GSA Data Repository item 2017070. Analtyical methods, geologic map, monazite and zircon U-Pb Concordia plots, monazite elemental (x-ray) maps, zircon and monazite data tables, whole rock data table, and monazite standards results

Appendix DR1. Analytical methods

Figure DR1. Geologic map

Figure DR2. U-Pb Concordia plot for zircon

Figure DR3. U-Pb Tera-Wasserburg plot for monazite

Figure DR4. Elemental maps of monazite

Figure DR5 LASS Sm-Nd + U-Pb isotope data for monazite reference materials

Table DR1. LASS Sm-Nd + U-Pb isotope data for monazite grains A, B, and C

Table DR2. Lu-Hf and U-Pb isotope data for zircon

Table DR3. Whole rock geochemical and isotope data

Table DR4. LASS Sm-Nd and U-Pb isotope data for monazite reference materials

Appendix DR1. Sample processing and imaging; U-Pb analytical methods; Sm-Nd-REE analytical methods; whole rock Sm-Nd isotope analytical methods.

Sample processing and imaging

Accessory minerals were separated from each sample using standard crushing, heavy liquid, magnetic separation, and hand-picking techniques. The mineral grains were mounted in epoxy and polished to reveal their interiors. The internal zoning was then documented using back-scattered electron (BSE) imaging for monazite, and cathodoluminescence (CL) using a Jeol JXA-8230 SuperProbe at Memorial University of Newfoundland.

X-ray maps were made on selected monazite grains (e.g., grains 2, 20, and 21) using the same Jeol JXA-8230 SuperProbe. The conditions used were 15 kV, 250 nA, W filament, with a focussed beam. The step size for the X-ray maps was 0.76 µm x 0.76 µm with a dwell time of 200 ms per step. The acquisition time for the X-ray maps ranged between 9 and 12 hours. The X-ray maps were processed using the Jeol software.

LASS analytical methods-monazite

Monazite from the peraluminous granite sample SW-1 was analyzed using the Laser Ablation-Split Stream (LASS) method at Memeorial Universtiy of Newfoundland. The main methodology, instrument specifics, and reference material specifics are described in detail in Goudie et al. (2014) and Fisher et al. (2011a), and thus only a few details relevant to the present study are given here. This method involved the ablation of sample and standards using a 20um laser beam (80um beam for LREE glass standard) operated at 6Hz and 6 J/cm^2. The ablation aerosol was split downstream of the laser cell to direct a portion of the ablated material to a ThermoFinnigan Element2 ICPMS for measurement of U-Th-Pb isotope measurement and to ThermoFinnigan Neptune MC-ICPMS for measurement of Sm-Nd isotope composition (in addition to isotopes of Ce, Eu, and Gd for concentration detemination). Results of quality control standard Mae Klang monazite are presented below. Additionally, the REE elemental ratios of Trebilock monazite, which are treated as unknowns here, are are also presented.

U-Pb analytical methods-monazite

As discussed in detail in Goudie et al. (2014), the U-Th-Pb isotope composition (age) of unknowns was calibrated to the Trebilcock monazite standard, which was also used as the calibration material for ^{143}Nd/^{144}Nd. Data for both U-Th-Pb and Sm-Nd-REE analyses were processed using the Iolite software package (Paton et. al., (2010, 2011). The Sm-Nd-REE Iolite Data Reduction Scheme is available from the first author.

Sm-Nd-REE analytical methods

^{143}Nd/^{144}Nd -Due to the reported bias of LA-MC-ICPMS determinations of Nd isotope composition relative to those obtained by thermal ionization mass spectrometry (TIMS), the benchmark technique for Sm-Nd isotope analysis, the reported ^{143}Nd/^{144}Nd presented here is normalized based on interspersed analyses of mineral reference materials (in this case Trebilcock monazite) which have been previously characterized by replicate TIMS analyses (see Fisher et al., 2011a). The magnitude of this correction is typically less than 0.5 epsilon units. The $^{143}Nd/^{144}Nd$ results of standard analyses are given in table DR4 below and plotted in Fig. DR5. Normalization is based on the mean of the measured laser ablation analyses according to equation 1:

$$Sample_{corr} = Sample_{meas} * \left(\frac{Std_{true}}{Std_{meas}^{mean}} \right) \qquad \text{Eqn. 1}$$

^{147}Sm/^{144}Nd-Correction of the measured $^{147}Sm/^{144}Nd$ is described in detail in Fisher et al. (2011a), and is corroborated by the close agreement between the $^{147}Sm/^{144}Nd$ determined for reference minerals during the course of this study and those determined by ID-TIMS for the same material. Due to the ubiquitous Sm/Nd zoning present in natural minerals, and the difficulty in producing synthetic mineral standards with homogeneous Sm/Nd, quantification of the accuracy and precision of LA-MC-ICPMS measurement of $^{147}Sm/^{144}Nd$ is difficult. The Trebilcock monazite standard has a relatively restricted range in Sm/Nd, and thus offers a good estimate of the reproducibility of our Sm/Nd measurements (see Fisher et al., 2011a). The $^{147}Sm/^{144}Nd$ measured for the Trebilcock standard during the course of this study is 0.2242 ± 0.0058 (2SD) which is in agreement with measured TIMS values (0.2167 ± 0.0125) and attests to the accuracy of the technique, though the measured values during this study are consistently on the higher end of the TIMS range. We attribute this to using a single piece of this standard with Sm/Nd slightly higher than the mean of the TIMS analyses. The relative standard deviation for Trebilcock monazite analyzed during this study is

~2.5%, which we consider to be a worse case estimate of the reproducibility of this method. As shown in figure DR5 (and Table DR4), our measurements of Trebilcock monazite display homogeneous $^{143}Nd/^{144}Nd$ and a relatively restricted range of Sm/Nd in agreement with results from ID-TIMS analyses (Fisher et al., 2011).

Ce/Gd and Eu/Eu*- A single data acquisition comprises the measurement of a number of Nd isotopes (143, 144, 145, 146) and Sm isotopes (147, 149) along with isotopes of Ce (142), Eu (153), and Gd (155). In order to determine the relative abundance of each element the signal intensity (in volts) is measured for the Ce, Eu, and Gd isotopes above as well as ^{146}Nd and ^{149}Sm. These voltages are then abundance normalized using the following isotopic abundances ^{142}Ce (11.08%), ^{146}Nd (17.19%), ^{149}Sm (11.30%), ^{153}Eu (52.20%), and ^{155}Gd (15.65%). With the exception ^{142}Ce, all other isotopes are interference-free. The isobaric interference of ^{142}Nd on ^{142}Ce is mathematically corrected using the measured ^{146}Nd and a $^{142}Nd/^{146}Nd$ of 1.5782 (Eqn. 2 and 3).

$$^{142}Ce(v)_{calculated} = total142(v) - {}^{142}Nd(v)_{calculated} \qquad \text{Eqn. 2}$$

$$^{142}Nd(v)_{calculated} = {}^{146}Nd(v)_{measured} * \left(\frac{^{142}Nd}{^{146}Nd}_{true} \right) \qquad \text{Eqn. 3}$$

Ce/Gd is determined using the resulting Ce and Gd abundance normalized REE voltages. These data are then further normalized to the LREE glass described in Fisher et al., 2011a. This normalization theoretically corrects for both instrumental drift (though drift was negligible (<1%) during the course of this study and thus normalization was based on the mean of the standards) as well as differential ablation yields of the individual elements. The LREE glass has been characterized for its Ce (23,200 ppm) and Gd (3470 ppm) content, and therefore Ce/Gd (6.69), by solution ICPMS. Normalization is done using Eqn. 1 above .

Eu/Eu* is a measure of the deviation of the actual Eu content of a material to that expected from a linear fit to neighboring REE's Sm and Gd, with each element normalized to chondritic (CN) abundances (Eqn. 4).

$$Eu / Eu^* = \frac{Eu_{CN}}{\left(Sm_{CN} * Gd_{CN}\right)^{0.5}} \qquad \text{Eqn. 4}$$

The chondrite normalization for the abundance normalized voltages of Sm, Eu, and Gd is done by dividing the these voltages by the chondritic concentration of these elements (all expressed in ppm) using the values of McDonough and Sun (1995). The resulting Eu/Eu* is further normalized to the Eu/Eu* (similarly calculated) determined in the LREE glass. Table 5 in Fisher et al. (2011a) summarizes a comparison of this approach to that of a 'typical' LA-ICPMS measurement (ie., normalized to a glass standard with further internal normalization done by electron microprobe elemental concentration analyses of a major mineral- see Jackson et al. (1992) for details). The data for each of the mineral standards analyzed during this study agree well with those of the Fisher et al. (2011a) study.

LASS quality control standard

Twenty-two analyses of the Mae Klang monazite (used here as a quality control standard) yielded a mean $^{143}Nd/^{144}Nd$ of 0.512641 ± 28 (2SD) and a $^{147}Sm/^{144}Nd$ range of 0.0867 to 0.1146, both of which are in excellent agreement with the ID-TIMS values presented by Fisher et al. (2011a) (mean $^{143}Nd/^{144}Nd$ = 0.512646 ± 10 (2SD); range of $^{147}Sm/^{144}Nd$ 0.0870 to 0.1209). Simultaneous U-Th-Pb age determinations yielded a ^{207}Pb-corrected weighted mean $^{206}Pb/^{238}U$ age of 26.8 ± 0.3 Ma (2σ), and a weighted mean $^{208}Pb/^{232}Th$ age of 27.1 ± 0.2 Ma (2σ), both of which are in agreement with the ID-TIMS age of 26.8 ± 0.5 Ma determined by Dunning et al. (1995).

Whole rock Sm-Nd isotope analytical methods

Whole rock powder for SW-1 was dissolved in Savilex© Teflon beakers using an 8 ml (4:1) mixture of 29 M HF – 15 M HNO_3. Prior to acid digestion, a mixed $^{150}Nd/^{149}Sm$ spike was added. After five days of digestion, the solution was evaporated to dryness and then taken up in a saturated solution of 6 M HCl and H_3BO_3 (boric acid) for at least 24 hours. Addition of boric acid ensured that any remaining solid fluorides were converted to soluble chlorides (Mulcahy et al., 2009). The sample was then evaporated to dryness and re-dissolved in 2.5 M HCL. Bulk rare earth elements (REE) were then isolated using cation exchange resin AG-50W-X8, H+ form, 200-400 mesh. This solution was then dried and taken up in 0.18 M HCl and loaded on a second column containing Eichrom© Ln resin (50-100 mesh) to isolate Sm and Nd from the other REE. All reagents were distilled and the average total chemical blank measured at the MUN TIMS laboratory was less than 100 pg for Nd and therefore considered negligible. Thus no blank correction was performed

Samarium and Nd concentrations and the Nd isotopic composition was determined using a multi-collector Finnigan Mat 262 mass spectrometer in static for concentration determination, and dynamic mode for Nd isotopic composition determination. Instrumental mass fractionation of Sm and Nd isotopes was corrected using a Raleigh law relative to $^{146}Nd/^{144}Nd$ = 0.7219 and $^{152}Sm/^{147}Sm$ = 1.783. The reported values were adjusted to the JNdi-1 standard ($^{143}Nd/^{144}Nd$ = 0.512115, Tanaka et al., 2000). During the course of this study JNdi-1 yield a mean $^{143}Nd/^{144}Nd$ = 0.512101 ± 16 (2SD, n=40). Five analyses of USGS whole rock reference material BRC-2 were run during the course of this study. Each analysis comprised a separate dissolution and thus provides the best estimate of the reproducibility of an individual whole rock analysis. The mean values of BCR-2 are as follows where the relative two standard deviations of the mean are given in percent in parenthesis; $^{143}Nd/^{144}Nd$ = 0.512636 (0.0025%); $^{147}Sm/^{144}Nd$ = 0.1384 (0.25%); Nd ppm=27.7 (0.7%); Sm = 6.34 (0.6%). These values are in excellent agreement with recent determinations made in other laboratories (eg., Razcek et al., 2001; Razcek et al., 2003; Schmitz et al., 2004; Weis et al., 2006). The analytical uncertainty given for Nd isotopic ratios is the in-run precision expressed as two standard error of the mean (2SE) and is typically <0.002%.

Zircon U-Th-Pb analytical methods

Zircon U-Pb geochronology and scanning ion imaging was performed using a CAMECA IMS1280 large geometry ion microprobe at the Nordsim facility, NRM. Geochronological analyses follow routine protocols outlined by Whitehouse et al. (1999) and Whitehouse and Kamber (2005). A ca. 4.5 nA, -13 kV O_2^- primary beam (imaged aperture of 150 μm corresponding to a spot diameter on the sample of ca. 15 μm) was used to generate +10 kV secondary ions which were admitted to the mass spectrometer and detected in a peak-hopping sequence using a single ion-counting electron multiplier. The mass spectrometer was operated at a mass resolution (M/ΔM) of 5400, sufficient to separate all species of interest from molecular interferences. Each analysis comprised a 90 second pre-sputter to remove the Au-coating and allow the secondary beam to stabilize, centering of the secondary beam in the field aperture, energy optimization in the 45 eV energy window, mass calibration adjustment using the $^{90}Zr_2{}^{16}O$ peak, and 12 cycles through the species of interest. Groups of analyses were performed in fully automated sequences, regularly interspersing standard analyses with those of the sample zircon grains. Data reduction utilized an in-house developed suite of software. Pb-isotope ratios were corrected for common Pb estimated from measured ^{204}Pb assuming the present-day terrestrial Pb isotope composition estimated from the model of Stacey and Kramers (1975); where the ^{204}Pb count was statistically insignificant relative to the long-term background on the EM, no correction was applied. U/Pb ratios were calibrated using an empirical power-law relationship between $^{206}Pb/^{238}U$ and $^{238}U^{16}O_2/^{238}U$ assuming the 1065 Ma age of the 91500 zircon (Wiedenbeck et al., 1995). Age calculations assume the decay constant recommendations of Steiger and Jäger (1975) and utilize the routines of Isoplot-Ex (Ludwig, 2004).

