	0.76851	0.01	0.20283	0.002	3738	31	1
JH013-063	408	154	137	1.12	0.3038	0.006	29.9435	0.35	0.71484	0.01	0.17872	0.002	3490	31	0
JH013-065	341	89	122	0.73	0.2985	0.006	27.5135	0.32	0.6683	0.01	0.17438	0.002	3463	31	4
JH013-069	578	35	209	0.17	0.3031	0.006	27.7396	0.32	0.66365	0.01	0.19026	0.002	3486	31	6
JH013-073	614	160	259	0.62	0.2341	0.005	18.3877	0.21	0.56961	0.01	0.16338	0.002	3080	32	5
JH013-077	635	168	228	0.74	0.3028	0.006	27.8390	0.32	0.66667	0.01	0.17614	0.002	3485	31	5
JH013-080	430	209	155	1.35	0.3028	0.006	27.8118	0.32	0.66603	0.01	0.17585	0.002	3485	31	5
JH013-083	169	29	52	0.56	0.3680	0.008	40.0176	0.49	0.78844	0.01	0.20225	0.002	3783	31	0
JH013-084	508	90	183	0.49	0.2989	0.006	27.5196	0.32	0.66757	0.01	0.18355	0.002	3465	31	5
JH013-089	700	155	256	0.61	0.2955	0.006	26.7891	0.3	0.65741	0.01	0.15885	0.002	3447	31	5
JH013-091	699	75	251	0.30	0.2944	0.006	27.2049	0.31	0.66998	0.01	0.182	0.002	3441	31	4
JH013-092	181	70	61	1.15	0.3085	0.006	30.3818	0.37	0.71421	0.01	0.19125	0.002	3513	31	1
JH013-095	657	87	243	0.36	0.2838	0.006	25.3949	0.29	0.64878	0.01	0.17349	0.002	3384	31	4
JH013-096	235	124	82	1.51	0.3049	0.006	29.0225	0.36	0.69018	0.01	0.17354	0.002	3495	31	3
JH013-099	751	148	284	0.52	0.2789	0.006	24.5249	0.28	0.63772	0.01	0.16643	0.002	3357	31	5
JH013-103	954	230	337	0.68	0.3037	0.006	28.5757	0.32	0.68217	0.01	0.17269	0.002	3489	31	4
JH013-104	139	69	48	1.44	0.3009	0.006	29.2268	0.37	0.70431	0.01	0.18012	0.002	3475	31	1
JH013-106	388	120	148	0.81	0.2918	0.006	25.4441	0.3	0.63227	0.01	0.15844	0.002	3427	31	8
JH013-109	198	97	72	1.35	0.3012	0.006	27.6566	0.33	0.66575	0.01	0.17147	0.002	3477	31	5
JH013-110	340	51	127	0.40	0.2921	0.006	26.1169	0.3	0.6482	0.01	0.19924	0.002	3429	31	6
JH013-111	745	126	275	0.46	0.2953	0.006	26.6839	0.3	0.65505	0.01	0.20228	0.002	3446	30	6
JH013-112	771	149	230	0.65	0.4269	0.008	47.8203	0.53	0.81192	0.01	0.22072	0.002	4007	29	4

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH013-114	177	88	60	1.47	0.3008	0.006	29.6164	0.35	0.7138	0.01	0.20383	0.002	3474	31	0
JH013-115	295	93	119	0.78	0.2289	0.005	18.9078	0.22	0.59872	0.01	0.1668	0.002	3045	32	0
JH013-122	307	59	115	0.51	0.3114	0.006	27.7828	0.32	0.64688	0.01	0.14552	0.002	3528	30	9
JH013-123	343	165	116	1.42	0.3007	0.006	29.6269	0.34	0.71422	0.01	0.19576	0.002	3474	30	-1
JH013-124	660	319	230	1.39	0.3025	0.006	28.9631	0.33	0.69418	0.01	0.23142	0.002	3483	30	2
JH013-125	328	65	103	0.63	0.3284	0.007	34.8028	0.4	0.76818	0.01	0.20973	0.002	3610	30	-2
JH013-127	637	220	242	0.91	0.2860	0.006	25.1401	0.28	0.63717	0.01	0.17991	0.002	3396	31	6
JH013-133	406	47	114	0.41	0.4323	0.009	51.1126	0.59	0.85721	0.01	0.25161	0.003	4025	29	0
JH013-139	585	71	204	0.35	0.3026	0.006	28.9274	0.33	0.69312	0.01	0.20507	0.002	3484	30	2
JH013-140	511	23	173	0.13	0.3040	0.006	29.9303	0.34	0.71393	0.01	0.19709	0.003	3491	31	0
JH013-142	322	56	123	0.46	0.2378	0.005	20.8191	0.25	0.63488	0.01	0.17961	0.002	3105	32	-3
JH013-145	885	255	339	0.75	0.2862	0.006	24.8692	0.28	0.63006	0.01	0.17302	0.002	3397	31	7
JH013-150	496	165	176	0.94	0.3108	0.006	29.1188	0.34	0.67939	0.01	0.1591	0.002	3525	31	5
JH013-151	539	194	192	1.01	0.2952	0.006	27.6254	0.32	0.67845	0.01	0.18395	0.002	3445	31	3
JH013-156	293	74	97	0.76	0.3042	0.006	30.6203	0.36	0.72995	0.01	0.20136	0.002	3492	31	-2
JH013-157	614	143	219	0.65	0.2961	0.006	27.6223	0.32	0.67637	0.01	0.17288	0.002	3450	31	3
JH013-161	412	110	210	0.52	0.1798	0.004	11.7083	0.14	0.47213	0.01	0.10857	0.001	2651	33	6
JH013-163	359	105	119	0.88	0.3015	0.006	30.2257	0.36	0.72689	0.01	0.19684	0.002	3478	31	-2
JH013-165	742	152	245	0.62	0.3005	0.006	30.2106	0.35	0.729	0.01	0.20918	0.002	3473	31	-2
JH013-167	527	139	213	0.65	0.2418	0.005	19.8898	0.23	0.5964	0.01	0.16381	0.002	3132	32	3
JH013-169	254	115	92	1.25	0.3086	0.006	28.4327	0.34	0.66817	0.01	0.14522	0.002	3514	31	6
JH013-170	447	108	173	0.62	0.2847	0.006	24.4271	0.28	0.62223	0.01	0.17035	0.002	3389	31	8
JH013-172	899	53	317	0.17	0.3005	0.006	28.2985	0.32	0.68283	0.01	0.18756	0.002	3473	31	3

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH013-173	600	229	217	1.06	0.2835	0.006	25.9915	0.3	0.6647	0.01	0.18733	0.002	3383	31	2
JH013-176	290	61	93	0.66	0.3302	0.007	34.2841	0.41	0.75299	0.01	0.20421	0.002	3618	31	-1
JH013-179	820	100	292	0.34	0.3029	0.006	28.1945	0.32	0.67496	0.01	0.18191	0.002	3485	31	4
JH013-189	439	97	151	0.64	0.2877	0.006	27.6774	0.33	0.69771	0.01	0.17244	0.002	3405	31	-1
JH013-190	185	58	58	1.00	0.3553	0.007	37.4419	0.46	0.76417	0.01	0.19314	0.002	3730	31	1
JH013-191	507	203	191	1.06	0.2805	0.006	24.7503	0.29	0.63992	0.01	0.17104	0.002	3366	31	5
JH013-200	660	121	231	0.52	0.3304	0.007	31.2445	0.36	0.68573	0.01	0.18447	0.002	3619	31	7
JH013-202	499	126	196	0.64	0.2780	0.006	23.5038	0.28	0.61317	0.01	0.17825	0.002	3352	31	8
JH018-001	534	73	192	0.38	0.2861	0.006	27.5258	0.31	0.69763	0.01	0.18909	0.002	3397	30	-1
JH018-008	448	94	161	0.58	0.2808	0.006	27.0484	0.31	0.69866	0.01	0.18228	0.002	3367	31	-2
JH018-028	558	56	181	0.31	0.3163	0.006	33.3754	0.38	0.76515	0.01	0.20804	0.002	3552	30	-4
JH018-037	363	95	128	0.74	0.2844	0.006	27.6066	0.32	0.70394	0.01	0.18494	0.002	3387	31	-2
JH018-039	991	382	388	0.98	0.2985	0.006	26.0816	0.29	0.63363	0.01	0.17614	0.002	3462	30	9
JH018-041	426	33	147	0.22	0.3007	0.006	29.7061	0.34	0.71631	0.01	0.23997	0.003	3474	30	-1
JH018-057	571	203	213	0.95	0.2995	0.006	27.2867	0.31	0.66058	0.01	0.15097	0.001	3468	30	6
JH018-067	620	213	243	0.88	0.2846	0.006	24.5785	0.28	0.62615	0.01	0.14287	0.001	3389	30	8
JH018-069	171	58	62	0.94	0.2823	0.006	26.3531	0.32	0.67682	0.01	0.18031	0.002	3376	31	1
JH018-076	464	82	162	0.51	0.2939	0.006	27.7995	0.31	0.68591	0.01	0.18901	0.002	3438	30	2
JH018-086	477	72	159	0.45	0.3103	0.006	30.9716	0.35	0.72383	0.01	0.2188	0.002	3522	30	0
JH018-092	323	129	119	1.08	0.2927	0.006	26.5148	0.3	0.65688	0.01	0.1736	0.002	3432	30	5
JH018-094	704	118	210	0.56	0.3827	0.008	42.6919	0.48	0.80888	0.01	0.27779	0.003	3843	29	0
JH018-098	426	120	155	0.77	0.2785	0.006	25.5138	0.29	0.66441	0.01	0.18081	0.002	3354	31	2
JH018-101	304	73	108	0.68	0.2810	0.006	26.5058	0.31	0.68401	0.01	0.18872	0.002	3368	31	0

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH018-106	401	66	112	0.59	0.3412	0.007	40.9794	0.47	0.87102	0.01	0.78665	0.008	3668	30	-10
JH018-108	582	213	228	0.93	0.2812	0.006	24.0796	0.27	0.62091	0.01	0.16211	0.002	3370	30	8
JH018-109	567	207	212	0.98	0.2997	0.006	26.8536	0.3	0.64967	0.01	0.1815	0.002	3469	30	7
JH018-111	378	55	102	0.54	0.4628	0.009	57.2513	0.65	0.89698	0.01	0.24128	0.003	4127	29	-1
JH018-120	449	162	162	1.00	0.2826	0.006	26.4049	0.3	0.67755	0.01	0.18402	0.002	3377	31	1
JH018-123	591	191	217	0.88	0.3244	0.006	29.8134	0.34	0.66642	0.01	0.28578	0.003	3591	30	9
JH018-126	630	200	218	0.92	0.3493	0.007	34.0060	0.38	0.706	0.01	0.15416	0.002	3704	30	7
JH018-133	561	96	203	0.47	0.2867	0.006	26.8149	0.3	0.67816	0.01	0.18227	0.002	3400	30	1
JH018-135	375	116	130	0.89	0.2988	0.006	29.0754	0.33	0.70556	0.01	0.18309	0.002	3464	30	0
JH018-138	636	86	220	0.39	0.3147	0.006	30.8014	0.35	0.70981	0.01	0.18899	0.002	3544	30	2
JH018-144	565	90	194	0.46	0.3172	0.006	31.4280	0.36	0.7185	0.01	0.19385	0.002	3556	30	1
JH018-145	419	121	159	0.76	0.2848	0.006	25.5242	0.29	0.64984	0.01	0.16782	0.002	3390	31	5
JH018-153	466	157	169	0.93	0.2933	0.006	27.6030	0.32	0.68257	0.01	0.21055	0.002	3435	30	2
JH018-156	400	121	151	0.80	0.2821	0.006	25.4733	0.29	0.65484	0.01	0.15879	0.002	3375	31	3
JH019-001	695	209	264	0.79	0.2874	0.006	25.7802	0.29	0.65084	0.01	0.16817	0.002	3404	30	5
JH019-002	686	261	238	1.10	0.3530	0.007	34.6275	0.39	0.71173	0.01	0.18555	0.002	3720	29	7
JH019-006	480	69	140	0.49	0.4641	0.009	54.4263	0.61	0.8507	0.01	0.31829	0.003	4131	29	4
JH019-007	582	193	215	0.90	0.2838	0.006	26.1551	0.29	0.66857	0.01	0.18735	0.002	3384	30	2
JH019-011	654	120	219	0.55	0.3862	0.008	39.2705	0.44	0.73754	0.01	0.13825	0.001	3856	29	8
JH019-016	360	246	136	1.81	0.2640	0.005	23.7160	0.27	0.65168	0.01	0.17659	0.002	3271	31	1
JH019-018	863	336	335	1.00	0.2786	0.005	24.3933	0.27	0.63512	0.01	0.15795	0.002	3355	30	5
JH019-020	416	119	143	0.83	0.2994	0.006	29.4815	0.34	0.7143	0.01	0.20037	0.002	3467	30	-1
JH019-021	878	190	306	0.62	0.2941	0.006	28.6574	0.32	0.70664	0.01	0.19395	0.002	3440	30	-1

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH019-027	435	72	161	0.45	0.2736	0.005	25.0295	0.28	0.66349	0.01	0.16661	0.002	3327	31	1
JH019-030	690	199	233	0.85	0.3004	0.006	30.1282	0.34	0.72724	0.01	0.3188	0.003	3473	30	-2
JH019-035	217	69	76	0.91	0.3013	0.006	29.2083	0.35	0.70303	0.01	0.18718	0.002	3477	31	1
JH019-038	360	66	135	0.49	0.3054	0.006	27.6037	0.31	0.65552	0.01	0.76896	0.008	3498	30	7
JH019-039	835	272	325	0.84	0.2942	0.006	25.5183	0.28	0.62899	0.01	0.15473	0.002	3440	30	9
JH019-040	408	99	150	0.66	0.2836	0.006	26.0851	0.3	0.66702	0.01	0.17608	0.002	3383	31	2
JH019-042	643	119	204	0.58	0.3952	0.008	42.0784	0.47	0.77215	0.01	0.20474	0.002	3891	29	5
JH019-050	682	103	202	0.51	0.4314	0.009	49.0506	0.54	0.82441	0.01	0.25868	0.003	4022	29	3
JH019-051	1214	143	442	0.32	0.3093	0.006	28.5558	0.31	0.66938	0.01	0.16354	0.002	3518	30	6
JH019-055	353	55	122	0.45	0.3133	0.006	30.4873	0.34	0.7056	0.01	0.18328	0.002	3537	30	2
JH019-063	433	136	155	0.88	0.2851	0.006	26.6824	0.3	0.67849	0.01	0.17327	0.002	3391	31	1
JH019-067	94	4	26	0.15	0.4827	0.01	59.1398	0.74	0.88821	0.01	0.22617	0.005	4189	30	2
JH019-068	380	121	129	0.94	0.3529	0.007	34.7050	0.39	0.71302	0.01	0.19738	0.002	3720	30	7
JH019-072	391	56	141	0.40	0.2739	0.005	25.4114	0.28	0.67259	0.01	0.18346	0.002	3329	31	0
JH019-073	314	114	122	0.93	0.2815	0.006	24.1141	0.27	0.62117	0.01	0.1598	0.002	3371	31	8
JH019-074	595	152	223	0.68	0.2965	0.006	26.4823	0.29	0.64751	0.01	0.16724	0.002	3452	31	7
JH019-078	948	80	361	0.22	0.2881	0.006	25.2507	0.27	0.63544	0.01	0.18151	0.002	3407	31	7
JH019-079	225	66	85	0.78	0.2788	0.006	24.6225	0.28	0.64029	0.01	0.16913	0.002	3356	31	5
JH019-083	559	202	213	0.95	0.3000	0.006	26.2867	0.29	0.63534	0.01	0.17307	0.002	3470	31	9
JH019-086	487	216	176	1.23	0.3034	0.006	27.8808	0.31	0.66627	0.01	0.1757	0.002	3488	31	5
JH019-088	626	78	180	0.43	0.4662	0.009	53.9940	0.59	0.8397	0.01	0.20778	0.002	4138	29	5
JH019-091	616	107	229	0.47	0.3065	0.006	27.3643	0.3	0.64724	0.01	0.13073	0.001	3504	31	8
JH019-094	275	125	99	1.26	0.2850	0.006	26.2488	0.3	0.66781	0.01	0.1738	0.002	3390	31	2

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH019-096	304	113	109	1.04	0.2822	0.006	26.1154	0.29	0.67098	0.01	0.17654	0.002	3375	31	1
JH019-097	292	81	107	0.76	0.2869	0.006	25.9544	0.29	0.65587	0.01	0.17085	0.002	3401	31	4
JH019-099	359	67	103	0.65	0.4292	0.009	49.6374	0.55	0.8385	0.01	0.21184	0.002	4015	30	2
JH019-100	661	158	246	0.64	0.2884	0.006	25.6723	0.28	0.64536	0.01	0.1687	0.002	3409	31	6
JH019-102	137	64	46	1.39	0.2858	0.006	28.2242	0.34	0.71611	0.01	0.19363	0.002	3395	32	-3
JH019-107	629	321	240	1.34	0.2879	0.006	24.9688	0.27	0.62891	0.01	0.14502	0.001	3406	31	8
JH019-109	112	8	292	0.03	0.2912	0.006	25.5168	0.28	0.63552	0.01	0.16224	0.002	3424	31	7
JH019-112	289	149	151	0.99	0.2850	0.006	24.8761	0.28	0.63287	0.01	0.16322	0.002	3391	31	7
JH019-113	308	132	119	1.11	0.3649	0.007	39.4816	0.45	0.78467	0.01	0.19644	0.002	3770	30	0
JH019-121	112	8	286	0.03	0.2888	0.006	25.3784	0.28	0.63722	0.01	0.1565	0.002	3411	31	7
JH019-123	922	293	381	0.77	0.2833	0.006	24.2632	0.27	0.62104	0.01	0.15373	0.002	3381	31	8
JH019-126	1178	465	631	0.74	0.2691	0.005	22.4320	0.25	0.60444	0.01	0.15679	0.001	3301	31	8
JH019-130	431	122	176	0.69	0.3026	0.006	27.1811	0.3	0.65145	0.01	0.15395	0.002	3483	31	7
JH019-134	996	1717	621	2.76	0.2875	0.006	24.9094	0.28	0.62836	0.01	0.164	0.002	3404	31	8
JH019-135	451	151	175	0.86	0.2864	0.006	26.6719	0.3	0.6754	0.01	0.17371	0.002	3398	31	2
JH019-137	264	81	113	0.72	0.2828	0.006	26.0701	0.29	0.66849	0.01	0.18121	0.002	3378	31	2
JH019-140	307	117	119	0.98	0.2866	0.006	24.7548	0.27	0.62643	0.01	0.1592	0.002	3399	31	8
JH019-160	1270	531	545	0.97	0.3644	0.007	38.5273	0.43	0.76677	0.01	0.18763	0.002	3768	30	2
JH019-162	790	413	325	1.27	0.3331	0.007	31.8027	0.35	0.69224	0.01	0.31397	0.003	3632	30	7
JH019-165	955	813	419	1.94	0.2834	0.006	27.8824	0.31	0.71342	0.01	0.19575	0.002	3382	31	-3
JH019-167	625	728	479	1.52	0.3077	0.006	29.2246	0.33	0.68865	0.01	0.16242	0.002	3510	31	3
JH019-168	534	180	188	0.96	0.4320	0.009	46.8676	0.55	0.78676	0.01	0.16664	0.002	4024	30	7
JH019-178	744	382	309	1.24	0.3018	0.006	26.5468	0.29	0.63783	0.01	0.14382	0.001	3480	31	9

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH020-001	227	161	80	2.01	0.2884	0.006	27.6297	0.33	0.69477	0.01	0.18403	0.002	3409	31	0
JH020-003	305	125	109	1.15	0.2870	0.006	27.1358	0.31	0.6857	0.01	0.17755	0.002	3401	31	1
JH020-006	342	117	120	0.98	0.2986	0.006	28.7422	0.33	0.69793	0.01	0.18211	0.002	3463	31	1
JH020-012	244	31	72	0.43	0.4033	0.008	46.4079	0.54	0.83452	0.01	0.21544	0.002	3921	30	0
JH020-024	682	137	258	0.53	0.2898	0.006	26.0103	0.29	0.65088	0.01	0.15953	0.002	3416	31	5
JH020-025	790	240	251	0.96	0.3487	0.007	37.2722	0.42	0.77521	0.01	0.31083	0.003	3701	30	0
JH020-027	346	86	125	0.69	0.2867	0.006	26.8493	0.31	0.6792	0.01	0.1792	0.002	3400	31	1
JH020-028	605	89	212	0.42	0.3182	0.006	30.7924	0.35	0.70178	0.01	0.18275	0.002	3561	30	3
JH020-030	182	51	63	0.81	0.2932	0.006	28.9319	0.35	0.71548	0.01	0.187	0.002	3435	31	-2
JH020-033	855	366	339	1.08	0.2770	0.006	23.6653	0.27	0.61946	0.01	0.14132	0.001	3346	31	7
JH020-049	672	64	248	0.26	0.2885	0.006	26.5352	0.3	0.66693	0.01	0.17884	0.002	3410	31	3
JH020-053	208	56	68	0.82	0.3049	0.006	31.7222	0.38	0.75453	0.01	0.19981	0.002	3495	31	-4
JH020-063	1069	264	284	0.93	0.3831	0.008	48.8786	0.54	0.92523	0.01	0.75652	0.007	3844	30	-9
JH020-075	435	98	167	0.59	0.2842	0.006	25.1680	0.28	0.64208	0.01	0.17161	0.002	3386	31	5
JH020-078	328	89	99	0.90	0.3966	0.008	44.4002	0.51	0.8118	0.01	0.20918	0.002	3896	30	1
JH020-080	1914	309	806	0.38	0.2604	0.005	20.9757	0.23	0.58403	0.01	0.13702	0.001	3249	31	9
JH020-084	472	43	143	0.30	0.4429	0.009	49.4082	0.56	0.80891	0.01	0.19221	0.002	4062	29	6
JH020-089	289	207	106	1.95	0.2838	0.006	26.2432	0.3	0.6706	0.01	0.17377	0.002	3384	31	2
JH020-090	798	146	313	0.47	0.2843	0.006	24.5920	0.27	0.62717	0.01	0.15152	0.001	3387	31	7
JH020-100	843	148	293	0.51	0.3250	0.006	31.6655	0.36	0.70663	0.01	0.15923	0.002	3593	30	4
JH020-109	649	65	206	0.32	0.4210	0.008	45.0642	0.5	0.77615	0.01	0.13981	0.001	3986	29	7
JH020-111	492	172	175	0.98	0.2847	0.006	27.2237	0.31	0.69332	0.01	0.1797	0.002	3389	30	-1
JH020-112	755	162	288	0.56	0.3088	0.006	27.4808	0.31	0.64527	0.01	0.15351	0.002	3515	30	9

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH020-114	379	71	111	0.64	0.4356	0.009	50.5044	0.58	0.84083	0.01	0.21054	0.002	4037	29	2
JH020-119	192	38	67	0.57	0.2853	0.006	27.9242	0.33	0.70977	0.01	0.18666	0.002	3392	31	-2
JH020-125	881	116	288	0.40	0.3725	0.007	38.7104	0.44	0.75353	0.01	0.8583	0.008	3802	30	5
JH020-126	969	253	327	0.77	0.3910	0.008	39.2994	0.44	0.72877	0.01	0.16558	0.002	3875	29	9
JH020-127	738	154	272	0.57	0.3118	0.006	28.7328	0.32	0.66832	0.01	0.15066	0.001	3530	30	6
JH020-134	509	164	181	0.91	0.2980	0.006	28.4462	0.32	0.69212	0.01	0.17925	0.002	3460	30	2
JH020-145	702	237	190	1.25	0.4036	0.008	50.5978	0.57	0.90912	0.01	0.52753	0.005	3923	29	-6
JH020-148	493	81	181	0.45	0.3085	0.006	28.4724	0.32	0.66915	0.01	0.18472	0.002	3514	30	6
JH020-154	253	51	99	0.52	0.2836	0.006	24.5877	0.29	0.62876	0.01	0.14347	0.002	3383	31	7
JH020-157	416	163	151	1.08	0.2998	0.006	27.9688	0.32	0.67649	0.01	0.17318	0.002	3469	31	4
JH020-161	740	244	255	0.96	0.3464	0.007	34.0221	0.38	0.71216	0.01	0.32143	0.003	3691	30	6
JH020-162	754	81	238	0.34	0.3404	0.007	36.4233	0.41	0.77596	0.01	0.57152	0.006	3665	30	-2
JH020-166	135	83	46	1.80	0.2853	0.006	28.0410	0.35	0.71282	0.01	0.18155	0.002	3392	31	-3
JH020-167	566	175	215	0.81	0.3045	0.006	27.0845	0.31	0.64498	0.01	0.17599	0.002	3493	31	8
JH020-168	349	104	119	0.87	0.3038	0.006	30.0930	0.35	0.71835	0.01	0.1802	0.002	3490	31	-1
JH020-171	612	99	221	0.45	0.3185	0.006	29.7393	0.34	0.67711	0.01	0.14702	0.001	3563	30	6
JH020-172	598	166	212	0.78	0.3160	0.006	30.1092	0.34	0.69093	0.01	0.18144	0.002	3551	30	4
JH020-173	632	210	229	0.92	0.2862	0.006	26.6555	0.3	0.67533	0.01	0.17551	0.002	3397	31	2
JH020-175	455	189	165	1.15	0.3045	0.006	28.3251	0.33	0.67457	0.01	0.16676	0.002	3493	31	5
JH020-178	409	207	162	1.28	0.2839	0.006	24.2140	0.28	0.6184	0.01	0.15554	0.001	3385	31	9
JH021B-001	93	12	29	0.41	0.3466	0.007	37.0525	0.46	0.77515	0.01	0.20332	0.003	3692	31	-1
JH021B-002	473	26	159	0.16	0.3379	0.007	33.1713	0.36	0.7118	0.01	0.17561	0.002	3653	30	5
JH021B-003	244	3	75	0.04	0.3493	0.007	37.5951	0.43	0.78041	0.01	0.21067	0.005	3704	30	-1

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH021B-005	461	134	159	0.84	0.3063	0.006	29.4758	0.32	0.69768	0.01	0.18386	0.002	3503	30	2
JH021B-006	312	23	81	0.28	0.4623	0.009	59.0929	0.66	0.92684	0.01	0.25137	0.003	4125	29	-3
JH021B-008	503	127	185	0.69	0.3069	0.006	27.6365	0.3	0.65293	0.01	0.17523	0.002	3506	30	8
JH021B-009	452	120	164	0.73	0.3035	0.006	27.6438	0.3	0.66038	0.01	0.17096	0.002	3488	30	6
JH021B-010	565	122	204	0.60	0.3016	0.006	27.6798	0.3	0.66539	0.01	0.17252	0.002	3479	30	5
JH021B-011	535	159	193	0.82	0.3069	0.006	28.1772	0.31	0.6658	0.01	0.15097	0.001	3505	30	6
JH021B-012	439	155	153	1.01	0.2869	0.006	27.3549	0.3	0.69125	0.01	0.18493	0.002	3401	31	0
JH021B-013	346	41	120	0.34	0.2848	0.006	27.3574	0.31	0.69658	0.01	0.19122	0.002	3389	31	-1
JH021B-014	732	131	245	0.53	0.3132	0.006	31.0211	0.34	0.71824	0.01	0.19783	0.002	3537	30	1
JH021B-015	387	102	110	0.93	0.4306	0.009	50.3211	0.56	0.8473	0.01	0.22053	0.002	4020	29	1
JH021B-016	243	53	72	0.74	0.4403	0.009	49.5910	0.56	0.81676	0.01	0.20262	0.002	4053	29	5
JH021B-017	562	109	196	0.56	0.3200	0.006	30.5169	0.34	0.69162	0.01	0.17019	0.002	3570	30	5
JH021B-020	416	56	140	0.40	0.3117	0.006	30.7240	0.34	0.71486	0.01	0.19233	0.002	3529	30	1
JH021B-021	330	73	119	0.61	0.2831	0.006	26.1572	0.29	0.66998	0.01	0.17936	0.002	3380	31	2
JH021B-022	379	82	129	0.64	0.3247	0.006	31.7524	0.35	0.7092	0.01	0.19282	0.002	3592	30	3
JH021B-023	412	89	142	0.63	0.3032	0.006	29.2911	0.32	0.7006	0.01	0.18678	0.002	3486	30	1
JH021B-025	1088	55	374	0.15	0.2900	0.006	28.0566	0.31	0.70143	0.01	0.19695	0.002	3418	30	-1
JH021B-026	494	54	186	0.29	0.2865	0.006	25.2806	0.28	0.63991	0.01	0.08763	1E-03	3399	31	6
JH021B-029	328	102	107	0.95	0.3010	0.006	30.7473	0.35	0.74078	0.01	0.17865	0.002	3475	31	-3
JH021B-030	729	116	240	0.48	0.3207	0.006	32.4472	0.36	0.73378	0.01	0.1834	0.002	3573	30	0
JH021B-031	617	81	206	0.39	0.3337	0.007	33.3924	0.37	0.7257	0.01	0.19732	0.002	3634	30	3
JH021B-032	82	18	29	0.62	0.2835	0.006	27.1011	0.34	0.69312	0.01	0.20334	0.003	3382	32	-1
JH021B-033	208	39	73	0.53	0.2825	0.006	26.9239	0.31	0.69119	0.01	0.19613	0.002	3377	31	-1

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH021B-034	334	126	123	1.02	0.2798	0.006	25.2453	0.28	0.65425	0.01	0.17628	0.002	3362	31	3
JH021B-036	874	96	292	0.33	0.3198	0.006	31.9108	0.35	0.72359	0.01	0.21508	0.002	3569	30	1
JH021B-037	327	213	125	1.70	0.2817	0.006	24.6664	0.28	0.63491	0.01	0.15725	0.002	3373	31	6
JH021B-039	258	78	96	0.81	0.2831	0.006	25.3346	0.29	0.64893	0.01	0.17954	0.002	3380	31	4
JH021B-044	387	42	136	0.31	0.2906	0.006	27.6525	0.31	0.69009	0.01	0.18312	0.002	3421	31	1
JH021B-045	182	88	59	1.49	0.3058	0.006	31.5649	0.37	0.74844	0.01	0.19724	0.002	3500	31	-3
JH021B-047	269	66	90	0.73	0.2845	0.006	28.2746	0.33	0.72074	0.01	0.19243	0.002	3388	31	-4
JH021B-050	1238	76	356	0.21	0.4331	0.009	50.3959	0.55	0.84377	0.01	0.20689	0.002	4028	29	2
JH021B-052	449	58	153	0.38	0.3062	0.006	30.0317	0.34	0.71132	0.01	0.18742	0.002	3502	30	1
JH021B-053	305	66	101	0.65	0.3087	0.006	31.3448	0.36	0.7364	0.01	0.19648	0.002	3514	31	-2
JH021B-054	242	44	83	0.53	0.2942	0.006	28.7347	0.33	0.70827	0.01	0.17958	0.002	3440	31	-1
JH021B-055	188	73	71	1.03	0.3028	0.006	26.6936	0.31	0.63921	0.01	0.15215	0.002	3485	31	9
JH021B-057	417	112	147	0.76	0.3165	0.006	30.2300	0.34	0.69252	0.01	0.1651	0.002	3553	30	4
JH021B-058	367	94	135	0.70	0.2841	0.006	25.9913	0.29	0.66348	0.01	0.17448	0.002	3385	31	3
JH021B-061	291	91	109	0.83	0.2814	0.006	25.3308	0.29	0.65287	0.01	0.17172	0.002	3370	31	4
JH021B-062	593	135	201	0.67	0.3215	0.006	31.9118	0.36	0.71986	0.01	0.19553	0.002	3577	30	2
JH021B-064	802	274	301	0.91	0.3136	0.006	28.0728	0.31	0.64917	0.01	0.11963	0.001	3539	30	9
JH021B-068	409	105	147	0.71	0.2881	0.006	27.0373	0.31	0.68055	0.01	0.16012	0.002	3407	31	1
JH021B-069	406	69	154	0.45	0.2845	0.006	25.2532	0.29	0.64377	0.01	0.1642	0.002	3388	31	5
JH021B-072	520	96	184	0.52	0.3178	0.006	30.2936	0.34	0.69121	0.01	0.17699	0.002	3559	30	5
JH021B-073	550	51	183	0.28	0.3352	0.007	34.0013	0.38	0.73564	0.01	0.2004	0.002	3641	30	2
JH021B-074	173	49	61	0.80	0.2827	0.006	26.9954	0.32	0.69238	0.01	0.18441	0.002	3378	31	-1
JH021B-077	545	43	191	0.23	0.3141	0.006	30.1973	0.34	0.69725	0.01	0.18444	0.002	3541	30	3

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH021B-078	682	126	233	0.54	0.3286	0.007	32.3946	0.36	0.71481	0.01	0.19024	0.002	3611	30	3
JH021B-080	387	101	144	0.70	0.2772	0.006	25.1605	0.29	0.65821	0.01	0.11955	0.001	3347	31	2
JH021B-081	439	66	157	0.42	0.2867	0.006	27.0795	0.31	0.685	0.01	0.18824	0.002	3400	31	1
JH021B-082	357	146	138	1.06	0.2974	0.006	25.8848	0.3	0.63109	0.01	0.13872	0.001	3457	31	9
JH021B-083	1006	197	386	0.51	0.3019	0.006	26.6195	0.3	0.63939	0.01	0.16728	0.002	3480	30	9
JH021B-084	648	100	219	0.46	0.3194	0.006	31.9778	0.36	0.72595	0.01	0.17597	0.002	3567	30	1
JH021B-085	386	44	137	0.32	0.2912	0.006	27.7477	0.32	0.69106	0.01	0.18597	0.002	3424	31	1
JH021B-086	357	82	125	0.66	0.2864	0.006	27.7274	0.32	0.70207	0.01	0.19215	0.002	3398	31	-1
JH021B-087	335	49	88	0.56	0.5113	0.01	66.0323	0.75	0.93655	0.01	0.23975	0.003	4274	29	0
JH021B-090	812	106	310	0.34	0.2731	0.005	24.2611	0.27	0.64429	0.01	0.17691	0.002	3324	31	3
JH021B-091	402	115	135	0.85	0.3027	0.006	30.5080	0.35	0.73083	0.01	0.19474	0.002	3484	31	-2
JH021B-093	454	75	173	0.43	0.2828	0.006	25.1192	0.29	0.64407	0.01	0.11359	0.001	3379	31	5
JH021B-094	117	30	38	0.79	0.2867	0.006	30.2913	0.38	0.76613	0.01	0.19434	0.002	3400	32	-8
JH021B-097	809	190	299	0.64	0.3244	0.006	29.7493	0.33	0.665	0.01	0.11224	0.001	3591	30	9
JH021B-099	297	127	112	1.13	0.2922	0.006	26.3437	0.31	0.65382	0.01	0.17314	0.002	3429	31	5
JH021B-100	653	47	180	0.26	0.4621	0.009	57.0583	0.64	0.8954	0.01	0.23794	0.003	4125	29	0
JH021B-101	526	206	185	1.11	0.2908	0.006	28.0567	0.32	0.69955	0.01	0.18875	0.002	3422	31	0
JH021B-103	809	389	304	1.28	0.2903	0.006	26.2644	0.3	0.65595	0.01	0.15336	0.001	3419	31	5
JH021B-105	575	205	221	0.93	0.2818	0.006	24.9193	0.28	0.64125	0.01	0.14157	0.001	3373	31	5
JH021B-107	524	56	188	0.30	0.2899	0.006	27.4209	0.31	0.68581	0.01	0.16612	0.002	3417	31	1
JH021B-108	421	123	130	0.95	0.3485	0.007	38.5008	0.44	0.80098	0.01	0.2096	0.002	3701	30	-3
JH021B-109	371	122	136	0.90	0.2688	0.005	24.9549	0.29	0.67311	0.01	0.17515	0.002	3299	31	-1
JH021B-110	170	35	61	0.57	0.2832	0.006	27.0644	0.33	0.69303	0.01	0.18281	0.002	3381	31	-1

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH021B-111	295	172	106	1.62	0.2970	0.006	28.1566	0.33	0.68744	0.01	0.17486	0.002	3455	31	2
JH021B-113	375	68	131	0.52	0.2868	0.006	27.9058	0.32	0.70557	0.01	0.19252	0.002	3401	31	-2
JH021B-114	352	124	122	1.02	0.2860	0.006	27.9794	0.32	0.70953	0.01	0.17845	0.002	3396	31	-2
JH021B-115	251	88	98	0.90	0.2794	0.006	24.3907	0.29	0.63302	0.01	0.12797	0.001	3360	31	6
JH021B-118	340	134	130	1.03	0.2802	0.006	24.8003	0.29	0.64195	0.01	0.11413	0.001	3364	31	5
JH021B-119	138	43	46	0.93	0.3030	0.006	31.1921	0.38	0.74661	0.01	0.19807	0.002	3486	31	-4
JH021B-120	350	57	126	0.45	0.3015	0.006	28.4799	0.33	0.6851	0.01	0.18382	0.002	3478	31	3
JH021B-121	593	157	236	0.67	0.2896	0.006	24.7301	0.28	0.61929	0.01	0.13437	0.001	3415	31	9
JH021B-123	1057	107	316	0.34	0.4025	0.008	45.6776	0.51	0.82291	0.01	0.21874	0.002	3919	29	1
JH021B-124	581	110	213	0.52	0.2915	0.006	27.0324	0.31	0.67251	0.01	0.18305	0.002	3426	31	3
JH021B-125	779	176	296	0.59	0.3001	0.006	26.8183	0.3	0.64811	0.01	0.16962	0.002	3471	30	7
JH021B-127	154	66	53	1.25	0.2841	0.006	28.1891	0.35	0.71958	0.01	0.19405	0.002	3386	31	-4
JH021B-128	296	74	98	0.76	0.2862	0.006	29.3839	0.34	0.74449	0.01	0.19666	0.002	3397	31	-6
JH021B-130	568	92	162	0.57	0.4319	0.009	51.5519	0.58	0.86557	0.01	0.22005	0.002	4024	29	0
JH021B-132	1102	323	361	0.89	0.3874	0.008	40.1546	0.45	0.75174	0.01	0.13825	0.001	3861	30	6
JH021B-133	147	89	52	1.71	0.2866	0.006	27.4099	0.33	0.6936	0.01	0.18227	0.002	3399	31	0
JH021B-135	158	37	54	0.69	0.3026	0.006	30.2363	0.36	0.72473	0.01	0.18839	0.002	3483	31	-1
JH021B-136	916	115	347	0.33	0.2977	0.006	26.6832	0.3	0.65008	0.01	0.10232	0.001	3458	30	7
JH021B-137	344	93	136	0.68	0.2686	0.005	23.0477	0.27	0.62239	0.01	0.16651	0.002	3298	31	5
JH021B-138	627	207	234	0.88	0.3252	0.006	29.6280	0.33	0.66068	0.01	0.06377	7E-04	3595	30	9
JH021B-139	259	37	72	0.51	0.4442	0.009	54.2307	0.63	0.88544	0.01	0.21969	0.002	4066	29	-1
JH021B-140	434	79	128	0.62	0.4285	0.009	49.2105	0.56	0.83287	0.01	0.20481	0.002	4012	29	2
JH021B-143	505	88	184	0.48	0.2888	0.006	26.8731	0.3	0.67476	0.01	0.18361	0.002	3411	31	2

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH021B-144	373	190	140	1.36	0.2831	0.006	25.6117	0.29	0.656	0.01	0.1556	0.002	3380	31	3
JH021B-147	181	28	52	0.54	0.4263	0.009	50.2626	0.59	0.85503	0.01	0.21713	0.003	4005	30	0
JH021B-148	461	70	158	0.44	0.3152	0.006	31.1468	0.35	0.71665	0.01	0.19317	0.002	3546	30	1
JH021B-149	661	128	234	0.55	0.3083	0.006	29.5209	0.33	0.69443	0.01	0.17614	0.002	3512	30	3
JH021B-150	1127	115	385	0.30	0.3266	0.006	32.3744	0.36	0.71882	0.01	0.19127	0.002	3601	30	3
JH021B-151	107	8	29	0.28	0.4404	0.009	55.2546	0.68	0.90982	0.01	0.23613	0.004	4053	30	-3
JH021B-153	270	44	93	0.47	0.2758	0.006	27.0703	0.32	0.71178	0.01	0.19095	0.002	3339	31	-4
JH021B-154	565	157	189	0.83	0.3148	0.006	31.9264	0.36	0.73542	0.01	0.18524	0.002	3545	30	-1
JH021B-155	165	41	60	0.68	0.2861	0.006	26.8468	0.32	0.68052	0.01	0.10259	0.001	3396	31	1
JH021B-157	359	47	125	0.38	0.2863	0.006	27.7650	0.32	0.70334	0.01	0.19615	0.002	3397	31	-2
JH021B-158	422	74	158	0.47	0.2840	0.006	25.6063	0.29	0.65385	0.01	0.17395	0.002	3385	31	4
JH021B-164	453	310	151	2.05	0.2874	0.006	29.1846	0.34	0.73635	0.01	0.22832	0.002	3404	31	-5
JH021B-166	180	51	62	0.82	0.2838	0.006	27.8361	0.33	0.71136	0.01	0.19035	0.002	3384	31	-3
JH021B-167	421	60	151	0.40	0.3089	0.006	29.2200	0.33	0.68593	0.01	0.14274	0.002	3516	30	4
JH021B-168	422	77	140	0.55	0.3391	0.007	34.5045	0.39	0.73797	0.01	0.17141	0.002	3659	30	2
JH021B-170	789	271	295	0.92	0.3001	0.006	27.1767	0.3	0.65674	0.01	0.1799	0.002	3471	30	6
JH021B-172	628	251	241	1.04	0.2860	0.006	25.1738	0.28	0.63836	0.01	0.17117	0.002	3396	30	6
JH021B-175	203	65	73	0.89	0.2828	0.006	26.4512	0.31	0.67833	0.01	0.17599	0.002	3378	31	1
JH021B-176	794	250	288	0.87	0.3008	0.006	28.0757	0.31	0.67674	0.01	0.1726	0.002	3475	30	4
JH021B-181	569	84	196	0.43	0.3208	0.006	31.4673	0.35	0.71137	0.01	0.19581	0.002	3573	30	3
JH021B-182	808	240	294	0.82	0.3028	0.006	28.1310	0.31	0.6736	0.01	0.16114	0.002	3485	30	4
JH021B-184	717	354	249	1.42	0.2902	0.006	28.2799	0.32	0.70659	0.01	0.14127	0.001	3419	30	-1
JH021B-185	453	136	169	0.80	0.2827	0.006	25.6475	0.29	0.65784	0.01	0.16785	0.002	3378	31	3

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH021B-186	531	136	188	0.72	0.2879	0.006	27.4127	0.31	0.69035	0.01	0.18796	0.002	3407	30	0
JH021B-189	1406	350	552	0.63	0.2803	0.006	24.1276	0.27	0.62418	0.01	0.15843	0.002	3365	30	7
JH021B-191	116	26	40	0.65	0.2864	0.006	28.1619	0.35	0.71312	0.01	0.18561	0.002	3398	31	-3
JH021B-192	688	127	251	0.51	0.2891	0.006	26.8176	0.3	0.67265	0.01	0.1849	0.002	3413	30	2
JH021B-193	401	131	148	0.89	0.2812	0.006	25.7079	0.29	0.66279	0.01	0.15653	0.002	3370	31	2
JH021B-196	314	70	101	0.69	0.3802	0.008	39.8633	0.46	0.76029	0.01	0.18424	0.002	3833	30	5
JH021B-197	422	79	141	0.56	0.3799	0.008	38.5329	0.44	0.7355	0.01	0.13717	0.001	3831	30	7
JH021B-198	453	84	144	0.58	0.3563	0.007	37.8575	0.43	0.77034	0.01	0.20343	0.002	3734	30	1
JH021B-200	476	99	166	0.60	0.2930	0.006	28.4122	0.32	0.70308	0.01	0.18728	0.002	3434	30	0
JH021B-201	240	108	86	1.26	0.2845	0.006	26.8361	0.31	0.68392	0.01	0.18032	0.002	3388	31	0
JH021B-202	281	129	99	1.30	0.2834	0.006	27.0828	0.31	0.69297	0.01	0.18513	0.002	3382	31	-1
JH021B-203	903	137	337	0.41	0.2811	0.006	25.4269	0.28	0.65588	0.01	0.14738	0.002	3369	30	3
JH021B-204	539	215	208	1.03	0.2832	0.006	24.7945	0.28	0.63483	0.01	0.14051	0.001	3381	30	6
JH021B-205	1000	98	303	0.32	0.4042	0.008	44.9296	0.5	0.806	0.01	0.21356	0.002	3925	29	2
JH021B-207	165	58	57	1.02	0.3011	0.006	29.4828	0.35	0.71009	0.01	0.1889	0.002	3476	31	0
JH021B-208	302	46	87	0.53	0.4058	0.008	47.5558	0.55	0.84963	0.01	0.2128	0.002	3931	29	-1
JH021B-209	309	71	86	0.83	0.4411	0.009	53.5165	0.61	0.87968	0.01	0.22237	0.002	4056	29	-1
JH021B-210	352	48	100	0.48	0.4181	0.008	49.8750	0.57	0.86495	0.01	0.21602	0.002	3975	29	-2
JH021B-212	842	292	313	0.93	0.2906	0.006	26.3266	0.29	0.65676	0.01	0.1731	0.002	3421	30	5
JH021B-213	345	120	125	0.96	0.2797	0.006	25.9350	0.3	0.67239	0.01	0.18264	0.002	3361	31	1
JH021B-215	450	55	147	0.37	0.3242	0.006	33.4039	0.38	0.747	0.01	0.19916	0.002	3590	30	-1
JH021B-217	123	38	42	0.90	0.2985	0.006	29.7120	0.37	0.7217	0.01	0.18806	0.002	3462	31	-2
JH021B-218	674	332	245	1.36	0.2982	0.006	27.6156	0.31	0.67138	0.01	0.17284	0.002	3461	30	4

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH021B-220	602	180	229	0.79	0.2842	0.006	25.1547	0.28	0.64178	0.01	0.13584	0.001	3386	30	5
JH021B-222	264	151	92	1.64	0.2839	0.006	27.4716	0.32	0.70163	0.01	0.18454	0.002	3384	31	-2
JH021B-223	303	72	105	0.69	0.2824	0.006	27.5356	0.31	0.70691	0.01	0.1873	0.002	3376	31	-3
JH021B-224	353	59	115	0.51	0.3548	0.007	36.6864	0.42	0.74968	0.01	0.17946	0.002	3728	30	3
JH021B-226	359	51	126	0.40	0.2869	0.006	27.4494	0.31	0.69359	0.01	0.18503	0.002	3401	31	0
JH021B-227	490	98	132	0.74	0.4821	0.01	60.1572	0.67	0.90473	0.01	0.22931	0.002	4187	29	0
JH021B-228	435	67	121	0.55	0.4465	0.009	54.1388	0.61	0.87912	0.01	0.22592	0.002	4074	29	0
JH021B-233	284	41	95	0.43	0.2985	0.006	30.1041	0.35	0.73129	0.01	0.18952	0.002	3462	30	-3
JH021B-234	355	169	129	1.31	0.2975	0.006	27.5916	0.31	0.67236	0.01	0.16006	0.002	3457	30	4
JH021B-236	1038	125	380	0.33	0.2987	0.006	27.4885	0.3	0.66721	0.01	0.17082	0.002	3464	30	5
JH021B-238	219	24	64	0.38	0.4204	0.008	48.7490	0.57	0.84063	0.01	0.20687	0.003	3984	29	1
JH021B-239	332	137	117	1.17	0.2827	0.006	27.0587	0.31	0.69399	0.01	0.18568	0.002	3378	31	-1
JH021B-241	383	90	137	0.66	0.2807	0.006	26.4389	0.3	0.68278	0.01	0.18222	0.002	3367	31	0
JH021B-242	1168	189	385	0.49	0.3697	0.007	37.6654	0.41	0.73863	0.01	0.18006	0.002	3790	29	6
JH021B-243	1294	108	510	0.21	0.2826	0.006	24.1217	0.27	0.61873	0.01	0.10907	0.001	3378	30	8
JH021B-244	607	153	229	0.67	0.3071	0.006	27.3790	0.3	0.64635	0.01	0.1657	0.002	3506	30	9
JH021B-245	275	74	91	0.81	0.2973	0.006	30.0521	0.35	0.73296	0.01	0.18763	0.002	3456	30	-3
JH021B-246	736	254	288	0.88	0.2731	0.005	23.4614	0.26	0.62272	0.01	0.13566	0.001	3324	30	6
JH022-005	296	75	111	0.68	0.2851	0.006	25.3418	0.29	0.64458	0.01	0.16927	0.002	3391	31	5
JH022-008	653	96	260	0.37	0.2771	0.006	23.1911	0.26	0.60682	0.01	0.15402	0.001	3347	31	9
JH022-009	336	50	121	0.41	0.2858	0.006	26.3642	0.3	0.66889	0.01	0.18363	0.002	3395	31	2
JH022-010	247	80	90	0.89	0.2835	0.006	25.9553	0.3	0.66385	0.01	0.1711	0.002	3382	31	3
JH022-014	442	93	163	0.57	0.2868	0.006	25.8361	0.29	0.65326	0.01	0.17107	0.002	3400	31	4

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH022-015	233	36	89	0.40	0.2707	0.005	23.6679	0.27	0.63407	0.01	0.16159	0.002	3310	31	4
JH022-018	314	158	115	1.37	0.2862	0.006	25.9393	0.29	0.65729	0.01	0.16976	0.002	3397	31	4
JH022-025	455	92	168	0.55	0.2880	0.006	25.9015	0.29	0.65208	0.01	0.17397	0.002	3407	31	5
JH022-027	610	243	218	1.11	0.2970	0.006	27.6256	0.31	0.67445	0.01	0.17201	0.002	3455	31	3
JH022-028	274	29	79	0.37	0.4037	0.008	46.7696	0.54	0.83999	0.01	0.21272	0.002	3923	30	-1
JH022-033	547	96	188	0.51	0.3094	0.006	29.9477	0.34	0.70195	0.01	0.18563	0.002	3518	30	2
JH022-034	444	61	152	0.40	0.3065	0.006	29.8255	0.34	0.70565	0.01	0.18776	0.002	3503	30	1
JH022-035	806	134	313	0.43	0.2768	0.005	23.7076	0.26	0.62103	0.01	0.15003	0.001	3345	31	7
JH022-037	464	106	163	0.65	0.2846	0.006	26.9144	0.3	0.68571	0.01	0.18443	0.002	3388	31	0
JH022-038	335	88	125	0.70	0.2812	0.006	25.1593	0.29	0.64871	0.01	0.17269	0.002	3370	31	4
JH022-041	450	110	176	0.63	0.2848	0.006	24.2834	0.27	0.61819	0.01	0.16181	0.002	3390	31	9
JH022-043	626	109	182	0.60	0.3891	0.008	44.5610	0.5	0.83044	0.01	0.21613	0.002	3867	30	-1
JH022-045	335	77	122	0.63	0.2888	0.006	26.3816	0.3	0.6624	0.01	0.17444	0.002	3411	31	4
JH022-046	692	93	238	0.39	0.3148	0.006	30.4347	0.34	0.70101	0.01	0.18145	0.002	3545	30	3
JH022-047	232	45	79	0.57	0.2862	0.006	28.0841	0.32	0.71151	0.01	0.1835	0.002	3397	31	-2
JH022-049	797	61	225	0.27	0.4009	0.008	47.3512	0.53	0.85646	0.01	0.22375	0.002	3912	29	-2
JH022-050	276	67	87	0.77	0.2965	0.006	31.1836	0.36	0.76271	0.01	0.20416	0.002	3452	31	-6
JH022-053	841	215	319	0.67	0.2815	0.006	24.6707	0.28	0.63557	0.01	0.16402	0.002	3371	31	6
JH022-056	131	39	47	0.83	0.2812	0.006	26.0110	0.32	0.67068	0.01	0.17784	0.002	3370	31	1
JH022-057	647	210	251	0.84	0.2789	0.006	23.9387	0.27	0.62236	0.01	0.11555	0.001	3357	31	7
JH022-060	241	63	91	0.69	0.3009	0.006	26.5935	0.31	0.64079	0.01	0.16522	0.002	3475	31	8
JH022-065	853	45	289	0.16	0.3030	0.006	29.7335	0.33	0.71147	0.01	0.16478	0.002	3486	30	0
JH022-066	221	63	73	0.86	0.2819	0.006	28.2263	0.33	0.72602	0.01	0.19792	0.002	3374	31	-5

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH022-073	739	172	251	0.69	0.2949	0.006	28.9002	0.33	0.71059	0.01	0.17367	0.002	3444	30	-1
JH022-074	297	137	100	1.37	0.2931	0.006	28.8712	0.33	0.71431	0.01	0.18516	0.002	3434	31	-2
JH022-075	567	69	191	0.36	0.3048	0.006	30.1458	0.34	0.71711	0.01	0.19162	0.002	3495	30	0
JH022-081	349	190	130	1.46	0.2840	0.006	25.2628	0.29	0.64505	0.01	0.16538	0.002	3385	31	5
JH022-082	370	70	123	0.57	0.3530	0.007	35.4463	0.4	0.72824	0.01	0.18944	0.002	3720	30	5
JH022-083	203	57	78	0.73	0.2819	0.006	24.2302	0.28	0.62322	0.01	0.16412	0.002	3374	31	8
JH022-084	238	127	93	1.37	0.2850	0.006	24.1424	0.28	0.61417	0.01	0.16362	0.002	3391	31	9
JH022-086	1042	295	336	0.88	0.3693	0.007	38.1299	0.43	0.74873	0.01	0.17436	0.002	3789	30	5
JH022-087	335	91	118	0.77	0.3471	0.007	32.8525	0.38	0.68639	0.01	0.18216	0.002	3694	30	9
JH022-089	403	65	153	0.42	0.2760	0.005	24.1707	0.28	0.63502	0.01	0.16458	0.002	3341	31	5
JH022-093	761	64	253	0.25	0.3173	0.006	31.8092	0.36	0.72697	0.01	0.19248	0.002	3557	30	0
JH022-097	747	321	273	1.18	0.2798	0.006	25.4867	0.29	0.66051	0.01	0.16452	0.002	3362	31	2
JH022-098	323	150	121	1.24	0.2773	0.006	24.6354	0.29	0.64421	0.01	0.15837	0.002	3348	31	4
JH022-101	862	261	315	0.83	0.2928	0.006	26.6264	0.3	0.65936	0.01	0.12557	0.001	3433	30	5
JH022-104	573	157	215	0.73	0.2830	0.006	25.1117	0.29	0.64337	0.01	0.18736	0.002	3380	31	5
JH022-106	877	108	268	0.40	0.3309	0.007	35.9811	0.41	0.78853	0.01	0.21228	0.002	3621	30	-4
JH022-107	264	101	86	1.17	0.2868	0.006	29.2696	0.35	0.73997	0.01	0.20278	0.002	3401	31	-5
JH022-108	619	197	221	0.89	0.2779	0.006	25.8478	0.3	0.67443	0.01	0.15116	0.001	3351	31	0
JH022-109	1174	272	397	0.69	0.3704	0.007	36.4531	0.41	0.71367	0.01	0.17505	0.002	3793	30	9
JH022-111	241	101	88	1.15	0.2826	0.006	25.8227	0.3	0.66259	0.01	0.17715	0.002	3377	31	3
JH022-112	552	229	211	1.09	0.2762	0.005	23.9387	0.27	0.62849	0.01	0.16845	0.002	3342	30	6
JH022-113	1104	426	420	1.01	0.2583	0.005	22.4507	0.25	0.63029	0.01	0.15189	0.001	3236	30	2
JH022-115	573	74	188	0.39	0.3085	0.006	31.1651	0.35	0.73262	0.01	0.20314	0.002	3513	30	-1

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH022-116	440	54	144	0.38	0.3098	0.006	31.3557	0.36	0.73389	0.01	0.20708	0.002	3520	30	-1
JH022-117	110	49	39	1.26	0.2812	0.006	25.9858	0.32	0.67013	0.01	0.16982	0.002	3370	31	1
JH022-118	836	145	246	0.59	0.4518	0.009	50.7596	0.57	0.81471	0.01	0.19006	0.002	4091	29	6
JH022-122	306	99	111	0.89	0.2822	0.006	25.9012	0.3	0.66568	0.01	0.17312	0.002	3375	30	2
JH022-124	970	186	285	0.65	0.3845	0.008	43.5228	0.49	0.8209	0.01	0.21233	0.002	3849	29	-1
JH022-125	1423	224	505	0.44	0.3097	0.006	28.9795	0.32	0.67863	0.01	0.1349	0.001	3519	30	5
JH022-126	263	172	94	1.83	0.2856	0.006	26.4781	0.31	0.67224	0.01	0.17745	0.002	3394	30	2
JH022-128	260	67	95	0.71	0.2771	0.005	25.1464	0.29	0.65802	0.01	0.17197	0.002	3347	31	2
JH022-130	999	209	364	0.57	0.3149	0.006	28.7257	0.32	0.66161	0.01	0.13824	0.001	3545	30	8
JH022-131	691	193	197	0.98	0.3875	0.008	45.1358	0.51	0.84469	0.01	0.24726	0.002	3861	29	-3
JH022-133	556	209	200	1.05	0.2816	0.006	26.1073	0.3	0.67227	0.01	0.17641	0.002	3372	30	1
JH022-134	730	122	260	0.47	0.3092	0.006	28.8934	0.33	0.67763	0.01	0.15613	0.002	3517	30	5
JH022-135	660	168	236	0.71	0.2762	0.005	25.6975	0.29	0.67478	0.01	0.17502	0.002	3341	30	0
JH022-139	657	168	238	0.71	0.2781	0.005	25.5771	0.29	0.66706	0.01	0.17273	0.002	3352	30	1
JH022-140	229	126	76	1.66	0.2854	0.006	28.5668	0.34	0.72598	0.01	0.18726	0.002	3393	31	-4
JH022-145	1181	272	362	0.75	0.3855	0.008	42.0566	0.47	0.79109	0.01	0.19901	0.002	3854	29	2
JH022-148	722	86	206	0.42	0.3977	0.008	46.5946	0.53	0.8497	0.01	0.22381	0.002	3900	29	-2
JH022-154	151	94	45	2.09	0.3961	0.008	44.8661	0.54	0.82144	0.01	0.19637	0.002	3894	30	0
JH022-155	555	137	189	0.72	0.3359	0.007	33.2033	0.38	0.71682	0.01	0.17128	0.002	3644	30	4
JH022-156	711	160	246	0.65	0.3241	0.006	31.4668	0.36	0.70408	0.01	0.16366	0.002	3589	30	4
JH022-157	217	73	74	0.99	0.2830	0.006	27.7821	0.33	0.71193	0.01	0.18412	0.002	3380	31	-3
JH022-161	555	160	204	0.78	0.2850	0.006	26.1111	0.3	0.66439	0.01	0.14989	0.001	3391	31	3
JH022-165	504	118	173	0.68	0.2971	0.006	29.2329	0.34	0.71355	0.01	0.18708	0.002	3455	31	-1

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH022-166	446	181	149	1.21	0.2984	0.006	30.1978	0.35	0.73379	0.01	0.19265	0.002	3462	31	-3
JH022-168	1017	263	290	0.91	0.4248	0.008	50.2825	0.57	0.85835	0.01	0.19963	0.002	3999	29	0
JH022-171	892	128	338	0.38	0.2942	0.006	26.2101	0.3	0.64602	0.01	0.14175	0.001	3440	30	7
JH022-172	394	170	137	1.24	0.2961	0.006	28.7202	0.34	0.70334	0.01	0.1778	0.002	3450	31	0
JH022-174	467	92	177	0.52	0.2839	0.006	25.2905	0.29	0.64587	0.01	0.16602	0.002	3385	31	5
JH022-178	468	176	170	1.04	0.2985	0.006	27.8687	0.32	0.6769	0.01	0.17266	0.002	3463	31	3
JH022-180	629	122	215	0.57	0.3038	0.006	30.1296	0.35	0.71925	0.01	0.18448	0.002	3490	31	-1
JH022-182	245	157	97	1.62	0.2812	0.006	24.0857	0.29	0.62102	0.01	0.16	0.002	3370	31	8
JH023-001	407	237	150	1.58	0.2786	0.005	25.8110	0.29	0.67176	0.01	0.17892	0.002	3355	30	1
JH023-005	861	171	328	0.52	0.2792	0.005	25.0215	0.27	0.64989	0.01	0.14888	0.001	3359	30	4
JH023-009	597	212	244	0.87	0.2629	0.005	21.9266	0.24	0.60479	0.01	0.16134	0.002	3264	31	7
JH023-010	1082	327	419	0.78	0.2861	0.006	25.1741	0.28	0.63808	0.01	0.10114	1E-03	3397	30	6
JH023-011	728	247	221	1.12	0.4263	0.008	48.0115	0.53	0.81672	0.01	0.19964	0.002	4005	29	4
JH023-012	459	115	162	0.71	0.2806	0.006	27.1570	0.3	0.702	0.01	0.18366	0.002	3366	30	-2
JH023-015	500	85	204	0.42	0.2698	0.005	22.4755	0.25	0.60425	0.01	0.1288	0.001	3305	31	8
JH023-018	425	165	158	1.04	0.2744	0.005	25.1278	0.28	0.66409	0.01	0.16929	0.002	3331	30	1
JH023-019	1046	230	398	0.58	0.3068	0.006	27.4980	0.3	0.64994	0.01	0.10628	0.001	3505	30	8
JH023-023	672	333	265	1.26	0.2830	0.006	24.4690	0.27	0.6271	0.01	0.13624	0.001	3379	30	7
JH023-025	289	52	95	0.55	0.3190	0.006	33.2206	0.38	0.75529	0.01	0.19524	0.002	3565	30	-2
JH023-027	590	134	223	0.60	0.2952	0.006	26.5759	0.3	0.653	0.01	0.15245	0.002	3445	30	6
JH023-028	633	146	243	0.60	0.2793	0.005	25.4118	0.28	0.65989	0.01	0.1339	0.001	3359	30	2
JH023-030	330	97	117	0.83	0.2812	0.006	26.9751	0.31	0.69578	0.01	0.173	0.002	3369	30	-2
JH023-033	499	16	177	0.09	0.2744	0.005	26.4447	0.3	0.69898	0.01	0.18456	0.003	3331	31	-3

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH023-034	415	117	137	0.85	0.2982	0.006	30.7425	0.35	0.74758	0.01	0.19442	0.002	3461	30	-4
JH023-035	1043	104	342	0.30	0.4094	0.008	42.5995	0.47	0.75463	0.01	0.09698	0.001	3944	29	8
JH023-037	685	177	277	0.64	0.2792	0.005	23.4982	0.26	0.61028	0.01	0.08617	9E-04	3359	30	9
JH023-038	435	117	151	0.77	0.2907	0.006	28.4698	0.32	0.71026	0.01	0.18409	0.002	3421	30	-2
JH023-039	300	110	118	0.93	0.2617	0.005	22.6408	0.26	0.62753	0.01	0.15066	0.002	3257	31	3
JH023-040	427	143	154	0.93	0.2815	0.006	26.6357	0.3	0.68631	0.01	0.17012	0.002	3371	31	0
JH023-041	239	55	86	0.64	0.2830	0.006	26.8779	0.32	0.68887	0.01	0.18282	0.002	3379	31	0
JH023-043	223	73	83	0.88	0.2822	0.006	25.9964	0.31	0.66821	0.01	0.17486	0.002	3375	31	2
JH023-044	274	82	94	0.87	0.2968	0.006	29.4925	0.34	0.72063	0.01	0.18822	0.002	3454	30	-2
JH023-049	633	200	238	0.84	0.3214	0.006	29.1858	0.33	0.6585	0.01	0.06797	7E-04	3577	30	9
JH023-050	805	45	296	0.15	0.2874	0.006	26.6266	0.3	0.67192	0.01	0.20528	0.002	3404	30	2
JH023-054	459	44	129	0.34	0.4733	0.009	57.3750	0.65	0.87923	0.01	0.1301	0.002	4160	29	2
JH023-058	634	247	234	1.06	0.3442	0.007	32.3634	0.36	0.68189	0.01	0.13861	0.001	3682	30	9
JH023-059	362	39	122	0.32	0.3119	0.006	31.4391	0.36	0.73095	0.01	0.17718	0.002	3531	30	-1
JH023-061	661	219	266	0.82	0.2838	0.006	24.2122	0.27	0.61865	0.01	0.16309	0.002	3384	30	9
JH023-063	167	39	63	0.62	0.2790	0.006	25.1562	0.31	0.654	0.01	0.14687	0.002	3357	31	3
JH023-068	640	251	262	0.96	0.2838	0.006	24.9945	0.29	0.63876	0.01	0.14387	0.001	3384	31	6
JH023-070	393	130	157	0.83	0.2765	0.006	23.5011	0.27	0.61641	0.01	0.15293	0.002	3343	31	7
JH023-071	622	93	225	0.41	0.3057	0.006	28.7725	0.33	0.6825	0.01	0.18057	0.002	3500	30	4
JH023-072	600	84	162	0.52	0.4744	0.009	59.9508	0.68	0.91654	0.01	0.20822	0.002	4163	29	-1
JH023-074	458	59	159	0.37	0.2846	0.006	27.9229	0.32	0.71155	0.01	0.18467	0.002	3388	31	-3
JH023-082	762	446	316	1.41	0.2634	0.005	21.9475	0.25	0.60425	0.01	0.14231	0.001	3267	31	7
JH023-085	600	198	226	0.88	0.2821	0.006	25.5393	0.29	0.65654	0.01	0.12963	0.001	3375	31	3

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH023-086	336	102	102	1.00	0.3655	0.007	41.2879	0.48	0.81927	0.01	0.2183	0.002	3773	30	-3
JH023-089	602	153	195	0.78	0.3460	0.007	36.4847	0.42	0.76455	0.01	0.16263	0.002	3690	30	0
JH023-094	605	167	194	0.86	0.3548	0.007	37.7134	0.43	0.77081	0.01	0.19163	0.002	3728	30	1
JH023-095	891	173	359	0.48	0.2694	0.005	22.7620	0.26	0.61277	0.01	0.18525	0.002	3302	31	7
JH023-096	376	72	130	0.55	0.2860	0.006	28.1999	0.33	0.71499	0.01	0.1854	0.002	3396	31	-3
JH023-099	486	126	167	0.75	0.3026	0.006	29.9752	0.34	0.71822	0.01	0.1862	0.002	3484	30	-1
JH023-101	518	91	185	0.49	0.3016	0.006	28.7923	0.33	0.69215	0.01	0.18541	0.002	3479	31	2
JH023-103	571	109	191	0.57	0.3056	0.006	31.1712	0.36	0.73957	0.01	0.19709	0.002	3499	30	-2
JH023-106	1089	260	442	0.59	0.2767	0.006	23.2439	0.26	0.60907	0.01	0.11093	0.001	3345	31	9
JH023-107	159	21	45	0.47	0.4252	0.009	51.0921	0.62	0.8712	0.01	0.22429	0.003	4001	30	-1
JH023-108	326	72	94	0.77	0.4230	0.008	49.9495	0.58	0.85612	0.01	0.20546	0.002	3993	30	0
JH023-109	661	237	235	1.01	0.3054	0.006	29.3007	0.34	0.69564	0.01	0.176	0.002	3498	31	2
JH025-001	468	105	133	0.79	0.4860	0.01	55.2187	0.6	0.82393	0.01	0.16777	0.002	4199	29	8
JH025-002	178	55	64	0.86	0.2848	0.006	25.5668	0.29	0.65113	0.01	0.17005	0.002	3389	31	4
JH025-004	182	94	64	1.47	0.2841	0.006	26.1539	0.3	0.66751	0.01	0.18371	0.002	3386	31	2
JH025-006	1087	244	353	0.69	0.3577	0.007	35.6302	0.38	0.72231	0.01	0.17048	0.002	3740	30	6
JH025-007	848	366	314	1.17	0.2801	0.006	24.3247	0.26	0.62982	0.01	0.08797	8E-04	3363	31	6
JH025-008	380	53	129	0.41	0.3087	0.006	29.2654	0.32	0.68746	0.01	0.19047	0.002	3515	30	4
JH025-009	579	78	200	0.39	0.3143	0.006	29.3473	0.32	0.67723	0.01	0.18896	0.002	3542	30	6
JH025-010	284	67	104	0.64	0.3011	0.006	26.6049	0.3	0.64079	0.01	0.13769	0.001	3476	31	8
JH025-013	318	149	103	1.45	0.3000	0.006	29.9287	0.34	0.72338	0.01	0.18772	0.002	3470	31	-2
JH025-014	560	71	185	0.38	0.3089	0.006	30.2951	0.33	0.71123	0.01	0.19586	0.002	3515	30	1
JH025-015	844	503	327	1.54	0.2689	0.005	22.4765	0.24	0.60624	0.01	0.10267	1E-03	3300	31	8

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH025-016	296	58	105	0.55	0.2828	0.006	25.8031	0.29	0.66171	0.01	0.18988	0.002	3378	31	3
JH025-017	195	68	70	0.97	0.2751	0.006	25.0471	0.29	0.66022	0.01	0.16193	0.002	3336	31	2
JH025-019	632	64	181	0.35	0.4435	0.009	50.2500	0.55	0.82163	0.01	0.22352	0.002	4064	29	5
JH025-022	170	58	60	0.97	0.2849	0.006	26.4076	0.31	0.67226	0.01	0.17703	0.002	3390	31	2
JH025-023	156	69	53	1.30	0.3007	0.006	28.7636	0.33	0.69362	0.01	0.18555	0.002	3474	31	2
JH025-024	502	129	181	0.71	0.3131	0.006	28.2214	0.31	0.65375	0.01	0.13014	0.001	3536	30	9
JH025-025	652	237	250	0.95	0.2772	0.006	23.6158	0.26	0.61777	0.01	0.06829	7E-04	3347	31	7
JH025-026	279	12	82	0.15	0.3281	0.007	36.4893	0.41	0.80656	0.01	0.20906	0.003	3608	30	-6
JH025-027	81	14	23	0.61	0.3829	0.008	43.5528	0.55	0.82493	0.01	0.1898	0.003	3843	31	-1
JH025-028	331	85	109	0.78	0.3021	0.006	30.0454	0.34	0.72119	0.01	0.19928	0.002	3481	31	-1
JH025-030	142	15	38	0.39	0.4437	0.009	53.5511	0.64	0.87523	0.01	0.26839	0.003	4064	30	0
JH025-032	230	66	78	0.85	0.2835	0.006	27.2461	0.31	0.69687	0.01	0.18934	0.002	3383	31	-1
JH025-034	261	19	73	0.26	0.4200	0.008	48.9092	0.55	0.84441	0.01	0.23404	0.003	3982	30	0
JH025-035	645	112	185	0.61	0.4413	0.009	50.5182	0.56	0.83008	0.01	0.19376	0.002	4056	29	4
JH025-038	736	326	262	1.24	0.3059	0.006	28.2402	0.31	0.6695	0.01	0.14702	0.001	3500	30	5
JH025-039	1026	148	394	0.38	0.2812	0.006	24.0566	0.26	0.6204	0.01	0.09189	9E-04	3370	31	8
JH025-041	404	51	132	0.39	0.3407	0.007	34.3546	0.38	0.73119	0.01	0.20221	0.002	3666	30	3
JH025-044	291	67	104	0.64	0.2841	0.006	26.2480	0.3	0.66993	0.01	0.18399	0.002	3386	31	2
JH025-045	414	162	159	1.02	0.2924	0.006	25.0933	0.28	0.62243	0.01	0.17337	0.002	3430	31	9
JH025-047	513	105	178	0.59	0.2777	0.006	26.3434	0.29	0.68793	0.01	0.18486	0.002	3350	31	-1
JH025-048	185	74	64	1.16	0.2833	0.006	26.8719	0.31	0.68774	0.01	0.18661	0.002	3381	31	0
JH025-049	251	48	85	0.56	0.3115	0.006	30.3464	0.35	0.70636	0.01	0.19233	0.002	3529	31	2
JH025-050	1123	251	401	0.63	0.3025	0.006	27.9879	0.31	0.67092	0.01	0.16747	0.002	3483	30	5

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH025-051	235	74	85	0.87	0.2857	0.006	26.2573	0.3	0.66647	0.01	0.15262	0.002	3394	31	3
JH025-056	929	305	347	0.88	0.3029	0.006	26.8815	0.3	0.64363	0.01	0.12128	0.001	3485	30	8
JH025-059	1090	293	383	0.77	0.3127	0.006	29.5348	0.33	0.68481	0.01	0.12912	0.001	3535	30	5
JH025-061	345	91	116	0.78	0.3025	0.006	29.8296	0.34	0.71506	0.01	0.19755	0.002	3483	31	0
JH025-064	197	63	68	0.93	0.3018	0.006	29.1420	0.34	0.70028	0.01	0.18184	0.002	3479	31	1
JH025-065	273	72	92	0.78	0.3013	0.006	29.8614	0.34	0.71869	0.01	0.17312	0.002	3477	31	-1
JH025-066	267	130	99	1.31	0.2868	0.006	25.8067	0.3	0.65244	0.01	0.17993	0.002	3400	31	5
JH025-067	474	125	171	0.73	0.2863	0.006	26.4280	0.3	0.66939	0.01	0.14979	0.001	3398	31	2
JH025-068	898	212	317	0.67	0.2987	0.006	28.2525	0.31	0.68592	0.01	0.16853	0.002	3463	30	2
JH025-069	1057	329	403	0.82	0.2904	0.006	25.4337	0.28	0.63507	0.01	0.03122	3E-04	3420	31	7
JH025-070	491	244	190	1.28	0.2898	0.006	25.0253	0.28	0.62621	0.01	0.0949	9E-04	3416	31	8
JH025-071	420	77	145	0.53	0.2656	0.005	25.7936	0.29	0.70411	0.01	0.20327	0.002	3280	31	-5
JH025-073	900	262	330	0.79	0.2812	0.006	25.7118	0.29	0.6631	0.01	0.1483	0.001	3369	31	2
JH025-074	195	113	79	1.43	0.2688	0.005	22.1620	0.26	0.59782	0.01	0.04594	5E-04	3299	31	9
JH025-076	365	29	129	0.22	0.3323	0.007	31.6430	0.36	0.6904	0.01	0.16771	0.002	3628	30	7
JH025-079	201	18	69	0.26	0.2848	0.006	27.9612	0.33	0.71188	0.01	0.19058	0.002	3389	31	-3
JH025-080	376	38	132	0.29	0.2845	0.006	27.1320	0.31	0.69142	0.01	0.18494	0.002	3388	31	0
JH025-081	196	87	69	1.26	0.2854	0.006	27.0776	0.32	0.68805	0.01	0.18429	0.002	3392	31	0
JH025-082	663	119	192	0.62	0.4854	0.01	56.4046	0.63	0.84252	0.01	0.20171	0.002	4198	29	6
JH025-084	308	178	120	1.48	0.2879	0.006	24.8468	0.28	0.62575	0.01	0.09154	9E-04	3406	31	8
JH025-086	584	33	204	0.16	0.2846	0.006	27.5188	0.31	0.70105	0.01	0.18262	0.002	3388	31	-2
JH025-089	657	302	257	1.18	0.2779	0.006	23.9894	0.27	0.62579	0.01	0.09938	1E-03	3351	31	6
JH025-090	441	205	173	1.18	0.2822	0.006	24.3217	0.28	0.62485	0.01	0.10806	0.001	3375	31	7

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH025-091	799	151	268	0.56	0.3102	0.006	31.3976	0.35	0.73384	0.01	0.19034	0.002	3522	30	-1
JH025-092	297	63	105	0.60	0.2859	0.006	27.3668	0.32	0.69409	0.01	0.18856	0.002	3395	31	-1
JH025-093	714	290	281	1.03	0.2700	0.005	23.2288	0.26	0.62377	0.01	0.0939	9E-04	3306	31	5
JH025-094	621	371	221	1.68	0.2826	0.006	26.9908	0.31	0.69243	0.01	0.17674	0.002	3377	31	-1
JH025-095	143	46	49	0.94	0.2985	0.006	29.6520	0.36	0.72022	0.01	0.0126	0.001	3462	31	-1
JH025-096	292	52	95	0.55	0.2851	0.006	29.6992	0.35	0.75524	0.01	0.21447	0.002	3391	31	-7
JH025-097	616	233	227	1.03	0.2868	0.006	26.5213	0.3	0.67047	0.01	0.12208	0.001	3400	31	2
JH025-099	215	63	74	0.85	0.2853	0.006	28.3526	0.34	0.72042	0.01	0.19045	0.002	3392	31	-4
JH025-100	440	124	164	0.76	0.2807	0.006	25.6717	0.3	0.66314	0.01	0.16186	0.002	3367	31	2
JH025-101	413	147	149	0.99	0.2857	0.006	26.9648	0.31	0.68425	0.01	0.17341	0.002	3394	31	1
JH025-102	165	38	58	0.66	0.2805	0.006	27.3510	0.33	0.70689	0.01	0.18695	0.002	3366	31	-3
JH025-103	411	76	138	0.55	0.2995	0.006	30.4225	0.35	0.73652	0.01	0.20109	0.002	3467	31	-3
JH025-104	291	124	105	1.18	0.2761	0.006	26.2054	0.3	0.68819	0.01	0.17634	0.002	3341	31	-2
JH025-105	263	141	95	1.48	0.2843	0.006	26.9358	0.32	0.68698	0.01	0.15586	0.002	3387	31	0
JH025-106	831	276	264	1.05	0.3710	0.007	39.8276	0.45	0.77818	0.01	0.15182	0.001	3796	30	2
JH025-107	710	416	279	1.49	0.2883	0.006	25.0222	0.28	0.62928	0.01	0.10516	0.001	3408	31	8
JH025-109	408	180	149	1.21	0.2990	0.006	27.9626	0.33	0.67816	0.01	0.12766	0.001	3465	31	3
JH025-110	767	103	235	0.44	0.3248	0.006	36.0909	0.42	0.8056	0.01	0.21245	0.002	3593	30	-6
JH025-111	275	85	98	0.87	0.2841	0.006	27.1609	0.33	0.69321	0.01	0.12844	0.001	3386	31	-1
JH025-112	742	479	298	1.61	0.2752	0.005	23.3522	0.27	0.61516	0.01	0.08075	8E-04	3336	31	7
JH025-115	534	262	207	1.27	0.2763	0.006	24.2780	0.29	0.63721	0.01	0.08194	8E-04	3342	31	5
JH025-118	395	170	144	1.18	0.3013	0.006	28.1752	0.33	0.67814	0.01	0.12828	0.001	3477	31	4
JH025-119	200	48	70	0.69	0.2854	0.006	27.6102	0.34	0.70136	0.01	0.18336	0.002	3393	31	-1

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH025-120	363	122	141	0.87	0.2821	0.006	24.7342	0.29	0.63569	0.01	0.09784	0.001	3375	31	6
JH025-121	808	254	284	0.89	0.2663	0.005	25.7612	0.3	0.70152	0.01	0.18224	0.002	3284	31	-5
JH025-122	206	28	54	0.52	0.4250	0.009	54.5825	0.67	0.93113	0.01	0.23165	0.003	4000	30	-6
JH025-123	243	70	79	0.89	0.3063	0.006	31.9928	0.39	0.75745	0.01	0.24896	0.003	3502	31	-4
JH025-124	483	186	189	0.98	0.2840	0.006	24.5856	0.29	0.62766	0.01	0.16038	0.002	3385	31	7
JH025-126	953	399	287	1.39	0.4440	0.009	50.0174	0.58	0.81683	0.01	0.10908	0.001	4065	29	5
JH025-127	839	293	290	1.01	0.3166	0.006	31.0584	0.36	0.71137	0.01	0.11022	0.001	3553	30	2
JH025-128	356	76	125	0.61	0.2836	0.006	27.3405	0.33	0.69895	0.01	0.18878	0.002	3383	31	-1
JH025-129	309	64	105	0.61	0.2826	0.006	28.1935	0.34	0.72346	0.01	0.19089	0.002	3377	31	-4
JH025-130	692	204	227	0.90	0.3098	0.006	32.0416	0.37	0.74986	0.01	0.19491	0.002	3520	30	-3
JH025-131	303	62	80	0.78	0.4761	0.01	61.3088	0.73	0.93368	0.01	0.23265	0.002	4169	29	-2
JH025-132	1021	327	408	0.80	0.2627	0.005	22.3170	0.26	0.61606	0.01	0.06987	7E-04	3263	31	5
JH025-133	303	141	101	1.40	0.3045	0.006	30.8015	0.37	0.73351	0.01	0.18304	0.002	3493	31	-2
JH025-134	183	42	62	0.68	0.2844	0.006	28.3489	0.35	0.72281	0.01	0.18784	0.002	3387	31	-4
JH025-135	139	36	50	0.72	0.2691	0.005	25.2741	0.32	0.68103	0.01	0.05673	0.001	3301	32	-2
JH025-136	529	229	201	1.14	0.3031	0.006	27.0094	0.32	0.64614	0.01	0.1878	0.002	3486	31	8
JH025-138	877	646	348	1.86	0.2829	0.006	24.1290	0.28	0.61846	0.01	0.12106	0.001	3379	31	8
JH025-141	758	495	310	1.60	0.2737	0.005	22.6337	0.26	0.59963	0.01	0.04528	5E-04	3327	31	9
JH025-142	920	512	344	1.49	0.2751	0.005	24.9310	0.29	0.65719	0.01	0.11033	0.001	3335	31	2
JH025-144	700	330	270	1.22	0.2806	0.006	24.6087	0.29	0.63596	0.01	0.08582	9E-04	3366	31	6
JH025-145	430	142	154	0.92	0.2801	0.006	26.4452	0.31	0.68467	0.01	0.11368	0.001	3363	31	0
JH025-146	542	63	203	0.31	0.2734	0.005	24.6990	0.29	0.65509	0.01	0.10241	0.001	3326	31	2
JH025-147	495	117	140	0.84	0.5370	0.011	64.1409	0.75	0.86602	0.01	0.16917	0.002	4346	29	8

