Table 1 LA-ICP-MS zircon U-Pb dating results of volcanic samples from the Mashan Complex

Spot	Th/U	$^{207}Pb/^{206}Pb$		$^{207}Pb/^{235}U$		$^{206}Pb/^{238}U$		$^{207}Pb/^{206}Pb$		$^{207}Pb/^{235}U$		$^{206}Pb/^{238}U$	
		Ratios	1σ	Ratios	1σ	Ratios	1σ	Age (Ma)	1σ	Age (Ma)	1σ	Age (Ma)	1σ
MZ-1C2 (Trachyandesite)													
MZ-1C2-01	1.2	0.0488	0.0018	0.1705	0.0064	0.0251	0.0007	139.0	88.9	159.8	5.6	159.6	4.4
MZ-1C2-02	1.3	0.0490	0.0019	0.1671	0.0065	0.0245	0.0007	146.4	92.6	156.9	5.7	156.2	4.4
MZ-1C2-03	1.1	0.0509	0.0019	0.1780	0.0064	0.0251	0.0007	235.3	83.3	166.3	5.5	160.1	4.4
MZ-1C2-04	1.1	0.0508	0.0020	0.1748	0.0067	0.0248	0.0007	231.6	60.2	163.6	5.8	157.7	4.4
MZ-1C2-05	1.2	0.0508	0.0020	0.1743	0.0068	0.0247	0.0007	235.3	92.6	163.2	5.9	157.1	4.4
MZ-1C2-06	1.0	0.0535	0.0025	0.1880	0.0089	0.0253	0.0007	350.1	103.7	174.9	7.6	160.9	4.7
MZ-1C2-07	1.1	0.0526	0.0022	0.1812	0.0075	0.0248	0.0007	322.3	96.3	169.1	6.5	157.7	4.4
MZ-1C2-08	1.0	0.0469	0.0022	0.1634	0.0075	0.0251	0.0007	42.7	111.1	153.6	6.6	160.1	4.7
MZ-1C2-09	1.1	0.0499	0.0019	0.1715	0.0064	0.0248	0.0007	187.1	88.9	160.7	5.6	157.7	4.4
MZ-1C2-10	1.1	0.0499	0.0021	0.1699	0.0071	0.0246	0.0007	187.1	98.1	159.4	6.1	156.6	4.4
MZ-1C2-11	1.4	0.0495	0.0019	0.1710	0.0067	0.0248	0.0007	172.3	90.7	160.3	5.8	158.1	4.4
MZ-1C2-12	1.6	0.0497	0.0019	0.1708	0.0067	0.0247	0.0007	189.0	123.1	160.1	5.8	157.5	4.4
MZ-1C2-13	0.3	0.0513	0.0026	0.3519	0.0187	0.0496	0.0017	257.5	84.2	306.1	14.0	311.9	10.7
MZ-1C2-14	0.9	0.0504	0.0023	0.1745	0.0083	0.0249	0.0007	213.0	108.3	163.3	7.1	158.4	4.7
MZ-1C2-15	0.8	0.0501	0.0027	0.1750	0.0098	0.0252	0.0008	198.2	121.3	163.8	8.5	160.7	5.0
MZ-1C2-16	1.1	0.0493	0.0026	0.1723	0.0097	0.0251	0.0008	164.9	124.1	161.4	8.4	159.6	4.9
SQ-10 (Trachyandesite)													
SQ-10-01	1.0	0.0680	0.0021	1.049	0.032	0.1119	0.0034	878.0	-135.3	728.0	15.9	684.0	19.7
SQ-10-02	0.3	0.0609	0.0018	0.840	0.026	0.1000	0.0031	635.0	64.8	619.0	14.2	614.0	18.0
SQ-10-03	0.6	0.0583	0.0018	0.227	0.007	0.0282	0.0009	543.0	66.7	208.0	5.9	180.0	5.4
SQ-10-04	1.0	0.0717	0.0022	1.623	0.049	0.1641	0.0050	976.0	56.9	979.0	19.1	980.0	27.5

