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Neogene Chemical Weathering and Provenance Records of the Western Himalaya Preserved in the Arabian Sea

Peng Zhou

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NEOGENE CHEMICAL WEATHERING AND PROVENANCE RECORDS OF
THE WESTERN HIMALAYA PRESERVED IN THE ARABIAN SEA

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Department of Geology and Geophysics

by

Peng Zhou

B.S., Yangtze University, 2004

M.S, China University of Geoscience (Beijing), 2008

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ABSTRACT

Some tectonic models for the Himalaya emphasize the importance of surface processes in controlling the structural evolution. To investigate this tectonic–climatic interactions, and the weathering and erosion of the western Himalaya, International Ocean Discovery Program (IODP) Expedition 355 drilled two sites (site U1456 and U1457) in Laxmi Basin, which located in the Eastern Arabian Sea. In my research project, I plan to use a series of geochemical and geochronological methods on the sediment samples from the cores of these two sites, and sediments from an industrial borehole Indus Marine A-1, which near the Indus river mouth, to reconstruct a climatic and provenance record of Western Himalaya since Neogene.

According to the U-Pb geochronology analysis on the detrital zircon grains from the coarse marine sediments recovered from these two IODP sites and coupled with the Sr and Nd isotopic study prove the sediments recovered in site U1456 and U1457 are mainly derived from Indus river, rather than from Indian peninsula. Also, this could allow us to reconstruct the erosion patterns potentially change through time in the region of Western Himalayan area. Furthermore, we use the apatite fission track (AFT) analysis on these same samples, to constrain the exhumation rates in the western Himalaya and Karakoram since middle Miocene. Lastly, to further understand the long-term climate variation, we study the chemical weathering evolution, by using the Clay minerals, bulk sediment geochemistry, Diffuse Reflectance Spectroscopy (DRS), and magnetic susceptibility, to constrain the degrees of chemical alteration and the long-term climate change since Miocene.

CHAPTER 1. INTRODUCTION

1.1 Objective and Goals

Continental collision between India and Asia have generated some of the largest mountains on Earth known during the Phanerozoic (Molnar and Tapponnier, 1977). The links between the Asian monsoon and these mountains have become the type example of how the solid Earth may interact with the atmosphere via surface processes (Whipple, 2009; Clift et al., 2008b).

As one of the most dramatic climatic phenomena on Earth, the Asian summer monsoon has far-reaching environmental effects, both environmentally and socially. The monsoon flows from the Indian Ocean to the Tibetan Plateau every summer (Wang, 2006, Webster et al., 1998), bringing moisture across the floodplain and reaching the Himalaya. On millennial timescales the strength of the Asian summer monsoon is partly determined by changing Northern Hemisphere summer solar isolation ((Fleitmann et al., 2003), causing seasonal change in the Intertropical Convergence Zone (ITCZ), and is influenced by changes in oceanic and atmospheric circulation patterns, as well as the westerlies (Dykoski et al., 2005; Wünnemann et al., 2010).

As part of the Asian monsoon, the long-term development of the Indian summer monsoon has been linked to the growth of high topography in South and Central Asia (Boos and Kuang, 2010; Huber and Goldner, 2012). Meanwhile, some studies have suggested that changes in monsoon intensity can have significant impacts on the erosion history of the western end of the Himalayan mountain chain (Bookhagen et al., 2005a; Clift et al., 2008a; Clift et al., 2008b). The intensity of the Asian monsoon controls the erosion and chemical weathering of the Himalayan mountains, and this may feedback both to global climate (Raymo and Ruddiman,

1992), as well as controlling the nature of the structural development of the Himalaya (Beaumont et al., 2001; Koons, 1990).

The Western Himalaya region represents a classic example of an orogen formed by the collision of two continental plates. Sediment eroded from across this area records the development and unroofing of the mountains and has been accumulating in the Arabian Sea since the start of the collision, likely in the Paleocene-Eocene (DeCelles et al., 2014; Najman et al., 2010). Because erosion removes rocks from the mountains, the older history of the ranges is best reconstructed from the sedimentary record. Although some of this record is preserved onshore in the foreland basin (Najman, 2006), these sequences represent a relatively poorly dated and incomplete archive, with each particular section of the foreland basin only preserving a portion of the entire erosion history of the immediately adjacent range, rather than providing a complete regional record (Burbank et al., 1996). This makes it difficult to address the ongoing debate regarding the competing roles of climatically modulated surface processes compared to solid Earth tectonic forces in controlling the structural evolution of the Himalaya (Beaumont et al., 2001; Robinson et al., 2006; Webb et al., 2011).

Debate continues regarding what controls the erosion of the Himalaya, with some workers favoring tectonic processes, driving rock uplift (Burbank et al., 2003), as being the critical control, while others have argued for a dominance by monsoon rainfall or glaciation, which focus the sediment producing regions across a relatively narrow band of the range front and in turn drive exhumation of deep buried rocks (Thiede et al., 2004). It is however known that the erosion of the Himalaya is sensitive to climate change because erosion within the Indus catchment during the Last Glacial Maximum was focused more in the Karakoram, while erosion shifted strongly into the Lesser Himalayas since the onset of the Holocene ((Clift et al., 2008a)).

Focused erosion caused by monsoon rains can result in the exhumation of deep-buried rocks (Beaumont et al., 2001; Koons, 1990; Sinclair et al., 2005; Clift et al., 2008b; Whipple, 2009). Although these processes have been modeled in the past, they have only rarely been tested using geological records. In recent years the tectonic evolution of the Himalayas has been reconstructed in greater detail and advances have been made in constraining the height of the Tibetan Plateau (Ding et al., 2017; Harris, 2006; Saylor et al., 2009). Likewise, the evolving climate of Asia is increasingly better defined. If we are to understand how the climate and tectonics have interacted, we have to generate independent records of the effects of surface processes, both in terms of erosion and chemical weathering to compare with tectonic and climate reconstructions.

The International Ocean Discovery Program (IODP) Expedition 355 has been drilled two sites (U1456 and U1457) (Pandey et al., 2016c) in Laxmi Basin in the eastern Arabian Sea (Fig 1.1) that offer a unique opportunity to investigate tectonic–climatic interactions and the net impact of these processes on weathering and erosion in the western Himalaya. Sediment eroded from the Western Himalaya has been deposited in the Arabian Sea where it forms the second largest sediment body on Earth, the Indus submarine fan (Clift et al., 2001; Kolla and Coumes, 1987).

My thesis research is focused on developing a record of this type in the Western Himalaya so that the development of the climate and mountains can be compared over multimillion-year geologic time scales, and further to understand what feedbacks exist among climatic evolution, mountain building, and surface processes in the global-type area for these processes. Most of the sediments I used for my study are from these two drilling sites, IODP Sites U1456 and U1457, which penetrated the submarine fan to sediment dated at around 10.8

Ma (Pandey et al., 2016c). In addition, analysis of sedimentary rock cuttings from an industry borehole Indus Marine A-1 (Fig 1.1) allowed me to investigate the chemical weathering evolution as far as ~17 Ma.

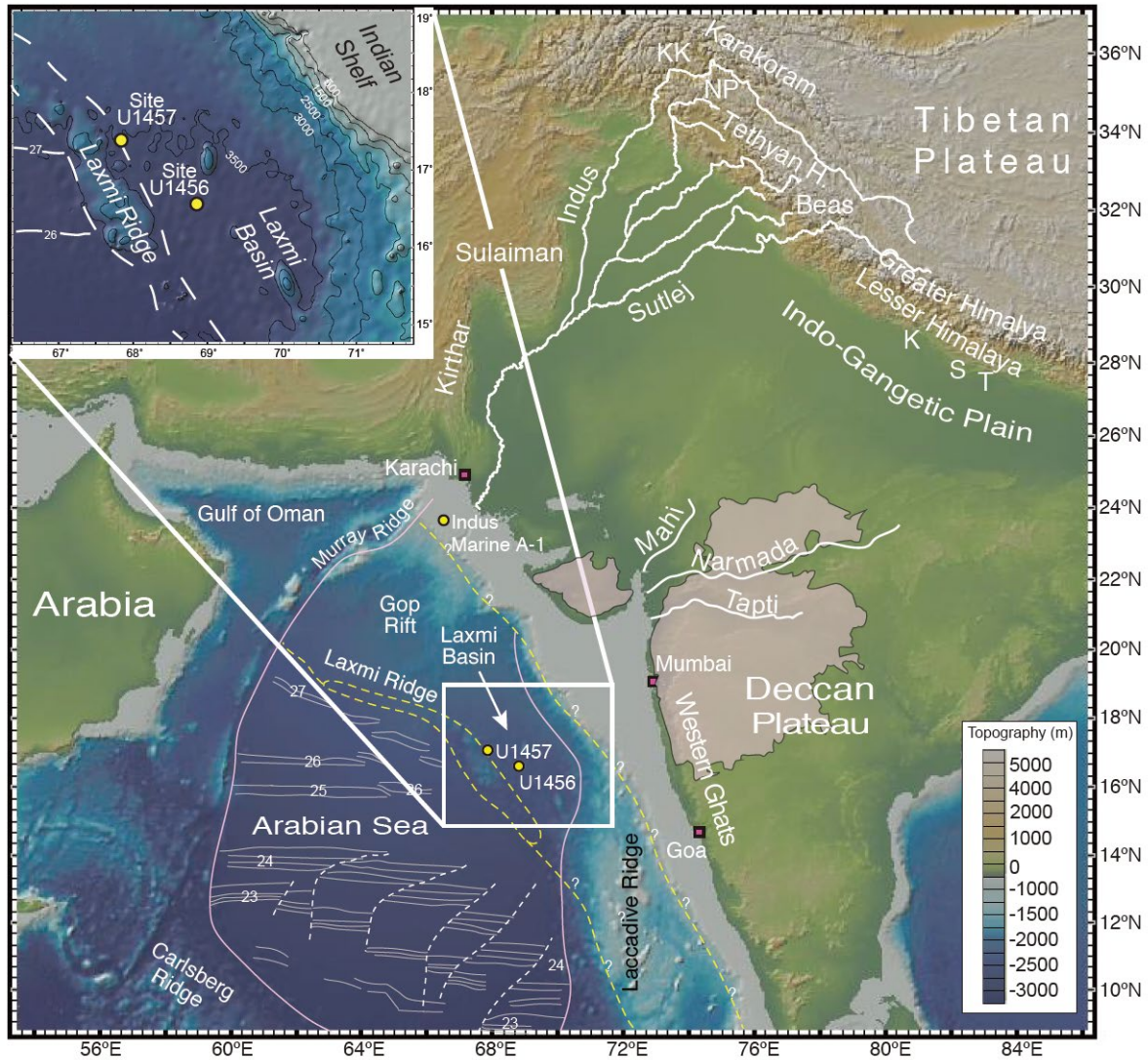


Figure 1.1. Shaded bathymetric and topographic map of the Arabian Sea area showing the location of the drilling sites within the Laxmi Basin. Map also shows the primary source ranges and the major tributary systems of the Indus River, as well as smaller peninsular Indian rivers that may have provided material to the drill sites. Magnetic anomalies are from Miles et al. (1993). KK = Karakoram; NP = Nanga Parbat.

These sediments allow us to reconstruct the changing erosion and chemical weathering since the Miocene and particularly spanning the important climatic transition previously identified at around 8 Ma (Kroon et al., 1991; Prell et al., 1992; Quade et al., 1989), and which may be related to the unroofing of the Lesser Himalaya. In this work, I particularly focus on assessing the links between tectonics and surface processes in this later period of Himalayan development.

1.2 Organization

In my research project, I applied a series of geochemical and geochronological methods to the sediment samples from the cores of IODP Sites U1456 and U1457, to reconstruct a weathering and erosional record of the Western Himalaya during the Neogene.

The new bulk sediment Sr and Nd isotopes, coupled with zircon U-Pb dating and apatite fission track (AFT) analysis were used to reconstruct the erosion history and regional exhumation, also provide essential information for reconstructing the erosion in the Indus catchment since ~17 Ma. In addition, the AFT ages from sediments allow me to constrain exhumation rates in the western Himalaya since 15.5 Ma. Moreover, in order to reconstruct the changes in chemical weathering in response to monsoon variation, multi-proxies were used, such as the Chemical Index of Alteration (Nesbitt et al., 1980), K/Al, and Si/Al from bulk sediment major element analysis, the clay minerals assemblage (Thiry, 2000) from XRD clay mineralogy, the ratio of Hematite/Goethite from spectral analysis could be used as high-resolution paleo-environmental proxies (Giosan et al., 2002). After reconstructing both erosion and regional exhumation history, as well as changes in chemical weathering, I investigated linkages between the Himalayan tectonics, Indian summer monsoon strength and surface processes since the Middle Miocene.

Chapters 2 to 4 are the three main chapters of this dissertation, which are organized in a format for peer-reviewed journals. Chapter 3 are published in *Geological Magazine*, and Chapter 2 and Chapter 4 are in preparation for resubmission and submission, respectively. As each chapter was formatted with the intent to stand independently, some of the information may appear repetitive but this is necessary for each chapter results and discussion.

The first main topic introduced in Chapter 2 is the use of detrital zircon grains dated by U-Pb geochronology to reconstruct how erosion patterns changed through time. The sandy and silty sediments recovered from the Laxmi Basin in the Eastern Arabian Sea provide a relatively continuous erosional record derived from the Indus River, spanning the last 15.5 Ma. Coupled with the Sr and Nd isotopes, bulk geochemistry, and grain size analysis allow me to determine their provenance and the nature of changing of erosion patterns, and further to examine the relationships to climate change and tectonics.

In Chapter 3, I focus on low-temperature AFT ages from sediments recovered IODP Sites U1456 and U1457, to constrain exhumation rates in the western Himalaya and Karakoram since 15.5 Ma. and especially since 9 Ma. I compare detrital AFT ages with depositional ages to constrain the evolution in exhumation rates within the Indus catchment. Samples were taken where suitable sandy material was available at both IODP Sites U1456 and U1457, which mostly the same as the samples used for zircon U-Pb dating.

In Chapter 4, multiple geochemical and mineralogical proxies were used for evaluating chemical alteration, including clay minerals, bulk sediment geochemistry, and magnetic susceptibility. Diffuse Reflectance Spectroscopy (DRS) was used to measure the abundance of the moisture-sensitive minerals, hematite, and goethite. Furthermore, the clay mineral and bulk sediment geochemistry analysis allows me to investigate the long-term evolution of chemical

weathering in the Western Himalaya, and further examine whether these long-term changes in chemical weathering were related to climatic changes or tectonics.

Lastly, Chapter 5 concludes my results and briefly summarizes the provenance, exhumation and chemical weathering result, as well as addressing opportunities for future work.

CHAPTER 2. ZIRCON U-PB AGE CONSTRAINTS ON THE EXHUMATION OF THE LESSER HIMALAYAS FROM THE LAXMI BASIN, ARABIAN SEA

2.1 Introduction

Collision between India and Eurasia, starting about 50–60 Ma (DeCelles et al., 2014; Najman et al., 2010; Wu et al., 2014), has resulted in the formation the largest mountain ranges on Earth. These have continued to evolve both in topography and structure as a result of ongoing tectonic deformation coupled with erosion, largely modulated by the strength of summer monsoon rains (Bookhagen et al., 2005b; Clift et al., 2008b; Wobus et al., 2003). Sediment eroded from the Western Himalaya has been deposited in the Arabian Sea where it forms the second largest sediment body on Earth, the Indus submarine fan (Clift et al., 2001; Kolla and Coumes, 1987). The sedimentary deposits of the Indus submarine fan represent an archive of the erosion and weathering history in the Western Himalaya since the onset of continental collision, at least since ~45 Ma (Clift et al., 2001). While bedrocks exposed at the surface in the mountains can be used to reconstruct the uplift and exhumation of those particular rock formations and a subset of the mountain range, the fan sedimentary record captures spatial and temporal variations of the long-term history of denudation. As older portions of bedrocks have been completely removed by erosion and their exhumation history is no longer accessible, the sedimentary record becomes the only record of the earlier erosion and exhumation history. Although this record is partially available in the Himalayan foreland basin, these syn-tectonic deposits are more difficult to date at high resolution, and the sequence is truncated by significant unconformities, and deformed by progressive incorporation into the sub-Himalayan fold and thrust belt (Najman, 2006). Moreover, any given stratigraphic section in the proximal foreland represents only local

rivers and erosion in a limited catchment of a particular part of the mountains, but does not provide a more integrated orogen-scale overview.

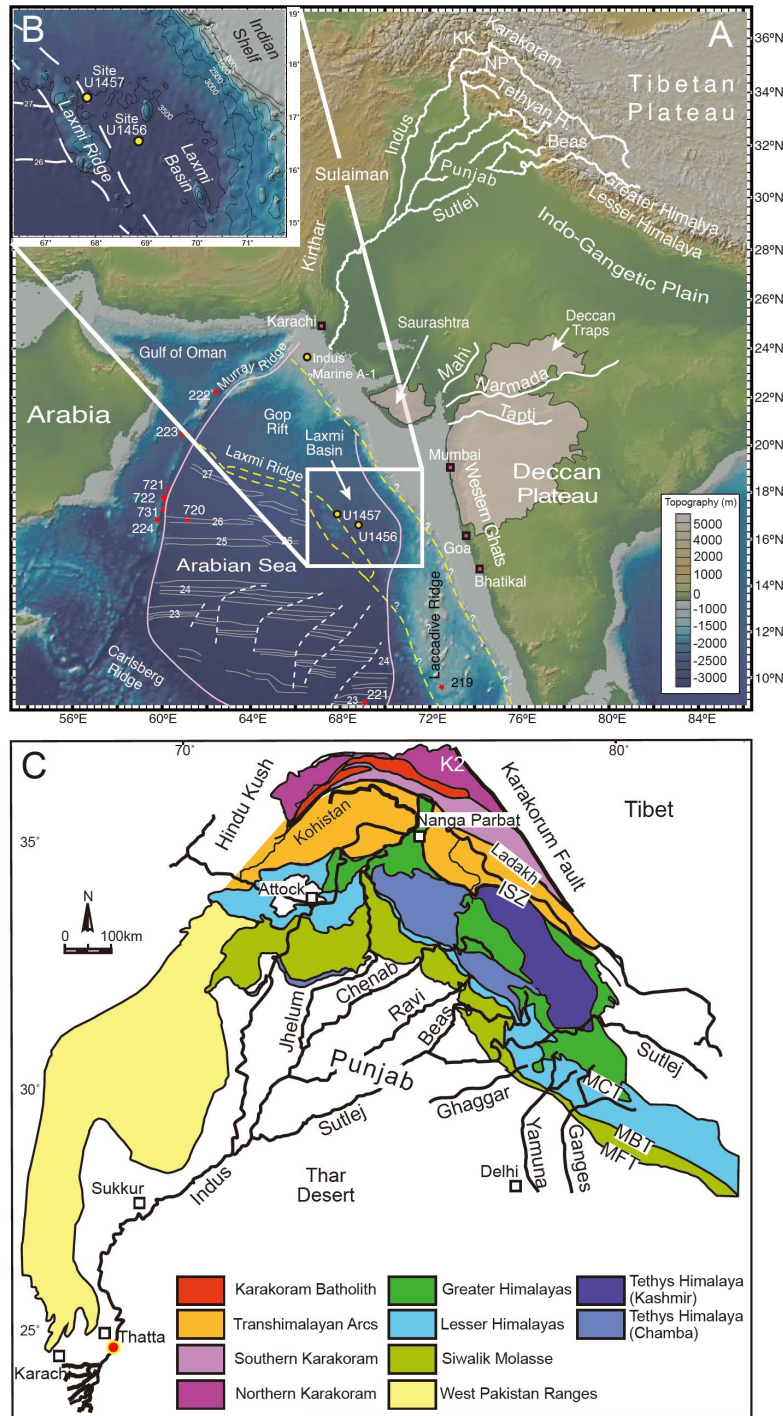


Figure 2.1 A) Shaded bathymetric and topographic map of the Arabian Sea area showing the location of the drilling sites within the Laxmi Basin, considered by this study. Map also shows (figure caption cont'd)

the primary source terranes and the major tributary systems of the Indus River, as well as smaller peninsular India rivers that may have provided material to the drill sites. B) Inset map shows detail of the Laxmi Basin and location of the drill sites considered in this study. Numbered red circles indicate existing scientific boreholes from Deep Sea Drilling Project (DSDP) and Ocean Drilling Program (ODP). Magnetic anomalies are from Miles et al. (1993). White dashed lines show transform faults. KK = Karakoram; NP = Nanga Parbat. C) Geological map of the western Himalaya showing the major tectonic units that are eroded by the Indus River and its tributaries. Map is modified after Garzanti et al. (2005). Rivers as shown in thick black lines. ISZ = Indus Suture Zone, MCT = Main Central Thrust, MBT = Main Boundary Thrust and MFT = Main Frontal Thrust. Thick black line shows the boundary of the Indus drainage, while thinner lines demark the limits of the major Himalayan tributaries.

Sediments from the western Himalaya are delivered to the Arabian Sea by the Indus River and its eastern tributaries in the Punjab (Fig. 2.1A). The Indus is particularly sensitive to variations in the strength of the Asian monsoon as it lies on the western edge of the zone affected by this climatic phenomenon. As a result, variations in monsoon strength can have a major impact on both patterns and rates of erosion in the various ranges that comprise the western end of the Himalayan mountain chain (Fig. 2.1B). A number of studies have suggested that changes in monsoon intensity significantly impact the erosion history of the western Himalaya (Bookhagen et al., 2005b; Clift et al., 2008a; Clift et al., 2008b).

Debate continues regarding what controls the erosion of the Himalaya, with some workers favoring tectonic processes and driving rock uplift (Burbank et al., 2003), as being the critical control, while others have argued for a dominance by monsoon rainfall and/or glaciation, which focus the sediment producing regions across a relatively narrow band of the range front and in turn drive exhumation of deep buried rocks (Thiede et al., 2004). It is however known that the erosion of the Himalaya is sensitive to climate change as sediment supply during the Last Glacial Maximum (LGM) was preferentially focused in the Karakoram, while erosion has shifted into the Lesser Himalaya since the onset of the Holocene (Clift et al., 2008a).

In this study we focus on the Late Miocene-Recent history and examine evidence for coupling between the tectonic evolution and the changing strength of summer monsoon rains. We take advantage of recently recovered sediments collected by the International Ocean Discovery Program (IODP) in 2015 from the Eastern Arabian Sea, which provides a record of erosion extending back to ~10.8 Ma, with one sample dated at ~15.5 Ma (Pandey et al., 2016c). This allows us to test for tectonic-climate coupling in this area over long geologic periods. We present a new data set of U-Pb ages from detrital zircon sand grains to reconstruct the evolving patterns of erosion. We then compare this detrital zircon provenance record with the climatic history in order to assess potential coupling.

2.2 Geologic Setting

The sediments analyzed in this study were retrieved from the Laxmi Basin in the Eastern Arabian Sea (Fig. 2.1A and 2.1B). This basin is separated from the rest of the Arabian Sea by a continental fragment known as Laxmi Ridge (Pandey et al., 1995). Rifting in Laxmi Basin preceded the breakup of the main Arabian Sea, and likely occurred in the latest Cretaceous (Bhattacharya et al., 1994). Since that time 2–3 km of sediment accumulated in the Laxmi Basin. Initial provenance investigation of these sediments using Nd isotopes and limited zircon U-Pb dating indicate that while some fine-grained material might be derived in part from peninsular India, immediately to the west of the Laxmi Basin, most of the sediment was sourced from the Indus Delta, located around 800 km towards the north (Clift et al., 2019b). Continuous sedimentation in Laxmi Basin was interrupted by the emplacement of a large mass transport complex (MTC) just before 10.8 Ma, which eroded most of the Middle Miocene at Site U1456 (Calvès et al., 2015; Dailey et al., 2019). At Site U1457 the MTC removed almost the entire

sediment fill from the edge of Laxmi Ridge leaving only a thin deposit of red Paleocene mudstones (Pandey et al., 2016b).

We also compare our sediments with those recovered as drill cuttings from the industrial borehole Indus Marine A-1 located on the Indus shelf (Fig. 2.1A). This site penetrated into the middle Miocene (Shuaib, 1982) and we used drill cuttings from the operations to look at the evolving provenance using Nd isotope methods (Clift and Blusztajn, 2005; Clift et al., 2019b). The Indus Marine A-1 drill site is located on the relatively flat continental shelf and is only affected by growth faulting, but has otherwise escaped major tectonic deformation since the breakup of the Arabian Sea, except along its western edge adjacent to the Murray Ridge (Clift et al., 2002a; Gaedicke et al., 2002). Unfortunately, the recovered sediments from Indus Marine A-1 are fine-grained and are not conducive to detrital zircon U-Pb dating in this proximal area. We examined, however, the major element chemistry of the sediments at Indus Marine A-1 for comparison with the more distal drill sites sampled by IODP. Neodymium isotope data indicate that these sediments were derived from the Indus River, consistent with their proximal location, providing a useful comparison with the deep-water materials (Clift and Blusztajn, 2005).

Determining the provenance of the sediment delivered to the Arabian Sea is facilitated by the leverage of the significant spatial diversity of bedrock ages and lithologies within the Indus drainage basin (Hodges, 2000; Searle, 1996). Geochemical and isotopic differences between bedrock sources are transferred to the eroded sediment and although grains may be altered during the transport process many of these differences are preserved in the final deposited sediment, allowing us to deconvolve the sources and variations using appropriate proxies. Figure. 2.1C shows the various mountain ranges that comprise the main distinct source regions to the modern Indus River, including the Greater and Lesser Himalaya, the Tethyan Himalaya that lie further

north, and that represent the telescoped, passive continental margin of Greater India (Garzanti et al., 1987). This unit is separated by the Indus Suture Zone from magmatic arc rocks of the Transhimalaya and Kohistan (Fig. 2.1C) that were largely emplaced in the Cretaceous and Paleogene (Khan et al., 1997; Rolland et al., 2002). Further north, across the Shyok Suture Zone, lie the Karakoram, the old active margin of continental Eurasia, which also comprises Mesozoic arc rocks, and experienced magmatism after collision, most notably in the form of the Early Miocene Karakoram Batholith (Ravikant et al., 2009; Searle et al., 1989). The Karakoram region was uplifted in response to both compressional tectonics and strike-slip displacement on the Karakoram Fault (Searle and Phillips, 2007). Farther to the west the Hindu Kush mountains are characterized by a similar pre-collisional history as the Karakoram, but subsequently did not experience such dramatic or rapid unroofing (Hildebrand et al., 2001; Zhuang et al., 2018). In addition, the Western Syntaxis of the mountain chain is marked by the Nanga Parbat Massif (Fig. 2.1C), characterized by high-grade metamorphic and igneous intrusive rocks that experienced recent, very rapid exhumation (Zeitler et al., 1989). However, it is unclear exactly when this process began because the rocks now at the surface are very young. Nonetheless, this does not preclude an earlier onset to erosion (Chirouze et al., 2015).

The Greater Himalaya were emplaced along the Main Central Thrust (MCT) after ~24 Ma, placing them over the Lesser Himalaya (Catlos et al., 2001; Stephenson et al., 2001). These in turn were unroofed and brought to the surface in the Late Miocene due to motion along the Main Boundary Thrust (MBT) and associated thrust duplexing (Bollinger et al., 2004; Huyghe et al., 2001). Evidence from the Siwalik Group foreland basin sedimentary strata indicates that the Lesser Himalaya were exposed only after 9 Ma and more widely after 6 Ma in NW India (Najman et al., 2009). The Siwalik Group rocks themselves have been up-thrusted and are

presently eroding, recycling older sediments back into the river system. However, estimates derived from the incision of terraces in the Nepalese frontal Himalaya suggest that the Siwaliks contribute no more than about 15% of the total flux (Lavé and Avouac, 2000). The western edge of the Indus drainage basin is characterized by fold and thrust belts (Sulaiman and Kirthar ranges, Fig. 2.1A), similar to the Siwalik Group in character (Roddaz et al., 2011), but with a more arid climate that need not limit erosion rates because of the effectiveness of erosion during occasional flash flooding events (Molnar, 2001).

Other potential sources of sediment delivered into the Laxmi Basin include the Precambrian cratonic rocks of peninsular India and associated Gondwanan sedimentary sequences (Mukhopadhyay et al., 2010; Yin et al., 2010), characterized by old (>500 Ma) bedrock zircon U-Pb ages, similar to those observed in the Himalaya, especially the Lesser Himalaya. Zircon U-Pb dating, given its high closure temperature (Hodges, 2003), only records initial crystallization or high-temperature metamorphism, and thus, do not allow us to exclude such old grains as having been derived from peninsular India rather than the Himalaya.

Sediments eroded from the Deccan Plateau, the latest Cretaceous flood basalt province that dominates the Western Ghats, immediately onshore from the drilling area, were erupted around 65 Ma (Courtillot et al., 2000) over a relatively short period of time. While these would be very distinctive, basalt is characterized by a very low zircon fertility and should not provide any significant zircon grains of that age into the adjoining basin. In any case, much of the flux from this area is transported east to the Bay of Bengal (Widdowson and Cox, 1996).

2.3 Sedimentology and Stratigraphy

Drilling at Sites U1456 and U1457 penetrated ~1100 m below the seafloor in both locations, with the basement being reached at Site U1457 (Fig. 2.2)(Pandey et al., 2016b).

Drilling at Site U1456 only just penetrated through the MTC, allowing a very short core of Middle Miocene sandstone to be recovered (Pandey et al., 2016a). At Site U1456 the sediments are relatively mud-rich, but with a number of silt and fine sand turbidite interbeds at 460–730 mbsf (meters below seafloor), which are overlain by a sequence of mud and carbonate-rich sediments. A thick, sand-rich package was recovered between 360 and 140 mbsf and interpreted as a submarine fan lobe (Pandey et al., 2016a). Above this the younger sand-rich package, the section is dominated by mud and carbonate, interpreted as hemipelagic sedimentation. Site U1457 is characterized by much lower proportions of sand, reflecting the drilling location on the flanks of the Laxmi Ridge. However, a sand-rich interval lies between 670 and 810 mbsf, overlain by a carbonate and mud-rich interval between 600 and 670 mbsf. More sand-rich beds were encountered between 470 and 600 mbsf. As at Site U1456, sediments shallower than 200 mbsf at Site U1457, are mud and carbonate-rich (Fig. 2.2). The coarse-grained intervals are again interpreted as lobe deposits (Pandey et al., 2016b). The sandy sediments are interpreted to be deposited by turbidity current, with the muddy sediments representing hemipelagic intervals between depositional events. Changes in grain size might also be driven by changes in the erosional power in the source regions, the discharge stream power of the river, or by changes in sea level, but could also reflect avulsion in the main depositional lobes in and out of Laxmi Basin and the main part of the Arabian Sea towards the West. Such auto cyclic behavior is commonly observed in submarine fans (Deptuck et al., 2008; Shanmugam and Moiola, 1991).

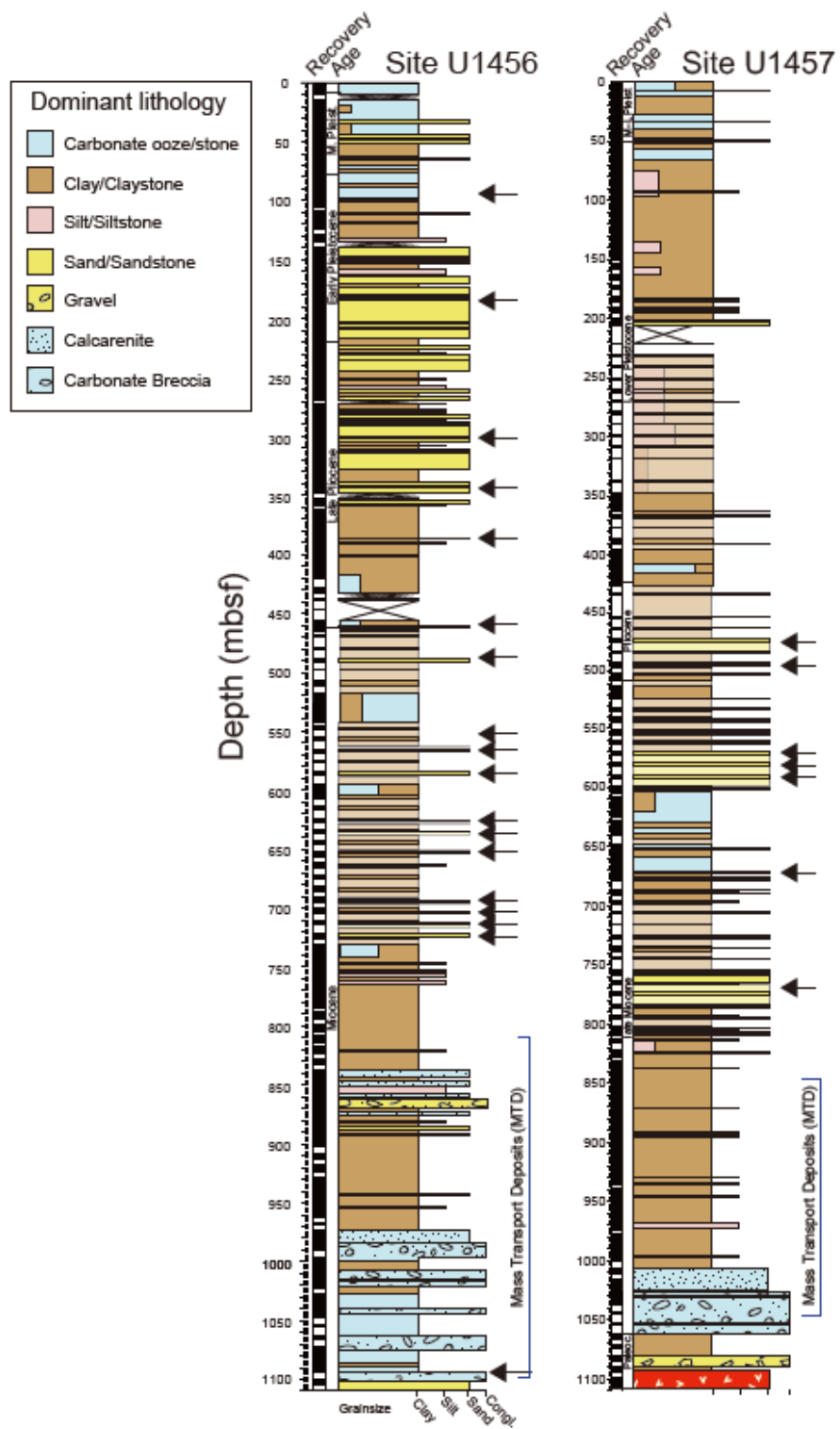


Figure 2.2. Simplified lithologic logs of the two drill sites considered in this study. Black arrows show the location of the samples analyzed. Modified from Pandey et al. [2016c].

2.4 Methods

U-Pb geochronology of detrital zircon grains has become a powerful and widely employed tool for discerning provenance in siliciclastic sedimentary systems. The methodology is based on the concept that different bedrock source rocks are characterized by distinct and/or different age populations of zircons. Although it is important to understand the relative zircon fertility of bedrock sources with regard to zircon if we are to estimate eroded rock budgets, this can be corrected for, either through point counting or by using Zr concentrations as a proxy for the relative abundance of zircons in a sediment (Amidon et al., 2005).

Zircon is a robust mineral and does not generally experience significant physical abrasion during sediment transport, unless it had accumulated major radiation damage. Hence, zircon can undergo multiple episodes of recycling and redeposition. Although the concentration of zircon in any given sediment can be affected by hydrodynamic sorting this process is generally not considered to be a strong influence on the resulting detrital age spectra because there is no simple relationship between grain size and crystallization age noted in this and other studies. For example, work in the Yangtze River indicates that the typical grain size range analyzed using LA-ICP-MS technology is representative of the overall population in the sediment without a bias related to grains size (Yang et al., 2012). Detrital zircon U-Pb dating has been widely applied in provenance studies in the Western Himalaya due to the large range of zircon U-Pb age differences between the various source terrains described above. Furthermore, studies of the modern Indus River documented a close correlation between the modern zircon U-Pb age spectra and the bedrock sources (Alizai et al., 2011; Zhuang et al., 2018). Several studies have also used detrital zircon dating to investigate the provenance of the Siwalik Group foreland basin sedimentary rocks (Baral et al., 2016; Bernet et al., 2006; DeCelles et al., 2004; Zhuang et al.,

2015) and to Quaternary sediments in the delta and offshore (Clift et al., 2008a; Li et al., 2019), allowing evolving erosion patterns to be reconstructed.

2.4.1 Major Element Analyses

In addition to detrital zircon U-Pb dating, bulk sediment samples were analyzed for their major element contents by Inductively Coupled Plasma Emission Spectrometry (ICP-ES) at Boston University (BU), USA. Sediment samples were decarbonated with acetic acid, washed with distilled and deionized water with a purity of 9–12 megaohms, and hand powdered at Louisiana State University (LSU) before total fusion preparation at BU. Glass beads for each sample were made in a muffle furnace under 1050°C by fusing 100 ± 0.5 mg of sample mixed with 400 ± 0.5 mg lithium metaborate (LiBO_2). The melted mixture was then dissolved in 5% HNO_3 , sonicated, manually shaken until no visible grains were observed, and further diluted for analysis (Dunlea et al., 2015). Precision for all elements was better than 1% of the measured value, and accuracy was confirmed by repeated analyses of International Standard Reference Materials (Basalt, Hawaiian Volcano Observatory, BHVO-2)(Wilson, 1997). Results of the geochemical measurements are shown in Table 2.1.

Table 2.1 Bulk sediment major element of IODP sites U1456, U1457 and Indus Marine A-1

Sample	Age (Ma)	SiO ₂ (%)	Al ₂ O ₃ (%)	CaO (%)	Fe ₂ O ₃ (%)	MgO (%)	Na ₂ O (%)	K ₂ O (%)	P ₂ O ₅ (%)	MnO (%)	TiO ₂ (%)	Ba (ppm)	Zr (ppm)	Sc (ppm)	Mean Grain Size
U1456A-11H-6 60-69 cm	0.93	56.53	14.00	3.14	8.68	2.86	1.98	1.96	0.21	0.04	1.44	323.5	174.4	244.1	31.9
U1456A-26F-3 50-58 cm	1.32	71.08	12.15	1.50	3.80	1.52	1.99	2.47	0.12	0.04	0.57	345.1	214.9	141.3	125.1
U1456A-51F-3 100-110 cm	1.56	71.69	12.23	1.54	3.81	1.66	2.10	2.52	0.13	0.04	0.60	399.7	216.1	151.4	137.4
U1456A-61F-3 40-50 cm	1.92	72.28	11.36	1.87	3.33	1.40	2.03	2.22	0.11	0.04	0.54	321.7	223.8	158.3	142.2
U1456A-63F-2 20-30 cm	2.50	68.28	13.09	1.50	4.61	2.00	1.92	2.50	0.14	0.05	0.71	461.7	229.5	136.9	62.1
U1456A-70F-2 10-16 cm	3.02	60.92	16.16	1.06	5.87	2.69	1.37	3.23	0.12	0.04	0.80	491.7	168.7	130.5	13.5
U1456C-45X-3 45-51 cm	3.57	64.81	14.33	1.13	5.25	2.39	1.59	2.87	0.10	0.04	0.73	423.6	138.9	132.1	60.3
U1456D-5R-1 12-20 cm	5.72	61.90	15.40	1.11	5.75	2.57	1.50	3.05	0.13	0.04	0.80	473.8	219.7	132.5	29.8
U1456D-12R-1 30-36 cm	7.00	67.20	13.36	2.05	4.70	2.24	2.06	2.37	0.14	0.05	0.67	318.5	170.0	187.9	94.6
U1456D-13R-1 30-38 cm	7.07	63.84	13.55	1.60	4.84	2.37	1.95	2.62	0.12	0.04	0.68	336.2	156.7	163.8	99.1
U1456D-15R-1 55-61 cm	7.27	65.51	13.66	1.62	4.79	2.33	1.92	2.61	0.13	0.04	0.69	331.1	169.2	165.6	43.3
U1456D-19R-2 20-26 cm	7.66	64.67	14.54	1.53	5.09	2.39	1.97	2.97	0.16	0.04	0.71	398.3	175.2	169.4	64.0
U1456D-20R-1 95-103 cm	7.72	63.54	14.45	1.36	4.86	2.45	1.64	2.85	0.15	0.04	0.75	304.9	190.6	145.2	32.3
U1456D-22R-1 73-83 cm	7.84	62.40	15.48	1.31	5.42	2.63	1.55	2.94	0.14	0.04	0.78	338.4	170.0	146.3	27.2
U1456D-26R-2 37-43 cm	8.08	67.41	12.96	1.66	4.51	2.28	2.12	2.37	0.14	0.04	0.64	348.4	208.4	166.1	71.8
U1456D-27R-2 100-106 cm	8.15	62.63	15.15	1.16	5.43	2.69	1.44	2.79	0.16	0.04	0.82	325.5	162.1	135.6	23.4
U1456D-28R-1 40-46 cm	8.20	62.57	14.94	1.18	5.28	2.58	1.59	2.72	0.16	0.04	0.75	362.7	187.9	141.2	23.5
U1456D-29R-2 24-34 cm	8.27	62.11	15.26	1.13	5.38	2.68	1.50	2.81	0.14	0.04	0.78	352.3	181.0	133.2	25.5
U1456D-52R-5 80-88 cm	10.77	51.10	17.16	0.31	8.53	3.28	0.37	3.15	0.10	0.04	1.22	309.4	147.0	101.8	13.9
U1456E-19R-3 10-20 cm	15.57	65.14	13.85	1.15	4.97	2.72	1.70	2.68	0.15	0.04	0.69	315.8	182.4	141.7	53.1
U1457C-31R-1 94-100 cm	3.17	62.19	15.57	1.24	5.70	2.59	1.91	3.67	0.16	0.05	0.74	541.3	177.2	151.7	46.5
U1457C-33R-3 10-17 cm	3.39	66.93	13.55	1.38	4.72	2.31	1.89	2.74	0.12	0.05	0.71	409.6	142.2	147.2	132.1
U1457C-41R-2 20-26 cm	5.77	64.85	14.74	1.20	5.28	2.37	1.57	2.73	0.14	0.04	0.77	413.8	210.2	135.0	47.1
U1457C-42R-1 80-88 cm	5.82	70.30	11.81	1.56	3.51	1.51	2.02	2.21	0.12	0.04	0.53	393.4	195.3	168.4	69.1
U1457C-43R-2 52-60 cm	5.87	65.58	14.25	1.27	4.99	2.30	1.69	2.93	0.13	0.04	0.74	395.4	193.8	141.4	103.5

(table cont'd)

Sample	Age (Ma)	SiO ₂ (%)	Al ₂ O ₃ (%)	CaO (%)	Fe ₂ O ₃ (%)	MgO (%)	Na ₂ O (%)	K ₂ O (%)	P ₂ O ₅ (%)	MnO (%)	TiO ₂ (%)	Ba (ppm)	Zr (ppm)	Sc (ppm)	Mean Grain Size
U1457C-51R-4 80-88 cm	7.77	66.13	13.89	1.43	4.75	2.31	1.85	2.66	0.12	0.04	0.70	311.3	153.7	154.2	63.0
U1457C-61R-1 8-18 cm	7.98	67.73	13.23	1.56	4.65	2.27	1.97	2.37	0.13	0.04	0.62	309.6	151.3	160.6	75.3
Indus Marine A1-1620	3.60	58.33	15.42	1.58	6.89	3.21	1.36	3.09	0.20	0.06	0.80	4954.7	193.6	15.1	17.2
Indus Marine A1-2200	5.16	56.88	13.97	2.90	8.90	2.59	1.35	2.68	0.20	0.09	0.70	1368.1	229.2	13.6	14.0
Indus Marine A1-3180	6.93	53.46	14.16	1.96	7.23	2.52	1.13	2.68	0.19	0.05	0.74	32834.9	192.8	13.2	13.7
Indus Marine A1-3960	8.29	57.99	14.60	2.10	8.99	2.69	1.65	2.84	0.19	0.06	0.76	715.1	228.2	13.5	16.2
Indus Marine A1-4180	8.68	57.30	14.68	1.91	8.27	2.72	1.53	2.75	0.18	0.06	0.75	1145.3	224.7	13.1	15.3
Indus Marine A1-4840	9.83	59.23	15.59	1.22	7.63	2.70	1.54	2.95	0.18	0.05	0.77	671.3	202.5	14.3	14.1
Indus Marine A1-4940	10.00	60.71	15.24	0.88	6.46	2.60	1.59	2.87	0.17	0.05	0.77	7977.0	222.6	13.5	13.9
Indus Marine A1-5360	10.72	57.44	15.63	1.46	8.77	3.11	1.31	2.80	0.21	0.06	0.83	686.6	203.3	14.6	12.8
Indus Marine A1-5920	11.67	56.44	16.72	0.62	7.96	2.96	1.18	3.28	0.16	0.05	0.85	532.3	185.7	15.5	10.4
Indus Marine A1-6360	12.35	57.18	16.77	0.71	7.15	3.08	1.16	3.12	0.16	0.04	0.86	534.6	191.3	15.7	12.0
Indus Marine A1-6460	12.51	60.96	16.20	0.72	7.15	2.96	1.23	2.87	0.17	0.04	0.81	498.5	177.5	14.2	9.9
Indus Marine A1-6680	12.86	58.50	18.08	3.68	6.92	3.42	1.19	3.05	0.18	0.04	0.84	420.1	178.5	15.1	10.3
Indus Marine A1-6890	13.19	58.98	16.90	0.84	7.04	3.11	1.06	3.04	0.17	0.04	0.87	488.8	192.4	15.3	10.7
Indus Marine A1-7090	13.50	58.76	16.27	0.62	7.05	3.13	0.79	2.96	0.16	0.04	0.88	420.8	206.2	14.6	12.0
Indus Marine A1-7190	13.66	59.46	15.38	0.66	8.12	2.88	0.90	2.72	0.16	0.05	0.83	763.8	223.4	13.9	11.9
Indus Marine A1-7400	13.99	58.12	16.08	0.64	7.82	3.06	0.93	3.08	0.15	0.04	0.84	520.6	197.6	15.6	11.7
Indus Marine A1-7500	14.14	59.07	16.23	0.58	7.58	3.06	0.69	3.04	0.15	0.04	0.88	518.3	225.1	15.6	10.4
Indus Marine A1-7620	14.33	58.48	16.12	0.57	7.17	3.05	0.82	2.99	0.16	0.04	0.86	483.7	224.5	15.7	12.0
Indus Marine A1-7720	14.49	58.75	16.42	0.74	7.06	3.20	0.87	3.15	0.15	0.04	0.87	454.1	216.7	14.9	11.7
Indus Marine A1-7820	14.64	57.76	16.12	0.59	7.00	3.07	0.88	2.91	0.15	0.04	0.86	530.2	215.8	14.8	10.8
Indus Marine A1-8040	14.99	58.43	16.32	0.58	7.07	3.12	0.83	3.14	0.15	0.04	0.87	465.6	206.4	15.4	10.7
Indus Marine A1-8140	15.15	58.48	16.47	0.53	7.34	3.20	0.84	3.15	0.16	0.04	0.87	359.5	214.8	14.6	11.4
Indus Marine A1-8240	15.30	57.92	16.05	0.79	7.01	3.34	0.81	2.99	0.17	0.04	0.88	366.9	224.7	16.4	12.5

(table cont'd)

Sample	Age (Ma)	SiO ₂ (%)	Al ₂ O ₃ (%)	CaO (%)	Fe ₂ O ₃ (%)	MgO (%)	Na ₂ O (%)	K ₂ O (%)	P ₂ O ₅ (%)	MnO (%)	TiO ₂ (%)	Ba (ppm)	Zr (ppm)	Sc (ppm)	Mean Grain Size
Indus Marine A1-8340	15.46	57.50	15.41	0.72	6.88	3.23	0.80	2.88	0.15	0.04	0.84	15154.2	226.9	15.2	13.6
Indus Marine A1-8450	15.63	53.35	11.98	0.77	6.18	2.37	0.72	2.10	0.12	0.03	0.67	67660.3	207.5	11.8	17.5
Indus Marine A1-8650	15.94	39.71	7.64	0.55	3.87	1.29	0.53	1.25	0.10	0.02	0.44	94222.9	225.8	8.5	16.9
Indus Marine A1-8950	16.42	48.08	9.12	0.72	4.51	1.64	0.87	1.51	0.11	0.03	0.55	95848.9	278.7	7.4	14.5
Indus Marine A1-9170	16.76	52.48	11.88	0.70	6.54	2.42	0.83	2.15	0.14	0.04	0.66	74337.3	187.9	10.4	20.9

2.4.2 Grain size Analysis

For quantitative grain size analysis, samples were prepared using standard procedures as described by Howell et al. (2014). We put a small amount of sample into a cleaned 50 ml plastic centrifuge tube and added 5–7 ml of sodium phosphate solution. The tube was capped and vortexed to deflocculate clay-sized sediment and separate organic particles. The sample was poured through an 850 μm sieve and funneled into a 15 ml glass test tube. After centrifuging and removing the clear supernatant, 2–3 ml of sodium phosphate and 5 ml of 30% H_2O_2 were added. Tubes were vortexed again and then put into a hot bath that was heated to 70°C. This step requires persistent monitoring to prevent loss of reactant by spraying it with acetone until the reaction is stabilized. Reactants then sat overnight to completely oxidize organic matter. Reacted supernatant was removed, and 5 ml of sodium phosphate was added. These treated samples were then rinsed with deionized water, transferred into clean 50 ml plastic centrifuge tubes, and topped with sodium phosphate into a sample solution of up to 40 ml. Samples were vortexed again prior to grain size analysis. Grain size analysis was conducted on a Beckmann Coulter LS13 320 laser diffraction particle size analyzer at LSU. The obscuration of all running samples in the aqueous liquid module (ALM) was between 8–12 %.

2.4.3 Zircon U-Pb dating

After standard mineral separation, zircon grains were sprinkle-mounted onto double-sided tape on 1” acrylic discs and analyzed at random using depth-profiling LA-ICP-MS U-Pb geochronology (Marsh and Stockli, 2015). For each sample at least 120 zircons were analyzed to obtain provenance datasets that resolve all components that comprise >5% of the total population (Vermeesch, 2004). The analyses were completed using a PhotonMachine Analyte G.2 Excimer laser (30 μm laser spot size) with a large-volume Helex sample cell and a Thermo Element2 ICP-

MS using procedures described in Hart et al. (2016) at the UTChron facilities at the Jackson School of Geosciences at the University of Texas at Austin. GJ1 was used as the primary reference standard (Jackson et al., 2004) and a secondary in-house zircon standard (Pak1 with a TIMS $^{206}\text{Pb}/^{239}\text{U}$ age of 43.0 Ma). The data from the analyses were then reduced using the Iolite data reduction software VizualAge (Paton et al., 2011; Petrus and Kamber, 2012). For analyzed detrital zircons, the $^{206}\text{Pb}/^{238}\text{U}$ age was used for grains younger than 850 Ma and the $^{207}\text{Pb}/^{206}\text{Pb}$ age was used for grains older than 850 Ma (Gehrels et al., 2008). All ages reported use 2σ absolute propagated uncertainties. $^{207}\text{Pb}/^{206}\text{Pb}$ ages are less than 30% discordant, and $^{206}\text{Pb}/^{238}\text{U}$ ages are less than 10% discordant (Gehrels et al., 2011). The discordance reported is calculated with the $^{206}\text{Pb}/^{238}\text{U}$ and $^{207}\text{Pb}/^{235}\text{U}$ ages if <850 Ma and the $^{206}\text{Pb}/^{238}\text{U}$ and $^{207}\text{Pb}/^{206}\text{Pb}$ ages if >850 Ma. The data are reported in Appendix A.

2.5 Results

2.5.1 Grain-size of sediments

The sediments were assessed using the classification scheme of Folk (1974)(Fig. 2.3). Sediments range from silty sand to silt and mud. The grain size variation in single samples can be better assessed by plotting the proportion of each grain size fraction as a spectrum (Fig. 2.4). We see a generally good sorting (positive kurtosis) and a Coarse-skewed, meaning a dominance of the finer grain sizes and a tail of coarser grains comprising a diminishing proportion of the sediment. This is especially true for the coarser-grained sediments. The vast majority of the sediment considered here is classified as fine sand to silt, with only small amounts of medium and coarse sand in a minority of samples. The spot size of the laser used for the U-Pb dating means that grains smaller than $\sim 30\text{ }\mu\text{m}$ were not considered in this study.

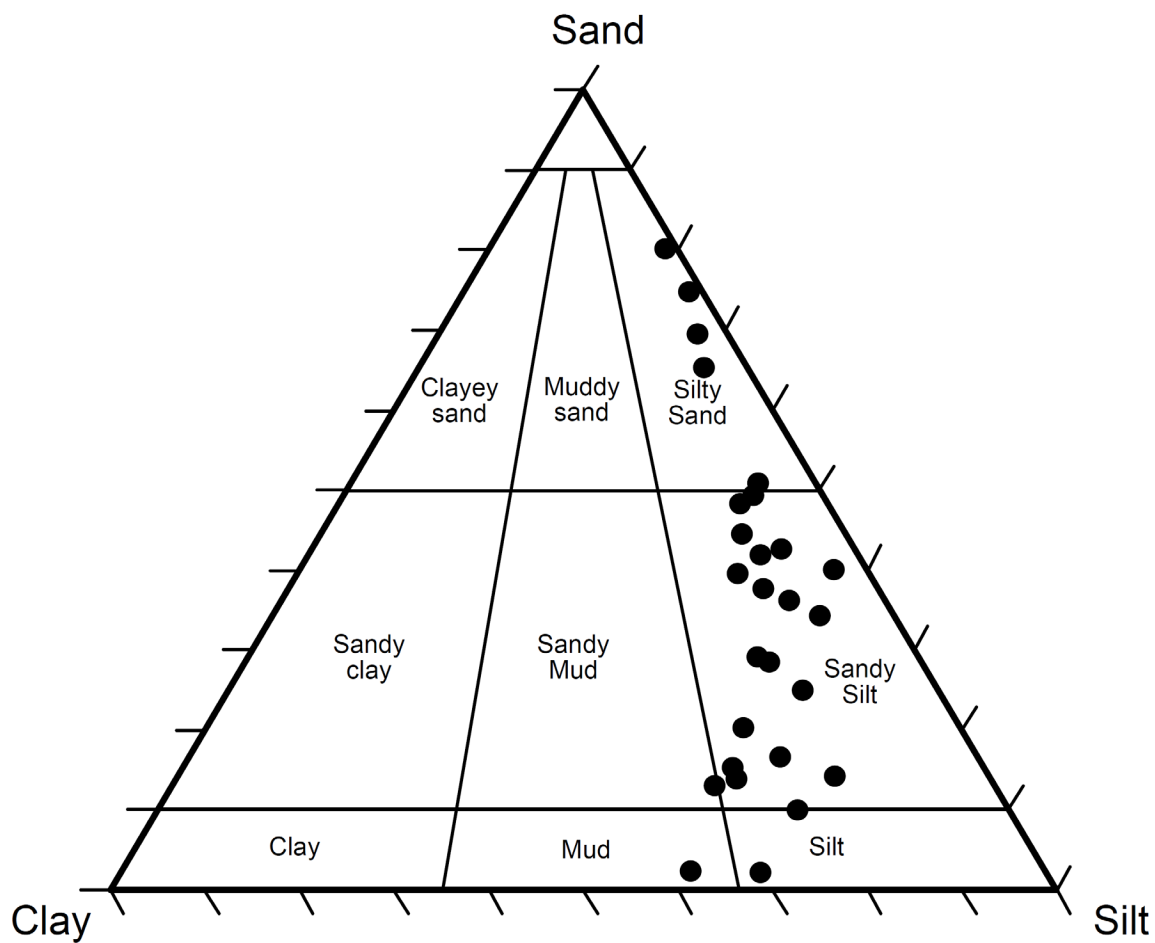


Figure 2.3. Grainsize range of all samples analyzed for U-Pb zircon dating from the Laxmi Basin shown on the scheme of Folk (1974).

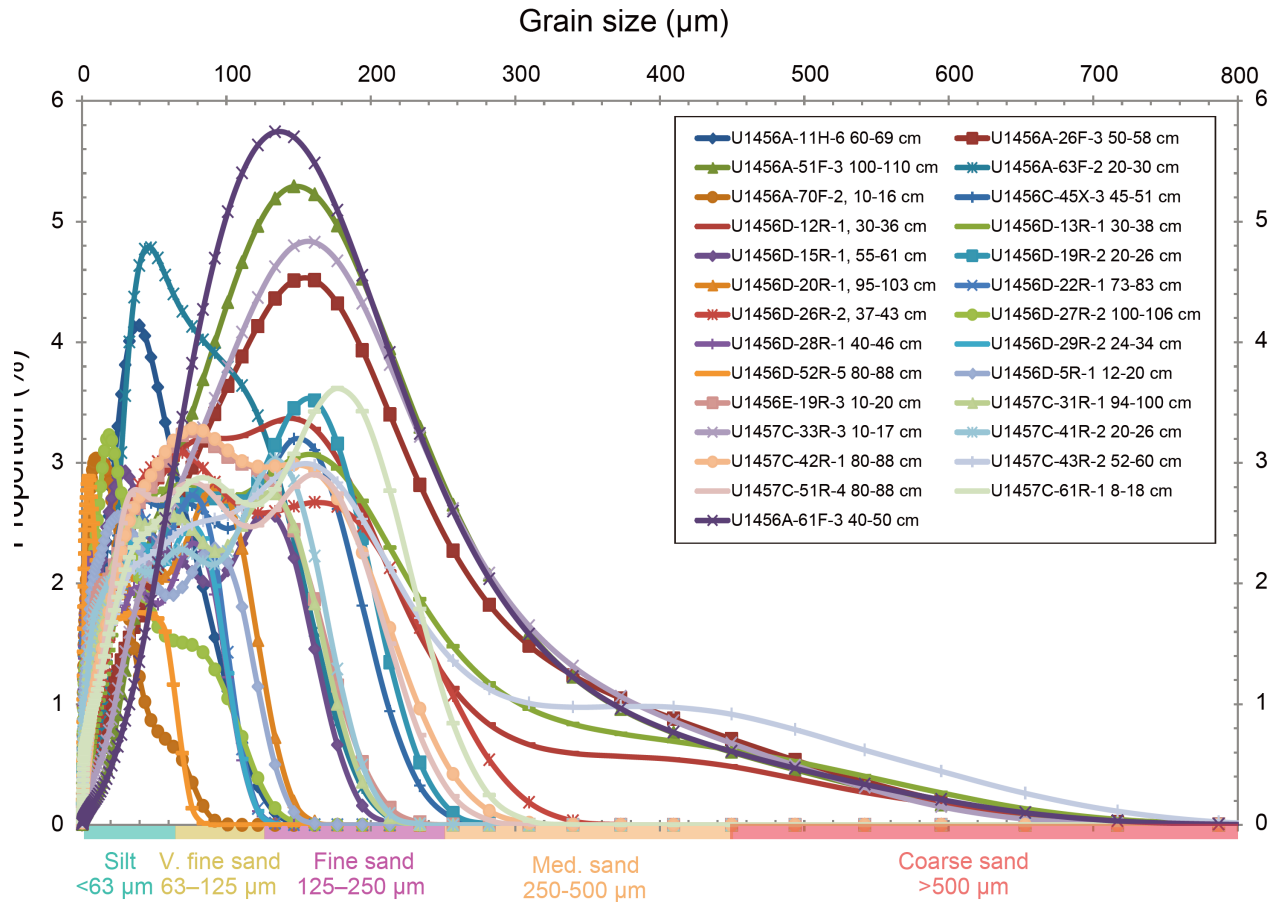


Figure 2.4. Detailed grain size spectra showing the range of sizes of the different samples considered within this study. Most of the sediment is fine sand to coarse silt in size and typically shows a Coarse-skewed.

2.5.2 Major Element Chemistry

The general geochemical character of the sediments can be seen on a CN-A-K ternary diagram (Fedo et al., 1995)(Fig. 2.5A). The IODP samples plot in an array with a Chemical Index of Alteration (CIA) of ~65 to 73 (Nesbitt et al., 1980). They form a roughly linear array trending towards the illite end member and suggestive of its progressive involvement as the primary mineral breakdown product. The Laxmi Basin samples can be compared with sediments from the Quaternary Indus delta (Clift et al., 2010), Indus Canyon (Li et al., 2018), the Indus Marine A-1 borehole, as well as modern sediments from the western Indian shelf and slope between the Saurashtra peninsula and Bhatikal (Kurian et al., 2013)(Fig. 2.1).

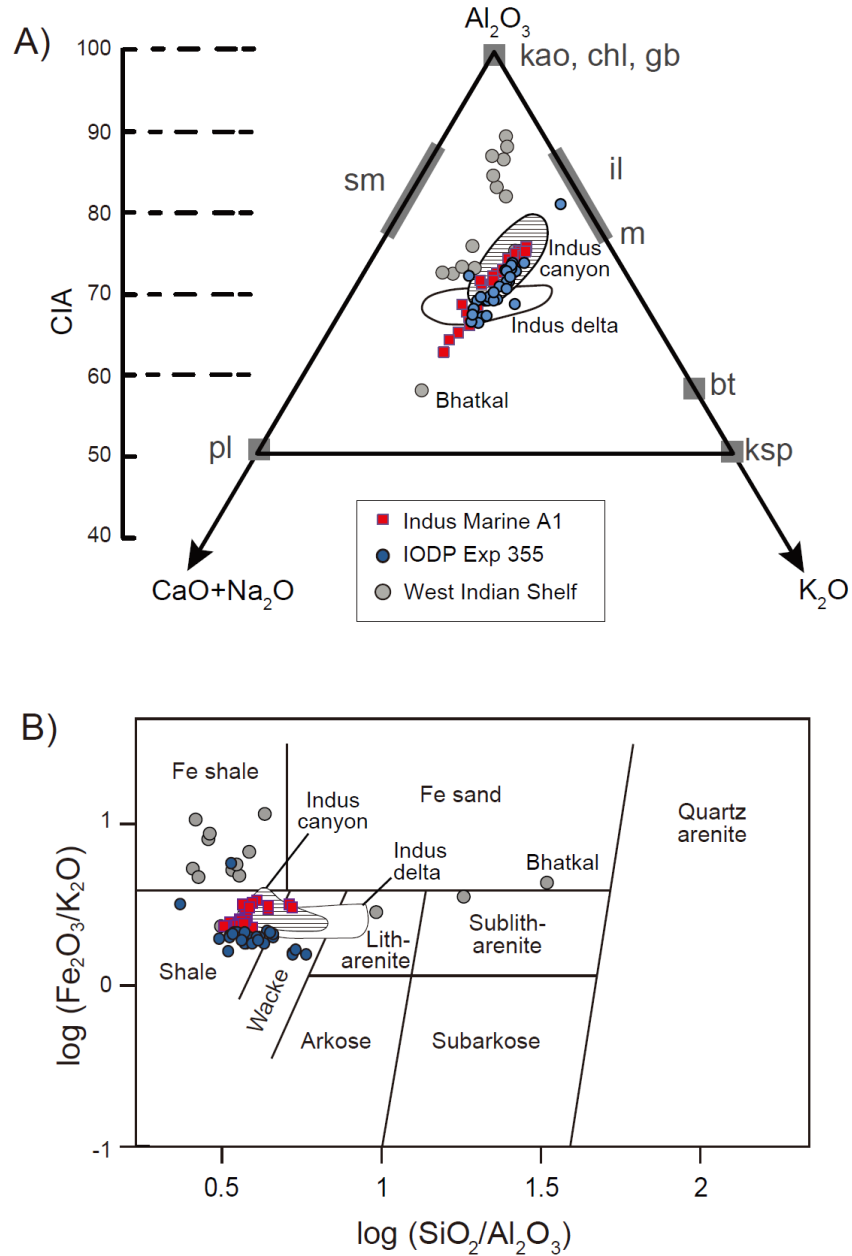


Figure 2.5. (A) Geochemical signature of the analyzed samples illustrated by a CN-A-K ternary diagram (Fedo et al., 1995). CN denotes the mole weight of Na_2O and CaO^* (CaO^* represent the CaO associated with silicate, excluding all the carbonate). A and K indicate the content of Al_2O_3 and K_2O respectively. Samples closer to A are rich in kaolinite, chlorite and/or gibbsite (representing by *kao*, *chl* and *gib*). CIA values are also calculated and shown on the left side, with its values are correlated with the CN-A-K. Samples from the delta have the lowest values of CIA and indicates high contents of CaO and Na_2O and plagioclase. Abbreviations: *sm* (smectite), *pl* (plagioclase), *ksp* (K-feldspar), *il* (illite), *m* (muscovite). (B) Geochemical classification of sediments from this study as well as those from the Indus delta (Clift et al., 2010), Indus Canyon (Li et al., 2018) and western Indian shelf (Kurian et al., 2013) following the scheme of Herron (1988).

The Laxmi Basin sands have very similar bulk compositions to the Quaternary Indus canyon and delta, as well as the Indus Marine A-1 samples (Fig. 2.5A), but plot below or to the right of the array of the western Indian shelf sediments. Only the shelf sample taken near Bhatikal (the southernmost sample lying offshore the Precambrian crystalline basement of India, rather than the Deccan Traps), plots below the Laxmi Basin sediments, with a lower CIA value. This plot confirms that the analyzed sands have little in common with material eroded from peninsular India and appear consistent with an Indus River origin. Likewise, the sediments plot close to the Quaternary Indus sediments and those of Indus Marine A-1 on the discrimination diagram of Herron (1988)(Fig. 2.5B). The IODP samples plot with slightly lower $\text{Fe}_2\text{O}_3/\text{K}_2\text{O}$ values compared to the proximal sediments. The Laxmi Basin sediments form an array defined as shales and wackes, while the western Indian shelf sediments fall into the Fe shale, litharenite, sublitharenite and Fe sand fields.

2.5.3 Detrital Zircon U-Pb

We examined the range of zircon U-Pb ages using a kernel density estimate (KDE) diagram (Fig. 2.6) to assess similarities between different sampled sediments and potential source regions (Fig. 2.6). All of the sediments analyzed in this study show a significant zircon U-Pb component younger than 200 Ma.

In addition, we see significant components dated at 350–1250 Ma and 1500–2300 Ma. The abundance of these older age components overall increases with decreasing sample depositional age. The 350–1250 Ma age component appears to increase in all sediment samples younger than 7.0 Ma compared to the older sediments. A particularly prominent age mode at ~1800 Ma, first occurs in sediments deposited at 3.43 Ma and becomes extremely prominent in

all samples younger than 1.92 Ma. This age mode is also observed in the modern sediment from the Indus river mouth (Clift et al., 2004).

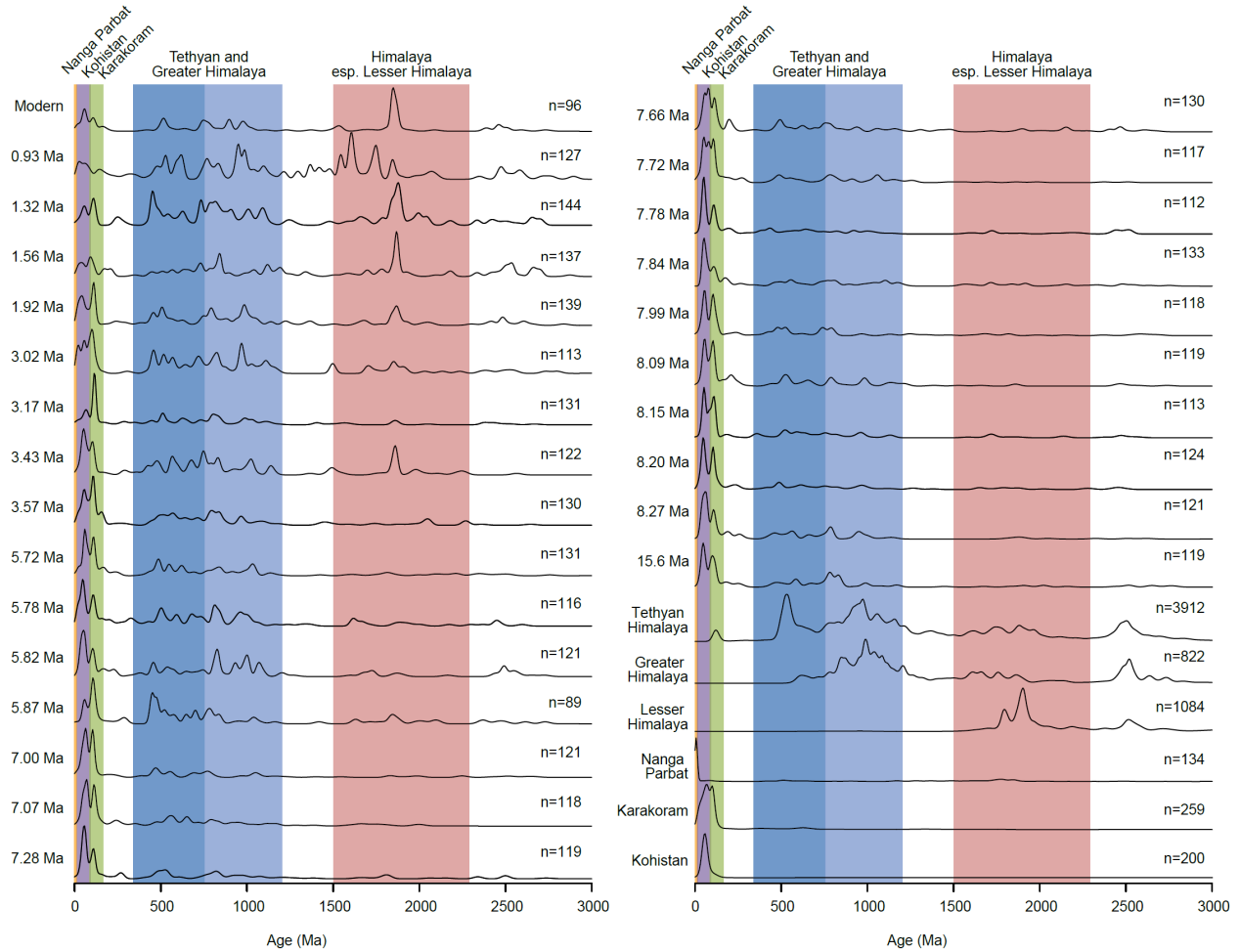


Figure 2.6. Kernel density estimate (KDE) diagram showing the range of the zircon U-Pb ages for individual sand grains back to 3000 Ma. Colored strips show the range of populations with diagnostic links to critical source terrains in the headwaters of the Indus. Data from the Siwaliks, as well as the Tethyan, Greater and Lesser Himalaya are compiled from DeCelles et al. (2004). Karakoram data is from Le Fort et al. (1983), Parrish and Tirrul (1989), Schärer et al. (1990), Fraser et al. (2001) and Ravikant et al. (2009). Nanga Parbat data is from Zeitler and Chamberlain (1991) and Zeitler et al. (1993). Transhimalayan data is from Honegger et al. (1982), Schärer et al. (1984), Krol et al. (1996), Weinberg and Dunlap (2000), Zeilinger et al. (2001), Dunlap and Wysoczanski (2002), Singh et al. (2007), and Ravikant et al. (2009).

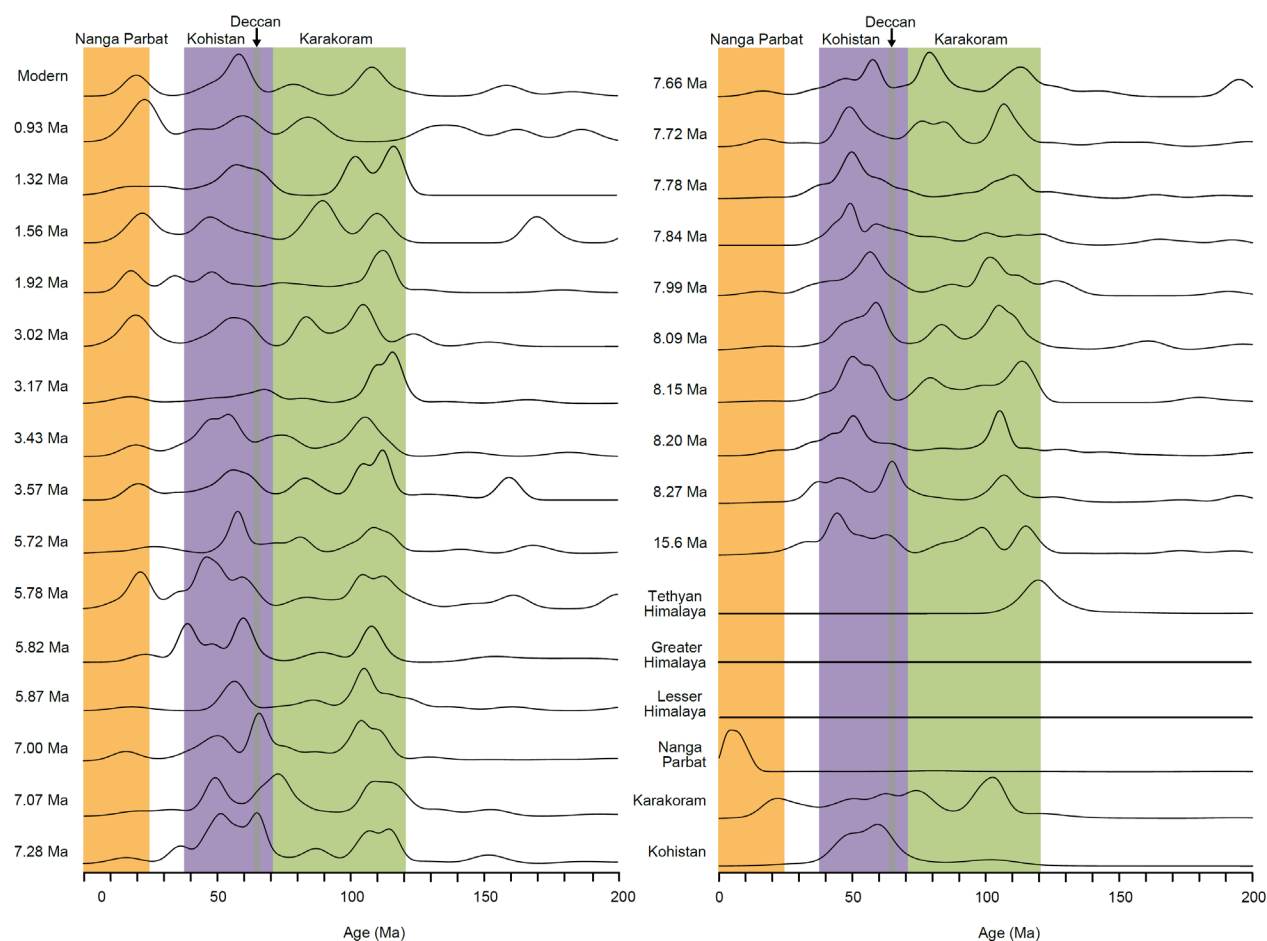


Figure 2.7. Kernel density estimate (KDE) diagram showing the range of the zircon U-Pb ages for individual sand grains back to 200 Ma. Colored strips show the range of populations with diagnostic links to critical source terrains in the headwaters. See Figure 2.6 caption for data sources.

Examining the <200 Ma zircon U-Pb ages in detail, we see that the vast majority of grains are younger than 120 Ma with prominent age peaks at around 100–120 Ma and 40–70 Ma (Fig. 2.7). In the youngest samples, especially those deposited after 3.17 Ma, we see another age mode at ~20 Ma, although this is also seen in the sample dated at 5.78 Ma. One sample deposited at 3.17 Ma differs in its <200 Ma age spectra from the other samples as it is characterized by a prominent age peak at 100–120 Ma, with a general lack of other young zircon grains.

2.6 Discussion

Major element discrimination diagrams (Fig. 2.5) suggest that the Laxmi Basin sediments are most similar to deposits found in the Quaternary and modern Indus River/delta/canyon, as well as the older sedimentary rocks from Indus Marine A-1 (Fig. 2.5). However, they are distinctly different from sediments on the modern western Indian shelf, largely derived from the Deccan Plateau and underlying units (Kurian et al., 2013). These geochemical data suggest that the sediments, most likely originated from the Indus River mouth.

We assessed the overall geochemical characteristics of the sediments by plotting the major element composition of each sample normalized to the upper continental crust (UCC; Fig. 2.8)(Taylor and McLennan, 1995). Most of the samples display a relatively uniform topology in these diagrams and similarity to both LGM sediments from the Indus Delta (KB-40-4) and, the modern Indus river (Thatta TH-1). Most of the samples show a similar major element composition compared to the UCC, with a consistent enrichment in TiO_2 , suggestive of a higher content of rutile grains. There are also relative depletions in CaO and Na_2O , as well as P_2O_5 , implying both a lower plagioclase and apatite content relative to the UCC. The systematically lower abundance of plagioclase and apatite likely reflects chemical weathering in the floodplains prior to deposition in the ocean, because these phases are less stable under conditions dominated by chemical weathering (Guidry and Mackenzie, 2000; White and Brantley, 1995). However, all samples show this effect and there is a general consistency in the overall composition, we conclude that we are comparing sediments of a similar bulk character.

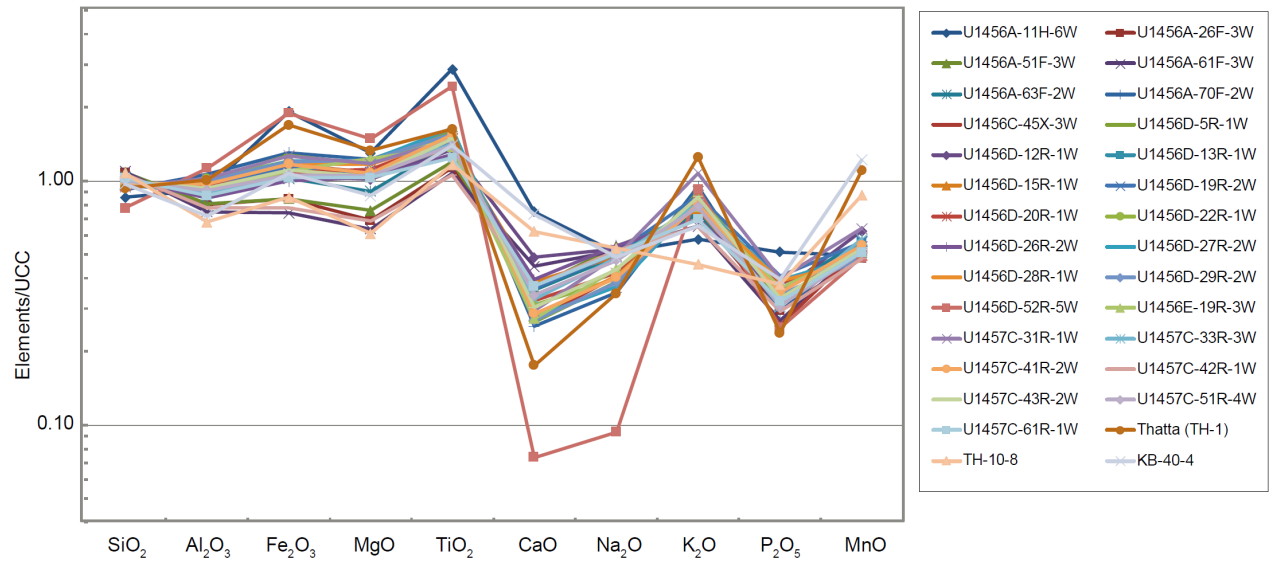


Figure 2.8. Upper continental crust normalized compositions of the samples whose zircons are the focus of the study. Bulk settlement compositions are normalized according to the average of the continental crust from Taylor and McLennan (1995).

The geochemistry can be further investigated using a multidimensional scalar diagram plotting select critical elements (MDS; Fig. 2.9). Silica mimics the overall quartz content, while Al_2O_3 and Fe_2O_3 are proxies for the total content of mafic and felsic minerals. Zirconium is used as a proxy for sediment zircon fertility. We compared the geochemistry with data from two Quaternary samples from the submarine canyon due to the paucity of Zr data from the recent and Quaternary delta (Li et al., 2018). The results show overall similarities of all analyses from the Arabian Sea, but with some significant departures. Samples deposited at ~ 10.77 Ma and 0.93 Ma appear to be enriched in mafic minerals, possibly due to hydrodynamic sorting. A number of samples deposited at 8.09, 2.5, 1.92, 1.56 and 1.32 Ma, show enrichment in Zr (Fig. 2.9). It is noteworthy that these are generally younger sediment compared to others considered in this study. The youngest samples that are enriched in zircon might reflect erosion from sources that are more abundant in this mineral compared to those eroded earlier in the Miocene and Pliocene. Bulk analysis of sediments from the modern river systems indicates that the eastern tributaries,

draining Himalayan source regions, are generally enriched in zircon compared to the trunk Indus, flowing from the suture zone (Alizai et al., 2011). This is an indication that erosion from the Himalaya appears to have increased since the Late Miocene and potentially particularly after 2.5 Ma.

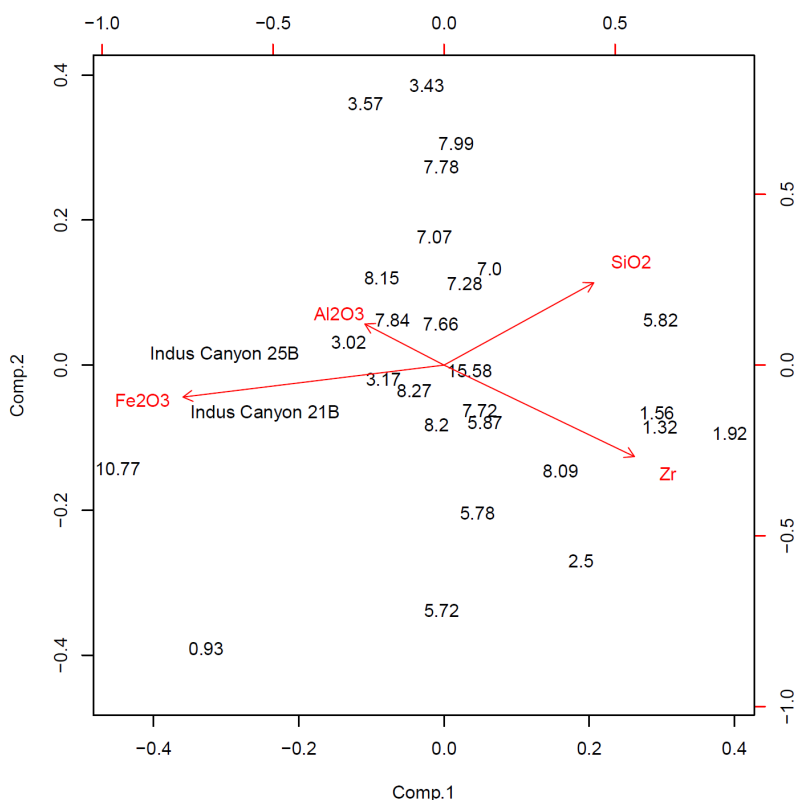


Figure 2.9. Principal component analysis (PCA) of the sediments considered in this study based on major element geochemical analysis and focusing on SiO_2 , Al_2O_3 , Fe_2O_3 and Zr . This figure shows the diversity and bulk settlement composition and the fact that many of the sediments cluster close to one another suggesting limited amounts of relative hydrodynamic sorting. Diagram was constructed using the statistical package of Vermeesch et al. (2016).

2.6.1 Changing Provenance

The zircon U-Pb age spectra are used to track the source evolution of sediment reaching the Arabian Sea and compared to bedrock zircon U-Pb age signatures of possible source areas (Fig. 2.6). The abundance of grains younger than 200 Ma correlates well with young bedrock from the Indus Suture Zone, particularly in Kohistan, the Transhimalaya and Karakoram, as well

as Nanga Parbat (Fig. 2.7). The abundance of these young zircon grains clearly points to sediment source from the Indus River and not from peninsular India, where no magmatism <200 Ma is known outside the Deccan Plateau. Detrital zircon grains older than 350 Ma also largely correlate with bedrock various sources known in the Himalaya. Detrital zircon age modes between 350 and 750 Ma have been correlated with bedrock sources in the Tethyan Himalaya (Alizai et al., 2011), although it is generally agreed that there is little real difference in terms of U-Pb ages, between Tethyan and Greater Himalaya zircon signatures (Gehrels et al., 2011). Consequently, zircons with ages between 350 and 1250 Ma could be derived from either source. The older samples show relatively low abundance of grains in this age range, but these increase significantly after ~7 Ma and become very abundant in the last few million years. Older grains, dating between 1500 and 2300 Ma, are particularly common in Lesser Himalayan sources, although they are also present in smaller amounts in the Tethyan and Greater Himalaya (DeCelles et al., 2000; Gehrels et al., 2011). These mainly Paleoproterozoic zircon grains are almost entirely absent from the Laxmi Basin Miocene samples, but show a marked increase after 3.57 Ma, becoming very abundant after 1.9 Ma (Fig. 2.6). We therefore interpret these patterns to indicate a progressive increase in erosion from the Himalaya starting after 7 Ma, with strong erosion from the Tethyan and Greater Himalayas. After 3 Ma there is a dramatic increase in erosional flux from the Lesser Himalaya, which have had a strong influence on the river system since the onset of the Holocene (Clift et al., 2004; Clift et al., 2008a).

If we only consider the zircon grains younger than 200 Ma then we can see that there is evidence of erosion, from both Kohistan and from the Karakoram, in most of the samples analyzed (Fig. 2.7). Kohistan is particularly noteworthy for having zircon dated between 40 and 70 Ma (Zhuang et al., 2018), although there are similar aged units in the Karakoram as well.

Zircon grains older than 70 Ma, but younger than 120 Ma are abundant throughout the section and should be almost exclusively derived from the Karakoram, based on comparison with bedrock data (Searle, 1996), and such grains are abundant throughout the section. The 3.17 Ma sample does not show the younger 40–70 Ma population, suggesting that it did not receive any significant material from Kohistan/Ladakh.

The youngest (<25 Ma) zircon grains are more enigmatic in terms of their provenance. While very young zircons are known from the present-day Nanga Parbat, these are generally younger even than the 25 Ma zircon U-Pb age component observed in many of the samples. The new data also show an increased influx from bedrocks sources with very young zircon after 3.1 Ma, as well as a brief appearance at around 5.78 Ma. It is possible that this increase after 3.17 Ma reflects the emergence of Nanga Parbat, although we cannot exclude the influence of other young sources in the southern Karakoram metamorphic belt, which also contains rocks of this age and have experienced very rapid exhumation in the last few million years (Wallis et al., 2016). Because the Deccan Plateau volcanic rocks were erupted rather quickly around 65 Ma, it is hard to completely exclude their influence because grains of a similar age are also known in Kohistan, and in the Karakoram. However, the erosion from the Deccan Plateau would not account for the other young grains and an influx from the Indian peninsula should result in a clear peak age at 65 Ma.

We also assessed the evolving provenance patterns of sediments in Laxmi Basin using MDS analysis of the detrital zircon U-Pb dates (Vermeesch, 2012). Figure 2.10A shows all the detrital samples data, along with a modern river and a delta sample (KB-40) dating from the LGM (Clift et al., 2008a). The MDS analysis shows clear and coherent patterns. Samples postdating 1.32 Ma, are relatively similar to the modern river. In contrast, the oldest samples plot

in a cluster suggesting similar Miocene provenance and a subsequent progressive shift from right to left with decreasing depositional age, although with some reversals, most notably at 3.17 and 3.57 Ma. This reflects an overall shift in the zircon age spectra through time. Nonetheless, the LGM sample has stronger similarities with sediments deposited on the fan during the Late Miocene. Earlier work argued that erosion during the LGM was focused in the Karakoram (Clift et al., 2008a) compared to the modern river or during the Holocene when the summer monsoon was strong (Caley et al., 2014; Fleitmann et al., 2003; Gupta et al., 2003). The new data suggest that older Miocene samples were also deriving their material from Karakoram sources, and followed by a progressive shift to more Himalayan sources, especially in the last few million years.

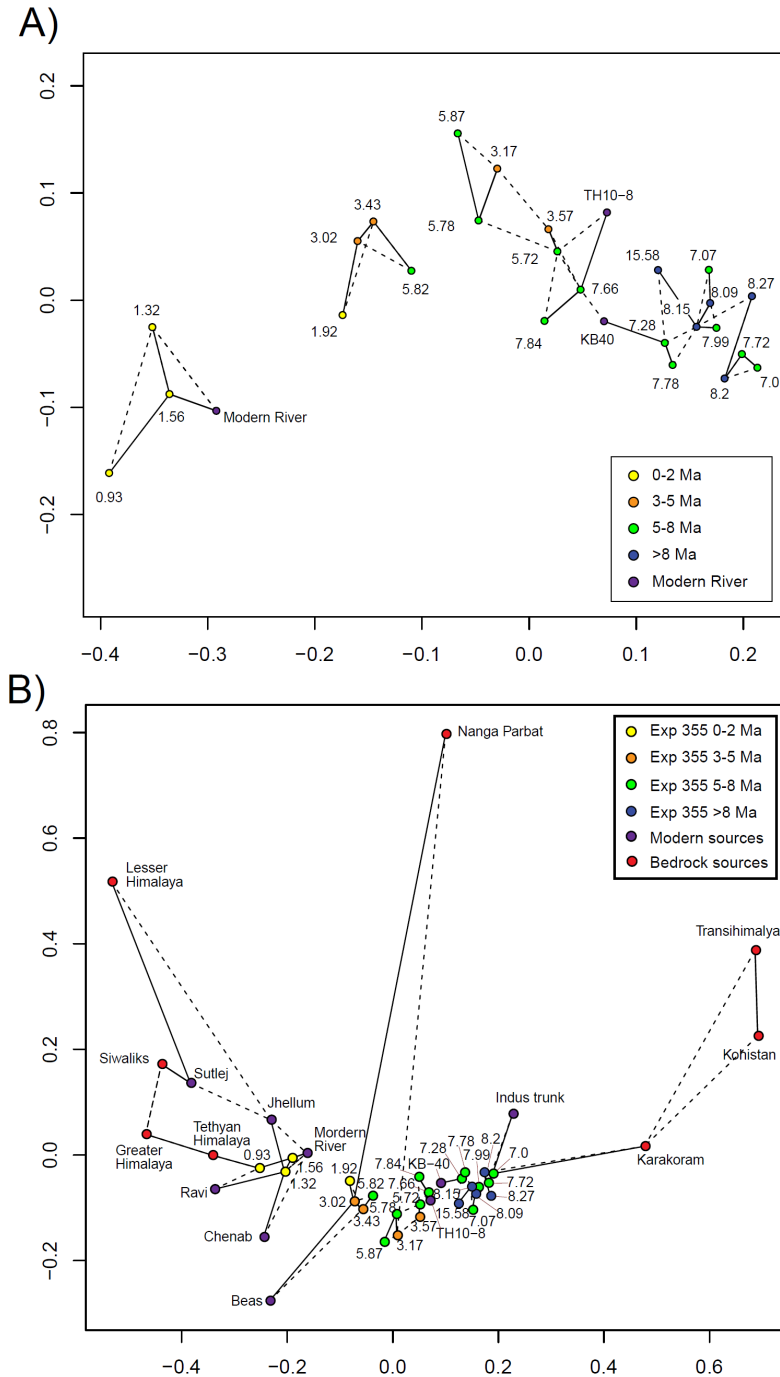


Figure 2.10. Multidimensional scalar (MDS) diagram made from zircon U-Pb age data showing (A) how the different sediment samples from IODP Expedition 355 compare with one another and (B) with the major source terranes in the Indus catchment, as well as the modern rivers for comparison. Sources of bedrock age data come from the literature, as described in Figure 2.6. Note that sediments older than 5 Ma plot towards the right in Figure 2.10B, in the direction of the Karakoram, whereas there is a progressive migration towards the left, towards Himalayan sources after that time. Diagram was constructed using the statistical package of Vermeesch et al. (2016).

The fact that the youngest turbidite sands are most similar to the modern interglacial river, and not the compositions of the Indus at the LGM, also implies that most of the sediment deposited in the Indus Fan has been eroded during times of strong monsoon, even if final deposition did not occur until the sea level fell during the onset of the subsequent glaciation. We envisage fast interglacial erosion generating great volumes of sediment, which is then mobilized, transported, and delivered to the delta as the rains strengthened (Jonell et al., 2017a). The sediment would then be stored on the shelf or in the upper canyon during sea level high stands before being eroded and redeposited as sea level fell (Li et al., 2018). This emphasizes the importance of monsoon intensity in controlling erosion and sediment delivery in the Western Himalaya.

We also compared the Arabian Sea sediments with known zircon ages from bedrock sources themselves. Figure 2.10B shows the progressive changes from the Miocene to the present and emphasizes the fact that the oldest detrital zircon signatures plot closest to sources in the Karakoram and have similarities with analyses from the trunk stream of the Indus, before it mixes with the Himalaya-draining Eastern tributaries, such as the Jhellum, Chenab, Ravi, Sutlej and Beas. Conversely, the youngest sediments plot on this diagram closest to Himalayan sources and have greater similarity not only to the modern river mouth, but also Himalayan tributaries such as the Ravi, Chenab and Jhellum rivers.

These data also argue for Nanga Parbat not being a very important contributor to the bulk sediment flux. Whether this is actually true or not is not entirely apparent because the bedrock analyses from Nanga Parbat were focused on igneous rocks in the center of that metamorphic massif and might not be representative of the net erosional flux from this particular source. However, the relationships displayed in Figure 2.10B can be readily explained as a simple

mixing between Karakoram and Himalayan sources, with a progressive shift towards the Himalaya through time.

2.6.2 Unmixing Sources

In order to further characterize the evolving source of sediments to the Indus Fan we employ the unmixing software of Sundell and Saylor (2017), which analyzes the U-Pb age spectra from each of the samples and compares them with the defined end-member compositions of the different source ranges compiled from the published literature. Data from the Tethyan, Greater and Lesser Himalaya were compiled from DeCelles et al. (2004). Data from the Karakoram from Le Fort et al. (1983), Parrish and Tirrul (1989), Schärer et al. (1990), Fraser et al. (2001) and Ravikant et al. (2009). Data from Nanga Parbat from Zeitler and Chamberlain (1991) and Zeitler et al. (1993). And data from the Transhimalayan is from Honegger et al. (1982), Schärer et al. (1984), Krol et al. (1996), Weinberg and Dunlap (2000), Zeilinger et al. (2001), Dunlap and Wysoczanski (2002), Singh et al. (2007), and Ravikant et al. (2009).

This unmixing method uses a Monte Carlo approach to estimate the contributions from the different sources that would be required to generate the modes and modal abundances of U-Pb ages seen in the sediment samples. Because this is relatively objective the method is considered robust for analyzing potential source contributions, assuming that the sources themselves have been well characterized. The results of our unmixing calculations show a progressive provenance evolution that consistent with that seen in the MDS diagram (Figs. 2.10 and 2.11). The very oldest sample deposited at 15.5 Ma shows a dominance of sediment eroded from the Karakoram and from the Tethyan and Greater Himalaya. Most of the Miocene samples dated between 8.2 and 5.78 Ma are more dominated by material from the Karakoram and, usually also show significant Tethyan and Greater Himalayan contributions. This is particularly

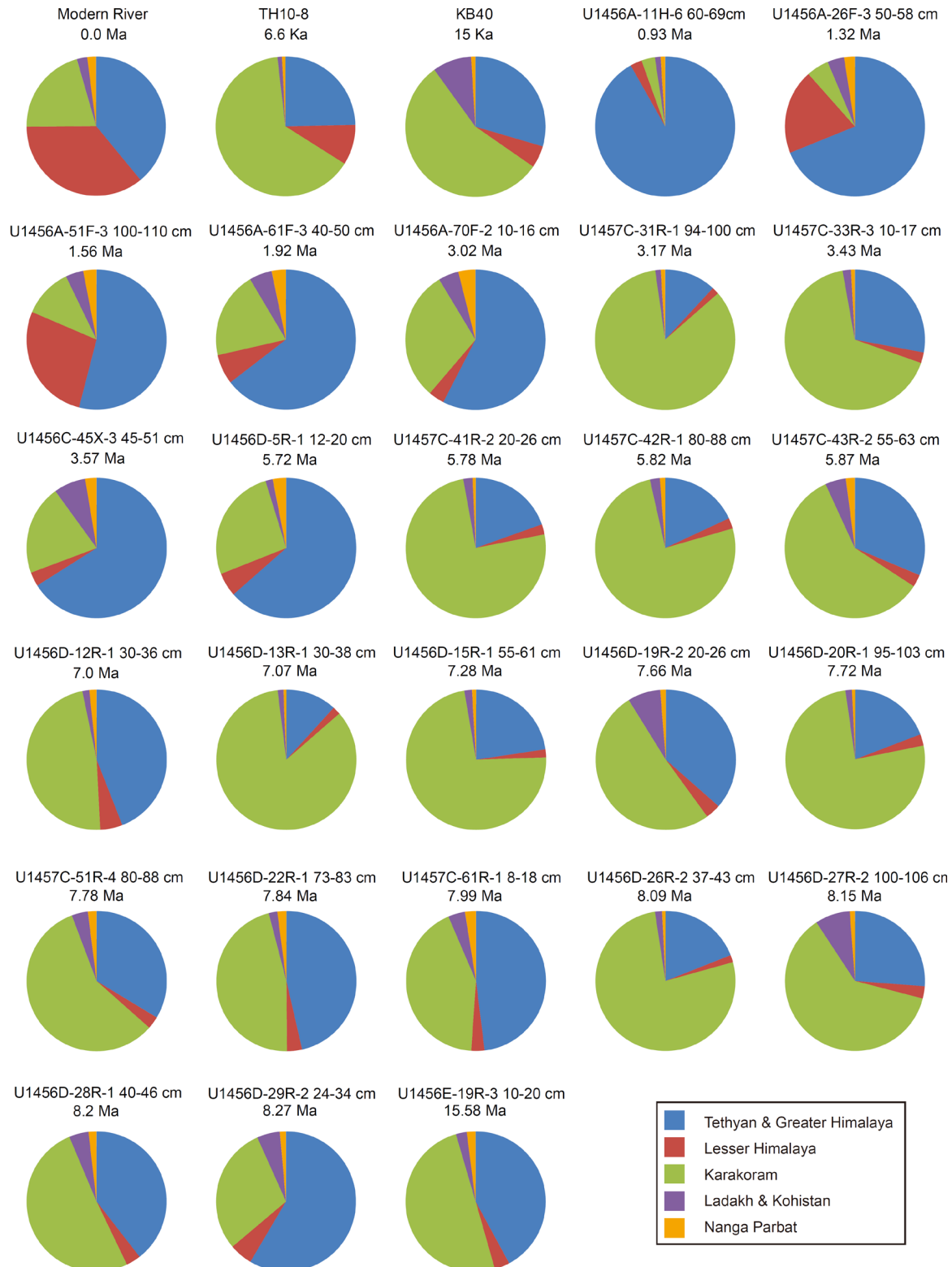


Figure 2.11. Pie diagrams showing the predicted source compositions of the zircon populations in sands from the Laxmi Basin as unmixed using the software of Sundell and Saylor (2017). Note the significant reduction in flux from the Karakoram starting around 3.02 Ma.

noteworthy at 7.99, 7.84, 7.0, 5.72 and 3.57 Ma. The proportion of Karakoram zircons shows a significant decrease after 3.17 Ma, which marks the high point in erosion from Karakoram sources.

From 3.02 Ma onwards the Himalaya dominate, with significant amounts of material from the Lesser Himalaya first appearing at 1.56 Ma. The sample dated as being deposited at 0.93 Ma is anomalous for being very similar in source signature to Tethyan and Greater Himalayan bed rocks sources. It is possible that this sediment is affected by erosion from peninsular India, although the presence of grains <200 Ma make this unlikely. The unmixing analysis mirrors the pattern shown by the MDS diagram, in showing a progressive long-term increase in erosion from the Himalaya relative to the Karakoram, although with significant departures making the evolution nonlinear. All of the samples contain a small amount of very young <25 Ma zircons. None of the samples analyzed show a close similarity with either the modern river or with early Holocene and LGM river compositions. Samples deposited at 6.6 and 15 ka are strongly enriched in Karakoram-derived grains compared to other sediments deposited since 3.2 Ma. The unmixing analysis suggests that erosion from the Himalaya has increased since the Late Miocene and that flux from the crystalline Lesser Himalaya has been important after 1,92 and at least since 1.56 Ma.

2.6.3 Relationships to Climate Change and Tectonics

The progressive increase in the relative flux from the Himalaya since the Middle Miocene represents the progressive unroofing of these units. Structural reconstructions of the Western Himalaya predict that prior to 5.4 Ma the Greater and Lesser Himalaya were not exposed (Webb, 2013) implying that the Himalayan contribution was derived entirely from the Tethyan Himalaya during the Miocene. As we are not able to distinguish between Tethyan and

Greater Himalaya we focused on the first appearance of significant amounts of Lesser Himalayan detritus after 1.6 Ma. These 1500–2300 Ma zircon components are typical of the crystalline Inner Lesser Himalaya (Gehrels et al., 2011), which have traditionally been considered to have been exposed before 1.6 Ma. The study of the Siwalik Group in the area of the Beas River Valley indicated an initial exposure of these units around 9 Ma and significant exposure by 6 Ma based on Nd isotope data (Najman et al., 2009). Our data suggest that this exposure may only reflect the local situation in the paleo-Beas River, but that widespread regional exposure of the Inner Lesser Himalayan units comes somewhat later. It is possible that enhanced erosion along the river valley brought these units to the surface earlier in this particular location, but without impacting the wider geology of the Western Himalaya.

Our result also appears to be in contrast to the suggestion by Myrow et al. (2015) that the Inner Lesser Himalaya were widely exposed and eroding by 16 Ma. Although we cannot exclude this from happening further east in the Ganges Basin our data do not support this in the region the western Himalaya until much later.

The timing of Lesser Himalayan unroofing may reflect the development of the thrust duplex, which characterizes the structure of the Lesser Himalaya in this area (Huyghe et al., 2001; Webb, 2013). Integrated metamorphic and geochronologic data indicate rapid cooling of the Inner Lesser Himalaya before 6 Ma, following peak metamorphism around 10 Ma (Caddick et al., 2007; Thiede et al., 2009), consistent with the reconstructed erosion history that predicts final unroofing after 6 Ma, largely starting around 1.9 Ma. This timing is younger than reconstructed by Colleps et al. (2018), (Colleps et al., 2019) who favor exposure of the Outer Lesser Himalaya after 16 Ma and of the Inner Lesser Himalaya after 11 Ma, although this study

was again located in an area farther east in the Ganges catchment and need not apply to the drier Indus basin.

Uplift of the duplex created a topographic barrier, susceptible to erosion as monsoon rains were focused along this topographic front. The increasing Himalayan character of the total zircon input comes at a time when the summer monsoon rains were generally weakening after ~8 Ma (Clift, 2017; Dettman et al., 2001). Moisture delivery to this area from the winter westerlies has also been shown to be reduced around 7 Ma (Vögeli et al., 2017). In the recent geologic past, since the LGM, strong Himalayan rather than Karakoram erosion has occurred when the summer monsoon was strong, during interglacial times and not when it was weak during glacial times (Clift et al., 2008a). The increase in Himalayan erosion over longer periods of time, correlating with the weakening monsoon, is the opposite of this shorter-term trend and may indicate that solid Earth tectonic forces, rather than climate, dominate the long-term evolution of erosion.

All of the samples show the presence of very young zircons (<25 Ma) that possibly correlate with bedrock dates from Nanga Parbat, although these are never very numerous. It is also possible that some of these young ages may in fact be derived from erosion of fast exhuming rocks in parts of the southern Karakoram (Wallis et al., 2014). However, even if that this material was derived from Nanga Parbat, the low abundance of such zircon grains in the Laxmi Basin sediments would suggest that this massif was not generating very high proportions of sediment in the trunk Indus river, unlike the situation in the eastern syntaxis (Garzanti et al., 2004; Stewart et al., 2008). This is consistent with the U-Pb zircon ages in the modern river downstream of Nanga Parbat (Alizai et al., 2011) that show neither many <25 Ma zircons or older 1500–2300 Ma grains that would be associated with less deeply buried rocks but with the Lesser Himalayan affiliation typically made with Nanga Parbat (Whittington et al., 1999).

These new zircon U-Pb data also shed light on drainage development in the Indus basin. It had previously been argued that changes in the sediment provenance, especially after 6 Ma, might reflect the capture of the Himalaya-draining eastern tributaries of the Indus (Clift and Blusztajn, 2005). Prior to that time the trunk stream, derived from North of the Himalaya, would have been flowing independently. The fact that our budgets, calculated in a variety of ways, always show significant volumes of material from the (Tethyan) Himalaya means that this drainage capture model is not realistic, as the trunk Indus river itself today carries very little material of that character (i.e., 350–1250 Ma)(Alizai et al., 2011). This lack of older zircon grains in the trunk Indus requires that this detritus was mostly derived from the Eastern tributaries, at least back to 15.5 Ma. Foreland basin records adjacent to the mainstream Indus also preclude large flux from the Tethyan Himalaya via that stream in the geologic past (Chirouze et al., 2015). An alternative model suggesting that the provenance change, as indicated by a change to more negative ϵNd values after 6 Ma, is driven by the uplift of Karakoram and the Nanga Parbat massif is also not sustainable (Chirouze et al., 2015). The Karakoram are relatively ϵNd positive (Clift et al., 2002c) and would cause the mixed sediment in the fan to shift in the opposite direction if this region was dominating.

We compare our detrital zircon budget with that of the Nd budget published by Clift et al. (2019b). Translating zircon budgets into rock erosion budgets is not due to bedrock zircon fertility variations. However, whole-rock geochemical analysis of Alizai et al. (2012) suggested that on average the eastern, Himalaya-draining tributaries are around 2.2 times more fertile in zircon than the trunk Indus. If we simply use the source percentages from the zircon unmixing calculation described above and the average ϵNd values for these different units then it is possible to predict the average composition of the bulk sediment through time. We use an ϵNd

value of -14.6 for the Greater and Tethyan Himalaya, -21.7 for the Lesser Himalaya, -9.3 for the Karakoram, -20 for Nanga Parbat and +5.1 for Kohistan and the Transhimalaya based on synthesis of the bedrock data, but especially the composition of river sediments that are derived from wide areas of these ranges (Clift et al., 2002c). Transhimalaya Nd data are from Rolland et al. (2002), Singh et al. (2002), and Khan et al. (1997). Greater and Lesser Himalayan data are from Ahmad et al. (2000), Deniel et al. (1987), Inger et al. (1993) and Parrish and Hodges (1996). Karakoram data are from Crawford and Searle (1992) and Schärer et al. (1990).

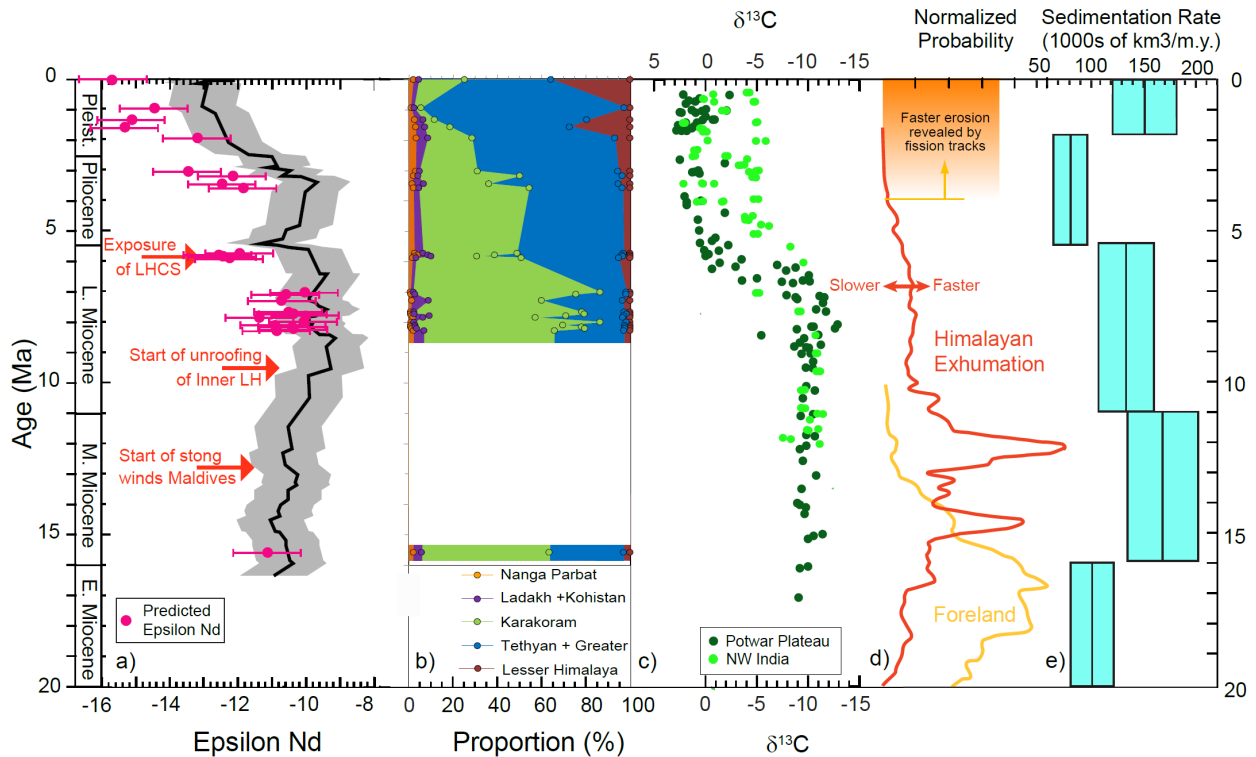


Figure 2.12. Comparison of climate, erosion and exhumation proxies in the Himalaya. (a) Smoothed Nd isotope history for the Indus River with grey background showing effective uncertainties from Clift et al. (2019b). (b) Breakdown of the sources of detrital zircons based on the unmixing procedure of Sundell and Saylor (2017). (c) Carbon isotope character of pedogenic carbonate in Pakistan as an indicator of dominant vegetation in the Potwar Plateau of Pakistan (Quade et al., 1989), and NW India (Singh et al., 2011). (d) Relative exhumation rates of the Greater Himalaya tracked by bedrock Ar-Ar dating (Clift et al., 2008b) and zircon fission track from foreland basin sediment (Chirouze et al., 2015). (e) Rates of sediment supply to the Arabian Sea calculated from regional seismic (Clift, 2006).

The results of this estimate are shown next to the smoothed long-term Nd isotope evolution from bulk sediment analysis (Clift et al., 2019b) (Fig. 2.12). We account for the ± 1 ϵ Nd uncertainty value estimated from the Indus Quaternary (Jonell et al., 2018). We note that before 6 Ma the estimates overlap with the bulk sediment record that was derived from muddy lithologies, suggesting similar sources. After this time both the estimated and measured ϵ Nd values become more negative. However, the predicted Nd isotope compositions are always more negative than those measured from the bulk sediment and this implies an over estimation in the flux from isotopically negative sources, i.e. the Himalaya, using the zircon method. This is consistent with the geochemical data from Alizai et al. (2011) indicating that the Himalaya are more abundant in zircon than the Karakoram, but have similar concentrations in Nd. As a result, our zircon budget (Fig. 2.12) represents an overestimate of the influence of the Himalaya compared the Karakoram through time in terms of total rock eroded. Nonetheless, the overall trends in the two data sets are consistent and the reconstruction of increasing Himalayan erosion since the 5.7 Ma is robust.

2.7 Conclusions

Sandy and silty sediments recovered from the Laxmi Basin in the Eastern Arabian Sea provide a relatively continuous erosional record derived from the Indus River and spanning the last 15.5 m.y. In this study samples were taken from IODP Sites U1456 and U1457 for geochemical and geochronological analyses. Detrital zircon grains were dated by U-Pb methods to determine their provenance. The sediments themselves are defined as wackes and are relatively muddy in composition, with bulk sediment characters similar to those found in the Quaternary delta of the Indus and in its submarine Canyon. They are readily distinguishable from sediments on the Western Indian Shelf, confirming their derivation from the Indus River and not

the peninsula. The sediments are mostly of silty sand to silt size, with only a few being classified as fine sand. Although the sediments are relatively depleted in Ca, Na and P relative to the upper continental crust this reflects chemical weathering during transport and does not affect the provenance analysis conducted here.

Detrital zircon U-Pb ages fall into a number of categories which can be correlated with bedrock sources in the Himalaya. The ubiquitous presence of zircon grains younger than 200 Ma requires the sediments to be the erosional products of the Himalaya/Karakoram and not peninsular India. The progressive increase in zircon grains dating at 350–1250 Ma, as well as 1500–2300 Ma, means that the erosional flux from the Himalaya increased through the studied time interval. Almost all the samples contain grains that could be derived from the Karakoram or from Kohistan, and there is an appearance of very young zircon grains, younger than 25 Ma, that is especially marked since 3.17 Ma. Such young zircon grains may be from Nanga Parbat or parts of the eastern Karakoram. Statistical analysis shows that there are a number of groupings and a progressive increase in Himalayan erosion through time, so that since 1.32 Ma the sediments are very similar to the modern Indus River, but not like the glacial-era river, which has more similarities with the Miocene Laxmi Basin samples and with enhanced erosion in the Karakoram. Detrital zircon population unmixing techniques allow us to objectively confirm the progressive increase of Himalayan erosion relative to the Karakoram, and the sharp jump in erosion from the Lesser Himalayas after 1.92 Ma but before 1.56 Ma. This is somewhat younger than the anticipated unroofing of these ranges derived from earlier studies, although much of the earlier data comes from further east in the Ganges catchment. The shift to more Himalayan erosion through time occurs as the monsoon climate weakened and this suggests that the

changing patterns of erosion are largely a function of solid earth tectonic forces building topography, rather than a response to climate change

CHAPTER 3. SLOWING RATES OF REGIONAL EXHUMATION IN THE WESTERN HIMALAYA: FISSION TRACK EVIDENCE FROM THE INDUS FAN

3.1 Introduction

If we are to understand how the evolving climate of Asia has impacted the tectonic development of the Himalaya and Tibetan Plateau, or vice versa, we must use the sedimentary records in basins adjacent to these mountain ranges in order to reconstruct the long-term history of exhumation caused by erosion. Thermochronology measurements on bedrock currently exposed at the surface only provide constraints on the most recent stages of the cooling history of those particular units. By definition older bedrock has been removed so that the older erosional history can only be reconstructed through study of the sedimentary record. However, interpreting the sedimentary record can be complicated if burial of sediment resets sensitive low temperature thermochronometers, eliminating the cooling history of the source bedrocks (Carter, 1999). Although higher temperature methods (e.g., muscovite Ar/Ar dating) (Szulc et al., 2006; White et al., 2002) can be useful in examining past erosion and are resistant to resetting, these have the disadvantage of being less sensitive to changes in the rates of exhumation by erosion because they require a greater amount of exhumation between isotopic closure and exposure at the surface. Nonetheless, detrital apatite fission track (AFT) can also have resolution problems, because single grain ages are often imprecise, especially for young grains with very low track counts.

A number of studies have examined the history of erosion in the Himalaya using the foreland basin sediment record, in particular sedimentary rocks belonging to the Miocene-Pliocene Siwalik Group (Baral et al., 2015; Bernet et al., 2006; Cervený et al., 1989; Chirouze et al., 2015; Chirouze et al., 2013; Ghosh and Kumar, 2000; Najman, 2006; van der Beek et al.,

2006). Although this stratigraphic unit has provided useful information about past patterns and rates of erosion, the quality of information from AFT thermochronology has been limited due to resetting caused by post-deposition burial, especially in the lower parts of the section (van der Beek et al., 2006). In addition, the foreland basin sequence at any one particular location will typically reflect the rivers that are flowing from the Himalaya at that point, providing a localized record. Although this may be very useful for examining single rivers, it is often hard to judge how effective each sequence might be in reconstructing erosion at the regional scale. For example, because the trunk Indus River lies on the western edge of the drainage, Siwalik Group rocks in the eastern parts of the catchment provide no information about how its sediment load may have evolved.

In this study we present AFT data from new scientific boreholes in the western Indian Ocean in order to derive a regional image of changing erosion rates within the Western Himalayas since ca. 15.5 Ma, and in particular after 9 Ma. Use of the International Ocean Discovery Program (IODP) boreholes in the Laxmi Basin (Fig. 3.1)(Pandey et al., 2016c) has the advantage that the sediment thickness is low (<1.1 km) and the geothermal gradient is $53^{\circ}\text{C}/\text{km}$ and $57^{\circ}\text{C}/\text{km}$ at Sites U1456 and U1457 respectively (Pandey et al., 2016c). Although these are high values, the low thickness means that even the base of the section will fall below temperatures required to cause significant annealing or resetting of fission tracks in apatite, i.e. $\sim 60\text{--}110^{\circ}\text{C}$ (Green, 1989) and therefore the original cooling history of the bedrock sources will be preserved. All but one of the samples were recovered from depths shallower than 722 mbsf, implying no more than 38°C burial temperature at the present maximum burial depth. The deepest sample (U1456E-19R-3, 10-20 cm) was recovered from a depth of 1103 mbsf but the fission track ages are older than the depositional age, indicating that this too is not reset.

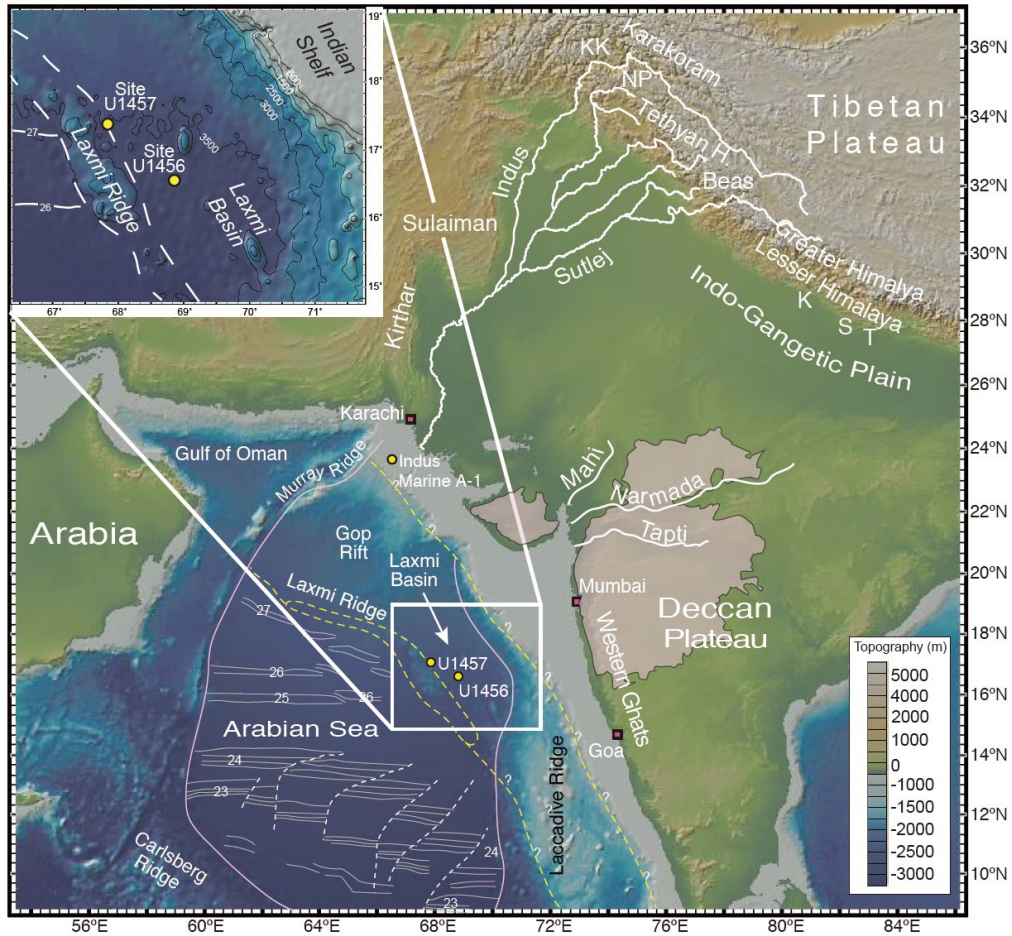


Figure 3.1. Shaded bathymetric and topographic map of the Arabian Sea area showing the location of the drilling sites within the Laxmi Basin. Map also shows the primary source ranges and the major tributary systems of the Indus River, as well as smaller peninsular Indian rivers that may have provided material to the drill sites. Magnetic anomalies are from Miles et al. (1993). KK = Karakoram; NP = Nanga Parbat; K = Karnali; S = Surai Khola; T = Tinau Khola.

Constraining rates of bedrock source cooling caused by erosion driven by rock uplift can help identify locations of active tectonics and the rates and patterns of mountain growth. However, climate change may also play a role in relation to variations in precipitation rate that are linked to the intensity of the South Asian monsoon. This is known to have varied significantly throughout the Cenozoic (Betzler et al., 2016; Gupta et al., 2015; Kroon et al., 1991; Prell et al., 1992; Quade et al., 1989). Debate continues concerning the history of strengthening of the South Asian monsoon, but increasingly there is a consensus that the climate

began to dry after 8 Ma (Behrensmeyer et al., 2007; Clift, 2017; Singh et al., 2011), following a period of maximum intensity in the middle Miocene (Clift et al., 2008b). It has been suggested that it was the strength of the summer monsoon rains during the middle Miocene that resulted in rapid exhumation of the Greater Himalaya at that time driven by strong erosion (Clift et al., 2008b). If that is true, one might predict that the rate of erosion since that time was also coupled with monsoon intensity. However, work within the foreland sedimentary rocks of the Siwalik Group in Nepal shows that the rate of exhumation in the central Nepalese Himalaya remained essentially constant after 8 Ma (van der Beek et al., 2006). In contrast, the same study argued that rates of erosion had increased between 8 and 3 Ma in Western Nepal, despite the fact that both sections lie within the Ganges drainage system, which is wetter than the Indus basin considered here (Bookhagen and Burbank, 2006). In contrast, AFT data from Ocean Drilling Program (ODP) Sites 717 and 718 on the Bengal fan showed that rapid rates of exhumation of the bedrock sediment sources to the Ganges-Brahmaputra basin have been ongoing since the middle Miocene (Corrigan and Crowley, 1990). Reappraisal of this data by van der Beek et al. (2006) indicated relatively constant lag times (i.e., the difference between the depositional age and the AFT cooling) since 9 Ma, suggestive of uniform erosion rates.

There are few constraints over how erosion rates might have changed during the Pleistocene. While some have argued that the onset of northern hemisphere glaciation (NHG) has intensified rates of erosion during the last couple of million years (Clift, 2006; Métiévier et al., 1999; Zhang et al., 2001), other workers, drawing on cosmogenic isotope data (Willenbring and von Blanckenburg, 2010), suggest that continental weathering rates have remained essentially steady-state during the Neogene and especially the Plio-Pleistocene. Such an observation does not require faster sediment delivery to the ocean, although this was proposed from a global data

compilation implying a steady state supply of sediment spanning tens of millions of years (Sadler and Jerolmack, 2014). Here we provide the first detailed AFT constraints on erosion rates in the Western Himalaya, within the Indus basin, in order to see whether the temporal evolution in that region mirrors that found in Nepal and in the Ganges-Brahmaputra drainage basin.

Over the period since 15.5 Ma considered by this study, the Western Himalaya have experienced significant tectonic changes. The Lesser Himalayas were brought to the surface because of duplexing above the Main Boundary Thrust (MBT) (Huyghe et al., 2001; Mugnier et al., 1994), coupled with focused erosion since the Late Miocene. There is continued debate about when unroofing of the Lesser Himalaya might have occurred. Early studies suggested that the MBT initiated around 10–11 Ma (Meigs et al., 1995) allowing the Lesser Himalayan Duplex to form and be uplifted and then eroded. Work from the Siwalik Group in Northwest India points to an initial exposure of the Lesser Himalaya at ca. 9 Ma followed by more widespread exposure after 6 Ma (Najman et al., 2009), although this may be only applicable to the Beas River area (Fig. 3.1). Nd and zircon U-Pb data from IODP Sites U1456 and U1457 now suggest initial exposure after 8.3 Ma and widespread unroofing after 1.9 Ma (Clift et al., 2019b). Other potentially important sources of sediment to the submarine fan include the Nanga Parbat massif that is located next to the Indus River in the Western Syntaxis (Fig. 3.1). Provenance studies from the Indus River downstream of Nanga Parbat indicate that this massif has only limited sediment generating potential at the present time (Clift et al., 2002c; Garzanti et al., 2005; Lee et al., 2003), despite the start of uplift ca. 6 Ma (Chirouze et al., 2015). In contrast, its eastern equivalent (Namche Barwe) is believed to be a major source of sediment to the Brahmaputra (Garzanti et al., 2004; Stewart et al., 2008). Bedrock thermochronology measurements testify to Nanga Parbat being very rapidly exhumed in the recent geologic past (Zeitler et al., 1993), but

this does not seem to generate much of the sediment in the river downstream of that point (Alizai et al., 2011). Zircon fission track (ZFT) and Nd isotope data in the western part of the Siwalik ranges in Pakistan indicate that this massif and other Himalayan units in the western syntaxis may have become more important as a sediment source after around 6 Ma (Chirouze et al., 2015). The sedimentary record in the Indus Fan may also been affected by large-scale drainage capture. Nd isotope measurements on samples from an industrial drill site on the Indus shelf, as well as limited ODP samples from the upper fan, were used to argue that the eastern tributaries of the Indus River were only been captured into the modern system after 5 Ma (Clift and Blusztajn, 2005). However, this is contradicted by combined ZFT and Nd isotope data that supports relative stability in drainage patterns but changing rates of erosion in the Himalaya and Karakoram since the Miocene (Chirouze et al., 2015).

3.2 Regional Setting

IODP Expedition 355 sampled sediments from the Indus Fan deposited within the Laxmi Basin offshore western India (Fig. 3.1). Although the Laxmi Basin is separated from the main Arabian Basin by the Laxmi Ridge, the bathymetry of the basin and the orientation of active channels (Mishra et al., 2016) indicate that the primary source of sediment to the coring locations would be the Indus River, with lesser input from peninsular rivers such as the Tapti and Narmada. Initial petrographic-based interpretations of the sediments made shipboard during the expedition suggested that there were limited amounts of sediment delivery from Western India, and tend to be found only in the youngest parts of the section (Pandey et al., 2016a).

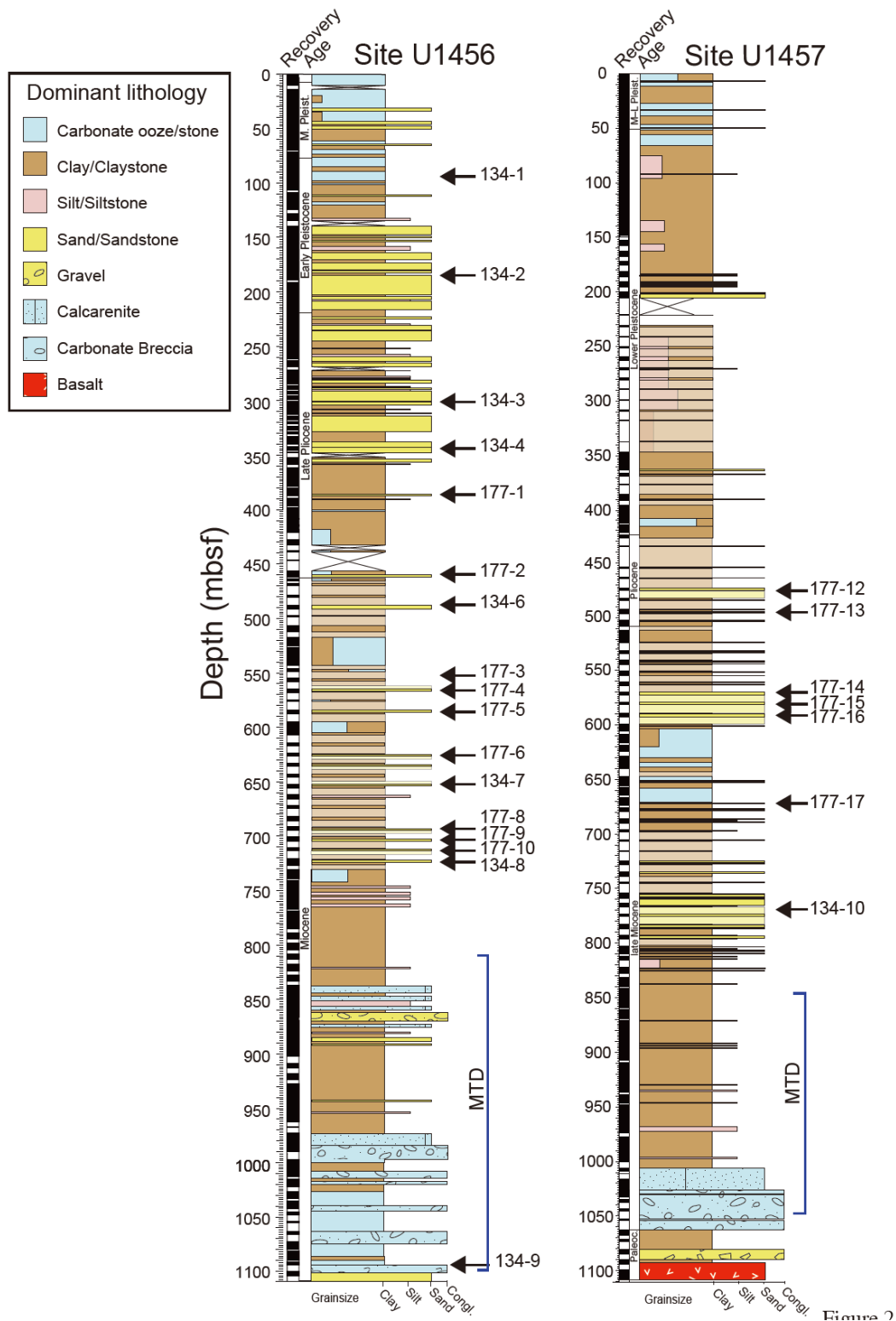


Figure 3.2. Simplified lithologic logs of the two drill sites considered in this study. Black arrows show the location of the samples analyzed. MTD = Mass Transport Deposit.

The Laxmi Basin itself dates from the latest Cretaceous when India began to separate from the Seychelles (Bhattacharya et al., 1994; Pandey et al., 1995). Following the onset of India-Asia collision, ca. 50–60 Ma (DeCelles et al., 2014; Najman et al., 2010), the uplift and erosion of the Himalaya have resulted in a huge flux of sediment into the Arabian Sea. Although the Indus Fan is much smaller than the Bengal Fan, it is nonetheless the second largest sediment body on Earth and is believed to have accumulated sediment eroded from the mountains at least since 45 Ma (Clift et al., 2001).

Drilling during Expedition 355 recovered a section that penetrated to basement at Site U1457 (Fig. 3.2), but because of large-scale mass wasting (Dailey et al., 2019) the most complete erosional record only spans the last 10.8 m.y., with much of the older sediment either missing, due to erosion or non-deposition, or not sampled. Coring was undertaken at two sites, Site U1456 in the central part of the Laxmi Basin, as well as at Site U1457 located on the flanks of the Laxmi Ridge (Fig. 3.1). In general, the sediment at Site U1456 tended to be coarser-grained (Fig. 3.2). The entire sedimentary cover is also more complete at Site U1456 than at Site U1457. The coarse-grained, sandy sediment that forms the focus of this study was taken from both sites and is the product of turbidity current flows. Nonetheless, significant parts of the section are fine-grained muddy facies together with carbonate-rich intervals and these are interbedded with sandy turbidite material caused by sedimentation on depositional lobes within the middle fan (Fig. 3.2). There are also interbeds of calcareous-rich pelagic material that reflects times when the main Indus-sourced depocentre was located to the west of the Laxmi Ridge, so that the primary clastic flux from the Indus River was not reaching the drilling area. Because the drilling sites are located above the carbonate compensation depth (CCD), it was possible to date the age of sedimentation using a combination of nannofossil and foraminifera biostratigraphy

coupled with magnetostratigraphy that provides a relatively robust age model (Pandey et al., 2016c). Drilling was able to penetrate a thick mass transport deposit (MTD) deposited just before 10.8 Ma (Calvès et al., 2015), but at Site U1456 coring was able to recover a short interval below the MTD, providing a single sample that is substantially older than any of the other sediments recovered and which has been approximately dated at 15.5 Ma (Pandey et al., 2016a). At Site U1457 all fan sediment predating the mass wasting event had been removed so that our studies are restricted to the section younger than 10.8 Ma at that location.

We apply the AFT thermochronology dating method to this sediment in order to understand how the source rocks that provided material to the Arabian Sea evolved in their cooling and exhumation history since the middle Miocene. Fission track studies are a well-established method for looking at bedrock unroofing and potentially also sediment provenance if the source regions themselves are sufficiently well defined and if cooling ages are relatively constant in a source area (Carter, 1999; Green et al., 1989; Laslett et al., 1987). In a complex area like the western Himalaya, cooling ages vary across tectonic blocks and through time so that the interpretation of the AFT ages is contingent on supporting provenance data and cannot be used to constrain provenance by themselves. In this study we draw on zircon U-Pb age data from these same boreholes (Clift et al., 2019b). Simple comparison of modern bedrock AFT ages and detrital AFT ages in sediments more than around a million years old is not justifiable because the cooling rates of the bedrock will change on such timescales.

3.3 Methodology

Low-temperature AFT central ages reflect cooling through 60–110°C over time scales of 1–10 m.y. (Green et al., 1989). Fission tracks form continuously through time at an abundance determined by the concentration of ^{238}U in the host apatite grain (Haack, 1977). The method has

been widely used and is effective for studying exhumation history and provenance of shallow-buried sediment (Carter, 2007; Gallagher et al., 1995). Samples were taken where suitable sandy material was available at both IODP sites, as shown in Figure 3.2 and Table 3.1. Some of the apatites were extracted from the same samples analysed for detrital zircon U-Pb dating by Clift et al. (2019b).

Following mineral separation AFT analysis was performed at the London Geochronology Centre based at University College, London, UK. Polished grain mounts of apatite were etched with 5N HNO₃ at 20°C for 20 seconds to reveal the spontaneous fission-tracks. Subsequently the uranium content of each crystal was determined by irradiation, which induced fission in a proportion of the ²³⁵U. The induced tracks were registered in mica external detectors. The samples for this study were irradiated in the FRM 11 thermal neutron facility at the University of Munich, Germany. The neutron flux was monitored by including Corning glass dosimeter CN-5, with a known uranium content of 11 ppm, at either end of the sample stack. After irradiation, sample and dosimeter mica detectors were etched in 40% HF at 20°C for 25 minutes. Only crystals with sections parallel to the c-crystallographic axis were counted, as these crystals have the lowest bulk etch rate. To avoid biased results through preferred selection of apatite crystals the samples were systematically scanned, and each crystal encountered with the correct orientation was analyzed, irrespective of track density. The results of the fission track analysis are presented in Table 3.2 and Supplementary Table in Appendix B. The chi test, used to detect extra Poisson variation, does not show how much over dispersion to be present in the dataset. Therefore, we include the central age and its percentage relative error because this provides a measure of the extent of age dispersion. It is also useful when there are low track counts (young ages) as the chi test is unreliable under these conditions.

