Data Repository Item

Table DR1 SHRIMP U-Pb zircon data for Bikou Group rhyolite samples 05BK69 and 05BK123

Grain	U(ppm)	Th(ppm)	%com. 206Pb	$^{206}Pb^*/^{238}U$		$^{207}Pb^*/^{235}U$		$^{206}Pb^*/^{238}U$ age(Ma)		$^{207}Pb^*/^{206}Pb^*$ age (Ma)		$^{208}Pb^*/^{232}Th$ age (Ma)	
05BK69													
1	396	281	0.07	0.1357	0.0008	1.256	0.013	820	5	841	17	856	8
2	424	325	0.09	0.1361	0.0008	1.262	0.014	823	5	845	19	823	8
3	867	1175	0.24	0.1367	0.0007	1.277	0.011	826	4	860	15	837	6
4	316	226	0.13	0.1348	0.0009	1.230	0.016	815	5	811	22	823	9
5	272	187	0.13	0.1362	0.0009	1.287	0.018	823	5	884	25	840	10
6	268	152	0.14	0.1377	0.0009	1.277	0.017	832	5	845	24	851	10
7	360	236	0.08	0.1416	0.0009	1.306	0.014	854	5	835	19	871	10
8	364	236	0.14	0.1411	0.0010	1.291	0.018	851	6	819	25	867	11
9	294	170	0.12	0.1431	0.0009	1.327	0.016	862	5	846	22	861	16
10	493	335	0.07	0.1369	0.0008	1.273	0.013	827	5	852	16	827	7
11	282	191	0.16	0.1341	0.0009	1.226	0.017	811	5	818	25	798	12
12	340	210	0.04	0.1255	0.0009	1.188	0.014	762	5	889	21	783	9
13	399	271	0.40	0.1360	0.0008	1.252	0.016	822	5	830	25	843	10
14	510	430	0.07	0.1362	0.0008	1.250	0.012	823	5	825	17	839	8
15	339	254	0.15	0.1312	0.0009	1.202	0.017	795	5	820	24	808	9
16	277	174	0.20	0.1295	0.0009	1.183	0.019	785	5	815	29	773	11
05BK123													
1.1	82	74	0.67	0.1193	0.0022	1.071	0.034	727	12	777	56	725	18
2.1	1001	867	0.30	0.1320	0.0020	1.212	0.021	799	11	825	16	801	13
3.1	504	14	0.06	0.4367	0.0067	9.290	0.146	2336	30	2394	5	2288	139
4.1	458	656	0.27	0.1358	0.0021	1.203	0.023	821	12	751	22	796	13
5.1	1051	1035	0.08	0.1380	0.0021	1.259	0.021	833	12	813	12	871	14
6.1	481	446	0.12	0.1401	0.0022	1.284	0.023	845	12	821	19	871	15
7.1	1233	545	0.03	0.1465	0.0022	1.344	0.022	881	13	822	10	899	16
8.1	194	288	0.17	0.1503	0.0024	1.407	0.029	903	14	866	26	962	17
9.1	161	151	0.32	0.1330	0.0022	1.192	0.029	805	13	775	37	848	17
10.1	69	41	1.20	0.1364	0.0025	1.190	0.076	824	14	717	131	844	38
11.1	182	251	0.52	0.1265	0.0029	1.193	0.042	768	17	881	56	824	21
12.1	206	226	0.27	0.1399	0.0031	1.288	0.034	844	18	830	31	953	23
13.1	97	71	0.70	0.1210	0.0029	1.111	0.045	737	16	825	69	877	28
14.1	377	377	0.31	0.1357	0.0030	1.232	0.031	820	17	802	24	847	22
15.1	105	88	0.99	0.1325	0.0031	1.203	0.059	802	17	803	90	889	28
16.1	101	111	0.42	0.1380	0.0032	1.274	0.043	833	18	837	51	932	25
17.1	349	332	0.22	0.1306	0.0029	1.185	0.029	791	16	801	24	855	20
18.1	190	324	0.33	0.1267	0.0028	1.166	0.032	769	16	829	33	820	20
19.1	185	181	1.15	0.1372	0.0031	1.236	0.047	829	18	784	65	938	27
20.1	297	250	0.53	0.1278	0.0028	1.199	0.032	775	16	870	32	805	21
21.1	256	186	0.27	0.1316	0.0029	1.176	0.031	797	17	769	29	866	21
22.1	202	175	0.25	0.1206	0.0027	1.089	0.030	734	15	790	34	800	20
23.1	309	411	0.15	0.1337	0.0029	1.221	0.030	809	17	813	23	846	19

Zircon standard SL13 (U = 238 ppm) was used for calibrating the U content, and

zircon standard TEMORA ($^{206}Pb/^{238}U$ = 0.0668 corresponding to 417 Ma) were used to calibrate the $^{206}Pb/^{238}U$ ratios. All error is 1sigma (1σ).

