

Supplementary materials

Table S1. Analytical results on volcanic rocks from initial flows and Molabushan, Longmenshan volcanoes.

Sample	1 CH-15-40 PT	2 CH-15-41 PT	3 CH-15-42 PT	4 CH-15-43 PT	5 CH-15-44 PT	6 CH-15-45 PT	7 CH-15-46 PT
SiO ₂ , wt%	49.86	49.29	48.64	48.45	48.77	48.44	48.35
TiO ₂	2.58	2.60	2.55	2.59	2.44	2.61	2.59
Al ₂ O ₃	13.43	13.52	13.48	12.87	13.12	13.28	13.72
Fe ₂ O ₃	2.98	9.31	8.94	9.99	7.46	7.48	6.66
FeO	6.17	0.62	1.24	0.62	2.60	2.54	3.14
MnO	0.13	0.13	0.14	0.15	0.14	0.14	0.14
MgO	7.82	7.34	7.87	7.73	7.71	8.10	8.01
CaO	6.91	6.92	7.33	7.30	7.44	7.43	7.56
Na ₂ O	3.76	3.65	3.41	3.75	3.47	3.50	3.49
K ₂ O	4.74	4.89	4.56	4.58	4.50	4.44	4.48
P ₂ O ₅	0.89	0.90	0.97	0.97	0.99	0.97	0.96
H ₂ O ⁻	0.10	0.11	0.12	0.11	0.18	0.14	0.13
H ₂ O ⁺	1.00	0.62	1.03	0.81	1.04	0.87	0.98
Total	100.37	99.91	100.28	99.92	99.86	99.94	100.21
Be, ppm	2.9	3.0	2.9	3.1	2.9	3.0	3.0
S _{tot}	185	180	n. d.	280	n. d.	240	120
Sc	12.7	16.8	12.9	13.1	13.3	13.0	13.1
V	156	140	142	144	141	141	135
Co	38	35	38	38	38	38	39
Ni	192	166	192	183	184	191	192
Cu	36	29	28	30	32	36	37
Zn	90	125	121	85	82	83	82
Rb	95.4	100.5	88.3	88.6	94.5	91.9	98.4
Sr	1364	1368	1452	1455	1473	1454	1459
Y	21.3	21.7	22.2	22.6	22.6	22.2	22.2
Zr	360	373	349	359	356	355	356
Nb	70.2	67.3	71.5	75.1	73.8	72.1	73.5
Cs	0.95	1.11	1.07	0.94	1.04	0.95	0.99
Ba	1638	1657	1722	1671	1699	1677	1679
La	86.3	90.7	93.3	94.1	93.3	92.3	92.8
Ce	154.2	169.0	176.6	164.4	164.9	162.7	163.2
Pr	16.97	18.25	19.02	18.47	18.26	18.00	17.89
Nd	63.7	67.0	68.4	69.3	68.2	67.4	67.7
Sm	10.50	11.16	11.62	11.39	11.51	11.01	11.27
Eu	2.97	3.15	3.33	3.13	3.14	3.04	3.08
Gd	8.18	8.98	9.47	9.00	8.67	8.56	8.85
Tb	1.05	1.19	1.25	1.11	1.13	1.12	1.11
Dy	4.53	5.55	5.78	4.70	4.82	4.70	4.68
Ho	0.80	0.81	0.84	0.82	0.83	0.82	0.81
Er	1.81	1.96	2.01	1.89	1.90	1.91	1.86
Yb	1.27	1.24	1.27	1.27	1.37	1.30	1.30
Lu	0.16	0.16	0.16	0.16	0.17	0.16	0.15
Hf	9.36	9.45	8.69	9.24	9.18	9.15	9.33
Ta	3.51	4.31	4.45	3.75	3.63	3.59	3.71
Pb	12.9	21.2	11.1	12.8	11.6	11.6	12.1
Th	8.65	9.91	10.36	9.28	9.46	9.35	9.35
U	1.64	1.43	1.47	1.66	1.71	1.74	1.77
²⁰⁶ Pb/ ²⁰⁴ Pb	17.1183±14	17.0470±14	n. d.	17.1469±11	n. d.	17.1478±11	n. d.
²⁰⁷ Pb/ ²⁰⁴ Pb	15.4459±15	15.4377±13	n. d.	15.4372±10	n. d.	15.4379±11	n. d.
²⁰⁸ Pb/ ²⁰⁴ Pb	37.2230±38	37.1464±33	n. d.	37.2631±27	n. d.	37.2593±29	n. d.