Zircon Lu-Hf analytical methods

Following SIMS analysis of the U-Pb-Th ages, zircons were analyzed for their Lu-Hf isotope composition at Memorial University of Newfoundland. Analyses were done using a ThermoFinnigan Neptune MC-ICPMS coupled to a Geolas Pro 193 nm Ar-F excimer laser operating at 10Hz, 5 J/cm^2, and a 50 um diameter spot size. The cup configuration, analytical methodology, and data reduction protocol are described in detail in Fisher et al. (2011b).

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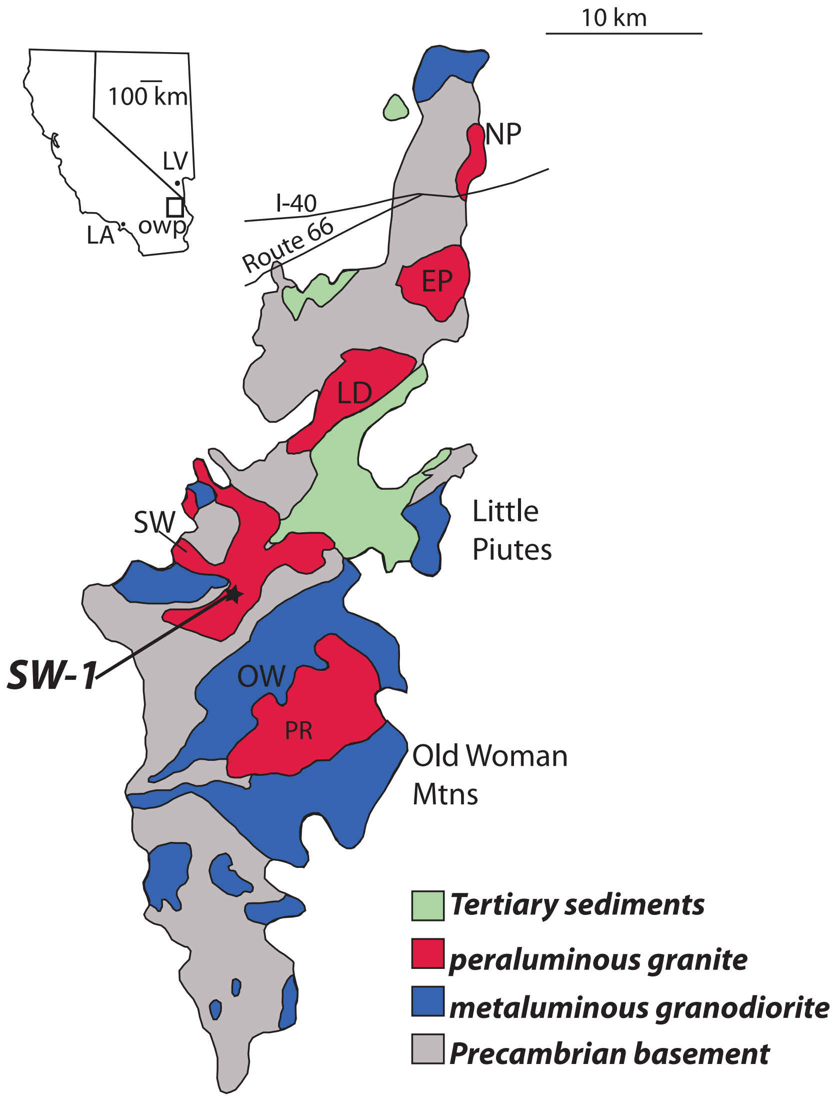

Figure DR1. Geologic map of the Late Cretaceous Old Woman-Puite Range batholith, southeastern California. Star denotes sample location of SW-1 discussed in this study. Modified after Foster et al., 1992. PR-Painted Rock pluton, OW-Old Woman pluton, SW- Sweetwater Wash pluton, LD-Lazy Daisy pluton, EP -East Puite pluton, NP-North Puite pluton.

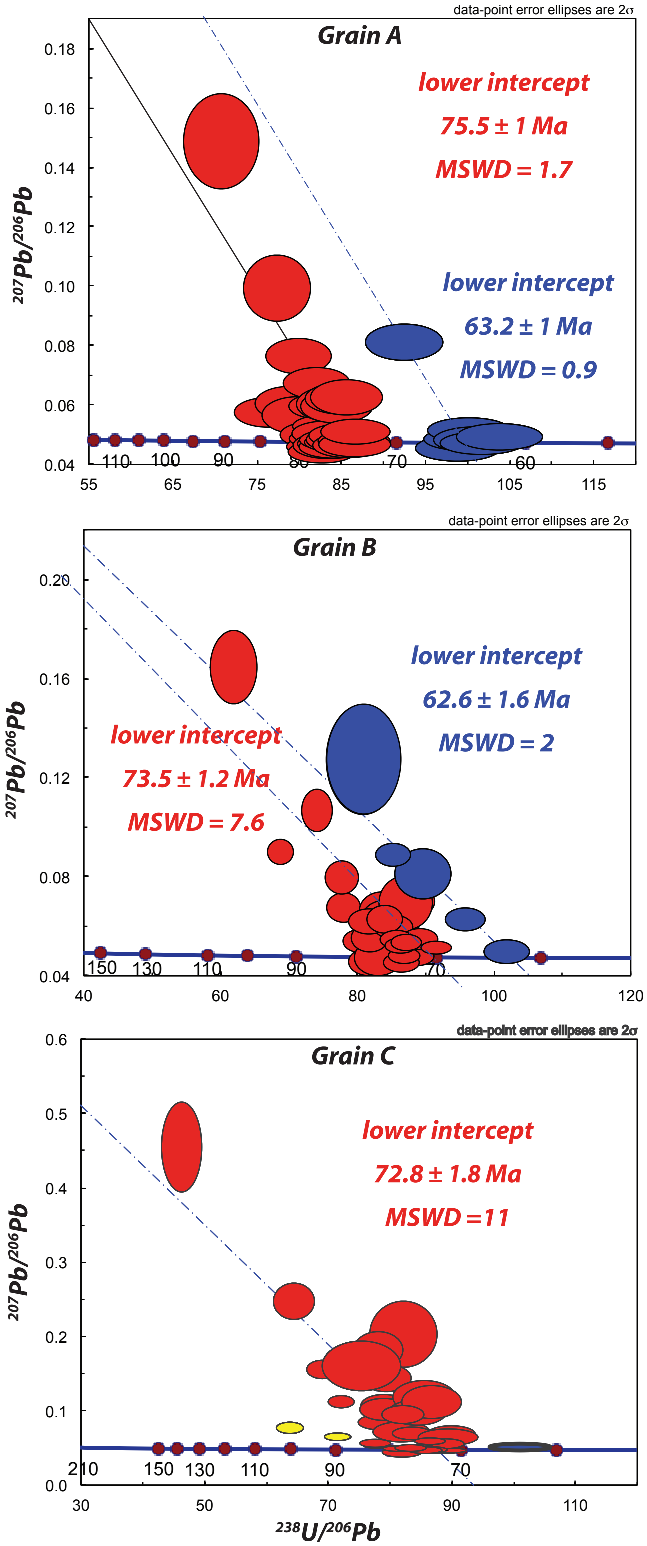

Figure DR2. Tera-Wasserburg plot of SW-1 monazite grains A, B, and C.

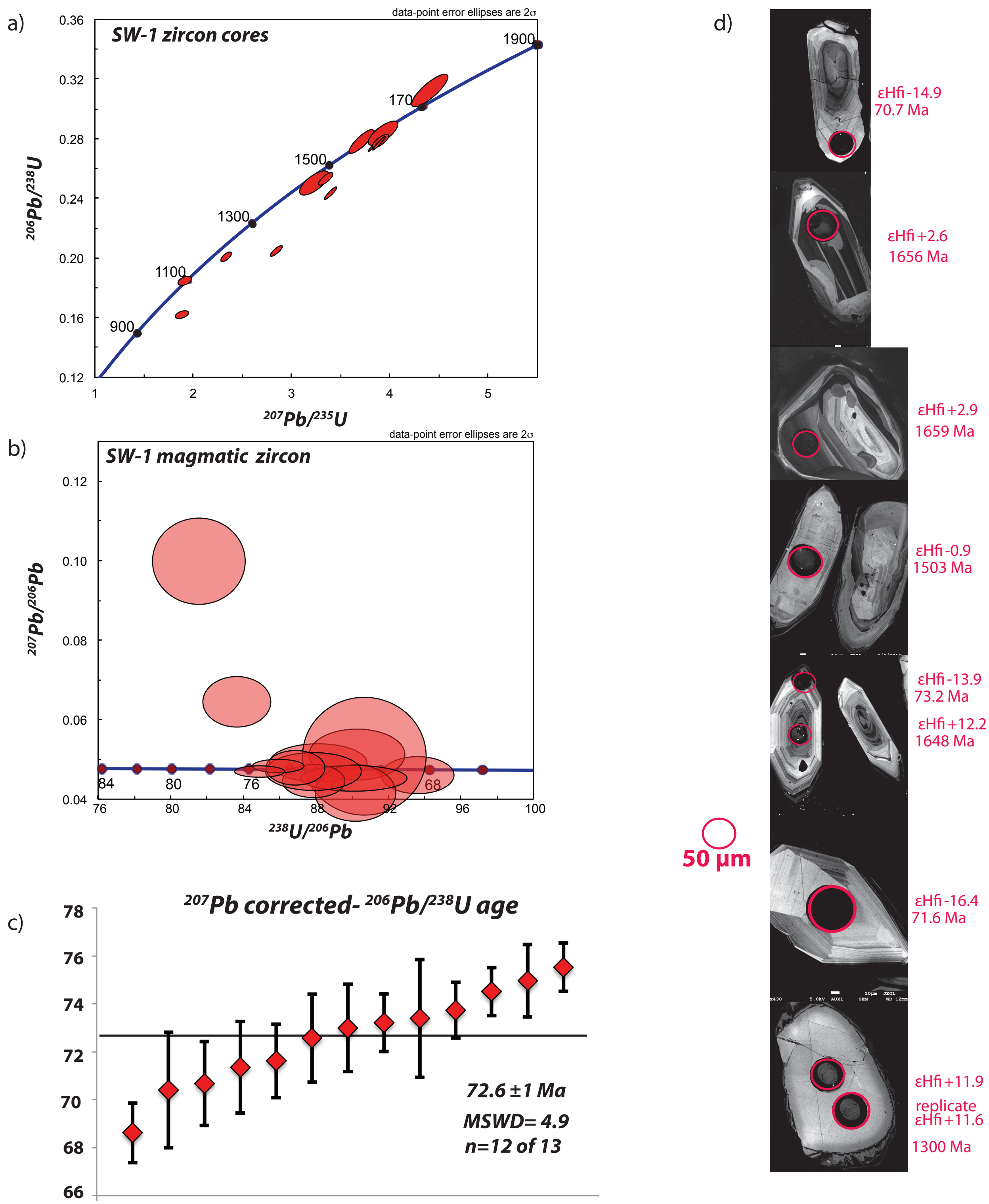

Figure DR3. U-Pb age data for SW-1 zircon samples. a) concordia plot of inherited zircon cores ; b) Tera-Wasserburg plot of magmatic zircon; c) weighted mean ^{207}Pb corrected $^{206}Pb/^{238}U$ agesof magmatic zircon; d) representative cathodoluminesence images (CL) of zircon crystals in sample SW-1, along with initial εHf values calculated at the prefered age (U/Pb age for Cretaceous zircon; Pb/Pb age for Proterozoic zircon), laser spot size is 50µm in all images.