Table DR2 major and trace elements for the Bikou Group basalts and two dating rhyolites

sample#	05BK22	05BK43	05BK44	05BK45	05BK57	05BK59	05BK61	05BK62	05BK64	05BK65	05BK68	05BK69	05BK74	05BK75	05BK79	05BK81	05BK83	05BK85	05BK88	05BK89
Major (%)	lower															Upper				
SiO_2	52.0	54.2	55.3	52.8	47.9	47.0	48.9	48.4	51.5	49.1	48.6	77.0	50.2	53.6	51.2	49.0	48.0	47.6	48.0	46.0
TiO_2	1.43	0.92	0.92	0.78	1.57	1.54	0.49	0.46	0.83	1.60	1.20	0.16	2.60	1.27	1.37	1.18	1.74	2.53	1.73	3.08
Al_2O_3	15.4	16.8	15.9	17.8	15.7	15.4	12.0	12.2	17.0	16.0	17.5	12.0	14.4	10.7	13.6	14.4	15.8	13.9	16.8	13.5
$Fe_2O_3^T$	9.87	8.82	8.68	7.49	11.2	11.9	10.4	9.74	6.77	10.6	14.4	2.13	13.6	10.4	10.7		11.9	12.7	13.1	14.5
MnO	0.13	0.13	0.14	0.09	0.16	0.16	0.15	0.15	0.16	0.20	0.22	0.05	0.24	0.20	0.14	0.22	0.17	0.17	0.20	0.18
MgO	5.40	6.13	6.38	6.44	6.61	7.31	12.7	11.7	1.81	6.85	5.94	0.23	4.39	7.99	3.19	10.0	7.46	5.90	7.00	8.66
CaO	6.66	4.28	3.87	3.45	8.00	10.3	9.92	11.0	10.5	8.82	5.17	1.22	6.97	9.19	10.9	8.60	9.66	12.4	6.49	8.06
Na_2O	3.13	5.05	4.93	2.19	2.74	3.21	2.04	2.15	5.07	2.79	3.04	4.20	3.88	2.66	4.80	2.51	2.97	1.91	2.32	2.58
K_2O	1.58	1.48	1.90	5.63	0.47	0.03	0.02	0.02	0.61	1.41	0.02	1.77	1.08	1.73	0.50	2.03	0.03	0.97	0.30	0.08
P_2O_5	0.24	0.13	0.13	0.12	0.26	0.31	0.33	0.31	0.36	0.33	0.11	0.00	0.86	0.39	0.29	0.11	0.31	0.27	0.15	0.33
Mg#	56.0	61.8	63.1	66.7	57.9	58.9	74.0	73.7	38.4	60.1	49.0	20.3	42.9	64.2	41.0	100	59.4	52.0	55.5	58.2
LOI	4.35	2.40	2.12	3.24	5.75	2.82	2.61	3.63	5.61	2.56	3.84	1.67	2.02	2.05	2.94	1.17	2.28	1.96	3.81	3.19
Total	100	100	100	100	100	99.9	99.5	99.8	100	100	100	100	100	100	99.7	189	100	100	99.9	100
trace(ppm)																				
Sc	31.4	30.5	35.1	25.9	38.5	35.9	35.4	37.5	18.5	38.7	50.0	0.15	33.4	30.8	29.5	47.3	39.5	37.3	41.3	30.1
V	232	200	226	215	321	307	170	230	191	299	309	5.63	226	200	259	241	323	377	270	300
Cr	42.3	217	256	222	242	141	1024	1132	9.76	170	161	0.46	37.2	110	105	754	168	193	173	359
Mn	1085	1040	1212	682	1412	1321	1176	1252	1277	1467	1779	385	1930	1539	1254	1790	1358	1477	1324	1482
Co	35.4	36.6	42.0	33.0	53.8	47.1	64.2	58.0	30.4	48.3	47.0	26.6	34.8	36.4	65.4	67.0	49.8	49.8	51.6	64.8
Ni	20.6	71.2	64.8	60.2	121	79.4	265	256	4.78	75.2	79.7	0.98	19.3	59.4	55.8	232	77.9	91.9	57.0	197
Cu	17.4	24.8	38.0	16.0	95.2	104	32.9	66.5	45.3	131	39.3	1.70	39.0	39.1	32.3	94.1	82.9	120	72.3	91.6
Zn	70.3	78.0	78.8	60.8	92.7	96.5	78.1	82.5	103	186	176	16.2	108	166	85.2	87.5	98.2	90.0	79.9	132
Ga	18.2	19.5	17.6	20.5	19.0	22.5	11.8	13.2	18.5	19.6	19.0	32.6	21.2	20.5	14.1	14.9	21.6	25.0	16.9	21.8
Rb	35.1	33.7	40.5	116	7.92	0.42	0.19	0.12	16.5	39.5	0.62	66.4	29.6	41.2	10.2	59.9	0.19	21.3	7.53	1.92
Sr	146	232	141	82.7	368	345	528	381	1326	568	530	62.6	342	288	259	49.7	380	523	292	303
Y	32.5	21.6	22.5	14.2	25.9	30.4	32.5	34.5	18.0	30.0	24.5	130	47.6	41.4	28.9	22.5	31.2	34.0	28.0	26.0
Zr	143	114	109	101	101	121	88.9	84.9	118	126	66.3	643	128	178	114	60.6	121	177	85.1	200
Nb	7.20	6.11	5.48	5.37	3.79	5.18	13.5	12.0	6.15	5.33	2.33	28.0	6.64	9.45	5.21	2.22	4.92	13.0	3.40	25.6
Ba	612	709	681	2183	293	20.4	45.5	60.1	267	536	30.3	324	338	305	306	507	23.9	143	80.1	43.9
La	27.3	18.8	16.1	9.28	11.9	16.3	126	136	38.8	15.9	6.88	47.2	26.4	53.7	16.1	3.62	16.2	14.4	5.16	22.4

