To my arrow...

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June, 2014

Geochronology of Southern McMurdo Sound and development of Pychron: A $^{40}Ar/^{39}Ar$ data collection and processing software suite

by

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ABSTRACT

Minna Bluff has been a significant topographic barrier to the flow of the Ross Ice Shelf since the mid-Miocene. Detailed Ar-Ar analyses of kaersutite and sanidine phenocrysts, and groundmass concentrates from volcanic units indicate an overall west to east progression of volcanic activity. Eruptions of basaltic to intermediate lavas, domes, and scoria cones started at ~12 Ma in at what is now the eastern most point of Minna Bluff, "Minna Hook." Activity was centered in this area from 12 - 4 Ma, constructing a pre-Minna Bluff island. Multiple glacial unconformities found at Minna Hook suggest repeated interaction with large warm-based, erosive ice sheets. Activity migrated westward from Minna Bluff Island at 7-8 Ma closing the gap created by the island and the mainland. Significant edifice construction continued until 4-5 Ma with sporadic and parasitic scoria cone eruptions, possibly associated with Mt. Discovery activity, continuing until ~1 Ma.

The orientations of Minna Bluff's two major axes are strongly controlled by regional tectonic features. Minna Bluff's E-W axis, Central Minna Bluff, is subparallel to the Radian Lineament and the N-S axis, Minna Hook, appears to be an extension of faulting bounding the Terror Rift. The constructional evolution of the 70km long volcanic complex has an important role in interpreting the climate signals recovered by the ANDRILL Project. Minna Bluff influenced the material delivered to the AND-1B drill site (ANDRILL MIS 2006-2007) in three critical

ways: 1) Minna Bluff diverted upstream material, 2) provided a pinning and stabilizing point for the Ross Ice Shelf, possible controlling the calving line prior to the emergence of Ross Island, and 3) was a significant source of fresh volcanic material throughout much of the period recovered by ANDRILL MIS. For example, a kaersutite-bearing clast recovered from 822.78 mbsf in AND-1B yielded an age of 8.53 $\pm$0.51 Ma, and was likely derived from Minna Bluff. The results from this study can be incorporated into detailed glacier and ice-sheet models of the McMurdo Sound region, a critical area for interpreting the Ross Ice Sheet history and the global climate system.

Keywords: Antarctica; Ar-Ar geochronology; Python

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CONTENTS

LIST OF TABLES **vi**

LIST OF FIGURES **vii**

PREFACE **ix**

1. DEVELOPMENT OF AN AGE-DEPTH MODEL FOR ANDRILL MIS AND-1B DRILL CORE, MCMURDO SOUND, ANTARCTICA **1**

1.1 ANDRILL in Global Planetary Change 1

2. GEOCHRONOLOGY OF MINNA BLUFF, SOUTHERN MCMURDO SOUND, ANTARTICA **15**

2.1 Abstract 15

2.2 Introduction 16

2.3 Background 19

2.3.1 Geographic Setting 19

2.3.2 Volcanic Setting 20

2.3.3 Tectonic Setting 23

2.4 Methods 24

2.4.1 Sampling 24

2.4.2 Electron Microprobe 25

2.4.3 XRF 26

2.4.4 $^{40}Ar/^{39}Ar$ 26

2.5 Lithostratigraphic Units 29

2.5.1 Felsic lava domes and carapace breccia 32

2.5.2 Quenched pillow/lobe lava hyaloclastite 32

2.5.3 Suberial lava and flows and autoclastic breccia 33

2.5.4 Basanite scoria cones and vent complexes 34

2.5.5 Dikes 34

2.5.6 Mafic Hydrovolcanic tuff 34

2.5.7 Felsic Pyroclastic Tuff 35

2.5.8 Polymict sediments 35

2.6 Results 36

2.6.1 $^{40}Ar/^{39}Ar$ 36

2.6.2 Glacial Erosional Events 50

2.7 Discussion 55

2.8 Conclusion 68

3. PYCHRON: $^{40}Ar/^{39}Ar$ DATA ACQUISITION AND PROCESSING SOFTWARE SUITE 69

3.1 Abstract 69

3.2 Introduction 70

3.3 Distributed Control 73

3.4 Data Collection 74

3.5 PyScripts 80

3.6 Data Processing 82

3.7 Calculations 87

3.8 Advanced Features 92

3.9 Conclusions 99

A. ^{40}Ar/^{39}Ar FUSION FIGURES **101**

B. ^{40}Ar/^{39}Ar STEP HEAT FIGURES **107**

C. ^{40}Ar/^{39}Ar STEP HEAT FIGURES (INTEGRATED) **131**

D. ^{40}Ar/^{39}Ar MAP FUSION DATA TABLE **140**

E. ^{40}Ar/^{39}Ar MAP STEP HEAT DATA TABLE **153**

F. ^{40}Ar/^{39}Ar ARGUS FUSION DATA TABLE **227**

G. ^{40}Ar/^{39}Ar ARGUS STEP HEAT DATA TABLE **233**

H. XRF DATA **241**

REFERENCES **267**

LIST OF TABLES

2.1 Irradiations 27

2.2 Lithostratigraphic Units 31

2.3 $^{40}Ar/^{39}Ar$ Summary 39

D.1 $^{40}Ar/^{39}Ar$ MAP Fusion Data Table 141

E.1 $^{40}Ar/^{39}Ar$ MAP Step Heat Data Table 154

F.1 $^{40}Ar/^{39}Ar$ Argus Fusion Data Table 228

G.1 $^{40}Ar/^{39}Ar$ Argus Step Heat Data Table 234

H.1 XRF Data 242

LIST OF FIGURES

2.1 Minna Bluff, Antarctica 17

2.2 $^{40}Ar/^{39}Ar$ Dating Coverage 37

2.3 Representative Step Heating Results for GMC and Kaer 47

2.4 Representative Step Heating Results for Plag 48

2.5 Representative Fusion Results for Volcanic Feldspar 49

2.6 $^{40}Ar/^{39}Ar$ Results for Bracketing Samples 51

2.7 Glacial Erosional Events 54

2.8 $^{40}Ar/^{39}Ar$ Relative Age Error 57

2.9 Two Phase Volcanic Activity at Minna Bluff 59

2.10 Phase One TAS diagram 62

2.11 Phase Two TAS diagram 63

2.12 Dry Valleys Ash Provenance 67

3.1 Data Collection Workflow 75

3.2 Experiment Text File 78

3.3 Experiment Inprogress 79

3.4 Ideogram Task Window 84

3.5 Data Processing Workflow 86

3.6 Section Flooding 94

3.7 Power Mapping 96

3.8 Auto Positioning 98

This dissertation is accepted on behalf of the faculty of the Institute by the following committee:

William C. McIntosh, Advisor

I release this document to the New Mexico Institute of Mining and Technology.

Jake Ross Date

PREFACE

This dissertation is divided into three chapters, 1.) ANDRILL, 2.) Minna Bluff and 3.) Pychron. The ANDRILL and Minna Bluff chapters are related to Ar-Ar geochronology of Cenozoic volcanism in Southern McMurdo Sound, Antarctica and their implications to the development of past climate models and interpretations of the Cryosphere in during the last 12 Ma. The last chapter, Pychron, discusses to the development of new generation software tools for use in Ar-Ar geochronology, both for data aquisition and data processing.

CHAPTER 1

DEVELOPMENT OF AN AGE-DEPTH MODEL FOR ANDRILL MIS AND-1B DRILL CORE, MCMURDO SOUND, ANTARCTICA

1.1 ANDRILL in Global Planetary Change

Please refer to Ross et al. (2012) (Development of a precise and accurate age–depth model based on $^{40}Ar/^{39}Ar$ dating of volcanic material in the AN-DRILL (1B) drill core, Southern McMurdo Sound, Antarctica)

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Development of a precise and accurate age–depth model based on $^{40}Ar/^{39}Ar$ dating of volcanic material in the ANDRILL (1B) drill core, Southern McMurdo Sound, Antarctica

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ABSTRACT

High precision $^{40}Ar/^{39}Ar$ dates on a variety of volcanic materials from the AND-1B drill core provide pinning points for defining the chronostratigraphy for the core. The volcanic materials dated include 1) felsic and basaltic tephra, 2) interior of a ~3 m thick intermediate submarine lava flow, and 3) felsic and basaltic volcanic clasts. In the upper 600 m of the core, two felsic tephra, two basaltic tephra and the intermediate laval flow yield precise and depositional ages, with further maximum age constraints from volcanic clasts. Below 600 m in the core, tephric intervals are significantly altered and maximum age constraints only are available from volcanic clasts. The ages for eight stratigraphic intervals are 1) 17.17–17.18 mbsf, basaltic clast (maximum depositional age 0.310 ± 0.039 Ma, all errors quoted at 2σ), 2) 52.80–52.82 mbsf, three basaltic clasts (maximum depositional age 0.726 ± 0.052 Ma), 3) 85.27–85.87 mbsf felsic tephra (1.014 ± 0.008 Ma), 4) ~112–145 mbsf sequence of basaltic tephra (1.633 ± 0.057 to 1.683 ± 0.055 Ma), 5) 480.97–481.96 mbsf pumice-rich mudstone (4.800 ± 0.076 Ma), 6) 646.30–649.34 mbsf intermediate lava flow (6.48 ± 0.13 Ma), 7) 822.78 mbsf kaersutite phenocrysts from volcanic clasts (maximum depositional age 8.53 ± 0.53 Ma) and 8) ~1280 mbsf, three volcanic clasts (maximum depositional age 13.57 ± 0.13 Ma). Minimum average sediment accumulation rates or 102 and 87 m/Ma for the upper and lower 650 m of core, respectively were calculated using the $^{40}Ar/^{39}Ar$ analyses. The volcanic material recovered from AND-1B also reveals a general northward progression of volcanism in Southern McMurdo Sound.

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1. Introduction

The AND-1B drill core was recovered near Hut Point Peninsula, Ross Island, Antarctica, as part of an international effort to sample a near continuous sedimentary record in southern McMurdo Sound (ANDRILL MIS Project), with the goal of reconstructing the Cenozoic paleoenvironment and paleoclimate of Antarctica. The ANDRILL MIS project drilled into the baythmetric and depocentral axis of a flexural moat formed by the Quaternary volcanic loading of the crust by Ross Island (Horgan et al. 2005). The recovered drill core, AND-1B, reached a depth of 1284.87 meters below sea floor (mbsf), sampling > 1200 m of alternating glacial and interglacial sediments inter-bedded with volcanic and volcaniclastic layers. (Naish et al., 2007).

Meaningful interpretation of the paleo-environmental record sampled by the AND-1B drill core requires an accurate chronology. This paper reports results of $^{40}Ar/^{39}Ar$ dating of volcanic materials sampled from eight stratigraphic intervals in the AND-1B drill core.

2. Volcanic stratigraphy and dating targets

Volcanic material is located throughout the drill core (Fig. 1). However, only a few select intervals have yielded accurate and precise $^{40}Ar/^{39}Ar$ time-stratigraphic pinning points. Four types of material were dated: felsic tephra, basaltic tephra, a submarine lava flow, and basaltic and intermediate clasts. The tephra and lava flow yield accurate depositional ages because they represent primary units that were emplaced shortly (<10's of ka) after eruption and yield precise and accurate $^{40}Ar/^{39}Ar$ ages. Volcanic clasts, however, because of the unknown and commonly significant time between eruption and deposition, provide a maximum depositional age.

AND-1B recovered only a few unaltered felsic tephra layers suitable for $^{40}Ar/^{39}Ar$ dating. Feldspar phenocrysts from the two fresh felsic tephra reported in this paper yield the highest precision and most accurate depositional ages. Fresh felsic tephra provide the best targets for $^{40}Ar/^{39}Ar$ dating because they commonly contain potassium-rich feldspar phenocrysts that accurately and precisely record the time of eruption (McIntosh 2000). The highest precision age of all analyses was obtained from euhedral K-feldspar phenocrysts separated from a pure phonolitic–trachytic/traydacitic tephra layer at 85.27–85.87 mbsf. This tephra layer consists of a concentrated interval of felsic pumice interpreted as a primary pyroclastic fall deposit

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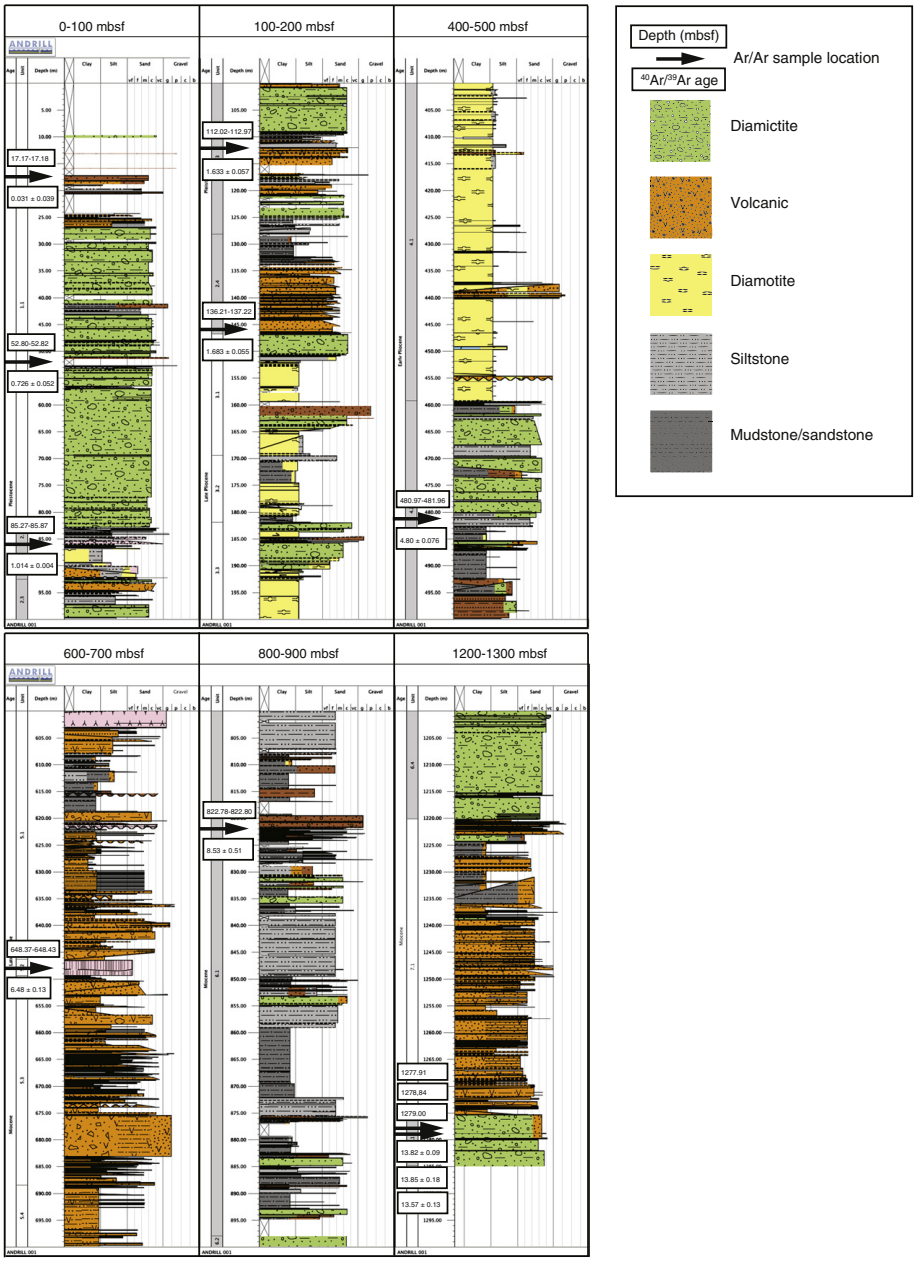

Fig. 1. 100 m summary stratigraphic columns. Markers indicate locations of $^{40}Ar/^{39}Ar$ dating targets. Figure made using images created by PSICAT (Reed et al., 2006).

(Pompilio et al., 2007) and can be used as an accurate time-stratigraphic horizon. A mudstone layer located from ~481.00 to 482.00 mbsf contains numerous but dispersed felsic pumice clasts up to 0.5 cm in diameter and containing unaltered feldspar phenocrysts. Although this interval is not a concentrated primary tephra we believe it nonetheless provides a precise and accurate time-

stratigraphic horizon because 1) it is comprised of a zone of numerous pumice clasts and, 2) the preservation of delicate pumices suggests limited transportation.

Basaltic tephra layers are abundant within the upper 150 mbsf of the drill core. A sequence of basaltic tephra inter-bedded with glacimarine sediments between ~110 and 150 mbsf is an important

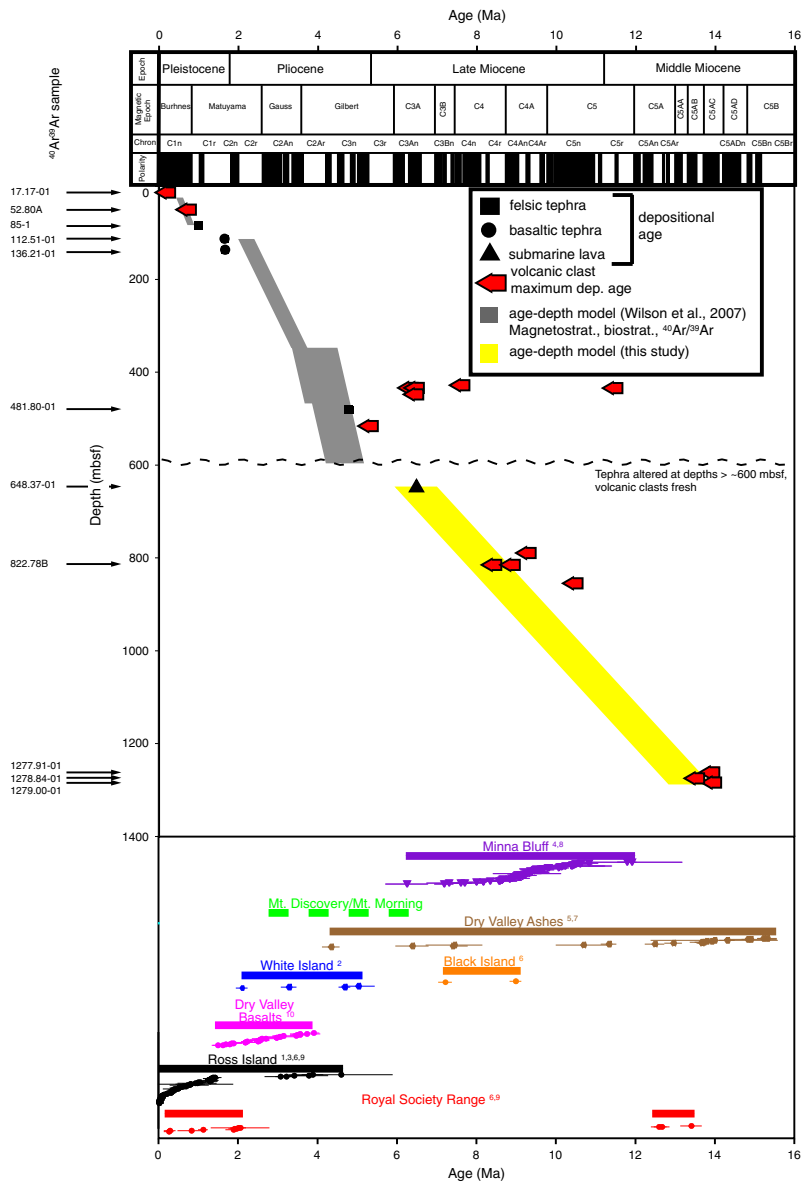

Fig. 2. Age (Ma) vs. depth (mbsf) plot showing $^{40}Ar/^{39}Ar$ ages used to constrain the age–depth models proposed by Wilson et al. 2007 and this study. Inset shows map of Antarctica and McMurdo Sound adapted from Cooper et al. (2007). Bottom plot displays ages for Southern McMurdo Sound volcanism complied from 1) Armstrong (1978), 2) Cooper et al. (2007), 3) Esser et al. (2004), 4) Fargo et al., 2008, 5) Lewis et al. (2006), 6) Lawrence et al. (2009), 7) Marchant et al. (1996), 8) Martin et al. (2010), 9) Tauxe (2004), 10) Wilch et al. (1993), 11) Wright-Grassham (1987).

target for dating and volcanic study. Pompilio et al. (2007) inferred that these layers are derived primarily from subaerial Hawaiian/Strombolian eruptions from vents on Hut Point Peninsula. Back Scatter Electron (BSE) images of the tephra indicate they are composed of abundant angular glass shards with minor amounts of plagioclase and/or olivine/pyroxene micro-phenocrysts. The preservation of the fragile angular glass shards and lack of rounding (Fig. 3C and D), suggests that these tephra have not experienced significant mass flow processes and were deposited by settling through the water column shortly after eruption (P. Kyle personal communication, Feb. 2009). The lack of K-rich phenocrysts, such as sanidine, anorthoclase or kaersutite within the basaltic tephra requires analysis of the basaltic glass shards to determine an accurate eruption age. Quantitative microprobe analysis of glass shards yields K_2O values ranging from ~1 to 3% (refer to supplementary material).

An approximately 3 m thick submarine lava flow at 636.49–649.30 mbsf provides an additional accurate $^{40}Ar/^{39}Ar$ age used to

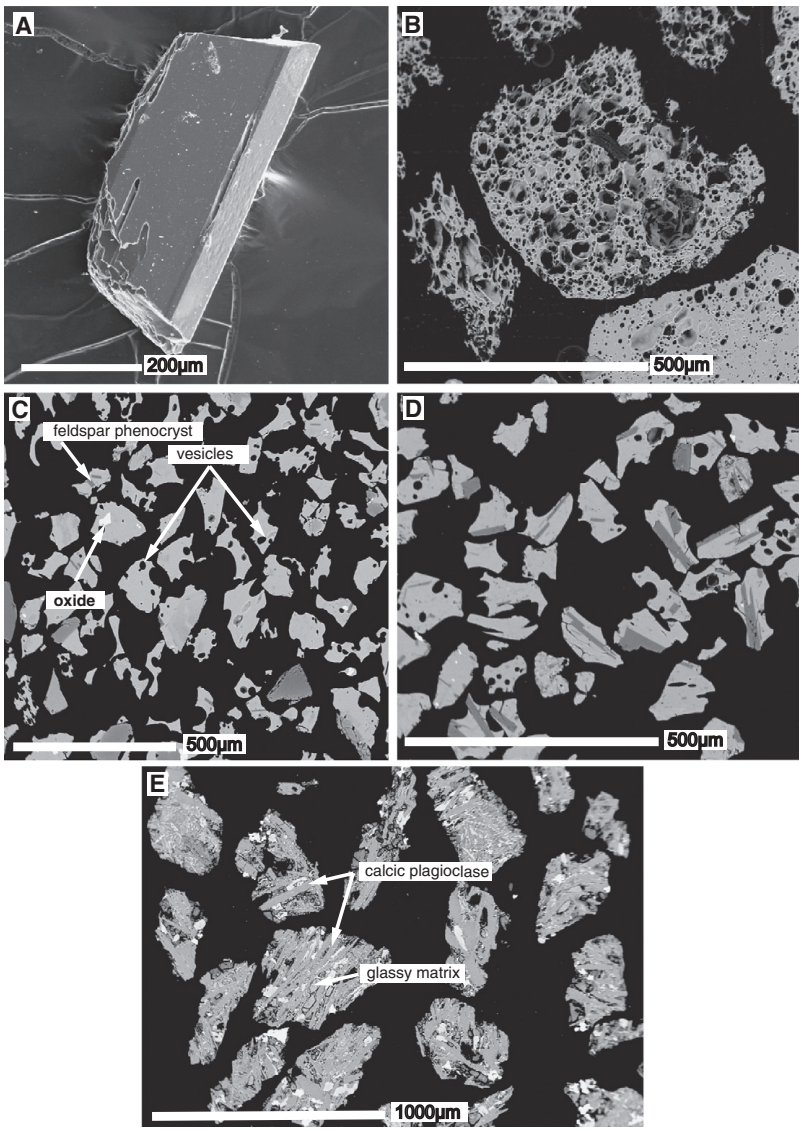

Fig. 3. A) Secondary Electron image (SE) of a 85-01 feldspar phenocryst. (B–E) Back Scatter Electron (BSE) images of B) 85-01 pumice, C) 112.51-01 and D) 136.21-01 processed basaltic glass shards and E) 648.37-01 groundmass concentrate of submarine lava flow.

form the age–depth model. This intermediate lava flow is located in the largest volcanic succession within the core and separates two thick volcaniclastic intervals. The upper and lower contacts of the flow display a thin glassy margin, subsequently replaced by clay minerals. (Pompilio et al., 2007).

Volcanic clasts are abundant within the AND-1B drill core (Talarico et al., 2007), and provide good potential targets for $^{40}Ar/^{39}Ar$ dating. Fifteen basaltic to intermediate clasts ranging from 10 to 25 mm in diameter have been sampled and dated. Although these clasts do not provide accurate depositional ages for the intervals in which they are found, the clasts nevertheless yield accurate maximum depositional ages, which are useful in constraining the chronology of the drill core. Age data for volcanic clasts are also useful for provenance studies, which can provide important insights into past ice flow paths (Talarico et al., 2007; Sandroni and Talarico, 2006).

3. Analytical methods

3.1. Sample preparation

Samples were prepared at the New Mexico Geochronology Research Laboratory (NMGRL) in Socorro, New Mexico, with the exception of the sample 85-01, which was prepared at McMurdo Station, Ross Island Antarctica. Sample preparation was tailored to each sample in order to optimize results. In general, the sample preparation process consisted of the following steps: mechanical crushing and hand sieving followed by extensive ultrasonic washing and acid treatment. Hand picking, the final sample preparation step, is used to remove any remaining contaminants from the separate. See Table 1. for additional sample preparation information.

3.2. Irradiation

Samples were packaged with neutron flux monitors of known age (Fish Canyon Tuff sanidine, 28.02 Ma; Renne et al., 1998), and irradiated at the reactor facility at Texas A & M, College Park, TX. See Table 1. for additional information on irradiation procedures.

3.3. Analysis

$^{40}Ar/^{39}Ar$ analyses were performed at NMGRL. Gas extraction was conducted in a fully automated all-metal extraction system, using either the 50 W CO_2 laser or double vacuum Mo resistance furnace systems. Isotopic ratios were determined using a MAP215-50 mass spectrometer by peak jumping in static mode. Further information on the instrumentation used at NMGRL, as well as details of analytical procedures, are located in the notes section of Table 1. and in McIntosh and Chamberlain (1994).

4. Results

Multiple analyses of eight volcanic intervals provide accurate and precise eruption ages. The volcanic samples separated from these eight intervals include: 1) felsic tephra, 2) basaltic tephra, 3) submarine lava, and 4) volcanic clasts. The precision and accuracy of the $^{40}Ar/^{39}Ar$ ages used to constrain depositional ages for the volcanic intervals are highly dependent on the sample material. The tephra and submarine lava flow provide accurate depositional ages of variable precision (0.8–2.0%), whereas the volcanic clasts, because of the unknown time between eruption and deposition, even when precisely dated yield only maximum depositional ages. A summary of the $^{40}Ar/^{39}Ar$ ages used to construct the AND-1B age-model (Wilson et al., this volume) is presented in Table 1. Tabulated $^{40}Ar/^{39}Ar$ results are listed in the supplementary material.

4.1. Volcanic clasts (17.17–17.18 mbsf)

Furnace incremental heating analysis of a groundmass concentrate from a volcanic clast sampled at 17.17–17.18 mbsf yields a statistically robust plateau age of 0.310 ± 0.039 Ma (MSWD = 1.48, Fig. 4A). We use the plateau definition of Harrison (1983) which states an acceptable plateau age is defined by three or more contiguous heating steps that overlap at 2σ in apparent age and represent >50% of the total $^{39}Ar_K$ released. The radiogenic yield, defined as the percent of ^{40}Ar derived by radioactive decay of ^{40}K and indicated by % $^{40}Ar^*$, of this analysis is low but consistent, ranging from 2 to 6% for 99.5% of the gas released, followed by an anomalously high radiogenic yield at the last step. The elevated radiogenic yield for the last step is likely caused by degassing of accumulated samples in the furnace at high temperature. K/Ca values range from 0.17 to 3.2, with an anomalously high value of 16.8 for the first step. The K/Ca values display a systematic decrease with increasing temperature, indicative of the initial degassing and dominance of the system by K-bearing plagioclase phenocrysts and matrix glass, followed by an exhaustion of argon from these reservoirs and a system dominated by the degassing of Ca-rich and K-poor phenocrysts, such as clinopyroxene and olivine (Olmsted, 2000).

A plot of the plateau steps on an inverse isochron diagram (Fig. 5A) as described in (Dalrymple et al., 1988) indicates a trapped argon component ($^{40}Ar/^{36}Ar_{intercept} = 299.0 \pm 2.6$) that is statistically indistinguishable from that of the atmosphere ($^{40}Ar/^{36}Ar_{atm} = 295.5$, Nier, 1950). Compared to the plateau age, the inverse isochron yields a younger, but less precise age of 0.22 ± 0.07 (MSWD = 0.33). The two dates, however, overlap at 2σ, and in conjunction with the near atmospheric $^{40}Ar/^{36}Ar$-intercept we infer that excess ^{40}Ar is not a contributing factor to the age of this analysis. The maximum depositional age for sediment at 17.17–17.18 mbsf therefore is given by the 17.17-01plateau age, 0.310 ± 0.039 Ma.

Table 1
Summary of $^{40}Ar/^{39}Ar$ results.

Sample	Location (mbsf)	L#	Irrad	Material	Preferred age				
					Analysis	n	MSWD	K/Ca ± 2σ	Age(Ma) ± 2σ
17.17-01	17.17–17.18	57571	NM-214	GM	Plateau	7	1.48	1.6 ± 1.4	0.310 ± 0.039
52.80A-01	52.80–52.82	57573	NM-214	GM	Plateau	10	1.35	0.6 ± 0.7	0.726 ± 0.052
52.80B-01	52.80–52.82	57594	NM-214	GM	Plateau	8	2.29	0.1 ± 0.1	7.25 ± 0.39
52.80C-01	52.80–52.82	57595	NM-214	GM	Plateau	5	1.94	1.1 ± 0.4	0.908 ± 0.059
85-01	85.27–85.87	56529	NM-198	San/An	Isochron	37	1.2	19.5 ± 18.3	1.014 ± 0.004
112.51-01	112.02–112.97	56873	NM-203	Glass	Isochron	6	1.05	0.20 ± 0.01	1.633 ± 0.057
136.21-01	136.21–137.22	56867	NM-203	Glass	Isochron	8	0.55	0.26 ± 0.07	1.683 ± 0.055
481.80-01	480.97–481.96	57593	NM-214	San/An	Weighted mean	11	0.7	11.9 ± 20.9	4.80 ± 0.076
648.37-01	648.37–648.43	56788	NM-203	GM	Plateau	6	1.7	0.4 ± 0.3	6.48 ± 0.13
822.78B-01	822.78–822.80	57845	NM-217	Kaer	Plateau	10	0.7	0.1 ± 0.1	8.53 ± 0.51
1277.91-01	1277.91–1277.95	56793	NM-203	San/An	Weighted mean	15	0.3	31.0 ± 30.4	13.82 ± 0.09
1278.84-01	1278.84–1278.97	56794	NM-203	San/An	Weighted mean	14	0.5	1854.7 ± 11014.7	13.85 ± 0.18
1279.00-01	1279.00–1279.04	56792	NM-203	San/An	Weighted mean	15	0.5	8.7 ± 5.8	13.57 ± 0.13

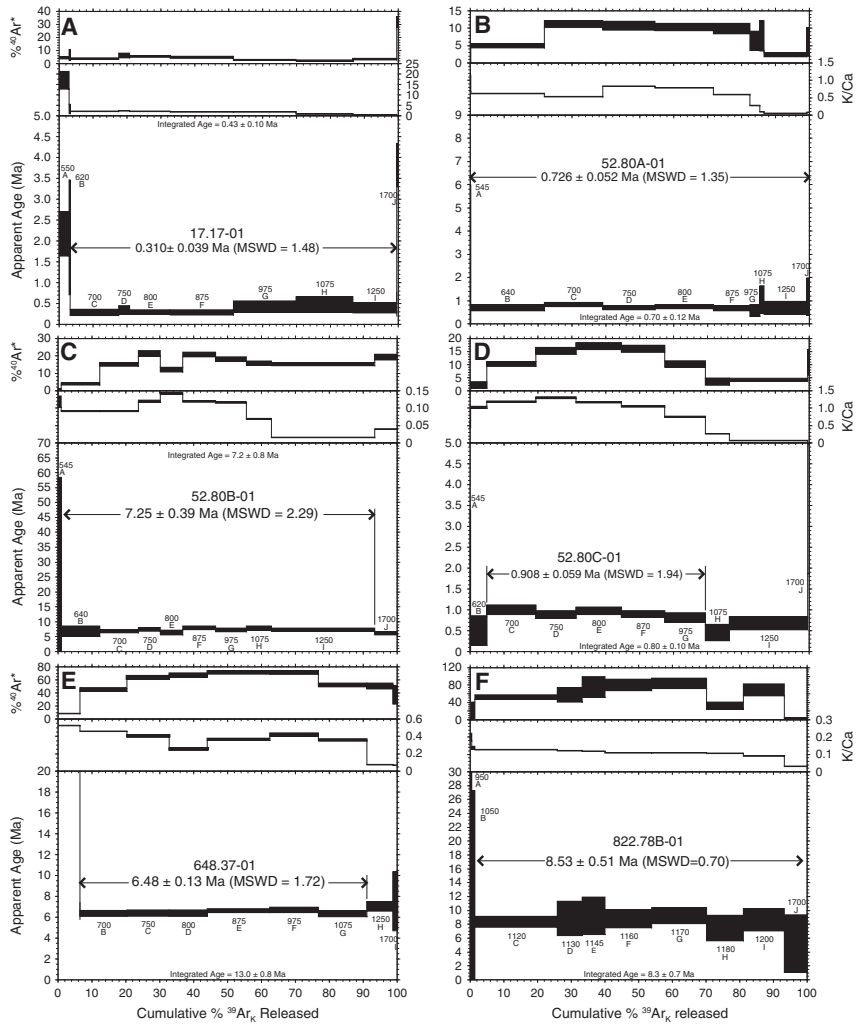

Fig. 4. $^{40}Ar/^{39}Ar$ age, K/Ca and radiogenic yield spectra for furnace analysis of A) 17.17-01 groundmass concentrate (gm) from volcanic clast, B,C,D) 52.80A,B,C-01 gm from volcanic clast, E) 648.37-01 gm from interior of ~3 m thick submarine lava flow, and F) 822.78B-01 kaersutite phenocryst mineral separate from volcanic clast.

4.2. Volcanic clasts (52.80–52.82 mbsf)

Incremental heating in the furnace of a groundmass concentrate (52.80A-01) from a volcanic clast sampled at 52.80–52.82 mbsf yields a statistically robust and precise plateau age of 0.726 ± 0.052 Ma (MSWD = 1.35, Fig. 4B). The plateau represents 100% of the gas released, adding confidence in the apparent age. An inverse isochron plot (Fig. 5B) yields a $^{40}Ar/^{36}Ar$ intercept (294.5 ± 2.2) statistically equivalent to the atmospheric value, indicating that excess ^{40}Ar is not a significant factor in the age of this sample. Radiogenic yields are low, with a maximum value of 10.6%. K/Ca ratios show a trend typical of basaltic groundmass analyses, i.e. decreasing K/Ca with increasing temperature.

Analysis of two other volcanic clasts sampled from the same interval, 52.80–52.82 mbsf, yield statistically older plateau ages (52.80B-01 7.25 ± 0.39, MSWD = 2.29; 52.80 C-01 0.908 ± 0.059 Ma, MSWD = 1.94, Fig. 4C and D) than that of 52.80A-01. The maximum depositional age for the 52.80–52.52 mbsf interval is therefore defined by 52.80-01, at 0.726 ± 0.052 Ma. 52.80B-01 and 52.80 C-01, do not help constrain the age of deposition, but nonetheless provide useful information for provenance studies.

