$^{40}Ar/^{39}Ar$ Geochronology Results for Lunar Crater Volcanic Field Basalts, Nevada

By

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Prepared for

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Introduction

Greg Valentine from SUNY-Buffalo submitted 4 basalt samples to the NMGRL for $^{40}Ar/^{39}Ar$ dating. The overall goal of the project is to study the Pliocene-Quaternary Lunar Crater Volcanic Field (central Nevada), with focus on linking physical volcanology, local structure, time-volume behavior, and geochemistry to understand the processes associated with intraplate volcanism. Ideally a geochronology-based reference of some units will allow undated units to be dated based on geomorphic characteristics.

$^{40}Ar/^{39}Ar$ Analytical Methods and Results

Groundmass concentrates were prepared from the 4 basaltic samples by crushing and choosing fragments visibly free of phenocrysts. The prepared samples were irradiated for 2 hours at the UGGS TRIGA reactor in Denver, CO along with the standard Fish Canyon tuff sanidine as a neutron flux monitor. Groundmass was analyzed by the step-heating method using a defocused diode laser to heat the samples (Tables 1, 2). A summary of the preferred eruption ages along with a listing of the analytical methods is provided in Table 1 and the general operational details for the NMGRL can be found at internet site http://geoinfo.nmt.edu/publications/openfile/argon/home/html.

The samples were run in duplicate and were incrementally heated using between 9 and 12 steps (Table 2). In general the duplicate analyses yield reproducible data, but in detail there is variability in age spectra shape and sometimes in total gas age (TGA) (Fig. 1). Sample LC10-01 reveals initially young ages between about 0 and 80 ka followed by a steep rise to apparent ages between about 0.5 and1 Ma (Figs. 1a, b). The TGA for both samples are similar at 157 and 161 ka, however split a has a plateau segment at 81 ka, whereas split b is with error of 0 ka. Split a has an isochron array that yields an apparent age of 9±2 ka and split b has highly clustered data with no meaningful trend (Fig. 2a, b).

Sample LC11-71 has age spectra similar to LC10-01 however the initial flat segments yields plateau ages of 144±8 and 133±13 ka for splits a and b, respectively (Figs. 1c, d). High temperature steps yield ages greater than 1 Ma and both splits yield similar TGA at 331±7 ka for split a and 300±8 ka for split b (Figs. 1c, d; Table 2). For both splits isochron data project to an

initial $^{40}Ar/^{36}Ar$ value of ~272 that at 2σ is just within the error of the atmospheric value of 295.5 (Fig 2c, d). The low $^{40}Ar/^{36}Ar$ value results in an isochron age being older than the plateau age (Figs. 2c, d).

Samples LC11-63 and LC10-05 have similar age spectra with generally slightly climbing ages across the spectra (Figs. 1e, f, g, h). Splits a and b of LC11-63 give analytically equal plateau ages of 588±9 and 572±11 ka, respectively (Figs. 1e, f) and somewhat younger isochron ages of 515±33 and 494±55 ka (Figs. 2e, f). Splits of LC10-05 yield analytically distinct TGA and plateau ages (Table 2). Split a has an initially young apparent age followed by a plateau segment at 739±7 ka and a fusion step that is ~800 ka; whereas split b has an initial flat segment for steps A-I with a plateau age of 620±12 ka followed by two older steps near 750 ka (Figs. 1g, h).

Discussion

The variation in plateau and isochron ages for duplicate splits of the 4 samples leads to difficulty in choosing a preferred eruption age. Sample LC10-01 is not older than the plateau age of 81±5 ka given by the initial steps of split a. An age near zero is permissible based on the zero ages provided by several steps of split b and the 9±2 ka isochron age given by split a. It is difficult to reconcile the similarity in TGA (157 and 161 ka) and the apparent discordance in apparent excess argon that would elevate the split a plateau age compared to the zero age give by split b. That is, the excess argon component would need to degas variably between the two splits to have one plateau age be 81 ka and the other be 0 ka. If 81 ka is accurate, one would need to believe that the isochron result from split a is not accurate because it is highly influenced by including steps I-K that could be anomalously old because of degassing an inherited phase. Also, if 81 ka is accurate it is difficult to understand the plateau age of -9±10 ka for split b, unless an argument of contamination by hydrocarbons at mass 36 causes over correction for atmospheric argon thus yielding an inaccurately young plateau age. Perhaps geology and other constraints can be used to best interpret this sample, however based solely on the argon data this sample appears to be near zero age.

