

GSA DATA REPOSITORY ITEM DR2009177

for

Fluid-rock interaction in orogenic crust tracked by zircon depth profiling

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Zircon was separated from a sample of migmatitic biotite gneiss using standard techniques. The stromatic migmatite sample contains quartz, plagioclase, and lesser amounts of K-feldspar, with accessory biotite, apatite, zircon, and monazite. The migmatite occurs structurally beneath the mantling granitoid bodies (Ladybird leucogranite and Airy quartz monzonite) and overlies the core gneisses of the Valhalla dome. The handpicked unpolished zircon grains were pressed into either prepolished aluminum or indium with a piston-press assembly. Standards AS3 (1099 ± 1 Ma; Paces and Miller, 1993) and Sri Lanka (SL-2) zircon ($564 \text{ Ma} \pm 4$ Ma; George Gehrels; personnel communication) were used for the U-Pb analyses. Measurements of standards NBS SRM 610 glass (70 % SiO₂; 434 ± 7 ppm Ti; Pearce et al., 1997) and SL13 zircon (15.3 % SiO₂; 6.32 ± 0.17 ppm Ti; Aikman, 2007) were interspersed for the Ti concentration analyses. Finally, for the oxygen isotope analyses, standards AS3 (+5.34‰; Trail et al., 2007) and Pacoima (+5.70‰; Booth et al., 2005) were used. Prior to depth profiling analyses, a MICROXAM surface profilometer was utilized to image the topography of each grain to identify those most favourable for analysis, i.e., those with flat crystal faces. All measurements were made using the Cameca ims1270 ion microprobe facility at the University of California, Los Angeles. Results are reported with 1σ errors, except for weighted mean ages that have 2σ errors (Table 1, 2). The U-Pb

measurements were made with a negative ion oxygen beam according to the methods of Breeding et al. (2004) for the depth profiling of unpolished crystals and Schmitt et al. (2003) for analyses of polished grains. For the Ti measurements, we used instrumental conditions for spot analyses similar to those reported in Harrison and Schmitt (2007). Rutile and quartz are present in the sample and assumed to be in equilibrium with the core and rim of the zircon; therefore, the activities of TiO_2 and SiO_2 are assumed to be equal to 1. Temperatures were calculated using the calibration of Ferry and Watson (2007) (Table 3). Table 3 also shows the temperatures calculated using the calibration of Watson et al (2006) for comparison. In comparison, a Cs^+ beam and multicollection of $^{16}\text{O}^-$ and $^{18}\text{O}^-$ was utilized for oxygen isotope analyses. Analytical settings for oxygen isotope measurements are described in Trail et al. (2007) and the results are shown in Table 4.

U-Pb isotopic ratios and ages were calculated from measured ion intensities using in-house software written by C.D. Coath (ZIPS v2.4). ISOPLOT v3 (Ludwig, 2003) was used to calculate $^{206}\text{Pb}/^{238}\text{U}$ - $^{207}\text{Pb}/^{235}\text{U}$ concordia diagrams (Fig. A1). Results from a single representative depth profile (grain 1; see table 1) are shown in Figure A1A. Statistically rigorous assessment of U-Pb concordance is hampered by low ion intensities of ^{207}Pb (typically 10-50 counts per second), and poor ^{207}Pb radiogenic yields (generally 50-90%) cause calculated $^{207}\text{Pb}/^{235}\text{U}$ ratios to be highly sensitive to correction for common Pb. Nevertheless, no obvious signs of U-Pb discordance are observed. Figure A1B shows a Concordia diagram containing the results from all of the depth profiling measurements ($N=13$). Each ellipse represents an integrated depth profiling analysis. Neither of the Concordia diagrams display convergence towards older ages and are thus

inconsistent with U-Pb discordance.

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Fig. DR1. $^{206}\text{Pb}/^{238}\text{U}$ vs. $^{207}\text{Pb}/^{235}\text{U}$ Concordia plots calculated using Isoplot v.3.0 software (see Ludwig, 2003). Error ellipses are 68.3 % confidence. (A) Representative depth profile run (EL20_g1). Error ellipses calculated for 75 individual cycles. (B) Results from all 13 depth profiles. Error ellipses calculated after integrating all data from respective depth profile runs. Detailed assessment of concordance is hampered by the high sensitivity of measured ^{207}Pb to common Pb correction.

List of Tables in the Data Repository

Table DR1: U-Pb zircon isotopic data from depth profiling

Table DR2. U-Pb zircon isotopic data from conventional polished analyses

Table DR3. Oxygen isotope compositions of zircon

Table DR4. Ti concentration measurements from zircon

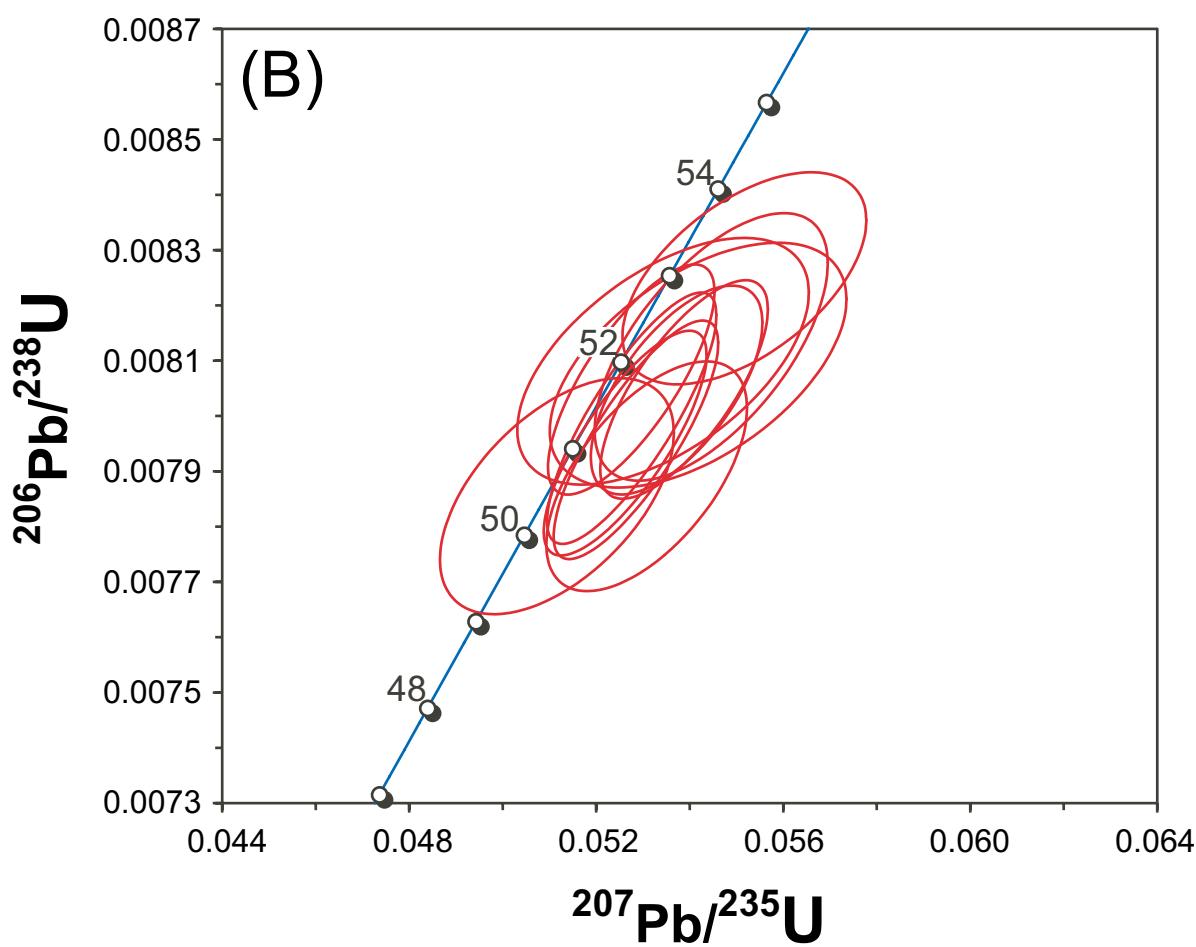
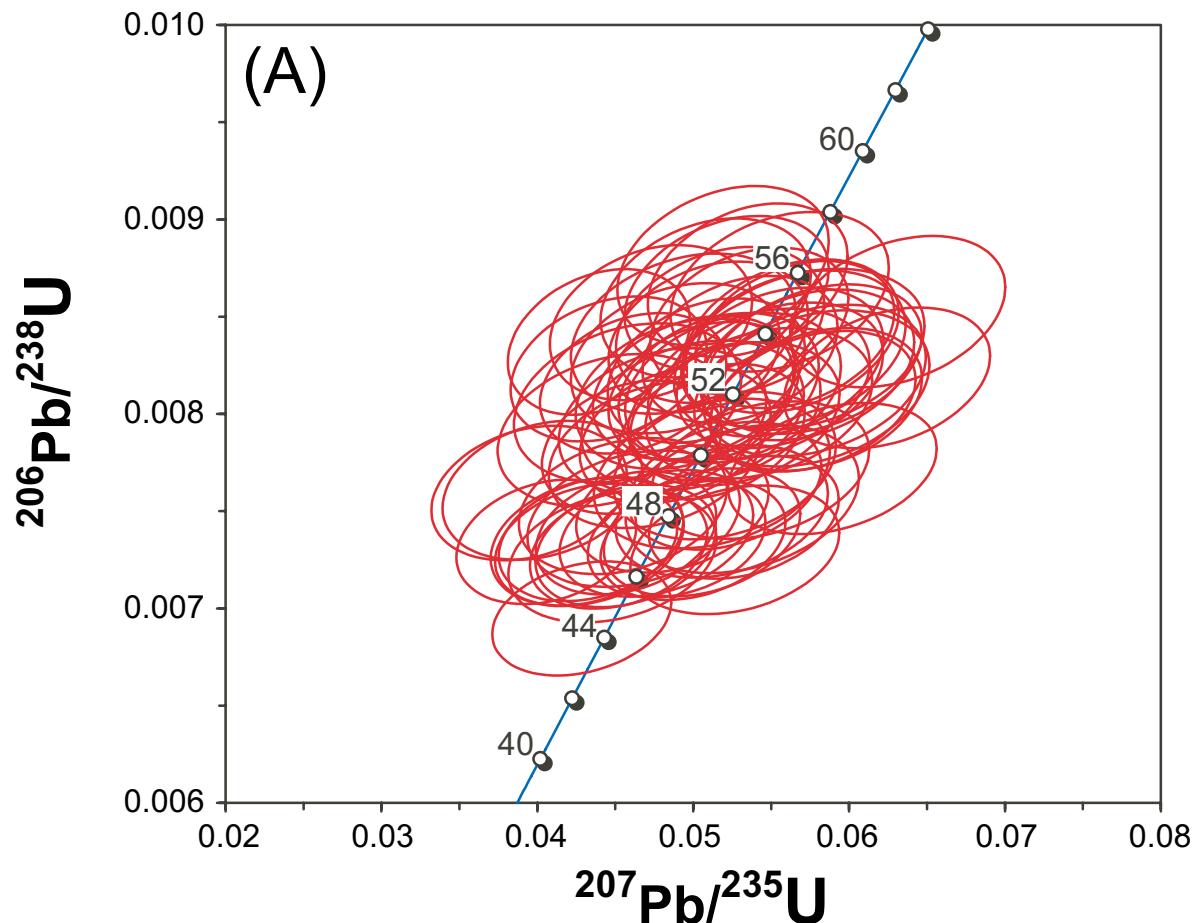


