SUPPLEMENTARY INFORMATION

Analytical techniques

Bulk-rock geochemistry

Samples were crushed to a fine powder using a jaw crusher and tungsten swing mill at the Department of Earth Sciences, Stellenbosch University, South Africa. Whole-rock compositions were determined at Acme Analytical Laboratories in Vancouver, Canada, following a Lithium metaborate/tetraborate fusion and dilute nitric digestion on 0.2g of powdered rock. Major oxide abundances were determined by Inductively Coupled Plasma (ICP)-emission spectrometry. Loss on ignition (LOI) is by weight difference after ignition at 1000°C. For each element analyzed, the reproducibility of replicate analyses and the deviation from the certified values of the secondary standards are less than 5% relative.

Mineral chemistry

Major element mineral compositions were analyzed using a Leo® 1430VP Scanning Electron Microscope at the Department of Earth Sciences, Stellenbosch University, South Africa. Textures were studied in backscattered electron (BSE) mode and mineral compositions quantified by EDX (Energy Dispersive X-ray) analysis using an Oxford Instruments ® 133 KeV ED X-ray detector and Oxford INCA software. Beam conditions during the quantitative analyses were 20 KV accelerating voltage and 1.5 nA probe current, with a working distance of 13mm and a specimen beam current of −4.0 nA. X-ray counts were typically ~7000 cps, and the counting time was 50s live-time. Analyses were quantified using natural mineral standards, and mineral chemical compositions were recalculated to mineral stoichiometries to obtain resultant mineral structural formulae. Comparisons between measured and accepted compositions of control standards within this laboratory, as a reflection of the accuracy of the analytical technique, have been published by Diener et al. (2005) and Moyen et al. (2006).

Zircon and monazite trace element compositions were analyzed via laser ablation-inductively-coupled-mass spectrometry (LA-ICP-MS) using an Agilent 7500ce quadrupole ICP-MS coupled to a 213 nm New Wave laser at the Department of Earth Sciences, Stellenbosch University, South Africa. Ablations occurred in a He carrier gas, and the resulting aerosol was mixed with Ar prior to introduction into the ICP-MS via a signal-smoothing manifold. Zircon and monazite analyses were performed on mineral separates mounted in epoxy. Zircon was ablated using a 20μm diameter spot size at a fluence of ~7.8 J/cm^2 and a repetition rate of 5Hz. Monazite was ablated using a 12μm diameter spot size at a fluence of ~4.0-4.5 J/cm^2 and a repetition rate of 4Hz. Data was acquired in time resolved mode which allowed potential contamination from mineral inclusions or fractures to be identified and excluded from the analysis. NIST-612 glass (Pearce et al., 1997) was used as the external standard and stoichiometric SiO_2 (zircon), and CeO_2 (monazite) contents were used as internal standards. Accuracy and reproducibility of multiple analyses was established from the analysis of the secondary standards BHVO 2G and BCR-2G (USGS natural basaltic glass standards). Results were better than 5% relative for most elements. Data was processed using the Glitter software package (Van Achterbergh et al., 2001) and absolute values in ppm, as well as chondrite-normalized trace element values, are reported (Taylor and McLennan, 1985).

LA-ICP-MS U-Pb geochronology

Mineral separates were extracted from 2-5kg rock samples using a panning table, a Frantz isodynamic separator and heavy liquids at the Dept of Earth Sciences Stellenbosch University. Zircon and monazite concentrates were subsequently handpicked, mounted in epoxy, and polished to half their thickness. Transmitted and reflected light microphotography, and SEM (scanning electron microscope; LEO 1450VP) cathodoluminescence (CL; zircon) and back-scattered electron (BSE; monazite) imaging were used to investigate internal structures. Zircon and monazite U–Pb dating was performed using the Stellenbosch University LA-ICP-MS (see above). A small volume sample cell was employed (Horstwood et al., 2003). Integration times for U/Pb age determinations were 15 ms for ^{206}Pb, 40 ms for ^{207}Pb, and 10 ms for ^{29}Si (zircon only), ^{140}Ce (monazite only), ^{208}Pb, ^{204}Pb, ^{232}Th and ^{238}U. The respective isotopic ratios were displayed in time-resolved mode. The first 5-10s of each analysis was discarded, and from the remainder of each analysis the integration window was chosen so as to maximize its concordance (Jackson et al., 2004). The data were not corrected for common Pb because of an interference of ^{204}Hg on ^{204}Pb. Instead, ^{204}Pb was measured so as to exclude analyses with abnormal concentrations of common Pb. Initial data reduction was performed by the Glitter software package (Van Achterbergh et al., 2001) to calculate the relevant isotopic ratios (^{207}Pb/^{206}Pb, ^{208}Pb/^{206}Pb, ^{208}Pb/^{232}Th, ^{206}Pb/^{238}U and ^{207}Pb/^{235}U). ^{235}U was calculated from ^{238}U counts via the natural abundance ratio ^{235}U = ^{238}U/137.88 (Jackson et al., 2004). Errors propagated by the software assume a 1% uncertainty on the age of the standard. The 1% uncertainty in the standard is propagated in quadrature into the uncertainty on each spot age. The U-Pb data were plotted on Concordia diagrams via the software Isoplot (Ludwig, 2000). For detailed information on the long-term reproducibility of U/Pb ages of zircon secondary standards using the Stellenbosch LA-ICP-MS, the reader is referred to Lana et al. (2011).

Zircon analyses were performed using a 30 μm diameter spot size at a fluence of ~10 J/cm^2 and a repetition rate of 10Hz. Instrumental drift was corrected against the primary zircon standard GJ-1 (weighted mean ^{207}Pb/^{206}Pb age = 609 ± 0.4 Ma, Jackson et al., 2004) using linear interpolative fits. Ablation depth-dependent elemental fractionation was corrected for by tying the integration window for the unknown zircon to the identical integration window of the standard (Jackson et al., 2004). Calibrations were based on 8 analyses of unknowns bracketed between 2 analyses of the primary standard (GJ-1), 2 analyses of a secondary standard (Plesoviče, weighted mean TIMS ^{206}Pb/^{238}U age = 337 ± 0.37 Ma, Sláma et al., 2008), and a trace element standard NIST-612 glass (Pearce et al., 1997). Uncertainties reported for individual analyses (ratios and ages) are at the 1σ level (Supplementary Table DR1). Calculated weighted mean or Concordia ages are reported at the 95% confidence level (Table 2, Fig. 8 & 9). Samples and standards were analyzed over multiple analytical sessions. Over the duration of this study the weighted mean ^{207}Pb/^{206}Pb age for the GJ-1 primary standard varied between 608 ± 11 Ma [n = 25, 95% c.l., MSWD = 0.27] and 609 ± 9 Ma [n = 12, 95% c.l., MSWD = 0.41], while the weighted mean ^{206}Pb/^{238}U age of the secondary standard Plesoviče zircon varied between 337.6 ± 1.8 Ma [n = 18, 95% c.l., MSWD = 0.46] and 346.2 ± 2.5 Ma [n = 7, 95% c.l., MSWD = 0.54] (Supplementary Table DR3).

Monazite analyses were performed using a 20 μm diameter spot size at a fluence of ~ 2.5-3.9 J/cm^2 and a repetition rate of 4Hz. Instrumental drift was corrected against the primary Thompson Mine monazite standard (ID-TIMS weighted mean ^{207}Pb/^{206}Pb age = 1766 Ma , Williams et al., 1996) using linear interpolative fits. Ablation depth-dependent elemental fractionation was corrected, as for zircon (Jackson et al., 2004). Calibrations were based on 8-10 analyses of unknowns bracketed between 2 analyses of the primary Thompson Mine monazite standard, one to two secondary monazite standards

(RGL4B, SHRIMP weighted mean $^{207}Pb/^{206}Pb$ age = 1566 ± 3 Ma, Rubatto et al., 2001; monazite 44069, ID-TIMS weighted mean $^{206}Pb/^{238}U$ age = 425 ± 0.4 Ma, Aleinikoff et al., 2006), as well as a trace element standard NIST-612 glass (Pearce et al., 1997). Uncertainties reported for individual analyses (ratios and ages) are at the 1σ level (Supplementary Table DR2). Calculated weighted mean ages are reported at the 95% confidence level (Table 2, Fig. 8 & 9). Samples and standards were analyzed over multiple analytical sessions. Over the duration of this study the weighted mean $^{207}Pb/^{206}Pb$ age for the Thompson Mine primary standard varied between 1758 ± 8 Ma [*n* = 19, 95% c.l., MSWD = 0.42] and 1767 ± 9 Ma [*n* = 18, 95% c.l., MSWD = 0.13]; and the weighted mean $^{207}Pb/^{206}Pb$ age of the secondary monazite standard RGL4B varied between 1532 ± 24 Ma [*n* = 7, 95% c.l., MSWD = 1.2] and 1568 ± 17 Ma [*n* = 7, 95% c.l., MSWD = 0.17] (Supplementary Table DR4).

Monazite geochronology via LA-ICP-MS or ionprobe may potentially be subject to matrix effects related to its highly variable REE (and hence Th) content, and potentially additionally due to grain orientation (Stern and Berman, 2000**;** Kohn, 2009**;** Fletcher et al., 2010). Matrix effects related to composition and grain orientation for LA-ICP-MS geochronology appear to be greater for the Th/Pb than the U/Pb system (Kohn, 2009) and, in the latter case, should affect $^{207}Pb/^{235}U$ and $^{206}Pb/^{238}U$ ages but not $^{207}Pb/^{206}Pb$ ages. In this study we used the 1766 Ma Thompson Mine monazite (Williams et al., 1996) as the primary age standard. However, its Th content is highly variable (Th = 7-19 wt%; e.g. Buick et al., 2011), and in general significantly higher than that of monazite from the samples in this study (e.g. for the Luboya and Kubuta migmatites, monazite Th content varied between 1.0-8.3 wt%). In order to test for the significance of matrix-related effects, in each analytical session we analyzed a secondary standard of variable but more comparable Th content to the unknowns, RGL4B (SHRIMP $^{207}Pb/^{206}Pb$ age = 1566 ± 3 Ma, Rubatto et al., 2001). The weighted mean $^{207}Pb/^{206}Pb$ age of RGL4B in the LA-ICP-MS sessions was always within error of its SHRIMP age (Supplementary Table DR4). In addition, we analyzed the much lower Th USGS monazite standard 44609 (Th = 1.3-5.0 wt%; Aleinikoff et al., 2006; Buick et al., 2011), in addition to Thompson Mine monazite and RGL4B for a couple of the samples. In these cases we calculated the age of the monazite first using Thompson Mine and then USGS monazite 44609 as the primary age standard. Use of the Palaeozoic USGS monazite standard 44609 resulted in calculation of weighted mean $^{207}Pb/^{206}Pb$ ages of the unknowns that were identical within error to those calculated via Thompson Mine monazite as the standard (Supplementary Table DR5). The weighted mean $^{207}Pb/^{206}Pb$ age of Thompson Mine, calculated using the USGS monazite as the standard, was within error of its accepted age; however the data were slightly reversely discordant. Because the preferred age determinations for Mesoproterozoic and older monazite depend primarily on weighted mean $^{207}Pb/^{206}Pb$ ages the use of variable but high-Th Thompson Mine as the primary age standard had no discernable effect on the calculated weighted mean $^{207}Pb/^{206}Pb$ ages for lower-Th monazite from the study area.

Mineral equilibria modeling

Pseudosection modeling was undertaken using the software program Thermocalc 3.30 (Powell and Holland, 1988) and the internally consistent dataset of Holland and Powell (1998, and subsequent upgrades), in the chemical system Na_2O-CaO-K_2O-FeO-MgO-Al_2O_3-SiO_2-H_2O-TiO_2-O_2 (NCKFMASHTO). Qtz was typically treated as a saturated phase and the ferric iron content of the rock was estimated at ~5% of total iron. Modeling began by calculating T-X_{H2O} sections at a range of set pressure conditions, with the aim of investigating the dependence of the given mineral equilibria on bulk-rock H_2O content. These were used to constrain the maximum bulk-H_2O contents to values consistent with the formation of the observed peak metamorphic assemblage in the rocks (see Taylor et al., 2010). For the two compositions modeled, the chosen bulk-H_2O contents were insensitive to changes in pressure in the range 5-8 kbar. This approach differs slightly from the convention of assuming the lowest possible bulk-H_2O content to fully hydrate the assemblage below the wet solidus (White et al., 2001). Given that the samples chosen for modeling contain a high proportion of peritectic mineral phases (20-40%) and limited *in situ* crystallized leucosome, it was assumed that the preservation of the dry, restitic granulite-facies assemblages was largely a consequence of melt loss (White and Powell, 2002).