The initial ~70% of ^{39}Ar released yields equal plateau ages for splits of LC11-71 (Figs. 1a, b). The old ages recorded by the spectra are interpreted to be excess ^{40}Ar and/or degassing of a xenolith component. The isochron dates are just equal at 2σ to the plateau ages and are

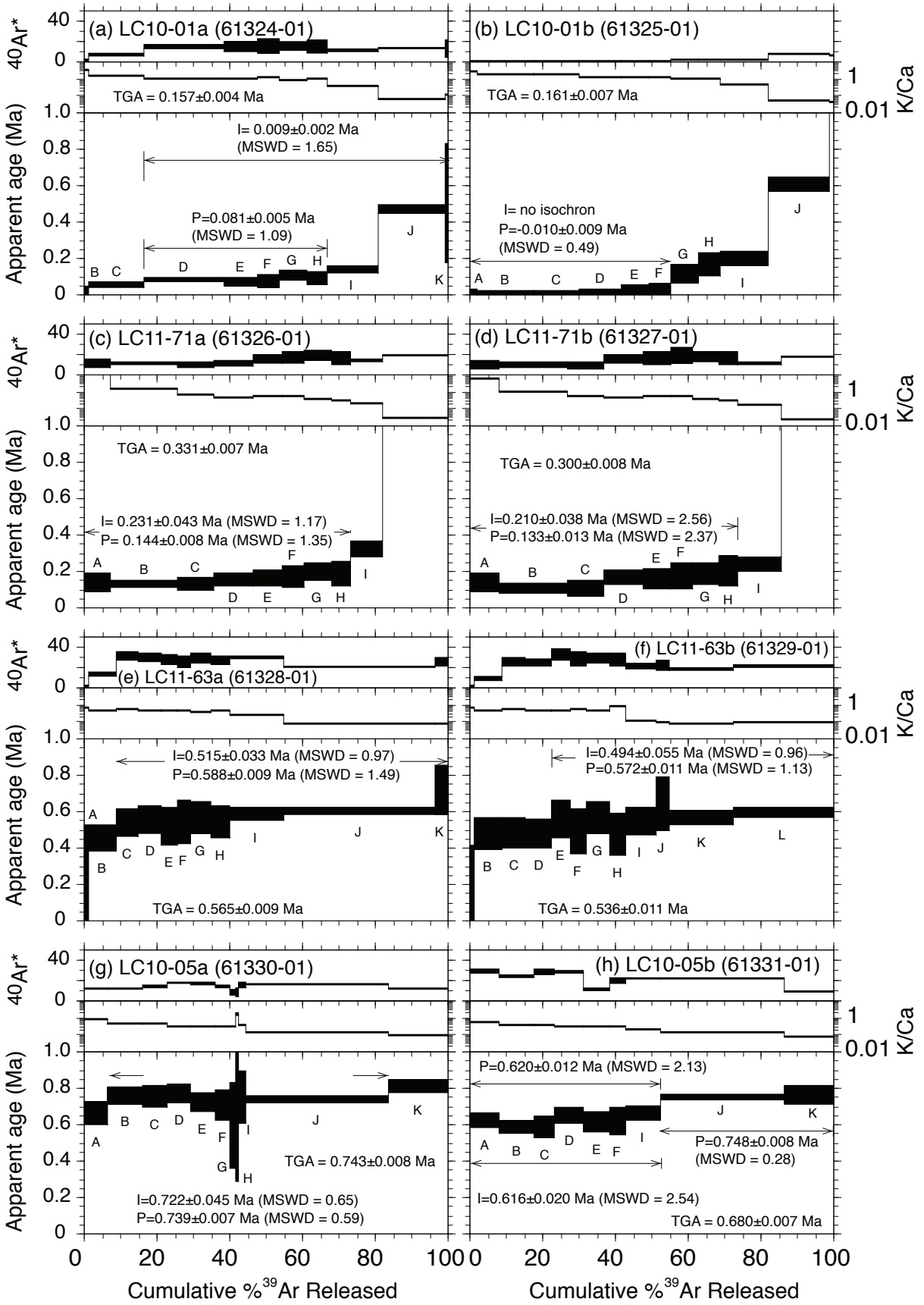

Figure 1. Age, K/Ca and radiogenic yield diagrams. Each sample was analyzed in duplicate as represented by an "a" and "b" label. Spectra are variably complex, but in general comparable TGA for each split suggest that samples are homogeneous at the ca. 15 mg level. Sample LC10-05 is the exception to this as the TGA do not overlap within uncertainty. Both a weighted mean plateau age (P) and an isochron age (I) is reported for most samples and the arrow defines the steps for each age calculation.

