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U-Pb geochronology of the Cottons Breccia, Tasmania, Australia, and global correlation of Marinoan deglaciation

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1. SHRIMP U-Pb GEOCHRONOLOGICAL METHODS AND RESULTS

Zircons were separated using standard magnetic and density techniques. Representative selections of several hundred zircons from each sample, together with zircon reference standards, were cast in an epoxy mount, which was polished to section the crystals for analysis. The mount was cleaned thoroughly, and the polished surface documented with transmitted and reflected light micrographs and cathodoluminescence (CL) images, then vacuum-coated with a ~50 nm layer of high-purity gold. To eliminate any residual water from the sampling surface, the mount was pumped down to high vacuum in the SHRIMP sample lock for 24 hours prior to each analytical session.

Measurements of U, Th, and Pb were conducted using the SHRIMP II ion microprobes at Curtin University of Technology. Analyses consisted of five scans through the mass range using a spot size of ~25 µm diameter and a primary ion beam (O^{2-}) with an intensity between 2 and 4 nA. U-Th-Pb ratios were determined relative to the Temora zircon standard ($^{206}Pb/^{238}U$ = 0.0668; 416.8 Ma : Black et al., 2003), and element concentrations were estimated by comparison with either the CZ3 zircon standard (551 ppm ^{238}U: Pidgeon et al., 1994) or the SL13 zircon standard (238 ppm ^{238}U: Claoué-Long et al., 1995), analyses of which were interspersed with those of unknown grains, using operating and data processing procedures similar to those described by Compston et al. (1984). Data were reduced using SQUID 1.10 (Ludwig, 2001). Decay constants employed are those recommended by Steiger and Jäger (1977).

Assessment of and correction for common-Pb contamination was made using measured $^{204}Pb/^{206}Pb$ and contemporaneous common-Pb isotopic compositions determined according to the model of Stacey and Kramers (1975), and also using the 207-correction, which assumes $^{238}U/^{206}Pb$ concordance. Although most common Pb corrections using ^{204}Pb are small, and the 204-corrected data are on average concordant (e.g. Fig. DR2B), some of the data show a good correlation between 204-corrected $^{207}Pb^*/^{206}Pb^*$ age and the 204-correction (*f*204). For this reason, the 204-correction is regarded as inaccurate for some analyses. Although 204-corrected results are reported in Table DR1, the 207-corrected $^{238}U/^{206}Pb^*$ ratio is taken as the best estimator of age for each zircon analysis. However, we emphasize that for the majority of these data, the small amount of common Pb present means that differences between 204- and 207-corrected $^{238}U/^{206}Pb^*$ ages are insignificant. Where multiple analyses of a single zircon agree to within analytical uncertainty, the 207-corrected $^{238}U/^{206}Pb^*$ ages are averaged, and the average used in further calculations. In cases where two ages for a zircon are significantly different, the younger analysis is interpreted to reflect loss of radiogenic Pb. Age components are calculated for each sample using the algorithm of Sambridge and Compston (1994). Uncertainties on mean ages are reported below with 95% confidence intervals.

Sample 1

Zircons separated from this sample are between 40 and 200 μm long, vary from euhedral and prismatic to strongly rounded, and are colourless and clear to brown and slightly turbid. Zircons showing some degree of rounding outnumber euhedral grains (Fig. DR1). They have few inclusions or cracks. Very few obvious cores were observed in CL images. Seventy-six analyses of 60 zircons were conducted during three analytical sessions (Table DR1). Most crystals are relatively low in uranium and thorium, and only three analyses of two zircons indicate >500 ppm of either species. Uranium ranges from 61 to 1184 ppm, with a median of 191 ppm, and thorium ranges from 29 to 1451 ppm, with a median of 97 ppm. Th/U ratios vary between 0.35 and 1.27, with a median of 0.54.

Five analyses (13.1, 14.1, 15.1, 60.1, 66.1), which have low UO^+/U^+ ratios and low count rates, indicative of local charging or inadequate secondary tuning, are not considered further. Also excluded are seven analyses for which Pb loss is indicated (Fig. DR2A, B). Two such analyses (21.1, 21.2) are of a single zircon which has the highest U and Th contents, yields substantially younger $^{238}U/^{206}Pb^*$ ages (Fig. DR2), and has almost certainly lost Pb. Another four analyses (2.1, 14.4, 18.1, 35.1) indicate significantly younger ages than additional analyses in the same zircons, implying that the younger analyses of these grains were of areas that have undergone Pb loss. Finally, analysis 60.2 indicated an age of 608 Ma, which is much younger than the remaining data and is likely to reflect loss of radiogenic Pb (an initial analysis of this zircon was excluded owing to its low UO^+/U^+ ratio).

After averaging pairs of ages for three zircons, the remaining 61 data yield 207-corrected $^{238}U/^{206}Pb^*$ ages between 687 and 625 Ma (Fig. DR2C), and are dispersed slightly beyond analytical precision (MSWD = 1.77). Mixture-modelling suggests the data can be deconvolved into two age components, at 662.5 ± 5.2 Ma (70 ± 21%) and 639.4 ± 7.3 Ma (30%).

Sample 2

Zircons are between 40 and 100 μm long, vary from euhedral and prismatic to predominantly variably rounded (Fig. DR1), and are clear and light brown. They have few inclusions, cracks, or cores. Thirty analyses of 25 zircons were conducted during two analytical sessions (Table DR1). Uranium ranges from 55 to 887 ppm, with a median of 185 ppm. Thorium ranges from 26 to 348 ppm, with a median of 104 ppm. Th/U ratios vary between 0.35 and 1.00, with a median of 0.57.

Four analyses (11.1, 14.1, 23.1, 25.1) yield concordant or near-concordant 204-corrected $^{207}Pb^*/^{206}Pb^*$ ages between 1721 and 1125 Ma (Table DR1), indicating the presence in this sample of Meso- and Paleoproterozoic zircons. Two analyses (4.1, 5.1) are excluded which indicate significantly younger ages than second analyses in the same zircons, implying that the initial analyses of these grains were of areas that have undergone Pb loss.

After averaging pairs of ages for three zircons, the remaining 21 data yield 207-corrected $^{238}U/^{206}Pb^*$ ages between 665 and 616 Ma (Fig. DR3C), and are dispersed well beyond analytical precision (MSWD = 3.08). Mixture-modelling indicates two age components, at 653.5 ± 5.3 Ma (66 ± 30%) and 629.6 ± 7.1 Ma (34%).

Sample 3

Zircons in this sample are between 40 and 200 μm long, are euhedral to rounded, and are clear and light brown with reddish surficial staining. Subhedral grains showing some degree of rounding appear to outnumber euhedral grains (Fig. DR1). They have few inclusions or cracks. Some are fragments of originally larger crystals. No cores were observed in CL images. Twenty-eight analyses of 25 zircons were conducted during two analytical sessions (Table DR1). Uranium ranges from 69 to 753 ppm, with a median of 232 ppm. Thorium ranges from 31 to 435 ppm, with a median of 162 ppm. Th/U ratios vary between 0.22 and 0.75, with a median of 0.59.

Two analyses (22.1, 24.1) of two zircons yield 207-corrected $^{238}U/^{206}Pb^*$ ages of 399 and 416 Ma, respectively, suggesting that these two zircons are contaminants introduced during sample processing. Four analyses (14.1, 15.1, 21.1, 23.1) yield concordant or near-concordant 204-corrected $^{207}Pb^*/^{206}Pb^*$ ages between 1776 and 1439 Ma, indicating the presence in this sample of Meso- and Paleoproterozoic detrital zircons. One analysis (12.1) indicates a significantly younger age than a second analysis in the same zircon, implying that the initial analysis was of an area that has undergone Pb loss. One other analysis (6.1), with an age of 603 Ma, is substantially younger than all remaining results (Fig. DR4A, B) and probably reflects loss of radiogenic Pb.

After averaging pairs of ages for two zircons, the remaining 18 data yield 207-corrected $^{238}U/^{206}Pb^*$ ages between 668 and 625 Ma (Fig. DR4C), and are dispersed well beyond analytical precision (MSWD = 2.81). Mixture-modelling suggests the presence of two age components, at 653.3 ± 5.0 Ma (77 ± 30%) and 633.0 ± 9.2 Ma (23%).

Sample 4

Zircons are between 30 and 120 μm long, mainly euhedral (Figs. DR1, DR6), and are clear and light brown. They have no inclusions and few cracks. Some are fragments of originally larger crystals. No cores were observed in CL images. Ninety analyses of 69 zircons were conducted during four analytical sessions (Table DR1). Most crystals are relatively low in uranium and thorium, only two have >500 ppm of either species. Uranium ranges from 76 to 1074 ppm, with a median of 168 ppm. Contents of ^{232}Th range from 32 to 900 ppm, with a median of 95 ppm. Th/U ratios vary between 0.33 and 0.87, with a median of 0.58.

Four analyses (4.1, 5.1, 6.1, 10.1), which have low UO^+/U^+ ratios and low count rates, indicative of local charging or inadequate secondary tuning, are not considered further. Also excluded are five analyses (13.1, 18.1, 28.1, 40.1, 52.1) which indicate significantly younger ages than additional analyses in the same zircons, implying that the younger analyses of these grains reflect material that has undergone Pb loss.

After averaging pairs of ages for 14 zircons, the remaining 67 data yield 207-corrected $^{238}U/^{206}Pb^*$ ages between 674 and 613 Ma (Fig. DR5C), and are dispersed only slightly beyond analytical precision (MSWD = 1.31). Mixture-modelling indicates two age components, at 661.9 ± 13.0 Ma (6 ± 24%) and 636.8 ± 2.3 Ma (94%).

2. CA-TIMS U-Pb GEOCHRONOLOGICAL METHODS AND RESULTS

U-Pb dates were obtained by the chemical abrasion isotope dilution thermal ionization mass spectrometry (CA-TIMS) method on carefully selected and characterized single zircon grains (Table DR2), extracted from an aliquot of Sample 4. Zircon grains were isolated from the rock sample using standard magnetic and density separation techniques, annealed in a muffle furnace at 900°C for 60 hours in quartz beakers, then hand picked, mounted in epoxy and polished until the centers of the grains were exposed. Cathodoluminescence (CL) images were obtained with a JEOL T-300 scanning electron microscope and Gatan MiniCL. Grains were selected for dating based on CL images that appear to lack inherited cores, removed from the epoxy mounts and subjected to a modified version of the chemical abrasion method of Mattinson (2005).

Single grains were transferred to 3 ml Teflon PFA beakers, washed in dilute HNO_3 and water, and loaded into 300 µl Teflon PFA microcapsules. Fifteen microcapsules were placed in a large-capacity Parr vessel, and the crystals partially dissolved in 120 µl of 29 M HF for 12 hours at 180°C. The contents of each microcapsule were returned to 3 ml Teflon PFA beakers, the HF removed and the residual grains immersed in 3.5 M HNO_3, ultrasonically cleaned for an hour, and fluxed on a hotplate at 80°C for an hour. The HNO_3 was removed and the grains were rinsed twice in ultrapure H_2O before being reloaded into the same 300 µl Teflon PFA microcapsules (rinsed and fluxed in 6 M HCl during crystal sonication and washing) and spiked with the EARTHTIME mixed ^{233}U-^{235}U-^{205}Pb tracer solution (ET535). These chemically abraded grains were dissolved in Parr vessels in 120 µl of 29 M HF with a trace of 3.5 M HNO_3 at 220°C for 48 hours, dried to fluorides, and then re-dissolved in 6 M HCl at 180°C overnight. U and Pb were separated from the zircon matrix using an HCl-based anion-exchange chromatographic procedure (Krogh, 1973), eluted together and dried with 2 µl of 0.05 N H_3PO_4.

Pb and U were loaded on a single outgassed Re filament in 5 µl of a silica-gel/phosphoric acid mixture (Gerstenberger and Haase, 1997), and U and Pb isotopic measurements made on an IsotopX Isoprobe-T multicollector thermal ionization mass spectrometer equipped with an ion-counting Daly detector. Pb isotopes were measured by peak-jumping all isotopes on the Daly detector for 100 to 150 cycles. Pb mass fractionation was externally corrected using a mass bias factor of 0.18 ± 0.03%/a.m.u. determined via measurements of $^{202}Pb/^{205}Pb$ (ET2535)-spiked samples analyzed during the same experimental period. Transitory isobaric interferences due to high-molecular weight organics, particularly on ^{204}Pb and ^{207}Pb, disappeared within approximately 30 cycles, while ionization efficiency averaged 10^4 cps/pg of each Pb isotope. Linearity (to ≥1.4 x 10^6 cps) and the associated deadtime correction of the Daly detector were monitored by repeated analyses of NBS982, and have been constant since installation. Uranium was analyzed as UO_2^+ ions in static Faraday mode on 10^{11} ohm resistors for 150 to 200 cycles, and corrected for isobaric interference of $^{233}U^{18}O^{16}O$ on $^{235}U^{16}O^{16}O$ with an $^{18}O/^{16}O$ of 0.00206. Ionization efficiency averaged 20 mV/ng of each U isotope. U mass fractionation was corrected using the known $^{233}U/^{235}U$ ratio of the ET535 tracer solution.