Table 3.1 Apatite fission track sample list

Lab No.	IODP Sample Name	Depositional Age (Ma)	Depth (mbsf)	AFT Minimum Age (Ma)	2 σ (Ma)	Number of grains	Zircon U-Pb ages
134-1	U1456A-11H-6 60-69 cm	0.93	97.60	20.70	3.80	24	Yes
134-2	U1456A-26F-3 50-58 cm	1.32	185.91	3.60	0.85	62	
134-3	U1456A-51F-3 100-110 cm	1.56	302.09	3.90	1.40	44	Yes
134-4	U1456A-61F-3 40-50 cm	1.92	345.32	6.50	1.10	45	Yes
177-1	U1456A-70F-2 10-16 cm	3.02	386.73	5.70	1.50	75	Yes
177-12	U1457C-31R-1 94-100 cm	3.17	474.25	5.10	1.80	52	
177-13	U1457C-33R-3 10-17 cm	3.43	499.10	6.40	1.20	49	Yes
177-2	U1456C-45X-3 45-51 cm	3.57	459.09	8.48	0.75	65	
134-6	U1456D-5R-1 12-20 cm	5.72	487.98	9.30	2.20	50	Yes
177-14	U1457C-41R-2 20-26 cm	5.78	572.16	5.91	0.83	46	
177-15	U1457C-42R-1 80-88 cm	5.82	580.40	6.40	1.10	55	
177-16	U1457C-43R-1 55-63 cm	5.87	590.53	9.00	1.20	57	Yes
177-3	U1456D-12R-1 30-36 cm	7.00	556.45	6.60	1.50	52	
177-4	U1456D-13R-1 30-38 cm	7.07	566.35	13.20	7.30	30	Yes
177-5	U1456D-15R-1 55-61 cm	7.28	586.00	15.80	1.90	50	
177-6	U1456D-19R-2 20-26 cm	7.66	625.73	11.90	1.80	40	
177-17	U1457C-51R-4 80-88 cm	7.78	675.16	12.00	3.20	51	
134-7	U1456D-22R-1 73-83 cm	7.84	653.50	15.48	0.97	69	Yes
134-10	U1457C-61R-1 8-18 cm	7.99	769.36	14.00	3.10	42	
177-8	U1456D-26R-2 37-43 cm	8.09	693.78	14.90	1.60	55	
177-9	U1456D-27R-2 100-106 cm	8.15	704.43	16.97	0.98	69	
177-10	U1456D-28R-1 40-46 cm	8.20	711.98	14.20	1.80	72	
134-8	U1456D-29R-2 24-34 cm	8.27	722.60	11.80	5.30	64	Yes
134-9	U1456E-19R-3 10-20 cm	15.58	1102.95	20.20	1.40	75	Yes

Table 3.2. Summary of apatite fission track analytical data.

	Lab No	Sample	Dep. Age	No. of	Dosimeter								Central Age	Minimum Age	P2 Age
			(Ma)	grains	ρ_d	Nd	ρ_s	Ns	ρ_i	Ni	$P\chi^2$	RE%	(Ma)	(Ma)	(Ma)
A	134-1	U1456A-11H-6 60-69 cm	0.93	24	1.583	4388	0.798	218	3.858	1440	0	111	61.2±14.9	20.7±3.8	223±28
B	134-2	U1456A-26F-3 50-58 cm	1.32	62	1.583	4388	0.108	308	3.555	11836	0	79	7.3±0.9	3.6±0.9	13.4±1.3
C	134-3	U1456A-51F-3 100-110 cm	1.56	44	1.583	4388	0.191	298	6.856	12192	0	70	6.8±0.9	3.9±1.4	7.2±0.9
D	134-4	U1456A-61F-3 40-50 cm	1.92	45	1.583	4388	0.178	349	5.498	11649	0	35.2	8.1±35.2	6.5±1.1	
E	177-1	U1456A-70F-2 10-16 cm	3.02	75	1.215	3367	0.206	446	4.539	11389	0	54.2	8.2±0.7	5.7±1.5	15.5±2.3
F	177-12	U1457C-31R-1 94-100 cm	3.17	75	1.215	3367	0.171	326	4.710	10359	0	51.5	6.8±0.6	5.1±1.8	12.7±2.1
G	177-13	U1457C-33R-3 10-17 cm	3.43	49	1.215	3367	0.211	313	4.528	8601	0	50.8	7.7±0.8	6.4±1.2	
H	177-2	U1456C-45X-3 45-51 cm	3.57	65	1.215	3367	0.349	474	4.737	9089	0	160	12.9±2.7	8.5±0.8	
I	134-6	U1456D-5R-1 12-20 cm	5.72	50	1.583	4388	0.272	314	6.211	7830	0	42.4	11.2±1.0	9.3±2.2	
J	177-14	U1457C-41R-2 20-26 cm	5.78	46	1.215	3367	0.186	236	3.801	6317	0	180	11.4±3.1	5.9±0.8	
K	177-15	U1457C-42R-1 80-88 cm	5.82	55	1.215	3367	0.179	361	4.073	9719	0	160	7.8±0.8	6.4±1.1	15.9±2.6
L	177-16	U1457C-43R-1 55-63 cm	5.87	80	1.215	3367	0.389	528	5.048	8747	0	12.4	13.7±1.6	9.0±1.2	29.4±1.2
M	177-3	U1456D-12R-1 30-36 cm	7.00	52	1.215	3367	0.241	347	4.004	6997	0	53.8	10.7±1.0	6.6±1.7	17.7±1.7
N	177-4	U1456D-13R-1 30-38 cm	7.07	30	1.215	3367	0.297	124	5.000	2061	2.1	44.7	11.4±1.5	11.4±1.5	
O	177-5	U1456D-15R-1 55-61 cm	7.28	50	1.215	3367	0.362	372	3.718	4683	0	39.2	16.5±1.3	15.8±1.9	
P	177-6	U1456D-19R-2 20-26 cm	7.66	40	1.215	3367	0.546	457	4.714	4931	0	73.4	19.9±2.6	11.9±1.8	28.0±4.7
Q	177-17	U1457C-51R-4 80-88 cm	7.78	51	1.215	3367	0.326	430	4.140	5605	0	40	14.7±1.2	12.0±3.2	19.9±1.6
R	134-7	U1456D-22R-1 73-83 cm	7.84	80	1.583	4388	0.424	799	6.226	12387	0	44.6	18.6±1.2	15.5±0.9	
S	134-10	U1457C-61R-1 8-18 cm	7.99	42	1.583	4388	0.353	468	5.490	7570	0	14.3	16.1±1.0	14.0±3.1	
T	177-8	U1456D-26R-2 37-43 cm	8.09	55	1.215	3367	0.337	403	3.651	5056	0	48.9	18.4±1.7	14.9±1.6	
U	177-9	U1456D-27R-2 100-106 cm	8.15	92	1.215	3367	0.309	605	3.710	7958	0	41.8	16.0±1.0	16.9±0.9	
V	177-10	U1456D-28R-1 40-46 cm	8.20	72	1.215	3367	0.499	639	5.203	7453	0	73.3	18.4±1.8	14.2±1.8	21.1±1.9
W	134-8	U1456D-29R-2 24-34 cm	8.27	72	1.583	4388	0.424	639	5.508	9347	0	48.6	19.3±1.4	11.8±5.3	38.8±3.8
X	134-9	U1456E-19R-3 10-20 cm	15.58	75	1.583	4388	0.462	873	4.957	9653	0	55.9	25.9±2.0	20.2±1.4	

Notes:

Track densities are ($\times 10^6$ tr cm^{-2}) numbers of tracks counted (N) shown in brackets. Analyses by external detector method using 0.5 for the 4p/2p geometry correction factor. Ages calculated using dosimeter glass CN-5; (apatite) $z\text{CN}5 = 338 \pm 5$; calibrated by multiple analyses of IUGS apatite and zircon age standards (Hurford, 1990). $P\chi^2$ is probability for obtaining χ^2 value for ν degrees of freedom, where $\nu = \text{no. crystals} - 1$. Central age is a modal age, weighted for different precisions of individual crystals (see Galbraith (1990)). Minimum age model after Galbraith (2005). P2 used peak fitting algorithm of Galbraith and Green, (1990) where there are >10 grains.

3.4 Results

Because all samples showed evidence of over-dispersion we examined the range of single grain AFT ages in each sample using a combination of kernel density estimates (KDE) plots following the method of Vermeesch (2012) and the radial diagrams of Galbraith (1990)(Fig. 3.3). Plots that combine both types of data presentation are known as abanico plots (Dietze et al., 2016). In the radial plots the single grain ages are plotted away from a central point on the left side of each diagram, with higher accuracy measurements plotted closer to the right-hand curved y-axis against which the ages are measured. This approach allows populations of grains with similar ages but varying degrees of uncertainty to be identified as arrays. In this particular study we focus on the identification of a minimum age population extracted using the algorithm of Galbraith (2005) that clusters in an array and trends towards the y-axis on the right-hand side of each diagram. This avoids problems associated with a general purpose, multi-component mixture model that can give a biased estimate of the minimum age towards younger values with increasing sample size. The radial plots show if there is a single source (single array) or multiple sources, if there is more than one array. Figure 3.3 and Table 3.2 show samples that have a second age component (P2) as defined by ten or more grains. In all cases the majority of analysed grains defines the minimum age and represents the time at which the dominant bedrock sources cooled through the AFT partial annealing zone (PAZ).

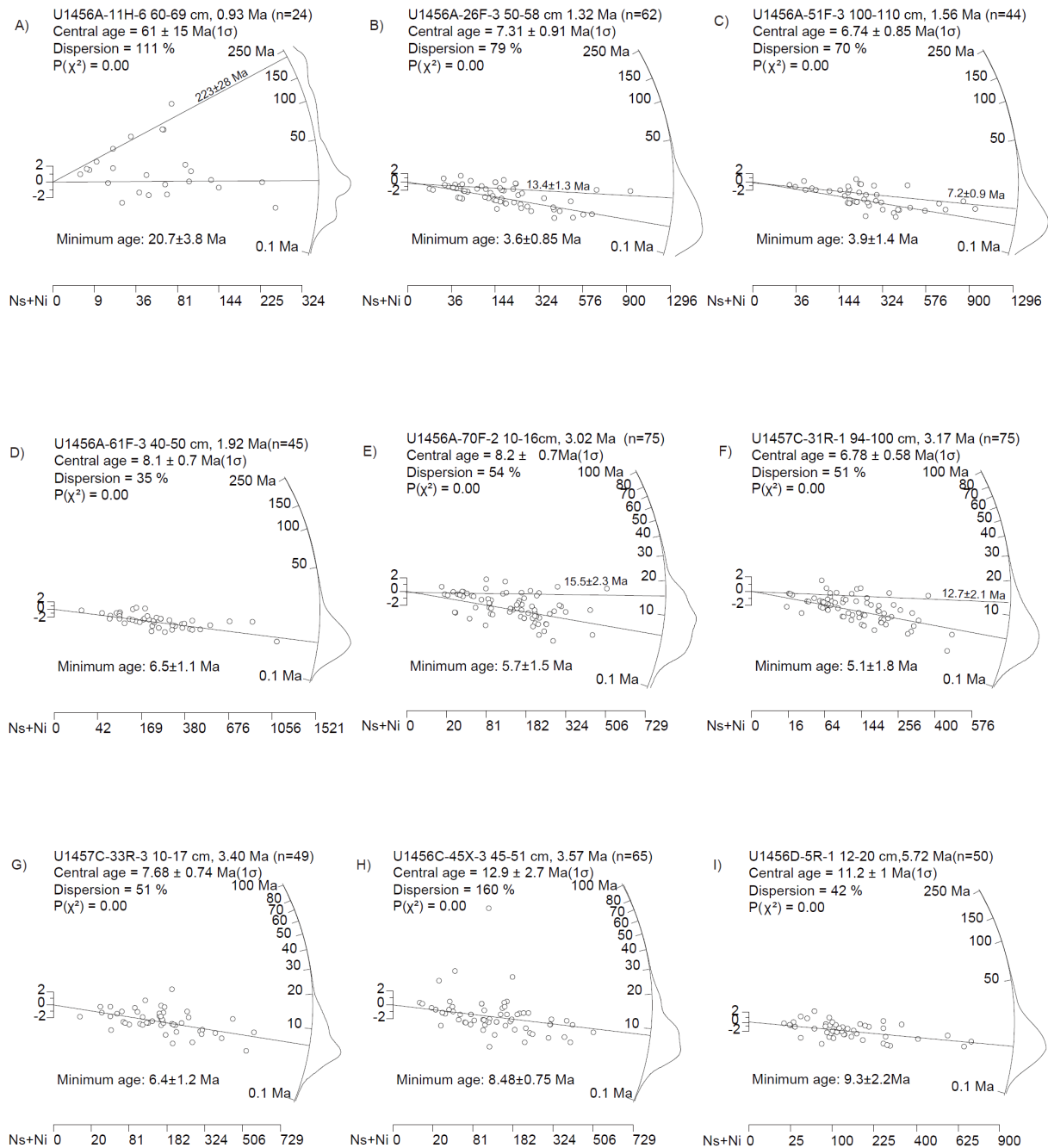
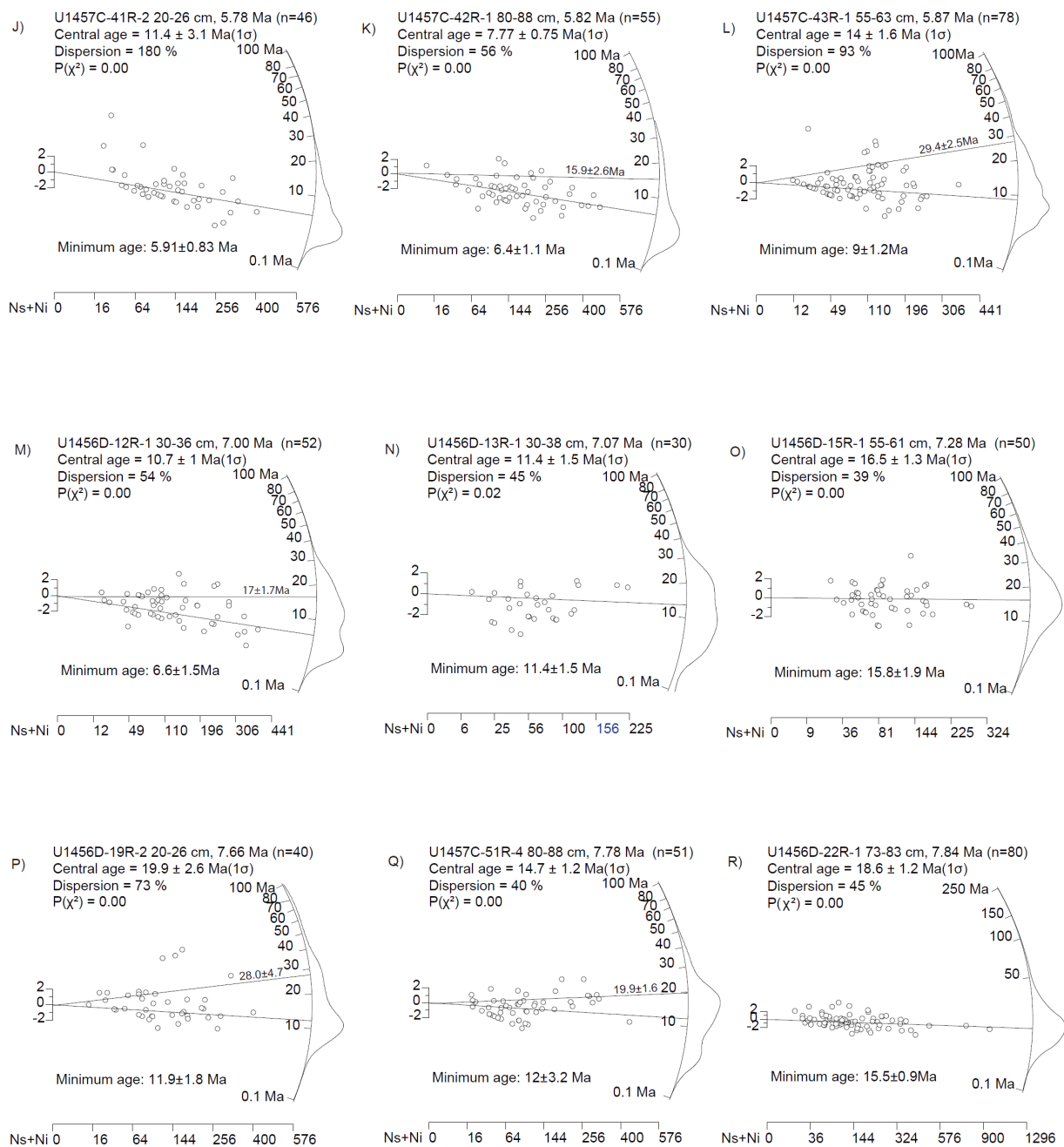
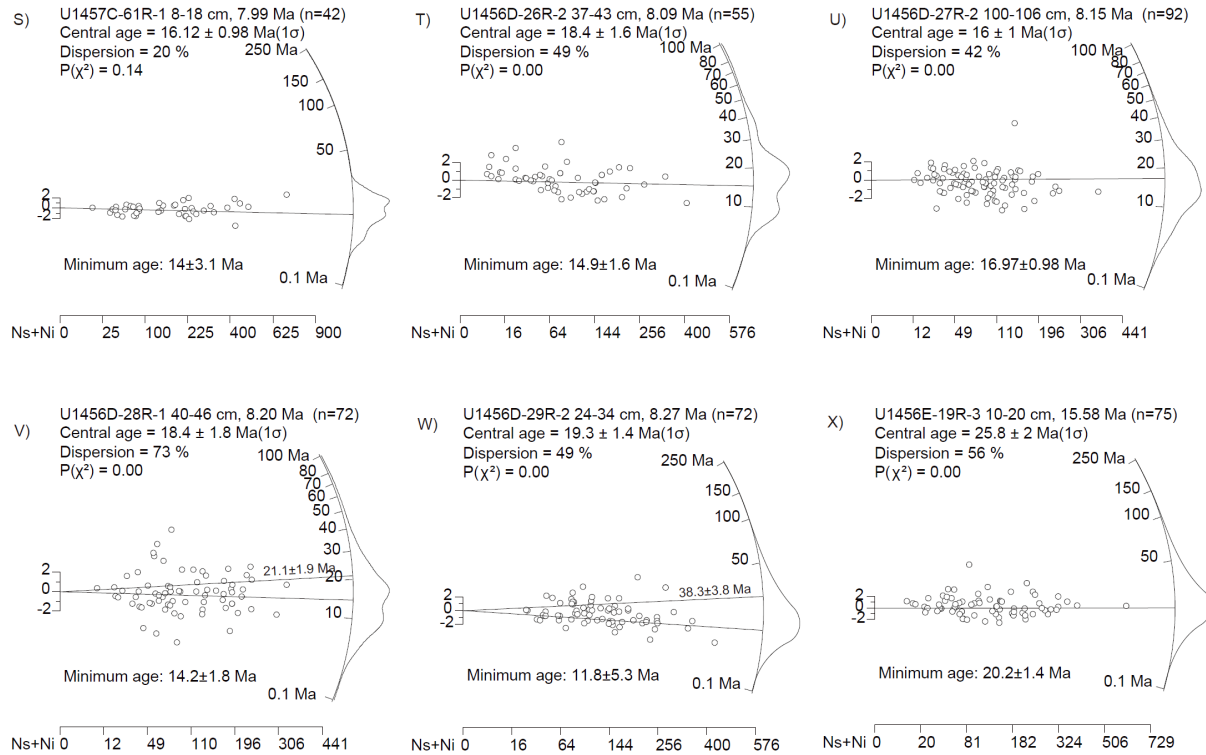


Figure 3.3. Radial plots and associated KDE spectra (abanico plots) showing the range of apatite fission track ages for each of the samples considered within the study (Galbraith, 1990). Ns—number of spontaneous fission tracks; Ni—number of induced tracks. Single ages are plotted with standard errors according to their precision ($1/\sigma$ on the 'x' axis). The error attached to each plotted point is standardized on the y scale. The value of the age and the 2σ uncertainty can be read off the radial axis by extrapolating lines from point 0,0 through the plotted age. (figure cont'd)



(figure cont'd)



In each case we also show the calculated depositional age derived from the shipboard biostratigraphy and magnetic stratigraphy (Fig. 3.3). The minimum ages are older than or concordant with the depositional age, as might be expected in a relatively shallow borehole in which the temperatures are not elevated above those known to reset fission tracks in apatite crystals. All samples have minimum ages less than 20 Ma, and P2 AFT ages are all less than 40 Ma (apart from the youngest sample) post-dating the initial collision of India and Asia. There are particularly noteworthy concentrations of grain ages between 3 and 20 Ma. 50% of samples have a minimum age younger than 10 Ma. The minimum age gets younger with decreasing depositional age but not in a systematic way. The age difference between the minimum age and deposition age is <5 m.y. for most samples, i.e., short lag times, but increases for samples deposited between 7.84 and 8.2 Ma, as well as 7.07–7.28 Ma. The youngest sample (U1456A-

11H-6, 60-69 cm) is unlike many of the others in showing significantly older AFT ages (Fig. 3.3).

The youngest deposited sample is anomalous in having a minimum age population of 20.7 Ma, despite only having been deposited around 930 ka (Fig. 3.3A). This may be due to the sample containing fewer apatites, with only 24 grains being countable, which is the smallest number out of all samples analysed. This is in strong contrast with the much younger minimum ages of the directly underlying samples. It is only the very oldest sample (~15 Ma, U1456E-19R-3, 10–20 cm) which also has a minimum age of that value, but that sample has a short lag time (Fig. 3.3W). We can assess the possible impact of low grain numbers on the critical minimum age result in Figure 3.4. This plot shows that there is no correlation between the number of grains and the minimum age, only reinforcing the fact that samples with low numbers of grains have larger uncertainty in the result, but not causing short lag times.

The core is not altered or veined and the modern maximum burial temperature of the samples with lag times close to zero is far too cool to have affected the AFT ages. The ages are within error of the depositional age, not resolvably younger, especially considering uncertainties in the depositional age too. Although sample U1456D-12R-1 30-36 cm (Fig. 3.3M) has a minimum age population slightly younger (6.6 ± 1.5 Ma) than the calculated depositional age (7.0 Ma) but within error of that value and need not be reset. Moreover, the young ages are also accompanied by older age populations that are also consistent with the sediment not being thermally reset, as well as with the modern borehole temperatures being well below the apatite partial annealing zone (556 mbsf (29.4°C) at Site U1456, 572–590 mbsf (32.6–33.6°C) at Site U1457).

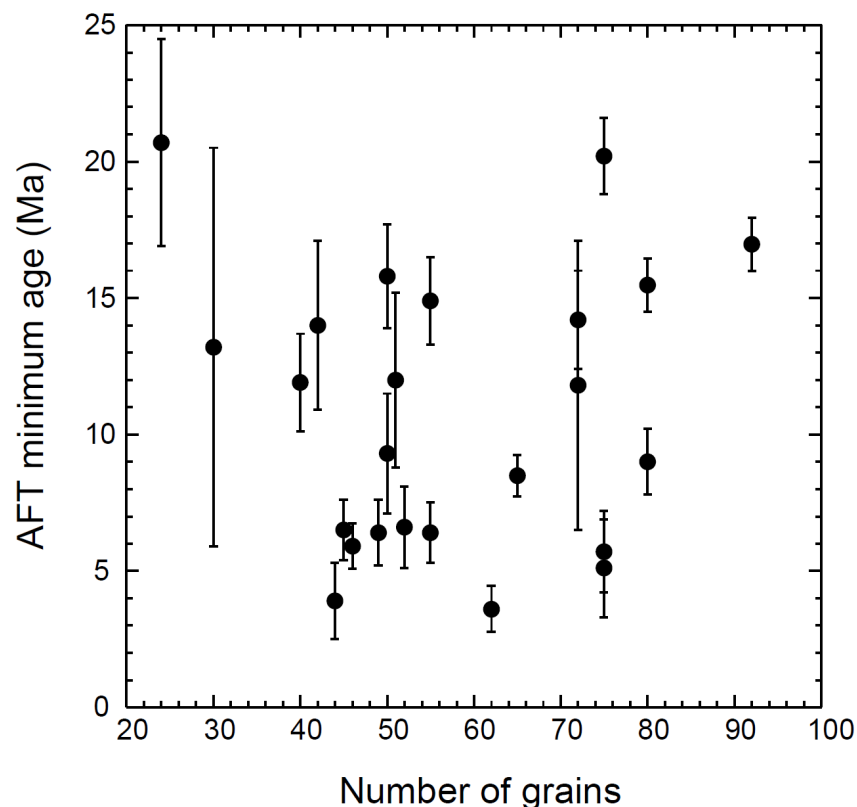


Figure 3.4. Cross plot of numbers of grains compared to minimum ages with 2σ uncertainties displayed. There is no correspondence between the numbers of grains and the minimum age that might bias the result of the lag time analysis.

3.5 Discussion

The fact that all of our AFT ages are relatively young and mostly postdate widely accepted times of India-Asia collision is a clear indication that they are derived from Himalayan/Karakoram sources supplied by the Indus River and, with the exception of the youngest sample, not from peninsular India. Ancient rocks of the Indian peninsula have not been substantially deformed and uplifted during the Cenozoic and basement apatite fission track ages are mostly Jurassic-Cretaceous. Although they range as young as 54 Ma (Gunnell et al., 2003; Kalaswad et al., 1993), 95% of the ages measured are older than 100 Ma, averaging 228 Ma (Fig. 3.5H). This is somewhat older than most of the grain ages in Sample U1456A-11H-6, 60-69 cm. (Fig. 3.3A), but does match the P2 older population in that sample (Table 3.2). Nonetheless, the

minimum age population of 20.7 ± 3.8 Ma requires a Himalaya-Karakoram provenance for 14 of the 24 grains measured. U-Pb zircon ages from this same sample (Clift et al., 2019b) show that 8% of the grains date to <200 Ma, requiring derivation from the Indus River because such zircon ages can only be generated by erosion from Kohistan or Karakoram sources. Zircon grains older than 300 Ma could be from the peninsula or the Tethyan/Greater Himalaya. This youngest sample seems likely to be of mixed provenance, with material from both the Indus and the peninsula. For the other samples the AFT data argue strongly for the sand at these drilling sites being entirely derived from the Indus River because they are generally much younger than AFT ages from the western margin of peninsular India and broadly consistent with the AFT ages derived from sands that are definitely of Indus derivation (Clift et al., 2004; Clift et al., 2010).

Some information can also be derived about where the sediments may be coming from within the possible source ranges if we refer to the bedrock data that has been measured onshore, as summarized in Figure 3.5. Comparison of these sources and detrital data is only valid for the youngest sediments because young bedrock AFT ages do not inform us about the cooling of these sources in the older geologic past, only the cooling of the rocks now exposed. We note that the different ranges within the Indus basin have a number of distinctive peaks and that some of these are distinct in terms of their AFT age spectra. We note that the Greater and Lesser Himalaya have relatively similar fission track ages, clustering around 3–4 Ma, but with some ranging to ca. 1 Ma, at least in the Sutlej Valley (Thiede et al., 2004), and that these also overlap with ages known from the Karakoram, especially the eastern Karakoram (Wallis et al., 2016) and the Yasil Dome lying in the Karakoram immediately north of the Nanga Parbat Massif (Poupeau et al., 1991). The Karakoram however, also has bedrock AFT ages that range to older values, suggestive of earlier exhumation in at least parts of that block, most notably in the west and their

continuation into the Hindu Kush (Zhuang et al., 2018). The very youngest grains are measured around the Nanga Parbat Massif (Zeitler, 1985), while the oldest are found in the Transhimalayan Ladakh Batholith (Kirstein et al., 2009) and Deosai Plateau (van der Beek et al., 2009). The Tethyan Himalaya has also yielded older AFT ages in the central Himalaya (Li et al., 2015), but has not been dated within the Indus catchment. Uplift and erosion in the mountains around the Indus Suture and located to the north of the Greater Himalaya are widely accepted to have initiated earlier and then mostly slowed as the exhumation shifted into the Greater and Lesser Himalayan ranges (Searle, 1996).

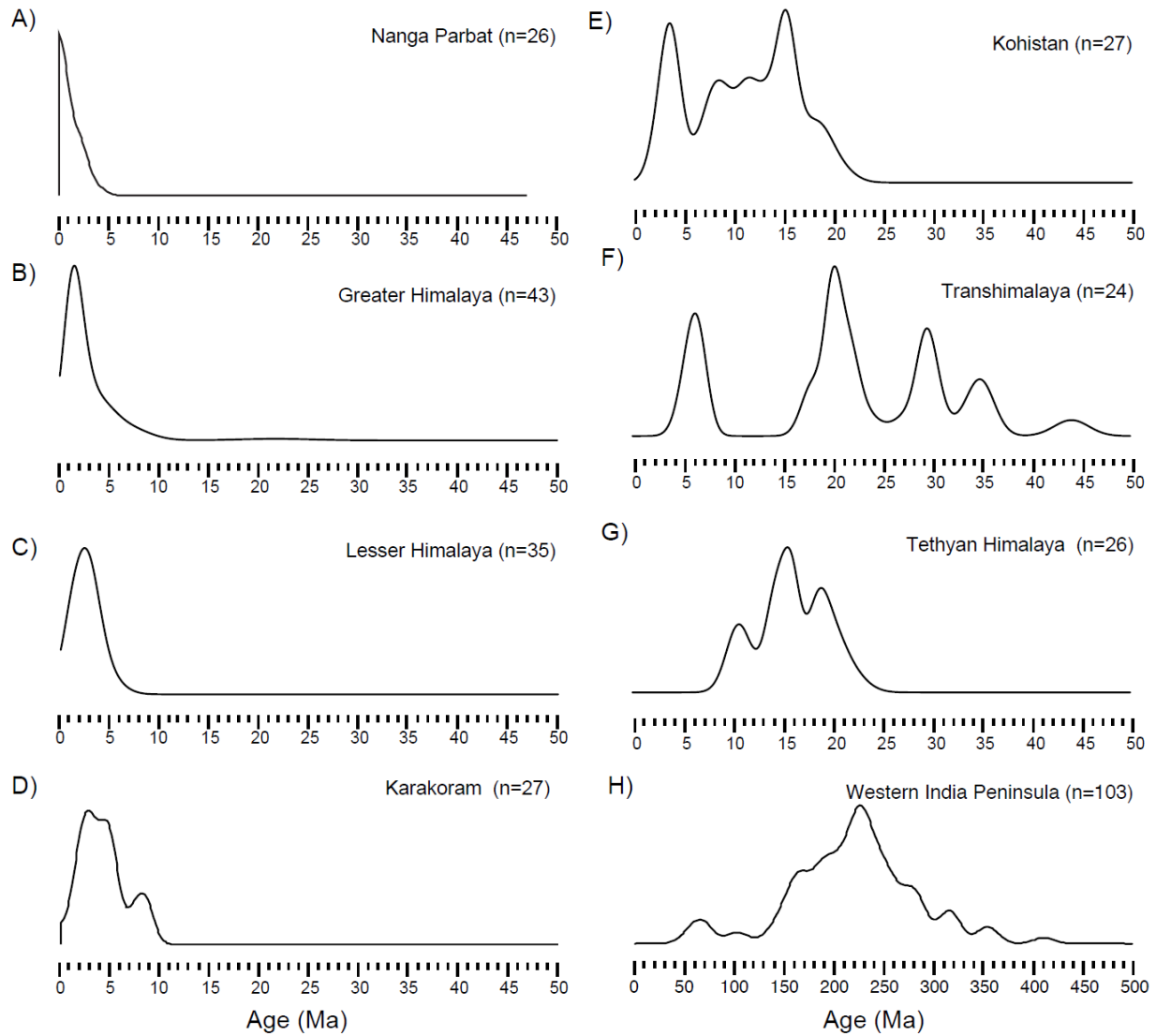


Figure 3.5. KDE plots for the apatite fission track central ages of potential bedrock sources within the headwaters of the Indus basin. Nanga Parbat data are from Warner et al. (1993), and Zeitler (1985). Greater Himalaya data are from Kumar et al. (1995), Jain et al. (2000) and Thiede et al. (2004). Lesser Himalaya data are from Thiede et al. (2004) and Vannay et al. (2004). Karakoram data are from Foster et al. (1994), Zeitler (1985), Wallis et al. (2016) and Poupeau et al. (1991). Kohistan data are from Zeitler (1985) and Zeilinger et al. (2001). Transhimalaya data are from Kirstein et al. (2009; 2006), and Clift et al. (2002b). Tethyan Himalaya data are from Li et al. (2015) and unpublished from Andrew Carter (UCL, 2017). Indian Peninsula data are from Gunnell et al. (2003) and Kalaswad et al. (1993).

Although many of the measured fission tracks at Nanga Parbat have ages of less than 1 Ma (Zeitler et al., 1989), clearly this could not have been the case before 1 Ma, when the fastest cooled grains must have had ages within error of or older than 1 Ma. Lag times could however have been short prior to 1 Ma. Consequently, direct comparison of the modern bedrock with the detrital ages in old sediments is not appropriate for most of our samples. Because the cooling rates of bedrock sources change on timescale of $>10^6$ yr, source lag times need not have been constant in the geologic past. Different, higher temperature thermochronometers can constrain exhumation rates during those earlier times and provide clues about lag times. We can however deduce that because many of the grains' AFT ages are relatively young (<15 Ma) and their lag times are short, they were probably derived from fast exhuming sources in the Himalaya, Nanga Parbat or Karakoram (Zeitler et al., 1993; Zhuang et al., 2018), rather than in Kohistan, the Transhimalaya or Tethyan Himalaya where uplift and exhumation were mostly older. The cooling histories of these latter sources imply that their AFT lag times would be mostly long during the Late Miocene-Present (Fig. 3.5) (Kirstein et al., 2009; Krol et al., 1996; Searle, 1996). Although some young AFT ages <6.3 Ma have been recorded in the Ladakh Transhimalayan Batholith along the Shyok Suture (Kirstein et al., 2009), these represent quite a small part of that tectonic block. Zircon U-Pb ages from the same IODP sites imply that the Transhimalaya has not been a dominant source during the period targeted by this study (maximum of 28% at 15.5 Ma and this is likely a large overestimate because the Karakoram and Transhimalaya overlap in zircon U-Pb ages) (Clift et al., 2019b).

The prevalence of short AFT lag times implies rapid exhumation in the dominant sediment-producing sources close to the time of sedimentation. The AFT data require that little sediment was stored for significant periods of geologic time between erosion in the mountain

sources and sedimentation on the Indus submarine fan because the difference/lag between minimum ages and deposition is typically <4 m.y. (75% of samples), representing an upper limit to the storage time. The lag time of a grain largely represents the time between cooling and erosion. While the lag time also includes time spent during sediment transport, study of the Quaternary Indus system indicates transport times of no more than ~105 y for the bulk of the sediment delivered to the deep basin (Clift and Giosan, 2014). Some of the sediment may be recycled from foreland basin sedimentary rocks of the Siwalik Group and this would introduce an additional lag into the sediment transport history. Secondary AFT age populations between 15 and 38 Ma (Table 3.2) would fit with this type of recycling. We can discount that these older ages are coming from direct erosion of the slower cooled Ladakh Batholith or Tethyan Himalaya because heavy mineral studies (Garzanti et al., 2005), trace element characteristics of detrital amphiboles (Lee et al., 2003) and zircon U-Pb ages (Alizai et al., 2011) from the trunk Indus River close to the Himalayan front show dominance by the Karakoram (especially the Southern Karakoram Metamorphic Belt) over other sources in the modern upstream basin. That the Siwalik Group sedimentary rocks themselves have not been entirely reset in AFT during burial is known from studies in central Nepal (van der Beek et al., 2006) and these ranges could thus be a source of the older AFT ages measured. Quantifying the amount of recycling out of the Siwalik Ranges is impossible for our data because older grains could come from slow cooling sources or the Siwalik Group. However, the high abundance of short lag time grains suggests that the degree of this recycling cannot be too large. Rates of incision in modern gorges cutting the Siwalik Group in Nepal have been used to estimate that they account for no more than 15% of the total flux (Lavé and Avouac, 2001), while an isotope-based mass balance for the Ganges basin indicates <10% of the mass flux in that drainage is from the Siwalik Group (Wasson,

2003). A contribution on that order to the Indus Basin would be consistent with the AFT data presented here. The AFT data by themselves cannot resolve erosion from the Siwaliks, as they share older AFT ages with sources in the Tethyan Himalaya, Kohistan and Transhimalaya.

On shorter timescales if sediment was being buffered on the floodplains, in the delta or on the continental shelf, then this is expected to have occurred only for a short amount of time, essentially tens of thousands of years (Li et al., 2019). Storage and recycling on million-year timescales would have resulted in longer lag times. When the lag times of our samples are 3–4 m.y. some of this time must have been spent during transport. With the exception of storage and recycling via Siwalik Group foreland sequences discussed above, the assumption is that most of this time would have been spent undergoing rock uplift prior to exposure and erosion because estimates of transport time in the Quaternary Indus are just 105 y for the bulk of the sediment delivered to the deep basin (Clift and Giosan, 2014). Modern bedrock AFT data from the Greater and Lesser Himalaya and Karakoram indicate this order of lag time at the present day (Fig. 3.5), without factoring in much additional transport time. Our data are broadly consistent with the idea of rapidly uplifting mountains being strongly eroded and so supplying most of the sediment into the Indus River during the period of study since 15.5 Ma.

Combined Nd isotope and detrital zircon U-Pb age data from bulk sediment samples from Sites U1456 and U1457 show that there was a change in provenance starting around 5.7 Ma (Clift et al., 2019b). This analysis indicates more material coming from the Greater and Lesser Himalaya and relatively less from the Karakoram after this time. The range of lag times in sediments younger than 7.0 Ma is similar to those found at the Indus delta during the phase of strong summer monsoon in the early Holocene, i.e. 2–5 m.y. (Fig. 3.6), when the provenance constraints indicate that these were preferentially derived from Greater and Lesser Himalayan

sources (Clift et al., 2019b). In contrast, sediments older than 7.0 Ma have longer lag times (3.5–8.8 m.y., average 6.0 m.y.) and are inferred to be more derived from the Karakoram, based on their zircon U-Pb age spectra (Fig. 3.6) (Clift et al., 2019b). The fact that lag times of pre-7.0 Ma samples are longer, like Indus delta LGM sediments that have an AFT central age of 9 ± 1 Ma (Clift et al., 2010) is consistent with a dominant Karakoram source.

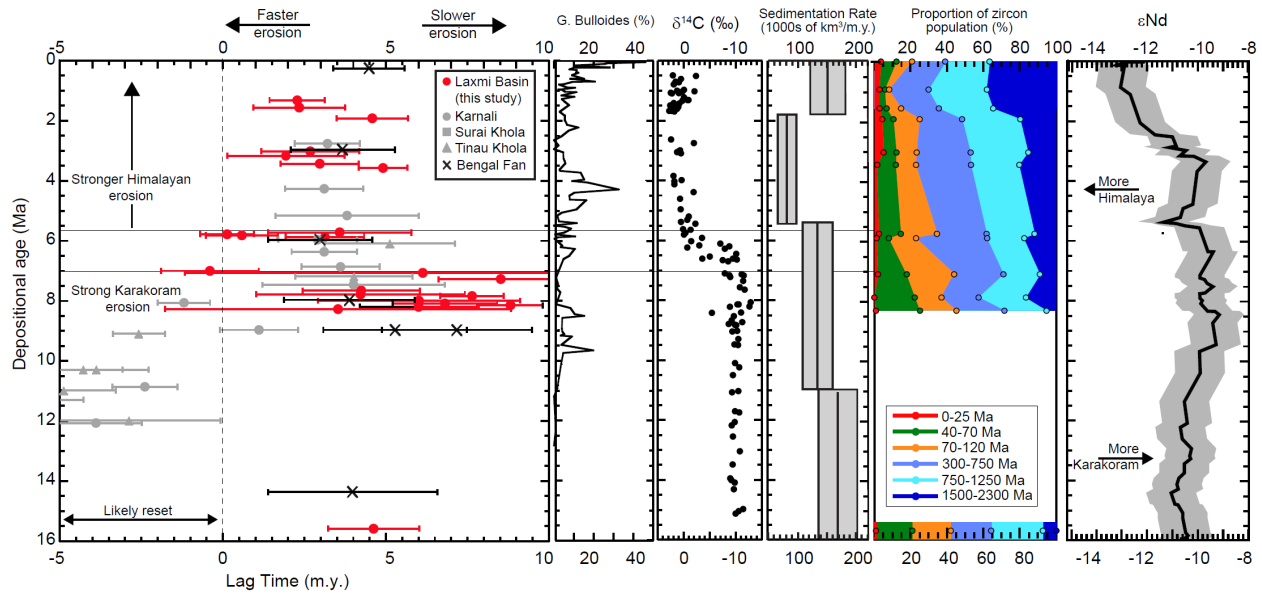


Figure 3.6. Lag time plot of detrital apatite fission track minimum ages showing the lag time between the cooling and depositional ages. Note the minimum lag time achieved between 9 and 6 Ma. Siwalik data from Nepal is from van der Beek et al. (2006), Bengal Fan data is from Corrigan and Crowley (1990). Monsoon records of *G. Bulloides* from Huang et al. (2007), foreland basin $\delta^{14}\text{C}$ record from Quade et al. (1989). Sediment budget for Indus Fan from Clift (2006). Evolution in the age spectra of zircon U-Pb ages and ϵNd values are from Clift et al. (2019b). Stippled area shows the time of the climatic transition to drier conditions in the foreland basin.

That the Nd isotope provenance data change at around the same time as the AFT lag times (after 5.7 Ma; Fig. 3.6) supports the idea that a change in provenance may account for at least part of the changing AFT lag times at that time. The absence of the very short lag time samples does mean that after 5.7 Ma there are no longer any significant fast eroding ranges in the catchment. As noted above, the Crystalline Inner Lesser Himalaya is known to be experiencing

unroofing after ~6 Ma, at least in the vicinity of the Beas River catchment (Najman et al., 2009) and the shift in the general character of the AFT age populations after 5.7 Ma may in large part simply reflects more sediment delivery from the Greater and Lesser Himalayas, potentially related to tectonic imbrication and rock uplift (Bollinger et al., 2004; Huyghe et al., 2001; Webb, 2013). Such a shift is consistent with the evolving provenance data in Laxmi Basin (Clift et al., 2019b). The structural reconstructions of Webb (2013) for the western Himalaya propose that both the Greater and Lesser Himalaya remained buried under the Tethyan Himalaya until after 5.4 Ma. This would imply that the source of rapidly cooled grains before that time would be from the Karakoram and Tethyan Himalaya.

The AFT ages can be used to constrain changing rates of exhumation in the bedrock sources. Comparing depositional age against the AFT minimum age populations allows us to assess the lag time between cooling of bedrock sources as they passed through the 60–110°C PAZ and their final deposition in the deep water of the Indian Ocean (Fig. 3.6). In our analysis we further compare our results with those similar aged fluvial sedimentary rocks from the Siwalik Group in Western and Central Nepal (van der Beek et al., 2006), as well as from the Bengal Fan collected by ODP Leg 116 (Corrigan and Crowley, 1990). It is clear that many of these minimum age groups have relatively short lag times, which indicates fast cooling and exhumation of bedrock sources. We note that both the oldest (15.5 Ma) sample from the Laxmi Basin and a slightly younger sample from the Bengal Fan show lag times close to 4 m.y. in the middle Miocene. This would imply exhumation rates of 1.1–1.4 km/m.y. assuming 25–35°C/km geothermal gradients.

Unfortunately, we have little information between that time and ~8.5 Ma when the next youngest dateable sandy sediment was deposited and preserved at the drilling sites. Although one

of the minimum age groups still lags by ~ 4.2 m.y., we note that there is some scatter to longer lag times of up to 8.8 m.y. between 8.5 and 7.0 Ma and with large uncertainties. Combined zircon U-Pb (40–70 and 70–120 Ma grains) and bulk sediment Nd isotope (ϵNd values > -10) provenance data indicate that much of the sediment at that time was derived from the Karakoram (Clift et al., 2019b). The zircon U-Pb budget over-represents the net flux from the Himalaya because these bedrocks are >2.2 times more fertile with regard to zircon than the Karakoram and Transhimalaya.

After 7.0 Ma lag times shortened significantly. Three samples from the Laxmi Basin drilling sites are within error of the depositional age between 7.0 and 5.7 Ma, requiring exhumation rates that were so rapid that we are unable to constrain the duration between cooling through the PAZ (60–110°C) and sedimentation, i.e., lag times close to zero. This implies a maximum rate of cooling in the sources at that time. All three of the fast cooling samples have accompanying zircon U-Pb ages that show that they continue a trend towards more Himalayan erosion but that there is not a sharp contrast with the sediment deposited before 7.0 Ma. After 5.7 Ma, the change in Nd isotopes is especially marked and implies that a change in provenance may be responsible for the slowing of exhumation rates. Nonetheless, one sample, U1457C-43R-1 55-63 cm, deposited at 5.78 Ma, has a minimum age lag time 3.13 m.y., longer than the others. This implies that not all sources were supplying large volumes of sediment at all times and that not all bedrock sources were exhuming so quickly.

Although provenance data indicate mostly Karakoram sources, these rapidly cooled grains could also be derived from the Himalayan tectonic units. Zircon U-Pb ages allow us to discriminate between erosion of Karakoram (40–120 Ma) and Himalayan (>300 Ma) sources, the largest sources at that time. However, the zircon ages only apply to these minerals and the

provenance cannot be transferred to the apatites. Therefore, we only know that there were rapidly cooling areas between 7.0 and 5.7 Ma, but not which range they are located in. However, because there are large numbers of grains in the minimum age group, it might reasonably be expected that these are derived from bedrocks sources that also supply large volumes of other mineral types. Between 7.0 and 5.7 Ma the longest lag time was 3.13 m.y. in the sediment deposited at 5.87 Ma. This indicates an average cooling rate of at least $35.1 \pm 9.7^\circ\text{C/m.y.}$, faster than the cooling rates of 12.5 to 26.1°C/m.y. between 8.2 and 7.0 Ma. These are faster rates than those recorded in the Siwalik Group from Nepal (van der Beek et al., 2006), as well as sparse data from the Bengal Fan (Corrigan and Crowley, 1990), although they are within the uncertainties of the peak rates in Nepal at that time. However, in Nepal the sources must have been Himalayan, not Karakoram. In the youngest part of the section (<4 Ma), which is more dominated by Himalaya erosion (Clift et al., 2019b), these very short lag times are not visible and are always more than 1.93 m.y., equivalent to approximate exhumation rates of $\sim 2.3\text{--}1.6$ km/m.y. The moderate exhumation rates after 4 Ma compare with data from both the Bengal Fan and from the Nepalese part of the Himalayan foreland. Both these sediment sequences are dominated by Himalayan erosion (Bouquillon et al., 1990). Slowing of exhumation in the Indus basin after 5.7 Ma is consistent with data from western Nepal (Karnali), but the slowing from peak rates at 7.0 to 5.7 Ma is in contrast to conclusions of work from central Nepal (Surai and Tinau Khola) that argued for relatively steady state cooling in that part of the mountain range (van der Beek et al., 2006). The very youngest sample deposited at 930 ka stands out as having by far the largest lag time and is inferred to have a unique source, likely a mixture of sediment from the Indus River and Peninsular India.

We can compare this pattern of accelerating exhumation before 7.0 Ma and then slowing after 5.7 Ma with the climatic history (Fig. 3.6), while recognizing the shift in provenance that is occurring at the same time. One of the most popular long-term proxies for monsoon intensity in the Arabian Sea is the relative abundance of *G. Bulloides* offshore the margin of Arabia. The abundance of *G. Bulloides* is largely a function of the availability of nutrients derived from upwelling caused by the summer monsoon rains (Curry et al., 1992). There is little evidence for such strong upwelling prior to around 13 Ma (Betzler et al., 2016). A general intensification of upwelling is noted after 5.3 and 3.0 Ma (Gupta et al., 2015; Huang et al., 2007) (Fig. 3.6). However, upwelling is not a direct proxy of rainfall and this apparent intensification does not reflect the delivery of summer rains to the mountain front, because this proxy does not correlate with other climatically sensitive indicators (Clift, 2017).

Stable oxygen isotope data from the foreland basin instead agree with chemical weathering data from the South China and Arabian Seas in arguing for relatively wet conditions in the middle Miocene between 10 and 12 Ma (Dettman et al., 2001), followed by a decrease in humidity particularly after around 6–8 Ma (Clift, 2017; Singh et al., 2011). Moisture delivery to this area from the winter Westerlies is also reconstructed to reduce around 7 Ma (Vögeli et al., 2017). The increasing lag time seen in the minimum age populations after 5.7 Ma would be consistent with slower erosion and could be linked to weaker monsoon rainfall. Weaker monsoon and Westerly rains would also reduce discharge and potentially slow the transport of sediment across the flood plains. Increased aridity is consistent with decreasing strength of chemical weathering seen in Indus Marine A-1 located on the Indus shelf (Clift et al., 2008b), as well as Site U1456 (Clift et al., 2019a), but largely postdates the carbon isotope transition from 8 to 6 Ma in the foreland basin (Quade et al., 1989).

The acceleration in exhumation rates from 7.8 to 7.0 Ma generally coincides with the climatic drying, which may seem counterintuitive. However, this also assumes that stronger rains, sometimes modulated through glaciation, always increase erosion. There is evidence that drier conditions, especially when this involves heightened seasonality, can increase erosion provided the drying is not too extreme, but sufficient to reduce vegetation cover that reduces soil erosion (Giosan et al., 2017). There is no evidence that the period of fast erosion at 5.7–7.0 Ma was caused by faster India and Asia convergence. Indeed, convergence rates appear to have slowed gradually during the Cenozoic (Clark, 2012).

3.6. Conclusions

Apatite fission track ages derived from turbidite sediments from IODP Sites U1456 and U1457 in the Laxmi Basin, eastern Arabian Sea, provide an opportunity to reconstruct changing exhumation rates in the western Himalaya and Karakoram since 15.5 Ma, and especially since 9 Ma. AFT ages are mostly <50 Ma and demonstrate that the sediment is derived from the Indus River, not peninsular India, except in the case of the youngest sample, deposited at 0.93 Ma. Moreover, most samples show minimum age populations that are only slightly older than the depositional age, implying fast rates of exhumation in the sources and rapid transport through this time. Lag times of ~4 m.y. in the Middle Miocene imply exhumation rates of 1.1–1.4 km/m.y. After a period of longer lag times (~6 m.y.) between 8.5 and 7.8 Ma, these reach a minimum from 7.0 to 5.7 Ma, when lag times were within error of zero. Provenance U-Pb zircon and Nd isotope data indicate erosion dominantly in the Karakoram, but the AFT ages could have also come from Himalayan sources, which were also important contributors at this time. The AFT data alone do not allow us to discriminate which of the two ranges contained the fast exhuming sources. After 5.7 Ma lag times lengthened to ~4.5 Ma, and exhumation rates slowed

to 2.3–1.6 km/m.y. at the same time that sediment supply came progressively more from the Himalaya and relatively less from the Karakoram.

The time of peak exhumation correlates with the transition to a drier climate in the foreland basin and of a weakening Westerly Jet. Erosion rates since 5.7 Ma are comparable or slightly faster than those seen in the Nepalese parts of the Himalaya and the Bengal Fan. Slowing exhumation rates after 5.7 Ma correlate with a drying climate and weaker summer monsoon rains in the Late Miocene. There is a general shift in the AFT age populations from longer lag times, more similar to the glacial era Indus River and associated with dominant erosion in the Karakoram prior to 7 Ma, to shorter lag times and more erosion of the Himalaya, similar to the Holocene Indus River after 5.7 Ma. The acceleration of exhumation as the climate dried between 7.8 and 7.0 Ma seems to imply a dominant tectonic control of erosion. The AFT data support models that imply a non-linear relationship between summer monsoon rain strength and the erosion of the western Himalaya.

CHAPTER 4. MARINE SEDIMENTARY RECORDS OF CHEMICAL WEATHERING EVOLUTION IN THE WESTERN HIMALAYA SINCE 17 MA

4.1 Introduction

Chemical weathering is an important process that affects the surface of the Earth and is responsible for the breakdown of bedrock and its subsequent transformation into soil and then into fluvial and marine sediment. This process has important feedbacks to global climate because breakdown of silicate minerals consumes CO₂ (Berner and Berner, 1997), a well-known greenhouse gas, that has been linked to long-term global cooling during the Cenozoic (Raymo and Ruddiman, 1992). Rates of chemical weathering are controlled by humidity and temperature (Kump et al., 2000; West et al., 2005) and therefore should be linked to the intensity of the Asian summer monsoon. If the long-term cooling of the planet during the Cenozoic is truly caused by increased chemical weathering fluxes then this should be reflected in the sediment record, especially in the Asian marginal seas because the uplift of high topography in Asia is likely the primary cause for the increased erosion and weathering during that time (Raymo and Ruddiman, 1992).

In this study we use sediment cores recovered from the eastern Arabian Sea to examine the history of chemical weathering in the western Himalaya. Cores penetrating into the Upper Miocene provide an erosion and weathering record stretching back almost 11 m.y., which can then be compared with existing climatic and oceanographic records in order to determine possible controlling mechanisms of chemical weathering. We extend this record further back in time by integrating samples dating back to ~17 Ma from an industrial borehole on the Indus continental shelf. We employ a series of established weathering proxies based on clay mineralogy, as well as bulk sediment geochemistry, in order to define the state of alteration of

the recovered sediment. We then use these data to examine how weathering in the onshore river basin changed through geologic time. We use a matrix of different proxies in order to establish confidence in the long-term weathering history, and we test to see whether changes in chemical weathering intensity are linked to tectonic or global climatic variation.

The alteration state of any particular sediment is controlled not only by the rate of chemical weathering but also by the duration (Wan et al., 2017). As a result, links between climate and chemical weathering are complicated. For example, wetter conditions may result in faster weathering rates, but the higher precipitation may also increase discharge in river systems and shorten transport times, providing less opportunity for fresh minerals to be degraded into chemical weathering products, such as clays. We undertake this investigation in the Arabian Sea where the sediment has been largely derived from the high mountains of the Himalaya, Karakoram and adjacent ranges (Fig. 4.1). Although there is evidence that the patterns and sources of erosion have changed through time (Clift et al., 2008a; Zhuang et al., 2018), there is no indication that the drainage basin itself has changed radically in its extent since the Late Miocene (Clift et al., 2019b). We make use of existing provenance data from the same boreholes to constrain the possible influence of changing sources in governing clay mineralogy and sediment chemistry (Clift et al., 2019b), and in doing so we allow their relationships with regional climate and tectonic processes to be investigated.

We analyze sediments recovered by the International Ocean Discovery Program (IODP) Expedition 355, which in 2015 recovered long sections of sediment in the Laxmi Basin of the Eastern Arabian Sea, offshore western India (Pandey et al., 2016c). Drilling at IODP Site U1456 penetrated a ~1100-m-thick sequence of turbidite silt and sandstones, mudstones, and occasional carbonates, before bottoming in a large mass transport deposit emplaced at approximately 10.8

Ma (Calvès et al., 2015). At Site U1457, drilling penetrated the mass transport deposit but the underlying sediment was dated as Paleocene, predating India-Asia collision and Indus Fan sedimentation (Pandey et al., 2016b).

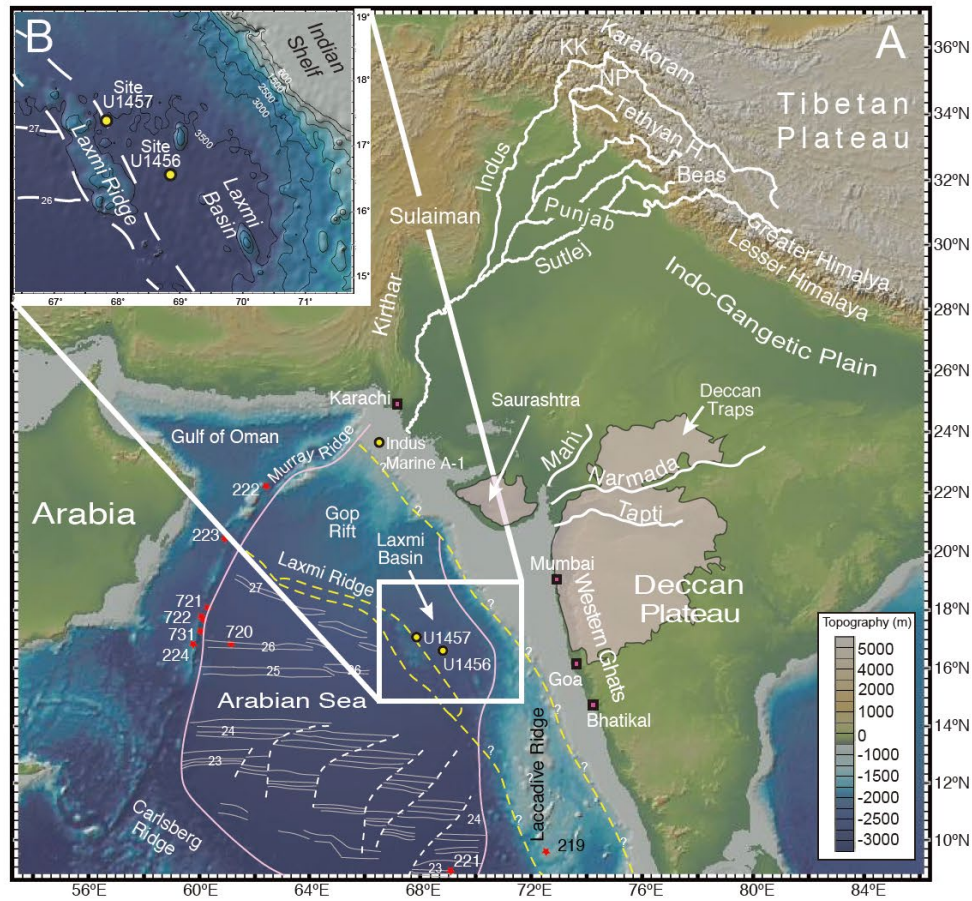
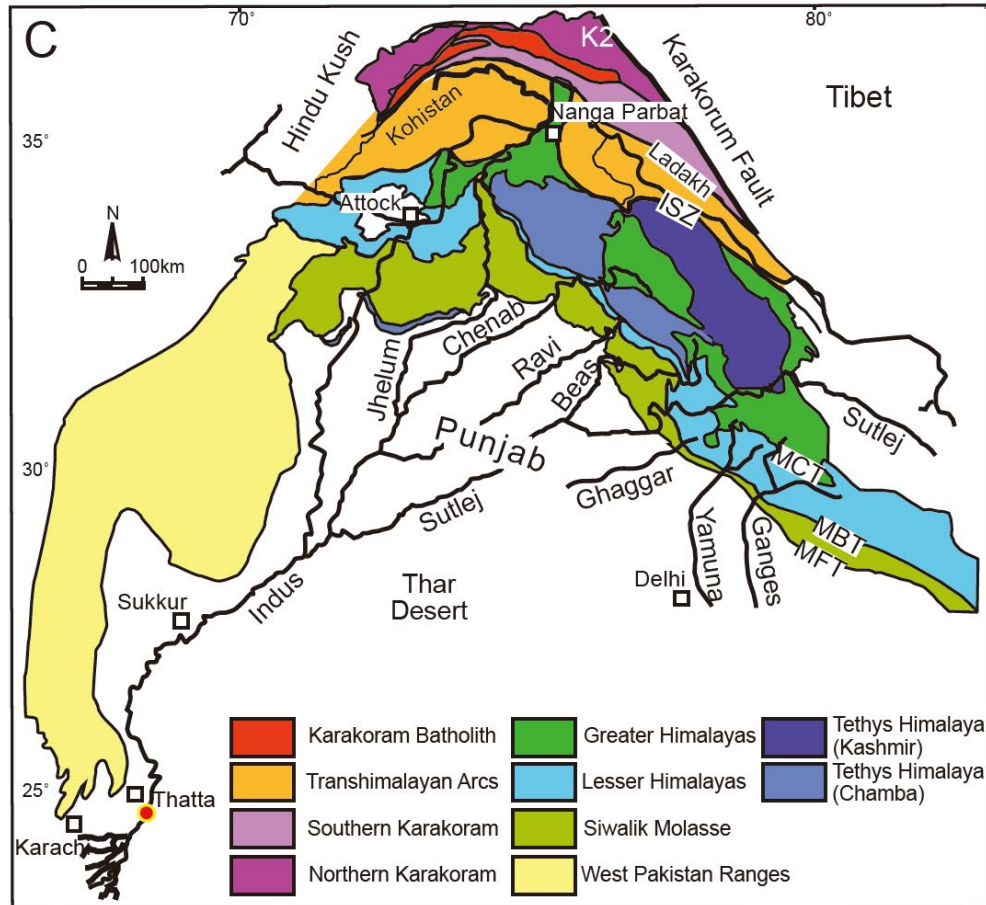


Figure 4.1. A) Shaded bathymetric and topographic map of the Arabian Sea area showing the location of the drilling sites within the Laxmi Basin, considered by this study. Map also shows the primary source terranes and the major tributary systems of the Indus River, as well as smaller peninsular India rivers that may have provided material to the drill sites. B) Inset map shows detail of the Laxmi Basin and location of the drill sites considered in this study. Numbered red circles indicate existing scientific boreholes from Deep Sea Drilling Project (DSDP) and Ocean Drilling Program (ODP). Magnetic anomalies are from Miles et al. (1993). White dashed lines show transform faults. KK = Karakoram; NP = Nanga Parbat. C) Geological map of the western Himalaya showing the major tectonic units that are eroded by the Indus River and its tributaries. Map is modified after Garzanti et al. (2005). Rivers as shown in thick black lines. ISZ = Indus Suture Zone, MCT = Main Central Thrust, MBT = Main Boundary Thrust and MFT = Main Frontal Thrust. Thick black line shows the boundary of the Indus drainage, while thinner lines demark the limits of the major Himalayan tributaries. (figure cont'd)



Sediments represent a variety of depositional settings in the deep-water basin, with the sandy material interpreted as turbidite lobe deposits on the upper fan and the muddy material representing hemipelagic sedimentation that accumulated when the active lobes had avulsed to different regions of the basin and distal fine-grained sedimentation via hypopycnal plumes dominated (Pandey et al., 2016c). A relative reduction in coarser siliciclastic sediment flux might represent times of reduced Indus River discharge, or a simple avulsion of the fan depositional lobes out of the Laxmi Basin, or even a bloom in biogenic productivity offshore western India diluting the clastic flux. Nd isotope data from the fine grained clastic sediments suggest that the vast majority were supplied from the Indus River (Clift et al., 2019b), with lesser quantities

derived from western India, especially in the past ~4 Ma, often linked to times of lower sealevel (Khim et al., 2019; Yu et al., 2019).

4.2 History of the Asian Monsoon

Scientific drilling offshore Arabia has demonstrated that oceanic upwelling, driven by summer monsoon winds, intensified at least after ~8 Ma (Kroon et al., 1991; Prell et al., 1992). More recent analysis now indicates that the first strengthening may date from ~13 Ma (Gupta et al., 2015), consistent with new constraints on biogenic production in the Maldives, also linked to seasonal winds (Betzler et al., 2016). While marine biogenic production now correlates with the summer monsoon rains (Curry et al., 1992), it is not clear if the same was always true in the deep geologic past. Other proxy records suggest that the monsoon may be somewhat older and that the Late Miocene was a time of drying (Clift et al., 2008b; Dettman et al., 2001). Carbon isotopes from the western Himalayan foreland basin indicate a transition from woody-dominated vegetation to a more grass-dominated assemblage after ~8 Ma, suggestive of the drying trend (Dettman et al., 2001; Singh et al., 2011). This interpretation is consistent with apparent reductions in erosion rates in many Asian marginal seas at that time (Clift, 2006), as well as records of chemical weathering in the South China Sea (Clift et al., 2014). Since the onset of Northern Hemispheric Glaciation (NHG) at approximately 2.7 Ma (Haug et al., 2005), the intensity of the monsoon has varied strongly with these cycles. In general, the summer rains are stronger when the global climate is warm and become weaker during phases of strong glaciation, when colder, drier conditions tend to dominate in lower latitudes (Clemens and Prell, 2003; Clemens and Prell, 2007).

In the present day the Indus basin is affected by summer monsoon rains, but also receives moisture during the winter via the Westerly Jet that supplies moisture, especially to the northern

parts of the flood plains, close to the Himalayan front, as well as to the Karakoram in the form of snow (Demske et al., 2009; Karim and Veizer, 2002). Spring melting of this snow is an important part of the total discharge to the Indus River, in contrast to the eastern Ganges-Brahmaputra River basin (Immerzeel et al., 2010). In general, the Indus basin lies on the edge of the Asian monsoon precipitation maximum and is thus more sensitive to changes in rainfall intensity compared to the eastern parts of the Himalaya (Bookhagen and Burbank, 2006). This makes the Indus especially suitable for looking at the impact of changing monsoon strength on the development of landscape and chemical weathering.

4.3 Regional Geology

IODP Sites U1456 and U1457 are located in the Laxmi Basin, which forms the eastern part of the Arabian Sea (Fig. 4.1). The basin is separated from the main oceanic Arabian Basin by the continental Laxmi Ridge. The Laxmi Basin rifted during the latest Cretaceous when India began to separate from the Seychelles, as seafloor spreading initiated between these continental fragments (Bhattacharya et al., 1994; Pandey et al., 1995). Following the onset of India-Asia collision (~50–60 Ma) (DeCelles et al., 2014; Ding et al., 2016; Najman et al., 2010), the uplift and erosion of the Himalaya drove faster bedrock erosion and supplied large sediment volumes to the Indus Submarine Fan. The Indus Fan is the second largest sediment body on Earth, totaling 4 to 5 x 10⁶ km³ (Naini and Kolla, 1982). The fan reaches a thickness of >11 km under the Indus Shelf (Clift et al., 2001), but is much thinner in the Laxmi Basin (Kolla and Coumes, 1987; Nair and Pandey, 2018).

Sites U1456 and U1457 lie above the carbonate compensation depth (CCD) making it possible to date the age of sedimentation using a combination of nannofossil and foraminiferal

biostratigraphy, coupled with magnetostratigraphy that provides a relatively robust age model (Routledge et al., 2018).

Sediment at Site U1456 is generally coarser grained than Site U1457 because it lies in the center of the Laxmi Basin, while the latter is positioned on the eastern flank of the Laxmi Ridge where it has received less siliciclastic sediment from turbidity currents that tend to focus into the topographic low in the basin center (Pandey et al., 2016c). The primary source of sediment to these sites is the Indus River (Clift et al., 2019b), although the sites also received lesser inputs from rivers draining the Indian peninsula, including the Tapti, Mahi, and Narmada (Khim et al., 2019; Yu et al., 2019)(Fig. 4.1). Petrographic investigations indicate that there have been limited amounts of sediment delivery from Western India, mostly in the youngest parts of the section (Pandey et al., 2016a). Bulk sediment Nd isotope measurements of sediments (Yu et al., 2019) indicate a dominantly Indus-derived supply during interglacial times and more erosion from the Indian peninsula during glacial times when sea level was low. This type of variability can only have affected the region after the onset of the NHG. A lower resolution study of Nd isotopes and associated zircon U-Pb ages spanning the longer time interval considered here indicates that provenance within the basin was mostly stable and largely from the Indus (Clift et al., 2019b).

Other sediment sources are not important inputs to the IODP sites studied here. Wind patterns do not now favor eolian transport from Arabia, although some supply from the Somali region might be possible at the present times based on regional wind patterns (Vecchi et al., 2004). Sediment trap data from the western and central Arabian Sea document reduced eolian sedimentation moving east away from Arabia (Pease et al., 1998). The highest eolian sedimentation rates occur during the winter and spring when the South Asian winter monsoon can transport material from the Thar Desert, which is itself derived from the Indus delta (East et

al., 2015). Given they have the same or similar sources, it is difficult to resolve eolian from water-transported sediment. Nonetheless, sedimentation rates suggest that eolian processes are not significant in comparison to the fluvial sources. In the Upper Miocene at Site U1456, during one of the slower periods of accumulation, sedimentation rates were approximately 10 cm/k.y. Assuming an average dry sediment density of about 1.6 g/cm³, this is equivalent to about 160 g/cm²/k.y. of total siliciclastic sedimentation. In contrast, modern sediment traps offshore western India constrain average eolian sedimentation rates to range 0.29–1.05 g/cm²/k.y. (Honjo et al., 1999). This means that the eolian contribution is a very small fraction of the total deposit, even when sedimentation rates were slow.

The sediment supplied by the Indus is derived from a number of mountain ranges at the western end of the Himalaya and Tibetan Plateau. Study of modern sediment suggests that the Karakoram and Himalaya dominate the sediment supply to the Indus River (Clift et al., 2002c; Garzanti et al., 2005) and that the balance between the two is dependent on monsoon strength, being more Himalayan when the summer rains are strong (Clift et al., 2008a). The source regions have not always been as they are today, because the foreland basin sedimentary rocks of the Siwalik Group (Fig. 4.1C) have been uplifted most recently (Lavé and Avouac, 2000). Even the Lesser Himalaya have only started to contribute large volumes more recently than ~3 Ma (Clift et al., 2019b), although evidence from the proximal foreland basin indicates that these were first exposed after ~9 Ma, at least locally (Huyghe et al., 2001; Najman et al., 2009). The Greater Himalaya, comprising high-grade metamorphic rocks and granites, are somewhat older and record their strongest cooling and exhumation in the Early Miocene (Stephenson et al., 2001; Walker et al., 2001). In contrast, the Tethyan Himalaya that lie north of the Greater Himalaya and which represent the telescoped, but weakly metamorphosed, passive margin of Greater India

(Garzanti et al., 1987) have been available for erosion since long before the start of our studied period (Webb, 2013). Sediment is also supplied from the terrains that represent the old active margin of Eurasia, most notably the Karakoram, as well as the accreted oceanic arc rocks of Kohistan, and the along strike, but less metamorphosed, sequences of the Hindu Kush (Zhuang et al., 2018).

Although there is evidence for sediment storage and reworking as material is transported to the Arabian Sea, the timescale of this process is generally 10⁴–10⁵ y (Blöthe et al., 2014; Clift and Giosan, 2014; Jonell et al., 2017b), so that this should not be so important on the very much longer timescales considered here. Greater reworking likely occurred when the foreland basin was partly eroded ~20 Ma (Najman, 2006) but, again this precedes the studied time interval so that material analyzed here is largely the product of erosion close to the time of sedimentation. We recognize that much of the chemical weathering would have been achieved in the flood plains rather than in the mountains themselves or after deposition (Lupker et al., 2012).

4.4 Choice of Proxies

In this study we use a range of chemical weathering proxies to constrain the alteration state of the sediment recovered from the IODP drill sites. Geochemical proxies are based on the changing relative concentrations of elements readily mobilized during chemical weathering (e.g., Na, K, Ca) and immobile elements (e.g., aluminosilicate-bound Al and Si). We particularly use the Chemical Index of Alteration (CIA) proxy of Nesbitt et al. (1980) as being a well-defined alteration proxy with a correction made for excess Ca where appropriate, following the method of Singh (2005). Fresh granitic bedrock has a CIA value close to 50, while fully weathered material has a value of ~100. We further consider K/Si as a weathering intensity proxy. Si/Al is used as an associated grain size proxy, based on the concept that Si is rich in sediment dominated

by quartz silt and sand, while Al is more common in clay-rich sediments. Ti/Al is also used as a proxy for physical erosion based on the idea that Ti is mostly in the form of silt and sand-sized titanite, while Al is dominated by clay.

Clay minerals have been used as chemical weathering proxies for many years, based on the recognition that in the modern day their formation is largely linked to climate zones and environmental conditions (Thiry, 2000). Illite and chlorite are formed during diagenesis and low-grade metamorphism and are generally associated with physical erosion of bedrocks containing these minerals. In contrast, kaolinite and smectite are products of chemical weathering. Kaolinite is mostly associated with intense leaching under tropical conditions, while smectite is often linked to the breakdown of volcanic bedrock sources (Hillier, 1995). However, analysis of the modern and Holocene Indus flood plains shows that ~40–50% of the clay minerals are smectite (Alizai et al., 2012). Nonetheless, ratios of smectite or kaolinite compared to illite and/or chlorite have a long history of being used to determine chemical weathering intensities, including several examples from monsoonal Asia (Colin et al., 1999; Liu et al., 2019; Liu et al., 2005).

Kaolinite/smectite has also been used as a proxy to determine whether weathering occurred under tropical or semiarid conditions (Alizai et al., 2012). Alteration can also be charted using the Illite Chemical Index, which is determined from the ratio of the 0.5 and 1 nm peak areas in the XRD analysis. Values below 0.5 represent Fe-Mg-rich illites (biotites, micas), which are characteristic of physical erosion. In contrast, ratios above 0.5 are found in Al-rich illites (muscovites), associated with strong hydrolysis during chemical breakdown (Gingele et al., 2001; Gingele et al., 1998).

We further track chemical weathering using magnetic susceptibility (MS). MS is linked to the mineralogy of the Fe-bearing minerals in the sediment and as such is controlled by

environmental conditions during chemical weathering in flood plains, as well as diagenesis. Reduction of iron during burial occurs in the shallow sub-surface (Coleman et al., 1993) so that over longer sections variations in MS are considered to reflect significant variations in the original sediment composition. MS has been applied for paleoenvironmental studies in sedimentary sections, such as the Chinese Loess Plateau where strongly weathered soils, rich in Fe-bearing minerals have high MS and contrast with low MS loess sediment deposited during drier intervals (An et al., 1991; Heller and Evans, 1995).

4.5 Methods

Over 200 samples from IODP Sites U1456 and U1457, together with Indus Marine A-1, were selected for bulk sediment major element geochemical analysis, which was conducted by Inductively Coupled Plasma Emission Spectrometry (ICP-ES) at Boston University (BU), USA. Sediment samples were decarbonated with acetic acid, washed with distilled and deionized water with a purity of 9–12 megaohms, and hand powdered at Louisiana State University (LSU) before total fusion preparation at BU. Glass beads for each sample were made in a muffle furnace at 1050°C by fusing 100 ± 0.5 mg of sample mixed with 400 ± 0.5 mg lithium metaborate (LiBO_2). The melted mixture was then dissolved in 5% HNO_3 , sonicated, manually shaken (not stirred) until no visible grains were observed, and further diluted for analysis (Dunlea et al., 2015). Precision for all elements was better than 1% of the measured value, and accuracy was confirmed by repeated analyses of International Standard Reference Materials (Basalt, Hawaiian Volcano Observatory, BHVO-2)(Wilson, 1997).

Clay mineralogy measurements were undertaken at LSU by using a Panalytical Empyrean X-Ray Diffractometer. The samples are mostly the same as those selected for bulk geochemical analysis. These samples were decarbonated with 20% acetic acid and then soaked in

distilled water until there was no flocculation, with Na_3PO_4 added to de-flocculate when necessary. Four XRD patterns were generated from each oriented sample smear. The first was collected from the sample in the air-dried condition. The slide was then placed in a desiccator with ethylene glycol for a minimum of eight hours at 25°C , and the second XRD pattern was generated from a glycolated sample. The third and fourth XRD data sets were collected after the sample was subjected to heat treatments of 300°C for one hour, and then 550°C for another hour, respectively. XRD analysis began immediately after glycolation, and immediately after the first heat treatment. The semi-quantitative method of Biscaye (1965) was used to estimate the clay assemblage, which is based on peak-intensity factors determined from calculated XRD patterns, as measured by MACDIFF software. For clay minerals present in amounts $>10\text{ wt}\%$ the uncertainty is estimated to be better than $\pm 5\text{ wt}\%$ at the 95% confidence level. Uncertainty of peak area measurement based on repeated measurements is typically $<5\%$ of the measured value.

Diffuse reflectance spectroscopy (DRS) data are a standard physical properties measurement performed by IODP. DRS data were collected at the IODP Gulf Coast Repository (GCR) in College Station, Texas (USA) using a hand-held Minolta CM-2002 Spectrophotometer. Sediment reflectance spectra between 400–700 nm wavelength range were measured every 2 cm along each core. For each measurement the amount (in units of percent) of light intensity reflected from the sample surface was obtained at a 10 nm interval. Giosan et al. (2002) have demonstrated that the 565 and 435 nm bands are sensitive to the presence of hematite and goethite respectively. The first order derivatives of 565 nm and 435 nm were calculated from the data. Since these two minerals are often clay-size their ratio is not affected by grain size. Hematite usually represents dry, warmer environments (Schwertmann, 1971), while goethite is generally associated with cooler, wetter environments (Sangode and

Bloemendal, 2004; Schwertmann, 1971). The 565/435 ratio can be used to represent the relative abundance of hematite and goethite with a very high resolution (2 cm). This ratio has previously been used as a proxy of relative humidity (Balsam et al., 1997; Giosan et al., 2002; Ji et al., 2002). The hematite/goethite record provides an important additional method to help resolve the effect of climatic change. Lower hematite/goethite values would indicate more rainfall, potentially linked to summer monsoon intensification, although a strong seasonality involving a dry season as well could promote higher hematite/goethite values.

4.6 Results

Before using the 565/435 proxy, we need to make sure there is an appropriate level of signal for both these wavelengths in the scanning data. Figure 4.2A shows the spectra for Site U1456. In general, there is more strength in the signal for 435 (goethite) compared to 565, which is almost absent below 600 mbsf, particularly in the mass transport deposit. The signal is strongest for both these wavelengths in the uppermost part of the core, but again with a dominance for goethite, so that the 565/435 proxy is largely controlled by the abundance of that mineral. Comparison with the core descriptions indicates that both minerals, but particularly goethite, are more abundant in the fine-grained sediment interbedded with carbonates, rather than in the sandy turbidite deposits.

At Site U1457 we see the strongest development of both wavelengths at the top of the section, in carbonate-rich, muddy material and very little hematite is present at the bottom of the core, particularly within the mass transport deposit (Fig. 4.2B). There does, however, appear to be a weak signal for 565 throughout much of the section. Because of this, the relative intensities of 565/435 are largely controlled by the abundance of goethite. Only in the middle of the core, at ~300–600 mbsf, does it appear that hematite has a stronger signal than goethite.

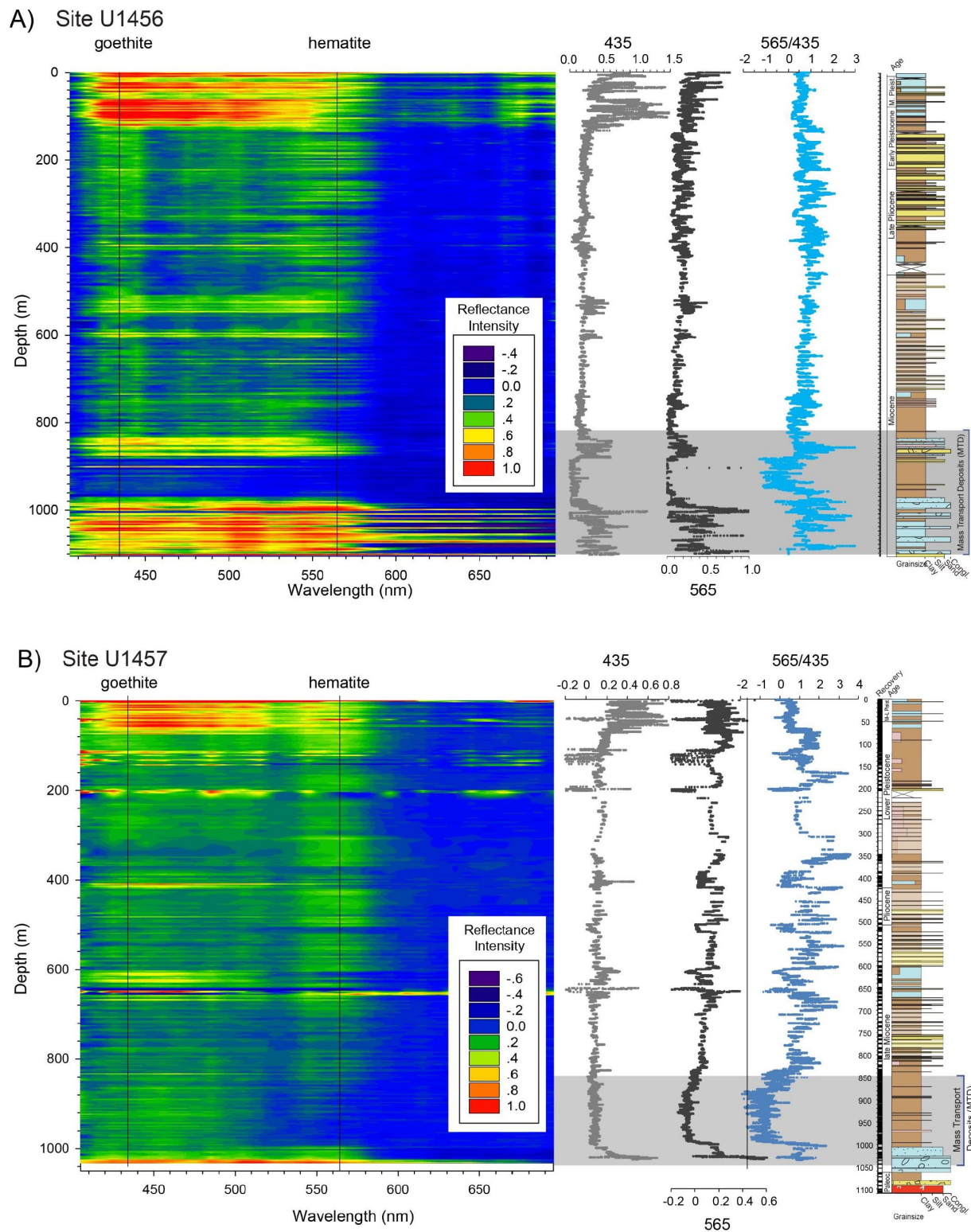


Figure 4.2. Plot of depth against wavelength for DRS data. A) Site U1456 and B) Site U1457.

The various weathering proxies are plotted against depth to look for long term trends. At Site U1456 we observed variable and low values of MS in the mass transport deposit, with an increase above 750 mbsf and then a slight long-term trend to higher values up-section (Fig. 4.3). In particular, we note much greater variation and low values of MS above 120 mbsf where the cores contain significant carbonate. There is no clear trend in Si/Al. The 565/435 (hematite/goethite) proxy is noisy in the mass transport deposit, but then gradually increases from ~820 to 370 mbsf above which point it becomes more erratic and falls towards the top of the cores. CIA values are high in the mass transport deposit but then fall over through the sequence, especially above 750 mbsf and again at 350–400 mbsf. Clay mineralogy shows a dominance of smectite at the base of the cores, especially in the mass transport deposit, although this mineral is present throughout. Illite becomes more dominant up-section, while kaolinite is always a very minor component of the total. Minor volumes of palygorskite are found in restricted intervals, especially finer grained sediments with more carbonate. Illite crystallinity falls going up-section, especially above the mass transport deposit. At the same time, kaolinite/(illite + chlorite) shows a general decrease up-section.

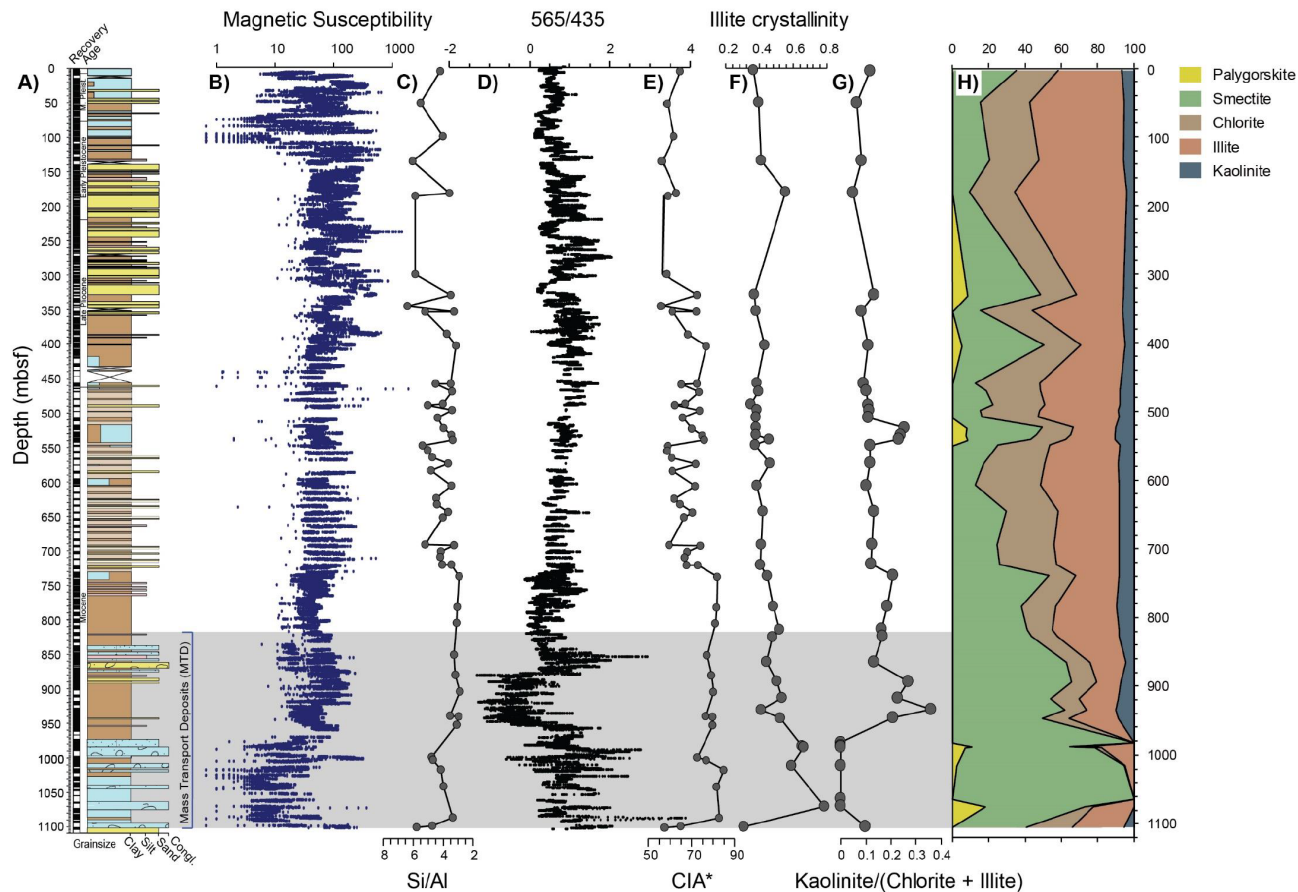


Figure 4.3. A) Sedimentary log of the drilled section at Site U1456 plotted with B) Magnetic susceptibility, C) Si/Al, D) 435/565 hematite/goethite proxy, F) CIA*, G) illite crystallinity, H) kaolinite/(illite/chlorite), and I) clay mineral assemblage.

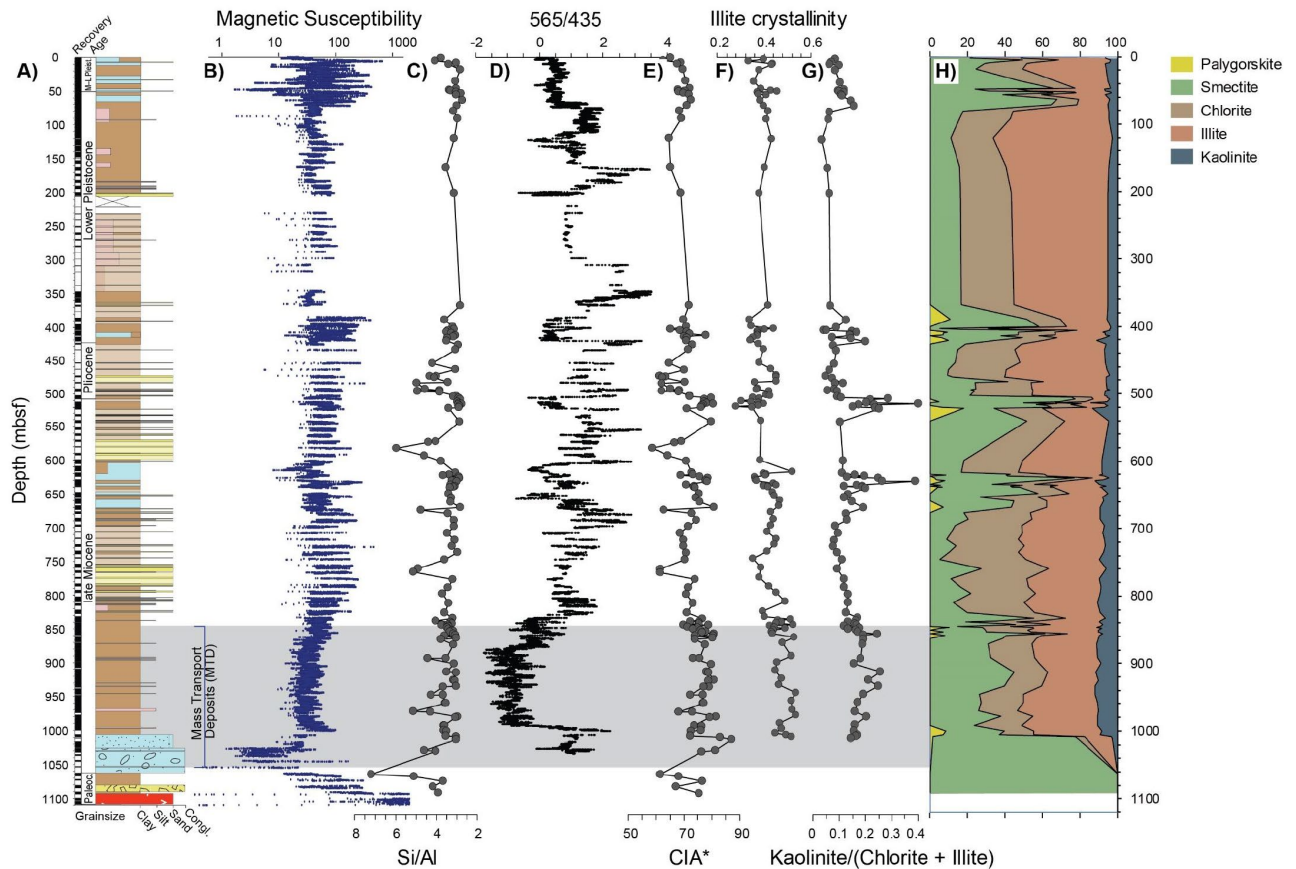


Figure 4.4. A) Sedimentary log of the drilled section at Site U1457 plotted with B) Magnetic susceptibility, C) Si/Al, D) 435/565 hematite/goethite proxy, F) CIA*, G) Illite crystallinity, H) kaolinite/(illite/chlorite), and I) Clay mineral assemblage.

Proxy variations at Site U1457 share some similarities with Site U1456 (Fig. 4.4). Again, MS is lowest in the mass transport deposit, then increases up-section and shows a series of low amplitude cycles, with a highly variable upper 80 m, associated with common muddy lithologies. Si/Al shows no long-term coherent trends, although locally it spikes to higher values, usually in association with sections marked by the frequent presence of sandy turbidite interbeds. These intervals affect all the proxies. 565/435 (hematite/goethite) increases above the mass transport deposit, with a number of intervals showing lower values, typically in the mud/carbonate-rich sections. 565/435 values peaks around 350 mbsf and then fall over the long scale going up-section, albeit with a secondary peak around 170 mbsf. CIA, illite crystallinity, and kaolinite/(illite+chlorite) show an overall decrease in values up-section. Illite proportions

increase up-section, but muddy/carbonate-rich intervals are characterized by higher smectite contents and the presence of small volumes of palygorskite.

4.7 Discussion

We can assess the state of chemical weathering of the sediments by comparing K/Si and Al/Si (Lupker et al., (2012). K/Si provides a measure of alteration because K is water mobile, while Si is generally unaffected by chemical weathering. However, this proxy is also affected by grain size, and especially the presence of clay because mudstones are usually more weathered than coarser sandy and silty deposits. Clays are rich in Al, while quartz-rich silt and sand have high Si contents, allowing Al/Si to be used as a grain size proxy. This approach can be used to normalize K/Si to a constant Al/Si value and thus eliminate grain size as an influence over this proxy. Figure 4.5A shows the sediments from the IODP wells, as well as Indus Marine A-1, compared with existing analyses from the Quaternary Indus Canyon (Li et al., 2018) and river mouth/delta (Clift et al., 2010). Within a given set of data, the overall slope of the array provides a measure of the state of alteration. The Quaternary sediments and the older rocks from Indus Marine A-1 show very similar slopes, suggesting that burial diagenesis has not had a big influence on the composition of the older sedimentary rocks with regard to these elements. The IODP samples, however, show more gentle gradients, indicative of slightly stronger chemical weathering. We compare these analyses with shipboard data from similar sediments recovered from the Bengal Fan (IODP Expedition 354, (France-Lanord et al., 2016). The Bengal sediments are comparable to the Indus Marine A-1 material on the K/Si vs Al/Si plot (Fig. 4.5B) but are moderately less altered than the Laxmi Basin deposits.

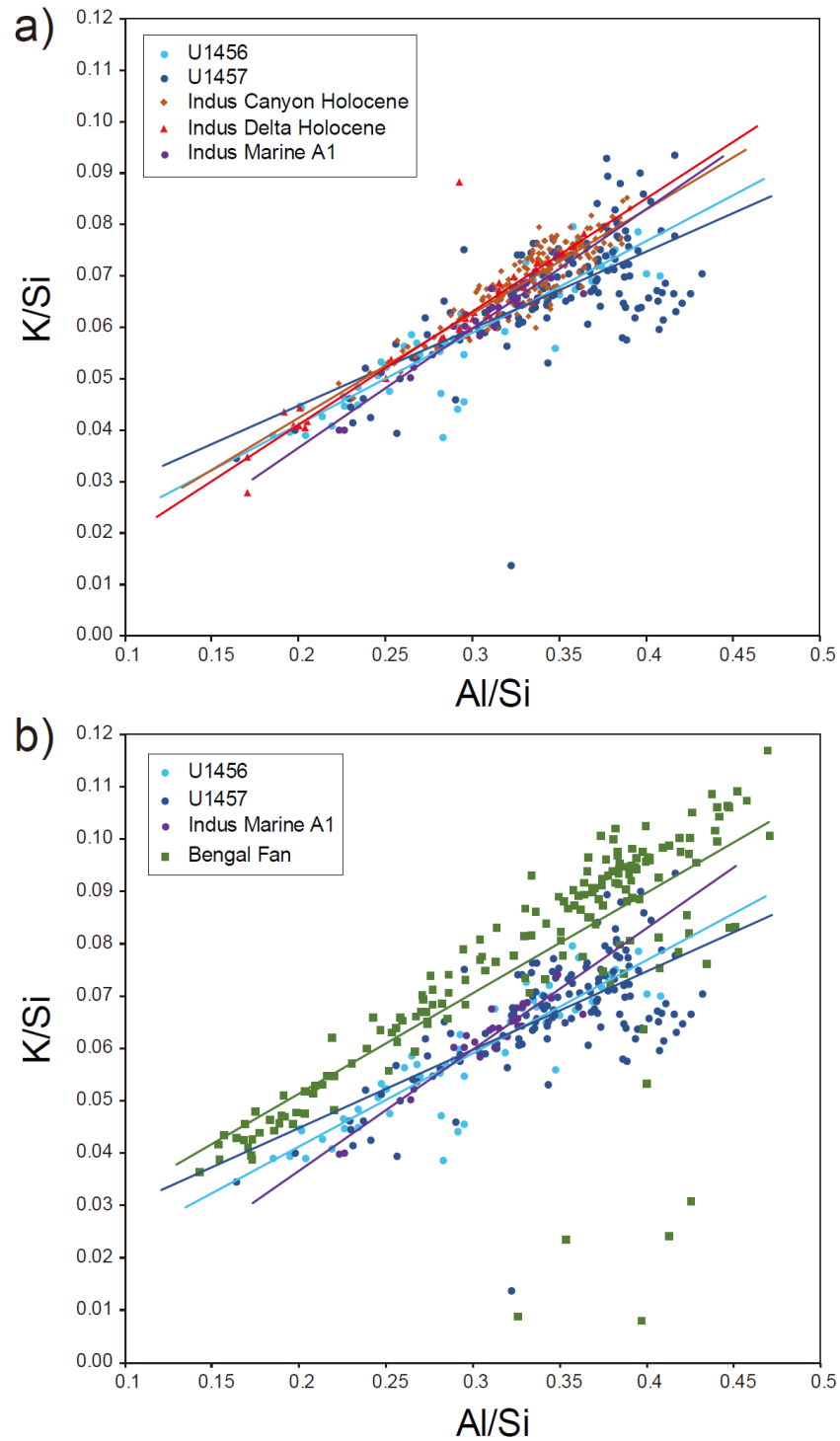


Figure 4.5. K/Si plotted against Al/Si for A) Arabian Sea sediments including Sites U1456 and U1457, as well as Indus Marine A1 and Holocene sediments from the Indus Canyon (Li et al., 2018) and onshore delta (Clift et al., 2010), and B) IODP Sites U1456 and U1457 compared with the Bengal Fan, IODP Expedition 354 (France-Lanord et al., 2016).

We suggest two possible explanations for the discrepancy between the IODP analyses and other Indian Ocean sediments. Because they were analyzed at the same time as the Indus Marine A-1 sediments we consider the differences to be real and not a function of analytical procedure. Although the overall drier conditions in the Indus basin compared with the Ganges-Brahmaputra would drive slower rates of chemical weathering (Kump et al., 2000; West et al., 2005) the temperature difference would not be significant and so can be ruled out. Furthermore, fast rates of alteration need not generate more altered sediment because this depends also on the duration of alteration. If sediment transport was slower from source to sink in the Indus catchment as a result of the lower discharge and stream power, then this could result in deposition of more altered sediments. However, the fact that Indus Marine A-1 and the Quaternary sediments are not also more weathered makes this argument hard to sustain, unless weathering was generally more intense in the Indus Basin over the time of the IODP sedimentation (since 10.8 Ma) than during the Quaternary. This is quite possible as the climate has been generally colder and drier since the onset of NHG compared to the deeper past.

The Indus Marine A-1 sediments are for the most part somewhat older than the IODP sediments, spanning back to 16.7 Ma, into the Early Miocene, when global climate was warmer (Zachos et al., 2001) and potentially wetter because of the intensified hydrologic cycle associated with higher temperatures. Alternatively, the geochemical data may suggest that more weathered sediment is transported to the deep-water and not preserved under the shelf. Greater alteration of sediment in the deep-water basin seems less likely as this should have influenced the Bengal Fan as well.

Another factor may be sediment flux from western India to the Laxmi Basin which would not influence the proximal Indus drill sites. Rivers such as the Tapti and Narmada (Fig. 4.1)

derive their sediment from the Indian peninsula where lack of rock uplift/erosion and sub-tropical conditions would favor strong chemical weathering, as evidenced by the development of thick laterite deposits, especially in the regions of the Deccan Plateau (Maclaren, 1906). Addition of this more altered material could influence the Laxmi Basin sediments. Nd isotope evidence suggests that such sediment supply does take place (Khim et al., 2019; Yu et al., 2019), although over the time scale of this study the great majority of the fine-grained sediment is still believed to come from the Indus River (Clift et al., 2019b).

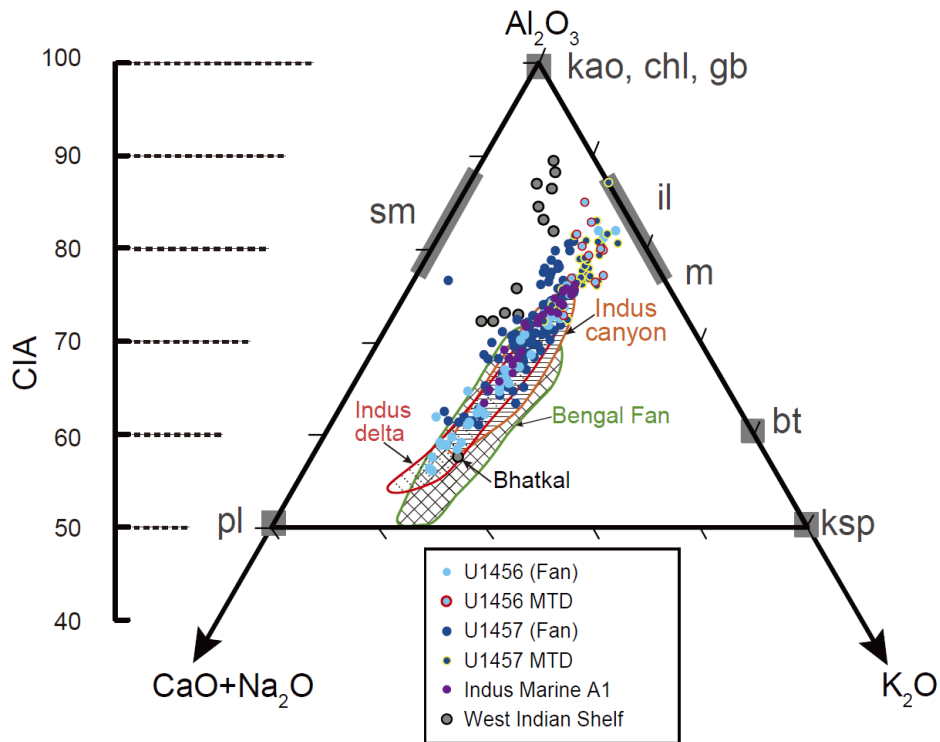


Figure 4.6. Geochemical signature of the analyzed samples illustrated by a CN-A-K ternary diagram (Fedo et al., 1995). CN denotes the mole weight of Na₂O and CaO* (CaO* represent the CaO associated with silicate, excluding all the carbonate). A and K indicate the content of Al₂O₃ and K₂O respectively. Samples closer to Al₂O₃ are rich in kaolinite, chlorite and/or gibbsite (representing by Kao, Chl and Gib). CIA values are also calculated and shown on the left side. Abbreviations: sm (smectite), pl (plagioclase), ksp (K-feldspar), il (illite), m (muscovite). IODP data are compared with Holocene sediments from the Indus Canyon (Li et al., 2018) and onshore delta (Clift et al., 2010), as well as modern shelf sediments from western India (Kurian et al., 2013).

We further examine the major element geochemistry using the CN-A-K ternary diagram of Fedo et al. (1995)(Fig. 4.6). This compares the major element chemistry with the end member compositions of various weathering products. Unweathered materials plot towards the base of the diagram, with more weathered nearer the top apex. The IODP samples largely plot in an array trending from the lower left towards the illite end member, consistent with the observed clay mineralogy. Although there is overlap, we note that the fan sediments generally plot lower and to the left of the mass transport deposits from the same sites (Dailey et al., 2019). Most of the IODP sediments plot within the range seen in the Quaternary Indus Canyon and Indus Delta, although they tend to plot at the more weathered end of that range. As seen in the K/Si vs Al/Si plot (Fig. 4.5), the Laxmi Basin sediments plot within the range of, but also with more altered compositions, compared to Bengal Fan sediments.

The IODP sediments can also be compared with those from the modern western Indian Shelf (Kurian et al., 2013). We only consider those sediments as far south as Bhatikal (Fig. 4.1) because those from further south are of a different composition and given the south-directed longshore current extremely unlikely to have been redeposited into the Laxmi Basin close to the drilling sites. Many of the sediments on the northern part of the shelf receive sediment eroded from the Deccan Plateau and plot close to the apex of CN-A-K plot, or to the left of the fields representing the Quaternary delta and canyon. They do not overlap with the IODP samples, indicating that if there is an influence from the western margin then it is never dominant. Those sediments from the mass transport deposit have the closest association with the western shelf sediments, consistent with the origin of the deposit from the western shelf of Saurashtra (Calvès et al., 2015). The range of CIA values derived from the plot for Indus fan sediment is from 56 to 81, representing a wide range of alteration states.

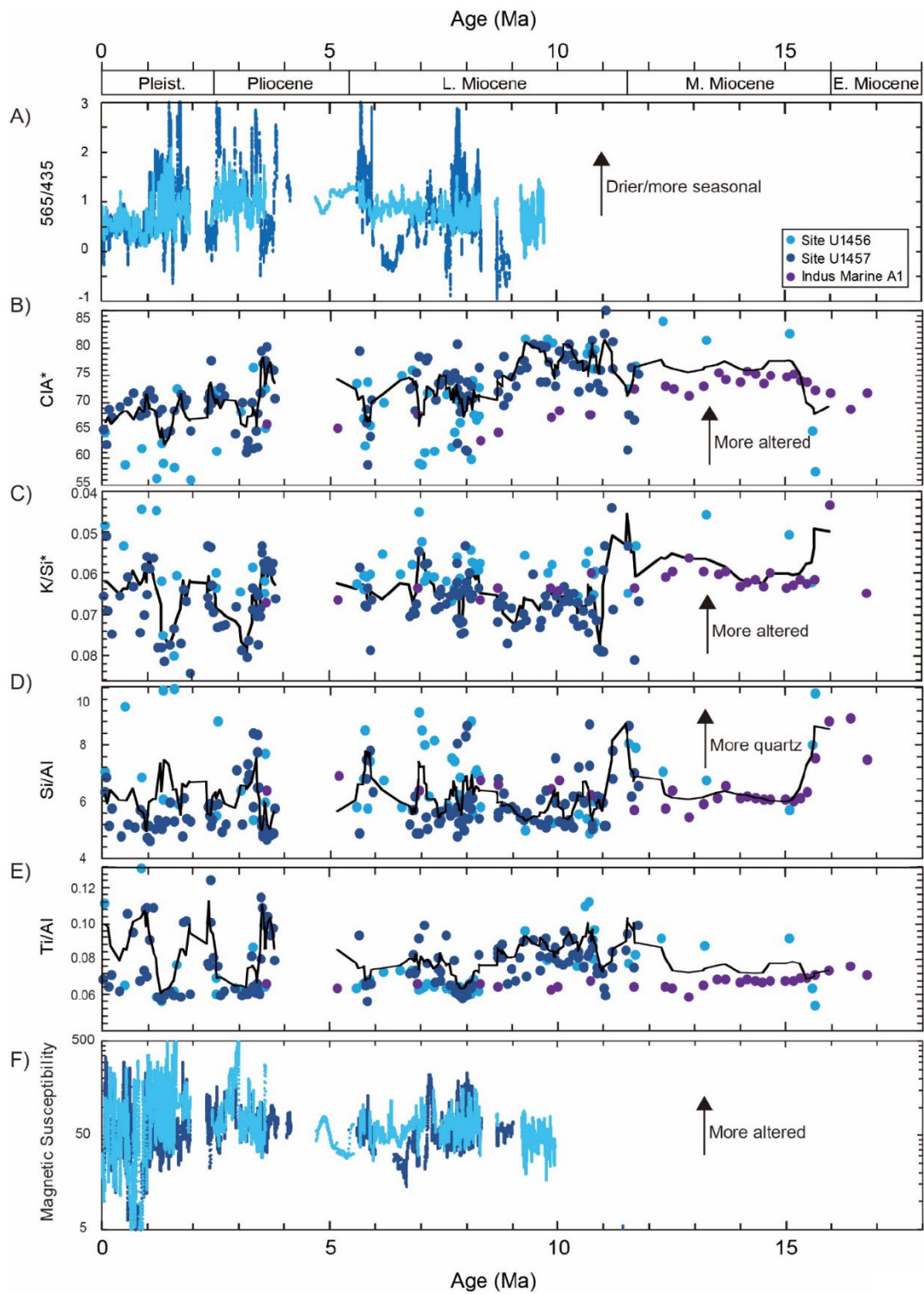


Figure 4.7. Temporal evolution in geochemical, spectral and magnetic weathering proxies since 18 Ma of A) 565/435 hematite/goethite, B) CIA*, C) K/Si*, D) Si/Al, E) Ti/Al, and F) magnetic susceptibility.

We consider the temporal evolution in the chemical indices for alteration in Figure 4.7. We plot a five-point running average to look at the long-term evolution since there is a significant amount of scatter in much of the data at the IODP wells. Data from Indus Marine A-1 is in contrast much more stable. We see generally high CIA values from 16 to 11.5 Ma followed by a peak from 11.5 to 9 Ma, then a fall, especially between 9 and 8 Ma. A further sharp fall is noted around 3.2 Ma with the lowest values seen in the Pleistocene. We infer reduced chemical alteration through time. The K/Si* proxy shows a less clear temporal evolution, although there is a clear drop in the degree of alteration around 11 Ma. This proxy shows much greater variability during the Pleistocene.

In general, the decreasing intensity of chemical alteration can be correlated with the gradual cooling of the global climate since the Middle Miocene (Zachos et al., 2001). The humidity index 565/435 is quite noisy at Site U1457, but the record at Site U1456 implies a steady increase in aridity/seasonality through the Miocene, which would also be consistent with formation of less altered sediment as drier conditions slow alteration rates. 565/435 values at both sites imply a peak in aridity in the late Pliocene to early Pleistocene (Fig. 4.7) coincident with deposition of weakly altered sediments. The 565/435 proxy at both sites became more variable during the Pliocene (<4 Ma), possibly linked to the onset of the high amplitude climate cycles driven by NHG.

The Ti/Al proxy for the presence of titanite-bearing sand versus Al-rich clay does not show a clear temporal variation but like the K/Si proxy also shows high amplitude variations starting around 3.5 Ma. We interpret this to be linked to intensified erosion under the influence of NHG, as well as high amplitude sea level variations pumping coarser grained sediment into the deep basin (Vail et al., 1977).

We also compare the clay mineralogy of the sediments in the boreholes with the Quaternary samples from the Indus Delta and Canyon (Fig. 4.8). There is a significant amount of overlap with the older samples from the boreholes, although these also scatter to assemblages with more smectite, as well as with more illite and chlorite. The IODP samples typically have slightly more kaolinite in them than Quaternary sediments from the proximal Indus suggestive of stronger chemical weathering in the past. There is clearly a wide range in the analyses, although sediments older than 8 Ma tend to contain no more than 70% illite and chlorite, with the sediments richest in those minerals being generally younger. Sediments older than 8 Ma are also enriched in kaolinite, consistent with stronger chemical weathering at that time. The sediments with the highest amounts of smectite are generally either younger than 4 Ma or older than 10 Ma. Younger sediments with higher amounts of smectite are likely the product of some sediment flux from peninsular India during sea level low stands (Yu et al., 2019).

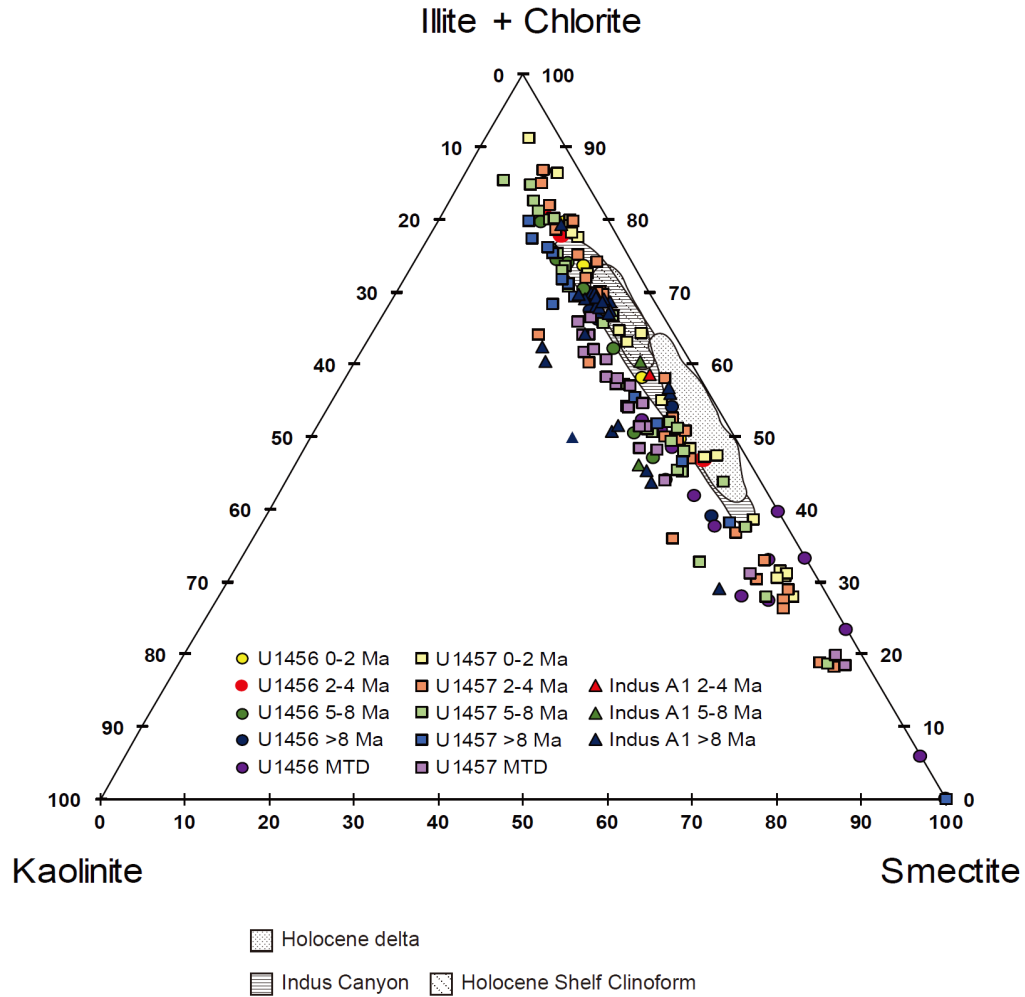


Figure 4.8. Ternary plot showing the clay mineral assemblages for each IODP site color coded to show depositional. Data are compared with the Holocene onshore delta (Alizai et al., 2012), the Holocene Indus Canyon (Li, 2018), and the Holocene Shelf clinoform (Limmer et al., 2012).

In order to see how closely coupled the clay mineral and geochemical weathering proxies are we plot illite crystallinity against CIA (Fig. 4.9). This comparison shows that there is a rather poor positive correlation at the IODP sites, as well as at Indus Marine A1 between these proxies. This means that either that the proxies have different degrees of sensitivity to chemical weathering, or that other processes are also influencing their composition.

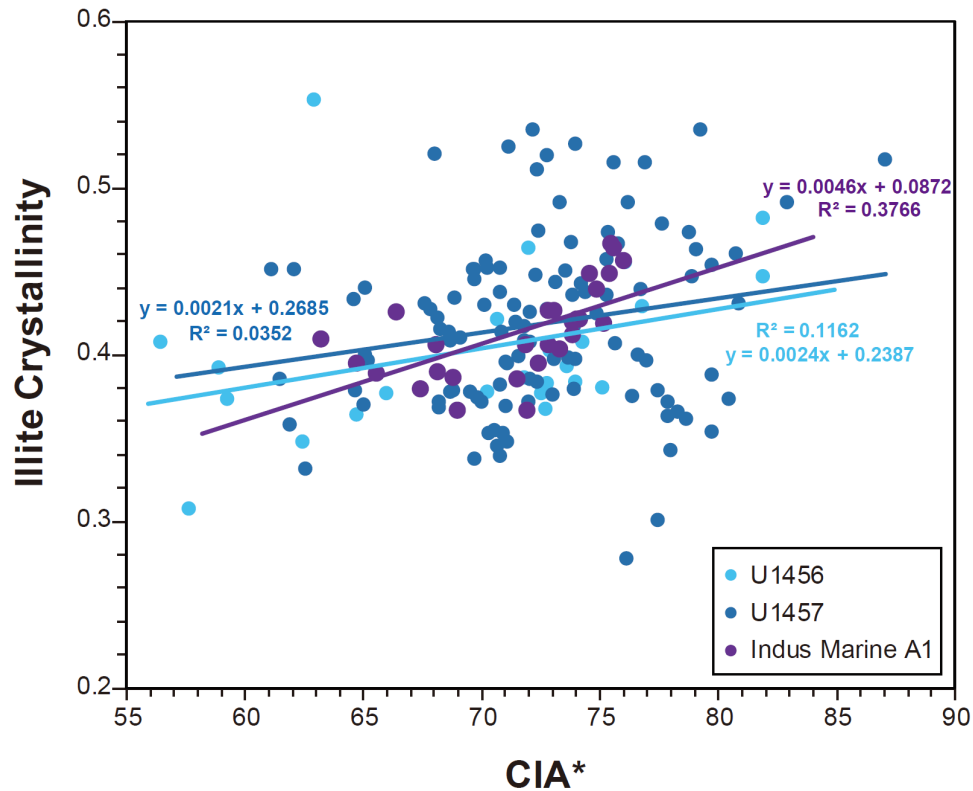


Figure 4.9. Cross plot of illite crystallinity versus CIA* (Singh et al., 2005). Note the rough positive correlation.

The illite crystallinity is seen to decrease from 16 to 11 Ma (Fig. 4.10), followed by an increase again until a peak at 7 Ma. There is a sharp decrease in the crystallinity and therefore reduced alteration around 3.5 Ma, after which alteration is low and variable during the Plio-Pleistocene. When considering kaolinite/(chlorite+illite) we notice a more significant offset between the more proximal sediments of Indus Marine A-1 and the drill sites in the Laxmi Basin (Fig. 4.10C). This proxy also indicates decreasing chemical weathering between 16 and 11 Ma, followed by an increase with peaks around 10 and 7 Ma. Again, there is a sharp decrease in the index at 3.5 Ma. Taken together, these two proxies indicate low degrees of chemical weathering since 3.5 Ma when the NHG starts (Raymo, 1994). There is also a trend towards less alteration from 16 to 11 Ma. The period from 11 to 5 Ma is more complicated and variable with a trend

towards less alteration between 10 and 8 Ma, but then an increase to more alteration by 7 Ma. The kaolinite/smectite proxy shows little coherent long-term variability, except for after 3 Ma when the weathering becomes more smectite-dominated, potentially more seasonal and less tropical. The fact that this change also coincides with a change in provenance as tracked by Nd isotopes (Fig. 4.10E), may indicate that this is not simply a response to climate forcing.

We assess the potential impact of sediment source on clay mineralogy in Figure 4.11. Smectite/kaolinite does not show a close correlation with ϵNd , which is a chondrite normalized representation of the $^{143}\text{Nd}/^{144}\text{Nd}$ composition (DePaolo and Wasserburg, 1976)(Fig. 4.11A). The very highest smectite/kaolinite values are associated with the most positive ϵNd values, which may be linked to sediment flux from peninsular India and thus from the Deccan Plateau volcanic rocks (Khim et al., 2019; Yu et al., 2019). Smectite/(illite+chlorite) shows a similar pattern, with the highest values being associated with most positive ϵNd values (Fig. 4.11B), again consistent with smectite being enhanced in sediment eroded from the Deccan Plateau. Kaolinite/(chlorite+illite) does not show such a strong relationship (Fig. 4.11C), although higher values are seen when ϵNd is Less than -9. Peak kaolinite/(chlorite+illite) values are recorded in the older sediments at Indus Marine A-1 which generally have intermediate ϵNd values. In this case the high kaolinite/(chlorite+illite) values may simply reflect stronger chemical weathering at the time of their sedimentation and is not obviously linked to provenance.

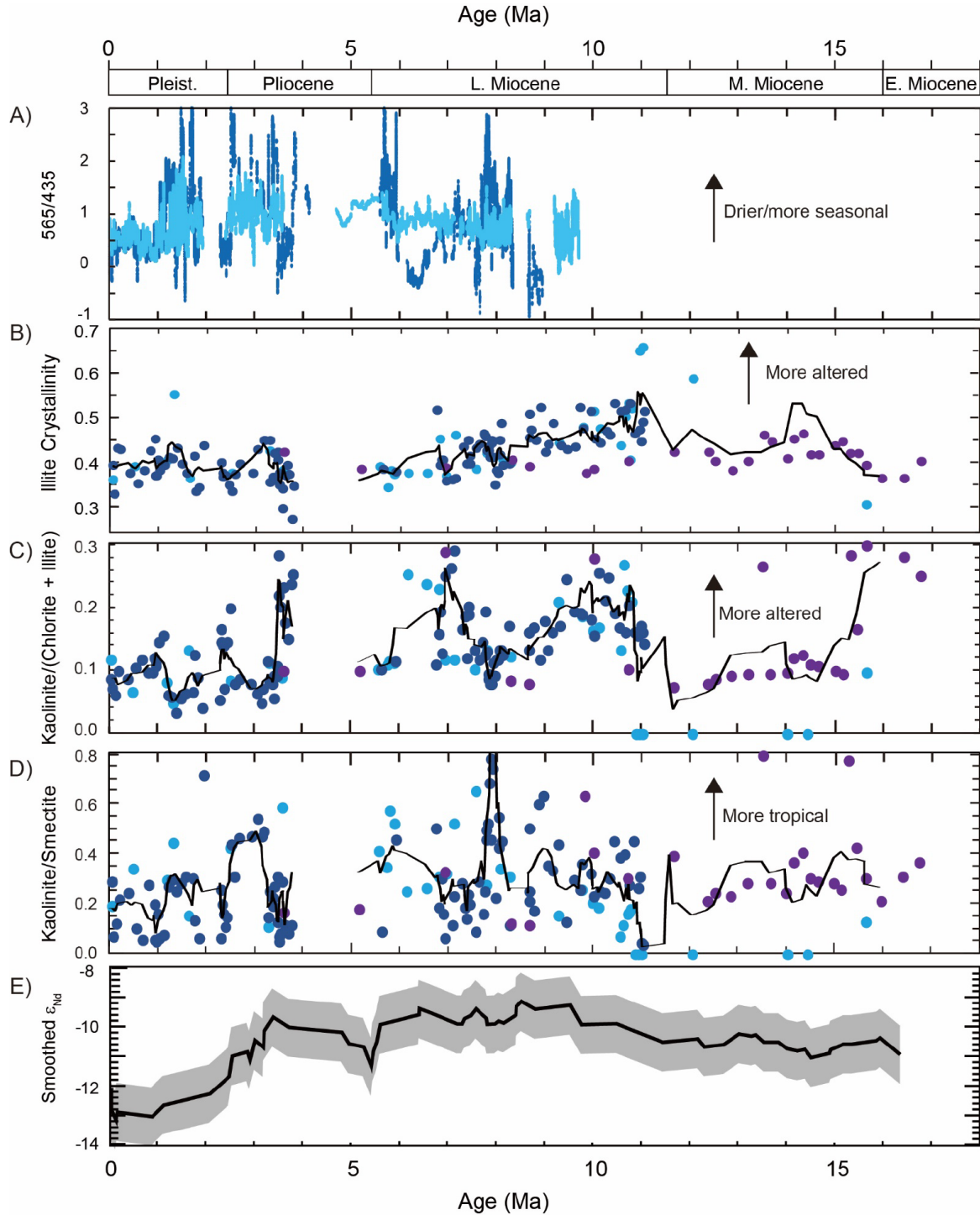


Figure 4.10. Temporal evolution in clay mineral and spectral proxies since 18 Ma. = A) 565/435 (hematite/goethite), B) illite chemical index, C) kaolinite/(illite/chlorite), D) kaolinite/smectite, E) smoothed ϵ_{Nd} values from Clift et al. (2014), as a proxy for sediment provenance.

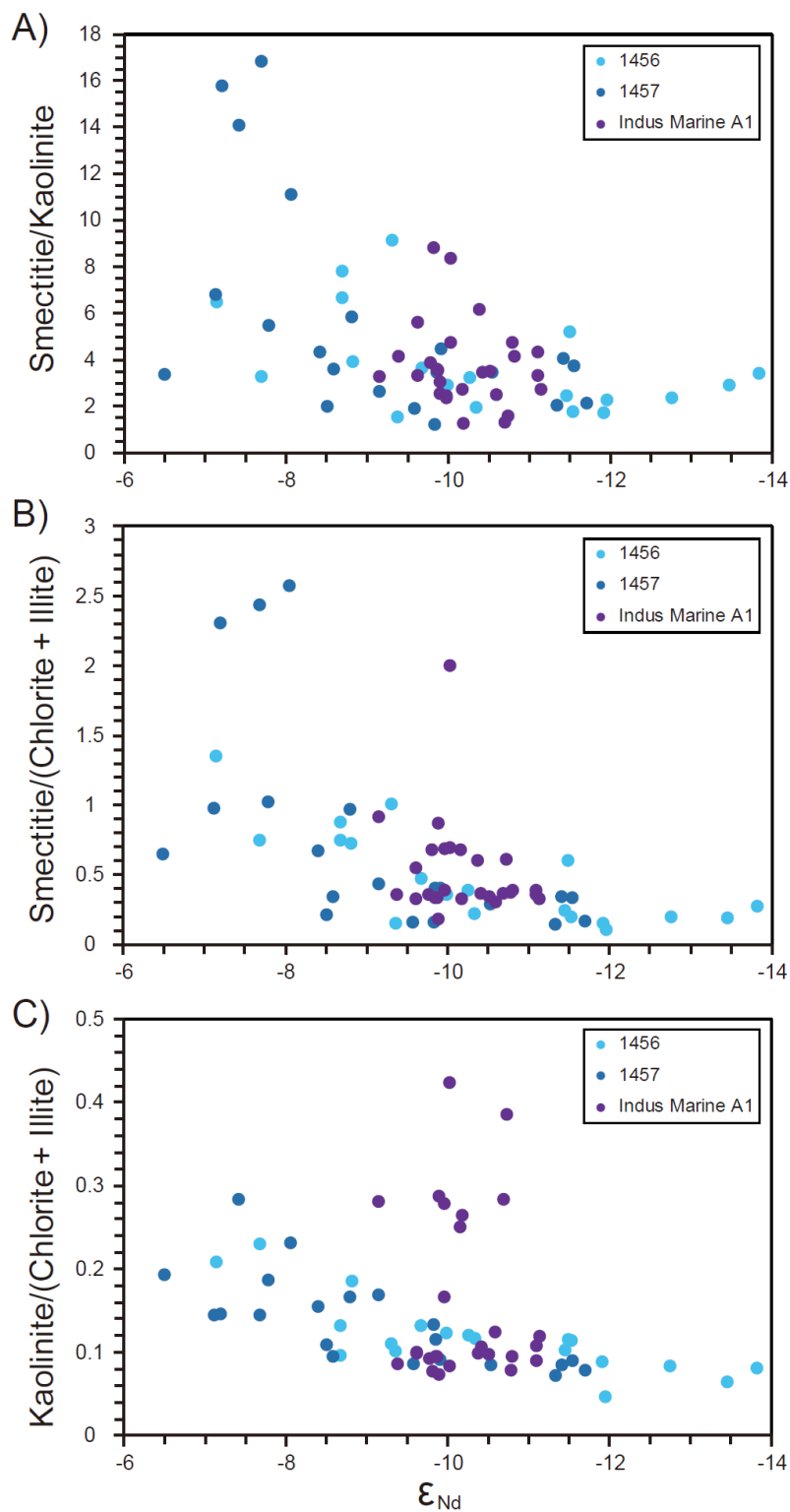


Figure 4.11. Plots of ϵ_{Nd} values and select clay mineral ratios testing for links between provenance and clay mineral assemblage. (A) smectite/kaolinite versus ϵ_{Nd} values. (B) smectite/(chlorite + illite) versus ϵ_{Nd} values. (C) kaolinite/(illite + chlorite) versus ϵ_{Nd} values.

If we consider our most reliable, moderately variable chemical weathering indices then we can see a significant parallel development between illite crystallinity and CIA (Fig. 4.12). We prefer illite crystallinity as a weathering proxy because it does not have the sensitivity to provenance variations seen in the other clay mineral ratios. Both of these proxies show moderately high degrees of alteration from 17 Ma to 11 Ma, and then achieve maximum values from 11 to 9 Ma. We then see a reduction in alteration from 9 to 6 Ma, followed by a period of relatively stable low alteration to the present day. None of these transitions appears to be related to variations in global temperatures, as tracked by foraminiferal oxygen isotopes (Zachos et al., 2001). However, the time of decreased alteration does correlate with the carbon isotope transition in the foreland basin (Fig. 4.12G) that has been linked to a change in the vegetation and generally attributed to drier conditions in the floodplains (Clift, 2017; Dettman et al., 2001). This is also a time when sediment flux to ocean was decreasing (Clift, 2006)(Fig. 4.12E). Furthermore, the abundance of hematite using the strength of the 565 signal (Fig. 4.12A) rises significantly at that time, especially in the more continuous Site U1456 record. Because this mineral is associated with weathering in arid or seasonal conditions (Walker, 1967), this is consistent with the reconstruction of a drying climate in the Indus Basin causing reduced chemical alteration. Hematite is also very common in the Pleistocene, reflecting weathering under more arid glacial conditions at the same time.

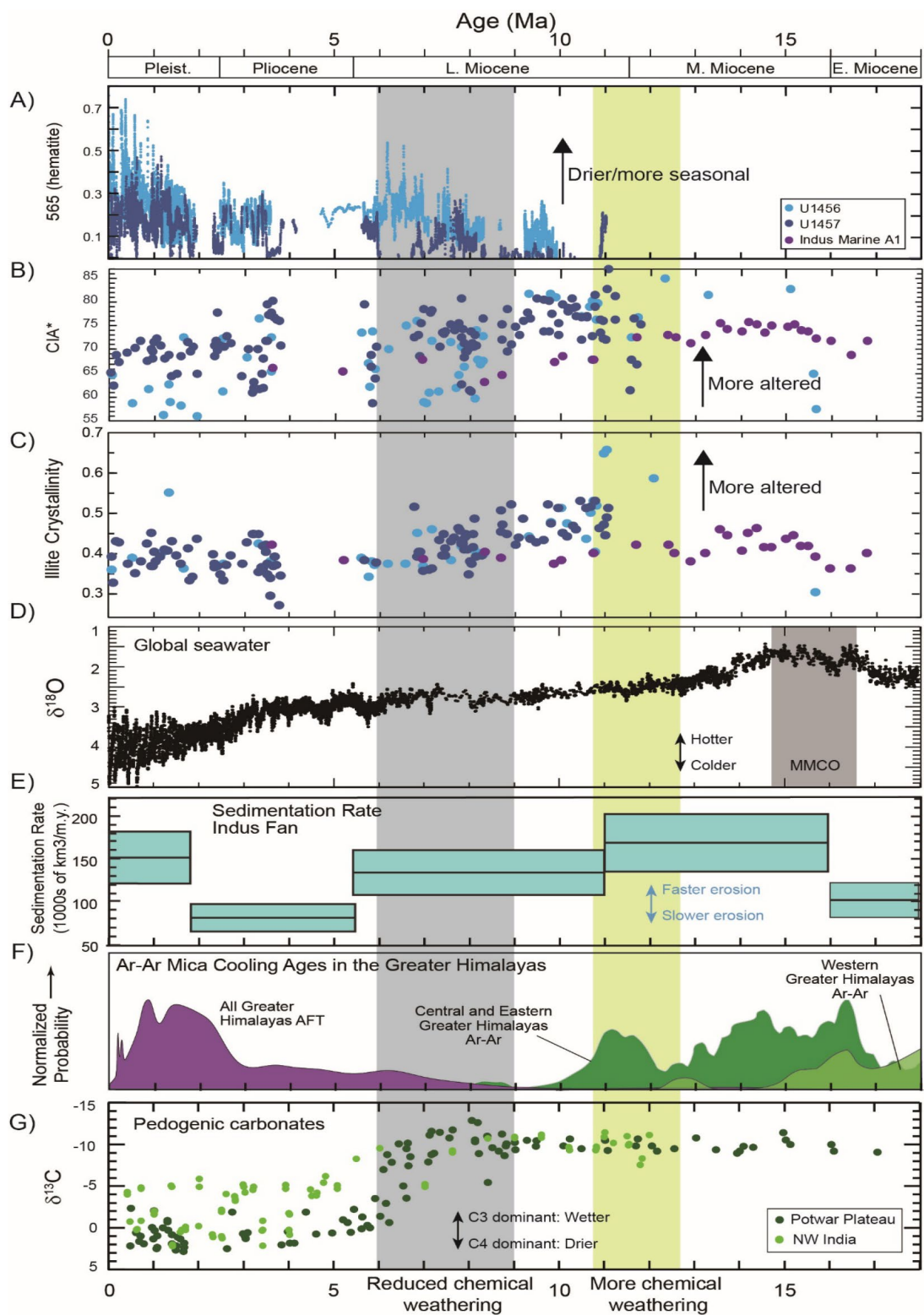


Figure 4.12. Temporal evolution in weathering proxies together with possible forcing factors. (figure caption cont'd)

A) 565 hematite, B) CIA*, C) illite crystallinity, D) global seawater $\delta^{18}\text{O}$ as a proxy for seawater temperature (Zachos et al., 2001), E) Sedimentation rates for the Indus Fan (Clift, 2006), F) Probability densities for $^{40}\text{Ar}/^{39}\text{Ar}$ muscovite dates from the Himalayan hinterland and proximal foreland (Clift et al., 2008b). G) Pedogenic carbonate $\delta^{13}\text{C}$ from the Siwaliks (Quade et al., 1989; Singh et al., 2011), H) 565/435 from ODP Site 1148 in South China Sea (Clift et al., 2008b). Yellow shaded vertical bar indicates a time of increasing chemical weathering, while the gray-shaded bar indicates a time of long-term reduced weathering.

It is harder to assess the importance of the increased weathering from 13 to 11 Ma, as this is inferred from the difference between sediments at Indus Marine A-1 and the IODP sites where the record before 10.8 Ma is lost to mass wasting (Pandey et al., 2016c). The difference could represent the difference between proximal and distal records, although the fact that this is seen in the illite crystallinity where similarly aged samples have similar values is encouraging. This transition is not mirrored in the carbon isotope record, although it is still recognized as a time of rapid exhumation in the Greater Himalaya based on the bedrock compilation of Clift et al. (2008b), as well as being a time of rapid sedimentation on the Indus Fan (Fig. 4.12E). These factors are consistent with 11–13 Ma being a time of strong monsoon precipitation. It is recognized that when the monsoon is strong enough, that moderate changes in intensity do not influence the vegetation in the flood plains and would thus not be recorded in the stable isotope record (Vögeli et al., 2017).

