Passive margin magmatism caused by enhanced slab-pull forces in Central Tibet

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Text DR1. Analytical methods

1.1. Zircon U-Pb age analysis

Measurements of U, Th and Pb were conducted using the Cameca IMS-1280 SIMS at the Institute of Geology and Geophysics, Chinese Academy of Sciences (IGG-CAS), Beijing. The analytical procedures were similar to those described by [Li et al. \(2009\)](#). The O_2^- primary ion beam with an intensity of ca. 10 nA was accelerated at -13 kV. A single electron multiplier was used in ion-counting mode to measure secondary ion beam intensities by peak jumping. Each measurement consisted of seven cycles, and the total analytical time is ca. 13 min. A long-term uncertainty of 1.5% (1 RSD) for $^{206}Pb/^{238}U$ measurements of the standard zircons was propagated to the unknowns ([Li et al., 2010a](#)), despite that the measured $^{206}Pb/^{238}U$ error during the course of this study is generally around 1% (1 RSD) or less. Uncertainties on individual analyses in the data tables are reported at a 1σ level. Mean ages for pooled U/Pb and Pb/Pb analyses are quoted with 2σ and/or 95% confidence intervals.

1.2. Zircon O isotope analysis

Zircon O isotopes were measured in two laboratories following standard procedures ([Li et al., 2010b](#); [Tang et al., 2015](#)). Sample 13GZ123-1 was measured using the same Cameca IMS-1280 SIMS at IGG-CAS, and sample 15ZB65-1 and 15ZB142-1 using Cameca IMS-1280-HR at the State Key Laboratory of Isotope Geochemistry, the Guangzhou Institute of Geochemistry, Chinese Academy of Sciences (SKLaBIG GIGCAS). The measured oxygen isotopic data were corrected for instrumental mass fractionation using the Penglai zircon standard ($\delta^{18}O_{VSMOW} = 5.3\text{‰}$) ([Li et al., 2010b](#)). The internal precision of a single analysis generally was better than 0.20‰ (1σ standard

error) and 0.15‰ for the $^{18}\text{O}/^{16}\text{O}$ ratio in IGG-CAS and GIGCAS, respectively. The external precision, measured by the reproducibility of repeated analyses of Penglai standard in both laboratories is similar, with 0.41‰ (2SD, $n = 20$) at IGG-CAS and 0.42‰ (2SD, $n = 25$). Eight and 12 measurements of the Qinghu zircon standard during the course of these studies yielded weighted mean of $\delta^{18}\text{O} = 5.51 \pm 0.35\text{‰}$ (2SD) at IGG-CAS and $5.27 \pm 0.31\text{‰}$ (2SD) at GIGCAS, both of which are consistent within errors with the reported value of $5.4 \pm 0.2\text{‰}$ (Li et al., 2013).

1.3. Geochemical analysis

Whole-rock geochemical analyses, including major and trace elements, and Sr-Nd isotopes, were carried at SKLaBIG GIGCAS. Rock samples crushed to ~200-mesh size were used for geochemical analyses. Major element oxides were analyzed on fused glass beads using a Rigaku RIX 2000 X-ray fluorescence spectrometer. Calibration lines used in quantification were produced by bivariate regression of data from 36 reference materials encompassing a wide range of silicate compositions (Li et al., 2005). Analytical uncertainties are between 1% and 5%. Trace elements were analyzed using an Agilent 7500a ICP-MS. Analytical procedures were similar to those described by Li et al. (2000). An internal standard solution containing the single element Rh was used to monitor signal drift during counting. A set of USGS and Chinese national rock standards, including BHVO-2, AGV-2, W-2a, GSR-1 and GSR-2 were chosen for calibration. Analytical precision is typically better than 5%. Sr-Nd isotopic compositions were determined using a Micromass Isoprobe multi-collector ICP-MS. Analytical procedures are similar to those described in Li et al. (2004). All measured Nd and Sr isotope ratios were normalized to $^{146}\text{Nd}/^{144}\text{Nd} = 0.7219$ and $^{86}\text{Sr}/^{88}\text{Sr} = 0.1194$, respectively. The

measured $^{87}\text{Sr}/^{86}\text{Sr}$ ratio of the NBS 987 standard and $^{143}\text{Nd}/^{144}\text{Nd}$ ratio of the JNdi-1 standard were 0.710274 ± 18 ($n = 11, 2\sigma$) and 0.512093 ± 11 ($n = 11, 2\sigma$), respectively. The reported Sr and Nd isotope values were adjusted to 0.710248 and 0.512115, respectively.

Figure DR1 The distribution and occurrence of mafic dikes in the Southern Qiangtang Terrane. (a) The Enhanced Thematic Mapper (ETM) of the Pianshishan area show that the mafic dikes (black banding) are 1~5 km long and several to tens of meters width (reproduced from Wang et al., 2009). It is note that mafic dikes with tens of meters width are composite dikes, not single dike based on field observation. (b) Mafic dikes are several meters or less in width, but surrounded by weathered zones that exaggerate their apparent width. (c) Microphotograph show mafic dikes consist of clinopyroxene and plagioclase displaying ophitic texture, with mild alteration to chlorite and sericite, respectively.

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Figure DR2 SIMS zircon U-Pb dating results for mafic dike samples. Left two columns, SIMS U-Pb Concordia plots for zircons in the mafic dike samples in. Most zircons are concordant or nearly so. Right column, Uranium concentrations vs. U-Pb ages. U-rich zircons have anomalously older ages and have been excluded based on the high-U matrix effect (White and Ireland, 2012). The cathodoluminescence (CL) images of representative zircons for in situ analysis of U-Pb isotopes. The white scale bars are 100 μm long.

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99 **Figure DR3** Plot of Nd versus $\epsilon_{\text{Nd}}(t)$. The curves are based on the energy-constrained
 100 assimilation-fractional crystallization (EC-AFC) model (Bohrson & Spera, 2001). The
 101 potential contaminants are the Paleozoic metasedimentary rocks or the basement rocks
 102 (480 Ma granites, Hu et al., 2015), but only geochemical data are available from the 480
 103 granites. The physical characteristics of the magma body-country rock system are those
 104 suggested by Bohrson & Spera (2001) for standard upper crust. The model parameters are
 105 in Table DR4.

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Figure DR4 Non-modal batch melting model for Dy/Yb vs. La/Yb and Yb vs. La/Yb, using the equation of Shaw (1970). Small circles along the curves indicate the percentages of melting. Melting modes are from Thirlwall et al. (1994). Full model parameters are given in Table DR5. Results suggest melting in the transition zone of the spinel–garnet stability field for the great majority of the samples.

Figure DR5 Plots of (a) Ti versus V (Shervais, 1982) and (b) Nb/Yb versus Th/Yb (Pearce et al., 2008). Data sources: basalts in the SQT (this study); basalts in the GLS (Liu et al., 2016); basalts in the Okinawa trough (Shinjo et al., 1999); basalts in the Mariana trough (Pearce et al., 2005). BABB, back-arc basin basalt.