SQ-10-05	0.5	0.0699	0.0021	1.275	0.039	0.1322	0.0040	924.0	61.9	835.0	17.4	801.0	22.9
SQ-10-06	1.0	0.0538	0.0017	0.176	0.006	0.0237	0.0007	361.0	72.2	165.0	4.9	151.0	4.5
SQ-10-07	0.6	0.0654	0.0020	1.187	0.036	0.1315	0.0040	787.0	63.0	795.0	16.9	796.0	22.9
SQ-10-08	0.3	0.0858	0.0026	2.501	0.076	0.2113	0.0064	1333.0	58.8	1272.0	22.1	1236.0	34.2
SQ-10-09	0.4	0.0597	0.0018	0.533	0.017	0.0647	0.0021	591.0	66.7	434.0	11.4	404.0	12.7
SQ-10-10	0.6	0.0750	0.0023	1.839	0.056	0.1777	0.0054	1133.0	61.1	1059.0	20.2	1055.0	29.8
SQ-10-11	0.5	0.0503	0.0015	0.172	0.005	0.0248	0.0008	206.0	38.0	161.0	4.6	158.0	4.8
SQ-10-12	0.7	0.0638	0.0019	1.060	0.032	0.1205	0.0037	744.0	64.0	734.0	16.0	734.0	21.2
SQ-10-13	0.7	0.0498	0.0015	0.167	0.005	0.0243	0.0007	187.0	65.7	157.0	4.5	155.0	4.7
SQ-10-14	1.0	0.0508	0.0015	0.176	0.005	0.0252	0.0008	228.0	65.7	165.0	4.7	160.0	4.9
SQ-10-15	0.3	0.0624	0.0019	0.884	0.027	0.1028	0.0031	687.0	64.8	643.0	14.4	631.0	18.2
SQ-10-16	0.3	0.0727	0.0022	1.558	0.047	0.1554	0.0047	1006.0	61.1	954.0	18.7	931.0	26.3
SQ-10-17	0.6	0.0829	0.0025	1.934	0.059	0.1691	0.0051	1278.0	58.6	1093.0	20.3	1007.0	28.2
SQ-10-18	0.8	0.0580	0.0018	0.225	0.007	0.0282	0.0009	532.0	66.7	206.0	5.7	179.0	5.4
SQ-10-19	1.5	0.0658	0.0020	1.175	0.037	0.1295	0.0040	798.0	58.3	789.0	17.0	785.0	22.9
SQ-10-20	0.3	0.0627	0.0019	0.833	0.025	0.0964	0.0029	698.0	64.8	615.0	14.0	593.0	17.2
SQ-10-21	0.5	0.0745	0.0022	1.554	0.048	0.1510	0.0046	1055.0	60.0	952.0	19.0	907.0	25.9
SQ-10-22	0.8	0.0540	0.0016	0.186	0.005	0.0250	0.0005	372.3	45.8	173.5	4.6	159.4	3.4
SQ-10-23	0.9	0.0529	0.0017	0.181	0.006	0.0249	0.0008	324.1	75.0	169.3	5.4	158.7	4.8
SQ-10-24	0.9	0.0492	0.0010	0.173	0.006	0.0255	0.0007	166.8	50.0	162.2	4.9	162.5	4.6
SQ-10-25	1.0	0.0493	0.0009	0.172	0.005	0.0253	0.0006	164.9	41.7	161.4	4.2	161.2	3.5