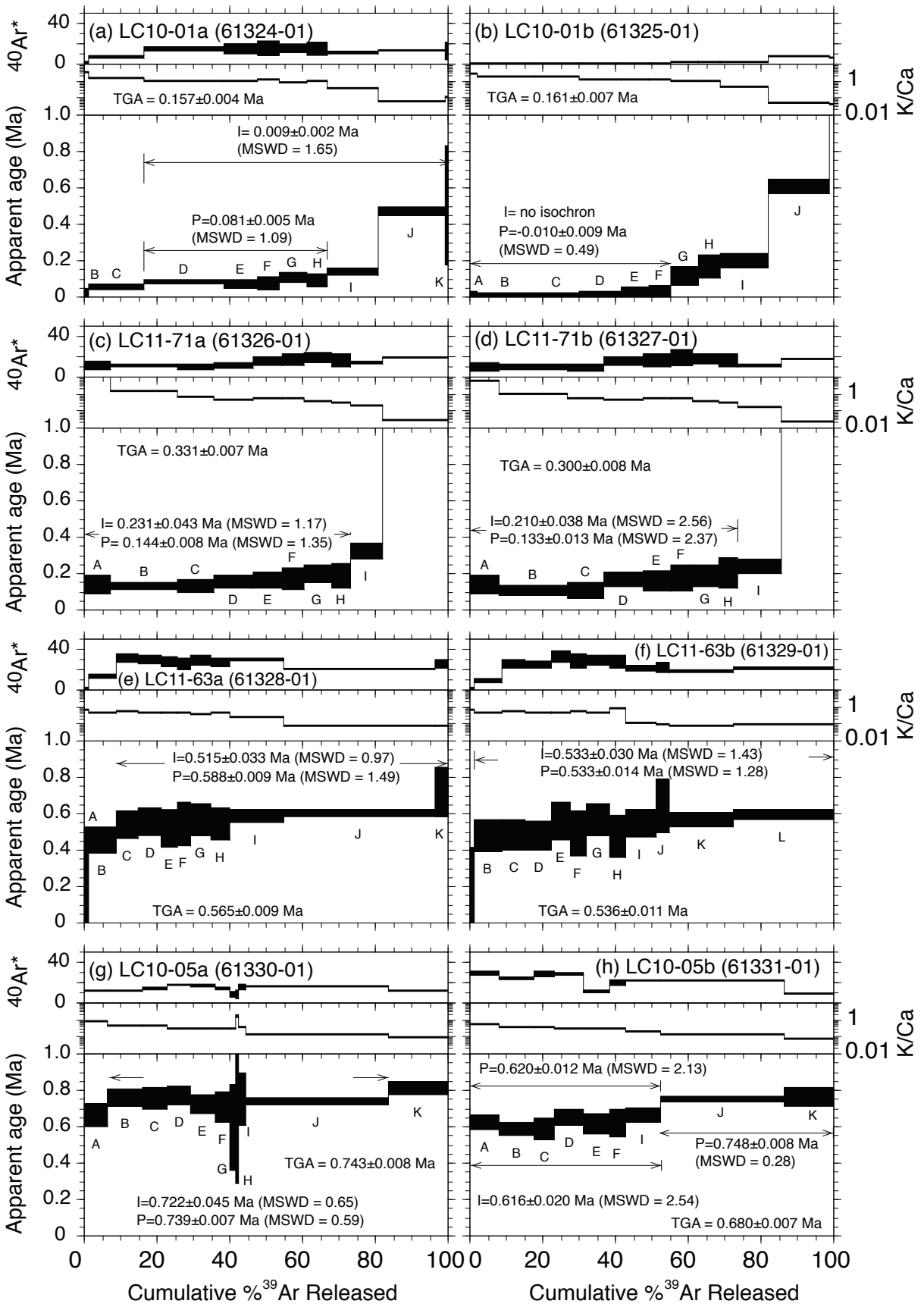

Figure 1. Age, K/Ca and radiogenic yield diagrams. Each sample was analyzed in duplicate as represented by an "a" and "b" label. Spectra are variably complex, but in general comparable TGA for each split suggest that samples are homogeneous at the ca. 15 mg level. Sample LC10-05 is the exception to this as the TGA do not overlap within uncertainty. Both a weighted mean plateau age (P) and an isochron age (I) is reported for most samples and the arrow defines the steps for each age calculation.

