

Table 1. Major elements. Values are reported in weight percent (wt. %)
 Tabla 1. Elementos mayores. Los valores se reportan en porcentaje en peso.

Sample	SiO ₂	TiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MnO	MgO	CaO	Na ₂ O	K ₂ O	P ₂ O ₅	LOI	Total
Qt1												
<i>a</i> HJ-14-02	68.37	0.59	15.68	3.65	0.08	0.66	1.85	5.31	3.81	0.14	0.03	100.10
HJ-14-17	68.84	0.53	15.26	3.17	0.07	0.62	1.65	5.14	4.44	0.12	0.01	99.84
HJ-14-22	67.56	0.57	15.91	3.56	0.08	0.67	1.98	5.58	3.73	0.13	0.04	99.80
HJ-14-23	67.05	0.68	16.03	4.06	0.09	0.86	2.25	5.27	3.61	0.18	0.07	100.00
HJ-14-33	66.06	0.68	15.77	4.04	0.09	0.83	2.28	6.00	3.86	0.17	0.14	99.91
HJ-14-34	66.84	0.69	15.81	4.09	0.08	0.87	2.25	5.31	3.62	0.19	0.26	100.00
HJ-14-65	68.31	0.73	15.54	3.09	0.07	0.78	1.89	5.20	4.00	0.14	0.18	99.92
HK-14-02	67.55	0.58	15.96	3.56	0.08	0.68	1.88	5.48	3.70	0.14	0.19	99.82
HK-14-03	68.35	0.54	15.55	3.23	0.07	0.71	1.74	5.08	4.00	0.13	0.32	99.72
HK-14-04	68.03	0.58	15.76	3.62	0.08	0.63	1.80	5.31	3.81	0.14	0.05	99.80
HK-14-07	68.57	0.56	15.25	3.38	0.07	0.72	1.73	5.00	4.12	0.15	0.26	99.81
HK-14-11	68.14	0.56	15.33	3.67	0.09	0.66	1.92	5.40	3.94	0.12	0.05	99.86
HK-14-12	66.61	0.68	16.33	3.92	0.08	0.85	2.24	5.42	3.50	0.16	0.03	99.81
<i>e</i> CH52a	67.00	0.59	15.70	3.75	0.08	0.77	2.04	5.20	3.65	0.13	0.42	99.33
CH59	65.00	0.66	15.50	3.85	0.08	0.88	2.20	5.34	3.58	0.16	0.58	97.83
<i>f</i> 1165	68.39	0.59	15.78	3.61	0.08	0.75	1.98	5.53	3.78	0.09	0.19	100.77
1176	67.25	0.60	15.75	3.23	0.10	0.77	2.02	5.53	3.85	0.12	0.14	99.36
Qb1												
<i>a</i> HJ-14-08	48.56	1.51	17.15	10.47	0.16	8.56	10.22	3.27	0.36	0.20	0.58	99.89
HJ-14-20	48.55	1.42	17.53	10.33	0.16	7.99	10.55	3.29	0.33	0.17	0.54	99.79
HK-14-16	48.53	1.49	16.81	10.89	0.17	8.68	10.05	3.12	0.35	0.19	0.46	99.82
HU1128	48.65	1.44	17.86	10.69	0.16	8.60	9.42	3.01	0.40	0.21	0.54	99.89
<i>e</i> HF117	49.20	1.22	16.06	8.88	0.02	11.11	8.95	3.24	0.49	0.18	–	99.35
CH51a	48.61	1.44	17.11	10.76	0.17	8.11	10.49	3.03	0.32	0.16	–	100.20
CH51b	48.49	1.40	17.37	10.65	0.17	8.24	10.60	3.14	0.26	0.15	–	100.47
CH53	48.36	1.48	16.77	10.94	0.17	8.51	10.05	3.18	0.39	0.20	–	100.04
<i>f</i> 935	49.23	1.61	16.96	9.73	0.23	8.59	9.98	3.48	0.58	0.21	0.03	100.63
1167	48.50	1.70	16.99	9.94	0.22	8.57	9.90	3.38	0.48	0.22	–	99.90
Qtab												
<i>a</i> HJ-14-27	55.02	1.60	16.69	9.13	0.14	3.93	7.36	4.20	1.66	0.37	0.09	99.99
HJ-14-28	56.56	1.44	16.76	8.32	0.13	3.61	6.99	4.33	1.74	0.34	0.21	100.01
HJ-14-29	57.87	1.53	16.42	8.31	0.13	2.93	6.02	4.55	2.01	0.38	0.28	99.87
HJ-14-30	57.81	1.52	16.56	8.32	0.12	2.89	5.99	4.49	2.05	0.39	0.02	100.17
HJ-14-31	57.15	1.33	17.30	7.30	0.11	2.94	6.53	4.18	2.01	0.33	0.55	99.74
HJ-14-32	57.45	1.50	16.66	8.28	0.12	2.97	6.14	4.55	2.00	0.37	0.18	99.86
HJ-14-71	57.21	1.53	16.74	8.17	0.13	3.07	6.21	4.71	2.07	0.37	0.26	99.94
HJ-14-73	56.35	1.53	16.86	8.11	0.13	3.82	6.94	4.20	1.85	0.33	0.01	100.11
LH-13-01	54.20	1.63	17.08	8.88	0.14	3.88	7.34	4.25	1.70	0.38	0.20	99.70
HU1101	54.74	1.60	17.72	8.99	0.14	3.77	7.08	4.04	1.64	0.34	0.29	99.76
HU1102	54.41	1.54	17.70	8.83	0.13	3.98	7.31	3.95	1.65	0.35	0.03	99.82
HU1103	55.79	1.40	17.85	8.17	0.12	3.68	7.00	4.06	1.74	0.31	0.16	99.96