Ce	53.3	36.5	31.8	21.6	28.1	37.1	255	240	76.2	36.0	15.1	92.7	58.0	101	35.6	10.7	35.2	35.8	12.5	50.4
Pr	6.72	4.48	3.99	2.92	4.08	5.31	34.1	33.9	10.4	5.23	2.14	11.4	8.23	13.3	5.12	1.78	5.01	5.33	2.04	7.10
Nd	28.2	18.5	16.7	12.0	19.2	24.5	137	138	42.9	24.1	10.3	46.4	38.2	54.8	23.0	9.71	23.2	26.4	10.7	32.5
Sm	5.83	3.82	3.86	2.68	4.58	5.49	21.5	22.4	7.54	5.53	2.94	10.8	9.00	9.41	5.20	3.02	5.54	7.06	3.32	7.38
Eu	1.55	1.13	1.13	0.63	1.58	2.14	4.51	4.30	2.38	1.79	0.98	0.13	3.29	2.16	1.63	0.93	2.03	2.40	1.33	2.42
Gd	6.07	3.97	3.80	2.73	5.13	5.87	13.4	12.6	5.90	5.94	3.93	12.2	9.20	8.08	5.57	3.91	5.65	7.13	4.12	7.69
Tb	1.07	0.67	0.70	0.47	0.88	1.04	1.61	1.58	0.79	1.00	0.76	2.87	1.60	1.20	0.96	0.78	1.04	1.23	0.81	1.21
Dy	6.26	4.09	4.47	2.87	5.20	6.28	7.13	7.24	3.85	6.02	4.94	22.4	9.89	7.29	5.66	4.67	6.40	7.20	5.27	6.16
Ho	1.31	0.83	0.92	0.59	1.03	1.21	1.14	1.22	0.67	1.19	1.01	5.49	2.02	1.42	1.13	0.97	1.31	1.36	1.12	1.07
Er	3.62	2.36	2.60	1.68	2.85	3.39	3.14	3.33	1.84	3.30	2.84	16.9	5.26	4.05	3.20	2.68	3.58	3.54	3.10	2.72
Tm	0.52	0.35	0.40	0.27	0.43	0.50	0.41	0.40	0.26	0.48	0.44	2.60	0.74	0.62	0.48	0.41	0.50	0.46	0.44	0.38
Yb	3.22	2.33	2.43	1.80	2.71	3.09	2.58	2.47	1.67	3.09	2.78	16.1	4.57	3.81	3.09	2.59	3.10	2.81	2.78	2.21
Lu	0.51	0.39	0.40	0.31	0.43	0.50	0.39	0.36	0.27	0.49	0.44	2.42	0.71	0.56	0.50	0.42	0.49	0.41	0.45	0.33
Hf	4.06	3.05	3.20	2.70	2.65	3.13	2.51	2.58	2.79	3.38	1.88	20.9	3.90	4.59	3.03	1.80	3.39	4.98	2.40	5.14
Ta	0.48	0.39	0.39	0.37	0.23	0.29	1.14	1.06	0.37	0.31	0.15	2.00	0.43	0.64	0.31	0.19	0.30	0.93	0.25	1.64
Pb	1.04	2.98	5.88	1.27	2.66	2.71	5.41	5.12	5.73	13.4	7.19	2.82	5.34	11.9	3.77	2.34	2.53	1.69	4.29	1.73
Th	5.10	3.19	3.08	3.07	0.82	0.79	21.9	20.6	3.61	0.90	1.13	22.2	2.74	9.47	1.65	0.28	0.84	1.15	0.38	2.10
U	0.54	0.62	0.67	0.55	0.20	0.23	3.92	3.69	0.67	0.25	0.26	4.49	0.54	1.85	0.46	0.05	0.22	0.46	0.09	0.53

sample#	05BK90	05BK94	05BK95	05BK96	05BK98	05BK99	05BK102A	05BK102B	05BK104	05BK106	05BK107	05BK108	05BK111	05BK113	05BK115	05BK117	05BK122	05BK123	05BK128	05BK130
Maior (%)																				
SiO_2	45.4	46.7	50.3	47.6	45.3	46.6	50.2	43.0	46.7	52.6	50.6	49.1	51.6	47.1	53.2	47.6	53.7	65.6	44.6	46.1
TiO_2	1.47	2.00	1.51	1.55	2.39	2.33	1.21	1.70	1.41	1.20	1.53	1.59	3.09	1.98	1.98	1.63	1.22	0.55	3.40	1.67
Al_2O_3	16.3	14.8	14.0	15.1	15.8	14.9	16.6	15.4	12.5	11.1	13.5	13.4	13.3	14.5	14.1	11.2	16.6	16.8	14.6	14.0
$Fe_2O_3^T$	10.9	13.8	10.2	11.1	13.9	13.2	12.8	15.4	15.7	13.5	13.8	14.8	15.6	13.6	16.3	11.1	10.9	4.39	16.0	15.3
MnO	0.16	0.19	0.16	0.17	0.20	0.18	0.20	0.25	0.22	0.18	0.20	0.22	0.16	0.19	0.23	0.18	0.15	0.07	0.56	0.20
MgO	7.98	6.82	6.47	7.12	7.54	6.36	3.27	7.15	6.23	4.42	6.18	6.12	4.18	6.96	2.37	4.78	2.50	1.24	5.59	6.00
CaO	9.56	10.4	11.6	11.4	8.29	10.5	12.4	12.5	11.1	11.3	11.6	11.3	6.34	11.0	6.69	15.7	10.6	4.40	8.87	9.33
Na_2O	2.32	1.78	2.37	2.45	2.87	3.32	0.91	1.31	2.44	1.61	1.67	2.28	3.13	2.09	3.62	0.94	2.86	2.54	1.03	2.27
K_2O	1.41	0.02	0.10	0.10	0.30	0.08	0.29	0.05	0.31	0.07	0.04	0.17	0.19	0.18	0.46	0.03	0.01	2.98	0.01	0.07
P_2O_5	0.12	0.20	0.14	0.14	0.25	0.28	0.16	0.14	0.11	0.12	0.12	0.13	0.35	0.16	0.22	0.15	0.08	0.09	0.42	0.13
Mg#	63.0	53.5	59.6	59.9	55.8	52.9	37.3	52.0	48.0	43.3	51.1	49.1	38.4	54.4	25.3	50.1	2.06	39.7	44.9	47.8
LOI	4.67	3.64	3.21	3.55	3.80	2.52	2.85	2.21	3.26	4.23	1.82	1.89	2.58	2.52	1.20	6.93	1.34	1.58	4.71	5.50
Total	100	100	100	100	101	100	101	99.2	100	100	101	101	101	100	100	100	100	100	99.9	100
trace(ppm)																				

