

GSA Data Repository Item 2018069

Chen, M., Sun, M., Buslov, M.M., Cai, K., Jiang, Y., Kulikova, A.V., Zheng, J., and Xia, X., 2018, Variable slab-mantle interaction in a nascent Neoproterozoic arc–back-arc system to generating boninitic-tholeiitic lavas and magnesian andesites: *GSA Bulletin*, <https://doi.org/10.1130/B31883.1>.

DATA REPOSITORY

Table DR1. Compositions of coarse-grained clinopyroxenes from the boninitic rocks

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Table DR1 Compositions of coarse-grained clinopyroxenes from the boninitic rocks

Sample #	CK-1								CK-3					C14-5
Spot #	1	2	3	4	5	6	7	8	1	2	3	4	5	1
Na ₂ O	0.11	0.11	0.12	0.11	0.10	0.10	0.12	0.10	0.15	0.10	0.09	0.13	0.15	0.14
K ₂ O	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.03	0.00	0.01	0.01	0.00	0.00	0.00
SiO ₂	55.4	55.6	55.4	55.8	55.8	55.6	55.6	54.0	53.5	54.0	53.8	53.4	53.4	52.9
FeO	2.72	3.06	4.98	2.33	2.35	2.53	2.90	6.80	6.96	6.65	7.45	8.09	7.14	9.87
CaO	21.8	20.7	20.4	21.6	22.0	22.0	21.1	20.1	18.8	19.5	19.2	19.1	19.1	19.0
Al ₂ O ₃	0.40	0.46	0.57	0.45	0.47	0.43	0.34	1.89	1.62	0.80	1.31	1.58	1.61	1.53
MnO	0.09	0.07	0.16	0.06	0.08	0.13	0.08	0.19	0.17	0.17	0.23	0.20	0.21	0.26
MgO	19.7	19.5	18.8	19.5	19.2	19.4	19.6	17.2	17.4	17.5	17.2	16.7	17.1	15.7
Cr ₂ O ₃	0.55	0.56	0.31	0.63	0.62	0.56	0.56	0.28	0.56	0.39	0.40	0.25	0.38	0.26
TiO ₂	0.04	0.03	0.04	0.05	0.01	0.00	0.01	0.09	0.03	0.09	0.04	0.02	0.05	0.01
Total	100.79	100.03	100.84	100.45	100.67	100.68	100.42	100.64	99.18	99.13	99.68	99.44	99.16	99.65
Oxygen	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Si	1.987	2.001	1.996	1.999	1.998	1.992	1.998	1.964	1.972	1.990	1.979	1.974	1.971	1.969
Ti	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.002	0.001	0.002	0.001	0.001	0.001	0.000
Al	0.017	0.020	0.024	0.019	0.020	0.018	0.014	0.081	0.070	0.035	0.057	0.069	0.070	0.067
Cr	0.016	0.016	0.009	0.018	0.018	0.016	0.016	0.008	0.016	0.011	0.012	0.007	0.011	0.008
Fe ³⁺	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe ²⁺	0.082	0.092	0.150	0.070	0.070	0.076	0.087	0.207	0.215	0.205	0.229	0.250	0.221	0.307
Mn	0.003	0.002	0.005	0.002	0.002	0.004	0.002	0.006	0.005	0.005	0.007	0.006	0.007	0.008
Mg	1.051	1.045	1.010	1.041	1.026	1.038	1.050	0.934	0.956	0.961	0.941	0.917	0.943	0.869
Ca	0.836	0.799	0.788	0.828	0.846	0.844	0.813	0.782	0.744	0.770	0.756	0.758	0.758	0.759
Na	0.008	0.008	0.008	0.008	0.007	0.007	0.008	0.007	0.011	0.007	0.006	0.009	0.011	0.010
K	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Total	4.000	3.984	3.991	3.985	3.987	3.995	3.990	3.993	3.990	3.988	3.989	3.992	3.992	3.998
Cr/(Cr + Al) × 100	48.5	44.4	27.3	48.6	47.4	47.1	53.3	9.0	18.6	23.9	17.4	9.2	13.6	10.7
Mg/(Mg + Fe) × 100	92.8	91.9	87.1	93.7	93.6	93.2	92.3	81.9	81.6	82.4	80.4	78.6	81.0	73.9

Table DR2 Major- and trace-element compositions of the volcanic suite from the Kurai Ridge, Gorny Altai terrane