Table DR1 SIMS Zircon U-Pb isotopic data

Sample spot	U/ ppm	Th/ ppm	Th/U	f ₂₀₆ % *	²⁰⁷ Pb/ ²⁰⁶ Pb	±σ%	²⁰⁷ Pb/ ²³⁵ U	±σ%	²⁰⁶ Pb/ ²³⁸ U	±σ%	ρ	²⁰⁷ Pb/ ²⁰⁶ Pb	±σ%	²⁰⁷ Pb/ ²³⁵ U	±σ%	²⁰⁶ Pb/ ²³⁸ U	±σ%
13GZ117-3@1	2067	5150	2.49	0.04	0.0508	0.55	0.261	1.598	0.0373	1.50	0.940	230.9	12.6	235.8	3.4	236.3	3.5
13GZ117-3@2	2104	4593	2.18	0.02	0.0511	0.51	0.268	1.584	0.0381	1.50	0.947	243.3	11.7	241.1	3.4	240.9	3.5
13GZ117-3@3	3199	8893	2.78	0.39	0.0506	0.61	0.264	1.620	0.0379	1.50	0.927	221.4	14.0	237.9	3.4	239.5	3.5
13GZ117-3@4	2196	4546	2.07	0.03	0.0509	0.62	0.268	1.621	0.0382	1.50	0.925	237.2	14.1	241.0	3.5	241.4	3.6
13GZ117-3@5	1009	1983	1.96	0.07	0.0508	0.82	0.263	1.710	0.0376	1.50	0.877	229.8	18.8	237.1	3.6	237.9	3.5
13GZ117-3@6	2322	5511	2.37	0.1	0.0505	0.56	0.264	1.601	0.0378	1.50	0.937	218.7	12.9	237.5	3.4	239.4	3.5
13GZ117-3@7	2532	7633	3.01	0.19	0.0510	0.62	0.269	1.624	0.0383	1.50	0.924	239.2	14.3	241.9	3.5	242.2	3.6
13GZ117-3@8	2098	4593	2.19	0.05	0.0511	0.68	0.263	1.649	0.0374	1.50	0.911	243.2	15.6	237.3	3.5	236.7	3.5
13GZ117-3@9	1199	3910	3.26	0.06	0.0508	0.98	0.328	1.971	0.0468	1.71	0.868	231.9	22.4	288.1	5.0	295.1	4.9
13GZ117-3@10	1898	4937	2.60	0.13	0.0506	0.65	0.263	1.636	0.0377	1.50	0.917	224.1	15.0	237.0	3.5	238.3	3.5
13GZ118-2@1	9639	24641	2.56	0.01	0.0510	0.27	0.286	1.532	0.0407	1.51	0.984	239.1	6.3	255.5	3.5	257.3	3.8
13GZ118-2@2	11579	34217	2.96	0.02	0.0512	0.22	0.294	1.517	0.0416	1.50	0.990	247.7	5.0	261.4	3.5	263.0	3.9
13GZ118-2@3	2577	4633	1.80	0.16	0.0508	0.59	0.262	1.622	0.0374	1.51	0.931	231.2	13.6	236.1	3.4	236.6	3.5
13GZ118-2@4	3055	6552	2.14	1.04	0.0499	0.90	0.269	1.752	0.0391	1.50	0.857	191.3	20.8	241.8	3.8	247.0	3.6
13GZ118-2@5	5103	16562	3.25	0.73	0.0514	0.73	0.282	1.670	0.0398	1.50	0.899	257.9	16.7	252.1	3.7	251.5	3.7
13GZ118-2@6	8737	17942	2.05	0.2	0.0512	0.34	0.281	1.539	0.0398	1.50	0.975	248.5	7.9	251.2	3.4	251.5	3.7
13GZ118-2@7	4529	20358	4.49	1.07	0.0506	1.26	0.275	1.957	0.0395	1.50	0.767	222.1	28.8	247.1	4.3	249.7	3.7
13GZ118-2@8	3041	6196	2.04	0.06	0.0508	0.46	0.275	1.569	0.0393	1.50	0.956	229.9	10.6	246.9	3.4	248.7	3.7
13GZ118-2@9	5497	24915	4.53	0.18	0.0513	0.39	0.285	1.553	0.0403	1.50	0.968	254.7	9.0	254.7	3.5	254.7	3.8
13GZ118-2@10	12908	29292	2.27	0.01	0.0511	0.21	0.296	1.558	0.0420	1.54	0.991	246.8	4.8	263.2	3.6	265.1	4.0
13GZ118-2@11	8128	27105	3.33	0.02	0.0511	0.26	0.280	1.529	0.0397	1.51	0.986	246.9	5.9	250.7	3.4	251.1	3.7

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Sample spot	U/ ppm	Th/ ppm	Th/U	f ₂₀₆ %*	²⁰⁷ Pb/ ²⁰⁶ Pb	±σ%	²⁰⁷ Pb/ ²³⁵ U	±σ%	²⁰⁶ Pb/ ²³⁸ U	±σ%	ρ	²⁰⁷ Pb/ ²⁰⁶ Pb	±σ%	²⁰⁷ Pb/ ²³⁵ U	±σ%	²⁰⁶ Pb/ ²³⁸ U	±σ%
13GZ120-2@1	1946	6412	3.29	0.07	0.0509	0.57	0.268	1.605	0.0382	1.50	0.936	234.1	13.0	240.7	3.4	241.4	3.6
13GZ120-2@2	2272	8855	3.90	0.05	0.0511	0.90	0.271	1.750	0.0384	1.50	0.857	245.9	20.6	243.2	3.8	242.9	3.6
13GZ120-2@3	1804	7204	3.99	0.13	0.0508	0.64	0.273	1.631	0.0390	1.50	0.920	229.6	14.7	244.8	3.6	246.4	3.6
13GZ120-2@4	9317	38676	4.15	0.03	0.0509	0.31	0.268	2.855	0.0382	2.84	0.994	234.5	7.2	241.3	6.2	242.0	6.7
13GZ120-2@5	2934	15652	5.34	0.14	0.0504	0.61	0.263	1.631	0.0378	1.51	0.927	214.0	14.1	237.0	3.5	239.4	3.6
13GZ120-2@6	1771	6510	3.68	0.06	0.0503	0.62	0.270	1.623	0.0390	1.50	0.924	207.6	14.3	243.1	3.5	246.7	3.6
13GZ120-2@7	2072	12800	6.18	0.11	0.0501	0.59	0.269	1.616	0.0389	1.50	0.931	200.8	13.6	241.5	3.5	245.7	3.6
13GZ120-2@8	2875	9272	3.22	0.11	0.0511	0.61	0.274	1.620	0.0390	1.50	0.926	243.8	14.0	246.3	3.5	246.5	3.6
13GZ120-2@9	2684	16294	6.07	0.06	0.0513	0.51	0.266	1.586	0.0376	1.50	0.946	252.9	11.8	239.4	3.4	238.0	3.5
13GZ123-1@1	709	1998	2.82	0.16	0.0497	1.29	0.263	1.984	0.0383	1.50	0.759	182.8	29.8	236.7	4.2	242.1	3.6
13GZ123-1@2	3044	18886	6.20	0.15	0.0515	0.41	0.283	1.557	0.0399	1.50	0.964	264.7	9.5	253.3	3.5	252.0	3.7
13GZ123-1@3	4407	21719	4.93	0.06	0.0510	0.37	0.285	1.546	0.0406	1.50	0.971	241.2	8.5	254.8	3.5	256.3	3.8
13GZ123-1@4	5251	19111	3.64	0.5	0.0509	0.75	0.276	1.685	0.0394	1.51	0.895	234.3	17.2	247.6	3.7	249.0	3.7
13GZ123-1@5	4177	18120	4.34	0.05	0.0506	0.40	0.283	1.552	0.0405	1.50	0.966	224.2	9.2	252.9	3.5	256.0	3.8
13GZ123-1@6	2344	7644	3.26	0.07	0.0508	0.60	0.274	1.615	0.0392	1.50	0.929	229.9	13.7	246.1	3.5	247.8	3.6
13GZ123-1@7	1784	9196	5.15	0.31	0.0507	0.92	0.271	1.764	0.0388	1.50	0.853	228.3	21.2	243.8	3.8	245.4	3.6
13GZ123-1@8	2887	7167	2.48	0.11	0.0510	0.51	0.276	1.583	0.0392	1.50	0.948	242.1	11.6	247.3	3.5	247.9	3.6
13GZ123-1@9	1589	3924	2.47	0.27	0.0521	0.57	0.276	1.606	0.0384	1.50	0.934	290.5	13.0	247.5	3.5	242.9	3.6
13GZ123-1@10	3046	14060	4.62	0.1	0.0509	0.80	0.276	1.703	0.0392	1.50	0.881	238.3	18.5	247.1	3.7	248.1	3.7
13GZ123-1@11	653	2574	3.94	0.53	0.0501	1.91	0.262	2.433	0.0379	1.50	0.617	199.5	43.9	235.9	5.1	239.6	3.5
13GZ123-1@12	2514	20179	8.03	0.53	0.0497	1.37	0.267	2.035	0.0390	1.50	0.738	182.5	31.7	240.5	4.4	246.5	3.6
13GZ123-1@13	1521	7993	5.26	0.19	0.0504	0.82	0.269	1.715	0.0387	1.50	0.877	214.2	19.0	241.8	3.7	244.7	3.6