Sc	49.8	35.7	41.3	42.9	43.8	45.5	40.0	68.4	43.2	37.4	45.1	45.2	29.7	53.6	46.4	38.9	33.0	15.9	35.0	50.8
V	322	288	273	272	356	352	234	344	377	299	373	383	337	446	275	289	270	75.7	357	434
Cr	321	134	175	304	171	189	111	226	57.9	58.1	85.9	71.0	7.83	153	24.9	85.3	188	18.9	66.3	77.3
Mn	1359	1457	1462	1408	1570	1576	1627	2098	1801	1508	1603	1684	1201	1522	1838	1395	1307	614	4856	1678
Co	50.7	55.3	52.8	52.0	54.8	46.3	58.7	71.2	54.0	55.9	51.9	60.6	47.3	58.9	61.4	47.7	55.4	16.4	51.6	58.4
Ni	102	95.1	57.5	72.4	99.6	53.6	50.8	117	59.2	52.8	175	65.0	25.1	77.5	37.9	41.4	73.5	14.8	55.2	71.8
Cu	86.8	82.9	90.7	95.8	60.1	58.0	74.2	188	261	185	217	198	38.5	109	100	68.3	43.4	15.0	48.2	188
Zn	74.5	113	78.7	82.3	113	101	94.8	125	108	83.8	102	107	129	106	124	81.5	60.8	57.4	148	116
Ga	18.2	21.4	16.7	17.3	20.0	21.3	19.6	20.7	17.4	15.9	16.9	17.6	22.4	19.8	20.4	16.0	25.0	20.5	27.2	19.9
Rb	35.4	0.39	1.30	1.37	5.98	0.93	7.46	1.36	6.96	1.34	0.83	4.68	4.39	4.27	11.6	0.76	28.8	93.9	0.68	2.13
Sr	116	278	284	271	226	367	166	221	149	192	144	130	254	151	105	157	147	370	340	223
Y	21.8	28.9	25.1	23.0	34.9	37.8	38.0	35.3	28.4	25.2	26.6	30.4	39.6	36.6	49.2	32.4	31.4	41.8	47.8	31.5
Zr	79.4	123	103	99.1	171	180	104	98.6	83.3	67.4	74.1	91.3	227	120	142	99.4	86.8	178	282	93.4
Nb	7.90	8.95	6.40	6.22	10.7	12.9	4.06	4.60	4.07	3.42	4.16	4.57	16.9	4.99	5.56	3.27	12.2	9.36	22.8	4.61
Ba	226	278	38.4	29.5	148	31.1	95.2	37.6	73.0	22.0	18.3	68.8	86.3	61.9	102	123	155	1029	19.8	82.9
La	6.38	9.45	7.28	7.08	12.2	13.5	5.99	5.41	5.34	5.05	5.22	5.56	21.0	7.54	8.31	4.02	11.9	36.8	23.9	5.99
Ce	15.9	23.0	18.0	18.1	30.2	33.0	16.1	14.3	13.5	12.7	13.2	14.4	47.3	18.2	20.4	11.6	26.0	75.3	55.9	15.0
Pr	2.45	3.44	2.88	2.78	4.60	4.97	2.52	2.34	2.09	1.91	2.22	2.34	6.88	3.04	3.46	2.05	3.18	9.68	7.92	2.45
Nd	12.3	16.9	14.3	13.8	22.8	24.6	13.2	12.0	11.0	9.85	11.6	11.9	32.2	15.6	18.0	11.5	11.3	38.5	36.5	12.6
Sm	3.28	4.46	3.98	3.79	6.21	6.56	4.15	3.82	3.37	2.91	3.55	3.58	8.20	4.65	5.57	3.64	2.98	8.29	8.29	3.78
Eu	1.15	1.63	1.42	1.37	2.05	2.11	1.34	1.40	1.20	1.05	1.30	1.33	2.58	1.46	1.71	1.35	1.18	1.72	2.64	1.39
Gd	3.81	5.33	4.80	4.62	6.44	6.86	5.26	4.88	4.09	3.56	4.60	4.68	8.33	5.37	7.09	4.95	3.90	7.39	9.04	4.64
Tb	0.71	0.97	0.89	0.82	1.18	1.25	1.07	0.99	0.80	0.70	0.88	0.93	1.44	1.07	1.41	0.98	0.76	1.34	1.57	0.96
Dy	4.42	5.72	5.38	4.89	7.32	7.68	7.02	6.57	5.43	4.50	5.46	5.86	8.37	7.07	9.00	6.08	4.53	8.38	9.16	6.13
Ho	0.86	1.14	1.05	0.96	1.47	1.59	1.53	1.42	1.11	1.01	1.13	1.21	1.59	1.42	2.00	1.25	0.94	1.70	1.81	1.34
Er	2.40	3.08	2.87	2.59	4.03	4.21	4.38	3.96	3.20	2.79	3.12	3.36	4.16	3.97	5.58	3.65	2.55	4.90	4.95	3.63
Tm	0.37	0.47	0.42	0.39	0.56	0.61	0.62	0.57	0.46	0.41	0.47	0.51	0.56	0.56	0.82	0.56	0.41	0.69	0.77	0.52
Yb	2.30	2.87	2.65	2.47	3.43	3.57	3.93	3.69	2.94	2.44	2.94	3.36	3.27	3.43	5.02	3.67	2.40	4.33	4.79	3.31
Lu	0.36	0.45	0.41	0.38	0.54	0.55	0.60	0.60	0.47	0.39	0.46	0.53	0.49	0.55	0.78	0.59	0.35	0.66	0.75	0.53
Hf	2.18	3.31	2.74	2.61	4.79	4.74	3.36	3.02	2.62	2.11	1.84	2.61	6.52	3.51	4.00	2.72	3.25	5.90	6.83	2.88
Ta	0.52	0.65	0.44	0.44	0.77	0.87	0.30	0.36	0.29	0.24	0.29	0.33	1.15	0.35	0.39	0.23	0.93	0.73	1.53	0.33
Pb	1.77	3.37	1.04	1.12	1.06	1.64	1.00	2.23	0.75	0.76	0.83	0.94	1.14	1.17	0.75	1.60	5.64	16.7	6.01	1.46
Th	0.60	0.94	0.66	0.63	0.86	1.06	0.56	0.48	0.39	0.33	0.40	0.44	1.74	0.52	0.69	0.24	2.64	9.04	2.44	0.45
U	0.18	0.25	0.19	0.18	0.26	0.31	0.10	0.11	0.10	0.08	0.10	0.12	0.51	0.15	0.13	0.09	0.76	2.03	0.59	0.11