The data presented here show that in the Late Miocene chemical weathering intensity was decreasing while at the same time sedimentation rates in Indus Fan were also decreasing, indicating reduced chemical weathering flux. These data are not consistent with models that link long-term global cooling to an increase in chemical weathering, drawing down atmospheric CO_2 (Raymo and Ruddiman, 1992). The decrease in global temperatures since 5 Ma is not reflected by stronger weathering in these sites, although sedimentation rates did increase. It is possible that

in the wetter Eastern Himalaya at this situation might be reversed but we can state that the Western Himalaya are not the region driving global climate change in the Neogene.

4.8 Conclusions

In this study we present a multi-proxy chemical weathering reconstruction of the Indus drainage basin dating from 17 Ma, as recovered from the Arabian Sea. Bulk sediment geochemistry and clay mineral assemblages show progressive long-term changes since that time. Chemical weathering appears to have been relatively strong from 17 to 11 Ma. Grain size does not appear to be a major control on the chemical weathering indices. Indus submarine fan sediments are more weathered than those found in the Bengal Fan that span a similar time period. They are also more weathered than Quaternary Indus Fan and Delta sediments. The higher degrees of alteration may reflect longer transport times despite the drier climate in the Indus basin, compared to the Ganges-Brahmaputra. Although clay mineral proxies, such as illite crystallinity, do not correlate closely with the geochemical ratios they do show the same long-term trend towards reduced chemical weathering, particularly between 9 and 6 Ma. This is the same time that the vegetation in the floodplains changed from being C3 wood-dominated to C4 grass-dominated. Concentrations of hematite, a mineral associated with formation under arid or at least seasonal conditions, also increase at this time. Clay mineral proxies show some tendency to being controlled by provenance. In particular, sediment flux from peninsular India may have been important, typically during times of lower sea level. Consequently, greater confidence was placed in the illite crystallinity proxy which is not influenced by these additional contributions. The weathering record is broadly consistent with a drying climate following the relatively hot and humid environmental conditions in the Middle Miocene. This means that the oceanic upwelling and biogenic production record from the Indian Ocean is essentially decoupled from

the precipitation history in the Himalaya and its adjacent basins. Falling chemical weathering in the Late Miocene at the same time that sedimentation rates in the submarine fan decreased means that total weathering fluxes must have been falling at this time and cannot have been the mechanism by which atmospheric CO₂ was reduced, driving long-term global cooling. Although this uplift hypothesis for planetary climate change may be viable in the Eastern Himalayas it is not applicable to the Indus basin.

CHAPTER 5. CONCLUSIONS

Physical erosion and chemical weathering play a pivotal role in controlling the recycling of bedrock material from source to sink. After the initial collision between India and Eurasia, a series of mountains belts were uplifted and continued to evolve both in in topography and structure, as a result of ongoing tectonic deformation coupled with focused erosion, largely modulated by the strength of summer monsoon rains (Bookhagen et al., 2005b; Clift et al., 2008b; Wobus et al., 2003)). The Indus basin and the primary sources in the western Himalaya and Karakoram lie to the west of the Asian monsoon precipitation maximum and are thus sensitive to changes in rainfall intensity. The sediments eroded from the Western Himalaya have been deposited in the Indus submarine fan in the Arabian Sea (Clift et al., 2001; Kolla and Coumes, 1987). In my study, a number of geochemistry and geochronology methods was applied to sediment samples from the Indus submarine fan, specifically, from the IODP Sites U1456 and U1457 (Pandey et al., 2016c)) in the Laxmi Basin on the eastern edge of the fan. My objective was to investigate the tectonic-climatic interactions since the Mid Miocene and the net impact of these processes on weathering and erosion in the western Himalaya.

The first objective of this study was addressing the question about whether sediments collected from these two IODP sites are derived from the Indus River or from local India peninsula rivers, such as the Narmada or Tapti, since the drill sites are geographically closer to these local rivers rather than the Indus river mouth (Fig 1.1). The origin of the sediments, and how this may have evolved through time is critical to the entire study.

IODP Site U1456 and U1457 provide a relatively continuous erosional record derived from the Indus River and spanning back to 10.8 Ma with a small section also available around 15.5 Ma. This record was further supplemented by samples from industrial well Indus Marine A-

1, located close to the Indus River mouth, and dating back to 17 Ma. In Chapter 2, U-Pb dating methods were applied to detrital zircon grains that were separated and picked from sandy and silty sediments to determine their provenance. The grain size study proved that the sediments used for zircon U-Pb dating were generally silty sand to silt, and have a good sorting. In terms of their geochemistry the CA-A-K ternary diagram (Fedo et al., 1995) and geochemical classification of sediments following the scheme of Herron (1988) indicate that the samples from Sites U1456 and U1457 are most similar to deposits found in the Quaternary delta of the Indus and its submarine canyon (Li et al., 2018), and are distinguishable from sediments on the modern Western Indian Shelf (Kurian et al., 2013). The detrital zircon U-Pb ages distribute into several categories which can be correlated with bedrock sources in the Himalaya and Karakoram. Grains younger than 200 Ma correlate well with young bedrocks from the Karakoram, Kohistan, Ladakh and Nanga Parbat. The observation of multiple grains of this age confirmed that the sediment source was from the Indus River and not from peninsular India.

Furthermore, long-term increases in detrital zircon U-Pb components of 750–1200 Ma and 1500–2300 Ma show increasing preferential erosion of the Himalaya relative to the Karakoram starting ~5.7 Ma. An increase in the contribution of 1500–2300 Ma zircons after 1.9 Ma but before 1.6 Ma indicates significant unroofing of the Inner Lesser Himalaya at that time, later than seen farther east and in the Ganges catchment (Najman et al., 2009). The trend in zircon U-Pb age populations is consistent with bulk sediment Nd isotopes measured from the same boreholes, and implies greater zircon fertility of Himalaya bedrock compared to the Karakoram and Transhimalaya. The deduced changes in spatial erosion patterns are not easily correlated to the drying climate of the Indus foreland since the Late Miocene and hence likely reflect orographic rainfall and erosion due to rising topography in response to the formation of

the Lesser Himalayan thrust duplex, especially during the Pliocene. The influence of the Nanga Parbat Massif to the bulk sediment flux is modest, in contrast to the situation in the eastern Himalaya syntaxis, where Namche Barwe accounts of ~40% of the sediment in the Brahmaputra.

In Chapter 3 I described the fission track (AFT) analysis of apatite grains picked from the same samples which were used for the detrital zircon U-Pb dating. I use these data to constrain exhumation rates in the western Himalaya and Karakoram since 15.5 Ma. With the exception of a Triassic population in the youngest (0.93 Ma) sample which was supplied from western Peninsular India, AFT ages are overwhelmingly Cenozoic, largely <25 Ma, consistent with both a Himalaya-Karakoram source and rapid erosion. Comparison of the minimum cooling age of each sample with depositional age (lag time) indicates an acceleration in exhumation between 7.8 and 7.0 Ma, with lag times shortening from ~6.0 m.y. at 8.5–7.8 Ma to being within the error of zero between 7.0 and 5.7 Ma. Sediment supply at 7.0–5.7 Ma was largely from the Karakoram, and to a lesser extent the Himalaya, based on U-Pb zircon ages from the same samples. This time coincides with a period of drying in the Himalayan foreland caused by weaker summer monsoons and Westerly winds (Quade et al., 1995); (Clift et al., 2019b). It also correlates with a shift of erosion away from the Karakoram, Kohistan and the Tethyan Himalaya towards more erosion of the Lesser, Greater Himalaya and Nanga Parbat, as shown by zircon U-Pb provenance data and especially after 5.7 Ma based on Nd isotope data. Samples younger than 5.7 Ma have lag times ~4.5 m.y., similar to Holocene Indus delta sediments.

Chapters 2 and 3 discussed how the exhumation of the mountains was primarily controlled by tectonic influence on the erosion pattern. Furthermore, to understand the climatic impacts on the surface process and the links between the Indian monsoon and the growth of the high topography in Western Himalayan. I examine the history of chemical weathering in the

onshore river basin changed through geologic time. I further test whether changes in chemical weathering intensity are linked to tectonic or global climatic variation. Fine grained samples were analyzed for clay mineralogy, and bulk sediment geochemistry, contrasting with the coarse sediments considered for U-Pb zircon dating and AFT analysis. Coupled with the sediments from industrial borehole Indus Marine A-1, I examined the long-term evolution of chemical weathering back to ~17 Ma. These methods were supplemented by diffuse reflectance spectroscopy and magnetic susceptibility that provided a high-resolution record of the changing of chemical alteration.

The chemical weathering appears to have been relatively strong from 17 to 11 Ma. Clay mineral proxies such as illite crystallinity, do not correlate closely with the geochemical proxies, but they do show the same long-term trend towards reduced chemical weathering, particularly between 9 and 6 Ma. This change correlates with the shift in floodplain vegetation from C3 wood-dominated to C4 grass-dominated (Quade et al., 1989) and is also coincident with the increasing trend of hematite, an iron oxide associated with arid conditions. Since 6 Ma, weathering has been weak but especially variable since a final reduction in weathering after 3.5 Ma that is linked to the onset of Northern Hemispheric Glaciation.

The weathering record is broadly consistent with a drying climate following the relatively hot and humid environmental conditions in the Middle Miocene. This means that the oceanic upwelling and biogenic production record from the western Indian Ocean are essentially decoupled from the precipitation history in the Himalaya and its adjacent basins. Falling chemical weathering in the Late Miocene at the same time that sedimentation rates in the submarine fan decreased means that total weathering fluxes must have been falling at this time

and cannot have been the mechanism by which global atmospheric CO₂ was reduced, driving long-term global cooling (Raymo and Ruddiman, 1992).

In summary, this study constrained the changes in regional exhumation and erosion pattern in the Western Himalaya since ~11 Ma and reconstructs the long-term evolution in chemical alteration since ~17 Ma. Furthermore, I investigated how these changes in physical erosion and chemical weathering related to the evolution of tectonic or paleoenvironmental forcing processes. The primary result revealed there are more influenced by tectonics than monsoon intensity or climate in the Western Himalayan and Indus River drainage basins.

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APPENDIX A. CONSENT FOR CHAPTER 3



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APPENDIX B. DETRITAL ZIRCON U-Pb AGES OF IODP Sites U1456 and U1457

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456A-11H-6 60-69 cm	268.1	0.501	0.151	0.010	0.0222	0.0006	0.23247	141.6	8.9	141.2	3.7	160	130	141.2	3.7	0.3
U1456A-11H-6 60-69 cm	211	0.895	4.113	0.097	0.2665	0.0058	0.52878	1657	20	1522	30	1840	41	1840.0	41.0	17.3
U1456A-11H-6 60-69 cm	509	3.610	2.842	0.080	0.2219	0.0046	0.75194	1361	21	1290	24	1461	34	1461.0	34.0	11.7
U1456A-11H-6 60-69 cm	823	0.844	0.155	0.023	0.0203	0.0012	0.22659	146	20	129.7	7.7	360	310	129.7	7.7	11.2
U1456A-11H-6 60-69 cm	92.3	0.695	1.461	0.051	0.1474	0.0025	0.20208	911	21	886	14	923	75	923.0	75.0	4.0
U1456A-11H-6 60-69 cm	415	0.474	3.350	0.120	0.2217	0.0051	0.56972	1487	26	1290	27	1756	49	1756.0	49.0	26.5
U1456A-11H-6 60-69 cm	323	0.732	3.779	0.061	0.2715	0.0040	0.51163	1586	13	1551	19	1614	28	1614.0	28.0	3.9
U1456A-11H-6 60-69 cm	53.6	0.104	1.857	0.066	0.1464	0.0026	0.04576	1055	24	880	14	1407	76	DISC	DISC	37.5
U1456A-11H-6 60-69 cm	291	0.529	3.710	0.054	0.2704	0.0031	0.61491	1571	12	1542	15	1599	21	1599.0	21.0	3.6
U1456A-11H-6 60-69 cm	245	1.503	4.870	0.057	0.3055	0.0030	0.39815	1796.5	9.9	1718	15	1892	21	1892.0	21.0	9.2
U1456A-11H-6 60-69 cm	1465	0.477	0.016	0.001	0.0026	0.0001	0.02348	16.3	1.4	16.79	0.49	10	160	16.8	0.5	3.0
U1456A-11H-6 60-69 cm	739	0.740	1.352	0.045	0.1361	0.0038	0.57127	867	19	822	21	984	55	822.0	21.0	5.2
U1456A-11H-6 60-69 cm	399	6.240	4.076	0.057	0.2778	0.0035	0.54294	1647	11	1579	18	1734	26	1734.0	26.0	8.9
U1456A-11H-6 60-69 cm	380.1	0.754	11.310	0.280	0.4670	0.0110	0.66615	2547	22	2470	49	2609	33	2609.0	33.0	5.3
U1456A-11H-6 60-69 cm	324	3.440	1.531	0.035	0.1442	0.0020	0.35867	943	14	868	12	1098	46	1098.0	46.0	20.9
U1456A-11H-6 60-69 cm	372	0.540	4.340	0.110	0.2937	0.0056	0.37534	1698	20	1659	28	1739	46	1739.0	46.0	4.6
U1456A-11H-6 60-69 cm	1164	11.440	0.435	0.022	0.0519	0.0027	0.66130	366	16	326	17	611	91	326.0	17.0	10.9
U1456A-11H-6 60-69 cm	2249	8.460	3.323	0.087	0.2404	0.0065	0.71746	1484	20	1388	34	1612	38	1612.0	38.0	13.9
U1456A-11H-6 60-69 cm	592	0.792	2.871	0.094	0.2141	0.0058	0.56938	1372	25	1250	31	1553	53	1553.0	53.0	19.5
U1456A-11H-6 60-69 cm	158.3	0.665	4.574	0.084	0.2923	0.0046	0.50524	1746	15	1655	22	1843	30	1843.0	30.0	10.2
U1456A-11H-6 60-69 cm	3393	2.940	0.267	0.004	0.0363	0.0005	0.35715	240.4	3.5	229.6	2.9	341	38	229.6	2.9	4.5
U1456A-11H-6 60-69 cm	317	2.420	1.450	0.040	0.1499	0.0034	0.52356	909	16	900	19	938	49	938.0	49.0	4.1
U1456A-11H-6 60-69 cm	446	1.518	1.407	0.030	0.1378	0.0019	0.36318	890	13	832	11	1032	41	832.0	11.0	6.5
U1456A-11H-6 60-69 cm	230.3	0.429	1.733	0.069	0.1486	0.0052	0.52669	1018	26	893	29	1280	71	DISC	DISC	30.2
U1456A-11H-6 60-69 cm	638	0.308	3.370	0.130	0.2300	0.0110	0.85644	1494	32	1335	59	1749	47	1749.0	47.0	23.7
U1456A-11H-6 60-69 cm	296	1.870	0.613	0.022	0.0754	0.0016	0.27435	484	14	468.7	9.7	555	78	468.7	9.7	3.2
U1456A-11H-6 60-69 cm	428	2.040	7.620	0.190	0.3252	0.0081	0.90037	2183	22	1813	39	2572	24	2572.0	24.0	29.5
U1456A-11H-6 60-69 cm	107	0.561	4.012	0.084	0.2818	0.0042	0.40152	1634	17	1599	21	1690	39	1690.0	39.0	5.4
U1456A-11H-6 60-69 cm	124.6	0.743	7.830	0.200	0.3450	0.0100	0.55255	2209	23	1910	49	2510	45	2510.0	45.0	23.9
U1456A-11H-6 60-69 cm	291.9	0.670	4.480	0.140	0.2933	0.0078	0.63694	1722	27	1656	39	1769	46	1769.0	46.0	6.4
U1456A-11H-6 60-69 cm	160	0.670	1.168	0.051	0.0981	0.0030	0.58805	778	24	602	18	1264	70	DISC	DISC	22.6
U1456A-11H-6 60-69 cm	1467	1.150	1.591	0.038	0.1504	0.0032	0.62046	965	15	903	18	1073	39	1073.0	39.0	15.8
U1456A-11H-6 60-69 cm	352	1.126	1.132	0.036	0.1037	0.0030	0.51044	766	17	636	17	1121	59	DISC	DISC	17.0
U1456A-11H-6 60-69 cm	315	0.765	1.361	0.034	0.1474	0.0026	0.34549	872	15	886	15	854	53	854.0	53.0	3.7
U1456A-11H-6 60-69 cm	74.4	0.253	0.633	0.035	0.0792	0.0016	0.20609	492	22	491.3	9.8	490	110	491.3	9.8	0.1

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456A-11H-6 60-69 cm	280.2	0.424	1.459	0.034	0.1409	0.0020	0.29528	911	14	850	11	1093	47	1093.0	47.0	22.2
U1456A-11H-6 60-69 cm	588	1.027	1.177	0.029	0.1311	0.0026	0.35838	788	13	794	15	818	50	794.0	15.0	0.8
U1456A-11H-6 60-69 cm	203	0.849	4.400	0.100	0.2833	0.0053	0.54427	1708	19	1607	27	1857	38	1857.0	38.0	13.5
U1456A-11H-6 60-69 cm	1748	2.570	0.599	0.018	0.0765	0.0025	0.49918	476	11	475	15	490	75	475.0	15.0	0.2
U1456A-11H-6 60-69 cm	1079	1.600	13.120	0.290	0.4900	0.0079	0.84148	2686	22	2570	34	2766	22	2766.0	22.0	7.1
U1456A-11H-6 60-69 cm	750	2.778	0.697	0.014	0.0856	0.0011	0.36679	536.4	8.7	529.2	6.4	533	45	529.2	6.4	1.3
U1456A-11H-6 60-69 cm	400	1.720	0.805	0.035	0.0935	0.0033	0.73253	597	20	576	19	640	66	576.0	19.0	3.5
U1456A-11H-6 60-69 cm	24.93	0.506	13.280	0.320	0.4533	0.0081	0.49383	2693	23	2406	36	2895	36	2895.0	36.0	16.9
U1456A-11H-6 60-69 cm	360	3.540	2.862	0.064	0.2309	0.0041	0.34814	1369	17	1339	22	1416	47	1416.0	47.0	5.4
U1456A-11H-6 60-69 cm	1236	0.906	2.438	0.059	0.1740	0.0038	0.80662	1250	17	1033	21	1649	29	DISC	DISC	37.4
U1456A-11H-6 60-69 cm	411	1.075	27.940	0.370	0.6631	0.0078	0.74623	3416	13	3277	30	3510	15	3510.0	15.0	6.6
U1456A-11H-6 60-69 cm	1260	#####	0.025	0.003	0.0039	0.0002	0.33883	25.3	2.6	25	1.4	80	190	25.0	1.4	1.2
U1456A-11H-6 60-69 cm	498	0.810	0.933	0.038	0.1028	0.0026	0.42813	668	20	631	15	822	80	631.0	15.0	5.5
U1456A-11H-6 60-69 cm	294	1.874	0.795	0.019	0.0957	0.0014	0.35935	593	11	588.8	8.3	622	53	588.8	8.3	0.7
U1456A-11H-6 60-69 cm	1560	0.722	0.023	0.001	0.0035	0.0001	0.02915	23	1.4	22.67	0.44	120	120	22.7	0.4	1.4
U1456A-11H-6 60-69 cm	872	18.600	0.082	0.005	0.0126	0.0003	0.19347	79.9	4.2	80.7	2	90	110	80.7	2.0	1.0
U1456A-11H-6 60-69 cm	329.5	1.015	2.530	0.064	0.1786	0.0038	0.71149	1278	18	1059	21	1678	34	DISC	DISC	36.9
U1456A-11H-6 60-69 cm	232	0.560	1.196	0.026	0.1272	0.0015	0.38733	796	12	771.5	8.7	862	42	771.5	8.7	3.1
U1456A-11H-6 60-69 cm	384	1.130	0.091	0.007	0.0136	0.0004	0.15149	90.7	7.3	87.1	2.7	160	150	87.1	2.7	4.0
U1456A-11H-6 60-69 cm	114.7	0.826	2.732	0.092	0.2313	0.0048	0.18634	1333	26	1341	25	1295	72	1295.0	72.0	3.6
U1456A-11H-6 60-69 cm	577	62.600	0.854	0.023	0.1008	0.0022	0.37786	625	12	619	13	597	61	619.0	13.0	1.0
U1456A-11H-6 60-69 cm	1475	1.463	1.521	0.027	0.1489	0.0022	0.64116	937	11	895	12	1009	29	1009.0	29.0	11.3
U1456A-11H-6 60-69 cm	471	0.761	3.703	0.050	0.2676	0.0032	0.55908	1572	11	1528	16	1607	23	1607.0	23.0	4.9
U1456A-11H-6 60-69 cm	256	0.984	1.559	0.033	0.1559	0.0021	0.27245	951	13	935	12	955	45	955.0	45.0	2.1
U1456A-11H-6 60-69 cm	1939	5.130	0.843	0.032	0.0960	0.0039	0.59862	619	17	591	23	715	74	591.0	23.0	4.5
U1456A-11H-6 60-69 cm	1153	1.076	1.341	0.028	0.1389	0.0020	0.29287	863	12	838	12	906	45	838.0	12.0	2.9
U1456A-11H-6 60-69 cm	233.2	0.936	6.310	0.210	0.3560	0.0130	0.50464	2012	29	1960	63	2056	63	2056.0	63.0	4.7
U1456A-11H-6 60-69 cm	351	0.488	0.050	0.005	0.0066	0.0002	0.04586	49.6	4.3	42.6	1.1	300	170	42.6	1.1	14.1
U1456A-11H-6 60-69 cm	1230	1.030	0.680	0.019	0.0856	0.0017	0.58752	524	11	529	10	521	45	529.0	10.0	1.0
U1456A-11H-6 60-69 cm	972	0.708	1.137	0.016	0.1227	0.0014	0.49718	770.1	7.5	745.6	7.8	858	27	745.6	7.8	3.2
U1456A-11H-6 60-69 cm	167.6	0.527	9.560	0.150	0.4354	0.0073	0.57418	2390	14	2335	33	2460	25	2460.0	25.0	5.1
U1456A-11H-6 60-69 cm	1442	7.670	0.727	0.014	0.0851	0.0014	0.60110	553.5	7.9	526.3	8.4	700	33	526.3	8.4	4.9
U1456A-11H-6 60-69 cm	831	1.088	3.250	0.057	0.2422	0.0041	0.67171	1467	14	1397	21	1592	26	1592.0	26.0	12.2
U1456A-11H-6 60-69 cm	284.9	0.713	3.906	0.067	0.2794	0.0044	0.50213	1613	14	1591	21	1660	31	1660.0	31.0	4.2
U1456A-11H-6 60-69 cm	1109	0.658	3.621	0.046	0.2644	0.0035	0.61393	1553	10	1512	18	1625	22	1625.0	22.0	7.0

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456A-11H-6 60-69 cm	325	0.782	4.414	0.059	0.2961	0.0033	0.57809	1715	11	1671	16	1748	21	1748.0	21.0	4.4
U1456A-11H-6 60-69 cm	380	5.180	0.949	0.027	0.0980	0.0019	0.20652	677	14	603	11	900	67	603.0	11.0	10.9
U1456A-11H-6 60-69 cm	310	0.985	1.526	0.037	0.1490	0.0025	0.45128	939	15	895	14	996	46	996.0	46.0	10.1
U1456A-11H-6 60-69 cm	24.34	2.120	2.170	0.150	0.1644	0.0058	-0.03804	1164	47	980	32	1450	150	DISC	DISC	32.4
U1456A-11H-6 60-69 cm	442	1.656	2.953	0.042	0.2231	0.0028	0.55326	1395	11	1298	15	1488	24	1488.0	24.0	12.8
U1456A-11H-6 60-69 cm	600	3.490	0.563	0.022	0.0704	0.0019	0.39349	452	14	438	11	470	87	438.0	11.0	3.1
U1456A-11H-6 60-69 cm	1312	2.980	1.261	0.033	0.1265	0.0039	0.71551	827	15	767	22	959	47	767.0	22.0	7.3
U1456A-11H-6 60-69 cm	788	7.560	7.530	0.140	0.3604	0.0057	0.70095	2175	17	1983	27	2349	25	2349.0	25.0	15.6
U1456A-11H-6 60-69 cm	486	0.534	2.346	0.092	0.1659	0.0056	0.75081	1229	31	989	31	1662	57	DISC	DISC	40.5
U1456A-11H-6 60-69 cm	107	1.776	6.260	0.210	0.3510	0.0110	0.69331	2010	29	1935	53	2102	45	2102.0	45.0	7.9
U1456A-11H-6 60-69 cm	852	0.790	1.487	0.035	0.1511	0.0028	0.77556	923	14	907	16	985	31	985.0	31.0	7.9
U1456A-11H-6 60-69 cm	593	0.657	1.599	0.061	0.1422	0.0047	0.77414	968	24	857	27	1249	52	DISC	DISC	31.4
U1456A-11H-6 60-69 cm	191	0.484	11.640	0.170	0.4857	0.0058	0.56881	2576	13	2551	25	2586	22	2586.0	22.0	1.4
U1456A-11H-6 60-69 cm	345	0.579	6.400	0.110	0.3586	0.0052	0.43554	2030	15	1975	24	2076	31	2076.0	31.0	4.9
U1456A-11H-6 60-69 cm	161.4	0.624	3.202	0.068	0.2477	0.0032	0.54689	1452	16	1426	17	1481	33	1481.0	33.0	3.7
U1456A-11H-6 60-69 cm	58	1.607	1.950	0.120	0.1521	0.0044	0.29202	1088	42	912	24	1430	110	DISC	DISC	36.2
U1456A-11H-6 60-69 cm	61.3	0.137	1.874	0.073	0.1483	0.0034	0.12250	1065	26	891	19	1435	80	DISC	DISC	37.9
U1456A-11H-6 60-69 cm	263	2.100	1.869	0.062	0.1491	0.0039	0.45381	1067	22	895	22	1441	59	DISC	DISC	37.9
U1456A-11H-6 60-69 cm	2550	42.200	0.725	0.073	0.0819	0.0042	0.82600	551	42	507	25	740	130	507.0	25.0	8.0
U1456A-11H-6 60-69 cm	266.4	1.136	9.770	0.260	0.4406	0.0095	0.51577	2410	25	2352	42	2473	40	2473.0	40.0	4.9
U1456A-11H-6 60-69 cm	679	1.440	1.473	0.046	0.1449	0.0042	0.45925	918	19	872	24	1039	65	1039.0	65.0	16.1
U1456A-11H-6 60-69 cm	270	2.580	1.650	0.037	0.1601	0.0023	0.44138	988	14	958	13	1039	41	1039.0	41.0	7.8
U1456A-11H-6 60-69 cm	138.6	1.060	3.764	0.078	0.2769	0.0054	0.62389	1582	17	1574	27	1584	32	1584.0	32.0	0.6
U1456A-11H-6 60-69 cm	453	1.820	2.228	0.081	0.1682	0.0054	0.34254	1188	26	1002	30	1520	78	DISC	DISC	34.1
U1456A-11H-6 60-69 cm	351	0.713	2.872	0.043	0.2344	0.0025	0.53807	1372	11	1357	13	1367	25	1367.0	25.0	0.7
U1456A-11H-6 60-69 cm	372.8	3.790	2.567	0.075	0.2085	0.0038	0.49435	1288	21	1220	20	1367	49	1367.0	49.0	10.8
U1456A-11H-6 60-69 cm	327	0.379	3.497	0.068	0.2535	0.0040	0.51818	1524	15	1456	20	1603	31	1603.0	31.0	9.2
U1456A-11H-6 60-69 cm	185	0.567	1.581	0.036	0.1573	0.0023	0.34510	959	14	941	13	986	47	986.0	47.0	4.6
U1456A-11H-6 60-69 cm	813	1.083	13.650	0.160	0.5272	0.0056	0.71374	2724	11	2728	23	2713	14	2713.0	14.0	0.6
U1456A-11H-6 60-69 cm	94.1	0.498	0.055	0.016	0.0089	0.0008	-0.13259	54	15	56.8	5.2	30	480	56.8	5.2	5.2
U1456A-11H-6 60-69 cm	537	0.593	5.780	0.230	0.2629	0.0096	0.84836	1937	34	1502	49	2446	37	DISC	DISC	38.6
U1456A-11H-6 60-69 cm	204.3	1.830	1.426	0.048	0.1429	0.0033	0.40356	900	21	860	19	986	68	986.0	68.0	12.8
U1456A-11H-6 60-69 cm	405	2.110	1.754	0.046	0.1608	0.0027	0.43698	1023	17	960	15	1149	50	1149.0	50.0	16.4
U1456A-11H-6 60-69 cm	243.3	0.763	1.792	0.045	0.1496	0.0025	0.56738	1039	16	898	14	1339	40	DISC	DISC	32.9
U1456A-11H-6 60-69 cm	294	0.626	6.560	0.160	0.2755	0.0057	0.82895	2047	21	1566	29	2567	22	DISC	DISC	39.0

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456A-11H-6 60-69 cm	197.5	0.955	3.145	0.085	0.2398	0.0054	0.65452	1442	21	1385	28	1538	45	1538.0	45.0	9.9
U1456A-11H-6 60-69 cm	355	0.487	3.840	0.130	0.2799	0.0094	0.90254	1591	27	1584	48	1593	23	1593.0	23.0	0.6
U1456A-11H-6 60-69 cm	74.8	0.555	3.320	0.061	0.2658	0.0036	0.49845	1484	14	1519	18	1431	31	1431.0	31.0	6.1
U1456A-11H-6 60-69 cm	17.41	0.202	1.658	0.059	0.1481	0.0023	0.31324	986	22	892	13	1210	68	1210.0	68.0	26.3
U1456A-11H-6 60-69 cm	135.4	1.243	3.143	0.064	0.2400	0.0045	0.55698	1441	16	1386	23	1542	38	1542.0	38.0	10.1
U1456A-11H-6 60-69 cm	98.4	0.671	4.465	0.078	0.3082	0.0046	0.61401	1722	15	1731	23	1717	26	1717.0	26.0	0.8
U1456A-11H-6 60-69 cm	154	0.575	2.418	0.046	0.2010	0.0039	0.66774	1246	13	1180	21	1366	29	1366.0	29.0	13.6
U1456A-11H-6 60-69 cm	400	0.845	0.699	0.012	0.0867	0.0014	0.51507	537.2	7.3	535.6	8.5	539	35	535.6	8.5	0.3
U1456A-11H-6 60-69 cm	193.6	5.210	3.958	0.060	0.2663	0.0035	0.64797	1623	12	1521	18	1757	22	1757.0	22.0	13.4
U1456A-11H-6 60-69 cm	221.3	3.094	2.356	0.033	0.2114	0.0031	0.58507	1228	9.8	1236	16	1218	26	1218.0	26.0	1.5
U1456A-11H-6 60-69 cm	237.6	1.725	3.427	0.065	0.2579	0.0050	0.72551	1509	15	1478	26	1555	27	1555.0	27.0	5.0
U1456A-11H-6 60-69 cm	184	1.483	1.544	0.029	0.1573	0.0026	0.64558	946	11	941	14	955	28	955.0	28.0	1.5
U1456A-11H-6 60-69 cm	294	0.740	1.537	0.033	0.1580	0.0036	0.74027	946	14	945	20	943	31	943.0	31.0	0.2
U1456A-11H-6 60-69 cm	213.6	0.347	1.407	0.021	0.1439	0.0016	0.47593	890.5	8.8	866.5	9.1	947	29	947.0	29.0	8.5
U1456A-11H-6 60-69 cm	123.2	0.441	3.379	0.046	0.2436	0.0025	0.48588	1498	11	1405	13	1634	24	1634.0	24.0	14.0
U1456A-11H-6 60-69 cm	631	2.890	0.773	0.029	0.0773	0.0030	0.59222	578	17	479	18	994	69	DISC	DISC	17.1
U1456A-11H-6 60-69 cm	184	1.742	0.887	0.017	0.1018	0.0015	0.54695	643.2	9.1	624.6	8.9	707	36	624.6	8.9	2.9
U1456A-11H-6 60-69 cm	429	2.510	11.260	0.130	0.4889	0.0074	0.38027	2543	11	2563	33	2537	27	2537.0	27.0	1.0
U1456A-11H-6 60-69 cm	277	0.420	0.180	0.004	0.0255	0.0003	0.13961	168.2	3.2	162.3	1.8	231	48	162.3	1.8	3.5
U1456A-11H-6 60-69 cm	87.6	1.104	3.860	0.080	0.2941	0.0059	0.72515	1605	17	1660	29	1540	31	1540.0	31.0	7.8
U1456A-11H-6 60-69 cm	17.49	0.924	2.486	0.075	0.1491	0.0042	0.39337	1270	23	897	24	1962	62	DISC	DISC	54.3
U1456A-11H-6 60-69 cm	53	4.390	1.327	0.034	0.1013	0.0015	0.04766	856	15	622.1	9	1520	56	DISC	DISC	27.3
U1456A-11H-6 60-69 cm	342.7	0.325	1.411	0.023	0.1426	0.0021	0.68987	892.5	9.7	859	12	977	25	977.0	25.0	12.1
U1456A-11H-6 60-69 cm	1318	1.300	0.065	0.003	0.0098	0.0005	0.47059	64	3.2	62.7	3	140	100	62.7	3.0	2.0
U1456A-11H-6 60-69 cm	257.6	1.343	11.120	0.120	0.4933	0.0056	0.64978	2532	10	2583	24	2480	16	2480.0	16.0	4.2
U1456A-11H-6 60-69 cm	114.7	1.081	3.700	0.120	0.2525	0.0078	0.82854	1565	27	1449	40	1723	35	1723.0	35.0	15.9
U1456A-11H-6 60-69 cm	12.29	0.288	4.600	0.120	0.2720	0.0048	0.44844	1740	22	1549	25	1972	46	1972.0	46.0	21.5
U1456A-11H-6 60-69 cm	64.6	1.140	0.273	0.012	0.0105	0.0003	0.15151	244	9.4	67.3	1.6	2679	81	DISC	DISC	72.4
U1456A-11H-6 60-69 cm	335	0.710	1.398	0.025	0.1424	0.0026	0.63965	886	11	858	15	954	30	954.0	30.0	10.1
U1456A-11H-6 60-69 cm	383	0.391	3.970	0.075	0.2527	0.0050	0.70935	1624	15	1450	26	1844	27	1844.0	27.0	21.4
U1456A-11H-6 60-69 cm	1913	3.410	0.338	0.008	0.0464	0.0009	0.54330	295.4	6.3	292.2	5.6	292	55	292.2	5.6	1.1
U1456A-11H-6 60-69 cm	135.4	0.882	2.847	0.054	0.2295	0.0039	0.83130	1364	14	1331	20	1410	21	1410.0	21.0	5.6
U1456A-11H-6 60-69 cm	279	0.539	1.320	0.021	0.1314	0.0018	0.73889	852.7	9.2	796	10	996	24	796.0	10.0	6.6
U1456A-11H-6 60-69 cm	162.7	0.502	1.155	0.017	0.1263	0.0013	0.37735	779.3	8.4	766.5	7.5	808	30	766.5	7.5	1.6
U1456A-11H-6 60-69 cm	298	1.440	3.678	0.052	0.2662	0.0034	0.72140	1565	11	1521	17	1613	22	1613.0	22.0	5.7

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456A-11H-6 60-69 cm	155.9	0.526	1.834	0.036	0.1727	0.0040	0.71877	1055	13	1026	22	1117	30	1117.0	30.0	8.1
U1456A-11H-6 60-69 cm	294.6	0.790	1.185	0.015	0.1214	0.0014	0.63968	792.9	6.9	738.5	8.3	942	22	738.5	8.3	6.9
U1456A-11H-6 60-69 cm	67	0.157	1.534	0.032	0.1228	0.0016	0.29690	942	13	746.2	9	1419	39	DISC	DISC	20.8
U1456A-11H-6 60-69 cm	899	1.215	0.498	0.012	0.0576	0.0011	0.61536	409.4	7.9	360.7	6.9	682	42	360.7	6.9	11.9
U1456A-11H-6 60-69 cm	99.7	0.738	2.218	0.037	0.1899	0.0031	0.60919	1184	12	1122	17	1296	30	1296.0	30.0	13.4
U1456A-11H-6 60-69 cm	300	8.060	0.850	0.019	0.1008	0.0018	0.53160	623	10	619	10	617	41	619.0	10.0	0.6
U1456A-11H-6 60-69 cm	200.9	0.453	5.216	0.080	0.3010	0.0043	0.68044	1853	13	1695	21	2020	21	2020.0	21.0	16.1
U1456A-11H-6 60-69 cm	73.6	1.561	0.209	0.017	0.0294	0.0010	0.37400	192	14	186.5	6.4	240	150	186.5	6.4	2.9
U1456A-26F-3 50-58 cm	84.7	0.650	3.165	0.098	0.2422	0.0065	0.67560	1439	24	1395	34	1492	43	1492.0	43.0	6.5
U1456A-26F-3 50-58 cm	154.1	0.687	0.329	0.021	0.0419	0.0011	0.12871	286	16	264.7	6.8	390	130	264.7	6.8	7.4
U1456A-26F-3 50-58 cm	1343	5.100	1.006	0.048	0.1051	0.0035	0.48429	702	24	644	20	852	92	644.0	20.0	8.3
U1456A-26F-3 50-58 cm	353	0.901	3.200	0.110	0.2479	0.0090	0.81233	1451	26	1422	46	1466	42	1466.0	42.0	3.0
U1456A-26F-3 50-58 cm	1055	3.860	1.425	0.027	0.1447	0.0024	0.62559	898	11	871	14	932	31	932.0	31.0	6.5
U1456A-26F-3 50-58 cm	357	1.010	4.080	0.110	0.2660	0.0069	0.71484	1645	23	1519	35	1795	38	1795.0	38.0	15.4
U1456A-26F-3 50-58 cm	225.4	1.042	6.890	0.140	0.3338	0.0065	0.61705	2093	18	1855	31	2331	32	2331.0	32.0	20.4
U1456A-26F-3 50-58 cm	845	0.611	1.078	0.024	0.1214	0.0027	0.63016	740	12	738	16	728	37	738.0	16.0	0.3
U1456A-26F-3 50-58 cm	452	12.200	0.607	0.030	0.0746	0.0026	0.28461	480	19	464	16	540	110	464.0	16.0	3.3
U1456A-26F-3 50-58 cm	638	3.860	9.590	0.320	0.4200	0.0100	0.85228	2386	31	2256	46	2493	30	2493.0	30.0	9.5
U1456A-26F-3 50-58 cm	1990	#####	1.229	0.039	0.1193	0.0025	0.46646	811	18	726	14	1021	59	726.0	14.0	10.5
U1456A-26F-3 50-58 cm	434	1.703	1.689	0.038	0.1580	0.0025	0.41509	1001	14	945	14	1100	44	1100.0	44.0	14.1
U1456A-26F-3 50-58 cm	952	13.900	4.280	0.170	0.2740	0.0110	0.94443	1676	34	1553	54	1840	25	1840.0	25.0	15.6
U1456A-26F-3 50-58 cm	125.9	1.458	1.451	0.043	0.1429	0.0032	0.35897	905	18	860	18	1004	64	1004.0	64.0	14.3
U1456A-26F-3 50-58 cm	345	1.420	5.440	0.150	0.3171	0.0052	0.27778	1882	24	1774	25	1993	51	1993.0	51.0	11.0
U1456A-26F-3 50-58 cm	604	29.900	4.320	0.120	0.2770	0.0067	0.60334	1694	22	1575	34	1848	41	1848.0	41.0	14.8
U1456A-26F-3 50-58 cm	280	1.440	5.580	0.097	0.3525	0.0055	0.65838	1909	15	1944	26	1890	24	1890.0	24.0	2.9
U1456A-26F-3 50-58 cm	365	2.300	1.338	0.042	0.1410	0.0035	0.49897	860	18	850	20	906	59	906.0	59.0	6.2
U1456A-26F-3 50-58 cm	595	2.930	7.580	0.270	0.3720	0.0110	0.77236	2175	32	2035	51	2340	39	2340.0	39.0	13.0
U1456A-26F-3 50-58 cm	221	1.114	4.883	0.073	0.3125	0.0041	0.44704	1799	13	1752	20	1887	26	1887.0	26.0	7.2
U1456A-26F-3 50-58 cm	1494	13.800	4.028	0.069	0.2640	0.0056	0.69214	1638	14	1508	28	1851	28	1851.0	28.0	18.5
U1456A-26F-3 50-58 cm	234	1.480	2.209	0.041	0.2008	0.0025	0.54417	1181	13	1179	13	1228	32	1228.0	32.0	4.0
U1456A-26F-3 50-58 cm	2090	2.600	0.525	0.018	0.0688	0.0022	0.78530	430	13	429	13	481	50	429.0	13.0	0.2
U1456A-26F-3 50-58 cm	559	3.005	2.092	0.045	0.1885	0.0038	0.63927	1143	15	1112	21	1247	37	1247.0	37.0	10.8
U1456A-26F-3 50-58 cm	173.4	0.901	4.788	0.068	0.3059	0.0033	0.43106	1780	12	1720	16	1875	24	1875.0	24.0	8.3
U1456A-26F-3 50-58 cm	264.2	1.015	9.660	0.280	0.3928	0.0085	0.71597	2400	26	2135	39	2647	32	2647.0	32.0	19.3
U1456A-26F-3 50-58 cm	777	2.006	0.752	0.016	0.0886	0.0015	0.64481	568	9.1	546.9	8.7	658	35	546.9	8.7	3.7

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456A-26F-3 50-58 cm	181.5	0.613	6.040	0.150	0.3521	0.0073	0.75946	1976	21	1948	36	1998	29	1998.0	29.0	2.5
U1456A-26F-3 50-58 cm	246	0.653	0.127	0.007	0.0182	0.0004	-0.00277	120.7	6.1	116.1	2.7	200	110	116.1	2.7	3.8
U1456A-26F-3 50-58 cm	840	7.870	1.356	0.061	0.1409	0.0065	0.59051	862	26	847	37	877	82	847.0	37.0	1.7
U1456A-26F-3 50-58 cm	558	2.330	1.612	0.020	0.1607	0.0019	0.38757	973.6	7.8	960	10	979	27	979.0	27.0	1.9
U1456A-26F-3 50-58 cm	73.7	0.550	5.035	0.099	0.3213	0.0047	0.46029	1822	17	1795	23	1836	34	1836.0	34.0	2.2
U1456A-26F-3 50-58 cm	278.2	2.420	1.692	0.037	0.1605	0.0029	0.58625	1002	14	959	16	1080	35	1080.0	35.0	11.2
U1456A-26F-3 50-58 cm	582	11.680	10.470	0.120	0.4683	0.0056	0.68670	2475	11	2475	25	2454	17	2454.0	17.0	0.9
U1456A-26F-3 50-58 cm	191.9	0.401	1.217	0.025	0.1339	0.0019	0.39850	806	11	810	11	780	41	810.0	11.0	0.5
U1456A-26F-3 50-58 cm	359	1.850	2.375	0.037	0.2049	0.0031	0.64717	1232	11	1201	17	1274	27	1274.0	27.0	5.7
U1456A-26F-3 50-58 cm	123	2.790	3.650	0.160	0.2395	0.0088	0.80108	1538	36	1378	46	1771	45	1771.0	45.0	22.2
U1456A-26F-3 50-58 cm	230.2	0.901	1.223	0.025	0.1323	0.0017	0.16629	809	12	800.6	9.5	801	47	800.6	9.5	1.0
U1456A-26F-3 50-58 cm	1158	1.692	2.566	0.072	0.1709	0.0054	0.89131	1287	20	1016	29	1760	29	DISC	DISC	42.3
U1456A-26F-3 50-58 cm	870	7.000	0.557	0.019	0.0723	0.0022	0.73205	448	12	450	13	409	52	450.0	13.0	0.4
U1456A-26F-3 50-58 cm	339	1.746	1.356	0.038	0.1369	0.0037	0.75324	869	16	827	21	967	43	827.0	21.0	4.8
U1456A-26F-3 50-58 cm	163.9	0.802	0.676	0.024	0.0860	0.0020	0.47140	521	15	531	12	445	69	531.0	12.0	1.9
U1456A-26F-3 50-58 cm	242	0.891	5.150	0.120	0.3022	0.0053	0.44961	1843	20	1701	26	1975	40	1975.0	40.0	13.9
U1456A-26F-3 50-58 cm	680	8.630	0.637	0.019	0.0768	0.0015	0.63511	498	12	476.5	9.3	546	53	476.5	9.3	4.3
U1456A-26F-3 50-58 cm	1811	#####	4.270	0.120	0.2651	0.0069	0.65253	1685	23	1515	35	1874	32	1874.0	32.0	19.2
U1456A-26F-3 50-58 cm	332	1.610	4.971	0.089	0.3094	0.0055	0.60017	1810	15	1736	27	1901	27	1901.0	27.0	8.7
U1456A-26F-3 50-58 cm	128.1	1.085	4.950	0.082	0.3179	0.0045	0.29933	1808	14	1778	22	1833	35	1833.0	35.0	3.0
U1456A-26F-3 50-58 cm	192	0.484	1.350	0.038	0.1428	0.0030	0.33662	863	16	860	17	873	61	873.0	61.0	1.5
U1456A-26F-3 50-58 cm	73.5	0.808	0.146	0.015	0.0183	0.0007	0.01855	135	13	117.1	4.3	350	190	117.1	4.3	13.3
U1456A-26F-3 50-58 cm	728	2.030	1.664	0.039	0.1577	0.0022	0.35147	992	15	944	12	1108	45	1108.0	45.0	14.8
U1456A-26F-3 50-58 cm	478	3.490	1.434	0.035	0.1433	0.0029	0.73956	902	15	862	16	1008	34	1008.0	34.0	14.5
U1456A-26F-3 50-58 cm	371	0.586	1.316	0.041	0.1353	0.0022	0.51986	847	18	818	13	899	56	818.0	13.0	3.4
U1456A-26F-3 50-58 cm	392	1.203	4.083	0.059	0.2888	0.0039	0.63763	1648	12	1634	19	1657	21	1657.0	21.0	1.4
U1456A-26F-3 50-58 cm	1741	4.790	0.061	0.002	0.0087	0.0001	0.21112	59.8	1.7	56.08	0.76	179	59	56.1	0.8	6.2
U1456A-26F-3 50-58 cm	850	1.140	5.060	0.100	0.3196	0.0064	0.88923	1825	17	1786	31	1832	22	1832.0	22.0	2.5
U1456A-26F-3 50-58 cm	290	0.445	3.184	0.083	0.1982	0.0045	0.74978	1449	20	1165	24	1867	32	DISC	DISC	37.6
U1456A-26F-3 50-58 cm	241	1.476	4.638	0.067	0.2892	0.0035	0.52709	1754	12	1637	18	1870	24	1870.0	24.0	12.5
U1456A-26F-3 50-58 cm	122.7	0.758	1.742	0.053	0.1694	0.0029	0.39694	1020	20	1009	16	1025	58	1025.0	58.0	1.6
U1456A-26F-3 50-58 cm	80.4	0.532	11.870	0.180	0.4677	0.0068	0.54379	2592	15	2471	30	2704	23	2704.0	23.0	8.6
U1456A-26F-3 50-58 cm	259	0.521	6.550	0.180	0.3560	0.0086	0.72733	2052	26	1961	41	2172	35	2172.0	35.0	9.7
U1456A-26F-3 50-58 cm	26.2	3.400	0.579	0.051	0.0717	0.0032	0.29593	449	34	446	19	460	170	446.0	19.0	0.7
U1456A-26F-3 50-58 cm	70.3	0.385	5.140	0.100	0.3324	0.0046	0.49512	1837	17	1849	22	1858	32	1858.0	32.0	0.5

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456A-26F-3 50-58 cm	170	0.861	4.864	0.076	0.3104	0.0040	0.61134	1794	13	1741	20	1888	25	1888.0	25.0	7.8
U1456A-26F-3 50-58 cm	32.7	1.547	0.108	0.016	0.0160	0.0008	0.14794	100	14	102.2	4.8	20	240	102.2	4.8	2.2
U1456A-26F-3 50-58 cm	73.1	4.050	4.150	0.180	0.2911	0.0087	0.46816	1664	32	1645	44	1690	65	1690.0	65.0	2.7
U1456A-26F-3 50-58 cm	774	14.980	0.282	0.014	0.0382	0.0013	0.51551	252	11	241.7	7.9	372	91	241.7	7.9	4.1
U1456A-26F-3 50-58 cm	410	6.690	0.629	0.028	0.0735	0.0022	0.63868	494	17	457	13	684	76	457.0	13.0	7.5
U1456A-26F-3 50-58 cm	356	1.521	1.572	0.035	0.1502	0.0023	0.53902	956	14	902	13	1096	38	1096.0	38.0	17.7
U1456A-26F-3 50-58 cm	120	1.284	3.640	0.140	0.2259	0.0076	0.57304	1559	33	1311	40	1923	65	DISC	DISC	31.8
U1456A-26F-3 50-58 cm	1685	0.751	1.133	0.023	0.1274	0.0027	0.63683	768	11	773	15	769	38	773.0	15.0	0.7
U1456A-26F-3 50-58 cm	335	6.700	5.860	0.120	0.3385	0.0076	0.65379	1954	18	1876	36	2034	32	2034.0	32.0	7.8
U1456A-26F-3 50-58 cm	1308	9.880	9.960	0.160	0.3953	0.0058	0.56883	2431	14	2145	27	2670	22	2670.0	22.0	19.7
U1456A-26F-3 50-58 cm	245.6	1.085	10.820	0.180	0.4524	0.0088	0.75154	2508	15	2401	39	2577	23	2577.0	23.0	6.8
U1456A-26F-3 50-58 cm	358	0.427	0.076	0.006	0.0101	0.0003	0.15550	74.3	5.5	64.6	1.9	300	150	64.6	1.9	13.1
U1456A-26F-3 50-58 cm	148	1.178	1.658	0.083	0.1393	0.0049	0.46489	985	33	840	28	1317	91	840.0	28.0	14.7
U1456A-26F-3 50-58 cm	156.5	1.076	1.529	0.052	0.1585	0.0035	0.59768	937	21	948	20	880	61	880.0	61.0	7.7
U1456A-26F-3 50-58 cm	1374	0.615	0.691	0.023	0.0796	0.0018	0.50796	531	14	493	11	666	62	493.0	11.0	7.2
U1456A-26F-3 50-58 cm	456	1.490	4.257	0.096	0.2712	0.0067	0.59054	1682	18	1544	34	1862	36	1862.0	36.0	17.1
U1456A-26F-3 50-58 cm	1128	1.530	0.671	0.025	0.0797	0.0033	0.65750	521	15	494	20	659	69	494.0	20.0	5.2
U1456A-26F-3 50-58 cm	367	1.089	1.616	0.050	0.1549	0.0030	0.51160	971	19	928	17	1085	57	1085.0	57.0	14.5
U1456A-26F-3 50-58 cm	913	3.060	4.180	0.130	0.2486	0.0060	0.65579	1661	26	1432	32	2004	46	2004.0	46.0	28.5
U1456A-26F-3 50-58 cm	404	1.060	11.100	0.290	0.4377	0.0088	0.55011	2525	25	2336	39	2707	40	2707.0	40.0	13.7
U1456A-26F-3 50-58 cm	3540	22.900	1.060	0.016	0.1113	0.0014	0.62833	732.5	7.8	679.9	8.1	915	26	679.9	8.1	7.2
U1456A-26F-3 50-58 cm	641	0.409	3.918	0.091	0.2388	0.0061	0.85993	1612	19	1378	32	1957	22	1957.0	22.0	29.6
U1456A-26F-3 50-58 cm	2173	6.400	1.343	0.035	0.1344	0.0031	0.62212	863	16	813	18	1012	46	813.0	18.0	5.8
U1456A-26F-3 50-58 cm	512	0.766	3.114	0.098	0.2289	0.0054	0.72373	1433	25	1328	28	1597	42	1597.0	42.0	16.8
U1456A-26F-3 50-58 cm	232.6	1.201	1.876	0.047	0.1893	0.0037	0.39408	1070	16	1117	20	994	56	994.0	56.0	12.4
U1456A-26F-3 50-58 cm	286	0.720	4.118	0.081	0.3087	0.0068	0.77425	1653	16	1731	33	1568	27	1568.0	27.0	10.4
U1456A-26F-3 50-58 cm	54	0.692	5.300	0.210	0.3207	0.0086	0.48007	1857	34	1789	42	1929	67	1929.0	67.0	7.3
U1456A-26F-3 50-58 cm	273	1.680	1.339	0.064	0.1415	0.0049	0.75196	856	28	852	28	869	61	869.0	61.0	2.0
U1456A-26F-3 50-58 cm	382	2.200	3.479	0.096	0.2141	0.0051	0.80960	1516	22	1249	27	1917	29	DISC	DISC	34.8
U1456A-26F-3 50-58 cm	118.5	0.631	1.119	0.045	0.1277	0.0044	0.49001	759	22	774	25	699	86	774.0	25.0	2.0
U1456A-26F-3 50-58 cm	2780	5.700	1.350	0.075	0.1410	0.0061	0.77378	864	32	850	34	913	67	913.0	67.0	6.9
U1456A-26F-3 50-58 cm	643	0.775	1.228	0.024	0.1306	0.0019	0.53299	812	11	791	11	878	33	791.0	11.0	2.6
U1456A-26F-3 50-58 cm	191.8	0.716	8.250	0.180	0.3817	0.0072	0.71693	2253	20	2086	35	2424	26	2424.0	26.0	13.9
U1456A-26F-3 50-58 cm	1910	#####	0.051	0.010	0.0086	0.0014	0.75380	51	10	55	8.7	-40	250	DISC	DISC	7.8
U1456A-26F-3 50-58 cm	110.5	1.329	0.914	0.054	0.0978	0.0039	0.38595	654	28	601	23	810	120	601.0	23.0	8.1

(table cont'd)

								207/235		206/238		207/206				
	[U]		207/23	2σ				Age	2σ	Age	2σ	Age	2σ	Best age	2σ	%
Sample Name	ppm	U/Th	5	error	206/238	2σ error	RHO	(Ma)	error	(Ma)	error	(Ma)	error	(Ma)	error	Discordance*
U1456A-26F-3 50-58 cm	1498	74.000	0.122	0.008	0.0183	0.0007	0.56701	116.3	7	117.1	4.5	120	110	117.1	4.5	0.7
U1456A-26F-3 50-58 cm	688	1.160	3.920	0.150	0.2473	0.0088	0.92689	1604	31	1420	45	1879	25	1879.0	25.0	24.4
U1456A-26F-3 50-58 cm	1641	1.691	0.017	0.001	0.0025	0.0001	0.07867	17.3	1.2	16.25	0.39	160	130	16.3	0.4	6.1
U1456A-26F-3 50-58 cm	195.8	2.390	4.563	0.077	0.2895	0.0043	0.49561	1741	14	1638	21	1866	28	1866.0	28.0	12.2
U1456A-26F-3 50-58 cm	661	1.002	9.850	0.110	0.4298	0.0048	0.68886	2419	11	2304	22	2521	15	2521.0	15.0	8.6
U1456A-26F-3 50-58 cm	757	4.780	0.567	0.037	0.0726	0.0039	0.72287	454	24	451	23	470	99	451.0	23.0	0.7
U1456A-26F-3 50-58 cm	1159	1.635	3.302	0.073	0.2375	0.0069	0.78698	1480	17	1372	36	1660	34	1660.0	34.0	17.3
U1456A-26F-3 50-58 cm	50.7	0.492	0.065	0.014	0.0105	0.0007	-0.04178	61	13	67.2	4.4	-130	330	67.2	4.4	10.2
U1456A-26F-3 50-58 cm	250	1.850	0.710	0.023	0.0871	0.0019	0.29124	542	14	538	11	550	73	538.0	11.0	0.7
U1456A-26F-3 50-58 cm	171.4	1.031	1.434	0.042	0.1410	0.0021	0.27283	900	18	850	12	1020	63	1020.0	63.0	16.7
U1456A-26F-3 50-58 cm	149.3	0.899	1.177	0.027	0.1297	0.0021	0.10608	791	13	786	12	805	59	786.0	12.0	0.6
U1456A-26F-3 50-58 cm	181.9	0.918	11.750	0.210	0.4760	0.0078	0.53797	2581	17	2512	33	2652	28	2652.0	28.0	5.3
U1456A-26F-3 50-58 cm	484	1.322	1.411	0.021	0.1447	0.0021	0.27781	893.9	9.3	871	12	962	38	962.0	38.0	9.5
U1456A-26F-3 50-58 cm	308	0.434	1.293	0.032	0.1367	0.0024	0.61330	840	14	826	13	907	44	826.0	13.0	1.7
U1456A-26F-3 50-58 cm	342	0.887	1.095	0.026	0.1214	0.0019	0.30099	749	13	740	11	777	54	740.0	11.0	1.2
U1456A-26F-3 50-58 cm	2350	6.500	0.584	0.011	0.0730	0.0011	0.51636	467.5	7.4	454.3	6.8	540	38	454.3	6.8	2.8
U1456A-26F-3 50-58 cm	289	33.300	0.672	0.022	0.0812	0.0013	0.29633	519	13	503.4	7.5	571	68	503.4	7.5	3.0
U1456A-26F-3 50-58 cm	489	2.510	4.919	0.096	0.3049	0.0052	0.66760	1807	16	1714	26	1899	28	1899.0	28.0	9.7
U1456A-26F-3 50-58 cm	925	0.668	0.119	0.005	0.0175	0.0003	0.23817	113.9	4.2	111.5	2	147	73	111.5	2.0	2.1
U1456A-26F-3 50-58 cm	285	1.417	1.866	0.039	0.1734	0.0026	0.43566	1066	14	1032	15	1131	37	1131.0	37.0	8.8
U1456A-26F-3 50-58 cm	972	0.722	0.112	0.004	0.0161	0.0003	0.23124	107.5	3.3	102.7	1.7	201	67	102.7	1.7	4.5
U1456A-26F-3 50-58 cm	292	1.686	3.995	0.061	0.2739	0.0036	0.45460	1630	12	1562	18	1700	28	1700.0	28.0	8.1
U1456A-26F-3 50-58 cm	1489	1.854	0.106	0.003	0.0156	0.0003	0.36819	102.4	2.9	99.9	1.7	146	56	99.9	1.7	2.4
U1456A-26F-3 50-58 cm	338	4.260	1.587	0.048	0.1622	0.0036	0.60580	962	19	968	20	916	51	916.0	51.0	5.7
U1456A-26F-3 50-58 cm	464	0.667	1.665	0.027	0.1589	0.0021	0.39114	994	11	950	12	1070	34	1070.0	34.0	11.2
U1456A-26F-3 50-58 cm	244	0.653	1.453	0.041	0.1509	0.0032	0.58176	908	17	907	17	897	51	897.0	51.0	1.1
U1456A-26F-3 50-58 cm	511	25.300	4.950	0.130	0.2833	0.0077	0.74519	1809	21	1605	39	2045	34	2045.0	34.0	21.5
U1456A-26F-3 50-58 cm	258	1.440	1.314	0.035	0.1407	0.0038	0.63569	849	16	847	21	860	49	847.0	21.0	0.2
U1456A-26F-3 50-58 cm	149.9	2.330	0.893	0.033	0.1032	0.0043	0.51171	648	19	631	25	719	77	631.0	25.0	2.6
U1456A-26F-3 50-58 cm	3190	16.500	0.305	0.007	0.0388	0.0010	0.79969	270.1	5.7	245.1	6.2	512	37	245.1	6.2	9.3
U1456A-26F-3 50-58 cm	250.5	1.080	5.945	0.099	0.3404	0.0054	0.79713	1965	15	1887	26	2052	19	2052.0	19.0	8.0
U1456A-26F-3 50-58 cm	300.9	1.405	0.746	0.017	0.0912	0.0019	0.69026	565	10	562	11	574	40	562.0	11.0	0.5
U1456A-26F-3 50-58 cm	637	0.375	0.056	0.002	0.0089	0.0002	0.24553	55.7	1.6	57.2	1	22	56	57.2	1.0	2.7
U1456A-26F-3 50-58 cm	127.7	0.366	1.109	0.029	0.1191	0.0024	0.67959	755	14	725	14	843	41	725.0	14.0	4.0
U1456A-26F-3 50-58 cm	305	0.518	0.778	0.013	0.0953	0.0015	0.47723	583.2	7.4	586.8	8.8	577	36	586.8	8.8	0.6

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456A-26F-3 50-58 cm	656	4.640	0.378	0.009	0.0459	0.0010	0.72796	325.5	6.3	289.4	5.9	579	38	289.4	5.9	11.1
U1456A-26F-3 50-58 cm	443	1.214	1.617	0.041	0.1580	0.0030	0.78286	974	16	945	17	1046	30	1046.0	30.0	9.7
U1456A-26F-3 50-58 cm	435	4.670	5.570	0.210	0.2920	0.0120	0.54818	1902	31	1643	62	2188	62	2188.0	62.0	24.9
U1456A-26F-3 50-58 cm	619	9.800	0.560	0.010	0.0723	0.0011	0.58003	451.6	6.3	449.9	6.5	453	34	449.9	6.5	0.4
U1456A-26F-3 50-58 cm	432	2.450	6.680	0.150	0.3091	0.0061	0.70793	2065	19	1739	31	2410	26	2410.0	26.0	27.8
U1456A-26F-3 50-58 cm	95	0.631	0.048	0.004	0.0075	0.0002	0.20078	47.3	3.4	47.9	1.3	40	130	47.9	1.3	1.3
U1456A-26F-3 50-58 cm	143.2	0.829	0.104	0.007	0.0097	0.0004	0.06961	100.1	6.5	62.1	2.5	1100	150	DISC	DISC	38.0
U1456A-26F-3 50-58 cm	45.8	1.941	1.200	0.031	0.1296	0.0022	0.43591	797	14	787	12	811	53	787.0	12.0	1.3
U1456A-26F-3 50-58 cm	355	2.280	3.882	0.066	0.2458	0.0049	0.75611	1608	14	1415	25	1882	28	1882.0	28.0	24.8
U1456A-26F-3 50-58 cm	482	2.029	3.788	0.062	0.2721	0.0052	0.62575	1588	13	1550	26	1633	31	1633.0	31.0	5.1
U1456A-26F-3 50-58 cm	129.7	2.750	1.181	0.053	0.1255	0.0053	0.69240	786	25	760	30	865	74	760.0	30.0	3.3
U1456A-26F-3 50-58 cm	52	0.522	0.868	0.031	0.1026	0.0017	0.42155	634	17	630	10	635	69	630.0	10.0	0.6
U1456A-26F-3 50-58 cm	177.4	7.800	1.116	0.026	0.1211	0.0029	0.55427	759	12	736	17	830	46	736.0	17.0	3.0
U1456A-26F-3 50-58 cm	882	3.000	0.606	0.009	0.0767	0.0009	0.57126	480.6	5.9	476.3	5.4	503	30	476.3	5.4	0.9
U1456A-26F-3 50-58 cm	1017	#####	0.034	0.004	0.0047	0.0006	0.76833	33.9	3.9	30.5	3.6	310	170	30.5	3.6	10.0
U1456A-26F-3 50-58 cm	183.9	0.809	1.113	0.025	0.1203	0.0022	0.64702	760	12	732	13	842	35	732.0	13.0	3.7
U1456A-26F-3 50-58 cm	139	38.000	0.860	0.082	0.1010	0.0100	0.59128	625	43	620	60	650	170	620.0	60.0	0.8
U1456A-26F-3 50-58 cm	256	1.127	4.422	0.086	0.2908	0.0061	0.70162	1713	16	1644	30	1791	31	1791.0	31.0	8.2
U1456A-51F-3 100-110 cm	455	42.400	4.670	0.120	0.2876	0.0076	0.82778	1756	22	1625	38	1927	28	1927.0	28.0	15.7
U1456A-51F-3 100-110 cm	299	0.965	0.121	0.008	0.0178	0.0011	0.52834	115.6	6.8	113.4	7.1	260	110	113.4	7.1	1.9
U1456A-51F-3 100-110 cm	333	3.240	1.930	0.041	0.1813	0.0034	0.70154	1088	14	1073	19	1111	30	1111.0	30.0	3.4
U1456A-51F-3 100-110 cm	114.3	0.640	12.570	0.310	0.4940	0.0120	0.70263	2643	23	2589	52	2692	30	2692.0	30.0	3.8
U1456A-51F-3 100-110 cm	108.3	0.518	0.192	0.018	0.0166	0.0005	0.23733	177	14	105.8	3.2	1240	160	DISC	DISC	40.2
U1456A-51F-3 100-110 cm	439	0.587	0.939	0.024	0.1081	0.0020	0.50026	671	12	661	11	705	49	661.0	11.0	1.5
U1456A-51F-3 100-110 cm	397.6	8.750	3.918	0.098	0.2501	0.0051	0.71467	1614	20	1443	28	1848	33	1848.0	33.0	21.9
U1456A-51F-3 100-110 cm	69.8	0.530	4.754	0.082	0.3005	0.0045	0.55797	1776	15	1693	22	1873	28	1873.0	28.0	9.6
U1456A-51F-3 100-110 cm	221	5.910	0.202	0.013	0.0275	0.0016	0.40397	186	11	175	10	340	140	175.0	10.0	5.9
U1456A-51F-3 100-110 cm	120.2	1.007	0.078	0.005	0.0094	0.0002	0.02080	76.3	4.5	60.4	1.6	530	130	DISC	DISC	20.8
U1456A-51F-3 100-110 cm	853	1.437	1.433	0.033	0.1390	0.0038	0.71275	900	14	838	22	1061	42	838.0	22.0	6.9
U1456A-51F-3 100-110 cm	180	5.690	0.064	0.007	0.0078	0.0008	0.48841	62.2	6.8	50.2	5.1	660	210	DISC	DISC	19.3
U1456A-51F-3 100-110 cm	369	1.030	0.116	0.003	0.0171	0.0003	0.29100	111.3	3	109.3	2	161	59	109.3	2.0	1.8
U1456A-51F-3 100-110 cm	285	2.280	1.894	0.050	0.1674	0.0039	0.50383	1073	17	999	22	1232	50	1232.0	50.0	18.9
U1456A-51F-3 100-110 cm	104.3	0.863	3.515	0.082	0.2371	0.0060	0.77280	1528	19	1369	31	1756	34	1756.0	34.0	22.0
U1456A-51F-3 100-110 cm	450	1.588	1.840	0.053	0.1623	0.0047	0.76904	1057	19	968	26	1262	39	1262.0	39.0	23.3
U1456A-51F-3 100-110 cm	71.5	1.166	1.115	0.031	0.1194	0.0035	0.40999	758	15	727	20	841	70	727.0	20.0	4.1

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456A-51F-3 100-110 cm	194.5	2.492	4.919	0.088	0.3128	0.0059	0.69311	1804	15	1753	29	1865	26	1865.0	26.0	6.0
U1456A-51F-3 100-110 cm	1570	2.420	0.247	0.006	0.0330	0.0007	0.41750	223.9	4.7	209.4	4.1	393	51	209.4	4.1	6.5
U1456A-51F-3 100-110 cm	104.2	0.812	1.139	0.028	0.1081	0.0022	0.44646	771	13	664	12	1101	48	664.0	12.0	13.9
U1456A-51F-3 100-110 cm	126.2	1.347	2.070	0.050	0.1878	0.0050	0.61921	1138	16	1108	27	1195	45	1195.0	45.0	7.3
U1456A-51F-3 100-110 cm	1160	6.370	4.666	0.077	0.1933	0.0038	0.55341	1758	14	1141	20	2602	26	DISC	DISC	56.1
U1456A-51F-3 100-110 cm	484	6.230	4.029	0.060	0.2799	0.0044	0.82776	1638	12	1590	22	1700	18	1700.0	18.0	6.5
U1456A-51F-3 100-110 cm	469	0.719	0.153	0.020	0.0148	0.0018	0.08173	143	18	95	11	950	300	DISC	DISC	33.6
U1456A-51F-3 100-110 cm	122.1	1.178	5.530	0.140	0.3491	0.0093	0.73824	1902	22	1924	44	1884	33	1884.0	33.0	2.1
U1456A-51F-3 100-110 cm	202.1	1.162	1.966	0.045	0.1810	0.0044	0.42691	1103	15	1072	24	1165	54	1165.0	54.0	8.0
U1456A-51F-3 100-110 cm	140.5	1.513	4.931	0.095	0.3252	0.0065	0.64320	1805	16	1816	32	1789	30	1789.0	30.0	1.5
U1456A-51F-3 100-110 cm	427	3.150	5.680	0.160	0.3080	0.0100	0.57757	1922	26	1722	49	2162	50	2162.0	50.0	20.4
U1456A-51F-3 100-110 cm	148.3	0.828	0.090	0.004	0.0129	0.0003	0.19273	86.7	4.1	82.6	2.1	230	100	82.6	2.1	4.7
U1456A-51F-3 100-110 cm	368	1.385	2.225	0.052	0.1875	0.0046	0.55426	1186	17	1109	26	1339	44	1339.0	44.0	17.2
U1456A-51F-3 100-110 cm	1314	1.728	0.047	0.001	0.0073	0.0001	0.08130	46.6	1	46.82	0.54	48	47	46.8	0.5	0.5
U1456A-51F-3 100-110 cm	333.1	2.480	10.800	0.150	0.4740	0.0064	0.46299	2503	13	2499	28	2507	22	2507.0	22.0	0.3
U1456A-51F-3 100-110 cm	605	7.530	0.190	0.007	0.0264	0.0010	0.42356	175.9	5.8	167.9	6	298	76	167.9	6.0	4.5
U1456A-51F-3 100-110 cm	677	5.110	1.484	0.051	0.1403	0.0053	0.72380	927	21	845	30	1125	53	845.0	30.0	8.8
U1456A-51F-3 100-110 cm	658	#####	0.024	0.002	0.0035	0.0002	0.25792	23.9	1.7	22.4	1.1	200	140	22.4	1.1	6.3
U1456A-51F-3 100-110 cm	152.4	1.409	2.190	0.150	0.1980	0.0140	0.52405	1161	49	1156	76	1190	130	1190.0	130.0	2.9
U1456A-51F-3 100-110 cm	222	1.424	3.580	0.150	0.2563	0.0083	0.73159	1535	31	1468	43	1634	54	1634.0	54.0	10.2
U1456A-51F-3 100-110 cm	171.6	3.410	4.950	0.110	0.3014	0.0062	0.59050	1805	18	1695	31	1954	33	1954.0	33.0	13.3
U1456A-51F-3 100-110 cm	155.6	8.320	0.156	0.013	0.0123	0.0008	0.40893	146	11	78.4	5.2	1400	170	DISC	DISC	46.3
U1456A-51F-3 100-110 cm	793	3.360	0.471	0.021	0.0378	0.0019	0.59887	390	14	239	12	1416	81	DISC	DISC	38.7
U1456A-51F-3 100-110 cm	126.6	1.592	5.307	0.064	0.3352	0.0039	0.56698	1868	10	1862	19	1870	21	1870.0	21.0	0.4
U1456A-51F-3 100-110 cm	851	1.696	1.833	0.030	0.1714	0.0028	0.58843	1056	11	1019	16	1124	30	1124.0	30.0	9.3
U1456A-51F-3 100-110 cm	197.2	0.695	0.180	0.005	0.0266	0.0004	0.18670	168.1	4.8	169.2	2.3	167	64	169.2	2.3	0.7
U1456A-51F-3 100-110 cm	41.61	0.192	0.389	0.015	0.0133	0.0004	0.34391	333	11	85.1	2.5	2906	69	DISC	DISC	74.4
U1456A-51F-3 100-110 cm	241	0.765	3.558	0.096	0.2225	0.0069	0.65286	1537	22	1291	36	1910	45	DISC	DISC	32.4
U1456A-51F-3 100-110 cm	695	12.700	1.740	0.120	0.1605	0.0099	0.61271	1011	46	957	55	1160	110	1160.0	110.0	17.5
U1456A-51F-3 100-110 cm	323	0.850	3.018	0.089	0.2224	0.0067	0.78319	1406	22	1292	35	1593	36	1593.0	36.0	18.9
U1456A-51F-3 100-110 cm	123.1	0.858	6.520	0.390	0.3460	0.0200	0.80793	2043	53	1912	94	2182	70	2182.0	70.0	12.4
U1456A-51F-3 100-110 cm	155.3	0.866	3.570	0.060	0.2686	0.0044	0.47079	1544	12	1532	23	1568	29	1568.0	29.0	2.3
U1456A-51F-3 100-110 cm	355	1.400	1.352	0.021	0.1450	0.0020	0.52915	866.8	9.1	873	11	846	32	846.0	11.0	0.7
U1456A-51F-3 100-110 cm	872	7.200	0.228	0.005	0.0327	0.0006	0.63964	208.3	3.7	207.1	3.5	224	35	207.1	3.5	0.6
U1456A-51F-3 100-110 cm	1009	9.540	1.069	0.017	0.1210	0.0018	0.67628	737.2	8.2	736	10	737	26	736.0	10.0	0.2

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456A-51F-3 100-110 cm	222	1.900	1.138	0.032	0.1207	0.0031	0.64452	769	15	736	18	879	50	736.0	18.0	4.3
U1456A-51F-3 100-110 cm	234	0.753	8.110	0.250	0.3436	0.0093	0.91064	2233	27	1900	44	2546	30	2546.0	30.0	25.4
U1456A-51F-3 100-110 cm	183	1.570	1.690	0.042	0.1712	0.0051	0.62070	1002	16	1016	28	982	50	982.0	50.0	3.5
U1456A-51F-3 100-110 cm	545	11.610	1.171	0.018	0.1282	0.0019	0.53509	785.7	8.6	779	11	801	29	779.0	11.0	0.9
U1456A-51F-3 100-110 cm	416	0.708	4.143	0.085	0.2901	0.0058	0.77701	1660	17	1641	29	1688	26	1688.0	26.0	2.8
U1456A-51F-3 100-110 cm	319	1.990	1.962	0.062	0.1851	0.0068	0.59401	1101	21	1102	39	1102	69	1102.0	69.0	0.0
U1456A-51F-3 100-110 cm	360	0.957	1.686	0.038	0.1678	0.0044	0.51748	1002	15	998	25	1000	47	1000.0	47.0	0.2
U1456A-51F-3 100-110 cm	188	1.710	1.663	0.042	0.1628	0.0035	0.64477	990	16	971	19	1042	41	1042.0	41.0	6.8
U1456A-51F-3 100-110 cm	316	1.360	13.480	0.470	0.4760	0.0180	0.66966	2695	33	2493	80	2874	49	2874.0	49.0	13.3
U1456A-51F-3 100-110 cm	209	3.570	4.330	0.160	0.2750	0.0110	0.61631	1692	30	1561	54	1864	59	1864.0	59.0	16.3
U1456A-51F-3 100-110 cm	601	1.040	1.298	0.020	0.1406	0.0019	0.65951	843.3	9	848	11	833	25	848.0	11.0	0.6
U1456A-51F-3 100-110 cm	652	0.714	0.032	0.003	0.0051	0.0003	0.19258	32.1	2.6	32.8	1.8	50	170	32.8	1.8	2.2
U1456A-51F-3 100-110 cm	276	1.249	2.795	0.063	0.2298	0.0053	0.56310	1352	17	1332	28	1374	43	1374.0	43.0	3.1
U1456A-51F-3 100-110 cm	64.7	0.813	2.121	0.049	0.1989	0.0031	0.31579	1153	16	1169	17	1127	45	1127.0	45.0	3.7
U1456A-51F-3 100-110 cm	228.5	0.921	1.942	0.028	0.1837	0.0022	0.57306	1094.9	9.9	1087	12	1119	26	1119.0	26.0	2.9
U1456A-51F-3 100-110 cm	135.1	0.527	24.790	0.310	0.6709	0.0091	0.70109	3299	12	3305	35	3287	16	3287.0	16.0	0.5
U1456A-51F-3 100-110 cm	643	11.600	1.564	0.045	0.1543	0.0047	0.57602	958	19	925	26	1051	58	1051.0	58.0	12.0
U1456A-51F-3 100-110 cm	321	0.656	7.560	0.160	0.3260	0.0057	0.61525	2179	19	1818	28	2538	29	2538.0	29.0	28.4
U1456A-51F-3 100-110 cm	125.9	0.852	0.101	0.005	0.0149	0.0003	0.09366	96.9	4.3	95	2	157	95	95.0	2.0	2.0
U1456A-51F-3 100-110 cm	193.1	2.160	0.895	0.019	0.1026	0.0019	0.42262	648	10	629	11	711	46	629.0	11.0	2.9
U1456A-51F-3 100-110 cm	688	1.780	0.018	0.001	0.0026	0.0001	0.08174	18.2	1.3	16.83	0.51	180	140	16.8	0.5	7.5
U1456A-51F-3 100-110 cm	98.2	0.817	5.066	0.090	0.3269	0.0057	0.54275	1828	15	1822	28	1841	30	1841.0	30.0	1.0
U1456A-51F-3 100-110 cm	154	1.251	0.097	0.005	0.0141	0.0003	0.22117	94.6	4.5	90.5	2.1	210	98	90.5	2.1	4.3
U1456A-51F-3 100-110 cm	495	#####	0.050	0.002	0.0071	0.0002	0.29284	49.9	1.8	45.8	1.3	250	79	45.8	1.3	8.2
U1456A-51F-3 100-110 cm	305.1	1.968	1.354	0.025	0.1414	0.0024	0.64640	868	11	852	13	899	28	899.0	28.0	5.2
U1456A-51F-3 100-110 cm	18.7	0.773	1.020	0.100	0.0210	0.0018	0.02580	694	47	134	12	3650	150	DISC	DISC	80.7
U1456A-51F-3 100-110 cm	128.2	0.951	1.001	0.036	0.1119	0.0024	0.36116	701	18	684	14	743	64	684.0	14.0	2.4
U1456A-51F-3 100-110 cm	376	1.390	0.123	0.005	0.0169	0.0004	0.47443	117.8	4	108	2.4	296	65	108.0	2.4	8.3
U1456A-51F-3 100-110 cm	131	1.350	1.376	0.054	0.1397	0.0049	0.64610	875	23	842	28	957	62	842.0	28.0	3.8
U1456A-51F-3 100-110 cm	195	1.316	0.892	0.017	0.1033	0.0016	0.52542	646	9.2	633.5	9.6	695	38	633.5	9.6	1.9
U1456A-51F-3 100-110 cm	30.2	0.148	2.350	0.110	0.1711	0.0080	0.46611	1227	30	1025	47	1610	89	DISC	DISC	36.3
U1456A-51F-3 100-110 cm	285	2.795	4.730	0.130	0.2631	0.0069	0.76600	1768	23	1504	35	2098	49	2098.0	49.0	28.3
U1456A-51F-3 100-110 cm	104.9	2.650	5.341	0.093	0.3469	0.0060	0.71184	1871	15	1917	29	1822	23	1822.0	23.0	5.2
U1456A-51F-3 100-110 cm	183.5	1.365	0.739	0.015	0.0902	0.0015	0.53613	560.2	8.8	556.7	9	568	39	556.7	9.0	0.6
U1456A-51F-3 100-110 cm	85.5	0.471	10.190	0.160	0.4576	0.0081	0.67438	2450	14	2426	36	2467	23	2467.0	23.0	1.7

(table cont'd)

Sample Name	[U] ppm	U/Th	207/235					207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			207/23	2σ	206/238	2σ	RHO	Age	2σ	Age	2σ	Age	2σ			
			5	error		error		(Ma)	error	(Ma)	error	(Ma)	error	(Ma)	error	
U1456A-51F-3 100-110 cm	63.4	1.835	9.530	0.450	0.4170	0.0150	0.70628	2374	44	2236	71	2509	49	2509.0	49.0	10.9
U1456A-51F-3 100-110 cm	89.1	2.650	5.090	0.110	0.3188	0.0065	0.58917	1829	17	1781	32	1884	35	1884.0	35.0	5.5
U1456A-51F-3 100-110 cm	404	2.550	1.405	0.041	0.1395	0.0042	0.57453	888	17	841	24	1009	56	841.0	24.0	5.3
U1456A-51F-3 100-110 cm	200	1.220	4.400	0.130	0.3035	0.0084	0.72013	1706	25	1703	42	1705	38	1705.0	38.0	0.1
U1456A-51F-3 100-110 cm	1011	3.665	0.405	0.007	0.0557	0.0009	0.63097	344.8	5.3	349.3	5.4	320	32	349.3	5.4	1.3
U1456A-51F-3 100-110 cm	124.3	1.560	5.030	0.140	0.3190	0.0100	0.52230	1819	23	1793	49	1862	52	1862.0	52.0	3.7
U1456A-51F-3 100-110 cm	561	0.881	0.067	0.002	0.0099	0.0001	0.14288	65.6	1.7	63.46	0.74	148	56	63.5	0.7	3.3
U1456A-51F-3 100-110 cm	315	0.922	2.457	0.082	0.1835	0.0055	0.79872	1255	24	1085	30	1577	40	DISC	DISC	31.2
U1456A-51F-3 100-110 cm	120	0.458	1.437	0.026	0.1514	0.0019	0.52141	902	11	908	11	887	31	887.0	31.0	2.4
U1456A-51F-3 100-110 cm	39.9	0.546	1.319	0.051	0.1364	0.0031	0.55986	850	22	824	18	921	65	824.0	18.0	3.1
U1456A-51F-3 100-110 cm	347.2	1.205	4.829	0.060	0.3209	0.0043	0.64697	1789	10	1793	21	1789	21	1789.0	21.0	0.2
U1456A-51F-3 100-110 cm	313	1.420	2.339	0.050	0.2110	0.0040	0.78143	1220	15	1233	21	1198	27	1198.0	27.0	2.9
U1456A-51F-3 100-110 cm	393.5	0.891	1.243	0.026	0.1287	0.0029	0.73867	819	12	780	16	921	30	780.0	16.0	4.8
U1456A-51F-3 100-110 cm	269.1	0.557	0.667	0.038	0.0717	0.0034	0.82977	516	23	446	20	812	70	446.0	20.0	13.6
U1456A-51F-3 100-110 cm	16.5	0.425	11.480	0.300	0.4940	0.0110	0.49420	2555	25	2582	48	2533	40	2533.0	40.0	1.9
U1456A-51F-3 100-110 cm	194	0.935	0.096	0.005	0.0141	0.0004	0.12668	92.7	4.5	90.1	2.2	170	90	90.1	2.2	2.8
U1456A-51F-3 100-110 cm	217	18.800	4.757	0.099	0.3171	0.0058	0.61925	1773	18	1778	27	1772	30	1772.0	30.0	0.3
U1456A-51F-3 100-110 cm	394	0.557	1.353	0.033	0.1302	0.0029	0.64078	865	14	790	17	1068	37	790.0	17.0	8.7
U1456A-51F-3 100-110 cm	641	1.154	12.780	0.290	0.5100	0.0140	0.84898	2660	21	2653	60	2665	23	2665.0	23.0	0.5
U1456A-51F-3 100-110 cm	2970	1.670	0.025	0.001	0.0035	0.0001	0.53152	24.7	0.97	22.5	0.85	258	76	22.5	0.9	8.9
U1456A-51F-3 100-110 cm	1153	1.600	0.273	0.010	0.0314	0.0006	0.61432	244.7	8.2	199.2	3.8	682	61	DISC	DISC	18.6
U1456A-51F-3 100-110 cm	286	2.650	0.687	0.045	0.0832	0.0035	0.60879	529	27	515	21	570	110	515.0	21.0	2.6
U1456A-51F-3 100-110 cm	355	2.640	1.333	0.016	0.1359	0.0016	0.56474	859.3	7.1	821.1	9.3	962	23	821.1	9.3	4.4
U1456A-51F-3 100-110 cm	213.8	1.121	4.594	0.066	0.2949	0.0039	0.71737	1747	12	1665	20	1846	20	1846.0	20.0	9.8
U1456A-51F-3 100-110 cm	221.2	0.422	0.831	0.026	0.0929	0.0026	0.52978	613	15	572	15	763	63	572.0	15.0	6.7
U1456A-51F-3 100-110 cm	130.7	0.774	5.246	0.070	0.3326	0.0040	0.65864	1859	11	1850	19	1867	20	1867.0	20.0	0.9
U1456A-51F-3 100-110 cm	296	0.602	1.767	0.043	0.1733	0.0042	0.73929	1029	16	1029	23	1034	35	1034.0	35.0	0.5
U1456A-51F-3 100-110 cm	1223	5.070	0.592	0.019	0.0715	0.0026	0.70724	473	12	445	15	615	55	445.0	15.0	5.9
U1456A-51F-3 100-110 cm	46.6	7.460	10.680	0.190	0.4567	0.0072	0.68987	2490	16	2422	32	2542	23	2542.0	23.0	4.7
U1456A-51F-3 100-110 cm	354	11.500	0.232	0.007	0.0340	0.0008	0.59633	210.8	5.7	215.2	4.7	168	52	215.2	4.7	2.1
U1456A-51F-3 100-110 cm	819	2.550	2.799	0.022	0.1770	0.0016	0.65490	1354.7	5.8	1050.4	8.9	1864	13	DISC	DISC	43.6
U1456A-51F-3 100-110 cm	248	1.830	2.024	0.082	0.1679	0.0073	0.62224	1117	26	1001	41	1335	69	1335.0	69.0	25.0
U1456A-51F-3 100-110 cm	678	7.170	3.378	0.054	0.1843	0.0038	0.69247	1496	13	1089	21	2135	28	DISC	DISC	49.0
U1456A-51F-3 100-110 cm	570.4	4.130	4.420	0.180	0.1717	0.0060	0.94032	1710	32	1021	33	2698	20	DISC	DISC	62.2
U1456A-51F-3 100-110 cm	197.5	4.740	0.679	0.010	0.0826	0.0008	0.44705	525.2	5.8	511.3	4.6	575	29	511.3	4.6	2.6

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456A-51F-3 100-110 cm	95.3	0.924	9.800	0.130	0.4335	0.0052	0.71318	2413	12	2320	23	2489	17	2489.0	17.0	6.8
U1456A-51F-3 100-110 cm	228.4	1.167	4.423	0.040	0.2806	0.0025	0.59299	1715.6	7.4	1595	13	1858	15	1858.0	15.0	14.2
U1456A-51F-3 100-110 cm	926	1.738	4.163	0.082	0.2369	0.0043	0.76459	1662	16	1369	23	2055	20	DISC	DISC	33.4
U1456A-51F-3 100-110 cm	43	1.237	1.088	0.025	0.1222	0.0014	-0.00616	745	12	742.9	8.1	722	51	742.9	8.1	0.3
U1456A-51F-3 100-110 cm	149.7	1.189	5.099	0.089	0.3190	0.0058	0.53389	1834	14	1783	28	1873	32	1873.0	32.0	4.8
U1456A-51F-3 100-110 cm	536	4.760	1.320	0.049	0.1337	0.0035	0.76639	853	21	809	20	967	51	809.0	20.0	5.2
U1456A-51F-3 100-110 cm	483	1.083	4.283	0.076	0.2377	0.0027	0.55585	1689	15	1374	14	2100	25	DISC	DISC	34.6
U1456A-51F-3 100-110 cm	790	8.200	0.771	0.015	0.0922	0.0017	0.56177	580	8.5	568.6	9.8	632	30	568.6	9.8	2.0
U1456A-51F-3 100-110 cm	203.6	0.782	1.070	0.018	0.1179	0.0012	0.43776	738.1	9	718.3	7.2	777	34	718.3	7.2	2.7
U1456A-51F-3 100-110 cm	2480	4.610	0.619	0.006	0.0779	0.0007	0.58329	489	3.6	483.3	4.1	508	18	483.3	4.1	1.2
U1456A-51F-3 100-110 cm	262.3	1.402	4.342	0.046	0.2748	0.0027	0.73767	1700.2	8.7	1565	14	1864	14	1864.0	14.0	16.0
U1456A-51F-3 100-110 cm	277.5	1.821	5.189	0.067	0.3263	0.0042	0.74851	1849	11	1819	20	1875	17	1875.0	17.0	3.0
U1456A-51F-3 100-110 cm	1202	#####	0.091	0.004	0.0134	0.0005	0.48158	88.6	3.6	86	3.2	195	91	86.0	3.2	2.9
U1456A-51F-3 100-110 cm	420	0.843	5.163	0.068	0.3190	0.0038	0.66692	1846	11	1784	19	1913	19	1913.0	19.0	6.7
U1456A-51F-3 100-110 cm	789	0.610	3.185	0.032	0.2442	0.0024	0.76667	1453.6	7.6	1408	13	1506	13	1506.0	13.0	6.5
U1456A-51F-3 100-110 cm	669	0.955	1.057	0.013	0.1163	0.0014	0.47197	732.1	6.5	709.4	8.2	791	26	709.4	8.2	3.1
U1456A-51F-3 100-110 cm	595	56.600	0.053	0.004	0.0037	0.0003	-0.35104	52.6	4.2	23.5	1.6	1700	240	DISC	DISC	55.3
U1456A-51F-3 100-110 cm	137.1	0.568	0.058	0.004	0.0084	0.0002	0.12555	57.1	3.5	53.6	1	180	120	53.6	1.0	6.1
U1456A-51F-3 100-110 cm	313.8	2.820	6.759	0.084	0.2962	0.0037	0.64427	2078	11	1672	18	2500	15	DISC	DISC	33.1
U1456A-51F-3 100-110 cm	258	1.124	4.497	0.036	0.2820	0.0021	0.57134	1729.7	6.6	1601	11	1878	13	1878.0	13.0	14.7
U1456A-51F-3 100-110 cm	179	1.712	4.914	0.071	0.2570	0.0044	0.72534	1803	12	1473	23	2197	21	DISC	DISC	33.0
U1456A-51F-3 100-110 cm	190.7	0.546	0.920	0.019	0.0997	0.0018	0.71873	662.5	9.7	613	10	812	30	613.0	10.0	7.5
U1456A-61F-3 40-50 cm	757	7.990	6.480	0.170	0.3010	0.0120	0.50420	2039	23	1699	60	2427	61	2427.0	61.0	30.0
U1456A-61F-3 40-50 cm	630	4.420	0.318	0.012	0.0444	0.0017	0.56840	278.7	9.5	280	10	301	75	280.0	10.0	0.5
U1456A-61F-3 40-50 cm	239	1.780	4.110	0.110	0.2642	0.0077	0.60414	1654	22	1507	40	1849	46	1849.0	46.0	18.5
U1456A-61F-3 40-50 cm	186	1.218	2.624	0.097	0.2133	0.0075	0.57197	1300	27	1248	41	1377	62	1377.0	62.0	9.4
U1456A-61F-3 40-50 cm	476	1.740	0.133	0.004	0.0169	0.0005	0.40037	126.2	3.7	107.7	3.3	462	71	107.7	3.3	14.7
U1456A-61F-3 40-50 cm	780	1.479	1.678	0.059	0.1619	0.0059	0.65121	998	22	965	32	1069	54	1069.0	54.0	9.7
U1456A-61F-3 40-50 cm	160.9	2.282	0.652	0.021	0.0815	0.0023	0.60687	508	13	505	14	517	60	505.0	14.0	0.6
U1456A-61F-3 40-50 cm	913	5.040	0.601	0.008	0.0772	0.0009	0.69667	478	4.7	479.6	5	463	21	479.6	5.0	0.3
U1456A-61F-3 40-50 cm	328	5.800	0.453	0.007	0.0597	0.0006	0.41797	379.2	4.6	373.8	3.8	411	32	373.8	3.8	1.4
U1456A-61F-3 40-50 cm	479	1.018	0.109	0.003	0.0161	0.0004	0.45716	104.9	3.1	102.9	2.4	146	57	102.9	2.4	1.9
U1456A-61F-3 40-50 cm	1410	13.300	0.561	0.015	0.0706	0.0018	0.71770	451.3	9.9	440	11	504	42	440.0	11.0	2.5
U1456A-61F-3 40-50 cm	254	6.850	0.596	0.016	0.0743	0.0018	0.58018	474	10	461	11	526	50	461.0	11.0	2.7
U1456A-61F-3 40-50 cm	4.21	0.760	25.000	1.200	0.5410	0.0290	0.48179	3298	51	2770	120	3653	82	3653.0	82.0	24.2

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456A-61F-3 40-50 cm	336	19.500	0.092	0.014	0.0114	0.0009	0.51865	89	13	73.3	5.6	490	300	DISC	DISC	17.6
U1456A-61F-3 40-50 cm	149.1	1.394	0.364	0.010	0.0480	0.0008	0.40391	314.4	7.8	302.1	5.2	377	63	302.1	5.2	3.9
U1456A-61F-3 40-50 cm	380	20.400	0.850	0.140	0.0900	0.0100	0.50201	613	73	552	62	820	260	552.0	62.0	10.0
U1456A-61F-3 40-50 cm	207.7	4.120	8.890	0.290	0.3670	0.0120	0.66788	2316	29	2006	58	2602	42	2602.0	42.0	22.9
U1456A-61F-3 40-50 cm	427	9.130	0.547	0.025	0.0639	0.0026	0.71926	440	16	399	15	637	68	399.0	15.0	9.3
U1456A-61F-3 40-50 cm	656	#####	1.409	0.052	0.1424	0.0035	0.62523	895	23	858	19	979	59	979.0	59.0	12.4
U1456A-61F-3 40-50 cm	250.4	0.751	9.480	0.220	0.4220	0.0110	0.73505	2382	22	2268	48	2484	30	2484.0	30.0	8.7
U1456A-61F-3 40-50 cm	543	4.360	0.650	0.010	0.0823	0.0013	0.56320	508.4	6.5	509.9	7.5	487	33	509.9	7.5	0.3
U1456A-61F-3 40-50 cm	335	0.900	9.530	0.260	0.3960	0.0140	0.63727	2381	26	2140	65	2608	46	2608.0	46.0	17.9
U1456A-61F-3 40-50 cm	378	0.678	5.270	0.120	0.3091	0.0077	0.64400	1862	19	1737	39	2013	35	2013.0	35.0	13.7
U1456A-61F-3 40-50 cm	414	3.540	1.588	0.030	0.1593	0.0031	0.70409	963	12	954	18	992	31	992.0	31.0	3.8
U1456A-61F-3 40-50 cm	473	3.630	1.827	0.037	0.1788	0.0037	0.67844	1052	13	1059	20	1045	34	1045.0	34.0	1.3
U1456A-61F-3 40-50 cm	325	0.541	1.460	0.014	0.1495	0.0014	0.52024	913.5	5.8	897.8	8	947	19	947.0	19.0	5.2
U1456A-61F-3 40-50 cm	1130	5.410	0.273	0.011	0.0382	0.0027	0.64127	245.1	8.4	242	17	360	130	242.0	17.0	1.3
U1456A-61F-3 40-50 cm	40.9	0.575	1.977	0.051	0.1841	0.0052	0.50495	1104	18	1091	29	1136	56	1136.0	56.0	4.0
U1456A-61F-3 40-50 cm	219	1.358	3.340	0.110	0.2346	0.0073	0.82864	1481	26	1355	38	1684	33	1684.0	33.0	19.5
U1456A-61F-3 40-50 cm	143.6	1.225	1.431	0.027	0.1507	0.0019	0.45527	900	11	906	10	884	36	884.0	36.0	2.5
U1456A-61F-3 40-50 cm	688	4.120	2.348	0.074	0.2093	0.0051	0.59349	1218	22	1223	27	1219	36	1219.0	36.0	0.3
U1456A-61F-3 40-50 cm	87.3	0.500	0.103	0.008	0.0110	0.0006	0.11212	98.7	7.4	70.2	3.5	800	170	DISC	DISC	28.9
U1456A-61F-3 40-50 cm	726	1.035	0.019	0.001	0.0029	0.0001	0.29917	19.5	1	18.5	0.5	150	93	18.5	0.5	5.1
U1456A-61F-3 40-50 cm	1191	1.261	0.036	0.002	0.0053	0.0002	0.28977	35.4	2.4	33.8	1.2	150	130	33.8	1.2	4.5
U1456A-61F-3 40-50 cm	140	1.620	14.500	0.350	0.5220	0.0110	0.69178	2773	24	2701	46	2838	29	2838.0	29.0	4.8
U1456A-61F-3 40-50 cm	443.4	7.490	1.526	0.027	0.1543	0.0031	0.57761	939	11	924	17	971	34	971.0	34.0	4.8
U1456A-61F-3 40-50 cm	1365	1.500	0.023	0.001	0.0036	0.0001	0.26403	23.2	0.84	23.14	0.64	70	74	23.1	0.6	0.3
U1456A-61F-3 40-50 cm	1600	5.330	0.592	0.010	0.0744	0.0014	0.52015	471	6.5	462.2	8.5	522	39	462.2	8.5	1.9
U1456A-61F-3 40-50 cm	405	2.369	0.678	0.011	0.0852	0.0013	0.56128	524.5	6.6	526.8	8	511	33	526.8	8.0	0.4
U1456A-61F-3 40-50 cm	526	2.070	0.631	0.014	0.0802	0.0018	0.29403	495	8.9	497	11	500	55	497.0	11.0	0.4
U1456A-61F-3 40-50 cm	83.7	0.792	3.593	0.081	0.2588	0.0057	0.72615	1545	19	1485	30	1639	31	1639.0	31.0	9.4
U1456A-61F-3 40-50 cm	106.7	0.490	1.205	0.022	0.1292	0.0020	0.51461	801	10	783	11	848	35	783.0	11.0	2.2
U1456A-61F-3 40-50 cm	348	6.400	2.140	0.110	0.1749	0.0090	0.68194	1141	37	1032	49	1365	82	1365.0	82.0	24.4
U1456A-61F-3 40-50 cm	503	8.460	0.642	0.025	0.0840	0.0026	0.73823	501	15	520	15	425	59	520.0	15.0	3.8
U1456A-61F-3 40-50 cm	581	2.609	0.015	0.001	0.0023	0.0000	0.11668	15.56	0.85	14.93	0.3	120	100	14.9	0.3	4.0
U1456A-61F-3 40-50 cm	130	0.786	0.073	0.005	0.0109	0.0004	0.24442	71.5	4.8	70	2.6	160	130	70.0	2.6	2.1
U1456A-61F-3 40-50 cm	506	4.400	0.573	0.019	0.0729	0.0023	0.77889	457	12	453	14	483	63	453.0	14.0	0.9
U1456A-61F-3 40-50 cm	295	6.370	2.405	0.043	0.2108	0.0031	0.68023	1241	13	1232	16	1258	26	1258.0	26.0	2.1

(table cont'd)

Sample Name	[U] ppm	207/23		2σ error	206/238		RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
		U/Th	5		206/238	2σ error		Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456A-61F-3 40-50 cm	550	1.826	0.925	0.021	0.1046	0.0027	0.67497	666	12	643	16	754	40	643.0	16.0	3.5
U1456A-61F-3 40-50 cm	144	1.013	5.233	0.073	0.3308	0.0046	0.67800	1857	12	1841	22	1878	22	1878.0	22.0	2.0
U1456A-61F-3 40-50 cm	29	0.771	8.950	0.350	0.3980	0.0140	0.71723	2319	38	2154	64	2479	48	2479.0	48.0	13.1
U1456A-61F-3 40-50 cm	100.1	1.846	1.489	0.054	0.1527	0.0054	0.61565	920	22	913	30	944	68	944.0	68.0	3.3
U1456A-61F-3 40-50 cm	509	1.620	5.146	0.099	0.3166	0.0068	0.58762	1839	16	1774	34	1921	32	1921.0	32.0	7.7
U1456A-61F-3 40-50 cm	660	0.894	1.275	0.026	0.1215	0.0020	0.49759	833	11	739	11	1102	37	739.0	11.0	11.3
U1456A-61F-3 40-50 cm	564	21.300	0.941	0.043	0.1006	0.0048	0.65344	671	22	617	28	856	78	617.0	28.0	8.0
U1456A-61F-3 40-50 cm	44.6	1.511	6.690	0.220	0.3780	0.0120	0.64244	2067	29	2064	58	2072	49	2072.0	49.0	0.4
U1456A-61F-3 40-50 cm	408	0.748	2.401	0.035	0.2144	0.0036	0.65881	1242	11	1253	18	1222	28	1222.0	28.0	2.5
U1456A-61F-3 40-50 cm	95	1.430	1.465	0.043	0.1462	0.0026	0.43010	913	18	879	14	984	48	984.0	48.0	10.7
U1456A-61F-3 40-50 cm	781	4.060	1.449	0.035	0.1541	0.0030	0.87220	907	15	923	17	878	27	878.0	27.0	5.1
U1456A-61F-3 40-50 cm	108	0.640	1.519	0.035	0.1570	0.0035	0.67374	938	13	944	18	933	37	933.0	37.0	1.2
U1456A-61F-3 40-50 cm	221	1.400	2.453	0.055	0.2076	0.0043	0.68040	1257	16	1215	23	1339	36	1339.0	36.0	9.3
U1456A-61F-3 40-50 cm	66.2	0.353	1.184	0.023	0.1289	0.0017	0.38143	794	11	781.3	9.9	822	38	781.3	9.9	1.6
U1456A-61F-3 40-50 cm	473	1.960	4.490	0.120	0.2899	0.0071	0.73490	1724	22	1639	36	1841	35	1841.0	35.0	11.0
U1456A-61F-3 40-50 cm	461.8	5.670	1.222	0.026	0.1314	0.0021	0.58733	809	12	796	12	849	33	796.0	12.0	1.6
U1456A-61F-3 40-50 cm	412	1.610	1.630	0.075	0.1432	0.0072	0.66424	976	29	861	41	1274	84	DISC	DISC	32.4
U1456A-61F-3 40-50 cm	143.3	0.396	11.210	0.140	0.4797	0.0058	0.70559	2540	11	2527	25	2550	16	2550.0	16.0	0.9
U1456A-61F-3 40-50 cm	71.2	0.594	1.324	0.027	0.1417	0.0021	0.44638	854	12	854	12	851	40	851.0	40.0	0.4
U1456A-61F-3 40-50 cm	251.7	1.650	0.067	0.004	0.0088	0.0003	0.42476	65.7	3.6	56.7	2	400	110	56.7	2.0	13.7
U1456A-61F-3 40-50 cm	1562	65.000	0.040	0.007	0.0053	0.0005	0.66011	39.6	6.9	33.8	3.2	350	240	33.8	3.2	14.6
U1456A-61F-3 40-50 cm	293	0.798	1.678	0.021	0.1665	0.0016	0.48154	999.1	7.8	992.8	8.8	1003	24	1003.0	24.0	1.0
U1456A-61F-3 40-50 cm	1123	1.273	0.046	0.001	0.0070	0.0001	0.52355	45.9	1.3	45.22	0.83	89	54	45.2	0.8	1.5
U1456A-61F-3 40-50 cm	79.4	0.844	0.868	0.027	0.1020	0.0023	0.47329	633	15	626	13	645	62	626.0	13.0	1.1
U1456A-61F-3 40-50 cm	40.89	0.440	1.183	0.043	0.1325	0.0021	0.25505	789	20	802	12	748	74	802.0	12.0	1.6
U1456A-61F-3 40-50 cm	763	1.137	0.018	0.001	0.0026	0.0001	0.17872	17.77	0.84	16.57	0.36	177	95	16.6	0.4	6.8
U1456A-61F-3 40-50 cm	387	4.390	0.082	0.003	0.0123	0.0003	0.40360	80.5	2.5	78.9	1.6	141	63	78.9	1.6	2.0
U1456A-61F-3 40-50 cm	599	5.230	4.758	0.089	0.2995	0.0056	0.72124	1775	16	1688	27	1885	24	1885.0	24.0	10.5
U1456A-61F-3 40-50 cm	358	5.810	0.732	0.025	0.0885	0.0029	0.58003	555	15	546	17	603	69	546.0	17.0	1.6
U1456A-61F-3 40-50 cm	180.2	0.723	0.076	0.004	0.0114	0.0002	0.10226	73.8	3.7	73.3	1.2	106	99	73.3	1.2	0.7
U1456A-61F-3 40-50 cm	346	3.460	1.463	0.031	0.1466	0.0029	0.63077	913	13	881	16	989	41	989.0	41.0	10.9
U1456A-61F-3 40-50 cm	297	2.220	0.119	0.005	0.0172	0.0004	0.05902	113.6	4.2	110.1	2.4	190	88	110.1	2.4	3.1
U1456A-61F-3 40-50 cm	651	2.277	0.758	0.015	0.0933	0.0017	0.58845	571.8	8.8	575	10	574	41	575.0	10.0	0.6
U1456A-61F-3 40-50 cm	587	34.100	0.019	0.002	0.0028	0.0001	-0.13532	19	2.2	17.88	0.93	200	260	17.9	0.9	5.9
U1456A-61F-3 40-50 cm	421	1.784	1.668	0.033	0.1633	0.0030	0.81555	994	13	974	17	1036	25	1036.0	25.0	6.0

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456A-61F-3 40-50 cm	283	1.926	5.210	0.140	0.3376	0.0099	0.69578	1853	23	1871	47	1839	37	1839.0	37.0	1.7
U1456A-61F-3 40-50 cm	219	0.809	0.136	0.005	0.0171	0.0003	0.03699	129.2	4.8	109	1.6	461	87	DISC	DISC	15.6
U1456A-61F-3 40-50 cm	950	2.680	0.198	0.008	0.0282	0.0010	0.66620	183.5	6.4	179.3	6.5	238	66	179.3	6.5	2.3
U1456A-61F-3 40-50 cm	247	1.760	0.125	0.005	0.0177	0.0004	0.31662	119.1	4.2	113	2.5	243	74	113.0	2.5	5.1
U1456A-61F-3 40-50 cm	259	3.900	0.755	0.026	0.0812	0.0027	0.59848	568	15	505	16	828	64	505.0	16.0	11.1
U1456A-61F-3 40-50 cm	865	5.520	1.226	0.023	0.1174	0.0020	0.68218	812	11	715	12	1073	26	715.0	12.0	11.9
U1456A-61F-3 40-50 cm	134.7	0.790	0.798	0.028	0.0700	0.0022	0.29673	593	16	436	14	1260	75	DISC	DISC	26.5
U1456A-61F-3 40-50 cm	572	1.225	1.192	0.021	0.1314	0.0020	0.67078	795	10	796	12	798	30	796.0	12.0	0.1
U1456A-61F-3 40-50 cm	201.5	2.391	6.290	0.110	0.3616	0.0067	0.65037	2017	16	1988	32	2046	26	2046.0	26.0	2.8
U1456A-61F-3 40-50 cm	239	1.329	5.179	0.093	0.3276	0.0066	0.64716	1846	15	1824	32	1868	29	1868.0	29.0	2.4
U1456A-61F-3 40-50 cm	147.7	0.853	1.095	0.023	0.1220	0.0025	0.57910	750	11	742	15	766	43	742.0	15.0	1.1
U1456A-61F-3 40-50 cm	553	0.530	1.603	0.024	0.1625	0.0026	0.69564	969.9	9.2	970	14	971	26	971.0	26.0	0.1
U1456A-61F-3 40-50 cm	161.4	1.553	4.692	0.083	0.2933	0.0051	0.72539	1763	14	1656	26	1887	24	1887.0	24.0	12.2
U1456A-61F-3 40-50 cm	1395	11.750	1.342	0.038	0.1245	0.0039	0.62798	861	17	755	22	1139	53	755.0	22.0	12.3
U1456A-61F-3 40-50 cm	328	5.530	1.423	0.030	0.1492	0.0026	0.61664	897	12	896	15	895	35	895.0	35.0	0.1
U1456A-61F-3 40-50 cm	220.6	1.762	10.590	0.240	0.4670	0.0110	0.70607	2480	22	2466	47	2505	30	2505.0	30.0	1.6
U1456A-61F-3 40-50 cm	309.3	1.254	3.573	0.081	0.2450	0.0057	0.67583	1538	18	1414	31	1697	33	1697.0	33.0	16.7
U1456A-61F-3 40-50 cm	627	32.400	0.073	0.007	0.0058	0.0004	0.38960	71.2	6.6	37.2	2.5	1400	190	DISC	DISC	47.8
U1456A-61F-3 40-50 cm	221	0.650	0.101	0.004	0.0143	0.0003	0.25132	97.5	4	91.5	1.7	219	81	91.5	1.7	6.2
U1456A-61F-3 40-50 cm	353	2.254	1.665	0.021	0.1649	0.0019	0.60401	994.3	7.9	984	10	1014	21	1014.0	21.0	3.0
U1456A-61F-3 40-50 cm	309	1.953	1.270	0.024	0.1301	0.0018	0.64118	830	11	788	10	945	31	788.0	10.0	5.1
U1456A-61F-3 40-50 cm	643	19.100	1.337	0.043	0.1362	0.0039	0.74891	859	18	823	22	951	44	823.0	22.0	4.2
U1456A-61F-3 40-50 cm	131	1.980	2.003	0.039	0.1852	0.0034	0.53016	1115	13	1095	19	1141	37	1141.0	37.0	4.0
U1456A-61F-3 40-50 cm	291	0.923	0.132	0.008	0.0170	0.0005	0.47562	125.6	7.3	108.8	2.9	420	110	108.8	2.9	13.4
U1456A-61F-3 40-50 cm	192.5	0.866	0.302	0.011	0.0368	0.0011	0.36661	267	8.5	233.1	6.8	548	75	233.1	6.8	12.7
U1456A-61F-3 40-50 cm	277	7.060	1.616	0.057	0.1560	0.0051	0.44989	973	22	934	29	1059	73	1059.0	73.0	11.8
U1456A-61F-3 40-50 cm	100.4	0.485	4.100	0.180	0.2877	0.0096	0.71649	1643	37	1627	48	1664	56	1664.0	56.0	2.2
U1456A-61F-3 40-50 cm	245.1	0.782	10.320	0.130	0.4603	0.0064	0.65668	2464	12	2439	28	2482	19	2482.0	19.0	1.7
U1456A-61F-3 40-50 cm	698	3.460	7.160	0.160	0.3546	0.0080	0.59445	2128	19	1954	38	2302	34	2302.0	34.0	15.1
U1456A-61F-3 40-50 cm	56	0.989	0.065	0.010	0.0094	0.0004	0.19865	63.1	9.2	60.4	2.5	70	230	60.4	2.5	4.3
U1456A-61F-3 40-50 cm	260	0.612	0.111	0.004	0.0171	0.0003	0.22831	106.6	3.4	109.4	1.9	71	64	109.4	1.9	2.6
U1456A-61F-3 40-50 cm	210.7	2.170	0.133	0.005	0.0179	0.0005	0.26384	126.4	4.3	114.4	3.3	361	82	114.4	3.3	9.5
U1456A-61F-3 40-50 cm	219.7	0.544	0.030	0.002	0.0029	0.0001	0.22211	29.8	2.1	18.44	0.54	910	150	DISC	DISC	38.1
U1456A-61F-3 40-50 cm	404	3.900	0.124	0.006	0.0179	0.0004	0.35393	118.1	4.9	114.1	2.7	192	84	114.1	2.7	3.4
U1456A-61F-3 40-50 cm	393	3.330	4.860	0.130	0.3131	0.0091	0.67582	1788	23	1752	45	1837	44	1837.0	44.0	4.6

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456A-61F-3 40-50 cm	102.3	0.541	1.276	0.030	0.1248	0.0020	0.38782	832	13	757	12	1027	47	757.0	12.0	9.0
U1456A-61F-3 40-50 cm	132.4	0.529	0.137	0.007	0.0176	0.0005	0.24289	129.7	5.8	112.7	2.9	408	97	112.7	2.9	13.1
U1456A-61F-3 40-50 cm	486	11.000	4.960	0.100	0.3029	0.0057	0.72904	1808	17	1709	29	1928	26	1928.0	26.0	11.4
U1456A-61F-3 40-50 cm	119.9	0.562	0.053	0.004	0.0076	0.0002	0.09951	52	3.8	48.9	1.2	150	140	48.9	1.2	6.0
U1456A-61F-3 40-50 cm	285	12.800	34.310	0.460	0.7245	0.0076	0.81469	3616	14	3510	29	3668	14	3668.0	14.0	4.3
U1456A-61F-3 40-50 cm	210	1.738	5.028	0.068	0.3174	0.0045	0.78109	1822	11	1778	22	1863	17	1863.0	17.0	4.6
U1456A-61F-3 40-50 cm	418	1.518	2.555	0.046	0.1955	0.0029	0.78037	1285	13	1151	16	1506	22	1506.0	22.0	23.6
U1456A-61F-3 40-50 cm	282	0.497	1.467	0.023	0.1461	0.0016	0.75191	915	9.4	879.1	8.8	985	21	985.0	21.0	10.8
U1456A-61F-3 40-50 cm	1401	1.164	0.036	0.001	0.0051	0.0001	0.24980	35.45	0.8	32.83	0.34	191	47	32.8	0.3	7.4
U1456A-61F-3 40-50 cm	17.87	1.372	0.809	0.033	0.0938	0.0018	0.07083	595	19	578	10	617	91	578.0	10.0	2.9
U1456A-61F-3 40-50 cm	451	1.270	7.260	0.100	0.3336	0.0049	0.66028	2142	13	1855	23	2417	20	2417.0	20.0	23.3
U1456A-61F-3 40-50 cm	203	1.895	1.255	0.025	0.1342	0.0023	0.56374	823	11	811	13	835	36	811.0	13.0	1.5
U1456A-61F-3 40-50 cm	69	1.038	1.232	0.037	0.1084	0.0022	0.30961	810	17	663	13	1220	60	DISC	DISC	18.1
U1456A-61F-3 40-50 cm	39.6	5.400	7.950	0.150	0.3711	0.0063	0.64443	2223	17	2033	30	2384	29	2384.0	29.0	14.7
U1456A-61F-3 40-50 cm	916	0.536	0.048	0.001	0.0074	0.0001	0.27400	47.9	1.3	47.26	0.72	91	55	47.3	0.7	1.3
U1456A-61F-3 40-50 cm	288	3.900	4.621	0.068	0.2911	0.0043	0.77041	1750	13	1648	21	1867	18	1867.0	18.0	11.7
U1456A-61F-3 40-50 cm	140.2	1.884	0.142	0.008	0.0198	0.0005	0.28468	136	7.3	126.2	3.1	280	110	126.2	3.1	7.2
U1456A-61F-3 40-50 cm	1113	10.310	0.090	0.002	0.0132	0.0002	0.49627	87.4	1.8	84.4	1	149	37	84.4	1.0	3.4
U1456A-61F-3 40-50 cm	896	3.620	0.190	0.230	0.0181	0.0016	0.05795	120	190	116	10	400	190	116.0	10.0	3.3
U1456A-61F-3 40-50 cm	360	1.632	3.460	0.150	0.2082	0.0086	0.88419	1494	36	1213	46	1931	36	DISC	DISC	37.2
U1456A-61F-3 40-50 cm	167.1	0.751	1.319	0.043	0.1401	0.0048	0.49198	854	20	844	27	866	72	844.0	27.0	1.2
U1456A-61F-3 40-50 cm	87	2.270	4.500	0.110	0.3000	0.0100	0.66205	1732	22	1687	51	1780	48	1780.0	48.0	5.2
U1456A-61F-3 40-50 cm	341	0.635	0.051	0.002	0.0077	0.0002	0.24525	50.3	2.1	49.5	1	85	82	49.5	1.0	1.6
U1456A-61F-3 40-50 cm	665	3.430	0.570	0.012	0.0727	0.0019	0.55106	457.1	7.9	452	11	476	50	452.0	11.0	1.1
U1456A-61F-3 40-50 cm	1719	2.101	0.041	0.001	0.0062	0.0001	0.50417	41	1.2	39.62	0.76	111	55	39.6	0.8	3.4
U1456A-61F-3 40-50 cm	345.6	3.580	11.860	0.200	0.4745	0.0086	0.63012	2588	16	2504	38	2653	24	2653.0	24.0	5.6
U1456A-61F-3 40-50 cm	681	12.360	1.435	0.017	0.1412	0.0016	0.63159	903.1	7.1	851.4	8.9	1016	19	1016.0	19.0	16.2
U1456A-61F-3 40-50 cm	232.5	1.146	4.738	0.058	0.2992	0.0033	0.60806	1772	10	1686	16	1867	18	1867.0	18.0	9.7
U1456A-61F-3 40-50 cm	170.4	0.567	0.646	0.011	0.0815	0.0009	0.32690	505.1	6.9	504.7	5.3	480	38	504.7	5.3	0.1
U1456A-61F-3 40-50 cm	1170	0.234	0.118	0.004	0.0155	0.0004	0.40924	113.1	3.5	98.9	2.3	425	74	98.9	2.3	12.6
U1456A-70F-2 10-16 cm	1371	0.615	0.089	0.004	0.0130	0.0004	0.48513	86.4	3.5	83.1	2.3	183	79	83.1	2.3	3.8
U1456A-70F-2 10-16 cm	1240	2.830	10.030	0.160	0.4491	0.0055	0.75103	2436	15	2391	24	2478	18	2478.0	18.0	3.5
U1456A-70F-2 10-16 cm	1097	2.850	6.065	0.053	0.3315	0.0022	0.69287	1984.2	7.6	1845	11	2134	11	2134.0	11.0	13.5
U1456A-70F-2 10-16 cm	369	1.296	5.047	0.064	0.3223	0.0035	0.83832	1825	11	1800	17	1858	14	1858.0	14.0	3.1
U1456A-70F-2 10-16 cm	491.8	3.632	0.559	0.008	0.0721	0.0006	0.30503	450.1	5.5	448.6	3.5	458	33	448.6	3.5	0.3

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456A-70F-2 10-16 cm	570.1	1.606	1.435	0.023	0.1493	0.0013	0.59779	904.3	8.9	896.7	7.3	921	26	921.0	26.0	2.6
U1456A-70F-2 10-16 cm	141.1	0.388	0.687	0.017	0.0854	0.0008	0.06321	529	10	527.9	5	521	56	527.9	5.0	0.2
U1456A-70F-2 10-16 cm	1256	13.800	0.783	0.015	0.0949	0.0020	0.75361	587	8.7	584	12	604	32	584.0	12.0	0.5
U1456A-70F-2 10-16 cm	57	2.000	1.476	0.050	0.1550	0.0025	0.20042	916	21	929	14	870	74	870.0	74.0	6.8
U1456A-70F-2 10-16 cm	570	0.795	1.190	0.019	0.1271	0.0012	0.61310	794.9	8.8	771.4	6.7	870	25	771.4	6.7	3.0
U1456A-70F-2 10-16 cm	235	1.463	0.706	0.017	0.0885	0.0011	0.35931	541	10	546.5	6.8	510	52	546.5	6.8	1.0
U1456A-70F-2 10-16 cm	1219	1.433	0.098	0.003	0.0147	0.0003	0.31254	94.8	2.5	94.2	1.7	124	57	94.2	1.7	0.6
U1456A-70F-2 10-16 cm	2431	35.500	2.555	0.031	0.1702	0.0018	0.81372	1286.9	8.9	1013	10	1776	13	DISC	DISC	43.0
U1456A-70F-2 10-16 cm	19.83	-7.800	0.135	0.026	0.0045	0.0006	0.30015	121	23	28.9	3.6	1820	610	DISC	DISC	76.1
U1456A-70F-2 10-16 cm	90	1.122	0.257	0.024	0.0129	0.0006	0.01731	229	20	82.3	3.6	2110	220	DISC	DISC	64.1
U1456A-70F-2 10-16 cm	460	1.708	0.107	0.004	0.0160	0.0002	0.04384	103	3.5	102.5	1.3	143	75	102.5	1.3	0.5
U1456A-70F-2 10-16 cm	150.9	0.591	0.162	0.012	0.0238	0.0009	0.15317	152	11	151.7	5.4	160	140	151.7	5.4	0.2
U1456A-70F-2 10-16 cm	190.2	1.088	4.957	0.068	0.3174	0.0034	0.70295	1810	12	1776	17	1847	18	1847.0	18.0	3.8
U1456A-70F-2 10-16 cm	235.6	55.100	18.850	0.180	0.5687	0.0053	0.62521	3035.2	9.1	2901	22	3128	13	3128.0	13.0	7.3
U1456A-70F-2 10-16 cm	414	0.989	0.109	0.004	0.0163	0.0002	0.03393	105	3.6	104	1.3	142	76	104.0	1.3	1.0
U1456A-70F-2 10-16 cm	439.2	0.872	1.708	0.020	0.1670	0.0016	0.45167	1010.7	7.6	995.5	8.6	1038	23	1038.0	23.0	4.1
U1456A-70F-2 10-16 cm	354	1.318	0.114	0.004	0.0170	0.0002	0.19911	109.2	3.6	108.5	1.4	124	68	108.5	1.4	0.6
U1456A-70F-2 10-16 cm	182	1.178	0.744	0.019	0.0920	0.0013	0.36591	563	11	567	7.9	526	58	567.0	7.9	0.7
U1456A-70F-2 10-16 cm	55.6	-5.000	0.200	0.024	0.0214	0.0010	0.04703	183	20	136.8	6.6	730	250	DISC	DISC	25.2
U1456A-70F-2 10-16 cm	666	3.080	5.090	0.220	0.2327	0.0092	0.96407	1835	36	1346	49	2433	22	DISC	DISC	44.7
U1456A-70F-2 10-16 cm	128.9	2.640	0.888	0.026	0.0919	0.0015	0.33295	643	15	566.8	8.9	894	62	566.8	8.9	11.9
U1456A-70F-2 10-16 cm	787	7.160	1.103	0.066	0.1191	0.0037	0.49482	753	32	726	21	830	120	726.0	21.0	3.6
U1456A-70F-2 10-16 cm	3370	15.580	2.309	0.025	0.1611	0.0015	0.85092	1214.2	7.6	962.7	8.1	1687	10	DISC	DISC	42.9
U1456A-70F-2 10-16 cm	226.7	1.698	4.900	0.110	0.2811	0.0054	0.60898	1801	19	1596	27	2032	30	2032.0	30.0	21.5
U1456A-70F-2 10-16 cm	56.4	0.704	0.352	0.023	0.0486	0.0015	0.09230	304	17	305.7	9	290	140	305.7	9.0	0.6
U1456A-70F-2 10-16 cm	1578	2.060	2.623	0.048	0.2015	0.0030	0.88654	1305	14	1183	16	1505	17	1505.0	17.0	21.4
U1456A-70F-2 10-16 cm	1531	3.230	2.817	0.050	0.1632	0.0019	0.80048	1358	14	974	11	2021	19	DISC	DISC	51.8
U1456A-70F-2 10-16 cm	671	0.860	0.069	0.003	0.0097	0.0002	0.14198	67.5	3.2	62.5	1.1	215	97	62.5	1.1	7.4
U1456A-70F-2 10-16 cm	1219	5.020	0.547	0.012	0.0683	0.0013	0.44241	442.5	7.8	425.8	7.6	519	45	425.8	7.6	3.8
U1456A-70F-2 10-16 cm	171	1.610	0.112	0.027	0.0154	0.0011	0.06240	107	25	98.2	7.3	260	500	98.2	7.3	8.2
U1456A-70F-2 10-16 cm	196.6	1.453	0.915	0.024	0.1034	0.0016	0.39042	658	13	634.2	9.6	722	55	634.2	9.6	3.6
U1456A-70F-2 10-16 cm	653	1.050	0.049	0.003	0.0064	0.0001	0.14859	48.3	2.5	41.02	0.73	360	110	DISC	DISC	15.1
U1456A-70F-2 10-16 cm	266	13.500	0.323	0.016	0.0369	0.0017	0.45426	283	12	234	11	700	120	DISC	DISC	17.3
U1456A-70F-2 10-16 cm	501	4.560	1.236	0.041	0.0889	0.0022	0.79192	814	19	549	13	1627	38	DISC	DISC	32.6
U1456A-70F-2 10-16 cm	1005	2.880	1.499	0.015	0.1531	0.0014	0.66391	929.4	6.3	917.9	7.6	951	16	951.0	16.0	3.5

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456A-70F-2 10-16 cm	336.8	1.308	8.782	0.096	0.4191	0.0042	0.75652	2315	9.7	2258	18	2362	13	2362.0	13.0	4.4
U1456A-70F-2 10-16 cm	306	0.968	0.131	0.005	0.0192	0.0004	0.13944	124.8	4.2	122.7	2.3	173	76	122.7	2.3	1.7
U1456A-70F-2 10-16 cm	1920	2.921	0.131	0.005	0.0195	0.0005	0.64528	124.7	4.4	124.3	3.1	133	60	124.3	3.1	0.3
U1456A-70F-2 10-16 cm	913	20.070	0.294	0.016	0.0335	0.0010	0.63080	261	13	212.6	6.5	690	95	DISC	DISC	18.5
U1456A-70F-2 10-16 cm	347	1.420	5.760	0.150	0.2958	0.0067	0.70168	1938	24	1669	33	2235	34	2235.0	34.0	25.3
U1456A-70F-2 10-16 cm	225.2	0.346	1.097	0.021	0.1169	0.0014	0.45003	750	10	712.7	7.9	849	42	712.7	7.9	5.0
U1456A-70F-2 10-16 cm	493	2.990	1.264	0.021	0.1375	0.0018	0.61339	828.5	9.5	830	10	829	27	830.0	10.0	0.2
U1456A-70F-2 10-16 cm	2970	3.487	0.567	0.011	0.0733	0.0015	0.77012	455.8	7.2	456.2	8.9	451	30	456.2	8.9	0.1
U1456A-70F-2 10-16 cm	270	2.200	27.830	0.380	0.6436	0.0091	0.86088	3414	13	3201	36	3533	11	3533.0	11.0	9.4
U1456A-70F-2 10-16 cm	2149	2.680	0.052	0.002	0.0077	0.0002	0.32953	51.4	2.1	49.29	0.93	149	82	49.3	0.9	4.1
U1456A-70F-2 10-16 cm	481	0.785	1.637	0.020	0.1646	0.0017	0.62417	983.6	7.8	982.3	9.6	979	21	979.0	21.0	0.3
U1456A-70F-2 10-16 cm	346	1.529	3.290	0.110	0.2226	0.0062	0.71339	1474	26	1295	33	1726	35	1726.0	35.0	25.0
U1456A-70F-2 10-16 cm	248.4	1.459	1.504	0.035	0.1435	0.0024	0.71534	929	14	864	13	1076	31	1076.0	31.0	19.7
U1456A-70F-2 10-16 cm	335	1.209	9.140	0.310	0.3897	0.0094	0.92528	2353	32	2119	43	2556	25	2556.0	25.0	17.1
U1456A-70F-2 10-16 cm	126	0.988	14.510	0.190	0.5327	0.0068	0.70447	2782	13	2751	28	2801	16	2801.0	16.0	1.8
U1456A-70F-2 10-16 cm	450	16.200	1.401	0.078	0.1388	0.0069	0.72968	886	33	837	39	1016	79	837.0	39.0	5.5
U1456A-70F-2 10-16 cm	552	1.457	3.340	0.080	0.2305	0.0042	0.82575	1491	19	1336	22	1699	26	1699.0	26.0	21.4
U1456A-70F-2 10-16 cm	125.2	0.705	1.074	0.028	0.1229	0.0022	0.38809	738	14	747	12	707	51	747.0	12.0	1.2
U1456A-70F-2 10-16 cm	381	5.750	4.234	0.084	0.2658	0.0048	0.70374	1679	16	1519	25	1885	25	1885.0	25.0	19.4
U1456A-70F-2 10-16 cm	792	1.860	4.054	0.054	0.2818	0.0038	0.61180	1644	11	1600	19	1700	22	1700.0	22.0	5.9
U1456A-70F-2 10-16 cm	547	3.510	4.213	0.067	0.2617	0.0036	0.65124	1675	13	1498	19	1907	22	1907.0	22.0	21.4
U1456A-70F-2 10-16 cm	358	3.780	1.552	0.029	0.1563	0.0023	0.72432	949	12	936	13	978	27	978.0	27.0	4.3
U1456A-70F-2 10-16 cm	156.2	2.232	0.770	0.019	0.0926	0.0013	0.38843	577	11	570.6	7.6	588	51	570.6	7.6	1.1
U1456A-70F-2 10-16 cm	1070	5.160	0.604	0.011	0.0743	0.0010	0.49912	478.8	6.8	461.9	6.1	550	36	461.9	6.1	3.5
U1456A-70F-2 10-16 cm	2060	4.710	0.018	0.001	0.0027	0.0001	0.57940	18.5	1	17.2	0.57	195	93	17.2	0.6	7.0
U1456A-70F-2 10-16 cm	172.1	1.004	1.219	0.026	0.1325	0.0016	0.08938	807	12	801.8	8.8	805	52	801.8	8.8	0.6
U1456A-70F-2 10-16 cm	279	1.629	1.275	0.019	0.1374	0.0014	0.44370	833.2	8.5	829.8	7.9	836	29	829.8	7.9	0.4
U1456A-70F-2 10-16 cm	242.7	1.355	1.552	0.031	0.1575	0.0024	0.65466	949	12	942	14	966	31	966.0	31.0	2.5
U1456A-70F-2 10-16 cm	955	0.575	5.690	0.170	0.2544	0.0076	0.85503	1923	27	1461	40	2497	20	DISC	DISC	41.5
U1456A-70F-2 10-16 cm	993	1.946	0.306	0.011	-0.0023	0.0001	0.64905	270.8	8.2	-14.72	0.37	367	61	DISC	DISC	105.4
U1456A-70F-2 10-16 cm	1283	39.200	1.776	0.047	0.1719	0.0039	0.81476	1032	17	1022	21	1069	32	1069.0	32.0	4.4
U1456A-70F-2 10-16 cm	1036	1.890	1.060	0.029	-0.0073	0.0005	0.01725	733	14	-47	3.2	830	36	DISC	DISC	106.4
U1456A-70F-2 10-16 cm	552	1.201	0.023	0.001	0.0034	0.0001	0.04980	23.3	1.2	21.57	0.48	190	100	21.6	0.5	7.4
U1456A-70F-2 10-16 cm	342	1.081	1.846	0.038	0.1746	0.0028	0.66613	1058	14	1037	15	1103	31	1103.0	31.0	6.0
U1456A-70F-2 10-16 cm	670	1.324	0.058	0.008	0.0069	0.0004	0.28078	57.3	7.3	44.5	2.8	590	300	DISC	DISC	22.3

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456A-70F-2 10-16 cm	1720	0.933	0.018	0.001	0.0027	0.0001	0.42070	17.8	1.2	17.23	0.61	140	120	17.2	0.6	3.2
U1456A-70F-2 10-16 cm	183	1.531	1.770	0.057	0.1680	0.0046	0.59560	1031	21	1000	25	1112	55	1112.0	55.0	10.1
U1456A-70F-2 10-16 cm	109.8	3.920	0.917	0.035	0.1058	0.0025	0.67750	657	18	648	14	682	58	648.0	14.0	1.4
U1456A-70F-2 10-16 cm	839	1.520	9.980	0.260	0.4370	0.0100	0.86163	2423	25	2330	47	2519	22	2519.0	22.0	7.5
U1456A-70F-2 10-16 cm	74.1	0.542	0.693	0.026	0.0812	0.0018	0.48915	532	16	503	11	635	71	503.0	11.0	5.5
U1456A-70F-2 10-16 cm	442	1.255	0.094	0.004	-0.0019	0.0009	0.02950	90.6	3.9	-12.4	5.7	267	82	DISC	DISC	113.7
U1456A-70F-2 10-16 cm	405	1.518	0.093	0.007	0.0128	0.0006	0.49120	89.9	6.6	81.7	3.7	290	130	81.7	3.7	9.1
U1456A-70F-2 10-16 cm	165.4	1.513	0.088	0.005	0.0129	0.0003	0.10736	85.1	4.4	82.7	1.9	160	110	82.7	1.9	2.8
U1456A-70F-2 10-16 cm	348	0.814	0.090	0.004	0.0137	0.0003	0.41472	87.4	3.5	87.5	2.1	93	75	87.5	2.1	0.1
U1456A-70F-2 10-16 cm	150.8	0.404	3.112	0.074	0.2406	0.0050	0.56939	1431	18	1388	26	1496	41	1496.0	41.0	7.2
U1456A-70F-2 10-16 cm	450	1.268	0.592	0.033	0.0749	0.0019	0.31529	472	21	465	12	500	120	465.0	12.0	1.5
U1456A-70F-2 10-16 cm	665	1.010	1.488	0.069	0.1458	0.0031	0.40534	921	26	877	18	988	59	988.0	59.0	11.2
U1456A-70F-2 10-16 cm	770	1.664	4.090	0.270	0.2610	0.0150	0.90647	1646	54	1491	78	1849	56	1849.0	56.0	19.4
U1456A-70F-2 10-16 cm	280	1.142	1.878	0.031	0.1774	0.0027	0.62620	1071	11	1052	15	1112	27	1112.0	27.0	5.4
U1456A-70F-2 10-16 cm	285	0.998	1.090	0.024	0.1183	0.0024	0.82728	746	12	720	14	820	31	720.0	14.0	3.5
U1456A-70F-2 10-16 cm	362	25.800	0.065	0.004	0.0091	0.0003	0.49675	63.3	3.5	58.6	2.2	193	90	58.6	2.2	7.4
U1456A-70F-2 10-16 cm	242	2.030	5.278	0.070	0.3232	0.0037	0.79974	1864	11	1805	18	1921	14	1921.0	14.0	6.0
U1456A-70F-2 10-16 cm	169	1.007	1.510	0.040	0.1525	0.0030	0.55306	935	17	914	17	966	48	966.0	48.0	5.4
U1456A-70F-2 10-16 cm	262	1.285	0.905	0.018	0.1001	0.0018	0.59386	655	10	615	11	791	35	615.0	11.0	6.1
U1456A-70F-2 10-16 cm	833	1.330	1.530	0.057	0.1493	0.0042	0.71790	937	22	900	25	1020	52	1020.0	52.0	11.8
U1456A-70F-2 10-16 cm	2019	0.707	0.023	0.001	0.0034	0.0001	0.28679	23.4	1.1	22.12	0.57	146	91	22.1	0.6	5.5
U1456A-70F-2 10-16 cm	469	0.357	1.176	0.022	0.1291	0.0024	0.67633	788	10	782	14	806	31	782.0	14.0	0.8
U1456A-70F-2 10-16 cm	330	1.012	0.675	0.013	0.0831	0.0011	0.61248	522.8	7.9	514.8	6.8	542	39	514.8	6.8	1.5
U1456A-70F-2 10-16 cm	635	0.869	1.232	0.019	0.1343	0.0018	0.65741	813.6	8.7	812	10	811	25	812.0	10.0	0.2
U1456A-70F-2 10-16 cm	211.5	1.075	1.589	0.045	0.1556	0.0026	0.58023	964	17	932	15	1023	45	1023.0	45.0	8.9
U1456A-70F-2 10-16 cm	381	1.511	0.111	0.005	0.0164	0.0004	0.40281	107	4.4	104.7	2.8	152	85	104.7	2.8	2.1
U1456A-70F-2 10-16 cm	4140	3.290	0.012	0.000	0.0018	0.0000	0.43234	12.24	0.42	11.69	0.24	134	63	11.7	0.2	4.5
U1456A-70F-2 10-16 cm	164	1.890	1.490	0.069	0.1478	0.0030	0.66782	921	25	889	17	966	57	966.0	57.0	8.0
U1456A-70F-2 10-16 cm	696	0.809	0.043	0.002	0.0068	0.0001	0.24416	43.1	1.6	43.76	0.79	45	70	43.8	0.8	1.5
U1456A-70F-2 10-16 cm	165.5	1.200	1.188	0.025	0.1322	0.0022	0.74204	794	12	802	13	773	30	802.0	13.0	1.0
U1456A-70F-2 10-16 cm	1150	1.644	1.158	0.028	0.1138	0.0025	0.80518	780	13	694	15	1042	29	694.0	15.0	11.0
U1456A-70F-2 10-16 cm	283	1.131	4.800	0.130	0.3115	0.0075	0.86508	1777	23	1744	37	1818	24	1818.0	24.0	4.1
U1456A-70F-2 10-16 cm	1296	#####	0.031	0.004	0.0044	0.0004	0.75855	30.9	3.5	28	2.4	260	160	28.0	2.4	9.4
U1456A-70F-2 10-16 cm	689	1.624	0.055	0.002	0.0085	0.0002	0.36930	54.4	2	54.4	1	103	68	54.4	1.0	0.0
U1456A-70F-2 10-16 cm	1616	10.110	0.598	0.011	0.0764	0.0013	0.73859	475.3	6.7	474.5	7.5	477	27	474.5	7.5	0.2

