Rhabdophane Th-Pb ages indicate reactivation of Mesoarchean structures in west Pilbara Craton during breakup of Greater India and Australia-Antarctica

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Energy Dispersive X-ray Microanalysis

Rhabdophane crystals were identified in polished thin sections using both optical microscopy and scanning electron microscopy (SEM) with energy dispersive X-ray spectrometry (EDS). Rhabdophane crystals >15 μm in size were drilled from polished thin sections, cast into epoxy to make 25-mm-diameter mounts (Fig. S1).

Rhabdophane crystals in plugs of shale mounted in epoxy disc were analysed with an Oxford Instruments X-Max50 Energy Dispersive X-ray detector (EDS) mounted on a TESCAN VEGA3 scanning electron microscope (SEM). AZtec software from Oxford Instruments was used to collect and process the X-ray spectra. Fully quantitative analyses were collected at 15 kV accelerating voltage and 1-2 nA beam current. The system count rate was calibrated using pure copper, and standard spectra were collected on the VEGA3 from jadeite (Na), periclase (Mg), corundum (Al), wollastonite (Si and Ca), orthoclase (K), rutile (Ti), chromite (Cr), rhodonite (Mn), pyrite (Fe), Durango apatite for P, synthetic glasses (Si + Al + Ca + REY) for rare-earth-elements and Y, synthetic ThO_2 and U metal.

Analytical precision is $\pm 1\text{-}2\%$ relative for major elements (>10 wt%) and $\pm 5\text{-}10\%$ relative for minor elements (<10 wt%). Analysis totals are low (90-95%) whereas analyses of a monazite standard embedded in the same disc give totals 98-102%, confirming the hydrous nature of the rhabdophane. Rhabdophane and monazite analyses are presented in Tables S1 and S2, respectively.

SHRIMP Analytical Techniques

Rhabdophane crystals in 25-mm-diameter mounts were analyzed using the Sensitive High-Resolution Ion MicroProbe (SHRIMP) housed in the John de Laeter Centre, Perth, Australia. Analytical procedures followed established methodologies for monazite (Fletcher et al., 2010), using O_2^- primary ion beam focused onto an ellipsoidal spot 10-15 μm in dimension. The calibration of U-Th-Pb data collected from rhabdophane was carried out using a suite of monazite standards, a mineral that closely matches the chemical composition of rhabdophane. Monazite standards were set in separate mounts that were cleaned and gold-coated with the rhabdophane sample mounts.

Rhabdophane was analyzed with a 13-peak run table as defined by Fletcher et al. (2010) for monazite, which includes mass stations for the estimation of La, Ce and Nd (REEPO_2^+), and Y (YCeO^+). Eight or seven scans of the mass spectrum were recorded for each analysis. Count times per scan for background position 204.045, and Pb isotopes 204, 206, 207 and 208 are, respectively, 10 seconds, 10 seconds, 10 seconds, 10 seconds and 30 seconds. A pre-collector retardation lens was activated to reduce arrivals of stray ions including isobars that interfere with the Pb isotopes.

Figure S1. Backscattered electron (BSE) images of rhabdophane aggregates dated in this study (samples ABDP6-8 to ABDP6-12). Red ellipses represent SHRIMP analytical pits and corresponding $^{208}\text{Pb}/^{232}\text{Th}$ dates with 1σ errors.

For rhabdophane analysis, the primary and secondary reference materials used were French ($^{206}\text{Pb}/^{238}\text{U}$ age = 514 Ma, $^{208}\text{Pb}/^{232}\text{Th}$ age = 504 Ma, U = 1,000 ppm and Th = 63,000 ppm) and 2908 ($^{207}\text{Pb}/^{206}\text{Pb}$ age = 1796 Ma), respectively (Fletcher et al., 2010). An additional standard 2234 was also analyzed and used to correct for matrix effects of U-Th-Pb data (Fletcher et al., 2010). Data were collected during two analytical sessions. During both sessions, mass resolution ($M/\Delta M$ at 1% peak height) was >5000 . During session 1, 6 spot analyses were acquired from 2 grains (BR07-25B and C). The 1σ external spot-to-spot error of monazite standard (French) Pb/Th was 1.47% ($n = 6$). During session 2, a total of 24 spot analyses were acquired on mounts BR20-18, 20-19 and 20-20. The 1σ external spot-to-spot error of standard Pb/Th was 1.12% ($n = 6$).

