Supplementary Table 1

Tephra label	Depth (cm)	Thickness (cm)	Color	Heavy mineralogy	Interpretation
PU-II-P2-4	4.0–4.5	0.5	Light green	--	T1
PU-II-P2-8	8.0–8.5	0.5	Light green	--	T2
PU-II-P2-11	10.8–11.2	0.4	Black	Opx (83%), cpx (13%), bb amph (2%)	T3
PU-II-P2-42	41.5–42.0	0.5	Black + red	Oli (77%), opx (11%)	T4
PU-I-P1-48	47.5–48.0	0.5 (+3.5)	Light gray	--	T1–T2
PU-I-P1-54	53.5–54.0	0.5	Black	Opx (87%), cpx (11%), bb amp (1.5%)	T3
PU-II-16	15.7–16.0	0.3	Black	Opx (76%), cpx (17%), bb amp (6%)	T3
PU-II-59	58.5–59.0	0.5	Black + red	Opx (38%), cpx (29%), oli (25%)	T4
PU-II-79	78.8–79.3	0.5	Black	Opx (62%), cpx (35%)	T5
PU-SC1-13	13.4–13.6	0.2	Black	Opx (76%), cpx (18%), bb amp (5%)	T3
PU-SC1-50	50.4–50.6	0.2	Black	Opx (48%), cpx (47%)	T5
PU-SC2-58	57.8–58.2	0.4	Black	Opx (33%), cpx (43%), oli (19%)	T4
PU-SC2-61	60.4–60.6	0.2	Black	Opx (52%), cpx (36%)	T5
PU-SC3-18	16.0–19.0	3.0	Black	Opx (70%), cpx (23%), bb amp (4%)	?
PU-SC3-35	35.5–35.8	0.3	Black	Opx (78%), cpx (13%), bb amp (9%)	T3
PU-SC3-52	51.5–52.0	0.5	Black	Opx (50%), cpx (41%), bb amp (2%)	T5
PU-SC4-18	18.5–19.2	0.7	Black	Opx (82%), cpx (14%), bb amp (4.3%)	T3
PU-SC4-82	82.0–82.2	0.2	Black	Cpx (49%), opx (44%), bb amp (1%)	T5
PU-SC7-51	50.0–50.5	0.5	Dark gray	Opx (80%), cpx (15%), bb amp (3%)	T3
PU-SC7-71	70.9–71.1	0.2	Black	Opx (45%), cpx (33%), bb amp (2.2%)	T5