Samples	CK-1	CK-2	CK-3	CK-8	K010a	K010b	K022	C14-5	C14-6	C14-13	C14-15
GPS	N50°08'41.9" E88°22'02.2"	N50°08'41.9" E88°22'02.2"	N50°08'41.9" E88°22'02.2"	N50°08'41.9" E88°22'02.2"	N50°08'15.0" E88°18'23.0"	N50°08'15.0" E88°18'23.0"	N50°10'24.0" E88°13'54.0"	N50°10'20.6" E88°13'56.6"	N50°10'20.6" E88°18'45.7"	N50°09'36.7" E88°18'56.6"	N50°10'20.6" E88°18'45.7"
Rock types ^a	BON										
Major elements^b											
SiO ₂	53.3	53.2	54.3	53.1	55.5	55.1	55.3	56.2	55.7	56.7	55.5
TiO ₂	0.22	0.28	0.20	0.22	0.37	0.40	0.29	0.29	0.30	0.32	0.28
Al ₂ O ₃	6.16	7.89	8.20	16.5	13.1	10.1	13.5	13.2	13.7	11.2	9.92
Fe ₂ O ₃ ^T	10.4	11.1	11.7	9.71	10.4	11.1	10.3	10.4	10.4	11.6	11.5
MnO	0.24	0.25	0.25	0.20	0.44	0.19	0.21	0.21	0.20	0.22	0.24
MgO	16.1	14.6	14.1	9.19	8.06	11.7	8.83	9.67	9.11	9.33	12.2
CaO	12.4	11.2	9.54	6.11	8.86	8.89	8.02	7.66	7.86	8.68	8.84
Na ₂ O	0.89	1.29	1.30	4.78	2.62	2.14	3.26	1.89	1.77	1.80	1.27
K ₂ O	0.30	0.14	0.38	0.19	0.61	0.35	0.29	0.43	0.52	0.12	0.25
P ₂ O ₅	0.03	0.03	0.02	0.02	0.04	0.04	0.03	0.02	0.03	0.03	0.03
LOI	1.26	1.73	1.74	2.47	4.05	5.38	4.86	2.09	2.17	1.38	1.83
CaO/Al ₂ O ₃	2.01	1.42	1.16	0.37	0.68	0.88	0.60	0.58	0.57	0.78	0.89
FeO ^T /MgO	0.58	0.68	0.74	0.95	1.16	0.85	1.05	0.97	1.02	1.12	0.84
Mg ^{#c}	75.3	72.3	70.6	65.2	60.6	67.7	63.0	64.8	63.5	61.4	67.9
Trace elements											
Sc	57.5	43.1	45.7	40.4	53.0	52.8	48.1	38.9	39.1	45.0	40.9
V	210	192	204	174	233	234	197	186	191	231	197
Cr	1130	1020	930	365	343	685	338	546	492	503	725
Co	59.1	49.9	52.8	39.8	48.4	52.1	41.8	40.7	38.3	46.9	46.2
Ni	106	113	114	90.9	50.3	118	56.2	94.5	85.9	53.9	95.4
Cu	3.00	10.2	26.7	14.1	8.15	33.4	91.1	56.8	61.5	77.2	16.0
Zn	208	148	205	169	167	137	82.7	167	161	159	142
Ga	6.03	6.75	6.74	9.67	11.4	9.55	10.4	10.3	10.9	9.44	9.33
Rb	5.47	2.32	6.48	2.20	9.89	6.12	4.13	11.8	15.1	3.08	7.82
Sr	48.0	91.7	46.5	103	157	95.3	147	200	227	116	53.3
Y	6.42	7.42	5.73	5.16	9.68	9.53	7.53	9.08	9.35	8.84	8.54
Zr	13.5	11.7	8.84	6.25	15.4	18.3	9.06	9.77	10.8	16.1	12.7
Nb	1.05	0.816	0.546	0.382	0.433	0.476	0.370	0.621	0.565	0.794	0.709
Cs	0.100	0.0829	0.0540	0.175	0.217	0.128	0.160	0.354	0.406	0.128	0.168
Ba	56.7	28.0	68.2	44.5	106	40.9	121	143	146	38.5	47.3