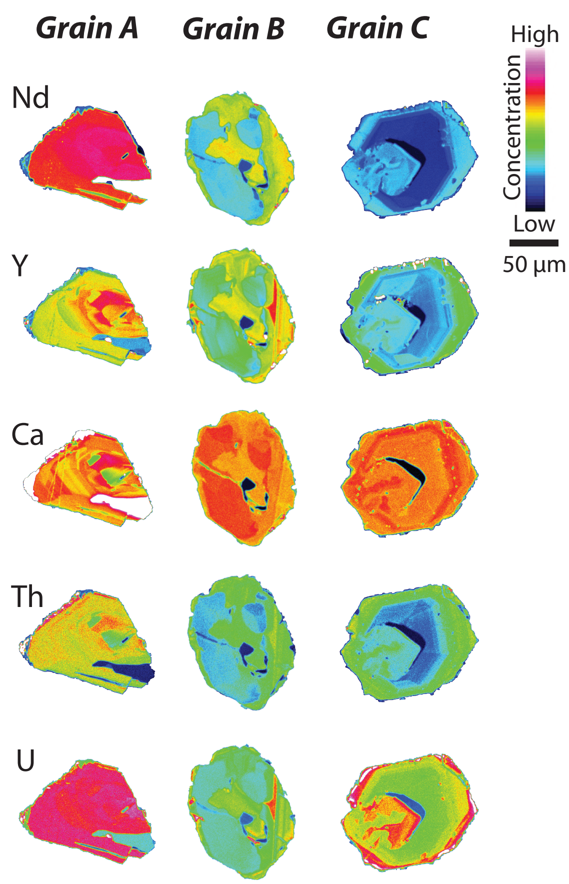

Figure DR4. Compositional (elemental) x-ray maps for the monazite grains A, B, and C

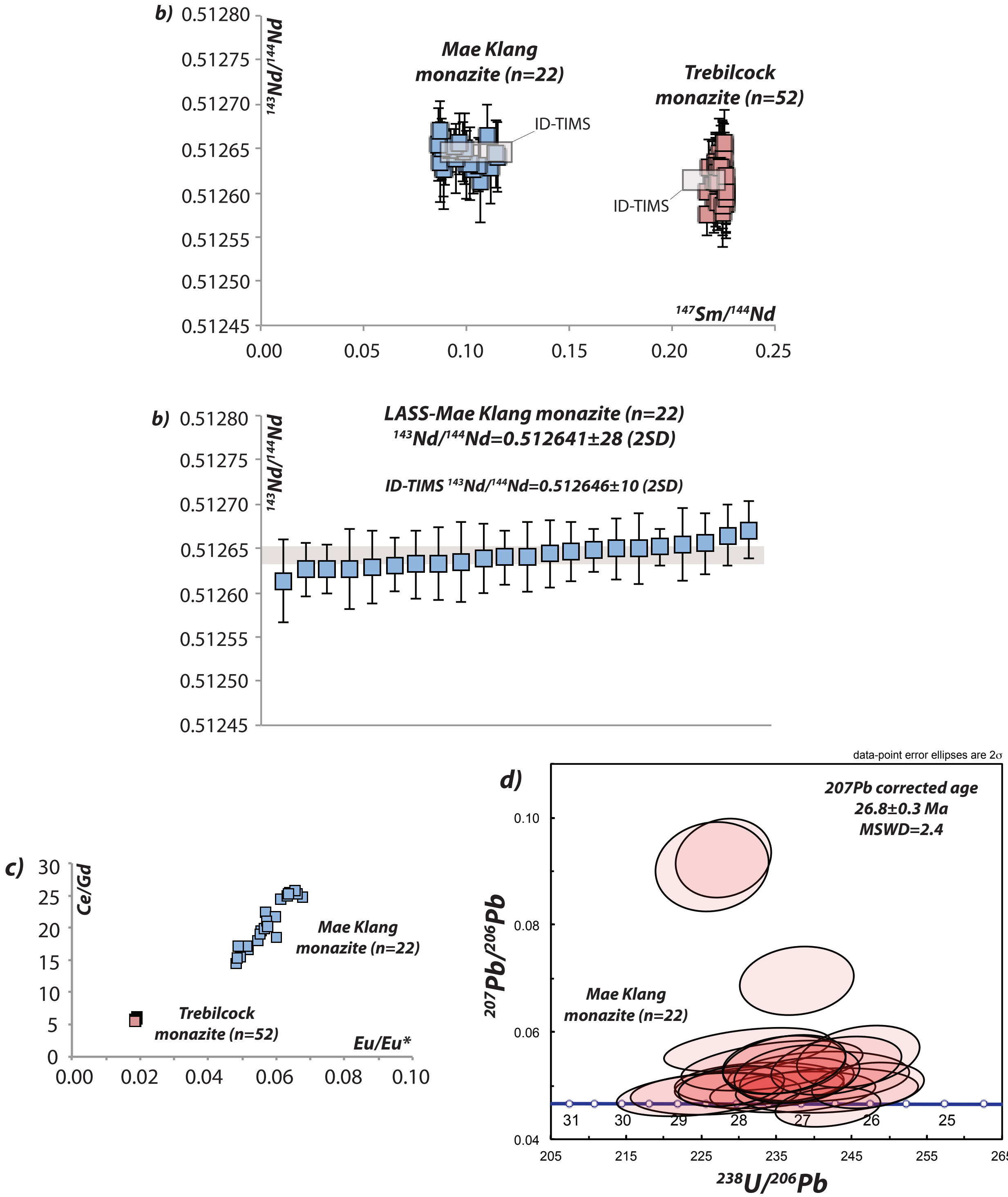

Figure DR5. a) Reproducibility of Mae Klang and Trebilcock monazite Nd-standards for $^{143}Nd/^{144}Nd$ and $^{147}Sm/^{144}Nd$ compared to ID-TIMS analyses (in grey box). Note that Trebilock analyses are self-normalized for $^{143}Nd/^{144}Nd$, but not for $^{147}Sm/^{144}Nd$. b) Reproducibility of $^{143}Nd/^{144}Nd$ for the Mae Klang Nd-standard compared to ID-TIMS, note reproducibitly is ~0.5 epsilson units (2SD). c) Reproducibility of Mae Klang and Trebilcock monazite Nd-standards for Ce/Gd vs. Eu/Eu*. d) Tera-Wasserburg diagram of concurrent U-Pb age results from the Mae Klang monazite; ID-TIMS age 26.8 Ma (Dunning et al., 1995)