Supplementary Table 2

Tephra label	Depth (cm)	Thickness (cm)	Grain-size mode (µm)	3 coarsest grains (mm)	Color	Bulk mineralogy	Heavy mineralogy	Magma comp.	Corundum %	Differen-ciation index	Comments and typical characteristics	Age (cal. yr. BP ± 2 σ)
PU-II-16	15.7–16.0	0.3	250		Black	Op. (12%) and tr. (27%) scoria; felsic phenocrystals (52%)	Opx (76%), cpx (17%), bb amp (6%)	--	--	--	See comments for T3 (short cores)	1908 AD
PU-II-59	58.5–59.0	0.5	215		Black + red	Op. (26%) and tr. (27%) scoria; brown g.s. (30%)	Opx (38%), cpx (29%), oli (25%)	--	--	--	See comments for T4 (short cores)	1570 AD
PU-II-79	78.8–79.3	0.5	434		Black	Op. (9%) and tr. (7%) scoria; ves. colorless g.s. (61%); felsic phenocrystals (12 %)	Opx (62%), cpx (35%)	--	--	--	See comments for T5 (short cores)	980 ± 65 AD
PU-II-106	102.3–109.8	7.5	567	1.4; 1.4; 1.4	Black	Felsics (44%), op. scoria (35%); pt scoria (13 %)	Opx (57 %), cpx (41 %)	--	--	--	TC1/2, thickest tephra in PU-II long core	1665 ± 110
PU-II-179	178.0–180.2	2.2	62	1; 1; 1	Black	Brown (48%) and colorless (32%) ves. g.s.	Opx (52 %), cpx (44%)	Alkaline andesite	--	61	TC2, 80% of ves. glass shards, differentiated suite: alkaline andesite to alkaline dacite	3240 ± 150
PU-II-255	253.8–255.8	2.0	249	2; 1; 1	Black	Brown micr. (27%) and ves. (32%) g.s.; tr. scoria (15%), felsics (15%)	Opx (61 %), cpx (35%)	Dacite	0.26	75	TC2, 59% of brownish glass shards	4110 ± 160
PU-II-377	376.8–378.1	1.3	384	2; 1.4; 1.4	Black + red	Op. (34%) and tr. scoria (34%)	Cpx (69 %), oli (23 %)	--	--	--	TC1, high cpx and olivine contents	5535 ± 140
PU-II-419	418.1–419.1	1.0	1000-1400	4; 2.9; 2.9	Black	Tr. (37%) and op. (25%) scoria; brown g.s. (25%)	Cpx (52%), opx (19%), oli (14%)	Basaltic andesite	--	41	TC1/2, coarsest tephra in PU-II long core, 2 populations of g.s.	5985 ± 125
PU-II-490	488.6–490.8	1.8	95	2.9; 2.2; 1.4	Black	Op. (34%) and tr. (29%) scoria; felsics (14%), brown g.s. (10%)	Cpx (47 %), opx (22%), oli (21%)	--	--	--	TC1/2, 21% of olivine in the heavy mineral suite	6815 ± 115
PU-II-500	497.4–502.9	5.5	411	2; 2; 1.4	Black + white	Op. (55%) and tr. scoria (20%), felsics (15%)	Cpx (53 %), opx (31 %)	--	--	--	TC1/2, relatively rich in dark brown amphibole (5%, uncommon)	6895 ± 115
PU-II-633	632.7–633.6	0.9	141	1; 1; 1	Green + gray	Colorless ves. g.s.(62%), felsics (19%)	Gg amp (56%), bg amp (19%), opx (12%)	K-rhyolite	3.57	87	62% of colorless. ves. g. s., Heavy mineralogy dominated by amp.	8455 ± 115
PU-II-744	743.5–744.5	1.0	389	1.4; 1.4; 1	Black	Tr. (35%) and op. (32%) scoria; felsics (22%)	Bg amp (24%), bb amp (15%), gg amp (6%), cpx (30%), opx (18%)	--	--	--	TC1, 15% of dark brown amphibole	10,640 ± 255
PU-II-837	836.2–837.0	0.8	192	1; 1; 1	Black	Tr. (38%) and op. (32%) scoria; felsics (19%)	Opx (56%), cpx (39%)	--	--	--	TC1/2, low content in green amphibole	12,540 ± 325
PU-II-901	899.5–903.0	3.5	154	0.7; 0.7; 0.7	Light gray	Colorless ves. g.s. (50%), felsics (35%)	Opx (76%), bg amp (13%)	Rhyolite	2.82	78	50% of colorless and highly differentiated g.s., 76% opx	13,825 ± 370
PU-II-929	928.5–929.8	1.3	190	1.4; 1; 0.7	Black	Op. (23%) and tr. (19%) scoria; brown ves. (22%) and mic. (14%) g.s; colorless ves. g.s.(12%)	Cpx (47%), opx (36%)	Andesite Rhyolite	0 3.05	50 83	TC2, Black to dark grey scoria, two geochemical populations of g.s.	14,345 ± 450
PU-II-933	932.5–933.8	1.3	365	1.4; 1.4; 1.4	Black	Tr. (41%) and op.(22%) scoria, brown mic. g.s.(15%)	Opx (64%), cpx (34%)	Andesite Rhyolite	0 3.37	51 82	TC1/2, Dark grey scoria, two geochemical populations of g.s.	14,400 ± 465
PU-II-1003	1002.4–1003.0	0.6	217	1; 0.7; 0.7	Black	Tr. (50%) and op. (32%) scoria; felsics (10 %)	Cpx (45%), oli (30%), opx (14 %)	--	--	--	TC1/2, 30% of olivine	15,510 ± 720
PU-II-1005	1005.0–1005.8	0.8	153	0.7; 0.7; 0.7	Black	Tr. (70%) and op. (14%) scoria	Cpx (37%), opx (37%)	--	--	--	TC1/2, low oli (8%) and amp (8%) contents	15,540 ± 725