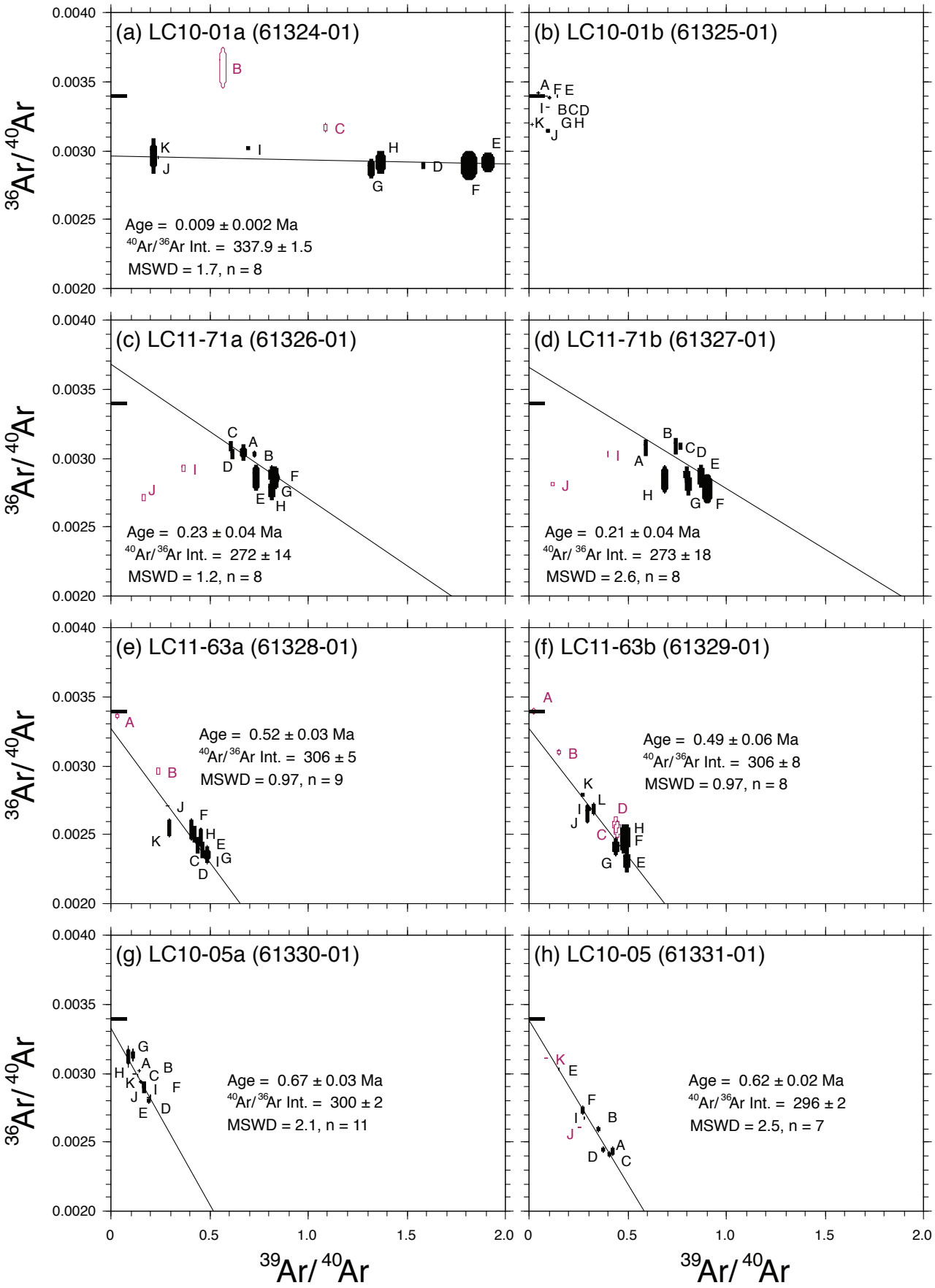

Figure 2. Isotope correlation diagrams for step-heating results. In general the data cluster thereby providing relatively imprecise age and trapped component values. No isochron is calculated for LC10-10b as no linear trend is evident.

Table 1. Summary of analytical methods and instrumentation.

Summary

Sample	L#	min	Plateau Age	±	MSWD	%^{39}Ar	n	Isochron Age	±	^{40}Ar/^{36}Ar$_i$	±	MSWD	%^{39}Ar	n
LC10-01a	61324-01	gm	0.081	0.005	1.1	50.3	5	0.009	0.002	337.9	1.5	1.7	83.4	8
LC10-01b	61325-01	gm	-0.010	0.009	0.60	49.5	5	na	na	na	na	na	na	na
LC10-01 multiple interpretations: End members at 0±10 ka and 81±5 ka														
LC11-71a	61326-01	gm	0.144	0.008	1.4	73.5	8	0.231	0.043	272	14	1.2	73.5	8
LC11-71b	61327-01	gm	0.133	0.013	2.4	73.8	8	0.210	0.038	273	18	2.6	73.8	8
LC11-71 preferred age			0.140	0.005	1.8		16	combine plateau steps of both splits						
LC11-63a	61328-01	gm	0.588	0.009	1.5	91.1	9	0.515	0.033	306.1	4.8	0.97	91.1	9
LC11-63b	61329-01	gm	0.572	0.008	1.1	77.5	8	0.494	0.055	306.1	7.8	0.96	77.5	8
LC11-63 preferred age			0.582	0.006	1.3		17	combine plateau steps of both splits						
LC10-05a	61330-01	gm	0.739	0.007	0.59	77.4	9	0.722	0.045	296.7	3.3	0.7	77.4	9
LC10-05b	61331-01	gm	0.620	0.012	2.1	52.7	7	0.616	0.020	296.1	2.5	2.5	52.7	7
LC10-05b	61331-01	gm	0.748	0.008	0.28	47.3	2	0.740	0.017	296.2	1.3	na	47.3	2
LC10-05 multiple interpretations: Age between ~0.620 and 0.740 Ma														

