GSA Data Repository Item 2020071

Yunying Zhang, Chao Yuan, Min Sun, Xiaoping Long, Zongying Huang, Yingde Jiang, Pengfei Li, and Long Du, 2020, Two late Carboniferous belts of Nb-enriched mafic magmatism in the Eastern Tianshan: Heterogeneous mantle sources and geodynamic implications: GSA Bulletin, https://doi.org/10.1130/B35366.1.

Data Repository

Supplemental file 1. Geological maps of the studied areas

Supplemental file 2. CL images and 206Pb–238U ages for effective zircons from the dated samples

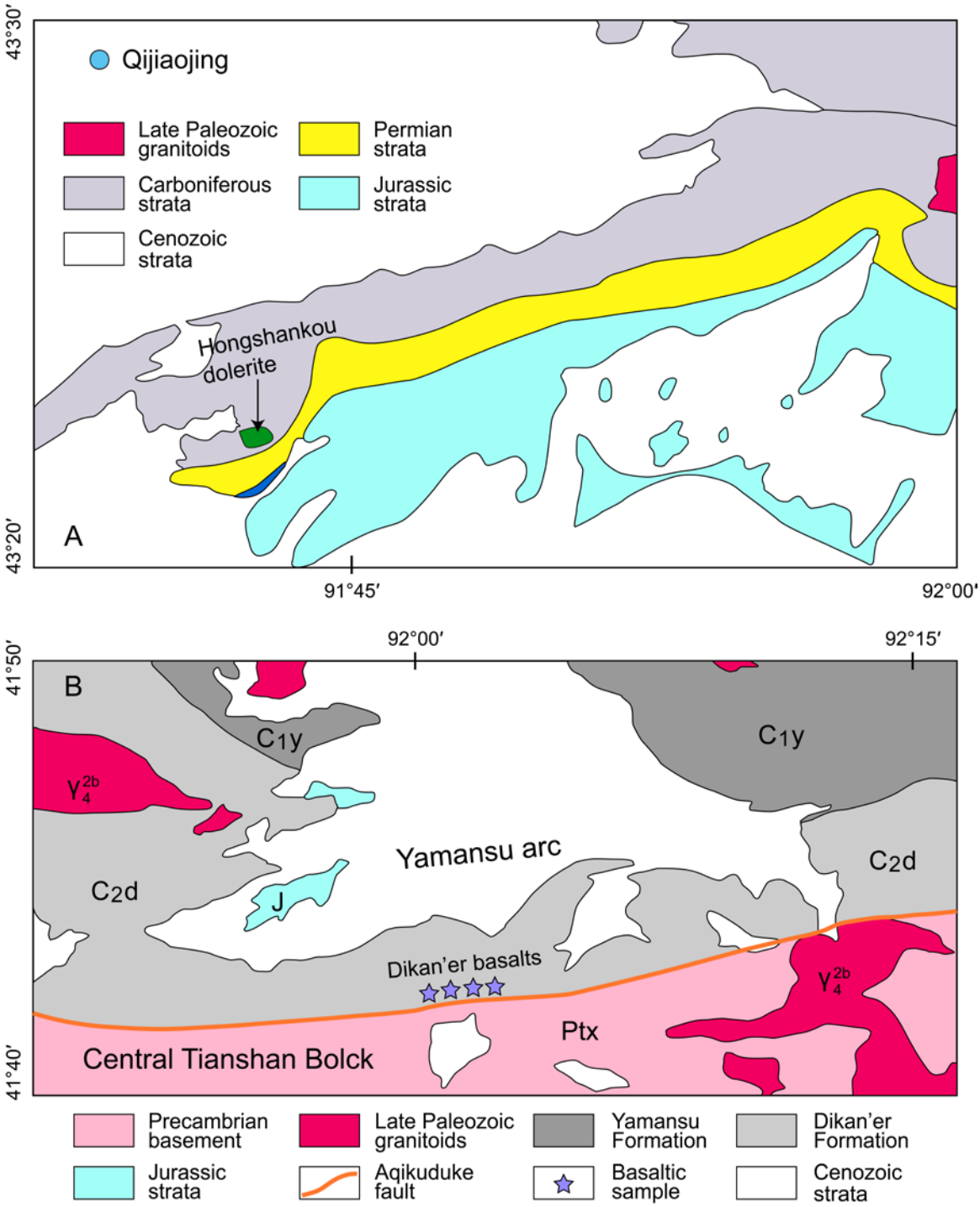
Supplemental file 3. LA-ICP-MS zircon U–Pb dating results