La	1.32	0.672	0.451	0.464	0.794	1.04	0.725	0.875	0.936	0.877	0.770
Ce	3.09	1.92	1.27	1.15	2.25	2.92	1.89	2.01	2.19	2.21	2.06
Pr	0.422	0.301	0.197	0.174	0.386	0.481	0.304	0.282	0.300	0.337	0.313
Nd	2.04	1.64	1.06	0.947	2.05	2.44	1.58	1.42	1.58	1.67	1.48
Sm	0.497	0.540	0.385	0.328	0.771	0.834	0.623	0.520	0.637	0.539	0.591
Eu	0.171	0.240	0.144	0.140	0.330	0.332	0.263	0.216	0.261	0.189	0.217
Gd	0.751	0.811	0.605	0.521	1.31	1.31	1.04	0.798	0.854	0.802	0.781
Tb	0.134	0.170	0.112	0.0956	0.235	0.233	0.188	0.159	0.163	0.161	0.167
Dy	0.899	1.18	0.887	0.738	1.66	1.62	1.31	1.10	1.23	1.20	1.18
Ho	0.202	0.268	0.215	0.179	0.374	0.358	0.290	0.266	0.279	0.260	0.263
Er	0.609	0.759	0.581	0.512	1.09	1.03	0.846	0.785	0.803	0.774	0.751
Tm	0.0920	0.118	0.0939	0.0804	0.171	0.170	0.132	0.116	0.120	0.119	0.119
Yb	0.611	0.785	0.703	0.580	1.17	1.10	0.891	0.772	0.835	0.843	0.821
Lu	0.0953	0.133	0.109	0.0947	0.178	0.172	0.146	0.128	0.135	0.138	0.139
Hf	0.457	0.402	0.286	0.204	0.441	0.483	0.307	0.270	0.298	0.402	0.377
Ta	0.132	0.0640	0.0620	0.0350	0.0650	0.0480	0.0380	0.0520	0.0370	0.0470	0.0852
Pb	0.605	1.16	2.61	1.78	0.871	0.426	4.40	2.36	1.97	1.10	0.605
Th	0.434	0.117	0.0880	0.0499	0.0930	0.0860	0.0900	0.132	0.142	0.102	0.0814
U	0.101	0.103	0.0741	0.0592	0.0610	0.0510	0.0680	0.0844	0.0867	0.118	0.0736
(La/Sm) _N	1.71	0.80	0.76	0.91	0.66	0.81	0.75	1.09	0.95	1.05	0.84
(Gd/Yb) _N	1.02	0.85	0.71	0.74	0.93	0.99	0.96	0.86	0.85	0.79	0.79
(La/Yb) _N	1.55	0.61	0.46	0.57	0.49	0.68	0.58	0.81	0.80	0.75	0.67
(Yb) _N	3.59	4.62	4.14	3.41	6.89	6.45	5.24	4.54	4.91	4.96	4.83
ΣREE	10.9	9.53	6.81	6.00	12.8	14.0	10.2	9.45	10.3	10.1	9.65
Ce/Ce*	1.01	1.05	1.04	0.99	0.99	1.01	0.98	0.99	1.01	1.00	1.03
Eu/Eu*	0.85	1.10	0.91	1.03	1.00	0.97	1.00	1.02	1.08	0.88	0.98
Nb/Th	2.42	6.98	6.21	7.65	4.66	5.53	4.11	4.70	3.98	7.78	8.71
Zr/Hf	29.5	29.1	30.9	30.6	34.9	37.9	29.5	36.2	36.2	40.0	33.7
Zr/Sm	27.2	21.7	23.0	19.1	20.0	22.0	14.5	18.8	17.0	29.9	21.5
Zr/Nb	12.9	14.3	16.2	16.4	35.6	38.5	24.5	15.7	19.1	20.3	17.9
Ce/Pb	5.11	1.66	0.49	0.65	2.58	6.85	0.43	0.85	1.11	2.01	3.40
Nb/U	10.4	7.94	7.37	6.45	7.10	9.33	5.44	7.36	6.52	6.74	9.64
Th/U	4.30	1.14	1.19	0.84	1.52	1.69	1.32	1.56	1.64	0.87	1.11