Table DR1. Sm-Nd and U-Pb isotope data for monazite grains A, B, and C

Sample	^{147}Sm (V)	^{146}Nd (V)	^{143}Nd/^{144}Nd	2SE	^{145}Nd/^{144}Nd	2SE	^{147}Sm/^{144}Nd	2SE	εNd(0Ma)[1]	2SE	εNd(73Ma)[1,2]	Eu/Eu*	Ce/Gd	Duration(s)	Comments	^{207}Pb/^{235}U	1SE	^{206}Pb/^{238}U	1SE	rho	^{238}U/^{206}Pb	1SE	^{207}Pb/^{206}Pb	1SE	rho	^{208}Pb/^{232}Th	1SE	^{207}Pb/^{235}U	1SE	^{206}Pb/^{238}U	1SE	^{208}Pb/^{232}Th	1SE	^{207}Pb cor ^{206}Pb/^{238}U age	1SE
Grain A-01	0.19	1.43	0.511645	0.000023	0.348422	0.000017	0.0895	0.0002	-19.22	0.45	-17.56	0.143	20.46	62	SW1-g2-01	0.0806	0.0030	0.0121	0.0002	0.062	82.8500	1.6474	0.0499	0.0015	0.262	0.00379	0.00008	78	3	77	2	76	1	77.1	1.5
Grain A-02	0.25	1.88	0.511821	0.000035	0.348422	0.000019	0.0897	0.0002	-15.79	0.68	-14.12	0.132	20.74	62	SW1-g2-02	0.0518	0.0021	0.0100	0.0002	0.062	99.7009	1.9881	0.0498	0.0016	0.259	0.00305	0.00006	51	2	64	1	61	1	64.1	1.3
Grain A-03	0.21	1.55	0.511808	0.000027	0.348430	0.000016	0.0931	0.0008	-16.04	0.53	-14.38	0.135	19.13	60	SW1-g2-03	0.0837	0.0035	0.0122	0.0003	-0.102	81.7662	1.6714	0.0511	0.0018	0.394	0.00381	0.00008	81	3	78	2	77	2	78.0	1.6
Grain A-04	0.22	1.55	0.511808	0.000042	0.348407	0.000016	0.0946	0.0005	-16.04	0.82	-14.38	0.135	18.38	64	SW1-g2-04	0.0780	0.0032	0.0121	0.0002	0.007	82.4402	1.6311	0.0473	0.0016	0.275	0.00379	0.00008	75	3	78	2	77	1	77.8	1.6
Grain A-05	0.24	1.77	0.511860	0.000029	0.348418	0.000017	0.0919	0.0018	-15.03	0.57	-13.36	0.136	19.63	64	SW1-g2-05	0.0840	0.0034	0.0120	0.0002	-0.036	83.2640	1.6986	0.0516	0.0017	0.340	0.00377	0.00007	81	3	77	2	76	1	76.6	1.6
Grain A-06	0.19	1.43	0.511665	0.000029	0.348414	0.000019	0.0893	0.0002	-18.83	0.57	-17.16	0.142	20.70	64	SW1-g2-06	0.0883	0.0033	0.0120	0.0002	0.032	83.1255	1.6238	0.0540	0.0015	0.272	0.00378	0.00007	85	3	77	2	76	1	76.5	1.5
Grain A-07	0.18	1.35	0.511663	0.000051	0.348392	0.000024	0.0888	0.0001	-18.87	1.00	-17.20	0.143	20.72	64	SW1-g2-07	0.0788	0.0029	0.0118	0.0002	0.011	84.5309	1.6077	0.0487	0.0014	0.246	0.00370	0.00007	76	3	76	1	75	1	75.7	1.5
Grain A-08	0.20	1.57	0.511816	0.000034	0.348406	0.000016	0.0863	0.0003	-15.89	0.66	-14.22	0.132	22.48	64	SW1-g2-08	0.0480	0.0021	0.0101	0.0002	0.094	98.9120	2.0546	0.0466	0.0018	0.128	0.00298	0.00006	47	2	65	1	60	1	64.9	1.4
Grain A-09	0.23	1.76	0.511892	0.000038	0.348402	0.000020	0.0899	0.0010	-14.40	0.74	-12.74	0.124	20.69	64	SW1-g2-09	0.0491	0.0021	0.0099	0.0002	0.045	101.1122	2.0959	0.0495	0.0018	0.283	0.00303	0.00006	48	2	63	1	61	1	63.3	1.3
Grain A-10	0.20	1.54	0.511835	0.000044	0.348425	0.000020	0.0883	0.0012	-15.52	0.86	-13.85	0.135	21.13	60	SW1-g2-10	0.0983	0.0044	0.0118	0.0002	0.114	84.4595	1.7477	0.0607	0.0023	0.215	0.00369	0.00007	93	4	76	2	75	1	74.6	1.6
Grain A-11	0.18	1.36	0.511655	0.000054	0.348425	0.000018	0.0887	0.0007	-19.03	1.06	-17.36	0.141	21.54	48	SW1-g2-11	0.0494	0.0021	0.0096	0.0002	0.018	103.8422	2.1027	0.0505	0.0018	0.194	0.00290	0.00006	49	2	62	1	59	1	61.5	1.3
Grain A-12	0.18	1.35	0.511547	0.000061	0.348440	0.000027	0.0913	0.0002	-21.14	1.19	-19.47	0.135	21.70	~~64~~	~~SW1-g2-12~~	~~6.6900~~	~~0.3000~~	~~0.0752~~	~~0.0028~~	~~0.855~~	~~13.2979~~	~~0.4863~~	~~0.5710~~	~~0.0120~~	~~-0.479~~	~~0.00556~~	~~0.00014~~	~~1804~~	~~50~~	~~460~~	~~17~~	~~112~~	~~3~~	~~158.8~~	~~16.5~~
Grain A-13	0.15	1.22	0.511549	0.000033	0.348452	0.000032	0.0846	0.0003	-21.10	0.64	-19.42	0.146	23.35	34	SW1-g2-13	0.1017	0.0043	0.0127	0.0003	0.000	78.8022	1.6766	0.0617	0.0023	0.532	0.00384	0.00008	98	4	81	2	77	2	79.8	1.7
Grain A-14	0.17	1.34	0.511632	0.000028	0.348412	0.000019	0.0871	0.0001	-19.48	0.55	-17.81	0.141	21.69	64	SW1-g2-14	0.0976	0.0037	0.0121	0.0002	0.108	82.6446	1.6051	0.0607	0.0018	0.231	0.00379	0.00008	93	3	78	2	76	1	76.2	1.5
Grain A-15	0.18	1.35	0.511656	0.000029	0.348427	0.000013	0.0883	0.0002	-19.01	0.57	-17.34	0.142	20.95	64	SW1-g2-15	0.0467	0.0019	0.0098	0.0002	0.089	101.7294	2.0180	0.0484	0.0016	0.285	0.00306	0.00006	46	2	63	1	62	1	63.0	1.3
Grain A-16	0.18	1.44	0.511706	0.000048	0.348427	0.000014	0.0869	0.0006	-18.03	0.94	-16.36	0.139	21.62	64	SW1-g2-16	0.0532	0.0021	0.0100	0.0002	0.047	100.2004	2.0080	0.0527	0.0017	0.263	0.00306	0.00006	52	2	64	1	62	1	63.6	1.3
Grain A-17	0.21	1.62	0.511640	0.000028	0.348435	0.000021	0.0891	0.0004	-19.32	0.55	-17.65	0.140	20.51	38	SW1-g2-17	0.0749	0.0033	0.0120	0.0002	0.097	83.4028	1.7042	0.0477	0.0018	0.215	0.00368	0.00008	72	3	77	2	74	1	76.8	1.6
Grain A-18	0.16	1.29	0.511611	0.000042	0.348430	0.000016	0.0850	0.0002	-19.89	0.82	-18.21	0.141	22.65	64	SW1-g2-20	0.1282	0.0050	0.0125	0.0003	0.259	79.8722	1.5949	0.0774	0.0024	0.058	0.00375	0.00008	120	5	80	2	76	1	77.2	1.6
Grain A-19	0.16	1.23	0.511607	0.000044	0.348409	0.000021	0.0866	0.0003	-19.96	0.86	-18.29	0.142	21.80	57	SW1-g2-21	0.1116	0.0044	0.0122	0.0002	0.049	82.0345	1.6151	0.0684	0.0021	0.269	0.00375	0.00008	106	4	78	2	76	1	76.0	1.5
Grain A-20	0.19	1.48	0.511598	0.000038	0.348452	0.000022	0.0893	0.0004	-20.14	0.74	-18.47	0.148	20.64	32	SW1-g2-22	0.1800	0.0100	0.0129	0.0003	0.428	77.2798	1.6423	0.1000	0.0045	-0.214	0.00385	0.00008	165	9	83	2	78	2	77.4	1.8
Grain A-21	0.23	1.87	0.511675	0.000030	0.348402	0.000022	0.0844	0.0004	-18.64	0.59	-16.97	0.141	22.50	45	SW1-g2-23	0.0985	0.0046	0.0119	0.0002	0.370	83.8223	1.7214	0.0613	0.0024	-0.079	0.00372	0.00008	92	4	77	2	75	1	75.1	1.6
Grain A-22	0.12	0.90	0.511672	0.000038	0.348422	0.000024	0.0881	0.0002	-18.70	0.74	-17.03	0.143	20.76	60	SW1-g2-25	0.0863	0.0033	0.0108	0.0002	0.002	92.5069	1.8827	0.0820	0.0025	0.373	0.00322	0.00007	83	3	69	1	65	1	66.3	1.4
Grain A-23	0.19	1.46	0.511727	0.000026	0.348426	0.000016	0.0911	0.0006	-17.62	0.51	-15.96	0.148	19.01	64	SW1-g2-26	0.0744	0.0031	0.0121	0.0002	0.028	82.6446	1.6392	0.0455	0.0016	0.242	0.00371	0.00007	72	3	78	2	75	1	77.7	1.6
Grain A-24	0.19	1.42	0.511907	0.000035	0.348408	0.000016	0.0898	0.0005	-14.11	0.68	-12.44	0.184	21.33	60	SW1-g2-27	0.0768	0.0031	0.0119	0.0002	0.030	83.8926	1.6891	0.0482	0.0016	0.283	0.00381	0.00008	74	3	76	2	77	2	76.3	1.5
Grain A-25	0.20	1.46	0.511751	0.000031	0.348407	0.000016	0.0952	0.0007	-17.16	0.61	-15.49	0.141	17.49	64	SW1-g2-28	0.0759	0.0031	0.0119	0.0002	0.140	84.1043	1.6976	0.0473	0.0016	0.179	0.00373	0.00007	73	3	76	2	75	1	76.2	1.6
Grain A-26	0.22	1.55	0.511777	0.000042	0.348398	0.000021	0.0934	0.0011	-16.65	0.82	-14.98	0.143	18.29	64	SW1-g2-29	0.0748	0.0031	0.0117	0.0002	-0.107	85.8369	1.7315	0.0477	0.0017	0.345	0.00371	0.00007	72	3	75	2	75	1	74.6	1.5
Grain A-27	0.17	1.32	0.511673	0.000035	0.348425	0.000016	0.0875	0.0002	-18.68	0.68	-17.01	0.141	20.95	64	SW1-g2-30	0.0792	0.0030	0.0119	0.0002	0.067	84.1043	1.6623	0.0495	0.0015	0.252	0.00367	0.00007	77	3	76	2	74	1	76.0	1.5
Grain A-28	0.11	0.83	0.511640	0.000055	0.348410	0.000026	0.0884	0.0002	-19.32	1.07	-17.65	0.144	20.32	~~22~~	~~SW1-g2-31~~	~~0.2900~~	~~0.0120~~	~~0.0136~~	~~0.0003~~	~~0.140~~	~~73.8007~~	~~1.6612~~	~~0.1580~~	~~0.0055~~	~~0.304~~	~~0.00369~~	~~0.00008~~	~~256~~	~~9~~	~~87~~	~~2~~	~~74~~	~~2~~	~~74.6~~	~~2.0~~
Grain A-29	0.17	1.28	0.511720	0.000035	0.348433	0.000018	0.0911	0.0006	-17.76	0.68	-16.09	0.144	18.90	64	SW1-g2-32	0.1022	0.0043	0.0118	0.0002	0.059	84.8896	1.7295	0.0633	0.0022	0.229	0.00374	0.00008	97	4	76	2	75	2	74.0	1.6
Grain A-30	0.19	1.42	0.511847	0.000038	0.348414	0.000014	0.0894	0.0006	-15.28	0.74	-13.61	0.168	20.67	64	SW1-g2-33	0.0769	0.0031	0.0116	0.0002	0.077	86.5052	1.7585	0.0491	0.0016	0.224	0.00368	0.00007	74	3	74	2	74	1	73.9	1.5
Grain A-31	0.21	1.42	0.511775	0.000034	0.348422	0.000019	0.0953	0.0011	-16.69	0.66	-15.02	0.152	17.32	64	SW1-g2-34	0.0811	0.0033	0.0115	0.0002	0.007	86.6551	1.6895	0.0523	0.0017	0.322	0.00370	0.00007	79	3	74	1	75	1	73.5	1.5
Grain A-32	0.20	1.47	0.511745	0.000026	0.348431	0.000014	0.0926	0.0012	-17.27	0.51	-15.61	0.144	18.07	64	SW1-g2-35	0.0801	0.0032	0.0117	0.0002	0.067	85.3242	1.7109	0.0509	0.0017	0.287	0.00364	0.00007	77	3	75	2	74	1	74.8	1.5
Grain A-33	0.24	1.80	0.511847	0.000053	0.348427	0.000013	0.0905	0.0005	-15.28	1.04	-13.61	0.142	19.64	64	SW1-g2-37	0.1035	0.0046	0.0117	0.0002	0.182	85.6164	1.7592	0.0636	0.0024	0.239	0.00366	0.00008	97	4	75	2	74	1	73.3	1.6
Grain A-34	0.20	1.51	0.511816	0.000028	0.348424	0.000020	0.0889	0.0006	-15.89	0.55	-14.22	0.154	20.40	64	SW1-g2-38	0.0778	0.0033	0.0116	0.0002	0.056	86.5801	1.7616	0.0480	0.0017	0.262	0.00360	0.00007	75	3	74	2	73	1	74.0	1.5
Grain A-35	0.21	1.49	0.511741	0.000031	0.348426	0.000016	0.0960	0.0014	-17.35	0.61	-15.69	0.152	16.78	64	SW1-g2-39	0.0819	0.0034	0.0118	0.0002	0.016	84.9618	1.6963	0.0496	0.0017	0.313	0.00359	0.00007	79	3	75	2	72	1	75.2	1.5
Grain A-36	0.21	1.56	0.511856	0.000060	0.348450	0.000019	0.0900	0.0001	-15.11	1.17	-13.44	0.144	20.03	60	SW1-g2-41	0.2910	0.0155	0.0142	0.0004	0.461	70.6215	1.8204	0.1490	0.0065	0.164	0.00412	0.00011	239	11	91	2	83	2	79.0	2.3
Grain A-37	0.23	1.67	0.511784	0.000028	0.348417	0.000018	0.0928	0.0016	-16.51	0.55	-14.85	0.144	18.35	60	SW1-g2-42	0.1056	0.0043	0.0131	0.0003	0.056	76.2195	1.6266	0.0587	0.0020	0.329	0.00398	0.00008	100	4	84	2	80	2	82.8	1.8
Grain B-01	0.37	2.81	0.511863	0.000031	0.348442	0.000035	0.0912	0.0041	-14.96	0.61	-13.29	0.238	22.10	36	SW1-g20-01	0.1113	0.0045	0.0118	0.0002	-0.065	84.5309	1.2147	0.0684	0.0028	0.363	0.00372	0.00005	106	4	76	1	75	1	73.8	1.1
Grain B-02	0.33	2.59	0.511950	0.000029	0.348415	0.000017	0.0860	0.0009	-13.26	0.57	-11.59	0.200	24.83	58	SW1-g20-02	0.0944	0.0036	0.0116	0.0002	0.034	86.2069	1.1891	0.0596	0.0023	0.321	0.00373	0.00004	90	3	74	1	75	1	73.2	1.0
