

TABLE A-1. U-Pb ISOTOPIC DATA AND APPARENT AGES

Fraction size (μm)	Weight (mg)	Concentration [†]		Isotopic composition			Apparent ages (Ma)		
		U	Pb*	$\frac{^{206}\text{Pb}^*}{^{238}\text{U}}$	$\frac{^{207}\text{Pb}^*}{^{235}\text{U}}$	$\frac{^{207}\text{Pb}^*}{^{206}\text{Pb}^*}$	$\frac{^{206}\text{Pb}^*}{^{238}\text{U}}$	$\frac{^{207}\text{Pb}^*}{^{235}\text{U}}$	$\frac{^{207}\text{Pb}^*}{^{206}\text{Pb}^*}$
+200 mesh	2.0	296	5.6	0.0219	0.1486	0.0491	140.1	140.7	151.3
200–325 mesh	2.0	344	6.4	0.0217	0.1467	0.0491	138.2	139.0	151.6
Less than 325	1.8	420	7.4	0.0204	0.1379	0.0490	130.2	131.2	148.0

[†]Pb* is radiogenic Pb; both U and Pb are expressed as ppm.

TABLE A-2. $^{40}\text{Ar}/^{39}\text{Ar}$ DATA FOR SAMPLES* FROM ROCKS WITHIN THE HANAGITA FAULT SYSTEM, CHUGACH MOUNTAINS, SOUTHERN ALASKA

91SR25C, Hornblende							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
700	0.2645	0.02820	9.37	0.24	31.0	0.9	83.3 ± 0.6
750	.10278	.00917	11.21	.45	63.6	.3	99.2 ± 0.3
800	.20058	.01684	11.92	.43	82.4	.6	105.0 ± 2.0
850	.27746	.02294	12.10	.23	85.7	.8	106.8 ± 0.4
900	.60802	.04027	15.10	.18	85.6	1.3	132.3 ± 0.4
950	1.1227	.06567	17.10	.22	93.6	2.2	149.1 ± 0.3
975	13.524	.80370	16.83	.31	98.4	26.7	146.9 ± 0.2
1000 ^P	16.959	1.0128	16.74	.32	98.7	33.6	146.2 ± 0.2
1025 ^P	10.401	0.6218	16.73	.33	98.9	20.7	146.0 ± 0.2
1050 ^P	2.4836	.14837	16.74	.32	97.8	4.9	146.1 ± 0.2
1100	1.6526	.10003	16.52	.27	95.4	3.3	144.3 ± 0.2
1150	1.9004	.11367	16.72	.31	96.7	3.8	146.0 ± 0.2
1250	.29274	.01811	16.16	.28	81.8	.6	141.3 ± 1.1
1350	.13802	.00863	16.00	.28	62.8	.3	140.0 ± 2

Note: Total-gas date: 144.9 ± 0.3 Ma; Plateau date: 146.1 ± 0.2 Ma; Isochron date: 145.9 ± 0.2 Ma
($^{40}\text{Ar}/^{36}\text{Ar}$)_i=404 ± 10 (950–1100 °C); J=0.005041, ±0.1%; wt. 199 mg

91SR25D, Hornblende							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
600	0.02636	0.00245	10.8	0.10	26.9	0.3	153.0 ± 8
700	.1165	.01942	6.00	.18	23.1	2.1	86.9 ± 0.1
800	.2718	.03992	6.81	.32	70.1	4.3	98.4 ± 0.8
850	.2391	.03374	7.08	.11	77.9	3.7	102.3 ± 1.1
900	.2920	.03732	7.83	.04	77.7	4.0	113.0 ± 1.5
950	.6142	.06355	9.66	.05	83.1	6.9	138.1 ± 0.8
1000 ^W	2.236	.22219	10.06	.07	91.2	24.1	143.6 ± 0.2
1025 ^W	1.1300	.11169	10.12	.07	89.8	12.1	144.3 ± 0.3
1050 ^W	.29187	.02855	10.22	.06	79.6	3.1	145.8 ± 0.8
1075 ^W	.27025	.02709	9.98	.06	61.7	2.9	142.0 ± 1.6
1100 ^W	.5316	.05325	9.98	.07	82.5	5.8	142.5 ± 0.2
1150 ^W	.9358	.09338	10.02	.07	88.1	10.1	143.0 ± 0.8
1200 ^W	.6181	.06223	9.93	.07	85.1	6.7	142.0 ± 1.4
1350 ^W	1.2784	.12812	9.98	.07	89.7	13.9	142.4 ± 0.4

Note: Total-gas date: 137.1 ± 0.6 Ma; Weighted mean date: 143.2 ± 0.4 Ma; Isochron date: 143.6 ± 0.4 Ma
($^{40}\text{Ar}/^{36}\text{Ar}$)_i=294 ± 4 (1000–1350 °C); J=0.008233, ±0.1%; wt. 152. mg

(continued)

TABLE A-2. (continued)

90SR5A, Hornblende							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
700	0.0377	0.0022	17.18	20	21.8	0.1	184.0 ± 35
800	.04298	.0116	3.714	658	44.6	.5	41.0 ± 2
900	.3875	.0499	7.765	686	44.7	2.3	85.7 ± 1.
950	.3931	.04384	8.967	1015	84.0	2.0	98.6 ± 1.1
1000	2.5962	.19980	12.99	942	97.2	9.2	141.2 ± 0.4
1025	4.5520	.34782	13.09	1461	98.1	16.1	142.2 ± 0.4
1050 ^P	4.4828	.33642	13.32	870	98.2	15.5	144.6 ± 0.4
1075 ^P	.64451	.04821	13.37	1044	96.3	2.2	145.9 ± 1.2
1100 ^P	1.6766	.12621	13.28	1141	98.1	5.8	144.2 ± 0.4
1150 ^P	7.1404	.53480	13.35	938	98.6	24.7	144.9 ± 0.4
1200 ^P	2.8817	.21726	13.26	697	98.0	10.0	144.0 ± 0.4
1250	1.1159	.08343	13.38	367	98.4	3.9	145.2 ± 0.4
1450	2.2008	.16519	13.32	52	98.4	7.6	144.6 ± 0.5

Note: Total-gas date: 144.7 ± 0.5 Ma; Plateau date: 144.6 ± 0.6 Ma; Isochron date: 144.2 ± 0.3 Ma
($^{40}\text{Ar}/^{36}\text{Ar}$)=338 ± 26 (850–1050 °C); J=0.006265, ±0.25%; wt. 258.5 mg

90SR6, Hornblende							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
700 ^L	0.4096	0.09779	4.19	1.41	30.6	4.2	54.4 ± 0.5
800 ^L	.8722	.18007	4.84	2.92	68.1	7.6	62.8 ± 0.1
850 ^L	.4678	.09431	4.96	2.31	87.7	4.0	64.3 ± 0.4
875 ^L	.32730	.06312	5.18	1.68	89.6	2.7	67.1 ± 0.4
900 ^L	.41453	.08315	4.98	.81	87.7	3.5	64.6 ± 0.3
950 ^L	.6238	.11764	5.30	.17	87.8	5.0	68.6 ± 0.4
1000	1.7811	.17802	10.01	.20	96.6	7.6	127.4 ± 0.3
1025 ^H	6.3524	.57116	11.12	.29	98.8	24.3	141.1 ± 0.2
1050 ^H	5.0393	.44961	11.21	.30	99.2	19.1	142.1 ± 0.2
1075 ^H	1.7577	.15848	11.09	.29	98.5	6.7	140.7 ± 0.2
1100 ^H	.7829	.07122	10.99	.26	97.0	3.0	139.5 ± 0.4
1125 ^H	.9724	.08723	11.15	.25	97.3	3.7	141.4 ± 0.6
1150 ^H	.7158	.06312	11.34	.27	96.2	2.7	143.7 ± 0.5
1200 ^H	1.4070	.12059	11.67	.26	96.8	5.1	147.7 ± 0.2
1250 ^H	.07026	.00581	12.09	.14	59.5	.2	153.0 ± 8
1350 ^H	.1595	.01341	11.90	.16	71.4	.6	150.0 ± 4

Note: Total-gas date: 120.0 ± 0.4 Ma; No plateau; High-temperature isochron date: 142.2 ± 0.5 Ma
($^{40}\text{Ar}/^{36}\text{Ar}$)=332 ± 5 (1025–1350 °C); Low-temperature isochron date: 67.0 ± 0.5 Ma; ($^{40}\text{Ar}/^{36}\text{Ar}$)=264 ± 5 (700–950 °C);
J=0.006265, ±0.25%; wt. 258.5 mg

(continued)

TABLE A-2. (continued)

90SR7, Hornblende							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
700	0.12896	0.03784	3.41	0.18	41.3	2.0	44.3 ± 0.9
800 ^L	.4068	.07561	5.38	.80	51.4	3.9	69.4 ± 0.6
850 ^L	.13020	.02419	5.38	.48	81.3	1.3	69.4 ± 1.4
900 ^L	.19914	.03696	5.39	.23	87.2	1.9	69.5 ± 0.9
950 ^L	.32655	.06153	5.31	.08	88.9	3.2	68.5 ± 0.8
1000	1.0785	.12552	8.59	.08	95.6	6.5	109.6 ± 0.3
1025	4.0937	.37047	11.05	.17	98.5	19.2	139.8 ± 0.4
1050 ^P	4.5699	.40719	11.22	.18	98.4	21.1	141.8 ± 0.4
1075 ^P	1.8312	.16377	11.18	.17	98.1	8.5	141.4 ± 0.6
1100 ^P	.60389	.05386	11.21	.16	98.5	2.8	141.7 ± 0.4
1150 ^P	2.477	.22140	11.19	.17	98.5	11.5	141.4 ± 0.4
1200 ^P	2.758	.24469	11.27	.17	98.9	12.7	142.4 ± 0.4
1250 ^P	.49684	.04413	11.26	.17	97.0	2.3	142.3 ± 0.8
1450 ^P	.6690	.05931	11.28	.17	95.7	3.1	142.5 ± 1.3

