$^{40}Ar/^{39}Ar$ Thermochronology

In order to constrain the post-metamorphic cooling history in the Manaslu-Himal Chuli Himalaya, a suite of specimens was collected from across the study area for $^{40}Ar/^{39}Ar$ analyses of muscovite and biotite (Figure 4)[1]. Whole mica grains from these specimens were mechanically separated through standard crushing procedures and handpicked from sieved size-fractions under an optical microscope to eliminate grains with inclusions or mineral inter-growths. Cooling ages for irradiated muscovite and biotite aliquots were obtained through laser step-heating analysis (see subsequent sections of this data repository for complete analytical procedures and data tables) and errors are reported at 1σ. The $^{40}Ar/^{39}Ar$ results for the muscovite and biotite specimens analyzed from the study area are presented in Table DR1.

Previous investigations of the $^{40}Ar/^{39}Ar$ thermochronologic characteristics of the Manaslu-Himal Chuli Himalaya have delineated an interval of conspicuously young cooling ages, c. 3 Ma (Copeland et al., 1990; Copeland et al., 1991; Wobus et al., 2003, 2005) in the middle of the Greater Himalayan sequence. The young cooling ages and their spatial distribution may be related to out-of-sequence thrusting (Wobus et al., 2005) or uplift due to under-plating and duplexing of the mid-crust (Bollinger et al., 2006). All $^{40}Ar/^{39}Ar$ cooling ages reported previously from the Greater Himalayan sequence, nonetheless, are Cenozoic (Copeland et al., 1990;

[1] This figure citation is referring to a figure in the main text of the manuscript. References to tables and figures within the data repository are given the prefix 'DR'.

1991; Wobus et al., 2003) whereas $^{40}Ar/^{39}Ar$ cooling ages from the Lesser Himalayan sequence are Paleozoic and older (Wobus et al., 2003).

Muscovite

Three muscovite specimens have been analyzed by the $^{40}Ar/^{39}Ar$ technique and the corresponding ages are shown in Table DR1 and Figure DR1. These specimens were obtained from three distinct rock types and locations and show a range in their plateau age between 15.18 ± 0.18 M and 3.07 ± 0.20 Ma with age increasing at higher structural level. The structurally highest specimen, MS-43, was sampled from the Chhokang arm of the Manaslu pluton (Figure 4). Specimen MS-30 was sampled from a sillimanite-grade meta-sandstone while the structurally lowest specimen, MS-23B, was sampled from a kyanite-bearing paragneiss (Figure 4).

The muscovite analyses yield generally well-behaved age spectra with a flat release profiles (Figure DR1). $^{40}Ar/^{39}Ar$ versus $^{36}Ar/^{40}Ar$ correlation ages are also reported in Table 2 and do not differ significantly from the interpreted plateau age.

Biotite

Five biotite separates from the Greater Himalayan sequence have been analyzed using the $^{40}Ar/^{39}Ar$ technique and the resulting plateau ages (Figure DR1), which range from 53.89 ± 0.41 Ma to 2.60 ± 0.15 Ma, are reported in Table 2 with associated isochron ages and rock types.

With the exception of specimen MS-16, all biotite specimens yield flat, well-behaved age spectra (Figure DR1) that define plateau ages indistinguishable from $^{40}Ar/^{39}Ar$ versus $^{36}Ar/^{40}Ar$ correlation ages (Table DR1). ^{39}Ar release spectra for specimen MS-16 appear to define a pseudo-plateau at 53.89 ± 0.41 Ma that

comprises 67.4% of released ^{39}Ar. When compared to muscovite and hornblende cooling ages for nearby locations reported by Copeland et al., (1991) the biotite cooling age of ~53 Ma is anomalously high and may reflect excess ^{40}Ar as indicated by the initial $^{40}Ar/^{36}Ar$ ratio for specimen MS-16 (c. 558 compared to an atmospheric ratio of c. 295). The biotite age for specimen MS-23B may also reflect excess argon as it is statistically older than that determined for muscovite from the same specimen, 3.07 ± 0.20 Ma versus 3.83 ± 0.12 Ma (Figure DR1).

Captions

Figure DR1

$^{40}Ar/^{39}Ar$ analyses of muscovite (ms) and biotite (bt) specimens from across the Greater Himalayan sequence. The interpreted plateau age is depicted as a dashed line. Heating steps included in calculation of the plateau age for each specimen are grey-filled.

Table DR1

Specimen	Lab #	Mineral	Plateau Age (Ma)	err (1σ)	Isochron Age (Ma)	err (1σ)	Closure Temperature (˚C)	err
MS-43	KL-12	Ms	15.18	0.18	15.50	0.31	432	24
MS-37	KL-5	Bt	12.43	0.15	12.63	0.27	345	16
MS-32B	KL-6	Bt	4.46	0.09	4.53	0.12	345	16
MS-30	KL-8	Ms	4.34	0.14	4.47	0.31	345	16
MS-30	KL-9	Bt	2.60	0.15	2.93	0.68	418	25
MS-23B	KL-10	Ms	3.07	0.20	2.98	0.56	418	25
MS-23B	KL-11	Bt	3.83	0.12	3.90	0.52	345	16
MS-16	KL-7	Bt	53.89	0.41	50.52	4.36	332	20

Closure temperatures calculated based on the equations of Dodson (1973) using cooling rate of 80˚C/Ma as estimated by Godin et al., (2006b) for the Nar area (Figure 4.1) with an estimated error of ±20˚C/Ma. Biotite (Bt) parameters and errors are from Grove and Harrison (1996). Muscovite (Ms) parameters are from Hames and Bowring (1994) with estimated error in the activation energy of ± 6% and coefficient of diffusion error of ±75%.

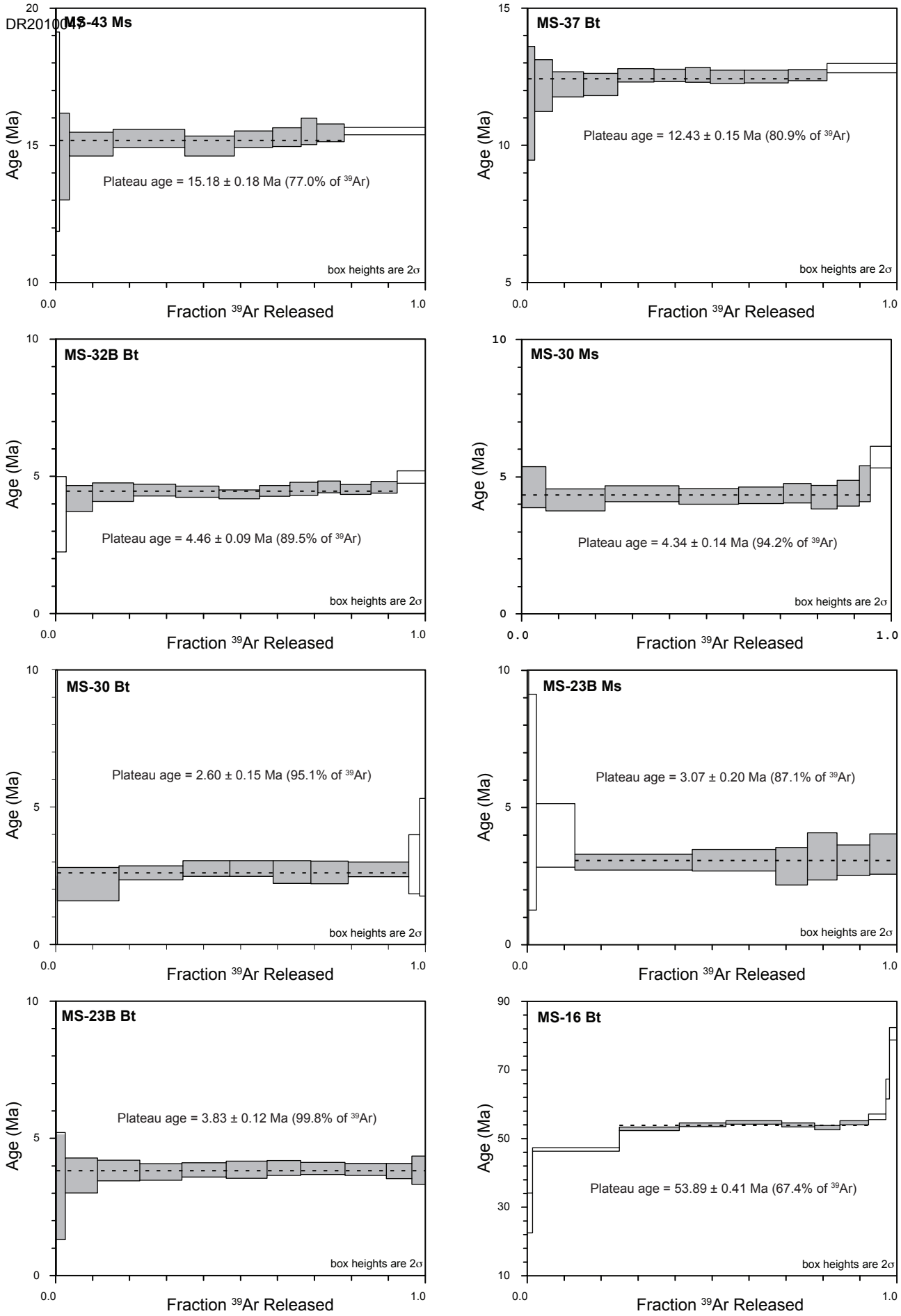

MS-43 Ms
Plateau age = 15.18 ± 0.18 Ma (77.0% of 39Ar)
box heights are 2σ
MS-37 Bt
Plateau age = 12.43 ± 0.15 Ma (80.9% of 39Ar)
box heights are 2σ
MS-32B Bt
Plateau age = 4.46 ± 0.09 Ma (89.5% of 39Ar)
box heights are 2σ
MS-30 Ms
Plateau age = 4.34 ± 0.14 Ma (94.2% of 39Ar)
box heights are 2σ
MS-30 Bt
Plateau age = 2.60 ± 0.15 Ma (95.1% of 39Ar)
box heights are 2σ
MS-23B Ms
Plateau age = 3.07 ± 0.20 Ma (87.1% of 39Ar)
box heights are 2σ
MS-23B Bt
Plateau age = 3.83 ± 0.12 Ma (99.8% of 39Ar)
box heights are 2σ
MS-16 Bt
Plateau age = 53.89 ± 0.41 Ma (67.4% of 39Ar)
box heights are 2σ
Age (Ma)
Fraction 39Ar Released

Figure DR1

$^{40}Ar/^{39}Ar$ Thermochronologic methods

Specimens and flux-monitors (standards) were wrapped in Al-foil and loaded into an 11.5 cm long and 2.0 cm diameter irradiation container, and then irradiated with fast neutrons in position 5C of the McMaster Nuclear Reactor (Hamilton, Ontario) for 9 hours. A group of flux monitors (7 in total) were located at approximately every 0.5 cm along the irradiation container and J-values for individual samples were determined by interpolation.

For total-fusion of monitors and step-heating of the unknowns, specimens were mounted in an aluminum sample-holder, beneath the sapphire view-port of a small stainless-steel chamber connected to an ultra-high vacuum purification system. An 8W Lexel continuous argon-ion laser was used for step-heating by de-focusing the laser beam to cover the entire sample and heating for approximately 3 minutes at increasing power settings. The evolved gas, after purification using an SAES C50 getter, was admitted to an on-line, MAP 216 mass spectrometer, with a Bäur Signer source and an electron multiplier (set to a gain of 100 over the Faraday), and analyzed in static mode. Blanks, measured routinely, were subtracted from the subsequent sample gas-fractions.

Measured argon-isotope peak heights were extrapolated to zero-time, normalized to the $^{40}Ar/^{39}Ar$ atmosphere ratio (295.5), and corrected for neutron-induced ^{40}Ar from potassium and ^{39}Ar and ^{36}Ar from calcium. Dates and errors were calculated using formulae given by Dalrymple et al. (1981), and the constants recommended by Steiger and Jäger (1977). Errors shown represent the analytical precision at 2σ, assuming that the error in the J-value is zero. A conservative estimate of error in the J-value is 0.5% and can be added for inter-sample comparison. Intra-laboratory standard MAC-83 Biotite (24.36 Ma referenced to FCT sanidine at 28.02 Ma; Renne et al. 1998) was used as the monitor for laser step-heating analyses.

References

Dalrymple, G. B., E. C. Alexander, Jr., M. A. Lanphere, and G. P. Kraker (1981), Irradiation of samples for $^{40}Ar/^{39}Ar$ dating using the Geological Survey TRIGA Reactor.

U.S. Geological Survey, Professional Paper 1176.

Renne, P. R., C. C. Swisher, A. L. Deino, D. B. Karner, T. L. Owens, and D. J. DePaolo (1998), Intercalibration of standards, absolute ages and uncertainties in $^{40}Ar/^{39}Ar$ dating, *Chemical Geology, 145*, 117-152.

Steiger, R. H., and E. Jäger (1977), Subcommission on geochronology: Conventional use of decay constants in geo- and cosmo- chronology. *Earth and Planetary Science Letters, 36*, 359-362.