L# = Lab number
min = material dated. gm = groundmass concentrate
n = number of steps for plateau or isochron used for age calculation.
%^{39}Ar = percentage of total ^{39}Ar comprising the plateau or isochron steps.
All errors at 1σ

Analytical Methods and Instrumentation

Sample preparation and irradiation:

Groundmass prepared by crushing and hand-picking fragments devoid of phenocrysts.
Samples were loaded into machined Al discs and irradiated for 2 hours, USGS TRIGA Reactor, Denver, CO
Neutron flux monitor Fish Canyon Tuff sanidine (FC-2). Assigned age = 28.02 Ma (Renne et al., 1998)

Instrumentation:

Thermo-Fisher Scientific ARGUS VI mass spectrometer on line with automated all-metal extraction system.
System = Obama
Multi-collector configuration: 40Ar-H1, 39Ar-Ax, 38Ar-L1, 37Ar-L2, 36Ar-L3
Amplification: H1, AX, L1, L2 all 1E12 ohm Faraday, L3 - CDD ion counter, deadtime 14 nS.
Laser Step-heating:
Samples step-heated with 75W Photon-Machines 810 nm diode laser
Reactive gases removed by 10 min reaction with 2 SAES GP-50 getters; 1 at 450°C, 1 at 20°C.
Gas also exposed to cold finger operated at -140°C and a W filament operated at ~2000°C.

Analytical parameters:

Mass spectrometer sensitivity = 1E-16 mol/fA
Total system blank and background: 85±4%, 0.5±95%, 0.25±92%, 0.1±100%, 0.30±0.4%, x 10^{-17} moles for masses 40, 39, 38, 37, 36, respectively.
J-factors determined to a precision of ~± 0.01% by CO_2 laser-fusion of 6 single crystals from each of 6 radial positions around the irradiation tray.
Correction factors for interfering nuclear reactions were determined using K-glass and CaF_2 and are as follows:
$(^{40}Ar/^{39}Ar)_K = 0.008236\pm0.00013$; $(^{36}Ar/^{37}Ar)_{Ca} = 0.000273\pm0.0000002$; and $(^{39}Ar/^{37}Ar)_{Ca} = 0.000698\pm0.0000078$.

Table 2. Argon isotopic data and age results.