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH025-148	608	267	229	1.17	0.2805	0.006	25.1695	0.3	0.65066	0.01	0.15392	0.002	3366	31	4
JH025-149	655	184	229	0.80	0.3006	0.006	29.1336	0.34	0.70271	0.01	0.10317	0.001	3473	31	1
JH025-150	842	459	255	1.80	0.4341	0.009	48.4767	0.56	0.80978	0.01	0.07822	8E-04	4032	29	5
JH025-152	565	57	172	0.33	0.3351	0.007	37.1527	0.43	0.80396	0.01	0.18179	0.002	3641	30	-5
JH025-154	556	165	191	0.86	0.3100	0.006	30.4722	0.36	0.71287	0.01	0.15251	0.002	3521	31	1
JH025-155	444	210	167	1.26	0.2995	0.006	26.8239	0.32	0.6494	0.01	0.13239	0.001	3468	31	7
JH025-156	309	68	105	0.65	0.2966	0.006	29.3510	0.35	0.71764	0.01	0.1384	0.001	3452	31	-1
JH025-157	211	50	69	0.72	0.2850	0.006	29.1564	0.35	0.7419	0.01	0.20705	0.002	3390	31	-6
JH025-158	767	396	251	1.58	0.3742	0.007	38.5343	0.45	0.74666	0.01	0.06074	6E-04	3809	30	5
JH025-159	499	231	168	1.38	0.3006	0.006	30.1404	0.35	0.72706	0.01	0.18749	0.002	3473	31	-2
JH025-161	583	372	224	1.66	0.2901	0.006	25.4933	0.3	0.63729	0.01	0.07911	8E-04	3418	31	7
JH025-162	439	106	163	0.65	0.2709	0.005	24.5773	0.29	0.65798	0.01	0.16307	0.002	3311	31	1
JH025-164	880	301	321	0.94	0.2957	0.006	27.2945	0.32	0.66935	0.01	0.09323	9E-04	3448	31	4
JH025-165	424	204	145	1.41	0.3530	0.007	34.6415	0.41	0.71164	0.01	0.14058	0.001	3720	30	7
JH025-166	862	505	338	1.49	0.2607	0.005	22.4192	0.26	0.62365	0.01	0.11723	0.001	3251	31	4
JH025-167	117	35	37	0.95	0.3003	0.006	31.8792	0.41	0.76983	0.01	0.21227	0.002	3472	31	-6
JH025-168	979	198	320	0.62	0.3872	0.008	39.8864	0.46	0.747	0.01	0.13108	0.001	3860	30	7
JH025-170	830	251	277	0.91	0.3162	0.006	31.8331	0.37	0.72996	0.01	0.11374	0.001	3552	30	0
JH025-171	335	129	123	1.05	0.2835	0.006	25.9530	0.31	0.66371	0.01	0.12234	0.001	3383	31	3
JH025-172	539	179	182	0.98	0.3482	0.007	34.7677	0.41	0.72395	0.01	0.07802	8E-04	3699	30	5
JH025-173	368	49	127	0.39	0.3129	0.006	30.5862	0.36	0.70872	0.01	0.1979	0.002	3536	31	2
JH025-174	801	299	284	1.05	0.2988	0.006	28.3669	0.33	0.6884	0.01	0.17301	0.002	3464	31	2
JH025-176	446	98	158	0.62	0.2927	0.006	27.7627	0.33	0.68771	0.01	0.15888	0.002	3432	31	1

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH025-177	755	222	254	0.87	0.2940	0.006	29.4190	0.34	0.72561	0.01	0.1588	0.002	3439	31	-3
JH025-179	1124	124	357	0.35	0.3909	0.008	41.3037	0.47	0.76615	0.01	0.09074	9E-04	3875	30	5
JH025-180	924	414	325	1.27	0.2925	0.006	27.9482	0.32	0.69291	0.01	0.12876	0.001	3431	31	1
JH025-181	498	150	171	0.88	0.2833	0.006	27.6223	0.32	0.70697	0.01	0.17408	0.002	3381	31	-2
JH025-182	351	53	94	0.56	0.4379	0.009	54.8887	0.65	0.90885	0.01	0.24159	0.003	4045	30	-3
JH025-183	1085	569	411	1.38	0.2723	0.005	24.1480	0.28	0.64308	0.01	0.07488	7E-04	3319	31	3
JH025-184	307	121	105	1.15	0.2998	0.006	29.3640	0.35	0.71029	0.01	0.17056	0.002	3469	31	0
JH025-185	608	375	230	1.63	0.2800	0.006	24.8327	0.29	0.64324	0.01	0.12523	0.001	3363	31	5
JH025-186	636	252	230	1.10	0.2873	0.006	26.6047	0.31	0.67153	0.01	0.18123	0.002	3403	31	2
JH025-188	231	92	74	1.24	0.3092	0.006	32.3695	0.39	0.75913	0.01	0.20863	0.002	3517	31	-4
JH025-189	640	239	213	1.12	0.3561	0.007	35.7721	0.41	0.72838	0.01	0.09215	9E-04	3733	30	5
JH025-190	273	62	85	0.73	0.3585	0.007	38.7296	0.46	0.78349	0.01	0.20359	0.002	3743	30	0
JH025-191	243	64	67	0.96	0.4297	0.009	52.3967	0.62	0.88431	0.01	0.22526	0.002	4016	30	-2
JH025-192	528	152	195	0.78	0.2821	0.006	25.5906	0.3	0.65777	0.01	0.09557	1E-03	3375	31	3
JH025-193	762	307	293	1.05	0.2786	0.006	24.2282	0.28	0.6307	0.01	0.07098	7E-04	3355	31	6
JH025-194	383	80	138	0.58	0.2710	0.005	25.2274	0.3	0.67505	0.01	0.18587	0.002	3312	31	-1
JH025-195	1160	757	457	1.66	0.2619	0.005	22.2299	0.26	0.61559	0.01	0.05465	5E-04	3258	31	5
JH025-196	447	111	162	0.69	0.2997	0.006	27.6490	0.32	0.66911	0.01	0.16755	0.002	3468	31	5
JH025-197	384	140	143	0.98	0.2865	0.006	25.7278	0.3	0.65114	0.01	0.16798	0.002	3399	31	5
JH025-199	379	102	127	0.80	0.3043	0.006	30.2557	0.35	0.72099	0.01	0.18382	0.002	3492	31	-1
JH025-200	772	163	279	0.58	0.2948	0.006	27.2748	0.31	0.67087	0.01	0.16663	0.002	3443	31	4
JH025-201	775	77	224	0.34	0.4436	0.009	51.2689	0.59	0.83804	0.01	0.05527	6E-04	4064	29	3
JH025-207	419	107	145	0.74	0.2834	0.006	27.4426	0.32	0.70224	0.01	0.18794	0.002	3382	31	-2

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH025-208	463	159	172	0.92	0.2806	0.006	25.2693	0.29	0.65298	0.01	0.09404	1E-03	3366	31	3
JH025-211	435	158	152	1.04	0.3568	0.007	34.1546	0.4	0.69426	0.01	0.12073	0.001	3736	30	9
JH025-212	698	150	198	0.76	0.4262	0.009	50.2060	0.58	0.85427	0.01	0.19795	0.002	4004	30	0
JH025-213	432	152	153	0.99	0.2850	0.006	26.8983	0.31	0.68441	0.01	0.18115	0.002	3391	31	0
JH025-214	726	190	259	0.73	0.2825	0.006	26.4663	0.3	0.67932	0.01	0.13715	0.001	3377	31	1
JH025-217	415	58	145	0.40	0.3056	0.006	29.2029	0.34	0.6929	0.01	0.18507	0.002	3499	31	3
JH025-219	393	64	137	0.47	0.2868	0.006	27.4359	0.32	0.69379	0.01	0.18389	0.002	3400	31	0
JH025-220	791	138	250	0.55	0.3286	0.007	34.6014	0.4	0.76365	0.01	0.20038	0.002	3611	30	-2
JH025-221	648	191	245	0.78	0.2966	0.006	26.1769	0.3	0.64013	0.01	0.06079	6E-04	3452	31	8
JH025-222	530	60	183	0.33	0.2874	0.006	27.7727	0.32	0.70072	0.01	0.1898	0.002	3404	31	-1
JH025-223	316	91	107	0.85	0.3001	0.006	29.4373	0.35	0.71139	0.01	0.20131	0.002	3471	31	0
JH025-225	413	111	134	0.83	0.3056	0.006	31.4277	0.37	0.74585	0.01	0.19032	0.002	3499	31	-3
JH025-226	1138	471	394	1.20	0.3313	0.007	31.8183	0.36	0.69658	0.01	0.12005	0.001	3623	30	6
JH025-228	551	122	197	0.62	0.2895	0.006	26.9834	0.31	0.67591	0.01	0.17623	0.002	3415	31	2
JH025-229	575	209	219	0.95	0.2850	0.006	24.9261	0.29	0.63432	0.01	0.11098	0.001	3390	31	7
JH025-230	529	90	180	0.50	0.3165	0.006	30.9404	0.36	0.70895	0.01	0.19112	0.002	3553	30	2
JH025-231	621	275	229	1.20	0.2681	0.005	24.1646	0.28	0.65365	0.01	0.07567	8E-04	3295	31	1
JH025-234	322	113	103	1.10	0.4141	0.008	42.9874	0.5	0.75289	0.01	0.14909	0.002	3961	30	9
JH025-235	975	294	340	0.86	0.3263	0.007	31.0906	0.35	0.69109	0.01	0.10285	0.001	3600	30	6
JH025-236	461	317	179	1.77	0.2812	0.006	24.0860	0.28	0.62109	0.01	0.10347	0.001	3370	31	8
JH025-237	448	50	148	0.34	0.3119	0.006	31.2709	0.36	0.72708	0.01	0.20395	0.002	3530	31	0
JH027-002	329	64	118	0.54	0.2861	0.006	27.0944	0.32	0.6866	0.01	0.18314	0.002	3397	31	0
JH027-007	1245	192	453	0.42	0.2848	0.006	26.4906	0.3	0.67453	0.01	0.15547	0.002	3389	31	1

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH027-009	589	186	195	0.95	0.3135	0.006	32.0019	0.37	0.7402	0.01	0.2008	0.002	3538	31	-1
JH027-013	784	251	261	0.96	0.3388	0.007	34.2981	0.39	0.73405	0.01	0.27664	0.003	3657	30	3
JH027-015	768	149	275	0.54	0.2871	0.006	27.1064	0.31	0.68455	0.01	0.15664	0.002	3402	31	1
JH027-016	642	152	236	0.64	0.2815	0.006	25.8989	0.3	0.66717	0.01	0.14829	0.001	3371	31	2
JH027-018	1272	500	497	1.01	0.2755	0.006	23.8115	0.27	0.6267	0.01	0.11908	0.001	3338	31	6
JH027-025	230	73	82	0.89	0.2866	0.006	27.0062	0.32	0.68316	0.01	0.17561	0.002	3400	31	1
JH027-029	495	54	144	0.38	0.4609	0.009	53.5135	0.62	0.84187	0.01	0.15091	0.002	4121	30	4
JH027-031	438	249	154	1.62	0.2873	0.006	27.5577	0.32	0.69542	0.01	0.17996	0.002	3403	31	-1
JH027-032	714	50	246	0.20	0.3068	0.006	29.9257	0.34	0.70729	0.01	0.19587	0.002	3505	31	1
JH027-034	603	145	204	0.71	0.3134	0.006	31.0654	0.36	0.71883	0.01	0.17976	0.002	3538	31	1
JH027-035	526	222	198	1.12	0.2933	0.006	26.2300	0.3	0.64847	0.01	0.15709	0.002	3435	31	6
JH027-036	211	134	75	1.79	0.2809	0.006	26.4278	0.32	0.68232	0.01	0.16827	0.002	3368	31	0
JH027-037	608	101	210	0.48	0.2898	0.006	28.2263	0.32	0.70631	0.01	0.17198	0.002	3416	31	-1
JH027-038	319	79	111	0.71	0.2833	0.006	27.2750	0.32	0.6982	0.01	0.13964	0.001	3381	31	-1
JH027-039	253	76	86	0.88	0.2870	0.006	28.2322	0.33	0.71335	0.01	0.18707	0.002	3401	31	-3
JH027-041	737	326	278	1.17	0.2864	0.006	25.4516	0.29	0.64437	0.01	0.11532	0.001	3398	31	5
JH027-043	895	172	340	0.51	0.2977	0.006	26.2777	0.3	0.64001	0.01	0.12743	0.001	3458	31	8
JH027-045	339	52	120	0.43	0.2875	0.006	27.3315	0.32	0.68945	0.01	0.19369	0.002	3404	31	0
JH027-046	493	86	180	0.48	0.3108	0.006	28.5414	0.33	0.66592	0.01	0.25794	0.003	3525	31	7
JH027-049	702	347	260	1.33	0.2881	0.006	26.0277	0.3	0.65511	0.01	0.13865	0.001	3407	31	4
JH027-051	211	121	80	1.51	0.3005	0.006	26.5733	0.32	0.64119	0.01	0.15799	0.002	3473	31	8
JH027-060	862	196	341	0.57	0.2819	0.006	23.8234	0.27	0.61285	0.01	0.06197	6E-04	3373	31	9
JH027-061	978	203	303	0.67	0.3950	0.008	42.5871	0.48	0.78179	0.01	0.19728	0.002	3890	30	4

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH027-067	433	114	145	0.79	0.3100	0.006	30.8478	0.35	0.72166	0.01	0.18708	0.002	3521	31	0
JH027-069	550	123	215	0.57	0.2835	0.006	24.2197	0.27	0.61943	0.01	0.11905	0.001	3383	31	8
JH027-070	437	210	156	1.35	0.2862	0.006	26.6269	0.31	0.6747	0.01	0.16506	0.002	3397	31	2
JH027-074	255	132	90	1.47	0.2865	0.006	27.1138	0.32	0.68632	0.01	0.17783	0.002	3399	31	0
JH027-077	423	105	161	0.65	0.2795	0.006	24.4671	0.28	0.63476	0.01	0.1512	0.002	3360	31	6
JH027-078	695	88	189	0.47	0.4712	0.009	57.4917	0.65	0.88475	0.01	0.22009	0.002	4154	29	1
JH027-080	440	120	159	0.75	0.2838	0.006	26.1397	0.3	0.66788	0.01	0.16454	0.002	3384	31	2
JH027-081	485	177	173	1.02	0.2868	0.006	26.6891	0.31	0.67479	0.01	0.16712	0.002	3400	31	2
JH027-090	586	116	149	0.78	0.5031	0.01	65.4891	0.74	0.94401	0.01	0.23878	0.002	4250	29	-1
JH027-091	403	112	141	0.79	0.2864	0.006	27.0232	0.31	0.68415	0.01	0.18072	0.002	3398	31	1
JH027-092	605	220	234	0.94	0.2871	0.006	24.6470	0.28	0.62243	0.01	0.15699	0.001	3402	31	9
JH027-095	334	78	107	0.73	0.3581	0.007	36.9314	0.42	0.74778	0.01	0.18274	0.002	3742	30	3
JH027-101	699	235	252	0.93	0.3051	0.006	28.0664	0.31	0.66703	0.01	0.16946	0.002	3496	30	6
JH027-104	712	288	266	1.08	0.2860	0.006	25.3432	0.28	0.64268	0.01	0.14893	0.001	3396	31	6
JH027-107	586	169	213	0.79	0.3202	0.006	29.0832	0.33	0.65867	0.01	0.0996	1E-03	3571	30	9
JH027-110	544	62	157	0.39	0.4149	0.008	46.3764	0.51	0.81006	0.01	0.17288	0.002	3964	29	3
JH027-116	439	36	147	0.24	0.3200	0.006	30.9677	0.35	0.70135	0.01	0.18136	0.002	3570	30	4
JH027-124	372	100	124	0.81	0.3004	0.006	29.1856	0.33	0.70418	0.01	0.17736	0.002	3473	31	1
JH027-128	385	189	143	1.32	0.2822	0.006	24.6937	0.28	0.63443	0.01	0.16156	0.002	3375	31	6
JH027-130	853	380	318	1.19	0.2845	0.006	24.8297	0.27	0.63259	0.01	0.12774	0.001	3388	31	7
JH027-131	1242	223	453	0.49	0.3045	0.006	27.1282	0.3	0.6459	0.01	0.13105	0.001	3493	30	8
JH027-134	1289	276	393	0.70	0.3911	0.008	41.7888	0.46	0.77452	0.01	0.20055	0.002	3875	30	4
JH027-136	590	170	215	0.79	0.2905	0.006	25.9424	0.29	0.64735	0.01	0.16047	0.002	3420	31	6

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH027-138	532	96	160	0.60	0.4302	0.009	46.4828	0.52	0.78332	0.01	0.20054	0.002	4018	29	7
JH027-139	535	157	152	1.03	0.4764	0.009	54.7919	0.61	0.83382	0.01	0.20086	0.002	4170	29	6
JH027-144	871	277	313	0.88	0.3067	0.006	27.8934	0.31	0.65944	0.01	0.1202	0.001	3504	30	7
JH027-145	742	261	266	0.98	0.3240	0.006	29.5194	0.33	0.66061	0.01	0.11693	0.001	3589	30	9
JH027-146	915	316	322	0.98	0.3146	0.006	29.2598	0.32	0.67436	0.01	0.23665	0.002	3544	30	6
JH027-147	521	317	198	1.60	0.2847	0.006	24.4808	0.28	0.6234	0.01	0.14389	0.001	3389	31	8
JH027-149	510	176	195	0.90	0.2914	0.006	24.9905	0.28	0.62191	0.01	0.10823	0.001	3425	31	9
JH027-159	247	79	88	0.90	0.2853	0.006	26.2194	0.31	0.66627	0.01	0.16559	0.002	3392	31	3
JH027-160	390	69	139	0.50	0.2907	0.006	26.7940	0.31	0.66825	0.01	0.16735	0.002	3422	31	3
JH027-161	518	87	186	0.47	0.2887	0.006	26.3922	0.3	0.6628	0.01	0.17547	0.002	3411	31	4
JH027-163	278	74	102	0.73	0.2840	0.006	25.3983	0.3	0.64845	0.01	0.16656	0.002	3385	31	5
JH027-165	672	108	232	0.47	0.3180	0.006	30.2733	0.34	0.69037	0.01	0.16563	0.002	3560	30	5
JH027-166	612	78	199	0.39	0.3318	0.007	33.6448	0.38	0.73541	0.01	0.1948	0.002	3625	30	2
JH027-167	406	92	125	0.74	0.3961	0.008	42.2581	0.48	0.77364	0.01	0.20298	0.002	3894	30	5
JH027-169	1322	92	363	0.25	0.4720	0.009	56.6530	0.63	0.87037	0.01	0.22212	0.002	4156	29	2
JH027-171	166	48	49	0.98	0.3596	0.007	40.5113	0.49	0.81707	0.01	0.20351	0.002	3748	30	-3
JH027-172	381	87	132	0.66	0.2873	0.006	27.3911	0.32	0.6915	0.01	0.18312	0.002	3403	31	0
JH027-176	434	155	152	1.02	0.2993	0.006	28.1864	0.32	0.68284	0.01	0.1484	0.001	3467	31	3
JH027-177	400	93	145	0.64	0.2860	0.006	26.0629	0.3	0.66092	0.01	0.17513	0.002	3396	31	3
JH027-178	308	169	112	1.51	0.3014	0.006	27.3744	0.32	0.65877	0.01	0.16547	0.002	3477	31	6
JH027-180	985	268	370	0.72	0.2998	0.006	26.3490	0.3	0.63734	0.01	0.0893	9E-04	3469	31	9
JH027-185	465	75	144	0.52	0.3273	0.007	34.8977	0.4	0.77337	0.01	0.20743	0.002	3604	30	-3
JH027-189	853	249	279	0.89	0.3952	0.008	40.0689	0.45	0.73527	0.01	0.1709	0.002	3891	30	9

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH027-190	822	297	324	0.92	0.2795	0.006	23.5240	0.27	0.61038	0.01	0.09005	9E-04	3360	31	9
JH027-196	623	129	179	0.72	0.4627	0.009	53.4851	0.61	0.83834	0.01	0.2014	0.002	4127	29	5
JH027-198	488	66	135	0.49	0.4536	0.009	54.7375	0.63	0.8753	0.01	0.2264	0.002	4097	29	1
JH027-200	1283	141	426	0.33	0.3374	0.007	33.8251	0.38	0.7272	0.01	0.17801	0.002	3651	30	3
JH031-001	273	33	95	0.35	0.2893	0.006	27.7532	0.32	0.69566	0.01	0.18682	0.002	3414	31	0
JH031-009	820	259	300	0.86	0.2850	0.006	25.8340	0.29	0.65729	0.01	0.16801	0.002	3391	30	4
JH031-011	183	92	65	1.42	0.2838	0.006	26.5811	0.32	0.67914	0.01	0.16672	0.002	3384	31	1
JH031-012	504	60	145	0.41	0.4461	0.009	51.2945	0.58	0.83375	0.01	0.2073	0.002	4072	29	4
JH031-013	179	66	61	1.08	0.2839	0.006	27.8083	0.33	0.71031	0.01	0.18966	0.002	3384	31	-3
JH031-014	498	210	195	1.08	0.2802	0.006	23.7626	0.27	0.61497	0.01	0.14243	0.001	3364	31	8
JH031-017	186	20	50	0.40	0.4596	0.009	56.4419	0.67	0.89046	0.01	0.19375	0.002	4117	29	0
JH031-020	376	69	130	0.53	0.2907	0.006	27.9397	0.32	0.69696	0.01	0.18813	0.002	3421	31	0
JH031-021	141	25	38	0.66	0.4431	0.009	54.1584	0.65	0.88624	0.01	0.22755	0.003	4062	30	-1
JH031-022	252	33	72	0.46	0.4585	0.009	52.9984	0.62	0.83826	0.01	0.20527	0.002	4113	29	4
JH031-025	596	94	217	0.43	0.2707	0.005	24.6317	0.28	0.65978	0.01	0.1682	0.002	3310	31	1
JH031-029	236	39	64	0.61	0.4691	0.009	57.6867	0.68	0.89175	0.01	0.21564	0.002	4147	29	0
JH031-030	85	15	26	0.58	0.4480	0.009	48.1960	0.61	0.78004	0.01	0.13582	0.002	4079	30	9
JH031-033	736	231	242	0.95	0.3742	0.007	37.7920	0.42	0.73226	0.01	0.11694	0.001	3809	30	7
JH031-036	337	75	118	0.64	0.3002	0.006	28.4200	0.33	0.68645	0.01	0.18877	0.002	3471	30	3
JH031-042	189	77	70	1.10	0.2700	0.005	24.1025	0.29	0.6473	0.01	0.1696	0.002	3306	31	2
JH031-043	597	35	195	0.18	0.3188	0.006	32.2391	0.36	0.7334	0.01	0.18396	0.002	3564	30	0
JH031-050	469	155	171	0.91	0.2958	0.006	26.8474	0.3	0.65813	0.01	0.17514	0.002	3448	30	5
JH031-052	266	39	88	0.44	0.2990	0.006	29.7401	0.35	0.72134	0.01	0.1919	0.002	3465	30	-2

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH031-053	463	212	180	1.18	0.2785	0.006	23.7100	0.27	0.6173	0.01	0.07063	7E-04	3355	31	8
JH031-054	723	106	255	0.42	0.2937	0.006	27.5237	0.31	0.67948	0.01	0.10649	0.001	3438	30	2
JH031-061	484	66	135	0.49	0.4356	0.009	51.8257	0.59	0.86265	0.01	0.24679	0.003	4037	29	0
JH031-064	820	324	313	1.04	0.2735	0.005	23.6892	0.26	0.62809	0.01	0.09893	1E-03	3326	31	5
JH031-066	833	205	255	0.80	0.3980	0.008	43.0204	0.48	0.78382	0.01	0.18396	0.002	3902	29	4
JH031-068	169	39	57	0.68	0.3007	0.006	29.7364	0.36	0.717	0.01	0.18991	0.002	3474	31	-1
JH031-070	588	278	221	1.26	0.2975	0.006	26.2045	0.3	0.63883	0.01	0.15376	0.002	3457	30	8
JH031-071	220	63	80	0.79	0.3004	0.006	27.2290	0.32	0.65732	0.01	0.1458	0.002	3472	31	6
JH031-072	375	53	108	0.49	0.4249	0.008	48.6901	0.56	0.83104	0.01	0.21327	0.002	4000	29	2
JH031-073	239	166	84	1.98	0.2857	0.006	27.1334	0.32	0.68875	0.01	0.17373	0.002	3394	31	0
JH031-074	631	208	238	0.87	0.2854	0.006	25.1706	0.28	0.63959	0.01	0.14912	0.001	3393	31	6
JH031-075	322	108	107	1.01	0.3013	0.006	29.9642	0.35	0.72114	0.01	0.20508	0.002	3477	31	-1
JH031-081	360	48	94	0.51	0.5052	0.01	64.5013	0.74	0.92584	0.01	0.22229	0.002	4256	29	0
JH031-083	1373	1664	466	3.57	0.3628	0.007	35.4961	0.4	0.70938	0.01	0.14415	0.001	3762	30	8
JH031-084	333	81	119	0.68	0.2861	0.006	26.5927	0.31	0.674	0.01	0.18429	0.002	3397	31	2
JH031-090	376	82	141	0.58	0.2846	0.006	25.2323	0.29	0.64299	0.01	0.17297	0.002	3388	31	5
JH031-091	554	166	214	0.78	0.2809	0.006	24.1680	0.27	0.62394	0.01	0.15347	0.002	3368	31	7
JH031-092	719	101	240	0.42	0.3197	0.006	31.8228	0.36	0.72172	0.01	0.18103	0.002	3569	30	1
JH031-093	395	115	138	0.83	0.2964	0.006	28.1420	0.32	0.68859	0.01	0.18322	0.002	3451	31	2
JH031-094	727	299	264	1.13	0.3139	0.006	28.7283	0.32	0.66361	0.01	0.07286	7E-04	3540	30	7
JH031-100	234	105	84	1.25	0.2848	0.006	26.2303	0.31	0.66797	0.01	0.17422	0.002	3389	31	2
JH031-101	864	151	309	0.49	0.3176	0.006	29.5232	0.33	0.67408	0.01	0.18201	0.002	3558	30	7
JH031-103	1290	168	418	0.40	0.3790	0.007	38.8331	0.43	0.74297	0.01	0.10103	0.001	3828	30	6

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH031-107	292	107	106	1.01	0.2872	0.006	26.3515	0.3	0.66531	0.01	0.17936	0.002	3403	31	3
JH031-111	151	18	42	0.43	0.4348	0.009	53.3959	0.65	0.89058	0.01	0.23313	0.003	4034	30	-2
JH031-112	494	98	167	0.59	0.3155	0.006	31.3263	0.36	0.72009	0.01	0.18901	0.002	3548	30	1
JH031-113	321	43	84	0.51	0.4779	0.01	61.1832	0.71	0.92831	0.01	0.23616	0.003	4175	29	-2
JH031-120	712	198	262	0.76	0.2866	0.006	26.2132	0.3	0.66325	0.01	0.17959	0.002	3399	31	3
JH031-125	247	80	93	0.86	0.2858	0.006	25.6010	0.3	0.64958	0.01	0.16707	0.002	3395	31	5
JH031-127	232	92	87	1.06	0.2855	0.006	25.5402	0.3	0.64876	0.01	0.16205	0.002	3393	31	5
JH031-129	630	246	247	1.00	0.2873	0.006	24.6081	0.28	0.62113	0.01	0.10516	0.001	3403	31	9
JH031-131	588	56	210	0.27	0.2866	0.006	26.9511	0.31	0.68193	0.01	0.18022	0.002	3399	31	1
JH031-135	865	271	329	0.82	0.3033	0.006	26.7466	0.3	0.63948	0.01	0.12493	0.001	3487	30	9
JH031-141	322	60	115	0.52	0.2870	0.006	26.9455	0.31	0.6808	0.01	0.18948	0.002	3401	31	1
JH031-144	401	81	149	0.54	0.2727	0.005	24.6148	0.29	0.65463	0.01	0.18092	0.002	3321	31	2
JH031-146	733	210	236	0.89	0.3876	0.008	40.2993	0.46	0.75386	0.01	0.12433	0.001	3862	30	6
JH031-148	173	64	56	1.14	0.2863	0.006	29.2848	0.36	0.7417	0.01	0.2101	0.002	3398	31	-6
JH031-151	186	15	47	0.32	0.4557	0.009	59.7900	0.72	0.9514	0.01	0.23713	0.003	4104	30	-5
JH031-153	85	16	25	0.64	0.3897	0.008	43.3251	0.57	0.80623	0.01	0.20803	0.003	3870	31	1
JH031-162	937	197	302	0.65	0.3853	0.008	39.8895	0.45	0.75079	0.01	0.20835	0.002	3853	30	6
JH031-166	526	126	183	0.69	0.3143	0.006	30.1170	0.34	0.69477	0.01	0.18051	0.002	3542	30	4
JH031-167	395	82	135	0.61	0.2992	0.006	29.2509	0.34	0.70885	0.01	0.19087	0.002	3466	31	0
JH031-169	825	284	308	0.92	0.3039	0.006	27.1052	0.31	0.64675	0.01	0.10178	0.001	3490	30	8
JH031-178	752	102	224	0.46	0.4277	0.008	47.6761	0.54	0.80834	0.01	0.1974	0.002	4009	29	4
JH031-185	353	98	115	0.85	0.3542	0.007	36.2013	0.42	0.74101	0.01	0.15855	0.002	3725	30	4
JH031-187	869	161	302	0.53	0.2963	0.006	28.2491	0.32	0.69135	0.01	0.18763	0.002	3451	31	1

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH031-188	605	122	202	0.60	0.3203	0.006	31.7412	0.36	0.71849	0.01	0.17783	0.002	3571	30	2
JH031-189	637	276	232	1.19	0.3208	0.006	29.1368	0.33	0.65858	0.01	0.0757	8E-04	3574	30	9
JH031-191	727	220	266	0.83	0.3097	0.006	28.0023	0.32	0.65561	0.01	0.11125	0.001	3519	30	8
JH031-195	553	62	202	0.31	0.3117	0.006	28.3069	0.32	0.65853	0.01	0.12978	0.001	3529	30	8
JH031-196	1117	273	406	0.67	0.2993	0.006	27.2302	0.31	0.6597	0.01	0.11147	0.001	3467	30	6
JH031-199	356	127	114	1.11	0.3612	0.007	37.3751	0.43	0.75038	0.01	0.16759	0.002	3755	30	4
JH031-200	393	101	131	0.77	0.3023	0.006	29.9126	0.35	0.71743	0.01	0.15897	0.002	3482	31	-1
JH031-204	184	82	65	1.26	0.2837	0.006	26.6693	0.32	0.68172	0.01	0.17653	0.002	3383	31	0
JH031-205	457	358	177	2.02	0.2761	0.006	23.5820	0.27	0.61929	0.01	0.1305	0.001	3341	31	7
JH031-209	253	80	91	0.88	0.2834	0.006	25.8925	0.3	0.66245	0.01	0.15787	0.002	3382	31	3
JH031-210	740	134	281	0.48	0.2886	0.006	25.0878	0.28	0.6304	0.01	0.16422	0.002	3410	31	8
JH031-213	1121	210	393	0.53	0.3132	0.006	29.4571	0.33	0.68197	0.01	0.11702	0.001	3537	30	5
JH031-214	643	180	232	0.78	0.2854	0.006	26.0983	0.3	0.66304	0.01	0.16029	0.002	3393	31	3
JH031-217	151	44	53	0.83	0.2869	0.006	27.0952	0.33	0.68479	0.01	0.18466	0.002	3401	31	1
JH031-219	533	137	188	0.73	0.2968	0.006	27.7237	0.32	0.67734	0.01	0.18193	0.002	3453	31	3
JH031-222	505	97	174	0.56	0.2956	0.006	28.1945	0.32	0.69158	0.01	0.16035	0.002	3447	31	1
JH031-223	279	75	83	0.90	0.4050	0.008	44.5903	0.52	0.7982	0.01	0.09771	0.001	3928	30	3
JH031-225	511	145	177	0.82	0.3167	0.006	30.1573	0.34	0.69034	0.01	0.11342	0.001	3554	30	5
JH031-228	503	134	188	0.71	0.2876	0.006	25.2204	0.29	0.63588	0.01	0.1588	0.002	3405	31	7
JH031-229	432	83	146	0.57	0.3155	0.006	30.6639	0.35	0.70463	0.01	0.19032	0.002	3548	30	3
JH031-231	340	68	121	0.56	0.2878	0.006	26.5217	0.31	0.66805	0.01	0.17065	0.002	3406	31	3
JH031-232	353	58	117	0.50	0.2887	0.006	28.6679	0.33	0.71987	0.01	0.20521	0.002	3411	31	-3
JH031-233	225	63	76	0.83	0.3125	0.006	30.2312	0.36	0.70137	0.01	0.18077	0.002	3533	31	3

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH033-002	533	170	198	0.86	0.2857	0.006	25.1940	0.28	0.63938	0.01	0.14678	0.001	3395	31	6
JH033-003	397	127	144	0.88	0.2834	0.006	25.5503	0.29	0.65384	0.01	0.17371	0.002	3382	31	4
JH033-004	273	103	105	0.98	0.2740	0.005	23.3341	0.27	0.61744	0.01	0.1571	0.002	3329	31	7
JH033-008	414	91	147	0.62	0.3123	0.006	28.8389	0.33	0.66964	0.01	0.17752	0.002	3532	30	6
JH033-013	400	112	146	0.77	0.2787	0.006	25.0272	0.28	0.65107	0.01	0.16606	0.002	3356	31	3
JH033-015	231	37	81	0.46	0.2769	0.006	25.9713	0.3	0.68014	0.01	0.18613	0.002	3346	31	0
JH033-017	435	141	155	0.91	0.2819	0.006	25.9348	0.29	0.66704	0.01	0.17095	0.002	3374	31	2
JH033-021	358	43	128	0.34	0.2933	0.006	26.9194	0.31	0.66561	0.01	0.18017	0.002	3435	31	4
JH033-032	249	97	89	1.09	0.2907	0.006	26.7162	0.31	0.66633	0.01	0.18833	0.002	3422	31	3
JH033-036	1071	241	409	0.59	0.2763	0.005	23.8826	0.26	0.62676	0.01	0.07251	7E-04	3342	31	6
JH033-037	252	83	88	0.94	0.2799	0.006	26.3437	0.31	0.68252	0.01	0.18082	0.002	3362	31	0
JH033-038	863	260	337	0.77	0.2532	0.005	21.4343	0.24	0.61375	0.01	0.16786	0.002	3205	31	3
JH033-039	702	261	257	1.02	0.2779	0.006	25.0946	0.28	0.6548	0.01	0.16766	0.002	3351	31	3
JH033-041	304	92	93	0.99	0.3538	0.007	38.3150	0.44	0.78523	0.01	0.20342	0.002	3724	30	-1
JH033-042	436	157	134	1.17	0.3638	0.007	39.2076	0.44	0.78142	0.01	0.20094	0.002	3766	30	1
JH033-043	762	185	236	0.78	0.3939	0.008	42.0921	0.47	0.77497	0.01	0.1523	0.001	3886	29	5
JH033-044	1006	222	300	0.74	0.3938	0.008	43.6571	0.48	0.8039	0.01	0.20867	0.002	3886	29	2
JH033-045	736	255	278	0.92	0.2661	0.005	23.3715	0.26	0.637	0.01	0.13677	0.001	3283	31	3
JH033-051	1323	282	402	0.70	0.3825	0.008	41.7582	0.46	0.79169	0.01	0.21014	0.002	3842	29	2
JH033-052	413	87	138	0.63	0.2867	0.006	28.4099	0.32	0.71846	0.01	0.1937	0.002	3400	31	-3
JH033-065	261	97	95	1.02	0.2820	0.006	25.8601	0.3	0.6651	0.01	0.17622	0.002	3374	31	2
JH033-066	329	110	113	0.97	0.3027	0.006	29.2507	0.33	0.70068	0.01	0.18632	0.002	3484	30	1
JH033-071	545	101	189	0.53	0.3096	0.006	29.8294	0.33	0.69868	0.01	0.1789	0.002	3519	30	3

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH033-076	241	111	92	1.21	0.2862	0.006	25.1137	0.29	0.63627	0.01	0.1408	0.001	3397	31	7
JH033-079	444	65	138	0.47	0.4075	0.008	43.8315	0.49	0.78003	0.01	0.15411	0.002	3937	29	5
JH033-080	686	188	208	0.90	0.4327	0.009	47.7815	0.53	0.8008	0.01	0.15791	0.002	4027	29	6
JH033-082	323	35	91	0.38	0.4264	0.008	50.4905	0.58	0.85868	0.01	0.21332	0.002	4005	29	0
JH033-087	550	139	209	0.67	0.2998	0.006	26.5488	0.3	0.64211	0.01	0.14874	0.001	3469	30	8
JH033-090	95	11	29	0.38	0.4196	0.008	45.9037	0.56	0.79336	0.01	0.19015	0.003	3981	30	5
JH033-092	305	187	101	1.85	0.3014	0.006	30.6825	0.35	0.73822	0.01	0.19716	0.002	3477	30	-3
JH033-093	671	153	261	0.59	0.2875	0.006	24.8739	0.28	0.62744	0.01	0.07644	8E-04	3404	30	8
JH033-094	1133	191	426	0.45	0.2967	0.006	26.5478	0.29	0.64882	0.01	0.17816	0.002	3453	30	7
JH033-097	231	81	79	1.03	0.3019	0.006	29.8668	0.35	0.7175	0.01	0.19214	0.002	3480	31	-1
JH033-104	216	68	77	0.88	0.2938	0.006	27.9997	0.33	0.69111	0.01	0.18934	0.002	3438	31	1
JH033-123	390	118	145	0.81	0.2839	0.006	25.1642	0.28	0.64291	0.01	0.15154	0.001	3384	31	5
JH033-125	1057	378	336	1.13	0.3703	0.007	38.3081	0.42	0.75036	0.01	0.32384	0.003	3792	30	5
JH033-126	297	58	111	0.52	0.2854	0.006	25.2465	0.29	0.64157	0.01	0.17682	0.002	3393	31	6
JH033-128	522	197	178	1.11	0.3274	0.007	31.6446	0.35	0.70086	0.01	0.18472	0.002	3605	30	5
JH033-131	412	133	148	0.90	0.2844	0.006	26.0299	0.29	0.6638	0.01	0.16383	0.002	3387	31	3
JH033-133	199	94	78	1.21	0.2814	0.006	23.7742	0.28	0.61279	0.01	0.1298	0.001	3371	31	9
JH033-139	188	66	67	0.99	0.2855	0.006	26.4473	0.31	0.67176	0.01	0.17143	0.002	3393	31	2
JH033-142	641	129	209	0.62	0.3900	0.008	39.5268	0.44	0.73507	0.01	0.21826	0.002	3871	30	8
JH033-148	797	135	329	0.41	0.2582	0.005	20.6878	0.23	0.58097	0.01	0.16506	0.002	3236	31	9
JH033-150	532	220	206	1.07	0.2639	0.005	22.5717	0.25	0.62033	0.01	0.16436	0.002	3270	31	5
JH033-152	289	132	108	1.22	0.2837	0.006	25.1109	0.29	0.64179	0.01	0.17057	0.002	3384	31	5
JH033-156	969	166	345	0.48	0.3174	0.006	29.5577	0.33	0.67533	0.01	0.11656	0.001	3557	30	6

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH033-158	492	277	185	1.50	0.2883	0.006	25.4188	0.28	0.6393	0.01	0.11184	0.001	3409	30	6
JH033-164	141	29	49	0.59	0.2873	0.006	27.4998	0.33	0.694	0.01	0.17745	0.002	3403	31	0
JH033-167	409	84	143	0.59	0.2900	0.006	27.6680	0.31	0.69179	0.01	0.18613	0.002	3418	31	0
JH033-168	798	142	230	0.62	0.4315	0.009	49.7431	0.55	0.83589	0.01	0.21631	0.002	4023	29	2
JH033-171	884	183	316	0.58	0.3119	0.006	29.0842	0.32	0.67612	0.01	0.11245	0.001	3531	30	6
JH033-172	287	96	96	1.00	0.3023	0.006	30.1015	0.35	0.72206	0.01	0.18887	0.002	3482	30	-1
JH033-174	535	213	193	1.10	0.2972	0.006	27.4862	0.31	0.67061	0.01	0.16169	0.002	3456	30	4
JH033-176	268	73	80	0.91	0.4586	0.009	51.3983	0.59	0.81265	0.01	0.16227	0.002	4113	29	7
JH033-179	262	76	93	0.82	0.2812	0.006	26.4012	0.3	0.68085	0.01	0.18042	0.002	3370	31	0
JH033-180	303	100	112	0.89	0.2829	0.006	25.5744	0.29	0.65542	0.01	0.16466	0.002	3379	31	3
JH033-182	716	428	272	1.57	0.2859	0.006	25.1911	0.28	0.63881	0.01	0.12048	0.001	3396	30	6
JH033-185	176	35	67	0.52	0.2809	0.006	24.7427	0.29	0.63874	0.01	0.12145	0.001	3368	31	5
JH033-186	1284	300	413	0.73	0.3828	0.008	39.8304	0.44	0.75447	0.01	0.2132	0.002	3843	29	6
JH033-188	243	55	84	0.65	0.2847	0.006	27.4823	0.32	0.70002	0.01	0.18352	0.002	3389	31	-1
JH033-189	250	88	89	0.99	0.2821	0.006	26.4327	0.31	0.67951	0.01	0.16375	0.002	3374	31	0
JH033-191	203	74	73	1.01	0.2839	0.006	26.3454	0.31	0.6728	0.01	0.1607	0.002	3385	31	2
JH033-192	660	342	249	1.37	0.2819	0.006	25.0067	0.28	0.64332	0.01	0.09637	9E-04	3373	30	5
JH033-194	320	334	126	2.65	0.2801	0.006	23.7952	0.27	0.616	0.01	0.10998	0.001	3363	31	8
JH033-198	174	60	54	1.11	0.3457	0.007	37.4707	0.44	0.78597	0.01	0.19624	0.002	3688	30	-2
JH033-201	579	113	169	0.67	0.4343	0.009	49.9932	0.56	0.83458	0.01	0.21593	0.002	4032	29	3
JH033-202	409	96	140	0.69	0.3021	0.006	29.6478	0.34	0.71155	0.01	0.18577	0.002	3481	30	0
JH033-204	471	118	170	0.69	0.2971	0.006	27.6708	0.31	0.67542	0.01	0.18125	0.002	3455	30	3
JH033-210	675	132	254	0.52	0.3063	0.006	27.3880	0.31	0.64837	0.01	0.10019	0.001	3502	30	8

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH033-212	192	38	66	0.58	0.2922	0.006	28.5616	0.34	0.70872	0.01	0.17408	0.002	3429	31	-1
JH033-214	324	50	118	0.42	0.2806	0.006	25.9379	0.3	0.6702	0.01	0.14592	0.002	3366	31	1
JH034-001	143	35	50	0.70	0.2995	0.006	28.6802	0.32	0.69443	0.01	0.17028	0.002	3468	31	2
JH034-002	104	39	37	1.05	0.2935	0.006	27.2707	0.31	0.67375	0.01	0.17236	0.002	3436	31	3
JH034-003	346	47	123	0.38	0.3060	0.006	28.6715	0.3	0.67942	0.01	0.16589	0.002	3501	31	4
JH034-004	502	83	182	0.46	0.3167	0.006	29.1003	0.31	0.66638	0.01	0.16744	0.002	3554	30	7
JH034-006	307	62	107	0.58	0.2971	0.006	28.4973	0.31	0.69563	0.01	0.18307	0.002	3455	31	1
JH034-007	825	274	307	0.89	0.2926	0.006	26.2289	0.27	0.64996	0.01	0.17542	0.002	3432	31	6
JH034-008	143	37	50	0.74	0.2928	0.006	27.9303	0.31	0.69178	0.01	0.1844	0.002	3432	31	1
JH034-012	305	42	82	0.51	0.4593	0.009	57.1262	0.61	0.90185	0.01	0.22451	0.002	4116	29	-1
JH034-013	1372	141	489	0.29	0.3078	0.006	28.8131	0.3	0.67885	0.01	0.18289	0.002	3510	30	5
JH034-014	365	36	108	0.33	0.4462	0.009	51.8003	0.55	0.84176	0.01	0.44089	0.004	4073	29	3
JH034-016	221	55	79	0.70	0.2828	0.006	26.4130	0.29	0.67719	0.01	0.18186	0.002	3379	31	1
JH034-018	322	75	115	0.65	0.2941	0.006	27.4764	0.29	0.67745	0.01	0.18155	0.002	3439	31	3
JH034-019	273	89	102	0.87	0.2918	0.006	25.9862	0.28	0.64565	0.01	0.11323	0.001	3427	31	6
JH034-022	303	83	109	0.76	0.2789	0.006	25.8364	0.28	0.67179	0.01	0.17902	0.002	3357	31	1
JH034-023	729	220	265	0.83	0.3171	0.006	29.1706	0.31	0.667	0.01	0.17291	0.002	3556	30	7
JH034-025	279	103	97	1.06	0.2974	0.006	28.6448	0.31	0.69853	0.01	0.18396	0.002	3457	31	1
JH034-026	250	104	86	1.21	0.2833	0.006	27.5915	0.3	0.70614	0.01	0.18767	0.002	3381	31	-2
JH034-028	434	98	159	0.62	0.2931	0.006	26.8416	0.28	0.664	0.01	0.18318	0.002	3434	31	4
JH034-029	218	86	76	1.13	0.2875	0.006	27.4954	0.3	0.69349	0.01	0.18363	0.002	3404	31	0
JH034-030	615	65	187	0.35	0.4545	0.009	50.1163	0.53	0.79955	0.01	0.17436	0.002	4100	29	8
JH034-031	339	70	134	0.52	0.2946	0.006	25.4552	0.27	0.62646	0.01	0.16273	0.002	3442	31	9

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH034-033	262	79	91	0.87	0.2926	0.006	28.3969	0.31	0.70363	0.01	0.1908	0.002	3432	31	-1
JH034-035	190	107	70	1.53	0.2870	0.006	26.2147	0.28	0.66241	0.01	0.17613	0.002	3401	31	3
JH034-037	792	172	313	0.55	0.2703	0.005	22.9649	0.24	0.61612	0.01	0.14077	0.001	3308	31	6
JH034-038	269	39	76	0.51	0.4603	0.009	54.4385	0.58	0.85756	0.01	0.22467	0.002	4119	29	3
JH034-039	638	692	264	2.62	0.2410	0.005	19.5869	0.21	0.5893	0.01	0.16919	0.002	3127	31	4
JH034-042	571	94	195	0.48	0.3281	0.007	32.1877	0.34	0.7113	0.01	0.19697	0.002	3608	30	4
JH034-043	276	329	117	2.81	0.2349	0.005	18.6248	0.2	0.57487	0.01	0.15322	0.001	3086	32	5
JH034-044	911	140	318	0.44	0.3278	0.007	31.5857	0.33	0.69866	0.01	0.14859	0.001	3607	30	5
JH034-047	148	69	51	1.35	0.2868	0.006	28.3510	0.32	0.71672	0.01	0.19814	0.002	3401	31	-3
JH034-049	596	187	243	0.77	0.2401	0.005	19.7750	0.21	0.59723	0.01	0.17035	0.002	3121	31	3
JH034-051	292	44	106	0.42	0.2885	0.006	26.8732	0.29	0.67551	0.01	0.18373	0.002	3409	31	2
JH034-052	948	202	351	0.58	0.2907	0.006	26.4270	0.28	0.65921	0.01	0.18647	0.002	3421	30	4
JH034-055	466	76	184	0.41	0.2877	0.006	24.4866	0.26	0.61716	0.01	0.15245	0.002	3405	31	9
JH034-057	235	146	84	1.74	0.2847	0.006	26.8106	0.29	0.68296	0.01	0.18604	0.002	3389	31	0
JH034-061	477	123	169	0.73	0.2865	0.006	27.1880	0.29	0.68823	0.01	0.23061	0.002	3399	31	0
JH034-065	146	78	51	1.53	0.2866	0.006	27.6357	0.31	0.6993	0.01	0.19862	0.002	3399	31	-1
JH034-069	333	48	109	0.44	0.3184	0.006	31.8001	0.33	0.72424	0.01	0.19351	0.002	3562	31	1
JH034-071	244	61	81	0.75	0.2890	0.006	28.4809	0.3	0.71451	0.01	0.18866	0.002	3413	31	-2
JH034-073	406	104	145	0.72	0.3047	0.006	27.8645	0.29	0.66322	0.01	0.17648	0.002	3494	31	6
JH034-074	486	208	171	1.22	0.3070	0.006	28.4975	0.3	0.67301	0.01	0.17921	0.002	3506	31	5
JH034-075	755	123	272	0.45	0.2964	0.006	26.9449	0.28	0.65914	0.01	0.17735	0.002	3452	31	5
JH034-076	209	61	76	0.80	0.2800	0.006	25.4086	0.27	0.65797	0.01	0.1678	0.001	3363	31	3
JH034-077	168	50	58	0.86	0.2847	0.006	26.9076	0.28	0.68545	0.01	0.17649	0.002	3389	31	0

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH034-078	509	141	187	0.75	0.2960	0.006	26.3524	0.27	0.64551	0.01	0.15956	0.001	3450	31	7
JH034-079	532	87	141	0.62	0.4966	0.01	61.2020	0.64	0.89373	0.01	0.23033	0.002	4231	29	2
JH034-084	475	83	164	0.51	0.2905	0.006	27.5302	0.29	0.68729	0.01	0.18912	0.002	3420	31	1
JH034-085	395	31	136	0.23	0.3123	0.006	29.7292	0.31	0.69015	0.01	0.20229	0.002	3533	30	4
JH034-086	579	155	200	0.78	0.3063	0.006	29.1148	0.3	0.68927	0.01	0.18632	0.002	3502	30	3
JH034-087	353	160	121	1.32	0.3067	0.006	29.4419	0.31	0.69599	0.01	0.18529	0.002	3505	31	2
JH034-088	185	42	58	0.72	0.2859	0.006	30.1619	0.32	0.76502	0.01	0.18934	0.002	3395	31	-8
JH034-089	280	85	94	0.90	0.2861	0.006	27.8883	0.29	0.70679	0.01	0.19261	0.002	3397	31	-2
JH034-094	869	162	316	0.51	0.2927	0.006	26.5501	0.28	0.65765	0.01	0.17759	0.002	3432	31	5
JH034-095	895	666	373	1.79	0.2413	0.005	19.0429	0.2	0.57218	0.01	0.15614	0.001	3129	31	7
JH034-096	201	30	66	0.45	0.3529	0.007	35.6891	0.37	0.7332	0.01	0.18631	0.002	3720	30	4
JH034-098	336	171	122	1.40	0.3080	0.006	27.9130	0.29	0.65721	0.01	0.17418	0.002	3511	30	7
JH034-101	572	102	211	0.48	0.3047	0.006	27.3058	0.28	0.64986	0.01	0.17308	0.002	3494	30	8
JH034-102	1121	123	399	0.31	0.3010	0.006	27.9131	0.29	0.6725	0.01	0.16598	0.001	3475	30	4
JH034-106	812	177	290	0.61	0.3067	0.006	28.3443	0.3	0.6701	0.01	0.1481	0.001	3504	30	5
JH034-108	674	127	264	0.48	0.2715	0.005	22.8887	0.24	0.61138	0.01	0.12583	0.001	3314	31	7
JH034-109	388	72	137	0.53	0.2857	0.006	26.6792	0.28	0.67719	0.01	0.1879	0.002	3394	31	1
JH034-110	311	117	106	1.10	0.3008	0.006	29.1073	0.3	0.70165	0.01	0.19106	0.002	3474	30	1
JH034-113	119	50	44	1.14	0.2861	0.006	25.7711	0.27	0.65315	0.01	0.17135	0.002	3397	31	4
JH034-114	1230	209	470	0.44	0.2836	0.006	24.5364	0.26	0.62733	0.01	0.11086	1E-03	3383	31	7
JH034-118	307	128	109	1.17	0.3232	0.006	30.0722	0.31	0.67476	0.01	0.15249	0.001	3585	30	7
JH034-119	299	73	102	0.72	0.2956	0.006	28.6264	0.3	0.70232	0.01	0.1796	0.002	3447	30	0
JH034-121	606	198	219	0.90	0.3246	0.006	29.7219	0.31	0.66405	0.01	0.15817	0.001	3592	30	9

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH034-122	317	61	114	0.54	0.2911	0.006	26.9440	0.28	0.67115	0.01	0.166	0.001	3424	30	3
JH034-123	237	78	79	0.99	0.3032	0.006	30.0724	0.32	0.71912	0.01	0.18892	0.002	3487	30	-1
JH034-124	673	148	235	0.63	0.3178	0.006	30.2283	0.32	0.68974	0.01	0.14452	0.001	3559	30	5
JH034-130	387	83	124	0.67	0.3321	0.007	34.4155	0.36	0.75141	0.01	0.19936	0.002	3627	30	0
JH034-133	883	155	309	0.50	0.3104	0.006	29.5229	0.31	0.68961	0.01	0.17268	0.002	3523	30	4
JH034-137	297	119	106	1.12	0.3049	0.006	28.5192	0.3	0.67832	0.01	0.18396	0.002	3495	30	4
JH034-138	291	69	109	0.63	0.2785	0.005	24.7040	0.26	0.64322	0.01	0.17889	0.002	3355	30	4
JH034-139	325	85	108	0.79	0.3081	0.006	28.9157	0.31	0.68064	0.01	0.1737	0.002	3511	31	4
JH034-140	232	43	64	0.67	0.4347	0.009	49.0187	0.52	0.81776	0.01	0.19593	0.002	4034	30	4
JH034-144	231	40	76	0.53	0.2966	0.006	28.2680	0.31	0.69123	0.01	0.1774	0.002	3452	31	1
JH034-145	185	16	64	0.25	0.2942	0.006	26.6965	0.29	0.65797	0.01	0.16627	0.002	3440	31	5
JH034-146	256	43	87	0.49	0.2956	0.006	27.1826	0.29	0.66681	0.01	0.16788	0.002	3447	31	4
JH034-148	266	46	89	0.52	0.3173	0.006	29.6517	0.32	0.67759	0.01	0.16866	0.002	3557	31	6
JH034-151	685	211	273	0.77	0.2438	0.005	19.1700	0.2	0.57015	0.01	0.15384	0.001	3145	32	8
JH034-152	234	103	78	1.32	0.3076	0.006	28.9444	0.31	0.68237	0.01	0.17494	0.002	3509	31	4
JH034-153	795	94	282	0.33	0.3032	0.006	26.8202	0.28	0.64136	0.01	0.16837	0.001	3487	31	9
JH034-154	224	47	79	0.59	0.2876	0.006	25.6633	0.27	0.64699	0.01	0.17097	0.002	3405	31	5
JH034-156	235	86	82	1.05	0.2875	0.006	26.0264	0.28	0.65647	0.01	0.16604	0.001	3404	31	4
JH034-159	268	60	79	0.76	0.4323	0.009	46.1541	0.49	0.77413	0.01	0.12351	0.001	4025	30	8
JH034-160	525	215	147	1.46	0.3454	0.007	38.8122	0.41	0.81467	0.01	0.30157	0.003	3687	30	-5
JH034-161	325	81	96	0.84	0.3376	0.007	36.0463	0.38	0.77401	0.01	0.20198	0.002	3652	30	-2
JH034-162	1062	678	364	1.86	0.2724	0.005	25.1074	0.26	0.66825	0.01	0.03942	3E-04	3320	31	0
JH034-164	206	26	71	0.37	0.2686	0.005	24.7662	0.27	0.66838	0.01	0.17226	0.002	3298	31	-1

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH034-166	390	186	138	1.35	0.2958	0.006	26.3977	0.28	0.64692	0.01	0.1589	0.001	3449	31	7
JH034-170	273	45	94	0.48	0.2976	0.006	27.5681	0.29	0.67165	0.01	0.17388	0.002	3458	31	4
JH034-173	471	137	160	0.86	0.3122	0.006	29.1705	0.31	0.67737	0.01	0.19209	0.002	3532	30	5
JH034-174	489	138	178	0.78	0.2838	0.006	24.7688	0.26	0.6328	0.01	0.19137	0.002	3384	31	7
JH034-176	257	123	91	1.35	0.2906	0.006	26.1111	0.28	0.65144	0.01	0.17068	0.002	3421	31	5
JH034-177	189	31	68	0.46	0.2818	0.006	24.9416	0.27	0.64177	0.01	0.16141	0.002	3373	31	5
JH034-178	267	97	96	1.01	0.2902	0.006	25.6403	0.27	0.64064	0.01	0.17159	0.002	3419	31	7
JH034-179	818	321	289	1.11	0.3096	0.006	27.9552	0.29	0.65475	0.01	0.1747	0.002	3519	30	8
JH034-180	303	144	111	1.30	0.2922	0.006	25.4716	0.27	0.63195	0.01	0.16921	0.002	3430	31	8
JH034-187	348	153	125	1.22	0.2905	0.006	25.9783	0.28	0.64849	0.01	0.17427	0.002	3420	31	6
JH034-188	363	145	126	1.15	0.2886	0.006	26.6219	0.28	0.66887	0.01	0.16611	0.001	3410	31	3
JH034-192	308	61	107	0.57	0.3026	0.006	27.9501	0.3	0.66985	0.01	0.17899	0.002	3483	30	5
JH034-194	336	67	107	0.63	0.3080	0.006	31.1626	0.33	0.73373	0.01	0.18795	0.002	3511	30	-2
JH034-195	574	76	202	0.38	0.2913	0.006	26.5869	0.28	0.66174	0.01	0.16993	0.002	3425	30	4
JH034-196	638	36	211	0.17	0.3067	0.006	29.8298	0.31	0.70536	0.01	0.19252	0.002	3504	30	1
JH034-197	220	28	60	0.47	0.4423	0.009	51.8528	0.56	0.85016	0.01	0.21157	0.002	4059	29	2
JH034-198	229	37	76	0.49	0.3044	0.006	29.7627	0.32	0.7091	0.01	0.1863	0.002	3493	30	1
JH034-199	141	45	46	0.98	0.3021	0.006	30.2727	0.34	0.72679	0.01	0.19528	0.002	3481	31	-2
JH034-200	197	48	69	0.70	0.2927	0.006	26.9076	0.29	0.66664	0.01	0.17413	0.002	3432	30	4
JH034-203	130	48	45	1.07	0.2905	0.006	26.9141	0.3	0.67192	0.01	0.1336	0.001	3420	31	3
JH034-204	490	93	163	0.57	0.2936	0.006	28.5160	0.3	0.70432	0.01	0.19073	0.002	3437	30	-1
JH034-206	192	92	69	1.33	0.2787	0.006	25.0884	0.27	0.65285	0.01	0.17138	0.002	3356	31	3
JH034-207	514	224	184	1.22	0.2914	0.006	26.3237	0.28	0.65531	0.01	0.17648	0.002	3425	30	5

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH034-209	411	132	144	0.92	0.3087	0.006	28.4825	0.3	0.66923	0.01	0.18008	0.002	3514	30	6
JH034-211	868	307	368	0.83	0.2358	0.005	18.0632	0.19	0.55557	0.01	0.12816	0.001	3092	31	8
JH037-001	541	90	191	0.47	0.2864	0.006	27.3820	0.32	0.69336	0.01	0.18988	0.002	3398	31	0
JH037-003	291	79	100	0.79	0.2874	0.006	28.3625	0.33	0.7157	0.01	0.18833	0.002	3403	31	-3
JH037-005	755	113	254	0.44	0.3247	0.007	32.5534	0.37	0.72693	0.01	0.19757	0.002	3592	30	1
JH037-006	732	147	259	0.57	0.3176	0.006	30.3011	0.35	0.6918	0.01	0.17378	0.002	3558	31	4
JH037-007	640	173	240	0.72	0.2885	0.006	25.9598	0.3	0.65243	0.01	0.15743	0.002	3410	31	5
JH037-008	942	131	337	0.39	0.3223	0.006	30.3944	0.34	0.68391	0.01	0.14421	0.001	3581	30	6
JH037-013	548	124	211	0.59	0.2792	0.006	24.4492	0.28	0.63504	0.01	0.15117	0.002	3358	31	5
JH037-022	1041	260	378	0.69	0.2906	0.006	27.0101	0.3	0.6739	0.01	0.20079	0.002	3421	31	3
JH037-023	574	128	205	0.62	0.2876	0.006	27.1933	0.31	0.68554	0.01	0.18651	0.002	3405	31	1
JH037-026	323	92	122	0.75	0.2791	0.006	24.8875	0.29	0.64667	0.01	0.09702	0.001	3358	31	4
JH037-028	672	223	263	0.85	0.2810	0.006	24.2603	0.28	0.62605	0.01	0.10782	0.001	3369	31	7
JH037-029	268	19	84	0.23	0.3629	0.007	38.8946	0.46	0.77719	0.01	0.21126	0.003	3762	30	1
JH037-030	1542	46	519	0.09	0.3829	0.008	38.3403	0.43	0.72607	0.01	0.1082	0.001	3843	30	9
JH037-035	343	123	115	1.07	0.3053	0.006	30.6581	0.36	0.72831	0.01	0.19138	0.002	3497	31	-1
JH037-040	1290	301	521	0.58	0.2600	0.005	21.7049	0.24	0.60546	0.01	0.11366	0.001	3246	31	6
JH037-041	576	115	203	0.57	0.3107	0.006	29.7035	0.34	0.69322	0.01	0.19703	0.002	3525	30	3
JH037-042	485	95	168	0.57	0.3015	0.006	29.4493	0.34	0.70838	0.01	0.18524	0.002	3478	31	0
JH037-043	571	145	172	0.84	0.4682	0.009	52.4583	0.6	0.81255	0.01	0.14637	0.001	4144	29	8
JH037-057	534	196	205	0.96	0.2890	0.006	25.3265	0.29	0.6355	0.01	0.16061	0.002	3412	31	7
JH037-058	311	188	109	1.72	0.2847	0.006	27.4305	0.32	0.69873	0.01	0.181	0.002	3389	31	-1
JH037-062	258	92	92	1.00	0.2835	0.006	26.6211	0.31	0.68103	0.01	0.17887	0.002	3382	31	1

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH037-063	716	241	262	0.92	0.2888	0.006	26.5748	0.3	0.66736	0.01	0.17893	0.002	3411	31	3
JH037-064	255	46	82	0.56	0.3073	0.006	32.0846	0.38	0.75712	0.01	0.18901	0.002	3507	31	-4
JH037-065	548	68	164	0.41	0.4189	0.008	47.1265	0.53	0.81571	0.01	0.21894	0.002	3979	29	3
JH037-069	204	61	71	0.86	0.2782	0.006	26.7396	0.32	0.69695	0.01	0.18352	0.002	3353	31	-2
JH037-071	732	69	282	0.24	0.2877	0.006	25.1154	0.28	0.63299	0.01	0.16753	0.002	3405	31	7
JH037-077	725	201	278	0.72	0.2836	0.006	24.8553	0.28	0.63552	0.01	0.16452	0.002	3383	31	6
JH037-081	552	103	204	0.50	0.2857	0.006	26.0326	0.29	0.66082	0.01	0.1579	0.002	3394	31	3
JH037-083	820	299	293	1.02	0.2887	0.006	27.2349	0.3	0.68403	0.01	0.18361	0.002	3411	30	1
JH037-084	705	190	253	0.75	0.3120	0.006	29.2965	0.33	0.68087	0.01	0.14226	0.001	3531	30	5
JH037-085	310	44	114	0.39	0.2772	0.006	25.4452	0.29	0.66559	0.01	0.17675	0.002	3347	31	1
JH037-086	391	99	143	0.69	0.2821	0.006	25.9481	0.3	0.66687	0.01	0.17551	0.002	3375	31	2
JH037-088	322	95	104	0.91	0.3266	0.006	34.0274	0.39	0.7554	0.01	0.19514	0.002	3601	30	-1
JH037-090	286	59	97	0.61	0.2819	0.006	28.0694	0.33	0.72199	0.01	0.19274	0.002	3374	31	-4
JH037-092	463	121	167	0.72	0.2835	0.006	26.5405	0.3	0.67877	0.01	0.18107	0.002	3382	31	1
JH037-094	533	141	205	0.69	0.2819	0.006	24.7154	0.28	0.63582	0.01	0.15039	0.001	3373	31	6
JH037-095	525	207	197	1.05	0.3000	0.006	26.8622	0.3	0.64934	0.01	0.11108	0.001	3470	30	7
JH037-096	180	45	63	0.71	0.2809	0.006	26.8475	0.32	0.693	0.01	0.18077	0.002	3368	31	-1
JH037-107	662	310	251	1.24	0.2948	0.006	26.1673	0.29	0.64359	0.01	0.19182	0.002	3443	30	7
JH037-108	960	217	364	0.60	0.3063	0.006	27.1620	0.3	0.64297	0.01	0.12045	0.001	3502	30	9
JH037-109	1133	80	332	0.24	0.4287	0.008	49.2768	0.54	0.8334	0.01	0.21093	0.002	4013	29	2
JH037-112	198	49	58	0.84	0.4269	0.008	50.1446	0.59	0.85166	0.01	0.2188	0.002	4007	29	0
JH037-122	166	55	59	0.93	0.2775	0.006	26.7535	0.32	0.69909	0.01	0.17813	0.002	3349	31	-3
JH037-123	395	198	141	1.40	0.2993	0.006	28.7123	0.33	0.69556	0.01	0.18442	0.002	3467	30	1

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH037-124	509	99	186	0.53	0.2821	0.006	26.4040	0.3	0.67876	0.01	0.18436	0.002	3374	30	1
JH037-125	468	70	169	0.41	0.3036	0.006	28.8392	0.33	0.68871	0.01	0.19744	0.002	3489	30	3
JH037-126	328	119	129	0.92	0.2788	0.006	24.2503	0.28	0.63071	0.01	0.16404	0.002	3356	31	6
JH037-127	426	84	156	0.54	0.2820	0.006	26.3204	0.3	0.67672	0.01	0.17778	0.002	3374	31	1
JH037-131	1201	363	413	0.88	0.3700	0.007	36.7515	0.41	0.72017	0.01	0.18446	0.002	3791	29	8
JH037-133	821	461	278	1.66	0.3658	0.007	36.9566	0.41	0.73248	0.01	0.17198	0.002	3774	30	6
JH037-135	1230	282	410	0.69	0.3722	0.007	38.2400	0.42	0.745	0.01	0.18215	0.002	3800	29	5
JH037-137	607	221	227	0.97	0.2887	0.006	26.4072	0.3	0.66318	0.01	0.1777	0.002	3411	30	4
JH037-138	254	95	90	1.06	0.2798	0.006	27.0596	0.32	0.70124	0.01	0.1832	0.002	3362	31	-2
JH037-139	656	310	240	1.29	0.2894	0.006	27.0501	0.3	0.67761	0.01	0.18147	0.002	3415	30	2
JH037-140	803	253	323	0.78	0.2754	0.005	23.4194	0.26	0.61659	0.01	0.14718	0.001	3337	31	7
JH037-141	255	74	89	0.83	0.2825	0.006	27.7049	0.32	0.7112	0.01	0.1863	0.002	3377	31	-3
JH037-142	583	241	203	1.19	0.3549	0.007	34.8568	0.39	0.71211	0.01	0.18244	0.002	3728	30	7
JH037-146	387	194	155	1.25	0.2880	0.006	24.5635	0.28	0.61831	0.01	0.15213	0.002	3407	31	9
JH037-148	572	159	170	0.94	0.3610	0.007	41.7268	0.47	0.83803	0.01	0.38582	0.004	3754	30	-5
JH037-151	508	47	157	0.30	0.3776	0.007	41.8795	0.47	0.80406	0.01	0.22022	0.002	3822	30	0
JH037-152	547	149	218	0.68	0.2765	0.005	23.8113	0.27	0.62434	0.01	0.14379	0.001	3343	31	6
JH037-156	365	104	132	0.79	0.2813	0.006	26.6143	0.3	0.686	0.01	0.18187	0.002	3370	31	0
JH037-157	138	25	42	0.60	0.3590	0.007	40.1534	0.5	0.81095	0.01	0.21215	0.003	3746	30	-3
JH037-159	1158	239	485	0.49	0.2646	0.005	21.6358	0.24	0.5929	0.01	0.15401	0.002	3274	31	9
JH037-167	526	387	215	1.80	0.2681	0.005	22.4793	0.26	0.60795	0.01	0.16792	0.002	3295	31	7
JH037-170	719	142	252	0.56	0.3052	0.006	29.8132	0.34	0.70836	0.01	0.19429	0.002	3497	30	1
JH037-171	483	183	179	1.02	0.2867	0.006	26.5677	0.3	0.67183	0.01	0.17925	0.002	3400	30	2

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH037-174	319	68	114	0.60	0.2821	0.006	27.0100	0.31	0.69432	0.01	0.18847	0.002	3374	31	-1
JH037-175	1309	531	452	1.17	0.3585	0.007	35.5566	0.4	0.71913	0.01	0.21294	0.002	3743	30	7
JH037-179	594	125	217	0.58	0.2848	0.006	26.6897	0.3	0.67936	0.01	0.18697	0.002	3390	30	1
JH037-180	367	151	130	1.16	0.3009	0.006	29.1342	0.34	0.70206	0.01	0.19081	0.002	3475	30	1
JH037-185	598	172	209	0.82	0.3405	0.007	33.3679	0.38	0.7106	0.01	0.14404	0.001	3665	30	5
JH037-186	794	88	297	0.30	0.2829	0.006	25.8950	0.29	0.66363	0.01	0.1714	0.002	3379	30	2
JH037-187	263	112	94	1.19	0.2984	0.006	28.6997	0.34	0.6973	0.01	0.18585	0.002	3462	31	1
JH037-188	431	148	171	0.87	0.2798	0.006	24.2397	0.28	0.62821	0.01	0.16911	0.002	3362	31	6
JH037-197	320	63	111	0.57	0.3130	0.006	30.9873	0.36	0.71784	0.01	0.18805	0.002	3536	30	1
JH037-208	540	206	205	1.00	0.2835	0.006	25.6101	0.29	0.65492	0.01	0.16232	0.002	3382	31	4
JH037-209	535	128	194	0.66	0.2903	0.006	27.4691	0.32	0.686	0.01	0.19056	0.002	3419	31	1
JH037-210	655	161	238	0.68	0.3047	0.006	28.7581	0.33	0.68438	0.01	0.17427	0.002	3494	30	3
JH037-216	308	141	111	1.27	0.2827	0.006	27.0421	0.32	0.69343	0.01	0.18238	0.002	3378	31	-1
JH037-217	305	50	89	0.56	0.4363	0.009	51.4074	0.6	0.85425	0.01	0.22514	0.002	4039	29	1
JH037-218	664	298	258	1.16	0.2856	0.006	25.2144	0.29	0.64001	0.01	0.14821	0.001	3394	31	6
JH037-220	414	62	147	0.42	0.3003	0.006	28.9712	0.34	0.69943	0.01	0.19619	0.002	3472	30	1
JH037-225	554	92	171	0.54	0.3606	0.007	40.1392	0.46	0.80696	0.01	0.23903	0.002	3753	30	-2
JH037-226	1074	231	377	0.61	0.3280	0.006	32.0431	0.36	0.70825	0.01	0.10747	0.001	3608	30	4
JH037-227	512	194	181	1.07	0.2876	0.006	28.0141	0.32	0.70632	0.01	0.19109	0.002	3404	31	-2
JH037-229	332	243	121	2.01	0.2814	0.006	26.4911	0.31	0.68258	0.01	0.17906	0.002	3371	31	0
JH037-231	457	93	161	0.58	0.3124	0.006	30.4721	0.35	0.70721	0.01	0.16509	0.002	3533	30	2
JH037-233	465	97	156	0.62	0.3286	0.007	33.7093	0.39	0.74367	0.01	0.199	0.002	3611	30	0
JH037-236	751	179	261	0.69	0.3289	0.007	32.5503	0.37	0.71757	0.01	0.16132	0.002	3612	30	3

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH037-237	494	77	182	0.42	0.2807	0.006	26.2052	0.3	0.67678	0.01	0.19396	0.002	3367	31	1
JH037-240	253	32	89	0.36	0.2824	0.006	27.5159	0.33	0.70639	0.01	0.19021	0.002	3376	31	-2
JH037-242	311	105	112	0.94	0.2844	0.006	27.1105	0.32	0.69107	0.01	0.18984	0.002	3387	31	0
JH037-244	468	117	160	0.73	0.2811	0.006	28.2637	0.33	0.72894	0.01	0.21762	0.002	3369	31	-5
JH037-245	382	124	133	0.93	0.2787	0.006	27.6114	0.32	0.71832	0.01	0.19353	0.002	3356	31	-4
JH037-247	784	178	295	0.60	0.3163	0.006	28.9345	0.33	0.66327	0.01	0.16388	0.002	3552	30	8
JH038-008	812	69	313	0.22	0.2889	0.006	25.2641	0.27	0.63422	0.01	0.06544	7E-04	3411	30	7
JH038-010	736	124	268	0.46	0.3181	0.006	29.4198	0.31	0.67055	0.01	0.16794	0.002	3561	30	7
JH038-011	425	129	161	0.80	0.2914	0.006	25.9244	0.28	0.64503	0.01	0.11106	0.001	3425	30	6
JH038-021	244	79	73	1.08	0.3762	0.007	42.2421	0.46	0.81422	0.01	0.21317	0.002	3817	30	-1
JH038-028	181	64	63	1.02	0.3054	0.006	29.6710	0.33	0.70453	0.01	0.18127	0.002	3498	31	1
JH038-029	1196	266	454	0.59	0.3002	0.006	26.5532	0.28	0.64134	0.01	0.09535	9E-04	3471	30	8
JH038-030	631	155	242	0.64	0.2908	0.006	25.5020	0.27	0.63586	0.01	0.13132	0.001	3422	30	7
JH038-033	333	113	118	0.96	0.2893	0.006	27.4086	0.3	0.68694	0.01	0.18954	0.002	3414	31	1
JH038-036	837	170	229	0.74	0.3960	0.008	48.6233	0.52	0.89028	0.01	0.79439	0.007	3894	29	-6
JH038-039	985	253	368	0.69	0.2897	0.006	26.0154	0.28	0.65114	0.01	0.17206	0.002	3416	30	5
JH038-043	1720	375	578	0.65	0.3519	0.007	35.1047	0.37	0.72345	0.01	0.58317	0.005	3715	30	5
JH038-045	1438	605	373	1.62	0.4182	0.008	53.9332	0.57	0.93517	0.01	0.46114	0.004	3976	29	-7
JH038-047	315	87	102	0.85	0.3756	0.007	38.7557	0.42	0.74823	0.01	0.22067	0.002	3814	30	5
JH038-048	356	78	122	0.64	0.3049	0.006	29.7603	0.32	0.70784	0.01	0.15039	0.001	3495	30	1
JH038-049	561	224	208	1.08	0.2935	0.006	26.5167	0.28	0.65514	0.01	0.15452	0.001	3436	30	5
JH038-052	217	54	62	0.87	0.4552	0.009	53.4420	0.59	0.85126	0.01	0.18141	0.002	4102	29	3
JH038-054	513	106	195	0.54	0.2924	0.006	25.7725	0.28	0.63917	0.01	0.15093	0.001	3430	30	7

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH038-059	426	138	162	0.85	0.3012	0.006	26.5593	0.29	0.63952	0.01	0.08567	8E-04	3476	30	9
JH038-065	511	74	186	0.40	0.3083	0.006	28.3438	0.3	0.66668	0.01	0.16099	0.002	3512	30	6
JH038-067	452	88	158	0.56	0.3147	0.006	29.9758	0.32	0.69067	0.01	0.2145	0.002	3544	30	4
JH038-069	589	178	185	0.96	0.3422	0.007	36.2691	0.39	0.7685	0.01	0.37238	0.003	3673	30	-1
JH038-074	1061	227	322	0.70	0.3830	0.008	42.0349	0.45	0.79596	0.01	0.18942	0.002	3844	29	1
JH038-075	1339	368	410	0.90	0.4343	0.009	47.2842	0.5	0.78949	0.01	0.38003	0.003	4032	29	7
JH038-078	173	90	66	1.36	0.2868	0.006	24.9768	0.28	0.6316	0.01	0.15167	0.001	3400	31	7
JH038-079	321	119	117	1.02	0.2941	0.006	26.8982	0.29	0.66322	0.01	0.16238	0.002	3439	30	4
JH038-080	5	5	2	2.50	0.3312	0.014	35.3668	1.6	0.77427	0.03	0.09424	0.004	3623	62	-2
JH038-083	320	68	119	0.57	0.2834	0.006	25.3582	0.28	0.64879	0.01	0.14711	0.001	3382	31	4
JH038-093	191	62	69	0.90	0.2944	0.006	26.9893	0.3	0.66484	0.01	0.22299	0.002	3441	31	4
JH038-096	570	83	182	0.46	0.3236	0.006	33.7149	0.36	0.75562	0.01	0.19388	0.002	3587	30	-2
JH038-097	469	130	161	0.81	0.3255	0.006	31.5407	0.34	0.70273	0.01	0.1069	0.001	3596	30	4
JH038-098	437	122	154	0.79	0.2956	0.006	27.7819	0.3	0.68144	0.01	0.18082	0.002	3448	30	2
JH038-099	467	63	132	0.48	0.4583	0.009	53.8256	0.58	0.85164	0.01	0.21242	0.002	4112	29	3
JH038-107	460	221	169	1.31	0.2971	0.006	26.7738	0.29	0.65353	0.01	0.17903	0.002	3455	30	6
JH038-108	457	301	175	1.72	0.2955	0.006	25.5935	0.28	0.62798	0.01	0.06899	6E-04	3447	30	9
JH038-112	256	77	90	0.86	0.3072	0.006	30.1805	0.34	0.71257	0.01	0.18993	0.002	3507	30	1
JH038-113	812	292	312	0.94	0.2919	0.006	26.1807	0.29	0.65053	0.01	0.1732	0.002	3428	30	6
JH038-116	1245	338	296	1.14	0.4896	0.01	70.7706	0.77	1.04839	0.01	0.53731	0.005	4210	29	-9
JH038-118	918	294	292	1.01	0.3839	0.008	41.5286	0.45	0.78469	0.01	0.34413	0.003	3847	30	3
JH038-120	570	79	205	0.39	0.3103	0.006	29.6524	0.32	0.69306	0.01	0.20412	0.002	3523	30	3
JH038-123	759	316	297	1.06	0.2893	0.006	25.3104	0.28	0.63444	0.01	0.1361	0.001	3414	30	7

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH038-127	361	113	129	0.88	0.2975	0.006	28.4023	0.31	0.69231	0.01	0.19855	0.002	3458	30	1
JH038-128	340	94	123	0.76	0.2919	0.006	27.4204	0.3	0.68132	0.01	-0.08294	0.001	3428	31	2
JH038-130	133	42	52	0.81	0.3018	0.006	26.4085	0.31	0.63467	0.01	0.19331	0.002	3479	31	9
JH038-134	570	160	220	0.73	0.2932	0.006	25.7740	0.28	0.63756	0.01	0.12716	0.001	3435	30	8
JH038-135	358	154	119	1.29	0.3080	0.006	31.3893	0.34	0.73923	0.01	0.19687	0.002	3511	30	-2
JH038-138	1156	350	373	0.94	0.3238	0.006	34.0241	0.37	0.76204	0.01	0.20978	0.002	3588	30	-2
JH038-141	404	120	156	0.77	0.2771	0.006	24.2264	0.27	0.63399	0.01	0.1635	0.002	3347	31	5
JH038-145	837	158	323	0.49	0.3009	0.006	26.3150	0.28	0.63428	0.01	0.18418	0.002	3475	30	9
JH038-149	348	75	120	0.63	0.3135	0.006	30.5726	0.34	0.70719	0.01	0.15352	0.002	3538	30	2
JH038-152	899	85	323	0.26	0.3273	0.006	30.6324	0.33	0.67868	0.01	0.1299	0.001	3605	30	7
JH038-155	625	125	244	0.51	0.2900	0.006	24.8840	0.27	0.62218	0.01	0.09635	9E-04	3418	30	9
JH038-157	573	89	219	0.41	0.2876	0.006	25.1042	0.27	0.63301	0.01	0.1562	0.001	3405	30	7
JH038-158	443	147	166	0.89	0.2932	0.006	26.1770	0.28	0.64752	0.01	0.14902	0.001	3435	30	6
JH038-159	504	260	192	1.35	0.2886	0.006	25.3576	0.28	0.63718	0.01	0.14099	0.001	3410	30	7
JH038-160	5215	1554	1250	1.24	0.4930	0.01	68.6572	0.73	1.00984	0.01	0.95062	0.008	4221	29	-7
JH038-161	377	105	136	0.77	0.3000	0.006	27.6449	0.3	0.66833	0.01	0.22942	0.002	3470	30	5
JH038-166	748	58	237	0.24	0.3332	0.007	35.0455	0.38	0.76274	0.01	0.17807	0.002	3632	30	-1
JH038-170	545	51	195	0.26	0.3129	0.006	29.0122	0.31	0.67241	0.01	0.18934	0.002	3535	30	6
JH038-171	685	51	244	0.21	0.3063	0.006	28.4913	0.3	0.67441	0.01	0.182	0.002	3503	30	5
JH038-175	892	214	328	0.65	0.2893	0.006	26.0125	0.28	0.65209	0.01	0.14202	0.001	3414	30	5
JH038-185	2240	1216	667	1.82	0.4379	0.009	48.2497	0.52	0.79899	0.01	0.38584	0.003	4045	29	6
JH038-188	368	138	136	1.01	0.2942	0.006	26.0807	0.28	0.6427	0.01	0.17858	0.002	3440	30	7
JH038-189	307	60	98	0.61	0.3652	0.007	37.4405	0.4	0.74327	0.01	0.19355	0.002	3772	30	5

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH038-195	723	16	247	0.06	0.3338	0.007	31.7957	0.34	0.69068	0.01	0.18534	0.002	3634	30	7
JH038-200	607	107	211	0.51	0.3153	0.006	29.5599	0.31	0.67965	0.01	0.1824	0.002	3547	30	6
JH038-201	441	114	156	0.73	0.3046	0.006	27.9712	0.3	0.6657	0.01	0.17554	0.002	3494	30	6
JH042-002	134	15	45	0.33	0.2950	0.006	28.8484	0.35	0.70918	0.01	0.18763	0.002	3444	32	-1
JH042-003	271	48	95	0.51	0.2909	0.006	27.2511	0.32	0.67921	0.01	0.16944	0.002	3423	31	2
JH042-004	800	138	293	0.47	0.2850	0.006	25.5308	0.29	0.64955	0.01	0.17135	0.002	3391	31	5
JH042-005	573	160	218	0.73	0.2898	0.006	25.0610	0.29	0.62697	0.01	0.12651	0.001	3417	31	8
JH042-009	489	140	175	0.80	0.3098	0.006	28.4676	0.33	0.66627	0.01	0.17257	0.002	3520	31	6
JH042-010	535	88	204	0.43	0.2850	0.006	24.6333	0.28	0.62677	0.01	0.16165	0.002	3390	31	8
JH042-011	349	139	129	1.08	0.2819	0.006	25.1167	0.29	0.64609	0.01	0.16611	0.002	3373	31	4
JH042-014	130	37	35	1.06	0.4601	0.009	55.9117	0.69	0.88113	0.01	0.21839	0.002	4118	30	1
JH042-016	115	38	40	0.95	0.3000	0.006	28.0173	0.35	0.67728	0.01	0.17399	0.002	3470	32	4
JH042-019	411	82	144	0.57	0.3010	0.006	28.2396	0.33	0.68029	0.01	0.17682	0.002	3475	31	3
JH042-022	324	89	113	0.79	0.2854	0.006	26.9318	0.31	0.68423	0.01	0.18181	0.002	3393	31	0
JH042-028	523	153	193	0.79	0.2908	0.006	25.9753	0.3	0.6476	0.01	0.16522	0.002	3422	31	6
JH042-029	408	153	144	1.06	0.3002	0.006	27.9052	0.32	0.67414	0.01	0.17435	0.002	3471	31	4
JH042-033	429	125	151	0.83	0.2893	0.006	27.0483	0.31	0.67808	0.01	0.17612	0.002	3414	31	2
JH042-038	404	133	146	0.91	0.2873	0.006	26.1751	0.3	0.66056	0.01	0.17223	0.002	3403	31	4
JH042-039	94	36	34	1.06	0.2886	0.006	25.9176	0.33	0.65123	0.01	0.15168	0.002	3410	32	5
JH042-041	445	156	171	0.91	0.2898	0.006	24.7701	0.28	0.61985	0.01	0.15472	0.001	3416	31	9
JH042-043	1148	81	402	0.20	0.3091	0.006	29.0684	0.33	0.68191	0.01	0.04641	5E-04	3517	31	4
JH042-045	178	173	58	2.98	0.2898	0.006	29.1703	0.35	0.72979	0.01	0.18383	0.002	3417	31	-4
JH042-047	247	159	80	1.99	0.2886	0.006	29.3792	0.34	0.73828	0.01	0.1964	0.002	3410	31	-5