KL-5: MS-37 Bt HP

Run date: 2007/12/18 **Can/Pos:** 208/6 **J Value:** 0.003438
Printed: 2008/01/29 **Mass:** 0.0 mg ± 0.000022

Volume 39K: 26.71 x 1E-10 cm3 NTP **Approx.** % K
Integrated Age: 12.50 ± 0.14 Ma % Ca

Initial 40/36: 286.86 ± 21.59 (MSWD = 0.26, isochron between 0.50 and 2.00)
Correlation Age: 12.63 ± 0.27 Ma (80.9% of 39Ar, steps marked by >) **MSWD** 0.630

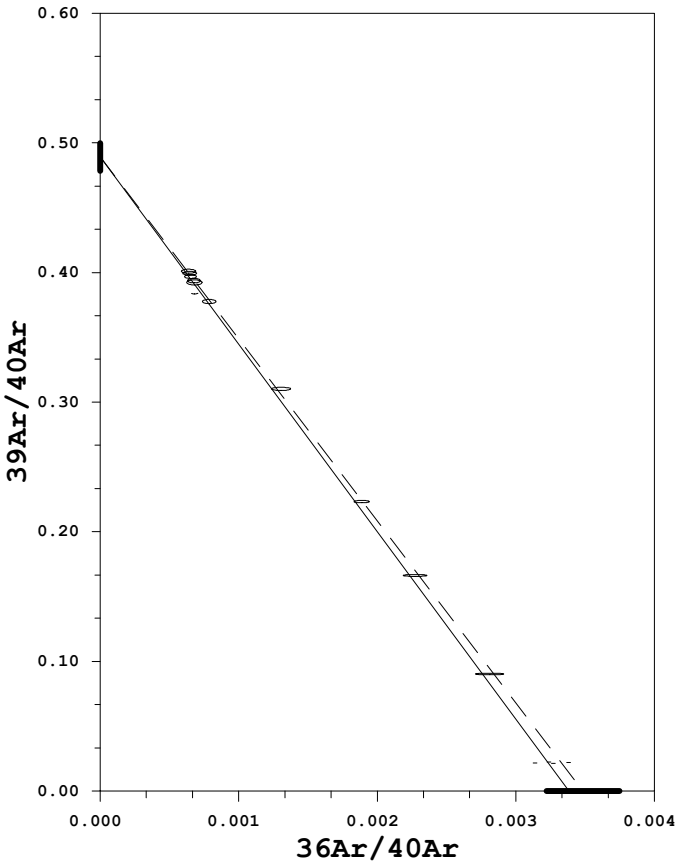
Plateau Age: 12.43 ± 0.15 Ma (80.9% of 39Ar, steps marked by <) **Mod. err.** 0.11

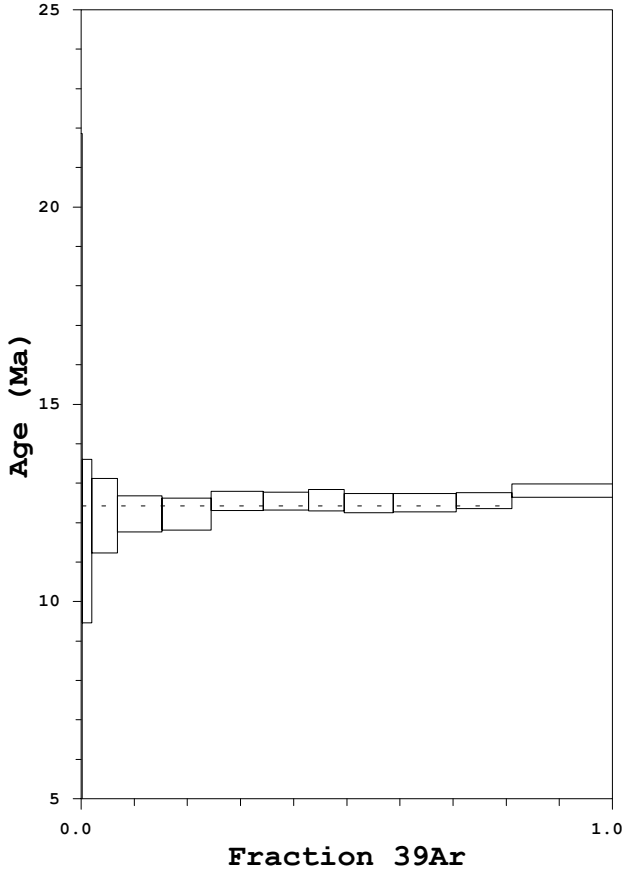
Power	36Ar/40Ar	39Ar/40Ar	r	Ca/K	%40Atm	%39Ar	40Ar*/39K	Age
0.50	0.003259±0.000138	0.022012±0.000406	0.012	0.019	96.23	0.21	1.686±1.855	10.43±11.44
< 1.00>	0.002813 0.000102	0.090475 0.000624	0.013	0.007	82.88	1.82	1.867 0.336	11.54 2.07
< 1.50>	0.002274 0.000086	0.166479 0.000727	0.023	0.003	66.85	4.84	1.971 0.153	12.18 0.94
< 2.00>	0.001889 0.000055	0.223450 0.000907	0.015	0.002	55.44	8.40	1.978 0.074	12.22 0.46
< 2.50>	0.001307 0.000069	0.310440 0.001178	0.014	0.002	38.27	9.23	1.977 0.067	12.22 0.41
< 3.00>	0.000788 0.000049	0.377796 0.001675	0.012	0.001	23.02	9.80	2.031 0.039	12.55 0.24
< 3.50>	0.000678 0.000047	0.393920 0.001708	0.013	0.001	19.79	8.53	2.030 0.036	12.55 0.22
< 4.00>	0.000681 0.000057	0.392553 0.001897	0.011	0.001	19.89	6.69	2.035 0.044	12.58 0.27
< 5.00>	0.000639 0.000052	0.401158 0.001580	0.012	0.001	18.66	9.24	2.022 0.039	12.50 0.24
< 6.00>	0.000648 0.000050	0.399624 0.001472	0.012	0.001	18.90	11.85	2.024 0.038	12.51 0.23
< 7.00>	0.000653 0.000043	0.397064 0.001401	0.012	0.001	19.07	10.48	2.032 0.033	12.56 0.20
7.50	0.000682 0.000034	0.385047 0.001316	0.012	0.001	19.92	18.90	2.074 0.027	12.82 0.17

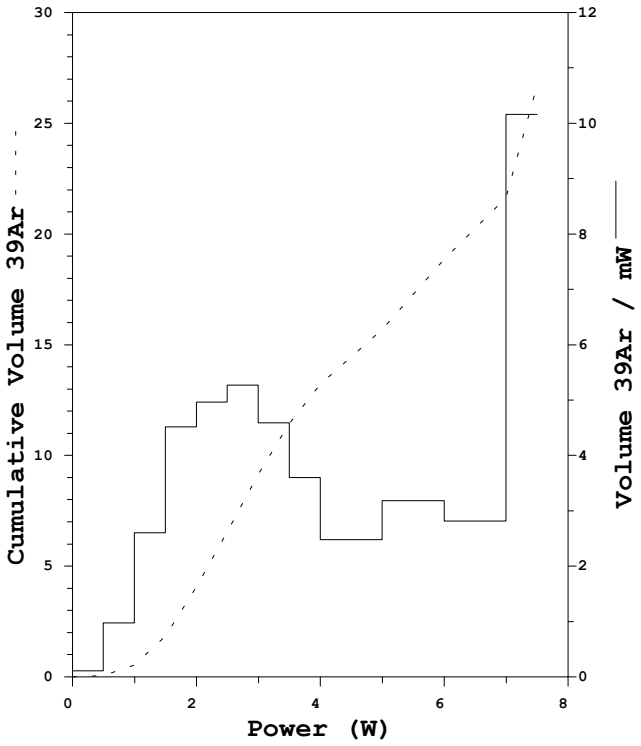
Power	40Ar	39Ar	38Ar	37Ar	36Ar	Blank 40Ar	Atmos 40/36
0.50	2.583±0.007	0.057±0.001	0.004±0.000	0.001±0.000	0.009±0.000	0.033	287.137
< 1.00>	5.426 0.009	0.490 0.003	0.014 0.001	0.002 0.000	0.016 0.001	0.033	287.137
< 1.50>	7.835 0.015	1.301 0.005	0.029 0.001	0.002 0.000	0.018 0.001	0.033	287.137
< 2.00>	10.138 0.013	2.258 0.009	0.046 0.002	0.002 0.000	0.020 0.001	0.033	287.137
< 2.50>	8.050 0.013	2.482 0.008	0.047 0.001	0.002 0.000	0.011 0.001	0.034	287.137
< 3.00>	7.044 0.013	2.637 0.010	0.050 0.001	0.002 0.000	0.006 0.000	0.033	287.137
< 3.50>	5.889 0.012	2.295 0.009	0.043 0.001	0.002 0.000	0.004 0.000	0.033	287.137
< 4.00>	4.642 0.010	1.800 0.008	0.033 0.001	0.001 0.000	0.004 0.000	0.033	287.137
< 5.00>	6.260 0.012	2.485 0.008	0.046 0.002	0.002 0.000	0.004 0.000	0.034	287.137
< 6.00>	8.048 0.015	3.186 0.010	0.058 0.002	0.002 0.000	0.006 0.000	0.034	287.137
< 7.00>	7.169 0.012	2.819 0.009	0.051 0.001	0.001 0.000	0.005 0.000	0.034	287.137
7.50	13.298 0.018	5.083 0.016	0.093 0.002	0.002 0.000	0.010 0.000	0.034	287.137

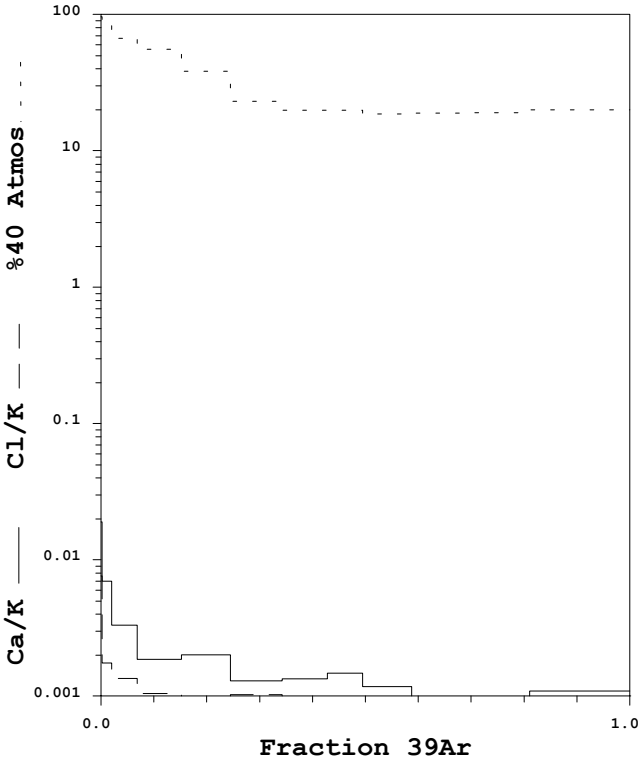
Measured volumes are x 1E-10 cm3 NTP. All errors are 2 x standard error. Intrim13 28-Mar-02

KL-5: MS-37 Bt HP









Measured volumes are x 1E-10 cm3 NTP. All errors are 2 x standard error. Intrim13 28-Mar-02

KL-6: MS-32B Bt HP

Run date: 2007/12/19 **Can/Pos:** 208/7 **J Value:** 0.003439
Printed: 2008/01/29 **Mass:** 0.0 mg ± 0.000022

Volume 39K: 28.53 x 1E-10 cm3 NTP **Approx.** % K
Integrated Age: 4.47 ± 0.09 Ma % Ca

Initial 40/36: 291.01 ± 17.10 (MSWD = 0.80, isochron between 0.50 and 2.00)
Correlation Age: 4.53 ± 0.12 Ma (89.5% of 39Ar, steps marked by >) **MSWD** 0.889

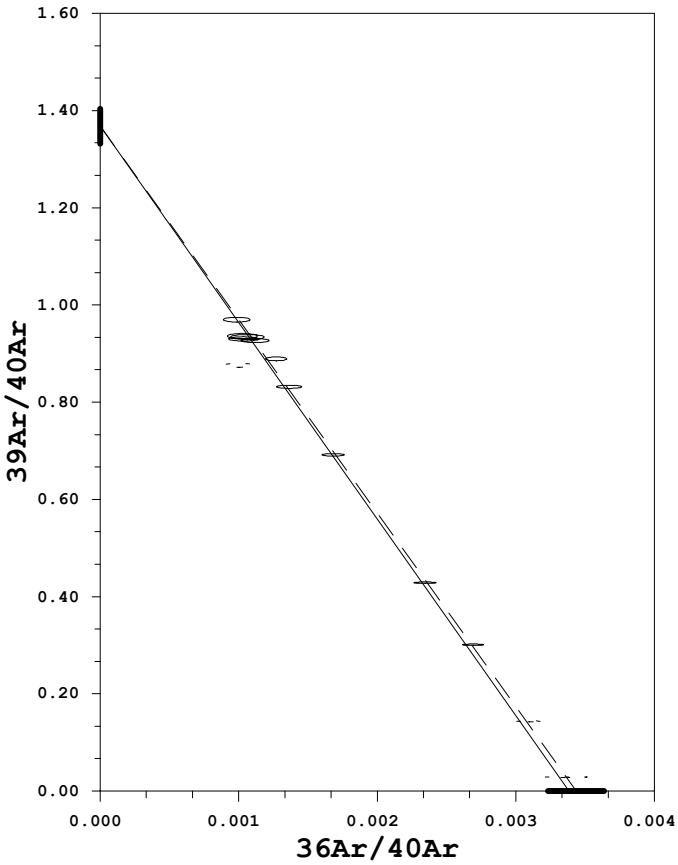
Plateau Age: 4.46 ± 0.09 Ma (89.5% of 39Ar, steps marked by <) **Mod. err.** 0.07