Mg# = 100*Mg/(Fe^{2+}+Mg), assuming Fe^{2+}/Fe^{total} = 0.85; LOI = loss of ignition.

Table DR3 Sm-Nd and Lu-Hf data for the Bikou Group basalts

Sample#	$^{176}Hf/^{177}Hf$	$\pm 2\sigma_m$	$^{176}Lu/^{177}Hf$	$\varepsilon Hf(T)$	$^{143}Nd/^{144}Nd$	$\pm 2\sigma_m$	$^{147}Sm/^{144}Nd$	$\varepsilon Nd(T)$
Lower group								
05BK22	0.282306	0.000003	0.0177	-8.00	0.511845	0.000014	0.125	-7.92
05BK22-dupl.	0.282306	0.000001						
05BK43	0.282493	0.000006	0.0180	-1.54	0.512125	0.000010	0.125	-2.47
05BK43-dupl.					0.512126	0.000010	0.125	-2.44
05BK44	0.282478	0.000016	0.0175	-1.80	0.512132	0.000010	0.139	-3.81
05BK45	0.282463	0.000004	0.0163	-1.64	0.512083	0.000011	0.135	-4.33
05BK52	0.282318	0.000005	0.0184	-7.94	0.511788	0.000013	0.128	-9.40
05BK52-dupl.	0.282318	0.000003						
05BK54	0.282306	0.000009	0.0175	-7.86	0.511800	0.000011	0.122	-8.44
05BK57	0.282806	0.000005	0.0230	6.81	0.512509	0.000011	0.144	3.06
05BK57-dupl.	0.282806	0.000002						
05BK59	0.282798	0.000004	0.0226	6.73	0.512477	0.000012	0.136	3.32
05BK59-dupl.	0.282798	0.000002						
05BK61	0.282790	0.000005	0.0220	6.80	0.512426	0.000011	0.095	6.60
05BK61-dupl.	0.282806	0.000002						
05BK62	0.282784	0.000008	0.0195	7.98	0.512301	0.000009	0.098	3.83
05BK62-dupl.					0.512312	0.000009	0.098	4.04
05BK65	0.282710	0.000004	0.0206	4.68	0.512416	0.000010	0.139	1.78
05BK65-dupl.					0.512421	0.000010	0.139	1.89
05BK75	0.282569	0.000011	0.0174	1.53	0.512205	0.000008	0.104	1.35
05BK75-dupl.					0.512206	0.000008	0.104	1.38
05BK77	0.282748	0.000006	0.0197	6.57	0.512364	0.000013	0.113	3.46
05BK77-dupl.	0.282748	0.000003						
Upper group								
05BK81	0.283063	0.000005	0.0332	10.31	0.513047	0.000013	0.188	8.86
05BK83	0.282778	0.000009	0.0203	7.17	0.512567	0.000011	0.144	3.98
05BK89	0.282593	0.000013	0.0065	8.04	0.512637	0.000008	0.137	6.05
05BK89-dupl.					0.512643	0.000008	0.137	6.16
05BK90	0.282882	0.000004	0.0212	10.40	0.512906	0.000011	0.161	8.89
05BK94	0.282846	0.000004	0.0192	10.20	0.512866	0.000011	0.159	8.30
05BK95	0.282828	0.000005	0.0212	8.43	0.512772	0.000013	0.168	5.55
05BK96	0.282806	0.000004	0.0205	8.06	0.512755	0.000009	0.166	5.46
05BK98	0.282832	0.000008	0.0168	11.00	0.512905	0.000011	0.165	8.51
05BK99	0.282831	0.000008	0.0172	10.73	0.512850	0.000010	0.161	7.80
05BK101	0.283062	0.000005	0.0312	11.34	0.512874	0.000005	0.188	5.55
05BK102B	0.283053	0.000008	0.0279	12.84	0.512943	0.000008	0.193	6.35
05BK103a	0.282653	0.000004	0.0102	8.19	0.512327	0.000013	0.092	4.66
05BK103a-dupl.	0.282653	0.000002						
05BK104	0.282978	0.000010	0.0255	11.48	0.512799	0.000007	0.186	4.24
05BK106	0.282987	0.000009	0.0264	11.29	0.512796	0.000010	0.179	4.95
05BK107	0.282979	0.000008	0.0352	6.23	0.512805	0.000009	0.185	4.42
05BK108	0.282976	0.000004	0.0289	9.52	0.512731	0.000010	0.181	3.40
05BK111	0.282633	0.000005	0.0106	7.24	0.512633	0.000006	0.154	4.30
05BK113	0.282958	0.000007	0.0222	12.54	0.512844	0.000007	0.181	5.65

