

Appendix-E: Isotopic age data

The following pages contain the $^{40}\text{Ar}/^{39}\text{Ar}$ analytical data from incremental heating experiments on biotites of volcanic rocks from the southern Bolivian foreland basin. The table gives the sample names, formation names, and location names.

Sample	Formation	Section
Abapó-1	Emborozú	Abapó
CH-095	undeformed sediments	Pirití
CH-160	Tariquia	Masavi
CH-318	Petaca	Itapú
CH-01	Tariquia	Chiquiaca
EMB -01	Emborozú	Emborozú
EMB -02	Emborozú	Emborozú
EMB -04	Emborozú	Emborozú
EMB -05	Emborozú	Emborozú
EMB -06	Emborozú	Emborozú
EMB -07	Emborozú	Emborozú
EMB -10	Emborozú	Emborozú
EMB -11	Emborozú	Emborozú

step no.	T (°C)	³⁶ Ar (x 10 ⁻¹¹)	³⁷ Ar _{Ca} (x 10 ⁻¹¹)	³⁸ Ar _{Cl} (x 10 ⁻¹¹)	³⁹ Ar _K (x 10 ⁻¹¹)	⁴⁰ Ar* (x 10 ⁻¹¹)	³⁹ Ar _K (%)	Age (Ma)	2σ (±) (Ma)	
Abapó: Biotite										
1	533	0.75	0.40	9.59	60.20	48.42	1.28	5.43	1.94	
2	718	1.87	4.44	145.53	935.25	332.96	19.91	2.40	0.13	
3	815	0.91	2.21	68.37	441.55	157.25	9.40	2.41	0.26	
4	906	0.92	2.29	54.75	352.58	107.96	7.51	2.07	0.32	
5	1005	1.20	5.49	111.21	726.43	189.98	15.47	1.77	0.16	
6	1185	2.65	17.97	301.93	1962.51	578.82	41.79	1.99	0.06	
7	1404	0.75	1.98	33.20	216.85	54.17	4.62	1.69	0.56	
Mass = 0.0441		Total gas age = 2.05 ± 0.22 Ma					MSWD = 11.3			
J-value = 0.00375		Plateau age = 1.96 ± 0.06 Ma (steps 4-7)					MSWD = 2.7			
⁴⁰ Ar/ ³⁶ Ar intercept ± 2σ = 286 ± 84		Isochron age = 2.00 ± 4.20 Ma (steps 4-7)					MSWD = 3.9			
CH095: Biotite										
1	510	0.40	0.53	1.54	10.39	-3.33	0.15	-2.17	11.20	
2	598	2.25	2.27	39.27	272.86	44.91	4.07	1.11	0.44	
3	715	3.04	4.97	191.77	1350.73	79.91	20.13	0.40	0.09	
4	817	1.31	3.22	79.13	566.06	24.24	8.43	0.29	0.22	
5	904	1.38	3.63	52.02	358.42	0.00	5.34	0.00	0.34	
6	998	1.48	7.91	170.21	1194.78	36.36	17.98	0.21	0.10	
7	1086	1.37	14.07	290.18	2111.35	106.52	31.46	0.34	0.06	
8	1168	1.10	19.47	93.71	680.13	15.08	10.13	0.15	0.19	
9	1409	1.05	5.66	21.53	154.92	1.46	2.31	0.06	0.80	
Mass = 0.0491		Total gas age = 0.321 ± 0.090 Ma					MSWD = 3.6			
J-value = 0.00375		Plateau age = 0.294 ± 0.089 Ma (steps 3-9)					MSWD = 2.2			
⁴⁰ Ar/ ³⁶ Ar intercept ± 2σ = 288 ± 13		Isochron age = 0.370 ± 0.200 Ma (steps 3-9)					MSWD = 3.1			
CH160: Biotite										
1	550	3.37	8.76	5.80	72.51	4031.60	6.11	341.37	1.72	
2	610	3.72	5.81	6.01	100.07	6639.90	8.43	400.52	3.00	
3	738	4.71	8.98	9.03	111.24	6335.01	9.37	348.88	1.36	
4	838	7.84	8.42	13.21	160.50	8579.11	13.52	329.29	1.06	
5	920	12.81	15.97	14.04	230.03	15311.90	19.38	401.65	0.98	
6	1111	8.77	20.43	26.93	392.84	22224.10	33.10	346.77	0.74	
7	1181	2.58	5.16	6.81	97.25	5602.46	8.19	352.55	1.24	
8	1421	1.66	1.63	1.82	22.39	1287.38	1.89	351.90	4.60	
Mass = 0.0471		Total gas age = 356 ± 22 Ma					MSWD = 1879			
J-value = 0.00375		Integrated age = 348 ± 8 Ma (steps 6-8)					MSWD = 33			
⁴⁰ Ar/ ³⁶ Ar intercept ± 2σ = 295 ± 38		Isochron age = 348 ± 6700 Ma (steps 6-8)					MSWD = 47			