HU1104	56.29	1.46	17.88	8.40	0.12	3.49	6.76	4.20	1.65	0.33	0.04	100.54
HU1105	57.74	1.52	17.26	8.26	0.12	2.80	5.89	4.47	1.93	0.37	0.23	100.58
HU1106	57.37	1.51	17.36	8.33	0.13	2.81	5.97	4.39	1.94	0.37	0.75	100.94
HU1107	58.00	1.55	16.75	8.31	0.12	2.77	6.01	4.62	1.93	0.36	0.58	99.84
HU1108	57.43	1.48	17.04	8.15	0.12	2.85	6.05	4.50	1.91	0.37	0.74	100.64
HU1111	57.26	1.50	17.43	8.22	0.12	2.81	5.91	4.25	2.00	0.36	0.33	100.19
HU1112	56.08	1.40	17.75	8.27	0.12	3.69	7.12	4.22	1.62	0.32	0.27	100.85
<i>f</i> CH46	54.00	1.46	17.42	7.85	0.13	4.36	7.71	4.24	1.53	0.35	0.67	99.72
CH47	53.93	1.43	17.35	8.91	0.14	4.60	6.67	3.75	2.02	0.39	0.58	99.77
Qtal												
<i>a</i> HK-14-19	58.37	1.52	16.25	8.35	0.14	2.79	5.36	4.65	2.36	0.40	0.18	100.00
HK-14-23	57.83	1.51	16.29	8.28	0.14	2.80	5.38	4.73	2.36	0.40	0.15	99.88
HK-14-35	55.93	1.38	17.93	7.29	0.11	3.11	7.27	4.03	1.87	0.37	0.67	99.95
HK-14-45	56.87	1.17	17.70	6.41	0.10	4.00	7.67	3.52	1.76	0.22	0.62	100.03
HK-14-46	58.15	1.32	16.93	7.42	0.11	3.02	6.22	4.13	2.10	0.31	0.44	100.15
HK-14-47	55.34	1.59	16.94	8.79	0.14	3.72	6.64	4.38	1.98	0.36	0.07	99.94
HU1109	58.88	1.49	16.99	8.03	0.14	2.47	5.12	4.87	2.26	0.38	0.17	100.78
HU1110	59.65	1.14	17.81	6.72	0.10	2.56	5.86	4.33	2.09	0.25	0.02	100.48
HU1124	56.92	1.48	17.45	8.18	0.12	2.73	6.00	4.34	2.14	0.37	0.23	99.94
<i>f</i> CH39	52.69	1.40	18.18	7.71	0.14	4.90	8.03	3.93	1.87	0.33	0.90	100.08
CH40	53.05	1.20	18.82	8.21	0.14	4.71	7.30	2.96	1.88	0.39	1.16	99.82
Qab												
<i>a</i> HJ-14-24	56.81	1.34	16.93	7.89	0.12	3.60	6.98	4.24	1.75	0.32	-0.11	99.98
HJ-14-39	56.29	1.08	18.70	6.51	0.10	3.23	7.83	3.95	1.66	0.26	0.14	99.75
HJ-14-40	56.52	1.06	18.41	6.64	0.10	3.46	7.88	3.72	1.63	0.26	0.39	100.06
HJ-14-42	53.74	1.61	17.08	9.42	0.14	4.33	7.69	4.01	1.48	0.36	0.03	99.90
HK-14-20	53.31	1.51	17.59	9.17	0.14	4.64	7.95	3.90	1.42	0.35	0.06	99.91
HK-14-48	52.77	1.57	17.83	9.06	0.14	4.61	8.07	4.09	1.47	0.35	0.01	99.96
HK-14-50	53.37	1.64	17.04	9.37	0.15	4.46	7.50	4.34	1.61	0.36	0.27	100.10
HU1117	53.13	1.52	18.45	9.14	0.13	4.52	7.75	3.72	1.33	0.35	0.13	99.90
HU1118	56.57	1.31	18.29	7.54	0.11	3.45	7.43	3.83	1.60	0.31	0.26	100.69
HU1119	53.23	1.56	18.10	9.29	0.14	4.36	7.49	3.95	1.40	0.36	0.01	99.87
HU1120	56.12	1.06	19.72	6.57	0.10	3.14	7.64	3.70	1.56	0.25	1.13	100.98
<i>f</i> CH16	52.91	1.54	18.39	7.86	0.14	4.44	7.54	3.65	1.31	0.39	1.60	99.77
CH18	52.52	1.58	18.38	8.12	0.14	4.87	7.82	3.60	1.38	0.36	0.71	99.48
CH24	54.02	0.82	21.77	5.14	0.08	3.00	9.46	3.24	1.23	0.28	0.91	99.95
CH25	55.68	1.02	20.28	5.60	0.09	3.15	8.56	3.40	1.44	0.24	0.68	100.14
CH27	55.09	0.88	20.02	6.00	0.09	4.25	8.18	2.51	1.92	0.25	0.84	100.03
CH28	55.37	0.96	19.80	5.84	0.09	3.59	8.52	3.51	1.49	0.24	0.87	100.28
CH30	55.93	0.95	19.72	5.62	0.09	3.32	7.82	3.84	1.52	0.23	0.51	99.55
CH31	55.83	1.03	19.40	5.64	0.09	3.34	7.54	3.99	1.51	0.24	0.83	99.44
CH33	51.86	1.40	18.71	8.66	0.14	5.13	7.03	3.12	1.69	0.47	0.84	99.05
CH34	52.54	1.34	19.10	8.39	0.14	5.58	7.08	2.94	1.68	0.39	0.75	99.93
903	53.65	1.94	17.72	7.33	0.20	4.97	7.90	4.16	1.37	0.40	–	99.64
1171	56.77	1.26	17.26	7.49	0.12	3.69	7.11	4.43	1.66	0.28	–	100.07