05BK114	0.283001	0.000005	0.0238	13.18	0.512906	0.000013	0.186	6.34
05BK114-dupl.	0.283001	0.000002						
05BK117	0.283062	0.000005	0.0293	12.41	0.512968	0.000007	0.191	6.99
05BK122	0.282718	0.000011	0.0153	7.75	0.512466	0.000011	0.159	0.46
05BK123	0.282593	0.000005	0.0160	2.96	0.512194	0.000008	0.130	-1.88
05BK123-dupl.					0.512245	0.000008		
05BK128	0.282663	0.000005	0.0156	5.63	0.512437	0.000008	0.137	2.18
05BK130	0.282952	0.000009	0.0260	10.26	0.512748	0.000006	0.182	3.66
International standard rocks								
BHVO-2	0.283100	0.000003			0.512973	0.00001		
JB-1	0.282980	0.000005			0.512778	0.000011		

dupl. = duplicate sample

T = 825 Ma and 810 Ma, crystallization age of the lower and upper group basalts, respectively

Table DR4 Parameters used in simple binary mixing and AFC modeling.

element	*Co*	*Ca*	*D*
La	5	60	0.0704
Sm	3.4	5	0.10065
Th	0.8	17	0.010128
Ta	0.3	1.4	0.022
Hf	2	5	0.0769
Nd	10	38	0.0915
εNd(T)	5	-18	
εHf(T)	9	-21	

The parental magma (C_0) for the lower group basalts (La/Sm=1.5, Th/Ta=2.7, εHf(823) =9 and εNd (823Ma) =5) were estimated at approximately by extrapolation from the correlations of εNd(t) vs. εHf(t), La/Sm vs. εNd(t) and Th/Ta vs. εNd (t). Data on the basement rocks (C_a) for Bikou basalts are not available, but the binary mixing model was tested using basement rocks from the surrounding areas, the average of Archean-Paleoproterozoic metasedimentary rocks from the northern Yangtze craton (Gao et al., 1999), and εHf (823Ma) =-21 estimated by the correlation of εNd vs. εHf in the Terrestrial array rocks (εHf(t) =1.36×εNd (t) +2.95; (Vervoort et al., 1999). The bulk partition coefficients between melt and minerals (D) are estimated by the proportional crystallization minerals determined by Fig. xx. We just show the binary mixing results because the results determined by simple binary mixing and AFC processes (DePaolo, 1983) are much closed.

Table DR5 Values used in trace element partial melting modeling.

				eclogite melting				peridotite melting					
	Basement	DM	N-MORB	Cpx/liq	Grt/liq	Rutile/liq	D	Cpx	Opx	Ol	Grt	D	P
Th	11.2	0.0137	0.12	0.0070	0.0015	0	0.005	0.0120	0.0000	1.00E-07	9.00E-03	0.005	0.017
U	3.16	0.0047	0.047	0.0080	0.0060	0	0.007	0.0103	0.0000	1.00E-07	2.80E-02	0.005	0.017
Nb	15.4	0.21	2.33	0.0210	0.0080	94	0.956	0.0077	0.0005	0.0002	0.0300	0.023	0.014
Ta	1.04	0.0138	0.132	0.0120	0.0040	129	1.299	0.0200	0.0010	0.0004	0.0320	0.036	0.030
La	45.3	0.234	2.5	0.0281	0.0055	0	0.019	0.0540	0.0002	0.0001	0.0100	0.021	0.072
Ce	87.5	0.772	7.5	0.0480	0.0125	0	0.033	0.0860	0.0004	0.0002	0.0210	0.034	0.115
Pr	9.75	0.131	1.32	0.0640	0.0283	0	0.049	0.1390	0.0006	0.0003	0.0540	0.056	0.189
Nd	35.4	0.713	7.3	0.0899	0.0568	0	0.076	0.1870	0.0010	0.0004	0.0870	0.076	0.256
Zr	184	7.94	74	0.0930	2.6000	5	1.145	0.1300	0.0050	0.0040	0.4000	0.074	0.220
Hf	4.69	0.199	2.05	0.1700	2.0000	4	0.940	0.2000	0.0100	0.0060	0.6800	0.117	0.346
Sm	6.18	0.27	2.63	0.1310	0.1938	0	0.155	0.2910	0.0030	0.0004	0.2170	0.122	0.408
Eu	1.04	0.107	1.02	0.1375	0.2660	0	0.188	0.3500	0.0040	0.0006	0.3200	0.149	0.498
Ti	3322	798	9680	0.3300	1.1000	100	1.635	0.3300	0.0700	0.0070	0.1000	0.147	0.411
Gd	5.45	0.395	3.68	0.1474	0.3473	0	0.226	0.4000	0.0128	0.0008	0.4980	0.178	0.583
Tb	0.78	0.075	0.67	0.1889	0.6820	0	0.384	0.4290	0.0186	0.0010	0.7500	0.202	0.650
Dy	4.37	0.531	4.55	0.2270	1.1408	0	0.590	0.4420	0.0261	0.0014	1.0600	0.223	0.704
Ho	0.88	0.122	1.01	0.2111	1.3870	0	0.679	0.4390	0.0356	0.0018	1.5300	0.246	0.757
Er	2.53	0.371	2.97	0.2176	1.5925	0	0.765	0.4360	0.0474	0.0024	2.0000	0.269	0.808
Tm	0.39	0.06	0.456	0.2541	2.0988	0	0.989	0.4330	0.0617	0.0030	3.0000	0.319	0.927
Yb	2.59	0.401	3.05	0.2906	2.6050	0	1.213	0.4300	0.0787	0.0036	4.0300	0.370	1.049
Lu	0.39	0.063	0.455	0.2580	2.7355	0	1.246	0.4270	0.0986	0.0044	5.5000	0.444	1.226