Data Reduction, Presentation and Assessment

Raw SHRIMP data from the analyzed rhabdophane were reduced using custom task files for the Squid2 (v. 2.50) software (Ludwig, 2009), and then calculated and plotted using Isoplot3 (Ludwig, 2012). Common Pb was corrected from ^{204}Pb measurements following corrections for a 204 isobar using a ThO_2^+ vs. 204 isobar relationship (Fletcher et al., 2010). Common Pb composition was calculated using the initial $^{208}\text{Pb}/^{204}\text{Pb}$ values determined by the $^{232}\text{Th}/^{204}\text{Pb}$ vs. $^{208}\text{Pb}/^{204}\text{Pb}$ isochron plot (see Fig. 3). The 1σ external spot-to-spot error of standard Pb/Th was propagated to the individual unknown data, and the 2σ error (1.2%) of mean in standard Pb/Th was propagated in quadrature to the weighted mean dates calculated for grouped data.

The dated rhabdophane crystals are depleted in U relative to Th, and contain much higher common Pb fraction in ^{206}Pb (denoted as f_{206}) compared with that in ^{208}Pb (f_{208}) (see below). These features, as well as the young nature of the rhabdophane, render the $^{206}\text{Pb}/^{238}\text{U}$ and $^{207}\text{Pb}/^{206}\text{Pb}$ systems useless in deriving meaningful dates, and make $^{208}\text{Pb}/^{232}\text{Th}$ the system of choice. Due to the lack of comparable dates from other systems (i.e., $^{206}\text{Pb}/^{238}\text{U}$ and $^{207}\text{Pb}/^{206}\text{Pb}$), the concordance of the $^{208}\text{Pb}/^{232}\text{Th}$ dates cannot be evaluated. The data are filtered and assessed in terms of common Pb (f_{208}) level and the overall consistency of the dataset.

Analytical Results

Authigenic rhabdophane

The rhabdophane grains identified in the shale samples are inclusion-rich, xenoblastic aggregates up to 150 μm in length (Fig. S1). The dataset comprises a total of 30 analyses from 22 rhabdophane grains. Twenty-nine of the analyses are characterized by high Th relative to U contents (mean Th/U = 52), with one exception (2019K.1-1) which records anomalously low Ce counts and is not considered further. Using a $^{232}\text{Th}/^{204}\text{Pb}$ vs. $^{208}\text{Pb}/^{204}\text{Pb}$ plot (Fig. 3A), the 29 data points define an isochron age of 126.0 ± 8.2 Ma (MSWD = 1.3, probability = 0.12). The isochron plot indicates an initial $^{208}\text{Pb}/^{204}\text{Pb}$ value of 74.3 ± 7.9 , which is used to derive the common Pb compositions of the samples. Common ^{208}Pb (f_{208}) fraction vary from 7-73% (Table S3).

After common Pb correction, all analyses yielded $^{208}\text{Pb}/^{232}\text{Th}$ dates ranging from 88 ± 26 Ma (1σ) to 164 ± 8 Ma (1σ). There is no correlation between the f_{208} and $^{208}\text{Pb}/^{232}\text{Th}$ dates. Furthermore, regardless what cut-off value (e.g., 20% vs. 60%) of f_{208} is applied to the data, the screened datasets display virtually identical age patterns, although analyses with higher common ^{208}Pb normally yielded less precise dates. These suggest that the common Pb compositions adapted in Pb/Th correction approximate the real values. Therefore, all $^{208}\text{Pb}/^{232}\text{Th}$ dates derived from the 29 analyses are considered in evaluation and interpretation of age distribution. The probability density plot of 29 $^{208}\text{Pb}/^{232}\text{Th}$ dates resolves 3 age peaks at 152 ± 6 Ma (95% confidence level, $n = 10$, MSWD = 0.48, probability = 0.89), 132 ± 4 Ma (95% confidence level, $n = 7$, MSWD = 0.83, probability = 0.55), and 119 ± 4 Ma (95% confidence level, $n = 12$, MSWD = 0.54, probability = 0.88) (Fig. 3B, C). Together, these indicate multiple episodes of rhabdophane growth from ca. 152 Ma through to ca. 119 Ma.