Grain B-03	0.27	1.96	0.511928	0.000040	0.348406	0.000017	0.0920	0.0006	-13.69	0.78	-12.02	0.203	21.17	40	SW1-g20-03	0.2070	0.0070	0.0135	0.0002	0.254	74.0741	0.9054	0.1076	0.0035	0.047	0.00407	0.00005	187	6	86	1	82	1	79.9	1.1
Grain B-04	0.27	1.78	0.511812	0.000034	0.348421	0.000013	0.1030	0.0005	-15.95	0.66	-14.29	0.242	16.53	40	SW1-g20-04	0.0894	0.0027	0.0122	0.0001	0.031	81.7662	0.9360	0.0521	0.0015	0.268	0.00376	0.00004	88	2	78	1	76	1	77.9	0.9
Grain B-05	0.30	1.74	0.511755	0.000038	0.348417	0.000017	0.1177	0.0024	-17.06	0.66	-15.42	0.182	13.65	30	SW1-g20-05	0.0906	0.0034	0.0121	0.0002	0.126	82.7130	1.1288	0.0552	0.0021	0.270	0.00384	0.00005	89	3	78	1	77	1	76.7	1.1
Grain B-06	0.35	1.93	0.511750	0.000028	0.348416	0.000013	0.1220	0.0013	-17.16	0.55	-15.52	0.161	12.65	58	SW1-g20-06	0.1215	0.0043	0.0128	0.0002	0.090	78.0031	1.0039	0.0688	0.0024	0.211	0.00373	0.00004	114	4	82	1	75	1	79.9	1.1
Grain B-07	0.32	1.87	0.511799	0.000028	0.348422	0.000017	0.1122	0.0015	-16.20	0.45	-14.56	0.207	14.08	58	SW1-g20-07	0.1072	0.0039	0.0113	0.0002	0.149	88.4956	1.1747	0.0712	0.0025	0.566	0.00326	0.00004	101	4	72	1	66	1	70.2	1.0
Grain B-08	0.36	2.26	0.511736	0.000035	0.348429	0.000022	0.1094	0.0020	-17.43	0.68	-15.78	0.246	15.19	~~32~~	~~SW1-g20-08~~	~~0.0942~~	~~0.0028~~	~~0.0104~~	~~0.0001~~	~~0.135~~	~~95.8773~~	~~1.1598~~	~~0.0641~~	~~0.0019~~	~~0.234~~	~~0.00314~~	~~0.00004~~	~~91~~	~~3~~	~~67~~	~~1~~	~~63~~	~~1~~	~~65.5~~	~~0.9~~
Grain B-09	0.26	2.01	0.512008	0.000032	0.348423	0.000014	0.0874	0.0001	-12.13	0.63	-10.46	0.187	23.91	54	SW1-g20-09	0.0927	0.0040	0.0118	0.0002	0.131	84.8176	1.2230	0.0568	0.0024	0.204	0.00368	0.00004	89	4	76	1	74	1	74.7	1.1
Grain B-10	0.24	1.83	0.511988	0.000029	0.348416	0.000015	0.0878	0.0003	-12.52	0.57	-10.85	0.188	23.65	58	SW1-g20-10	0.0999	0.0038	0.0117	0.0002	0.028	85.6164	1.2461	0.0647	0.0025	0.335	0.00378	0.00004	95	3	75	1	76	1	73.2	1.1
Grain B-11	0.25	1.87	0.511966	0.000030	0.348411	0.000015	0.0899	0.0004	-12.95	0.59	-11.28	0.195	22.29	40	SW1-g20-11	0.0910	0.0039	0.0121	0.0002	0.048	82.3723	1.1874	0.0544	0.0023	0.261	0.00379	0.00005	87	4	78	1	76	1	77.1	1.1
Grain B-12	0.25	1.62	0.511776	0.000026	0.348419	0.000013	0.1064	0.0009	-16.65	0.59	-15.00	0.253	15.10	32	SW1-g20-12	0.0948	0.0032	0.0124	0.0002	0.002	80.3859	1.0016	0.0555	0.0019	0.252	0.00379	0.00005	94	3	80	1	76	1	78.9	1.0
Grain B-13	0.31	1.84	0.511764	0.000035	0.348414	0.000016	0.1116	0.0015	-16.89	0.68	-15.24	0.221	14.09	17	SW1-g20-13	0.0834	0.0027	0.0118	0.0001	-0.143	84.6024	1.0378	0.0509	0.0016	0.073	0.00357	0.00005	81	3	76	1	72	1	75.4	0.9
Grain B-14	0.31	1.90	0.511806	0.000026	0.348435	0.000017	0.1120	0.0019	-16.07	0.51	-14.42	0.221	14.31	57	SW1-g20-14	0.1044	0.0036	0.0121	0.0001	0.028	82.5764	0.9887	0.0623	0.0021	0.170	0.00364	0.00004	100	3	78	1	74	1	76.1	0.9
Grain B-15	0.33	2.10	0.511771	0.000024	0.348432	0.000017	0.1068	0.0014	-16.75	0.47	-15.10	0.248	14.84	24	SW1-g20-15	0.0773	0.0035	0.0118	0.0002	0.199	84.8176	1.3669	0.0490	0.0022	0.058	0.00371	0.00005	75	3	76	1	75	1	75.4	1.2
Grain B-16	0.26	2.03	0.511959	0.000034	0.348428	0.000014	0.0867	0.0001	-13.08	0.66	-11.41	0.188	24.20	49	SW1-g20-16	0.0802	0.0045	0.0119	0.0002	0.092	84.0336	1.4476	0.0513	0.0029	0.275	0.00381	0.00005	77	4	76	1	77	1	75.9	1.3
Grain B-17	0.23	1.84	0.511967	0.000031	0.348422	0.000015	0.0851	0.0002	-12.93	0.61	-11.25	0.189	25.41	58	SW1-g20-17	0.1029	0.0047	0.0120	0.0002	0.089	83.6120	1.3632	0.0674	0.0031	0.278	0.00369	0.00005	97	4	77	1	74	1	74.7	1.3
Grain B-18	0.23	1.84	0.511977	0.000030	0.348425	0.000019	0.0860	0.0004	-12.73	0.59	-11.06	0.188	24.79	58	SW1-g20-18	0.1087	0.0048	0.0119	0.0002	0.107	84.0336	1.3417	0.0648	0.0029	0.218	0.00364	0.00005	102	4	76	1	74	1	76.1	1.2
Grain B-19	0.26	1.82	0.511910	0.000026	0.348408	0.000016	0.0961	0.0005	-14.04	0.51	-12.38	0.235	18.63	53	SW1-g20-19	0.0830	0.0024	0.0116	0.0001	-0.039	85.9845	1.0351	0.0517	0.0015	0.348	0.00372	0.00005	80	2	75	1	75	1	74.1	0.9
Grain B-20	0.34	1.78	0.511763	0.000024	0.348408	0.000015	0.1367	0.0025	-16.91	0.47	-15.28	0.117	10.94	46	SW1-g20-20	0.0809	0.0022	0.0118	0.0001	0.011	84.5309	0.8932	0.0494	0.0013	0.220	0.00363	0.00004	78	2	76	1	73	1	75.6	0.8
Grain B-21	0.34	1.74	0.511770	0.000024	0.348412	0.000016	0.1351	0.0042	-16.77	0.46	-15.14	0.125	12.36	~~17~~	~~SW1-g20-21~~	~~0.0680~~	~~0.0025~~	~~0.0098~~	~~0.0001~~	~~0.096~~	~~101.9368~~	~~1.3508~~	~~0.0511~~	~~0.0019~~	~~0.217~~	~~0.00305~~	~~0.00004~~	~~67~~	~~2~~	~~63~~	~~1~~	~~62~~	~~1~~	~~62.6~~	~~0.8~~
Grain B-22	0.33	2.00	0.511765	0.000035	0.348430	0.000015	0.1121	0.0021	-16.87	0.68	-15.22	0.225	14.21	26	SW1-g20-22	0.0925	0.0034	0.0116	0.0001	0.175	86.0585	1.0739	0.0570	0.0020	0.100	0.00362	0.00004	89	3	75	1	73	1	73.6	1.0
Grain B-23	0.23	1.67	0.511858	0.000038	0.348433	0.000018	0.0938	0.0013	-15.05	0.74	-13.39	0.215	20.23	43	SW1-g20-23	0.0791	0.0038	0.0122	0.0002	0.043	81.6994	1.2348	0.0472	0.0023	0.251	0.00374	0.00005	76	4	78	1	76	1	78.5	1.2
Grain B-24	0.30	2.39	0.511963	0.000039	0.348415	0.000014	0.0865	0.0008	-13.00	0.76	-11.33	0.198	24.48	24	SW1-g20-24	0.0810	0.0043	0.0120	0.0002	-0.036	83.0565	1.4142	0.0488	0.0030	0.313	0.00357	0.00006	78	4	77	1	72	1	77.0	1.3
Grain B-25	0.25	1.95	0.511948	0.000033	0.348434	0.000016	0.0898	0.0010	-13.30	0.64	-11.63	0.207	22.21	42	SW1-g20-25	0.0943	0.0038	0.0122	0.0002	-0.068	81.8331	1.1049	0.0568	0.0023	0.318	0.00365	0.00005	90	4	78	1	74	1	77.4	1.1
Grain B-26	0.26	1.97	0.511918	0.000030	0.348430	0.000017	0.0899	0.0013	-13.88	0.66	-12.21	0.194	22.12	38	SW1-g20-26	0.1040	0.0060	0.0115	0.0002	-0.106	87.1080	1.5914	0.0708	0.0044	0.528	0.00348	0.00005	97	6	74	1	70	1	76.1	1.4
Grain B-27	0.26	2.04	0.511951	0.000033	0.348422	0.000016	0.0925	0.0023	-13.24	0.64	-11.57	0.194	21.47	~~21~~	~~SW1-g20-27~~	~~0.2090~~	~~0.0150~~	~~0.0124~~	~~0.0003~~	~~0.276~~	~~80.8407~~	~~2.2220~~	~~0.1280~~	~~0.0090~~	~~0.350~~	~~0.00364~~	~~0.00006~~	~~182~~	~~12~~	~~79~~	~~2~~	~~73~~	~~1~~	~~71.4~~	~~2.2~~
Grain B-28	0.23	1.37	0.511733	0.000034	0.348444	0.000019	0.1108	0.0005	-17.49	0.66	-15.84	0.216	14.24	17	SW1-g20-28	0.0992	0.0031	0.0117	0.0002	0.037	85.3242	1.1648	0.0611	0.0020	0.321	0.00375	0.00005	96	3	75	1	76	1	73.8	1.0
Grain B-29	0.25	1.75	0.511803	0.000029	0.348410	0.000016	0.1068	0.0030	-16.13	0.57	-14.47	0.186	16.26	58	SW1-g20-30	0.0753	0.0024	0.0113	0.0001	0.041	88.6525	1.0610	0.0483	0.0016	0.212	0.00354	0.00004	73	2	72	1	71	1	72.1	0.9
Grain B-30	0.25	1.74	0.511952	0.000031	0.348421	0.000017	0.0853	0.0004	-13.22	0.61	-11.55	0.208	26.09	~~58~~	~~SW1-g20-31~~	~~0.1170~~	~~0.0055~~	~~0.0112~~	~~0.0002~~	~~-0.077~~	~~89.6057~~	~~1.6861~~	~~0.0822~~	~~0.0041~~	~~0.471~~	~~0.00320~~	~~0.00004~~	~~109~~	~~5~~	~~72~~	~~1~~	~~65~~	~~1~~	~~68.4~~	~~1.4~~
Grain B-31	0.25	1.72	0.511872	0.000033	0.348433	0.000023	0.0929	0.0025	-14.78	0.61	-13.11	0.213	21.10	34	SW1-g20-32	0.1063	0.0035	0.0122	0.0002	0.147	81.6994	1.2348	0.0634	0.0021	0.247	0.00390	0.00007	103	3	78	1	79	1	76.8	1.2
Grain B-32	0.25	1.71	0.511716	0.000061	0.348420	0.000031	0.1121	0.0008	-17.82	1.19	-16.18	0.271	14.09	25	SW1-g20-33	0.0871	0.0026	0.0112	0.0001	0.019	89.2061	1.0743	0.0562	0.0017	0.301	0.00357	0.00005	84	2	72	1	72	1	71.1	0.9
Grain B-33	0.25	1.70	0.511777	0.000050	0.348428	0.000024	0.1092	0.0028	-16.63	0.98	-14.98	0.226	15.26	38	SW1-g20-34	0.1040	0.0037	0.0119	0.0002	0.212	84.0336	1.0592	0.0641	0.0023	0.092	0.00379	0.00005	100	3	76	1	77	1	74.7	1.0
Grain B-34	0.24	1.69	0.511800	0.000035	0.348403	0.000016	0.1106	0.0020	-16.18	0.68	-14.54	0.214	14.55	46	SW1-g20-35	0.0741	0.0025	0.0116	0.0001	0.072	86.4304	1.0832	0.0469	0.0016	0.216	0.00355	0.00004	72	2	74	1	72	1	74.2	1.0
Grain B-35	0.24	1.67	0.511798	0.000030	0.348425	0.000014	0.1300	0.0033	-16.22	0.59	-14.59	0.157	12.32	41	SW1-g20-36	0.0784	0.0021	0.0115	0.0001	-0.019	86.8810	0.9435	0.0496	0.0013	0.389	0.00361	0.00004	76	2	74	1	73	1	73.6	0.8
Grain B-36	0.24	1.66	0.511726	0.000036	0.348406	0.000015	0.1368	0.0077	-17.63	0.70	-16.00	0.144	11.46	34	SW1-g20-37	0.0784	0.0017	0.0109	0.0001	0.052	91.5751	0.9225	0.0528	0.0011	0.239	0.00348	0.00004	76	2	70	1	70	1	69.5	0.7
Grain B-37	0.24	1.65	0.511737	0.000029	0.348431	0.000020	0.1280	0.0055	-17.41	0.57	-15.78	0.162	11.97	38	SW1-g20-38	0.0893	0.0025	0.0117	0.0001	0.208	85.7633	0.9930	0.0561	0.0015	0.098	0.00355	0.00004	86	2	75	1	72	1	73.9	0.9
Grain B-38	0.23	1.61	0.511734	0.000038	0.348419	0.000021	0.1076	0.0010	-17.47	0.74	-15.82	0.255	14.44	42	SW1-g20-41	0.0851	0.0021	0.0116	0.0001	0.036	86.3558	0.9322	0.0536	0.0013	0.229	0.00356	0.00004	83	2	74	1	72	1	73.6	0.8
Grain B-39	0.23	1.60	0.511786	0.000038	0.348424	0.000018	0.1074	0.0004	-16.46	0.74	-14.81	0.252	14.33	38	SW1-g20-42	0.0860	0.0022	0.0115	0.0001	0.052	87.1840	0.9121	0.0549	0.0014	0.212	0.00349	0.00004	83	2	74	1	70	1	72.8	0.8
Grain B-40	0.23	1.58	0.511763	0.000050	0.348471	0.000025	0.1068	0.0005	-16.91	0.98	-15.25	0.273	14.37	59	SW1-g20-43	0.1788	0.0042	0.0146	0.0002	-0.028	68.6813	0.7783	0.0910	0.0021	0.365	0.00434	0.00006	167	4	93	1	88	1	88.1	1.1
Grain C-01	0.20	1.44	0.511787	0.000031	0.348428	0.000019	0.0978	0.0029	-16.45	0.61	-14.79	0.260	19.20	62	SW1-g21-02	0.0566	0.0022	0.0099	0.0002	0.088	100.8065	2.0324	0.0558	0.0018	0.361	0.00303	0.00006	56	2	64	1	61	1	62.9	1.3
Grain C-02	0.23	1.96	0.511799	0.000025	0.348412	0.000010	0.0887	0.0050	-16.20	0.49	-14.54	0.252	24.40	59	SW1-g21-03	0.1550	0.0065	0.0129	0.0002	0.123	77.8210	1.3929	0.0888	0.0040	0.089	0.00372	0.00004	140	6	82	1	75	1	78.0	1.5
Grain C-03	0.26	2.08	0.511787	0.000020	0.348411	0.000014	0.0832	0.0017	-16.44	0.39	-14.76	0.268	23.90	59	SW1-g21-04	0.1725	0.0037	0.0121	0.0001	0.130	82.5083	0.8850	0.1034	0.0021	0.250	0.00388	0.00005	161	3	78	1	78	1	72.1	0.9