CA-TIMS U-Pb dates and uncertainties were calculated using the algorithms of Schmitz and Schoene (2007), ET535 tracer solution (Condon et al., 2007) with calibration of $^{235}U/^{205}Pb$ = 100.233, $^{233}U/^{235}U$ = 0.99506, and $^{205}Pb/^{204}Pb$ = 11268, and U decay constants recommended by Jaffey et al. (1971). $^{206}Pb/^{238}U$ ratios and dates were corrected for initial ^{230}Th disequilibrium using a Th/U[magma] = 3 ± 1 using the algorithms of Crowley et al. (2007), resulting in an increase in the $^{206}Pb/^{238}U$ dates of ~0.09 Ma. All common Pb in analyses was attributed to laboratory blank and subtracted based on the measured laboratory Pb isotopic composition and associated uncertainty. U blanks were estimated at 0.07 pg.

The quoted uncertainty on the weighted mean $^{206}Pb/^{238}U$ date of 8 equivalent analyses (± 0.34 Ma) is the internal error based on analytical uncertainties only, including counting statistics, subtraction of tracer solution, and blank and initial common Pb subtraction. It is given at the 2 sigma confidence interval. This error should be considered when comparing our date with $^{206}Pb/^{238}U$ dates from other laboratories that used the same EARTHTIME tracer solution or a tracer solution that was cross-calibrated using EARTHTIME gravimetric standards. When comparing our date with those derived from laboratories that did not use the same EARTHTIME tracer solution or a tracer solution that was cross-calibrated using EARTHTIME gravimetric standards, a systematic uncertainty in the tracer calibration of 0.05% should be added to the internal error in quadrature. This error is ± 0.45 Ma. When comparing our date with those derived from other decay schemes (e.g., $^{40}Ar/^{39}Ar$, ^{187}Re-^{187}Os), systematic uncertainties in the tracer calibration and ^{238}U decay constant (Jaffey et al., 1971) should be added to the internal error in quadrature. This error is ± 0.80 Ma. Errors on the $^{206}Pb/^{238}U$ dates from individual grains are also given at the 2 sigma confidence interval.

CL images of zircon grains from Sample 4 are illustrated in Fig. DR6, with dated grains labeled. Crystals dated by CA-TIMS yielded $^{206}Pb/^{238}U$ dates between 666.8 ± 2.6 and 635.6 ± 2.4 Ma. The eight youngest dates are equivalent with a weighted mean of 636.41 ± 0.34 Ma (MSWD = 1.5) (Fig. DR7).

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FIGURES

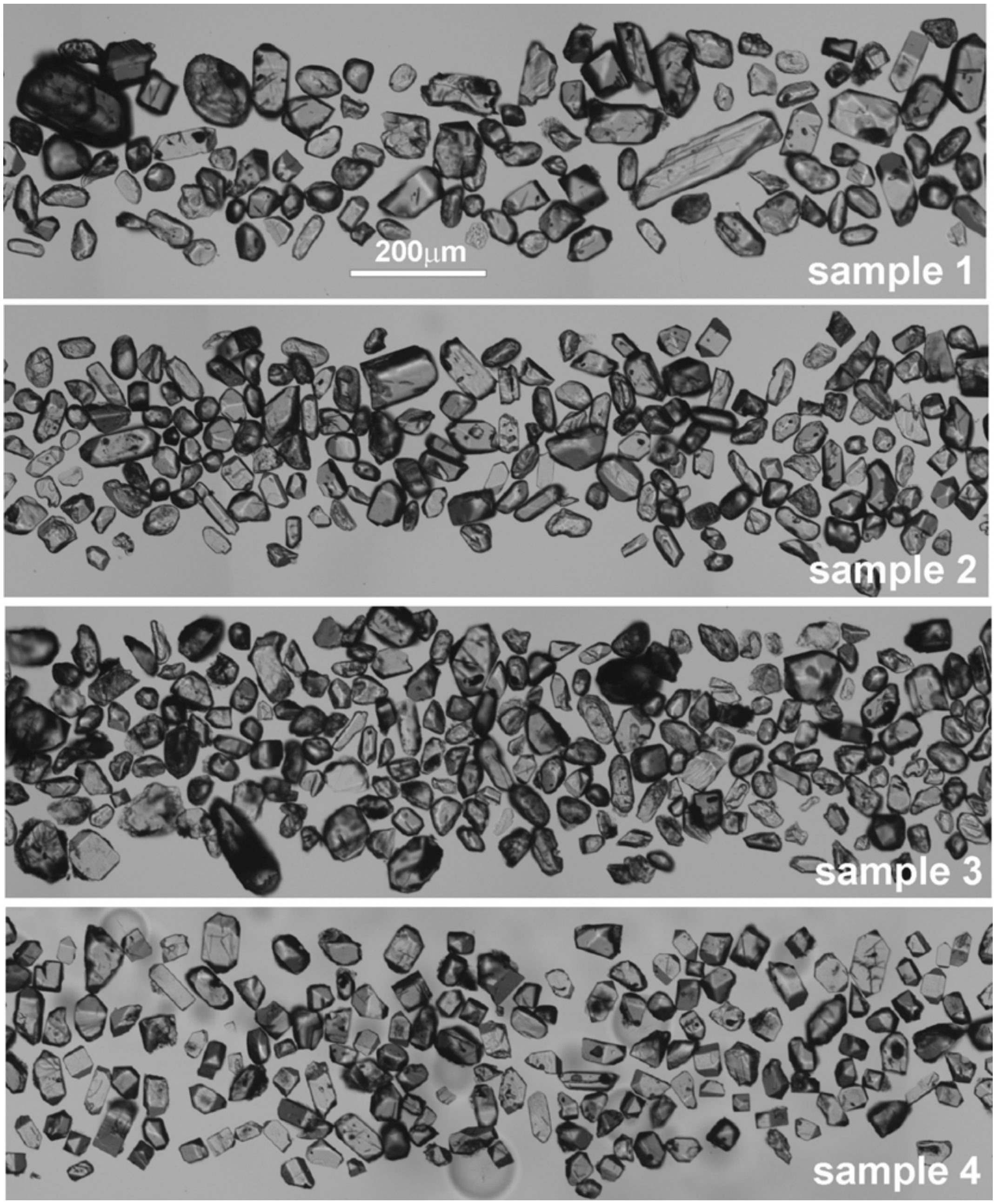

Figure DR1: Transmitted-light images of zircons extracted from samples 1 - 4. Note that samples 1, 2 and 3 contain a high proportion of subhedral, rounded crystals, whereas sample 4 is dominated by euhedral crystals.

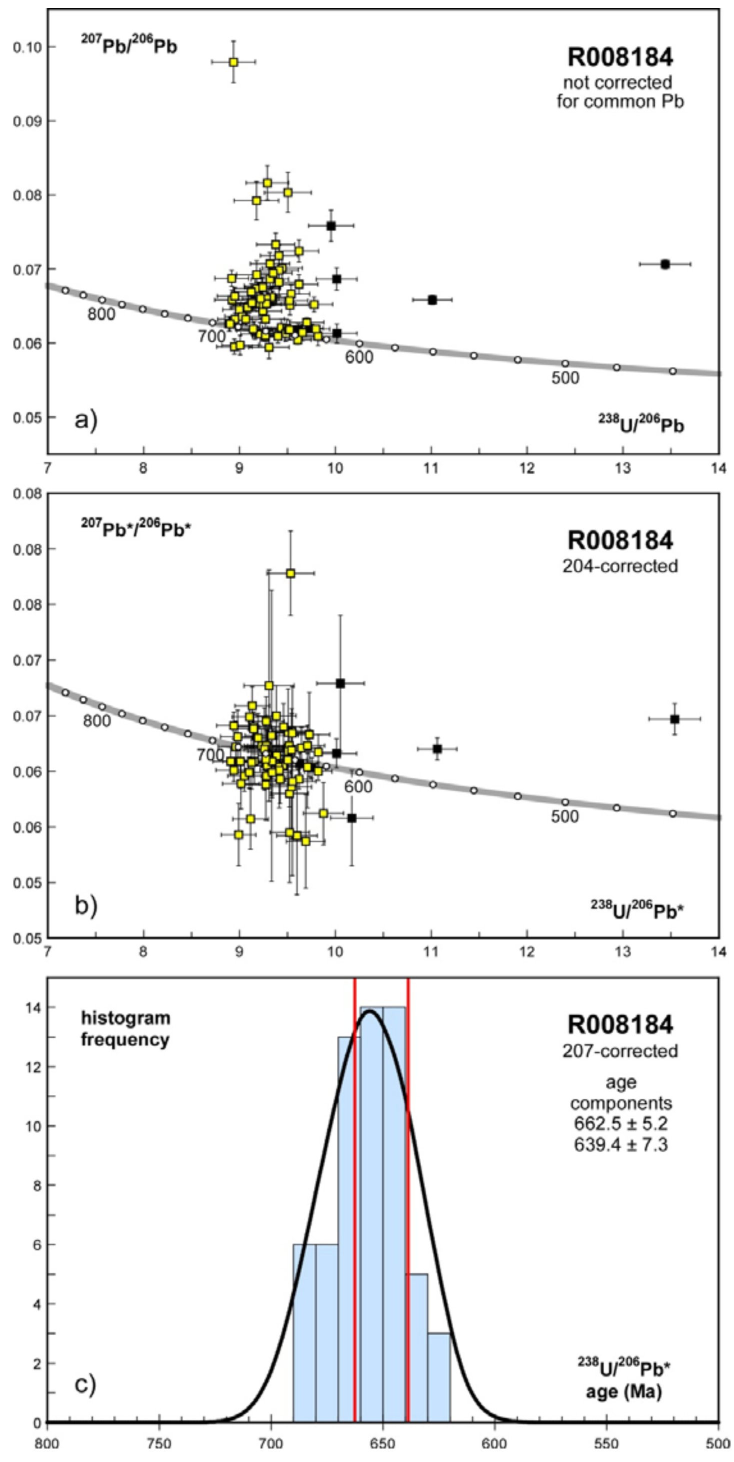

Figure DR2: SHRIMP U-Pb analytical data for zircons from sample 1(R008184). A: not corrected for common Pb, B: corrected for common Pb using measured ^{204}Pb, C: probability density diagram and histogram of 207-corrected ^{238}U/^{206}Pb* ages. In A and B, black squares indicate data interpreted to reflect loss of radiogenic Pb; these data are not included in C. Excluded from all three diagrams are data points with low UO^+/U^+. Ages of components in C are in Ma.

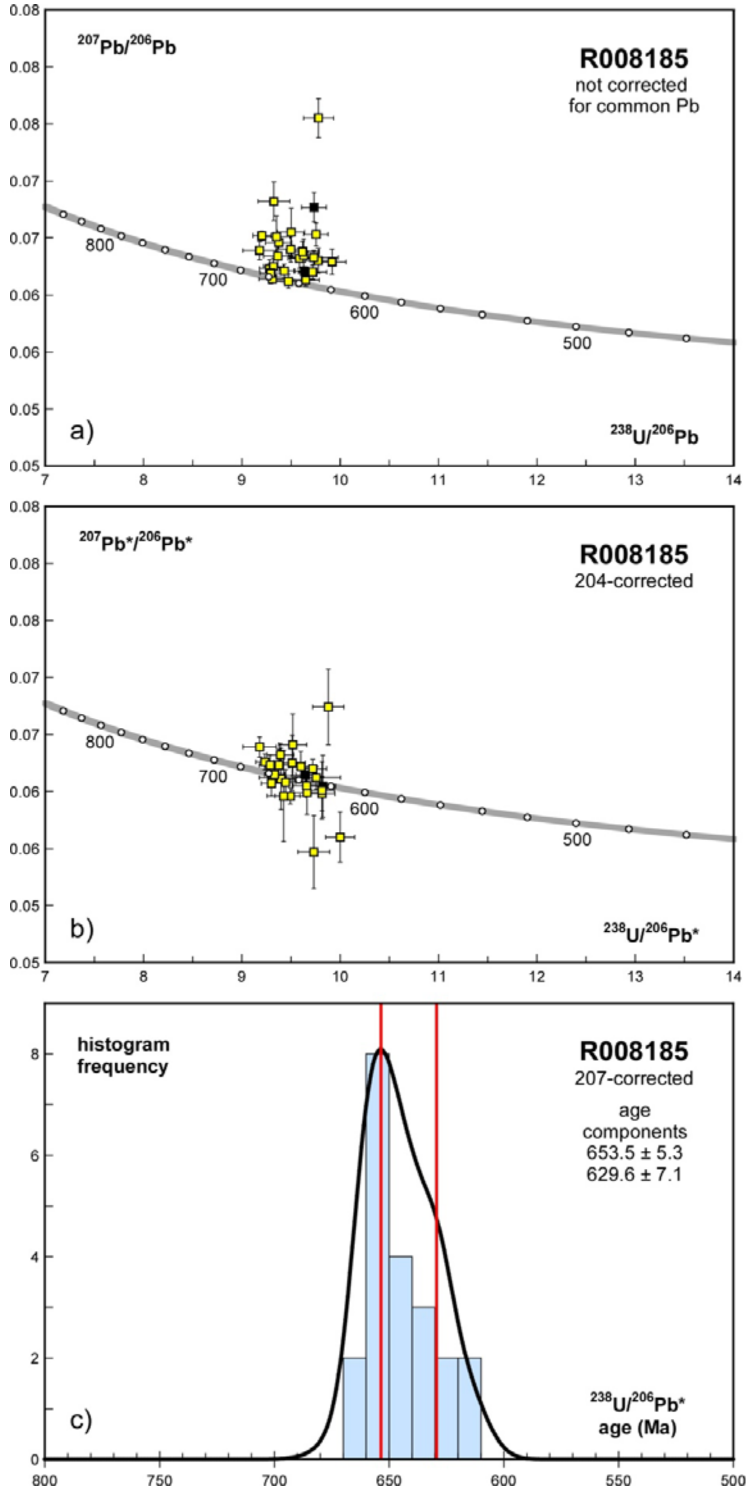

Figure DR3: SHRIMP U-Pb analytical data for zircons from sample 2(R008185). Excluded from all three diagrams are four data points for Meso- and Paleoproterozoic zircons. Other notes as in Fig. DR2.