Table S1. *Cont.*

Sample	8	9	10	11	12	13	14	15
	CH-15-47 PT	CH-15-39 BTA	CH-15-48 BTA	CH-15-49 BTA	CH-15-50 BTA	CH-15-52 PT	CH-15-64 PT	CH-15-68 PT
SiO ₂ , wt%	48.34	52.31	52.18	51.92	53.00	47.97	47.76	48.27
TiO ₂	2.62	2.59	2.55	2.55	2.29	2.59	2.48	2.49
Al ₂ O ₃	13.82	14.01	14.78	14.08	14.46	13.28	13.07	13.04
Fe ₂ O ₃	5.82	3.17	2.95	2.01	2.27	3.50	9.59	9.89
FeO	4.01	4.80	5.19	6.31	5.63	6.22	0.59	0.40
MnO	0.14	0.13	0.12	0.12	0.10	0.13	0.13	0.13
MgO	8.03	6.43	6.47	7.06	6.53	8.46	7.88	7.91
CaO	7.42	5.90	5.79	5.95	5.55	8.21	7.99	8.20
Na ₂ O	3.38	3.44	3.46	3.41	3.26	3.82	4.09	3.94
K ₂ O	4.51	5.45	5.00	5.03	5.12	4.32	4.08	4.62
P ₂ O ₅	0.95	0.96	0.94	0.92	0.95	1.04	1.01	1.02
H ₂ O ⁻	0.11	0.06	0.04	0.11	0.18	0.10	0.12	n.d.
H ₂ O ⁺	0.90	0.66	0.58	0.65	0.72	0.85	0.87	0.05
Total	100.05	99.91	100.04	100.11	100.06	100.49	99.66	99.96
Be, ppm	2.8	3.1	3.1	3.1	3.1	3.0	2.9	2.9
Sc _{tot}	n. d.	270	90	90	110	80	170	86
Sc	13.4	11.2	11.6	11.8	11.4	14.9	15.2	14.2
V	137	119	130	127	114	160	161	156
Co	39	30	32	33	30	39	39	38
Ni	196	167	178	202	184	180	160	157
Cu	37	30	37	28	31	34	59	25
Zn	92	77	89	78	92	52	126	118
Rb	98.8	97.9	110.0	94.9	91.5	91.1	100.9	100.6
Sr	1468	1431	1438	1411	1441	1469	1481	1528
Y	22.7	20.4	20.5	20.3	20.2	23.4	23.2	23.3
Zr	361	394	396	385	393	380	317	328
Nb	74.0	56.6	61.0	57.8	54.9	74.6	66.5	69.1
Cs	1.00	0.81	0.88	0.81	0.69	0.89	1.02	0.97
Ba	1678	1714	1709	1665	1718	1732	1723	1741
La	93.1	83.1	83.7	81.9	81.3	98.4	91.8	97.2
Ce	164.0	149.4	150.0	147.5	147.0	179.3	164.5	174.2
Pr	17.97	16.68	16.60	16.51	16.39	20.00	18.5	19.4
Nd	67.3	63.5	62.6	62.7	61.6	73.4	68.3	71.1
Sm	11.12	10.57	10.59	10.46	10.53	12.45	11.47	11.98
Eu	3.09	2.91	2.95	2.91	2.89	3.45	3.22	3.31
Gd	8.72	8.05	8.16	8.09	7.99	9.63	8.98	9.12
Tb	1.10	1.05	1.06	1.02	1.02	1.28	1.14	1.17
Dy	4.82	4.38	4.44	4.34	4.38	5.54	5.01	4.96
Ho	0.82	0.75	0.77	0.74	0.74	0.90	0.85	0.87
Er	1.90	1.74	1.79	1.75	1.66	2.13	2.03	2.01
Yb	1.29	1.22	1.22	1.16	1.21	1.38	1.34	1.36
Lu	0.16	0.16	0.15	0.15	0.14	0.18	0.20	0.19
Hf	9.40	9.89	10.04	9.91	9.85	9.02	8.04	8.35
Ta	3.62	2.79	2.94	2.88	2.68	3.99	3.71	3.81
Pb	12.1	12.8	13.6	12.7	13.0	10.6	5.3	9.8
Th	9.45	7.04	7.22	7.02	6.64	9.80	9.33	9.79
U	2.16	1.36	1.49	1.37	1.23	1.51	1.61	1.66
²⁰⁶ Pb/ ²⁰⁴ Pb	n. d.	16.9000±13	n. d.	16.9431±12	n. d.	n. d.	17.2456±20	n. d.
²⁰⁷ Pb/ ²⁰⁴ Pb	n. d.	15.4468±13	n. d.	15.4435±12	n. d.	n. d.	15.4663±19	n. d.
²⁰⁸ Pb/ ²⁰⁴ Pb	n. d.	36.9245±34	n. d.	36.9740±29	n. d.	n. d.	37.4526±48	n. d.