4.3. Lapilli tuff (85.27–85.87 mbsf)

Data from 37 of 39 euhedral sanidine and anorthoclase phenocrysts separated from the 85.27–85.87 mbsf phonolite lapilli tuff

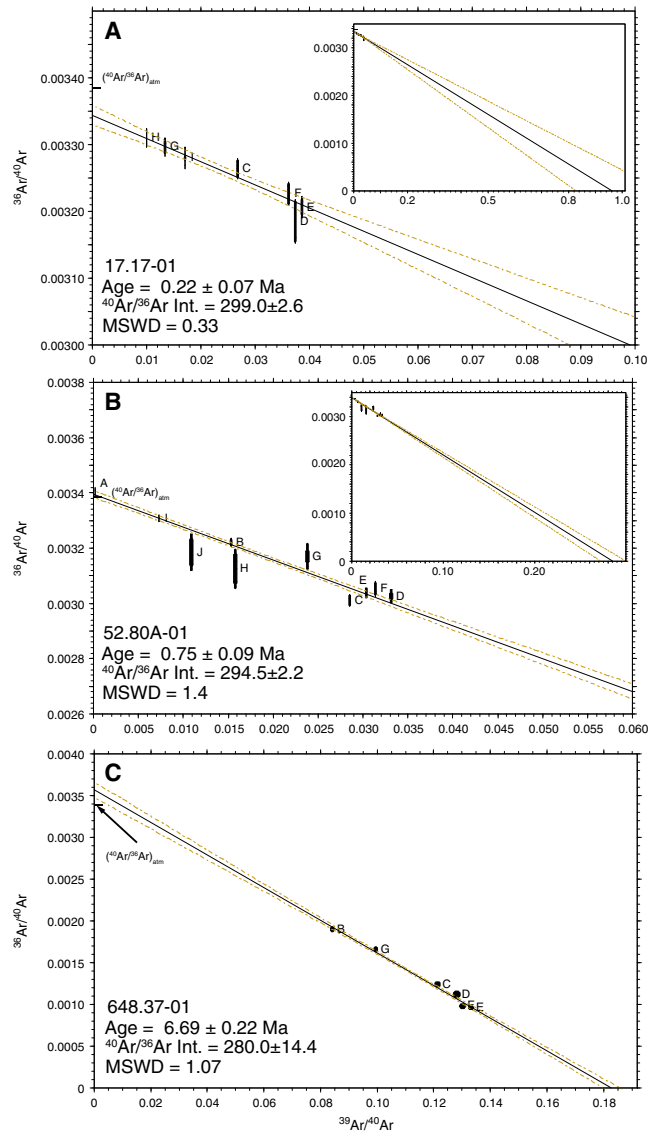

Fig. 5. Inverse isochron plots for A) 17.17-01, B) 52.80A-01, and C) 648.37-01. Insets for plots A and B show both x and y intercepts. Isochron age and ($^{40}Ar/^{36}Ar$) intercept calculated from all temperature steps for A and B, for C only plateau steps used.

(Pompilio et al., 2007) yield a precise inverse isochron age of 1.014 ± 0.008 Ma. The sample grains, both single crystal and groups of two to three crystals, were fused using the CO_2 laser system. The data form a unimodal normal distribution with a weighted mean age of 1.034 ± 0.004 Ma (MSWD = 1.16 Fig. 6A), after rejecting 6 statistically older analyses. Radiogenic yields for individual analyses display significant variation from 35.0 to 98.8%, but with an average of 81.1 ± 14.3(1σ)%. K/Ca ratios demonstrate a similar spread in value, 0.7–33.9 and an average of 19.5 ± 9.0(1σ).

The 37 data points, plotted on an inverse isochron diagram (Fig. 6C) form a linear array with a $^{40}Ar/^{36}Ar_{intercept} = 335 \pm 12$ and inverse isochron age of 1.014 ± 0.008 Ma (MSWD = 1.2). The isochron age, however, is sensitive to which data points are included in the age calculations. For example, all 39 analyses yield a significantly younger

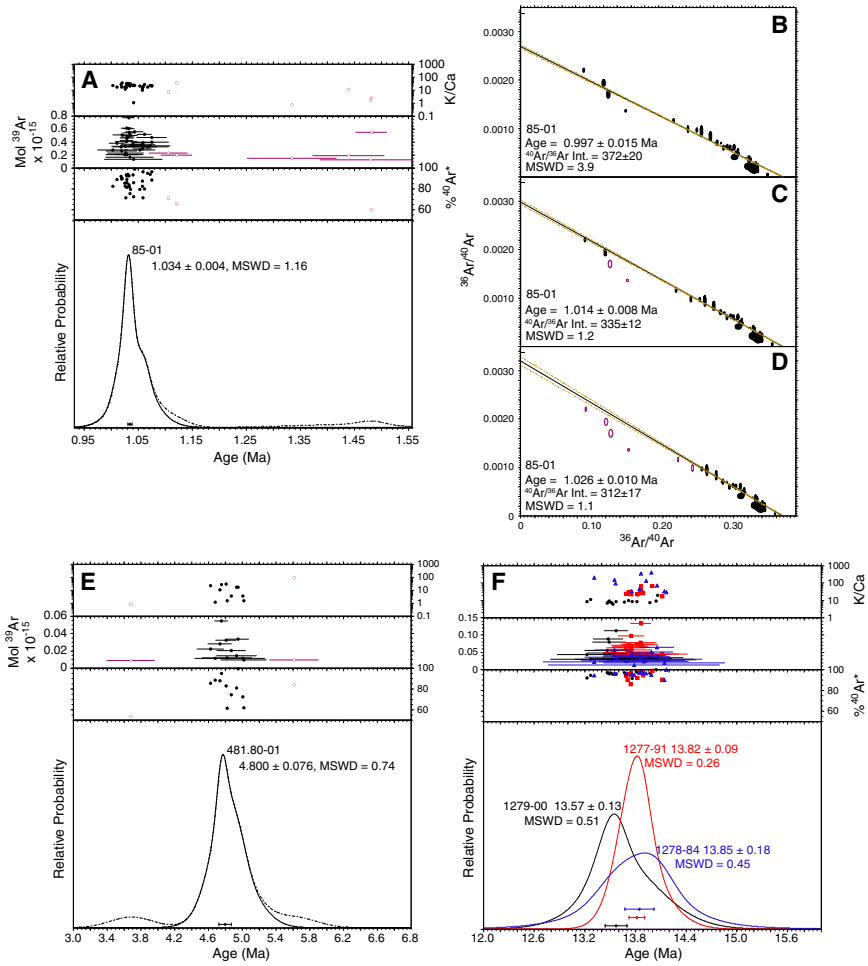

Fig. 6. $^{40}Ar/^{39}Ar$ age-probability with stacked auxiliary plots of radiogenic yield, moles of ^{39}Ar, and K/Ca and isochron diagrams for laser fusion of single and groups of 2–3 crystals. A) 85-01 age-probability with isochrons of total population B) 39 analyses, and 2 subgroups. C) 37 valid analyses, and D) 33 valid analyses (open ellipses omitted). E) 481.80-01 age-probability diagram. Solid line indicates relative probability with open circles omitted from age calculation, dashed line — open circles included in age calculation. F) age-probability diagrams for 1277–91 (red square), 1278–84 (blue triangle), and 1279-00 (black circle).

isochron age of 0.997 ± 0.015 Ma ($^{40}Ar/^{36}Ar_{intercept}$ = 372 ± 20, MSWD = 3.9, Fig. 6B). The inverse isochron age for the 33 analyses used to calculated the weighted mean age is 1.026 ± 0.010 Ma (MSWD = 1.1, Fig. 6D) with a $^{40}Ar/^{36}Ar_{intercept}$ = 312 ± 17. We choose 1.014 ± 0.008 as the most accurate eruption age for this tephra.

4.4. Basaltic tephra

The age spectra produced by incremental heating of the glass shard samples generally do not yield statistically defined plateau ages. The discordant spectra display a reproducible 'saddle-shape' with old apparent ages at low and high-temperatures (Fig. 7). Of the 25+ analyses conducted, only two (112.51-01 and 136.21-01), as detailed below, yield statistically robust and precise plateau and inverse isochron ages.

4.4.1. Basaltic glass microprobe results

Quantitative geochemical and qualitative morphological data for the basaltic glass shard samples were obtained by Electron Microprobe analysis (supplementary material). Samples were characterized at this scale 1) to ensure sample homogeneity, 2) identify alteration and or glass hydration, 3) qualitatively assess the amount of reworking based on grain morphology and 4) ensure that the sample preparation process adequately removed contaminants such as clay minerals.

Fig. 3C and D display representative back-scatter electron (BSE) images of two basaltic glass separates. The glass shards display little

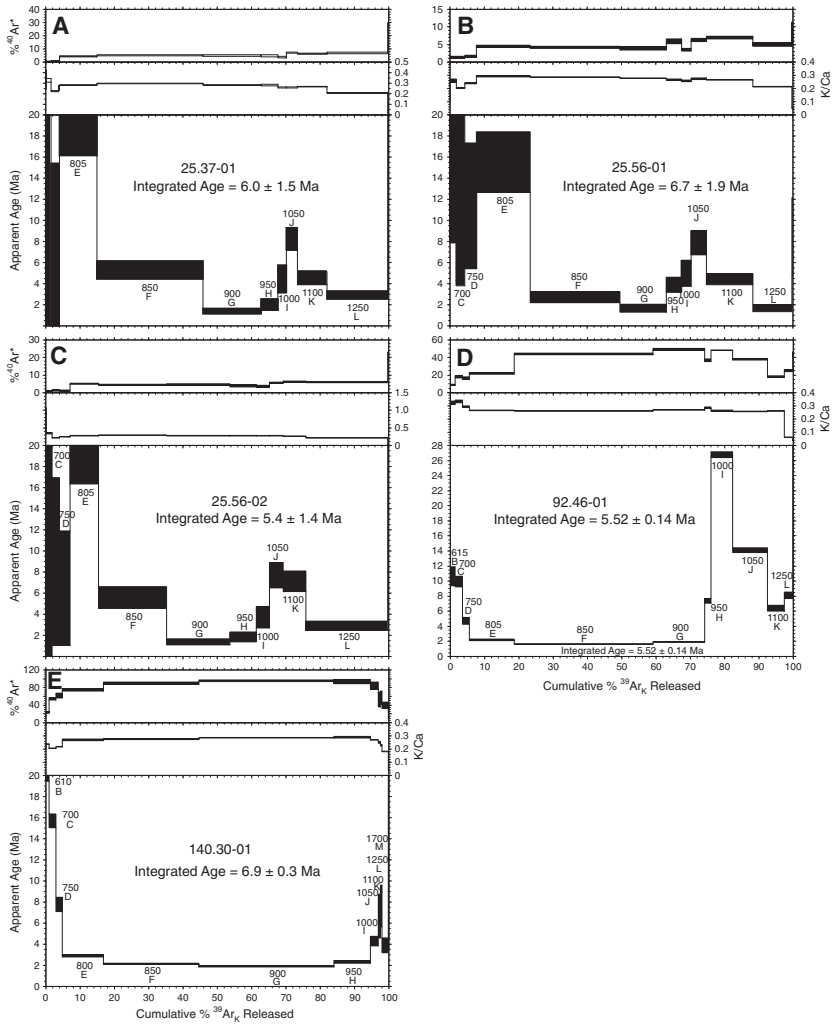

Fig. 7. A–E, Examples of the discordant U-shaped spectrum produced by furnace heating of basaltic glass shards. Note that all of the spectrum display a degassing profile described by old apparent ages for the low temperature steps (600–800 °C) followed by a decrease in apparent age to a minimum at ~50% gas released (800–900 °C). Further heating (950–1700 °C) produces increased apparent ages with a subsequent decrease at higher temperature.

evidence for excessive hydration, i.e. lack of hydration rims, and fragile features such as vesicle walls and angular irregular morphologies are preserved. A large degree of lithic contamination is not apparent in the BSE images, however, the presence of a small amount of old, K-bearing contamination, such as fine grained volcaniclastic material from one of the numerous volcanic centers directly to the south of the AND-1B drill site e.g. Minna Bluff (<12 Ma Fargo et al., 2008) could significantly affect the $^{40}Ar/^{39}Ar$ age.

4.4.2. Basaltic Tephra (112.02–112.97 mbsf)

Analyses 112.51-01, 02, 03 are from a basaltic tephra interval spanning 112.02–112.97 mbsf, consisting of fresh unaltered brown/black glass shards containing sparse micro-phenocrysts (Fig. 3C).

Incremental furnace heating of 112.51-01 yields the common 'saddle-shaped' spectrum displayed by the basaltic glass samples. However, a statistically robust plateau age of 1.676 ± 0.057 Ma (MSWD = 1.85, Fig. 8A) is defined by > 89.7% of the $^{39}Ar_K$ released. Radiogenic yields are variable with a minimum of 4.9% for step A (500 °C) and maximum of 83.9% for step G (900 °C). K/Ca ratios for 94.6% of the spectrum show only minor variation (0.16–0.21). An inverse isochron plot of the plateau steps D–I (Fig. 8B) yields a trapped $^{40}Ar/^{36}Ar$ ratio (318.6 ± 21.8) statistically resolvable from the atmospheric value, and a precise isochron age (1.633 ± 0.057 Ma, MSWD = 1.05) that is younger than the plateau age, but overlapping at the 95% confidence level (2σ). From the isochron results we infer 112.51-01 contains a significant quantity of excess ^{40}Ar, causing an increase in

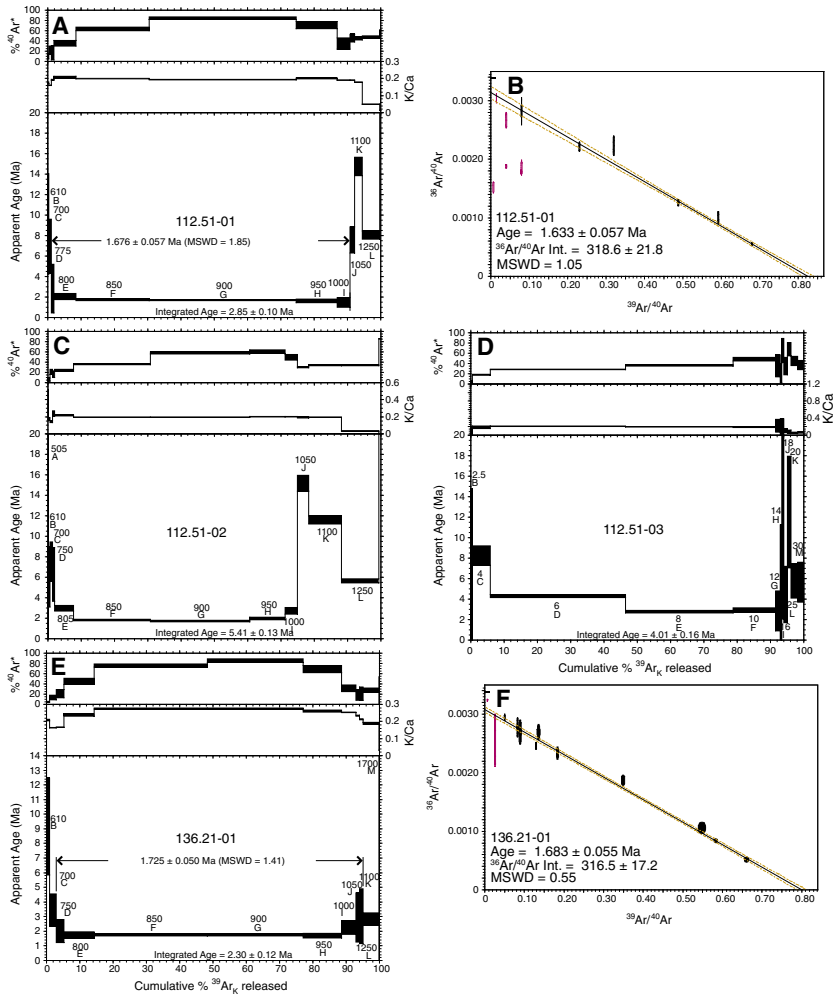

Fig. 8. $^{40}Ar/^{39}Ar$ age spectra and inverse isochron diagrams for furnace and laser heating of basaltic glass shards. 112.51-01 (A) and 136.21-01 (E) are the only analyses to yield statistically defined plateau ages, but display the U-shaped spectrum. The corresponding isochron plots (B and F, respectively) are well constrained and suggest the presence of excess ^{40}Ar. 112.51-02 (C) and 112.51-03 (D) illustrate the reproducibility of the U-shaped spectrum in both the laser and furnace heating devices.

apparent age by ~30–40 ka and consider the isochron age an accurate eruption age.

Repeat furnace incremental heating of basaltic glass from 112.51 to 112.62 mbsf (112.51-02, Fig. 8C) yields the reproducible 'saddle-shaped' spectrum displayed by all furnace heated basaltic glasses. No statistically acceptable plateau is defined by analysis 112.51-02, although steps F and G overlap within 2σ uncertainty of the plateau steps F and G of analysis 112.51-01. The K/Ca values for all steps from 112.51-02 are nearly identical to that of 112.51-01 and display a similar trend, an approximately constant value (~0.2) for much of the gas released and a pronounced decrease in value for the last high temperature steps. The radiogenic yields for 112.51-02 are, in general, less than those displayed by 112.51-01. An important difference between 112.51-02 and 112.51-01, other than the lack of a plateau for 112.51-02, is the large discrepancy in integrated or total gas ages, 5.41 ± 0.13 Ma and 2.85 ± 0.10 Ma, respectively. The variability in integrated age suggests varying degrees of contamination of the sample by older xenocrystic material and/or excess ^{40}Ar.

Basaltic glass samples incrementally heated using the CO_2 laser system yield similar spectra to the furnace analyses. Laser analyses do not perfectly mimic the degassing behavior displayed by furnace analyses, most likely because of thermal gradients caused by heterogeneous laser coupling, but do show the same general trend of old low and high temperature apparent ages with a minimum age at ~50% $^{39}Ar_K$ released. For example, analysis 112.51-03 (Fig. 8D) displays apparent ages that progressively decrease in apparent age for

the first 4 heating steps, followed by an increase in apparent age for the last 3 steps. Radiogenic yields for 112.51-03 are similar to 112.51-01 and 112.51-02, with a maximum value of 67.9%. Sample weight (51.25 mg), K_2O% (0.92%) and total moles of $^{39}Ar_K$ released (14.14×10^{-15} mol) for 112.51-03 are similar to the values obtained for 112.51-02 (Weight = 55.4 mg, K_2O = 1.12%, $^{39}Ar_K = 18.57\times10^{-15}$ mol). The agreement of these parameters between 112.51-02 and 112.51-03 adds confidence to the validity of direct comparison of laser and furnace spectra. Note that the ~4 times greater value in total $^{39}Ar_K$ released for 112.51-01 (70.9×10^{-15} mol) compared to 112.51-02 and 112.51-03 is the result of different irradiation times; analysis 112.51-01, 7 hour irradiation vs., 112.51-02,112.51-03,1 hour irradiation.

The integrated age for 112.51-03 (4.01 ± 0.16 Ma) falls between the integrated ages for 112.51-01 (2.85 ± 0.10 Ma) and 112.51-02 (5.41 ± 0.13 Ma), and demonstrates an additional aspect of non-reproducibility for $^{40}Ar/^{39}Ar$ basaltic glass analyses. The variability in integrate age suggests the presence of a heterogeneously disturbed older K-bearing phase such as xenocrysts, or silt sized lithic fragments. Analysis 112.51-01 has the best agreement between integrated and isochron age indicating the this sample has the least contamination and represents an accurate depositional age for the interval 112.02–112.97 mbsf.

4.4.3. Basaltic tephra (136.12–137.22 mbsf)

Incremental furnace heating of a basaltic glass sample separated from 136.12 to 137.22 mbsf yields a statistically defined plateau age of 1.725 ± 0.050 Ma (MSWD = 1.41 Fig. 8E), representing 92.1% of the $^{39}Ar_K$ released. Radiogenic yield and K/Ca ratios for 136.21-01 display values and trends similar to 112.51-01. As with 112.51-01, a plot of the 136.21-01 plateau steps on an inverse isochron (Fig. 8F) yields a $^{40}Ar/^{36}Ar$ ratio (316.5 ± 17.2) statistically distinguishable from atmosphere and a precise isochron age (1.683 ± 0.055 Ma, MSWD = 0.55) younger than the plateau age, but overlapping at 2σ. The elevated $^{40}Ar/^{36}Ar$ ratio suggests that excess ^{40}Ar has a significant effect on the age of this sample. Therefore, we use the isochron age as our preferred eruption age for 136.21-01.

4.5. Pumice clasts (480.97–481.96 mbsf)

Single-crystal laser fusion analysis of feldspar grains separated from a pumice clast in a pumice-rich mudstone interval spanning 480.97–481.96 mbsf yield a precise weighted mean age of 4.800 ± 0.076 Ma (Fig. 6E). The weighted mean age is statistically robust, indicated by a unimodal normal distribution of ages and a mean square weighted deviation close to unity (MSWD = 0.74). Analyses 481.80-01-2, 9 and 14 are statistical outliers omitted from mean age calculations. Analysis 481.80-01-2 yields an age statistically younger than the mean. The low radiogenic yield (53.4%) and K/Ca (0.79), in addition, suggest 481.80-01-2 is an altered or low potassium grain. Analysis 481.80-01-9 yields an older age than the weighted mean, but a similar radiogenic yield and K/Ca. We infer that this analysis represents an older inherited grain or a grain containing significant excess ^{40}Ar. Analysis 481.80-01-14 has an anomalously low $^{39}Ar_K$ signal (0.001×10^{-15} mol), a $^{40}Ar/^{39}Ar$ ratio (1424.0) inconsistent with the rest of the data set (30.7_{MEAN}), and an anomalously old age (221.6 ± 52.4 Ma). We consider 481.80-01-14 is an altered or xenocrystic grain. The K/Ca values for all analyses used in the mean age calculation exhibit significant variability, ranging from 1.1 to 28.5 (refer to supplementary material). This variability in K/Ca, however, does not exceed the range of typical anorthoclase-sanidine values (Deer et al., 1978).

4.6. Submarine lava flow 648.36-01 (646.49–649.30 mbsf)

Incremental heating in the furnace of a groundmass sample separated from the interior of a submarine lava flow spanning the interval of 646.49–649.30 mbsf yields a moderately robust plateau age of 6.48 ± 0.13 Ma (Fig. 4E). The radiogenic yields for this sample are variable, ranging from 8.0 to 71.9%. However, all of the plateau steps display radiogenic yields >40%, with the maximum value in the approximate middle of the plateau. K/Ca values for the plateau temperature steps all fall in the range of 0.1 to 0.5, typical of plagioclase (Deer et al., 1978). The final high-temperature steps display the decrease in K/Ca characteristic of basaltic groundmass samples. Electron microprobe sample characterization supports the interpretation of the K/Ca spectrum, indicating that the lava consists of a K-rich glassy groundmass containing abundant calcic plagioclase micro-phenocrysts with K-bearing rims and mafic micro-phenocrysts such as pyroxene and/or magnetite (Fig. 3E).

An inverse isochron plot for this sample yields a low-precision isochron age of 6.6 ± 0.22 Ma (MSWD = 2.74, Fig. 5C), statistically equivalent to the plateau age. In addition, the isochron indicates the sample does not have a significant excess ^{40}Ar component ($^{40}Ar/^{36}Ar_{intercept}$ = 288.9 ± 13.8). From the isochron results, we infer that excess ^{40}Ar does not have a measurable effect on the apparent age of the sample and use the plateau as our preferred eruption age.

4.7. Volcanic clasts (822.78–822.80 mbsf)

Incremental heating of a large kaersutite phenocryst separated from a volcanic clast at 822.78–822.80 mbsf yields a plateau age of 8.53 ± 0.51 Ma (MSWD = 0.70, Fig. 4F). The plateau age is defined by 100% of the gas released. The majority of degassing took place over a narrow temperature range from 1050 to 1200 °C, a pattern common of amphibole step heating analyses (Lee et al., 1991). The radiogenic yields for the individual steps are variable, displaying an increase from 0.5% for the first step (A., 950 °C, Fig. 4F) to a maximum of 83.5% at step G (1170 °C). We consider the plateau age for this sample statistically robust and an accurate maximum depositional age.

4.8. Volcanic clasts (1277.91–1279.00 mbsf)

After failing to find fresh K-rich feldspar phenocrysts in altered pumice from the base of the core we dated three volcanic clasts from near 1280 mbsf in an attempt to determine a maximum depositional age. Single-crystal laser fusion of volcanic feldspar phenocrysts, anorthoclase to sanidine in composition, separated from three volcanic clasts at ~1280 mbsf yield a maximum depositional age of 13.57 ± 0.13 Ma. In contrast to the altered tephra, these volcanic clasts contain large fresh feldspar phenocrysts. Fifteen phenocrysts separated from each of these clasts were individually fused using a CO_2 laser. The analyses from each of these three clasts yield tightly grouped normal age distributions. Weighted mean ages for the three clasts are: 1277.91-01, 13.82 ± 0.09 Ma, 1278.84-01, 13.85 ± 0.18 Ma and 1279.00-01, 13.57 ± 0.13 Ma (Fig. 6F). Radiogenic yields for all crystals analyzed are >90%, typical of high-precision single-crystal feldspar analyses.

The K/Ca values for samples 1277.91-01 and 1279.00-01 exhibit only minor intra -sample variability (refer to supplementary material). Thirteen of fifteen grains dated from 1277.91-01 yield an average K/Ca value of 25.6 ± 11.2. Sample 1279.00-01 exhibits the same small range in K/Ca values (8.0 ± 2.5) for 14 out of 15 feldspar analyses. In contrast, the K/Ca values for the individual analyses of sample 1278.84-01 are imprecise and variable, spanning a large range in value from undefined to >20,000 and ten of fifteen analyses have ^{37}Ar signals near or exceeding the detection limit of our system (mean value 1.45×10^{-5} pA or 7.25×10^{-19} mol). These analyses represent Ca-poor composition feldspars and suggesting that the $^{39}Ar_K/^{37}Ar_{Ca}$ ratio is a poor representation of feldspar geochemistry for this sample.

5. Discussion

5.1. Felsic tephra

The inverse isochron age (1.014 ± 0.008 Ma) obtained by laser fusion analysis of 33 aliquots represents an accurate and precise eruption age. The high concentration of pumice and pumice fragments, and preservation of fragile features such as vesicle walls, suggests rapid deposition of the layer with limited or no reworking. The absence of a lag between eruption and emplacement permits the use of the eruption age as an accurate proxy for the time of deposition.

We believe the weighted mean age of 4.800 ± 0.076 Ma for a population of feldspar grains separated from a pumice clast represents an accurate and precise constraint on the time of deposition for the mudstone interval at 480.97–481.96 mbsf. Although the pumice clasts are scattered within the mudstone interval, their fragile nature and their restriction to a narrow stratigraphic interval suggests that they were deposited soon after eruption as pyroclastic ejecta, and therefore an eruption age is inferred to reflect the time of deposition (cf McIntosh 2000).

The variation in K/Ca, exhibited by the 11 analyses used to calculated the mean age, and supported by electron microprobe characterization (refer to supplementary material) can be accounted for by the analysis of 1) zoned feldspars fragmented upon eruption, 2) feldspars from a chemically zoned magma chamber or 3) xenocrystic feldspars incorporated by a vent clearing eruption.

5.2. Submarine lava flow

The plateau age for analysis 648.37-01 represents an accurate eruption age for the submarine lava flow at 646.49–649.30 mbsf. This submarine flow is part of a thick sequence of volcanic and volcaniclastic rocks and is thought to have erupted from a local submarine vent, within 4 km of AND-1B, based on the average distance traveled by lava of similar composition (Walker et al., 1973). We therefore consider the time of eruption equivalent to the time of deposition and the plateau age of 6.48 ± 0.13 Ma an accurate depositional age.

5.3. Basaltic tephra

Analyses 112.51-01 and 136.21-01 yield precise plateau and inverse isochron ages. These analyses, despite displaying the consistent saddle or 'U'-shaped spectrum, produce the youngest and most precise plateau ages of all the basaltic glass analyses. The presence of a small but significant amount of excess ^{40}Ar is inferred from inverse isochron plots and we therefore consider the isochron ages accurate eruption ages.

The 'U'-shaped spectrum, attributed to excess ^{40}Ar (Lanphere and Dalrymple, 1976; McDougall and Harrison, 1999; Wartho et al., 1996), is commonly associated with low potassium minerals such as plagioclase, amphibole, and clinopyroxene. Excess ^{40}Ar, however, is not abundant in volcanic systems because upon eruption outgassing provides a release mechanism (Kelley 2002). In addition to excess ^{40}Ar several possible explanations for the 'U'-shaped spectra displayed by basaltic glass shard analyses include: 1) irradiation induced effects, such as ^{39}Ar mobilization (i.e. recoil), 2) presence of older material (inherited argon), 3) K loss caused by alteration and/or hydration, or 4) degassing of residual sample material remaining in the furnace crucible.

The basaltic tephra represent important dating targets for the upper 600 m of the drill core because of their abundance and relatively high potassium content. The discordant age spectra commonly produced by the glass analyses, however, require that special attention is taken when determining a ^{40}Ar/^{39}Ar age for basaltic tephra. Only 2 of 25 + analyses, 112.51-01, 136.21-01, produced statistically robust plateau and inverse isochron ages. The samples represent the least contaminated and therefore best measure of depositional age for their respective intervals.

5.4. Volcanic clasts

Volcanic clasts have been used, in the absence of primary volcanic tephra, to set a maximum depositional age for the host interval. Mineral and groundmass separates of eight clasts, four groundmass concentrates, one kaersutite mineral separate and three single and multi-crystal feldspar analyses, yield accurate maximum depositional ages for four stratigraphic intervals.

Fig. 2 illustrates the rich history of volcanism in Southern McMurdo Sound recorded by the AND-1B drill core. The drill core recovered volcanic material spanning an interval from ~14 to <1 Ma. This interval represents a majority of the time of know volcanism in the region. Work by various authors (Armstrong (1978), Cooper et al. (2007), Esser et al. (2004), Fargo et al., 2008 Lewis et al. (2006) Lawrence et al. (2009), Marchant et al. (1996), Tauxe et al. (2004), Wilch et al. (1993), and Wright-Grassham (1987)) dating the volcanic centers has revealed a general northward progression of activity starting in the early Miocene at Mt. Morning and Mt Discovery (Martin et al., 2010, Wright-Grassham (1987)) and continuing today at the currently active Mt. Erebus (Oppenheimer and Kyle 2008). This same progression of volcanic activity is evident in the AND-1B drill core. Clasts from the base of the core dated at ~13 Ma were likely derived from Mt Morning during its first pulse of activity 18.7–11.4 Ma (Martin et al., 2010). The majority of magmatism then shifted to Minna Bluff and remained centered there from ~12 to 6 Ma (Fargo et al. 2008). This migration of activity is represented in the core by the abundance of Minna Bluff age and composition clasts at 822.78–822.80 mbsf. The thick volcanic sequences, LSU 5 to LSU 2 (Pompilio et al., 2007), dated by analyses 648.37-01, 481.80-01, 136.21-01, and 112.51-01, represent the migration of volcanic activity to centers proximal to the AND-1B drill core, such as Hut Point Peninsula (LeMasurier and Thomson, 1990) and submarine vents (Pompilio et al., 2007).

The ^{40}Ar/^{39}Ar ages can also be used to calculate average sedimentation rates for certain intervals. For the interval from 1280 to 648 mbsf the average rate of sediment accumulation is 86 m/Ma. The upper 600 m yields a higher average rate of 102 m/Ma. These sedimentation rates represent the minimum possible rate because much of the sediment has been removed from the record by glacial erosion.

6. Conclusions

The AND-1B drill core recovered a rich and abundant volcanic record. ^{40}Ar/^{39}Ar analysis of the mineral separates and groundmass concentrates separated from volcanic units provide time-stratigraphic pinning points for developing a precise and accurate age–depth model. The lack of fresh unaltered primary tephra below ~600 mbsf requires analysis of populations of volcanic clasts to provide the chronostratigraphic control. Volcanic clasts, however, can only be used to infer a maximum depositional age. The drill core also provides a record of general south to north migration of volcanism from Mt Morning to Ross Island and Mt Erebus. Minimum sedimentation rates for the upper and lower halves of the drill core, 87 and 102 m/Ma respectively, were also calculated from the ^{40}Ar/^{39}Ar analyses.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.gloplacha.2012.05.005.

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CHAPTER 2

GEOCHRONOLOGY OF MINNA BLUFF, SOUTHERN MCMURDO SOUND, ANTARTICA

2.1 Abstract

This paper presents the results of $^{40}Ar/^{39}Ar$ analysis from a suite of samples collected from Minna Bluff during two field seasons, 2006-2007 and 2007-2008. 538 samples were collected from Minna Bluff. One hundred fifty seven samples were dated by the $^{40}Ar/^{39}Ar$ technique yielding a detailed picture of the topographic and temporal evolution of Minna Bluff. $^{40}Ar/^{39}Ar$ analyses of kaersutite and sanidine phenocrysts, and groundmass concentrates from volcanic units indicate an overall west to east progression of volcanic activity. Eruptions of basaltic to intermediate lavas, domes, and scoria cones started at 12 Ma in at what is now the eastern most point of Minna Bluff, "Minna Hook." Activity was centered in this area from 12 - 4 Ma, constructing a pre-Minna Bluff island. Multiple glacial unconformities found at Minna Hook suggest repeated interaction with large, warm-based, erosive ice sheets. Activity migrated westward from Minna Bluff Island at 7-8 Ma closing the gap created by the island and the mainland (now Discovery center). Significant edifice construction continued until 4-5 Ma with sporadic and parasitic scoria cone eruptions, possibly associated with Mt. Discovery activity, continuing until ~1 Ma. The orientations of Minna Bluff's two major axes are strongly controlled by regional tectonic features. Minna Bluff's E-W axis, Central Minna Bluff, is sub-parallel to the Radian

Lineament and the N-S axis, Minna Hook, appears to be an extension of faulting bounding the Terror Rift. The constructional evolution of the 70 km long volcanic complex has an important role in interpreting the climate signals recovered by the ANDRILL Project. Minna Bluff influenced the material delivered to the AND-1B drill site (ANDRILL MIS 2006-2007) in three critical ways: 1) Minna Bluff diverted upstream material, 2) provided a pinning and stabilizing point for the Ross Ice Shelf, possible controlling the calving line prior to the emergence of Ross Island, and 3) was a significant source of fresh volcanic material throughout much of the 0-13 Ma period recovered by ANDRILL MIS. For example, an 8.53 $\pm$0.51 Ma kaersutite-bearing clast recovered from 822.78 mbsf in AND-1B was likely derived from Minna Bluff. The results from this study can be incorporated into detailed glacier and ice-sheet models of the McMurdo Sound region, a critical area for interpreting Ross Ice Sheet history and the global climate system.

2.2 Introduction

Minna Bluff (78°25′ - 78°48′S, 165°30′-167°15′ E Figure 2.1) is a Late Miocene volcanic peninsula on the western margin of the Ross Embayment, Antarctica. This ˜45 km peninsula has played an important role in both recording and influencing the glacial, tectonic and volcanic evolution of the western Ross Embayment. The numerous well-exposed volcanic features that compose Minna Bluff are part of the Late Cenozoic (19-0 Ma) Erebus Volcanic Province. The Erebus Volcanic Province (EVP) is one of several Cenozoic (early Oligocene and younger) alkaline volcanic provinces that are exposed in the West Antarctic Rift System along the length of the Antarctic Pacific Margin (>3000 m) (LeMasurier and Thomson, 1990)

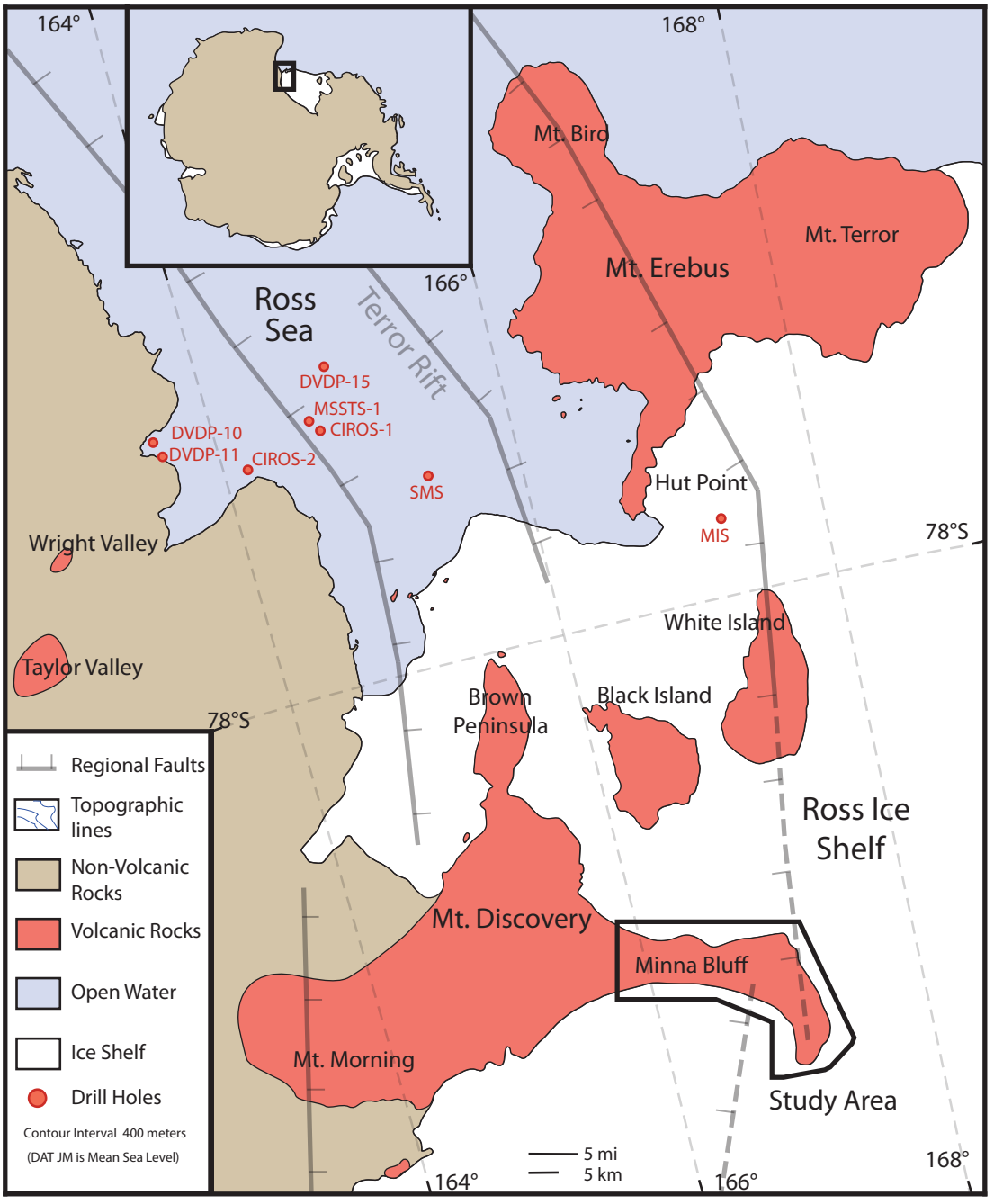


Figure 2.1 Regional Map of the Erebus Volcanic Province of the McMurdo Volcanic Group-Western Ross Embayment (Base map modified from Cooper et. al. 2007). Regional faults from Horgan et al. (2005)

Volcanism, tectonism, and glaciation in the western Ross Embayment have been dynamically interconnected by negative and positive feedbacks throughout the Late Cenozoic. Rifting and crustal thinning may have induced melting followed by volcanism (Rocchi et al., 2002, 2006). Rift-related structures provided conduits for magma ascent from the subsurface (Paulsen and Wilson, 2009) and pathways for glaciation on the surface (Van der Wateren and Cloetingh, 1999). At other locations, tectonic landforms such as the Transantarctic Mountains (Kerr and Huybrechts, 1999), and volcanic landforms, such as Minna Bluff (Kyle, 1981a) have obstructed and redirected the flow of ice. At different periods, volcanic and tectonic activity may have been suppressed by glaciation or facilitated by deglaciation. At times when volcanoes did erupt through or into glacial ice, the interaction of magma and ice/melt-water strongly affected the eruptive style and emplacement of the resulting volcanic rocks (Smellie, 2006; **?**). The volcanic-induced melting likely affected the thermal characteristics and flow dynamics of glaciers (Blankenship et al., 1993). Many of these complex interactions are evident at Minna Bluff, which until now was only studied in single unpublished Ph.D. thesis (Wright-Grassham, 1987).