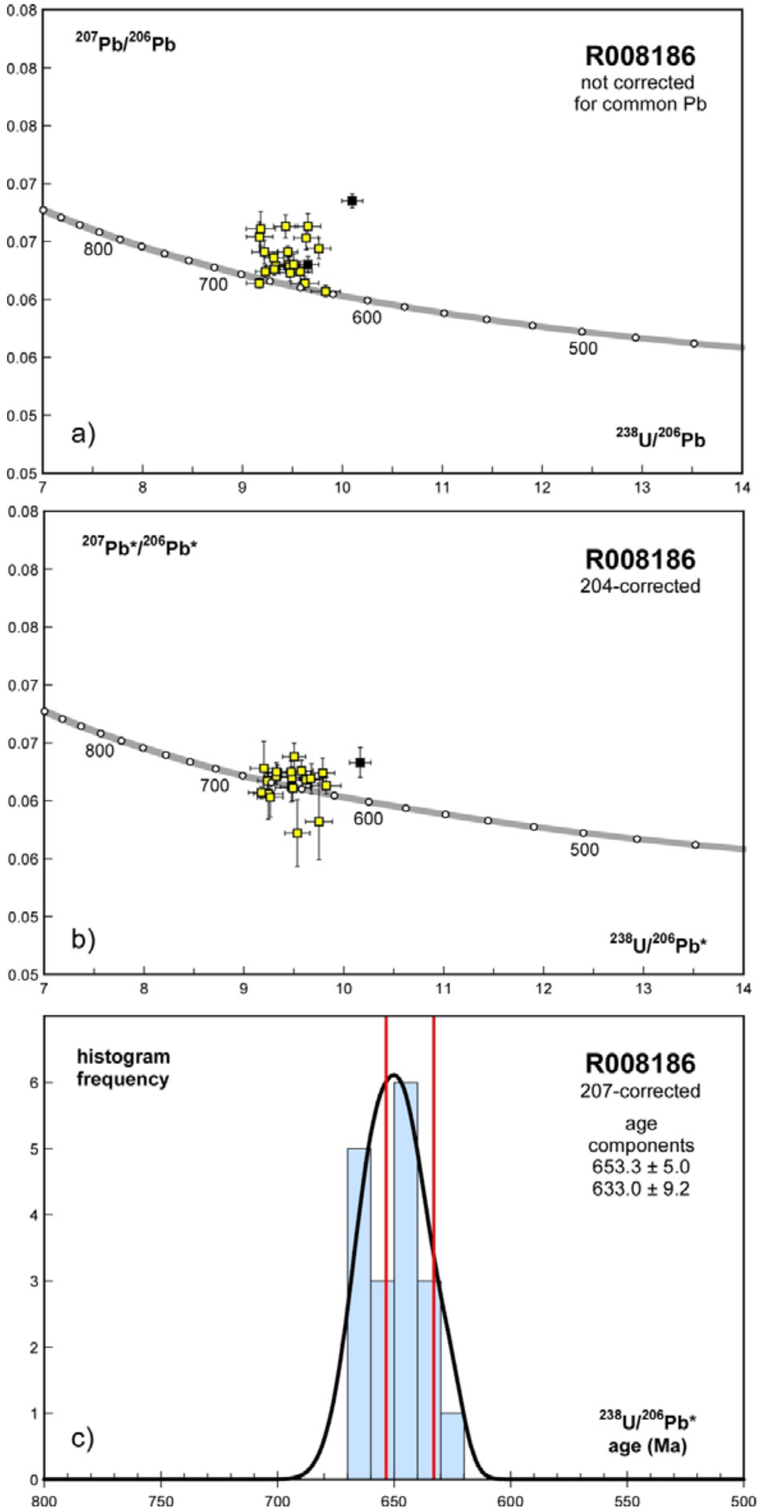

Figure DR4: SHRIMP U-Pb analytical data for zircons from sample 3(R008186). Excluded from all three diagrams are four data points for Meso- and Paleoproterozoic zircons. Other notes as in Fig. DR2.

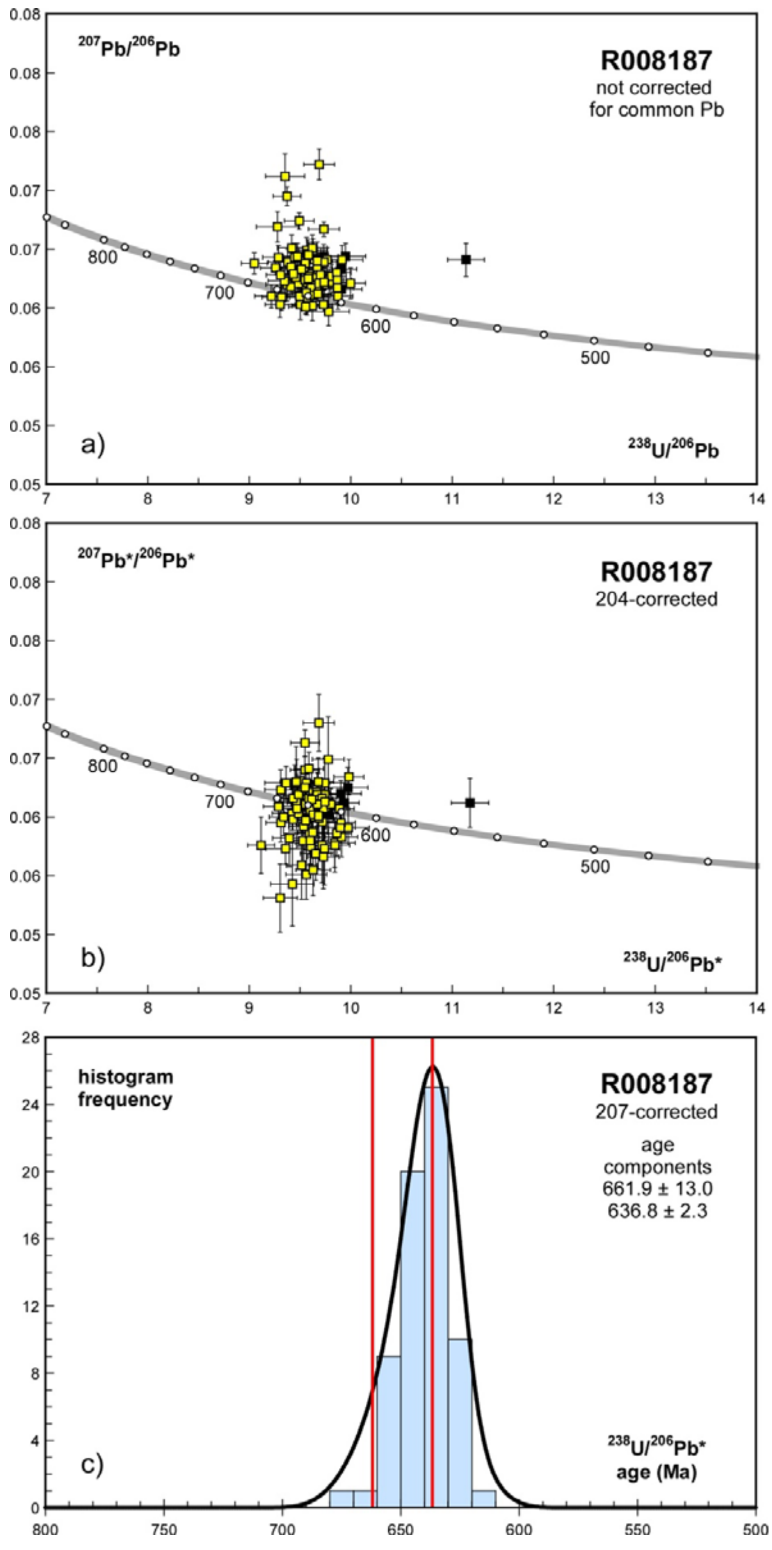

Figure DR5. SHRIMP U-Pb analytical data for zircons from sample 4 (R008187). Other notes as in Fig. DR2.

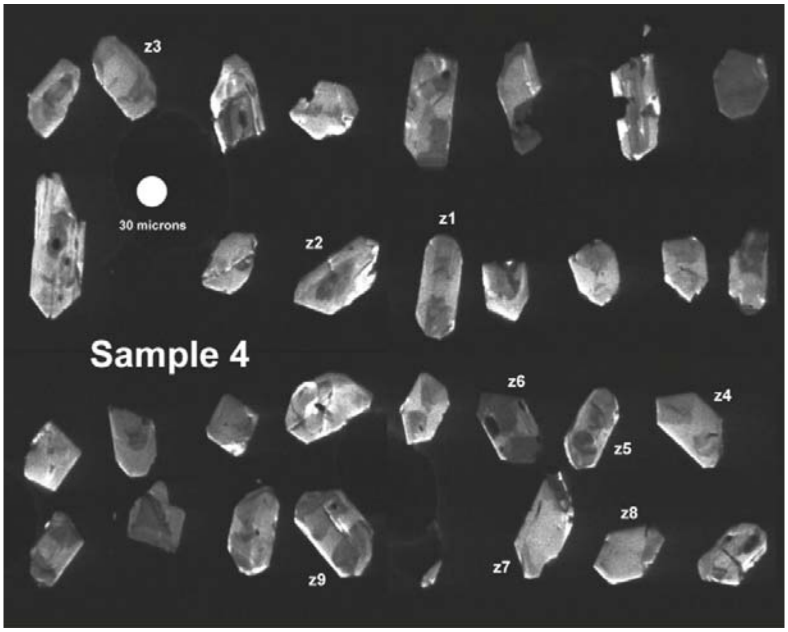

Figure DR6: Cathodoluminescence images for zircons grain of Sample 4, from which CA-TIMS analyses (labeled) were undertaken.

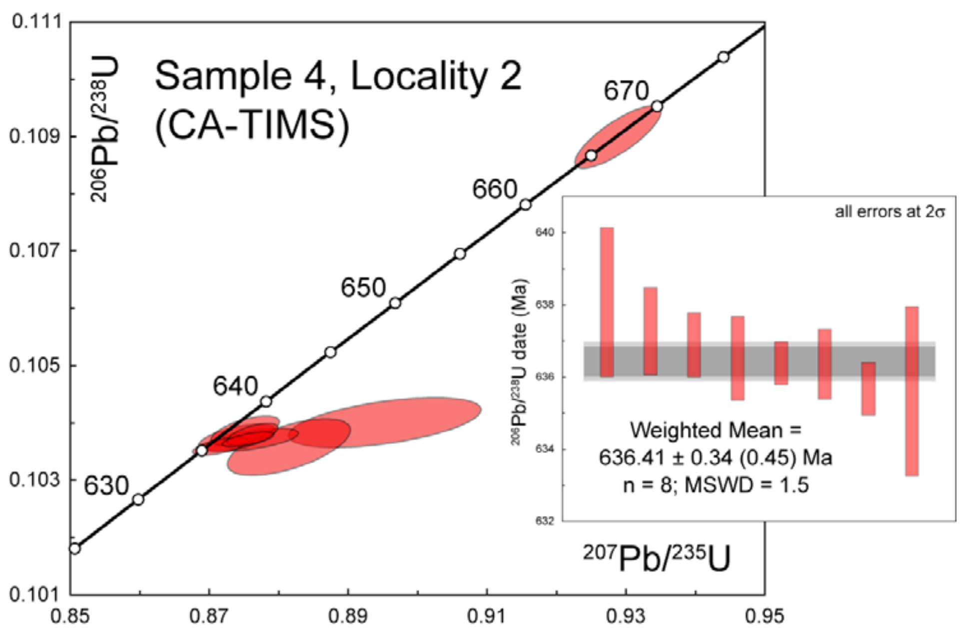

Figure DR7: U-Pb concordia diagram illustrating CA-TIMS results for Sample 4 of Locality 2, along with ranked $^{206}Pb/^{238}U$ dates for the majority cluster. Uncertainties are illustrated at the 95% confidence interval.