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456A-70F-2 10-16 cm	545	2.621	0.932	0.025	0.1084	0.0022	0.72601	667	13	663	13	668	41	663.0	13.0	0.6
U1456A-70F-2 10-16 cm	769	9.120	2.902	0.090	0.2263	0.0066	0.85559	1376	23	1313	34	1493	29	1493.0	29.0	12.1
U1456A-70F-2 10-16 cm	534	0.831	12.130	0.290	0.4690	0.0110	0.61356	2609	22	2473	47	2732	32	2732.0	32.0	9.5
U1456A-70F-2 10-16 cm	470	1.937	3.730	0.110	0.2503	0.0079	0.72986	1576	24	1439	41	1765	42	1765.0	42.0	18.5
U1456A-70F-2 10-16 cm	323	1.280	0.577	0.015	0.0728	0.0017	0.59916	460.8	9.5	453	10	489	49	453.0	10.0	1.7
U1456A-70F-2 10-16 cm	170.7	1.090	2.172	0.039	0.1982	0.0028	0.61801	1169	12	1165	15	1176	27	1176.0	27.0	0.9
U1456A-70F-2 10-16 cm	224	20.300	0.698	0.019	0.0835	0.0018	0.51293	536	11	517	10	609	48	517.0	10.0	3.5
U1456A-70F-2 10-16 cm	1313	1.469	2.047	0.048	0.1880	0.0035	0.78397	1130	17	1109	19	1156	30	1156.0	30.0	4.1
U1456A-70F-2 10-16 cm	986	5.510	1.084	0.030	0.1149	0.0033	0.79448	744	14	701	19	861	39	701.0	19.0	5.8
U1456A-70F-2 10-16 cm	509	1.510	0.065	0.004	0.0097	0.0005	0.60790	63.2	3.8	62	2.9	133	93	62.0	2.9	1.9
U1456A-70F-2 10-16 cm	116.5	2.424	1.096	0.028	0.1214	0.0024	0.37923	752	15	738	14	760	56	738.0	14.0	1.9
U1456A-70F-2 10-16 cm	1019	2.045	0.369	0.007	-0.0029	0.0002	0.02356	318.7	5.3	-18.8	1.1	434	37	DISC	DISC	105.9
U1456A-70F-2 10-16 cm	129.9	0.659	0.059	0.004	0.0084	0.0002	0.28099	58.1	4.2	54	1.4	200	130	54.0	1.4	7.1
U1456A-70F-2 10-16 cm	1044	2.796	1.348	0.023	0.1414	0.0019	0.64595	866	10	852	11	872	28	872.0	28.0	2.3
U1456A-70F-2 10-16 cm	525	2.066	8.960	0.230	0.4150	0.0093	0.74575	2330	23	2234	42	2406	30	2406.0	30.0	7.1
U1456A-70F-2 10-16 cm	215	1.795	0.712	0.058	0.0835	0.0053	0.73030	542	33	516	31	630	120	516.0	31.0	4.8
U1456A-70F-2 10-16 cm	179.8	2.725	1.482	0.035	0.1490	0.0028	0.69129	925	14	895	16	964	37	964.0	37.0	7.2
U1456A-70F-2 10-16 cm	385	1.457	0.113	0.004	0.0168	0.0004	0.24742	108	3.6	107.2	2.3	128	69	107.2	2.3	0.7
U1456A-70F-2 10-16 cm	374	1.065	2.114	0.061	0.1953	0.0045	0.74440	1153	19	1149	25	1136	38	1136.0	38.0	1.1
U1456A-70F-2 10-16 cm	2520	0.767	1.288	0.023	0.1365	0.0020	0.82166	839	10	825	12	857	22	825.0	12.0	1.7
U1457C-31R-1 94-100 cm	354	0.984	5.475	0.049	0.3430	0.0031	0.81701	1895.6	7.7	1900	15	1866	12	1866.0	12.0	1.8
U1457C-31R-1 94-100 cm	371.6	3.840	0.836	0.023	0.0982	0.0020	0.61468	616	13	604	12	639	52	604.0	12.0	1.9
U1457C-31R-1 94-100 cm	340	1.340	1.690	0.038	0.1682	0.0029	0.82446	1003	14	1002	16	981	27	981.0	27.0	2.1
U1457C-31R-1 94-100 cm	6940	7.076	0.013	0.000	0.0019	0.0000	0.24127	12.82	0.25	12.15	0.13	110	41	12.2	0.1	5.2
U1457C-31R-1 94-100 cm	746	0.979	1.165	0.023	0.1052	0.0015	0.36862	783	11	644.8	8.5	1168	38	DISC	DISC	17.7
U1457C-31R-1 94-100 cm	1119	0.832	0.049	0.001	0.0075	0.0001	0.11565	48.6	1.2	48.19	0.53	85	51	48.2	0.5	0.8
U1457C-31R-1 94-100 cm	34.1	0.510	0.150	0.019	0.0212	0.0009	0.05884	140	17	135.3	5.5	210	230	135.3	5.5	3.4
U1457C-31R-1 94-100 cm	355	15.600	0.585	0.039	0.0683	0.0046	0.66295	466	25	426	27	670	110	426.0	27.0	8.6
U1457C-31R-1 94-100 cm	150.4	2.410	0.891	0.021	0.1012	0.0016	0.52574	645	11	621.4	9.2	737	42	621.4	9.2	3.7
U1457C-31R-1 94-100 cm	590	1.387	0.122	0.003	0.0185	0.0003	0.34804	116.4	2.6	118.1	1.9	113	48	118.1	1.9	1.5
U1457C-31R-1 94-100 cm	3070	49.500	0.121	0.002	0.0178	0.0002	0.72091	115.8	2	113.6	1.4	173	29	113.6	1.4	1.9
U1457C-31R-1 94-100 cm	268.2	1.771	0.319	0.007	0.0433	0.0005	0.06268	280.7	5.3	272.9	2.9	353	49	272.9	2.9	2.8
U1457C-31R-1 94-100 cm	1030	0.884	0.129	0.003	0.0189	0.0003	0.34476	122.8	2.8	120.5	1.9	190	50	120.5	1.9	1.9
U1457C-31R-1 94-100 cm	401	0.698	0.121	0.005	0.0179	0.0004	0.27868	115.8	4	114.6	2.7	164	74	114.6	2.7	1.0
U1457C-31R-1 94-100 cm	57.3	0.407	1.256	0.034	0.1389	0.0017	0.33720	824	16	837.9	9.8	760	53	837.9	9.8	1.7

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-31R-1 94-100 cm	776	1.705	0.124	0.003	0.0185	0.0002	0.22117	118.9	2.5	118.4	1.5	151	49	118.4	1.5	0.4
U1457C-31R-1 94-100 cm	486	1.629	0.116	0.003	0.0172	0.0003	0.34065	110.8	2.9	109.6	1.8	150	56	109.6	1.8	1.1
U1457C-31R-1 94-100 cm	3210	3.340	0.131	0.006	0.0192	0.0008	0.65559	124.9	5.4	122.5	5.1	182	81	122.5	5.1	1.9
U1457C-31R-1 94-100 cm	262	0.845	0.119	0.005	0.0175	0.0003	0.08406	114.1	4.9	111.6	1.9	195	96	111.6	1.9	2.2
U1457C-31R-1 94-100 cm	192	0.501	0.059	0.004	0.0093	0.0002	0.06902	58.2	3.5	59.5	0.99	50	110	59.5	1.0	2.2
U1457C-31R-1 94-100 cm	1017	17.320	1.162	0.020	0.1192	0.0021	0.78876	781.2	9.6	726	12	967	23	726.0	12.0	7.1
U1457C-31R-1 94-100 cm	1380	7.000	0.234	0.005	0.0340	0.0006	0.55196	213.1	3.8	215.2	3.8	203	36	215.2	3.8	1.0
U1457C-31R-1 94-100 cm	304	0.896	1.719	0.045	0.1706	0.0037	0.81225	1015	16	1015	20	1025	27	1025.0	27.0	1.0
U1457C-31R-1 94-100 cm	558	16.100	1.749	0.023	0.1724	0.0017	0.61412	1025.9	8.5	1025.2	9.1	1032	21	1032.0	21.0	0.7
U1457C-31R-1 94-100 cm	648	#####	0.025	0.003	0.0035	0.0005	0.43168	24.7	3.3	22.5	3.3	280	260	DISC	DISC	8.9
U1457C-31R-1 94-100 cm	579	0.899	1.285	0.023	0.1362	0.0023	0.71516	838	10	823	13	880	27	823.0	13.0	1.8
U1457C-31R-1 94-100 cm	759	7.760	0.574	0.008	0.0717	0.0008	0.66304	460.6	5.2	446.1	4.8	531	24	446.1	4.8	3.1
U1457C-31R-1 94-100 cm	1970	6.660	0.129	0.003	0.0180	0.0003	0.51976	123.3	2.7	114.8	2.1	281	45	114.8	2.1	6.9
U1457C-31R-1 94-100 cm	970	#####	0.032	0.005	0.0047	0.0007	0.44404	31.7	4.8	29.9	4.4	190	320	DISC	DISC	5.7
U1457C-31R-1 94-100 cm	918	#####	1.335	0.028	0.1321	0.0021	0.63407	861	13	800	12	1024	31	800.0	12.0	7.1
U1457C-31R-1 94-100 cm	932	3.410	1.688	0.058	0.1665	0.0053	0.76991	1002	22	992	29	1025	40	1025.0	40.0	3.2
U1457C-31R-1 94-100 cm	847	0.594	2.708	0.033	0.2185	0.0021	0.66329	1330	9.1	1274	11	1409	18	1409.0	18.0	9.6
U1457C-31R-1 94-100 cm	822	1.937	9.683	0.079	0.4589	0.0042	0.51503	2404.1	7.5	2434	19	2377	15	2377.0	15.0	2.4
U1457C-31R-1 94-100 cm	666	1.339	9.760	0.110	0.4580	0.0058	0.68838	2410	10	2437	26	2373	18	2373.0	18.0	2.7
U1457C-31R-1 94-100 cm	167	0.721	1.185	0.024	0.1348	0.0019	0.39094	792	11	815	11	701	41	815.0	11.0	2.9
U1457C-31R-1 94-100 cm	418.3	1.166	3.611	0.045	0.2678	0.0031	0.68483	1550.7	9.8	1529	16	1567	18	1567.0	18.0	2.4
U1457C-31R-1 94-100 cm	140.1	0.820	0.086	0.005	0.0129	0.0003	0.22871	83	4.8	82.3	1.6	110	110	82.3	1.6	0.8
U1457C-31R-1 94-100 cm	327	1.649	0.713	0.011	0.0884	0.0008	0.30282	546	6.5	546.2	4.4	532	33	546.2	4.4	0.0
U1457C-31R-1 94-100 cm	228	3.170	0.121	0.004	0.0182	0.0003	0.01748	115.4	3.5	116	1.6	120	69	116.0	1.6	0.5
U1457C-31R-1 94-100 cm	402	4.070	0.634	0.013	0.0815	0.0009	0.35005	498.3	8.2	505.2	5.4	459	45	505.2	5.4	1.4
U1457C-31R-1 94-100 cm	482	0.991	4.784	0.052	0.3066	0.0025	0.59994	1781.2	9.2	1724	12	1848	16	1848.0	16.0	6.7
U1457C-31R-1 94-100 cm	217	1.610	1.435	0.022	0.1541	0.0017	0.41470	902	9.2	923.6	9.7	853	30	853.0	30.0	8.3
U1457C-31R-1 94-100 cm	279.2	0.362	1.269	0.018	0.1385	0.0009	0.40057	830.9	7.7	836.2	4.9	820	25	836.2	4.9	0.6
U1457C-31R-1 94-100 cm	232.9	2.130	1.769	0.023	0.1777	0.0012	0.27402	1033.1	8.5	1054.3	6.4	995	26	995.0	26.0	6.0
U1457C-31R-1 94-100 cm	476	2.710	6.460	0.200	0.3720	0.0110	0.76930	2036	27	2036	50	2049	37	2049.0	37.0	0.6
U1457C-31R-1 94-100 cm	1240	2.060	1.474	0.062	0.1402	0.0052	0.54298	917	25	845	29	1108	76	845.0	29.0	7.9
U1457C-31R-1 94-100 cm	3950	0.619	0.101	0.004	0.0126	0.0003	0.68907	98	3.9	80.4	2.2	539	65	DISC	DISC	18.0
U1457C-31R-1 94-100 cm	485	0.390	1.915	0.031	0.1785	0.0025	0.56753	1085	11	1059	14	1129	28	1129.0	28.0	6.2
U1457C-31R-1 94-100 cm	2919	2.420	1.296	0.011	0.1360	0.0010	0.61022	843.6	4.9	821.9	5.9	879	15	821.9	5.9	2.6
U1457C-31R-1 94-100 cm	203	2.105	0.853	0.026	0.1003	0.0026	0.72162	625	14	619	14	619	49	619.0	14.0	1.0

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-31R-1 94-100 cm	2369	1.556	0.587	0.013	0.0720	0.0017	0.81255	468.4	8.6	448	10	530	27	448.0	10.0	4.4
U1457C-31R-1 94-100 cm	1870	1.660	0.177	0.004	0.0256	0.0003	0.35586	165.2	3.2	163.1	1.9	135	43	163.1	1.9	1.3
U1457C-31R-1 94-100 cm	390	1.127	1.144	0.017	0.1237	0.0013	0.05581	773.3	8.1	752	7.3	786	31	752.0	7.3	2.8
U1457C-31R-1 94-100 cm	305	0.829	1.198	0.014	0.1308	0.0013	0.43178	799.9	6.8	792.6	7.2	768	24	792.6	7.2	0.9
U1457C-31R-1 94-100 cm	262	2.390	5.300	0.180	0.3320	0.0120	0.73390	1866	29	1846	60	1852	36	1852.0	36.0	0.3
U1457C-31R-1 94-100 cm	1219	5.460	0.930	0.019	0.1062	0.0018	0.84956	667.1	9.9	651	11	684	28	651.0	11.0	2.4
U1457C-31R-1 94-100 cm	1132	3.990	10.490	0.140	0.4130	0.0055	0.88762	2477	12	2227	25	2667.7	9.9	2667.7	9.9	16.5
U1457C-31R-1 94-100 cm	229.2	0.907	2.232	0.033	0.2014	0.0019	0.52568	1190	10	1183	10	1174	24	1174.0	24.0	0.8
U1457C-31R-1 94-100 cm	199	0.735	1.211	0.074	0.1269	0.0043	0.51907	804	33	770	24	880	100	770.0	24.0	4.2
U1457C-31R-1 94-100 cm	1272	1.540	0.019	0.001	0.0029	0.0000	0.00536	19.47	0.74	18.91	0.28	97	77	18.9	0.3	2.9
U1457C-31R-1 94-100 cm	1274	2.920	1.674	0.025	0.1690	0.0021	0.74557	997	9.8	1006	12	991	22	991.0	22.0	1.5
U1457C-31R-1 94-100 cm	358.8	0.756	1.275	0.013	0.1422	0.0010	0.36278	834	5.8	857.2	5.8	804	21	804.0	5.8	2.8
U1457C-31R-1 94-100 cm	1260	10.700	1.722	0.057	0.1673	0.0039	0.78771	1015	21	997	22	1087	41	1087.0	41.0	8.3
U1457C-31R-1 94-100 cm	328.1	2.465	3.296	0.054	0.2545	0.0031	0.77182	1479	13	1462	16	1539	20	1539.0	20.0	5.0
U1457C-31R-1 94-100 cm	670	0.438	0.067	0.002	0.0102	0.0002	0.17216	65.5	2	65.2	1	135	65	65.2	1.0	0.5
U1457C-31R-1 94-100 cm	237	2.679	1.703	0.024	0.1760	0.0016	0.57927	1008.2	8.8	1044.6	8.9	964	22	964.0	22.0	8.4
U1457C-31R-1 94-100 cm	120.2	0.689	0.842	0.020	0.1017	0.0013	0.20824	620	11	624	7.6	624	53	624.0	7.6	0.6
U1457C-31R-1 94-100 cm	453	6.230	0.615	0.008	0.0801	0.0006	0.42372	485.9	4.8	496.6	3.7	447	26	496.6	3.7	2.2
U1457C-31R-1 94-100 cm	1553	1.110	0.072	0.002	0.0108	0.0002	0.19372	70.3	2.1	69.2	1.2	135	70	69.2	1.2	1.6
U1457C-31R-1 94-100 cm	725	4.537	9.540	0.120	0.4452	0.0050	0.73779	2389	11	2372	22	2419	13	2419.0	13.0	1.9
U1457C-31R-1 94-100 cm	805	#####	0.581	0.010	0.0744	0.0008	0.42437	464.6	6.1	462.5	4.5	478	33	462.5	4.5	0.5
U1457C-31R-1 94-100 cm	4900	1.215	0.084	0.001	0.0128	0.0002	0.58700	82.3	1.3	82.1	1.1	88	30	82.1	1.1	0.2
U1457C-31R-1 94-100 cm	781	26.100	0.034	0.005	0.0043	0.0004	0.42769	33.5	5.1	27.6	2.4	440	300	DISC	DISC	17.6
U1457C-31R-1 94-100 cm	1158	6.420	1.354	0.030	0.1215	0.0022	0.73203	868	13	739	12	1213	30	739.0	12.0	14.9
U1457C-31R-1 94-100 cm	285.7	2.615	0.486	0.013	0.0626	0.0008	0.21899	401.4	8.5	391.4	4.6	449	57	391.4	4.6	2.5
U1457C-31R-1 94-100 cm	146	1.940	1.559	0.036	0.1639	0.0030	0.46972	952	14	978	16	892	41	892.0	41.0	9.6
U1457C-31R-1 94-100 cm	249.4	2.316	0.778	0.015	0.0938	0.0014	0.09791	583.8	8.8	577.7	8.1	606	50	577.7	8.1	1.0
U1457C-31R-1 94-100 cm	304	0.774	2.840	0.140	0.2080	0.0087	0.93086	1359	38	1217	47	1597	34	1597.0	34.0	23.8
U1457C-31R-1 94-100 cm	1889	15.780	0.117	0.006	0.0169	0.0005	0.37993	112	5.4	107.9	3.3	200	100	107.9	3.3	3.7
U1457C-31R-1 94-100 cm	353	1.099	2.749	0.049	0.2150	0.0045	0.78044	1341	13	1255	24	1480	25	1480.0	25.0	15.2
U1457C-31R-1 94-100 cm	383	5.040	0.451	0.029	0.0547	0.0027	0.34445	377	20	343	17	570	120	343.0	17.0	9.0
U1457C-31R-1 94-100 cm	763	0.707	1.915	0.025	0.1825	0.0019	0.70729	1084.9	8.7	1080	11	1096	19	1096.0	19.0	1.5
U1457C-31R-1 94-100 cm	794	15.000	1.066	0.020	0.1184	0.0023	0.70122	736	10	721	13	777	32	721.0	13.0	2.0
U1457C-31R-1 94-100 cm	626	1.738	1.681	0.050	0.1629	0.0044	0.88343	1000	19	973	24	1046	34	1046.0	34.0	7.0
U1457C-31R-1 94-100 cm	1015	2.401	1.601	0.026	0.1608	0.0022	0.67218	970	10	961	12	985	25	985.0	25.0	2.4

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-31R-1 94-100 cm	669	0.711	0.183	0.004	0.0267	0.0003	0.33036	170.7	3.5	169.7	1.6	195	47	169.7	1.6	0.6
U1457C-31R-1 94-100 cm	341	1.485	0.330	0.007	0.0469	0.0006	0.45330	289.3	5	295.4	3.9	228	43	295.4	3.9	2.1
U1457C-31R-1 94-100 cm	1640	4.120	0.656	0.009	0.0820	0.0009	0.62299	511.8	5.4	507.8	5.6	523	24	507.8	5.6	0.8
U1457C-31R-1 94-100 cm	857	4.020	0.900	0.014	0.1075	0.0015	0.73992	650.6	7.6	657.8	8.6	627	23	657.8	8.6	1.1
U1457C-31R-1 94-100 cm	2030	2.430	0.123	0.004	0.0184	0.0003	0.03581	118.6	3.7	117.6	1.9	120	71	117.6	1.9	0.8
U1457C-31R-1 94-100 cm	901	6.380	0.428	0.010	0.0554	0.0009	0.56174	361.1	6.8	347.7	5.2	460	42	347.7	5.2	3.7
U1457C-31R-1 94-100 cm	978	1.750	1.238	0.016	0.1320	0.0015	0.70364	817.4	7.2	799.2	8.6	876	20	799.2	8.6	2.2
U1457C-31R-1 94-100 cm	1304	3.190	0.116	0.003	0.0174	0.0003	0.28445	111.2	2.3	111.1	1.8	129	48	111.1	1.8	0.1
U1457C-31R-1 94-100 cm	220	1.382	0.625	0.040	0.0249	0.0008	0.45065	488	25	158.3	5.1	2686	86	DISC	DISC	67.6
U1457C-31R-1 94-100 cm	107.3	1.467	0.720	0.032	0.0748	0.0021	0.02390	548	19	465	13	900	110	DISC	DISC	15.1
U1457C-31R-1 94-100 cm	2420	1.550	0.039	0.001	0.0058	0.0001	0.17940	38.4	1	37.59	0.41	113	56	37.6	0.4	2.1
U1457C-31R-1 94-100 cm	101.9	0.564	0.064	0.005	0.0108	0.0003	0.03479	63	4.5	69.5	1.6	-100	120	69.5	1.6	10.3
U1457C-31R-1 94-100 cm	533	2.320	5.513	0.080	0.3510	0.0044	0.83166	1903	12	1941	21	1874	15	1874.0	15.0	3.6
U1457C-31R-1 94-100 cm	1225	0.786	0.072	0.002	0.0107	0.0001	0.41221	70.4	1.8	68.61	0.91	154	51	68.6	0.9	2.5
U1457C-31R-1 94-100 cm	414	1.079	2.774	0.050	0.2280	0.0034	0.83730	1346	14	1323	18	1400	18	1400.0	18.0	5.5
U1457C-31R-1 94-100 cm	400	0.741	0.957	0.014	0.1053	0.0012	0.55439	680.9	7.3	645	7.2	811	25	645.0	7.2	5.3
U1457C-31R-1 94-100 cm	473	1.831	0.121	0.003	0.0185	0.0003	0.06953	116.3	3	118.2	1.6	108	62	118.2	1.6	1.6
U1457C-31R-1 94-100 cm	2029	3.520	0.651	0.010	0.0825	0.0012	0.69005	508.3	6.4	511	7	496	27	511.0	7.0	0.5
U1457C-31R-1 94-100 cm	1452	0.991	1.123	0.010	0.1151	0.0007	0.56522	764.3	5	702.1	4.2	960	16	702.1	4.2	8.1
U1457C-31R-1 94-100 cm	130.5	0.518	0.052	0.004	0.0080	0.0002	0.00452	50.8	3.3	51.4	1.1	70	130	51.4	1.1	1.2
U1457C-31R-1 94-100 cm	630	3.470	0.111	0.003	0.0170	0.0002	0.16014	106.9	2.3	108.8	1.2	103	47	108.8	1.2	1.8
U1457C-31R-1 94-100 cm	98	1.301	1.266	0.028	0.1412	0.0016	0.42511	828	13	851.3	9.2	790	43	790.0	9.2	2.8
U1457C-31R-1 94-100 cm	409	2.179	0.658	0.009	0.0843	0.0009	0.38844	512.7	5.7	521.8	5.1	498	31	521.8	5.1	1.8
U1457C-31R-1 94-100 cm	493	2.360	0.711	0.018	0.0878	0.0012	0.68574	545	11	542.7	6.8	567	41	542.7	6.8	0.4
U1457C-31R-1 94-100 cm	588	1.108	2.007	0.016	0.1920	0.0014	0.32950	1117.6	5.5	1131.9	7.7	1120	18	1120.0	18.0	1.1
U1457C-31R-1 94-100 cm	217.3	1.960	1.558	0.028	0.1619	0.0023	0.51988	953	11	967	13	947	32	947.0	32.0	2.1
U1457C-31R-1 94-100 cm	248	1.806	9.690	0.150	0.4394	0.0053	0.85028	2403	15	2347	24	2475	14	2475.0	14.0	5.2
U1457C-31R-1 94-100 cm	336	3.620	0.645	0.028	0.0822	0.0031	0.89913	500	17	508	19	488	38	508.0	19.0	1.6
U1457C-31R-1 94-100 cm	2110	1.320	0.018	0.001	0.0029	0.0000	0.03520	18.36	0.6	18.45	0.25	50	69	18.5	0.3	0.5
U1457C-31R-1 94-100 cm	751	3.770	0.644	0.016	0.0830	0.0016	0.33587	504.3	9.7	513.7	9.5	463	56	513.7	9.5	1.9
U1457C-31R-1 94-100 cm	900	2.000	0.122	0.010	0.0181	0.0006	0.10162	116.7	8.6	115.3	3.9	150	160	115.3	3.9	1.2
U1457C-31R-1 94-100 cm	127.1	2.080	7.650	0.220	0.3505	0.0091	0.74138	2185	26	1935	43	2435	34	2435.0	34.0	20.5
U1457C-31R-1 94-100 cm	661	1.480	0.111	0.004	0.0168	0.0003	0.35107	106.9	3.7	107.4	1.8	103	66	107.4	1.8	0.5
U1457C-31R-1 94-100 cm	860	1.750	0.322	0.008	0.0454	0.0010	0.59663	283.6	6.3	286	5.9	254	46	286.0	5.9	0.8
U1457C-31R-1 94-100 cm	180	0.871	0.061	0.004	0.0094	0.0002	0.04967	59.7	3.9	60.1	1.3	60	120	60.1	1.3	0.7

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-31R-1 94-100 cm	195.9	1.167	0.107	0.005	0.0158	0.0004	0.16914	102.9	4.2	101.2	2.5	162	90	101.2	2.5	1.7
U1457C-31R-1 94-100 cm	89.8	0.951	11.010	0.170	0.4762	0.0075	0.74810	2520	15	2508	33	2532	19	2532.0	19.0	0.9
U1457C-31R-1 94-100 cm	366	1.363	0.113	0.005	0.0165	0.0003	0.36309	108.6	4.1	105.1	2.1	186	75	105.1	2.1	3.2
U1457C-31R-1 94-100 cm	333	1.595	0.117	0.005	0.0172	0.0003	0.11268	112	4.3	109.8	1.8	162	80	109.8	1.8	2.0
U1457C-31R-1 94-100 cm	375	1.140	0.126	0.005	0.0180	0.0003	0.11869	119.9	4.3	115.3	2.1	216	81	115.3	2.1	3.8
U1457C-31R-1 94-100 cm	947	1.221	0.638	0.016	-0.0043	0.0001	0.62151	500	10	-28.02	0.58	567	47	DISC	DISC	105.6
U1457C-33R-3 10-17 cm	63.7	1.381	0.063	0.007	0.0085	0.0004	0.06741	62.3	6.8	54.5	2.3	230	200	54.5	2.3	12.5
U1457C-33R-3 10-17 cm	287	10.130	0.758	0.018	0.0907	0.0017	0.53796	571	10	560	10	600	46	560.0	10.0	1.9
U1457C-33R-3 10-17 cm	422	20.570	1.719	0.045	0.1573	0.0027	0.35497	1013	17	941	15	1159	51	1159.0	51.0	18.8
U1457C-33R-3 10-17 cm	183.5	0.332	2.127	0.043	0.1965	0.0034	0.61612	1155	14	1156	18	1140	32	1140.0	32.0	1.4
U1457C-33R-3 10-17 cm	975	1.342	0.992	0.035	0.1081	0.0038	0.74590	697	18	661	22	803	51	661.0	22.0	5.2
U1457C-33R-3 10-17 cm	460	64.500	0.041	0.002	0.0061	0.0002	0.25511	40.3	2.4	39.2	1.1	120	120	39.2	1.1	2.7
U1457C-33R-3 10-17 cm	134.4	0.377	6.620	0.180	0.3789	0.0099	0.85280	2058	23	2069	47	2033	26	2033.0	26.0	1.8
U1457C-33R-3 10-17 cm	4740	33.500	0.487	0.036	0.0601	0.0042	0.61057	402	25	376	25	540	140	376.0	25.0	6.5
U1457C-33R-3 10-17 cm	477	0.887	1.352	0.030	0.1191	0.0023	0.73938	866	13	725	13	1226	30	DISC	DISC	16.3
U1457C-33R-3 10-17 cm	270	1.160	1.496	0.035	0.1511	0.0029	0.61060	926	14	906	16	959	37	959.0	37.0	5.5
U1457C-33R-3 10-17 cm	355	5.750	5.075	0.082	0.3289	0.0051	0.74761	1830	14	1832	25	1809	19	1809.0	19.0	1.3
U1457C-33R-3 10-17 cm	826	1.310	4.435	0.086	0.2840	0.0060	0.87189	1716	16	1610	30	1839	21	1839.0	21.0	12.5
U1457C-33R-3 10-17 cm	214	0.427	0.086	0.005	0.0125	0.0003	0.09115	83.5	4.5	79.9	2	180	110	79.9	2.0	4.3
U1457C-33R-3 10-17 cm	255	1.635	5.051	0.077	0.3215	0.0045	0.79840	1825	13	1796	22	1867	17	1867.0	17.0	3.8
U1457C-33R-3 10-17 cm	608	1.139	1.159	0.043	0.1078	0.0036	0.67571	779	21	659	21	1183	55	DISC	DISC	15.4
U1457C-33R-3 10-17 cm	1425	9.510	0.601	0.014	0.0675	0.0015	0.75040	477.2	8.6	421.1	8.9	787	30	421.1	8.9	11.8
U1457C-33R-3 10-17 cm	348	0.627	1.435	0.037	0.1452	0.0034	0.60908	901	15	873	19	985	45	985.0	45.0	11.4
U1457C-33R-3 10-17 cm	50.2	1.728	1.250	0.110	0.1209	0.0031	0.41576	779	32	735	18	910	100	735.0	18.0	5.6
U1457C-33R-3 10-17 cm	826	1.239	0.047	0.002	0.0071	0.0002	0.36021	46.3	1.7	45.7	1.1	123	72	45.7	1.1	1.3
U1457C-33R-3 10-17 cm	184	1.013	0.323	0.010	0.0457	0.0008	0.22561	282.8	7.8	288	4.9	266	67	288.0	4.9	1.8
U1457C-33R-3 10-17 cm	122.8	1.131	1.274	0.046	0.1292	0.0021	0.11746	829	20	783	12	943	62	783.0	12.0	5.5
U1457C-33R-3 10-17 cm	2820	0.822	0.096	0.003	0.0141	0.0004	0.72850	92.7	2.3	90.1	2.2	182	40	90.1	2.2	2.8
U1457C-33R-3 10-17 cm	321.4	1.971	0.055	0.003	0.0083	0.0002	0.21980	54.1	3	53.1	1.6	120	110	53.1	1.6	1.8
U1457C-33R-3 10-17 cm	581	0.693	0.124	0.004	0.0168	0.0003	0.34724	119.3	3.7	107.4	2.1	361	68	107.4	2.1	10.0
U1457C-33R-3 10-17 cm	136.4	0.934	2.628	0.087	0.2083	0.0051	0.58973	1302	24	1219	27	1466	50	1466.0	50.0	16.8
U1457C-33R-3 10-17 cm	705	4.810	0.960	0.014	0.1099	0.0016	0.66029	682.4	7.5	672	9.3	720	25	672.0	9.3	1.5
U1457C-33R-3 10-17 cm	227.1	0.881	18.860	0.340	0.5720	0.0110	0.67300	3031	17	2911	45	3117	24	3117.0	24.0	6.6
U1457C-33R-3 10-17 cm	251.9	1.199	1.102	0.020	0.1217	0.0016	0.47222	753.9	9.9	739.8	9.2	796	35	739.8	9.2	1.9
U1457C-33R-3 10-17 cm	577	2.450	1.955	0.055	0.1833	0.0047	0.80823	1096	19	1084	26	1131	33	1131.0	33.0	4.2

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-33R-3 10-17 cm	932	29.500	1.284	0.029	0.1365	0.0026	0.58662	837	13	824	15	871	40	824.0	15.0	1.6
U1457C-33R-3 10-17 cm	162	2.392	3.380	0.200	0.2610	0.0092	0.80195	1492	47	1494	48	1517	66	1517.0	66.0	1.5
U1457C-33R-3 10-17 cm	604.5	5.170	5.853	0.087	0.3055	0.0046	0.75482	1952	13	1717	23	2211	17	2211.0	17.0	22.3
U1457C-33R-3 10-17 cm	673	1.072	0.864	0.021	0.0920	0.0022	0.85769	630	11	567	13	855	26	567.0	13.0	10.0
U1457C-33R-3 10-17 cm	97.2	1.254	1.459	0.041	0.1617	0.0035	0.63642	908	17	965	19	749	44	749.0	19.0	6.3
U1457C-33R-3 10-17 cm	248	0.715	1.030	0.026	0.1076	0.0022	0.50475	717	13	659	13	893	50	659.0	13.0	8.1
U1457C-33R-3 10-17 cm	258.9	9.590	4.574	0.060	0.3069	0.0038	0.70202	1743	11	1725	19	1755	19	1755.0	19.0	1.7
U1457C-33R-3 10-17 cm	196.5	1.174	1.174	0.022	0.1302	0.0017	0.60964	786	10	788.8	9.5	758	32	788.8	9.5	0.4
U1457C-33R-3 10-17 cm	287	1.040	0.974	0.027	0.1117	0.0026	0.52126	689	14	682	15	698	53	682.0	15.0	1.0
U1457C-33R-3 10-17 cm	293	2.020	15.580	0.830	0.4290	0.0220	0.82535	2810	55	2280	100	3249	54	3249.0	54.0	29.8
U1457C-33R-3 10-17 cm	477	4.850	0.598	0.015	0.0749	0.0014	0.55262	475.3	9.6	465.6	8.6	506	55	465.6	8.6	2.0
U1457C-33R-3 10-17 cm	429	1.920	0.790	0.015	0.0957	0.0012	0.50737	590.1	8.4	588.9	7.1	590	34	588.9	7.1	0.2
U1457C-33R-3 10-17 cm	480	1.370	1.845	0.033	0.1795	0.0036	0.77914	1059	12	1063	20	1052	26	1052.0	26.0	1.0
U1457C-33R-3 10-17 cm	82.6	0.509	5.960	0.230	0.3290	0.0110	0.74620	1955	32	1824	51	2109	45	2109.0	45.0	13.5
U1457C-33R-3 10-17 cm	1634	1.378	0.020	0.001	0.0032	0.0001	0.33125	20.54	0.99	20.44	0.53	71	90	20.4	0.5	0.5
U1457C-33R-3 10-17 cm	98.6	1.236	0.068	0.007	0.0092	0.0003	0.05566	65.8	6.1	59.2	1.9	260	180	59.2	1.9	10.0
U1457C-33R-3 10-17 cm	539	1.409	1.433	0.026	0.1411	0.0024	0.66875	901	11	851	14	1029	29	1029.0	29.0	17.3
U1457C-33R-3 10-17 cm	266	1.357	7.720	0.170	0.3943	0.0071	0.83229	2194	20	2141	33	2244	24	2244.0	24.0	4.6
U1457C-33R-3 10-17 cm	784	4.680	0.119	0.003	0.0175	0.0004	0.44012	114.5	3.2	112	2.2	151	58	112.0	2.2	2.2
U1457C-33R-3 10-17 cm	1772	7.610	1.282	0.026	0.1326	0.0024	0.78890	836	12	802	13	922	26	802.0	13.0	4.1
U1457C-33R-3 10-17 cm	122.5	1.420	1.249	0.031	0.1309	0.0020	0.60216	820	14	793	12	884	45	793.0	12.0	3.3
U1457C-33R-3 10-17 cm	869	3.670	5.182	0.070	0.3112	0.0037	0.83859	1847	11	1746	18	1957	13	1957.0	13.0	10.8
U1457C-33R-3 10-17 cm	1347	2.610	0.121	0.003	0.0178	0.0003	0.62319	115.6	2.5	113.4	1.7	150	40	113.4	1.7	1.9
U1457C-33R-3 10-17 cm	36.7	0.587	1.109	0.049	0.1249	0.0033	0.21041	755	25	758	19	710	100	758.0	19.0	0.4
U1457C-33R-3 10-17 cm	1610	4.910	1.807	0.036	0.1681	0.0030	0.79254	1046	13	1001	17	1138	25	1138.0	25.0	12.0
U1457C-33R-3 10-17 cm	902	2.008	0.414	0.013	0.0548	0.0014	0.69438	350.8	9.2	344.1	8.6	393	46	344.1	8.6	1.9
U1457C-33R-3 10-17 cm	317	8.410	1.385	0.027	0.1459	0.0026	0.64613	880	11	879	15	904	34	904.0	34.0	2.8
U1457C-33R-3 10-17 cm	102.2	0.945	1.057	0.035	0.1146	0.0027	0.61202	732	18	699	15	834	54	699.0	15.0	4.5
U1457C-33R-3 10-17 cm	267	2.740	1.197	0.036	0.1238	0.0035	0.64852	798	17	754	19	935	52	754.0	19.0	5.5
U1457C-33R-3 10-17 cm	330	1.630	0.973	0.029	0.1111	0.0033	0.72935	689	16	680	20	752	44	680.0	20.0	1.3
U1457C-33R-3 10-17 cm	112.2	1.309	0.087	0.006	0.0120	0.0004	0.19158	84	5.8	76.9	2.5	300	140	76.9	2.5	8.5
U1457C-33R-3 10-17 cm	655	1.557	5.150	0.160	0.3069	0.0092	0.90709	1839	26	1723	45	1992	22	1992.0	22.0	13.5
U1457C-33R-3 10-17 cm	163.2	0.969	1.541	0.027	0.1540	0.0018	0.51508	945	11	923	10	1007	32	1007.0	32.0	8.3
U1457C-33R-3 10-17 cm	534	0.948	0.154	0.004	0.0226	0.0004	0.38107	145.2	3.9	144	2.7	168	58	144.0	2.7	0.8
U1457C-33R-3 10-17 cm	246	0.956	1.275	0.024	0.1390	0.0023	0.71121	834	11	838	13	830	31	838.0	13.0	0.5

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-33R-3 10-17 cm	261	1.024	4.950	0.092	0.3160	0.0048	0.75446	1807	16	1769	24	1844	22	1844.0	22.0	4.1
U1457C-33R-3 10-17 cm	857	22.800	0.757	0.014	0.0910	0.0017	0.77284	571.5	8.4	561	10	600	27	561.0	10.0	1.8
U1457C-33R-3 10-17 cm	1941	0.606	0.544	0.007	0.0685	0.0009	0.69494	440.8	4.6	427.2	5.7	493	23	427.2	5.7	3.1
U1457C-33R-3 10-17 cm	592	1.500	1.191	0.024	0.1248	0.0021	0.73728	795	11	758	12	900	26	758.0	12.0	4.7
U1457C-33R-3 10-17 cm	776	2.300	5.134	0.089	0.3265	0.0053	0.74023	1843	16	1820	26	1858	22	1858.0	22.0	2.0
U1457C-33R-3 10-17 cm	681	8.990	1.120	0.022	0.1226	0.0021	0.70470	761	11	745	12	796	31	745.0	12.0	2.1
U1457C-33R-3 10-17 cm	615	11.820	0.633	0.015	0.0783	0.0018	0.76640	497.4	9.5	486	11	535	38	486.0	11.0	2.3
U1457C-33R-3 10-17 cm	2793	16.400	0.640	0.029	0.0774	0.0035	0.80653	501	18	480	21	601	65	480.0	21.0	4.2
U1457C-33R-3 10-17 cm	258.9	0.831	1.110	0.030	0.1204	0.0027	0.67283	756	14	733	15	841	39	733.0	15.0	3.0
U1457C-33R-3 10-17 cm	1370	#####	0.026	0.004	0.0038	0.0004	0.25117	25.8	3.5	24.7	2.7	170	300	DISC	DISC	4.3
U1457C-33R-3 10-17 cm	85.9	0.896	3.270	0.120	0.2538	0.0095	0.59003	1468	28	1456	49	1490	57	1490.0	57.0	2.3
U1457C-33R-3 10-17 cm	2880	0.793	0.039	0.001	0.0054	0.0001	0.50680	38.8	1.3	34.78	0.61	285	64	34.8	0.6	10.4
U1457C-33R-3 10-17 cm	969	9.850	5.054	0.081	0.3050	0.0049	0.87434	1825	13	1714	24	1977	14	1977.0	14.0	13.3
U1457C-33R-3 10-17 cm	1500	0.465	0.046	0.002	0.0069	0.0002	0.11982	45.9	2.2	44.1	1	160	100	44.1	1.0	3.9
U1457C-33R-3 10-17 cm	301	2.600	0.837	0.019	0.1001	0.0014	0.61735	616	10	614.7	8.4	642	36	614.7	8.4	0.2
U1457C-33R-3 10-17 cm	641	1.424	0.111	0.003	0.0165	0.0003	0.24011	106.7	3.1	105.3	1.6	157	61	105.3	1.6	1.3
U1457C-33R-3 10-17 cm	81.5	0.599	0.113	0.010	0.0120	0.0005	0.13504	107.6	8.7	77.1	3.4	760	190	DISC	DISC	28.3
U1457C-33R-3 10-17 cm	301	1.561	0.814	0.023	0.0923	0.0022	0.68544	603	13	569	13	721	47	569.0	13.0	5.6
U1457C-33R-3 10-17 cm	685	7.950	0.615	0.018	0.0756	0.0020	0.59337	485	11	469	12	533	47	469.0	12.0	3.3
U1457C-33R-3 10-17 cm	262.7	0.925	0.712	0.017	0.0814	0.0016	0.40526	546	10	504	9.4	681	52	504.0	9.4	7.7
U1457C-33R-3 10-17 cm	772	3.350	7.320	0.190	0.3650	0.0110	0.67754	2141	23	2000	52	2266	38	2266.0	38.0	11.7
U1457C-33R-3 10-17 cm	960	6.200	0.207	0.011	0.0251	0.0011	0.35181	190.7	8.9	159.5	7	590	120	DISC	DISC	16.4
U1457C-33R-3 10-17 cm	340	1.022	1.280	0.030	0.1379	0.0033	0.80449	834	14	832	19	823	32	832.0	19.0	0.2
U1457C-33R-3 10-17 cm	251.2	1.123	4.972	0.069	0.3157	0.0043	0.70157	1812	12	1768	21	1848	19	1848.0	19.0	4.3
U1457C-33R-3 10-17 cm	1819	4.860	1.069	0.016	0.1148	0.0016	0.80136	737	7.7	700.4	9	836	17	700.4	9.0	5.0
U1457C-33R-3 10-17 cm	649	0.867	0.052	0.003	0.0075	0.0002	0.39442	51.4	2.4	48.33	0.93	206	89	48.3	0.9	6.0
U1457C-33R-3 10-17 cm	1426	6.200	0.075	0.008	0.0108	0.0008	0.25042	73.4	7.5	69.3	5.4	130	250	69.3	5.4	5.6
U1457C-33R-3 10-17 cm	731	4.250	5.157	0.082	0.3265	0.0051	0.89121	1842	14	1820	25	1860	13	1860.0	13.0	2.2
U1457C-33R-3 10-17 cm	452	4.790	1.581	0.034	0.1600	0.0034	0.69730	959	13	956	19	996	36	996.0	36.0	4.0
U1457C-33R-3 10-17 cm	1128	16.500	0.057	0.002	0.0084	0.0003	0.70340	56.3	2.3	54	1.6	156	62	54.0	1.6	4.1
U1457C-33R-3 10-17 cm	437	1.374	1.686	0.048	0.1648	0.0031	0.71508	1000	18	983	17	1030	38	1030.0	38.0	4.6
U1457C-33R-3 10-17 cm	560	4.780	0.198	0.006	0.0286	0.0006	0.32433	182.9	5.4	181.7	3.4	201	66	181.7	3.4	0.7
U1457C-33R-3 10-17 cm	650	1.920	0.961	0.024	0.0961	0.0022	0.70135	682	12	591	13	996	37	591.0	13.0	13.3
U1457C-33R-3 10-17 cm	3350	3.240	0.100	0.002	0.0149	0.0002	0.69428	96.7	1.7	95.3	1.3	136	30	95.3	1.3	1.4
U1457C-33R-3 10-17 cm	257	0.566	0.061	0.004	0.0089	0.0002	0.03003	59.8	3.6	57.4	1.3	170	120	57.4	1.3	4.0

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-33R-3 10-17 cm	489	1.025	0.111	0.004	0.0166	0.0003	0.30640	106.3	3.3	106	1.8	138	66	106.0	1.8	0.3
U1457C-33R-3 10-17 cm	263.8	1.425	5.042	0.069	0.3210	0.0043	0.69180	1826	11	1794	21	1864	19	1864.0	19.0	3.8
U1457C-33R-3 10-17 cm	171.2	0.885	0.080	0.005	0.0115	0.0003	0.08009	77.4	4.7	73.7	1.9	210	120	73.7	1.9	4.8
U1457C-33R-3 10-17 cm	4050	7.420	0.772	0.023	0.0750	0.0020	0.67078	580	13	466	12	1067	43	DISC	DISC	19.7
U1457C-33R-3 10-17 cm	172.6	3.470	5.249	0.097	0.3339	0.0060	0.78299	1858	16	1856	29	1875	23	1875.0	23.0	1.0
U1457C-33R-3 10-17 cm	2371	0.971	0.018	0.001	0.0028	0.0000	0.09146	18.35	0.62	18.29	0.26	78	70	18.3	0.3	0.3
U1457C-33R-3 10-17 cm	1049	2.180	0.790	0.017	0.0910	0.0017	0.74220	590.2	9.5	561	10	724	31	561.0	10.0	4.9
U1457C-33R-3 10-17 cm	732	6.990	0.344	0.008	0.0460	0.0008	0.62567	300	5.9	289.6	4.7	417	42	289.6	4.7	3.5
U1457C-33R-3 10-17 cm	635	1.707	0.106	0.004	0.0158	0.0003	0.26150	102.4	3.2	100.7	1.8	187	67	100.7	1.8	1.7
U1457C-33R-3 10-17 cm	125	0.952	5.231	0.076	0.3358	0.0039	0.59883	1855	12	1865	19	1871	22	1871.0	22.0	0.3
U1457C-33R-3 10-17 cm	366	4.060	0.039	0.003	0.0045	0.0001	0.03112	38.3	3.1	29.03	0.81	580	170	DISC	DISC	24.2
U1457C-33R-3 10-17 cm	345	3.020	8.850	0.170	0.3735	0.0065	0.70406	2318	17	2043	31	2565	24	2565.0	24.0	20.4
U1457C-33R-3 10-17 cm	472	0.783	0.050	0.002	0.0075	0.0002	0.24285	49.1	2.3	48.36	0.94	95	85	48.4	0.9	1.5
U1457C-33R-3 10-17 cm	702	2.430	1.309	0.024	0.1388	0.0024	0.59094	852	10	837	14	883	32	837.0	14.0	1.8
U1457C-33R-3 10-17 cm	606	1.051	0.647	0.012	0.0800	0.0011	0.66319	505.3	7.5	496.2	6.7	549	30	496.2	6.7	1.8
U1457C-33R-3 10-17 cm	924	7.700	1.673	0.026	0.1650	0.0022	0.66177	997.9	9.5	984	12	1028	24	1028.0	24.0	4.3
U1457C-33R-3 10-17 cm	798	8.200	5.147	0.079	0.3289	0.0050	0.79084	1841	13	1831	24	1857	18	1857.0	18.0	1.4
U1457C-33R-3 10-17 cm	445	0.932	1.271	0.028	0.1374	0.0023	0.61486	831	13	829	13	847	38	829.0	13.0	0.2
U1457C-33R-3 10-17 cm	400	8.520	0.795	0.013	0.0976	0.0012	0.41334	593.8	6.9	600.4	7	572	33	600.4	7.0	1.1
U1457C-33R-3 10-17 cm	1130	#####	0.584	0.017	0.0728	0.0019	0.66238	466	11	453	12	528	52	453.0	12.0	2.8
U1457C-33R-3 10-17 cm	160.7	1.557	1.633	0.041	0.1611	0.0028	0.40150	981	16	962	16	1018	47	1018.0	47.0	5.5
U1457C-33R-3 10-17 cm	187.8	1.910	2.747	0.059	0.2289	0.0042	0.72880	1344	15	1327	22	1367	31	1367.0	31.0	2.9
U1457C-33R-3 10-17 cm	179.8	1.265	3.134	0.072	0.2439	0.0049	0.74638	1437	18	1405	25	1493	29	1493.0	29.0	5.9
U1457C-33R-3 10-17 cm	96.4	2.330	1.415	0.060	0.1501	0.0052	0.61953	889	25	900	29	861	70	861.0	70.0	4.5
U1457C-33R-3 10-17 cm	59	1.000	3.790	0.150	0.2860	0.0100	0.76532	1583	33	1617	51	1551	50	1551.0	50.0	4.3
U1457C-33R-3 10-17 cm	380	2.146	1.500	0.026	0.1547	0.0025	0.73401	930	10	927	14	940	25	940.0	25.0	1.4
U1457C-33R-3 10-17 cm	586	6.340	0.530	0.011	0.0679	0.0010	0.60926	431.1	7	423.6	6.1	464	34	423.6	6.1	1.7
U1457C-33R-3 10-17 cm	391	1.212	0.072	0.003	0.0104	0.0002	0.15632	70.2	3	66.4	1.3	196	89	66.4	1.3	5.4
U1457C-33R-3 10-17 cm	630	2.500	0.108	0.004	0.0160	0.0003	0.27850	103.6	3.4	102.3	1.6	137	67	102.3	1.6	1.3
U1457C-33R-3 10-17 cm	75.7	1.030	1.361	0.035	0.1418	0.0024	0.30896	870	15	854	13	919	52	919.0	52.0	7.1
U1456C-45X-3 45-51 cm	216.3	0.759	0.087	0.006	0.0117	0.0004	0.11918	84.4	5.1	74.9	2.4	340	110	74.9	2.4	11.3
U1456C-45X-3 45-51 cm	139.4	1.305	7.850	0.260	0.3970	0.0130	0.73516	2198	32	2146	61	2278	38	2278.0	38.0	5.8
U1456C-45X-3 45-51 cm	660	0.747	1.463	0.030	0.1422	0.0024	0.58917	916	12	856	14	1064	34	1064.0	34.0	19.5
U1456C-45X-3 45-51 cm	1172	9.360	1.590	0.050	0.1518	0.0050	0.67672	960	20	913	29	1095	54	1095.0	54.0	16.6
U1456C-45X-3 45-51 cm	422	2.456	0.685	0.017	0.0879	0.0019	0.36377	529	11	543	11	457	58	543.0	11.0	2.6

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456C-45X-3 45-51 cm	434	3.660	0.908	0.026	0.0936	0.0025	0.51467	652	14	578	15	925	53	578.0	15.0	11.3
U1456C-45X-3 45-51 cm	2620	2.310	0.760	0.038	0.0920	0.0030	0.81483	573	22	567	18	588	71	567.0	18.0	1.0
U1456C-45X-3 45-51 cm	506	1.480	1.325	0.019	0.1433	0.0017	0.54189	855.5	8.5	863	9.8	840	28	840.0	9.8	0.9
U1456C-45X-3 45-51 cm	606.7	27.200	5.830	0.074	0.3518	0.0049	0.71567	1950	11	1941	23	1958	19	1958.0	19.0	0.9
U1456C-45X-3 45-51 cm	607	6.740	1.473	0.044	0.1500	0.0047	0.55367	918	18	899	26	968	55	968.0	55.0	7.1
U1456C-45X-3 45-51 cm	410	4.950	0.630	0.013	0.0784	0.0012	0.35836	495.2	8.3	486.3	7.4	530	46	486.3	7.4	1.8
U1456C-45X-3 45-51 cm	545	2.200	0.696	0.021	0.0849	0.0028	0.49020	534	12	524	16	584	65	524.0	16.0	1.9
U1456C-45X-3 45-51 cm	1278	1.673	0.018	0.001	0.0028	0.0001	0.29228	17.85	0.94	18.15	0.36	20	97	18.2	0.4	1.7
U1456C-45X-3 45-51 cm	305	1.771	1.392	0.022	0.1493	0.0019	0.45146	883.8	9.3	897	11	847	33	847.0	11.0	1.5
U1456C-45X-3 45-51 cm	1223	2.570	0.379	0.013	0.0480	0.0015	0.47257	325.4	9.7	301.9	9.1	471	66	301.9	9.1	7.2
U1456C-45X-3 45-51 cm	165.8	0.970	0.057	0.004	0.0085	0.0002	0.10121	56.9	3.9	54.8	1.2	120	130	54.8	1.2	3.7
U1456C-45X-3 45-51 cm	1410	28.000	0.765	0.071	0.0847	0.0057	0.74242	574	40	524	34	760	140	524.0	34.0	8.7
U1456C-45X-3 45-51 cm	151.8	1.310	22.020	0.420	0.6180	0.0130	0.64145	3182	18	3097	52	3235	26	3235.0	26.0	4.3
U1456C-45X-3 45-51 cm	578	1.433	0.302	0.010	0.0417	0.0010	0.49469	267.7	7.7	263.2	6.4	316	62	263.2	6.4	1.7
U1456C-45X-3 45-51 cm	786	1.460	1.034	0.033	0.1083	0.0032	0.65655	716	16	662	18	895	48	662.0	18.0	7.5
U1456C-45X-3 45-51 cm	614	1.890	0.100	0.004	0.0158	0.0006	0.49912	96.7	4	100.7	3.5	35	72	100.7	3.5	4.1
U1456C-45X-3 45-51 cm	546	16.800	4.544	0.057	0.3054	0.0036	0.70934	1737	10	1717	18	1760	17	1760.0	17.0	2.4
U1456C-45X-3 45-51 cm	423	1.188	0.110	0.004	0.0161	0.0002	0.13300	106	3.2	103.2	1.5	168	67	103.2	1.5	2.6
U1456C-45X-3 45-51 cm	104.6	0.846	0.061	0.009	0.0097	0.0007	0.26836	59.1	8.3	62.2	4.4	50	250	62.2	4.4	5.2
U1456C-45X-3 45-51 cm	149.4	1.193	5.640	0.110	0.3305	0.0064	0.63976	1919	17	1839	31	2008	29	2008.0	29.0	8.4
U1456C-45X-3 45-51 cm	229	3.720	1.575	0.048	0.1612	0.0054	0.52391	956	19	961	30	956	61	956.0	61.0	0.5
U1456C-45X-3 45-51 cm	1360	2.110	0.798	0.026	0.0865	0.0030	0.39895	595	15	535	18	826	76	535.0	18.0	10.1
U1456C-45X-3 45-51 cm	195.7	1.404	2.017	0.038	0.1908	0.0027	0.55385	1119	13	1125	14	1103	32	1103.0	32.0	2.0
U1456C-45X-3 45-51 cm	857	12.660	3.166	0.092	0.2052	0.0056	0.57772	1442	22	1201	30	1814	46	DISC	DISC	33.8
U1456C-45X-3 45-51 cm	246	2.350	0.059	0.004	0.0091	0.0004	0.15517	57.8	3.9	58.3	2.2	50	130	58.3	2.2	0.9
U1456C-45X-3 45-51 cm	332	11.100	0.167	0.024	0.0252	0.0024	0.54244	156	21	160	15	110	240	160.0	15.0	2.6
U1456C-45X-3 45-51 cm	311	1.734	1.307	0.027	0.1398	0.0024	0.71402	850	12	843	14	865	35	843.0	14.0	0.8
U1456C-45X-3 45-51 cm	598	3.380	1.669	0.024	0.1699	0.0018	0.52709	997.4	9.4	1011	10	960	25	960.0	25.0	5.3
U1456C-45X-3 45-51 cm	289	1.940	3.229	0.073	0.2561	0.0046	0.70219	1460	18	1469	24	1447	31	1447.0	31.0	1.5
U1456C-45X-3 45-51 cm	663	1.390	1.207	0.019	0.1336	0.0015	0.58266	802.7	8.6	808.4	8.4	788	26	808.4	8.4	0.7
U1456C-45X-3 45-51 cm	812	5.060	1.270	0.110	0.1293	0.0088	0.73218	826	50	783	50	940	130	783.0	50.0	5.2
U1456C-45X-3 45-51 cm	270	1.510	0.075	0.009	0.0104	0.0008	0.12752	73.4	8.2	66.9	4.8	290	250	66.9	4.8	8.9
U1456C-45X-3 45-51 cm	561	2.990	5.320	0.120	0.3357	0.0070	0.56605	1867	19	1862	34	1877	34	1877.0	34.0	0.8
U1456C-45X-3 45-51 cm	427	4.530	1.825	0.046	0.1831	0.0042	0.64515	1049	16	1082	23	985	40	985.0	40.0	9.8
U1456C-45X-3 45-51 cm	340.4	1.064	3.355	0.038	0.2633	0.0033	0.58016	1492.6	9	1506	17	1468	23	1468.0	23.0	2.6

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456C-45X-3 45-51 cm	216	1.966	0.113	0.007	0.0167	0.0004	0.08373	108.3	6.2	106.4	2.5	170	120	106.4	2.5	1.8
U1456C-45X-3 45-51 cm	256	13.700	0.832	0.027	0.0989	0.0024	0.59376	611	15	607	14	616	55	607.0	14.0	0.7
U1456C-45X-3 45-51 cm	858	2.256	6.080	0.100	0.3077	0.0044	0.82163	1987	15	1729	22	2270	16	2270.0	16.0	23.8
U1456C-45X-3 45-51 cm	86.2	0.687	0.744	0.027	0.0903	0.0018	0.41808	562	16	557	11	568	72	557.0	11.0	0.9
U1456C-45X-3 45-51 cm	2343	0.770	0.039	0.001	0.0057	0.0001	0.27568	38.73	0.99	36.42	0.38	184	53	36.4	0.4	6.0
U1456C-45X-3 45-51 cm	868	4.120	0.995	0.026	0.1049	0.0023	0.63491	698	13	643	14	885	44	643.0	14.0	7.9
U1456C-45X-3 45-51 cm	199	0.999	0.103	0.010	0.0139	0.0004	0.15782	99	9.1	88.7	2.8	320	190	88.7	2.8	10.4
U1456C-45X-3 45-51 cm	492.4	1.927	5.568	0.081	0.3222	0.0049	0.75322	1911	12	1799	24	2034	19	2034.0	19.0	11.6
U1456C-45X-3 45-51 cm	736	1.638	4.330	0.110	0.2490	0.0056	0.74632	1695	21	1432	29	2044	32	2044.0	32.0	29.9
U1456C-45X-3 45-51 cm	7.98	1.810	2.130	0.120	0.1869	0.0072	0.27513	1128	42	1106	40	1150	120	1150.0	120.0	3.8
U1456C-45X-3 45-51 cm	414	1.029	1.151	0.022	0.1281	0.0022	0.49142	776	10	777	13	786	39	777.0	13.0	0.1
U1456C-45X-3 45-51 cm	1000	1.610	0.059	0.003	0.0089	0.0004	0.22952	58.5	3.2	57.3	2.4	130	120	57.3	2.4	2.1
U1456C-45X-3 45-51 cm	421	9.300	1.744	0.042	0.1692	0.0037	0.54256	1022	16	1007	21	1052	49	1052.0	49.0	4.3
U1456C-45X-3 45-51 cm	113.8	1.061	1.209	0.052	0.1352	0.0044	0.62103	798	23	816	25	742	69	816.0	25.0	2.3
U1456C-45X-3 45-51 cm	241	1.791	2.066	0.052	0.1876	0.0044	0.48011	1132	17	1107	24	1197	44	1197.0	44.0	7.5
U1456C-45X-3 45-51 cm	743	1.770	0.547	0.012	0.0715	0.0021	0.51908	442.9	8	445	13	469	56	445.0	13.0	0.5
U1456C-45X-3 45-51 cm	158.4	1.497	8.080	0.120	0.4114	0.0055	0.53498	2238	13	2220	25	2258	24	2258.0	24.0	1.7
U1456C-45X-3 45-51 cm	81.7	0.575	4.435	0.067	0.3039	0.0035	0.44383	1716	12	1710	17	1724	27	1724.0	27.0	0.8
U1456C-45X-3 45-51 cm	427	1.970	7.300	0.280	0.3500	0.0130	0.91179	2138	36	1928	60	2361	28	2361.0	28.0	18.3
U1456C-45X-3 45-51 cm	59.6	0.835	1.211	0.034	0.1318	0.0020	0.24937	803	16	798	11	808	63	798.0	11.0	0.6
U1456C-45X-3 45-51 cm	430	3.240	6.890	0.099	0.3938	0.0051	0.66866	2096	12	2139	24	2058	20	2058.0	20.0	3.9
U1456C-45X-3 45-51 cm	854	3.060	1.274	0.023	0.1343	0.0021	0.62317	833	10	812	12	898	32	812.0	12.0	2.5
U1456C-45X-3 45-51 cm	155.6	1.389	6.541	0.064	0.3731	0.0032	0.50028	2050.4	8.7	2043	15	2060	17	2060.0	17.0	0.8
U1456C-45X-3 45-51 cm	990	0.892	0.081	0.002	0.0126	0.0001	0.04478	79.3	2.3	80.74	0.91	59	61	80.7	0.9	1.8
U1456C-45X-3 45-51 cm	989	0.771	0.175	0.004	0.0251	0.0003	0.27054	163.4	3.3	160	2.1	202	46	160.0	2.1	2.1
U1456C-45X-3 45-51 cm	466	1.559	3.196	0.065	0.2066	0.0037	0.83724	1453	15	1210	20	1831	20	DISC	DISC	33.9
U1456C-45X-3 45-51 cm	188.6	1.152	0.807	0.023	0.0982	0.0019	0.53061	598	13	603	11	553	50	603.0	11.0	0.8
U1456C-45X-3 45-51 cm	2650	3.950	0.116	0.004	0.0176	0.0004	0.48284	111.8	3.5	112.1	2.4	100	59	112.1	2.4	0.3
U1456C-45X-3 45-51 cm	718	2.360	0.659	0.012	0.0823	0.0015	0.53832	512.8	7.1	509.6	8.8	515	38	509.6	8.8	0.6
U1456C-45X-3 45-51 cm	195	3.900	0.843	0.035	0.1029	0.0041	0.55812	620	20	630	24	578	85	630.0	24.0	1.6
U1456C-45X-3 45-51 cm	204	1.175	0.148	0.010	0.0195	0.0008	0.28850	139.5	9.1	124.2	4.8	380	150	124.2	4.8	11.0
U1456C-45X-3 45-51 cm	81.3	1.237	0.792	0.027	0.0955	0.0021	0.08393	589	15	587	13	564	72	587.0	13.0	0.3
U1456C-45X-3 45-51 cm	138.7	0.541	0.187	0.019	0.0142	0.0005	0.33879	173	16	91	3.3	1430	190	DISC	DISC	47.4
U1456C-45X-3 45-51 cm	196	0.917	0.091	0.010	0.0131	0.0005	0.10840	88.3	8.8	84.1	3	200	200	84.1	3.0	4.8
U1456C-45X-3 45-51 cm	316	1.035	0.187	0.007	0.0248	0.0005	0.27104	173.1	6	158.1	3.1	334	76	158.1	3.1	8.7

(table cont'd)

Sample Name	[U] ppm	U/Th	207/235					206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			207/23 5	2σ error	206/238	2σ error	RHO	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456C-45X-3 45-51 cm	465	2.610	10.120	0.280	0.4070	0.0120	0.74964	2437	26	2193	56	2646	34	2646.0 34.0 17.1
U1456C-45X-3 45-51 cm	2620	1.211	0.175	0.003	0.0255	0.0003	0.87875	163.2	2.8	162	2	158	30	162.0 2.0 0.7
U1456C-45X-3 45-51 cm	193.3	1.910	0.122	0.007	0.0175	0.0005	0.06835	116.2	5.9	111.9	2.9	180	100	111.9 2.9 3.7
U1456C-45X-3 45-51 cm	253	2.880	1.273	0.041	0.1290	0.0028	0.45211	830	19	781	16	927	61	781.0 16.0 5.9
U1456C-45X-3 45-51 cm	531	#####	0.019	0.003	0.0029	0.0002	0.31775	19	2.9	18.5	1.3	90	250	18.5 1.3 2.6
U1456C-45X-3 45-51 cm	1180	2.530	0.727	0.041	0.0748	0.0038	0.57053	552	24	464	23	900	100	DISC DISC 15.9
U1456C-45X-3 45-51 cm	178.8	1.056	0.708	0.018	0.0912	0.0024	0.45612	543	11	562	14	447	62	562.0 14.0 3.5
U1456C-45X-3 45-51 cm	144.4	0.474	0.612	0.015	0.0818	0.0016	0.32830	482.9	9.7	506.3	9.3	358	55	506.3 9.3 4.8
U1456C-45X-3 45-51 cm	1359	#####	0.151	0.021	0.0207	0.0018	0.50550	142	18	132	11	260	230	132.0 11.0 7.0
U1456C-45X-3 45-51 cm	1374	0.561	0.769	0.009	0.0937	0.0009	0.47805	578.7	5.4	577	5.2	572	24	577.0 5.2 0.3
U1456C-45X-3 45-51 cm	920	26.400	0.058	0.004	0.0085	0.0004	0.49499	57.2	3.4	54.7	2.3	145	97	54.7 2.3 4.4
U1456C-45X-3 45-51 cm	1797	4.980	0.024	0.002	0.0036	0.0002	0.62972	24.3	1.5	23.2	1.1	127	93	23.2 1.1 4.5
U1456C-45X-3 45-51 cm	644	1.426	0.586	0.018	0.0747	0.0014	0.51337	467	11	464.5	8.1	457	60	464.5 8.1 0.5
U1456C-45X-3 45-51 cm	1545	25.300	0.643	0.039	0.0717	0.0040	0.69458	499	24	445	24	740	100	445.0 24.0 10.8
U1456C-45X-3 45-51 cm	1674	1.580	0.022	0.001	0.0034	0.0001	0.21532	22.1	1.1	21.84	0.55	65	91	21.8 0.6 1.2
U1456C-45X-3 45-51 cm	206	1.970	1.096	0.038	0.1219	0.0044	0.59815	748	18	740	25	779	69	740.0 25.0 1.1
U1456C-45X-3 45-51 cm	425	2.410	1.032	0.036	0.1177	0.0034	0.73025	714	18	716	20	695	52	716.0 20.0 0.3
U1456C-45X-3 45-51 cm	393	36.000	0.047	0.005	0.0073	0.0004	0.17837	46.5	5.2	46.6	2.3	30	220	46.6 2.3 0.2
U1456C-45X-3 45-51 cm	2720	#####	0.114	0.011	0.0171	0.0008	0.15502	109.7	9.7	109.1	5	110	200	109.1 5.0 0.5
U1456C-45X-3 45-51 cm	513	8.520	0.911	0.017	0.1041	0.0019	0.73501	656.8	9.3	638	11	710	34	638.0 11.0 2.9
U1456C-45X-3 45-51 cm	451	5.780	1.025	0.018	0.1175	0.0019	0.45430	716.1	9.1	717	11	716	36	717.0 11.0 0.1
U1456C-45X-3 45-51 cm	818	13.000	0.164	0.006	0.0245	0.0008	0.55973	153.9	5.2	156.1	4.9	124	63	156.1 4.9 1.4
U1456C-45X-3 45-51 cm	499	12.310	1.273	0.031	0.1372	0.0036	0.64390	830	14	830	20	843	45	830.0 20.0 0.0
U1456C-45X-3 45-51 cm	687	1.456	0.966	0.015	0.1130	0.0017	0.36981	685.6	7.6	689.8	9.8	662	36	689.8 9.8 0.6
U1456C-45X-3 45-51 cm	85	1.950	1.041	0.061	0.1096	0.0053	0.61139	714	31	668	31	858	92	668.0 31.0 6.4
U1456C-45X-3 45-51 cm	147.7	0.577	3.295	0.096	0.2508	0.0065	0.51267	1476	22	1444	33	1507	52	1507.0 52.0 4.2
U1456C-45X-3 45-51 cm	473	1.042	0.112	0.004	0.0164	0.0003	0.30310	107.7	3.9	104.7	2.2	167	75	104.7 2.2 2.8
U1456C-45X-3 45-51 cm	62.5	0.787	0.060	0.012	0.0082	0.0003	0.12567	57.6	9.8	52.8	2.1	70	200	52.8 2.1 8.3
U1456C-45X-3 45-51 cm	247.5	3.060	0.239	0.008	0.0348	0.0008	0.13218	217.5	6.9	220.3	4.9	197	75	220.3 4.9 1.3
U1456C-45X-3 45-51 cm	916	4.630	0.605	0.009	0.0788	0.0009	0.54356	479.9	5.7	488.8	5.1	439	28	488.8 5.1 1.9
U1456C-45X-3 45-51 cm	261	0.583	0.154	0.008	0.0221	0.0005	0.12194	145.1	7	140.6	3.4	240	120	140.6 3.4 3.1
U1456C-45X-3 45-51 cm	152.5	0.640	0.043	0.004	0.0068	0.0002	0.03976	43	4.2	43.8	1.4	40	180	43.8 1.4 1.9
U1456C-45X-3 45-51 cm	260.7	1.449	0.117	0.004	0.0164	0.0003	0.21724	112.4	3.8	105	2	259	72	105.0 2.0 6.6
U1456C-45X-3 45-51 cm	285	1.220	1.205	0.022	0.1317	0.0018	0.54064	803	10	798	10	795	32	798.0 10.0 0.6
U1456C-45X-3 45-51 cm	104.6	0.621	1.551	0.034	0.1555	0.0027	0.54817	948	14	931	15	970	41	970.0 41.0 4.0

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456C-45X-3 45-51 cm	86	1.352	0.082	0.006	0.0126	0.0004	0.03869	80.3	5.8	80.8	2.4	80	130	80.8	2.4	0.6
U1456C-45X-3 45-51 cm	728	2.720	0.112	0.003	0.0161	0.0003	0.43625	107.4	3	102.7	1.6	199	56	102.7	1.6	4.4
U1456C-45X-3 45-51 cm	393.3	3.347	1.353	0.019	0.1440	0.0017	0.46847	867.6	8	866.8	9.8	865	28	865.0	28.0	0.2
U1456C-45X-3 45-51 cm	102.7	1.517	3.609	0.091	0.2661	0.0057	0.70853	1547	20	1520	29	1592	34	1592.0	34.0	4.5
U1456C-45X-3 45-51 cm	65.9	1.383	0.081	0.007	0.0132	0.0004	0.03177	77.9	6.7	84.3	2.7	-40	150	84.3	2.7	8.2
U1456C-45X-3 45-51 cm	520	3.360	0.611	0.010	0.0786	0.0011	0.52203	483.3	6.4	487.4	6.7	458	35	487.4	6.7	0.8
U1456C-45X-3 45-51 cm	441	6.220	0.051	0.003	0.0078	0.0002	0.16873	50.5	2.5	50.2	1.4	80	100	50.2	1.4	0.6
U1456C-45X-3 45-51 cm	847	1.845	0.115	0.003	0.0177	0.0003	0.43336	110.8	2.3	112.9	1.7	85	42	112.9	1.7	1.9
U1456C-45X-3 45-51 cm	1560	0.950	0.034	0.001	0.0051	0.0001	0.22126	34.3	1.2	32.92	0.56	136	73	32.9	0.6	4.0
U1456C-45X-3 45-51 cm	318	1.890	1.272	0.026	0.1411	0.0028	0.65389	831	12	850	16	786	36	786.0	16.0	2.3
U1456C-45X-3 45-51 cm	211.4	1.874	3.073	0.042	0.2470	0.0031	0.51342	1425	10	1422	16	1423	25	1423.0	25.0	0.1
U1456C-45X-3 45-51 cm	2103	72.000	0.097	0.003	0.0143	0.0003	0.66174	93.5	2.3	91.7	1.8	156	40	91.7	1.8	1.9
U1456C-45X-3 45-51 cm	1430	4.990	0.117	0.005	0.0177	0.0005	0.67274	111.7	4.4	113	3.1	82	62	113.0	3.1	1.2
U1456C-45X-3 45-51 cm	757	0.401	0.069	0.003	0.0099	0.0002	0.39307	67.9	2.8	63.2	1.2	208	80	63.2	1.2	6.9
U1456C-45X-3 45-51 cm	1014	2.145	1.346	0.021	0.1445	0.0024	0.74004	865.3	9.2	870	14	870	24	870.0	24.0	0.0
U1456C-45X-3 45-51 cm	490	2.522	0.119	0.003	0.0182	0.0003	0.23765	113.9	3	116.3	1.6	92	57	116.3	1.6	2.1
U1456C-45X-3 45-51 cm	103.7	1.987	1.139	0.024	0.1222	0.0016	0.48057	770	12	743	9.3	831	41	743.0	9.3	3.5
U1456C-45X-3 45-51 cm	256	1.600	1.289	0.023	0.1387	0.0019	0.49998	839	10	837	10	840	33	837.0	10.0	0.2
U1456C-45X-3 45-51 cm	1647	2.690	0.117	0.003	0.0177	0.0003	0.55779	112.5	2.3	113	1.7	105	38	113.0	1.7	0.4
U1456C-45X-3 45-51 cm	3790	#####	0.017	0.005	0.0025	0.0004	0.62749	17.3	5	16.2	2.8	150	340	DISC	DISC	6.4
U1456C-45X-3 45-51 cm	873	7.420	0.992	0.022	0.1152	0.0027	0.70543	700	11	702	16	692	37	702.0	16.0	0.3
U1456C-45X-3 45-51 cm	171.1	1.169	0.062	0.004	0.0096	0.0003	0.20625	60.5	3.6	61.7	1.6	70	120	61.7	1.6	2.0
U1456C-45X-3 45-51 cm	247.7	1.227	1.044	0.023	-0.0065	0.0001	0.66906	725	11	-42.03	0.8	751	36	DISC	DISC	105.8
U1456C-45X-3 45-51 cm	871	1.321	0.117	0.003	0.0174	0.0003	0.40829	112.5	2.9	110.9	1.9	152	53	110.9	1.9	1.4
U1456C-45X-3 45-51 cm	647	2.820	1.732	0.041	0.1720	0.0042	0.83692	1017	15	1022	23	1012	27	1012.0	27.0	1.0
U1456C-45X-3 45-51 cm	346	10.600	1.434	0.026	0.1491	0.0022	0.65471	901	11	896	12	906	27	906.0	27.0	1.1
U1456D-5R-1 12-20 cm	98.7	0.532	1.589	0.032	0.1625	0.0026	0.64782	963	13	970	14	920	31	920.0	31.0	5.4
U1456D-5R-1 12-20 cm	469	0.788	1.242	0.020	0.1347	0.0019	0.74492	818.7	8.9	814	11	798	22	814.0	11.0	0.6
U1456D-5R-1 12-20 cm	14.44	0.172	7.400	0.230	0.3724	0.0084	0.51897	2154	28	2045	41	2225	46	2225.0	46.0	8.1
U1456D-5R-1 12-20 cm	343.1	0.807	0.112	0.003	0.0170	0.0003	0.27802	108.3	2.5	108.7	1.6	86	50	108.7	1.6	0.4
U1456D-5R-1 12-20 cm	298	0.597	0.055	0.004	0.0086	0.0002	0.15253	54.4	3.5	55.3	1.4	60	120	55.3	1.4	1.7
U1456D-5R-1 12-20 cm	1270	12.700	0.111	0.003	0.0167	0.0004	0.58789	106.8	2.7	106.8	2.3	143	45	106.8	2.3	0.0
U1456D-5R-1 12-20 cm	127.7	0.446	0.069	0.003	0.0113	0.0002	0.03230	67.4	3	72.2	1.3	52	87	72.2	1.3	7.1
U1456D-5R-1 12-20 cm	230.7	2.250	6.490	0.190	0.3561	0.0087	0.63690	2040	25	1962	41	2110	40	2110.0	40.0	7.0
U1456D-5R-1 12-20 cm	60.6	0.589	10.140	0.150	0.4610	0.0073	0.66454	2448	14	2442	32	2441	22	2441.0	22.0	0.0

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-5R-1 12-20 cm	105.8	0.905	0.173	0.020	0.0268	0.0013	0.55362	162	18	170.5	8.3	40	190	170.5	8.3	5.2
U1456D-5R-1 12-20 cm	167.8	1.837	0.689	0.019	0.0784	0.0018	0.27738	534	11	486	11	720	60	486.0	11.0	9.0
U1456D-5R-1 12-20 cm	547	1.234	0.104	0.002	0.0158	0.0002	0.31399	100.3	2.2	100.8	1.2	77	45	100.8	1.2	0.5
U1456D-5R-1 12-20 cm	594.8	6.150	0.057	0.002	0.0083	0.0002	0.25131	55.8	2.3	53.2	1.2	151	87	53.2	1.2	4.7
U1456D-5R-1 12-20 cm	159.8	0.517	0.057	0.003	0.0090	0.0002	-0.01140	56.3	2.7	57.42	0.98	39	95	57.4	1.0	2.0
U1456D-5R-1 12-20 cm	185.4	0.928	0.868	0.015	0.1020	0.0014	0.47300	633.4	8.2	626.1	8.2	656	32	626.1	8.2	1.2
U1456D-5R-1 12-20 cm	36.92	0.527	0.283	0.020	0.0097	0.0005	0.02641	252	16	62.3	3.2	2900	150	DISC	DISC	75.3
U1456D-5R-1 12-20 cm	341.9	0.655	0.824	0.019	0.0994	0.0015	0.37302	609	10	610.4	8.8	630	45	610.4	8.8	0.2
U1456D-5R-1 12-20 cm	54.9	0.886	0.068	0.010	0.0091	0.0005	0.05041	66.8	9.6	58.6	2.9	360	300	58.6	2.9	12.3
U1456D-5R-1 12-20 cm	155.5	2.150	1.019	0.033	0.1144	0.0031	0.78832	711	17	698	18	737	44	698.0	18.0	1.8
U1456D-5R-1 12-20 cm	207	0.744	7.840	0.240	0.3644	0.0084	0.90157	2207	27	2010	43	2379	23	2379.0	23.0	15.5
U1456D-5R-1 12-20 cm	332	1.770	5.410	0.110	0.3404	0.0070	0.88499	1881	18	1889	33	1864	18	1864.0	18.0	1.3
U1456D-5R-1 12-20 cm	159.9	5.160	14.470	0.200	0.5405	0.0078	0.69642	2778	13	2783	33	2757	19	2757.0	19.0	0.9
U1456D-5R-1 12-20 cm	38.5	0.648	1.204	0.029	0.1294	0.0017	0.44815	801	14	784	9.5	817	51	784.0	9.5	2.1
U1456D-5R-1 12-20 cm	38.9	1.313	0.537	0.024	0.0698	0.0016	0.34557	432	16	435.9	9.3	381	88	435.9	9.3	0.9
U1456D-5R-1 12-20 cm	284	1.496	0.611	0.011	0.0791	0.0012	0.44729	483.5	6.6	490.5	7	421	40	490.5	7.0	1.4
U1456D-5R-1 12-20 cm	106.9	0.704	0.444	0.024	0.0204	0.0009	0.32208	375	17	130.2	5.4	2415	96	DISC	DISC	65.3
U1456D-5R-1 12-20 cm	144.2	0.905	0.051	0.003	0.0080	0.0002	0.22903	51.1	2.7	51.5	1.1	90	100	51.5	1.1	0.8
U1456D-5R-1 12-20 cm	268	2.150	0.190	0.006	0.0273	0.0005	0.47326	175.9	5.2	173.7	3.2	201	62	173.7	3.2	1.3
U1456D-5R-1 12-20 cm	333	1.017	0.059	0.002	0.0090	0.0002	0.19628	58.2	2.1	57.5	1.1	96	71	57.5	1.1	1.2
U1456D-5R-1 12-20 cm	533	0.415	0.023	0.002	0.0035	0.0001	0.15441	23	2.1	22.52	0.73	90	160	22.5	0.7	2.1
U1456D-5R-1 12-20 cm	647	18.700	0.121	0.007	0.0182	0.0007	0.56503	116.3	5.9	116.2	4.4	128	93	116.2	4.4	0.1
U1456D-5R-1 12-20 cm	231	0.874	0.977	0.025	0.1005	0.0023	0.59962	691	13	617	13	942	45	617.0	13.0	10.7
U1456D-5R-1 12-20 cm	2079	76.600	0.025	0.001	0.0039	0.0001	0.37308	25.26	0.65	24.81	0.45	81	49	24.8	0.5	1.8
U1456D-5R-1 12-20 cm	366	3.260	0.088	0.003	0.0129	0.0002	0.14073	85.9	3	82.7	1.5	162	66	82.7	1.5	3.7
U1456D-5R-1 12-20 cm	1147	0.610	0.178	0.004	0.0260	0.0005	0.49472	166	3.4	165.7	3	168	45	165.7	3.0	0.2
U1456D-5R-1 12-20 cm	186.7	0.936	2.888	0.038	0.2317	0.0031	0.58145	1377	10	1343	16	1425	23	1425.0	23.0	5.8
U1456D-5R-1 12-20 cm	1540	23.300	0.606	0.008	0.0771	0.0010	0.40394	480.9	5.1	478.4	5.9	478	29	478.4	5.9	0.5
U1456D-5R-1 12-20 cm	1086	4.405	4.246	0.040	0.2505	0.0024	0.70770	1682.4	7.7	1441	13	1995	14	1995.0	14.0	27.8
U1456D-5R-1 12-20 cm	233.6	0.946	1.708	0.026	0.1701	0.0023	0.61636	1010	10	1013	13	996	27	996.0	27.0	1.7
U1456D-5R-1 12-20 cm	524	27.000	0.232	0.009	0.0325	0.0010	0.27233	211.2	7.6	206	6	269	77	206.0	6.0	2.5
U1456D-5R-1 12-20 cm	191	1.340	0.722	0.022	0.0878	0.0017	0.49165	551	13	542	10	578	60	542.0	10.0	1.6
U1456D-5R-1 12-20 cm	326	1.283	4.223	0.060	0.2857	0.0039	0.58071	1679	11	1619	19	1741	24	1741.0	24.0	7.0
U1456D-5R-1 12-20 cm	104.8	0.485	1.000	0.039	0.1140	0.0045	0.56482	703	20	695	26	718	78	695.0	26.0	1.1
U1456D-5R-1 12-20 cm	125.2	1.037	0.648	0.024	0.0801	0.0012	0.29076	506	15	496.5	7.2	528	79	496.5	7.2	1.9

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-5R-1 12-20 cm	189.7	1.001	9.100	0.150	0.4399	0.0085	0.59248	2346	16	2346	38	2348	27	2348.0	27.0	0.1
U1456D-5R-1 12-20 cm	109.5	0.479	10.570	0.190	0.4709	0.0084	0.56088	2485	17	2484	37	2491	28	2491.0	28.0	0.3
U1456D-5R-1 12-20 cm	359.1	0.644	0.082	0.003	0.0127	0.0003	0.24370	79.6	2.6	81.4	1.9	87	67	81.4	1.9	2.3
U1456D-5R-1 12-20 cm	327.3	1.535	0.114	0.004	0.0171	0.0002	0.14848	109.2	3.3	109.2	1.5	146	67	109.2	1.5	0.0
U1456D-5R-1 12-20 cm	1046	9.680	0.716	0.032	0.0879	0.0063	0.58009	548	19	543	37	610	120	543.0	37.0	0.9
U1456D-5R-1 12-20 cm	365.1	4.660	1.563	0.028	0.1553	0.0030	0.63448	955	11	931	17	1044	33	1044.0	33.0	10.8
U1456D-5R-1 12-20 cm	1078	73.300	0.165	0.011	0.0224	0.0014	0.49365	154.7	9.7	142.8	8.8	380	140	142.8	8.8	7.7
U1456D-5R-1 12-20 cm	290.8	4.074	0.851	0.017	0.1027	0.0016	0.34422	624.7	9.4	630	9.2	631	47	630.0	9.2	0.8
U1456D-5R-1 12-20 cm	19.7	3.550	0.139	0.066	0.0112	0.0018	-0.17277	125	56	72	11	750	920	DISC	DISC	42.4
U1456D-5R-1 12-20 cm	230	0.938	0.057	0.003	0.0090	0.0002	0.22408	56.5	2.5	57.8	1.1	79	86	57.8	1.1	2.3
U1456D-5R-1 12-20 cm	229	0.861	0.121	0.004	0.0178	0.0004	0.24048	115.6	3.9	113.5	2.5	172	69	113.5	2.5	1.8
U1456D-5R-1 12-20 cm	528	7.610	0.700	0.025	0.0886	0.0019	0.63009	532	11	547	11	514	41	547.0	11.0	2.8
U1456D-5R-1 12-20 cm	281	1.696	1.250	0.020	0.1387	0.0019	0.32802	822.8	8.8	837	11	783	36	837.0	11.0	1.7
U1456D-5R-1 12-20 cm	479	47.600	0.126	0.009	0.0180	0.0008	0.47731	119.9	7.9	114.9	5	210	130	114.9	5.0	4.2
U1456D-5R-1 12-20 cm	33.46	0.688	0.718	0.055	0.0877	0.0022	-0.13411	546	32	542	13	530	170	542.0	13.0	0.7
U1456D-5R-1 12-20 cm	223	2.247	1.178	0.026	0.1257	0.0022	0.48728	788	12	763	12	844	43	763.0	12.0	3.2
U1456D-5R-1 12-20 cm	675	2.060	0.128	0.008	0.0182	0.0010	0.52628	122.2	6.9	116.1	6.5	220	130	116.1	6.5	5.0
U1456D-5R-1 12-20 cm	41.1	1.093	1.769	0.066	0.1644	0.0052	0.59873	1038	27	981	29	1128	64	1128.0	64.0	13.0
U1456D-5R-1 12-20 cm	761	4.800	0.624	0.011	0.0773	0.0014	0.57877	491.6	6.7	479.8	8.6	509	35	479.8	8.6	2.4
U1456D-5R-1 12-20 cm	204	0.440	10.010	0.410	0.3360	0.0110	0.74409	2421	37	1860	52	2906	44	DISC	DISC	36.0
U1456D-5R-1 12-20 cm	187	0.961	0.061	0.003	0.0092	0.0002	0.15048	59.6	3.3	58.7	1.4	120	110	58.7	1.4	1.5
U1456D-5R-1 12-20 cm	295.7	0.628	1.262	0.033	0.1340	0.0035	0.54294	828	15	810	20	876	52	810.0	20.0	2.2
U1456D-5R-1 12-20 cm	143.6	3.590	1.846	0.034	0.1814	0.0034	0.65749	1061	12	1074	19	1037	33	1037.0	33.0	3.6
U1456D-5R-1 12-20 cm	210.2	1.249	2.172	0.065	0.2035	0.0062	0.55193	1171	21	1191	33	1135	56	1135.0	56.0	4.9
U1456D-5R-1 12-20 cm	199	1.246	1.784	0.021	0.1742	0.0019	0.59579	1040.5	7.8	1035	11	1041	21	1041.0	21.0	0.6
U1456D-5R-1 12-20 cm	332	0.478	1.626	0.060	0.1625	0.0062	0.66713	977	23	969	34	1002	59	1002.0	59.0	3.3
U1456D-5R-1 12-20 cm	735	2.940	0.035	0.001	0.0054	0.0001	0.25372	35.1	1.2	34.47	0.66	84	72	34.5	0.7	1.8
U1456D-5R-1 12-20 cm	596	57.300	0.282	0.023	0.0394	0.0038	0.74741	251	18	248	23	310	130	248.0	23.0	1.2
U1456D-5R-1 12-20 cm	41.3	0.821	0.101	0.009	0.0152	0.0006	0.20541	98	8	97.1	3.7	130	150	97.1	3.7	0.9
U1456D-5R-1 12-20 cm	483	3.830	1.440	0.065	0.1481	0.0051	0.63874	900	27	889	29	903	72	903.0	72.0	1.6
U1456D-5R-1 12-20 cm	681	3.000	0.119	0.003	0.0176	0.0004	0.49024	114.3	3	112.4	2.3	158	48	112.4	2.3	1.7
U1456D-5R-1 12-20 cm	190.8	1.401	1.302	0.049	0.1358	0.0043	0.59711	842	22	820	24	890	66	820.0	24.0	2.6
U1456D-5R-1 12-20 cm	534	1.091	6.560	0.100	0.3681	0.0060	0.64358	2052	14	2019	28	2079	21	2079.0	21.0	2.9
U1456D-5R-1 12-20 cm	1660	82.500	0.082	0.011	0.0110	0.0006	0.11071	80	11	70.4	3.7	350	280	70.4	3.7	12.0
U1456D-5R-1 12-20 cm	185.8	0.902	1.453	0.028	0.1514	0.0023	0.49948	910	11	908	13	930	35	930.0	35.0	2.4

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-5R-1 12-20 cm	99.9	0.997	7.250	0.160	0.3214	0.0081	0.67408	2142	21	1794	39	2527	33	2527.0	33.0	29.0
U1456D-5R-1 12-20 cm	263	1.115	0.112	0.004	0.0167	0.0003	0.32604	107.6	3.2	106.6	1.6	145	60	106.6	1.6	0.9
U1456D-5R-1 12-20 cm	930	2.260	0.111	0.003	0.0165	0.0004	0.43368	106.9	2.8	105.5	2.5	140	59	105.5	2.5	1.3
U1456D-5R-1 12-20 cm	90.1	0.791	1.289	0.027	0.1398	0.0031	0.46633	838	12	845	18	847	49	845.0	18.0	0.8
U1456D-5R-1 12-20 cm	138.8	0.792	0.078	0.006	0.0115	0.0006	0.29589	76.2	5.2	73.7	3.7	150	130	73.7	3.7	3.3
U1456D-5R-1 12-20 cm	157.6	0.992	0.062	0.003	0.0092	0.0002	-0.04473	60.9	2.6	59.3	1.1	125	89	59.3	1.1	2.6
U1456D-5R-1 12-20 cm	190.2	1.847	0.928	0.013	0.1105	0.0011	0.46892	666.3	6.8	675.5	6.2	628	28	675.5	6.2	1.4
U1456D-5R-1 12-20 cm	513	20.900	0.248	0.009	0.0350	0.0006	0.43650	224.6	7.3	221.6	3.4	257	73	221.6	3.4	1.3
U1456D-5R-1 12-20 cm	381	5.210	0.577	0.010	0.0732	0.0009	0.35815	462.5	6.1	455.5	5.5	485	40	455.5	5.5	1.5
U1456D-5R-1 12-20 cm	123.1	0.693	0.081	0.005	0.0125	0.0002	0.13838	79	4.4	80.2	1.5	60	100	80.2	1.5	1.5
U1456D-5R-1 12-20 cm	73.7	0.866	0.143	0.007	0.0219	0.0004	0.12672	134.8	6	139.9	2.5	78	89	139.9	2.5	3.8
U1456D-5R-1 12-20 cm	72.4	0.306	0.744	0.026	0.0904	0.0026	0.37581	563	15	558	15	575	76	558.0	15.0	0.9
U1456D-5R-1 12-20 cm	37.9	0.767	6.980	0.220	0.3420	0.0100	0.82722	2100	28	1891	49	2317	35	2317.0	35.0	18.4
U1456D-5R-1 12-20 cm	82.4	1.447	3.100	0.120	0.2282	0.0050	0.37626	1429	29	1324	26	1583	63	1583.0	63.0	16.4
U1456D-5R-1 12-20 cm	537	0.689	0.066	0.002	0.0099	0.0002	0.46192	64.6	1.7	63.4	1.4	127	53	63.4	1.4	1.9
U1456D-5R-1 12-20 cm	682	32.300	1.330	0.017	0.1411	0.0019	0.54917	857.7	7.5	850	11	883	26	883.0	26.0	3.7
U1456D-5R-1 12-20 cm	1622	2.430	0.649	0.008	0.0805	0.0010	0.56107	507.3	4.9	498.8	5.8	542	23	498.8	5.8	1.7
U1456D-5R-1 12-20 cm	258	1.010	1.414	0.020	0.1530	0.0021	0.63752	893.3	8.5	917	12	847	23	847.0	12.0	2.7
U1456D-5R-1 12-20 cm	84.4	1.130	7.358	0.069	0.3969	0.0037	0.62772	2154.5	8.5	2154	17	2159	13	2159.0	13.0	0.2
U1456D-5R-1 12-20 cm	350	34.000	0.135	0.009	0.0195	0.0010	0.82219	128.4	7.6	124.6	6.4	202	75	124.6	6.4	3.0
U1456D-5R-1 12-20 cm	230	1.930	0.922	0.033	0.1012	0.0032	0.60900	663	17	621	19	804	60	621.0	19.0	6.3
U1456D-5R-1 12-20 cm	163.1	1.064	4.971	0.057	0.3226	0.0036	0.54080	1814.3	9.4	1801	17	1827	20	1827.0	20.0	1.4
U1456D-5R-1 12-20 cm	186	1.740	1.740	0.025	0.1717	0.0018	0.41803	1022.8	9.2	1021.1	9.8	1025	28	1025.0	28.0	0.4
U1456D-5R-1 12-20 cm	47.1	0.262	0.770	0.020	0.0901	0.0015	0.44220	577	12	555.6	9	663	55	555.6	9.0	3.7
U1456D-5R-1 12-20 cm	85.2	1.176	4.820	0.110	0.3150	0.0064	0.54344	1786	19	1764	32	1812	37	1812.0	37.0	2.6
U1456D-5R-1 12-20 cm	177.5	1.530	1.612	0.025	0.1588	0.0022	0.78193	973.7	9.9	950	12	1029	24	1029.0	24.0	7.7
U1456D-5R-1 12-20 cm	96	0.500	0.481	0.012	0.0641	0.0008	0.25869	397.1	8.5	401.1	4.8	365	55	401.1	4.8	1.0
U1456D-5R-1 12-20 cm	2745	1.328	0.013	0.001	0.0018	0.0001	0.17759	13	0.61	11.82	0.44	250	110	11.8	0.4	9.1
U1456D-5R-1 12-20 cm	1603	1.653	0.032	0.003	0.0047	0.0003	0.71786	32.2	2.6	30.1	1.9	190	130	30.1	1.9	6.5
U1456D-5R-1 12-20 cm	922	2.470	0.073	0.002	0.0103	0.0003	0.43286	71	2.3	66.1	1.7	238	71	66.1	1.7	6.9
U1456D-5R-1 12-20 cm	249.1	0.692	1.726	0.025	0.1688	0.0020	0.70426	1016.9	9.4	1005	11	1051	24	1051.0	24.0	4.4
U1456D-5R-1 12-20 cm	104	0.826	1.345	0.023	0.1410	0.0015	0.44934	866	10	849.8	8.3	905	32	849.8	8.3	1.9
U1456D-5R-1 12-20 cm	601	0.644	0.089	0.002	0.0125	0.0002	0.44966	86.8	2.1	79.7	1.2	296	53	79.7	1.2	8.2
U1456D-5R-1 12-20 cm	543	2.108	0.690	0.018	0.0811	0.0017	0.33365	532	11	503	10	686	64	503.0	10.0	5.5
U1456D-5R-1 12-20 cm	282.6	1.710	1.401	0.042	0.1428	0.0038	0.80661	887	18	860	21	968	34	968.0	34.0	11.2

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-5R-1 12-20 cm	257.5	1.230	0.865	0.034	0.0963	0.0031	0.87212	630	18	593	18	773	40	593.0	18.0	5.9
U1456D-5R-1 12-20 cm	509	0.377	0.034	0.008	0.0052	0.0022	-0.02740	32.8	7.7	33	14	200	58	DISC	DISC	0.6
U1456D-5R-1 12-20 cm	222.7	7.950	2.531	0.057	0.1794	0.0035	0.87475	1278	16	1063	19	1668	20	DISC	DISC	36.3
U1456D-5R-1 12-20 cm	358.2	0.967	1.106	0.018	0.1236	0.0021	0.68470	756	8.3	751	12	768	28	751.0	12.0	0.7
U1456D-5R-1 12-20 cm	208	0.627	1.764	0.021	0.1748	0.0015	0.55470	1032.2	7.3	1038	8.1	1019	18	1019.0	18.0	1.9
U1456D-5R-1 12-20 cm	84.7	1.346	2.943	0.084	0.2109	0.0048	0.83082	1384	22	1232	25	1634	29	1634.0	29.0	24.6
U1456D-5R-1 12-20 cm	170.6	3.760	0.321	0.012	0.0393	0.0012	0.61974	282	9.2	248.6	7.4	557	68	248.6	7.4	11.8
U1456D-5R-1 12-20 cm	289	11.060	0.609	0.012	0.0782	0.0014	0.63994	481.6	7.7	485.3	8.3	472	37	485.3	8.3	0.8
U1456D-5R-1 12-20 cm	326	10.720	0.992	0.017	0.1052	0.0018	0.64073	699.1	8.8	644	11	880	31	644.0	11.0	7.9
U1456D-5R-1 12-20 cm	1390	15.950	0.794	0.023	0.0941	0.0022	0.58816	593	13	580	13	645	58	580.0	13.0	2.2
U1456D-5R-1 12-20 cm	112	0.844	1.574	0.047	0.1593	0.0033	0.64124	963	20	952	18	978	51	978.0	51.0	2.7
U1456D-5R-1 12-20 cm	125	4.620	7.300	0.220	0.3810	0.0099	0.72939	2135	28	2080	45	2207	36	2207.0	36.0	5.8
U1456D-5R-1 12-20 cm	475	8.940	0.609	0.009	0.0758	0.0012	0.54677	482.4	5.8	471.1	7.1	515	34	471.1	7.1	2.3
U1456D-5R-1 12-20 cm	104.7	0.657	1.189	0.018	0.1284	0.0015	0.30263	795.5	8	778.3	8.8	832	34	778.3	8.8	2.2
U1456D-5R-1 12-20 cm	331	3.290	3.616	0.062	0.2386	0.0042	0.81456	1551	13	1379	22	1788	20	1788.0	20.0	22.9
U1456D-5R-1 12-20 cm	431	1.930	1.736	0.055	0.1584	0.0048	0.88799	1014	21	946	27	1175	28	1175.0	28.0	19.5
U1456D-5R-1 12-20 cm	378	0.988	0.114	0.003	0.0172	0.0002	0.31290	109.4	2.4	109.7	1.3	113	47	109.7	1.3	0.3
U1456D-5R-1 12-20 cm	1370	5.240	0.177	0.006	0.0260	0.0006	0.54727	165.4	4.8	165.7	3.8	160	55	165.7	3.8	0.2
U1456D-5R-1 12-20 cm	71.2	0.568	0.058	0.004	0.0088	0.0002	-0.04422	57.3	3.7	56.5	1.4	120	130	56.5	1.4	1.4
U1456D-5R-1 12-20 cm	511	4.490	0.579	0.016	0.0704	0.0018	0.58367	462	10	438	11	575	54	438.0	11.0	5.2
U1456D-5R-1 12-20 cm	551	3.130	0.091	0.002	0.0130	0.0002	0.36951	88.2	2.1	83.5	1.4	207	53	83.5	1.4	5.3
U1456D-5R-1 12-20 cm	92.7	0.539	0.058	0.004	0.0090	0.0002	0.11501	56.9	3.7	57.5	1.5	40	110	57.5	1.5	1.1
U1456D-5R-1 12-20 cm	239	1.210	0.100	0.004	0.0159	0.0003	0.56791	96.8	3.5	101.4	2	76	62	101.4	2.0	4.8
U1456D-5R-1 12-20 cm	223	4.750	0.403	0.020	0.0426	0.0017	0.61092	343	15	269	11	867	87	DISC	DISC	21.6
U1457C-41R-2 20-26 cm	65.7	0.479	10.190	0.180	0.4614	0.0063	0.37949	2449	17	2444	28	2444	31	2444.0	31.0	0.0
U1457C-41R-2 20-26 cm	1080	7.600	0.705	0.033	0.0839	0.0018	0.66618	541	19	519	11	615	76	519.0	11.0	4.1
U1457C-41R-2 20-26 cm	1711	13.330	2.931	0.098	0.2125	0.0059	0.94941	1387	26	1241	32	1611	26	1611.0	26.0	23.0
U1457C-41R-2 20-26 cm	934	1.441	0.126	0.004	0.0179	0.0003	0.50480	120.8	3.3	114.3	2.1	247	55	114.3	2.1	5.4
U1457C-41R-2 20-26 cm	228	0.882	1.076	0.021	0.1215	0.0014	0.31996	740	10	739.2	8.1	735	42	739.2	8.1	0.1
U1457C-41R-2 20-26 cm	303	0.668	0.059	0.006	0.0091	0.0003	0.08016	57.8	6	58.6	1.9	30	190	58.6	1.9	1.4
U1457C-41R-2 20-26 cm	1281	0.664	0.021	0.001	0.0030	0.0001	0.01711	20.9	0.91	19.38	0.34	190	91	19.4	0.3	7.3
U1457C-41R-2 20-26 cm	534	2.460	1.307	0.027	0.1390	0.0025	0.52010	847	12	839	14	870	41	839.0	14.0	0.9
U1457C-41R-2 20-26 cm	717	10.200	0.424	0.017	0.0507	0.0017	0.63048	358	12	318	11	611	72	318.0	11.0	11.2
U1457C-41R-2 20-26 cm	229	0.972	0.038	0.003	0.0057	0.0002	0.15030	37.2	2.9	36.81	0.97	80	140	36.8	1.0	1.0
U1457C-41R-2 20-26 cm	279.4	3.090	1.380	0.024	0.1465	0.0017	0.37933	879	10	881.3	9.6	862	35	862.0	35.0	2.2

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-41R-2 20-26 cm	303.8	1.462	1.613	0.026	0.1614	0.0019	0.38570	974.1	9.9	965	10	992	29	992.0	29.0	2.7
U1457C-41R-2 20-26 cm	572	1.954	1.278	0.017	0.1345	0.0012	0.53509	835.2	7.7	813.6	7.1	884	24	813.6	7.1	2.6
U1457C-41R-2 20-26 cm	272	1.120	1.536	0.024	0.1580	0.0014	0.36204	943.3	9.4	945.6	7.9	929	30	929.0	30.0	1.8
U1457C-41R-2 20-26 cm	959	0.525	0.047	0.002	0.0070	0.0001	0.08146	46.7	1.9	45.13	0.61	128	80	45.1	0.6	3.4
U1457C-41R-2 20-26 cm	525	3.890	0.796	0.013	0.0943	0.0011	0.48271	593.5	7.4	581.1	6.2	629	32	581.1	6.2	2.1
U1457C-41R-2 20-26 cm	663	1.635	1.247	0.018	0.1331	0.0018	0.62175	821	8.4	805	10	861	26	805.0	10.0	1.9
U1457C-41R-2 20-26 cm	114.4	2.770	1.087	0.028	0.1150	0.0019	0.30222	745	14	702	11	869	55	702.0	11.0	5.8
U1457C-41R-2 20-26 cm	575	1.396	1.602	0.025	0.1570	0.0016	0.42963	970	9.6	939.7	9	1052	31	1052.0	31.0	10.7
U1457C-41R-2 20-26 cm	1457	2.870	0.023	0.001	0.0035	0.0001	0.15765	22.68	0.89	22.65	0.4	72	78	22.7	0.4	0.1
U1457C-41R-2 20-26 cm	943	15.000	0.236	0.007	0.0351	0.0009	0.58434	214.3	6	222.3	5.8	150	53	222.3	5.8	3.7
U1457C-41R-2 20-26 cm	169.4	1.929	1.315	0.024	0.1403	0.0015	0.27397	850	11	846.2	8.3	869	39	846.2	8.3	0.4
U1457C-41R-2 20-26 cm	1145	2.140	0.169	0.003	0.0251	0.0002	0.30694	158.5	2.5	159.8	1.4	152	36	159.8	1.4	0.8
U1457C-41R-2 20-26 cm	449	1.829	0.653	0.012	0.0816	0.0008	0.48043	509.1	7.5	505.6	5	535	37	505.6	5.0	0.7
U1457C-41R-2 20-26 cm	501	3.680	1.231	0.016	0.1330	0.0013	0.50280	813.6	7.5	804.6	7.7	844	25	804.6	7.7	1.1
U1457C-41R-2 20-26 cm	275	1.260	0.174	0.006	0.0256	0.0004	0.16234	162.5	4.8	162.8	2.4	177	65	162.8	2.4	0.2
U1457C-41R-2 20-26 cm	200	1.024	0.692	0.023	0.0860	0.0018	0.46663	533	14	531	11	529	66	531.0	11.0	0.4
U1457C-41R-2 20-26 cm	436	1.507	1.086	0.026	0.1097	0.0014	0.51644	745	13	670.9	8	982	42	670.9	8.0	9.9
U1457C-41R-2 20-26 cm	1170	5.410	2.251	0.059	0.1913	0.0042	0.65198	1195	18	1128	23	1318	41	1318.0	41.0	14.4
U1457C-41R-2 20-26 cm	292	7.640	3.373	0.075	0.2413	0.0042	0.62444	1497	17	1393	22	1669	38	1669.0	38.0	16.5
U1457C-41R-2 20-26 cm	309	2.150	1.125	0.024	0.1261	0.0020	0.45663	763	11	765	11	780	39	765.0	11.0	0.3
U1457C-41R-2 20-26 cm	242	0.674	0.995	0.051	0.1133	0.0028	0.54779	702	27	691	16	748	95	691.0	16.0	1.6
U1457C-41R-2 20-26 cm	465	5.750	1.683	0.063	0.1526	0.0043	0.20372	993	23	917	25	1163	65	1163.0	65.0	21.2
U1457C-41R-2 20-26 cm	582	3.750	2.450	0.130	0.1759	0.0066	0.86408	1232	37	1041	36	1604	53	DISC	DISC	35.1
U1457C-41R-2 20-26 cm	765	25.900	4.940	0.110	0.2996	0.0066	0.61973	1804	18	1687	32	1945	34	1945.0	34.0	13.3
U1457C-41R-2 20-26 cm	172.7	0.741	0.109	0.007	0.0164	0.0005	0.35166	104.7	6.2	104.5	3	130	110	104.5	3.0	0.2
U1457C-41R-2 20-26 cm	454	1.329	1.638	0.020	0.1650	0.0014	0.55530	983.9	7.6	984.1	8	987	21	987.0	21.0	0.3
U1457C-41R-2 20-26 cm	1377	1.042	0.997	0.026	0.0940	0.0021	0.65745	701	13	579	12	1122	41	DISC	DISC	17.4
U1457C-41R-2 20-26 cm	142.3	0.688	3.982	0.068	0.2900	0.0052	0.52713	1627	14	1640	26	1616	33	1616.0	33.0	1.5
U1457C-41R-2 20-26 cm	433	1.660	7.830	0.120	0.3565	0.0056	0.65278	2209	13	1964	27	2448	21	2448.0	21.0	19.8
U1457C-41R-2 20-26 cm	1470	1.596	0.133	0.004	0.0195	0.0003	0.35110	126.8	3.4	124.4	2	177	54	124.4	2.0	1.9
U1457C-41R-2 20-26 cm	1099	27.700	0.570	0.035	0.0691	0.0034	0.84811	456	22	430	20	590	75	430.0	20.0	5.7
U1457C-41R-2 20-26 cm	44.5	#####	1.315	0.063	0.1375	0.0054	0.43207	842	28	828	30	860	100	828.0	30.0	1.7
U1457C-41R-2 20-26 cm	1047	6.020	6.900	0.240	0.3290	0.0130	0.76747	2095	30	1829	64	2373	44	2373.0	44.0	22.9
U1457C-41R-2 20-26 cm	77.5	0.912	1.376	0.045	0.1482	0.0036	0.37693	877	18	890	20	810	63	810.0	20.0	1.5
U1457C-41R-2 20-26 cm	1224	35.700	5.040	0.130	0.3170	0.0110	0.59420	1823	22	1774	54	1856	50	1856.0	50.0	4.4

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-41R-2 20-26 cm	780	1.761	0.110	0.004	0.0163	0.0004	0.44147	105.8	3.4	104.2	2.3	144	63	104.2	2.3	1.5
U1457C-41R-2 20-26 cm	80.5	0.480	0.661	0.022	0.0820	0.0016	0.22096	512	13	507.6	9.6	501	72	507.6	9.6	0.9
U1457C-41R-2 20-26 cm	87.9	1.296	0.127	0.014	0.0186	0.0009	0.39623	120	13	118.7	5.9	130	180	118.7	5.9	1.1
U1457C-41R-2 20-26 cm	129.9	1.064	0.060	0.005	0.0082	0.0003	0.04673	58.8	5	52.3	1.6	280	160	52.3	1.6	11.1
U1457C-41R-2 20-26 cm	57.9	0.651	0.060	0.008	0.0078	0.0004	0.04158	58.2	7.6	50.2	2.3	200	240	50.2	2.3	13.7
U1457C-41R-2 20-26 cm	208	1.503	0.043	0.003	0.0068	0.0002	0.00739	42.3	2.7	43.4	1.1	20	120	43.4	1.1	2.6
U1457C-41R-2 20-26 cm	846	0.964	0.924	0.029	0.0918	0.0029	0.64648	664	15	566	17	1015	52	566.0	17.0	14.8
U1457C-41R-2 20-26 cm	733	0.626	0.068	0.003	0.0001	0.0011	0.01815	66.9	2.5	0.4	7	91	71	DISC	DISC	99.4
U1457C-41R-2 20-26 cm	379.4	1.408	0.319	0.011	0.0451	0.0008	0.32064	280.4	8.1	284.1	4.8	263	68	284.1	4.8	1.3
U1457C-41R-2 20-26 cm	373	1.946	1.580	0.022	0.1603	0.0016	0.47070	960.8	8.6	958.3	8.9	971	25	971.0	25.0	1.3
U1457C-41R-2 20-26 cm	1550	14.820	4.761	0.066	0.2996	0.0041	0.75711	1776	12	1688	21	1882	18	1882.0	18.0	10.3
U1457C-41R-2 20-26 cm	470	1.476	2.521	0.053	0.2080	0.0029	0.71000	1275	15	1218	16	1368	27	1368.0	27.0	11.0
U1457C-41R-2 20-26 cm	3800	3.670	0.014	0.000	0.0020	0.0000	0.34510	14.5	0.41	13.07	0.22	259	58	13.1	0.2	9.9
U1457C-41R-2 20-26 cm	969	3.620	4.915	0.071	-0.0164	0.0002	0.75166	1803	12	-106.3	1.4	1966	18	DISC	DISC	105.9
U1457C-41R-2 20-26 cm	572	1.700	0.123	0.004	0.0174	0.0002	0.32794	117.5	3.2	111.1	1.4	236	57	111.1	1.4	5.4
U1457C-41R-2 20-26 cm	569	2.940	1.462	0.024	0.1498	0.0019	0.60897	913	9.8	899	11	943	27	943.0	27.0	4.7
U1457C-41R-2 20-26 cm	595	25.700	0.650	0.016	0.0812	0.0014	0.59652	507.9	9.6	503.3	8.4	520	44	503.3	8.4	0.9
U1457C-41R-2 20-26 cm	3330	1.562	0.021	0.001	0.0032	0.0003	0.11688	20.6	0.61	20.7	1.7	84	61	20.7	1.7	0.5
U1457C-41R-2 20-26 cm	448	4.050	5.460	0.150	-0.0178	0.0004	0.90096	1891	22	-115.9	2.6	2003	22	DISC	DISC	106.1
U1457C-41R-2 20-26 cm	236.1	0.591	1.141	0.030	0.1236	0.0026	0.49314	771	15	751	15	823	52	751.0	15.0	2.6
U1457C-41R-2 20-26 cm	346	2.187	9.970	0.110	0.4460	0.0042	0.73483	2430	10	2376	19	2472	13	2472.0	13.0	3.9
U1457C-41R-2 20-26 cm	92.9	1.492	1.320	0.036	0.1370	0.0025	0.42700	851	16	827	14	914	51	827.0	14.0	2.8
U1457C-41R-2 20-26 cm	246	2.420	0.983	0.022	0.1111	0.0018	0.47912	693	11	679	10	727	38	679.0	10.0	2.0
U1457C-41R-2 20-26 cm	370	11.600	0.819	0.019	0.0979	0.0017	0.59268	606	11	601.9	9.9	609	42	601.9	9.9	0.7
U1457C-41R-2 20-26 cm	1228	3.240	0.680	0.022	0.0796	0.0019	0.50953	526	14	494	11	671	62	494.0	11.0	6.1
U1457C-41R-2 20-26 cm	62.6	1.592	1.379	0.053	0.1483	0.0037	0.55221	875	23	891	21	846	71	846.0	21.0	1.8
U1457C-41R-2 20-26 cm	244	0.970	0.068	0.007	0.0081	0.0004	0.59782	66.2	6.7	52.2	2.7	550	170	DISC	DISC	21.1
U1457C-41R-2 20-26 cm	1482	0.953	0.127	0.003	0.0175	0.0003	0.43136	121	3	111.8	1.7	310	49	111.8	1.7	7.6
U1457C-41R-2 20-26 cm	1009	11.210	0.484	0.020	0.0632	0.0017	0.66944	400	14	395	10	442	75	395.0	10.0	1.3
U1457C-41R-2 20-26 cm	427	6.500	1.527	0.050	0.1472	0.0032	0.58300	938	19	885	18	1069	37	1069.0	37.0	17.2
U1457C-41R-2 20-26 cm	1558	5.350	0.107	0.003	0.0162	0.0003	0.42118	102.9	2.3	103.8	1.6	97	45	103.8	1.6	0.9
U1457C-41R-2 20-26 cm	634	0.665	0.061	0.003	0.0090	0.0001	0.31213	59.6	2.4	57.72	0.91	157	80	57.7	0.9	3.2
U1457C-41R-2 20-26 cm	162	1.063	0.066	0.006	0.0097	0.0003	0.05440	64.8	5.2	62.2	1.9	170	160	62.2	1.9	4.0
U1457C-41R-2 20-26 cm	195	1.115	0.091	0.005	0.0134	0.0004	0.16914	87.7	4.8	85.8	2.3	170	110	85.8	2.3	2.2
U1457C-41R-2 20-26 cm	1130	4.180	0.384	0.012	0.0513	0.0012	0.56766	328.9	8.6	322.3	7.4	364	53	322.3	7.4	2.0

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-41R-2 20-26 cm	2050	2.930	0.551	0.011	0.0713	0.0013	0.75132	444.8	7.1	443.8	7.8	465	29	443.8	7.8	0.2
U1457C-41R-2 20-26 cm	336	1.556	1.245	0.028	0.1337	0.0023	0.60390	820	13	809	13	866	38	809.0	13.0	1.3
U1457C-41R-2 20-26 cm	27.5	0.412	1.102	0.049	0.1196	0.0034	0.16975	748	24	728	19	800	100	728.0	19.0	2.7
U1457C-41R-2 20-26 cm	603	4.520	8.380	0.140	0.4172	0.0068	0.81761	2269	15	2245	31	2298	18	2298.0	18.0	2.3
U1457C-41R-2 20-26 cm	139.3	1.482	7.459	0.092	0.3984	0.0043	0.63381	2166	11	2161	20	2174	17	2174.0	17.0	0.6
U1457C-41R-2 20-26 cm	540	4.420	0.954	0.020	0.1039	0.0020	0.67753	680	11	637	12	827	33	637.0	12.0	6.3
U1457C-41R-2 20-26 cm	336	1.350	0.986	0.028	0.1101	0.0026	0.65858	695	14	673	15	752	46	673.0	15.0	3.2
U1457C-41R-2 20-26 cm	115.6	1.613	1.078	0.027	-0.0050	0.0170	0.04607	741	13	-5	72	811	51	DISC	DISC	100.7
U1457C-41R-2 20-26 cm	1686	0.768	0.157	0.003	0.0230	0.0015	0.05421	148.2	2.5	146.2	9.7	187	33	146.2	9.7	1.3
U1457C-41R-2 20-26 cm	121.4	0.764	0.070	0.006	0.0100	0.0003	0.04998	68.5	5.7	63.9	1.8	200	160	63.9	1.8	6.7
U1457C-41R-2 20-26 cm	378.9	1.347	5.708	0.089	0.3315	0.0046	0.76866	1929	14	1844	22	2006	18	2006.0	18.0	8.1
U1457C-41R-2 20-26 cm	1356	10.850	0.752	0.013	0.0870	0.0014	0.68740	568.4	7.4	537.8	8.3	672	28	537.8	8.3	5.4
U1457C-41R-2 20-26 cm	1806	1.268	0.047	0.001	0.0070	0.0001	0.42464	46.5	1.2	44.96	0.69	106	50	45.0	0.7	3.3
U1457C-41R-2 20-26 cm	193.1	1.338	0.855	0.037	0.0963	0.0023	0.51667	629	21	592	14	710	83	592.0	14.0	5.9
U1457C-41R-2 20-26 cm	427.8	2.153	1.560	0.026	0.1566	0.0023	0.68958	954	11	937	13	966	27	966.0	27.0	3.0
U1457C-41R-2 20-26 cm	1970	16.840	0.459	0.018	0.0567	0.0020	0.48564	383	13	355	12	536	81	355.0	12.0	7.3
U1457C-41R-2 20-26 cm	254.3	1.215	1.729	0.042	0.1686	0.0031	0.65943	1017	16	1004	17	1019	38	1019.0	38.0	1.5
U1457C-41R-2 20-26 cm	551	1.160	0.098	0.003	0.0150	0.0003	0.30562	94.5	2.8	96	1.7	60	59	96.0	1.7	1.6
U1457C-41R-2 20-26 cm	670	73.500	0.242	0.019	0.0314	0.0014	0.48701	220	16	199.6	8.4	410	150	199.6	8.4	9.3
U1457C-41R-2 20-26 cm	326.5	1.997	10.430	0.200	0.4282	0.0071	0.54699	2473	18	2297	32	2597	30	2597.0	30.0	11.6
U1457C-41R-2 20-26 cm	657	1.594	0.828	0.026	0.0972	0.0024	0.76408	610	14	598	14	636	44	598.0	14.0	2.0
U1457C-41R-2 20-26 cm	3120	1.530	0.025	0.001	0.0037	0.0001	0.40658	25.49	0.79	23.66	0.4	186	59	23.7	0.4	7.2
U1457C-41R-2 20-26 cm	473	4.170	0.610	0.021	0.0781	0.0027	0.57040	483	13	484	16	451	69	484.0	16.0	0.2
U1457C-41R-2 20-26 cm	105.1	1.550	1.522	0.044	0.1490	0.0028	0.45950	936	18	895	16	1015	54	1015.0	54.0	11.8
U1457C-41R-2 20-26 cm	123.1	1.570	0.457	0.027	0.0540	0.0018	0.65579	379	19	339	11	590	100	339.0	11.0	10.6
U1457C-41R-2 20-26 cm	453	1.469	1.107	0.021	0.1177	0.0015	0.51252	755.7	9.9	717.4	8.9	846	33	717.4	8.9	5.1
U1457C-41R-2 20-26 cm	353.5	6.270	1.531	0.029	0.1555	0.0026	0.71005	942	12	931	15	949	29	949.0	29.0	1.9
U1457C-41R-2 20-26 cm	344	1.165	1.638	0.039	0.1618	0.0036	0.62292	982	15	965	20	1004	43	1004.0	43.0	3.9
U1457C-41R-2 20-26 cm	587	5.390	1.700	0.048	0.1490	0.0036	0.75995	1005	18	895	20	1239	37	1239.0	37.0	27.8
U1457C-41R-2 20-26 cm	117.3	0.493	0.637	0.018	0.0780	0.0013	0.47399	498	11	483.8	8	533	54	483.8	8.0	2.9
U1457C-41R-2 20-26 cm	843	5.230	0.315	0.007	0.0421	0.0008	0.64725	277.6	5.5	265.8	4.8	351	39	265.8	4.8	4.3
U1457C-41R-2 20-26 cm	808	0.583	0.051	0.003	0.0073	0.0002	0.19642	50.8	3.2	46.7	1.2	210	130	46.7	1.2	8.1
U1457C-41R-2 20-26 cm	267.7	3.310	1.434	0.057	0.1469	0.0042	0.72928	901	24	883	23	917	56	917.0	56.0	3.7
U1457C-41R-2 20-26 cm	1283	2.164	3.764	0.052	0.2647	0.0031	0.71955	1583	11	1513	16	1659	17	1659.0	17.0	8.8
U1457C-41R-2 20-26 cm	146	1.756	1.634	0.037	0.1643	0.0029	0.55047	983	15	980	16	961	40	961.0	40.0	2.0

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-41R-2 20-26 cm	231	0.590	0.055	0.004	0.0079	0.0002	0.14652	54.1	3.8	50.5	1.3	180	130	50.5	1.3	6.7
U1457C-41R-2 20-26 cm	491	1.072	3.975	0.055	0.2838	0.0035	0.68021	1627	11	1609	17	1623	20	1623.0	20.0	0.9
U1457C-41R-2 20-26 cm	588	16.210	5.142	0.091	0.3118	0.0047	0.77705	1843	14	1749	23	1914	21	1914.0	21.0	8.6
U1457C-41R-2 20-26 cm	520	4.740	4.601	0.079	0.3112	0.0049	0.71524	1747	14	1746	24	1710	22	1710.0	22.0	2.1
U1457C-41R-2 20-26 cm	332.9	0.335	0.781	0.035	0.0801	0.0024	0.34344	584	20	496	14	894	91	DISC	DISC	15.1
U1457C-41R-2 20-26 cm	738	1.212	2.635	0.065	0.1811	0.0040	0.76162	1308	18	1073	22	1680	29	DISC	DISC	36.1
U1457C-41R-2 20-26 cm	1215	2.920	0.223	0.004	0.0315	0.0004	0.51601	204.2	3.5	199.9	2.7	208	37	199.9	2.7	2.1
U1457C-41R-2 20-26 cm	303	0.818	0.095	0.007	0.0125	0.0004	0.16668	92	6.8	80.3	2.3	330	150	80.3	2.3	12.7
U1457C-41R-2 20-26 cm	540	4.300	0.038	0.003	0.0055	0.0002	0.15940	37.7	3	35	1.3	180	150	35.0	1.3	7.2
U1457C-42R-1 80-88 cm	324	1.270	1.011	0.019	0.1152	0.0015	0.51582	708.6	9.7	703	8.7	726	36	703.0	8.7	0.8
U1457C-42R-1 80-88 cm	652	1.209	1.807	0.018	0.1719	0.0014	0.56609	1047.2	6.3	1022.3	7.8	1075	17	1075.0	17.0	4.9
U1457C-42R-1 80-88 cm	101.1	0.827	1.663	0.028	0.1632	0.0015	0.31721	994	11	974.3	8.2	1006	33	1006.0	33.0	3.2
U1457C-42R-1 80-88 cm	682	30.100	11.660	0.120	0.4624	0.0037	0.62544	2576	10	2450	16	2651	14	2651.0	14.0	7.6
U1457C-42R-1 80-88 cm	608	3.680	0.806	0.011	0.0944	0.0010	0.31832	599.7	6.1	581.3	5.9	636	30	581.3	5.9	3.1
U1457C-42R-1 80-88 cm	138	1.780	0.040	0.003	0.0057	0.0002	0.12465	39.5	3.3	36.7	1.1	130	150	36.7	1.1	7.1
U1457C-42R-1 80-88 cm	201	0.598	0.052	0.004	0.0075	0.0002	0.11508	50.9	3.5	48.2	1.2	150	130	48.2	1.2	5.3
U1457C-42R-1 80-88 cm	192.7	0.718	0.057	0.003	0.0090	0.0002	0.12405	56.4	3.1	57.6	1.2	50	110	57.6	1.2	2.1
U1457C-42R-1 80-88 cm	100.4	0.521	0.089	0.006	0.0139	0.0003	0.02780	86.4	5.6	88.9	1.6	40	120	88.9	1.6	2.9
U1457C-42R-1 80-88 cm	1823	46.200	0.050	0.001	0.0076	0.0002	0.66367	49.1	1.2	48.9	1	90	43	48.9	1.0	0.4
U1457C-42R-1 80-88 cm	1085	23.400	1.384	0.036	0.1454	0.0036	0.65247	879	15	875	20	924	44	924.0	44.0	5.3
U1457C-42R-1 80-88 cm	749	6.180	1.776	0.032	0.1750	0.0034	0.74200	1036	12	1039	18	1064	30	1064.0	30.0	2.3
U1457C-42R-1 80-88 cm	248	1.663	0.115	0.006	0.0168	0.0006	0.33376	109.6	5.5	107.2	3.6	192	99	107.2	3.6	2.2
U1457C-42R-1 80-88 cm	283	0.585	0.178	0.005	0.0265	0.0004	0.42668	165.5	4.6	168.3	2.7	155	57	168.3	2.7	1.7
U1457C-42R-1 80-88 cm	584	3.300	5.070	0.260	0.3170	0.0170	0.58596	1826	44	1771	81	1903	86	1903.0	86.0	6.9
U1457C-42R-1 80-88 cm	358	1.798	13.810	0.180	0.5354	0.0050	0.56513	2735	12	2763	21	2728	17	2728.0	17.0	1.3
U1457C-42R-1 80-88 cm	595	20.200	0.251	0.016	0.0356	0.0015	0.47398	227	13	225.6	9.2	230	130	225.6	9.2	0.6
U1457C-42R-1 80-88 cm	341.4	2.287	9.300	0.110	0.4248	0.0055	0.69229	2367	11	2282	25	2438	19	2438.0	19.0	6.4
U1457C-42R-1 80-88 cm	459	3.370	0.992	0.024	0.1043	0.0020	0.76466	698	12	639	11	892	31	639.0	11.0	8.5
U1457C-42R-1 80-88 cm	383	3.260	10.860	0.180	0.4537	0.0068	0.64298	2509	15	2411	30	2579	23	2579.0	23.0	6.5
U1457C-42R-1 80-88 cm	493	2.179	1.799	0.025	0.1777	0.0021	0.65642	1045.2	9.6	1054	12	1000	23	1000.0	23.0	5.4
U1457C-42R-1 80-88 cm	259.4	1.127	4.629	0.070	0.2890	0.0048	0.68363	1753	13	1635	24	1873	23	1873.0	23.0	12.7
U1457C-42R-1 80-88 cm	163.1	3.510	1.380	0.022	0.1468	0.0017	0.37485	878.9	9.4	882.9	9.7	834	29	834.0	9.7	0.5
U1457C-42R-1 80-88 cm	904	13.340	0.637	0.010	0.0795	0.0010	0.38155	499.8	5.8	492.8	6.1	497	34	492.8	6.1	1.4
U1457C-42R-1 80-88 cm	193.6	1.476	4.617	0.071	0.3121	0.0049	0.71722	1749	13	1750	24	1730	21	1730.0	21.0	1.2
U1457C-42R-1 80-88 cm	237	1.241	1.608	0.026	0.1647	0.0028	0.48156	971	10	982	15	931	36	931.0	36.0	5.5

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-42R-1 80-88 cm	82.2	0.784	4.910	0.150	0.3298	0.0086	0.59682	1794	26	1832	42	1735	49	1735.0	49.0	5.6
U1457C-42R-1 80-88 cm	92.5	0.543	11.300	0.150	0.4947	0.0051	0.59480	2546	12	2590	22	2496	19	2496.0	19.0	3.8
U1457C-42R-1 80-88 cm	152.6	2.510	1.089	0.030	0.1233	0.0026	0.74816	745	14	749	15	737	42	749.0	15.0	0.5
U1457C-42R-1 80-88 cm	537	0.490	0.707	0.012	0.0869	0.0011	0.70446	542.3	7	537.1	6.4	555	27	537.1	6.4	1.0
U1457C-42R-1 80-88 cm	725	30.000	0.026	0.005	0.0037	0.0003	0.08860	25.8	4.4	23.6	1.8	210	340	23.6	1.8	8.5
U1457C-42R-1 80-88 cm	369	1.064	0.256	0.005	0.0364	0.0003	0.02170	231.3	4.2	230.5	2.1	217	48	230.5	2.1	0.3
U1457C-42R-1 80-88 cm	770	2.470	2.044	0.018	0.1977	0.0016	0.71931	1129.6	6	1162.8	8.8	1057	12	1057.0	12.0	10.0
U1457C-42R-1 80-88 cm	678	9.110	1.002	0.022	0.1158	0.0020	0.59087	704	11	706	12	683	40	706.0	12.0	0.3
U1457C-42R-1 80-88 cm	241	2.100	4.566	0.062	0.2905	0.0039	0.87463	1741	11	1643	19	1849	14	1849.0	14.0	11.1
U1457C-42R-1 80-88 cm	698	5.010	1.681	0.024	0.1676	0.0022	0.66904	999.7	9	999	12	989	24	989.0	24.0	1.0
U1457C-42R-1 80-88 cm	382	1.902	1.220	0.013	0.1338	0.0010	0.49116	808.9	6.1	809.6	5.8	788	22	809.6	5.8	0.1
U1457C-42R-1 80-88 cm	593	0.654	0.042	0.002	0.0063	0.0001	0.02537	41.3	1.4	40.24	0.68	100	70	40.2	0.7	2.6
U1457C-42R-1 80-88 cm	194.4	1.350	1.627	0.025	0.1631	0.0016	0.61519	978.8	9.6	973.7	8.9	974	25	974.0	25.0	0.0
U1457C-42R-1 80-88 cm	66.2	0.305	1.630	0.041	0.1604	0.0026	0.28297	982	16	959	14	1009	54	1009.0	54.0	5.0
U1457C-42R-1 80-88 cm	50.9	0.657	1.262	0.031	0.1375	0.0016	0.19800	825	14	830.4	9.2	775	55	830.4	9.2	0.7
U1457C-42R-1 80-88 cm	197	0.619	0.057	0.004	0.0090	0.0002	0.00845	55.6	3.4	57.8	1.2	20	110	57.8	1.2	4.0
U1457C-42R-1 80-88 cm	260.1	1.200	1.314	0.018	0.1426	0.0012	0.32979	851.8	8.2	859.1	7	808	29	808.0	7.0	0.9
U1457C-42R-1 80-88 cm	1061	39.900	0.161	0.012	0.0233	0.0010	0.78800	152	11	148.5	6	159	98	148.5	6.0	2.3
U1457C-42R-1 80-88 cm	144.5	1.110	1.507	0.024	0.1561	0.0013	0.39058	931.8	9.7	934.9	7.5	898	30	898.0	30.0	4.1
U1457C-42R-1 80-88 cm	908	1.765	0.564	0.006	0.0723	0.0005	0.35797	453.8	4	449.9	3.1	450	23	449.9	3.1	0.9
U1457C-42R-1 80-88 cm	319	0.983	0.061	0.003	0.0092	0.0002	0.12978	60.4	2.7	58.8	1.1	117	87	58.8	1.1	2.6
U1457C-42R-1 80-88 cm	104.9	0.973	1.757	0.045	0.1746	0.0035	0.57208	1027	17	1037	19	980	50	980.0	50.0	5.8
U1457C-42R-1 80-88 cm	236	1.803	1.272	0.019	0.1377	0.0016	0.33342	832.6	8.6	831.3	9.2	826	33	831.3	9.2	0.2
U1457C-42R-1 80-88 cm	546.9	3.730	1.579	0.018	0.1624	0.0017	0.51570	961.2	7.3	970	9.4	937	22	937.0	22.0	3.5
U1457C-42R-1 80-88 cm	391	0.585	0.464	0.008	0.0625	0.0005	0.20623	387.1	5.3	390.7	3	372	37	390.7	3.0	0.9
U1457C-42R-1 80-88 cm	191.4	0.986	0.088	0.004	0.0133	0.0002	0.06521	84.9	3.6	84.9	1.4	130	87	84.9	1.4	0.0
U1457C-42R-1 80-88 cm	259	2.010	1.340	0.063	0.1472	0.0078	0.53868	859	28	883	44	830	100	830.0	44.0	2.8
U1457C-42R-1 80-88 cm	494	4.540	11.410	0.500	0.4960	0.0180	0.94500	2540	44	2588	78	2539	27	2539.0	27.0	1.9
U1457C-42R-1 80-88 cm	916	4.900	1.146	0.015	0.1243	0.0014	0.59777	774.9	7.1	755.3	8	869	22	755.3	8.0	2.5
U1457C-42R-1 80-88 cm	113.2	1.024	0.067	0.005	0.0087	0.0002	0.01039	65.6	4.8	55.6	1.5	380	150	DISC	DISC	15.2
U1457C-42R-1 80-88 cm	125	1.530	0.559	0.016	0.0736	0.0008	0.18843	449	11	457.7	4.9	411	62	457.7	4.9	1.9
U1457C-42R-1 80-88 cm	4760	7.420	0.039	0.001	0.0061	0.0001	0.14562	38.8	1.1	39.22	0.45	43	55	39.2	0.5	1.1
U1457C-42R-1 80-88 cm	972	1.378	0.274	0.004	0.0373	0.0004	0.45356	245.3	3.2	235.9	2.4	283	30	235.9	2.4	3.8
U1457C-42R-1 80-88 cm	854	1.814	9.350	0.160	0.4086	0.0056	0.85787	2370	15	2207	25	2489	15	2489.0	15.0	11.3
U1457C-42R-1 80-88 cm	674	6.150	0.114	0.004	0.0170	0.0004	0.31141	109.2	3.8	108.6	2.2	116	72	108.6	2.2	0.5