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH042-049	481	99	164	0.60	0.2873	0.006	27.7733	0.32	0.70093	0.01	0.18701	0.002	3403	31	-1
JH042-050	518	245	182	1.35	0.3005	0.006	28.2513	0.32	0.68184	0.01	0.12994	0.001	3473	31	3
JH042-056	382	119	135	0.88	0.3030	0.006	28.2935	0.32	0.6772	0.01	0.18192	0.002	3486	31	4
JH042-058	338	66	120	0.55	0.2799	0.006	25.9466	0.3	0.67216	0.01	0.17841	0.002	3363	31	1
JH042-059	426	115	158	0.73	0.3081	0.006	27.4619	0.31	0.64635	0.01	0.15491	0.002	3511	31	9
JH042-061	222	30	77	0.39	0.2879	0.006	27.5578	0.32	0.69412	0.01	0.18149	0.002	3406	31	0
JH042-062	350	141	123	1.15	0.3003	0.006	28.2672	0.32	0.68263	0.01	0.17495	0.002	3472	31	3
JH042-063	449	84	129	0.65	0.4558	0.009	52.3453	0.59	0.83273	0.01	0.21511	0.002	4104	30	5
JH042-066	1103	204	337	0.61	0.4479	0.009	48.3915	0.54	0.78353	0.01	0.18979	0.002	4078	30	9
JH042-067	465	165	169	0.98	0.2876	0.006	26.0688	0.3	0.65738	0.01	0.16795	0.002	3405	31	4
JH042-068	181	18	47	0.38	0.4309	0.009	54.2634	0.65	0.91317	0.01	0.23594	0.003	4021	30	-4
JH042-073	278	83	95	0.87	0.2869	0.006	27.6781	0.32	0.69961	0.01	0.18444	0.002	3401	31	-1
JH042-078	335	19	86	0.22	0.4424	0.009	56.5725	0.65	0.92739	0.01	0.26672	0.003	4060	30	-5
JH042-079	285	28	97	0.29	0.2938	0.006	28.5260	0.33	0.70419	0.01	0.10816	0.002	3438	31	0
JH042-083	379	68	136	0.50	0.2863	0.006	26.2799	0.3	0.66566	0.01	0.16388	0.002	3398	31	3
JH042-085	328	84	116	0.72	0.2856	0.006	26.7181	0.31	0.67845	0.01	0.17726	0.002	3394	31	1
JH042-086	183	90	64	1.41	0.2835	0.006	26.7983	0.32	0.68551	0.01	0.17972	0.002	3382	31	0
JH042-091	430	102	154	0.66	0.2909	0.006	26.8063	0.3	0.66821	0.01	0.17782	0.002	3422	31	3
JH042-092	406	71	121	0.59	0.4460	0.009	49.4940	0.56	0.80469	0.01	0.20276	0.002	4072	30	6
JH042-093	413	127	161	0.79	0.2797	0.006	23.6658	0.27	0.61347	0.01	0.13069	0.001	3362	31	9
JH042-100	366	78	127	0.61	0.3011	0.006	28.5912	0.32	0.6887	0.01	0.18109	0.002	3476	31	2
JH042-101	335	63	120	0.53	0.2896	0.006	26.8230	0.3	0.67155	0.01	0.17637	0.002	3416	31	3
JH042-113	255	69	82	0.84	0.3524	0.007	37.2412	0.44	0.76635	0.01	0.20275	0.002	3717	30	1

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH042-115	764	25	261	0.10	0.3543	0.007	35.1525	0.4	0.71956	0.01	0.07948	0.001	3725	30	6
JH042-117	1199	278	451	0.62	0.3079	0.006	27.6863	0.31	0.65215	0.01	0.12563	0.001	3510	30	8
JH042-118	310	103	105	0.98	0.3040	0.006	30.2589	0.36	0.72169	0.01	0.20155	0.002	3491	31	-1
JH042-120	373	50	134	0.37	0.2789	0.006	26.2787	0.3	0.68321	0.01	0.18994	0.002	3357	31	0
JH042-121	143	44	47	0.94	0.3018	0.006	31.0096	0.38	0.74505	0.01	0.19481	0.002	3480	31	-4
JH042-122	624	82	210	0.39	0.3464	0.007	34.7696	0.4	0.72793	0.01	0.1855	0.002	3691	30	4
JH042-124	252	48	72	0.67	0.4331	0.009	51.2073	0.6	0.85747	0.01	0.21891	0.002	4028	29	0
JH042-126	394	165	155	1.06	0.2849	0.006	24.4726	0.28	0.623	0.01	0.12547	0.001	3390	31	8
JH042-127	348	76	123	0.62	0.2871	0.006	27.2730	0.32	0.68894	0.01	0.18927	0.002	3402	31	0
JH042-130	362	138	119	1.16	0.2986	0.006	30.6512	0.36	0.74431	0.01	0.2001	0.002	3463	31	-4
JH042-135	830	454	313	1.45	0.2836	0.006	25.3228	0.29	0.64742	0.01	0.17206	0.002	3383	31	5
JH042-136	293	114	106	1.08	0.2983	0.006	27.6357	0.32	0.67188	0.01	0.17927	0.002	3461	31	4
JH042-137	241	51	84	0.61	0.2818	0.006	27.1621	0.32	0.699	0.01	0.18796	0.002	3373	31	-2
JH042-138	374	173	130	1.33	0.2982	0.006	28.7083	0.33	0.6982	0.01	0.18313	0.002	3461	31	1
JH042-142	680	115	251	0.46	0.2814	0.006	25.5648	0.29	0.6587	0.01	0.17224	0.002	3371	31	3
JH042-143	498	165	157	1.05	0.3263	0.006	34.7114	0.4	0.77141	0.01	0.20771	0.002	3600	30	-3
JH042-145	336	90	113	0.80	0.3062	0.006	30.4867	0.35	0.72191	0.01	0.19219	0.002	3502	31	-1
JH042-146	390	77	136	0.57	0.2903	0.006	27.9580	0.32	0.69834	0.01	0.1884	0.002	3419	31	0
JH042-147	900	145	318	0.46	0.3206	0.006	30.3894	0.34	0.68735	0.01	0.13885	0.001	3573	30	5
JH042-149	355	85	102	0.83	0.3560	0.007	41.2964	0.48	0.84107	0.01	0.21437	0.002	3733	30	-6
JH042-152	706	186	245	0.76	0.2900	0.006	27.9388	0.32	0.6986	0.01	0.18826	0.002	3418	31	0
JH042-153	345	67	118	0.57	0.2967	0.006	28.8578	0.33	0.70538	0.01	0.19302	0.002	3453	31	0
JH042-161	542	86	199	0.43	0.2874	0.006	26.0358	0.3	0.657	0.01	0.17842	0.002	3403	31	4

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH042-162	615	85	203	0.42	0.3148	0.006	31.7604	0.36	0.73157	0.01	0.20134	0.002	3545	30	0
JH042-165	349	108	124	0.87	0.2852	0.006	26.7652	0.31	0.68053	0.01	0.18194	0.002	3392	31	1
JH042-166	345	48	92	0.52	0.4703	0.009	58.6587	0.68	0.90439	0.01	0.24038	0.003	4151	29	-1
JH042-168	640	157	224	0.70	0.2913	0.006	27.6363	0.31	0.68784	0.01	0.18695	0.002	3425	31	1
JH042-170	284	88	97	0.91	0.3057	0.006	29.7731	0.35	0.70632	0.01	0.18806	0.002	3499	31	1
JH042-171	260	90	90	1.00	0.3035	0.006	28.9921	0.34	0.69259	0.01	0.18076	0.002	3488	31	2
JH042-172	409	194	136	1.43	0.2983	0.006	29.7542	0.34	0.72317	0.01	0.19129	0.002	3462	31	-2
JH042-173	755	307	279	1.10	0.2954	0.006	26.4713	0.3	0.64985	0.01	0.11304	0.001	3446	31	6
JH042-176	189	58	60	0.97	0.3297	0.007	34.1964	0.41	0.75212	0.01	0.1995	0.002	3616	30	0
JH042-180	275	88	90	0.98	0.2973	0.006	29.9345	0.35	0.73004	0.01	0.19687	0.002	3456	31	-3
JH042-181	541	66	187	0.35	0.2959	0.006	28.2856	0.32	0.69313	0.01	0.19173	0.002	3449	31	1
JH042-182	226	31	75	0.41	0.3135	0.006	31.1987	0.37	0.72169	0.01	0.20009	0.002	3538	31	1
JH042-183	210	58	70	0.83	0.2934	0.006	29.1666	0.35	0.72081	0.01	0.18963	0.002	3436	31	-2
JH042-184	397	109	131	0.83	0.3046	0.006	30.4982	0.35	0.72595	0.01	0.20289	0.002	3494	31	-1
JH042-186	481	48	169	0.28	0.2971	0.006	27.9065	0.32	0.68106	0.01	0.18802	0.002	3455	31	3
JH042-189	164	53	55	0.96	0.2951	0.006	29.1423	0.35	0.7161	0.01	0.19157	0.002	3445	31	-2
JH042-191	257	60	85	0.71	0.2897	0.006	28.8911	0.34	0.72314	0.01	0.19072	0.002	3416	31	-3
JH042-193	353	117	123	0.95	0.2863	0.006	26.9963	0.31	0.68364	0.01	0.18323	0.002	3398	31	1
JH042-194	256	76	89	0.85	0.2840	0.006	27.0182	0.32	0.68976	0.01	0.18666	0.002	3385	31	0
JH042-196	278	92	96	0.96	0.2839	0.006	27.0551	0.32	0.69112	0.01	0.18087	0.002	3384	31	-1
JH042-198	318	67	110	0.61	0.3023	0.006	28.6306	0.33	0.68686	0.01	0.1759	0.002	3482	31	3
JH042-199	835	244	244	1.00	0.4343	0.009	48.8072	0.55	0.81494	0.01	0.17917	0.002	4032	29	4
JH042-205	846	220	291	0.76	0.2858	0.006	27.2149	0.31	0.69054	0.01	0.18906	0.002	3395	31	0

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH042-207	306	62	109	0.57	0.2849	0.006	26.2253	0.3	0.66749	0.01	0.17857	0.002	3390	31	2
JH042-208	202	76	69	1.10	0.2865	0.006	27.4314	0.32	0.69419	0.01	0.18529	0.002	3399	31	0
JH045-002	568	134	184	0.73	0.3204	0.006	33.3999	0.39	0.75563	0.01	0.16736	0.002	3572	30	-2
JH045-010	237	57	78	0.73	0.3142	0.006	32.4283	0.39	0.74807	0.01	0.23777	0.002	3542	30	-2
JH045-014	266	76	91	0.84	0.3117	0.006	30.7968	0.36	0.71628	0.01	0.19691	0.002	3529	30	1
JH045-015	278	61	94	0.65	0.2819	0.006	28.0155	0.33	0.72032	0.01	0.19048	0.002	3374	31	-4
JH045-019	670	329	240	1.37	0.3289	0.007	31.0137	0.36	0.68358	0.01	0.19978	0.002	3612	30	7
JH045-020	335	107	112	0.96	0.2962	0.006	29.9076	0.35	0.73187	0.01	0.19125	0.002	3451	31	-3
JH045-022	979	505	325	1.55	0.3467	0.007	35.2270	0.4	0.7366	0.01	0.17754	0.002	3693	30	3
JH045-025	230	70	74	0.95	0.3043	0.006	31.7690	0.38	0.75697	0.01	0.19364	0.002	3492	31	-4
JH045-027	401	112	137	0.82	0.3049	0.006	30.0782	0.35	0.71505	0.01	0.18452	0.002	3496	30	0
JH045-028	234	50	80	0.63	0.2846	0.006	28.0569	0.34	0.71459	0.01	0.19042	0.002	3389	31	-3
JH045-030	365	95	125	0.76	0.2839	0.006	27.9098	0.33	0.71262	0.01	0.19244	0.002	3385	31	-3
JH045-032	314	203	125	1.62	0.2817	0.006	23.8063	0.28	0.6127	0.01	0.08691	9E-04	3372	31	9
JH045-035	1316	541	401	1.35	0.4478	0.009	49.4919	0.56	0.80119	0.01	0.43517	0.004	4078	29	7
JH045-037	690	216	253	0.85	0.2838	0.006	26.0592	0.3	0.66571	0.01	0.0812	8E-04	3384	31	2
JH045-039	987	162	327	0.50	0.3129	0.006	31.8066	0.36	0.73702	0.01	0.18764	0.002	3535	30	-1
JH045-040	563	361	200	1.81	0.2850	0.006	27.0467	0.31	0.68793	0.01	0.17914	0.002	3391	31	0
JH045-041	424	89	120	0.74	0.4244	0.008	50.6541	0.59	0.86541	0.01	0.22663	0.002	3998	29	-1
JH045-043	384	165	122	1.35	0.3072	0.006	32.5153	0.38	0.76742	0.01	0.0691	7E-04	3507	30	-5
JH045-044	1190	688	426	1.62	0.3317	0.007	31.1814	0.35	0.68153	0.01	0.08865	8E-04	3625	30	8
JH045-046	484	186	168	1.11	0.2967	0.006	28.7570	0.33	0.70278	0.01	0.14558	0.001	3453	31	0
JH045-047	269	20	80	0.25	0.3597	0.007	40.4845	0.48	0.81597	0.01	0.19445	0.002	3749	30	-3

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH045-048	682	243	240	1.01	0.3066	0.006	29.2577	0.34	0.69199	0.01	0.16164	0.002	3504	30	3
JH045-051	212	71	71	1.00	0.3096	0.006	31.2783	0.37	0.73252	0.01	0.17866	0.002	3519	31	-1
JH045-053	374	152	139	1.09	0.2820	0.006	25.5099	0.3	0.65589	0.01	0.16737	0.002	3374	31	3
JH045-054	346	43	117	0.37	0.3034	0.006	30.0058	0.35	0.71718	0.01	0.18781	0.002	3488	30	0
JH045-055	434	75	153	0.49	0.2796	0.006	26.6638	0.31	0.69153	0.01	0.17818	0.002	3361	31	-1
JH045-057	375	52	126	0.41	0.3026	0.006	30.2883	0.35	0.72582	0.01	0.19251	0.002	3484	30	-1
JH045-058	588	832	237	3.51	0.2341	0.005	19.5110	0.22	0.60427	0.01	0.16502	0.002	3080	31	1
JH045-059	592	275	228	1.21	0.2973	0.006	25.9218	0.3	0.63222	0.01	0.04455	5E-04	3456	30	9
JH045-060	391	59	127	0.46	0.3114	0.006	32.2010	0.37	0.74989	0.01	0.20367	0.002	3528	30	-3
JH045-061	764	100	259	0.39	0.3166	0.006	31.3670	0.36	0.71836	0.01	0.19045	0.002	3554	30	1
JH045-062	399	62	141	0.44	0.2776	0.006	26.3788	0.31	0.68901	0.01	0.18533	0.002	3350	31	-1
JH045-063	586	121	194	0.62	0.3158	0.006	32.0111	0.37	0.73503	0.01	0.16708	0.002	3550	30	-1
JH045-066	496	190	171	1.11	0.2845	0.006	27.6889	0.32	0.70585	0.01	0.07169	7E-04	3388	31	-2
JH045-067	337	130	117	1.11	0.3052	0.006	29.4695	0.34	0.70026	0.01	0.15727	0.002	3497	31	2
JH045-068	719	255	268	0.95	0.2982	0.006	26.8506	0.31	0.65297	0.01	0.14068	0.001	3461	30	6
JH045-073	578	177	209	0.85	0.2844	0.006	26.4503	0.3	0.67451	0.01	0.15229	0.001	3387	31	1
JH045-074	404	118	143	0.83	0.2948	0.006	27.9261	0.32	0.68689	0.01	0.18008	0.002	3443	31	2
JH045-075	702	216	258	0.84	0.2904	0.006	26.5306	0.3	0.66259	0.01	0.15567	0.002	3420	31	4
JH045-076	427	115	153	0.75	0.2852	0.006	26.6551	0.31	0.67768	0.01	0.18031	0.002	3392	31	1
JH045-077	279	74	93	0.80	0.3301	0.007	33.3476	0.39	0.73253	0.01	0.28244	0.003	3618	30	2
JH045-079	394	140	140	1.00	0.2829	0.006	26.7193	0.31	0.68485	0.01	0.18067	0.002	3379	31	0
JH045-080	519	64	172	0.37	0.3210	0.006	32.4153	0.37	0.73229	0.01	0.19514	0.002	3575	30	0
JH045-081	307	50	88	0.57	0.4340	0.009	50.8233	0.59	0.84925	0.01	0.21203	0.002	4031	29	1

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH045-082	256	59	88	0.67	0.2864	0.006	28.0515	0.33	0.71021	0.01	0.1516	0.002	3398	31	-2
JH045-083	516	163	196	0.83	0.2699	0.005	23.8620	0.27	0.6411	0.01	0.15729	0.002	3306	31	3
JH045-086	299	86	105	0.82	0.2828	0.006	27.0216	0.32	0.69302	0.01	0.18663	0.002	3378	31	-1
JH045-087	178	41	59	0.69	0.2867	0.006	29.1542	0.35	0.73746	0.01	0.20633	0.002	3400	31	-5
JH045-088	684	381	246	1.55	0.2860	0.006	26.5741	0.3	0.67384	0.01	0.16319	0.002	3396	31	2
JH045-091	259	35	66	0.53	0.4488	0.009	58.8193	0.7	0.95056	0.01	0.26648	0.003	4081	29	-6
JH045-092	650	128	220	0.58	0.3102	0.006	30.7241	0.35	0.71827	0.01	0.19226	0.002	3522	30	0
JH045-093	464	75	163	0.46	0.2999	0.006	28.6289	0.33	0.69225	0.01	0.18686	0.002	3470	31	2
JH045-095	773	815	231	3.53	0.4679	0.009	52.4703	0.59	0.81333	0.01	0.19511	0.002	4143	29	7
JH045-096	1026	318	298	1.07	0.4548	0.009	52.4611	0.59	0.83659	0.01	0.08958	9E-04	4101	29	4
JH045-097	687	109	218	0.50	0.3239	0.006	34.2337	0.39	0.76648	0.01	0.24604	0.002	3589	30	-3
JH045-098	473	285	174	1.64	0.2902	0.006	26.3926	0.3	0.65959	0.01	0.11536	0.001	3419	31	4
JH045-099	550	61	161	0.38	0.4227	0.008	48.4061	0.55	0.83059	0.01	0.21313	0.002	3992	29	2
JH045-100	491	101	170	0.59	0.2858	0.006	27.6760	0.32	0.70246	0.01	0.19021	0.002	3395	31	-2
JH045-101	610	277	228	1.21	0.2726	0.005	24.4364	0.28	0.65022	0.01	0.17185	0.002	3321	31	2
JH045-102	965	556	299	1.86	0.3622	0.007	39.1002	0.44	0.78305	0.01	0.21221	0.002	3759	30	0
JH045-104	344	47	98	0.48	0.4544	0.009	53.1551	0.61	0.84842	0.01	0.21793	0.002	4100	29	3
JH045-105	1196	463	338	1.37	0.3925	0.008	46.3761	0.52	0.85699	0.01	0.36629	0.003	3881	30	-3
JH045-106	152	53	54	0.98	0.2913	0.006	27.6175	0.34	0.68769	0.01	0.14314	0.002	3425	31	1
JH045-108	223	52	78	0.67	0.2863	0.006	27.2709	0.32	0.69102	0.01	0.1875	0.002	3397	31	0
JH045-109	357	50	120	0.42	0.3205	0.006	31.8789	0.37	0.7215	0.01	0.19074	0.002	3572	30	2
JH045-110	226	45	78	0.58	0.2848	0.006	27.4396	0.32	0.69879	0.01	0.18502	0.002	3390	31	-1
JH045-111	301	43	87	0.49	0.3785	0.008	43.7309	0.51	0.83804	0.01	0.23442	0.003	3826	30	-3

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH045-113	84	10	24	0.42	0.4070	0.008	46.5780	0.58	0.83005	0.01	0.21532	0.003	3935	31	1
JH045-114	180	36	58	0.62	0.3066	0.006	30.5249	0.36	0.72227	0.01	0.18858	0.002	3504	31	-1
JH045-119	794	104	276	0.38	0.2906	0.006	26.9828	0.3	0.67355	0.01	0.17921	0.002	3421	31	3
JH045-125	642	259	243	1.07	0.2883	0.006	24.7794	0.28	0.6234	0.01	0.14659	0.001	3408	31	9
JH045-127	502	96	168	0.57	0.3196	0.006	31.0942	0.35	0.70554	0.01	0.18228	0.002	3568	31	3
JH045-128	302	104	110	0.95	0.2889	0.006	25.8786	0.3	0.6497	0.01	0.17339	0.002	3411	31	5
JH045-130	634	145	227	0.64	0.2864	0.006	26.1348	0.29	0.66184	0.01	0.17266	0.002	3398	31	3
JH045-131	390	186	139	1.34	0.2858	0.006	26.2305	0.3	0.66546	0.01	0.1789	0.002	3395	31	3
JH045-132	751	135	247	0.55	0.3236	0.006	32.2131	0.36	0.72191	0.01	0.48878	0.005	3587	30	2
JH045-133	693	233	244	0.95	0.2890	0.006	26.9306	0.3	0.67584	0.01	0.18397	0.002	3412	31	2
JH045-136	988	318	276	1.15	0.3970	0.008	46.8986	0.52	0.85667	0.01	0.39749	0.004	3898	30	-3
JH045-144	631	116	196	0.59	0.3855	0.008	41.2299	0.47	0.77546	0.01	0.25439	0.003	3854	30	4
JH045-147	151	78	48	1.63	0.3041	0.006	31.6796	0.39	0.75545	0.01	0.21991	0.002	3491	31	-4
JH045-148	225	89	76	1.17	0.2882	0.006	28.4621	0.34	0.71617	0.01	0.19461	0.002	3408	31	-3
JH045-149	663	183	247	0.74	0.2784	0.006	24.9409	0.28	0.64954	0.01	0.14246	0.001	3354	31	3
JH045-150	255	37	79	0.47	0.3200	0.006	34.7238	0.41	0.78688	0.01	0.46474	0.005	3570	31	-5
JH045-151	397	57	112	0.51	0.4347	0.009	51.7487	0.6	0.86315	0.01	0.22884	0.002	4034	29	0
JH045-152	632	305	173	1.76	0.3909	0.008	47.7760	0.54	0.88618	0.01	0.35168	0.003	3875	30	-6
JH045-153	333	57	113	0.50	0.3120	0.006	30.9222	0.36	0.71866	0.01	0.19464	0.002	3531	31	1
JH045-154	180	36	56	0.64	0.3428	0.007	37.1643	0.45	0.78617	0.01	0.24416	0.003	3675	31	-2
JH045-156	523	278	199	1.40	0.2812	0.006	24.8773	0.28	0.64149	0.01	0.09073	9E-04	3370	31	5
JH045-157	403	136	140	0.97	0.3013	0.006	29.1596	0.34	0.70187	0.01	0.17879	0.002	3477	31	1
JH046-001	380	248	142	1.75	0.2841	0.006	25.1326	0.29	0.64153	0.01	0.13342	0.001	3385	31	5

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH046-002	216	314	81	3.88	0.2840	0.006	24.9892	0.3	0.63793	0.01	0.07251	7E-04	3385	31	6
JH046-003	330	63	111	0.57	0.2841	0.006	27.8793	0.33	0.71157	0.01	0.18457	0.002	3386	31	-3
JH046-004	241	26	74	0.35	0.2842	0.006	30.8168	0.37	0.7863	0.01	0.19611	0.002	3386	31	-10
JH046-005	910	18	263	0.07	0.4057	0.008	46.5732	0.53	0.83238	0.01	0.13825	0.002	3930	29	0
JH046-006	212	21	58	0.36	0.4245	0.008	51.5824	0.62	0.88106	0.01	0.2187	0.003	3998	30	-2
JH046-007	159	17	43	0.40	0.4296	0.009	52.1735	0.64	0.88073	0.01	0.22214	0.003	4016	30	-2
JH046-008	491	218	171	1.27	0.2864	0.006	27.2749	0.31	0.69051	0.01	0.12709	0.001	3398	31	0
JH046-009	183	49	61	0.80	0.2808	0.006	27.7604	0.34	0.71688	0.01	0.17908	0.002	3367	31	-4
JH046-010	1321	745	341	2.18	0.4135	0.008	53.1656	0.6	0.93236	0.01	0.16877	0.002	3959	29	-7
JH046-011	339	99	112	0.88	0.3031	0.006	30.3535	0.35	0.72606	0.01	0.19216	0.002	3486	30	-1
JH046-012	398	286	153	1.87	0.2791	0.006	24.0868	0.28	0.62576	0.01	0.05376	5E-04	3358	31	7
JH046-014	165	83	47	1.77	0.4421	0.009	51.8806	0.63	0.85084	0.01	0.06562	7E-04	4059	30	2
JH046-015	807	46	243	0.19	0.3449	0.007	37.9631	0.43	0.79813	0.01	0.2124	0.002	3685	30	-3
JH046-016	440	326	162	2.01	0.2916	0.006	26.3012	0.3	0.65395	0.01	0.10087	1E-03	3426	31	5
JH046-017	373	59	127	0.46	0.2826	0.006	27.5423	0.32	0.70663	0.01	0.13818	0.002	3378	31	-2
JH046-019	397	248	140	1.77	0.2843	0.006	26.6778	0.31	0.68043	0.01	0.17197	0.002	3387	31	1
JH046-020	718	500	288	1.74	0.2698	0.005	22.3136	0.25	0.59972	0.01	0.03992	4E-04	3305	31	9
JH046-021	230	137	81	1.69	0.2846	0.006	26.9241	0.32	0.68594	0.01	0.1728	0.002	3389	31	0
JH046-023	215	50	74	0.68	0.2806	0.006	26.9844	0.32	0.69725	0.01	0.18583	0.002	3366	31	-2
JH046-024	655	263	243	1.08	0.2831	0.006	25.3233	0.29	0.64864	0.01	0.10371	0.001	3380	31	4
JH046-025	543	413	200	2.07	0.2855	0.006	25.7694	0.3	0.65445	0.01	0.05488	5E-04	3393	31	4
JH046-026	463	92	165	0.56	0.2852	0.006	26.6157	0.31	0.67661	0.01	0.18425	0.002	3392	31	1
JH046-027	598	263	221	1.19	0.2878	0.006	25.8851	0.3	0.65219	0.01	0.11334	0.001	3406	31	5

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH046-028	561	143	196	0.73	0.2885	0.006	27.4464	0.31	0.68984	0.01	0.1852	0.002	3410	31	0
JH046-030	448	349	169	2.07	0.3056	0.006	26.9247	0.31	0.63882	0.01	0.07574	7E-04	3499	30	9
JH046-031	143	32	50	0.64	0.2820	0.006	26.7572	0.33	0.688	0.01	0.17878	0.002	3374	31	-1
JH046-033	278	90	100	0.90	0.2833	0.006	26.3287	0.31	0.67381	0.01	0.18139	0.002	3381	31	1
JH046-034	1354	404	428	0.94	0.3916	0.008	41.2444	0.46	0.76377	0.01	0.03961	4E-04	3877	29	5
JH046-037	585	415	208	2.00	0.3009	0.006	28.0982	0.32	0.67721	0.01	0.067	7E-04	3475	30	4
JH046-038	161	103	54	1.91	0.2843	0.006	27.9777	0.35	0.71361	0.01	0.18594	0.002	3387	31	-3
JH046-039	416	153	143	1.07	0.2899	0.006	28.0241	0.33	0.70093	0.01	0.1842	0.002	3417	31	-1
JH046-041	295	88	94	0.94	0.3039	0.006	31.8055	0.38	0.75886	0.01	0.1985	0.002	3490	31	-5
JH046-044	489	183	164	1.12	0.2977	0.006	29.5100	0.34	0.71877	0.01	0.18902	0.002	3458	31	-1
JH046-045	173	23	57	0.40	0.2797	0.006	28.3970	0.35	0.73611	0.01	0.61454	0.007	3361	31	-6
JH046-046	207	25	68	0.37	0.2780	0.006	28.1187	0.34	0.73353	0.01	0.19296	0.002	3352	31	-6
JH046-047	433	66	143	0.46	0.2871	0.006	29.0145	0.34	0.73272	0.01	0.20105	0.002	3402	31	-4
JH046-049	1033	105	340	0.31	0.3254	0.006	33.0095	0.37	0.73554	0.01	0.17396	0.002	3596	30	1
JH046-051	385	83	105	0.79	0.4209	0.008	51.4215	0.6	0.8858	0.01	0.16006	0.002	3986	30	-3
JH046-052	359	206	127	1.62	0.2958	0.006	27.9887	0.33	0.68605	0.01	0.11783	0.001	3449	31	2
JH046-053	881	499	280	1.78	0.3673	0.007	38.5364	0.44	0.7607	0.01	0.11968	0.001	3781	30	3
JH046-054	306	106	100	1.06	0.2853	0.006	29.1609	0.34	0.74118	0.01	0.20526	0.002	3392	31	-6
JH046-055	280	49	77	0.64	0.4265	0.009	51.7100	0.61	0.87918	0.01	0.22522	0.002	4005	30	-2
JH046-056	408	74	134	0.55	0.3035	0.006	30.7895	0.36	0.7356	0.01	0.19446	0.002	3488	31	-2
JH046-057	558	72	185	0.39	0.3143	0.006	31.6659	0.36	0.73049	0.01	0.19843	0.002	3542	30	0
JH046-058	173	65	58	1.12	0.3036	0.006	30.4250	0.37	0.72662	0.01	0.19828	0.002	3489	31	-1
JH046-059	382	206	139	1.48	0.3052	0.006	27.9487	0.32	0.66409	0.01	0.08834	9E-04	3497	31	6

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH046-060	515	69	183	0.38	0.2859	0.006	26.8434	0.31	0.68095	0.01	0.176	0.002	3395	31	1
JH046-061	410	467	158	2.96	0.2823	0.006	24.4524	0.28	0.62818	0.01	0.04689	5E-04	3376	31	7
JH046-064	241	111	79	1.41	0.2820	0.006	28.6492	0.34	0.73678	0.01	0.19721	0.002	3374	31	-6
JH046-066	1001	643	367	1.75	0.3196	0.006	29.1475	0.33	0.66136	0.01	0.04193	4E-04	3568	30	9
JH046-068	800	243	268	0.91	0.3045	0.006	30.3354	0.35	0.72232	0.01	0.16008	0.002	3493	30	-1
JH046-071	111	25	38	0.66	0.2830	0.006	27.5405	0.35	0.70577	0.01	0.19029	0.002	3379	32	-2
JH046-073	413	190	129	1.47	0.3511	0.007	37.4917	0.43	0.77424	0.01	0.18638	0.002	3712	30	0
JH046-075	527	14	188	0.07	0.2930	0.006	27.4879	0.31	0.68029	0.01	0.23272	0.003	3434	31	2
JH046-077	313	51	107	0.48	0.2867	0.006	28.1146	0.33	0.71122	0.01	0.18958	0.002	3400	31	-2
JH046-079	110	19	32	0.59	0.3999	0.008	46.0985	0.57	0.83587	0.01	0.20898	0.003	3909	30	-1
JH046-080	100	18	29	0.62	0.3992	0.008	45.5669	0.58	0.82774	0.01	0.21351	0.003	3906	30	0
JH046-081	446	88	135	0.65	0.3511	0.007	38.7020	0.45	0.79943	0.01	0.20758	0.002	3712	30	-2
JH046-082	579	161	191	0.84	0.2989	0.006	30.3917	0.35	0.73724	0.01	0.19444	0.002	3465	31	-3
JH046-085	455	66	155	0.43	0.2914	0.006	28.7080	0.33	0.71444	0.01	0.18181	0.002	3425	31	-2
JH046-088	339	226	112	2.02	0.2864	0.006	29.0170	0.34	0.73463	0.01	0.17421	0.002	3398	31	-5
JH046-089	364	97	122	0.80	0.2856	0.006	28.6362	0.34	0.72699	0.01	0.19113	0.002	3394	31	-4
JH046-090	342	188	117	1.61	0.2846	0.006	28.0213	0.33	0.71389	0.01	0.12635	0.001	3389	31	-3
JH046-091	378	121	122	0.99	0.3058	0.006	31.6322	0.37	0.75008	0.01	0.19834	0.002	3500	31	-3
JH046-093	108	20	32	0.63	0.3550	0.007	40.3237	0.52	0.82361	0.01	0.22017	0.003	3729	31	-4
JH046-096	111	57	37	1.54	0.2882	0.006	28.8421	0.37	0.72573	0.01	0.19348	0.002	3408	32	-4
JH046-098	585	92	188	0.49	0.3151	0.006	32.8920	0.38	0.75689	0.01	0.20866	0.002	3546	30	-3
JH046-099	729	370	277	1.34	0.2823	0.006	24.9593	0.29	0.64125	0.01	0.04602	5E-04	3375	31	5
JH046-101	160	45	51	0.88	0.3027	0.006	31.8923	0.4	0.76405	0.01	0.21036	0.002	3484	31	-5

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH046-103	806	595	293	2.03	0.3126	0.006	28.8358	0.33	0.66889	0.01	0.04802	5E-04	3534	30	7
JH046-105	342	65	110	0.59	0.2975	0.006	31.1079	0.37	0.75834	0.01	0.20585	0.002	3457	31	-5
JH046-106	481	428	178	2.40	0.2894	0.006	26.2112	0.3	0.65688	0.01	0.05451	6E-04	3414	31	4
JH046-108	521	54	174	0.31	0.3120	0.006	31.4877	0.36	0.73187	0.01	0.20235	0.002	3531	31	-1
JH046-109	575	205	193	1.06	0.3171	0.006	31.7873	0.37	0.72691	0.01	0.11056	0.001	3556	30	0
JH046-111	251	53	75	0.71	0.3536	0.007	39.9217	0.47	0.81871	0.01	0.20726	0.002	3723	30	-4
JH046-112	797	463	298	1.55	0.3131	0.006	28.1278	0.32	0.65156	0.01	0.05483	5E-04	3536	30	9
JH046-113	649	168	223	0.75	0.2849	0.006	27.7895	0.31	0.70744	0.01	0.19224	0.002	3390	30	-2
JH046-115	391	96	127	0.76	0.2949	0.006	30.3314	0.35	0.74605	0.01	0.1935	0.002	3443	31	-5
JH046-116	441	194	151	1.28	0.2806	0.006	27.4921	0.31	0.71045	0.01	0.18448	0.002	3367	31	-3
JH046-117	354	220	133	1.65	0.2804	0.006	25.0170	0.29	0.647	0.01	0.05483	6E-04	3365	31	4
JH046-118	468	188	164	1.15	0.2851	0.006	27.3155	0.31	0.69482	0.01	0.09834	1E-03	3391	31	-1
JH046-119	197	22	51	0.43	0.4521	0.009	58.3634	0.69	0.93627	0.01	0.2376	0.003	4092	29	-4
JH046-120	293	70	97	0.72	0.2808	0.006	28.2718	0.33	0.73027	0.01	0.19895	0.002	3367	31	-5
JH046-122	671	754	259	2.91	0.2735	0.005	23.6876	0.27	0.62802	0.01	0.14405	0.001	3326	31	5
JH046-123	368	78	98	0.80	0.4295	0.009	53.8039	0.62	0.90848	0.01	0.22841	0.002	4016	29	-4
JH046-125	1392	998	530	1.88	0.2796	0.006	24.5646	0.27	0.63719	0.01	0.03156	3E-04	3361	30	5
JH046-127	777	260	283	0.92	0.2860	0.006	26.2167	0.29	0.66481	0.01	0.11354	0.001	3396	30	3
JH046-128	677	541	260	2.08	0.2881	0.006	25.0893	0.28	0.63157	0.01	0.0566	5E-04	3407	30	7
JH046-130	664	340	237	1.43	0.3317	0.007	31.0886	0.35	0.67971	0.01	0.05987	6E-04	3625	30	8
JH046-131	817	682	321	2.12	0.2846	0.006	24.1787	0.27	0.61617	0.01	0.05115	5E-04	3388	30	9
JH046-132	937	616	357	1.73	0.2857	0.006	25.0804	0.28	0.63663	0.01	0.06261	6E-04	3394	30	6
JH046-133	514	81	167	0.49	0.3104	0.006	31.8416	0.36	0.74398	0.01	0.14666	0.001	3523	30	-2

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH046-134	209	69	64	1.08	0.3603	0.007	39.4619	0.46	0.79431	0.01	0.20158	0.002	3751	30	-1
JH046-135	607	163	218	0.75	0.2839	0.006	26.3818	0.3	0.67394	0.01	0.09219	9E-04	3384	31	1
JH046-136	686	212	243	0.87	0.3039	0.006	28.6785	0.32	0.68437	0.01	0.07122	7E-04	3490	30	3
JH046-137	476	184	178	1.03	0.2888	0.006	25.7526	0.29	0.6467	0.01	0.10649	0.001	3411	30	6
JH046-139	563	88	187	0.47	0.3227	0.006	32.3373	0.36	0.72661	0.01	0.17279	0.002	3583	30	1
JH046-140	371	121	138	0.88	0.2799	0.006	25.1110	0.29	0.65071	0.01	0.17049	0.002	3362	31	4
JH046-141	2454	4106	680	6.04	0.3896	0.008	46.8744	0.52	0.8726	0.01	0.10558	1E-03	3869	29	-5
JH046-142	774	380	275	1.38	0.3119	0.006	29.2643	0.33	0.68046	0.01	0.0889	8E-04	3530	30	5
JH046-143	925	132	320	0.41	0.2977	0.006	28.6856	0.32	0.69873	0.01	0.18677	0.002	3458	30	1
JH046-146	574	93	198	0.47	0.3122	0.006	30.1714	0.34	0.70076	0.01	0.18657	0.002	3532	30	3
JH046-148	1188	243	405	0.60	0.3157	0.006	30.7974	0.34	0.70754	0.01	0.102	1E-03	3549	30	2
JH046-149	504	158	175	0.90	0.3158	0.006	30.2916	0.34	0.69567	0.01	0.10256	0.001	3549	30	4
JH046-151	205	64	65	0.98	0.3027	0.006	31.8540	0.37	0.76305	0.01	0.20026	0.002	3484	31	-5
JH046-153	548	83	148	0.56	0.4318	0.009	53.0665	0.59	0.89124	0.01	0.22274	0.002	4024	29	-3
JH046-155	756	283	263	1.08	0.3124	0.006	29.8468	0.33	0.69285	0.01	0.07829	8E-04	3533	30	4
JH046-156	766	60	215	0.28	0.4369	0.009	51.7757	0.58	0.85928	0.01	0.23124	0.002	4041	29	1
JH046-158	340	83	121	0.69	0.2852	0.006	26.6887	0.3	0.67857	0.01	0.17705	0.002	3392	31	1
JH046-159	865	175	294	0.60	0.3187	0.006	31.1991	0.35	0.70997	0.01	0.18887	0.002	3563	30	3
JH046-160	543	245	204	1.20	0.2890	0.006	25.5002	0.29	0.63986	0.01	0.03481	4E-04	3412	31	7
JH046-161	331	157	118	1.33	0.2766	0.006	25.7230	0.29	0.67428	0.01	0.08911	9E-04	3344	31	0
JH046-163	370	88	132	0.67	0.2810	0.006	26.0852	0.3	0.6732	0.01	0.17826	0.002	3368	31	1
JH046-164	271	99	96	1.03	0.2831	0.006	26.5045	0.3	0.67897	0.01	0.17392	0.002	3380	31	1
JH046-166	208	65	73	0.89	0.2822	0.006	26.6344	0.31	0.68446	0.01	0.17886	0.002	3375	31	0

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH046-167	205	105	76	1.38	0.3089	0.006	27.4828	0.32	0.64525	0.01	0.04777	5E-04	3515	31	9
JH046-168	450	124	166	0.75	0.2843	0.006	25.5569	0.29	0.65195	0.01	0.17222	0.002	3387	31	4
JH046-171	313	113	113	1.00	0.2837	0.006	26.0657	0.3	0.66613	0.01	0.16848	0.002	3384	31	2
JH046-172	255	122	87	1.40	0.2853	0.006	27.5378	0.32	0.69986	0.01	0.18101	0.002	3392	31	-1
JH046-174	394	53	113	0.47	0.4421	0.009	51.2116	0.57	0.83997	0.01	0.21932	0.002	4059	29	3
JH046-175	337	62	105	0.59	0.3772	0.008	39.9559	0.45	0.76817	0.01	0.1325	0.001	3821	30	3
JH046-177	171	20	48	0.42	0.4197	0.008	49.3876	0.57	0.8532	0.01	0.22486	0.003	3981	30	0
JH046-178	436	63	131	0.48	0.4081	0.008	44.8260	0.5	0.79656	0.01	0.19925	0.002	3939	29	4
JH046-181	861	163	283	0.58	0.3184	0.006	31.9686	0.35	0.72811	0.01	0.16881	0.002	3562	30	1
JH046-182	157	44	52	0.85	0.2808	0.006	28.0677	0.34	0.72491	0.01	0.19369	0.002	3367	31	-5
JH046-183	565	97	147	0.66	0.4972	0.01	63.3309	0.71	0.92361	0.01	0.24015	0.002	4233	29	0
JH046-185	591	137	209	0.66	0.3370	0.007	31.5402	0.35	0.6786	0.01	0.12172	0.001	3649	30	9
JH046-186	728	191	233	0.82	0.3437	0.007	35.5487	0.39	0.74993	0.01	0.07256	7E-04	3679	30	1
JH046-188	297	76	103	0.74	0.2835	0.006	26.8587	0.31	0.68708	0.01	0.17835	0.002	3382	31	0
JH046-189	223	112	74	1.51	0.2986	0.006	29.5597	0.34	0.7178	0.01	0.15451	0.002	3463	31	-1
JH046-190	630	64	179	0.36	0.4178	0.008	48.6071	0.54	0.84352	0.01	0.21294	0.002	3975	29	0
JH046-191	261	71	87	0.82	0.2848	0.006	28.2338	0.33	0.71875	0.01	0.19166	0.002	3390	31	-3
JH046-193	321	159	122	1.30	0.2820	0.006	24.6040	0.28	0.6326	0.01	0.13413	0.001	3374	31	6
JH046-198	190	55	66	0.83	0.2781	0.006	26.5065	0.31	0.69116	0.01	0.16246	0.002	3352	31	-2
JH046-201	389	166	131	1.27	0.3018	0.006	29.4365	0.33	0.70721	0.01	0.10971	0.001	3480	30	0
JH046-203	925	355	307	1.16	0.3003	0.006	29.8049	0.33	0.71963	0.01	0.17264	0.002	3472	30	-1
JH046-204	809	139	235	0.59	0.3916	0.008	44.4450	0.49	0.82288	0.01	0.12961	0.001	3877	30	0
JH047-001	333	53	117	0.45	0.2799	0.005	26.1012	0.29	0.67628	0.01	0.18959	0.002	3362	30	0

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH047-002	264	34	93	0.37	0.2796	0.006	25.9750	0.29	0.67366	0.01	0.18015	0.002	3361	30	1
JH047-003	93	15	29	0.52	0.3502	0.007	37.1117	0.46	0.76848	0.01	0.20115	0.003	3708	30	0
JH047-004	412	51	144	0.35	0.3232	0.006	30.2878	0.34	0.67958	0.01	0.1202	0.001	3585	30	7
JH047-009	792	386	250	1.54	0.3906	0.008	40.5902	0.44	0.7536	0.01	0.04915	5E-04	3873	29	6
JH047-010	581	288	181	1.59	0.3844	0.008	40.5463	0.45	0.76491	0.01	0.08375	8E-04	3849	29	5
JH047-011	190	36	62	0.58	0.2914	0.006	29.2196	0.34	0.72727	0.01	0.19933	0.002	3425	30	-3
JH047-013	385	69	126	0.55	0.3032	0.006	30.4617	0.34	0.7285	0.01	0.19062	0.002	3487	30	-2
JH047-014	487	247	163	1.52	0.2998	0.006	29.4911	0.33	0.71332	0.01	0.11292	0.001	3469	30	-1
JH047-017	134	44	45	0.98	0.3060	0.006	30.1555	0.36	0.71467	0.01	0.20644	0.002	3501	31	0
JH047-019	166	66	55	1.20	0.2986	0.006	29.4410	0.35	0.7151	0.01	0.20539	0.002	3463	31	-1
JH047-020	893	161	300	0.54	0.3220	0.006	31.6184	0.35	0.71209	0.01	0.17798	0.002	3579	30	3
JH047-025	221	89	69	1.29	0.3574	0.007	37.8205	0.44	0.76734	0.01	0.11504	0.001	3739	30	1
JH047-028	201	118	67	1.76	0.2795	0.006	27.5451	0.33	0.71474	0.01	0.1896	0.002	3360	31	-4
JH047-029	492	121	175	0.69	0.2669	0.005	24.7300	0.28	0.67206	0.01	0.16166	0.002	3288	31	-1
JH047-030	127	16	37	0.43	0.3791	0.008	42.9754	0.53	0.8222	0.01	0.21561	0.003	3828	30	-2
JH047-031	548	364	203	1.79	0.2925	0.006	26.0105	0.29	0.64488	0.01	0.11338	0.001	3431	30	6
JH047-032	864	206	296	0.70	0.3207	0.006	30.8794	0.34	0.6983	0.01	0.06366	6E-04	3573	30	4
JH047-033	312	85	109	0.78	0.2807	0.006	26.4825	0.3	0.68417	0.01	0.17945	0.002	3367	31	0
JH047-034	325	144	110	1.31	0.2802	0.006	27.3283	0.31	0.70721	0.01	0.1638	0.002	3364	31	-3
JH047-036	716	116	212	0.55	0.4570	0.009	50.7097	0.56	0.80472	0.01	0.09763	1E-03	4108	29	7
JH047-040	476	204	172	1.19	0.2945	0.006	26.9575	0.3	0.6638	0.01	0.07125	7E-04	3442	30	4
JH047-043	338	81	118	0.69	0.2812	0.006	26.5633	0.3	0.685	0.01	0.18432	0.002	3370	31	0
JH047-045	417	99	130	0.76	0.3544	0.007	37.7710	0.43	0.7729	0.01	0.20203	0.002	3726	30	0

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH047-047	569	67	189	0.35	0.3155	0.006	31.4072	0.35	0.72204	0.01	0.19653	0.002	3548	30	1
JH047-049	319	83	118	0.70	0.2729	0.005	24.3984	0.28	0.64843	0.01	0.17883	0.002	3323	31	3
JH047-052	410	121	120	1.01	0.4155	0.008	47.1685	0.53	0.82323	0.01	0.07327	8E-04	3966	29	2
JH047-055	506	50	180	0.28	0.2836	0.006	26.4460	0.3	0.67629	0.01	0.181	0.002	3383	30	1
JH047-057	248	96	71	1.35	0.4076	0.008	47.5078	0.55	0.84517	0.01	0.08903	9E-04	3938	29	-1
JH047-058	359	135	129	1.05	0.2733	0.005	25.2007	0.29	0.66875	0.01	0.16613	0.002	3325	31	0
JH047-063	144	18	40	0.45	0.4421	0.009	52.5986	0.63	0.86279	0.01	0.21781	0.003	4059	29	1
JH047-065	209	58	75	0.77	0.2804	0.006	26.1864	0.31	0.6772	0.01	0.18259	0.002	3365	31	0
JH047-069	353	40	119	0.34	0.3094	0.006	30.6840	0.35	0.71909	0.01	0.19378	0.002	3518	30	0
JH047-072	336	127	121	1.05	0.2812	0.006	26.0336	0.3	0.67136	0.01	0.18065	0.002	3370	31	1
JH047-078	546	213	203	1.05	0.2828	0.006	25.3385	0.29	0.64982	0.01	0.12629	0.001	3378	31	4
JH047-079	622	149	222	0.67	0.2795	0.006	26.1490	0.29	0.67857	0.01	0.15455	0.002	3360	31	0
JH047-080	465	172	171	1.01	0.2846	0.006	25.8282	0.29	0.65802	0.01	0.1428	0.001	3389	31	3
JH047-088	204	99	81	1.22	0.2311	0.005	19.5253	0.23	0.61273	0.01	0.16894	0.002	3060	32	-1
JH047-091	454	139	137	1.01	0.4031	0.008	44.6980	0.51	0.80401	0.01	0.12926	0.001	3921	30	3
JH047-094	293	103	100	1.03	0.2923	0.006	28.8024	0.34	0.71464	0.01	0.18005	0.002	3430	31	-2
JH047-102	115	26	32	0.81	0.4277	0.009	51.9009	0.66	0.87996	0.01	0.29872	0.004	4009	30	-2
JH047-104	220	139	78	1.78	0.2828	0.006	26.9046	0.32	0.68996	0.01	0.17599	0.002	3378	31	-1
JH047-106	555	320	209	1.53	0.2842	0.006	25.4100	0.29	0.64842	0.01	0.07441	7E-04	3386	31	5
JH047-109	541	128	207	0.62	0.2837	0.006	25.0430	0.29	0.64017	0.01	0.16669	0.002	3383	31	6
JH047-112	384	97	133	0.73	0.3096	0.006	30.0972	0.35	0.70491	0.01	0.14888	0.002	3519	31	2
JH047-113	395	183	153	1.20	0.2871	0.006	24.9196	0.29	0.62938	0.01	0.12667	0.001	3402	31	8
JH047-115	657	167	250	0.67	0.2841	0.006	25.1301	0.28	0.64141	0.01	0.07966	8E-04	3386	31	5

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH047-116	154	48	54	0.89	0.2869	0.006	27.8724	0.34	0.7045	0.01	0.18336	0.002	3401	31	-2
JH047-123	75	26	27	0.96	0.2877	0.006	27.5705	0.37	0.69495	0.01	0.17174	0.002	3405	32	0
JH047-124	273	190	95	2.00	0.2869	0.006	27.9365	0.33	0.70601	0.01	0.17908	0.002	3401	31	-2
JH047-126	602	174	190	0.92	0.3205	0.006	34.3604	0.39	0.77743	0.01	0.23808	0.002	3572	30	-4
JH048-001	210	155	76	2.04	0.2871	0.006	27.2804	0.28	0.68914	0.01	0.18592	0.002	3402	31	0
JH048-005	734	181	226	0.80	0.4523	0.009	50.4972	0.51	0.8097	0.01	0.17229	0.002	4093	29	7
JH048-016	458	141	168	0.84	0.3115	0.006	29.1414	0.29	0.67835	0.01	0.15756	0.001	3529	30	5
JH048-020	699	151	247	0.61	0.3222	0.006	31.1525	0.31	0.70125	0.01	0.15469	0.001	3580	30	4
JH048-021	628	363	205	1.77	0.3715	0.007	38.9621	0.39	0.76047	0.01	0.23492	0.002	3798	30	4
JH048-030	541	184	204	0.90	0.3057	0.006	27.6810	0.28	0.65655	0.01	0.13578	0.001	3500	30	7
JH048-031	138	45	52	0.87	0.2734	0.005	24.7800	0.26	0.65715	0.01	0.19468	0.002	3326	31	2
JH048-032	119	51	44	1.16	0.2836	0.006	26.3902	0.27	0.6749	0.01	0.17209	0.002	3383	31	1
JH048-033	370	187	142	1.32	0.2850	0.006	25.3781	0.26	0.6457	0.01	0.1735	0.002	3391	31	5
JH048-037	1189	1326	376	3.53	0.3791	0.008	40.8684	0.41	0.78178	0.01	0.15075	0.001	3828	30	2
JH048-045	586	107	198	0.54	0.3078	0.006	31.0925	0.31	0.73259	0.01	0.29975	0.003	3510	30	-1
JH048-047	588	125	224	0.56	0.2792	0.006	24.9799	0.25	0.64882	0.01	0.14448	0.001	3358	31	4
JH048-048	659	267	185	1.44	0.3535	0.007	42.8084	0.43	0.8781	0.01	0.27891	0.002	3722	30	-9
JH048-051	357	125	138	0.91	0.2836	0.006	24.9197	0.25	0.63709	0.01	0.14016	0.001	3383	31	6
JH048-056	782	203	239	0.85	0.4372	0.009	48.4475	0.49	0.80355	0.01	0.20599	0.002	4042	29	6
JH048-058	400	257	151	1.70	0.2879	0.006	25.8432	0.26	0.65095	0.01	0.11691	0.001	3406	30	5
JH048-059	837	731	271	2.70	0.3365	0.007	35.3280	0.36	0.76121	0.01	0.13879	0.001	3647	30	-1
JH048-062	1290	834	372	2.24	0.4605	0.009	54.1108	0.55	0.85204	0.01	0.14486	0.001	4120	29	3
JH048-063	432	107	151	0.71	0.3076	0.006	29.7722	0.3	0.70173	0.01	0.11317	0.001	3509	30	2

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH048-066	303	75	104	0.72	0.2827	0.006	28.0516	0.29	0.71964	0.01	0.16992	0.002	3378	31	-4
JH048-067	1016	223	370	0.60	0.3088	0.006	28.7228	0.29	0.67439	0.01	0.07524	7E-04	3515	30	5
JH048-082	630	150	236	0.64	0.2912	0.006	26.3146	0.27	0.65522	0.01	0.14301	0.001	3424	30	5
JH048-086	167	43	61	0.70	0.2833	0.006	26.2122	0.27	0.67092	0.01	0.17996	0.002	3381	31	2
JH048-093	334	64	122	0.52	0.2802	0.006	26.0007	0.27	0.6729	0.01	0.17473	0.002	3364	31	1
JH048-108	264	153	97	1.58	0.2878	0.006	26.5160	0.29	0.66806	0.01	0.17908	0.002	3406	31	3
JH048-110	206	80	73	1.10	0.3064	0.006	29.4122	0.33	0.69615	0.01	0.1803	0.002	3503	31	2
JH048-114	345	69	121	0.57	0.2885	0.006	27.9224	0.31	0.70169	0.01	0.16829	0.002	3410	31	-1
JH048-118	802	144	266	0.54	0.3239	0.006	33.1909	0.35	0.74308	0.01	0.19489	0.002	3588	30	0
JH048-123	735	625	242	2.58	0.3274	0.007	33.7772	0.36	0.74808	0.01	0.1559	0.001	3605	30	0
JH048-124	374	118	131	0.90	0.2912	0.006	28.1986	0.31	0.70206	0.01	0.18274	0.002	3424	31	-1
JH048-126	114	59	39	1.51	0.3027	0.006	30.1179	0.35	0.7215	0.01	0.18766	0.002	3484	31	-1
JH048-131	515	314	200	1.57	0.2939	0.006	25.7775	0.27	0.63591	0.01	0.08169	7E-04	3439	31	8
JH048-132	517	275	202	1.36	0.2900	0.006	25.2371	0.27	0.63107	0.01	0.07228	7E-04	3417	31	8
JH048-133	602	230	233	0.99	0.2923	0.006	25.7021	0.27	0.63749	0.01	0.11854	0.001	3430	31	7
JH048-135	349	123	125	0.98	0.3103	0.006	29.5794	0.32	0.69122	0.01	0.16979	0.002	3522	31	3
JH048-137	499	139	185	0.75	0.2949	0.006	27.0372	0.29	0.66476	0.01	0.16678	0.002	3444	31	4
JH048-143	742	139	276	0.50	0.2933	0.006	26.8818	0.29	0.66455	0.01	0.14917	0.001	3435	31	4
JH048-144	459	194	170	1.14	0.2885	0.006	26.4894	0.28	0.66569	0.01	0.1561	0.001	3410	31	3
JH048-145	997	203	372	0.55	0.3191	0.006	29.1773	0.31	0.66298	0.01	0.10209	9E-04	3566	30	8
JH048-147	284	101	113	0.89	0.2803	0.006	24.1328	0.26	0.62428	0.01	0.12159	0.001	3365	31	7
JH048-150	439	128	169	0.76	0.2925	0.006	25.8916	0.28	0.64181	0.01	0.12212	0.001	3431	31	7
JH048-152	556	261	214	1.22	0.3083	0.006	27.4156	0.29	0.64475	0.01	0.13073	0.001	3513	30	9

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH048-154	617	297	243	1.22	0.2937	0.006	25.4199	0.27	0.62762	0.01	0.1069	1E-03	3437	31	9
JH048-156	366	99	120	0.83	0.3062	0.006	31.8760	0.34	0.75475	0.01	0.26983	0.002	3502	30	-4
JH048-163	622	282	203	1.39	0.3175	0.006	33.2077	0.35	0.75839	0.01	0.19909	0.002	3558	30	-3
JH048-171	473	36	169	0.21	0.2928	0.006	28.1386	0.3	0.69695	0.01	0.18304	0.002	3432	30	0
JH048-173	734	236	281	0.84	0.2851	0.006	25.4772	0.27	0.64803	0.01	0.15131	0.001	3391	31	5
JH048-174	314	123	114	1.08	0.2900	0.006	27.2407	0.29	0.68112	0.01	0.16834	0.002	3418	31	2
JH048-176	624	208	245	0.85	0.2788	0.006	24.3305	0.26	0.6328	0.01	0.16441	0.001	3356	31	6
JH048-180	352	84	133	0.63	0.2936	0.006	26.7508	0.29	0.66077	0.01	0.16496	0.002	3437	30	5
JH048-181	292	188	111	1.69	0.3041	0.006	27.5411	0.3	0.65673	0.01	0.12352	0.001	3491	30	7
JH048-183	180	65	69	0.94	0.2759	0.006	24.7384	0.27	0.65013	0.01	0.16469	0.002	3340	31	3
JH048-187	656	352	192	1.83	0.3301	0.007	38.6853	0.41	0.84973	0.01	0.24037	0.002	3618	30	-9
JH048-188	980	214	350	0.61	0.3205	0.006	30.8818	0.32	0.69869	0.01	0.15798	0.001	3572	30	4
JH048-194	762	353	268	1.32	0.3329	0.007	32.5779	0.34	0.70956	0.01	0.15476	0.001	3631	30	5
JH048-196	522	181	203	0.89	0.3065	0.006	27.1862	0.29	0.64325	0.01	0.12611	0.001	3503	30	9
JH048-197	213	64	71	0.90	0.3006	0.006	30.9512	0.34	0.74666	0.01	0.19948	0.002	3473	30	-4
JH048-198	298	79	86	0.92	0.3346	0.007	39.9739	0.43	0.86629	0.01	0.35678	0.003	3638	30	-10
JH048-199	205	39	72	0.54	0.2974	0.006	29.0234	0.32	0.7077	0.01	0.23603	0.002	3457	30	0
JH048-204	658	284	256	1.11	0.2853	0.006	25.2555	0.27	0.64199	0.01	0.1283	0.001	3392	30	6
JH048-207	599	358	234	1.53	0.2716	0.005	23.9289	0.25	0.63904	0.01	0.1088	1E-03	3315	31	4
JH049-001	479	277	181	1.53	0.2912	0.006	25.3038	0.27	0.62998	0.01	0.04635	4E-04	3424	31	8
JH049-002	267	92	103	0.89	0.2828	0.006	24.0061	0.26	0.61544	0.01	0.10059	1E-03	3379	31	9
JH049-006	865	235	318	0.74	0.3052	0.006	27.3416	0.29	0.64951	0.01	0.15582	0.001	3497	30	8
JH049-009	571	105	186	0.56	0.3644	0.007	36.7922	0.39	0.73222	0.01	0.19284	0.002	3768	30	6

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH049-011	575	330	213	1.55	0.2929	0.006	26.0093	0.28	0.64399	0.01	0.39182	0.003	3433	30	7
JH049-015	326	126	121	1.04	0.2879	0.006	25.4447	0.27	0.64097	0.01	0.07863	7E-04	3406	31	6
JH049-017	195	54	68	0.79	0.2846	0.006	26.8689	0.3	0.68466	0.01	0.17579	0.002	3388	31	0
JH049-018	145	35	43	0.81	0.4302	0.009	48.3682	0.54	0.81535	0.01	0.14244	0.002	4018	30	4
JH049-019	126	15	36	0.42	0.4345	0.009	49.5613	0.56	0.82706	0.01	0.22221	0.003	4033	30	3
JH049-024	377	60	135	0.44	0.3239	0.006	29.7252	0.32	0.66546	0.01	0.1775	0.002	3589	30	9
JH049-027	225	122	86	1.42	0.2854	0.006	24.5671	0.27	0.62422	0.01	0.16082	0.001	3393	31	8
JH049-031	184	46	70	0.66	0.2797	0.006	24.2431	0.27	0.6285	0.01	0.15281	0.002	3361	31	6
JH049-036	739	70	286	0.24	0.2769	0.005	23.5038	0.25	0.61557	0.01	0.13751	0.001	3345	31	8
JH049-037	282	82	109	0.75	0.2726	0.005	23.1536	0.25	0.61594	0.01	0.16772	0.002	3321	31	7
JH049-039	275	200	100	2.00	0.2852	0.006	25.8285	0.28	0.65672	0.01	0.17135	0.002	3392	31	4
JH049-040	316	81	118	0.69	0.2802	0.006	24.6418	0.26	0.63763	0.01	0.17141	0.002	3364	31	5
JH049-042	204	44	74	0.59	0.2799	0.006	25.4519	0.28	0.65935	0.01	0.17104	0.002	3363	31	2
JH049-043	212	48	75	0.64	0.2812	0.006	26.2857	0.29	0.67783	0.01	0.18276	0.002	3370	31	1
JH049-047	216	43	74	0.58	0.2679	0.005	25.6163	0.28	0.69333	0.01	0.18379	0.002	3294	31	-3
JH049-057	303	107	110	0.97	0.2865	0.006	25.9531	0.28	0.65682	0.01	0.1757	0.002	3399	31	4
JH049-058	283	82	83	0.99	0.4300	0.009	48.0873	0.51	0.81102	0.01	0.21242	0.002	4017	29	4
JH049-059	125	26	36	0.72	0.4251	0.008	48.5218	0.54	0.82771	0.01	0.21271	0.002	4000	30	2
JH049-063	573	269	210	1.28	0.2867	0.006	25.7125	0.27	0.65035	0.01	0.10662	1E-03	3400	30	5
JH049-066	884	920	300	3.07	0.3051	0.006	29.4623	0.33	0.70028	0.01	0.08652	8E-04	3496	31	2
JH049-072	1280	1366	478	2.86	0.2708	0.005	23.8526	0.25	0.63862	0.01	0.10073	9E-04	3311	31	3
JH049-073	397	202	145	1.39	0.2849	0.006	25.6492	0.28	0.65273	0.01	0.13198	0.001	3390	31	4
JH049-074	208	59	68	0.87	0.2842	0.006	28.5839	0.32	0.72936	0.01	0.19429	0.002	3386	31	-5

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH049-076	415	128	149	0.86	0.2876	0.006	26.2877	0.28	0.66277	0.01	0.12748	0.001	3405	31	3
JH049-080	318	128	118	1.08	0.2860	0.006	25.3879	0.27	0.64369	0.01	0.17274	0.002	3396	31	6
JH049-083	650	73	222	0.33	0.3347	0.007	32.2635	0.34	0.69893	0.01	0.18492	0.002	3639	30	6
JH049-084	353	178	132	1.35	0.2938	0.006	25.9029	0.28	0.63927	0.01	0.17282	0.002	3438	31	7
JH049-085	365	166	130	1.28	0.2925	0.006	26.8701	0.28	0.6663	0.01	0.18593	0.002	3431	30	4
JH049-086	590	201	202	1.00	0.3230	0.006	30.9687	0.32	0.69531	0.01	0.09472	9E-04	3584	30	5
JH049-087	426	156	152	1.03	0.2903	0.006	26.6500	0.28	0.66579	0.01	0.11815	0.001	3419	30	3
JH049-089	673	294	259	1.14	0.2739	0.005	23.3238	0.24	0.61764	0.01	0.05038	5E-04	3328	31	7
JH049-095	201	129	71	1.82	0.2851	0.006	26.2866	0.29	0.66861	0.01	0.17646	0.002	3391	31	2
JH049-096	240	162	85	1.91	0.2898	0.006	26.7677	0.29	0.66994	0.01	0.17892	0.002	3416	31	3
JH049-099	606	113	210	0.54	0.3174	0.006	29.9799	0.31	0.68501	0.01	0.19425	0.002	3557	30	5
JH049-104	156	25	49	0.51	0.4154	0.008	43.0429	0.47	0.75138	0.01	0.18385	0.002	3966	29	9
JH049-105	135	17	40	0.43	0.4258	0.008	46.5337	0.51	0.79257	0.01	0.21272	0.002	4003	29	6
JH049-108	255	87	87	1.00	0.2854	0.006	27.5396	0.3	0.69988	0.01	0.20203	0.002	3393	31	-1
JH049-111	671	81	234	0.35	0.3184	0.006	30.1655	0.32	0.68683	0.01	0.04749	8E-04	3562	30	5
JH049-112	471	97	130	0.75	0.4610	0.009	55.2444	0.6	0.86892	0.01	0.16396	0.002	4121	29	2
JH049-114	838	306	308	0.99	0.3056	0.006	27.4701	0.3	0.65168	0.01	0.02101	2E-04	3499	30	8
JH049-116	898	177	326	0.54	0.2724	0.005	24.7875	0.27	0.65978	0.01	0.15269	0.001	3320	31	1
JH049-120	184	53	64	0.83	0.2843	0.006	27.0813	0.31	0.69075	0.01	0.17144	0.002	3387	31	0
JH049-122	236	191	89	2.15	0.2870	0.006	25.0279	0.28	0.63238	0.01	0.14617	0.001	3401	31	7
JH049-129	550	226	185	1.22	0.3477	0.007	34.1318	0.37	0.71168	0.01	0.17045	0.002	3697	30	6
JH049-130	255	118	87	1.36	0.2842	0.006	27.6130	0.31	0.70446	0.01	0.1875	0.002	3386	31	-2
JH049-133	901	280	333	0.84	0.2913	0.006	25.9575	0.28	0.64621	0.01	0.15422	0.001	3424	30	6

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH049-134	515	112	180	0.62	0.3167	0.006	29.8510	0.32	0.68343	0.01	0.11583	0.001	3554	30	5
JH049-135	907	228	325	0.70	0.2910	0.006	26.7273	0.29	0.66585	0.01	0.07237	7E-04	3423	30	4
JH049-137	343	69	109	0.63	0.3569	0.007	37.0038	0.41	0.75172	0.01	0.16051	0.002	3737	30	3
JH049-138	414	157	151	1.04	0.2885	0.006	26.0585	0.28	0.6549	0.01	0.13219	0.001	3410	31	4
JH049-140	468	143	159	0.90	0.3102	0.006	30.0518	0.32	0.70234	0.01	0.13229	0.001	3522	30	2
JH049-143	364	163	132	1.23	0.3087	0.006	28.0984	0.3	0.65999	0.01	0.17138	0.002	3514	30	7
JH049-144	1214	186	445	0.42	0.2824	0.006	25.3247	0.27	0.65029	0.01	0.17629	0.002	3376	31	4
JH049-145	346	50	120	0.42	0.3303	0.007	31.3523	0.34	0.68835	0.01	0.18349	0.002	3618	30	7
JH049-149	315	101	111	0.91	0.2778	0.006	25.8078	0.28	0.67367	0.01	0.14099	0.001	3351	31	0
JH049-150	136	34	45	0.76	0.2656	0.005	26.5780	0.31	0.72551	0.01	0.19658	0.002	3280	31	-7
JH049-151	106	28	37	0.76	0.2634	0.005	24.7870	0.3	0.68232	0.01	0.17587	0.002	3267	32	-3
JH049-152	354	90	103	0.87	0.4603	0.009	52.1386	0.57	0.82137	0.01	0.18182	0.002	4119	29	6
JH049-154	164	36	51	0.71	0.2867	0.006	30.0244	0.34	0.75938	0.01	0.21384	0.002	3400	31	-7
JH049-155	827	445	309	1.44	0.2936	0.006	25.7679	0.27	0.63629	0.01	0.03456	3E-04	3437	30	8
JH049-159	480	164	170	0.96	0.2908	0.006	26.8373	0.29	0.66924	0.01	0.18079	0.002	3422	31	3
JH049-160	722	218	218	1.00	0.3907	0.008	42.4897	0.45	0.78857	0.01	0.13642	0.001	3874	30	3
JH049-163	632	110	221	0.50	0.2885	0.006	26.9274	0.29	0.67689	0.01	0.19019	0.002	3409	31	2
JH049-164	762	200	276	0.72	0.3065	0.006	27.6894	0.29	0.65503	0.01	0.16194	0.001	3504	30	7
JH049-166	479	120	157	0.76	0.3383	0.007	33.8854	0.36	0.72631	0.01	0.19049	0.002	3655	30	3
JH049-167	460	97	132	0.73	0.4730	0.009	54.1778	0.58	0.83056	0.01	0.2178	0.002	4159	29	6
JH049-168	334	63	95	0.66	0.4483	0.009	51.7071	0.56	0.83639	0.01	0.22201	0.002	4080	29	4
JH049-170	461	50	134	0.37	0.4595	0.009	51.7552	0.56	0.81679	0.01	0.16428	0.002	4116	29	6
JH049-172	425	103	142	0.73	0.3129	0.006	30.5310	0.33	0.70745	0.01	0.22032	0.002	3536	30	2

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH049-173	146	45	49	0.92	0.3028	0.006	29.3254	0.33	0.70234	0.01	0.19022	0.002	3484	31	1
JH049-174	113	26	40	0.65	0.2959	0.006	26.9935	0.31	0.66152	0.01	0.24836	0.003	3449	31	5
JH049-176	282	85	102	0.83	0.2856	0.006	25.6787	0.28	0.6519	0.01	0.17332	0.002	3394	31	4
JH049-177	815	166	278	0.60	0.3236	0.006	30.9563	0.33	0.6937	0.01	0.13908	0.001	3587	30	5
JH049-186	398	209	147	1.42	0.2888	0.006	25.5088	0.27	0.64051	0.01	0.17063	0.002	3411	31	6
JH049-190	232	78	78	1.00	0.3020	0.006	29.3866	0.32	0.70561	0.01	0.16983	0.002	3481	31	1
JH049-191	318	74	93	0.80	0.4332	0.009	48.3176	0.52	0.80876	0.01	0.20244	0.002	4029	29	5
JH049-198	321	63	119	0.53	0.2853	0.006	24.9879	0.27	0.63521	0.01	0.17392	0.002	3392	31	6
JH049-199	607	96	215	0.45	0.3254	0.006	29.8896	0.32	0.66607	0.01	0.14878	0.001	3596	30	9
JH049-201	559	96	202	0.48	0.3145	0.006	28.3012	0.3	0.65264	0.01	0.15452	0.001	3543	30	9
JH049-202	355	67	118	0.57	0.3184	0.006	31.2337	0.34	0.71141	0.01	0.18641	0.002	3562	30	2
JH049-204	834	327	254	1.29	0.3907	0.008	41.0071	0.43	0.76118	0.01	0.09871	9E-04	3874	30	6
JH049-205	305	57	101	0.56	0.3217	0.006	31.6234	0.34	0.71285	0.01	0.194	0.002	3578	30	3
JH049-210	725	470	269	1.75	0.2795	0.006	24.4393	0.26	0.63421	0.01	0.07969	7E-04	3360	31	6
JH049-214	794	406	249	1.63	0.3782	0.007	37.7024	0.4	0.72303	0.01	0.08465	8E-04	3824	30	9
JH049-223	642	475	233	2.04	0.2839	0.006	25.2894	0.27	0.6459	0.01	0.04871	5E-04	3385	31	5
JH049-224	383	88	136	0.65	0.3157	0.006	30.0522	0.32	0.6904	0.01	0.13914	0.001	3549	30	4
JH049-225	124	28	45	0.62	0.2838	0.006	25.5053	0.29	0.6517	0.01	0.22779	0.002	3384	31	4
JH049-226	103	21	37	0.57	0.2896	0.006	25.9118	0.3	0.64896	0.01	0.17124	0.002	3415	31	5
JH049-228	427	83	143	0.58	0.2919	0.006	28.1021	0.3	0.69825	0.01	0.19762	0.002	3428	31	0
JH051-001	1160	381	447	0.85	0.2863	0.006	25.4028	0.29	0.64329	0.01	0.08995	9E-04	3398	30	6
JH051-002	274	90	98	0.92	0.2691	0.005	25.6867	0.31	0.69205	0.01	0.18383	0.002	3301	31	-3
JH051-003	716	99	261	0.38	0.2934	0.006	27.4897	0.31	0.67946	0.01	0.18386	0.002	3436	30	2

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH051-004	586	85	216	0.39	0.2915	0.006	27.0647	0.31	0.67331	0.01	0.10362	0.001	3426	30	3
JH051-006	439	65	117	0.56	0.4742	0.009	60.8433	0.71	0.93043	0.01	0.35139	0.004	4163	29	-2
JH051-007	156	33	55	0.60	0.2827	0.006	27.2285	0.34	0.69838	0.01	0.18777	0.002	3378	31	-2
JH051-010	228	34	82	0.41	0.2828	0.006	26.6608	0.32	0.68354	0.01	0.18485	0.002	3379	31	0
JH051-011	299	85	111	0.77	0.2811	0.006	25.6621	0.3	0.66204	0.01	0.16999	0.002	3369	31	2
JH051-012	473	100	166	0.60	0.3084	0.006	29.8891	0.35	0.70273	0.01	0.19003	0.002	3513	30	2
JH051-013	272	200	93	2.15	0.2864	0.006	28.4954	0.34	0.72154	0.01	0.18156	0.002	3398	31	-3
JH051-014	209	59	74	0.80	0.2823	0.006	27.1933	0.33	0.69855	0.01	0.18111	0.002	3376	31	-2
JH051-016	322	88	116	0.76	0.2790	0.006	26.3398	0.31	0.68468	0.01	0.17713	0.002	3357	31	-1
JH051-017	208	25	60	0.42	0.4159	0.008	48.8692	0.6	0.85213	0.01	0.22556	0.003	3967	30	-1
JH051-020	570	72	202	0.36	0.2925	0.006	27.9492	0.32	0.693	0.01	0.18673	0.002	3431	30	1
JH051-021	678	90	245	0.37	0.2916	0.006	27.3164	0.31	0.67927	0.01	0.18542	0.002	3426	30	2
JH051-022	631	62	219	0.28	0.3240	0.006	31.6728	0.36	0.70883	0.01	0.18568	0.002	3589	30	3
JH051-023	298	93	109	0.85	0.2681	0.005	24.8345	0.3	0.67166	0.01	0.16801	0.002	3295	31	-1
JH051-025	466	143	152	0.94	0.3591	0.007	37.2458	0.43	0.75217	0.01	0.19122	0.002	3746	30	3
JH051-026	388	117	135	0.87	0.2834	0.006	27.5041	0.32	0.70366	0.01	0.1709	0.002	3382	31	-2
JH051-029	256	77	85	0.91	0.3011	0.006	30.4542	0.37	0.73353	0.01	0.18966	0.002	3476	31	-3
JH051-030	467	125	158	0.79	0.3013	0.006	30.0031	0.35	0.72218	0.01	0.19055	0.002	3477	30	-1
JH051-031	284	103	99	1.04	0.2820	0.006	27.3856	0.33	0.70431	0.01	0.15164	0.002	3374	31	-2
JH051-032	295	90	105	0.86	0.2825	0.006	26.8600	0.32	0.68946	0.01	0.18082	0.002	3377	31	-1
JH051-033	213	83	76	1.09	0.2822	0.006	26.7290	0.33	0.68681	0.01	0.1828	0.002	3375	31	0
JH051-035	739	304	291	1.04	0.2697	0.005	23.0862	0.26	0.62072	0.01	0.09245	9E-04	3304	31	6
JH051-037	496	30	153	0.20	0.3804	0.008	41.4099	0.48	0.78935	0.01	0.22568	0.003	3833	30	2

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH051-042	591	254	232	1.09	0.2756	0.005	23.5878	0.27	0.62062	0.01	0.07958	8E-04	3338	31	7
JH051-043	262	44	92	0.48	0.2806	0.006	26.7118	0.32	0.69025	0.01	0.18241	0.002	3366	31	-1
JH051-044	356	177	139	1.27	0.2818	0.006	24.1553	0.28	0.62158	0.01	0.09917	1E-03	3373	31	8
JH051-045	462	120	159	0.75	0.3009	0.006	29.3351	0.34	0.70696	0.01	0.18749	0.002	3475	30	0
JH051-046	128	38	42	0.90	0.3002	0.006	30.7745	0.41	0.74326	0.01	0.19739	0.002	3471	31	-4
JH051-047	1276	670	524	1.28	0.2609	0.005	21.3147	0.24	0.59244	0.01	0.03829	4E-04	3252	31	8
JH051-048	482	88	139	0.63	0.4034	0.008	47.0128	0.54	0.84508	0.01	0.21614	0.002	3922	29	-1
JH051-049	294	57	100	0.57	0.2787	0.006	27.4841	0.33	0.71521	0.01	0.18923	0.002	3355	31	-4
JH051-050	406	93	144	0.65	0.2829	0.006	26.6919	0.31	0.68427	0.01	0.17201	0.002	3379	31	0
JH051-051	406	36	137	0.26	0.2842	0.006	28.2060	0.33	0.71965	0.01	0.20541	0.002	3386	31	-4
JH051-052	599	385	223	1.73	0.2823	0.006	25.3294	0.29	0.65054	0.01	0.09442	9E-04	3376	31	4
JH051-054	392	85	132	0.64	0.2788	0.006	27.6895	0.33	0.7202	0.01	0.19211	0.002	3356	31	-5
JH051-055	473	258	159	1.62	0.2816	0.006	28.0362	0.33	0.72207	0.01	0.10667	0.001	3372	31	-4
JH051-059	308	43	86	0.50	0.4335	0.009	51.9718	0.61	0.8694	0.01	0.2033	0.002	4029	29	-1
JH051-061	190	60	66	0.91	0.2921	0.006	27.8126	0.34	0.69044	0.01	0.14186	0.002	3429	31	1
JH051-062	110	44	41	1.07	0.3006	0.006	26.8022	0.35	0.64653	0.01	0.14365	0.002	3473	31	8
JH051-066	248	53	86	0.62	0.2807	0.006	26.8865	0.32	0.69453	0.01	0.18178	0.002	3367	31	-1
JH051-067	207	100	70	1.43	0.2931	0.006	28.8707	0.35	0.71425	0.01	0.18134	0.002	3434	31	-2
JH051-068	984	187	327	0.57	0.3441	0.007	34.4110	0.39	0.72513	0.01	0.17562	0.002	3681	30	4
JH051-069	1249	91	372	0.24	0.4188	0.008	46.6186	0.52	0.80715	0.01	0.0588	7E-04	3978	29	4
JH051-071	1162	328	565	0.58	0.1805	0.004	12.3210	0.14	0.49503	0.01	0.06501	6E-04	2657	32	2
JH051-072	880	179	271	0.66	0.3917	0.008	42.2192	0.48	0.78149	0.01	0.20066	0.002	3878	29	4
JH051-073	144	18	41	0.44	0.4219	0.008	48.8403	0.62	0.83948	0.01	0.21005	0.003	3989	30	1

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH051-075	347	186	127	1.46	0.2791	0.006	25.3484	0.3	0.65846	0.01	0.17513	0.002	3358	31	2
JH051-081	1133	222	408	0.54	0.2847	0.006	26.1062	0.29	0.66489	0.01	0.15341	0.001	3389	30	3
JH051-082	382	102	139	0.73	0.3065	0.006	27.9049	0.32	0.66027	0.01	0.11179	0.001	3503	30	7
JH051-083	728	236	270	0.87	0.2805	0.006	24.9622	0.28	0.6454	0.01	0.10054	1E-03	3366	30	4
JH051-084	606	72	214	0.34	0.2904	0.006	27.0896	0.31	0.67646	0.01	0.18322	0.002	3420	30	2
JH051-085	326	72	113	0.64	0.2809	0.006	26.6683	0.31	0.68831	0.01	0.18384	0.002	3368	31	-1
JH051-087	559	89	190	0.47	0.3169	0.006	30.7830	0.35	0.70426	0.01	0.19035	0.002	3555	30	3
JH051-089	344	67	118	0.57	0.2838	0.006	27.2523	0.32	0.6964	0.01	0.18659	0.002	3384	31	-1
JH051-090	391	119	139	0.86	0.2768	0.005	25.6360	0.3	0.6715	0.01	0.17231	0.002	3345	31	1
JH051-092	553	233	197	1.18	0.2842	0.006	26.1680	0.3	0.66776	0.01	0.17318	0.002	3386	30	2
JH051-094	636	95	178	0.53	0.4423	0.009	51.9106	0.59	0.85099	0.01	0.22063	0.002	4060	29	2
JH051-096	346	62	119	0.52	0.2804	0.006	26.7722	0.31	0.69234	0.01	0.1819	0.002	3365	31	-1
JH051-097	297	62	103	0.60	0.2777	0.006	26.2425	0.31	0.68533	0.01	0.17932	0.002	3350	31	-1
JH051-098	311	1	86	0.01	0.4155	0.008	49.1846	0.58	0.85837	0.01	0.12523	0.006	3966	29	-1
JH051-100	361	82	100	0.82	0.4800	0.009	56.6327	0.66	0.85548	0.01	0.14787	0.002	4181	29	4
JH051-101	294	60	101	0.59	0.2786	0.006	26.5361	0.31	0.69072	0.01	0.17177	0.002	3355	31	-1
JH051-102	118	13	33	0.39	0.4124	0.008	48.1295	0.62	0.84628	0.01	0.2175	0.003	3955	30	0
JH051-103	370	112	131	0.85	0.2826	0.006	26.1412	0.3	0.67069	0.01	0.16755	0.002	3378	31	2
JH051-105	251	62	87	0.71	0.2792	0.006	26.1798	0.31	0.67985	0.01	0.17863	0.002	3359	31	0
JH051-106	292	59	104	0.57	0.2820	0.006	25.8860	0.3	0.66569	0.01	0.18452	0.002	3374	31	2
JH051-107	478	90	162	0.56	0.2997	0.006	28.9068	0.33	0.69944	0.01	0.18424	0.002	3469	30	1
JH051-109	303	77	103	0.75	0.2809	0.006	27.0597	0.32	0.69844	0.01	0.1826	0.002	3368	31	-2
JH051-110	240	56	81	0.69	0.2832	0.006	27.5881	0.32	0.70636	0.01	0.19258	0.002	3381	31	-2