Note: Total-gas date: 130.1 ± 0.5 Ma; Plateau date: 141.9 ± 0.6 Ma; Isochron date: 144.2 ± 0.3 Ma
 $(^{40}\text{Ar}/^{36}\text{Ar})_i=343 \pm 16$ (1050-1450°C); Low-temperature isochron date: 69.1 ± 0.5 Ma; $(^{40}\text{Ar}/^{36}\text{Ar})_i=298 \pm 2$ (800-950 °C);
 $J=0.007289$, ±0.25%; wt. 245.3 mg

90SR14b, Hornblende							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
700	0.3693	0.07729	4.78	0.48	68.1	4.3	53.5 ± 0.3
800 ^L	.4128	.07111	5.80	1.67	56.9	3.9	64.8 ± 0.4
850 ^L	.2833	.04883	5.80	1.12	87.6	2.7	64.8 ± 0.9
900 ^L	.4438	.08018	5.54	.44	87.7	4.4	61.8 ± 0.6
950	.3953	.05483	7.21	.08	83.4	3.0	80.1 ± 0.3
975	.31600	.03062	10.32	.05	78.8	1.7	114.0 ± 2
1000 ^P	1.0129	.08037	12.60	.10	91.2	4.5	137.8 ± 0.4
1025 ^P	4.8588	.36959	13.15	.14	97.5	20.5	143.6 ± 0.4
1075 ^P	5.2285	.3990	13.10	.13	93.8	22.1	143.1 ± 0.4
1100 ^P	.7101	.05456	13.02	.12	82.9	3.0	142.2 ± 0.4
1150 ^P	3.5181	.26754	13.15	.13	96.2	14.8	143.6 ± 0.4
1200 ^P	2.6287	.20000	13.14	.13	97.0	11.1	143.6 ± 0.4
1250 ^P	.4287	.03299	13.00	.13	82.9	1.8	142.0 ± 2
1350 ^P	.4606	.03533	13.04	.13	88.6	2.0	142.4 ± 0.8

Note: Total-gas date: 128.2 ± 0.5 Ma; Plateau date: 143.3 ± 0.6 Ma; Isochron date: 143.9 ± 0.2 Ma
 $(^{40}\text{Ar}/^{36}\text{Ar})_i=277 \pm 1$ (1050-1450°C); Low-temperature isochron date: 63.0 ± 0.9 Ma; $(^{40}\text{Ar}/^{36}\text{Ar})_i=307 \pm 10$ (700-950 °C);
 $J=0.006306$, ±0.25%; wt. 251 mg

TABLE A-2. (continued)

90SR35, Hornblende							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
700	0.1638	0.01177	13.92	0.08	46.9	0.4	152.0 ± 0.4
800	.6447	.05244	12.29	.40	52.3	1.9	134.9 ± 0.4
900	.8260	.08195	10.08	.22	84.8	3.0	111.3 ± 0.4
950	1.0234	.08686	11.78	.05	85.6	3.2	129.5 ± 1.3
1000	3.2464	.21067	15.41	.12	96.0	7.8	167.5 ± 0.4
1025 ^W	5.8382	.37136	15.72	.16	95.9	13.8	170.8 ± 0.4
1050 ^W	7.4922	.47788	15.68	.17	95.6	17.7	170.3 ± 0.4
1075 ^W	1.3803	.08851	15.59	.14	95.0	3.3	169.4 ± 0.7
1100 ^W	2.1746	.13775	15.79	.15	95.7	5.1	171.4 ± 0.5
1150 ^W	11.6594	.74546	15.64	.17	95.2	27.6	169.9 ± 0.4
1200 ^W	3.7429	.23490	15.93	.14	94.7	8.7	173.0 ± 0.5
1250 ^W	.7829	.05006	15.64	.15	92.7	1.9	169.9 ± 1.1
1450 ^W	2.3447	.14931	15.70	.15	94.4	5.5	170.6 ± 0.4

Note: Total-gas date: 166.5 ± 0.5 Ma; Weighted mean date: 170.6 ± 0.6 Ma; Isochron date: 171.5 ± 1.1 Ma
($^{40}\text{Ar}/^{36}\text{Ar}$)=269 ± 36 (1025–1450 °C); J=0.006315, ±0.25%; wt. 277.9 mg

91SR58H, Hornblende							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
700	0.2045	0.05380	3.80	0.22	37.1	2.0	49.8 ± 0.5
800	.16572	.02784	5.95	.36	65.8	1.0	77.5 ± 0.4
850	.08146	.00892	9.14	.62	85.3	.3	118.0 ± 3
900	.10700	.00866	12.35	.35	91.1	.3	157.0 ± 1
950	.9212	.07105	12.97	.37	97.5	2.7	164.7 ± 0.4
1000	7.071	.62247	11.36	.36	99.4	23.5	145.1 ± 0.2
1025	5.702	.50709	11.24	.35	99.5	19.1	143.7 ± 0.2
1050 ^P	3.105	.27670	11.22	.35	99.2	10.4	143.4 ± 0.2
1075 ^P	2.3211	.20734	11.20	.35	99.4	7.8	143.0 ± 0.4
1100 ^P	2.0131	.17923	11.23	.35	99.1	6.8	143.5 ± 0.2
1150 ^P	3.5719	.31660	11.28	.34	99.6	11.9	144.1 ± 0.2
1200 ^P	3.3574	.29861	11.24	.35	99.2	11.2	143.6 ± 0.3
1250 ^P	.5577	.04959	11.25	.36	97.9	1.9	143.7 ± 1.0
1350 ^P	.29958	.02649	11.31	.35	92.1	1.0	144.0 ± 3

Note: Total-gas date: 142.0 ± 0.3 Ma; Plateau date: 143.6 ± 0.4 Ma; Isochron date: 144.1 ± 0.2 Ma
($^{40}\text{Ar}/^{36}\text{Ar}$)=255 ± 47 (1025–1250 °C); J=0.007372, ±0.1%; wt. 212.6 mg

(continued)

TABLE A-2. (continued)

91SR59A, Hornblende							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
700 ^L	1.8878	.46455	4.064	4.30	83.5	18.4	53.2 ± 0.1
800 ^L	1.1784	.26795	4.398	3.80	93.6	10.6	57.5 ± 0.1
850 ^L	.82748	.17140	4.828	2.30	95.6	6.8	63.1 ± 0.3
900 ^L	.70014	.15751	4.445	1.33	94.3	6.3	58.2 ± 0.2
950 ^L	.78821	.16205	4.864	.54	93.7	6.4	63.5 ± 0.2
1000	3.0575	.33380	9.160	.22	97.6	13.3	117.8 ± 0.2
1025	3.9934	.37407	10.68	.18	98.6	14.9	136.6 ± 0.2
1050 ^H	3.3601	.30620	10.97	.18	98.8	12.2	140.3 ± 0.2
1075 ^H	.8921	.08178	10.91	.17	98.6	3.2	139.5 ± 0.5
1100 ^H	.29885	.02736	10.92	.16	99.0	1.1	139.7 ± 1.6
1125 ^H	.32130	.02961	10.85	.15	97.2	1.2	138.8 ± 0.8
1150 ^H	.33896	.03098	10.94	.15	97.6	1.2	139.9 ± 1.1
1200 ^H	.75780	.06889	11.00	.16	98.1	2.7	140.6 ± 0.6
1350 ^H	0.46154	.04238	10.89	.16	96.1	1.7	139.2 ± 0.7

Note: Total-gas date: 96.9 ± 0.2 Ma; No plateau; High-temperature isochron date: 140.5 ± 0.3 Ma
($^{40}\text{Ar}/^{36}\text{Ar}$)=233 ± 25 (1050–1350 °C); Low-temperature isochron date: 64.4 ± 1.5 Ma; ($^{40}\text{Ar}/^{36}\text{Ar}$)=-24 ± 76 (700–950 °C);
J=0.007369, ±0.1%; wt. 204.6 mg

91SR77D, Hornblende							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
700 ^L	1.0309	0.25350	4.067	1.35	73.3	19.4	52.9 ± 0.1
800 ^L	.61115	.13932	4.387	1.95	86.0	10.7	57.0 ± 0.4
850 ^L	.34492	.07793	4.426	1.09	90.2	6.0	57.5 ± 0.6
900 ^L	.34023	.07890	4.312	.35	88.1	6.0	56.0 ± 0.9
950 ^L	.39229	.08013	4.896	.09	85.5	6.1	63.4 ± 0.2
1000	1.0086	.11578	8.711	.11	92.7	8.9	111.4 ± 0.5
1025	1.9050	.17709	10.76	.12	97.0	13.5	136.6 ± 0.2
1050	1.6990	.15368	11.06	.12	97.3	11.7	140.2 ± 0.4
1075 ^H	.58022	.05314	10.92	.12	90.6	4.1	138.6 ± 0.2
1100 ^H	.22832	.02133	10.70	.10	92.4	1.6	135.9 ± 1.1
1125 ^H	.7396	.06650	11.12	.10	93.6	5.1	141.0 ± 0.5
1150 ^H	.2783	.02535	10.98	.09	92.8	1.9	139.3 ± 2.1
1200 ^H	.3658	.03313	11.04	.09	92.5	2.5	140.1 ± 1.4
1350 ^H	.3586	.03228	11.11	.09	91.8	2.5	140.9 ± 1.1

Note: Total-gas date: 97.0 ± 0.5 Ma; No plateau; High-temperature isochron date: 142 ± 4 Ma
($^{40}\text{Ar}/^{36}\text{Ar}$)=233 ± 90 (1075–1350 °C); Low-temperature isochron date: 60 ± 2 Ma; ($^{40}\text{Ar}/^{36}\text{Ar}$)=204 ± 55 (700–950 °C);
J=0.007312, ±0.1%; wt. 203.3 mg

(continued)

TABLE A-2. (continued)