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-42R-1 80-88 cm	324	1.108	10.499	0.079	0.4683	0.0031	0.69760	2478.9	6.9	2476	13	2451.2	9.9	2451.2	9.9	1.0
U1457C-42R-1 80-88 cm	67.4	0.306	0.102	0.012	0.0094	0.0004	0.05771	97	11	60.3	2.3	910	260	DISC	DISC	37.8
U1457C-42R-1 80-88 cm	695	5.090	2.286	0.050	0.2023	0.0034	0.68994	1206	15	1187	18	1202	31	1202.0	31.0	1.2
U1457C-42R-1 80-88 cm	1133	1.264	0.040	0.001	0.0060	0.0001	0.22610	39.9	1.1	38.5	0.48	67	56	38.5	0.5	3.5
U1457C-42R-1 80-88 cm	925	18.490	0.764	0.009	0.0922	0.0009	0.55055	576.1	5	568.6	5.1	562	22	568.6	5.1	1.3
U1457C-42R-1 80-88 cm	505	2.940	0.098	0.002	0.0147	0.0002	0.02080	94.8	2.1	93.7	1	81	52	93.7	1.0	1.2
U1457C-42R-1 80-88 cm	1145	3.360	1.539	0.022	0.1509	0.0021	0.73707	945.4	8.8	906	11	1011	20	1011.0	20.0	10.4
U1457C-42R-1 80-88 cm	758	4.300	9.756	0.074	0.4177	0.0031	0.66280	2412.2	6.8	2249	14	2538	10	2538.0	10.0	11.4
U1457C-42R-1 80-88 cm	152.4	1.718	0.070	0.005	0.0104	0.0002	0.07441	68	4.3	66.8	1.4	110	120	66.8	1.4	1.8
U1457C-42R-1 80-88 cm	72.2	0.890	2.045	0.038	0.1837	0.0021	0.35899	1128	13	1087	11	1203	36	1203.0	36.0	9.6
U1457C-42R-1 80-88 cm	705	1.340	0.061	0.002	0.0093	0.0002	0.08509	59.7	2	59.4	1.3	110	73	59.4	1.3	0.5
U1457C-42R-1 80-88 cm	768	5.800	0.044	0.001	0.0062	0.0001	0.00555	43.3	1.4	40	0.51	237	67	40.0	0.5	7.6
U1457C-42R-1 80-88 cm	348	3.061	1.909	0.045	0.1679	0.0030	0.56993	1081	16	1000	17	1270	38	1270.0	38.0	21.3
U1457C-42R-1 80-88 cm	22.19	1.026	0.074	0.011	0.0095	0.0005	0.03629	71	10	61.4	3	250	270	61.4	3.0	13.5
U1457C-42R-1 80-88 cm	619	1.780	1.635	0.019	0.1651	0.0015	0.67714	983	7.2	984.6	8.1	1006	17	1006.0	17.0	2.1
U1457C-42R-1 80-88 cm	544	4.050	0.899	0.012	0.1087	0.0014	0.55056	651.4	6.4	664.7	8.3	634	26	664.7	8.3	2.0
U1457C-42R-1 80-88 cm	1406	1.918	0.023	0.001	0.0036	0.0000	0.15891	23.5	0.78	23.03	0.25	105	65	23.0	0.3	2.0
U1457C-42R-1 80-88 cm	218	1.543	1.205	0.022	0.1350	0.0016	0.45427	801.1	9.9	816	8.9	786	33	816.0	8.9	1.9
U1457C-42R-1 80-88 cm	161.3	0.736	0.116	0.005	0.0178	0.0003	0.06753	111.1	4.3	113.9	1.9	112	82	113.9	1.9	2.5
U1457C-42R-1 80-88 cm	114.5	1.289	1.224	0.019	0.1361	0.0012	0.23119	811.5	9.2	822.2	6.5	808	35	822.2	6.5	1.3
U1457C-42R-1 80-88 cm	540	1.249	0.113	0.003	0.0173	0.0003	0.34554	108.7	2.8	110.5	1.9	107	54	110.5	1.9	1.7
U1457C-42R-1 80-88 cm	468	1.933	0.560	0.009	0.0737	0.0010	0.18784	451.1	5.8	458.4	6	414	33	458.4	6.0	1.6
U1457C-42R-1 80-88 cm	1298	4.120	0.040	0.001	0.0059	0.0001	0.22598	40	1	37.99	0.76	179	59	38.0	0.8	5.0
U1457C-42R-1 80-88 cm	126.3	0.900	1.286	0.046	0.1399	0.0044	0.77596	840	22	844	25	843	48	844.0	25.0	0.5
U1457C-42R-1 80-88 cm	181.3	1.223	4.614	0.098	0.3277	0.0070	0.64259	1748	18	1824	34	1674	33	1674.0	33.0	9.0
U1457C-42R-1 80-88 cm	347.1	1.777	1.880	0.018	0.1825	0.0013	0.38593	1073.2	6.5	1080.7	7	1075	19	1075.0	19.0	0.5
U1457C-42R-1 80-88 cm	818	2.930	0.679	0.013	0.0867	0.0017	0.50977	525.8	8	536	10	506	43	536.0	10.0	1.9
U1457C-42R-1 80-88 cm	70.8	1.022	0.066	0.010	0.0097	0.0005	0.22075	64.2	9.4	62	2.9	140	290	62.0	2.9	3.4
U1457C-42R-1 80-88 cm	887	2.900	0.483	0.013	0.0606	0.0015	0.83495	398.7	8.7	378.9	9.3	542	31	378.9	9.3	5.0
U1457C-42R-1 80-88 cm	216	1.843	1.050	0.016	0.1219	0.0010	0.28889	727.6	7.8	741.1	5.9	703	33	741.1	5.9	1.9
U1457C-42R-1 80-88 cm	1398	8.700	0.946	0.021	0.1055	0.0024	0.92491	674	11	646	14	796	20	646.0	14.0	4.2
U1457C-42R-1 80-88 cm	51.3	0.341	0.661	0.021	0.0831	0.0013	0.15966	514	13	514.7	7.7	506	70	514.7	7.7	0.1
U1457C-42R-1 80-88 cm	956	29.000	0.578	0.047	0.0736	0.0042	0.51276	470	25	457	25	510	130	457.0	25.0	2.8
U1457C-42R-1 80-88 cm	349.7	3.125	3.828	0.078	0.2658	0.0052	0.62760	1596	16	1519	27	1680	30	1680.0	30.0	9.6
U1457C-42R-1 80-88 cm	501	7.210	0.413	0.020	0.0527	0.0016	0.59198	350	15	330.9	9.7	435	88	330.9	9.7	5.5

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-42R-1 80-88 cm	560	1.874	1.219	0.018	0.1334	0.0017	0.58388	808.1	8	807	9.5	781	25	807.0	9.5	0.1
U1457C-42R-1 80-88 cm	1520	3.730	0.592	0.012	0.0742	0.0013	0.65306	470.9	7.5	461.2	7.6	485	34	461.2	7.6	2.1
U1457C-42R-1 80-88 cm	306.2	1.454	7.170	0.110	0.3802	0.0057	0.68977	2130	14	2076	27	2165	22	2165.0	22.0	4.1
U1457C-42R-1 80-88 cm	965	1.865	0.109	0.003	0.0165	0.0003	0.39528	105	2.6	105.6	1.6	84	49	105.6	1.6	0.6
U1457C-42R-1 80-88 cm	107.4	1.690	0.066	0.005	0.0096	0.0003	0.16319	64.7	4.9	61.5	1.8	120	140	61.5	1.8	4.9
U1457C-42R-1 80-88 cm	613	2.360	0.187	0.009	0.0246	0.0006	0.16293	176.7	8.6	156.5	3.4	390	110	156.5	3.4	11.4
U1457C-42R-1 80-88 cm	87.8	1.246	1.424	0.035	0.1456	0.0022	0.37402	897	14	876	12	939	48	939.0	48.0	6.7
U1457C-42R-1 80-88 cm	82.2	0.940	2.072	0.046	0.1957	0.0031	0.43596	1137	15	1152	17	1094	42	1094.0	42.0	5.3
U1457C-42R-1 80-88 cm	390.3	0.713	0.047	0.002	0.0075	0.0001	0.10602	46.9	2.1	48.4	0.85	10	85	48.4	0.9	3.2
U1457C-42R-1 80-88 cm	138.5	1.794	0.101	0.009	0.0128	0.0004	0.06994	97.4	8.5	82.2	2.5	410	190	DISC	DISC	15.6
U1457C-42R-1 80-88 cm	257	2.060	1.759	0.042	0.1750	0.0032	0.70912	1028	15	1039	18	998	34	998.0	34.0	4.1
U1457C-42R-1 80-88 cm	890	14.300	0.760	0.039	0.0937	0.0038	0.53575	572	23	577	22	550	100	577.0	22.0	0.9
U1457C-42R-1 80-88 cm	2730	10.000	0.114	0.006	0.0151	0.0052	0.11928	109.8	5.4	96	33	247	63	DISC	DISC	12.6
U1457C-42R-1 80-88 cm	368	1.710	0.114	0.005	0.0170	0.0004	0.33805	109.5	4.2	108.5	2.5	139	77	108.5	2.5	0.9
U1457C-42R-1 80-88 cm	379	1.041	1.625	0.040	0.1571	0.0036	0.60085	977	15	940	20	1065	43	1065.0	43.0	11.7
U1457C-42R-1 80-88 cm	512	0.543	7.690	0.260	0.3440	0.0100	0.81814	2201	26	1904	49	2488	31	2488.0	31.0	23.5
U1457C-42R-1 80-88 cm	209.5	2.263	3.652	0.099	0.2678	0.0069	0.62398	1557	21	1528	35	1601	42	1601.0	42.0	4.6
U1457C-42R-1 80-88 cm	296	1.155	0.046	0.002	-0.0002	0.0011	0.02704	45.9	2.3	1.2	5.3	139	97	DISC	DISC	97.4
U1457C-42R-1 80-88 cm	119.3	1.653	0.712	0.023	0.0876	0.0019	0.43477	544	14	541	11	551	69	541.0	11.0	0.6
U1457C-42R-1 80-88 cm	205	1.389	1.309	0.042	0.1380	0.0044	0.70122	848	19	832	25	882	51	832.0	25.0	1.9
U1457C-42R-1 80-88 cm	63	-7.000	0.025	0.009	0.0036	0.0004	0.30148	24.7	8.3	23.1	2.4	-60	520	DISC	DISC	6.5
U1457C-42R-1 80-88 cm	450	1.810	1.343	0.034	0.1429	0.0033	0.52193	862	15	860	18	861	46	861.0	46.0	0.1
U1457C-42R-1 80-88 cm	160.9	1.057	10.920	0.340	0.4820	0.0130	0.79010	2511	28	2532	56	2496	29	2496.0	29.0	1.4
U1457C-42R-1 80-88 cm	164	1.027	1.432	0.037	0.1452	0.0027	0.52579	898	15	874	15	934	47	934.0	47.0	6.4
U1457C-42R-1 80-88 cm	160	1.354	0.111	0.006	0.0165	0.0004	0.33419	106.4	5.2	105.3	2.5	147	98	105.3	2.5	1.0
U1457C-42R-1 80-88 cm	1889	1.121	1.473	0.019	0.1482	0.0019	0.60372	918.7	7.9	891	10	974	24	974.0	24.0	8.5
U1457C-42R-1 80-88 cm	215	1.232	4.473	0.092	0.3062	0.0060	0.71701	1721	17	1720	30	1717	27	1717.0	27.0	0.2
U1457C-42R-1 80-88 cm	361	17.090	0.214	0.007	0.0309	0.0005	0.30187	196.3	5.6	196	3	182	61	196.0	3.0	0.2
U1457C-42R-1 80-88 cm	474	5.660	1.785	0.038	0.1684	0.0029	0.65380	1037	14	1003	16	1096	34	1096.0	34.0	8.5
U1457C-42R-1 80-88 cm	563	1.900	11.430	0.250	0.4812	0.0090	0.71474	2553	20	2529	39	2563	26	2563.0	26.0	1.3
U1457C-42R-1 80-88 cm	65.9	2.433	0.202	0.013	0.0287	0.0006	0.04271	185	10	182.4	4	190	120	182.4	4.0	1.4
U1457C-43R-1 55-63 cm	561	9.300	0.133	0.011	0.0193	0.0008	0.17954	126.5	9.9	123.2	5.1	160	150	123.2	5.1	2.6
U1457C-43R-1 55-63 cm	566	6.200	0.812	0.014	0.0946	0.0013	0.59881	604	7.9	582.4	7.9	686	30	582.4	7.9	3.6
U1457C-43R-1 55-63 cm	576	1.099	0.059	0.003	0.0092	0.0003	0.51610	58.4	3.1	58.9	1.6	49	85	58.9	1.6	0.9
U1457C-43R-1 55-63 cm	2816	2.810	0.559	0.005	0.0713	0.0006	0.56429	450.6	3.5	443.7	3.6	482	20	443.7	3.6	1.5

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-43R-1 55-63 cm	114.5	0.557	1.360	0.033	0.1389	0.0023	0.51033	868	14	838	13	939	51	838.0	13.0	3.5
U1457C-43R-1 55-63 cm	240	0.670	3.248	0.048	0.2362	0.0025	0.50113	1469	11	1366	13	1622	25	1622.0	25.0	15.8
U1457C-43R-1 55-63 cm	63.5	1.870	3.070	0.200	0.1469	0.0093	0.76026	1418	52	880	52	2372	80	DISC	DISC	62.9
U1457C-43R-1 55-63 cm	144	0.877	1.262	0.050	0.1284	0.0021	0.32946	825	22	779	12	950	80	779.0	12.0	5.6
U1457C-43R-1 55-63 cm	138	2.158	5.389	0.080	0.3142	0.0043	0.57795	1881	13	1760	21	2024	24	2024.0	24.0	13.0
U1457C-43R-1 55-63 cm	815	1.461	1.215	0.019	0.1312	0.0018	0.59357	808.5	9.1	794	10	850	30	794.0	10.0	1.8
U1457C-43R-1 55-63 cm	236	30.500	0.785	0.022	0.0949	0.0019	0.64713	587	12	586	11	585	50	586.0	11.0	0.2
U1457C-43R-1 55-63 cm	560	2.220	9.100	0.110	0.4112	0.0051	0.86136	2345	11	2219	23	2453	14	2453.0	14.0	9.5
U1457C-43R-1 55-63 cm	533	1.146	1.322	0.046	0.1231	0.0035	0.55229	854	20	748	20	1116	62	748.0	20.0	12.4
U1457C-43R-1 55-63 cm	775	4.560	4.777	0.094	0.3060	0.0065	0.78531	1778	17	1719	32	1849	25	1849.0	25.0	7.0
U1457C-43R-1 55-63 cm	374	1.360	0.177	0.012	0.0252	0.0006	0.03553	165	10	160.5	3.8	210	140	160.5	3.8	2.7
U1457C-43R-1 55-63 cm	130.7	5.180	8.080	0.110	0.3871	0.0040	0.69746	2237	12	2108	18	2356	17	2356.0	17.0	10.5
U1457C-43R-1 55-63 cm	767	1.740	8.380	0.210	0.3937	0.0091	0.85716	2274	22	2138	42	2382	23	2382.0	23.0	10.2
U1457C-43R-1 55-63 cm	211.4	0.472	0.743	0.019	0.0891	0.0015	0.49945	562	11	550	8.9	585	53	550.0	8.9	2.1
U1457C-43R-1 55-63 cm	499	1.091	0.150	0.009	0.0214	0.0006	0.05261	141.4	7.5	136.6	3.5	200	130	136.6	3.5	3.4
U1457C-43R-1 55-63 cm	716	3.760	3.210	0.050	0.2222	0.0038	0.78261	1458	12	1293	20	1711	22	1711.0	22.0	24.4
U1457C-43R-1 55-63 cm	125.3	1.630	1.735	0.039	0.1666	0.0027	0.53030	1018	14	993	15	1071	38	1071.0	38.0	7.3
U1457C-43R-1 55-63 cm	566	44.200	0.088	0.004	0.0133	0.0003	0.21091	85.7	4.1	84.9	1.8	116	95	84.9	1.8	0.9
U1457C-43R-1 55-63 cm	195.2	1.940	0.106	0.006	0.0164	0.0004	0.00949	101.4	5.5	104.7	2.6	80	110	104.7	2.6	3.3
U1457C-43R-1 55-63 cm	177.4	0.621	0.593	0.017	0.0732	0.0010	0.33529	473	11	455	5.9	536	59	455.0	5.9	3.8
U1457C-43R-1 55-63 cm	170.5	1.057	0.993	0.028	0.1058	0.0017	0.33309	698	14	648	10	857	57	648.0	10.0	7.2
U1457C-43R-1 55-63 cm	116.7	0.920	0.062	0.006	0.0088	0.0003	0.03517	60.1	5.2	56.7	1.8	180	160	56.7	1.8	5.7
U1457C-43R-1 55-63 cm	1578	0.979	0.018	0.001	0.0028	0.0001	0.08851	17.7	1	17.77	0.33	60	110	17.8	0.3	0.4
U1457C-43R-1 55-63 cm	118.2	1.360	1.569	0.029	0.1572	0.0018	0.37285	956	11	941	10	978	36	978.0	36.0	3.8
U1457C-43R-1 55-63 cm	267.8	1.817	11.320	0.170	0.4659	0.0067	0.77437	2550	14	2464	29	2616	17	2616.0	17.0	5.8
U1457C-43R-1 55-63 cm	889	1.088	0.791	0.023	0.0750	0.0017	0.77505	590	13	466	10	1106	37	DISC	DISC	21.0
U1457C-43R-1 55-63 cm	214.6	0.891	1.049	0.025	0.1150	0.0019	0.37803	727	13	701	11	795	49	701.0	11.0	3.6
U1457C-43R-1 55-63 cm	115.2	0.892	5.320	0.110	0.2969	0.0048	0.69244	1869	18	1678	25	2084	29	2084.0	29.0	19.5
U1457C-43R-1 55-63 cm	436	1.850	1.574	0.023	0.1541	0.0020	0.52769	958.5	9.2	924	11	1038	28	1038.0	28.0	11.0
U1457C-43R-1 55-63 cm	482	1.032	0.060	0.003	0.0090	0.0002	0.24159	59	3	57.9	1.5	117	99	57.9	1.5	1.9
U1457C-43R-1 55-63 cm	394	1.166	1.315	0.042	0.1378	0.0039	0.83035	850	19	832	22	893	44	832.0	22.0	2.1
U1457C-43R-1 55-63 cm	176	1.156	0.119	0.008	0.0156	0.0003	0.00469	113.6	6.9	99.5	2	350	130	99.5	2.0	12.4
U1457C-43R-1 55-63 cm	922	8.600	0.586	0.027	0.0699	0.0027	0.77833	468	17	436	16	588	65	436.0	16.0	6.8
U1457C-43R-1 55-63 cm	568	4.760	1.390	0.034	0.1269	0.0027	0.76112	882	14	770	15	1175	33	770.0	15.0	12.7
U1457C-43R-1 55-63 cm	1047	6.400	0.694	0.009	0.0843	0.0012	0.46774	534.7	5.5	522.3	7.1	586	31	522.3	7.1	2.3

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-43R-1 55-63 cm	459	6.180	0.678	0.014	0.0860	0.0014	0.39499	524.7	8.6	532.8	8	490	47	532.8	8.0	1.5
U1457C-43R-1 55-63 cm	392	4.300	0.572	0.010	0.0723	0.0010	0.08636	458.2	6.8	449.7	6.1	492	41	449.7	6.1	1.9
U1457C-43R-1 55-63 cm	508.3	2.255	1.019	0.013	0.1151	0.0011	0.44304	712.7	6.7	701.9	6.1	741	27	701.9	6.1	1.5
U1457C-43R-1 55-63 cm	600	2.050	0.554	0.011	0.0717	0.0011	0.51131	446.7	7.5	446.2	6.7	438	42	446.2	6.7	0.1
U1457C-43R-1 55-63 cm	172	3.630	10.220	0.130	0.4519	0.0056	0.46352	2452	12	2406	24	2495	22	2495.0	22.0	3.6
U1457C-43R-1 55-63 cm	140.8	1.215	0.939	0.038	0.1068	0.0034	0.47482	669	20	653	20	710	80	653.0	20.0	2.4
U1457C-43R-1 55-63 cm	839	6.100	4.010	0.065	0.2872	0.0038	0.80417	1633	13	1626	19	1639	18	1639.0	18.0	0.8
U1457C-43R-1 55-63 cm	2965	5.850	5.322	0.068	0.3164	0.0037	0.70834	1871	11	1772	18	1982	21	1982.0	21.0	10.6
U1457C-43R-1 55-63 cm	187.9	1.464	0.111	0.006	0.0167	0.0004	0.16862	106.4	5.5	107	2.2	110	100	107.0	2.2	0.6
U1457C-43R-1 55-63 cm	514	1.031	0.125	0.006	0.0165	0.0003	0.18832	119.2	5.5	105.3	1.9	370	100	105.3	1.9	11.7
U1457C-43R-1 55-63 cm	1880	1.140	0.079	0.003	0.0115	0.0003	0.39454	76.8	2.8	74	1.6	144	68	74.0	1.6	3.6
U1457C-43R-1 55-63 cm	1231	1.310	0.056	0.002	0.0081	0.0002	0.34461	55.4	1.8	52.2	1.1	185	67	52.2	1.1	5.8
U1457C-43R-1 55-63 cm	2010	#####	0.111	0.008	0.0165	0.0008	0.67418	107	7.1	105.3	5.1	120	100	105.3	5.1	1.6
U1457C-43R-1 55-63 cm	357	6.730	0.681	0.023	0.0763	0.0021	0.60866	525	14	474	12	750	56	474.0	12.0	9.7
U1457C-43R-1 55-63 cm	843	0.731	0.680	0.041	0.0786	0.0042	0.71193	524	25	487	25	671	93	487.0	25.0	7.1
U1457C-43R-1 55-63 cm	1360	2.480	0.916	0.016	0.1048	0.0011	0.64409	659.2	8.4	642.4	6.7	716	26	642.4	6.7	2.5
U1457C-43R-1 55-63 cm	659	3.020	0.624	0.017	0.0788	0.0018	0.55992	491	10	489	11	489	48	489.0	11.0	0.4
U1457C-43R-1 55-63 cm	431	1.034	0.091	0.004	0.0137	0.0002	0.00584	88.4	3.3	87.9	1.4	113	75	87.9	1.4	0.6
U1457C-43R-1 55-63 cm	145.1	#####	0.593	0.018	0.0734	0.0014	0.34156	473	12	456.6	8.7	522	64	456.6	8.7	3.5
U1457C-43R-1 55-63 cm	54.3	1.069	12.140	0.520	0.4650	0.0210	0.87333	2609	40	2456	94	2730	37	2730.0	37.0	10.0
U1457C-43R-1 55-63 cm	514	1.996	1.160	0.020	0.1257	0.0023	0.67492	780.6	9.6	763	13	817	32	763.0	13.0	2.3
U1457C-43R-1 55-63 cm	104.7	1.087	0.123	0.008	0.0179	0.0004	0.06188	117.3	6.9	114.2	2.4	180	120	114.2	2.4	2.6
U1457C-43R-1 55-63 cm	188.7	1.026	5.141	0.083	0.3307	0.0045	0.67034	1839	14	1840	22	1839	21	1839.0	21.0	0.1
U1457C-43R-1 55-63 cm	94.2	0.649	1.177	0.043	0.1326	0.0030	0.38104	785	20	805	18	699	76	805.0	18.0	2.5
U1457C-43R-1 55-63 cm	2960	32.300	0.602	0.011	0.0760	0.0012	0.77070	477.8	7	472.1	7.2	491	26	472.1	7.2	1.2
U1457C-43R-1 55-63 cm	961	2.529	0.109	0.003	0.0160	0.0002	0.38601	104.7	2.5	102.5	1.3	161	49	102.5	1.3	2.1
U1457C-43R-1 55-63 cm	867	7.910	0.680	0.021	0.0830	0.0018	0.70077	525	13	514	10	564	48	514.0	10.0	2.1
U1457C-43R-1 55-63 cm	239	5.800	1.567	0.050	0.1539	0.0044	0.70560	955	20	922	25	1036	47	1036.0	47.0	11.0
U1457C-43R-1 55-63 cm	1566	1.800	1.049	0.055	0.1160	0.0053	0.81523	726	28	707	31	795	63	707.0	31.0	2.6
U1457C-43R-1 55-63 cm	2600	3.500	0.113	0.009	0.0176	0.0010	0.45818	108.2	8.3	112.5	6	60	130	112.5	6.0	4.0
U1457C-43R-1 55-63 cm	432	4.870	0.551	0.010	0.0720	0.0009	0.51433	444.7	6.5	448.6	5.5	428	37	448.6	5.5	0.9
U1457C-43R-1 55-63 cm	915	1.649	1.862	0.041	0.1713	0.0029	0.75550	1066	14	1019	16	1162	28	1162.0	28.0	12.3
U1457C-43R-1 55-63 cm	822	1.446	0.616	0.011	0.0762	0.0011	0.65508	486.4	6.9	473	6.5	546	31	473.0	6.5	2.8
U1457C-43R-1 55-63 cm	105	1.206	0.055	0.006	0.0084	0.0003	0.03543	53.3	5.9	53.9	1.8	-10	190	53.9	1.8	1.1
U1457C-43R-1 55-63 cm	407	1.100	1.222	0.022	0.1304	0.0020	0.64187	809	10	790	11	854	32	790.0	11.0	2.3

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-43R-1 55-63 cm	154.6	1.052	1.448	0.034	0.1481	0.0026	0.41550	906	14	890	15	932	50	932.0	50.0	4.5
U1457C-43R-1 55-63 cm	177.5	0.725	4.868	0.073	0.3159	0.0046	0.71040	1796	13	1768	23	1827	21	1827.0	21.0	3.2
U1457C-43R-1 55-63 cm	308	1.104	0.343	0.011	0.0455	0.0012	0.67868	298	8.7	286.6	7.5	387	55	286.6	7.5	3.8
U1457C-43R-1 55-63 cm	1563	31.600	0.224	0.005	0.0322	0.0006	0.55803	204.9	4.3	204	3.5	215	42	204.0	3.5	0.4
U1457C-43R-1 55-63 cm	328	8.030	0.629	0.023	-0.0043	0.0001	0.70758	494	15	-27.87	0.84	543	59	DISC	DISC	105.6
U1457C-43R-1 55-63 cm	619	2.880	0.338	0.007	0.0469	0.0008	0.43718	296	5.6	295.4	4.9	309	46	295.4	4.9	0.2
U1457C-43R-1 55-63 cm	461	3.740	5.534	0.087	0.3495	0.0058	0.71950	1904	14	1930	27	1886	22	1886.0	22.0	2.3
U1457C-43R-1 55-63 cm	67.5	0.622	1.146	0.043	0.1132	0.0026	0.39940	769	20	691	15	988	72	691.0	15.0	10.1
U1457C-43R-1 55-63 cm	923	3.760	2.462	0.036	0.2002	0.0033	0.72301	1260	11	1176	18	1418	22	1418.0	22.0	17.1
U1457C-43R-1 55-63 cm	54.5	0.676	1.350	0.039	0.1402	0.0019	0.27411	862	17	845	11	891	59	845.0	11.0	2.0
U1457C-43R-1 55-63 cm	322	1.309	0.130	0.006	0.0189	0.0005	0.31432	124.2	5.6	120.5	3.3	213	95	120.5	3.3	3.0
U1457C-43R-1 55-63 cm	242	6.380	4.580	0.230	0.3050	0.0120	0.77008	1737	41	1714	58	1777	55	1777.0	55.0	3.5
U1457C-43R-1 55-63 cm	48.5	0.794	7.000	0.180	0.3888	0.0077	0.52250	2105	23	2115	36	2110	41	2110.0	41.0	0.2
U1457C-43R-1 55-63 cm	329	1.538	5.202	0.081	0.3321	0.0058	0.71403	1851	13	1847	28	1869	23	1869.0	23.0	1.2
U1457C-43R-1 55-63 cm	999	2.730	0.321	0.009	0.0408	0.0010	0.76491	282.1	6.5	257.5	6.4	488	38	257.5	6.4	8.7
U1457C-43R-1 55-63 cm	1077	4.140	0.723	0.041	0.0771	0.0037	0.26727	550	23	478	22	870	130	478.0	22.0	13.1
U1457C-43R-1 55-63 cm	579	17.100	0.682	0.022	0.0834	0.0023	0.51665	527	13	516	14	575	65	516.0	14.0	2.1
U1457C-43R-1 55-63 cm	240.6	1.573	0.744	0.030	0.0917	0.0033	0.59647	561	17	567	19	547	67	567.0	19.0	1.1
U1456D-12R-1 30-36 cm	274	1.910	0.071	0.003	0.0103	0.0002	0.26415	70.3	3.4	65.8	1.2	224	94	65.8	1.2	6.4
U1456D-12R-1 30-36 cm	986	3.790	0.523	0.011	0.0615	0.0010	0.74803	426	7.1	384.4	6.2	659	30	384.4	6.2	9.8
U1456D-12R-1 30-36 cm	152.2	1.118	3.505	0.085	0.2222	0.0047	0.76975	1524	19	1292	25	1866	28	DISC	DISC	30.8
U1456D-12R-1 30-36 cm	607	10.300	0.480	0.011	0.0627	0.0012	0.54421	397.4	7.8	391.7	7.5	427	48	391.7	7.5	1.4
U1456D-12R-1 30-36 cm	442	1.840	0.136	0.005	0.0203	0.0003	0.16823	129	4	129.4	2	120	65	129.4	2.0	0.3
U1456D-12R-1 30-36 cm	1143	10.800	0.587	0.009	0.0753	0.0011	0.62776	468.5	5.6	467.7	6.5	457	29	467.7	6.5	0.2
U1456D-12R-1 30-36 cm	1408	18.500	0.100	0.002	0.0151	0.0003	0.28177	96.3	2	96.7	1.6	97	44	96.7	1.6	0.4
U1456D-12R-1 30-36 cm	200	1.602	0.988	0.019	0.1093	0.0014	0.48163	696	9.6	668.5	8.2	775	38	668.5	8.2	4.0
U1456D-12R-1 30-36 cm	296	0.799	0.081	0.004	0.0116	0.0002	0.12945	78.8	3.9	74.5	1.2	220	100	74.5	1.2	5.5
U1456D-12R-1 30-36 cm	287	0.951	0.071	0.003	0.0107	0.0002	0.01167	69.1	3.2	68.6	1.2	113	93	68.6	1.2	0.7
U1456D-12R-1 30-36 cm	551	7.830	1.758	0.027	0.1708	0.0026	0.67216	1028.8	9.8	1016	14	1062	25	1062.0	25.0	4.3
U1456D-12R-1 30-36 cm	292	0.782	0.068	0.003	0.0102	0.0002	0.09108	67	3.2	65.4	1.3	151	96	65.4	1.3	2.4
U1456D-12R-1 30-36 cm	2332	9.820	0.752	0.021	0.0904	0.0018	0.63201	569	12	558	11	628	49	558.0	11.0	1.9
U1456D-12R-1 30-36 cm	1182	1.501	1.654	0.032	0.1598	0.0034	0.78819	990	12	955	19	1071	29	1071.0	29.0	10.8
U1456D-12R-1 30-36 cm	1780	1.000	0.055	0.002	0.0079	0.0002	0.50476	54	1.9	50.8	1.3	215	65	50.8	1.3	5.9
U1456D-12R-1 30-36 cm	1827	9.350	1.801	0.031	0.1690	0.0026	0.76814	1044	11	1006	15	1140	23	1140.0	23.0	11.8
U1456D-12R-1 30-36 cm	1970	37.200	0.013	0.002	0.0021	0.0001	0.02885	13.1	1.9	13.64	0.65	-20	250	13.6	0.7	4.1

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-12R-1 30-36 cm	563	0.660	0.081	0.005	0.0116	0.0004	0.41009	78.9	5	74.6	2.8	220	130	74.6	2.8	5.4
U1456D-12R-1 30-36 cm	322	0.773	0.114	0.010	0.0162	0.0005	0.32033	109.7	8.8	103.7	3.1	240	170	103.7	3.1	5.5
U1456D-12R-1 30-36 cm	593	3.550	1.452	0.021	0.1471	0.0018	0.55857	909	8.8	885	10	974	26	974.0	26.0	9.1
U1456D-12R-1 30-36 cm	1440	4.830	0.213	0.004	0.0309	0.0004	0.57437	195.6	3.3	196.4	2.5	186	34	196.4	2.5	0.4
U1456D-12R-1 30-36 cm	454	0.725	0.616	0.021	0.0739	0.0022	0.61662	486	13	459	13	622	61	459.0	13.0	5.6
U1456D-12R-1 30-36 cm	120	2.193	0.732	0.022	0.0895	0.0015	0.40340	556	12	552.4	8.8	524	60	552.4	8.8	0.6
U1456D-12R-1 30-36 cm	363	0.973	0.176	0.006	0.0239	0.0004	0.35348	163.7	5.1	152	2.5	306	67	152.0	2.5	7.1
U1456D-12R-1 30-36 cm	75.1	1.288	0.089	0.008	0.0135	0.0005	0.14274	85.7	7.5	86.2	3	50	150	86.2	3.0	0.6
U1456D-12R-1 30-36 cm	382.6	0.821	0.118	0.004	0.0172	0.0003	0.19496	113.1	3.5	110.2	1.8	154	69	110.2	1.8	2.6
U1456D-12R-1 30-36 cm	344.2	2.300	0.274	0.010	0.0388	0.0009	0.29714	245.2	7.7	245.3	5.8	233	72	245.3	5.8	0.0
U1456D-12R-1 30-36 cm	2200	0.367	0.042	0.001	0.0065	0.0001	0.44791	42.1	1.4	41.45	0.72	78	61	41.5	0.7	1.5
U1456D-12R-1 30-36 cm	296	0.494	0.073	0.008	0.0102	0.0003	0.04989	71.5	7.6	65.6	2.1	210	210	65.6	2.1	8.3
U1456D-12R-1 30-36 cm	758	1.426	1.053	0.030	0.1150	0.0025	0.36967	730	15	702	14	802	60	702.0	14.0	3.8
U1456D-12R-1 30-36 cm	251	11.000	0.976	0.027	0.1119	0.0024	0.58803	688	14	683	14	689	49	683.0	14.0	0.7
U1456D-12R-1 30-36 cm	59.3	1.048	0.064	0.008	0.0085	0.0004	0.16759	61.8	7.6	54.5	2.3	230	220	54.5	2.3	11.8
U1456D-12R-1 30-36 cm	568	5.060	4.902	0.063	0.3169	0.0041	0.63601	1802	10	1774	20	1831	20	1831.0	20.0	3.1
U1456D-12R-1 30-36 cm	1372	2.160	0.110	0.002	0.0163	0.0002	0.36915	105.9	2.1	104.2	1.5	151	43	104.2	1.5	1.6
U1456D-12R-1 30-36 cm	2100	0.733	0.114	0.002	0.0170	0.0003	0.53850	109.1	2.1	108.3	1.6	137	38	108.3	1.6	0.7
U1456D-12R-1 30-36 cm	354	2.690	4.960	0.130	0.2950	0.0077	0.84587	1808	23	1664	38	1982	27	1982.0	27.0	16.0
U1456D-12R-1 30-36 cm	471	1.034	1.126	0.018	0.1222	0.0019	0.60167	765.3	9	743	11	834	30	743.0	11.0	2.9
U1456D-12R-1 30-36 cm	353	0.909	0.113	0.006	0.0169	0.0003	0.03119	108.8	5.3	108.2	2.2	150	110	108.2	2.2	0.6
U1456D-12R-1 30-36 cm	551.3	1.379	0.191	0.005	0.0278	0.0004	0.37165	177.4	3.8	176.5	2.7	179	49	176.5	2.7	0.5
U1456D-12R-1 30-36 cm	2593	11.010	0.034	0.001	0.0050	0.0001	0.39284	34	1.3	31.81	0.7	180	76	31.8	0.7	6.4
U1456D-12R-1 30-36 cm	167	0.462	1.218	0.032	0.1292	0.0021	0.39286	808	15	783	12	868	54	783.0	12.0	3.1
U1456D-12R-1 30-36 cm	301	2.200	0.123	0.011	0.0179	0.0006	0.17520	117	10	114.5	3.5	200	180	114.5	3.5	2.1
U1456D-12R-1 30-36 cm	727	6.110	0.617	0.011	0.0770	0.0011	0.64234	487	6.7	478.2	6.6	531	30	478.2	6.6	1.8
U1456D-12R-1 30-36 cm	1040	1.331	0.120	0.004	0.0175	0.0003	0.45069	115.6	3.7	111.7	2	186	60	111.7	2.0	3.4
U1456D-12R-1 30-36 cm	468	1.007	0.082	0.003	0.0121	0.0003	0.42872	80	3.2	77.6	1.8	158	74	77.6	1.8	3.0
U1456D-12R-1 30-36 cm	292	3.130	0.606	0.012	0.0779	0.0012	0.70984	479.9	7.8	483.7	7	479	39	483.7	7.0	0.8
U1456D-12R-1 30-36 cm	312.6	0.930	0.066	0.003	0.0101	0.0002	0.07072	65	3.2	64.8	1.3	79	98	64.8	1.3	0.3
U1456D-12R-1 30-36 cm	1577	23.300	0.605	0.034	0.0746	0.0024	0.49781	479	21	464	14	550	100	464.0	14.0	3.1
U1456D-12R-1 30-36 cm	249	1.745	9.090	0.240	0.3720	0.0110	0.81543	2343	24	2038	50	2625	27	2625.0	27.0	22.4
U1456D-12R-1 30-36 cm	898	1.102	0.103	0.003	0.0156	0.0003	0.41578	99.5	2.4	100.1	1.6	94	47	100.1	1.6	0.6
U1456D-12R-1 30-36 cm	1720	0.907	0.088	0.003	0.0109	0.0002	0.46672	85.1	2.7	69.6	1.5	522	64	DISC	DISC	18.2
U1456D-12R-1 30-36 cm	381	2.012	10.270	0.180	0.4408	0.0093	0.75407	2458	16	2353	41	2532	26	2532.0	26.0	7.1

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-12R-1 30-36 cm	2462	1.399	0.040	0.002	0.0059	0.0001	0.29072	39.4	2.1	38.12	0.93	120	100	38.1	0.9	3.2
U1456D-12R-1 30-36 cm	309.6	0.995	7.610	0.250	0.3490	0.0110	0.85290	2180	30	1926	52	2433	29	2433.0	29.0	20.8
U1456D-12R-1 30-36 cm	569	1.508	0.673	0.010	0.0842	0.0011	0.48684	522.1	6.3	521.2	6.3	519	32	521.2	6.3	0.2
U1456D-12R-1 30-36 cm	771	1.887	0.115	0.004	0.0164	0.0003	0.27225	110.2	3.8	104.7	1.8	229	75	104.7	1.8	5.0
U1456D-12R-1 30-36 cm	170.2	1.890	0.020	0.004	0.0027	0.0002	0.21486	20.2	3.8	17.03	0.97	180	320	DISC	DISC	15.7
U1456D-12R-1 30-36 cm	3800	17.700	0.567	0.010	0.0719	0.0013	0.71641	455.7	6.7	447.7	7.6	506	30	447.7	7.6	1.8
U1456D-12R-1 30-36 cm	202.3	0.936	0.068	0.004	0.0103	0.0002	0.07301	66.7	3.9	66.1	1.5	110	120	66.1	1.5	0.9
U1456D-12R-1 30-36 cm	63.4	0.908	1.203	0.037	0.1270	0.0027	0.41302	797	17	770	15	856	63	770.0	15.0	3.4
U1456D-12R-1 30-36 cm	1274	1.150	0.121	0.003	0.0176	0.0002	0.33086	116	2.5	112.2	1.5	197	47	112.2	1.5	3.3
U1456D-12R-1 30-36 cm	897	0.752	0.041	0.003	0.0063	0.0002	0.01680	41.2	2.4	40.4	1	80	120	40.4	1.0	1.9
U1456D-12R-1 30-36 cm	551	0.960	0.070	0.003	0.0100	0.0002	0.02850	68.4	2.4	64.1	1.2	210	73	64.1	1.2	6.3
U1456D-12R-1 30-36 cm	191.7	0.627	1.108	0.022	0.1212	0.0018	0.32558	755	11	737	11	798	46	737.0	11.0	2.4
U1456D-12R-1 30-36 cm	1388	1.675	0.054	0.002	0.0082	0.0001	0.27951	53.7	1.5	52.39	0.78	117	56	52.4	0.8	2.4
U1456D-12R-1 30-36 cm	236	0.822	0.071	0.004	0.0103	0.0003	0.10692	68.9	3.8	65.7	1.6	210	110	65.7	1.6	4.6
U1456D-12R-1 30-36 cm	232.5	0.678	2.058	0.039	0.1877	0.0030	0.66306	1132	13	1108	16	1168	29	1168.0	29.0	5.1
U1456D-12R-1 30-36 cm	650	1.411	0.113	0.003	0.0172	0.0003	0.09940	108.9	2.8	109.7	1.6	103	57	109.7	1.6	0.7
U1456D-12R-1 30-36 cm	928	3.550	0.109	0.003	0.0157	0.0002	0.20125	104.9	2.5	100.3	1.3	207	54	100.3	1.3	4.4
U1456D-12R-1 30-36 cm	505	0.922	7.380	0.210	0.3238	0.0084	0.89285	2153	26	1806	41	2506	22	2506.0	22.0	27.9
U1456D-12R-1 30-36 cm	137	0.937	0.106	0.007	0.0128	0.0003	0.08504	101.5	6.1	81.7	2	510	130	DISC	DISC	19.5
U1456D-12R-1 30-36 cm	765	0.900	0.073	0.003	0.0105	0.0002	0.02575	71.3	2.3	67.4	1.1	232	71	67.4	1.1	5.5
U1456D-12R-1 30-36 cm	249	4.710	1.828	0.035	0.1801	0.0030	0.84424	1053	13	1067	16	1039	30	1039.0	30.0	2.7
U1456D-12R-1 30-36 cm	1900	2.730	0.124	0.006	0.0161	0.0008	0.18266	118.5	5.4	102.9	5.3	460	140	102.9	5.3	13.2
U1456D-12R-1 30-36 cm	273.3	1.129	3.860	0.110	0.2491	0.0066	0.77784	1601	24	1433	34	1830	39	1830.0	39.0	21.7
U1456D-12R-1 30-36 cm	916	27.900	0.768	0.030	0.0925	0.0027	0.51594	577	17	570	16	614	75	570.0	16.0	1.2
U1456D-12R-1 30-36 cm	217.2	1.105	1.767	0.033	0.1732	0.0027	0.45480	1034	12	1029	15	1050	37	1050.0	37.0	2.0
U1456D-12R-1 30-36 cm	552	1.450	0.065	0.003	0.0098	0.0002	0.22478	63.8	3	62.6	1.5	125	95	62.6	1.5	1.9
U1456D-12R-1 30-36 cm	89.9	0.881	0.071	0.007	0.0105	0.0004	0.14271	70.1	6.9	67.3	2.5	140	180	67.3	2.5	4.0
U1456D-12R-1 30-36 cm	596.8	1.273	0.017	0.001	0.0026	0.0001	0.08097	17.1	1.2	17.01	0.38	40	120	17.0	0.4	0.5
U1456D-12R-1 30-36 cm	304	1.483	0.054	0.005	0.0083	0.0003	0.07758	53.2	4.7	53	1.7	50	160	53.0	1.7	0.4
U1456D-12R-1 30-36 cm	255	2.836	1.208	0.020	0.1337	0.0016	0.47793	802.5	9.4	808.5	9.4	756	33	808.5	9.4	0.7
U1456D-12R-1 30-36 cm	273	1.005	0.057	0.008	0.0077	0.0004	0.02688	56.5	7.7	49.1	2.5	290	310	49.1	2.5	13.1
U1456D-12R-1 30-36 cm	229.9	2.099	0.109	0.005	0.0162	0.0003	0.10151	104.6	4.6	103.8	2	109	91	103.8	2.0	0.8
U1456D-12R-1 30-36 cm	3580	2.260	0.016	0.000	0.0023	0.0000	0.10445	15.62	0.48	15.02	0.22	93	63	15.0	0.2	3.8
U1456D-12R-1 30-36 cm	186	1.079	0.077	0.005	0.0120	0.0003	0.00331	74.8	4.3	76.6	1.7	30	110	76.6	1.7	2.4
U1456D-12R-1 30-36 cm	114	0.613	0.725	0.021	0.0879	0.0016	0.36141	553	13	542.7	9.5	562	65	542.7	9.5	1.9

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-12R-1 30-36 cm	569	0.983	0.588	0.011	0.0750	0.0010	0.50059	469	6.7	466.2	6	459	36	466.2	6.0	0.6
U1456D-12R-1 30-36 cm	248	2.226	12.670	0.170	0.5037	0.0065	0.67368	2654	13	2627	28	2665	18	2665.0	18.0	1.4
U1456D-12R-1 30-36 cm	2983	6.740	0.047	0.001	0.0072	0.0002	0.34546	46.3	1.4	46.44	0.95	65	62	46.4	1.0	0.3
U1456D-12R-1 30-36 cm	168.5	1.383	8.200	0.120	0.4162	0.0058	0.66305	2251	14	2242	26	2254	22	2254.0	22.0	0.5
U1456D-12R-1 30-36 cm	77.2	2.178	0.107	0.009	0.0144	0.0004	0.11105	102.3	7.8	92.1	2.8	300	160	92.1	2.8	10.0
U1456D-12R-1 30-36 cm	1860	2.830	0.124	0.003	0.0179	0.0003	0.44431	119	2.8	114.2	1.7	209	49	114.2	1.7	4.0
U1456D-12R-1 30-36 cm	155	2.918	0.768	0.026	0.0910	0.0019	0.52331	575	15	561	11	618	63	561.0	11.0	2.4
U1456D-12R-1 30-36 cm	175.7	1.216	0.060	0.005	0.0085	0.0003	0.22396	58.6	5	54.3	1.9	220	160	54.3	1.9	7.3
U1456D-12R-1 30-36 cm	161	0.946	0.092	0.006	0.0137	0.0003	0.13523	89	5.5	87.4	2	140	120	87.4	2.0	1.8
U1456D-12R-1 30-36 cm	1260	17.900	0.224	0.005	0.0324	0.0005	0.38857	205.2	3.8	205.3	3	215	43	205.3	3.0	0.0
U1456D-12R-1 30-36 cm	354	0.766	1.591	0.028	0.1623	0.0025	0.69493	964	11	969	14	966	26	966.0	26.0	0.3
U1456D-12R-1 30-36 cm	144.8	0.887	3.407	0.058	0.2584	0.0035	0.56643	1508	13	1481	18	1544	28	1544.0	28.0	4.1
U1456D-12R-1 30-36 cm	170.4	1.443	2.616	0.045	0.2138	0.0033	0.51186	1306	13	1248	18	1403	32	1403.0	32.0	11.0
U1456D-12R-1 30-36 cm	78.5	0.612	1.185	0.032	0.1315	0.0020	0.32892	790	15	796	12	763	56	796.0	12.0	0.8
U1456D-12R-1 30-36 cm	276.7	0.988	0.116	0.005	0.0175	0.0003	0.13159	111.4	4.4	111.8	1.7	122	82	111.8	1.7	0.4
U1456D-12R-1 30-36 cm	463	0.643	0.089	0.004	0.0132	0.0003	0.27254	86.5	3.7	84.5	1.6	143	86	84.5	1.6	2.3
U1456D-12R-1 30-36 cm	3640	0.913	0.105	0.002	0.0155	0.0003	0.72487	100.9	2.2	99.4	2.1	153	34	99.4	2.1	1.5
U1456D-12R-1 30-36 cm	378	0.420	0.046	0.002	0.0072	0.0001	0.10842	45.5	2.3	46.37	0.87	45	99	46.4	0.9	1.9
U1456D-12R-1 30-36 cm	135.1	2.490	1.616	0.036	0.1579	0.0026	0.51823	973	14	945	14	1041	41	1041.0	41.0	9.2
U1456D-12R-1 30-36 cm	85.2	0.617	0.606	0.021	0.0783	0.0014	0.25717	478	13	486	8.4	430	72	486.0	8.4	1.7
U1456D-12R-1 30-36 cm	99.7	1.013	0.128	0.008	0.0163	0.0005	0.14429	120.9	7.4	104.2	2.9	420	130	104.2	2.9	13.8
U1456D-12R-1 30-36 cm	25.2	0.642	3.970	0.140	0.2372	0.0071	0.47978	1619	29	1370	37	1971	62	DISC	DISC	30.5
U1456D-12R-1 30-36 cm	522	0.919	0.052	0.004	0.0077	0.0003	0.03671	51.2	4	49.7	1.6	130	160	49.7	1.6	2.9
U1456D-12R-1 30-36 cm	119.8	1.213	0.083	0.007	0.0111	0.0004	0.22522	80.5	6.1	71	2.6	350	150	71.0	2.6	11.8
U1456D-12R-1 30-36 cm	1657	3.880	1.178	0.020	0.1256	0.0021	0.78702	789.2	9.3	762	12	872	22	762.0	12.0	3.4
U1456D-12R-1 30-36 cm	670	0.859	0.137	0.004	0.0203	0.0004	0.52926	130.4	3.5	129.4	2.4	170	49	129.4	2.4	0.8
U1456D-12R-1 30-36 cm	308.3	0.596	0.044	0.003	0.0071	0.0002	0.04286	43.9	2.6	45.31	0.96	20	110	45.3	1.0	3.2
U1456D-12R-1 30-36 cm	846	4.170	0.647	0.010	0.0813	0.0013	0.75929	505.9	6.4	503.5	7.7	519	24	503.5	7.7	0.5
U1456D-12R-1 30-36 cm	636	2.023	0.110	0.003	0.0164	0.0002	0.37762	106	2.4	104.6	1.4	133	46	104.6	1.4	1.3
U1456D-12R-1 30-36 cm	92.9	0.928	1.175	0.031	0.1277	0.0021	0.48371	791	16	774	12	814	49	774.0	12.0	2.1
U1456D-12R-1 30-36 cm	597	1.668	1.060	0.019	0.1165	0.0019	0.77880	732.4	9.5	710	11	794	24	710.0	11.0	3.1
U1456D-12R-1 30-36 cm	358	1.643	0.974	0.029	0.1121	0.0029	0.77503	691	15	685	17	698	41	685.0	17.0	0.9
U1456D-12R-1 30-36 cm	422	12.340	1.951	0.063	0.1743	0.0044	0.81664	1097	22	1036	24	1229	37	1229.0	37.0	15.7
U1456D-12R-1 30-36 cm	598	4.110	5.800	0.160	0.3386	0.0078	0.91329	1941	24	1877	38	2001	20	2001.0	20.0	6.2
U1456D-12R-1 30-36 cm	520	0.649	4.020	0.110	0.2456	0.0064	0.78656	1633	22	1414	33	1914	27	1914.0	27.0	26.1

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		2σ	206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error					Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-12R-1 30-36 cm	352	0.771	0.064	0.004	0.0099	0.0002	0.04417	62.6	4		63.6	1.5	50	120	63.6	1.5	1.6
U1456D-12R-1 30-36 cm	870	0.913	0.274	0.006	0.0384	0.0007	0.47138	245.3	5		242.6	4.5	245	48	242.6	4.5	1.1
U1456D-12R-1 30-36 cm	904	1.980	0.018	0.001	0.0028	0.0001	0.20846	18.47	0.97		17.8	0.37	110	100	17.8	0.4	3.6
U1456D-12R-1 30-36 cm	356	2.556	8.560	0.180	0.4347	0.0081	0.89786	2287	19		2324	36	2242	16	2242.0	16.0	3.7
U1456D-13R-1 30-38 cm	272	0.681	0.078	0.005	0.0118	0.0002	0.02588	75.9	4.4		75.3	1.3	110	120	75.3	1.3	0.8
U1456D-13R-1 30-38 cm	3010	9.100	0.622	0.019	0.0787	0.0024	0.79676	490	12		488	14	495	46	488.0	14.0	0.4
U1456D-13R-1 30-38 cm	1085	0.994	0.944	0.011	0.1061	0.0012	0.63945	674.5	5.5		650.1	7.1	756	18	650.1	7.1	3.6
U1456D-13R-1 30-38 cm	5440	#####	0.445	0.012	0.0561	0.0015	0.93621	372.8	8.3		351.6	9.2	508	20	351.6	9.2	5.7
U1456D-13R-1 30-38 cm	331	0.838	5.394	0.081	0.3200	0.0039	0.84743	1882	13		1789	19	1984	14	1984.0	14.0	9.8
U1456D-13R-1 30-38 cm	215.5	1.026	1.182	0.018	0.1306	0.0015	0.52695	790.8	8.6		791.1	8.8	780	28	791.1	8.8	0.0
U1456D-13R-1 30-38 cm	656	7.170	1.364	0.022	0.1421	0.0020	0.64799	872.5	9.4		856	11	910	30	910.0	30.0	5.9
U1456D-13R-1 30-38 cm	446	1.636	3.822	0.046	0.2648	0.0031	0.76057	1595.9	9.7		1514	16	1701	16	1701.0	16.0	11.0
U1456D-13R-1 30-38 cm	87.3	0.668	0.083	0.008	0.0117	0.0003	0.16777	79.5	7.6		75	1.9	170	170	75.0	1.9	5.7
U1456D-13R-1 30-38 cm	446	0.959	0.125	0.004	0.0185	0.0003	0.19381	119	4		117.9	2.1	158	75	117.9	2.1	0.9
U1456D-13R-1 30-38 cm	1458	22.340	0.553	0.015	0.0705	0.0017	0.65047	446.1	9.5		439	10	476	47	439.0	10.0	1.6
U1456D-13R-1 30-38 cm	1346	0.241	0.126	0.006	0.0176	0.0007	0.45475	119.9	5.4		112.6	4.2	230	92	112.6	4.2	6.1
U1456D-13R-1 30-38 cm	305.8	0.570	1.345	0.025	0.1287	0.0020	0.40451	864	11		780	11	1076	39	780.0	11.0	9.7
U1456D-13R-1 30-38 cm	755	0.589	0.073	0.002	0.0111	0.0002	0.18171	71.9	1.9		71	1	120	57	71.0	1.0	1.3
U1456D-13R-1 30-38 cm	535	0.678	0.131	0.004	0.0187	0.0004	0.38362	124.8	3.6		119.3	2.2	229	59	119.3	2.2	4.4
U1456D-13R-1 30-38 cm	531	11.100	1.467	0.023	0.1533	0.0023	0.63099	917.1	9.2		919	13	911	26	911.0	26.0	0.9
U1456D-13R-1 30-38 cm	262	1.633	0.914	0.026	0.1026	0.0027	0.68169	659	13		629	15	749	45	629.0	15.0	4.6
U1456D-13R-1 30-38 cm	1500	0.750	0.073	0.002	0.0112	0.0001	0.07119	71.5	2		71.63	0.91	72	57	71.6	0.9	0.2
U1456D-13R-1 30-38 cm	309.8	1.250	1.994	0.027	0.1880	0.0021	0.57248	1112.5	9		1110	12	1117	23	1117.0	23.0	0.6
U1456D-13R-1 30-38 cm	493	1.340	1.414	0.021	0.1416	0.0018	0.65302	893.5	8.8		853	10	977	25	977.0	25.0	12.7
U1456D-13R-1 30-38 cm	318	0.947	3.802	0.058	0.2730	0.0038	0.74255	1592	12		1555	19	1643	20	1643.0	20.0	5.4
U1456D-13R-1 30-38 cm	291.5	1.287	0.084	0.003	0.0117	0.0002	0.04547	81.2	3.1		74.74	0.96	259	83	74.7	1.0	8.0
U1456D-13R-1 30-38 cm	2149	1.708	0.035	0.001	0.0052	0.0001	0.18187	34.5	1		33.62	0.61	100	66	33.6	0.6	2.6
U1456D-13R-1 30-38 cm	633	0.626	0.788	0.013	0.0930	0.0010	0.58163	589.2	7		573	5.9	651	29	573.0	5.9	2.7
U1456D-13R-1 30-38 cm	307	0.602	0.054	0.004	0.0070	0.0002	0.17435	53.4	4.2		44.9	1	380	160	DISC	DISC	15.9
U1456D-13R-1 30-38 cm	899	0.962	0.066	0.002	0.0102	0.0002	0.32491	64.8	1.9		65.16	0.94	76	57	65.2	0.9	0.6
U1456D-13R-1 30-38 cm	1781	0.726	0.019	0.001	0.0027	0.0001	0.26064	18.94	0.99		17.34	0.34	210	100	17.3	0.3	8.4
U1456D-13R-1 30-38 cm	2560	1.791	0.630	0.014	0.0759	0.0018	0.57727	495.6	8.7		472	11	589	44	472.0	11.0	4.8
U1456D-13R-1 30-38 cm	164.4	5.200	4.052	0.046	0.2873	0.0029	0.47838	1643.2	9.2		1627	15	1666	20	1666.0	20.0	2.3
U1456D-13R-1 30-38 cm	132	1.027	0.106	0.007	0.0160	0.0003	0.06949	101.4	6.3		102.4	2.2	90	120	102.4	2.2	1.0
U1456D-13R-1 30-38 cm	4350	3.090	0.048	0.001	0.0072	0.0001	0.33845	47.35	0.96		46.09	0.7	119	44	46.1	0.7	2.7

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-13R-1 30-38 cm	238.2	0.384	0.150	0.007	0.0192	0.0004	0.11126	141.4	5.9	122.8	2.6	432	98	122.8	2.6	13.2
U1456D-13R-1 30-38 cm	160.6	0.477	1.064	0.030	0.1180	0.0018	0.36895	732	15	719	11	774	56	719.0	11.0	1.8
U1456D-13R-1 30-38 cm	1440	1.194	0.080	0.003	0.0120	0.0002	0.09182	78.1	2.3	77	1.3	112	70	77.0	1.3	1.4
U1456D-13R-1 30-38 cm	454	0.678	0.052	0.003	0.0076	0.0002	0.40220	50.5	2.5	49.01	0.94	136	85	49.0	0.9	3.0
U1456D-13R-1 30-38 cm	345	0.576	1.884	0.038	0.1775	0.0034	0.69397	1073	13	1052	18	1112	22	1112.0	22.0	5.4
U1456D-13R-1 30-38 cm	1000	1.993	0.298	0.012	0.0377	0.0011	0.82851	264.3	9	238.8	6.7	496	46	238.8	6.7	9.6
U1456D-13R-1 30-38 cm	782	0.873	0.054	0.002	0.0080	0.0001	0.21953	53	2.3	51.24	0.75	160	89	51.2	0.8	3.3
U1456D-13R-1 30-38 cm	1300	1.400	0.114	0.003	0.0167	0.0002	0.13552	109	2.4	106.7	1.5	155	48	106.7	1.5	2.1
U1456D-13R-1 30-38 cm	246	0.635	1.372	0.026	0.1445	0.0020	0.60947	875	11	870	11	884	31	884.0	31.0	1.6
U1456D-13R-1 30-38 cm	119.2	1.391	0.688	0.017	0.0844	0.0011	0.25473	531	10	522	6.7	559	54	522.0	6.7	1.7
U1456D-13R-1 30-38 cm	504	1.119	0.102	0.004	0.0147	0.0003	0.39537	98.6	3.7	94.3	2.1	198	77	94.3	2.1	4.4
U1456D-13R-1 30-38 cm	1100	0.764	0.051	0.002	0.0069	0.0002	0.43870	50.3	2.1	44.6	1.1	322	78	44.6	1.1	11.3
U1456D-13R-1 30-38 cm	1477	6.500	0.807	0.014	0.0937	0.0018	0.37046	600.2	8.1	578	11	681	45	578.0	11.0	3.7
U1456D-13R-1 30-38 cm	246	1.126	1.526	0.027	0.1557	0.0022	0.57133	940	11	933	12	951	31	951.0	31.0	1.9
U1456D-13R-1 30-38 cm	87.4	1.148	0.088	0.012	0.0092	0.0003	0.19507	85	11	58.9	2.1	700	260	DISC	DISC	30.7
U1456D-13R-1 30-38 cm	594	1.522	0.092	0.005	0.0080	0.0002	0.01563	89.2	4.5	51	1.3	1250	110	DISC	DISC	42.8
U1456D-13R-1 30-38 cm	396.3	2.013	2.852	0.042	0.2334	0.0032	0.60004	1368	11	1352	17	1387	24	1387.0	24.0	2.5
U1456D-13R-1 30-38 cm	479	1.408	4.660	0.063	0.3033	0.0039	0.69892	1758	11	1707	19	1820	19	1820.0	19.0	6.2
U1456D-13R-1 30-38 cm	457	11.200	0.931	0.017	0.1094	0.0019	0.47498	669	9.2	669	11	665	40	669.0	11.0	0.0
U1456D-13R-1 30-38 cm	784	1.390	0.125	0.004	0.0183	0.0003	0.33869	119.1	3.3	116.7	2	176	63	116.7	2.0	2.0
U1456D-13R-1 30-38 cm	740	1.108	0.133	0.006	0.0189	0.0006	0.58276	126.2	5.1	120.9	3.7	239	76	120.9	3.7	4.2
U1456D-13R-1 30-38 cm	1130	0.769	0.065	0.003	0.0089	0.0002	0.02592	63.5	2.7	57.2	1.3	300	100	57.2	1.3	9.9
U1456D-13R-1 30-38 cm	1506	1.846	0.160	0.003	0.0225	0.0003	0.50336	150.3	2.9	143.4	1.9	217	37	143.4	1.9	4.6
U1456D-13R-1 30-38 cm	744	5.260	0.719	0.012	0.0873	0.0013	0.63979	549.2	6.9	539.6	7.9	580	30	539.6	7.9	1.7
U1456D-13R-1 30-38 cm	274	2.170	0.240	0.008	0.0343	0.0007	0.21302	217.9	6.4	217.4	4.5	223	70	217.4	4.5	0.2
U1456D-13R-1 30-38 cm	1500	2.290	0.116	0.002	0.0170	0.0002	0.26047	111.1	2.1	108.9	1	142	37	108.9	1.0	2.0
U1456D-13R-1 30-38 cm	480	1.847	0.075	0.003	0.0114	0.0002	0.13246	73.5	2.5	73	1	121	73	73.0	1.0	0.7
U1456D-13R-1 30-38 cm	881	0.646	1.018	0.015	0.1148	0.0016	0.65688	712.2	7.3	700.6	9.3	744	24	700.6	9.3	1.6
U1456D-13R-1 30-38 cm	798	2.244	0.269	0.005	0.0377	0.0006	0.50245	241.3	3.8	238.4	3.6	248	36	238.4	3.6	1.2
U1456D-13R-1 30-38 cm	509	1.670	1.822	0.020	0.1669	0.0014	0.51964	1052.6	7.1	994.8	7.5	1169	18	1169.0	18.0	14.9
U1456D-13R-1 30-38 cm	423	0.688	0.074	0.003	0.0106	0.0001	0.20267	72.6	2.8	68.23	0.91	198	74	68.2	0.9	6.0
U1456D-13R-1 30-38 cm	665	0.542	0.351	0.007	0.0470	0.0006	0.39461	306.2	5.1	295.9	3.5	375	40	295.9	3.5	3.4
U1456D-13R-1 30-38 cm	175	0.629	0.059	0.006	0.0074	0.0003	0.31726	58.4	5.8	47.3	1.6	410	190	DISC	DISC	19.0
U1456D-13R-1 30-38 cm	243	0.725	0.061	0.004	0.0084	0.0002	0.11856	60.2	4.1	54	1.1	280	150	54.0	1.1	10.3
U1456D-13R-1 30-38 cm	575	0.490	1.391	0.018	0.1389	0.0017	0.50246	884.2	7.7	838.3	9.4	1001	25	838.3	9.4	5.2

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-13R-1 30-38 cm	162	0.875	0.054	0.006	0.0078	0.0002	0.12223	53	5.8	50.3	1.3	80	190	50.3	1.3	5.1
U1456D-13R-1 30-38 cm	1210	8.400	0.224	0.020	0.0303	0.0025	0.84603	204	17	193	16	340	100	193.0	16.0	5.4
U1456D-13R-1 30-38 cm	324	0.954	0.799	0.019	0.0905	0.0019	0.58780	596	10	558	11	734	44	558.0	11.0	6.4
U1456D-13R-1 30-38 cm	81.9	0.490	1.946	0.040	0.1780	0.0028	0.60342	1095	14	1057	16	1172	33	1172.0	33.0	9.8
U1456D-13R-1 30-38 cm	538	2.210	1.747	0.048	0.1513	0.0039	0.76649	1024	18	907	22	1281	36	1281.0	36.0	29.2
U1456D-13R-1 30-38 cm	511	1.052	0.066	0.003	0.0093	0.0002	0.26115	65.1	2.4	59.55	0.94	262	76	59.6	0.9	8.5
U1456D-13R-1 30-38 cm	126	2.600	1.154	0.024	0.1184	0.0020	0.52238	777	11	721	12	939	39	721.0	12.0	7.2
U1456D-13R-1 30-38 cm	628	1.224	0.977	0.021	0.1072	0.0021	0.70345	691	11	656	12	819	37	656.0	12.0	5.1
U1456D-13R-1 30-38 cm	453	0.724	0.114	0.004	0.0165	0.0003	0.39485	109.5	3.1	105.8	2.2	185	60	105.8	2.2	3.4
U1456D-13R-1 30-38 cm	109	1.182	1.322	0.025	0.1377	0.0015	0.39424	853	11	831.3	8.4	902	36	831.3	8.4	2.5
U1456D-13R-1 30-38 cm	874	5.510	0.609	0.009	0.0768	0.0008	0.60219	482.5	5.4	477	4.5	499	25	477.0	4.5	1.1
U1456D-13R-1 30-38 cm	208	0.392	0.075	0.008	0.0107	0.0004	0.18193	73.2	7.7	68.3	2.6	260	210	68.3	2.6	6.7
U1456D-13R-1 30-38 cm	1300	12.600	0.749	0.027	0.0920	0.0034	0.76638	566	15	567	20	563	53	567.0	20.0	0.2
U1456D-13R-1 30-38 cm	725	5.470	0.934	0.018	0.1074	0.0021	0.64542	669	9.6	658	12	705	35	658.0	12.0	1.6
U1456D-13R-1 30-38 cm	134	0.814	0.055	0.010	0.0081	0.0008	0.34553	54.1	9.9	52.1	5.4	240	320	DISC	DISC	3.7
U1456D-13R-1 30-38 cm	408.4	6.860	0.468	0.013	0.0569	0.0014	0.73636	389.1	9.2	356.6	8.4	592	44	356.6	8.4	8.4
U1456D-13R-1 30-38 cm	535	0.696	0.860	0.021	0.0977	0.0022	0.70594	633	14	601	13	743	45	601.0	13.0	5.1
U1456D-13R-1 30-38 cm	419	1.761	4.428	0.086	0.3008	0.0056	0.39267	1715	16	1694	28	1741	32	1741.0	32.0	2.7
U1456D-13R-1 30-38 cm	141.3	1.351	0.720	0.019	0.0878	0.0009	0.34577	551	11	542.6	5.3	565	55	542.6	5.3	1.5
U1456D-13R-1 30-38 cm	498	1.415	0.117	0.003	0.0167	0.0003	0.22843	111.9	3.1	106.7	1.7	229	63	106.7	1.7	4.6
U1456D-13R-1 30-38 cm	98.5	1.037	0.078	0.008	0.0112	0.0003	0.05458	75.1	7	71.6	2	160	180	71.6	2.0	4.7
U1456D-13R-1 30-38 cm	373.4	2.054	1.442	0.044	0.1469	0.0042	0.83203	903	18	882	24	957	41	957.0	41.0	7.8
U1456D-13R-1 30-38 cm	313	2.510	0.069	0.004	0.0102	0.0002	0.22392	67.4	3.3	65.4	1.2	120	88	65.4	1.2	3.0
U1456D-13R-1 30-38 cm	188	0.837	0.085	0.006	0.0126	0.0003	0.00607	83.2	5.3	80.6	1.6	160	130	80.6	1.6	3.1
U1456D-13R-1 30-38 cm	827	2.160	0.303	0.010	0.0396	0.0010	0.39518	268.7	7.7	250.3	5.9	421	74	250.3	5.9	6.8
U1456D-13R-1 30-38 cm	581	1.080	0.048	0.002	0.0076	0.0002	0.17902	47.8	2.1	48.7	0.96	26	82	48.7	1.0	1.9
U1456D-13R-1 30-38 cm	370	4.200	0.116	0.005	0.0174	0.0003	0.28818	110.7	4.3	111	2.1	133	81	111.0	2.1	0.3
U1456D-13R-1 30-38 cm	39.08	1.046	0.152	0.016	0.0206	0.0007	0.24386	140	14	131.4	4.4	220	190	131.4	4.4	6.1
U1456D-13R-1 30-38 cm	2230	1.310	0.023	0.001	0.0034	0.0001	0.28583	22.71	0.84	21.78	0.49	119	72	21.8	0.5	4.1
U1456D-13R-1 30-38 cm	214.6	0.471	1.240	0.024	0.1307	0.0020	0.42160	817	11	791	11	884	38	791.0	11.0	3.2
U1456D-13R-1 30-38 cm	1086	0.618	0.977	0.016	0.1060	0.0018	0.57596	691.6	8.3	649	11	833	28	649.0	11.0	6.2
U1456D-13R-1 30-38 cm	598	26.200	0.159	0.012	0.0240	0.0013	0.63733	150	10	152.9	7.9	100	110	152.9	7.9	1.9
U1456D-13R-1 30-38 cm	220	1.970	1.593	0.043	0.1542	0.0034	0.73742	965	17	924	19	1050	39	1050.0	39.0	12.0
U1456D-13R-1 30-38 cm	404	0.829	0.117	0.005	0.0168	0.0003	0.39115	111.9	4.5	107.2	2.1	194	77	107.2	2.1	4.2
U1456D-13R-1 30-38 cm	56	0.555	0.094	0.018	0.0126	0.0005	0.11098	89	17	80.7	3.3	120	330	80.7	3.3	9.3

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-13R-1 30-38 cm	1858	0.458	0.780	0.010	0.0941	0.0011	0.70399	585	5.5	579.8	6.6	601	20	579.8	6.6	0.9
U1456D-13R-1 30-38 cm	475	0.884	1.169	0.018	0.1321	0.0018	0.56370	784.7	8.6	800	10	744	28	800.0	10.0	1.9
U1456D-13R-1 30-38 cm	461	3.230	0.735	0.025	0.0859	0.0035	0.61288	558	14	531	21	656	64	531.0	21.0	4.8
U1456D-13R-1 30-38 cm	1353	0.485	0.069	0.001	0.0101	0.0001	0.25229	67.8	1.4	64.95	0.77	178	47	65.0	0.8	4.2
U1456D-13R-1 30-38 cm	324	0.757	0.090	0.004	0.0135	0.0002	0.13578	86.9	3.9	86.5	1.4	103	87	86.5	1.4	0.5
U1456D-13R-1 30-38 cm	940	11.650	0.325	0.022	0.0427	0.0026	0.59807	285	17	269	16	400	110	269.0	16.0	5.6
U1456D-13R-1 30-38 cm	1105	2.300	0.927	0.014	0.1028	0.0014	0.78116	665.5	7.4	630.9	8	781	20	630.9	8.0	5.2
U1456D-13R-1 30-38 cm	373	60.000	0.175	0.009	0.0242	0.0007	0.31864	163.1	7.8	154.3	4.4	280	110	154.3	4.4	5.4
U1456D-13R-1 30-38 cm	437	0.870	0.117	0.004	0.0175	0.0002	0.39599	112.5	3.8	112	1.4	128	67	112.0	1.4	0.4
U1456D-13R-1 30-38 cm	744	1.800	0.123	0.007	0.0181	0.0006	0.52625	117.3	6.6	115.9	3.8	150	100	115.9	3.8	1.2
U1456D-13R-1 30-38 cm	324	2.044	3.350	0.110	0.2235	0.0064	0.82234	1491	25	1300	34	1772	34	1772.0	34.0	26.6
U1456D-13R-1 30-38 cm	166.3	22.900	2.848	0.075	0.1846	0.0043	0.74503	1363	20	1091	23	1823	31	DISC	DISC	40.2
U1456D-13R-1 30-38 cm	3440	1.466	0.051	0.002	0.0074	0.0001	0.58250	50.8	1.5	47.39	0.75	175	43	47.4	0.8	6.7
U1456D-13R-1 30-38 cm	184.2	2.610	1.253	0.030	0.1379	0.0025	0.61202	822	14	832	14	810	39	832.0	14.0	1.2
U1456D-13R-1 30-38 cm	287	1.206	0.122	0.010	0.0179	0.0007	0.06818	116.3	8.8	114.5	4.3	110	120	114.5	4.3	1.5
U1456D-13R-1 30-38 cm	97.2	1.104	6.069	0.059	0.3556	0.0023	0.46540	1985.4	8.6	1961	11	2010	15	2010.0	15.0	2.4
U1456D-13R-1 30-38 cm	1266	0.483	0.014	0.001	0.0016	0.0000	0.05264	13.8	1.2	10.05	0.26	610	170	DISC	DISC	27.2
U1456D-13R-1 30-38 cm	1630	61.200	0.736	0.015	0.0893	0.0019	0.61897	559.3	8.6	551	11	591	35	551.0	11.0	1.5
U1456D-13R-1 30-38 cm	337.5	1.892	1.670	0.041	0.1644	0.0036	0.59548	996	16	981	20	1023	46	1023.0	46.0	4.1
U1456D-13R-1 30-38 cm	543	1.354	2.980	0.071	0.2199	0.0052	0.79599	1397	19	1280	28	1591	30	1591.0	30.0	19.5
U1456D-13R-1 30-38 cm	1119	1.068	0.143	0.002	0.0207	0.0002	0.26537	136	2.1	132.1	1.1	202	35	132.1	1.1	2.9
U1456D-13R-1 30-38 cm	4150	1.781	0.036	0.001	0.0053	0.0001	0.42963	35.7	0.92	34.1	0.51	160	50	34.1	0.5	4.5
U1456D-13R-1 30-38 cm	553.9	0.943	0.052	0.003	0.0078	0.0001	0.02670	51.4	2.3	49.82	0.68	119	81	49.8	0.7	3.1
U1456D-13R-1 30-38 cm	84.1	0.802	1.165	0.024	0.1253	0.0013	0.17416	783	11	760.8	7.2	834	43	760.8	7.2	2.8
U1456D-15R-1 55-61 cm	83.4	0.602	0.077	0.008	0.0105	0.0003	0.15682	73.8	7.8	67.3	2.1	200	190	67.3	2.1	8.8
U1456D-15R-1 55-61 cm	81.7	0.377	0.669	0.022	0.0808	0.0009	0.19239	517	13	500.9	5.4	550	69	500.9	5.4	3.1
U1456D-15R-1 55-61 cm	370	1.207	0.165	0.006	0.0233	0.0003	0.29452	154.5	5	148.5	2	225	68	148.5	2.0	3.9
U1456D-15R-1 55-61 cm	438	1.954	0.071	0.003	0.0103	0.0002	0.18708	69	2.9	65.9	1.2	167	83	65.9	1.2	4.5
U1456D-15R-1 55-61 cm	511	2.859	0.051	0.003	0.0078	0.0001	0.15775	50.3	2.4	49.86	0.82	68	91	49.9	0.8	0.9
U1456D-15R-1 55-61 cm	197.7	0.857	10.610	0.150	0.4628	0.0052	0.54118	2488	13	2451	23	2512	21	2512.0	21.0	2.4
U1456D-15R-1 55-61 cm	1509	3.360	0.037	0.001	0.0056	0.0001	0.19057	37.2	1.1	36.06	0.35	119	61	36.1	0.4	3.1
U1456D-15R-1 55-61 cm	1625	1.542	0.036	0.001	0.0055	0.0001	0.14914	35.6	1.1	35.46	0.42	59	62	35.5	0.4	0.4
U1456D-15R-1 55-61 cm	1130	3.840	0.047	0.002	0.0071	0.0001	0.00514	46.7	1.8	45.36	0.71	140	81	45.4	0.7	2.9
U1456D-15R-1 55-61 cm	1680	0.930	0.053	0.002	0.0082	0.0001	0.35549	52.6	1.5	52.89	0.84	36	52	52.9	0.8	0.6
U1456D-15R-1 55-61 cm	140	2.440	0.812	0.020	0.0978	0.0016	0.23667	601	11	601.3	9.3	576	57	601.3	9.3	0.0

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-15R-1 55-61 cm	279	1.306	0.059	0.004	0.0085	0.0002	0.14404	57.6	3.4	54.8	1	160	120	54.8	1.0	4.9
U1456D-15R-1 55-61 cm	200.4	1.760	2.103	0.035	0.1910	0.0028	0.64050	1148	12	1126	15	1191	26	1191.0	26.0	5.5
U1456D-15R-1 55-61 cm	65.29	0.938	0.137	0.010	0.0200	0.0005	0.05131	129.2	8.5	127.9	2.9	170	140	127.9	2.9	1.0
U1456D-15R-1 55-61 cm	1045	1.700	7.461	0.090	0.3627	0.0048	0.71437	2168	11	1994	22	2340	16	2340.0	16.0	14.8
U1456D-15R-1 55-61 cm	1452	1.350	0.037	0.001	0.0055	0.0001	0.31835	36.4	1.3	35.21	0.71	139	69	35.2	0.7	3.3
U1456D-15R-1 55-61 cm	428	5.800	4.229	0.078	0.2966	0.0048	0.64848	1675	15	1673	24	1685	28	1685.0	28.0	0.7
U1456D-15R-1 55-61 cm	1190	10.800	0.631	0.011	0.0786	0.0012	0.63628	496.4	7	487.9	7.1	546	28	487.9	7.1	1.7
U1456D-15R-1 55-61 cm	119	1.700	0.327	0.012	0.0432	0.0009	0.26202	285.7	9.3	272.4	5.5	380	80	272.4	5.5	4.7
U1456D-15R-1 55-61 cm	163.2	1.895	1.104	0.033	0.1219	0.0020	0.46291	753	16	741	12	786	54	741.0	12.0	1.6
U1456D-15R-1 55-61 cm	584	1.380	0.643	0.013	0.0863	0.0015	0.43936	503.3	8.1	533.3	9.1	376	45	533.3	9.1	6.0
U1456D-15R-1 55-61 cm	362	4.070	0.333	0.013	0.0424	0.0013	0.37253	291.3	9.7	267.9	8.1	501	90	267.9	8.1	8.0
U1456D-15R-1 55-61 cm	528	4.030	0.829	0.012	0.0998	0.0010	0.33434	612	6.7	613.2	6	611	31	613.2	6.0	0.2
U1456D-15R-1 55-61 cm	380	1.311	0.213	0.013	0.0180	0.0004	0.05074	195	11	114.7	2.4	1290	120	DISC	DISC	41.2
U1456D-15R-1 55-61 cm	1260	1.511	0.039	0.001	0.0059	0.0001	0.20802	38.5	1.3	38.15	0.65	109	72	38.2	0.7	0.9
U1456D-15R-1 55-61 cm	730	2.490	0.445	0.045	0.0488	0.0022	0.67434	372	31	307	13	790	200	DISC	DISC	17.5
U1456D-15R-1 55-61 cm	137.3	6.200	2.310	0.060	0.2009	0.0032	0.22327	1214	18	1180	17	1282	51	1282.0	51.0	8.0
U1456D-15R-1 55-61 cm	1181	11.130	0.124	0.009	0.0160	0.0008	0.61032	118.2	8.3	102.5	4.9	430	120	102.5	4.9	13.3
U1456D-15R-1 55-61 cm	247.1	0.721	0.601	0.017	0.0699	0.0018	0.43515	478	10	435	11	696	59	435.0	11.0	9.0
U1456D-15R-1 55-61 cm	558	1.121	0.104	0.003	0.0161	0.0002	0.14633	100.4	2.9	102.6	1.3	89	62	102.6	1.3	2.2
U1456D-15R-1 55-61 cm	438	0.717	0.070	0.003	0.0079	0.0002	0.28951	68.6	3.2	50.7	1.3	710	100	DISC	DISC	26.1
U1456D-15R-1 55-61 cm	359	1.037	0.307	0.007	0.0433	0.0006	0.36083	271.2	5.1	272.9	3.4	260	48	272.9	3.4	0.6
U1456D-15R-1 55-61 cm	1147	1.960	0.017	0.001	0.0026	0.0000	0.09437	16.82	0.86	16.72	0.29	70	100	16.7	0.3	0.6
U1456D-15R-1 55-61 cm	138.5	0.325	0.711	0.019	0.0888	0.0014	0.29709	543	11	548.4	8.2	515	60	548.4	8.2	1.0
U1456D-15R-1 55-61 cm	1789	2.494	0.230	0.005	0.0334	0.0007	0.58736	210.7	4.1	211.9	4.5	206	43	211.9	4.5	0.6
U1456D-15R-1 55-61 cm	983	1.120	0.051	0.002	0.0073	0.0001	0.14761	50	1.9	46.97	0.73	185	79	47.0	0.7	6.1
U1456D-15R-1 55-61 cm	289.1	1.547	4.270	0.120	0.2786	0.0078	0.63484	1678	22	1580	39	1823	41	1823.0	41.0	13.3
U1456D-15R-1 55-61 cm	674	1.960	0.112	0.004	0.0167	0.0003	0.36304	108	3.2	106.5	2	139	54	106.5	2.0	1.4
U1456D-15R-1 55-61 cm	563	43.000	0.651	0.023	0.0796	0.0023	0.42488	508	14	493	14	549	69	493.0	14.0	3.0
U1456D-15R-1 55-61 cm	245	1.991	1.312	0.036	0.1392	0.0033	0.64598	853	17	840	19	886	49	840.0	19.0	1.5
U1456D-15R-1 55-61 cm	221.6	4.870	4.540	0.110	0.3047	0.0073	0.63916	1732	20	1711	36	1763	37	1763.0	37.0	2.9
U1456D-15R-1 55-61 cm	231	1.303	1.450	0.029	0.1468	0.0019	0.57685	909	12	883	11	966	34	966.0	34.0	8.6
U1456D-15R-1 55-61 cm	293	1.782	0.094	0.006	0.0138	0.0005	0.21311	90.7	5.4	88.1	3.3	200	120	88.1	3.3	2.9
U1456D-15R-1 55-61 cm	190.4	0.925	0.066	0.006	0.0091	0.0003	0.23398	64.5	5.3	58.3	2	240	160	58.3	2.0	9.6
U1456D-15R-1 55-61 cm	289	1.724	1.310	0.031	0.1338	0.0031	0.45351	847	14	809	18	930	52	809.0	18.0	4.5
U1456D-15R-1 55-61 cm	362.5	0.675	0.067	0.004	0.0102	0.0003	0.11510	65.2	3.6	65.1	1.6	70	100	65.1	1.6	0.2

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-15R-1 55-61 cm	815	1.790	0.702	0.012	0.0862	0.0011	0.51942	539.3	7	532.8	6.3	549	32	532.8	6.3	1.2
U1456D-15R-1 55-61 cm	887	#####	0.569	0.038	0.0661	0.0056	0.49316	461	27	412	34	720	160	412.0	34.0	10.6
U1456D-15R-1 55-61 cm	363	1.751	3.344	0.092	0.2377	0.0066	0.63743	1488	21	1373	34	1645	45	1645.0	45.0	16.5
U1456D-15R-1 55-61 cm	176.4	2.185	1.914	0.042	0.1824	0.0034	0.53045	1082	14	1079	19	1072	38	1072.0	38.0	0.7
U1456D-15R-1 55-61 cm	640	0.860	0.064	0.003	0.0097	0.0002	0.10194	63.1	2.4	62.36	0.97	89	79	62.4	1.0	1.2
U1456D-15R-1 55-61 cm	121.2	0.662	3.032	0.071	0.2469	0.0044	0.72583	1415	17	1425	22	1386	31	1386.0	31.0	2.8
U1456D-15R-1 55-61 cm	319	0.828	0.093	0.005	0.0133	0.0003	0.17346	89.7	4.3	85.4	1.9	180	100	85.4	1.9	4.8
U1456D-15R-1 55-61 cm	1133	1.360	0.018	0.001	0.0024	0.0001	0.16924	18.16	0.98	15.52	0.51	320	110	15.5	0.5	14.5
U1456D-15R-1 55-61 cm	354	3.680	0.054	0.007	0.0066	0.0005	0.38079	53.4	6.6	42.5	2.9	440	250	DISC	DISC	20.4
U1456D-15R-1 55-61 cm	281	1.552	1.186	0.016	0.1298	0.0015	0.56926	793.1	7.6	786.5	8.5	805	25	786.5	8.5	0.8
U1456D-15R-1 55-61 cm	891.3	0.689	0.099	0.002	0.0077	0.0001	0.25413	95.6	2.2	49.55	0.6	1464	47	DISC	DISC	48.2
U1456D-15R-1 55-61 cm	176	1.237	0.093	0.006	0.0135	0.0003	0.02429	89.8	5.6	86.3	1.7	170	120	86.3	1.7	3.9
U1456D-15R-1 55-61 cm	447	1.101	0.061	0.003	0.0093	0.0002	0.07524	59.8	2.6	59.9	1	104	93	59.9	1.0	0.2
U1456D-15R-1 55-61 cm	268.9	1.504	6.908	0.070	0.3366	0.0030	0.52017	2098.7	9.1	1870	14	2340	16	2340.0	16.0	20.1
U1456D-15R-1 55-61 cm	798	14.200	1.702	0.023	0.1684	0.0020	0.72492	1008	8.5	1003	11	1025	18	1025.0	18.0	2.1
U1456D-15R-1 55-61 cm	148.8	1.774	9.860	0.140	0.4392	0.0061	0.71296	2420	13	2346	27	2494	18	2494.0	18.0	5.9
U1456D-15R-1 55-61 cm	182	0.769	0.050	0.004	0.0079	0.0002	0.02958	49.2	3.4	50.9	1.3	20	130	50.9	1.3	3.5
U1456D-15R-1 55-61 cm	552	0.799	0.046	0.002	0.0070	0.0001	0.03758	45.6	2.3	45.17	0.56	89	94	45.2	0.6	0.9
U1456D-15R-1 55-61 cm	1510	3.441	0.121	0.002	0.0183	0.0002	0.31999	115.6	2	117	1.1	114	35	117.0	1.1	1.2
U1456D-15R-1 55-61 cm	297	1.401	0.063	0.004	0.0101	0.0002	0.07362	61.8	3.3	65.1	1.3	7	99	65.1	1.3	5.3
U1456D-15R-1 55-61 cm	641	23.100	0.698	0.034	0.0856	0.0019	0.21871	536	19	529	11	545	69	529.0	11.0	1.3
U1456D-15R-1 55-61 cm	224.2	3.940	1.281	0.028	0.1383	0.0018	0.38091	836	13	835	10	863	45	835.0	10.0	0.1
U1456D-15R-1 55-61 cm	595	4.270	0.590	0.011	0.0768	0.0013	0.63597	470.2	7.2	476.7	7.9	474	38	476.7	7.9	1.4
U1456D-15R-1 55-61 cm	167	1.920	1.966	0.042	0.1603	0.0024	0.50124	1101	14	958	13	1422	36	DISC	DISC	32.6
U1456D-15R-1 55-61 cm	372.5	3.620	1.491	0.029	0.1563	0.0028	0.59600	925	12	935	16	924	36	924.0	36.0	1.2
U1456D-15R-1 55-61 cm	521	0.709	6.350	0.110	0.2915	0.0046	0.77553	2021	15	1648	23	2450	19	DISC	DISC	32.7
U1456D-15R-1 55-61 cm	284	1.060	0.051	0.004	0.0082	0.0002	0.14062	50.5	3.6	52.7	1.3	70	140	52.7	1.3	4.4
U1456D-15R-1 55-61 cm	103	2.620	0.112	0.013	0.0180	0.0007	0.06922	106	12	115.2	4.5	0	210	115.2	4.5	8.7
U1456D-15R-1 55-61 cm	168.9	0.505	0.616	0.028	0.0763	0.0018	0.37829	485	18	474	11	556	96	474.0	11.0	2.3
U1456D-15R-1 55-61 cm	900	0.510	0.052	0.002	0.0080	0.0002	0.32354	50.9	1.8	51.35	0.96	102	68	51.4	1.0	0.9
U1456D-15R-1 55-61 cm	304	0.878	0.076	0.004	0.0121	0.0002	0.46123	74.6	3.3	77.3	1.2	63	89	77.3	1.2	3.6
U1456D-15R-1 55-61 cm	139.7	0.743	0.074	0.005	0.0111	0.0003	0.19994	72.2	4.7	71.4	1.7	120	120	71.4	1.7	1.1
U1456D-15R-1 55-61 cm	86.1	2.179	1.436	0.039	0.1524	0.0023	0.16380	902	16	914	13	890	61	890.0	61.0	2.7
U1456D-15R-1 55-61 cm	733	2.947	9.820	0.110	0.4400	0.0048	0.64071	2418	11	2349	21	2497	15	2497.0	15.0	5.9
U1456D-15R-1 55-61 cm	752	1.617	0.118	0.003	0.0178	0.0003	0.27007	113	2.4	113.8	1.6	143	49	113.8	1.6	0.7

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-15R-1 55-61 cm	314	2.790	0.660	0.012	0.0826	0.0009	0.43634	513.4	7.2	511.5	5.1	538	35	511.5	5.1	0.4
U1456D-15R-1 55-61 cm	250	1.031	1.229	0.017	0.1364	0.0014	0.44995	812.7	8	824.1	8.1	792	29	824.1	8.1	1.4
U1456D-15R-1 55-61 cm	207.4	1.132	0.060	0.004	0.0086	0.0002	0.05529	59	3.6	55.3	1.2	210	120	55.3	1.2	6.3
U1456D-15R-1 55-61 cm	179.7	1.620	3.620	0.100	0.2406	0.0073	0.71617	1549	23	1388	38	1794	40	1794.0	40.0	22.6
U1456D-15R-1 55-61 cm	144	2.280	1.248	0.027	0.1326	0.0018	0.23898	820	12	802	10	876	45	802.0	10.0	2.2
U1456D-15R-1 55-61 cm	272.8	1.008	0.051	0.003	0.0073	0.0002	0.04189	50.1	3.1	47.1	1	170	120	47.1	1.0	6.0
U1456D-15R-1 55-61 cm	427	4.720	1.597	0.025	0.1512	0.0023	0.35310	967.5	9.6	907	13	1125	34	1125.0	34.0	19.4
U1456D-15R-1 55-61 cm	1611	3.670	0.117	0.003	0.0177	0.0003	0.49797	112.2	2.5	113	1.9	107	44	113.0	1.9	0.7
U1456D-15R-1 55-61 cm	1151	18.900	1.117	0.036	0.1268	0.0043	0.60374	760	17	769	24	722	66	769.0	24.0	1.2
U1456D-15R-1 55-61 cm	660	0.581	0.629	0.025	0.0744	0.0021	0.68407	495	15	463	13	672	53	463.0	13.0	6.5
U1456D-15R-1 55-61 cm	610	6.980	0.367	0.012	0.0428	0.0010	0.73954	316.3	9	270	6.4	657	49	270.0	6.4	14.6
U1456D-15R-1 55-61 cm	52.5	0.639	0.065	0.006	0.0003	0.0015	0.00716	63.3	6	1.4	9.4	-30	180	DISC	DISC	97.8
U1456D-15R-1 55-61 cm	49	0.911	0.090	0.010	0.0143	0.0006	0.03400	86.5	8.8	91.5	3.5	-10	180	91.5	3.5	5.8
U1456D-15R-1 55-61 cm	276	0.680	0.060	0.003	0.0089	0.0002	0.14727	59	2.9	57	1.4	150	100	57.0	1.4	3.4
U1456D-15R-1 55-61 cm	780	9.000	0.661	0.024	0.0837	0.0027	0.70412	514	15	518	16	482	60	518.0	16.0	0.8
U1456D-15R-1 55-61 cm	541	2.057	1.577	0.044	0.1653	0.0050	0.65681	959	17	986	28	912	42	912.0	42.0	8.1
U1456D-15R-1 55-61 cm	97.8	1.299	1.065	0.029	0.1189	0.0026	0.43986	733	14	724	15	741	56	724.0	15.0	1.2
U1456D-15R-1 55-61 cm	226.7	0.977	1.459	0.056	0.1455	0.0054	0.47953	904	23	877	31	979	76	979.0	76.0	10.4
U1456D-15R-1 55-61 cm	1469	1.332	0.069	0.002	0.0104	0.0002	0.41005	67.3	1.8	66.9	1.1	86	51	66.9	1.1	0.6
U1456D-15R-1 55-61 cm	476	7.500	1.617	0.050	0.1653	0.0044	0.80919	975	20	987	24	944	35	944.0	35.0	4.6
U1456D-15R-1 55-61 cm	511	0.999	0.054	0.002	0.0078	0.0002	0.18537	52.9	2	50.02	0.99	202	82	50.0	1.0	5.4
U1456D-15R-1 55-61 cm	299	2.270	0.116	0.005	0.0181	0.0005	0.52492	110.8	4.5	115.7	3.2	44	66	115.7	3.2	4.4
U1456D-15R-1 55-61 cm	573	8.370	0.202	0.006	0.0295	0.0007	0.46378	186.7	5.3	187.6	4.4	190	72	187.6	4.4	0.5
U1456D-15R-1 55-61 cm	291	1.436	1.810	0.130	0.1490	0.0080	0.74405	1033	42	891	45	1360	90	DISC	DISC	34.5
U1456D-15R-1 55-61 cm	168.4	1.564	0.743	0.042	0.0886	0.0036	0.54539	562	25	547	22	610	110	547.0	22.0	2.7
U1456D-15R-1 55-61 cm	988	23.600	1.300	0.046	0.1354	0.0041	0.87310	842	21	818	23	913	35	818.0	23.0	2.9
U1456D-15R-1 55-61 cm	409	5.290	1.894	0.050	0.1821	0.0038	0.67739	1077	17	1078	20	1078	38	1078.0	38.0	0.0
U1456D-15R-1 55-61 cm	3050	#####	0.070	0.009	0.0107	0.0016	0.91794	68.1	8.8	68.4	9.9	110	120	DISC	DISC	0.4
U1456D-15R-1 55-61 cm	272	1.193	1.623	0.029	0.1617	0.0025	0.53136	977	11	966	14	997	33	997.0	33.0	3.1
U1456D-15R-1 55-61 cm	1337	1.057	0.068	0.002	0.0101	0.0001	0.35698	66.6	1.8	64.85	0.88	135	53	64.9	0.9	2.6
U1456D-15R-1 55-61 cm	573	1.570	4.820	0.220	0.3090	0.0140	0.82003	1786	37	1731	69	1826	47	1826.0	47.0	5.2
U1456D-15R-1 55-61 cm	442	0.746	0.266	0.009	0.0371	0.0007	0.54639	239	7.2	234.9	4.6	271	62	234.9	4.6	1.7
U1456D-15R-1 55-61 cm	266.4	0.874	0.167	0.006	0.0238	0.0005	0.15309	156.1	4.9	151.6	3	238	74	151.6	3.0	2.9
U1456D-15R-1 55-61 cm	361	1.330	3.690	0.130	0.2432	0.0096	0.73513	1562	31	1398	49	1803	40	1803.0	40.0	22.5
U1456D-15R-1 55-61 cm	310	1.220	0.115	0.009	0.0168	0.0006	0.43214	109.7	7.7	107.6	3.6	130	130	107.6	3.6	1.9

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-15R-1 55-61 cm	666	9.990	7.190	0.380	0.3880	0.0220	0.64901	2142	42	2110	100	2155	83	2155.0	83.0	2.1
U1456D-15R-1 55-61 cm	89.7	1.810	12.940	0.280	0.4950	0.0100	0.76368	2670	20	2590	44	2737	24	2737.0	24.0	5.4
U1456D-15R-1 55-61 cm	512	0.828	0.117	0.004	0.0168	0.0002	0.12508	111.9	3.1	107.3	1.5	205	62	107.3	1.5	4.1
U1456D-15R-1 55-61 cm	65.1	0.522	6.430	0.130	0.3656	0.0068	0.61641	2030	18	2006	32	2061	32	2061.0	32.0	2.7
U1456D-15R-1 55-61 cm	354	1.026	0.067	0.003	0.0100	0.0003	0.16661	65.5	2.8	64	1.6	130	88	64.0	1.6	2.3
U1456D-15R-1 55-61 cm	2030	1.570	0.498	0.011	0.0004	0.0073	0.09830	409.4	7.4	-1	34	493	29	DISC	DISC	100.2
U1456D-15R-1 55-61 cm	1280	1.382	0.132	0.010	0.0181	0.0012	0.64039	125.5	9.2	115.9	7.5	270	130	115.9	7.5	7.6
U1456D-15R-1 55-61 cm	523	2.910	0.118	0.006	0.0171	0.0005	0.25324	112.6	5.3	109.5	3.1	200	100	109.5	3.1	2.8
U1456D-15R-1 55-61 cm	616	0.892	0.109	0.005	0.0164	0.0005	0.62305	104.8	4.2	104.5	2.9	137	67	104.5	2.9	0.3
U1456D-15R-1 55-61 cm	400	1.277	2.187	0.051	0.1966	0.0045	0.80005	1176	16	1156	25	1220	29	1220.0	29.0	5.2
U1456D-15R-1 55-61 cm	2510	1.640	0.105	0.004	-0.0002	0.0014	0.00276	101.3	3.5	-1.5	9.1	201	51	DISC	DISC	101.5
U1456D-15R-1 55-61 cm	402.5	0.993	1.313	0.031	0.1406	0.0022	0.59912	849	13	848	12	862	37	848.0	12.0	0.1
U1456D-15R-1 55-61 cm	108.8	1.043	1.139	0.030	0.1268	0.0020	0.43299	768	14	769	11	759	56	769.0	11.0	0.1
U1456D-15R-1 55-61 cm	857	0.601	0.176	0.006	0.0245	0.0005	0.59320	164.1	4.8	155.8	3.1	270	54	155.8	3.1	5.1
U1456D-15R-1 55-61 cm	941	1.390	0.064	0.002	0.0093	0.0002	0.19071	62.4	2.3	59.4	1.2	171	79	59.4	1.2	4.8
U1456D-19R-2 20-26 cm	1041	2.220	0.121	0.003	0.0178	0.0002	0.38983	115.7	2.5	113.7	1.4	165	43	113.7	1.4	1.7
U1456D-19R-2 20-26 cm	430	1.377	1.972	0.021	0.1828	0.0014	0.40189	1105.1	7.3	1082.3	7.6	1155	21	1155.0	21.0	6.3
U1456D-19R-2 20-26 cm	360	3.500	0.623	0.083	0.0770	0.0058	0.53881	484	49	478	35	560	230	478.0	35.0	1.2
U1456D-19R-2 20-26 cm	602	3.720	8.030	0.120	0.3766	0.0060	0.81141	2232	13	2059	28	2406	16	2406.0	16.0	14.4
U1456D-19R-2 20-26 cm	196	1.410	0.119	0.015	0.0145	0.0007	0.08857	114	14	92.5	4.6	480	250	DISC	DISC	18.9
U1456D-19R-2 20-26 cm	482	0.836	0.062	0.003	0.0089	0.0001	0.02348	60.5	2.4	57	0.72	206	82	57.0	0.7	5.8
U1456D-19R-2 20-26 cm	21.61	1.840	0.174	0.024	0.0210	0.0009	0.09155	156	21	133.6	5.8	320	260	133.6	5.8	14.4
U1456D-19R-2 20-26 cm	810	5.720	1.932	0.021	0.1855	0.0018	0.61040	1091.4	7.4	1097	9.7	1084	18	1084.0	18.0	1.2
U1456D-19R-2 20-26 cm	170.9	0.628	0.088	0.005	0.0132	0.0003	0.03505	85.3	5	84.6	1.7	120	120	84.6	1.7	0.8
U1456D-19R-2 20-26 cm	49.9	1.636	0.848	0.027	0.1016	0.0014	0.04721	623	15	623.6	8.1	599	72	623.6	8.1	0.1
U1456D-19R-2 20-26 cm	465	1.180	0.062	0.003	0.0085	0.0001	0.02600	60.5	2.7	54.71	0.76	274	94	54.7	0.8	9.6
U1456D-19R-2 20-26 cm	38.76	1.504	0.839	0.040	0.0998	0.0020	0.31115	612	22	615	11	591	96	615.0	11.0	0.5
U1456D-19R-2 20-26 cm	433	1.886	7.710	0.130	0.3461	0.0046	0.74721	2194	16	1915	22	2464	20	2464.0	20.0	22.3
U1456D-19R-2 20-26 cm	469	1.350	0.081	0.005	0.0122	0.0003	0.15919	79	4.8	78	1.8	110	120	78.0	1.8	1.3
U1456D-19R-2 20-26 cm	398	0.859	10.470	0.160	0.4692	0.0077	0.76222	2477	15	2478	34	2470	19	2470.0	19.0	0.3
U1456D-19R-2 20-26 cm	54.8	2.543	1.249	0.038	0.1282	0.0019	0.15739	817	18	777	11	892	70	777.0	11.0	4.9
U1456D-19R-2 20-26 cm	784	3.290	1.424	0.021	0.1449	0.0017	0.27663	898.1	9	872	9.3	952	31	952.0	31.0	8.4
U1456D-19R-2 20-26 cm	290	1.457	2.212	0.043	0.1972	0.0035	0.53043	1184	13	1160	19	1203	36	1203.0	36.0	3.6
U1456D-19R-2 20-26 cm	389	2.650	0.994	0.017	0.1162	0.0017	0.55873	700.6	8.4	708.4	9.7	660	34	708.4	9.7	1.1
U1456D-19R-2 20-26 cm	2560	42.300	0.084	0.004	0.0123	0.0003	0.38197	82.2	3.7	79.1	2	129	93	79.1	2.0	3.8

(table cont'd)

Sample Name	[U] ppm	U/Th	207/235					206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			207/23	2σ	206/238	2σ error	RHO	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-19R-2 20-26 cm	211.2	3.270	4.180	0.160	0.2065	0.0083	0.92048	1666	32	1209	45	2292	29	DISC
U1456D-19R-2 20-26 cm	222	1.517	0.062	0.007	0.0090	0.0005	0.01693	61.2	6.4	58	3.1	210	240	58.0
U1456D-19R-2 20-26 cm	31.02	0.287	0.227	0.018	0.0134	0.0006	0.03810	204	15	85.7	3.5	1710	200	DISC
U1456D-19R-2 20-26 cm	625	2.170	0.245	0.007	0.0339	0.0006	0.08865	221.6	5.6	215	3.9	260	55	215.0
U1456D-19R-2 20-26 cm	108.36	1.064	3.283	0.053	0.2539	0.0028	0.35017	1475	13	1458	15	1475	31	1475.0
U1456D-19R-2 20-26 cm	134.7	1.499	1.083	0.044	0.1139	0.0026	0.00107	743	21	695	15	833	99	695.0
U1456D-19R-2 20-26 cm	641	5.210	1.452	0.038	0.1482	0.0032	0.45900	909	16	891	18	921	53	921.0
U1456D-19R-2 20-26 cm	567	2.254	2.277	0.037	0.1831	0.0019	0.48381	1206	11	1084	10	1405	28	1405.0
U1456D-19R-2 20-26 cm	477	4.230	2.668	0.045	0.2252	0.0027	0.63092	1318	12	1309	14	1300	26	1300.0
U1456D-19R-2 20-26 cm	356	0.000	0.151	0.017	0.0223	0.0018	0.52378	146	16	142	11	190	180	142.0
U1456D-19R-2 20-26 cm	537	3.350	4.292	0.084	0.2699	0.0062	0.64831	1690	16	1539	32	1862	33	1862.0
U1456D-19R-2 20-26 cm	992	12.820	1.132	0.097	0.1240	0.0110	0.91654	766	46	752	64	782	84	752.0
U1456D-19R-2 20-26 cm	1868	15.620	5.708	0.091	0.2930	0.0033	0.83882	1930	14	1656	17	2214	16	2214.0
U1456D-19R-2 20-26 cm	238	1.358	2.203	0.031	0.2002	0.0025	0.54636	1181	10	1176	14	1165	26	1165.0
U1456D-19R-2 20-26 cm	251	1.374	8.321	0.085	0.3825	0.0030	0.59760	2265.4	9.3	2087	14	2407	15	2407.0
U1456D-19R-2 20-26 cm	52	0.211	3.125	0.067	0.0432	0.0011	0.37283	1435	17	272.3	6.8	4297	39	DISC
U1456D-19R-2 20-26 cm	20	0.166	1.297	0.067	0.1275	0.0034	0.07790	840	30	773	19	940	120	773.0
U1456D-19R-2 20-26 cm	339	2.460	1.403	0.017	0.1410	0.0013	0.51030	889.3	7.3	849.9	7.6	973	24	849.9
U1456D-19R-2 20-26 cm	1000	1.259	0.044	0.002	0.0067	0.0001	0.22329	43.7	1.9	42.7	0.77	108	85	42.7
U1456D-19R-2 20-26 cm	189	3.850	0.223	0.013	0.0310	0.0008	0.27100	203	10	196.6	5.1	250	110	196.6
U1456D-19R-2 20-26 cm	1466	1.145	0.124	0.003	0.0180	0.0002	0.28701	118.5	2.3	115.3	1.1	157	43	115.3
U1456D-19R-2 20-26 cm	191	1.690	0.763	0.018	0.0923	0.0012	0.26581	574	10	568.9	7	572	49	568.9
U1456D-19R-2 20-26 cm	652	1.920	7.260	0.160	0.3601	0.0075	0.76221	2143	19	1979	36	2285	25	2285.0
U1456D-19R-2 20-26 cm	565	0.864	0.083	0.003	0.0121	0.0002	0.35727	80.7	2.9	77.4	1.3	178	74	77.4
U1456D-19R-2 20-26 cm	1670	1.560	0.088	0.003	0.0128	0.0002	0.28230	85.9	2.4	82.2	1.4	171	63	82.2
U1456D-19R-2 20-26 cm	3110	2.440	0.219	0.003	0.0312	0.0003	0.77078	200.8	2.6	198	2	218	25	198.0
U1456D-19R-2 20-26 cm	1047	3.400	0.213	0.004	0.0301	0.0004	0.41404	195.7	3.2	191.2	2.4	240	39	191.2
U1456D-19R-2 20-26 cm	433	5.947	1.563	0.019	0.1592	0.0014	0.47369	954.7	7.7	952.2	7.7	949	23	949.0
U1456D-19R-2 20-26 cm	977	0.721	0.051	0.002	0.0076	0.0001	0.23751	50.8	1.6	48.84	0.61	127	64	48.8
U1456D-19R-2 20-26 cm	1576	19.380	4.778	0.089	0.2856	0.0066	0.43902	1781	16	1616	33	1980	41	1980.0
U1456D-19R-2 20-26 cm	217.2	1.140	1.073	0.023	0.1226	0.0018	0.61149	739	11	745	10	716	37	745.0
U1456D-19R-2 20-26 cm	222.1	0.635	5.530	0.110	0.3430	0.0052	0.64566	1901	17	1900	25	1900	27	1900.0
U1456D-19R-2 20-26 cm	1847	6.360	0.211	0.004	0.0304	0.0005	0.53652	195	3.3	192.9	3.4	211	40	192.9
U1456D-19R-2 20-26 cm	165.9	1.488	9.640	0.290	0.4320	0.0120	0.87478	2391	29	2312	52	2464	27	2464.0
U1456D-19R-2 20-26 cm	238	5.390	0.134	0.007	0.0199	0.0008	0.30600	127	6.4	126.7	4.9	150	100	126.7

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-19R-2 20-26 cm	565	3.510	0.493	0.014	0.0592	0.0015	0.64661	406.2	9.7	370.8	9.4	613	52	370.8	9.4	8.7
U1456D-19R-2 20-26 cm	589	2.050	0.117	0.003	0.0173	0.0002	0.19182	112	3.1	110.6	1.5	154	59	110.6	1.5	1.3
U1456D-19R-2 20-26 cm	850	1.815	0.065	0.004	0.0091	0.0003	0.35349	63.3	3.8	58.3	2.2	250	110	58.3	2.2	7.9
U1456D-19R-2 20-26 cm	210	1.320	0.077	0.004	0.0118	0.0003	0.29958	75.2	4.1	75.8	1.9	100	100	75.8	1.9	0.8
U1456D-19R-2 20-26 cm	3080	1.470	0.119	0.005	0.0172	0.0006	0.46847	114.2	4.4	110	3.7	204	88	110.0	3.7	3.7
U1456D-19R-2 20-26 cm	174.2	2.127	0.461	0.022	0.0548	0.0020	0.37932	383	16	344	12	630	100	344.0	12.0	10.2
U1456D-19R-2 20-26 cm	160.7	1.417	0.096	0.005	0.0128	0.0003	0.21582	93.4	4.9	81.9	1.6	350	110	81.9	1.6	12.3
U1456D-19R-2 20-26 cm	53.38	0.884	1.442	0.052	0.1512	0.0019	0.51029	899	20	907	11	873	64	873.0	64.0	3.9
U1456D-19R-2 20-26 cm	777	16.000	0.716	0.037	0.0800	0.0037	0.54852	547	22	496	22	769	76	496.0	22.0	9.3
U1456D-19R-2 20-26 cm	633	4.320	5.120	0.230	0.2743	0.0097	0.81179	1824	38	1558	49	2158	48	2158.0	48.0	27.8
U1456D-19R-2 20-26 cm	500	2.490	2.726	0.078	0.2187	0.0048	0.70505	1331	21	1274	26	1430	41	1430.0	41.0	10.9
U1456D-19R-2 20-26 cm	284.9	0.866	1.086	0.021	0.1220	0.0014	0.39472	746	10	741.8	7.8	759	39	741.8	7.8	0.6
U1456D-19R-2 20-26 cm	362	60.000	0.123	0.010	0.0190	0.0008	0.23453	117.1	8.9	121	5.3	80	150	121.0	5.3	3.3
U1456D-19R-2 20-26 cm	420	4.240	3.240	0.130	0.1570	0.0052	0.92464	1458	30	939	29	2340	25	DISC	DISC	59.9
U1456D-19R-2 20-26 cm	442	1.656	11.210	0.160	0.4704	0.0078	0.78593	2537	14	2482	34	2593	17	2593.0	17.0	4.3
U1456D-19R-2 20-26 cm	367	4.950	2.198	0.061	0.1880	0.0034	0.65156	1174	20	1110	19	1316	41	1316.0	41.0	15.7
U1456D-19R-2 20-26 cm	262	3.790	4.000	0.190	0.2480	0.0110	0.71949	1615	39	1421	55	1903	60	1903.0	60.0	25.3
U1456D-19R-2 20-26 cm	1840	4.730	0.110	0.002	0.0162	0.0002	0.27878	106.1	1.8	103.5	1.3	168	38	103.5	1.3	2.5
U1456D-19R-2 20-26 cm	418	2.670	1.570	0.021	0.1631	0.0017	0.55421	957.2	8.5	973.7	9.2	931	24	931.0	24.0	4.6
U1456D-19R-2 20-26 cm	156	2.120	1.101	0.064	0.1241	0.0053	0.75345	748	32	753	30	759	85	753.0	30.0	0.7
U1456D-19R-2 20-26 cm	66.1	1.621	2.420	0.130	0.1911	0.0076	0.62580	1248	41	1126	41	1490	81	1490.0	81.0	24.4
U1456D-19R-2 20-26 cm	351.9	1.273	0.075	0.003	0.0108	0.0002	0.17990	73.6	3.2	69.3	1.5	222	89	69.3	1.5	5.8
U1456D-19R-2 20-26 cm	136.2	1.306	0.069	0.005	0.0091	0.0003	0.06494	67.2	4.5	58.1	1.7	340	130	58.1	1.7	13.5
U1456D-19R-2 20-26 cm	603	0.822	4.093	0.056	0.2834	0.0041	0.81005	1652	11	1607	21	1718	16	1718.0	16.0	6.5
U1456D-19R-2 20-26 cm	538	2.890	0.586	0.008	0.0747	0.0007	0.21569	467.5	5.2	464.5	4	483	32	464.5	4.0	0.6
U1456D-19R-2 20-26 cm	206.7	1.020	0.136	0.007	0.0176	0.0003	0.05364	128.4	5.8	112.5	1.7	393	98	112.5	1.7	12.4
U1456D-19R-2 20-26 cm	247.2	1.188	0.615	0.017	0.0707	0.0012	0.57427	485	11	440.1	7.4	692	53	440.1	7.4	9.3
U1456D-19R-2 20-26 cm	447	0.641	0.085	0.003	0.0123	0.0002	0.00164	82.7	2.5	78.59	0.97	206	67	78.6	1.0	5.0
U1456D-19R-2 20-26 cm	299	30.100	0.127	0.007	0.0197	0.0013	0.35691	120.7	6.6	125.5	8.1	80	130	125.5	8.1	4.0
U1456D-19R-2 20-26 cm	289	2.020	0.746	0.023	0.0885	0.0024	0.45650	564	13	546	14	634	65	546.0	14.0	3.2
U1456D-19R-2 20-26 cm	400	28.800	0.244	0.025	0.0326	0.0036	0.55932	220	20	207	22	400	190	DISC	DISC	5.9
U1456D-19R-2 20-26 cm	250	5.670	0.633	0.029	0.0765	0.0036	0.60766	496	19	474	21	610	90	474.0	21.0	4.4
U1456D-19R-2 20-26 cm	541	5.230	1.554	0.026	0.1521	0.0022	0.35596	956	12	912	12	1052	36	1052.0	36.0	13.3
U1456D-19R-2 20-26 cm	272	24.600	0.363	0.013	0.0484	0.0016	0.72629	313.6	9.8	304.4	9.7	380	59	304.4	9.7	2.9
U1456D-19R-2 20-26 cm	401	65.000	0.033	0.004	0.0055	0.0004	0.04339	33.1	3.8	35.1	2.3	50	260	35.1	2.3	6.0

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-19R-2 20-26 cm	203.9	1.527	0.185	0.009	0.0160	0.0006	0.42941	172	7.9	102.3	3.5	1300	100	DISC	DISC	40.5
U1456D-19R-2 20-26 cm	546	2.300	1.875	0.077	0.1844	0.0072	0.71671	1061	28	1086	39	1051	58	1051.0	58.0	3.3
U1456D-19R-2 20-26 cm	315	1.934	10.020	0.340	0.4390	0.0150	0.68339	2421	31	2333	65	2509	45	2509.0	45.0	7.0
U1456D-19R-2 20-26 cm	412	0.772	0.099	0.004	0.0147	0.0002	0.08643	96	3.2	94	1.4	157	73	94.0	1.4	2.1
U1456D-19R-2 20-26 cm	3140	2.280	0.039	0.001	0.0058	0.0001	0.44842	38.55	0.94	36.98	0.61	144	48	37.0	0.6	4.1
U1456D-19R-2 20-26 cm	85.8	0.894	0.079	0.014	0.0113	0.0009	0.27148	76	13	72.1	5.6	170	280	72.1	5.6	5.1
U1456D-19R-2 20-26 cm	267	1.230	0.096	0.010	0.0135	0.0005	0.42917	92.3	9	86.3	3.4	220	170	86.3	3.4	6.5
U1456D-19R-2 20-26 cm	1318	2.520	0.111	0.003	0.0168	0.0003	0.35234	106.4	2.5	107.1	1.7	117	50	107.1	1.7	0.7
U1456D-19R-2 20-26 cm	2040	3.190	0.817	0.011	0.0984	0.0012	0.64442	605.5	5.9	605.1	7.1	622	25	605.1	7.1	0.1
U1456D-19R-2 20-26 cm	148	1.260	0.882	0.023	0.1039	0.0025	0.46237	639	12	636	15	669	53	636.0	15.0	0.5
U1456D-19R-2 20-26 cm	831	2.720	0.241	0.008	0.0341	0.0010	0.53059	219.2	6.2	215.9	6.1	255	63	215.9	6.1	1.5
U1456D-19R-2 20-26 cm	424	0.539	1.942	0.025	0.1847	0.0021	0.73066	1094.3	8.9	1092	11	1117	19	1117.0	19.0	2.2
U1456D-19R-2 20-26 cm	3360	2.040	0.016	0.001	0.0025	0.0001	0.35602	16.58	0.69	15.86	0.35	138	71	15.9	0.4	4.3
U1456D-19R-2 20-26 cm	1817	0.672	0.055	0.001	0.0079	0.0001	0.43973	54.7	1.4	50.91	0.89	243	51	50.9	0.9	6.9
U1456D-19R-2 20-26 cm	651	0.835	6.992	0.085	0.3818	0.0050	0.59248	2109	11	2084	23	2145	20	2145.0	20.0	2.8
U1456D-19R-2 20-26 cm	335	2.240	10.250	0.150	0.4093	0.0054	0.65472	2456	13	2211	25	2675	19	2675.0	19.0	17.3
U1456D-19R-2 20-26 cm	265.8	2.211	0.219	0.008	0.0308	0.0006	0.27062	200.7	6.7	195.2	3.5	289	78	195.2	3.5	2.7
U1456D-19R-2 20-26 cm	274.5	3.650	5.060	0.170	0.2715	0.0083	0.73119	1822	30	1551	43	2157	45	2157.0	45.0	28.1
U1456D-19R-2 20-26 cm	830	4.810	0.122	0.003	0.0181	0.0003	0.31450	116.4	2.9	115.6	2.2	159	56	115.6	2.2	0.7
U1456D-19R-2 20-26 cm	360	3.590	0.268	0.008	0.0363	0.0008	0.62141	240.9	6.5	229.5	5.1	376	53	229.5	5.1	4.7
U1456D-19R-2 20-26 cm	699	7.700	0.523	0.013	0.0557	0.0012	0.69119	427.3	9.2	349.4	7.2	891	39	DISC	DISC	18.2
U1456D-19R-2 20-26 cm	695	15.100	1.208	0.018	0.1296	0.0016	0.62870	802.7	8.5	786.3	8.8	857	25	786.3	8.8	2.0
U1456D-19R-2 20-26 cm	596	67.200	0.168	0.006	0.0230	0.0005	0.67626	156.8	4.9	146.5	3	304	53	146.5	3.0	6.6
U1456D-19R-2 20-26 cm	229.9	1.396	0.064	0.004	0.0091	0.0002	0.10587	63.2	4.1	58.4	1.4	250	130	58.4	1.4	7.6
U1456D-19R-2 20-26 cm	1349	15.590	0.680	0.009	0.0841	0.0008	0.71246	526.3	5.2	520.6	4.6	553	22	520.6	4.6	1.1
U1456D-19R-2 20-26 cm	129	1.337	0.082	0.006	0.0122	0.0004	0.25031	80.1	5.3	78.2	2.8	180	130	78.2	2.8	2.4
U1456D-19R-2 20-26 cm	712	2.690	1.206	0.081	0.1308	0.0073	0.73257	797	38	791	41	814	96	791.0	41.0	0.8
U1456D-19R-2 20-26 cm	1346	1.500	0.047	0.002	0.0070	0.0001	0.43726	46.6	1.6	44.99	0.87	148	62	45.0	0.9	3.5
U1456D-19R-2 20-26 cm	117	1.677	1.212	0.025	0.1332	0.0017	0.30490	804	12	805.5	9.7	797	44	805.5	9.7	0.2
U1456D-19R-2 20-26 cm	80.6	2.710	1.417	0.034	0.1528	0.0025	0.39730	892	14	916	14	832	48	832.0	14.0	2.7
U1456D-19R-2 20-26 cm	974	0.904	1.065	0.020	0.1129	0.0022	0.72907	735	10	689	12	887	24	689.0	12.0	6.3
U1456D-19R-2 20-26 cm	1027	1.187	0.112	0.003	0.0166	0.0003	0.47681	108	2.7	106.2	2.1	162	49	106.2	2.1	1.7
U1456D-19R-2 20-26 cm	320	1.334	0.097	0.004	0.0143	0.0003	0.28379	93.8	3.7	91.2	1.8	165	79	91.2	1.8	2.8
U1456D-19R-2 20-26 cm	534	2.810	0.064	0.003	0.0093	0.0002	0.43993	62.5	2.5	59.4	1.4	189	77	59.4	1.4	5.0
U1456D-19R-2 20-26 cm	518	6.850	0.017	0.001	0.0027	0.0001	0.19308	17.1	1.3	17.49	0.49	30	140	17.5	0.5	2.3

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-19R-2 20-26 cm	80.6	1.320	0.077	0.006	0.0097	0.0003	0.02350	74.4	5.9	62.4	1.8	380	160	DISC	DISC	16.1
U1456D-19R-2 20-26 cm	1510	1.360	0.066	0.002	0.0075	0.0002	0.37010	65.1	2.3	48.22	0.99	710	69	DISC	DISC	25.9
U1456D-19R-2 20-26 cm	271.2	0.950	0.047	0.003	0.0073	0.0002	0.12976	46.1	2.7	47.1	1	30	110	47.1	1.0	2.2
U1456D-19R-2 20-26 cm	728	51.200	0.725	0.013	0.0896	0.0013	0.33118	553.1	7.5	552.8	7.5	547	38	552.8	7.5	0.1
U1456D-19R-2 20-26 cm	38.5	1.100	6.300	0.300	0.3470	0.0100	0.46228	2014	44	1921	50	2109	77	2109.0	77.0	8.9
U1456D-19R-2 20-26 cm	859	34.600	0.618	0.010	0.0803	0.0011	0.56742	488	6.4	497.7	6.8	436	32	497.7	6.8	2.0
U1456D-19R-2 20-26 cm	528	8.010	0.626	0.016	0.0803	0.0019	0.63047	493	10	498	11	460	48	498.0	11.0	1.0
U1456D-19R-2 20-26 cm	224.7	0.627	0.661	0.011	0.0826	0.0009	0.24264	514.7	6.8	511.5	5.1	524	38	511.5	5.1	0.6
U1456D-19R-2 20-26 cm	66.7	1.064	0.081	0.008	0.0127	0.0004	0.09352	78.4	7.1	81.5	2.3	40	170	81.5	2.3	4.0
U1456D-19R-2 20-26 cm	512	9.030	6.180	0.110	0.3556	0.0064	0.65153	2000	15	1960	30	2034	26	2034.0	26.0	3.6
U1456D-19R-2 20-26 cm	336	7.100	11.520	0.180	0.4720	0.0060	0.72498	2564	15	2492	26	2618	18	2618.0	18.0	4.8
U1456D-19R-2 20-26 cm	776	2.820	0.069	0.003	0.0102	0.0002	0.37912	67.7	2.6	65.5	1.5	145	74	65.5	1.5	3.2
U1456D-19R-2 20-26 cm	656	20.600	0.924	0.021	0.1051	0.0019	0.60349	662	11	644	11	718	38	644.0	11.0	2.7
U1456D-19R-2 20-26 cm	330	0.784	0.125	0.004	0.0184	0.0002	0.10987	119.3	3.8	117.5	1.5	163	71	117.5	1.5	1.5
U1456D-19R-2 20-26 cm	399	5.000	0.616	0.018	0.0790	0.0022	0.46280	486	11	490	13	454	66	490.0	13.0	0.8
U1456D-20R-1 95-103 cm	2720	2.257	0.017	0.001	0.0026	0.0001	0.21752	17.59	0.92	16.98	0.44	130	100	17.0	0.4	3.5
U1456D-20R-1 95-103 cm	99.4	1.285	1.018	0.026	0.1164	0.0015	0.14084	711	13	709.4	8.8	724	59	709.4	8.8	0.2
U1456D-20R-1 95-103 cm	779	0.446	0.053	0.002	0.0083	0.0001	0.12758	52.3	1.7	53.39	0.72	55	65	53.4	0.7	2.1
U1456D-20R-1 95-103 cm	190	1.046	0.676	0.015	0.0842	0.0008	0.08777	524	9	521	5	537	54	521.0	5.0	0.6
U1456D-20R-1 95-103 cm	32.21	0.837	1.430	0.051	0.1470	0.0024	0.19258	895	21	884	13	914	80	914.0	80.0	3.3
U1456D-20R-1 95-103 cm	342	1.388	0.083	0.007	0.0126	0.0003	0.02422	80.8	6.2	80.8	2	140	170	80.8	2.0	0.0
U1456D-20R-1 95-103 cm	445	0.902	0.061	0.004	0.0068	0.0001	0.21957	60.2	3.8	43.52	0.76	690	130	DISC	DISC	27.7
U1456D-20R-1 95-103 cm	124.8	0.617	0.090	0.006	0.0136	0.0003	0.00489	86.7	5.2	86.8	1.7	80	110	86.8	1.7	0.1
U1456D-20R-1 95-103 cm	357.4	1.171	0.318	0.011	0.0434	0.0007	0.45327	280	8.3	273.7	4.5	330	66	273.7	4.5	2.3
U1456D-20R-1 95-103 cm	1462	1.782	0.040	0.003	0.0053	0.0001	0.54547	39.6	3.1	34.09	0.91	350	150	34.1	0.9	13.9
U1456D-20R-1 95-103 cm	398	4.610	0.236	0.007	0.0153	0.0002	0.28707	214.8	5.5	97.8	1.2	1811	50	DISC	DISC	54.5
U1456D-20R-1 95-103 cm	118.3	1.010	4.324	0.051	0.3029	0.0026	0.50097	1696.3	9.7	1705	13	1695	20	1695.0	20.0	0.6
U1456D-20R-1 95-103 cm	362	1.300	0.078	0.003	0.0120	0.0002	0.20756	76.5	2.9	76.9	1.4	108	80	76.9	1.4	0.5
U1456D-20R-1 95-103 cm	515	3.440	1.622	0.034	0.1345	0.0021	0.64854	977	13	814	12	1390	31	DISC	DISC	16.7
U1456D-20R-1 95-103 cm	251.4	0.993	2.818	0.057	0.2236	0.0034	0.44451	1359	15	1301	18	1477	38	1477.0	38.0	11.9
U1456D-20R-1 95-103 cm	234.2	1.363	0.054	0.003	0.0077	0.0002	0.20036	53.3	3	49.1	1.1	250	110	49.1	1.1	7.9
U1456D-20R-1 95-103 cm	1245	2.534	0.221	0.004	0.0315	0.0003	0.33833	202.9	2.9	199.8	1.7	275	33	199.8	1.7	1.5
U1456D-20R-1 95-103 cm	60.4	0.863	0.092	0.009	0.0136	0.0004	0.00211	90.4	8.6	86.8	2.7	200	180	86.8	2.7	4.0
U1456D-20R-1 95-103 cm	322	0.695	0.076	0.005	0.0098	0.0002	0.03956	74.3	4.5	62.9	1.2	420	130	DISC	DISC	15.3
U1456D-20R-1 95-103 cm	300	0.874	1.601	0.022	0.1594	0.0016	0.39507	970.4	8.4	953	9.1	1016	27	1016.0	27.0	6.2

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-20R-1 95-103 cm	722	3.475	1.994	0.028	0.1508	0.0019	0.63132	1112.8	9.5	905	11	1543	22	DISC	DISC	41.3
U1456D-20R-1 95-103 cm	1244	9.440	0.294	0.005	0.0398	0.0003	0.31917	261.8	3.6	251.8	2	323	34	251.8	2.0	3.8
U1456D-20R-1 95-103 cm	73.1	6.540	0.747	0.024	0.0902	0.0013	0.14088	564	14	556.7	7.6	546	72	556.7	7.6	1.3
U1456D-20R-1 95-103 cm	1434	1.954	1.326	0.017	0.1370	0.0015	0.67588	857.8	7.2	827.6	8.3	906	19	827.6	8.3	3.5
U1456D-20R-1 95-103 cm	1480	28.500	0.632	0.031	0.0766	0.0030	0.79352	496	20	476	18	572	65	476.0	18.0	4.0
U1456D-20R-1 95-103 cm	295	2.517	2.298	0.042	0.1986	0.0027	0.71430	1210	13	1167	15	1265	26	1265.0	26.0	7.7
U1456D-20R-1 95-103 cm	216.1	0.587	0.080	0.004	0.0114	0.0002	0.06975	77.5	4.1	72.9	1.5	200	110	72.9	1.5	5.9
U1456D-20R-1 95-103 cm	1272	2.678	0.086	0.002	0.0130	0.0002	0.19679	83.6	2.2	83.3	1.3	103	54	83.3	1.3	0.4
U1456D-20R-1 95-103 cm	278.2	1.357	0.108	0.005	0.0166	0.0003	0.04799	103.6	4.1	106.2	1.6	64	80	106.2	1.6	2.5
U1456D-20R-1 95-103 cm	1029	2.260	1.704	0.043	0.1666	0.0040	0.84536	1009	16	993	22	1047	29	1047.0	29.0	5.2
U1456D-20R-1 95-103 cm	8450	2.940	0.080	0.001	0.0123	0.0001	0.45009	78.4	0.77	78.49	0.53	94	21	78.5	0.5	0.1
U1456D-20R-1 95-103 cm	873	7.440	1.950	0.020	0.1873	0.0018	0.67427	1098.4	7.2	1106.4	9.9	1105	17	1105.0	17.0	0.1
U1456D-20R-1 95-103 cm	463	2.494	1.436	0.027	0.1523	0.0025	0.61350	903	11	913	14	907	33	907.0	33.0	0.7
U1456D-20R-1 95-103 cm	323.7	0.555	0.089	0.007	0.0107	0.0003	0.34598	86.2	6.3	68.7	2	620	170	DISC	DISC	20.3
U1456D-20R-1 95-103 cm	6150	8.750	0.017	0.000	0.0026	0.0000	0.14447	16.85	0.49	16.87	0.31	62	61	16.9	0.3	0.1
U1456D-20R-1 95-103 cm	833	2.198	2.427	0.027	0.1796	0.0017	0.65411	1249.7	8	1064.6	9.3	1576	16	DISC	DISC	32.4
U1456D-20R-1 95-103 cm	335.4	7.120	0.215	0.008	0.0314	0.0004	0.13588	197.3	6.3	199.2	2.5	179	77	199.2	2.5	1.0
U1456D-20R-1 95-103 cm	987	5.800	0.849	0.010	0.1016	0.0009	0.47405	624.3	5.2	623.7	5.2	608	22	623.7	5.2	0.1
U1456D-20R-1 95-103 cm	927	2.204	1.298	0.032	0.1276	0.0028	0.77016	844	14	774	16	1040	36	774.0	16.0	8.3
U1456D-20R-1 95-103 cm	403	1.336	1.531	0.021	0.1595	0.0017	0.65342	941.4	8.7	953.9	9.4	916	26	916.0	26.0	4.1
U1456D-20R-1 95-103 cm	804	0.713	0.313	0.009	0.0437	0.0007	0.27910	276.2	7.2	275.5	4.2	289	64	275.5	4.2	0.3
U1456D-20R-1 95-103 cm	147	2.324	1.322	0.035	0.1407	0.0028	0.37085	853	15	848	16	866	55	848.0	16.0	0.6
U1456D-20R-1 95-103 cm	2210	4.010	0.975	0.026	0.0927	0.0026	0.91533	689	13	571	15	1119	22	DISC	DISC	17.1
U1456D-20R-1 95-103 cm	133.7	0.953	0.056	0.006	0.0078	0.0003	0.01117	55.1	5.3	50.1	1.8	210	180	50.1	1.8	9.1
U1456D-20R-1 95-103 cm	62.5	0.397	1.551	0.052	0.1481	0.0031	0.25405	947	21	890	18	1066	73	1066.0	73.0	16.5
U1456D-20R-1 95-103 cm	631	2.110	0.105	0.006	0.0164	0.0004	0.28432	101	5.2	104.7	2.2	40	120	104.7	2.2	3.7
U1456D-20R-1 95-103 cm	819	0.745	2.988	0.042	0.2214	0.0032	0.79059	1403	11	1292	18	1563	19	1563.0	19.0	17.3
U1456D-20R-1 95-103 cm	533	1.530	10.410	0.110	0.4566	0.0046	0.76051	2470.7	9.9	2424	20	2511	12	2511.0	12.0	3.5
U1456D-20R-1 95-103 cm	887	1.500	0.051	0.003	0.0077	0.0002	0.00777	50	2.7	49.6	1.1	90	110	49.6	1.1	0.8
U1456D-20R-1 95-103 cm	85.1	0.629	0.080	0.006	0.0116	0.0003	0.18334	77.6	6	74.6	2.2	150	150	74.6	2.2	3.9
U1456D-20R-1 95-103 cm	141	1.477	1.740	0.045	0.1713	0.0033	0.51402	1021	17	1021	17	1012	48	1012.0	48.0	0.9
U1456D-20R-1 95-103 cm	620	2.240	0.108	0.005	0.0163	0.0003	0.22660	103.7	4.6	104.1	1.6	95	84	104.1	1.6	0.4
U1456D-20R-1 95-103 cm	354	0.509	0.059	0.004	0.0086	0.0002	0.06830	58.3	3.5	55.5	1.3	170	120	55.5	1.3	4.8
U1456D-20R-1 95-103 cm	443	1.282	1.174	0.015	0.1303	0.0011	0.28593	788.3	7.1	789.4	6.3	781	28	789.4	6.3	0.1
U1456D-20R-1 95-103 cm	520	0.996	1.368	0.044	0.1279	0.0040	0.90669	869	19	774	23	1135	26	774.0	23.0	10.9

