

Appendix I. Whole rock XRF analyses for major and trace elements

Area	Yellowstone						Jemez Mountains			Lipari
Location	Nez Perce Creek	Upper Basin member	Dry Creek	Solfatara Plateau	Mount Jackson	Lava Creek Tuff	Bear Canyon	Camp May-Pajarito Mtn	Ancho Canyon	Aeolian Arc Italy
Unit	Qpcn	Qpu	Qpcd	Qpcf	Qmj	Qyl	Qbt (Upper Bandelier Tuff)			V. ne Gabelotto
# of Sample	98821	98822	98823	98824	98825	98827	95504	95521	95531	98502
XRF										
SiO ₂	75.17 (0.27)	75.39 (0.27)	76.79 (0.28)	74.13 (0.27)	75.55 (0.27)	76.94 (0.28)	74.80 (0.27)	75.08 (0.27)	77.68 (0.28)	73.95 (0.27)
TiO ₂	0.10 (<.01)	0.20 (<.01)	0.12 (<.01)	0.17 (<.01)	0.04 (<.01)	0.08 (<.01)	0.09 (<.01)	0.16 (<.01)	0.06 (<.01)	0.04 (<.01)
Al ₂ O ₃	12.62 (0.15)	13.24 (0.15)	12.34 (0.14)	12.71 (0.15)	13.40 (0.16)	12.63 (0.15)	13.63 (0.16)	13.21 (0.15)	12.41 (0.15)	13.99 (0.16)
FeO	1.28 (0.02)	1.15 (0.02)	0.93 (0.01)	1.89 (0.03)	0.70 (0.01)	1.03 (0.01)	1.37 (0.02)	1.58 (0.02)	1.36 (0.02)	1.39 (0.02)
MnO	0.06 (<.01)	0.01 (<.01)	0.03 (<.01)	0.05 (<.01)	0.01 (<.01)	0.01 (<.01)	0.00	0.02 (<.01)	0.08 (<.01)	0.04 (<.01)
MgO	0.00	0.04 (<.01)	0.00	0.00	0.00	0.00	0.07 (<.01)	0.03 (<.01)	0.07 (<.01)	0.11 (<.01)
CaO	0.42 (0.01)	0.57 (0.01)	0.34 (0.01)	0.60 (0.01)	0.35 (0.01)	0.36 (0.01)	0.00	0.09 (0.00)	0.27 (0.01)	0.74 (0.01)
Na ₂ O	3.88 (0.07)	3.46 (0.07)	3.53 (0.07)	4.00 (0.08)	4.28 (0.08)	3.60 (0.07)	4.37 (0.08)	4.26 (0.08)	4.18 (0.08)	3.85 (0.07)
K ₂ O	4.96 (0.25)	4.80 (0.24)	4.73 (0.24)	4.92 (0.25)	4.68 (0.23)	4.60 (0.23)	4.62 (0.23)	4.60 (0.23)	4.11 (0.21)	5.17 (0.26)
P ₂ O ₅	0.03 (<.01)	0.06 (0.01)	0.05 (0.01)	0.03 (<.01)	0.04 (<.01)	0.04 (<.01)	0.06 (0.01)	0.06 (0.01)	0.05 (0.01)	0.01 (<.01)
Total	98.52	98.92	98.86	98.50	99.05	99.29	99.01	99.09	100.27	99.29
ASI ⁽¹⁾	1.01	1.11	1.07	0.98	1.05	1.09	1.12	1.09	1.05	1.05
AI	0.93	0.82	0.89	0.94	0.90	0.86	0.89	0.91	0.91	0.85
Rb	183 (10.6)	167 (9.6)	177 (10.2)	132 (7.6)	282 (16.3)	162 (9.3)	151 (8.7)	99 (5.7)	230 (13.3)	288 (16.6)
Sr	7 (0.3)	68 (2.8)	18 (0.7)	12 (0.5)	2 (0.1)	36 (1.5)	19 (0.8)	33 (1.3)	20 (0.8)	11 (0.4)
Ba	214 (7.3)	1088 (37.2)	406 (13.9)	1193 (40.8)	18 (0.6)	793 (27.1)	107 (3.7)	168 (5.7)	38 (1.3)	5 (0.2)
Y	71 (3.3)	57 (2.6)	65 (3.0)	60 (2.8)	97 (4.5)	46 (2.1)	45 (2.1)	35 (1.6)	85 (3.9)	43 (2.0)
Zr	308 (12.9)	232 (9.7)	212 (8.9)	482 (20.2)	138 (5.8)	184 (7.7)	234 (9.8)	292 (12.2)	270 (11.3)	142 (5.9)
Nb	87 (6.5)	73 (5.4)	84 (6.2)	77 (5.7)	130 (9.6)	69 (5.1)	78 (5.8)	52 (3.9)	118 (8.8)	48 (3.6)
Th	25	26	23	19	31	23	21	14	26	44
La	96	78	86	87	58	55	57	65	54	
Ce	203	125	164	178	111	169	160	113	105	
Nd	83	45	65	69	53	39	50	37	35	

Number in parentheses represents standard errors.