Table DR1: U-Pb zircon isotopic data from depth profiling

Grain*	Th	U	$^{207}\text{Pb}/^{206}\text{Pb}$	$^{207}\text{Pb}/^{235}\text{U}$	$^{206}\text{Pb}/^{238}\text{U}$	Correlation of Concordia Ellipses	% Radiogenic	% Radiogenic	Analysis Run	$^{207}\text{Pb}/^{206}\text{Pb}^1$	$^{207}\text{Pb}/^{235}\text{U}$	$^{206}\text{Pb}/^{238}\text{U}$							
	(est. ppm)	(est. ppm)	Th/U	value	1 s.e.	value	1 s.e.	value	1 s.e.	^{207}Pb	^{206}Pb	Time (s)	Age (Ma)	1 s.e.	Age (Ma)	1 s.e.	Age (Ma)		
EL-20 Migmatite (location: 49°50'58"N; 117°43'27"W)																			
Grain 1	69.52	1013.82	0.069	0.0518	0.0038	0.0592	0.0046	0.0083	0.0003	0.3241	85.55	98.98	186.3	274.3	170.0	58.4	4.4	53.3	1.6
Cycle 2	73.68	1007.08	0.073	0.0462	0.0036	0.0503	0.0041	0.0079	0.0002	0.2979	65.51	97.86	235.9	5.7	188.0	49.8	4.0	50.8	1.5
Cycle 3	81.21	1054.37	0.077	0.0462	0.0036	0.0524	0.0043	0.0082	0.0002	0.3090	56.91	97.31	285.4	6.4	186.0	51.9	4.1	52.9	1.6
Cycle 4	73.63	996.97	0.074	0.0471	0.0035	0.0552	0.0043	0.0085	0.0002	0.3043	51.27	97.07	335.0	55.5	177.0	54.5	4.1	54.5	1.6
Cycle 5	83.80	989.09	0.085	0.0453	0.0035	0.0540	0.0044	0.0086	0.0003	0.3095	62.38	97.80	384.6	0.0	0.0	53.4	4.3	55.4	1.7
Cycle 6	76.26	972.66	0.078	0.0395	0.0033	0.0456	0.0040	0.0084	0.0002	0.2823	65.26	98.26	434.1	0.0	0.0	45.3	3.8	53.8	1.6
Cycle 7	72.74	973.46	0.075	0.0466	0.0035	0.0522	0.0041	0.0081	0.0002	0.2970	52.63	97.17	483.6	27.2	181.0	51.7	4.0	52.2	1.5
Cycle 8	83.40	996.34	0.084	0.0407	0.0036	0.0463	0.0042	0.0082	0.0002	0.2909	64.05	97.89	533.3	0.0	0.0	46.0	4.1	52.9	1.6
Cycle 9	75.58	987.94	0.077	0.0566	0.0038	0.0640	0.0045	0.0082	0.0002	0.3153	66.77	97.80	583.0	476.8	147.0	63.0	4.3	52.6	1.5
Cycle 10	79.35	998.24	0.079	0.0484	0.0036	0.0536	0.0042	0.0080	0.0002	0.2938	77.96	98.69	632.5	120.0	176.0	53.0	4.0	51.5	1.5
Cycle 11	81.08	955.18	0.085	0.0425	0.0035	0.0479	0.0040	0.0082	0.0002	0.2813	69.68	98.38	682.1	0.0	0.0	47.5	3.9	52.5	1.5
Cycle 12	74.08	945.38	0.078	0.0532	0.0038	0.0593	0.0044	0.0081	0.0002	0.3144	66.34	97.72	731.7	337.2	162.0	58.5	4.3	51.9	1.5
Cycle 13	79.75	978.97	0.081	0.0454	0.0036	0.0527	0.0043	0.0084	0.0003	0.3028	73.82	98.51	781.3	0.0	0.0	52.1	4.2	54.0	1.6
Cycle 14	76.30	987.71	0.077	0.0475	0.0035	0.0546	0.0042	0.0083	0.0002	0.3001	65.32	98.08	830.8	73.2	176.0	54.0	4.1	53.6	1.6
Cycle 15	77.43	982.44	0.079	0.0483	0.0036	0.0527	0.0040	0.0079	0.0002	0.2925	66.76	98.08	880.3	113.2	174.0	52.2	3.9	50.9	1.5
Cycle 16	79.91	986.21	0.081	0.0502	0.0035	0.0583	0.0043	0.0084	0.0002	0.3119	71.07	98.31	1005.0	202.0	164.0	57.5	4.1	54.1	1.6
Cycle 17	73.55	1002.05	0.073	0.0459	0.0034	0.0551	0.0043	0.0087	0.0003	0.3145	76.34	98.62	1055.0	0.0	0.0	54.5	4.2	55.9	1.7
Cycle 18	73.21	938.49	0.078	0.0550	0.0038	0.0648	0.0047	0.0085	0.0003	0.3234	75.50	98.40	1105.0	413.2	153.0	63.8	4.4	54.8	1.6
Cycle 19	62.96	903.19	0.070	0.0442	0.0036	0.0535	0.0046	0.0088	0.0003	0.3087	89.13	99.34	1154.0	0.0	0.0	52.9	4.4	56.3	1.7
Cycle 20	64.56	837.33	0.077	0.0440	0.0035	0.0476	0.0039	0.0078	0.0002	0.2615	79.48	98.97	1204.0	0.0	0.0	47.2	3.8	50.4	1.5
Cycle 21	64.88	789.14	0.082	0.0506	0.0038	0.0573	0.0045	0.0082	0.0002	0.2911	70.55	98.26	1253.0	220.8	174.0	56.5	4.3	52.7	1.6
Cycle 22	57.55	819.42	0.070	0.0472	0.0037	0.0531	0.0043	0.0082	0.0003	0.2869	86.95	99.27	1303.0	60.4	187.0	52.5	4.2	52.3	1.6
Cycle 23	70.85	810.68	0.087	0.0462	0.0038	0.0519	0.0044	0.0082	0.0002	0.2804	84.24	99.10	1352.0	5.3	197.0	51.3	4.2	52.3	1.6
Cycle 24	63.29	808.91	0.078	0.0442	0.0037	0.0525	0.0046	0.0086	0.0003	0.2901	80.44	98.93	1402.0	0.0	0.0	52.0	4.4	55.3	1.7
Cycle 25	68.12	796.04	0.086	0.0420	0.0036	0.0491	0.0044	0.0085	0.0003	0.2771	96.24	99.81	1451.0	0.0	0.0	48.7	4.3	54.5	1.7
Cycle 26	63.14	802.89	0.079	0.0500	0.0038	0.0571	0.0045	0.0083	0.0003	0.2910	90.86	99.47	1501.0	196.7	178.0	56.4	4.4	53.2	1.6
Cycle 27	69.82	820.69	0.085	0.0458	0.0037	0.0535	0.0045	0.0085	0.0003	0.2867	100.00	100.00	1550.0	0.0	0.0	53.0	4.4	54.4	1.7
Cycle 28	69.49	829.57	0.084	0.0518	0.0039	0.0591	0.0046	0.0083	0.0003	0.2993	100.00	100.00	1600.0	277.3	173.0	58.3	4.5	53.1	1.6
Cycle 29	71.31	830.64	0.086	0.0535	0.0039	0.0597	0.0046	0.0081	0.0002	0.2970	100.00	100.00	1649.0	349.1	167.0	58.8	4.4	52.0	1.6
Cycle 30	70.04	852.23	0.082	0.0501	0.0038	0.0581	0.0046	0.0084	0.0003	0.3070	97.62	99.86	1699.0	198.3	177.0	57.3	4.4	54.0	1.7
Cycle 31	67.23	779.29	0.086	0.0443	0.0038	0.0507	0.0045	0.0083	0.0003	0.2917	79.10	98.76	1824.0	0.0	0.0	50.2	4.4	53.3	1.6
Cycle 32	65.65	771.81	0.085	0.0482	0.0038	0.0574	0.0047	0.0086	0.0003	0.2984	87.39	99.28	1874.0	107.5	187.0	56.7	4.6	55.5	1.7
Cycle 33	66.																		