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Sample spot	U/ ppm	Th/ ppm	Th/U	f ₂₀₆ % *	²⁰⁷ Pb/ ²⁰⁶ Pb	±σ%	²⁰⁷ Pb/ ²³⁵ U	±σ%	²⁰⁶ Pb/ ²³⁸ U	±σ%	ρ	²⁰⁷ Pb/ ²⁰⁶ Pb	±σ%	²⁰⁷ Pb/ ²³⁵ U	±σ%	²⁰⁶ Pb/ ²³⁸ U	±σ%
15ZB65-1@1	1226	3385	2.76	0.04	0.0508	0.90	0.267	1.86	0.0382	1.63	0.876	231.6	20.5	240.6	4.0	241.5	3.9
15ZB65-1@2	1932	5770	2.99	0.06	0.0515	1.03	0.266	1.86	0.0374	1.55	0.833	265.1	23.5	239.4	4.0	236.8	3.6
15ZB65-1@3	961	2102	2.19	0.05	0.0516	1.39	0.268	2.11	0.0376	1.58	0.751	269.0	31.6	240.7	4.5	237.8	3.7
15ZB65-1@4	807	1536	1.90	0.04	0.0514	1.03	0.265	1.82	0.0375	1.50	0.825	259.0	23.4	239.1	3.9	237.0	3.5
15ZB65-1@5	987	2124	2.15	0.08	0.0512	0.98	0.264	1.81	0.0375	1.52	0.839	250.5	22.5	238.3	3.8	237.0	3.5
15ZB65-1@6	1895	4884	2.58	0.04	0.0507	0.75	0.261	1.70	0.0374	1.53	0.897	229.2	17.2	235.8	3.6	236.5	3.5
15ZB65-1@7	2092	6153	2.94	0.02	0.0516	0.76	0.267	1.74	0.0375	1.56	0.898	267.7	17.4	240.0	3.7	237.2	3.6
15ZB65-1@8	1729	5882	3.40	0.05	0.0512	0.67	0.272	1.66	0.0384	1.52	0.915	250.7	15.3	243.9	3.6	243.2	3.6
15ZB65-1@9	1096	2482	2.26	0.05	0.0508	1.18	0.257	2.14	0.0367	1.78	0.833	232.9	27.1	232.4	4.4	232.3	4.1
15ZB65-1@10	639	1515	2.37	0.07	0.0516	1.34	0.267	2.02	0.0376	1.51	0.746	267.6	30.5	240.5	4.3	237.8	3.5
15ZB65-1@11	544	841	1.55	>1e6	0.0521	1.17	0.269	1.93	0.0374	1.53	0.795	290.4	26.5	241.7	4.2	236.7	3.6
15ZB65-1@12	1490	3753	2.52	0.11	0.0510	0.85	0.261	1.78	0.0371	1.57	0.880	239.2	19.4	235.4	3.7	235.0	3.6
15ZB65-1@13	1307	3616	2.77	0.05	0.0512	0.83	0.264	1.79	0.0374	1.59	0.887	251.2	18.9	238.0	3.8	236.7	3.7
15ZB142-1@1	746	1266	1.70	0.07	0.0512	1.16	0.263	2.00	0.0373	1.63	0.815	249.6	26.4	237.2	4.2	236.0	3.8
15ZB142-1@2	989	1683	1.70	0.03	0.0510	1.12	0.264	1.87	0.0375	1.50	0.802	242.6	25.6	237.6	4.0	237.2	3.5
15ZB142-1@3	1669	2934	1.76	0.05	0.0516	0.96	0.266	1.81	0.0374	1.54	0.848	267.4	21.9	239.6	3.9	236.8	3.6
15ZB142-1@4	1253	1811	1.45	0.03	0.0509	0.80	0.263	1.70	0.0375	1.50	0.883	234.2	18.3	237.3	3.6	237.6	3.5
15ZB142-1@5	779	1198	1.54	0.04	0.0505	1.01	0.261	1.82	0.0375	1.51	0.833	218.1	23.1	235.8	3.8	237.6	3.5
15ZB142-1@6	880	1531	1.74	0.05	0.0512	1.03	0.261	1.89	0.0370	1.58	0.840	248.5	23.4	235.6	4.0	234.3	3.6
15ZB142-1@7	1709	3802	2.23	0.02	0.0509	0.67	0.266	1.66	0.0378	1.51	0.914	237.2	15.5	239.3	3.5	239.5	3.6
15ZB142-1@8	1591	3120	1.96	0.04	0.0510	0.87	0.266	1.87	0.0379	1.65	0.884	239.1	20.0	239.6	4.0	239.6	3.9
15ZB142-1@9	1219	2912	2.39	0.05	0.0511	0.86	0.266	1.78	0.0377	1.55	0.874	245.9	19.8	239.3	3.8	238.6	3.6
15ZB142-1@10	1722	3887	2.26	0.01	0.0511	0.68	0.265	1.67	0.0376	1.53	0.913	246.9	15.6	238.6	3.6	237.8	3.6
15ZB142-1@11	1303	2451	1.88	0.19	0.0510	1.33	0.262	2.02	0.0372	1.52	0.752	242.4	30.4	236.2	4.3	235.6	3.5