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-20R-1 95-103 cm	375	0.597	0.049	0.003	0.0075	0.0002	0.10084	48.2	2.5	48.03	0.99	110	110	48.0	1.0	0.4
U1456D-20R-1 95-103 cm	316.8	5.600	6.070	0.100	0.3598	0.0051	0.68056	1981	15	1979	24	1985	22	1985.0	22.0	0.3
U1456D-20R-1 95-103 cm	528	2.319	5.169	0.053	0.3300	0.0039	0.76999	1846.1	8.8	1837	19	1864	15	1864.0	15.0	1.4
U1456D-20R-1 95-103 cm	213	5.600	0.122	0.011	0.0177	0.0006	0.05511	116.8	9.6	113	3.8	190	180	113.0	3.8	3.3
U1456D-20R-1 95-103 cm	1300	7.500	0.212	0.005	0.0301	0.0004	0.53544	195.6	4.1	191.2	2.8	240	44	191.2	2.8	2.2
U1456D-20R-1 95-103 cm	86.1	1.642	0.128	0.009	0.0198	0.0005	0.11917	121.5	7.7	126.4	2.9	60	120	126.4	2.9	4.0
U1456D-20R-1 95-103 cm	526	0.693	0.051	0.004	0.0074	0.0003	0.00756	50.2	3.6	47.5	1.6	220	150	47.5	1.6	5.4
U1456D-20R-1 95-103 cm	726	2.490	2.164	0.040	0.1904	0.0037	0.71094	1170	13	1122	20	1260	28	1260.0	28.0	11.0
U1456D-20R-1 95-103 cm	476	1.654	0.171	0.005	0.0253	0.0005	0.16294	159.7	4.1	160.9	3.1	168	63	160.9	3.1	0.8
U1456D-20R-1 95-103 cm	16.77	-5.900	0.065	0.017	0.0038	0.0006	0.08627	67	18	24.5	3.5	880	690	DISC	DISC	63.4
U1456D-20R-1 95-103 cm	354	0.940	0.114	0.005	0.0169	0.0003	0.04949	109	4.6	108.1	1.7	140	90	108.1	1.7	0.8
U1456D-20R-1 95-103 cm	375	1.175	0.065	0.003	0.0092	0.0002	0.16613	63.7	3	59	1.2	236	96	59.0	1.2	7.4
U1456D-20R-1 95-103 cm	900	1.929	0.162	0.005	0.0231	0.0007	0.51133	151.7	4.7	147.2	4.4	208	66	147.2	4.4	3.0
U1456D-20R-1 95-103 cm	272	3.770	0.799	0.016	0.0964	0.0012	0.32509	595.1	8.9	593.3	7.1	605	44	593.3	7.1	0.3
U1456D-20R-1 95-103 cm	927	44.300	0.119	0.005	0.0176	0.0005	0.37169	113.9	4.7	112.3	2.9	147	85	112.3	2.9	1.4
U1456D-20R-1 95-103 cm	1010	9.750	0.621	0.009	0.0776	0.0009	0.59842	489.7	5.3	481.9	5.3	526	25	481.9	5.3	1.6
U1456D-20R-1 95-103 cm	400	0.783	0.049	0.003	0.0070	0.0002	0.05269	48.3	3.1	45	1	210	130	45.0	1.0	6.8
U1456D-20R-1 95-103 cm	296	0.446	0.157	0.006	0.0230	0.0006	0.20664	147.6	5.4	146.4	3.5	187	80	146.4	3.5	0.8
U1456D-20R-1 95-103 cm	677	1.590	0.091	0.003	0.0133	0.0003	0.30277	87.9	3	84.9	1.8	158	72	84.9	1.8	3.4
U1456D-20R-1 95-103 cm	110.1	1.754	0.089	0.007	0.0134	0.0005	0.04015	85.4	6.2	86	2.9	140	140	86.0	2.9	0.7
U1456D-20R-1 95-103 cm	473	0.876	0.054	0.003	0.0080	0.0002	0.21716	53.3	2.6	51.4	1.2	144	95	51.4	1.2	3.6
U1456D-20R-1 95-103 cm	594	0.585	0.055	0.003	0.0087	0.0002	0.13792	54.3	2.7	55.7	1.2	57	95	55.7	1.2	2.6
U1456D-20R-1 95-103 cm	3180	#####	0.581	0.009	0.0736	0.0010	0.71846	464.7	5.6	457.7	6.2	486	25	457.7	6.2	1.5
U1456D-20R-1 95-103 cm	178	2.140	0.813	0.019	0.0987	0.0015	0.28471	602	11	606.6	8.9	578	54	606.6	8.9	0.8
U1456D-20R-1 95-103 cm	207.3	1.806	1.911	0.031	0.1853	0.0025	0.52810	1083	11	1095	13	1064	32	1064.0	32.0	2.9
U1456D-20R-1 95-103 cm	119	0.750	8.730	0.230	0.4136	0.0088	0.69407	2305	24	2229	40	2374	32	2374.0	32.0	6.1
U1456D-20R-1 95-103 cm	570	10.000	0.669	0.030	0.0813	0.0023	0.30340	519	18	504	14	610	110	504.0	14.0	2.9
U1456D-20R-1 95-103 cm	175.1	0.737	21.770	0.260	0.6061	0.0065	0.65368	3171	12	3052	26	3243	15	3243.0	15.0	5.9
U1456D-20R-1 95-103 cm	496	1.275	0.112	0.004	0.0169	0.0004	0.37147	108.4	3.7	107.8	2.4	123	65	107.8	2.4	0.6
U1456D-20R-1 95-103 cm	417.3	0.835	0.048	0.003	0.0070	0.0002	0.05912	47.9	3.3	44.7	1.3	210	150	44.7	1.3	6.7
U1456D-20R-1 95-103 cm	207	1.337	0.067	0.004	0.0107	0.0004	0.19878	65.5	4.1	68.5	2.5	50	120	68.5	2.5	4.6
U1456D-20R-1 95-103 cm	192	0.822	2.470	0.045	0.2215	0.0029	0.64956	1261	13	1289	16	1207	28	1207.0	28.0	6.8
U1456D-20R-1 95-103 cm	549	0.914	0.031	0.002	0.0048	0.0001	0.08913	31.3	1.8	30.7	0.83	120	120	30.7	0.8	1.9
U1456D-20R-1 95-103 cm	296	1.183	0.086	0.005	0.0131	0.0003	0.27895	83.3	4.4	84	1.9	74	98	84.0	1.9	0.8
U1456D-20R-1 95-103 cm	484	0.687	0.118	0.004	0.0167	0.0002	0.36684	112.8	3.2	106.5	1.5	240	61	106.5	1.5	5.6

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-20R-1 95-103 cm	190.2	13.930	0.103	0.005	0.0144	0.0004	0.35632	98.8	4.8	92	2.6	266	97	92.0	2.6	6.9
U1456D-20R-1 95-103 cm	537	2.060	0.124	0.010	0.0175	0.0010	0.51217	118.5	9.4	111.8	6.2	260	150	111.8	6.2	5.7
U1456D-20R-1 95-103 cm	159.5	1.016	0.048	0.004	0.0075	0.0002	0.02071	47.7	3.4	47.8	1.2	90	140	47.8	1.2	0.2
U1456D-20R-1 95-103 cm	170.1	0.523	1.124	0.024	0.1229	0.0018	0.33711	763	11	747	11	811	45	747.0	11.0	2.1
U1456D-20R-1 95-103 cm	1937	1.990	0.104	0.002	0.0158	0.0003	0.53480	99.9	2.2	101.1	2	101	44	101.1	2.0	1.2
U1456D-20R-1 95-103 cm	323.4	5.030	0.075	0.003	0.0117	0.0002	0.31830	73.7	2.8	75.1	1.3	64	74	75.1	1.3	1.9
U1456D-20R-1 95-103 cm	264.5	1.530	0.045	0.003	0.0071	0.0002	0.04024	44.3	2.6	45.33	0.95	40	110	45.3	1.0	2.3
U1456D-20R-1 95-103 cm	1253	29.100	0.066	0.004	0.0098	0.0004	0.23158	64.7	4.1	62.6	2.3	170	140	62.6	2.3	3.2
U1456D-20R-1 95-103 cm	87.8	1.448	1.200	0.043	0.1304	0.0034	0.55051	804	20	790	19	843	66	790.0	19.0	1.7
U1456D-20R-1 95-103 cm	72.6	2.453	1.309	0.038	0.1411	0.0031	0.46068	845	17	853	18	812	61	812.0	18.0	0.9
U1456D-20R-1 95-103 cm	1465	3.940	1.992	0.036	0.1851	0.0032	0.84431	1111	12	1094	17	1153	20	1153.0	20.0	5.1
U1456D-20R-1 95-103 cm	688	1.959	0.093	0.005	-0.0002	0.0012	0.04794	90.3	4.2	-1.7	8	218	73	DISC	DISC	101.9
U1456D-20R-1 95-103 cm	716	1.734	0.114	0.003	0.0172	0.0003	0.30541	109	2.5	110	1.6	119	50	110.0	1.6	0.9
U1456D-20R-1 95-103 cm	157	0.668	2.118	0.052	0.1983	0.0040	0.65919	1149	17	1165	21	1137	39	1137.0	39.0	2.5
U1456D-20R-1 95-103 cm	600	1.942	0.255	0.006	0.0359	0.0005	0.57653	230.4	4.6	227.4	3.3	273	41	227.4	3.3	1.3
U1456D-20R-1 95-103 cm	258	1.991	0.111	0.007	0.0167	0.0004	0.30838	106.8	5.9	106.7	2.7	140	110	106.7	2.7	0.1
U1456D-20R-1 95-103 cm	45.6	2.164	0.113	0.010	0.0164	0.0006	0.11722	107.3	9.2	104.6	3.7	170	160	104.6	3.7	2.5
U1456D-20R-1 95-103 cm	167	1.214	0.330	0.016	0.0444	0.0012	0.32983	288	12	280.2	7.5	357	95	280.2	7.5	2.7
U1456D-20R-1 95-103 cm	1568	1.668	0.017	0.001	0.0026	0.0001	0.18171	16.76	0.73	16.45	0.35	103	85	16.5	0.4	1.8
U1456D-20R-1 95-103 cm	423	2.060	0.075	0.004	0.0115	0.0005	0.49541	73.3	4.1	73.4	2.8	116	91	73.4	2.8	0.1
U1456D-20R-1 95-103 cm	1780	18.300	0.610	0.022	0.0791	0.0025	0.43598	482	14	490	15	465	80	490.0	15.0	1.7
U1456D-20R-1 95-103 cm	417	1.880	1.113	0.030	0.1254	0.0031	0.58534	758	14	761	18	780	51	761.0	18.0	0.4
U1456D-20R-1 95-103 cm	424	1.584	1.892	0.041	0.1851	0.0035	0.70711	1076	14	1094	19	1057	30	1057.0	30.0	3.5
U1456D-20R-1 95-103 cm	227.4	0.776	2.096	0.038	0.1935	0.0024	0.66202	1145	12	1140	13	1172	27	1172.0	27.0	2.7
U1456D-20R-1 95-103 cm	121.6	1.299	0.060	0.008	0.0096	0.0006	0.32305	60.2	7.9	61.5	4.1	70	230	61.5	4.1	2.2
U1456D-20R-1 95-103 cm	193.7	1.930	1.901	0.072	0.1866	0.0064	0.83242	1075	26	1101	35	1058	38	1058.0	38.0	4.1
U1456D-20R-1 95-103 cm	64.4	1.330	0.753	0.046	0.0887	0.0026	0.53161	565	26	547	16	630	110	547.0	16.0	3.2
U1456D-20R-1 95-103 cm	662	2.390	0.548	0.018	0.0713	0.0021	0.60186	442	12	444	13	473	64	444.0	13.0	0.5
U1456D-20R-1 95-103 cm	451	15.220	0.723	0.013	0.0900	0.0014	0.65928	551.2	7.4	556.1	8.2	555	31	556.1	8.2	0.9
U1456D-20R-1 95-103 cm	485	0.753	0.086	0.004	0.0121	0.0003	0.32494	83.3	3.8	77.3	1.6	255	92	77.3	1.6	7.2
U1456D-20R-1 95-103 cm	598	1.131	0.058	0.003	0.0080	0.0002	0.33571	57.3	2.5	51.4	1.1	289	84	51.4	1.1	10.3
U1456D-20R-1 95-103 cm	1210	3.630	0.591	0.011	-0.0041	0.0001	0.54251	470.8	6.9	-26.7	0.43	514	34	DISC	DISC	105.7
U1456D-20R-1 95-103 cm	1358	1.920	0.112	0.004	0.0168	0.0005	0.64223	107.4	3.7	107.1	2.9	139	61	107.1	2.9	0.3
U1456D-20R-1 95-103 cm	164.8	1.088	0.030	0.004	0.0039	0.0002	0.12506	29.5	4	24.7	1.3	320	260	DISC	DISC	16.3
U1456D-20R-1 95-103 cm	968	1.806	0.125	0.008	0.0180	0.0006	0.53863	119.1	7.5	114.9	3.9	200	110	114.9	3.9	3.5

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-20R-1 95-103 cm	265.3	0.851	0.174	0.007	0.0251	0.0005	0.33886	162.8	6	160	2.9	213	77	160.0	2.9	1.7
U1456D-20R-1 95-103 cm	149	1.021	0.634	0.017	0.0798	0.0012	0.42909	497	10	494.6	7.1	535	58	494.6	7.1	0.5
U1456D-20R-1 95-103 cm	38.4	1.412	0.137	0.013	0.0193	0.0007	0.00350	130	11	123.3	4.3	240	170	123.3	4.3	5.2
U1456D-20R-1 95-103 cm	161	0.606	1.232	0.071	0.1342	0.0058	0.62054	807	32	811	33	820	100	811.0	33.0	0.5
U1457C-51R-4 80-88 cm	481.6	0.667	0.051	0.002	0.0077	0.0001	0.10289	50.4	2.2	49.69	0.76	99	87	49.7	0.8	1.4
U1457C-51R-4 80-88 cm	696	18.360	1.305	0.018	0.1398	0.0019	0.72643	846.8	8	843	11	863	21	843.0	11.0	0.4
U1457C-51R-4 80-88 cm	309	0.605	0.057	0.004	0.0086	0.0002	0.19831	55.8	3.6	55.2	1.1	80	120	55.2	1.1	1.1
U1457C-51R-4 80-88 cm	343	0.576	0.050	0.003	0.0078	0.0001	0.05352	49.2	2.7	49.84	0.88	50	100	49.8	0.9	1.3
U1457C-51R-4 80-88 cm	405.2	1.183	1.520	0.019	0.1536	0.0018	0.55525	937.2	7.6	922	10	980	23	980.0	23.0	5.9
U1457C-51R-4 80-88 cm	415	27.600	7.180	0.180	0.3687	0.0053	0.80315	2127	22	2022	25	2240	27	2240.0	27.0	9.7
U1457C-51R-4 80-88 cm	208	0.906	0.173	0.007	0.0255	0.0004	0.00478	161.7	5.7	162.2	2.3	175	80	162.2	2.3	0.3
U1457C-51R-4 80-88 cm	124.6	1.054	0.335	0.018	0.0469	0.0008	0.76911	294	14	295.4	5	274	94	295.4	5.0	0.5
U1457C-51R-4 80-88 cm	126.2	1.110	1.267	0.049	0.1051	0.0025	0.53915	829	22	644	15	1375	64	DISC	DISC	22.3
U1457C-51R-4 80-88 cm	155	0.870	10.610	0.120	0.4628	0.0037	0.61496	2489	10	2454	17	2528	15	2528.0	15.0	2.9
U1457C-51R-4 80-88 cm	2493	1.950	0.603	0.015	0.0639	0.0016	0.40237	479	9.5	399.1	9.9	896	58	DISC	DISC	16.7
U1457C-51R-4 80-88 cm	141.1	0.582	1.107	0.016	0.1265	0.0009	0.19420	756.4	8.1	768	5.1	727	33	768.0	5.1	1.5
U1457C-51R-4 80-88 cm	182.2	0.439	1.144	0.041	0.1196	0.0029	0.42112	773	20	728	16	912	70	728.0	16.0	5.8
U1457C-51R-4 80-88 cm	457	3.340	3.376	0.041	0.2519	0.0027	0.69676	1498	9.6	1448	14	1582	18	1582.0	18.0	8.5
U1457C-51R-4 80-88 cm	487	1.105	0.097	0.003	0.0145	0.0002	0.09192	94.1	2.6	92.8	1.2	147	61	92.8	1.2	1.4
U1457C-51R-4 80-88 cm	408	1.084	1.053	0.017	0.1092	0.0016	0.63750	729.3	8.4	668.2	9.1	927	28	668.2	9.1	8.4
U1457C-51R-4 80-88 cm	444	0.458	3.421	0.053	0.2493	0.0038	0.74836	1509	12	1434	20	1628	21	1628.0	21.0	11.9
U1457C-51R-4 80-88 cm	181.2	0.566	1.686	0.027	0.1696	0.0016	0.59580	1002	10	1009.5	9	988	27	988.0	27.0	2.2
U1457C-51R-4 80-88 cm	44.31	0.954	0.144	0.015	0.0202	0.0006	0.06669	134	13	129	4	220	190	129.0	4.0	3.7
U1457C-51R-4 80-88 cm	294	3.570	1.890	0.019	0.1836	0.0015	0.51381	1077.4	6.8	1086.7	8.1	1067	18	1067.0	18.0	1.8
U1457C-51R-4 80-88 cm	103.6	1.132	0.072	0.007	0.0095	0.0002	0.13848	69.9	6.9	61.1	1.3	270	190	61.1	1.3	12.6
U1457C-51R-4 80-88 cm	368	0.538	0.225	0.012	0.0248	0.0003	0.54862	204.7	9.5	157.8	1.9	752	91	DISC	DISC	22.9
U1457C-51R-4 80-88 cm	500	0.953	0.120	0.004	0.0177	0.0002	0.22912	114.8	3.3	113.1	1.4	161	60	113.1	1.4	1.5
U1457C-51R-4 80-88 cm	222.9	1.573	0.110	0.011	0.0160	0.0005	0.16038	105	10	102	3.3	160	200	102.0	3.3	2.9
U1457C-51R-4 80-88 cm	282.6	3.109	0.505	0.018	0.0622	0.0018	0.66552	414	12	389	11	566	61	389.0	11.0	6.0
U1457C-51R-4 80-88 cm	928	0.627	0.048	0.002	0.0073	0.0001	0.24051	48.1	1.7	46.72	0.77	131	70	46.7	0.8	2.9
U1457C-51R-4 80-88 cm	140.6	0.448	9.310	0.100	0.4275	0.0040	0.64140	2367	10	2294	18	2443	15	2443.0	15.0	6.1
U1457C-51R-4 80-88 cm	83.5	0.433	4.473	0.067	0.3079	0.0039	0.54308	1724	12	1730	19	1726	24	1726.0	24.0	0.2
U1457C-51R-4 80-88 cm	753	10.400	1.479	0.016	0.1546	0.0015	0.58614	922	6.6	926.3	8.6	920	20	920.0	20.0	0.7
U1457C-51R-4 80-88 cm	581	0.977	0.055	0.002	0.0082	0.0001	0.06952	54	2	52.91	0.67	125	78	52.9	0.7	2.0
U1457C-51R-4 80-88 cm	779	0.562	0.048	0.003	0.0076	0.0001	0.12517	47.9	2.4	48.81	0.78	43	88	48.8	0.8	1.9

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-51R-4 80-88 cm	366.1	1.139	0.067	0.003	0.0098	0.0001	0.01070	65.9	2.6	62.63	0.84	203	84	62.6	0.8	5.0
U1457C-51R-4 80-88 cm	515	2.350	0.110	0.003	0.0163	0.0002	0.12153	105.5	2.7	103.9	1.3	164	58	103.9	1.3	1.5
U1457C-51R-4 80-88 cm	566	0.746	2.960	0.140	0.2060	0.0092	0.97604	1382	33	1202	48	1713	17	1713.0	17.0	29.8
U1457C-51R-4 80-88 cm	552	0.980	0.022	0.002	0.0027	0.0001	0.14689	22.3	1.6	17.49	0.38	470	140	DISC	DISC	21.6
U1457C-51R-4 80-88 cm	661	3.240	1.463	0.021	0.1536	0.0017	0.66659	916.5	9.3	920.8	9.7	916	26	916.0	26.0	0.5
U1457C-51R-4 80-88 cm	470	2.386	0.208	0.006	0.0301	0.0003	0.27417	191.1	4.7	191.2	1.9	210	55	191.2	1.9	0.1
U1457C-51R-4 80-88 cm	552	0.947	3.977	0.038	0.2748	0.0020	0.72071	1630.7	8.2	1565	10	1727	13	1727.0	13.0	9.4
U1457C-51R-4 80-88 cm	497.1	20.400	0.131	0.006	0.0191	0.0003	0.27816	124.7	5.7	121.7	2	182	98	121.7	2.0	2.4
U1457C-51R-4 80-88 cm	536	0.564	0.046	0.002	0.0070	0.0001	0.11760	45.8	2.3	44.84	0.69	129	96	44.8	0.7	2.1
U1457C-51R-4 80-88 cm	230	2.050	9.430	0.140	0.4393	0.0041	0.85253	2378	14	2347	18	2418	14	2418.0	14.0	2.9
U1457C-51R-4 80-88 cm	626	0.923	0.116	0.004	0.0171	0.0003	0.08655	111	3.9	109.6	1.7	161	79	109.6	1.7	1.3
U1457C-51R-4 80-88 cm	121	0.947	0.072	0.009	0.0112	0.0003	0.00208	69.2	8	71.9	2	10	190	71.9	2.0	3.9
U1457C-51R-4 80-88 cm	374	2.770	0.866	0.028	0.1031	0.0021	0.70618	631	15	632	12	634	50	632.0	12.0	0.2
U1457C-51R-4 80-88 cm	687	4.120	0.547	0.007	0.0698	0.0007	0.62594	442.3	4.7	434.9	4.2	503	23	434.9	4.2	1.7
U1457C-51R-4 80-88 cm	271.7	0.854	0.064	0.004	0.0084	0.0002	0.15812	62.3	3.6	54.08	0.96	360	120	54.1	1.0	13.2
U1457C-51R-4 80-88 cm	612	0.636	0.051	0.002	0.0076	0.0001	0.12497	50.2	1.9	48.93	0.6	135	82	48.9	0.6	2.5
U1457C-51R-4 80-88 cm	879	29.600	0.201	0.009	0.0291	0.0009	0.64077	185.4	7.3	184.8	5.8	214	74	184.8	5.8	0.3
U1457C-51R-4 80-88 cm	396.4	1.754	0.549	0.011	0.0713	0.0007	0.36916	444	7.4	443.7	4.4	467	46	443.7	4.4	0.1
U1457C-51R-4 80-88 cm	421	1.015	0.654	0.009	0.0816	0.0008	0.43774	510.1	5.6	505.3	4.6	553	29	505.3	4.6	0.9
U1457C-51R-4 80-88 cm	476	44.000	0.771	0.013	0.0942	0.0010	0.61857	579.6	7.4	580.2	5.7	588	30	580.2	5.7	0.1
U1457C-51R-4 80-88 cm	1196	3.250	0.111	0.002	0.0164	0.0001	0.35448	106.7	1.9	105.12	0.9	168	38	105.1	0.9	1.5
U1457C-51R-4 80-88 cm	1830	54.900	0.519	0.011	0.0688	0.0013	0.68148	424.5	7.5	428.7	7.6	430	35	428.7	7.6	1.0
U1457C-51R-4 80-88 cm	494	1.496	5.110	0.190	0.2891	0.0084	0.94385	1825	33	1634	42	2074	25	2074.0	25.0	21.2
U1457C-51R-4 80-88 cm	387	2.650	0.593	0.009	0.0762	0.0008	0.54726	473.6	6	473	4.6	492	30	473.0	4.6	0.1
U1457C-51R-4 80-88 cm	334	15.800	0.251	0.009	0.0347	0.0005	0.23507	226.8	7.3	219.7	3.3	299	74	219.7	3.3	3.1
U1457C-51R-4 80-88 cm	304.6	2.420	0.469	0.016	0.0604	0.0012	0.35647	390	11	378	7.3	471	70	378.0	7.3	3.1
U1457C-51R-4 80-88 cm	2546	1.810	0.047	0.002	0.0072	0.0002	0.81581	46.6	1.5	46.3	1.3	88	41	46.3	1.3	0.6
U1457C-51R-4 80-88 cm	708	0.636	0.051	0.002	0.0077	0.0001	0.09498	50.8	2	49.59	0.62	132	79	49.6	0.6	2.4
U1457C-51R-4 80-88 cm	390	3.065	0.885	0.023	0.1049	0.0023	0.53282	642	12	643	13	649	49	643.0	13.0	0.2
U1457C-51R-4 80-88 cm	657	0.901	9.851	0.095	0.4298	0.0040	0.77239	2419.9	9	2304	18	2528	10	2528.0	10.0	8.9
U1457C-51R-4 80-88 cm	94.2	0.744	0.062	0.007	0.0089	0.0002	0.11235	59.9	6.6	56.9	1.5	110	190	56.9	1.5	5.0
U1457C-51R-4 80-88 cm	594	2.590	0.715	0.031	0.0881	0.0036	0.74516	546	18	544	21	541	69	544.0	21.0	0.4
U1457C-51R-4 80-88 cm	257	3.000	1.108	0.029	0.1231	0.0027	0.52503	755	14	748	16	787	52	748.0	16.0	0.9
U1457C-51R-4 80-88 cm	774	5.050	0.061	0.002	0.0091	0.0002	0.51270	60.4	2.3	58.2	1.5	157	71	58.2	1.5	3.6
U1457C-51R-4 80-88 cm	160.7	0.990	0.069	0.005	0.0093	0.0002	0.16963	67	5.2	59.7	1.5	320	150	59.7	1.5	10.9

(table cont'd)

Sample Name	[U] ppm	U/Th	207/235					206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			207/23 5	2σ error	206/238	2σ error	RHO	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-51R-4 80-88 cm	337	1.280	6.900	0.100	0.3735	0.0058	0.77444	2098	13	2045	27	2151.0	18.0	4.9
U1457C-51R-4 80-88 cm	1112	0.493	0.049	0.001	0.0071	0.0001	0.11542	48.9	1.2	45.53	0.48	45.5	0.5	6.9
U1457C-51R-4 80-88 cm	227.8	0.810	0.096	0.005	0.0135	0.0003	0.02532	92.7	4.3	86.4	1.6	86.4	1.6	6.8
U1457C-51R-4 80-88 cm	1352	40.500	0.158	0.021	0.0227	0.0023	0.66105	148	18	145	15	200	210	DISC
U1457C-51R-4 80-88 cm	713	1.279	1.517	0.034	0.1366	0.0029	0.76991	936	14	825	17	1209	31	DISC
U1457C-51R-4 80-88 cm	59.1	0.797	0.075	0.011	0.0109	0.0004	0.03908	71	10	69.6	2.5	50	250	DISC
U1457C-51R-4 80-88 cm	573	0.682	0.569	0.013	0.0701	0.0013	0.60721	456.8	8.7	436.4	8	562	41	DISC
U1457C-51R-4 80-88 cm	340	1.167	0.175	0.005	0.0259	0.0003	0.02007	163.6	4.3	165	1.9	144	61	DISC
U1457C-51R-4 80-88 cm	791	1.699	10.161	0.084	0.4595	0.0032	0.68921	2448.5	7.7	2437	14	2458	10	DISC
U1457C-51R-4 80-88 cm	309	1.942	5.180	0.150	0.2736	0.0080	0.78280	1844	26	1557	40	2193	33	DISC
U1457C-51R-4 80-88 cm	2850	0.814	0.036	0.001	0.0053	0.0001	0.43496	35.9	1	34.19	0.58	166	62	DISC
U1457C-51R-4 80-88 cm	210.4	14.000	8.400	0.380	0.3750	0.0180	0.77705	2268	42	2050	84	2495	47	DISC
U1457C-51R-4 80-88 cm	2570	2.880	0.054	0.003	0.0080	0.0003	0.80329	53.5	2.9	51.5	1.9	169	68	DISC
U1457C-51R-4 80-88 cm	1071	30.100	0.258	0.019	0.0336	0.0019	0.87330	233	16	213	12	437	90	DISC
U1457C-51R-4 80-88 cm	650	1.940	1.707	0.038	0.1686	0.0038	0.75466	1010	14	1004	21	1015	35	DISC
U1457C-51R-4 80-88 cm	212	1.843	2.122	0.050	0.1971	0.0027	0.63331	1154	16	1160	15	1141	37	DISC
U1457C-51R-4 80-88 cm	1368	0.960	0.120	0.002	0.0180	0.0001	0.26926	115	1.9	114.82	0.85	131	36	DISC
U1457C-51R-4 80-88 cm	424	1.200	9.806	0.068	0.4378	0.0029	0.70498	2415.9	6.4	2340	13	2483.3	8.9	DISC
U1457C-51R-4 80-88 cm	1031	2.190	0.225	0.003	0.0322	0.0003	0.28399	206.1	2.6	204.4	1.8	226	32	DISC
U1457C-51R-4 80-88 cm	145.8	0.966	0.835	0.023	0.0982	0.0014	0.39993	618	14	603.9	7.9	664	59	DISC
U1457C-51R-4 80-88 cm	1058	0.392	0.041	0.002	0.0062	0.0001	0.30884	40.4	1.6	40.11	0.77	88	82	DISC
U1457C-51R-4 80-88 cm	29.31	0.596	5.440	0.110	0.3398	0.0045	0.19450	1888	17	1885	21	1890	40	DISC
U1457C-51R-4 80-88 cm	65.1	0.719	0.098	0.018	0.0110	0.0004	0.00343	93	16	70.6	2.6	490	300	DISC
U1457C-51R-4 80-88 cm	1221	1.050	4.075	0.043	0.2680	0.0027	0.65717	1649.8	8.2	1530	14	1803	15	DISC
U1457C-51R-4 80-88 cm	367	0.690	0.098	0.004	0.0116	0.0002	0.08473	94.8	4.2	74.6	1.4	590	100	DISC
U1457C-51R-4 80-88 cm	295.3	6.800	0.430	0.020	0.0532	0.0019	0.37375	362	14	334	12	540	100	DISC
U1457C-51R-4 80-88 cm	437	1.077	0.971	0.016	0.1110	0.0016	0.44760	688.1	8.3	678.2	9	720	35	DISC
U1457C-51R-4 80-88 cm	509	0.753	0.072	0.003	0.0107	0.0002	0.11463	70.6	2.5	68.64	0.97	143	73	DISC
U1457C-51R-4 80-88 cm	1231	9.430	0.692	0.006	0.0866	0.0005	0.35852	533.7	3.8	535.3	3.1	519	20	DISC
U1457C-51R-4 80-88 cm	349	1.023	0.054	0.003	0.0082	0.0001	0.05118	53.4	2.9	52.5	0.73	110	110	DISC
U1457C-51R-4 80-88 cm	179	0.783	0.050	0.005	0.0079	0.0002	0.01602	48.7	4.5	50.8	1.2	-30	160	DISC
U1457C-51R-4 80-88 cm	3680	22.100	0.117	0.004	0.0174	0.0003	0.18733	112.3	3.5	110.9	1.7	139	72	DISC
U1457C-51R-4 80-88 cm	144	4.030	1.830	0.028	0.1787	0.0020	0.44320	1055.7	9.7	1060	11	1032	29	DISC
U1457C-51R-4 80-88 cm	420	2.657	2.793	0.039	0.1910	0.0023	0.71040	1352	10	1126	13	1719	19	DISC
U1457C-51R-4 80-88 cm	651	90.000	0.144	0.006	0.0212	0.0006	0.72474	136.2	5.2	135.5	4	152	61	DISC

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-51R-4 80-88 cm	920	3.550	0.121	0.002	0.0177	0.0002	0.22787	116.2	2.1	113.11	0.94	175	41	113.1	0.9	2.7
U1457C-51R-4 80-88 cm	333	9.440	0.131	0.006	0.0193	0.0004	0.47054	124.7	4.9	123.3	2.8	144	73	123.3	2.8	1.1
U1457C-51R-4 80-88 cm	2350	0.732	0.040	0.001	0.0058	0.0001	0.25922	39.3	1.3	37.2	0.66	175	78	37.2	0.7	5.3
U1457C-51R-4 80-88 cm	729	2.620	0.774	0.008	0.0948	0.0008	0.44980	582.5	4.2	583.9	4.5	563	20	583.9	4.5	0.2
U1457C-51R-4 80-88 cm	948	2.880	1.312	0.063	0.1346	0.0052	0.79754	849	28	814	30	937	61	814.0	30.0	4.1
U1457C-51R-4 80-88 cm	303.9	2.460	0.540	0.013	0.0630	0.0008	0.33918	437.6	8.5	393.9	4.6	651	49	393.9	4.6	10.0
U1457C-51R-4 80-88 cm	635	0.845	0.102	0.003	0.0151	0.0002	0.17818	98.5	2.5	96.32	0.97	137	56	96.3	1.0	2.2
U1457C-51R-4 80-88 cm	2600	2.290	0.091	0.010	0.0088	0.0008	0.91865	88.1	9.8	56.7	5.4	1037	98	DISC	DISC	35.6
U1457C-51R-4 80-88 cm	155.5	1.078	9.110	0.100	0.4151	0.0042	0.61920	2348	10	2237	19	2436	16	2436.0	16.0	8.2
U1457C-51R-4 80-88 cm	624	0.965	0.881	0.009	0.1040	0.0008	0.32328	641	4.6	638	4.4	644	22	638.0	4.4	0.5
U1457C-51R-4 80-88 cm	1560	4.620	0.022	0.002	0.0033	0.0001	0.65733	22.4	2	21.02	0.76	190	170	21.0	0.8	6.2
U1457C-51R-4 80-88 cm	2020	1.590	0.041	0.001	0.0057	0.0001	0.05866	40.2	1.1	36.4	0.33	250	60	36.4	0.3	9.5
U1457C-51R-4 80-88 cm	357.2	0.484	0.089	0.005	0.0074	0.0001	0.07368	86.3	4.1	47.64	0.75	1260	100	DISC	DISC	44.8
U1457C-51R-4 80-88 cm	125.1	0.492	0.114	0.008	0.0161	0.0004	0.07349	108.6	7.5	103.1	2.2	250	130	103.1	2.2	5.1
U1457C-51R-4 80-88 cm	833	2.070	1.008	0.026	0.1131	0.0028	0.68078	707	13	691	16	756	41	691.0	16.0	2.3
U1457C-51R-4 80-88 cm	385	0.887	1.580	0.027	0.1632	0.0021	0.62962	961	10	975	12	927	29	927.0	29.0	5.2
U1457C-51R-4 80-88 cm	4800	1.283	0.043	0.001	0.0064	0.0001	0.59619	42.55	0.81	41.27	0.66	125	36	41.3	0.7	3.0
U1457C-51R-4 80-88 cm	220	0.740	0.068	0.005	0.0099	0.0002	0.14129	66.7	4.7	63.3	1.3	200	130	63.3	1.3	5.1
U1457C-51R-4 80-88 cm	230.9	0.596	0.119	0.005	0.0173	0.0002	0.10271	113.7	4.2	110.6	1.4	190	83	110.6	1.4	2.7
U1457C-51R-4 80-88 cm	761	1.838	0.795	0.019	0.0674	0.0014	0.78778	593	11	420.3	8.7	1308	30	DISC	DISC	29.1
U1457C-51R-4 80-88 cm	591	0.587	0.118	0.003	0.0169	0.0002	0.36271	113.1	3.1	108	1.3	205	56	108.0	1.3	4.5
U1457C-51R-4 80-88 cm	40	0.447	11.100	0.130	0.4814	0.0045	0.45254	2529	11	2532	19	2514	20	2514.0	20.0	0.7
U1456D-22R-1 73-83 cm	191	12.600	4.703	0.057	0.3223	0.0032	0.72405	1766	10	1800	16	1751	15	1751.0	15.0	2.8
U1456D-22R-1 73-83 cm	87.1	0.789	1.165	0.022	0.1172	0.0016	0.48045	783	11	714.3	9.2	989	38	714.3	9.2	8.8
U1456D-22R-1 73-83 cm	279.3	0.404	0.720	0.014	0.0792	0.0014	0.77068	549.6	8.3	491.2	8.3	827	26	491.2	8.3	10.6
U1456D-22R-1 73-83 cm	149.2	0.848	0.368	0.006	0.0513	0.0005	0.37770	318.5	4.5	322.1	3.3	326	35	322.1	3.3	1.1
U1456D-22R-1 73-83 cm	91.5	0.827	0.070	0.003	0.0098	0.0002	0.24549	68.7	3.1	62.9	1.3	268	96	62.9	1.3	8.4
U1456D-22R-1 73-83 cm	188	1.242	2.016	0.031	0.1951	0.0021	0.66923	1121	10	1149	11	1094	23	1094.0	23.0	5.0
U1456D-22R-1 73-83 cm	42.4	0.884	0.073	0.005	0.0104	0.0003	0.24628	70.9	4.4	66.5	1.6	280	120	66.5	1.6	6.2
U1456D-22R-1 73-83 cm	25.71	1.006	0.132	0.009	0.0191	0.0004	-0.01689	126.2	7.8	121.7	2.4	190	130	121.7	2.4	3.6
U1456D-22R-1 73-83 cm	81.4	0.863	1.207	0.018	0.1321	0.0018	0.58870	804.2	8.3	799	10	830	28	799.0	10.0	0.6
U1456D-22R-1 73-83 cm	645	0.795	0.078	0.001	0.0119	0.0001	0.36333	76.2	1	75.97	0.73	92	30	76.0	0.7	0.3
U1456D-22R-1 73-83 cm	295	0.680	0.046	0.001	0.0068	0.0001	0.17819	45.2	1.3	43.81	0.58	121	60	43.8	0.6	3.1
U1456D-22R-1 73-83 cm	70.5	1.009	0.067	0.004	0.0091	0.0002	0.14749	65.8	3.5	58.4	1.1	290	110	58.4	1.1	11.2
U1456D-22R-1 73-83 cm	129.2	0.655	0.082	0.003	0.0126	0.0002	0.19114	80	2.5	80.5	1.2	86	64	80.5	1.2	0.6

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-22R-1 73-83 cm	231.3	2.965	1.399	0.020	0.1423	0.0019	0.75103	888	8.5	857	11	951	20	951.0	20.0	9.9
U1456D-22R-1 73-83 cm	150	1.840	0.047	0.002	0.0071	0.0001	0.12614	46.8	1.9	45.64	0.76	116	82	45.6	0.8	2.5
U1456D-22R-1 73-83 cm	79.2	0.899	0.059	0.003	0.0073	0.0002	0.25542	57.7	2.7	47.1	1.3	490	110	DISC	DISC	18.4
U1456D-22R-1 73-83 cm	520.9	0.265	0.055	0.002	0.0079	0.0001	0.28752	54.2	1.4	50.82	0.67	228	65	50.8	0.7	6.2
U1456D-22R-1 73-83 cm	382	5.530	4.933	0.052	0.3178	0.0034	0.75831	1808	9	1780	16	1843	14	1843.0	14.0	3.4
U1456D-22R-1 73-83 cm	87.8	1.283	7.680	0.160	0.3756	0.0069	0.50205	2198	18	2055	32	2351	36	2351.0	36.0	12.6
U1456D-22R-1 73-83 cm	534	1.670	0.107	0.002	0.0159	0.0002	0.35145	103.1	1.5	101.42	0.98	132	32	101.4	1.0	1.6
U1456D-22R-1 73-83 cm	239	3.480	11.019	0.078	0.4716	0.0038	0.71539	2524.6	6.5	2490	17	2552	10	2552.0	10.0	2.4
U1456D-22R-1 73-83 cm	266.9	1.120	0.107	0.003	0.0158	0.0003	0.41948	103.7	2.3	101.1	1.6	137	46	101.1	1.6	2.5
U1456D-22R-1 73-83 cm	179	1.580	0.133	0.006	0.0104	0.0002	0.18090	126.1	5.1	66.4	1.1	1457	80	DISC	DISC	47.3
U1456D-22R-1 73-83 cm	824	5.110	0.192	0.004	0.0279	0.0005	0.78674	178.3	3.5	177.6	3.3	179	31	177.6	3.3	0.4
U1456D-22R-1 73-83 cm	141.8	0.891	7.870	0.100	0.3528	0.0039	0.76145	2218	12	1949	19	2475	15	2475.0	15.0	21.3
U1456D-22R-1 73-83 cm	564	1.774	5.806	0.098	0.3223	0.0064	0.58756	1947	15	1802	31	2099	22	2099.0	22.0	14.1
U1456D-22R-1 73-83 cm	138.6	2.794	0.714	0.018	0.0893	0.0017	0.68451	546	10	553	10	516	36	553.0	10.0	1.3
U1456D-22R-1 73-83 cm	1036	1.388	0.167	0.002	0.0246	0.0002	0.51964	156.6	1.6	156.7	1.3	155	23	156.7	1.3	0.1
U1456D-22R-1 73-83 cm	732	1.638	0.044	0.003	0.0060	0.0004	0.72629	43.9	2.7	38.5	2.2	337	57	38.5	2.2	12.3
U1456D-22R-1 73-83 cm	340	1.549	1.310	0.015	0.1367	0.0015	0.61417	850.8	6.6	826.9	8.3	923	22	826.9	8.3	2.8
U1456D-22R-1 73-83 cm	257	0.608	0.047	0.002	0.0062	0.0001	0.07181	46.9	1.8	39.78	0.7	442	88	DISC	DISC	15.2
U1456D-22R-1 73-83 cm	295.6	1.044	1.164	0.013	0.1283	0.0009	0.53768	783.3	6.2	777.9	5.4	820	21	777.9	5.4	0.7
U1456D-22R-1 73-83 cm	5000	1.292	0.049	0.001	0.0064	0.0001	0.54002	48.6	1.2	41.37	0.5	462	45	41.4	0.5	14.9
U1456D-22R-1 73-83 cm	875	18.800	0.052	0.002	0.0076	0.0001	0.03131	51.8	1.7	48.46	0.88	210	70	48.5	0.9	6.4
U1456D-22R-1 73-83 cm	262	32.000	0.742	0.021	0.0896	0.0020	0.56090	562	12	553	12	616	49	553.0	12.0	1.6
U1456D-22R-1 73-83 cm	17.96	1.860	5.650	0.190	0.3159	0.0091	0.79387	1921	29	1768	45	2154	41	2154.0	41.0	17.9
U1456D-22R-1 73-83 cm	119.5	0.969	0.126	0.004	0.0174	0.0002	0.14392	120.5	3.6	111	1.2	321	67	111.0	1.2	7.9
U1456D-22R-1 73-83 cm	36.09	1.130	0.124	0.010	0.0195	0.0005	-0.05313	118.1	8.7	124.2	3.2	0	150	124.2	3.2	5.2
U1456D-22R-1 73-83 cm	349.9	4.070	1.578	0.015	0.1606	0.0012	0.69384	960.8	5.8	959.9	6.6	980	14	980.0	14.0	2.1
U1456D-22R-1 73-83 cm	415.6	0.801	4.677	0.066	0.2404	0.0041	0.81806	1762	12	1391	22	2259	20	DISC	DISC	38.4
U1456D-22R-1 73-83 cm	104.7	0.740	1.116	0.016	0.1236	0.0012	0.56716	760.3	7.8	751.1	7	809	26	751.1	7.0	1.2
U1456D-22R-1 73-83 cm	1386	4.230	0.530	0.014	0.0581	0.0016	0.69565	431.4	9.1	363.9	9.4	836	50	DISC	DISC	15.6
U1456D-22R-1 73-83 cm	336	2.200	1.497	0.022	0.1441	0.0018	0.74744	929.6	8.7	867.9	9.9	1112	18	1112.0	18.0	22.0
U1456D-22R-1 73-83 cm	98.2	0.654	0.108	0.008	0.0154	0.0004	0.12858	104.1	6.9	98.2	2.4	300	150	98.2	2.4	5.7
U1456D-22R-1 73-83 cm	80.1	0.626	4.362	0.061	0.3005	0.0033	0.62547	1704	12	1693	16	1721	20	1721.0	20.0	1.6
U1456D-22R-1 73-83 cm	46.4	1.158	6.950	0.100	0.3566	0.0036	0.68227	2103	13	1967	17	2249	20	2249.0	20.0	12.5
U1456D-22R-1 73-83 cm	1693	13.170	0.867	0.016	0.0929	0.0028	0.53460	633.5	8.5	573	16	853	48	573.0	16.0	9.6
U1456D-22R-1 73-83 cm	300.5	0.749	0.058	0.003	0.0080	0.0003	0.60968	57.1	3.2	51.2	1.8	341	93	51.2	1.8	10.3

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-22R-1 73-83 cm	2290	1.043	0.039	0.001	0.0058	0.0001	0.41288	38.52	0.66	37.05	0.33	156	36	37.1	0.3	3.8
U1456D-22R-1 73-83 cm	293	0.612	3.628	0.055	0.2728	0.0042	0.84337	1557	12	1556	21	1565	16	1565.0	16.0	0.6
U1456D-22R-1 73-83 cm	561.7	0.713	6.590	0.140	0.2713	0.0059	0.89787	2056	19	1546	30	2624	16	DISC	DISC	41.1
U1456D-22R-1 73-83 cm	565	0.637	0.050	0.001	0.0077	0.0001	0.20395	49	1	49.53	0.56	41	44	49.5	0.6	1.1
U1456D-22R-1 73-83 cm	18.08	0.877	0.135	0.011	0.0203	0.0004	0.06928	127.3	9.6	129.6	2.7	110	140	129.6	2.7	1.8
U1456D-22R-1 73-83 cm	284	0.799	1.500	0.019	0.1446	0.0019	0.82562	931.1	7.7	870	11	1088	16	1088.0	16.0	20.0
U1456D-22R-1 73-83 cm	245	1.164	0.050	0.002	0.0079	0.0001	0.07889	49.2	1.5	50.53	0.59	7	62	50.5	0.6	2.7
U1456D-22R-1 73-83 cm	59.2	0.637	1.092	0.016	0.1227	0.0012	0.33505	749.3	7.6	745.8	7.1	745	29	745.8	7.1	0.5
U1456D-22R-1 73-83 cm	478	0.868	1.048	0.018	0.1068	0.0017	0.81840	726.8	8.7	654.1	9.6	960	20	654.1	9.6	10.0
U1456D-22R-1 73-83 cm	76.5	71.000	0.740	0.033	0.0915	0.0026	0.78682	561	19	564	15	552	56	564.0	15.0	0.5
U1456D-22R-1 73-83 cm	146.6	2.984	1.673	0.022	0.1635	0.0018	0.48980	997.6	8.3	976.2	9.7	1034	25	1034.0	25.0	5.6
U1456D-22R-1 73-83 cm	177.6	1.028	0.322	0.007	0.0437	0.0006	0.32609	283.8	5.1	275.7	3.8	324	44	275.7	3.8	2.9
U1456D-22R-1 73-83 cm	206	1.709	1.526	0.030	0.1486	0.0025	0.84701	944	12	894	14	1059	22	1059.0	22.0	15.6
U1456D-22R-1 73-83 cm	837	0.865	0.047	0.001	0.0068	0.0001	0.24941	46.4	1.1	43.58	0.6	225	51	43.6	0.6	6.1
U1456D-22R-1 73-83 cm	130.6	0.597	0.129	0.004	0.0186	0.0002	0.21087	123.3	3.9	118.5	1.5	221	72	118.5	1.5	3.9
U1456D-22R-1 73-83 cm	73.4	1.016	9.080	0.190	0.4052	0.0084	0.74934	2346	19	2201	38	2477	25	2477.0	25.0	11.1
U1456D-22R-1 73-83 cm	232.9	0.869	1.922	0.019	0.1801	0.0017	0.67351	1088.6	6.7	1067.5	9.4	1115	16	1115.0	16.0	4.3
U1456D-22R-1 73-83 cm	65.4	1.029	4.963	0.062	0.3194	0.0027	0.57203	1813	11	1786	13	1839	19	1839.0	19.0	2.9
U1456D-22R-1 73-83 cm	76.7	0.522	0.085	0.003	0.0127	0.0002	-0.03196	82.3	3	81.2	1.1	125	77	81.2	1.1	1.3
U1456D-22R-1 73-83 cm	538	43.400	0.218	0.004	0.0310	0.0006	0.50959	199.8	3.4	196.9	4	203	44	196.9	4.0	1.5
U1456D-22R-1 73-83 cm	141.3	1.780	1.112	0.033	0.1175	0.0018	0.32693	761	15	716	10	882	50	716.0	10.0	5.9
U1456D-22R-1 73-83 cm	111.9	0.730	0.078	0.003	0.0114	0.0002	0.07795	76.3	2.8	73	1.1	165	79	73.0	1.1	4.3
U1456D-22R-1 73-83 cm	182.8	1.066	0.096	0.002	0.0144	0.0002	0.13370	92.9	2.1	92.2	1	103	49	92.2	1.0	0.8
U1456D-22R-1 73-83 cm	67.2	0.835	0.095	0.006	0.0121	0.0003	0.11572	92.5	5.8	77.5	2	460	150	DISC	DISC	16.2
U1456D-22R-1 73-83 cm	99.4	0.714	1.265	0.021	0.1366	0.0014	0.48455	828.9	9.2	825.3	8.2	824	32	825.3	8.2	0.4
U1456D-22R-1 73-83 cm	118.3	0.849	0.053	0.003	0.0076	0.0001	0.37663	52.2	2.5	49.05	0.86	167	94	49.1	0.9	6.0
U1456D-22R-1 73-83 cm	256.5	0.718	0.642	0.008	0.0803	0.0008	0.52062	503.1	4.9	497.8	4.5	503	26	497.8	4.5	1.1
U1456D-22R-1 73-83 cm	362	3.530	0.312	0.008	0.0414	0.0009	0.86054	275.7	6.2	261.7	5.3	383	28	261.7	5.3	5.1
U1456D-22R-1 73-83 cm	479	2.030	0.206	0.008	0.0298	0.0008	0.61713	189.9	6.5	189.4	4.7	133	65	189.4	4.7	0.3
U1456D-22R-1 73-83 cm	1550	10.090	0.662	0.055	0.0814	0.0039	0.73280	514	33	505	23	600	130	505.0	23.0	1.8
U1456D-22R-1 73-83 cm	527.4	3.420	3.365	0.037	0.2212	0.0025	0.58123	1495.8	8.5	1290	13	1789	19	1789.0	19.0	27.9
U1456D-22R-1 73-83 cm	260	0.632	0.074	0.002	0.0109	0.0002	0.23034	72.8	2.3	70.2	1.4	126	64	70.2	1.4	3.6
U1456D-22R-1 73-83 cm	104.6	0.928	1.249	0.027	0.1334	0.0020	0.60307	823	12	809	12	870	35	809.0	12.0	1.7
U1456D-22R-1 73-83 cm	543	1.890	0.117	0.003	0.0175	0.0002	0.28265	112.2	2.4	111.6	1.5	126	43	111.6	1.5	0.5
U1456D-22R-1 73-83 cm	266	0.957	1.650	0.023	0.1616	0.0018	0.42611	990	8.7	965.4	9.8	1023	27	1023.0	27.0	5.6

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-22R-1 73-83 cm	334	1.619	1.846	0.046	0.1607	0.0020	0.26852	1059	16	960	11	1214	44	1214.0	44.0	20.9
U1456D-22R-1 73-83 cm	119	1.990	1.200	0.018	0.1274	0.0017	0.66718	800.1	8.3	772.5	9.9	871	25	772.5	9.9	3.4
U1456D-22R-1 73-83 cm	326	1.442	0.824	0.032	0.0981	0.0040	0.71726	608	17	602	23	611	64	602.0	23.0	1.0
U1456D-22R-1 73-83 cm	99.7	0.853	1.090	0.014	0.1200	0.0010	0.42953	748.2	6.8	730.6	5.8	783	25	730.6	5.8	2.4
U1456D-22R-1 73-83 cm	118.6	1.703	5.160	0.052	0.3112	0.0030	0.61511	1844.7	8.6	1746	15	1926	16	1926.0	16.0	9.3
U1456D-22R-1 73-83 cm	134.4	0.846	0.286	0.008	0.0388	0.0008	0.15207	255	6.4	245.6	5	287	78	245.6	5.0	3.7
U1456D-22R-1 73-83 cm	696	2.150	0.066	0.002	0.0096	0.0002	0.78650	64.7	1.6	61.8	1.4	140	37	61.8	1.4	4.5
U1456D-22R-1 73-83 cm	192	0.532	0.052	0.002	0.0075	0.0001	0.06058	51.3	1.8	48.33	0.58	149	76	48.3	0.6	5.8
U1456D-22R-1 73-83 cm	46.1	0.929	0.058	0.004	0.0090	0.0002	0.08825	56.6	3.5	57.9	1.2	90	120	57.9	1.2	2.3
U1456D-22R-1 73-83 cm	403	1.896	1.546	0.018	0.1534	0.0015	0.79826	948.1	7.3	919.6	8.6	995	16	995.0	16.0	7.6
U1456D-22R-1 73-83 cm	166	0.765	0.064	0.003	0.0089	0.0001	0.35530	63.2	2.4	57.24	0.85	270	73	57.2	0.9	9.4
U1456D-22R-1 73-83 cm	551.5	1.238	10.750	0.140	0.4009	0.0096	0.12802	2504	12	2171	45	2751	35	2751.0	35.0	21.1
U1456D-22R-1 73-83 cm	108.3	2.847	1.358	0.017	0.1414	0.0010	0.46878	870.1	7.1	852.6	5.9	886	22	886.0	22.0	3.8
U1456D-22R-1 73-83 cm	368	0.680	0.068	0.002	0.0103	0.0001	0.30869	66.4	1.7	65.89	0.75	84	51	65.9	0.8	0.8
U1456D-22R-1 73-83 cm	498	1.556	6.131	0.088	0.2983	0.0041	0.84916	1996	12	1682	21	2317	13	2317.0	13.0	27.4
U1456D-22R-1 73-83 cm	285	0.960	0.049	0.002	0.0076	0.0001	0.19509	48.3	1.4	48.64	0.64	49	59	48.6	0.6	0.7
U1456D-22R-1 73-83 cm	167.2	1.041	0.089	0.003	0.0133	0.0002	0.04841	86.7	2.4	85.2	1.1	113	63	85.2	1.1	1.7
U1456D-22R-1 73-83 cm	187	1.250	0.046	0.002	0.0068	0.0001	0.05452	45.3	1.8	43.97	0.58	120	86	44.0	0.6	2.9
U1456D-22R-1 73-83 cm	420	6.820	4.312	0.091	0.2644	0.0045	0.92939	1693	17	1511	23	1917	13	1917.0	13.0	21.2
U1456D-22R-1 73-83 cm	160.8	0.771	0.072	0.002	0.0095	0.0001	0.14843	70.5	1.9	61.15	0.85	365	65	61.2	0.9	13.3
U1456D-22R-1 73-83 cm	333.7	0.971	1.357	0.013	0.1430	0.0014	0.61504	871	5.5	861.4	7.7	895	17	895.0	17.0	3.8
U1456D-22R-1 73-83 cm	882.3	4.965	3.322	0.033	0.2149	0.0022	0.81926	1487.6	7.7	1255	12	1846	11	DISC	DISC	32.0
U1456D-22R-1 73-83 cm	418	1.650	1.227	0.010	0.1336	0.0011	0.39291	812.6	4.7	809	6.4	805	18	809.0	6.4	0.4
U1456D-22R-1 73-83 cm	172	1.084	1.906	0.027	0.1815	0.0023	0.74997	1083.1	9.3	1075	13	1105	21	1105.0	21.0	2.7
U1456D-22R-1 73-83 cm	285.9	0.659	0.059	0.002	0.0089	0.0001	0.17196	58.6	1.5	57.11	0.72	112	53	57.1	0.7	2.5
U1456D-22R-1 73-83 cm	2090	42.100	0.575	0.004	0.0743	0.0006	0.58681	461.2	2.3	462.1	3.5	456	13	462.1	3.5	0.2
U1456D-22R-1 73-83 cm	356	7.650	0.177	0.004	0.0259	0.0006	0.82462	164.8	3.6	164.8	3.5	156	29	164.8	3.5	0.0
U1456D-22R-1 73-83 cm	386	1.413	5.526	0.086	0.2971	0.0047	0.76226	1903	13	1676	23	2161	20	2161.0	20.0	22.4
U1456D-22R-1 73-83 cm	75.7	0.763	3.683	0.057	0.2705	0.0033	0.58798	1568	13	1545	17	1594	23	1594.0	23.0	3.1
U1456D-22R-1 73-83 cm	1080	11.420	0.446	0.019	0.0571	0.0023	0.56520	374	13	358	14	533	96	358.0	14.0	4.3
U1456D-22R-1 73-83 cm	63.68	1.111	2.055	0.053	0.1848	0.0043	0.68674	1132	18	1093	23	1192	39	1192.0	39.0	8.3
U1456D-22R-1 73-83 cm	98.2	0.504	0.744	0.013	0.0884	0.0008	0.42135	562.9	7.3	546.1	4.5	642	35	546.1	4.5	3.0
U1456D-22R-1 73-83 cm	464	2.790	0.176	0.005	0.0258	0.0004	0.31058	164.1	4	164.3	2.2	141	63	164.3	2.2	0.1
U1456D-22R-1 73-83 cm	753	16.800	0.595	0.013	0.0743	0.0015	0.75540	473.6	8.2	462	9.1	521	31	462.0	9.1	2.4
U1456D-22R-1 73-83 cm	467	0.420	0.050	0.001	0.0077	0.0001	0.33671	49.3	1.2	49.42	0.52	66	45	49.4	0.5	0.2

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-22R-1 73-83 cm	64.5	0.532	4.187	0.045	0.2912	0.0032	0.71222	1672.2	9.1	1647	16	1707	16	1707.0	16.0	3.5
U1456D-22R-1 73-83 cm	388	12.330	4.552	0.041	0.2819	0.0027	0.74830	1740.4	7.4	1602	14	1903	12	1903.0	12.0	15.8
U1456D-22R-1 73-83 cm	720	1.041	0.141	0.005	0.0189	0.0005	0.60560	133.9	4.4	120.6	3.1	376	66	120.6	3.1	9.9
U1456D-22R-1 73-83 cm	496	46.600	0.214	0.007	0.0303	0.0007	0.52772	197	5.9	192.5	4.1	245	60	192.5	4.1	2.3
U1456D-22R-1 73-83 cm	78.5	1.056	3.070	0.063	0.2119	0.0034	0.58138	1424	16	1239	18	1713	27	1713.0	27.0	27.7
U1456D-22R-1 73-83 cm	69.5	0.641	0.115	0.009	0.0124	0.0007	0.01888	110.4	7.9	79.3	4.6	750	200	DISC	DISC	28.2
U1456D-22R-1 73-83 cm	438	1.840	1.127	0.092	0.1272	0.0085	0.81953	761	45	771	49	720	110	771.0	49.0	1.3
U1456D-22R-1 73-83 cm	451	4.420	2.331	0.036	0.2122	0.0033	0.74517	1221	11	1240	18	1173	22	1173.0	22.0	5.7
U1456D-22R-1 73-83 cm	1332	1.229	0.198	0.005	0.0271	0.0006	0.62315	183.1	4	172.5	3.6	299	44	172.5	3.6	5.8
U1456D-22R-1 73-83 cm	73	2.786	11.530	0.220	0.4975	0.0075	0.67428	2563	18	2600	32	2527	23	2527.0	23.0	2.9
U1456D-22R-1 73-83 cm	103.1	0.837	12.110	0.190	0.4888	0.0084	0.82042	2613	14	2563	36	2637	16	2637.0	16.0	2.8
U1456D-22R-1 73-83 cm	280	2.210	1.647	0.083	0.1563	0.0064	0.73914	973	32	933	35	1053	72	1053.0	72.0	11.4
U1456D-22R-1 73-83 cm	82.3	0.888	0.115	0.006	0.0166	0.0005	0.26319	109.6	5.1	106.4	3.2	171	94	106.4	3.2	2.9
U1456D-22R-1 73-83 cm	208.9	0.723	0.121	0.004	0.0178	0.0004	0.56146	116.1	3.9	113.5	2.7	187	67	113.5	2.7	2.2
U1456D-22R-1 73-83 cm	247	4.270	0.880	0.019	0.1045	0.0022	0.59207	639	10	640	13	613	41	640.0	13.0	0.2
U1456D-22R-1 73-83 cm	383	1.162	1.755	0.050	0.1618	0.0048	0.58097	1026	19	966	26	1146	54	1146.0	54.0	15.7
U1456D-22R-1 73-83 cm	335	3.600	1.880	0.130	0.1720	0.0120	0.61693	1062	47	1018	66	1170	120	1170.0	120.0	13.0
U1456D-22R-1 73-83 cm	181.9	0.725	3.640	0.160	0.2691	0.0087	0.75228	1553	35	1535	44	1542	58	1542.0	58.0	0.5
U1456D-22R-1 73-83 cm	13.86	0.285	0.695	0.036	0.0848	0.0019	0.33224	530	22	525	11	510	100	525.0	11.0	0.9
U1456D-22R-1 73-83 cm	206	0.882	0.068	0.003	0.0107	0.0002	0.21818	66.7	3	68.8	1.3	34	85	68.8	1.3	3.1
U1456D-22R-1 73-83 cm	117.7	0.886	3.630	0.100	0.2609	0.0078	0.64251	1550	22	1491	40	1629	45	1629.0	45.0	8.5
U1456D-22R-1 73-83 cm	230	0.775	0.105	0.006	0.0155	0.0006	0.37162	101.1	5.2	98.9	3.6	160	100	98.9	3.6	2.2
U1456D-22R-1 73-83 cm	2230	#####	0.574	0.012	0.0722	0.0017	0.74987	460.2	7.7	449	10	505	38	449.0	10.0	2.4
U1456D-22R-1 73-83 cm	65.4	2.060	0.828	0.024	0.0978	0.0028	0.45693	609	13	601	16	639	64	601.0	16.0	1.3
U1457C-61R-1 8-18 cm	7030	34.730	0.124	0.002	0.0181	0.0003	0.57549	118.4	1.6	115.7	1.6	199	28	115.7	1.6	2.3
U1457C-61R-1 8-18 cm	246.1	0.600	2.104	0.033	0.1809	0.0015	0.56181	1149	10	1072.5	8.1	1304	27	1304.0	27.0	17.8
U1457C-61R-1 8-18 cm	358	3.032	0.183	0.004	0.0016	0.0000	0.54884	170.1	3.7	10.09	0.18	148	43	DISC	DISC	94.1
U1457C-61R-1 8-18 cm	289.6	0.893	0.257	0.007	0.0290	0.0005	0.37645	232.6	5.5	184	3.3	734	47	DISC	DISC	20.9
U1457C-61R-1 8-18 cm	395	3.729	1.239	0.013	0.1323	0.0012	0.57883	819.6	6.1	801.2	7	874	19	801.2	7.0	2.2
U1457C-61R-1 8-18 cm	172	0.920	0.266	0.005	0.0374	0.0004	0.34437	239.2	3.9	236.9	2.2	271	39	236.9	2.2	1.0
U1457C-61R-1 8-18 cm	448	1.917	1.813	0.018	0.1712	0.0015	0.63757	1049.7	6.6	1018.7	8.2	1123	16	1123.0	16.0	9.3
U1457C-61R-1 8-18 cm	1473	4.680	0.054	0.001	0.0007	0.0001	-0.04950	53	1.1	4.16	0.64	336	42	DISC	DISC	92.2
U1457C-61R-1 8-18 cm	1051	1.075	0.016	0.001	0.0025	0.0000	0.34662	16.56	0.53	16.04	0.23	129	62	16.0	0.2	3.1
U1457C-61R-1 8-18 cm	108	4.150	0.706	0.021	0.0853	0.0020	0.80845	542	13	528	12	591	42	528.0	12.0	2.6
U1457C-61R-1 8-18 cm	747	3.051	0.878	0.008	0.1010	0.0007	0.44358	639.9	4.1	620.2	4.1	724	16	620.2	4.1	3.1

(table cont'd)

								207/235		206/238		207/206				
	[U]		207/23	2σ				Age	2σ	Age	2σ	Age	2σ	Best age	2σ	%
Sample Name	ppm	U/Th	5	error	206/238	2σ error	RHO	(Ma)	error	(Ma)	error	(Ma)	error	(Ma)	error	Discordance*
U1457C-61R-1 8-18 cm	542	1.775	0.277	0.004	0.0398	0.0004	0.47518	247.9	2.8	251.4	2.4	206	26	251.4	2.4	1.4
U1457C-61R-1 8-18 cm	387	3.171	0.554	0.009	0.0689	0.0009	0.79087	447.5	6	429.6	5.1	545	22	429.6	5.1	4.0
U1457C-61R-1 8-18 cm	81.3	0.497	0.094	0.004	0.0138	0.0002	0.13184	90.8	3.8	88.1	1.3	145	83	88.1	1.3	3.0
U1457C-61R-1 8-18 cm	236	0.449	0.117	0.003	0.0173	0.0002	0.18564	112.1	2.9	110.6	1.4	126	57	110.6	1.4	1.3
U1457C-61R-1 8-18 cm	7.6	#####	1.741	0.064	0.1610	0.0036	0.27345	1021	23	961	20	1142	78	1142.0	78.0	15.8
U1457C-61R-1 8-18 cm	938	1.824	2.468	0.031	0.1569	0.0018	0.71450	1263	8.8	939	10	1875	16	DISC	DISC	49.9
U1457C-61R-1 8-18 cm	192	0.559	0.119	0.003	0.0176	0.0002	0.09054	113.9	2.8	112.6	1.3	139	55	112.6	1.3	1.1
U1457C-61R-1 8-18 cm	456	4.390	0.681	0.012	0.0835	0.0011	0.57202	526.8	7.2	516.9	6.6	552	33	516.9	6.6	1.9
U1457C-61R-1 8-18 cm	192.8	0.667	0.506	0.009	0.0634	0.0009	0.58574	415.2	5.8	396.3	5.6	526	32	396.3	5.6	4.6
U1457C-61R-1 8-18 cm	177	1.370	0.093	0.003	0.0133	0.0002	0.18739	90.5	2.8	85.3	1.3	251	69	85.3	1.3	5.7
U1457C-61R-1 8-18 cm	144.5	0.992	7.060	0.140	0.3808	0.0066	0.73354	2120	18	2079	31	2154	22	2154.0	22.0	3.5
U1457C-61R-1 8-18 cm	244	1.965	0.408	0.006	0.0541	0.0006	0.49279	347.1	4.4	339.7	3.5	353	33	339.7	3.5	2.1
U1457C-61R-1 8-18 cm	550	7.630	1.170	0.017	0.1303	0.0018	0.79745	789.5	7.8	789	10	782	19	789.0	10.0	0.1
U1457C-61R-1 8-18 cm	255	1.481	1.250	0.019	0.1303	0.0018	0.80094	822.3	8.6	789	10	908	18	789.0	10.0	4.0
U1457C-61R-1 8-18 cm	154	1.037	0.061	0.003	0.0086	0.0002	0.30232	59.8	2.7	55.3	1.1	224	89	55.3	1.1	7.5
U1457C-61R-1 8-18 cm	96.5	0.694	1.525	0.019	0.1544	0.0020	0.42150	940.2	7.4	926	11	968	27	968.0	27.0	4.3
U1457C-61R-1 8-18 cm	284	5.490	0.594	0.008	0.0750	0.0006	0.49844	473.6	4.8	466.2	3.8	504	25	466.2	3.8	1.6
U1457C-61R-1 8-18 cm	208	0.995	3.822	0.041	0.2779	0.0022	0.63582	1598.1	8.4	1581	11	1609	14	1609.0	14.0	1.7
U1457C-61R-1 8-18 cm	879	1.186	0.054	0.001	0.0082	0.0001	0.65178	53.8	1.1	52.4	0.62	127	38	52.4	0.6	2.6
U1457C-61R-1 8-18 cm	1000	0.948	0.060	0.001	0.0091	0.0001	0.46284	59.44	0.9	58.19	0.56	119	29	58.2	0.6	2.1
U1457C-61R-1 8-18 cm	174.4	1.181	0.067	0.002	0.0100	0.0001	0.23437	65.9	2.1	64.27	0.73	109	64	64.3	0.7	2.5
U1457C-61R-1 8-18 cm	712	1.562	0.035	0.001	0.0054	0.0001	0.26992	34.5	0.69	34.67	0.34	48	41	34.7	0.3	0.5
U1457C-61R-1 8-18 cm	236	1.083	0.136	0.003	0.0202	0.0003	0.17820	129.3	2.7	129.2	1.5	131	48	129.2	1.5	0.1
U1457C-61R-1 8-18 cm	186.1	0.471	0.091	0.003	0.0135	0.0002	0.10537	88.3	2.6	86.7	1.3	130	66	86.7	1.3	1.8
U1457C-61R-1 8-18 cm	258	1.387	3.730	0.070	0.2633	0.0031	0.80462	1578	15	1507	16	1671	20	1671.0	20.0	9.8
U1457C-61R-1 8-18 cm	158	0.751	0.073	0.003	0.0090	0.0001	0.25861	71.3	2.5	57.45	0.92	531	81	DISC	DISC	19.4
U1457C-61R-1 8-18 cm	1180	0.975	0.048	0.001	0.0074	0.0001	0.56805	47.2	1	47.31	0.68	55	38	47.3	0.7	0.2
U1457C-61R-1 8-18 cm	162.5	0.853	4.875	0.064	0.2899	0.0036	0.74608	1797	11	1640	18	1989	16	1989.0	16.0	17.5
U1457C-61R-1 8-18 cm	181.5	0.771	0.059	0.003	0.0087	0.0002	0.17300	57.6	2.8	56.12	0.99	120	100	56.1	1.0	2.6
U1457C-61R-1 8-18 cm	131.8	0.775	0.081	0.003	0.0094	0.0001	0.22864	78.9	2.7	60.37	0.87	677	74	DISC	DISC	23.5
U1457C-61R-1 8-18 cm	391	0.730	0.106	0.002	0.0163	0.0002	0.42502	102.5	2	104.2	1.2	98	37	104.2	1.2	1.7
U1457C-61R-1 8-18 cm	762	2.382	0.115	0.001	0.0173	0.0001	0.23419	110.6	1.3	110.31	0.84	137	30	110.3	0.8	0.3
U1457C-61R-1 8-18 cm	317	2.330	10.830	0.150	0.4501	0.0052	0.75311	2507	13	2398	23	2599	18	2599.0	18.0	7.7
U1457C-61R-1 8-18 cm	1923	1.259	0.129	0.001	0.0184	0.0002	0.47381	123	1.2	117.5	1.2	238	25	117.5	1.2	4.5
U1457C-61R-1 8-18 cm	145	0.383	0.655	0.014	0.0765	0.0012	0.44915	511.6	8.7	475.3	7.3	682	40	475.3	7.3	7.1

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-61R-1 8-18 cm	337	1.239	4.289	0.048	0.0160	0.0002	0.71838	1691.4	9.1	102	1.1	1880	14	DISC	DISC	94.0
U1457C-61R-1 8-18 cm	183.7	0.706	0.108	0.003	0.0157	0.0002	0.02776	103.7	2.5	100.6	1.1	191	58	100.6	1.1	3.0
U1457C-61R-1 8-18 cm	57.9	1.220	1.220	0.019	0.1318	0.0010	0.27173	812	8.3	797.8	6	855	31	797.8	6.0	1.7
U1457C-61R-1 8-18 cm	559	1.706	0.057	0.002	0.0076	0.0002	0.72908	56.5	2	48.7	1.3	446	49	48.7	1.3	13.8
U1457C-61R-1 8-18 cm	289.3	0.994	0.111	0.003	0.0164	0.0002	0.21190	106.5	2.3	104.8	1.4	175	54	104.8	1.4	1.6
U1457C-61R-1 8-18 cm	399	1.181	0.686	0.010	0.0791	0.0011	0.74370	530.4	6.3	490.4	6.8	719	23	490.4	6.8	7.5
U1457C-61R-1 8-18 cm	697	0.552	0.112	0.002	0.0165	0.0001	0.36077	107.9	1.5	105.44	0.85	162	32	105.4	0.9	2.3
U1457C-61R-1 8-18 cm	602	1.083	2.148	0.049	0.1806	0.0038	0.94092	1163	16	1070	21	1355	15	1355.0	15.0	21.0
U1457C-61R-1 8-18 cm	76.1	1.268	0.080	0.005	0.0123	0.0003	0.08190	78.1	4.5	78.9	1.7	90	110	78.9	1.7	1.0
U1457C-61R-1 8-18 cm	82.5	0.314	0.694	0.012	0.0881	0.0011	0.49207	535.1	7.5	544.4	6.6	536	36	544.4	6.6	1.7
U1457C-61R-1 8-18 cm	370	1.137	1.125	0.021	0.1208	0.0022	0.86151	764	10	735	12	863	20	735.0	12.0	3.8
U1457C-61R-1 8-18 cm	231	1.116	0.665	0.008	0.0844	0.0007	0.38122	517.5	4.7	522.4	4.2	516	26	522.4	4.2	0.9
U1457C-61R-1 8-18 cm	197.9	0.723	0.139	0.004	0.0209	0.0002	0.26189	131.7	3.2	133.3	1.2	126	50	133.3	1.2	1.2
U1457C-61R-1 8-18 cm	42.1	1.429	11.510	0.160	0.4740	0.0062	0.58383	2567	13	2499	27	2646	19	2646.0	19.0	5.6
U1457C-61R-1 8-18 cm	2400	0.936	0.016	0.000	0.0025	0.0000	0.17987	16.08	0.3	16.24	0.14	43	38	16.2	0.1	1.0
U1457C-61R-1 8-18 cm	1069	1.432	0.682	0.006	0.0851	0.0006	0.54876	527.6	3.4	526.4	3.8	546	17	526.4	3.8	0.2
U1457C-61R-1 8-18 cm	52.4	1.092	10.930	0.120	0.4780	0.0058	0.73918	2520	10	2517	25	2531	17	2531.0	17.0	0.6
U1457C-61R-1 8-18 cm	100	0.602	0.049	0.003	0.0079	0.0002	0.07607	48.4	2.4	50.5	1	6	94	50.5	1.0	4.3
U1457C-61R-1 8-18 cm	412	0.637	0.056	0.002	0.0085	0.0001	0.24143	55.2	1.5	54.58	0.68	97	55	54.6	0.7	1.1
U1457C-61R-1 8-18 cm	795	1.465	1.181	0.022	0.1225	0.0020	0.61677	792	10	746	11	954	30	746.0	11.0	5.8
U1457C-61R-1 8-18 cm	262.6	1.463	0.108	0.002	0.0162	0.0002	0.35852	104	2.1	103.3	1.1	133	45	103.3	1.1	0.7
U1457C-61R-1 8-18 cm	195.4	0.905	2.123	0.023	0.1881	0.0016	0.47648	1156.1	7.3	1112.3	8.7	1238	19	1238.0	19.0	10.2
U1457C-61R-1 8-18 cm	282.9	1.283	1.152	0.013	0.1263	0.0011	0.50846	778.1	6	766.6	6.2	804	23	766.6	6.2	1.5
U1457C-61R-1 8-18 cm	356	1.153	0.060	0.002	0.0090	0.0001	0.42707	58.7	1.9	57.46	0.74	93	58	57.5	0.7	2.1
U1457C-61R-1 8-18 cm	371.8	0.766	2.676	0.042	0.2099	0.0030	0.66437	1323	12	1230	16	1470	23	1470.0	23.0	16.3
U1457C-61R-1 8-18 cm	176	0.939	0.060	0.003	0.0088	0.0002	0.23375	59.3	2.4	56.4	1.5	134	84	56.4	1.5	4.9
U1457C-61R-1 8-18 cm	170.5	2.619	1.253	0.018	0.1337	0.0019	0.53091	824.5	8.1	809	11	838	28	809.0	11.0	1.9
U1457C-61R-1 8-18 cm	680	38.900	0.201	0.020	0.0301	0.0023	0.71171	186	17	191	15	330	240	191.0	15.0	2.7
U1457C-61R-1 8-18 cm	169.8	1.221	22.640	0.300	0.5876	0.0077	0.65119	3211	13	2985	32	3329	19	3329.0	19.0	10.3
U1457C-61R-1 8-18 cm	192	1.568	0.294	0.010	0.0379	0.0015	0.44515	262.3	8.1	239.6	9.2	415	80	239.6	9.2	8.7
U1457C-61R-1 8-18 cm	443	1.199	1.228	0.014	0.1286	0.0015	0.63396	813.5	6.2	779.6	8.7	875	22	779.6	8.7	4.2
U1457C-61R-1 8-18 cm	23	1.448	2.190	0.042	0.1894	0.0021	0.34509	1176	14	1118	11	1248	38	1248.0	38.0	10.4
U1457C-61R-1 8-18 cm	289.3	1.994	8.716	0.089	0.4097	0.0043	0.72650	2308.1	9.5	2213	20	2370	13	2370.0	13.0	6.6
U1457C-61R-1 8-18 cm	960	1.970	0.111	0.002	0.0157	0.0002	0.44844	106.7	1.7	100.6	1.1	201	33	100.6	1.1	5.7
U1457C-61R-1 8-18 cm	1129	1.350	0.034	0.001	0.0052	0.0001	0.40020	34.37	0.78	33.71	0.44	46	42	33.7	0.4	1.9

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-61R-1 8-18 cm	449.7	2.730	1.032	0.017	0.1104	0.0015	0.76609	721.6	8.8	674.9	8.9	809	23	674.9	8.9	6.5
U1457C-61R-1 8-18 cm	1594	3.137	0.043	0.001	0.0065	0.0001	0.51786	42.89	0.78	41.68	0.64	80	38	41.7	0.6	2.8
U1457C-61R-1 8-18 cm	1730	1.089	0.099	0.001	0.0144	0.0001	0.42660	95.7	1.2	92.39	0.75	140	28	92.4	0.8	3.5
U1457C-61R-1 8-18 cm	110	0.615	3.993	0.043	0.2715	0.0026	0.56100	1633.7	8.8	1548	13	1723	16	1723.0	16.0	10.2
U1457C-61R-1 8-18 cm	247	3.800	0.554	0.011	0.0679	0.0008	0.26530	446.7	6.9	423.2	4.9	509	33	423.2	4.9	5.3
U1457C-61R-1 8-18 cm	761	4.870	0.107	0.003	0.0156	0.0003	0.44553	102.8	2.8	99.8	2	146	52	99.8	2.0	2.9
U1457C-61R-1 8-18 cm	20.73	1.010	0.068	0.008	0.0096	0.0003	0.09963	66	7.7	61.3	2.1	200	220	61.3	2.1	7.1
U1457C-61R-1 8-18 cm	2499	1.437	0.043	0.001	0.0064	0.0001	0.39820	42.38	0.6	41.42	0.49	103	31	41.4	0.5	2.3
U1457C-61R-1 8-18 cm	592	2.736	4.511	0.045	0.2922	0.0031	0.71268	1732	8.3	1655	15	1821	13	1821.0	13.0	9.1
U1457C-61R-1 8-18 cm	722	35.300	0.142	0.006	0.0205	0.0006	0.71139	135.5	5.4	131	3.7	175	63	131.0	3.7	3.3
U1457C-61R-1 8-18 cm	395	1.208	0.110	0.003	0.0176	0.0005	0.58422	105.7	3.1	112.4	3	11	50	112.4	3.0	6.3
U1457C-61R-1 8-18 cm	4.005	0.457	12.040	0.320	0.1061	0.0027	0.49090	2608	25	651	16	4995	50	DISC	DISC	75.0
U1457C-61R-1 8-18 cm	45.3	26.600	0.875	0.023	0.1008	0.0013	0.28449	639	12	618.8	7.8	703	52	618.8	7.8	3.2
U1457C-61R-1 8-18 cm	222.7	1.153	1.549	0.026	0.1566	0.0025	0.62028	951	10	938	14	968	30	968.0	30.0	3.1
U1457C-61R-1 8-18 cm	4000	#####	0.046	0.004	0.0068	0.0008	0.66048	45.3	3.7	43.5	5.2	190	200	43.5	5.2	4.0
U1457C-61R-1 8-18 cm	870	10.030	0.541	0.013	0.0699	0.0016	0.65410	438.1	8.6	435.3	9.6	448	41	435.3	9.6	0.6
U1457C-61R-1 8-18 cm	118.1	0.592	0.056	0.003	0.0081	0.0001	0.09118	55.3	2.6	52.2	0.91	188	93	52.2	0.9	5.6
U1457C-61R-1 8-18 cm	327	0.864	0.107	0.003	0.0156	0.0002	0.22787	103	2.4	99.5	1.2	165	52	99.5	1.2	3.4
U1457C-61R-1 8-18 cm	192.4	1.011	0.063	0.003	0.0089	0.0002	0.15764	61.5	2.3	57.36	0.96	215	84	57.4	1.0	6.7
U1457C-61R-1 8-18 cm	256.1	0.765	0.063	0.002	0.0093	0.0001	0.13286	61.5	1.9	59.51	0.87	126	69	59.5	0.9	3.2
U1457C-61R-1 8-18 cm	275	3.490	1.091	0.025	0.1175	0.0023	0.57949	747	12	717	13	841	41	717.0	13.0	4.0
U1457C-61R-1 8-18 cm	198	0.670	0.068	0.003	0.0105	0.0002	0.34500	66.9	2.5	67.4	1.2	74	70	67.4	1.2	0.7
U1457C-61R-1 8-18 cm	444	1.432	0.617	0.008	0.0778	0.0009	0.51454	488.2	4.7	483.1	5.5	508	24	483.1	5.5	1.0
U1457C-61R-1 8-18 cm	799	1.823	0.035	0.001	0.0055	0.0001	0.50717	35.16	0.87	35.55	0.66	22	48	35.6	0.7	1.1
U1457C-61R-1 8-18 cm	421	7.570	10.800	0.210	0.4237	0.0069	0.79994	2504	18	2277	31	2694	20	2694.0	20.0	15.5
U1457C-61R-1 8-18 cm	134	0.943	0.135	0.004	0.0195	0.0003	0.25404	128.3	3.4	124.4	1.8	209	58	124.4	1.8	3.0
U1457C-61R-1 8-18 cm	79.7	0.267	3.870	0.044	0.2717	0.0028	0.55312	1608	9.1	1549	14	1687	20	1687.0	20.0	8.2
U1457C-61R-1 8-18 cm	319	0.748	1.102	0.014	0.1223	0.0013	0.71225	753.9	6.5	743.4	7.6	822	19	743.4	7.6	1.4
U1457C-61R-1 8-18 cm	190	0.372	1.086	0.013	0.1205	0.0012	0.68872	746.4	6.5	733.9	7.2	793	19	733.9	7.2	1.7
U1457C-61R-1 8-18 cm	1367	0.776	0.063	0.001	0.0095	0.0001	0.27149	62.34	0.93	60.78	0.58	147	35	60.8	0.6	2.5
U1457C-61R-1 8-18 cm	469	0.455	0.112	0.002	0.0164	0.0001	0.32293	107.4	1.8	105.09	0.87	167	35	105.1	0.9	2.2
U1457C-61R-1 8-18 cm	383.2	21.000	0.130	0.006	0.0197	0.0009	0.71941	123.7	5.6	125.9	5.7	132	74	125.9	5.7	1.8
U1457C-61R-1 8-18 cm	193.6	1.935	0.641	0.014	0.0775	0.0014	0.48620	502.3	8.8	482.6	8.5	611	46	482.6	8.5	3.9
U1457C-61R-1 8-18 cm	112.9	1.163	9.741	0.092	0.4150	0.0038	0.73952	2411.8	9.1	2241	18	2572	12	2572.0	12.0	12.9
U1457C-61R-1 8-18 cm	550	0.994	0.102	0.002	0.0154	0.0002	0.28933	98.6	2.1	98.8	1.1	114	42	98.8	1.1	0.2

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1457C-61R-1 8-18 cm	141.1	3.030	0.109	0.003	0.0156	0.0003	0.34798	105.1	2.9	99.7	1.6	247	61	99.7	1.6	5.1
U1457C-61R-1 8-18 cm	548	1.587	0.617	0.009	0.0772	0.0009	0.62691	487.3	5.9	479.1	5.6	546	25	479.1	5.6	1.7
U1457C-61R-1 8-18 cm	162	0.640	0.071	0.004	0.0108	0.0003	0.26826	70.6	3.2	68.9	2	89	84	68.9	2.0	2.4
U1457C-61R-1 8-18 cm	266.9	0.746	2.884	0.045	0.1842	0.0032	0.74773	1376	12	1092	18	1849	23	DISC	DISC	40.9
U1457C-61R-1 8-18 cm	961	0.400	0.072	0.002	0.0103	0.0002	0.50858	70.2	1.4	65.78	0.97	228	39	65.8	1.0	6.3
U1457C-61R-1 8-18 cm	247.6	43.100	0.128	0.008	0.0193	0.0008	0.64776	122.3	6.8	123.3	5.3	132	89	123.3	5.3	0.8
U1457C-61R-1 8-18 cm	224.5	0.520	0.759	0.013	0.0911	0.0009	0.34322	573.8	7.5	562	5.6	628	34	562.0	5.6	2.1
U1457C-61R-1 8-18 cm	604	3.880	4.380	0.047	0.2885	0.0027	0.74922	1708.3	9	1635	14	1819	13	1819.0	13.0	10.1
U1457C-61R-1 8-18 cm	186	0.899	0.668	0.010	0.0850	0.0010	0.45923	518.9	6.4	525.8	5.6	504	33	525.8	5.6	1.3
U1457C-61R-1 8-18 cm	75.1	2.518	1.057	0.020	0.1217	0.0025	0.65870	732.8	9.9	740	14	720	38	740.0	14.0	1.0
U1457C-61R-1 8-18 cm	619	14.600	0.210	0.003	0.0301	0.0003	0.33630	193.2	2.2	190.9	1.9	207	29	190.9	1.9	1.2
U1456D-26R-2 37-43 cm	111	0.792	1.656	0.035	0.1663	0.0019	0.13113	989	13	991	10	971	47	971.0	47.0	2.1
U1456D-26R-2 37-43 cm	770	2.338	0.755	0.014	0.0876	0.0014	0.63088	571.2	7.9	541.4	8.6	678	34	541.4	8.6	5.2
U1456D-26R-2 37-43 cm	80	4.620	0.102	0.011	0.0158	0.0005	0.05325	96.9	9.7	101	3.4	60	180	101.0	3.4	4.2
U1456D-26R-2 37-43 cm	1630	2.158	0.239	0.015	0.0337	0.0013	0.54804	217	12	213.7	8.1	260	110	213.7	8.1	1.5
U1456D-26R-2 37-43 cm	301	1.335	10.700	0.400	0.4490	0.0120	0.76744	2489	34	2387	52	2566	39	2566.0	39.0	7.0
U1456D-26R-2 37-43 cm	2510	26.400	0.132	0.006	0.0182	0.0006	0.49947	125.6	5.3	116	3.5	296	87	116.0	3.5	7.6
U1456D-26R-2 37-43 cm	638	3.500	16.940	0.810	0.4700	0.0230	0.91974	2923	47	2480	100	3253	35	3253.0	35.0	23.8
U1456D-26R-2 37-43 cm	516	1.217	0.232	0.008	0.0334	0.0007	0.53881	211.4	6.5	211.9	4.6	208	59	211.9	4.6	0.2
U1456D-26R-2 37-43 cm	219	0.272	2.049	0.037	0.1903	0.0023	0.58761	1131	12	1124	13	1142	30	1142.0	30.0	1.6
U1456D-26R-2 37-43 cm	68.4	0.626	0.667	0.027	0.0826	0.0015	0.13878	514	17	511.1	8.8	523	91	511.1	8.8	0.6
U1456D-26R-2 37-43 cm	682	1.748	9.840	0.130	0.4368	0.0052	0.77803	2418	13	2335	23	2490	14	2490.0	14.0	6.2
U1456D-26R-2 37-43 cm	256.7	0.829	0.099	0.006	0.0111	0.0003	0.01372	95.5	5	71.1	1.6	700	120	DISC	DISC	25.5
U1456D-26R-2 37-43 cm	123	1.378	1.655	0.044	0.1643	0.0026	0.56291	987	17	980	15	1014	47	1014.0	47.0	3.4
U1456D-26R-2 37-43 cm	461	15.900	2.197	0.028	0.1961	0.0025	0.65308	1178.9	8.9	1154	14	1222	22	1222.0	22.0	5.6
U1456D-26R-2 37-43 cm	1071	0.489	0.047	0.004	0.0063	0.0002	0.29538	46.3	3.9	40.5	1.4	310	160	40.5	1.4	12.5
U1456D-26R-2 37-43 cm	388.7	0.588	0.112	0.004	0.0163	0.0003	0.14646	107.4	3.6	104.5	1.8	185	75	104.5	1.8	2.7
U1456D-26R-2 37-43 cm	216	1.035	1.839	0.032	0.1702	0.0020	0.51295	1060	11	1013	11	1156	30	1156.0	30.0	12.4
U1456D-26R-2 37-43 cm	470	0.759	0.131	0.004	0.0198	0.0003	0.17346	125	3.7	126.4	1.8	105	63	126.4	1.8	1.1
U1456D-26R-2 37-43 cm	498	1.057	0.063	0.003	0.0093	0.0002	0.18061	61.3	3.3	59.4	1.3	140	100	59.4	1.3	3.1
U1456D-26R-2 37-43 cm	576	3.170	0.705	0.030	0.0846	0.0028	0.65634	540	18	523	17	602	72	523.0	17.0	3.1
U1456D-26R-2 37-43 cm	689	7.070	0.684	0.014	0.0829	0.0017	0.62104	527.7	8.3	513	10	585	40	513.0	10.0	2.8
U1456D-26R-2 37-43 cm	163.5	0.575	1.722	0.045	0.1712	0.0029	0.58509	1014	17	1018	16	992	43	992.0	43.0	2.6
U1456D-26R-2 37-43 cm	1390	39.600	0.300	0.021	0.0394	0.0028	0.76214	265	16	249	17	419	99	249.0	17.0	6.0
U1456D-26R-2 37-43 cm	572	0.882	0.017	0.002	0.0024	0.0001	0.19730	16.9	1.6	15.43	0.6	160	170	15.4	0.6	8.7

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-26R-2 37-43 cm	112.5	1.826	0.129	0.012	0.0113	0.0005	0.20621	124	11	72.3	3.3	1070	190	DISC	DISC	41.7
U1456D-26R-2 37-43 cm	246	0.405	1.152	0.039	0.1291	0.0029	0.60198	775	18	782	17	747	59	782.0	17.0	0.9
U1456D-26R-2 37-43 cm	1707	6.350	0.215	0.004	0.0308	0.0004	0.42041	197.1	3.4	195.6	2.5	212	39	195.6	2.5	0.8
U1456D-26R-2 37-43 cm	436	2.200	0.108	0.009	0.0148	0.0008	0.62058	103.2	8	94.7	5.2	290	120	94.7	5.2	8.2
U1456D-26R-2 37-43 cm	2800	2.290	0.238	0.008	0.0318	0.0009	0.60566	216.3	6.2	201.7	5.8	371	58	201.7	5.8	6.7
U1456D-26R-2 37-43 cm	711	7.320	0.698	0.027	0.0833	0.0023	0.30512	537	16	516	14	614	86	516.0	14.0	3.9
U1456D-26R-2 37-43 cm	435.4	1.483	8.160	0.130	0.3711	0.0057	0.75278	2246	14	2034	27	2448	19	2448.0	19.0	16.9
U1456D-26R-2 37-43 cm	377.6	3.920	0.063	0.004	0.0093	0.0002	0.25177	61.6	3.4	59.6	1.2	130	100	59.6	1.2	3.2
U1456D-26R-2 37-43 cm	241	1.485	0.114	0.006	0.0165	0.0003	0.02210	109	5.3	105.5	2	170	100	105.5	2.0	3.2
U1456D-26R-2 37-43 cm	810	3.194	2.972	0.042	0.2436	0.0030	0.77161	1399	11	1405	16	1387	17	1387.0	17.0	1.3
U1456D-26R-2 37-43 cm	224.8	0.881	0.058	0.005	0.0093	0.0003	0.14126	56.5	4.7	59.9	1.9	-20	140	59.9	1.9	6.0
U1456D-26R-2 37-43 cm	75.9	0.754	4.198	0.073	0.2973	0.0035	0.23793	1672	14	1677	17	1657	35	1657.0	35.0	1.2
U1456D-26R-2 37-43 cm	108.8	1.115	1.176	0.029	0.1295	0.0017	0.22436	788	14	784.9	9.5	777	53	784.9	9.5	0.4
U1456D-26R-2 37-43 cm	153.2	0.692	0.088	0.006	0.0131	0.0003	0.00410	85.8	6	83.6	1.7	170	140	83.6	1.7	2.6
U1456D-26R-2 37-43 cm	398	7.630	0.755	0.034	0.0861	0.0026	0.50427	569	19	532	16	722	76	532.0	16.0	6.5
U1456D-26R-2 37-43 cm	1465	94.000	2.087	0.030	0.1870	0.0021	0.68362	1145	10	1105	12	1214	22	1214.0	22.0	9.0
U1456D-26R-2 37-43 cm	670	0.977	0.080	0.004	0.0118	0.0002	0.16446	77.5	3.6	75.9	1.3	128	91	75.9	1.3	2.1
U1456D-26R-2 37-43 cm	1071	0.862	0.112	0.003	0.0164	0.0002	0.24221	107.6	2.8	104.6	1.4	177	55	104.6	1.4	2.8
U1456D-26R-2 37-43 cm	1070	3.030	0.108	0.003	0.0166	0.0003	0.38658	104	2.9	106	1.8	82	56	106.0	1.8	1.9
U1456D-26R-2 37-43 cm	72.4	0.696	0.067	0.009	0.0098	0.0004	0.02967	66	8.6	63	2.5	110	230	63.0	2.5	4.5
U1456D-26R-2 37-43 cm	233.3	0.774	0.062	0.005	0.0093	0.0003	0.07415	61.1	5.2	59.4	1.8	140	160	59.4	1.8	2.8
U1456D-26R-2 37-43 cm	438	1.180	0.117	0.005	0.0173	0.0002	0.17836	112.1	4.3	110.5	1.5	157	79	110.5	1.5	1.4
U1456D-26R-2 37-43 cm	362.4	2.017	1.625	0.025	0.1630	0.0021	0.55075	978.2	9.7	973	12	988	29	988.0	29.0	1.5
U1456D-26R-2 37-43 cm	450	0.624	0.177	0.005	0.0256	0.0003	0.08413	165.5	4.7	163.2	2	205	66	163.2	2.0	1.4
U1456D-26R-2 37-43 cm	3770	0.998	0.094	0.003	0.0126	0.0002	0.33434	91.2	2.4	80.6	1	359	56	80.6	1.0	11.6
U1456D-26R-2 37-43 cm	1039	2.143	1.657	0.017	0.1672	0.0015	0.61177	991.5	6.6	996.3	8.2	982	17	982.0	17.0	1.5
U1456D-26R-2 37-43 cm	2869	22.300	4.445	0.079	0.2804	0.0048	0.85069	1719	14	1592	25	1862	17	1862.0	17.0	14.5
U1456D-26R-2 37-43 cm	119.8	0.850	0.069	0.007	0.0101	0.0003	0.04974	66.9	6.3	64.7	1.9	90	170	64.7	1.9	3.3
U1456D-26R-2 37-43 cm	1599	30.300	0.299	0.010	0.0384	0.0007	0.59191	265	8	243.1	4.5	434	64	243.1	4.5	8.3
U1456D-26R-2 37-43 cm	680.9	12.160	0.623	0.012	0.0696	0.0009	0.31355	491.2	7.6	433.5	5.4	766	41	433.5	5.4	11.7
U1456D-26R-2 37-43 cm	349.3	0.708	0.054	0.003	0.0082	0.0002	0.02424	53.6	3.3	52.6	1.1	100	110	52.6	1.1	1.9
U1456D-26R-2 37-43 cm	670	0.839	0.114	0.004	0.0162	0.0004	0.31492	109.3	3.7	103.2	2.7	260	74	103.2	2.7	5.6
U1456D-26R-2 37-43 cm	576	0.651	1.237	0.030	0.0977	0.0013	0.57482	816	13	600.8	7.5	1454	37	DISC	DISC	26.4
U1456D-26R-2 37-43 cm	2390	1.911	0.122	0.003	0.0185	0.0002	0.28087	116.4	2.2	118	1.2	83	40	118.0	1.2	1.4
U1456D-26R-2 37-43 cm	2234	7.200	0.551	0.026	0.0724	0.0036	0.59264	443	17	450	22	418	98	450.0	22.0	1.6

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-26R-2 37-43 cm	1470	7.100	0.106	0.006	0.0155	0.0005	0.37706	102.2	5	99	3	170	100	99.0	3.0	3.1
U1456D-26R-2 37-43 cm	264	3.120	0.904	0.024	0.1066	0.0021	0.48889	651	13	653	12	660	52	653.0	12.0	0.3
U1456D-26R-2 37-43 cm	677	10.210	0.050	0.004	0.0072	0.0002	0.01732	49.3	3.4	46.5	1.3	190	140	46.5	1.3	5.7
U1456D-26R-2 37-43 cm	79.6	1.364	13.700	0.180	0.5223	0.0060	0.65908	2726	12	2707	25	2739	17	2739.0	17.0	1.2
U1456D-26R-2 37-43 cm	900	1.510	1.325	0.053	0.1329	0.0039	0.84684	855	23	804	22	982	46	804.0	22.0	6.0
U1456D-26R-2 37-43 cm	73.5	0.464	1.179	0.038	0.1303	0.0021	0.24227	786	18	789	12	751	71	789.0	12.0	0.4
U1456D-26R-2 37-43 cm	1420	1.667	0.050	0.002	0.0074	0.0001	0.23257	49.1	1.6	47.21	0.7	142	66	47.2	0.7	3.8
U1456D-26R-2 37-43 cm	711	0.720	0.166	0.005	0.0237	0.0004	0.16966	155.4	4.4	151.1	2.3	217	66	151.1	2.3	2.8
U1456D-26R-2 37-43 cm	424	4.400	0.733	0.029	0.0871	0.0016	0.16884	562	15	538.6	9.3	648	72	538.6	9.3	4.2
U1456D-26R-2 37-43 cm	724	1.718	0.882	0.015	0.1059	0.0010	0.70799	641.2	7.9	648.6	5.7	614	31	648.6	5.7	1.2
U1456D-26R-2 37-43 cm	112.2	0.788	2.673	0.095	0.2039	0.0037	0.39688	1324	27	1196	20	1530	63	1530.0	63.0	21.8
U1456D-26R-2 37-43 cm	163.3	1.190	0.120	0.013	0.0177	0.0007	0.12500	115	11	112.8	4.5	160	200	112.8	4.5	1.9
U1456D-26R-2 37-43 cm	371.5	1.731	0.263	0.013	0.0335	0.0009	0.60056	236	10	212.3	5.6	436	83	212.3	5.6	10.0
U1456D-26R-2 37-43 cm	1399	11.440	0.275	0.005	0.0382	0.0005	0.41078	246.2	3.9	241.7	2.9	280	38	241.7	2.9	1.8
U1456D-26R-2 37-43 cm	193	1.427	10.570	0.140	0.4751	0.0048	0.71903	2483	12	2505	21	2466	16	2466.0	16.0	1.6
U1456D-26R-2 37-43 cm	103.7	0.831	0.095	0.008	0.0134	0.0004	0.09430	92.4	7.5	86	2.7	220	160	86.0	2.7	6.9
U1456D-26R-2 37-43 cm	505	1.522	0.111	0.004	0.0165	0.0003	0.24250	106.5	3.6	105.3	1.7	142	70	105.3	1.7	1.1
U1456D-26R-2 37-43 cm	142.7	1.786	2.180	0.064	0.2046	0.0054	0.75548	1169	20	1197	29	1112	40	1112.0	40.0	7.6
U1456D-26R-2 37-43 cm	393	0.995	1.268	0.027	0.1418	0.0031	0.55792	829	12	854	17	772	44	772.0	17.0	3.0
U1456D-26R-2 37-43 cm	1500	1.270	0.052	0.002	0.0072	0.0001	0.16815	51	2	46.27	0.59	256	79	46.3	0.6	9.3
U1456D-26R-2 37-43 cm	3050	0.907	0.025	0.002	0.0036	0.0003	0.31617	25.4	2.1	23.2	1.6	300	200	23.2	1.6	8.7
U1456D-26R-2 37-43 cm	853	21.600	1.581	0.035	0.1615	0.0035	0.66226	960	14	965	20	952	36	952.0	36.0	1.4
U1456D-26R-2 37-43 cm	366.3	1.588	2.369	0.062	0.2158	0.0046	0.34490	1231	18	1259	24	1182	51	1182.0	51.0	6.5
U1456D-26R-2 37-43 cm	626	3.090	0.947	0.018	0.1128	0.0018	0.52927	674.9	9.2	689	11	623	38	689.0	11.0	2.1
U1456D-26R-2 37-43 cm	227	1.880	0.762	0.030	0.0894	0.0020	0.25724	572	18	552	12	631	89	552.0	12.0	3.5
U1456D-26R-2 37-43 cm	277.2	1.120	0.045	0.004	0.0071	0.0002	0.06344	44.5	3.6	45.8	1.2	0	140	45.8	1.2	2.9
U1456D-26R-2 37-43 cm	244.9	1.328	0.837	0.023	0.1083	0.0027	0.57545	616	13	662	16	459	53	662.0	16.0	7.5
U1456D-26R-2 37-43 cm	408	0.970	0.106	0.007	0.0156	0.0006	0.30522	101.6	6.4	100	3.9	160	120	100.0	3.9	1.6
U1456D-26R-2 37-43 cm	90.4	0.928	1.355	0.065	0.1360	0.0029	0.37319	865	27	822	17	957	90	822.0	17.0	5.0
U1456D-26R-2 37-43 cm	620	2.262	0.361	0.015	0.0451	0.0015	0.15652	312	11	284	9.5	535	85	284.0	9.5	9.0
U1456D-26R-2 37-43 cm	187	0.851	0.093	0.006	0.0130	0.0004	0.15751	89.7	5.8	83.4	2.7	250	130	83.4	2.7	7.0
U1456D-26R-2 37-43 cm	1770	2.290	0.059	0.004	0.0090	0.0003	0.34906	57.8	3.3	57.5	2	100	110	57.5	2.0	0.5
U1456D-26R-2 37-43 cm	407	1.399	0.056	0.004	0.0085	0.0003	0.21308	55.1	3.3	54.8	1.6	80	110	54.8	1.6	0.5
U1456D-26R-2 37-43 cm	283	4.480	0.703	0.034	0.0814	0.0029	0.54945	538	21	504	17	645	92	504.0	17.0	6.3
U1456D-26R-2 37-43 cm	540	1.514	1.469	0.027	0.1478	0.0024	0.60513	916	11	888	13	983	32	983.0	32.0	9.7

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-26R-2 37-43 cm	212	0.967	0.891	0.035	0.1111	0.0035	0.61815	641	19	678	20	507	65	678.0	20.0	5.8
U1456D-26R-2 37-43 cm	1401	1.217	0.064	0.002	0.0094	0.0001	0.27530	62.5	2	60.46	0.8	145	64	60.5	0.8	3.3
U1456D-26R-2 37-43 cm	2290	69.000	0.198	0.018	0.0297	0.0018	0.75921	183	15	189	11	110	130	189.0	11.0	3.3
U1456D-26R-2 37-43 cm	525	1.617	1.147	0.044	0.1314	0.0046	0.76984	770	21	795	26	691	54	795.0	26.0	3.2
U1456D-26R-2 37-43 cm	678	33.500	0.265	0.025	0.0341	0.0026	0.64457	237	20	216	16	430	150	216.0	16.0	8.9
U1456D-26R-2 37-43 cm	336	2.770	0.831	0.025	0.0980	0.0025	0.58111	614	15	602	14	654	56	602.0	14.0	2.0
U1456D-26R-2 37-43 cm	448	1.256	0.049	0.004	0.0079	0.0003	0.23752	48.7	3.4	50.8	2	10	120	50.8	2.0	4.3
U1456D-26R-2 37-43 cm	613	1.811	0.091	0.004	0.0135	0.0004	0.48546	88.2	3.6	86.4	2.7	163	74	86.4	2.7	2.0
U1456D-26R-2 37-43 cm	54.6	1.170	0.104	0.013	0.0146	0.0006	0.12622	98	12	93.2	3.9	100	210	93.2	3.9	4.9
U1456D-26R-2 37-43 cm	272	0.990	0.056	0.004	0.0084	0.0002	0.18334	55.3	3.9	53.7	1.4	150	140	53.7	1.4	2.9
U1456D-26R-2 37-43 cm	1490	1.318	0.120	0.003	0.0173	0.0002	0.12814	114.7	2.8	110.4	1.2	202	54	110.4	1.2	3.7
U1456D-26R-2 37-43 cm	4460	6.840	0.057	0.002	0.0070	0.0002	0.28023	56.6	1.8	44.7	1	580	75	DISC	DISC	21.0
U1456D-26R-2 37-43 cm	214.9	0.743	5.056	0.065	0.3229	0.0033	0.44249	1826	11	1803	16	1857	21	1857.0	21.0	2.9
U1456D-26R-2 37-43 cm	126.5	1.021	0.089	0.007	0.0128	0.0005	0.04796	86	6.5	82.2	3	210	160	82.2	3.0	4.4
U1456D-26R-2 37-43 cm	2533	23.400	0.177	0.003	0.0256	0.0004	0.56563	165.1	2.8	163.1	2.3	195	36	163.1	2.3	1.2
U1456D-26R-2 37-43 cm	620	2.306	1.766	0.034	0.1652	0.0029	0.52492	1030	12	985	16	1119	36	1119.0	36.0	12.0
U1456D-26R-2 37-43 cm	543	3.500	0.831	0.020	0.1030	0.0016	0.61313	612	11	631.4	9.5	515	41	631.4	9.5	3.2
U1456D-26R-2 37-43 cm	675	1.632	1.374	0.023	0.1477	0.0017	0.51602	876.8	9.7	888.1	9.5	850	30	850.0	30.0	1.3
U1456D-26R-2 37-43 cm	644	0.413	0.063	0.005	0.0090	0.0004	0.34621	61.5	4.4	57.7	2.8	230	150	57.7	2.8	6.2
U1456D-26R-2 37-43 cm	846	2.509	1.509	0.021	0.1595	0.0021	0.50640	932.8	8.6	954	12	884	28	884.0	28.0	7.9
U1456D-26R-2 37-43 cm	447	0.917	0.052	0.003	0.0080	0.0002	0.00693	51.3	3.2	51.4	1.2	80	120	51.4	1.2	0.2
U1456D-26R-2 37-43 cm	299	1.173	0.126	0.006	0.0173	0.0003	0.04971	119.4	5.6	110.4	1.8	280	100	110.4	1.8	7.5
U1456D-26R-2 37-43 cm	1603	1.527	0.037	0.001	0.0057	0.0001	0.10064	37.2	1.3	36.39	0.45	100	70	36.4	0.5	2.2
U1456D-26R-2 37-43 cm	237	0.933	0.590	0.015	0.0754	0.0008	0.09810	468.8	9.9	468.7	5.1	459	60	468.7	5.1	0.0
U1456D-26R-2 37-43 cm	1240	0.768	0.155	0.004	0.0248	0.0005	0.42523	146.1	3.9	157.7	3.3	12	52	157.7	3.3	7.9
U1456D-26R-2 37-43 cm	160.9	0.473	0.067	0.009	0.0079	0.0005	0.13453	65.3	8.8	50.9	3	510	270	DISC	DISC	22.1
U1456D-26R-2 37-43 cm	506	1.830	0.799	0.018	0.0983	0.0010	0.23504	595	10	604.2	5.8	553	49	604.2	5.8	1.5
U1456D-26R-2 37-43 cm	820	2.380	0.769	0.013	0.0886	0.0010	0.51758	578	7.7	547.4	6	706	33	547.4	6.0	5.3
U1456D-26R-2 37-43 cm	1130	2.080	0.135	0.005	0.0172	0.0003	0.34349	128.4	4.2	109.7	1.8	467	71	109.7	1.8	14.6
U1456D-26R-2 37-43 cm	1077	0.618	0.078	0.003	0.0109	0.0002	0.05118	75.9	2.5	70.1	1.1	255	73	70.1	1.1	7.6
U1456D-27R-2 100-106 cm	1001	1.407	0.212	0.003	0.0304	0.0003	0.41428	194.8	2.7	192.9	1.6	210	31	192.9	1.6	1.0
U1456D-27R-2 100-106 cm	247.1	0.807	0.667	0.010	0.0822	0.0006	0.13646	518.4	6.2	508.9	3.7	548	36	508.9	3.7	1.8
U1456D-27R-2 100-106 cm	613	1.063	0.051	0.002	0.0077	0.0001	0.16329	50.1	1.6	49.67	0.58	90	67	49.7	0.6	0.9
U1456D-27R-2 100-106 cm	381	1.105	0.104	0.003	0.0156	0.0002	0.10286	100.5	3.1	99.8	1.1	128	66	99.8	1.1	0.7
U1456D-27R-2 100-106 cm	74.4	0.677	1.675	0.040	0.1559	0.0023	0.47089	995	15	934	13	1134	44	1134.0	44.0	17.6

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-27R-2 100-106 cm	224	0.564	0.073	0.006	0.0079	0.0003	0.06166	71.1	5.6	50.8	1.7	770	190	DISC	DISC	28.6
U1456D-27R-2 100-106 cm	188	1.546	0.895	0.016	0.1054	0.0011	0.25762	647.6	8.7	645.7	6.6	644	40	645.7	6.6	0.3
U1456D-27R-2 100-106 cm	448	0.606	0.113	0.006	0.0116	0.0004	0.04450	108.1	5.7	74.3	2.4	910	130	DISC	DISC	31.3
U1456D-27R-2 100-106 cm	366.7	5.620	0.814	0.014	0.0867	0.0008	0.47248	604	7.6	536.1	5	787	31	536.1	5.0	11.2
U1456D-27R-2 100-106 cm	261	3.076	0.908	0.015	0.1047	0.0009	0.22486	654.8	7.9	641.5	5	694	35	641.5	5.0	2.0
U1456D-27R-2 100-106 cm	308	0.779	0.059	0.003	0.0085	0.0002	0.00692	58.4	3.4	54.8	1.1	200	120	54.8	1.1	6.2
U1456D-27R-2 100-106 cm	731	1.299	0.125	0.004	0.0184	0.0004	0.34794	120.2	3.3	117.7	2.3	156	57	117.7	2.3	2.1
U1456D-27R-2 100-106 cm	350	0.882	1.588	0.022	0.1614	0.0018	0.69795	964.2	8.5	964	10	960	23	960.0	23.0	0.4
U1456D-27R-2 100-106 cm	173.1	1.320	0.858	0.014	0.0990	0.0010	0.27673	629	8	608.2	6.1	696	37	608.2	6.1	3.3
U1456D-27R-2 100-106 cm	588	1.109	0.466	0.009	0.0618	0.0010	0.67211	388	6.2	386.3	6.1	386	34	386.3	6.1	0.4
U1456D-27R-2 100-106 cm	245	1.540	1.560	0.042	0.1636	0.0036	0.66818	949	17	975	20	890	43	890.0	43.0	9.6
U1456D-27R-2 100-106 cm	117.9	0.922	3.955	0.046	0.2921	0.0024	0.40263	1623.4	9.3	1652	12	1585	21	1585.0	21.0	4.2
U1456D-27R-2 100-106 cm	216	0.683	0.063	0.006	0.0081	0.0002	0.00714	62	5.3	51.8	1.3	380	180	DISC	DISC	16.5
U1456D-27R-2 100-106 cm	3520	0.564	0.043	0.001	0.0064	0.0001	0.22827	42.8	0.84	41.23	0.47	108	42	41.2	0.5	3.7
U1456D-27R-2 100-106 cm	59.1	1.031	8.320	0.240	0.3740	0.0100	0.87738	2256	28	2043	48	2467	27	2467.0	27.0	17.2
U1456D-27R-2 100-106 cm	218	1.370	1.267	0.022	0.1352	0.0020	0.66302	830	10	817	11	858	29	817.0	11.0	1.6
U1456D-27R-2 100-106 cm	600	0.615	0.019	0.001	0.0028	0.0001	0.08818	18.7	1.1	18.07	0.4	110	110	18.1	0.4	3.4
U1456D-27R-2 100-106 cm	1033	3.330	0.719	0.012	0.0858	0.0013	0.62977	549.5	6.9	530.3	7.5	627	28	530.3	7.5	3.5
U1456D-27R-2 100-106 cm	869	0.881	0.061	0.002	0.0092	0.0001	0.20368	60.5	1.7	59.22	0.78	112	60	59.2	0.8	2.1
U1456D-27R-2 100-106 cm	123.5	1.164	0.056	0.005	0.0081	0.0002	0.09760	55.3	4.6	51.7	1.3	190	160	51.7	1.3	6.5
U1456D-27R-2 100-106 cm	2360	0.755	0.053	0.001	0.0075	0.0001	0.15525	51.9	1.4	48.08	0.76	217	57	48.1	0.8	7.4
U1456D-27R-2 100-106 cm	363	0.776	0.123	0.005	0.0168	0.0003	0.02902	117.4	4.1	107.7	1.6	303	82	107.7	1.6	8.3
U1456D-27R-2 100-106 cm	208	1.020	9.050	0.150	0.4280	0.0071	0.79767	2339	15	2294	32	2382	17	2382.0	17.0	3.7
U1456D-27R-2 100-106 cm	305.8	2.518	4.289	0.040	0.2999	0.0025	0.51910	1690.2	7.6	1690	13	1691	16	1691.0	16.0	0.1
U1456D-27R-2 100-106 cm	150.2	1.062	0.840	0.020	0.0954	0.0014	0.30360	619	11	587.5	8.3	740	51	587.5	8.3	5.1
U1456D-27R-2 100-106 cm	141.6	0.945	0.649	0.016	0.0830	0.0011	0.38536	508	10	513.7	6.8	482	54	513.7	6.8	1.1
U1456D-27R-2 100-106 cm	95.1	1.375	1.430	0.032	0.1460	0.0026	0.42633	900	14	878	15	948	47	948.0	47.0	7.4
U1456D-27R-2 100-106 cm	74.5	0.786	0.199	0.012	0.0282	0.0006	0.20871	183	10	179.2	3.5	210	110	179.2	3.5	2.1
U1456D-27R-2 100-106 cm	327	0.771	0.054	0.003	0.0079	0.0002	0.09153	53.6	2.8	50.8	1	180	100	50.8	1.0	5.2
U1456D-27R-2 100-106 cm	616	1.038	2.043	0.026	0.1905	0.0016	0.52209	1129.1	8.7	1124.1	8.6	1140	22	1140.0	22.0	1.4
U1456D-27R-2 100-106 cm	2140	2.145	0.111	0.002	0.0162	0.0002	0.54816	106.8	1.8	103.7	1.3	176	33	103.7	1.3	2.9
U1456D-27R-2 100-106 cm	192	0.665	4.481	0.047	0.3082	0.0027	0.54395	1726.1	8.8	1731	14	1715	17	1715.0	17.0	0.9
U1456D-27R-2 100-106 cm	1050	1.440	0.099	0.003	0.0147	0.0003	0.50058	95.9	2.7	94	2.1	156	52	94.0	2.1	2.0
U1456D-27R-2 100-106 cm	179	0.531	0.080	0.005	0.0117	0.0002	0.01564	77.5	4.6	75.2	1.4	140	120	75.2	1.4	3.0
U1456D-27R-2 100-106 cm	355	0.716	0.709	0.022	0.0861	0.0018	0.63308	543	13	532	10	578	55	532.0	10.0	2.0

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-27R-2 100-106 cm	376	9.230	1.384	0.030	0.1429	0.0021	0.65272	880	12	861	12	933	30	933.0	30.0	7.7
U1456D-27R-2 100-106 cm	351	1.100	1.915	0.018	0.1805	0.0013	0.47095	1086.4	6.2	1069.8	6.9	1112	18	1112.0	18.0	3.8
U1456D-27R-2 100-106 cm	477	2.860	0.129	0.010	0.0181	0.0008	0.11709	123.2	9	115.5	4.9	260	170	115.5	4.9	6.3
U1456D-27R-2 100-106 cm	266	0.813	0.872	0.021	0.0994	0.0018	0.46604	638	12	611	11	731	51	611.0	11.0	4.2
U1456D-27R-2 100-106 cm	336.9	1.254	0.753	0.015	0.0909	0.0013	0.56977	569.6	8.2	560.8	7.8	596	34	560.8	7.8	1.5
U1456D-27R-2 100-106 cm	1640	25.900	0.293	0.020	0.0376	0.0026	0.80355	260	16	238	16	460	100	238.0	16.0	8.5
U1456D-27R-2 100-106 cm	372	0.245	1.122	0.016	0.1219	0.0011	0.31896	762.9	7.9	741.1	6	831	32	741.1	6.0	2.9
U1456D-27R-2 100-106 cm	322.4	0.917	7.031	0.072	0.3846	0.0034	0.76972	2114.3	9.2	2097	16	2129	13	2129.0	13.0	1.5
U1456D-27R-2 100-106 cm	123.7	0.811	0.068	0.006	0.0091	0.0003	0.10188	66.6	5.1	58.3	1.6	280	140	58.3	1.6	12.5
U1456D-27R-2 100-106 cm	156.2	0.488	1.301	0.020	0.1405	0.0013	0.30880	844.4	9.1	847.5	7.4	833	34	847.5	7.4	0.4
U1456D-27R-2 100-106 cm	1117	0.749	0.121	0.002	0.0177	0.0001	0.30210	115.7	2	113.04	0.82	175	37	113.0	0.8	2.3
U1456D-27R-2 100-106 cm	245.7	1.126	1.444	0.022	0.1572	0.0024	0.43589	906	9	941	13	818	34	818.0	13.0	3.9
U1456D-27R-2 100-106 cm	905	0.460	0.041	0.001	0.0062	0.0001	0.17249	40.8	1.4	39.64	0.5	119	68	39.6	0.5	2.8
U1456D-27R-2 100-106 cm	177.3	1.034	0.079	0.005	0.0126	0.0004	0.30096	76.7	4.5	80.4	2.2	20	110	80.4	2.2	4.8
U1456D-27R-2 100-106 cm	84.5	0.569	10.940	0.120	0.4792	0.0050	0.69598	2516	10	2522	22	2514	15	2514.0	15.0	0.3
U1456D-27R-2 100-106 cm	380.1	1.293	0.118	0.004	0.0176	0.0003	0.16126	113	3.7	112.5	1.9	149	72	112.5	1.9	0.4
U1456D-27R-2 100-106 cm	260	1.780	0.118	0.005	0.0177	0.0003	0.16535	113.2	4.2	113.2	1.8	131	77	113.2	1.8	0.0
U1456D-27R-2 100-106 cm	162.8	0.887	1.167	0.027	0.1233	0.0022	0.39795	783	12	749	13	875	48	749.0	13.0	4.3
U1456D-27R-2 100-106 cm	258.2	0.968	11.620	0.120	0.4908	0.0046	0.70586	2572.7	9.4	2573	20	2571	14	2571.0	14.0	0.1
U1456D-27R-2 100-106 cm	850	0.656	0.054	0.004	0.0081	0.0002	0.13559	54	3.7	51.7	1.1	160	120	51.7	1.1	4.3
U1456D-27R-2 100-106 cm	177	0.644	0.081	0.008	0.0116	0.0005	0.22723	78.7	7.4	74.1	3.1	210	170	74.1	3.1	5.8
U1456D-27R-2 100-106 cm	487	0.484	0.128	0.004	0.0187	0.0002	0.30754	122.4	3.6	119.2	1.2	189	59	119.2	1.2	2.6
U1456D-27R-2 100-106 cm	58.2	0.495	0.607	0.037	0.0778	0.0016	0.13448	478	23	482.9	9.8	430	130	482.9	9.8	1.0
U1456D-27R-2 100-106 cm	59	0.677	0.062	0.010	0.0094	0.0003	0.14323	59.7	9.1	60.4	2	10	240	60.4	2.0	1.2
U1456D-27R-2 100-106 cm	436	1.900	1.144	0.014	0.1258	0.0010	0.48035	773.9	6.4	763.9	5.7	800	23	763.9	5.7	1.3
U1456D-27R-2 100-106 cm	700	1.033	0.884	0.008	0.1040	0.0008	0.48066	642.6	4.4	637.4	4.7	658	19	637.4	4.7	0.8
U1456D-27R-2 100-106 cm	156	1.165	0.124	0.008	0.0183	0.0004	0.10081	117.6	7.5	117.1	2.3	120	120	117.1	2.3	0.4
U1456D-27R-2 100-106 cm	317	7.200	0.985	0.015	0.1114	0.0013	0.55531	695.3	7.5	680.6	7.7	753	29	680.6	7.7	2.1
U1456D-27R-2 100-106 cm	161	0.854	0.088	0.006	0.0124	0.0003	0.13094	84.9	5.4	79.5	1.6	220	130	79.5	1.6	6.4
U1456D-27R-2 100-106 cm	2830	4.000	0.042	0.001	0.0057	0.0002	0.34811	41.2	1.3	36.8	1	323	77	36.8	1.0	10.7
U1456D-27R-2 100-106 cm	460	0.960	0.123	0.004	0.0185	0.0003	0.22832	118.1	3.4	118.2	1.8	120	66	118.2	1.8	0.1
U1456D-27R-2 100-106 cm	502	3.350	1.436	0.024	0.1445	0.0020	0.79670	903	10	870	11	971	22	971.0	22.0	10.4
U1456D-27R-2 100-106 cm	1420	0.889	0.064	0.003	0.0083	0.0002	0.39749	63.3	2.9	53.5	1.2	422	92	DISC	DISC	15.5
U1456D-27R-2 100-106 cm	643	0.501	1.383	0.021	0.1310	0.0012	0.58774	881.3	8.9	793.3	6.8	1109	25	793.3	6.8	10.0
U1456D-27R-2 100-106 cm	276	0.723	0.051	0.003	0.0075	0.0001	0.05756	50.7	2.8	48.01	0.88	180	110	48.0	0.9	5.3

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-27R-2 100-106 cm	252.4	1.270	0.805	0.013	0.0952	0.0010	0.43461	598.9	7.1	586.3	5.6	640	31	586.3	5.6	2.1
U1456D-27R-2 100-106 cm	179.8	0.627	0.091	0.005	0.0126	0.0003	0.15077	87.8	4.2	80.5	1.6	270	100	80.5	1.6	8.3
U1456D-27R-2 100-106 cm	2400	62.700	0.121	0.002	0.0180	0.0001	0.35162	115.8	1.6	115.15	0.9	134	31	115.2	0.9	0.6
U1456D-27R-2 100-106 cm	860	3.580	0.099	0.003	0.0150	0.0002	0.45459	95.7	2.3	96.1	1.4	95	46	96.1	1.4	0.4
U1456D-27R-2 100-106 cm	195.6	0.870	0.051	0.004	0.0077	0.0002	0.03699	50.5	4.2	49.5	1.1	70	140	49.5	1.1	2.0
U1456D-27R-2 100-106 cm	244.6	1.262	0.104	0.006	0.0159	0.0004	0.17622	100.4	5.2	101.4	2.6	100	100	101.4	2.6	1.0
U1456D-27R-2 100-106 cm	881	1.738	4.681	0.075	0.3065	0.0067	0.51133	1763	13	1723	33	1808	36	1808.0	36.0	4.7
U1456D-27R-2 100-106 cm	377	1.070	1.526	0.027	0.1548	0.0029	0.75590	941	10	927	16	971	26	971.0	26.0	4.5
U1456D-27R-2 100-106 cm	334	0.726	0.096	0.004	0.0138	0.0002	0.15526	93	3.4	88.6	1.2	202	76	88.6	1.2	4.7
U1456D-27R-2 100-106 cm	531	10.290	0.529	0.017	0.0661	0.0014	0.55847	430	11	412.6	8.4	519	56	412.6	8.4	4.0
U1456D-27R-2 100-106 cm	70.2	0.781	3.640	0.110	0.2472	0.0051	0.54994	1555	24	1423	26	1734	48	1734.0	48.0	17.9
U1456D-27R-2 100-106 cm	144.6	1.105	8.620	0.150	0.3880	0.0068	0.74467	2295	16	2112	31	2470	20	2470.0	20.0	14.5
U1456D-27R-2 100-106 cm	643	0.345	0.047	0.002	0.0072	0.0001	0.02218	46.2	2.1	46.15	0.67	88	95	46.2	0.7	0.1
U1456D-27R-2 100-106 cm	287.4	4.520	0.117	0.006	0.0172	0.0005	0.28730	112.4	5.2	109.6	2.9	175	97	109.6	2.9	2.5
U1456D-27R-2 100-106 cm	263	1.104	0.064	0.004	0.0093	0.0002	0.33745	62.4	3.7	59.7	1.3	180	110	59.7	1.3	4.3
U1456D-27R-2 100-106 cm	872	0.469	0.090	0.002	0.0134	0.0002	0.29577	87.3	1.7	85.8	1.1	141	43	85.8	1.1	1.7
U1456D-27R-2 100-106 cm	152.7	0.886	0.104	0.008	0.0127	0.0003	0.19458	99.8	7.1	81	2.1	480	140	DISC	DISC	18.8
U1456D-27R-2 100-106 cm	613	1.297	3.285	0.050	0.2251	0.0028	0.84107	1476	12	1308	15	1720	15	1720.0	15.0	24.0
U1456D-27R-2 100-106 cm	465	0.633	0.056	0.002	0.0082	0.0001	0.13526	55.3	2.1	52.3	0.67	172	78	52.3	0.7	5.4
U1456D-27R-2 100-106 cm	478	0.876	1.049	0.037	0.1141	0.0041	0.77479	727	18	696	23	825	50	696.0	23.0	4.3
U1456D-27R-2 100-106 cm	160.9	0.603	1.127	0.025	0.1256	0.0017	0.49389	765	12	762.3	9.5	780	40	762.3	9.5	0.4
U1456D-27R-2 100-106 cm	149.8	0.878	0.113	0.006	0.0166	0.0003	0.04433	108.2	5.2	106.4	1.8	154	99	106.4	1.8	1.7
U1456D-27R-2 100-106 cm	86.4	0.769	0.083	0.007	0.0125	0.0003	0.03846	81.3	6.9	80	1.8	80	150	80.0	1.8	1.6
U1456D-27R-2 100-106 cm	402	0.772	0.049	0.002	0.0074	0.0001	0.02061	48.6	2.4	47.58	0.69	108	96	47.6	0.7	2.1
U1456D-27R-2 100-106 cm	250	7.000	22.250	0.290	0.6323	0.0093	0.61277	3192	13	3159	36	3217	18	3217.0	18.0	1.8
U1456D-27R-2 100-106 cm	1132	59.000	0.201	0.006	0.0282	0.0008	0.59588	186.1	5.4	179.4	4.9	270	62	179.4	4.9	3.6
U1456D-27R-2 100-106 cm	162.7	1.751	1.069	0.029	0.1156	0.0024	0.52723	741	15	705	14	842	54	705.0	14.0	4.9
U1456D-27R-2 100-106 cm	134.2	1.053	0.084	0.008	0.0120	0.0005	0.19798	81.8	7.6	76.7	3	220	180	76.7	3.0	6.2
U1456D-27R-2 100-106 cm	977	1.540	0.116	0.003	0.0173	0.0003	0.32741	111.6	2.3	110.2	1.6	151	46	110.2	1.6	1.3
U1456D-27R-2 100-106 cm	5110	0.946	0.017	0.001	0.0021	0.0000	0.36653	16.76	0.81	13.63	0.3	450	100	DISC	DISC	18.7
U1456D-27R-2 100-106 cm	169.4	1.064	0.791	0.014	0.0940	0.0009	0.28658	590.5	8.1	579	5.2	629	40	579.0	5.2	1.9
U1456D-27R-2 100-106 cm	130.4	1.018	0.059	0.006	0.0089	0.0002	0.03718	57.3	5.4	57	1.3	50	160	57.0	1.3	0.5
U1456D-27R-2 100-106 cm	265	0.907	0.449	0.011	0.0573	0.0007	0.29752	376.8	7.7	359.3	4.3	482	54	359.3	4.3	4.6
U1456D-27R-2 100-106 cm	1620	2.100	0.093	0.002	0.0137	0.0002	0.47901	90	1.9	87.8	1.1	121	39	87.8	1.1	2.4
U1456D-27R-2 100-106 cm	779	1.153	0.105	0.003	0.0152	0.0002	0.26848	101.5	2.5	97.2	1.2	206	54	97.2	1.2	4.2

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-27R-2 100-106 cm	541	6.840	0.428	0.008	0.0559	0.0009	0.60300	361.6	5.6	350.5	5.5	427	34	350.5	5.5	3.1
U1456D-27R-2 100-106 cm	642	5.440	0.450	0.013	0.0567	0.0012	0.76354	376.6	8.8	355.5	7.6	505	40	355.5	7.6	5.6
U1456D-27R-2 100-106 cm	79.6	0.949	5.620	0.120	0.3525	0.0088	0.73522	1917	18	1945	42	1876	39	1876.0	39.0	3.7
U1456D-27R-2 100-106 cm	239.8	0.480	1.620	0.034	0.1608	0.0025	0.53356	976	13	961	14	1010	37	1010.0	37.0	4.9
U1456D-27R-2 100-106 cm	809	1.185	6.431	0.074	0.3486	0.0038	0.80943	2035	10	1927	18	2147	12	2147.0	12.0	10.2
U1456D-27R-2 100-106 cm	445	0.763	0.062	0.004	0.0088	0.0002	0.06103	60.5	3.9	56.4	1.4	260	140	56.4	1.4	6.8
U1456D-27R-2 100-106 cm	497	2.220	0.120	0.004	0.0176	0.0002	0.06590	114.7	3.8	112.5	1.4	166	76	112.5	1.4	1.9
U1456D-27R-2 100-106 cm	757	0.529	0.059	0.002	0.0088	0.0001	0.09671	57.8	1.8	56.49	0.64	128	65	56.5	0.6	2.3
U1456D-27R-2 100-106 cm	523	1.120	0.668	0.009	0.0831	0.0008	0.52817	519.2	5.2	514.7	5	537	25	514.7	5.0	0.9
U1456D-28R-1 40-46 cm	291	0.998	0.069	0.003	0.0107	0.0002	0.23273	67.7	3.1	68.3	1.4	43	84	68.3	1.4	0.9
U1456D-28R-1 40-46 cm	293.9	0.967	0.114	0.005	0.0160	0.0004	0.26478	109.9	5	102.6	2.6	248	96	102.6	2.6	6.6
U1456D-28R-1 40-46 cm	622	0.981	0.025	0.001	0.0040	0.0001	0.06574	25.1	1.3	25.54	0.51	0	100	25.5	0.5	1.8
U1456D-28R-1 40-46 cm	388	2.368	1.013	0.021	0.1121	0.0019	0.57751	709	10	685	11	788	36	685.0	11.0	3.4
U1456D-28R-1 40-46 cm	475	1.008	0.053	0.003	0.0072	0.0001	0.06023	52.5	2.4	46.37	0.92	328	99	46.4	0.9	11.7
U1456D-28R-1 40-46 cm	163.3	1.408	1.710	0.045	0.1622	0.0030	0.65584	1009	17	968	17	1100	39	1100.0	39.0	12.0
U1456D-28R-1 40-46 cm	1782	1.810	0.226	0.004	0.0313	0.0005	0.76303	206.5	3.3	198.5	3	294	27	198.5	3.0	3.9
U1456D-28R-1 40-46 cm	170.2	1.005	2.809	0.074	0.1850	0.0047	0.77898	1355	19	1093	25	1808	31	DISC	DISC	39.5
U1456D-28R-1 40-46 cm	1619	2.650	0.108	0.003	0.0155	0.0003	0.41959	104	2.4	99	1.6	222	48	99.0	1.6	4.8
U1456D-28R-1 40-46 cm	544	1.391	0.118	0.005	0.0164	0.0003	0.36443	112.5	4.6	104.6	1.9	289	82	104.6	1.9	7.0
U1456D-28R-1 40-46 cm	176.1	0.620	0.054	0.004	0.0089	0.0002	0.09208	53.3	3.7	56.9	1.5	-20	120	56.9	1.5	6.8
U1456D-28R-1 40-46 cm	248.5	0.724	0.058	0.006	0.0083	0.0003	0.16696	56.8	5.8	53.1	2.2	210	190	53.1	2.2	6.5
U1456D-28R-1 40-46 cm	5110	0.486	0.045	0.001	0.0066	0.0001	0.62388	45	1.3	42.29	0.83	236	58	42.3	0.8	6.0
U1456D-28R-1 40-46 cm	1196	0.448	0.047	0.002	0.0066	0.0001	0.46539	46.7	1.6	42.1	0.87	300	66	42.1	0.9	9.9
U1456D-28R-1 40-46 cm	274.8	1.618	3.673	0.087	0.2633	0.0059	0.85138	1561	19	1505	30	1648	23	1648.0	23.0	8.7
U1456D-28R-1 40-46 cm	488	2.080	7.700	0.140	0.3847	0.0067	0.83404	2193	16	2096	31	2291	18	2291.0	18.0	8.5
U1456D-28R-1 40-46 cm	1602	0.610	0.092	0.002	0.0136	0.0002	0.40252	89.2	2	87.1	1.3	152	45	87.1	1.3	2.4
U1456D-28R-1 40-46 cm	674	27.540	5.127	0.064	0.3247	0.0043	0.85465	1839	11	1811	21	1870	13	1870.0	13.0	3.2
U1456D-28R-1 40-46 cm	627	1.530	0.538	0.011	0.0680	0.0011	0.63486	436.2	7.3	424.9	6.6	490	36	424.9	6.6	2.6
U1456D-28R-1 40-46 cm	3180	2.120	0.044	0.001	0.0065	0.0001	0.58240	43.4	1.3	41.79	0.69	126	52	41.8	0.7	3.7
U1456D-28R-1 40-46 cm	139.2	0.625	0.060	0.004	0.0078	0.0002	0.07980	59	4.2	49.8	1.4	370	150	DISC	DISC	15.6
U1456D-28R-1 40-46 cm	663	1.304	0.112	0.003	0.0162	0.0003	0.37086	107.3	3	103.9	1.7	174	55	103.9	1.7	3.2
U1456D-28R-1 40-46 cm	532	0.706	0.058	0.003	0.0090	0.0002	0.28819	57.3	2.6	57.4	1.2	66	80	57.4	1.2	0.2
U1456D-28R-1 40-46 cm	141.5	1.158	1.179	0.027	0.1324	0.0023	0.61975	789	13	801	13	739	42	801.0	13.0	1.5
U1456D-28R-1 40-46 cm	578	2.120	1.406	0.030	0.1479	0.0028	0.73788	889	12	888	16	893	30	893.0	30.0	0.6
U1456D-28R-1 40-46 cm	440	0.490	0.634	0.014	0.0805	0.0014	0.59641	497.4	9	499	8.3	490	41	499.0	8.3	0.3