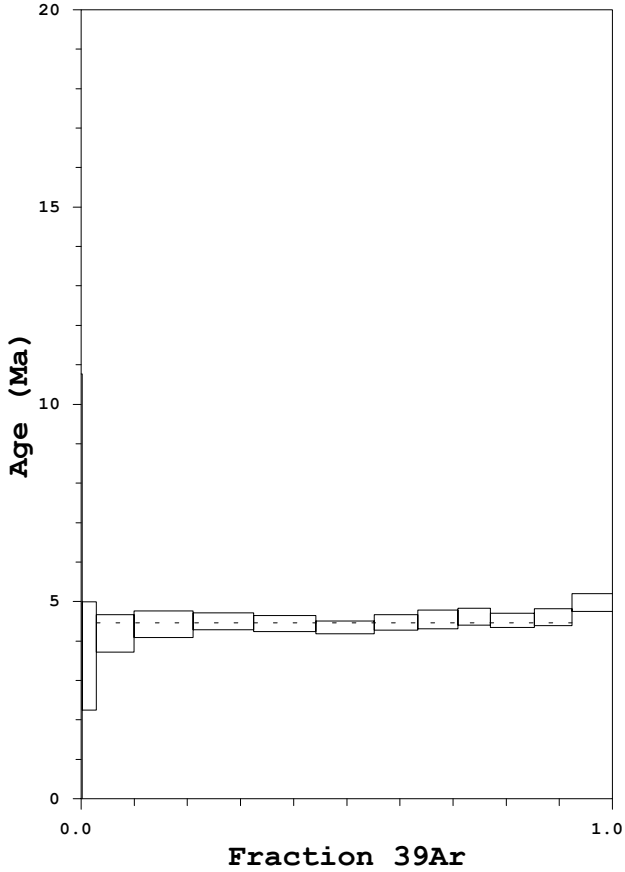
Power	36Ar/40Ar	39Ar/40Ar	r	Ca/K	%40Atm	%39Ar	40Ar*/39K	Age
0.50	0.003364±0.000150	0.028989±0.000515	0.014	0.033	99.33	0.23	0.203±1.536	1.26±9.52
1.00	0.003100 0.000107	0.143521 0.000975	0.023	0.011	91.20	2.66	0.585 0.222	3.63 1.37
< 1.50>	0.002694 0.000077	0.301386 0.001430	0.023	0.005	78.86	7.07	0.678 0.076	4.20 0.47
< 2.00>	0.002346 0.000078	0.429007 0.001512	0.022	0.004	68.41	11.13	0.716 0.054	4.43 0.34
< 2.50>	0.001683 0.000081	0.692199 0.002515	0.028	0.003	48.68	11.42	0.727 0.035	4.50 0.22
< 3.00>	0.001365 0.000091	0.832060 0.003279	0.021	0.002	39.31	11.72	0.718 0.032	4.45 0.20
< 3.50>	0.001272 0.000077	0.889592 0.003936	0.028	0.002	36.56	10.97	0.702 0.026	4.35 0.16
< 4.00>	0.001120 0.000101	0.927296 0.003987	0.018	0.001	32.14	8.17	0.722 0.032	4.47 0.20
< 4.50>	0.001064 0.000121	0.934449 0.005045	0.020	0.002	30.53	7.59	0.734 0.039	4.55 0.24
< 5.00>	0.001038 0.000110	0.930600 0.004446	0.018	0.001	29.77	6.12	0.746 0.035	4.62 0.22
< 6.00>	0.000987 0.000096	0.970107 0.004867	0.026	0.001	28.29	8.27	0.731 0.030	4.53 0.18
< 7.00>	0.001027 0.000108	0.936476 0.005175	0.017	0.001	29.47	7.07	0.744 0.034	4.61 0.21
7.50	0.001002 0.000107	0.876465 0.003956	0.015	0.001	28.80	7.57	0.804 0.036	4.98 0.23

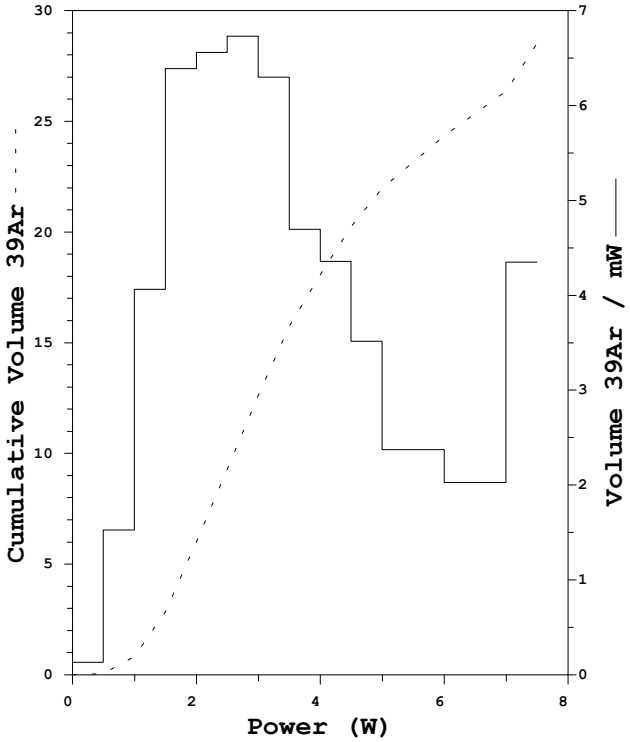
Power	40Ar	39Ar	38Ar	37Ar	36Ar	Blank 40Ar	Atmos 40/36
0.50	2.344±0.007	0.067±0.001	0.006±0.000	0.002±0.000	0.008±0.000	0.033	287.137
1.00	5.351 0.012	0.765 0.005	0.032 0.002	0.002 0.001	0.017 0.001	0.033	287.137
< 1.50>	6.789 0.012	2.032 0.009	0.071 0.002	0.003 0.001	0.019 0.001	0.033	287.137
< 2.00>	7.527 0.012	3.196 0.010	0.106 0.002	0.003 0.001	0.018 0.001	0.033	287.137
< 2.50>	4.838 0.010	3.280 0.009	0.101 0.002	0.002 0.000	0.008 0.000	0.033	287.137
< 3.00>	4.153 0.009	3.366 0.010	0.100 0.002	0.002 0.001	0.006 0.000	0.033	287.137
< 3.50>	3.644 0.010	3.150 0.011	0.091 0.002	0.002 0.001	0.005 0.000	0.033	287.137
< 4.00>	2.618 0.007	2.348 0.007	0.069 0.001	0.002 0.001	0.003 0.000	0.033	287.137
< 4.50>	2.414 0.008	2.179 0.009	0.065 0.002	0.002 0.001	0.003 0.000	0.033	287.137
< 5.00>	1.963 0.006	1.759 0.006	0.052 0.002	0.001 0.001	0.002 0.000	0.033	287.137
< 6.00>	2.536 0.009	2.375 0.008	0.070 0.001	0.002 0.001	0.003 0.000	0.033	287.137
< 7.00>	2.248 0.007	2.031 0.009	0.060 0.002	0.002 0.001	0.003 0.000	0.034	287.137
7.50	2.564 0.007	2.175 0.007	0.067 0.001	0.001 0.000	0.003 0.000	0.034	287.137

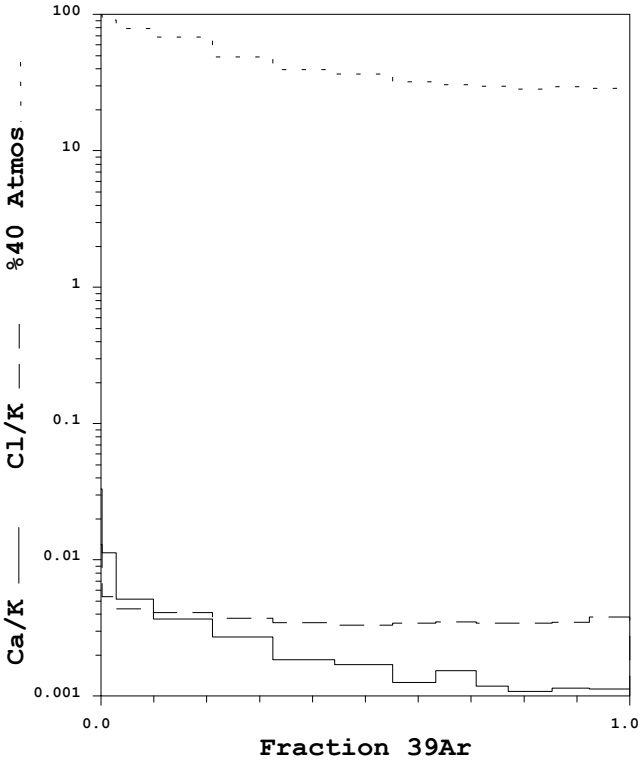
Measured volumes are x 1E-10 cm3 NTP. All errors are 2 x standard error. Intrim13 28-Mar-02

KL-6: MS-32B Bt HP









Measured volumes are x 1E-10 cm3 NTP. All errors are 2 x standard error. Intrim13 28-Mar-02

KL-7: MS-16 Bt HP

Run date: 2010/12/19 **Can/Pos:** 208/12 **J Value:** 0.003449
Printed: 2008/01/29 **Mass:** 0.0 mg ± 0.000022

Volume 39K: 9.34 x 1E-10 cm3 NTP **Approx.** % K
Integrated Age: 52.62 ± 0.40 Ma % Ca

Initial 40/36: 557.92 ± 384.13 (MSWD = 4.70, isochron between 0.29 and 2.41)
Correlation Age: 50.52 ± 4.36 Ma (67.4% of 39Ar, steps marked by >) **MSWD** 7.677

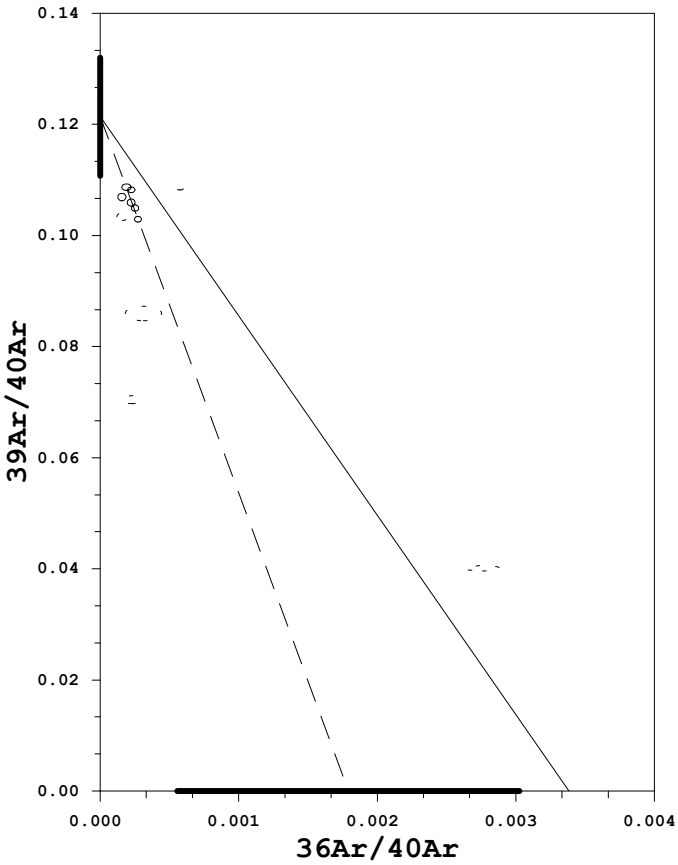
Plateau Age: 53.89 ± 0.41 Ma (67.4% of 39Ar, steps marked by <) **Mod. err.** 0.62

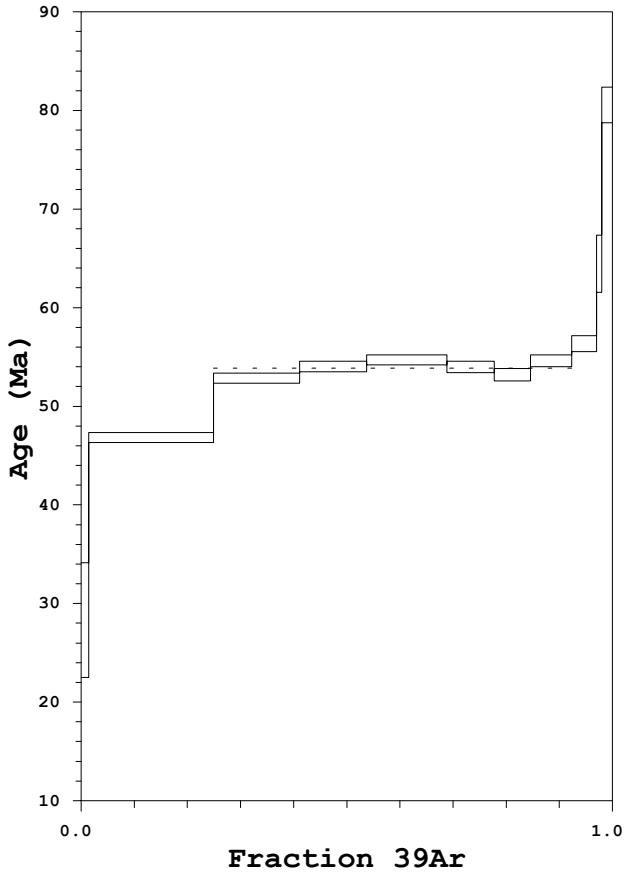
Power	36Ar/40Ar	39Ar/40Ar	r	Ca/K	%40Atm	%39Ar	40Ar*/39K	Age
0.50	0.002761±0.000128	0.040125±0.000466	0.012	0.276	81.48	1.47	4.592±0.950	28.35±5.82
1.50	0.000579 0.000029	0.108706 0.000487	0.006	0.065	17.03	23.52	7.628 0.087	46.85 0.53
< 2.00>	0.000226 0.000026	0.108258 0.000489	0.004	0.015	6.64	16.20	8.622 0.082	52.86 0.50
< 2.50>	0.000253 0.000026	0.104981 0.000572	0.004	0.014	7.42	12.60	8.816 0.088	54.04 0.53
< 3.00>	0.000274 0.000025	0.102972 0.000521	0.005	0.013	8.04	15.10	8.928 0.086	54.72 0.52
< 3.50>	0.000225 0.000028	0.105978 0.000642	0.004	0.010	6.61	8.89	8.811 0.096	54.01 0.58
< 4.00>	0.000191 0.000033	0.108741 0.000592	0.004	0.009	5.59	6.81	8.681 0.103	53.22 0.62
< 5.00>	0.000158 0.000030	0.106970 0.000674	0.002	0.009	4.63	7.76	8.914 0.100	54.63 0.60
6.00	0.000163 0.000041	0.103441 0.000691	0.001	0.009	4.78	4.67	9.204 0.134	56.38 0.81
7.00	0.000314 0.000131	0.086014 0.001309	0.003	0.009	9.23	1.00	10.550 0.480	64.48 2.88
7.50	0.000228 0.000065	0.070457 0.000699	0.002	0.012	6.69	1.99	13.241 0.305	80.56 1.81