Note: (a), BON, boninitic rocks; MA, Magnesian andesite; THO, tholeiite. (b) The oxides are normalized to 100 wt.%. (c), Mg[#] = 100 × MgO/(MgO + FeO^T), mole ratios

Table DR2 continued

Samples	C14-9	C14-10	CK-9	C14-16	C14-18	CK-4	CK-10
GPS	N50°26'06.4" E87°35'30.7"	N50°26'06.4" E87°35'30.7"	N50°08'41.9" E88°22'02.2"	N50°10'20.6" E88°18'45.7"	N50°10'20.6" E88°18'45.7"	N50°08'41.9" E88°22'02.2"	N50°08'41.9" E88°22'02.2"
Rock types	MA	MA	Group I THO	GROUP I THO	GROUP I THO	GROUP II THO	Group II THO
Major elements							
SiO ₂	55.6	54.9	56.1	51.4	54.8	56.1	54.0
TiO ₂	0.72	0.71	1.45	1.54	1.39	0.62	0.80
Al ₂ O ₃	15.7	15.7	15.7	14.8	14.1	14.7	17.2
Fe ₂ O ₃ ^T	9.92	11.1	13.6	13.8	13.3	11.8	12.9
MnO	0.17	0.16	0.27	0.20	0.24	0.22	0.19
MgO	6.37	8.14	3.78	4.45	5.80	5.61	3.18
CaO	9.66	7.38	3.42	10.0	5.53	8.57	8.61
Na ₂ O	1.39	1.80	5.44	3.68	4.65	1.62	2.79
K ₂ O	0.35	0.00	0.04	0.02	0.04	0.67	0.22
P ₂ O ₅	0.13	0.14	0.20	0.16	0.16	0.07	0.06
LOI	2.59	3.40	2.65	1.16	1.80	1.57	1.89
CaO/Al ₂ O ₃	0.62	0.47	0.22	0.68	0.39	0.58	0.50
FeO ^T /MgO	1.40	1.22	3.23	2.78	2.06	1.90	3.66
Mg ^{#c}	56.0	59.3	35.5	39.1	46.4	48.4	32.7
Trace elements							
Sc	31.4	32.3	35.4	32.4	35.2	42.9	45.4
V	223	227	310	357	318	300	363
Cr	243	266	4.00	24.1	24.8	82.0	27.4
Co	40.3	43.6	60.8	26.1	54.0	63.6	33.3
Ni	103	107	2.52	21.3	18.0	22.7	9.44
Cu	30.0	8.12	46.3	11.1	97.3	13.6	170
Zn	156	158	134	103	161	111	111
Ga	15.5	14.0	19.5	19.4	14.3	14.3	16.5
Rb	17.0	0.487	1.01	0.640	1.47	10.8	3.05
Sr	289	306	125	81.1	42.5	139	280
Y	18.8	20.6	41.0	40.2	34.5	16.7	17.1
Zr	81.6	81.1	101	112	103	30.6	32.8
Nb	4.30	4.10	3.62	2.08	1.99	0.976	0.767
Cs	0.384	0.0419	0.102	0.0472	0.150	0.0629	0.0747
Ba	79.7	20.8	42.6	14.1	41.1	162	59.5
La	9.40	9.86	7.52	5.00	6.60	2.48	1.74
Ce	20.2	21.0	21.2	13.8	16.7	6.41	5.07
Pr	2.34	2.54	2.56	2.10	2.66	0.940	0.748
Nd	9.61	9.79	13.4	10.8	12.9	4.46	4.00
Sm	2.25	2.25	3.72	3.41	3.80	1.58	1.44
Eu	0.664	0.725	2.01	1.21	1.21	0.600	0.532
Gd	2.46	2.57	5.12	4.30	4.98	2.11	1.90
Tb	0.412	0.433	0.854	0.826	0.861	0.389	0.385
Dy	2.77	2.95	5.64	5.63	5.85	2.66	2.63
Ho	0.577	0.629	1.22	1.21	1.20	0.591	0.574
Er	1.61	1.81	3.56	3.48	3.59	1.86	1.84
Tm	0.237	0.252	0.492	0.509	0.543	0.257	0.273
Yb	1.58	1.65	3.38	3.30	3.29	1.77	1.89
Lu	0.265	0.266	0.494	0.527	0.524	0.268	0.298
Hf	1.77	1.80	2.34	2.55	2.59	1.04	0.876
Ta	0.358	0.220	0.321	0.139	0.169	0.158	0.0793
Pb	4.81	5.30	1.27	1.54	1.13	2.10	1.82
Th	1.24	1.27	0.516	0.281	0.321	0.413	0.250
U	0.430	0.417	0.288	0.221	0.161	0.214	0.172
(La/Sm) _N	2.70	2.83	1.31	0.95	1.12	1.01	0.78
(Gd/Yb) _N	1.29	1.29	1.25	1.08	1.25	0.99	0.83
(La/Yb) _N	4.27	4.29	1.60	1.09	1.44	1.01	0.66
(Yb) _N	9.3	9.7	19.9	19.4	19.4	10.4	11.1
ΣREE	54.4	56.7	71.1	56.1	64.7	26.4	23.3
Ce/Ce*	1.03	1.00	1.18	1.04	0.98	1.03	1.09
Eu/Eu*	0.86	0.92	1.41	0.97	0.85	1.00	0.98
Nb/Th	3.47	3.22	7.02	7.40	6.20	2.36	3.07
Zr/Hf	46.1	45.1	43.2	43.9	39.8	29.4	37.4
Zr/Sm	36.3	36.0	27.2	32.8	27.1	19.4	22.8
Zr/Nb	19.0	19.8	27.9	53.9	51.8	31.4	42.8
Ce/Pb	4.20	3.96	16.7	8.96	14.8	3.05	2.79
Nb/U	10.0	9.82	12.6	9.40	12.4	4.56	4.46
Th/U	2.88	3.05	1.79	1.27	1.99	1.93	1.45