Notes

1. Data for basement rocks is from Gao et al. (1999); DM = depleted mantle, from Salters and Stracke (2004); N-MORB = normal mid-ocean ridge basalt, from Sun and McDonough (1989).
2. Peridotite melting: D values of Cpx/melt, Ol/melt and Opx/melt for peridotite melting are from Ionov et al. (2002) and reference therein. $D^{Grt/melt}$ values for REE are from McKenzie & O'Nions (1991); $D^{Grt/melt}$ values for Th and U are from Salters and Stracke (2004); $D^{Grt/melt}$ values for Nb, Ta, Zr, and Hf are from Klemme et al. (2002).
3. Eclogite melting: $D^{Grt/melt}$ and $D^{Cpx/melt}$ values for REE from Tuff &Gibson (2007); $D^{Grt/melt}$ and $D^{Cpx/melt}$ values for Th, U, Nb, and Ta are from Klemme et al. (2002); $D^{Grt/melt}$ values for Zr and Hf are from Ca-rich garnet (van Westrenen et al.,1999).
4. $D^{Rutile/melt}$ value for Ti is from Kelemen et al. (2003); $D^{Rutile/melt}$ values for Nb, Ta, Zr and Hf are from Xiong et al. (2005).
5. The garnet peridotite rock model is olivine: garnet: Cpx: Opx: rutile = 0.53: 0.05: 0.38: 0.04: 0.00075, and the melting reaction is 0.05olivine + 0.13garnet + 1.31Cpx = 1melt + 0.49Opx (Salters, 1996) (Salters, 1996). The proportion of rutile is constrained by $D_{Nb} \approx D_{Nd}$ by the slope of Nb-Nd on the log (Nb)-log (Nd) space.
6. The eclogite rock model is garnet: Cpx: Rutile =0.4: 0.59: 0.01.
7. Modal batch melting equation: $C_L/C_0 = 1/(D_0+F(1-D_0))$; non-modal batch melting equation: $C_L/C_0 = 1/(D_0+F(1-P))$. CL is the concentration of a trace element in melt; Co is the concentration of a trace element in the original source; D_0 is the bulk distribution coefficient at the onset of melting; P is the bulk distribution coefficient of the minerals which enter into melt. Eclogite melting is simulated by Modal batch melting, whereas the peridotite melting simulated by non-batch melting.

Method for calculating melt compositions

The datasets were first filtered to exclude all glasses with MgO <7% (volatile-free), in order to eliminate highly fractionated compositions. A number of filtered parameters including Nb/La, Nb/U, SiO_2 and Hf-Nd isotopes were further used to strip off samples which suffered from significant crustal contamination. The remaining samples with MgO <8% were then corrected to 8% MgO using the $Fe_{8.0}$ and $Si_{8.0}$ expressions from Klein and Langmuir (1987). We then employed the method proposed by Kelley et al.(2006) to make additional fractionation correction to 8.5% MgO because most melts are still on olivine + plagioclase cotectics at 8% MgO and adding olivine only at this point would lead to false high Fe. Samples with MgO between 8.0 and 8.5% were corrected to 8.5% MgO only along these linear olivine + plagioclase cotectics (Kelley et al., 2006). We then back corrected these 8.5% MgO-equivalent compositions, as well as all samples with initial MgO >8.5% (to which no correction had yet been applied), to primary mantle melts by adding equilibrium olivine to each sample composition at 1% increments until the resulting basaltic magma obtained 71 < Mg# < 81 (Albarède, 1992) and was in equilibrium with Fo90, using Kd = $(FeO/MgO)^{Ol}/(FeO/MgO)^{L}$ = 0.30 (Roeder and Emslie, 1970), assuming Fe^{2+}/total Fe = 0.90. Most samples required <25% olivine additions to reach Fo90 equilibrium. To avoid artifacts from overcorrection, a few samples that require >30% olivine additions were excluded from further analyses.