Supplemental file 4. Whole-rock major and trace element data

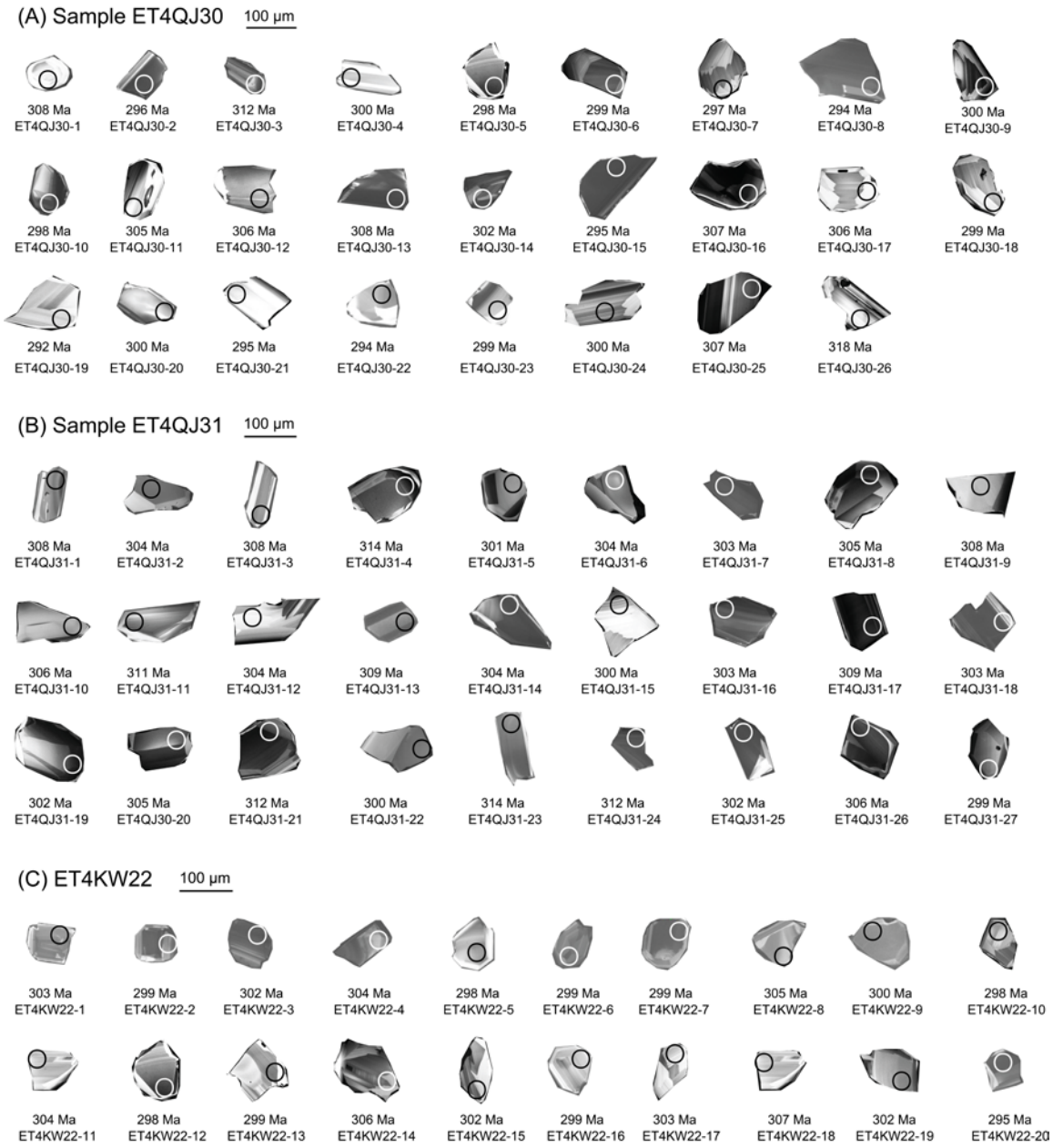
Supplemental file 5. Whole-rock Sm–Nd and Rb–Sr isotopic analytical results

Supplemental file 6. Whole-rock Pb isotopic analytical results

Supplemental file 1 Geological maps of the studied areas: (A) the location for the Hongshankou dolerite, and (B) the location for the Dikan'er basalt.



Supplemental file 2 CL images and $^{206}Pb–^{238}U$ ages for effective zircons from the dated samples: (A) and (B) Hongshankou dolerites, and (C) Dikan'er basalt