Cycle 5	106.95	1217.92	0.088	0.0405	0.0038	0.0441	0.0043	0.0079	0.0002	0.2980	62.55	97.75	376.9	0.0	0.0	43.8	4.2	50.7	1.6
Cycle 6	108.73	1242.60	0.088	0.0484	0.0037	0.0548	0.0044	0.0082	0.0003	0.3220	89.45	99.34	426.4	120.0	181.0	54.1	4.3	52.7	1.6
Cycle 7	118.06	1243.43	0.095	0.0488	0.0037	0.0554	0.0044	0.0082	0.0003	0.3046	87.62	99.34	475.9	135.6	178.0	54.7	4.2	52.9	1.6
Cycle 8	111.06	1242.14	0.089	0.0401	0.0036	0.0443	0.0042	0.0080	0.0002	0.3010	85.93	99.18	525.5	0.0	0.0	44.1	4.1	51.5	1.6
Cycle 9	123.87	1266.41	0.098	0.0447	0.0036	0.0486	0.0040	0.0079	0.0002	0.3005	67.20	98.22	575.1	0.0	0.0	48.2	3.9	50.6	1.5
Cycle 10	137.87	1332.93	0.103	0.0448	0.0036	0.0500	0.0042	0.0081	0.0002	0.3149	54.54	97.37	624.6	0.0	0.0	49.6	4.1	52.0	1.6
Cycle 11	133.13	1322.45	0.101	0.0486	0.0036	0.0550	0.0043	0.0082	0.0003	0.3287	78.76	98.76	674.2	126.5	175.0	54.3	4.2	52.7	1.6
Cycle 12	132.05	1332.55	0.099	0.0459	0.0036	0.0504	0.0041	0.0080	0.0002	0.3192	82.32	98.94	723.7	0.0	0.0	49.9	4.0	51.1	1.5
Cycle 13	134.85	1350.65	0.100	0.0489	0.0035	0.0572	0.0044	0.0085	0.0003	0.3316	84.75	99.11	773.3	144.7	169.0	56.5	4.2	54.4	1.7
Cycle 14	137.38	1380.35	0.100	0.0462	0.0034	0.0519	0.0040	0.0081	0.0002	0.3150	76.54	98.71	822.9	7.3	179.0	51.4	3.9	52.3	1.6
Cycle 15	138.50	1351.56	0.102	0.0556	0.0037	0.0645	0.0046	0.0084	0.0003	0.3532	99.13	99.94	872.4	436.0	148.0	63.5	4.4	54.1	1.6
Cycle 16	133.73	1389.76	0.096	0.0458	0.0034	0.0539	0.0042	0.0085	0.0003	0.3304	90.05	99.43	997.2	0.0	0.0	53.3	4.1	54.8	1.7
Cycle 17	142.30	1412.74	0.101	0.0466	0.0034	0.0514	0.0040	0.0080	0.0002	0.3178	87.72	99.28	1047.0	30.3	177.0	50.9	3.9	51.3	1.5
Cycle 18	156.42	1452.01	0.108	0.0546	0.0036	0.0616	0.0043	0.0082	0.0002	0.3456	82.42	98.88	1096.0	394.0	149.0	60.7	4.2	52.6	1.6
Cycle 19	163.11	1473.77	0.111	0.0437	0.0033	0.0492	0.0040	0.0082	0.0002	0.3195	74.71	98.62	1146.0	0.0	0.0	48.8	3.8	52.4	1.5
Cycle 20	171.20	1516.92	0.113	0.0482	0.0034	0.0543	0.0041	0.0082	0.0002	0.3366	65.96	97.99	1195.0	109.4	167.0	53.7	3.9	52.5	1.5
Cycle 21	178.80	1539.93	0.116	0.0423	0.0032	0.0463	0.0037	0.0079	0.0002	0.3105	77.60	98.84	1245.0	0.0	0.0	46.0	3.6	51.0	1.5
Cycle 22	188.12	1625.89	0.116	0.0530	0.0034	0.0632	0.0044	0.0087	0.0003	0.3630	97.79	99.87	1295.0	326.8	147.0	62.2	4.2	55.5	1.7
Cycle 23	192.26	1660.17	0.116	0.0477	0.0033	0.0551	0.0040	0.0084	0.0002	0.3439	89.73	99.39	1344.0	86.2	162.0	54.4	3.9	53.7	1.5
Cycle 24	199.58	1698.81	0.117	0.0486	0.0033	0.0557	0.0040	0.0083	0.0002	0.3350	84.18	99.14	1394.0	126.3	159.0	55.1	3.8	53.4	1.5
Cycle 25	184.10	1663.36	0.111	0.0495	0.0034	0.0540	0.0039	0.0079	0.0002	0.3433	92.22	99.49	1443.0	171.7	160.0	53.4	3.8	50.8	1.4
Cycle 26	182.05	1624.59	0.112	0.0532	0.0034	0.0577	0.0039	0.0079	0.0002	0.3440	92.03	99.50	1493.0	336.0	145.0	57.0	3.8	50.6	1.4
Cycle 27	181.63	1698.20	0.107	0.0457	0.0033	0.0515	0.0040	0.0082	0.0002	0.3437	91.52	99.49	1543.0	0.0	0.0	51.0	3.8	52.4	1.6
Cycle 28	176.56	1608.67	0.110	0.0503	0.0033	0.0544	0.0038	0.0079	0.0002	0.3276	91.31	99.50	1592.0	208.4	153.0	53.8	3.7	50.4	1.4
Cycle 29	178.89	1667.54	0.107	0.0408	0.0031	0.0469	0.0038	0.0083	0.0002	0.3271	85.24	99.23	1642.0	0.0	0.0	46.6	3.7	53.6	1.6
Cycle 30	177.11	1600.89	0.111	0.0482	0.0033	0.0534	0.0039	0.0080	0.0002	0.3348	74.77	98.56	1691.0	110.0	163.0	52.8	3.8	51.5	1.5
Cycle 31	160.61	1534.90	0.105	0.0519	0.0035	0.0535	0.0038	0.0075	0.0002	0.3274	84.87	99.05	1816.0	279.3	153.0	53.0	3.6	48.1	1.3
Cycle 32	166.66	1498.64	0.111	0.0480	0.0034	0.0539	0.0041	0.0081	0.0002	0.3410	71.81	98.30	1866.0	97.9	168.0	53.3	3.9	52.3	1.5
Cycle 33	144.01	1467.57	0.098	0.0428	0.0032	0.0463	0.0037	0.0079	0.0002	0.3114	85.77	99.20	1915.0	0.0	0.0	46.0	3.6	50.4	1.4
Cycle 34	148.34	1516.11	0.098	0.0487	0.0034	0.0563	0.0042	0.0084	0.0003	0.3475	74.41	98.51	1965.0	132.1	163.0	55.6	4.0	53.8	1.6
Cycle 35	152.32	1474.86	0.103	0.0497	0.0035	0.0518	0.0038	0.0076	0.0002	0.3218	86.46	99.18	2014.0	180.1	163.0	51.2	3.7	48.5	1.4
Cycle 36	151.35	1419.85	0.107	0.0493	0.0034	0.0548	0.0040	0.0081	0.0002	0.3246	97.48	99.86	2064.0	163.1	163.0	54.1	3.9	51.7	1.5
Cycle 37	145.49	1436.42	0.101	0.0420	0.0033	0.0449	0.0037	0.0077	0.0002	0.3055	89.16	99.43	2113.0	0.0	0.0	44.6	3.6	49.8	1.5
Cycle 38	143.11	1457.91	0.098	0.0508	0.0035	0.0561	0.0042	0.0080	0.0002	0.3346	90.49	99.42	2163.0	230.6	161.0	55.4	4.0	51.5	1.5
Cycle 39	129.17	1360.63	0.095	0.0470	0.0035	0.0529	0.0042	0.0082	0.0002	0.3311	92.70	99.56	2212.0	50.9	177.0	52.3	4.0	52.4	1.6
Cycle 40	128.07	1307.18	0.098	0.0517	0.0037	0.0548	0.0041	0.0077	0.0002	0.3245	94.97	99.68	2262.0</td						