step no.	T (°C)	³⁶ Ar (x 10 ⁻¹¹)	³⁷ Ar _{Ca} (x 10 ⁻¹¹)	³⁸ Ar _{Cl} (x 10 ⁻¹¹)	³⁹ Ar _K (x 10 ⁻¹¹)	⁴⁰ Ar* (x 10 ⁻¹¹)	³⁹ Ar _K (%)	Age (Ma)	2σ (±) (Ma)	
CH318: Biotite										
1	532	0.46	0.76	3.79	19.33	274.10	0.49	93.39	6.60	
2	611	2.66	6.72	57.28	277.06	2328.16	7.10	55.91	0.44	
3	729	0.39	1.12	29.71	131.28	522.55	3.36	26.70	0.88	
4	836	0.44	0.95	27.38	117.28	387.16	3.00	22.17	1.00	
5	916	2.96	9.51	211.96	899.38	3537.40	23.03	26.39	0.14	
6	1016	2.02	9.74	288.95	1286.22	4487.41	32.94	23.43	0.10	
7	1102	1.94	9.16	284.15	1132.58	3126.38	29.00	18.56	0.13	
8	1420	0.60	1.79	9.47	40.66	151.75	1.04	25.05	2.80	
Mass = 0.0448		Total gas age = 23.5 ± 5.2 Ma					MSWD = 4262			
J-value = 0.00375		Integrated age = 22.7 ± 4.0 Ma (steps 3-7)					MSWD = 1794			
⁴⁰ Ar/ ³⁶ Ar intercept ± 2σ = 428 ± 930		Isochron age = 20.8 ± 1.5 Ma (steps 3-7)					MSWD = 232			
CH01: Biotite										
1	526	2.91	0.98	19.21	118.29	253.94	2.11	14.45	1.10	
2	713	2.86	2.54	57.33	346.73	618.01	6.20	12.01	0.36	
3	810	1.77	2.18	40.41	247.10	513.29	4.42	13.98	0.52	
4	900	0.35	0.51	5.71	33.51	42.54	0.60	8.56	3.60	
5	998	3.86	10.74	335.92	2141.38	2990.29	38.28	9.41	0.06	
6	1083	2.54	9.84	293.78	1917.75	2611.67	34.28	9.18	0.07	
7	1168	1.24	5.89	93.12	616.23	882.12	11.02	9.65	0.22	
8	1412	1.24	3.19	26.33	172.94	260.86	3.09	10.17	0.74	
Mass = 0.0554		Total gas age = 9.41 ± 0.52 Ma					MSWD = 93			
J-value = 0.00375 ± 0.4 %		Integrated age = 9.30 ± 1.50 Ma (steps 5-6)					MSWD = 24			
⁴⁰ Ar/ ³⁶ Ar intercept ± 2σ = 368 ± 17		Isochron age = 8.55 ± 0.19 Ma (steps 5-6)					MSWD = 0			
EMB01: Biotite										
1	533	2.18	2.48	17.21	99.55	23.24	2.77	1.58	1.26	
2	609	3.71	4.20	54.25	291.25	78.53	8.11	1.82	0.44	
3	825	2.61	4.53	91.35	528.57	653.00	14.72	8.33	0.26	
4	913	1.95	6.97	48.14	269.06	301.07	7.50	7.55	0.44	
5	1011	4.48	20.76	199.34	1146.88	1365.23	31.95	8.03	0.11	
6	1096	1.99	23.58	154.58	896.95	1083.88	24.99	8.15	0.15	
7	1176	0.94	22.37	48.28	268.70	296.38	7.49	7.44	0.42	
8	1417	0.81	21.26	18.18	85.94	94.39	2.39	7.41	1.40	
Mass = 0.0491		Total gas age = 7.80 ± 1.10 Ma					MSWD = 128			
J-value = 0.00375 ± 0.4 %		Integrated age = 8.07 ± 0.41 Ma (steps 3, 5, 6)					MSWD = 1.3			
⁴⁰ Ar/ ³⁶ Ar intercept ± 2σ = 284 ± 14		Isochron age = 8.43 ± 0.32 Ma (steps 3, 5, 6)					MSWD = 0.1			