Supplemental file 3 LA-ICP-MS zircon U–Pb dating results

Sample spot #	U (ppm)	Th (ppm)	Th/U	$^{207}Pb/^{206}Pb$	±1σ (%)	$^{207}Pb/^{235}U$	±1σ (%)	$^{206}Pb/^{238}U$	±1σ (%)	$t_{207/235}$ (Ma)	±1σ	$t_{206/238}$ (Ma)	±1σ
Hongshankou dolerite (ET4QJ30)													
ET4QJ30-01	396	173	0.44	0.0528	0.0017	0.3561	0.0112	0.0490	0.0004	309	8	308	3
ET4QJ30-02	175	202	1.15	0.0543	0.0024	0.3519	0.0153	0.0470	0.0005	306	12	296	3
ET4QJ30-03	324	105	0.33	0.0527	0.0017	0.3603	0.0119	0.0496	0.0004	312	9	312	3
ET4QJ30-04	225	141	0.63	0.0537	0.0023	0.3502	0.0142	0.0476	0.0005	305	11	300	3
ET4QJ30-05	144	121	0.84	0.0530	0.0025	0.3431	0.0162	0.0473	0.0007	300	12	298	4
ET4QJ30-06	203	161	0.79	0.0559	0.0022	0.3657	0.0142	0.0474	0.0006	316	11	299	3
ET4QJ30-07	323	147	0.46	0.0734	0.0015	1.6836	0.0341	0.1655	0.0013	1002	13	987	7
ET4QJ30-08	359	160	0.45	0.0539	0.0017	0.3497	0.0105	0.0472	0.0004	304	8	297	3
ET4QJ30-09	117	57.0	0.49	0.0575	0.0026	0.4635	0.0210	0.0584	0.0007	387	15	366	4
ET4QJ30-10	233	207	0.89	0.0571	0.0015	0.6401	0.0174	0.0812	0.0007	502	11	503	4
ET4QJ30-11	135	154	1.15	0.0532	0.0024	0.3379	0.0143	0.0467	0.0006	296	11	294	4
ET4QJ30-12	123	64.1	0.52	0.0550	0.0027	0.3589	0.0180	0.0477	0.0006	311	13	300	4
ET4QJ30-13	241	113	0.47	0.0559	0.0021	0.3671	0.0142	0.0474	0.0005	317	11	298	3
ET4QJ30-14	234	387	1.65	0.0528	0.0021	0.3531	0.0142	0.0485	0.0005	307	11	305	3
ET4QJ30-15	133	75.2	0.57	0.0542	0.0031	0.3573	0.0192	0.0486	0.0007	310	14	306	5
ET4QJ30-16	125	81.3	0.65	0.0532	0.0027	0.3586	0.0177	0.0489	0.0007	311	13	308	4
ET4QJ30-17	128	83.7	0.65	0.0541	0.0028	0.3549	0.0177	0.0479	0.0007	308	13	302	5
ET4QJ30-18	97.3	58.9	0.61	0.0544	0.0028	0.3465	0.0170	0.0469	0.0007	302	13	295	4
ET4QJ30-19	398	513	1.29	0.0568	0.0016	0.3834	0.0103	0.0488	0.0004	330	8	307	3
ET4QJ30-20	138	66.5	0.48	0.0552	0.0026	0.3667	0.0170	0.0487	0.0006	317	13	306	4
ET4QJ30-21	96.7	76.7	0.79	0.0532	0.0027	0.3482	0.0188	0.0474	0.0007	303	14	299	4
ET4QJ30-22	145	127	0.88	0.0539	0.0025	0.3444	0.0166	0.0463	0.0006	300	13	292	4
ET4QJ30-23	113	109	0.97	0.0556	0.0029	0.3567	0.0180	0.0476	0.0007	310	13	300	4
ET4QJ30-24	134	139	1.04	0.0526	0.0025	0.3388	0.0159	0.0468	0.0007	296	12	295	4
ET4QJ30-25	96.1	64.6	0.67	0.0542	0.0031	0.3465	0.0193	0.0467	0.0007	302	15	294	5
ET4QJ30-26	301	222	0.74	0.0705	0.0030	0.4742	0.0204	0.0488	0.0005	394	14	307	3
ET4QJ30-27	204	135	0.66	0.0485	0.0020	0.3103	0.0118	0.0475	0.0005	274	9	299	3
ET4QJ30-28	208	161	0.77	0.0539	0.0023	0.3497	0.0144	0.0476	0.0006	304	11	300	3

Continued Supplemental file 3

ET4QJ30-29	289	195	0.68	0.0523	0.0019	0.3517	0.0120	0.0488	0.0005	306	9	307	3
ET4QJ30-30	135	91.3	0.67	0.0506	0.0030	0.3551	0.0232	0.0506	0.0007	309	17	318	4
Hongshankou dolerite (ET4QJ31)													
ET4QJ31-01	438	317	0.72	0.0539	0.0016	0.3651	0.0113	0.0489	0.0006	316	8	308	3
ET4QJ31-02	226	77.1	0.34	0.0540	0.0017	0.3621	0.0117	0.0483	0.0005	314	9	304	3
ET4QJ31-03	283	112	0.40	0.0534	0.0018	0.3631	0.0117	0.0490	0.0005	315	9	308	3
ET4QJ31-04	284	112	0.39	0.0531	0.0019	0.3655	0.0129	0.0500	0.0005	316	10	314	3
ET4QJ31-05	388	211	0.54	0.0521	0.0017	0.3411	0.0114	0.0477	0.0005	298	9	301	3
ET4QJ31-06	210	99.9	0.47	0.0498	0.0021	0.3309	0.0144	0.0482	0.0006	290	11	304	4
ET4QJ31-07	126	72.6	0.57	0.0517	0.0025	0.3405	0.0172	0.0481	0.0006	298	13	303	4
ET4QJ31-08	262	123	0.47	0.0485	0.0016	0.3219	0.0101	0.0484	0.0005	283	8	305	3
ET4QJ31-09	315	139	0.44	0.0546	0.0018	0.3625	0.0110	0.0490	0.0007	314	8	308	4
ET4QJ31-10	239	97.1	0.41	0.0537	0.0042	0.3582	0.0279	0.0487	0.0006	311	21	306	4
ET4QJ31-11	291	148	0.51	0.0508	0.0019	0.3412	0.0122	0.0494	0.0006	298	9	311	4
ET4QJ31-12	342	179	0.52	0.0518	0.0017	0.3441	0.0106	0.0484	0.0005	300	8	304	3
ET4QJ31-13	225	95.2	0.42	0.0527	0.0019	0.3536	0.0121	0.0492	0.0005	307	9	309	3
ET4QJ31-14	285	106	0.37	0.0514	0.0017	0.3410	0.0112	0.0482	0.0005	298	9	304	3
ET4QJ31-15	472	212	0.45	0.0536	0.0015	0.3517	0.0095	0.0477	0.0005	306	7	300	3
ET4QJ31-16	316	144	0.46	0.0519	0.0017	0.3460	0.0122	0.0482	0.0006	302	9	303	4
ET4QJ31-17	230	88.0	0.38	0.0537	0.0019	0.3651	0.0129	0.0491	0.0006	316	10	309	4
ET4QJ31-18	321	191	0.60	0.0530	0.0017	0.3536	0.0119	0.0481	0.0005	307	9	303	3
ET4QJ31-19	416	159	0.38	0.0546	0.0016	0.3613	0.0105	0.0479	0.0004	313	8	302	3
ET4QJ31-20	315	189	0.60	0.0519	0.0018	0.3466	0.0122	0.0485	0.0005	302	9	305	3
ET4QJ31-21	257	103	0.40	0.0523	0.0019	0.3587	0.0126	0.0496	0.0006	311	9	312	3
ET4QJ31-22	518	257	0.50	0.0541	0.0015	0.3554	0.0095	0.0476	0.0004	309	7	300	3
ET4QJ31-23	372	194	0.52	0.0516	0.0019	0.3538	0.0130	0.0499	0.0006	308	10	314	3
ET4QJ31-24	185	98	0.53	0.0529	0.0024	0.3625	0.0174	0.0495	0.0006	314	13	312	4
ET4QJ31-25	226	111	0.49	0.0527	0.0023	0.3480	0.0153	0.0480	0.0006	303	12	302	4
ET4QJ31-26	211	108	0.51	0.0514	0.0020	0.3466	0.0139	0.0487	0.0006	302	10	306	4
ET4QJ31-27	182	62.1	0.34	0.0503	0.0021	0.3268	0.0135	0.0475	0.0005	287	10	299	3