Supplementary Table 3

Sample no.	SiO_2	TiO_2	Al_2O_3	FeO[a]	MgO	CaO	Na_2O	K_2O	n
Pilot cores									
PU-II-P2-4	69.62 ± 3.00	0.75 ± 0.10	14.79 ± 1.15	4.46 ± 0.73	0.87 ± 0.48	3.08 ± 1.36	3.97 ± 0.56	2.46 ± 0.75	10
PU-II-P2-8	70.45 ± 1.16	0.75 ± 0.13	14.68 ± 0.38	4.13 ± 0.37	0.72 ± 0.18	2.61 ± 0.42	3.95 ± 0.37	2.72 ± 0.20	15
PU-II-P2-11	70.48 ± 3.72	0.62 ± 0.29	15.20 ± 1.69	3.19 ± 2.27	0.59 ± 0.58	2.98 ± 0.90	4.65 ± 0.73	2.30 ± 0.77	8
PU-II-P2-11-coating	72.71 ± 2.33	0.54 ± 0.36	14.21 ± 2.46	2.78 ± 1.39	0.35 ± 0.17	2.22 ± 0.88	4.03 ± 0.66	3.15 ± 0.66	5
PU-II-P2-42	53.81 ± 0.36	1.53 ± 0.11	14.39 ± 0.39	11.39 ± 0.35	5.66 ± 0.45	9.32 ± 0.13	2.77 ± 0.20	0.89 ± 0.06	10
PU-I-P1-48	71.51 ± 0.96	0.79 ± 0.18	14.31 ± 0.34	4.20 ± 0.43	0.71 ± 0.16	2.48 ± 0.43	3.22 ± 0.18	2.78 ± 0.19	9
PU-I-P1-54	72.42 ± 4.83	0.38 ± 0.20	14.20 ± 2.20	2.98 ± 1.53	0.88 ± 0.75	2.96 ± 1.36	4.38 ± 1.02	1.81 ± 0.48	10
PU-I-P1-54-coating	74.56 ± 2.91	0.35 ± 0.18	14.38 ± 1.52	1.83 ± 0.90	0.21 ± 0.09	2.33 ± 0.70	4.39 ± 0.79	1.95 ± 0.81	6
PU-II long core									
PU-II-79	72.18 ± 0.59	0.75 ± 0.08	14.24 ± 0.15	3.97 ± 0.21	0.65 ± 0.07	2.29 ± 0.11	3.02 ± 0.25	2.91 ± 0.08	10
PU-II-179	62.10 ± 4.42	1.20 ± 0.36	16.03 ± 0.14	6.64 ± 1.81	2.45 ± 1.04	5.05 ± 1.80	4.16 ± 0.13	2.38 ± 0.60	10
PU-II-255	70.16 ± 0.77	0.89 ± 0.09	13.97 ± 0.11	5.17 ± 0.29	0.83 ± 0.07	2.68 ± 0.21	3.60 ± 0.36	2.69 ± 0.11	12
PU-II-419	56.15 ± 0.93	1.26 ± 0.23	15.13 ± 1.21	9.85 ± 0.94	4.32 ± 0.75	8.82 ± 0.40	3.58 ± 0.17	0.89 ± 0.18	9
PU-II-633	77.74 ± 0.22	0.06 ± 0.04	13.62 ± 0.16	1.32 ± 0.09	0.21 ± 0.03	1.26 ± 0.06	2.63 ± 0.23	3.17 ± 0.07	11
PU-II-901	74.75 ± 1.59	0.31 ± 0.12	14.43 ± 0.45	2.60 ± 0.55	0.57 ± 0.15	2.84 ± 0.58	2.81 ± 0.29	1.69 ± 0.50	11
PU-II-929-pop 1	73.85 ± 0.56	0.37 ± 0.08	14.91 ± 0.19	2.48 ± 0.14	0.40 ± 0.08	1.71 ± 0.19	3.49 ± 0.15	2.78 ± 0.10	9
PU-II-929-pop 2	58.86 ± 0.80	1.72 ± 0.17	15.24 ± 0.08	9.25 ± 0.34	3.04 ±0.35	6.74 ± 0.33	3.81 ± 0.16	1.36 ± 0.13	3
PU-II-933-pop 1	59.47 ± 1.24	1.86 ± 0.08	14.88 ± 0.40	9.46 ± 0.46	2.84 ± 0.55	6.42 ± 0.65	3.55 ± 0.54	1.51 ± 0.23	5
PU-II-933-pop 2	67.24 ± 0.00	0.89 ± 0.00	14.94 ± 0.00	5.76 ± 0.00	1.06 ± 0.00	3.76 ± 0.00	3.42 ± 0.00	2.93 ± 0.00	1
PU-II-933-pop 3	73.50 ± 1.66	0.39 ± 0.19	15.48 ± 1.56	2.25 ± 0.52	0.37 ± 0.18	1.92 ± 0.56	3.57 ± 1.03	2.53 ± 0.56	5
Historical lavas[b]									
CC-1960	70.38 ± 0.31	0.69 ± 0.02	14.27 ± 0.04	4.06 ± 0.07	0.47 ± 0.07	2.19 ± 0.07	5.17 ± 0.20	2.78 ± 0.04	7
CC-1921-22	69.47 ± 0.11	0.78 ± 0.03	14.47 ± 0.06	4.37 ± 0.10	0.63 ± 0.06	2.50 ± 0.07	5.15 ± 0.13	2.63 ± 0.01	4