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH051-111	634	194	227	0.85	0.2789	0.006	25.5026	0.29	0.66291	0.01	0.1659	0.002	3357	31	2
JH051-114	610	155	213	0.73	0.2824	0.006	26.5326	0.3	0.68112	0.01	0.18801	0.002	3377	31	0
JH051-115	225	56	75	0.75	0.2825	0.006	27.8843	0.33	0.71582	0.01	0.19252	0.002	3377	31	-3
JH051-116	385	37	140	0.26	0.2809	0.006	25.4493	0.29	0.65685	0.01	0.18336	0.002	3368	31	3
JH051-117	867	155	291	0.53	0.3220	0.006	31.5934	0.35	0.71138	0.01	0.11597	0.001	3580	30	3
JH051-122	530	67	173	0.39	0.3129	0.006	31.5324	0.36	0.73072	0.01	0.20252	0.002	3535	30	-1
JH051-123	652	153	229	0.67	0.2835	0.006	26.6668	0.3	0.68195	0.01	0.14165	0.001	3383	31	0
JH051-124	453	117	168	0.70	0.2795	0.006	24.8797	0.28	0.64537	0.01	0.16011	0.002	3360	31	4
JH051-127	441	198	162	1.22	0.2842	0.006	25.6011	0.29	0.65319	0.01	0.1644	0.002	3386	31	4
JH051-129	282	93	106	0.88	0.2769	0.006	24.3350	0.28	0.63726	0.01	0.13425	0.001	3346	31	5
JH051-130	413	176	125	1.41	0.3447	0.007	37.6791	0.43	0.79253	0.01	0.25707	0.002	3684	30	-3
JH051-132	291	73	104	0.70	0.2841	0.006	26.3402	0.31	0.67238	0.01	0.1836	0.002	3385	31	2
JH051-134	335	95	117	0.81	0.3117	0.006	29.6891	0.34	0.69075	0.01	0.13261	0.001	3529	30	4
JH051-135	183	52	66	0.79	0.2828	0.006	25.9776	0.31	0.66615	0.01	0.17716	0.002	3378	31	2
JH051-137	351	102	131	0.78	0.2834	0.006	25.1386	0.29	0.64311	0.01	0.15829	0.002	3382	31	5
JH051-138	283	71	102	0.70	0.2831	0.006	25.9488	0.3	0.66466	0.01	0.18545	0.002	3380	31	2
JH051-141	628	274	238	1.15	0.2789	0.006	24.4343	0.28	0.63519	0.01	0.0945	9E-04	3357	31	5
JH051-142	539	285	208	1.37	0.2816	0.006	24.1461	0.27	0.62176	0.01	0.09096	9E-04	3372	31	8
JH051-149	412	95	146	0.65	0.2845	0.006	26.7089	0.31	0.68087	0.01	0.18325	0.002	3388	31	1
JH051-151	573	423	214	1.98	0.2985	0.006	26.6718	0.3	0.64803	0.01	0.06171	6E-04	3462	31	7
JH051-152	518	238	191	1.25	0.3108	0.006	28.1102	0.32	0.65593	0.01	0.06076	6E-04	3525	30	8
JH051-155	932	101	314	0.32	0.3218	0.006	31.8863	0.36	0.71853	0.01	0.19644	0.002	3578	30	2
JH051-157	248	40	83	0.48	0.3125	0.006	31.2802	0.37	0.72586	0.01	0.19394	0.002	3533	31	0

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH051-158	495	155	178	0.87	0.2969	0.006	27.5450	0.32	0.67272	0.01	0.1529	0.002	3454	31	4
JH051-159	530	132	179	0.74	0.2977	0.006	29.4763	0.34	0.71791	0.01	0.19424	0.002	3458	31	-1
JH051-163	458	67	159	0.42	0.2839	0.006	27.3383	0.32	0.69837	0.01	0.18824	0.002	3384	31	-1
JH051-164	615	271	223	1.22	0.3030	0.006	27.9381	0.32	0.66868	0.01	0.12855	0.001	3486	30	5
JH051-165	346	24	117	0.21	0.3233	0.006	32.0973	0.38	0.72	0.01	0.18607	0.002	3585	30	2
JH051-166	617	105	209	0.50	0.3202	0.006	31.5669	0.36	0.71492	0.01	0.0718	8E-04	3571	30	2
JH051-167	343	121	132	0.92	0.2795	0.006	24.3616	0.29	0.63205	0.01	0.17175	0.002	3360	31	6
JH051-169	159	50	61	0.82	0.2868	0.006	24.9638	0.31	0.63119	0.01	0.14244	0.002	3400	31	7
JH051-170	826	204	243	0.84	0.4519	0.009	51.5347	0.59	0.82691	0.01	0.17672	0.002	4092	29	5
JH051-171	370	63	103	0.61	0.4307	0.009	51.7047	0.6	0.87062	0.01	0.22017	0.002	4020	29	-1
JH051-172	553	107	196	0.55	0.2837	0.006	26.8260	0.31	0.68572	0.01	0.18784	0.002	3383	31	0
JH051-174	973	390	352	1.11	0.3084	0.006	28.6256	0.33	0.67301	0.01	0.0898	9E-04	3513	30	5
JH051-175	381	145	141	1.03	0.2774	0.006	25.2517	0.3	0.66009	0.01	0.1774	0.002	3348	31	2
JH051-179	819	453	329	1.38	0.2796	0.006	23.4491	0.27	0.60818	0.01	0.03967	4E-04	3361	31	9
JH051-183	199	137	71	1.93	0.2851	0.006	27.0986	0.33	0.68933	0.01	0.107	0.001	3391	31	0
JH051-185	867	491	338	1.45	0.2798	0.006	24.1686	0.28	0.62644	0.01	0.08184	8E-04	3362	31	7
JH051-191	491	195	180	1.08	0.2848	0.006	26.2809	0.31	0.6691	0.01	0.13549	0.001	3390	31	2
JH051-195	454	99	167	0.59	0.2898	0.006	26.6916	0.31	0.66789	0.01	0.18131	0.002	3417	31	3
JH051-196	248	38	88	0.43	0.2841	0.006	27.1426	0.33	0.69284	0.01	0.18023	0.002	3386	31	-1
JH051-197	846	134	299	0.45	0.2952	0.006	28.3688	0.33	0.69676	0.01	0.1891	0.002	3445	31	1
JH051-198	304	79	96	0.82	0.3649	0.007	39.2166	0.47	0.77935	0.01	0.56092	0.006	3770	30	1
JH051-199	453	98	152	0.64	0.3152	0.006	31.8380	0.37	0.73238	0.01	0.18561	0.002	3547	30	0
JH051-200	239	47	82	0.57	0.2975	0.006	29.3330	0.36	0.71508	0.01	0.18795	0.002	3457	31	-1

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH051-203	501	77	176	0.44	0.2831	0.006	27.3146	0.32	0.69965	0.01	0.1675	0.002	3380	31	-2
JH051-206	1058	311	407	0.76	0.2783	0.006	24.6296	0.28	0.64172	0.01	0.10925	0.001	3353	31	4
JH051-207	269	13	77	0.17	0.4096	0.008	48.6230	0.59	0.86087	0.01	0.21854	0.003	3945	30	-2
JH051-208	242	101	85	1.19	0.2884	0.006	27.7477	0.34	0.69775	0.01	0.19433	0.002	3409	31	-1
JH051-211	795	119	288	0.41	0.2875	0.006	27.0555	0.31	0.68247	0.01	0.18585	0.002	3404	31	1
JH053-005	112	75	39	1.92	0.3062	0.006	28.8443	0.33	0.68318	0.01	0.17752	0.002	3502	31	4
JH053-006	310	217	117	1.85	0.2912	0.006	25.3811	0.28	0.63194	0.01	0.16967	0.002	3424	31	8
JH053-009	236	44	79	0.56	0.3073	0.006	30.4308	0.34	0.71817	0.01	0.18967	0.002	3507	31	0
JH053-010	365	57	126	0.45	0.3228	0.006	30.9920	0.34	0.69609	0.01	0.19146	0.002	3583	30	5
JH053-011	395	112	141	0.79	0.2928	0.006	27.0218	0.3	0.66925	0.01	0.17456	0.002	3432	31	3
JH053-012	236	56	79	0.71	0.2850	0.006	28.1836	0.32	0.71714	0.01	0.19225	0.002	3390	31	-3
JH053-014	1078	201	335	0.60	0.3954	0.008	42.1224	0.45	0.77251	0.01	0.4044	0.004	3892	30	5
JH053-015	967	110	324	0.34	0.3250	0.006	32.1099	0.35	0.71646	0.01	0.19576	0.002	3594	30	3
JH053-017	238	73	84	0.87	0.3052	0.006	28.7942	0.32	0.68408	0.01	0.18827	0.002	3497	31	4
JH053-018	247	100	85	1.18	0.2770	0.006	26.6827	0.3	0.69846	0.01	0.18153	0.002	3346	31	-3
JH053-020	282	54	103	0.52	0.2880	0.006	26.0450	0.29	0.65583	0.01	0.18072	0.002	3407	31	4
JH053-028	403	63	108	0.58	0.4506	0.009	55.9914	0.61	0.90101	0.01	0.24544	0.002	4087	29	-2
JH053-030	1070	445	299	1.49	0.4964	0.01	58.9879	0.63	0.86159	0.01	0.52541	0.005	4231	29	5
JH053-037	886	455	251	1.81	0.4785	0.009	56.1956	0.6	0.85164	0.01	0.38275	0.003	4176	29	5
JH053-038	203	39	69	0.57	0.2885	0.006	28.0260	0.31	0.70432	0.01	0.20744	0.002	3410	31	-1
JH053-042	328	57	116	0.49	0.3202	0.006	30.1666	0.33	0.68307	0.01	0.18836	0.002	3571	30	6
JH053-047	174	26	50	0.52	0.4518	0.009	52.2404	0.58	0.83837	0.01	0.21877	0.002	4091	29	4
JH053-048	1141	175	322	0.54	0.4801	0.009	56.6787	0.6	0.85612	0.01	0.22249	0.002	4181	29	4

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH053-049	1728	521	571	0.91	0.3951	0.008	39.8346	0.43	0.73099	0.01	0.47436	0.004	3891	29	9
JH053-050	667	17	169	0.10	0.4866	0.01	63.9160	0.69	0.95252	0.01	3.67226	0.038	4201	29	-3
JH053-053	900	332	341	0.97	0.2951	0.006	25.9487	0.28	0.63753	0.01	0.1772	0.002	3445	30	8
JH053-060	360	51	105	0.49	0.4740	0.009	54.3187	0.59	0.83088	0.01	0.31217	0.003	4162	29	6
JH053-061	239	71	82	0.87	0.2833	0.006	27.4987	0.3	0.70379	0.01	0.19092	0.002	3381	31	-2
JH053-063	1006	215	322	0.67	0.3544	0.007	37.0409	0.4	0.75784	0.01	0.3351	0.003	3726	30	2
JH053-065	299	97	99	0.98	0.3034	0.006	30.4661	0.33	0.72825	0.01	0.21659	0.002	3487	30	-2
JH053-068	1382	228	539	0.42	0.2722	0.005	23.3476	0.25	0.62191	0.01	0.13712	0.001	3319	30	6
JH053-070	575	81	193	0.42	0.2995	0.006	29.7806	0.32	0.72113	0.01	0.22421	0.002	3467	30	-1
JH053-071	564	115	186	0.62	0.3375	0.007	34.1938	0.37	0.73458	0.01	0.37877	0.003	3652	30	2
JH053-076	264	83	95	0.87	0.3088	0.006	28.6887	0.31	0.67357	0.01	0.18373	0.002	3515	30	5
JH053-079	444	100	165	0.61	0.2909	0.006	26.2222	0.28	0.65357	0.01	0.14996	0.001	3423	30	5
JH053-082	382	89	138	0.64	0.2886	0.006	26.8180	0.29	0.67372	0.01	0.18541	0.002	3410	30	2
JH053-083	229	73	87	0.84	0.2778	0.005	24.5122	0.27	0.63981	0.01	0.16106	0.002	3351	30	5
JH053-087	659	231	177	1.31	0.5151	0.01	64.4139	0.68	0.90684	0.01	0.65836	0.006	4285	28	2
JH053-088	200	72	79	0.91	0.2844	0.006	24.2662	0.27	0.61866	0.01	0.14031	0.001	3387	30	9
JH053-093	430	98	116	0.84	0.4762	0.009	59.2004	0.63	0.90142	0.01	0.32045	0.003	4169	29	0
JH053-101	190	86	65	1.32	0.3155	0.006	31.2986	0.35	0.71948	0.01	0.20389	0.002	3548	30	1
JH053-108	290	139	104	1.34	0.2879	0.006	27.1072	0.29	0.68275	0.01	0.18228	0.002	3406	30	1
JH053-109	554	175	200	0.88	0.2917	0.006	27.2468	0.29	0.67736	0.01	0.18176	0.002	3427	30	2
JH053-110	896	184	312	0.59	0.3313	0.006	32.0990	0.34	0.7025	0.01	0.15196	0.001	3623	29	5
JH053-111	600	95	204	0.47	0.3177	0.006	31.5305	0.33	0.71967	0.01	0.19164	0.002	3559	30	1
JH053-113	249	57	67	0.85	0.4195	0.008	52.7898	0.58	0.91252	0.01	0.23253	0.002	3981	29	-5

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH053-114	805	109	246	0.44	0.4192	0.008	46.2140	0.49	0.7994	0.01	0.17453	0.002	3980	29	5
JH053-118	739	129	246	0.52	0.3159	0.006	32.0047	0.34	0.73477	0.01	0.19589	0.002	3550	30	-1
JH053-120	904	417	306	1.36	0.3681	0.007	36.6814	0.39	0.72273	0.01	0.27561	0.002	3783	29	7
JH053-122	1117	538	338	1.59	0.4012	0.008	44.9121	0.47	0.81178	0.01	0.33802	0.003	3914	29	2
JH053-126	1019	163	379	0.43	0.2820	0.005	25.6440	0.27	0.65946	0.01	0.12734	0.001	3374	30	3
JH053-130	331	80	121	0.66	0.3053	0.006	28.3101	0.3	0.6725	0.01	0.29197	0.003	3497	30	5
JH053-131	259	82	100	0.82	0.2747	0.005	24.1386	0.26	0.63731	0.01	0.15641	0.001	3333	30	4
JH053-132	251	78	90	0.87	0.2802	0.005	26.5084	0.29	0.68605	0.01	0.18082	0.002	3364	30	-1
JH053-133	206	60	70	0.86	0.2807	0.006	27.5207	0.3	0.71093	0.01	0.19139	0.002	3367	30	-3
JH053-142	258	78	97	0.80	0.2851	0.006	25.3205	0.27	0.64408	0.01	0.18167	0.002	3391	30	5
JH053-144	2476	917	601	1.53	0.5266	0.01	72.1639	0.74	0.99379	0.01	0.7034	0.006	4317	28	-3
JH053-146	2118	996	584	1.71	0.5413	0.011	65.3781	0.68	0.87588	0.01	0.5784	0.005	4358	28	7
JH053-147	500	140	177	0.79	0.2989	0.006	28.2249	0.3	0.68476	0.01	0.22456	0.002	3465	30	3
JH053-149	788	124	210	0.59	0.4791	0.009	60.0079	0.63	0.90838	0.01	0.36315	0.003	4178	28	0
JH053-157	377	61	122	0.50	0.3937	0.008	40.4092	0.43	0.74444	0.01	0.17429	0.002	3885	29	8
JH053-159	1737	186	387	0.48	0.5369	0.01	80.3398	0.84	1.08515	0.01	1.71107	0.015	4346	28	-9
JH053-161	481	95	177	0.54	0.2874	0.006	26.0215	0.28	0.65665	0.01	0.18407	0.002	3404	30	4
JH053-166	593	104	183	0.57	0.3716	0.007	40.0985	0.42	0.78271	0.01	0.50764	0.005	3798	29	1
JH053-167	362	169	140	1.21	0.2904	0.006	25.0640	0.27	0.62591	0.01	0.16032	0.001	3420	30	9
JH053-168	233	107	87	1.23	0.2833	0.006	25.2144	0.28	0.64543	0.01	0.16779	0.002	3381	30	5
JH053-170	603	155	220	0.70	0.2867	0.006	26.2534	0.28	0.66411	0.01	0.1792	0.002	3400	30	3
JH053-171	594	113	204	0.55	0.3154	0.006	30.6566	0.33	0.70486	0.01	0.19855	0.002	3548	30	3
JH053-174	1105	123	362	0.34	0.3610	0.007	36.7979	0.39	0.73936	0.01	0.80036	0.007	3754	29	5

Appendix C Continued.

	Content (ppm)			Ratio										Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH053-176	635	174	235	0.74	0.3126	0.006	28.1871	0.3	0.65403	0.01	0.17879	0.002	3534	30	8
JH053-180	435	54	130	0.42	0.4372	0.009	49.0660	0.53	0.81388	0.01	0.21831	0.002	4042	29	5
JH053-185	505	126	193	0.65	0.2906	0.006	25.4578	0.27	0.63537	0.01	0.13373	0.001	3421	30	7
JH053-190	233	62	77	0.81	0.2805	0.006	28.4069	0.32	0.73456	0.01	0.19962	0.002	3366	31	-6
JH053-191	150	43	53	0.81	0.3285	0.007	31.2789	0.36	0.69051	0.01	0.28742	0.003	3610	30	6
JH053-197	462	109	182	0.60	0.2819	0.006	23.9359	0.26	0.61589	0.01	0.08658	9E-04	3373	31	9
JH053-198	276	41	95	0.43	0.2860	0.006	27.8484	0.31	0.70613	0.01	0.19447	0.002	3396	31	-2
JH053-200	958	255	340	0.75	0.3276	0.007	30.9169	0.33	0.68451	0.01	0.33385	0.003	3606	30	7
JH053-201	352	57	140	0.41	0.2797	0.006	23.6072	0.26	0.61222	0.01	0.16766	0.002	3361	31	9
JH053-203	624	117	226	0.52	0.3213	0.006	29.7737	0.32	0.67196	0.01	0.15592	0.001	3576	30	7
JH053-204	724	129	229	0.56	0.4043	0.008	42.7666	0.46	0.76724	0.01	0.73023	0.007	3925	30	6
JH053-207	300	150	111	1.35	0.2872	0.006	25.9873	0.29	0.65619	0.01	0.18363	0.002	3403	31	4
JH053-208	182	12	53	0.23	0.4259	0.009	48.7636	0.55	0.83032	0.01	0.24053	0.003	4003	30	2
JH053-212	164	107	58	1.84	0.2900	0.006	27.3526	0.32	0.684	0.01	0.18874	0.002	3418	31	1
JH053-215	342	75	125	0.60	0.2989	0.006	27.5774	0.31	0.6692	0.01	0.18274	0.002	3464	31	4
JH053-218	442	50	160	0.31	0.2983	0.006	27.5882	0.3	0.67059	0.01	0.18929	0.002	3462	31	4
JH053-223	320	126	111	1.14	0.3101	0.006	30.1563	0.34	0.70519	0.01	0.19493	0.002	3521	31	2
JH053-225	444	140	136	1.03	0.4211	0.008	46.1966	0.51	0.79552	0.01	0.52309	0.005	3986	30	5
JH053-226	771	133	256	0.52	0.3312	0.007	33.5472	0.37	0.73438	0.01	0.23324	0.002	3623	30	2
JH053-227	373	132	139	0.95	0.2908	0.006	26.1787	0.29	0.65272	0.01	0.16481	0.002	3422	31	5
JH053-231	551	147	197	0.75	0.2947	0.006	27.6762	0.31	0.68089	0.01	0.18801	0.002	3443	31	2
JH053-234	583	148	209	0.71	0.2979	0.006	28.0288	0.31	0.6822	0.01	0.19049	0.002	3459	31	3
JH053-238	300	59	106	0.56	0.2855	0.006	27.0987	0.31	0.6882	0.01	0.17544	0.002	3393	31	0

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH053-239	769	145	275	0.53	0.3255	0.007	30.6486	0.34	0.68266	0.01	0.17898	0.002	3596	31	7
JH058-004	417	83	147	0.56	0.2799	0.006	25.9497	0.3	0.67243	0.01	0.16136	0.002	3362	31	1
JH058-006	366	108	112	0.96	0.3631	0.007	38.6369	0.44	0.77181	0.01	0.19731	0.002	3763	30	2
JH058-007	748	209	266	0.79	0.2797	0.006	25.6588	0.29	0.66539	0.01	0.18097	0.002	3361	31	2
JH058-016	375	78	147	0.53	0.2415	0.005	20.1347	0.23	0.6047	0.01	0.17727	0.002	3130	32	2
JH058-017	360	71	143	0.50	0.2387	0.005	19.6717	0.23	0.59767	0.01	0.17198	0.002	3111	32	3
JH058-019	515	254	189	1.34	0.2855	0.006	25.4586	0.29	0.64677	0.01	0.16857	0.002	3393	31	5
JH058-020	445	188	164	1.15	0.2765	0.006	24.5068	0.28	0.6428	0.01	0.13958	0.001	3343	31	4
JH058-021	351	69	121	0.57	0.2801	0.006	26.6289	0.31	0.68944	0.01	0.19073	0.002	3363	31	-1
JH058-023	674	204	229	0.89	0.3028	0.006	29.0921	0.33	0.69683	0.01	0.14388	0.001	3484	31	2
JH058-025	391	121	146	0.83	0.2800	0.006	24.5869	0.28	0.63668	0.01	0.17434	0.002	3363	31	5
JH058-028	1070	278	374	0.74	0.3277	0.007	30.6570	0.34	0.67837	0.01	0.16589	0.002	3606	30	8
JH058-030	444	100	161	0.62	0.2813	0.006	25.4000	0.29	0.65476	0.01	0.18871	0.002	3370	31	3
JH058-034	525	160	180	0.89	0.3248	0.007	31.0482	0.35	0.69316	0.01	0.16163	0.002	3593	30	5
JH058-037	577	210	213	0.99	0.2858	0.006	25.4445	0.29	0.64556	0.01	0.16528	0.002	3395	31	5
JH058-038	449	86	162	0.53	0.2866	0.006	26.0544	0.3	0.65912	0.01	0.17829	0.002	3399	31	4
JH058-041	886	416	323	1.29	0.2772	0.006	24.9378	0.28	0.65221	0.01	0.17518	0.002	3348	31	3
JH058-046	1075	394	428	0.92	0.2630	0.005	21.6616	0.24	0.5973	0.01	0.13574	0.001	3265	31	8
JH058-051	341	155	131	1.18	0.2728	0.005	23.3479	0.27	0.62052	0.01	0.13633	0.001	3322	31	6
JH058-055	462	64	131	0.49	0.4696	0.009	54.4907	0.62	0.84131	0.01	0.20648	0.002	4149	29	5
JH058-059	352	234	131	1.79	0.3002	0.006	26.6237	0.31	0.64301	0.01	0.09262	9E-04	3471	31	8
JH058-060	486	230	181	1.27	0.2722	0.005	24.0700	0.27	0.64114	0.01	0.17087	0.002	3319	31	3
JH058-063	514	139	187	0.74	0.3110	0.006	28.0872	0.32	0.65484	0.01	0.21584	0.002	3526	30	8

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH058-064	802	313	309	1.01	0.2766	0.006	23.5866	0.27	0.61838	0.01	0.14034	0.001	3344	31	7
JH058-067	90	12	31	0.39	0.2742	0.006	26.2329	0.33	0.69376	0.01	0.19884	0.003	3330	32	-2
JH058-068	348	74	143	0.52	0.2345	0.005	18.7363	0.22	0.57928	0.01	0.16625	0.002	3083	32	4
JH058-069	382	99	135	0.73	0.2999	0.006	27.8722	0.32	0.67379	0.01	0.17477	0.002	3470	31	4
JH058-070	800	233	323	0.72	0.2337	0.005	19.0902	0.22	0.5922	0.01	0.15903	0.002	3078	31	2
JH058-072	786	301	314	0.96	0.2642	0.005	21.8108	0.25	0.59862	0.01	0.15186	0.001	3272	31	8
JH058-076	513	269	202	1.33	0.2761	0.005	23.1655	0.26	0.60828	0.01	0.07421	7E-04	3341	31	9
JH058-078	366	153	128	1.20	0.3003	0.006	28.3372	0.33	0.6841	0.01	0.17425	0.002	3472	31	3
JH058-081	406	125	153	0.82	0.2756	0.005	24.0586	0.27	0.63305	0.01	0.16282	0.002	3338	31	5
JH058-083	347	108	111	0.97	0.3521	0.007	36.4096	0.42	0.74975	0.01	0.1935	0.002	3716	30	3
JH058-085	406	130	145	0.90	0.2749	0.005	25.4825	0.29	0.67212	0.01	0.17652	0.002	3334	31	0
JH058-086	773	210	281	0.75	0.3149	0.006	28.6486	0.32	0.65968	0.01	0.12017	0.001	3545	30	8
JH058-090	722	196	272	0.72	0.2713	0.005	23.8343	0.27	0.63691	0.01	0.14583	0.001	3314	31	4
JH058-091	330	139	128	1.09	0.2650	0.005	22.5284	0.26	0.61645	0.01	0.12568	0.001	3277	31	5
JH058-092	282	55	94	0.59	0.2753	0.005	27.3841	0.32	0.72135	0.01	0.19948	0.002	3336	31	-5
JH058-095	199	123	67	1.84	0.2875	0.006	28.1748	0.34	0.71069	0.01	0.17965	0.002	3404	31	-2
JH058-096	622	224	229	0.98	0.2983	0.006	26.7982	0.3	0.65132	0.01	0.14344	0.001	3462	30	7
JH058-097	614	271	204	1.33	0.3214	0.006	31.9550	0.36	0.721	0.01	0.18347	0.002	3576	30	2
JH058-101	618	185	222	0.83	0.2751	0.005	25.3603	0.29	0.66842	0.01	0.17073	0.002	3335	31	1
JH058-102	1047	361	417	0.87	0.2590	0.005	21.5598	0.24	0.60352	0.01	0.15823	0.002	3241	31	6
JH058-103	357	99	127	0.78	0.2759	0.005	25.7372	0.3	0.67653	0.01	0.1773	0.002	3340	31	0
JH058-111	129	100	51	1.96	0.2806	0.006	23.5721	0.29	0.60911	0.01	0.09611	1E-03	3366	31	9
JH058-120	548	97	202	0.48	0.2653	0.005	23.9433	0.27	0.65433	0.01	0.18208	0.002	3279	31	1

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH058-121	718	134	242	0.55	0.3197	0.006	31.4920	0.35	0.71432	0.01	0.02293	7E-04	3568	30	2
JH058-122	424	624	211	2.96	0.1927	0.004	12.8787	0.15	0.48456	0.01	0.04135	4E-04	2766	32	8
JH058-123	591	246	223	1.10	0.3012	0.006	26.5762	0.3	0.63988	0.01	0.14309	0.001	3476	30	9
JH058-132	440	127	153	0.83	0.3008	0.006	28.7173	0.33	0.69232	0.01	0.1674	0.002	3474	30	2
JH058-133	313	80	104	0.77	0.2996	0.006	29.7646	0.34	0.72042	0.01	0.17027	0.002	3468	30	-1
JH058-137	556	207	201	1.03	0.2938	0.006	26.9043	0.3	0.66396	0.01	0.15812	0.001	3438	30	4
JH058-140	502	211	187	1.13	0.2914	0.006	25.9828	0.3	0.64655	0.01	0.12824	0.001	3425	30	6
JH058-143	569	174	211	0.82	0.2762	0.005	24.6351	0.28	0.64681	0.01	0.14776	0.001	3341	31	3
JH058-146	693	207	278	0.74	0.2718	0.005	22.4067	0.25	0.59787	0.01	0.15159	0.001	3316	31	9
JH058-150	704	125	251	0.50	0.3126	0.006	28.9767	0.33	0.67212	0.01	0.16175	0.002	3534	30	6
JH058-152	316	77	110	0.70	0.2747	0.005	26.1662	0.3	0.6907	0.01	0.17861	0.002	3333	31	-2
JH058-153	397	166	144	1.15	0.3157	0.006	28.6871	0.33	0.65891	0.01	0.20993	0.002	3549	30	8
JH058-155	552	144	201	0.72	0.2760	0.005	25.0832	0.28	0.65902	0.01	0.14859	0.001	3340	31	2
JH058-157	419	144	162	0.89	0.2733	0.005	23.3144	0.26	0.61861	0.01	0.11782	0.001	3325	31	7
JH058-158	340	99	124	0.80	0.3038	0.006	27.6257	0.32	0.65949	0.01	0.1459	0.001	3490	30	6
JH058-159	843	178	300	0.59	0.3136	0.006	29.1395	0.33	0.67374	0.01	0.11347	0.001	3539	30	6
JH058-163	339	108	128	0.84	0.2728	0.005	23.8892	0.27	0.63505	0.01	0.15498	0.001	3322	31	4
JH058-164	815	171	316	0.54	0.2805	0.006	23.9080	0.27	0.61803	0.01	0.10252	1E-03	3366	31	8
JH058-166	469	108	165	0.65	0.2863	0.006	26.8540	0.31	0.68016	0.01	0.17408	0.002	3398	31	1
JH058-168	823	333	303	1.10	0.3000	0.006	26.9102	0.3	0.65045	0.01	0.13734	0.001	3470	30	7
JH058-172	157	75	56	1.34	0.3016	0.006	27.9599	0.33	0.67229	0.01	0.16487	0.002	3478	31	4
JH058-175	1319	232	452	0.51	0.3267	0.006	31.4673	0.35	0.6985	0.01	0.13731	0.001	3602	30	5
JH058-176	469	186	172	1.08	0.2955	0.006	26.5918	0.3	0.6526	0.01	0.15414	0.001	3447	30	6

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH059-002	163	35	52	0.67	0.2828	0.006	29.6724	0.36	0.76071	0.01	0.20376	0.002	3379	31	-8
JH059-003	342	36	97	0.37	0.4256	0.008	50.4715	0.59	0.85978	0.01	0.223	0.002	4002	29	0
JH059-014	527	117	193	0.61	0.2820	0.006	25.8403	0.3	0.66449	0.01	0.1666	0.002	3374	31	2
JH059-022	420	146	158	0.92	0.3011	0.006	26.7654	0.31	0.64448	0.01	0.09897	0.001	3476	30	8
JH059-026	739	67	205	0.33	0.3961	0.008	47.6769	0.55	0.87275	0.01	0.23273	0.002	3894	29	-4
JH059-028	524	151	179	0.84	0.2843	0.006	27.7875	0.32	0.70867	0.01	0.18452	0.002	3387	31	-2
JH059-029	561	210	207	1.01	0.2822	0.006	25.5524	0.29	0.65648	0.01	0.11747	0.001	3375	31	3
JH059-034	323	78	109	0.72	0.2858	0.006	28.2357	0.33	0.71628	0.01	0.22479	0.002	3395	31	-3
JH059-036	271	31	72	0.43	0.4824	0.01	60.3743	0.7	0.90758	0.01	0.21558	0.002	4188	29	0
JH059-037	237	55	77	0.71	0.2864	0.006	29.2846	0.35	0.74156	0.01	0.20085	0.002	3398	31	-5
JH059-043	511	153	191	0.80	0.2876	0.006	25.5832	0.29	0.64513	0.01	0.14835	0.001	3404	31	6
JH059-044	492	212	183	1.16	0.2921	0.006	26.1830	0.3	0.64988	0.01	0.1124	0.001	3429	30	6
JH059-045	194	66	66	1.00	0.3056	0.006	29.8201	0.35	0.70756	0.01	0.16717	0.002	3499	31	1
JH059-049	247	53	81	0.65	0.3020	0.006	30.5278	0.36	0.73291	0.01	0.19579	0.002	3481	31	-2
JH059-050	265	49	72	0.68	0.4276	0.009	52.2879	0.61	0.88672	0.01	0.22912	0.002	4009	29	-3
JH059-051	524	153	181	0.85	0.2838	0.006	27.2602	0.31	0.69665	0.01	0.18813	0.002	3384	31	-1
JH059-052	402	148	150	0.99	0.2831	0.006	25.1503	0.29	0.64431	0.01	0.14479	0.001	3380	31	5
JH059-054	1307	445	367	1.21	0.4681	0.009	55.2046	0.62	0.85517	0.01	0.17516	0.002	4144	29	4
JH059-056	177	33	47	0.70	0.4617	0.009	58.0151	0.7	0.91112	0.01	0.21525	0.002	4124	29	-2
JH059-061	767	71	206	0.34	0.4522	0.009	55.6468	0.63	0.89238	0.01	0.22684	0.002	4092	29	-1
JH059-064	89	7	27	0.26	0.3497	0.007	37.7795	0.48	0.78337	0.01	0.22595	0.004	3706	31	-1
JH059-066	473	144	159	0.91	0.3036	0.006	29.8590	0.34	0.7133	0.01	0.18406	0.002	3489	30	0
JH059-067	474	91	154	0.59	0.3163	0.006	32.1465	0.37	0.73693	0.01	0.18845	0.002	3552	30	-1

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH059-071	571	206	212	0.97	0.2836	0.006	25.1632	0.29	0.64338	0.01	0.1581	0.002	3383	31	5
JH059-080	922	285	278	1.03	0.4241	0.008	46.1885	0.52	0.78987	0.01	0.18303	0.002	3997	29	6
JH059-081	249	109	87	1.25	0.3042	0.006	28.6256	0.33	0.68246	0.01	0.12348	0.001	3492	31	4
JH059-085	328	74	111	0.67	0.3011	0.006	29.1238	0.33	0.70137	0.01	0.18325	0.002	3476	31	1
JH059-092	314	81	102	0.79	0.3231	0.006	32.5312	0.37	0.73029	0.01	0.18893	0.002	3585	30	1
JH059-093	126	30	42	0.71	0.2877	0.006	28.5704	0.35	0.72027	0.01	0.18371	0.002	3405	31	-3
JH059-094	459	137	166	0.83	0.2861	0.006	25.8921	0.29	0.65641	0.01	0.13343	0.001	3396	31	4
JH059-095	185	16	48	0.33	0.4685	0.009	58.5804	0.69	0.90693	0.01	0.22454	0.003	4145	29	-1
JH059-096	201	15	55	0.27	0.4413	0.009	52.3694	0.61	0.86073	0.01	0.20922	0.003	4056	29	1
JH059-097	458	80	121	0.66	0.4304	0.009	53.5469	0.62	0.90229	0.01	0.23302	0.002	4019	29	-4
JH059-098	413	50	128	0.39	0.3315	0.007	35.0647	0.4	0.76727	0.01	0.16541	0.002	3624	30	-2
JH059-099	319	41	107	0.38	0.2837	0.006	27.6483	0.32	0.70686	0.01	0.18261	0.002	3383	31	-2
JH059-113	467	83	160	0.52	0.3008	0.006	29.0554	0.34	0.70051	0.01	0.11359	0.001	3474	31	1
JH059-116	71	18	21	0.86	0.3543	0.007	38.9853	0.51	0.79787	0.01	0.25426	0.003	3726	31	-2
JH059-117	224	34	74	0.46	0.2900	0.006	28.8632	0.34	0.72162	0.01	0.19404	0.002	3418	31	-3
JH059-121	207	72	67	1.07	0.3062	0.006	30.9461	0.36	0.7328	0.01	0.18934	0.002	3502	31	-2
JH059-125	438	159	162	0.98	0.3020	0.006	26.7721	0.31	0.64277	0.01	0.14882	0.001	3481	31	8
JH059-130	326	127	108	1.18	0.3059	0.006	30.1503	0.35	0.71482	0.01	0.18267	0.002	3500	31	0
JH059-133	269	93	93	1.00	0.3016	0.006	28.4235	0.33	0.68352	0.01	0.11922	0.001	3478	31	3
JH059-135	613	197	221	0.89	0.2866	0.006	25.9026	0.29	0.6553	0.01	0.14099	0.001	3400	31	4
JH059-137	218	41	58	0.71	0.4687	0.009	57.6244	0.67	0.89159	0.01	0.21901	0.002	4146	30	0
JH059-138	297	35	85	0.41	0.4539	0.009	51.8890	0.59	0.82901	0.01	0.20378	0.002	4098	30	5
JH059-144	430	70	146	0.48	0.2950	0.006	28.1925	0.32	0.69292	0.01	0.16111	0.002	3444	31	1

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH059-156	367	212	133	1.59	0.2865	0.006	25.5053	0.29	0.6455	0.01	0.16072	0.002	3399	31	5
JH059-157	170	40	57	0.70	0.2852	0.006	27.4461	0.32	0.69775	0.01	0.18915	0.002	3392	31	-1
JH059-163	496	95	170	0.56	0.2917	0.006	27.2018	0.3	0.67629	0.01	0.18124	0.002	3427	31	2
JH059-164	253	33	76	0.43	0.3384	0.007	36.1512	0.41	0.77459	0.01	0.18252	0.002	3656	30	-2
JH059-171	389	179	138	1.30	0.3056	0.006	27.4446	0.3	0.65126	0.01	0.16898	0.002	3499	31	8
JH062-001	479	61	175	0.35	0.2883	0.006	26.4296	0.3	0.66454	0.01	0.17813	0.002	3409	31	3
JH062-002	444	230	166	1.39	0.3106	0.006	27.8807	0.32	0.65078	0.01	0.14376	0.001	3524	31	9
JH062-003	314	62	105	0.59	0.3267	0.007	32.8573	0.39	0.72919	0.01	0.18947	0.002	3602	31	2
JH062-006	496	214	180	1.19	0.3075	0.006	28.4184	0.33	0.66994	0.01	0.13203	0.001	3509	31	6
JH062-007	1023	262	369	0.71	0.3073	0.006	28.5980	0.33	0.67473	0.01	0.13866	0.001	3507	30	5
JH062-008	902	57	310	0.18	0.3051	0.006	29.7572	0.34	0.70709	0.01	0.16888	0.002	3496	31	1
JH062-011	859	175	311	0.56	0.2927	0.006	27.0433	0.31	0.66989	0.01	0.14007	0.001	3432	31	3
JH062-012	203	35	61	0.57	0.3905	0.008	43.5930	0.52	0.80937	0.01	0.19567	0.002	3873	30	1
JH062-013	353	67	103	0.65	0.4241	0.008	48.7173	0.57	0.83292	0.01	0.20933	0.002	3997	30	2
JH062-014	257	32	73	0.44	0.4281	0.009	50.5391	0.59	0.856	0.01	0.21454	0.002	4011	30	0
JH062-016	1099	159	413	0.38	0.3014	0.006	26.8242	0.3	0.64524	0.01	0.11382	0.001	3478	31	8
JH062-017	623	90	174	0.52	0.4584	0.009	55.0344	0.63	0.8705	0.01	0.22736	0.002	4113	29	1
JH062-018	1137	384	411	0.93	0.3070	0.006	28.3793	0.32	0.67022	0.01	0.12551	0.001	3506	30	6
JH062-019	955	122	336	0.36	0.2856	0.006	27.1564	0.31	0.68932	0.01	0.18136	0.002	3394	31	0
JH062-020	456	111	151	0.74	0.3075	0.006	31.1297	0.36	0.73405	0.01	0.16945	0.002	3508	31	-2
JH062-021	402	44	109	0.40	0.4413	0.009	54.2054	0.63	0.89054	0.01	0.22453	0.002	4056	30	-2
JH062-023	309	104	114	0.91	0.2921	0.006	26.5152	0.31	0.65824	0.01	0.15191	0.002	3429	31	5
JH062-024	781	288	279	1.03	0.3321	0.007	31.1093	0.35	0.67913	0.01	0.20209	0.002	3627	30	8

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	^{207}Pb/^{206}Pb	1σ	^{207}Pb/^{235}U	1σ	^{206}Pb/^{238}U	1σ	^{208}Pb/^{232}Th	1σ	^{207}Pb/^{206}Pb	1σ	% Disc
JH062-028	1061	230	311	0.74	0.4627	0.009	52.6226	0.59	0.82455	0.01	0.16259	0.002	4127	29	6
JH062-031	411	127	146	0.87	0.2872	0.006	26.9507	0.31	0.68053	0.01	0.17661	0.002	3402	31	1
JH062-032	587	58	210	0.28	0.2797	0.006	26.0458	0.3	0.67514	0.01	0.17991	0.002	3361	31	1
JH062-043	290	86	104	0.83	0.2903	0.006	26.9081	0.31	0.67213	0.01	0.1313	0.001	3419	31	3
JH062-045	470	95	167	0.57	0.2889	0.006	26.9060	0.31	0.67524	0.01	0.18704	0.002	3412	31	2
JH062-046	884	266	322	0.83	0.2875	0.006	26.1994	0.3	0.66079	0.01	0.17554	0.002	3404	31	4
JH062-047	864	269	305	0.88	0.3065	0.006	28.7952	0.32	0.68117	0.01	0.14102	0.001	3504	30	4
JH062-048	303	56	110	0.51	0.2839	0.006	25.9608	0.3	0.66314	0.01	0.17563	0.002	3384	31	3
JH062-051	424	182	155	1.17	0.3040	0.006	27.5811	0.32	0.65781	0.01	0.10416	0.001	3491	31	7
JH062-052	300	15	109	0.14	0.2953	0.006	26.8654	0.31	0.65971	0.01	0.23251	0.003	3446	31	5
JH062-054	362	432	138	3.13	0.2927	0.006	25.4400	0.29	0.63036	0.01	0.03979	4E-04	3432	31	8
JH062-056	217	49	61	0.80	0.4306	0.009	50.7641	0.6	0.85493	0.01	0.21343	0.002	4019	30	0
JH062-058	308	127	103	1.23	0.2950	0.006	29.1784	0.34	0.71725	0.01	0.18418	0.002	3444	31	-2
JH062-060	331	47	130	0.36	0.2745	0.006	23.1154	0.27	0.61073	0.01	0.11264	0.001	3332	31	8
JH062-062	228	56	79	0.71	0.2863	0.006	27.4322	0.32	0.69474	0.01	0.18163	0.002	3398	31	-1
JH062-063	652	163	222	0.73	0.3631	0.007	35.1901	0.4	0.70282	0.01	0.1507	0.001	3763	30	9
JH062-064	193	59	64	0.92	0.3240	0.007	32.5972	0.39	0.72967	0.01	0.1894	0.002	3589	31	1
JH062-065	373	86	137	0.63	0.2722	0.005	24.5474	0.28	0.65387	0.01	0.17311	0.002	3319	31	2
JH062-067	1098	125	379	0.33	0.3103	0.006	29.6675	0.33	0.69343	0.01	0.18701	0.002	3522	30	3
JH062-068	638	193	241	0.80	0.2940	0.006	25.6813	0.29	0.63347	0.01	0.12191	0.001	3439	31	8
JH062-069	1099	210	309	0.68	0.4724	0.009	55.3809	0.62	0.85022	0.01	0.18266	0.002	4157	29	4
JH062-070	548	108	195	0.55	0.2868	0.006	26.6361	0.3	0.6735	0.01	0.18337	0.002	3400	31	2
JH062-071	813	239	276	0.87	0.3068	0.006	29.7732	0.33	0.70377	0.01	0.1823	0.002	3505	30	2

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH062-072	171	63	57	1.11	0.3426	0.007	33.9949	0.41	0.71961	0.01	0.18783	0.002	3674	30	5
JH062-073	456	158	165	0.96	0.3077	0.006	28.0782	0.32	0.66176	0.01	0.1518	0.001	3509	30	7
JH062-075	281	31	95	0.33	0.2980	0.006	29.1106	0.34	0.70835	0.01	0.19381	0.002	3460	31	0
JH062-076	646	47	188	0.25	0.4164	0.008	46.9776	0.53	0.81814	0.01	0.21594	0.002	3969	29	2
JH062-078	376	65	131	0.50	0.2893	0.006	27.2307	0.31	0.68264	0.01	0.18576	0.002	3414	31	1
JH062-080	385	121	135	0.90	0.3041	0.006	28.5044	0.33	0.67985	0.01	0.17688	0.002	3491	30	4
JH062-081	231	108	82	1.32	0.2840	0.006	26.2857	0.31	0.67118	0.01	0.17445	0.002	3385	31	2
JH062-083	610	189	219	0.86	0.3043	0.006	27.9376	0.31	0.6659	0.01	0.17997	0.002	3492	30	6
JH062-084	218	41	63	0.65	0.4327	0.009	48.9539	0.57	0.82057	0.01	0.17892	0.002	4027	30	4
JH062-085	349	45	104	0.43	0.4382	0.009	48.2238	0.55	0.79809	0.01	0.21482	0.002	4046	29	6
JH062-086	302	50	110	0.45	0.2889	0.006	26.0162	0.3	0.65305	0.01	0.1387	0.001	3412	31	5
JH062-087	272	193	100	1.93	0.2811	0.006	25.1849	0.29	0.64987	0.01	0.15183	0.001	3369	31	4
JH062-088	162	97	55	1.76	0.2989	0.006	29.1611	0.35	0.70745	0.01	0.17337	0.002	3465	31	0
JH062-090	658	192	268	0.72	0.2392	0.005	19.3008	0.22	0.58514	0.01	0.11826	0.001	3115	31	4
JH062-091	150	44	49	0.90	0.3018	0.006	30.4919	0.37	0.73266	0.01	0.19361	0.002	3480	31	-2
JH062-092	698	142	235	0.60	0.3071	0.006	29.9207	0.34	0.70668	0.01	0.18903	0.002	3506	30	1
JH062-093	371	118	130	0.91	0.2981	0.006	27.9018	0.32	0.6789	0.01	0.18351	0.002	3460	31	3
JH062-094	247	42	86	0.49	0.2852	0.006	26.9398	0.31	0.68516	0.01	0.19842	0.002	3391	31	0
JH062-095	200	90	68	1.32	0.3025	0.006	29.0619	0.34	0.69686	0.01	0.17974	0.002	3483	31	2
JH062-096	718	110	264	0.42	0.2878	0.006	25.6833	0.29	0.64716	0.01	0.13491	0.001	3406	31	5
JH062-097	565	79	206	0.38	0.3068	0.006	27.5092	0.31	0.65039	0.01	0.13897	0.001	3505	30	8
JH062-098	576	95	205	0.46	0.2876	0.006	26.4898	0.3	0.66804	0.01	0.18409	0.002	3405	31	3
JH062-100	591	258	232	1.11	0.2759	0.005	23.0296	0.26	0.60536	0.01	0.10005	1E-03	3340	31	9

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH074-003	546	449	347	1.29	0.2959	0.009	31.3919	1.05	0.7159	0.01	0.14711	0.002	3449	47	-1
JH074-013	682	360	290	1.24	0.3998	0.01	44.4528	0.88	0.84036	0.01	0.12532	0.001	3908	39	-1
JH074-019	719	246	294	0.84	0.3446	0.008	34.6282	0.55	0.76584	0.01	0.14072	0.001	3683	36	0
JH074-021	589	183	209	0.88	0.3736	0.009	42.0769	0.63	0.85708	0.01	0.22319	0.002	3806	35	-5
JH074-025	389	104	137	0.76	0.3059	0.007	32.7326	0.45	0.80839	0.01	0.20428	0.002	3500	34	-9
JH074-029	481	188	187	1.01	0.3117	0.007	29.1950	0.37	0.70144	0.01	0.08265	8E-04	3530	33	3
JH074-041	344	200	131	1.53	0.2685	0.005	22.6015	0.23	0.59993	0.01	0.1192	0.001	3297	29	8
JH074-043	396	198	140	1.41	0.2603	0.005	22.9114	0.22	0.61583	0.01	0.066	6E-04	3248	28	5
JH074-059	315	89	122	0.73	0.2901	0.006	24.9355	0.27	0.62308	0.01	0.13277	0.001	3418	30	9
JH074-061	555	210	208	1.01	0.2814	0.006	24.8494	0.26	0.64006	0.01	0.13588	0.001	3371	30	5
JH074-063	266	52	93	0.56	0.2787	0.005	26.3143	0.29	0.68453	0.01	0.16544	0.002	3356	30	-1
JH074-064	334	54	118	0.46	0.2842	0.006	26.7268	0.29	0.68188	0.01	0.16253	0.002	3386	30	1
JH074-068	430	60	155	0.39	0.3053	0.006	28.2085	0.3	0.66996	0.01	0.16559	0.002	3497	30	5
JH074-073	395	46	143	0.32	0.2914	0.006	26.8899	0.29	0.66911	0.01	0.17037	0.002	3425	30	3
JH074-085	1826	764	972	0.79	0.1707	0.003	10.7120	0.12	0.45515	0	0.11073	1E-03	2564	33	6
JH074-086	389	132	184	0.72	0.1869	0.004	13.2047	0.15	0.51227	0.01	0.20932	0.002	2715	32	1
JH074-087	361	293	253	1.16	0.1251	0.002	5.9655	0.07	0.34579	0	0.03617	3E-04	2030	35	6
JH074-088	222	57	173	0.33	0.1104	0.002	4.7231	0.06	0.31041	0	0.0944	1E-03	1805	36	3
JH074-096	333	88	113	0.78	0.2921	0.006	28.8891	0.33	0.71744	0.01	0.18295	0.002	3429	31	-2
JH074-097	501	55	130	0.42	0.4277	0.008	55.3420	0.61	0.93843	0.01	1.06512	0.01	4010	29	-7
JH074-102	602	86	206	0.42	0.2966	0.006	29.1443	0.32	0.71265	0.01	0.17429	0.002	3453	31	-1
JH074-112	1150	154	370	0.42	0.3258	0.007	34.2048	0.38	0.76157	0.01	0.1716	0.002	3597	30	-2
JH074-118	365	53	126	0.42	0.2891	0.006	27.5017	0.29	0.68963	0.01	0.17229	0.002	3413	30	0

Appendix C Continued.

	Content (ppm)			Ratio									Age		
Spot	^{206}Pb	Th	U	Th/U	$^{207}Pb/^{206}Pb$	1σ	$^{207}Pb/^{235}U$	1σ	$^{206}Pb/^{238}U$	1σ	$^{208}Pb/^{232}Th$	1σ	$^{207}Pb/^{206}Pb$	1σ	% Disc
JH074-135	1093	401	403	1.00	0.2889	0.006	25.8953	0.27	0.64997	0.01	0.15791	0.001	3412	30	5
JH074-143	518	194	197	0.98	0.2826	0.006	24.6235	0.27	0.63178	0.01	0.06895	7E-04	3377	31	6
JH074-151	1054	145	461	0.31	0.2372	0.005	17.9769	0.19	0.54954	0.01	0.05506	5E-04	3101	31	9
JH074-154	362	74	129	0.57	0.3144	0.006	29.3926	0.32	0.67786	0.01	0.18429	0.002	3543	30	6
JH074-163	756	147	272	0.54	0.3276	0.006	30.2612	0.32	0.66988	0.01	0.15007	0.001	3606	30	9
JH074-167	471	79	166	0.48	0.3291	0.007	31.0678	0.34	0.68464	0.01	0.16847	0.002	3613	30	7
JH074-200	373	122	139	0.88	0.3112	0.006	28.0085	0.31	0.65268	0.01	0.17904	0.002	3527	31	8
JH075-014	360	169	131	1.29	0.2994	0.006	26.8565	0.3	0.65044	0.01	0.16704	0.002	3467	31	7
JH075-034	377	118	135	0.87	0.2813	0.006	25.7381	0.29	0.66337	0.01	0.1724	0.002	3370	31	2
JH075-038	492	199	167	1.19	0.3369	0.007	32.6079	0.37	0.70191	0.01	0.17761	0.002	3649	30	6
JH075-041	522	85	192	0.44	0.3015	0.006	26.9118	0.3	0.64722	0.01	0.15843	0.002	3478	30	8
JH075-043	280	93	106	0.88	0.2867	0.006	24.8663	0.29	0.62885	0.01	0.1512	0.002	3400	31	8
JH075-055	264	70	88	0.80	0.3122	0.006	30.8461	0.36	0.71642	0.01	0.17666	0.002	3532	30	1
JH075-056	801	175	288	0.61	0.3136	0.006	28.8006	0.32	0.66589	0.01	0.13074	0.001	3539	30	7
JH075-076	459	173	176	0.98	0.2928	0.006	25.3607	0.29	0.62799	0.01	0.13318	0.001	3433	30	9
JH075-166	175	102	64	1.59	0.2899	0.006	26.1651	0.31	0.65456	0.01	0.17638	0.002	3417	31	5
JH075-167	182	47	68	0.69	0.2946	0.006	26.2397	0.31	0.64599	0.01	0.15628	0.002	3442	31	7

Appendix D zircon Lu-Hf isotope results from analytical session 1 (Xi'an).

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH013-003	3295	31	3	0.02476	0.00017	0.00090	0.00001	0.28059	0.00002	0.28054	-77.8	-4.0	0.7	-0.97	3667	3712	3754	3891	4145	3467
JH013-004	3896	30	3	0.01433	0.00001	0.00055	0.00000	0.28019	0.00002	0.28015	-91.9	-3.2	0.7	-0.98	4158	4193	4222	4320	4501	4030
JH013-005	3626	31	1	0.01750	0.00012	0.00066	0.00001	0.28038	0.00002	0.28033	-85.4	-3.3	0.7	-0.98	3928	3967	4001	4113	4322	3767
JH013-006	3570	31	0	0.01465	0.00016	0.00052	0.00000	0.28038	0.00002	0.28035	-85.3	-4.2	0.7	-0.98	3910	3956	3994	4121	4356	3747
JH013-011	3059	32	6	0.02182	0.00028	0.00078	0.00001	0.28078	0.00002	0.28073	-71.3	-2.7	0.8	-0.98	3411	3455	3494	3625	3866	3175
JH013-016	3490	31	-1	0.03307	0.00112	0.00115	0.00003	0.28030	0.00002	0.28023	-88.0	-10.4	0.8	-0.97	4077	4144	4209	4424	4822	3935
JH013-021	3507	31	1	0.01570	0.00013	0.00061	0.00000	0.28032	0.00002	0.28028	-87.5	-8.1	0.6	-0.98	4000	4065	4120	4304	4644	3850
JH013-036	3445	31	1	0.00556	0.00003	0.00028	0.00000	0.28036	0.00002	0.28034	-86.0	-7.3	0.5	-0.99	3911	3977	4030	4205	4529	3750
JH013-038	3506	31	3	0.00913	0.00007	0.00038	0.00000	0.28032	0.00002	0.28029	-87.5	-7.6	0.7	-0.99	3980	4045	4098	4275	4604	3827
JH013-044	3918	30	3	0.01702	0.00029	0.00063	0.00001	0.28020	0.00002	0.28015	-91.6	-2.6	0.6	-0.98	4156	4187	4214	4302	4466	4028
JH013-049	3591	31	5	0.04970	0.00060	0.00180	0.00002	0.28021	0.00003	0.28009	-91.2	-12.8	1.1	-0.95	4268	4333	4406	4649	5101	4151
JH013-052	3738	31	1	0.02935	0.00134	0.00102	0.00004	0.28021	0.00002	0.28014	-91.2	-7.5	0.7	-0.97	4182	4235	4284	4447	4750	4055
JH013-063	3490	31	0	0.03375	0.00039	0.00123	0.00001	0.28032	0.00002	0.28024	-87.3	-9.8	0.7	-0.96	4058	4122	4185	4393	4778	3913
JH013-073	3080	32	5	0.02482	0.00076	0.00086	0.00002	0.28076	0.00002	0.28071	-71.8	-2.9	0.6	-0.97	3436	3480	3520	3651	3895	3203
JH013-083	3783	31	0	0.01495	0.00008	0.00057	0.00000	0.28024	0.00002	0.28020	-90.3	-4.3	0.6	-0.98	4101	4143	4179	4297	4516	3965
JH013-092	3513	31	1	0.01508	0.00037	0.00059	0.00001	0.28036	0.00002	0.28032	-85.9	-6.3	0.6	-0.98	3939	3996	4043	4202	4495	3780
JH013-104	3475	31	1	0.03068	0.00080	0.00108	0.00002	0.28033	0.00002	0.28026	-87.0	-9.5	0.9	-0.97	4030	4095	4157	4361	4739	3882
JH013-112	4007	29	4	0.06139	0.00053	0.00220	0.00001	0.28011	0.00002	0.27994	-94.9	-8.1	0.8	-0.93	4455	4493	4541	4700	4997	4365
JH013-114	3474	31	0	0.04379	0.00076	0.00149	0.00002	0.28021	0.00002	0.28012	-91.2	-14.7	0.8	-0.96	4233	4312	4395	4670	5181	4112
JH013-115	3045	32	0	0.02652	0.00074	0.00093	0.00002	0.28065	0.00003	0.28060	-75.6	-7.7	1.0	-0.97	3587	3653	3713	3913	4284	3376
JH013-123	3474	30	-1	0.02492	0.00063	0.00092	0.00002	0.28035	0.00002	0.28029	-86.3	-8.5	0.7	-0.97	3989	4052	4109	4299	4651	3835
JH013-125	3610	30	-2	0.01312	0.00018	0.00049	0.00000	0.28040	0.00002	0.28036	-84.7	-2.6	0.8	-0.99	3886	3923	3954	4057	4248	3720
JH013-133	4025	29	0	0.03962	0.00185	0.00128	0.00005	0.27995	0.00002	0.27985	-100.7	-11.0	0.8	-0.96	4566	4627	4686	4883	5250	4494
JH013-140	3491	31	0	0.01009	0.00012	0.00050	0.00000	0.28017	0.00002	0.28014	-92.7	-13.5	0.9	-0.99	4182	4276	4353	4611	5089	4058

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH013-142	3105	32	-3	0.01524	0.00013	0.00054	0.00000	0.28069	0.00002	0.28066	-74.2	-4.1	0.6	-0.98	3499	3552	3596	3743	4015	3278
JH013-156	3492	31	-2	0.01296	0.00027	0.00047	0.00001	0.28047	0.00002	0.28044	-82.0	-2.7	0.6	-0.99	3785	3824	3857	3967	4170	3604
JH013-163	3478	31	-2	0.01840	0.00015	0.00069	0.00001	0.28037	0.00002	0.28032	-85.8	-7.3	0.6	-0.98	3946	4006	4058	4232	4554	3787
JH013-165	3473	31	-2	0.06317	0.00081	0.00221	0.00002	0.28042	0.00002	0.28027	-84.0	-9.3	0.7	-0.93	4037	4084	4145	4346	4718	3885
JH013-167	3132	32	3	0.06406	0.00355	0.00207	0.00011	0.28056	0.00002	0.28044	-79.0	-11.5	0.8	-0.94	3826	3886	3961	4209	4668	3642
JH013-176	3618	31	-1	0.01177	0.00017	0.00043	0.00000	0.28038	0.00002	0.28035	-85.4	-3.0	0.6	-0.99	3907	3946	3979	4087	4287	3744
JH013-189	3405	31	-1	0.02011	0.00021	0.00082	0.00001	0.28048	0.00002	0.28042	-81.9	-5.4	0.7	-0.98	3815	3866	3911	4063	4344	3637
JH013-190	3730	31	1	0.02147	0.00027	0.00074	0.00001	0.28027	0.00002	0.28021	-89.3	-5.0	0.6	-0.98	4081	4126	4165	4295	4537	3942
JH018-001	3397	30	-1	0.01211	0.00006	0.00051	0.00000	0.28016	0.00002	0.28012	-93.2	-16.3	0.8	-0.98	4204	4312	4402	4703	5261	4082
JH018-008	3367	31	-2	0.01254	0.00018	0.00052	0.00000	0.28034	0.00002	0.28031	-86.7	-10.4	0.9	-0.98	3962	4041	4108	4330	4740	3806
JH018-028	3552	30	-4	0.01221	0.00011	0.00048	0.00000	0.28045	0.00002	0.28042	-82.9	-2.1	0.6	-0.99	3816	3852	3882	3981	4164	3641
JH018-037	3387	31	-2	0.02305	0.00027	0.00088	0.00001	0.28029	0.00002	0.28023	-88.5	-12.6	0.6	-0.97	4066	4149	4224	4475	4939	3923
JH018-041	3474	30	-1	0.01609	0.00041	0.00062	0.00001	0.28024	0.00002	0.28020	-90.3	-11.8	0.8	-0.98	4107	4190	4261	4496	4932	3972
JH018-069	3376	31	1	0.01963	0.00043	0.00072	0.00001	0.28022	0.00003	0.28017	-91.1	-15.1	0.9	-0.98	4148	4247	4333	4619	5150	4018
JH018-076	3438	30	2	0.02151	0.00072	0.00077	0.00002	0.28027	0.00002	0.28022	-89.3	-11.9	0.9	-0.98	4084	4166	4238	4477	4920	3945
JH018-086	3522	30	0	0.02219	0.00017	0.00085	0.00001	0.28039	0.00002	0.28033	-85.0	-5.9	0.9	-0.97	3934	3985	4031	4183	4465	3773
JH018-094	3843	29	0	0.03363	0.00024	0.00120	0.00001	0.28022	0.00002	0.28013	-91.1	-5.4	0.8	-0.96	4197	4238	4277	4406	4647	4072
JH018-101	3368	31	0	0.02022	0.00033	0.00076	0.00001	0.28026	0.00003	0.28021	-89.6	-13.9	1.0	-0.98	4097	4189	4270	4540	5040	3960
JH018-111	4127	29	-1	0.02001	0.00118	0.00069	0.00003	0.27994	0.00003	0.27989	-100.8	-7.0	0.9	-0.98	4501	4550	4591	4730	4988	4421
JH018-120	3377	31	1	0.02684	0.00006	0.00103	0.00000	0.28041	0.00002	0.28034	-84.2	-8.9	0.6	-0.97	3922	3987	4047	4248	4619	3759
JH018-126	3704	30	7	0.04448	0.00062	0.00155	0.00002	0.28012	0.00003	0.28001	-94.4	-12.9	0.9	-0.95	4363	4431	4503	4742	5185	4261
JH018-133	3400	30	1	0.02563	0.00016	0.00104	0.00001	0.28044	0.00002	0.28037	-83.1	-7.2	0.6	-0.97	3880	3937	3990	4167	4494	3711
JH018-135	3464	30	0	0.02468	0.00065	0.00097	0.00002	0.28031	0.00002	0.28024	-87.8	-10.3	0.9	-0.97	4050	4121	4186	4402	4802	3906
JH018-138	3544	30	2	0.06465	0.00232	0.00198	0.00006	0.28035	0.00002	0.28021	-86.6	-9.7	0.7	-0.94	4110	4161	4222	4425	4801	3969

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH018-144	3556	30	1	0.01314	0.00026	0.00047	0.00001	0.28038	0.00001	0.28035	-85.3	-4.4	0.5	-0.99	3907	3954	3993	4124	4367	3744
JH018-145	3390	31	5	0.02155	0.00019	0.00088	0.00001	0.28038	0.00002	0.28032	-85.3	-9.3	0.9	-0.97	3948	4017	4078	4284	4666	3789
JH018-156	3375	31	3	0.04940	0.00133	0.00166	0.00005	0.28042	0.00003	0.28032	-83.8	-10.0	1.0	-0.95	3970	4030	4094	4309	4708	3810
JH019-002	3720	29	7	0.05111	0.00081	0.00173	0.00002	0.28020	0.00002	0.28008	-91.7	-10.2	0.9	-0.95	4279	4333	4394	4595	4969	4164
JH019-006	4131	29	4	0.02070	0.00050	0.00079	0.00002	0.28008	0.00002	0.28001	-96.1	-2.5	0.8	-0.98	4340	4366	4390	4467	4610	4237
JH019-011	3856	29	8	0.01281	0.00012	0.00049	0.00000	0.28020	0.00002	0.28017	-91.6	-3.7	0.7	-0.99	4141	4179	4211	4317	4514	4011
JH019-016	3271	31	1	0.03683	0.00035	0.00148	0.00001	0.28058	0.00002	0.28049	-78.1	-6.2	0.8	-0.96	3735	3784	3835	4004	4317	3542
JH019-020	3467	30	-1	0.01755	0.00016	0.00075	0.00000	0.28029	0.00003	0.28024	-88.5	-10.5	1.1	-0.98	4054	4129	4194	4412	4815	3911
JH019-021	3440	30	-1	0.02057	0.00007	0.00079	0.00000	0.28043	0.00001	0.28038	-83.4	-6.1	0.5	-0.98	3868	3922	3969	4128	4422	3698
JH019-027	3327	31	1	0.03606	0.00040	0.00134	0.00001	0.28036	0.00002	0.28028	-85.9	-12.5	0.6	-0.96	4018	4094	4170	4422	4889	3867
JH019-030	3473	30	-2	0.03478	0.00028	0.00129	0.00001	0.28030	0.00002	0.28021	-88.2	-11.3	0.7	-0.96	4097	4167	4235	4464	4887	3958
JH019-035	3477	31	1	0.01760	0.00029	0.00070	0.00001	0.28030	0.00002	0.28025	-88.2	-9.8	0.7	-0.98	4038	4111	4173	4381	4768	3893
JH019-042	3891	29	5	0.04140	0.00054	0.00147	0.00001	0.28021	0.00002	0.28010	-91.2	-5.1	0.6	-0.96	4231	4266	4304	4427	4656	4110
JH019-050	4022	29	3	0.01958	0.00003	0.00074	0.00000	0.28012	0.00002	0.28006	-94.5	-3.4	0.6	-0.98	4276	4308	4336	4430	4604	4164
JH019-063	3391	31	1	0.04322	0.00029	0.00155	0.00001	0.28025	0.00003	0.28014	-90.1	-15.7	1.0	-0.95	4199	4282	4370	4663	5206	4073
JH019-067	4189	30	2	0.00832	0.00017	0.00036	0.00001	0.27998	0.00002	0.27995	-99.6	-3.4	0.6	-0.99	4420	4453	4478	4565	4725	4330
JH019-068	3720	30	7	0.04530	0.00013	0.00165	0.00001	0.28015	0.00002	0.28003	-93.5	-11.9	0.8	-0.95	4340	4403	4470	4694	5111	4235
JH019-072	3329	31	0	0.03216	0.00078	0.00123	0.00003	0.28056	0.00002	0.28048	-79.0	-5.2	0.7	-0.96	3743	3789	3835	3986	4267	3552
JH019-088	4138	29	5	0.01582	0.00036	0.00064	0.00001	0.28004	0.00003	0.27998	-97.5	-3.4	0.9	-0.98	4376	4407	4433	4522	4686	4278
JH019-099	4015	30	2	0.02049	0.00007	0.00079	0.00000	0.28012	0.00002	0.28006	-94.4	-3.6	0.6	-0.98	4276	4309	4338	4435	4615	4164
JH019-113	3770	30	0	0.02361	0.00030	0.00086	0.00001	0.28016	0.00002	0.28010	-93.2	-8.3	0.7	-0.97	4240	4298	4350	4523	4845	4122
JH019-162	3632	30	7	0.02778	0.00075	0.00105	0.00003	0.28028	0.00002	0.28021	-88.7	-7.5	0.6	-0.97	4093	4148	4199	4368	4683	3954
JH019-168	4024	30	7	0.01748	0.00010	0.00065	0.00000	0.28008	0.00002	0.28003	-96.0	-4.5	0.7	-0.98	4320	4358	4391	4501	4705	4214
JH020-001	3409	31	0	0.02363	0.00007	0.00089	0.00000	0.28024	0.00002	0.28018	-90.2	-13.8	0.7	-0.97	4132	4221	4301	4567	5062	3999

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH020-003	3401	31	1	0.03865	0.00015	0.00142	0.00000	0.28034	0.00002	0.28025	-86.7	-11.7	0.6	-0.96	4054	4124	4196	4433	4874	3908
JH020-006	3463	31	1	0.02495	0.00009	0.00094	0.00000	0.28031	0.00002	0.28025	-87.7	-10.2	0.6	-0.97	4043	4114	4178	4392	4789	3898
JH020-012	3921	30	0	0.01285	0.00015	0.00050	0.00001	0.28005	0.00002	0.28001	-97.0	-7.6	0.7	-0.99	4340	4396	4443	4599	4889	4238
JH020-025	3701	30	0	0.02352	0.00044	0.00087	0.00001	0.28046	0.00002	0.28039	-82.6	0.7	0.7	-0.97	3845	3863	3879	3932	4030	3671
JH020-027	3400	31	1	0.02766	0.00020	0.00110	0.00001	0.28039	0.00002	0.28032	-85.1	-9.4	0.8	-0.97	3961	4026	4088	4294	4676	3802
JH020-028	3561	30	3	0.02069	0.00013	0.00083	0.00000	0.28040	0.00002	0.28034	-84.8	-4.7	0.7	-0.98	3922	3967	4007	4140	4387	3759
JH020-030	3435	31	-2	0.01070	0.00013	0.00041	0.00000	0.28057	0.00002	0.28054	-78.6	-0.4	0.7	-0.99	3649	3678	3702	3782	3931	3450
JH020-063	3844	30	-9	0.02853	0.00063	0.00102	0.00002	0.28018	0.00002	0.28010	-92.4	-6.2	0.8	-0.97	4229	4275	4317	4459	4721	4109
JH020-078	3896	30	1	0.01117	0.00014	0.00042	0.00001	0.27999	0.00002	0.27996	-99.1	-10.1	0.8	-0.99	4410	4480	4538	4729	5085	4318
JH020-084	4062	29	6	0.01107	0.00010	0.00046	0.00000	0.28011	0.00002	0.28007	-95.0	-2.2	0.7	-0.99	4264	4292	4315	4391	4531	4152
JH020-089	3384	31	2	0.02470	0.00022	0.00093	0.00001	0.28029	0.00002	0.28023	-88.6	-12.9	0.6	-0.97	4077	4162	4238	4494	4968	3936
JH020-100	3593	30	4	0.05278	0.00274	0.00169	0.00007	0.28028	0.00002	0.28016	-88.9	-10.2	0.8	-0.95	4168	4225	4288	4495	4880	4037
JH020-109	3986	29	7	0.01489	0.00023	0.00056	0.00001	0.28012	0.00002	0.28007	-94.6	-3.8	0.7	-0.98	4259	4295	4326	4428	4616	4145
JH020-111	3389	30	-1	0.03410	0.00025	0.00127	0.00001	0.28028	0.00002	0.28020	-88.7	-13.7	0.6	-0.96	4115	4196	4276	4541	5032	3978
JH020-114	4037	29	2	0.01434	0.00015	0.00055	0.00000	0.28008	0.00002	0.28003	-96.0	-4.0	0.6	-0.98	4311	4348	4379	4481	4671	4205
JH020-119	3392	31	-2	0.00994	0.00015	0.00039	0.00001	0.28036	0.00002	0.28034	-86.0	-8.8	0.6	-0.99	3923	3997	4056	4255	4624	3763
JH020-125	3802	30	5	0.04397	0.00105	0.00159	0.00003	0.28019	0.00002	0.28007	-92.1	-8.4	0.8	-0.95	4280	4328	4380	4554	4875	4165
JH020-126	3875	29	9	0.04313	0.00024	0.00154	0.00001	0.28017	0.00002	0.28005	-92.7	-7.2	0.7	-0.95	4298	4342	4388	4541	4826	4187
JH020-134	3460	30	2	0.03313	0.00062	0.00120	0.00002	0.28037	0.00002	0.28029	-85.8	-9.0	0.7	-0.96	3999	4061	4120	4317	4683	3846
JH020-145	3923	29	-6	0.04501	0.00234	0.00139	0.00006	0.28030	0.00003	0.28020	-88.0	-1.0	1.1	-0.96	4104	4123	4143	4209	4331	3964
JH020-161	3691	30	6	0.02680	0.00011	0.00098	0.00000	0.28032	0.00002	0.28025	-87.4	-4.6	0.6	-0.97	4036	4077	4115	4242	4477	3889
JH020-162	3665	30	-2	0.01454	0.00039	0.00057	0.00001	0.28033	0.00003	0.28029	-87.0	-3.8	0.9	-0.98	3979	4021	4056	4174	4391	3826
JH020-168	3490	31	-1	0.05217	0.00121	0.00173	0.00003	0.28029	0.00002	0.28017	-88.6	-12.4	0.8	-0.95	4163	4229	4302	4545	4995	4031
JH020-171	3563	30	6	0.02577	0.00020	0.00102	0.00001	0.28043	0.00002	0.28036	-83.5	-3.8	0.6	-0.97	3894	3933	3970	4092	4318	3726

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH020-172	3551	30	4	0.01680	0.00019	0.00060	0.00001	0.28044	0.00001	0.28040	-83.1	-2.7	0.5	-0.98	3838	3876	3908	4014	4213	3664
JH021B-003	3704	30	-1	0.00651	0.00008	0.00030	0.00000	0.28014	0.00002	0.28012	-93.9	-9.1	0.6	-0.99	4205	4275	4331	4519	4867	4084
JH021B-006	4125	29	-3	0.01718	0.00010	0.00058	0.00000	0.28000	0.00002	0.27995	-98.8	-4.8	0.6	-0.98	4418	4457	4490	4599	4801	4327
JH021B-012	3401	31	0	0.03666	0.00010	0.00139	0.00000	0.28038	0.00002	0.28029	-85.3	-10.3	0.7	-0.96	4001	4065	4131	4349	4754	3847
JH021B-013	3389	31	-1	0.01969	0.00010	0.00088	0.00000	0.28045	0.00002	0.28039	-83.0	-7.0	0.6	-0.97	3860	3918	3971	4145	4467	3689
JH021B-014	3537	30	1	0.02683	0.00025	0.00109	0.00001	0.28046	0.00002	0.28038	-82.5	-3.6	0.7	-0.97	3864	3902	3938	4058	4280	3691
JH021B-015	4020	29	1	0.01111	0.00003	0.00041	0.00000	0.28009	0.00002	0.28006	-95.5	-3.5	0.6	-0.99	4274	4310	4338	4433	4610	4164
JH021B-020	3529	30	1	0.01469	0.00004	0.00057	0.00000	0.28043	0.00002	0.28039	-83.5	-3.5	0.6	-0.98	3849	3892	3927	4046	4267	3677
JH021B-023	3486	30	1	0.03003	0.00007	0.00118	0.00000	0.28032	0.00002	0.28025	-87.3	-9.8	0.7	-0.97	4052	4117	4179	4386	4770	3906
JH021B-025	3418	30	-1	0.02322	0.00002	0.00096	0.00000	0.28048	0.00002	0.28042	-81.8	-5.3	0.7	-0.97	3822	3871	3916	4064	4340	3644
JH021B-030	3573	30	0	0.03240	0.00028	0.00110	0.00001	0.28034	0.00002	0.28026	-86.9	-7.2	0.8	-0.97	4031	4084	4134	4302	4614	3882
JH021B-032	3382	32	-1	0.00723	0.00003	0.00027	0.00000	0.28050	0.00002	0.28048	-81.2	-4.0	0.6	-0.99	3736	3786	3826	3959	4205	3550
JH021B-033	3377	31	-1	0.02304	0.00012	0.00092	0.00000	0.28039	0.00002	0.28033	-84.9	-9.3	0.5	-0.97	3936	4004	4066	4272	4654	3775
JH021B-036	3569	30	1	0.02838	0.00003	0.00113	0.00000	0.28046	0.00002	0.28038	-82.6	-3.0	0.6	-0.97	3870	3905	3938	4049	4253	3698
JH021B-073	3641	30	2	0.01465	0.00004	0.00063	0.00000	0.28036	0.00002	0.28032	-85.9	-3.5	0.6	-0.98	3945	3985	4019	4132	4342	3787
JH021B-078	3611	30	3	0.02741	0.00011	0.00104	0.00000	0.28039	0.00001	0.28032	-85.0	-4.2	0.5	-0.97	3951	3992	4029	4154	4386	3792
JH021B-100	4125	29	0	0.02030	0.00009	0.00089	0.00000	0.27999	0.00002	0.27992	-99.0	-5.9	0.6	-0.97	4459	4500	4537	4661	4890	4373
JH021B-107	3417	31	1	0.01482	0.00065	0.00061	0.00002	0.28039	0.00001	0.28035	-85.1	-7.8	0.5	-0.98	3910	3975	4030	4214	4554	3747
JH021B-108	3701	30	-3	0.03208	0.00060	0.00117	0.00002	0.28025	0.00002	0.28016	-90.1	-7.6	0.6	-0.97	4156	4208	4258	4425	4735	4026
JH021B-109	3299	31	-1	0.02006	0.00008	0.00087	0.00000	0.28068	0.00001	0.28063	-74.6	-0.6	0.5	-0.97	3541	3571	3598	3688	3854	3324
JH021B-110	3381	31	-1	0.01799	0.00039	0.00066	0.00001	0.28033	0.00001	0.28029	-86.9	-10.7	0.5	-0.98	3986	4064	4132	4356	4773	3833
JH021B-130	4024	29	0	0.02588	0.00019	0.00094	0.00001	0.28016	0.00002	0.28009	-93.2	-2.5	0.6	-0.97	4247	4275	4299	4382	4534	4131
JH021B-133	3399	31	0	0.01724	0.00006	0.00068	0.00000	0.28042	0.00001	0.28037	-83.9	-7.3	0.5	-0.98	3876	3938	3991	4168	4496	3707
JH021B-135	3483	31	-1	0.02832	0.00035	0.00110	0.00001	0.28047	0.00001	0.28039	-82.3	-4.6	0.5	-0.97	3856	3900	3941	4078	4332	3683

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH021B-139	4066	29	-1	0.01258	0.00007	0.00050	0.00000	0.28003	0.00001	0.27999	-97.6	-4.7	0.5	-0.99	4362	4402	4435	4546	4751	4263
JH021B-140	4012	29	2	0.01852	0.00006	0.00070	0.00000	0.28007	0.00002	0.28002	-96.1	-5.1	0.6	-0.98	4331	4373	4408	4527	4746	4228
JH021B-147	4005	30	0	0.00512	0.00008	0.00019	0.00000	0.28012	0.00001	0.28011	-94.5	-2.2	0.5	-0.99	4216	4246	4270	4349	4496	4097
JH021B-148	3546	30	1	0.01397	0.00019	0.00057	0.00001	0.28049	0.00002	0.28045	-81.3	-0.9	0.5	-0.98	3767	3796	3821	3903	4055	3583
JH021B-151	4053	30	-3	0.00569	0.00002	0.00023	0.00000	0.28007	0.00001	0.28005	-96.3	-3.0	0.5	-0.99	4286	4320	4346	4434	4596	4178
JH021B-154	3545	30	-1	0.02198	0.00006	0.00084	0.00000	0.28050	0.00001	0.28045	-81.0	-1.3	0.5	-0.98	3781	3811	3837	3925	4087	3599
JH021B-155	3396	31	1	0.02324	0.00037	0.00088	0.00001	0.28042	0.00002	0.28037	-83.8	-7.7	0.6	-0.97	3891	3952	4007	4190	4529	3724
JH021B-157	3397	31	-2	0.03007	0.00059	0.00122	0.00003	0.28043	0.00001	0.28035	-83.6	-8.3	0.5	-0.96	3919	3978	4035	4225	4579	3754
JH021B-175	3378	31	1	0.00998	0.00003	0.00039	0.00000	0.28038	0.00001	0.28035	-85.4	-8.6	0.5	-0.99	3902	3974	4032	4228	4591	3738
JH021B-184	3419	30	-1	0.02190	0.00020	0.00081	0.00001	0.28035	0.00001	0.28030	-86.4	-9.6	0.5	-0.98	3982	4053	4116	4324	4711	3828
JH021B-186	3407	30	0	0.01825	0.00005	0.00069	0.00000	0.28040	0.00002	0.28035	-84.7	-7.9	0.6	-0.98	3905	3970	4025	4210	4553	3741
JH021B-196	3833	30	5	0.03357	0.00015	0.00125	0.00001	0.28024	0.00002	0.28015	-90.2	-4.9	0.6	-0.96	4171	4209	4246	4370	4599	4042
JH021B-197	3831	30	7	0.06396	0.00435	0.00203	0.00011	0.28017	0.00002	0.28002	-92.7	-9.5	0.6	-0.94	4352	4399	4455	4641	4987	4247
JH021B-198	3734	30	1	0.01707	0.00009	0.00060	0.00000	0.28027	0.00001	0.28023	-89.2	-4.5	0.5	-0.98	4065	4109	4146	4269	4497	3924
JH021B-205	3925	29	2	0.06487	0.00114	0.00228	0.00003	0.28006	0.00002	0.27989	-96.5	-11.9	0.7	-0.93	4528	4577	4641	4856	5253	4448
JH021B-207	3476	31	0	0.01757	0.00007	0.00063	0.00000	0.28032	0.00001	0.28028	-87.3	-8.8	0.5	-0.98	3997	4065	4123	4317	4677	3846
JH021B-208	3931	29	-1	0.01314	0.00002	0.00050	0.00000	0.28005	0.00001	0.28001	-96.9	-7.3	0.4	-0.99	4339	4394	4439	4592	4874	4237
JH021B-209	4056	29	-1	0.02885	0.00009	0.00104	0.00000	0.28002	0.00002	0.27994	-98.1	-7.1	0.6	-0.97	4444	4490	4533	4676	4941	4355
JH021B-210	3975	29	-2	0.01594	0.00004	0.00059	0.00000	0.28004	0.00001	0.28000	-97.3	-6.9	0.5	-0.98	4363	4414	4457	4601	4868	4264
JH021B-215	3590	30	-1	0.02139	0.00010	0.00079	0.00000	0.28027	0.00002	0.28022	-89.1	-8.3	0.6	-0.98	4081	4143	4198	4379	4716	3941
JH021B-224	3728	30	3	0.01528	0.00024	0.00061	0.00001	0.28025	0.00001	0.28020	-90.0	-5.4	0.5	-0.98	4093	4141	4182	4318	4570	3956
JH021B-226	3401	31	0	0.01268	0.00016	0.00051	0.00001	0.28052	0.00002	0.28048	-80.5	-3.3	0.5	-0.98	3731	3775	3812	3935	4163	3543
JH021B-227	4187	29	0	0.04533	0.00021	0.00183	0.00001	0.27999	0.00002	0.27984	-99.3	-7.4	0.7	-0.95	4580	4617	4660	4801	5063	4509
JH021B-228	4074	29	0	0.01836	0.00007	0.00068	0.00000	0.28008	0.00001	0.28003	-95.8	-3.3	0.5	-0.98	4318	4350	4377	4468	4636	4212