91SR77G, Hornblende							
T (°C)	Radiogenic $^{40}\text{Ar}^+$	K-derived $^{39}\text{Ar}^+$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K$ §	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}$ #	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
700	0.27853	0.05930	4.70	0.35	40.4	10.2	61.0 ± 0.9
800	.18788	.03432	5.47	.69	82.2	5.9	70.9 ± 0.5
850	.11569	.02328	4.97	.47	84.4	4.0	64.4 ± 1.3
900	.09627	.01966	4.90	.11	81.4	3.4	63.5 ± 1.1
950	.12934	.02048	6.31	.03	81.6	3.5	81.5 ± 2.1
1000	.35508	.03620	9.81	.05	89.6	6.2	125.1 ± 1.1
1025	1.0559	.09625	10.97	.06	94.7	16.5	139.3 ± 0.6
1050 ^P	1.1710	.10389	11.27	.06	96.7	17.8	143.0 ± 0.8
1075 ^P	.47306	.04183	11.31	.06	96.9	7.2	143.5 ± 0.8
1100 ^P	.10529	.00936	11.25	.06	94.9	1.6	143.0 ± 7.0
1150 ^P	.39530	.03537	11.18	.06	94.8	6.1	141.8 ± 0.3
1200 ^P	.44793	.03970	11.28	.06	96.2	6.8	143.1 ± 1.2
1350 ^P	.7224	.06407	11.28	.06	94.8	11.0	143.0 ± 0.4

Note: Total-gas date: 121.0 ± 1.0 Ma; Plateau date: 143.0 ± 1.9 Ma; Isochron date: 144.5 ± 0.4Ma
($^{40}\text{Ar}/^{36}\text{Ar}$)=224 ± 20 (1050–1350 °C); J=0.007319, ±0.1%; wt. 211.2 mg

91SR84B, Hornblende							
T (°C)	Radiogenic $^{40}\text{Ar}^+$	K-derived $^{39}\text{Ar}^+$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K$ §	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}$ #	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
700 ^L	1.0012	0.14167	7.067	1.17	59.5	12.6	63.9 ± 0.1
800 ^L	.37787	.05297	7.134	3.85	81.8	4.7	64.5 ± 0.4
850 ^L	.4170	.06019	6.927	2.38	69.3	5.4	62.7 ± 0.1
900 ^L	.48654	.07129	6.825	1.50	74.1	6.4	61.8 ± 0.5
950 ^L	.10718	.01689	6.34	1.30	36.2	1.5	57.0 ± 3.0
1000 ^L	.6456	.09388	6.877	.15	76.2	8.4	62.2 ± 0.1
1025	1.3685	.09858	13.88	.08	85.9	8.8	123.4 ± 0.2
1050 ^H	2.868	.18203	15.76	.09	92.6	16.2	139.5 ± 0.2
1075 ^H	1.7074	.10749	15.88	.09	91.2	9.6	140.6 ± 0.6
1100 ^H	.32651	.02031	16.08	.08	75.3	1.8	142.2 ± 1.7
1125 ^H	.50842	.03175	16.01	.08	80.9	2.8	141.7 ± 0.6
1150 ^H	1.9241	.12018	16.01	.09	92.2	10.7	141.6 ± 0.2
1200 ^H	1.3100	.08193	15.99	.09	90.7	7.3	141.5 ± 0.4
1350 ^H	.68258	.04258	16.03	.09	84.1	3.8	141.8 ± 0.4

Note: Total-gas date: 109.3 ± 0.4 Ma; No plateau; High-temperature isochron date: 140.5 ± 0.3 Ma
($^{40}\text{Ar}/^{36}\text{Ar}$)=310 ± 4 (1050–1350 °C); Low-temperature isochron date: 64.4 ± 0.5 Ma; ($^{40}\text{Ar}/^{36}\text{Ar}$)=278 ± 4 (700–1000 °C);
J=0.005102, ±0.1%; wt. 186.5 mg

(continued)

TABLE A-2. (continued)

91SR89A, Hornblende							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
700 ^L	0.97085	0.23276	4.171	3.37	71.6	12.1	54.3 ± 0.2
800 ^L	.6148	.14015	40387	3.73	91.6	7.3	57.1 ± 0.4
850 ^L	.2735	.05860	4.67	2.54	90.2	3.0	60.7 ± 0.9
900 ^L	.39451	.07616	5.18	1.73	95.0	3.9	67.3 ± 1.5
950 ^L	.45142	.09738	4.636	.87	90.4	5.0	60.3 ± 0.2
1000	.5313	.09010	5.896	.36	93.6	4.7	76.4 ± 0.7
1025	.9393	.10426	9.009	.23	96.9	5.4	115.4 ± 0.4
1050	2.612	.24539	10.64	.19	98.0	12.7	135.6 ± 0.2
1075 ^H	2.887	.26046	11.08	.18	98.3	13.5	141.0 ± 0.4
1100 ^H	2.5029	.22265	11.24	.18	98.2	11.5	142.9 ± 0.4
1150 ^H	2.1779	.19394	11.23	.17	97.9	10.0	142.8 ± 0.2
1200 ^H	1.0509	.09370	11.22	.17	94.0	4.9	142.6 ± 1.1
1250 ^H	.7430	.06618	11.23	.17	96.8	3.4	142.8 ± 1.0
1450 ^H	.5468	.04962	11.02	.17	91.3	2.6	140.2 ± 1.4

Note: Total-gas date: 110.9 ± 0.6 Ma; No plateau; High-temperature isochron date: 141.9 ± 0.4 Ma
 $(^{40}\text{Ar}/^{36}\text{Ar})=310 \pm 4$ (1075–1450 °C); Low-temperature isochron date: 64.1 ± 1.4 Ma; $(^{40}\text{Ar}/^{36}\text{Ar})_i=149 \pm 4$ 2(700–950 °C);
 J=0.007335, ±0.1%; wt. 203.2 mg

91SR106D, Hornblende							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
600	0.5567	0.12122	4.59	0.56	63.6	4.4	43.8 ± 0.2
700 ^L	1.0098	.17689	5.71	4.17	66.8	6.4	54.2 ± 0.3
750 ^L	.63143	.10961	5.761	3.68	86.5	4.0	54.7 ± 0.1
800 ^L	.30390	.05091	5.969	1.67	81.2	1.8	56.7 ± 0.1
850 ^L	.3594	.06070	5.92	.73	83.1	2.2	56.2 ± 0.4
900	.5648	.09357	6.037	.23	82.6	3.4	57.3 ± 0.1
950	1.211	.15488	7.82	.18	86.9	5.6	73.9 ± 0.3
1000	8.605	.6471	13.30	.25	96.4	23.5	123.9 ± 0.2
1025 ^H	10.253	.68193	15.04	.21	97.5	24.7	139.5 ± 0.2
1050 ^H	4.711	.30874	15.26	.21	97.9	11.2	141.5 ± 0.2
1075 ^H	2.3433	.15343	15.27	.20	97.5	5.6	141.6 ± 0.2
1100 ^H	.7815	.05133	15.22	.18	95.6	1.9	141.2 ± 0.2
1150 ^H	.6447	.0422	15.26	.15	94.9	1.5	141.5 ± 1.6
1350 ^H	1.625	.1031	15.75	.16	94.9	3.7	145.9 ± 0.4

Note: Total-gas date: 113.9 ± 0.3 Ma; No plateau; High-temperature isochron date: 139.2 ± 1.2 Ma
 $(^{40}\text{Ar}/^{36}\text{Ar})=310 \pm 4$ (1025–1350 °C); Low-temperature isochron date: 56.6 ± 0.7 Ma; $(^{40}\text{Ar}/^{36}\text{Ar})_i=276 \pm 14$ (700–850 °C);
 J=0.007335, ±0.1%; wt. 203.2 mg

(continued)

TABLE A-2. (continued)

73AH279A, Hornblende							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
700	0.91075	0.17188	5.299	0.54	84.2	9.2	59.0 ± 0.4
800 ^L	.7614	.10956	6.95	.75	59.7	5.9	77.0 ± 1.2
850 ^L	.14996	.02245	6.681	.27	63.4	1.2	74.1 ± 0.5
900 ^L	.10771	.01607	6.70	.11	73.0	.9	74.0 ± 3.0
950 ^L	.12763	.01809	7.05	.06	60.2	1.0	78.0 ± 3.0
1000	1.7900	.14504	12.34	.11	95.7	7.8	134.6 ± 0.6
1025	4.560	.3514	12.98	.12	98.2	18.8	141.3 ± 0.5
1050 ^P	3.9094	.29945	13.06	.12	97.9	16.0	142.1 ± 0.4
1075 ^{E^P}	1.4806	.11400	12.99	.11	96.1	6.1	141.4 ± 0.6
1100 ^P	1.100	.0839	13.10	.10	95.1	4.5	142.6 ± 0.4
1150 ^P	3.1408	.24044	13.06	.10	96.4	12.9	142.2 ± 0.4
1200 ^P	2.926	.2232	13.10	.11	97.2	11.9	142.6 ± 0.4
1350 ^P	.55711	.04312	12.92	.11	93.8	2.3	140.7 ± 1.0
1450 ^P	.38798	.03050	12.72	.12	90.9	1.6	139.0 ± 3.0

Note: Total-gas date: 128.1 ± 0.6 Ma; Plateau date: 142.2 ± 0.5 Ma; Isochron date: 142.4 ± 0.9 Ma
($^{40}\text{Ar}/^{36}\text{Ar}$)_i=214 ± 20 (1050–1450 °C); Low-temperature isochron date: 70.4 ± 1.5 Ma; ($^{40}\text{Ar}/^{36}\text{Ar}$)_i=334 ± 10 (800–950 °C);
J=0.006278, ±0.25%; wt. 257.4 mg