step no.	T (°C)	³⁶ Ar (x 10 ⁻¹¹)	³⁷ Ar _{Ca} (x 10 ⁻¹¹)	³⁸ Ar _{Cl} (x 10 ⁻¹¹)	³⁹ Ar _K (x 10 ⁻¹¹)	⁴⁰ Ar* (x 10 ⁻¹¹)	³⁹ Ar _K (%)	Age (Ma)	2σ (±) (Ma)	
EMB02: Biotite										
1	537	2.60	1.86	14.35	116.02	23.24	-90.21	-5.26	1.40	
2	609	6.97	8.80	84.10	556.24	78.53	422.72	5.13	0.28	
3	723	4.69	6.87	145.50	926.35	653.00	1019.55	7.42	0.15	
4	820	3.13	4.59	87.22	566.09	301.07	753.00	8.97	0.22	
5	915	0.16	0.16	0.63	3.34	1365.23	-39.35	-81.33	44.00	
6	1014	0.26	1.04	1.55	8.85	1083.88	-44.07	-33.97	13.20	
7	1100	0.27	1.85	2.45	13.51	296.38	-52.37	-26.40	9.20	
8	1177	1.36	12.35	21.40	128.22	94.39	165.59	8.71	1.40	
9	1415	0.76	2.13	1.73	8.48	94.39	-15.41	-12.33	15.00	
Mass =0.0538		Total gas age = 7.50 ± 2.30 Ma						MSWD = 158		
J-value =0.00375										
EMB04: Biotite										
1	514	0.59	0.54	3.39	21.21	34.81	0.38	11.06	5.60	
2	597	7.58	3.63	94.32	591.03	699.82	10.62	7.98	0.34	
3	719	7.30	5.18	183.94	1179.77	1437.41	21.20	8.22	0.14	
4	909	2.43	3.24	50.81	323.47	364.42	5.81	7.60	0.36	
5	1008	5.87	14.86	294.86	1910.25	2143.38	34.32	7.57	0.08	
6	1095	1.17	15.73	194.02	1281.25	1551.58	23.02	8.17	0.09	
7	1173	1.03	8.00	42.25	252.36	257.99	4.53	6.90	0.56	
8	1405	0.63	0.59	1.27	6.25	9.84	0.11	10.61	20.00	
Mass =0.0460		Total gas age = 7.86 ± 0.28 Ma						MSWD = 21.0		
J-value =0.00375		Integrated age = 8.10 ± 0.08 Ma (steps 2-3)						MSWD = 0.9		
⁴⁰ Ar/ ³⁶ Ar intercept ± 2σ = 295 ± 3		Isochron age = 8.20 ± 0.11 Ma (steps 2-3)						MSWD = 0.0		
EMB05: Biotite										
1	530	3.03	2.27	14.49	85.46	197.54	2.37	15.55	1.46	
2	605	0.21	0.45	1.13	6.64	6.68	0.18	6.78	18.40	
3	620	3.25	2.86	20.36	122.82	211.89	3.41	11.62	1.00	
4	725	12.62	13.40	128.18	765.39	1195.04	21.25	10.52	0.28	
5	834	6.17	8.51	79.47	480.87	723.65	13.35	10.14	0.30	
6	917	3.86	5.90	39.81	242.64	301.70	6.74	8.38	0.52	
7	1015	13.36	29.17	165.71	990.29	1170.01	27.49	7.97	0.22	
8	1183	6.61	38.19	135.51	823.93	1056.53	25.07	8.65	1.50	
9	1483	1.75	1.28	1.61	5.16	-7.66	0.14	-10.05	22.00	
Mass =0.0431		Total gas age = 9.30 ± 1.10 Ma						MSWD = 46.0		
J-value =0.00375		Plateau age = 8.04 ± 0.20 Ma (steps 6-9)						MSWD = 1.8		
⁴⁰ Ar/ ³⁶ Ar intercept ± 2σ = 277 ± 10		Isochron age = 9.05 ± 0.96 Ma (steps 6-9)						MSWD = 3.4		