Continued Supplemental file 3

Dikan'er basalt (ET4KW22)													
ET4KW22-01	174	85.3	0.49	0.05390	0.00217	0.35525	0.01392	0.04817	0.00063	309	10	303	4
ET4KW22-02	123	83.2	0.68	0.05437	0.00262	0.38834	0.01808	0.05228	0.00065	333	13	328	4
ET4KW22-03	148	89.0	0.60	0.05590	0.00248	0.56053	0.02495	0.07294	0.00077	452	16	454	5
ET4KW22-04	191	162	0.85	0.05408	0.00222	0.39032	0.01579	0.05251	0.00054	335	12	330	3
ET4KW22-05	253	156	0.62	0.05480	0.00188	0.35710	0.01185	0.04750	0.00047	310	9	299	3
ET4KW22-06	337	199	0.59	0.05444	0.00180	0.35663	0.01198	0.04802	0.00071	310	9	302	4
ET4KW22-07	214	148	0.69	0.05802	0.00166	0.56706	0.01732	0.07101	0.00085	456	11	442	5
ET4KW22-08	160	58.4	0.36	0.05435	0.00216	0.36208	0.01584	0.04836	0.00053	314	12	304	3
ET4KW22-09	168	167	0.99	0.05472	0.00213	0.39240	0.01774	0.05218	0.00064	336	13	328	4
ET4KW22-10	133	79.9	0.60	0.06088	0.00243	0.39531	0.01900	0.04735	0.00064	338	14	298	4
ET4KW22-11	299	224	0.75	0.05315	0.00169	0.34762	0.01268	0.04755	0.00048	303	10	299	3
ET4KW22-12	339	64.7	0.19	0.05095	0.00192	0.36941	0.01594	0.05230	0.00065	319	12	329	4
ET4KW22-13	333	258	0.78	0.05194	0.00159	0.34106	0.01173	0.04748	0.00047	298	9	299	3
ET4KW22-14	515	308	0.60	0.05314	0.00145	0.35503	0.01019	0.04844	0.00047	308	8	305	3
ET4KW22-15	242	153	0.63	0.05412	0.00191	0.35385	0.01235	0.04767	0.00057	308	9	300	4
ET4KW22-16	232	136	0.59	0.05313	0.00211	0.34324	0.01297	0.04724	0.00051	300	10	298	3
ET4KW22-17	135	80.5	0.60	0.05909	0.00207	0.55431	0.01991	0.06814	0.00077	448	13	425	5
ET4KW22-18	330	229	0.69	0.05325	0.00177	0.35241	0.01109	0.04826	0.00054	307	8	304	3
ET4KW22-19	272	162	0.59	0.05452	0.00197	0.35389	0.01205	0.04730	0.00046	308	9	298	3
ET4KW22-20	330	271	0.82	0.05367	0.00169	0.35115	0.01053	0.04740	0.00044	306	8	299	3
ET4KW22-21	125	100	0.80	0.05651	0.00255	0.38071	0.01609	0.04861	0.00066	328	12	306	4
ET4KW22-22	164	155	0.94	0.05488	0.00234	0.35928	0.01460	0.04795	0.00058	312	11	302	4
ET4KW22-23	108	70.2	0.65	0.04583	0.00360	0.30223	0.02252	0.04925	0.00067	268	18	310	4
ET4KW22-24	376	211	0.56	0.05279	0.00176	0.37844	0.01264	0.05231	0.00062	326	9	329	4
ET4KW22-25	260	164	0.63	0.05477	0.00209	0.35925	0.01441	0.04744	0.00051	312	11	299	3
ET4KW22-26	185	109	0.59	0.05367	0.00245	0.36140	0.01655	0.04818	0.00070	313	12	303	4
ET4KW22-27	477	186	0.39	0.05459	0.00187	0.37135	0.01392	0.04872	0.00057	321	10	307	3
ET4KW22-28	190	114	0.60	0.05504	0.00313	0.36011	0.01919	0.04803	0.00059	312	14	302	4
ET4KW22-29	158	77.9	0.49	0.05378	0.00319	0.34214	0.01979	0.04682	0.00059	299	15	295	4