Data from: (a) This work; (b) Carrasco-Núñez and Branney (2005); (c) Dávila-Harris and Carrasco-Núñez (2014); (d) Ferriz and Mahood (1987); (e) Verma (2000); (f) Verma and López (1982); (g) Willcox (2011).

Table 1. Continued

Sample	SiO ₂	TiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MnO	MgO	CaO	Na ₂ O	K ₂ O	P ₂ O ₅	LOI	Total
Qab1												
<i>a</i> HJ-14-14	57.19	0.93	18.62	6.12	0.09	3.40	7.98	3.62	1.65	0.21	0.27	100.09
HJ-14-54	56.34	0.94	18.99	6.00	0.09	3.47	8.19	3.83	1.60	0.21	0.28	99.95
HJ-14-55	54.59	1.32	19.25	6.76	0.10	3.77	8.06	4.01	1.51	0.28	0.30	99.95
HJ-14-56	55.89	1.46	18.60	6.54	0.10	3.72	7.74	3.76	1.55	0.27	0.26	99.87
HJ-14-57	56.39	0.95	19.00	6.09	0.09	3.45	8.13	3.88	1.61	0.21	0.16	99.95
HJ-14-58	55.35	1.14	18.79	7.06	0.11	3.79	7.87	3.86	1.66	0.27	0.23	100.11
<i>f</i> 1159	54.94	1.12	17.41	7.62	0.13	4.90	9.01	3.75	1.31	0.26	—	100.45
QtC												
<i>c</i> TC-22	66.48	0.49	15.40	3.18	0.06	0.80	1.83	4.62	4.06	0.14	3.03	100.09
TC-48A	64.91	0.58	15.53	3.33	0.08	0.79	1.98	5.24	3.88	0.13	3.70	100.13
TC-24	66.46	0.52	15.02	3.30	0.07	0.81	1.85	4.75	4.11	0.15	3.05	100.09
TC-26	63.68	0.76	15.84	4.67	0.08	1.43	2.70	4.72	3.51	0.20	2.46	100.06
TC-04	53.27	1.56	18.19	9.22	0.13	4.36	7.27	3.99	1.44	0.34	0.24	100.00
TC-27	53.36	1.53	17.97	9.25	0.14	4.43	7.47	3.92	1.39	0.32	0.22	100.00
TC-28	64.84	0.61	15.82	3.82	0.08	0.86	2.00	5.06	3.67	0.16	3.17	100.10
TC-06	53.81	1.50	17.43	8.98	0.13	4.54	7.49	4.04	1.45	0.33	0.32	100.00
TC-29	56.66	1.21	18.51	6.99	0.10	3.17	6.79	3.78	1.80	0.24	0.77	100.01
TC-30	58.49	1.31	16.83	7.18	0.10	2.37	4.77	4.28	2.24	0.30	2.17	100.05
TC-13A	63.81	0.65	16.24	4.04	0.08	0.94	2.07	5.03	3.54	0.16	3.46	100.00
TC-13C	59.27	1.32	16.68	7.29	0.11	2.51	4.99	4.57	2.24	0.34	0.68	100.00
TC-51A	59.94	1.19	16.94	6.47	0.10	2.35	5.10	4.63	2.22	0.27	0.80	100.01
Qta2												
<i>a</i> HJ-14-70	57.17	1.57	16.71	8.23	0.13	2.92	6.00	4.73	2.11	0.38	0.01	99.94
HK-14-15	57.06	1.53	16.69	8.02	0.13	2.95	6.19	4.49	2.05	0.38	0.36	99.84
HK-14-17	57.46	1.57	16.43	8.46	0.13	2.82	5.92	4.35	2.18	0.40	0.04	99.75
HK-14-18	59.01	1.18	17.24	6.71	0.10	2.85	6.03	4.40	2.11	0.28	0.13	99.76
HK-14-36	57.01	1.54	16.71	8.24	0.13	2.98	6.07	4.60	2.21	0.38	0.08	99.94
HK-14-37	54.53	1.78	16.75	9.26	0.15	3.75	7.21	4.44	1.73	0.39	0.04	99.95
HK-14-38	57.11	1.54	16.79	8.21	0.13	2.97	6.09	4.75	2.01	0.38	0.03	99.94
HK-14-39	57.36	1.53	16.79	8.19	0.13	2.98	6.14	4.76	2.02	0.38	0.32	99.94
HK-14-40	58.39	1.93	16.27	7.72	0.12	2.90	5.69	4.55	2.04	0.38	0.04	99.95
HU1129	57.77	1.50	17.26	8.26	0.12	2.80	5.99	4.54	1.93	0.36	0.58	101.10
<i>f</i> CH56	54.35	1.71	16.68	9.35	0.15	3.81	7.17	4.67	1.66	0.38	—	99.93
<i>e</i> 1178	57.70	1.51	16.85	8.21	0.13	2.97	6.11	4.74	1.95	0.33	—	100.50
Qta3												
<i>a</i> HJ-14-01	59.57	1.36	16.72	7.58	0.11	2.60	5.57	4.37	2.07	0.33	0.29	99.97
HJ-14-03	61.16	1.20	17.19	5.99	0.12	1.90	4.11	5.25	2.52	0.45	0.16	99.72
HJ-14-04	60.12	1.34	16.36	7.31	0.11	2.34	5.07	4.54	2.34	0.34	-0.04	99.86