Table DR1: SHRIMP U-Pb analytical data for zircons from Cottons Breccia samples.

SAMPLE 1 (R008184)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
spot	session	U ppm	Th ppm	Th/U	f204%	f207%	0-238U/ 206Pb	±0-U/Pb	0-207Pb/ 206Pb	±0-7/6	4-238U/ 206Pb*	±4-U/Pb*	4-207Pb*/ 206Pb*	±4-7*/6*	7-238U/ 206Pb*	±7-U/Pb*	4-U/Pb* age	±4-U/Pb* age	4-7*/6* age	±4-7*/6* age	4-Disc, %	7-U/Pb* age	±7-U/Pb* age
8184-1.1	1	123	51	0.43	-0.272	-0.010	9.162	0.190	0.0617	0.0012	9.137	0.189	0.0640	0.0012	9.161	0.194	669.5	13.2	740.5	39.6	9.6	667.9	13.5
8184-2.1^	1	110	65	0.61	-0.036	0.129	10.016	0.210	0.0613	0.0013	10.012	0.210	0.0616	0.0013	10.029	0.215	613.7	12.3	660.4	45.0	7.1	612.7	12.5
8184-2.2	5	138	81	0.61	0.136	-0.068	9.607	0.139	0.0604	0.0006	9.620	0.139	0.0593	0.0009	9.601	0.142	637.5	8.8	578.8	34.7	-10.1	638.8	9.0
8184-3.1	1	169	102	0.62	-0.090	0.059	9.656	0.196	0.0614	0.0011	9.647	0.197	0.0621	0.0018	9.662	0.201	635.8	12.4	677.6	61.9	6.2	634.9	12.6
8184-4.1	1	98	41	0.43	0.171	0.204	9.271	0.197	0.0632	0.0014	9.287	0.198	0.0618	0.0019	9.289	0.202	659.3	13.3	668.5	66.9	1.4	659.1	13.6
8184-5.1	1	97	51	0.55	-0.218	-0.061	9.215	0.201	0.0612	0.0016	9.195	0.201	0.0630	0.0022	9.209	0.206	665.5	13.9	708.5	75.6	6.1	664.5	14.1
8184-6.1	1	272	106	0.40	-0.118	0.113	8.952	0.179	0.0632	0.0009	8.942	0.179	0.0641	0.0012	8.962	0.184	683.4	13.0	745.6	40.8	8.3	681.9	13.3
8184-7.1	1	213	72	0.35	-0.072	-0.350	8.947	0.185	0.0595	0.0010	8.941	0.185	0.0601	0.0010	8.916	0.189	683.5	13.4	605.4	36.9	-12.9	685.3	13.8
8184-8.1	1	193	96	0.51	0.209	0.029	8.889	0.184	0.0626	0.0010	8.908	0.185	0.0609	0.0013	8.892	0.189	685.9	13.5	635.7	47.4	-7.9	687.0	13.9
8184-9.1	1	155	90	0.60	0.189	0.098	9.436	0.194	0.0621	0.0011	9.454	0.195	0.0605	0.0012	9.445	0.199	648.2	12.7	622.3	41.8	-4.2	648.8	13.0
8184-10.1	1	341	391	1.19	0.055	-0.060	9.401	0.187	0.0609	0.0009	9.406	0.187	0.0604	0.0009	9.395	0.191	651.3	12.3	618.8	33.5	-5.3	652.0	12.6
8184-11.1	1	126	51	0.42	0.118	0.099	9.493	0.197	0.0620	0.0012	9.504	0.198	0.0610	0.0016	9.502	0.202	644.9	12.8	639.5	54.8	-0.8	645.0	13.1
8184-12.1	1	108	48	0.46	0.577	0.037	9.819	0.206	0.0609	0.0013	9.876	0.209	0.0562	0.0028	9.822	0.211	621.8	12.6	458.5	111.2	-35.6	625.0	12.8
8184-13.1†	1	198	93	0.49	1.343	0.558	8.335	0.173	0.0681	0.0012	8.448	0.178	0.0570	0.0034	8.382	0.179	721.2	14.4	491.8	131.6	-46.6	726.6	14.6
8184-14.1†	1	168	94	0.58	0.244	0.322	10.583	0.222	0.0620	0.0014	10.609	0.222	0.0600	0.0014	10.618	0.227	580.7	11.6	603.4	51.5	3.8	580.2	11.9
8184-14.2*	1	153	82	0.55	0.095	0.014	9.484	0.194	0.0613	0.0011	9.522	0.195	0.0580	0.0012	9.485	0.199	643.8	12.5	531.2	46.8	-21.2	646.1	12.9
8184-14.3*	5	171	95	0.57	0.143	-0.105	9.270	0.133	0.0608	0.0006	9.283	0.133	0.0596	0.0008	9.260	0.136	659.5	9.0	588.6	29.1	-12.1	661.1	9.2
8184-14.X																						656.0	7.5
8184-14.4^	5	170	92	0.56	0.200	0.153	9.735	0.139	0.0620	0.0006	9.755	0.140	0.0603	0.0009	9.750	0.143	629.1	8.6	615.9	33.1	-2.1	629.4	8.8
8184-15.1†	1	88	42	0.50	0.398	0.204	10.212	0.235	0.0616	0.0018	10.194	0.234	0.0630	0.0018	10.233	0.241	603.2	13.2	708.9	62.2	14.9	601.1	13.5
8184-16.1	1	103	60	0.60	-0.175	-0.308	9.008	0.191	0.0597	0.0013	9.016	0.192	0.0589	0.0023	8.980	0.195	678.0	13.7	562.7	86.4	-20.5	680.6	14.0
8184-17.1	1	105	47	0.46	-0.053	0.088	9.523	0.199	0.0618	0.0013	9.518	0.199	0.0623	0.0013	9.531	0.204	644.0	12.8	683.2	44.2	5.7	643.2	13.1
8184-18.1^	1	327	156	0.49	0.128	0.102	9.614	0.189	0.0618	0.0008	9.627	0.190	0.0607	0.0009	9.625	0.194	637.1	11.9	629.7	30.9	-1.2	637.3	12.2
8184-18.2	5	365	173	0.49	0.036	-0.075	9.270	0.137	0.0610	0.0004	9.273	0.137	0.0607	0.0004	9.263	0.140	660.2	9.3	628.9	14.2	-5.0	660.9	9.5
8184-19.1	1	75	42	0.58	-0.324	-0.262	9.308	0.210	0.0594	0.0015	9.278	0.209	0.0621	0.0016	9.284	0.215	659.9	14.1	677.1	53.4	2.6	659.5	14.5
8184-20.1	1	195	88	0.47	0.129	0.007	9.143	0.186	0.0619	0.0009	9.155	0.187	0.0609	0.0020	9.144	0.191	668.3	13.0	634.0	71.2	-5.4	669.1	13.2
8184-21.1^	3	813	724	0.92	0.452	0.867	11.013	0.203	0.0658	0.0006	11.064	0.204	0.0620	0.0010	11.109	0.209	557.8	9.9	675.6	33.9	17.4	555.6	10.0
8184-21.2^	3	1184	1451	1.27	0.717	1.792	13.440	0.265	0.0706	0.0006	13.540	0.268	0.0647	0.0014	13.685	0.274	459.4	8.8	763.4	46.9	39.8	454.6	8.8
8184-22.1	3	369	178	0.50	0.602	0.298	8.998	0.172	0.0645	0.0008	9.052	0.174	0.0596	0.0014	9.025	0.177	675.5	12.3	590.0	49.8	-14.5	677.4	12.6
8184-23.1	3	241	131	0.56	0.013	0.385	9.104	0.181	0.0650	0.0010	9.105	0.181	0.0649	0.0012	9.139	0.186	671.8	12.7	771.7	37.9	12.9	669.4	13.0
8184-24.1	3	149	110	0.76	1.099	1.423	9.621	0.206	0.0724	0.0015	9.729	0.212	0.0633	0.0038	9.760	0.214	630.7	13.1	718.8	126.7	12.3	628.8	13.1
8184-25.1	3	186	104	0.58	0.186	0.496	9.526	0.196	0.0651	0.0013	9.544	0.197	0.0636	0.0020	9.573	0.202	642.4	12.6	727.3	65.7	11.7	640.5	12.9
8184-26.1	3	380	215	0.58	0.465	0.325	9.244	0.196	0.0643	0.0009	9.287	0.197	0.0605	0.0017	9.275	0.201	659.2	13.3	619.9	60.9	-6.3	660.1	13.6
8184-27.1*	3	191	96	0.52	0.909	0.861	9.621	0.196	0.0679	0.0013	9.709	0.202	0.0604	0.0037	9.705	0.203	631.9	12.5	618.3	132.0	-2.2	632.2	12.6
8184-27.2*	5	205	99	0.50	-0.006	0.074	9.509	0.135	0.0617	0.0005	9.509	0.135	0.0618	0.0005	9.517	0.138	644.6	8.7	666.9	17.8	3.3	644.1	8.9
8184-27.X																						640.2	7.3
8184-28.1	3	145	109	0.77	0.698	1.151	9.318	0.205	0.0707	0.0015	9.385	0.208	0.0650	0.0027	9.427	0.212	652.7	13.7	773.7	86.8	15.6	649.9	13.9
8184-29.1	3	335	140	0.43	0.367	0.443	9.198	0.181	0.0653	0.0010	9.232	0.182	0.0623	0.0015	9.239	0.186	663.0	12.4	684.1	51.9	3.1	662.5	12.7
8184-30.1	3	239	105	0.46	0.670	0.749	9.233	0.183	0.0677	0.0011	9.296	0.185	0.0622	0.0018	9.303	0.189	658.7	12.5	680.3	63.0	3.2	658.2	12.7
8184-31.1	3	157	95	0.63	2.369	1.482	9.378	0.199	0.0733	0.0015	9.600	0.212	0.0542	0.0053	9.518	0.207	638.8	13.4	378.0	218.9	-69.0	644.0	13.3
8184-32.1	3	757	586	0.80	0.067	0.250	9.703	0.179	0.0628	0.0006	9.709	0.179	0.0623	0.0007	9.727	0.183	631.9	11.1	683.2	24.8	7.5	630.8	11.3
8184-33.1	3	178	74	0.43	1.002	1.306	9.412	0.194	0.0718	0.0014	9.508	0.200	0.0635	0.0039	9.537	0.201	644.7	12.9	726.6	129.7	11.3	642.8	12.9
8184-34.1	3	293	136	0.48	0.830	0.572	9.346	0.183	0.0660	0.0010	9.424	0.186	0.0593	0.0022	9.399	0.188	650.1	12.2	576.9	80.9	-12.7	651.7	12.4
8184-35.1^	3	83	43	0.54	0.953	1.927	9.956	0.235	0.0758	0.0021	10.054	0.247	0.0679	0.0061	10.152	0.246	611.2	14.3	865.4	185.4	29.4	605.7	14.0
8184-35.2	3	61	29	0.50	0.297	2.387	9.505	0.244	0.0803	0.0027	9.534	0.247	0.0778	0.0038	9.737	0.257	643.0	15.8	1141.4	97.7	43.7	630.2	15.9
8184-36.1	3	66	36	0.56	4.221	4.445	8.939	0.226	0.0979	0.0028	9.336	0.277	0.0632	0.0131	9.355	0.245	656.0	18.5	713.4	440.1	8.0	654.7	16.3
8184-37.1	3	279	160	0.59	0.687	0.800	8.919	0.175	0.0687	0.0011	8.981	0.177	0.0631	0.0024	8.990	0.181	680.6	12.8	711.1	79.9	4.3	679.9	13.0
8184-38.1	3	193	75	0.40	0.439	0.440	8.922	0.180	0.0658	0.0013	8.961	0.182	0.0622	0.0023	8.961	0.186	682.0	13.2	682.3	78.6	0.0	682.0	13.4
8184-39.1	3	239	97	0.42	0.585	0.592	9.333	0.188	0.0662	0.0012	9.388	0.190	0.0614	0.0022	9.389	0.194	652.5	12.6	654.4	76.5	0.3	652.5	12.8
8184-40.1	3	136	80	0.61	0.999	1.107	9.446	0.208	0.0701	0.0017	9.542	0.213	0.0619	0.0033	9.552	0.216	642.5	13.7	672.2	112.7	4.4	641.8	13.8
8184-41.1	3	155	98	0.65	1.375	1.051	9.413	0.200	0.0698	0.0015	9.543	0.209	0.0586	0.0047	9.513	0.208	642.4	13.4	550.5	173.9	-16.7	644.3	13.4
8184-42.1	3	190	142	0.77	0.356	0.448	9.246	0.190	0.0652	0.0013	9.279	0.193	0.0623	0.0027	9.288	0.196	659.8	13.0	685.1	94.1	3.7	659.2	13.2
8184-43.1*	3	320	330	1.07	0.439	0.571	9.779	0.192	0.0652	0.0010	9.823	0.193	0.0617	0.0016	9.836	0.197	625.0	11.7	662.0	56.1	5.6	624.2	11.9
8184-43.2*	5	272	217	0.82	0.236	0.159	9.798	0.143	0.0619	0.0005	9.821	0.143	0.0600	0.0008	9.814	0.146	625.1	8.7	602.9	27.6	-3.7	625.6	8.9
8184-43.X																						625.1	7.1
8184-44.1	3	167	83	0.51	1.043	0.692	9.179	0.243	0.0673	0.0014	9.275	0.247	0.0588	0.0032	9.243	0.250	660.1	16.7	560.7	120.2	-17.7	662.2	17.0
8184-45.1	3	456	204	0.46	0.150	0.425	9.137	0.173	0.0653	0.0008	9.151	0.173	0.0640	0.0011	9.176	0.178	668.6	12.0	743.0	35.6	10.0	666.8	12.3
8184-46.1	3	223	261	1.21	1.596	0.686	9.540	0.193	0.0666	0.0012	9.691	0.201	0.0537	0.0042	9.605	0.199	633.1	12.5	360.0	176.6	-75.9	638.4	12.6
8184-47.1	3	207	114	0.57	1.033	0.880	9.318	0.195	0.0686	0.0014	9.415	0.200	0.0601	0.0034	9.401	0.202	650.7	13.2	608.1	122.0	-7.0	651.7	13.3
8184-48.1	3	181	67	0.38	1.845	0.997	9.352	0.196	0.0694	0.0018	9.524	0.205	0.0545	0.0045	9.446	0.204	643.6	13.2	393.5	186.3	-63.6	648.7	13.3
8184-49.1	3	217	133	0.64	0.657	0.506	8.951	0.181	0.0663	0.0012	9.010	0.183	0.0609	0.0024	8.997	0.186	678.5	13.1	636.8	84.5	-6.6	679.5	13.3
8184-50.1	3	195	107	0.56	0.620	0.552	9.283	0.192	0.0660	0.0013	9.340	0.196	0.0609	0.0031	9.334	0.198	655.7	13.1	636.7	108.6	-3.0	656.1	13.2