	ID	Power (Watts)	$^{40}Ar/^{39}Ar$	$^{37}Ar/^{39}Ar$	$^{36}Ar/^{39}Ar$ (x 10^{-3})	$^{39}Ar_K$ (x 10^{-15} mol)	K/Ca	$^{40}Ar^*$ (%)	^{39}Ar (%)	Age (Ma)	±1σ (Ma)
	LC10-01a, groundmass, 17.7 mg, J=0.000486±0.05%, IC=1.0180±0.0013, NM-252B, Lab#=61324-01										
Xi	A	17.00	-4.2306	2.241	10.88	-0.004	0.23	171.4	0.0	-6	15
Xi	B	17.50	1.763	0.1781	6.356	0.704	2.9	-6.2	1.6	-0.095	0.068
Xi	C	18.00	0.9248	0.3326	2.990	6.70	1.5	6.5	16.6	0.053	0.008
	D	18.50	0.6386	0.4776	1.951	9.90	1.1	14.7	38.8	0.081	0.005
	E	18.75	0.5301	0.4606	1.642	4.07	1.1	14.2	47.9	0.065	0.012
	F	19.00	0.5578	0.4359	1.704	2.71	1.2	14.8	53.9	0.071	0.018
	G	19.50	0.7644	0.5736	2.322	3.24	0.89	15.4	61.2	0.102	0.015
	H	20.00	0.7374	0.5268	2.263	2.55	0.97	14.2	66.9	0.091	0.019
X	I	22.00	1.427	1.375	4.647	6.21	0.37	11.1	80.8	0.138	0.009
X	J	30.00	4.108	8.331	14.35	8.26	0.061	13.0	99.4	0.469	0.011
X	K	40.00	4.475	4.513	14.43	0.286	0.11	12.7	100.0	0.50	0.17
	Integrated age ± 1σ			n=11		44.6	0.25	K2O=1.99%		0.157	0.004
	Plateau ± 1σ	steps D-H		n=5	MSWD=1.09	22.5			50.3	0.081	0.005
	Isochron±1σ	steps D-K		n=8	MSWD=1.65		$^{40}Ar/^{36}Ar$=	337.9±1.5		0.009	0.002
	LC10-01b, groundmass, 16.8 mg, J=0.0004856±0.04%, IC=1.0180±0.0013, NM-252B, Lab#=61325-01										
i	A	17.50	18.14	0.1917	61.86	0.889	2.7	-0.7	2.1	-0.112	0.072
i	B	18.00	6.853	0.2835	23.29	6.65	1.8	-0.2	17.7	-0.013	0.016
i	C	18.25	6.806	0.2967	23.13	5.33	1.7	-0.2	30.1	-0.010	0.017
i	D	18.50	7.356	0.4088	25.00	4.91	1.2	-0.1	41.7	-0.006	0.018
i	E	18.75	9.224	0.3919	31.28	3.33	1.3	0.0	49.5	0.003	0.026
Xi	F	19.00	10.73	0.3808	36.39	2.57	1.3	0.0	55.5	-0.002	0.032
Xi	G	19.50	9.364	0.5087	31.37	3.21	1.0	1.4	63.0	0.111	0.026
Xi	H	20.00	9.495	0.4822	31.60	2.59	1.1	2.0	69.1	0.165	0.030
Xi	I	22.00	9.730	1.048	32.43	5.52	0.49	2.3	82.0	0.196	0.020
Xi	J	30.00	9.579	9.098	32.56	7.31	0.056	7.1	99.1	0.602	0.019
Xi	K	40.00	46.38	11.18	150.6	0.368	0.046	6.0	100.0	2.46	0.19
	Integrated age ± 1σ			n=11		42.7	0.25	K2O=2.01%		0.162	0.007
	Plateau ± 1σ	steps A-E		n=5	MSWD=0.60	21.1			49.5	-0.010	0.009
	Isochron±1σ	no isochron									
	LC11-71a, groundmass, 14 mg, J=0.0004845±0.04%, IC=1.0180±0.0013, NM-252B, Lab#=61326-01										
	A	17.50	1.482	0.0426	4.482	1.957	12.0	10.4	7.5	0.134	0.025
	B	18.00	1.378	0.3502	4.237	4.76	1.5	10.7	25.7	0.128	0.012
	C	18.25	1.638	0.8042	5.243	2.70	0.63	9.0	36.0	0.128	0.019
	D	18.50	1.615	1.052	5.144	2.79	0.49	10.7	46.6	0.151	0.018
	E	18.75	1.227	0.9761	3.772	2.09	0.52	15.1	54.6	0.161	0.023
	F	19.00	1.200	0.9238	3.649	1.616	0.55	15.8	60.8	0.165	0.030
	G	19.50	1.227	1.392	3.750	1.933	0.37	18.3	68.2	0.195	0.025
	H	20.00	1.354	1.618	4.287	1.406	0.32	15.6	73.5	0.183	0.035
Xi	I	22.00	2.685	2.592	8.527	2.27	0.20	13.7	82.2	0.320	0.023
Xi	J	30.00	6.772	16.08	23.12	4.67	0.032	18.2	100.0	1.088	0.019
	Integrated age ± 1σ			n=10		26.2	0.14	K2O=1.48%		0.331	0.007
	Plateau ± 1σ	steps A-H		n=8	MSWD=1.35	19.26			73.5	0.144	0.008
	Isochron±1σ	steps A-H		n=8	MSWD=1.17		$^{40}Ar/^{36}Ar$=	272.1±13.9		0.231	0.043

Table 2. Argon isotopic data and age results.