Detailed U-Pb geochronology interpretation

Luboya and Kubuta metasedimentary rocks

Sample Kub23

Zircon - This metagraywacke yielded 50-400 µm, subrounded to oval shaped zircons. The grains display complex internal zoning, as indicated via cathodoluminescence (CL) imaging. CL-bright, euhedral, oscillatory zoned cores are enveloped and truncated by two distinct rim generations; an inner structureless domain of intermediate CL response around the cores and an outer, more uniform, CL-dark-grey overgrowth (Fig. 7a,b). Twenty-four spot analyses of the cores show that they have variable, moderate to high Th/U (Th/U = 1.14-0.29) (Table DR1). All twenty-four analyses have $^{207}Pb/^{206}Pb$ equal within analytical error, are 100-95% concordant and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3514 ± 12 Ma [95 % c.l., MSWD = 0.14] (Table DR1, Fig. 8a). In contrast, ten spot analyses of the inner, and twelve spot analyses of the outer overgrowths (Fig. 7a,b) show that both rims are characterized by low Th/U ratios (inner rim Th/U = 0.13-0.01; outer rim Th/U = 0.07-0.01) (Table DR1). All ten analyses of the inner overgrowths with a brighter CL response have $^{207}Pb/^{206}Pb$ equal within analytical error, are 100-96% concordant and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3222 ± 19 Ma [95% c.l., MSWD = 0.05] (Table DR1, Fig. 8a). The twelve analyses of the outer rims are more variably concordant (100-83%). However, all have $^{207}Pb/^{206}Pb$ within analytical error, and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3098 ± 18 Ma [95% c.l., MSWD = 0.06]. The relationship between the CL zoning in the zircons and the Th/U ratios of the various CL domains lead us to interpret the cores to be of magmatic, detrital origin and both rim generations to be of metamorphic origin (e.g. Corfu et al., 2003; Williams and Claesson, 1987).

Monazite – Kub23 yielded 80-200 µm, amoeboid shaped, subrounded to slightly elongate monazite grains. Back-scattered electron (BSE) imaging shows that they are either internally unzoned, or display patchy zonation patterns where darker BSE domains typically occur around the edges of the grains, and lighter domains are concentrated in the centre of the grains (Fig. 7f). Spot analyses of both unzoned and zoned grains define three distinct, concordant- to near-concordant age populations (Table DR2; Fig. 8b). Nineteen analyses of unzoned monazite and brighter BSE domains in the center of the grains have highly variable Th/U (21.7-2.8). However, all have $^{207}Pb/^{206}Pb$ equal within analytical error, are 100-98% concordant and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3228.6 ± 7.5 Ma [95% c.l., MSWD = 0.24]. Ten analyses of unzoned grains or irregular, BSE-bright domains in the grains have Th/U = 16.4-8.2, have $^{207}Pb/^{206}Pb$ equal within analytical error, are 100-96% concordant and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3160 ± 11 Ma [95% c.l., MSWD = 0.12]. Fifteen analyses of unzoned grains or darker BSE domains along the edges of the grains have Th/U = 17.9-11.7, $^{207}Pb/^{206}Pb$ equal within analytical error, are 103-95% concordant and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3080 ± 8.9 Ma [95% c.l., MSWD = 0.92]. The inferred $^{207}Pb/^{206}Pb$ age of the oldest and youngest monazite age populations from this sample are therefore identical within error to corresponding metamorphic zircon rim ages from the same sample. In addition to dating monazite grain separates, we dated *in situ* monazite inclusions in garnet using polished rock chips mounted in epoxy, so as to provide better constraints on the age of garnet growth in these samples. Six out of eight spot analyses of *in situ* monazite inclusions have $^{207}Pb/^{206}Pb$ equal within analytical error, are 100-96% concordant and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3216 ± 19 Ma [95% c.l., MSWD = 0.52] (Table DR2). The remaining two analyses obtained from a single grain inclusion are 100% concordant and give $^{207}Pb/^{206}Pb$ spot ages of 3083 ± 25 Ma and 3072 ± 22 Ma (Table DR2). Therefore, the ages of *in situ* monazite inclusions in garnet are identical within error to the oldest and youngest monazite ages obtained from dating grain separates from this sample. There was no systematic correlation between the position of the monazite inclusion in the garnet and its age.

Sample Kub17

Zircon – This metapelite contains 50-400 µm, prismatic, subhedral to subrounded zircon grains with weakly developed apical terminations. CL imaging reveals that the zircons are complexly zoned, with CL-light-grey to -dark, euhedral, oscillatory zoned cores truncated by bright, structureless overgrowths around the cores (Fig. 7c & d). Twenty-seven spot analyses of the oscillatory-zoned cores have variable Th/U (0.80-0.26) (Table DR1). All have the same $^{207}Pb/^{206}Pb$ within analytical uncertainty, are 101-95% concordant and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3320.2 ± 7.3 Ma [95% c.l., MSWD = 0.61] (Table DR1). A subset of the fourteen most concordant analyses produce a Concordia age of 3332.9 ± 7.6 Ma [95% c.l., MSWD = 1.00] (Fig. 8c). Thirty-three analyses of the structureless rim overgrowths on the cores were obtained. Of these, fourteen analyses have $^{207}Pb/^{206}Pb$ equal within analytical error, are 99-88% concordant and were combined to form a population. The remaining nineteen analyses gave apparent $^{207}Pb/^{206}Pb$ spot ages ranging between 3150 ± 47 Ma and 2878 ± 29 Ma; however they are highly discordant and it is not apparent whether they lie on a Discordia segment related to the other analyses, hence they were not included in the age calculations. The fourteen 99-88% concordant analyses of the rims have Th/U = 0.03-0.00, and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3092 ± 12 Ma [95% c.l., MSWD = 0.64] (Table DR1; Fig. 8c). Based on the CL zoning and Th/U content of the core and rim domains, we interpret the cores to be magmatic in origin and hence detrital, and the rims to be of metamorphic origin.

Monazite – Kub17 contains abundant 80-200 µm, rounded, oval to subhedral, elongate grains of monazite. They are characterized by weak, patchy zonation in BSE (Fig. 7g). This typically involves a brighter core domain truncated by darker domains along the edges of the grains, but locally this relationship is reversed. As in the metagraywacke sample Kub23, spot analyses of the various BSE domains define three distinct, concordant age populations (Table DR2, Fig. 8d). The relationship between the BSE domains and $^{207}Pb/^{206}Pb$ age is not consistent, however there appears to be a general tendency for the BSE bright core domains to be older than the BSE intermediate to darker rims. Twenty-nine analyses from predominantly brighter core domains all have $^{207}Pb/^{206}Pb$ equal within analytical error, are 100-99% concordant, have Th/U = 28.6-17.1 and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3213.8 ± 6.0 Ma [95% c.l., MSWD = 0.24]. This appears to be the dominant monazite age population from this sample. Five analyses of intermediate to darker monazite domains all have $^{207}Pb/^{206}Pb$ equal within analytical error, are 100-99% concordant, have Th/U = 28.0-15.6 and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3161 ± 15 Ma [95% c.l., MSWD = 0.05]. Five analyses of darker domains concentrated along the edges of the grains all have $^{207}Pb/^{206}Pb$ equal within analytical error, are concordant, have a narrow range of Th/U (23.1-19.3) and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3087 ± 15 Ma [MSWD = 0.46]. The inferred $^{207}Pb/^{206}Pb$ age of the oldest and youngest monazite age populations are therefore identical within error to corresponding metamorphic zircon rim ages from this sample, as well as sample Kub23. In addition, the three monazite age populations from this sample are identical within error to the three monazite age populations from Kub23.

Sample Kub8

Monazite **–** This metagraywacke contains 40-180 µm, rounded, oval to teardrop-shaped monazite grains. In BSE images the grains are largely unzoned, with rare brighter, patchy domains in their cores (Fig. 7h). Twenty-two analyses of unzoned monazite have a wide range of Th/U (49.3-5.4), are 101-99% concordant, and have the same $^{207}Pb/^{206}Pb$ within analytical error. They are therefore interpreted to form a single age population, with a weighted mean $^{207}Pb/^{206}Pb$ age of 3091.3 ± 7.1 Ma [95% c.l., MSWD = 0.87] (Table DR2; Fig. 8e). The age of this population is equal within error to the youngest monazite from samples Kub23 and Kub17. One additional grain analyzed gave a concordant $^{207}Pb/^{206}Pb$ spot age of 3332 ± 17 Ma, and one bright core domain in another grain gave a concordant $^{207}Pb/^{206}Pb$ spot age of 3223 ± 19 Ma. As in sample Kub23, we dated *in situ* monazite inclusions in garnet in order to constrain the age of garnet growth in this sample. Seven spot analyses of monazite, included in the poikiloblastic core domains of the garnet and up to 100 µm from the rim, all have $^{207}Pb/^{206}Pb$ equal within analytical error, are 101-97% concordant and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3110 ± 21 Ma [95% c.l., MSWD = 0.42] (Table DR2, Fig. 7m). This age is identical within error to the age of the dominant monazite population obtained from grain separates from this sample, and indicates that the garnet grew at, or after ca. 3.10 Ga.

Sample Lu17

Zircon **–** This Grt-bearing metapsammite contains 50-300 µm, subhedral prismatic or oval/rounded zircon grains. Two varieties of zircon can be distinguished based on morphology and CL zoning in the grains. Larger, prismatic zircons contain euhedral cores with moderate to weak CL response, with occasional, faint oscillatory zoning. Cores in these large grains are typically surrounded by euhedral to subhedral, faintly oscillatory-zoned to structureless rims (Fig. 7e). Smaller, well-rounded, structureless zircon grains are also present. Three spot analyses of euhedral, uniformly grey cores in three large grains have $^{207}Pb/^{206}Pb$ equal within analytical error, Th/U = 0.37-0.33, are 96-94% concordant and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3503 ± 31 Ma [95% c.l., MSWD = 0.0013] (Table DR1; Fig. 9a). Ten spot analyses targeting a combination of CL-dark, euhedral zircon cores, euhedral- to subhedral oscillatory-zoned rims around these cores, or patchy domains in small structureless grains have same $^{207}Pb/^{206}Pb$ within analytical uncertainty, low Th/U (0.01-0.07), and are 101-95% concordant. They yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3225 ± 16 Ma [95% c.l., MSWD = 0.07] (Table DR1; Fig. 9a). Nine analyses targeting a combination of rims on larger grains with ca. 3.50 Ga or 3.22 Ga cores, as well as domains in small structureless grains have $^{207}Pb/^{206}Pb$ equal within analytical error, low Th/U (0.02-0.04), are 100-83% concordant and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3108 ± 16 Ma [95% c.l., MSWD = 0.04] (Table DR1, Fig. 9a). Based on CL zoning and Th/U ratios we interpret the rare ca. 3.5 Ga cores in larger prismatic grains to be magmatic, and hence detrital in origin. The ca. 3.22 Ga zircon cores, ca. 3.22 Ga and ca. 3.10 Ga rims on the larger grains as well as smaller, structureless grains are interpreted to be metamorphic in origin. Both $^{207}Pb/^{206}Pb$ ages obtained for the metamorphic zircon domains/grains are therefore identical within error to corresponding metamorphic zircon rim ages, and the oldest and youngest monazite age populations from metasediments Kub23, Kub17 and Kub8.