This paper describes the two-stage construction of Minna Bluff based on field mapping an extensive suite of $^{40}Ar/^{39}Ar$ geochronologic analyses. A detailed understanding of the paleo-geographic and topographic evolution of Minna Bluff provides important insights into the volcanic, glacial and tectonic evolution of the western Ross Embayment. Minna Bluff records a rich history of Late Miocene-Early Pliocene alkaline volcanism, with more than 200 eruptive episodes spanning 10 Ma. From 12-4 Ma, Minna Bluff has been a significant and evolving barrier to regional ice-flow and has affected ice-flow configurations at important downstream field and drilling sites within the McMurdo Sound area. These sites

are the basis of many late Neogene ice-sheet reconstructions and broad climate interpretations (Naish et al., 2001, 2009; **?**), increasing the importance of an accurate understanding of the evolution of Minna Bluff. We suggest that Minna Bluff is in a geographically and temporally critical position with respect to the Ross Ice Shelf and has played an important role in the regional glacial history, and has important implications for the interpretation of the overall history of the Antarctic Ice Sheet.

2.3 Background

2.3.1 Geographic Setting

Minna Bluff is a well-exposed highly-dissected volcanic peninsula extending 50 km ESE into the Ross Embayment from the base of Mt Discovery, a 2681 m shield volcano. Its is located north of the southern boundary of Victoria Land and surrounded on three sides by the Ross Ice Shelf. Northward flow of the ice shelf is deflected around the east end of the peninsula and terminates at the current calving front. The calving front has been pinned at Ross Island for more than a century. It is likely that calving front was pinned by the eastern terminus of Minna Bluff prior to the emergence of the Plio-Pleistocene volcanoes that compose Ross Island.

Minna Bluff is divided into three named areas: Minna Saddle, a 600 m high saddle starting at the base of Mt. Discovery; Central Minna Bluff , a 40 km long by 5 km wide section that comprises the bulk of the current volcanic edifice; and Minna Hook, the 15 km x 2-4 km north-south oriented segment of Minna Bluff and site of the oldest observed ages. The top of Minna Bluff along Central Minna Bluff and Minna Hook ranges from 800-1000 m in elevation and terminates in

steep cliffs on all but the northwest side. Wright-Grassham (1987) speculated the cliffs were formed by a combination of tectonic movement and glacial and marine erosion. The south side of Central Minna Bluff, McIntosh Cliffs, is steep with limited outcrop exposure with the base of the cliffs buried in snow and ice on or adjacent to the Eady Ice Piedmont. The top of Minna Bluff is consists of moraine-free, wind-eroded cinder cones. The north facing side of Central Minna Bluff is moraine covered up to elevations of 637 m (Denton and Marchant, 2000).

The top of Minna Hook consists of lava domes and cones and is capped by a scattering of erratic boulders. Minna Hook is surrounded by 400-800 m cliffs on the eastern, southern and western sides. The east-facing cliffs along the southern 10 km of Minna Hook rise from a shear zone at the edge of the Ross Ice Shelf. Steep ice-cored talus fans rise in gullies between volcanic outcrops. Debris shed from the step cliff faces of Minna Hook disappears into the shear zone and is removed as the ice shelf flows around the end of Minna Bluff. The base of the south-facing cliffs at the southern end of Minna Bluff is composed of hummocky talus and morainal debris. The west-facing cliffs are largely covered in snow and ice, similar to and contiguous with the south-facing cliffs of McIntosh Cliffs.

Minna Saddle is a low elevation (max. 400 m) section of Minna Bluff, connecting Mt. Discovery to Central Minna Bluff. The surface of Minna Saddle is dominantly snow and ice covered with a few exposed volcanic features including cinder cones and a tuff cone.

2.3.2 Volcanic Setting

The Mid to Late Miocene volcanism at Minna Bluff is part of the early history of the Erebus Volcanic Province (EVP), which was concentrated in the

southern part of the province. The oldest dated outcrops of EVP are deeply eroded 18.7 $\pm$0.3 Ma trachyandesite lavas located on the northern flank of Mt. Morning (Kyle and Muncy, 1989). Mildly alkaline volcanism continued at Mt. Morning until 11.4 Ma (Martin et al., 2010). This early phase of volcanism was dominated by subaerial activity; however, the presence of pillow breccias suggest intermittent interaction with a thick overlying section of water or ice (Martin et al., 2010). Mt. Morning is the postulated source of 24.1-18.4 Ma volcanic debris found in the Cape Roberts marine cores, which increases the age of EVP inception to pre-Miocene times (C.R.S.T., 1999). Combining the dating from CRP-2/2A and Martin et al. (2010) indicates that an early phase of volcanism at Mt. Morning occurred from 24.1 to 11.4 Ma. This early phase of activity was followed by a 5.3 Ma hiatus. Volcanic activity resumed at 6.13 Ma and continued to 0.02 Ma. This latest phase of activity is characterized by strongly alkaline compositions and formed the current shield volcanic edifice of Mt Morning (Martin et al., 2010).

Minna Bluff provides the most extensive evidence for late Miocene activity in the EVP. There are two samples that indicate Miocene magmatism at the predominantly Pliocene and younger White Island and Black Island of 7.65 $\pm$0.69 Ma (Cooper et al., 2007) and 11.19 $\pm$0.4 Ma (Armstrong, 1978). In addition to outcrops at White and Black Island, a 175 m thick section of volcanic material was recovered from the ANDRILL-1B drill core between 584 and 759 msbf (Pompilio et al., 2007). The upper 105 m of this section is interpreted as representing cyclic submarine to emergent subaerial volcanism proximal to the drill site (Di Roberto et al., 2010). This upper section includes a 6.48 Ma, 2.81 m thick subaqueously emplaced lava flow (Wilson et al., 2007). Mass flow deposits, inferred to have originated from a distal submarine source, dominate the lower section of this

volcanic interval. It appears that volcanism during the 11.4 to 6.13 Ma Mt. Morning hiatus was concentrated almost completely at Minna Bluff, which was active between 11.87 $\pm$0.03 and 4.14 $\pm$ 0.08 Ma (this study). Previous work at Minna Bluff was limited to reconnaissance and emphasized the petrogenesis of Minna Bluff in the context other volcanism located at the southern boundary of the EVP, including Mt. Morning, Mt. Discovery and Brown Peninsula (Wright-Grassham, 1987; Wright and Kyle, 1990) . Previous chronology of volcanism at Minna Bluff is based on nine low precision K-Ar dates from 11.0 $\pm$1.1 to 7.26 $\pm$0.22 Ma (Wright-Grassham, 1987). Wright-Grassham (1987) identified two informal stratigraphic units that define two phases of volcanism; MB1 and MB2. MB1 is characterized as a basanite-benmoreite-trachyte phase emplaced between 11 and 9 Ma. MB1 contains an interval of subaqueous activity that is likely subglacial in origin. The MB1 stratigraphy contains an unconformity that is inferred as glacial in origin. The second phase MB2 lasted from 8.3 to 7.2 Ma and was deliminated from MB1 by the first appearance of phonolite lava. All volcanism during MB2 was subaerial. Minna Bluff is implicated in two different hypotheses about the origin of volcanism in the EVP. One hypothesis suggested that the three-armed radial pattern of volcanoes and volcanic outcrop has resulted from upwelling and rifting induced by mantle plumes, first centered at Mt. Discovery and now at Mt. Erebus on Ross Island (Kyle, 1990; Kyle et al., 1991; Kyle and Cole, 1974). Volcanoes on Ross Island exhibits a three-armed radial symmetry, with the active Mt. Erebus phonolite volcano situated at the center and Plio-Pleistocene Mt. Terror, Mt. Bird, and Hut Point extending from the center and separated by ~120°angles (Kyle, 1990; Kyle and Cole, 1974). The 120°radial symmetry is repeated around Mt. Discovery, which is flanked to the north by Pliocene Brown Peninsula, to the southwest by Miocene and younger Mt. Morning, and to the southeast by

Late Miocene Minna Bluff (Kyle, 1990). An alternative hypothesis suggests that the regional transtensional tectonic regime controls the volcanic patterns and has formed stress-controlled linear fissure arrays and reactivated pre-existing structures (Paulsen and Wilson, 2009; Wilson, 1999; Wilson and Demosthenous, 2000; Wilson et al., 2003). As described further below, the Minna Bluff volcanic peninsula is situated along one of these pre-existing structures.

2.3.3 Tectonic Setting

In South Victoria Land, just west of Minna Bluff, the Transantarctic Mountains form a prominent rift shoulder that separates the East Antarctic craton from submarine rift basins of the intracontinental West Antarctic Rift System. The mountains are characterized by distinct crustal blocks separated by transverse fault zones (Fitzgerald, 1992; Wilson, 1999, 1995). The Discovery Accomodation Zone (DAZ) is one such fault zone and occurs at an offset of the rift flank and coastline in South Victoria Land (Wilson, 1999). On land, the DAZ includes two structural blocks, the Royal Society and Skelton blocks, which are separated by the Radian lineament, an E-W transfer fault. Numerous Miocene-Pliocene basaltic cinder cones (Sugden et al., 1999; Wright, 1980) are located in the foothills of the Royal Society Range, and appear to be aligned along the Radian Lineament (Wilson, 1999). Offshore the DAZ includes major volcanoes of the Discovery Volcanic Subprovince, including Mt. Morning, Mt. Discovery, and Minna Bluff. The WNW-ESE orientation of Minna Bluff peninsula is approximately aligned with the inland Radian Lineament. Wilson (1999) suggested that volcanism in the Royal Society Range and the Discovery Volcanic Subprovince may have been focused along structural weaknesses associated with the DAZ.

Minna Bluff is located near the western boundary of the Ross Embayment, which is characterized by large north-south oriented rift structures, including the Terror Rift graben extending north from Ross Island, that comprise the Victoria Land Basin (Cooper et al., 1991; Cooper and Davey, 1985). Seismic reflection surveys in the southern McMurdo Ice Shelf area between Minna Bluff and White and Black Island revealed steep-dipping N- S faults that were interpreted as southern extensions of the Terror Rift faults (Johnston et al., 2008). The bathymetry also appears to be similar to the Victoria Basin with ridges (horsts) and swales (grabens) (Johnston et al., 2008).

The rift tectonics of the Ross Embayment is complicated by the presence of large Late Cenozoic volcanoes that locally depress the crust, creating large flexural moats. The flexural moat created by Ross Island, located in the northern part of the Erebus Volcanic Province, accommodated 1200m of sediment. Seismic record shows evidence for limited flexural moat development around volcanoes south of Ross Island (Johnston et al., 2008). Stratigraphic sequences revealed by the seismic surveys are composed of both syn-rifting (Eocene- to Early Miocene?) and post-rifting (late Neogene?) strata.

2.4 Methods

2.4.1 Sampling

A total of 578 samples were collected from Minna Bluff, 340 during the 2006-2007 field season and 238 during the 2007-2008 field season. Of the 578 samples collected 380 were selected as potential $^{40}Ar/^{39}Ar$ dating targets. 1-5kg hand samples were removed from outcrops and preliminarily cleaned of surficial weathering rinds. GPS coordinates and both GPS and barometric elevations

were recorded for each sample. Preliminary characterization for each sample was noted in the field, including eruptive environment, lithology, and major phenocryst phases.

Where glacial unconformities were identified, samples were collected stratigraphically above and below the erosional surface. In most cases the bracketing samples were collected within centimeters of the unconformity.

2.4.2 Electron Microprobe

Detailed sample characterization was performed on samples analyzed by the $^{40}Ar/^{39}Ar$ technique. Groundmass concentrates and mineral separates were analyzed using the Cameca SX-100 electron microprobe located at the New Mexico Bureau of Geology and Mineral Resources' Electron Microprobe Laboratory. Grain mounts of mineral separates and rock fragments were analyzed for sample characterization purposes, primarily for the presence of K-bearing phases, hydration of matrix glass and the quality of the mineral separation process, i.e. sample homogeneity and removal of secondary phases such as clay and zeolite.

Grain mounts were prepared for crushed whole rock, groundmass concentrate, and mineral separates. Samples were covered in heat-activated epoxy and baked for 8+ hours at 80°Cto harden the epoxy. Sample disks were polished using a Polimet I Buehler polisher with diamond disks of 163 μm, 68 μm and 30 μm. The final polishing of sample disks was performed with a series of polishing cloths, diamond powder (15μm, 6μm and 1μm) and deionized water. Polished sample mount surfaces were cleaned using petroleum ether and carbon coated.

Electron microprobe quantitative spot analyses were measured using a 15 kV accelerating potential and 20nA ion current. Amphibole, pyroxene and

olivine analyses were performed with a 1μm (diameter) beam, feldspar analyses with a 10μm or 5μm beam (depending on crystal size and availability of clean surface), and groundmass analyses with a 5μm, 10μm or 20μm beam. Natural mineral reference materials were used for calibration and determination of analytical precision for unknowns of similar composition. Analyses with totals of <98 or >101 wt. % were rejected unless they contained >10% Na.

2.4.3 XRF

Please refer to Johnson et al. (1999) for full XRF analytical details.

2.4.4 ^{40}Ar/^{39}Ar

All ^{40}Ar/^{39}Ar sample preparation and analyses were conducted at the New Mexico Geochronology Research Laboratory (NMGRL). Samples were crushed, sieved, washed, acid treated, and magnetically separated. Feldspar samples were further purified using heavy liquid density separation. Finally, samples were hand picked to remove remaining contaminants.

Samples were irradiated in five separate irradiations. Purified separates along with a neutron flux monitor, FC-2 (28.201 Ma Kuiper et al. (2008)), were loaded into aluminum trays with precisely known geometries. See table~2.1. for additional irradiation details.

Table 2.1 Irradiations

Irradiation	Duration (hr)	Reactor
NM-205	7.0	Texas A&M
NM-213	7.2	Texas A&M
NM-216	7.0	Texas A&M
NM-220	10.0	USGS Denver
NM-222	8.9	Texas A&M
NM-256	19.6	USGS Denver

Texas A&M= 1 MW TRIGA Reactor. Nuclear Science Center, Texas A&M University, College Station, TX. http://nsc.tamu.edu/about-the-nsc/

USGS Denver= 1 MW TRIGA Reactor. U.S. Geological Survey, Lakewood, CO. http://pubs.usgs.gov/fs/2012/3093/

Following irradiation, single crystals of irradiated FC-2 were loaded into machined copper trays for total fusion analysis. Total fusion of single and multi-grain aliquots were performed using a 50W Synrad CO_2 laser or a Photon Machines 75W CO_2 Fusions system. Typical heating parameters for total fusion were 1-6 W for 60 seconds. Sample gas was purified by exposure to one "hot" getter (350°C, 2.0A), two cold getters and an ionizing filament for an additional 1-2mins after the end of lasing.

Step-heat experiments were performed with a resistance furnace or direct heating with a diode 810 nm laser. Step-heating protocols were tailored to the material being analyzed. Temperatures for Ar extraction from groundmass concentrate heated in a resistance furnace range from 550-1250°C, typically increasing by 50-75°Cper step. A final 1700°Cstep was used to fully degas the sample prior to adding subsequent samples to the furnace crucible. Commonly, ten heating steps were used to extract Ar from the groundmass concentrate samples. Kaersutite samples are significantly less stable during vacuum heating compared to groundmass concentrate, and will release a majority of their hosted Ar between 1100-1200°C. Typically step-heating extraction of Ar from kaersutite samples consisted of eight steps from 950-1700°C. All furnace heating steps we conducted for 540s, followed by an additional 360 s of gas purification. Reactive gases were getter using a cold trap operated at ˜-130°Cand the getter configuration described above. Groundmass concentrate samples step-heated with a 810 nm diode laser were lased for 45s followed by 480s of gas purification. Typical diode step-heating experiments consisted of ten to twelve steps ranging from 0.25-11.5 W, incrementing ˜0.5 W per step.

$^{40}Ar/^{39}Ar$ analyses were measured using two different mass spectrometers. Unknowns and associated neutron flux monitors were measured using

the same instrument. Most analyses (samples from irradiations NM-205,NM-213, NM-216, NM-220 and NM-222) were measured using an MAP-215-50. Samples from NM-256 were measured using a new next-generation Thermo Argus VI mass spectrometer. The NMGRL's MAP-215-50 is a dual collector (faraday and analog multiplier) instrument. Isotopic ratios are collected using a "peak hop" procedure. Typically all Ar isotopes are measured with the analog multiplier, however, for high Ca samples ^{37}Ar was measured using a faraday cup and amplified with a 10^{11} ohm resistor. A well-characterized intercalibration factor, determined by measuring ^{40}Ar on both the analog multiplier and faraday detectors, was used to scale the ^{37}Ar measurements to analog multiplier units (pA). The new ArgusVI mass spectrometers are multi-collector instruments with five electronically calibrated faraday cups with high gain (10^{12} ohm resistor) amplifiers and one ion counting electron multiplier. The five relevant Ar isotopes (40, 39, 38, 37, 36) were collected simultaneously when measured using the ArgusVI. Automated data collection of all analyses was conducted using a custom version of the popular noble gas application, Mass Spec. However, data processing was accomplished with Pychron, a newer data acquisition and processing software package developed at NMGRL (Ross, 2014). All isotopic data was translated and transferred from the Mass Spec database schema to the Pychron schema. Detailed systematic testing was preformed on Pychron to ensure algorithmic consistency with Mass Spec. A detailed manuscript describing Pychron and its development is in progress (Ross 2014).

2.5 Lithostratigraphic Units

Four major and four minor igneous units and one sedimentary unit characterize the lithostratigraphy of Minna Bluff (Table 2.2). All igneous units are

volcanic in origin, except for dikes and shallow level intrusions. Central Minna Bluff and Minna Saddle expose intact to partially eroded lava domes and cinder cones. Forty-two basanitic cinder cones, 11 phonolitic domes and 1 basanitic tuff ring were sampled along the top of Minna Bluff. The phonolitic centers are concentrated at Minna Hook. All units are exposed in cross-section along cliff faces; an additional 14 lava domes were sampled in the cliff sections on the east side of Minna Hook.

Table 2.2 Lithostratigraphic Units

Major units	**Outcrop Location**
1. Lava domes and carapace breccia	Minna Hook cliffs and bluff top, Minna Saddle
2. Quenched lobe lava and hyaloclastite	Minna Hook cliffs
3. Sub-aerial flows and autoclastic breccia	Ubiquitous, many show signs of slight interaction with water, such as quenched lower contact
4. Basanite scoria cones and vent complexes	Scoria cones along the bluff top from Minna Saddle to the south end of Minna Hook , scoria cone vent complexes exposed in McIntosh Cliffs
Minor Units	
5. Dikes and dike swarms	Minna Hook cliffs and McIntosh Cliff
6. Hydrovolcanic tuff	Minna Hook cliff, Minna Saddle
7. Pyroclastic Tuff	Minna Hook cliff
8. Polymict sediment	Minna Hook cliff

2.5.1 Felsic lava domes and carapace breccia

More than twenty felsic lava domes, composed of massive to flow-banded phonolitic lava are exposed at Minna Hook. The domes are exposed on the top surface as rounded knobs and in cliff outcrops as convex-up bodies. In cliff exposures some of the domes measure >100 m think. The base of the domes are typically underlain by a <1 to 3 m thick basal monomict blocky breccia. The lower contact of the dome and breccia sequence conforms to the underlaying volcanic topography, which varies from flat to highly irregular. A thin layer of glassy quenched breccia and lava occurs at the base of some locations, suggesting emplacement onto a snow-covered surface. There is no evidence that the domes were emplaced in stable water-filled chambers. In most cases the dome lava and breccia exhibit no signs of melt-water interaction, suggesting emplacement in a dry subaerial environment.

2.5.2 Quenched pillow/lobe lava hyaloclastite

This lithostratigraphic unit is common in lower parts of cliff exposures at Minna Hook and includes the full range of alkaline compositions. The quenched lava bodies range from discrete pillows, typically 0.3-2 m in diameter, to irregular lobe lavas that are up to several meters thick. The pillow units include sequences of nested pillows with minimal hyaloclastite breccia to isolated pillows floating in hyaloclastite breccia matrix. The thickness of quenched margins varies from mm- to cm-scale and is difficult to determine where the flows granulate into hyaloclastite breccia. The hyaloclastites are typically massive, fines-poor breccias, composed of angular, blocky glassy fragments. Stacks of pillow and lobe

hyaloclastite breccia are up to 10's m thick in places. The presence of quenched margins on lava bodies and the formation of hyaloclastite breccia are indicative of emplacement in direct contact with water. Where there is a thin glassy margin only at the lava's basal contact, interaction with water is limited to melting of thin snow or ice cover. The typical upsection sequence at Minna Bluff is 1) pillow or lobe hyaloclastite, overlain by 2) a mixture of oxidized autobreccia and blocky hyaloclastite, capped by 3) oxidized autobreccia. Sharp horizontal passage zones between exclusively subaqueous and exclusively subaerial lithofacies, common in pahoehoes-feed lava delta sequences in glaciovolcanic tables mountains and marine seamounts (Smellie, 2006), are rare at Minna Bluff. The less defined passage zones at Minna Bluff more closely resemble those described in the Hallet Volcanic Province in Northern Victoria Land, Antarctica by Smellie et al. (2011). These passage zones are interpreted to result from the flow of subaerial aa lava into a subaqueous environment.

2.5.3 Suberial lava and flows and autoclastic breccia

The suberial lava and autoclastic breccia lithostratigraphic unit is common in cliff exposures at Minna Hook and dominates the Central Minna Bluff exposures. Similar to lithostratigraphic unit 2, these unit displays the full range of alkaline compositions, thought most are basanitic to phonotephrite and tephriphonolite. The lava flows are tabular and range from <1 to 10's of m in thickness and are horizontal to moderately dipping, depending on the pre-existing topography. The flows are interpreted as subaerial because of 1) the absence of quenched glassy margins and 2) association with either vesicular oxidized breccia or spatter-fed breccia exhibiting welded pyroclastic textures.

2.5.4 Basanite scoria cones and vent complexes

Forty-two basanite scoria cones and cone remnants were mapped along the top surface of Minna Bluff. Intact and partially intact crater rims are common in Central Minna Bluff; more eroded cone remnants are common along the top of Minna Hook. Some of the crater rims exhibit elongate forms parallel to the long axis of Central Minna Bluff, possibly resulting from fissure vents. Scoria cone lithofacies are dominated by spatter-fed lavas and non-welded to welded bombs. Welded units are preferentially preserved although some non-welded remnants of lapilli tuff sections are locally preserved. Eroded scoria cone vent complexes are exposed in several places along the steep south facing cliff section of Central Minna Bluff. These vent complexes feature 1) large bodies of pyroclastic debris or spatter-fed lavas, 2) multiple, in many cases cross-cutting dikes, and 3) massive, 10's of m thick lava bodies, some with columnar jointing. In places, the dissected vent complex is linked to a subaerial exposure of a scoria cone. At the lowest portions of some of the steep south facing cliff sections, localized bodies of quenched lava (pillow and lobe forms) and hyaloclastite were observed.

2.5.5 Dikes

Many stratigraphic sequences exposed in cliff sections at Minna Hook and Central Minna Bluff are cross-cut by minor volumes of dikes. The dikes range from <1 to 5m in thickness and intrude all four major lithostratigraphic units.

2.5.6 Mafic Hydrovolcanic tuff

Minor amounts of explosively erupted mafic hydrovolcanic tuff, lapilli tuff, and tuf breccia deposits are locally exposed at the south end of Minna Hook,

in the east-facing Minna Hook cliff sections, in Central Minna Bluff cliff sections and in Minna Saddle. The palagonitized hydrovolcanic tuffs are typically associated with intercalated strombolian-style bombs and smaller pyroclasts and are not associated with quenched lava or hyaloclastite deposits.

2.5.7 Felsic Pyroclastic Tuff

A 4+ m thick stratigraphic sequence of phonolite explosion breccia, block and ash flows, pyroclastic surge and fall deposits crop out on the south side of Minna Hook, below the top surface of the bluff. Despite the limited extent of this deposit, it is notable because such explosively erupted deposites are rare in outcrop in the EVP. Alkaline felsic ashes and lapilli tuff deposits are widely recognized in marine sediment cores (Di Vincenzo et al., 2010; Naish et al., 2001, 2009) and in Dry Valleys surficial deposits (Lewis et al., 2007, 2006; Marchant et al., 1993a,b, 1996; Marchant and Denton, 1996; Marchant et al., 2002; Sugden et al., 1995)

2.5.8 Polymict sediments

Polymict sediments are a common but volumetrically minor part of the Minna Hook stratigraphic sequences. The polymict sediments are composed exclusively of volcanic detritus, typically mixtures of felsic and mafic clasts. Rare granitoid lithologies are present in some units, through their provenance is unclear, originating from either eroded basement rocks or milled xenoliths. Rock types include mudstone, sandstone, breccia and diamictite. Most of the sediments occur along recognizable undulating unconformities eroded into volcanic

units, though some appear to occur within eruptive units. It is common to have multiple superposed sedimentary rock types along unconformity boundaries with composite erosion surfaces exposed. Erosion surfaces cutting into volcanic units tend to cut across layering and structures and in places the eroded surfaces are polished or striated. The units and sedimentary structures mantle the undulating unconformities, rising and falling along the eroded contacts. Some of the diamictite units contain subrounded to rounded molded, polished and striated clasts.

2.6 Results

2.6.1 ^{40}Ar/^{39}Ar

For this study a total of 157 samples were analyzed using the $^{40}\mathrm{Ar}/^{39}\mathrm{Ar}$ technique. Four categories of material were analyzed; 1) Volcanic feldspar mineral separates with compositions ranging from sanidine to anorthoclase, 2) volcanic amphibole mineral separates, classified as kaersutite, 3) groundmass concentrate, and 4) plagioclase mineral separates. Eighty samples of groundmass concentrate, thirty-three kaersutite, and three plagioclase mineral separates were step-heated using a resistance furnace or 810 nm diode laser. Populations of 15 to 35 crystals from 19 samples of volcanic feldspar mineral separate were fused using a CO_2 laser. The samples dated in this study provide extensive coverage of the from the entirety of Minna Buff as depicted in Figure 2.2. All ages are reported as $\pm 2\sigma$ unless stated otherwise.

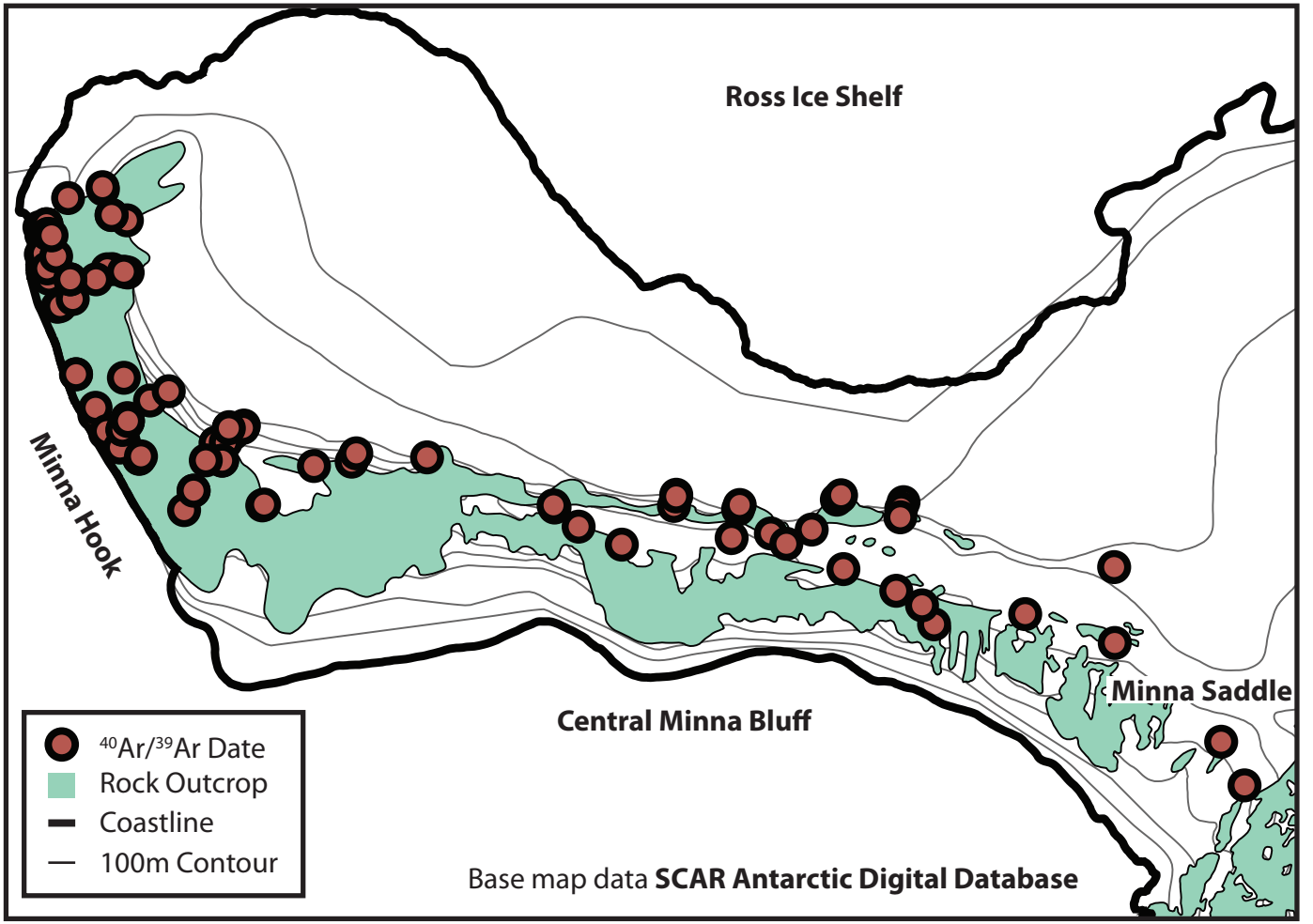


Figure 2.2 Dating coverage for Minna Bluff. Circles represent all valid (Weighted Mean and Plateau) $^{40}Ar/^{39}Ar$ dates. Base map shapefiles from SCAR Antarctic Digital Database (www.add.scar.org)

Of the 80 groundmass concentrate samples analyzed 57 yielded plateau ages defined by Fleck et al. (1977). A plateau is defined as a section of an age spectrum composed of contiguous gas fractions of more than three steps representing >50% of the total ^{39}Ar released and for which no difference in age at the 95% (2σ) confidence interval is detected between any two steps. Twenty-seven of the thirty-three kaersutite mineral separates yielded concordant age spectrum and precise plateau ages. The 19 samples of volcanic feldspar (sanidine - anorthoclase) mineral separates yielded normal distributions of ages with MSWD values within or near the acceptable ranges as defined by Mahon (1996). All 3 samples of plagioclase mineral separates yielded flat age spectra that meet to the plateau criteria defined above.

The ^{40}Ar/^{39}Ar dating preformed in this study reveals that activity at Minna Bluff lasted for ~8 Ma, starting at >12 Ma and lasting until ~4 Ma. The oldest date measured, 12.40 $\pm$0.466 Ma, is a plateau age from a groundmass concentrate sample located at Minna Hook. There is little doubt that buried submarine activity prior to 12.40 Ma is present at Minna Hook, but was not sampled during this study. The youngest date for Minna Bluff, 4.44 $\pm$0.064 Ma, is a plateau age from a groundmass concentrate located at the western end of Central Minna Bluff. Four dates younger than 4 Ma (2.23 $\pm$0.332 Ma to 0.89 $\pm$0.445) were measured during this study, all from Minna Saddle, that we associated with Mt. Discovery activity. Table 2.3 provides a comprehensive list of the 106 ^{40}Ar/^{39}Ar eruption ages produced from this study and supplementary analytical information.