89SR88A, Hornblende							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
500	0.1646	0.04853	3.39	0.25	56.6	1.0	48.5 ± 1.2
600	.3729	.09475	3.936	.65	83.9	1.9	56.2 ± 0.5
700 ^L	.8832	.15135	5.836	.52	61.7	3.0	82.7 ± 0.6
800 ^L	2.2132	.37087	5.968	.40	93.4	7.4	84.5 ± 0.2
850 ^L	.9755	.16179	6.029	.47	95.8	3.2	85.4 ± 0.5
900	.8572	.10265	8.351	.19	94.0	2.1	117.2 ± 0.5
925	1.3304	.13590	9.79	.16	94.6	2.7	136.6 ± 0.5
950 ^H	1.9507	.18737	10.41	.16	96.4	3.8	145.0 ± 0.4
975 ^H	7.8095	.72837	10.72	.17	98.7	14.6	149.1 ± 0.4
1000 ^H	8.0017	.74684	10.71	.17	99.0	15.0	149.0 ± 0.4
1025 ^H	4.6834	.44201	10.60	.20	98.5	8.9	147.4 ± 0.6
1050 ^H	2.2863	.21561	10.60	.17	98.2	4.3	147.6 ± 0.4
1100 ^H	4.5081	.42336	10.65	.17	98.9	8.5	148.2 ± 0.4
1150 ^H	4.4194	.41249	10.71	.17	98.8	8.3	149.0 ± 0.4
1200 ^H	1.2349	.11946	10.34	.18	96.7	2.4	144.0 ± 0.4
1250 ^H	4.6796	.43661	10.72	.17	97.9	8.8	149.1 ± 0.4
1450 ^H	2.1588	0.20302	10.63	.18	91.6	4.1	148.0 ± 0.7

Note: Total-gas date: 136.0 ± 0.4 Ma; No plateau; High-temperature isochron date: 148.7 ± 0.9 Ma
($^{40}\text{Ar}/^{36}\text{Ar}$)_i=310 ± 4 (1025–1450 °C); Low-temperature isochron date: 85.2 ± 0.3 Ma; ($^{40}\text{Ar}/^{36}\text{Ar}$)_i=281 ± 2 (700–850 °C);
J=0.008038, ±0.2%; wt. 319.2 mg

(continued)

TABLE A-2. (continued)

90SR27C, Muscovite							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
500	0.19009	.05350	3.55	20	71.8	1.4	40.0 ± 0.5
600	.7056	.12049	5.86	658	93.9	3.2	65.5 ± 0.5
650	1.106	.16496	6.70	686	97.1	4.4	74.8 ± 0.7
700	1.930	.2642	7.304	1015	89.0	7.0	81.4 ± 0.2
750	3.237	.3861	8.384	942	97.3	10.3	93.1 ± 0.2
800	5.550	.5437	10.21	1461	99.2	14.5	112.7 ± 0.2
850	2.823	.23279	12.13	870	99.6	6.2	133.2 ± 0.3
900	6.191	.49794	12.43	1044	99.6	13.3	136.4 ± 0.3
950	4.004	.3184	12.58	1141	99.6	8.5	137.9 ± 0.3
1000	7.480	.5898	12.68	938	99.5	15.7	139.0 ± 0.3
1050	3.212	.2525	12.72	697	99.1	6.7	139.4 ± 0.3
1100	2.291	.17764	12.90	367	99.6	4.7	141.3 ± 0.3
1250	1.953	.15340	12.73	52	98.9	4.1	139.6 ± 0.3

Note: Total-gas date: 119.4 ± 0.3 Ma; No plateau; J=0.006317, ±0.2%; wt. 77.3 mg

90SR27F, Muscovite							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
500	0.1633	0.04558	3.585	85	66.5	0.7	40.2 ± 1.3
600	0.7774	.12550	6.195	677	95.3	2.0	68.9 ± 0.2
650	0.9218	.13136	7.017	452	98.1	2.1	77.8 ± 0.2
700	1.810	.2426	7.462	429	91.1	3.9	82.6 ± 0.3
750	3.258	.3857	8.446	634	94.3	6.2	93.2 ± 0.2
800	5.629	.5587	10.08	870	99.1	9.0	110.7 ± 0.3
850	16.295	1.3771	11.83	1505	99.4	22.2	129.3 ± 0.4
900	18.986	1.5276	12.43	3772	99.6	24.7	135.6 ± 0.4
950	5.507	.4395	12.53	3691	99.6	7.1	136.7 ± 0.4
1000	7.642	.6047	12.64	2049	99.0	9.8	137.8 ± 0.4
1100	9.262	.71706	12.92	1089	99.2	11.6	140.7 ± 0.4
1250	.5046	.04012	12.58	9.4	94.9	.6	137.2 ± 0.8

Note: Total-gas date: 125.0 ± 0.4 Ma; No plateau; J=0.006281, ±0.2%; wt. 63.2 mg

(continued)

TABLE A-2. (continued)

91SR58A Muscovite							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
600	1.2715	0.31101	4.088	33	89.2	9.8	52.9 ± 0.2
650	1.6349	.37320	4.381	28	87.7	11.8	56.6 ± 0.2
700	.8402	.19878	4.226	85	93.0	6.3	54.7 ± 0.2
750 ^P	1.0213	.24045	4.247	146	91.7	7.6	54.9 ± 0.3
800 ^P	1.7218	.40782	4.222	79	89.9	12.9	54.6 ± 0.2
850 ^P	2.3904	.56817	4.207	134	88.8	18.0	54.4 ± 0.1
900 ^P	2.3462	.55789	4.206	110	88.3	17.7	54.4 ± 0.1
950 ^P	1.3454	.32075	4.195	86	87.6	10.2	54.2 ± 0.4
1000 ^P	.48655	.11707	4.156	47	88.6	3.7	53.8 ± 0.7
1100 ^P	.15807	.03903	4.050	26	90.0	1.2	54.0 ± 2.0
1250	.09092	.02386	3.810	5.8	84.4	.8	49.0 ± 3.0

Note: Total-gas date: 54.5 ± 0.2 Ma; Plateau date: 54.4 ± 0.5 Ma; J=0.007278, ±0.1%; wt. 60.1 mg

91SR69B, Muscovite							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
600	0.3940	0.04539	8.679	16	72.1	2.5	79.7 ± 0.8
700	.6948	.05981	11.62	20	78.3	3.3	105.9 ± 0.7
750	1.0759	.07768	13.85	4.2	95.4	4.3	125.6 ± 0.4
850	6.3808	.41486	15.38	19	98.3	23.0	139.0 ± 0.3
900 ^W	5.2730	.33725	15.64	37	98.9	18.7	141.2 ± 0.2
950 ^W	4.0404	.25867	15.62	75	98.7	14.4	141.1 ± 0.2
1000 ^W	4.1608	.26598	15.64	118	98.4	14.8	141.3 ± 0.2
1050 ^W	3.6237	.23042	15.73	57	98.9	12.8	142.0 ± 0.3
1100 ^W	1.5057	.09594	15.70	11	98.9	5.3	141.7 ± 0.4
1150	.07901	.00641	12.33	.63	85.6	.4	112.0 ± 9
1350	.07439	.00766	9.70	.36	76.2	.4	89.0 ± 9

Note: Total-gas date: 137.1 ± 0.4 Ma; Weighted mean date: 141.4 ± 0.3 Ma; J=0.005207, ±0.1%; wt. 38.9 mg

91SR110C, Muscovite							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
500	0.12689	0.01861	6.818	49	5509.0	0.3	98.2 ± 1.0
600	.2058	.03963	5.193	12	65.2	.7	75.2 ± 1.6
700	.4705	.10877	4.326	35	52.4	1.9	62.9 ± 0.5
750	.92351	.19325	4.779	106	82.8	3.4	69.4 ± 0.3
800	2.4535	.4196	5.847	246	82.8	7.3	84.5 ± 0.1
850	3.6021	.5365	6.714	189	84.9	9.4	96.7 ± 0.3
900	4.6506	.62285	7.467	527	91.0	10.9	107.2 ± 0.2
950	5.1026	.62130	8.213	360	92.1	10.9	117.6 ± 0.2
1000	9.0231	1.0091	8.942	568	92.6	17.6	127.7 ± 0.2
1050	14.557	1.5333	9.494	962	95.1	26.8	135.3 ± 0.2
1100	5.1902	.55494	9.353	213	97.2	9.7	133.3 ± 0.2
1150	.37391	.04343	8.609	25	94.6	.8	123.1 ± 1.6
1350	.13980	.01725	8.103	10	82.0	.3	116.1 ± 0.3

Note: Total-gas date: 117.2 ± 0.2 Ma; No plateau; J=0.008202, ±0.1%; wt. 33.8 mg

(continued)

TABLE A-2. (continued)

91SR59A, Muscovite							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
600	0.1588	0.0530	3.00	1.73	56.0	1.7	39.1 ± 1.0
700	1.9918	.4570	4.359	2.76	84.8	14.2	56.6 ± 0.3
750	2.4877	.4603	5.404	5.80	94.3	14.4	69.8 ± 0.1
800	2.8624	.42220	6.780	7.49	97.6	13.2	87.2 ± 0.1
850	4.9700	.63282	7.854	7.15	98.0	19.7	100.6 ± 0.2
900	5.8354	.70630	8.404	9.14	98.5	22.0	107.5 ± 0.2
950	2.5833	.34760	7.432	2.49	96.7	10.8	95.4 ± 0.2
1000	.3667	.06194	5.921	.54	89.4	1.9	76.4 ± 0.4
1050	.2301	.04046	5.688	.12	85.9	1.3	73.4 ± 1.6
1300	.1419	.02526	5.618	.13	79.5	.8	72.6 ± 2.0

Note: Total-gas date: 87.2 ± 0.2 Ma; No plateau; J=0.007305, ±0.1%; wt. 50.5 mg

91SR77D, Muscovite							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
600	0.1231	0.04499	2.74	nd	55.3	0.9	36.2 ± 0.7
700	2.8189	.71874	3.922	nd	87.2	14.0	51.6 ± 0.1
750	2.6469	.61456	4.307	nd	96.4	12.0	56.6 ± 0.1
800	2.3440	.50792	4.615	nd	97.4	9.9	60.6 ± 0.1
850	4.0462	.81134	4.987	nd	98.4	15.8	65.4 ± 0.1
900	5.0880	.95126	5.349	nd	98.3	18.5	70.1 ± 0.1
950	4.2039	.74580	5.637	nd	97.4	14.5	73.7 ± 0.3
1000	2.3474	.38809	6.049	nd	97.4	7.6	79.0 ± 0.2
1050	1.3372	.21569	6.200	nd	95.8	4.2	80.9 ± 0.7
1100	.6379	.10785	5.915	nd	95.6	2.1	77.3 ± 0.3
1350	.1622	.03244	5.00	nd	82.0	.6	66.0 ± 1.0