Sample Lu6

Monazite **–**The metapelite sample Lu6 contains abundant, 100-400 µm monazite with a variety of grain shapes that vary from elongate, subhedral/blocky, to subrounded/oval in shape. BSE imaging shows that the zoning in monazite from this sample is extremely complex, with as many as four distinct, irregular and patchy BSE domains observed (Fig. 7i). Fifty spot analyses of the various monazite domains define five concordant age populations (Table DR2, Fig. 9b). In general, the older domains in composite grains are BSE dark and tend to occur in grain cores. The BSE brighter domains are younger and typically occur in the rims. Throughout the analytical session where monazite grain separates from sample Lu6 were dated, the trace element standard NIST-612 glass was not analyzed, therefore the Th/U ratios of the individual spot analyses presented in Table DR2 are not available. Subsequent trace element work on the same monazites targeting the same age domains in the grains has however allowed the Th/U ratios of the various age populations to be determined (Table 2). Three analyses from older grain domains have $^{207}Pb/^{206}Pb$ equal within analytical error, Th/U = 35.4-7.4, are 100% concordant and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3436 ± 19 Ma [95% c.l., MSWD = 0.04]. One analysis has Th/U = 36.8 and gives a concordant $^{207}Pb/^{206}Pb$ spot age of 3395 ± 17 Ma. Three analyses have the same $^{207}Pb/^{206}Pb$ within analytical uncertainty, Th/U = 18.5-14.7, are 100-99% concordant and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3356 ± 20 Ma [95% c.l., MSWD = 0.16]. However, the majority of the U-Pb data from this sample define three younger monazite age populations. One population, comprised of eleven 101-99% concordant analyses, has Th/U = 54.1-16.0 and yields a weighted mean $^{207}Pb/^{206}Pb$ age of 3234 ± 10 Ma [95% c.l., MSWD = 0.35]. A population comprised of fourteen 100-99% concordant analyses has Th/U = 31.8-17.6, and yielded a weighted mean $^{207}Pb/^{206}Pb$ age of 3101.9 ± 9.2 Ma [95% c.l., MSWD = 0.24]. The youngest monazite age population obtained from analysing the brightest rim domains on some of the monazite grains consists of eighteen 100-99% concordant analyses with Th/U = 31.5-17.7, and yields a weighted mean $^{207}Pb/^{206}Pb$ age of 2993.8 ± 8.5 Ma [95% c.l., MSWD = 0.39]. As in samples Kub23 and Kub8, we performed *in situ* dating of monazite included in peritectic Grt, in order to constrain the maximum age of Grt growth in this sample. Five out of twelve spot analyses of *in situ* monazite inclusions in Grt can be grouped to form a 100-98% concordant population with a weighted mean $^{207}Pb/^{206}Pb$ age of 3440 ± 28 Ma [95% c.l., MSWD = 0.33] (Table DR2). Three out of twelve spot analyses can be grouped to form a 100-99% concordant population with a weighted mean $^{207}Pb/^{206}Pb$ age of 3402 ± 42 Ma [95% c.l., MSWD = 0.007] (Table DR2). The latter two ages are identical within error to the oldest monazite ages obtained from dating grain separates from this sample. These older monazite inclusions are situated ~1000 µm from the Grt margin, in the core domain, and also occur as older domains in younger monazite inclusions situated ~250 µm inboard from the Grt margin, in the inclusion-rim of the Grt. One out of twelve spot analyses from a younger domain in a ca. 3.40 Ga aged monazite gave a concordant $^{207}Pb/^{206}Pb$ spot age of 3231 ± 28 Ma. Three out of twelve spot analyses can be grouped to form a 100% concordant population with a weighted mean $^{207}Pb/^{206}Pb$ age of 3072 ± 33 Ma [95% c.l., MSWD = 0.16] (Table DR2), identical within error to the ca. 3.10 Ga monazite age obtained from dating grain separates from this sample. The youngest monazites occur in the 100-400 µm wide inclusion-rich, peritectic rims of the Grt porphyroblasts. In one particular example a 375µm long monazite was found included in the rim domain of a peritectic Grt, ~250 µm from the Grt edge (Fig. 7n & o). The monazite, together with micro-inclusions of zircon and ilmenite, define an internal foliation in the Grt. Dating of a lighter domain in this monazite gave a concordant analysis with a $^{207}Pb/^{206}Pb$ spot age of 3402 ± 28 Ma, while a darker domain gave a concordant analysis with a $^{207}Pb/^{206}Pb$ spot age of 3078 ± 23 Ma (these two spot analyses were included in the calculated weighted mean $^{207}Pb/^{206}Pb$ ca. 3.40 Ga and ca. 3.07 Ga ages described for the *in situ* inclusions above).

Luboya and Kubuta anatectic leucosomes

Sample Kub14

Monazite – This Grt-bearing leucosome contains very few monazite grains. These are 80-100 µm in size, euhedral to crescent shaped, and are unzoned in BSE images (Fig. 7j). Fourteen spot analyses were performed on 8 grains. Thirteen out of the fourteen analyses have $^{207}Pb/^{206}Pb$ equal within analytical uncertainty, Th/U = 21.6-12.0, are 101-98% concordant and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3082.5 ± 8.8 Ma [96% c.l., MSWD = 0.24] (Table DR2; Fig. 8f). The remaining analysis has a concordant $^{207}Pb/^{206}Pb$ spot age of 3212 ± 16 Ma (Th/U = 14). Thus we interpret the weighted mean $^{207}Pb/^{206}Pb$ age of 3082.5 ± 8.8 Ma to be the best estimate of the crystallization age of the leucosome. This estimate is identical within error to the age of the youngest monazite populations dated in host gneisses from this area i.e. samples Kub23, Kub17 and Kub8.

Sample Lu9

Monazite – This Grt-bearing leucosome contains abundant 80-100 µm, subrounded, oval to amoeboid shaped monazite grains. They are largely unzoned in BSE images or show weak, irregular, patchy zonation (Fig. 7k & l). Thirty-three spot analyses of unzoned monazite or darker BSE domains in the cores of the grains have the same $^{207}Pb/^{206}Pb$ within analytical uncertainty. They show a wide range of Th/U (32.6-5.2), are 100-97% concordant and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3188.9 ± 6.2 Ma [95% c.l., MSWD = 0.23] (Table DR2; Fig. 9c). Nineteen spot analyses of brighter domains typically concentrated in the rims of the grains define two younger age populations (Table DR2; Fig. 9c). Thirteen out of the nineteen analyses are 100-98% concordant, have Th/U = 29.0-4.9 and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3114 ± 10 Ma [95% c.l., MSWD = 0.74]. The remaining six analyses are 100-99% concordant, have Th/U = 23.8-10.7 and yield a weighted mean $^{207}Pb/^{206}Pb$ age of 3058 ± 14 Ma [95% c.l., MSWD = 0.29]. Two analyses of brighter rim domains have Th/U = 28.9-16.2, are 95-93% concordant and have $^{207}Pb/^{206}Pb$ spot ages of 2997 ± 17 Ma and 2973 ± 24 Ma (Table DR2).

References cited

Aleinikoff, J. N., Schenk, W. S., Plank, M. O., Srogi, LA, Fanning, C. M., Kamo, S. L., and Bosbyshell, H., 2006, Deciphering igneous and metamorphic events in high-grade rocks of the Wilmington complex, Delaware: Morphology, cathodoluminescence and backscattered electron zoning, and SHRIMP U/Pb geochronology of zircon and monazite: Geological Society of America Bulletin, v. 118, p. 39-64.

Buick, I.S., Lana, C., and Gregory, C., 2011, A LA-ICP-MS and SHRIMP U/Pb age constraint on the timing of REE mineralization associated with Bushveld granites: South African Journal of Geology, *in press*

Corfu, F., Hanchar, J.M., Hoskin, P.W.O., and Kinny, P., 2003, Atlas of zircon textures, *in* Hanchar, J.M., and Hoskin, P.W.O., eds., Zircon. Mineralogical Society of America, v. 53, p. 468-500

Diener, J.F.A, Stevens, G., Kisters, A.F.M., and Poujol, M., 2005, Geotectonic evolution of the Tjakastad Schist belt, Barberton greenstone belt, South Africa: a record of mid-Archaean metamorphism and terrain exhumation: Precambrian Research, v. 143, p. 87-112

Fletcher, I.R., McNaughton, N.J., Davis, W.J., 2010, Matrix effects and calibration limitations in ionprobe U-Pb and Th-Pb dating of monazite: Chemical Geology, v. 270, p. 31-44.

Holland, T.J.B., and Powell, R., 1998, An internally consistent thermodynamic data set for phases of petrological interest: Journal of Metamorphic Geology, v. 16, p. 309-343

Horstwood, M. S. A., Foster, G. L., Parrish, R. R., Noble, S. R., and Nowell, G. M., 2003, Common-Pb corrected in situ U–Pb accessory mineral geochronology by LA-MC-ICP-MS: Journal of Analytical Atomic Spectrometry, v. 18, p. 837–846.

Jackson, S. E., Pearson, N.J., Griffin, W. L., and Belousova, E. A., 2004, The application of laser ablation-inductively coupled plasma-mass spectrometry to in situ U-Pb zircon geochronology: Chemical Geology, v. 211, p. 47–69.

Kohn, M. J., 2009, Chronologic microanalysis of monazite. V.M. Goldschmidt Conference in Geochemistry, Abstracts Volume, p. A675

Ludwig, K.R., 2000, Isoplot/Ex: a Geochronological Toolkit for Microsoft Excel. Berkeley, California, *in* Berkeley Geochronology Center, Special Publication, v. 1a, p. 53

Moyen, J.F., Stevens, G., and Kisters, A., 2006, Record of mid-Archaean subduction from metamorphism in the Barberton terrain, South Africa: Nature, v. 442, p. 559-562.

Pearce, N. J. G., Perkins, W. T., Westgate, J. A., Gorton, M. P., Jackson, S. E., Neal, C. R., and Chenery, S. P., 1997, A compilation of new and published major and trace element data for NIST SRM 610 and NIST SRM 612 glass reference materials: Geostandards Newsletter, v. 21, p. 115-144.

Powell, R., and Holland, T.J.B., 1988, An internally consistent dataset with uncertainties and correlations 3. Applications to geobarometry, worked examples and a computer-program: Journal of Metamorphic Geology, v. 6, p. 173-204

Rubatto, D., Williams, I.S., and Buick, I.S., 2001, Zircon and monazite response to prograde metamorphism in the Reynolds Range, central Australia: Contributions to Mineralogy and Petrology, v. 140, p. 458-468

Sláma, J., Košler, J., Condon, D.J., Crowley, J.L., Gerdes, A., Hanchar, J.M., Horstwood, M.S. A., Morris, G.A., Nasdala, L., Norberg, N., Schaltegger, U., Schoene, B., Tubrett, M.N., and Whitehouse, M.J., 2008, Plešovice zircon—a new natural reference material for U–Pb and Hf isotopic microanalysis: Chemical Geology, v. 249, p. 1–35

Stern, R. A., and Berman, R. G., 2000, Monazite U–Pb and Th–Pb geochronology by ion probe, with an application to in situ dating of an Archean metasedimentary rock: Chemical Geology, v. 172, p. 113–130.

Taylor, S.R., and McLennan, S.M., 1985, The continental crust: its composition and evolution. Blackwell, Oxford. P. 312

Taylor, J., Stevens, G., Armstrong, R.A., and Kisters, A.F.M., 2010, Granulite facies anatexis in the Ancient Gneiss Complex, Swaziland, at 2.73 Ga: Mid-crustal metamorphic evidence for mantle heating of the Kaapvaal craton during Ventersdorp magmatism: Precambrian Research, v. 177, p. 88-102

Van Achterbergh, E., Ryan, C. G., Jackson, S. E., and Griffin, W., 2001, Data reduction software for LA-ICP-MS, in Sylvester, P., ed., Laser ablation-ICPMS in the Earth Science, Mineralogical Association of Canada, v. 29, p. 239-243.

White, R.W., and Powell, R., 2002, Melt loss and the preservation of granulite facies mineral assemblages: Journal of Metamorphic Geology, v. 20, p. 621-632

White, R.W., Powell, R., and Holland, T.J.B., 2001, Calculation of partial melting equilibria in the system Na_2O-CaO-K_2O-FeO-MgO-Al_2O_3-SiO_2-H_2O (NCKFMASH): Journal of Metamorphic Geology, v. 19, p. 139-153

Williams, I. S., Buick, I. S., and Cartwright, I., 1996, An extended episode of early Mesoproterozoic metamorphic fluid flow in the Reynolds Range, central Australia: Journal of Metamorphic Geology, v. 14, p. 29-48

Williams, I.S., and Claesson, S., 1987, Isotopic evidence for the Precambrian provenance and Caledonian metamorphism of high grade paragneisses from the Seve Nappes, Scandinavian Caledonides. Contributions to Mineralogy Petrology, v. 97, p. 205–217.

Table DR1 Summary of LA-ICP-MS U-Pb zircon age data for metasediments Kub23, Kub17, and Lu17 from south-central Swaziland. Errors are 1-sigma. Data presented in this table are < 5% discordant. magm. = magmatic; met. = metamorphic; Disc. = discordance.