4 Table 2 Major oxides (wt.%) and trace elemental (ppm) compositions of volcanic samples from the Mashan Complex

Sample	MZ-1C2	MZ-1B4	SQ-2	SQ-3	SQ-4	SQ-5	SQ-13	MZ-4	MZ-10	MZ-18	MZ-24	MZ-27	MZ-28	MZ-34	MZ-35	MZ-36
Lithology	Trachy-andesite	Trachy-andesite	Trachy-andesite	Trachy-andesite	Trachy-andesite	Trachy-andesite	Trachy-basalt	Trachy-basalt	Trachy-basalt	Trachy-basalt	Trachy-basalt	Trachy-basalt	Trachy-basalt	Trachy-basalt	Trachy-basalt	Trachy-basalt
SiO_2	55.82	54.44	52.13	55.44	52.86	55.15	49.43	47.83	50.01	50.88	48.68	50.28	48.59	48.83	49.17	47.50
TiO_2	1.16	1.17	2.45	2.10	2.51	2.15	2.09	1.72	1.63	1.80	1.54	1.61	1.55	1.54	1.93	1.44
Al_2O_3	16.12	16.06	15.41	14.83	15.66	14.92	13.94	13.65	14.34	14.51	12.80	13.90	13.59	13.40	14.08	13.05
Fe_2O_{3t}	7.15	8.00	10.33	9.70	10.41	9.17	12.19	11.63	11.28	11.20	11.02	11.23	11.51	11.43	11.35	10.98
MnO	0.13	0.15	0.24	0.24	0.19	0.23	0.20	0.18	0.17	0.16	0.15	0.15	0.19	0.16	0.14	0.17
MgO	2.71	2.94	2.61	2.34	2.62	2.41	5.06	6.09	5.32	4.76	6.68	5.44	6.81	6.59	5.46	6.36
CaO	4.01	5.76	8.61	7.37	5.90	7.07	10.01	10.95	8.02	6.99	9.73	7.73	8.63	8.92	7.87	10.30
Na_2O	4.04	3.54	4.11	3.82	3.61	3.34	3.63	2.23	2.24	3.73	1.80	3.30	2.53	2.38	2.50	2.47
K_2O	4.71	3.99	2.54	3.09	4.84	4.52	2.01	2.94	3.99	3.56	4.50	3.53	3.46	3.79	4.02	3.40
P_2O_5	0.46	0.50	0.66	0.56	0.67	0.59	0.65	0.56	0.56	0.57	0.58	0.55	0.65	0.65	0.56	0.61
L.O.I	3.49	3.37	0.63	0.26	0.41	0.20	0.37	1.72	1.97	1.47	2.03	1.86	2.01	1.83	2.44	3.30
Total	99.80	99.94	99.71	99.75	99.68	99.75	99.59	99.49	99.52	99.62	99.50	99.59	99.53	99.52	99.53	99.57
$Mg^{\#}$	47	46	37	36	37	38	49	55	52	50	59	53	58	57	53	57
Sc	10.4	11.7	15.9	13.4	14.3	12.9	27	29.7	28.8	22.9	28	30.9	24.6	24.5	25.5	24.2
V	122	141	158	142	175	140	294	310	293	249	282	299	256	258	296	262
Cr	11.1	13.6	13.8	12	12.3	14.7	53.7	122	44.8	49.6	157	44.4	135	140	56.9	133
Co	17.7	19.6	23.6	22.5	23.1	22.5	41.7	42.9	39.5	34.9	42.3	37.4	43.5	41.9	39.2	40.9
Ni	10.2	11.2	15.4	15.3	14	15.2	45.9	51.2	38.8	33.7	64.8	38	60.1	58.4	47.1	60.3
Cu	54.4	67.5	23.4	17.9	25.6	18.4	96.8	109	64.3	69.0	97.6	65.2	114.4	105	86.4	124
Zn	77.7	100	130	122	126	115	126	100	132	103	97.4	135	113	99.1	118	94.1
Ga	17.6	18.1	20.5	20	20.9	19.5	23.3	18.3	18.4	18.9	16.3	17	16.1	15.7	19.5	17

Rb	154	130	65.7	78.3	132	118	69.9	92.8	134	115	131	115	105	114	129	104
Sr	606	804	671	634	674	648	869	1020	849	768	754	743	668	780	659	690
Y	23.8	23.5	33.3	29.5	32.4	30.6	32.5	27.5	28.1	30.7	26.1	27	25.8	24.5	27.4	23.8
Zr	228	179	296	288	342	301	257	177	202	242	187	189	168	164	231	162
Nb	45.6	40.5	66.6	58.6	59.4	59.9	58.5	33.4	33.5	48.9	32.9	31.4	32.7	31.4	45.1	30
Cs	2.53	2.95	2.99	3.00	2.78	3.10	1.24	1.18	1.10	0.98	1.51	0.99	1.29	1.53	2.30	0.87
Ba	771	948	712	750	952	1140	793	826	1070	829	1170	841	1080	1120	924	922
La	43.5	42.2	64.3	56.7	59.6	60.9	60.3	35.8	38.6	50.8	42.1	34.5	39.1	36.5	49.8	35.7
Ce	82.3	78.4	122	107	117	112	115	68.6	70.8	91.0	76.9	65.8	70.9	69.1	96.2	71.5
Pr	9.64	9.20	14.4	12.3	13.2	13.0	12.8	8.71	8.86	11.0	9.75	8.34	8.98	8.38	11.1	8.47
Nd	35.1	34.4	55	47.3	54.1	50.8	48.5	34	33.8	42.5	37.6	31.5	35.6	32.7	42.5	32.3
Sm	6.23	6.04	10.3	8.9	9.99	9.25	9.17	6.85	6.78	7.89	7.36	6.6	6.65	6.52	8.01	6.39
Eu	1.61	1.99	3.08	2.59	2.85	2.75	2.70	1.98	1.88	2.20	2.14	1.76	1.88	1.86	2.24	1.88
Gd	5.35	5.37	7.53	6.82	8.20	7.29	7.33	5.85	6.42	8.23	6.88	6.27	5.92	6.38	6.44	4.96
Tb	0.76	0.74	1.44	1.25	1.43	1.33	1.30	1.02	1.04	1.22	1.06	1.01	0.97	0.98	1.16	0.94
Dy	4.26	4.17	6.45	5.56	6.21	5.84	5.93	4.91	5.01	5.64	4.85	4.88	4.56	4.46	5.32	4.41
Ho	0.85	0.84	1.19	1.03	1.16	1.07	1.11	0.97	0.99	1.09	0.93	0.96	0.88	0.86	1.00	0.84
Er	2.28	2.18	3.46	3.01	3.38	3.22	3.28	2.79	2.86	3.29	2.69	2.83	2.60	2.57	2.97	2.50
Tm	0.32	0.31	0.43	0.38	0.41	0.39	0.41	0.38	0.39	0.43	0.35	0.38	0.34	0.33	0.38	0.32
Yb	2.15	2.07	2.73	2.46	2.66	2.60	2.67	2.44	2.53	2.83	2.22	2.45	2.24	2.18	2.47	2.13
Lu	0.33	0.32	0.39	0.35	0.38	0.37	0.39	0.36	0.37	0.42	0.32	0.36	0.33	0.32	0.36	0.31
Hf	5.50	4.25	7.10	6.62	7.75	6.94	5.87	4.22	4.93	5.61	4.50	4.64	3.88	3.82	5.33	3.66
Ta	3.09	2.54	3.72	3.45	3.46	3.7	3.22	1.91	1.86	2.73	1.87	1.8	1.94	1.77	2.74	1.71
Pb	10.7	9.92	8.11	9.83	10.9	10.7	14.4	8.5	11.7	8.63	15.4	11.7	4.75	12.4	8.58	7.45
Th	12.2	8.03	11.9	14.2	9.49	13.80	10.50	5.58	8.05	9.52	7.27	7.58	6.71	5.83	8.74	6.70
U	3.69	2.35	2.60	2.80	2.26	2.93	1.84	1.83	2.01	2.47	2.53	1.88	2.31	2.04	2.40	1.83