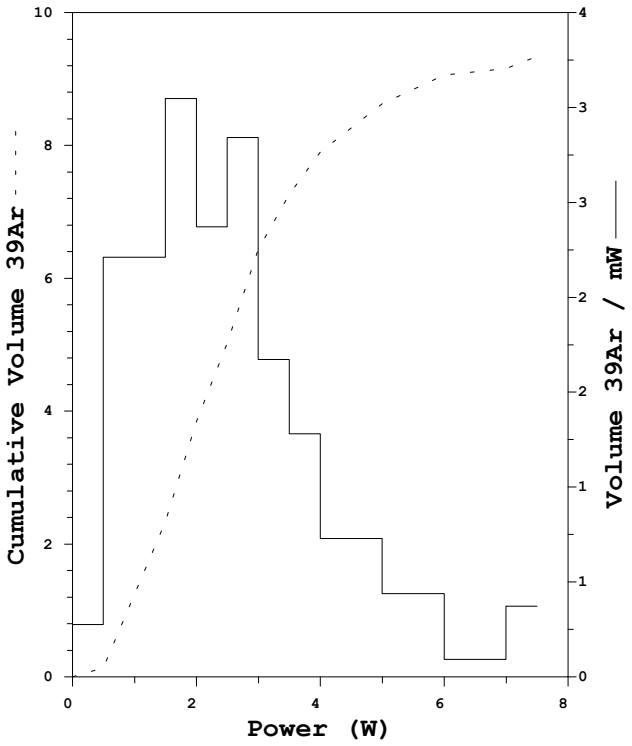
Power	40Ar	39Ar	38Ar	37Ar	36Ar	Blank 40Ar	Atmos 40/36
0.50	3.456±0.008	0.138±0.002	0.011±0.001	0.007±0.001	0.010±0.000	0.033	287.137
1.50	20.313 0.023	2.212 0.009	0.172 0.005	0.024 0.002	0.012 0.001	0.033	287.137
< 2.00>	14.059 0.020	1.524 0.006	0.120 0.003	0.005 0.001	0.004 0.000	0.033	287.137
< 2.50>	11.286 0.016	1.186 0.006	0.095 0.002	0.004 0.001	0.003 0.000	0.034	287.137
< 3.00>	13.780 0.020	1.421 0.007	0.115 0.003	0.004 0.001	0.004 0.000	0.033	287.137
< 3.50>	7.896 0.014	0.836 0.005	0.068 0.002	0.002 0.001	0.002 0.000	0.034	287.137
< 4.00>	5.907 0.012	0.641 0.003	0.051 0.002	0.002 0.000	0.001 0.000	0.034	287.137
< 5.00>	6.836 0.011	0.730 0.004	0.058 0.002	0.002 0.001	0.001 0.000	0.033	287.137
6.00	4.264 0.008	0.439 0.003	0.035 0.001	0.002 0.001	0.001 0.000	0.034	287.137
7.00	1.119 0.006	0.094 0.001	0.008 0.001	0.001 0.000	0.001 0.000	0.033	287.137
7.50	2.674 0.007	0.187 0.002	0.015 0.001	0.002 0.001	0.001 0.000	0.033	287.137

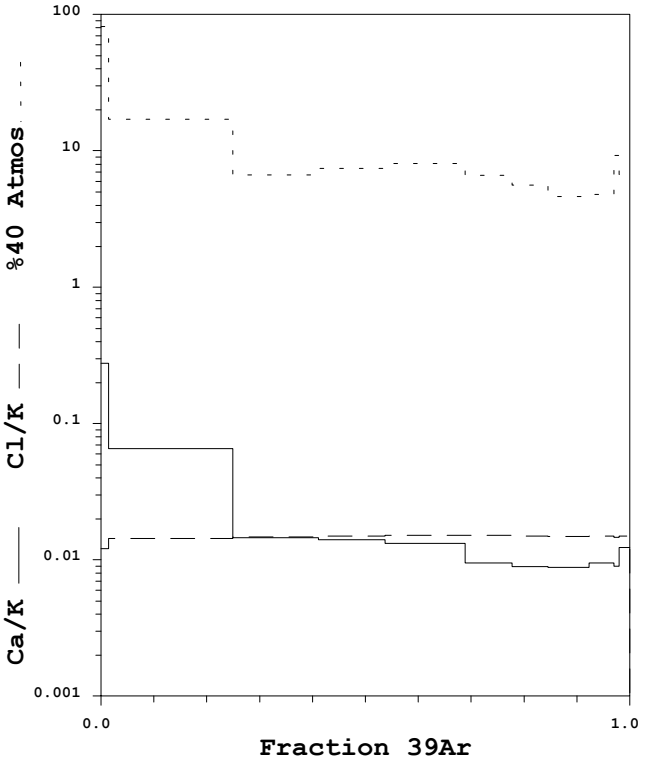
Measured volumes are x 1E-10 cm3 NTP. All errors are 2 x standard error. Intrim13 28-Mar-02

KL-7: MS-16 Bt HP









Measured volumes are x 1E-10 cm3 NTP. All errors are 2 x standard error. Intrim13 28-Mar-02

KL-8: MS-30 Mu HP

Run date: 2007/12/20 **Can/Pos:** 208/9 **J Value:** 0.003444
Printed: 2008/01/29 **Mass:** 0.0 mg ± 0.000022

Volume 39K: 14.52 x 1E-10 cm3 NTP **Approx.** % K
Integrated Age: 4.46 ± 0.14 Ma 14.28% Ca

Initial 40/36: 288.43 ± 39.40 (MSWD = 0.75, isochron between 0.47 and 2.07)
Correlation Age: 4.47 ± 0.31 Ma (94.2% of 39Ar, steps marked by >) **MSWD** 0.442

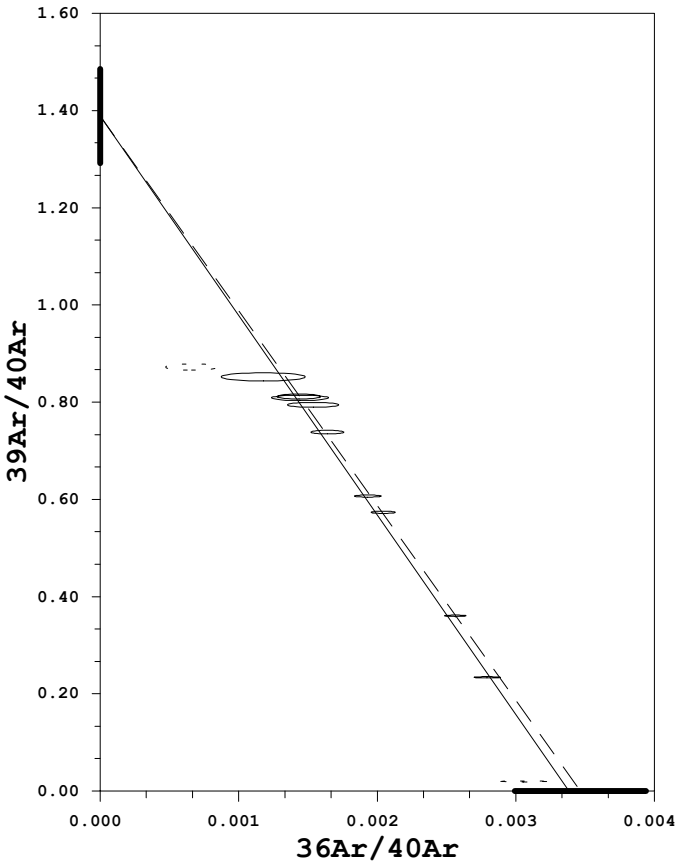
Plateau Age: 4.34 ± 0.14 Ma (94.2% of 39Ar, steps marked by <) **Mod. err.** 0.19

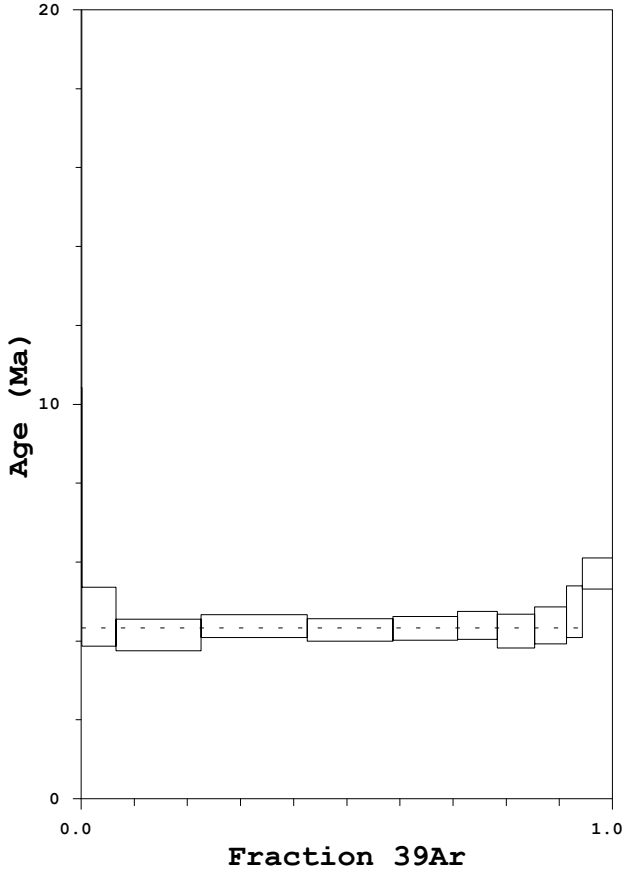
Power	36Ar/40Ar	39Ar/40Ar	r	Ca/K	%40Atm	%39Ar	40Ar*/39K	Age
0.50	0.003056±0.000215	0.020060±0.000652	0.013	0.000	90.24	0.14	4.838±3.171	29.81±19.38
< 1.50>	0.002793 0.000095	0.234340 0.001410	0.032	0.004	81.97	6.45	0.745 0.121	4.62 0.75
< 2.00>	0.002566 0.000077	0.360962 0.001493	0.027	0.001	75.01	16.01	0.670 0.064	4.16 0.40
< 2.50>	0.001933 0.000097	0.607302 0.002152	0.028	0.000	56.09	19.96	0.706 0.047	4.38 0.29
< 3.00>	0.002044 0.000088	0.573913 0.002337	0.031	0.001	59.37	16.19	0.690 0.045	4.28 0.28
< 3.50>	0.001641 0.000119	0.738740 0.003819	0.026	0.001	47.44	12.16	0.697 0.048	4.33 0.30
< 4.00>	0.001435 0.000158	0.811994 0.005201	0.024	0.001	41.40	7.46	0.709 0.058	4.40 0.36
< 5.00>	0.001538 0.000185	0.794889 0.005058	0.022	0.001	44.39	7.04	0.686 0.069	4.26 0.43
< 6.00>	0.001443 0.000207	0.809359 0.005465	0.019	0.001	41.63	5.99	0.709 0.076	4.40 0.47
< 7.00>	0.001178 0.000303	0.852563 0.008400	0.011	0.000	33.94	2.95	0.765 0.105	4.74 0.65
7.50	0.000661 0.000188	0.872786 0.006438	0.008	0.001	19.04	5.64	0.922 0.064	5.72 0.40