Sample/Spot	^{206}Pb (ppm)	U (ppm)	$^{232}Th/^{238}U$	$^{206}Pb/^{238}U$ Age (Ma)	1σ	$^{207}Pb/^{235}U$ Age (Ma)	1σ	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Disc.	$^{206}Pb/^{238}U$ ratio	1σ	$^{207}Pb/^{235}U$ ratio	1σ	$^{207}Pb/^{206}Pb$ ratio	1σ	Rho
Kub23 magm. cores																	
KUB23-1	271	96	0.29	3520	33	3514	15	3510	23	0	0.72652	0.00870	30.84560	0.46221	0.30789	0.00459	0.80
KUB23-2	740	282	0.46	3515	39	3512	23	3511	36	0	0.72507	0.01036	30.77101	0.73073	0.30800	0.00729	0.60
KUB23-3	292	111	0.32	3512	36	3513	17	3514	25	0	0.72411	0.00954	30.82399	0.51709	0.30868	0.00511	0.79
KUB23-4	133	50	0.32	3512	43	3516	22	3519	34	0	0.72421	0.01145	30.89293	0.68695	0.30953	0.00698	0.71
KUB23-5	614	233	0.37	3509	36	3515	20	3518	31	0	0.72341	0.00962	30.86706	0.62257	0.30950	0.00626	0.66
KUB23-6	179	68	0.45	3495	38	3503	17	3509	27	0	0.71963	0.01024	30.50761	0.53807	0.30764	0.00535	0.81
Kub23 met. rim 1																	
KUB23-7	654	245	0.01	3220	31	3218	15	3217	24	0	0.64792	0.00796	22.77875	0.34550	0.25511	0.00397	0.81
KUB23-8	891	326	0.01	3226	34	3231	24	3235	39	0	0.64936	0.00876	23.10320	0.57212	0.25806	0.00654	0.54
KUB23-9	767	259	0.01	3220	30	3226	18	3230	31	0	0.64801	0.00759	22.98046	0.43051	0.25720	0.00505	0.63
KUB23-10	799	297	0.02	3220	31	3226	17	3231	28	0	0.64799	0.00784	22.97769	0.40578	0.25737	0.00467	0.69
KUB23-11	882	328	0.01	3213	31	3219	19	3223	31	0	0.64615	0.00800	22.81536	0.43317	0.25618	0.00505	0.65
KUB23-12	788	264	0.01	3206	30	3212	18	3216	29	0	0.64422	0.00761	22.64199	0.40833	0.25493	0.00475	0.66
Kub23 met. rim 2																	
KUB23-13	1018	453	0.05	3106	31	3100	17	3095	27	0	0.61905	0.00783	20.16974	0.35071	0.23632	0.00400	0.73
KUB23-14	807	331	0.02	3060	45	3083	36	3099	60	1	0.60752	0.01126	19.81737	0.73362	0.23689	0.00910	0.50
KUB23-15	939	408	0.03	3048	29	3080	16	3102	26	1	0.60457	0.00718	19.77551	0.32808	0.23729	0.00387	0.72
KUB23-16	980	440	0.02	3018	30	3069	18	3103	28	2	0.59697	0.00738	19.53401	0.35450	0.23741	0.00426	0.68
KUB23-17	1118	516	0.02	3006	35	3064	20	3103	33	2	0.59406	0.00861	19.44034	0.40811	0.23747	0.00501	0.69
KUB23-18	485	188	0.01	2936	42	3035	29	3102	49	3	0.57684	0.01024	18.86131	0.57440	0.23725	0.00736	0.58
Kub17 magm. cores																	
KUB17-1	333	126	0.28	3357	37	3338	16	3326	23	-1	0.68332	0.00963	25.77515	0.41621	0.27354	0.00405	0.87
KUB17-2	439	153	0.33	3348	31	3334	12	3325	17	0	0.68096	0.00808	25.66359	0.31606	0.27334	0.00303	0.96
KUB17-3	568	214	0.38	3343	34	3331	14	3324	20	0	0.67964	0.00888	25.59854	0.36470	0.27314	0.00343	0.92
KUB17-4	469	164	0.39	3350	31	3338	12	3332	17	0	0.68135	0.00810	25.78547	0.31929	0.27448	0.00306	0.96
KUB17-5	254	94	0.26	3347	34	3338	14	3333	19	0	0.68064	0.00891	25.77580	0.35748	0.27468	0.00339	0.94
KUB17-6	273	105	0.28	3336	37	3336	16	3336	22	0	0.67791	0.00952	25.71487	0.40712	0.27513	0.00395	0.89
Kub17 met. rim1																	
KUB17-7	711	320	0.01	3093	37	3099	20	3103	32	0	0.61583	0.00938	20.15967	0.41741	0.23751	0.00474	0.74
KUB17-8	1090	464	0.01	3051	32	3084	15	3105	21	1	0.60528	0.00800	19.84580	0.29938	0.23776	0.00320	0.88
KUB17-9	1122	499	0.01	2944	32	3034	15	3093	22	3	0.57886	0.00773	18.83631	0.29246	0.23599	0.00329	0.86
KUB17-10	1143	534	0.00	2859	30	2994	14	3087	20	5	0.55804	0.00726	18.08358	0.25943	0.23510	0.00303	0.91

Table DR1 Continued.

Sample/Spot	^{206}Pb (ppm)	U (ppm)	$^{232}Th/^{238}U$	$^{206}Pb/^{238}U$ Age (Ma)	1σ	$^{207}Pb/^{235}U$ Age (Ma)	1σ	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Disc.	$^{206}Pb/^{238}U$ ratio	1σ	$^{207}Pb/^{235}U$ ratio	1σ	$^{207}Pb/^{206}Pb$ ratio	1σ	Rho
Lu17 magm. cores																	
LU17-1	284	109	0.33	3306	31	3430	14	3503	21	4	0.67004	0.00797	28.30416	0.39427	0.30641	0.00415	0.85
LU17-2	335	143	0.36	3273	40	3418	24	3503	37	4	0.66152	0.01039	27.95577	0.69062	0.30633	0.00749	0.64
Lu17 met. rim 1																	
LU17-3	1140	397	0.05	3315	31	3266	13	3236	20	-1	0.67234	0.00803	23.93437	0.31570	0.25827	0.00325	0.91
LU17-4	396	159	0.01	3227	35	3228	15	3229	22	0	0.64975	0.00905	23.02180	0.35695	0.25702	0.00358	0.90
LU17-5	963	636	0.07	3212	33	3217	17	3221	28	0	0.64582	0.00853	22.76728	0.39898	0.25582	0.00461	0.75
LU17-6	1072	415	0.05	3208	33	3217	15	3223	22	0	0.64479	0.00850	22.76540	0.35233	0.25618	0.00364	0.85
LU17-7	889	664	0.03	3189	32	3204	19	3214	29	0	0.64010	0.00813	22.46855	0.43432	0.25458	0.00473	0.66
LU17-8	384	166	0.02	3169	40	3201	20	3221	30	1	0.63502	0.01025	22.38852	0.45717	0.25581	0.00491	0.79
Lu17 met. rim 2																	
LU17-9	931	341	0.02	3105	30	3105	14	3105	23	0	0.61883	0.00758	20.28194	0.30055	0.23774	0.00341	0.83
LU17-10	938	338	0.04	3058	29	3086	14	3104	23	1	0.60703	0.00718	19.88409	0.28221	0.23756	0.00338	0.83
LU17-11	988	362	0.02	3030	36	3075	18	3104	30	1	0.59999	0.00883	19.65449	0.35585	0.23762	0.00444	0.81

Table DR2 Summary of LA-ICP-MS U-Pb monazite age data for metasediments Kub23, Kub17, Kub8, and Lu6 and anatectic leucosomes Kub14 and Lu9 from south-central Swaziland. Errors are 1-sigma. Data presented are ≤ 5% discordant. Disc. = discordance. Incl. = inclusion. n.a. = not analyzed.

Sample/Spot	^{206}Pb (ppm)	U (ppm)	$^{232}Th/^{238}U$	$^{206}Pb/^{238}U$ Age (Ma)	1σ	$^{207}Pb/^{235}U$ Age (Ma)	1σ	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Disc.	$^{206}Pb/^{238}U$ ratio	1σ	$^{207}Pb/^{235}U$ ratio	1σ	$^{207}Pb/^{206}Pb$ ratio	1σ	Rho
Kub23																	
KUB23 -1	3993	1630	9.7	3213	35	3220	13	3225	16	0	0.64610	0.00895	22.83972	0.31482	0.25643	0.00259	1.00
KUB23 -2	3477	1425	10.7	3200	35	3207	14	3212	17	0	0.64278	0.00897	22.53890	0.31500	0.25439	0.00268	1.00
KUB23 -3	3084	1224	14.5	3207	36	3217	14	3223	18	0	0.64448	0.00912	22.75401	0.32626	0.25615	0.00287	0.99
KUB23 -4	2133	881	21.7	3204	36	3215	14	3222	18	0	0.64372	0.00920	22.70876	0.32704	0.25591	0.00285	0.99
KUB23 -5	3686	1483	12.5	3201	37	3215	14	3225	18	0	0.64312	0.00936	22.72272	0.33605	0.25636	0.00293	0.98
KUB23 -6	3230	1338	12.8	3203	35	3218	14	3228	16	0	0.64363	0.00897	22.79225	0.31669	0.25688	0.00264	1.00
Incl. in Grt	**7174**	**3390**	**5.1**	**3197**	**38**	**3196**	**17**	**3196**	**24**	**0**	**0.64190**	**0.00973**	**22.27485**	**0.37702**	**0.25174**	**0.00387**	0.90
Incl. in Grt	**7414**	**3416**	**3.4**	**3185**	**38**	**3196**	**16**	**3203**	**24**	**0**	**0.63898**	**0.00976**	**22.27684**	**0.37387**	**0.25287**	**0.00384**	0.91
Incl. in Grt	**3928**	**1878**	**9.6**	**3168**	**37**	**3192**	**16**	**3208**	**23**	**1**	**0.63473**	**0.00945**	**22.19536**	**0.36439**	**0.25362**	**0.00379**	0.91
Incl. in Grt	**4280**	**2101**	**9.4**	**3097**	**39**	**3172**	**18**	**3220**	**27**	**2**	**0.61687**	**0.00973**	**21.73049**	**0.39116**	**0.25563**	**0.00434**	0.88
Incl. in Grt	**4409**	**2165**	**10.3**	**3070**	**36**	**3167**	**16**	**3229**	**23**	**3**	**0.60989**	**0.00902**	**21.61823**	**0.34772**	**0.25712**	**0.00371**	0.92
Incl. in Grt	**4699**	**2335**	**8.3**	**3061**	**38**	**3171**	**17**	**3243**	**26**	**4**	**0.60765**	**0.00950**	**21.71568**	**0.38513**	**0.25937**	**0.00430**	0.88
KUB23 -7	2945	1197	13.2	3160	35	3159	14	3159	17	0	0.63272	0.00896	21.44633	0.30579	0.24591	0.00270	0.99
KUB23 -8	3734	1516	12.6	3151	35	3151	14	3151	18	0	0.63034	0.00885	21.25990	0.30289	0.24466	0.00274	0.99
KUB23 -9	3382	1336	15.5	3158	35	3161	14	3163	18	0	0.63223	0.00881	21.48165	0.30483	0.24651	0.00275	0.98
KUB23 -10	3723	1573	11.5	3113	35	3144	14	3165	17	1	0.62079	0.00870	21.12084	0.29778	0.24684	0.00265	0.99
KUB23 -11	3113	1353	14.8	3102	35	3137	14	3161	17	1	0.61798	0.00882	20.97218	0.29908	0.24619	0.00259	1.00
KUB23 -12	3346	1499	13.5	3094	36	3132	14	3157	17	1	0.61609	0.00893	20.86068	0.30345	0.24561	0.00264	1.00
KUB23 -13	3020	1298	16.7	3078	41	3067	17	3059	25	0	0.61200	0.01032	19.49565	0.34925	0.23097	0.00362	0.94
KUB23 -14	3056	1310	14.5	3071	34	3073	14	3074	17	0	0.61019	0.00848	19.61650	0.27319	0.23321	0.00246	1.00
KUB23 -15	3388	1501	12.1	3062	34	3064	13	3066	16	0	0.60807	0.00845	19.44856	0.26926	0.23202	0.00236	1.00
KUB23 -16	3026	1298	14.4	3068	34	3071	13	3074	17	0	0.60940	0.00843	19.59084	0.27156	0.23321	0.00244	1.00
KUB23 -17	3070	1368	12.9	3064	35	3072	14	3079	18	0	0.60837	0.00877	19.60557	0.28563	0.23387	0.00262	0.99
KUB23 -18	2520	1102	17.9	3062	35	3073	14	3081	17	0	0.60797	0.00861	19.62384	0.28011	0.23417	0.00257	0.99
Incl. in Grt	**5912**	**2980**	**6.3**	**3076**	**38**	**3080**	**17**	**3083**	**25**	**0**	**0.61143**	**0.00958**	**19.76782**	**0.34145**	**0.23443**	**0.00372**	0.91
Incl. in Grt	**6179**	**3112**	**5.5**	**3081**	**36**	**3076**	**15**	**3072**	**22**	**0**	**0.61274**	**0.00895**	**19.67863**	**0.31184**	**0.23287**	**0.00329**	0.92

Table DR2 Continued.