Table S1. *Cont.*

Sample	16	17	18	19	20	21	22
	CH-15-65 PT	CH-15-66 PT	CH-15-67 PT	CH-15-69 PT	CH-15-53 BTA	CH-15-54 TA	CH-15-55 TA
SiO ₂ , wt%	49.12	47.83	48.03	48.12	51.83	53.19	54.01
TiO ₂	2.50	2.35	2.54	2.56	2.78	2.49	2.49
Al ₂ O ₃	13.01	13.12	13.91	13.47	13.87	13.93	14.63
Fe ₂ O ₃	8.99	9.72	9.91	3.62	5.32	1.95	2.40
FeO	0.33	0.41	0.42	6.16	3.03	5.57	5.18
MnO	0.13	0.13	0.13	0.13	0.11	0.10	0.09
MgO	7.51	7.57	7.36	7.99	5.99	6.10	5.97
CaO	7.71	8.19	7.84	7.81	6.01	5.54	5.34
Na ₂ O	3.73	3.48	3.84	3.76	3.76	3.64	3.44
K ₂ O	4.65	4.49	4.32	4.18	5.15	5.08	5.24
P ₂ O ₅	1.05	1.01	1.01	1.02	1.09	0.90	0.91
H ₂ O ⁻	0.24	0.12	0.06	0.16	0.13	0.14	0.04
H ₂ O ⁺	1.08	1.43	0.82	0.91	0.81	1.11	0.38
Total	100.05	99.85	100.19	99.89	99.88	99.74	100.12
Be, ppm	3.0	2.8	2.7	2.9	3.9	3.2	3.2
S _{tot}	93	130	170	<60	90	180	n. d.
Sc	14.1	14.8	14.1	16.6	11.5	13.6	16.8
V	146	158	159	165	124	127	126
Co	37	39	38	39	31	30	30
Ni	144	150	158	171	146	167	160
Cu	42	35	44	33	50	34	36
Zn	154	116	131	51	149	116	125
Rb	101.8	105.8	110.4	93.0	117.2	95.2	97.4
Sr	1597	1467	1441	1490	1685	1461	1434
Y	23.1	23.3	22.3	23.7	22.8	19.4	19.0
Zr	321	322	310	392	491	403	402
Nb	69.4	68.1	65.8	76.1	63.1	50.7	49.7
Cs	1.03	1.19	1.02	0.98	0.85	0.76	0.70
Ba	1856	1708	1671	1776	1876	1746	1713
La	96.2	91.9	88.9	98.4	101.2	78.5	76.2
Ce	172.8	165.7	159.5	179.0	187.5	144.0	140.1
Pr	19.4	18.6	17.9	19.87	21.3	16.5	16.0
Nd	72.0	68.9	66.4	72.4	78.6	61.5	60.3
Sm	12.03	11.67	11.27	12.38	12.91	10.41	10.19
Eu	3.40	3.22	3.12	3.42	3.59	2.99	2.83
Gd	9.32	9.14	8.69	9.45	9.45	7.87	7.75
Tb	1.19	1.14	1.09	1.27	1.18	0.99	0.99
Dy	5.02	5.02	4.91	5.36	5.04	4.32	4.21
Ho	0.86	0.87	0.84	0.86	0.87	0.75	0.73
Er	2.03	2.04	1.97	2.12	1.97	1.71	1.65
Yb	1.33	1.31	1.36	1.37	1.28	1.12	1.08
Lu	0.18	0.19	0.20	0.18	0.19	0.16	0.16
Hf	8.29	8.22	7.89	9.21	12.62	10.37	10.57
Ta	3.81	3.82	3.73	4.04	3.44	2.81	2.72
Pb	3.7	3.7	6.7	10.3	15.3	12.7	11.6
Th	9.57	9.31	9.09	9.92	7.51	6.60	6.36
U	1.72	1.47	1.54	1.61	1.49	1.59	1.24
²⁰⁶ Pb/ ²⁰⁴ Pb	17.1830±23	17.2420±21	17.2420±19	17.1853±14	n. d.	16.8719±17	n. d.
²⁰⁷ Pb/ ²⁰⁴ Pb	15.4464±21	15.4563±19	15.4490±18	15.4436±12	n. d.	15.4503±17	n. d.
²⁰⁸ Pb/ ²⁰⁴ Pb	37.3333±51	37.4077±49	37.4007±45	37.3285±32	n. d.	36.8964±42	n. d.