Cycle 22	184.54	1598.28	0.115	0.0467	0.0033	0.0496	0.0037	0.0077	0.0002	0.3146	69.97	98.24	1295.0	33.0	170.0	49.1	3.6	49.5	1.4
Cycle 23	173.46	1625.12	0.107	0.0459	0.0033	0.0515	0.0039	0.0081	0.0002	0.3331	83.13	98.97	1345.0	0.0	0.0	51.0	3.8	52.2	1.5
Cycle 24	169.06	1602.51	0.105	0.0459	0.0032	0.0527	0.0039	0.0083	0.0002	0.3269	81.98	98.98	1394.0	0.0	0.0	52.2	3.8	53.5	1.5
Cycle 25	171.46	1573.84	0.109	0.0512	0.0035	0.0545	0.0039	0.0077	0.0002	0.3298	81.57	98.80	1444.0	248.8	157.0	53.9	3.8	49.6	1.4
Cycle 26	175.20	1596.70	0.110	0.0490	0.0034	0.0543	0.0039	0.0080	0.0002	0.3195	69.38	98.29	1493.0	146.8	161.0	53.6	3.8	51.6	1.5
Cycle 27	174.41	1604.96	0.109	0.0486	0.0034	0.0540	0.0040	0.0081	0.0002	0.3238	67.18	98.11	1543.0	126.8	166.0	53.4	3.9	51.8	1.5
Cycle 28	166.76	1524.28	0.109	0.0488	0.0035	0.0561	0.0042	0.0083	0.0002	0.3298	79.15	98.74	1592.0	138.3	168.0	55.4	4.1	53.5	1.6
Cycle 29	151.43	1441.90	0.105	0.0464	0.0034	0.0509	0.0039	0.0080	0.0002	0.3015	71.91	98.48	1642.0	19.2	174.0	50.4	3.7	51.1	1.4
Cycle 30	147.19	1346.78	0.109	0.0498	0.0036	0.0549	0.0042	0.0081	0.0002	0.3072	68.86	98.25	1816.0	126.8	173.0	53.4	4.0	51.7	1.5
Cycle 31	159.98	1364.59	0.117	0.0486	0.0036	0.0540	0.0042	0.0081	0.0002	0.3072	71.35	98.49	1865.0	0.0	0.0	44.8	3.7	49.2	1.4
Cycle 32	146.13	1345.98	0.109	0.0427	0.0035	0.0451	0.0038	0.0077	0.0002	0.2882	84.93	99.04	1964.0	200.3	177.0	55.8	4.4	52.5	1.6
Cycle 33	151.54	1306.98	0.116	0.0502	0.0038	0.0537	0.0042	0.0078	0.0002	0.3094	89.62	99.37	1915.0	204.2	175.0	53.1	4.1	49.8	1.5
Cycle 34	149.55	1289.17	0.116	0.0501	0.0038	0.0565	0.0045	0.0082	0.0002	0.3224	71.02	98.22	2014.0	311.3	168.0	56.1	4.2	50.3	1.5
Cycle 35	147.15	1252.10	0.118	0.0526	0.0039	0.0568	0.0044	0.0078	0.0002	0.3103	78.47	98.68	2063.0	118.4	189.0	50.2	4.1	48.8	1.4
Cycle 36	142.68	1160.57	0.123	0.0484	0.0039	0.0507	0.0042	0.0076	0.0002	0.2963	79.93	98.82	2113.0	213.5	180.0	54.4	4.3	50.9	1.5
Cycle 37	140.40	1192.61	0.118	0.0504	0.0039	0.0551	0.0045	0.0079	0.0002	0.3044	91.35	99.49	2163.0	58.0	198.0	52.1	4.4	51.9	1.6
Cycle 38	141.89	1130.09	0.126	0.0472	0.0039	0.0526	0.0046	0.0081	0.0002	0.3030	100.00	100.00	2212.0	498.6	161.0	59.6	4.4	49.2	1.5
Cycle 39	132.70	1116.46	0.119	0.0572	0.0042	0.0605	0.0046	0.0077	0.0002	0.3144	100.00	100.00	2262.0	329.6	173.0	59.4	4.6	52.9	1.7
Cycle 40	134.78	1132.83	0.119	0.0530	0.0040	0.0603	0.0048	0.0082	0.0003	0.3182	100.00	100.00	2311.0	0.0	0.0	45.8	4.0	47.5	1.4
Cycle 41	133.97	1068.04	0.125	0.0452	0.0039	0.0461	0.0041	0.0074	0.0002	0.2775	91.44	99.43	2361.0	347.0	176.0	54.9	4.3	48.4	1.4
Cycle 42	121.66	1041.89	0.117	0.0534	0.0042	0.0555	0.0045	0.0075	0.0002	0.2978	90.00	99.42	2635.0	0.0	0.0	44.4	4.2	45.8	1.4
Cycle 43	128.21	1026.17	0.125	0.0522	0.0041	0.0566	0.0047	0.0079	0.0002	0.2946	69.41	98.19	2411.0	293.8	181.0	55.9	4.5	50.5	1.6
Cycle 44	131.43	1014.32	0.130	0.0574	0.0043	0.0627	0.0049	0.0079	0.0002	0.3046	88.20	99.27	2460.0	504.9	165.0	61.8	4.7	50.9	1.6
Cycle 45	139.96	1000.46	0.140	0.0528	0.0043	0.0557	0.0047	0.0076	0.0002	0.2923	87.48	99.25	2510.0	320.4	184.0	55.0	4.5	49.1	1.5
Cycle 46	136.02	1006.76	0.135	0.0454	0.0042	0.0447	0.0043	0.0071	0.0002	0.2768	80.12	98.74	2784.0	408.9	185.0	58.7	5.0	50.5	1.7
Cycle 47	132.58	1025.87	0.129	0.0500	0.0043	0.0533	0.0048	0.0077	0.0002	0.3057	96.78	99.80	2685.0	193.5	201.0	52.7	4.6	49.6	1.6
Cycle 48	139.01	1031.87	0.135	0.0395	0.0040	0.0413	0.0044	0.0076	0.0002	0.2725	83.72	99.20	2734.0	0.0	0.0	41.1	4.3	48.8	1.6
Cycle 49	142.95	1044.75	0.137	0.0549	0.0045	0.0595	0.0052	0.0079	0.0003	0.3133	80.12	98.74	2784.0	408.9	185.0	58.7	5.0	50.5	1.7
Grain 5	91.31	965.92	0.095	0.0554	0.0061	0.0640	0.0074	0.0084	0.0003	0.3371	40.36	93.24	178.5	426.5	244.0	63.0	7.1	53.9	1.9
Cycle 2	91.41	1053.12	0.087	0.0502	0.0049	0.0561	0.0057	0.0081	0.0003	0.3198	63.87	96.81	228.0	203.6	225.0	55.4	5.5	52.0	1.7
Cycle 3	108.70	1202.49	0.090	0.0416	0.0040	0.0468	0.0047	0.0082	0.0003	0.3035	53.45	96.95	277.5	0.0	0.0	46.5	4.6	52.4	1.7
Cycle 4	135.03	1284.39	0.105	0.0535	0.0041	0.0603	0.0049	0.0082	0.0003	0.3389	64.21	97.28	327.1	348.1	171.0	59.5	4.7	52.5	1.6
Cycle 5	156.02	1420.10	0.110	0.0526	0.0039	0.0569	0.0045	0.0078	0.0002	0.3348	83.19	98.76	376.7	312.5	170.0	56.2	4.3	50.4	1.5
Cycle 6	189.28	1627.87	0.116	0.0379	0.0034	0.0423	0.0040	0.0081	0.0002	0.2962	81.92	99.02	426.3	0.0	0.0	42.1	3.9	51.9	1.5
Cycle 7	190.31	1694.16	0.112	0.0537	0.0036	0.0634	0.0045	0.0086	0.0003	0.3599	91.44	99.45	475.8	359.0	151.0	62.4	4.3	54.9	1.7
Cycle 8	193.77	1683.24	0.115	0.0475	0.0035	0.0536	0.0042	0.0082	0.0002	0.3374									