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Sample spot	U/ ppm	Th/ ppm	Th/U	f ₂₀₆ % *	²⁰⁷ Pb/ ²⁰⁶ Pb	±σ%	²⁰⁷ Pb/ ²³⁵ U	±σ%	²⁰⁶ Pb/ ²³⁸ U	±σ%	ρ	²⁰⁷ Pb/ ²⁰⁶ Pb	±σ%	²⁰⁷ Pb/ ²³⁵ U	±σ%	²⁰⁶ Pb/ ²³⁸ U	±σ%
15ZB165-1@1	618	540	0.87	0.01	0.0619	0.74	0.926	1.68	0.1085	1.50	0.896	670.9	15.9	665.6	8.2	664.0	9.5
15ZB165-1@2	3579	4686	1.31	0.01	0.0513	0.49	0.275	1.58	0.0388	1.50	0.951	255.2	11.2	246.3	3.5	245.4	3.6
15ZB165-1@3	5833	10979	1.88	0.34	0.0506	0.60	0.271	1.62	0.0389	1.50	0.928	220.4	13.9	243.6	3.5	246.1	3.6
15ZB165-1@4	5281	20818	3.94	0.18	0.0513	0.65	0.269	1.64	0.0381	1.50	0.918	255.5	14.8	242.2	3.5	240.8	3.6
15ZB165-1@5	4871	18808	3.86	0.82	0.0515	1.00	0.264	1.82	0.0371	1.53	0.837	261.9	22.7	237.6	3.9	235.1	3.5
15ZB165-1@6	8298	25465	3.07	0.18	0.0507	0.45	0.275	1.57	0.0394	1.50	0.958	227.3	10.4	247.0	3.4	249.1	3.7
15ZB165-1@7	9540	22800	2.39	0.10	0.0510	0.36	0.277	1.54	0.0394	1.50	0.972	241.5	8.3	248.1	3.4	248.8	3.7
15ZB165-1@8	20561	26372	1.28	0.13	0.0511	0.28	0.294	1.55	0.0417	1.52	0.983	245.5	6.5	261.5	3.6	263.2	3.9
15ZB165-1@9	3499	16184	4.62	0.06	0.0515	0.60	0.280	1.63	0.0394	1.51	0.929	263.9	13.8	250.4	3.6	248.9	3.7
15ZB165-1@10	16586	42679	2.57	0.28	0.0510	0.42	0.295	1.56	0.0419	1.50	0.963	242.8	9.6	262.3	3.6	264.5	3.9
15ZB165-1@11	5901	23242	3.94	0.45	0.0504	0.83	0.278	1.72	0.0400	1.50	0.875	212.9	19.1	248.8	3.8	252.6	3.7
15ZB165-1@12	9686	25780	2.66	0.28	0.0513	0.47	0.286	1.58	0.0404	1.51	0.955	255.8	10.7	255.4	3.6	255.4	3.8
15ZB165-1@13	10989	32312	2.94	0.20	0.0512	0.70	0.287	1.71	0.0407	1.56	0.913	249.1	15.9	256.5	3.9	257.3	3.9
15ZB165-1@14	4817	36940	7.67	0.85	0.0509	0.92	0.269	1.76	0.0383	1.50	0.852	237.2	21.2	241.6	3.8	242.0	3.6

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143 * f₂₀₆ is the percentage of common ²⁰⁶Pb in total ²⁰⁶Pb

Sample spot	delta O18	2SE
13GZ123-1@1	5.28	0.39
13GZ123-1@2	5.54	0.26
13GZ123-1@3	5.34	0.23
13GZ123-1@4	5.54	0.33
13GZ123-1@5	4.96	0.26
13GZ123-1@6	5.48	0.37
13GZ123-1@7	5.53	0.25
15ZB65-1@01	5.51	0.20
15ZB65-1@02	5.44	0.20
15ZB65-1@03	5.53	0.20
15ZB65-1@04	5.42	0.13
15ZB65-1@05	5.57	0.23
15ZB65-1@06	5.45	0.20
15ZB65-1@07	5.52	0.20
15ZB65-1@08	5.54	0.16
15ZB65-1@09	5.64	0.20
15ZB65-1@10	5.41	0.22
15ZB65-1@11	5.65	0.22
15ZB65-1@12	5.50	0.28
15ZB65-1@13	5.50	0.22
15ZB65-1@14	5.49	0.29
15ZB65-1@15	5.07	0.24
15ZB65-1@16	5.56	0.17
15ZB65-1@17	5.71	0.29
15ZB65-1@18	5.99	0.20
15ZB65-1@19	5.57	0.22

15ZB65-1@20	5.81	0.20
15ZB65-1@21	5.72	0.24
15ZB65-1@22	6.11	0.17
15ZB65-1@23	5.77	0.19
15ZB142-1@01	5.38	0.25
15ZB142-1@02	5.45	0.20
15ZB142-1@03	5.47	0.20
15ZB142-1@04	5.42	0.22
15ZB142-1@05	5.28	0.21
15ZB142-1@06	5.53	0.15
15ZB142-1@07	5.47	0.21
15ZB142-1@08	5.65	0.17
15ZB142-1@09	5.64	0.21
15ZB142-1@10	5.57	0.24
15ZB142-1@11	5.62	0.20
15ZB142-1@12	5.39	0.21
15ZB142-1@13	5.38	0.17
15ZB142-1@14	5.51	0.13
15ZB142-1@15	5.58	0.25
15ZB142-1@16	5.70	0.15
15ZB142-1@17	5.75	0.17
15ZB142-1@18	5.42	0.11
15ZB142-1@19	5.62	0.13
15ZB142-1@20	5.56	0.30
15ZB142-1@21	5.63	0.13
15ZB142-1@22	5.56	0.21
15ZB142-1@23	5.88	0.20