Table 3 Sr-Nd isotopic compositions of volcanic samples from the Mashan Complex

Sample	Lithology	Age (Ma)	$^{87}Rb/^{86}Sr$	$^{87}Sr/^{86}Sr$	2σ	$(^{87}Sr/^{86}Sr)_i$	$^{147}Sm/^{144}Nd$	$^{143}Nd/^{144}Nd$	2σ	$\varepsilon Nd_{(t)}$	T_{DM}(Ga)	Ref.
SQ-2	Trachyandesite	158	0.28	0.705891	0.000010	0.70526	0.11	0.512661	0.000005	2.1	0.74	this study
SQ-4	Trachyandesite	158	0.57	0.707586	0.000012	0.70631	0.11	0.512645	0.000006	1.9	0.76	this study
SQ-13	Trachybasalt	158	0.23	0.705640	0.000012	0.70512	0.11	0.512685	0.000005	2.6	0.72	this study
MZ-4	Trachybasalt	158	0.26	0.706329	0.000013	0.70574	0.12	0.512713	0.000006	3.0	0.73	this study
MZ-18	Trachybasalt	158	0.43	0.706546	0.000012	0.70557	0.11	0.512646	0.000005	1.9	0.76	this study
MZ-35	Trachybasalt	158	0.57	0.708205	0.000013	0.70693	0.11	0.512615	0.000008	1.2	0.82	this study
Mszy-7-1HB	Trachybasalt	158	0.35	0.706030	0.000040	0.70525	0.11	0.512589	0.000005	0.8	0.83	Wang (2013)
Mszy-7-5HB	Trachybasalt	158	0.31	0.705660	0.000020	0.70496	0.11	0.512609	0.000006	1.1	0.82	Wang (2013)
GG07-12-3	Trachybasalt	158	0.64	0.705970		0.70452	0.11	0.512640		1.9	0.72	Duan et al. (2013)
GG07-12-4	Trachybasalt	158	0.61	0.705909		0.70454	0.11	0.512640		1.8	0.75	Duan et al. (2013)
GG07-12-5	Trachyandesite	158	0.56	0.705810		0.70454	0.11	0.512637		1.7	0.77	Duan et al. (2013)

Table 4 Synthesis of the formation age of the Mashan Complex

No.	Lithology	Sample	Dating method	Age (Ma)	Ref.
1	Diorite porphyry	12730-3	Ar-Ar	153.8±0.6	Lao et al. (2015)
2	Diorite	Mszy-1	LA-ICP MS	164.1±1.1	Wang (2013)
3	Pyroxenite	Mszy-2	LA-ICP MS	166.2±1.7	Wang (2013)
4	Pyroxenite	Mszy-5	LA-ICP MS	164.7±2.0	Wang (2013)
5	Syenite	Mszy-3	LA-ICP MS	163.8±1.4	Wang (2013)
6	Syenite	Mszy-8	LA-ICP MS	162.0±1.3	Wang (2013)
7	Monzonite	Mszy-4	LA-ICP MS	165.3±1.2	Wang (2013)
8	Trachyandesite	MZ-1C2	LA-ICP MS	158.4±1.1	this study
9	Trachyandesite	SQ-10	LA-ICP MS	158.6±3.0	this study