Note: Total-gas date: 65.7 ± 0.2 Ma; No plateau; J=0.007402, ±0.2%; wt. 52.5 mg

91SR89A, White Mica							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
600	0.6360	.2331	2.728	3.18	66.4	6.6	35.9 ± 0.2
700	.9296	.2239	4.152	2.25	94.7	6.3	54.3 ± 0.1
750	1.3172	.2899	4.543	2.07	88.6	8.2	59.4 ± 0.4
800	1.7127	.3527	4.856	5.58	96.3	10.0	63.4 ± 0.2
850	2.0178	.3574	5.645	5.30	97.4	10.1	73.5 ± 0.1
900	4.7638	.6697	7.003	6.37	98.5	18.9	92.1 ± 0.2
950	7.3194	.9285	7.883	4.74	98.5	26.2	101.8 ± 0.2
1000	1.9523	0.30520	6.397	1.35	95.8	8.6	83.0 ± 0.2
1050	.56770	.10167	5.584	.33	88.7	2.9	72.7 ± 0.3
1100	.2384	.04695	5.078	.16	75.3	1.3	66.2 ± 0.6
1150	.0708	.01239	5.71	.13	78.8	.4	74.0 ± 2.0
1350	.1101	.01687	6.53	.15	86.2	.5	85.0 ± 2.0

Note: Total-gas date: 79.4 ± 0.2 Ma; No plateau; J=0.007363, ±0.2%; wt. 82.4 mg

(continued)

TABLE A-2. (continued)

90SR14B, White Mica							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
500	0.1489	0.0893	1.667	6.89	48.6	2.2	18.8 ± 0.4
600	.5946	.1571	3.784	5.57	88.3	3.8	42.5 ± 0.1
650	.9667	.24641	3.923	5.00	69.5	6.0	44.1 ± 0.2
700	1.7657	.2976	5.933	9.48	88.8	7.2	66.2 ± 0.2
750	2.3235	.4045	5.744	14.0	88.9	9.8	64.1 ± 0.2
800	2.7576	.5083	5.425	20.9	96.9	12.3	60.7 ± 0.2
850	3.7115	.6940	5.348	26.9	98.7	16.8	59.8 ± 0.2
900	6.4779	1.2386	5.230	15.3	99.0	30.0	58.5 ± 0.2
950	1.6599	.32089	5.173	3.26	96.1	7.8	57.9 ± 0.3
1000	.4974	.09527	5.221	1.02	90.8	2.3	58.4 ± 0.3
1050	.26204	.04627	5.663	.41	81.5	1.1	63.3 ± 0.4
1100	.10280	.01851	5.56	.16	63.4	.4	62.0 ± 3.0
1250	.08589	.01694	5.07	.16	67.6	.4	57.0 ± 4.0

Note: Total-gas date: 58.8 ± 0.2 Ma; No plateau; J=0.006303, ±0.2%; wt. 61.3 mg

91SR104H, White Mica							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
600	0.1128	0.02741	4.12	1.38	42.9	5.8	38.0 ± 1
700	.3520	.06382	5.515	.78	64.3	13.5	50.8 ± 0.6
750 ^P	.5456	.09147	5.964	3.67	95.2	19.3	54.8 ± 0.4
800 ^P	.4402	.07379	5.966	4.32	97.2	15.6	54.8 ± 0.2
850 ^P	.5228	.08788	5.949	3.78	97.1	18.6	54.7 ± 0.6
900 ^P	.34349	.05809	5.913	2.62	96.0	12.3	54.4 ± 0.3
950	.19795	.03418	5.792	1.14	89.9	7.2	53.3 ± 0.8
1000	.09359	.01617	5.788	.83	84.5	3.4	53.2 ± 0.4
1050	.07357	.01204	6.11	.61	90.6	2.5	56.0 ± 5
1100	.04370	.0084	5.20	.50	72.8	1.8	48.0 ± 4

Note: Total-gas date: 53.0 ± 0.7 Ma; Plateau date: 54.8 ± 0.2 Ma; J=0.005174, ±0.2%; wt. 52.7 mg

91SR111D, Muscovite							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
600	1.6384	0.46729	3.506	nd	84.9	8.2	45.9 ± 0.1
700	.4385	.11210	3.912	nd	86.9	2.0	51.1 ± 0.4
750	4.5089	1.1278	3.998	nd	91.8	19.8	52.2 ± 0.1
800	3.7230	.94207	3.952	nd	96.9	16.6	51.6 ± 0.1
850 ^P	3.2003	.81196	3.941	nd	97.6	14.3	51.5 ± 0.1
900 ^P	3.5404	.89837	3.941	nd	97.7	15.8	51.5 ± 0.1
950 ^P	2.9917	.76000	3.936	nd	97.4	13.4	51.4 ± 0.1
1000 ^P	1.3719	.34758	3.947	nd	95.4	6.1	51.5 ± 0.1
1050	.57224	.14329	3.994	nd	92.0	2.5	52.1 ± 0.1
1100	.21735	.0559	3.89	nd	84.6	1.0	51.0 ± 2.0
1350	.09207	.0230	4.00	nd	70.4	.4	52.0 ± 2.0

Note: Total-gas date: 51.2 ± 0.1 Ma; Plateau date: 51.4 ± 0.1 Ma; J=0.007342, ±0.2%; wt. 74.2 mg

(continued)

TABLE A-2. (continued)

94SR23A, Biotite							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
600	0.0074	0.00687	1.07	8.64	2.9	0.6	18.0 ± 6
700	.0273	.02325	1.18	13.0	9.4	2.0	20.0 ± 3
800	.4346	.14424	3.013	117	76.3	12.4	49.9 ± 0.2
850	.6598	.21393	3.084	328	92.5	18.3	51.1 ± 0.2
900	.5200	.16759	3.103	133	96.8	14.4	51.4 ± 0.2
950	.2492	.07920	3.146	56.4	94.3	6.8	52.1 ± 0.5
1000	.20239	.06461	3.133	43.8	90.9	5.5	51.9 ± 0.1
1050	.4551	.13968	3.258	73.3	97.2	12.0	53.9 ± 0.3
1100	.3844	.12194	3.153	58.0	96.5	10.5	52.2 ± 0.2
1150	.3577	.11599	3.083	62.6	95.3	9.9	51.1 ± 0.3
1200	.1511	.05004	3.02	27.9	91.1	4.3	50.0 ± 1
1350	.1193	.03926	3.04	12.5	90.8	3.4	50.0 ± 2

Note: Total-gas date: 50.6 ± 0.6 Ma; No plateau; J=0.009310, ±0.2%; wt. 20.0 mg

91SR69B, K-feldspar							
T (°C)	Radiogenic $^{40}\text{Ar}^{\dagger}$	K-derived $^{39}\text{Ar}^{\dagger}$	$^{40}\text{Ar}_R/^{39}\text{Ar}_K^{\S}$	$^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}^{\#}$	Radiogenic yield (%)	$^{39}\text{Ar}_K$ (%)	Apparent age and error** (Ma)
500	0.2973	0.07402	4.017	376	76.5	2.7	38.3 ± 0.4
600	1.5144	.33761	4.486	371	97.0	12.5	42.7 ± 0.2
650	.9507	.19836	4.793	423	95.8	7.4	45.6 ± 0.1
700	.5771	.11760	4.907	230	81.5	4.4	46.6 ± 0.5
750	.3731	.07645	4.880	40.7	92.4	2.8	46.4 ± 0.4
800	.29554	.06086	4.856	24.1	90.8	2.3	46.2 ± 0.7
850	.22728	.04347	5.228	20.7	95.1	1.6	50.0 ± 2.0
900	.22321	.04336	5.148	44.3	93.7	1.6	48.9 ± 0.6
950	.3056	.05951	5.134	128	94.1	2.2	49.0 ± 1.0
1000	.3952	.07795	5.070	165	94.0	2.9	48.2 ± 0.6
1050	.5387	.10815	4.981	120	93.5	4.0	47.3 ± 0.5
1100	.5585	.11004	5.075	92.7	95.4	4.1	48.2 ± 0.8
1150	.9473	.18852	5.025	105	93.9	7.0	47.8 ± 0.2
1200	1.4268	.28267	5.048	168	93.8	10.5	48.0 ± 0.2
1250	2.4255	.47671	5.088	484	93.1	17.7	48.3 ± 0.1
1350	1.7512	.33968	5.156	539	92.6	12.6	49.0 ± 0.2
1475	.4994	.09962	5.013	510	86.1	3.7	47.6 ± 0.2

Note: Total-gas date: 46.9 ± 0.3 Ma; No plateau; J=0.005337, ±0.2%; wt. 35.5 mg

Notes:

*Mineral concentrates were derived from rock samples that were crushed, ground, and sieved to 60–120 mesh size (250–125 micrometers). Concentrates were passed through magnetic separator and heavy liquids and then handpicked to greater than 99% purity. All samples then were cleaned with reagent-grade acetone, alcohol, and deionized water and air-dried in an oven at 75 °C. Thirty to 300 mg of mineral were wrapped in aluminum foil packages and encapsulated in silica vials along with neutron-fluence standards prior to irradiation. The standards for this experiment are hornblende MMhb-1 with percent K = 1.555, $^{40}\text{Ar}_R = 1.624 \times 10^{-9}$ mole/gm, and K-Ar age = 520.4 Ma (Samson and Alexander, 1987). For irradiation, an aluminum canister was loaded with six silica vials, each containing samples and standards. Standards were placed between every two samples as well as at the top and bottom of each silica vial. Samples were irradiated in one of nine different irradiation packages in the TRIGA reactor at the U.S. Geological Survey in Denver, Colorado. Length of irradiation ranged from 20 to 40 hours. Each irradiation package was rotated at 1 rpm during irradiation. All samples and standards were analyzed in the Denver Argon Laboratory of the U.S. Geological Survey using a Mass Analyser Products 215 rare-gas mass spectrometer on a Faraday-cup collector. Each sample was heated in a double-vacuum low-blank resistance furnace for 20 minutes, in a series of 10 to 15 steps, to a maximum of 1450 °C, and analyzed using the standard

stepwise heating technique described by Snee (2002). Each standard was degassed to release argon in a single step at 1250 °C for MMhb-1, hornblende. For every argon measurement, five isotopes of argon (^{40}Ar , ^{39}Ar , ^{38}Ar , ^{37}Ar , and ^{36}Ar) are measured. Detection limit at the time of these experiments was 2×10^{-17} moles of argon.