Table S1. *Cont.*

Sample	23	24	25	26	27	28	29	30
	CH-15-56 TA	CH-15-57 TA	CH-15-58 TA	CH-15-59 TA	CH-15-59A TA	CH-15-61 TA	CH-15-62 TA	CH-15-63 TA
SiO ₂ , wt%	53.80	54.13	53.98	54.18	53.92	53.90	53.99	53.28
TiO ₂	2.50	2.40	2.47	2.49	2.40	2.47	2.45	2.44
Al ₂ O ₃	13.94	14.05	13.95	14.03	13.95	13.69	13.59	13.94
Fe ₂ O ₃	2.84	3.30	2.71	4.61	5.12	5.68	2.23	6.99
FeO	4.85	4.39	5.11	3.16	2.65	2.32	5.32	1.06
MnO	0.11	0.09	0.10	0.10	0.10	0.09	0.10	0.10
MgO	6.08	6.08	6.35	5.95	5.94	6.10	6.00	6.09
CaO	5.62	5.18	5.56	5.54	5.48	5.62	5.46	5.77
Na ₂ O	3.53	3.60	3.48	3.77	3.72	3.51	3.64	3.56
K ₂ O	5.13	5.46	5.11	5.11	5.15	5.11	4.95	4.80
P ₂ O ₅	0.94	0.90	0.94	0.92	0.92	0.90	0.92	0.98
H ₂ O ⁻	0.12	0.08	0.07	n.d.	0.06	0.07	0.09	0.10
H ₂ O ⁺	0.96	0.53	0.53	0.47	0.53	0.54	0.82	0.87
Total	100.42	100.19	100.36	100.33	99.94	100.00	99.56	99.98
Be, ppm	2.8	3.1	2.7	3.2	3.4	3.3	3.2	3.1
Sc _{tot}	160	n. d.	70	n. d.	n. d.	n. d.	n. d.	n. d.
Sc	11.8	13.1	10.8	9.5	10.5	10.1	10.2	9.8
V	127	128	127	126	124	117	124	112
Co	30	31	31	30	30	31	30	30
Ni	159	174	177	165	164	169	165	164
Cu	24	29	42	33	44	53	41	49
Zn	139	126	226	137	105	210	111	141
Rb	91.0	91.2	95.9	97.8	98.1	96.9	98.7	86.5
Sr	1464	1471	1446	1422	1439	1462	1419	1452
Y	18.9	19.3	18.9	18.6	19.5	18.9	19.2	19.2
Zr	368	384	371	373	381	372	367	370
Nb	49.9	50.6	49.7	50.5	50.3	49.6	49.0	48.5
Cs	0.36	0.40	0.47	0.71	0.80	0.68	0.80	0.65
Ba	1751	1771	1753	1721	1679	1707	1683	1720
La	77.2	78.8	77.7	76.1	78.6	78.1	76.6	78.3
Ce	142.3	145.6	143.6	140.5	145.0	143.9	141.0	144.0
Pr	16.3	16.6	16.4	16.1	16.5	16.4	16.2	16.4
Nd	60.5	61.6	61.0	60.1	61.3	60.4	60.2	61.4
Sm	10.45	10.51	10.51	10.39	10.40	10.46	10.35	10.49
Eu	2.96	2.87	2.84	2.81	2.86	2.94	2.87	2.95
Gd	7.67	7.92	7.99	7.62	7.88	7.58	7.76	7.96
Tb	0.97	0.99	1.02	0.95	0.99	0.97	0.99	0.99
Dy	4.29	4.34	4.30	4.21	4.28	4.19	4.35	4.28
Ho	0.74	0.75	0.73	0.72	0.74	0.71	0.75	0.74
Er	1.63	1.71	1.61	1.63	1.66	1.64	1.67	1.66
Yb	1.03	1.09	1.13	1.05	1.12	1.08	1.11	1.11
Lu	0.14	0.15	0.17	0.16	0.16	0.16	0.16	0.16
Hf	9.63	9.82	9.39	9.62	9.72	9.56	9.25	9.63
Ta	2.78	2.80	2.71	2.77	2.77	2.74	2.69	2.67
Pb	11.2	10.9	11.9	13.9	12.6	12.6	12.6	11.6
Th	6.35	6.53	6.34	6.36	6.34	6.38	6.32	6.48
U	1.55	1.13	1.14	1.29	1.25	1.26	1.21	1.22
²⁰⁶ Pb/ ²⁰⁴ Pb	n. d.	n. d.	16.8707±17	n. d.	n. d.	n. d.	n. d.	n. d.
²⁰⁷ Pb/ ²⁰⁴ Pb	n. d.	n. d.	15.4515±16	n. d.	n. d.	n. d.	n. d.	n. d.
²⁰⁸ Pb/ ²⁰⁴ Pb	n. d.	n. d.	36.8949±39	n. d.	n. d.	n. d.	n. d.	n. d.