References Cited

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Table S1. EDS analyses of rhabdophane from SHRIMP mount BR20-20 (ABDP6-8; 264.5-264.6 m)

Grain	A S253	A S254	A S255	B S256	B S257	B S258	C S259	C S260	D1 S261	D1 S262	D2 S263	D2 S264	E1 S265	E1 S266
SiO ₂	0.39	0.38	0.52	0.49	0.30	0.26	0.35	b.d.	1.03	0.41	b.d.	b.d.	0.85	0.57
P ₂ O ₅	26.96	26.86	28.96	29.38	28.84	28.30	28.35	25.39	28.24	28.43	28.49	26.43	26.18	27.06
CaO	1.76	2.09	2.28	3.12	2.97	3.04	2.96	3.08	2.99	2.89	3.04	2.92	2.73	2.73
FeO	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.
Y ₂ O ₃	1.14	3.11	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	0.74	1.04	0.89	b.d.	b.d.	1.10
La ₂ O ₃	16.06	15.41	16.66	16.61	16.57	16.49	16.67	16.17	14.20	15.26	15.47	17.55	17.22	16.43
Ce ₂ O ₃	29.21	28.76	30.78	30.15	30.44	30.30	30.68	29.57	27.49	28.46	29.32	30.49	31.15	29.22
Pr ₂ O ₃	3.09	3.05	2.50	3.21	3.54	2.66	3.03	2.40	3.30	2.52	2.59	2.30	2.86	2.87
Nd ₂ O ₃	9.63	9.39	8.98	9.65	9.41	9.90	9.33	8.28	10.98	9.55	10.13	8.99	8.32	9.04
Sm ₂ O ₃	1.46	1.48	b.d.	1.59	1.77	b.d.	1.21	b.d.	1.62	2.53	1.91	1.49	1.53	1.27
Eu ₂ O ₃	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.
Gd ₂ O ₃	b.d.	b.d.	b.d.	1.01	1.02	b.d.	b.d.	b.d.	1.58	1.30	b.d.	0.95	b.d.	b.d.
Dy ₂ O ₃	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	1.02	b.d.	1.00	b.d.
Yb ₂ O ₃	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.
ThO ₂	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	3.30	b.d.	b.d.	b.d.	b.d.	0.65
UO ₂	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.
TOTAL	89.15	90.03	90.86	91.50	94.87	94.89	90.96	92.36	89.12	91.45	92.13	92.74	91.77	93.25
16 OX														
Si	0.07	0.07	0.09	0.08	0.05	0.04	0.06	0.00	0.18	0.07	0.00	0.00	0.14	0.10
P	3.94	3.91	3.85	4.01	3.98	3.94	3.98	3.97	3.76	3.96	3.98	3.97	3.80	3.78
Ca	0.32	0.38	0.41	0.55	0.51	0.53	0.53	0.55	0.56	0.51	0.54	0.52	0.50	0.50
Fe	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Y	0.10	0.10	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.09	0.08	0.00	0.00
La	1.04	1.01	0.96	1.00	0.98	0.99	1.01	1.02	1.04	0.87	0.93	0.94	1.10	1.08
Ce	1.84	1.83	1.78	1.84	1.77	1.80	1.84	1.86	1.89	1.67	1.72	1.77	1.89	1.95
Pr	0.18	0.19	0.19	0.15	0.19	0.21	0.16	0.18	0.15	0.20	0.15	0.16	0.14	0.18
Nd	0.56	0.59	0.57	0.52	0.55	0.54	0.59	0.55	0.52	0.65	0.56	0.60	0.54	0.51
Sm	0.08	0.09	0.09	0.00	0.09	0.10	0.00	0.07	0.00	0.09	0.14	0.11	0.09	0.09
Eu	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gd	0.00	0.00	0.00	0.00	0.05	0.05	0.00	0.00	0.00	0.09	0.07	0.00	0.05	0.00
Dy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.06
Yb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.03
U	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	8.13	8.17	8.21	8.15	8.17	8.20	8.17	8.20	8.24	8.17	8.19	8.19	8.25	8.27

Cations calculated on the basis of 16 oxygen atoms.