Supplemental file 4 Whole-rock major (wt%) and trace element (ppm) data

Sample	Hongshankou low-Nb/La dolerite					Hongshankou high-Nb/La dolerite							
	ET4QJ 32	ET4QJ 33	ET4QJ 34	ET4QJ 35	ET4QJ 36	ET4QJ 42	ET4QJ 38	ET4QJ 39	ET3QJ 40	ET4QJ 41	ET4QJ 43	ET4QJ 44	ET4QJ 45
Major oxides (wt%)													
SiO_2	48.3	48.9	51.1	48.2	48.6	49.4	51.6	51.7	51.4	51.2	50.3	50.7	50.1
TiO_2	1.86	1.87	1.99	1.85	1.82	1.92	2.01	2.15	1.92	1.87	2.00	2.13	2.05
Al_2O_3	15.7	16.2	15.6	15.5	15.4	17.6	15.1	14.9	15.3	16.8	18.1	17.4	17.2
Fe_2O_3T	11.0	11.7	11.3	11.8	11.6	10.9	11.4	11.7	12.4	10.1	10.9	11.5	11.4
MnO	0.12	0.15	0.17	0.17	0.17	0.12	0.15	0.15	0.13	0.17	0.12	0.11	0.10
MgO	4.50	4.74	3.38	4.84	6.05	3.57	4.56	4.80	4.59	3.97	3.46	3.04	3.47
CaO	10.7	9.92	9.87	10.6	8.94	8.57	8.06	8.12	7.93	9.32	7.93	8.79	8.95
Na_2O	2.88	2.92	3.14	2.98	4.17	4.09	2.90	2.82	2.49	2.85	4.01	3.30	3.20
K_2O	0.99	0.96	1.05	0.66	0.99	0.99	0.82	0.78	0.60	0.51	0.90	0.85	0.77
P_2O_5	0.47	0.45	0.48	0.39	0.61	0.28	0.12	0.10	0.09	0.09	0.10	0.07	0.09
L.O.I	2.69	2.13	1.65	3.04	1.72	2.21	2.63	2.40	3.03	2.54	1.95	1.90	1.95
Total	99.30	99.91	99.72	99.94	100.01	99.57	99.31	99.56	99.85	99.34	99.74	99.79	99.36
Trace elements (ppm)													
Sc	28.0	26.9	30.3	27.9	28.2	26.9	30.6	31.4	25.4	27.7	27.2	26.8	25.9
V	236	231	256	238	237	228	258	262	230	254	247	252	235
Cr	147	148	142	219	185	107	159	157	244	222	102	110	109
Co	31.7	36.1	32.7	44.3	37.2	33.9	24.8	26.5	27.9	23.2	28.3	22.1	29.9
Ni	46.3	51.5	43.7	116	86.5	60.2	41.1	43.6	87.8	51.5	41.0	39.8	63.4
Cu	21.8	22.6	29.1	38.8	34.8	33.5	22.3	26.1	28.3	23.7	24.1	24.9	30.7
Zn	102	107	119	104	117	115	130	123	96.9	129	102	97.8	97.1
Ga	18.4	18.6	19.5	18.3	19.2	20.1	19.1	19.1	17.3	19.5	21.8	19.1	19.0
Ge	2.95	2.95	3.18	2.98	3.20	2.90	2.64	2.61	2.89	2.47	2.85	2.67	2.78
Rb	17.2	17.4	21.6	8.82	14.5	15.1	13.1	11.5	8.22	5.00	13.1	10.8	7.65
Sr	606	606	623	528	524	643	496	499	474	597	657	572	565
Y	27.6	26.0	29.8	25.6	30.5	20.5	18.0	17.7	11.8	14.1	12.8	13.6	14.0
Zr	176	170	189	165	217	190	263	273	173	199	205	185	180
Nb	6.26	5.98	6.60	5.77	8.97	7.27	10.8	11.0	7.62	9.05	7.55	7.38	7.14
Cs	0.41	0.42	0.46	0.15	0.39	0.77	1.55	1.54	2.34	0.85	0.75	0.54	0.40
Ba	290	277	323	188	302	291	325	334	231	290	296	221	218
La	17.8	17.1	19.0	14.5	24.7	10.8	9.80	9.20	5.88	9.42	5.34	5.26	5.72
Ce	43.5	41.8	47.8	36.3	60.1	27.4	23.6	22.6	14.1	21.1	13.3	13.4	14.5
Pr	6.13	5.93	6.63	5.20	8.01	3.91	3.19	3.01	1.93	2.71	1.92	1.95	2.08
Nd	27.6	26.6	30.1	23.6	34.8	17.8	14.4	13.8	8.87	11.6	9.02	9.16	9.74
Sm	6.66	6.36	7.20	5.75	7.77	4.36	3.67	3.55	2.36	2.86	2.38	2.47	2.58
Eu	2.03	2.01	2.22	1.85	2.23	1.73	1.67	1.68	1.25	1.45	1.39	1.40	1.42
Gd	6.18	5.93	6.64	5.48	7.04	4.15	3.53	3.40	2.34	2.76	2.39	2.49	2.60
Tb	0.97	0.94	1.06	0.90	1.10	0.70	0.62	0.60	0.41	0.48	0.42	0.45	0.46
Dy	5.52	5.40	6.04	5.21	6.25	4.13	3.74	3.66	2.45	2.93	2.58	2.81	2.88
Ho	1.12	1.08	1.21	1.06	1.26	0.85	0.78	0.76	0.51	0.60	0.55	0.59	0.60
Er	3.01	2.84	3.21	2.81	3.30	2.31	2.20	2.17	1.43	1.72	1.56	1.68	1.73
Tm	0.44	0.41	0.47	0.41	0.48	0.35	0.34	0.34	0.23	0.26	0.25	0.27	0.27
Yb	2.69	2.52	2.83	2.47	2.96	2.19	2.20	2.23	1.48	1.76	1.63	1.73	1.74
Lu	0.41	0.39	0.44	0.38	0.45	0.35	0.35	0.35	0.24	0.27	0.27	0.28	0.28
Hf	4.12	4.05	4.53	3.85	5.02	4.48	5.97	6.09	4.07	4.54	4.64	4.27	4.20
Ta	0.43	0.41	0.45	0.40	0.55	0.45	0.67	0.66	0.48	0.54	0.47	0.47	0.44
Pb	5.26	5.19	5.86	4.55	6.42	6.07	5.78	6.80	5.01	7.00	4.43	5.84	4.34
Th	2.45	2.37	2.63	1.48	2.02	0.92	1.39	1.41	0.84	1.10	0.77	0.83	0.83
U	0.66	0.65	0.78	0.52	0.61	0.52	0.37	0.37	0.26	0.39	0.35	0.36	0.32
Mg#	47.4	47.2	39.7	47.5	53.5	42.0	46.9	47.5	45.0	46.5	41.2	36.7	40.0
Nb/La	0.35	0.35	0.35	0.40	0.36	0.67	1.11	1.19	1.30	0.96	1.41	1.40	1.25
Eu/Eu*	0.97	1.00	0.98	1.01	0.92	1.24	1.42	1.48	1.63	1.58	1.78	1.72	1.67