HJ-14-05	58.95	1.45	16.70	7.41	0.11	2.58	5.54	4.46	2.15	0.35	0.23	99.93
HJ-14-06	58.38	1.46	16.45	7.69	0.11	2.55	5.45	4.80	2.18	0.36	0.75	100.18
HJ-14-18	56.46	1.42	17.07	7.79	0.12	3.03	6.41	4.01	1.94	0.35	1.13	99.74
HJ-14-46	59.96	1.52	16.34	7.24	0.11	2.65	5.40	4.36	2.13	0.32	0.14	99.89
HJ-14-49	58.59	1.56	16.08	7.98	0.12	2.78	5.65	4.42	2.19	0.38	0.41	100.16
HJ-14-59	59.40	1.50	16.53	7.29	0.12	2.49	4.82	4.73	2.38	0.39	0.26	99.91
HJ-14-60	59.26	1.48	16.58	7.80	0.12	2.64	5.30	4.52	2.28	0.36	0.20	100.13
HJ-14-62	60.29	1.35	17.13	6.74	0.11	2.40	4.68	4.61	2.56	0.30	0.11	100.06
HJ-14-64	56.08	1.41	16.88	7.97	0.12	3.03	6.43	4.15	1.91	0.35	1.62	99.94
HK-14-05	61.42	1.23	16.64	6.35	0.11	2.09	4.59	4.76	2.39	0.31	0.16	99.72
HK-14-06	58.13	1.57	16.78	7.58	0.12	2.79	5.93	4.22	2.10	0.40	0.41	100.04
HK-14-29	59.69	1.39	16.45	7.58	0.12	2.64	5.42	4.51	2.25	0.32	0.28	100.11
HK-14-30	59.34	1.36	16.70	7.55	0.12	2.77	5.59	4.33	2.18	0.32	0.12	100.14
HK-14-31	56.91	1.38	17.81	7.41	0.11	2.82	6.61	3.96	2.01	0.30	0.78	100.11
<i>f</i> CH1	59.34	1.40	16.72	6.44	0.12	2.63	5.38	5.00	2.27	0.35	0.54	100.19
CH4	59.23	1.41	16.78	6.45	0.12	2.65	5.50	4.84	2.21	0.35	0.61	100.15
Qab2												
<i>a</i> HJ-14-38	54.55	1.14	19.15	6.86	0.11	3.71	8.07	3.96	1.53	0.27	0.39	99.75
HJ-14-52	57.29	0.93	19.02	6.09	0.10	3.41	7.89	3.73	1.64	0.21	0.11	100.18
HJ-14-53	55.97	1.09	19.67	5.77	0.09	3.38	8.09	3.73	1.61	0.21	0.35	99.95
HK-14-33	55.42	1.15	18.73	7.08	0.11	3.80	7.83	3.95	1.59	0.27	0.25	100.19
HJ-15-01	56.16	0.92	19.13	5.88	0.09	3.76	8.48	3.74	1.50	0.20	0.09	99.95
<i>f</i> 1158	54.91	1.37	18.75	4.78	0.14	4.30	8.91	4.03	1.41	0.29	0.18	99.07
Qta4												
<i>a</i> HJ-14-10	62.29	0.92	16.80	5.15	0.08	2.31	4.47	4.43	2.59	0.25	0.74	100.02
HJ-14-12	60.87	1.25	16.53	6.79	0.10	2.30	5.07	4.47	2.26	0.31	0.02	99.90
HJ-14-15	59.81	1.48	16.54	7.28	0.11	2.32	4.99	4.76	2.28	0.41	0.13	99.84
HJ-14-19	62.97	0.96	16.66	5.36	0.08	1.88	4.10	4.50	2.78	0.28	0.23	99.80
HJ-14-21	61.83	0.97	16.58	5.58	0.09	2.31	4.63	4.22	2.82	0.27	0.58	99.86
HJ-14-25	62.88	0.97	16.42	5.49	0.10	2.11	4.32	4.48	2.86	0.26	0.00	99.89
HJ-14-67	60.63	1.31	16.85	6.33	0.10	2.42	5.24	4.65	2.21	0.29	0.11	99.93
HK-14-14	62.03	1.07	16.80	5.82	0.09	2.03	4.50	4.74	2.53	0.27	0.15	99.73
Qt2												
<i>a</i> HJ-14-45	68.22	0.59	15.36	3.40	0.08	0.79	1.90	5.42	4.14	0.13	0.05	100.09
HJ-14-48	66.43	0.60	16.01	3.86	0.08	0.70	1.81	5.35	4.13	0.14	0.81	99.90
HK-14-28	68.37	0.98	15.27	3.10	0.07	0.81	1.86	5.21	4.07	0.14	0.05	99.91
Qr1												
<i>a</i> HJ-14-16	70.23	0.44	14.98	2.49	0.05	0.45	1.30	5.12	4.30	0.08	0.26	99.71
HJ-14-47	68.86	0.50	15.04	3.00	0.06	0.83	1.89	4.96	4.17	0.10	0.50	99.91
HK-14-08	71.59	0.28	14.94	2.01	0.03	0.19	0.73	4.83	5.04	0.05	0.29	99.98
HJ-15-08	69.08	0.52	15.24	3.18	0.06	0.81	1.97	4.72	4.13	0.13	0.30	100.15
Qr2												
<i>a</i> HJ-14-13	71.48	0.39	14.38	2.37	0.05	0.40	1.07	4.80	4.56	0.08	0.33	99.90
HK-14-10	70.61	0.42	15.01	2.64	0.05	0.48	1.32	4.80	4.30	0.08	0.12	99.82