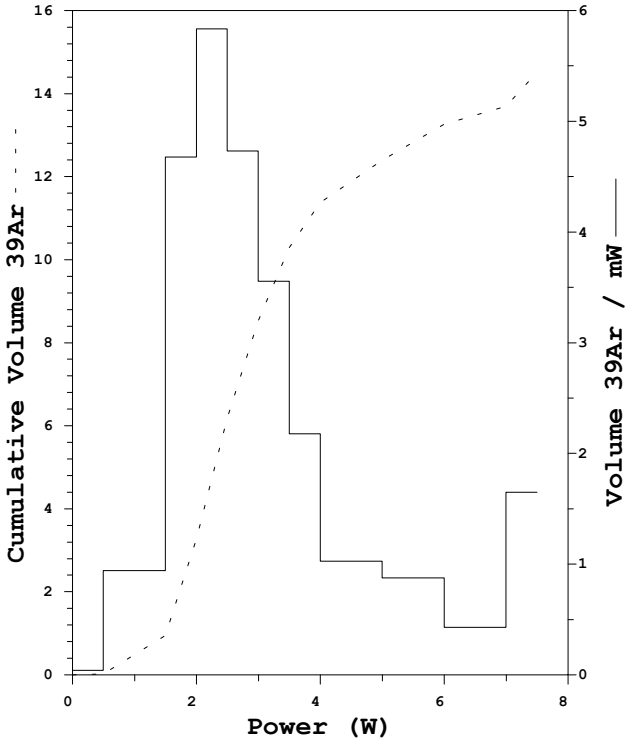
Power	40Ar	39Ar	38Ar	37Ar	36Ar	Blank 40Ar	Atmos 40/36
0.50	1.086±0.005	0.021±0.001	0.001±0.000	0.001±0.000	0.004±0.000	0.038	287.137
< 1.50>	4.062 0.010	0.943 0.005	0.014 0.001	0.001 0.000	0.012 0.000	0.039	287.137
< 2.00>	6.547 0.012	2.340 0.009	0.033 0.001	0.002 0.000	0.017 0.000	0.038	287.137
< 2.50>	4.897 0.010	2.918 0.008	0.038 0.001	0.001 0.000	0.010 0.000	0.038	287.137
< 3.00>	4.206 0.009	2.367 0.008	0.031 0.001	0.001 0.000	0.009 0.000	0.038	287.137
< 3.50>	2.482 0.007	1.778 0.007	0.023 0.001	0.001 0.000	0.004 0.000	0.038	287.137
< 4.00>	1.405 0.006	1.090 0.005	0.014 0.001	0.001 0.000	0.002 0.000	0.039	287.137
< 5.00>	1.356 0.005	1.030 0.005	0.013 0.001	0.001 0.000	0.002 0.000	0.039	287.137
< 6.00>	1.141 0.005	0.876 0.004	0.011 0.001	0.001 0.000	0.002 0.000	0.039	287.137
< 7.00>	0.553 0.003	0.431 0.003	0.006 0.001	0.001 0.000	0.001 0.000	0.038	287.137
7.50	1.003 0.005	0.825 0.004	0.010 0.001	0.001 0.000	0.001 0.000	0.040	287.137

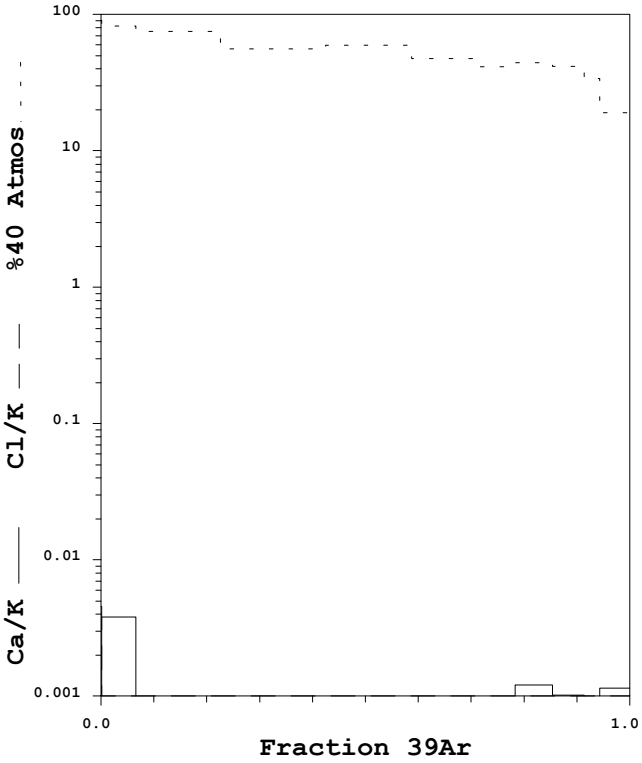
Measured volumes are x 1E-10 cm3 NTP. All errors are 2 x standard error. Intrim13 28-Mar-02

KYL-8: MS-30 Mu HP









Measured volumes are x 1E-10 cm3 NTP. All errors are 2 x standard error. Intrim13 28-Mar-02

KL-9: MS-30 Bt HP

Run date: 2007/12/20 **Can/Pos:** 208/8 **J Value:** 0.003442
Printed: 2008/01/29 **Mass:** 0.0 mg ± 0.000022

Volume 39K: 13.33 x 1E-10 cm3 NTP **Approx.** % K
Integrated Age: 2.62 ± 0.16 Ma % Ca

Initial 40/36: 280.95 ± 123.66 (MSWD = 0.53, isochron between 0.37 and 2.26)
Correlation Age: 2.93 ± 0.68 Ma (95.1% of 39Ar, steps marked by >) **MSWD** 0.633

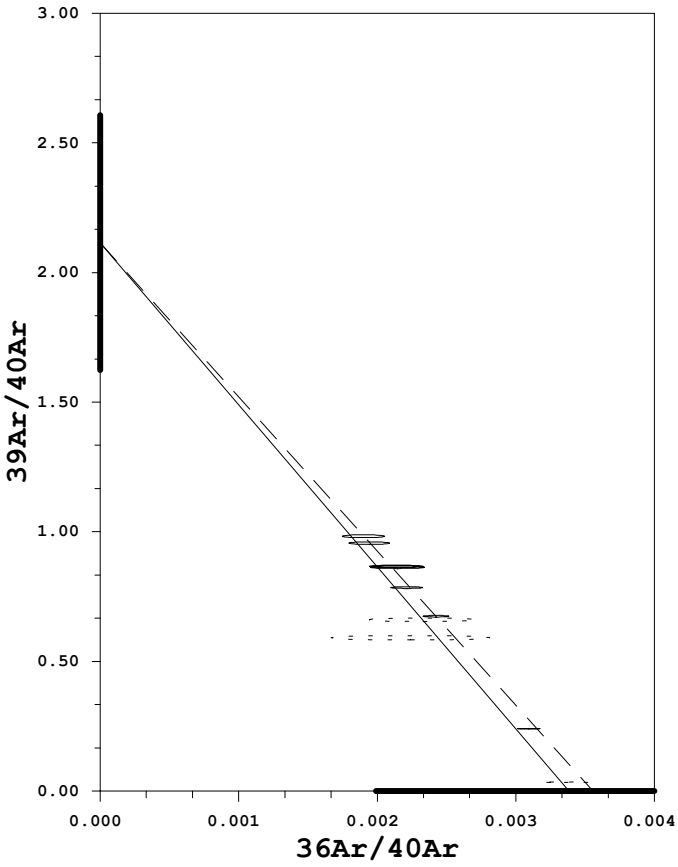
Plateau Age: 2.60 ± 0.15 Ma (95.1% of 39Ar, steps marked by <) **Mod. err.** 0.15

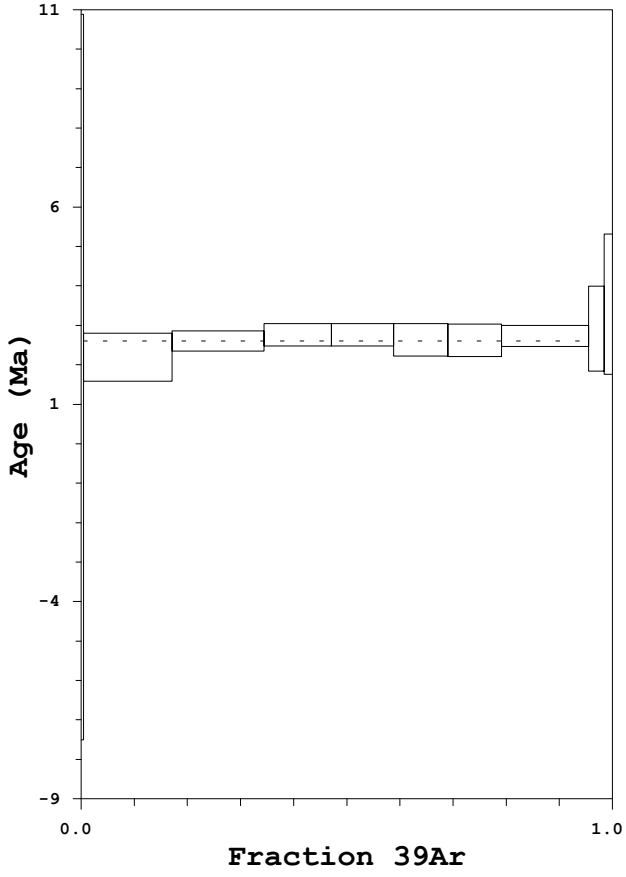
Power	36Ar/40Ar	39Ar/40Ar	r	Ca/K	%40Atm	%39Ar	40Ar*/39K	Age
0.50	0.003352±0.000174	0.034674±0.000600	0.015	0.019	98.95	0.47	0.273±1.482	1.69±9.19
< 1.50>	0.003095 0.000080	0.241346 0.001134	0.038	0.002	90.78	16.70	0.355 0.099	2.20 0.61
< 2.00>	0.002426 0.000093	0.675092 0.002881	0.038	0.001	70.21	17.28	0.420 0.041	2.61 0.26
< 2.50>	0.001943 0.000147	0.957043 0.005008	0.032	0.001	55.75	12.68	0.446 0.046	2.76 0.28
< 3.00>	0.001901 0.000153	0.983813 0.005480	0.036	0.001	54.50	11.75	0.446 0.046	2.77 0.29
< 3.50>	0.002138 0.000194	0.867661 0.004798	0.030	0.001	61.50	10.16	0.425 0.066	2.64 0.41
< 4.00>	0.002147 0.000195	0.864024 0.004945	0.029	0.001	61.79	10.13	0.424 0.067	2.63 0.41
< 6.00>	0.002213 0.000114	0.785523 0.003322	0.033	0.000	63.84	16.40	0.441 0.043	2.74 0.27
7.00	0.002331 0.000387	0.661410 0.006608	0.024	0.000	67.50	2.90	0.471 0.173	2.92 1.07
7.50	0.002241 0.000573	0.592100 0.008457	0.023	0.003	65.01	1.54	0.571 0.286	3.54 1.77

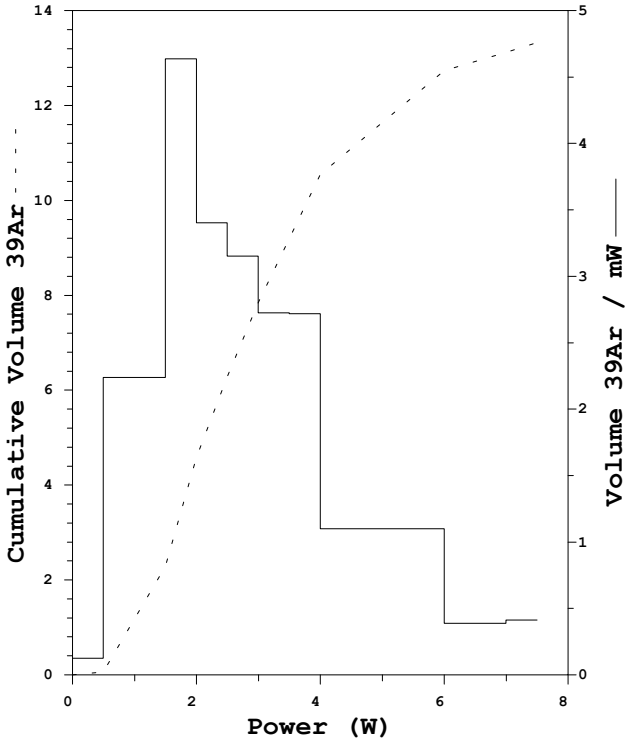
Power	40Ar	39Ar	38Ar	37Ar	36Ar	Blank 40Ar	Atmos 40/36
0.50	1.844±0.006	0.063±0.001	0.004±0.000	0.001±0.000	0.007±0.000	0.039	287.137
< 1.50>	9.330 0.020	2.241 0.009	0.078 0.002	0.002 0.000	0.030 0.001	0.039	287.137
< 2.00>	3.519 0.008	2.319 0.008	0.072 0.002	0.002 0.000	0.009 0.000	0.039	287.137
< 2.50>	1.856 0.006	1.702 0.006	0.052 0.001	0.001 0.000	0.004 0.000	0.039	287.137
< 3.00>	1.678 0.006	1.577 0.006	0.049 0.001	0.001 0.000	0.003 0.000	0.039	287.137
< 3.50>	1.640 0.006	1.363 0.005	0.042 0.001	0.001 0.000	0.004 0.000	0.039	287.137
< 4.00>	1.642 0.006	1.360 0.005	0.041 0.001	0.001 0.000	0.004 0.000	0.039	287.137
< 6.00>	2.887 0.007	2.200 0.007	0.068 0.002	0.001 0.000	0.007 0.000	0.040	287.137
7.00	0.634 0.004	0.389 0.003	0.012 0.001	0.001 0.000	0.002 0.000	0.039	287.137
7.50	0.391 0.003	0.206 0.002	0.006 0.001	0.001 0.000	0.001 0.000	0.039	287.137