Mg#=100*Mg/(Mg+Fe^{2+}), assuming Fe^{2+}/Fe^{total} =0.90; LOI=loss of ignition; $Fe_2O_3^T$ =total Fe oxides as Fe_2O_3.

Continued Supplemental file 4

	Dikan'er Nb-rich basalt							Dikan'er normal arc basalt				
Sample	X3ETC 01	X3ETC 02	X3ETC 05	X3ETC 06	X3ETC 07	X3ETC 09	X3ETC 10	X3ETC 12	X3ETC 14	X3ETC 15	X3ETC 19	X3ETC 23
Major oxides (wt%)												
SiO_2	47.6	48.5	49.4	48.6	48.8	47.7	49.2	46.6	48.2	45.3		47.2
TiO_2	1.29	1.36	1.47	1.47	1.40	1.33	1.33	1.47	1.50	1.62		1.22
Al_2O_3	16.7	16.9	16.1	16.5	16.3	16.4	16.4	16.0	16.3	16.4		15.5
Fe_2O_3T	10.1	10.7	10.8	11.1	10.7	10.6	10.8	11.3	11.6	11.5		10.3
MnO	0.14	0.15	0.19	0.18	0.17	0.15	0.15	0.16	0.14	0.16		0.17
MgO	6.51	6.01	6.09	6.25	6.38	5.89	6.12	6.28	5.25	6.03		4.33
CaO	10.8	9.94	9.46	10.9	10.0	11.3	9.29	11.3	10.8	12.1		11.9
Na_2O	2.14	2.01	2.11	1.73	2.06	1.86	2.30	1.91	2.08	2.26		2.30
K_2O	0.34	0.39	0.32	0.21	0.28	0.38	0.51	0.39	0.59	0.56		0.91
P_2O_5	0.47	0.46	0.49	0.47	0.48	0.47	0.45	0.41	0.36	0.40		0.32
L.O.I	3.45	3.31	2.97	2.63	2.89	3.31	3.08	4.11	3.09	3.69		5.31
Total	99.45	99.65	99.31	100.07	99.53	99.32	99.61	99.91	99.85	100.06		99.41
Trace elements (ppm)												
Sc	25.3	27.9	28.8	29.6	26.9	32.3	28.6	26.5	26.1	30.1	27.9	24.5
V	211	225	235	244	221	267	227	230	208	245	263	206
Cr	157	142	172	177	161	182	169	128	146	188	158	141
Co	32.6	36.2	35.6	39.7	35.5	43.0	36.6	41.6	41.0	45.1	36.1	39.5
Ni	75.2	79.4	85.9	91.2	86.4	98.8	91.5	108	118	125	102	110
Cu	36.6	48.8	54.4	88.9	72.7	47.4	53.4	37.2	36.8	33.3	23.1	76.5
Zn	93.3	87.2	96.8	99.2	95.5	99.4	106	88.9	87.0	107	81.4	96.3
Ga	17.9	18.1	18.3	19.5	17.3	20.9	17.3	17.4	17.0	18.6	16.8	15.9
Ge	2.58	2.55	2.76	2.93	2.81	3.03	2.77	2.74	2.88	2.96	2.70	2.56
Rb	5.86	6.16	4.53	3.18	3.69	6.94	7.24	4.69	7.59	7.35	24.7	12.8
Sr	665	534	466	574	439	666	449	505	697	622	381	392
Y	24.7	26.6	28.3	29.1	26.5	29.9	25.5	24.9	23.2	27.1	25.5	21.8
Zr	162	160	177	172	167	173	154	148	137	157	136	126
Nb	7.91	8.32	8.10	8.23	7.74	9.07	7.77	6.16	5.66	6.10	5.51	4.82
Cs	1.77	2.01	2.07	1.65	1.94	2.15	2.17	1.70	2.06	2.46	4.78	3.95
Ba	180	185	134	83.3	104	176	179	129	194	156	390	235
La	17.5	18.9	19.4	19.0	17.9	20.2	17.9	13.9	13.0	13.2	11.9	10.5
Ce	42.8	44.9	46.7	45.5	43.1	48.4	42.6	34.2	31.8	33.4	30.7	26.8
Pr	5.89	5.96	6.17	6.19	5.85	6.56	5.73	4.83	4.44	4.79	4.39	3.87
Nd	25.4	26.2	27.2	27.5	25.4	28.9	24.9	21.6	20.1	21.9	20.4	17.7
Sm	5.38	5.66	6.18	6.13	5.85	6.30	5.70	5.22	4.83	5.44	4.86	4.38