† Abundance of “Radiogenic ^{40}Ar ” and “K-derived ^{39}Ar ” is measured in volts and calculated to five decimal places. Voltage may be converted to moles using 1.160×10^{-12} moles argon per volt signal. “ $^{40}\text{Ar}_R/^{39}\text{Ar}_K$ ” is calculated to three decimal places. All three are rounded to significant figures using analytical precision.

§ “ $^{40}\text{Ar}_R/^{39}\text{Ar}_K$ ” has been corrected for mass discrimination. Mass discrimination was determined by calculating the $^{40}\text{Ar}/^{36}\text{Ar}$ ratio of aliquots of atmospheric argon pipetted from a fixed pipette on the extraction line; the ratio during these experiment was between 296.6 and 299.1, which was corrected to 295.5 to account for mass discrimination. “ $^{40}\text{Ar}_R/^{39}\text{Ar}_K$ ” was corrected for all interfering isotopes of argon including atmospheric argon. ^{37}Ar and ^{39}Ar , which are produced during irradiation, are radioactive and their abundances were corrected for radioactive decay. Abundances of interfering isotopes from K and Ca were calculated from reactor production ratios determined by irradiating and analyzing pure CaF_2 and K_2SO_4 ; the K_2SO_4 was degassed in a vacuum furnace prior to irradiation to release extraneous argon. Corrections for Cl-derived ^{36}Ar were determined using the method of Roddick (1983). Production ratios for this experiment were determined ($^{40}\text{Ar}/^{39}\text{Ar}$)_K, ($^{38}\text{Ar}/^{39}\text{Ar}$)_K, ($^{37}\text{Ar}/^{39}\text{Ar}$)_K, ($^{36}\text{Ar}/^{37}\text{Ar}$)_{Ca}, ($^{39}\text{Ar}/^{37}\text{Ar}$)_{Ca}, and ($^{38}\text{Ar}/^{37}\text{Ar}$)_{Ca}; measured values are available upon request.

#To calculate apparent K/Ca ratios, divide the “ $^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}$ ” by 2. The accuracy of apparent K/Ca ratios is dependent upon fast to thermal neutron ratios in the particular reactor. In the U.S. Geological Survey TRIGA reactor the correction factor has not been determined since Dalrymple et al. (1981). Because reactor fuel in the USGS TRIGA has been changed since 1981, this ratio must be viewed as approximate but is internally consistent for each sample and reveals within-sample variability.

**Apparent ages and associated errors were calculated from raw analytical data then rounded using associated analytical errors. Apparent ages of each fraction include the error in J value (0.11%), which was calculated from the reproducibility of splits of the argon from several standards. Apparent ages were calculated using decay constants of Steiger and Jäger (1977). All apparent age errors are cited at 1 sigma. Uncertainties in the calculations for apparent age of individual fractions were calculated using equations of Dalrymple et al. (1981). Isochron analysis followed the method of York (1969).

^p Fraction included in plateau date. Plateaus determined according to the method of Fleck et al. (1977).

TABLE A-3: MICROPROBE ANALYSES OF MINERAL SEPARATES FOR ⁴⁰AR/³⁹AR DATES*

Sample no.	90SR07	90SR07	91SR59a	91SR59a	91SR84b	91SR77d	91SR77d
Mineral	[†] Hbd—core	Actin—rim	Musc in Hbd	Bio in Hbd	Musc in Hbd	Bio in Hbd	K-feldspar in Hbd
SiO ₂	42.80	53.43	47.11	34.45	51.97	36.31	63.91
TiO ₂	1.11	0.02	1.03	0.93	0.04	0.72	0.62
Al ₂ O ₃	12.61	3.14	24.69	18.73	25.07	17.52	18.07
[§] Fe ₂ O ₃	7.66	0.86					0.57
FeO	9.84	13.62	8.43	21.43	4.44	16.89	N.A.
MnO	0.33	0.37	0.01	0.38	0.10	0.24	N.A.
MgO	10.49	13.74	3.84	10.19	5.84	12.93	0.03
CaO	11.37	12.41	0.09	0.16	0.13	0.03	0.60
Na ₂ O	1.33	0.22	0.13	0.03	0.07	0.08	0.38
K ₂ O	0.92	0.14	10.77	8.58	8.31	9.51	14.99
BaO	[#] N.A.	N.A.	0.17	0.00	N.A.	N.A.	N.A.
Cl	0.20	0.00	N.A.	N.A.	N.A.	N.A.	N.A.
F	0.03	0.00	N.A.	N.A.	0.42	0.39	N.A.
[§] H ₂ O	1.97	2.08	4.34	3.88	4.33	3.75	
[§] O = Cl	0.04	0.00	N.A.	N.A.	N.A.	N.A.	
[§] O = F	0.01	0.00	N.A.	N.A.	0.18	0.17	
Sum Ox%	100.61	100.03	100.61	98.76	100.54	98.2	99.17
Si	6.29	7.72	6.50	5.32	6.87	5.53	2.97
Ti	0.12	0.00	0.11	0.11	0.00	0.08	0.02
Al ^{IV}	1.71	0.28	1.50	2.68	1.13	2.47	0.99
Al ^{VI}	0.48	0.26	2.52	0.73	2.78	0.68	0.00
Fe ³⁺	0.85	0.09					0.02
Fe ²⁺	1.21	1.65	0.97	2.77	0.49	2.15	N.A.
Mn ²⁺	0.04	0.05	0.00	0.05	0.01	0.03	N.A.
Mg	2.30	2.96	0.79	2.34	1.15	2.94	0.00
Ca	1.79	1.92	0.01	0.03	0.02	0.01	0.03
Na	0.38	0.06	0.03	0.01	0.02	0.02	0.03
K	0.17	0.03	1.90	1.69	1.40	1.85	0.89
Ba	N.A.	N.A.	0.01	0.00	N.A.	N.A.	N.A.
Cl	0.05	0.00	N.A.	N.A.	N.A.	N.A.	N.A.
F	0.02	0.00	N.A.	N.A.	0.18	0.19	N.A.
OH	1.94	2.00	4.00	4.00	3.82	3.81	
Sum Cations	17.35	17.01	18.35	19.72	17.88	19.75	4.96

*Analyses acquired with Cameca SX-50 wds microprobe by Sarah Roeske. Accelerating voltage 15 Kev, current 10 namp for hornblende and K-feldspar, 7 namp for micas. Spot size 1 micron for hornblende, 10 microns for micas and K-feldspar.

[†]Abbreviations for minerals: Hbd—hornblende, Actin—actinolite, Musc—muscovite, Bio—biotite, K-feldspar—potassium feldspar.

[§]Where both Fe₂O₃ and FeO are reported, values are calculated. H₂O and replacement of Cl and F for O are calculated.

[#]N.A.—not analyzed.