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH021B-238	3984	29	1	0.00907	0.00007	0.00032	0.00000	0.28012	0.00001	0.28010	-94.4	-3.0	0.5	-0.99	4225	4259	4286	4377	4544	4108
JH021B-242	3790	29	6	0.02727	0.00020	0.00103	0.00001	0.28014	0.00002	0.28006	-93.8	-9.0	0.5	-0.97	4283	4341	4396	4577	4913	4171
JH022-028	3923	30	-1	0.00701	0.00010	0.00035	0.00000	0.28021	0.00002	0.28018	-91.5	-1.6	0.7	-0.99	4122	4149	4172	4246	4384	3990
JH022-034	3503	30	1	0.00833	0.00005	0.00034	0.00000	0.28055	0.00002	0.28053	-79.4	0.6	0.6	-0.99	3673	3697	3716	3780	3898	3478
JH022-037	3388	31	0	0.03206	0.00017	0.00121	0.00001	0.28029	0.00002	0.28021	-88.4	-13.3	0.6	-0.96	4100	4180	4258	4519	5001	3961
JH022-043	3867	30	-1	0.02755	0.00028	0.00102	0.00001	0.28026	0.00002	0.28019	-89.5	-2.7	0.7	-0.97	4118	4148	4175	4267	4438	3982
JH022-047	3397	31	-2	0.02381	0.00032	0.00092	0.00001	0.28031	0.00002	0.28025	-87.9	-11.9	0.7	-0.97	4050	4129	4202	4442	4888	3905
JH022-049	3912	29	-2	0.02514	0.00005	0.00100	0.00000	0.28015	0.00002	0.28008	-93.4	-5.5	0.8	-0.97	4262	4304	4342	4471	4709	4147
JH022-056	3370	31	1	0.01140	0.00004	0.00047	0.00000	0.28040	0.00002	0.28037	-84.5	-8.0	0.6	-0.99	3876	3944	4001	4190	4540	3708
JH022-065	3486	30	0	0.00617	0.00004	0.00026	0.00000	0.28049	0.00002	0.28047	-81.5	-1.8	0.6	-0.99	3745	3782	3811	3908	4088	3560
JH022-073	3444	30	-1	0.02918	0.00044	0.00110	0.00002	0.28040	0.00002	0.28032	-84.7	-8.0	0.6	-0.97	3947	4006	4061	4246	4589	3787
JH022-074	3434	31	-2	0.01796	0.00026	0.00067	0.00001	0.28039	0.00002	0.28035	-84.8	-7.3	0.6	-0.98	3908	3969	4022	4198	4524	3744
JH022-075	3495	30	0	0.01421	0.00012	0.00055	0.00000	0.28042	0.00002	0.28038	-83.8	-4.6	0.7	-0.98	3860	3908	3949	4085	4337	3689
JH022-082	3720	30	5	0.01450	0.00005	0.00054	0.00000	0.28029	0.00002	0.28025	-88.5	-4.0	0.7	-0.98	4032	4074	4108	4225	4440	3886
JH022-086	3789	30	5	0.04781	0.00067	0.00171	0.00002	0.28021	0.00002	0.28008	-91.4	-8.3	0.7	-0.95	4265	4312	4363	4535	4854	4148
JH022-093	3557	30	0	0.07495	0.00078	0.00248	0.00002	0.28037	0.00002	0.28020	-85.6	-9.7	0.8	-0.93	4130	4173	4234	4436	4811	3990
JH022-106	3621	30	-4	0.02322	0.00027	0.00086	0.00001	0.28032	0.00002	0.28026	-87.5	-6.1	0.7	-0.97	4026	4077	4122	4271	4549	3879
JH022-108	3351	31	0	0.02753	0.00046	0.00109	0.00002	0.28037	0.00002	0.28029	-85.9	-11.3	0.7	-0.97	3989	4064	4134	4368	4802	3835
JH022-109	3793	30	9	0.05580	0.00026	0.00196	0.00001	0.28023	0.00002	0.28009	-90.5	-7.9	0.6	-0.94	4259	4301	4351	4518	4828	4140
JH022-115	3513	30	-1	0.01221	0.00020	0.00048	0.00001	0.28043	0.00002	0.28040	-83.5	-3.7	0.6	-0.99	3840	3884	3921	4043	4269	3668
JH022-116	3520	30	-1	0.00659	0.00009	0.00028	0.00000	0.28060	0.00002	0.28059	-77.4	3.2	0.7	-0.99	3594	3604	3612	3640	3691	3387
JH022-117	3370	31	1	0.02013	0.00016	0.00077	0.00000	0.28042	0.00002	0.28037	-83.8	-8.0	0.8	-0.98	3879	3944	4001	4189	4539	3711
JH022-118	4091	29	6	0.04219	0.00145	0.00143	0.00005	0.27998	0.00002	0.27987	-99.4	-8.7	0.7	-0.96	4538	4586	4635	4797	5098	4461
JH022-124	3849	29	-1	0.03830	0.00046	0.00138	0.00002	0.28027	0.00002	0.28017	-89.2	-3.8	0.7	-0.96	4144	4176	4208	4316	4514	4011

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH022-131	3861	29	-3	0.02404	0.00038	0.00093	0.00001	0.28018	0.00002	0.28011	-92.3	-5.4	0.8	-0.97	4213	4256	4295	4425	4665	4092
JH022-133	3372	30	1	0.02911	0.00009	0.00107	0.00000	0.28042	0.00002	0.28035	-84.0	-8.9	0.6	-0.97	3919	3983	4044	4245	4617	3755
JH022-135	3341	30	0	0.03950	0.00041	0.00149	0.00001	0.28031	0.00002	0.28022	-87.8	-14.3	0.7	-0.96	4103	4183	4267	4543	5056	3964
JH022-139	3352	30	1	0.03139	0.00036	0.00123	0.00001	0.28035	0.00002	0.28027	-86.3	-12.1	0.8	-0.96	4023	4098	4172	4417	4872	3872
JH022-145	3854	29	2	0.03938	0.00018	0.00142	0.00001	0.28024	0.00002	0.28013	-90.3	-5.0	0.8	-0.96	4193	4230	4267	4390	4619	4067
JH022-148	3900	29	-2	0.00680	0.00006	0.00033	0.00000	0.28025	0.00002	0.28023	-89.8	-0.4	0.6	-0.99	4057	4079	4097	4156	4265	3916
JH022-154	3894	30	0	0.01213	0.00013	0.00047	0.00000	0.28019	0.00002	0.28015	-92.1	-3.2	0.6	-0.99	4157	4193	4222	4320	4502	4029
JH022-155	3644	30	4	0.02768	0.00045	0.00100	0.00002	0.28023	0.00002	0.28016	-90.5	-8.9	0.8	-0.97	4155	4216	4272	4460	4809	4025
JH022-156	3589	30	4	0.03080	0.00073	0.00100	0.00002	0.28034	0.00002	0.28027	-86.7	-6.4	0.7	-0.97	4012	4062	4109	4264	4553	3861
JH022-165	3455	31	-1	0.01847	0.00001	0.00068	0.00000	0.28041	0.00002	0.28036	-84.4	-6.4	0.6	-0.98	3893	3949	3998	4161	4462	3727
JH022-168	3999	29	0	0.06137	0.00032	0.00221	0.00001	0.28009	0.00002	0.27992	-95.4	-8.9	0.8	-0.93	4478	4518	4569	4739	5055	4391
JH022-172	3450	31	0	0.01952	0.00004	0.00072	0.00000	0.28038	0.00002	0.28033	-85.3	-7.6	0.6	-0.98	3932	3994	4048	4227	4558	3772
JH022-180	3490	31	-1	0.02291	0.00125	0.00084	0.00003	0.28043	0.00002	0.28037	-83.6	-5.2	0.6	-0.98	3879	3927	3970	4114	4381	3710
JH023-001	3355	30	1	0.05455	0.00012	0.00199	0.00000	0.28024	0.00002	0.28011	-90.2	-17.6	0.7	-0.94	4249	4330	4426	4747	5340	4129
JH023-011	4005	29	4	0.03619	0.00058	0.00144	0.00002	0.28012	0.00002	0.28001	-94.4	-5.6	0.8	-0.96	4349	4386	4423	4549	4781	4245
JH023-012	3366	30	-2	0.02130	0.00005	0.00079	0.00000	0.28025	0.00002	0.28020	-90.0	-14.4	0.8	-0.98	4115	4209	4293	4570	5084	3980
JH023-018	3331	30	1	0.02619	0.00017	0.00102	0.00000	0.28048	0.00002	0.28041	-81.9	-7.6	0.7	-0.97	3835	3894	3950	4135	4478	3658
JH023-025	3565	30	-2	0.01499	0.00010	0.00055	0.00000	0.28031	0.00003	0.28027	-87.7	-6.9	1.0	-0.98	4003	4062	4111	4274	4577	3854
JH023-030	3369	30	-2	0.03021	0.00057	0.00122	0.00002	0.28033	0.00002	0.28025	-87.0	-12.3	0.7	-0.96	4045	4122	4196	4444	4902	3899
JH023-035	3944	29	8	0.02012	0.00029	0.00070	0.00001	0.27999	0.00002	0.27994	-99.1	-9.7	0.8	-0.98	4441	4505	4561	4745	5087	4353
JH023-038	3421	30	-2	0.01576	0.00012	0.00056	0.00000	0.28044	0.00002	0.28040	-83.4	-5.9	0.8	-0.98	3842	3898	3945	4102	4393	3670
JH023-039	3257	31	3	0.03307	0.00032	0.00123	0.00001	0.28048	0.00002	0.28040	-81.8	-9.6	0.7	-0.96	3849	3916	3981	4197	4599	3674
JH023-040	3371	31	0	0.02920	0.00009	0.00110	0.00000	0.28042	0.00002	0.28035	-83.9	-8.9	0.6	-0.97	3918	3982	4042	4243	4615	3753
JH023-041	3379	31	0	0.01387	0.00011	0.00051	0.00000	0.28037	0.00002	0.28034	-85.5	-8.9	0.6	-0.99	3918	3990	4050	4251	4623	3756

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH023-044	3454	30	-2	0.02708	0.00146	0.00080	0.00003	0.28014	0.00004	0.28009	-93.9	-16.3	1.3	-0.98	4258	4360	4449	4747	5299	4144
JH023-054	4160	29	2	0.00855	0.00021	0.00028	0.00000	0.28002	0.00002	0.28000	-97.9	-2.2	0.8	-0.99	4350	4377	4398	4470	4602	4250
JH023-059	3531	30	-1	0.01300	0.00014	0.00052	0.00001	0.28030	0.00003	0.28027	-88.1	-8.0	1.0	-0.98	4016	4081	4135	4316	4651	3868
JH023-072	4163	29	-1	0.01880	0.00058	0.00063	0.00002	0.28004	0.00002	0.27998	-97.5	-2.7	0.7	-0.98	4375	4403	4426	4505	4651	4278
JH023-082	3267	31	7	0.03457	0.00072	0.00125	0.00003	0.28035	0.00004	0.28027	-86.3	-14.0	1.6	-0.96	4023	4108	4191	4467	4979	3873
JH023-086	3773	30	-3	0.02482	0.00025	0.00088	0.00001	0.28012	0.00002	0.28006	-94.4	-9.5	0.9	-0.97	4288	4351	4408	4598	4951	4177
JH023-089	3690	30	0	0.02886	0.00079	0.00102	0.00003	0.28014	0.00003	0.28007	-93.8	-11.2	1.2	-0.97	4280	4350	4415	4632	5034	4167
JH023-094	3728	30	1	0.02081	0.00029	0.00084	0.00001	0.28019	0.00002	0.28013	-92.1	-8.2	0.7	-0.98	4197	4255	4308	4481	4803	4074
JH023-099	3484	30	-1	0.02199	0.00021	0.00079	0.00001	0.28024	0.00002	0.28019	-90.3	-12.0	0.8	-0.98	4126	4207	4279	4516	4957	3993
JH023-103	3499	30	-2	0.02466	0.00031	0.00088	0.00001	0.28033	0.00002	0.28027	-87.1	-8.6	0.7	-0.97	4014	4078	4135	4325	4678	3865
JH023-107	4001	30	-1	0.00881	0.00005	0.00035	0.00000	0.28008	0.00002	0.28005	-95.9	-4.2	0.8	-0.99	4284	4324	4355	4462	4658	4175
JH023-108	3993	30	0	0.01456	0.00039	0.00055	0.00001	0.28008	0.00002	0.28003	-96.0	-5.1	0.6	-0.98	4312	4355	4390	4509	4729	4206
JH025-006	3740	30	6	0.03237	0.00040	0.00121	0.00001	0.28037	0.00003	0.28028	-85.7	-2.4	0.9	-0.96	3997	4026	4054	4148	4322	3843
JH025-013	3470	31	-2	0.04257	0.00015	0.00154	0.00001	0.28033	0.00002	0.28023	-87.1	-10.8	0.8	-0.95	4084	4148	4215	4437	4850	3942
JH025-014	3515	30	1	0.01666	0.00009	0.00065	0.00000	0.28044	0.00002	0.28039	-83.3	-3.8	0.8	-0.98	3849	3893	3930	4054	4284	3677
JH025-019	4064	29	5	0.01649	0.00024	0.00063	0.00001	0.28008	0.00002	0.28003	-95.9	-3.5	0.9	-0.98	4315	4348	4376	4469	4642	4209
JH025-026	3608	30	-6	0.00869	0.00020	0.00035	0.00001	0.28014	0.00003	0.28011	-93.8	-11.5	1.0	-0.99	4210	4293	4361	4586	5004	4090
JH025-027	3843	31	-1	0.00592	0.00002	0.00022	0.00000	0.28019	0.00002	0.28017	-92.2	-3.9	0.9	-0.99	4135	4177	4210	4320	4523	4005
JH025-028	3481	31	-1	0.02033	0.00013	0.00074	0.00000	0.28039	0.00002	0.28034	-85.1	-6.6	0.8	-0.98	3925	3982	4031	4196	4501	3763
JH025-030	4064	30	0	0.02216	0.00010	0.00085	0.00001	0.28001	0.00002	0.27994	-98.5	-6.7	0.8	-0.97	4435	4481	4523	4660	4914	4346
JH025-032	3383	31	-1	0.02217	0.00017	0.00082	0.00001	0.28025	0.00002	0.28019	-90.0	-14.1	0.8	-0.98	4117	4209	4291	4563	5066	3983
JH025-034	3982	30	0	0.01280	0.00003	0.00049	0.00000	0.28015	0.00002	0.28011	-93.5	-2.6	0.7	-0.99	4211	4242	4267	4352	4510	4090
JH025-035	4056	29	4	0.02725	0.00060	0.00108	0.00002	0.28015	0.00002	0.28006	-93.6	-2.5	0.9	-0.97	4277	4303	4328	4409	4559	4164
JH025-047	3350	31	-1	0.02212	0.00047	0.00096	0.00002	0.28062	0.00002	0.28056	-76.7	-1.7	0.7	-0.97	3630	3664	3695	3798	3990	3425

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH025-048	3381	31	0	0.01587	0.00001	0.00062	0.00000	0.28043	0.00002	0.28039	-83.4	-7.0	0.8	-0.98	3852	3913	3966	4141	4465	3680
JH025-061	3483	31	0	0.03287	0.00032	0.00123	0.00001	0.28048	0.00002	0.28040	-81.8	-4.4	0.9	-0.96	3848	3890	3930	4064	4311	3673
JH025-064	3479	31	1	0.01265	0.00022	0.00050	0.00001	0.28045	0.00002	0.28041	-83.0	-3.9	0.8	-0.99	3821	3867	3905	4033	4269	3646
JH025-065	3477	31	-1	0.01220	0.00009	0.00049	0.00000	0.28041	0.00002	0.28038	-84.1	-5.2	0.8	-0.99	3865	3917	3960	4105	4373	3695
JH025-080	3388	31	0	0.01560	0.00013	0.00069	0.00001	0.28043	0.00002	0.28039	-83.5	-7.1	0.9	-0.98	3860	3921	3974	4149	4473	3689
JH025-081	3392	31	0	0.01707	0.00003	0.00065	0.00000	0.28039	0.00003	0.28034	-85.1	-8.5	1.0	-0.98	3916	3984	4043	4237	4598	3754
JH025-082	4198	29	6	0.03635	0.00060	0.00121	0.00002	0.27999	0.00003	0.27989	-99.1	-5.3	0.9	-0.96	4502	4536	4570	4681	4887	4421
JH025-086	3388	31	-2	0.00840	0.00004	0.00039	0.00000	0.28045	0.00002	0.28043	-82.7	-5.6	0.8	-0.99	3803	3860	3907	4062	4350	3626
JH025-091	3522	30	-1	0.02896	0.00034	0.00105	0.00001	0.28044	0.00002	0.28037	-83.1	-4.4	0.8	-0.97	3880	3923	3962	4094	4338	3711
JH025-092	3395	31	-1	0.04477	0.00059	0.00158	0.00002	0.28039	0.00003	0.28029	-84.9	-10.4	1.1	-0.95	4003	4065	4132	4352	4760	3849
JH025-094	3377	31	-1	0.01446	0.00011	0.00052	0.00000	0.28064	0.00003	0.28060	-76.3	0.3	1.0	-0.98	3574	3600	3622	3695	3831	3363
JH025-095	3462	31	-1	0.01511	0.00006	0.00058	0.00000	0.28037	0.00002	0.28033	-85.6	-7.2	0.8	-0.98	3928	3990	4042	4215	4536	3768
JH025-101	3394	31	1	0.03496	0.00007	0.00136	0.00000	0.28025	0.00002	0.28016	-89.8	-14.9	0.8	-0.96	4168	4252	4337	4619	5142	4038
JH025-104	3341	31	-2	0.03468	0.00011	0.00132	0.00000	0.28060	0.00002	0.28052	-77.5	-3.6	0.8	-0.96	3696	3735	3774	3904	4145	3498
JH025-105	3387	31	0	0.02990	0.00048	0.00110	0.00002	0.28030	0.00002	0.28022	-88.3	-12.9	0.7	-0.97	4081	4162	4239	4494	4967	3940
JH025-106	3796	30	2	0.04829	0.00014	0.00174	0.00001	0.28024	0.00002	0.28011	-90.2	-7.0	0.8	-0.95	4224	4266	4312	4466	4753	4101
JH025-110	3593	30	-6	0.01243	0.00003	0.00047	0.00000	0.28038	0.00002	0.28035	-85.2	-3.5	0.8	-0.99	3903	3945	3980	4096	4311	3740
JH025-111	3386	31	-1	0.03952	0.00048	0.00143	0.00002	0.28032	0.00002	0.28022	-87.5	-12.9	0.8	-0.96	4088	4163	4240	4496	4970	3947
JH025-119	3393	31	-1	0.01389	0.00013	0.00055	0.00001	0.28029	0.00003	0.28025	-88.7	-11.9	1.2	-0.98	4039	4125	4198	4439	4885	3895
JH025-122	4000	30	-6	0.02125	0.00017	0.00082	0.00001	0.28003	0.00003	0.27996	-97.8	-7.5	1.0	-0.98	4407	4458	4504	4654	4933	4314
JH025-126	4065	29	5	0.02834	0.00051	0.00101	0.00002	0.28003	0.00003	0.27995	-97.8	-6.5	1.1	-0.97	4430	4474	4514	4648	4897	4339
JH025-128	3383	31	-1	0.01705	0.00007	0.00064	0.00000	0.28037	0.00002	0.28033	-85.7	-9.4	0.9	-0.98	3939	4011	4073	4280	4663	3779
JH025-131	4169	29	-2	0.02218	0.00012	0.00082	0.00000	0.28001	0.00002	0.27994	-98.5	-4.1	0.8	-0.98	4431	4464	4493	4590	4770	4341
JH025-133	3493	31	-2	0.03014	0.00026	0.00111	0.00001	0.28037	0.00002	0.28029	-85.8	-8.0	0.9	-0.97	3989	4047	4102	4284	4621	3835

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH025-135	3301	32	-2	0.01815	0.00023	0.00070	0.00001	0.28059	0.00002	0.28054	-78.1	-3.7	0.9	-0.98	3657	3703	3743	3875	4120	3458
JH025-145	3363	31	0	0.01816	0.00021	0.00070	0.00001	0.28036	0.00002	0.28031	-86.2	-10.4	0.9	-0.98	3962	4039	4105	4327	4738	3805
JH025-149	3473	31	1	0.03558	0.00114	0.00127	0.00004	0.28036	0.00002	0.28027	-86.2	-9.2	0.8	-0.96	4019	4080	4140	4339	4709	3868
JH025-150	4032	29	5	0.04613	0.00011	0.00155	0.00000	0.28006	0.00003	0.27993	-96.8	-7.7	1.0	-0.95	4453	4497	4543	4696	4979	4364
JH025-154	3521	31	1	0.02220	0.00010	0.00081	0.00000	0.28046	0.00003	0.28041	-82.4	-3.1	0.9	-0.98	3830	3868	3903	4017	4229	3654
JH025-156	3452	31	-1	0.00687	0.00003	0.00026	0.00000	0.28054	0.00002	0.28053	-79.6	-0.6	0.8	-0.99	3673	3704	3729	3812	3965	3478
JH025-158	3809	30	5	0.03209	0.00029	0.00115	0.00001	0.28023	0.00002	0.28014	-90.7	-5.7	0.8	-0.97	4179	4221	4262	4398	4649	4052
JH025-159	3473	31	-2	0.03009	0.00010	0.00113	0.00000	0.28056	0.00002	0.28049	-78.9	-1.5	0.8	-0.97	3731	3761	3789	3883	4059	3539
JH025-162	3311	31	1	0.01382	0.00005	0.00053	0.00000	0.28057	0.00003	0.28054	-78.6	-3.6	0.9	-0.98	3661	3708	3747	3878	4120	3463
JH025-165	3720	30	7	0.03789	0.00037	0.00138	0.00001	0.28021	0.00002	0.28011	-91.2	-8.9	0.8	-0.96	4223	4278	4333	4516	4856	4102
JH025-168	3860	30	7	0.01999	0.00016	0.00074	0.00001	0.28011	0.00002	0.28006	-94.8	-7.5	0.8	-0.98	4286	4341	4388	4546	4839	4176
JH025-170	3552	30	0	0.02417	0.00014	0.00089	0.00000	0.28039	0.00002	0.28033	-85.1	-5.4	0.8	-0.97	3940	3988	4031	4174	4440	3780
JH025-172	3699	30	5	0.03680	0.00018	0.00134	0.00001	0.28026	0.00002	0.28016	-89.6	-7.6	0.9	-0.96	4158	4208	4258	4425	4735	4027
JH025-176	3432	31	1	0.02146	0.00029	0.00088	0.00001	0.28055	0.00002	0.28049	-79.4	-2.4	0.8	-0.97	3724	3760	3792	3900	4100	3533
JH025-179	3875	30	5	0.01251	0.00020	0.00051	0.00001	0.28022	0.00002	0.28018	-91.0	-2.7	0.7	-0.99	4121	4154	4182	4274	4444	3988
JH025-180	3431	31	1	0.03600	0.00011	0.00128	0.00000	0.28044	0.00002	0.28036	-83.1	-7.1	0.8	-0.96	3904	3957	4008	4181	4501	3736
JH025-181	3381	31	-2	0.03092	0.00008	0.00112	0.00000	0.28027	0.00002	0.28020	-89.2	-14.0	0.8	-0.97	4120	4206	4287	4558	5060	3984
JH025-182	4045	30	-3	0.02882	0.00021	0.00106	0.00001	0.28016	0.00002	0.28007	-93.3	-2.5	0.8	-0.97	4265	4291	4315	4396	4546	4150
JH025-184	3469	31	0	0.02182	0.00038	0.00081	0.00001	0.28041	0.00002	0.28036	-84.2	-6.2	0.9	-0.98	3898	3952	4000	4159	4453	3732
JH025-189	3733	30	5	0.01950	0.00006	0.00073	0.00000	0.28022	0.00003	0.28017	-90.9	-6.5	0.9	-0.98	4139	4191	4237	4387	4666	4008
JH025-190	3743	30	0	0.03471	0.00055	0.00127	0.00002	0.28025	0.00003	0.28015	-90.1	-6.9	1.1	-0.96	4167	4214	4261	4416	4703	4038
JH025-191	4016	30	-2	0.02292	0.00001	0.00084	0.00000	0.28011	0.00002	0.28005	-94.8	-4.1	0.9	-0.98	4298	4334	4365	4469	4662	4189
JH025-194	3312	31	-1	0.01145	0.00007	0.00043	0.00000	0.28053	0.00002	0.28050	-80.1	-4.9	0.8	-0.99	3708	3762	3807	3955	4229	3517
JH025-195	3258	31	5	0.02577	0.00018	0.00099	0.00001	0.28044	0.00002	0.28037	-83.3	-10.7	0.9	-0.97	3884	3959	4029	4259	4687	3715

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH025-199	3492	31	-1	0.02146	0.00029	0.00080	0.00001	0.28027	0.00002	0.28022	-89.2	-10.7	0.8	-0.98	4086	4160	4226	4446	4853	3947
JH025-201	4064	29	3	0.00606	0.00007	0.00028	0.00000	0.28012	0.00003	0.28010	-94.5	-1.1	0.9	-0.99	4227	4250	4268	4329	4442	4110
JH025-207	3382	31	-2	0.02118	0.00016	0.00074	0.00000	0.28051	0.00002	0.28046	-80.9	-4.7	0.8	-0.98	3767	3816	3859	4001	4266	3582
JH025-211	3736	30	9	0.02324	0.00019	0.00087	0.00001	0.28023	0.00002	0.28016	-90.7	-6.7	0.8	-0.97	4149	4200	4246	4398	4680	4018
JH025-212	4004	30	0	0.04760	0.00110	0.00174	0.00004	0.28019	0.00002	0.28005	-92.2	-4.2	0.8	-0.95	4299	4327	4359	4466	4663	4187
JH025-213	3391	31	0	0.02777	0.00020	0.00094	0.00001	0.28046	0.00002	0.28040	-82.4	-6.5	0.8	-0.97	3844	3899	3949	4117	4427	3670
JH025-214	3377	31	1	0.02962	0.00026	0.00107	0.00001	0.28038	0.00002	0.28031	-85.3	-10.0	0.8	-0.97	3965	4034	4099	4315	4716	3808
JH025-219	3400	31	0	0.02285	0.00038	0.00088	0.00001	0.28025	0.00003	0.28019	-90.0	-13.8	1.2	-0.97	4124	4213	4293	4560	5055	3990
JH025-220	3611	30	-2	0.02819	0.00010	0.00095	0.00000	0.28036	0.00002	0.28030	-86.0	-5.0	0.8	-0.97	3980	4025	4065	4202	4454	3825
JH025-222	3404	31	-1	0.01129	0.00026	0.00044	0.00001	0.28049	0.00003	0.28046	-81.4	-4.0	0.9	-0.99	3758	3806	3846	3978	4223	3574
JH025-223	3471	31	0	0.02790	0.00023	0.00103	0.00001	0.28037	0.00003	0.28030	-85.6	-8.1	0.9	-0.97	3975	4034	4090	4275	4619	3818
JH025-231	3295	31	1	0.02393	0.00005	0.00089	0.00000	0.28028	0.00002	0.28023	-88.8	-15.0	0.8	-0.97	4078	4174	4261	4550	5085	3937
JH025-234	3961	30	9	0.01974	0.00002	0.00074	0.00000	0.28007	0.00003	0.28001	-96.3	-6.7	1.0	-0.98	4343	4392	4435	4577	4839	4241
JH025-237	3530	31	0	0.01176	0.00006	0.00049	0.00000	0.28051	0.00002	0.28047	-80.8	-0.6	0.8	-0.99	3740	3769	3792	3870	4016	3554
JH027-002	3397	31	0	0.03198	0.00032	0.00123	0.00001	0.28055	0.00005	0.28047	-79.2	-3.8	1.9	-0.96	3751	3790	3829	3959	4199	3561
JH027-007	3389	31	1	0.05961	0.00023	0.00211	0.00001	0.28046	0.00005	0.28032	-82.6	-9.5	1.9	-0.94	3970	4021	4083	4291	4675	3808
JH027-009	3538	31	-1	0.02440	0.00018	0.00088	0.00001	0.28045	0.00008	0.28039	-83.0	-3.6	2.7	-0.97	3861	3901	3937	4056	4278	3690
JH027-013	3657	30	3	0.01800	0.00015	0.00067	0.00000	0.28047	0.00003	0.28042	-82.3	0.5	1.1	-0.98	3813	3833	3850	3908	4015	3635
JH027-015	3402	31	1	0.04295	0.00059	0.00158	0.00002	0.28054	0.00003	0.28043	-79.8	-5.1	1.1	-0.95	3808	3850	3894	4041	4314	3625
JH027-025	3400	31	1	0.02968	0.00065	0.00109	0.00002	0.28033	0.00006	0.28026	-87.2	-11.5	2.2	-0.97	4038	4113	4184	4418	4853	3891
JH027-029	4121	30	4	0.02955	0.00019	0.00109	0.00001	0.28021	0.00006	0.28012	-91.3	1.2	2.0	-0.97	4194	4202	4210	4237	4286	4069
JH027-031	3403	31	-1	0.02632	0.00019	0.00094	0.00001	0.28057	0.00004	0.28051	-78.5	-2.2	1.4	-0.97	3695	3731	3763	3871	4071	3500
JH027-032	3505	31	1	0.01994	0.00016	0.00072	0.00001	0.28058	0.00005	0.28053	-78.3	0.8	1.9	-0.98	3669	3690	3708	3769	3882	3471
JH027-034	3538	31	1	0.02428	0.00043	0.00093	0.00001	0.28047	0.00004	0.28040	-82.3	-3.0	1.3	-0.97	3839	3876	3909	4020	4226	3664

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH027-036	3368	31	0	0.03925	0.00095	0.00144	0.00003	0.28050	0.00005	0.28040	-81.1	-6.9	1.6	-0.96	3846	3897	3950	4124	4446	3670
JH027-037	3416	31	-1	0.01460	0.00003	0.00059	0.00000	0.28042	0.00003	0.28038	-84.0	-6.7	1.2	-0.98	3868	3928	3979	4147	4459	3699
JH027-038	3381	31	-1	0.02447	0.00041	0.00090	0.00001	0.28027	0.00004	0.28021	-89.3	-13.6	1.6	-0.97	4098	4186	4266	4530	5021	3960
JH027-045	3404	31	0	0.03091	0.00013	0.00124	0.00000	0.28057	0.00004	0.28049	-78.7	-3.2	1.4	-0.96	3733	3770	3806	3927	4150	3541
JH027-061	3890	30	4	0.04653	0.00034	0.00158	0.00001	0.28033	0.00007	0.28021	-87.3	-1.4	2.4	-0.95	4094	4115	4137	4211	4348	3953
JH027-067	3521	31	0	0.01678	0.00011	0.00062	0.00000	0.28060	0.00004	0.28056	-77.5	2.2	1.4	-0.98	3630	3644	3656	3697	3772	3426
JH027-074	3399	31	0	0.02026	0.00011	0.00072	0.00000	0.28043	0.00003	0.28038	-83.7	-7.2	1.0	-0.98	3873	3933	3986	4162	4487	3703
JH027-078	4154	29	1	0.03877	0.00023	0.00133	0.00001	0.27999	0.00002	0.27989	-99.0	-6.5	0.8	-0.96	4511	4550	4589	4720	4961	4431
JH027-090	4250	29	-1	0.00986	0.00013	0.00041	0.00000	0.28010	0.00002	0.28007	-95.2	2.3	0.7	-0.99	4268	4270	4272	4279	4291	4156
JH027-091	3398	31	1	0.01747	0.00026	0.00063	0.00001	0.28033	0.00004	0.28029	-87.0	-10.3	1.4	-0.98	3987	4064	4129	4348	4753	3834
JH027-095	3742	30	3	0.04553	0.00051	0.00157	0.00001	0.28030	0.00009	0.28019	-88.0	-5.6	3.1	-0.95	4122	4161	4203	4340	4596	3985
JH027-110	3964	29	3	0.01174	0.00052	0.00042	0.00002	0.28024	0.00005	0.28021	-90.2	0.5	1.9	-0.99	4081	4097	4110	4154	4235	3943
JH027-124	3473	31	1	0.01951	0.00008	0.00076	0.00000	0.28053	0.00006	0.28048	-80.1	-1.9	2.0	-0.98	3741	3775	3804	3904	4088	3552
JH027-134	3875	30	4	0.04664	0.00027	0.00161	0.00001	0.28036	0.00003	0.28024	-86.1	-0.7	1.2	-0.95	4054	4072	4092	4157	4277	3907
JH027-138	4018	29	7	0.03486	0.00036	0.00128	0.00001	0.28015	0.00006	0.28005	-93.4	-3.8	2.1	-0.96	4293	4324	4354	4454	4640	4182
JH027-139	4170	29	6	0.04535	0.00044	0.00161	0.00001	0.28018	0.00004	0.28005	-92.5	-0.3	1.5	-0.95	4296	4309	4323	4368	4453	4184
JH027-165	3560	30	5	0.02428	0.00035	0.00087	0.00001	0.28046	0.00006	0.28040	-82.6	-2.6	2.1	-0.97	3844	3879	3910	4015	4209	3670
JH027-166	3625	30	2	0.01693	0.00006	0.00060	0.00000	0.28042	0.00004	0.28038	-83.8	-1.6	1.3	-0.98	3863	3894	3920	4009	4172	3693
JH027-167	3894	30	5	0.01971	0.00048	0.00075	0.00002	0.28024	0.00005	0.28019	-90.2	-2.1	1.8	-0.98	4116	4144	4169	4251	4403	3981
JH027-169	4156	29	2	0.02881	0.00068	0.00106	0.00003	0.28012	0.00003	0.28004	-94.5	-1.1	1.2	-0.97	4309	4327	4344	4400	4505	4201
JH027-171	3748	30	-3	0.02767	0.00054	0.00099	0.00002	0.28042	0.00007	0.28035	-84.0	0.1	2.4	-0.97	3909	3928	3946	4006	4116	3744
JH027-172	3403	31	0	0.03463	0.00062	0.00128	0.00002	0.28057	0.00005	0.28048	-78.8	-3.4	1.9	-0.96	3740	3778	3815	3938	4167	3549
JH027-185	3604	30	-3	0.01311	0.00027	0.00056	0.00001	0.28038	0.00004	0.28034	-85.4	-3.6	1.5	-0.98	3917	3959	3994	4111	4327	3755

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH027-189	3891	30	9	0.04523	0.00032	0.00170	0.00001	0.28041	0.00006	0.28028	-84.3	1.2	2.1	-0.95	3996	4006	4018	4056	4126	3840
JH027-196	4127	29	5	0.03891	0.00033	0.00137	0.00001	0.28023	0.00006	0.28012	-90.6	1.3	2.0	-0.96	4198	4206	4213	4239	4288	4073
JH027-198	4097	29	1	0.01732	0.00023	0.00062	0.00001	0.28007	0.00002	0.28002	-96.5	-3.2	0.9	-0.98	4334	4366	4392	4480	4644	4231
JH027-200	3651	30	3	0.02159	0.00004	0.00081	0.00000	0.28036	0.00003	0.28030	-86.1	-3.8	1.2	-0.98	3969	4009	4044	4162	4380	3813
JH031-001	3414	31	0	0.01542	0.00003	0.00042	0.00000	0.28055	0.00004	0.28053	-79.2	-1.5	1.4	-0.99	3674	3710	3739	3837	4017	3479
JH031-011	3384	31	1	0.02668	0.00051	0.00067	0.00001	0.28026	0.00003	0.28021	-89.6	-13.3	1.1	-0.98	4088	4179	4257	4518	5003	3949
JH031-012	4072	29	4	0.02976	0.00025	0.00075	0.00001	0.28016	0.00003	0.28010	-93.1	-0.8	1.1	-0.98	4224	4243	4260	4316	4419	4104
JH031-017	4117	29	0	0.02545	0.00065	0.00060	0.00002	0.28005	0.00004	0.28001	-96.8	-3.1	1.5	-0.98	4347	4378	4403	4489	4648	4246
JH031-020	3421	31	0	0.01506	0.00004	0.00040	0.00000	0.28020	0.00004	0.28018	-91.6	-13.8	1.3	-0.99	4131	4229	4309	4574	5066	4000
JH031-021	4062	30	-1	0.02461	0.00013	0.00063	0.00000	0.28005	0.00003	0.28000	-97.1	-4.7	1.1	-0.98	4359	4398	4431	4541	4746	4259
JH031-025	3310	31	1	0.06195	0.00073	0.00170	0.00002	0.28050	0.00004	0.28039	-81.1	-8.8	1.5	-0.95	3870	3925	3986	4188	4563	3695
JH031-029	4147	29	0	0.06399	0.00075	0.00165	0.00002	0.28000	0.00004	0.27986	-98.9	-7.4	1.5	-0.95	4543	4583	4626	4769	5034	4467
JH031-033	3809	30	7	0.06751	0.00040	0.00157	0.00001	0.28018	0.00003	0.28006	-92.4	-8.5	1.1	-0.95	4288	4338	4390	4564	4886	4176
JH031-043	3564	30	0	0.01272	0.00018	0.00035	0.00000	0.28034	0.00003	0.28031	-86.9	-5.6	1.1	-0.99	3953	4007	4051	4196	4466	3797
JH031-052	3465	30	-2	0.01666	0.00048	0.00050	0.00001	0.28036	0.00004	0.28032	-86.2	-7.5	1.6	-0.99	3941	4005	4059	4236	4566	3783
JH031-061	4037	29	0	0.04658	0.00032	0.00116	0.00001	0.28000	0.00003	0.27991	-98.6	-8.4	1.2	-0.97	4477	4527	4576	4737	5036	4392
JH031-066	3902	29	4	0.08254	0.00148	0.00199	0.00003	0.28010	0.00003	0.27995	-95.1	-10.2	1.2	-0.94	4440	4489	4547	4740	5097	4348
JH031-068	3474	31	-1	0.03706	0.00027	0.00091	0.00001	0.28034	0.00004	0.28027	-86.9	-9.0	1.3	-0.97	4010	4076	4135	4333	4700	3860
JH031-072	4000	29	2	0.02180	0.00007	0.00055	0.00000	0.28004	0.00003	0.28000	-97.4	-6.3	1.2	-0.98	4362	4411	4451	4586	4837	4263
JH031-073	3394	31	0	0.04365	0.00048	0.00104	0.00001	0.28018	0.00003	0.28011	-92.3	-16.6	1.0	-0.97	4226	4325	4417	4723	5290	4106
JH031-075	3477	31	-1	0.06426	0.00033	0.00156	0.00001	0.28034	0.00003	0.28024	-86.7	-10.3	1.1	-0.95	4070	4131	4196	4411	4809	3925
JH031-083	3762	30	8	0.06574	0.00072	0.00163	0.00002	0.28031	0.00004	0.28020	-87.7	-4.9	1.4	-0.95	4114	4150	4188	4316	4552	3976
JH031-092	3569	30	1	0.01696	0.00010	0.00047	0.00000	0.28031	0.00003	0.28028	-87.9	-6.7	1.2	-0.99	4001	4060	4109	4270	4569	3852
JH031-103	3828	30	6	0.01710	0.00008	0.00042	0.00000	0.28009	0.00002	0.28006	-95.4	-8.1	0.8	-0.99	4275	4337	4387	4554	4864	4164

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH031-111	4034	30	-2	0.03117	0.00041	0.00081	0.00001	0.28003	0.00004	0.27997	-97.8	-6.6	1.5	-0.98	4404	4450	4491	4628	4882	4310
JH031-112	3548	30	1	0.02501	0.00024	0.00064	0.00001	0.28040	0.00004	0.28036	-84.6	-4.3	1.3	-0.98	3895	3941	3979	4109	4348	3730
JH031-131	3399	31	1	0.02071	0.00025	0.00057	0.00001	0.28032	0.00003	0.28028	-87.6	-10.7	1.0	-0.98	4001	4081	4149	4373	4788	3851
JH031-141	3401	31	1	0.03725	0.00005	0.00090	0.00000	0.28040	0.00003	0.28034	-84.7	-8.5	1.1	-0.97	3927	3991	4050	4244	4603	3765
JH031-146	3862	30	6	0.04184	0.00016	0.00108	0.00001	0.28019	0.00003	0.28011	-92.0	-5.6	1.0	-0.97	4221	4264	4303	4435	4680	4101
JH031-151	4104	30	-5	0.00731	0.00004	0.00019	0.00000	0.28010	0.00003	0.28009	-95.1	-0.4	0.9	-0.99	4237	4257	4272	4322	4415	4122
JH031-199	3755	30	4	0.03451	0.00042	0.00090	0.00001	0.28013	0.00003	0.28007	-94.0	-9.6	1.2	-0.97	4275	4339	4397	4589	4945	4163
JH031-213	3537	30	5	0.01719	0.00033	0.00043	0.00001	0.28034	0.00003	0.28031	-86.9	-6.4	1.0	-0.99	3960	4018	4065	4223	4516	3804
JH031-225	3554	30	5	0.04316	0.00107	0.00109	0.00003	0.28039	0.00004	0.28032	-84.9	-5.6	1.4	-0.97	3953	3999	4043	4189	4461	3793
JH031-229	3548	30	3	0.03337	0.00041	0.00088	0.00001	0.28045	0.00004	0.28039	-82.8	-3.1	1.4	-0.97	3855	3892	3926	4039	4249	3682
JH033-015	3346	31	0	0.01844	0.00007	0.00047	0.00000	0.28046	0.00004	0.28043	-82.6	-6.7	1.3	-0.99	3806	3869	3921	4093	4412	3629
JH033-037	3362	31	0	0.03666	0.00009	0.00096	0.00000	0.28036	0.00002	0.28030	-86.0	-10.9	0.9	-0.97	3982	4057	4125	4354	4777	3827
JH033-038	3205	31	3	0.11621	0.00043	0.00263	0.00001	0.28047	0.00004	0.28031	-82.0	-14.2	1.5	-0.92	4005	4062	4146	4428	4949	3845
JH033-041	3724	30	-1	0.05512	0.00115	0.00131	0.00002	0.28013	0.00003	0.28003	-94.3	-11.7	1.1	-0.96	4332	4399	4465	4687	5099	4226
JH033-042	3766	30	1	0.06662	0.00046	0.00159	0.00001	0.28009	0.00003	0.27998	-95.5	-12.7	1.1	-0.95	4410	4476	4546	4779	5211	4315
JH033-043	3886	29	5	0.07214	0.00116	0.00163	0.00002	0.28017	0.00003	0.28005	-92.7	-7.2	1.0	-0.95	4309	4351	4397	4550	4834	4198
JH033-044	3886	29	2	0.08832	0.00041	0.00207	0.00001	0.28017	0.00003	0.28001	-92.8	-8.5	1.0	-0.94	4362	4404	4455	4625	4941	4258
JH033-045	3283	31	3	0.02268	0.00017	0.00056	0.00000	0.28048	0.00003	0.28044	-81.9	-7.6	1.2	-0.98	3787	3854	3911	4098	4446	3607
JH033-051	3842	29	2	0.08191	0.00052	0.00193	0.00001	0.28014	0.00003	0.28000	-93.9	-10.2	1.0	-0.94	4385	4435	4494	4689	5050	4285
JH033-066	3484	30	1	0.04919	0.00042	0.00121	0.00001	0.28031	0.00003	0.28023	-87.8	-10.4	1.0	-0.96	4075	4142	4207	4423	4823	3932
JH033-071	3519	30	3	0.03718	0.00027	0.00099	0.00001	0.28033	0.00003	0.28027	-87.0	-8.3	1.2	-0.97	4021	4081	4137	4322	4664	3872
JH033-079	3937	29	5	0.02353	0.00050	0.00058	0.00001	0.28003	0.00004	0.27999	-97.7	-8.2	1.3	-0.98	4377	4435	4485	4648	4952	4280
JH033-080	4027	29	6	0.04042	0.00074	0.00104	0.00001	0.28004	0.00003	0.27996	-97.3	-6.9	1.2	-0.97	4413	4458	4501	4643	4906	4319
JH033-082	4005	29	0	0.01569	0.00019	0.00042	0.00000	0.28015	0.00002	0.28011	-93.6	-2.0	0.9	-0.99	4208	4236	4258	4334	4475	4087

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH033-090	3981	30	5	0.01225	0.00010	0.00029	0.00000	0.28012	0.00004	0.28009	-94.7	-3.3	1.3	-0.99	4233	4269	4297	4392	4567	4117
JH033-097	3480	31	-1	0.04602	0.00036	0.00114	0.00001	0.28023	0.00004	0.28015	-90.7	-13.3	1.2	-0.97	4177	4258	4335	4590	5064	4050
JH033-104	3438	31	1	0.03347	0.00031	0.00084	0.00001	0.28035	0.00003	0.28029	-86.5	-9.3	1.2	-0.98	3988	4056	4117	4320	4697	3834
JH033-125	3792	30	5	0.02182	0.00026	0.00056	0.00001	0.28030	0.00003	0.28026	-88.3	-2.1	0.9	-0.98	4025	4056	4082	4169	4330	3879
JH033-128	3605	30	5	0.07456	0.00074	0.00179	0.00003	0.28035	0.00004	0.28022	-86.4	-7.7	1.3	-0.95	4084	4130	4181	4354	4673	3940
JH033-142	3871	30	8	0.07871	0.00042	0.00179	0.00001	0.28017	0.00003	0.28003	-92.8	-8.1	1.0	-0.95	4330	4374	4424	4589	4896	4222
JH033-150	3270	31	5	0.04138	0.00011	0.00102	0.00000	0.28061	0.00003	0.28055	-77.1	-4.1	1.1	-0.97	3650	3696	3738	3878	4137	3448
JH033-164	3403	31	0	0.02227	0.00007	0.00058	0.00000	0.28037	0.00003	0.28033	-85.7	-8.7	1.0	-0.98	3930	4000	4059	4255	4619	3770
JH033-167	3418	31	0	0.04336	0.00016	0.00123	0.00000	0.28051	0.00004	0.28042	-80.9	-5.0	1.3	-0.96	3816	3861	3904	4050	4320	3636
JH033-168	4023	29	2	0.11304	0.00156	0.00260	0.00003	0.28010	0.00004	0.27990	-95.2	-9.2	1.4	-0.92	4515	4551	4603	4776	5098	4433
JH033-172	3482	30	-1	0.05003	0.00042	0.00120	0.00001	0.28029	0.00003	0.28021	-88.5	-11.1	1.1	-0.96	4099	4170	4238	4464	4882	3961
JH033-176	4113	29	7	0.02127	0.00020	0.00056	0.00000	0.27995	0.00003	0.27990	-100.6	-6.9	1.1	-0.98	4482	4531	4573	4710	4964	4400
JH033-179	3370	31	0	0.05404	0.00019	0.00140	0.00001	0.28036	0.00003	0.28027	-86.0	-11.7	1.2	-0.96	4026	4097	4169	4408	4851	3876
JH033-186	3843	29	6	0.08617	0.00038	0.00204	0.00001	0.28018	0.00003	0.28002	-92.6	-9.1	1.1	-0.94	4347	4392	4446	4627	4961	4241
JH033-188	3389	31	-1	0.03218	0.00035	0.00083	0.00002	0.28028	0.00004	0.28023	-88.8	-12.7	1.3	-0.98	4072	4158	4234	4486	4955	3931
JH033-189	3374	31	0	0.02204	0.00059	0.00057	0.00001	0.28034	0.00003	0.28030	-86.8	-10.5	0.9	-0.98	3972	4051	4117	4340	4752	3817
JH033-198	3688	30	-2	0.03816	0.00019	0.00092	0.00000	0.28019	0.00003	0.28012	-92.2	-9.4	1.2	-0.97	4209	4273	4331	4523	4879	4087
JH033-201	4032	29	3	0.06394	0.00018	0.00164	0.00000	0.28014	0.00003	0.28001	-93.7	-4.8	1.1	-0.95	4346	4378	4412	4526	4736	4242
JH033-202	3481	30	0	0.04948	0.00010	0.00123	0.00000	0.28029	0.00003	0.28021	-88.5	-11.3	0.9	-0.96	4104	4174	4243	4471	4893	3966
JH033-212	3429	31	-1	0.01837	0.00030	0.00044	0.00001	0.28028	0.00003	0.28025	-88.9	-11.0	1.0	-0.99	4038	4121	4189	4416	4837	3893
JH033-214	3366	31	1	0.04250	0.00043	0.00114	0.00001	0.28035	0.00003	0.28028	-86.3	-11.5	1.1	-0.97	4012	4087	4158	4394	4833	3861
JH037-001	3398	31	0	0.04885	0.00044	0.00188	0.00002	0.28040	0.00002	0.28027	-84.7	-10.9	0.6	-0.94	4028	4086	4154	4381	4800	3875
JH037-005	3592	30	1	0.01427	0.00016	0.00055	0.00001	0.28043	0.00002	0.28039	-83.7	-2.1	0.6	-0.98	3852	3887	3916	4013	4193	3681
JH037-023	3405	31	1	0.03777	0.00057	0.00148	0.00002	0.28034	0.00002	0.28024	-86.7	-11.8	0.8	-0.96	4062	4131	4203	4441	4884	3916

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH037-029	3762	30	1	0.01264	0.00021	0.00052	0.00001	0.28002	0.00002	0.27998	-98.0	-12.5	0.6	-0.98	4380	4463	4532	4763	5190	4284
JH037-030	3843	30	9	0.04184	0.00016	0.00177	0.00001	0.28010	0.00002	0.27997	-95.3	-11.2	0.7	-0.95	4423	4479	4541	4750	5137	4328
JH037-035	3497	31	-1	0.02756	0.00038	0.00102	0.00001	0.28030	0.00002	0.28024	-88.0	-9.9	0.7	-0.97	4062	4130	4192	4400	4785	3919
JH037-042	3478	31	0	0.01188	0.00008	0.00048	0.00001	0.28049	0.00002	0.28046	-81.3	-2.2	0.7	-0.99	3757	3794	3825	3929	4122	3572
JH037-043	4144	29	8	0.03512	0.00078	0.00122	0.00003	0.27997	0.00002	0.27987	-100.0	-7.4	0.7	-0.96	4533	4577	4620	4762	5026	4456
JH037-058	3389	31	-1	0.03859	0.00025	0.00142	0.00001	0.28029	0.00002	0.28020	-88.5	-13.8	0.7	-0.96	4124	4202	4283	4550	5046	3987
JH037-062	3382	31	1	0.03480	0.00096	0.00126	0.00004	0.28035	0.00002	0.28026	-86.5	-11.6	0.7	-0.96	4032	4104	4176	4413	4853	3883
JH037-065	3979	29	3	0.01505	0.00031	0.00060	0.00001	0.28013	0.00002	0.28009	-94.1	-3.6	0.9	-0.98	4245	4280	4310	4409	4593	4130
JH037-069	3353	31	-2	0.02259	0.00012	0.00087	0.00000	0.28035	0.00002	0.28029	-86.6	-11.4	0.8	-0.97	3994	4073	4144	4380	4819	3841
JH037-083	3411	30	1	0.04988	0.00034	0.00207	0.00002	0.28043	0.00002	0.28030	-83.5	-9.8	0.9	-0.94	4000	4052	4116	4326	4717	3843
JH037-088	3601	30	-1	0.01363	0.00017	0.00052	0.00001	0.28038	0.00002	0.28035	-85.2	-3.3	0.7	-0.98	3906	3947	3981	4094	4305	3743
JH037-109	4013	29	2	0.01189	0.00034	0.00043	0.00001	0.28008	0.00003	0.28005	-96.0	-4.2	0.9	-0.99	4297	4335	4367	4473	4670	4189
JH037-112	4007	29	0	0.02687	0.00028	0.00099	0.00001	0.28007	0.00002	0.28000	-96.1	-6.1	0.9	-0.97	4364	4407	4447	4578	4822	4264
JH037-131	3791	29	8	0.05224	0.00035	0.00186	0.00001	0.28023	0.00002	0.28010	-90.5	-7.7	0.8	-0.94	4248	4291	4341	4505	4809	4128
JH037-133	3774	30	6	0.03027	0.00150	0.00114	0.00005	0.28013	0.00003	0.28005	-94.2	-9.9	1.0	-0.97	4307	4368	4427	4622	4984	4198
JH037-135	3800	29	5	0.06156	0.00079	0.00213	0.00002	0.28023	0.00002	0.28007	-90.7	-8.4	0.7	-0.94	4285	4327	4379	4552	4872	4170
JH037-142	3728	30	7	0.02908	0.00052	0.00107	0.00002	0.28021	0.00002	0.28013	-91.3	-8.0	0.7	-0.97	4193	4247	4298	4469	4785	4068
JH037-148	3754	30	-5	0.02706	0.00114	0.00095	0.00003	0.28017	0.00002	0.28010	-92.6	-8.4	0.7	-0.97	4229	4287	4339	4514	4839	4110
JH037-151	3822	30	0	0.01295	0.00014	0.00045	0.00000	0.28016	0.00002	0.28013	-93.0	-5.8	0.9	-0.99	4188	4237	4278	4415	4668	4064
JH037-157	3746	30	-3	0.01862	0.00024	0.00066	0.00001	0.28020	0.00002	0.28015	-91.8	-7.0	0.7	-0.98	4168	4222	4270	4426	4717	4041
JH037-170	3497	30	1	0.01092	0.00052	0.00044	0.00002	0.28032	0.00002	0.28029	-87.5	-7.9	0.8	-0.99	3983	4049	4104	4285	4622	3830
JH037-174	3374	31	-1	0.01592	0.00017	0.00059	0.00000	0.28029	0.00002	0.28025	-88.4	-12.2	0.8	-0.98	4035	4122	4196	4441	4897	3889
JH037-175	3743	30	7	0.04771	0.00051	0.00161	0.00002	0.27998	0.00002	0.27986	-99.5	-17.3	0.8	-0.95	4562	4645	4734	5031	5581	4489
JH037-216	3378	31	-1	0.02019	0.00047	0.00080	0.00002	0.28039	0.00002	0.28034	-84.9	-9.0	0.6	-0.98	3925	3994	4055	4257	4633	3763

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH037-217	4039	29	1	0.02669	0.00037	0.00102	0.00001	0.28018	0.00002	0.28010	-92.6	-1.8	0.7	-0.97	4234	4257	4279	4351	4484	4115
JH037-225	3753	30	-2	0.02300	0.00032	0.00085	0.00001	0.28019	0.00002	0.28012	-92.2	-7.7	0.7	-0.97	4201	4256	4306	4472	4778	4078
JH037-229	3371	31	0	0.02628	0.00070	0.00092	0.00002	0.28045	0.00002	0.28039	-82.9	-7.4	0.6	-0.97	3860	3920	3974	4155	4490	3689
JH037-233	3611	30	0	0.02088	0.00015	0.00079	0.00001	0.28035	0.00002	0.28030	-86.2	-4.9	0.7	-0.98	3973	4019	4059	4193	4441	3818
JH037-237	3367	31	1	0.01995	0.00025	0.00082	0.00001	0.28043	0.00002	0.28037	-83.6	-8.0	0.6	-0.98	3878	3942	3999	4188	4539	3710
JH038-021	3817	30	-1	0.02097	0.00008	0.00085	0.00000	0.28032	0.00002	0.28025	-87.6	-1.5	0.7	-0.97	4029	4055	4079	4158	4303	3882
JH038-028	3498	31	1	0.01996	0.00013	0.00071	0.00001	0.28044	0.00003	0.28039	-83.2	-4.3	1.1	-0.98	3853	3899	3938	4070	4314	3681
JH038-033	3414	31	1	0.02144	0.00021	0.00088	0.00001	0.28050	0.00004	0.28044	-81.0	-4.4	1.3	-0.97	3786	3832	3873	4010	4265	3604
JH038-047	3814	30	5	0.02789	0.00058	0.00090	0.00001	0.28019	0.00003	0.28012	-92.0	-6.2	1.2	-0.97	4200	4247	4290	4432	4696	4077
JH038-052	4102	29	3	0.01868	0.00044	0.00068	0.00001	0.28010	0.00005	0.28005	-95.1	-1.9	1.7	-0.98	4291	4315	4336	4406	4536	4181
JH038-069	3673	30	-1	0.04585	0.00068	0.00155	0.00002	0.28042	0.00006	0.28031	-83.9	-3.0	2.1	-0.95	3964	3994	4026	4132	4328	3804
JH038-074	3844	29	1	0.06265	0.00045	0.00207	0.00002	0.28035	0.00004	0.28020	-86.4	-2.9	1.3	-0.94	4112	4136	4165	4261	4439	3971
JH038-075	4032	29	7	0.04951	0.00043	0.00172	0.00001	0.28018	0.00005	0.28005	-92.4	-3.8	1.6	-0.95	4306	4333	4362	4461	4644	4195
JH038-096	3587	30	-2	0.01258	0.00012	0.00046	0.00000	0.28051	0.00005	0.28048	-80.7	1.0	1.6	-0.99	3733	3753	3769	3824	3925	3545
JH038-098	3448	30	2	0.03462	0.00046	0.00124	0.00002	0.28035	0.00003	0.28027	-86.5	-10.0	1.1	-0.96	4027	4093	4156	4368	4762	3878
JH038-099	4112	29	3	0.01377	0.00007	0.00051	0.00000	0.28016	0.00003	0.28011	-93.3	0.7	1.1	-0.98	4205	4217	4228	4262	4326	4084
JH038-112	3507	30	1	0.02251	0.00024	0.00078	0.00001	0.28045	0.00003	0.28040	-82.8	-3.8	1.2	-0.98	3844	3886	3923	4048	4279	3670
JH038-116	4210	29	-9	0.09335	0.00056	0.00321	0.00001	0.28036	0.00006	0.28010	-86.1	2.4	2.1	-0.91	4229	4230	4232	4238	4250	4101
JH038-127	3458	30	1	0.02875	0.00055	0.00105	0.00002	0.28029	0.00003	0.28022	-88.7	-11.5	1.2	-0.97	4091	4166	4236	4469	4900	3951
JH038-135	3511	30	-2	0.01676	0.00016	0.00061	0.00001	0.28055	0.00004	0.28051	-79.4	0.1	1.4	-0.98	3699	3724	3745	3815	3945	3506
JH038-166	3632	30	-1	0.02869	0.00020	0.00105	0.00000	0.28043	0.00003	0.28036	-83.5	-2.3	1.0	-0.97	3897	3928	3957	4055	4235	3729
JH038-189	3772	30	5	0.02785	0.00005	0.00093	0.00000	0.28028	0.00004	0.28022	-88.7	-4.0	1.3	-0.97	4081	4118	4152	4266	4477	3940
JH042-002	3444	32	-1	0.00638	0.00003	0.00019	0.00000	0.28047	0.00004	0.28046	-82.2	-3.3	1.4	-0.99	3762	3808	3844	3964	4186	3580
JH042-014	4118	30	1	0.01806	0.00017	0.00045	0.00000	0.28001	0.00004	0.27998	-98.3	-4.1	1.3	-0.99	4385	4421	4451	4550	4735	4289

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH042-022	3393	31	0	0.03847	0.00005	0.00098	0.00000	0.28031	0.00003	0.28024	-87.9	-12.1	1.2	-0.97	4054	4134	4207	4451	4902	3910
JH042-049	3403	31	-1	0.03367	0.00010	0.00088	0.00000	0.28035	0.00004	0.28029	-86.3	-10.0	1.2	-0.97	3985	4057	4121	4336	4735	3831
JH042-058	3363	31	1	0.02558	0.00018	0.00065	0.00000	0.28057	0.00004	0.28053	-78.5	-2.6	1.5	-0.98	3669	3709	3743	3857	4068	3471
JH042-061	3406	31	0	0.03942	0.00012	0.00109	0.00000	0.28024	0.00004	0.28017	-90.3	-14.5	1.4	-0.97	4157	4245	4328	4603	5114	4027
JH042-063	4104	30	5	0.05346	0.00082	0.00129	0.00002	0.28012	0.00004	0.28002	-94.4	-2.9	1.3	-0.96	4333	4358	4384	4467	4622	4227
JH042-066	4078	30	9	0.03771	0.00019	0.00086	0.00001	0.27995	0.00004	0.27989	-100.4	-8.3	1.3	-0.97	4507	4561	4608	4767	5061	4428
JH042-073	3401	31	-1	0.03433	0.00028	0.00085	0.00001	0.28030	0.00003	0.28024	-88.2	-11.9	1.1	-0.97	4051	4131	4204	4444	4889	3906
JH042-078	4060	30	-5	0.03089	0.00017	0.00083	0.00000	0.27994	0.00004	0.27988	-100.7	-9.0	1.3	-0.98	4517	4574	4625	4794	5107	4439
JH042-079	3438	31	0	0.01881	0.00013	0.00050	0.00000	0.28049	0.00003	0.28046	-81.4	-3.4	1.1	-0.99	3765	3809	3845	3967	4193	3581
JH042-085	3394	31	1	0.04987	0.00057	0.00129	0.00001	0.28032	0.00004	0.28024	-87.3	-12.2	1.4	-0.96	4065	4139	4213	4458	4912	3920
JH042-086	3382	31	0	0.03547	0.00006	0.00088	0.00000	0.28029	0.00003	0.28023	-88.6	-12.8	1.1	-0.97	4070	4155	4231	4485	4956	3928
JH042-092	4072	30	6	0.03876	0.00037	0.00093	0.00001	0.28001	0.00003	0.27994	-98.4	-6.7	1.2	-0.97	4443	4488	4529	4666	4920	4354
JH042-113	3717	30	1	0.03580	0.00026	0.00081	0.00001	0.28029	0.00003	0.28023	-88.6	-4.8	1.2	-0.98	4062	4105	4143	4271	4507	3919
JH042-115	3725	30	6	0.01791	0.00047	0.00037	0.00001	0.28025	0.00003	0.28022	-90.1	-5.0	1.1	-0.99	4073	4121	4160	4290	4530	3933
JH042-118	3491	31	-1	0.02764	0.00024	0.00070	0.00001	0.28045	0.00003	0.28040	-83.0	-4.2	1.2	-0.98	3844	3889	3928	4059	4302	3670
JH042-120	3357	31	0	0.03029	0.00012	0.00076	0.00000	0.28063	0.00004	0.28058	-76.4	-0.8	1.3	-0.98	3601	3632	3659	3750	3917	3393
JH042-122	3691	30	4	0.02825	0.00009	0.00068	0.00000	0.28025	0.00004	0.28020	-90.0	-6.5	1.3	-0.98	4101	4154	4199	4351	4633	3964
JH042-124	4028	29	0	0.02857	0.00076	0.00070	0.00002	0.28011	0.00003	0.28006	-94.7	-3.3	1.2	-0.98	4279	4311	4339	4432	4605	4168
JH042-127	3402	31	0	0.07133	0.00078	0.00178	0.00002	0.28041	0.00004	0.28029	-84.3	-10.1	1.4	-0.95	4001	4059	4124	4340	4740	3845
JH042-137	3373	31	-2	0.05639	0.00057	0.00148	0.00001	0.28040	0.00004	0.28031	-84.4	-10.2	1.5	-0.96	3976	4040	4106	4325	4731	3818
JH042-138	3461	31	1	0.03193	0.00018	0.00077	0.00000	0.28047	0.00004	0.28042	-82.1	-4.2	1.3	-0.98	3817	3863	3902	4034	4279	3640
JH042-143	3600	30	-3	0.04622	0.00012	0.00110	0.00000	0.28027	0.00004	0.28020	-89.1	-8.8	1.4	-0.97	4113	4173	4230	4418	4768	3977
JH042-145	3502	31	-1	0.01501	0.00004	0.00043	0.00000	0.28037	0.00003	0.28034	-85.6	-5.9	1.2	-0.99	3913	3970	4016	4169	4454	3751
JH042-146	3419	31	0	0.04107	0.00014	0.00119	0.00000	0.28047	0.00004	0.28039	-82.3	-6.3	1.5	-0.96	3865	3916	3965	4129	4431	3693

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH042-149	3733	30	-6	0.03111	0.00071	0.00077	0.00001	0.28007	0.00004	0.28001	-96.4	-12.2	1.5	-0.98	4351	4429	4498	4727	5151	4250
JH042-152	3418	31	0	0.03321	0.00058	0.00080	0.00001	0.28035	0.00003	0.28029	-86.5	-9.7	1.1	-0.98	3985	4056	4119	4329	4718	3831
JH042-153	3453	31	0	0.02553	0.00036	0.00064	0.00001	0.28048	0.00004	0.28044	-81.6	-3.6	1.3	-0.98	3786	3830	3867	3991	4221	3605
JH042-162	3545	30	0	0.02917	0.00026	0.00079	0.00001	0.28052	0.00004	0.28047	-80.4	-0.5	1.3	-0.98	3752	3779	3802	3878	4021	3566
JH042-165	3392	31	1	0.03003	0.00033	0.00076	0.00001	0.28039	0.00004	0.28034	-85.0	-8.7	1.3	-0.98	3923	3991	4050	4247	4612	3761
JH042-166	4151	29	-1	0.03111	0.00025	0.00084	0.00000	0.28003	0.00003	0.27996	-97.6	-3.8	1.2	-0.98	4403	4435	4463	4556	4729	4309
JH042-168	3425	31	1	0.04428	0.00021	0.00108	0.00001	0.28024	0.00005	0.28017	-90.1	-13.9	1.9	-0.97	4149	4234	4314	4580	5074	4018
JH042-170	3499	31	1	0.03054	0.00005	0.00073	0.00000	0.28028	0.00003	0.28023	-88.8	-10.0	1.1	-0.98	4063	4135	4198	4407	4795	3921
JH042-172	3462	31	-2	0.03288	0.00006	0.00075	0.00000	0.28053	0.00003	0.28048	-79.8	-1.8	1.2	-0.98	3730	3764	3794	3893	4077	3540
JH042-176	3616	30	0	0.01869	0.00014	0.00045	0.00000	0.28024	0.00003	0.28021	-90.4	-8.1	1.0	-0.99	4092	4157	4210	4388	4718	3955
JH042-181	3449	31	1	0.03401	0.00007	0.00088	0.00000	0.28048	0.00003	0.28042	-81.8	-4.4	1.2	-0.97	3815	3860	3901	4036	4287	3637
JH042-182	3538	31	1	0.02394	0.00040	0.00061	0.00001	0.28042	0.00004	0.28038	-83.8	-3.7	1.5	-0.98	3863	3906	3942	4063	4287	3693
JH042-183	3436	31	-2	0.02244	0.00022	0.00062	0.00001	0.28045	0.00003	0.28041	-82.7	-5.0	1.1	-0.98	3825	3876	3919	4063	4331	3649
JH042-199	4032	29	4	0.03617	0.00028	0.00087	0.00001	0.28009	0.00004	0.28002	-95.6	-4.6	1.4	-0.97	4332	4369	4403	4513	4719	4228
JH045-002	3572	30	-2	0.02587	0.00021	0.00094	0.00001	0.28045	0.00002	0.28038	-83.0	-2.9	0.8	-0.97	3867	3903	3936	4045	4247	3696
JH045-010	3542	30	-2	0.02983	0.00027	0.00113	0.00001	0.28033	0.00003	0.28026	-86.9	-8.0	0.9	-0.97	4034	4091	4146	4326	4661	3886
JH045-014	3529	30	1	0.02565	0.00040	0.00100	0.00002	0.28039	0.00002	0.28032	-85.1	-6.1	0.9	-0.97	3951	4002	4049	4204	4492	3792
JH045-027	3496	30	0	0.02030	0.00011	0.00072	0.00000	0.28045	0.00004	0.28040	-82.8	-4.0	1.4	-0.98	3838	3882	3920	4048	4283	3664
JH045-039	3535	30	-1	0.02990	0.00016	0.00112	0.00001	0.28043	0.00002	0.28036	-83.4	-4.6	0.8	-0.97	3899	3941	3981	4115	4362	3732
JH045-040	3391	31	0	0.04860	0.00060	0.00177	0.00002	0.28068	0.00003	0.28056	-74.9	-0.8	1.0	-0.95	3637	3661	3688	3777	3942	3428
JH045-041	3998	29	-1	0.02571	0.00022	0.00092	0.00001	0.28022	0.00002	0.28015	-90.9	-0.8	0.8	-0.97	4160	4180	4198	4258	4369	4031
JH045-046	3453	31	0	0.03269	0.00065	0.00120	0.00002	0.28040	0.00002	0.28032	-84.7	-8.0	0.9	-0.96	3957	4014	4070	4254	4596	3798
JH045-047	3749	30	-3	0.00895	0.00017	0.00034	0.00000	0.28033	0.00003	0.28030	-87.1	-1.3	1.1	-0.99	3960	3989	4013	4092	4239	3805
JH045-051	3519	31	-1	0.01507	0.00021	0.00056	0.00001	0.28038	0.00002	0.28034	-85.2	-5.5	0.8	-0.98	3912	3964	4008	4155	4426	3750

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH045-054	3488	30	0	0.01817	0.00043	0.00065	0.00001	0.28049	0.00002	0.28045	-81.3	-2.4	0.8	-0.98	3773	3810	3842	3948	4145	3590
JH045-055	3361	31	-1	0.02038	0.00014	0.00072	0.00000	0.28062	0.00003	0.28057	-76.9	-1.1	1.2	-0.98	3615	3648	3676	3771	3946	3409
JH045-057	3484	30	-1	0.02454	0.00063	0.00087	0.00002	0.28045	0.00002	0.28039	-82.7	-4.5	0.8	-0.97	3850	3896	3936	4072	4323	3677
JH045-058	3080	31	1	0.02968	0.00007	0.00102	0.00000	0.28092	0.00003	0.28086	-66.1	2.5	1.0	-0.97	3233	3252	3268	3325	3429	2970
JH045-061	3554	30	1	0.01536	0.00011	0.00059	0.00001	0.28043	0.00002	0.28039	-83.6	-3.0	0.7	-0.98	3853	3893	3926	4038	4245	3682
JH045-062	3350	31	-1	0.01861	0.00057	0.00065	0.00002	0.28061	0.00002	0.28057	-77.2	-1.6	0.8	-0.98	3623	3658	3689	3790	3979	3418
JH045-063	3550	30	-1	0.02823	0.00032	0.00099	0.00001	0.28051	0.00003	0.28044	-80.8	-1.4	0.9	-0.97	3790	3819	3846	3934	4099	3608
JH045-066	3388	31	-2	0.02689	0.00035	0.00099	0.00001	0.28033	0.00002	0.28026	-87.2	-11.5	0.7	-0.97	4029	4106	4177	4413	4850	3881
JH045-077	3618	30	2	0.02355	0.00030	0.00089	0.00001	0.28038	0.00002	0.28032	-85.2	-3.9	0.7	-0.97	3944	3984	4020	4140	4363	3784
JH045-080	3575	30	0	0.01976	0.00015	0.00078	0.00001	0.28042	0.00002	0.28036	-84.0	-3.4	0.6	-0.98	3887	3926	3961	4076	4291	3719
JH045-081	4031	29	1	0.01110	0.00009	0.00041	0.00000	0.28010	0.00002	0.28007	-95.1	-2.8	0.7	-0.99	4262	4294	4320	4406	4566	4149
JH045-092	3522	30	0	0.01387	0.00011	0.00052	0.00000	0.28043	0.00003	0.28039	-83.6	-3.6	0.9	-0.98	3847	3891	3927	4048	4273	3676
JH045-099	3992	29	2	0.01850	0.00010	0.00073	0.00000	0.28011	0.00002	0.28005	-94.8	-4.4	0.8	-0.98	4287	4325	4358	4467	4670	4177
JH045-102	3759	30	0	0.04686	0.00029	0.00165	0.00001	0.28045	0.00004	0.28033	-82.8	-0.1	1.3	-0.95	3930	3947	3966	4028	4143	3765
JH045-104	4100	29	3	0.01331	0.00017	0.00051	0.00001	0.28008	0.00002	0.28004	-95.9	-2.3	0.8	-0.98	4304	4331	4354	4430	4571	4197
JH045-105	3881	30	-3	0.03284	0.00039	0.00118	0.00001	0.28038	0.00002	0.28029	-85.5	1.2	0.8	-0.97	3985	3996	4008	4046	4117	3829
JH045-111	3826	30	-3	0.01791	0.00014	0.00068	0.00000	0.28022	0.00002	0.28017	-91.1	-4.5	0.7	-0.98	4144	4185	4220	4338	4557	4013
JH046-005	3930	29	0	0.00462	0.00006	0.00020	0.00000	0.28010	0.00002	0.28008	-95.4	-5.0	0.6	-0.99	4250	4295	4331	4451	4674	4136
JH046-006	3998	30	-2	0.00640	0.00005	0.00027	0.00000	0.28005	0.00002	0.28003	-96.9	-5.0	0.6	-0.99	4312	4356	4392	4509	4728	4207
JH046-007	4016	30	-2	0.00830	0.00006	0.00034	0.00000	0.28001	0.00002	0.27998	-98.5	-6.4	0.7	-0.99	4378	4428	4469	4604	4855	4281
JH046-008	3398	31	0	0.04457	0.00137	0.00148	0.00004	0.28032	0.00002	0.28022	-87.5	-12.7	0.9	-0.96	4091	4164	4240	4492	4958	3950
JH046-010	3959	29	-7	0.05339	0.00024	0.00189	0.00001	0.28030	0.00002	0.28015	-88.2	-1.6	0.7	-0.94	4162	4181	4203	4276	4411	4029
JH046-011	3486	30	-1	0.02158	0.00004	0.00079	0.00000	0.28035	0.00002	0.28030	-86.3	-7.8	0.7	-0.98	3975	4036	4090	4271	4606	3820
JH046-014	4059	30	2	0.01538	0.00021	0.00058	0.00001	0.28007	0.00003	0.28003	-96.1	-3.7	0.9	-0.98	4319	4353	4382	4479	4658	4214

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH046-015	3685	30	-3	0.04477	0.00020	0.00188	0.00001	0.28030	0.00002	0.28016	-88.2	-7.9	0.7	-0.94	4164	4208	4260	4432	4751	4031
JH046-017	3378	31	-2	0.01157	0.00006	0.00045	0.00000	0.28050	0.00002	0.28047	-81.1	-4.4	0.5	-0.99	3749	3800	3842	3981	4238	3564
JH046-019	3387	31	1	0.03168	0.00029	0.00116	0.00001	0.28034	0.00002	0.28026	-86.8	-11.6	0.7	-0.97	4034	4108	4179	4416	4856	3885
JH046-021	3389	31	0	0.02405	0.00004	0.00087	0.00000	0.28031	0.00002	0.28025	-87.9	-11.9	0.6	-0.97	4043	4123	4196	4437	4885	3897
JH046-023	3366	31	-2	0.01951	0.00020	0.00078	0.00001	0.28064	0.00002	0.28058	-76.3	-0.6	0.7	-0.98	3599	3628	3654	3740	3900	3390
JH046-026	3392	31	1	0.03520	0.00075	0.00136	0.00002	0.28022	0.00003	0.28013	-91.1	-16.2	1.0	-0.96	4215	4305	4395	4695	5251	4092
JH046-028	3410	31	0	0.02643	0.00031	0.00102	0.00001	0.28037	0.00002	0.28031	-85.6	-9.4	0.6	-0.97	3971	4038	4100	4306	4689	3814
JH046-031	3374	31	-1	0.01315	0.00005	0.00051	0.00000	0.28023	0.00002	0.28019	-90.8	-14.4	0.7	-0.98	4114	4213	4296	4571	5083	3980
JH046-033	3381	31	1	0.01333	0.00003	0.00056	0.00000	0.28033	0.00002	0.28030	-87.0	-10.5	0.6	-0.98	3979	4059	4125	4348	4760	3826
JH046-034	3877	29	5	0.02493	0.00157	0.00085	0.00004	0.28016	0.00002	0.28010	-93.0	-5.6	0.6	-0.97	4233	4277	4317	4448	4692	4115
JH046-039	3417	31	-1	0.03597	0.00021	0.00136	0.00001	0.28025	0.00002	0.28016	-90.0	-14.6	0.7	-0.96	4175	4257	4340	4616	5128	4046
JH046-044	3458	31	-1	0.02476	0.00021	0.00093	0.00001	0.28034	0.00002	0.28028	-86.7	-9.2	0.8	-0.97	4003	4069	4129	4330	4702	3851
JH046-051	3986	30	-3	0.02152	0.00006	0.00079	0.00000	0.28010	0.00002	0.28004	-95.3	-5.1	0.6	-0.98	4310	4351	4387	4507	4729	4202
JH046-053	3781	30	3	0.08025	0.00201	0.00227	0.00005	0.28014	0.00002	0.27998	-93.7	-12.3	0.7	-0.93	4418	4471	4539	4765	5186	4322
JH046-055	4005	30	-2	0.01837	0.00017	0.00068	0.00000	0.28007	0.00002	0.28002	-96.4	-5.5	0.8	-0.98	4337	4380	4418	4541	4769	4234
JH046-056	3488	31	-2	0.01758	0.00017	0.00065	0.00001	0.28039	0.00003	0.28034	-85.1	-6.3	0.9	-0.98	3918	3974	4022	4181	4477	3755
JH046-057	3542	30	0	0.01060	0.00013	0.00042	0.00000	0.28047	0.00002	0.28044	-82.3	-1.6	0.7	-0.99	3789	3823	3850	3943	4113	3610
JH046-060	3395	31	1	0.02133	0.00025	0.00087	0.00001	0.28042	0.00002	0.28036	-84.1	-7.9	0.7	-0.97	3900	3962	4018	4204	4550	3734
JH046-068	3493	30	-1	0.03608	0.00074	0.00130	0.00003	0.28039	0.00002	0.28031	-84.9	-7.5	0.7	-0.96	3973	4027	4079	4254	4579	3816
JH046-071	3379	32	-2	0.01608	0.00057	0.00061	0.00002	0.28032	0.00002	0.28028	-87.4	-11.0	0.8	-0.98	3998	4079	4148	4378	4804	3847
JH046-073	3712	30	0	0.01449	0.00041	0.00055	0.00001	0.28019	0.00002	0.28015	-92.2	-7.9	0.8	-0.98	4170	4231	4282	4453	4769	4044
JH046-077	3400	31	-2	0.02092	0.00033	0.00090	0.00001	0.28043	0.00002	0.28037	-83.5	-7.3	0.8	-0.97	3881	3940	3994	4171	4501	3712
JH046-079	3909	30	-1	0.01003	0.00003	0.00039	0.00000	0.28011	0.00002	0.28008	-94.8	-5.4	0.7	-0.99	4248	4295	4333	4460	4695	4134
JH046-080	3906	30	0	0.01084	0.00004	0.00042	0.00000	0.28002	0.00002	0.27999	-98.1	-8.9	0.7	-0.99	4375	4439	4492	4667	4992	4278

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH046-081	3712	30	-2	0.03944	0.00027	0.00140	0.00001	0.28025	0.00002	0.28015	-90.0	-7.9	0.7	-0.96	4179	4229	4280	4451	4766	4051
JH046-085	3425	31	-2	0.01279	0.00011	0.00055	0.00000	0.28054	0.00002	0.28050	-79.7	-2.1	0.6	-0.98	3704	3742	3773	3877	4070	3512
JH046-093	3729	31	-4	0.01358	0.00006	0.00053	0.00000	0.28000	0.00002	0.27997	-98.6	-13.9	0.8	-0.98	4405	4495	4571	4823	5289	4312
JH046-098	3546	30	-3	0.01647	0.00004	0.00063	0.00000	0.28040	0.00002	0.28036	-84.6	-4.3	0.7	-0.98	3895	3940	3979	4109	4349	3729
JH046-108	3531	31	-1	0.01644	0.00008	0.00066	0.00000	0.28049	0.00002	0.28044	-81.6	-1.8	0.8	-0.98	3787	3821	3849	3945	4121	3606
JH046-109	3556	30	0	0.01523	0.00018	0.00060	0.00001	0.28039	0.00002	0.28035	-85.0	-4.4	0.8	-0.98	3907	3953	3993	4123	4365	3743
JH046-111	3723	30	-4	0.02137	0.00028	0.00076	0.00001	0.28026	0.00002	0.28020	-89.6	-5.6	0.7	-0.98	4096	4143	4184	4323	4579	3958
JH046-113	3390	30	-2	0.04975	0.00017	0.00194	0.00001	0.28038	0.00002	0.28025	-85.4	-11.8	0.9	-0.94	4059	4120	4192	4433	4878	3911
JH046-118	3391	31	-1	0.03247	0.00030	0.00126	0.00001	0.28029	0.00002	0.28021	-88.4	-13.3	0.8	-0.96	4104	4183	4261	4522	5004	3965
JH046-119	4092	29	-4	0.01474	0.00008	0.00057	0.00001	0.28009	0.00002	0.28004	-95.6	-2.4	0.7	-0.98	4299	4326	4349	4426	4569	4190
JH046-123	4016	29	-4	0.02018	0.00008	0.00073	0.00000	0.28010	0.00002	0.28005	-95.1	-4.1	0.7	-0.98	4296	4332	4363	4467	4659	4187
JH046-133	3523	30	-2	0.02115	0.00089	0.00077	0.00003	0.28049	0.00002	0.28044	-81.3	-2.0	0.7	-0.98	3787	3821	3850	3948	4130	3606
JH046-134	3751	30	-1	0.02338	0.00008	0.00091	0.00000	0.28023	0.00003	0.28017	-90.6	-6.2	0.9	-0.97	4146	4195	4239	4385	4655	4016
JH046-135	3384	31	1	0.01049	0.00035	0.00042	0.00001	0.28035	0.00002	0.28032	-86.3	-9.4	0.7	-0.99	3939	4015	4077	4285	4669	3781
JH046-139	3583	30	1	0.02058	0.00015	0.00076	0.00001	0.28038	0.00002	0.28033	-85.4	-4.6	0.7	-0.98	3937	3982	4021	4152	4395	3776
JH046-141	3869	29	-5	0.05444	0.00129	0.00174	0.00003	0.28035	0.00002	0.28022	-86.4	-1.5	0.8	-0.95	4077	4097	4120	4195	4334	3933
JH046-156	4041	29	1	0.01793	0.00013	0.00066	0.00000	0.28011	0.00002	0.28006	-94.7	-2.9	0.7	-0.98	4275	4306	4332	4419	4580	4163
JH046-158	3392	31	1	0.01103	0.00031	0.00046	0.00001	0.28035	0.00003	0.28032	-86.4	-9.4	0.9	-0.99	3945	4020	4082	4288	4671	3787
JH046-161	3344	31	0	0.01501	0.00028	0.00057	0.00001	0.28025	0.00002	0.28021	-90.1	-14.5	0.7	-0.98	4093	4192	4276	4555	5072	3956
JH046-163	3368	31	1	0.02173	0.00007	0.00084	0.00000	0.28035	0.00002	0.28029	-86.5	-11.0	0.7	-0.98	3990	4067	4136	4365	4791	3837
JH046-164	3380	31	1	0.02099	0.00019	0.00079	0.00001	0.28032	0.00002	0.28027	-87.5	-11.6	0.7	-0.98	4021	4102	4173	4410	4850	3873
JH046-166	3375	31	0	0.01947	0.00022	0.00076	0.00001	0.28039	0.00002	0.28034	-84.9	-9.0	0.8	-0.98	3921	3991	4052	4254	4629	3759
JH046-172	3392	31	-1	0.02155	0.00009	0.00079	0.00000	0.28030	0.00002	0.28025	-88.1	-11.9	0.8	-0.98	4044	4126	4199	4440	4887	3899
JH046-174	4059	29	3	0.02403	0.00024	0.00090	0.00001	0.28007	0.00002	0.28000	-96.2	-4.7	0.6	-0.97	4356	4393	4426	4535	4739	4255