Eu	1.63	1.70	1.87	1.86	1.73	1.94	1.75	1.66	1.58	1.78	1.63	1.46
Gd	5.22	5.15	5.87	5.60	5.53	5.76	5.36	4.99	4.62	5.31	4.69	4.33
Tb	0.84	0.85	0.94	0.93	0.89	0.96	0.85	0.82	0.77	0.89	0.81	0.72
Dy	4.90	5.10	5.56	5.55	5.25	5.70	5.06	4.91	4.60	5.32	4.85	4.33
Ho	1.00	1.06	1.14	1.13	1.08	1.16	1.04	1.00	0.92	1.10	1.00	0.89
Er	2.71	2.88	3.13	3.11	2.93	3.23	2.83	2.73	2.53	2.96	2.76	2.42
Tm	0.40	0.41	0.46	0.44	0.44	0.46	0.42	0.40	0.37	0.44	0.39	0.35
Yb	2.53	2.65	2.87	2.83	2.68	2.88	2.58	2.53	2.32	2.72	2.47	2.17
Lu	0.38	0.41	0.45	0.44	0.42	0.46	0.40	0.38	0.36	0.42	0.38	0.34
Hf	3.86	3.80	4.14	3.93	3.87	4.08	3.61	3.45	3.21	3.70	3.22	2.94
Ta	0.47	0.50	0.47	0.48	0.46	0.52	0.45	0.38	0.35	0.37	0.34	0.29
Pb	8.79	5.26	5.31	6.95	4.72	6.16	3.68	5.22	5.36	3.93	2.84	4.09
Th	1.71	1.64	1.56	1.48	1.46	1.68	1.40	0.96	0.89	0.87	0.74	0.69
U	0.71	0.67	0.59	0.60	0.54	0.68	0.59	0.69	0.49	0.52	1.00	0.72
Mg#	58.7	55.3	55.5	55.3	56.7	55.0	55.6	55.1	50.0	53.5		48.1
Nb/La	0.45	0.44	0.42	0.43	0.43	0.45	0.43	0.44	0.44	0.46	0.46	0.46
Eu/Eu*	0.94	0.96	0.95	0.97	0.93	0.98	0.97	1.00	1.02	1.01	1.05	1.02

Continued Supplemental file 4

Dikan'er normal arc basalt				
Sample	X3ETC 24	X3ETC 26	X3ETC 27	X3ETC 28
Major oxides (wt%)				
SiO_2	46.1	46.5		46.7
TiO_2	1.46	1.55		1.61
Al_2O_3	16.6	16.4		16.5
Fe_2O_3T	10.8	11.3		10.9
MnO	0.17	0.15		0.17
MgO	6.33	6.69		6.38
CaO	10.6	10.2		10.7
Na_2O	2.56	2.93		2.47
K_2O	0.52	0.47		0.48
P_2O_5	0.34	0.38		0.36
L.O.I	4.01	3.52		3.44
Total	99.55	99.99		99.67
Trace elements (ppm)				
Sc	29.2	29.4	28.0	28.2
V	236	232	230	219
Cr	185	173	190	174
Co	47.9	41.8	44.8	44.5
Ni	131	126	135	129
Cu	33.1	34.0	35.0	46.2
Zn	89.0	94.8	94.4	86.5
Ga	18.1	17.8	17.3	18.4
Ge	2.84	2.64	2.87	2.76
Rb	7.71	6.07	3.95	5.66
Sr	449	531	599	464
Y	25.2	26.5	25.2	25.9
Zr	134	152	146	141
Nb	5.51	5.87	5.61	5.65
Cs	2.57	2.09	1.56	2.75
Ba	150	165	129	162
La	12.1	12.7	12.1	12.3
Ce	31.0	32.2	31.1	31.8
Pr	4.46	4.65	4.46	4.55
Nd	20.8	21.3	20.3	21.2
Sm	4.95	5.32	5.04	5.01
Eu	1.66	1.72	1.65	1.68
Gd	4.77	5.17	4.93	4.85
Tb	0.82	0.87	0.84	0.83
Dy	4.92	5.21	4.98	5.06
Ho	1.02	1.07	1.02	1.04
Er	2.77	2.97	2.78	2.84
Tm	0.39	0.44	0.41	0.41
Yb	2.47	2.71	2.52	2.60
Lu	0.39	0.41	0.39	0.40
Hf	3.28	3.59	3.39	3.41
Ta	0.34	0.36	0.34	0.36
Pb	3.39	5.59	4.13	3.38
Th	0.74	0.86	0.81	0.80
U	0.74	0.38	0.49	0.41
Mg#	56.2	56.6		56.4
Nb/La	0.46	0.46	0.46	0.46
Eu/Eu*	1.05	1.00	1.01	1.04