⁽¹⁾ ASI = molar Al₂O₃/(CaO+Na₂O+K₂O); AI = molar (Na₂O+K₂O)/Al₂O₃

* Trace elements of 93908 were also analyzed by INAA at ACTLABS.

Appendix I. Whole rock XRF analyses for major and trace elements (continued)

Area	Colorado		Thomas Range		Long Valley					Taylor Creek
Location	Engineer Mtn	Topaz Mtn		Spor Mtn	Glass Creek	Deer Mtn	Mammoth K	Glass Mtn	Punch Bowl	Boiler Peak
Unit					Cp		Qmm	ODgs	Qmrm	SMC
# of Sample	92690	98701	98702	98703	98711	98713	98714	98716	98717	98911
XRF										
SiO ₂	71.79 (0.26)	73.94 (0.27)	72.66 (0.26)	75.37 (0.27)	70.27 (0.25)	71.22 (0.26)	76.18 (0.27)	77.49 (0.28)	76.65 (0.28)	76.59 (0.28)
TiO ₂	0.16 (<.01)	0.08 (<.01)	0.05 (<.01)	0.00	0.31 (0.01)	0.27 (0.01)	0.07 (<.01)	0.00	0.01 (<.01)	0.08 (<.01)
Al ₂ O ₃	15.97 (0.19)	14.41 (0.17)	14.13 (0.17)	15.07 (0.18)	14.58 (0.17)	14.45 (0.17)	13.69 (0.16)	13.54 (0.16)	13.49 (0.16)	13.17 (0.15)
FeO	1.04 (0.01)	0.35 (<.01)	0.26 (<.01)	0.49 (0.01)	1.60 (0.02)	1.52 (0.02)	0.45 (0.01)	0.27 (<.01)	0.66 (0.01)	0.57 (0.01)
MnO	0.11 (<.01)	0.06 (<.01)	0.06 (<.01)	0.08 (<.01)	0.05 (<.01)	0.05 (<.01)	0.05 (<.01)	0.07 (<.01)	0.04 (<.01)	0.05 (<.01)
MgO	0.16 (0.01)	0.03 (<.01)	0.04 (<.01)	0.36 (0.01)	0.80 (0.03)	0.62 (0.02)	0.02	0.00	0.00	0.00
CaO	0.41 (0.01)	0.61 (0.01)	1.15 (0.02)	0.76 (0.01)	1.66 (0.03)	1.44 (0.03)	0.57 (0.01)	0.25 (<.01)	0.45 (0.01)	0.07 (<.01)
Na ₂ O	5.06 (0.10)	4.07 (0.08)	4.37 (0.08)	3.65 (0.07)	4.19 (0.08)	4.22 (0.08)	3.70 (0.07)	4.20 (0.08)	4.12 (0.08)	4.12 (0.08)
K ₂ O	5.21 (0.26)	5.00 (0.25)	4.84 (0.24)	4.52 (0.23)	4.16 (0.21)	4.21 (0.21)	4.55 (0.23)	4.27 (0.21)	4.40 (0.22)	4.65 (0.23)
P ₂ O ₅	0.03 (<.01)	0.03 (<.01)	0.04 (<.01)	0.05 (<.01)	0.13 (0.01)	0.12 (0.01)	0.05 (0.01)	0.04 (<.01)	0.04 (<.01)	0.03 (<.01)
Total	99.94	98.58	97.60	100.35	97.75	98.12	99.33	100.13	99.86	99.33
ASI	1.09	1.09	0.97	1.23	1.01	1.02	1.14	1.13	1.09	1.10
AI	0.87	0.84	0.88	0.72	0.78	0.80	0.80	0.85	0.86	0.90
Rb	164 (9.5)	376 (21.7)	403 (23.3)	1295 (74.7)	110 (6.3)	119 (6.9)	180 (10.4)	242 (14.0)	186 (10.7)	352 (20.3)
Sr	9 (0.4)	25 (1.0)	21 (0.9)	14 (0.6)	319 (13.0)	248 (10.1)	45 (1.8)	4 (0.2)	8 (0.3)	6 (0.2)
Ba	63 (2.2)	41 (1.4)	33 (1.1)	4 (0.1)	918 (31.4)	830 (28.4)	106 (3.6)	11 (0.4)	21 (0.7)	23 (0.8)
Y	34 (1.6)	47 (2.2)	47 (2.2)	101 (4.7)	16 (0.7)	17 (0.8)	26 (1.2)	43 (2.0)	33 (1.5)	104 (4.8)
Zr	242 (10.1)	113 (4.7)	96 (4.0)	68 (2.8)	179 (7.5)	165 (6.9)	92 (3.9)	69 (2.9)	103 (4.3)	143 (6.0)
Nb	53 (3.9)	90 (6.7)	93 (6.9)	250 (18.6)	12 (0.9)	16 (1.2)	36 (2.7)	71 (5.3)	40 (3.0)	103 (7.6)
Th	22	63	57	39	13	12	18	31	19	34
La		59	46	36	29	30	18	12	22	42
Ce		107	86	113	51	52	38	36	49	106
Nd		38	33	48	13	15	20	25	26	46