8184-51.1	3	218	78	0.37	0.367	0.734	9.244	0.186	0.0675	0.0014	9.279	0.188	0.0645	0.0022	9.313	0.193	659.8	12.7	758.5	72.7	13.0	657.5	12.9
8184-52.1	3	107	52	0.50	0.873	0.923	9.180	0.209	0.0692	0.0019	9.261	0.213	0.0620	0.0037	9.265	0.216	661.0	14.5	674.8	128.4	2.0	660.7	14.7
8184-53.1	3	225	115	0.53	0.656	0.461	9.280	0.187	0.0653	0.0012	9.340	0.190	0.0599	0.0023	9.322	0.193	655.7	12.7	600.8	82.0	-9.1	656.9	12.9
8184-54.1	3	191	115	0.62	0.602	0.538	9.220	0.189	0.0660	0.0013	9.276	0.191	0.0611	0.0016	9.270	0.195	660.0	12.9	642.3	55.8	-2.8	660.4	13.2
8184-55.1	3	249	147	0.61	0.978	0.189	9.029	0.181	0.0636	0.0012	9.116	0.185	0.0557	0.0027	9.046	0.186	671.0	12.9	439.9	109.8	-52.5	675.9	13.2
8184-56.1	3	260	118	0.47	0.277	0.566	9.522	0.191	0.0657	0.0011	9.549	0.192	0.0634	0.0018	9.577	0.196	642.0	12.3	721.2	61.6	11.0	640.3	12.5
8184-57.1	3	283	139	0.51	0.119	0.621	9.123	0.181	0.0669	0.0011	9.134	0.182	0.0659	0.0017	9.180	0.187	669.7	12.7	802.8	54.8	16.6	666.6	12.9
8184-58.1	3	97	63	0.67	2.753	2.498	9.291	0.221	0.0816	0.0023	9.552	0.246	0.0591	0.0085	9.529	0.233	641.8	15.7	571.6	313.2	-12.3	643.3	15.0
8184-59.1	3	70	41	0.61	1.381	2.171	9.177	0.231	0.0792	0.0026	9.309	0.261	0.0677	0.0104	9.381	0.243	657.8	17.5	859.9	317.9	23.5	653.0	16.1
8184-60.1†	3	101	47	0.48	0.939	3.449	10.336	0.272	0.0874	0.0031	10.441	0.287	0.0794	0.0070	10.706	0.291	589.6	15.5	1183.0	174.0	50.2	575.7	14.9
8184-60.2^	3	175	109	0.65	1.581	1.036	10.014	0.212	0.0686	0.0015	10.172	0.221	0.0558	0.0043	10.118	0.219	604.5	12.5	443.6	170.9	-36.3	607.6	12.5
8184-61.1	3	275	139	0.52	0.488	0.350	9.083	0.180	0.0648	0.0012	9.127	0.182	0.0608	0.0024	9.115	0.185	670.2	12.7	631.9	83.3	-6.1	671.1	12.9
8184-62.1	3	109	48	0.45	0.519	0.861	9.411	0.251	0.0682	0.0018	9.460	0.253	0.0640	0.0021	9.492	0.260	647.8	16.5	740.5	70.1	12.5	645.7	16.8
8184-63.1	3	463	196	0.44	0.401	0.142	9.066	0.172	0.0632	0.0008	9.102	0.173	0.0599	0.0014	9.079	0.176	672.0	12.1	599.1	49.6	-12.2	673.6	12.4
8184-64.1	3	259	135	0.54	0.198	0.444	9.130	0.221	0.0654	0.0011	9.148	0.222	0.0638	0.0015	9.171	0.228	668.8	15.4	735.3	50.9	9.1	667.2	15.7
8184-65.1	3	281	122	0.45	1.026	0.030	8.901	0.176	0.0626	0.0010	8.991	0.180	0.0543	0.0028	8.904	0.181	679.9	12.9	384.5	114.5	-76.8	686.2	13.2
8184-66.1†	3	72	37	0.54	0.258	2.157	9.892	0.272	0.0778	0.0027	9.919	0.282	0.0756	0.0062	10.110	0.286	619.2	16.8	1084.1	164.9	42.9	608.0	16.4

SAMPLE 2 (R008185)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
spot	session	U ppm	Th ppm	Th/U	f204%	f207%	0-238U/ 206Pb	±0-U/Pb	0-207Pb/ 206Pb	±0-7/6	4-238U/ 206Pb*	±4-U/Pb*	4-207Pb*/ 206Pb*	±4-7*/6*	7-238U/ 206Pb*	±7-U/Pb*	4-U/Pb* age	±4-U/Pb* age	4-7*/6* age	±4-7*/6* age	4-Disc, %	7-U/Pb* age	±7-U/Pb* age
8185-1.1*	2	124	57	0.47	0.391	0.295	9.777	0.130	0.0630	0.0011	9.816	0.131	0.0598	0.0015	9.806	0.134	625.4	8.0	597.6	54.6	-4.7	626.0	8.1
8185-1.2*	5	146	71	0.50	0.005	0.158	9.720	0.141	0.0620	0.0006	9.721	0.141	0.0620	0.0008	9.736	0.144	631.2	8.7	674.2	26.0	6.4	630.3	8.9
8185-1.X																						628.0	6.0
8185-2.1	2	110	81	0.76	0.180	0.352	9.496	0.129	0.0640	0.0011	9.513	0.132	0.0625	0.0024	9.529	0.133	644.4	8.5	692.0	82.8	6.9	643.3	8.6
8185-3.1	2	175	102	0.60	0.125	0.277	9.587	0.116	0.0632	0.0009	9.599	0.117	0.0622	0.0013	9.614	0.120	638.9	7.4	681.3	45.5	6.2	637.9	7.6
8185-4.1^	2	720	281	0.40	0.069	0.143	9.633	0.097	0.0621	0.0004	9.640	0.097	0.0615	0.0006	9.647	0.099	636.3	6.1	657.1	19.8	3.2	635.8	6.2
8185-4.2	5	712	272	0.40	0.177	-0.015	9.311	0.137	0.0614	0.0003	9.314	0.137	0.0612	0.0003	9.310	0.140	657.5	9.2	645.4	11.1	-1.9	657.7	9.4
8185-5.1^	2	184	101	0.57	0.874	0.865	9.730	0.125	0.0677	0.0013	9.816	0.130	0.0605	0.0027	9.815	0.130	625.4	7.9	622.9	97.8	-0.4	625.4	7.9
8185-5.2	5	194	115	0.61	0.248	0.405	9.376	0.134	0.0646	0.0006	9.393	0.135	0.0632	0.0010	9.414	0.138	652.2	8.9	714.9	34.1	8.8	650.8	9.1
8185-6.1	2	87	35	0.42	0.169	0.543	9.502	0.139	0.0655	0.0021	9.518	0.141	0.0641	0.0027	9.554	0.145	644.0	9.1	746.3	89.1	13.7	641.7	9.3
8185-7.1	2	172	123	0.74	0.838	0.311	9.916	0.144	0.0629	0.0011	10.000	0.147	0.0560	0.0022	9.947	0.148	614.4	8.6	454.0	86.8	-35.3	617.5	8.8
8185-8.1	2	80	48	0.62	1.071	0.319	9.628	0.155	0.0635	0.0014	9.732	0.161	0.0547	0.0032	9.659	0.160	630.5	9.9	398.5	130.4	-58.2	635.1	10.0
8185-9.1*	2	140	78	0.58	0.636	0.568	9.753	0.123	0.0653	0.0010	9.815	0.127	0.0601	0.0025	9.808	0.127	625.5	7.7	605.8	91.6	-3.2	625.9	7.7
8185-9.2*	5	192	100	0.54	0.093	0.314	9.733	0.245	0.0633	0.0006	9.757	0.246	0.0612	0.0010	9.763	0.251	629.0	15.1	647.5	35.1	2.9	628.6	15.4
8185-9.X																						626.4	6.9
8185-10.1	2	327	154	0.49	0.196	0.088	9.283	0.101	0.0623	0.0008	9.301	0.102	0.0607	0.0011	9.291	0.104	658.3	6.9	627.8	37.9	-4.9	659.0	7.0
8185-11.1	2	186	105	0.58	0.194	0.660	3.408	0.039	0.1071	0.0007	3.415	0.039	0.1054	0.0011	3.431	0.043	1655.8	16.6	1721.2	19.3	3.8	1649.0	18.2
8185-12.1	2	212	119	0.58	0.001	0.269	9.181	0.168	0.0639	0.0008	9.181	0.168	0.0639	0.0009	9.206	0.173	666.5	11.6	739.3	28.7	9.9	664.8	11.8
8185-13.1	2	72	39	0.56	1.000	1.847	9.781	0.153	0.0755	0.0017	9.880	0.158	0.0674	0.0033	9.965	0.160	621.5	9.5	848.7	102.6	26.8	616.5	9.5
8185-14.1	2	262	89	0.35	0.048	0.025	3.914	0.047	0.0922	0.0006	3.916	0.047	0.0918	0.0006	3.915	0.051	1466.2	15.9	1462.5	13.4	-0.3	1466.5	17.2
8185-15.1	2	369	191	0.53	0.188	-0.007	9.475	0.155	0.0612	0.0006	9.493	0.156	0.0596	0.0007	9.474	0.159	645.7	10.1	589.7	25.6	-9.5	646.9	10.3
8185-16.1	2	99	60	0.63	0.491	0.459	9.353	0.133	0.0651	0.0018	9.399	0.136	0.0611	0.0027	9.396	0.138	651.8	9.0	642.8	95.7	-1.4	652.0	9.1
8185-17.1	2	55	26	0.49	1.055	0.842	9.326	0.162	0.0682	0.0017	9.425	0.168	0.0596	0.0040	9.405	0.168	650.1	11.1	588.3	146.4	-10.5	651.4	11.1
8185-18.1	2	341	223	0.67	0.120	0.122	9.322	0.102	0.0625	0.0007	9.334	0.102	0.0615	0.0007	9.334	0.105	656.1	6.8	656.6	25.3	0.1	656.1	7.0
8185-19.1	2	887	348	0.41	0.320	0.434	9.205	0.092	0.0652	0.0004	9.234	0.092	0.0626	0.0007	9.245	0.094	662.8	6.3	694.4	24.0	4.5	662.1	6.4
8185-20.1	2	174	151	0.90	0.134	0.245	9.366	0.143	0.0634	0.0010	9.378	0.143	0.0623	0.0014	9.389	0.146	653.1	9.5	683.9	47.2	4.5	652.5	9.7
8185-21.1	2	387	224	0.60	0.159	0.097	9.431	0.102	0.0621	0.0006	9.446	0.102	0.0608	0.0011	9.440	0.104	648.7	6.7	631.3	38.6	-2.7	649.1	6.8
8185-22.1	2	202	96	0.49	-0.054	0.038	9.295	0.112	0.0619	0.0009	9.290	0.112	0.0623	0.0009	9.299	0.115	659.0	7.5	684.4	29.6	3.7	658.5	7.7
8185-23.1	2	79	42	0.55	0.483	0.111	3.340	0.051	0.1044	0.0012	3.356	0.052	0.1002	0.0022	3.344	0.057	1681.2	23.0	1627.8	40.6	-3.3	1686.7	25.4
8185-24.1*	2	208	154	0.77	0.470	0.351	9.618	0.167	0.0638	0.0009	9.663	0.169	0.0599	0.0019	9.652	0.171	634.8	10.6	600.5	68.7	-5.7	635.5	10.7
8185-24.2*	5	270	255	0.98	0.028	0.044	9.649	0.136	0.0613	0.0005	9.658	0.136	0.0605	0.0008	9.653	0.139	635.1	8.5	621.1	27.0	-2.3	635.4	8.7
8185-24.X																						635.5	6.8
8185-25.1	2	147	142	1.00	0.161	0.189	5.265	0.064	0.0785	0.0009	5.274	0.065	0.0772	0.0013	5.275	0.068	1119.3	12.6	1125.3	34.3	0.5	1119.0	13.2