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH046-175	3821	30	3	0.01321	0.00003	0.00050	0.00000	0.28006	0.00002	0.28002	-96.8	-9.8	0.7	-0.99	4334	4403	4461	4652	5007	4231
JH046-177	3981	30	0	0.02462	0.00020	0.00094	0.00001	0.28018	0.00002	0.28010	-92.5	-2.9	0.8	-0.97	4222	4252	4278	4367	4532	4102
JH046-178	3939	29	4	0.02180	0.00017	0.00083	0.00001	0.28015	0.00002	0.28009	-93.4	-4.5	0.6	-0.98	4244	4282	4316	4428	4637	4127
JH046-181	3562	30	1	0.02878	0.00010	0.00109	0.00000	0.28043	0.00002	0.28036	-83.5	-4.0	0.7	-0.97	3901	3940	3978	4102	4333	3734
JH046-183	4233	29	0	0.04985	0.00029	0.00170	0.00001	0.28000	0.00002	0.27986	-98.7	-5.4	0.8	-0.95	4543	4574	4607	4719	4927	4467
JH046-186	3679	30	1	0.02144	0.00040	0.00080	0.00002	0.28032	0.00002	0.28026	-87.6	-4.7	0.7	-0.98	4025	4068	4107	4235	4472	3877
JH046-188	3382	31	0	0.02861	0.00011	0.00111	0.00000	0.28036	0.00002	0.28029	-86.0	-10.8	0.7	-0.97	3998	4070	4138	4364	4782	3845
JH046-189	3463	31	-1	0.02046	0.00023	0.00073	0.00001	0.28024	0.00002	0.28020	-90.2	-12.1	0.8	-0.98	4112	4195	4268	4508	4955	3977
JH046-190	3975	29	0	0.01179	0.00018	0.00044	0.00001	0.28016	0.00003	0.28012	-93.3	-2.4	1.0	-0.99	4197	4227	4252	4335	4489	4075
JH046-198	3352	31	-2	0.02893	0.00046	0.00102	0.00002	0.28059	0.00002	0.28053	-77.8	-3.0	0.7	-0.97	3679	3718	3754	3874	4097	3481
JH046-201	3480	30	0	0.02194	0.00017	0.00082	0.00001	0.28028	0.00002	0.28022	-89.0	-10.8	0.8	-0.98	4078	4153	4220	4441	4852	3938
JH046-203	3472	30	-1	0.02333	0.00013	0.00082	0.00000	0.28041	0.00002	0.28035	-84.4	-6.4	0.8	-0.98	3907	3962	4010	4171	4469	3743
JH046-204	3877	30	0	0.01370	0.00013	0.00051	0.00000	0.28018	0.00002	0.28014	-92.4	-4.1	0.7	-0.98	4173	4213	4246	4357	4561	4048
JH047-001	3362	30	0	0.01257	0.00011	0.00051	0.00000	0.28052	0.00002	0.28048	-80.5	-4.3	0.6	-0.98	3732	3781	3823	3960	4216	3544
JH047-002	3361	30	1	0.00699	0.00003	0.00028	0.00000	0.28052	0.00002	0.28050	-80.4	-3.6	0.7	-0.99	3705	3753	3792	3921	4160	3514
JH047-003	3708	30	0	0.00589	0.00010	0.00025	0.00000	0.28009	0.00001	0.28007	-95.5	-10.6	0.5	-0.99	4260	4338	4400	4607	4991	4147
JH047-009	3873	29	6	0.05298	0.00333	0.00169	0.00008	0.28009	0.00002	0.27996	-95.7	-10.7	0.7	-0.95	4428	4483	4543	4743	5114	4335
JH047-010	3849	29	5	0.07070	0.00031	0.00252	0.00001	0.28023	0.00002	0.28004	-90.7	-8.4	0.7	-0.93	4332	4368	4419	4590	4906	4223
JH047-013	3487	30	-2	0.01908	0.00015	0.00075	0.00001	0.28046	0.00002	0.28041	-82.6	-4.1	0.7	-0.98	3835	3879	3918	4047	4286	3660
JH047-014	3469	30	-1	0.04247	0.00133	0.00141	0.00004	0.28031	0.00002	0.28022	-87.8	-11.3	0.7	-0.96	4097	4165	4233	4462	4885	3957
JH047-017	3501	31	0	0.02593	0.00045	0.00093	0.00002	0.28037	0.00002	0.28031	-85.5	-7.1	0.6	-0.97	3961	4017	4068	4238	4552	3804
JH047-019	3463	31	-1	0.03146	0.00023	0.00110	0.00001	0.28036	0.00002	0.28029	-86.0	-8.9	0.7	-0.97	3998	4060	4119	4315	4679	3844
JH047-025	3739	30	1	0.02227	0.00010	0.00082	0.00000	0.28023	0.00002	0.28017	-90.8	-6.6	0.6	-0.98	4147	4198	4243	4394	4674	4016
JH047-029	3288	31	-1	0.01057	0.00005	0.00041	0.00000	0.28060	0.00002	0.28058	-77.5	-2.8	0.7	-0.99	3610	3654	3690	3811	4034	3405

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH047-030	3828	30	-2	0.01933	0.00023	0.00075	0.00001	0.28004	0.00002	0.27999	-97.2	-10.7	0.6	-0.98	4377	4447	4508	4712	5089	4280
JH047-033	3367	31	0	0.03637	0.00046	0.00145	0.00001	0.28041	0.00002	0.28031	-84.4	-10.3	0.8	-0.96	3971	4035	4101	4321	4728	3812
JH047-043	3370	31	0	0.02176	0.00016	0.00085	0.00001	0.28035	0.00001	0.28029	-86.4	-10.8	0.5	-0.97	3984	4061	4129	4356	4777	3831
JH047-045	3726	30	0	0.02289	0.00034	0.00082	0.00001	0.28022	0.00002	0.28016	-91.0	-7.1	0.8	-0.98	4154	4208	4255	4414	4707	4025
JH047-047	3548	30	1	0.01503	0.00005	0.00055	0.00000	0.28041	0.00001	0.28037	-84.4	-3.9	0.5	-0.98	3881	3925	3962	4086	4316	3714
JH047-055	3383	30	1	0.00855	0.00013	0.00038	0.00000	0.28032	0.00002	0.28029	-87.6	-10.6	0.7	-0.99	3980	4063	4130	4354	4768	3828
JH047-057	3938	29	-1	0.01570	0.00009	0.00060	0.00000	0.28014	0.00002	0.28009	-93.8	-4.3	0.8	-0.98	4236	4275	4309	4420	4626	4119
JH047-058	3325	31	0	0.05276	0.00439	0.00159	0.00011	0.28051	0.00002	0.28041	-80.7	-7.8	0.8	-0.95	3842	3895	3951	4139	4486	3664
JH047-063	4059	29	1	0.01582	0.00002	0.00061	0.00000	0.28003	0.00002	0.27998	-97.8	-5.4	0.6	-0.98	4383	4425	4461	4582	4805	4286
JH047-065	3365	31	0	0.01428	0.00012	0.00056	0.00000	0.28039	0.00001	0.28035	-85.1	-8.9	0.5	-0.98	3906	3978	4039	4240	4613	3743
JH047-069	3518	30	0	0.01362	0.00049	0.00051	0.00002	0.28040	0.00002	0.28036	-84.7	-4.8	0.6	-0.99	3886	3936	3977	4114	4369	3720
JH047-072	3370	31	1	0.02860	0.00004	0.00107	0.00000	0.28035	0.00001	0.28028	-86.4	-11.4	0.5	-0.97	4009	4085	4155	4390	4825	3858
JH047-079	3360	31	0	0.03703	0.00215	0.00122	0.00005	0.28050	0.00002	0.28042	-81.1	-6.6	0.6	-0.96	3824	3876	3927	4097	4411	3645
JH047-088	3060	32	-1	0.05895	0.00059	0.00217	0.00002	0.28080	0.00002	0.28067	-70.4	-4.7	0.5	-0.94	3504	3542	3589	3748	4041	3272
JH047-091	3921	30	3	0.04034	0.00031	0.00139	0.00001	0.28016	0.00002	0.28006	-93.1	-6.1	0.6	-0.96	4294	4334	4375	4511	4762	4182
JH047-094	3430	31	-2	0.01782	0.00002	0.00065	0.00000	0.28029	0.00002	0.28024	-88.6	-11.2	0.6	-0.98	4046	4126	4195	4424	4848	3902
JH047-102	4009	30	-2	0.01810	0.00016	0.00068	0.00001	0.28008	0.00002	0.28003	-95.8	-4.8	0.7	-0.98	4317	4357	4391	4506	4717	4211
JH047-104	3378	31	-1	0.02194	0.00042	0.00080	0.00001	0.28039	0.00002	0.28034	-84.9	-9.0	0.7	-0.98	3924	3992	4053	4255	4629	3762
JH047-116	3401	31	-2	0.01982	0.00020	0.00077	0.00001	0.28040	0.00002	0.28035	-84.7	-8.2	0.7	-0.98	3912	3977	4034	4223	4575	3749
JH047-123	3405	32	0	0.00749	0.00002	0.00029	0.00000	0.28022	0.00001	0.28020	-91.1	-13.4	0.4	-0.99	4102	4200	4278	4540	5024	3967
JH047-124	3401	31	-2	0.03222	0.00003	0.00118	0.00000	0.28026	0.00002	0.28019	-89.5	-14.0	0.6	-0.97	4135	4219	4299	4568	5066	4001
JH047-126	3572	30	-4	0.02278	0.00020	0.00089	0.00001	0.28042	0.00001	0.28036	-84.0	-3.8	0.5	-0.97	3900	3940	3976	4097	4322	3734
JH048-001	3402	31	0	0.01915	0.00004	0.00067	0.00000	0.28049	0.00004	0.28044	-81.5	-4.7	1.3	-0.98	3783	3832	3875	4016	4278	3601
JH048-032	3383	31	1	0.01645	0.00037	0.00060	0.00001	0.28029	0.00004	0.28025	-88.5	-12.0	1.4	-0.98	4037	4123	4196	4439	4890	3892

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH048-037	3828	30	2	0.03309	0.00092	0.00117	0.00002	0.28043	0.00004	0.28034	-83.6	2.0	1.4	-0.97	3910	3920	3929	3959	4015	3744
JH048-056	4042	29	6	0.07041	0.00050	0.00240	0.00001	0.28029	0.00004	0.28010	-88.5	-1.5	1.4	-0.93	4232	4247	4267	4334	4459	4108
JH048-059	3647	30	-1	0.01730	0.00020	0.00063	0.00001	0.28032	0.00003	0.28028	-87.5	-4.9	1.2	-0.98	4002	4049	4089	4221	4466	3852
JH048-062	4120	29	3	0.02591	0.00060	0.00091	0.00002	0.28011	0.00006	0.28004	-94.7	-1.8	2.0	-0.97	4303	4325	4346	4413	4539	4194
JH048-093	3364	31	1	0.01475	0.00006	0.00055	0.00000	0.28053	0.00004	0.28050	-79.9	-3.8	1.3	-0.98	3714	3760	3800	3930	4172	3523
JH048-114	3410	31	-1	0.01110	0.00019	0.00042	0.00001	0.28032	0.00003	0.28029	-87.4	-9.9	1.0	-0.99	3977	4055	4119	4331	4724	3824
JH048-118	3588	30	0	0.02616	0.00013	0.00098	0.00000	0.28053	0.00003	0.28046	-80.0	0.5	1.2	-0.97	3756	3776	3795	3856	3971	3569
JH048-123	3605	30	0	0.03406	0.00038	0.00121	0.00001	0.28048	0.00003	0.28039	-81.9	-1.7	1.2	-0.96	3851	3879	3906	3996	4163	3676
JH048-124	3424	31	-1	0.02712	0.00029	0.00097	0.00001	0.28036	0.00004	0.28029	-86.1	-9.6	1.4	-0.97	3988	4055	4118	4325	4710	3834
JH048-126	3484	31	-1	0.01980	0.00033	0.00071	0.00001	0.28034	0.00004	0.28030	-86.6	-8.0	1.3	-0.98	3978	4041	4096	4279	4618	3824
JH048-171	3432	30	0	0.01004	0.00023	0.00039	0.00001	0.28032	0.00005	0.28029	-87.4	-9.3	1.7	-0.99	3977	4053	4114	4318	4696	3825
JH048-194	3631	30	5	0.02529	0.00012	0.00091	0.00000	0.28036	0.00003	0.28030	-85.9	-4.4	1.2	-0.97	3972	4014	4052	4178	4411	3816
JH048-199	3457	30	0	0.02199	0.00016	0.00079	0.00001	0.28040	0.00004	0.28034	-84.8	-7.0	1.3	-0.98	3918	3976	4027	4198	4515	3755
JH051-006	4163	29	-2	0.04229	0.00164	0.00142	0.00004	0.27994	0.00002	0.27982	-101.0	-8.5	0.8	-0.96	4595	4641	4688	4846	5137	4527
JH051-007	3378	31	-2	0.02011	0.00035	0.00082	0.00001	0.28041	0.00002	0.28036	-84.1	-8.3	0.7	-0.98	3896	3961	4019	4210	4566	3730
JH051-010	3379	31	0	0.02262	0.00014	0.00094	0.00001	0.28041	0.00002	0.28035	-84.3	-8.7	0.6	-0.97	3914	3979	4039	4236	4602	3750
JH051-012	3513	30	2	0.01791	0.00004	0.00069	0.00000	0.28045	0.00002	0.28041	-82.8	-3.4	0.6	-0.98	3834	3875	3911	4030	4250	3659
JH051-014	3376	31	-2	0.02402	0.00018	0.00098	0.00001	0.28038	0.00002	0.28032	-85.2	-9.7	0.7	-0.97	3951	4021	4084	4296	4689	3792
JH051-016	3357	31	-1	0.01976	0.00054	0.00074	0.00002	0.28046	0.00002	0.28041	-82.5	-7.0	0.6	-0.98	3829	3889	3941	4116	4440	3653
JH051-017	3967	30	-1	0.02256	0.00011	0.00093	0.00000	0.28013	0.00002	0.28006	-94.0	-4.7	0.6	-0.97	4279	4317	4351	4466	4679	4167
JH051-020	3431	30	1	0.01713	0.00014	0.00069	0.00001	0.28053	0.00002	0.28048	-80.1	-2.7	0.6	-0.98	3735	3774	3808	3920	4130	3546
JH051-022	3589	30	3	0.01766	0.00006	0.00073	0.00000	0.28036	0.00002	0.28031	-85.9	-4.9	0.6	-0.98	3954	4001	4041	4176	4427	3796
JH051-023	3295	31	-1	0.01082	0.00015	0.00041	0.00001	0.28056	0.00002	0.28053	-79.1	-4.2	0.6	-0.99	3670	3721	3763	3903	4163	3473
JH051-025	3746	30	3	0.03929	0.00046	0.00144	0.00001	0.28017	0.00002	0.28007	-92.7	-9.9	0.6	-0.96	4284	4341	4400	4596	4958	4171

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH051-026	3382	31	-2	0.02868	0.00039	0.00107	0.00001	0.28030	0.00002	0.28023	-88.3	-12.9	0.6	-0.97	4079	4160	4237	4493	4967	3937
JH051-030	3477	30	-1	0.02030	0.00006	0.00076	0.00000	0.28041	0.00002	0.28036	-84.3	-6.0	0.6	-0.98	3898	3952	3999	4155	4444	3733
JH051-031	3374	31	-2	0.02138	0.00007	0.00083	0.00000	0.28037	0.00001	0.28032	-85.6	-9.8	0.5	-0.98	3952	4024	4088	4302	4698	3794
JH051-032	3377	31	-1	0.01658	0.00008	0.00064	0.00000	0.28036	0.00001	0.28032	-85.9	-9.7	0.5	-0.98	3945	4019	4083	4294	4685	3787
JH051-033	3375	31	0	0.01930	0.00043	0.00073	0.00002	0.28033	0.00002	0.28028	-87.0	-11.1	0.6	-0.98	3996	4076	4145	4375	4802	3845
JH051-037	3833	30	2	0.00696	0.00010	0.00027	0.00000	0.28017	0.00001	0.28015	-92.7	-4.7	0.5	-0.99	4157	4203	4240	4361	4586	4030
JH051-043	3366	31	-1	0.01841	0.00014	0.00077	0.00001	0.28050	0.00002	0.28045	-81.0	-5.2	0.6	-0.98	3773	3824	3869	4020	4299	3589
JH051-045	3475	30	0	0.02192	0.00004	0.00080	0.00000	0.28036	0.00001	0.28031	-86.0	-7.8	0.5	-0.98	3964	4025	4079	4260	4596	3807
JH051-048	3922	29	-1	0.00940	0.00017	0.00037	0.00001	0.28002	0.00002	0.28000	-97.9	-8.2	0.6	-0.99	4360	4421	4470	4635	4939	4261
JH051-050	3379	31	0	0.01494	0.00009	0.00062	0.00000	0.28048	0.00002	0.28043	-82.0	-5.6	0.6	-0.98	3796	3851	3897	4053	4340	3617
JH051-059	4029	29	-1	0.00914	0.00007	0.00039	0.00000	0.28011	0.00002	0.28007	-95.0	-2.8	0.6	-0.99	4258	4289	4315	4400	4559	4145
JH051-061	3429	31	1	0.00959	0.00012	0.00038	0.00000	0.28040	0.00001	0.28038	-84.6	-6.5	0.5	-0.99	3869	3930	3979	4144	4450	3701
JH051-066	3367	31	-1	0.01377	0.00005	0.00055	0.00000	0.28036	0.00001	0.28032	-86.1	-9.9	0.5	-0.98	3942	4019	4083	4297	4695	3784
JH051-067	3434	31	-2	0.01056	0.00002	0.00041	0.00000	0.28045	0.00002	0.28042	-82.9	-4.8	0.6	-0.99	3811	3863	3906	4047	4308	3635
JH051-068	3681	30	4	0.02655	0.00038	0.00104	0.00001	0.28020	0.00002	0.28012	-91.9	-9.5	0.6	-0.97	4210	4272	4331	4525	4885	4087
JH051-069	3978	29	4	0.01296	0.00017	0.00046	0.00001	0.28004	0.00002	0.28000	-97.4	-6.6	0.6	-0.99	4353	4404	4446	4586	4846	4253
JH051-071	2657	32	2	0.01305	0.00011	0.00046	0.00000	0.28093	0.00002	0.28091	-65.8	-5.9	0.6	-0.99	3178	3248	3307	3501	3861	2911
JH051-072	3878	29	4	0.04645	0.00012	0.00165	0.00000	0.28024	0.00001	0.28011	-90.4	-5.1	0.5	-0.95	4222	4257	4294	4419	4650	4099
JH051-073	3989	30	1	0.02357	0.00024	0.00094	0.00001	0.28013	0.00002	0.28006	-94.2	-4.4	0.6	-0.97	4287	4324	4357	4467	4671	4176
JH051-085	3368	31	-1	0.01351	0.00012	0.00055	0.00000	0.28024	0.00002	0.28020	-90.3	-14.1	0.8	-0.98	4099	4197	4278	4551	5055	3963
JH051-089	3384	31	-1	0.02367	0.00024	0.00088	0.00001	0.28032	0.00002	0.28026	-87.6	-11.8	0.6	-0.97	4033	4113	4185	4425	4869	3886
JH051-090	3345	31	1	0.01751	0.00009	0.00069	0.00000	0.28036	0.00001	0.28032	-85.9	-10.5	0.5	-0.98	3950	4028	4096	4320	4736	3792
JH051-094	4060	29	2	0.02409	0.00018	0.00090	0.00001	0.28007	0.00001	0.28000	-96.2	-4.6	0.5	-0.97	4356	4392	4425	4534	4737	4255
JH051-096	3365	31	-1	0.02660	0.00038	0.00104	0.00002	0.28039	0.00002	0.28032	-84.9	-9.9	0.6	-0.97	3949	4018	4083	4297	4695	3789

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH051-097	3350	31	-1	0.03354	0.00046	0.00136	0.00002	0.28040	0.00002	0.28032	-84.5	-10.5	0.8	-0.96	3965	4032	4099	4323	4739	3806
JH051-098	3966	29	-1	0.00927	0.00012	0.00040	0.00001	0.28024	0.00001	0.28021	-90.2	0.6	0.5	-0.99	4080	4095	4108	4150	4229	3941
JH051-100	4181	29	4	0.02782	0.00026	0.00102	0.00001	0.27998	0.00002	0.27990	-99.3	-5.2	0.6	-0.97	4486	4522	4556	4668	4875	4403
JH051-101	3355	31	-1	0.01992	0.00011	0.00078	0.00001	0.28036	0.00001	0.28031	-86.0	-10.6	0.5	-0.98	3961	4038	4105	4330	4746	3805
JH051-102	3955	30	0	0.00671	0.00003	0.00025	0.00000	0.28017	0.00002	0.28015	-92.7	-1.8	0.5	-0.99	4155	4183	4206	4281	4420	4027
JH051-105	3359	31	0	0.01439	0.00002	0.00056	0.00000	0.28040	0.00001	0.28036	-84.6	-8.6	0.5	-0.98	3888	3959	4018	4215	4581	3722
JH051-107	3469	30	1	0.02238	0.00011	0.00087	0.00000	0.28037	0.00002	0.28031	-85.8	-7.9	0.7	-0.97	3964	4025	4080	4263	4603	3807
JH051-109	3368	31	-2	0.01091	0.00003	0.00045	0.00000	0.28042	0.00002	0.28039	-83.9	-7.5	0.6	-0.99	3853	3919	3974	4155	4491	3683
JH051-110	3381	31	-2	0.02748	0.00016	0.00108	0.00001	0.28044	0.00002	0.28037	-83.1	-7.8	0.6	-0.97	3885	3944	3999	4185	4528	3716
JH051-114	3377	31	0	0.02575	0.00025	0.00098	0.00001	0.28036	0.00001	0.28030	-86.0	-10.5	0.4	-0.97	3982	4055	4122	4345	4758	3827
JH051-117	3580	30	3	0.03596	0.00011	0.00132	0.00000	0.28037	0.00001	0.28028	-85.6	-6.3	0.5	-0.96	4003	4050	4096	4251	4537	3850
JH051-122	3535	30	-1	0.00933	0.00010	0.00036	0.00000	0.28043	0.00001	0.28041	-83.4	-2.8	0.5	-0.99	3826	3866	3899	4007	4209	3652
JH051-123	3383	31	0	0.03019	0.00057	0.00117	0.00002	0.28038	0.00001	0.28030	-85.4	-10.2	0.5	-0.97	3978	4047	4112	4331	4735	3822
JH051-130	3684	30	-3	0.04552	0.00061	0.00189	0.00002	0.28045	0.00002	0.28032	-82.7	-2.4	0.6	-0.94	3953	3977	4006	4103	4282	3789
JH051-149	3388	31	1	0.01853	0.00003	0.00072	0.00000	0.28037	0.00001	0.28032	-85.8	-9.5	0.5	-0.98	3948	4020	4082	4290	4675	3790
JH051-157	3533	31	0	0.01294	0.00027	0.00051	0.00001	0.28042	0.00002	0.28039	-83.8	-3.5	0.6	-0.99	3852	3895	3931	4050	4270	3681
JH051-159	3458	31	-1	0.01809	0.00020	0.00070	0.00001	0.28036	0.00002	0.28032	-86.0	-8.0	0.6	-0.98	3954	4017	4072	4256	4597	3796
JH051-163	3384	31	-1	0.02330	0.00003	0.00078	0.00000	0.28031	0.00001	0.28026	-87.7	-11.6	0.5	-0.98	4025	4107	4178	4415	4855	3878
JH051-170	4092	29	5	0.05153	0.00028	0.00181	0.00001	0.28012	0.00001	0.27997	-94.7	-4.9	0.5	-0.95	4402	4431	4465	4576	4783	4304
JH051-171	4020	29	-1	0.03505	0.00019	0.00128	0.00001	0.28024	0.00002	0.28014	-90.3	-0.7	0.5	-0.96	4177	4195	4212	4270	4377	4049
JH051-172	3383	31	0	0.01950	0.00006	0.00075	0.00000	0.28042	0.00001	0.28038	-83.7	-7.6	0.4	-0.98	3876	3938	3993	4175	4513	3707
JH051-183	3391	31	0	0.02931	0.00044	0.00112	0.00002	0.28034	0.00002	0.28026	-86.8	-11.4	0.6	-0.97	4029	4103	4174	4408	4842	3881
JH051-196	3386	31	-1	0.01485	0.00012	0.00062	0.00000	0.28042	0.00002	0.28038	-84.1	-7.6	0.6	-0.98	3874	3939	3993	4175	4512	3706
JH051-197	3445	31	1	0.02511	0.00009	0.00103	0.00000	0.28053	0.00002	0.28046	-80.2	-3.2	0.6	-0.97	3769	3807	3843	3962	4182	3583

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH051-198	3770	30	1	0.04380	0.00061	0.00153	0.00002	0.28013	0.00002	0.28001	-94.3	-11.2	0.8	-0.95	4356	4417	4481	4694	5088	4254
JH051-199	3547	30	0	0.01005	0.00008	0.00035	0.00000	0.28042	0.00002	0.28039	-84.0	-3.1	0.6	-0.99	3848	3890	3923	4036	4245	3677
JH051-200	3457	31	-1	0.01265	0.00008	0.00057	0.00000	0.28055	0.00002	0.28051	-79.4	-1.1	0.6	-0.98	3698	3729	3756	3846	4012	3504
JH051-203	3380	31	-2	0.01132	0.00005	0.00045	0.00000	0.28030	0.00002	0.28027	-88.0	-11.3	0.5	-0.99	4005	4090	4160	4393	4826	3856
JH051-207	3945	30	-2	0.00942	0.00004	0.00036	0.00000	0.28012	0.00001	0.28009	-94.6	-4.3	0.5	-0.99	4239	4280	4313	4423	4628	4123
JH051-208	3409	31	-1	0.02283	0.00029	0.00085	0.00001	0.28031	0.00002	0.28026	-87.7	-11.2	0.6	-0.97	4033	4110	4179	4410	4837	3886
JH051-211	3404	31	1	0.01596	0.00024	0.00063	0.00001	0.28042	0.00001	0.28038	-83.8	-6.9	0.5	-0.98	3865	3926	3977	4149	4466	3696
JH053-009	3507	31	0	0.01836	0.00013	0.00066	0.00000	0.28058	0.00006	0.28054	-78.2	1.1	2.0	-0.98	3660	3680	3697	3754	3859	3461
JH053-014	3892	30	5	0.03337	0.00039	0.00116	0.00001	0.28035	0.00003	0.28027	-86.2	0.8	1.0	-0.97	4010	4024	4037	4080	4160	3858
JH053-028	4093	29	-2	0.02981	0.00014	0.00107	0.00001	0.28035	0.00004	0.28027	-86.3	5.6	1.3	-0.97	4005	3995	3986	3953	3894	3854
JH053-037	3399	29	5	0.01254	0.00056	0.00049	0.00002	0.28047	0.00003	0.28044	-82.1	-5.0	1.2	-0.99	3789	3841	3885	4030	4300	3609
JH053-038	3410	31	-1	0.01808	0.00022	0.00068	0.00001	0.28044	0.00004	0.28039	-83.3	-6.3	1.3	-0.98	3851	3908	3958	4121	4425	3679
JH053-047	4091	29	4	0.02208	0.00015	0.00084	0.00001	0.28022	0.00003	0.28015	-91.1	1.4	1.1	-0.98	4159	4168	4175	4200	4247	4030
JH053-048	4181	29	4	0.04701	0.00070	0.00183	0.00003	0.28016	0.00005	0.28001	-93.2	-1.5	1.7	-0.95	4349	4365	4383	4444	4556	4244
JH053-050	4201	29	-3	0.00568	0.00009	0.00022	0.00000	0.28006	0.00003	0.28005	-96.5	0.4	1.2	-0.99	4292	4305	4315	4349	4413	4184
JH053-060	4162	29	6	0.03089	0.00053	0.00112	0.00002	0.28009	0.00004	0.28000	-95.6	-2.2	1.3	-0.97	4357	4379	4401	4472	4604	4255
JH053-061	3381	31	-2	0.02595	0.00038	0.00094	0.00001	0.28069	0.00004	0.28063	-74.3	1.4	1.3	-0.97	3538	3557	3574	3632	3739	3319
JH053-063	3726	30	2	0.02155	0.00015	0.00078	0.00000	0.28047	0.00004	0.28041	-82.2	1.9	1.3	-0.98	3820	3832	3843	3878	3942	3644
JH053-065	3487	30	-2	0.03984	0.00065	0.00140	0.00002	0.28045	0.00004	0.28036	-82.8	-5.8	1.5	-0.96	3905	3950	3996	4148	4430	3737
JH053-070	3467	30	-1	0.02830	0.00011	0.00105	0.00000	0.28041	0.00004	0.28034	-84.3	-6.9	1.4	-0.97	3928	3982	4033	4202	4516	3765
JH053-071	3652	30	2	0.03161	0.00072	0.00103	0.00002	0.28036	0.00003	0.28029	-86.1	-4.3	1.2	-0.97	3991	4031	4069	4193	4425	3837
JH053-087	3392	28	2	0.02443	0.00047	0.00090	0.00002	0.28049	0.00007	0.28043	-81.6	-5.5	2.4	-0.97	3808	3860	3906	4059	4344	3629
JH053-093	4169	29	0	0.05105	0.00063	0.00185	0.00003	0.28020	0.00004	0.28005	-91.8	-0.3	1.3	-0.95	4297	4309	4322	4368	4453	4184
JH053-101	3548	30	1	0.01690	0.00007	0.00062	0.00000	0.28028	0.00003	0.28024	-88.8	-8.6	1.1	-0.98	4052	4119	4175	4363	4710	3909

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH053-108	3406	30	1	0.01592	0.00028	0.00058	0.00001	0.28037	0.00003	0.28034	-85.5	-8.5	1.0	-0.98	3925	3993	4051	4244	4602	3764
JH053-111	3559	30	1	0.01289	0.00016	0.00048	0.00001	0.28043	0.00004	0.28040	-83.4	-2.5	1.4	-0.99	3836	3873	3905	4008	4200	3663
JH053-113	3981	29	-5	0.03111	0.00047	0.00107	0.00002	0.28017	0.00005	0.28008	-92.9	-3.6	1.9	-0.97	4252	4284	4314	4413	4598	4135
JH053-114	3980	29	5	0.01875	0.00013	0.00068	0.00000	0.28024	0.00003	0.28019	-90.2	0.1	1.1	-0.98	4111	4128	4142	4191	4281	3976
JH053-118	3550	30	-1	0.01987	0.00018	0.00077	0.00001	0.28046	0.00004	0.28041	-82.5	-2.5	1.3	-0.98	3831	3867	3898	4002	4195	3656
JH053-120	3783	29	7	0.03116	0.00027	0.00114	0.00001	0.28035	0.00004	0.28027	-86.2	-1.7	1.4	-0.97	4008	4034	4059	4142	4295	3857
JH053-122	3385	29	2	0.04192	0.00026	0.00150	0.00001	0.28046	0.00005	0.28036	-82.7	-8.2	1.6	-0.96	3911	3966	4023	4214	4568	3743
JH053-132	3364	30	-1	0.01974	0.00007	0.00079	0.00000	0.28059	0.00004	0.28054	-77.8	-2.2	1.4	-0.98	3657	3694	3726	3834	4035	3456
JH053-146	3396	28	7	0.02372	0.00019	0.00087	0.00001	0.28042	0.00003	0.28036	-84.0	-7.9	1.2	-0.97	3899	3961	4017	4203	4547	3733
JH053-149	4178	28	0	0.01884	0.00021	0.00070	0.00001	0.28009	0.00003	0.28004	-95.5	-0.5	1.2	-0.98	4308	4324	4339	4387	4476	4200
JH053-159	4045	28	-9	0.02537	0.00010	0.00089	0.00000	0.28025	0.00003	0.28018	-89.8	1.5	1.2	-0.97	4115	4124	4132	4158	4206	3980
JH053-166	3555	29	1	0.01597	0.00010	0.00060	0.00000	0.28050	0.00004	0.28045	-81.2	-0.7	1.3	-0.98	3767	3795	3819	3898	4044	3584
JH053-174	3754	29	5	0.01419	0.00014	0.00054	0.00000	0.28037	0.00002	0.28033	-85.6	-0.2	0.9	-0.98	3922	3945	3963	4026	4142	3761
JH053-180	4042	29	5	0.02275	0.00007	0.00085	0.00000	0.28022	0.00004	0.28015	-91.0	0.3	1.3	-0.97	4157	4171	4184	4226	4304	4028
JH053-198	3396	31	-2	0.00853	0.00008	0.00035	0.00000	0.28033	0.00003	0.28031	-87.0	-9.6	1.1	-0.99	3955	4033	4096	4306	4694	3800
JH053-204	3386	30	6	0.00716	0.00005	0.00031	0.00000	0.28051	0.00003	0.28048	-80.9	-3.7	1.2	-0.99	3727	3775	3814	3942	4179	3540
JH053-208	4003	30	2	0.00867	0.00004	0.00035	0.00000	0.28017	0.00004	0.28015	-92.7	-0.9	1.4	-0.99	4165	4188	4206	4267	4379	4039
JH053-212	3418	31	1	0.01769	0.00019	0.00063	0.00001	0.28040	0.00003	0.28036	-84.7	-7.5	1.2	-0.98	3899	3962	4015	4194	4526	3734
JH053-215	3464	31	4	0.02737	0.00009	0.00102	0.00000	0.28045	0.00004	0.28038	-82.8	-5.4	1.4	-0.97	3867	3915	3960	4108	4383	3696
JH053-218	3462	31	4	0.00720	0.00008	0.00029	0.00000	0.28030	0.00003	0.28028	-88.1	-9.1	1.1	-0.99	3993	4068	4127	4327	4696	3843
JH053-225	3372	30	5	0.02237	0.00008	0.00082	0.00000	0.28041	0.00003	0.28036	-84.1	-8.4	1.1	-0.98	3897	3963	4021	4215	4575	3731
JH053-226	3623	30	2	0.01621	0.00014	0.00061	0.00001	0.28044	0.00004	0.28040	-83.2	-1.0	1.4	-0.98	3840	3869	3893	3974	4123	3667
JH053-227	3422	31	5	0.02581	0.00005	0.00096	0.00000	0.28043	0.00003	0.28037	-83.6	-7.0	1.1	-0.97	3890	3947	3998	4171	4491	3722
JH053-231	3443	31	2	0.03081	0.00048	0.00114	0.00002	0.28052	0.00005	0.28044	-80.4	-3.7	1.7	-0.97	3787	3827	3865	3991	4225	3603

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH053-234	3459	31	3	0.01700	0.00011	0.00065	0.00000	0.28037	0.00005	0.28033	-85.5	-7.4	1.6	-0.98	3933	3995	4047	4223	4549	3773
JH053-238	3393	31	0	0.01445	0.00011	0.00055	0.00000	0.28038	0.00003	0.28034	-85.4	-8.5	1.2	-0.98	3917	3986	4045	4240	4601	3755
JH053-239	3596	31	7	0.01503	0.00005	0.00058	0.00000	0.28036	0.00003	0.28032	-86.0	-4.5	1.2	-0.98	3943	3989	4028	4157	4397	3785
JH059-003	4002	29	0	0.00862	0.00007	0.00034	0.00000	0.28020	0.00003	0.28017	-91.8	0.0	0.9	-0.99	4133	4151	4166	4215	4306	4003
JH059-028	3387	31	-2	0.05342	0.00137	0.00182	0.00005	0.28033	0.00003	0.28021	-87.0	-13.3	1.1	-0.95	4110	4179	4257	4517	5000	3970
JH059-036	4188	29	0	0.01978	0.00004	0.00068	0.00000	0.27995	0.00002	0.27990	-100.5	-5.3	0.8	-0.98	4490	4528	4562	4674	4881	4408
JH059-045	3499	31	1	0.02518	0.00014	0.00090	0.00001	0.28039	0.00002	0.28033	-84.9	-6.4	0.8	-0.97	3935	3988	4037	4197	4496	3774
JH059-049	3481	31	-2	0.01947	0.00020	0.00075	0.00001	0.28032	0.00002	0.28027	-87.6	-9.2	0.8	-0.98	4018	4086	4146	4345	4714	3869
JH059-050	4009	29	-3	0.01539	0.00007	0.00055	0.00000	0.28016	0.00002	0.28011	-93.3	-1.9	0.9	-0.98	4209	4235	4258	4332	4470	4088
JH059-054	4144	29	4	0.10888	0.00189	0.00347	0.00006	0.28027	0.00003	0.27999	-89.2	-3.0	1.2	-0.90	4384	4395	4420	4503	4656	4279
JH059-056	4124	29	-2	0.01786	0.00011	0.00066	0.00000	0.27997	0.00003	0.27992	-99.7	-6.0	1.0	-0.98	4461	4505	4543	4668	4900	4376
JH059-061	4092	29	-1	0.01667	0.00036	0.00064	0.00001	0.28007	0.00002	0.28002	-96.4	-3.3	0.7	-0.98	4335	4367	4394	4484	4651	4232
JH059-064	3706	31	-1	0.00549	0.00032	0.00020	0.00001	0.28032	0.00002	0.28030	-87.6	-2.5	0.9	-0.99	3962	3999	4028	4124	4303	3808
JH059-066	3489	30	0	0.01913	0.00008	0.00069	0.00000	0.28035	0.00002	0.28030	-86.5	-7.7	0.7	-0.98	3970	4033	4086	4265	4597	3815
JH059-067	3552	30	-1	0.03800	0.00035	0.00138	0.00001	0.28038	0.00002	0.28029	-85.3	-6.7	0.8	-0.96	3997	4045	4094	4256	4556	3842
JH059-080	3997	29	6	0.02599	0.00004	0.00095	0.00000	0.28011	0.00002	0.28003	-95.0	-5.1	0.6	-0.97	4318	4357	4393	4511	4731	4212
JH059-085	3476	31	1	0.01914	0.00004	0.00074	0.00000	0.28037	0.00002	0.28032	-85.6	-7.3	0.6	-0.98	3944	4004	4056	4230	4551	3785
JH059-092	3585	30	1	0.01464	0.00001	0.00056	0.00000	0.28047	0.00002	0.28043	-82.3	-0.9	0.6	-0.98	3801	3830	3855	3935	4085	3623
JH059-093	3405	31	-3	0.01933	0.00059	0.00073	0.00002	0.28034	0.00002	0.28030	-86.6	-9.9	0.9	-0.98	3979	4053	4117	4329	4724	3825
JH059-095	4145	29	-1	0.01389	0.00005	0.00053	0.00000	0.28003	0.00002	0.27998	-97.8	-3.2	0.7	-0.98	4376	4407	4433	4519	4679	4279
JH059-096	4056	29	1	0.00738	0.00002	0.00029	0.00000	0.28008	0.00002	0.28006	-95.9	-2.7	0.8	-0.99	4279	4311	4336	4420	4575	4169
JH059-097	4019	29	-4	0.01791	0.00033	0.00067	0.00001	0.28011	0.00002	0.28006	-94.7	-3.5	0.7	-0.98	4276	4310	4338	4434	4611	4165
JH059-098	3624	30	-2	0.03208	0.00037	0.00122	0.00002	0.28033	0.00002	0.28025	-87.0	-6.4	0.6	-0.96	4045	4093	4139	4293	4578	3898
JH059-099	3383	31	-2	0.01042	0.00002	0.00041	0.00000	0.28038	0.00003	0.28036	-85.2	-8.3	1.0	-0.99	3898	3968	4026	4219	4575	3734

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH059-116	3726	31	-2	0.01389	0.00023	0.00056	0.00001	0.28021	0.00003	0.28016	-91.5	-6.9	1.0	-0.98	4145	4201	4248	4404	4694	4015
JH059-121	3502	31	-2	0.02470	0.00049	0.00088	0.00002	0.28033	0.00002	0.28027	-87.1	-8.5	0.8	-0.97	4014	4077	4133	4322	4672	3864
JH059-130	3500	31	0	0.03493	0.00014	0.00130	0.00000	0.28036	0.00002	0.28027	-86.0	-8.5	0.8	-0.96	4016	4074	4130	4319	4668	3865
JH059-137	4146	30	0	0.01606	0.00007	0.00060	0.00000	0.28003	0.00002	0.27999	-97.6	-3.1	0.6	-0.98	4374	4405	4430	4515	4673	4277
JH059-138	4098	30	5	0.01484	0.00016	0.00056	0.00001	0.28000	0.00002	0.27996	-98.7	-5.3	0.6	-0.98	4412	4454	4489	4606	4823	4320
JH059-144	3444	31	1	0.01987	0.00096	0.00072	0.00003	0.28045	0.00002	0.28041	-82.7	-5.0	0.7	-0.98	3833	3883	3926	4071	4338	3659
JH059-157	3392	31	-1	0.01803	0.00001	0.00071	0.00000	0.28032	0.00001	0.28027	-87.4	-11.0	0.5	-0.98	4008	4088	4156	4385	4809	3859
JH059-163	3427	31	2	0.01798	0.00016	0.00071	0.00001	0.28035	0.00002	0.28030	-86.4	-9.1	0.5	-0.98	3969	4039	4099	4300	4673	3814
JH059-164	3656	30	-2	0.01777	0.00008	0.00070	0.00000	0.28027	0.00002	0.28022	-89.3	-6.6	0.6	-0.98	4076	4130	4177	4333	4622	3936
JH062-008	3496	31	1	0.01123	0.00013	0.00046	0.00000	0.28042	0.00002	0.28039	-83.9	-4.4	0.6	-0.99	3851	3899	3939	4071	4316	3680
JH062-012	3873	30	1	0.02328	0.00006	0.00094	0.00000	0.28019	0.00002	0.28012	-92.1	-5.0	0.7	-0.97	4207	4248	4285	4408	4636	4085
JH062-013	3997	30	2	0.02248	0.00017	0.00087	0.00001	0.28025	0.00002	0.28018	-90.0	0.3	0.7	-0.97	4121	4136	4150	4195	4280	3986
JH062-014	4011	30	0	0.00984	0.00004	0.00038	0.00000	0.28017	0.00002	0.28014	-92.9	-1.0	0.7	-0.99	4176	4199	4218	4280	4395	4052
JH062-017	4113	29	1	0.02154	0.00010	0.00088	0.00000	0.28019	0.00002	0.28012	-92.1	0.9	0.9	-0.97	4200	4210	4220	4252	4312	4076
JH062-019	3394	31	0	0.01881	0.00015	0.00081	0.00001	0.28044	0.00002	0.28039	-83.2	-7.0	0.9	-0.98	3862	3920	3972	4145	4466	3691
JH062-020	3508	31	-2	0.01475	0.00010	0.00058	0.00000	0.28043	0.00002	0.28039	-83.6	-4.2	0.8	-0.98	3855	3901	3940	4069	4308	3684
JH062-021	4056	30	-2	0.01689	0.00002	0.00066	0.00000	0.28010	0.00002	0.28005	-95.2	-3.0	0.7	-0.98	4292	4323	4349	4437	4600	4183
JH062-028	4127	29	6	0.01571	0.00007	0.00057	0.00000	0.28007	0.00002	0.28003	-96.2	-2.1	0.9	-0.98	4321	4346	4368	4440	4574	4216
JH062-031	3402	31	1	0.03317	0.00007	0.00124	0.00000	0.28025	0.00004	0.28016	-90.1	-14.7	1.2	-0.96	4164	4250	4334	4612	5129	4035
JH062-032	3361	31	1	0.02642	0.00003	0.00112	0.00000	0.28054	0.00002	0.28047	-79.6	-4.8	0.8	-0.97	3756	3802	3846	3991	4259	3568
JH062-056	4019	30	0	0.01802	0.00005	0.00071	0.00000	0.28014	0.00003	0.28008	-94.0	-2.8	0.9	-0.98	4253	4282	4308	4395	4555	4137
JH062-058	3444	31	-2	0.01231	0.00008	0.00046	0.00000	0.28047	0.00002	0.28044	-82.3	-4.0	0.8	-0.99	3792	3840	3879	4009	4250	3613
JH062-062	3398	31	-1	0.02869	0.00029	0.00111	0.00001	0.28032	0.00002	0.28025	-87.3	-11.7	0.8	-0.97	4045	4121	4192	4430	4870	3899
JH062-064	3589	31	1	0.01812	0.00006	0.00069	0.00000	0.28039	0.00002	0.28034	-85.0	-3.9	0.7	-0.98	3917	3959	3995	4117	4343	3754

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH062-065	3319	31	2	0.00877	0.00014	0.00040	0.00000	0.28061	0.00003	0.28058	-77.3	-1.8	0.9	-0.99	3601	3639	3671	3776	3971	3395
JH062-069	4157	29	4	0.01837	0.00010	0.00067	0.00000	0.28004	0.00003	0.27998	-97.4	-2.9	0.9	-0.98	4376	4405	4429	4511	4662	4279
JH062-072	3674	30	5	0.01934	0.00013	0.00075	0.00001	0.28043	0.00003	0.28038	-83.6	-0.6	0.9	-0.98	3868	3893	3915	3987	4120	3699
JH062-075	3460	31	0	0.00583	0.00001	0.00026	0.00000	0.28043	0.00002	0.28041	-83.5	-4.4	0.7	-0.99	3819	3870	3911	4046	4295	3645
JH062-076	3969	29	2	0.01423	0.00003	0.00057	0.00000	0.28007	0.00002	0.28002	-96.4	-6.1	0.7	-0.98	4327	4375	4415	4548	4795	4223
JH062-078	3414	31	1	0.03696	0.00033	0.00138	0.00001	0.28037	0.00002	0.28028	-85.6	-10.3	0.8	-0.96	4011	4076	4141	4358	4761	3858
JH062-084	4027	30	4	0.01611	0.00020	0.00064	0.00001	0.27994	0.00002	0.27989	-100.8	-9.3	0.7	-0.98	4496	4557	4610	4784	5108	4416
JH062-085	4046	29	6	0.01943	0.00030	0.00077	0.00001	0.28000	0.00002	0.27994	-98.9	-7.3	0.7	-0.98	4442	4492	4536	4683	4956	4354
JH062-088	3465	31	0	0.01451	0.00043	0.00058	0.00001	0.28028	0.00003	0.28025	-88.7	-10.3	1.0	-0.98	4043	4120	4184	4400	4799	3899
JH062-090	3115	31	4	0.03135	0.00031	0.00114	0.00001	0.28082	0.00002	0.28075	-69.9	-0.8	0.7	-0.97	3389	3421	3451	3552	3738	3148
JH062-091	3480	31	-2	0.01348	0.00003	0.00052	0.00000	0.28032	0.00002	0.28028	-87.6	-8.7	0.8	-0.98	3997	4066	4124	4317	4674	3846
JH062-092	3506	30	1	0.01426	0.00015	0.00056	0.00000	0.28034	0.00002	0.28030	-86.8	-7.4	0.6	-0.98	3971	4033	4085	4258	4579	3817
JH062-094	3391	31	0	0.01154	0.00022	0.00047	0.00001	0.28025	0.00002	0.28022	-89.9	-13.0	0.7	-0.99	4077	4170	4247	4503	4978	3938
JH074-019	3374	36	0	0.03377	0.00168	0.00112	0.00004	0.28062	0.00004	0.28055	-76.8	-1.7	1.4	-0.97	3649	3681	3712	3812	4000	3446
JH074-021	3466	35	-5	0.01351	0.00010	0.00049	0.00000	0.28047	0.00003	0.28044	-82.0	-3.3	1.1	-0.99	3784	3827	3863	3982	4202	3604
JH074-025	3500	34	-9	0.02088	0.00013	0.00076	0.00000	0.28060	0.00005	0.28055	-77.4	1.5	1.6	-0.98	3638	3656	3671	3722	3817	3435
JH074-029	3530	33	3	0.01690	0.00014	0.00061	0.00000	0.28033	0.00003	0.28028	-87.2	-7.4	1.1	-0.98	3992	4053	4105	4277	4596	3841
JH074-041	3297	29	8	0.02079	0.00022	0.00084	0.00001	0.28043	0.00004	0.28037	-83.7	-9.7	1.4	-0.98	3882	3955	4020	4236	4636	3713
JH074-059	3418	30	9	0.01683	0.00006	0.00064	0.00000	0.28057	0.00003	0.28053	-78.6	-1.3	1.2	-0.98	3672	3705	3733	3828	4003	3475
JH074-061	3371	30	5	0.04008	0.00081	0.00154	0.00003	0.28057	0.00004	0.28047	-78.5	-4.5	1.4	-0.95	3756	3796	3838	3977	4236	3565
JH074-063	3356	30	-1	0.01141	0.00008	0.00050	0.00000	0.28047	0.00004	0.28044	-82.1	-6.0	1.3	-0.99	3789	3847	3896	4058	4357	3609
JH074-064	3386	30	1	0.01480	0.00004	0.00067	0.00000	0.28055	0.00003	0.28050	-79.4	-3.0	1.2	-0.98	3705	3746	3782	3900	4120	3512
JH074-068	3497	30	5	0.01291	0.00014	0.00050	0.00001	0.28051	0.00004	0.28047	-80.9	-1.4	1.6	-0.99	3744	3777	3805	3896	4067	3557
JH074-073	3425	30	3	0.01534	0.00010	0.00062	0.00000	0.28055	0.00003	0.28051	-79.4	-1.9	1.2	-0.98	3701	3737	3767	3870	4060	3507

Appendix D Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH074-085	2564	33	6	0.03571	0.00062	0.00129	0.00002	0.28090	0.00003	0.28083	-67.0	-10.7	1.0	-0.96	3292	3373	3453	3719	4211	3035
JH074-087	2030	35	6	0.01649	0.00023	0.00064	0.00001	0.28154	0.00009	0.28151	-44.4	1.0	3.3	-0.98	2374	2419	2457	2584	2821	1988
JH074-096	3429	31	-2	0.01796	0.00038	0.00066	0.00001	0.28052	0.00003	0.28048	-80.3	-2.9	0.9	-0.98	3738	3778	3813	3928	4140	3550
JH074-102	3453	31	-1	0.02878	0.00008	0.00111	0.00000	0.28058	0.00003	0.28051	-78.2	-1.2	1.1	-0.97	3702	3731	3759	3850	4020	3506
JH074-112	3597	30	-2	0.01593	0.00047	0.00054	0.00001	0.28051	0.00003	0.28047	-80.8	0.9	1.2	-0.98	3745	3765	3781	3836	3938	3559
JH074-118	3413	30	0	0.00663	0.00003	0.00027	0.00000	0.28056	0.00003	0.28054	-78.9	-0.9	1.2	-0.99	3650	3683	3710	3799	3963	3451
JH074-154	3543	30	6	0.01431	0.00035	0.00054	0.00001	0.28045	0.00004	0.28041	-82.9	-2.5	1.4	-0.98	3823	3860	3891	3996	4189	3647
JH074-163	3606	30	9	0.03437	0.00045	0.00123	0.00001	0.28046	0.00004	0.28037	-82.5	-2.3	1.5	-0.96	3877	3907	3937	4036	4220	3706
JH074-167	3613	30	7	0.03952	0.00009	0.00148	0.00000	0.28057	0.00004	0.28047	-78.6	1.2	1.3	-0.96	3752	3766	3782	3832	3926	3561

Appendix E Zircon Lu-Hf isotope results from analytical session 2 (Beijing).

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH014-05	2766	16	5	0.04136	0.00155	0.00128	0.00004	0.28080	0.00002	0.28073	-70.6	-9.8	0.9	-0.96	3430	3504	3577	3819	4269	3194
JH014-08	1642	21	1	0.02471	0.00030	0.00089	0.00001	0.28148	0.00002	0.28145	-46.6	-10.4	0.9	-0.97	2475	2578	2670	2977	3548	2102
JH014-11	2557	8	4	0.02128	0.00015	0.00075	0.00000	0.28101	0.00002	0.28098	-62.9	-5.8	0.7	-0.98	3091	3159	3219	3417	3784	2810
JH014-18	3063	8	6	0.06818	0.00038	0.00232	0.00001	0.28093	0.00002	0.28079	-65.9	-0.4	0.8	-0.93	3339	3362	3391	3489	3671	3081
JH014-24	2637	12	6	0.00909	0.00007	0.00033	0.00000	0.28085	0.00002	0.28083	-68.8	-9.1	0.7	-0.99	3277	3366	3438	3678	4122	3025
JH014-27	3072	8	5	0.03163	0.00052	0.00111	0.00002	0.28088	0.00002	0.28081	-67.8	0.5	0.9	-0.97	3305	3332	3358	3444	3602	3052
JH014-28	2652	8	4	0.04833	0.00272	0.00145	0.00007	0.28099	0.00002	0.28092	-63.7	-5.7	0.9	-0.96	3177	3233	3290	3481	3835	2902
JH014-29	2734	7	7	0.03747	0.00182	0.00137	0.00006	0.28098	0.00003	0.28091	-64.1	-4.1	1.0	-0.96	3187	3236	3285	3450	3755	2913
JH014-30	4084	13	5	0.01448	0.00026	0.00056	0.00001	0.28007	0.00002	0.28002	-96.3	-3.2	0.8	-0.98	4324	4356	4383	4472	4637	4220
JH014-42	4143	8	4	0.02182	0.00040	0.00079	0.00001	0.28008	0.00002	0.28001	-96.1	-2.2	0.8	-0.98	4340	4364	4386	4459	4594	4237
JH014-47	2568	18	1	0.00912	0.00005	0.00031	0.00000	0.28073	0.00002	0.28072	-72.8	-14.7	0.7	-0.99	3426	3547	3643	3965	4561	3196
JH014-50	3090	10	7	0.02751	0.00040	0.00097	0.00001	0.28087	0.00002	0.28081	-67.9	1.0	0.8	-0.97	3299	3324	3347	3424	3566	3045
JH014-51	1960	34	5	0.02518	0.00051	0.00109	0.00002	0.28149	0.00003	0.28145	-46.0	-2.9	1.0	-0.97	2464	2523	2579	2764	3107	2087
JH014-53	1792	27	7	0.03217	0.00041	0.00119	0.00001	0.28154	0.00002	0.28150	-44.3	-5.1	0.7	-0.96	2407	2477	2545	2770	3188	2020
JH014-57	3056	7	2	0.05200	0.00068	0.00171	0.00002	0.28090	0.00002	0.28080	-66.8	-0.2	0.9	-0.95	3320	3346	3375	3471	3648	3064
JH014-58	4093	6	2	0.02345	0.00072	0.00090	0.00003	0.28012	0.00003	0.28004	-94.7	-2.3	0.9	-0.97	4300	4326	4349	4425	4567	4191
JH014-63	2627	13	8	0.01453	0.00012	0.00052	0.00000	0.28108	0.00002	0.28105	-60.7	-1.6	0.8	-0.98	2989	3038	3078	3213	3463	2695
JH015-01	4102	7	3	0.01731	0.00025	0.00063	0.00001	0.28004	0.00002	0.27999	-97.4	-4.1	0.7	-0.98	4373	4408	4439	4539	4726	4275
JH016-01	3483	7	0	0.02504	0.00024	0.00091	0.00001	0.28034	0.00002	0.28028	-86.6	-8.6	0.8	-0.97	4000	4063	4121	4311	4665	3848
JH016-07	3776	10	0	0.02746	0.00020	0.00100	0.00001	0.28005	0.00002	0.27998	-97.0	-12.4	0.8	-0.97	4396	4471	4539	4768	5191	4301
JH016-09	3520	6	0	0.02033	0.00080	0.00073	0.00003	0.28044	0.00002	0.28039	-83.3	-3.9	0.7	-0.98	3859	3902	3939	4065	4297	3687
JH016-10	3882	11	0	0.05079	0.00016	0.00177	0.00000	0.28021	0.00003	0.28008	-91.3	-6.3	1.0	-0.95	4270	4308	4350	4490	4749	4154
JH016-11	3549	7	3	0.01065	0.00011	0.00041	0.00000	0.28047	0.00002	0.28044	-82.3	-1.4	0.7	-0.99	3787	3820	3847	3936	4101	3608
JH016-12	3549	5	1	0.03489	0.00367	0.00116	0.00010	0.28053	0.00002	0.28045	-80.0	-0.9	0.9	-0.97	3774	3799	3824	3907	4059	3588

Appendix E Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH016-13	3408	14	-1	0.00977	0.00003	0.00037	0.00000	0.28034	0.00002	0.28032	-86.7	-9.1	0.7	-0.99	3948	4023	4083	4285	4660	3791
JH016-19	4050	5	6	0.02829	0.00019	0.00108	0.00001	0.28022	0.00002	0.28013	-91.0	-0.1	0.8	-0.97	4182	4197	4212	4261	4351	4055
JH016-20	4087	6	9	0.02604	0.00062	0.00089	0.00003	0.28004	0.00002	0.27997	-97.2	-5.0	0.8	-0.97	4392	4430	4464	4577	4786	4296
JH016-25	3746	15	-2	0.03121	0.00043	0.00111	0.00002	0.28028	0.00003	0.28020	-89.0	-5.3	0.9	-0.97	4109	4151	4191	4324	4570	3972
JH016-29	4077	18	0	0.01241	0.00018	0.00050	0.00001	0.28007	0.00002	0.28003	-96.3	-3.2	0.8	-0.99	4317	4350	4376	4466	4632	4212
JH016-36	4007	4	2	0.04974	0.00081	0.00171	0.00003	0.28021	0.00002	0.28008	-91.3	-3.2	0.8	-0.95	4262	4288	4315	4407	4578	4145
JH016-46	3965	6	0	0.01087	0.00013	0.00041	0.00000	0.28009	0.00002	0.28006	-95.6	-4.9	0.8	-0.99	4281	4324	4360	4478	4696	4171
JH016-49	4381	5	1	0.04732	0.00027	0.00166	0.00001	0.28010	0.00003	0.27996	-95.3	1.6	1.0	-0.95	4409	4412	4415	4425	4444	4314
JH016-50	4020	6	-1	0.03229	0.00036	0.00124	0.00001	0.28022	0.00002	0.28012	-91.1	-1.4	0.9	-0.96	4202	4222	4242	4309	4432	4078
JH017-01	3738	9	2	0.03477	0.00165	0.00131	0.00006	0.28028	0.00002	0.28018	-89.0	-6.0	0.8	-0.96	4132	4175	4219	4362	4629	3997
JH030-06	4007	6	4	0.02030	0.00006	0.00076	0.00000	0.28005	0.00002	0.27999	-97.0	-6.3	0.8	-0.98	4372	4418	4459	4594	4845	4273
JH030-07	4102	5	2	0.01752	0.00020	0.00066	0.00001	0.28005	0.00002	0.28000	-96.9	-3.7	0.8	-0.98	4357	4390	4419	4513	4689	4257
JH030-09	4077	6	3	0.01991	0.00003	0.00077	0.00000	0.28014	0.00002	0.28008	-93.7	-1.3	0.8	-0.98	4248	4269	4288	4352	4469	4132
JH034-006	3455	31	1	0.01219	0.00011	0.00045	0.00000	0.28053	0.00003	0.28050	-80.1	-1.5	1.2	-0.99	3710	3745	3773	3869	4045	3519
JH034-008	3432	31	1	0.01486	0.00002	0.00058	0.00000	0.28055	0.00003	0.28051	-79.4	-1.7	1.0	-0.98	3696	3731	3761	3859	4041	3503
JH034-016	3379	31	1	0.01556	0.00002	0.00058	0.00000	0.28043	0.00004	0.28039	-83.7	-7.3	1.3	-0.98	3858	3921	3975	4153	4483	3687
JH034-022	3357	31	1	0.02486	0.00012	0.00094	0.00001	0.28071	0.00004	0.28065	-73.6	1.5	1.3	-0.97	3512	3531	3548	3606	3712	3290
JH034-025	3457	31	1	0.01180	0.00003	0.00043	0.00000	0.28050	0.00003	0.28047	-81.3	-2.6	1.2	-0.99	3752	3793	3826	3936	4141	3567
JH034-026	3381	31	-2	0.02766	0.00012	0.00099	0.00001	0.28038	0.00003	0.28031	-85.5	-9.9	1.1	-0.97	3964	4034	4099	4313	4711	3807
JH034-029	3404	31	0	0.02325	0.00007	0.00083	0.00000	0.28051	0.00005	0.28046	-80.6	-4.1	1.7	-0.98	3765	3810	3850	3984	4231	3580
JH034-030	4100	29	8	0.01942	0.00010	0.00073	0.00000	0.28014	0.00004	0.28009	-93.7	-0.6	1.5	-0.98	4244	4262	4278	4331	4430	4127
JH034-033	3432	31	-1	0.03271	0.00116	0.00118	0.00003	0.28054	0.00003	0.28047	-79.6	-3.3	1.2	-0.97	3760	3798	3834	3954	4177	3573
JH034-038	4119	29	3	0.02628	0.00017	0.00102	0.00001	0.28012	0.00003	0.28004	-94.4	-1.8	1.2	-0.97	4303	4325	4346	4414	4539	4195
JH034-039	3127	31	4	0.03123	0.00023	0.00112	0.00001	0.28084	0.00003	0.28077	-69.1	0.3	0.9	-0.97	3359	3385	3411	3496	3654	3113

Appendix E Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH034-042	3608	30	4	0.00853	0.00008	0.00032	0.00000	0.28049	0.00007	0.28047	-81.4	1.2	2.6	-0.99	3745	3764	3779	3831	3926	3560
JH034-043	3086	32	5	0.01473	0.00004	0.00054	0.00000	0.28084	0.00002	0.28081	-69.0	0.7	0.8	-0.98	3305	3334	3358	3440	3591	3055
JH034-044	3607	30	5	0.03523	0.00026	0.00121	0.00001	0.28049	0.00003	0.28041	-81.4	-1.1	1.1	-0.96	3832	3857	3882	3964	4117	3654
JH034-049	3121	31	3	0.06325	0.00024	0.00229	0.00000	0.28106	0.00003	0.28092	-61.2	5.6	1.2	-0.93	3152	3155	3158	3169	3190	2866
JH034-057	3389	31	0	0.04689	0.00026	0.00160	0.00001	0.28063	0.00008	0.28053	-76.5	-2.2	2.9	-0.95	3684	3714	3747	3854	4052	3483
JH034-061	3399	31	0	0.02407	0.00005	0.00085	0.00000	0.28070	0.00004	0.28065	-73.9	2.5	1.3	-0.97	3514	3528	3541	3584	3663	3293
JH034-065	3399	31	-1	0.02979	0.00049	0.00105	0.00002	0.28034	0.00003	0.28028	-86.6	-10.8	1.2	-0.97	4013	4085	4153	4378	4796	3862
JH034-069	3562	31	1	0.00776	0.00015	0.00028	0.00000	0.28036	0.00004	0.28034	-85.9	-4.4	1.3	-0.99	3910	3959	3998	4129	4371	3748
JH034-071	3413	31	-2	0.01487	0.00022	0.00056	0.00001	0.28041	0.00003	0.28037	-84.4	-7.1	1.2	-0.98	3881	3944	3996	4171	4494	3714
JH034-077	3389	31	0	0.01753	0.00010	0.00067	0.00000	0.28035	0.00003	0.28031	-86.2	-9.8	1.1	-0.98	3961	4035	4099	4311	4705	3804
JH034-079	4231	29	2	0.05747	0.00137	0.00194	0.00004	0.28008	0.00004	0.27993	-95.8	-3.2	1.4	-0.94	4459	4480	4504	4586	4738	4370
JH034-084	3420	31	1	0.02219	0.00010	0.00080	0.00001	0.28063	0.00004	0.28058	-76.5	0.5	1.4	-0.98	3607	3631	3652	3721	3849	3400
JH034-089	3397	31	-2	0.02213	0.00016	0.00079	0.00000	0.28031	0.00003	0.28026	-87.9	-11.6	1.2	-0.98	4035	4115	4186	4422	4860	3888
JH034-095	3129	31	7	0.03301	0.00018	0.00113	0.00000	0.28084	0.00002	0.28077	-69.2	0.3	0.7	-0.97	3360	3387	3412	3497	3655	3115
JH034-096	3720	30	4	0.01336	0.00033	0.00047	0.00001	0.28027	0.00006	0.28024	-89.2	-4.5	2.1	-0.99	4051	4096	4133	4257	4486	3908
JH034-130	3627	30	0	0.02516	0.00004	0.00090	0.00000	0.28048	0.00003	0.28042	-81.7	-0.2	0.9	-0.97	3815	3838	3859	3928	4056	3636
JH034-140	4034	30	4	0.02737	0.00047	0.00100	0.00002	0.28009	0.00003	0.28001	-95.6	-4.9	1.2	-0.97	4344	4381	4416	4530	4741	4241
JH034-151	3145	32	8	0.05183	0.00067	0.00184	0.00002	0.28094	0.00003	0.28083	-65.5	2.8	1.0	-0.95	3282	3295	3310	3359	3451	3019
JH034-159	4025	30	8	0.00880	0.00009	0.00033	0.00000	0.28013	0.00003	0.28011	-94.1	-1.7	1.2	-0.99	4216	4243	4264	4336	4469	4097
JH034-164	3298	31	-1	0.01140	0.00042	0.00042	0.00002	0.28066	0.00004	0.28063	-75.4	-0.5	1.3	-0.99	3533	3565	3592	3680	3843	3317
JH034-194	3511	30	-2	0.00962	0.00013	0.00036	0.00001	0.28037	0.00003	0.28035	-85.5	-5.5	1.2	-0.99	3903	3958	4002	4149	4421	3740
JH034-196	3504	30	1	0.01197	0.00025	0.00046	0.00001	0.28038	0.00003	0.28035	-85.4	-5.7	0.9	-0.99	3908	3963	4008	4158	4438	3745
JH034-197	4059	29	2	0.03491	0.00049	0.00135	0.00002	0.28019	0.00004	0.28008	-92.2	-1.9	1.5	-0.96	4256	4277	4299	4370	4503	4139
JH034-211	3092	31	8	0.05001	0.00021	0.00169	0.00001	0.28086	0.00004	0.28076	-68.2	-0.8	1.3	-0.95	3373	3401	3432	3533	3722	3125

Appendix E Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH036-03	4029	7	4	0.01438	0.00019	0.00063	0.00001	0.28005	0.00002	0.28000	-97.1	-5.6	0.9	-0.98	4361	4404	4441	4565	4794	4261
JH036-24	3075	10	5	0.01421	0.00038	0.00049	0.00001	0.28070	0.00002	0.28067	-73.9	-4.3	0.8	-0.99	3483	3538	3583	3735	4017	3259
JH036-26	4059	7	6	0.01471	0.00031	0.00050	0.00001	0.28007	0.00002	0.28003	-96.4	-3.8	0.9	-0.99	4321	4357	4386	4484	4666	4217
JH036-41	3698	9	3	0.03575	0.00052	0.00128	0.00002	0.28027	0.00003	0.28018	-89.3	-7.1	0.9	-0.96	4138	4187	4235	4396	4693	4004
JH036-42	3405	10	3	0.02173	0.00041	0.00088	0.00002	0.28039	0.00002	0.28033	-84.9	-8.6	0.8	-0.97	3932	3997	4056	4251	4612	3771
JH036-47	3602	15	-4	0.03866	0.00067	0.00156	0.00002	0.28034	0.00002	0.28024	-86.6	-7.4	0.7	-0.95	4067	4114	4165	4334	4646	3921
JH036-49	4022	7	4	0.06586	0.00126	0.00218	0.00004	0.28019	0.00003	0.28002	-91.9	-4.8	1.0	-0.94	4340	4367	4401	4514	4724	4233
JH039A-01	3712	16	2	0.03336	0.00279	0.00121	0.00009	0.28032	0.00003	0.28023	-87.6	-4.9	0.9	-0.96	4067	4108	4147	4277	4518	3924
JH039A-06	4304	12	-2	0.00908	0.00006	0.00041	0.00000	0.27999	0.00003	0.27996	-99.1	-0.3	0.9	-0.99	4409	4424	4436	4475	4549	4317
JH039A-09	2454	9	9	0.06449	0.00188	0.00190	0.00004	0.28113	0.00003	0.28104	-58.9	-6.1	1.0	-0.94	3028	3081	3143	3349	3732	2726
JH039A-14	3462	9	2	0.02973	0.00073	0.00106	0.00002	0.28041	0.00002	0.28034	-84.4	-7.1	0.8	-0.97	3930	3985	4036	4208	4527	3767
JH039A-18	2650	11	3	0.03196	0.00098	0.00111	0.00004	0.28085	0.00002	0.28079	-68.7	-10.1	0.7	-0.97	3340	3421	3497	3750	4220	3092
JH039A-19	2595	27	2	0.02915	0.00170	0.00099	0.00006	0.28091	0.00002	0.28087	-66.4	-8.9	0.8	-0.97	3243	3321	3393	3632	4074	2982
JH039A-20	2676	8	2	0.02329	0.00024	0.00088	0.00001	0.28087	0.00002	0.28083	-68.0	-8.4	0.7	-0.97	3293	3370	3438	3666	4089	3040
JH039A-21	3516	7	1	0.01245	0.00047	0.00046	0.00002	0.28048	0.00002	0.28045	-81.8	-1.9	0.8	-0.99	3776	3811	3840	3937	4117	3594
JH039A-22	1765	29	0	0.05136	0.00228	0.00188	0.00008	0.28155	0.00002	0.28148	-44.1	-6.3	0.8	-0.94	2442	2505	2578	2821	3272	2052
JH039A-23	1754	19	-1	0.02242	0.00220	0.00076	0.00007	0.28141	0.00003	0.28138	-49.0	-10.1	0.9	-0.98	2559	2661	2751	3049	3601	2200
JH039A-25	3743	18	0	0.03242	0.00249	0.00113	0.00008	0.28030	0.00003	0.28022	-88.0	-4.4	1.0	-0.97	4075	4114	4150	4272	4498	3933
JH039A-27	4038	10	4	0.01072	0.00010	0.00040	0.00000	0.28006	0.00003	0.28003	-96.7	-4.2	0.9	-0.99	4320	4358	4390	4495	4690	4215
JH039A-29	3732	7	3	0.01967	0.00020	0.00074	0.00001	0.28022	0.00002	0.28016	-91.1	-6.7	0.8	-0.98	4147	4200	4246	4400	4685	4017
JH039A-33	3510	7	1	0.03651	0.00032	0.00131	0.00001	0.28040	0.00003	0.28031	-84.6	-6.9	0.9	-0.96	3965	4015	4065	4231	4539	3806
JH039A-36	2567	15	7	0.02160	0.00037	0.00076	0.00001	0.28103	0.00002	0.28099	-62.4	-5.1	0.7	-0.98	3073	3137	3194	3381	3729	2789
JH039A-40	2600	16	3	0.01042	0.00010	0.00039	0.00000	0.28088	0.00002	0.28086	-67.5	-8.8	0.7	-0.99	3236	3323	3395	3632	4073	2978
JH039A-41	2645	19	1	0.01424	0.00038	0.00051	0.00001	0.28093	0.00002	0.28090	-65.9	-6.4	0.8	-0.99	3184	3256	3317	3518	3890	2918

Appendix E Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH039A-47	1961	15	3	0.01152	0.00008	0.00047	0.00000	0.28093	0.00002	0.28091	-66.0	-22.1	0.8	-0.99	3182	3348	3485	3941	4787	2916
JH039A-49	2692	9	1	0.03566	0.00154	0.00127	0.00004	0.28089	0.00002	0.28083	-67.2	-7.9	0.9	-0.96	3296	3363	3429	3650	4059	3039
JH039A-51	2658	11	2	0.02038	0.00018	0.00076	0.00001	0.28079	0.00002	0.28076	-70.7	-11.3	0.8	-0.98	3384	3477	3557	3827	4326	3145
JH039A-54	2637	8	3	0.05420	0.00017	0.00198	0.00000	0.28105	0.00002	0.28095	-61.5	-4.7	0.7	-0.94	3137	3182	3236	3414	3746	2851
JH039A-55	2815	7	2	0.10309	0.00040	0.00361	0.00001	0.28109	0.00003	0.28090	-60.2	-2.6	0.9	-0.89	3224	3241	3284	3424	3684	2937
JH039B-04	3511	4	9	0.00627	0.00009	0.00029	0.00000	0.28043	0.00002	0.28041	-83.7	-3.5	0.7	-0.99	3828	3873	3909	4028	4249	3655
JH039B-05	2503	12	1	0.02867	0.00086	0.00108	0.00002	0.28107	0.00002	0.28102	-60.9	-5.6	0.7	-0.97	3040	3103	3162	3359	3724	2747
JH039B-06	2762	14	3	0.01706	0.00045	0.00069	0.00002	0.28072	0.00002	0.28069	-73.2	-11.3	0.8	-0.98	3474	3566	3646	3910	4400	3248
JH049-017	3388	31	0	0.02232	0.00024	0.00080	0.00001	0.28033	0.00003	0.28028	-87.1	-11.0	1.0	-0.98	4007	4084	4153	4382	4806	3856
JH049-018	4018	30	4	0.01919	0.00011	0.00073	0.00001	0.28010	0.00003	0.28004	-95.3	-4.3	1.1	-0.98	4305	4341	4373	4479	4676	4197
JH049-019	4033	30	3	0.01924	0.00004	0.00075	0.00000	0.28012	0.00003	0.28006	-94.6	-3.2	1.2	-0.98	4279	4311	4338	4429	4598	4168
JH049-043	3370	31	1	0.01805	0.00021	0.00073	0.00001	0.28055	0.00004	0.28051	-79.2	-3.3	1.3	-0.98	3704	3747	3784	3908	4138	3511
JH049-058	4017	29	4	0.02151	0.00013	0.00077	0.00000	0.28021	0.00003	0.28015	-91.2	-0.2	1.2	-0.98	4156	4173	4189	4240	4335	4027
JH049-059	4000	30	2	0.00831	0.00005	0.00031	0.00000	0.28011	0.00003	0.28008	-95.0	-3.2	1.0	-0.99	4247	4281	4309	4402	4573	4132
JH049-086	3584	30	5	0.03917	0.00016	0.00132	0.00001	0.28058	0.00006	0.28049	-78.2	1.3	2.3	-0.96	3722	3737	3752	3802	3895	3528
JH049-099	3557	30	5	0.01727	0.00017	0.00064	0.00001	0.28051	0.00004	0.28047	-80.7	-0.2	1.4	-0.98	3750	3775	3796	3868	4001	3564
JH049-104	3966	29	9	0.00751	0.00010	0.00027	0.00000	0.28013	0.00004	0.28011	-94.1	-3.0	1.4	-0.99	4210	4245	4272	4364	4533	4090
JH049-105	4003	29	6	0.00545	0.00006	0.00022	0.00000	0.28022	0.00002	0.28020	-91.0	1.2	0.6	-0.99	4091	4103	4113	4146	4207	3955
JH049-108	3393	31	-1	0.02502	0.00117	0.00098	0.00004	0.28056	0.00005	0.28050	-78.9	-3.1	1.8	-0.97	3717	3756	3792	3911	4132	3524
JH049-112	4121	29	2	0.02281	0.00031	0.00086	0.00001	0.28012	0.00003	0.28005	-94.7	-1.5	1.2	-0.97	4295	4317	4336	4400	4520	4186
JH049-116	3320	31	1	0.01841	0.00003	0.00069	0.00000	0.28058	0.00003	0.28054	-78.1	-3.3	1.0	-0.98	3660	3704	3742	3868	4101	3460
JH049-120	3387	31	0	0.01241	0.00017	0.00047	0.00001	0.28038	0.00003	0.28035	-85.4	-8.6	1.2	-0.99	3910	3982	4040	4236	4598	3748
JH049-130	3386	31	-2	0.01890	0.00011	0.00070	0.00000	0.28039	0.00003	0.28035	-84.9	-8.6	1.2	-0.98	3916	3984	4043	4239	4603	3753
JH049-137	3737	30	3	0.02243	0.00008	0.00080	0.00000	0.28044	0.00007	0.28038	-83.3	1.0	2.4	-0.98	3865	3881	3895	3942	4030	3694

Appendix E Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH049-145	3618	30	7	0.00997	0.00002	0.00036	0.00000	0.28040	0.00004	0.28037	-84.6	-2.0	1.3	-0.99	3870	3905	3934	4028	4203	3703
JH049-149	3351	31	0	0.03345	0.00012	0.00127	0.00001	0.28049	0.00004	0.28041	-81.4	-7.2	1.4	-0.96	3839	3893	3947	4125	4456	3662
JH049-150	3280	31	-7	0.01059	0.00006	0.00040	0.00000	0.28056	0.00004	0.28054	-78.9	-4.4	1.5	-0.99	3662	3715	3758	3900	4165	3465
JH049-151	3267	32	-3	0.01382	0.00007	0.00053	0.00000	0.28064	0.00003	0.28060	-76.3	-2.3	1.2	-0.98	3574	3615	3650	3764	3976	3364
JH049-152	4119	29	6	0.02540	0.00085	0.00097	0.00003	0.28020	0.00006	0.28012	-91.7	1.1	2.2	-0.97	4195	4204	4212	4240	4292	4070
JH049-160	3874	30	3	0.02277	0.00015	0.00075	0.00001	0.28006	0.00006	0.28001	-96.5	-8.9	2.0	-0.98	4350	4410	4463	4639	4966	4248
JH049-166	3655	30	3	0.05476	0.00110	0.00171	0.00003	0.28052	0.00003	0.28040	-80.4	-0.3	1.1	-0.95	3846	3865	3885	3954	4082	3667
JH049-167	4159	29	6	0.01385	0.00017	0.00052	0.00001	0.28003	0.00002	0.27999	-97.7	-2.7	0.9	-0.98	4370	4399	4422	4501	4647	4273
JH049-168	4080	29	4	0.00868	0.00001	0.00033	0.00000	0.28004	0.00003	0.28001	-97.4	-3.7	1.0	-0.99	4336	4372	4401	4497	4675	4234
JH049-170	4116	29	6	0.01474	0.00009	0.00053	0.00000	0.28016	0.00003	0.28012	-93.1	0.8	1.2	-0.98	4203	4214	4224	4256	4316	4081
JH049-173	3484	31	1	0.01946	0.00007	0.00071	0.00000	0.28043	0.00003	0.28038	-83.6	-5.0	1.1	-0.98	3867	3917	3959	4101	4365	3698
JH049-177	3587	30	5	0.02325	0.00020	0.00084	0.00000	0.28052	0.00003	0.28046	-80.4	0.3	1.0	-0.98	3758	3780	3799	3862	3980	3572
JH049-190	3481	31	1	0.01860	0.00008	0.00068	0.00000	0.28038	0.00003	0.28034	-85.3	-6.7	1.0	-0.98	3926	3983	4033	4198	4505	3764
JH049-191	4029	29	5	0.01296	0.00003	0.00048	0.00000	0.28005	0.00005	0.28001	-97.1	-5.1	1.7	-0.99	4342	4385	4420	4537	4754	4241
JH049-204	3874	30	6	0.05212	0.00021	0.00178	0.00001	0.28032	0.00003	0.28019	-87.3	-2.4	1.1	-0.95	4119	4142	4169	4257	4421	3980
JH049-205	3578	30	3	0.01448	0.00011	0.00056	0.00000	0.28059	0.00005	0.28055	-78.0	3.2	1.6	-0.98	3642	3650	3657	3681	3725	3440
JH049-214	3824	30	9	0.05573	0.00173	0.00181	0.00004	0.28039	0.00004	0.28025	-85.0	-1.3	1.4	-0.95	4033	4053	4076	4151	4290	3882
JH049-228	3428	31	0	0.01505	0.00005	0.00058	0.00000	0.28040	0.00002	0.28037	-84.5	-6.9	0.9	-0.98	3885	3946	3997	4167	4483	3719
JH050-01	3408	6	3	0.00992	0.00021	0.00035	0.00001	0.28034	0.00002	0.28031	-86.9	-9.3	0.6	-0.99	3953	4029	4090	4294	4672	3797
JH050-04	3632	4	5	0.00862	0.00015	0.00036	0.00001	0.28012	0.00002	0.28010	-94.4	-11.6	0.6	-0.99	4232	4315	4383	4607	5024	4115
JH050-09	3614	8	4	0.02597	0.00039	0.00094	0.00001	0.28013	0.00002	0.28007	-94.0	-13.0	0.7	-0.97	4280	4361	4435	4680	5136	4168
JH050-10	3974	6	2	0.00663	0.00006	0.00026	0.00000	0.28012	0.00002	0.28010	-94.6	-3.2	0.7	-0.99	4226	4261	4290	4384	4560	4108
JH050-14	3406	6	7	0.02730	0.00083	0.00100	0.00003	0.28034	0.00002	0.28027	-86.8	-10.8	0.8	-0.97	4016	4089	4157	4382	4798	3866
JH050-18	3589	4	5	0.03574	0.00077	0.00143	0.00002	0.28032	0.00002	0.28022	-87.5	-8.2	0.6	-0.96	4086	4139	4193	4374	4709	3944