Grain C-04	0.23	1.78	0.511781	0.000031	0.348428	0.000015	0.0871	0.0002	-16.56	0.61	-14.89	0.246	21.96	59	SW1-g21-05	0.0792	0.0019	0.0115	0.0001	0.069	87.2600	0.9137	0.0501	0.0012	0.223	0.00366	0.00004	77	2	73	1	74	1	73.2	0.8
Grain C-05	0.22	1.68	0.511777	0.000039	0.348425	0.000021	0.0889	0.0003	-16.63	0.76	-14.96	0.215	21.17	31	SW1-g21-06	0.0921	0.0025	0.0112	0.0001	0.137	88.9680	1.0686	0.0604	0.0016	0.193	0.00350	0.00005	90	2	72	1	71	1	70.9	0.9
Grain C-06	0.14	1.44	0.511797	0.000038	0.348434	0.000015	0.0651	0.0001	-16.24	0.74	-14.55	0.315	43.52	43	SW1-g21-07	0.5010	0.0190	0.0156	0.0003	0.078	63.9795	1.3713	0.2500	0.0100	0.574	0.00391	0.00008	399	13	100	2	79	2	74.3	2.2
Grain C-07	0.18	1.86	0.511775	0.000025	0.348428	0.000016	0.0660	0.0003	-16.67	0.49	-14.98	0.311	41.11	59	SW1-g21-08	0.1670	0.0080	0.0122	0.0003	0.034	82.1018	1.6852	0.1110	0.0060	0.377	0.00384	0.00006	147	7	78	2	77	1	71.7	1.6
Grain C-08	0.24	1.80	0.511772	0.000036	0.348414	0.000020	0.0952	0.0042	-16.73	0.70	-15.07	0.223	20.80	59	SW1-g21-09	0.1239	0.0045	0.0123	0.0002	0.109	81.0373	1.1492	0.0711	0.0026	0.318	0.00362	0.00004	116	4	79	1	73	1	76.7	1.1
Grain C-09	0.22	1.40	0.511784	0.000030	0.348426	0.000015	0.1063	0.0004	-16.50	0.59	-14.84	0.239	15.13	29	SW1-g21-10	0.1201	0.0038	0.0123	0.0001	0.461	81.4996	0.9299	0.0703	0.0020	-0.160	0.00375	0.00005	115	3	79	1	76	1	76.3	0.9
Grain C-10	0.20	1.65	0.511801	0.000036	0.348409	0.000017	0.0838	0.0033	-16.17	0.70	-14.49	0.238	26.30	30	SW1-g21-11.	0.1140	0.0080	0.0123	0.0003	0.070	81.4996	1.8930	0.0760	0.0055	0.495	0.00385	0.00005	104	7	79	2	78	1	75.8	1.8
Grain C-11	0.26	1.81	0.511792	0.000023	0.348409	0.000013	0.0964	0.0011	-16.34	0.45	-14.68	0.268	18.07	55	SW1-g21-12	0.0886	0.0025	0.0113	0.0001	0.159	88.3392	1.0145	0.0567	0.0015	0.130	0.00361	0.00004	85	2	73	1	73	1	71.7	0.8
Grain C-12	0.23	1.73	0.511790	0.000023	0.348407	0.000018	0.0899	0.0015	-16.38	0.45	-14.71	0.285	20.43	59	SW1-g21-13	0.0787	0.0019	0.0113	0.0001	0.057	88.4956	0.9789	0.0500	0.0012	0.265	0.00371	0.00005	76	2	72	1	75	1	72.2	0.8
Grain C-13	0.22	1.70	0.511761	0.000030	0.348433	0.000016	0.0879	0.0002	-16.95	0.59	-15.28	0.245	21.66	59	SW1-g21-14	0.0772	0.0020	0.0111	0.0001	0.058	89.7666	0.9267	0.0515	0.0013	0.259	0.00368	0.00005	76	2	71	1	74	1	71.0	0.8
Grain C-14	0.13	1.32	0.511800	0.000025	0.348415	0.000018	0.0662	0.0002	-16.18	0.49	-14.50	0.313	41.21	38	SW1-g21-15	0.2400	0.0140	0.0122	0.0003	-0.015	81.8331	2.2434	0.2060	0.0180	0.992	0.00366	0.00008	205	11	78	2	74	1	62.5	2.1
Grain C-15	0.19	1.78	0.511800	0.000030	0.348412	0.000014	0.0782	0.0044	-16.18	0.59	-14.51	0.267	31.40	46	SW1-g21-16	0.1710	0.0085	0.0127	0.0002	0.127	78.6164	1.5142	0.1110	0.0060	0.424	0.00363	0.00005	154	7	82	2	73	1	74.9	1.6
Grain C-16	0.25	1.61	0.511802	0.000037	0.348418	0.000018	0.1072	0.0016	-16.15	0.72	-14.49	0.205	15.29	59	SW1-g21-17	0.1012	0.0025	0.0129	0.0001	0.075	77.2798	0.8062	0.0578	0.0014	0.184	0.00396	0.00005	97	2	83	1	80	1	81.8	0.9
Grain C-17	0.19	1.29	0.511807	0.000035	0.348421	0.000018	0.0990	0.0026	-16.05	0.68	-14.39	0.208	18.40	47	SW1-g21-18	0.1710	0.0060	0.0158	0.0002	-0.034	63.3312	0.9024	0.0815	0.0029	0.323	0.00497	0.00007	157	5	101	1	100	1	96.7	1.5
Grain C-18	0.18	1.23	0.511783	0.000037	0.348431	0.000020	0.0999	0.0020	-16.52	0.72	-14.86	0.227	17.65	59	SW1-g21-19	0.1294	0.0039	0.0141	0.0002	0.083	71.0227	0.8575	0.0694	0.0021	0.262	0.00448	0.00006	122	3	90	1	90	1	87.7	1.1
Grain C-19	0.22	1.56	0.511743	0.000032	0.348418	0.000026	0.0961	0.0014	-17.30	0.63	-15.63	0.242	18.44	46	SW1-g21-20	0.1102	0.0041	0.0130	0.0002	0.161	77.2201	1.0137	0.0610	0.0022	0.161	0.00409	0.00006	105	4	83	1	82	1	81.5	1.1
Grain C-20	0.21	1.60	0.511787	0.000026	0.348420	0.000014	0.0903	0.0014	-16.44	0.51	-14.77	0.222	21.77	54	SW1-g21-21	0.1145	0.0037	0.0113	0.0001	0.043	88.7311	1.1023	0.0744	0.0024	0.270	0.00385	0.00005	109	3	72	1	78	1	69.8	0.9
Grain C-21	0.22	1.71	0.511802	0.000034	0.348412	0.000015	0.0869	0.0003	-16.15	0.66	-14.48	0.257	22.20	59	SW1-g21-22	0.0995	0.0027	0.0113	0.0001	0.187	88.8100	0.9859	0.0640	0.0017	0.142	0.00368	0.00005	95	2	72	1	74	1	70.7	0.8
Grain C-22	0.18	1.83	0.511771	0.000032	0.348418	0.000015	0.0679	0.0006	-16.75	0.63	-15.06	0.307	38.84	46	SW1-g21-23	0.2290	0.0100	0.0127	0.0003	0.033	78.9889	1.6534	0.1480	0.0075	0.547	0.00394	0.00006	201	8	81	2	80	1	70.7	1.7
Grain C-23	0.27	2.22	0.511824	0.000026	0.348398	0.000015	0.0891	0.0056	-15.72	0.51	-14.05	0.226	24.20	59	SW1-g21-24	0.0891	0.0035	0.0115	0.0002	-0.035	86.9565	1.2098	0.0584	0.0023	0.326	0.00368	0.00004	85	3	74	1	74	1	72.7	1.0
Grain C-24	0.14	0.88	0.511802	0.000036	0.348435	0.000032	0.1094	0.0017	-16.15	0.70	-14.50	0.232	15.40	50	SW1-g21-25	0.2130	0.0060	0.0140	0.0002	0.205	71.6846	0.8736	0.1158	0.0033	0.125	0.00419	0.00006	192	5	89	1	85	1	81.6	1.1
Grain C-25	0.32	2.10	0.511800	0.000028	0.348426	0.000019	0.1058	0.0011	-16.18	0.55	-14.53	0.204	16.00	55	SW1-g21-26	0.1880	0.0070	0.0125	0.0002	0.188	79.9361	1.1821	0.1085	0.0039	0.261	0.00370	0.00004	170	6	80	1	75	1	73.9	1.2
Grain C-26	0.06	0.39	0.511755	0.000045	0.348409	0.000034	0.0979	0.0020	-17.06	0.88	-15.40	0.242	20.25	13	SW1-g21-27	0.1080	0.0070	0.0112	0.0002	-0.053	89.6057	1.6058	0.0728	0.0046	0.349	0.00360	0.00006	102	6	72	1	73	1	69.2	1.3
Grain C-27	0.27	2.02	0.511787	0.000026	0.348424	0.000015	0.0889	0.0027	-16.44	0.51	-14.77	0.204	23.20	55	SW1-g21-28	0.0824	0.0042	0.0123	0.0002	0.016	81.5661	1.2973	0.0490	0.0026	0.342	0.00363	0.00004	78	4	79	1	73	1	78.4	1.3
Grain C-28	0.23	1.87	0.511782	0.000025	0.348417	0.000013	0.0847	0.0035	-16.54	0.49	-14.86	0.226	25.90	59	SW1-g21-29	0.1161	0.0050	0.0120	0.0002	0.101	83.1947	1.3151	0.0740	0.0034	0.489	0.00369	0.00004	108	5	77	1	74	1	74.4	1.2
Grain C-29	0.20	1.26	0.511746	0.000040	0.348436	0.000030	0.1082	0.0005	-17.24	0.78	-15.59	0.184	15.53	17	SW1-g21-30	0.0909	0.0025	0.0124	0.0002	0.082	80.9062	0.9819	0.0539	0.0014	0.210	0.00379	0.00005	89	2	79	1	76	1	78.6	1.0
Grain C-30	0.18	1.76	0.511793	0.000032	0.348418	0.000021	0.0747	0.0039	-16.32	0.63	-14.64	0.265	33.30	55	SW1-g21-31	0.1720	0.0090	0.0127	0.0003	0.102	78.5546	1.5736	0.1060	0.0060	0.498	0.00362	0.00005	151	8	82	2	73	1	75.5	1.7
Grain C-31	0.15	1.60	0.511789	0.000034	0.348431	0.000015	0.0658	0.0007	-16.40	0.66	-14.71	0.309	41.60	25	SW1-g21-32	0.2770	0.0215	0.0133	0.0005	0.128	74.9625	2.6130	0.1640	0.0135	0.035	0.00397	0.00011	230	17	85	3	80	2	72.8	3.0
Grain C-32	0.10	1.03	0.511809	0.000041	0.348403	0.000016	0.0643	0.0001	-16.01	0.80	-14.32	0.313	45.15	21	SW1-g21-33	1.2540	0.0500	0.0219	0.0007	0.085	45.6621	1.3553	0.4560	0.0245	0.752	0.00410	0.00014	808	23	140	4	83	3	67.1	4.2
Grain C-33	0.16	1.67	0.511778	0.000027	0.348414	0.000012	0.0641	0.0002	-16.61	0.53	-14.92	0.306	45.18	50	SW1-g21-34	0.1480	0.0090	0.0117	0.0003	0.023	85.1789	2.0678	0.1220	0.0090	0.904	0.00379	0.00006	130	8	75	2	76	1	68.1	1.9
Grain C-34	0.17	1.66	0.511780	0.000027	0.348416	0.000017	0.0740	0.0036	-16.58	0.53	-14.89	0.246	35.00	59	SW1-g21-35	0.1280	0.0075	0.0119	0.0003	-0.017	84.0336	1.9066	0.1020	0.0070	0.497	0.00374	0.00005	115	7	76	2	76	1	71.0	1.7
Grain C-35	0.26	1.78	0.511768	0.000033	0.348418	0.000021	0.1028	0.0032	-16.81	0.64	-15.15	0.193	17.40	59	SW1-g21-36	0.1750	0.0065	0.0123	0.0002	0.176	81.4332	1.2268	0.1016	0.0038	0.270	0.00376	0.00004	158	6	79	1	76	1	73.3	1.2
Grain C-36	0.24	1.76	0.511772	0.000029	0.348427	0.000020	0.0993	0.0034	-16.73	0.57	-15.07	0.222	18.00	25	SW1-g21-37	0.1000	0.0065	0.0112	0.0003	-0.029	89.1266	1.9859	0.0689	0.0044	0.296	0.00358	0.00005	95	6	72	2	72	1	70.0	1.6
Grain C-37	0.18	1.70	0.511798	0.000027	0.348408	0.000014	0.0756	0.0034	-16.22	0.53	-14.54	0.249	33.00	55	SW1-g21-38	0.2660	0.0120	0.0129	0.0003	0.166	77.7001	1.6301	0.1850	0.0100	0.993	0.00372	0.00005	231	10	82	2	75	1	68.0	1.7
Grain C-38	0.17	1.63	0.511793	0.000028	0.348418	0.000021	0.0711	0.0029	-16.32	0.55	-14.64	0.257	37.30	50	SW1-g21-39	0.1380	0.0085	0.0116	0.0003	0.140	86.4304	1.9796	0.1160	0.0090	0.800	0.00363	0.00005	123	8	74	2	73	1	67.7	1.7
Grain C-39	0.23	1.81	0.511785	0.000030	0.348413	0.000016	0.0911	0.0057	-16.48	0.59	-14.81	0.206	24.40	55	SW1-g21-40	0.1570	0.0070	0.0122	0.0002	0.067	81.6994	1.4017	0.0995	0.0049	0.445	0.00374	0.00004	143	6	78	1	75	1	73.2	1.4
Grain C-40	0.31	1.91	0.511784	0.000024	0.348424	0.000013	0.1110	0.0011	-16.50	0.47	-14.85	0.200	14.68	55	SW1-g21-41	0.0941	0.0041	0.0113	0.0002	0.029	88.5740	1.2945	0.0606	0.0027	0.436	0.00359	0.00004	90	4	72	1	73	1	71.2	1.1
Grain C-41	0.24	1.48	0.511737	0.000043	0.348431	0.000019	0.1104	0.0013	-17.41	0.84	-15.76	0.210	14.27	38	SW1-g21-42	0.0885	0.0033	0.0119	0.0002	0.024	84.3170	1.1375	0.0541	0.0020	0.252	0.00369	0.00004	85	3	76	1	74	1	75.4	1.0
Grain C-42	0.27	1.75	0.511778	0.000023	0.348409	0.000019	0.1074	0.0005	-16.61	0.45	-14.96	0.238	14.92	46	SW1-g21-43	0.0832	0.0025	0.0116	0.0001	0.083	86.5052	0.9728	0.0523	0.0016	0.255	0.00355	0.00004	81	2	74	1	72	1	73.6	0.9
Grain C-43	0.29	1.79	0.511792	0.000021	0.348415	0.000010	0.1092	0.0015	-16.34	0.41	-14.69	0.221	14.90	55	SW1-g21-44	0.0833	0.0029	0.0117	0.0002	-0.002	85.3242	1.1284	0.0515	0.0018	0.400	0.00366	0.00004	80	3	75	1	74	1	74.7	1.0
Grain C-44	0.27	1.71	0.511775	0.000026	0.348414	0.000015	0.1095	0.0016	-16.67	0.51	-15.02	0.233	14.54	59	SW1-g21-45	0.0880	0.0029	0.0121	0.0002	0.084	82.9876	1.0330	0.0546	0.0018	0.220	0.00368	0.00004	85	3	77	1	74	1	76.5	1.0
Grain C-45	0.31	2.08	0.511758	0.000025	0.348443	0.000020	0.1063	0.0008	-17.00	0.49	-15.35	0.258	15.09	42	SW1-g21-46	0.1021	0.0032	0.0116	0.0001	0.246	86.1326	1.0386	0.0637	0.0019	0.066	0.00363	0.00004	98	3	75	1	73	1	72.9	0.9