Table 1. Continued

Sample	SiO ₂	TiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MnO	MgO	CaO	Na ₂ O	K ₂ O	P ₂ O ₅	LOI	Total
QigZ												
b M2	58.34	1.41	17.13	7.00	0.1	2.53	5.24	3.36	2.17	0.26	1.63	99.17
P2	60.37	1.27	16.43	6.51	0.1	2.01	4.5	3.55	2.46	0.35	1.89	99.44
P4	60.68	1.3	16.45	6.34	0.104	2.05	4.55	3.9	2.54	0.39	1.77	100.074
F2	61.46	1.14	16.49	5.85	0.11	1.65	4.27	4.17	2.67	0.36	1.41	99.58
I2	61.74	1.09	16.37	5.65	0.1	1.6	4.2	4.02	2.9	0.35	1.63	99.65
C2	64.33	0.74	15.66	4.42	0.07	1.07	2.99	4.1	3.33	0.16	2.16	99.03
M3	64.86	0.76	15.87	4.32	0.084	1.06	3.07	4.25	3.42	0.2	2.1	99.994
M1	65.36	0.71	15.42	4.3	0.07	1.09	2.5	3.8	3.56	0.14	2.29	99.24
D1	67.24	0.51	14.81	3.26	0.06	0.64	1.9	4.22	3.96	0.09	2.22	98.91
I1	67.62	0.5	14.78	3.19	0.06	0.61	1.75	3.91	4.11	0.08	2.33	98.94
U	67.67	0.47	14.75	3.07	0.05	0.57	1.61	3.96	4.61	0.08	2.6	99.44
D2	67.7	0.52	14.92	3.26	0.06	0.67	1.9	4.16	4.06	0.09	2.44	99.78
B	67.76	0.48	14.62	3.08	0.05	0.6	1.72	4.2	4.06	0.08	2.5	99.15
A	67.89	0.55	14.99	3.12	0.06	0.63	1.95	4.16	4.05	0.08	2.32	99.8
F1	68.08	0.47	14.78	3.05	0.05	0.53	1.67	4.04	4.18	0.08	2.14	99.07
P1	68.13	0.47	14.76	2.3	0.05	0.57	1.49	3.97	4.41	0.08	2.28	98.51
I3	68.59	0.52	15.05	3.09	0.06	0.58	1.82	4.08	4.21	0.08	2.16	100.24
C1	68.6	0.45	14.66	2.86	0.05	0.46	1.49	4.15	4.24	0.07	2.51	99.54
P3	68.96	0.49	14.88	2.89	0.061	0.51	1.53	4.1	4.47	0.07	2.17	100.131
F3	69.02	0.49	14.98	2.94	0.061	0.52	1.71	4.13	4.21	0.07	2.02	100.151
QtF												
a LH-15-04b	68.07	0.78	14.11	2.14	0.06	1.03	1.34	3.98	4.50	0.09	4.02	100.12
g 14A-07	61.86	0.88	15.24	5.08	0.09	2.13	4.57	4.37	2.94	0.20	2.21	99.57
14A-05	66.78	0.56	14.66	2.94	0.06	0.67	2.03	4.31	4.10	0.13	3.30	99.53
28A01	58.78	1.06	17.33	6.42	0.11	3.15	6.50	4.14	1.88	0.29	0.64	100.29
28A02	67.17	0.49	14.92	2.82	0.06	0.55	1.90	4.57	3.93	0.11	3.41	99.93
28A05	59.17	1.12	16.87	6.36	0.11	2.96	6.21	3.91	2.06	0.32	1.26	100.35
15C03-08	66.68	0.55	14.44	2.86	0.06	0.63	1.85	4.22	4.36	0.13	3.58	99.35
15C-11	65.40	0.67	14.97	3.36	0.06	0.87	2.40	4.31	3.88	0.18	3.50	99.60
08A-03	65.62	0.66	14.87	3.48	0.06	0.88	2.48	4.43	3.87	0.18	3.20	99.73
36C06	62.65	1.10	16.19	5.85	0.10	1.99	4.49	4.57	2.42	0.29	0.56	100.21
36C07	66.52	0.71	15.40	3.86	0.07	1.02	2.66	4.50	3.19	0.18	2.29	100.40
d LH-31	72.20	0.32	14.70	1.93	0.04	0.37	1.16	4.44	4.71	0.06	4.40	104.33
LH-33	71.80	0.36	14.70	2.09	0.04	0.43	1.21	4.28	4.86	0.05	4.49	104.31
LH-34	69.10	0.56	15.50	3.12	0.05	0.75	2.14	4.36	4.25	0.14	3.71	103.68
LH-35	58.70	1.14	16.90	6.66	0.10	3.52	6.74	3.98	1.85	0.31	0.29	100.19
LH-36	69.20	0.55	15.50	2.91	0.05	0.73	2.01	4.51	4.35	0.14	3.86	103.81
QigX												
a LH-15-03	74.09	0.13	13.16	1.36	0.03	0.08	0.42	3.65	4.76	0.02	2.30	100.00
LH-15-04a	73.53	0.38	12.19	1.33	0.04	0.50	0.67	3.37	4.71	0.02	3.40	100.14
g 87D02	62.31	0.82	15.99	4.50	0.08	1.91	3.98	3.63	3.16	0.23	3.28	99.89
87D03	59.82	1.05	15.99	5.43	0.08	2.17	5.07	4.05	2.10	0.30	2.40	98.46
76B01	59.75	0.75	19.60	4.34	0.07	0.86	2.32	2.85	2.25	0.16	7.39	100.34
76B06	70.22	0.47	15.19	2.86	0.06	0.40	1.53	3.93	3.32	0.09	3.47	101.54
Various	70.99	0.34	14.39	2.39	0.06	0.35	1.31	3.65	3.84	0.06	3.11	100.49
76E02	73.30	0.11	14.17	1.70	0.04	0.02	0.46	3.33	4.30	0.01	3.43	100.87
29F02	62.62	0.95	16.47	4.66	0.09	1.22	3.04	3.59	2.51	0.25	5.18	100.58
58E01	61.97	0.86	16.69	4.82	0.09	1.05	2.77	3.74	3.03	0.20	4.99	100.21
d LH-7	76.90	0.05	12.40	1.17	0.02	—	0.40	3.64	5.16	—	3.39	103.13
LH-8	76.40	0.08	12.90	1.20	—	—	0.40	3.05	5.78	—	3.34	103.15
LH-11	71.30	0.26	16.60	2.04	0.04	0.31	0.86	3.11	5.33	—	5.24	105.09
LH-13	72.80	0.22	14.60	1.87	0.03	0.28	0.87	3.71	5.42	<0.05	3.70	103.50
LH-14	72.40	0.26	14.60	1.77	0.03	0.29	0.86	4.16	5.48	0.06	3.01	102.92
LH-17	60.80	0.99	16.40	6.19	0.10	3.35	5.15	3.89	2.81	0.21	1.77	101.66
LH-19	69.40	0.51	15.20	3.14	0.06	0.90	2.15	4.13	4.27	0.13	4.41	104.30
LH-20	66.40	0.76	16.10	4.28	0.08	1.06	2.65	4.50	3.88	0.21	3.99	103.91
LH-21	63.70	1.13	16.10	5.47	0.09	1.68	4.02	4.33	2.98	0.36	1.97	101.83
Qr												
a HJ-14-72	73.59	0.12	13.68	0.86	0.06	0.14	0.61	4.06	4.60	0.04	2.14	99.89
Qb2												
a HJ-14-36	52.99	1.05	18.12	7.76	0.12	5.75	9.03	3.45	1.12	0.23	0.26	99.88
HJ-14-44	56.00	1.08	17.42	6.91	0.11	4.47	7.69	3.72	1.88	0.23	0.43	99.95
HJ-14-74	53.73	1.67	16.21	8.37	0.14	6.14	7.83	3.74	1.48	0.39	0.30	99.99
HK-14-26	48.32	1.39	16.28	10.42	0.15	9.13	10.34	2.75	0.72	0.23	0.06	99.78
e CH55b	51.20	1.65	16.58	10.40	0.16	5.91	8.11	3.50	1.30	0.27	0.24	99.32
Qr3												
a HJ-14-35	76.68	0.11	12.77	0.74	0.05	0.08	0.33	4.27	4.41	0.01	0.35	99.79
HJ-14-37	73.99	0.14	12.79	1.33	0.03	0.08	0.49	3.43	5.31	0.03	2.19	99.80
HJ-14-51	72.87	0.12	14.47	0.90	0.04	0.11	0.57	4.47	5.02	0.01	1.41	99.98
HK-14-21	76.21	0.15	13.02	1.27	0.03	0.12	0.44	3.96	4.73	0.02	0.21	100.15
HK-14-22	76.13	0.10	13.30	0.88	0.04	0.07	0.31	3.77	4.44	0.01	0.74	99.79
HK-14-32	76.69	0.10	12.77	0.83	0.05	0.09	0.35	4.42	4.32	0.01	0.36	99.99
HK-14-41	75.01	0.17	13.09	1.44	0.04	0.14	0.54	4.39	4.95	0.02	0.16	99.94
HK-14-42	73.17	0.16	13.05	1.41	0.04	0.13	0.52	3.95	4.99	0.02	2.50	99.95
HK-14-43	75.92	0.12	12.77	1.20	0.03	0.12	0.40	4.07	4.92	0.02	0.40	99.98
Qr4												
a HK-14-34	74.47	0.12	12.40	0.97	0.03	0.13	0.44	3.78	4.89	0.02	2.69	99.95
HK-14-51	74.36	0.12	12.27	0.96	0.03	0.17	0.43	3.43	5.33	0.02	2.84	99.95
d LH-5	76.60	0.09	12.70	0.97	0.02	0.13	0.43	3.53	5.38	—	3.59	103.44
LH-6	75.80	0.09	14.20	1.01	0.04	0.11	0.36	3.47	4.84	—	4.75	104.67
Tpa												
a HK-14-44	47.07	2.76	17.47	13.33	0.19	5.58	8.53	4.07	0.91	0.49	-0.40	99.98
d LH-1	47.40	2.16	17.30	12.61	0.18	6.72	9.18	3.24	0.71	0.36	0.75	100.61
LH-3	47.00	2.80	16.40	13.62	0.20	5.85	8.88	3.71	0.94	0.52	0.69	100.61
LH-4	47.80	2.49	17.10	12.45	0.17	5.93	8.86	3.71	0.87	0.51	1.49	101.38