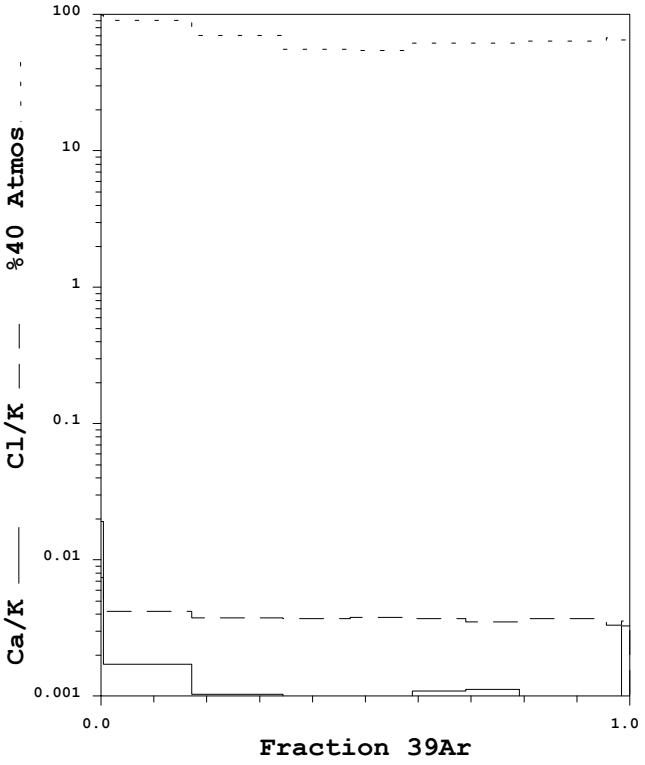
Measured volumes are x 1E-10 cm3 NTP. All errors are 2 x standard error. Intrim13 28-Mar-02

KL-9: MS-30 Bt HP









Measured volumes are x 1E-10 cm3 NTP. All errors are 2 x standard error. Intrim13 28-Mar-02

DR2010047

KL-10: MS-23B Mu HP

Run date: 2007/12/21 **Can/Pos:** 208/11 **J Value:** 0.003447
Printed: 2008/01/29 **Mass:** 0.0 mg ± 0.000022

Volume 39K: 6.45 x 1E-10 cm3 NTP **Approx.** % K
Integrated Age: 3.23 ± 0.24 Ma 3.81% Ca

Initial 40/36: 302.12 ± 96.13 (MSWD = 0.37, isochron between 0.42 and 2.15)
Correlation Age: 2.98 ± 0.56 Ma (99.6% of 39Ar, steps marked by >) **MSWD** 0.217

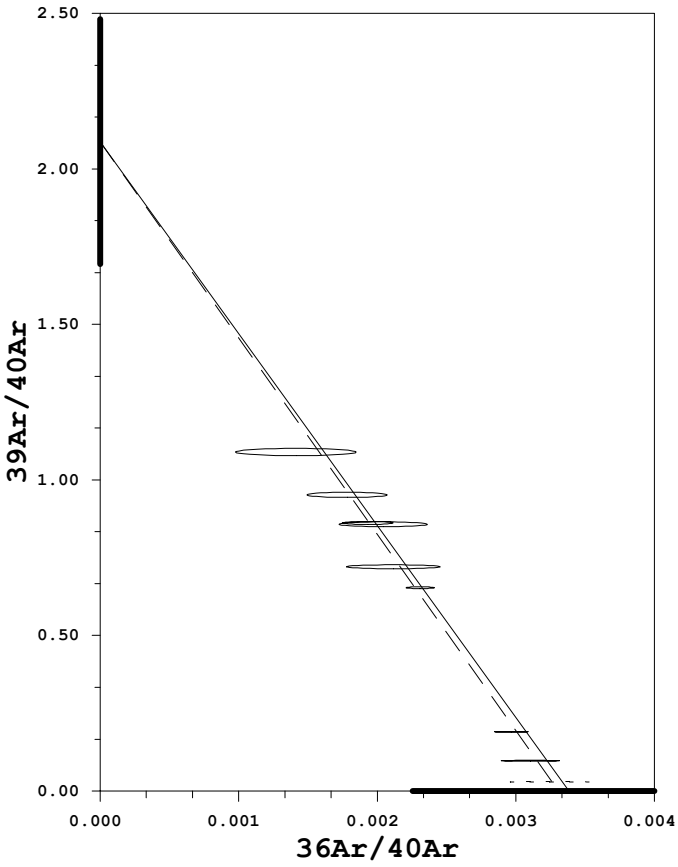
Plateau Age: 3.07 ± 0.20 Ma (87.1% of 39Ar, steps marked by <) **Mod. err.** 0.41

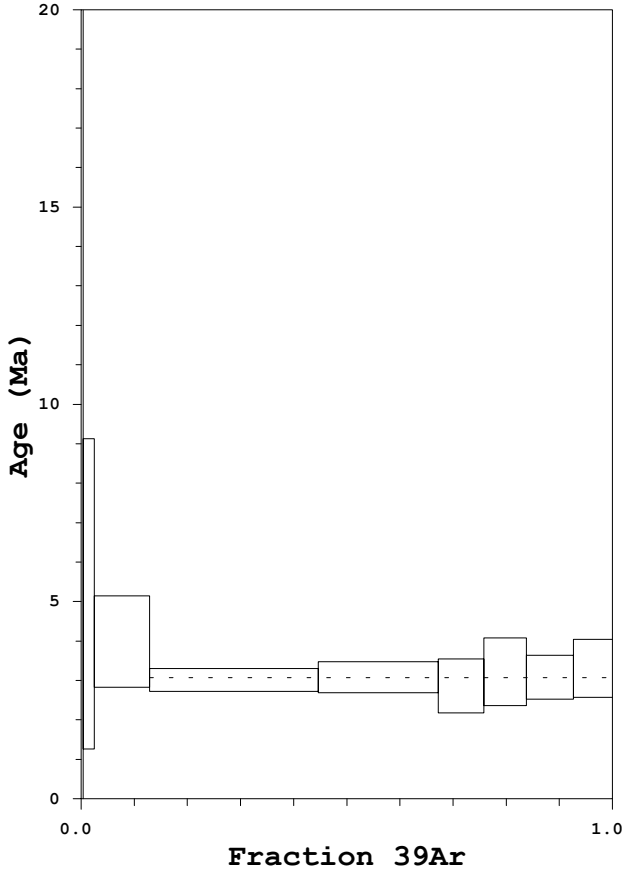
Power	36Ar/40Ar	39Ar/40Ar	r	Ca/K	%40Atm	%39Ar	40Ar*/39K	Age
0.75	0.003246±0.000285	0.030188±0.000867	0.017	0.021	95.82	0.41	1.355±2.785	8.40±17.24
1.50>	0.003107 0.000210	0.097942 0.001288	0.015	0.004	91.53	2.12	0.837 0.634	5.20 3.93
2.00>	0.002969 0.000120	0.190860 0.001066	0.024	0.000	87.23	10.38	0.643 0.187	3.99 1.16
< 2.50>	0.002310 0.000102	0.654230 0.002869	0.038	0.000	66.95	31.77	0.485 0.047	3.01 0.29
< 3.00>	0.001933 0.000184	0.862418 0.004784	0.028	0.001	55.67	22.59	0.497 0.063	3.09 0.39
< 3.50>	0.002044 0.000320	0.858183 0.007946	0.026	0.000	58.89	8.59	0.461 0.110	2.87 0.68
< 5.00>	0.002117 0.000338	0.721622 0.006124	0.022	0.002	61.23	7.95	0.519 0.139	3.22 0.86
< 7.00>	0.001783 0.000289	0.952934 0.008321	0.029	0.000	51.21	8.90	0.496 0.090	3.08 0.56
< 7.50>	0.001414 0.000436	1.090274 0.011702	0.017	0.001	40.46	7.29	0.534 0.118	3.32 0.74

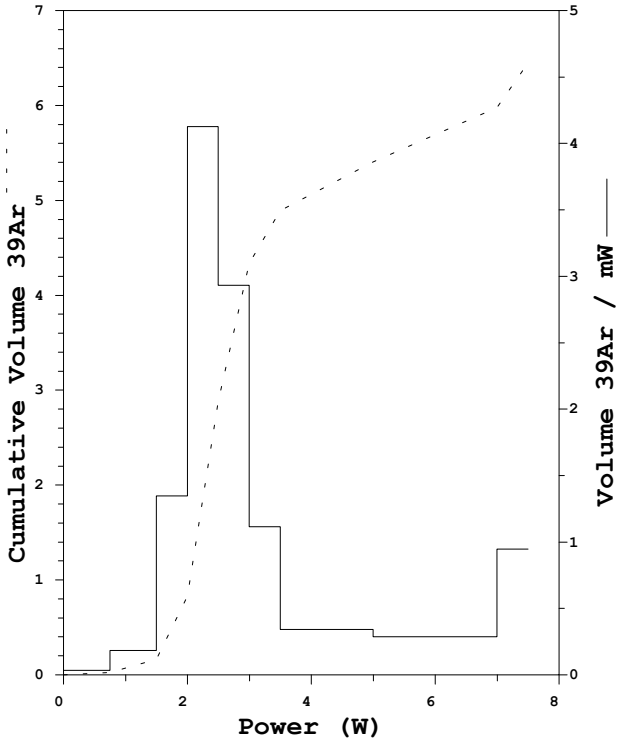
Power	40Ar	39Ar	38Ar	37Ar	36Ar	Blank 40Ar	Atmos 40/36
0.75	0.902±0.005	0.026±0.001	0.002±0.000	0.001±0.000	0.003±0.000	0.034	287.137
1.50>	1.432 0.005	0.138 0.002	0.003 0.000	0.001 0.000	0.005 0.000	0.034	287.137
2.00>	3.562 0.008	0.674 0.003	0.011 0.001	0.001 0.000	0.011 0.000	0.034	287.137
< 2.50>	3.228 0.008	2.063 0.007	0.027 0.001	0.001 0.000	0.008 0.000	0.034	287.137
< 3.00>	1.768 0.006	1.467 0.006	0.019 0.001	0.001 0.000	0.004 0.000	0.034	287.137
< 3.50>	0.695 0.004	0.558 0.004	0.007 0.001	0.001 0.000	0.002 0.000	0.033	287.137
< 5.00>	0.760 0.004	0.517 0.003	0.007 0.001	0.001 0.000	0.002 0.000	0.034	287.137
< 7.00>	0.654 0.004	0.578 0.003	0.008 0.001	0.001 0.000	0.001 0.000	0.034	287.137
< 7.50>	0.479 0.004	0.474 0.003	0.006 0.000	0.001 0.000	0.001 0.000	0.033	287.137

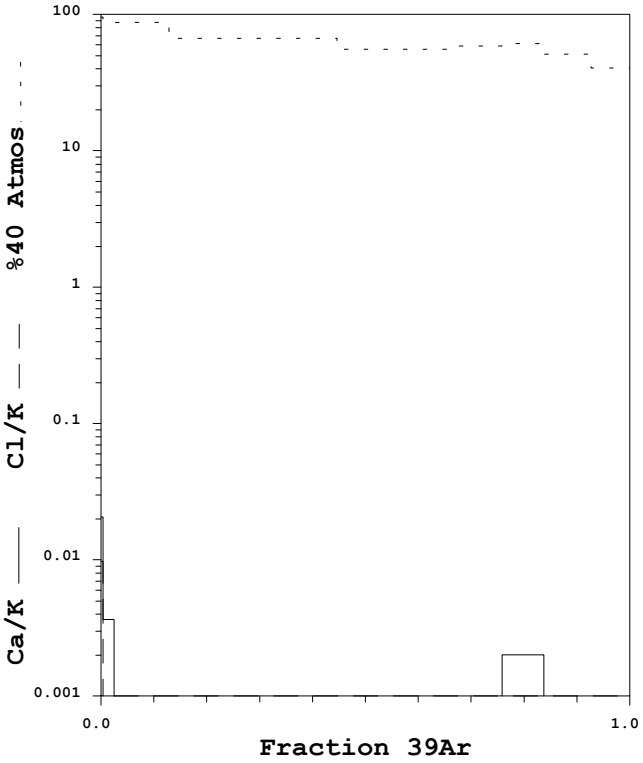
Measured volumes are x 1E-10 cm3 NTP. All errors are 2 x standard error. Intrim13 28-Mar-02

KL-10: MS-23B Mu HP









Measured volumes are x 1E-10 cm3 NTP. All errors are 2 x standard error. Intrim13 28-Mar-02

KL-11: MS-23B Bt HP

Run date: 2007/12/21 **Can/Pos:** 208/10 **J Value:** 0.003445
Printed: 2008/01/29 **Mass:** 0.0 mg ± 0.000022

Volume 39K: 17.22 x 1E-10 cm3 NTP **Approx.** % K
Integrated Age: 3.82 ± 0.12 Ma % Ca

Initial 40/36: 291.35 ± 80.76 (MSWD = 0.07, isochron between 0.53 and 1.94)
Correlation Age: 3.90 ± 0.52 Ma (99.8% of 39Ar, steps marked by >) **MSWD** 0.162

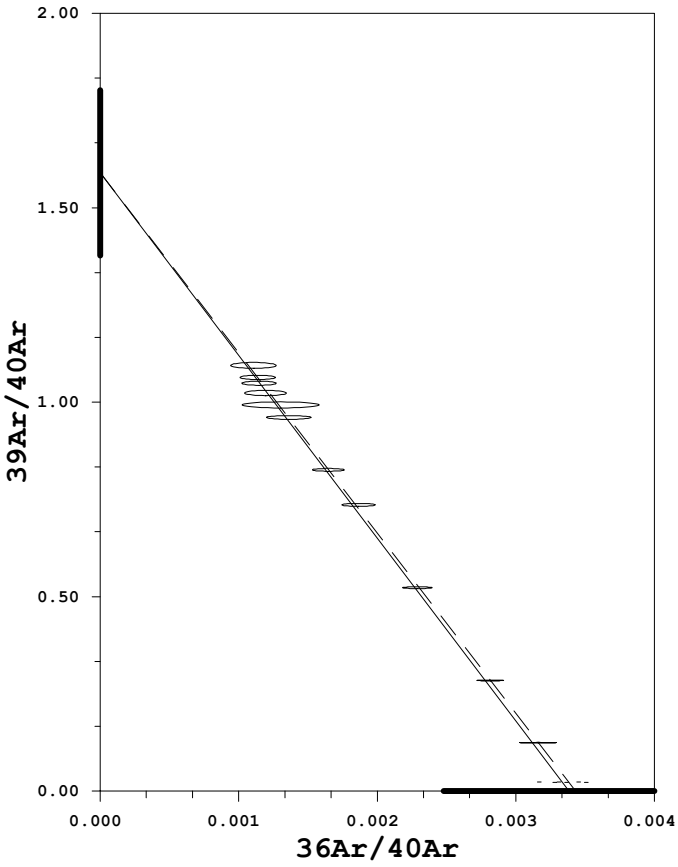
Plateau Age: 3.83 ± 0.12 Ma (99.8% of 39Ar, steps marked by <) **Mod. err.** 0.23