Table S1. contd. EDS analyses of rhabdophane from SHRIMP mount BR20-20 (ABDP6-8; 264.5-264.6 m)

Grain	E2 S267	E2 S268	F1 S269	F1 S270	F2 S271	F2 S272	G S273	G S274	J S275	J S276	K S279	K S280	L S281	L S282
SiO ₂	0.38	0.66	0.68	0.59	0.37	1.23	0.69	0.68	1.10	0.40	0.51	0.98	0.85	0.26
P ₂ O ₅	28.06	26.05	26.08	28.07	28.15	26.30	27.76	25.13	29.14	29.17	28.09	27.85	28.86	27.64
CaO	2.89	3.09	2.68	2.89	2.99	3.02	2.46	2.19	2.48	2.92	3.27	2.96	2.73	3.09
FeO	b.d.	b.d.	b.d.	0.48	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.
Y ₂ O ₃	0.93	b.d.	0.65	b.d.	b.d.	b.d.	1.24	b.d.	b.d.	b.d.	b.d.	1.00	0.84	1.17
La ₂ O ₃	15.86	16.67	15.64	15.74	15.11	18.77	16.34	16.62	16.77	16.24	16.29	14.24	15.67	15.55
Ce ₂ O ₃	28.95	29.96	28.64	29.01	28.79	30.49	29.08	29.99	31.24	30.79	30.47	26.89	28.93	28.97
Pr ₂ O ₃	2.88	2.54	2.06	3.09	2.34	2.42	2.70	2.84	3.57	3.08	2.63	2.36	3.01	2.31
Nd ₂ O ₃	10.17	8.22	8.65	9.68	9.57	8.06	8.44	8.07	9.68	9.48	9.73	10.95	10.46	9.60
Sm ₂ O ₃	1.27	1.65	1.23	1.73	1.22	1.35	1.42	1.21	1.66	1.35	1.16	2.00	1.72	1.36
Eu ₂ O ₃	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.
Gd ₂ O ₃	b.d.	b.d.	1.23	1.45	1.91	b.d.	b.d.	b.d.	1.41	1.10	b.d.	1.32	0.96	1.45
Dy ₂ O ₃	b.d.	b.d.	b.d.	b.d.	1.33	b.d.	0.97	b.d.	b.d.	b.d.	0.89	b.d.	b.d.	b.d.
Yb ₂ O ₃	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	1.12	b.d.	b.d.
ThO ₂	b.d.	b.d.	0.92	2.13	b.d.	b.d.	b.d.	b.d.	0.48	b.d.	b.d.	b.d.	b.d.	b.d.
UO ₂	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.
TOTAL	91.32	91.87	89.37	90.26	92.14	92.68	90.55	90.81	87.93	96.78	94.99	94.33	90.18	93.79
16 OX														
Si	0.06	0.11	0.12	0.10	0.06	0.20	0.12	0.11	0.19	0.06	0.08	0.16	0.14	0.04
P	3.92	3.91	3.83	3.81	3.94	3.89	3.82	3.93	3.76	3.92	3.94	3.86	3.94	3.96
Ca	0.52	0.55	0.50	0.53	0.53	0.53	0.45	0.39	0.47	0.50	0.56	0.52	0.49	0.54
Fe	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Y	0.10	0.08	0.00	0.06	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.09	0.07
La	0.96	0.96	1.07	1.00	0.96	0.91	1.19	1.01	1.08	0.98	0.96	0.98	0.88	0.94
Ce	1.77	1.75	1.91	1.81	1.76	1.72	1.92	1.78	1.94	1.82	1.80	1.81	1.64	1.72
Pr	0.14	0.17	0.16	0.13	0.19	0.14	0.15	0.16	0.18	0.21	0.18	0.16	0.14	0.18
Nd	0.57	0.60	0.51	0.53	0.57	0.56	0.49	0.50	0.51	0.55	0.54	0.56	0.65	0.61
Sm	0.08	0.07	0.10	0.07	0.10	0.07	0.08	0.08	0.07	0.09	0.07	0.06	0.12	0.10
Eu	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gd	0.08	0.00	0.00	0.07	0.08	0.10	0.00	0.00	0.00	0.07	0.06	0.00	0.07	0.05
Dy	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.05	0.00	0.00	0.00	0.05	0.00	0.00
Yb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00
Th	0.00	0.00	0.04	0.08	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
U	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	8.21	8.20	8.23	8.27	8.20	8.18	8.23	8.14	8.24	8.20	8.20	8.21	8.16	8.19

Cations calculated on the basis of 16 oxygen atoms.