Table 2. Summary of main features of the LHVC lithostratigraphic units.

Tabla 2. Resumen de las características principales de las unidades litoestratigráficas de LHVC

Stratigraphic Unit	Structure	Mineralogy / texture	Lithology	Age (method)
<i>4.1 Pre-caldera basement and intrusive rocks</i>				
Pz/K.- Granodiorites and schists	deformed crystalline complex	pl, k feld, qz, bt, hbl / hipidiomorphic / qz, musc	granodiorite, granite & schists	131± 5-246±7 ka (K/Ar; 10)
K/J.- Limestones and shales	deformed stratified		limestone, shale, sandstone, dolomite	Jurassic-Cretaceous
Tig.- Granites	stock	qz, k feld, pl, bt / phaneritic	granites and granodiorites	15.12±0.64 Ma (U/Pb; 1)
<i>4.2 Pre-caldera volcanism</i>				
Tm.- Miocene dacitic and andesitic lava flows	massive lava flows	pl, px, bt, hbl / porphyritic	andesite-dacite lava	8.9±0.4 Ma (K/Ar; 2) - 10.5±0.7 Ma (K/Ar; 10)
Tpa.- Pliocene Teziutlán andesitic lava flows	massive lava flows	pl, ol, opx, cpx / porphyritic	basalts to andesites	1.46 ± 0.31 to 2.61± 0.43 (Ar/Ar; 4)
<i>4.3 Other volcanism</i>				
Qacp2-Qacp3.- Cofre de Perote andesitic and trachyandesitic lava flows	lava flows and breccias	pl, opx, cpx / porphyritic	andesite and trachyandesites	510±60-307±35 ka (K/Ar; 3)
Qr.- Cerro Pizarro-Águilas rhyolitic domes	lava dome	qz, k feld, plg, bt / porphyritic	rhyolitic dome	220±60 - 65±10 ka (Ar/Ar; 6)
Qb2.- Basaltic and basaltic andesite lava flows	lava flows	pl, px, ol / porphyritic	basalts and basaltic andesites	190±20 Ka (Ar/Ar, 6)
<i>5. Los Humeros evolutionary stages</i>				
<i>5.1 Pre-caldera stage</i>				
Qr3.- Rhyolitic domes	masive lava dome	qz, pl, bt / glassy (sperulitic); banded	rhyolites dome	155.7±4.9 - 270 ±17ka (K/Ar; 8)
Qr4.- Rhyolitic lavas and dome	flow banded lava	qz, pl, bt / porphyritic	rhyolites	486.5±2.4 - 693±1.9 ka (Ar/Ar; 5)
<i>5.2 Caldera stage</i>				
QigX.- Xáltipan ignimbrite	massive ignimbrite welded and non-welded	pl, px, bt, hbl, glass / pyroclastic	rhyolitic and rhyodacitic ignimbrite	164±4.2 ka (Ar/Ar & U/Th; 5)
Qr2.- Los Potreros rhyolitic lavas	flow banded lavas	pl, k feld, px, qz / porphyritic	rhyolitic lavas	74.2±4.5 ka (U/Th; 5)
QtF.- Faby tuff	stratified sequence of fallout deposits	opx, cpx, hbl / vesicular	rhyodacitic to andesitic pumice	70±23 ka (Ar/Ar; 5)
QigZ.- Zaragoza ignimbrite	non-indurated massive intraplinian ignimbrite	opx, cpx, pl / pyroclastic	andesitic to dacitic ignimbrite	69±16 ka (Ar/Ar; 5)
<i>5.3 Post-Caldera stage</i>				
<i>5.3.1 Resurgent phase</i>				
Qr1.- Rhyolitic domes	flow banding domes	pl, k feld, opx, cpx / glassy	rhyolitic domes	44.8±1.7 ka (U/Th; 5) - 50.7±4.4 ka (Ar/Ar; 5)
Qt2.- Chicomiapa-Los Parajes trachytic lava flows	lava flows	pl, opx, cpx / porphyritic	trachytic lava	
QXm.- Xoxoctic member	fallout deposits	ol, pl, glass / vesicular	dacitic air-fall tuff	
Qta4.- Maxtaloya trachyandesitic and trachytic lava flows	lava flows	pl, px, hbl / porphyritic	trachyandesites and trachytes	
QLt.- Llano tuff	partly welded ignimbrite	pl, k feld, cpx, opx / welded pyroclastic	andesitic ignimbrite	28.27±0.11 ka (¹⁴ C; 9)
<i>5.3.2 Ring-fracture & bimodal phase</i>				
Qta3.- San Antonio-Las Chapas trachyandesitic lava flows	vesicular, brecciated lava	pl, px, ol / porphyritic	trachyandesites	8.9±0.03 ka (¹⁴ C; 1)
Qab2.- Orilla del Monte basaltic andesite lava flows	vesiculated lava flows	pl, cpx, opx, ol / porphyritic	basaltic andesites	

Continued: Table 2. Summary of main features of the LHVC lithostratigraphic units.