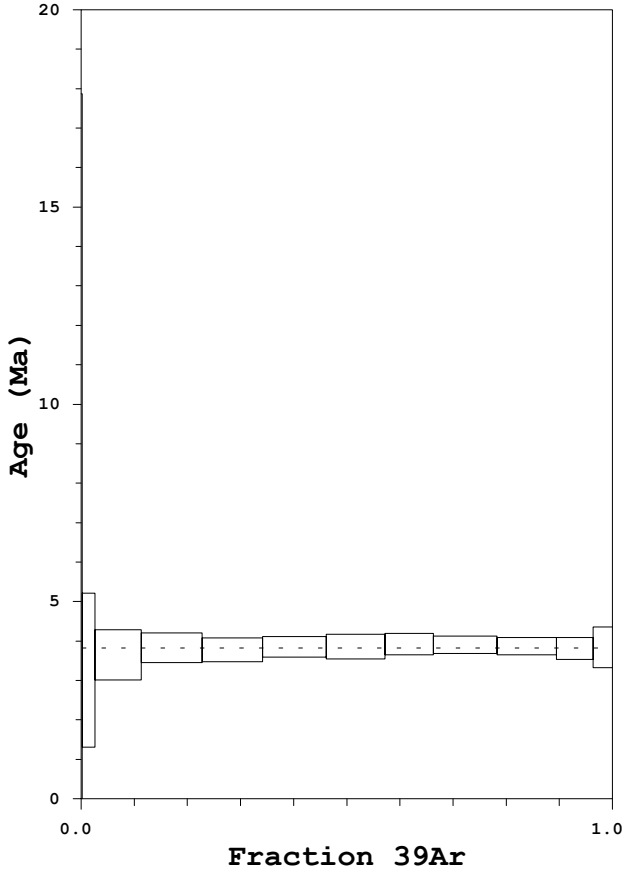
Power	36Ar/40Ar	39Ar/40Ar	r	Ca/K	%40Atm	%39Ar	40Ar*/39K	Age
0.50	0.003354±0.000199	0.023502±0.000631	0.015	0.036	99.04	0.24	0.377±2.503	2.34±15.54
< 1.00>	0.003162 0.000132	0.124806 0.000928	0.017	0.010	93.08	2.38	0.526 0.314	3.27 1.95
< 1.50>	0.002817 0.000098	0.284839 0.001225	0.026	0.005	82.52	8.74	0.589 0.102	3.66 0.64
< 2.00>	0.002291 0.000107	0.523493 0.002327	0.030	0.003	66.61	11.43	0.618 0.060	3.83 0.38
< 2.50>	0.001866 0.000121	0.736450 0.003756	0.027	0.003	53.92	11.42	0.609 0.049	3.78 0.30
< 3.00>	0.001648 0.000115	0.826528 0.003601	0.028	0.003	47.48	11.97	0.621 0.041	3.86 0.26
< 3.50>	0.001363 0.000162	0.961303 0.004661	0.016	0.002	39.09	11.05	0.622 0.050	3.86 0.31
< 4.00>	0.001195 0.000151	1.024198 0.006797	0.028	0.001	34.21	9.13	0.632 0.044	3.92 0.27
< 5.00>	0.001148 0.000124	1.049195 0.005204	0.020	0.002	32.85	11.96	0.630 0.035	3.91 0.22
< 6.00>	0.001138 0.000128	1.064228 0.005546	0.021	0.002	32.54	11.18	0.624 0.036	3.87 0.22
< 7.00>	0.001108 0.000165	1.095158 0.007602	0.023	0.001	31.66	6.86	0.614 0.045	3.82 0.28
< 7.50>	0.001304 0.000279	0.993557 0.007703	0.017	0.006	37.37	3.64	0.619 0.083	3.84 0.52

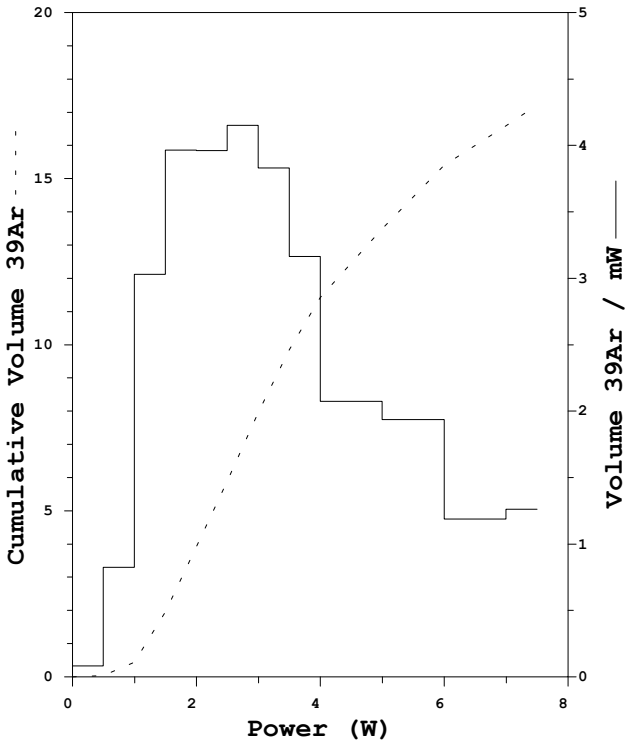
Power	40Ar	39Ar	38Ar	37Ar	36Ar	Blank 40Ar	Atmos 40/36
0.50	1.802±0.008	0.042±0.001	0.003±0.000	0.001±0.000	0.006±0.000	0.035	287.137
< 1.00>	3.332 0.008	0.413 0.003	0.014 0.001	0.002 0.000	0.011 0.000	0.034	287.137
< 1.50>	5.365 0.010	1.516 0.006	0.042 0.001	0.002 0.001	0.016 0.001	0.034	287.137
< 2.00>	3.855 0.009	1.982 0.007	0.050 0.001	0.002 0.000	0.009 0.000	0.034	287.137
< 2.50>	2.765 0.008	1.981 0.008	0.049 0.002	0.002 0.000	0.005 0.000	0.034	287.137
< 3.00>	2.590 0.007	2.076 0.006	0.051 0.001	0.002 0.001	0.005 0.000	0.034	287.137
< 3.50>	2.071 0.006	1.916 0.007	0.047 0.001	0.002 0.000	0.003 0.000	0.035	287.137
< 4.00>	1.617 0.008	1.583 0.007	0.039 0.001	0.001 0.000	0.002 0.000	0.034	287.137
< 5.00>	2.060 0.007	2.074 0.007	0.051 0.001	0.002 0.000	0.003 0.000	0.034	287.137
< 6.00>	1.901 0.007	1.938 0.007	0.047 0.001	0.002 0.000	0.002 0.000	0.034	287.137
< 7.00>	1.149 0.005	1.190 0.005	0.029 0.001	0.001 0.000	0.002 0.000	0.034	287.137
< 7.50>	0.684 0.004	0.631 0.003	0.015 0.001	0.002 0.000	0.001 0.000	0.035	287.137

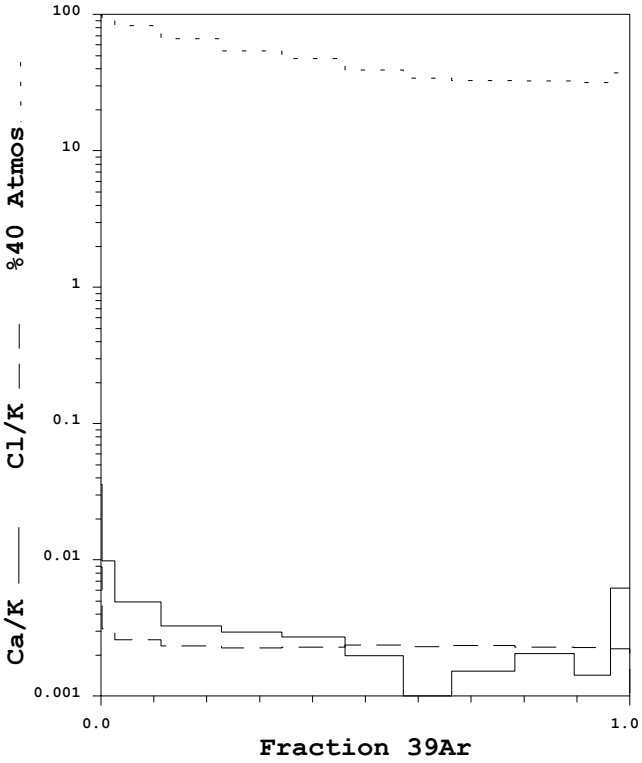
Measured volumes are x 1E-10 cm3 NTP. All errors are 2 x standard error. Intrim13 28-Mar-02

KL-11: MS-23B Bt HP









Measured volumes are x 1E-10 cm3 NTP. All errors are 2 x standard error. Intrim13 28-Mar-02

KL-12: MS-43 Mu HP

Run date: 2007/12/22 **Can/Pos:** 208/3 **J Value:** 0.003433
Printed: 2008/01/29 **Mass:** 0.0 mg ± 0.000020

Volume 39K: 20.16 x 1E-10 cm3 NTP **Approx.** % K
Integrated Age: 15.26 ± 0.16 Ma % Ca

Initial 40/36: 284.61 ± 18.12 (MSWD = 0.57, isochron between 0.42 and 2.15)
Correlation Age: 15.50 ± 0.31 Ma (77.0% of 39Ar, steps marked by >) **MSWD** 0.953

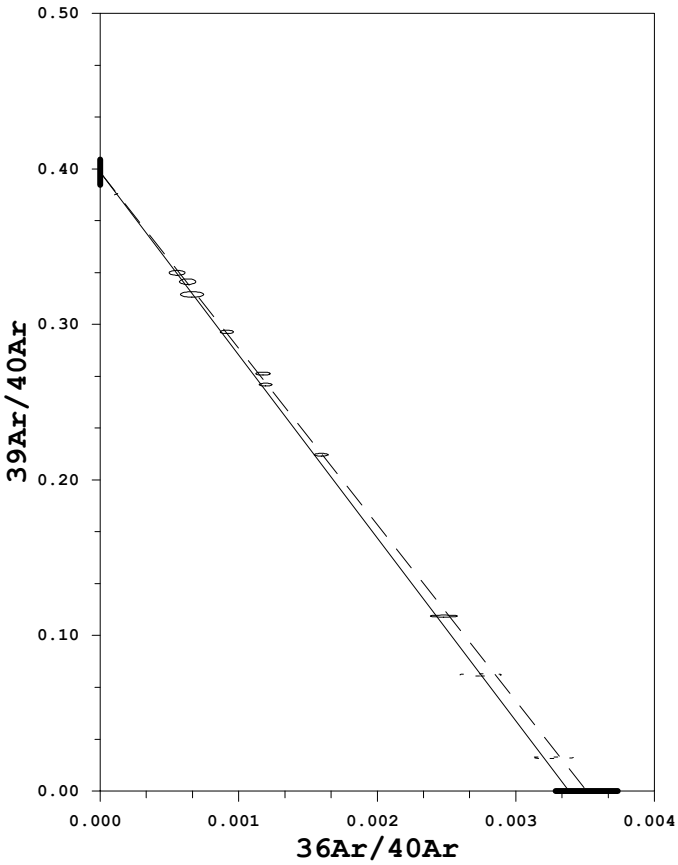
Plateau Age: 15.19 ± 0.18 Ma (77.0% of 39Ar, steps marked by <) **Mod. err.** 0.14