Cycle 8	48.57	638.64	0.076	0.0486	0.0049	0.0515	0.0054	0.0077	0.0003	0.2666	81.36	98.83	525.0	130.7	237.0	51.0	5.2	49.3	1.8
Cycle 9	44.71	613.47	0.073	0.0512	0.0050	0.0536	0.0054	0.0076	0.0003	0.2527	63.66	97.84	574.6	248.2	224.0	53.1	5.2	48.8	1.8
Cycle 10	43.76	638.48	0.069	0.0468	0.0050	0.0482	0.0053	0.0075	0.0003	0.2580	34.75	95.92	624.2	36.3	256.0	47.8	5.2	48.1	1.8
Cycle 11	42.58	597.26	0.071	0.0501	0.0051	0.0556	0.0058	0.0081	0.0003	0.2719	75.35	98.43	673.8	198.8	235.0	55.0	5.6	51.7	1.9
Cycle 12	41.12	579.40	0.071	0.0575	0.0053	0.0644	0.0062	0.0081	0.0003	0.2775	71.95	98.12	723.2	509.4	204.0	63.3	5.9	52.2	2.0
Cycle 13	43.61	590.25	0.074	0.0525	0.0053	0.0557	0.0057	0.0077	0.0003	0.2535	100.00	100.00	772.7	308.2	228.0	55.1	5.5	49.4	1.9
Cycle 14	42.16	597.73	0.071	0.0507	0.0052	0.0562	0.0059	0.0080	0.0003	0.2660	100.00	100.00	822.2	227.2	236.0	55.5	5.7	51.6	2.0
Cycle 15	40.54	584.19	0.069	0.0477	0.0051	0.0534	0.0059	0.0081	0.0003	0.2681	97.77	99.86	871.7	83.2	252.0	52.9	5.7	52.2	2.0
Cycle 16	42.37	534.86	0.079	0.0356	0.0048	0.0373	0.0051	0.0076	0.0003	0.2322	64.92	98.29	996.7	0.0	0.0	37.2	5.0	48.9	1.9
Cycle 17	45.41	547.51	0.083	0.0474	0.0052	0.0536	0.0061	0.0082	0.0003	0.2614	58.36	97.62	1046.0	71.6	261.0	53.0	5.9	52.6	2.1
Cycle 18	37.72	534.20	0.071	0.0374	0.0051	0.0413	0.0058	0.0080	0.0003	0.2511	81.42	98.96	1096.0	0.0	0.0	41.1	5.6	51.4	2.1
Cycle 19	44.60	536.41	0.083	0.0503	0.0057	0.0534	0.0063	0.0077	0.0003	0.2776	100.00	100.00	1146.0	209.7	264.0	52.8	6.1	49.4	2.0
Cycle 20	42.00	528.30	0.080	0.0567	0.0058	0.0568	0.0060	0.0073	0.0003	0.2643	88.99	99.22	1195.0	477.9	228.0	56.1	5.8	46.7	1.8
Cycle 21	41.77	549.67	0.076	0.0558	0.0056	0.0651	0.0068	0.0085	0.0004	0.2871	61.74	97.50	1245.0	444.4	224.0	64.1	6.5	54.4	2.2
Cycle 22	46.29	547.66	0.085	0.0407	0.0050	0.0464	0.0059	0.0083	0.0003	0.2536	65.39	98.22	1294.0	0.0	0.0	46.0	5.7	53.1	2.1
Cycle 23	39.00	518.92	0.075	0.0563	0.0057	0.0575	0.0060	0.0074	0.0003	0.2538	62.49	97.48	1344.0	464.6	224.0	56.7	5.7	47.5	1.8
Cycle 24	46.91	559.05	0.084	0.0619	0.0059	0.0715	0.0071	0.0084	0.0003	0.2855	79.13	98.56	1393.0	670.9	206.0	70.1	6.7	53.8	2.2
Cycle 25	50.16	561.96	0.089	0.0502	0.0056	0.0527	0.0061	0.0076	0.0003	0.2591	76.02	98.52	1443.0	204.3	259.0	52.1	5.9	48.9	1.9
Cycle 26	49.23	569.52	0.086	0.0437	0.0052	0.0488	0.0059	0.0081	0.0003	0.2456	71.53	98.57	1492.0	0.0	0.0	48.4	5.7	52.0	2.1
Cycle 27	43.01	552.64	0.078	0.0429	0.0052	0.0468	0.0058	0.0079	0.0003	0.2484	64.07	98.13	1542.0	0.0	0.0	46.5	5.6	50.9	2.1
Cycle 28	39.49	535.41	0.074	0.0442	0.0052	0.0482	0.0058	0.0079	0.0003	0.2469	51.02	97.43	1592.0	0.0	0.0	47.8	5.6	50.8	2.1
Cycle 29	42.28	534.84	0.079	0.0463	0.0055	0.0487	0.0060	0.0076	0.0003	0.2628	75.83	98.50	1641.0	11.3	286.0	48.3	5.8	49.0	2.0
Cycle 30	44.57	527.48	0.085	0.0619	0.0060	0.0664	0.0066	0.0078	0.0003	0.2726	81.22	98.69	1691.0	672.2	207.0	65.2	6.3	49.9	2.0
Cycle 31	49.90	550.72	0.091	0.0475	0.0053	0.0535	0.0062	0.0082	0.0003	0.2602	93.47	99.63	1815.0	76.4	266.0	53.0	6.0	52.4	2.1
Cycle 32	47.42	561.03	0.085	0.0488	0.0054	0.0539	0.0061	0.0080	0.0003	0.2553	67.06	98.17	1865.0	139.5	260.0	53.3	5.9	51.4	2.1
Cycle 33	50.17	558.26	0.090	0.0425	0.0051	0.0506	0.0063	0.0086	0.0004	0.2561	56.27	97.91	1914.0	0.0	0.0	50.1	6.0	55.4	2.3
Cycle 34	47.14	554.40	0.085	0.0518	0.0054	0.0579	0.0063	0.0081	0.0003	0.2712	94.27	99.64	1964.0	276.7	241.0	57.2	6.0	52.0	2.1
Cycle 35	51.57	586.54	0.088	0.0584	0.0058	0.0652	0.0067	0.0081	0.0003	0.2883	85.29	98.96	2013.0	546.0	216.0	64.2	6.4	52.0	2.1
Cycle 36	49.58	578.75	0.086	0.0387	0.0050	0.0433	0.0058	0.0081	0.0003	0.2497	100.00	100.00	2063.0	0.0	0.0	43.0	5.6	52.1	2.1
Cycle 37	46.29	568.02	0.081	0.0442	0.0052	0.0474	0.0057	0.0078	0.0003	0.2486	93.03	99.63	2112.0	0.0	0.0	47.1	5.5	50.0	2.0
Cycle 38	46.90	549.51	0.085	0.0444	0.0052	0.0470	0.0057	0.0077	0.0003	0.2448	71.43	98.54	2162.0	0.0	0.0	46.7	5.5	49.3	2.0
Cycle 39	49.70	517.83	0.096	0.0447	0.0054	0.0480	0.0059	0.0078	0.0003	0.2504	80.06	98.92	2211.0	0.0	0.0	47.6	5.7	50.1	2.0
Cycle 40	44.62	559.55	0.080	0.0516	0.0055	0.0568	0.0062	0.0080	0.0003	0.2666	100.00	100.00	2261.0	265.5	244.0	56.1	6.0	51.3	2.1
Cycle 41	47.15	548.80	0.086	0.0480	0.0055	0.0536	0.0064	0.0081	0.0003	0.2700	100.00	100.00	2311.0	100.4	272.0	53.0	6.2	52.0	2.2
Cycle 42	51.55	535.93	0.096	0.0424	0.0054	0.0423	0.0055	0.0072	0.0003	0.2387	92.51	99.61	2360.0	0.0	0.0	42.0	5.4	46.5	1.8
Cycle 43	47.15	550.58	0.086	0.0480	0.0053	0.0579	0.0067	0.0088	0.0004	0.2779	74.28	98.58	2410.0	97.6	262.0	57.2	6.4	56.2	2.4

Cycle 42	95.02	934.41	0.102	0.0504	0.0038	0.0597	0.0047	0.0086	0.0003	0.3129	95.00	99.67	2361.0	212.3	173.0	58.9	4.5	55.2	1.6
Cycle 43	104.62	952.16	0.110	0.0522	0.0039	0.0575	0.0044	0.0080	0.0002	0.3040	75.00	98.27	2411.0	295.8	168.0	56.8	4.3	51.3	1.4
Cycle 44	93.90	929.63	0.101	0.0453	0.0036	0.0528	0.0044	0.0085	0.0002	0.3004	61.69	97.59	2460.0	0.0	0.0	52.3	4.3	54.3	1.6
Cycle 45	92.10	905.63	0.102	0.0381	0.0034	0.0453	0.0042	0.0086	0.0002	0.2787	86.20	99.27	2510.0	0.0	0.0	45.0	4.1	55.4	1.6
Cycle 46	89.98	877.25	0.103	0.0480	0.0037	0.0535	0.0043	0.0081	0.0002	0.2954	73.72	98.30	2635.0	100.1	184.0	52.9	4.2	51.9	1.5
Cycle 47	100.25	927.17	0.108	0.0505	0.0038	0.0545	0.0043	0.0078	0.0002	0.2954	78.41	98.58	2685.0	216.0	175.0	53.9	4.1	50.3	1.4
Cycle 48	92.71	919.62	0.101	0.0521	0.0039	0.0578	0.0045	0.0081	0.0002	0.3068	79.82	98.59	2734.0	290.1	170.0	57.1	4.3	51.7	1.5
Cycle 49	99.71	905.35	0.110	0.0502	0.0038	0.0548	0.0044	0.0079	0.0002	0.2966	83.06	98.85	2784.0	205.9	177.0	54.1	4.2	50.8	1.4
Grain 10	58.44	1215.33	0.048	0.0400	0.0044	0.0405	0.0047	0.0073	0.0002	0.2756	53.76	96.19	179.6	0.0	0.0	40.3	4.6	47.1	1.4
Cycle 2	60.44	1131.47	0.053	0.0396	0.0043	0.0379	0.0043	0.0069	0.0002	0.2678	59.71	96.99	229.1	0.0	0.0	37.8	4.2	44.6	1.3
Cycle 3	73.36	1183.12	0.062	0.0463	0.0041	0.0475	0.0044	0.0074	0.0002	0.2950	58.42	96.98	278.6	14.1	213.0	47.1	4.3	47.8	1.5
Cycle 4	68.29	1102.85	0.062	0.0494	0.0044	0.0507	0.0047	0.0074	0.0002	0.3022	63.92	97.10	328.1	167.0	208.0	50.2	4.6	47.8	1.5
Cycle 5	74.41	1101.83	0.068	0.0500	0.0042	0.0546	0.0048	0.0079	0.0003	0.3100	73.77	98.09	377.6	194.1	193.0	54.0	4.6	50.9	1.6
Cycle 6	75.58	1055.08	0.072	0.0521	0.0044	0.0538	0.0048	0.0075	0.0002	0.3071	84.65	98.78	427.2	287.7	195.0	53.2	4.7	48.2	1.5
Cycle 7	79.41	1104.14	0.072	0.0462	0.0041	0.0524	0.0048	0.0082	0.0003	0.3064	63.76	97.62	476.8	9.1	211.0	51.9	4.7	52.8	1.7
Cycle 8	76.95	1068.02	0.072	0.0502	0.0044	0.0528	0.0049	0.0076	0.0002	0.3046	75.00	98.14	526.3	201.7	204.0	52.2	4.7	49.0	1.6
Cycle 9	67.97	1067.47	0.064	0.0376	0.0039	0.0404	0.0044	0.0078	0.0003	0.2690	92.53	99.57	575.8	0.0	0.0	40.3	4.3	50.1	1.6
Cycle 10	79.49	982.57	0.081	0.0556	0.0044	0.0636	0.0053	0.0083	0.0003	0.3234	79.67	98.53	625.4	435.1	177.0	62.6	5.1	53.3	1.8
Cycle 11	67.41	969.44	0.070	0.0573	0.0045	0.0592	0.0049	0.0075	0.0002	0.3049	85.62	98.91	675.0	504.2	173.0	58.4	4.7	48.1	1.5
Cycle 12	68.88	1037.39	0.066	0.0378	0.0038	0.0417	0.0044	0.0080	0.0003	0.2710	68.40	98.31	724.6	0.0	0.0	41.5	4.3	51.3	1.7
Cycle 13	63.70	1051.15	0.061	0.0390	0.0037	0.0453	0.0045	0.0084	0.0003	0.2837	76.32	98.75	774.1	0.0	0.0	45.0	4.4	54.1	1.8
Cycle 14	62.30	986.18	0.063	0.0474	0.0042	0.0507	0.0047	0.0078	0.0003	0.2942	93.35	99.56	823.6	67.7	210.0	50.2	4.5	49.9	1.6
Cycle 15	57.44	964.99	0.060	0.0467	0.0040	0.0506	0.0046	0.0079	0.0003	0.2917	70.67	98.20	873.2	34.4	207.0	50.2	4.4	50.5	1.7
Cycle 16	52.76	985.82	0.054	0.0432	0.0040	0.0476	0.0046	0.0080	0.0003	0.2897	49.23	96.96	998.0	0.0	0.0	47.2	4.4	51.4	1.7
Cycle 17	52.96	1007.99	0.053	0.0521	0.0042	0.0561	0.0048	0.0078	0.0003	0.3044	47.07	96.34	1048.0	290.9	185.0	55.4	4.6	50.1	1.7
Cycle 18	52.30	1033.46	0.051	0.0440	0.0039	0.0506	0.0047	0.0083	0.0003	0.3014	70.03	98.25	1097.0	0.0	0.0	50.1	4.6	53.5	1.9
Cycle 19	51.45	1010.80	0.051	0.0466	0.0039	0.0509	0.0044	0.0079	0.0003	0.2870	71.68	98.33	1147.0	30.5	200.0	50.4	4.3	50.8	1.7
Cycle 20	50.61	1038.52	0.049	0.0443	0.0039	0.0525	0.0048	0.0086	0.0003	0.3039	75.42	98.54	1196.0	0.0	0.0	51.9	4.6	55.1	1.9
Cycle 21	47.87	973.02	0.049	0.0403	0.0038	0.0435	0.0043	0.0078	0.0003	0.2716	74.90	98.64	1246.0	0.0	0.0	43.2	4.2	50.2	1.7
Cycle 22	46.62	878.05	0.053	0.0470	0.0044	0.0521	0.0051	0.0080	0.0003	0.3014	50.21	96.65	1295.0	51.0	222.0	51.6	4.9	51.6	1.8
Cycle 23	44.22	856.82	0.052	0.0424	0.0040	0.0458	0.0044	0.0078	0.0003	0.2637	31.54	96.44	1345.0	0.0	0.0	45.5	4.3	50.3	1.7
Cycle 24	43.38	870.13	0.050	0.0448	0.0043	0.0507	0.0051	0.0082	0.0003	0.2938	100.00	100.00	1394.0	0.0	0.0	50.2	4.9	52.7	1.9
Cycle 25	46.99	820.75	0.057	0.0445	0.0044	0.0465	0.0047	0.0076	0.0003	0.2699	91.09	99.46	1444.0	0.0	0.0	46.2	4.6	48.6	1.7
Cycle 26	47.86	814.85	0.059	0.0546	0.0047	0.0618	0.0056	0.0082	0.0003	0.3052	78.28	98.48	1494.0	396.1	193.0	60.9	5.3	52.7	1.9
Cycle 27	49.55	802.72	0.062	0.0370	0.0042	0.0393	0.0046	0.0077	0.0003	0.2533	100.00	100.00	1543.0	0.0	0.0	39.1	4.5	49.5	1.8
Cycle 28	50.78	761.85	0.067	0.0481	0.0046	0.0515	0.0051	0.0078	0.0003	0.2684	90.32	99.43	1593.0	103.7	225.0	51.0	4.9	49.9	1.8
Cycle 29</																			