Table DR3 Nd-Hf isotopic compositions of the volcanic suite from the Kurai Ridge, Gorny Altai terrane

Sample	Rock type	Sm (ppm)	Nd (ppm)	¹⁴⁷ Sm/ ¹⁴⁴ Nd	¹⁴³ Nd/ ¹⁴⁴ Nd	1 sigma	¹⁴³ Nd/ ¹⁴⁴ Nd _(600Ma)	ε _{Nd} (600 Ma)	Lu (ppm)	Hf (ppm)	¹⁷⁶ Lu/ ¹⁷⁷ Hf	¹⁷⁶ Hf/ ¹⁷⁷ Hf	1 sigma	¹⁷⁶ Hf/ ¹⁷⁷ Hf _(600Ma)	ε _{Hf} (600 Ma)
CK-2	BON	0.540	1.64	0.1990	0.513108	0.000006	0.512326	9.1	0.133	0.402	0.0470	0.283253	0.000004	0.282724	8.0
K010a	BON	0.771	2.05	0.2269	0.513145	0.000007	0.512253	7.7	0.178	0.441	0.0573	0.283391	0.000004	0.282746	8.8
K010b	BON	0.834	2.44	0.2067	0.513116	0.000005	0.512303	8.7	0.172	0.483	0.0506	0.283292	0.000004	0.282723	8.0
K022a	BON	0.623	1.58	0.2390	0.513129	0.000006	0.512189	6.4	0.146	0.307	0.0676	0.283543	0.000009	0.282783	10.1
C14-6	BON	0.637	1.58	0.2436	0.513100	0.000004	0.512142	5.5	0.135	0.298	0.0644	0.283559	0.000008	0.282835	12.0
C14-13	BON	0.539	1.67	0.1950	0.513063	0.000005	0.512296	8.5	0.138	0.402	0.0488	0.283336	0.000005	0.282787	10.3
C14-15	BON	0.591	1.48	0.2413	0.513107	0.000005	0.512158	5.8	0.139	0.377	0.0524	0.283348	0.000006	0.282759	9.3
C14-9	MA	2.25	9.61	0.1415	0.512562	0.000004	0.512006	2.9	0.265	1.770	0.0213	0.282889	0.000005	0.282650	5.4
C14-10	MA	2.25	9.79	0.1389	0.512572	0.000004	0.512026	3.3	0.266	1.800	0.0210	0.282892	0.000003	0.282656	5.6
CK-9	GROUP I THO	3.72	13.4	0.1682	0.512993	0.000006	0.512332	9.2							
C14-16	GROUP I THO	3.41	10.8	0.1908	0.513057	0.000006	0.512307	8.7							
C14-18	GROUP I THO	3.80	12.9	0.1780	0.513016	0.000005	0.512316	8.9							
CK-4	GROUP II THO	1.58	4.46	0.2141	0.512995	0.000006	0.512153	5.7							
CK-10	GROUP II THO	1.44	4.00	0.2175	0.513050	0.000007	0.512195	6.6							

Notes:

(1) ¹⁴⁷Sm/¹⁴⁴Nd and ¹⁷⁶Lu/¹⁷⁷Hf ratios were calculated based on the Sm, Nd, Lu and Hf concentrations, and measured ¹⁴³Nd/¹⁴⁴Nd and ¹⁷⁶Hf/¹⁷⁷Hf ratios. (2) $\epsilon_{Nd}(t)_{sample} = (^{143}Nd/^{144}Nd(t)_{sample} / ^{143}Nd/^{144}Nd(t)_{CHUR} - 1) \times 10000$, where CHUR means the chondrite. (3) $\epsilon_{Hf}(t)_{sample} = (^{176}Hf/^{177}Hf(t)_{sample} / ^{176}Hf/^{177}Hf(t)_{CHUR} - 1) \times 10000$. (4) ¹⁴³Nd/¹⁴⁴Nd(0)_{CHUR} = 0.512630 and ¹⁷⁶Hf/¹⁷⁷Hf(0)_{CHUR} = 0.282875 (Bouvier et al., 2008). (5) The decay constant of ¹⁴⁷Sm ($\lambda = 6.54 \times 10^{-12}$ /year) and ¹⁷⁶Lu ($\lambda = 1.865 \times 10^{-11}$ /year) are from Lugmair and Marti (1977) and Scherer et al. (2011), respectively.

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