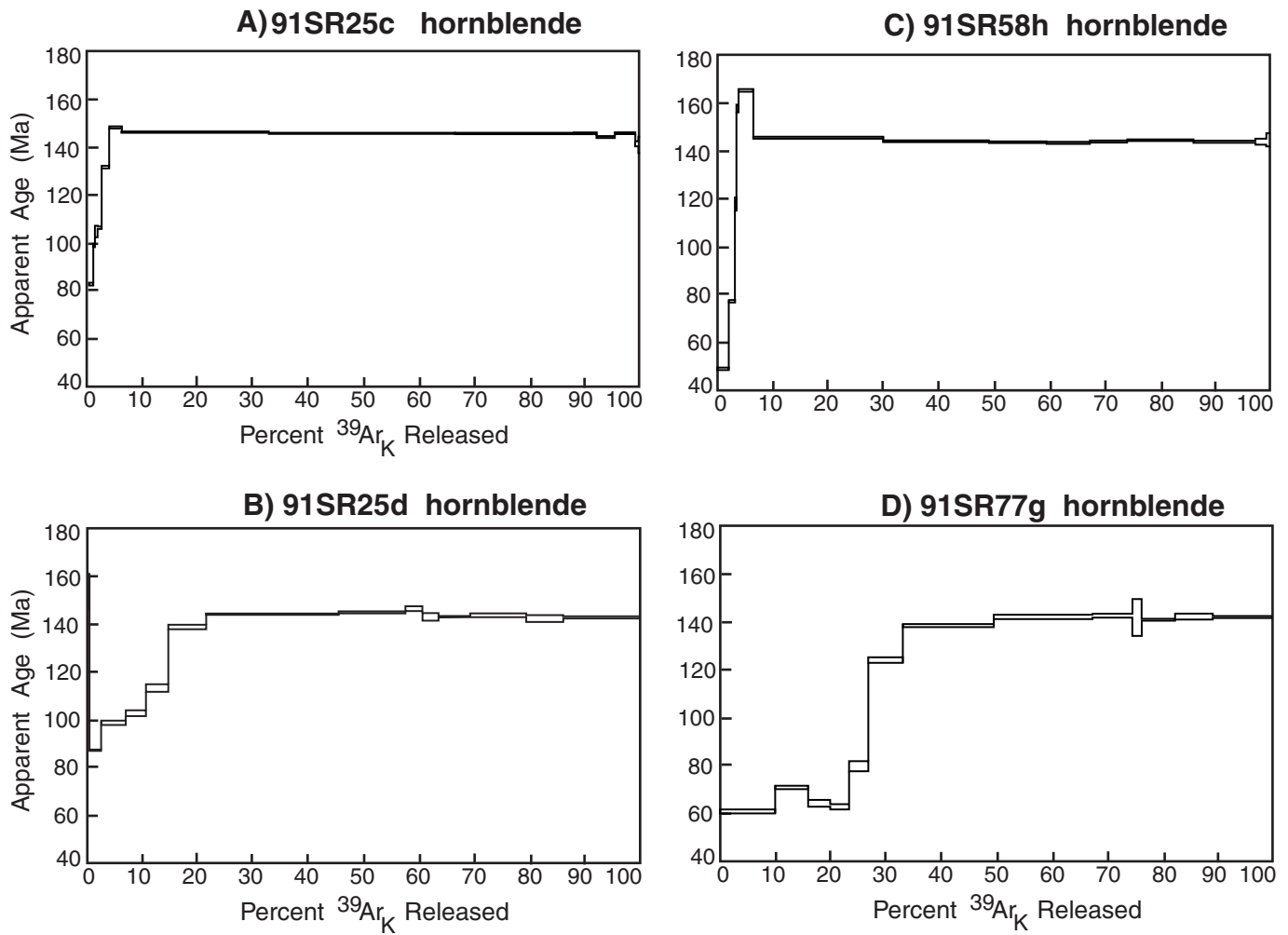


Figure A-1. Ar release spectra from hornblende separates from plutonic rocks, Hanagita fault zone. A and B: 91SR25c and 25d—gneissic diorites from Summit Lake region (Fig. 4). C: 91SR58h—brittly deformed quartz diorite from north of the northern strand of the Hanagita fault zone, Kiagna river region. D: 91SR77g—Quartz diorite with extensive low greenschist facies minerals but without penetrative fabric. Sample location shown on Figure 2.

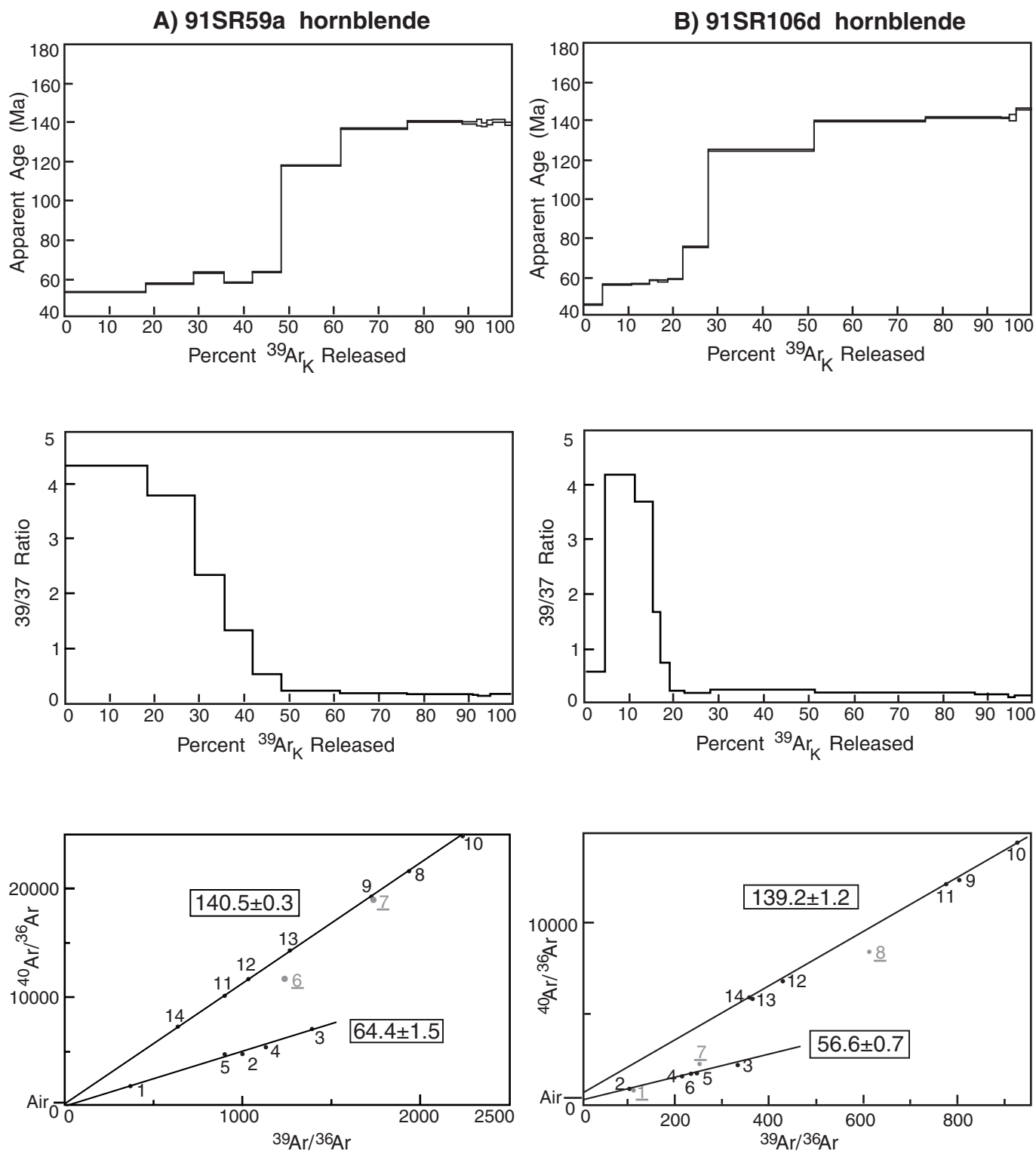
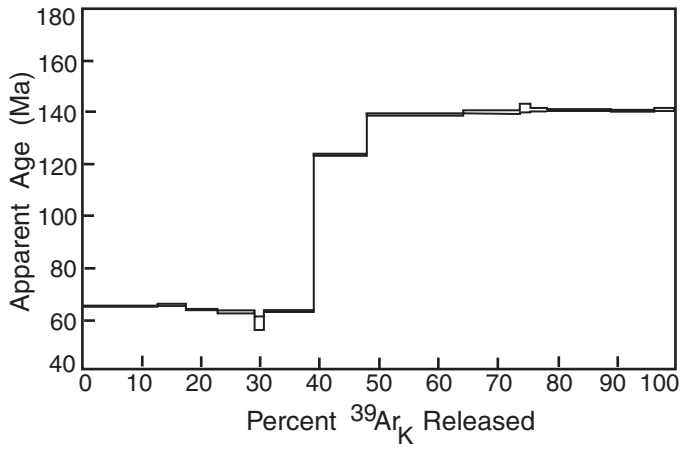
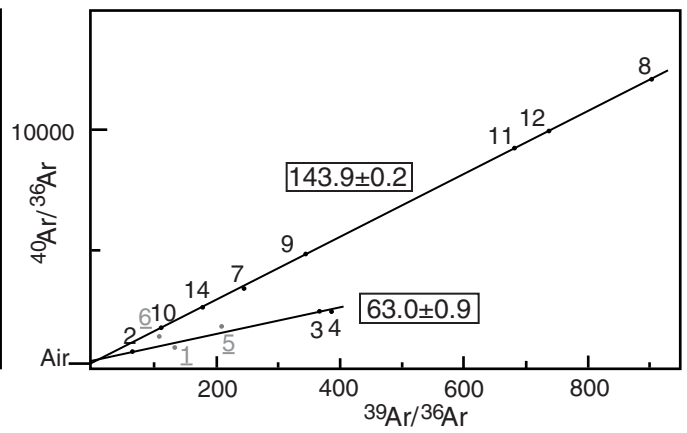
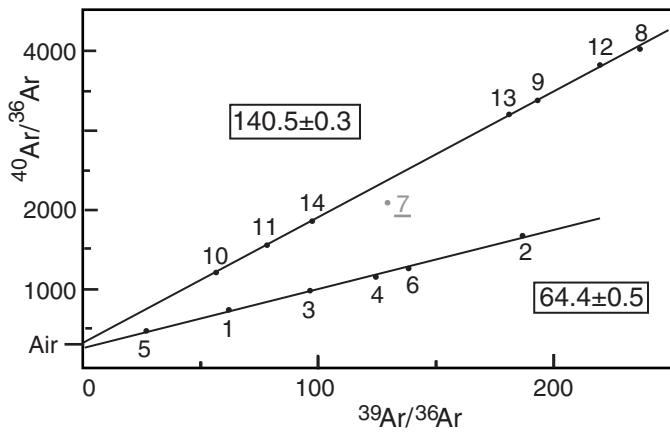
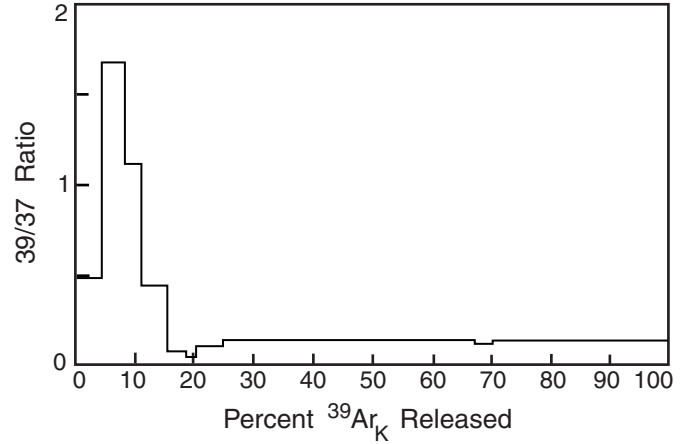
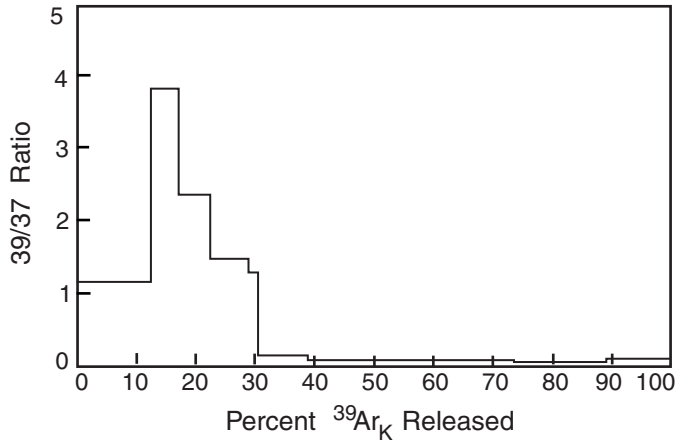
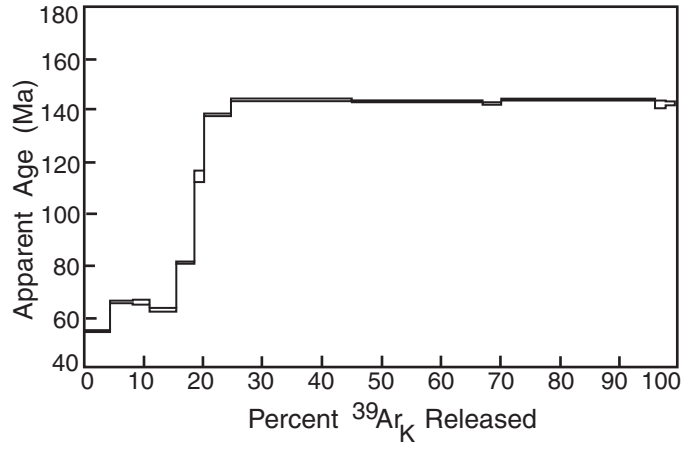