Continúa: Tabla 2. Resumen de las características principales de las unidades litoestratigráficas de LHVC

Stratigraphic Unit	Structure	Mineralogy / texture	Lithology	Age (method)
QtC.- Cuicuiltic Member	stratified sequence of fallout deposits	pl, cpx, opx, bt, k feld, px, hbl / vesicular	trachyandesitic pumice & basaltic-andesite scoria	7.3±0.1 ka (¹⁴ C; 7)
Qt2.- Victoria trachyandesitic lava flows	vesiculated blocky lava flows	pl, cpx, opx, ol / porphyritic	trachyandesites & basaltic trachyandesites	
Qtab.- Tepeyahualco basaltic trachyandesitic lava flows	lava flows	pl, cpx, opx / aphanitic to porphyritic	trachyandesites & basaltic trachyandesites	
Qta1.-Sarabia trachyandesitic lava flows	vesiculated blocky lava flows	pl, opx, cpx / porphyritic	trachyandesites, basaltic trachyandesites & andesites	
Qab. El Limón basaltic andesite lava flows.	vesiculated blocky lava flows	pl, cpx, opx, ol / porphyritic	basaltic andesites & basaltic trachyandesites	
Qab1.- Atecax basaltic andesite lava flows	brecciated lava flows	pl, cpx, opx / porphyritic	basaltic andesites	
Qb1.- Olivine-bearing basaltic lava flows	columnar	pl, ol, px / porphyritic	olivine basaltic lavas	3.87±0.13 ka (¹⁴ C; 1)
Qt1.- El Pájaro trachytic lava flows.	banding, blocky lava flows	pl, cpx, opx, hbl, qz / porphyritic	trachytes	2.86±0.03 ka (¹⁴ C; 1)
Qp.- Undefined pyroclastic deposits			pyroclastic deposits, reworked pumice deposits & soil.	

Data from: (1) This study; (2) Carrasco-Núñez et al. (1997); (3) Carrasco-Núñez et al. (2010); (4) Carrasco-Núñez et al. (2017a); (5) Carrasco-Núñez et al. (2017b, in press); (6) Carrasco-Núñez & Riggs (2008); (7) Dávila-Harris & Carrasco-Núñez (2014); (8) Ferriz & Mahood (1984); (9) Rojas-Ortega (2016); (10) Yáñez & García (1982). (bt) Biotite; (cpx) Clinopyroxene; (hbl) Hornblende; (k feld) Alkali feldspars; (musc) Muscovite; (ol) Olivine; (opx) Orthopyroxene; (pl) Plagioclase; (px) Pyroxene; (qz) Quartz.

Table 3. Summary of the U/Th, U/Pb; Ar/Ar and K/Ar dates for Los Humeros caldera.

Tabla 3. Resumen de los fechamientos U/Th, U/Pb; Ar/Ar y K/Ar para la caldera de Los Humeros.