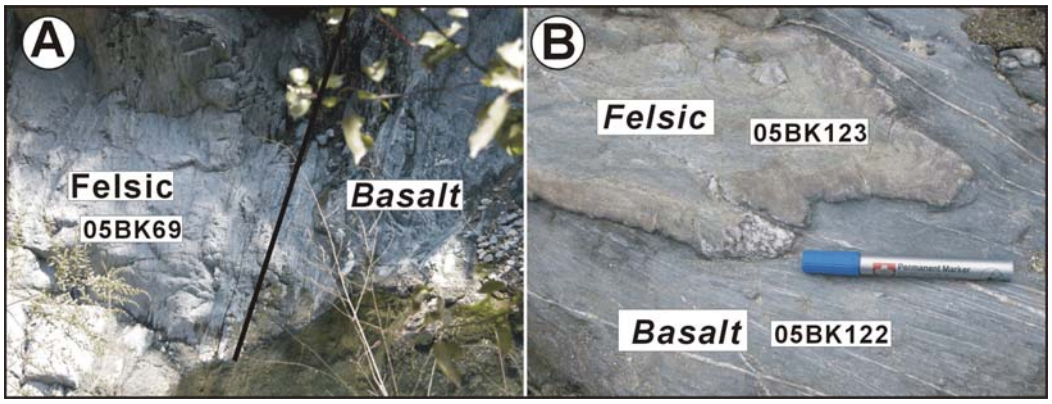

Fig. 1DR Photographs of basaltic and felsic rocks. (A) Ductile interaction between the lower group basalts and rhyolites when they are both in semi-solid state; (B) Felsic rocks interlayered with the upper group basalts. Sample 05BK69 and 05BK123 for U-Pb zircon dating were collected from the location (A) and (B), respectively.

References

DePaolo, D.J., 1981, Trace element and isotopic effects of combined wallrock assimilation and fractional crystallization: Earth and Planetary Science Letters, v. 53, p. 189-202, doi: 10.1016/0012-821X (81)90153-9.

Gao, S., Ling, W., Qiu, Y., Lian, Z., Hartmann, G., and Simon, K., 1999, Contrasting geochemical and Sm-Nd isotopic compositions of Archean metasediments from the Kongling high-grade terrain of the Yangtze craton: evidence for cratonic evolution and redistribution of REE during crustal anatexis: Geochimica et Cosmochimica Acta, v. 63, p. 2071-2088, doi:10.1016/S0016-7037(99)00153-2.

Ionov, D.A., Bodinier, J.-L., Mukasa, S.B., and Zanetti, A., 2002, Mechanisms and Sources of Mantle Metasomatism: Major and Trace Element Compositions of Peridotite Xenoliths from Spitsbergen in the Context of Numerical Modelling: Journal of Petrology, v. 43, p. 2219-2259.

Kelley, K.A., Plank, T., Grove, T.L., Stolper, E.M., Newman, S., and Hauri, E., 2006, Mantle melting as a function of water content beneath back-arc basins: Journal of Geophysical Research, v. 111, B092087, doi: 10.1029/2005JB003732.

Klein, E.M., and Langmuir, C.H., 1987, Global correlations of ocean ridge basalt chemistry with axial depth and crustal thickness: Journal of Geophysical Research,, v. 92, p. 8089-9115.

Klemme, S., Blundy, J.D., and Wood, B.J., 2002, Experimental constraints on major and trace element partitioning during partial melting of eclogite: Geochimica et Cosmochimica Acta, v. 66, p. 3109-3123, doi:10.1016/S0016-7037(02)00859-1.

McKenzie, D., and O'Nions, R.K., 1991, Partial melt distributions from inversion of rare earth element concentrations: Journal of Petrology, v. 32, p. 1021-1091.

Roeder, P.L., and Emslie, R.F., 1970, Olivine-liquid equilibrium: Contributions to Mineralogy and Petrology, v. 29, p. 275-289.

Salters, V.J.M., 1996, The generation of mid-ocean ridge basalts from the Hf and Nd isotope perspective: Earth and Planetary Science Letters, v. 141, p. 109-123, doi: 10.1016/0012-821X (96)00070-2.

Salters, V.J.M., and Stracke, A., 2004, Composition of the depleted mantle: Geochemistry, Geophysics, Geosystems, v. 5, Q05B07, p. doi: 10.1029/2003GC000597.

Sun, S.S., McDonough, W.F., 1989. Chemical and isotopic systematics of oceanic basalt: implications for mantle composition and processes, *In*: Saunders, A.D., and Norry, M.J., eds., Magmatism in the Ocean Basins: Geological Society Special Publication, v. 42, p. 528–548.

Tuff, J., and Gibson, S.A., 2007, Trace-element partitioning between garnet, clinopyroxene and Fe-rich picritic melts at 3 to 7 GPa: Contributions to Mineralogy and Petrology, v. 153, p. 369-387.

van Westrenen, W., Blundy, J., Wood, B., and Mungall, J.E., 1999, Crystal-chemical controls on

trace element partitioning between garnet and anhydrous silicate melt Kinetic controls on the partitioning of trace elements between silicate and sulfide liquids: American Mineralogist, v. 84, p. 838-847.

Vervoort, J.D., Patchett, P.J., Blichert-Toft, J., and Albarede, F., 1999, Relationships between Lu-Hf and Sm-Nd isotopic systems in the global sedimentary system: Earth and Planetary Science Letters, v. 168, p. 79-99, doi:10.1016/0009-2541 (94)00143-V.

Xiong, X.L., Adam, J., and Green, T.H., 2005, Rutile stability and rutile/melt HFSE partitioning during partial melting of hydrous basalt: Implications for TTG genesis: Chemical Geology, v. 218, p. 339-359, doi:10.1016/j.chemgeo.2005.01. 014