Table S1. *Cont.*

Sample	31	32	33	34	35	36	37
	LO-11-1 TA	LO-11-2 TA	LO-11-3 TA	CH-15-60 TA	CH-15-19 BTA	CH-15-20 BTA	CH-15-21 BTA
SiO ₂ , wt%	54,47	54.47	54.49	54.02	52.77	51.47	52.29
TiO ₂	2,36	2.35	2.42	2.51	2.24	2.63	2.59
Al ₂ O ₃	13,67	13.76	13.89	14.34	14.45	14.72	14.13
Fe ₂ O ₃	3,13	3.26	2.62	7.77	3.28	4.38	2.93
FeO	4,57	4.36	4.92	0.52	5.27	4.09	5.26
MnO	0,10	0.10	0.08	0.10	0.09	0.11	0.12
MgO	5,88	5.96	5.58	4.83	6.15	6.36	6.24
CaO	5,48	5.38	5.33	5.46	5.76	5.98	6.04
Na ₂ O	3,45	3.35	3.46	3.71	2.99	3.38	3.29
K ₂ O	5,11	5.26	5.19	5.13	4.27	3.92	5.07
P ₂ O ₅	0,90	0.90	0.91	0.90	0.88	0.93	0.91
H ₂ O ⁻	0,11	0.07	0.08	0.04	0.31	0.35	0.14
H ₂ O ⁺	0,72	0.70	0.95	0.65	1.54	1.86	1.14
Total	99,95	99.92	99.92	99.98	100.01	100.18	100.15
Be, ppm	2.9	3.2	3.0	3.2	3.0	3.2	3.3
S _{tot}	300	70	100	190	<60	<60	70
Sc	18.3	15.4	21.6	10.1	16.5	12.1	13.3
V	121	116	122	119	118	118	124
Co	27	27	26	31	31	33	32
Ni	151	152	141	177	157	161	158
Cu	29	29	28	54	27	32	32
Zn	103	112	133	200	76	76	83
Rb	89.6	91.3	91.0	89.9	68.3	136.3	121.4
Sr	1277	1304	1279	1446	1519	1481	1509
Y	19.6	20.2	20.6	19.5	19.6	20.2	19.7
Zr	440	417	467	375	409	414	416
Nb	51.2	52.5	52.0	50.0	56.4	58.2	61.0
Cs	0.64	0.79	0.50	0.51	0.70	0.96	0.83
Ba	1636	1663	1703	1722	1784	1825	1785
La	74.7	76.5	77.8	78.3	80.9	83.7	83.7
Ce	142.1	144.5	145.4	144.2	145.9	150.8	151.4
Pr	16.26	16.36	16.51	16.5	16.4	17.1	16.9
Nd	62.0	62.5	63.2	61.9	62.4	64.8	64.4
Sm	10.29	10.41	10.51	10.63	10.34	10.73	10.51
Eu	2.87	2.92	2.91	2.92	2.88	2.97	2.97
Gd	8.15	8.32	8.31	8.01	7.87	8.39	8.10
Tb	0.94	0.96	0.98	1.01	1.00	1.03	1.02
Dy	4.39	4.43	4.55	4.27	4.17	4.33	4.32
Ho	0.74	0.76	0.74	0.75	0.74	0.77	0.72
Er	1.68	1.74	1.74	1.70	1.67	1.74	1.60
Yb	1.15	1.18	1.18	1.13	1.14	1.19	1.11
Lu	0.14	0.14	0.14	0.16	0.14	0.15	0.14
Hf	10.17	10.18	10.99	9.69	10.31	10.41	10.44
Ta	3.25	3.33	3.23	2.79	2.74	2.82	2.91
Pb	13.4	13.7	13.3	13.4	12.73	15.63	12.98
Th	6.1	6.2	6.3	6.68	6.44	7.14	6.49
U	1.27	1.37	0.97	1.29	1.02	1.35	1.16
²⁰⁶ Pb/ ²⁰⁴ Pb	16.8669±17	16.9030±18	n. d.	16.9254±14	16.8860±13	16.8829±16	16.9303±14
²⁰⁷ Pb/ ²⁰⁴ Pb	15.4464±17	15.4503±17	n. d.	15.4517±14	15.4465±14	15.4465±15	15.4505±14
²⁰⁸ Pb/ ²⁰⁴ Pb	36.8763±42	36.9223±41	n. d.	36.9379±35	36.8779±36	36.8782±39	36.9288±33