Table S2. EDS analyses of monazite standard from mount BR20-20 and WDS analyses of a grain of the same standard collected from a different mount at a different time

	std	std	std	std	std	std	std	std	std	AV EDS (9)	SD	AV WDS (8)	SD
	Sp 249	Sp 250	Sp 251	Sp 252	Sp 277	Sp 278	Sp 283	Sp 284	Sp 285				
SiO ₂	1.43	1.43	1.29	1.40	1.42	1.20	1.40	1.43	1.33	1.37	0.08	1.46	0.03
P ₂ O ₅	26.66	26.53	26.30	26.49	26.45	26.39	26.68	26.52	26.63	26.52	0.13	28.52	0.08
CaO	0.54	0.56	0.65	0.51	0.58	0.40	0.44	0.43	0.63	0.53	0.09	0.42	0.01
FeO	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	0.00	0.03	0.01
Y ₂ O ₃	0.89	0.94	0.88	1.23	0.80	0.78	0.72	b.d.	b.d.	0.69	0.42	0.83	0.06
La ₂ O ₃	14.26	13.60	14.43	14.13	14.52	14.34	14.01	14.97	14.07	14.26	0.38	14.25	0.20
Ce ₂ O ₃	30.11	29.56	29.54	29.64	30.42	30.44	29.90	29.34	29.67	29.85	0.40	30.20	0.24
Pr ₂ O ₃	3.37	3.70	3.25	2.95	3.17	2.75	3.32	2.94	3.37	3.20	0.29	3.24	0.11
Nd ₂ O ₃	10.79	10.74	10.34	10.78	10.16	10.07	10.02	10.64	11.00	10.50	0.36	11.22	0.11
Sm ₂ O ₃	3.57	3.27	2.86	1.86	2.69	2.34	2.81	2.78	2.78	2.77	0.49	2.50	0.09
Eu ₂ O ₃	1.05	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	0.12	0.35	0.06	0.06
Gd ₂ O ₃	1.90	1.87	1.33	1.83	1.12	1.22	1.49	1.41	1.00	1.46	0.34	1.02	0.15
Tb ₂ O ₃	b.d.	b.d.	b.d.	1.34	b.d.	b.d.	b.d.	b.d.	b.d.	0.15	0.45	0.07	0.06
Dy ₂ O ₃	b.d.	b.d.	1.22	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	0.14	0.41	0.30	0.04
Er ₂ O ₃	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	0.00	0.08	0.02
Yb ₂ O ₃	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	0.00	b.d.	0.03
PbO	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	b.d.	0.00	0.23	0.04
ThO ₂	7.83	7.96	7.70	8.01	7.86	7.53	7.97	8.25	7.80	7.88	0.20	7.04	0.08
UO ₂	b.d.	b.d.	b.d.	b.d.	0.66	b.d.	b.d.	b.d.	b.d.	0.07	0.22	0.21	0.06
TOTAL	102.41	100.17	99.79	100.18	99.86	97.46	98.75	98.71	98.27	99.51		101.68	

Table S3. SHRIMP U-Th-Pb rhabdophane data from ABDP6, samples 8 to 12 (drill-depths 260-265 m)