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-28R-1 40-46 cm	630	0.852	0.117	0.004	0.0169	0.0003	0.18844	112.3	3.4	107.7	1.9	213	68	107.7	1.9	4.1
U1456D-28R-1 40-46 cm	37.93	1.107	0.140	0.017	0.0202	0.0008	0.09439	133	15	128.8	5.1	170	210	128.8	5.1	3.2
U1456D-28R-1 40-46 cm	555	1.496	1.302	0.028	0.1362	0.0025	0.71374	845	12	823	14	914	31	823.0	14.0	2.6
U1456D-28R-1 40-46 cm	135.5	0.446	4.160	0.120	0.2721	0.0071	0.78622	1663	24	1550	36	1816	34	1816.0	34.0	14.6
U1456D-28R-1 40-46 cm	275.6	2.540	1.006	0.033	0.1055	0.0025	0.72510	704	17	646	14	897	47	646.0	14.0	8.2
U1456D-28R-1 40-46 cm	200.6	1.713	0.270	0.008	0.0386	0.0005	0.24356	242.3	6.3	243.8	3	223	58	243.8	3.0	0.6
U1456D-28R-1 40-46 cm	404	0.891	8.750	0.390	0.4060	0.0150	0.92033	2307	41	2194	70	2420	28	2420.0	28.0	9.3
U1456D-28R-1 40-46 cm	573	1.019	0.051	0.002	0.0078	0.0002	0.11294	50.8	2.2	50.1	1	93	79	50.1	1.0	1.4
U1456D-28R-1 40-46 cm	2182	1.320	0.049	0.002	0.0068	0.0001	0.48305	48.2	1.7	43.52	0.78	276	60	43.5	0.8	9.7
U1456D-28R-1 40-46 cm	177.1	4.810	0.834	0.018	0.1000	0.0012	0.40813	615	10	614.5	7.2	605	44	614.5	7.2	0.1
U1456D-28R-1 40-46 cm	1161	6.500	0.115	0.008	0.0166	0.0005	0.52930	110.2	7.3	106.3	3.4	190	120	106.3	3.4	3.5
U1456D-28R-1 40-46 cm	129.7	0.540	0.070	0.008	0.0100	0.0004	0.04395	67.9	7.2	64.1	2.4	160	200	64.1	2.4	5.6
U1456D-28R-1 40-46 cm	302.8	1.936	0.901	0.019	0.1057	0.0014	0.13178	650.3	9.7	647.8	8.4	650	37	647.8	8.4	0.4
U1456D-28R-1 40-46 cm	3660	3.740	0.110	0.002	0.0165	0.0002	0.67384	105.9	1.6	105.3	1.4	119	27	105.3	1.4	0.6
U1456D-28R-1 40-46 cm	112.4	0.917	10.210	0.150	0.4574	0.0062	0.76517	2452	13	2426	27	2466	17	2466.0	17.0	1.6
U1456D-28R-1 40-46 cm	2970	2.380	0.022	0.001	0.0033	0.0001	0.53794	22.1	1.1	20.99	0.7	157	85	21.0	0.7	5.0
U1456D-28R-1 40-46 cm	2150	0.467	0.045	0.001	0.0069	0.0001	0.28673	44.9	1.2	44.28	0.66	93	52	44.3	0.7	1.4
U1456D-28R-1 40-46 cm	302	1.300	0.089	0.010	0.0133	0.0008	0.34555	86.3	9.5	85.2	5.2	120	200	85.2	5.2	1.3
U1456D-28R-1 40-46 cm	210	0.783	1.598	0.027	0.1625	0.0022	0.61931	968	10	970	12	964	28	964.0	28.0	0.6
U1456D-28R-1 40-46 cm	853	17.900	1.426	0.036	0.1416	0.0029	0.79513	897	15	853	16	1029	34	1029.0	34.0	17.1
U1456D-28R-1 40-46 cm	510	1.815	2.035	0.033	0.1898	0.0029	0.73761	1125	11	1120	16	1143	22	1143.0	22.0	2.0
U1456D-28R-1 40-46 cm	357	0.614	0.111	0.004	0.0163	0.0003	0.30914	106.9	3.8	104.1	2	189	72	104.1	2.0	2.6
U1456D-28R-1 40-46 cm	1660	0.942	0.570	0.011	0.0733	0.0013	0.79980	456.9	6.8	455.5	7.9	480	25	455.5	7.9	0.3
U1456D-28R-1 40-46 cm	68.8	0.870	0.087	0.007	0.0127	0.0004	0.05340	85.2	7	81.4	2.7	200	160	81.4	2.7	4.5
U1456D-28R-1 40-46 cm	570	0.786	0.107	0.003	0.0164	0.0003	0.31518	102.9	2.7	104.8	2	79	53	104.8	2.0	1.8
U1456D-28R-1 40-46 cm	314	7.500	4.990	0.140	0.3125	0.0091	0.87373	1812	24	1750	45	1886	25	1886.0	25.0	7.2
U1456D-28R-1 40-46 cm	825	27.900	3.188	0.063	0.2204	0.0039	0.74505	1450	15	1282	20	1702	18	1702.0	18.0	24.7
U1456D-28R-1 40-46 cm	554	3.180	1.463	0.034	0.1462	0.0027	0.70208	913	14	879	15	998	29	998.0	29.0	11.9
U1456D-28R-1 40-46 cm	137.9	1.860	1.471	0.024	0.1505	0.0019	0.45778	917	10	903	11	928	32	928.0	32.0	2.7
U1456D-28R-1 40-46 cm	2390	1.473	0.043	0.002	0.0059	0.0001	0.37062	42.7	1.4	37.67	0.69	316	70	37.7	0.7	11.8
U1456D-28R-1 40-46 cm	379	3.870	2.353	0.070	0.2056	0.0061	0.88346	1225	21	1204	33	1257	29	1257.0	29.0	4.2
U1456D-28R-1 40-46 cm	1600	18.900	0.220	0.004	0.0319	0.0005	0.57615	201.9	3.4	202.3	3.1	187	34	202.3	3.1	0.2
U1456D-28R-1 40-46 cm	431	1.830	1.634	0.029	0.1646	0.0025	0.78220	981	11	982	14	968	22	968.0	22.0	1.4
U1456D-28R-1 40-46 cm	617	0.784	0.051	0.002	0.0077	0.0001	0.04667	50.6	2.4	49.7	0.88	97	97	49.7	0.9	1.8
U1456D-28R-1 40-46 cm	1003	6.240	0.459	0.010	0.0571	0.0012	0.75807	383.1	7	357.8	7.2	537	35	357.8	7.2	6.6

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-28R-1 40-46 cm	326	1.681	0.823	0.031	0.0919	0.0025	0.74284	607	18	566	15	748	56	566.0	15.0	6.8
U1456D-28R-1 40-46 cm	178.6	0.796	0.055	0.004	0.0080	0.0002	0.15186	54.3	3.4	51.6	1.3	190	130	51.6	1.3	5.0
U1456D-28R-1 40-46 cm	243	1.025	0.052	0.004	0.0076	0.0002	0.16422	50.8	3.4	48.9	1.1	130	120	48.9	1.1	3.7
U1456D-28R-1 40-46 cm	204.7	0.512	0.067	0.005	0.0093	0.0002	0.14737	65.1	4.2	59.7	1.5	250	130	59.7	1.5	8.3
U1456D-28R-1 40-46 cm	165	2.592	1.095	0.027	0.1219	0.0025	0.37297	749	13	741	14	761	58	741.0	14.0	1.1
U1456D-28R-1 40-46 cm	361.8	0.651	0.304	0.008	0.0424	0.0007	0.40003	268.9	6.4	267.6	4.5	279	55	267.6	4.5	0.5
U1456D-28R-1 40-46 cm	227.6	0.848	0.267	0.010	0.0372	0.0009	0.40616	241.1	8.4	235.6	5.6	293	74	235.6	5.6	2.3
U1456D-28R-1 40-46 cm	1197	9.760	0.150	0.005	0.0224	0.0006	0.74098	141.5	4	142.9	3.8	137	43	142.9	3.8	1.0
U1456D-28R-1 40-46 cm	576	0.816	0.033	0.002	0.0050	0.0001	0.12413	33.3	2	32.17	0.74	160	110	32.2	0.7	3.4
U1456D-28R-1 40-46 cm	489	0.702	1.326	0.027	0.1368	0.0021	0.77323	855	12	827	12	929	26	827.0	12.0	3.3
U1456D-28R-1 40-46 cm	208	1.505	0.121	0.006	0.0185	0.0004	0.15659	115.3	5.5	117.8	2.3	86	95	117.8	2.3	2.2
U1456D-28R-1 40-46 cm	339	2.110	0.754	0.016	0.0898	0.0015	0.68704	569.1	9.3	554	8.7	622	34	554.0	8.7	2.7
U1456D-28R-1 40-46 cm	191.1	0.634	0.239	0.010	0.0340	0.0008	0.30319	216.7	7.8	215.6	5	216	80	215.6	5.0	0.5
U1456D-28R-1 40-46 cm	139.1	1.582	0.289	0.012	0.0386	0.0008	0.29773	255.8	9.6	243.9	4.6	336	83	243.9	4.6	4.7
U1456D-28R-1 40-46 cm	275	0.620	0.038	0.002	0.0058	0.0002	0.04459	38	2.3	37.1	1	140	130	37.1	1.0	2.4
U1456D-28R-1 40-46 cm	82.2	0.754	0.056	0.006	0.0083	0.0003	0.11203	54.3	5.4	53	1.7	60	170	53.0	1.7	2.4
U1456D-28R-1 40-46 cm	664	1.544	8.950	0.150	0.4051	0.0062	0.86805	2329	15	2194	28	2447	13	2447.0	13.0	10.3
U1456D-28R-1 40-46 cm	1439	8.180	0.035	0.001	0.0053	0.0001	0.40292	35.3	1.2	34.27	0.7	103	64	34.3	0.7	2.9
U1456D-28R-1 40-46 cm	386	2.970	3.795	0.083	0.2526	0.0047	0.82558	1591	18	1451	24	1769	23	1769.0	23.0	18.0
U1456D-28R-1 40-46 cm	1015	#####	0.121	0.006	0.0179	0.0007	0.42698	115.9	5	114.2	4.4	150	91	114.2	4.4	1.5
U1456D-28R-1 40-46 cm	168.6	0.685	1.017	0.046	0.1126	0.0031	0.39585	710	23	688	18	756	90	688.0	18.0	3.1
U1456D-28R-1 40-46 cm	323	1.440	0.101	0.008	0.0146	0.0008	0.45735	97.4	7.7	93.3	5.1	190	150	93.3	5.1	4.2
U1456D-28R-1 40-46 cm	1060	1.346	0.054	0.003	0.0076	0.0001	0.06275	53.5	2.4	48.99	0.92	250	100	49.0	0.9	8.4
U1456D-28R-1 40-46 cm	527	2.600	0.067	0.003	0.0101	0.0003	0.19349	65.9	2.9	64.8	1.6	121	89	64.8	1.6	1.7
U1456D-28R-1 40-46 cm	714	0.443	0.200	0.008	0.0219	0.0006	0.62388	185.1	7.1	139.4	3.9	794	70	DISC	DISC	24.7
U1456D-28R-1 40-46 cm	328	0.851	0.087	0.004	0.0123	0.0003	0.24560	84.5	3.9	79	1.8	227	95	79.0	1.8	6.5
U1456D-28R-1 40-46 cm	1401	91.000	0.819	0.052	0.0949	0.0054	0.76548	605	30	584	32	690	93	584.0	32.0	3.5
U1456D-28R-1 40-46 cm	174.9	2.132	4.350	0.170	0.2887	0.0090	0.75549	1696	32	1633	45	1791	41	1791.0	41.0	8.8
U1456D-28R-1 40-46 cm	2090	1.510	0.066	0.002	0.0100	0.0001	0.46095	64.6	1.5	63.84	0.82	102	42	63.8	0.8	1.2
U1456D-28R-1 40-46 cm	825	7.760	1.116	0.017	0.1258	0.0017	0.63539	760	8.2	763.9	9.7	753	26	763.9	9.7	0.5
U1456D-28R-1 40-46 cm	958	1.133	0.052	0.002	0.0078	0.0002	0.22374	51.5	2.1	50.3	1.1	139	86	50.3	1.1	2.3
U1456D-28R-1 40-46 cm	384	0.608	0.111	0.008	0.0149	0.0005	0.47444	106.1	7	95.2	2.9	330	120	95.2	2.9	10.3
U1456D-28R-1 40-46 cm	1621	0.940	0.116	0.002	0.0168	0.0002	0.30840	111.2	2.1	107.2	1.3	209	44	107.2	1.3	3.6
U1456D-28R-1 40-46 cm	419	0.864	0.024	0.002	0.0032	0.0001	0.09063	23.7	1.8	20.39	0.65	320	140	20.4	0.7	14.0
U1456D-28R-1 40-46 cm	841	5.930	0.639	0.016	0.0787	0.0018	0.73729	501	10	488	11	564	39	488.0	11.0	2.6

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-28R-1 40-46 cm	1037	5.980	0.605	0.017	0.0777	0.0021	0.81315	479	10	482	12	472	36	482.0	12.0	0.6
U1456D-28R-1 40-46 cm	895	1.232	0.058	0.003	0.0057	0.0001	0.35593	56.9	2.7	36.67	0.67	952	90	DISC	DISC	35.6
U1456D-28R-1 40-46 cm	2760	1.685	0.156	0.003	0.0226	0.0003	0.67602	146.9	2.4	144.2	2.2	198	31	144.2	2.2	1.8
U1456D-28R-1 40-46 cm	972	1.393	0.119	0.004	0.0167	0.0003	0.50764	113.7	3.3	106.4	2	286	59	106.4	2.0	6.4
U1456D-28R-1 40-46 cm	229	1.435	0.669	0.015	0.0821	0.0012	0.43071	518.3	9.3	508.4	7.4	573	46	508.4	7.4	1.9
U1456D-28R-1 40-46 cm	256	0.756	0.049	0.003	0.0076	0.0002	0.12393	48.8	3.2	48.9	1.1	110	120	48.9	1.1	0.2
U1456D-28R-1 40-46 cm	572	3.440	1.099	0.018	0.1206	0.0016	0.72573	751.6	8.8	733.7	9.4	827	24	733.7	9.4	2.4
U1456D-28R-1 40-46 cm	101.3	1.490	1.129	0.028	0.1258	0.0017	0.45947	764	13	763.8	9.7	773	48	763.8	9.7	0.0
U1456D-28R-1 40-46 cm	344.2	1.330	0.900	0.024	0.0999	0.0019	0.62273	654	13	613	11	803	45	613.0	11.0	6.3
U1456D-28R-1 40-46 cm	106.6	16.800	0.883	0.031	0.0998	0.0022	0.51018	640	17	613	13	754	71	613.0	13.0	4.2
U1456D-28R-1 40-46 cm	167.9	1.003	0.144	0.007	0.0203	0.0004	0.23649	136.2	6.1	129.3	2.5	246	88	129.3	2.5	5.1
U1456D-28R-1 40-46 cm	691	1.380	0.123	0.004	0.0180	0.0003	0.35902	117.1	3.8	114.8	1.7	185	65	114.8	1.7	2.0
U1456D-28R-1 40-46 cm	2010	1.450	0.524	0.011	0.0665	0.0012	0.75671	428.4	7.7	415	7.5	502	31	415.0	7.5	3.1
U1456D-28R-1 40-46 cm	1384	0.796	0.053	0.002	0.0081	0.0001	0.33490	52.4	1.4	52.1	0.85	87	54	52.1	0.9	0.6
U1456D-28R-1 40-46 cm	2290	5.110	0.624	0.009	0.0789	0.0011	0.79842	491.8	5.7	489.6	6.6	502	20	489.6	6.6	0.4
U1456D-28R-1 40-46 cm	580	1.120	0.171	0.004	0.0247	0.0004	0.40254	160.4	3.8	157.4	2.8	208	51	157.4	2.8	1.9
U1456D-28R-1 40-46 cm	315	1.030	0.137	0.005	0.0199	0.0003	0.07926	130.2	4.3	126.7	1.8	208	76	126.7	1.8	2.7
U1456D-28R-1 40-46 cm	457	2.153	4.514	0.098	0.2634	0.0059	0.75877	1734	19	1506	30	2023	28	2023.0	28.0	25.6
U1456D-28R-1 40-46 cm	725	1.490	0.115	0.003	0.0165	0.0002	0.34614	110	3.1	105.6	1.5	200	58	105.6	1.5	4.0
U1456D-28R-1 40-46 cm	210	2.105	1.574	0.027	0.1578	0.0018	0.50664	959	11	944	10	983	30	983.0	30.0	4.0
U1456D-28R-1 40-46 cm	884	1.000	1.464	0.017	0.1499	0.0018	0.71550	914.9	7	900	9.8	943	17	943.0	17.0	4.6
U1456D-28R-1 40-46 cm	216.8	1.210	4.194	0.075	0.2981	0.0052	0.81365	1669	15	1680	26	1648	24	1648.0	24.0	1.9
U1456D-28R-1 40-46 cm	154.9	4.360	7.390	0.130	0.3713	0.0056	0.78519	2157	15	2038	25	2266	18	2266.0	18.0	10.1
U1456D-28R-1 40-46 cm	301.7	0.547	0.057	0.005	0.0083	0.0002	0.00368	56.1	4.5	53.5	1.4	140	150	53.5	1.4	4.6
U1456D-28R-1 40-46 cm	554	4.830	2.354	0.093	0.2092	0.0072	0.41816	1225	28	1224	38	1274	52	1274.0	52.0	3.9
U1456D-28R-1 40-46 cm	337.6	1.708	2.565	0.043	0.2131	0.0036	0.60246	1289	12	1245	19	1381	27	1381.0	27.0	9.8
U1456D-28R-1 40-46 cm	528	3.580	0.667	0.027	0.0774	0.0026	0.76143	518	17	481	16	706	49	481.0	16.0	7.1
U1456D-28R-1 40-46 cm	2650	3.100	0.074	0.001	0.0112	0.0001	0.50159	72	1.3	71.99	0.87	89	34	72.0	0.9	0.0
U1456D-28R-1 40-46 cm	1531	2.026	0.035	0.001	0.0053	0.0001	0.13381	35.07	0.97	34.09	0.53	127	62	34.1	0.5	2.8
U1456D-28R-1 40-46 cm	262	2.160	10.110	0.200	0.4477	0.0077	0.71603	2448	20	2382	34	2498	26	2498.0	26.0	4.6
U1456D-28R-1 40-46 cm	1260	2.410	0.102	0.002	0.0156	0.0002	0.15564	98.7	2	100	1.2	80	44	100.0	1.2	1.3
U1456D-28R-1 40-46 cm	797	3.340	0.110	0.003	0.0167	0.0002	0.22129	106	2.6	106.8	1.4	102	50	106.8	1.4	0.8
U1456D-28R-1 40-46 cm	3190	2.208	0.099	0.002	0.0004	0.0022	0.04662	95.8	2	2	14	123	37	DISC	DISC	97.9
U1456D-29R-2 24-34 cm	255.3	0.728	0.068	0.002	0.0096	0.0001	0.10228	66.5	2	61.29	0.62	298	69	61.3	0.6	7.8
U1456D-29R-2 24-34 cm	2400	9.280	0.037	0.001	0.0057	0.0001	0.42237	36.89	0.88	36.47	0.6	83	48	36.5	0.6	1.1

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-29R-2 24-34 cm	150.7	0.614	0.066	0.003	0.0100	0.0002	0.12480	65.2	2.6	64.3	1	135	91	64.3	1.0	1.4
U1456D-29R-2 24-34 cm	500	0.437	1.232	0.014	0.1327	0.0011	0.68816	814.9	6.2	803.8	6.3	855	17	803.8	6.3	1.4
U1456D-29R-2 24-34 cm	505	0.967	0.066	0.001	0.0099	0.0001	0.20877	64.8	1.3	63.63	0.65	106	43	63.6	0.7	1.8
U1456D-29R-2 24-34 cm	766	0.418	0.065	0.001	0.0100	0.0001	0.37092	64.2	1.2	64.2	0.64	61	37	64.2	0.6	0.0
U1456D-29R-2 24-34 cm	463	3.020	0.544	0.009	0.0697	0.0010	0.77608	440.7	6	434.1	6.3	487	24	434.1	6.3	1.5
U1456D-29R-2 24-34 cm	251.3	0.631	0.109	0.002	0.0163	0.0002	0.06159	105.1	2	104.5	0.96	95	46	104.5	1.0	0.6
U1456D-29R-2 24-34 cm	279.3	1.272	0.686	0.016	0.0855	0.0019	0.90547	529.4	9.5	529	12	544	29	529.0	12.0	0.1
U1456D-29R-2 24-34 cm	266	0.817	0.086	0.007	0.0124	0.0004	-0.43483	83.9	6.4	79.6	2.3	190	170	79.6	2.3	5.1
U1456D-29R-2 24-34 cm	93.3	4.680	0.078	0.006	0.0113	0.0006	0.30456	76.2	5.2	72.5	3.6	250	130	72.5	3.6	4.9
U1456D-29R-2 24-34 cm	787	#####	0.100	0.004	0.0143	0.0009	0.58852	96.6	4	91.8	5.7	170	130	91.8	5.7	5.0
U1456D-29R-2 24-34 cm	511	1.738	1.264	0.017	0.1310	0.0019	0.60107	828.9	7.6	793	11	897	25	793.0	11.0	4.3
U1456D-29R-2 24-34 cm	113.2	1.639	1.068	0.013	0.1174	0.0009	0.36931	737.7	6.2	715.4	5.2	776	26	715.4	5.2	3.0
U1456D-29R-2 24-34 cm	122.8	0.765	0.109	0.004	0.0157	0.0003	0.15810	105	3.2	100.5	1.8	163	67	100.5	1.8	4.3
U1456D-29R-2 24-34 cm	93.3	0.583	1.663	0.026	0.1674	0.0018	0.45065	993.8	9.9	997.5	9.8	969	26	969.0	26.0	2.9
U1456D-29R-2 24-34 cm	703	10.420	0.731	0.009	0.0895	0.0010	0.48393	556.8	5	552.6	5.7	563	26	552.6	5.7	0.8
U1456D-29R-2 24-34 cm	638	3.110	0.787	0.021	0.0922	0.0017	0.53422	589	12	569	10	633	53	569.0	10.0	3.4
U1456D-29R-2 24-34 cm	327	2.270	1.477	0.019	0.1495	0.0016	0.73899	920.1	7.9	898.9	9.3	951	19	951.0	19.0	5.5
U1456D-29R-2 24-34 cm	60.1	0.727	0.066	0.004	0.0103	0.0002	0.15128	64.8	3.5	66.3	1.2	60	100	66.3	1.2	2.3
U1456D-29R-2 24-34 cm	621	1.672	1.521	0.022	0.1520	0.0022	0.85451	938.8	9.2	912	12	1005	16	1005.0	16.0	9.3
U1456D-29R-2 24-34 cm	352	3.030	0.039	0.001	0.0058	0.0001	0.11154	38.9	1.4	37.29	0.71	152	79	37.3	0.7	4.1
U1456D-29R-2 24-34 cm	310	2.136	5.476	0.091	0.3108	0.0036	0.74764	1894	15	1744	18	2047	21	2047.0	21.0	14.8
U1456D-29R-2 24-34 cm	119	0.515	1.900	0.025	0.1770	0.0021	0.65939	1080.7	8.8	1050	12	1134	24	1134.0	24.0	7.4
U1456D-29R-2 24-34 cm	659	1.423	1.504	0.019	0.1520	0.0017	0.67237	931.7	7.6	912.3	9.7	989	21	989.0	21.0	7.8
U1456D-29R-2 24-34 cm	1035	1.218	0.155	0.003	0.0213	0.0003	0.28038	146.4	2.3	136.1	1.9	322	42	136.1	1.9	7.0
U1456D-29R-2 24-34 cm	37.5	0.681	0.141	0.008	0.0191	0.0004	0.18373	135.9	7.5	121.7	2.2	320	120	121.7	2.2	10.4
U1456D-29R-2 24-34 cm	433	46.300	0.211	0.008	0.0308	0.0018	0.46480	194	6.4	195	11	220	110	195.0	11.0	0.5
U1456D-29R-2 24-34 cm	39.84	1.567	1.190	0.035	0.1225	0.0020	0.43876	794	16	745	12	913	55	745.0	12.0	6.2
U1456D-29R-2 24-34 cm	377	1.374	24.860	0.370	0.5610	0.0110	0.35764	3302	15	2867	45	3557	27	3557.0	27.0	19.4
U1456D-29R-2 24-34 cm	103.7	0.747	1.165	0.016	0.1290	0.0012	0.24802	783.2	7.5	782.2	7	782	31	782.2	7.0	0.1
U1456D-29R-2 24-34 cm	63.8	1.291	0.953	0.038	0.1068	0.0025	0.59952	682	21	654	14	814	61	654.0	14.0	4.1
U1456D-29R-2 24-34 cm	483	0.960	0.069	0.002	0.0101	0.0001	0.28754	67.6	1.5	65.06	0.77	147	44	65.1	0.8	3.8
U1456D-29R-2 24-34 cm	1738	12.190	0.844	0.008	0.0932	0.0008	0.73351	621.4	4.3	574.2	4.9	806	14	574.2	4.9	7.6
U1456D-29R-2 24-34 cm	853	4.210	0.103	0.001	0.0155	0.0001	0.22625	99.1	1.1	99.28	0.7	100	27	99.3	0.7	0.2
U1456D-29R-2 24-34 cm	169	2.060	2.031	0.023	0.1886	0.0016	0.55109	1127.4	7.7	1113.8	8.8	1151	21	1151.0	21.0	3.2
U1456D-29R-2 24-34 cm	76.3	0.459	0.084	0.004	0.0132	0.0002	0.00419	81.4	3.2	84.7	1.4	41	82	84.7	1.4	4.1

(table cont'd)

Sample Name	[U] ppm	207/23		2σ error	206/238		RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
		U/Th	5		206/238	2σ error		Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-29R-2 24-34 cm	1488	0.921	0.274	0.003	0.0380	0.0004	0.68970	246.1	2.7	240.7	2.6	289	23	240.7	2.6	2.2
U1456D-29R-2 24-34 cm	208.6	0.826	6.260	0.110	0.3063	0.0059	0.70689	2013	16	1721	29	2325	27	2325.0	27.0	26.0
U1456D-29R-2 24-34 cm	109.5	1.128	0.052	0.002	0.0078	0.0001	-0.06077	51	2.2	49.76	0.81	134	94	49.8	0.8	2.4
U1456D-29R-2 24-34 cm	315	1.057	1.576	0.014	0.1622	0.0013	0.52363	960.2	5.5	969	7.3	948	18	948.0	18.0	2.2
U1456D-29R-2 24-34 cm	1090	18.900	0.239	0.014	0.0263	0.0022	0.88084	217	11	168	14	751	91	DISC	DISC	22.6
U1456D-29R-2 24-34 cm	114.9	0.993	1.224	0.015	0.1301	0.0011	0.41064	812.6	6.5	788.2	6.2	875	24	788.2	6.2	3.0
U1456D-29R-2 24-34 cm	180.5	1.587	0.047	0.002	0.0070	0.0002	0.32913	46.5	2.2	44.7	1	151	91	44.7	1.0	3.9
U1456D-29R-2 24-34 cm	432	36.500	0.130	0.009	0.0200	0.0008	0.75905	124.1	8.1	127.4	5.2	120	110	127.4	5.2	2.7
U1456D-29R-2 24-34 cm	336	1.560	1.052	0.024	0.1179	0.0023	0.80479	730	12	718	13	780	26	718.0	13.0	1.6
U1456D-29R-2 24-34 cm	666	23.000	0.204	0.003	0.0302	0.0002	0.28484	188.3	2.3	191.6	1.3	143	28	191.6	1.3	1.8
U1456D-29R-2 24-34 cm	295	9.230	0.568	0.007	0.0742	0.0006	0.43824	456.6	4.5	461.2	3.6	445	26	461.2	3.6	1.0
U1456D-29R-2 24-34 cm	259.4	0.814	1.185	0.013	0.1303	0.0012	0.33042	793.3	6.1	789.8	6.6	820	24	789.8	6.6	0.4
U1456D-29R-2 24-34 cm	52.3	1.146	0.771	0.016	0.0917	0.0010	0.27883	579.6	9.2	565.7	6	639	45	565.7	6.0	2.4
U1456D-29R-2 24-34 cm	3500	4.450	0.074	0.001	0.0111	0.0002	0.71142	72	1.1	70.97	0.93	99	24	71.0	0.9	1.4
U1456D-29R-2 24-34 cm	172	0.477	0.769	0.011	0.0937	0.0012	0.42257	578.7	6.4	577.5	6.8	584	32	577.5	6.8	0.2
U1456D-29R-2 24-34 cm	592	1.398	0.038	0.001	0.0056	0.0001	0.24701	37.5	1.2	35.96	0.61	161	69	36.0	0.6	4.1
U1456D-29R-2 24-34 cm	681	45.600	0.216	0.007	0.0307	0.0010	0.57849	198.5	5.8	195	6	243	64	195.0	6.0	1.8
U1456D-29R-2 24-34 cm	1113	5.580	0.834	0.011	0.0902	0.0009	0.64572	615.2	5.8	556.7	5.2	848	21	556.7	5.2	9.5
U1456D-29R-2 24-34 cm	976	#####	0.134	0.004	0.0197	0.0005	0.59488	127.1	3.4	126	3.3	153	49	126.0	3.3	0.9
U1456D-29R-2 24-34 cm	350	2.920	1.479	0.027	0.1522	0.0027	0.64677	922	11	913	15	955	31	955.0	31.0	4.4
U1456D-29R-2 24-34 cm	908	1.160	0.037	0.002	0.0056	0.0001	0.45637	37.2	2.3	36.28	0.91	100	110	36.3	0.9	2.5
U1456D-29R-2 24-34 cm	682	1.650	0.037	0.001	0.0058	0.0001	0.25274	36.77	0.8	37.03	0.38	50	43	37.0	0.4	0.7
U1456D-29R-2 24-34 cm	805	1.248	0.111	0.001	0.0171	0.0002	0.44319	106.8	1.3	109.4	1.1	79	27	109.4	1.1	2.4
U1456D-29R-2 24-34 cm	184	0.933	0.113	0.003	0.0169	0.0002	0.23685	108.1	2.7	107.7	1.5	121	52	107.7	1.5	0.4
U1456D-29R-2 24-34 cm	70.4	0.387	1.090	0.024	0.1101	0.0017	0.60333	752	12	672.9	9.8	993	35	672.9	9.8	10.5
U1456D-29R-2 24-34 cm	562	15.500	0.359	0.008	0.0460	0.0010	0.68018	311.4	6.1	289.7	6.2	480	43	289.7	6.2	7.0
U1456D-29R-2 24-34 cm	1540	42.800	0.047	0.002	0.0072	0.0002	0.44141	46.7	1.7	46	1.4	124	76	46.0	1.4	1.5
U1456D-29R-2 24-34 cm	114.2	0.952	0.070	0.003	0.0102	0.0002	0.01948	68.8	2.7	65.1	1.2	200	88	65.1	1.2	5.4
U1456D-29R-2 24-34 cm	442	0.990	0.056	0.002	0.0087	0.0002	0.55459	55.5	1.6	55.6	1.1	83	51	55.6	1.1	0.2
U1456D-29R-2 24-34 cm	382	6.980	0.602	0.009	0.0789	0.0012	0.65312	478	5.7	489.4	7.1	436	28	489.4	7.1	2.4
U1456D-29R-2 24-34 cm	592	4.240	1.271	0.014	0.1297	0.0014	0.70010	833.6	6.4	785.9	8	969	17	785.9	8.0	5.7
U1456D-29R-2 24-34 cm	553	26.980	0.232	0.009	0.0316	0.0009	0.55992	212	7.2	200.7	5.9	350	81	200.7	5.9	5.3
U1456D-29R-2 24-34 cm	126.5	1.036	1.639	0.028	0.1636	0.0020	0.37845	986	11	979	10	998	35	998.0	35.0	1.9
U1456D-29R-2 24-34 cm	351	0.756	0.050	0.002	0.0077	0.0001	0.42495	49.7	1.5	49.66	0.83	88	56	49.7	0.8	0.1
U1456D-29R-2 24-34 cm	99	0.611	0.044	0.003	0.0069	0.0002	-0.04011	44	2.5	44.43	0.95	50	110	44.4	1.0	1.0

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-29R-2 24-34 cm	1044	1.251	0.198	0.006	0.0277	0.0008	0.44652	183.5	5.2	176	4.8	287	71	176.0	4.8	4.1
U1456D-29R-2 24-34 cm	482	31.000	0.526	0.021	0.0667	0.0023	0.66024	430	13	416	14	529	63	416.0	14.0	3.3
U1456D-29R-2 24-34 cm	166	0.938	10.070	0.110	0.4426	0.0041	0.62012	2440	10	2362	19	2509	16	2509.0	16.0	5.9
U1456D-29R-2 24-34 cm	277	1.152	10.700	0.160	0.4382	0.0062	0.70875	2495	14	2341	28	2620	21	2620.0	21.0	10.6
U1456D-29R-2 24-34 cm	261	1.241	0.123	0.003	0.0180	0.0004	0.54365	117.6	3.1	114.8	2.5	199	51	114.8	2.5	2.4
U1456D-29R-2 24-34 cm	100.1	1.389	0.742	0.020	0.0851	0.0020	0.59732	561	12	526	12	713	47	526.0	12.0	6.2
U1456D-29R-2 24-34 cm	774	0.583	0.034	0.001	0.0050	0.0001	0.27132	34.38	0.96	32.14	0.58	186	63	32.1	0.6	6.5
U1456D-29R-2 24-34 cm	673	0.555	6.570	0.130	0.2687	0.0065	0.52660	2055	18	1533	33	2576	28	DISC	DISC	40.5
U1456D-29R-2 24-34 cm	196	1.275	1.457	0.021	0.1497	0.0018	0.67538	912.5	8.4	899	10	939	22	939.0	22.0	4.3
U1456D-29R-2 24-34 cm	275	0.743	0.067	0.002	0.0101	0.0001	0.24479	65.9	1.7	64.7	0.7	119	55	64.7	0.7	1.8
U1456D-29R-2 24-34 cm	144.4	1.527	0.073	0.003	0.0103	0.0002	0.14680	71.1	2.6	65.91	0.99	286	85	65.9	1.0	7.3
U1456D-29R-2 24-34 cm	75.6	1.007	0.044	0.003	0.0066	0.0002	0.06918	43.5	3.2	42.7	1.3	90	140	42.7	1.3	1.8
U1456D-29R-2 24-34 cm	538	7.460	0.734	0.011	0.0793	0.0011	0.89573	558.3	6.6	492.1	6.6	825	15	492.1	6.6	11.9
U1456D-29R-2 24-34 cm	63.8	1.004	0.106	0.005	0.0168	0.0003	0.15507	102.6	4.3	107.5	1.6	12	81	107.5	1.6	4.8
U1456D-29R-2 24-34 cm	335.6	1.501	0.299	0.004	0.0412	0.0005	0.45850	265.7	3.1	260.5	2.8	289	29	260.5	2.8	2.0
U1456D-29R-2 24-34 cm	223.6	0.408	1.261	0.014	0.1308	0.0012	0.67933	827.5	6.4	792.1	6.6	903	17	792.1	6.6	4.3
U1456D-29R-2 24-34 cm	257	0.725	1.111	0.016	0.1253	0.0015	0.73392	759.9	7.3	761	8.6	754	19	761.0	8.6	0.1
U1456D-29R-2 24-34 cm	295.7	0.832	0.691	0.008	0.0836	0.0009	0.54667	533.1	4.9	517.6	5.6	589	23	517.6	5.6	2.9
U1456D-29R-2 24-34 cm	317	0.743	0.118	0.003	0.0166	0.0002	0.23090	114.1	2.2	105.9	1.1	263	47	105.9	1.1	7.2
U1456D-29R-2 24-34 cm	611	9.970	0.573	0.020	0.0743	0.0024	0.54006	463	13	462	14	419	69	462.0	14.0	0.2
U1456D-29R-2 24-34 cm	553.6	0.788	0.950	0.020	0.1063	0.0017	0.77237	679	10	651.1	9.7	783	28	651.1	9.7	4.1
U1456D-29R-2 24-34 cm	115.2	0.719	0.056	0.003	0.0084	0.0002	0.16572	55.5	3.1	53.7	1.1	160	110	53.7	1.1	3.2
U1456D-29R-2 24-34 cm	1290	#####	0.113	0.001	0.0166	0.0002	0.39442	108.5	1.2	106.36	0.98	136	26	106.4	1.0	2.0
U1456D-29R-2 24-34 cm	1710	27.200	0.045	0.001	0.0070	0.0001	0.47388	44.8	1.1	44.89	0.61	44	44	44.9	0.6	0.2
U1456D-29R-2 24-34 cm	118.4	0.875	0.291	0.012	0.0410	0.0011	0.36540	260.9	9.8	259	6.5	286	95	259.0	6.5	0.7
U1456D-29R-2 24-34 cm	418	1.059	0.113	0.002	0.0170	0.0002	0.32608	108.4	2	108.6	1.3	100	41	108.6	1.3	0.2
U1456D-29R-2 24-34 cm	270	0.638	1.786	0.026	0.1704	0.0018	0.80650	1039.1	9.5	1015	10	1075	18	1075.0	18.0	5.6
U1456D-29R-2 24-34 cm	151.3	0.676	0.042	0.002	0.0064	0.0001	0.00590	41.4	1.9	41.27	0.62	33	90	41.3	0.6	0.3
U1456D-29R-2 24-34 cm	191.1	1.305	0.060	0.003	0.0092	0.0001	0.43734	59.2	2.6	59.31	0.9	64	79	59.3	0.9	0.2
U1456D-29R-2 24-34 cm	216.3	1.890	4.803	0.055	0.3128	0.0033	0.78492	1783.9	9.8	1754	16	1813	16	1813.0	16.0	3.3
U1456D-29R-2 24-34 cm	491	6.230	0.169	0.003	0.0248	0.0003	0.52102	158.5	2.7	157.7	1.6	164	38	157.7	1.6	0.5
U1456D-29R-2 24-34 cm	30.88	0.518	0.201	0.009	0.0270	0.0005	-0.00458	186.9	8	172	2.9	320	99	172.0	2.9	8.0
U1456D-29R-2 24-34 cm	599	3.080	1.376	0.021	0.1433	0.0019	0.45485	878.2	8.7	863	11	909	30	909.0	30.0	5.1
U1456D-29R-2 24-34 cm	1100	3.350	0.079	0.002	0.0121	0.0001	0.35166	77.6	1.4	77.34	0.82	84	37	77.3	0.8	0.3
U1456D-29R-2 24-34 cm	670	0.820	0.071	0.001	0.0110	0.0001	0.28968	69.3	1.2	70.2	0.66	68	39	70.2	0.7	1.3

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456D-29R-2 24-34 cm	175.8	0.762	0.066	0.002	0.0102	0.0002	0.12398	65	1.7	65.19	0.96	55	59	65.2	1.0	0.3
U1456D-29R-2 24-34 cm	177.6	0.774	1.518	0.014	0.1563	0.0011	0.57375	939.5	5.7	937.5	6.3	933	17	933.0	17.0	0.5
U1456D-29R-2 24-34 cm	206	1.092	0.054	0.002	0.0080	0.0001	0.24115	53.4	2.1	51.11	0.88	119	75	51.1	0.9	4.3
U1456D-29R-2 24-34 cm	281	0.964	0.047	0.002	0.0076	0.0001	0.11817	47	1.5	48.8	0.52	-28	60	48.8	0.5	3.8
U1456D-29R-2 24-34 cm	275	3.140	0.545	0.008	0.0706	0.0008	0.59857	440.9	5.4	439.9	4.7	458	27	439.9	4.7	0.2
U1456D-29R-2 24-34 cm	188	4.374	5.374	0.089	0.3448	0.0058	0.64956	1879	14	1908	28	1858	24	1858.0	24.0	2.7
U1456D-29R-2 24-34 cm	161	1.284	0.602	0.044	0.0751	0.0036	0.74257	477	28	467	22	501	93	467.0	22.0	2.1
U1456D-29R-2 24-34 cm	298.7	1.841	4.440	0.110	0.2774	0.0088	0.68287	1719	21	1581	43	1910	37	1910.0	37.0	17.2
U1456D-29R-2 24-34 cm	471	21.500	0.298	0.014	0.0406	0.0019	0.50721	264	11	257	12	371	96	257.0	12.0	2.7
U1456D-29R-2 24-34 cm	209	1.110	1.121	0.023	0.1232	0.0025	0.65723	763	11	749	15	837	35	749.0	15.0	1.8
U1456D-29R-2 24-34 cm	1440	3.380	0.106	0.003	0.0162	0.0005	0.56902	101.7	2.9	103.6	3.3	48	55	103.6	3.3	1.9
U1456D-29R-2 24-34 cm	149.5	0.984	1.171	0.018	0.1269	0.0018	0.50636	787.4	8.5	770	10	830	32	770.0	10.0	2.2
U1456D-29R-2 24-34 cm	895	8.420	0.021	0.001	0.0033	0.0001	0.67296	21.49	0.9	21.07	0.76	49	58	21.1	0.8	2.0
U1456D-29R-2 24-34 cm	227	0.490	4.980	0.100	0.3169	0.0072	0.65564	1813	18	1773	35	1885	35	1885.0	35.0	5.9
U1456D-29R-2 24-34 cm	286	1.029	0.118	0.003	0.0176	0.0003	0.14321	112.8	3.1	112.7	1.9	146	57	112.7	1.9	0.1
U1456D-29R-2 24-34 cm	208.3	1.206	0.999	0.027	0.1084	0.0033	0.58700	702	14	663	19	863	50	663.0	19.0	5.6
U1456E-19R-3 10-20 cm	63.3	1.219	0.122	0.006	0.0175	0.0003	0.13588	116.6	5.8	111.9	2	220	110	111.9	2.0	4.0
U1456E-19R-3 10-20 cm	310	1.048	2.088	0.016	0.1917	0.0012	0.63031	1144.9	5.2	1130.5	6.5	1170	12	1170.0	12.0	3.4
U1456E-19R-3 10-20 cm	96.8	1.166	1.196	0.018	0.1289	0.0013	0.54167	799.3	8	782.7	7.4	843	28	782.7	7.4	2.1
U1456E-19R-3 10-20 cm	339	11.700	0.963	0.015	0.1070	0.0012	0.67390	683.9	7.5	654.9	6.9	782	24	654.9	6.9	4.2
U1456E-19R-3 10-20 cm	87.2	1.090	1.241	0.018	0.1289	0.0016	0.48233	818.6	8.3	781.4	9	915	28	781.4	9.0	4.5
U1456E-19R-3 10-20 cm	111.7	0.912	1.411	0.017	0.1450	0.0012	0.36764	893.7	7.4	872.9	6.6	936	25	936.0	25.0	6.7
U1456E-19R-3 10-20 cm	114.2	0.658	1.113	0.026	0.1206	0.0016	0.52913	760	12	733.7	9.3	814	43	733.7	9.3	3.5
U1456E-19R-3 10-20 cm	432	0.547	0.044	0.001	0.0070	0.0001	0.16618	44.1	1.2	44.84	0.49	45	56	44.8	0.5	1.7
U1456E-19R-3 10-20 cm	182.2	0.379	0.190	0.005	0.0269	0.0003	0.22440	176.5	4.4	170.9	1.8	241	60	170.9	1.8	3.2
U1456E-19R-3 10-20 cm	141.4	0.318	0.208	0.004	0.0301	0.0003	0.01029	191.6	3.4	190.8	1.7	176	46	190.8	1.7	0.4
U1456E-19R-3 10-20 cm	2330	2.820	0.035	0.001	0.0052	0.0001	0.37704	35.35	0.61	33.69	0.35	114	36	33.7	0.4	4.7
U1456E-19R-3 10-20 cm	340	0.812	1.455	0.018	0.1470	0.0018	0.76566	911	7.6	884	10	987	18	987.0	18.0	10.4
U1456E-19R-3 10-20 cm	153.7	0.234	0.045	0.004	0.0056	0.0002	0.22401	44.7	3.8	36	1.1	460	180	DISC	DISC	19.5
U1456E-19R-3 10-20 cm	1060	34.500	0.105	0.002	0.0029	0.0007	0.16675	101.3	2	18.4	4.4	54	45	DISC	DISC	81.8
U1456E-19R-3 10-20 cm	716	0.828	0.105	0.002	0.0158	0.0001	0.36435	101.6	1.5	100.96	0.9	99	33	101.0	0.9	0.6
U1456E-19R-3 10-20 cm	205	1.822	0.099	0.003	0.0147	0.0002	-0.04248	95.6	2.4	93.8	1	133	61	93.8	1.0	1.9
U1456E-19R-3 10-20 cm	892	1.401	4.353	0.058	0.2353	0.0031	0.74472	1702	11	1364	16	2129	18	DISC	DISC	35.9
U1456E-19R-3 10-20 cm	63.6	0.891	0.135	0.007	0.0186	0.0004	0.08826	128.3	5.7	118.6	2.2	299	98	118.6	2.2	7.6
U1456E-19R-3 10-20 cm	556.1	0.952	1.532	0.013	0.1489	0.0009	0.64485	943.4	5	894.9	4.9	1051	13	1051.0	13.0	14.9

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238		RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error	2σ error			Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456E-19R-3 10-20 cm	893	#####	0.102	0.004	0.0155	0.0004	0.47274	98.6	3.3	98.9	2.3	128	77	98.9	2.3	0.3
U1456E-19R-3 10-20 cm	172.3	4.477	4.550	0.100	0.2175	0.0049	0.80941	1740	19	1269	26	2339	29	DISC	DISC	45.7
U1456E-19R-3 10-20 cm	176.9	0.902	0.102	0.003	0.0146	0.0002	0.17454	98.7	2.6	93.3	1.1	207	64	93.3	1.1	5.5
U1456E-19R-3 10-20 cm	37.7	1.483	13.470	0.170	0.4988	0.0049	0.70057	2711	12	2610	21	2778	14	2778.0	14.0	6.0
U1456E-19R-3 10-20 cm	2190	1.100	0.068	0.002	0.0099	0.0001	0.35662	66.9	1.8	63.73	0.91	160	53	63.7	0.9	4.7
U1456E-19R-3 10-20 cm	8.45	0.420	3.707	0.098	0.2156	0.0045	0.39326	1576	21	1257	24	2041	48	DISC	DISC	38.4
U1456E-19R-3 10-20 cm	233.8	0.809	0.057	0.002	0.0079	0.0001	0.21565	56.4	2.1	50.81	0.9	332	81	50.8	0.9	9.9
U1456E-19R-3 10-20 cm	281.7	0.890	1.119	0.009	0.1226	0.0007	0.33320	762	4.3	745.7	3.8	818	18	745.7	3.8	2.1
U1456E-19R-3 10-20 cm	44.5	0.585	1.267	0.024	0.1357	0.0014	0.31520	832	11	820.4	7.9	853	37	820.4	7.9	1.4
U1456E-19R-3 10-20 cm	365	0.599	0.093	0.005	0.0137	0.0002	0.25412	90.2	4.4	87.7	1.3	150	100	87.7	1.3	2.8
U1456E-19R-3 10-20 cm	833	22.800	0.129	0.008	0.0189	0.0008	0.60832	123.2	7.5	120.6	4.9	132	98	120.6	4.9	2.1
U1456E-19R-3 10-20 cm	50.79	0.234	0.863	0.032	0.0977	0.0017	0.12358	631	17	600.7	9.8	750	70	600.7	9.8	4.8
U1456E-19R-3 10-20 cm	182.3	0.956	0.287	0.005	0.0386	0.0004	0.21556	255.9	4	244.2	2.3	395	39	244.2	2.3	4.6
U1456E-19R-3 10-20 cm	78.8	0.897	5.270	0.120	0.2893	0.0062	0.87212	1863	20	1636	31	2159	19	2159.0	19.0	24.2
U1456E-19R-3 10-20 cm	268.1	0.755	1.060	0.011	0.1181	0.0007	0.49142	734	5.1	719.5	4.2	794	18	719.5	4.2	2.0
U1456E-19R-3 10-20 cm	504	5.930	1.268	0.011	0.1384	0.0012	0.78116	831.2	5.1	835.7	7.1	841	14	835.7	7.1	0.5
U1456E-19R-3 10-20 cm	867	20.300	0.716	0.019	0.0923	0.0030	0.51929	548	11	569	18	501	65	569.0	18.0	3.8
U1456E-19R-3 10-20 cm	227	2.075	5.220	0.110	0.3054	0.0055	0.89005	1857	17	1720	27	2030	16	2030.0	16.0	15.3
U1456E-19R-3 10-20 cm	199.2	0.277	0.623	0.009	0.0769	0.0007	0.35782	491.5	5.4	477.6	3.9	580	30	477.6	3.9	2.8
U1456E-19R-3 10-20 cm	610	26.100	0.127	0.002	0.0179	0.0003	0.60231	121.4	1.9	114.4	1.7	261	34	114.4	1.7	5.8
U1456E-19R-3 10-20 cm	2172	3.240	1.053	0.015	0.1112	0.0015	0.67913	731.8	7.7	679.5	8.8	897	19	679.5	8.8	7.1
U1456E-19R-3 10-20 cm	370.6	33.300	0.069	0.006	0.0102	0.0003	0.32209	67.7	6.1	65.5	2.1	170	190	65.5	2.1	3.2
U1456E-19R-3 10-20 cm	363	1.960	0.658	0.010	0.0811	0.0012	0.72867	513.2	5.9	502.9	7	584	23	502.9	7.0	2.0
U1456E-19R-3 10-20 cm	145.4	0.873	0.101	0.003	0.0156	0.0002	0.06496	98	2.9	99.6	1.1	92	65	99.6	1.1	1.6
U1456E-19R-3 10-20 cm	787	0.606	0.041	0.001	0.0066	0.0001	0.03571	40.8	0.95	42.32	0.43	4	47	42.3	0.4	3.7
U1456E-19R-3 10-20 cm	546	0.876	0.060	0.002	0.0085	0.0001	0.38805	59	1.8	54.55	0.87	247	62	54.6	0.9	7.5
U1456E-19R-3 10-20 cm	1090	1.231	0.253	0.003	0.0365	0.0004	0.55952	228.9	2.6	230.8	2.3	241	25	230.8	2.3	0.8
U1456E-19R-3 10-20 cm	1123	9.240	0.699	0.006	0.0864	0.0007	0.70867	537.6	3.8	533.9	4.3	570	16	533.9	4.3	0.7
U1456E-19R-3 10-20 cm	588	1.980	0.551	0.007	0.0695	0.0009	0.66638	445.3	4.8	432.9	5.4	549	23	432.9	5.4	2.8
U1456E-19R-3 10-20 cm	138.5	0.915	0.086	0.003	0.0128	0.0002	0.17873	83.9	3.2	82.1	1.2	158	76	82.1	1.2	2.1
U1456E-19R-3 10-20 cm	138	1.723	0.088	0.003	0.0133	0.0002	0.07037	85.6	2.6	85.1	1	154	69	85.1	1.0	0.6
U1456E-19R-3 10-20 cm	638	4.260	1.353	0.020	0.1376	0.0022	0.65491	869.1	8.8	831	13	978	28	831.0	13.0	4.4
U1456E-19R-3 10-20 cm	190	2.111	0.028	0.003	0.0043	0.0001	0.18906	27.6	2.9	27.43	0.71	100	200	27.4	0.7	0.6
U1456E-19R-3 10-20 cm	104.3	2.127	12.720	0.160	0.4853	0.0072	0.79572	2659	12	2548	31	2748	14	2748.0	14.0	7.3
U1456E-19R-3 10-20 cm	339	23.200	5.288	0.038	0.3261	0.0024	0.72203	1866.9	6.1	1819	11	1920.6	9.5	1920.6	9.5	5.3

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456E-19R-3 10-20 cm	185.4	1.849	2.887	0.038	0.2292	0.0029	0.80093	1378	10	1330	15	1447	17	1447.0	17.0	8.1
U1456E-19R-3 10-20 cm	730	1.330	1.610	0.021	0.1624	0.0020	0.64930	974	8	971	11	989	18	989.0	18.0	1.8
U1456E-19R-3 10-20 cm	1031	47.400	0.048	0.001	0.0070	0.0001	0.26357	47.1	1	44.72	0.6	175	51	44.7	0.6	5.1
U1456E-19R-3 10-20 cm	188	1.193	0.791	0.009	0.0948	0.0008	0.48693	591.3	5.1	583.6	4.8	614	23	583.6	4.8	1.3
U1456E-19R-3 10-20 cm	365	0.655	0.165	0.003	0.0238	0.0002	0.26209	155	2.6	151.9	1.4	199	37	151.9	1.4	2.0
U1456E-19R-3 10-20 cm	627	17.330	0.120	0.002	0.0178	0.0003	0.45917	114.6	2.1	113.6	1.7	125	40	113.6	1.7	0.9
U1456E-19R-3 10-20 cm	196.9	5.380	1.345	0.020	0.1444	0.0023	0.78832	866	8.7	870	13	850	20	850.0	20.0	0.5
U1456E-19R-3 10-20 cm	84.6	0.918	0.121	0.005	0.0159	0.0003	0.30122	116	4.2	101.7	1.7	379	79	101.7	1.7	12.3
U1456E-19R-3 10-20 cm	186.6	1.031	1.174	0.010	0.1263	0.0009	0.42574	788.4	4.8	767.1	4.9	832	17	767.1	4.9	2.7
U1456E-19R-3 10-20 cm	328	1.201	1.342	0.015	0.1379	0.0013	0.51885	864.3	6.4	833.6	7.4	939	20	833.6	7.4	3.6
U1456E-19R-3 10-20 cm	42.4	0.506	0.136	0.007	0.0179	0.0004	0.17779	128.8	6.6	114.2	2.3	370	110	114.2	2.3	11.3
U1456E-19R-3 10-20 cm	100.7	1.062	1.620	0.022	0.1604	0.0013	0.42260	977.1	8.5	958.9	7	992	26	992.0	26.0	3.3
U1456E-19R-3 10-20 cm	1246	0.634	0.045	0.001	0.0065	0.0001	0.21911	44.3	0.84	42.03	0.35	149	41	42.0	0.4	5.1
U1456E-19R-3 10-20 cm	174	0.592	0.601	0.013	0.0739	0.0011	0.57647	480.5	8.1	459.4	6.7	554	39	459.4	6.7	4.4
U1456E-19R-3 10-20 cm	247	1.158	8.491	0.085	0.3835	0.0033	0.73490	2283.8	9	2092	16	2442	11	2442.0	11.0	14.3
U1456E-19R-3 10-20 cm	35.52	0.487	1.034	0.022	0.1080	0.0015	0.06503	723	11	661.2	8.5	897	51	661.2	8.5	8.5
U1456E-19R-3 10-20 cm	365	0.649	0.043	0.001	0.0067	0.0001	0.06312	42.9	1.1	43.03	0.43	43	52	43.0	0.4	0.3
U1456E-19R-3 10-20 cm	456	2.152	11.130	0.100	0.4417	0.0037	0.56433	2534.6	8.3	2357	17	2661	12	2661.0	12.0	11.4
U1456E-19R-3 10-20 cm	200	0.936	0.184	0.004	0.0276	0.0003	0.12823	171.2	3.4	175.2	1.9	134	48	175.2	1.9	2.3
U1456E-19R-3 10-20 cm	40.41	1.232	0.101	0.009	0.0106	0.0004	0.06829	97.4	8.4	67.6	2.5	890	200	DISC	DISC	30.6
U1456E-19R-3 10-20 cm	843.1	8.770	3.249	0.040	0.2260	0.0027	0.75646	1469	9.6	1313	14	1675	14	1675.0	14.0	21.6
U1456E-19R-3 10-20 cm	100.4	0.687	0.834	0.016	0.0964	0.0011	0.45071	616.3	8.7	593.3	6.4	682	37	593.3	6.4	3.7
U1456E-19R-3 10-20 cm	350	0.827	0.054	0.003	0.0067	0.0001	0.52826	53.3	3.1	43.13	0.84	520	120	DISC	DISC	19.1
U1456E-19R-3 10-20 cm	211.1	0.514	0.083	0.003	0.0125	0.0002	0.21046	80.6	2.3	80.2	0.93	121	61	80.2	0.9	0.5
U1456E-19R-3 10-20 cm	332	1.061	0.046	0.002	0.0071	0.0001	0.12455	45.7	1.6	45.58	0.6	58	70	45.6	0.6	0.3
U1456E-19R-3 10-20 cm	175.4	0.932	0.815	0.012	0.0954	0.0010	0.29860	605.4	6.7	587.7	5.8	671	35	587.7	5.8	2.9
U1456E-19R-3 10-20 cm	170.2	0.741	1.219	0.022	0.1244	0.0026	0.53554	809	10	755	15	961	41	755.0	15.0	6.7
U1456E-19R-3 10-20 cm	162.6	0.976	0.065	0.003	0.0094	0.0002	0.33697	63.5	2.4	60.4	1	147	75	60.4	1.0	4.9
U1456E-19R-3 10-20 cm	815	0.678	0.051	0.001	0.0007	0.0001	0.32244	50.7	1.1	4.6	0.75	83	42	DISC	DISC	90.9
U1456E-19R-3 10-20 cm	295.8	0.859	0.600	0.012	0.0731	0.0012	0.52995	476.8	7.6	454.8	7.5	582	44	454.8	7.5	4.6
U1456E-19R-3 10-20 cm	328	1.504	9.930	0.110	0.4360	0.0051	0.84134	2427	10	2331	23	2511	10	2511.0	10.0	7.2
U1456E-19R-3 10-20 cm	928	0.438	0.122	0.002	0.0183	0.0001	0.25282	117.1	1.4	117.04	0.79	111	26	117.0	0.8	0.1
U1456E-19R-3 10-20 cm	820	1.682	0.104	0.002	0.0151	0.0001	0.31834	100.2	1.4	96.69	0.91	174	34	96.7	0.9	3.5
U1456E-19R-3 10-20 cm	107.5	0.497	1.401	0.018	0.1409	0.0014	0.42975	889.2	7.7	849.4	7.7	989	26	849.4	7.7	4.5
U1456E-19R-3 10-20 cm	694	0.843	0.119	0.005	0.0105	0.0002	-0.03856	113.8	4.1	67	1.1	1254	83	DISC	DISC	41.1

(table cont'd)

Sample Name	[U] ppm	U/Th	207/23		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456E-19R-3 10-20 cm	893	1.668	0.031	0.001	0.0047	0.0000	0.17449	30.99	0.77	30.09	0.3	42	51	30.1	0.3	2.9
U1456E-19R-3 10-20 cm	993	1.097	0.106	0.002	0.0155	0.0002	0.50961	102	1.6	98.9	1.1	160	32	98.9	1.1	3.0
U1456E-19R-3 10-20 cm	476	0.557	0.043	0.001	0.0067	0.0001	0.11801	42.9	1.1	43.03	0.51	32	54	43.0	0.5	0.3
U1456E-19R-3 10-20 cm	614	0.917	1.773	0.016	0.1686	0.0011	0.43844	1035.7	5.8	1004.5	6.2	1088	16	1088.0	16.0	7.7
U1456E-19R-3 10-20 cm	483	3.150	12.250	0.210	0.4938	0.0077	0.87084	2624	16	2585	33	2640	12	2640.0	12.0	2.1
U1456E-19R-3 10-20 cm	877	1.304	0.639	0.009	0.0794	0.0007	0.40145	501.4	5.4	492.2	4.4	546	28	492.2	4.4	1.8
U1456E-19R-3 10-20 cm	347	2.440	1.317	0.016	0.1316	0.0013	0.57020	853.4	7	796.9	7.3	985	20	796.9	7.3	6.6
U1456E-19R-3 10-20 cm	468	0.839	1.089	0.022	0.1134	0.0016	-0.12403	747	10	692.3	9.1	885	40	692.3	9.1	7.3
U1456E-19R-3 10-20 cm	95.5	0.894	1.724	0.041	0.1579	0.0032	0.84145	1017	16	945	18	1172	29	1172.0	29.0	19.4
U1456E-19R-3 10-20 cm	394	0.994	0.056	0.002	0.0084	0.0001	0.15849	55.5	1.8	53.98	0.64	122	67	54.0	0.6	2.7
U1456E-19R-3 10-20 cm	438	0.626	0.051	0.002	0.0073	0.0001	0.04648	50.5	1.7	47.08	0.71	174	77	47.1	0.7	6.8
U1456E-19R-3 10-20 cm	68.7	0.917	0.127	0.004	0.0180	0.0003	0.05297	121.5	3.9	114.9	1.6	251	78	114.9	1.6	5.4
U1456E-19R-3 10-20 cm	1847	2.872	0.019	0.001	0.0028	0.0001	0.66699	18.74	0.53	18.11	0.37	89	45	18.1	0.4	3.4
U1456E-19R-3 10-20 cm	1040	5.500	0.819	0.019	0.0940	0.0016	0.70201	607	11	578.9	9.5	693	40	578.9	9.5	4.6
U1456E-19R-3 10-20 cm	49.3	0.633	7.710	0.230	0.3339	0.0087	0.63375	2209	27	1857	42	2525	40	2525.0	40.0	26.5
U1456E-19R-3 10-20 cm	129	0.944	1.167	0.013	0.1275	0.0011	0.30148	785.1	6	773.6	6.1	781	24	773.6	6.1	1.5
U1456E-19R-3 10-20 cm	130.3	0.613	0.070	0.003	0.0103	0.0001	0.18145	68.3	2.4	65.92	0.77	157	73	65.9	0.8	3.5
U1456E-19R-3 10-20 cm	198	0.375	0.045	0.002	0.0060	0.0001	0.00444	44.5	2.1	38.52	0.65	330	99	38.5	0.7	13.4
U1456E-19R-3 10-20 cm	186	0.606	0.067	0.005	0.0078	0.0002	-0.03680	65.7	4.8	49.9	1.3	640	170	DISC	DISC	24.0
U1456E-19R-3 10-20 cm	102.3	1.143	1.176	0.020	0.1269	0.0014	0.32745	788.5	9.5	770.8	8.2	826	37	770.8	8.2	2.2
U1456E-19R-3 10-20 cm	151.4	0.488	1.305	0.023	0.1344	0.0015	0.56483	849.6	9.5	812.7	8.8	929	26	812.7	8.8	4.3
U1456E-19R-3 10-20 cm	385.1	1.134	1.256	0.016	0.1307	0.0011	0.75605	825.8	7.1	791.8	6.4	911	16	791.8	6.4	4.1
U1456E-19R-3 10-20 cm	261	4.290	4.593	0.042	0.2961	0.0035	0.58025	1747.8	7.7	1671	17	1829	18	1829.0	18.0	8.6
U1456E-19R-3 10-20 cm	1070	1.650	0.066	0.003	0.0099	0.0002	0.40049	64.5	2.5	63.3	1.4	120	73	63.3	1.4	1.9
U1456E-19R-3 10-20 cm	200.2	0.729	0.290	0.005	0.0411	0.0004	0.34929	258.4	3.9	259.3	2.4	255	37	259.3	2.4	0.3
U1456E-19R-3 10-20 cm	294	0.738	1.206	0.014	0.1292	0.0010	0.59126	802.6	6.4	783.2	5.9	841	20	783.2	5.9	2.4
U1456E-19R-3 10-20 cm	539.6	0.519	0.059	0.001	0.0092	0.0001	0.12667	58.3	1.2	58.98	0.62	33	45	59.0	0.6	1.2
U1456E-19R-3 10-20 cm	1362	7.370	0.144	0.006	0.0207	0.0006	0.79143	136.4	5	132.2	3.7	171	64	132.2	3.7	3.1
U1456E-19R-3 10-20 cm	3840	6.470	0.097	0.002	0.0142	0.0002	0.68660	93.7	1.4	91	1.1	157	25	91.0	1.1	2.9
U1456E-19R-3 10-20 cm	248	1.527	4.739	0.038	0.2968	0.0024	0.61685	1775.1	6.7	1676	12	1899	12	1899.0	12.0	11.7
U1456E-19R-3 10-20 cm	810	5.780	1.320	0.011	0.1350	0.0010	0.74388	854	5	816.3	5.6	963	11	816.3	5.6	4.4
U1456E-19R-3 10-20 cm	178	1.070	0.059	0.004	0.0082	0.0001	0.12826	58.3	3.4	52.3	0.9	260	110	52.3	0.9	10.3
U1456E-19R-3 10-20 cm	1358	1.390	0.034	0.001	0.0053	0.0001	0.23886	34.07	0.73	33.87	0.39	61	44	33.9	0.4	0.6
U1456E-19R-3 10-20 cm	156.9	1.143	5.503	0.054	0.3226	0.0028	0.73429	1900	8.4	1802	14	2014	12	2014.0	12.0	10.5
U1456E-19R-3 10-20 cm	310	2.180	1.200	0.014	0.1311	0.0012	0.71501	799.6	6.7	794.3	6.6	833	18	794.3	6.6	0.7

(table cont'd)

Sample Name	[U] ppm	U/Th	207/235		206/238	2σ error	RHO	207/235		206/238		207/206		Best age (Ma)	2σ error	% Discordance*
			5	error				Age (Ma)	2σ error	Age (Ma)	2σ error	Age (Ma)	2σ error			
U1456E-19R-3 10-20 cm	873	5.500	0.672	0.019	0.0857	0.0023	0.85236	521	11	530	14	524	35	530.0	14.0	1.7
U1456E-19R-3 10-20 cm	68.2	0.496	0.313	0.009	0.0432	0.0005	0.21684	275.4	6.8	272.6	3.1	309	62	272.6	3.1	1.0
U1456E-19R-3 10-20 cm	1475	6.960	0.213	0.002	0.0308	0.0002	0.57167	195.8	1.6	195.8	1.3	216	18	195.8	1.3	0.0
U1456E-19R-3 10-20 cm	491	0.887	0.051	0.001	0.0074	0.0001	0.10746	50.7	1.3	47.41	0.53	231	58	47.4	0.5	6.5
U1456E-19R-3 10-20 cm	276	2.450	1.520	0.018	0.1387	0.0013	0.42606	938.7	7	838.4	7.8	1192	20	838.4	7.8	10.7

APPENDIX C. SINGLE GRAIN APATITE FISSION TRACK AGES OF IODP SITES U1456 AND U1457

Sample No.	134-1	Central age	61.2 ±	14.915 Ma
Irrad. No.	GAR 77	age dispersion	110.6 %	
Position	0			
Date	27/02/17	Pooled age	40.4 ±	2.997 Ma
Analyst	AC			
		Mean age	85.3 ±	19.760 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	347.48 with	23.000 df
No. of grains	24	P(chi-sq)	0.00 %	
Total Ns	218.000001 tr			Depositional age
Total Ni	1440 tr			0.93
Total Nd	4388 tr			
rho-d (CN5)	1.583E+06 tr/cm^2			
mean rho-s	7.981E+05 tr/cm^2			
mean rho-i	3.858E+06 tr/cm^2			
mean U	30.5 ppm			

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
5	9	0	8.017E-02	25	2.004E+06	0.0000	15.826	0.00	0.01
14	6	1	1.203E+05	47	5.652E+06	0.0213	44.629	5.69	5.75
22	12	1	6.013E+04	130	2.285E+06	0.0263	18.041	7.04	7.13
11	21	7	2.405E+05	252	8.658E+06	0.0278	68.367	7.43	2.85
19	24	2	6.013E+04	130	1.984E+06	0.0303	15.667	8.10	5.82
3	24	8	2.405E+05	136	4.089E+06	0.0588	32.284	15.72	5.72
9	8	4	3.608E+05	62	5.592E+06	0.0645	44.154	17.24	8.90
18	6	1	1.203E+05	15	1.804E+06	0.0667	14.243	17.81	18.40
2	40	16	2.886E+05	213	3.842E+06	0.0751	30.338	20.06	5.21
20	6	7	8.418E+05	90	1.082E+07	0.0778	85.459	20.77	8.16
10	15	10	4.810E+05	128	5.820E+06	0.0826	45.958	22.07	7.27
24	6	5	6.013E+05	41	4.930E+06	0.1220	38.931	32.54	15.42
23	6	11	1.323E+06	89	1.070E+07	0.1236	84.509	32.98	10.55
17	6	13	1.563E+06	79	9.500E+06	0.1646	75.014	43.87	13.15

(table cont'd)

21	18	4	1.603E+05	15	6.013E+05	0.2667	4.748	70.95	39.94
4	14	1	5.154E+04	127	1.546E+05	0.3333	1.221	88.56	102.27
8	12	2	1.203E+05	5	3.006E+05	0.4000	2.374	106.13	88.81
15	10	2	1.443E+05	4	2.886E+05	0.5000	2.279	132.39	114.67
1	18	4	1.603E+05	126	2.405E+05	0.6667	1.899	175.93	113.59
7	6	26	3.127E+06	128	4.570E+06	0.6842	36.083	180.49	46.02
12	10	26	1.876E+06	37	2.670E+06	0.7027	21.080	185.30	47.50
13	9	9	7.215E+05	129	8.017E+05	0.9000	6.330	236.39	108.67
16	8	16	1.443E+06	129	1.443E+06	1.0000	11.395	262.12	92.76
6	6	42	5.051E+06	32	3.848E+06	1.3125	30.385	341.90	80.39

(table cont'd)

58	50	1	1.443E+04	136	2.107E+06	0.0068	16.636	1.83	1.84
24	18	1	4.008E+04	140	5.612E+06	0.0071	44.312	1.91	1.92
54	40	1	1.804E+04	140	2.525E+06	0.0071	19.940	1.91	1.92
17	60	2	2.405E+04	267	3.211E+06	0.0075	25.353	2.00	1.42
4	60	1	1.203E+04	127	1.467E+06	0.0082	11.584	2.19	2.20
14	50	2	2.886E+04	238	3.434E+06	0.0084	27.119	2.25	1.60
34	30	1	2.405E+04	132	2.694E+06	0.0089	21.270	2.39	2.40
43	16	4	1.804E+05	134	1.939E+07	0.0093	153.114	2.49	1.25
55	49	2	2.945E+04	136	3.092E+06	0.0095	24.417	2.55	1.81
15	50	4	5.772E+04	399	5.758E+06	0.0100	45.464	2.68	1.35
57	60	6	7.215E+04	573	6.890E+06	0.0105	54.409	2.80	1.15
1	40	2	3.608E+04	126	2.940E+06	0.0123	23.216	3.28	2.34
27	100	5	3.608E+04	394	2.843E+06	0.0127	22.447	3.39	1.53
59	50	8	1.154E+05	630	9.091E+06	0.0127	71.785	3.40	1.21
33	50	2	2.886E+04	134	1.934E+06	0.0149	15.269	3.99	2.84
23	40	1	1.804E+04	66	1.190E+06	0.0152	9.400	4.05	4.08
56	50	1	1.443E+04	60	8.658E+05	0.0167	6.837	4.46	4.49
6	36	1	2.004E+04	59	1.182E+06	0.0169	9.337	4.53	4.57
13	35	1	2.061E+04	129	1.175E+06	0.0175	9.278	4.69	4.73
8	40	1	1.804E+04	43	7.756E+05	0.0233	6.125	6.22	6.29
9	36	3	6.013E+04	126	2.525E+06	0.0238	19.940	6.37	3.72
50	30	1	2.405E+04	38	9.139E+05	0.0263	7.217	7.04	7.13
51	40	1	1.804E+04	38	6.854E+05	0.0263	5.412	7.04	7.13
41	40	9	1.623E+05	340	6.133E+06	0.0265	48.427	7.08	2.39
61	60	13	1.563E+05	137	5.844E+06	0.0267	46.148	7.15	2.01
32	70	6	6.184E+04	224	2.309E+06	0.0268	18.231	7.16	2.96
20	25	1	2.886E+04	30	8.658E+05	0.0333	6.837	8.91	9.06
40	49	8	1.178E+05	133	3.504E+06	0.0336	27.672	8.99	3.23
48	24	3	9.019E+04	88	2.646E+06	0.0341	20.890	9.11	5.35
16	21	6	2.061E+05	129	5.738E+06	0.0359	45.307	9.60	3.99
52	40	4	7.215E+04	135	2.002E+06	0.0360	15.810	9.63	4.90
19	80	6	5.411E+04	130	1.443E+06	0.0375	11.395	10.02	4.17
46	25	1	2.886E+04	134	7.215E+05	0.0400	5.697	10.69	10.91

(table cont'd)

2	40	2	3.608E+04	49	8.838E+05	0.0408	6.979	10.91	7.87
26	35	9	1.855E+05	200	4.123E+06	0.0450	32.556	12.03	4.10
44	30	7	1.684E+05	153	3.680E+06	0.0458	29.056	12.23	4.73
22	20	2	7.215E+04	130	1.443E+06	0.0500	11.395	13.36	9.68
11	10	5	3.608E+05	98	7.071E+06	0.0510	55.833	13.63	6.25
3	40	35	6.313E+05	636	1.147E+07	0.0550	90.586	14.71	2.56
30	80	49	4.419E+05	884	7.973E+06	0.0554	62.955	14.81	2.19
28	50	3	4.329E+04	131	7.648E+05	0.0566	6.039	15.13	8.98
12	60	14	1.684E+05	206	2.477E+06	0.0680	19.561	18.16	5.02
37	15	14	6.734E+05	133	9.812E+06	0.0686	77.483	18.33	5.07
21	40	10	1.804E+05	134	2.417E+06	0.0746	19.086	19.93	6.54
45	24	10	3.006E+05	134	4.028E+06	0.0746	31.810	19.93	6.54
31	15	14	6.734E+05	132	7.648E+06	0.0881	60.391	23.51	6.56
53	32	6	1.353E+05	68	1.533E+06	0.0882	12.107	23.56	10.04
38	15	3	1.443E+05	21	1.010E+06	0.1429	7.976	38.11	23.53
42	12	7	4.209E+05	46	2.766E+06	0.1522	21.839	40.58	16.48

(table cont'd)

Sample No.	134-3	Central age	6.8 ±	0.854 Ma
Irrad. No.	GAR 77	age dispersion	69.8 %	
Position	0			
Date	01/03/17	Pooled age	6.5 ±	0.396 Ma
Analyst	AC			
		Mean age	7.2 ±	0.891 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	176.49 with	43.000 df
No. of grains	44	P(chi-sq)	0.00 %	
Total Ns	298.00001 tr			
Total Ni	12192 tr			
Total Nd	4388 tr	MTL	±	μm
rho-d (CN5)	1.583E+06 tr/cm^2	SD	μm	
mean rho-s	1.910E+05 tr/cm^2	N	0	
mean rho-i	6.856E+06 tr/cm^2			Depositional age
mean U	54.1 ppm			1.56 Ma

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
9	36	0	2.004E-01	244	4.890E+06	0.0000	38.615	0.00	0.00
15	40	1	1.804E+04	392	7.071E+06	0.0026	55.833	0.68	0.68
5	80	2	1.804E+04	380	3.427E+06	0.0053	27.062	1.41	1.00
24	20	1	3.608E+04	180	6.494E+06	0.0056	51.275	1.49	1.49
44	30	1	2.405E+04	178	4.281E+06	0.0056	33.804	1.50	1.51
21	16	1	4.509E+04	173	7.801E+06	0.0058	61.602	1.55	1.55
7	40	2	3.608E+04	128	5.826E+06	0.0062	46.005	1.66	1.18
16	40	2	3.608E+04	129	4.654E+06	0.0078	36.747	2.07	1.47
8	30	2	4.810E+04	206	4.954E+06	0.0097	39.121	2.60	1.85
39	60	2	2.405E+04	206	2.477E+06	0.0097	19.561	2.60	1.85
11	80	4	3.608E+04	408	3.680E+06	0.0098	29.056	2.62	1.32
28	30	2	4.810E+04	131	4.834E+06	0.0100	38.172	2.66	1.89

(table cont'd)

17	60	4	4.810E+04	400	4.810E+06	0.0100	37.982	2.67	1.34
2	30	2	4.810E+04	178	4.281E+06	0.0112	33.804	3.01	2.14
37	40	3	5.411E+04	133	4.509E+06	0.0120	35.608	3.21	1.86
3	60	8	9.620E+04	561	6.746E+06	0.0143	53.269	3.81	1.36
23	30	7	1.684E+05	468	1.126E+07	0.0150	88.877	4.00	1.52
10	40	5	9.019E+04	128	5.628E+06	0.0160	44.439	4.29	1.93
43	40	4	7.215E+04	134	4.221E+06	0.0171	33.329	4.57	2.31
22	40	5	9.019E+04	130	5.159E+06	0.0175	40.735	4.68	2.11
13	20	3	1.082E+05	129	5.772E+06	0.0188	45.578	5.01	2.92
38	30	1	2.405E+04	53	1.275E+06	0.0189	10.065	5.05	5.09
30	30	14	3.367E+05	699	1.681E+07	0.0200	132.746	5.36	1.45
19	30	24	5.772E+05	130	2.222E+07	0.0260	175.476	6.95	1.44
34	20	2	7.215E+04	132	2.706E+06	0.0267	21.365	7.13	5.11
1	15	3	1.443E+05	126	5.291E+06	0.0273	41.780	7.29	4.27
26	24	18	5.411E+05	648	1.948E+07	0.0278	153.826	7.43	1.78
33	40	7	1.263E+05	240	4.329E+06	0.0292	34.184	7.80	2.99
14	50	1	1.443E+04	34	4.906E+05	0.0294	3.874	7.86	7.98
18	24	5	1.503E+05	170	5.111E+06	0.0294	40.356	7.86	3.57
20	30	2	4.810E+04	66	1.587E+06	0.0303	12.534	8.10	5.82
36	20	9	3.247E+05	286	1.032E+07	0.0315	81.471	8.41	2.85
29	10	7	5.051E+05	210	1.515E+07	0.0333	119.642	8.91	3.43
12	10	5	3.608E+05	142	1.025E+07	0.0352	80.901	9.41	4.29
41	30	29	6.975E+05	821	1.975E+07	0.0353	155.915	9.44	1.79
40	60	1	1.203E+04	133	3.006E+05	0.0400	2.374	10.69	10.91
25	16	7	3.157E+05	131	7.756E+06	0.0407	61.246	10.88	4.20
32	20	9	3.247E+05	166	5.988E+06	0.0542	47.287	14.49	4.96
27	20	16	5.772E+05	266	9.596E+06	0.0602	75.774	16.07	4.14
42	30	28	6.734E+05	432	1.039E+07	0.0648	82.041	17.32	3.39
31	20	14	5.051E+05	132	7.648E+06	0.0660	60.391	17.64	4.88
4	18	14	5.612E+05	127	8.297E+06	0.0676	65.518	18.07	5.00
35	24	4	1.203E+05	47	1.413E+06	0.0851	11.157	22.73	11.84
6	50	17	2.453E+05	189	2.727E+06	0.0899	21.536	24.02	6.09

(table cont'd)

Sample No.	134-4	Central age	8.100509847 ±	0.659 Ma
Irrad. No.	GAR 77	age dispersion	35.23352474 %	
Position	0			
Date	42846	Pooled age	8.010037612 ±	0.452 Ma
Analyst	AC			
		Mean age	8.576348927 ±	0.738 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	87.62605486 with	44.000 df
No. of grains	45	P(chi-sq)	0.010139048 %	
Total Ns	349 tr			
Total Ni	11649 tr			
Total Nd	4388 tr			
rho-d (CN5)	1583000 tr/cm^2			Depositional age 1.92 Ma
mean rho-s	178082.157 tr/cm^2			
mean rho-i	5498064.55 tr/cm^2			
mean U	43.4149127 ppm			

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
28	30	1	24050.02405	131	5050505.051	0.0048	39.881	1.27	1.28
4	40	2	36075.03608	127	4870129.87	0.0074	38.456	1.98	1.41
3	60	1	12025.01203	110	1322751.323	0.0091	10.445	2.43	2.44
20	30	3	72150.07215	240	5772005.772	0.0125	45.578	3.34	1.94
16	40	4	72150.07215	129	5519480.519	0.0131	43.584	3.50	1.76
1	28	3	77303.64873	126	5437023.294	0.0142	42.933	3.80	2.21
35	24	1	30062.53006	68	2044252.044	0.0147	16.142	3.93	3.96
32	14	3	154607.2975	160	8245722.531	0.0188	65.112	5.01	2.92
29	30	8	192400.1924	417	10028860.03	0.0192	79.192	5.13	1.83
26	40	21	378787.8788	1080	19480519.48	0.0194	153.826	5.20	1.15
34	40	7	126262.6263	132	6457431.457	0.0196	50.990	5.23	2.00
2	60	8	96200.0962	402	4834054.834	0.0199	38.172	5.32	1.90
13	50	3	43290.04329	129	2106782.107	0.0205	16.636	5.49	3.21

(table cont'd)

36	30	2	48100.0481	94	2260702.261	0.0213	17.851	5.69	4.07
25	60	10	120250.1203	131	5603655.604	0.0215	44.249	5.74	1.84
40	40	7	126262.6263	133	5735930.736	0.0220	45.293	5.89	2.25
27	60	3	36075.03608	134	1611351.611	0.0224	12.724	5.99	3.50
23	40	5	90187.59019	218	3932178.932	0.0229	31.050	6.13	2.78
42	40	7	126262.6263	304	5483405.483	0.0230	43.299	6.16	2.36
17	40	3	54112.55411	124	2236652.237	0.0242	17.661	6.47	3.78
24	60	6	72150.07215	214	2573352.573	0.0280	20.320	7.50	3.11
15	30	10	240500.2405	354	8513708.514	0.0282	67.228	7.55	2.42
22	40	5	90187.59019	130	3120490.62	0.0289	24.641	7.73	3.51
8	36	2	40083.37342	69	1382876.383	0.0290	10.920	7.75	5.56
43	50	11	158730.1587	134	5281385.281	0.0301	41.704	8.04	2.46
38	24	6	180375.1804	194	5832130.832	0.0309	46.053	8.27	3.43
30	21	3	103071.5316	93	3195217.481	0.0323	25.231	8.62	5.06
9	20	17	613275.6133	524	18903318.9	0.0324	149.268	8.67	2.14
31	30	6	144300.1443	132	4256854.257	0.0339	33.614	9.06	3.76
44	50	10	144300.1443	286	4126984.127	0.0350	32.588	9.35	3.01
10	40	9	162337.6623	128	4401154.401	0.0369	34.753	9.86	3.35
39	40	9	162337.6623	244	4401154.401	0.0369	34.753	9.86	3.35
19	30	16	384800.3848	130	9812409.812	0.0392	77.483	10.48	2.68
37	60	9	108225.1082	133	2693602.694	0.0402	21.270	10.74	3.65
6	40	2	36075.03608	49	883838.3838	0.0408	6.979	10.91	7.87
45	60	8	96200.0962	186	2236652.237	0.0430	17.661	11.50	4.15
12	30	4	96200.0962	91	2188552.189	0.0440	17.282	11.75	6.00
11	40	29	523088.0231	654	11796536.8	0.0443	93.150	11.85	2.26
21	28	39	1004947.434	836	21541950.11	0.0467	170.104	12.47	2.05
7	35	4	82457.22531	128	1710987.425	0.0482	13.511	12.88	6.60
5	50	5	72150.07215	92	1327561.328	0.0543	10.483	14.52	6.67
14	40	1	18037.51804	16	288600.2886	0.0625	2.279	16.70	17.21
18	20	10	360750.3608	128	4617604.618	0.0781	36.462	20.87	6.86
33	14	14	721500.7215	170	8761080.19	0.0824	69.181	21.99	6.12
41	18	12	481000.481	138	5531505.532	0.0870	43.679	23.22	7.00

(table cont'd)

Sample No.	134-6	Central age	11.22448839 ±	1.012 Ma
Irrad. No.	GAR 77	age dispersion	42.40188367 %	
Position	0			
Date	42846	Pooled age	10.71949645 ±	0.638 Ma
Analyst	AC			
		Mean age	12.27626795 ±	1.327 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	108.1707175 with	49.000 df
No. of grains	50	P(chi-sq)	0.000237615 %	
Total Ns	314.000011 tr			
Total Ni	7830 tr			
Total Nd	4388 tr			
rho-d (CN5)	1583000 tr/cm^2			Depositional age 5.72 Ma
mean rho-s	272311.559 tr/cm^2			
mean rho-i	6211205.02 tr/cm^2			
mean U	49.0461546 ppm			

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
4	15	0.000001	0.048100048	127	1875901.876	0.0000	14.813	0.00	0.01
2	20	0.00001	0.360750361	76	2741702.742	0.0000	21.650	0.00	0.01
9	15	1	48100.0481	102	4906204.906	0.0098	38.741	2.62	2.64
8	28	1	25767.88291	92	2370645.228	0.0109	18.720	2.91	2.92
27	36	4	80166.74683	282	5651755.652	0.0142	44.629	3.79	1.91
38	15	4	192400.1924	270	12987012.99	0.0148	102.551	3.96	2.00
15	20	4	144300.1443	254	9163059.163	0.0157	72.355	4.21	2.12
19	18	3	120250.1203	130	7335257.335	0.0164	57.922	4.38	2.55
33	10	3	216450.2165	148	10678210.68	0.0203	84.319	5.42	3.16
10	30	2	48100.0481	128	2260702.261	0.0213	17.851	5.69	4.07
13	12	2	120250.1203	129	5170755.171	0.0233	40.830	6.22	4.45
22	40	3	54112.55411	130	2308802.309	0.0234	18.231	6.27	3.66
25	36	3	60125.06013	131	2525252.525	0.0238	19.940	6.37	3.72

(table cont'd)

50	10	3	216450.2165	108	7792207.792	0.0278	61.530	7.43	4.35
7	30	18	432900.4329	128	15440115.44	0.0280	121.921	7.50	1.80
3	15	3	144300.1443	103	4954304.954	0.0291	39.121	7.79	4.56
29	12	3	180375.1804	98	5892255.892	0.0306	46.528	8.18	4.80
45	25	8	230880.2309	260	7503607.504	0.0308	59.251	8.23	2.96
12	30	5	120250.1203	162	3896103.896	0.0309	30.765	8.25	3.75
40	30	13	312650.3127	133	9523809.524	0.0328	75.204	8.78	2.48
20	15	1	48100.0481	30	1443001.443	0.0333	11.395	8.91	9.06
32	30	4	96200.0962	120	2886002.886	0.0333	22.789	8.91	4.53
46	12	2	120250.1203	134	3607503.608	0.0333	28.486	8.91	6.41
5	18	1	40083.37342	29	1162417.829	0.0345	9.179	9.22	9.38
18	24	4	120250.1203	114	3427128.427	0.0351	27.062	9.38	4.77
31	20	25	901875.9019	132	24531024.53	0.0368	193.707	9.83	2.01
16	15	6	288600.2886	129	7263107.263	0.0397	57.352	10.62	4.42
35	12	1	60125.06013	24	1443001.443	0.0417	11.395	11.14	11.37
36	15	1	48100.0481	23	1106301.106	0.0435	8.736	11.62	11.87
42	40	24	432900.4329	540	9740259.74	0.0444	76.913	11.88	2.48
43	14	5	257678.8291	134	5772005.772	0.0446	45.578	11.93	5.46
14	8	6	541125.5411	134	12085137.09	0.0448	95.429	11.97	5.00
21	27	6	160333.4937	120	3206669.873	0.0500	25.321	13.36	5.59
23	16	4	180375.1804	80	3607503.608	0.0500	28.486	13.36	6.85
41	20	13	468975.469	246	8874458.874	0.0528	70.076	14.12	4.02
44	8	5	450937.9509	90	8116883.117	0.0556	64.094	14.85	6.82
6	18	11	440917.1076	195	7816257.816	0.0564	61.720	15.07	4.68
11	12	1	60125.06013	17	1022126.022	0.0588	8.071	15.72	16.18
47	10	6	432900.4329	102	7359307.359	0.0588	58.112	15.72	6.61
39	12	11	661375.6614	182	10942760.94	0.0604	86.408	16.15	5.02
1	12	5	300625.3006	126	4810004.81	0.0625	37.982	16.70	7.70
48	8	11	992063.4921	166	14971139.97	0.0663	118.218	17.70	5.52
17	20	21	757575.7576	312	11255411.26	0.0673	88.877	17.98	4.06
34	28	2	51535.76582	132	695732.8386	0.0741	5.494	19.79	14.50
49	10	7	505050.5051	135	6709956.71	0.0753	52.984	20.11	7.89
24	15	19	913900.9139	240	11544011.54	0.0792	91.156	21.14	5.05

(table cont'd)

26	20	9	324675.3247	84	3030303.03	0.1071	23.928	28.60	10.04
37	20	5	180375.1804	133	1587301.587	0.1136	12.534	30.33	14.32
28	28	5	128839.4146	131	876108.019	0.1471	6.918	39.22	18.80
30	8	10	901875.9019	52	4689754.69	0.1923	37.032	51.24	17.71

(table cont'd)

Sample No.	134-7	Central age	18.6 ±	1.244 Ma
Irrad. No.	GAR 77	age dispersion	44.6 %	
Position	0			
Date	25/04/17	Pooled age	17.2 ±	0.681 Ma
Analyst	AC			
		Mean age	20.9 ±	1.868 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	227.64 with	79.000 df
No. of grains	80	P(chi-sq)	0.00 %	
Total Ns	799 tr			
Total Ni	12387 tr			
Total Nd	4388 tr			
rho-d (CN5)	1.583E+06 tr/cm^2			
mean rho-s	4.247E+05 tr/cm^2			
mean rho-i	6.226E+06 tr/cm^2			
mean U	49.2 ppm			
			Depositional age	7.84 Ma

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
64	20	2	7.215E+04	137	4.942E+06	0.0146	39.026	3.90	2.78
56	30	5	1.203E+05	202	4.858E+06	0.0248	38.362	6.62	3.00
27	28	4	1.031E+05	152	3.917E+06	0.0263	30.928	7.04	3.57
58	16	1	4.509E+04	136	1.623E+06	0.0278	12.819	7.43	7.53
11	24	5	1.503E+05	164	4.930E+06	0.0305	38.931	8.15	3.70
48	15	6	2.886E+05	195	9.380E+06	0.0308	74.064	8.23	3.41
49	40	13	2.345E+05	135	7.431E+06	0.0316	58.682	8.44	2.38
32	20	2	7.215E+04	62	2.237E+06	0.0323	17.661	8.62	6.20
42	28	5	1.288E+05	152	3.917E+06	0.0329	30.928	8.79	4.00
52	16	2	9.019E+04	135	2.706E+06	0.0333	21.365	8.91	6.41
12	20	3	1.082E+05	89	3.211E+06	0.0337	25.353	9.01	5.29
37	14	4	2.061E+05	133	6.081E+06	0.0339	48.020	9.06	4.61
41	32	1	2.255E+04	27	6.088E+05	0.0370	4.807	9.90	10.08

(table cont'd)

39	28	13	3.350E+05	336	8.658E+06	0.0387	68.367	10.34	2.93
21	12	9	5.411E+05	230	1.383E+07	0.0391	109.197	10.46	3.56
17	7	2	2.061E+05	51	5.257E+06	0.0392	41.509	10.48	7.56
60	16	11	4.960E+05	272	1.227E+07	0.0404	96.853	10.81	3.33
8	27	4	1.069E+05	98	2.619E+06	0.0408	20.679	10.91	5.57
16	30	8	1.924E+05	129	4.425E+06	0.0435	34.943	11.62	4.20
33	12	6	3.608E+05	132	7.937E+06	0.0455	62.670	12.15	5.07
31	40	7	1.263E+05	132	2.742E+06	0.0461	21.650	12.31	4.76
10	18	3	1.203E+05	128	2.485E+06	0.0484	19.624	12.93	7.65
26	24	5	1.503E+05	102	3.066E+06	0.0490	24.213	13.10	6.00
22	30	4	9.620E+04	130	1.924E+06	0.0500	15.193	13.36	6.85
25	15	5	2.405E+05	131	4.666E+06	0.0515	36.842	13.78	6.32
59	24	12	3.608E+05	232	6.975E+06	0.0517	55.073	13.82	4.10
30	40	49	8.838E+05	904	1.631E+07	0.0542	128.758	14.48	2.14
36	50	7	1.010E+05	121	1.746E+06	0.0579	13.787	15.46	6.01
28	18	6	2.405E+05	131	4.089E+06	0.0588	32.284	15.72	6.61
57	10	7	5.051E+05	118	8.514E+06	0.0593	67.228	15.85	6.17
55	20	43	1.551E+06	136	2.597E+07	0.0597	205.101	15.96	2.52
43	14	8	4.123E+05	134	6.803E+06	0.0606	53.717	16.19	5.90
62	18	7	2.806E+05	114	4.570E+06	0.0614	36.083	16.41	6.39
9	10	14	1.010E+06	220	1.587E+07	0.0636	125.340	17.00	4.69
53	18	7	2.806E+05	110	4.409E+06	0.0636	34.817	17.00	6.63
44	25	7	2.020E+05	107	3.088E+06	0.0654	24.384	17.48	6.82
47	21	7	2.405E+05	105	3.608E+06	0.0667	28.486	17.81	6.96
78	15	24	1.154E+06	138	1.674E+07	0.0690	132.176	18.42	3.90
77	20	7	2.525E+05	101	3.644E+06	0.0693	28.771	18.51	7.24
5	10	20	1.443E+06	282	2.035E+07	0.0709	160.663	18.95	4.39
63	12	8	4.810E+05	109	6.554E+06	0.0734	51.750	19.61	7.19
7	15	3	1.443E+05	128	1.924E+06	0.0750	15.193	20.03	12.00
24	12	24	1.443E+06	320	1.924E+07	0.0750	151.927	20.03	4.25
6	15	5	2.405E+05	66	3.175E+06	0.0758	25.068	20.24	9.39
2	36	8	1.603E+05	104	2.084E+06	0.0769	16.459	20.55	7.54
40	16	16	7.215E+05	133	9.064E+06	0.0796	71.572	21.26	5.53

(table cont'd)

46	8	13	1.172E+06	134	1.461E+07	0.0802	115.369	21.43	6.19
18	16	8	3.608E+05	98	4.419E+06	0.0816	34.896	21.80	8.02
1	20	7	2.525E+05	126	3.066E+06	0.0824	24.213	21.99	8.65
35	16	8	3.608E+05	97	4.374E+06	0.0825	34.540	22.03	8.11
45	18	6	2.405E+05	69	2.766E+06	0.0870	21.839	23.22	9.89
3	15	21	1.010E+06	234	1.126E+07	0.0897	88.877	23.96	5.47
14	15	21	1.010E+06	232	1.116E+07	0.0905	88.118	24.17	5.52
76	30	2	4.810E+04	22	5.291E+05	0.0909	4.178	24.27	17.93
15	20	23	8.297E+05	251	9.055E+06	0.0916	71.501	24.47	5.34
80	9	3	2.405E+05	32	2.565E+06	0.0938	20.257	25.03	15.12
61	15	7	3.367E+05	137	3.223E+06	0.1045	25.448	27.89	11.09
29	40	13	2.345E+05	118	2.128E+06	0.1102	16.807	29.41	8.60
50	15	6	2.886E+05	54	2.597E+06	0.1111	20.510	29.66	12.77
79	16	7	3.157E+05	60	2.706E+06	0.1167	21.365	31.14	12.44
13	20	21	7.576E+05	129	6.349E+06	0.1193	50.136	31.84	7.37
20	18	23	9.219E+05	173	6.934E+06	0.1329	54.757	35.47	7.89
51	25	7	2.020E+05	51	1.472E+06	0.1373	11.622	36.62	14.77
23	15	3	1.443E+05	21	1.010E+06	0.1429	7.976	38.11	23.53
38	10	8	5.772E+05	50	3.608E+06	0.1600	28.486	42.66	16.26
34	14	21	1.082E+06	132	5.617E+06	0.1927	44.357	51.34	12.26
19	20	21	7.576E+05	130	2.814E+06	0.2692	22.219	71.63	17.64
54	15	9	4.329E+05	25	1.203E+06	0.3600	9.495	95.60	37.19
4	15	4	1.924E+05	127	5.291E+05	0.3636	4.178	96.56	56.40

(table cont'd)

Sample No.	134-8	Central age	19.34768705 ±	1.429 Ma
Irrad. No.	GAR 77	age dispersion	48.57903825 %	
Position	0			
Date	42850	Pooled age	18.26336879 ±	0.796 Ma
Analyst	AC			
		Mean age	20.24644548 ±	1.509 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	230.1587516 with	71.000 df
No. of grains	72	P(chi-sq)	1.09138E-16 %	
Total Ns	639 tr			
Total Ni	9347 tr			
Total Nd	4388 tr			
rho-d (CN5)	1583000 tr/cm^2			
mean rho-s	424285.689 tr/cm^2			
mean rho-i	5508474.69 tr/cm^2			
mean U	43.4971154 ppm			
				Depositional age 8.27 Ma

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
50	36	4	80166.74683	232	4649671.316	0.0172	36.716	4.61	2.33
17	24	3	90187.59019	152	4569504.57	0.0197	36.083	5.28	3.08
11	28	10	257678.8291	416	10719439.29	0.0240	84.645	6.43	2.06
43	16	1	45093.79509	134	1758658.009	0.0256	13.887	6.86	6.94
9	50	1	14430.01443	36	519480.5195	0.0278	4.102	7.43	7.53
27	80	5	45093.79509	160	1443001.443	0.0313	11.395	8.35	3.80
47	10	3	216450.2165	96	6926406.926	0.0313	54.694	8.35	4.90
12	15	2	96200.0962	60	2886002.886	0.0333	22.789	8.91	6.41
29	25	8	230880.2309	240	6926406.926	0.0333	54.694	8.91	3.21
16	30	5	120250.1203	129	3511303.511	0.0342	27.727	9.16	4.17
52	16	3	135281.3853	135	3427128.427	0.0395	27.062	10.55	6.21
13	40	4	72150.07215	129	1821789.322	0.0396	14.386	10.59	5.40
7	25	13	375180.3752	128	9466089.466	0.0396	74.748	10.59	3.00

(table cont'd)

60	21	6	206143.0633	144	4947433.519	0.0417	39.067	11.14	4.64
30	16	7	315656.5657	164	7395382.395	0.0427	58.397	11.41	4.41
59	12	6	360750.3608	140	8417508.418	0.0429	66.468	11.46	4.78
2	30	5	120250.1203	116	2789802.79	0.0431	22.029	11.52	5.27
21	9	9	721500.7215	208	16674683.34	0.0433	131.670	11.57	3.94
41	30	11	264550.2646	244	5868205.868	0.0451	46.338	12.05	3.72
58	12	2	120250.1203	136	2645502.646	0.0455	20.890	12.15	8.79
57	30	10	240500.2405	216	5194805.195	0.0463	41.020	12.37	4.01
3	14	2	103071.5316	43	2216037.93	0.0465	17.499	12.43	8.99
62	25	6	173160.1732	125	3607503.608	0.0480	28.486	12.83	5.36
32	12	9	541125.5411	186	11183261.18	0.0484	88.307	12.93	4.42
35	20	2	72150.07215	41	1479076.479	0.0488	11.679	13.04	9.44
25	24	12	360750.3608	131	7275132.275	0.0496	57.447	13.25	3.92
31	24	3	90187.59019	132	1803751.804	0.0500	14.243	13.36	7.91
14	30	11	264550.2646	216	5194805.195	0.0509	41.020	13.61	4.21
46	12	3	180375.1804	134	3487253.487	0.0517	27.537	13.82	8.19
49	20	18	649350.6494	135	12121212.12	0.0536	95.714	14.32	3.47
19	20	14	505050.5051	130	8658008.658	0.0583	68.367	15.59	4.29
48	10	6	432900.4329	102	7359307.359	0.0588	58.112	15.72	6.61
56	30	5	120250.1203	83	1996151.996	0.0602	15.762	16.10	7.42
54	15	12	577200.5772	198	9523809.524	0.0606	75.204	16.19	4.82
24	10	5	360750.3608	80	5772005.772	0.0625	45.578	16.70	7.70
22	21	6	206143.0633	130	3195217.481	0.0645	25.231	17.24	7.26
10	12	3	180375.1804	128	2585377.585	0.0698	20.415	18.64	11.13
15	15	20	962000.962	279	13419913.42	0.0717	105.969	19.15	4.44
53	15	6	288600.2886	81	3896103.896	0.0741	30.765	19.79	8.38
20	10	10	721500.7215	132	9523809.524	0.0758	75.204	20.24	6.64
18	15	13	625300.6253	171	8225108.225	0.0760	64.949	20.31	5.85
5	16	2	90187.59019	26	1172438.672	0.0769	9.258	20.55	15.08
36	10	8	577200.5772	104	7503607.504	0.0769	59.251	20.55	7.54
38	25	11	317460.3175	140	4040404.04	0.0786	31.905	20.99	6.58
26	40	8	144300.1443	100	1803751.804	0.0800	14.243	21.37	7.86
39	12	14	841750.8418	170	10221260.22	0.0824	80.711	21.99	6.12

(table cont'd)

44	20	11	396825.3968	133	4797979.798	0.0827	37.887	22.09	6.94
4	12	10	601250.6013	127	7094757.095	0.0847	56.023	22.63	7.46
51	15	8	384800.3848	90	4329004.329	0.0889	34.184	23.74	8.76
23	21	13	446643.3038	142	4878719.164	0.0915	38.524	24.45	7.09
37	20	10	360750.3608	133	3607503.608	0.1000	28.486	26.70	8.86
33	20	8	288600.2886	74	2669552.67	0.1081	21.080	28.86	10.75
63	16	8	360750.3608	72	3246753.247	0.1111	25.638	29.66	11.06
42	9	12	962000.962	99	7936507.937	0.1212	62.670	32.35	9.90
8	12	9	541125.5411	74	4449254.449	0.1216	35.133	32.46	11.47
34	25	7	202020.202	132	1645021.645	0.1228	12.990	32.77	13.13
28	28	18	463821.8924	131	3762110.905	0.1233	29.707	32.90	8.23
61	40	9	162337.6623	137	1298701.299	0.1250	10.255	33.35	11.80
1	8	16	1443001.443	126	11363636.36	0.1270	89.732	33.88	9.01
45	10	10	721500.7215	69	4978354.978	0.1449	39.311	38.66	13.09
6	10	36	2597402.597	240	17316017.32	0.1500	136.734	40.00	7.18
64	14	13	669964.9557	137	3504432.076	0.1912	27.672	50.94	15.44
55	10	37	2669552.67	136	12121212.12	0.2202	95.714	58.65	10.69
40	8	18	1623376.623	133	7124819.625	0.2278	56.260	60.67	15.87

(table cont'd)

Sample No.	134-9	Central age	25.88947241 ±	2.033 Ma
Irrad. No.	GAR 77	age dispersion	55.93407407 %	
Position	0			
Date	42788	Pooled age	24.14937149 ±	0.928 Ma
Analyst	AC			
		Mean age	28.47050393 ±	2.647 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	281.1535551 with	74.000 df
No. of grains	75	P(chi-sq)	6.75649E-24 %	
Total Ns	873 tr			
Total Ni	9653 tr			
Total Nd	4388 tr			
rho-d (CN5)	1583000 tr/cm^2			
mean rho-s	462869.271 tr/cm^2			Depositional age 15.58
mean rho-i	4956943.64 tr/cm^2			
mean U	39.142006 ppm			

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
51	30	2	48100.0481	80	1924001.924	0.0250	15.193	6.68	4.79
24	30	3	72150.07215	114	2741702.742	0.0263	21.650	7.04	4.12
2	14	2	103071.5316	74	3813646.671	0.0270	30.114	7.23	5.18
25	42	2	34357.17721	131	1254036.968	0.0274	9.902	7.33	5.25
11	60	4	48100.0481	145	1743626.744	0.0276	13.768	7.38	3.74
42	10	1	72150.07215	24	1731601.732	0.0417	13.673	11.14	11.37
1	40	6	108225.1082	126	2561327.561	0.0423	20.225	11.29	4.71
23	50	9	129870.1299	210	3030303.03	0.0429	23.928	11.46	3.90
44	50	4	57720.05772	92	1327561.328	0.0435	10.483	11.62	5.94
69	30	3	72150.07215	67	1611351.611	0.0448	12.724	11.97	7.06
67	40	9	162337.6623	138	3174603.175	0.0511	25.068	13.67	4.67
66	12	7	420875.4209	134	8056758.057	0.0522	63.619	13.96	5.42
37	28	11	283446.712	133	5333951.763	0.0531	42.119	14.20	4.40

(table cont'd)

64	40	3	54112.55411	137	992063.4921	0.0545	7.834	14.58	8.64
65	35	2	41228.61266	36	742115.0278	0.0556	5.860	14.85	10.79
54	28	13	334982.4778	228	5875077.304	0.0570	46.392	15.24	4.35
30	21	4	137428.7089	69	2370645.228	0.0580	18.720	15.49	7.97
40	24	4	120250.1203	133	2074314.574	0.0580	16.380	15.49	7.97
58	25	10	288600.2886	136	4963924.964	0.0581	39.197	15.54	5.06
60	12	16	962000.962	272	16354016.35	0.0588	129.138	15.72	4.05
33	50	12	173160.1732	198	2857142.857	0.0606	22.561	16.19	4.82
71	24	11	330687.8307	176	5291005.291	0.0625	41.780	16.70	5.20
75	15	8	384800.3848	125	6012506.013	0.0640	47.477	17.10	6.24
62	35	18	371057.5139	261	5380333.952	0.0690	42.485	18.42	4.50
59	20	21	757575.7576	296	10678210.68	0.0709	84.319	18.95	4.29
18	12	4	240500.2405	56	3367003.367	0.0714	26.587	19.08	9.88
28	20	10	360750.3608	131	5050505.051	0.0714	39.881	19.08	6.25
68	12	20	1202501.203	278	16714766.71	0.0719	131.986	19.22	4.46
43	14	15	773036.4873	134	10358688.93	0.0746	81.796	19.93	5.34
17	25	13	375180.3752	174	5021645.022	0.0747	39.653	19.96	5.75
6	20	3	108225.1082	40	1443001.443	0.0750	11.395	20.03	12.00
8	12	3	180375.1804	40	2405002.405	0.0750	18.991	20.03	12.00
72	8	19	1713564.214	250	22546897.55	0.0760	178.039	20.30	4.84
16	18	3	120250.1203	129	1523168.19	0.0789	12.028	21.09	12.65
39	49	2	29449.00904	25	368112.613	0.0800	2.907	21.37	15.70
47	21	24	824572.2531	300	10307153.16	0.0800	81.389	21.37	4.54
55	16	45	2029220.779	136	25342712.84	0.0801	200.116	21.39	3.33
50	14	30	1546072.975	364	18759018.76	0.0824	148.129	22.01	4.19
63	18	11	440917.1076	132	5291005.291	0.0833	41.780	22.26	6.99
49	10	11	793650.7937	135	9451659.452	0.0840	74.634	22.43	7.05
4	15	5	240500.2405	127	2837902.838	0.0847	22.409	22.63	10.55
57	12	5	300625.3006	57	3427128.427	0.0877	27.062	23.42	10.93
13	18	2	80166.74683	129	881834.2152	0.0909	6.963	24.27	17.93
53	30	22	529100.5291	238	5723905.724	0.0924	45.198	24.68	5.51
36	30	31	745550.7456	326	7840307.84	0.0951	61.910	25.39	4.79
38	20	8	288600.2886	82	2958152.958	0.0976	23.359	26.05	9.66

(table cont'd)

15	15	9	432900.4329	87	4184704.185	0.1034	33.044	27.62	9.68
45	20	10	360750.3608	96	3463203.463	0.1042	27.347	27.81	9.25
73	12	6	360750.3608	139	3427128.427	0.1053	27.062	28.10	12.07
70	15	15	721500.7215	138	6782106.782	0.1064	53.554	28.40	7.72
20	15	15	721500.7215	139	6685906.686	0.1079	52.795	28.81	7.84
7	20	15	541125.5411	128	4906204.906	0.1103	38.741	29.44	8.02
56	50	4	57720.05772	36	519480.5195	0.1111	4.102	29.66	15.64
35	12	7	420875.4209	62	3727753.728	0.1129	29.436	30.13	12.02
34	15	33	1587301.587	132	13997114	0.1134	110.527	30.27	5.58
10	40	11	198412.6984	128	1677489.177	0.1183	13.246	31.57	10.08
27	14	8	412286.1266	66	3401360.544	0.1212	26.859	32.35	12.12
41	35	14	288600.2886	114	2350030.921	0.1228	18.557	32.77	9.29
29	15	28	1346801.347	219	10533910.53	0.1279	83.180	34.11	6.87
3	18	30	1202501.203	210	8417508.418	0.1429	66.468	38.11	7.46
21	32	6	135281.3853	42	946969.697	0.1429	7.478	38.11	16.64
52	25	2	57720.05772	135	404040.404	0.1429	3.190	38.11	28.81
19	30	24	577200.5772	130	3703703.704	0.1558	29.246	41.56	9.14
9	30	8	192400.1924	49	1178451.178	0.1633	9.306	43.53	16.61
31	35	2	41228.61266	132	247371.6759	0.1667	1.953	44.43	33.94
61	8	15	1352813.853	137	7936507.937	0.1705	62.670	45.44	12.71
48	30	8	192400.1924	42	1010101.01	0.1905	7.976	50.76	19.59
74	21	36	1236858.38	186	6390434.962	0.1935	50.461	51.57	9.42
14	15	8	384800.3848	37	1779701.78	0.2162	14.053	57.59	22.47
5	100	5	36075.03608	23	165945.1659	0.2174	1.310	57.90	28.58
32	18	22	881834.2152	101	4048420.715	0.2178	31.968	58.01	13.68
22	35	2	41228.61266	130	164914.4506	0.2500	1.302	66.54	52.61
12	12	13	781625.7816	48	2886002.886	0.2708	22.789	72.05	22.55
26	20	12	432900.4329	40	1443001.443	0.3000	11.395	79.76	26.28
46	20	34	1226551.227	134	1875901.876	0.6538	14.813	172.59	38.15

(table cont'd)

Sample No.	134-10	Central age	16.11786793 ±	1.007 Ma
Irrad. No.	GAR 77	age dispersion	20.11404325 %	
Position	0			
Date	42788	Pooled age	16.51813691 ±	0.825 Ma
Analyst	AC			
		Mean age	15.47008782 ±	0.490 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	50.65882556 with	74.000 df
No. of grains	75	P(chi-sq)	98.26482214 %	
Total Ns	468 tr			
Total Ni	7570 tr			
Total Nd	4388 tr			
rho-d (CN5)	1583000 tr/cm ²			
mean rho-s	353854.384 tr/cm ²			
mean rho-i	5490009.01 tr/cm ²			
mean U	43.351303 ppm			
				Depositional age 7.99 Ma

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
3	16	1	45093.79509	53	2389971.14	0.0189	18.872	5.05	5.09
24	28	1	25767.88291	45	1159554.731	0.0222	9.156	5.94	6.01
1	20	2	72150.07215	126	2813852.814	0.0256	22.219	6.86	4.91
39	60	11	132275.1323	414	4978354.978	0.0266	39.311	7.10	2.17
9	24	2	60125.06013	74	2224627.225	0.0270	17.567	7.23	5.18
7	16	1	45093.79509	128	1533189.033	0.0294	12.107	7.86	7.98
29	40	7	126262.6263	224	4040404.04	0.0313	31.905	8.35	3.21
22	30	8	192400.1924	130	5098605.099	0.0377	40.261	10.09	3.64
33	40	3	54112.55411	79	1424963.925	0.0380	11.252	10.15	5.97
16	30	8	192400.1924	129	5050505.051	0.0381	39.881	10.18	3.67
19	30	8	192400.1924	130	4521404.521	0.0426	35.703	11.37	4.11
27	40	11	198412.6984	246	4437229.437	0.0447	35.038	11.95	3.69
23	20	6	216450.2165	128	4617604.618	0.0469	36.462	12.53	5.24

(table cont'd)

12	21	4	137428.7089	83	2851645.709	0.0482	22.518	12.88	6.60
31	20	2	72150.07215	132	1479076.479	0.0488	11.679	13.04	9.44
15	20	12	432900.4329	234	8441558.442	0.0513	66.658	13.70	4.06
37	40	16	288600.2886	133	5627705.628	0.0513	44.439	13.70	3.52
5	10	7	505050.5051	134	9668109.668	0.0522	76.343	13.96	5.42
20	40	3	54112.55411	56	1010101.01	0.0536	7.976	14.32	8.49
17	25	2	57720.05772	37	1067821.068	0.0541	8.432	14.44	10.49
6	20	15	541125.5411	272	9812409.812	0.0551	77.483	14.74	3.91
41	25	12	346320.3463	204	5887445.887	0.0588	46.490	15.72	4.67
40	21	5	171785.8861	133	2851645.709	0.0602	22.518	16.10	7.42
2	30	14	336700.3367	226	5435305.435	0.0619	42.919	16.55	4.57
34	20	23	829725.8297	132	13131313.13	0.0632	103.690	16.88	3.64
42	60	30	360750.3608	460	5531505.532	0.0652	43.679	17.42	3.29
38	10	20	1443001.443	294	21212121.21	0.0680	167.499	18.17	4.21
21	20	12	432900.4329	168	6060606.061	0.0714	47.857	19.08	5.71
28	15	5	240500.2405	131	3367003.367	0.0714	26.587	19.08	8.84
36	70	1	10307.15316	14	144300.1443	0.0714	1.139	19.08	19.75
4	15	10	481000.481	127	6589706.59	0.0730	52.035	19.50	6.39
13	50	3	43290.04329	129	591630.5916	0.0732	4.672	19.55	11.69
26	40	31	559163.0592	418	7539682.54	0.0742	59.536	19.81	3.70
35	30	6	144300.1443	80	1924001.924	0.0750	15.193	20.03	8.49
30	15	13	625300.6253	171	8225108.225	0.0760	64.949	20.31	5.85
14	30	5	120250.1203	65	1563251.563	0.0769	12.344	20.55	9.54
11	15	11	529100.5291	126	6060606.061	0.0873	47.857	23.31	7.34
18	16	34	1533189.033	388	17496392.5	0.0876	138.159	23.40	4.20
8	20	5	180375.1804	57	2056277.056	0.0877	16.237	23.42	10.93
10	20	59	2128427.128	128	23448773.45	0.0908	185.161	24.24	3.32
32	40	18	324675.3247	192	3463203.463	0.0938	27.347	25.03	6.18
25	40	21	378787.8788	131	3751803.752	0.1010	29.626	26.95	6.18

(table cont'd)

Sample No.	177-1	Central age	8.172723851 ±	0.694 Ma
	1456A-70F-2W			
Irrad. No.	GAR 78	age dispersion	54.18039458 %	
Position	0			
Date	42919	Pooled age	8.036030303 ±	0.412 Ma
Analyst	AC			
		Mean age	8.828819137 ±	0.753 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	208.5118405 with	74.000 df
No. of grains	75	P(chi-sq)	9.63997E-13 %	
Total Ns	446.00004 tr			
Total Ni	11389 tr			
Total Nd	3367 tr			
rho-d (CN5)	1215000 tr/cm^2			
mean rho-s	206107.504 tr/cm^2			
mean rho-i	4592536.09 tr/cm^2			
mean U	47.2483137 ppm			
				Depositional age 3.02 Ma

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
67	60	0.00001	0.12025012	137	962000.962	0.0000	9.897	0.00	0.01
74	100	0.00001	0.072150072	51	367965.368	0.0000	3.786	0.00	0.01
60	35	0.00001	0.206143063	31	639043.4962	0.0000	6.575	0.00	0.02
73	60	0.00001	0.12025012	138	360750.3608	0.0000	3.711	0.00	0.02
61	30	1	24050.02405	137	6613756.614	0.0036	68.043	0.75	0.75
58	45	1	16033.34937	136	3607503.608	0.0044	37.114	0.91	0.91
22	32	2	45093.79509	130	5456349.206	0.0083	56.135	1.70	1.21
37	36	2	40083.37342	133	4088504.089	0.0098	42.063	2.01	1.43
20	16	1	45093.79509	94	4238816.739	0.0106	43.609	2.18	2.20
17	27	1	26722.24894	90	2405002.405	0.0111	24.743	2.28	2.29
63	60	3	36075.03608	220	2645502.646	0.0136	27.217	2.80	1.63
33	30	3	72150.07215	210	5050505.051	0.0143	51.960	2.93	1.71

(table cont'd)

46	40	7	126262.6263	134	7864357.864	0.0161	80.909	3.30	1.26
23	40	4	72150.07215	248	4473304.473	0.0161	46.022	3.31	1.67
16	20	4	144300.1443	129	8874458.874	0.0163	91.301	3.34	1.68
69	36	1	20041.68671	60	1202501.203	0.0167	12.371	3.42	3.45
56	10	3	216450.2165	175	12626262.63	0.0171	129.900	3.52	2.05
68	25	3	86580.08658	175	5050505.051	0.0171	51.960	3.52	2.05
21	30	3	72150.07215	165	3968253.968	0.0182	40.826	3.73	2.18
26	28	4	103071.5316	200	5153576.582	0.0200	53.020	4.11	2.07
39	14	2	103071.5316	90	4638218.924	0.0222	47.718	4.56	3.26
25	35	3	61842.91899	131	2762317.048	0.0224	28.419	4.60	2.68
1	32	5	112734.4877	126	5005411.255	0.0225	51.496	4.62	2.09
10	12	2	120250.1203	128	5170755.171	0.0233	53.197	4.77	3.42
18	40	5	90187.59019	212	3823953.824	0.0236	39.341	4.84	2.19
45	30	5	120250.1203	207	4978354.978	0.0242	51.218	4.96	2.25
36	50	5	72150.07215	185	2669552.67	0.0270	27.465	5.55	2.52
3	18	4	160333.4937	142	5691839.025	0.0282	58.558	5.78	2.93
31	24	6	180375.1804	132	6192881.193	0.0291	63.713	5.98	2.48
30	40	4	72150.07215	136	2453102.453	0.0294	25.238	6.04	3.06
72	60	4	48100.0481	135	1623376.623	0.0296	16.701	6.08	3.09
43	40	5	90187.59019	134	2976190.476	0.0303	30.619	6.22	2.83
12	25	8	230880.2309	255	7359307.359	0.0314	75.713	6.44	2.31
41	35	5	103071.5316	152	3133374.562	0.0329	32.236	6.75	3.07
44	60	7	84175.08418	204	2453102.453	0.0343	25.238	7.04	2.71
24	24	3	90187.59019	86	2585377.585	0.0349	26.599	7.16	4.21
50	15	3	144300.1443	85	4088504.089	0.0353	42.063	7.24	4.26
42	18	10	400833.7342	270	10822510.82	0.0370	111.343	7.60	2.45
38	20	12	432900.4329	314	11327561.33	0.0382	116.539	7.84	2.31
65	25	6	173160.1732	150	4329004.329	0.0400	44.537	8.21	3.42
75	28	8	206143.0633	194	4998969.285	0.0412	51.430	8.46	3.06
5	30	7	168350.1684	164	3944203.944	0.0427	40.578	8.76	3.38
66	40	3	54112.55411	69	1244588.745	0.0435	12.804	8.92	5.26
29	28	4	103071.5316	88	2267573.696	0.0455	23.329	9.33	4.77
51	18	7	280583.6139	153	6132756.133	0.0458	63.094	9.39	3.63

(table cont'd)

14	18	19	761584.0949	414	16594516.59	0.0459	170.725	9.42	2.22
6	15	14	673400.6734	294	14141414.14	0.0476	145.488	9.77	2.68
71	10	1	72150.07215	21	1515151.515	0.0476	15.588	9.77	10.00
47	20	4	144300.1443	82	2958152.958	0.0488	30.434	10.01	5.13
64	20	14	505050.5051	137	10317460.32	0.0490	106.147	10.04	2.75
11	20	2	72150.07215	39	1406926.407	0.0513	14.475	10.52	7.63
34	40	8	144300.1443	132	2795815.296	0.0516	28.764	10.59	3.84
55	21	3	103071.5316	136	1889644.747	0.0545	19.441	11.19	6.64
59	15	1	48100.0481	18	865800.8658	0.0556	8.907	11.40	11.71
52	20	2	72150.07215	135	1262626.263	0.0571	12.990	11.72	8.53
13	20	3	108225.1082	129	1875901.876	0.0577	19.299	11.84	7.03
48	30	2	48100.0481	34	817700.8177	0.0588	8.413	12.07	8.78
53	20	10	360750.3608	168	6060606.061	0.0595	62.352	12.21	3.98
27	28	2	51535.76582	32	824572.2531	0.0625	8.483	12.82	9.35
32	30	3	72150.07215	44	1058201.058	0.0682	10.887	13.98	8.35
40	15	14	673400.6734	133	9812409.812	0.0686	100.951	14.08	3.90
9	40	8	144300.1443	112	2020202.02	0.0714	20.784	14.65	5.37
62	12	9	541125.5411	119	7154882.155	0.0756	73.610	15.51	5.37
4	18	12	481000.481	127	6333173	0.0759	65.156	15.58	4.67
2	15	16	769600.7696	210	10101010.1	0.0762	103.920	15.63	4.06
7	15	3	144300.1443	128	1875901.876	0.0769	19.299	15.78	9.46
54	12	2	120250.1203	26	1563251.563	0.0769	16.083	15.78	11.58
19	30	3	72150.07215	130	889850.8899	0.0811	9.155	16.63	9.99
57	36	15	300625.3006	182	3647586.981	0.0824	37.527	16.90	4.55
15	30	41	986050.9861	474	11399711.4	0.0865	117.281	17.74	2.90
70	20	25	901875.9019	138	9668109.668	0.0933	99.466	19.13	4.01
8	18	7	280583.6139	74	2966169.633	0.0946	30.516	19.39	7.68
49	9	14	1122334.456	135	8898508.899	0.1261	91.548	25.85	7.34
28	36	2	40083.37342	131	280583.6139	0.1429	2.887	29.27	22.13
35	10	11	793650.7937	71	5122655.123	0.1549	52.702	31.73	10.30

(table cont'd)

Sample No.	177-2			Central age	12.9398698 ±			2.680 Ma	
Irrad. No.	GAR 78			age dispersion	160.0236137 %				
Position	0								
Date	42921			Pooled age	10.69953185 ±			0.537 Ma	
Analyst	AC								
				Mean age	17.58846124 ±			5.684 Ma	
zeta (CN5)	338								
zeta error	5			Chi squared	1148.295015 with			64.000 df	
No. of grains	65			P(chi-sq)	1.9484E-196 %				
Total Ns	474.00002 tr								
Total Ni	9089 tr								
Total Nd	3367 tr								
rho-d (CN5)	1215000 tr/cm^2								
mean rho-s	348632.416 tr/cm^2								
mean rho-i	4737434.52 tr/cm^2								
mean U	48.7390383 ppm								
								Depositional age	3.57 Ma
crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
13		40	0.00001	0.18037518	129	2128427.128	0.0000	21.897	0.00
15		20	0.00001	0.360750361	29	1046176.046	0.0000	10.763	0.00
41		30	1	24050.02405	130	3126503.127	0.0077	32.166	1.58
47		40	2	36075.03608	218	3932178.932	0.0092	40.455	1.88
17		30	1	24050.02405	102	2453102.453	0.0098	25.238	2.01
45		20	1	36075.03608	75	2705627.706	0.0133	27.836	2.74
63		25	1	28860.02886	66	1904761.905	0.0152	19.596	3.11
36		40	1	18037.51804	65	1172438.672	0.0154	12.062	3.16
54		15	1	48100.0481	54	2597402.597	0.0185	26.722	3.80
9		10	2	144300.1443	105	7575757.576	0.0190	77.940	3.91
53		30	6	144300.1443	300	7215007.215	0.0200	74.228	4.11
1		30	8	192400.1924	126	9379509.38	0.0205	96.497	4.21
60		24	5	150312.6503	242	7275132.275	0.0207	74.847	4.24

(table cont'd)

20	40	5	90187.59019	232	4184704.185	0.0216	43.053	4.42	2.00
61	20	4	144300.1443	137	6637806.638	0.0217	68.290	4.46	2.26
22	10	2	144300.1443	130	5916305.916	0.0244	60.867	5.01	3.58
46	100	9	64935.06494	134	2626262.626	0.0247	27.019	5.07	1.71
4	20	4	144300.1443	127	5627705.628	0.0256	57.898	5.26	2.67
26	30	3	72150.07215	113	2717652.718	0.0265	27.959	5.45	3.19
24	40	6	108225.1082	218	3932178.932	0.0275	40.455	5.65	2.34
29	30	3	72150.07215	106	2549302.549	0.0283	26.227	5.81	3.40
40	40	1	18037.51804	133	613275.6133	0.0294	6.309	6.04	6.13
50	30	3	72150.07215	102	2453102.453	0.0294	25.238	6.04	3.54
21	50	3	43290.04329	100	1443001.443	0.0300	14.846	6.16	3.61
2	28	4	103071.5316	132	3401360.544	0.0303	34.993	6.22	3.16
16	20	4	144300.1443	129	4761904.762	0.0303	48.991	6.22	3.16
51	30	1	24050.02405	30	721500.7215	0.0333	7.423	6.84	6.95
64	25	1	28860.02886	137	865800.8658	0.0333	8.907	6.84	6.95
3	20	4	144300.1443	114	4112554.113	0.0351	42.310	7.20	3.67
30	24	6	180375.1804	168	5050505.051	0.0357	51.960	7.33	3.05
7	40	2	36075.03608	128	992063.4921	0.0364	10.206	7.46	5.37
44	40	18	324675.3247	490	8838383.838	0.0367	90.930	7.54	1.81
18	25	12	346320.3463	301	8686868.687	0.0399	89.371	8.18	2.41
37	12	12	721500.7215	133	18037518.04	0.0400	185.571	8.21	2.42
42	24	3	90187.59019	74	2224627.225	0.0405	22.887	8.32	4.90
57	20	7	252525.2525	172	6204906.205	0.0407	63.836	8.35	3.22
14	20	17	613275.6133	392	14141414.14	0.0434	145.488	8.90	2.21
6	20	1	36075.03608	22	793650.7937	0.0455	8.165	9.33	9.54
27	12	2	120250.1203	44	2645502.646	0.0455	27.217	9.33	6.75
62	25	1	28860.02886	22	634920.6349	0.0455	6.532	9.33	9.54
49	40	18	324675.3247	135	6565656.566	0.0495	67.548	10.15	2.46
56	30	15	360750.3608	303	7287157.287	0.0495	74.971	10.16	2.69
10	16	7	315656.5657	128	6313131.313	0.0500	64.950	10.26	3.98
19	18	8	320666.9873	130	6253006.253	0.0513	64.331	10.52	3.82
34	20	2	72150.07215	132	1370851.371	0.0526	14.103	10.80	7.84
52	36	10	200416.8671	135	3727753.728	0.0538	38.351	11.03	3.59

(table cont'd)

65	28	1	25767.88291	18	463821.8924	0.0556	4.772	11.40	11.71
48	15	11	529100.5291	192	9235209.235	0.0573	95.012	11.75	3.65
58	12	12	721500.7215	136	12265512.27	0.0588	126.188	12.07	3.59
23	15	13	625300.6253	219	10533910.53	0.0594	108.374	12.18	3.48
33	10	6	432900.4329	100	7215007.215	0.0600	74.228	12.31	5.18
5	10	10	721500.7215	142	10245310.25	0.0704	105.404	14.44	4.73
38	15	3	144300.1443	42	2020202.02	0.0714	20.784	14.65	8.76
43	15	11	529100.5291	134	7070707.071	0.0748	72.744	15.35	4.80
11	16	8	360750.3608	92	4148629.149	0.0870	42.681	17.83	6.58
31	25	8	230880.2309	132	2655122.655	0.0870	27.316	17.83	6.58
35	15	13	625300.6253	144	6926406.926	0.0903	71.259	18.51	5.37
25	10	14	1010101.01	131	10822510.82	0.0933	111.343	19.14	5.36
28	30	1	24050.02405	131	240500.2405	0.1000	2.474	20.50	21.50
55	8	4	360750.3608	136	3336940.837	0.1081	34.331	22.16	11.67
12	30	1	24050.02405	8	192400.1924	0.1250	1.979	25.62	27.17
59	15	31	1491101.491	150	7215007.215	0.2067	74.228	42.30	8.38
39	8	9	811688.3117	18	1623376.623	0.5000	16.701	101.86	41.62
32	6	17	2044252.044	32	3848003.848	0.5313	39.589	108.17	32.52
8	10	74	5339105.339	42	3030303.03	1.7619	31.176	351.99	68.27

(table cont'd)

Sample No.	177-3	Central age	10.65368796 ±	1.046 Ma
Irrad. No.	GAR 78	age dispersion	53.83662705 %	
Position	0			
Date	42927	Pooled age	10.17507932 ±	0.586 Ma
Analyst	AC			
		Mean age	11.03890211 ±	1.038 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	156.7809061 with	51.000 df
No. of grains	52	P(chi-sq)	1.08314E-10 %	
Total Ns	347.00001 tr			
Total Ni	6997 tr			
Total Nd	3367 tr			
rho-d (CN5)	1215000 tr/cm^2			
mean rho-s	240718.281 tr/cm^2			
mean rho-i	4003549.18 tr/cm^2			
mean U	41.1887775 ppm			Depositional age 7.0 Ma

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
7	30	0.00001	0.240500241	128	1154401.154	0.0000	11.877	0.00	0.01
48	50	4	57720.05772	339	4891774.892	0.0118	50.327	2.42	1.22
2	30	2	48100.0481	152	3655603.656	0.0132	37.609	2.70	1.92
31	40	3	54112.55411	132	3679653.68	0.0147	37.857	3.02	1.76
24	20	6	216450.2165	308	11111111.11	0.0195	114.312	4.00	1.65
25	30	1	24050.02405	131	1491101.491	0.0161	15.341	3.31	3.34
10	60	8	96200.0962	128	3968253.968	0.0242	40.826	4.98	1.78
9	24	2	60125.06013	102	3066378.066	0.0196	31.547	4.02	2.87
19	24	3	90187.59019	130	4208754.209	0.0214	43.300	4.40	2.57
16	24	1	30062.53006	129	1713564.214	0.0175	17.629	3.60	3.63
23	20	2	72150.07215	96	3463203.463	0.0208	35.630	4.28	3.06
22	27	6	160333.4937	130	6146117.257	0.0261	63.232	5.35	2.22
3	18	1	40083.37342	54	2164502.165	0.0185	22.269	3.80	3.84

(table cont'd)

46	50	6	86580.08658	134	3232323.232	0.0268	33.254	5.50	2.28
29	40	11	198412.6984	376	6782106.782	0.0293	69.775	6.00	1.84
6	40	2	36075.03608	86	1551226.551	0.0233	15.959	4.77	3.42
18	30	3	72150.07215	118	2837902.838	0.0254	29.197	5.22	3.05
44	30	2	48100.0481	82	1972101.972	0.0244	20.289	5.01	3.58
42	16	1	45093.79509	45	2029220.779	0.0222	20.877	4.56	4.61
51	40	4	72150.07215	130	2344877.345	0.0308	24.124	6.31	3.21
8	30	9	216450.2165	238	5723905.724	0.0378	58.888	7.76	2.64
4	60	14	168350.1684	127	3872053.872	0.0435	39.836	8.92	2.44
41	16	2	90187.59019	56	2525252.525	0.0357	25.980	7.33	5.28
13	24	4	120250.1203	129	2946127.946	0.0408	30.310	8.38	4.27
35	30	7	168350.1684	144	3463203.463	0.0486	35.630	9.97	3.86
45	50	4	57720.05772	85	1226551.227	0.0471	12.619	9.66	4.94
34	24	10	300625.3006	132	5381192.881	0.0559	55.362	11.46	3.73
28	28	10	257678.8291	131	4586683.158	0.0562	47.188	11.53	3.75
26	15	16	769600.7696	267	12842712.84	0.0599	132.127	12.29	3.17
14	12	1	60125.06013	25	1503126.503	0.0400	15.464	8.21	8.37
17	10	5	360750.3608	88	6349206.349	0.0568	65.321	11.66	5.36
5	40	18	324675.3247	266	4797979.798	0.0677	49.362	13.88	3.39
40	15	6	288600.2886	133	4761904.762	0.0606	48.991	12.43	5.23
36	24	2	60125.06013	40	1202501.203	0.0500	12.371	10.26	7.44
43	24	5	150312.6503	134	2465127.465	0.0610	25.361	12.51	5.77
27	30	10	240500.2405	148	3559403.559	0.0676	36.619	13.86	4.53
38	10	6	432900.4329	92	6637806.638	0.0652	68.290	13.38	5.64
1	15	1	48100.0481	126	962000.962	0.0500	9.897	10.26	10.51
12	30	8	192400.1924	107	2573352.573	0.0748	26.475	15.33	5.63
49	40	8	144300.1443	135	1731601.732	0.0833	17.815	17.09	6.30
37	40	5	90187.59019	133	1154401.154	0.0781	11.877	16.02	7.44
11	15	5	240500.2405	60	2886002.886	0.0833	29.691	17.09	7.96
50	80	5	45093.79509	58	523088.0231	0.0862	5.382	17.68	8.24
52	14	23	1185322.614	135	11028653.89	0.1075	113.464	22.03	4.85
20	12	7	420875.4209	72	4329004.329	0.0972	44.537	19.93	7.90
33	14	25	1288394.146	222	11440940.01	0.1126	117.705	23.08	4.89

(table cont'd)

32	18	4	160333.4937	43	1723585.057	0.0930	17.732	19.07	9.98
39	12	10	601250.6013	94	5651755.652	0.1064	58.146	21.81	7.26
30	18	9	360750.3608	81	3246753.247	0.1111	33.403	22.77	8.01
21	10	17	1226551.227	138	9956709.957	0.1232	102.435	25.25	6.50
15	15	2	96200.0962	17	817700.8177	0.1176	8.413	24.11	18.03
47	18	21	841750.8418	121	4850088.183	0.1736	49.898	35.54	8.42

(table cont'd)

Sample No.	177-4	Central age	11.37768302 ±	1.509 Ma
Irrad. No.	GAR 78	age dispersion	44.71262148 %	
Position	0			
Date	42928	Pooled age	12.34215524 ±	1.161 Ma
Analyst	AC			
		Mean age	10.9771404 ±	1.502 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	46.49682059 with	29.000 df
No. of grains	30	P(chi-sq)	2.092947361 %	
Total Ns	124.00004 tr			
Total Ni	2061 tr			
Total Nd	3367 tr			
rho-d (CN5)	1215000 tr/cm^2			
mean rho-s	297580.977 tr/cm^2			
mean rho-i	4999866.39 tr/cm^2			
mean U	51.4389546 ppm			
				Depositional age 7.07 Ma

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
24	21	0.00001	0.343571772	48	1649144.506	0.0000	16.967	0.00	0.01
8	10	0.00001	0.721500722	39	2813852.814	0.0000	28.949	0.00	0.02
22	7	0.00001	1.030715316	130	2576788.291	0.0000	26.510	0.00	0.03
13	7	0.00001	1.030715316	129	2370645.228	0.0000	24.389	0.00	0.03
27	10	1	72150.07215	62	4473304.473	0.0161	46.022	3.31	3.34
1	6	1	120250.1203	126	6734006.734	0.0179	69.280	3.67	3.70
21	15	1	48100.0481	55	2645502.646	0.0182	27.217	3.73	3.77
30	10	2	144300.1443	90	6493506.494	0.0222	66.806	4.56	3.26
29	10	2	144300.1443	89	6421356.421	0.0225	66.063	4.61	3.30
15	15	2	96200.0962	85	4088504.089	0.0235	42.063	4.83	3.46
23	8	1	90187.59019	36	3246753.247	0.0278	33.403	5.70	5.78
4	8	4	360750.3608	127	9920634.921	0.0364	102.064	7.46	3.80
19	10	3	216450.2165	130	5627705.628	0.0385	57.898	7.89	4.65

(table cont'd)