Sample	13GZ116-1	13GZ116-2	13GZ117-1	13GZ117-2	13GZ117-3	13GZ117-4	13GZ118-1
Latitude	33°24'19"	33°24'19"	33°25'47.5"	33°25'47.5"	33°25'47.5"	33°25'47.5"	33°26'22"
Longitude	85°02'45"	85°02'45"	85°01'54"	85°01'54"	85°01'54"	85°01'54"	85°02'03"
Major element (%)							
SiO ₂	50.69	50.58	49.69	48.28	47.99	49.68	49.95
TiO ₂	1.93	1.84	2.21	2.13	1.88	1.90	1.59
Al ₂ O ₃	16.87	17.30	14.43	12.89	11.41	15.06	15.67
Fe ₂ O ₃	8.34	8.19	10.04	10.60	10.85	8.14	8.16
MnO	0.16	0.14	0.16	0.17	0.16	0.14	0.16
MgO	5.70	5.51	9.26	12.49	14.96	7.93	7.60
CaO	11.70	12.17	9.56	9.10	9.06	13.00	12.52
Na ₂ O	2.41	2.32	2.45	2.08	1.58	2.16	1.70
K ₂ O	0.75	0.55	0.58	0.62	0.49	0.62	1.30
P ₂ O ₅	0.17	0.17	0.19	0.17	0.15	0.14	0.11
Total	99.64	99.68	99.67	99.71	99.75	99.67	99.67
L.O.I	2.05	1.99	2.77	3.27	3.78	2.07	2.62
Trace element (ppm)							
Sc	27.0	25.3	27.2	25.1	24.2	35.0	24.1
V	219	208	241	228	215	244	199
Cr	374	142	492	794	1195	212	261
Co	31.7	30.8	48.4	66.9	62.6	38.9	36.5
Ni	83.3	74.3	225	404	436	103	62.9
Cu	55.3	36.7	69.4	138	72.4	25.7	35.6
Zn	89.1	77.5	91.9	93.8	106	71.8	82.6
Ga	22.5	23.3	19.3	18.1	16.6	20.2	19.4
Ge	2.83	2.52	2.97	2.68	2.94	2.66	1.50
Rb	21.1	16.0	20.1	22.6	13.8	18.0	47.0
Sr	387	457	493	277	247	375	442
Y	21.3	22.7	20.4	20.4	18.1	18.0	18.0
Zr	163	157	148	133	117	119	115
Nb	13.6	12.8	15.0	13.4	11.9	11.8	9.16
Cs	0.33	0.50	0.63	0.85	0.70	0.50	1.92
Ba	195	181	160	191	161	265	252
La	18.4	19.4	15.7	14.7	12.4	12.2	12.0
Ce	41.2	41.7	36.4	33.5	27.8	29.3	28.1
Pr	5.49	5.29	5.04	4.44	3.98	4.05	3.69
Nd	23.5	22.0	22.5	19.5	17.9	18.3	16.1
Sm	4.98	4.85	5.01	4.60	4.15	4.30	3.90
Eu	1.70	1.71	1.82	1.66	1.46	1.63	1.33
Gd	4.83	4.83	4.91	4.57	4.26	4.23	3.98
Tb	0.80	0.76	0.82	0.75	0.68	0.73	0.66
Dy	4.59	4.51	4.59	4.31	3.83	4.10	3.87
Ho	0.90	0.90	0.87	0.83	0.76	0.78	0.77
Er	2.33	2.36	2.11	2.09	1.90	1.94	1.97
Tm	0.34	0.33	0.30	0.29	0.26	0.27	0.27
Yb	2.12	2.09	1.78	1.72	1.51	1.61	1.67
Lu	0.32	0.32	0.26	0.25	0.22	0.23	0.25
Hf	4.51	4.20	4.10	3.64	3.19	3.33	3.03
Ta	0.97	0.95	1.05	1.00	0.89	0.84	0.72
Pb	5.77	5.22	5.60	4.34	4.44	2.37	5.18
Th	4.00	4.03	2.36	2.10	1.68	1.72	2.88
U	0.65	0.66	0.53	0.51	0.42	0.41	0.71
Mg ^{#a}	60.1	59.7	67.0	72.2	75.2	68.2	67.2
(La/Yb) _N	6.26	6.69	6.34	6.14	5.92	5.45	5.18
Nb/U	21	19	28	26	28	29	13
Ce/Pb	7	8	6.5	7.7	6.3	12	5
Nb/La	0.74	0.66	0.95	0.91	0.96	0.97	0.76
⁸⁷ Rb/ ⁸⁶ Sr			0.1177	0.2360	0.1620		0.2847
⁸⁷ Sr/ ⁸⁶ Sr _(m)			0.711750	0.710975	0.709355		0.709821
1SE			0.000007	0.000008	0.000006		0.000007
⁸⁷ Sr/ ⁸⁶ Sr _(i)			0.711351	0.710176	0.708806		0.708857
¹⁴⁷ Sm/ ¹⁴⁴ Nd			0.1345	0.1428	0.1401		0.2847
¹⁴⁷ Nd/ ¹⁴⁶ Nd _(m)			0.512651	0.512660	0.512663		0.709821
1SE			0.000004	0.000005	0.000004		0.000007
ε _{Nd} (t)			2.15	2.06	2.20		-1.31

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(to be continued)

Sample	13GZ118-2	13GZ118-3	13GZ119-1	13GZ120-1	13GZ120-2	13GZ121-1	13GZ122-2
Latitude	33°26'22"	33°26'22"	33°27'34"	33°27'54"	33°27'54"	33°28'35"	33°31'13"
Longitude	85°02'03"	85°02'03"	85°02'08"	85°02'15"	85°02'15"	85°02'22"	85°04'44"
Major element (%)							
SiO ₂	50.09	48.69	48.80	51.23	49.63	50.10	49.48
TiO ₂	1.52	1.63	1.84	1.69	1.51	1.81	1.94
Al ₂ O ₃	15.58	16.34	15.69	14.43	15.48	14.74	16.31
Fe ₂ O ₃	8.42	8.33	10.24	10.52	10.45	11.20	8.82
MnO	0.15	0.15	0.17	0.17	0.20	0.18	0.18
MgO	7.55	7.50	8.91	7.26	8.05	6.93	7.37
CaO	12.65	12.92	10.35	9.44	9.43	9.53	11.08
Na ₂ O	1.66	1.76	2.40	2.72	2.64	2.70	2.74
K ₂ O	1.03	1.27	0.06	0.83	0.95	0.96	0.65
P ₂ O ₅	0.12	0.13	0.17	0.26	0.23	0.28	0.18
Total	99.69	99.64	99.78	99.73	99.73	99.66	99.74
L.O.I	2.72	3.00	4.21	3.27	3.50	3.12	3.61
Trace element (ppm)							
Sc	26.1	26.7	29.4	32.4	29.6	34.9	27.1
V	215	220	233	257	236	278	220
Cr	193	139	325	152	209	209	466
Co	40.6	39.4	45.4	41.5	43.0	42.1	33.6
Ni	61.0	54.3	129	85.2	108	74.3	102
Cu	36.4	25.0	58.5	33.1	43.8	47.1	55.3
Zn	89.8	90.1	88.9	95.7	128	70.1	167
Ga	19.6	21.4	18.9	19.7	19.6	20.83	19.3
Ge	2.48	2.68	1.61	3.10	1.73	3.25	1.49
Rb	34.8	45.1	0.33	18.9	25.5	25.4	15.7
Sr	353	484	135	154	93.6	301	244
Y	19.0	18.7	22.6	28.9	28.1	30.9	20.4
Zr	114	117	131	159	140	157	131
Nb	9.25	10.4	10.8	12.4	10.5	12.6	13.1
Cs	1.30	1.38	0.34	0.58	1.03	1.28	1.16
Ba	178	260	66.8	413	333	637	288
La	13.1	13.5	13.5	19.9	17.4	22.1	14.8
Ce	29.5	31.0	30.7	41.5	37.5	45.9	33.3
Pr	3.78	4.16	4.08	5.33	4.72	5.91	4.36
Nd	16.4	18.6	18.0	22.7	19.9	24.8	18.8
Sm	3.93	4.22	4.36	5.02	4.62	5.51	4.36
Eu	1.36	1.39	1.52	1.56	1.51	1.75	1.65
Gd	4.13	4.22	4.51	5.36	4.86	6.01	4.42
Tb	0.67	0.71	0.77	0.90	0.84	0.99	0.73
Dy	3.91	4.00	4.59	5.45	5.16	6.01	4.27
Ho	0.77	0.78	0.95	1.16	1.10	1.26	0.87
Er	1.94	1.97	2.52	3.18	3.02	3.43	2.23
Tm	0.27	0.27	0.36	0.47	0.44	0.50	0.31
Yb	1.62	1.70	2.24	2.93	2.82	3.12	1.91
Lu	0.24	0.25	0.34	0.45	0.43	0.49	0.29
Hf	3.09	3.29	3.37	4.19	3.58	4.20	3.28
Ta	0.71	0.77	0.78	0.94	0.77	0.95	0.95
Pb	4.23	2.98	5.30	13.0	10.1	1.39	2.35
Th	2.92	3.07	1.84	5.51	4.83	5.17	2.23
U	0.73	0.74	0.36	0.62	0.56	0.61	0.42
Mg ^{#a}	66.4	66.5	65.7	60.3	62.9	57.7	64.8
(La/Yb) _N	5.81	5.72	4.34	4.88	4.42	5.10	5.59
Nb/U	13	14	30	20	19	21	31
Ce/Pb	7	10	6	3	4	33	14
Nb/La	0.71	0.77	0.80	0.62	0.61	0.57	0.89
⁸⁷ Rb/ ⁸⁶ Sr			0.0070		0.7859	0.2440	
⁸⁷ Sr/ ⁸⁶ Sr _(m)			0.711064		0.711888	0.713788	
1SE			0.000010		0.000008	0.000008	
⁸⁷ Sr/ ⁸⁶ Sr _(i)			0.711040		0.709227	0.712962	
¹⁴⁷ Sm/ ¹⁴⁴ Nd			0.1464		0.1400	0.1343	
¹⁴⁷ Nd/ ¹⁴⁶ Nd _(m)			0.512565		0.512373	0.512360	
1SE			0.000004		0.000004	0.000005	
ε _{Nd} (t)			0.11		-3.45	-3.54	