Sample/Spot	^{206}Pb (ppm)	U (ppm)	$^{232}Th/^{238}U$	$^{206}Pb/^{238}U$ Age (Ma)	1σ	$^{207}Pb/^{235}U$ Age (Ma)	1σ	$^{207}Pb/^{206}Pb$ Age (Ma)	1σ	% Disc.	$^{206}Pb/^{238}U$ ratio	1σ	$^{207}Pb/^{235}U$ ratio	1σ	$^{207}Pb/^{206}Pb$ ratio	1σ	Rho
Kub17																	
KUB17 -1	3328	1349	17.5	3207	36	3204	14	3203	17	0	0.64455	0.00926	22.46459	0.32514	0.25285	0.00273	0.99
KUB17 -2	3732	1515	20.4	3213	37	3210	15	3209	18	0	0.64613	0.00947	22.60983	0.33819	0.25385	0.00291	0.98
KUB17 -3	3544	1432	20.6	3207	36	3209	14	3211	16	0	0.64469	0.00914	22.58259	0.31719	0.25411	0.00258	1.01
KUB17 -4	3892	1557	17.7	3211	36	3214	14	3216	16	0	0.64554	0.00907	22.68669	0.31576	0.25494	0.00258	1.01
KUB17 -5	3640	1473	17.1	3204	36	3207	14	3210	16	0	0.64386	0.00914	22.54215	0.31995	0.25397	0.00264	1.00
KUB17 -6	3060	1236	28.6	3201	36	3206	14	3209	16	0	0.64294	0.00910	22.50357	0.31490	0.25391	0.00257	1.01
KUB17 -7	2921	1203	19.1	3156	36	3157	14	3158	18	0	0.63168	0.00916	21.39998	0.31492	0.24577	0.00276	0.99
KUB17 -8	3663	1493	15.6	3162	36	3164	14	3166	17	0	0.63307	0.00906	21.55392	0.31008	0.24699	0.00269	0.99
KUB17 -9	3453	1423	17.1	3156	36	3161	15	3165	18	0	0.63165	0.00919	21.49350	0.32069	0.24685	0.00285	0.98
KUB17 -10	3265	1336	20.3	3141	35	3151	14	3158	17	0	0.62776	0.00891	21.26797	0.30186	0.24578	0.00262	1.00
KUB17 -11	6427	2650	28.0	3127	36	3146	14	3159	18	1	0.62425	0.00900	21.16077	0.30807	0.24591	0.00277	0.99
KUB17 -12	3371	1423	23.1	3080	36	3088	15	3093	19	0	0.61253	0.00894	19.92409	0.29844	0.23598	0.00277	0.97
KUB17 -13	4987	2090	19.3	3075	35	3082	14	3087	17	0	0.61131	0.00862	19.81264	0.27957	0.23511	0.00249	1.00
KUB17 -14	2961	1249	20.4	3080	35	3082	14	3083	18	0	0.61252	0.00883	19.79921	0.28848	0.23452	0.00261	0.99
KUB17 -15	3617	1521	20.6	3089	36	3076	14	3068	18	0	0.61480	0.00897	19.68100	0.29099	0.23227	0.00266	0.99
KUB17 -16	3213	1368	19.7	3090	35	3095	14	3099	16	0	0.61492	0.00877	20.08112	0.28459	0.23690	0.00243	1.01
Kub8																	
KUB8 -1	2049	834	47.0	3336	38	3333	14	3332	17	0	0.67786	0.00975	25.65411	0.36954	0.27458	0.00296	1.00
KUB8 -2	5067	2143	33.8	3232	38	3226	15	3223	19	0	0.65090	0.00977	22.98342	0.35807	0.25616	0.00306	0.96
KUB8 -3	10608	4815	9.0	3099	37	3100	15	3101	18	0	0.61714	0.00928	20.17183	0.31182	0.23709	0.00273	0.97
KUB8 -4	15185	6756	5.4	3102	35	3101	14	3100	16	0	0.61807	0.00870	20.19663	0.28210	0.23707	0.00240	1.01
KUB8 -5	5872	2663	16.3	3070	35	3088	14	3100	17	1	0.60987	0.00870	19.92789	0.28505	0.23706	0.00250	1.00
KUB8 -6	8925	4104	9.5	3099	35	3099	14	3099	16	0	0.61718	0.00882	20.15356	0.28613	0.23689	0.00242	1.01
KUB8 -7	12447	5431	6.8	3113	36	3102	15	3095	18	0	0.62067	0.00905	20.21284	0.30437	0.23633	0.00270	0.97
KUB8 -8	5573	2499	16.2	3097	36	3095	14	3093	17	0	0.61683	0.00904	20.06639	0.29518	0.23600	0.00249	1.00
Incl. in Grt	**6813**	**3027**	**14.6**	**3082**	**59**	**3076**	**27**	**3073**	**45**	**0**	**0.61304**	**0.01472**	**19.67976**	**0.55482**	**0.23297**	**0.00669**	0.85
Incl. in Grt	**15480**	**7090**	**6.0**	**3081**	**37**	**3089**	**16**	**3095**	**24**	**0**	**0.61266**	**0.00920**	**19.94456**	**0.33866**	**0.23627**	**0.00359**	0.88
Incl. in Grt	**7514**	**3620**	**4.4**	**3028**	**39**	**3069**	**18**	**3096**	**28**	**1**	**0.59945**	**0.00958**	**19.54238**	**0.36498**	**0.23645**	**0.00416**	0.86
Incl. in Grt	**13547**	**5841**	**6.0**	**3053**	**76**	**3096**	**36**	**3125**	**60**	**1**	**0.60580**	**0.01892**	**20.09174**	**0.74435**	**0.24075**	**0.00932**	0.84
Incl. in Grt	**4871**	**2317**	**8.3**	**3021**	**41**	**3072**	**20**	**3106**	**31**	**2**	**0.59790**	**0.01023**	**19.60406**	**0.39724**	**0.23784**	**0.00469**	0.84
Incl. in Grt	**9308**	**4568**	**10.1**	**3000**	**37**	**3076**	**17**	**3126**	**25**	**3**	**0.59261**	**0.00904**	**19.67588**	**0.34146**	**0.24097**	**0.00384**	0.88

Table DR2 Continued.

Sample/Spot	^{206}Pb (ppm)	U (ppm)	^{232}Th/^{238}U	^{206}Pb/^{238}U Age (Ma)	1σ	^{207}Pb/^{235}U Age (Ma)	1σ	^{207}Pb/^{206}Pb Age (Ma)	1σ	% Disc.	^{206}Pb/^{238}U ratio	1σ	^{207}Pb/^{235}U ratio	1σ	^{207}Pb/^{206}Pb ratio	1σ	Rho
Kub14																	
KUB14 -1	11253	4448	14.7	3213	35	3213	14	3212	16	0	0.64622	0.00902	22.66031	0.31613	0.25440	0.00265	1.00
KUB14 -2	10066	4202	16.3	3132	36	3101	14	3081	17	-1	0.62559	0.00897	20.19914	0.28778	0.23426	0.00245	1.01
KUB14 -3	9897	4166	19.8	3129	35	3101	14	3084	16	-1	0.62481	0.00881	20.20820	0.28158	0.23461	0.00238	1.01
KUB14 -4	10604	4245	17.7	3128	35	3101	14	3084	16	-1	0.62445	0.00883	20.19504	0.28415	0.23462	0.00242	1.00
KUB14 -5	11786	4839	13.5	3118	35	3098	13	3085	16	-1	0.62197	0.00871	20.13762	0.27961	0.23484	0.00238	1.01
KUB14 -6	7663	3121	21.6	3115	34	3101	13	3093	16	0	0.62130	0.00863	20.20462	0.27734	0.23590	0.00237	1.01
KUB14 -7	11214	4563	13.0	3106	34	3095	13	3087	16	0	0.61903	0.00857	20.06492	0.27557	0.23515	0.00239	1.01
Lu9																	
LU9 -1	2868	1211	8.7	3160	36	3175	14	3185	18	0	0.63265	0.00905	21.81109	0.31875	0.25008	0.00289	0.98
LU9 -2	8574	3778	5.2	3170	38	3188	16	3200	21	1	0.63518	0.00965	22.09495	0.36031	0.25239	0.00336	0.93
LU9 -3	2565	1050	9.6	3156	37	3178	15	3192	20	1	0.63150	0.00926	21.86766	0.33650	0.25116	0.00324	0.95
LU9 -4	3586	1544	22.8	3131	37	3158	15	3176	20	1	0.62532	0.00922	21.43085	0.33112	0.24865	0.00315	0.95
LU9 -5	3879	1613	17.1	3139	36	3166	15	3184	19	1	0.62724	0.00905	21.60863	0.32374	0.24989	0.00307	0.96
LU9 -6	2081	848	16.6	3129	38	3158	15	3178	21	1	0.62475	0.00944	21.42786	0.33715	0.24890	0.00336	0.96
LU9 -7	3333	1438	17.3	3124	39	3130	16	3133	23	0	0.62363	0.00969	20.80492	0.34823	0.24201	0.00349	0.93
LU9 -8	1946	857	13.2	3111	42	3120	19	3126	28	0	0.62032	0.01051	20.60447	0.40323	0.24094	0.00435	0.87
LU9 -9	3239	1497	20.6	3052	36	3090	15	3114	19	1	0.60552	0.00897	19.96334	0.29927	0.23910	0.00284	0.99
LU9 -10	2017	907	29.0	3069	36	3094	14	3110	18	1	0.60980	0.00896	20.04966	0.29369	0.23855	0.00266	1.00
LU9 -11	3403	1525	14.4	3079	36	3096	14	3107	18	1	0.61233	0.00890	20.09500	0.29286	0.23798	0.00268	1.00
LU9 -12	3121	1356	17.1	3090	36	3097	14	3101	18	0	0.61506	0.00896	20.10796	0.29497	0.23714	0.00273	0.99
LU9 -13	4765	1994	20.3	3039	34	3059	14	3073	17	1	0.60223	0.00855	19.34075	0.27531	0.23298	0.00250	1.00
LU9 -14	6863	3080	10.7	3042	39	3058	17	3069	23	1	0.60298	0.00957	19.32298	0.33392	0.23243	0.00333	0.92
LU9 -15	4130	1827	23.8	3058	35	3058	14	3059	17	0	0.60690	0.00861	19.32843	0.27101	0.23100	0.00241	1.01
LU9 -16	3801	1750	22.2	3061	35	3057	14	3055	16	0	0.60782	0.00869	19.29897	0.26967	0.23039	0.00234	1.02
LU9 -17	3836	1684	23.2	3062	35	3057	14	3053	17	0	0.60798	0.00860	19.29290	0.26987	0.23017	0.00239	1.01
LU9 -18	3550	1616	22.7	3072	35	3057	14	3047	17	0	0.61036	0.00875	19.29940	0.27449	0.22932	0.00248	1.01
LU9 -20	2657	1437	16.2	2736	38	2873	17	2973	24	5	0.52878	0.00888	15.93479	0.28270	0.21895	0.00333	0.95

Table DR2 Continued.