SAMPLE 3 (R008186)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
spot	session	U ppm	Th ppm	Th/U	f204%	f207%	0-238U/ 206Pb	±0-U/Pb	0-207Pb/ 206Pb	±0-7/6	4-238U/ 206Pb*	±4-U/Pb*	4-207Pb*/ 206Pb*	±4-7*/6*	7-238U/ 206Pb*	±7-U/Pb*	4-U/Pb* age	±4-U/Pb* age	4-7*/6* age	±4-7*/6* age	4-Disc, %	7-U/Pb* age	±7-U/Pb* age
8186-1.1	2	244	153	0.65	0.222	0.220	9.457	0.109	0.0630	0.0008	9.478	0.110	0.0612	0.0013	9.478	0.112	646.6	7.1	646.3	47.1	-0.1	646.6	7.3
8186-2.1	2	600	435	0.75	0.065	0.180	9.332	0.095	0.0629	0.0005	9.338	0.096	0.0624	0.0007	9.349	0.098	655.8	6.4	687.9	22.6	4.7	655.1	6.5
8186-3.1*	2	151	98	0.67	0.415	0.544	9.637	0.122	0.0653	0.0010	9.677	0.123	0.0619	0.0013	9.689	0.126	634.0	7.6	670.3	44.1	5.4	633.2	7.8
8186-3.2*	5	168	102	0.63	-0.045	0.059	9.624	0.139	0.0614	0.0006	9.620	0.139	0.0618	0.0007	9.630	0.142	637.5	8.8	666.8	25.1	4.4	636.9	9.0
8186.3.X																						634.8	5.9
8186-4.1	2	609	202	0.34	0.061	0.140	9.317	0.113	0.0626	0.0005	9.323	0.113	0.0621	0.0007	9.330	0.116	656.9	7.6	679.0	22.8	3.3	656.4	7.8
8186-5.1	2	498	272	0.56	0.645	0.264	9.313	0.099	0.0636	0.0005	9.326	0.100	0.0625	0.0008	9.337	0.102	656.6	6.7	690.1	27.9	4.9	655.9	6.8

8186-6.1^	2	524	238	0.47	0.143	1.049	10.099	0.105	0.0685	0.0006	10.165	0.107	0.0633	0.0013	10.206	0.109	604.9	6.1	718.2	43.4	15.8	602.6	6.1
8186-7.1	2	69	31	0.46	0.672	0.541	9.183	0.145	0.0661	0.0015	9.245	0.147	0.0606	0.0022	9.233	0.150	662.1	10.0	625.0	78.6	-5.9	662.9	10.3
8186-8.1	2	87	51	0.60	0.313	0.444	9.171	0.132	0.0654	0.0013	9.200	0.134	0.0628	0.0023	9.212	0.136	665.2	9.2	701.4	78.8	5.2	664.3	9.3
8186-9.1	2	168	95	0.58	0.208	0.195	9.471	0.175	0.0628	0.0009	9.491	0.175	0.0611	0.0011	9.490	0.179	645.8	11.4	642.0	40.3	-0.6	645.9	11.6
8186-10.1*	2	171	103	0.62	0.236	0.458	9.765	0.119	0.0644	0.0009	9.789	0.120	0.0624	0.0013	9.810	0.122	627.1	7.3	689.2	45.7	9.0	625.7	7.4
8186-10.2*	5	188	116	0.64	-0.074	0.018	9.832	0.146	0.0607	0.0005	9.825	0.146	0.0613	0.0007	9.834	0.149	624.9	8.9	651.0	24.1	4.0	624.3	9.0
8186-10.X																						625.2	5.7
8186-11.1	2	311	164	0.54	0.036	0.133	9.477	0.105	0.0623	0.0007	9.480	0.106	0.0620	0.0009	9.489	0.108	646.5	6.9	673.6	31.3	4.0	645.9	7.0
8186-12.1^	2	341	211	0.64	0.132	0.266	9.657	0.106	0.0630	0.0007	9.669	0.106	0.0619	0.0007	9.682	0.109	634.4	6.6	672.1	25.2	5.6	633.6	6.8
8186-12.2	5	303	177	0.60	0.084	-0.048	9.168	0.128	0.0614	0.0004	9.176	0.128	0.0607	0.0005	9.164	0.131	666.8	8.9	629.7	17.3	-5.9	667.7	9.1
8186-13.1	2	146	106	0.75	1.105	0.630	9.431	0.120	0.0663	0.0010	9.536	0.125	0.0572	0.0029	9.490	0.124	642.9	8.0	501.1	112.6	-28.3	645.8	8.0
8186-14.1	2	216	146	0.70	0.103	0.146	4.018	0.045	0.0915	0.0008	4.022	0.045	0.0906	0.0009	4.024	0.048	1431.4	14.3	1438.7	18.5	0.5	1430.8	15.4
8186-15.1	2	590	248	0.43	0.103	0.603	3.446	0.034	0.1057	0.0004	3.450	0.034	0.1048	0.0005	3.467	0.038	1640.8	14.5	1711.6	7.9	4.1	1633.6	15.9
8186-16.1	2	276	127	0.48	0.460	0.302	9.221	0.127	0.0641	0.0010	9.264	0.129	0.0603	0.0017	9.249	0.131	660.8	8.8	615.9	62.1	-7.3	661.8	8.9
8186-17.1	2	175	116	0.68	-0.023	0.168	9.579	0.118	0.0624	0.0009	9.577	0.118	0.0626	0.0009	9.595	0.121	640.3	7.5	693.3	31.9	7.6	639.1	7.7
8186-18.1	2	186	95	0.53	-0.099	0.230	9.513	0.115	0.0630	0.0009	9.504	0.115	0.0638	0.0012	9.535	0.118	645.0	7.4	734.9	40.7	12.2	642.9	7.6
8186-19.1	2	624	402	0.67	0.195	0.351	9.454	0.097	0.0641	0.0005	9.473	0.097	0.0625	0.0009	9.488	0.099	646.9	6.3	690.5	29.6	6.3	646.0	6.4
8186-20.1	2	123	68	0.57	0.990	0.681	9.655	0.129	0.0663	0.0011	9.752	0.135	0.0582	0.0033	9.721	0.133	629.3	8.3	537.8	125.8	-17.0	631.2	8.2
8186-21.1	2	190	72	0.39	0.026	0.114	3.336	0.038	0.1045	0.0007	3.337	0.038	0.1043	0.0007	3.339	0.042	1689.9	16.9	1702.0	13.2	0.7	1688.6	18.7
8186-22.1**	2	753	160	0.22	0.368	0.541	15.562	0.163	0.0591	0.0006	15.619	0.165	0.0561	0.0012	15.647	0.166	400.0	4.1	455.6	49.1	12.2	399.4	4.1
8186-23.1	2	554	206	0.38	0.098	-0.405	3.025	0.030	0.1095	0.0004	3.027	0.030	0.1086	0.0005	3.012	0.034	1839.9	16.1	1775.9	7.9	-3.6	1847.9	18.3
8186-24.1**	2	219	152	0.72	0.457	0.341	14.996	0.219	0.0578	0.0010	15.065	0.222	0.0541	0.0021	15.048	0.223	414.3	5.9	376.2	85.8	-10.1	414.8	5.9
8186-25.1	2	487	183	0.39	0.083	0.088	9.229	0.097	0.0624	0.0005	9.237	0.097	0.0617	0.0007	9.237	0.099	662.6	6.6	664.1	23.6	0.2	662.6	6.8