	ID	Power (Watts)	$^{40}Ar/^{39}Ar$	$^{37}Ar/^{39}Ar$	$^{36}Ar/^{39}Ar$ (x 10^{-3})	$^{39}Ar_K$ (x 10^{-15} mol)	K/Ca	$^{40}Ar^*$ (%)	^{39}Ar (%)	Age (Ma)	±1σ (Ma)
	LC11-71b, groundmass, 17 mg, J=0.0004842±0.04%, IC=1.0180±0.0013, NM-252B, Lab#=61327-01										
	A	17.50	1.688	0.0814	5.183	1.765	6.3	9.3	8.2	0.136	0.028
	B	18.00	1.308	0.5197	4.141	4.01	0.98	9.2	27.0	0.104	0.013
	C	18.25	1.346	0.8654	4.364	2.18	0.59	8.8	37.2	0.103	0.022
	D	18.50	1.252	1.035	3.855	2.25	0.49	15.1	47.7	0.165	0.021
	E	18.75	1.151	0.9522	3.527	1.639	0.54	15.6	55.4	0.156	0.029
	F	19.00	1.106	0.9362	3.292	1.303	0.55	18.3	61.4	0.175	0.036
	G	19.50	1.244	1.409	3.850	1.534	0.36	17.2	68.6	0.185	0.031
	H	20.00	1.450	1.558	4.517	1.113	0.33	16.1	73.8	0.203	0.042
Xi	I	22.00	2.493	2.678	8.235	2.54	0.19	10.8	85.7	0.234	0.021
Xi	J	30.00	7.789	19.20	27.10	3.06	0.027	17.0	100.0	1.171	0.026
	Integrated age ± 1σ			n=10		21.4	0.14	K2O=1.00%		0.301	0.008
	Plateau ± 1σ	steps A-H		n=8	MSWD=2.37	15.80			73.8	0.133	0.013
	Isochron±1σ	steps A-H		n=8	MSWD=2.56		$^{40}Ar/^{36}Ar$=	273.1±17.9		0.210	0.038
	LC11-63a, groundmass, 16 mg, J=0.0004845±0.05%, IC=1.0180±0.0013, NM-252B, Lab#=61328-01										
Xi	A	17.50	27.43	0.7767	92.34	0.296	0.66	0.7	1.5	0.17	0.18
Xi	B	18.00	4.096	1.024	12.37	1.514	0.50	12.6	8.9	0.451	0.034
	C	18.25	2.027	0.9380	5.009	1.260	0.54	30.4	15.2	0.537	0.037
	D	18.50	2.149	1.151	5.425	1.231	0.44	29.5	21.2	0.552	0.038
	E	18.75	2.190	1.135	5.699	0.921	0.45	27.0	25.8	0.516	0.050
	F	19.00	2.446	1.080	6.462	0.758	0.47	25.3	29.5	0.539	0.061
	G	19.50	2.250	1.311	5.770	1.073	0.39	28.7	34.8	0.562	0.044
	H	20.00	2.353	1.129	6.167	1.055	0.45	26.2	40.1	0.537	0.044
	I	22.00	2.278	1.871	5.929	3.02	0.27	29.5	55.0	0.585	0.017
	J	30.00	3.392	5.869	10.75	8.42	0.087	20.1	96.6	0.598	0.009
	K	40.00	3.293	7.076	10.28	0.691	0.072	24.9	100.0	0.718	0.068
	Integrated age ± 1σ			n=11		20.2	0.15	K2O=1.00%		0.565	0.009
	Plateau ± 1σ	steps C-K		n=9	MSWD=1.49	18.43			91.1	0.588	0.009
	Isochron±1σ	steps C-K		n=9	MSWD=0.97		$^{40}Ar/^{36}Ar$=	306.1±4.8		0.515	0.033
	LC11-63b, groundmass, 16 mg, J=0.0004849±0.05%, IC=1.0180±0.0013, NM-252B, Lab#=61329-01										
Xi	A	17.50	32.71	0.7164	111.0	0.240	0.71	-0.1	1.4	-0.04	0.23
Xi	B	18.00	6.271	1.043	19.63	1.232	0.49	8.7	8.9	0.479	0.044
Xi	C	18.25	2.201	0.9549	5.816	1.111	0.53	25.1	15.5	0.483	0.043
Xi	D	18.50	2.241	1.139	6.033	1.156	0.45	24.3	22.5	0.475	0.041
	E	18.75	2.004	1.049	4.881	0.884	0.49	32.0	27.8	0.559	0.052
	F	19.00	2.057	0.8526	5.282	0.732	0.60	27.2	32.2	0.488	0.063
	G	19.50	2.241	1.080	5.666	1.039	0.47	28.9	38.5	0.565	0.045
	H	20.00	1.999	0.6460	5.093	0.789	0.79	27.0	43.2	0.471	0.059
	I	20.00	2.992	4.484	9.224	1.337	0.11	20.8	51.2	0.544	0.038
	J	22.00	3.334	5.697	10.34	0.628	0.090	22.0	55.0	0.641	0.075
	K	30.00	3.603	6.567	11.79	2.91	0.078	17.8	72.5	0.563	0.021
	L	40.00	3.233	5.342	10.10	4.57	0.096	20.8	100.0	0.589	0.014
	Integrated age ± 1σ			n=12		16.63	0.14	K2O=0.82%		0.537	0.011
	Plateau ± 1σ	steps E-L		n=8	MSWD=1.13	12.89			77.5	0.572	0.011
	Isochron±1σ	steps E-L		n=8	MSWD=0.96		$^{40}Ar/^{36}Ar$=	306.1±7.8		0.494	0.055

Table 2. Argon isotopic data and age results.