Cycle 27	156.46	1305.67	0.120	0.0507	0.0036	0.0576	0.0043	0.0082	0.0002	0.3150	83.99	99.02	1542.0	227.6	164.0	56.9	4.1	52.9	1.5
Cycle 28	146.32	1281.82	0.114	0.0397	0.0034	0.0439	0.0039	0.0080	0.0002	0.2826	89.37	99.42	1591.0	0.0	0.0	43.7	3.8	51.6	1.4
Cycle 29	144.70	1190.71	0.122	0.0525	0.0037	0.0585	0.0043	0.0081	0.0002	0.3020	90.65	99.42	1641.0	307.3	160.0	57.7	4.1	51.9	1.4
Cycle 30	131.57	1116.10	0.118	0.0512	0.0037	0.0565	0.0043	0.0080	0.0002	0.2965	89.80	99.39	1690.0	248.2	168.0	55.8	4.1	51.5	1.5
Cycle 31	121.41	1076.96	0.113	0.0578	0.0040	0.0628	0.0046	0.0079	0.0002	0.3010	89.87	99.34	1815.0	522.9	153.0	61.8	4.4	50.6	1.5
Cycle 32	129.79	1058.44	0.123	0.0520	0.0039	0.0583	0.0046	0.0081	0.0002	0.2965	89.37	99.35	1864.0	283.4	172.0	57.5	4.4	52.3	1.5
Cycle 33	128.61	1036.20	0.124	0.0451	0.0037	0.0521	0.0044	0.0084	0.0002	0.2744	87.24	99.35	1914.0	0.0	0.0	51.6	4.3	53.8	1.6
Cycle 34	115.91	995.29	0.116	0.0470	0.0040	0.0534	0.0047	0.0082	0.0003	0.2992	91.77	99.49	1963.0	48.3	201.0	52.8	4.5	52.9	1.6
Cycle 35	107.16	1002.89	0.107	0.0532	0.0041	0.0567	0.0045	0.0077	0.0002	0.2959	100.00	100.00	2013.0	335.0	174.0	56.0	4.4	49.7	1.5
Cycle 36	111.60	954.80	0.117	0.0476	0.0039	0.0544	0.0047	0.0083	0.0003	0.2879	100.00	100.00	2062.0	81.6	195.0	53.8	4.5	53.1	1.6
Cycle 37	111.33	936.04	0.119	0.0455	0.0039	0.0504	0.0045	0.0080	0.0002	0.2849	93.69	99.63	2112.0	0.0	0.0	50.0	4.4	51.7	1.6
Cycle 38	112.55	954.87	0.118	0.0478	0.0039	0.0534	0.0046	0.0081	0.0002	0.2798	81.14	98.94	2161.0	89.9	196.0	52.8	4.4	52.0	1.6
Cycle 39	102.03	926.49	0.110	0.0424	0.0038	0.0469	0.0044	0.0080	0.0002	0.2741	96.52	99.81	2211.0	0.0	0.0	46.6	4.3	51.5	1.6
Cycle 40	112.18	915.40	0.123	0.0471	0.0040	0.0543	0.0048	0.0084	0.0003	0.2860	79.15	98.86	2260.0	52.6	204.0	53.7	4.7	53.7	1.7
Cycle 41	109.19	926.62	0.118	0.0504	0.0042	0.0565	0.0049	0.0081	0.0003	0.2756	63.94	98.07	2310.0	215.3	192.0	55.8	4.7	52.2	1.6
Cycle 42	106.10	841.85	0.126	0.0572	0.0044	0.0637	0.0051	0.0081	0.0002	0.3006	91.96	99.44	2359.0	498.0	170.0	62.7	4.9	51.9	1.6
Cycle 43	100.17	870.38	0.115	0.0538	0.0043	0.0591	0.0050	0.0080	0.0003	0.2860	89.71	99.37	2409.0	362.7	182.0	58.3	4.8	51.1	1.6
Cycle 44	104.59	848.59	0.123	0.0525	0.0044	0.0578	0.0050	0.0080	0.0002	0.2797	69.77	98.21	2458.0	307.2	189.0	57.1	4.8	51.3	1.6
Cycle 45	96.08	805.71	0.119	0.0418	0.0042	0.0434	0.0045	0.0075	0.0002	0.2648	98.49	99.91	2508.0	0.0	0.0	43.2	4.4	48.3	1.5
Cycle 46	95.27	804.20	0.118	0.0462	0.0043	0.0492	0.0048	0.0077	0.0002	0.2722	81.74	98.92	2632.0	7.9	226.0	48.8	4.6	49.6	1.6
Cycle 47	102.59	783.55	0.131	0.0537	0.0046	0.0579	0.0052	0.0078	0.0003	0.2821	75.46	98.46	2682.0	356.8	195.0	57.1	5.0	50.2	1.6
Cycle 48	91.38	729.97	0.125	0.0535	0.0047	0.0557	0.0051	0.0075	0.0002	0.2773	82.66	98.86	2731.0	350.0	198.0	55.0	4.9	48.5	1.5
Cycle 49	95.23	763.18	0.125	0.0490	0.0045	0.0513	0.0049	0.0076	0.0002	0.2565	67.14	98.19	2781.0	148.3	216.0	50.7	4.7	48.7	1.6
Grain 13	85.54	1078.70	0.079	0.0498	0.0037	0.0535	0.0042	0.0078	0.0002	0.3078	64.23	97.46	178.7	186.3	172.0	52.9	4.0	50.0	1.4
Cycle 2	85.48	998.25	0.086	0.0467	0.0038	0.0493	0.0042	0.0077	0.0002	0.2928	81.90	98.75	228.2	32.3	194.0	48.8	4.0	49.2	1.4
Cycle 3	94.38	1028.13	0.092	0.0439	0.0035	0.0474	0.0040	0.0078	0.0002	0.2793	77.49	98.73	277.7	0.0	0.0	47.0	3.8	50.3	1.4
Cycle 4	85.73	1010.90	0.085	0.0537	0.0039	0.0559	0.0042	0.0076	0.0002	0.3009	81.96	98.70	327.1	357.5	164.0	55.2	4.1	48.5	1.4
Cycle 5	83.68	966.56	0.087	0.0497	0.0037	0.0558	0.0043	0.0081	0.0002	0.2957	82.03	98.88	376.6	180.9	173.0	55.1	4.2	52.2	1.5
Cycle 6	73.72	879.58	0.084	0.0493	0.0039	0.0514	0.0042	0.0076	0.0002	0.2817	89.25	99.30	426.1	161.1	183.0	50.9	4.0	48.6	1.4
Cycle 7	69.21	836.94	0.083	0.0471	0.0038	0.0507	0.0042	0.0078	0.0002	0.2737	84.98	99.11	475.7	54.4	190.0	50.2	4.1	50.2	1.5
Cycle 8	67.27	822.77	0.082	0.0438	0.0038	0.0482	0.0043	0.0080	0.0002	0.2772	78.64	98.73	525.2	0.0	0.0	47.8	4.2	51.3	1.5
Cycle 9	66.64	752.51	0.089	0.0445	0.0039	0.0505	0.0046	0.0082	0.0003	0.2781	87.22	99.24	574.7	0.0	0.0	50.1	4.5	52.9	1.6
Cycle 10	65.67	700.46	0.094	0.0428	0.0040	0.0455	0.0043	0.0077	0.0002	0.2527	80.67	98.97	624.2	0.0	0.0	45.2	4.2	49.6	1.5
Cycle 11	73.16	696.99	0.105	0.0490	0.0044	0.0526	0.0049	0.0078	0.0002	0.2730	75.39	98.47	673.7	145.3	211.0	52.1	4.7	50.1	1.6
Cycle 12	64.04	664.49	0.096	0.0499	0.0044	0.0549	0.0050	0.0080	0.0003	0.2728	85.68	99.11	723.2	191.3	205.0	54.3	4.8	51.3	1.6
Cycle 13	65.94	622.77	0.106	0.0439	0.0043	0.0465	0.0047	0.0077	0.0002	0.2541	88.35	99.33	772.7	0.0	0.0	46.1</td			