SAMPLE 4 (R008187)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
							0-238U/		0-207Pb/		4-238U/		4-207Pb*/		7-238U/		4-U/Pb*	±4-U/Pb*	4-7*/6*	±4-7*/6*		7-U/Pb*	±7-U/Pb*
spot	session	U ppm	Th ppm	Th/U	f204%	f207%	206Pb	±0-U/Pb	206Pb	±0-7/6	206Pb*	±4-U/Pb*	206Pb*	±4-7*/6*	206Pb*	±7-U/Pb*	age	age	age	age	4-Disc, %	age	age
8187-1.1	1	131	63	0.50	-0.380	-0.115	9.782	0.204	0.0597	0.0012	9.745	0.204	0.0629	0.0021	9.770	0.209	629.8	12.6	703.2	70.9	10.4	628.2	12.8
8187-2.1	1	414	233	0.58	0.017	0.261	9.503	0.186	0.0633	0.0007	9.505	0.186	0.0631	0.0007	9.528	0.191	644.9	12.0	712.1	25.0	9.4	643.4	12.3
8187-3.1*	1	166	93	0.58	0.535	0.189	9.790	0.200	0.0622	0.0011	9.843	0.202	0.0578	0.0021	9.809	0.205	623.8	12.2	521.0	81.5	-19.7	625.8	12.4
8187-3.2*	5	188	106	0.58	0.238	0.162	9.471	0.147	0.0625	0.0006	9.479	0.147	0.0618	0.0007	9.487	0.150	646.5	9.5	667.6	25.6	3.2	646.1	9.7
8187-3.X																						638.4	7.7
8187-4.1†	1	173	105	0.63	-0.508	1.003	11.542	0.262	0.0662	0.0019	11.484	0.261	0.0703	0.0019	11.659	0.270	538.2	11.7	936.0	55.1	42.5	530.5	11.8
8187-5.1†	1	172	97	0.58	-0.096	0.568	10.723	0.247	0.0638	0.0014	10.713	0.247	0.0645	0.0014	10.784	0.254	575.3	12.7	759.2	45.5	24.2	571.7	12.9
8187-6.1†	1	146	76	0.54	-0.143	0.128	9.921	0.212	0.0615	0.0015	9.907	0.212	0.0626	0.0017	9.933	0.217	619.9	12.6	695.7	59.2	10.9	618.3	12.9
8187-7.1*	1	149	78	0.54	0.618	0.460	9.915	0.205	0.0641	0.0012	9.976	0.206	0.0591	0.0015	9.961	0.211	615.8	12.1	569.8	56.6	-8.1	616.7	12.4
8187-7.2*	5	165	94	0.59	0.087	0.170	9.737	0.140	0.0621	0.0006	9.753	0.141	0.0608	0.0009	9.753	0.144	629.3	8.7	632.4	30.4	0.5	629.2	8.8
8187-7.X																						625.0	7.2
8187-8.1	1	115	54	0.48	0.329	0.234	9.595	0.203	0.0629	0.0014	9.626	0.205	0.0602	0.0026	9.617	0.208	637.1	12.9	610.0	94.7	-4.4	637.7	13.1
8187-9.1	1	138	77	0.58	1.208	1.214	9.354	0.192	0.0712	0.0019	9.468	0.197	0.0613	0.0036	9.469	0.200	647.2	12.8	648.9	126.1	0.2	647.2	13.0
8187-10.1†	1	155	92	0.61	1.563	0.455	8.261	0.171	0.0675	0.0012	8.392	0.177	0.0545	0.0037	8.299	0.177	725.7	14.5	391.7	153.1	-85.3	733.5	14.7
8187-11.1	1	153	99	0.67	0.435	0.309	9.380	0.192	0.0639	0.0011	9.421	0.194	0.0603	0.0021	9.409	0.197	650.3	12.7	614.5	74.7	-5.8	651.1	13.0
8187-12.1	1	451	251	0.58	0.059	0.114	9.559	0.186	0.0620	0.0007	9.565	0.187	0.0615	0.0010	9.570	0.191	641.0	11.9	656.5	34.8	2.4	640.7	12.2
8187-13.1^	1	160	91	0.59	-0.049	0.148	9.908	0.203	0.0616	0.0011	9.903	0.202	0.0620	0.0011	9.923	0.207	620.1	12.1	675.5	38.8	8.2	619.0	12.3
8187-13.2	5	163	88	0.56	0.685	0.273	9.411	0.148	0.0635	0.0006	9.433	0.149	0.0616	0.0009	9.437	0.152	649.5	9.7	658.9	31.0	1.4	649.3	9.9
8187-14.1	1	126	70	0.57	0.624	-0.108	9.504	0.199	0.0603	0.0013	9.563	0.201	0.0551	0.0021	9.493	0.203	641.1	12.8	418.2	84.8	-53.3	645.6	13.2
8187-15.1	1	351	111	0.33	0.063	0.205	9.738	0.191	0.0624	0.0007	9.744	0.191	0.0619	0.0008	9.758	0.196	629.8	11.8	669.8	27.4	6.0	628.9	12.0
8187-16.1	1	133	67	0.52	0.435	-0.079	9.318	0.192	0.0609	0.0011	9.358	0.193	0.0573	0.0013	9.310	0.196	654.5	12.8	503.0	50.8	-30.1	657.7	13.2
8187-17.1	1	122	65	0.55	0.029	-0.093	9.622	0.201	0.0602	0.0013	9.625	0.201	0.0600	0.0018	9.614	0.205	637.2	12.7	602.3	65.4	-5.8	637.9	13.0
8187-18.1^	4	147	74	0.52	0.352	0.679	11.137	0.181	0.0641	0.0014	11.176	0.183	0.0612	0.0021	11.213	0.180	552.4	8.6	647.4	75.3	14.7	550.7	8.8
8187-18.2*	4	155	79	0.53	0.413	0.147	9.869	0.159	0.0617	0.0013	9.910	0.160	0.0583	0.0017	9.883	0.158	619.7	9.6	541.4	62.4	-14.5	621.3	9.8
8187-18.3*	5	166	86	0.53	-0.085	-0.123	9.555	0.166	0.0601	0.0006	9.541	0.166	0.0612	0.0007	9.543	0.170	642.5	10.7	647.9	25.6	0.8	642.4	10.9
8187-18.X																						630.8	7.3
8187-19.1*	4	180	94	0.54	0.505	0.264	9.812	0.144	0.0627	0.0010	9.862	0.146	0.0586	0.0019	9.838	0.142	622.6	8.8	552.0	69.3	-12.8	624.0	9.0
8187-19.2*	5	253	186	0.76	0.299	0.060	9.551	0.143	0.0616	0.0005	9.556	0.143	0.0611	0.0005	9.557	0.146	641.6	9.2	643.0	18.8	0.2	641.5	9.4
8187-19.X																						632.4	6.5
8187-20.1	4	260	182	0.72	0.013	0.153	9.627	0.133	0.0622	0.0008	9.628	0.133	0.0621	0.0009	9.641	0.131	637.0	8.4	676.1	30.4	5.8	636.2	8.6
8187-21.1*	4	220	145	0.68	0.429	0.312	9.862	0.141	0.0630	0.0011	9.904	0.142	0.0595	0.0017	9.892	0.138	620.1	8.5	586.2	60.2	-5.8	620.8	8.7
8187-21.2*	5	168	98	0.61	0.055	-0.052	9.730	0.140	0.0603	0.0006	9.727	0.140	0.0606	0.0006	9.725	0.143	630.9	8.6	626.8	22.5	-0.6	631.0	8.8
8187-21.X																						625.8	6.2
8187-22.1	4	176	103	0.60	0.458	0.312	9.677	0.142	0.0633	0.0010	9.722	0.144	0.0596	0.0022	9.707	0.140	631.2	8.9	588.8	81.1	-7.2	632.1	9.0
8187-23.1*	4	173	99	0.59	0.106	0.155	9.741	0.144	0.0620	0.0010	9.751	0.145	0.0611	0.0017	9.756	0.142	629.3	8.9	643.1	59.2	2.1	629.1	9.1
8187-23.2*	5	176	103	0.61	-0.037	0.052	9.589	0.137	0.0614	0.0006	9.587	0.137	0.0616	0.0006	9.594	0.140	639.6	8.7	660.1	19.9	3.1	639.1	8.9
8187-23.X																						634.2	6.4
8187-24.1	4	129	82	0.66	0.892	1.417	9.690	0.150	0.0722	0.0013	9.778	0.156	0.0649	0.0036	9.830	0.150	627.7	9.6	771.7	115.2	18.7	624.6	9.4
8187-25.1*	4	175	97	0.57	0.787	0.424	9.767	0.144	0.0641	0.0010	9.844	0.147	0.0576	0.0023	9.809	0.142	623.7	8.9	515.7	86.3	-20.9	625.9	9.0

8187-25.2*	5	175	96	0.57	-0.059	0.100	9.667	0.139	0.0617	0.0006	9.661	0.139	0.0621	0.0006	9.676	0.142	635.0	8.7	679.1	21.5	6.5	634.0	8.9
8187-25.X																						630.0	6.3
8187-26.1	4	259	182	0.73	-0.077	0.147	9.570	0.132	0.0622	0.0008	9.562	0.133	0.0629	0.0011	9.584	0.130	641.2	8.5	703.4	37.0	8.8	639.8	8.6
8187-27.1	4	187	110	0.61	0.172	0.018	9.548	0.258	0.0612	0.0009	9.565	0.259	0.0598	0.0018	9.550	0.261	641.0	16.5	596.7	63.8	-7.4	642.0	16.9
8187-28.1^	4	166	87	0.54	0.252	0.356	9.911	0.147	0.0633	0.0011	9.936	0.148	0.0612	0.0017	9.946	0.145	618.2	8.8	647.7	60.5	4.6	617.6	9.0
8187-28.2	5	745	506	0.70	0.240	0.053	9.589	0.138	0.0614	0.0003	9.599	0.138	0.0606	0.0004	9.594	0.141	638.9	8.8	625.0	13.2	-2.2	639.1	8.9
8187-29.1	4	176	103	0.61	-0.157	0.227	9.998	0.147	0.0621	0.0013	9.982	0.147	0.0634	0.0015	10.021	0.145	615.5	8.7	721.7	48.9	14.7	613.2	8.8
8187-30.1	4	207	100	0.50	0.247	0.342	9.288	0.155	0.0643	0.0010	9.311	0.156	0.0623	0.0017	9.321	0.154	657.6	10.5	684.0	57.9	3.9	657.0	10.7
8187-31.1	4	76	32	0.44	0.654	-0.024	9.567	0.168	0.0609	0.0015	9.629	0.170	0.0555	0.0022	9.564	0.167	636.9	10.7	431.1	89.1	-47.8	641.1	11.0
8187-32.1*	4	179	107	0.61	0.216	0.238	9.867	0.144	0.0624	0.0010	9.888	0.145	0.0607	0.0013	9.890	0.142	621.0	8.7	627.5	46.5	1.0	620.9	8.9
8187-32.2*	5	159	79	0.51	-0.021	0.095	9.611	0.139	0.0617	0.0006	9.629	0.140	0.0602	0.0012	9.620	0.143	637.0	8.8	610.1	43.2	-4.4	637.5	9.0
8187-32.X																						629.1	6.3
8187-33.1	4	118	56	0.49	-0.515	0.387	9.736	0.152	0.0639	0.0012	9.686	0.153	0.0680	0.0024	9.773	0.151	633.4	9.6	869.4	74.2	27.2	628.0	9.6
8187-34.1	4	166	96	0.60	-0.105	-0.017	9.496	0.139	0.0610	0.0010	9.486	0.139	0.0619	0.0010	9.494	0.137	646.1	9.0	670.7	34.7	3.7	645.6	9.2
8187-35.1	4	144	70	0.50	0.507	0.021	9.632	0.145	0.0611	0.0011	9.681	0.146	0.0569	0.0013	9.634	0.143	633.7	9.1	488.5	51.9	-29.7	636.7	9.3
8187-36.1*	4	173	92	0.55	0.237	0.062	9.874	0.147	0.0610	0.0011	9.897	0.147	0.0591	0.0011	9.880	0.145	620.5	8.8	569.4	42.3	-9.0	621.5	9.0
8187-36.2*	5	143	76	0.55	-0.142	0.042	9.676	0.140	0.0612	0.0006	9.668	0.140	0.0619	0.0008	9.681	0.143	634.5	8.8	670.0	26.0	5.3	633.7	8.9
8187-36.X																						627.7	6.4
8187-37.1	4	168	96	0.59	-0.112	0.068	9.373	0.208	0.0620	0.0014	9.363	0.208	0.0629	0.0014	9.380	0.210	654.2	13.8	703.7	48.4	7.0	653.1	14.1
8187-38.1	4	167	89	0.55	0.097	-0.152	9.304	0.146	0.0603	0.0011	9.313	0.147	0.0595	0.0016	9.289	0.144	657.5	9.8	586.4	58.7	-12.1	659.1	10.1
8187-39.1	4	169	100	0.61	0.953	-0.083	9.218	0.162	0.0610	0.0010	9.306	0.167	0.0531	0.0029	9.210	0.162	658.0	11.2	334.9	125.7	-96.5	664.5	11.4
8187-40.1^	4	190	106	0.58	0.489	0.449	9.734	0.142	0.0644	0.0010	9.782	0.145	0.0603	0.0025	9.778	0.140	627.5	8.9	615.9	89.1	-1.9	627.7	8.9
8187-40.2	5	167	84	0.52	0.814	0.221	9.259	0.147	0.0634	0.0006	9.287	0.147	0.0609	0.0011	9.280	0.151	659.3	10.0	637.1	38.9	-3.5	659.8	10.2
8187-41.1	4	131	62	0.49	0.495	0.107	9.484	0.148	0.0621	0.0012	9.531	0.150	0.0580	0.0022	9.494	0.146	643.2	9.6	529.3	82.8	-21.5	645.6	9.8
8187-42.1	4	200	119	0.61	0.216	0.212	9.711	0.140	0.0625	0.0010	9.732	0.142	0.0607	0.0017	9.731	0.138	630.5	8.7	629.3	60.8	-0.2	630.5	8.9
8187-43.1	4	174	96	0.57	0.106	0.285	9.540	0.140	0.0634	0.0012	9.550	0.141	0.0625	0.0016	9.567	0.139	642.0	9.0	691.7	53.1	7.2	640.9	9.2
8187-44.1*	4	160	82	0.53	0.126	0.212	9.666	0.145	0.0626	0.0011	9.678	0.147	0.0615	0.0022	9.686	0.143	633.9	9.1	658.1	75.9	3.7	633.4	9.3
8187-44.2*	5	187	105	0.58	0.159	0.053	9.408	0.137	0.0618	0.0006	9.431	0.138	0.0598	0.0009	9.414	0.141	649.7	9.0	596.8	33.2	-8.9	650.8	9.2
8187-44.X																						642.1	6.5
8187-45.1*	4	1074	900	0.87	0.082	0.164	9.687	0.120	0.0621	0.0004	9.695	0.120	0.0615	0.0005	9.702	0.116	632.8	7.5	655.8	16.7	3.5	632.4	7.6
8187-45.2*	5	179	110	0.64	0.101	0.745	9.736	0.152	0.0667	0.0006	9.803	0.154	0.0611	0.0013	9.809	0.157	626.2	9.4	643.3	45.7	2.7	625.8	9.5
8187-45.X																						629.8	6.0
8187-46.1*	4	170	95	0.57	0.555	0.442	9.632	0.149	0.0645	0.0011	9.686	0.150	0.0599	0.0016	9.675	0.148	633.4	9.4	600.8	58.8	-5.4	634.1	9.6
8187-46.2*	5	170	97	0.59	0.110	1.013	9.373	0.135	0.0695	0.0008	9.450	0.137	0.0629	0.0015	9.469	0.140	648.4	8.9	703.7	52.1	7.8	647.2	9.1
8187-46.X																						641.0	6.6
8187-47.1	4	197	118	0.62	0.453	0.027	9.563	0.138	0.0613	0.0010	9.607	0.139	0.0575	0.0015	9.566	0.136	638.4	8.8	512.5	55.7	-24.6	641.0	9.0
8187-48.1	4	173	101	0.60	0.710	0.214	9.586	0.148	0.0627	0.0010	9.655	0.151	0.0569	0.0023	9.607	0.146	635.3	9.5	486.9	87.5	-30.5	638.3	9.6
8187-49.1	4	178	104	0.60	0.154	0.253	9.703	0.142	0.0628	0.0010	9.718	0.143	0.0616	0.0016	9.728	0.140	631.4	8.9	659.5	55.3	4.3	630.8	9.0
8187-5.2	3	188	127	0.70	1.555	0.661	9.279	0.207	0.0669	0.0013	9.425	0.214	0.0543	0.0036	9.342	0.213	650.0	14.0	385.1	149.9	-68.8	655.5	14.2
8187-50.1	4	179	102	0.59	0.401	0.431	9.632	0.142	0.0644	0.0010	9.671	0.145	0.0611	0.0027	9.674	0.140	634.3	9.1	642.9	96.6	1.3	634.1	9.1
8187-51.1	4	168	96	0.59	-0.030	0.334	9.551	0.142	0.0638	0.0011	9.548	0.142	0.0640	0.0011	9.583	0.141	642.1	9.1	741.6	35.7	13.4	639.9	9.3
8187-52.1^	4	155	86	0.57	0.231	0.496	9.949	0.198	0.0644	0.0011	9.972	0.199	0.0625	0.0017	9.998	0.199	616.1	11.7	690.5	56.6	10.8	614.5	11.9
8187-52.2	5	144	71	0.51	0.469	0.774	9.493	0.146	0.0674	0.0007	9.595	0.149	0.0586	0.0018	9.567	0.151	639.1	9.4	552.7	65.5	-15.6	640.9	9.6
8187-53.1	4	177	101	0.59	-0.166	0.483	9.566	0.141	0.0649	0.0011	9.550	0.141	0.0663	0.0011	9.612	0.140	642.0	9.0	815.1	33.9	21.2	638.0	9.2
8187-54.1	4	135	81	0.62	0.372	0.441	9.579	0.148	0.0646	0.0012	9.615	0.151	0.0615	0.0025	9.622	0.147	637.8	9.5	657.2	86.3	3.0	637.4	9.6
8187-55.1	4	141	77	0.57	0.164	0.380	9.447	0.154	0.0643	0.0012	9.463	0.158	0.0630	0.0030	9.483	0.154	647.6	10.3	707.5	100.9	8.5	646.3	10.3
8187-56.1	4	152	74	0.50	0.541	0.171	9.550	0.175	0.0624	0.0011	9.602	0.177	0.0580	0.0020	9.566	0.175	638.7	11.2	529.8	76.7	-20.5	640.9	11.5
8187-57.1	4	184	108	0.61	0.893	0.498	9.630	0.141	0.0649	0.0010	9.716	0.146	0.0576	0.0032	9.678	0.139	631.5	9.1	514.3	122.2	-22.8	633.9	9.0
8187-58.1*	4	159	81	0.53	0.751	0.324	9.669	0.145	0.0635	0.0012	9.742	0.150	0.0573	0.0031	9.700	0.143	629.9	9.2	502.8	119.8	-25.3	632.5	9.3
8187-58.2*	5	190	113	0.61	1.068	0.165	9.460	0.135	0.0626	0.0006	9.486	0.136	0.0603	0.0010	9.476	0.139	646.1	8.8	616.1	35.9	-4.9	646.8	9.0
8187-58.X																						639.8	6.5
8187-59.1	4	163	89	0.57	0.840	0.195	9.437	0.147	0.0629	0.0011	9.517	0.152	0.0559	0.0029	9.455	0.146	644.1	9.8	449.3	114.4	-43.4	648.1	9.9
8187-6.2	5	170	96	0.58	0.189	0.178	9.737	0.139	0.0622	0.0006	9.747	0.140	0.0613	0.0007	9.754	0.143	629.6	8.6	648.9	25.4	3.0	629.2	8.8
8187-60.1*	4	122	56	0.47	0.908	0.392	9.643	0.152	0.0641	0.0013	9.731	0.156	0.0566	0.0027	9.681	0.152	630.6	9.7	475.1	105.9	-32.7	633.7	9.8
8187-60.2*	5	178	110	0.64	0.271	0.189	9.581	0.144	0.0625	0.0006	9.626	0.146	0.0587	0.0013	9.599	0.148	637.1	9.2	555.3	47.8	-14.7	638.8	9.4
8187-60.X																						636.4	6.8
8187-61.1	4	153	81	0.55	0.607	0.515	9.623	0.145	0.0651	0.0011	9.682	0.148	0.0601	0.0022	9.673	0.144	633.7	9.2	607.1	80.1	-4.4	634.2	9.4
8187-62.1	4	159	78	0.51	0.505	0.110	9.348	0.162	0.0623	0.0010	9.395	0.164	0.0582	0.0024	9.358	0.161	652.0	10.9	536.3	90.4	-21.6	654.5	11.0
8187-63.1	4	168	91	0.56	0.623	0.392	9.476	0.141	0.0644	0.0011	9.535	0.146	0.0592	0.0032	9.513	0.139	642.9	9.4	576.0	117.7	-11.6	644.3	9.3
8187-64.1	4	163	88	0.56	0.338	0.157	9.308	0.140	0.0628	0.0012	9.339	0.141	0.0600	0.0016	9.322	0.138	655.7	9.4	604.3	58.3	-8.5	656.9	9.6
8187-65.1	4	164	94	0.60	0.044	0.430	9.584	0.144	0.0645	0.0011	9.588	0.144	0.0641	0.0014	9.625	0.142	639.6	9.1	745.3	46.9	14.2	637.2	9.3
8187-66.1	4	169	94	0.58	0.538	0.468	9.419	0.141	0.0651	0.0011	9.470	0.145	0.0607	0.0029	9.463	0.139	647.2	9.4	627.1	102.4	-3.2	647.6	9.4
8187-67.1	4	137	65	0.49	0.118	0.386	9.670	0.150	0.0640	0.0016	9.681	0.150	0.0630	0.0020	9.707	0.149	633.7	9.4	708.1	67.6	10.5	632.1	9.6
8187-68.1	4	182	105	0.60	0.431	0.266	9.514	0.139	0.0633	0.0010	9.555	0.140	0.0597	0.0011	9.539	0.137	641.6	8.9	594.3	40.3	-8.0	642.7	9.2
8187-69.1	4	217	118	0.56	0.750	0.213	9.050	0.128	0.0638	0.0009	9.118	0.132	0.0576	0.0024	9.070	0.126	670.8	9.2	513.2	92.9	-30.7	674.3	9.3