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(to be continued)

Sample	13GZ122-4	13GZ123-1	13GZ123-2	13GZ125-1	13GZ125-2	13GZ126-1	13GZ126-3
Latitude	33°31'13"	33°29'12"	33°29'12"	33°27'00"	33°27'00"	33°27'30"	33°27'30"
Longitude	85°04'44"	85°09'10"	85°09'10"	85°10'56"	85°10'56"	85°12'20"	85°12'20"
Major element (%)							
SiO ₂	49.53	49.36	49.75	49.94	49.75	49.61	49.87
TiO ₂	1.80	1.33	1.42	1.40	1.45	1.38	1.45
Al ₂ O ₃	16.24	15.36	15.44	15.51	15.20	15.30	15.13
Fe ₂ O ₃	9.01	9.36	9.40	9.46	9.81	9.51	10.04
MnO	0.16	0.17	0.16	0.16	0.18	0.17	0.18
MgO	7.30	9.14	8.71	8.00	8.48	8.60	8.09
CaO	11.38	10.95	10.58	10.79	10.71	10.76	10.43
Na ₂ O	2.49	2.31	2.38	2.36	2.23	2.36	2.20
K ₂ O	0.56	0.58	0.72	0.88	0.66	0.87	1.05
P ₂ O ₅	0.18	0.12	0.13	0.14	0.14	0.13	0.14
Total	99.65	99.72	99.74	99.70	99.70	99.73	99.71
L.O.I	3.39	3.67	3.42	2.91	3.05	3.25	3.07
Trace element (ppm)							
Sc	27.4	32.9	31.7	32.4	30.0	31.7	31.8
V	219	235	238	228	227	236	244
Cr	496	290	265	243	320	324	283
Co	35.0	47.5	44.4	43.4	42.9	39.0	41.7
Ni	109	153	140	112	130	118	113
Cu	53.9	32.6	43.4	61.3	60.6	53.8	56.7
Zn	90.1	87.0	84.4	81.1	91.1	74.0	120
Ga	18.6	18.5	18.4	18.9	18.5	18.1	18.9
Ge	2.68	2.74	2.60	2.72	1.54	1.57	1.70
Rb	13.4	14.4	18.7	23.4	17.2	22.3	26.5
Sr	321	206	259	275	295	177	292
Y	18.8	20.2	21.1	22.2	22.5	21.8	24.1
Zr	129	118	122	111	123	115	132
Nb	13.6	8.67	8.79	8.37	8.66	8.36	8.89
Cs	0.88	0.77	1.12	1.00	1.04	1.44	1.88
Ba	210	209	209	317	216	276	434
La	14.5	11.9	13.6	13.5	13.6	12.2	14.3
Ce	31.5	27.4	29.8	28.8	30.3	27.6	32.2
Pr	4.37	3.57	3.99	3.91	3.89	3.59	4.16
Nd	19.4	15.8	17.2	17.1	16.8	15.7	18.0
Sm	4.23	3.66	3.92	3.94	3.99	3.86	4.30
Eu	1.58	1.25	1.27	1.32	1.32	1.27	1.40
Gd	4.27	3.84	4.07	4.31	4.21	4.11	4.60
Tb	0.72	0.69	0.72	0.72	0.72	0.70	0.78
Dy	4.09	4.09	4.24	4.35	4.45	4.32	4.80
Ho	0.80	0.85	0.88	0.92	0.94	0.91	1.02
Er	2.01	2.29	2.33	2.49	2.57	2.48	2.78
Tm	0.29	0.34	0.34	0.35	0.37	0.36	0.40
Yb	1.80	2.14	2.19	2.19	2.34	2.25	2.53
Lu	0.27	0.33	0.33	0.34	0.36	0.35	0.39
Hf	3.53	3.24	3.22	2.98	3.11	2.93	3.35
Ta	0.92	0.59	0.59	0.61	0.61	0.59	0.64
Pb	2.33	12.4	11.81	3.67	6.32	2.58	9.90
Th	2.24	2.83	2.70	2.52	2.92	2.65	3.40
U	0.42	0.33	0.34	0.33	0.36	0.33	0.44
Mg ^{#a}	64.1	68.3	67.1	65.1	65.5	66.6	63.9
(La/Yb) _N	5.79	4.01	4.45	4.43	4.19	3.88	4.06
Nb/U	33	26	26	25	24	25	20
Ce/Pb	14	2	3	8	5	11	3
Nb/La	0.94	0.73	0.65	0.62	0.64	0.69	0.62
⁸⁷ Rb/ ⁸⁶ Sr		0.2023				0.3629	
⁸⁷ Sr/ ⁸⁶ Sr _(m)		0.707774				0.709587	
1SE		0.000007				0.000008	
⁸⁷ Sr/ ⁸⁶ Sr _(i)		0.707089				0.708359	
¹⁴⁷ Sm/ ¹⁴⁴ Nd		0.1404				0.1486	
¹⁴⁷ Nd/ ¹⁴⁶ Nd _(m)		0.512422				0.512439	
1SE		0.000005				0.000004	
ε _{Nd} (t)		-2.50				-2.41	

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(to be continued)