Figure A-2. Ar data from hornblende separates. Top figure for each is Ar release spectrum. Middle figure is $^{39}\text{Ar}_K/^{37}\text{Ar}_{Ca}$ value for each heating step (equal to $2 \times$ the K/Ca ratio) (see footnotes, Table A-2, Appendix). Bottom figure is isochron diagram. Dates in boxes refer to low- T isochrons (younger dates) and high- T isochrons (older dates). Black numbers refer to steps included in the isochrons; gray underlined numbers were not included. See Table 1 for summary of dates, text for discussion, and Table A-2, Appendix, for complete data.

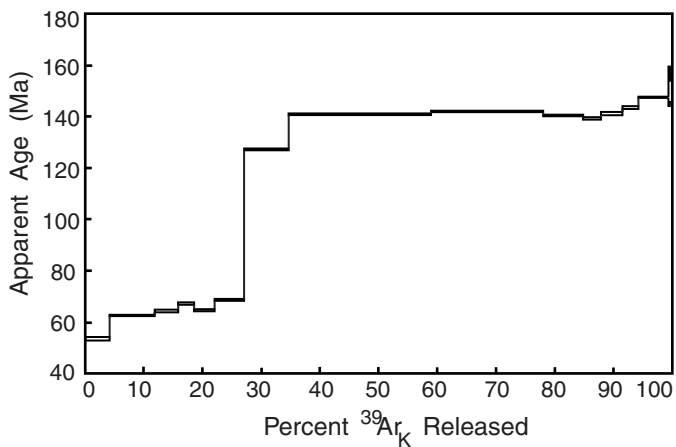
C) 91SR84b hornblende



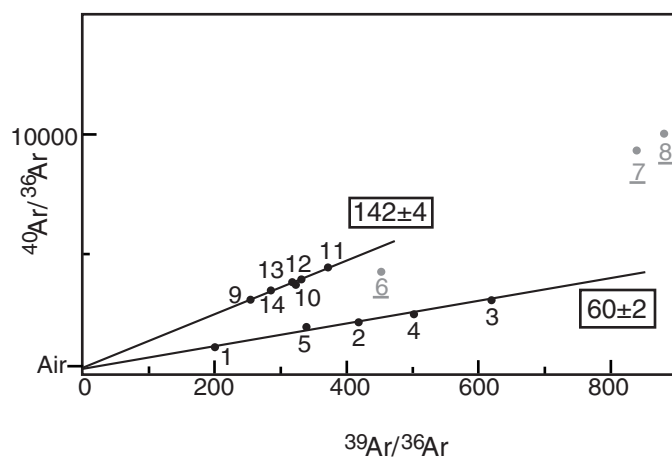
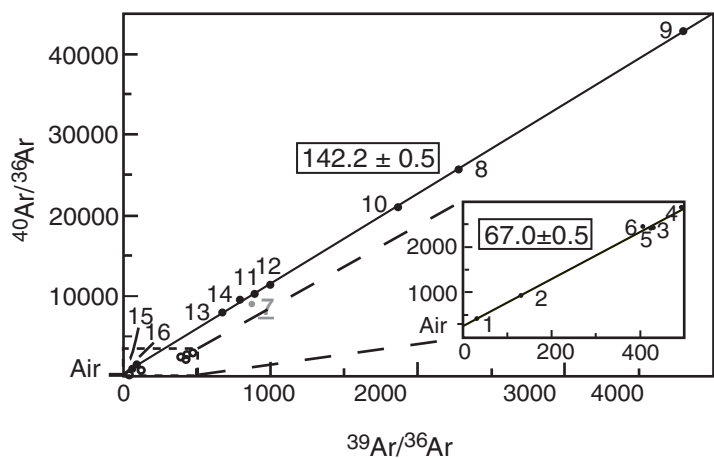
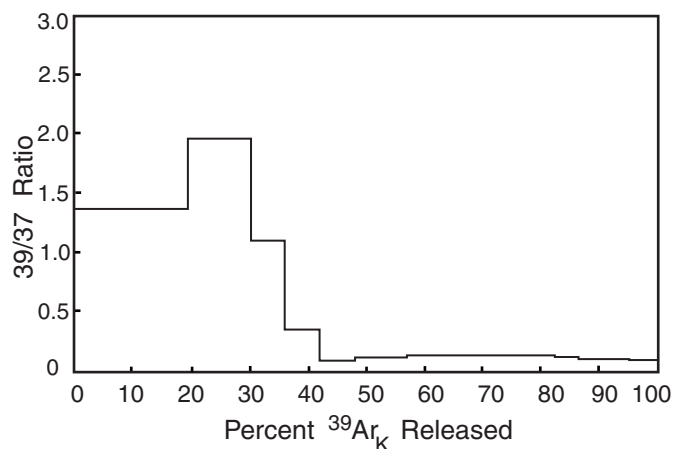
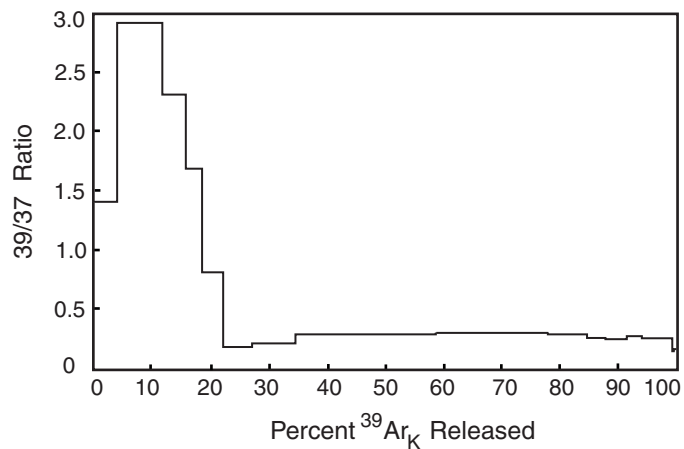
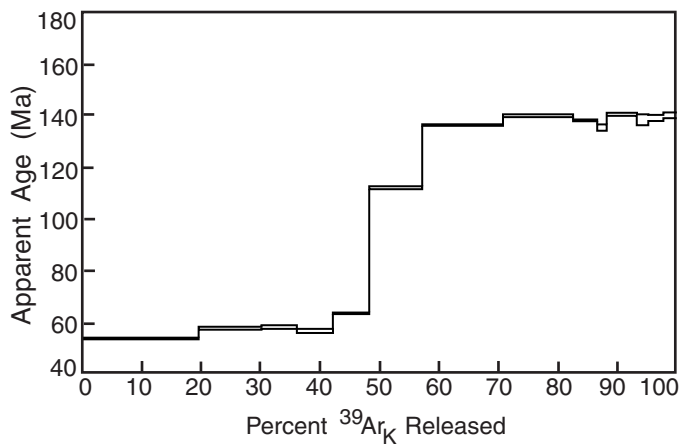
D) 90SR14b hornblende



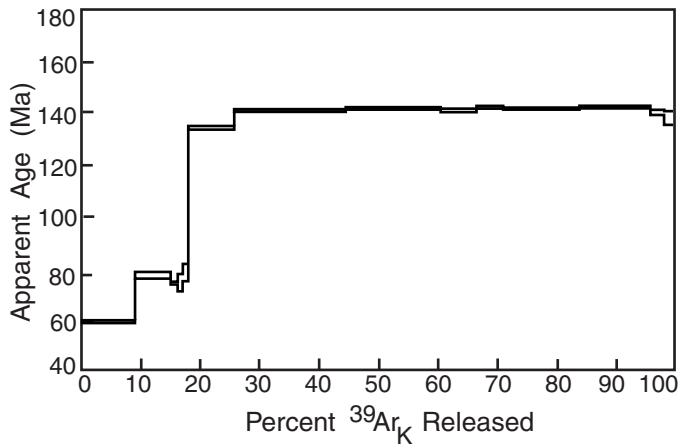
E) 90SR06 hornblende



F) 91SR77d hornblende



G) 73AH279a hornblende



H) 90SR07 hornblende