Appendix E Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH050-27	3350	6	4	0.02763	0.00131	0.00101	0.00004	0.28075	0.00002	0.28068	-72.4	2.5	0.7	-0.97	3472	3487	3500	3545	3629	3244
JH050-28	3411	9	3	0.01968	0.00080	0.00071	0.00003	0.28042	0.00002	0.28038	-83.8	-6.9	0.7	-0.98	3872	3931	3983	4154	4471	3703
JH052-14	3509	6	3	0.01356	0.00064	0.00049	0.00002	0.28043	0.00002	0.28039	-83.7	-3.9	0.7	-0.99	3847	3893	3931	4057	4291	3676
JH052-18	3385	5	3	0.00705	0.00013	0.00031	0.00000	0.28041	0.00002	0.28039	-84.4	-7.2	0.7	-0.99	3856	3922	3975	4152	4479	3687
JH052-21	4100	9	7	0.01539	0.00031	0.00057	0.00001	0.28000	0.00002	0.27996	-98.7	-5.3	0.8	-0.98	4412	4454	4489	4605	4821	4320
JH052-23	4028	8	5	0.01847	0.00027	0.00071	0.00001	0.28015	0.00002	0.28010	-93.4	-2.1	0.8	-0.98	4232	4258	4281	4357	4498	4114
JH052-24	3528	6	3	0.02062	0.00024	0.00077	0.00001	0.28051	0.00002	0.28045	-80.9	-1.3	0.7	-0.98	3769	3800	3827	3916	4081	3585
JH052-40	4055	7	2	0.02754	0.00041	0.00098	0.00001	0.28011	0.00002	0.28003	-95.0	-3.7	0.7	-0.97	4319	4351	4380	4477	4657	4213
JH052-49	3594	7	0	0.01468	0.00051	0.00055	0.00002	0.28043	0.00002	0.28039	-83.6	-2.0	0.8	-0.98	3850	3884	3913	4008	4185	3679
JH052-52	3932	48	3	0.01675	0.00016	0.00062	0.00001	0.28004	0.00002	0.28000	-97.2	-7.9	0.7	-0.98	4363	4419	4467	4627	4924	4263
JH052-53	3571	8	3	0.01678	0.00011	0.00061	0.00000	0.28033	0.00002	0.28028	-87.2	-6.3	0.7	-0.98	3991	4046	4092	4248	4538	3839
JH052-56	3555	9	4	0.00921	0.00011	0.00035	0.00000	0.28044	0.00002	0.28041	-83.3	-2.1	0.6	-0.99	3819	3856	3886	3985	4168	3644
JH052-59	3384	8	0	0.02434	0.00060	0.00100	0.00003	0.28050	0.00002	0.28043	-81.3	-5.6	0.8	-0.97	3806	3857	3904	4059	4347	3626
JH055-03	3063	5	6	0.05868	0.00107	0.00204	0.00004	0.28091	0.00002	0.28079	-66.6	-0.5	0.7	-0.94	3339	3363	3393	3492	3675	3083
JH055-07	3982	4	6	0.01081	0.00001	0.00041	0.00000	0.28018	0.00002	0.28015	-92.3	-1.2	0.6	-0.99	4160	4185	4205	4271	4395	4033
JH055-10	4239	4	2	0.03395	0.00004	0.00118	0.00000	0.28005	0.00002	0.27996	-96.8	-1.9	0.8	-0.96	4413	4432	4451	4515	4632	4319
JH055-19	3666	4	3	0.05754	0.00244	0.00198	0.00008	0.28029	0.00002	0.28015	-88.5	-8.9	0.8	-0.94	4185	4232	4288	4474	4819	4055
JH055-25	3721	6	3	0.04314	0.00086	0.00150	0.00003	0.28022	0.00002	0.28011	-90.9	-8.8	0.9	-0.96	4225	4278	4332	4515	4854	4103
JH055-26	3383	8	0	0.01745	0.00015	0.00067	0.00001	0.28039	0.00002	0.28035	-84.9	-8.6	0.7	-0.98	3912	3980	4039	4236	4600	3748
JH055-31	3616	7	2	0.04555	0.00136	0.00161	0.00004	0.28049	0.00002	0.28038	-81.5	-2.0	0.8	-0.95	3878	3904	3933	4027	4203	3705
JH055-39	3637	16	1	0.03131	0.00174	0.00113	0.00006	0.28026	0.00002	0.28018	-89.4	-8.3	0.7	-0.97	4128	4185	4239	4419	4752	3993
JH055-43	4180	6	3	0.01219	0.00011	0.00050	0.00001	0.28006	0.00003	0.28002	-96.8	-1.2	0.9	-0.99	4332	4353	4370	4427	4533	4229
JH055-44	3618	13	1	0.00898	0.00014	0.00036	0.00001	0.28022	0.00002	0.28019	-91.1	-8.5	0.7	-0.99	4109	4178	4233	4417	4758	3976
JH055-51	3938	5	4	0.02561	0.00002	0.00093	0.00000	0.28016	0.00002	0.28009	-93.1	-4.5	0.9	-0.97	4246	4283	4317	4431	4641	4129

Appendix E Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH055-63	4012	4	4	0.03960	0.00033	0.00138	0.00001	0.28016	0.00002	0.28005	-93.1	-4.0	0.7	-0.96	4296	4327	4358	4461	4653	4185
JH058-004	3362	31	1	0.02077	0.00018	0.00074	0.00000	0.28068	0.00003	0.28064	-74.6	1.2	1.1	-0.98	3530	3552	3571	3633	3748	3312
JH058-006	3763	30	2	0.08183	0.00180	0.00251	0.00005	0.28032	0.00005	0.28013	-87.6	-7.2	1.8	-0.93	4210	4243	4291	4449	4741	4082
JH058-016	3130	32	2	0.04229	0.00051	0.00133	0.00001	0.28074	0.00002	0.28066	-72.6	-3.6	0.8	-0.96	3510	3552	3593	3732	3989	3285
JH058-017	3111	32	3	0.02475	0.00031	0.00076	0.00001	0.28065	0.00004	0.28061	-75.6	-5.8	1.3	-0.98	3571	3630	3681	3852	4168	3359
JH058-021	3363	31	-1	0.01830	0.00017	0.00068	0.00000	0.28057	0.00002	0.28053	-78.6	-2.7	0.7	-0.98	3676	3717	3752	3868	4084	3480
JH058-028	3606	30	8	0.03144	0.00043	0.00104	0.00001	0.28032	0.00004	0.28025	-87.4	-6.8	1.5	-0.97	4042	4094	4142	4302	4600	3896
JH058-055	4149	29	5	0.01792	0.00053	0.00068	0.00002	0.27993	0.00004	0.27988	-101.2	-6.9	1.4	-0.98	4515	4563	4604	4740	4993	4438
JH058-067	3330	32	-2	0.01305	0.00038	0.00044	0.00001	0.28058	0.00003	0.28055	-78.2	-2.6	1.2	-0.99	3640	3682	3717	3833	4047	3439
JH058-068	3083	32	4	0.01866	0.00026	0.00069	0.00001	0.28088	0.00002	0.28084	-67.7	1.7	0.6	-0.98	3266	3289	3310	3377	3503	3010
JH058-070	3078	31	2	0.06750	0.00053	0.00230	0.00002	0.28092	0.00002	0.28078	-66.3	-0.4	0.8	-0.93	3352	3374	3403	3501	3681	3096
JH058-083	3716	30	3	0.04146	0.00033	0.00131	0.00001	0.28032	0.00003	0.28023	-87.4	-4.9	1.1	-0.96	4071	4110	4149	4278	4518	3927
JH058-085	3334	31	0	0.07149	0.00260	0.00223	0.00007	0.28069	0.00004	0.28054	-74.5	-2.8	1.5	-0.93	3669	3697	3733	3852	4073	3461
JH058-091	3277	31	5	0.02090	0.00042	0.00075	0.00001	0.28057	0.00002	0.28053	-78.5	-4.8	0.7	-0.98	3678	3729	3773	3922	4197	3481
JH058-095	3404	31	-2	0.02366	0.00050	0.00075	0.00002	0.28035	0.00003	0.28030	-86.3	-9.7	1.2	-0.98	3970	4042	4105	4315	4704	3815
JH058-101	3335	31	1	0.11870	0.00078	0.00346	0.00002	0.28067	0.00004	0.28045	-75.1	-6.2	1.3	-0.90	3816	3839	3888	4054	4360	3623
JH058-103	3340	31	0	0.03828	0.00022	0.00131	0.00001	0.28069	0.00003	0.28060	-74.5	-0.6	1.1	-0.96	3579	3605	3631	3719	3880	3364
JH058-120	3279	31	1	0.02011	0.00018	0.00071	0.00001	0.28071	0.00004	0.28067	-73.6	0.3	1.3	-0.98	3490	3518	3541	3620	3765	3267
JH058-121	3568	30	2	0.03947	0.00064	0.00134	0.00002	0.28044	0.00003	0.28035	-83.1	-4.1	1.2	-0.96	3911	3949	3986	4111	4343	3744
JH058-122	2766	32	8	0.06044	0.00124	0.00192	0.00003	0.28094	0.00003	0.28083	-65.7	-6.0	0.9	-0.94	3295	3343	3400	3590	3943	3033
JH058-133	3468	30	-1	0.02314	0.00025	0.00081	0.00001	0.28045	0.00004	0.28040	-82.7	-4.7	1.3	-0.98	3842	3889	3930	4069	4325	3668
JH058-152	3333	31	-2	0.01820	0.00013	0.00069	0.00000	0.28060	0.00002	0.28056	-77.5	-2.4	0.7	-0.98	3637	3676	3710	3823	4032	3434
JH058-166	3398	31	1	0.02902	0.00017	0.00094	0.00000	0.28056	0.00003	0.28050	-78.9	-2.9	1.2	-0.97	3714	3752	3787	3904	4120	3521
JH058-175	3602	30	5	0.02668	0.00043	0.00088	0.00001	0.28039	0.00003	0.28033	-85.1	-4.2	1.0	-0.97	3940	3981	4019	4144	4375	3779

Appendix E Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH071-01	3452	9	2	0.02992	0.00078	0.00111	0.00003	0.28054	0.00002	0.28047	-79.7	-2.8	0.9	-0.97	3758	3794	3828	3940	4149	3571
JH071-03	3469	6	4	0.01952	0.00024	0.00077	0.00001	0.28050	0.00002	0.28045	-81.1	-3.0	0.8	-0.98	3780	3819	3853	3968	4181	3597
JH071-05	3448	4	4	0.02088	0.00024	0.00074	0.00001	0.28052	0.00002	0.28047	-80.4	-2.7	0.7	-0.98	3750	3788	3822	3934	4142	3563
JH071-08	3480	4	2	0.04100	0.00074	0.00140	0.00002	0.28041	0.00002	0.28032	-84.2	-7.3	0.7	-0.96	3957	4008	4060	4234	4556	3796
JH071-14	3427	4	2	0.02145	0.00107	0.00079	0.00003	0.28051	0.00003	0.28046	-80.7	-3.6	1.0	-0.98	3764	3807	3844	3969	4201	3579
JH071-21	3450	8	3	0.01304	0.00027	0.00053	0.00001	0.28055	0.00002	0.28051	-79.4	-1.1	0.8	-0.98	3691	3723	3750	3840	4007	3497
JH075-014	3467	31	7	0.02744	0.00083	0.00090	0.00002	0.28055	0.00005	0.28049	-79.3	-1.5	1.9	-0.97	3724	3755	3784	3879	4054	3533
JH075-034	3370	31	2	0.03300	0.00042	0.00118	0.00001	0.28056	0.00002	0.28048	-79.1	-4.2	0.7	-0.97	3743	3786	3827	3963	4217	3553
JH075-038	3649	30	6	0.02280	0.00088	0.00079	0.00002	0.28043	0.00003	0.28037	-83.7	-1.4	1.1	-0.98	3877	3905	3931	4015	4171	3708
JH075-041	3478	30	8	0.01338	0.00008	0.00051	0.00000	0.28046	0.00002	0.28042	-82.7	-3.7	0.8	-0.98	3811	3856	3893	4017	4248	3634
JH075-043	3400	31	8	0.02075	0.00010	0.00074	0.00000	0.28046	0.00002	0.28041	-82.6	-6.0	0.8	-0.98	3832	3887	3935	4095	4391	3657
JH075-055	3532	30	1	0.01303	0.00003	0.00050	0.00000	0.28042	0.00002	0.28038	-84.0	-3.7	0.7	-0.99	3859	3903	3940	4062	4289	3689
JH075-056	3539	30	7	0.02013	0.00011	0.00076	0.00000	0.28039	0.00002	0.28034	-84.8	-5.1	0.8	-0.98	3917	3965	4007	4147	4407	3754
JH075-076	3433	30	9	0.04427	0.00029	0.00151	0.00001	0.28054	0.00002	0.28044	-79.7	-4.2	0.8	-0.96	3798	3836	3876	4008	4254	3614
JH075-166	3417	31	5	0.02048	0.00050	0.00070	0.00002	0.28047	0.00002	0.28043	-82.0	-5.0	0.8	-0.98	3807	3857	3901	4045	4314	3629
JH075-167	3442	31	7	0.03499	0.00021	0.00128	0.00001	0.28054	0.00003	0.28046	-79.6	-3.3	1.1	-0.96	3770	3806	3842	3962	4184	3583
JH076-01	3384	4	4	0.02016	0.00068	0.00076	0.00002	0.28047	0.00002	0.28042	-82.1	-5.9	0.8	-0.98	3814	3869	3917	4076	4372	3637
JH076-04	3382	5	5	0.04723	0.00169	0.00176	0.00006	0.28048	0.00003	0.28036	-81.8	-8.0	1.0	-0.95	3905	3955	4012	4200	4550	3735
JH076-06	3376	5	5	0.03474	0.00069	0.00137	0.00003	0.28052	0.00002	0.28043	-80.5	-5.9	0.8	-0.96	3814	3862	3910	4069	4365	3633
JH096-01	2533	14	-1	0.02082	0.00007	0.00078	0.00000	0.28092	0.00002	0.28088	-66.2	-9.8	0.8	-0.98	3219	3306	3382	3636	4107	2955
JH096-02	2548	19	-3	0.01725	0.00006	0.00068	0.00000	0.28082	0.00002	0.28079	-69.8	-12.8	0.8	-0.98	3346	3450	3539	3835	4384	3102
JH096-04	2473	20	-1	0.01893	0.00016	0.00068	0.00001	0.28085	0.00002	0.28082	-68.7	-13.5	0.7	-0.98	3304	3412	3504	3813	4385	3054
JH145-01	3236	12	0	0.01919	0.00048	0.00073	0.00002	0.28054	0.00002	0.28049	-79.8	-7.0	0.7	-0.98	3724	3786	3841	4021	4357	3534
JH145-05	3246	12	0	0.01122	0.00010	0.00043	0.00000	0.28065	0.00003	0.28062	-75.9	-2.2	0.9	-0.99	3552	3593	3628	3742	3954	3338

Appendix E Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH145-08	4119	22	2	0.04982	0.00159	0.00174	0.00005	0.28012	0.00002	0.27998	-94.6	-4.0	0.9	-0.95	4390	4416	4446	4544	4725	4291
JH145-09	3252	10	0	0.03018	0.00021	0.00105	0.00001	0.28032	0.00002	0.28026	-87.4	-15.0	0.8	-0.97	4044	4137	4225	4516	5055	3897
JH145-11	3831	10	0	0.01870	0.00040	0.00069	0.00001	0.28014	0.00002	0.28009	-93.6	-6.9	0.8	-0.98	4238	4291	4336	4487	4768	4121
JH145-12	3266	10	0	0.01778	0.00024	0.00067	0.00001	0.28040	0.00002	0.28035	-84.8	-11.2	0.7	-0.98	3905	3988	4059	4297	4737	3741
JH145-15	3272	5	2	0.06788	0.00062	0.00238	0.00002	0.28067	0.00002	0.28052	-75.2	-5.2	0.9	-0.93	3708	3743	3789	3944	4230	3506
JH145-16	3296	24	2	0.05552	0.00029	0.00199	0.00001	0.28068	0.00002	0.28056	-74.6	-3.2	0.8	-0.94	3647	3678	3716	3842	4075	3437
JH145-19	3210	10	0	0.02063	0.00030	0.00085	0.00001	0.28060	0.00002	0.28055	-77.4	-5.4	0.7	-0.97	3646	3701	3749	3910	4209	3444
JH145-21	3297	6	0	0.01189	0.00015	0.00044	0.00000	0.28058	0.00002	0.28056	-78.1	-3.3	0.7	-0.99	3637	3683	3721	3848	4084	3436
JH145-24	3634	5	1	0.06952	0.00119	0.00256	0.00004	0.28042	0.00002	0.28024	-84.0	-6.5	0.7	-0.92	4073	4105	4151	4306	4593	3924
JH149-01	3496	5	0	0.03720	0.00043	0.00135	0.00001	0.28049	0.00002	0.28040	-81.4	-4.0	0.9	-0.96	3845	3884	3922	4049	4286	3669
JH149-04	3509	10	2	0.02245	0.00070	0.00081	0.00002	0.28040	0.00003	0.28034	-84.7	-5.7	0.9	-0.98	3915	3966	4012	4162	4441	3752
JH149-09	3406	10	0	0.01678	0.00005	0.00063	0.00000	0.28035	0.00002	0.28030	-86.5	-9.6	0.7	-0.98	3968	4041	4104	4313	4700	3812
JH149-17	3500	6	0	0.01857	0.00037	0.00071	0.00001	0.28051	0.00002	0.28046	-80.7	-1.7	0.8	-0.98	3757	3790	3819	3914	4090	3572
JH149-24	3616	12	4	0.01479	0.00044	0.00057	0.00002	0.28036	0.00002	0.28032	-86.1	-4.0	0.8	-0.98	3945	3988	4025	4147	4374	3787
JH149-33	4031	7	2	0.00870	0.00008	0.00032	0.00000	0.28012	0.00002	0.28010	-94.4	-1.9	0.8	-0.99	4227	4255	4277	4350	4486	4110
JH149-38	3657	4	0	0.01479	0.00008	0.00063	0.00001	0.28026	0.00002	0.28022	-89.5	-6.7	0.8	-0.98	4080	4135	4182	4339	4631	3941
JH149-39	3748	7	0	0.03178	0.00039	0.00118	0.00001	0.28029	0.00002	0.28021	-88.4	-4.9	0.9	-0.97	4096	4136	4174	4302	4538	3957
JH149-41	3370	11	0	0.01351	0.00004	0.00051	0.00000	0.28037	0.00002	0.28034	-85.7	-9.3	0.8	-0.98	3925	4000	4062	4269	4653	3764
JH149-42	3477	5	0	0.03315	0.00044	0.00121	0.00001	0.28037	0.00002	0.28029	-85.7	-8.5	0.7	-0.96	3997	4057	4114	4304	4657	3844
JH149-43	3491	7	0	0.03203	0.00081	0.00115	0.00003	0.28044	0.00002	0.28036	-83.3	-5.6	0.8	-0.97	3900	3947	3992	4142	4420	3733
JH149-61	4012	6	8	0.02808	0.00019	0.00104	0.00001	0.28020	0.00002	0.28012	-91.7	-1.6	0.8	-0.97	4203	4226	4247	4317	4446	4080
JH149-63	3570	19	-3	0.00580	0.00001	0.00023	0.00000	0.28033	0.00002	0.28031	-87.2	-5.4	0.8	-0.99	3951	4005	4048	4191	4456	3795
JH149-65	3502	9	-3	0.03626	0.00079	0.00130	0.00003	0.28049	0.00002	0.28040	-81.5	-3.9	0.9	-0.96	3846	3884	3922	4048	4281	3670
JH149-69	3879	6	-3	0.03655	0.00117	0.00125	0.00003	0.28030	0.00002	0.28021	-88.2	-1.7	0.8	-0.96	4093	4117	4141	4219	4364	3953

Appendix E Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH149-70	3742	9	-1	0.02437	0.00017	0.00091	0.00001	0.28031	0.00003	0.28025	-87.7	-3.6	0.9	-0.97	4039	4076	4109	4219	4422	3893
JH149-73	3502	6	3	0.01651	0.00016	0.00063	0.00001	0.28042	0.00002	0.28038	-83.8	-4.6	0.8	-0.98	3866	3914	3955	4090	4341	3697
JH149-75	3502	5	-2	0.01199	0.00045	0.00046	0.00002	0.28040	0.00002	0.28037	-84.5	-4.8	0.7	-0.99	3874	3924	3966	4105	4362	3706
JH149-84	3567	6	0	0.01667	0.00008	0.00065	0.00000	0.28035	0.00002	0.28030	-86.5	-5.8	0.7	-0.98	3968	4020	4065	4214	4491	3813
JH149-87	3471	6	0	0.04133	0.00043	0.00158	0.00002	0.28056	0.00002	0.28046	-78.8	-2.6	0.8	-0.95	3771	3802	3835	3943	4145	3583
JH151-02	3325	5	2	0.01728	0.00042	0.00069	0.00002	0.28062	0.00002	0.28058	-76.7	-1.7	0.8	-0.98	3605	3641	3672	3776	3969	3398
JH151-05	3404	5	2	0.01605	0.00018	0.00060	0.00001	0.28049	0.00002	0.28045	-81.5	-4.5	0.7	-0.98	3778	3827	3868	4007	4265	3596
JH151-09	4182	6	0	0.07093	0.00064	0.00244	0.00002	0.28023	0.00003	0.28003	-90.6	-0.6	1.1	-0.93	4319	4330	4344	4393	4483	4208
JH151-13	2622	6	0	0.05278	0.00097	0.00186	0.00003	0.28092	0.00002	0.28082	-66.4	-9.8	0.7	-0.94	3318	3383	3458	3708	4172	3060
JH151-14	4167	7	4	0.02408	0.00003	0.00089	0.00000	0.28008	0.00002	0.28001	-95.9	-1.7	0.8	-0.97	4343	4364	4384	4448	4569	4240
JH151-15	3350	5	3	0.02766	0.00023	0.00111	0.00001	0.28064	0.00002	0.28057	-76.0	-1.4	0.8	-0.97	3619	3651	3680	3779	3963	3412
JH151-16	3757	9	6	0.01872	0.00098	0.00071	0.00003	0.28005	0.00002	0.28000	-97.1	-12.2	0.8	-0.98	4369	4448	4516	4743	5163	4270
JH151-19	3558	7	1	0.00921	0.00005	0.00035	0.00000	0.28038	0.00002	0.28036	-85.2	-4.0	0.8	-0.99	3890	3936	3973	4098	4328	3725
JH151-23	3512	16	3	0.02177	0.00016	0.00082	0.00001	0.28050	0.00002	0.28045	-80.9	-1.9	0.8	-0.98	3777	3810	3840	3938	4119	3594
JH151-29	3738	12	1	0.03304	0.00110	0.00116	0.00004	0.28029	0.00003	0.28021	-88.5	-5.1	0.9	-0.97	4097	4139	4178	4310	4554	3958
JH151-35	3418	9	3	0.01317	0.00024	0.00053	0.00001	0.28046	0.00002	0.28042	-82.6	-5.1	0.7	-0.98	3811	3864	3907	4054	4325	3634
JH151-38	3567	8	1	0.00483	0.00001	0.00020	0.00000	0.28036	0.00002	0.28034	-86.2	-4.4	0.7	-0.99	3912	3961	4000	4129	4370	3751
JH151-48	3360	7	2	0.01302	0.00063	0.00056	0.00003	0.28070	0.00003	0.28067	-73.9	2.2	1.0	-0.98	3490	3508	3522	3571	3661	3267
JH151-49	3755	5	5	0.06222	0.00098	0.00210	0.00003	0.28032	0.00003	0.28017	-87.4	-6.1	1.0	-0.94	4158	4193	4236	4380	4646	4024
JH151-52	3318	6	3	0.02215	0.00004	0.00085	0.00000	0.28070	0.00003	0.28064	-74.1	0.3	1.0	-0.97	3524	3550	3573	3649	3790	3305
JH151-55	3370	9	4	0.02647	0.00019	0.00098	0.00001	0.28046	0.00002	0.28040	-82.3	-7.0	0.9	-0.97	3846	3903	3956	4131	4456	3672
JH152-02	3982	6	3	0.01338	0.00010	0.00055	0.00000	0.28001	0.00003	0.27997	-98.3	-7.6	1.0	-0.98	4395	4450	4496	4650	4935	4301
JH152-04	3635	4	-2	0.01623	0.00020	0.00064	0.00001	0.28018	0.00002	0.28013	-92.5	-10.2	0.8	-0.98	4190	4262	4324	4530	4911	4066
JH152-05	4043	22	-9	0.00872	0.00006	0.00033	0.00000	0.28006	0.00002	0.28003	-96.7	-3.9	0.8	-0.99	4311	4349	4379	4480	4667	4206

Appendix E Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH152-09	3435	3	0	0.02950	0.00085	0.00111	0.00003	0.28056	0.00002	0.28049	-78.9	-2.3	0.7	-0.97	3727	3761	3793	3900	4098	3535
JH152-10	3991	7	-8	0.03846	0.00048	0.00138	0.00002	0.28013	0.00002	0.28002	-94.3	-5.7	0.9	-0.96	4338	4376	4414	4541	4776	4233
JH152-16	4069	11	-10	0.01569	0.00004	0.00059	0.00000	0.28009	0.00002	0.28005	-95.5	-2.8	0.8	-0.98	4295	4324	4350	4433	4589	4186
JH152-17	4006	9	-2	0.00833	0.00008	0.00031	0.00000	0.28011	0.00003	0.28008	-95.0	-3.1	0.9	-0.99	4248	4282	4309	4400	4568	4134
JH152-24	4039	8	5	0.00401	0.00002	0.00016	0.00000	0.28005	0.00002	0.28003	-97.2	-4.0	0.8	-1.00	4311	4350	4381	4483	4672	4206
JH152-27	3903	6	4	0.01677	0.00080	0.00062	0.00003	0.28011	0.00002	0.28006	-94.8	-6.2	0.9	-0.98	4274	4323	4364	4503	4759	4162
JH152-28	4027	9	-5	0.00526	0.00002	0.00021	0.00000	0.28009	0.00002	0.28007	-95.6	-2.9	0.8	-0.99	4258	4291	4317	4404	4565	4146
JH152-29	3352	9	-1	0.01862	0.00028	0.00075	0.00001	0.28053	0.00002	0.28048	-80.0	-4.6	0.8	-0.98	3735	3784	3827	3969	4232	3546
JH152-34	4019	4	5	0.01227	0.00033	0.00048	0.00001	0.28015	0.00003	0.28011	-93.5	-1.7	1.0	-0.99	4212	4238	4259	4331	4465	4092
JH152-36	3736	10	3	0.02610	0.00040	0.00093	0.00001	0.28027	0.00002	0.28020	-89.4	-5.5	0.8	-0.97	4105	4150	4191	4327	4580	3969
JH152-37	3989	4	1	0.01825	0.00048	0.00068	0.00002	0.28019	0.00002	0.28014	-92.1	-1.5	0.6	-0.98	4179	4204	4225	4296	4426	4054
JH152-40	4193	16	5	0.00983	0.00018	0.00038	0.00001	0.28002	0.00003	0.27999	-98.0	-1.8	0.9	-0.99	4365	4389	4408	4473	4592	4267
JH152-41	3972	20	3	0.01847	0.00010	0.00070	0.00000	0.28013	0.00002	0.28008	-94.2	-4.1	0.8	-0.98	4259	4295	4327	4433	4630	4144
JH152-42	3870	11	2	0.02215	0.00022	0.00088	0.00001	0.28025	0.00003	0.28018	-90.1	-2.9	0.9	-0.97	4126	4158	4186	4281	4457	3993
JH152-45	3738	8	1	0.01906	0.00023	0.00067	0.00001	0.28031	0.00002	0.28026	-87.8	-3.1	0.8	-0.98	4018	4054	4085	4189	4381	3869
JH152-46	3605	8	0	0.04638	0.00119	0.00165	0.00004	0.28048	0.00003	0.28037	-81.7	-2.6	0.9	-0.95	3890	3919	3950	4053	4244	3718
JH152-48	4023	10	5	0.00644	0.00016	0.00024	0.00001	0.28008	0.00003	0.28006	-95.8	-3.3	0.9	-0.99	4270	4305	4333	4425	4597	4159
JH152-50	4169	4	5	0.12249	0.00068	0.00420	0.00002	0.28036	0.00003	0.28002	-86.2	-1.5	1.1	-0.88	4351	4356	4374	4436	4550	4238
JH152-53	3934	7	2	0.02432	0.00046	0.00086	0.00002	0.28006	0.00003	0.27999	-96.7	-8.0	0.9	-0.97	4371	4425	4473	4635	4934	4272
JH152-56	4114	14	0	0.02563	0.00130	0.00094	0.00005	0.28008	0.00002	0.28001	-95.9	-3.1	0.8	-0.97	4349	4377	4403	4489	4649	4246
JH152-58	4055	22	6	0.01370	0.00013	0.00050	0.00000	0.28000	0.00002	0.27996	-98.7	-6.2	0.6	-0.99	4406	4453	4493	4624	4866	4313
JH152-62	4048	11	0	0.01815	0.00014	0.00068	0.00000	0.28015	0.00002	0.28010	-93.5	-1.6	0.9	-0.98	4231	4255	4275	4343	4469	4113
JH152-64	1643	25	-1	0.01316	0.00006	0.00047	0.00000	0.28150	0.00002	0.28149	-45.7	-9.0	0.7	-0.99	2413	2518	2604	2892	3425	2036
JH152-68	3531	24	2	0.01355	0.00020	0.00052	0.00001	0.28048	0.00003	0.28044	-81.8	-1.6	0.9	-0.98	3781	3815	3843	3936	4108	3600
JH152-75	4115	6	2	0.00801	0.00015	0.00034	0.00001	0.27998	0.00002	0.27995	-99.6	-5.2	0.8	-0.99	4420	4462	4496	4610	4822	4329
JH154-03	3536	13	-1	0.01438	0.00028	0.00057	0.00001	0.28045	0.00002	0.28041	-82.7	-2.6	0.7	-0.98	3821	3859	3890	3996	4193	3645
JH154-04	3515	22	-5	0.00787	0.00005	0.00030	0.00000	0.28041	0.00002	0.28039	-84.2	-3.9	0.8	-0.99	3850	3897	3935	4060	4293	3680
JH154-05	3540	7	0	0.01420	0.00030	0.00060	0.00001	0.28044	0.00002	0.28040	-83.1	-2.9	0.8	-0.98	3836	3875	3908	4018	4223	3662

Appendix F Zircon Lu-Hf isotope results from analytical sessions 1 and 2 (Xi'an and Beijing).

Xi'an session

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH027-002	3397	31	0	0.02764	3E-04	0.0011326	9E-06	0.280385	2E-05	0.28031	-85.1	-9.6	0.7	-0.97	3966	4032	4095	4304	4692	3809
JH027-007	3389	31	1	0.056319	3E-04	0.0020911	8E-06	0.280212	2E-05	0.28008	-91.3	-18.2	0.7	-0.94	4304	4383	4481	4808	5414	4191
JH027-009	3538	31	-1	0.024041	3E-04	0.000904	1E-05	0.280386	2E-05	0.28032	-85.1	-5.7	0.7	-0.97	3942	3992	4037	4186	4462	3782
JH027-013	3657	30	3	0.025981	4E-04	0.001013	8E-06	0.280421	2E-05	0.28035	-83.9	-2.0	0.7	-0.97	3907	3937	3965	4057	4227	3742
JH027-015	3402	31	1	0.035582	1E-04	0.0013668	4E-06	0.280349	2E-05	0.28026	-86.4	-11.3	0.6	-0.96	4039	4109	4178	4411	4841	3891
JH027-025	3400	31	1	0.027724	3E-04	0.0010376	9E-06	0.280216	3E-05	0.28015	-91.1	-15.3	1.1	-0.97	4182	4275	4361	4648	5182	4055
JH027-029	4121	30	4	0.026045	1E-04	0.001011	4E-06	0.279904	2E-05	0.27982	-102.2	-9.5	0.8	-0.97	4591	4647	4699	4872	5193	4523
JH027-031	3403	31	-1	0.031097	8E-05	0.0011333	3E-06	0.28032	2E-05	0.28025	-87.5	-11.8	0.6	-0.97	4054	4130	4201	4440	4883	3909
JH027-032	3505	31	1	0.016575	4E-04	0.0005458	1E-05	0.280345	2E-05	0.28031	-86.5	-7.1	0.9	-0.98	3960	4020	4071	4241	4555	3804
JH027-034	3538	31	1	0.026819	2E-04	0.0009731	8E-06	0.280362	2E-05	0.28030	-86.0	-6.8	0.8	-0.97	3982	4035	4084	4248	4551	3827
JH027-036	3368	31	0	0.05268	5E-04	0.0019735	2E-05	0.280355	2E-05	0.28023	-86.2	-13.3	0.8	-0.94	4096	4162	4241	4502	4986	3954
JH027-037	3416	31	-1	0.020764	1E-04	0.0008155	6E-06	0.280387	2E-05	0.28033	-85.1	-8.3	0.7	-0.98	3932	3996	4053	4244	4597	3770
JH027-038	3381	31	-1	0.019349	7E-05	0.0007104	3E-06	0.280249	2E-05	0.28020	-89.9	-13.8	0.8	-0.98	4103	4196	4276	4544	5040	3967
JH027-045	3404	31	0	0.019126	2E-04	0.0008048	7E-06	0.280533	2E-05	0.28048	-79.9	-3.4	0.7	-0.98	3737	3779	3816	3940	4168	3548
JH027-061	3890	30	4	0.051489	1E-04	0.0018317	3E-06	0.280204	2E-05	0.28007	-91.5	-6.4	0.7	-0.95	4285	4322	4365	4507	4770	4170
JH027-067	3521	31	0	0.016351	2E-04	0.0006162	7E-06	0.280421	2E-05	0.28038	-83.9	-4.2	0.7	-0.98	3867	3913	3952	4081	4320	3698
JH027-074	3399	31	0	0.016735	4E-05	0.000618	8E-07	0.28038	2E-05	0.28034	-85.3	-8.5	0.6	-0.98	3922	3990	4049	4243	4604	3760
JH027-078	4154	29	1	0.038772	2E-04	0.0013322	6E-06	0.279993	2E-05	0.27989	-99.0	-6.5	0.8	-0.96	4511	4550	4589	4720	4961	4431
JH027-090	4250	29	-1	0.009858	1E-04	0.0004125	4E-06	0.280099	2E-05	0.28007	-95.2	2.3	0.7	-0.99	4268	4270	4272	4279	4291	4156
JH027-091	3398	31	1	0.01956	2E-04	0.0007433	6E-06	0.280333	2E-05	0.28028	-87.0	-10.5	0.6	-0.98	3997	4073	4140	4362	4773	3845
JH027-095	3742	30	3	0.034565	4E-04	0.0012316	2E-05	0.280123	3E-05	0.28003	-94.4	-11.2	1.2	-0.96	4327	4393	4457	4671	5068	4221
JH027-110	3964	29	3	0.014448	7E-04	0.0004959	2E-05	0.280096	2E-05	0.28006	-95.4	-5.0	0.7	-0.99	4281	4324	4360	4478	4697	4171
JH027-124	3473	31	1	0.015675	1E-04	0.0006343	4E-06	0.280297	2E-05	0.28025	-88.3	-9.8	0.6	-0.98	4032	4105	4168	4376	4761	3886

Appendix F Continued.

Xi'an session																				
Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH027-134	3875	30	4	0.055351	5E-04	0.0019999	1E-05	0.280233	2E-05	0.28008	-90.5	-6.2	0.7	-0.94	4265	4300	4342	4481	4740	4147
JH027-138	4018	29	7	0.025976	0.001	0.0009995	4E-05	0.280032	2E-05	0.27995	-97.6	-7.3	0.6	-0.97	4421	4469	4513	4661	4936	4328
JH027-139	4170	29	6	0.040904	4E-04	0.0014821	2E-05	0.280022	2E-05	0.27990	-98.0	-5.5	0.6	-0.96	4490	4524	4559	4675	4890	4406
JH027-165	3560	30	5	0.020143	1E-04	0.0007895	3E-06	0.280121	2E-05	0.28007	-94.5	-14.4	0.7	-0.98	4280	4371	4451	4717	5211	4168
JH027-166	3625	30	2	0.013155	7E-05	0.0005006	3E-06	0.28037	2E-05	0.28034	-85.7	-3.2	0.7	-0.99	3923	3963	3996	4107	4313	3762
JH027-167	3894	30	5	0.015276	2E-04	0.0005767	8E-06	0.280203	3E-05	0.28016	-91.6	-3.0	0.9	-0.98	4150	4184	4213	4308	4484	4021
JH027-169	4156	29	2	0.012692	1E-04	0.0004785	4E-06	0.27999	2E-05	0.27995	-99.1	-4.1	0.8	-0.99	4418	4453	4482	4580	4761	4326
JH027-171	3748	30	-3	0.018246	3E-04	0.0007083	9E-06	0.280153	2E-05	0.28010	-93.3	-8.6	0.8	-0.98	4229	4291	4345	4523	4854	4111
JH027-172	3403	31	0	0.017003	5E-04	0.0006581	2E-05	0.280264	3E-05	0.28022	-89.4	-12.7	0.9	-0.98	4078	4166	4241	4492	4957	3938
JH027-185	3604	30	-3	0.011311	2E-04	0.0004921	7E-06	0.280281	2E-05	0.28025	-88.8	-6.9	0.8	-0.99	4039	4098	4147	4309	4610	3895
JH027-189	3891	30	9	0.033732	5E-04	0.001312	2E-05	0.280317	2E-05	0.28022	-87.5	-1.0	0.7	-0.96	4076	4096	4117	4184	4309	3933
JH027-196	4127	29	5	0.033496	3E-04	0.0012324	1E-05	0.280036	2E-05	0.27994	-97.5	-5.3	0.7	-0.96	4442	4477	4512	4627	4841	4352
JH027-198	4097	29	1	0.017322	2E-04	0.0006152	7E-06	0.280065	2E-05	0.28002	-96.5	-3.2	0.9	-0.98	4334	4366	4392	4480	4644	4231
JH027-200	3409	30	3	0.021075	1E-04	0.0008138	5E-06	0.280236	3E-05	0.28018	-90.4	-13.9	0.9	-0.98	4132	4223	4303	4571	5067	4000
JH038-021	3817	30	-1	0.020966	8E-05	0.0008517	4E-06	0.280317	2E-05	0.28025	-87.6	-1.5	0.7	-0.97	4029	4055	4079	4158	4303	3882
JH038-028	3498	31	1	0.013274	8E-05	0.0005348	3E-06	0.28052	2E-05	0.28048	-80.4	-1.0	0.7	-0.98	3729	3760	3786	3872	4032	3541
JH038-033	3414	31	1	0.018356	8E-05	0.0008335	3E-06	0.280657	2E-05	0.28060	-75.5	1.2	0.7	-0.98	3575	3595	3612	3672	3782	3362
JH038-047	3814	30	5	0.016483	5E-05	0.0006281	1E-06	0.280399	2E-05	0.28035	-84.7	1.9	0.7	-0.98	3897	3908	3917	3948	4006	3732
JH038-052	4102	29	3	0.024658	3E-04	0.0009357	9E-06	0.280319	4E-05	0.28024	-87.5	5.1	1.3	-0.97	4035	4027	4019	3995	3949	3888
JH038-069	3673	30	-1	0.029328	3E-04	0.001129	1E-05	0.280379	3E-05	0.28030	-85.4	-3.4	1.2	-0.97	3974	4009	4043	4153	4358	3818
JH038-074	3844	29	1	0.041716	1E-04	0.0016082	3E-06	0.280622	2E-05	0.28050	-76.8	8.0	0.8	-0.95	3695	3680	3663	3610	3510	3495
JH038-075	4032	29	7	0.038802	6E-04	0.0015166	2E-05	0.280384	2E-05	0.28027	-85.2	4.1	0.7	-0.96	4008	4005	4002	3994	3977	3854
JH038-096	3587	30	-2	0.007226	1E-04	0.000302	6E-06	0.280486	2E-05	0.28047	-81.6	0.5	0.7	-0.99	3751	3774	3793	3855	3969	3567

Appendix F Continued.

Xi'an session																				
Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH038-098	3448	30	2	0.031552	2E-04	0.001253	6E-06	0.280687	2E-05	0.28060	-74.5	2.1	0.7	-0.96	3574	3588	3602	3648	3733	3358
JH038-099	4112	29	3	0.009652	5E-05	0.0003919	1E-06	0.28022	2E-05	0.28019	-91.0	3.3	0.7	-0.99	4109	4108	4108	4106	4104	3975
JH038-112	3507	30	1	0.023958	3E-04	0.0009071	1E-05	0.280609	2E-05	0.28055	-77.2	1.5	0.7	-0.97	3646	3663	3678	3730	3825	3443
JH038-116	4210	29	-9	0.055108	5E-04	0.0021064	2E-05	0.280746	2E-05	0.28057	-72.4	19.5	0.7	-0.94	3573	3518	3450	3222	2800	3352
JH038-127	3458	30	1	0.024067	2E-04	0.0009653	8E-06	0.280564	2E-05	0.28050	-78.8	-1.4	0.7	-0.97	3712	3742	3770	3864	4038	3518
JH038-135	3511	30	-2	0.012736	9E-05	0.0005381	4E-06	0.280661	2E-05	0.28062	-75.4	4.3	0.6	-0.98	3543	3548	3551	3564	3586	3328
JH038-166	3632	30	-1	0.025834	5E-05	0.0010569	1E-06	0.280589	2E-05	0.28051	-77.9	3.3	0.6	-0.97	3687	3693	3699	3719	3757	3489
JH038-189	3772	30	5	0.017391	2E-04	0.0006543	9E-06	0.280388	2E-05	0.28034	-85.1	0.5	0.8	-0.98	3915	3934	3950	4003	4101	3752
JH045-002	3572	30	-2	0.024738	1E-04	0.0009737	4E-06	0.280431	2E-05	0.28036	-83.5	-3.5	0.8	-0.97	3890	3929	3964	4081	4299	3722
JH045-010	3542	30	-2	0.024996	9E-05	0.0010193	4E-06	0.280289	2E-05	0.28022	-88.6	-9.4	0.8	-0.97	4084	4148	4208	4407	4777	3943
JH045-014	3529	30	1	0.026818	2E-04	0.0011123	1E-05	0.280478	2E-05	0.28040	-81.9	-3.2	0.8	-0.97	3841	3878	3912	4027	4239	3666
JH045-027	3496	30	0	0.023103	3E-04	0.000848	9E-06	0.28046	3E-05	0.28040	-82.5	-4.0	1.1	-0.97	3839	3882	3920	4047	4282	3665
JH045-039	3535	30	-1	0.030608	2E-04	0.0012071	8E-06	0.280621	2E-05	0.28054	-76.8	1.9	0.8	-0.96	3658	3672	3685	3730	3814	3455
JH045-040	3391	31	0	0.031496	2E-04	0.001341	6E-06	0.280842	2E-05	0.28075	-69.0	6.1	0.8	-0.96	3372	3370	3368	3361	3348	3126
JH045-041	3998	29	-1	0.023019	2E-04	0.0008888	7E-06	0.280349	2E-05	0.28028	-86.4	3.8	0.6	-0.97	3990	3989	3988	3985	3980	3837
JH045-046	3453	31	0	0.031597	3E-04	0.001238	1E-05	0.280535	3E-05	0.28045	-79.9	-3.2	0.9	-0.96	3777	3814	3849	3968	4187	3591
JH045-047	3749	30	-3	0.006306	1E-04	0.0002611	5E-06	0.280871	2E-05	0.28085	-68.0	18.2	0.7	-0.99	3241	3169	3112	2921	2568	2985
JH045-051	3519	31	-1	0.019521	3E-04	0.0007631	9E-06	0.281264	2E-05	0.28121	-54.1	25.5	0.9	-0.98	2755	2658	2573	2290	1765	2424
JH045-054	3488	30	0	0.015398	1E-04	0.0006036	4E-06	0.281164	2E-05	0.28112	-57.6	21.6	0.6	-0.98	2877	2796	2728	2501	2080	2565
JH045-055	3361	31	-1	0.015603	1E-04	0.0005985	4E-06	0.281322	3E-05	0.28128	-52.0	24.2	0.9	-0.98	2665	2573	2495	2236	1756	2322
JH045-057	3484	30	-1	0.01584	6E-05	0.0006514	4E-06	0.281236	2E-05	0.28119	-55.0	23.9	0.9	-0.98	2784	2692	2614	2354	1872	2458
JH045-058	3080	31	1	0.025425	1E-04	0.0009268	2E-06	0.281652	2E-05	0.28160	-40.3	28.7	0.6	-0.97	2236	2133	2040	1729	1152	1827
JH045-061	3554	30	1	0.020318	2E-04	0.0008334	1E-05	0.281371	2E-05	0.28131	-50.3	29.9	0.7	-0.98	2615	2497	2393	2046	1403	2262

Appendix F Continued.

Xi'an session

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH045-062	3350	31	-1	0.013578	4E-05	0.0005286	2E-06	0.281457	2E-05	0.28142	-47.2	28.9	0.8	-0.98	2477	2361	2263	1938	1336	2108
JH045-063	3550	30	-1	0.027619	6E-04	0.0010011	2E-05	0.281692	2E-05	0.28162	-38.9	40.9	0.8	-0.97	2186	2023	1872	1371	441	1769
JH045-066	3388	31	-2	0.042151	8E-05	0.0016429	3E-06	0.281859	3E-05	0.28175	-33.0	41.5	0.9	-0.95	1989	1849	1697	1191	253	1533
JH045-077	3618	30	2	0.01929	2E-04	0.0007693	5E-06	0.280672	2E-05	0.28062	-75.0	6.7	0.9	-0.98	3550	3541	3534	3508	3462	3334
JH045-081	4031	29	1	0.010578	4E-05	0.0003923	2E-06	0.280239	2E-05	0.28021	-90.3	2.1	0.7	-0.99	4083	4091	4096	4116	4152	3946
JH045-099	3992	29	2	0.018497	7E-05	0.0007725	3E-06	0.280249	2E-05	0.28019	-90.0	0.4	0.8	-0.98	4111	4126	4139	4183	4264	3975
JH045-102	3759	30	0	0.038034	5E-04	0.0014194	2E-05	0.280762	2E-05	0.28066	-71.8	11.5	0.8	-0.96	3487	3458	3428	3329	3145	3258
JH045-104	4100	29	3	0.010219	6E-05	0.0003981	8E-07	0.280251	2E-05	0.28022	-89.9	4.1	0.7	-0.99	4068	4064	4060	4049	4027	3928
JH045-105	3881	30	-3	0.034456	5E-04	0.0012904	2E-05	0.280669	2E-05	0.28057	-75.1	11.4	0.8	-0.96	3602	3571	3540	3438	3249	3390
JH045-111	3826	30	-3	0.01439	3E-04	0.0005734	1E-05	0.280357	3E-05	0.28031	-86.1	0.9	0.9	-0.98	3948	3964	3977	4023	4107	3790
JH048-001	3402	31	0	0.016997	9E-06	0.0006655	5E-07	0.280509	2E-05	0.28047	-80.8	-4.0	0.7	-0.98	3756	3802	3841	3973	4217	3571
JH048-032	3383	31	1	0.013592	1E-04	0.0005332	4E-06	0.280247	4E-05	0.28021	-90.0	-13.5	1.5	-0.98	4088	4182	4261	4524	5011	3950
JH048-037	3828	30	2	0.032915	5E-04	0.0012989	2E-05	0.28057	2E-05	0.28047	-78.6	6.6	0.7	-0.96	3736	3726	3716	3683	3621	3544
JH048-056	4042	29	6	0.076362	9E-04	0.0029246	3E-05	0.280734	2E-05	0.28050	-72.8	12.9	0.8	-0.91	3670	3647	3608	3478	3237	3458
JH048-059	3647	30	-1	0.025537	4E-04	0.0010039	1E-05	0.280489	2E-05	0.28042	-81.5	0.2	0.8	-0.97	3815	3835	3854	3916	4031	3637
JH048-062	4120	29	3	0.016728	1E-04	0.000654	4E-06	0.280164	2E-05	0.28011	-93.0	0.7	0.7	-0.98	4210	4221	4231	4265	4327	4089
JH048-093	3364	31	1	0.011749	9E-05	0.0004883	3E-06	0.280523	2E-05	0.28049	-80.3	-3.9	0.5	-0.99	3720	3768	3808	3941	4188	3531
JH048-114	3410	31	-1	0.015574	2E-04	0.0006376	8E-06	0.280467	1E-05	0.28042	-82.3	-5.2	0.5	-0.98	3809	3861	3906	4054	4329	3631
JH048-118	3588	30	0	0.017406	7E-05	0.000718	3E-06	0.280645	2E-05	0.28059	-76.0	5.1	0.7	-0.98	3581	3580	3579	3576	3571	3370
JH048-123	3605	30	0	0.050866	1E-03	0.0019971	3E-05	0.280808	2E-05	0.28067	-70.2	8.2	0.8	-0.94	3478	3467	3453	3408	3324	3244
JH048-124	3424	31	-1	0.026467	2E-04	0.0010406	7E-06	0.280573	2E-05	0.28050	-78.5	-2.0	0.6	-0.97	3706	3740	3771	3875	4067	3512
JH048-126	3484	31	-1	0.014827	2E-04	0.0005882	6E-06	0.280416	1E-05	0.28038	-84.1	-5.2	0.5	-0.98	3871	3922	3965	4109	4376	3702
JH048-171	3432	30	0	0.012205	3E-04	0.0004683	8E-06	0.28041	2E-05	0.28038	-84.3	-6.3	0.6	-0.99	3867	3926	3975	4137	4437	3698

Appendix F Continued.

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
Xi'an session																				
JH048-194	3631	30	5	0.012495	3E-05	0.0005215	2E-06	0.280698	1E-05	0.28066	-74.1	8.5	0.5	-0.98	3492	3473	3458	3406	3310	3270
JH048-199	3457	30	0	0.025062	1E-04	0.0010061	4E-06	0.280491	2E-05	0.28042	-81.4	-4.1	0.6	-0.97	3813	3856	3895	4026	4269	3634
JH053-009	3507	31	0	0.014681	3E-04	0.0006174	1E-05	0.280619	2E-05	0.28058	-76.9	2.5	0.6	-0.98	3606	3619	3630	3667	3735	3399
JH053-014	3892	30	5	0.033062	2E-04	0.0012467	8E-06	0.280628	2E-05	0.28053	-76.5	10.3	0.7	-0.96	3652	3625	3599	3512	3349	3448
JH053-028	4087	29	-2	0.032666	2E-04	0.0012921	6E-06	0.280554	2E-05	0.28045	-79.2	12.1	0.7	-0.96	3756	3720	3683	3563	3339	3567
JH053-037	4176	29	5	0.017529	1E-04	0.0006854	4E-06	0.280624	2E-05	0.28057	-76.7	18.4	0.7	-0.98	3606	3532	3468	3257	2864	3399
JH053-038	3410	31	-1	0.019115	3E-04	0.000787	1E-05	0.280669	2E-05	0.28062	-75.1	1.6	0.7	-0.98	3554	3573	3589	3642	3742	3339
JH053-047	4091	29	4	0.021221	1E-04	0.0009175	5E-06	0.280435	2E-05	0.28036	-83.4	9.0	0.8	-0.97	3879	3853	3829	3751	3605	3709
JH053-048	4181	29	4	0.049788	3E-04	0.0020811	9E-06	0.280755	2E-05	0.28059	-72.1	19.2	0.7	-0.94	3559	3505	3438	3216	2804	3336
JH053-050	4201	29	-3	0.006074	6E-05	0.0002261	9E-07	0.280075	2E-05	0.28006	-96.1	0.8	0.7	-0.99	4279	4290	4299	4328	4383	4169
JH053-060	4162	29	6	0.025017	1E-04	0.000954	5E-06	0.280371	2E-05	0.28029	-85.6	8.3	0.8	-0.97	3967	3944	3922	3850	3717	3811
JH053-061	3381	31	-2	0.018519	3E-04	0.000744	9E-06	0.280885	3E-05	0.28084	-67.5	8.8	0.9	-0.98	3263	3248	3234	3190	3109	3006
JH053-063	3726	30	2	0.018913	2E-04	0.0007711	8E-06	0.280625	2E-05	0.28057	-76.7	7.5	0.8	-0.98	3612	3597	3585	3542	3464	3405
JH053-065	3487	30	-2	0.037859	2E-04	0.0014547	8E-06	0.280943	2E-05	0.28085	-65.4	11.6	0.8	-0.96	3244	3218	3191	3103	2939	2979
JH053-070	3467	30	-1	0.017555	8E-05	0.0007141	3E-06	0.280597	2E-05	0.28055	-77.7	0.6	0.7	-0.98	3644	3666	3686	3751	3873	3442
JH053-071	3652	30	2	0.026026	6E-04	0.0009951	2E-05	0.28065	2E-05	0.28058	-75.8	6.1	0.8	-0.97	3600	3593	3588	3568	3533	3390
JH053-087	4285	28	2	0.025816	5E-04	0.0010129	2E-05	0.280668	2E-05	0.28058	-75.1	21.6	0.8	-0.97	3577	3493	3414	3154	2671	3364
JH053-093	4169	29	0	0.051076	2E-04	0.0020285	1E-05	0.280795	2E-05	0.28063	-70.6	20.5	0.7	-0.94	3498	3439	3366	3126	2681	3266
JH053-101	3548	30	1	0.014266	1E-04	0.0005723	5E-06	0.280518	2E-05	0.28048	-80.4	0.0	0.8	-0.98	3735	3760	3781	3850	3980	3547
JH053-108	3406	30	1	0.017963	1E-04	0.0006931	4E-06	0.280459	2E-05	0.28041	-82.5	-5.7	0.7	-0.98	3824	3878	3925	4080	4367	3648
JH053-111	3559	30	1	0.00972	4E-05	0.0003864	1E-06	0.280554	2E-05	0.28053	-79.2	2.0	0.7	-0.99	3670	3685	3698	3739	3816	3474
JH053-113	3981	29	-5	0.02845	1E-04	0.0010926	6E-06	0.280473	2E-05	0.28039	-82.0	7.3	0.7	-0.97	3845	3829	3814	3765	3673	3670
JH053-114	3980	29	5	0.013074	9E-05	0.0005221	3E-06	0.280371	2E-05	0.28033	-85.7	5.1	0.6	-0.98	3924	3917	3911	3890	3852	3764

Appendix F Continued.

Xi'an session																				
Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH053-118	3550	30	-1	0.016892	1E-04	0.000694	4E-06	0.28066	2E-05	0.28061	-75.4	4.8	0.7	-0.98	3558	3559	3560	3563	3568	3344
JH053-120	3783	29	7	0.028946	3E-04	0.0011384	1E-05	0.280755	2E-05	0.28067	-72.1	12.6	0.8	-0.97	3472	3436	3402	3288	3076	3243
JH053-122	3914	29	2	0.031174	1E-04	0.0012201	4E-06	0.280775	2E-05	0.28068	-71.4	16.1	0.8	-0.96	3452	3399	3349	3180	2866	3219
JH053-132	3364	30	-1	0.014725	1E-04	0.0006344	5E-06	0.280658	2E-05	0.28062	-75.5	0.5	0.8	-0.98	3556	3581	3602	3673	3805	3342
JH053-146	4358	28	7	0.031355	5E-04	0.0012397	2E-05	0.280825	2E-05	0.28072	-69.6	28.3	0.9	-0.96	3386	3277	3170	2815	2156	3143
JH053-149	4178	28	0	0.016062	4E-05	0.000627	2E-06	0.280264	2E-05	0.28021	-89.4	5.8	0.8	-0.98	4075	4061	4049	4011	3940	3935
JH053-159	4346	28	-9	0.025553	1E-04	0.00097	6E-06	0.280544	2E-05	0.28046	-79.5	18.8	0.7	-0.97	3739	3665	3598	3375	2960	3549
JH053-166	3798	29	1	0.01408	8E-05	0.0005833	3E-06	0.280723	2E-05	0.28068	-73.2	13.2	0.7	-0.98	3465	3421	3384	3260	3031	3238
JH053-174	3754	29	5	0.024802	2E-04	0.0009681	7E-06	0.280741	2E-05	0.28067	-72.6	11.8	0.6	-0.97	3475	3442	3411	3308	3118	3248
JH053-180	4042	29	5	0.019394	9E-05	0.0007771	4E-06	0.280514	2E-05	0.28045	-80.6	11.1	0.7	-0.98	3760	3724	3693	3588	3395	3574
JH053-198	3396	31	-2	0.014313	4E-04	0.0006009	2E-05	0.28058	2E-05	0.28054	-78.2	-1.4	0.9	-0.98	3655	3689	3718	3815	3993	3456
JH053-204	3925	30	6	0.007999	5E-05	0.0003579	2E-06	0.280519	2E-05	0.28049	-80.4	9.6	0.7	-0.99	3713	3683	3659	3580	3433	3523
JH053-208	4003	30	2	0.01228	3E-04	0.0005217	1E-05	0.280347	2E-05	0.28031	-86.5	4.9	0.7	-0.98	3955	3949	3944	3926	3893	3799
JH053-212	3418	31	1	0.012132	6E-05	0.0004678	2E-06	0.280571	2E-05	0.28054	-78.6	-0.9	0.7	-0.99	3656	3688	3715	3804	3969	3457
JH053-215	3464	31	4	0.026702	4E-04	0.0011147	2E-05	0.280812	2E-05	0.28074	-70.1	7.2	0.8	-0.97	3393	3385	3377	3351	3302	3152
JH053-218	3462	31	4	0.005218	2E-05	0.0002337	9E-07	0.280398	2E-05	0.28038	-84.7	-5.5	0.7	-0.99	3859	3916	3961	4110	4387	3691
JH053-225	3986	30	5	0.019584	1E-04	0.0008059	5E-06	0.280678	2E-05	0.28062	-74.8	15.5	0.8	-0.98	3544	3489	3440	3276	2973	3327
JH053-226	3623	30	2	0.014496	3E-05	0.000601	1E-06	0.280715	2E-05	0.28067	-73.5	8.7	0.8	-0.98	3477	3458	3441	3387	3286	3252
JH053-227	3422	31	5	0.027536	8E-05	0.0011218	2E-06	0.280801	2E-05	0.28073	-70.4	5.8	0.8	-0.97	3408	3406	3405	3400	3390	3169
JH053-231	3443	31	2	0.029384	3E-04	0.0011573	8E-06	0.280842	2E-05	0.28077	-69.0	7.7	0.7	-0.97	3356	3346	3336	3304	3245	3109
JH053-234	3459	31	3	0.014119	2E-04	0.0005646	8E-06	0.280686	2E-05	0.28065	-74.5	4.0	0.7	-0.98	3511	3518	3524	3544	3579	3292
JH053-238	3393	31	0	0.013061	3E-05	0.0005343	2E-06	0.280605	2E-05	0.28057	-77.4	-0.4	0.7	-0.98	3617	3646	3671	3754	3909	3412
JH053-239	3596	31	7	0.019769	1E-04	0.0008352	7E-06	0.280791	2E-05	0.28073	-70.8	10.2	0.8	-0.98	3396	3371	3349	3275	3138	3158

Appendix F Continued.

Xi'an session																					
Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH074-019	3683	36	0	0.015131	2E-04	0.0006203	7E-06	0.28066	2E-05	0.28062	-75.4	8.2	0.7	-0.98	3551	3534	3519	3470	3379	3337
JH074-021	3806	35	-5	0.011714	8E-05	0.0004617	2E-06	0.280625	2E-05	0.28059	-76.7	10.3	0.6	-0.99	3583	3553	3528	3445	3291	3374
JH074-025	3500	34	-9	0.027933	5E-04	0.0010717	2E-05	0.280664	2E-05	0.28059	-75.3	2.9	0.9	-0.97	3588	3598	3608	3640	3699	3376
JH074-029	3530	33	3	0.027386	7E-04	0.000954	2E-05	0.280474	2E-05	0.28041	-82.0	-2.9	0.7	-0.97	3831	3867	3900	4011	4217	3654
JH074-041	3297	29	8	0.029016	1E-04	0.0012281	5E-06	0.280714	2E-05	0.28064	-73.5	-0.4	0.8	-0.96	3535	3562	3588	3675	3836	3314
JH074-059	3418	30	9	0.016799	4E-05	0.0007032	1E-06	0.28064	2E-05	0.28059	-76.1	1.0	0.8	-0.98	3586	3608	3626	3689	3804	3376
JH074-061	3371	30	5	0.046335	3E-04	0.0019192	1E-05	0.280793	3E-05	0.28067	-70.7	2.5	1.0	-0.94	3490	3502	3514	3557	3637	3258
JH074-063	3356	30	-1	0.014041	2E-05	0.0006626	1E-06	0.280589	2E-05	0.28055	-77.9	-2.2	0.7	-0.98	3650	3688	3721	3830	4033	3449
JH074-064	3386	30	1	0.010827	5E-05	0.0005179	2E-06	0.280559	2E-05	0.28052	-79.0	-2.2	0.6	-0.98	3676	3715	3748	3856	4057	3480
JH074-068	3497	30	5	0.01357	3E-05	0.0005704	2E-06	0.280532	2E-05	0.28049	-80.0	-0.7	0.8	-0.98	3717	3746	3770	3852	4004	3526
JH074-073	3425	30	3	0.015695	1E-04	0.0007014	7E-06	0.280654	1E-05	0.28061	-75.6	1.7	0.5	-0.98	3567	3585	3601	3654	3752	3354
JH074-085	2564	33	6	0.022156	3E-04	0.0008421	1E-05	0.280697	5E-05	0.28066	-74.1	-17.1	1.9	-0.98	3523	3642	3748	4102	4759	3302
JH074-087	2030	35	6	0.021264	5E-04	0.0008107	1E-05	0.281382	2E-05	0.28135	-49.9	-4.8	0.8	-0.98	2597	2668	2731	2941	3330	2243
JH074-096	3429	31	-2	0.028445	2E-04	0.0011262	7E-06	0.280665	2E-05	0.28059	-75.3	1.1	0.8	-0.97	3592	3610	3628	3688	3799	3380
JH074-102	3453	31	-1	0.020249	1E-04	0.0008765	3E-06	0.280681	2E-05	0.28062	-74.7	2.9	0.7	-0.97	3547	3559	3569	3604	3669	3331
JH074-112	3597	30	-2	0.008997	1E-04	0.0003931	4E-06	0.280564	2E-05	0.28054	-78.8	3.3	0.7	-0.99	3657	3665	3672	3694	3736	3459
JH074-118	3413	30	0	0.0067	4E-05	0.0002847	9E-07	0.280609	2E-05	0.28059	-77.2	0.8	0.7	-0.99	3588	3613	3632	3698	3820	3381
JH074-154	3543	30	6	0.013039	2E-04	0.0005446	1E-05	0.280546	2E-05	0.28051	-79.5	0.9	0.7	-0.98	3696	3716	3734	3791	3896	3503
JH074-163	3606	30	9	0.03412	8E-04	0.0012225	2E-05	0.280748	3E-05	0.28066	-72.3	8.0	1.0	-0.96	3489	3476	3463	3421	3341	3262
JH074-167	3613	30	7	0.035327	1E-05	0.0014289	1E-06	0.280747	2E-05	0.28065	-72.3	7.6	0.8	-0.96	3509	3498	3486	3448	3378	3283

Appendix F Continued.

Beijing session

Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH027-002	3397	31	0	0.031976	3E-04	0.0012344	1E-05	0.280554	5E-05	0.28047	-79.2	-3.8	1.9	-0.96	3751	3790	3829	3959	4199	3561
JH027-007	3389	31	1	0.059613	2E-04	0.0021137	8E-06	0.280458	5E-05	0.28032	-82.6	-9.5	1.9	-0.94	3970	4021	4083	4291	4675	3808
JH027-009	3538	31	-1	0.024397	2E-04	0.0008832	6E-06	0.280445	8E-05	0.28039	-83.0	-3.6	2.7	-0.97	3861	3901	3937	4056	4278	3690
JH027-013	3657	30	3	0.017999	2E-04	0.0006703	3E-06	0.280466	3E-05	0.28042	-82.3	0.5	1.1	-0.98	3813	3833	3850	3908	4015	3635
JH027-015	3402	31	1	0.042948	6E-04	0.0015796	2E-05	0.280537	3E-05	0.28043	-79.8	-5.1	1.1	-0.95	3808	3850	3894	4041	4314	3625
JH027-025	3400	31	1	0.029683	7E-04	0.0010861	2E-05	0.280328	6E-05	0.28026	-87.2	-11.5	2.2	-0.97	4038	4113	4184	4418	4853	3891
JH027-029	4121	30	4	0.029548	2E-04	0.0010883	6E-06	0.280211	6E-05	0.28012	-91.3	1.2	2.0	-0.97	4194	4202	4210	4237	4286	4069
JH027-031	3403	31	-1	0.026321	2E-04	0.0009382	6E-06	0.280574	4E-05	0.28051	-78.5	-2.2	1.4	-0.97	3695	3731	3763	3871	4071	3500
JH027-032	3505	31	1	0.019941	2E-04	0.0007236	6E-06	0.280579	5E-05	0.28053	-78.3	0.8	1.9	-0.98	3669	3690	3708	3769	3882	3471
JH027-034	3538	31	1	0.024276	4E-04	0.0009258	1E-05	0.280465	4E-05	0.28040	-82.3	-3.0	1.3	-0.97	3839	3876	3909	4020	4226	3664
JH027-036	3368	31	0	0.039251	1E-03	0.0014387	3E-05	0.280498	5E-05	0.28040	-81.1	-6.9	1.6	-0.96	3846	3897	3950	4124	4446	3670
JH027-037	3416	31	-1	0.014598	3E-05	0.0005941	1E-06	0.280418	3E-05	0.28038	-84.0	-6.7	1.2	-0.98	3868	3928	3979	4147	4459	3699
JH027-038	3381	31	-1	0.024472	4E-04	0.0009046	1E-05	0.280268	4E-05	0.28021	-89.3	-13.6	1.6	-0.97	4098	4186	4266	4530	5021	3960
JH027-045	3404	31	0	0.030907	1E-04	0.0012421	4E-06	0.280568	4E-05	0.28049	-78.7	-3.2	1.4	-0.96	3733	3770	3806	3927	4150	3541
JH027-061	3890	30	4	0.046528	3E-04	0.0015764	1E-05	0.280325	7E-05	0.28021	-87.3	-1.4	2.4	-0.95	4094	4115	4137	4211	4348	3953
JH027-067	3521	31	0	0.016784	1E-04	0.0006214	4E-06	0.280601	4E-05	0.28056	-77.5	2.2	1.4	-0.98	3630	3644	3656	3697	3772	3426
JH027-074	3399	31	0	0.020262	1E-04	0.0007242	3E-06	0.280425	3E-05	0.28038	-83.7	-7.2	1.0	-0.98	3873	3933	3986	4162	4487	3703
JH027-078	4154	29	1	0.038772	2E-04	0.0013322	6E-06	0.279993	2E-05	0.27989	-99.0	-6.5	0.8	-0.96	4511	4550	4589	4720	4961	4431
JH027-090	4250	29	-1	0.009858	1E-04	0.0004125	4E-06	0.280099	2E-05	0.28007	-95.2	2.3	0.7	-0.99	4268	4270	4272	4279	4291	4156
JH027-091	3398	31	1	0.017466	3E-04	0.0006348	9E-06	0.280332	4E-05	0.28029	-87.0	-10.3	1.4	-0.98	3987	4064	4129	4348	4753	3834
JH027-095	3742	30	3	0.045527	5E-04	0.0015722	1E-05	0.280304	9E-05	0.28019	-88.0	-5.6	3.1	-0.95	4122	4161	4203	4340	4596	3985
JH027-110	3964	29	3	0.011736	5E-04	0.0004234	2E-05	0.280243	5E-05	0.28021	-90.2	0.5	1.9	-0.99	4081	4097	4110	4154	4235	3943
JH027-124	3473	31	1	0.019511	8E-05	0.0007577	2E-06	0.280527	6E-05	0.28048	-80.1	-1.9	2.0	-0.98	3741	3775	3804	3904	4088	3552
JH027-134	3875	30	4	0.046643	3E-04	0.0016076	8E-06	0.280357	3E-05	0.28024	-86.1	-0.7	1.2	-0.95	4054	4072	4092	4157	4277	3907
JH027-138	4018	29	7	0.034861	4E-04	0.0012772	1E-05	0.280152	6E-05	0.28005	-93.4	-3.8	2.1	-0.96	4293	4324	4354	4454	4640	4182
JH027-139	4170	29	6	0.045351	4E-04	0.0016122	1E-05	0.280178	4E-05	0.28005	-92.5	-0.3	1.5	-0.95	4296	4309	4323	4368	4453	4184

Appendix F Continued.

Beijing session																					
Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH027-165	3560	30	5	0.024279	4E-04	0.0008735	1E-05	0.280458	6E-05	0.28040	-82.6	-2.6	2.1	-0.97	3844	3879	3910	4015	4209	3670
JH027-166	3625	30	2	0.01693	6E-05	0.0006012	2E-06	0.280423	4E-05	0.28038	-83.8	-1.6	1.3	-0.98	3863	3894	3920	4009	4172	3693
JH027-167	3894	30	5	0.019711	5E-04	0.0007512	2E-05	0.280243	5E-05	0.28019	-90.2	-2.1	1.8	-0.98	4116	4144	4169	4251	4403	3981
JH027-169	4156	29	2	0.028813	7E-04	0.0010633	3E-05	0.280122	3E-05	0.28004	-94.5	-1.1	1.2	-0.97	4309	4327	4344	4400	4505	4201
JH027-171	3748	30	-3	0.027668	5E-04	0.0009864	2E-05	0.280417	7E-05	0.28035	-84.0	0.1	2.4	-0.97	3909	3928	3946	4006	4116	3744
JH027-172	3403	31	0	0.034633	6E-04	0.0012817	2E-05	0.280565	5E-05	0.28048	-78.8	-3.4	1.9	-0.96	3740	3778	3815	3938	4167	3549
JH027-185	3604	30	-3	0.013108	3E-04	0.000564	1E-05	0.280379	4E-05	0.28034	-85.4	-3.6	1.5	-0.98	3917	3959	3994	4111	4327	3755
JH027-189	3891	30	9	0.045233	3E-04	0.0017045	1E-05	0.280408	6E-05	0.28028	-84.3	1.2	2.1	-0.95	3996	4006	4018	4056	4126	3840
JH027-196	4127	29	5	0.038907	3E-04	0.0013657	1E-05	0.280231	6E-05	0.28012	-90.6	1.3	2.0	-0.96	4198	4206	4213	4239	4288	4073
JH027-198	4097	29	1	0.017322	2E-04	0.0006152	7E-06	0.280065	2E-05	0.28002	-96.5	-3.2	0.9	-0.98	4334	4366	4392	4480	4644	4231
JH027-200	3651	30	3	0.021586	4E-05	0.0008082	1E-06	0.280359	3E-05	0.28030	-86.1	-3.8	1.2	-0.98	3969	4009	4044	4162	4380	3813
JH038-021	3817	30	-1	0.020966	8E-05	0.0008517	4E-06	0.280317	2E-05	0.28025	-87.6	-1.5	0.7	-0.97	4029	4055	4079	4158	4303	3882
JH038-028	3498	31	1	0.019961	1E-04	0.0007138	5E-06	0.280439	3E-05	0.28039	-83.2	-4.3	1.1	-0.98	3853	3899	3938	4070	4314	3681
JH038-033	3414	31	1	0.02144	2E-04	0.00088	8E-06	0.280502	4E-05	0.28044	-81.0	-4.4	1.3	-0.97	3786	3832	3873	4010	4265	3604
JH038-047	3814	30	5	0.027889	6E-04	0.0008962	1E-05	0.280191	3E-05	0.28012	-92.0	-6.2	1.2	-0.97	4200	4247	4290	4432	4696	4077
JH038-052	4102	29	3	0.018683	4E-04	0.0006785	1E-05	0.280104	5E-05	0.28005	-95.1	-1.9	1.7	-0.98	4291	4315	4336	4406	4536	4181
JH038-069	3673	30	-1	0.045851	7E-04	0.0015498	2E-05	0.280419	6E-05	0.28031	-83.9	-3.0	2.1	-0.95	3964	3994	4026	4132	4328	3804
JH038-074	3844	29	1	0.062647	5E-04	0.0020709	2E-05	0.280351	4E-05	0.28020	-86.4	-2.9	1.3	-0.94	4112	4136	4165	4261	4439	3971
JH038-075	4032	29	7	0.049514	4E-04	0.0017223	1E-05	0.28018	5E-05	0.28005	-92.4	-3.8	1.6	-0.95	4306	4333	4362	4461	4644	4195
JH038-096	3587	30	-2	0.012577	1E-04	0.0004645	4E-06	0.280512	5E-05	0.28048	-80.7	1.0	1.6	-0.99	3733	3753	3769	3824	3925	3545
JH038-098	3448	30	2	0.034617	5E-04	0.0012371	2E-05	0.280348	3E-05	0.28027	-86.5	-10.0	1.1	-0.96	4027	4093	4156	4368	4762	3878
JH038-099	4112	29	3	0.013775	7E-05	0.0005123	2E-06	0.280156	3E-05	0.28011	-93.3	0.7	1.1	-0.98	4205	4217	4228	4262	4326	4084
JH038-112	3507	30	1	0.022506	2E-04	0.0007832	1E-05	0.280451	3E-05	0.28040	-82.8	-3.8	1.2	-0.98	3844	3886	3923	4048	4279	3670

Appendix F Continued.

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Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH038-116	4210	29	-9	0.093348	6E-04	0.0032107	1E-05	0.280359	6E-05	0.28010	-86.1	2.4	2.1	-0.91	4229	4230	4232	4238	4250	4101
JH038-127	3458	30	1	0.028754	6E-04	0.0010453	2E-05	0.280285	3E-05	0.28022	-88.7	-11.5	1.2	-0.97	4091	4166	4236	4469	4900	3951
JH038-135	3511	30	-2	0.016758	2E-04	0.0006139	6E-06	0.280548	4E-05	0.28051	-79.4	0.1	1.4	-0.98	3699	3724	3745	3815	3945	3506
JH038-166	3632	30	-1	0.028691	2E-04	0.0010513	4E-06	0.280432	3E-05	0.28036	-83.5	-2.3	1.0	-0.97	3897	3928	3957	4055	4235	3729
JH038-189	3772	30	5	0.02785	5E-05	0.0009297	2E-06	0.280284	4E-05	0.28022	-88.7	-4.0	1.3	-0.97	4081	4118	4152	4266	4477	3940
JH045-002	3572	30	-2	0.025867	2E-04	0.0009386	7E-06	0.280445	2E-05	0.28038	-83.0	-2.9	0.8	-0.97	3867	3903	3936	4045	4247	3696
JH045-010	3542	30	-2	0.029831	3E-04	0.0011291	1E-05	0.280334	3E-05	0.28026	-86.9	-8.0	0.9	-0.97	4034	4091	4146	4326	4661	3886
JH045-014	3529	30	1	0.025647	4E-04	0.0009982	2E-05	0.280386	2E-05	0.28032	-85.1	-6.1	0.9	-0.97	3951	4002	4049	4204	4492	3792
JH045-027	3496	30	0	0.020298	1E-04	0.0007232	4E-06	0.280451	4E-05	0.28040	-82.8	-4.0	1.4	-0.98	3838	3882	3920	4048	4283	3664
JH045-039	3535	30	-1	0.029899	2E-04	0.0011174	6E-06	0.280435	2E-05	0.28036	-83.4	-4.6	0.8	-0.97	3899	3941	3981	4115	4362	3732
JH045-040	3391	31	0	0.048602	6E-04	0.0017733	2E-05	0.280676	3E-05	0.28056	-74.9	-0.8	1.0	-0.95	3637	3661	3688	3777	3942	3428
JH045-041	3998	29	-1	0.025707	2E-04	0.0009166	8E-06	0.280223	2E-05	0.28015	-90.9	-0.8	0.8	-0.97	4160	4180	4198	4258	4369	4031
JH045-046	3453	31	0	0.032687	6E-04	0.0012005	2E-05	0.280398	2E-05	0.28032	-84.7	-8.0	0.9	-0.96	3957	4014	4070	4254	4596	3798
JH045-047	3749	30	-3	0.008949	2E-04	0.0003416	5E-06	0.28033	3E-05	0.28030	-87.1	-1.3	1.1	-0.99	3960	3989	4013	4092	4239	3805
JH045-051	3519	31	-1	0.015072	2E-04	0.0005624	8E-06	0.280383	2E-05	0.28034	-85.2	-5.5	0.8	-0.98	3912	3964	4008	4155	4426	3750
JH045-054	3488	30	0	0.018172	4E-04	0.0006517	1E-05	0.280495	2E-05	0.28045	-81.3	-2.4	0.8	-0.98	3773	3810	3842	3948	4145	3590
JH045-055	3361	31	-1	0.020379	1E-04	0.0007181	4E-06	0.280619	3E-05	0.28057	-76.9	-1.1	1.2	-0.98	3615	3648	3676	3771	3946	3409
JH045-057	3484	30	-1	0.024537	6E-04	0.0008711	2E-05	0.280453	2E-05	0.28039	-82.7	-4.5	0.8	-0.97	3850	3896	3936	4072	4323	3677
JH045-058	3080	31	1	0.029676	7E-05	0.0010225	3E-06	0.280924	3E-05	0.28086	-66.1	2.5	1.0	-0.97	3233	3252	3268	3325	3429	2970
JH045-061	3554	30	1	0.015362	1E-04	0.0005869	5E-06	0.280429	2E-05	0.28039	-83.6	-3.0	0.7	-0.98	3853	3893	3926	4038	4245	3682
JH045-062	3350	31	-1	0.018605	6E-04	0.0006531	2E-05	0.280608	2E-05	0.28057	-77.2	-1.6	0.8	-0.98	3623	3658	3689	3790	3979	3418
JH045-063	3550	30	-1	0.028233	3E-04	0.0009893	8E-06	0.280507	3E-05	0.28044	-80.8	-1.4	0.9	-0.97	3790	3819	3846	3934	4099	3608
JH045-066	3388	31	-2	0.026888	3E-04	0.0009873	1E-05	0.280327	2E-05	0.28026	-87.2	-11.5	0.7	-0.97	4029	4106	4177	4413	4850	3881

Appendix F Continued.

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Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH045-077	3618	30	2	0.02355	3E-04	0.0008859	1E-05	0.280384	2E-05	0.28032	-85.2	-3.9	0.7	-0.97	3944	3984	4020	4140	4363	3784
JH045-080	3575	30	0	0.019765	1E-04	0.0007812	6E-06	0.280419	2E-05	0.28036	-84.0	-3.4	0.6	-0.98	3887	3926	3961	4076	4291	3719
JH045-081	4031	29	1	0.011105	9E-05	0.0004063	3E-06	0.280103	2E-05	0.28007	-95.1	-2.8	0.7	-0.99	4262	4294	4320	4406	4566	4149
JH045-092	3522	30	0	0.01387	1E-04	0.0005228	4E-06	0.280429	3E-05	0.28039	-83.6	-3.6	0.9	-0.98	3847	3891	3927	4048	4273	3676
JH045-099	3992	29	2	0.018495	1E-04	0.0007332	5E-06	0.280111	2E-05	0.28005	-94.8	-4.4	0.8	-0.98	4287	4325	4358	4467	4670	4177
JH045-102	3759	30	0	0.04686	3E-04	0.0016549	9E-06	0.280452	4E-05	0.28033	-82.8	-0.1	1.3	-0.95	3930	3947	3966	4028	4143	3765
JH045-104	4100	29	3	0.013314	2E-04	0.0005111	6E-06	0.28008	2E-05	0.28004	-95.9	-2.3	0.8	-0.98	4304	4331	4354	4430	4571	4197
JH045-105	3881	30	-3	0.032841	4E-04	0.0011767	1E-05	0.280375	2E-05	0.28029	-85.5	1.2	0.8	-0.97	3985	3996	4008	4046	4117	3829
JH045-111	3826	30	-3	0.017909	1E-04	0.0006755	5E-06	0.280216	2E-05	0.28017	-91.1	-4.5	0.7	-0.98	4144	4185	4220	4338	4557	4013
JH048-001	3402	31	0	0.019146	4E-05	0.000674	3E-06	0.280489	4E-05	0.28044	-81.5	-4.7	1.3	-0.98	3783	3832	3875	4016	4278	3601
JH048-032	3383	31	1	0.016452	4E-04	0.0006008	1E-05	0.280291	4E-05	0.28025	-88.5	-12.0	1.4	-0.98	4037	4123	4196	4439	4890	3892
JH048-037	3828	30	2	0.033087	9E-04	0.0011673	2E-05	0.28043	4E-05	0.28034	-83.6	2.0	1.4	-0.97	3910	3920	3929	3959	4015	3744
JH048-056	4042	29	6	0.070407	5E-04	0.0023978	1E-05	0.28029	4E-05	0.28010	-88.5	-1.5	1.4	-0.93	4232	4247	4267	4334	4459	4108
JH048-059	3647	30	-1	0.017297	2E-04	0.0006301	8E-06	0.280319	3E-05	0.28028	-87.5	-4.9	1.2	-0.98	4002	4049	4089	4221	4466	3852
JH048-062	4120	29	3	0.025913	6E-04	0.0009137	2E-05	0.280114	6E-05	0.28004	-94.7	-1.8	2.0	-0.97	4303	4325	4346	4413	4539	4194
JH048-093	3364	31	1	0.014749	6E-05	0.0005523	2E-06	0.280533	4E-05	0.28050	-79.9	-3.8	1.3	-0.98	3714	3760	3800	3930	4172	3523
JH048-114	3410	31	-1	0.011098	2E-04	0.0004163	8E-06	0.280322	3E-05	0.28029	-87.4	-9.9	1.0	-0.99	3977	4055	4119	4331	4724	3824
JH048-118	3588	30	0	0.026161	1E-04	0.0009833	3E-06	0.280532	3E-05	0.28046	-80.0	0.5	1.2	-0.97	3756	3776	3795	3856	3971	3569
JH048-123	3605	30	0	0.034063	4E-04	0.0012138	1E-05	0.280478	3E-05	0.28039	-81.9	-1.7	1.2	-0.96	3851	3879	3906	3996	4163	3676
JH048-124	3424	31	-1	0.027125	3E-04	0.0009703	8E-06	0.280357	4E-05	0.28029	-86.1	-9.6	1.4	-0.97	3988	4055	4118	4325	4710	3834
JH048-126	3484	31	-1	0.019804	3E-04	0.0007103	1E-05	0.280345	4E-05	0.28030	-86.6	-8.0	1.3	-0.98	3978	4041	4096	4279	4618	3824
JH048-171	3432	30	0	0.010043	2E-04	0.0003923	6E-06	0.28032	5E-05	0.28029	-87.4	-9.3	1.7	-0.99	3977	4053	4114	4318	4696	3825
JH048-194	3631	30	5	0.025293	1E-04	0.0009086	5E-06	0.280364	3E-05	0.28030	-85.9	-4.4	1.2	-0.97	3972	4014	4052	4178	4411	3816

Appendix F Continued.