Sample	X	Y	Rock	Method; mineral analyzed	Age ka	Rock unit
HK-14-08 ^(a)	662393	2175352	Rhyolite	U/Th; Zir	44.8 ± 1.7 ka	Qr1 Rhyolitic domes
Hj-14-47 ^(a)	667734	2187277	Rhyolite	Ar/Ar; Pl	50.7 ± 4.4 ka	Qr1 Rhyolitic domes
LH-15-01 ^(a)	666983	2175180	Pumice	Ar/Ar; Pl	69 ± 16 ka	QigZ Zaragoza ignimbrite
LH-15-04b ^(a)	689390	2169260	Pumice	Ar/Ar; Pl	70 ± 23 ka	QtF Faby tuff
HK-14-10 ^(a)	666653	2174721	Rhyolite	U/Th; Zir	74.2 ± 4.4-4.5 ka	Qr2 Los Potreros rhyolitic lavas
LH-15-04a ^(a)	689438	2169308	Ignimbrite	Ar/Ar; Pl	153 ± 13 ka	QigX Xaltipan ignimbrite
LH-15-04a ^(a)	689438	2169308	Ignimbrite	U/Th; Zir	160.3 ± 15.1 ka	QigX Xaltipan ignimbrite
16-28a ^(a)	644085	2180113	Ignimbrite	U/Th; Zir	158.4 ± 8.3 ka	QigX Xaltipan ignimbrite
68A ^(g)	671688	2191175	Ignimbrite	Ar/Ar; Pl	170 ± 50 ka	QigX Xaltipan ignimbrite
LH-15-03 ^(a)	674359	2184836	Ignimbrite	U/Th; Zir	180 ± 13 ka	QigX Xaltipan ignimbrite
HK-14-43 ^(a)	655591	2187477	Rhyolite	U/Th; Zir	155.7 ± 4.6-4.9 ka	Qr3 Rhyolitic domes
H2 ^(f)	657621	2185961	Rhyolite	K/Ar; San	220 ± 20 ka	Qr3 Rhyolitic domes
HK-14-21 ^(a)	653766	2175788	Rhyolite	U/Th; Zir	270 ± 17-15 ka	Qr3 Rhyolitic domes
D ^(f)	658087	2185965	Rhyolite	K/Ar; San	360 ± 50 ka	Qr3 Rhyolitic domes
HK-14-32 ^(a)	671168	2188623	Rhyolite	U/Th; Zir	>350 ka	Qr3 Rhyolitic domes
Hj-14-51 ^(a)	672524	2189054	Rhyolite	U/Th; Zir	> 350 ka	Qr3 Rhyolitic domes
Hj-14-35 ^(a)	656849	2178432	Rhyolite	U/Th; Zir	> 350 ka	Qr4 Rhyolitic lavas and dome
Hj-15-05 ^(a)	656849	2178432	Rhyolite	U/Th; Zir	> 350 ka	Qr4 Rhyolitic lavas and dome
Hj-15-05 ^(a)	656849	2178432	Rhyolite	Ar/Ar; Pl	693.0 ± 1.7 ka	Qr4 Rhyolitic lavas and dome
Hj-15-06 ^(a)	668241	2166910	Rhyolite	Ar/Ar; Pl	485.7 ± 2.2 ka	Qr4 Rhyolitic lavas and dome
PZ 01 ^(e)	662120	2157480	Pumice	Ar/Ar; San	65 ± 10 Ka	Qr Cerro Pizarro-Águilas rhyolite
PZ 026 ^(e)	665628	2157486	Rhyolite	Ar/Ar; San	116 ± 12 ka	Qr Cerro Pizarro-Águilas rhyolite
PZ 019 ^(e)	664052	2157638	Rhyolite	Ar/Ar; Bt	180 ± 20 ka	Qr Cerro Pizarro-Águilas rhyolite
PZ 02 ^(e)	663343	2158646	Rhyolite	Ar/Ar; San	220 ± 60 ka	Qr Cerro Pizarro-Águilas rhyolite
PZ 011a ^(e)	666140	2158856	Basalt	Ar/Ar; gms	190 ± 20 ka	Qb2 Basalt and basaltic andesite
CP-011 ^(c)	688577	2160215	Trachyandesite	Ar/Ar; gms	307 ± 35 ka	Qacp2 Andesite and trachyandesite
CP-190 ^(c)	692869	2159707	Trachyandesite	Ar/Ar; gms	376 ± 17 ka	Qacp2 Andesite and trachyandesite
CP-013 ^(c)	690715	2162083	Basaltic andesite	Ar/Ar; gms	510 ± 60 ka	Qacp3 Andesite and trachyandesite
HU0801 ^(d)	692068	2175044	Basaltic andesite	Ar/Ar; gms	1.46 ± 0.31 Ma	Tpa Teziutlán basaltic lava flows
RS-350-78 ^(f)	657691	2187868	Andesite	K/Ar; wr	1.55 ± 0.1 Ma	Tpa Teziutlán basaltic lava flows
H26N3 ^(d)	663133	2175459	Basaltic andesite	Ar/Ar; gms	1.55 ± 0.54 Ma	Tpa Teziutlán basaltic lava flows
HU0806 ^(d)	692580	2176215	Basaltic andesite	Ar/Ar; gms	1.62 ± 0.04 Ma	Tpa Teziutlán basaltic lava flows
H25N2 ^(d)	666396	2176169	Basalt	Ar/Ar; gms	1.80 ± 0.98 Ma	Tpa Teziutlán basaltic lava flows
H20N2 ^(d)	663330	2177486	Andesite	Ar/Ar; gms	2.08 ± 0.21 Ma	Tpa Teziutlán basaltic lava flows
H20N5 ^(d)	663330	2177486	Andesite	Ar/Ar; gms	2.53 ± 0.86 Ma	Tpa Teziutlán basaltic lava flows
H42 ^(d)	663265	2173558	Andesite	Ar/Ar; gms	2.61 ± 0.43 Ma	Tpa Teziutlán basaltic lava flows
16 ^(b)	640050	2167700	Andesite	K/Ar; wr	8.9 ± 0.4 Ma	Tm dacitic and andesitic lava flows
CY 443-79 ^(h)	645150	2170450	Andesite	K/Ar; wr	10.5 ± 0.7 Ma	Tm dacitic and andesitic lava flows
HK-14-49 ⁽ⁱ⁾	652811	2156261	Granite	U/Pb; Zir	15.12 ± 0.64 Ma	Tig Granites

Data from: (a) Carrasco-Núñez et al. (2017b, in press); (b) Carrasco-Núñez et al. (1997); (c) Carrasco-Núñez et al. (2010); (d) Carrasco-Núñez et al. (2017); (e) Carrasco-Núñez & Riggs (2008); (f) Ferriz & Mahood (1984); (g) Willcox (2011); (h) Yáñez & García (1982); (i) This study. (Bt) Biotite; (gms) ground mass; (Pl) Plagioclase; (wr) whole rock; (Zir) Zircon.

Table 4. Summary of the 14C dates for Los Humeros caldera.

Table 4. Resumen de los fechamientos 14C para la caldera de Los Humeros.

Sample	X	Y	material dated	Conventional age (BP)	Age (1 sigma calibration)	Age (2 sigma calibration)	Rock unit
Hk-14-24	661935	2173502	Charcoal	2860 ± 30	Cal BP 3000 to 2950	Cal BP 3065 to 2920 Cal BP 3065 to 2920	Qt1 El Pájaro trachytic lava flows.
GC1	653680	2167274	Charcoal	3870 ± 130	Cal BP 4090 to 4439 Cal BP 4486 to 4499	Cal BP 3899 to 4628 Cal BP 4638 to 4641 Cal BP 4684 to 4686 Cal BP 4762 to 4797	Qb1 Olivine-bearing basaltic lava flows
X2*	667120	2171592	Paleosol	7355 ± 105	Cal BP 8042 to 8216 Cal BP 8242 to 8303	Cal BP 7982 to 8371	Qtc Cuicuiltic Member
Hj-14-50	668406	2185584	Charcoal	8910 ± 30	Cal BP 10170 to 10120 Cal BP 10065 to 10005 Cal BP 9995 to 9930	Cal BP 10185 to 9910	Qta3 San Antonio-Las Chapas trachyandesitic lava flows
tl-01**	665999	2173999	Paleosol	28270 ± 110	Cal BP 31844 to 32405	Cal BP 31642 to 32647	QLt Llano tuff

Data from: (*) Dávila-Harris and Carrasco-Núñez (2014); (**) Rojas-Ortega (2017). Ages calibrated by Calib 7.1: INTCAL 13 (Stuiver et al., 2017).