step no.	T (°C)	³⁶ Ar (x 10 ⁻¹¹)	³⁷ Ar _{Ca} (x 10 ⁻¹¹)	³⁸ Ar _{Cl} (x 10 ⁻¹¹)	³⁹ Ar _K (x 10 ⁻¹¹)	⁴⁰ Ar* (x 10 ⁻¹¹)	³⁹ Ar _K (%)	Age (Ma)	2σ (±) (Ma)
EMB06: Biotite									
1	525	0.28	-4.53	-2.88	-7.79	-169.56	-0.13	141.38	18.40
2	606	5.26	5.62	11.52	75.40	-122.59	1.22	11.02	1.88
3	724	6.35	6.55	46.62	321.81	397.62	5.21	8.33	0.46
4	824	3.13	3.81	46.47	338.14	456.89	5.48	9.11	0.38
5	908	3.32	8.23	74.16	545.37	957.26	8.83	11.82	0.24
6	1006	5.90	19.98	320.76	2412.07	3176.03	39.07	8.88	0.06
7	1175	2.89	27.45	293.81	2238.96	2919.73	36.27	8.79	0.58
8	1406	1.69	2.40	6.82	48.71	59.04	0.79	8.17	2.60
Mass =0.0470		Total gas age = 9.05 ± 0.73 Ma					MSWD = 113.00		
J-value =0.00375		Plateau age = 8.88 ± 0.07 Ma (steps 6-8)					MSWD = 0.19		
⁴⁰ Ar/ ³⁶ Ar intercept ± 2σ = 294 ± 6		Isochron age = 8.92 ± 0.10 Ma (steps 6-9)					MSWD = 2.00		
EMB07: Biotite									
1	508	1.58	1.76	22.58	99.72	158.25	1.35	10.69	1.20
2	598	3.29	6.59	106.21	488.59	598.17	6.63	8.25	0.26
3	720	1.85	3.78	192.21	914.28	1432.06	12.41	10.55	0.14
4	820	3.42	8.03	298.66	1436.27	2259.84	19.50	10.60	0.09
5	905	1.63	7.22	76.57	348.67	612.30	4.73	11.83	0.36
6	1012	2.56	22.10	525.51	2575.90	4030.23	34.97	10.54	0.05
7	1095	1.39	25.07	277.22	1357.38	2085.84	18.43	10.36	0.09
8	1183	1.05	15.02	28.83	130.03	250.44	1.77	12.97	0.90
9	1414	1.19	5.12	4.33	15.35	67.99	0.21	29.70	7.60
Mass =0.0555		Total gas age = 10.49 ± 0.35 Ma					MSWD = 53.0		
J-value =0.00375		Integrated age = 10.59 ± 0.07 Ma (steps 3, 4, 6)					MSWD = 0.5		
⁴⁰ Ar/ ³⁶ Ar intercept ± 2σ = 299 ± 4		Isochron age = 10.53 ± 0.06 Ma (steps 3, 4, 6)					MSWD = 22.0		
EMB10: Biotite									
1	543	0.21	0.27	0.76	4.85	44.18	0.08	60.53	24.00
2	615	1.96	4.23	61.58	440.77	653.79	6.90	10.00	0.28
3	735	2.37	7.63	171.46	1234.28	1521.43	19.32	8.31	0.10
4	834	1.60	3.76	116.85	888.81	1255.05	13.91	9.52	0.13
5	920	1.13	4.59	59.77	440.87	681.36	6.90	10.41	0.26
6	991	0.91	5.58	54.56	405.08	621.34	6.34	10.34	0.30
7	1091	1.92	28.92	319.47	2252.10	3334.53	35.26	9.98	0.06
8	1175	0.90	17.72	87.17	623.33	966.73	9.76	10.45	0.19
9	1408	1.23	6.50	13.15	97.73	202.41	1.53	13.94	1.18
Mass =0.0551		Total gas age = 9.67 ± 0.58 Ma					MSWD = 124		
J-value =0.00375									

step no.	T (°C)	³⁶ Ar (x 10 ⁻¹¹)	³⁷ Ar _{Ca} (x 10 ⁻¹¹)	³⁸ Ar _{Cl} (x 10 ⁻¹¹)	³⁹ Ar _K (x 10 ⁻¹¹)	⁴⁰ Ar* (x 10 ⁻¹¹)	³⁹ Ar _K (%)	Age (Ma)	2σ (±) (Ma)
EMB11: Biotite									
1	460	4.36	2.06	9.88	76.57	219.88	2.31	15.70	0.72
2	538	4.34	2.43	25.97	160.63	402.33	4.85	13.70	0.34
3	618	2.45	2.59	73.05	393.20	778.50	11.87	10.84	0.14
4	781	1.19	1.89	65.40	347.75	559.05	10.50	8.81	0.14
5	780	1.20	1.61	62.00	324.81	537.01	9.81	9.06	0.15
6	828	0.98	1.47	26.24	136.46	195.24	4.12	7.84	0.35
7	847	0.77	1.10	15.85	82.93	148.50	2.50	9.81	0.56
8	886	0.77	2.04	17.75	91.57	175.48	2.76	10.49	0.53
9	930	0.59	1.97	17.54	90.91	187.14	2.74	11.27	0.52
10	1011	1.08	5.15	86.64	455.13	762.43	13.74	9.18	0.11
11	1183	2.68	14.10	201.97	1071.34	1627.97	32.35	8.32	0.05
12	1410	1.41	4.78	15.30	80.83	206.51	2.44	13.98	0.64
Mass =0.0423		Total gas age = 8.83 ± 0.68 Ma				MSWD = 67			
J-value =0.00375		Integrated age = 8.90 ± 1.60 Ma (steps 4-5)				MSWD = 2			
⁴⁰ Ar/ ³⁶ Ar intercept ± 2σ = 265 ± 460		Isochron age = 11.70 ± 1.60 Ma (steps 4-5)				MSWD = 0			