[1]εNd is determined using the CHUR parameters of Bouvier et al. (2008)

Table DR2. Lu-Hf and U-Pb isotope data for SW1 zircons

	$^{176}Hf/^{177}Hf$	2SE	$^{176}Lu/^{177}Hf$	2SE	$^{176}Yb/^{177}Hf$	2SE	$^{178}Hf/^{177}Hf$	2SE	$^{176}Hf/^{177}Hf(i)$	*eHf(t)*[1]	2SE	*eHf(73Ma)*[1]
SW1_b	0.282369	0.000021	0.000494	0.000034	0.012792	0.000947	1.467237	0.000031	0.282369	-13.1	0.8	-
SW1_13	0.282317	0.000028	0.000472	0.000012	0.015219	0.000217	1.467264	0.000035	0.282316	-15.1	1.0	-
SW1_83	0.282320	0.000019	0.000251	0.000005	0.006833	0.000175	1.467236	0.000035	0.282320	-14.9	0.7	-
SW1_h	0.282319	0.000031	0.000729	0.000068	0.018318	0.001727	1.467273	0.000050	0.282318	-15.0	1.1	-
SW1_76	0.282276	0.000030	0.000569	0.000013	0.016623	0.000338	1.467246	0.000043	0.282275	-16.4	1.1	-
SW1_f	0.282427	0.000021	0.001422	0.000134	0.034405	0.003241	1.467231	0.000039	0.282425	-11.1	0.8	-
SW1_74r	0.282347	0.000024	0.001386	0.000068	0.040932	0.001994	1.467247	0.000040	0.282346	-13.9	0.9	-
SW1_e	0.282378	0.000029	0.000651	0.000043	0.017868	0.001094	1.467250	0.000044	0.282377	-12.8	1.0	-
SW1_a	0.282314	0.000029	0.001003	0.000082	0.027416	0.002329	1.467264	0.000043	0.282312	-15.1	1.0	-
SW1_112	0.282273	0.000033	0.000848	0.000023	0.029242	0.000892	1.467237	0.000050	0.282272	-16.5	1.2	-
SW1_130	0.282357	0.000021	0.001338	0.000041	0.042354	0.001715	1.467217	0.000041	0.282356	-13.5	0.8	-
SW1_107	0.282326	0.000038	0.001128	0.000039	0.032918	0.000549	1.467276	0.000075	0.282324	-14.6	1.3	-
SW1_134	0.282418	0.000023	0.000945	0.000015	0.030901	0.000829	1.467240	0.000035	0.282417	-11.4	0.8	-
SW1_72	0.282311	0.000031	0.000629	0.000000	0.018356	0.000143	1.467279	0.000049	0.282298	6.9	1.1	-15.2
SW1_47c	0.282223	0.000030	0.000933	0.000016	0.023778	0.000241	1.467275	0.000051	0.282200	8.5	1.1	-18.3
SW1_58	0.281820	0.000023	0.000609	0.000007	0.019337	0.000371	1.467275	0.000038	0.281805	-5.4	0.8	-32.6
SW1_195	0.281844	0.000029	0.000650	0.000052	0.018807	0.001492	1.467278	0.000037	0.281825	-0.1	1.0	-31.7
SW1_25	0.281888	0.000034	0.000806	0.000025	0.026212	0.001139	1.467291	0.000054	0.281864	2.3	1.2	-30.1
SW1_d	0.282163	0.000025	0.000533	0.000035	0.013218	0.000998	1.467248	0.000040	0.282148	12.7	0.9	-20.4
SW1_j	0.281851	0.000021	0.000538	0.000057	0.014294	0.001453	1.467252	0.000037	0.281834	1.8	0.8	-31.5
SW1_g	0.282033	0.000034	0.000686	0.000018	0.017708	0.000401	1.467241	0.000033	0.282012	9.5	1.2	-25.0
SW1_33	0.282090	0.000030	0.001066	0.000027	0.031751	0.000529	1.467181	0.000046	0.282057	11.3	1.1	-23.0
SW1_61	0.281829	0.000029	0.000814	0.000028	0.025112	0.001273	1.467236	0.000041	0.281804	2.4	1.0	-32.2
SW1_74c	0.282095	0.000031	0.000503	0.000032	0.015048	0.000942	1.467236	0.000045	0.282079	12.2	1.1	-22.8
SW1_18	0.281816	0.000029	0.000783	0.000014	0.026060	0.000238	1.467257	0.000052	0.281791	2.2	1.0	-32.7
SW1_81	0.281854	0.000027	0.001390	0.000032	0.036763	0.000670	1.467241	0.000032	0.281810	2.9	1.0	-31.4
SW1_184	0.281809	0.000023	0.000462	0.000011	0.012115	0.000276	1.467229	0.000039	0.281794	2.5	0.8	-32.9

	$^{207}Pb/^{235}U$	1SE	$^{206}Pb/^{238}U$	1SE	rho	$^{207}Pb/^{206}Pb$	1SE	$^{207}Pb/^{206}Pb$ age	1SE	$^{207}Pb/^{235}U$ age	1SE	$^{206}Pb/^{238}U$ age	1SE	207-corr age (Ma)	1SE	U (ppm)	Th (ppm)	Th/U
SW1_b	0.05624	11.78	0.0112	1.29	0.10946	0.03653	11.71	nd	291.4	55.6	6.4	71.6	0.9	72.6	0.9	120	106	0.89
SW1_13	0.04717	12.79	0.0105	0.94	0.07354	0.03257	12.76	nd	336.6	46.8	5.9	67.4	0.6	68.6	0.6	132	66	0.50
SW1_83	0.05708	15.04	0.0109	1.30	0.08622	0.03800	14.98	nd	357.3	56.4	8.3	69.8	0.9	70.7	0.9	66	49	0.75
SW1_h	no data	no data	0.0106	1.81	no data	nd	nd	nd	nd	nd	nd	68.2	1.2	70.4	1.2	19	21	1.11
SW1_76	0.06332	7.10	0.0111	1.01	0.14170	0.04142	7.03	nd	169.5	62.3	4.3	71.1	0.7	71.6	0.8	34	51	1.50
SW1_f	0.05979	5.78	0.0110	1.35	0.23273	0.03936	5.62	nd	140.4	59.0	3.3	70.6	0.9	71.4	1.0	224	79	0.35
SW1_74r	0.06203	6.27	0.0113	0.81	0.12907	0.03977	6.22	nd	153.9	61.1	3.7	72.5	0.6	73.2	0.6	103	128	1.24
SW1_e	0.05367	11.44	0.0112	1.26	0.10989	0.03473	11.37	nd	291.8	53.1	5.9	71.8	0.9	73.0	0.9	109	56	0.51
SW1_a	no data	no data	0.0110	2.13	no data	nd	nd	nd	nd	nd	nd	70.5	1.5	73.4	1.2	50	120	2.40
SW1_112	0.07265	4.54	0.0115	0.77	0.16899	0.04590	4.48	nd	104.7	71.2	3.1	73.6	0.6	73.7	0.6	144	147	1.02
SW1_130	0.07509	1.78	0.0116	0.67	0.37643	0.04688	1.65	nd	39.0	73.5	1.3	74.5	0.5	74.5	0.5	884	351	0.40
SW1_107	0.08113	9.94	0.0117	0.99	0.10001	0.05014	9.89	nd	214.8	79.2	7.6	75.2	0.7	75.0	0.8	82	96	1.17
SW1_134	0.07486	1.52	0.0118	0.66	0.43668	0.04615	1.37	nd	38.1	73.3	1.1	75.4	0.5	75.5	0.5	969	102	0.11
SW1_72	1.91459	1.50	0.1846	0.67	0.44529	0.07524	1.34	1074.9	26.7	1086.2	10.0	1091.8	6.7			40	26	0.66
SW1_47c	2.33417	0.95	0.2008	0.66	0.69115	0.08433	0.69	1300.1	13.4	1222.7	6.8	1179.4	7.1			116	51	0.44
SW1_58	1.88608	1.45	0.1620	0.66	0.45442	0.08446	1.29	1303.2	24.9	1076.2	9.7	967.6	5.9			56	67	1.19
SW1_195	3.23346	1.88	0.2502	1.32	0.70425	0.09372	1.33	1502.5	25.0	1465.2	14.7	1439.6	17.1			23	18	0.78
SW1_25	3.34982	0.87	0.2529	0.68	0.77379	0.09606	0.55	1549.0	10.3	1492.7	6.8	1453.5	8.8			187	143	0.77
SW1_d	3.71122	1.37	0.2781	1.15	0.83958	0.09680	0.74	1563.4	13.9	1573.8	11.0	1581.6	16.1			80	31	0.39
SW1_j	1.27340	1.42	0.0948	1.26	0.88652	0.09739	0.66	1574.8	12.2	833.9	8.1	584.0	7.0			390	85	0.22
SW1_g	3.93227	1.57	0.2836	1.16	0.73917	0.10057	1.05	1634.6	19.5	1620.3	12.8	1609.4	16.5			35	18	0.53
SW1_33	2.84766	0.86	0.2046	0.72	0.83554	0.10095	0.47	1641.7	8.7	1368.2	6.5	1199.9	7.8			211	101	0.48
SW1_61	3.84720	0.70	0.2759	0.68	0.96857	0.10115	0.18	1645.3	3.2	1602.7	5.7	1570.5	9.5			1244	689	0.55
SW1_74c	3.40024	0.76	0.2434	0.69	0.91404	0.10130	0.31	1648.1	5.7	1504.5	6.0	1404.6	8.8			653	45	0.07
SW1_18	3.90346	0.88	0.2783	0.68	0.76919	0.10174	0.56	1656.0	10.4	1614.4	7.1	1582.7	9.5			107	132	1.23
SW1_81	3.89076	0.70	0.2770	0.68	0.96094	0.10189	0.19	1658.8	3.6	1611.8	5.7	1576.0	9.5			779	127	0.16
SW1_184	4.40476	1.71	0.3123	1.42	0.83022	0.10229	0.95	1666.1	17.5	1713.2	14.2	1752.1	21.8			34	27	0.78

[1]εHf is determined using the CHUR parameters of Bouvier et al. (2008)

Table DR3. Whole rock major and trace element geochemistry.

Analyte	SW-1	Unit	Detection Limit
SiO2	73.06	%	0.01
Al2O3	15.36	%	0.01
Fe2O3(T)	1.89	%	0.01
MnO	0.03	%	0.001
MgO	0.29	%	0.01
CaO	1.72	%	0.01
Na2O	3.76	%	0.01
K2O	3.93	%	0.01
TiO2	0.136	%	0.001
P2O5	0.06	%	0.01
LOI	0.43	%	
Total	**100.7**	%	0.01
Sc	3	ppm	1
Be	3	ppm	1
V	8	ppm	5
Cr	260	ppm	20
Co	28	ppm	1
Ni	120	ppm	20
Cu	10	ppm	10
Zn	50	ppm	30
Ga	20	ppm	1
Ge	1.5	ppm	0.5
As	< 5	ppm	5
Rb	131	ppm	1
Sr	474	ppm	2
Y	21.4	ppm	0.5
Zr	169	ppm	1
Nb	23	ppm	0.2
Mo	5	ppm	2
Ag	0.6	ppm	0.5
In	< 0.1	ppm	0.1
Sn	5	ppm	1
Sb	< 0.2	ppm	0.2
Cs	3.4	ppm	0.1
Ba	1483	ppm	3
La	37.6	ppm	0.05
Ce	72.9	ppm	0.05
Pr	7.93	ppm	0.01
Nd	28.7	ppm	0.05
Sm	5.33	ppm	0.01
Eu	0.924	ppm	0.005
Gd	3.89	ppm	0.01
Tb	0.63	ppm	0.01
Dy	3.87	ppm	0.01
Ho	0.8	ppm	0.01
Er	2.37	ppm	0.01
Tm	0.367	ppm	0.005
Yb	2.43	ppm	0.01
Lu	0.368	ppm	0.002
Hf	4.4	ppm	0.1
Ta	5.43	ppm	0.01
W	295	ppm	0.5
Tl	0.57	ppm	0.05
Pb	35	ppm	5
Bi	0.4	ppm	0.1
Th	13.6	ppm	0.05
U	2.17	ppm	0.01
Sm (ppm)	5.08		
Nd (ppm)	28.86		
$^{147}Sm/^{144}Nd$	0.1064		
$^{143}Nd/^{144}Nd$	0.511778		
2SE	0.000007		
εNd_{73Ma}[1]	-15.8		
Eu/Eu*	0.61		
Ce/Gd	18.7		

[1]ε_{Nd} values calculated using CHUR values of Bouvier et al., (2008).