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Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH048-199	3457	30	0	0.021992	2E-04	0.0007934	8E-06	0.280396	4E-05	0.28034	-84.8	-7.0	1.3	-0.98	3918	3976	4027	4198	4515	3755
JH053-009	3507	31	0	0.018357	1E-04	0.0006621	3E-06	0.280581	6E-05	0.28054	-78.2	1.1	2.0	-0.98	3660	3680	3697	3754	3859	3461
JH053-014	3892	30	5	0.033366	4E-04	0.0011582	1E-05	0.280355	3E-05	0.28027	-86.2	0.8	1.0	-0.97	4010	4024	4037	4080	4160	3858
JH053-028	4093	29	-2	0.029813	1E-04	0.0010734	7E-06	0.280352	4E-05	0.28027	-86.3	5.6	1.3	-0.97	4005	3995	3986	3953	3894	3854
JH053-037	3399	29	5	0.012535	6E-04	0.000486	2E-05	0.280471	3E-05	0.28044	-82.1	-5.0	1.2	-0.99	3789	3841	3885	4030	4300	3609
JH053-038	3410	31	-1	0.018085	2E-04	0.0006751	8E-06	0.280438	4E-05	0.28039	-83.3	-6.3	1.3	-0.98	3851	3908	3958	4121	4425	3679
JH053-047	4091	29	4	0.02208	1E-04	0.0008393	7E-06	0.280217	3E-05	0.28015	-91.1	1.4	1.1	-0.98	4159	4168	4175	4200	4247	4030
JH053-048	4181	29	4	0.047005	7E-04	0.0018253	3E-05	0.280156	5E-05	0.28001	-93.2	-1.5	1.7	-0.95	4349	4365	4383	4444	4556	4244
JH053-050	4201	29	-3	0.005679	9E-05	0.0002227	3E-06	0.280065	3E-05	0.28005	-96.5	0.4	1.2	-0.99	4292	4305	4315	4349	4413	4184
JH053-060	4162	29	6	0.030886	5E-04	0.0011203	2E-05	0.280091	4E-05	0.28000	-95.6	-2.2	1.3	-0.97	4357	4379	4401	4472	4604	4255
JH053-061	3381	31	-2	0.025954	4E-04	0.0009446	1E-05	0.280692	4E-05	0.28063	-74.3	1.4	1.3	-0.97	3538	3557	3574	3632	3739	3319
JH053-063	3726	30	2	0.021553	2E-04	0.0007805	4E-06	0.280469	4E-05	0.28041	-82.2	1.9	1.3	-0.98	3820	3832	3843	3878	3942	3644
JH053-065	3487	30	-2	0.039843	6E-04	0.0013956	2E-05	0.280451	4E-05	0.28036	-82.8	-5.8	1.5	-0.96	3905	3950	3996	4148	4430	3737
JH053-070	3467	30	-1	0.028302	1E-04	0.0010509	4E-06	0.280408	4E-05	0.28034	-84.3	-6.9	1.4	-0.97	3928	3982	4033	4202	4516	3765
JH053-071	3652	30	2	0.031613	7E-04	0.0010257	2E-05	0.280359	3E-05	0.28029	-86.1	-4.3	1.2	-0.97	3991	4031	4069	4193	4425	3837
JH053-087	3392	28	2	0.024428	5E-04	0.0008978	2E-05	0.280486	7E-05	0.28043	-81.6	-5.5	2.4	-0.97	3808	3860	3906	4059	4344	3629
JH053-093	4169	29	0	0.051049	6E-04	0.001851	3E-05	0.280197	4E-05	0.28005	-91.8	-0.3	1.3	-0.95	4297	4309	4322	4368	4453	4184
JH053-101	3548	30	1	0.016898	7E-05	0.000617	2E-06	0.28028	3E-05	0.28024	-88.8	-8.6	1.1	-0.98	4052	4119	4175	4363	4710	3909
JH053-108	3406	30	1	0.015919	3E-04	0.0005759	1E-05	0.280374	3E-05	0.28034	-85.5	-8.5	1.0	-0.98	3925	3993	4051	4244	4602	3764
JH053-111	3559	30	1	0.012887	2E-04	0.0004786	5E-06	0.280435	4E-05	0.28040	-83.4	-2.5	1.4	-0.99	3836	3873	3905	4008	4200	3663
JH053-113	3981	29	-5	0.031114	5E-04	0.0010737	2E-05	0.280166	5E-05	0.28008	-92.9	-3.6	1.9	-0.97	4252	4284	4314	4413	4598	4135
JH053-114	3980	29	5	0.018753	1E-04	0.0006839	5E-06	0.280241	3E-05	0.28019	-90.2	0.1	1.1	-0.98	4111	4128	4142	4191	4281	3976
JH053-118	3550	30	-1	0.019873	2E-04	0.0007654	5E-06	0.28046	4E-05	0.28041	-82.5	-2.5	1.3	-0.98	3831	3867	3898	4002	4195	3656

Appendix F Continued.

Beijing session																					
Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH053-120	3783	29	7	0.031163	3E-04	0.001136	1E-05	0.280354	4E-05	0.28027	-86.2	-1.7	1.4	-0.97	4008	4034	4059	4142	4295	3857
JH053-122	3385	29	2	0.041922	3E-04	0.0014995	9E-06	0.280455	5E-05	0.28036	-82.7	-8.2	1.6	-0.96	3911	3966	4023	4214	4568	3743
JH053-132	3364	30	-1	0.019738	7E-05	0.0007898	2E-06	0.280593	4E-05	0.28054	-77.8	-2.2	1.4	-0.98	3657	3694	3726	3834	4035	3456
JH053-146	3396	28	7	0.023717	2E-04	0.0008727	7E-06	0.280416	3E-05	0.28036	-84.0	-7.9	1.2	-0.97	3899	3961	4017	4203	4547	3733
JH053-149	4178	28	0	0.018844	2E-04	0.000699	8E-06	0.280093	3E-05	0.28004	-95.5	-0.5	1.2	-0.98	4308	4324	4339	4387	4476	4200
JH053-159	4045	28	-9	0.025373	1E-04	0.0008889	3E-06	0.280254	3E-05	0.28018	-89.8	1.5	1.2	-0.97	4115	4124	4132	4158	4206	3980
JH053-166	3555	29	1	0.015972	1E-04	0.0006009	4E-06	0.280496	4E-05	0.28045	-81.2	-0.7	1.3	-0.98	3767	3795	3819	3898	4044	3584
JH053-174	3754	29	5	0.014191	1E-04	0.0005399	4E-06	0.280374	2E-05	0.28033	-85.6	-0.2	0.9	-0.98	3922	3945	3963	4026	4142	3761
JH053-180	4042	29	5	0.022747	7E-05	0.0008473	2E-06	0.28022	4E-05	0.28015	-91.0	0.3	1.3	-0.97	4157	4171	4184	4226	4304	4028
JH053-198	3396	31	-2	0.008533	8E-05	0.0003471	3E-06	0.280334	3E-05	0.28031	-87.0	-9.6	1.1	-0.99	3955	4033	4096	4306	4694	3800
JH053-204	3386	30	6	0.007158	5E-05	0.0003128	2E-06	0.280505	3E-05	0.28048	-80.9	-3.7	1.2	-0.99	3727	3775	3814	3942	4179	3540
JH053-208	4003	30	2	0.008668	4E-05	0.0003478	1E-06	0.280173	4E-05	0.28015	-92.7	-0.9	1.4	-0.99	4165	4188	4206	4267	4379	4039
JH053-212	3418	31	1	0.017686	2E-04	0.0006297	7E-06	0.280398	3E-05	0.28036	-84.7	-7.5	1.2	-0.98	3899	3962	4015	4194	4526	3734
JH053-215	3464	31	4	0.027374	9E-05	0.0010225	3E-06	0.280451	4E-05	0.28038	-82.8	-5.4	1.4	-0.97	3867	3915	3960	4108	4383	3696
JH053-218	3462	31	4	0.007198	8E-05	0.0002905	3E-06	0.280301	3E-05	0.28028	-88.1	-9.1	1.1	-0.99	3993	4068	4127	4327	4696	3843
JH053-225	3372	30	5	0.022374	8E-05	0.000823	4E-06	0.280414	3E-05	0.28036	-84.1	-8.4	1.1	-0.98	3897	3963	4021	4215	4575	3731
JH053-226	3623	30	2	0.016214	1E-04	0.0006148	7E-06	0.280442	4E-05	0.28040	-83.2	-1.0	1.4	-0.98	3840	3869	3893	3974	4123	3667
JH053-227	3422	31	5	0.025805	5E-05	0.0009636	2E-06	0.28043	3E-05	0.28037	-83.6	-7.0	1.1	-0.97	3890	3947	3998	4171	4491	3722
JH053-231	3443	31	2	0.030809	5E-04	0.001142	2E-05	0.28052	5E-05	0.28044	-80.4	-3.7	1.7	-0.97	3787	3827	3865	3991	4225	3603
JH053-234	3459	31	3	0.017001	1E-04	0.0006517	4E-06	0.280374	5E-05	0.28033	-85.5	-7.4	1.6	-0.98	3933	3995	4047	4223	4549	3773
JH053-238	3393	31	0	0.014445	1E-04	0.0005498	5E-06	0.280378	3E-05	0.28034	-85.4	-8.5	1.2	-0.98	3917	3986	4045	4240	4601	3755
JH053-239	3596	31	7	0.015028	5E-05	0.0005834	2E-06	0.280361	3E-05	0.28032	-86.0	-4.5	1.2	-0.98	3943	3989	4028	4157	4397	3785
JH074-019	3374	36	0	0.033765	0.002	0.0011162	4E-05	0.280621	4E-05	0.28055	-76.8	-1.7	1.4	-0.97	3649	3681	3712	3812	4000	3446

Appendix F Continued.

Beijing session																				
Sample	t (Ma)	1σ	% Disc	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf_{(i)}$	$e_{Hf}(0)$	$e_{Hf}(t)$	2 s	$f_{Lu/Hf}$	T_{DM} (Ma)	T_{DM2} (Ma) 0.005	T_{DM2} (Ma) 0.008	T_{DM2} (Ma) 0.015	T_{DM2} (Ma) 0.022	T_{CHUR} (Ma)
JH074-021	3466	35	-5	0.013509	1E-04	0.0004887	3E-06	0.280475	3E-05	0.28044	-82.0	-3.3	1.1	-0.99	3784	3827	3863	3982	4202	3604
JH074-025	3500	34	-9	0.020881	1E-04	0.0007639	4E-06	0.280605	5E-05	0.28055	-77.4	1.5	1.6	-0.98	3638	3656	3671	3722	3817	3435
JH074-029	3530	33	3	0.016899	1E-04	0.0006134	5E-06	0.280326	3E-05	0.28028	-87.2	-7.4	1.1	-0.98	3992	4053	4105	4277	4596	3841
JH074-041	3297	29	8	0.020786	2E-04	0.0008391	7E-06	0.280427	4E-05	0.28037	-83.7	-9.7	1.4	-0.98	3882	3955	4020	4236	4636	3713
JH074-059	3418	30	9	0.016825	6E-05	0.0006404	3E-06	0.280571	3E-05	0.28053	-78.6	-1.3	1.2	-0.98	3672	3705	3733	3828	4003	3475
JH074-061	3371	30	5	0.040079	8E-04	0.0015396	3E-05	0.280573	4E-05	0.28047	-78.5	-4.5	1.4	-0.95	3756	3796	3838	3977	4236	3565
JH074-063	3356	30	-1	0.011412	8E-05	0.000504	3E-06	0.280472	4E-05	0.28044	-82.1	-6.0	1.3	-0.99	3789	3847	3896	4058	4357	3609
JH074-064	3386	30	1	0.014797	4E-05	0.0006701	9E-07	0.280548	3E-05	0.28050	-79.4	-3.0	1.2	-0.98	3705	3746	3782	3900	4120	3512
JH074-068	3497	30	5	0.012912	1E-04	0.0004978	6E-06	0.280506	4E-05	0.28047	-80.9	-1.4	1.6	-0.99	3744	3777	3805	3896	4067	3557
JH074-073	3425	30	3	0.015344	1E-04	0.0006202	4E-06	0.280548	3E-05	0.28051	-79.4	-1.9	1.2	-0.98	3701	3737	3767	3870	4060	3507
JH074-085	2564	33	6	0.035714	6E-04	0.0012941	2E-05	0.280898	3E-05	0.28083	-67.0	-10.7	1.0	-0.96	3292	3373	3453	3719	4211	3035
JH074-087	2030	35	6	0.016491	2E-04	0.0006356	1E-05	0.281539	9E-05	0.28151	-44.4	1.0	3.3	-0.98	2374	2419	2457	2584	2821	1988
JH074-096	3429	31	-2	0.017964	4E-04	0.0006604	1E-05	0.280522	3E-05	0.28048	-80.3	-2.9	0.9	-0.98	3738	3778	3813	3928	4140	3550
JH074-102	3453	31	-1	0.028782	8E-05	0.0011128	4E-06	0.280582	3E-05	0.28051	-78.2	-1.2	1.1	-0.97	3702	3731	3759	3850	4020	3506
JH074-112	3597	30	-2	0.015926	5E-04	0.000543	1E-05	0.280508	3E-05	0.28047	-80.8	0.9	1.2	-0.98	3745	3765	3781	3836	3938	3559
JH074-118	3413	30	0	0.006628	3E-05	0.0002748	6E-07	0.280562	3E-05	0.28054	-78.9	-0.9	1.2	-0.99	3650	3683	3710	3799	3963	3451
JH074-154	3543	30	6	0.014307	4E-04	0.0005442	1E-05	0.280449	4E-05	0.28041	-82.9	-2.5	1.4	-0.98	3823	3860	3891	3996	4189	3647
JH074-163	3606	30	9	0.034374	5E-04	0.0012258	1E-05	0.28046	4E-05	0.28037	-82.5	-2.3	1.5	-0.96	3877	3907	3937	4036	4220	3706
JH074-167	3613	30	7	0.039524	9E-05	0.0014804	2E-06	0.280571	4E-05	0.28047	-78.6	1.2	1.3	-0.96	3752	3766	3782	3832	3926	3561

Appendix G Standard information of zircon Lu-Hf isotope (Xi’an session)

Sample	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ
20110804A001,MON-1	0.000503	0.000003	0.000017	0.000000	0.282794	0.000008
20110804A015,MON-1	0.000405	0.000004	0.000013	0.000000	0.282683	0.000008
20110804A029,MON-1	0.000432	0.000003	0.000013	0.000000	0.282787	0.000006
20110804A042,MON-1	0.000505	0.000002	0.000016	0.000000	0.282758	0.000007
20110804A050,MON-1	0.000448	0.000003	0.000015	0.000000	0.282768	0.000006
20110805A001,MON-1	0.000424	0.000002	0.000014	0.000000	0.282771	0.000006
20110805A014,MON-1	0.000429	0.000002	0.000014	0.000000	0.282785	0.000005
20110805A026,MON-1	0.000414	0.000002	0.000013	0.000000	0.282796	0.000006
20110805A039,MON-1	0.000442	0.000002	0.000014	0.000000	0.282781	0.000007
20110805A047,MON-1	0.000412	0.000003	0.000013	0.000000	0.282754	0.000006
20110805D001,MON-1	0.000441	0.000003	0.000014	0.000000	0.282734	0.000007
20110805D014,MON-1	0.000471	0.000002	0.000015	0.000000	0.282768	0.000004
20110805D027,MON-1	0.000447	0.000002	0.000014	0.000000	0.282754	0.000005
20110805D040,MON-1	0.000523	0.000002	0.000016	0.000000	0.282769	0.000004
20110805D053,MON-1	0.000516	0.000001	0.000016	0.000000	0.282735	0.000005
20110805D067,MON-1	0.000528	0.000002	0.000017	0.000000	0.282787	0.000005
20110805F001,MON-1	0.000460	0.000002	0.000015	0.000000	0.282768	0.000004
20110805F014,MON-1	0.000449	0.000002	0.000014	0.000000	0.282761	0.000006
20110805F028,MON-1	0.000463	0.000002	0.000014	0.000000	0.282789	0.000005
20110806A001,MON-1	0.000459	0.000002	0.000015	0.000000	0.282789	0.000005
20110806A014,MON-1	0.000446	0.000002	0.000014	0.000000	0.282786	0.000006
20110806A027,MON-1	0.000441	0.000002	0.000014	0.000000	0.282786	0.000006
20110806B001,MON-1	0.000490	0.000002	0.000015	0.000000	0.282752	0.000005
20110806B014,MON-1	0.000430	0.000002	0.000014	0.000000	0.282767	0.000005
20110806B027,MON-1	0.000467	0.000002	0.000014	0.000000	0.282774	0.000005
20110806B036,MON-1	0.000445	0.000002	0.000014	0.000000	0.282757	0.000005
20110806C001,MON-1	0.000442	0.000002	0.000014	0.000000	0.282768	0.000005
20110806C014,MON-1	0.000438	0.000002	0.000014	0.000000	0.282755	0.000005
20110806C027,MON-1	0.000460	0.000002	0.000014	0.000000	0.282772	0.000005
20110806C034,MON-1	0.000435	0.000002	0.000013	0.000000	0.282743	0.000005
20110806D001,MON-1	0.000447	0.000002	0.000014	0.000000	0.282758	0.000004
20110806D014,MON-1	0.000428	0.000002	0.000014	0.000000	0.282789	0.000005
20110806D027,MON-1	0.000442	0.000002	0.000014	0.000000	0.282754	0.000005
20110806D040,MON-1	0.000441	0.000002	0.000014	0.000000	0.282764	0.000005
20110806D045,MON-1	0.000562	0.000002	0.000017	0.000000	0.282777	0.000005
20110806G001,MON-1	0.000487	0.000002	0.000015	0.000000	0.282778	0.000005
20110806G014,MON-1	0.000534	0.000002	0.000016	0.000000	0.282785	0.000005
20110806G027,MON-1	0.000442	0.000002	0.000014	0.000000	0.282790	0.000005
20110806G040,MON-1	0.000529	0.000002	0.000016	0.000000	0.282782	0.000005
20110806G053,MON-1	0.000447	0.000002	0.000014	0.000000	0.282767	0.000005
20110806G066,MON-1	0.000484	0.000002	0.000015	0.000000	0.282763	0.000005
20110806G079,MON-1	0.000452	0.000002	0.000014	0.000000	0.282782	0.000006
20110806G091,MON-1	0.000484	0.000002	0.000015	0.000000	0.282737	0.000006
20110807A001,MON-1	0.000463	0.000002	0.000015	0.000000	0.282787	0.000006
20110807A014,MON-1	0.000443	0.000002	0.000013	0.000000	0.282775	0.000005
20110807A027,MON-1	0.000453	0.000002	0.000014	0.000000	0.282790	0.000006
20110807A040,MON-1	0.000469	0.000002	0.000015	0.000000	0.282793	0.000006
20110807A046,MON-1	0.000492	0.000002	0.000014	0.000000	0.282731	0.000007
20110807B001,MON-1	0.000423	0.000002	0.000013	0.000000	0.282781	0.000006

Appendix G continued.

Sample	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ
20110807B014,MON-1	0.000415	0.000002	0.000013	0.000000	0.282773	0.000005
20110807B027,MON-1	0.000437	0.000002	0.000014	0.000000	0.282738	0.000007
20110807B040,MON-1	0.000461	0.000002	0.000014	0.000000	0.282784	0.000006
20110807B053,MON-1	0.000442	0.000002	0.000014	0.000000	0.282787	0.000008
20110807B066,MON-1	0.000493	0.000002	0.000015	0.000000	0.282769	0.000006
20110807B079,MON-1	0.000539	0.000002	0.000017	0.000000	0.282781	0.000006
20110807B088,MON-1	0.000563	0.000002	0.000018	0.000000	0.282765	0.000006
20110807C001,MON-1	0.000479	0.000002	0.000015	0.000000	0.282751	0.000006
20110807C014,MON-1	0.000538	0.000002	0.000017	0.000000	0.282790	0.000006
20110807C027,MON-1	0.000608	0.000002	0.000019	0.000000	0.282793	0.000005
20110807C040,MON-1	0.000477	0.000002	0.000014	0.000000	0.282784	0.000007
20110807C045,MON-1	0.000481	0.000002	0.000015	0.000000	0.282791	0.000006
20110807D001,MON-1	0.000439	0.000002	0.000014	0.000000	0.282792	0.000007
20110807D014,MON-1	0.000619	0.000002	0.000019	0.000000	0.282762	0.000006
20110807D027,MON-1	0.000294	0.000003	0.000009	0.000000	0.282790	0.000007
20110807D040,MON-1	0.000534	0.000002	0.000016	0.000000	0.282785	0.000005
20110807D048,MON-1	0.000559	0.000002	0.000018	0.000000	0.282791	0.000007
20110807F001,MON-1	0.000527	0.000002	0.000017	0.000000	0.282791	0.000008
20110807F014,MON-1	0.000477	0.000003	0.000014	0.000000	0.282772	0.000006
20110807F027,MON-1	0.000454	0.000002	0.000014	0.000000	0.282767	0.000006
20110807F040,MON-1	0.000535	0.000002	0.000016	0.000000	0.282790	0.000006
20110807F053,MON-1	0.000455	0.000002	0.000015	0.000000	0.282787	0.000005
20110807F066,MON-1	0.000451	0.000003	0.000014	0.000000	0.282787	0.000006
20110807F079,MON-1	0.000472	0.000004	0.000015	0.000000	0.282788	0.000009
20110807F092,MON-1	0.000447	0.000002	0.000014	0.000000	0.282776	0.000005
20110807F101,MON-1	0.000457	0.000002	0.000014	0.000000	0.282784	0.000007
20110808A001,MON-1	0.000488	0.000002	0.000014	0.000000	0.282781	0.000006
20110808A014,MON-1	0.000559	0.000002	0.000017	0.000000	0.282731	0.000006
20110808A027,MON-1	0.000522	0.000002	0.000016	0.000000	0.282768	0.000007
20110808A040,MON-1	0.000560	0.000002	0.000017	0.000000	0.282757	0.000006
20110809B001,MON-1	0.000367	0.000003	0.000013	0.000000	0.282724	0.000009
20110809B014,MON-1	0.000372	0.000003	0.000012	0.000000	0.282709	0.000007
20110809C001,MON-1	0.000370	0.000005	0.000012	0.000000	0.282795	0.000009
20110809C014,MON-1	0.000392	0.000003	0.000013	0.000000	0.282693	0.000007
20110809D001,MON-1	0.000398	0.000003	0.000012	0.000000	0.282763	0.000007
20110809D014,MON-1	0.000388	0.000003	0.000012	0.000000	0.282719	0.000007
20110809D027,MON-1	0.000379	0.000003	0.000012	0.000000	0.282719	0.000006
20110809D038,MON-1	0.000373	0.000003	0.000012	0.000000	0.282723	0.000006
20110809F001,MON-1	0.000610	0.000007	0.000012	0.000000	0.282714	0.000013
20110809F014,MON-1	0.000645	0.000008	0.000013	0.000000	0.282736	0.000013
20110809F027,MON-1	0.000687	0.000007	0.000015	0.000000	0.282686	0.000015
20110809F040,MON-1	0.000635	0.000005	0.000014	0.000000	0.282714	0.000012
20110809F053,MON-1	0.000723	0.000007	0.000014	0.000000	0.282719	0.000012
20110809G001,MON-1	0.000707	0.000005	0.000014	0.000000	0.282715	0.000011
20110809G014,MON-1	0.000670	0.000005	0.000014	0.000000	0.282730	0.000011
20110809G027,MON-1	0.000763	0.000006	0.000016	0.000000	0.282775	0.000012
20110809G040,MON-1	0.000711	0.000006	0.000014	0.000000	0.282692	0.000011
20110809G047,MON-1	0.000644	0.000006	0.000013	0.000000	0.282691	0.000012
20110809H001,MON-1	0.000721	0.000006	0.000014	0.000000	0.282759	0.000011

Appendix G continued.

Sample	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ
20110809H014,MON-1	0.000717	0.000005	0.000014	0.000000	0.282715	0.000010
20110809H027,MON-1	0.000683	0.000005	0.000015	0.000000	0.282769	0.000009
20110809H040,MON-1	0.000683	0.000006	0.000013	0.000000	0.282694	0.000013
20110809H048,MON-1	0.000647	0.000006	0.000012	0.000000	0.282735	0.000010
20110804A002,91500	0.006824	0.000004	0.000280	0.000000	0.282362	0.000009
20110804A016,91500	0.006983	0.000005	0.000292	0.000000	0.282253	0.000010
20110804A030,91500	0.006722	0.000004	0.000280	0.000000	0.282307	0.000008
20110804A043,91500	0.007227	0.000006	0.000300	0.000000	0.282361	0.000011
20110804A051,91500	0.006923	0.000007	0.000288	0.000000	0.282358	0.000013
20110805A002,91500	0.007062	0.000006	0.000292	0.000000	0.282306	0.000008
20110805A015,91500	0.007030	0.000004	0.000287	0.000000	0.282329	0.000008
20110805A027,91500	0.007131	0.000005	0.000287	0.000000	0.282343	0.000009
20110805A040,91500	0.006643	0.000006	0.000277	0.000000	0.282355	0.000014
20110805A048,91500	0.006740	0.000005	0.000282	0.000000	0.282355	0.000011
20110805D002,91500	0.007458	0.000003	0.000294	0.000000	0.282344	0.000007
20110805D015,91500	0.007555	0.000004	0.000292	0.000000	0.282312	0.000006
20110805D028,91500	0.007695	0.000003	0.000295	0.000000	0.282313	0.000007
20110805D041,91500	0.007715	0.000007	0.000294	0.000000	0.282354	0.000007
20110805D054,91500	0.007692	0.000007	0.000292	0.000000	0.282267	0.000007
20110805D068,91500	0.007463	0.000008	0.000288	0.000000	0.282322	0.000007
20110805F002,91500	0.007747	0.000009	0.000294	0.000000	0.282349	0.000006
20110805F015,91500	0.007418	0.000004	0.000289	0.000000	0.282357	0.000009
20110805F029,91500	0.007486	0.000006	0.000293	0.000000	0.282349	0.000006
20110806A002,91500	0.008085	0.000007	0.000306	0.000000	0.282299	0.000009
20110806A015,91500	0.007751	0.000005	0.000297	0.000000	0.282314	0.000006
20110806A028,91500	0.007450	0.000005	0.000293	0.000000	0.282299	0.000006
20110806B002,91500	0.007436	0.000007	0.000292	0.000000	0.282310	0.000007
20110806B015,91500	0.007657	0.000004	0.000298	0.000000	0.282311	0.000008
20110806B028,91500	0.007720	0.000006	0.000295	0.000000	0.282290	0.000007
20110806B037,91500	0.007649	0.000007	0.000293	0.000000	0.282319	0.000007
20110806C002,91500	0.007386	0.000004	0.000288	0.000000	0.282335	0.000009
20110806C015,91500	0.007679	0.000010	0.000293	0.000000	0.282354	0.000008
20110806C028,91500	0.007538	0.000005	0.000287	0.000000	0.282329	0.000008
20110806C035,91500	0.007467	0.000006	0.000289	0.000000	0.282317	0.000008
20110806D002,91500	0.007637	0.000004	0.000297	0.000000	0.282322	0.000007
20110806D015,91500	0.007589	0.000004	0.000293	0.000000	0.282352	0.000007
20110806D028,91500	0.007575	0.000013	0.000287	0.000000	0.282302	0.000008
20110806D041,91500	0.007534	0.000006	0.000292	0.000000	0.282328	0.000008
20110806D046,91500	0.007562	0.000005	0.000293	0.000000	0.282323	0.000008
20110806G002,91500	0.007409	0.000005	0.000288	0.000000	0.282315	0.000008
20110806G015,91500	0.007421	0.000006	0.000294	0.000000	0.282346	0.000007
20110806G028,91500	0.007464	0.000005	0.000294	0.000000	0.282314	0.000007
20110806G041,91500	0.007313	0.000005	0.000290	0.000000	0.282286	0.000007
20110806G054,91500	0.007437	0.000004	0.000297	0.000000	0.282356	0.000014
20110806G067,91500	0.007451	0.000005	0.000295	0.000000	0.282360	0.000008
20110806G080,91500	0.007337	0.000003	0.000289	0.000000	0.282285	0.000009
20110806G092,91500	0.007564	0.000005	0.000296	0.000000	0.282317	0.000008
20110807A002,91500	0.007524	0.000006	0.000295	0.000000	0.282292	0.000007
20110807A015,91500	0.007470	0.000006	0.000292	0.000000	0.282357	0.000007

Appendix G continued.

Sample	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ
20110807A028,91500	0.007514	0.000004	0.000294	0.000000	0.282305	0.000007
20110807A041,91500	0.007418	0.000005	0.000290	0.000000	0.282304	0.000007
20110807A047,91500	0.007481	0.000005	0.000292	0.000000	0.282339	0.000009
20110807B002,91500	0.007478	0.000004	0.000292	0.000000	0.282325	0.000007
20110807B015,91500	0.007420	0.000005	0.000291	0.000000	0.282331	0.000008
20110807B028,91500	0.007568	0.000004	0.000294	0.000000	0.282353	0.000008
20110807B041,91500	0.007515	0.000011	0.000290	0.000000	0.282356	0.000008
20110807B054,91500	0.007391	0.000004	0.000289	0.000000	0.282327	0.000009
20110807B067,91500	0.007476	0.000005	0.000293	0.000000	0.282349	0.000007
20110807B080,91500	0.007562	0.000007	0.000295	0.000000	0.282349	0.000008
20110807B089,91500	0.007345	0.000006	0.000291	0.000000	0.282335	0.000008
20110807C002,91500	0.007589	0.000004	0.000299	0.000000	0.282353	0.000008
20110807C015,91500	0.007476	0.000007	0.000289	0.000000	0.282311	0.000008
20110807C028,91500	0.007385	0.000004	0.000289	0.000000	0.282339	0.000007
20110807C041,91500	0.007480	0.000005	0.000290	0.000000	0.282356	0.000008
20110807C046,91500	0.007433	0.000005	0.000290	0.000000	0.282289	0.000007
20110807D002,91500	0.007380	0.000007	0.000288	0.000000	0.282347	0.000010
20110807D015,91500	0.007463	0.000006	0.000288	0.000000	0.282356	0.000009
20110807D028,91500	0.007761	0.000006	0.000303	0.000000	0.282334	0.000009
20110807D041,91500	0.007538	0.000006	0.000290	0.000000	0.282344	0.000009
20110807D049,91500	0.007520	0.000008	0.000290	0.000000	0.282351	0.000007
20110807F002,91500	0.007609	0.000006	0.000296	0.000000	0.282299	0.000008
20110807F015,91500	0.007521	0.000007	0.000292	0.000000	0.282304	0.000008
20110807F028,91500	0.007742	0.000008	0.000307	0.000000	0.282351	0.000008
20110807F041,91500	0.007480	0.000006	0.000298	0.000000	0.282357	0.000008
20110807F054,91500	0.007489	0.000007	0.000291	0.000000	0.282304	0.000009
20110807F067,91500	0.007509	0.000005	0.000292	0.000000	0.282296	0.000008
20110807F080,91500	0.007568	0.000006	0.000296	0.000000	0.282346	0.000009
20110807F093,91500	0.007687	0.000012	0.000295	0.000000	0.282307	0.000009
20110807F102,91500	0.007387	0.000007	0.000290	0.000000	0.282355	0.000008
20110808A002,91500	0.007705	0.000007	0.000302	0.000000	0.282355	0.000010
20110808A015,91500	0.007746	0.000004	0.000303	0.000000	0.282327	0.000008
20110808A028,91500	0.007958	0.000009	0.000309	0.000000	0.282329	0.000009
20110808A041,91500	0.007722	0.000011	0.000296	0.000000	0.282354	0.000011
20110809B002,91500	0.006850	0.000009	0.000282	0.000000	0.282308	0.000012
20110809B015,91500	0.006957	0.000009	0.000283	0.000000	0.282267	0.000018
20110809B028,91500	0.006989	0.000008	0.000282	0.000000	0.282346	0.000014
20110809C002,91500	0.006876	0.000010	0.000283	0.000000	0.282353	0.000017
20110809C015,91500	0.007219	0.000007	0.000296	0.000000	0.282265	0.000012
20110809D002,91500	0.006907	0.000006	0.000282	0.000000	0.282289	0.000012
20110809D015,91500	0.007041	0.000009	0.000290	0.000000	0.282261	0.000015
20110809D028,91500	0.007192	0.000006	0.000292	0.000000	0.282257	0.000010
20110809D039,91500	0.007008	0.000005	0.000285	0.000000	0.282269	0.000012
20110809F002,91500	0.012944	0.000020	0.000357	0.000001	0.282257	0.000027
20110809F015,91500	0.012536	0.000013	0.000342	0.000000	0.282347	0.000021
20110809F028,91500	0.012572	0.000021	0.000337	0.000000	0.282256	0.000030
20110809F041,91500	0.012331	0.000013	0.000337	0.000000	0.282291	0.000019
20110809F054,91500	0.012473	0.000015	0.000334	0.000000	0.282261	0.000025
20110809G002,91500	0.012450	0.000017	0.000337	0.000000	0.282315	0.000022

Appendix G continued.

Sample	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ
20110809G015,91500	0.012482	0.000014	0.000339	0.000000	0.282264	0.000022
20110809G028,91500	0.012264	0.000017	0.000335	0.000000	0.282296	0.000018
20110809G041,91500	0.012314	0.000013	0.000334	0.000000	0.282275	0.000023
20110809G048,91500	0.012177	0.000018	0.000335	0.000000	0.282262	0.000022
20110809H002,91500	0.012375	0.000015	0.000337	0.000000	0.282262	0.000019
20110809H015,91500	0.012344	0.000015	0.000341	0.000000	0.282316	0.000022
20110809H028,91500	0.011941	0.000014	0.000339	0.000000	0.282283	0.000019
20110809H041,91500	0.012211	0.000020	0.000338	0.000000	0.282255	0.000028
20110809H049,91500	0.012104	0.000021	0.000330	0.000000	0.282258	0.000021
20110804A003,GJ-1	0.005754	0.000003	0.000242	0.000000	0.282069	0.000007
20110804A017,GJ-1	0.005576	0.000005	0.000240	0.000000	0.281961	0.000013
20110804A018,GJ-1	0.005696	0.000005	0.000244	0.000000	0.281968	0.000011
20110804A031,GJ-1	0.005181	0.000005	0.000219	0.000000	0.282064	0.000008
20110804A044,GJ-1	0.005924	0.000006	0.000245	0.000000	0.282068	0.000008
20110804A052,GJ-1	0.005583	0.000004	0.000235	0.000000	0.282062	0.000010
20110805A003,GJ-1	0.005891	0.000003	0.000246	0.000000	0.282062	0.000008
20110805A016,GJ-1	0.005840	0.000004	0.000242	0.000000	0.282068	0.000009
20110805A028,GJ-1	0.006111	0.000006	0.000251	0.000000	0.282067	0.000011
20110805A041,GJ-1	0.005739	0.000008	0.000239	0.000000	0.282066	0.000008
20110805A049,GJ-1	0.005703	0.000008	0.000235	0.000000	0.282068	0.000012
20110805D003,GJ-1	0.006467	0.000005	0.000260	0.000000	0.282064	0.000007
20110805D016,GJ-1	0.006351	0.000006	0.000247	0.000000	0.282048	0.000005
20110805D029,GJ-1	0.006283	0.000005	0.000248	0.000000	0.282039	0.000005
20110805D042,GJ-1	0.006137	0.000008	0.000242	0.000000	0.282065	0.000006
20110805D055,GJ-1	0.006288	0.000006	0.000247	0.000000	0.282059	0.000006
20110805D069,GJ-1	0.006131	0.000004	0.000243	0.000000	0.282056	0.000006
20110805F003,GJ-1	0.006457	0.000005	0.000251	0.000000	0.282065	0.000006
20110805F016,GJ-1	0.006307	0.000007	0.000248	0.000000	0.282066	0.000008
20110805F030,GJ-1	0.006429	0.000007	0.000257	0.000000	0.282052	0.000006
20110806A003,GJ-1	0.007097	0.000007	0.000283	0.000000	0.282070	0.000007
20110806A016,GJ-1	0.006281	0.000004	0.000250	0.000000	0.282059	0.000006
20110806A029,GJ-1	0.006190	0.000008	0.000249	0.000000	0.282063	0.000007
20110806B003,GJ-1	0.006236	0.000006	0.000248	0.000000	0.282053	0.000007
20110806B016,GJ-1	0.006291	0.000005	0.000248	0.000000	0.282003	0.000006
20110806B029,GJ-1	0.006289	0.000007	0.000245	0.000000	0.282040	0.000006
20110806B038,GJ-1	0.006160	0.000004	0.000242	0.000000	0.282060	0.000006
20110806C003,GJ-1	0.006151	0.000005	0.000243	0.000000	0.282058	0.000006
20110806C016,GJ-1	0.006393	0.000010	0.000248	0.000000	0.282055	0.000008
20110806C029,GJ-1	0.006431	0.000007	0.000251	0.000000	0.282047	0.000007
20110806C036,GJ-1	0.006086	0.000004	0.000242	0.000000	0.282045	0.000006
20110806D003,GJ-1	0.005894	0.000004	0.000240	0.000000	0.282033	0.000007
20110806D016,GJ-1	0.005902	0.000005	0.000239	0.000000	0.282026	0.000006
20110806D029,GJ-1	0.005932	0.000004	0.000240	0.000000	0.282063	0.000006
20110806D042,GJ-1	0.006210	0.000004	0.000246	0.000000	0.282039	0.000006
20110806D047,GJ-1	0.006236	0.000006	0.000248	0.000000	0.282043	0.000007
20110806G003,GJ-1	0.006284	0.000003	0.000257	0.000000	0.282059	0.000007
20110806G016,GJ-1	0.005795	0.000004	0.000236	0.000000	0.282056	0.000008
20110806G029,GJ-1	0.006258	0.000003	0.000254	0.000000	0.282045	0.000007
20110806G042,GJ-1	0.006594	0.000003	0.000269	0.000000	0.282087	0.000007

Appendix G continued.

Sample	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ
20110806G055,GJ-1	0.006310	0.000004	0.000257	0.000000	0.282037	0.000007
20110806G068,GJ-1	0.006014	0.000004	0.000244	0.000000	0.282008	0.000007
20110806G081,GJ-1	0.006109	0.000003	0.000249	0.000000	0.282052	0.000006
20110806G093,GJ-1	0.006036	0.000004	0.000246	0.000000	0.282070	0.000009
20110807A003,GJ-1	0.005999	0.000003	0.000243	0.000000	0.282046	0.000006
20110807A016,GJ-1	0.006015	0.000004	0.000245	0.000000	0.282050	0.000007
20110807A029,GJ-1	0.006439	0.000004	0.000263	0.000000	0.282022	0.000007
20110807A042,GJ-1	0.005992	0.000003	0.000244	0.000000	0.282064	0.000006
20110807A048,GJ-1	0.006081	0.000004	0.000246	0.000000	0.282068	0.000010
20110807B003,GJ-1	0.006207	0.000004	0.000251	0.000000	0.282062	0.000009
20110807B016,GJ-1	0.006161	0.000004	0.000247	0.000000	0.282053	0.000008
20110807B029,GJ-1	0.006252	0.000004	0.000250	0.000000	0.282060	0.000006
20110807B042,GJ-1	0.006680	0.000004	0.000271	0.000000	0.282050	0.000008
20110807B055,GJ-1	0.006085	0.000009	0.000242	0.000000	0.282066	0.000010
20110807B068,GJ-1	0.005757	0.000004	0.000233	0.000000	0.282013	0.000007
20110807B081,GJ-1	0.006136	0.000006	0.000250	0.000000	0.282021	0.000007
20110807B090,GJ-1	0.006020	0.000004	0.000245	0.000000	0.282068	0.000009
20110807C003,GJ-1	0.006522	0.000003	0.000266	0.000000	0.282070	0.000008
20110807C016,GJ-1	0.006032	0.000005	0.000242	0.000000	0.282056	0.000007
20110807C029,GJ-1	0.006125	0.000005	0.000244	0.000000	0.282049	0.000007
20110807C042,GJ-1	0.006292	0.000003	0.000251	0.000000	0.282051	0.000008
20110807C047,GJ-1	0.006257	0.000005	0.000256	0.000000	0.282056	0.000011
20110807D003,GJ-1	0.006214	0.000004	0.000246	0.000000	0.282028	0.000007
20110807D016,GJ-1	0.006574	0.000006	0.000255	0.000000	0.282018	0.000007
20110807D029,GJ-1	0.006612	0.000005	0.000263	0.000000	0.282019	0.000008
20110807D042,GJ-1	0.005967	0.000005	0.000243	0.000000	0.282044	0.000007
20110807D050,GJ-1	0.005831	0.000006	0.000236	0.000000	0.282063	0.000008
20110807F003,GJ-1	0.006410	0.000007	0.000259	0.000000	0.282055	0.000013
20110807F016,GJ-1	0.006873	0.000004	0.000276	0.000000	0.282065	0.000008
20110807F029,GJ-1	0.006499	0.000003	0.000264	0.000000	0.282054	0.000008
20110807F042,GJ-1	0.006194	0.000003	0.000252	0.000000	0.282060	0.000008
20110807F055,GJ-1	0.005962	0.000004	0.000243	0.000000	0.282054	0.000007
20110807F068,GJ-1	0.006392	0.000005	0.000261	0.000000	0.282064	0.000008
20110807F081,GJ-1	0.006138	0.000003	0.000248	0.000000	0.282025	0.000007
20110807F094,GJ-1	0.006096	0.000003	0.000245	0.000000	0.282046	0.000008
20110807F103,GJ-1	0.006177	0.000009	0.000246	0.000000	0.282068	0.000008
20110808A003,GJ-1	0.006850	0.000005	0.000273	0.000000	0.282067	0.000012
20110808A016,GJ-1	0.006376	0.000004	0.000254	0.000000	0.282067	0.000009
20110808A029,GJ-1	0.005907	0.000005	0.000240	0.000000	0.282061	0.000008
20110808A042,GJ-1	0.006261	0.000006	0.000252	0.000000	0.282046	0.000008
20110809B003,GJ-1	0.005871	0.000006	0.000241	0.000000	0.282006	0.000012
20110809B016,GJ-1	0.005838	0.000007	0.000241	0.000000	0.281974	0.000011
20110809B029,GJ-1	0.006099	0.000007	0.000237	0.000000	0.282057	0.000011
20110809C003,GJ-1	0.005921	0.000007	0.000238	0.000000	0.282068	0.000013
20110809C016,GJ-1	0.005909	0.000007	0.000246	0.000000	0.281965	0.000012
20110809D003,GJ-1	0.005979	0.000007	0.000238	0.000000	0.282019	0.000011
20110809D016,GJ-1	0.006036	0.000007	0.000236	0.000000	0.282000	0.000011
20110809D029,GJ-1	0.006192	0.000005	0.000255	0.000000	0.281963	0.000011
20110809D040,GJ-1	0.006011	0.000006	0.000237	0.000000	0.281971	0.000010

Appendix G continued.

Sample	$^{176}Yb/^{177}Hf$	2σ	$^{176}Lu/^{177}Hf$	2σ	$^{176}Hf/^{177}Hf$	2σ
20110809F003,GJ-1	0.010176	0.000012	0.000297	0.000000	0.282058	0.000020
20110809F016,GJ-1	0.009882	0.000014	0.000291	0.000000	0.281967	0.000024
20110809F029,GJ-1	0.009702	0.000012	0.000284	0.000000	0.281963	0.000020
20110809F042,GJ-1	0.009470	0.000013	0.000287	0.000000	0.281973	0.000021
20110809F055,GJ-1	0.009764	0.000018	0.000289	0.000000	0.281961	0.000022
20110809G003,GJ-1	0.009617	0.000013	0.000283	0.000000	0.281971	0.000021
20110809G016,GJ-1	0.009776	0.000015	0.000292	0.000000	0.281961	0.000027
20110809G029,GJ-1	0.009816	0.000016	0.000288	0.000000	0.281978	0.000024
20110809G042,GJ-1	0.010015	0.000014	0.000289	0.000000	0.281970	0.000016
20110809G049,GJ-1	0.009419	0.000011	0.000277	0.000000	0.281983	0.000019
20110809H003,GJ-1	0.009678	0.000012	0.000280	0.000000	0.281979	0.000021
20110809H016,GJ-1	0.009810	0.000012	0.000289	0.000000	0.281992	0.000016
20110809H029,GJ-1	0.009561	0.000012	0.000280	0.000000	0.281973	0.000024
20110809H042,GJ-1	0.009942	0.000016	0.000287	0.000000	0.281997	0.000016
20110809H050,GJ-1	0.009653	0.000012	0.000284	0.000000	0.281961	0.000026

Appendix H Standard information of zircon Lu-Hf isotope (Beijing Session)

Sample	beta $^{2/3}$Yb	2σ	beta $^{7/9}$Hf	2σ	^{176}Yb/^{177}Hf(corr)	2σ	^{176}Lu/^{177}Hf(corr)	2σ	^{176}Hf/^{177}Hf(corr)	2σ
GJ-1 60U8H 01	-0.932527	0.3	-1.311752	0.004	0.006869	9.6E-06	0.000259	3.3E-07	0.282008	2.0E-05
GJ-1 60U8H 02	-0.879140	0.3	-1.298667	0.005	0.006870	9.0E-06	0.000260	3.5E-07	0.282003	2.4E-05
GJ-1 60U8H 03	-1.040099	0.3	-1.304873	0.004	0.006892	9.3E-06	0.000260	3.0E-07	0.281986	2.2E-05
GJ-1 60U8H 04	-1.054158	0.3	-1.325577	0.004	0.006807	1.0E-05	0.000257	3.1E-07	0.282034	2.4E-05
GJ-1 60U8H 05	-0.852460	0.3	-1.321385	0.005	0.006681	1.0E-05	0.000252	3.2E-07	0.282024	2.4E-05
GJ-1 60U8H 06	-0.906231	0.3	-1.325441	0.004	0.006962	8.6E-06	0.000264	3.7E-07	0.282035	2.3E-05
GJ-1 60U8H 07	-1.123807	0.3	-1.320655	0.004	0.007042	1.0E-05	0.000266	3.1E-07	0.281990	2.3E-05
GJ-1 60U8H 08	-0.977028	0.3	-1.319819	0.005	0.006975	9.6E-06	0.000263	3.4E-07	0.282015	2.4E-05
GJ-1 60U8H 09	-0.897775	0.3	-1.299653	0.005	0.006642	9.1E-06	0.000252	3.3E-07	0.282017	2.4E-05
GJ-1 60U8H 10	-0.950143	0.3	-1.304134	0.005	0.006589	9.4E-06	0.000249	3.5E-07	0.282018	2.4E-05
GJ-1 60U8H 11	-0.875095	0.3	-1.311935	0.004	0.006523	8.8E-06	0.000247	3.2E-07	0.282041	2.4E-05
GJ-1 60U8H 12	-0.965591	0.3	-1.303470	0.005	0.006514	9.5E-06	0.000247	3.4E-07	0.282033	2.3E-05
GJ-1 60U8H 13	-0.860942	0.3	-1.296811	0.005	0.006650	1.0E-05	0.000251	3.4E-07	0.282008	2.3E-05
GJ-1 60U8H 14	-0.984420	0.3	-1.301636	0.005	0.006821	9.8E-06	0.000258	3.5E-07	0.282008	2.5E-05
GJ-1 60U8H 15	-0.943880	0.4	-1.310960	0.005	0.006496	1.0E-05	0.000246	3.4E-07	0.282024	2.4E-05
GJ-1 60U8H 16	-0.953170	0.3	-1.307958	0.005	0.006492	1.1E-05	0.000246	3.5E-07	0.282042	2.6E-05
GJ-1 60U8H 17	-0.722352	0.4	-1.298055	0.005	0.006500	9.6E-06	0.000247	3.6E-07	0.282032	2.4E-05
GJ-1 60U8H 18	-1.034091	0.3	-1.301177	0.004	0.006503	1.0E-05	0.000246	3.4E-07	0.281992	2.5E-05
GJ-1 60U8H 19	-1.005048	0.4	-1.300460	0.005	0.006635	1.2E-05	0.000251	3.3E-07	0.282016	2.5E-05
GJ-1 60U8H 20	-0.907448	0.4	-1.298952	0.005	0.006612	9.5E-06	0.000250	3.3E-07	0.282005	2.2E-05
GJ-1 60U8H 21	-1.099304	0.3	-1.303182	0.004	0.006521	9.8E-06	0.000246	3.2E-07	0.282035	2.3E-05
GJ-1 60U8H 22	-1.231638	0.4	-1.301059	0.005	0.006575	1.1E-05	0.000247	3.7E-07	0.282003	2.7E-05
GJ-1 60U8H 23	-0.878740	0.4	-1.238650	0.005	0.006884	1.1E-05	0.000260	4.1E-07	0.282039	2.7E-05
GJ-1 60U8H 24	-1.260094	0.4	-1.223645	0.006	0.006924	1.3E-05	0.000262	4.3E-07	0.282008	2.9E-05

Appendix H Continued.

Sample	beta $^{2/3}$Yb	2σ	beta $^{7/9}$Hf	2σ	^{176}Yb/^{177}Hf(corr)	2σ	^{176}Lu/^{177}Hf(corr)	2σ	^{176}Hf/^{177}Hf(corr)	2σ
GJ-1 60U8H 25	-0.800696	0.4	-1.202732	0.005	0.006556	1.3E-05	0.000250	3.7E-07	0.282014	3.0E-05
GJ-1 60U8H 26	-1.079128	0.4	-1.205989	0.005	0.006570	1.1E-05	0.000249	4.4E-07	0.282006	2.7E-05
GJ-1 60U8H 27	-0.822251	0.4	-1.207929	0.005	0.006484	1.0E-05	0.000248	3.7E-07	0.281986	2.7E-05
GJ-1 60U8H 28	-0.915835	0.5	-1.216092	0.006	0.006450	1.1E-05	0.000246	3.8E-07	0.282001	2.7E-05
GJ-1 60U8H 29	-0.696921	0.5	-1.212315	0.005	0.006444	1.1E-05	0.000246	4.3E-07	0.282050	2.7E-05
GJ-1 60U8H 30	-0.902890	0.4	-1.214291	0.005	0.006495	1.1E-05	0.000248	4.5E-07	0.282005	2.8E-05
GJ-1 60U8H 31	-1.021075	0.3	-1.212245	0.005	0.006641	1.1E-05	0.000253	3.7E-07	0.282003	2.6E-05
GJ-1 60U8H 32	-0.992416	0.4	-1.221486	0.005	0.006479	1.1E-05	0.000247	3.8E-07	0.282046	2.6E-05
GJ-1 60U8H 33	-0.963251	0.4	-1.207751	0.005	0.006451	1.0E-05	0.000246	3.8E-07	0.282013	2.8E-05
GJ-1 60U8H 34	-1.018213	0.3	-1.209360	0.005	0.006901	1.1E-05	0.000264	3.4E-07	0.281996	2.6E-05
GJ-1 60U8H 35	-0.875828	0.4	-1.209857	0.006	0.006501	1.1E-05	0.000248	4.1E-07	0.282028	2.7E-05
GJ-1 60U8H 36	-0.815578	0.4	-1.209100	0.006	0.006760	1.1E-05	0.000258	4.1E-07	0.282017	2.6E-05
GJ-1 60U8H 37	-0.828641	0.4	-1.214932	0.005	0.006470	1.0E-05	0.000248	4.0E-07	0.282048	2.4E-05
GJ-1 60U8H 38	-0.880388	0.4	-1.215715	0.005	0.006481	1.1E-05	0.000247	3.7E-07	0.282020	2.9E-05
GJ-1 60U8H 39	-0.972022	0.4	-1.215897	0.005	0.006530	1.2E-05	0.000250	4.0E-07	0.282012	2.8E-05
GJ-1 60U8H 40	-0.680433	0.5	-1.218678	0.006	0.006448	1.3E-05	0.000247	4.7E-07	0.282042	3.0E-05
GJ-1 60U8H 41	-0.958875	0.4	-1.271552	0.005	0.006520	1.2E-05	0.000246	4.2E-07	0.282015	3.2E-05
GJ-1 60U8H 42	-0.937165	0.4	-1.254339	0.005	0.006486	1.2E-05	0.000246	4.5E-07	0.282035	2.8E-05
GJ-1 60U8H 44	-1.232888	0.4	-1.226098	0.005	0.007020	1.0E-05	0.000266	4.0E-07	0.281994	2.9E-05
GJ-1 60U8H 45	-0.724101	0.4	-1.218981	0.005	0.006922	1.2E-05	0.000264	3.9E-07	0.282028	2.6E-05
GJ-1 60U8H 46	-0.912810	0.4	-1.225648	0.005	0.006955	1.1E-05	0.000267	3.8E-07	0.282033	2.9E-05
GJ-1 60U8H 47	-0.905634	0.4	-1.224801	0.005	0.006978	1.0E-05	0.000267	4.0E-07	0.282021	2.8E-05
GJ-1 60U8H 48	-0.972058	0.4	-1.223581	0.005	0.006909	1.2E-05	0.000263	3.9E-07	0.282017	2.7E-05
GJ-1 60U8H 49	-1.169830	0.5	-1.232710	0.005	0.006523	1.4E-05	0.000247	4.5E-07	0.282019	3.0E-05

Appendix H Continued.

Sample	beta $^{2/3}$Yb	2σ	beta $^{7/9}$Hf	2σ	^{176}Yb/^{177}Hf(corr)	2σ	^{176}Lu/^{177}Hf(corr)	2σ	^{176}Hf/^{177}Hf(corr)	2σ
MUD 60U8H 01	-0.102623	2.8	-1.321145	0.003	0.000473	7.4E-06	0.000015	2.3E-07	0.282496	1.7E-05
MUD 60U8H 02	-0.791448	1.2	-1.318986	0.004	0.001215	5.7E-06	0.000038	1.9E-07	0.282488	1.8E-05
MUD 60U8H 03	-0.412696	1.3	-1.317494	0.003	0.001044	7.9E-06	0.000032	2.3E-07	0.282495	1.7E-05
MUD 60U8H 04	-0.517762	1.1	-1.321058	0.003	0.001252	5.2E-06	0.000039	2.0E-07	0.282507	1.6E-05
MUD 60U8H 05	-1.237493	1.0	-1.318685	0.003	0.001363	5.6E-06	0.000042	2.4E-07	0.282488	1.8E-05
MUD 60U8H 06	-0.587255	1.1	-1.320815	0.004	0.001224	5.4E-06	0.000038	2.0E-07	0.282504	1.7E-05
MUD 60U8H 07	-0.608196	1.1	-1.320161	0.004	0.001264	4.9E-06	0.000039	2.1E-07	0.282519	1.7E-05
MUD 60U8H 08	-0.149357	1.0	-1.322373	0.003	0.001198	4.7E-06	0.000037	2.0E-07	0.282537	1.8E-05
MUD 60U8H 09	-0.495278	1.5	-1.299990	0.004	0.000852	5.4E-06	0.000026	2.1E-07	0.282480	1.6E-05
MUD 60U8H 10	-1.667123	3.0	-1.305632	0.004	0.000463	5.4E-06	0.000014	2.1E-07	0.282501	1.8E-05
MUD 60U8H 11	-1.197451	1.1	-1.309359	0.004	0.001236	5.1E-06	0.000038	2.0E-07	0.282491	1.7E-05
MUD 60U8H 12	-0.207430	1.0	-1.307278	0.003	0.001263	5.5E-06	0.000039	1.8E-07	0.282520	1.8E-05
MUD 60U8H 13	-0.181432	1.5	-1.303863	0.003	0.000876	4.2E-06	0.000027	1.9E-07	0.282518	1.6E-05
MUD 60U8H 14	-0.673015	1.3	-1.306223	0.004	0.001010	5.7E-06	0.000031	1.8E-07	0.282499	1.7E-05
MUD 60U8H 15	-0.869351	1.2	-1.301510	0.003	0.001058	5.2E-06	0.000033	1.9E-07	0.282483	1.6E-05
MUD 60U8H 16	-0.384871	1.0	-1.308443	0.004	0.001321	5.5E-06	0.000041	1.9E-07	0.282515	1.7E-05
MUD 60U8H 17	-1.063281	1.2	-1.302447	0.004	0.001223	5.6E-06	0.000038	2.1E-07	0.282504	1.9E-05
MUD 60U8H 18	-0.037285	1.0	-1.303634	0.004	0.001330	5.0E-06	0.000041	2.0E-07	0.282527	1.8E-05
MUD 60U8H 19	-1.617304	1.6	-1.296255	0.003	0.000904	4.9E-06	0.000027	2.1E-07	0.282474	1.7E-05
MUD 60U8H 20	-0.147763	1.4	-1.299832	0.003	0.001076	5.5E-06	0.000034	1.9E-07	0.282500	1.7E-05
MUD 60U8H 21	-0.141678	1.4	-1.300363	0.004	0.000885	4.6E-06	0.000028	2.0E-07	0.282513	1.7E-05
MUD 60U8H 22	-0.775323	1.5	-1.301281	0.004	0.000938	5.3E-06	0.000029	1.9E-07	0.282520	1.6E-05
MUD 60U8H 23	0.082313	1.3	-1.214625	0.004	0.001220	7.6E-06	0.000038	2.6E-07	0.282514	2.0E-05
MUD 60U8H 24	-0.718562	1.2	-1.211760	0.004	0.001372	6.3E-06	0.000042	2.4E-07	0.282517	2.0E-05

Appendix H Continued.

Sample	beta $^{2/3}$Yb	2σ	beta $^{7/9}$Hf	2σ	^{176}Yb/^{177}Hf(corr)	2σ	^{176}Lu/^{177}Hf(corr)	2σ	^{176}Hf/^{177}Hf(corr)	2σ
MUD 60U8H 25	0.427286	1.4	-1.210092	0.004	0.001177	6.4E-06	0.000037	2.5E-07	0.282529	2.0E-05
MUD 60U8H 26	-1.717772	1.3	-1.213720	0.004	0.001249	6.3E-06	0.000038	2.4E-07	0.282498	1.7E-05
MUD 60U8H 27	-1.262082	1.3	-1.218034	0.004	0.001397	6.6E-06	0.000043	2.4E-07	0.282509	2.1E-05
MUD 60U8H 28	-0.698729	1.1	-1.215501	0.004	0.001459	6.2E-06	0.000046	2.3E-07	0.282504	1.9E-05
MUD 60U8H 29	-1.117220	1.8	-1.216015	0.004	0.000899	6.0E-06	0.000027	2.2E-07	0.282500	2.0E-05
MUD 60U8H 30	-0.992937	1.7	-1.214386	0.004	0.000951	6.9E-06	0.000029	2.3E-07	0.282470	2.0E-05
MUD 60U8H 31	0.171445	1.3	-1.216827	0.003	0.001487	6.2E-06	0.000047	2.5E-07	0.282518	2.0E-05
MUD 60U8H 32	-1.428450	1.2	-1.215753	0.004	0.001230	5.6E-06	0.000038	2.5E-07	0.282500	1.9E-05
MUD 60U8H 33	-1.144865	1.6	-1.214968	0.004	0.001144	7.0E-06	0.000035	2.3E-07	0.282490	1.8E-05
MUD 60U8H 34	-0.878965	1.7	-1.215240	0.004	0.001070	6.0E-06	0.000033	2.6E-07	0.282502	2.1E-05
MUD 60U8H 35	-0.486714	1.4	-1.214791	0.004	0.001277	7.1E-06	0.000040	2.7E-07	0.282519	2.2E-05
MUD 60U8H 36	-0.823707	1.7	-1.218149	0.004	0.000936	6.1E-06	0.000029	2.0E-07	0.282495	2.1E-05
MUD 60U8H 37	-1.009699	1.3	-1.226490	0.004	0.001294	6.1E-06	0.000040	2.5E-07	0.282505	1.9E-05
MUD 60U8H 38	-0.788572	1.3	-1.217129	0.004	0.001382	6.3E-06	0.000043	2.2E-07	0.282492	1.9E-05
MUD 60U8H 39	-1.217641	1.7	-1.220762	0.004	0.001012	7.0E-06	0.000031	2.7E-07	0.282500	2.1E-05
MUD 60U8H 40	-0.959631	1.4	-1.220331	0.004	0.001283	6.5E-06	0.000040	2.3E-07	0.282505	1.9E-05
MUD 60U8H 41	-0.201292	1.4	-1.230515	0.004	0.001236	5.8E-06	0.000039	2.2E-07	0.282527	1.9E-05
MUD 60U8H 42	-0.426708	1.2	-1.226944	0.004	0.001376	6.0E-06	0.000043	2.3E-07	0.282504	2.0E-05
MUD 60U8H 43	-0.360406	1.3	-1.227149	0.004	0.001359	5.8E-06	0.000043	2.4E-07	0.282507	1.9E-05
MUD 60U8H 44	-0.766821	1.4	-1.231032	0.004	0.001285	6.6E-06	0.000040	2.3E-07	0.282515	1.9E-05
MUD 60U8H 45	-1.229269	1.3	-1.230670	0.004	0.001400	5.8E-06	0.000043	2.5E-07	0.282496	2.0E-05
MUD 60U8H 46	-0.408801	1.4	-1.224993	0.004	0.001166	5.7E-06	0.000036	2.3E-07	0.282516	1.9E-05
MUD 60U8H 47	-1.809453	1.2	-1.229973	0.004	0.001458	6.4E-06	0.000045	2.5E-07	0.282499	2.0E-05
MUD 60U8H 48	0.985013	2.6	-1.221373	0.004	0.000661	6.4E-06	0.000021	2.2E-07	0.282509	2.1E-05

Appendix H Continued.

Sample	beta $^{2/3}$Yb	2σ	beta $^{7/9}$Hf	2σ	^{176}Yb/^{177}Hf(corr)	2σ	^{176}Lu/^{177}Hf(corr)	2σ	^{176}Hf/^{177}Hf(corr)	2σ
MUD 60U8H 49	-1.395909	6.0	-1.227488	0.004	0.000266	6.4E-06	0.000008	2.0E-07	0.282529	1.7E-05
GJ-1 60U8H 01	-1.041518	0.5	-1.222274	0.006	0.006441	1.3E-05	0.000242	4.9E-07	0.281984	3.0E-05
GJ-1 60U8H 02	-0.833934	0.5	-1.230256	0.006	0.006393	1.2E-05	0.000243	4.7E-07	0.282055	3.2E-05
GJ-1 60U8H 04	-1.177200	0.3	-1.197123	0.004	0.006802	7.1E-06	0.000260	2.9E-07	0.281965	2.2E-05
GJ-1 60U8H 05	-1.017543	0.3	-1.195526	0.004	0.006729	7.9E-06	0.000257	3.3E-07	0.281991	2.3E-05
GJ-1 60U8H 06	-0.958218	0.3	-1.206789	0.004	0.006802	7.6E-06	0.000261	3.7E-07	0.281992	2.1E-05
GJ-1 60U8H 07	-0.934434	0.2	-1.207758	0.004	0.006848	9.1E-06	0.000263	3.7E-07	0.282013	2.1E-05
GJ-1 60U8H 08	-0.784739	0.3	-1.211223	0.004	0.006767	7.2E-06	0.000261	3.2E-07	0.282022	2.1E-05
GJ-1 60U8H 09	-1.108158	0.3	-1.227095	0.004	0.006811	7.7E-06	0.000261	2.8E-07	0.281996	1.8E-05
GJ-1 60U8H 10	-0.983628	0.3	-1.226523	0.004	0.006499	7.0E-06	0.000250	2.9E-07	0.282012	1.9E-05
GJ-1 60U8H 11	-1.038954	0.3	-1.220493	0.005	0.006843	8.1E-06	0.000264	3.4E-07	0.282005	2.3E-05
GJ-1 60U8H 12	-0.891493	0.3	-1.232248	0.004	0.006933	7.3E-06	0.000268	3.6E-07	0.282023	2.0E-05
GJ-1 60U8H 13	-0.945510	0.3	-1.224813	0.004	0.006712	7.8E-06	0.000258	3.6E-07	0.282016	2.0E-05
GJ-1 60U8H 14	-0.942256	0.3	-1.224444	0.004	0.006804	7.1E-06	0.000261	3.0E-07	0.282002	2.1E-05
GJ-1 60U8H 15	-0.991243	0.3	-1.218593	0.004	0.006582	7.1E-06	0.000253	3.4E-07	0.282000	2.1E-05
GJ-1 60U8H 16	-1.140736	0.2	-1.225091	0.004	0.006577	6.8E-06	0.000253	2.8E-07	0.281997	1.9E-05
GJ-1 60U8H 17	-1.016003	0.3	-1.218479	0.004	0.006416	7.4E-06	0.000248	2.8E-07	0.281997	2.0E-05
GJ-1 60U8H 18	-1.052972	0.3	-1.225489	0.004	0.006472	7.1E-06	0.000249	2.7E-07	0.281993	1.9E-05
GJ-1 60U8H 19	-1.077034	0.3	-1.228884	0.004	0.006552	7.0E-06	0.000251	2.8E-07	0.281993	2.1E-05
GJ-1 60U8H 20	-1.036780	0.3	-1.232289	0.004	0.006582	7.2E-06	0.000252	2.7E-07	0.282021	1.9E-05
GJ-1 60U8H 21	-1.084770	0.2	-1.282711	0.004	0.006414	6.2E-06	0.000246	2.7E-07	0.281999	1.9E-05
GJ-1 60U8H 22	-1.141480	0.2	-1.283842	0.003	0.006435	6.7E-06	0.000246	2.6E-07	0.281992	1.6E-05
GJ-1 60U8H 23	-0.942001	0.3	-1.271641	0.004	0.006451	6.6E-06	0.000247	2.5E-07	0.282018	1.9E-05
GJ-1 60U8H 24	-0.842241	0.3	-1.270559	0.004	0.006395	6.4E-06	0.000245	2.5E-07	0.282043	2.0E-05

Appendix H Continued.

Sample	beta $^{2/3}$Yb	2σ	beta $^{7/9}$Hf	2σ	^{176}Yb/^{177}Hf(corr)	2σ	^{176}Lu/^{177}Hf(corr)	2σ	^{176}Hf/^{177}Hf(corr)	2σ
GJ-1 60U8H 25	-0.761580	0.5	-1.265039	0.006	0.006369	1.3E-05	0.000245	4.6E-07	0.282046	2.8E-05
GJ-1 60U8H 26	-0.736581	0.5	-1.265701	0.005	0.006312	1.2E-05	0.000243	4.6E-07	0.282043	3.0E-05
GJ-1 60U8H 27	-0.859492	0.5	-1.256268	0.006	0.006303	1.3E-05	0.000244	4.5E-07	0.282016	3.1E-05
GJ-1 60U8H 28	-1.111156	0.5	-1.251295	0.006	0.006349	1.2E-05	0.000245	4.9E-07	0.281993	3.3E-05
GJ-1 60U8H 29	-0.784314	0.5	-1.253894	0.006	0.006286	1.1E-05	0.000244	4.5E-07	0.282042	2.9E-05
GJ-1 60U8H 30	-0.946883	0.5	-1.253322	0.006	0.006322	1.3E-05	0.000245	4.9E-07	0.282021	3.1E-05
GJ-1 60U8H 31	-0.898008	0.5	-1.253857	0.006	0.006368	1.3E-05	0.000246	5.1E-07	0.282030	3.1E-05
GJ-1 60U8H 32	-1.071086	0.5	-1.261514	0.006	0.006413	1.4E-05	0.000247	5.1E-07	0.282036	3.3E-05
GJ-1 60U8H 33	-0.666806	0.5	-1.254717	0.006	0.006342	1.3E-05	0.000246	5.5E-07	0.282018	2.9E-05
GJ-1 60U8H 34	-0.817415	0.5	-1.247671	0.006	0.006329	1.2E-05	0.000245	5.1E-07	0.282004	3.0E-05
GJ-1 60U8H 35	-0.676296	0.5	-1.250198	0.006	0.006348	1.3E-05	0.000246	5.1E-07	0.282029	3.2E-05
GJ-1 60U8H 36	-0.871423	0.5	-1.256297	0.005	0.006426	1.2E-05	0.000247	4.4E-07	0.282011	3.3E-05
GJ-1 60U8H 37	-0.722027	0.5	-1.259718	0.006	0.006344	1.2E-05	0.000246	4.3E-07	0.282044	3.0E-05
GJ-1 60U8H 38	-0.826421	0.5	-1.263335	0.005	0.006334	1.4E-05	0.000245	5.0E-07	0.282023	2.9E-05
GJ-1 60U8H 39	-0.906314	0.4	-1.298700	0.006	0.006879	1.2E-05	0.000264	5.0E-07	0.282037	2.8E-05
GJ-1 60U8H 40	-0.970796	0.5	-1.297221	0.005	0.006873	1.2E-05	0.000263	4.6E-07	0.282002	3.1E-05
GJ-1 60U8H 41	-0.943094	0.5	-1.281898	0.005	0.006328	1.3E-05	0.000244	4.6E-07	0.282009	3.1E-05
GJ-1 60U8H 42	-1.097977	0.4	-1.294579	0.005	0.006328	1.0E-05	0.000243	4.1E-07	0.282025	3.0E-05
GJ-1 60U8H 43	-1.184090	0.4	-1.286949	0.005	0.006359	1.2E-05	0.000244	4.2E-07	0.281992	2.9E-05
GJ-1 60U8H 44	-1.163376	0.5	-1.287449	0.006	0.006329	1.1E-05	0.000243	4.2E-07	0.282009	2.9E-05
GJ-1 60U8H 45	-0.807575	0.5	-1.288147	0.006	0.006255	1.1E-05	0.000242	4.6E-07	0.282023	2.7E-05
GJ-1 60U8H 46	-1.100167	0.5	-1.288347	0.006	0.006367	1.2E-05	0.000245	4.1E-07	0.281993	2.7E-05
GJ-1 60U8H 47	-0.845870	0.5	-1.289073	0.005	0.006251	1.1E-05	0.000242	4.0E-07	0.282024	2.8E-05
GJ-1 60U8H 48	-1.134483	0.5	-1.296055	0.006	0.006343	1.0E-05	0.000243	4.0E-07	0.282007	3.2E-05

Appendix H Continued.

Sample	beta $^{2/3}$Yb	2σ	beta $^{7/9}$Hf	2σ	^{176}Yb/^{177}Hf(corr)	2σ	^{176}Lu/^{177}Hf(corr)	2σ	^{176}Hf/^{177}Hf(corr)	2σ
GJ-1 60U8H 49	-0.844006	0.5	-1.291435	0.005	0.006324	1.2E-05	0.000243	4.7E-07	0.282031	3.0E-05
GJ-1 60U8H 50	-1.190118	0.5	-1.296903	0.005	0.006374	1.1E-05	0.000245	4.4E-07	0.282022	3.0E-05
GJ-1 60U8H 51	-0.992585	0.4	-1.289929	0.005	0.006758	1.1E-05	0.000261	4.2E-07	0.282004	2.9E-05
MUD 60U8H 01	-0.778052	0.8	-1.212230	0.003	0.001378	4.4E-06	0.000043	1.6E-07	0.282504	1.4E-05
MUD 60U8H 02	-1.346728	0.7	-1.218532	0.003	0.001355	3.8E-06	0.000042	1.7E-07	0.282501	1.6E-05
MUD 60U8H 03	-1.083080	1.3	-1.221855	0.003	0.000831	5.0E-06	0.000026	1.7E-07	0.282511	1.3E-05
MUD 60U8H 04	0.037459	1.0	-1.226624	0.003	0.000963	3.7E-06	0.000030	1.6E-07	0.282523	1.6E-05
MUD 60U8H 05	-1.292803	0.9	-1.232645	0.003	0.001234	4.0E-06	0.000039	1.7E-07	0.282504	1.3E-05
MUD 60U8H 06	-0.504690	0.9	-1.230249	0.003	0.001285	4.5E-06	0.000041	1.6E-07	0.282499	1.5E-05
MUD 60U8H 07	-0.767586	1.2	-1.220339	0.003	0.001026	4.8E-06	0.000032	1.5E-07	0.282515	1.6E-05
MUD 60U8H 08	-0.543240	1.3	-1.228749	0.003	0.000819	4.2E-06	0.000026	1.6E-07	0.282503	1.4E-05
MUD 60U8H 09	-0.310936	1.2	-1.230672	0.003	0.000975	4.4E-06	0.000031	1.6E-07	0.282527	1.7E-05
MUD 60U8H 10	-1.372970	0.8	-1.229624	0.003	0.001372	5.1E-06	0.000043	1.9E-07	0.282500	1.6E-05
MUD 60U8H 11	-1.468962	0.8	-1.232780	0.003	0.001189	4.1E-06	0.000037	1.5E-07	0.282479	1.3E-05
MUD 60U8H 12	-0.375874	1.2	-1.231750	0.003	0.000751	4.2E-06	0.000024	1.3E-07	0.282517	1.6E-05
MUD 60U8H 13	-0.710807	0.6	-1.223434	0.003	0.001739	4.3E-06	0.000055	1.6E-07	0.282518	1.5E-05
MUD 60U8H 14	-0.799132	0.6	-1.228314	0.003	0.001673	5.1E-06	0.000052	1.9E-07	0.282510	1.4E-05
MUD 60U8H 15	-0.835381	0.6	-1.227820	0.003	0.001983	3.7E-06	0.000062	1.5E-07	0.282504	1.5E-05
MUD 60U8H 16	-1.057862	0.7	-1.232012	0.003	0.001612	4.0E-06	0.000050	1.5E-07	0.282498	1.5E-05
MUD 60U8H 17	-1.015722	1.0	-1.274502	0.003	0.001057	4.0E-06	0.000033	1.6E-07	0.282513	1.4E-05
MUD 60U8H 18	-1.658998	1.0	-1.279065	0.003	0.000940	3.8E-06	0.000029	1.4E-07	0.282497	1.4E-05
MUD 60U8H 19	-1.317652	0.7	-1.267607	0.003	0.001195	3.9E-06	0.000037	1.5E-07	0.282508	1.5E-05
MUD 60U8H 20	-1.173365	0.7	-1.267205	0.003	0.001437	3.6E-06	0.000045	1.5E-07	0.282515	1.4E-05
MUD 60U8H 21	-0.542744	1.3	-1.262642	0.004	0.001368	7.2E-06	0.000043	2.5E-07	0.282500	2.3E-05

Appendix H Continued.

Sample	beta $^{2/3}$Yb	2σ	beta $^{7/9}$Hf	2σ	^{176}Yb/^{177}Hf(corr)	2σ	^{176}Lu/^{177}Hf(corr)	2σ	^{176}Hf/^{177}Hf(corr)	2σ
MUD 60U8H 22	-1.561114	1.2	-1.262630	0.004	0.001620	7.5E-06	0.000050	3.3E-07	0.282478	2.1E-05
MUD 60U8H 23	-0.905058	1.2	-1.253436	0.004	0.001514	7.1E-06	0.000048	2.9E-07	0.282519	2.2E-05
MUD 60U8H 24	-1.012768	1.1	-1.260382	0.004	0.001782	6.8E-06	0.000056	2.7E-07	0.282520	2.2E-05
MUD 60U8H 25	-2.124210	2.1	-1.254580	0.004	0.000967	7.4E-06	0.000029	3.0E-07	0.282477	2.2E-05
MUD 60U8H 26	-0.839128	1.9	-1.258165	0.005	0.001066	7.3E-06	0.000033	2.8E-07	0.282509	2.3E-05
MUD 60U8H 27	-0.817144	1.9	-1.261426	0.004	0.001002	7.7E-06	0.000031	3.2E-07	0.282512	2.0E-05
MUD 60U8H 28	-1.533034	1.6	-1.253767	0.004	0.001325	8.7E-06	0.000041	3.0E-07	0.282483	2.0E-05
MUD 60U8H 29	-0.128987	1.7	-1.263346	0.004	0.001053	7.5E-06	0.000033	2.9E-07	0.282530	2.0E-05
MUD 60U8H 30	0.156211	2.1	-1.260435	0.004	0.001066	7.5E-06	0.000034	2.7E-07	0.282516	2.3E-05
MUD 60U8H 31	-2.165743	1.7	-1.261981	0.004	0.001285	7.5E-06	0.000039	3.2E-07	0.282494	1.9E-05
MUD 60U8H 32	-0.663697	1.8	-1.262323	0.005	0.001205	7.5E-06	0.000038	2.8E-07	0.282506	2.1E-05
MUD 60U8H 33	1.053517	1.7	-1.253524	0.004	0.001029	7.1E-06	0.000033	2.8E-07	0.282528	2.0E-05
MUD 60U8H 34	-0.667876	1.3	-1.260310	0.005	0.001289	8.4E-06	0.000040	3.3E-07	0.282477	2.3E-05
MUD 60U8H 35	-0.884992	1.4	-1.301507	0.004	0.001297	7.0E-06	0.000040	2.7E-07	0.282510	2.2E-05
MUD 60U8H 36	-1.849896	1.3	-1.302502	0.004	0.001390	7.8E-06	0.000043	3.2E-07	0.282492	2.1E-05
MUD 60U8H 37	-0.487060	1.3	-1.288047	0.004	0.001358	6.9E-06	0.000042	2.7E-07	0.282518	2.1E-05
MUD 60U8H 38	-1.263905	1.3	-1.294460	0.004	0.001373	7.2E-06	0.000043	2.8E-07	0.282518	1.9E-05
MUD 60U8H 39	-0.700299	1.7	-1.286687	0.004	0.001141	7.5E-06	0.000036	3.1E-07	0.282521	2.3E-05
MUD 60U8H 40	-0.389000	1.2	-1.290601	0.004	0.001493	6.9E-06	0.000047	2.7E-07	0.282510	1.8E-05
MUD 60U8H 41	0.106843	1.3	-1.297378	0.004	0.001388	6.4E-06	0.000044	2.5E-07	0.282520	2.1E-05
MUD 60U8H 42	-1.332104	1.4	-1.302015	0.004	0.001421	6.5E-06	0.000044	2.9E-07	0.282502	1.9E-05
MUD 60U8H 43	-0.911849	1.2	-1.295077	0.004	0.001566	7.9E-06	0.000049	3.0E-07	0.282525	2.1E-05
MUD 60U8H 44	-0.476664	1.2	-1.293957	0.004	0.001367	6.9E-06	0.000043	2.6E-07	0.282516	2.0E-05
MUD 60U8H 45	-1.066864	1.6	-1.290732	0.004	0.001116	7.1E-06	0.000035	2.8E-07	0.282491	2.0E-05

Appendix H Continued.

Sample	beta $^{2/3}$Yb	2σ	beta $^{7/9}$Hf	2σ	^{176}Yb/^{177}Hf(corr)	2σ	^{176}Lu/^{177}Hf(corr)	2σ	^{176}Hf/^{177}Hf(corr)	2σ
MUD 60U8H 46	-0.984727	1.4	-1.296805	0.004	0.001292	7.6E-06	0.000040	2.7E-07	0.282495	2.0E-05
GJ-1 44U8H 01	-1.084189	0.4	-1.301495	0.005	0.006752	1.2E-05	0.000257	4.6E-07	0.282009	3.1E-05
GJ-1 44U8H 02	-0.819946	0.4	-1.295003	0.005	0.006755	1.2E-05	0.000258	4.2E-07	0.282020	2.9E-05
GJ-1 44U8H 03	-1.075151	0.4	-1.363093	0.005	0.006680	1.2E-05	0.000253	4.2E-07	0.282012	2.8E-05
GJ-1 44U8H 04	-0.930770	0.4	-1.364931	0.005	0.006574	1.4E-05	0.000250	4.1E-07	0.282006	2.7E-05
GJ-1 44U8H 05	-0.753803	0.5	-1.349825	0.005	0.006525	1.4E-05	0.000250	4.5E-07	0.282042	2.8E-05
GJ-1 44U8H 06	-0.931189	0.4	-1.351373	0.005	0.006544	1.4E-05	0.000250	4.6E-07	0.282015	3.1E-05
GJ-1 44U8H 07	-1.103413	0.4	-1.347676	0.005	0.006958	1.5E-05	0.000265	4.7E-07	0.282002	2.7E-05
GJ-1 44U8H 08	-1.313841	0.4	-1.354858	0.005	0.006874	1.4E-05	0.000261	4.4E-07	0.281994	2.8E-05
GJ-1 44U8H 09	-1.104268	0.4	-1.353875	0.006	0.006556	1.3E-05	0.000251	4.5E-07	0.282006	2.9E-05
GJ-1 44U8H 10	-0.984977	0.5	-1.350046	0.005	0.006547	1.3E-05	0.000250	4.2E-07	0.282023	2.7E-05
GJ-1 44U8H 11	-0.979231	0.4	-1.332753	0.006	0.006517	1.0E-05	0.000248	4.3E-07	0.282028	2.8E-05
GJ-1 44U8H 12	-0.997852	0.4	-1.330157	0.005	0.006522	1.1E-05	0.000249	4.6E-07	0.282021	2.5E-05
GJ-1 44U8H 13	-0.909118	0.4	-1.310171	0.005	0.006598	1.0E-05	0.000254	3.9E-07	0.282009	2.8E-05
GJ-1 44U8H 14	-0.925823	0.4	-1.318851	0.005	0.006583	1.1E-05	0.000253	3.9E-07	0.282025	2.5E-05
GJ-1 44U8H 15	-1.049663	0.4	-1.320148	0.005	0.006740	1.1E-05	0.000257	3.7E-07	0.281993	2.7E-05
GJ-1 44U8H 16	-1.063935	0.4	-1.317729	0.005	0.006826	1.2E-05	0.000260	4.2E-07	0.281997	2.6E-05
MUD 44U8H 01	-0.177593	1.7	-1.303177	0.004	0.001110	6.7E-06	0.000035	2.5E-07	0.282505	2.4E-05
MUD 44U8H 02	-1.725268	1.0	-1.305394	0.004	0.001652	6.2E-06	0.000052	2.5E-07	0.282486	2.0E-05
MUD 44U8H 03	-1.387701	1.5	-1.366373	0.005	0.001064	6.8E-06	0.000034	2.7E-07	0.282524	2.0E-05
MUD 44U8H 04	-1.554385	1.6	-1.352913	0.004	0.001066	6.8E-06	0.000034	2.7E-07	0.282479	2.1E-05
MUD 44U8H 05	-0.949152	1.2	-1.351934	0.004	0.001433	7.2E-06	0.000046	2.9E-07	0.282492	1.9E-05
MUD 44U8H 06	-0.631838	1.5	-1.348139	0.004	0.001246	7.3E-06	0.000040	2.9E-07	0.282499	2.2E-05
MUD 44U8H 07	-0.608034	1.7	-1.352139	0.004	0.001083	7.0E-06	0.000035	2.7E-07	0.282518	2.3E-05

Appendix H Continued.

Sample	beta $^{2/3}$Yb	2σ	beta $^{7/9}$Hf	2σ	^{176}Yb/^{177}Hf(corr)	2σ	^{176}Lu/^{177}Hf(corr)	2σ	^{176}Hf/^{177}Hf(corr)	2σ
MUD 44U8H 08	-1.207565	1.3	-1.353569	0.004	0.001380	6.7E-06	0.000044	3.5E-07	0.282478	2.0E-05
MUD 44U8H 9	-1.783180	1.5	-1.347735	0.004	0.001359	7.0E-06	0.000043	3.0E-07	0.282499	2.2E-05
MUD 44U8H 10	-1.468761	1.4	-1.349396	0.004	0.001273	9.5E-06	0.000040	3.4E-07	0.282497	2.0E-05
MUD 44U8H 11	-1.051039	0.8	-1.330913	0.004	0.002053	6.8E-06	0.000065	3.3E-07	0.282513	2.2E-05
MUD 44U8H 12	-1.110889	1.0	-1.327146	0.004	0.001622	1.5E-05	0.000051	4.4E-07	0.282494	1.9E-05
MUD 44U8H 13	-0.805961	1.4	-1.322515	0.004	0.001285	6.4E-06	0.000041	3.1E-07	0.282507	2.2E-05
MUD 44U8H 14	-0.702819	1.1	-1.318178	0.004	0.001550	8.9E-06	0.000050	3.3E-07	0.282521	2.0E-05
MUD 44U8H 15	0.031538	1.3	-1.328415	0.004	0.001349	6.2E-06	0.000044	2.5E-07	0.282516	1.9E-05
MUD 44U8H 16	-1.091697	1.1	-1.335412	0.004	0.001567	6.4E-06	0.000049	2.8E-07	0.282506	2.1E-05