Cycle 44	49.29	436.84	0.113	0.0502	0.0055	0.0549	0.0063	0.0079	0.0003	0.2752	89.98	99.33	2458.0	204.7	255.0	54.3	6.0	50.9	1.9
Cycle 45	56.67	456.09	0.124	0.0601	0.0058	0.0662	0.0066	0.0080	0.0003	0.2737	63.86	97.57	2508.0	606.4	208.0	65.1	6.3	51.3	1.9
Cycle 46	57.13	454.32	0.126	0.0427	0.0053	0.0466	0.0060	0.0079	0.0003	0.2569	83.59	99.06	2632.0	-1.0	0.0	46.3	5.8	50.9	1.9
Cycle 47	50.56	425.03	0.119	0.0554	0.0057	0.0620	0.0066	0.0081	0.0003	0.2776	84.39	98.96	2681.0	429.5	230.0	61.0	6.3	52.1	2.0
Cycle 48	45.91	418.33	0.110	0.0547	0.0057	0.0580	0.0062	0.0077	0.0003	0.2724	57.82	97.04	2731.0	401.5	233.0	57.2	6.0	49.3	1.9
Cycle 49	56.91	428.52	0.133	0.0478	0.0055	0.0551	0.0066	0.0084	0.0003	0.2619	100.00	100.00	2781.0	87.2	274.0	54.5	6.3	53.8	2.1

*grain, cycle represents the analyses measured as the beam sputters into the crystal

† 0.0 represents analyses in which the data did not yield reliable calculated dates

Table DR2. U-Pb zircon isotopic data from conventional polished analyses

Grain	Th	U	$^{207}\text{Pb}/^{206}\text{Pb}$		$^{207}\text{Pb}/^{235}\text{U}$		$^{206}\text{Pb}/^{238}\text{U}$		Correlation of Concordia Ellipses		% Radiogenic ^{207}Pb	% Radiogenic ^{206}Pb	$^{207}\text{Pb}/^{206}\text{Pb}$	$^{207}\text{Pb}/^{235}\text{U}$		
	(est. ppm)	(est. ppm)	Th/U	value	1 s.e.	value	1 s.e.	value	1 s.e.	Concordia Ellipses	^{207}Pb	^{206}Pb	Age (Ma)	1 s.e.	Age (Ma)	1 s.e.
EL-20 Migmatite (location: 49°50'58"N; 117°43'27"W)																
1sp1	171.3	591.8	0.289	0.0533	0.0049	0.0665	0.0063	0.0091	0.0002	0.258	74.88	97.98	340.9	208.0	65.4	6.0
2sp1	63.4	393.1	0.161	0.0609	0.0023	0.5873	0.0253	0.0700	0.0012	0.483	59.19	95.27	634.8	81.4	469.1	16.2
4sp1	101.9	901.1	0.113	0.0321	0.0023	0.0952	0.0072	0.0215	0.0004	0.367	37.42	94.08	-1.0	0.0	92.4	6.6
5sp1	183.1	726.2	0.252	0.0541	0.0040	0.0660	0.0050	0.0088	0.0002	0.222	78.56	98.31	373.9	166.0	64.9	4.8
6sp1	254.0	1013.1	0.251	0.0549	0.0028	0.0725	0.0039	0.0096	0.0002	0.367	83.75	98.77	408.0	113.0	71.1	3.7
7sp1	65.0	350.0	0.186	0.0521	0.0051	0.0650	0.0066	0.0091	0.0002	0.222	72.30	97.71	289.5	225.0	64.0	6.3
10sp1	206.3	956.4	0.216	0.0479	0.0029	0.0590	0.0039	0.0089	0.0002	0.383	80.51	98.67	92.2	144.0	58.3	3.7
11sp1	173.1	778.0	0.222	0.0517	0.0043	0.0705	0.0063	0.0099	0.0006	0.464	79.93	98.51	270.5	189.0	69.2	6.0
12sp1	134.9	602.0	0.224	0.0525	0.0034	0.0651	0.0046	0.0090	0.0002	0.423	81.96	98.67	307.0	149.0	64.0	4.4
13sp1	61.0	453.2	0.135	0.0483	0.0035	0.0579	0.0048	0.0087	0.0003	0.468	75.90	98.21	116.1	172.0	57.1	4.6
15sp1	36.1	378.8	0.095	0.0496	0.0079	0.0582	0.0095	0.0085	0.0002	0.293	59.27	96.12	174.7	370.0	57.4	9.1
16sp1	52.6	730.5	0.072	0.0532	0.0036	0.0624	0.0046	0.0085	0.0002	0.378	76.41	98.16	336.9	154.0	61.5	4.4
18sp1	201.3	724.5	0.278	0.0498	0.0073	0.0598	0.0091	0.0087	0.0002	0.347	63.11	96.75	184.0	341.0	59.0	8.7
19sp1	65.3	359.1	0.182	0.0539	0.0087	0.0664	0.0112	0.0089	0.0002	0.317	58.99	95.79	366.2	364.0	65.2	10.6

$$^{206}\text{Pb}/^{238}\text{U}$$

Age (Ma) 1 s.e.

58.1	1.3
436.0	7.4
137.4	2.8
56.8	1.0
61.5	1.1
58.1	1.4
57.4	1.0
63.5	4.0
57.7	1.2
55.7	1.9
54.7	1.2
54.6	1.2
56.0	1.1
57.3	1.5

Table DR3. Ti concentration measurements from zircon

Grain	Ti content (ppm)	Temperature* (Watson et al., 2006) (°C)	Temperature** (Ferry & Watson, 2007) (°C)
EL-20 Migmatite (location: 49°50'58"N; 117°43'27"W)			
Polished			
EL20_alm1_g1s	3.03	645.94	644.79
EL20_alm1_g3s	3.39	654.13	653.44
EL20_alm1_g4s	4.29	671.63	671.96
EL20_alm1_g5s	4.00	666.29	666.31
EL20_alm1_g7s	3.36	653.47	652.74
EL20_alm1_g8s	3.66	659.75	659.39
EL20_alm1_g9s	3.78	662.15	661.93
EL20_alm1_g10s	7.99	721.60	725.07
EL20_alm1_g12s	3.98	665.92	665.91
EL20_alm1_g17s	3.88	664.14	664.03
EL20_alm1_g22s	3.75	661.57	661.31
EL20_alm1_g23s	3.28	651.55	650.71
EL20_alm1_g25s	3.26	651.11	650.25
EL20_alm1_g26s	5.61	692.63	694.24
EL20_alm1_g28s	4.45	674.50	675.00
EL20_alm1_g30s	4.13	668.86	669.03
EL20_alm1_g31s	3.43	654.95	654.31
Unpolished			
EL20_alm1_g3b_s1	2.38	628.68	626.58
EL20_alm1_g4b_s1	2.51	632.54	630.65
EL20_alm1_g9b_s1	2.66	636.48	634.80
EL20_alm1_g10b_s1	2.40	629.46	627.40
EL20_alm1_g12b_s1	2.75	638.95	637.41
EL20_alm1_g30_s1	2.62	635.43	633.70
EL20_alm1_g30_s2	3.25	650.85	649.98
EL20_alm1_g31_s1	2.40	629.43	627.37
EL20_alm1_g32_s1	2.49	631.97	630.05
EL20_alm1_g33_s1	2.77	639.42	637.91
EL20_Alm1_g1_s1	5.04	684.06	685.14
EL20_Alm1_g2_s1	4.85	681.06	681.96
EL20_Alm1_g3_s1	36.17	868.16	882.75
EL20_Alm1_g4_s1	67.03	941.23	962.46
EL20_Alm1_g5_s1	2.74	638.59	637.03
EL20_Alm1_g5_s2	4.87	681.36	682.28
EL20_Alm1_g6_s1	5.62	692.75	694.37
EL20_Alm1_g7_s1	12.62	761.84	768.07
EL20_Alm1_g8_s1	7.00	710.59	713.34
EL20_Alm1_g9_s1	37.16	871.17	886.02
EL20_Alm1_g11_s1	4.35	672.69	673.09
EL20_Alm1_g12_s1	85.53	972.74	997.07
EL20_Alm1_g14_s1	4.55	676.11	676.71
EL20_Alm1_g15_s1	4.95	682.66	683.65
EL20_Alm1_g16_s1	42.05	885.17	901.24
EL20_Alm1_g17_s1	2.22	624.09	621.75
EL20_Alm1_g19_s1	3.63	659.15	658.75
EL20_Alm1_g20_s1	2.95	643.95	642.68

EL20_Alm1_g21_s1	9.95	740.51	745.25
EL20_Alm1_g22_s1	2.56	633.74	631.91
EL20_Alm1_g24_s1	16.64	787.78	795.91
EL20_Alm1_g25_s1	2.99	644.92	643.71
EL20_Alm1_g25_s2	2.55	633.61	631.78
EL20_Alm1_g26_s1	3.09	647.32	646.25
EL20_Alm1_g27_s1	10.25	743.15	748.07

*Temperature calculated using calibration of Watson et al. (2006), assuming activities of TiO₂ and SiO₂ = 1.