Appendix I. Whole rock XRF analyses for major and trace elements (continued)

Area	Taylor Creek						Jemez Mountains						
Location	North Boiler Peak		Penamoum Canyon		Kemp Mesa		BM 8407		Jemez Falls		Las Conchas Campground		
Unit	BLP		DGC		KPM		Qvvf (South Mountain Rhyolite-SMC)						
# of Sample	98912		98913		98914		93908B		95811B		98901		
XRF													
SiO ₂	75.02	(0.27)	75.63	(0.27)	77.04	(0.28)	76.29	(0.27)	75.93	(0.27)	77.20	(0.28)	
TiO ₂	0.08	(<.01)	0.07	(<.01)	0.10	(<.01)	0.09	(<.01)	0.08	(<.01)	0.08	(<.01)	
Al ₂ O ₃	14.53	(0.17)	14.18	(0.17)	13.34	(0.16)	14.02	(0.16)	14.08	(0.16)	13.51	(0.16)	
FeO	0.55	(0.01)	0.56	(0.01)	0.35	(<.01)	0.49	(0.01)	0.60	(0.01)	0.48	(0.01)	
MnO	0.11	(<.01)	0.05	(<.01)	0.06	(<.01)	0.05	(<.01)	0.07	(<.01)	0.05	(<.01)	
MgO	0.00		0.00				0.01	(<.01)	0.06	(<.01)	0.01	(<.01)	
CaO	0.03	(<.01)	0.04	(<.01)	0.11	(<.01)	0.41	(0.01)	0.45	(0.01)	0.45	(0.01)	
Na ₂ O	4.39	(0.08)	4.27	(0.08)	3.61	(0.07)	4.01	(0.08)	4.10	(0.08)	3.69	(0.07)	
K ₂ O	5.00	(0.25)	4.85	(0.24)	4.78	(0.24)	4.45	(0.22)	4.46	(0.22)	4.37	(0.22)	
P ₂ O ₅	0.02	(<.01)	0.02	(<.01)	0.03	(<.01)	0.04	(<.01)	0.03	(<.01)	0.05	(0.01)	
Total	99.73		99.67		99.42		99.86		99.86		99.89		
ASI	1.15		1.15		1.18		1.15		1.14		1.16		
AI	0.87		0.87		0.83		0.81		0.82		0.80		
93908*													
INAA													
Rb	382	(22.0)	364	(21.0)	246	(14.2)	201	(11.6)	208	211	(12.2)	198	(11.4)
Sr	5	(0.2)	5	(0.2)	13	(0.5)	28	(1.1)		27	(1.1)	28	(1.1)
Ba	33	(1.1)	15	(0.5)	68	(2.3)	120	(4.1)	190	107	(3.7)	126	(4.3)
Y	31	(1.4)	39	(1.8)	61	(2.8)	59	(2.7)		63	(2.9)	56	(2.6)
Zr	146	(6.1)	141	(5.9)	142	(5.9)	105	(4.4)		103	(4.3)	100	(4.2)
Nb	75	(5.6)	78	(5.8)	69	(5.1)	98	(7.3)		101	(7.5)	90	(6.7)
Th	34		29		27		28		28.4	31		28	
La	13		13		39		33		36.7	33		33	
Ce	133		114		94		70		75	76		68	
Nd	20		20		42		31		29	35		31	
Eu									0.31				