Table 2.3 $^{40}Ar/^{39}Ar$ Summary Table

					Preferred Age						
Sample	L#	Irrad	Material	Lithology	Type	N	MSWD	K/Ca	± 2σ	Age(Ma)	± 2σ
MB06-712	56964	NM-205F 5	GMC		Plateau	4	1.0	0.05	3.1519E-04	12.40	0.477
MB06-595	57549	NM-213K 2	GMC	Benmoreite	Plateau	10	1.6	0.22	0.002	11.97	0.099
MB06-727	61604	NM-256F 4	Sanidine	Trachyte	Weighted Mean	28	3.1	2.70	0.038	11.72	0.014
MB06-710	56977	NM-205H 12	Sanidine		Weighted Mean	15	1.5	7.21	0.035	11.68	0.073
MB06-734	61605	NM-256F 6	Sanidine		Weighted Mean	25	58.9	6.36	0.037	11.65	0.017
MB06-596	57550	NM-213K 3	GMC	Mugaerite	Plateau	7	1.8	0.33	0.002	11.60	0.145
MB06-704	61603	NM-256F 2	Sanidine	Phonolite	Weighted Mean	29	5.2	13.87	0.486	11.58	0.012
MB06-546	57545	NM-213J 4	GMC	Phonolite	Plateau	4	1.1	1.14	0.010	11.44	0.096
MB06-763	57553	NM-213K 6	GMC	Tephri-phonolite	Plateau	5	2.1	0.29	0.002	11.40	0.171
MB06-762	57552	NM-213K 5	GMC	Phonolite	Plateau	6	0.9	0.85	0.008	11.34	0.085
MB06-833	57543	NM-213J 2	Kaersutite	Tephri-phonolite	Plateau	7	2.4	0.06	3.9956E-04	10.81	0.368
MB07-139	58627	NM-220N 6	GMC	Phono-tephrite	Plateau	8	0.7	1.01	0.004	10.78	0.364
MB07-163	58784	NM-222D 1	GMC	Phonolite	Plateau	4	3.1	0.65	0.008	10.54	0.331
MB07-017	57729	NM-216E 2	Kaersutite	Basanite	Plateau	9	1.7	0.01	7.8928E-04	10.46	0.304
MB06-582	56966	NM-205G 1	GMC	Tephri-phonolite	Plateau	7	0.1	0.34	0.002	10.45	0.071
MB06-508	56968	NM-205G 3	Kaersutite	Tephri-phonolite	Plateau	6	1.0	0.11	4.2927E-04	10.40	0.108
MB06-832	57542	NM-213J 1	Kaersutite	Phonolite	Plateau	8	1.2	0.08	4.5394E-04	10.37	0.182
MB07-144	57736	NM-216E 16	Kaersutite	Tephri-phonolite	Plateau	6	1.7	0.12	0.001	10.33	0.246
MB06-547	61610	NM-256F 16	Plagioclase		Plateau	5	1.4	0.04	4.0704E-05	10.32	0.146
MB06-828	57540	NM-213I 5	Kaersutite	Phono-tephrite	Plateau	7	1.8	0.02	2.0052E-04	10.26	0.347
MB06-834	57557	NM-213L 4	GMC	Hawaiite	Plateau	4	0.5	0.02	3.6402E-04	10.25	0.263
MB07-174	57738	NM-216E 20	Kaersutite	Tephri-phonolite	Plateau	9	1.0	0.12	9.4668E-04	10.24	0.224
MB06-831	57541	NM-213I 6	Kaersutite	Phonolite	Plateau	10	2.0	0.04	5.4710E-04	10.22	0.207

					Preferred Age						
Sample	L#	Irrad	Material	Lithology	Type	N	MSWD	K/Ca	± 2σ	Age(Ma)	± 2σ
MB06-634	56970	NM-205G 5	Kaersutite	Phono-tephrite	Plateau	7	0.9	0.03	3.3020E-04	10.18	0.112
MB07-142	57743	NM-216F 10	Feldspar		Weighted Mean	8	5.7	2.63	0.029	10.16	0.351
MB07-119	57723	NM-216C 6	GMC	Basanite	Plateau	10	0.6	0.14	0.001	10.01	0.632
MB07-113	57741	NM-216F 6	Feldspar		Weighted Mean	27	1.1	2.39	0.013	9.95	0.085
MB06-827	57493	NM-213C 18	Sanidine	Phonolite	Weighted Mean	15	1.0	0.04	6.3429E-04	9.95	0.558
MB06-615	56958	NM-205E 5	GMC	Basanite	Plateau	7	1.5	0.04	2.2973E-04	9.92	0.464
MB06-826b	57539	NM-213I 4	Kaersutite		Plateau	7	1.0	0.04	3.1976E-04	9.91	0.186
MB07-009	58768	NM-222A 3	GMC	Basanite	Plateau	6	0.6	9.3900E-03	3.7308E-04	9.85	0.952
MB07-169	58785	NM-222D 2	GMC	Phonolite	Plateau	8	1.1	1.86	0.017	9.80	0.114
MB06-830	57494	NM-213C 20	Sanidine	Tephri-phonolite	Weighted Mean	15	0.6	3.56	0.054	9.79	0.107
MB06-501	57536	NM-213I 1	Kaersutite	Phono-tephrite	Plateau	4	0.6	0.11	0.001	9.77	0.173
MB07-064	58630	NM-220O 3	GMC	Basanite	Plateau	7	0.7	0.17	8.1849E-04	9.75	0.319
MB06-765	57555	NM-213L 2	GMC	Basanite	Plateau	6	2.0	0.04	4.3168E-04	9.73	0.835
MB06-741	61606	NM-256F 8	Sanidine	Phonolite	Weighted Mean	22	1.1	8.35	0.124	9.72	0.006
MB06-524	57018	NM-205O 10	Kaersutite	Phono-tephrite	Plateau	7	1.5	7.0526E-03	9.3818E-05	9.70	0.095
MB06-539	61612	NM-256F 20	Plagioclase	Phonolite	Plateau	6	1.6	0.27	5.2600E-04	9.63	0.060
MB07-176	57745	NM-216F 14	Feldspar		Weighted Mean	15	2.1	3.08	0.023	9.60	0.126
MB06-507	56955	NM-205E 2	GMC	Phonolite	Plateau	8	1.5	0.04	5.0436E-04	9.55	0.098
MB06-525	57017	NM-205O 8	Kaersutite	Basanite	Plateau	10	0.6	0.07	5.8830E-04	9.53	0.208
MB07-121	57724	NM-216D 1	GMC	Basanite	Plateau	6	2.0	0.11	9.2195E-04	9.52	0.385
MB07-133	57734	NM-216E 12	Kaersutite	Hawaiite	Plateau	8	0.9	0.04	5.8266E-04	9.42	0.256
MB07-022	57739	NM-216F 2	Feldspar		Weighted Mean	24	1.9	7.30	0.054	9.40	0.098
MB07-167	58631	NM-220O 4	GMC	Basanite	Plateau	6	1.5	0.20	0.001	9.26	0.433
MB06-612	56960	NM-205F 1	GMC	Phonolite	Plateau	6	0.3	0.49	0.002	9.25	0.070

					Preferred Age						
Sample	L#	Irrad	Material	Lithology	Type	N	MSWD	K/Ca	± 2σ	Age(Ma)	± 2σ
MB07-143	57744	NM-216F 12	Feldspar		Weighted Mean	17	3.4	2.84	0.023	9.16	0.218
MB06-825	57538	NM-213I 3	Kaersutite	Phono-tephrite	Plateau	8	0.6	6.0058E-03	1.0534E-04	9.16	0.554
MB06-674	56954	NM-205E 1	GMC	Basanite	Plateau	6	1.4	0.01	9.6858E-05	9.15	0.309
MB07-134	57742	NM-216F 8	Feldspar		Weighted Mean	29	1.8	3.10	0.015	9.14	0.082
MB06-587	56965	NM-205F 6	GMC	Basanite	Plateau	10	1.5	0.05	3.1386E-04	9.11	0.358
MB07-145	57737	NM-216E 18	Kaersutite	Phono-tephrite	Plateau	8	1.5	0.01	2.8758E-04	9.11	0.358
MB06-671	56957	NM-205E 4	GMC	Basanite	Plateau	4	1.3	0.02	1.7029E-04	9.10	0.102
MB06-826a	57475	NM-213A 20	Sanidine		Weighted Mean	11	1.1	0.08	0.001	9.10	2.615
MB06-565	57548	NM-213K 1	GMC	Basanite	Plateau	5	2.3	0.02	3.3904E-04	9.07	0.711
MB07-022	57720	NM-216C 3	GMC		Plateau	8	1.6	0.16	0.001	9.06	0.134
MB06-747	56971	NM-205G 6	Kaersutite	Tephri-phonolite	Plateau	10	1.6	0.11	6.8717E-04	9.05	0.113
MB07-015	58616	NM-220M 1	GMC	Basanite	Plateau	5	1.8	0.10	5.9332E-04	9.04	1.137
MB07-114	57732	NM-216E 8	Kaersutite	Phonolite	Plateau	9	1.0	0.08	0.001	8.98	0.186
MB06-613	56959	NM-205E 6	GMC	Basanite	Plateau	8	1.7	0.03	1.6029E-04	8.96	0.656
MB07-141	57725	NM-216D 2	GMC	Basanite	Plateau	7	1.1	0.06	6.3934E-04	8.95	1.196
MB06-753	56974	NM-205H 6	Sanidine		Weighted Mean	15	1.4	2.53	0.027	8.80	0.093
MB06-560	57547	NM-213J 6	GMC	Basanite	Plateau	5	1.7	0.03	4.9087E-04	8.79	0.600
MB06-610	56962	NM-205F 3	GMC	Basanite	Plateau	6	1.2	0.08	4.3094E-04	8.73	0.152
MB06-673a	56972	NM-205H 2	Kaersutite		Plateau	5	2.8	0.02	3.2472E-04	8.64	0.240
MB07-136	57735	NM-216E 14	Kaersutite	Basanite	Plateau	6	0.9	0.12	0.001	8.62	0.214
MB07-028	58611	NM-220L 15	Kaersutite	Mugaerite	Plateau	4	8.5730E-02	0.11	6.5604E-04	8.60	0.629
MB06-750b	56973	NM-205H 4	Sanidine		Weighted Mean	14	3.8	2.57	0.017	8.59	0.188
MB06-748	57537	NM-213I 2	Kaersutite	Phonolite	Plateau	10	0.8	0.11	6.1115E-04	8.58	0.251
MB06-750a	56969	NM-205G 4	Kaersutite		Plateau	10	0.5	0.03	2.1587E-04	8.57	0.119

					Preferred Age						
Sample	L#	Irrad	Material	Lithology	Type	N	MSWD	K/Ca	± 2σ	Age(Ma)	± 2σ
MB06-673b	56976	NM-205H 10	Sanidine		Weighted Mean	15	1.2	22.68	0.254	8.48	0.059
MB06-840	57544	NM-213J 3	Kaersutite	Tephri-phonolite	Plateau	7	0.5	0.10	3.8518E-04	8.42	0.154
MB06-746	56975	NM-205H 8	Sanidine	Phonolite	Weighted Mean	14	2.5	22.30	0.356	8.20	0.113
MB07-052	58617	NM-220M 2	GMC	Basanite	Plateau	10	1.8	0.08	7.1671E-04	8.14	0.692
MB07-008	57719	NM-216C 2	GMC	Basanite	Plateau	6	2.2	0.13	0.001	8.09	1.655
MB07-027	57721	NM-216C 4	GMC	Phonolite	Plateau	5	2.6	1.09	0.007	8.09	0.123
MB07-104	58625	NM-220N 4	GMC	Basanite	Plateau	5	2.9	0.36	0.002	7.91	1.000
MB07-193	61601	NM-256E 4	GMC	Basanite	Plateau	5	0.9	0.04	4.5130E-05	7.89	0.056
MB07-154	58783	NM-222C 6	GMC	Hawaiite	Plateau	9	0.8	0.02	3.6086E-04	7.64	0.454
MB07-071	58775	NM-222B 4	GMC	Basalt	Plateau	8	1.8	0.01	4.3478E-04	7.60	1.079
MB07-032	58770	NM-222A 5	GMC	Basanite	Plateau	9	1.1	7.6869E-03	1.6386E-04	7.54	0.320
MB07-040	58629	NM-220O 2	GMC	Basanite	Plateau	7	1.6	0.06	3.8374E-04	7.50	0.300
MB07-217	61611	NM-256F 18	Plagioclase		Plateau	9	0.9	0.09	1.0197E-04	7.45	0.061
MB07-186	57727	NM-216D 4	GMC	Basanite	Plateau	4	2.4	0.06	5.4012E-04	7.41	0.749
MB07-033	58771	NM-222A 6	GMC	Basanite	Plateau	7	1.2	0.03	4.2153E-04	7.40	0.295
MB07-084	58624	NM-220N 3	GMC		Plateau	6	1.9	0.48	0.002	7.31	0.233
MB07-075	58621	NM-220M 6	GMC	Basanite	Plateau	7	2.1	0.12	6.5845E-04	7.26	0.462
MB07-046	58773	NM-222B 2	GMC	Basanite	Plateau	7	2.3	0.01	1.6401E-04	7.24	0.736
MB07-089	57740	NM-216F 4	Feldspar		Weighted Mean	19	3.0	0.47	0.003	7.14	0.247
MB07-073	57722	NM-216C 5	GMC	Basanite	Plateau	4	3.4	0.12	7.7334E-04	7.11	0.367
MB07-103	58780	NM-222C 3	GMC	Hawaiite	Plateau	9	1.3	0.03	5.3143E-04	7.11	0.692
MB07-081	58623	NM-220N 2	GMC	Basanite	Plateau	10	1.3	0.38	0.002	7.08	0.474
MB07-149	58782	NM-222C 5	GMC	Basanite	Plateau	9	2.5	8.6655E-03	1.8864E-04	6.84	2.187
MB07-065	58620	NM-220M 5	GMC	Basanite	Plateau	8	1.5	0.06	4.0153E-04	6.31	0.946

					Preferred Age						
Sample	L#	Irrad	Material	Lithology	Type	N	MSWD	K/Ca	± 2σ	Age(Ma)	± 2σ
MB07-147	58781	NM-222C 4	GMC	Basanite	Plateau	7	2.1	0.02	4.1699E-04	5.84	1.767
MB07-068	57731	NM-216E 6	Kaersutite	Basanite	Plateau	9	1.0	9.8258E-03	1.7628E-04	5.74	0.307
MB07-063	58619	NM-220M 4	GMC	Basanite	Plateau	8	1.3	0.19	8.2643E-04	5.73	0.254
MB07-056	58618	NM-220M 3	GMC	Basanite	Plateau	8	0.2	0.07	3.6910E-04	5.37	0.479
MB07-004	58628	NM-220O 1	GMC	Basanite	Plateau	8	1.3	0.08	5.1837E-04	5.03	0.456
MB07-070	58612	NM-220L 17	Kaersutite	Basanite	Plateau	7	1.2	0.12	6.9402E-04	4.94	0.706
MB07-064	61599	NM-256E 2	GMC	Basanite	Plateau	6	1.6	0.03	1.3986E-05	4.45	0.064
MB07-078	58622	NM-220N 1	GMC		Plateau	6	1.0	0.07	4.2736E-04	2.23	0.332
MB07-129	58626	NM-220N 5	GMC	Phonolite	Plateau	10	0.7	1.71	0.013	2.06	0.079
MB07-094	61600	NM-256E 3	GMC		Plateau	6	1.6	0.06	2.0058E-05	1.99	0.026
MB07-122	57733	NM-216E 10	Kaersutite	Basanite	Plateau	5	1.6	0.20	0.002	0.89	0.445

L# = Lab number, Irrad = Irradiation number and tray letter, n = number of analyses use to compute age, MSWD = Mean Square Weighted Deviation Kaer= kaersutite phenocrysts, GMC= groundmass concentrate, San/An= sanidine and/or anorthoclase phenocrysts

Notes:

Irradiation:

All samples and neutron flux monitors were loaded into machined Al discs in a known geometry Neutron flux monitor Fish Canyon Tuff sanidine (FC-2). Assigned age = 28.201 Ma (Kuiper et al., 2008)

Instrumentation:

Mass Analyzer Products 215-50 mass spectrometer on line with automated all-metal extraction system. Samples step-heated using a Mo double-vacuum resistance furnace or defocused CO2 laser. Heating duration in the furnace and laser were 10 min and 30 sec, respectively. Reactive gases removed during analysis by reaction with 3 SAES GP-50 getters, 2 operated at ~450°C and 1 at 20°C. Gas also exposed to a W filament operated at ~2000°C.

Analytical parameters:

Averaged furnace sensitivity 1.24×10^{-16} mol/pA. Averaged laser sensitivity 7.12×10^{-17} mol/pA J-factors determined to a precision of ± 0.1% by CO2 laser-fusion of 4 to 6 single crystals from each of the 6 or 10 radial positions around the irradiation tray (6 for a 12 hole disc, 10 for a 20 hole disc). Correction factors for interfering nuclear reactions were determined using K-glass and CaF2 and are as follows: $(^{40}Ar/^{39}Ar)_K$ = 0 ±0.0004; $(^{36}Ar/^{37}Ar)_{Ca}$ = 0.000289±0.000005; and $(^{39}Ar/^{37}Ar)_{Ca}$ = 0.00068±0.00002

Age calculations:

Plateau age or preferred age calculated for the indicated steps by weighting each step by the inverse of the variance. Plateau age error is inverse-variance-weighted mean error (Taylor, 1982) times root MSWD where MSWD>1. MSWD values are calculated for n-1 degrees of freedom for plateau age. Isochron ages, $^{40}Ar/^{36}Ar_i$ and MSWD values calculated from regression results obtained by the methods of York (1969). Decay constants and isotopic abundances after Min et al. (2000). All errors reported at ±2σ, unless otherwise noted.

The subsequent section provides brief descriptions of representative analyses for the various materials analyses by the $^{40}Ar/^{39}Ar$ technique.

MB06-674, Figure 2.3B represents a typical concordant analysis of groundmass concentrate measured using the NMGRL's lower precision MAP-215-50 mass spectrometer and extraction line. The incremental release spectrum yields a statistically defined age plateau. The declining K/Ca spectrum is a common pattern for groundmass concentrate samples representing the progressive degassing of multiple phases. The high K/Ca values for the lowest temperature steps represent degassing of glassy matrix, where present. The moderate temperature steps are dominated by plagioclase. The lowest K/Ca values recorded at the highest temperature steps represent degassing of retentive Ca-rich pyroxene microphenocrysts. The radiogenic yield, the percent of ^{40}Ar that is the result of radioactive decay, starts low (>20%) and climbs to a maximum of 76%. The low radiogenic yields for low- temperature steps suggest the removal of loosely bound atmospheric Ar located at or near grain boundaries. An inverse isochron plot of all steps indicates a trapped $^{40}Ar/^{36}Ar$ ratio with in error the current accepted atmospheric value (295.5 (Nier, 1950)) suggesting the absence of significant excess ^{40}Ar contamination. The plateau age is therefore used as the best measurement of the eruption age for this sample.

MB07-005, Figure 2.3D represents a typical discordant peat analysis of groundmass concentrate using the MAP-215-50. This sample does not yield a plateau defined by the required criteria and therefore no plateau age assignment is possible. The commonly observed declining K/Ca pattern for groundmass concentrates is present. Radiogenic yields for the majority of the spectrum are low (<20 %) with a maximum value of 23% recorded at step D (750°C). The non-isochronous age spectrum is likely the result of ^{39}Ar recoil redistribution and loss

and/or secondary alteration of the glassy matrix. Therefore the integrated age represents a low-precision eruption age of dubious accuracy.

Figure 2.5A illustrates the results from a typical sanidine mineral separate (MB06-673b) using the MAP-215-50. Single-crystal laser fusion of 15 phenocrysts yields a normal distribution of ages and a weighted-mean age of 8.475$\pm$0.059 Ma. The MSWD for this population is 1.25 indicating the observed scatter in age is accounted for by analytical uncertainty. We consider the weighted-mean age to represent an accurate and precise measurement of this sample's eruption age.

Figure 2.3C illustrates the results from a kaersutite mineral separate from the same sample as MB06-673b (Figure 2.5A). Incremental heating analysis of this sample yields a concordant age spectrum and a plateau age of 8.64 $\pm$0.240 Ma. The steps used to calculate the plateau age represent >70% of the cumulative ^{39}Ar released. Radiogenic yields for this sample start below 30% for the low temperature steps and climb to a maximum of 85% at step E (1120°C). The plateau age for this sample is indistinguishable at 2σ from the weighted-mean age of sanidine from MB06-673b. The analytical age agreement between these two samples suggests kaersutite phenocrysts accurately record the unit's eruption age. In the absence of higher K phases such as sanidine and anorthoclase, kaersutite is useful for defining an accurate and precise eruption age.

Figure 2.5B illustrates the results from a typical sanidine mineral separate using the ArgusVI, a new generation multi-collector mass spectrometer. The precision on individual (ca. 0.25%) analyses using the new instrument is greatly increased compared to the older MAP-215-50 (ca 1%). However, the scatter typical of sanidine populations is similar for both instruments leading to elevated MSWD's, (in some cases >10). Despite the high MSWD values, which are likely

caused by a combination of neutron flux and geologic variation, we consider the weighted-mean value of the population to represent an accurate eruption age.

Figure 2.4 displays the results from a representative low-K feldspar (plagioclase) mineral separate sample. Step heat analysis of plagioclase yields a concordant age spectrum with a plateau age defined by 100% of the ^{39}Ar released and a precise age of 7.45 $\pm$0.061 Ma. K/Ca values of $\tilde{0}$.1% are typical for plagioclase. The radiogenic yields for this sample are near 100% for the majority of the spectra. An inverse isochron plot of the plateau steps yields a trapped ^{40}Ar/^{36}Ar component indistinguishable at the 95% confidence level from the atmospheric value, indicating excess ^{40}Ar contamination is not a contributing factor for the age of this sample. Therefore, we consider the plateau age an accurate and precise determination for the eruption age of this sample.

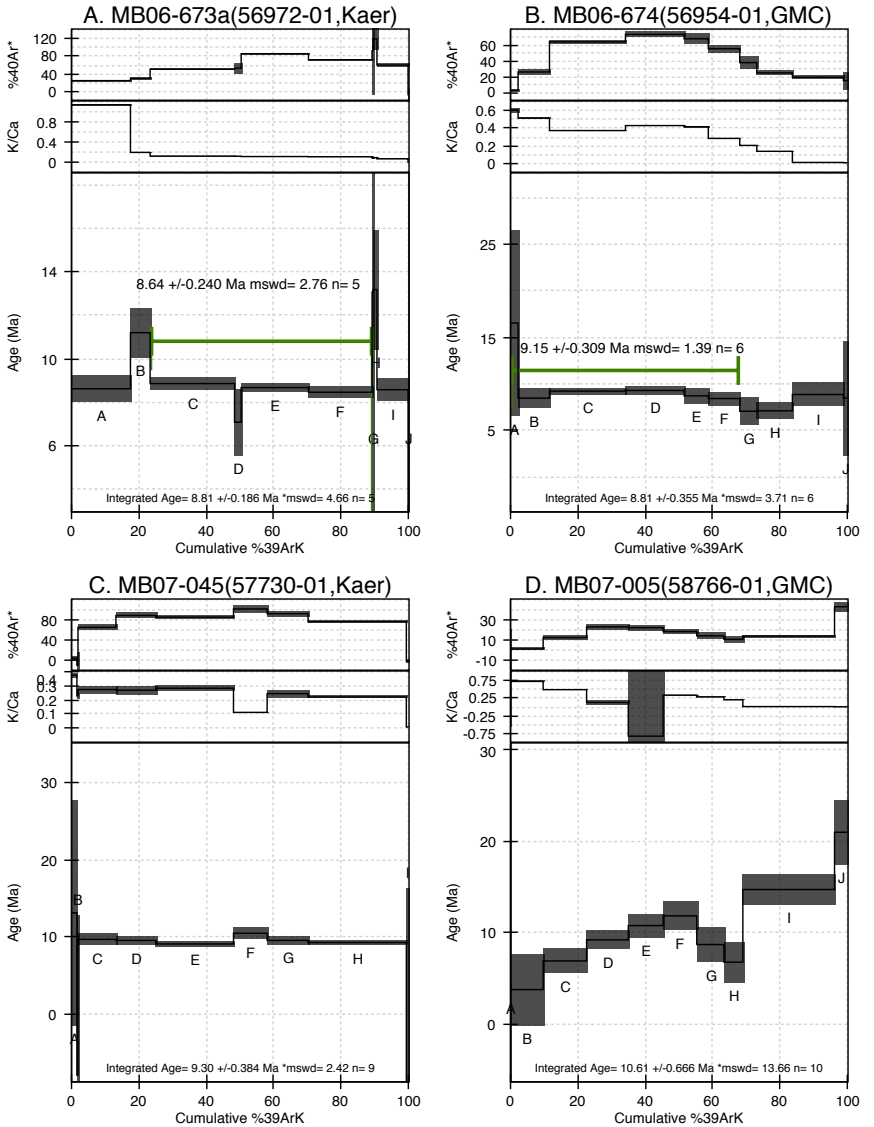


Figure 2.3 Representative step heating analyses. Concordant age spectra for A.) kaersutite mineral separate sample and B.) groundmass concentrate that yield precise plateau ages. Discordant age spectra for C.) kaersutite and D.) groundmass concentrate that do not yield plateau ages. Plateau and Integrated Age uncertainties ±2σ. Error envelopes ±2σ GMC=Groundmass Concentrate, Kaer=Kaersutite

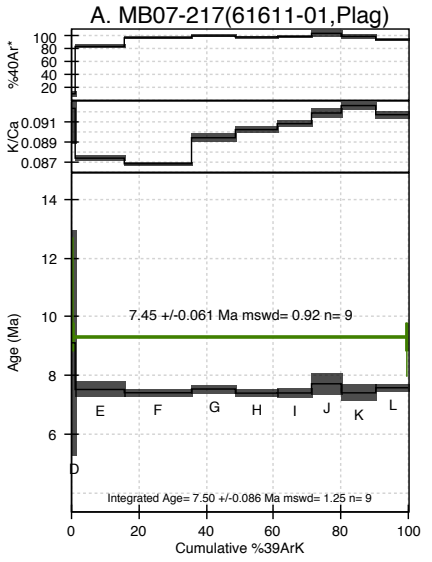


Figure 2.4 Representative step heating analyses and age spectrum for plagioclase mineral separate
Plateau and Integrated Age uncertainties ±2σ. Error envelopes ±2σ

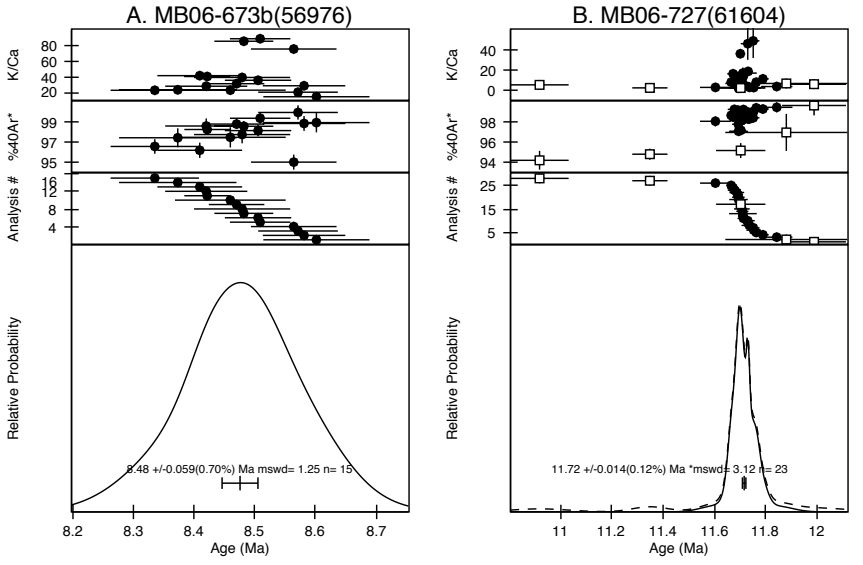


Figure 2.5 Representative single crystal laser fusion analyses. Ideograms of A.) MAP-215-50 and B.) Argus VI analyses. Weighted mean age for sanidine phenocrysts A.) MB06-673b indistinguishable from kaersutite from the same sample MB06-673a at 95% confidence level (See Figure X A.) Analyses omitted from calculation indicated by open squares. Dashed line represents cumulative probability for all analyses. Weighted mean age uncertainties ±2σ. Error bars ±1σ

2.6.2 Glacial Erosional Events

Three glacial unconformities were recognized in the field and interpreted as Glacial Erosional Events (GEE). Samples were taken, where present, that bracket the glacial unconformities stratigraphically above and below the erosional surface. Figure 2.6 displays the $^{40}Ar/^{39}Ar$ analyses for samples that tightly constrain the age for these events Figure 2.7 is a compilation showing the samples in relative position to the GEEs and their respective ages.

The ages for the GEEs are reported as the maximum possible time spans. The lower and upper age bounds for the GEEs are defined by using the youngest date plus its 2σ uncertainty, stratigraphically below the unconformity, and the oldest date minus its 2σ uncertainty, stratigraphically above the unconformity, respectively. GEE-0 is bracketed by samples MB06-595 and MB06-710 below the unconformity and MB06-596 above. MB06-710 provides a date for a lower age bound at 11.75 Ma and MB06-596 defines the upper bound of 11.45 Ma. The age of GEE-1 is tightly defined by samples MB06-508 and MB06-509. MB06-508 is stratigraphically below the unconformity and defines a lower bound of 10.51 Ma. MB06-509 lies above GEE-1 and below GEE-2 and defines the upper bound of GEE-1 at 9.92 Ma. Samples MB06-507 and MB06-524 provide the tightest bounds for GEE-2 at 9.45 and 9.80 Ma, respectively.

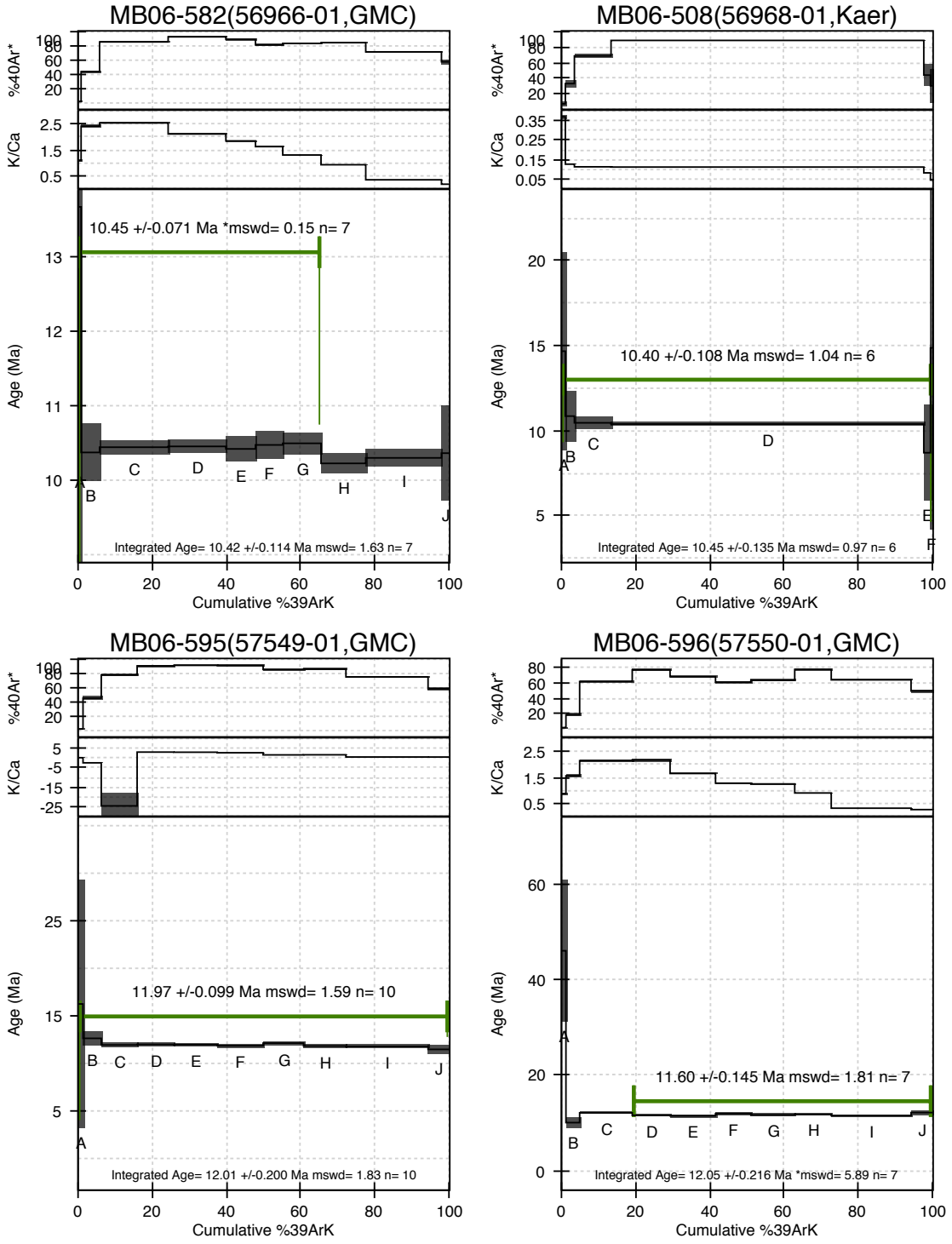


Figure 2.6 Step heating analyses from samples that bracket glacial unconformities. Plateau and Integrated Age uncertainties ±2σ GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase

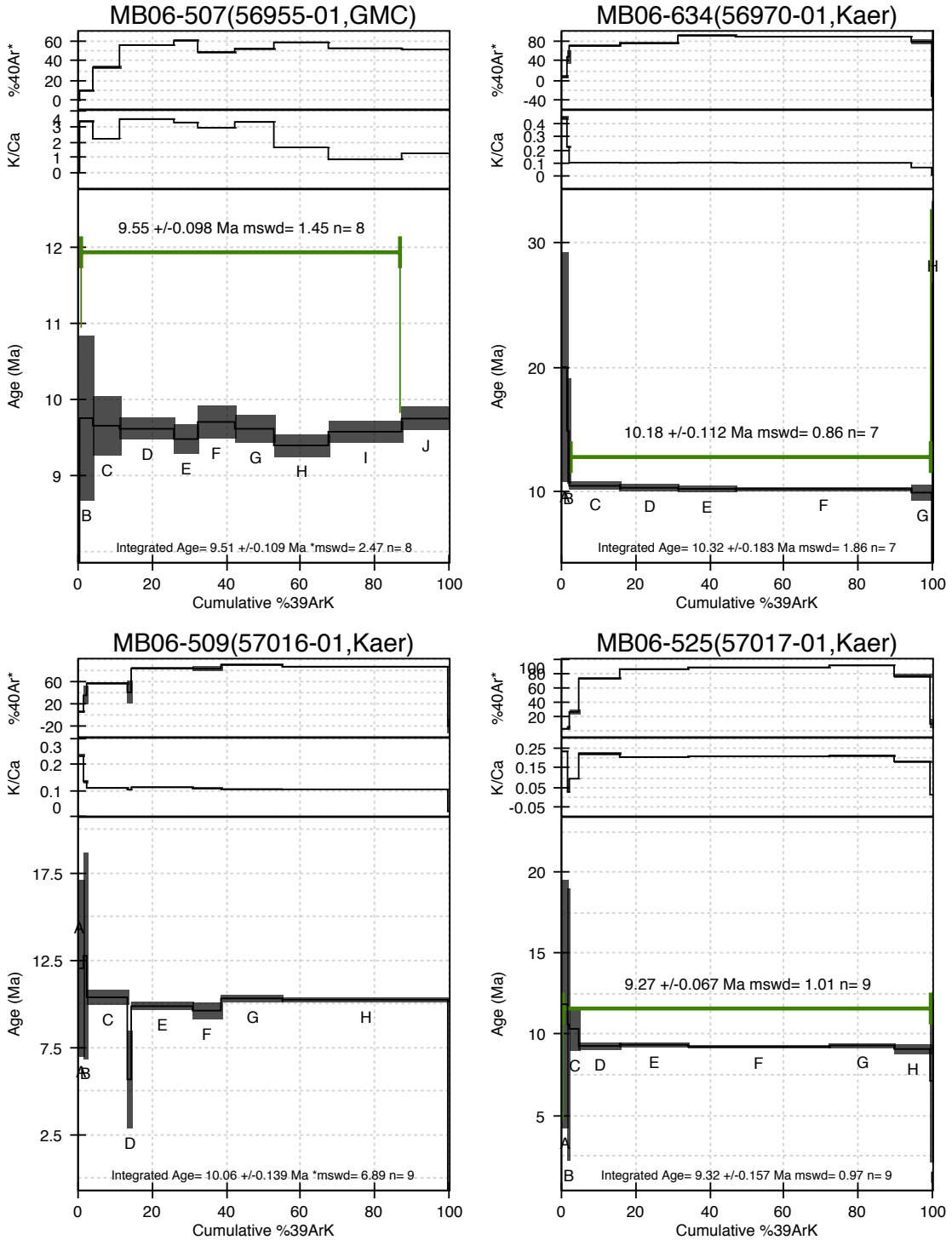


Figure 2.6 Continued. Step heating analyses from samples that bracket glacial unconformities. Plateau and Integrated Age uncertainties ±2σ GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase

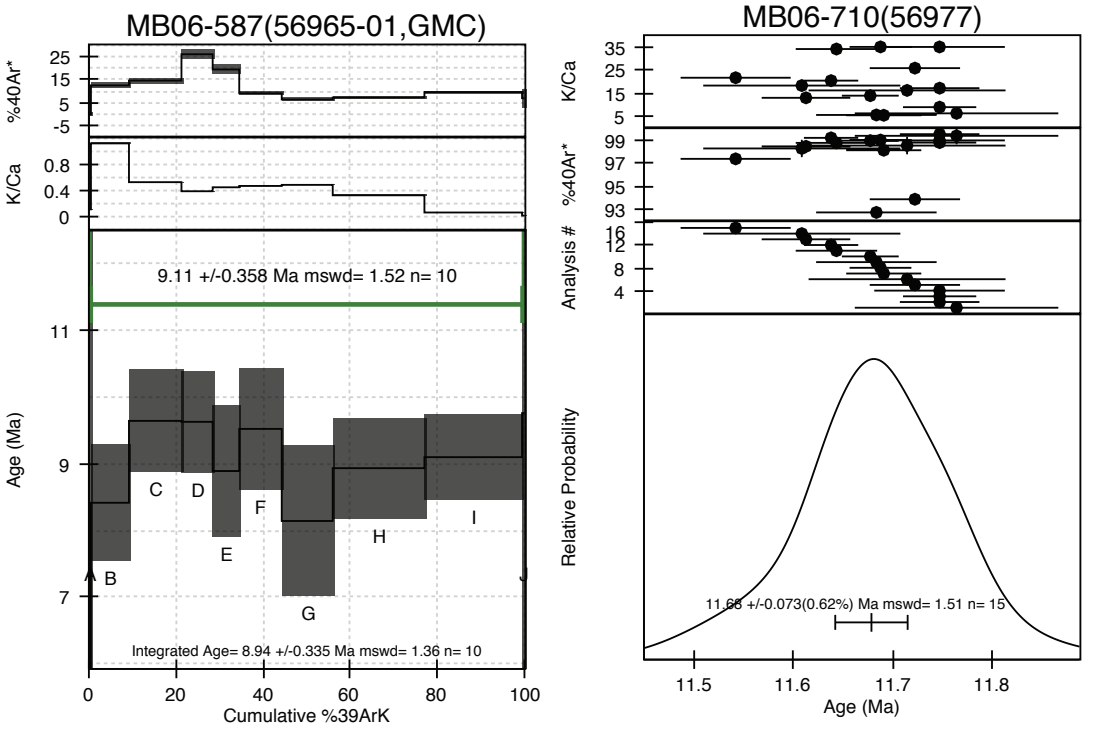


Figure 2.6 Continued. Step heating and Total Fusion analyses from samples that bracket glacial unconformities. Plateau and Integrated Age uncertainties ±2σ GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase

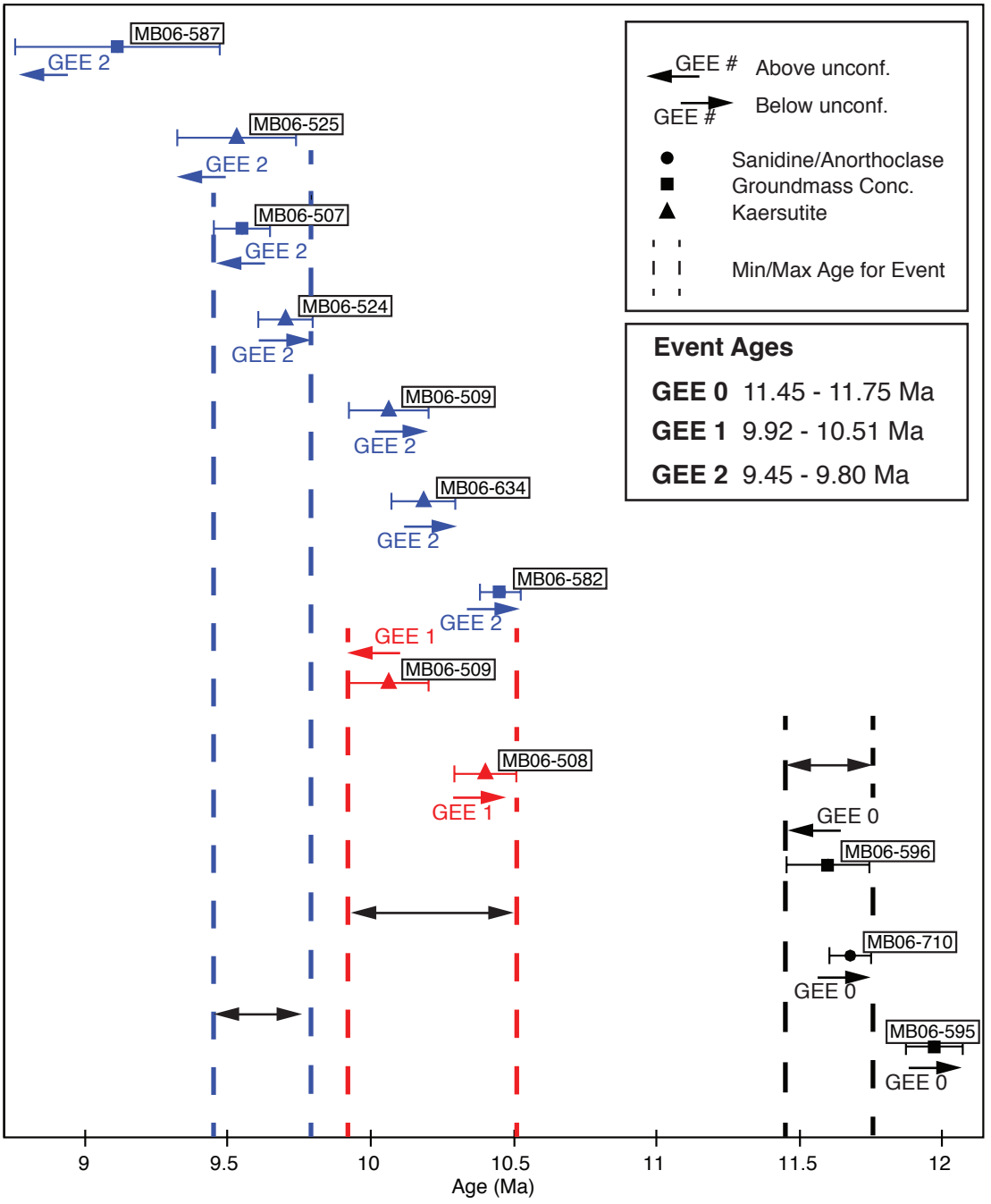


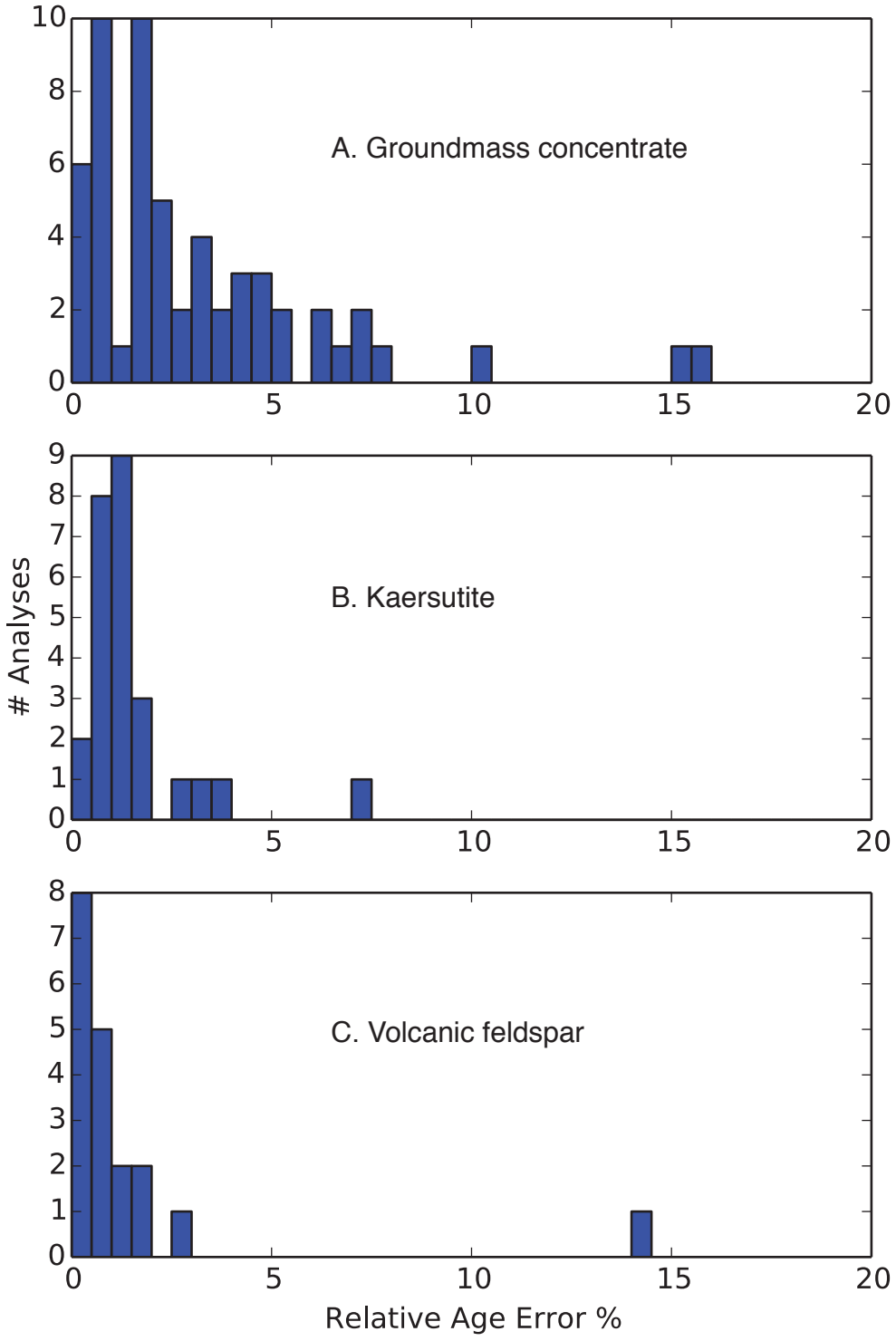
Figure 2.7 Age of glacial erosional events determined from bracketing $^{40}Ar/^{39}Ar$ ages. Sample MB06-509 appears twice on the diagram because it is located above GEE 1 and below GEE 2. Ages for Sanidine/Anorthoclase samples are "Weighted Mean" ages. Ages for Kaersutite and Groundmass concentrate samples are "Plateau" ages except for MB06-509 which is an "Integrated" age. Error bars represent ±2σ uncertainties.

2.7 Discussion

The geochronology dataset in this study provides an extensive view of the eruptive history of Minna Bluff. One hundred fifty seven samples were dated using the $^{40}Ar/^{39}Ar$ technique resulting in ages of variable quality. As expected a strong correlation between K_20 and age precision is apparent in this data set. Figure 2.8 illustrates the relative error between three different sample materials, A) volcanic feldspar (sanidine-anorthoclase) B) kaersutite and C) groundmass concentrate. The highest quality ages are produced from volcanic feldspar. In a few cases, analysis of kaersutite phenocrysts yield relative errors comparable to the volcanic feldspars, but in general kaersutite is less precise than volcanic feldspar. Analyses from groundmass concentrates are the least precise and show a large range in relative precision. The groundmass concentrate samples are typically glassy and prone to post eruption hydration and alteration that causes variable loss of radiogenic Ar and uptake of atmospheric Ar. In the absence of high K volcanic feldspars such as sanidine and anorthoclase, kaersutite phenocrysts are preferable to groundmass concentrate.

The new generation multi-collector mass spectrometers, notably the Argus VI and associated low volume UHV extraction systems, provide substantial improvements in precision and sensitivity compared to the older single collector high volume instruments used in the past for $^{40}Ar/^{39}Ar$ analysis. The new instruments offer the opportunity to measure smaller quantities of lower K material with greater precision compared to the older circa 1980's instruments. One area where this increased precision would be of great utility is determining the timing of the glacial erosional events preserved as unconformities at Minna Hook. Reanalyses of samples from lava flows and domes positioned above and below the

erosional surfaces, the new instruments could potentially yield much narrower bounds on the timing of this events. Less uncertainty in timing of these events would a higher degree of confidence when matching these events to regional features, such as glacial erosion surfaces in the ANDRILL drill cores (Krissek et al., 2007; Fielding et al., 2011), and global geologic records, such as the benthic $\delta_{18}O$ stack (Lisiecki and Raymo, 2005).



Figue 2.8 Relative age error for the three primary materials analyzed, A.) Groundmass concentrate, B.) Kaersutite and C.) Volcanic feldspar (san-an). Relative age error is defined as (1σ / age)*100. Bin width is 0.5%

We have grouped activity at Minna Bluff into two distinct temporal and geographic phases: 1) an early phase from 12-8 Ma and 2) a later phase from 8-4 Ma (Figure 2.9. Phase one was geographically centered at a proto Minna Island and that now forms Minna Hook. Phase two activity is responsible for the construction of Central Minna Bluff, the dominant East-West edifice of Minna Bluff. This new detailed picture of the volcanic evolution of Minna Bluff provides insight into glacial-volcanic interaction, regional tectonic stresses, evolution of large intraplate volcanic centers, the influence of volcanic centers on the flow of the Ross Ice Shelf, and interpretation of climate records recovered during scientific drilling projects. Dating of Minna Bluff suggests large volcanic centers, such as Mt. Discovery and Ross Island, start as smaller centers at the periphery followed gradual migration of activity towards the center. Ascent of magma appears strongly controlled by regional tectonic stress and preexisting structural features. Development of volcanic centers in the path of large ice sheets/shelves simultaneously obstruct the flow of ice and provide high-quality time stratigraphic horizons for determining the ages and rates of climatic events recorded in the geologic record.

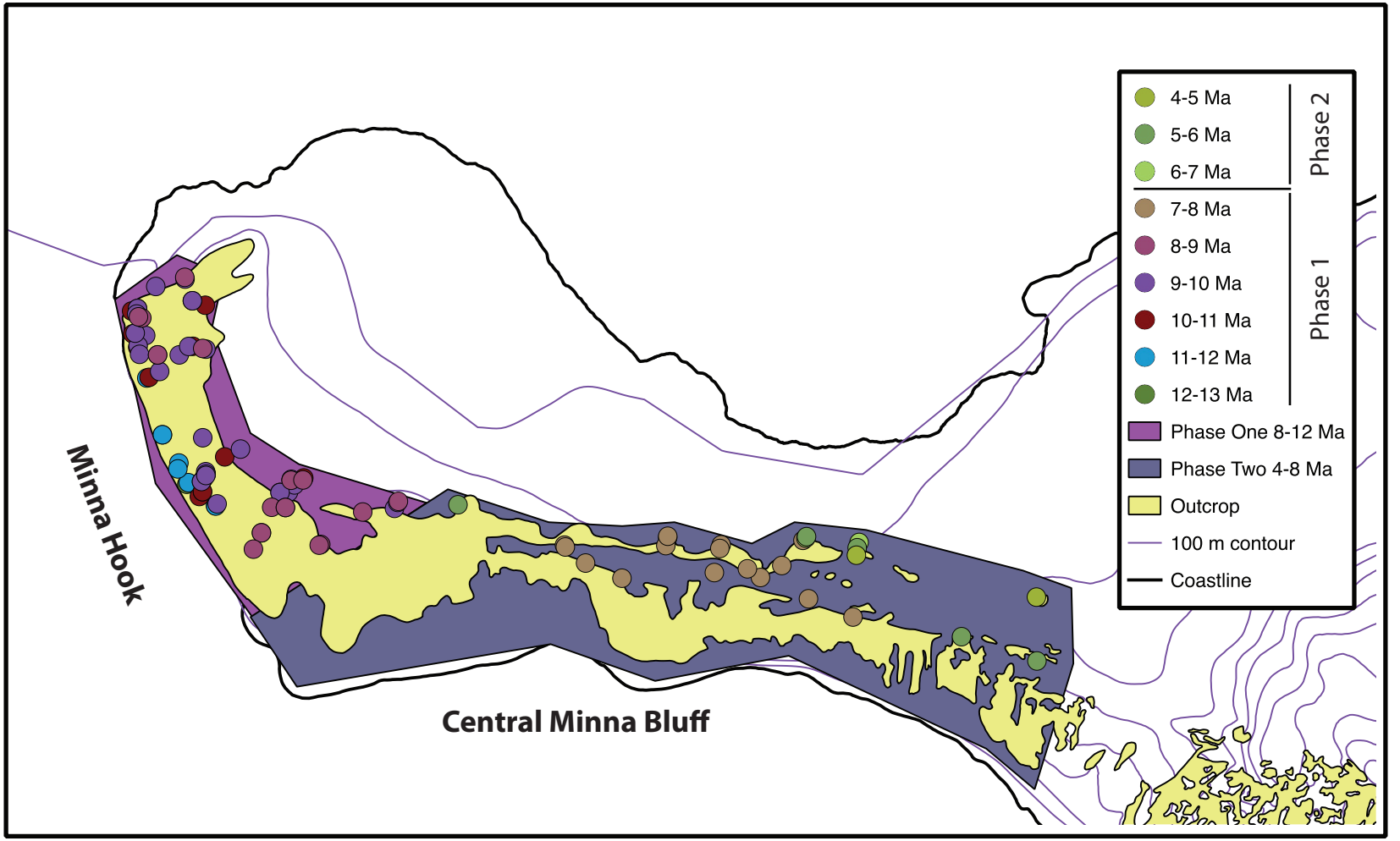


Figure 2.9 $^{40}Ar/^{39}Ar$ ages parsed into 1 Ma bins. Phase 1 (8-12 Ma) activity is located a Minna Hook and and Phase 2 (8-4 Ma) is limited to Central Minna Bluff.

Activity at Minna Hook undoubtedly began prior to 12 Ma, but was submarine and subsequently buried by later activity. We can estimate the maximum age of submarine activity at Minna Bluff by extrapolating the measured growth rate. As a first order approximation we calculate the vertical growth rate of Minna Hook as 410 m/Ma, assuming a constant linear rate from 12.40 $\pm$0.466 Ma (0 m) to 10.5$\pm$0.332 Ma (1100 m). The seafloor in the proximity of Minna Bluff is ~600 m Johnston et al. (2008) below current sea level. Therefore, by extrapolation, submarine activity that breached the sea floor surface, likely did not start significantly before 14.3 Ma.

Using the new geochronology dataset, we are able to estimate magma eruption rates at Minna Bluff. We estimated the volume of magma erupted by measuring the areal extent of activity during each phase and multiplying by the maximum elevation in each region. For phase one which lasted from 12-8 Ma, covered 70 km^2 and has a maximum elevation of 1092 m, estimate a magma production rate of 21 km^3/Ma. Phase two activity occurred from 8-4Ma, covered 220 km^2 with a maximum elevation 862 m, yielding a magma production rate of 47 km^3/Ma. We consider these estimates to represent maximum limits of magma production rate as our volume calculations likely overestimate the true volume of erupted magma. The increased in magma production rate of phase two compared to phase one could be the result of reduced overlying pressure because of deglaciation. No evidence of volcanic-ice interaction is present at Central Minna Bluff suggesting the absence of an overlying local ice sheet. Minna Hook, however displays evidence for multiple volcanic-ice interaction events as well as at least three periods of overriding warm based glacial events.

The shift in activity from Minna Hook to Central Minna Bluff suggests a change in the regional tectonic stress. The extensive dating conducted for this

study is useful for determining the timing of this change. Phase One activity appears to utilize crustal weakness related to Terror Rift and E-W crustal extension in the Victoria Land basin. Magmatic activity during Phase one is dominantly N-S and sub-parallel to Terror Rift. Phase two however is exclusively E-W and appears to coincide with continental structure features such as the Radian Lineament and the Discovery Accommodation Zone. The change regional stress field may also account for the decreased magma production rates observed during phase one compared to phase two.

In addition to a temporal distinction between at Minna Hook and Central Minna Bluff, there exists a difference in geochemical signature between the two phases. Two Total Alkali vs. Silica diagrams grouped by age illustrate the difference in geochemistry observed between the two phases. Figure 2.10 displays the geochemical results obtained by XRF for samples with ages 12-8 Ma. These samples, all located at Minna Hook, display the full range in geochemical compositions, from picrites to phonolites. Figure 2.11 displays the geochemistry for all samples <8 Ma. The phase two samples, located at Central Minna Bluff, are predominantly primitive magma compositions, with restricted range from basanite to hawaiite. This geochemical distinction may be related to the different structural regimes in which the magmas evolved. The Minna Hook magmas, controlled by the extension of Terror rift faulting, appear to have ascended slower than the Central Minna Bluff magmas, in which the ascent was controlled by transform faulting such as the Radian Lineament. The slower magma ascent rates for Minna Hook, allowed this magmas to evolve and differential, where as the Central Minna Bluff magmas were rapidly emplaced and show little evidence for substantial differentiation. This difference in magma ascent rates is also manifested in the difference in cumulative eruptive volumes for Minna Hook and Central Minna Bluff as discussed above.

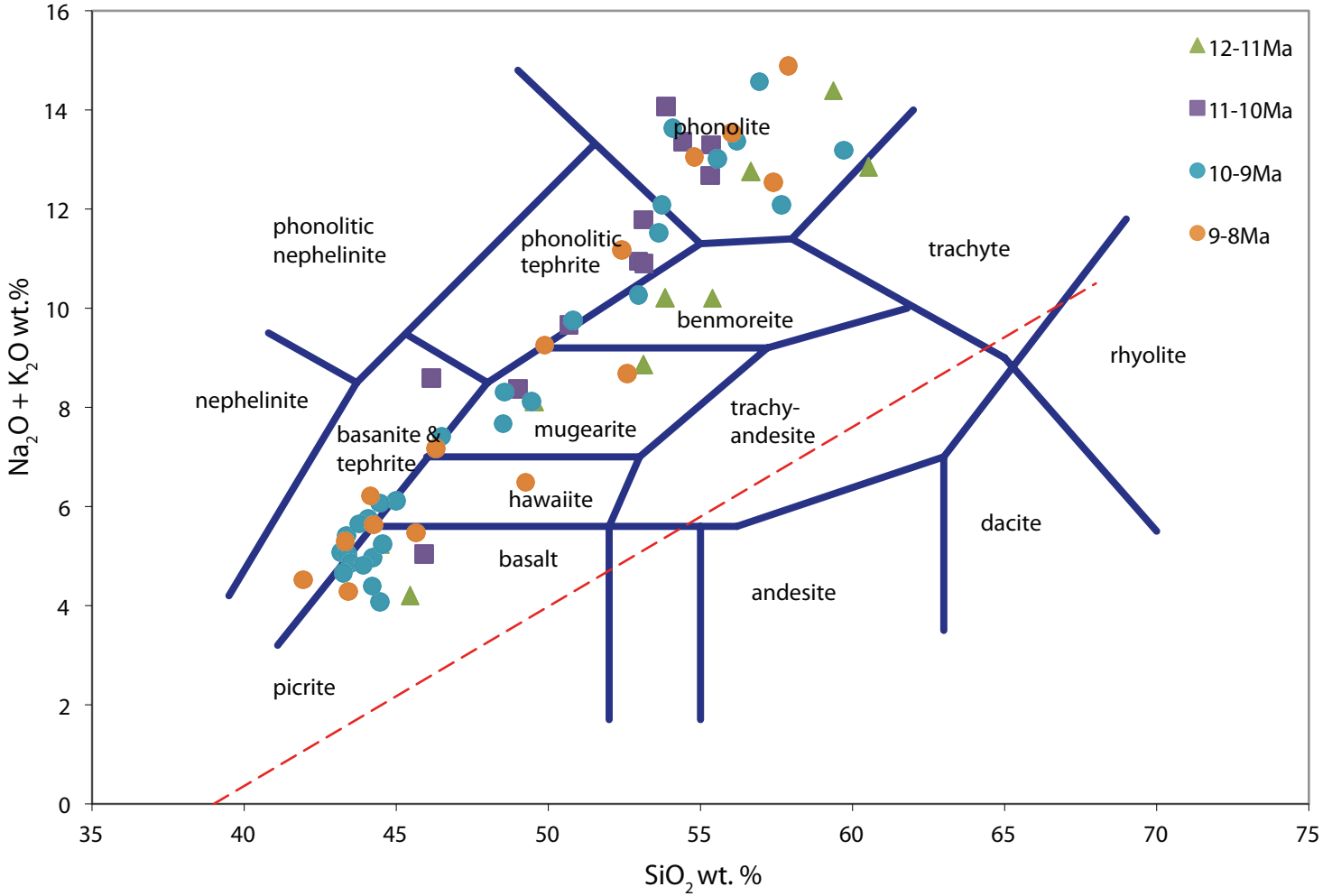


Figure 2.10 Total Alkali vs. Silica Diagram for all samples erupted during "Phase One" of Minna Bluff activity 12-8Ma. Geographically all of these samples are located at Minna Hook.

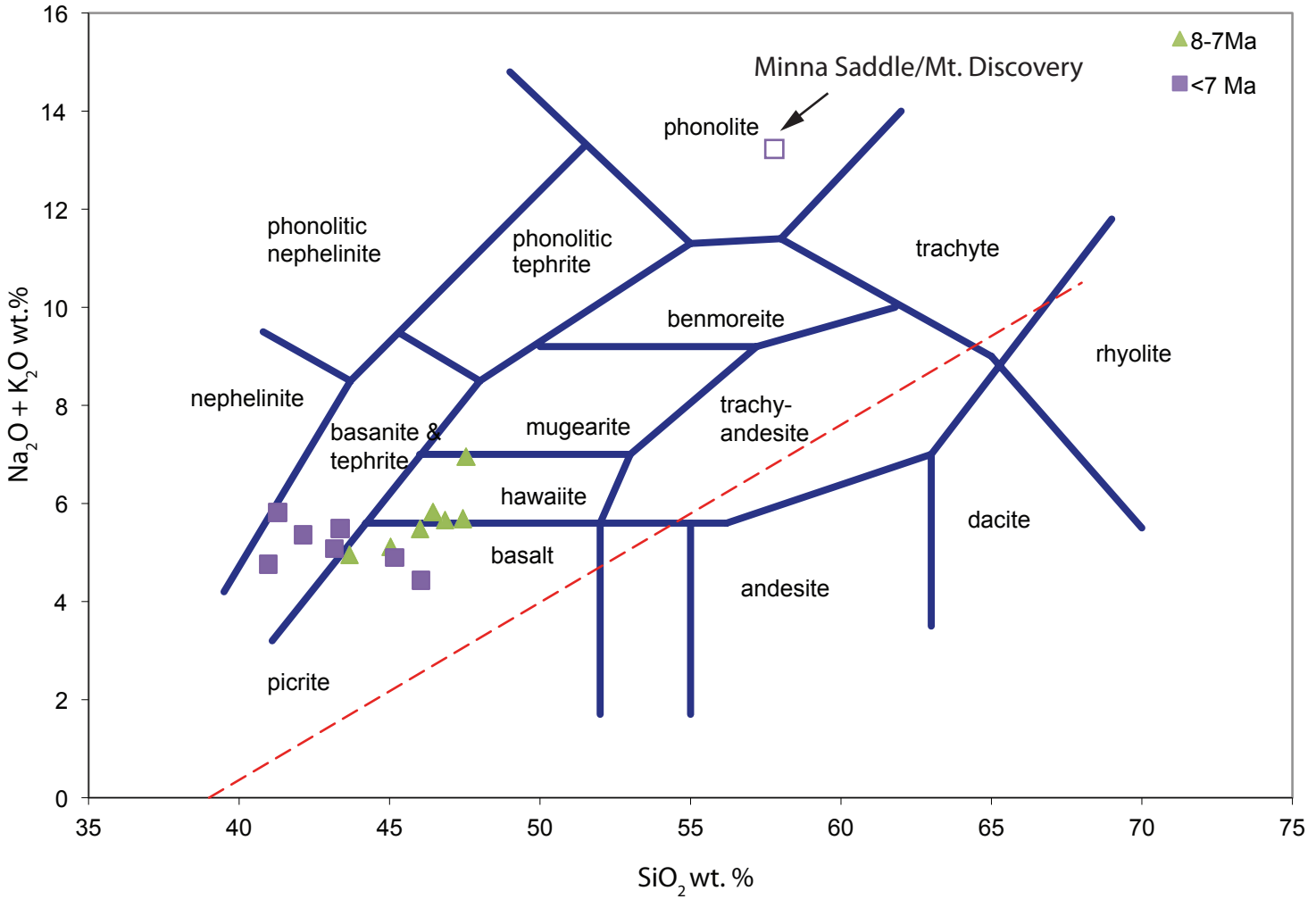


Figure 2.11 Total Alkali vs. Silica Diagram for all samples erupted during "Phase Two" of Minna Bluff activity < 8 Ma. Geographically all of these samples are located at Central Minna Bluff, except for the single phonolite sample, indicated by an open square, which is located at Minna Saddle and is associated with Mt. Discovery activity.

The development of major volcanic edifices has long been recognized as having a major influence on the patterns of glacial outflow from the Trans-Antarctic Mountains and the Ross Ice Shelf into the Ross Sea (Kyle, 1981a; Paulsen and Wilson, 2004; Wilson, 1999) Minna Bluff has played an important role in influencing the flow of the Ross Ice Shelf from the Mid-Miocene to present. Multiple ice-sheet reconstructions of the last glacial maximum both by geologic reconstruction using the distribution of glacial erratics (Denton and Marchant, 2000; Denton and Hughes, 2002) and numerical modeling (Golledge et al., 2013) show that ice flow lines are deflected around Minna Hook and cause the Ross Ice sheet to flow westward from Ross Embayment into southern McMurdo Sound. The influence of Minna Bluff on the Ross Ice Shelf is currently manifested as shear zones with ˜1 km wide tears east of Minna Hook and considerably slower ice flow rates (Kyle, 1981a).

Seismic profiles directly to the north of Minna Bluff (Johnston et al. (2008) Fig. 4) suggest that, prior to the development of Central Minna Bluff, ice flow was relatively unobstructed and the Ross Ice Shelf was able to flow between Minna Island and the mainland. Johnston et al. (2008) suggested that an irregular high amplitude surface is a glacial trough indicating SW to NE flow direction . The presence of multiple glacial erosional surfaces at Minna Hook supports this interpretation and indicates that prior to ˜9.5 Ma the Ross Ice Shelf was able to flow over and around the proto Minna Island.

Studies of basement and volcanic clasts recovered from AND-1B suggest changes in paleogeography from regional volcanic evolution represent an important factor that strongly influences the sediment provenance and complicates the climatic signal (Talarico and Sandroni, 2009). For example, prior to the emplacement of Central Minna Bluff (<˜8 Ma) clasts derived from East Antarctic, and

transported by the outlet glaciers, Byrd, Mulock, and Skelton, were are present in the AND-1B drill core. However, after Central Minna Bluff was formed the Byrd glacier was sufficiently deflected to the east to prevent it from depositing substantial material at the AND-1B drill site, resulting in a clast record that is dominated by Mulock and Skelton glaciers(Talarico and Sandroni, 2009). In this case the absence of clasts sourced by the Byrd glacial does not suggest any change in glacial or climatic conditions but is principally driven by changes in paleogeography. Incorporation and understanding of these changes in paleogeography are therefore necessary for developing accurate ice models and interpreting geologic signals recovered from sediment drill cores.

The precise dating of the GEEs located at Minna Hook maybe useful for improving the chronostratigraphy of the base of the AND-1B core. Below ~600 mbsf no well-preserved primary tephra layers are present and the chronology for this section is primarily constrained by $^{40}Ar/^{39}Ar$ dates of volcanic clasts. These $^{40}Ar/^{39}Ar$ dates are precise and accurate eruption ages, however, they only provide maximum depositional ages (Ross et al., 2012) in the context of a chronostratigraphic framework. By correlating the GEEs at Minna Bluff with the Glacial Surfaces of Erosion (GSE) in AND-1B the chronostratigraphy of the lower 600 m of the core would be improved. A higher resolution chronostratigraphy for this section of the core would allow for more accurate and higher resolution climate interpretations back to ~12 Ma. Currently, the lack of a high resolution chronostratigraphy for >600 mbsf limits the usefulness of AND-1B, with respect to a climate record, to the mid Pliocene (Naish et al., 2009). The climatic implications of the GEEs and relationship to ANDRILL will be explored in a subsequent paper.

Volcanism at Minna Bluff is a potential source for tephra found in the Dry Valleys region of the Transantarctic Mountains in Southern Victoria Land.

Marchant et al. (1996) mapped 75 distinct ashes preserved as loose and unconsolidated deposits. Microprobe analysis indicated the Dry Valley ashes are chemically similar to alkaline volcanic rocks found either in the McMurdo Volcanic Group (Kyle, 1990) or in Marie Byrd Land (LeMasurier and Thomson, 1990). The coarse texture and bimodal grain-size distributions, indicates deposition close to eruptive source (Marchant et al., 1996), which, limits potential source areas for the Dry Valley ashes to volcanic centers in the McMurdo Volcanic Group, most likely the numerous alkali volcanoes of the proximal Erebus Volcanic Province. The ashes discovered in Beacon and Arena Dry Valleys, ~170 km to the Northeast of Minna Bluff are particularly good candidates to have erupted from Minna Bluff. The Beacon Valley and Arena Valley ashes was dated using $^{40}Ar/^{39}Ar$ laser fusion at 10.66 $\pm$ 0.28 Ma and 11.28 $\pm$ 0.05 Ma, respectively (Marchant et al., 1996). This study demonstrates that phonolitic activity at Minna Bluff lasted from 11.58 $\pm$0.012 Ma to 8.09 $\pm$0.12 Ma. Figure 2.12 illustrates the overlap in dates for phonolitic activity at Minna Bluff with Dry Valley ashes from (Marchant et al., 1996).

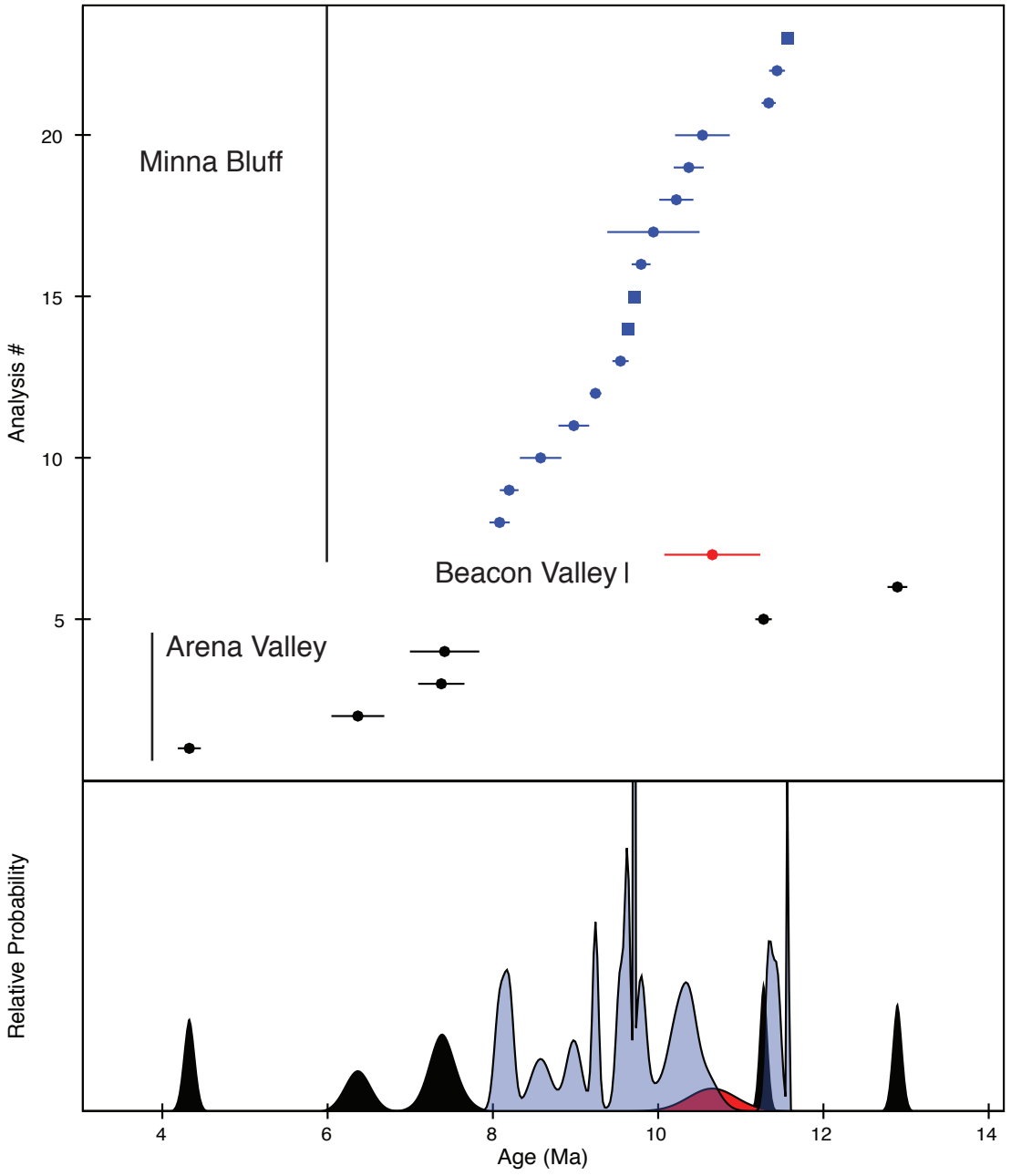


Figure 2.12 Ideogram comparing $^{40}Ar/^{39}Ar$ ages for Minna Bluff phonolitic activity (this study) to $^{40}Ar/^{39}Ar$ ages for ashes preserved at Arena and Beacon Valleys in the Dry Valleys region of the Transantarctic Mountains (Marchant, 1996). The agreement of composition and age between Minna Bluff samples and the Dry Valleys ashes, in addition to grain size and morphology, all suggest Minna Bluff is the likely source of at least some of the Dry Valleys ashes. Note the much higher precision of the Minna Bluff samples measured using the new generation Argus VI system (squares) compared to both the Marchant, 1996 samples and samples from this study measured with the MAP-215-50 (circles). Error bars display 1σ. Width of Argus VI 1σ error bars less than size of the symbol.

2.8 Conclusion

This study provides a new extensive geochronologic and geochemical dataset for Minna Bluff, a large volcanic peninsula in Southern McMurdo Sound. Minna Bluff was constructed in two phases, 1) an early phase from >12-8 Ma centered at Minna Hook, followed by 2) a later contiguous phase from 8-4 Ma at Central Minna Bluff. Evidence of minor activity <4 Ma is present but is most likely associated with Mt. Discovery. The first phase is predominately oriented N-S and the second phase is predominantly E-W. Activity during phase one displays the fully range of alkaline compositions from basanite to phonolite, where as phase two is dominantly basaltic. Phase one shows a range of eruption environments from subaqueous to subaerial. Only minor subaqueous activity was observed in Central Minna Bluff during phase two and is always located near the base of the bluffs near present day sea level. At least three glacial erosional surfaces are preserved at Minna Hook during phase one. These events provide well dated records of glacial erosion in the terrestrial setting not found anywhere else in Southern McMurdo Sound.

CHAPTER 3

PYCHRON: $^{40}Ar/^{39}Ar$ DATA ACQUISITION AND PROCESSING SOFTWARE SUITE

3.1 Abstract

Pychron is a fully featured open source project for automated data collection and processing. The majority of Pychron's codebase is written using Python, an increasing popular programming language within the scientific and open source communities. Pychron is optimized for use with the next generation multi-collector mass spectrometers from Thermo Scientific. However, Pychron was designed with flexibility and extensibility in mind and application to other hardware and isotopic systems is readily achievable.