Supplemental file 5 Whole-rock Sm–Nd and Rb–Sr isotopic analytical results

Sample	Rb (ppm)	Sr (ppm)	$^{87}Rb/^{86}Sr$	$^{87}Sr/^{86}Sr$	2σ	$(^{87}Sr/^{86}Sr)i$	Sm (ppm)	Nd (ppm)	$^{147}Sm/^{144}Nd$	$^{143}Nd/^{144}Nd$	2σ	$^{143}Nd/^{144}Ndi$	εNd(t)
ET4QJ34	21.6	623	0.1003	0.704393	0.000007	0.7040	7.20	30.1	0.144878	0.512787	0.000006	0.512498	4.9
ET4QJ35	8.82	528	0.0483	0.703803	0.000010	0.7036	5.75	23.6	0.147605	0.512820	0.000006	0.512525	5.5
ET4QJ36	14.5	524	0.0799	0.704218	0.000006	0.7039	7.77	34.8	0.135039	0.512745	0.000005	0.512475	4.5
ET4QJ38	13.1	496	0.0765	0.704111	0.000007	0.7038	3.67	14.4	0.154083	0.512765	0.000007	0.512457	4.1
ET4QJ41	5.00	597	0.0243	0.703889	0.000010	0.7038	2.86	11.6	0.149342	0.512769	0.000008	0.512471	4.4
ET4QJ45	7.65	565	0.0392	0.703912	0.000006	0.7037	2.58	9.74	0.160193	0.512837	0.000005	0.512517	5.3
X3ETC02	6.16	534	0.0333	0.704714	0.000009	0.7046	5.66	26.2	0.130806	0.512723	0.000005	0.512466	4.2
X3ETC06	3.18	574	0.0160	0.704453	0.000006	0.7044	6.13	27.5	0.134711	0.512743	0.000004	0.512478	4.4
X3ETC07	3.69	439	0.0243	0.704480	0.000006	0.7044	5.85	25.4	0.139235	0.512741	0.000006	0.512467	4.2
X3ETC09	6.94	666	0.0301	0.704620	0.000007	0.7045	6.30	28.9	0.131830	0.512711	0.000005	0.512451	3.9
X3ETC19	24.7	381	0.1874	0.705034	0.000006	0.7042	4.86	20.4	0.144092	0.512808	0.000005	0.512524	5.3
X3ETC24	7.71	449	0.0497	0.704523	0.000006	0.7043	4.95	20.8	0.144039	0.512775	0.000007	0.512491	4.7
X3ETC27	3.95	599	0.0190	0.704671	0.000006	0.7046	5.04	20.3	0.150311	0.512806	0.000006	0.512510	5.1
X3ETC28	5.66	464	0.0353	0.704254	0.000008	0.7041	5.01	21.2	0.142923	0.512819	0.000004	0.512538	5.6

Supplemental file 6 Whole-rock Pb isotopic analytical results

Sample	Th (ppm)	U (ppm)	Pb (ppm)	$^{206}Pb/^{204}Pb$	$^{207}Pb/^{204}Pb$	$^{208}Pb/^{204}Pb$	$^{206}Pb/^{204}Pbt$	$^{207}Pb/^{204}Pbt$	$^{208}Pb/^{204}Pbt$
X3ETC02	1.64	0.67	5.26	18.413	15.561	38.248	18.031	15.541	37.942
X3ETC06	1.48	0.60	6.95	18.341	15.554	38.151	18.083	15.540	37.943
X3ETC07	1.46	0.54	4.72	18.377	15.556	38.204	18.030	15.538	37.900
X3ETC09	1.68	0.68	6.16	18.365	15.558	38.181	18.033	15.540	37.915
X3ETC19	0.74	1.00	2.84	19.077	15.587	38.177	18.004	15.531	37.918
X3ETC24	0.74	0.74	3.39	18.558	15.560	38.092	17.901	15.526	37.879
X3ETC27	0.81	0.49	4.13	18.293	15.553	38.174	17.931	15.534	37.982
X3ETC28	0.80	0.41	3.38	18.271	15.540	38.094	17.903	15.521	37.863