Table DR4. Sm-Nd and U-Pb isotope results for Trebilcock monazite

Analysis	^{147}Sm (V)	^{146}Nd (V)	measured ^{143}Nd/^{144}Nd	2SE	measured ^{145}Nd/^{144}Nd	2SE	^{147}Sm/^{144}Nd	2SE	Eu/Eu*	Ce/Gd
Treb_1	0.47	1.39	0.512581	0.000027	0.348436	0.000016	0.2248	0.0003	0.019	5.913
Treb_2	0.43	1.30	0.512544	0.000033	0.348382	0.000014	0.2250	0.0003	0.019	5.934
Treb_3	0.44	1.33	0.512578	0.000034	0.348398	0.000014	0.2240	0.0003	0.019	6.039
Treb_4	0.42	1.29	0.512506	0.000038	0.348403	0.000020	0.2243	0.0003	0.019	6.044
Treb_5	0.40	1.23	0.512563	0.000034	0.348413	0.000019	0.2232	0.0004	0.019	6.116
Treb_6	0.41	1.26	0.512548	0.000034	0.348383	0.000016	0.2239	0.0002	0.019	5.992
Treb_7	0.40	1.22	0.512570	0.000025	0.348384	0.000015	0.2237	0.0003	0.019	6.038
Treb_8	0.41	1.27	0.512533	0.000029	0.348435	0.000020	0.2202	0.0003	0.019	6.164
Treb_9	0.42	1.29	0.512562	0.000043	0.348425	0.000018	0.2230	0.0003	0.019	5.996
Treb_10	0.40	1.24	0.512540	0.000031	0.348430	0.000021	0.2195	0.0003	0.019	6.150
Treb_11	0.41	1.28	0.512544	0.000021	0.348447	0.000018	0.2192	0.0002	0.019	6.136
Treb_12	0.37	1.13	0.512555	0.000036	0.348434	0.000017	0.2212	0.0004	0.019	6.042
Treb_13	0.57	1.73	0.512547	0.000033	0.348459	0.000027	0.2221	0.0001	0.019	5.893
Treb_14	0.41	1.25	0.512527	0.000032	0.348425	0.000020	0.2218	0.0005	0.019	5.985
Treb_15	0.39	1.18	0.512538	0.000032	0.348439	0.000023	0.2204	0.0004	0.019	6.030
Treb_16	0.37	1.14	0.512564	0.000034	0.348442	0.000018	0.2205	0.0004	0.019	6.023
Treb_17	0.41	1.25	0.512535	0.000044	0.348430	0.000013	0.2210	0.0002	0.019	5.883
Treb_18	0.35	1.09	0.512515	0.000031	0.348463	0.000015	0.2201	0.0005	0.019	6.023
Treb_19	0.35	1.10	0.512530	0.000028	0.348449	0.000016	0.2164	0.0003	0.019	6.156
Treb_20	0.35	1.07	0.512543	0.000034	0.348459	0.000024	0.2201	0.0004	0.019	5.940
Treb_21	0.32	1.00	0.512556	0.000032	0.348433	0.000018	0.2189	0.0005	0.019	6.004
Treb_22	0.36	1.11	0.512505	0.000024	0.348439	0.000015	0.2169	0.0004	0.019	5.996
Treb_23	0.37	1.15	0.512558	0.000031	0.348441	0.000017	0.2172	0.0002	0.019	5.973
Treb_1	0.53	1.59	0.512526	0.000045	0.348445	0.000022	0.2257	0.0002	0.019	5.657
Treb_2	0.46	1.43	0.512528	0.000030	0.348452	0.000015	0.2223	0.0003	0.019	5.899
Treb_3	0.51	1.56	0.512569	0.000040	0.348437	0.000020	0.2224	0.0003	0.019	5.870
Treb_4	0.48	1.47	0.512555	0.000028	0.348437	0.000018	0.2222	0.0003	0.019	5.891
Treb_5	0.50	1.53	0.512561	0.000030	0.348440	0.000018	0.2212	0.0004	0.019	5.913
Treb_6	0.46	1.39	0.512520	0.000035	0.348444	0.000020	0.2245	0.0005	0.019	5.777
Treb_7	0.47	1.43	0.512564	0.000042	0.348428	0.000019	0.2244	0.0003	0.019	5.769
Treb_8	0.45	1.38	0.512553	0.000031	0.348445	0.000014	0.2247	0.0004	0.019	5.703
Treb_9	0.47	1.42	0.512544	0.000039	0.348437	0.000018	0.2247	0.0005	0.019	5.716
Treb_10	0.41	1.25	0.512528	0.000027	0.348420	0.000022	0.2252	0.0004	0.019	5.641
Treb_11	0.47	1.43	0.512539	0.000035	0.348433	0.000015	0.2255	0.0005	0.019	5.632
Treb_12	0.46	1.39	0.512535	0.000022	0.348427	0.000013	0.2259	0.0003	0.019	5.541
Treb_13	0.43	1.30	0.512512	0.000038	0.348443	0.000021	0.2258	0.0004	0.019	5.581
Treb_14	0.42	1.31	0.512514	0.000031	0.348427	0.000017	0.2214	0.0004	0.019	5.869
Treb_15	0.44	1.37	0.512550	0.000029	0.348436	0.000018	0.2225	0.0003	0.019	5.725
Treb_16	0.46	1.42	0.512564	0.000030	0.348425	0.000017	0.2251	0.0004	0.019	5.625
Treb_17	0.42	1.31	0.512556	0.000027	0.348439	0.000020	0.2210	0.0003	0.019	5.864
Treb_18	0.46	1.43	0.512555	0.000027	0.348430	0.000013	0.2232	0.0007	0.019	5.737
Treb_19	0.43	1.33	0.512556	0.000030	0.348451	0.000016	0.2216	0.0003	0.019	5.819
Treb_20	0.41	1.26	0.512541	0.000031	0.348439	0.000020	0.2214	0.0004	0.019	5.804
Treb_21	0.45	1.36	0.512523	0.000032	0.348431	0.000018	0.2258	0.0005	0.019	5.631
Treb_22	0.44	1.37	0.512549	0.000037	0.348424	0.000014	0.2214	0.0004	0.019	5.783
Treb_23	0.47	1.42	0.512510	0.000033	0.348452	0.000017	0.2243	0.0013	0.019	5.570
Treb_24	0.55	1.71	0.512537	0.000033	0.348453	0.000018	0.2214	0.0001	0.019	5.769
Treb_25	0.42	1.28	0.512554	0.000038	0.348441	0.000019	0.2231	0.0011	0.019	5.710
Treb_26	0.46	1.41	0.512518	0.000038	0.348434	0.000016	0.2257	0.0005	0.019	5.578
Treb_27	0.46	1.42	0.512582	0.000037	0.348432	0.000016	0.2254	0.0003	0.018	5.567
Treb_28	0.44	1.34	0.512527	0.000037	0.348440	0.000016	0.2255	0.0004	0.019	5.582
Treb_29	0.47	1.43	0.512545	0.000033	0.348435	0.000011	0.2260	0.0003	0.018	5.514

Table DR4. Sm-Nd and U-Pb isotope results for Mae Klang monazite

Analysis	^{147}Sm (V)	^{146}Nd (V)	^{143}Nd/^{144}Nd	2SE	^{145}Nd/^{144}Nd	2SE	^{147}Sm/^{144}Nd	2SE	εNd_{0Ma}[1]	2SE	εNd_{27Ma}[1]	Eu/Eu*	Ce/Gd
28-Apr													
Thai_1	0.15	1.18	***0.512640***	***0.000031***	0.348435	0.000017	0.0892	0.0003	0.2	0.6	0.9	0.066	25.310
Thai_2	0.18	1.12	***0.512665***	***0.000035***	0.348412	0.000023	0.1096	0.0005	0.7	0.7	1.4	0.049	17.140
Thai_3	0.19	1.13	***0.512644***	***0.000038***	0.348428	0.000013	0.1142	0.0005	0.3	0.7	0.9	0.049	15.300
Thai_4	0.17	1.16	***0.512650***	***0.000040***	0.348417	0.000019	0.0991	0.0004	0.4	0.8	1.1	0.057	19.880
Thai_5	0.18	1.18	***0.512633***	***0.000041***	0.348431	0.000021	0.1016	0.0010	0.1	0.8	0.7	0.060	18.550
Thai_6	0.17	1.17	***0.512632***	***0.000039***	0.348405	0.000020	0.0998	0.0009	0.0	0.8	0.7	0.056	19.540
Thai_7	0.15	1.16	***0.512626***	***0.000030***	0.348419	0.000021	0.0885	0.0004	-0.1	0.6	0.6	0.061	24.350
Thai_8	0.21	1.29	***0.512629***	***0.000041***	0.348432	0.000028	0.1112	0.0007	0.0	0.8	0.6	0.049	15.520
Thai_9	0.16	1.22	***0.512671***	***0.000032***	0.348413	0.000021	0.0867	0.0003	0.8	0.6	1.5	0.064	25.320
Thai_10	0.18	1.22	***0.512647***	***0.000034***	0.348402	0.000023	0.0983	0.0009	0.3	0.7	1.0	0.055	19.060
29-Apr													
Thai_1	0.24	1.59	***0.512626***	***0.000028***	0.348419	0.000019	0.1032	0.0010	-0.1	0.5	0.6	0.055	17.940
Thai_2	0.26	1.69	***0.512631***	***0.000030***	0.348414	0.000020	0.1056	0.0014	0.0	0.6	0.7	0.051	17.140
Thai_3	0.20	1.48	***0.512638***	***0.000039***	0.348429	0.000021	0.0945	0.0007	0.2	0.8	0.8	0.057	22.330
Thai_4	0.22	1.30	***0.512640***	***0.000040***	0.348415	0.000019	0.1146	0.0007	0.2	0.8	0.9	0.048	14.400
Thai_5	0.22	1.39	***0.512613***	***0.000047***	0.348418	0.000020	0.1069	0.0014	-0.3	0.9	0.4	0.052	16.630
Thai_6	0.21	1.51	***0.512655***	***0.000035***	0.348432	0.000020	0.0964	0.0011	0.5	0.7	1.2	0.058	20.290
Thai_7	0.20	1.44	***0.512651***	***0.000021***	0.348421	0.000017	0.0939	0.0006	0.4	0.4	1.1	0.057	21.030
Thai_8	0.18	1.38	***0.512634***	***0.000045***	0.348410	0.000027	0.0870	0.0003	0.1	0.9	0.8	0.064	25.520
Thai_9	0.19	1.38	***0.512647***	***0.000024***	0.348433	0.000020	0.0920	0.0003	0.3	0.5	1.0	0.060	21.650
Thai_10	0.17	1.31	***0.512626***	***0.000045***	0.348438	0.000022	0.0887	0.0002	-0.1	0.9	0.6	0.068	24.739
Thai_11	0.18	1.46	***0.512654***	***0.000041***	0.348426	0.000019	0.0865	0.0001	0.5	0.8	1.2	0.065	25.790
Thai_12	0.19	1.48	***0.512649***	***0.000035***	0.348419	0.000020	0.0876	0.0002	0.4	0.7	1.1	0.063	24.940
				mean	***0.512641***								
				2SD	***0.000028***								

Analysis	^{207}Pb/^{235}U	2SE	^{206}Pb/^{238}U	2SE	rho	^{238}U/^{206}Pb	2SE	^{207}Pb/^{206}Pb	2SE	~~rho~~	^{208}Pb/^{238}Th	2SE	^{207}Pb/^{235}U age	2SE	^{206}Pb/^{238}U age	2SE	^{208}Pb/^{238}Th age	2SE	~~^{207}Pb/^{206}Pb age~~	~~2SE~~
Thai_1	0.029	0.002	0.0043	0.0002	0.072	232.56	9.19	0.0496	0.0032	~~0.19627~~	0.00135	0.00005	28.7	2.3	27.7	1.1	27.2	1.1	~~100.0~~	~~110~~
Thai_2	0.030	0.002	0.0043	0.0002	0.118	232.56	9.19	0.0503	0.0032	~~0.18304~~	0.00136	0.00005	29.3	2.3	27.7	1.1	27.4	1.0	~~130.0~~	~~110~~
Thai_3	0.033	0.003	0.0043	0.0002	-0.100	230.95	9.07	0.0566	0.0033	~~0.40296~~	0.00134	0.00005	32.9	2.4	27.8	1.1	27.1	1.0	~~360.0~~	~~110~~
Thai_4	0.028	0.002	0.0042	0.0002	0.014	236.97	8.98	0.0487	0.0031	~~0.26153~~	0.00135	0.00005	27.7	2.2	27.1	1.0	27.3	1.1	~~60.0~~	~~110~~
Thai_5	0.030	0.003	0.0042	0.0002	0.192	240.38	9.82	0.0516	0.0038	~~0.17475~~	0.00132	0.00005	29.4	2.6	26.8	1.1	26.6	1.0	~~210.0~~	~~130~~
Thai_6	0.028	0.002	0.0044	0.0002	0.080	226.76	9.26	0.0484	0.0032	~~0.19061~~	0.00139	0.00005	28.1	2.3	28.4	1.1	28.0	1.1	~~50.0~~	~~110~~
Thai_7	0.030	0.003	0.0043	0.0002	-0.017	234.19	9.87	0.0536	0.0038	~~0.43793~~	0.00134	0.00005	29.3	2.4	27.5	1.1	27.1	1.1	~~200.0~~	~~120~~
Thai_8	0.029	0.002	0.0045	0.0002	0.018	224.72	9.09	0.0482	0.0033	~~0.35775~~	0.00137	0.00005	28.4	2.3	28.6	1.1	27.6	1.1	~~40.0~~	~~110~~
Thai_9	0.028	0.002	0.0041	0.0002	0.092	241.55	9.92	0.049	0.0034	~~0.18248~~	0.00129	0.00005	27.9	2.3	26.6	1.1	26.1	1.0	~~70.0~~	~~120~~
Thai_1	0.057	0.004	0.0044	0.0001	0.175	227.79	5.19	0.0922	0.006	~~0.14117~~	0.00135	0.00003	55.5	3.6	28.2	0.7	27.2	0.6	~~1160.0~~	~~130~~
Thai_2	0.029	0.002	0.0042	0.0001	0.038	237.53	6.21	0.051	0.0033	~~0.27941~~	0.00132	0.00003	28.6	1.8	27.1	0.7	26.6	0.6	~~150.0~~	~~110~~
Thai_3	0.055	0.005	0.0044	0.0001	0.274	226.24	6.14	0.0906	0.0068	~~0.098433~~	0.00135	0.00003	53.5	4.2	28.4	0.8	27.3	0.7	~~1070.0~~	~~150~~
Thai_4	0.030	0.002	0.0044	0.0001	-0.031	228.83	5.76	0.0498	0.0031	~~0.31654~~	0.00138	0.00003	29.7	1.8	28.1	0.7	27.9	0.6	~~150.0~~	~~110~~
Thai_5	0.026	0.002	0.0041	0.0001	-0.039	241.66	5.72	0.0459	0.003	~~0.24243~~	0.00130	0.00003	25.5	1.7	26.6	0.6	26.2	0.6	~~-10.0~~	~~110~~
Thai_6	0.028	0.002	0.0041	0.0001	0.019	246.91	6.10	0.0499	0.0035	~~0.22622~~	0.00131	0.00003	27.5	1.8	26.0	0.7	26.4	0.6	~~110.0~~	~~120~~
Thai_7	0.031	0.003	0.0042	0.0001	0.015	235.85	6.67	0.0538	0.0044	~~0.20724~~	0.00135	0.00003	30.2	2.4	27.3	0.8	27.3	0.7	~~110.0~~	~~130~~
Thai_8	0.030	0.003	0.0041	0.0001	0.022	245.70	6.64	0.0553	0.0047	~~0.29804~~	0.00138	0.00003	30.1	2.5	26.2	0.7	27.9	0.7	~~200.0~~	~~140~~
Thai_9	0.031	0.003	0.0041	0.0001	0.056	242.72	7.07	0.0536	0.0044	~~0.31001~~	0.00137	0.00004	30.3	2.5	26.5	0.8	27.6	0.8	~~150.0~~	~~140~~
Thai_10	0.037	0.003	0.0042	0.0001	0.197	237.53	6.21	0.0694	0.0052	~~0.14201~~	0.00134	0.00003	36.9	2.9	27.1	0.7	27.0	0.7	~~530.0~~	~~140~~
Thai_11	0.030	0.003	0.0042	0.0001	0.083	237.53	6.77	0.052	0.0044	~~0.23065~~	0.00137	0.00004	29.9	2.4	27.1	0.8	27.6	0.7	~~180.0~~	~~140~~
Thai_12	0.031	0.003	0.0042	0.0001	0.007	235.85	6.67	0.0538	0.0045	~~0.307~~	0.00136	0.00003	31.3	2.5	27.3	0.8	27.4	0.7	~~170.0~~	~~140~~