The applications that comprise Pychron use Qt for a modern graphical user interface. GUI's are provided for all major hardware components such as the mass spectrometer and laser systems, in addition to interfaces for configuring and executing sequences of automated analyses.

Pychron can save data to a variety of SQL databases such as MySQL and PostgreSQL. Export facilities are available to translate analysis data and metadata to numerous formats including, XML, CSV, HDF5 and the MassSpec MySQL schema.

Analyses are processed manually using a streamlined workflow. Pychron also provides configurable batch processing procedures to automate the data re-

duction process. Pychron features interactive plots including, time series, ideograms, spectra, and inverse isochrons. Summary PDF tables following the Renne et al. (2009) format and appendix style data tables in PDF, CSV or Excel 97-2004 format are generated from easy-to-use dialogs.

Built-in unittests are provided with Pychron to verify the accuracy of the Ar-Ar and other statistical calculations. Unittests are executed autonomously and continuously using the Continuous Integration service, Travis CI. Documentation is located at ReadTheDocs.org (`https://pychron.rtfd.org`). The entire Pychron source code is licensed under the liberal Apache 2.0 open source license and publicly hosted at GitHub.com (`https://github.com/nmgrl/pychron`). A beta version of Pychron is currently available that includes both data acquisition and processing capabilities, identified by the DOI 10.5281/zenodo.9884 (Ross, 2014).

3.2 Introduction

Software has become an essential part of the Ar-Ar geochronology technique, both for data collection and data processing. The technique has greatly benefited from inexpensive and accessible computing hardware facilitating fully automated data acquisition. Storage of raw isotopic measurements and metadata in central relational database management systems (RDBMS) such as MySQL have dramatically increased the quality and throughput of analytical data from Ar-Ar facilities. Although software and interfacing with hardware has long been recognized as a critical piece of a laboratory's infrastructure currently, there exists only one widely used and fully integrated package for Ar-Ar analysis, Mass Spec by Alan Deino of Berkeley Geochronology Center (BGC). Mass Spec has been of

great value to the community for 20+ years, however we do not consider it a viable and sustainable product for the future in its current form. Mass Spec does not make use of the many advancements in software development and engineering that have occurred in the recent past. Mass spec has no adequate version control scheme and relies completely on version numbers for maintaining a history of changes. No API or extensive documentation is available for Mass Spec, making upgrades, bug fixes and generic modifications time consuming and inefficient. Mass Spec uses a custom esoteric scripting language for data collection that greatly limits is flexibility and extensibility. For all of these reasons and more we determined that a new platform was necessary for sustaining the high quality and highly desired results produced by Ar-Ar geochronology.

To address many of our concerns with Mass Spec and the general software ecosystem in Ar-Ar geochronology we chose to develop an open-source and extensible software product named Pychron. Pychron is freely available and makes use of many recent advancements in software development. It features robust version control via Git and is publicly hosted at GitHub. Pychron leverages the tremendous efforts of the open-source and scientific communities and uses widely used and accepted packages such as Numpy, Scipy (Jones et al., 2001) and SQLAlchemy (Bayer, 2006) to ensure sustainability and efficient design.

The name Pychron is a portmanteau of Python (the main language used for implementation) and Chronology (its main domain space). We choose Python because of its increasing popularity among the scientific community as well as the web development community, an area we hope pychron will benefit from in the near future. Python allows for rapid prototyping of new features, a critical property for evolving experimental scientific laboratories. As articulated in the

Zen of Python (PEP 20 Peters (2004)), Python follows the paradigm that code is more often read than written, making it an ideal language for both novice and advanced programmers, the full range of which is found in the scientific community. Python's "batteries included" concept makes it easy to implement new features, robustly, and when included components are not adequate an extensive body of open source and proprietary packages are readily available. Python, being an interpreted language, is often criticized for being too slow. However if computation speed becomes a limiting factor, algorithms can be implemented using lower level compiled languages, such as Fortran or C, and accessed directly from python modules. Python tools designed for optimization and speed such as Cython or its predecessor Pyrex provide additional means to mitigate any speed limitations.

Pychron was specifically designed to operate with Thermo Scientific new generation multicollector mass spectrometers, notably the ArgusVI. Instead of directly communicating with the ArgusVI's electronics we wrote a lightweight remote method invocation server in C-sharp, called `RemoteControlServer.cs`. This relatively simple UDP/TCP server runs within Thermo's Qtegra environment and facilitates remote control of the mass spectrometer either locally or over a shared network. The `RemoteControlServer.cs` model, over the past 1-2 years has proven itself as a easy and rapid way to control the new generation of mass spectrometers, allowing users to quickly move from instrument setup and installation to the end goal of making isotopic measurements. It is installed at numerous noble gas laboratories around the world and is currently the de facto method for interfacing third party software with Qtegra.

Running Pychron on any system is achievable by a variety of mechanisms. A simple entry point script is provided for developers to launch from the command-

line or their preferred IDE (Integrated Development Environment). For end users, a self-contained application is constructed using a built-in python script called `app_maker.py`. The resulting application bundle allows the user to launch from the dock or start menu. (Currently `app_maker.py` is only setup for Mac OSX, but variants for Windows and Linux are possible)

3.3 Distributed Control

Pychron embraces a distributed control paradigm for hardware automation and data collection. The three major components of a typical Ar-Ar laboratory, a UHV (Ultra High Vacuum) extraction system, extraction device, and mass spectrometer, are each controlled independently by a dedicated computer. All components are centrally controlled by a master application to perform the necessary data collection. Preprogrammed sequences (PyScripts) are stored on the master computer. The scripts are written in pure python and augmented with a set of Pychron specific commands and variables. See section 3.5 for further discussion of PyScripts.

Each component in the distributed control system has a public API that is served locally or on a LAN by a "remote control" instance. Pychron applications use either an independent or embedded gate-keeper application to handle communication. As mentioned in the introduction, communication and control of the mass spectrometer, in the case of the New Mexico Geochronology Research Laboratory (NMGRL), a pair of Argus VI, is accomplished by the embedded C# script `RemoteControlServer.cs`.

This model allows for a great degree of flexibility during both development and nominal operation. Delegating control to multiple applications facilitates independent development of each subsystem. It also allows laboratories

to use a mix of hardware and software that best serves their needs. The distributed control model makes it easy to share expensive components such as integrated laser systems, e.g. a Photon Machines Fusions system, between multiple extraction lines and mass spectrometers. A simple semaphore protocol is used to synchronize access to shared components. This feature eliminates the requirement for duplicate extraction devices and UHV extraction lines, allowing multiple master applications to access the shared component as soon as it is available.

3.4 Data Collection

Collecting isotopic data with Pychron starts by entering sample and irradiation metadata into the database. The user has multiple methods for accomplishing the data entry: 1) manual entry, 2) import from an Excel or text file or 2) import from a Mass Spec database. Importing from Mass Spec is advantageous if the user plans on processing their analyses with Mass Spec; this concept is elaborated below. Figure 3.1 illustrates the workflow Pychron uses for data collection and persistence.

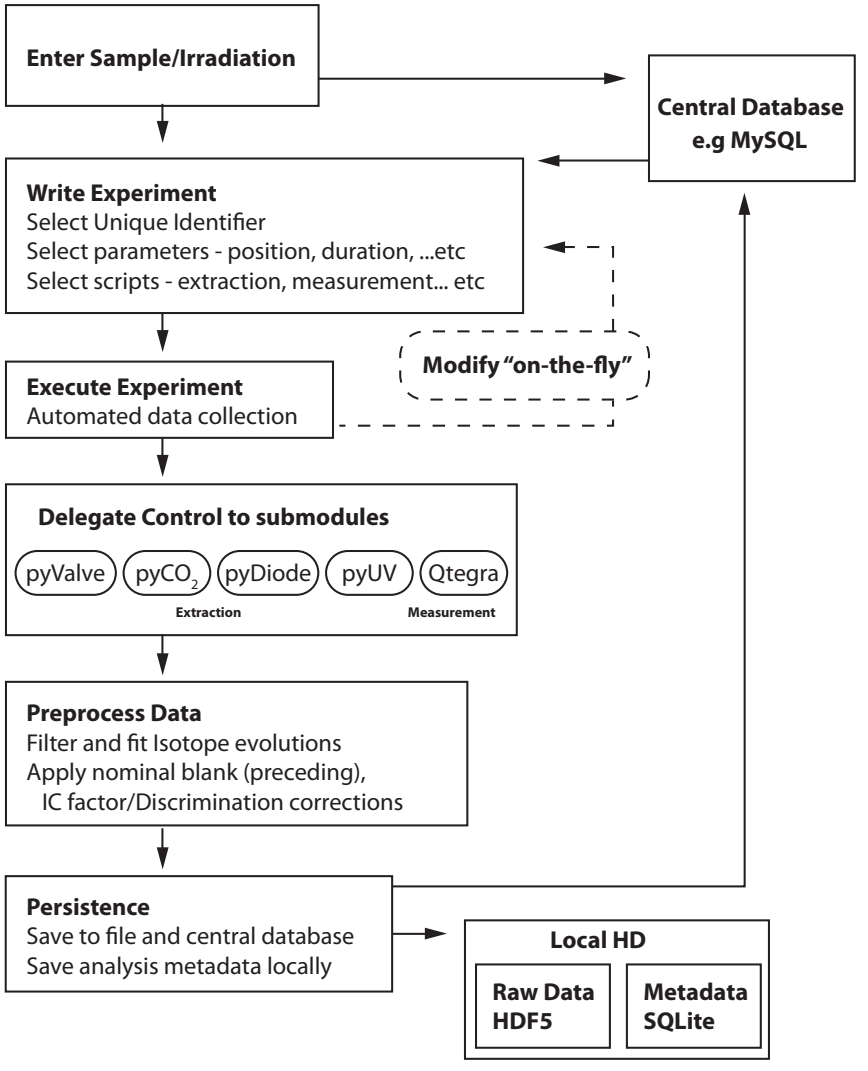


Figure 3.1. Data collection workflow. 1) Metadata entered into the database. 2) Experiment constructed and executed. 3) Data preprocessed and saved to the datdabase

After sample and irradiation information are saved to the Pychron database, the user can construct a sequence of planned automated analyses called an "Experiment". An "Experiment" is analogous to the "Multiple runs sequence" used by Mass Spec. Experiments are simple text files that the user can make with Pychron's built-in "Experiment Editor" or construct and edit her preferred text editor. The experiment file consists of two sections, 1) a top metadata section that specifies global properties, such as "delay between analyses", and 2) a section that lists the automated analyses to execute. An analysis entry consists of numerous values, most importantly a unique identifier (i.e. Labnumber) and a set of four PyScripts. The PyScripts are flexible augmented python scripts that define how an analysis is executed. Section 3.5 elaborates on the design and function of PyScripts. The four categories of PyScripts are 1) Extraction 2) Measurement 3) Post Equilibration 4) and Post Measurement. The extraction script defines how the sample gas is extracted, processed and delivered to the mass spectrometer. The measurement script defines the measurement procedure, e.g. multicollect or peak hop, number of points collected, etc. The post equilibration scripts defines what valves to open and close after the gas has been equilibrated and the mass spectrometer is isolated from the rest of the extraction line. Finally the post measurement script defines what actions to take following measurement completion; typically the only action is to evacuate the mass spectrometer using its attached ion pump.

Not all PyScripts are required and for special analysis cases one of more may be omitted. For example a static mass spectrometer background analysis only requires a measurement and post-measurement script because gas is neither extracted from a sample nor equilibrated with the mass spectrometer. Figure 3.2

shows an example `Experiment` file in text format and Figure 3.3 displays Pychron in the process of executing an experiment.

1. Metadata/Globals

```
username: MH
date: 2014-04-15 16:29:07.219730
mass_spectrometer: Jan
delay_before_analyses: 5
delay_between_analyses: 60
extract_device: Fusions CO2
tray:
load:
#==============================================================================
```

2. Analysis Queue

labnumber	sample	position	e_value	e_units	duration	cleanup	beam_diam	pattern	extraction	measurement	post_meas.	post_equilibration	
23433	FC-2	1	3	watts	30	60	0.75	pentagon.lp	co2	unknown400_120		pump_ms	pump_extraction_line
bu-FC-J	blank_unknown		1			30	60			co2	unknown400_120	pump_ms	pump_extraction_line
23433	FC-2	2	3	watts	30	60	0.75	pentagon.lp	co2	unknown400_120		pump_ms	pump_extraction_line
23433	FC-2	3	3	watts	30	60	0.75	pentagon.lp	co2	unknown400_120		pump_ms	pump_extraction_line
23433	FC-2	4	3	watts	30	60	0.75	pentagon.lp	co2	unknown400_120		pump_ms	pump_extraction_line
23433	FC-2	5	3	watts	30	60	0.75	pentagon.lp	co2	unknown400_120		pump_ms	pump_extraction_line
bu-FC-J	blank_unknown		1			30	60			co2	unknown400_120	pump_ms	pump_extraction_line
ba-01-J	blank_air								sniffair_x1	unknown600_180		pump_ms	pump_extraction_line
a-01-J	air								sniffair_x1	unknown600_180		pump_ms	pump_extraction_line
bc-01-J	blank_cocktail									cocktail_x1	unknown400_120	pump_ms	pump_extraction_line
c-01-J	cocktail								cocktail_x1	unknown400_120		pump_ms	pump_extraction_line
62736	VN-FCT-98	70	3	watts	30	60	0.75	pentagon.lp	co2	unknown400_120		pump_ms	pump_extraction_line
62736	VN-FCT-98	71	3	watts	30	60	0.75	pentagon.lp	co2	unknown400_120		pump_ms	pump_extraction_line
62736	VN-FCT-98	72	3	watts	30	60	0.75	pentagon.lp	co2	unknown400_120		pump_ms	pump_extraction_line
62736	VN-FCT-98	73	3	watts	30	60	0.75	pentagon.lp	co2	unknown400_120		pump_ms	pump_extraction_line
23434	FC-2	6	3	watts	30	60	0.75	pentagon.lp	co2	unknown400_120		pump_ms	pump_extraction_line
23434	FC-2	7	3	watts	30	60	0.75	pentagon.lp	co2	unknown400_120		pump_ms	pump_extraction_line
23434	FC-2	8	3	watts	30	60	0.75	pentagon.lp	co2	unknown400_120		pump_ms	pump_extraction_line
23434	FC-2	9	3	watts	30	60	0.75	pentagon.lp	co2	unknown400_120		pump_ms	pump_extraction_line
bu-FC-J	blank_unknown		1			30	60			co2	unknown400_120	pump_ms	pump_extraction_line
23434	FC-2	10	3	watts	30	60	0.75	pentagon.lp	co2	unknown400_120		pump_ms	pump_extraction_line

Figure 3.2 Example experiment file as viewed in a generic text editor. Section 1.) is used to define metadata and global attributes such as the user that wrote the experiment (username) and the amount of time to delay between analyses in seconds (delay_between_analyses). Section 2.) lists a set of analyses to collected with their associated extraction and measurement values. For example “e_value” defines the power to set the laser to during extraction. The PyScripts for each analysis are defined under “extraction”, “measurement”, etc. Additional columns are used during normal operation but are ommited here for clarity

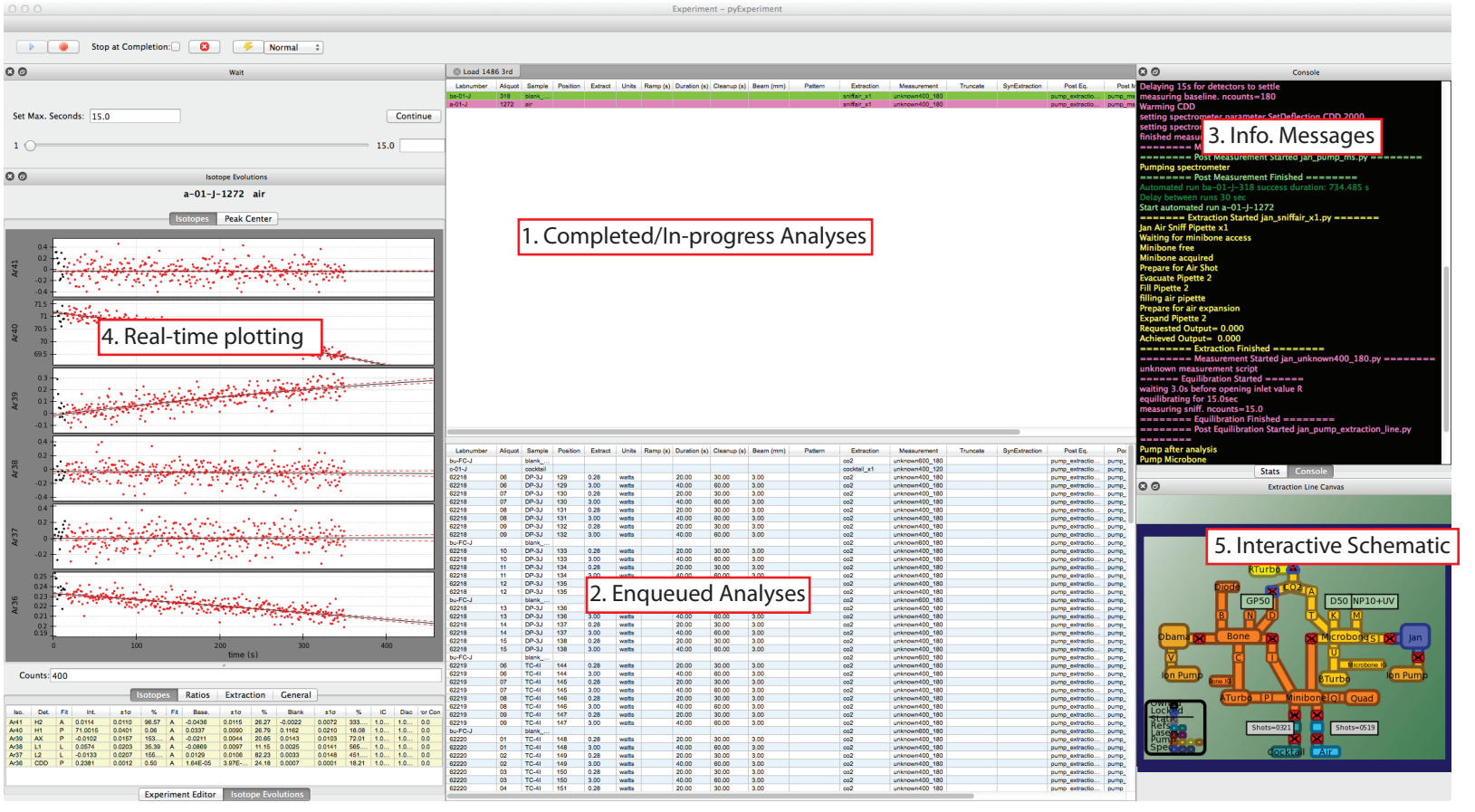


Figure 3.3 Pychron in the process of executing an Experiment. 1). List of finished (green) and inprogress (magenta) analyses. 2) list of enqueued analyses 3). Color coded list of information messages. 4) Real-time graphing and preprocessing of isotope measurements 5) Interactive Extraction line schematic

Measuring isotopic data would be of limited value if it could not be stored and retrieved with relative ease. Data must be robustly persisted and associated with the relevant metadata. Therefore, Pychron saves analyses to multiple locations in and in multiple formats. During data collection, the raw isotopic data is continuously saved locally to an HDF5 file using the pytables package (Alted et al., 02). Following the completion of the analyses raw, and minimally processed data is uploaded to primary and secondary databases located on one or more dedicated servers. Currently only the Mass Spec schema is implemented as a secondary database store but given the required information other databases are possible. Typically a MySQL database is used, however, all database backends supported by SQLAlchemy, including MSSQL and PostgreSQL are theoretically available.

In addition to the central databases, Pychron saves a metadata log locally to a lightweight SQLite database (`http://www.sqlite.org/`) for redundancy and recovery of analyses that failed to successfully save to the central database, for example if network connectivity was lost during the saving process.

3.5 PyScripts

Automated data collection is an essential aspect of the Ar-Ar technique. Repeatable sequences of hardware actions such as opening and closing valves and positioning and firing lasers are performed numerous times during the analysis of a single sample. During the course of one Ar-Ar experiment, tens to hundreds of individual analyses maybe required. Automated data collection allows Ar-Ar laboratories to function continuously, greatly increasing analytical throughput and the efficiency of a laboratory's analytical time.

Pychron provides a mechanism for preprogramming automated sequences with a feature called, "PyScripts". PyScripts are pure python scripts augmented with a set of pychron specific commands and variables. For example, sample gas is manipulated and transferred using a series of `open(ValveName)` and `close(ValveName)` commands. Because PyScripts are pure python, all the power of python is included by default. Users can modify PyScripts with python control structures, such as `if-else` conditionals, `for` and `while` loops. Users are allowed to perform math operations and declare variables. Complicated tasks can be bundled into anonymous `(lambda)` or named `(def)` functions. Object-oriented techniques are possible using python's `class` construct. Any module or package located on the users `PYTHONPATH` is also accessible from within a PyScript. Control is passed to subroutinues using the `gosub` command, which enables a great degree of code reusability. PyScripts are typically executed from within the `Experiment` context. The experiment file defines the values for Pychron specific variables. For example the experiment file defines two extraction related values, `extract_value` and `extract_units`. When an analysis is executed the extraction PyScript is provided with a context object (python dictionary) that contains the values for `extract_value` and `extract_units` that are directly reference-able from within the PyScript.

The use of standard python syntax means that a custom parser is not necessary. Using python's built-in parser and abstract syntax tree generator, complicated patterns are readily added by any user familiar with the python language. No longer is there a need to learn an esoteric, typically fragile, built-in scripting language, such as was used by previous software solutions. For example, Mass Spec's scripting language is custom built and lacks numerous features of a true scripting language, such as nested conditionals and control structures, variable

assignment and function declaration. These features come built-in with PyScripts and are robustly implemented as core components of the Python Language Services.

3.6 Data Processing

Following the automated collection of isotopic data, additional processing is necessary to arrive at final publishable results. In the case of $^{40}Ar/^{39}Ar$ geochronology multiple post-processing steps are required to transform an isotopic analysis into a geologic age, including instrument background correction and determination and application of detector intercalibration factors. To accomplish the necessary post-processing steps, Pychron uses a significantly different workflow compared to other $^{40}Ar/^{39}Ar$ software products such as Mass Spec, Isoplot and ArArCalc. Pychron uses Graphically User Interfaces, GUIs, and procedures more commonly encountered in software Integrated Development Environments (IDE) than typically encountered in the other in $^{40}Ar/^{39}Ar$ data processing software. For example when constructing analysis plots such as Ideograms, instead of multiple selection and configuration dialogs as with Mass Spec, a majority of the user interaction occurs with a single "Task" window (Figure 3.4). A Task window consists of a configurable and movable set of "Panes" and an "Editor Area". The most used pane is the "Browser." This interface allows the user to quickly navigate and filter the available analyses. Typically these analyses are stored in a centralize RDBMS. Offline access of data archives is also possible. The "Editor Area" provides context specific "Editor" tabs for viewing the selected dataset. A "Controls" pane that is linked to the selected editor allows the user to interact with the editor and control what is displayed or how

to proceed with data processing. Graphical editors have a comprehensive set of controls accessible from the “Plot Options” pane, allowing the user to configure the appearance and visibility of graphical elements.

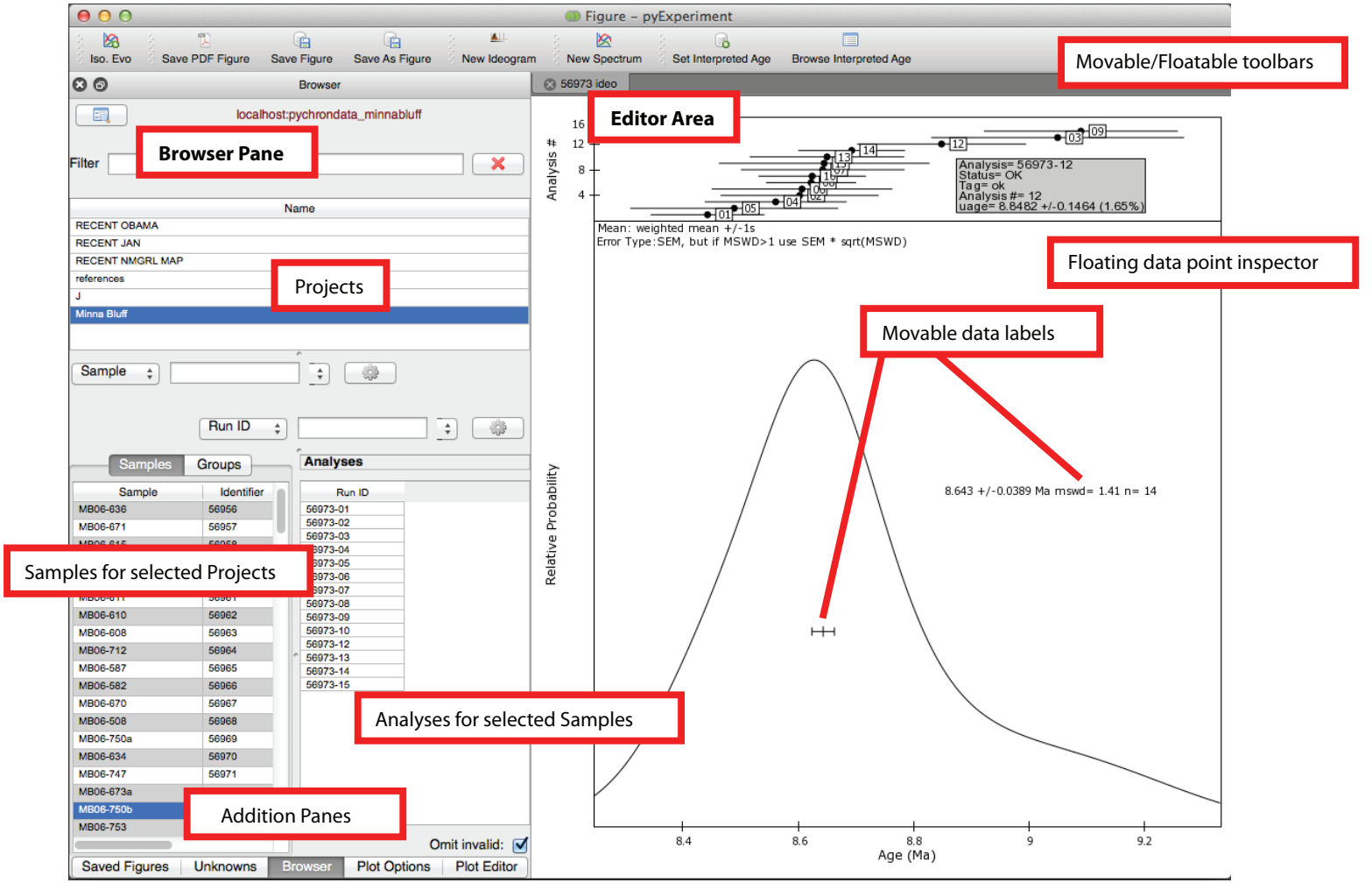


Figure 3.4 Ideogram Task Window. The main components are the "Browser Pane" and the "Editor Area." The Browser Pane is used to select a set of analyses to plot in the Editor Area. Multiple editor tabs may be added to the Editor Area to view multiple sets of analyses simulateously

During the data reduction process of $^{40}Ar/^{39}Ar$ geochronology the user commonly makes many subjective and objective choices. Pychron keeps a granular record of all of these choices so that not only are the decisions recorded for traceability but the user also has the ability to revert to any point within the processing history. A typical frustrating and time consuming aspect of $^{40}Ar/^{39}Ar$ data processing is determining associated reference analyses such as when defining system blank/background corrections. Pychron offers a convenient feature that automatically selects references analyses for a set of unknown analyses. The user only has to select the set of unknowns she wishes to fit and Pychron searches the database for the appropriate reference analyses. The user has complete control of the search process, specifically the ability to define the type of reference analysis and the upper and lower limits for searching. In the event further modification to the automatically generated reference list is necessary, the user may manually prune or add to the list.

When the user is satisfied with the result for an analysis or group of analyses she may define an "interpreted age" for the set. The interpreted age may represent the best estimate for the eruption age of a given sample, or it may represent the time at which the sample cooled below a given temperature. Along with the numerical age, 1σ error and age type, metadata such as the set of analyses used to calculate the age, the MSWD, an average K/Ca value, etc are stored in the database. For publication and dissemination, groups of interpreted ages are later exported to PDF and/or Excel, both as summary and analysis tables. Figure 3.5 provides a graphical representation of the $^{40}Ar/^{39}Ar$ data reduction process in Pychron.

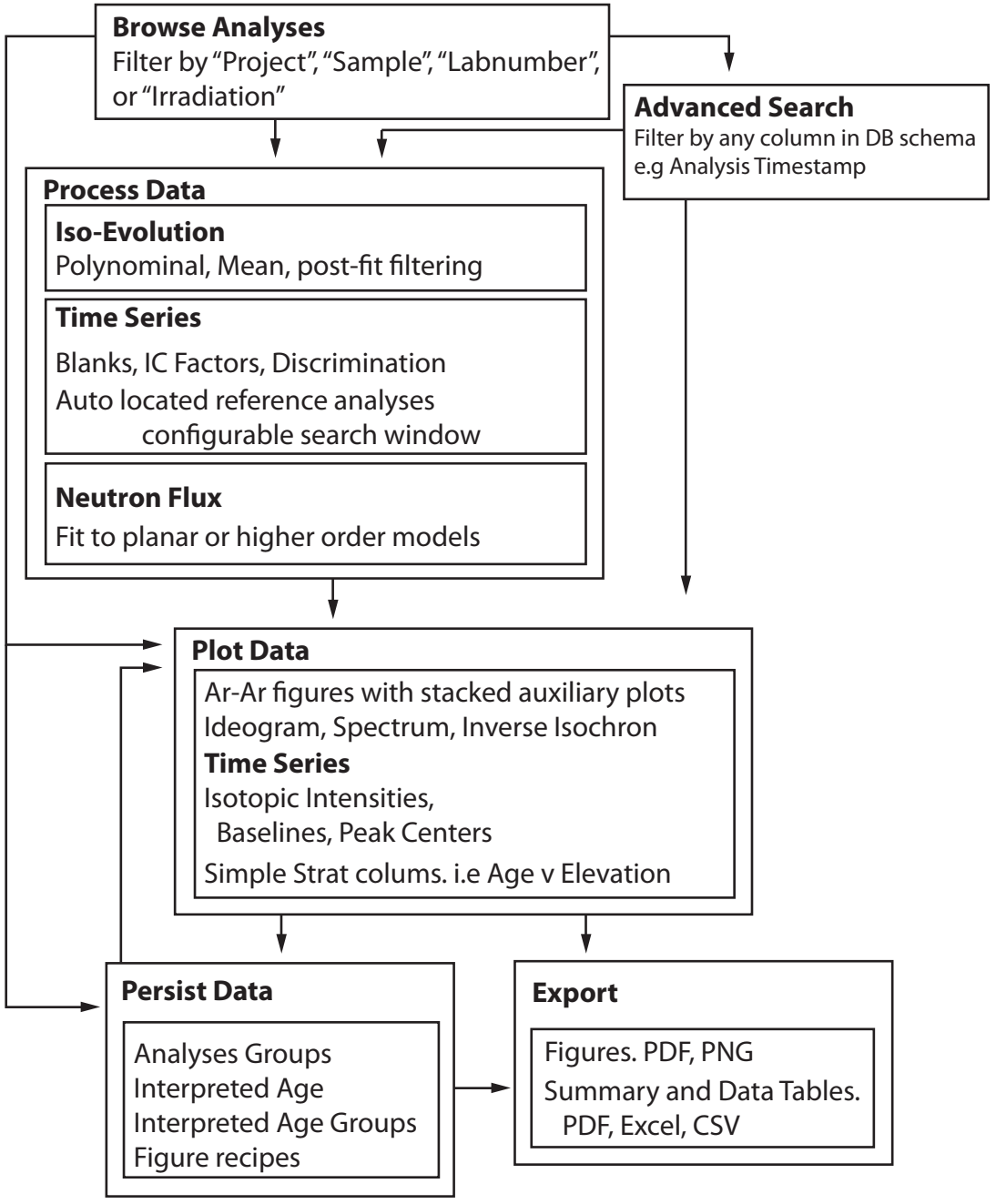


Figure 3.5 Data processing workflow. Processing starts at the top by first browsing and selected a set of analyses. A number of processing steps may be performed on this data set, such as correction for system backgrounds. Finally analyses are saved to a database and/or locally exported in a variety of formats

3.7 Calculations

This sections outlines the major statistical and geochronological equations and alogrithms used by Pychron to process raw isotopic data into geologic ages. Pychron makes use of the tremendous efforts within the scientific python communities to eliminate duplicating previous efforts, a philosophy commonly referred to as "don't reinvent the wheel." Pychron uses the Uncertainties package (Lebigot, 2010) to handle much of the error propagation. This convenient and powerful package automatically propagates uncertainties through an algorithm according to linear error propagation theory. Only in a few cases is simple algebraic error propagation necessary.

Calculation of isotopic intensities by Ordinary Least Squares regression of time vs intensity is handled by Statsmodels (Seabold and Perktold, 2010). The uncertainty on the intensity is calculated following Draper and Smith (1981) (chapter 4.5 page 130). The variance in Y for a general linear regression model is calculated as

$$\begin{aligned} V(\hat{Y_0}) &= [1, X_0] \begin{bmatrix} V(b_0) & cov(b_0, b_1) \\ cov(b_0, b_1) & V(b_1) \end{bmatrix} \begin{bmatrix} 1 \\ X_0 \end{bmatrix} \\ &= X_0'(X'X)^{-1} X_0 \sigma_{fit}^2 \end{aligned} \tag{3.1}$$

$$\sigma_{fit}^2 = \frac{\sum (\bar{X} - X_i)^2}{n - q} \tag{3.2}$$

Generic statistical calculations, when possible, are handled by Scipy and manipulation of arrayed data is handled by the extremely powerful and popular Numpy package (Jones et al., 2001). For example, Average and weighted

mean values are calculated using Numpy's "average" function. Statistical distributions, such as the reduced Chi^2 used for validating MSWD values, are provided by the scipy.stats module.

The "discrimination" correction, a process used to correct for measurement bias based on isotopic mass, is applied as a power law. For example, the discrimination corrected intensity for ^{40}Ar is

$$^{40}Ar_{disc} =^{40} Ar_o D_o^{m_{40}-m_{ref}} \tag{3.3}$$

where $^{40}Ar_o$ is the blank and baseline corrected intensity, m_{40} is the atomic weight of ^{40}Ar (39.9642) and m_{ref} is the mass of the reference isotope, typically ^{36}Ar (35.9675).

The age calculation algorithm takes a simple and natural form and uses the uncertainties package for robust first principles error propagation.

Ages are calculated using

$$age = \frac{1}{\lambda_K} \ln(JF + 1) \tag{3.4}$$

where J is an estimate of the neutron flux received by the sample and F is the daughter-parent ratio

$$F =^{40} Ar * /^{39} Ar_K \tag{3.5}$$

For a detailed view of the algorithm used to calculate $^{40}Ar*$ and $^{39}Ar_K$ please refer to `argon_calculations.py` module located in Pychron's `processing` package.

^{37}Ar and ^{39}Ar decay factors are calculated following McDougall and Harrison (1988) (p.75 equation 3.22)

$$d_{37} = \frac{A}{B} \tag{3.6}$$

where

$$A = \sum P_i t_i$$
$$B = \sum \frac{P_i(1 - e^{(-\lambda_{37} t_i)})}{\lambda e^{(\lambda_{37} d_i)}}$$

P_i is a power coefficient and is typically 1, D_i is the duration of the irradiation segment, and λ_{37} is the decay constant for ^{37}Ar. The decay factor for ^{39}Ar is calculated by substituting λ_{39} for λ_{37}. McDougall and Harrison (1988) suggest that t_i is calculated as $t_i = t_{analysis_i} - t_{irradiation_i}$ where $t_{analysis_i}$ is the time of analysis and $t_{irradiation_i}$ is time of the end of irradiation of segment i. However, we prefer to define $t_{irradiation_i}$ as the **start time** of irradiation segment i, which is equivalent to the Mass Spec definition.

Irradiation interference corrections for K and Ca are iteratively calculated using

```
for _ in range(5):
    ca37 = s37 - k37
    ca39 = ca3937 * ca37
    k39 = s39 - ca39
    k37 = k3739 * k39
```

where s37 and s39 are the corrected measured intensities for m/z 37 and 39 (m/z=Mass/Charge). (Corrected, in this context means corrected for baseline, blank, and detector intercalibration.) Atmospheric and Cl-derived ^{36}Ar are iteratively calculated using

```
for _ in range(5):
    ar38atm = atm3836 * atm36
    cl38 = s38 - ar38atm - k38 - ca38
    cl36 = cl38 * m
    atm36 = s36 - ca36 - cl36
```

Cumulative probability diagrams are constructed by summing the gaussian probability for each analysis. The probability curve is calculated as

$$f(x, \mu, \sigma) = \frac{1}{\sigma\sqrt{2\pi}} e^{\frac{-(x-\mu)^2}{2\sigma^2}} \tag{3.7}$$

where μ and σ are the age and uncertainty of the analysis, respectively.