Sample	13GZ127-1	13GZ127-3	13GZ82-1	13GZ82-2	13GZ93-1	13GZ94-1	15ZB65-1
Latitude	33°28'23.7"	33°28'23.7"	33°24'25"	33°24'25"	33°25'04"	33°26'13"	33°39'46"
Longitude	85°24'41"	85°24'41"	85°58'33"	85°58'33"	86°00'33"	86°00'11"	85°14'12"
Major element (%)							
SiO ₂	49.60	50.12	49.71	49.98	48.86	51.34	48.56
TiO ₂	1.69	1.31	1.96	2.21	1.89	1.64	1.84
Al ₂ O ₃	15.62	16.44	14.61	14.30	15.00	15.83	15.26
Fe ₂ O ₃	9.10	8.21	10.83	10.63	11.39	8.87	11.47
MnO	0.16	0.14	0.15	0.18	0.16	0.14	0.16
MgO	7.20	6.77	8.11	8.18	8.98	6.70	8.94
CaO	12.31	12.66	10.96	10.88	10.50	11.38	10.86
Na ₂ O	2.23	2.42	2.58	2.53	2.21	2.56	2.21
K ₂ O	0.63	0.59	0.58	0.65	0.52	1.06	0.42
P ₂ O ₅	0.14	0.12	0.17	0.16	0.18	0.13	0.26
Total	99.70	99.69	99.66	99.68	99.68	99.65	99.98
L.O.I	3.13	3.29	2.35	2.45	2.83	2.04	2.51
Trace element (ppm)							
Sc	35.9	32.2	29.7	28.7	28.2	28.7	26.7
V	249	206	248	236	235	227	222
Cr	350	324	300	364	182	217	301
Co	39.4	36.6	40.4	39.7	47.6	34.2	46.1
Ni	70.0	59.7	95.7	98.4	142	30.3	126
Cu	68.4	56.2	13.0	18.4	43.0	29.1	45.1
Zn	98.2	77.8	97.7	94.4	95.2	80.3	101
Ga	18.3	18.8	20.1	18.3	19.0	20.3	18.4
Ge	2.75	2.35	3.08	2.86	2.53	2.79	2.67
Rb	12.9	13.6	16.9	20.9	13.2	35.9	10.0
Sr	228	289	341	296	304	413	291
Y	19.5	18.1	20.3	18.3	22.6	19.7	19.6
Zr	111	93.6	130	123	137	118	118
Nb	10.2	8.13	12.1	11.9	12.4	10.4	11.7
Cs	0.57	0.81	0.45	0.65	0.78	1.32	0.74
Ba	186	189	118	140	209	229	174
La	11.5	10.4	14.2	13.4	14.2	13.5	13.3
Ce	26.1	23.0	31.7	29.9	31.8	30.1	29.3
Pr	3.64	3.05	4.40	4.29	4.19	4.09	4.02
Nd	16.6	13.6	19.4	19.0	18.3	18.0	17.5
Sm	3.88	3.31	4.51	4.36	4.38	4.21	4.15
Eu	1.44	1.43	1.59	1.51	1.55	1.38	1.50
Gd	4.04	3.54	4.58	4.24	4.55	4.34	4.26
Tb	0.72	0.60	0.75	0.72	0.75	0.71	0.69
Dy	4.11	3.64	4.28	4.06	4.53	4.06	4.04
Ho	0.83	0.74	0.84	0.78	0.91	0.80	0.82
Er	2.13	1.92	2.16	1.96	2.38	2.08	2.12
Tm	0.31	0.27	0.30	0.28	0.33	0.28	0.30
Yb	1.95	1.69	1.77	1.70	2.08	1.71	1.87
Lu	0.29	0.25	0.27	0.25	0.31	0.25	0.28
Hf	3.13	2.54	3.50	3.44	3.54	3.31	3.31
Ta	0.70	0.58	0.93	0.86	0.87	0.84	0.80
Pb	4.41	3.40	5.16	4.73	2.60	5.27	3.11
Th	1.44	1.18	2.38	2.39	1.95	3.03	1.91
U	0.29	0.23	0.53	0.50	0.31	0.62	0.44
Mg# ^a	63.5	64.5	62.2	62.9	63.5	62.5	63.2
(La/Yb) _N	4.23	4.45	5.76	5.67	4.92	5.68	5.10
Nb/U	36	35	23	24	40	17	27
Ce/Pb	6	7	6	6	12	6	9
Nb/La	0.89	0.78	0.86	0.89	0.87	0.77	0.88
⁸⁷ Rb/ ⁸⁶ Sr		0.1363			0.1253		
⁸⁷ Sr/ ⁸⁶ Sr _(m)		0.706618			0.707357		
1SE		0.000006			0.000006		
⁸⁷ Sr/ ⁸⁶ Sr _(i)		0.706156			0.706933		
¹⁴⁷ Sm/ ¹⁴⁴ Nd		0.1473			0.1450		
¹⁴⁷ Nd/ ¹⁴⁶ Nd _(m)		0.512552			0.512565		
1SE		0.000005			0.000004		
ε _{Nd} (t)		-0.17			0.15		

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(to be continued)

Sample	15ZB70-1	15ZB142-1	15ZB165-1
Latitude	33°30'57"	33°18'41"	33°18'40"
Longitude	85°20'28"	86°42'30"	86°47'03"
Major element (%)			
SiO ₂	47.56	47.78	50.09
TiO ₂	1.75	2.65	1.44
Al ₂ O ₃	12.56	13.47	10.05
Fe ₂ O ₃	12.03	14.04	10.86
MnO	0.15	0.18	0.17
MgO	13.47	10.36	13.72
CaO	9.42	7.27	11.25
Na ₂ O	1.93	2.97	1.37
K ₂ O	0.53	0.81	0.88
P ₂ O ₅	0.15	0.37	0.12
Total	99.55	99.91	99.94
L.O.I	3.49	3.01	3.18
Trace element (ppm)			
Sc	26.3	23.2	31.8
V	227	229	237
Cr	879	471	1201
Co	66.7	57.9	52.2
Ni	325	207	159
Cu	70.6	73.4	48.1
Zn	92.6	162	90.6
Ga	16.4	20.4	14.1
Ge	2.86	3.33	2.72
Rb	13.7	18.0	29.1
Sr	286	460	172
Y	16.4	27.3	18.7
Zr	104	241	102
Nb	11.1	30.0	9.80
Cs	0.48	1.19	1.43
Ba	179.4	1109	290
La	11.1	28.9	13.5
Ce	25.7	65.3	30.3
Pr	3.51	8.24	4.00
Nd	15.5	34.3	16.9
Sm	3.73	7.34	4.04
Eu	1.36	2.36	1.13
Gd	3.82	7.08	4.08
Tb	0.62	1.06	0.68
Dy	3.55	5.91	3.93
Ho	0.70	1.17	0.78
Er	1.78	2.92	2.01
Tm	0.24	0.40	0.28
Yb	1.49	2.48	1.74
Lu	0.22	0.37	0.26
Hf	2.92	6.00	3.06
Ta	0.75	2.09	0.75
Pb	1.81	7.74	4.40
Th	1.67	3.99	4.05
U	0.41	0.96	0.95
Mg ^{#a}	71.1	61.9	73.6
(La/Yb) _N	5.36	8.36	5.58
Nb/U	27	31	10
Ce/Pb	14	8	7
Nb/La	1.00	1.04	0.72
⁸⁷ Rb/ ⁸⁶ Sr			
⁸⁷ Sr/ ⁸⁶ Sr _(m)			
1SE			
⁸⁷ Sr/ ⁸⁶ Sr _(i)			
¹⁴⁷ Sm/ ¹⁴⁴ Nd			
¹⁴⁷ Nd/ ¹⁴⁶ Nd _(m)			
1SE			
ε _{Nd} (t)			