	ID	Power (Watts)	$^{40}Ar/^{39}Ar$	$^{37}Ar/^{39}Ar$	$^{36}Ar/^{39}Ar$ (x 10^{-3})	$^{39}Ar_K$ (x 10^{-15} mol)	K/Ca	$^{40}Ar^*$ (%)	^{39}Ar (%)	Age (Ma)	±1σ (Ma)
	LC10-05a, groundmass, 16 mg, J=0.0004861±0.05%, IC=1.0180±0.0013, NM-252B, Lab#=61330-01										
Xi	A	17.50	6.785	0.6489	20.56	2.00	0.79	11.1	6.5	0.661	0.031
	B	18.00	7.254	1.131	21.91	2.95	0.45	11.9	16.1	0.756	0.024
	C	18.25	6.335	1.146	18.83	2.07	0.45	13.5	22.8	0.751	0.030
	D	18.50	5.073	1.641	14.62	2.08	0.31	17.3	29.6	0.769	0.027
	E	18.75	4.933	1.588	14.32	2.05	0.32	16.7	36.2	0.720	0.028
	F	19.00	5.730	1.699	17.12	1.281	0.30	14.0	40.4	0.704	0.042
	G	19.50	8.656	1.734	27.46	0.429	0.29	7.8	41.8	0.59	0.12
	H	20.00	11.03	0.3247	34.47	0.200	1.6	7.8	42.4	0.76	0.24
	I	22.00	5.753	1.311	16.91	0.679	0.39	14.9	44.6	0.749	0.073
	J	30.00	5.021	3.331	15.04	12.09	0.15	16.7	83.9	0.736	0.009
Xi	K	40.00	7.871	4.993	24.87	4.97	0.10	11.7	100.0	0.808	0.018
	Integrated age ± 1σ			n=11		30.8	0.19	K2O=1.52%		0.744	0.007
	Plateau ± 1σ	steps B-J	n=9	MSWD=0.59		23.8	0.27 ±0.42		77.4	0.739	0.007
	Isochron±1σ	steps B-J	n=9	MSWD=0.65			$^{40}Ar/^{36}Ar$=	296.7±3.3		0.722	0.045
	LC10-05b, groundmass, 17 mg, J=0.0004865±0.05%, IC=1.0180±0.0013, NM-252B, Lab#=61331-01										
	A	17.50	2.434	0.8522	6.060	2.55	0.60	29.0	8.2	0.618	0.021
	B	18.00	2.823	1.294	7.639	2.97	0.39	23.5	17.7	0.581	0.018
	C	18.25	2.357	1.278	6.054	1.723	0.40	28.2	23.3	0.583	0.029
	D	18.50	2.639	1.687	6.870	2.50	0.30	28.0	31.3	0.648	0.020
	E	18.75	6.497	1.753	20.09	2.32	0.29	10.7	38.8	0.610	0.027
	F	19.00	3.639	1.479	10.32	1.356	0.34	19.3	43.1	0.616	0.037
	I	22.00	3.543	2.427	10.08	2.98	0.21	21.3	52.7	0.661	0.019
Xi	J	30.00	4.005	3.666	11.66	10.56	0.14	21.2	86.6	0.746	0.008
Xi	K	40.00	10.47	5.965	34.12	4.16	0.086	8.2	100.0	0.760	0.024
	Integrated age ± 1σ			n=9		31.1	0.18	K2O=1.45%		0.681	0.006
	Plateau ± 1σ	steps A-I	n=7	MSWD=2.13		16.393			52.7	0.620	0.012
	Plateau ± 1σ	steps J-K	n=2	MSWD=0.28		17.723			47.3	0.748	0.008
	Isochron±1σ	steps A-I	n=7	MSWD=2.54			$^{40}Ar/^{36}Ar$=	296.1±2.5		0.616	0.020

Notes:

Isotopic ratios corrected for blank, radioactive decay, and IC, not corrected for interfering reactions.
Errors quoted for individual analyses include analytical error only, without interfering reaction or J uncertainties.
Integrated age calculated by summing isotopic measurements of all steps.
Integrated age error calculated by quadratically combining errors of isotopic measurements of all steps.
Plateau age is inverse-variance-weighted mean of selected steps.
Plateau age error is inverse-variance-weighted mean error (Taylor, 1982) times root MSWD where MSWD>1.
Plateau error is weighted error of Taylor (1982).
Decay constants and isotopic abundances after Steiger and Jäger (1977).
X preceding sample ID denotes analyses excluded from plateau age calculations.
i preceding sample ID denotes analyses excluded from isochron age calculations.
Weight percent K_2O calculated from ^{39}Ar signal, sample weight, and instrument sensitivity.
Ages calculated relative to FC-2 Fish Canyon Tuff sanidine interlaboratory standard at 28.02 Ma
Decay Constant (LambdaK (total)) = 5.543e-10/a
IC = Measured (40Ar/36Ar)/295.5
Correction factors:
$(^{39}Ar/^{37}Ar)_{Ca}$ = 0.000698 ± 8e-6
$(^{36}Ar/^{37}Ar)_{Ca}$ = 0.000273 ± 2e-7
$(^{40}Ar/^{39}Ar)_{K}$ = 0.008236 ± 0.00013