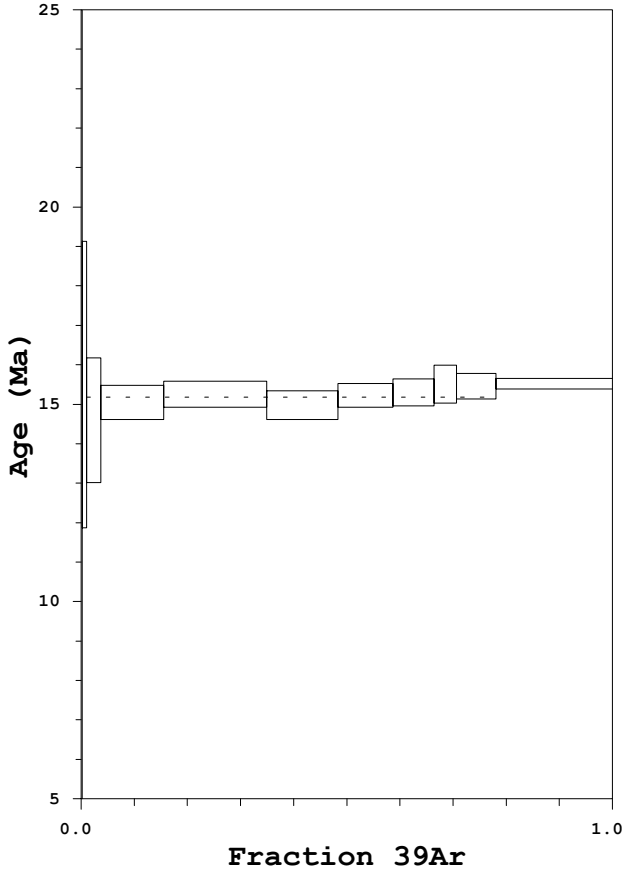
Power	36Ar/40Ar	39Ar/40Ar	r	Ca/K	%40Atm	%39Ar	40Ar*/39K	Age
0.75	0.003248±0.000169	0.021618±0.000435	0.011	0.003	95.92	0.23	1.856±2.312	11.46±14.23
1.50	0.002747 0.000149	0.074871 0.000779	0.015	0.005	81.00	0.82	2.513 0.591	15.50 3.63
< 2.00>	0.002482 0.000098	0.112624 0.000625	0.013	0.004	73.09	2.69	2.367 0.258	14.60 1.58
< 2.50>	0.001597 0.000051	0.216379 0.000839	0.019	0.001	46.88	11.85	2.441 0.071	15.05 0.44
< 3.00>	0.001196 0.000046	0.261415 0.000920	0.015	0.001	35.05	19.36	2.474 0.053	15.26 0.33
< 3.50>	0.001177 0.000052	0.268491 0.000981	0.014	0.002	34.50	13.45	2.429 0.059	14.98 0.36
< 4.00>	0.000916 0.000048	0.295321 0.001062	0.014	0.002	26.82	10.35	2.470 0.049	15.23 0.30
< 4.50>	0.000633 0.000059	0.327621 0.001787	0.010	0.004	18.51	7.69	2.482 0.055	15.31 0.34
< 5.00>	0.000664 0.000084	0.319420 0.001736	0.007	0.011	19.45	4.25	2.516 0.079	15.52 0.48
< 7.00>	0.000556 0.000058	0.333310 0.001553	0.007	0.030	16.28	7.40	2.507 0.053	15.46 0.32
7.50	0.000105 0.000026	0.384858 0.001277	0.002	0.065	3.06	21.91	2.518 0.022	15.53 0.13

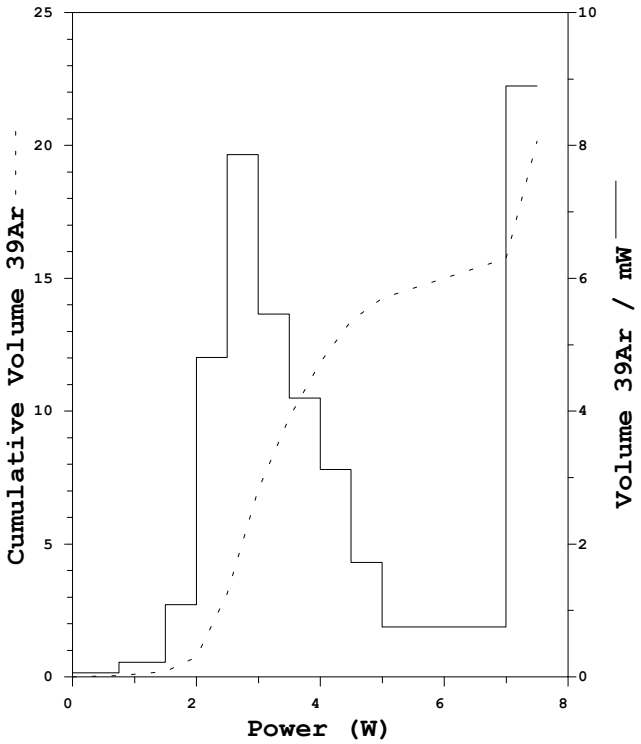
Power	40Ar	39Ar	38Ar	37Ar	36Ar	Blank 40Ar	Atmos 40/36
0.75	2.163±0.006	0.046±0.001	0.005±0.000	0.001±0.000	0.007±0.000	0.036	287.137
1.50	2.243 0.006	0.166 0.002	0.004 0.000	0.001 0.000	0.007 0.000	0.037	287.137
< 2.00>	4.873 0.008	0.547 0.003	0.009 0.001	0.002 0.000	0.013 0.000	0.037	287.137
< 2.50>	11.150 0.017	2.406 0.008	0.034 0.001	0.002 0.000	0.019 0.001	0.036	287.137
< 3.00>	15.090 0.021	3.931 0.012	0.052 0.002	0.002 0.000	0.019 0.001	0.037	287.137
< 3.50>	10.220 0.015	2.731 0.009	0.037 0.001	0.002 0.000	0.013 0.001	0.036	287.137
< 4.00>	7.165 0.012	2.101 0.007	0.028 0.001	0.002 0.000	0.007 0.000	0.037	287.137
< 4.50>	4.817 0.011	1.562 0.008	0.020 0.001	0.002 0.001	0.003 0.000	0.037	287.137
< 5.00>	2.744 0.006	0.862 0.004	0.011 0.001	0.003 0.001	0.002 0.000	0.037	287.137
< 7.00>	4.561 0.009	1.503 0.006	0.020 0.001	0.008 0.001	0.003 0.000	0.037	287.137
7.50	11.651 0.017	4.449 0.013	0.056 0.002	0.045 0.002	0.002 0.000	0.037	287.137

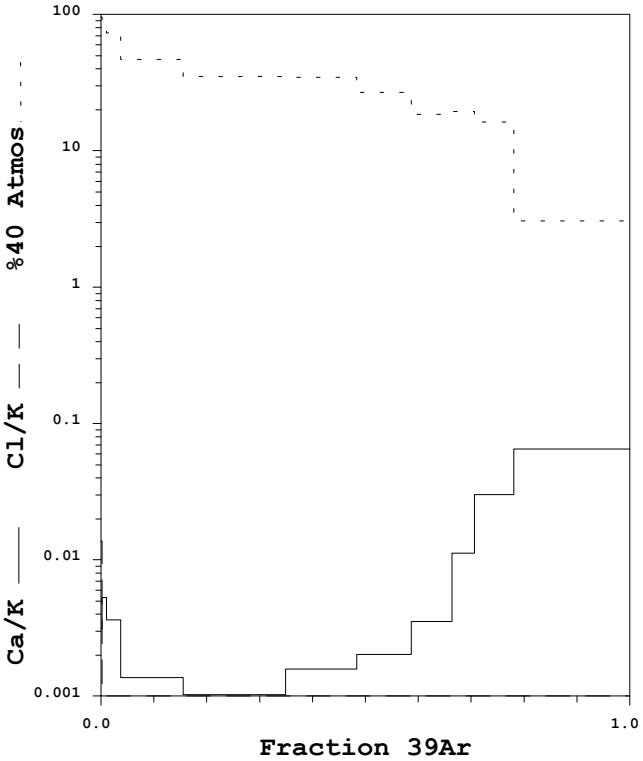
Measured volumes are x 1E-10 cm3 NTP. All errors are 2 x standard error. Intrim13 28-Mar-02

KL-12: MS-43 Mu HP









Measured volumes are x 1E-10 cm3 NTP. All errors are 2 x standard error. Intrim13 28-Mar-02

Electron Microprobe Methods and Data

Quantitative analyses were made on an automated 4 spectrometer Cameca Camebax MBX electron probe by the wavelength dispersive x-ray analysis method (WDX). Operating conditions were: 15kv accelerating voltage, 20 nan0-amperes beam current . Specimens were analyzed using either a focused electron beam (1 micron diameter) or a rastered electron beam 5 x5 to 10x10 microns in size on beam sensitive minerals such as plagioclase or mica. Counting times were 15-40 seconds or 40,000 accumulated counts. Background positions were carefully selected to avoid instances of peak overlap. Background measurements were made at 50% peak counting time on each side of the analyzed peak. Raw x-ray data were converted to elemental weight % by the Cameca PAP matrix correction program. A suite of well characterized natural and synthetic minerals and compounds were used as calibration standards. Analyses are accurate to 1-2 % relative for major elements (>10 wt %), 3-5 % relative for minor elements (>0.5<5.0 wt %). As detection limit is approached (<0.1 wt %), relative errors approach 100 %.

Element Line Standard

Si,Ca K-alpha wollastonite

Al K-alpha syn spinel

Ti,Mn K-alpha syn MnTiO3

Cr K-alpha syn Cr2O3

Fe K-alpha syn. fayalite

Mg K-alpha olivine

Ba L-alpha barite

Na K-alpha albite

K K-alpha orthoclase

Cl K-alpha tugtupite

F K-alpha syn LiF

Specimens were also examined with an EDX (energy-dispersive x-ray analysis)

system to confirm mineral identifications and determinethe presence or absence of major and trace elements prior to quantitative analysis.

Digital BSE (back-scattered electron) images were collected at 512 x 512 pixel resolution with an Electron Optic Services digital imaging system consisting of : a 4Pi Analysis Inc. digital imaging and EDX x-ray system and Power Macintosh G3 computer interfaced to at a Lamont 4 element solid state BSE detector and BSE Quad Summing Amplifier, Kevex EDX detector, and Aptec spectroscopy amplifier.

In specimens ms62, ms32B, ms34, ms21, and ms12 analyses of two paired garnet/biotite phases were measured. The temperature (and pressure if appropriate) of equilibrium was calculated for each pair; the results from the same specimen were invariably well-within error. Rather than choose one estimate over another from one specimen the thermobarometric estimates used in this study represents the average of the two analysis.

Mineral compositions from schists and gneisses
Budhi Gandaki and Darondi valleys, central Nepal

Plagioclase rim compositions

Sample	ms62-1	ms62-2	ms59	ms31	ms32B-1
XAn	0.234	0.237	0.197	0.126	0.200
XAlb	0.763	0.758	0.796	0.870	0.793
XOr	0.004	0.006	0.007	0.004	0.007

Sample	ms32B-2	ms34-1	ms34-2	ms47	ms37
XAn	0.199	0.231	0.210	0.239	0.226
XAlb	0.793	0.759	0.783	0.750	0.763
XOr	0.008	0.009	0.007	0.011	0.011

Garnet Minimum-Mn compositions

Sample	ms76	ms12-1	ms12-2	ms21A-1	ms21A-2
XPrp	0.122	0.097	0.093	0.106	0.095
XAlm	0.838	0.810	0.806	0.825	0.779
XSps	0.010	0.006	0.007	0.005	0.007
XGrs	0.031	0.088	0.095	0.063	0.118
Fe/(Fe+Mg)	0.873	0.893	0.897	0.886	0.891

Sample	ms62-1	ms62-2	ms59	ms31	ms32B-1
XPrp	0.170	0.181	0.100	0.124	0.072
XAlm	0.682	0.671	0.799	0.734	0.752
XSps	0.080	0.080	0.061	0.112	0.144
XGrs	0.068	0.067	0.041	0.030	0.032
Fe/(Fe+Mg)	0.800	0.787	0.889	0.856	0.912

Sample	ms32B-2	ms34-1	ms34-2	ms47	ms37
XPrp	0.071	0.078	0.072	0.093	0.094
XAlm	0.751	0.704	0.712	0.747	0.780
XSps	0.146	0.183	0.182	0.125	0.093
XGrs	0.033	0.036	0.033	0.034	0.033
Fe/(Fe+Mg)	0.914	0.901	0.908	0.889	0.893

Mlca compositions (bt, biotite; ms, muscovite)

Sample	ms76 bt	ms12-1 bt	ms12-2 bt	ms21A-1 bt	ms21A-2 bt
Si	2.946	2.997	2.975	2.945	2.974
Al	1.959	1.935	1.906	1.921	1.924
Ti	0.038	0.055	0.070	0.073	0.042
Mg	1.126	1.071	1.081	0.886	1.036
Fe^{2+}	1.451	1.430	1.460	1.658	1.528
Mn	0.002	0.000	0.004	0.004	0.003
Ca	0.002	0.002	0.007	0.004	0.000
Na	0.021	0.034	0.057	0.053	0.050
K	1.004	0.949	0.940	0.961	0.975
Fe/(Fe+Mg)	0.563	0.572	0.575	0.652	0.596

Sample	ms62-1 bt	ms62-2 bt	ms59 bt	ms31 bt	ms32 ms
Si	2.969	2.995	2.964	2.961	3.353
Al	1.800	1.782	1.876	1.862	3.020
Ti	0.139	0.139	0.131	0.146	0.044
Mg	1.283	1.311	0.997	1.241	0.066
Fe^{2+}	1.271	1.236	1.504	1.246	0.074
Mn	0.011	0.007	0.003	0.010	0.000
Ca	0.000	0.002	0.001	0.001	0.000
Na	0.057	0.064	0.035	0.049	0.225
K	0.963	0.931	0.931	0.928	0.827
Fe/(Fe+Mg)	0.498	0.485	0.601	0.501	0.529

Sample	ms32B-1 bt	ms32B-2 bt	ms34-1 bt	ms34-2 bt	ms47 bt
Si	2.968	2.968	2.909	2.904	2.926
Al	1.845	1.834	1.868	1.889	1.958
Ti	0.147	0.158	0.229	0.211	0.127
Mg	0.714	0.680	0.810	0.802	0.873
Fe^{2+}	1.725	1.751	1.550	1.577	1.547
Mn	0.021	0.024	0.014	0.020	0.013
Ca	0.001	0.000	0.001	0.000	0.001
Na	0.016	0.015	0.026	0.021	0.021
K	1.051	1.052	1.035	1.023	1.021
Fe/(Fe+Mg)	0.707	0.720	0.657	0.663	0.639

Sample	ms37 bt
Si	2.924
Al	2.009
Ti	0.103
Mg	0.886
Fe^{2+}	1.507
Mn	0.009
Ca	0.001
Na	0.025
K	1.024
Fe/(Fe+Mg)	0.630