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a) Parameters: $Mg^{\#} = Mg^{2+} \times 100 / (Mg^{2+} + Fe^{2+})$, assuming $FeO / (FeO + Fe_2O_3) = 0.9$

Table DR4 EC-AFC parameters

Compositional parameters	Nd
Magma initial concentration (ppm)	10.0
Magma isotope ratio	0.51246
Magma trace element distribution coefficient, D_m	0.25
Assimilant initial concentration (ppm) ^a	30.0
Assimilant isotope ratio ^a	0.51182
Assimilant trace element distribution coefficient, D_a ^b	0.25
Thermal parameters ^b	
Magma liquidus temperature, $T_{l,m}$	1280°C
Magma initial temperature	1280°C
Assimilant liquidus temperature, $T_{a,m}$	1000°C
Assimilant initial temperature	300°C
Solidus temperature, T_s	900°C
Equilibration temperature, T_{eq}	980°C
Crystallization enthalpy, Δh_{cry} (J/kg)	396000
Isobaric specific heat of magma, $C_{p,m}$ (J/kg per K)	1484
Fusion enthalpy, Δh_{fus} (J/kg)	270000
Isobaric specific heat of assimilant, $C_{p,a}$ (J/kg per K)	1370

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Notes: The potential contaminants are the Paleozoic metasedimentary rocks or the basement rocks (480 Ma granites, [Hu et al., 2015](#)), but only geochemical data are available from the 480 granites. The physical characteristics of the magma body-country rock system are those suggested by [Bohrson and Spera \(2001\)](#) for standard upper crust. Parameters in a and b are from [Hu et al. \(2015\)](#) and [Bohrson and Spera \(2001\)](#), respectively.

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Table DR5 Parameters for non-modal batch melting model

Spinel Peridotite

	Initial composition		Melt proportions	0.544	0.674	0.441	0.648
				Gd	Dy	Yb	La
Partition coefficients	Ol	0.548	0.09	0.0012	0.004	0.023	0.0028
	Opx	0.27	0.25	0.04	0.06	0.1	0.008
	Cpx	0.119	0.48	0.4	0.38	0.4	0.002
	Sp	0.033	0.12	0.0006	0.0015	0.0045	0.01
	Gt						
	Amph	0.025	0.06	0.018	0.014	0.102	0.016
	Rut	0.005	0.001	0.01	0.012	0.012	0.0055
	Initial			0.0596	0.0641	0.0900	0.0047
	Melts			0.203	0.199	0.226	0.005
	f=20			2.48	3.00	1.80	3.18
	f=15			3.04	3.66	2.14	4.21
	f=10			3.91	4.67	2.63	6.22
	f=5			5.47	6.47	3.43	11.9
	f=2			7.20	8.41	4.18	26.4
	f=1			8.05	9.35	4.51	44.3
	f=0.5			8.56	9.90	4.70	67.1
	f=0.1			9.01	10.4	4.86	114

Garnet Peridotite

	Initial composition		Melt proportions	0.544	0.674	0.441	0.648
				Gd	Dy	Yb	La
Partition coefficients	Ol	0.568	0.05	0.0012	0.004	0.023	0.0028
	Opx	0.211	0.19	0.04	0.06	0.1	0.008
	Cpx	0.076	0.28	0.4	0.38	0.4	0.002
	Sp						
	Gt	0.115	0.42	1	1.06	4.01	0.0014
	Amph	0.025	0.06	0.018	0.014	0.102	0.016
	Rut	0.005	1	0.01	0.012	0.012	0.0055
	Initial			0.156	0.167	0.532	0.0046
	Melts			0.541	0.564	1.822	0.0038
	f=20			2.20	2.66	1.20	3.18
	f=15			2.42	2.91	1.08	4.21
	f=10			2.70	3.21	0.98	6.22
	f=5			3.05	3.58	0.90	11.91
	f=2			3.30	3.84	0.86	26.45
	f=1			3.39	3.94	0.84	44.56
	f=0.5			3.44	3.99	0.84	67.78
	f=0.1			3.48	4.03	0.83	116

178 Notes: Non-modal batch melting model is using the equation of [Shaw \(1970\)](#) and melting modes are
179 from [Thirlwall et al. \(1994\)](#).

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Table DR6 Estimated primary melt compositions, mantle potential temperatures and melting conditions

Starting sample	13GZ117- 4	13GZ118- 1	13GZ118- 2	13GZ118- 3	13GZ127- 1	13GZ127- 3
Olivine add. (%)	8	11	13	11	19	14
Major element (%)						
SiO ₂	49.84	49.84	49.80	48.72	48.91	49.68
TiO ₂	1.79	1.45	1.37	1.50	1.44	1.17
Al ₂ O ₃	14.14	14.32	13.96	14.95	13.26	14.56
Fe ₂ O ₃	0.76	0.75	0.75	0.76	0.77	0.73
FeO	7.03	7.15	7.42	7.29	8.12	7.34
MnO	0.15	0.16	0.15	0.16	0.17	0.15
MgO	11.26	11.94	12.62	11.84	14.18	12.27
CaO	12.23	11.47	11.37	11.85	10.50	11.25
Na ₂ O	2.02	1.55	1.48	1.61	1.89	2.14
K ₂ O	0.58	1.19	0.92	1.16	0.53	0.52
P ₂ O ₅	0.13	0.10	0.10	0.12	0.12	0.10
T ₁	1338	1356	1373	1360	1418	1365
T ₂	1324	1340	1355	1347	1397	1348
T ₃	1318	1337	1356	1343	1407	1347
T ₄	1289	1311	1326	1309	1374	1320
T ₅	1262	1279	1292	1277	1330	1290
T ₆	1306	1325	1340	1327	1385	1334
P _f ¹	1.12	1.17	1.23	1.36	1.54	1.22
P _f ²	1.56	1.68	1.79	1.70	2.08	1.74
P _f ³	1.38	1.38	1.40	1.87	1.79	1.45
P _f ⁴	1.35	1.41	1.47	1.64	1.80	1.47
Tp	1336	1355	1372	1352	1414	1363

Notes: T₁ to T₆ are the melting temperatures (°C) of the melt segregation: T₁ is according to Albarède (1992); T₂ is according to Sugawara (2000); T₃ is according to Herzberg et al. (2007); T₄ is according to equation 14 of Putirka (2008); T₅ is according to Herzberg and Asimow (2015); T₆ is the average of T₁ to T₅. P_f¹ to P_f⁴ are effective melting pressures in kbar. P_f¹ is as defined by Albarède (1992); P_f² as defined by McKenzie and Bickle (1988); P_f³ as defined by Haase (1996); P_f⁴ is the average of P_f¹ to P_f³. Tp is the mantle potential temperatures in °C, following Herzberg & Asimow (2015). The calculated mantle potential temperatures (1336–1414 °C) are in good agreement with the ambient mantle of 1350 ± 50 °C (e.g., McKenzie et al., 2005).

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