**Temperature calculated using calibration of Ferry and Watson (2007) assuming activities of TiO₂ and SiO₂ = 1.

Table DR 4. Oxygen isotope compositions of zircon

Grain	$^{18}\text{O}/^{16}\text{O}$ measure (x1000)	internal precision (1 SD x1000)	delta ^{18}O V-SMOW (‰)*	delta ^{18}O V-SMOW (1 SD ‰)*
EL-20 Migmatite (location: 49°50'58"N; 117°43'27"W) - unpolished rims				
EL20_m2_g1@1.ais	2.0200	0.000251	8.1	0.3
EL20_m2_g1@2.ais	2.0199	0.000131	8.1	0.3
EL20_m2_g2@1.ais	2.0215	0.000116	8.9	0.3
EL20_m2_g2@2.ais	2.0205	0.000217	8.4	0.3
EL20_m2_g3@1.ais	2.0217	0.000153	9.0	0.3
EL20_m3_s1_g1@1.ais	2.0195	0.000149	8.5	0.3
EL20_m3_s1_g2@1.ais	2.0194	0.000143	8.5	0.3
EL20_m3_s1_g3@1.ais	2.0154	0.000181	6.5	0.3
EL20_m3_s1_g4@1.ais	2.0166	0.000156	7.1	0.3
EL20_inM1_g1_s1.ais	2.0233	0.000137	9.2	0.7
EL20_inM1_g1_s2.ais	2.0229	0.000101	9.0	0.7
EL20_inM1_g2_s1.ais	2.0209	0.000184	8.0	0.7
EL20_inM1_g2_s2.ais	2.0203	0.000203	7.7	0.7
EL20_inM1_g3_s1.ais	2.0223	0.000112	8.7	0.7
EL20_inM1_g3_s2.ais	2.0231	0.000184	9.1	0.7
EL20_inM1_g4_s1.ais	2.0234	0.000156	9.2	0.7
EL20_inM1_g4_s2.ais	2.0235	0.000129	9.3	0.7
EL20_inM1_g5_s1.ais	2.0238	0.000146	9.4	0.7
EL20_inM1_g5_s2.ais	2.0234	0.000151	9.2	0.7
EL20_inM1_g6_s1.ais	2.0203	0.000125	7.7	0.7
EL20_inM1_g6_s2.ais	2.0203	0.000143	7.7	0.7
EL20_inM1_g7_s1.ais	2.0231	0.000175	9.1	0.7
EL20_inM1_g7_s2.ais	2.0230	0.000161	9.0	0.7
EL20_inM1_g8_s1.ais	2.0233	0.000127	9.2	0.7
EL20_inM1_g8_s2.ais	2.0235	0.000094	9.3	0.7
EL20_inM1_g9_s1.ais	2.0215	0.000162	8.3	0.7
EL20_inM1_g10_s1.ais	2.0203	0.000170	7.7	0.7
EL20_inM1_g10_s2.ais	2.0204	0.000125	7.7	0.7
EL20_inM1_g11_s1.ais	2.0229	0.000131	9.0	0.7
EL20_inM1_g11_s2.ais	2.0232	0.000195	9.1	0.7
EL20_inM1_g13_s2.ais	2.0234	0.000123	9.2	0.7
EL20_inM1_g14_s1.ais	2.0210	0.000102	8.1	0.7
EL20_inM1_g14_s2.ais	2.0202	0.000175	7.6	0.7
EL20_inM1_g12_s1.ais	2.0203	0.000180	7.7	0.7
EL20_inM1_g12_s2.ais	2.0208	0.000093	7.9	0.7
EL20_inM1_g13_s1.ais	2.0228	0.000117	9.0	0.7
EL20_inM1_g15_s1.ais	2.0212	0.000142	8.1	0.7
EL20_inM1_g16_s1.ais	2.0191	0.000185	7.1	0.7
EL20_inM1_g16_s2.ais	2.0196	0.000125	7.3	0.7
EL20_inM1_g17_s1.ais	2.0204	0.000123	7.7	0.7
EL20_inM1_g17_s2.ais	2.0198	0.000110	7.4	0.7
EL20_inM1_g19_s2.ais	2.0235	0.000129	9.3	0.7
EL20_inM1_g18_s1.ais	2.0229	0.000104	9.0	0.7
EL20_inM1_g18_s2.ais	2.0226	0.000092	8.8	0.7
EL20_inM1_g19_s1.ais	2.0240	0.000186	9.5	0.7
EL20 Migmatite - interior				
GM1_EL20_g24@1.ais	2.0166	0.000291	7.0	0.3
GM1_EL20_g24@2.ais	2.0169	0.000152	7.2	0.3
GM1_EL20_g23@1.ais	2.0182	0.000129	7.8	0.3
GM1_EL20_g23@2.ais	2.0154	0.000220	6.4	0.3
GM1_EL20_g22@1.ais	2.0162	0.000151	6.8	0.3
GM1_EL20_g22@2.ais	2.0138	0.000135	5.7	0.3

GM1_EL20_g21@1.ais	2.0161	0.000124	6.8	0.3
GM1_EL20_g21@2.ais	2.0163	0.000106	6.9	0.3
GM1_EL20_g20@1.ais	2.0175	0.000149	7.5	0.3
GM1_EL20_g20@2.ais	2.0161	0.000186	6.8	0.3
GM1_EL20_g19@1.ais	2.0159	0.000242	6.7	0.3
GM1_EL20_g19@2.ais	2.0160	0.000116	6.7	0.3
GM1_EL20_g18@1.ais	2.0185	0.000125	8.0	0.3
GM1_EL20_g18@2.ais	2.0172	0.000203	7.3	0.3
GM1_EL20_g17@1.ais	2.0164	0.000193	6.9	0.3
GM1_EL20_g17@2.ais	2.0159	0.000134	6.7	0.3
GM1_EL20_g16@1.ais	2.0057	0.000136	1.6	0.3
GM1_EL20_g16@2.ais	2.0066	0.000165	2.1	0.3
GM1_EL20_g15@1.ais	2.0159	0.000195	6.7	0.3
GM1_EL20_g15@2.ais	2.0167	0.000129	7.1	0.3
GM1_EL20_g14@1.ais	2.0162	0.000161	6.8	0.3
GM1_EL20_g14@2.ais	2.0157	0.000103	6.6	0.3
GM1_EL20_g13@1.ais	2.0168	0.000185	7.1	0.3
GM1_EL20_g13@2.ais	2.0164	0.000119	6.9	0.3
GM1_EL20_g12@1.ais	2.0186	0.000156	8.0	0.3
GM1_EL20_g12@2.ais	2.0178	0.000199	7.6	0.3
GM1_EL20_g11@1.ais	2.0157	0.000199	6.6	0.3
GM1_EL20_g11@2.ais	2.0172	0.000208	7.4	0.3
EL20_m2_s2@1.ais	2.0165	0.000220	7.8	0.3
EL20_m2_s2@2.ais	2.0144	0.000250	6.7	0.3
EL20_m2_s2@3.ais	2.0156	0.000193	7.3	0.3
EL20_m2_s2@4.ais	2.0164	0.000142	7.7	0.3
EL20_m2_s2@5.ais	2.0120	0.000198	5.5	0.3
EL20_m2_s2@6.ais	2.0160	0.000147	7.5	0.3
EL20_m2_s2@7.ais	2.0154	0.000128	7.2	0.3
EL20_m2_s2@8.ais	2.0155	0.000100	7.3	0.3
EL20_m2_s2@9.ais	2.0173	0.000165	8.2	0.3
EL20_m2_s2_g2@1.ais	2.0161	0.000228	7.6	0.3
EL20_m2_s2_g2@2.ais	2.0160	0.000238	7.5	0.3
EL20_m2_s2_g2@3.ais	2.0158	0.000154	7.4	0.3
EL20_m2_s2_g2@4.ais	2.0158	0.000152	7.4	0.3
EL20_m2_s2_g2@5.ais	2.0163	0.000174	7.6	0.3
EL20_m2_s2_g2@6.ais	2.0161	0.000179	7.5	0.3
EL20_m2_s2_g2@7.ais	2.0146	0.000108	6.8	0.3
EL20_m2_s2_g2@8.ais	2.0156	0.000125	7.3	0.3
EL20_m2_s2_g2@9.ais	2.0157	0.000109	7.4	0.3
EL20_m2_s2_g2@10.ais	2.0188	0.000189	8.9	0.3

*after correction for instrumental mass fractionation using Pacoima and AS3 zircon standard