Table S1. *Cont.*

Sample	38	39	40	41	42	43	44
	CH-15-22 BTA	CH-15-23 BTA	CH-16-135 TA	CH-16-136 TA	CH-16-138 TA	CH-16-140 TA	CH-16-145 TA
SiO ₂ , wt%	51.90	52.86	56.70	56.01	56.70	56.85	56.71
TiO ₂	2.52	2.43	2.08	2.25	2.12	2.20	2.15
Al ₂ O ₃	14.43	14.55	15.03	15.18	14.95	14.98	15.02
Fe ₂ O ₃	2.60	3.35	3.09	3.85	3.51	3.30	4.21
FeO	5.58	4.72	4.46	4.11	4.28	4.30	3.46
MnO	0.11	0.14	0.10	0.10	0.10	0.09	0.10
MgO	6.41	6.52	3.25	3.30	3.49	3.34	3.13
CaO	5.95	5.84	5.23	5.14	5.31	5.20	5.23
Na ₂ O	3.31	3.34	3.81	3.63	3.84	3.86	3.72
K ₂ O	5.18	4.14	4.65	4.30	4.57	4.60	4.62
P ₂ O ₅	0.92	0.88	0.79	0.79	0.78	0.78	0.77
H ₂ O ⁻	0.11	0.18	0.10	0.23	0.06	0.06	0.12
H ₂ O ⁺	1.01	1.31	0.73	0.86	0.36	0.36	0.72
Total	100.03	100.25	100.03	99.75	100.06	99.92	99.96
Be, ppm	3.0	2.9	3.6	2.6	3.3	3.5	3.6
S _{tot}	<60	n. d.	70	130	n. d.	n. d.	<60
Sc	12.1	11.8	13.2	9.0	15.3	15.1	17.5
V	116	121	102	90	104	106	101
Co	30	32	22	21	23	23	23
Ni	153	170	42	41	47	48	52
Cu	30	31	26	9	27	32	28
Zn	80	80	128	28	124	126	124
Rb	106.7	72.5	86.7	65.1	89.7	86.0	86.4
Sr	1454	1402	1111	965	1112	1124	1122
Y	19.3	19.1	20.4	18.2	20.4	20.7	20.7
Zr	379	375	402	371	414	405	421
Nb	55.2	54.5	40.1	40.2	40.2	40.3	39.1
Cs	0.85	0.68	0.52	0.20	0.50	0.48	0.53
Ba	1770	1745	1176	1195	1218	1167	1190
La	80.5	75.4	85.4	76.8	84.9	85.2	85.9
Ce	146.0	137.0	158.8	149.0	159.4	158.1	158.4
Pr	16.6	15.5	17.2	17.1	17.2	17.2	17.3
Nd	62.0	58.7	62.0	59.6	62.3	61.7	61.4
Sm	10.53	9.90	10.16	10.05	10.19	9.93	10.12
Eu	2.91	2.76	2.70	2.62	2.70	2.71	2.76