5	10	5	360750.3608	114	8225108.225	0.0439	84.620	9.00	4.11
7	15	2	96200.0962	128	2164502.165	0.0444	22.269	9.12	6.59
9	8	3	270562.7706	64	5772005.772	0.0469	59.383	9.62	5.68
18	7	1	103071.5316	20	2061430.633	0.0500	21.208	10.26	10.51
11	10	4	288600.2886	72	5194805.195	0.0556	53.444	11.40	5.86
3	9	2	160333.4937	34	2725669.392	0.0588	28.042	12.07	8.78
25	12	4	240500.2405	131	3667628.668	0.0656	37.733	13.45	6.95
2	8	6	541125.5411	80	7215007.215	0.0750	74.228	15.38	6.52
20	10	4	288600.2886	51	3679653.68	0.0784	37.857	16.08	8.36
12	10	2	144300.1443	23	1659451.659	0.0870	17.073	17.83	13.15
28	12	19	1142376.142	131	12145262.15	0.0941	124.951	19.28	4.64
14	8	1	90187.59019	10	901875.9019	0.1000	9.279	20.50	21.50
16	10	18	1298701.299	129	12987012.99	0.1000	133.611	20.50	5.08
26	10	12	865800.8658	114	8225108.225	0.1053	84.620	21.58	6.56
17	6	5	601250.6013	43	5170755.171	0.1163	53.197	23.83	11.27
6	12	13	781625.7816	110	6613756.614	0.1182	68.043	24.22	7.12
10	12	6	360750.3608	128	2525252.525	0.1429	25.980	29.27	12.78

(table cont'd)

Sample No.	177-5	Central age	16.48072231 ±	1.343 Ma
Irrad. No.	GAR 78	age dispersion	39.2224905 %	
Position	0			
Date	42919	Pooled age	16.29044343 ±	0.921 Ma
Analyst	AC			
		Mean age	17.29844964 ±	1.501 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	103.0058982 with	49.000 df
No. of grains	50	P(chi-sq)	0.001031382 %	
Total Ns	372 tr			
Total Ni	4683 tr			
Total Nd	3367 tr			
rho-d (CN5)	1215000 tr/cm^2			
mean rho-s	326162.99 tr/cm^2			
mean rho-i	3718022.06 tr/cm^2			
mean U	38.2512557 ppm			
				Depositional age 7.28 Ma

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
44	25	1	28860.02886	80	2308802.309	0.0125	23.753	2.57	2.58
34	30	1	24050.02405	132	1875901.876	0.0128	19.299	2.63	2.65
1	24	1	30062.53006	126	1352813.853	0.0222	13.918	4.56	4.61
39	25	3	86580.08658	130	3751803.752	0.0231	38.599	4.74	2.77
41	40	2	36075.03608	70	1262626.263	0.0286	12.990	5.86	4.21
40	20	2	72150.07215	133	2200577.201	0.0328	22.640	6.73	4.84
27	40	2	36075.03608	60	1082251.082	0.0333	11.134	6.84	4.92
11	30	2	48100.0481	57	1370851.371	0.0351	14.103	7.20	5.18
30	40	7	126262.6263	154	2777777.778	0.0455	28.578	9.33	3.61
5	30	8	192400.1924	174	4184704.185	0.0460	43.053	9.43	3.42
47	28	6	154607.2975	124	3195217.481	0.0484	32.873	9.93	4.15
10	12	5	300625.3006	128	6132756.133	0.0490	63.094	10.06	4.61
4	21	5	171785.8861	127	3298289.013	0.0521	33.933	10.69	4.91

(table cont'd)

38	20	5	180375.1804	96	3463203.463	0.0521	35.630	10.69	4.91
2	30	3	72150.07215	54	1298701.299	0.0556	13.361	11.40	6.76
43	24	4	120250.1203	134	2164502.165	0.0556	22.269	11.40	5.86
8	16	2	90187.59019	35	1578282.828	0.0571	16.237	11.72	8.53
14	12	4	240500.2405	66	3968253.968	0.0606	40.826	12.43	6.41
42	18	10	400833.7342	159	6373256.373	0.0629	65.568	12.90	4.21
12	20	17	613275.6133	262	9451659.452	0.0649	97.239	13.31	3.34
25	18	17	681417.3481	131	9980759.981	0.0683	102.683	14.00	3.52
37	12	11	661375.6614	133	9379509.38	0.0705	96.497	14.46	4.52
28	25	11	317460.3175	131	4473304.473	0.0710	46.022	14.56	4.55
3	15	3	144300.1443	42	2020202.02	0.0714	20.784	14.65	8.76
6	30	2	48100.0481	28	673400.6734	0.0714	6.928	14.65	10.73
29	25	11	317460.3175	150	4329004.329	0.0733	44.537	15.04	4.71
35	40	5	90187.59019	66	1190476.19	0.0758	12.248	15.54	7.21
18	10	7	505050.5051	92	6637806.638	0.0761	68.290	15.60	6.12
13	40	4	72150.07215	129	883838.3838	0.0816	9.093	16.74	8.71
45	10	10	721500.7215	118	8513708.514	0.0847	87.590	17.38	5.73
46	12	7	420875.4209	134	4870129.87	0.0864	50.104	17.72	6.99
22	20	11	396825.3968	130	4545454.545	0.0873	46.764	17.90	5.64
23	10	6	432900.4329	64	4617604.618	0.0938	47.506	19.22	8.21
36	24	7	210437.7104	74	2224627.225	0.0946	22.887	19.39	7.68
24	60	4	48100.0481	42	505050.5051	0.0952	5.196	19.53	10.22
31	15	12	577200.5772	132	5627705.628	0.1026	57.898	21.03	6.38
21	15	5	240500.2405	48	2308802.309	0.1042	23.753	21.35	10.04
17	12	14	841750.8418	134	8056758.057	0.1045	82.888	21.42	6.03
20	12	5	300625.3006	46	2765752.766	0.1087	28.454	22.28	10.50
50	15	8	384800.3848	71	3415103.415	0.1127	35.135	23.09	8.62
26	30	8	192400.1924	70	1683501.684	0.1143	17.320	23.42	8.75
48	21	17	584072.0126	147	5050505.051	0.1156	51.960	23.70	6.09
15	12	18	1082251.082	150	9018759.019	0.1200	92.786	24.59	6.15
32	21	10	343571.7721	75	2576788.291	0.1333	26.510	27.32	9.21
49	24	10	300625.3006	135	2224627.225	0.1351	22.887	27.69	9.34
19	30	12	288600.2886	130	1803751.804	0.1600	18.557	32.77	10.20

(table cont'd)

33	10	7	505050.5051	42	3030303.03	0.1667	31.176	34.13	13.95
16	20	7	252525.2525	129	1406926.407	0.1795	14.475	36.75	15.10
9	12	5	300625.3006	20	1202501.203	0.2500	12.371	51.13	25.58
7	10	28	2020202.02	128	7792207.792	0.2593	80.167	53.02	11.28

(table cont'd)

Sample No.	177-6	Central age	19.86254342 ±	2.594 Ma
Irrad. No.	GAR 78	age dispersion	73.40029407 %	
Position	0			
Date	43004	Pooled age	19.00220217 ±	0.985 Ma
Analyst	AC			
		Mean age	21.42473328 ±	2.888 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	278.1398941 with	39.000 df
No. of grains	40	P(chi-sq)	7.43184E-36 %	
Total Ns	457 tr			
Total Ni	4931 tr			
Total Nd	3367 tr			
rho-d (CN5)	1215000 tr/cm^2			
mean rho-s	546460.567 tr/cm^2			
mean rho-i	4714484.7 tr/cm^2			
mean U	48.502929 ppm			
				Depositional age 7.66 Ma

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
40	40	2	36075.03608	133	1948051.948	0.0185	20.042	3.80	2.71
19	28	5	128839.4146	130	3916718.202	0.0329	40.295	6.75	3.07
36	28	3	77303.64873	90	2319109.462	0.0333	23.859	6.84	4.02
37	40	9	162337.6623	133	4725829.726	0.0344	48.620	7.05	2.39
31	30	3	72150.07215	132	1851851.852	0.0390	19.052	8.00	4.71
21	24	4	120250.1203	96	2886002.886	0.0417	29.691	8.55	4.37
35	14	3	154607.2975	71	3659039.373	0.0423	37.644	8.67	5.11
6	30	4	96200.0962	94	2260702.261	0.0426	23.258	8.73	4.46
24	30	8	192400.1924	174	4184704.185	0.0460	43.053	9.43	3.42
18	32	7	157828.2828	136	3066378.066	0.0515	31.547	10.56	4.10
10	30	12	288600.2886	128	5531505.532	0.0522	56.908	10.70	3.17
15	18	9	360750.3608	172	6894340.228	0.0523	70.929	10.74	3.68
28	20	2	72150.07215	131	1370851.371	0.0526	14.103	10.80	7.84

(table cont'd)

32	20	2	72150.07215	36	1298701.299	0.0556	13.361	11.40	8.28
2	18	15	601250.6013	266	10662177.33	0.0564	109.693	11.57	3.08
38	12	9	541125.5411	158	9499759.5	0.0570	97.734	11.69	4.01
29	40	5	90187.59019	82	1479076.479	0.0610	15.217	12.51	5.77
26	15	3	144300.1443	49	2356902.357	0.0612	24.248	12.56	7.47
33	30	10	240500.2405	162	3896103.896	0.0617	40.083	12.66	4.13
34	20	25	901875.9019	132	13564213.56	0.0665	139.550	13.64	2.83
8	14	15	773036.4873	212	10925582.35	0.0708	112.403	14.51	3.89
23	28	15	386518.2437	206	5308183.88	0.0728	54.611	14.93	4.00
5	16	1	45093.79509	12	541125.5411	0.0833	5.567	17.09	17.79
11	12	8	481000.481	93	5591630.592	0.0860	57.527	17.64	6.51
13	14	11	566893.424	129	6235827.664	0.0909	64.155	18.64	5.88
1	20	20	721500.7215	126	7647907.648	0.0943	78.682	19.34	4.54
16	20	16	577200.5772	129	5916305.916	0.0976	60.867	20.00	5.25
17	18	8	320666.9873	72	2886002.886	0.1111	29.691	22.77	8.50
25	24	3	90187.59019	131	751563.2516	0.1200	7.732	24.59	15.03
39	10	12	865800.8658	93	6709956.71	0.1290	69.032	26.44	8.12
22	50	9	129870.1299	130	937950.938	0.1385	9.650	28.37	10.10
30	40	7	126262.6263	50	901875.9019	0.1400	9.279	28.68	11.59
3	8	11	992063.4921	76	6854256.854	0.1447	70.517	29.65	9.58
9	18	10	400833.7342	64	2565335.899	0.1563	26.392	32.00	10.90
7	15	44	2116402.116	128	13131313.13	0.1612	135.096	33.01	5.39
4	30	5	120250.1203	127	601250.6013	0.2000	6.186	40.94	20.07
27	24	4	120250.1203	18	541125.5411	0.2222	5.567	45.47	25.15
14	10	39	2813852.814	111	8008658.009	0.3514	82.394	71.74	13.41
12	10	33	2380952.381	88	6349206.349	0.3750	65.321	76.54	15.68
20	10	46	3318903.319	122	8802308.802	0.3770	90.559	76.96	13.38

(table cont'd)

Sample No.	177-8	Central age	18.3513693 ±	1.668 Ma
Irrad. No.	GAR 78	age dispersion	48.92502151 %	
Position	0			
Date	03/011/2017	Pooled age	16.34595256 ±	0.892 Ma
Analyst	AC			
		Mean age	26.11640803 ±	4.277 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	162.7826731 with	54.000 df
No. of grains	55	P(chi-sq)	7.67811E-11 %	
Total Ns	403 tr			
Total Ni	5056 tr			
Total Nd	3367 tr			
rho-d (CN5)	1215000 tr/cm^2			
mean rho-s	337518.142 tr/cm^2			
mean rho-i	3651410.52 tr/cm^2			
mean U	37.5659518 ppm			
				Depositional age 8.09 Ma

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
14	20	2	72150.07215	80	2886002.886	0.0250	29.691	5.13	3.67
24	20	3	108225.1082	95	3427128.427	0.0316	35.259	6.48	3.80
12	28	5	128839.4146	146	3762110.905	0.0342	38.705	7.03	3.20
25	30	6	144300.1443	131	3848003.848	0.0375	39.589	7.70	3.20
35	40	2	36075.03608	50	901875.9019	0.0400	9.279	8.21	5.92
36	20	3	108225.1082	74	2669552.67	0.0405	27.465	8.32	4.90
31	15	5	240500.2405	132	5483405.483	0.0439	56.414	9.00	4.11
46	21	3	103071.5316	134	2336288.051	0.0441	24.036	9.05	5.34
33	20	9	324675.3247	200	7215007.215	0.0450	74.228	9.23	3.15
54	20	18	649350.6494	390	14069264.07	0.0462	144.746	9.47	2.29
44	40	5	90187.59019	108	1948051.948	0.0463	20.042	9.50	4.35
27	40	6	108225.1082	122	2200577.201	0.0492	22.640	10.09	4.22
5	30	3	72150.07215	59	1418951.419	0.0508	14.598	10.43	6.18

(table cont'd)

26	20	7	252525.2525	136	4906204.906	0.0515	50.475	10.56	4.10
30	25	7	202020.202	135	3896103.896	0.0519	40.083	10.64	4.13
29	20	7	252525.2525	126	4545454.545	0.0556	46.764	11.40	4.43
41	30	4	96200.0962	69	1659451.659	0.0580	17.073	11.89	6.12
1	30	13	312650.3127	126	5002405.002	0.0625	51.465	12.82	3.67
9	36	4	80166.74683	58	1162417.829	0.0690	11.959	14.15	7.32
51	40	18	324675.3247	252	4545454.545	0.0714	46.764	14.65	3.58
28	24	10	300625.3006	131	4088504.089	0.0735	42.063	15.08	4.95
48	15	10	481000.481	135	6493506.494	0.0741	66.806	15.19	4.99
18	9	3	240500.2405	40	3206669.873	0.0750	32.990	15.38	9.21
19	18	2	80166.74683	130	1042167.709	0.0769	10.722	15.78	11.58
45	24	5	150312.6503	62	1863876.864	0.0806	19.176	16.54	7.69
43	20	3	108225.1082	134	1334776.335	0.0811	13.732	16.63	9.99
15	15	5	240500.2405	59	2837902.838	0.0847	29.197	17.38	8.10
16	20	2	72150.07215	129	829725.8297	0.0870	8.536	17.83	13.15
53	20	27	974025.974	308	11111111.11	0.0877	114.312	17.98	3.62
52	12	9	541125.5411	135	6132756.133	0.0882	63.094	18.09	6.30
34	14	1	51535.76582	132	566893.424	0.0909	5.832	18.64	19.47
49	24	3	90187.59019	135	962000.962	0.0938	9.897	19.22	11.61
2	30	14	336700.3367	146	3511303.511	0.0959	36.125	19.66	5.51
37	10	14	1010101.01	133	10533910.53	0.0959	108.374	19.66	5.51
23	15	3	144300.1443	31	1491101.491	0.0968	15.341	19.84	12.00
4	12	4	240500.2405	127	2465127.465	0.0976	25.361	20.00	10.48
8	16	5	225468.9755	49	2209595.96	0.1020	22.732	20.92	9.83
32	10	17	1226551.227	162	11688311.69	0.1049	120.250	21.51	5.50
42	12	5	300625.3006	46	2765752.766	0.1087	28.454	22.28	10.50
17	14	23	1185322.614	207	10667903.53	0.1111	109.752	22.77	5.02
47	15	8	384800.3848	72	3463203.463	0.1111	35.630	22.77	8.50
50	15	8	384800.3848	72	3463203.463	0.1111	35.630	22.77	8.50
21	12	21	1262626.263	180	10822510.82	0.1167	111.343	23.91	5.53
20	30	1	24050.02405	7	168350.1684	0.1429	1.732	29.27	31.29
55	16	8	360750.3608	136	2254689.755	0.1600	23.196	32.77	12.49
39	8	13	1172438.672	78	7034632.035	0.1667	72.373	34.13	10.24

(table cont'd)

40	12	2	120250.1203	133	721500.7215	0.1667	7.423	34.13	26.08
6	14	2	103071.5316	11	566893.424	0.1818	5.832	37.23	28.62
11	15	4	192400.1924	21	1010101.01	0.1905	10.392	38.99	21.28
3	35	1	20614.30633	5	103071.5316	0.2000	1.060	40.94	44.85
13	8	20	1803751.804	129	5591630.592	0.3226	57.527	65.90	16.98
10	10	2	144300.1443	128	360750.3608	0.4000	3.711	81.62	68.30
22	14	5	257678.8291	130	618429.1899	0.4167	6.362	84.99	45.26
7	15	9	432900.4329	128	769600.7696	0.5625	7.918	114.48	47.74
38	15	4	192400.1924	4	192400.1924	1.0000	1.979	202.13	142.97

(table cont'd)

Sample No.	177-9	Central age	15.95494189 ±	1.043 Ma
Irrad. No.	GAR 78	age dispersion	41.82997857 %	
Position	0			
Date	43048	Pooled age	15.59154394 ±	0.710 Ma
Analyst	AC			
		Mean age	17.08122751 ±	1.120 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	192.5830606 with	91.000 df
No. of grains	92	P(chi-sq)	2.90685E-07 %	
Total Ns	605.00001 tr			
Total Ni	7958 tr			
Total Nd	3367 tr			
rho-d (CN5)	1215000 tr/cm^2			
mean rho-s	308856.866 tr/cm^2			
mean rho-i	3710054.49 tr/cm^2			
mean U	38.1692849 ppm			
				Depositional age 8.15 Ma

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
74	30	0.00001	0.240500241	30	721500.7215	0.0000	7.423	0.00	0.02
16	20	1	36075.03608	129	2272727.273	0.0159	23.382	3.26	3.28
7	30	2	48100.0481	128	2837902.838	0.0169	29.197	3.48	2.48
48	20	1	36075.03608	52	1875901.876	0.0192	19.299	3.95	3.99
73	40	3	54112.55411	122	2200577.201	0.0246	22.640	5.05	2.95
6	15	1	48100.0481	35	1683501.684	0.0286	17.320	5.86	5.95
9	18	3	120250.1203	104	4168670.835	0.0288	42.888	5.92	3.47
4	24	2	60125.06013	127	1863876.864	0.0323	19.176	6.62	4.76
91	30	3	72150.07215	92	2212602.213	0.0326	22.763	6.69	3.93
18	40	7	126262.6263	180	3246753.247	0.0389	33.403	7.98	3.08
30	20	4	144300.1443	99	3571428.571	0.0404	36.743	8.29	4.23
13	25	3	86580.08658	129	2106782.107	0.0411	21.675	8.43	4.97
85	21	4	137428.7089	95	3263931.835	0.0421	33.580	8.64	4.41

(table cont'd)

19	25	3	86580.08658	130	1991341.991	0.0435	20.487	8.92	5.26
87	30	3	72150.07215	137	1611351.611	0.0448	16.578	9.19	5.42
81	25	6	173160.1732	136	3809523.81	0.0455	39.193	9.33	3.90
45	15	2	96200.0962	42	2020202.02	0.0476	20.784	9.77	7.07
8	21	5	171785.8861	99	3401360.544	0.0505	34.993	10.36	4.75
92	50	8	115440.1154	155	2236652.237	0.0516	23.011	10.59	3.84
31	28	3	77303.64873	132	1443001.443	0.0536	14.846	10.99	6.52
29	18	12	481000.481	219	8778258.778	0.0548	90.311	11.24	3.34
75	18	8	320666.9873	135	5531505.532	0.0580	56.908	11.89	4.33
28	10	5	360750.3608	131	6132756.133	0.0588	63.094	12.07	5.56
43	15	14	673400.6734	134	11255411.26	0.0598	115.796	12.27	3.38
39	32	3	67640.69264	50	1127344.877	0.0600	11.598	12.31	7.32
80	14	7	360750.3608	114	5875077.304	0.0614	60.443	12.60	4.91
82	20	21	757575.7576	340	12265512.27	0.0618	126.188	12.67	2.86
10	18	1	40083.37342	128	641333.9747	0.0625	6.598	12.82	13.22
77	21	4	137428.7089	63	2164502.165	0.0635	22.269	13.02	6.72
20	20	6	216450.2165	94	3391053.391	0.0638	34.887	13.09	5.52
40	80	3	27056.27706	133	423881.6739	0.0638	4.361	13.09	7.80
41	25	4	115440.1154	62	1789321.789	0.0645	18.409	13.23	6.83
89	20	2	72150.07215	31	1118326.118	0.0645	11.505	13.23	9.66
35	10	3	216450.2165	45	3246753.247	0.0667	33.403	13.67	8.16
36	18	9	360750.3608	130	5210838.544	0.0692	53.609	14.20	4.90
15	15	4	192400.1924	57	2741702.742	0.0702	28.207	14.39	7.45
86	15	6	288600.2886	81	3896103.896	0.0741	40.083	15.19	6.43
33	15	5	240500.2405	66	3174603.175	0.0758	32.661	15.54	7.21
32	24	13	390812.8908	168	5050505.051	0.0774	51.960	15.87	4.58
17	30	2	48100.0481	25	601250.6013	0.0800	6.186	16.41	12.06
79	16	9	405844.1558	112	5050505.051	0.0804	51.960	16.48	5.72
1	10	11	793650.7937	126	9668109.668	0.0821	99.466	16.83	5.29
44	10	1	72150.07215	12	865800.8658	0.0833	8.907	17.09	17.79
37	15	5	240500.2405	133	2741702.742	0.0877	28.207	17.99	8.40
49	12	15	901875.9019	135	10101010.1	0.0893	103.920	18.31	4.94
83	14	12	618429.1899	134	6905792.62	0.0896	71.047	18.36	5.54

(table cont'd)

22	12	3	180375.1804	130	1984126.984	0.0909	20.413	18.64	11.24
90	20	9	324675.3247	137	3535353.535	0.0918	36.372	18.83	6.57
46	18	7	280583.6139	134	2966169.633	0.0946	30.516	19.39	7.68
84	20	17	613275.6133	137	6421356.421	0.0955	66.063	19.58	4.98
11	12	2	120250.1203	20	1202501.203	0.1000	12.371	20.50	15.21
78	14	9	463821.8924	136	4535147.392	0.1023	46.658	20.97	7.35
38	25	6	173160.1732	58	1673881.674	0.1034	17.221	21.21	9.10
24	10	5	360750.3608	48	3463203.463	0.1042	35.630	21.35	10.04
76	10	15	1082251.082	140	10101010.1	0.1071	103.920	21.96	5.98
27	15	15	721500.7215	137	6589706.59	0.1095	67.795	22.44	6.12
14	10	6	432900.4329	54	3896103.896	0.1111	40.083	22.77	9.81
23	15	3	144300.1443	27	1298701.299	0.1111	13.361	22.77	13.87
88	16	11	496031.746	99	4464285.714	0.1111	45.929	22.77	7.25
21	10	12	865800.8658	100	7215007.215	0.1200	74.228	24.59	7.53
12	16	5	225468.9755	41	1848845.599	0.1220	19.021	24.99	11.85
26	20	6	216450.2165	43	1551226.551	0.1395	15.959	28.59	12.47
5	9	12	962000.962	78	6253006.253	0.1538	64.331	31.51	9.79
25	10	8	577200.5772	131	3751803.752	0.1538	38.599	31.51	11.98
42	18	2	80166.74683	13	521083.8544	0.1538	5.361	31.51	23.94
34	12	11	661375.6614	132	3727753.728	0.1774	38.351	36.33	11.90
2	8	6	541125.5411	32	2886002.886	0.1875	29.691	38.39	17.09
47	12	5	300625.3006	20	1202501.203	0.2500	12.371	51.13	25.58
3	15	37	1779701.78	107	5146705.147	0.3458	52.950	70.62	13.52

(table cont'd)

Sample No.	177-10	Central age	18.36123583 ±	1.837 Ma
Irrad. No.	GAR 78	age dispersion	73.30390422 %	
Position	0			
Date	43048	Pooled age	17.58087623 ±	0.785 Ma
Analyst	AC			
		Mean age	19.92742355 ±	2.282 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	318.6779791 with	71.000 df
No. of grains	72	P(chi-sq)	4.41012E-31 %	
Total Ns	639.00021 tr			
Total Ni	7453 tr			
Total Nd	3367 tr			
rho-d (CN5)	1215000 tr/cm^2			
mean rho-s	499000.756 tr/cm^2			
mean rho-i	5202641.34 tr/cm^2			
mean U	53.5251166 ppm			
				Depositional age 8.2 Ma

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
7	40	0.00001	0.18037518	128	1587301.587	0.0000	16.330	0.00	0.01
49	30	0.0001	2.405002405	142	1443001.443	0.0000	14.846	0.00	0.03
70	10	0.0001	7.215007215	149	3246753.247	0.0000	33.403	0.00	0.05
23	18	3	120250.1203	182	7295173.962	0.0165	75.053	3.38	1.97
52	21	2	68714.35443	143	3160860.304	0.0217	32.519	4.46	3.19
63	15	1	48100.0481	42	2020202.02	0.0238	20.784	4.89	4.95
68	10	2	144300.1443	82	5916305.916	0.0244	60.867	5.01	3.58
6	10	1	72150.07215	40	2886002.886	0.0250	29.691	5.13	5.20
50	14	2	103071.5316	69	3555967.842	0.0290	36.584	5.95	4.27
43	12	1	60125.06013	140	1984126.984	0.0303	20.413	6.22	6.31
65	40	4	72150.07215	126	2272727.273	0.0317	23.382	6.52	3.31
10	25	2	57720.05772	129	1500721.501	0.0385	15.440	7.89	5.69
16	15	5	240500.2405	131	6060606.061	0.0397	62.352	8.14	3.72

(table cont'd)

54	18	2	80166.74683	50	2004168.671	0.0400	20.619	8.21	5.92
55	14	3	154607.2975	144	3865182.437	0.0400	39.765	8.21	4.83
69	30	8	192400.1924	195	4689754.69	0.0410	48.249	8.42	3.04
36	18	3	120250.1203	72	2886002.886	0.0417	29.691	8.55	5.04
56	30	13	312650.3127	288	6926406.926	0.0451	71.259	9.26	2.63
57	15	8	384800.3848	168	8080808.081	0.0476	83.136	9.77	3.54
61	12	1	60125.06013	146	1262626.263	0.0476	12.990	9.77	10.00
58	16	11	496031.746	145	10101010.1	0.0491	103.920	10.08	3.12
38	16	3	135281.3853	60	2705627.706	0.0500	27.836	10.26	6.07
17	12	4	240500.2405	78	4689754.69	0.0513	48.249	10.52	5.40
11	18	5	200416.8671	96	3848003.848	0.0521	39.589	10.69	4.91
59	30	1	24050.02405	19	456950.457	0.0526	4.701	10.80	11.08
15	10	7	505050.5051	126	9090909.091	0.0556	93.528	11.40	4.43
28	30	10	240500.2405	135	4329004.329	0.0556	44.537	11.40	3.71
31	14	10	515357.6582	136	9276437.848	0.0556	95.437	11.40	3.71
46	20	2	72150.07215	141	1262626.263	0.0571	12.990	11.72	8.53
20	16	4	180375.1804	64	2886002.886	0.0625	29.691	12.82	6.61
21	16	10	450937.9509	160	7215007.215	0.0625	74.228	12.82	4.18
51	24	4	120250.1203	59	1773689.274	0.0678	18.248	13.91	7.19
39	60	14	168350.1684	198	2380952.381	0.0707	24.495	14.50	4.02
12	24	9	270562.7706	126	3787878.788	0.0714	38.970	14.65	5.06
41	10	4	288600.2886	55	3968253.968	0.0727	40.826	14.92	7.73
18	12	12	721500.7215	160	9620009.62	0.0750	98.971	15.38	4.61
71	18	5	200416.8671	66	2645502.646	0.0758	27.217	15.54	7.21
40	8	14	1262626.263	139	15873015.87	0.0795	163.303	16.31	4.54
29	16	3	135281.3853	37	1668470.418	0.0811	17.165	16.63	9.99
22	21	7	240500.2405	133	2954717.24	0.0814	30.398	16.69	6.57
42	12	9	541125.5411	110	6613756.614	0.0818	68.043	16.78	5.82
37	12	6	360750.3608	138	4389129.389	0.0822	45.156	16.85	7.16
25	20	7	252525.2525	134	3030303.03	0.0833	31.176	17.09	6.73
66	20	12	432900.4329	144	5194805.195	0.0833	53.444	17.09	5.14
62	18	17	681417.3481	198	7936507.937	0.0859	81.651	17.61	4.46
33	10	11	793650.7937	128	9235209.235	0.0859	95.012	17.62	5.55

(table cont'd)

32	18	15	601250.6013	173	6934423.601	0.0867	71.342	17.78	4.80
67	21	2	68714.35443	148	790215.0759	0.0870	8.130	17.83	13.15
60	12	28	1683501.684	301	18097643.1	0.0930	186.190	19.07	3.78
45	9	17	1362834.696	174	13949013.95	0.0977	143.508	20.03	5.10
64	8	7	631313.1313	147	6403318.903	0.0986	65.878	20.21	8.01
19	12	7	420875.4209	132	4088504.089	0.1029	42.063	21.10	8.38
35	15	23	1106301.106	213	10245310.25	0.1080	105.404	22.13	4.87
48	12	17	1022126.022	156	9379509.38	0.1090	96.497	22.34	5.72
1	14	12	618429.1899	126	5617398.475	0.1101	57.792	22.57	6.87
9	16	5	225468.9755	45	2029220.779	0.1111	20.877	22.77	10.74
27	18	2	80166.74683	17	681417.3481	0.1176	7.010	24.11	18.03
34	10	24	1731601.732	137	14430014.43	0.1200	148.457	24.59	5.33
2	15	1	48100.0481	8	384800.3848	0.1250	3.959	25.62	27.17
5	9	16	1282667.949	121	9700176.367	0.1322	99.796	27.09	7.22
24	12	29	1743626.744	204	12265512.27	0.1422	126.188	29.12	5.80
26	15	23	1106301.106	159	7647907.648	0.1447	78.682	29.63	6.63
47	12	17	1022126.022	114	6854256.854	0.1491	70.517	30.55	7.96
30	8	16	1443001.443	98	8838383.838	0.1633	90.930	33.44	9.03
44	8	14	1262626.263	82	7395382.395	0.1707	76.084	34.96	10.13
4	8	5	450937.9509	127	2164502.165	0.2083	22.269	42.64	20.97
53	10	7	505050.5051	32	2308802.309	0.2188	23.753	44.76	18.69
3	10	14	1010101.01	55	3968253.968	0.2545	40.826	52.06	15.61
8	14	14	721500.7215	43	2216037.93	0.3256	22.799	66.51	20.50
13	12	15	901875.9019	130	2465127.465	0.3659	25.361	74.69	22.57
72	10	19	1370851.371	42	3030303.03	0.4524	31.176	92.23	25.55
14	12	28	1683501.684	52	3126503.127	0.5385	32.166	109.63	25.77

(table cont'd)

Sample No.	177-12	Central age	6.780981761 ±	0.589 Ma
Irrad. No.	GAR 78	age dispersion	51.06744489 %	
Position	0			
Date	010/11/2017	Pooled age	6.458701255 ±	0.380 Ma
Analyst	AC			
		Mean age	7.195808286 ±	0.629 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	166.5801171 with	74.000 df
No. of grains	75	P(chi-sq)	4.34255E-07 %	
Total Ns	326.00002 tr			
Total Ni	10359 tr			
Total Nd	3367 tr			
rho-d (CN5)	1215000 tr/cm^2			
mean rho-s	171204.876 tr/cm^2			
mean rho-i	4709629.04 tr/cm^2			
mean U	48.4529737 ppm			
				Depositional age 3.17 Ma

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
49	20	0.00001	0.360750361	135	1082251.082	0.0000	11.134	0.00	0.02
12	36	1	20041.68671	179	3587461.921	0.0056	36.908	1.15	1.15
10	30	3	72150.07215	128	10894660.89	0.0066	112.085	1.36	0.79
9	30	1	24050.02405	149	3583453.583	0.0067	36.867	1.38	1.38
31	40	1	18037.51804	132	2128427.128	0.0085	21.897	1.74	1.75
22	20	1	36075.03608	130	3607503.608	0.0100	37.114	2.05	2.06
7	20	1	36075.03608	128	3535353.535	0.0102	36.372	2.09	2.11
75	20	3	108225.1082	135	10389610.39	0.0104	106.889	2.14	1.24
36	24	4	120250.1203	300	9018759.019	0.0133	92.786	2.74	1.38
45	30	3	72150.07215	212	5098605.099	0.0142	52.455	2.91	1.69
40	30	1	24050.02405	133	1659451.659	0.0145	17.073	2.98	3.00
23	21	1	34357.17721	68	2336288.051	0.0147	24.036	3.02	3.04
14	15	2	96200.0962	120	5772005.772	0.0167	59.383	3.42	2.44

(table cont'd)

73	25	1	28860.02886	60	1731601.732	0.0167	17.815	3.42	3.45
27	20	1	36075.03608	56	2020202.02	0.0179	20.784	3.67	3.70
19	20	2	72150.07215	130	3968253.968	0.0182	40.826	3.73	2.66
2	20	9	324675.3247	470	16955266.96	0.0191	174.437	3.93	1.32
34	20	6	216450.2165	132	11111111.11	0.0195	114.312	4.00	1.65
30	50	4	57720.05772	204	2943722.944	0.0196	30.285	4.02	2.03
35	21	3	103071.5316	150	5153576.582	0.0200	53.020	4.11	2.39
4	36	4	80166.74683	127	3968253.968	0.0202	40.826	4.15	2.10
3	30	3	72150.07215	147	3535353.535	0.0204	36.372	4.19	2.44
20	30	3	72150.07215	134	3222703.223	0.0224	33.155	4.60	2.68
44	20	5	180375.1804	218	7864357.864	0.0229	80.909	4.71	2.13
25	16	2	90187.59019	131	3923160.173	0.0230	40.362	4.72	3.38
29	20	6	216450.2165	228	8225108.225	0.0263	84.620	5.40	2.24
32	20	1	36075.03608	38	1370851.371	0.0263	14.103	5.40	5.47
1	20	1	36075.03608	126	1298701.299	0.0278	13.361	5.70	5.78
26	20	6	216450.2165	204	7359307.359	0.0294	75.713	6.04	2.50
38	30	2	48100.0481	68	1635401.635	0.0294	16.825	6.04	4.33
46	50	6	86580.08658	134	2669552.67	0.0324	27.465	6.66	2.76
13	15	2	96200.0962	129	2837902.838	0.0339	29.197	6.96	5.00
5	18	11	440917.1076	297	11904761.9	0.0370	122.477	7.60	2.34
33	20	2	72150.07215	54	1948051.948	0.0370	20.042	7.60	5.47
47	27	3	80166.74683	80	2137779.916	0.0375	21.994	7.70	4.53
21	40	3	54112.55411	74	1334776.335	0.0405	13.732	8.32	4.90
28	16	4	180375.1804	131	4329004.329	0.0417	44.537	8.55	4.37
11	10	7	505050.5051	164	11832611.83	0.0427	121.735	8.76	3.38
41	21	8	274857.4177	186	6390434.962	0.0430	65.745	8.83	3.19
48	21	2	68714.35443	45	1546072.975	0.0444	15.906	9.12	6.59
6	12	7	420875.4209	152	9139009.139	0.0461	94.023	9.45	3.66
42	25	6	173160.1732	125	3607503.608	0.0480	37.114	9.85	4.12
74	21	5	171785.8861	101	3470074.899	0.0495	35.700	10.16	4.66
39	30	1	24050.02405	19	456950.457	0.0526	4.701	10.80	11.08
43	40	4	72150.07215	134	1262626.263	0.0571	12.990	11.72	6.03
16	15	9	432900.4329	129	7215007.215	0.0600	74.228	12.31	4.23

(table cont'd)

37	30	1	24050.02405	133	384800.3848	0.0625	3.959	12.82	13.22
18	18	8	320666.9873	112	4489337.823	0.0714	46.187	14.65	5.37
8	21	25	858929.4304	348	11956297.67	0.0718	123.007	14.73	3.06
15	30	6	144300.1443	80	1924001.924	0.0750	19.794	15.38	6.52
24	16	16	721500.7215	210	9469696.97	0.0762	97.425	15.63	4.06
17	15	6	288600.2886	61	2934102.934	0.0984	30.186	20.17	8.63

(table cont'd)

Sample No.	177-13	Central age	7.679331176 ±	0.757 Ma
Irrad. No.	GAR 78	age dispersion	50.81398755 %	
Position	0			
Date	43052	Pooled age	7.46804309 ±	0.449 Ma
Analyst	AC			
		Mean age	7.708743653 ±	0.776 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	125.3451402 with	48.000 df
No. of grains	49	P(chi-sq)	7.84622E-07 %	
Total Ns	313.00002 tr			
Total Ni	8601 tr			
Total Nd	3367 tr			
rho-d (CN5)	1215000 tr/cm^2			
mean rho-s	211338.725 tr/cm^2			
mean rho-i	4528452.42 tr/cm^2			
mean U	46.5890166 ppm			
				Depositional age 3.43 Ma

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
36	30	0.00001	0.240500241	47	1130351.13	0.0000	11.629	0.00	0.01
46	15	0.00001	0.481000481	134	481000.481	0.0000	4.949	0.00	0.06
39	50	1	14430.01443	200	2886002.886	0.0050	29.691	1.03	1.03
1	50	3	43290.04329	126	3896103.896	0.0111	40.083	2.28	1.32
4	30	2	48100.0481	127	4232804.233	0.0114	43.547	2.33	1.66
9	40	1	18037.51804	80	1443001.443	0.0125	14.846	2.57	2.58
45	42	1	17178.58861	72	1236858.38	0.0139	12.725	2.85	2.87
13	30	1	24050.02405	129	1635401.635	0.0147	16.825	3.02	3.04
16	40	8	144300.1443	129	9343434.343	0.0154	96.126	3.17	1.13
24	30	2	48100.0481	110	2645502.646	0.0182	27.217	3.73	2.66
27	40	4	72150.07215	210	3787878.788	0.0190	38.970	3.91	1.97
10	40	2	36075.03608	128	1875901.876	0.0192	19.299	3.95	2.82
41	40	1	18037.51804	45	811688.3117	0.0222	8.351	4.56	4.61

(table cont'd)

21	20	9	324675.3247	392	14141414.14	0.0230	145.488	4.71	1.59
37	50	7	101010.101	133	4386724.387	0.0230	45.131	4.73	1.81
14	30	3	72150.07215	124	2982202.982	0.0242	30.681	4.97	2.90
11	24	4	120250.1203	160	4810004.81	0.0250	49.486	5.13	2.60
42	50	3	43290.04329	120	1731601.732	0.0250	17.815	5.13	3.00
6	40	8	144300.1443	296	5339105.339	0.0270	54.929	5.55	1.99
48	30	10	240500.2405	360	8658008.658	0.0278	89.074	5.70	1.83
8	60	6	72150.07215	204	2453102.453	0.0294	25.238	6.04	2.50
7	40	9	162337.6623	128	5483405.483	0.0296	56.414	6.08	2.06
44	40	4	72150.07215	134	2417027.417	0.0299	24.867	6.13	3.11
12	36	5	100208.4335	166	3326919.994	0.0301	34.228	6.18	2.81
25	40	6	108225.1082	131	3571428.571	0.0303	36.743	6.22	2.58
3	40	1	18037.51804	32	577200.5772	0.0313	5.938	6.41	6.51
19	28	6	154607.2975	130	4947433.519	0.0313	50.900	6.41	2.66
32	60	8	96200.0962	224	2693602.694	0.0357	27.712	7.33	2.64
34	50	2	28860.02886	132	793650.7937	0.0364	8.165	7.46	5.37
18	40	20	360750.3608	548	9884559.885	0.0365	101.693	7.49	1.71
22	25	6	173160.1732	130	4675324.675	0.0370	48.100	7.60	3.16
43	40	4	72150.07215	134	1948051.948	0.0370	20.042	7.60	3.87
2	30	6	144300.1443	158	3799903.8	0.0380	39.094	7.79	3.24
35	30	7	168350.1684	156	3751803.752	0.0449	38.599	9.21	3.56
26	20	7	252525.2525	152	5483405.483	0.0461	56.414	9.45	3.66
49	30	3	72150.07215	135	1515151.515	0.0476	15.588	9.77	5.78
28	16	12	541125.5411	131	11093073.59	0.0488	114.126	10.01	2.96
23	35	5	103071.5316	95	1958359.101	0.0526	20.148	10.80	4.96
20	28	23	592661.3069	432	11131725.42	0.0532	114.524	10.92	2.34
31	40	8	144300.1443	132	2705627.706	0.0533	27.836	10.94	3.97
15	10	9	649350.6494	162	11688311.69	0.0556	120.250	11.40	3.91
38	30	15	360750.3608	238	5723905.724	0.0630	58.888	12.93	3.45
47	30	6	144300.1443	88	2116402.116	0.0682	21.774	13.98	5.91
30	40	2	36075.03608	29	523088.0231	0.0690	5.382	14.15	10.34
33	36	3	60125.06013	43	861792.5285	0.0698	8.866	14.31	8.55
17	12	12	721500.7215	162	9740259.74	0.0741	100.208	15.19	4.55

(table cont'd)

5	14	12	618429.1899	152	7833436.405	0.0789	80.591	16.19	4.86
29	10	11	793650.7937	108	7792207.792	0.1019	80.167	20.88	6.62
40	9	25	2004168.671	133	13949013.95	0.1437	143.508	29.43	6.32

(table cont'd)

Sample No.	177-14	Central age	11.39964194 ±	3.114 Ma
Irrad. No.	GAR 78	age dispersion	180.0227008 %	
Position	0			
Date	43132	Pooled age	7.66665344 ±	0.525 Ma
Analyst	AC			
		Mean age	17.19167342 ±	7.424 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	519.780789 with	45.000 df
No. of grains	46	P(chi-sq)	5.12008E-80 %	
Total Ns	236 tr			
Total Ni	6317 tr			
Total Nd	3367 tr			
rho-d (CN5)	1215000 tr/cm^2			
mean rho-s	186315.487 tr/cm^2			
mean rho-i	3801016.05 tr/cm^2			
mean U	39.1051034 ppm			
				Depositional age 5.78 Ma

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
18	20	1	36075.03608	253	9126984.127	0.0040	93.899	0.81	0.81
38	40	2	36075.03608	280	5050505.051	0.0071	51.960	1.47	1.04
36	60	2	24050.02405	171	2056277.056	0.0117	21.155	2.40	1.71
19	16	1	45093.79509	130	3878066.378	0.0116	39.898	2.39	2.40
42	30	1	24050.02405	86	2068302.068	0.0116	21.279	2.39	2.40
21	50	3	43290.04329	200	2886002.886	0.0150	29.691	3.08	1.79
32	15	2	96200.0962	144	6926406.926	0.0139	71.259	2.85	2.03
14	40	5	90187.59019	300	5411255.411	0.0167	55.671	3.42	1.54
25	40	2	36075.03608	131	2525252.525	0.0143	25.980	2.93	2.09
26	14	1	51535.76582	76	3916718.202	0.0132	40.295	2.70	2.72
29	40	1	18037.51804	76	1370851.371	0.0132	14.103	2.70	2.72
10	30	2	48100.0481	128	2741702.742	0.0175	28.207	3.60	2.57
6	40	9	162337.6623	394	7106782.107	0.0228	73.115	4.69	1.58

(table cont'd)

35	24	2	60125.06013	110	3306878.307	0.0182	34.021	3.73	2.66
41	20	4	144300.1443	188	6782106.782	0.0213	69.775	4.37	2.21
23	40	1	18037.51804	62	1118326.118	0.0161	11.505	3.31	3.34
9	30	2	48100.0481	104	2501202.501	0.0192	25.733	3.95	2.82
15	15	2	96200.0962	96	4617604.618	0.0208	47.506	4.28	3.06
34	30	5	120250.1203	132	4834054.834	0.0249	49.733	5.11	2.31
1	40	6	108225.1082	126	4148629.149	0.0261	42.681	5.35	2.22
12	25	1	28860.02886	50	1443001.443	0.0200	14.846	4.11	4.15
22	40	10	180375.1804	130	5808080.808	0.0311	59.754	6.37	2.05
17	30	2	48100.0481	81	1948051.948	0.0247	20.042	5.07	3.63
7	36	1	20041.68671	128	881834.2152	0.0227	9.072	4.67	4.72
44	30	5	120250.1203	156	3751803.752	0.0321	38.599	6.58	2.99
3	30	2	48100.0481	71	1707551.708	0.0282	17.567	5.78	4.15
8	20	2	72150.07215	71	2561327.561	0.0282	26.351	5.78	4.15
45	12	5	300625.3006	146	8778258.778	0.0342	90.311	7.03	3.20
30	25	2	57720.05772	66	1904761.905	0.0303	19.596	6.22	4.47
27	20	11	396825.3968	268	9668109.668	0.0410	99.466	8.42	2.60
16	30	5	120250.1203	129	3030303.03	0.0397	31.176	8.14	3.72
20	25	4	115440.1154	98	2828282.828	0.0408	29.098	8.38	4.27
4	20	5	180375.1804	127	4112554.113	0.0439	42.310	9.00	4.11
46	21	10	343571.7721	134	7008864.152	0.0490	72.108	10.06	3.26
28	30	7	168350.1684	131	3463203.463	0.0486	35.630	9.97	3.86
40	30	8	192400.1924	133	3823953.824	0.0503	39.341	10.32	3.74
5	15	6	288600.2886	113	5435305.435	0.0531	55.919	10.89	4.57
13	60	20	240500.2405	129	3535353.535	0.0680	36.372	13.95	3.23
31	20	11	396825.3968	132	5483405.483	0.0724	56.414	14.84	4.64
43	15	3	144300.1443	134	2212602.213	0.0652	22.763	13.38	7.97
2	25	12	346320.3463	130	3751803.752	0.0923	38.599	18.93	5.72
24	16	3	135281.3853	31	1397907.648	0.0968	14.382	19.84	12.00
33	15	3	144300.1443	30	1443001.443	0.1000	14.846	20.50	12.42
11	10	16	1154401.154	62	4473304.473	0.2581	46.022	52.77	14.83
39	10	8	577200.5772	16	1154401.154	0.5000	11.877	101.86	44.14
37	10	20	1443001.443	133	865800.8658	1.6667	8.907	333.45	121.89

(table cont'd)

Sample No.	177-15	Central age	7.767539467 ±	0.759 Ma
Irrad. No.	GAR 78	age dispersion	56.18701287 %	
Position	0			
Date	43136	Pooled age	7.622401637 ±	0.429 Ma
Analyst	AC			
		Mean age	8.651242078 ±	1.116 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	160.1430483 with	54.000 df
No. of grains	55	P(chi-sq)	1.89254E-10 %	
Total Ns	361.00001 tr			
Total Ni	9719 tr			
Total Nd	3367 tr	MTL	#DIV/0! ±	#DIV/0! μm
rho-d (CN5)	1215000 tr/cm^2	SD	#DIV/0! μm	
mean rho-s	179849.414 tr/cm^2	N	0	
mean rho-i	4073465.54 tr/cm^2			Depositional age 5.82 Ma
mean U	41.9080816 ppm			

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
25	60	0.00001	0.12025012	131	913900.9139	0.0000	9.402	0.00	0.01
18	80	1	9018.759019	214	1930014.43	0.0047	19.856	0.96	0.96
54	30	1	24050.02405	136	2741702.742	0.0088	28.207	1.80	1.81
42	50	2	28860.02886	189	2727272.727	0.0106	28.058	2.17	1.54
36	70	1	10307.15316	84	865800.8658	0.0119	8.907	2.44	2.46
45	36	3	60125.06013	237	4749879.75	0.0127	48.867	2.60	1.51
21	30	4	96200.0962	312	7503607.504	0.0128	77.198	2.63	1.33
23	60	2	24050.02405	140	1683501.684	0.0143	17.320	2.93	2.09
48	60	2	24050.02405	135	1623376.623	0.0148	16.701	3.04	2.17
29	40	2	36075.03608	132	2380952.381	0.0152	24.495	3.11	2.22
2	60	3	36075.03608	194	2332852.333	0.0155	24.001	3.17	1.85
8	40	2	36075.03608	121	2182539.683	0.0165	22.454	3.39	2.42
6	40	1	18037.51804	58	1046176.046	0.0172	10.763	3.54	3.57

(table cont'd)

51	28	2	51535.76582	135	2679859.823	0.0192	27.571	3.95	2.82
3	40	5	90187.59019	244	4401154.401	0.0205	45.279	4.21	1.90
43	20	2	72150.07215	134	3463203.463	0.0208	35.630	4.28	3.06
52	50	3	43290.04329	144	2077922.078	0.0208	21.378	4.28	2.50
55	20	2	72150.07215	96	3463203.463	0.0208	35.630	4.28	3.06
49	30	7	168350.1684	135	7575757.576	0.0222	77.940	4.56	1.74
14	40	5	90187.59019	220	3968253.968	0.0227	40.826	4.67	2.11
16	30	4	96200.0962	129	3896103.896	0.0247	40.083	5.07	2.57
4	40	1	18037.51804	127	703463.2035	0.0256	7.237	5.26	5.33
41	40	5	90187.59019	178	3210678.211	0.0281	33.032	5.77	2.62
27	60	8	96200.0962	284	3415103.415	0.0282	35.135	5.78	2.08
38	35	11	226757.3696	385	7936507.937	0.0286	81.651	5.86	1.80
37	30	12	288600.2886	133	9956709.957	0.0290	102.435	5.95	1.75
40	60	14	168350.1684	133	5591630.592	0.0301	57.527	6.18	1.68
24	40	8	144300.1443	250	4509379.509	0.0320	46.393	6.57	2.36
7	30	4	96200.0962	128	2958152.958	0.0325	30.434	6.67	3.39
22	40	7	126262.6263	130	3463203.463	0.0365	35.630	7.48	2.88
53	30	4	96200.0962	106	2549302.549	0.0377	26.227	7.74	3.95
32	40	5	90187.59019	132	2380952.381	0.0379	24.495	7.77	3.54
5	16	6	270562.7706	156	7034632.035	0.0385	72.373	7.89	3.29
31	30	3	72150.07215	132	1827801.828	0.0395	18.805	8.10	4.77
17	30	4	96200.0962	100	2405002.405	0.0400	24.743	8.21	4.19
34	50	6	86580.08658	132	2135642.136	0.0405	21.972	8.32	3.47
11	16	5	225468.9755	119	5366161.616	0.0420	55.207	8.62	3.94
10	40	14	252525.2525	128	5988455.988	0.0422	61.610	8.65	2.37
28	30	6	144300.1443	131	3415103.415	0.0423	35.135	8.67	3.62
1	30	19	456950.457	126	10341510.34	0.0442	106.394	9.07	2.13
46	30	12	288600.2886	134	5844155.844	0.0494	60.125	10.13	3.00
9	21	9	309214.5949	180	6184291.899	0.0500	63.624	10.26	3.51
39	36	2	40083.37342	39	781625.7816	0.0513	8.041	10.52	7.63
30	40	18	324675.3247	339	6114718.615	0.0531	62.909	10.89	2.64
50	18	4	160333.4937	68	2725669.392	0.0588	28.042	12.07	6.21
47	28	16	412286.1266	256	6596578.025	0.0625	67.866	12.82	3.31

(table cont'd)

26	30	14	336700.3367	201	4834054.834	0.0697	49.733	14.29	3.96
15	25	11	317460.3175	155	4473304.473	0.0710	46.022	14.56	4.55
19	20	2	72150.07215	130	974025.974	0.0741	10.021	15.19	11.14
44	24	8	240500.2405	107	3216690.717	0.0748	33.094	15.33	5.63
13	10	16	1154401.154	129	13852813.85	0.0833	142.519	17.09	4.46
12	14	20	1030715.316	222	11440940.01	0.0901	117.705	18.47	4.32
35	20	15	541125.5411	120	4329004.329	0.1250	44.537	25.62	7.03
33	25	16	461760.4618	104	3001443.001	0.1538	30.879	31.51	8.48
20	21	2	68714.35443	8	274857.4177	0.2500	2.828	51.13	40.43

(table cont'd)

Sample No.	177-16	Central age	13.68030242 ±	1.618 Ma
Irrad. No.	GAR 78	age dispersion	94.07834073 %	
Position	0			
Date	43129	Pooled age	12.38284954 ±	0.595 Ma
Analyst	AC			
		Mean age	16.96763127 ±	4.164 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	437.1582448 with	79.000 df
No. of grains	80	P(chi-sq)	5.22641E-49 %	
Total Ns	528 tr			
Total Ni	8747 tr			
Total Nd	3367 tr			
rho-d (CN5)	1215000 tr/cm^2			
mean rho-s	389257.871 tr/cm^2			
mean rho-i	5048353.97 tr/cm^2			
mean U	51.937798 ppm			
				Depositional age 5.87 Ma

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
79	30	1	24050.02405	146	3511303.511	0.0068	36.125	1.41	1.41
12	40	1	18037.51804	106	1911976.912	0.0094	19.671	1.94	1.95
11	30	2	48100.0481	154	3703703.704	0.0130	38.104	2.67	1.90
46	30	3	72150.07215	134	4256854.257	0.0169	43.795	3.48	2.03
35	20	5	180375.1804	228	8225108.225	0.0219	84.620	4.50	2.04
4	24	1	30062.53006	127	1833814.334	0.0164	18.866	3.37	3.39
73	12	2	120250.1203	88	5291005.291	0.0227	54.434	4.67	3.34
28	50	5	72150.07215	131	2640692.641	0.0273	27.168	5.61	2.54
20	8	1	90187.59019	50	4509379.509	0.0200	46.393	4.11	4.15
49	18	1	40083.37342	135	1883918.551	0.0213	19.382	4.37	4.41
14	40	2	36075.03608	80	1443001.443	0.0250	14.846	5.13	3.67
3	12	1	60125.06013	46	2765752.766	0.0217	28.454	4.46	4.51
15	16	2	90187.59019	78	3517316.017	0.0256	36.186	5.26	3.77

(table cont'd)

48	40	2	36075.03608	76	1370851.371	0.0263	14.103	5.40	3.87
8	40	1	18037.51804	44	793650.7937	0.0227	8.165	4.67	4.72
27	20	4	144300.1443	128	4617604.618	0.0313	47.506	6.41	3.26
75	20	3	108225.1082	135	3354978.355	0.0323	34.516	6.62	3.89
25	20	9	324675.3247	131	8441558.442	0.0385	86.847	7.89	2.68
24	21	1	34357.17721	39	1339929.911	0.0256	13.785	5.26	5.33
41	20	7	252525.2525	186	6709956.71	0.0376	69.032	7.72	2.98
21	12	5	300625.3006	129	7756132.756	0.0388	79.796	7.95	3.63
80	32	2	45093.79509	57	1285173.16	0.0351	13.222	7.20	5.18
39	18	4	160333.4937	100	4008337.342	0.0400	41.238	8.21	4.19
23	30	5	120250.1203	118	2837902.838	0.0424	29.197	8.69	3.97
74	16	4	180375.1804	92	4148629.149	0.0435	42.681	8.92	4.56
43	14	3	154607.2975	134	3710575.139	0.0417	38.175	8.55	5.04
38	10	5	360750.3608	110	7936507.937	0.0455	81.651	9.33	4.27
9	12	1	60125.06013	30	1803751.804	0.0333	18.557	6.84	6.95
17	16	1	45093.79509	28	1262626.263	0.0357	12.990	7.33	7.46
29	12	6	360750.3608	116	6974506.975	0.0517	71.754	10.61	4.45
22	12	12	721500.7215	130	12626262.63	0.0571	129.900	11.72	3.49
26	15	21	1010101.01	342	16450216.45	0.0614	169.241	12.60	2.84
30	15	11	529100.5291	189	9090909.091	0.0582	93.528	11.94	3.71
42	40	7	126262.6263	124	2236652.237	0.0565	23.011	11.58	4.50
44	10	1	72150.07215	25	1803751.804	0.0400	18.557	8.21	8.37
76	15	8	384800.3848	132	6349206.349	0.0606	65.321	12.43	4.53
13	15	2	96200.0962	129	1972101.972	0.0488	20.289	10.01	7.25
6	40	1	18037.51804	24	432900.4329	0.0417	4.454	8.55	8.73
2	16	3	135281.3853	54	2435064.935	0.0556	25.052	11.40	6.76
34	40	7	126262.6263	132	1948051.948	0.0648	20.042	13.30	5.19
33	12	4	240500.2405	64	3848003.848	0.0625	39.589	12.82	6.61
37	15	10	481000.481	133	6493506.494	0.0741	66.806	15.19	4.99
1	8	1	90187.59019	126	1713564.214	0.0526	17.629	10.80	11.08
10	30	2	48100.0481	128	769600.7696	0.0625	7.918	12.82	9.35
31	14	9	463821.8924	132	5772005.772	0.0804	59.383	16.48	5.72
78	15	4	192400.1924	136	2549302.549	0.0755	26.227	15.48	8.03

(table cont'd)

36	12	5	300625.3006	59	3547378.547	0.0847	36.496	17.38	8.10
77	20	4	144300.1443	48	1731601.732	0.0833	17.815	17.09	8.90
16	12	11	661375.6614	129	6253006.253	0.1058	64.331	21.68	6.88
5	12	3	180375.1804	34	2044252.044	0.0882	21.031	18.09	10.90
7	10	15	1082251.082	128	9235209.235	0.1172	95.012	24.02	6.57
18	3	16	3848003.848	132	31746031.75	0.1212	326.605	24.84	6.59
40	12	15	901875.9019	133	7034632.035	0.1282	72.373	26.27	7.22
47	6	13	1563251.563	101	12145262.15	0.1287	124.951	26.38	7.78
45	10	5	360750.3608	40	2886002.886	0.1250	29.691	25.62	12.16
19	8	19	1713564.214	130	8116883.117	0.2111	83.507	43.20	10.93
32	10	26	1875901.876	100	7215007.215	0.2600	74.228	53.17	11.74

(table cont'd)

Sample No.	177-17	Central age	14.72356408 ±	1.218 Ma
Irrad. No.	GAR 78	age dispersion	39.86088431 %	
Position	0			
Date	43123	Pooled age	15.73351399 ±	0.833 Ma
Analyst	AC			
		Mean age	14.50862025 ±	1.276 Ma
zeta (CN5)	338			
zeta error	5	Chi squared	101.9462148 with	50.000 df
No. of grains	51	P(chi-sq)	0.002041795 %	
Total Ns	430 tr			
Total Ni	5605 tr			
Total Nd	3367 tr			
rho-d (CN5)	1215000 tr/cm^2			
mean rho-s	326314.027 tr/cm^2			
mean rho-i	4139609.27 tr/cm^2			
mean U	42.5885727 ppm			
				Depositional age 7.78 Ma

crystal	Ng	Ns	rho-s	Ni	rho-i	Ns/Ni	U	age	error
14	40	1	18037.51804	94	1695526.696	0.0106	17.444	2.18	2.20
1	20	1	36075.03608	126	2705627.706	0.0133	27.836	2.74	2.76
11	25	2	57720.05772	105	3030303.03	0.0190	31.176	3.91	2.79
36	50	2	28860.02886	100	1443001.443	0.0200	14.846	4.11	2.93
29	20	1	36075.03608	56	2020202.02	0.0179	20.784	3.67	3.70
46	30	1	24050.02405	134	1226551.227	0.0196	12.619	4.02	4.06
43	20	2	72150.07215	134	3138528.139	0.0230	32.289	4.72	3.38
39	35	2	41228.61266	86	1772830.344	0.0233	18.239	4.77	3.42
25	15	1	48100.0481	131	2212602.213	0.0217	22.763	4.46	4.51
7	18	1	40083.37342	128	1723585.057	0.0233	17.732	4.77	4.83
9	20	1	36075.03608	39	1406926.407	0.0256	14.475	5.26	5.33
30	15	1	48100.0481	39	1875901.876	0.0256	19.299	5.26	5.33
38	16	20	901875.9019	418	18849206.35	0.0478	193.922	9.82	2.25

(table cont'd)

50	40	2	36075.03608	54	974025.974	0.0370	10.021	7.60	5.47
31	12	3	180375.1804	132	4449254.449	0.0405	45.774	8.32	4.90
10	18	1	40083.37342	128	1202501.203	0.0333	12.371	6.84	6.95
20	18	6	240500.2405	120	4810004.81	0.0500	49.486	10.26	4.30
47	20	5	180375.1804	100	3607503.608	0.0500	37.114	10.26	4.70
34	30	5	120250.1203	132	2356902.357	0.0510	24.248	10.47	4.80
45	9	10	801667.4683	162	12987012.99	0.0617	133.611	12.66	4.13
15	30	8	192400.1924	132	3174603.175	0.0606	32.661	12.43	4.53
24	20	3	108225.1082	54	1948051.948	0.0556	20.042	11.40	6.76
2	10	4	288600.2886	67	4834054.834	0.0597	49.733	12.25	6.31
3	25	15	432900.4329	210	6060606.061	0.0714	62.352	14.65	3.92
22	35	2	41228.61266	130	762729.3342	0.0541	7.847	11.09	8.05
51	10	8	577200.5772	113	8152958.153	0.0708	83.878	14.52	5.32
42	20	4	144300.1443	61	2200577.201	0.0656	22.640	13.45	6.95
28	30	22	529100.5291	131	6493506.494	0.0815	66.806	16.71	3.72
37	20	1	36075.03608	133	721500.7215	0.0500	7.423	10.26	10.51
26	18	6	240500.2405	82	3286836.62	0.0732	33.815	15.01	6.35
49	24	17	511063.0111	135	6102693.603	0.0837	62.785	17.17	4.35
40	15	9	432900.4329	133	5483405.483	0.0789	56.414	16.19	5.61
5	10	6	432900.4329	80	5772005.772	0.0750	59.383	15.38	6.52
17	30	26	625300.6253	290	6974506.975	0.0897	71.754	18.38	3.78
13	21	11	377928.9494	129	4535147.392	0.0833	46.658	17.09	5.37
41	15	7	336700.3367	84	4040404.04	0.0833	41.568	17.09	6.73
16	30	25	601250.6013	129	6132756.133	0.0980	63.094	20.10	4.23
48	21	28	962000.962	279	9585652.443	0.1004	98.618	20.57	4.09
21	20	25	901875.9019	250	9018759.019	0.1000	92.786	20.50	4.31
32	18	8	320666.9873	90	3607503.608	0.0889	37.114	18.23	6.73
6	16	5	225468.9755	55	2480158.73	0.0909	25.516	18.64	8.71
44	20	4	144300.1443	42	1515151.515	0.0952	15.588	19.53	10.22
33	28	19	489589.7753	156	4019789.734	0.1218	41.356	24.96	6.08
4	12	11	661375.6614	127	5531505.532	0.1196	56.908	24.50	7.83
23	20	2	72150.07215	22	793650.7937	0.0909	8.165	18.64	13.77
8	30	35	841750.8418	226	5435305.435	0.1549	55.919	31.72	5.79

(table cont'd)

27	25	2	57720.05772	19	548340.5483	0.1053	5.641	21.58	16.05
19	10	11	793650.7937	130	5483405.483	0.1447	56.414	29.65	9.58
35	12	28	1683501.684	165	9920634.921	0.1697	102.064	34.75	7.13
18	10	7	505050.5051	35	2525252.525	0.2000	25.980	40.94	16.96
12	25	3	86580.08658	17	490620.4906	0.1765	5.048	36.13	22.64

APPENDIX D. BULK SEDIMENT MAJOR ELEMENT OF IODP SITES U1456, U1457 AND INDUS MARINE A-1

Sample Name	Age (Ma)	SiO ₂ (wt%)	Al ₂ O ₃ (wt%)	Fe ₂ O ₃ (wt%)	MgO (wt%)	TiO ₂ (wt%)	CaO (wt%)	Na ₂ O (wt%)	K ₂ O (wt%)	P ₂ O ₅ (wt%)	MnO (wt%)	Sr (ppm)	Ba (ppm)	Zr (ppm)	Sc (ppm)	Mean Grain Size
U1456A-1H-2, 145-150 cm	0.033	57.52	13.76	7.06	3.01	1.20	2.17	1.58	2.13	0.20	0.05	173.92	398.88	209.12	18.28	12.69
U1456A-6H-5, 145-150 cm	0.476	70.15	12.73	4.09	1.81	0.66	1.73	2.18	2.35	0.17	0.04	167.56	404.48	208.12	11.76	46.28
U1456A-11H-6 60-69 cm	0.842	56.53	14.00	8.68	2.86	1.44	3.14	1.98	1.96	0.21	0.04		323.47	174.37	244.14	31.93
U1456A-15H-5 129-134 cm	1.186	69.67	11.53	3.79	1.78	0.53	2.22	1.99	2.17	0.11	0.05	166.15	362.92	235.82	9.85	47.66
U1456A-25F-3 75-80 cm	1.308	59.26	16.55	6.44	3.09	0.73	3.93	1.93	3.16	0.15	0.06	318.89	532.37	156.98	16.58	40.86
U1456A-26F-3 50-58 cm	1.317	71.08	12.15	3.80	1.52	0.57	1.50	1.99	2.47	0.12	0.04		345.06	214.90	141.28	125.15
U1456A-51F-3 100-110 cm	1.556	71.69	12.23	3.81	1.66	0.60	1.54	2.10	2.52	0.13	0.04		399.69	216.05	151.39	137.35
U1456A-58F-1 89-99 cm	1.631	52.79	15.10	8.21	4.76	0.91	0.91	0.87	2.82	0.20	0.10	105.80	534.30	184.03	20.17	9.81
U1456A-61F-3 40-50 cm	1.923	72.28	11.36	3.33	1.40	0.54	1.87	2.03	2.22	0.11	0.04		321.73	223.83	158.35	142.24
U1456A-63F-1 140-150 cm	2.494	55.76	17.09	7.35	2.93	0.81	0.89	0.94	3.38	0.14	0.06	104.33	623.15	191.74	17.09	15.16
U1456A-63F-2 20-30 cm	2.499	68.28	13.09	4.61	2.00	0.71	1.50	1.92	2.50	0.14	0.05		461.68	229.54	136.94	62.11
U1456A-70F-2 10-16 cm	3.017	60.92	16.16	5.87	2.69	0.80	1.06	1.37	3.23	0.12	0.04		491.67	168.68	130.54	13.50
U1456A-72X-4 140-150 cm	3.290	49.25	15.64	8.87	4.15	1.07	1.11	0.53	2.77	0.22	0.06	113.70	580.26	172.80	22.56	8.08
U1456C-45X-2 111-121 cm	3.565	55.15	15.69	7.16	2.70	0.79	0.81	0.89	3.00	0.13	0.05	109.50	477.94	193.04	17.08	17.83
U1456C-45X-3 45-51 cm	3.567	64.81	14.33	5.25	2.39	0.73	1.13	1.59	2.87	0.10	0.04		423.64	138.95	132.12	60.31
U1456D-3R-CC 10-15 cm	5.564	57.48	16.79	7.23	2.93	0.84	0.79	0.86	3.26	0.15	0.06	111.59	473.12	183.06	17.47	12.33
U1456D-5R-1 12-20 cm	5.720	61.90	15.40	5.75	2.57	0.80	1.11	1.50	3.05	0.13	0.04		473.77	219.71	132.49	29.85
U1456D-5R-2 94-104 cm	5.736	68.29	13.57	4.94	1.98	0.69	1.40	1.90	2.59	0.13	0.05	171.05	484.35	212.64	13.29	68.44
U1456D-6R-CC 5-10 cm	5.793	57.11	16.75	7.19	3.02	0.89	0.81	0.84	3.14	0.15	0.05	110.45	432.40	202.83	17.26	9.57
U1456D-7R-1 84-94 cm	5.869	63.20	14.47	5.48	2.30	0.78	1.23	1.57	2.72	0.13	0.05	146.84	484.36	204.73	14.47	25.90
U1456D-8R-5 140-150 cm	6.152	58.86	14.76	6.34	3.44	0.84	1.02	1.15	2.53	0.10	0.05	125.27	429.10	181.49	11.50	9.27
U1456D-9R-5 123-133 cm	6.538	54.56	15.83	7.63	4.37	0.92	0.60	0.77	2.93	0.12	0.06	95.31	495.20	171.88	20.14	7.92
U1456D-10R-3 135-145 cm	6.790	51.18	15.22	7.75	4.34	0.88	1.23	0.58	2.67	0.16	0.08	106.61	446.69	159.58	20.32	8.46
U1456D-11R-CC WRND	6.948	67.78	12.61	4.50	1.99	0.62	1.78	2.01	2.18	0.09	0.05	185.60	344.58	154.26	7.94	97.10
U1456D-12R-1 30-36 cm	6.997	67.20	13.36	4.70	2.24	0.67	2.05	2.06	2.37	0.14	0.05		318.54	169.97	187.87	94.61
U1456D-13R-1 30-38 cm	7.065	63.84	13.55	4.84	2.37	0.68	1.60	1.95	2.62	0.12	0.04		336.16	156.73	163.81	99.15
U1456D-14R-CC 10-15 cm	7.132	58.06	15.87	6.70	3.07	0.82	0.89	1.02	2.97	0.14	0.05	118.26	318.25	178.92	16.69	9.71
U1456D-15R-1 55-61 cm	7.268	65.51	13.66	4.79	2.33	0.69	1.62	1.92	2.61	0.13	0.04		331.09	169.16	165.61	43.26
U1456D-17R-CC 10-15 cm	7.552	57.68	16.65	6.42	3.03	0.83	0.89	1.12	3.18	0.16	0.04	123.69	361.22	185.98	17.61	10.01
U1456D-19R-2 20-26 cm	7.663	64.67	14.54	5.09	2.39	0.71	1.53	1.97	2.97	0.16	0.04		398.27	175.21	169.39	63.99
U1456D-20R-1 95-103 cm	7.719	63.54	14.45	4.86	2.45	0.75	1.36	1.64	2.85	0.15	0.04		304.93	190.55	145.24	32.27
U1456D-21R-2 115-130 cm	7.789	56.10	15.19	6.70	3.63	0.77	4.03	1.06	2.61	0.14	0.09	162.03	319.51	150.04	16.50	20.37
U1456D-22R-1 73-83 cm	7.837	62.40	15.48	5.42	2.63	0.78	1.31	1.55	2.94	0.14	0.04		338.42	170.04	146.27	27.18
U1456D-26R-2 37-43 cm	8.085	67.41	12.96	4.51	2.28	0.64	1.66	2.12	2.37	0.14	0.04		348.37	208.41	166.12	71.76

(table cont'd)

Sample Name	Age (Ma)	SiO ₂ (wt%)	Al ₂ O ₃ (wt%)	Fe ₂ O ₃ (wt%)	MgO (wt%)	TiO ₂ (wt%)	CaO (wt%)	Na ₂ O (wt%)	K ₂ O (wt%)	P ₂ O ₅ (wt%)	MnO (wt%)	Sr (ppm)	Ba (ppm)	Zr (ppm)	Sc (ppm)	Mean Grain Size
U1456D-26R-CC 5-10 cm	8.091	52.25	15.94	7.14	3.60	0.76	2.76	0.77	2.76	0.14	0.09	139.25	319.79	158.71	17.37	18.09
U1456D-27R-2 100-106 cm	8.149	62.63	15.15	5.43	2.69	0.82	1.16	1.44	2.79	0.16	0.04		325.53	162.05	135.59	23.45
U1456D-28R-1 40-46 cm	8.196	62.57	14.94	5.28	2.58	0.75	1.18	1.59	2.72	0.16	0.04		362.69	187.90	141.21	23.50
U1456D-29R-2 24-34 cm	8.266	62.11	15.26	5.38	2.68	0.78	1.13	1.50	2.81	0.14	0.04		352.25	180.96	133.16	25.48
U1456D-29R-2 128-143 cm	8.269	51.51	14.98	6.88	3.44	0.74	4.46	0.83	2.63	0.14	0.09	166.60	350.23	154.29	16.68	39.77
U1456D-30R-CC 0-5 cm	9.268	47.77	16.24	10.11	3.51	1.22	0.62	0.22	2.64	0.15	0.07	94.62	379.37	171.64	26.81	4.91
U1456D-35R-4 107-122 cm	9.759	48.71	15.80	8.98	3.75	0.98	0.32	0.15	2.87	0.18	0.09	119.59	403.54	162.01	22.79	7.96
U1456D-38R-1, 22-24 cm	9.8716	52.99	17.12	7.93	3.33	1.12	0.19	0.40	2.98	0.12	0.04	96.48	431.06	152.43		
U1456D- 42R-6, 40-42 cm	10.422	53.39	16.21	8.56	4.15	0.97	0.18	0.69	3.34	0.13	0.05	82.60	368.68	162.15		
U1456D-46R-4, 8-10 cm	10.601	53.59	16.77	8.33	3.17	1.44	0.27	0.64	2.90	0.12	0.04	89.80	404.49	199.20		
U1456D-49R-1, 50-52 cm	10.67	49.57	17.18	9.50	3.01	1.51	0.54	0.38	2.72	0.12	0.06	125.28	414.05	178.69		
U1456D-52R-5, 65-67 cm	10.768	56.31	15.81	6.78	4.13	1.00	0.20	0.77	3.22	0.10	0.04	80.95	350.21	204.61		
U1456D-52R-5 80-88 cm	10.770	51.10	17.16	8.53	3.28	1.22	0.31	0.37	3.15	0.10	0.04		309.40	147.04	101.78	13.87
U1456D-54R-1, 5-7 cm	10.806	53.22	17.09	8.28	3.18	1.29	0.23	0.48	3.09	0.12	0.04	90.29	366.60	166.90		
U1456D-59R-5, 10-12 cm	11.534	54.77	11.51	7.50	3.17	0.71	1.31	0.55	2.30	0.09	0.05	738.40	2088.35	171.54		
U1456D-60R-1, 109-111 cm	11.691	53.12	11.39	6.96	3.37	0.74	1.48	0.39	1.98	0.26	0.10	308.40	1806.13	82.44		
U1456E-9R-4, 64-66 cm	12.276	51.60	12.40	8.54	3.43	0.89	1.63	0.15	1.56	0.04	0.07	282.36	1890.01	159.79		
U1456E-12R-1, 112-114 cm	13.233	51.45	12.89	8.85	3.25	0.89	1.25	0.28	1.84	0.07	0.03	108.74	736.09	181.84		
U1456E-17R-7, 42-44 cm	15.065	49.46	14.60	9.64	3.26	1.05	1.21	0.20	2.17	0.06	0.05	108.94	1250.60	159.60		
U1456E-19R-3 10-20 cm	15.566	65.14	13.85	4.97	2.72	0.69	1.15	1.70	2.68	0.15	0.04		315.79	182.37	141.75	53.13
U1456E-19R-CC 17-22	15.628	57.58	9.98	3.55	2.84	0.42	10.86	1.65	1.76	0.10	0.16	268.53	276.51	132.37	9.31	
U1457A-1H-2 83-87 cm	0.024	36.30	9.68	4.03	2.62	0.52	20.51	1.01	1.71	0.18	0.08	1247.12	431.84	118.28	9.90	17.96
U1457A-1H-5 10-12 cm	0.073	44.58	10.99	5.66	2.36	1.22	15.02	1.47	1.61	0.20	0.07	1665.15	257.01	219.33	12.54	30.51
U1457A-1H-CC 7-11 cm	0.119	31.46	10.40	4.80	2.63	0.53	21.55	0.80	1.91	0.15	0.09	809.09	531.38	95.92	11.60	10.26
U1457A-2H-2 45-48 cm	0.183	40.95	12.03	5.89	3.39	0.67	14.39	0.96	2.40	0.17	0.12	520.73	548.97	124.45	14.97	9.02
U1457A-3H-1 30-34 cm	0.378	22.40	7.93	3.42	2.14	0.39	25.82	0.61	1.37	0.14	0.06	2253.71	358.21	69.59	8.09	10.58
U1457A-4H-6 70-74 cm	0.541	36.25	11.84	6.75	2.95	0.98	11.66	0.88	1.89	0.16	0.07	932.01	260.09	113.53	18.17	13.32
U1457A-6H-1 2-4 cm	0.683	32.65	10.83	5.64	2.81	0.81	18.84	0.69	1.79	0.19	0.07	1515.66	335.47	101.46	15.25	11.07
U1457A-6H-2 53-55 cm	0.810	32.33	9.60	4.47	3.89	0.51	18.62	0.75	1.91	0.14	0.07	570.65	469.20	99.18	10.87	13.25
U1457A-6H-3 64-66 cm	0.910	32.98	10.02	4.64	4.13	0.58	19.67	0.68	1.88	0.17	0.08	699.55	685.32	106.82	12.90	9.61
U1457A-6H-4 72-76 cm	0.928	30.61	10.08	5.63	2.72	0.86	18.29	0.93	1.54	0.20	0.07	1936.95	269.33	101.44	13.88	15.84
U1457A-6H-6 9-13 cm	0.954	23.99	8.57	4.69	2.19	0.73	23.99	0.72	1.22	0.18	0.07	3120.79	302.09	84.03	12.37	11.56
U1457A-7H-1 2-4 cm	0.975	29.99	9.86	4.45	3.09	0.55	21.80	0.62	1.70	0.12	0.09	767.05	650.11	97.49	12.30	7.97
U1457A-7H-5 135-137 cm	1.026	22.25	8.17	4.77	3.43	0.58	25.36	0.54	1.23	0.17	0.12	2985.49	334.02	70.25	11.38	10.86

(table cont'd)

Sample Name	Age (Ma)	SiO ₂ (wt%)	Al ₂ O ₃ (wt%)	Fe ₂ O ₃ (wt%)	MgO (wt%)	TiO ₂ (wt%)	CaO (wt%)	Na ₂ O (wt%)	K ₂ O (wt%)	P ₂ O ₅ (wt%)	MnO (wt%)	Sr (ppm)	Ba (ppm)	Zr (ppm)	Sc (ppm)	Mean Grain Size
U1457A-8H-5 10-12 cm	1.126	33.04	11.04	6.37	2.79	0.94	18.66	0.84	1.60	0.23	0.07	1727.90	318.06	113.58	16.62	18.56
U1457A-9H-5 62-64 cm	1.210	50.74	16.02	6.74	3.48	0.74	6.27	1.16	3.35	0.15	0.09	184.38	510.96	132.41	15.96	12.18
U1457A-10H-5 72-76 cm	1.283	48.91	16.48	6.74	3.56	0.74	6.07	1.11	3.45	0.14	0.09	177.86	526.93	146.36	17.19	11.17
U1457A-15F-1 4-6 cm	1.364	50.91	16.32	6.95	3.73	0.77	5.63	1.54	3.57	0.16	0.09	193.96	544.67	131.58	17.14	12.41
U1457B-25F-1 128-130 cm	1.466	53.46	15.15	6.40	3.28	0.74	6.12	1.44	3.13	0.15	0.09	193.57	470.00	148.79	14.68	18.40
U1457C-3R-1 59-61 cm	1.558	49.27	15.73	7.30	3.50	0.74	6.65	1.16	3.08	0.16	0.10	192.66	478.11	137.09	15.69	15.83
U1457C-20R-2 84-86 cm	1.723	46.31	16.38	6.98	3.40	0.76	4.38	0.84	3.39	0.13	0.08	151.32	492.24	127.81	17.05	8.88
U1457C-22R-3 100-104 cm	1.761	43.74	12.13	6.89	4.88	0.96	8.06	0.92	2.08	0.22	0.14	272.61	410.99	151.29	16.56	11.88
U1457C-23R-4 45-49 cm	1.833	43.43	13.56	9.03	3.93	1.08	6.50	0.92	2.41	0.16	0.08	258.03	519.91	133.50	22.59	13.85
U1457C-23R-6 145-149 cm	1.929	52.25	16.73	7.22	3.87	0.80	4.39	1.48	3.80	0.16	0.14	183.97	649.94	121.99	16.97	12.14
U1457C-24R-1 87-89 cm	2.298	44.65	13.02	8.25	3.53	1.39	7.44	1.20	1.86	0.23	0.08	287.94	551.97	153.48	19.91	16.20
U1457C-24R-3 26-28 cm	2.319	41.89	11.95	6.12	4.49	0.73	11.66	0.79	2.10	0.16	0.11	420.71	390.28	132.93	15.64	16.92
U1457C-24R-4 127-129 cm	2.340	33.80	10.39	5.10	3.88	0.62	17.98	0.61	1.88	0.23	0.18	603.04	363.30	109.80	12.94	12.39
U1457C-24R-6 53-55 cm	2.361	42.02	13.78	9.59	3.82	1.34	5.89	0.56	1.91	0.18	0.07	255.83	599.66	144.75	25.82	18.46
U1457C-25R-1 0-4 cm	2.384	38.11	12.04	6.19	3.17	0.95	15.31	0.91	2.00	0.18	0.16	568.49	470.74	125.75	16.77	11.41
U1457C-25R-2 59-61 cm	2.429	46.70	13.48	7.18	4.78	0.85	6.09	0.86	2.50	0.24	0.11	244.16	474.50	153.25	19.73	11.84
U1457C-25R-4 145-149 cm	2.512	51.54	14.72	7.48	4.98	0.88	1.89	0.90	2.87	0.20	0.07	127.76	454.61	163.35	19.95	13.05
U1457C-26R-CC 2-6 cm	2.588	48.59	16.60	7.43	3.37	0.78	5.80	0.81	3.22	0.17	0.11	192.68	515.47	137.01	18.73	14.46
U1457C-27R-1 21-23 cm	2.681	47.23	15.36	6.82	3.23	0.75	6.31	0.88	2.97	0.17	0.11	201.62	486.00	145.79	17.11	10.87
U1457C-29R-1 30-32 cm	2.922	57.04	13.63	5.99	2.92	0.69	6.62	1.44	2.52	0.14	0.09	211.11	425.57	168.09	14.38	17.06
U1457C-30R-1 54-58 cm	3.045	51.26	16.75	7.38	3.54	0.79	4.99	1.00	3.54	0.15	0.12	180.78	561.65	138.65	17.11	9.68
U1457C-31R-1 18-20 cm	3.160	58.28	13.49	5.25	2.82	0.66	5.94	1.68	2.83	0.16	0.07	211.73	484.49	171.60	13.23	34.89
U1457C-31R-1 94-100 cm	3.169	62.19	15.57	5.70	2.59	0.74	1.24	1.91	3.67	0.16	0.05		541.32	177.15	151.66	46.45
U1457C-31R-2 72-74 cm	3.185	56.80	13.85	5.46	2.86	0.66	6.16	1.65	2.80	0.14	0.08	225.73	467.63	145.22	14.26	56.23
U1457C-32R-1 6-10 cm	3.278	49.85	14.52	8.54	4.65	0.94	3.37	0.99	2.67	0.19	0.07	178.16	425.15	146.81	19.93	10.61
U1457C-32R-2 56-58 cm	3.293	60.01	12.08	4.72	2.40	0.61	6.28	1.54	2.18	0.12	0.08	210.08	378.32	172.15	11.86	57.30
U1457C-33R-1 26-30 cm	3.370	59.99	13.16	5.41	2.57	0.64	6.23	1.37	2.36	0.12	0.08	211.74	412.93	160.64	13.17	50.80
U1457C-33R-2 72-76 cm	3.387	54.90	14.31	5.94	2.80	0.70	6.37	1.14	2.71	0.13	0.09	206.89	427.21	153.28	14.32	25.63
U1457C-33R-3 10-17 cm	3.393	66.93	13.55	4.72	2.31	0.71	1.38	1.89	2.74	0.12	0.05		409.57	142.15	147.25	132.08
U1457C-33R-CC 0-4 cm	3.401	53.75	14.02	6.10	2.85	0.70	6.55	1.17	2.49	0.12	0.09	204.67	436.50	163.52	13.93	22.28
U1457C-34R-1 52-54 cm	3.456	49.67	16.36	7.34	3.40	0.78	6.60	0.92	3.07	0.11	0.12	195.24	493.76	151.10	16.88	15.22
U1457C-34R-2 34-38 cm	3.467	46.18	14.61	7.67	3.86	0.92	5.96	0.85	2.66	0.24	0.27	261.08	475.62	140.41	20.14	15.17
U1457C-34R-3 82-86 cm	3.484	42.76	14.80	10.00	3.90	1.33	3.21	0.49	2.00	0.22	0.09	162.20	458.83	142.96	26.20	18.97
U1457C-34R-4 118-122 cm	3.500	43.11	15.28	10.20	4.03	1.31	2.73	0.65	2.14	0.21	0.12	145.66	439.01	144.53	27.83	23.73

(table cont'd)

Sample Name	Age (Ma)	SiO ₂ (wt%)	Al ₂ O ₃ (wt%)	Fe ₂ O ₃ (wt%)	MgO (wt%)	TiO ₂ (wt%)	CaO (wt%)	Na ₂ O (wt%)	K ₂ O (wt%)	P ₂ O ₅ (wt%)	MnO (wt%)	Sr (ppm)	Ba (ppm)	Zr (ppm)	Sc (ppm)	Mean Grain Size
U1457C-35R-1 14-16 cm	3.536	41.57	14.02	8.61	3.65	1.09	7.27	0.56	2.08	0.24	0.09	294.68	422.09	134.02	22.89	23.35
U1457C-35R-2 1-5 cm	3.565	44.57	15.37	9.95	4.02	1.25	3.48	0.55	2.35	0.20	0.10	174.29	439.93	150.69	25.53	25.80
U1457C-35R-2 133-135 cm	3.601	42.86	15.49	9.95	3.80	1.22	4.33	0.41	2.24	0.16	0.09	207.24	430.23	137.22	25.44	26.26
U1457C-35R-3 116-118 cm	3.637	45.01	15.34	9.54	3.90	1.25	3.39	0.63	2.32	0.18	0.10	170.86	434.75	137.20	23.78	20.86
U1457C-35R-5 14-16 cm	3.691	42.70	14.91	9.07	3.80	1.10	5.69	0.65	2.30	0.17	0.10	241.43	432.26	134.30	23.39	21.71
U1457C-35R-6 64-66 cm	3.745	44.63	15.42	9.75	4.21	1.18	4.33	0.72	2.28	0.14	0.10	198.54	408.58	142.04	24.37	19.53
U1457C-35R-7 47-51 cm	3.781	48.62	14.33	7.82	4.33	0.89	5.88	0.94	2.53	0.40	0.11	242.06	397.46	157.53	18.32	12.02
U1457C-38R-1 2-4 cm	5.621	49.73	17.27	9.10	3.34	1.26	0.55	0.54	2.61	0.13	0.05	88.28	446.61	142.69	21.31	5.02
U1457C-41R-1 0-2 cm	5.765	61.77	15.33	5.68	2.42	0.79	1.11	1.29	2.81	0.12	0.05	140.85	415.22	178.12	10.82	15.26
U1457C-41R-2 20-26 cm	5.773	64.85	14.74	5.28	2.37	0.77	1.20	1.57	2.73	0.14	0.04		413.77	210.24	134.99	47.12
U1457C-42R-1 80-88 cm	5.817	70.30	11.81	3.51	1.51	0.53	1.56	2.02	2.21	0.12	0.04		393.43	195.33	168.37	69.07
U1457C-43R-2 52-60 cm	5.871	65.58	14.25	4.99	2.30	0.74	1.27	1.69	2.93	0.13	0.04		395.42	193.77	141.41	103.53
U1457C-44R-1 16-20 cm	5.910	60.23	16.05	6.16	2.67	0.84	0.93	1.29	2.88	0.13	0.05	128.14	491.26	171.98	16.00	29.68
U1457C-45R-6 92-94 cm	6.741	43.20	14.05	6.75	3.75	0.80	10.45	0.73	2.64	0.16	0.08	394.56	476.73	123.34	16.71	17.92
U1457C-46R-1 73-75 cm	6.812	54.21	16.05	8.07	3.74	1.05	0.94	0.90	2.97	0.21	0.05	121.20	579.74	189.57	22.91	6.73
U1457C-46R-2 100-104 cm	6.852	49.93	13.68	6.32	4.18	0.77	6.38	1.05	2.56	0.16	0.07	249.29	428.71	174.26	16.70	14.01
U1457C-46R-3 85-87 cm	6.885	50.38	17.49	7.85	3.43	1.01	0.88	0.68	3.12	0.12	0.04	124.87	597.82	120.75	16.92	8.39
U1457C-46R-5 60-62 cm	6.947	31.40	10.92	6.05	2.82	0.78	19.82	0.40	1.52	0.16	0.08	768.27	442.45	106.99	16.13	19.46
U1457C-47R-1 6-10 cm	7.076	50.19	15.61	8.45	3.67	1.21	1.21	0.56	2.39	0.30	0.05	125.71	621.64	159.23	21.38	8.91
U1457C-47R-1 130-132 cm	7.118	31.86	10.69	5.62	3.01	0.65	21.12	0.38	1.59	0.14	0.10	824.79	382.33	98.35	13.54	18.68
U1457C-47R-5 51-53 cm	7.292	42.30	12.77	5.66	3.50	0.67	13.14	0.83	2.34	0.15	0.09	489.16	410.56	123.45	14.80	9.79
U1457C-47R-6 65-69 cm	7.347	37.21	12.04	5.90	3.35	0.70	15.98	0.62	2.08	0.16	0.09	613.41	431.29	113.92	14.14	9.11
U1457C-47R-7 0-4 cm	7.376	45.60	14.76	7.52	3.69	0.94	8.04	0.73	2.67	0.16	0.07	335.64	508.52	134.14	19.21	
U1457C-48R-1 31-35 cm	7.410	37.33	11.78	5.34	3.67	0.63	15.90	0.59	2.03	0.15	0.12	593.37	376.01	119.69	13.83	13.51
U1457C-48R-2 4-6 cm	7.426	44.08	13.23	6.62	4.45	0.76	9.56	0.68	2.25	0.15	0.11	381.92	444.28	140.84	16.17	13.20
U1457C-49R-1 46-50 cm	7.552	51.24	15.07	8.89	3.40	1.10	3.04	0.61	2.71	0.13	0.05	178.84	503.15	163.40	20.94	10.99
U1457C-49R-4 132-134 cm	7.626	48.72	14.94	6.67	3.39	0.76	6.77	0.72	2.60	0.12	0.11	204.72	380.63	139.95	15.70	10.54
U1457C-50R-2 79-81 cm	7.710	40.73	12.33	6.16	3.43	0.77	15.12	0.51	2.10	0.13	0.11	566.92	372.08	124.01	15.13	11.21
U1457C-51R-1 98-100 cm	7.762	23.29	8.23	4.37	2.26	0.40	27.26	0.20	1.22	0.18	0.27	895.41	234.18	70.87	9.19	8.42
U1457C-51R-4 80-88 cm	7.772	66.13	13.89	4.75	2.31	0.70	1.43	1.85	2.66	0.12	0.04		311.30	153.73	154.16	63.01
U1457C-52R-1 2-4 cm	7.782	49.52	14.41	6.46	3.67	0.70	7.79	0.85	2.40	0.15	0.10	206.14	336.14	132.79	15.67	16.82
U1457C-53R-1 41-43 cm	7.805	47.15	15.13	6.82	3.56	0.75	7.91	0.72	2.63	0.18	0.12	213.69	345.29	139.41	16.14	7.88
U1457C-54R-1 6-8 cm	7.826	48.71	15.65	6.42	3.72	0.73	6.80	0.91	3.02	0.14	0.11	201.73	399.71	129.51	15.87	14.92
U1457C-55R-1 30-32 cm	7.848	51.32	14.85	5.86	3.51	0.72	7.15	1.14	2.82	0.15	0.09	209.90	378.03	134.45	14.52	14.67

(table cont'd)

Sample Name	Age (Ma)	SiO ₂ (wt%)	Al ₂ O ₃ (wt%)	Fe ₂ O ₃ (wt%)	MgO (wt%)	TiO ₂ (wt%)	CaO (wt%)	Na ₂ O (wt%)	K ₂ O (wt%)	P ₂ O ₅ (wt%)	MnO (wt%)	Sr (ppm)	Ba (ppm)	Zr (ppm)	Sc (ppm)	Mean Grain Size
U1457C-56R-1 105-109 cm	7.871	47.70	15.48	7.21	3.63	0.72	5.93	1.03	3.10	0.15	0.11	187.42	396.33	130.57	16.02	8.77
U1457C-57R-1 12-14 cm	7.891	49.91	15.49	6.53	3.70	0.73	6.90	1.07	2.96	0.14	0.11	208.31	392.97	124.97	15.22	10.67
U1457C-58R-1 10-14 cm	7.912	48.83	16.51	7.39	3.86	0.76	6.01	0.98	3.29	0.19	0.13	197.88	409.27	126.60	17.52	6.57
U1457C-59R-1 102-106 cm	7.936	51.67	14.42	6.33	3.50	0.72	6.24	1.04	2.47	0.12	0.09	188.44	318.89	142.09	14.71	28.58
U1457C-60R-4 70-74 cm	7.967	59.32	12.15	4.71	2.81	0.59	7.51	1.66	1.98	0.13	0.08	234.67	288.93	198.76	11.41	57.75
U1457C-61R-1 8-18 cm	7.977	67.73	13.23	4.65	2.27	0.62	1.56	1.97	2.37	0.13	0.04		309.60	151.28	160.56	75.35
U1457C-62R-1 75-77 cm	8.001	48.99	15.39	6.34	3.56	0.76	6.60	0.80	2.60	0.13	0.10	196.19	325.17	144.74	16.93	14.78
U1457C-63R-3 92-94 cm	8.028	51.06	14.87	6.31	3.50	0.75	7.31	0.96	2.58	0.12	0.11	205.87	336.41	143.56	15.06	15.02
U1457C-64R-3 90-94 cm	8.050	51.54	13.99	5.75	3.24	0.73	8.02	1.00	2.28	0.12	0.10	218.62	312.72	156.02	13.75	20.16
U1457C-65R-6 44-48 cm	8.080	51.42	15.09	6.49	3.42	0.75	6.48	0.79	2.67	0.13	0.10	190.83	336.70	147.22	16.01	11.00
U1457C-67R-2 78-82 cm	8.112	50.36	13.96	6.07	3.36	0.72	7.55	0.92	2.45	0.13	0.10	206.08	342.13	155.45	14.83	13.61
U1457C-68R-1 73-75 cm	8.253	48.88	15.27	8.50	4.07	1.00	4.36	0.57	2.57	0.14	0.16	217.34	371.15	138.97	20.58	19.00
U1457C-68R-4 130-134 cm	8.666	58.36	14.50	6.70	2.65	0.95	0.90	0.90	2.64	0.17	0.05	108.23	355.84	210.52	16.18	14.44
U1457C-68R-6 32-34 cm	8.672	53.14	16.09	8.04	3.62	1.02	2.04	0.59	3.09	0.13	0.22	121.90	404.94	176.97	21.46	8.56
U1457C-68R-CC 6-8 cm	8.680	52.49	16.32	9.37	3.86	1.10	0.68	0.73	2.96	0.13	0.22	101.48	384.32	156.59	23.30	6.49
U1457C-68R-7, 128-130 cm	8.7789	56.57	16.51	7.16	3.42	1.05	0.20	0.74	2.89	0.11	0.04	82.06	409.00	168.76		
U1457C-69R-1 100-104 cm	8.779	55.14	14.85	7.93	3.52	1.04	2.39	1.07	2.71	0.15	0.13	142.59	378.54	198.38	20.07	8.88
U1457C-69R-3 42-46 cm	8.884	53.05	15.61	7.02	4.30	0.81	3.28	0.87	3.21	0.18	0.22	150.92	378.70	165.44	17.92	10.19
U1457C-69R-4 104-108 cm	8.975	53.50	15.50	7.60	4.92	0.91	1.30	0.65	2.84	0.15	0.17	100.61	346.80	176.97	19.21	7.97
U1457C-69R-6 13-15 cm	9.058	47.05	13.90	6.45	3.85	0.74	8.76	0.66	2.71	0.25	0.24	343.07	336.07	153.40	17.95	7.54
U1457C-69R-7 112-114 cm	9.163	51.61	16.02	8.59	3.55	1.02	0.65	0.50	3.09	0.12	0.08	104.08	385.13	161.96	21.53	7.33
U1457C-70R- 1, 6-8 cm	9.2306	54.35	17.25	8.05	3.18	1.22	0.43	0.56	3.20	0.12	0.04	85.26	416.50	154.32		
U1457C-70R-2 12-16 cm	9.297	53.49	16.11	7.37	4.06	0.89	0.42	0.63	3.07	0.11	0.06	87.76	357.41	153.89	16.34	7.39
U1457C-70R-3 131-133 cm	9.455	50.54	16.04	8.92	3.44	1.14	0.37	0.42	2.54	0.14	0.05	79.82	398.41	156.42	24.17	5.94
U1457C-73R-1, 10-12 cm	9.5892	53.52	17.40	8.18	3.28	1.12	0.09	0.38	3.39	0.11	0.03	69.86	357.88	156.13		
U1457C-70R-5 95-97 cm	9.612	53.30	14.87	7.90	4.85	0.86	1.05	0.67	2.84	0.34	0.29	105.17	344.01	169.51	20.17	10.77
U1457C-71R-1, 7-9 cm	9.7038	52.49	17.39	8.26	3.36	1.20	0.30	0.37	3.12	0.12	0.04	73.07	337.56	143.35		
U1457C-71R-2 109-111 cm	9.717	50.69	13.48	6.35	3.18	0.97	7.89	0.66	2.39	0.17	0.11	317.03	305.86	191.88	16.95	9.24
U1457C-72R-1 107-109 cm	9.772	51.68	16.34	8.23	3.53	1.04	2.21	0.46	2.94	0.14	0.10	142.98	346.71	173.34	21.85	10.19
U1457C-74R-2, 19-21 cm	9.9385	62.72	14.14	5.73	2.76	0.96	0.50	1.00	2.67	0.12	0.03	93.56	370.40	216.07		
U1457C-74R-2 25-27 cm	9.939	51.53	14.63	7.74	3.73	0.92	4.36	0.59	2.57	0.18	0.15	180.76	324.86	169.36	18.49	9.99
U1457C-75R-1 36-40 cm	10.014	50.12	16.01	8.51	4.00	0.98	2.34	0.28	2.91	0.15	0.20	155.71	325.69	162.80	22.13	9.70
U1457C-76R- 1, 90-92 cm	10.122	58.24	16.64	7.05	3.10	1.01	0.42	0.60	2.98	0.15	0.04	83.48	333.03	183.48		
U1457C-76R-3 44-48 cm	10.129	49.16	16.17	9.53	3.67	1.21	1.95	0.43	2.69	0.16	0.11	136.57	344.65	176.56	24.90	25.12

(table cont'd)

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U1457C-77R- 2, 3-5 cm	10.228	53.97	17.02	8.05	3.30	1.21	0.28	0.43	2.93	0.13	0.04	78.31	359.82	171.88		
U1457C-77R-5 26-30 cm	10.242	50.07	16.23	8.35	3.60	1.00	3.02	0.38	2.88	0.11	0.09	188.13	320.07	162.60	21.48	8.63
U1457C-78R-4 25-27 cm	10.318	49.34	16.33	9.62	3.79	1.17	1.61	0.39	2.80	0.14	0.13	132.21	305.89	178.48	25.27	7.49
U1457C-78R, 5, 50-52 cm	10.322	56.60	15.49	6.28	3.10	1.00	0.30	0.68	2.95	0.12	0.03	81.19	325.06	182.32		
U1457C-79R-5, 120-122	10.432	58.44	16.02	7.06	3.16	1.02	0.40	0.66	3.11	0.15	0.04	81.25	298.55	215.88		
U1457C-79R-5 129-131 cm	10.432	55.13	12.97	6.18	2.92	0.86	5.10	0.74	2.37	0.18	0.09	206.77	265.45	227.87	16.56	24.08
U1457C-81R-1 30-32 cm	10.545	53.22	14.95	7.45	3.46	0.90	3.36	0.45	2.77	0.15	0.12	157.01	270.30	179.71	18.31	13.21
U1457C-81R-1, 42-44 cm	10.547	57.32	16.27	7.19	3.34	0.97	0.42	0.62	3.15	0.15	0.05	81.33	279.34	176.67		
U1457C-82R-3 6-8 cm	10.659	58.78	11.45	6.10	2.96	0.73	4.59	0.93	2.13	0.15	0.13	168.04	245.10	246.76	13.88	23.47
U1457C-82R-3, 89-91 cm	10.667	62.47	14.53	6.40	2.99	0.96	0.62	0.95	2.88	0.17	0.04	94.57	306.87	222.25		
U1457C-83R-1, 61-63 cm	10.726	52.09	17.49	7.98	3.13	1.25	0.16	0.35	3.06	0.10	0.03	67.93	282.34	168.56		
U1457C-83R-2 18-20 cm	10.735	51.53	16.84	9.16	3.46	1.14	0.35	0.42	3.13	0.13	0.05	113.00	251.24	170.94	25.58	11.99
U1457C-84R-3 143-145 cm	10.849	50.76	13.93	6.60	3.43	0.82	5.32	0.63	2.66	0.17	0.15	216.79	239.29	177.86	17.31	10.06
U1457C-84R-6, 101-103 cm	10.853	56.77	15.83	7.12	3.88	0.90	0.28	0.69	3.31	0.14	0.06	78.23	266.53	185.01		
U1457C-85R- 1, 60-62 cm	10.913	57.92	16.02	7.09	3.98	0.92	0.29	0.71	3.36	0.12	0.05	82.51	274.00	184.78		
U1457C-85R-3 46-50 cm	10.925	53.58	15.32	7.86	4.65	0.89	0.99	0.72	3.21	0.16	0.15	116.33	261.00	185.22	20.70	9.50
U1457C-86R-1 6-8 cm	10.983	54.39	15.46	7.99	4.39	0.87	0.78	0.83	3.26	0.16	0.11	117.42	266.54	174.09	19.92	9.59
U1457C-86R-2 44-46 cm	11.001	18.69	6.14	2.73	1.75	0.31	31.32	0.07	0.95	0.11	0.07	720.11	611.45	57.03	8.84	9.40
U1457C-87R-1 14-18 cm	11.030	15.76	5.20	2.11	1.45	0.24	32.94	0.00	0.71	0.10	0.07	649.62	1357.92	47.83	6.95	16.49
U1457C-89R-2, 57-59 cm	11.179	52.64	11.45	8.63	3.41	0.76	1.93	0.26	1.63	0.08	0.06	222.78	1315.27	94.10		
U1457C-89R-3, 119-121 cm	11.195	52.31	13.01	7.46	4.03	0.77	0.90	0.43	2.41	0.05	0.03	82.01	308.97	138.94		
U1457C-93R-1 50-54 cm	11.500	49.93	6.95	8.47	3.58	0.47	2.69	0.87	1.36	0.19	4.72	504.24	2838.83	65.61	17.00	13.86
U1457C-93R-3 50-52 cm	11.527	51.91	10.18	8.06	3.18	0.75	3.64	0.89	1.69	0.09	0.12	266.42	705.71	92.53	25.31	15.53
U1457C-94R-2 55-59 cm	11.597	44.30	12.12	8.22	4.18	1.35	1.32	1.07	0.48	0.41	0.06	140.61	2.21	235.89	25.24	50.44
U1457C-95R-1 12-14 cm	11.666	50.65	12.20	9.50	3.46	0.72	0.64	1.38	2.59	0.09	0.09	315.55	99.65	1128.19	21.78	46.69
U1457C-96R-1 62-66 cm	11.756	47.67	12.29	10.46	3.37	0.95	0.92	0.49	2.22	0.09	1.10	113.58	102.65	139.86	29.92	33.75
Indus Marine A1-1620	3.597	58.33	15.42	6.89	3.21	0.80	1.58	1.36	3.09	0.20	0.06	315.00	4954.71	193.58	15.13	17.24
Indus Marine A1-2200	5.163	56.88	13.97	8.90	2.59	0.70	2.90	1.35	2.68	0.20	0.09	260.18	1368.07	229.19	13.60	14.02
Indus Marine A1-3180	6.926	53.46	14.16	7.23	2.52	0.74	1.96	1.13	2.68	0.19	0.05	1061.04	32834.89	192.77	13.18	13.74
Indus Marine A1-3960	8.290	57.99	14.60	8.99	2.69	0.76	2.10	1.65	2.84	0.19	0.06	180.36	715.08	228.23	13.52	16.21
Indus Marine A1-4180	8.675	57.30	14.68	8.27	2.72	0.75	1.91	1.53	2.75	0.18	0.06	191.12	1145.25	224.74	13.14	15.33
Indus Marine A1-4840	9.830	59.23	15.59	7.63	2.70	0.77	1.22	1.54	2.95	0.18	0.05	155.71	671.34	202.49	14.34	14.06
Indus Marine A1-4940	10.005	60.71	15.24	6.46	2.60	0.77	0.88	1.59	2.87	0.17	0.05	427.24	7977.01	222.64	13.52	13.93
Indus Marine A1-5360	10.716	57.44	15.63	8.77	3.11	0.83	1.46	1.31	2.80	0.21	0.06	159.98	686.64	203.26	14.55	12.81

(table cont'd)

Sample Name	Age (Ma)	SiO ₂ (wt%)	Al ₂ O ₃ (wt%)	Fe ₂ O ₃ (wt%)	MgO (wt%)	TiO ₂ (wt%)	CaO (wt%)	Na ₂ O (wt%)	K ₂ O (wt%)	P ₂ O ₅ (wt%)	MnO (wt%)	Sr (ppm)	Ba (ppm)	Zr (ppm)	Sc (ppm)	Mean Grain Size
Indus Marine A1-5920	11.665	56.44	16.72	7.96	2.96	0.85	0.62	1.18	3.28	0.16	0.05	128.82	532.29	185.73	15.45	10.42
Indus Marine A1-6360	12.355	57.18	16.77	7.15	3.08	0.86	0.71	1.16	3.12	0.16	0.04	126.26	534.62	191.28	15.74	11.95
Indus Marine A1-6460	12.512	60.96	16.20	7.15	2.96	0.81	0.72	1.23	2.87	0.17	0.04	126.23	498.53	177.55	14.24	9.94
Indus Marine A1-6680	12.857	58.50	18.08	6.92	3.42	0.84	3.68	1.19	3.05	0.18	0.04	323.68	420.15	178.48	15.12	10.32
Indus Marine A1-6890	13.186	58.98	16.90	7.04	3.11	0.87	0.84	1.06	3.04	0.17	0.04	139.51	488.75	192.40	15.33	10.66
Indus Marine A1-7090	13.499	58.76	16.27	7.05	3.13	0.88	0.62	0.79	2.96	0.16	0.04	113.45	420.82	206.22	14.64	12.04
Indus Marine A1-7190	13.656	59.46	15.38	8.12	2.88	0.83	0.66	0.90	2.72	0.16	0.05	127.00	763.85	223.36	13.85	11.93
Indus Marine A1-7400	13.985	58.12	16.08	7.82	3.06	0.84	0.64	0.93	3.08	0.15	0.04	122.18	520.62	197.58	15.62	11.70
Indus Marine A1-7500	14.142	59.07	16.23	7.58	3.06	0.88	0.58	0.69	3.04	0.15	0.04	127.18	518.28	225.09	15.62	10.44
Indus Marine A1-7620	14.330	58.48	16.12	7.17	3.05	0.86	0.57	0.82	2.99	0.16	0.04	108.80	483.66	224.51	15.71	11.98
Indus Marine A1-7720	14.487	58.75	16.42	7.06	3.20	0.87	0.74	0.87	3.15	0.15	0.04	116.08	454.10	216.74	14.87	11.70
Indus Marine A1-7820	14.644	57.76	16.12	7.00	3.07	0.86	0.59	0.88	2.91	0.15	0.04	114.17	530.19	215.80	14.80	10.81
Indus Marine A1-8040	14.989	58.43	16.32	7.07	3.12	0.87	0.58	0.83	3.14	0.15	0.04	110.36	465.64	206.38	15.44	10.71
Indus Marine A1-8140	15.145	58.48	16.47	7.34	3.20	0.87	0.53	0.84	3.15	0.16	0.04	107.42	359.48	214.75	14.58	11.36
Indus Marine A1-8240	15.302	57.92	16.05	7.01	3.34	0.88	0.79	0.81	2.99	0.17	0.04	108.59	366.90	224.73	16.44	12.52
Indus Marine A1-8340	15.459	57.50	15.41	6.88	3.23	0.84	0.72	0.80	2.88	0.15	0.04	555.06	15154.22	226.92	15.22	13.61
Indus Marine A1-8450	15.631	53.35	11.98	6.18	2.37	0.67	0.77	0.72	2.10	0.12	0.03	2145.19	67660.31	207.51	11.81	17.51
Indus Marine A1-8650	15.945	39.71	7.64	3.87	1.29	0.44	0.55	0.53	1.25	0.10	0.02	6242.03	94222.93	225.81	8.47	16.89
Indus Marine A1-8950	16.415	48.08	9.12	4.51	1.64	0.55	0.72	0.87	1.51	0.11	0.03	4123.97	95848.87	278.69	7.36	14.46
Indus Marine A1-9170	16.760	52.48	11.88	6.54	2.42	0.66	0.70	0.83	2.15	0.14	0.04	2414.14	74337.33	187.94	10.44	20.87

APPENDIX E. CLAY MINEROLOGY DATA OF IODP SITES U1456, U1457 AND INDUS MARINE A-1

Sample Name	Age (Ma)	Smectite/Mon tmorillonite	Chlorite	Palygorskite	Illite	Kaolinite	Quartz	Illite FWHM	Illite crystallinity	Illite chemical index
U1456A-1H-2, 145-150 cm	0.033	34.835	22.650	0.000	34.981	6.689	0.845	0.260	0.364	0.285
U1456A-6H-5, 145-150 cm	0.476	15.054	27.011	0.000	51.762	5.138	1.035	0.283	0.392	0.220
U1456A-15H-5 129-134 cm	1.186	20.209	26.818	0.000	45.969	5.909	1.093	0.296	0.408	0.263
U1456A-25F-3 75-80 cm	1.308	9.174	24.807	0.000	60.945	4.041	1.033	0.416	0.553	0.165
U1456A-58F-1 89-99 cm	1.631	39.843	19.777	8.139	25.423	5.989	0.828	0.262	0.368	0.352
U1456A-63F-1 140-150 cm	2.494	15.232	28.030	0.000	49.063	6.470	1.205	0.270	0.377	0.271
U1456A-72X-4 140-150 cm	3.290	44.007	19.503	5.082	23.996	4.877	0.286	0.313	0.429	0.346
U1456C-45X-2 111-121 cm	3.565	12.034	35.108	0.000	43.963	7.068	1.827	0.275	0.383	0.326
U1456D-3R-CC 10-15 cm	5.564	18.100	29.462	0.000	43.223	7.443	1.773	0.284	0.393	0.293
U1456D-5R-2 94-104 cm	5.736	21.725	28.333	0.000	41.054	7.587	1.302	0.246	0.348	0.289
U1456D-6R-CC 5-10 cm	5.793	14.912	31.786	0.000	42.276	8.492	2.534	0.276	0.384	0.304
U1456D-7R-1 84-94 cm	5.869	15.943	30.297	0.000	43.882	8.253	1.625	0.270	0.377	0.289
U1456D-8R-5 140-150 cm	6.152	41.064	16.860	7.983	23.320	10.156	0.617	0.271	0.378	0.355
U1456D-9R-5 123-133 cm	6.538	38.649	18.929	7.077	24.342	10.265	0.738	0.273	0.380	0.370
U1456D-10R-3 135-145 cm	6.790	34.449	19.212	8.198	26.580	10.547	1.013	0.335	0.455	0.354
U1456D-11R-CC WRND	6.948	24.193	28.280	0.000	37.612	7.770	2.145	0.267	0.374	0.301
U1456D-14R-CC 10-15 cm	7.132	16.475	33.076	0.000	39.781	8.556	2.113	0.342	0.464	0.313
U1456D-17R-CC 10-15 cm	7.552	12.069	35.240	0.000	42.084	7.880	2.727	0.278	0.387	0.306
U1456D-21R-2 115-130 cm	7.789	29.115	27.896	0.000	32.968	8.030	1.991	0.307	0.421	0.333
U1456D-26R-CC 5-10 cm	8.091	23.833	30.736	0.000	35.288	8.161	1.982	0.295	0.408	0.330
U1456D-29R-2 128-143 cm	8.269	25.216	30.554	0.000	34.073	7.816	2.341	0.291	0.402	0.328
U1456D-30R-CC 0-5 cm	9.268	52.507	15.023	0.000	23.754	8.094	0.621	0.328	0.447	0.266
U1456D-35R-4 107-122 cm	9.759	37.551	18.682	0.000	33.013	9.632	1.121	0.357	0.482	0.271
U1456D-39R-1,12-14 cm	9.988	40.880	13.810	0.000	36.820	8.240	0.250	0.385	0.516	0.257
U1456D-40R-1,60-62 cm	10.110	43.140	13.910	0.000	34.130	8.070	0.740	0.353	0.477	0.244
U1456D-43R-7,2-4 cm	10.551	62.190	12.910	0.000	19.920	4.380	0.600	0.323	0.441	0.211
U1456D-47R-4,58-60 cm	10.630	65.210	13.800	0.000	13.410	7.270	0.320	0.375	0.504	0.299
U1456D-50R-1,31-33 cm	10.698	53.770	15.450	0.000	21.870	8.490	0.410	0.401	0.535	0.257
U1456D-51R-6,20-22 cm	10.746	61.360	11.930	0.000	15.810	10.000	0.910	0.296	0.408	0.383
U1456D-53R-1,5-7 cm	10.779	49.050	14.620	0.000	27.000	8.700	0.630	0.391	0.523	0.274
U456E-5R-2, 25-27 cm	10.878	100.000	0.000	0.000	0.000	0.000	0.000			
U1456D-57R-7,75-77 cm	10.942	53.140	8.410	10.600	26.470	0.000	1.380	0.496	0.650	0.216
U1456D-58R-2,2-4 cm	10.998	69.870	3.830	6.700	17.490	0.000	2.110	0.505	0.661	0.209
U1456D-61R-1,40-42 cm	12.054	91.930	0.770	2.460	4.840	0.000	0.000	0.447	0.591	0.159
U1456E-14R-1,75-77 cm	14.005	96.940	0.000	0.000	0.000	0.000	3.060			

(table cont'd)

Sample Name	Age (Ma)	Smectite/Montmorillonite	Chlorite	Palygorskite	Illite	Kaolinite	Quartz	Illite FWHM	Illite crystallinity	Illite chemical index
U1456E-16R-2,5-7 cm	14.433	54.840	4.630	18.010	22.530	0.000	0.000	0.609	0.786	0.185
U1456E-19R-CC 17-22	15.628	39.988	24.972	0.000	28.280	5.123	1.637	0.213	0.308	0.276
U1457A-1H-2 83-87 cm	0.024	20.930	27.404	0.000	44.319	6.208	1.139	0.286	0.397	0.251
U1457A-1H-5 10-12 cm	0.073	48.806	19.369	0.000	27.470	3.328	1.028	0.233	0.332	0.264
U1457A-1H-CC 7-11 cm	0.119	31.512	22.275	0.000	41.292	3.880	1.041	0.318	0.435	0.221
U1457A-2H-2 45-48 cm	0.183	28.699	22.466	0.000	41.647	6.272	0.916	0.315	0.431	0.272
U1457A-3H-1 30-34 cm	0.378	24.370	24.677	0.000	44.061	5.889	1.003	0.271	0.378	0.250
U1457A-4H-6 70-74 cm	0.541	47.430	19.095	0.000	27.856	4.907	0.711	0.251	0.354	0.282
U1457A-6H-1 2-4 cm	0.683	65.328	11.983	0.000	18.676	3.564	0.450	0.277	0.385	0.297
U1457A-6H-2 53-55 cm	0.810	23.659	22.663	0.000	46.165	6.581	0.932	0.312	0.427	0.261
U1457A-6H-3 64-66 cm	0.910	30.392	22.511	0.000	39.741	6.063	1.294	0.336	0.456	0.242
U1457A-6H-4 72-76 cm	0.928	64.368	12.457	0.000	18.984	3.742	0.448	0.266	0.372	0.299
U1457A-6H-6 9-13 cm	0.954	65.358	12.428	0.000	18.505	3.298	0.411	0.268	0.374	0.307
U1457A-7H-1 2-4 cm	0.975	38.421	20.676	0.000	33.840	6.063	1.001	0.296	0.408	0.290
U1457A-7H-5 135-137 cm	1.026	67.802	11.405	0.000	16.417	4.032	0.344	0.276	0.384	0.382
U1457A-8H-5 10-12 cm	1.126	64.352	13.826	0.000	16.533	4.724	0.564	0.286	0.396	0.352
U1457A-9H-5 62-64 cm	1.210	17.397	26.332	0.000	50.186	4.634	1.451	0.302	0.415	0.218
U1457A-10H-5 72-76 cm	1.283	15.534	26.844	0.000	51.659	4.603	1.359	0.298	0.410	0.226
U1457A-15F-1 4-6 cm	1.364	10.705	22.525	0.000	62.762	2.695	1.313	0.317	0.433	0.126
U1457B-25F-1 128-130 cm	1.466	15.325	24.157	0.000	53.949	4.307	2.262	0.289	0.400	0.171
U1457C-3R-1 59-61 cm	1.558	15.744	26.812	0.000	51.140	4.866	1.439	0.271	0.379	0.215
U1457C-20R-2 84-86 cm	1.723	16.363	27.557	0.000	49.020	4.971	2.090	0.303	0.417	0.225
U1457C-22R-3 100-104 cm	1.761	39.969	17.771	10.600	24.647	5.268	1.745	0.237	0.338	0.302
U1457C-23R-4 45-49 cm	1.833	57.605	14.674	0.000	23.711	3.434	0.576	0.244	0.346	0.277
U1457C-23R-6 145-149 cm	1.929	5.059	25.321	0.000	64.148	3.604	1.867	0.323	0.441	0.132
U1457C-24R-1 14-16 cm	2.290	15.903	29.576	0.000	48.985	4.109	1.427	0.290	0.401	0.245
U1457C-24R-1 87-89 cm	2.298	66.364	11.664	0.000	17.103	4.205	0.664	0.271	0.378	0.299
U1457C-24R-3 26-28 cm	2.319	37.443	19.229	9.121	25.687	7.438	1.082	0.264	0.369	0.353
U1457C-24R-4 127-129 cm	2.340	38.967	18.888	6.712	25.675	6.348	0.595	0.266	0.372	0.355
U1457C-24R-6 53-55 cm	2.361	38.967	18.888	6.712	25.675	6.348	0.595	0.266	0.372	0.206
U1457C-25R-1 0-4 cm	2.384	37.269	20.140	0.000	37.257	4.094	1.240	0.266	0.372	0.222
U1457C-25R-2 59-61 cm	2.429	43.010	18.255	6.041	25.454	6.331	0.909	0.250	0.353	0.325
U1457C-25R-4 145-149 cm	2.512	24.549	25.293	9.564	28.275	10.654	1.665	0.239	0.339	0.373
U1457C-26R-CC 2-6 cm	2.588	18.546	29.369	0.000	44.019	5.766	2.301	0.269	0.376	0.267
U1457C-27R-1 21-23 cm	2.681	14.391	30.247	0.000	47.033	6.656	1.673	0.289	0.400	0.277

(table cont'd)

Sample Name	Age (Ma)	Smectite/Montmorillonite	Chlorite	Palygorskite	Illite	Kaolinite	Quartz	Illite FWHM	Illite crystallinity	Illite chemical index
U1457C-29R-1 30-32 cm	2.922	13.147	33.468	0.000	44.795	6.179	2.412	0.271	0.379	0.287
U1457C-30R-1 54-58 cm	3.045	9.598	30.308	0.000	53.189	5.194	1.710	0.314	0.430	0.223
U1457C-31R-1 18-20 cm	3.160	8.594	29.572	0.000	53.407	4.043	4.385	0.331	0.451	0.177
U1457C-31R-2 72-74 cm	3.185	11.874	27.193	0.000	53.583	5.809	1.540	0.332	0.452	0.195
U1457C-32R-1 6-10 cm	3.278	40.861	18.610	0.000	33.294	5.948	1.287	0.333	0.453	0.207
U1457C-32R-2 56-58 cm	3.293	23.561	29.329	0.000	39.355	5.818	1.937	0.254	0.358	0.318
U1457C-33R-1 26-30 cm	3.370	24.218	29.404	0.000	39.267	5.474	1.638	0.265	0.371	0.303
U1457C-33R-2 72-76 cm	3.387	21.324	32.363	0.000	40.396	4.051	1.866	0.263	0.369	0.299
U1457C-33R-CC 0-4 cm	3.401	23.176	30.730	0.000	37.769	6.208	2.117	0.308	0.422	0.357
U1457C-34R-1 52-54 cm	3.456	20.921	32.597	0.000	37.909	6.478	2.095	0.295	0.408	0.364
U1457C-34R-2 34-38 cm	3.467	42.924	21.114	0.000	28.974	5.332	1.656	0.311	0.426	0.311
U1457C-34R-3 82-86 cm	3.484	75.123	10.411	0.000	8.363	5.338	0.764	0.251	0.354	0.311
U1457C-34R-4 118-122 cm	3.500	77.314	9.637	0.000	8.667	4.014	0.368	0.272	0.379	0.246
U1457C-35R-1 14-16 cm	3.536	63.384	13.792	4.729	12.219	5.272	0.604	0.207	0.301	0.444
U1457C-35R-2 1-5 cm	3.565	49.346	17.203	0.000	18.531	14.235	0.685	0.242	0.343	0.492
U1457C-35R-2 133-135 cm	3.601	67.222	13.067	0.000	13.043	6.062	0.606	0.267	0.373	0.361
U1457C-35R-3 116-118 cm	3.637	56.142	18.199	0.000	18.141	6.365	1.154	0.287	0.397	0.315
U1457C-35R-5 14-16 cm	3.691	61.249	15.649	0.000	16.894	4.877	1.332	0.269	0.376	0.302
U1457C-35R-6 64-66 cm	3.745	57.842	18.386	6.260	9.770	6.704	1.038	0.188	0.278	0.675
U1457C-35R-7 47-51 cm	3.781	15.997	25.850	17.597	26.323	13.143	1.090	0.246	0.348	0.532
U1457C-38R-1 2-4 cm	5.621	51.517	20.222	0.000	23.303	4.435	0.524	0.279	0.388	0.285
U1457C-44R-1 16-20 cm	5.910	17.891	30.620	0.000	41.643	8.183	1.663	0.275	0.383	0.303
U1457C-45R-6 92-94 cm	6.741	16.052	29.805	0.000	43.582	8.037	2.524	0.388	0.520	0.247
U1457C-46R-1 73-75 cm	6.812	42.482	18.027	0.000	31.009	7.797	0.685	0.287	0.397	0.271
U1457C-46R-2 100-104 cm	6.852	31.950	20.853	8.175	28.267	9.532	1.222	0.296	0.409	0.372
U1457C-46R-3 85-87 cm	6.885	41.114	20.786	0.000	30.752	6.554	0.794	0.295	0.407	0.258
U1457C-46R-5 60-62 cm	6.947	74.319	9.686	2.287	8.524	4.537	0.647	0.257	0.361	0.391
U1457C-47R-1 6-10 cm	7.076	62.298	12.721	3.357	14.116	7.025	0.482	0.259	0.363	0.388
U1457C-47R-1 130-132 cm	7.118	49.739	16.121	7.817	13.749	11.578	0.996	0.261	0.366	0.642
U1457C-47R-5 51-53 cm	7.292	32.996	22.560	0.000	34.287	9.362	0.795	0.321	0.438	0.312
U1457C-47R-6 65-69 cm	7.347	43.284	18.879	5.266	23.438	7.908	1.226	0.288	0.399	0.394
U1457C-47R-7 0-4 cm	7.376	41.540	20.657	0.000	29.097	5.887	2.819	0.331	0.451	0.254
U1457C-48R-1 31-35 cm	7.410	36.975	20.417	6.214	26.423	8.830	1.141	0.287	0.398	0.366
U1457C-48R-2 4-6 cm	7.426	43.380	17.620	4.008	25.617	8.674	0.701	0.304	0.418	0.355
U1457C-49R-1 46-50 cm	7.552	56.792	16.570	0.000	20.546	4.942	1.149	0.319	0.436	0.389

(table cont'd)

Sample Name	Age (Ma)	Smectite/Montmorillonite	Chlorite	Palygorskite	Illite	Kaolinite	Quartz	Illite FWHM	Illite crystallinity	Illite chemical index
U1457C-49R-4 132-134 cm	7.626	25.783	30.041	0.000	33.875	7.432	2.869	0.324	0.443	0.351
U1457C-50R-2 79-81 cm	7.710	44.600	16.982	0.000	30.670	6.966	0.782	0.344	0.467	0.291
U1457C-51R-1 98-100 cm	7.762	35.463	18.404	6.813	27.680	8.984	0.434	0.340	0.461	0.336
U1457C-52R-1 2-4 cm	7.782	17.702	34.343	0.000	36.733	8.777	2.445	0.312	0.427	0.351
U1457C-53R-1 41-43 cm	7.805	19.632	33.368	0.000	35.741	8.980	2.279	0.321	0.438	0.340
U1457C-54R-1 6-8 cm	7.826	12.881	34.940	0.000	43.459	6.735	1.985	0.314	0.430	0.313
U1457C-55R-1 30-32 cm	7.848	10.972	37.206	0.000	41.750	7.454	2.618	0.300	0.414	0.324
U1457C-56R-1 105-109 cm	7.871	8.350	37.550	0.000	45.154	6.504	2.441	0.332	0.452	0.328
U1457C-57R-1 12-14 cm	7.891	13.308	35.593	0.000	42.665	6.060	2.375	0.327	0.445	0.275
U1457C-58R-1 10-14 cm	7.912	9.768	36.097	0.000	44.371	7.239	2.526	0.300	0.414	0.313
U1457C-59R-1 102-106 cm	7.936	4.780	43.529	0.000	37.095	8.916	5.680	0.250	0.353	0.308
U1457C-60R-4 70-74 cm	7.967	26.504	34.976	0.000	30.052	5.920	2.547	0.277	0.385	0.347
U1457C-62R-1 75-77 cm	8.001	10.479	39.628	0.000	37.587	9.053	3.254	0.272	0.380	0.344
U1457C-63R-3 92-94 cm	8.028	15.557	35.882	0.000	37.480	8.553	2.528	0.306	0.420	0.353
U1457C-64R-3 90-94 cm	8.050	21.015	33.716	0.000	33.724	8.915	2.630	0.333	0.453	0.342
U1457C-65R-6 44-48 cm	8.080	12.026	36.918	0.000	38.204	9.990	2.863	0.365	0.491	0.398
U1457C-67R-2 78-82 cm	8.112	19.351	35.172	0.000	34.175	8.716	2.586	0.285	0.395	0.358
U1457C-68R-1 73-75 cm	8.253	54.925	16.680	0.000	21.095	6.418	0.883	0.289	0.400	0.353
U1457C-68R-4 130-134 cm	8.666	35.186	21.946	0.000	33.040	8.825	1.003	0.381	0.511	0.313
U1457C-68R-6 32-34 cm	8.672	18.590	27.033	0.000	43.745	9.341	1.291	0.337	0.457	0.270
U1457C-68R-CC 6-8 cm	8.680	39.372	19.893	0.000	31.483	8.185	1.067	0.350	0.474	0.281
U1457C-69R-1 100-104 cm	8.779	44.985	18.575	0.000	27.587	7.723	1.131	0.331	0.451	0.301
U1457C-69R-3 42-46 cm	8.884	14.709	27.829	0.000	47.379	8.797	1.286	0.392	0.525	0.268
U1457C-69R-4 104-108 cm	8.975	17.243	27.212	9.853	33.536	10.860	1.296	0.310	0.425	0.341
U1457C-69R-6 13-15 cm	9.058	23.217	26.678	4.816	35.575	8.229	1.485	0.325	0.444	0.342
U1457C-69R-7 112-114 cm	9.163	29.014	22.550	0.000	37.400	9.691	1.345	0.365	0.491	0.295
U1457C-70R-2 12-16 cm	9.297	23.028	23.448	6.653	35.587	10.048	1.236	0.322	0.440	0.310
U1457C-70R-3 131-133 cm	9.455	60.937	12.067	0.000	18.774	7.557	0.665	0.315	0.431	0.299
U1457C-70R-5 95-97 cm	9.612	32.330	18.811	7.629	30.613	9.556	1.061	0.319	0.436	0.308
U1457C-71R-2 109-111 cm	9.717	38.521	17.938	0.000	33.196	9.743	0.601	0.394	0.526	0.300
U1457C-72R-1 107-109 cm	9.772	30.258	23.207	0.000	34.165	10.834	1.536	0.354	0.478	0.304
U1457C-74R-2 25-27 cm	9.939	31.817	23.057	0.000	33.241	10.259	1.626	0.385	0.516	0.328
U1457C-75R-1 36-40 cm	10.014	36.197	21.006	0.000	32.954	8.407	1.436	0.334	0.454	0.272
U1457C-76R-3 44-48 cm	10.129	44.316	17.886	0.000	25.761	11.175	0.862	0.328	0.447	0.319
U1457C-77R-5 26-30 cm	10.242	41.346	19.168	0.000	28.522	10.062	0.901	0.350	0.474	0.314

(table cont'd)

Sample Name	Age (Ma)	Smectite/Montmorillonite	Chlorite	Palygorskite	Illite	Kaolinite	Quartz	Illite FWHM	Illite crystallinity	Illite chemical index
U1457C-78R-4 25-27 cm	10.318	39.122	19.869	0.000	28.088	11.884	1.036	0.341	0.463	0.298
U1457C-79R-5 129-131 cm	10.432	26.232	23.115	0.000	37.933	11.716	1.004	0.401	0.535	0.298
U1457C-81R-1 30-32 cm	10.545	27.074	22.176	0.000	39.259	10.363	1.128	0.385	0.515	0.283
U1457C-82R-3 6-8 cm	10.659	25.496	20.890	0.000	42.639	10.162	0.814	0.389	0.520	0.260
U1457C-83R-2 18-20 cm	10.735	37.701	16.834	0.000	34.121	10.430	0.914	0.401	0.535	0.257
U1457C-84R-3 143-145 cm	10.849	23.081	25.040	0.000	39.915	10.391	1.573	0.345	0.468	0.289
U1457C-85R-3 46-50 cm	10.925	31.070	15.817	8.120	36.162	8.133	0.698	0.351	0.474	0.282
U1457C-86R-1 6-8 cm	10.983	29.615	18.172	6.925	35.293	9.139	0.855	0.329	0.448	0.299
U1457C-86R-2 44-46 cm	11.001	75.477	5.062	1.496	14.355	3.133	0.478	0.365	0.492	0.282
U1457C-87R-1 14-18 cm	11.030	76.992	4.472	1.492	13.650	2.582	0.812	0.386	0.517	0.198
U1457C-93R-1 50-54 cm	11.500	100.000	0.000	0.000	0.000	0.000	0.000			
U1457C-93R-3 50-52 cm	11.527	100.000	0.000	0.000	0.000	0.000	0.000			
U1457C-94R-2 55-59 cm	11.597	100.000	0.000	0.000	0.000	0.000	0.000			
U1457C-95R-1 12-14 cm	11.666	100.000	0.000	0.000	0.000	0.000	0.000			
U1457C-96R-1 62-66 cm	11.756	100.000	0.000	0.000	0.000	0.000	0.000			
Indus Marine A1-1620	3.597	35.009	19.637	0.000	38.100	5.710	1.543	0.311	0.426	0.168
Indus Marine A1-2200	5.163	32.993	24.412	0.000	35.108	5.878	1.609	0.280	0.389	0.285
Indus Marine A1-3180	6.926	39.910	15.981	0.000	29.632	13.128	1.349	0.281	0.390	0.321
Indus Marine A1-3960	8.290	38.631	21.426	0.000	33.790	4.628	1.525	0.297	0.409	0.231
Indus Marine A1-4180	8.675	38.130	24.317	0.000	31.612	4.320	1.622	0.285	0.395	0.268
Indus Marine A1-4840	9.830	30.241	13.611	0.000	35.588	18.988	1.572	0.272	0.379	0.274
Indus Marine A1-4940	10.005	34.449	20.206	0.000	29.862	13.941	1.542	0.278	0.386	0.308
Indus Marine A1-5360	10.716	22.760	32.684	0.000	35.962	6.887	1.707	0.294	0.406	0.324
Indus Marine A1-5920	11.665	14.628	36.028	0.000	41.894	5.737	1.712	0.311	0.427	0.299
Indus Marine A1-6360	12.355	25.246	31.649	0.000	35.795	5.322	1.989	0.311	0.427	0.316
Indus Marine A1-6460	12.512	24.376	34.671	0.000	33.244	5.892	1.816	0.294	0.406	0.354
Indus Marine A1-6680	12.857	25.914	32.869	0.000	33.247	5.995	1.976	0.277	0.385	0.338
Indus Marine A1-6890	13.186	23.135	34.554	0.000	33.435	6.449	2.427	0.292	0.404	0.347
Indus Marine A1-7090	13.499	20.489	26.169	0.000	35.304	16.252	1.787	0.342	0.464	0.399
Indus Marine A1-7190	13.656	22.696	34.716	0.000	32.925	6.413	3.249	0.329	0.449	0.350
Indus Marine A1-7400	13.985	25.711	33.421	0.000	31.991	6.226	2.651	0.299	0.412	0.355
Indus Marine A1-7500	14.142	21.994	35.014	0.000	32.152	8.070	2.769	0.336	0.456	0.378
Indus Marine A1-7620	14.330	20.936	34.475	0.000	33.376	8.448	2.765	0.344	0.467	0.365
Indus Marine A1-7720	14.487	23.765	34.001	0.000	32.328	7.201	2.704	0.305	0.420	0.369
Indus Marine A1-7820	14.644	24.223	33.193	0.000	32.635	7.014	2.935	0.305	0.419	0.356

(table cont'd)

Sample Name	Age (Ma)	Smectite/Mon tmorillonite	Chlorite	Palygorskite	Illite	Kaolinite	Quartz	Illite FWHM	Illite crystallinity	Illite chemical index
Indus Marine A1-8040	14.989	23.100	32.424	0.000	34.559	6.571	3.346	0.322	0.439	0.318
Indus Marine A1-8140	15.145	24.049	34.186	0.000	32.439	6.191	3.134	0.329	0.449	0.374
Indus Marine A1-8240	15.302	21.773	25.781	0.000	33.311	16.782	2.353	0.307	0.422	0.368
Indus Marine A1-8340	15.459	24.417	31.226	0.000	31.363	10.428	2.566	0.307	0.421	0.389
Indus Marine A1-8450	15.631	42.255	20.557	0.000	22.164	12.714	2.310	0.285	0.395	0.302
Indus Marine A1-8650	15.945	56.775	13.103	0.000	15.254	12.008	2.860	0.262	0.367	0.283
Indus Marine A1-8950	16.415	40.926	24.397	0.000	20.101	12.525	2.051	0.261	0.367	0.379
Indus Marine A1-9170	16.760	34.360	26.141	0.000	24.104	12.600	2.795	0.294	0.406	0.343

VITA

Peng Zhou was born in Xiantao, Hubei province, China. After completing high school, he entered Yangtze University and received Bachelor in Geological Engineering in June 2004. And then entered China University of Geoscience (Beijing) and received Master in Geological Engineering in June 2008. He was work in oil and gas industry for 7 years, and then entered the Department of Geology and Geophysics at Louisiana State University. For the next four and half years, Peng pursued his doctoral degree focused on sediment provenance and paleoenvironment until completion in Dec 2019.