The probability for any x along the curve is calculated using

$$p(x) = \sum f(x, \mu_i, \sigma_i) \tag{3.8}$$

Kernel Density ideograms are constructed using the `gaussian_kde` function located in the `scipy.stats.kde` module. The Probability Density Function is calculated by passing a list of ages to `gaussian_kde`. The curves is then generated by evaluating the PDF for an array of x values. Multiple methods are available for calculating the estimator bandwidth. Pychron defaults to the "Scott" estimator (Scott, 2009),

$$b = n^{\frac{-1}{d+4}} \tag{3.9}$$

where n is the number of data points and d the number of dimensions

Intercepts and errors for inverse isochrons can be calculated using the algorithms defined in Reed (1989) or Mahon (1996). Pychron uses the Reed (1989) method by default.

Error ellipses for the inverse isochron calculated from the 1σ x and y uncertainties and a correlation coefficient between x and y. The correlation coefficient ρxy is calculated following McDougall and Harrison (1988) as

$$\begin{aligned} \rho xy &= \sqrt{\frac{1}{(1+(\frac{s_{36}}{s_{40}})^2)(1+(\frac{s_{39}}{s_{40}})^2)}} \\ s_m &= \frac{\sigma_m}{I_m} \end{aligned} \tag{3.10}$$

where I_m and σ_m are the isotopic intensity and uncertainty of mass m, respectively

The rotation of the error ellipse is calculated using

$$\theta = \frac{1}{2}\tan^{-1}\left[\frac{2\cdot\rho xy\cdot\sigma_x\cdot\sigma_y}{a(\sigma_x^2-\sigma_y^2)}\right] \tag{3.11}$$

if $\sigma_x > \sigma_y$ the lengths of the semi-major (a) and semi-minor(b) axes are calculated as

$$\begin{aligned} a &= \sqrt{max(\lambda)} \\ b &= \sqrt{min(\lambda)} \end{aligned} \tag{3.12}$$

where λ is the eigenvalues of the covariance-variance matrix. if $\sigma_x < \sigma_y$ b is the semi-major axis and a is the semi-minor axis. The lengths of the semi-major and semi-minor axes are multiplied by a scaling factor k to yield a confidence ellipse of specified probability (95% $k = 2.4477$). The scaling factor k for a given probability p (e.g 95%=0.95) is determined from the chi-squared distribution

$$k = \sqrt{-2ln(1-p)} \tag{3.13}$$

The MSWD value for inverse isochrons is calculated using the numerical recipe provided by Press (2007). The weighting factors, however, are modified following Mahon (1996), to account for correlated errors.

The neutron flux for samples is estimated with Ordinary or Weighted Least Squares Regression. Two models are available 1) Planar or 2) Paraboloid. The standard error in predicted values is calculated using a Monte Carlo approach or using the quadratic sum of equations 3.1 and 3.2

3.8 Advanced Features

Pychron features multiple advanced features heretofore not available in $^{40}Ar/^{39}Ar$ geochronology software. These include 1) section flooding, 2) laser power mapping and 3) the integration of machine vision with laser systems.

Two-dimensional schematic representations of Ultra High Vacuum (UHV) extraction systems are an important aspect of $^{40}Ar/^{39}Ar$ data collection software. These schematic representations are usefully not only for normal operation, providing concise visual illustrations of commonly complex three-dimensional structures, but also quickly convey the basic layout of the extraction system to students, visitors, and policy makers. Pychron uses an underlying graph data structure to represent the extraction line. Staging sections, valves, lasers, pumps, etc. are represented as nodes and the UHV plumbing and connections as edges. Using a graph data structure to represent the extraction line facilitates two useful features: 1) "Section flooding" and 2) flexible volume calculation. The section flooding feature adds a highly visible way of indicating which sections of the extraction line are connected. Knowing which components are connected and summing their associated volumes readily leads to an accurate volume calculation of any extraction line configuration.

The section flooding process starts by doing a breadth-first traversal of the extraction line graph. The state of each node is checked during the traversal

before continuing. If the node's state is False, e.g. a closed valve, traversal of the current branch stops. Nodes that represent pumps, lasers or spectrometers are each assigned a value (i.e. a color). During the traversal the value of the node is checked against a global value for the entire section and the node with the highest precedence is applied to the entire section. When a valve is closed two subtrees are generated one for each side of the valve, and the subsections are colored and volumes calculated accordingly. Figure 3.6 provides a graphical illustration of the section flooding process.

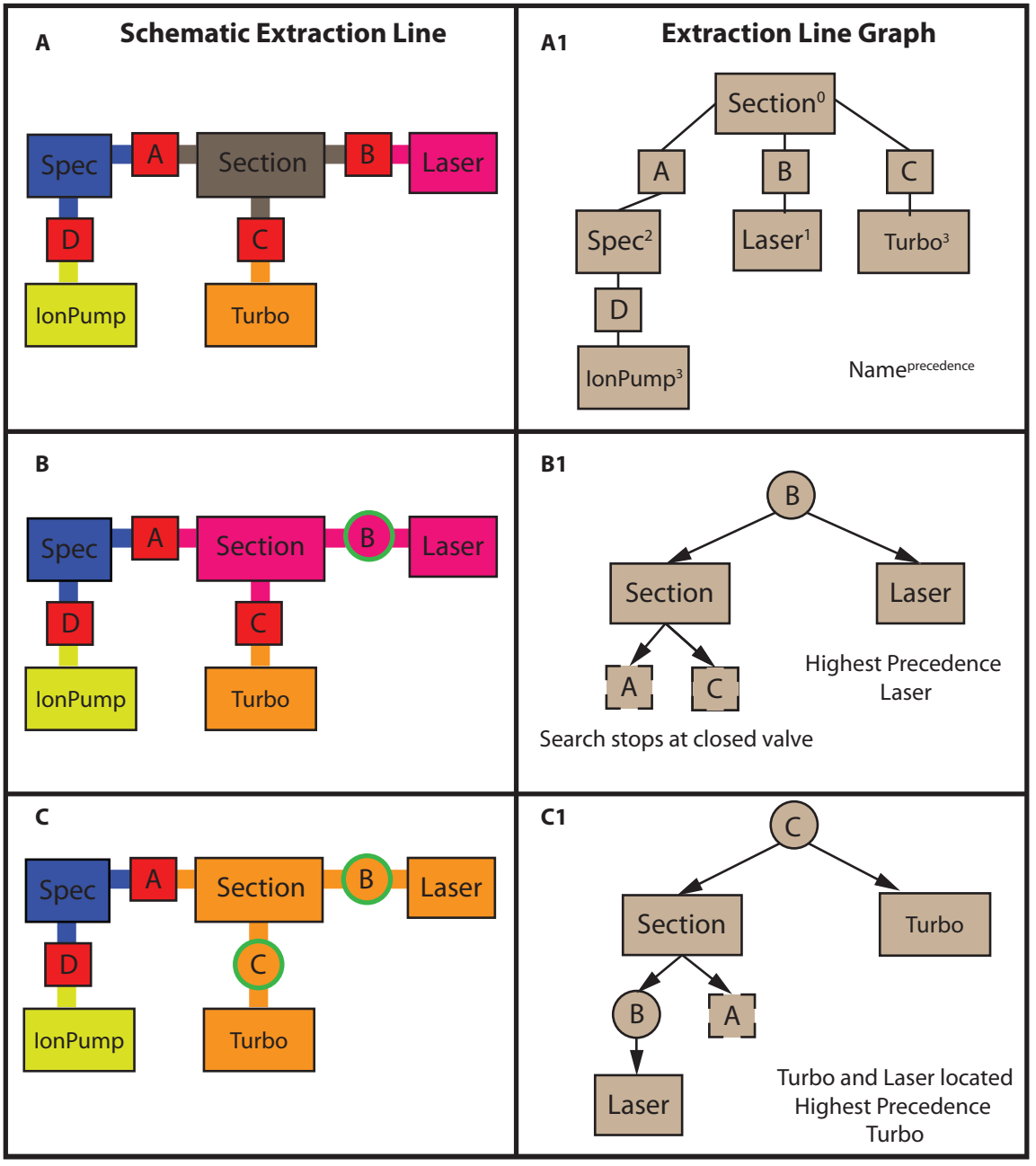


Figure 3.6 Schematic and Graph representation of a basic extraction line. A.) Default state, all valves closed. The color of each component determined internally. B.) Valve B opened. B1.) The associated graph representation. A Breath-First Traveral (BFT) is executed to locate the component of highest precedence. The color of this component is applied to all connected components in the current graph. C.) Valve C opened. C1.) A new graph constructed with Valve C as the root node. BFT locates Turbo has the highest precedence component.

Pychron provides multiple advanced features with respect to the characterization and operation of the laser systems using in $^{40}Ar/^{39}Ar$ geochronology. For laser characterization, Pychron provides an integrated laser-power mapping feature. The power distribution of a laser beam is an important characteristic when analyzing geologic materials. Knowledge of the laser power distribution is necessary to assess the homogeneity of sample heating, a highly desirable property in $^{40}Ar/^{39}Ar$ geochronology and necessary for accurate interpretation of isotopic results. Many $^{40}Ar/^{39}Ar$ laboratories have no quantitative method for measuring the power distribution and commonly resort to imprecise qualitative techniques such as lasing a piece of plexiglass or laser alignment paper. Pychron offers a relatively inexpensive but quantitative and precise measurement of IR laser (810nm-10.6μm) power distribution using a feature called "Power Mapping". Figure 3.7 provides a schematic representation of the power mapping process. A copper plate with a pinhole aperture is mounted over an inexpensive thermopile laser power meter. Pychron then slowly rasters the laser beam over the aperture gradually constructing a map of the power distribution. Pychron offers multiple methods for viewing the resulting data including contour maps, cross sections and 3D images.

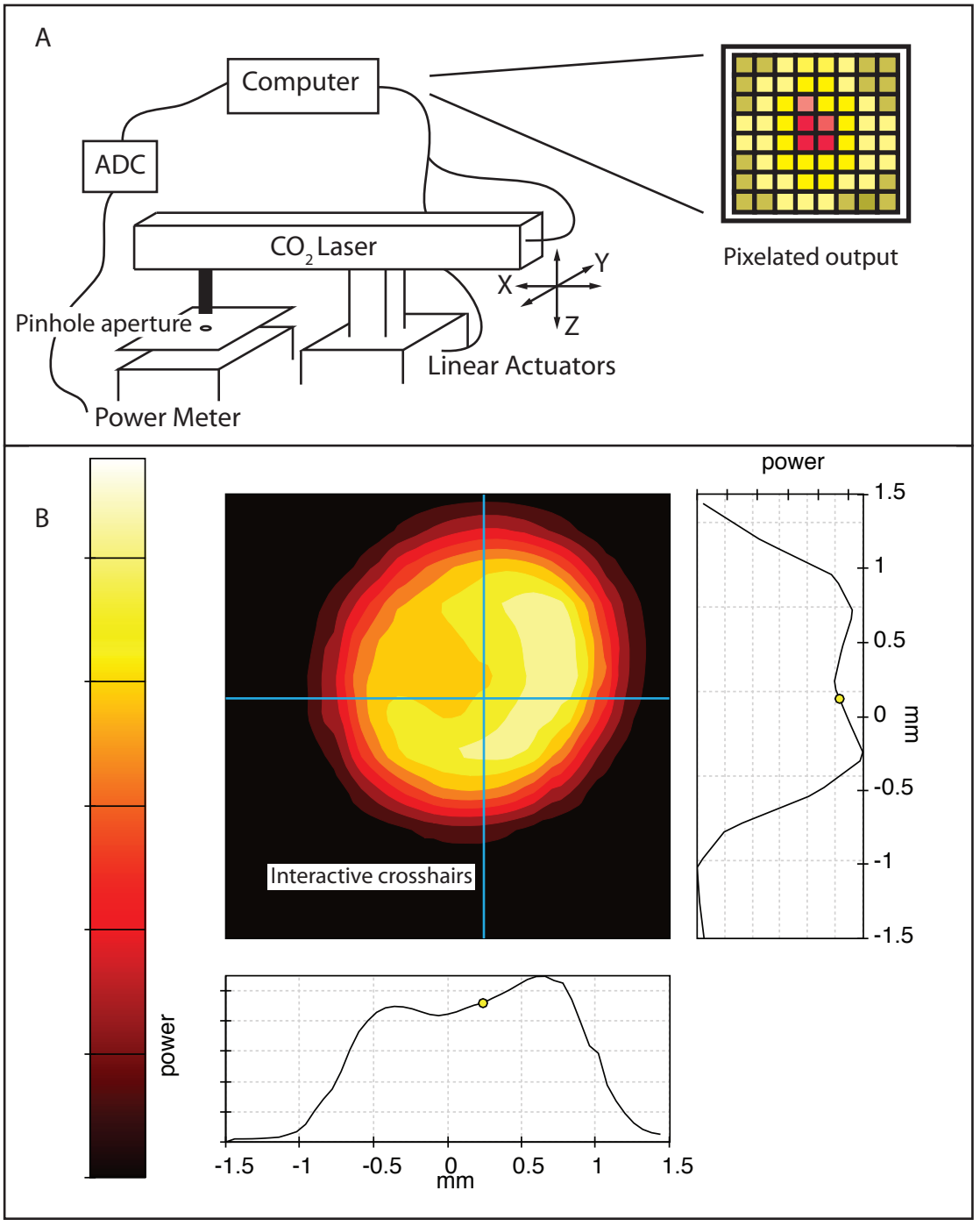


Figure 3.7 A) Schematic diagram of a Photon Machines Fusions CO_2 laser system in power mapping configuration. Computer controlled linear actuators move entire laser over a pinhole aperture and thermopile power meter to map the power distribution. The voltage output from the power meter is converted to a digital signal with an inexpensive analog to digital converter and recorded by the computer. B) Pychron's viewer of the resulting data. Movable crosshairs allow the user to view X and Y cross-sections interactively.

The availability of compact digital video cameras mounted on laser systems allows the use of common machine vision techniques for $^{40}Ar/^{39}Ar$ geochronology. Pychron uses machine vision for two unique features 1) auto laser targeting and 2) quantitative luminosity measurement. NMGRL uses a Photon Machines Fusions CO_2 system for routine $^{40}Ar/^{39}Ar$ total fusion analysis. This system differs from previous CO_2 configurations in that it moves the entire laser over a stationary sample chamber instead of the chamber moving under a stationary beam. The relatively large inertia of the laser and the use of encoder-less drive motors results in inaccurate automated positioning of the laser beam compared to the previous standard techniques using movable sample stages. To overcome the small (<10 mm) but significant positioning inaccuracy, Pychron uses machine vision to automatically reposition the beam over the desired sample. The auto positioning process is illustrated in figure 3.8. The process starts by first moving the laser to a nominal position. While positioned at the nominal location, an image of the sample well is captured and analyzed to locate its center. The offset between the current laser position and the desired position (the center of the sample well) is determined and the laser is repositioned to place the center of the laser beam directly over the center of the sample well. Lastly, an image of the new location is analyzed to verify correct positioning and minor adjustments are performed as required.

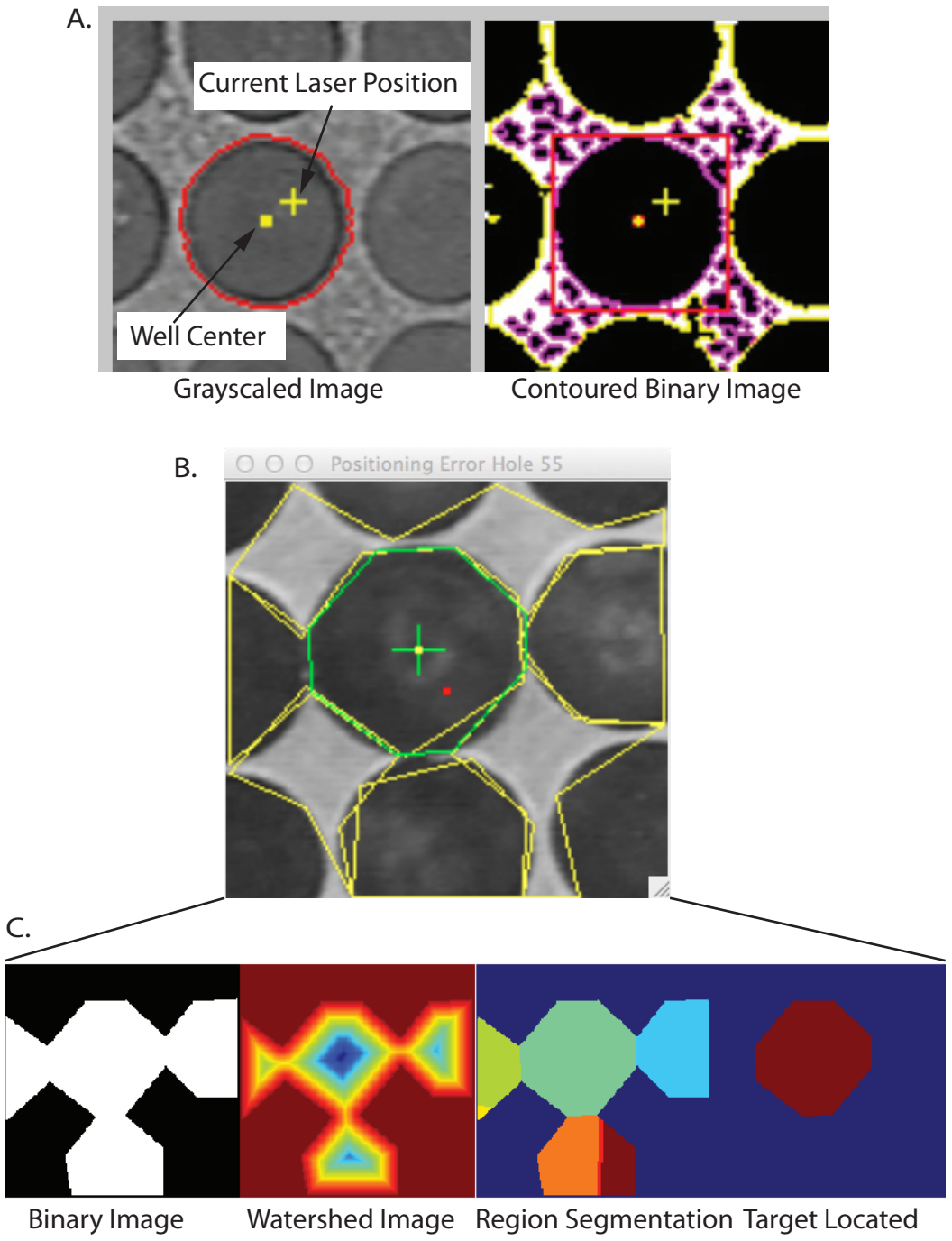


Figure 3.8 Auto laser targeting. A) Simple case where sufficient separation between wells exist. B) Sample wells connected requiring further processing to locate the sample center. C)The watershed algorithm is used to distinquish multiple connected wells.

Machine vision algorithms are also used in an experimental Pychron feature that measures the luminosity of a sample during lasing. The purpose of this measurement is to use it in a feedback loop to moderate the heating of a sample. A common task in $^{40}Ar/^{39}Ar$ geochronology is to incrementally heat a sample to reveal internal characteristics. Precise and accurate temperature control is typically accomplished with a thermocouple or optical pyrometer combined with a standard industrial PID controller. This technique, however, is not practical when using a CO_2 laser to heat single crystals, because 1) mounting individual thermocouples to hundreds of crystal is not feasible and 2) accurate temperature measurement is not possible using optical pyrometry with a CO_2 laser because of interference of the laser beam with the optical pyrometry. An additional issue when trying to incremental heat single crystals is the variable degassing of crystals of different mass and shape at constant laser power. Pychron attempts to resolve these issues using a high-resolution camera to measure the luminosity of the sample as a proxy for temperature and modulates the laser power to produce a constant brightness per unit area.

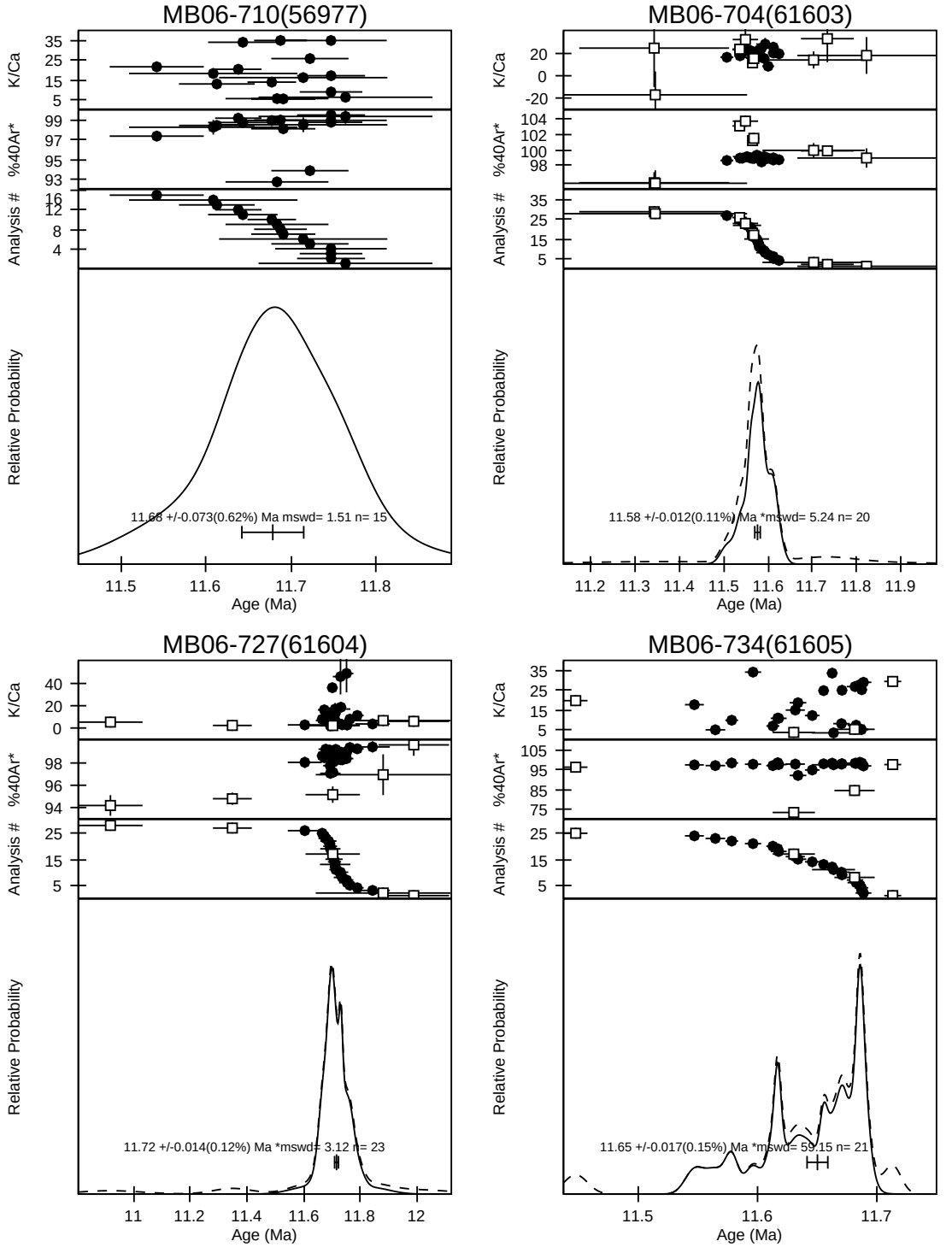
3.9 Conclusions

Pychron is full-featured open-source package for automated $^{40}Ar/^{39}Ar$ data collection and processing. Pychron is designed for ease of use for both user and developer, using modern software development tools and techniques. Pychron is suitable for $^{40}Ar/^{39}Ar$ geochronology and other noble gas laboratories seeking an alternative to Mass Spec, ArArCalc/ArArSuite, or other existing in-house developed software packages. Pychron offers many features not available in Mass Spec or other proprietary products, including coordinated and

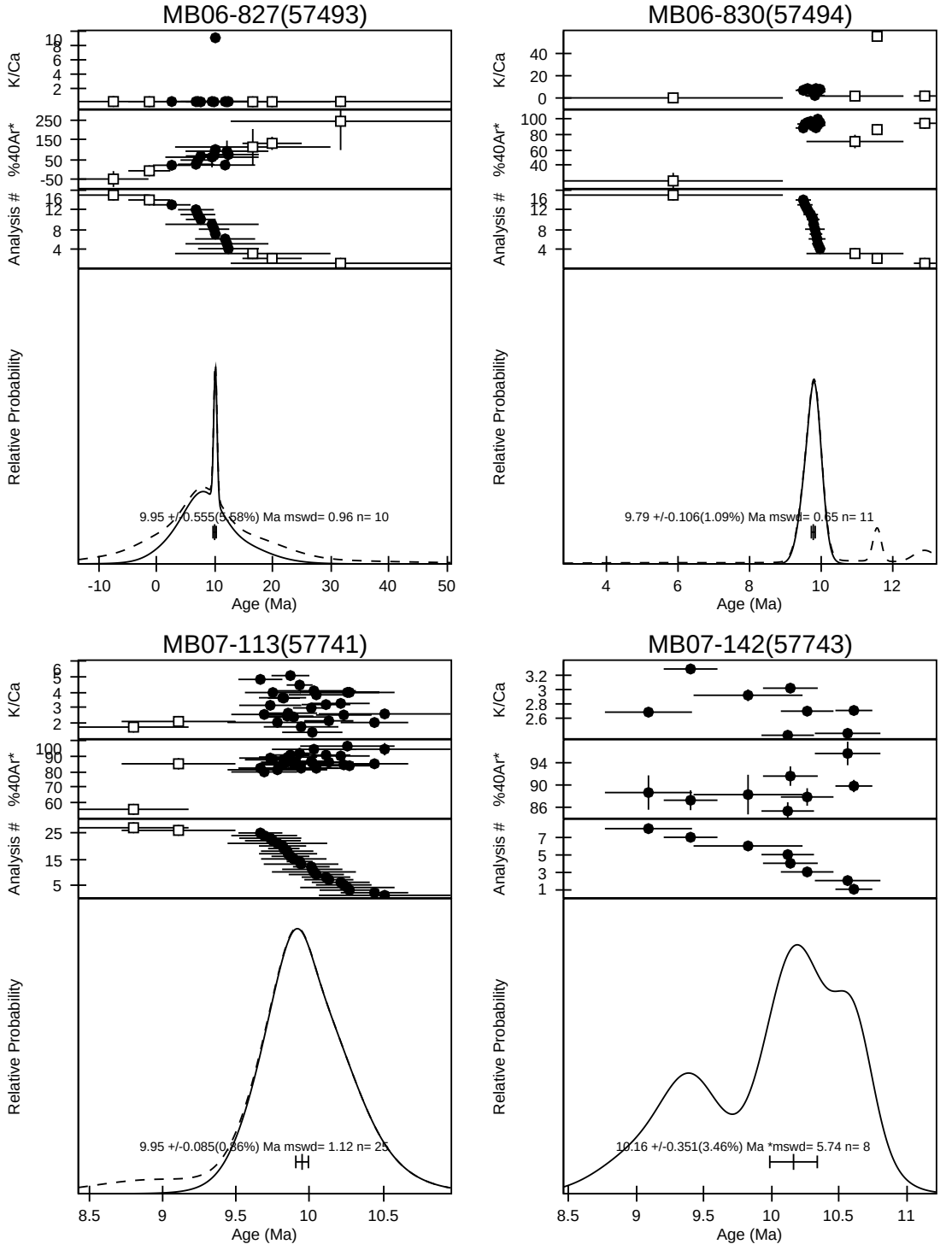
synchronized access to shared resources by multiple connected mass spectrometers during data collection, integration of machine vision with laser systems, and scriptable and automated data processing. Pychron is actively supported and developed by New Mexico Geochronology Research Laboratory, where existing features are continuously improved and new features regularly added. Pychron is entirely open source, licensed using the Apache 2.0 free software license, and publicly available for download and forking on GitHub.

APPENDIX A

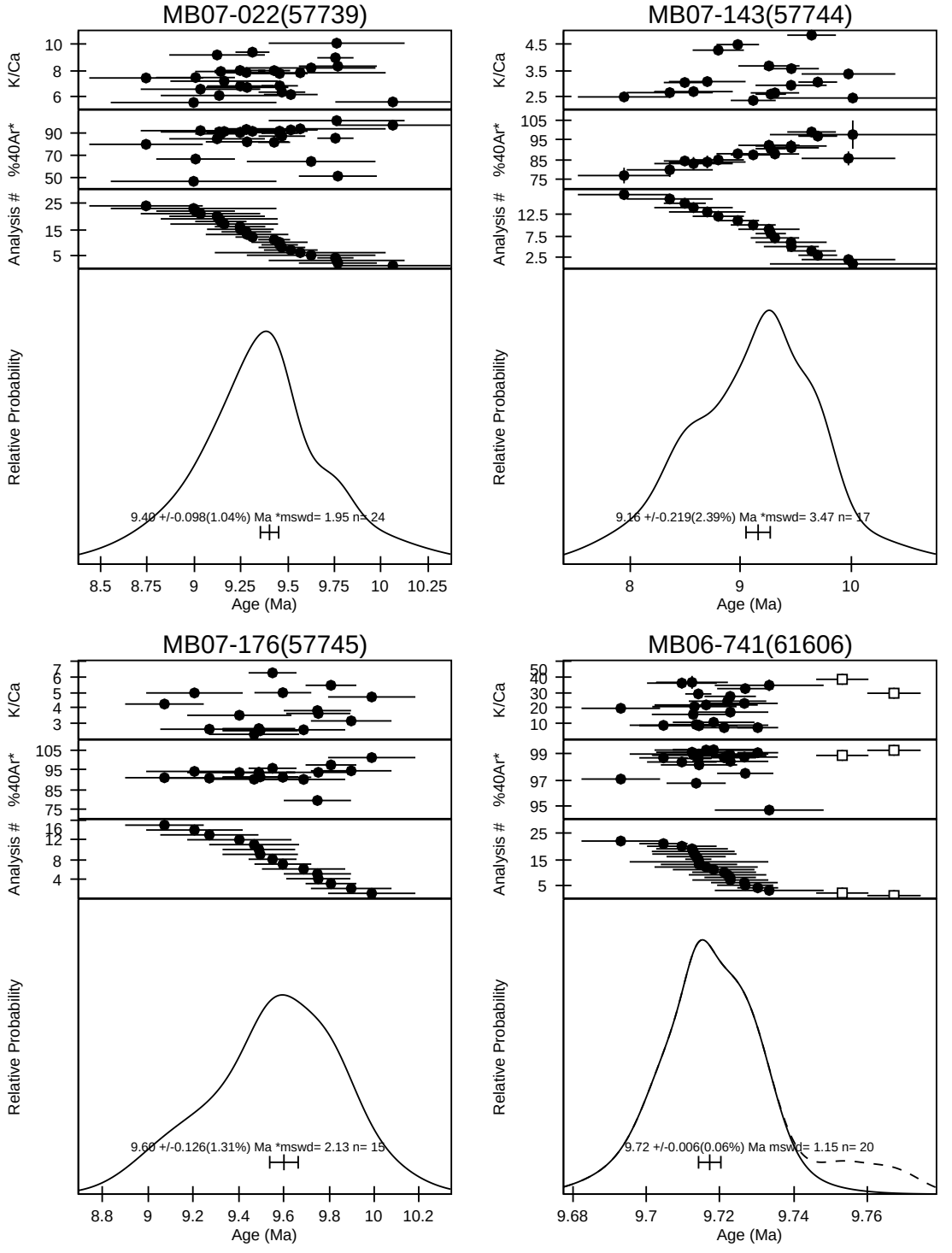
$^{40}Ar/^{39}Ar$ FUSION FIGURES



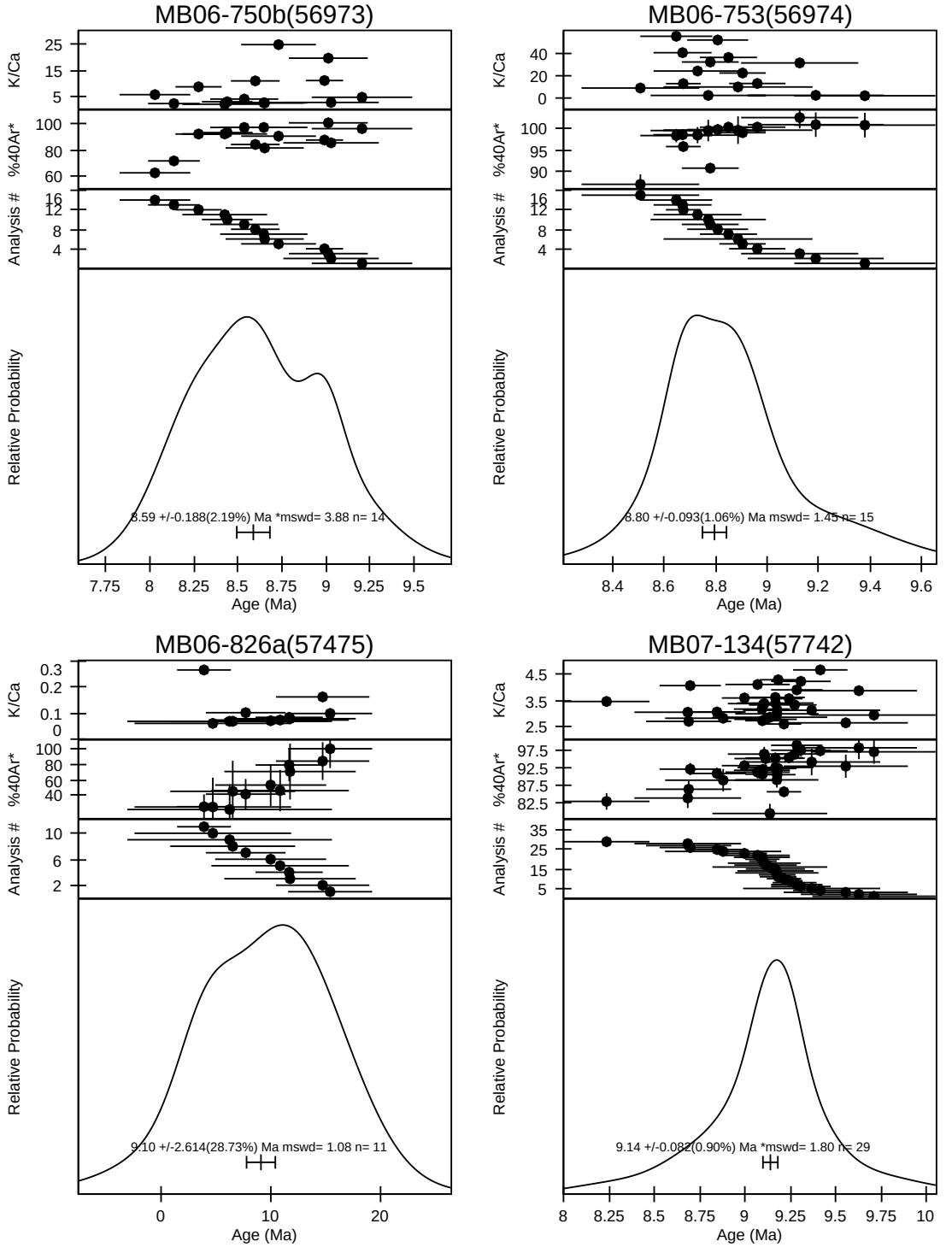
Mean: weighted mean +/-2σ Data: +/-1σ. Error Type:SEM, but if MSWD>1 use SEM * sqrt(MSWD). Analyses omitted from calculation indicated by open squares. Dashed line represents cumulative probability for all analyses



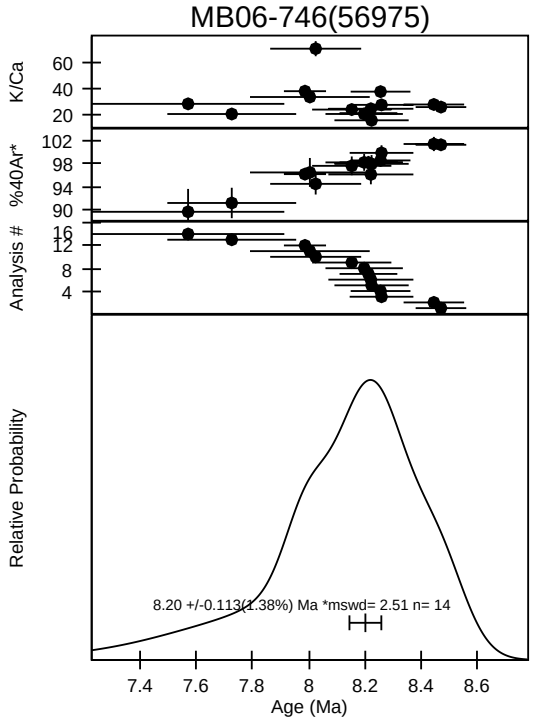
Mean: weighted mean +/-2σ Data: +/-1σ. Error Type:SEM, but if MSWD>1 use SEM * sqrt(MSWD). Analyses omitted from calculation indicated by open squares. Dashed line represents cumulative probability for all analyses