Analysis No.	U (ppm)	Th (ppm)	Th/U	f_{208} (%)	$^{204}\text{Pb}/^{206}\text{Pb}$	Err%	$^{208}\text{Pb}/^{206}\text{Pb}$	Err%	$^{208}\text{Pb}/^{232}\text{Th}$	$\pm$	$^{208}\text{Pb}^*/^{232}\text{Th}$	$\pm$	$^{208}\text{Pb}^*/^{232}\text{Th}$ Age (Ma)	$\pm$ (Ma)
2020K.1-1	120	1428	12	7	0.0095	37	9.73	4	0.0068	0.0002	0.0067	0.0002	134	5
2019F.3-1	71	4980	72	9	0.0194	19	15.62	10	0.0064	0.0001	0.0060	0.0001	122	3
2020D.1-1	95	5970	65	10	0.0204	21	15.61	3	0.0072	0.0001	0.0068	0.0002	137	4
2020J.1-1	91	3179	36	11	0.0174	20	12.09	5	0.0079	0.0002	0.0074	0.0002	149	5
2020E.1-1	46	2871	65	12	0.0213	24	13.62	8	0.0072	0.0001	0.0067	0.0002	135	5
0725B.1-2	17	1449	87	16	0.0197	20	9.31	4	0.0097	0.0003	0.0082	0.0004	164	8
2020H.1-2	91	3780	43	16	0.0317	17	14.62	12	0.0071	0.0002	0.0063	0.0003	126	5
2020G.1-2	27	2326	89	17	0.0240	24	10.73	8	0.0086	0.0004	0.0075	0.0005	152	10
2019H.1-2	43	3688	89	19	0.0325	17	12.78	6	0.0075	0.0001	0.0063	0.0003	128	5
2019F.2-1	63	8606	142	21	0.0390	12	13.77	12	0.0070	0.0002	0.0058	0.0002	118	4
2019F.1-1	114	4969	45	21	0.0299	15	10.52	4	0.0067	0.0001	0.0055	0.0002	112	5
2018G.1-1	54	2385	45	24	0.0301	19	9.28	11	0.0073	0.0001	0.0058	0.0003	117	7
2020H.1-1	152	1410	10	26	0.0172	20	4.96	6	0.0082	0.0005	0.0064	0.0006	129	11
0725B.1-2d	14	1992	146	28	0.0334	12	8.81	10	0.0104	0.0004	0.0075	0.0004	151	9
2020C.1-1	260	983	4	29	0.0172	22	4.32	3	0.0095	0.0013	0.0071	0.0011	143	22
2020L.1-1	347	5899	18	31	0.0231	17	5.43	1	0.0105	0.0003	0.0076	0.0006	153	12
2020I.1-1	159	3760	24	33	0.0278	10	6.26	4	0.0088	0.0002	0.0062	0.0003	124	7
2019H.2-1	95	2260	25	33	0.0290	14	6.50	6	0.0083	0.0001	0.0058	0.0004	118	8
2019H.2-2	146	2734	19	36	0.0291	13	6.06	2	0.0090	0.0002	0.0061	0.0004	123	9
0725C.1-1	14	294	22	39	0.0238	19	4.51	9	0.0135	0.0009	0.0082	0.0011	165	23
0725B.1-1	22	1764	83	42	0.0413	24	7.26	6	0.0128	0.0002	0.0074	0.0013	150	26
2020D.2-1	98	4745	50	44	0.0354	8	5.94	7	0.0106	0.0004	0.0062	0.0004	125	9
2020G.1-1	33	975	31	45	0.0243	16	3.96	11	0.0104	0.0009	0.0060	0.0009	120	18
0725B.1-1b	29	1246	45	49	0.0390	31	5.89	7	0.0086	0.0001	0.0044	0.0013	88	26
2020E.2-1	134	2852	22	53	0.0297	22	4.15	25	0.0107	0.0028	0.0053	0.0018	106	37
2020A.1-1	13	2623	215	55	0.0374	8	5.04	2	0.0146	0.0003	0.0069	0.0007	139	13

2019H.1-1	106	775	8	59	0.0241	17	3.03	4	0.0130	0.0007	0.0056	0.0014	113	27
2020B.1-1	133	481	4	61	0.0192	17	2.30	11	0.0168	0.0009	0.0068	0.0018	137	35
0725C.1-1b	20	141	7	73	0.0253	20	2.60	15	0.0184	0.0022	0.0050	0.0027	101	54

Not used

2019K.1-1	266	251	0.94	114	0.0315	20	2.03	3	0.0357	0.0017	-	165	-	-
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Pb* indicate radiogenic Pb after correction for common Pb