Sample/Spot	^{206}Pb (ppm)	U (ppm)	^{232}Th/^{238}U	^{206}Pb/^{238}U Age (Ma)	1σ	^{207}Pb/^{235}U Age (Ma)	1σ	^{207}Pb/^{206}Pb Age (Ma)	1σ	% Disc.	^{206}Pb/^{238}U ratio	1σ	^{207}Pb/^{235}U ratio	1σ	^{207}Pb/^{206}Pb ratio	1σ	Rho
Lu6																	
LU6 -1	n.a	n.a	n.a	3438	24	3434	9	3432	19	0	0.70466	0.00641	28.41883	0.26983	0.29263	0.00362	0.96
LU6 -2	n.a	n.a	n.a	3435	19	3436	7	3437	16	0	0.70391	0.00509	28.48871	0.20609	0.29370	0.00308	1.00
LU6 -3	n.a	n.a	n.a	3433	18	3436	7	3438	16	0	0.70329	0.00483	28.49596	0.19804	0.29391	0.00299	0.99
Incl. in Grt	**492**	**189**	**93.6**	**3437**	**85**	**3430**	**34**	**3427**	**54**	**0**	**0.70440**	**0.02246**	**28.30665**	**0.98577**	**0.29171**	**0.01032**	0.92
Incl. in Grt	**3221**	**1177**	**28.4**	**3429**	**40**	**3436**	**16**	**3441**	**21**	**0**	**0.70214**	**0.01062**	**28.49237**	**0.45268**	**0.29441**	**0.00392**	0.95
Incl. in Grt	**551**	**203**	**91.6**	**3389**	**71**	**3404**	**29**	**3412**	**44**	**0**	**0.69168**	**0.01850**	**27.56913**	**0.80045**	**0.28900**	**0.00837**	0.92
Incl. in Grt	**2230**	**816**	**30.2**	**3349**	**53**	**3424**	**22**	**3467**	**32**	**2**	**0.68128**	**0.01382**	**28.15033**	**0.61735**	**0.29940**	**0.00619**	0.92
Incl. in Grt	**571**	**222**	**95.5**	**3294**	**63**	**3376**	**26**	**3426**	**40**	**2**	**0.66699**	**0.01630**	**26.79878**	**0.70927**	**0.29150**	**0.00767**	0.92
LU6 -4	n.a	n.a	n.a	3378	20	3388	8	3395	17	0	0.68874	0.00533	27.13668	0.21384	0.28588	0.00315	0.98
Incl. in Grt	**2226**	**815**	**31.5**	**3413**	**71**	**3408**	**30**	**3398**	**47**	**0**	**0.69805**	**0.01877**	**27.66969**	**0.83933**	**0.28633**	**0.00874**	0.89
Incl. in Grt	**512**	**187**	**87.9**	**3374**	**71**	**3394**	**29**	**3406**	**45**	**1**	**0.68778**	**0.01870**	**27.27931**	**0.80271**	**0.28775**	**0.00848**	0.92
Incl. in Grt	**642**	**232**	**107.0**	**3400**	**50**	**3401**	**19**	**3402**	**28**	**0**	**0.69442**	**0.01306**	**27.47865**	**0.54534**	**0.28713**	**0.00522**	0.95
LU6 -5	n.a	n.a	n.a	3357	18	3352	7	3350	16	0	0.68318	0.00469	26.14818	0.18068	0.27769	0.00282	0.99
LU6 -6	n.a	n.a	n.a	3326	23	3346	9	3358	19	1	0.67528	0.00609	25.99640	0.25041	0.27910	0.00342	0.94
LU6 -7	n.a	n.a	n.a	3323	23	3349	9	3364	19	1	0.67449	0.00589	26.06789	0.25148	0.28016	0.00342	0.91
LU6 -8	n.a	n.a	n.a	3248	19	3229	8	3218	17	-1	0.65498	0.00478	23.04609	0.17655	0.25530	0.00275	0.95
LU6 -9	n.a	n.a	n.a	3232	20	3225	8	3222	18	0	0.65096	0.00509	22.95712	0.18787	0.25592	0.00287	0.96
LU6 -10	n.a	n.a	n.a	3224	19	3225	8	3227	17	0	0.64904	0.00486	22.96233	0.17992	0.25671	0.00281	0.96
LU6 -11	n.a	n.a	n.a	3231	21	3236	9	3241	18	0	0.65070	0.00538	23.22359	0.20333	0.25899	0.00303	0.94
LU6 -12	n.a	n.a	n.a	3229	18	3236	7	3241	16	0	0.65028	0.00461	23.21352	0.16725	0.25903	0.00269	0.98
LU6 -13	n.a	n.a	n.a	3214	20	3221	8	3226	18	0	0.64639	0.00505	22.86635	0.18852	0.25663	0.00287	0.95
Incl. in Grt	**1724**	**681**	**43.6**	**3235**	**45**	**3232**	**19**	**3231**	**28**	**0**	**0.65166**	**0.01155**	**23.11090**	**0.45388**	**0.25736**	**0.00467**	0.90
LU6 -14	n.a	n.a	n.a	3092	21	3093	9	3093	19	0	0.61556	0.00523	20.02355	0.18383	0.23593	0.00282	0.93
LU6 -15	n.a	n.a	n.a	3095	22	3096	10	3098	20	0	0.61619	0.00553	20.10208	0.19750	0.23671	0.00303	0.91
LU6 -16	n.a	n.a	n.a	3092	17	3095	7	3097	17	0	0.61541	0.00433	20.06414	0.14900	0.23653	0.00253	0.95
LU6 -17	n.a	n.a	n.a	3091	21	3095	9	3097	19	0	0.61522	0.00525	20.06877	0.18507	0.23652	0.00281	0.93
LU6 -18	n.a	n.a	n.a	3081	18	3096	7	3106	17	0	0.61285	0.00446	20.10041	0.15185	0.23788	0.00251	0.96
LU6 -19	n.a	n.a	n.a	3083	18	3098	7	3109	17	1	0.61323	0.00441	20.14555	0.15176	0.23832	0.00255	0.95
Incl. in Grt	**2317**	**971**	**24.9**	**3072**	**38**	**3075**	**16**	**3078**	**23**	**0**	**0.61054**	**0.00944**	**19.67321**	**0.32459**	**0.23378**	**0.00333**	0.94
Incl. in Grt	**4251**	**1623**	**27.8**	**3075**	**45**	**3075**	**20**	**3073**	**30**	**0**	**0.61133**	**0.01115**	**19.66544**	**0.40565**	**0.23300**	**0.00444**	0.88
Incl. in Grt	**2820**	**1241**	**20.2**	**3056**	**57**	**3053**	**26**	**3051**	**43**	**0**	**0.60649**	**0.01415**	**19.22272**	**0.52237**	**0.22979**	**0.00624**	0.86

Table DR2 Continued.

Sample/Spot	^{206}Pb (ppm)	U (ppm)	$^{232}Th/^{238}U$	$^{206}Pb/^{238}U$		$^{207}Pb/^{235}U$		$^{207}Pb/^{206}Pb$		%	$^{206}Pb/^{238}U$		$^{207}Pb/^{235}U$		$^{207}Pb/^{206}Pb$		Rho
				Age (Ma)	1σ	Age (Ma)	1σ	Age (Ma)	1σ	Disc.	ratio	1σ	ratio	1σ	ratio	1σ	
LU6 -20	n.a	n.a	n.a	2976	21	2986	9	2993	20	0	0.58670	0.00509	17.92025	0.17143	0.22170	0.00275	0.91
LU6 -21	n.a	n.a	n.a	2982	17	2992	7	3001	17	0	0.58821	0.00420	18.04852	0.13274	0.22273	0.00236	0.97
LU6 -22	n.a	n.a	n.a	2982	16	2994	7	3003	16	0	0.58826	0.00394	18.07720	0.12138	0.22302	0.00226	1.00
LU6 -23	n.a	n.a	n.a	2960	18	2973	8	2982	18	0	0.58284	0.00450	17.68571	0.14330	0.22020	0.00245	0.95
LU6 -24	n.a	n.a	n.a	2975	16	2988	6	2998	16	0	0.58655	0.00385	17.97111	0.11884	0.22233	0.00226	0.99
LU6 -25	n.a	n.a	n.a	2973	17	2987	7	2998	17	0	0.58601	0.00407	17.95087	0.12583	0.22235	0.00229	0.99

Table DR3 The performance of the secondary zircon standard Plesoviče, analyzed over multiple analytical sessions during the study.

Sample	$^{206}Pb/^{238}U$		$^{207}Pb/^{235}U$		$^{207}Pb/^{206}Pb$		$^{206}Pb/^{238}U$		$^{207}Pb/^{235}U$		$^{207}Pb/^{206}Pb$	
Kub17 (3 sessions)	***Age (Ma)***	***1σ***	***Age (Ma)***	***1σ***	***Age (Ma)***	***1σ***	***Ratio***	***1σ***	***Ratio***	***1σ***	***Ratio***	***1σ***
PLES-1	340.9	3.7	349.9	3.7	409	26	0.05431	0.00061	0.41139	0.00514	0.05493	0.00065
PLES-2	338.0	3.9	343.6	4.1	382	30	0.05383	0.00063	0.40271	0.00564	0.05426	0.00073
PLES-3	338.1	3.8	343.3	3.7	379	27	0.05385	0.00062	0.40234	0.00513	0.05419	0.00065
PLES-4	338.9	3.8	342.6	3.9	368	29	0.05397	0.00061	0.40134	0.00539	0.05393	0.00070
PLES-5	341.3	3.7	341.9	3.6	346	26	0.05437	0.00061	0.40038	0.00497	0.05340	0.00063
PLES-6	336.4	3.8	341.8	4.0	378	30	0.05357	0.00062	0.40016	0.00555	0.05418	0.00073
PLES-7	339.0	3.7	340.7	3.6	352	27	0.05400	0.00061	0.39870	0.00498	0.05355	0.00064
PLES-8	339.4	3.7	340.7	3.8	349	29	0.05406	0.00061	0.39868	0.00529	0.05349	0.00069
PLES-9	336.4	3.7	340.0	3.6	365	26	0.05356	0.00061	0.39770	0.00497	0.05385	0.00063
PLES-10	340.0	3.8	339.9	3.6	339	27	0.05416	0.00061	0.39759	0.00500	0.05324	0.00063
PLES-11	338.2	3.7	339.3	3.6	347	27	0.05386	0.00061	0.39677	0.00499	0.05342	0.00064
PLES-12	338.5	3.8	339.2	3.9	344	30	0.05391	0.00061	0.39660	0.00541	0.05335	0.00071
PLES-13	338.3	3.7	338.1	3.6	337	27	0.05389	0.00060	0.39515	0.00500	0.05318	0.00064
PLES-14	339.5	3.7	337.5	3.6	324	27	0.05407	0.00061	0.39435	0.00492	0.05289	0.00063
PLES-15	333.8	3.7	336.8	4.0	357	31	0.05315	0.00060	0.39335	0.00552	0.05368	0.00075
PLES-16	336.8	3.7	336.3	3.6	332	27	0.05364	0.00060	0.39259	0.00499	0.05308	0.00065
PLES-17	333.8	3.6	335.4	3.6	347	27	0.05314	0.00059	0.39146	0.00497	0.05342	0.00066
PLES-18	330.1	3.7	332.6	4.1	350	32	0.05255	0.00061	0.38762	0.00560	0.05350	0.00076
PLES-19	340.3	3.7	340.7	3.9	344	30	0.05421	0.00060	0.39875	0.00540	0.05335	0.00072
PLES-20	339.3	3.7	341.0	3.9	353	30	0.05404	0.00060	0.39913	0.00542	0.05357	0.00073
PLES-21	339.3	3.6	339.3	3.6	339	27	0.05404	0.00058	0.39675	0.00488	0.05325	0.00065
PLES-22	339.9	3.6	345.5	3.7	383	28	0.05414	0.00058	0.40532	0.00510	0.05430	0.00069
PLES-23	337.5	3.5	338.2	3.6	343	28	0.05374	0.00057	0.39526	0.00490	0.05334	0.00067
Kub23 (6 sessions)												
PLES-1	342.0	3.4	343.0	3.6	349	29	0.05449	0.00055	0.40187	0.00499	0.05349	0.00069
PLES-2	336.3	3.3	339.7	3.7	363	30	0.05356	0.00054	0.39729	0.00510	0.05380	0.00072
PLES-3	336.5	3.3	339.1	3.6	357	29	0.05359	0.00053	0.39651	0.00498	0.05366	0.00071
PLES-4	338.8	3.4	345.3	4.0	389	31	0.05396	0.00055	0.40507	0.00547	0.05444	0.00076
PLES-5	341.8	3.3	342.2	3.8	345	30	0.05446	0.00055	0.40075	0.00522	0.05337	0.00072
PLES-6	342.7	3.5	347.5	4.3	380	33	0.05460	0.00057	0.40812	0.00590	0.05422	0.00081
PLES-7	336.1	3.6	340.3	5.4	369	43	0.05353	0.00059	0.39819	0.00747	0.05396	0.00105
PLES-8	329.7	3.3	333.4	3.6	359	29	0.05248	0.00053	0.38865	0.00494	0.05372	0.00070
PLES-9	330.8	3.3	343.8	3.7	432	29	0.05265	0.00054	0.40295	0.00513	0.05551	0.00073

Table DR3 Continued.