Gd	7.89	7.55	7.49	7.32	7.51	7.53	7.51
Tb	1.00	0.97	1.02	0.89	1.05	1.06	1.04
Dy	4.25	4.12	4.38	4.28	4.32	4.36	4.40
Ho	0.73	0.71	0.76	0.77	0.76	0.73	0.76
Er	1.69	1.65	1.76	1.83	1.76	1.72	1.79
Yb	1.14	1.18	1.30	1.29	1.37	1.29	1.35
Lu	0.14	0.14	0.18	0.19	0.19	0.19	0.19
Hf	9.86	9.72	9.96	10.71	10.31	9.93	10.34
Ta	2.75	2.64	2.34	2.43	2.38	2.33	2.27
Pb	n. d.	12.05	13.31	14.17	12.92	12.88	13.12
Th	5.64	6.34	6.39	7.33	6.36	6.23	6.27
U	1.19	1.16	1.04	0.95	1.14	1.05	1.08
²⁰⁶ Pb/ ²⁰⁴ Pb	16.8885±23	n. d.	16.5903±24	16.6100±13	n. d.	16.5836±15	16.5876±18
²⁰⁷ Pb/ ²⁰⁴ Pb	15.4447±21	n. d.	15.4120±22	15.4141±13	n. d.	15.4108±14	15.4124±17
²⁰⁸ Pb/ ²⁰⁴ Pb	36.8818±53	n. d.	36.6785±53	36.6949±31	n. d.	36.6706±38	36.6767±42

Table S1. Cont.

Sample	45 CH-16-141 TA
SiO ₂ , wt%	55.78
TiO ₂	2.17
Al ₂ O ₃	15.41
Fe ₂ O ₃	4.27
FeO	3.62
MnO	0.10
MgO	3.37
CaO	5.44
Na ₂ O	3.80
K ₂ O	4.53
P ₂ O ₅	0.81
H ₂ O ⁻	0.11
H ₂ O ⁺	0.79
Total	100.20
Be, ppm	3.1
S _{tot}	n. d.
Sc	13.4
V	106
Co	22
Ni	45
Cu	23
Zn	123
Rb	75.6
Sr	1143
Y	20.6
Zr	412
Nb	40.6
Cs	0.37
Ba	1242
La	85.6
Ce	160.3
Pr	17.3
Nd	62.3
Sm	10.20
Eu	2.74
Gd	7.57
Tb	1.04
Dy	4.39
Ho	0.75
Er	1.72
Yb	1.33
Lu	0.19
Hf	10.11
Ta	2.39
Pb	13.10
Th	6.42
U	0.86
²⁰⁶ Pb/ ²⁰⁴ Pb	n. d.
²⁰⁷ Pb/ ²⁰⁴ Pb	n. d.
²⁰⁸ Pb/ ²⁰⁴ Pb	n. d.

1–12, Molabushan volcano: 1–8—cone, 9–12—flow; 13–19—East Longmenshan volcano; 20–34—West Longmenshan volcano; 35–39—Old Gelaqiushan flow; 40–45—Laoshantou flow. PT—phonotephrite, BTA—basaltic trachyandesite, TA—trachyandesite, n. d.—not determined.