Notes:
All uncertainties are 1 sigma. Pb* = radiogenic Pb.
Column 1: spot: the first number after dash indicates the crystal analysed; the second digit after the decimal indicates the number of the analysis within that grain. Where the second number is replaced with an 'X', this is an average of the two preceding analyses; * = ages for these analyses are excluded from averages in favour of their weighted mean. ^ = analysis interpreted to reflect loss of radiogenic Pb; † = analysis rejected owing to low UO+/U+ and low count rates; ** = analysis interpreted to be of a sample processing contaminant.
Column 2: Analytical session. Spot-to-spot reproducibilities and calibration uncertainties, respectively (all 1sigma%): session 1: 0.56, 1.81; session 2: 0.31, 0.87; session 3: 0.52, 1.69; session 4: 0.42, 1.10; session 5: 0.46, 1.27. All are included in tabulated $^{238}U/^{206}Pb$ ratios and ages.
Column 6: f204%: the proportion (%) of common ^{206}Pb in total ^{206}Pb, as determined from measured $^{204}Pb/^{206}Pb$.
Column 7: f207%: the proportion (%) of common ^{206}Pb in total ^{206}Pb, required to project measured $^{238}U/^{206}Pb$ to concordia, along a mixing line from common $^{207}Pb/^{206}Pb$.
Columns 8-11: $^{238}U/^{206}Pb$ and $^{207}Pb/^{206}Pb$ ratios and uncertainties, before correction for common Pb.
Columns 12-15: $^{238}U/^{206}Pb^*$ and $^{207}Pb^*/^{206}Pb^*$ ratios and uncertainties, corrected for common Pb using f204.
Columns 16-17: $^{238}U/^{206}Pb^*$ ratio and uncertainty, projected to concordia using f207.
Columns 18-21: $^{238}U/^{206}Pb^*$ and $^{207}Pb^*/^{206}Pb^*$ ages and uncertainties, based on ratios corrected for common Pb using f204.
Column 22: Discordance (%) = 100 × (1-[($^{238}U/^{206}Pb$ date)-($^{207}Pb/^{206}Pb$ date)]/($^{207}Pb/^{206}Pb$ date)), based on 204-corrected data.
Column 23-24: $^{238}U/^{206}Pb^*$ age and uncertainty, based on ratios projected to concordia using f207.

Table DR2: U-Pb isotopic CA-TIMS data.

							Radiogenic Isotope Ratios								Isotopic Dates					
Sample	$\frac{Th}{U}$	$^{206}Pb^{*}$ $\times 10^{-13}$ mol	mol % $^{206}Pb^{*}$	$\frac{Pb^{*}}{Pb_{c}}$	Pb_{c} (pg)	$\frac{^{206}Pb}{^{204}Pb}$	$\frac{^{208}Pb}{^{206}Pb}$	$\frac{^{207}Pb}{^{206}Pb}$	% err	$\frac{^{207}Pb}{^{235}U}$	% err	$\frac{^{206}Pb}{^{238}U}$	% err	corr. coef.	$\frac{^{207}Pb}{^{206}Pb}$	±	$\frac{^{207}Pb}{^{235}U}$	±	$\frac{^{206}Pb}{^{238}U}$	±
(a)	(b)	(c)	(c)	(c)	(c)	(d)	(e)	(e)	(f)	(e)	(f)	(e)	(f)		(g)	(f)	(g)	(f)	(g)	(f)
17577																				
z1	0.574	0.2543	98.05%	15	0.42	923	0.178	0.061074	0.377	0.875003	0.466	0.103908	0.199	0.617	641.86	8.11	638.28	2.21	637.27	1.21
z2	0.598	0.1717	97.07%	10	0.43	616	0.186	0.061228	0.557	0.875893	0.632	0.103752	0.159	0.569	647.26	11.96	638.76	2.99	636.36	0.96
z3	0.590	0.4880	98.43%	19	0.65	1147	0.183	0.061192	0.294	0.875413	0.348	0.103756	0.098	0.650	646.00	6.32	638.50	1.65	636.38	0.59
z4	0.553	0.3039	98.37%	19	0.42	1109	0.172	0.060981	0.320	0.871377	0.380	0.103636	0.121	0.618	638.57	6.88	636.31	1.80	635.68	0.73
z5	0.641	0.1468	96.53%	9	0.44	519	0.199	0.061688	0.667	0.881360	0.826	0.103623	0.386	0.604	663.30	14.30	641.72	3.93	635.60	2.34
z6	0.457	0.3633	98.47%	19	0.47	1183	0.142	0.061828	0.322	0.929048	0.544	0.108981	0.408	0.808	668.17	6.89	667.13	2.66	666.83	2.58
z7	0.629	0.4264	98.67%	23	0.48	1353	0.195	0.061187	0.285	0.876061	0.350	0.103842	0.146	0.613	645.81	6.12	638.85	1.66	636.89	0.88
z8	0.659	0.2888	97.74%	14	0.55	799	0.205	0.061066	0.438	0.873792	0.519	0.103778	0.191	0.574	641.57	9.41	637.62	2.46	636.51	1.16
z9	0.559	0.0962	94.52%	5	0.46	330	0.174	0.062405	1.140	0.895259	1.277	0.104046	0.339	0.514	688.03	24.32	649.19	6.12	638.08	2.06

Notes:

(a) z1, z2, etc. are labels for analyses composed of single zircon grains that were annealed and chemically abraded (Mattinson, 2005). Fraction labels in bold denote analyses used in the weighted mean calculations.

(b) Model Th/U ratio calculated from radiogenic $^{208}Pb/^{206}Pb$ ratio and $^{207}Pb/^{235}U$ date.

(c) Pb* and Pbc are radiogenic and common Pb, respectively. mol % $^{206}Pb^{*}$ is with respect to radiogenic and blank Pb.

(d) Measured ratio corrected for spike and fractionation only. Fractionation correction is 0.18 ± 0.03 (1 sigma) %/amu (atomic mass unit) for single-collector Daly analyses, based on analysis of EARTHTIME ^{202}Pb-^{205}Pb tracer solution.

(e) Corrected for fractionation, spike, common Pb, and initial disequilibrium in $^{230}Th/^{238}U$. Common Pb is assigned to procedural blank with composition of $^{206}Pb/^{204}Pb = 18.04 \pm 0.61\%$; $^{207}Pb/^{204}Pb = 15.54 \pm 0.52\%$; $^{208}Pb/^{204}Pb = 37.69 \pm 0.63\%$ (1 sigma). $^{206}Pb/^{238}U$ and $^{207}Pb/^{206}Pb$ ratios corrected for initial disequilibrium in $^{230}Th/^{238}U$ using Th/U [magma] = 3 ± 1.

(f) Errors are 2 sigma, propagated using algorithms of Schmitz and Schoene (2007) and Crowley et al. (2007).

(g) Calculations based on the decay constants of Jaffey et al. (1971). $^{206}Pb/^{238}U$ and $^{207}Pb/^{206}Pb$ dates corrected for initial disequilibrium in $^{230}Th/^{238}U$ using Th/U [magma] = 3 ± 1.