Sample	$^{206}Pb/^{238}U$		$^{207}Pb/^{235}U$		$^{207}Pb/^{206}Pb$		$^{206}Pb/^{238}U$		$^{207}Pb/^{235}U$		$^{207}Pb/^{206}Pb$	
Kub23 (continued)	***Age (Ma)***	***1σ***	***Age (Ma)***	***1σ***	***Age (Ma)***	***1σ***	***Ratio***	***1σ***	***Ratio***	***1σ***	***Ratio***	***1σ***
PLES-10	330.8	3.3	328.5	3.5	312	29	0.05266	0.00054	0.38193	0.00481	0.05260	0.00068
PLES-11	333.2	3.4	336.1	3.8	356	31	0.05304	0.00055	0.39234	0.00523	0.05365	0.00073
PLES-12	329.3	3.3	337.4	3.7	394	29	0.05241	0.00054	0.39418	0.00512	0.05455	0.00073
PLES-13	329.5	3.4	333.2	4.1	359	33	0.05244	0.00056	0.38834	0.00564	0.05372	0.00080
PLES-14	327.8	3.4	330.7	4.1	352	33	0.05216	0.00055	0.38503	0.00558	0.05354	0.00079
PLES-15	336.9	3.2	346.1	3.6	409	29	0.05365	0.00053	0.40618	0.00501	0.05491	0.00072
PLES-16	341.3	3.3	341.6	3.6	344	29	0.05437	0.00054	0.39992	0.00499	0.05336	0.00070
PLES-17	337.3	3.3	353.0	3.7	458	29	0.05371	0.00053	0.41572	0.00521	0.05614	0.00074
PLES-18	343.5	3.3	344.3	3.6	350	29	0.05473	0.00055	0.40369	0.00498	0.05350	0.00069
PLES-19	343.0	3.3	347.1	3.7	375	29	0.05464	0.00054	0.40754	0.00509	0.05409	0.00071
PLES-20	342.5	3.3	352.4	3.6	418	28	0.05457	0.00054	0.41486	0.00495	0.05513	0.00069
PLES-21	342.5	3.3	343.4	3.9	350	31	0.05456	0.00054	0.40239	0.00532	0.05349	0.00074
PLES-22	338.9	3.3	342.9	3.8	370	30	0.05398	0.00053	0.40174	0.00526	0.05398	0.00074
PLES-23	340.4	3.3	337.4	3.9	317	32	0.05423	0.00055	0.39422	0.00539	0.05272	0.00074
PLES-24	341.0	3.4	340.2	4.0	335	32	0.05431	0.00055	0.39805	0.00554	0.05315	0.00076
PLES-25	339.9	3.4	340.3	4.1	343	32	0.05415	0.00055	0.39816	0.00560	0.05333	0.00077
PLES-26	336.1	3.3	336.2	4.2	336	34	0.05352	0.00054	0.39245	0.00576	0.05318	0.00081
PLES-27	337.7	3.3	338.9	4.3	347	34	0.05378	0.00055	0.39618	0.00591	0.05343	0.00082
PLES-28	344.3	3.5	343.6	3.7	339	29	0.05486	0.00058	0.40265	0.00516	0.05323	0.00070
PLES-29	344.1	3.5	341.2	3.7	322	30	0.05482	0.00058	0.39943	0.00515	0.05285	0.00070
PLES-30	342.2	3.5	343.4	4.0	351	32	0.05452	0.00057	0.40243	0.00553	0.05353	0.00077
PLES-31	340.0	3.5	342.6	4.5	360	37	0.05416	0.00057	0.40127	0.00617	0.05374	0.00088
PLES-32	333.4	3.5	337.3	4.6	364	38	0.05308	0.00057	0.39407	0.00634	0.05384	0.00092
PLES-33	339.9	3.6	342.3	4.3	358	35	0.05415	0.00060	0.40091	0.00598	0.05369	0.00083
PLES-34	333.9	3.6	333.0	4.2	327	33	0.05317	0.00059	0.38816	0.00569	0.05295	0.00079
PLES-35	336.7	3.7	336.2	4.2	332	33	0.05362	0.00061	0.39248	0.00581	0.05308	0.00079
PLES-36	336.7	3.8	340.9	4.0	370	30	0.05362	0.00062	0.39902	0.00556	0.05397	0.00074
PLES-37	336.0	3.8	334.4	4.2	323	33	0.05351	0.00062	0.39006	0.00573	0.05287	0.00077
PLES-38	338.1	3.8	336.0	4.2	321	33	0.05385	0.00062	0.39218	0.00577	0.05282	0.00077
PLES-39	342.4	3.9	341.0	4.5	331	34	0.05455	0.00064	0.39905	0.00616	0.05306	0.00081
PLES-40	342.3	3.9	335.8	4.2	291	32	0.05454	0.00064	0.39198	0.00575	0.05213	0.00075
PLES-41	331.7	3.7	335.5	3.9	361	30	0.05281	0.00060	0.39150	0.00540	0.05377	0.00073
PLES-42	335.5	3.7	339.3	4.0	365	31	0.05342	0.00061	0.39675	0.00551	0.05386	0.00073

Table DR3 Continued.

Sample	$^{206}Pb/^{238}U$		$^{207}Pb/^{235}U$		$^{207}Pb/^{206}Pb$		$^{206}Pb/^{238}U$		$^{207}Pb/^{235}U$		$^{207}Pb/^{206}Pb$	
Kub23 (continued)	***Age (Ma)***	***1σ***	***Age (Ma)***	***1σ***	***Age (Ma)***	***1σ***	***Ratio***	***1σ***	***Ratio***	***1σ***	***Ratio***	***1σ***
PLES-43	334.2	3.7	336.3	3.9	351	30	0.05321	0.00060	0.39270	0.00539	0.05352	0.00072
PLES-44	345.8	5.5	385.0	8.0	628	52	0.05511	0.00090	0.46112	0.01152	0.06068	0.00148
PLES-45	339.9	3.8	341.8	4.0	354	30	0.05415	0.00061	0.40022	0.00545	0.05361	0.00071
PLES-46	340.1	3.8	342.4	3.9	357	30	0.05418	0.00061	0.40099	0.00542	0.05368	0.00071
PLES-47	346.8	3.9	347.5	4.2	352	31	0.05528	0.00063	0.40808	0.00579	0.05354	0.00075
PLES-48	341.6	3.8	339.1	4.1	322	31	0.05442	0.00062	0.39644	0.00561	0.05284	0.00073
Lu17 (4 sessions)												
PLES-1	350.6	3.3	350.6	3.6	351	29	0.05589	0.00054	0.41236	0.00504	0.05352	0.00069
PLES-2	347.3	3.3	345.3	3.7	332	30	0.05536	0.00054	0.40504	0.00507	0.05307	0.00070
PLES-3	346.3	3.3	345.6	3.6	341	29	0.05518	0.00054	0.40548	0.00493	0.05330	0.00069
PLES-4	344.9	3.4	339.6	3.8	303	30	0.05496	0.00056	0.39712	0.00517	0.05241	0.00071
PLES-5	346.0	3.3	343.4	3.6	326	29	0.05514	0.00054	0.40248	0.00499	0.05294	0.00069
PLES-6	345.6	3.4	344.7	4.0	338	32	0.05508	0.00056	0.40415	0.00555	0.05322	0.00076
PLES-7	342.3	3.6	340.0	4.5	324	35	0.05453	0.00059	0.39766	0.00612	0.05289	0.00083
PLES-8	341.2	3.5	342.3	3.9	350	30	0.05435	0.00057	0.40085	0.00532	0.05349	0.00073
PLES-9	349.1	3.5	348.3	3.9	343	30	0.05565	0.00058	0.40915	0.00544	0.05333	0.00073
PLES-10	349.7	3.5	343.6	3.9	303	31	0.05574	0.00058	0.40269	0.00536	0.05240	0.00072
PLES-11	339.2	3.5	341.7	4.0	359	31	0.05402	0.00056	0.40007	0.00544	0.05371	0.00075
PLES-12	347.7	3.5	345.4	4.0	330	32	0.05541	0.00058	0.40513	0.00559	0.05303	0.00075
PLES-13	339.8	3.5	341.9	4.1	356	33	0.05412	0.00057	0.40029	0.00568	0.05365	0.00078
PLES-14	342.1	3.5	342.4	4.1	344	33	0.05450	0.00057	0.40101	0.00570	0.05337	0.00078
PLES-15	341.0	3.5	341.4	3.9	345	32	0.05432	0.00057	0.39972	0.00537	0.05338	0.00077
PLES-16	341.0	3.4	339.2	3.5	328	30	0.05432	0.00055	0.39669	0.00487	0.05298	0.00070
PLES-17	341.2	3.2	341.2	3.2	341	27	0.05436	0.00053	0.39935	0.00440	0.05329	0.00064
PLES-18	336.6	3.3	343.2	3.5	388	28	0.05361	0.00054	0.40210	0.00480	0.05440	0.00070
PLES-19	337.3	3.4	340.9	3.6	366	30	0.05372	0.00056	0.39900	0.00501	0.05387	0.00072
PLES-20	347.7	3.6	345.5	3.7	331	30	0.05542	0.00058	0.40533	0.00511	0.05305	0.00070
PLES-21	341.6	3.5	345.4	3.7	371	30	0.05442	0.00057	0.40512	0.00518	0.05399	0.00073
PLES-22	341.7	3.8	340.5	4.0	332	30	0.05444	0.00063	0.39846	0.00544	0.05309	0.00070
PLES-23	326.6	3.6	327.9	3.6	338	28	0.05197	0.00059	0.38121	0.00496	0.05321	0.00067
PLES-24	337.7	3.8	341.0	3.8	364	28	0.05378	0.00062	0.39913	0.00527	0.05383	0.00068
PLES-25	337.7	3.8	340.7	3.9	361	29	0.05378	0.00062	0.39863	0.00541	0.05376	0.00070
PLES-26	342.2	3.8	342.7	3.8	346	28	0.05452	0.00062	0.40143	0.00524	0.05340	0.00067

Table DR3 Continued.

Sample	**$^{206}Pb/^{238}U$**		**$^{207}Pb/^{235}U$**		**$^{207}Pb/^{206}Pb$**		**$^{206}Pb/^{238}U$**		**$^{207}Pb/^{235}U$**		**$^{207}Pb/^{206}Pb$**	
Lu17 (continued)	***Age (Ma)***	***1σ***	***Age (Ma)***	***1σ***	***Age (Ma)***	***1σ***	***Ratio***	***1σ***	***Ratio***	***1σ***	***Ratio***	***1σ***
PLES-27	340.9	3.8	343.3	3.8	360	28	0.05430	0.00062	0.40227	0.00523	0.05373	0.00067
PLES-28	342.9	3.8	343.9	3.8	351	28	0.05463	0.00062	0.40316	0.00528	0.05353	0.00068
PLES-29	339.7	3.8	338.8	3.9	333	28	0.05410	0.00063	0.39601	0.00530	0.05309	0.00067
PLES-30	337.3	3.7	338.9	3.8	351	28	0.05371	0.00061	0.39626	0.00519	0.05351	0.00068
PLES-31	336.6	3.8	335.7	3.8	330	28	0.05360	0.00061	0.39186	0.00518	0.05302	0.00067
PLES-32	334.8	3.9	336.6	4.1	350	31	0.05330	0.00064	0.39309	0.00567	0.05349	0.00073
PLES-33	335.9	3.8	358.2	4.6	505	34	0.05349	0.00061	0.42297	0.00647	0.05735	0.00089
PLES-34	339.5	3.9	338.1	4.0	328	30	0.05408	0.00064	0.39514	0.00555	0.05299	0.00071
PLES-35	343.6	4.0	348.4	4.4	380	32	0.05475	0.00066	0.40937	0.00610	0.05423	0.00077
PLES-36	359.4	4.3	355.6	5.1	330	38	0.05734	0.00070	0.41934	0.00715	0.05304	0.00090
PLES-37	340.4	3.8	345.0	3.9	376	29	0.05422	0.00062	0.40460	0.00539	0.05412	0.00069

Table DR4 The performance of the secondary monazite standard RGL4B, analyzed over multiple analytical sessions during the study.

Sample	$^{206}Pb/^{238}U$		$^{207}Pb/^{235}U$		$^{207}Pb/^{206}Pb$		$^{206}Pb/^{238}U$		$^{207}Pb/^{235}U$		$^{207}Pb/^{206}Pb$	
Kub8 (1 session)	***Age (Ma)***	***1σ***	***Age (Ma)***	***1σ***	***Age (Ma)***	***1σ***	***Ratio***	***1σ***	***Ratio***	***1σ***	***Ratio***	***1σ***
RGL4B-1	1573	21	1571	12	1570	22	0.27629	0.00406	3.69998	0.05717	0.09714	0.00117
RGL4B-2	1535	20	1547	12	1563	21	0.26876	0.00392	3.58620	0.05336	0.09679	0.00107
RGL4B-3	1512	19	1536	12	1568	21	0.26435	0.00382	3.53755	0.05248	0.09706	0.00109
RGL4B-4	1565	21	1573	12	1585	22	0.27469	0.00406	3.70761	0.05703	0.09791	0.00115
RGL4B-5	1558	20	1562	12	1568	20	0.27343	0.00396	3.65770	0.05365	0.09703	0.00104
RGL4B-6	1575	22	1565	15	1552	29	0.27674	0.00442	3.67006	0.06733	0.09621	0.00150
RGL4B-7	1570	21	1567	13	1563	25	0.27566	0.00416	3.67873	0.06074	0.09680	0.00130
Kub14 (1 session)												
RGL4B-1	1521	19	1535	11	1554	20	0.26614	0.00370	3.53320	0.04946	0.09631	0.00101
RGL4B-2	1554	19	1552	11	1550	20	0.27255	0.00378	3.61038	0.05052	0.09610	0.00102
RGL4B-3	1526	19	1539	11	1558	20	0.26702	0.00372	3.55245	0.04972	0.09651	0.00102
RGL4B-4	1537	19	1537	12	1537	21	0.26918	0.00381	3.54139	0.05165	0.09543	0.00108
RGL4B-5	1537	19	1539	11	1541	21	0.26926	0.00381	3.55022	0.05132	0.09563	0.00107
RGL4B-6	1518	19	1526	12	1538	22	0.26544	0.00382	3.49548	0.05260	0.09550	0.00114
RGL4B-7	1562	20	1547	11	1527	20	0.27421	0.00386	3.58867	0.05050	0.09494	0.00100
RGL4B-8	1544	20	1541	12	1538	21	0.27056	0.00387	3.56154	0.05187	0.09551	0.00108
RGL4B-9	1550	20	1535	12	1516	23	0.27186	0.00397	3.53614	0.05456	0.09439	0.00117
RGL4B-10	1524	19	1536	11	1554	20	0.26669	0.00371	3.54021	0.04973	0.09630	0.00102
RGL4B-11	1500	19	1525	11	1561	20	0.26194	0.00366	3.49149	0.04952	0.09670	0.00104
RGL4B-12	1517	19	1542	11	1578	20	0.26529	0.00369	3.56689	0.05016	0.09754	0.00104
RGL4B-13	1518	19	1535	11	1560	20	0.26541	0.00370	3.53547	0.04988	0.09664	0.00103
RGL4B-14	1508	19	1534	11	1570	20	0.26348	0.00366	3.52800	0.04955	0.09714	0.00103
RGL4B-15	1504	19	1527	11	1559	20	0.26270	0.00365	3.49749	0.04887	0.09659	0.00102
RGL4B-16	1540	19	1546	11	1556	20	0.26983	0.00377	3.58584	0.05093	0.09641	0.00104
Kub17 (1 session)												
RGL4B-1	1513	19	1531	11	1556	20	0.26456	0.00375	3.51580	0.05049	0.09640	0.00104
RGL4B-2	1531	19	1545	12	1563	21	0.26813	0.00383	3.57792	0.05251	0.09680	0.00108
RGL4B-3	1504	19	1521	11	1545	19	0.26284	0.00371	3.47386	0.04901	0.09588	0.00098
RGL4B-4	1578	20	1570	12	1559	21	0.27742	0.00398	3.69331	0.05475	0.09658	0.00109
RGL4B-5	1564	20	1561	12	1557	21	0.27462	0.00396	3.65292	0.05461	0.09649	0.00110
RGL4B-6	1518	19	1539	12	1567	21	0.26555	0.00378	3.55098	0.05192	0.09700	0.00109
RGL4B-7	1514	19	1531	12	1556	21	0.26475	0.00378	3.51816	0.05189	0.09639	0.00110
RGL4B-8	1541	19	1550	11	1563	20	0.27012	0.00384	3.60408	0.05181	0.09679	0.00104

Table DR4 Continued.

Sample	$^{206}Pb/^{238}U$		$^{207}Pb/^{235}U$		$^{207}Pb/^{206}Pb$		$^{206}Pb/^{238}U$		$^{207}Pb/^{235}U$		$^{207}Pb/^{206}Pb$	
Kub17 (Continued)	***Age (Ma)***	***1σ***	***Age (Ma)***	***1σ***	***Age (Ma)***	***1σ***	***Ratio***	***1σ***	***Ratio***	***1σ***	***Ratio***	***1σ***
RGL4B-9	1513	19	1534	12	1564	21	0.26458	0.00377	3.53202	0.05187	0.09684	0.00111
RGL4B-10	1523	19	1533	11	1548	20	0.26643	0.00375	3.52683	0.04976	0.09603	0.00100
RGL4B-11	1506	19	1531	11	1565	21	0.26312	0.00373	3.51482	0.05100	0.09690	0.00108
RGL4B-12	1523	19	1539	12	1562	21	0.26640	0.00381	3.55299	0.05219	0.09675	0.00109
RGL4B-13	1531	19	1548	12	1571	21	0.26815	0.00383	3.59315	0.05300	0.09721	0.00111
Kub23 (1 session)												
RGL4B-1	1491	18	1525	11	1574	20	0.26025	0.00361	3.49176	0.04893	0.09734	0.00103
RGL4B-2	1543	19	1551	12	1562	21	0.27033	0.00377	3.60518	0.05215	0.09675	0.00110
RGL4B-3	1504	18	1533	11	1574	20	0.26277	0.00361	3.52643	0.04932	0.09736	0.00104
RGL4B-4	1523	19	1537	11	1556	20	0.26652	0.00367	3.54275	0.04920	0.09643	0.00101
RGL4B-5	1493	18	1532	11	1587	20	0.26066	0.00359	3.52125	0.04945	0.09800	0.00105
RGL4B-6	1519	19	1542	11	1574	21	0.26566	0.00367	3.56567	0.05112	0.09737	0.00110
RGL4B-7	1534	19	1543	11	1557	19	0.26865	0.00370	3.57240	0.04957	0.09647	0.00101
RGL4B-8	1502	19	1533	11	1577	20	0.26244	0.00368	3.52652	0.05079	0.09748	0.00107
RGL4B-9	1528	19	1541	11	1558	20	0.26756	0.00373	3.56031	0.05081	0.09653	0.00105
RGL4B-10	1523	19	1536	11	1553	20	0.26659	0.00371	3.53774	0.05008	0.09627	0.00104
RGL4B-11	1537	19	1551	11	1571	20	0.26927	0.00377	3.60777	0.05167	0.09720	0.00106
RGL4B-12	1524	19	1542	11	1567	19	0.26671	0.00370	3.56515	0.04962	0.09697	0.00100
RGL4B-13	1530	19	1551	11	1580	20	0.26787	0.00369	3.60661	0.05025	0.09767	0.00103
Lu9 (1 session)												
RGL4B-1	1510	19	1531	12	1560	22	0.26392	0.00382	3.51579	0.05324	0.09664	0.00116
RGL4B-2	1527	20	1523	12	1519	23	0.26721	0.00386	3.48181	0.05271	0.09452	0.00114
RGL4B-3	1549	20	1545	12	1539	21	0.27167	0.00388	3.57833	0.05197	0.09555	0.00106
RGL4B-4	1515	20	1518	12	1522	22	0.26498	0.00394	3.45887	0.05357	0.09470	0.00113
RGL4B-5	1557	27	1587	22	1627	48	0.27326	0.00536	3.77358	0.10161	0.10014	0.00263
RGL4B-6	1538	20	1527	12	1512	20	0.26945	0.00388	3.49841	0.05097	0.09419	0.00103
RGL4B-7	1568	20	1547	12	1519	23	0.27545	0.00403	3.59030	0.05547	0.09457	0.00117

Table DR5 The effect on the calculated U-Pb monazite ages for sample Kub23 when the lower Th, USGS monazite 44609 is used as the primary monazite standard.

Sample	$^{206}Pb/^{238}U$		$^{207}Pb/^{235}U$		$^{207}Pb/^{206}Pb$		$^{206}Pb/^{238}U$		$^{207}Pb/^{235}U$		$^{207}Pb/^{206}Pb$	
Kub23	***Age (Ma)***	***1σ***	***Age (Ma)***	***1σ***	***Age (Ma)***	***1σ***	***Ratio***	***1σ***	***Ratio***	***1σ***	***Ratio***	***1σ***
KUB23-1	3334	39	3284	15	3254	19	0.67732	0.01004	24.39117	0.38230	0.26118	0.00309
KUB23-2	3278	37	3252	15	3236	18	0.66266	0.00960	23.59017	0.35720	0.25816	0.00301
KUB23-3	3209	36	3225	16	3232	23	0.64506	0.00921	22.96135	0.38659	0.25751	0.00386
KUB23-4	3238	36	3230	15	3225	18	0.65249	0.00924	23.07277	0.34450	0.25639	0.00302
KUB23-5	3253	39	3235	18	3224	25	0.65631	0.00992	23.19112	0.42158	0.25631	0.00403
KUB23-6	3224	38	3224	18	3224	24	0.64890	0.00983	22.92506	0.41501	0.25629	0.00400
KUB23-7	3236	40	3228	19	3224	27	0.65207	0.01026	23.02566	0.45234	0.25623	0.00444
KUB23-8	3232	36	3226	15	3222	19	0.65109	0.00929	22.98383	0.34841	0.25601	0.00308
KUB23-9	3202	38	3214	18	3222	24	0.64340	0.00981	22.70069	0.41315	0.25595	0.00399
KUB23-10	3259	37	3236	15	3221	19	0.65787	0.00941	23.20435	0.35116	0.25581	0.00305
KUB23-11	3243	38	3229	17	3221	24	0.65380	0.00968	23.05594	0.41174	0.25572	0.00400
KUB23-12	3260	38	3232	17	3215	24	0.65824	0.00988	23.12343	0.41158	0.25485	0.00393
KUB23-13	3300	37	3245	15	3212	18	0.66846	0.00959	23.43914	0.34972	0.25427	0.00291
KUB23-14	3257	37	3228	15	3210	19	0.65740	0.00958	23.02374	0.36098	0.25402	0.00315
KUB23-15	3274	40	3234	19	3210	28	0.66182	0.01035	23.16927	0.45797	0.25401	0.00447
KUB23-16	3264	36	3232	15	3209	21	0.65921	0.00925	23.11286	0.35959	0.25379	0.00333
KUB23-17	3277	38	3231	16	3203	22	0.66254	0.00970	23.09499	0.38337	0.25288	0.00352
KUB23-18	3258	36	3222	15	3199	20	0.65754	0.00922	22.88475	0.34952	0.25222	0.00319
KUB23-19	3134	36	3164	15	3182	20	0.62600	0.00906	21.54692	0.33831	0.24963	0.00317
KUB23-20	3226	38	3190	16	3167	20	0.64941	0.00972	22.13250	0.35591	0.24721	0.00309
KUB23-21	3159	36	3164	15	3166	19	0.63237	0.00901	21.54703	0.32805	0.24711	0.00301
KUB23-22	3153	36	3156	15	3158	18	0.63073	0.00905	21.37978	0.32031	0.24582	0.00284
KUB23-23	3247	40	3190	17	3155	22	0.65469	0.01030	22.14196	0.39262	0.24530	0.00349
KUB23-24	3244	41	3188	22	3152	34	0.65392	0.01061	22.08847	0.50256	0.24494	0.00528
KUB23-25	3172	36	3159	14	3150	18	0.63558	0.00909	21.43475	0.31855	0.24455	0.00277
KUB23-26	3166	37	3145	15	3132	19	0.63402	0.00939	21.13894	0.33367	0.24185	0.00297
KUB23-27	3122	37	3127	18	3130	25	0.62301	0.00937	20.73940	0.37508	0.24153	0.00385

Table DR5 Continued.

Sample	$^{206}Pb/^{238}U$		$^{207}Pb/^{235}U$		$^{207}Pb/^{206}Pb$		$^{206}Pb/^{238}U$		$^{207}Pb/^{235}U$		$^{207}Pb/^{206}Pb$	
Kub23	***Age (Ma)***	***1σ***	***Age (Ma)***	***1σ***	***Age (Ma)***	***1σ***	***Ratio***	***1σ***	***Ratio***	***1σ***	***Ratio***	***1σ***
KUB23-28	3179	39	3138	19	3112	29	0.63755	0.00978	20.99273	0.42119	0.23879	0.00445
KUB23-29	3393	40	3216	17	3108	23	0.69267	0.01048	22.74178	0.39167	0.23818	0.00340
KUB23-30	3196	42	3140	20	3105	29	0.64173	0.01079	21.02652	0.44300	0.23772	0.00439
KUB23-31	3115	36	3099	15	3088	18	0.62138	0.00894	20.15868	0.30214	0.23527	0.00272
KUB23-32	3128	38	3101	18	3083	25	0.62461	0.00954	20.19501	0.36688	0.23453	0.00364
KUB23-33	3065	35	3074	15	3079	20	0.60882	0.00871	19.63639	0.30413	0.23392	0.00296
KUB23-34	3077	35	3078	15	3078	18	0.61170	0.00885	19.71626	0.29638	0.23374	0.00267
KUB23-35	3086	42	3083	24	3075	39	0.61401	0.01047	19.82773	0.50188	0.23328	0.00584
KUB23-36	3052	35	3066	16	3074	24	0.60552	0.00860	19.48484	0.32573	0.23312	0.00346
KUB23-37	3077	36	3075	16	3074	22	0.61183	0.00901	19.66054	0.32828	0.23310	0.00327
KUB23-38	2653	32	2902	21	3073	36	0.50908	0.00750	16.42951	0.36412	0.23302	0.00538
KUB23-39	3108	38	3084	18	3069	25	0.61959	0.00964	19.85728	0.36387	0.23243	0.00361
KUB23-40	3354	46	3175	26	3064	40	0.68251	0.01206	21.80980	0.57456	0.23174	0.00590
KUB23-41	3103	37	3079	15	3064	20	0.61825	0.00922	19.74787	0.31562	0.23168	0.00287
KUB23-42	3071	35	3067	15	3064	19	0.61028	0.00884	19.49631	0.29527	0.23166	0.00270
KUB23-43	3108	38	3078	17	3059	22	0.61960	0.00957	19.73256	0.33929	0.23106	0.00324
KUB23-44	3065	35	3061	14	3059	19	0.60871	0.00868	19.38594	0.29100	0.23094	0.00272
KUB23-45	3088	35	3070	15	3058	19	0.61444	0.00882	19.56070	0.29410	0.23087	0.00269
KUB23-46	3065	35	3060	15	3056	20	0.60884	0.00865	19.35753	0.30019	0.23057	0.00295
KUB23-47	3247	42	3127	19	3051	27	0.65490	0.01088	20.74809	0.41624	0.22979	0.00395
KUB23-48	3101	35	3067	15	3042	21	0.61764	0.00875	19.49715	0.30351	0.22862	0.00296