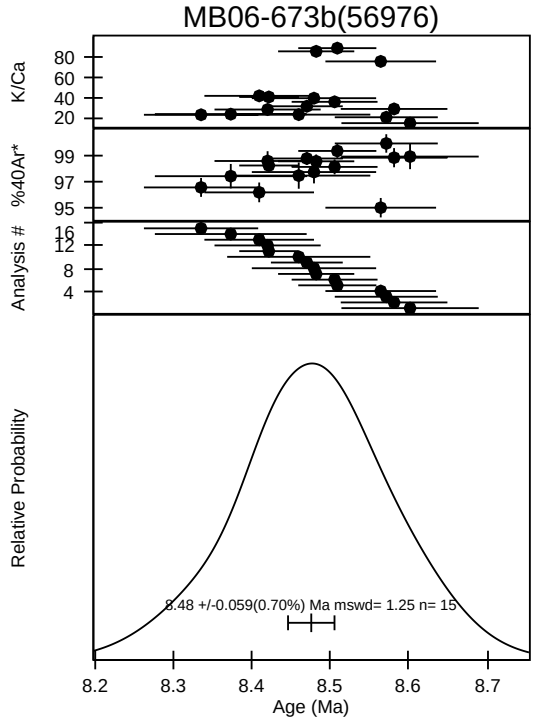


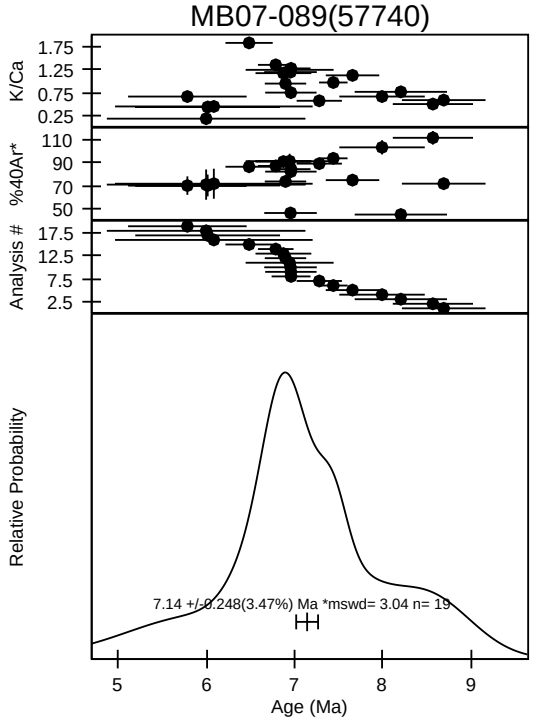
Mean: weighted mean +/-2σ Data: +/-1σ. Error Type:SEM, but if MSWD>1 use SEM * sqrt(MSWD). Analyses omitted from calculation indicated by open squares. Dashed line represents cumulative probability for all analyses



Mean: weighted mean +/-2σ Data: +/-1σ. Error Type:SEM, but if MSWD>1 use SEM * sqrt(MSWD). Analyses omitted from calculation indicated by open squares. Dashed line represents cumulative probability for all analyses



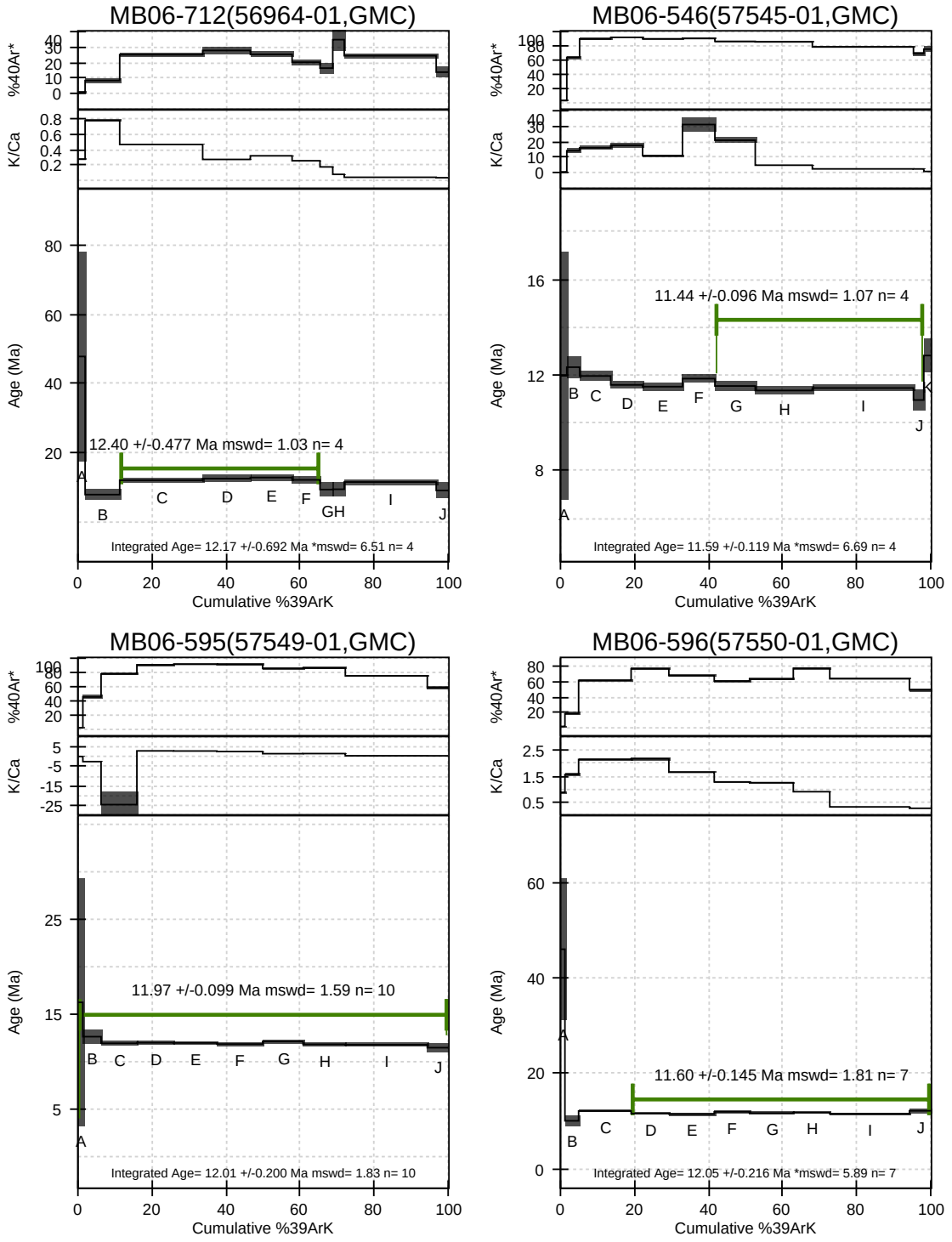




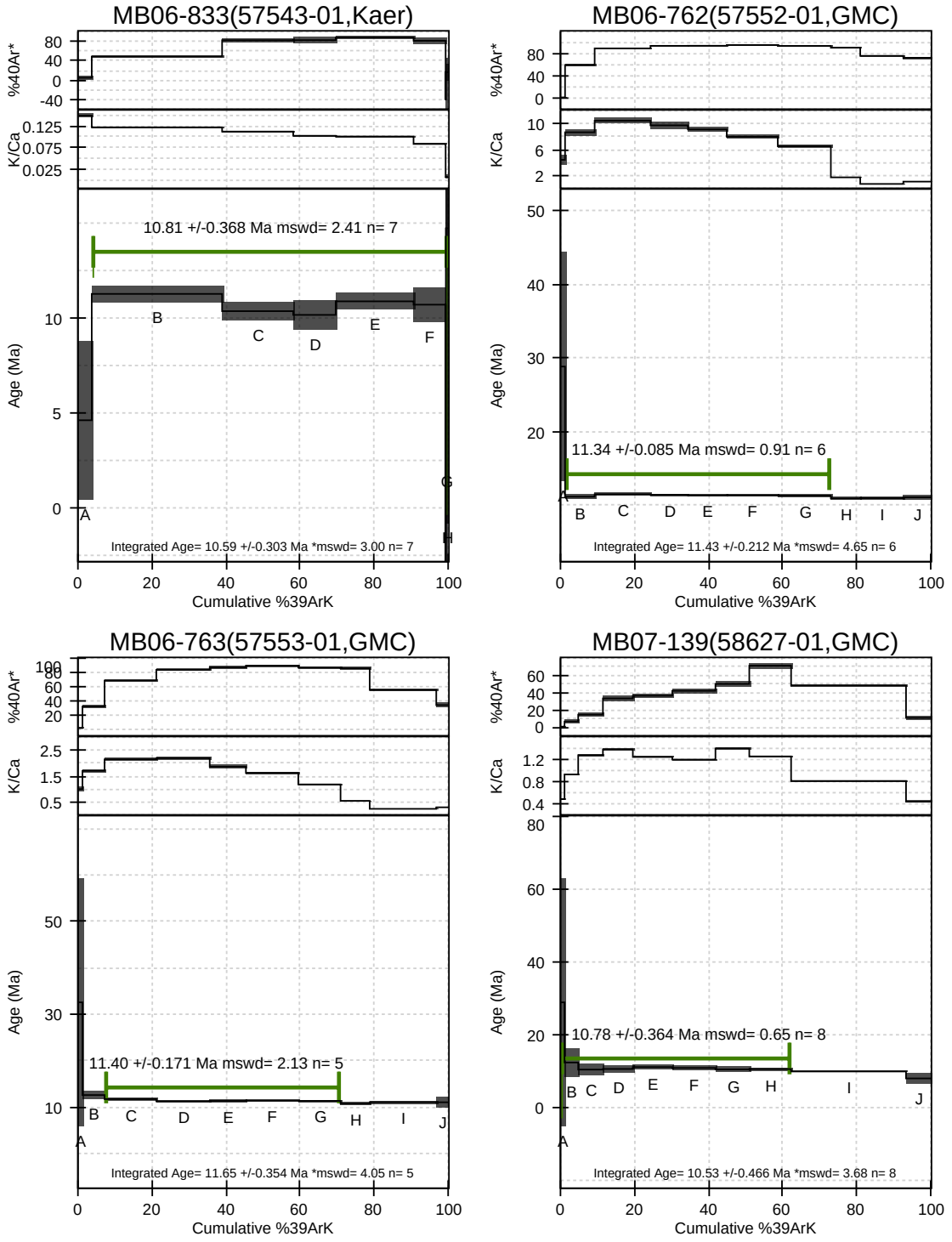
Mean: weighted mean +/-2σ Data: +/-1σ. Error Type:SEM, but if MSWD>1 use SEM * sqrt(MSWD). Analyses omitted from calculation indicated by open squares. Dashed line represents cumulative probability for all analyses

APPENDIX B

$^{40}Ar/^{39}Ar$ STEP HEAT FIGURES



Plateau age calculated as weighted mean of plateau steps. Integrated age calculated as isotopic recombination of all steps.
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



Plateau age calculated as weighted mean of plateau steps. Integrated age calculated as isotopic recombination of all steps.
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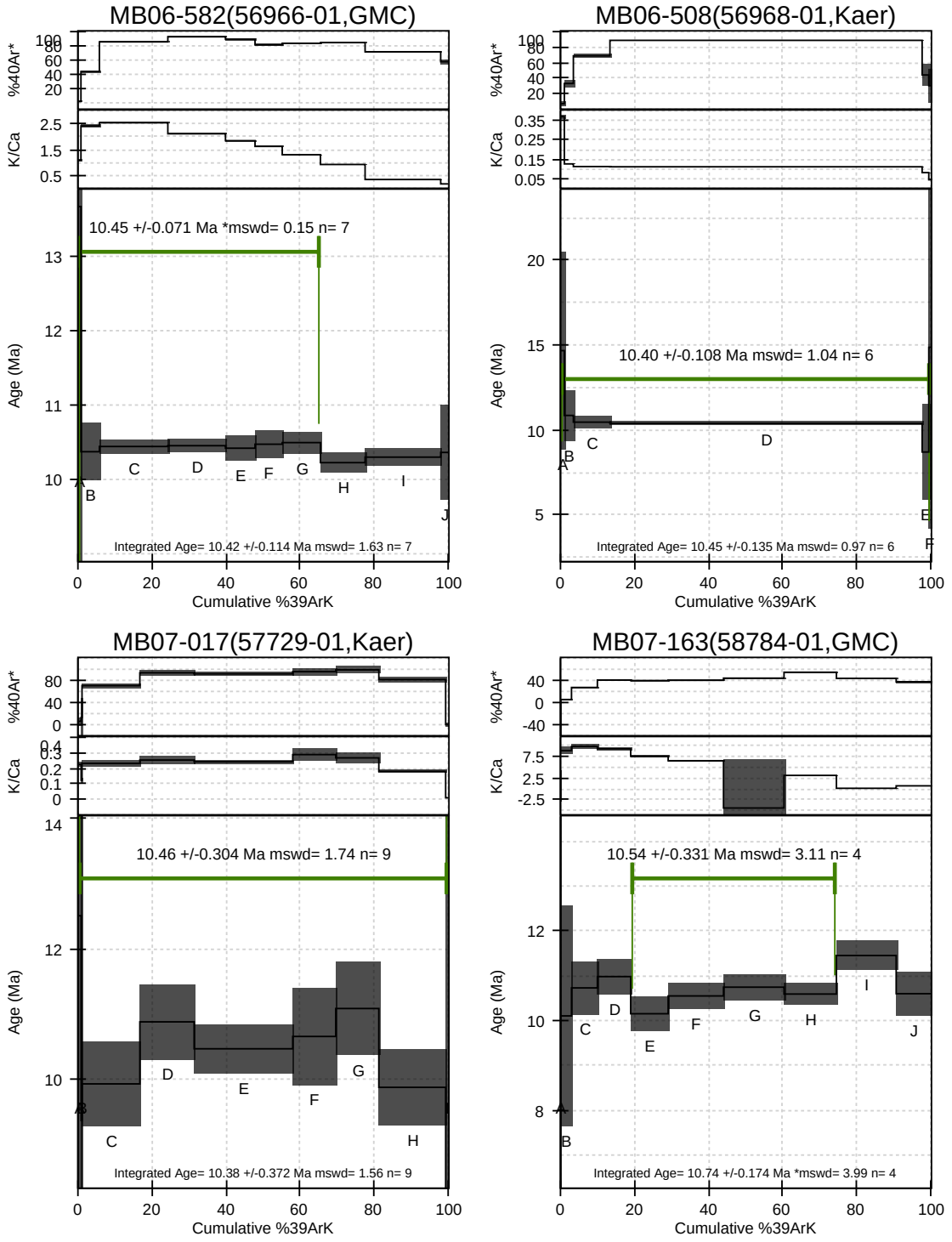
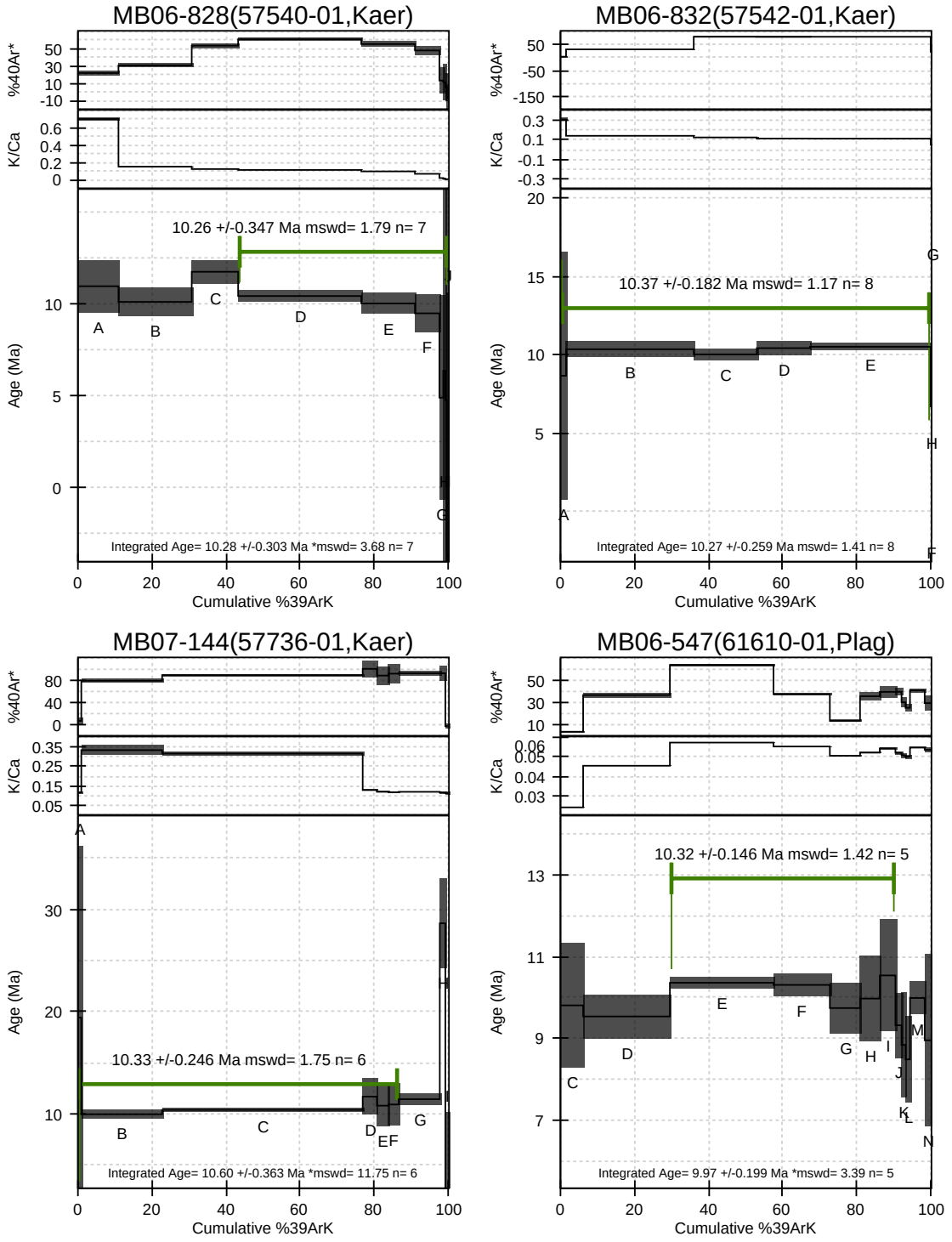
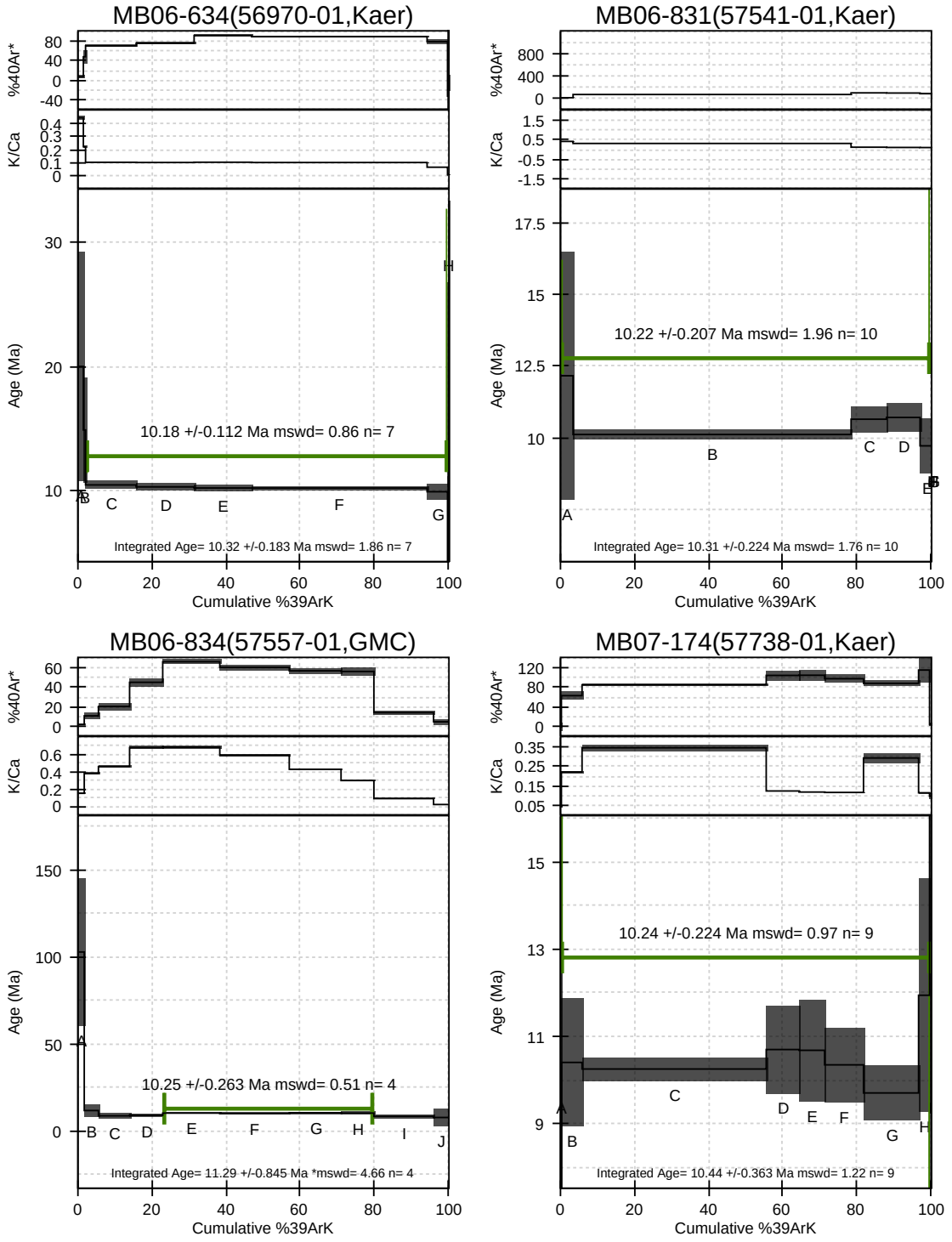


Plateau age calculated as weighted mean of plateau steps. Integrated age calculated as isotopic recombination of all steps.
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



Plateau age calculated as weighted mean of plateau steps. Integrated age calculated as isotopic recombination of all steps.
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



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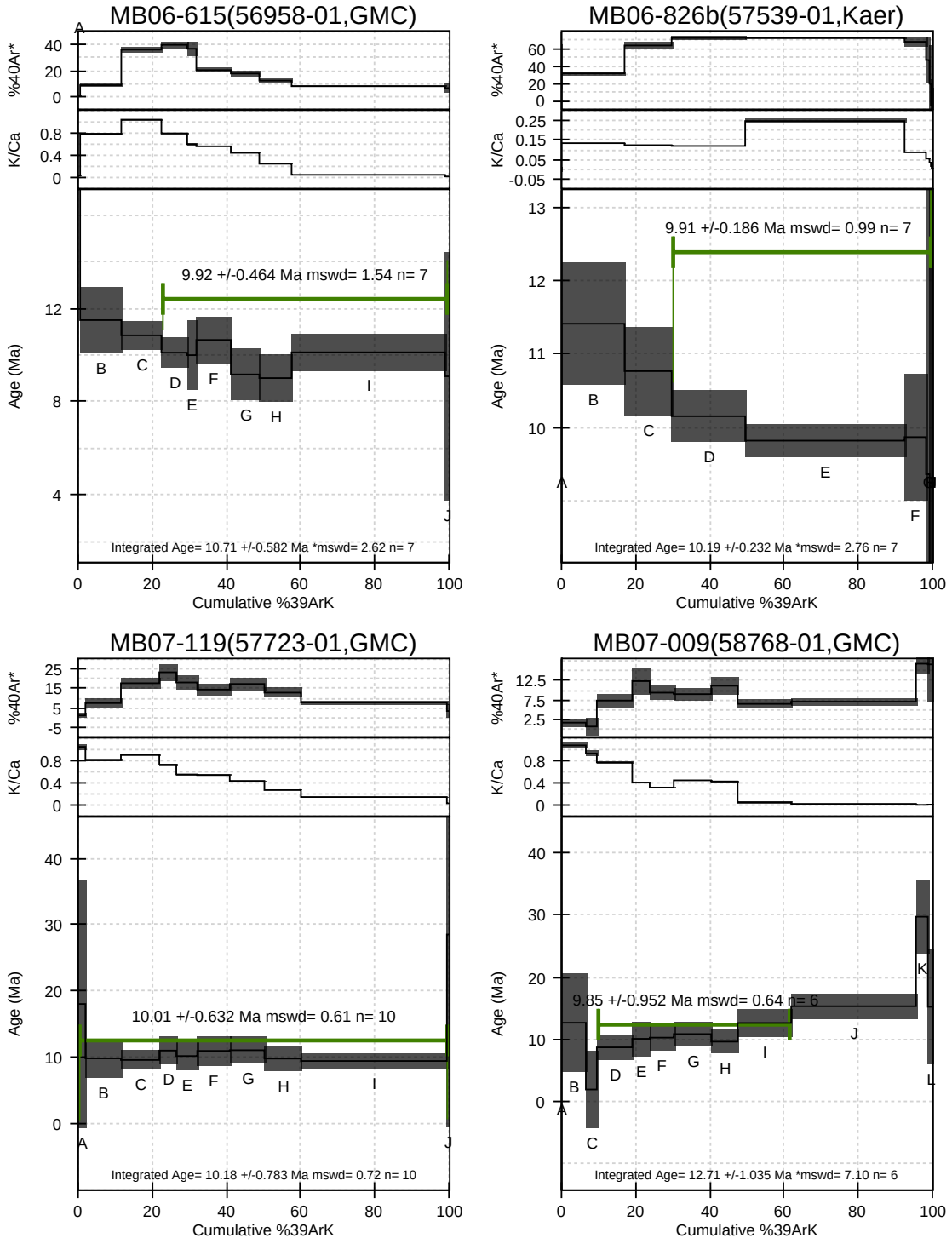

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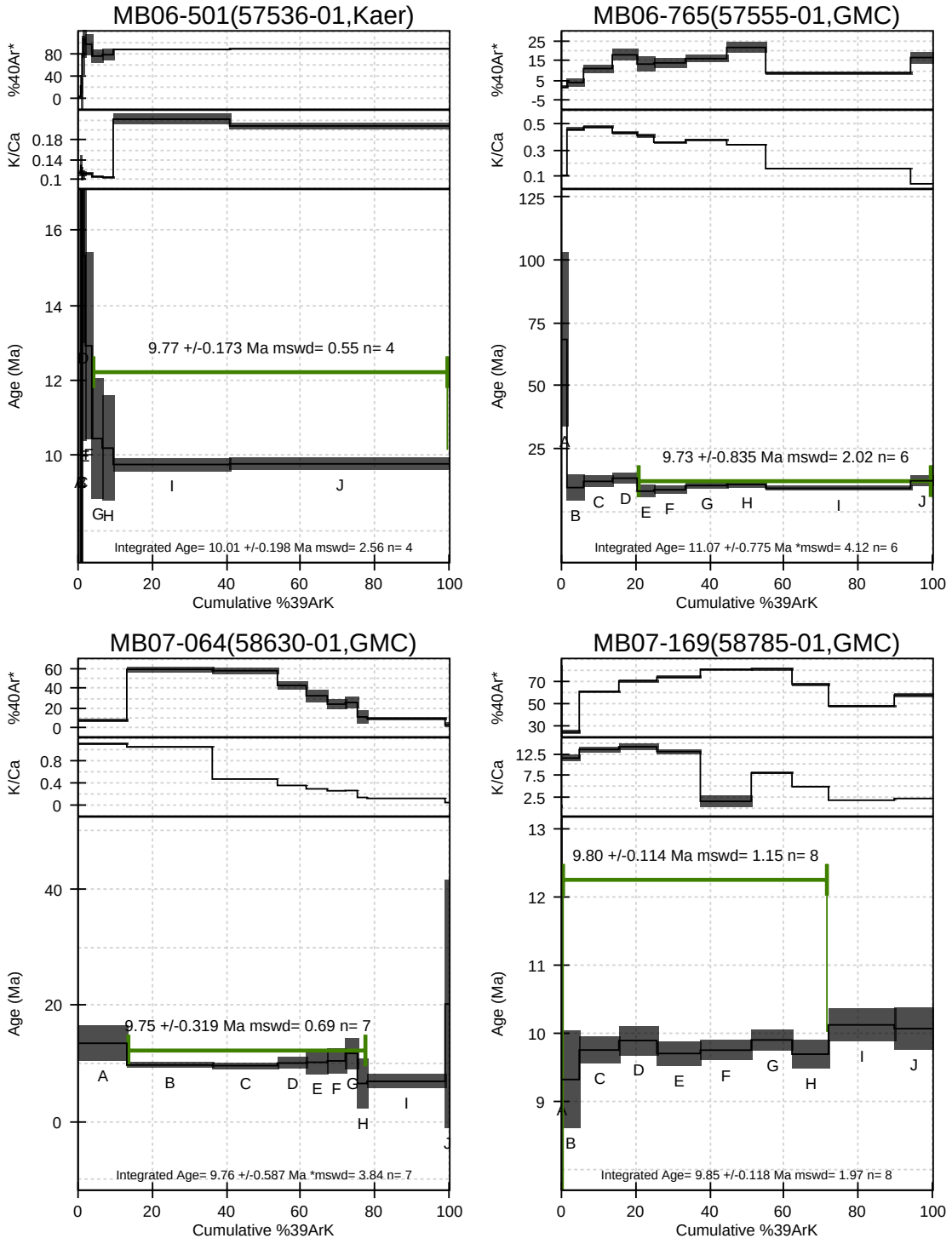
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



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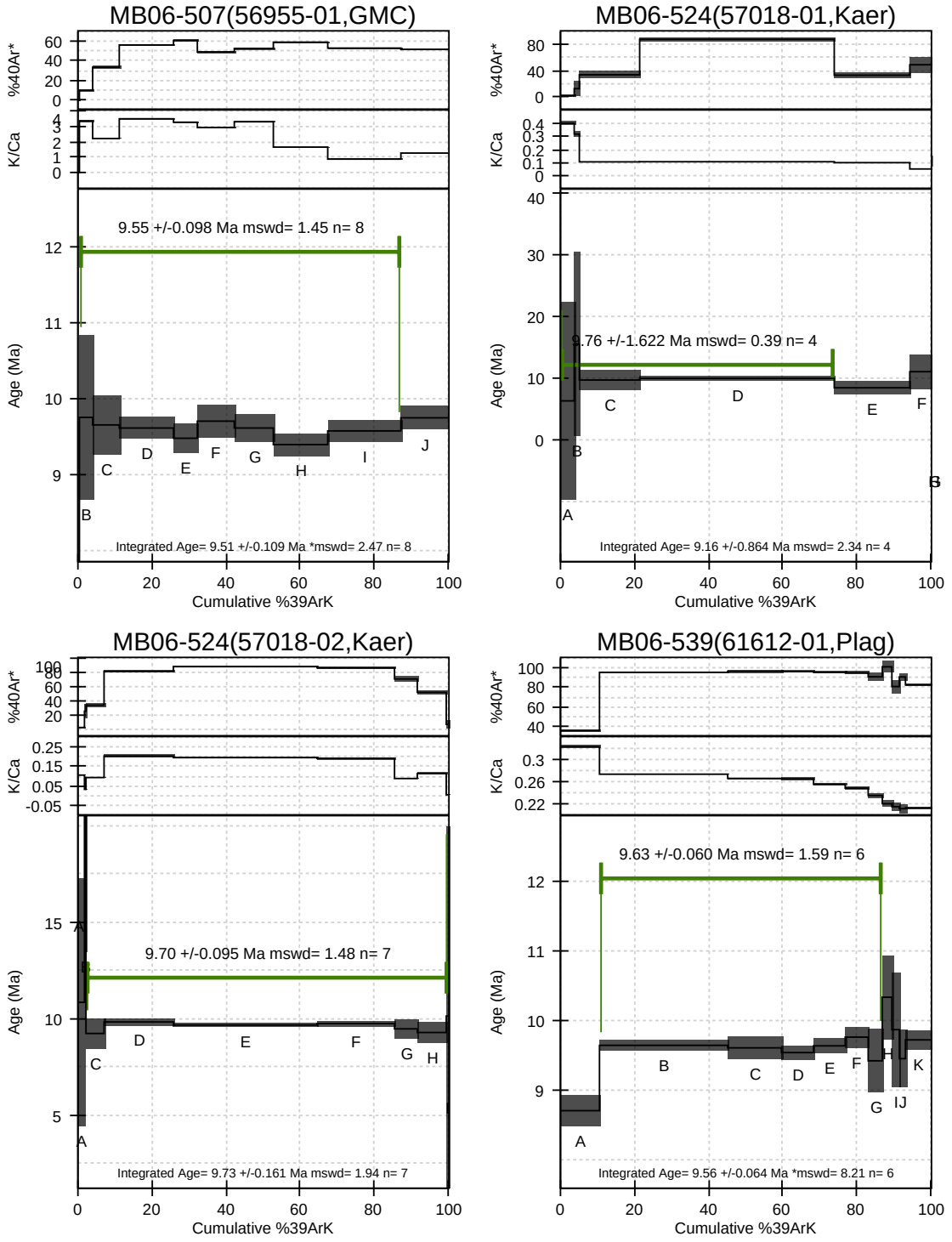

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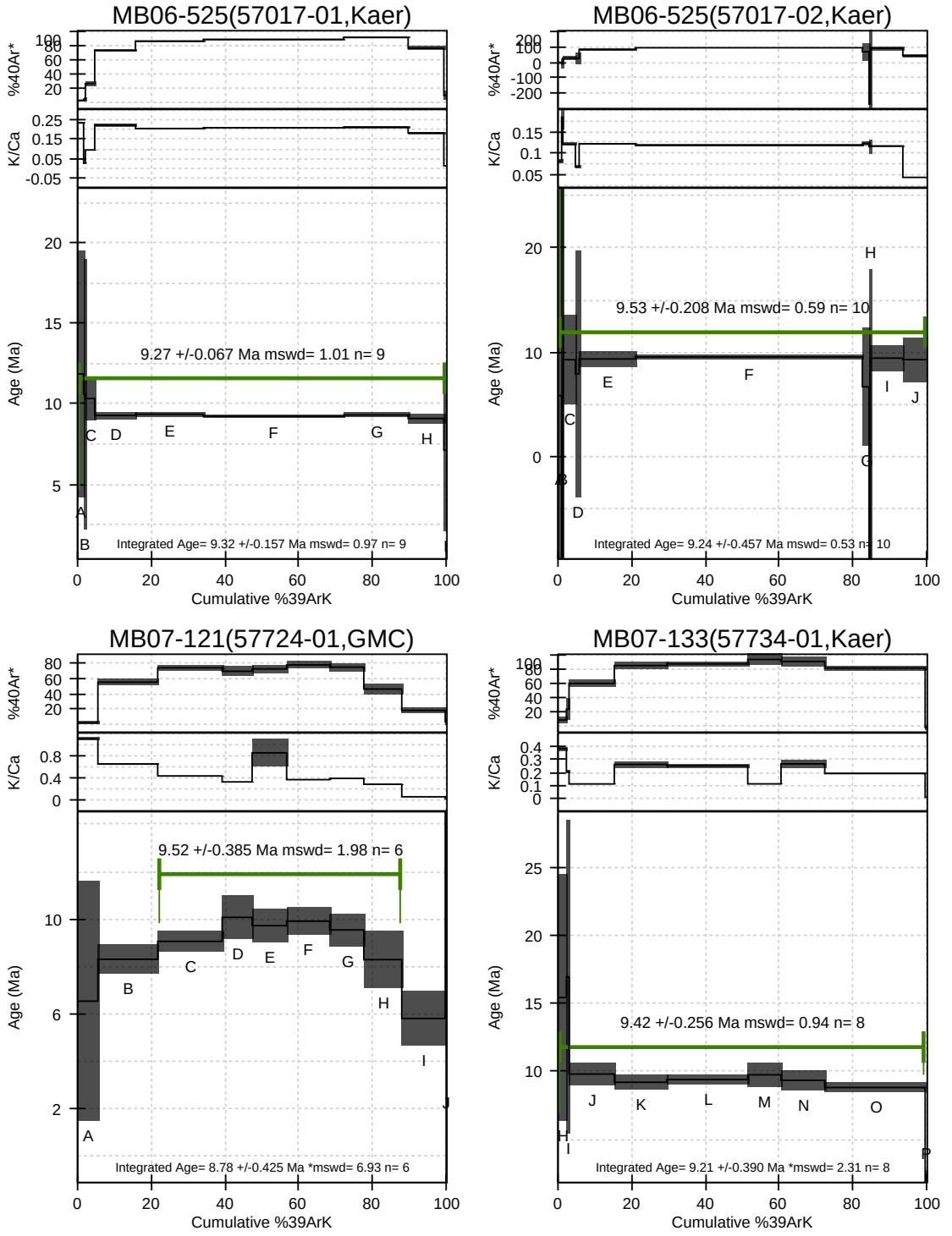

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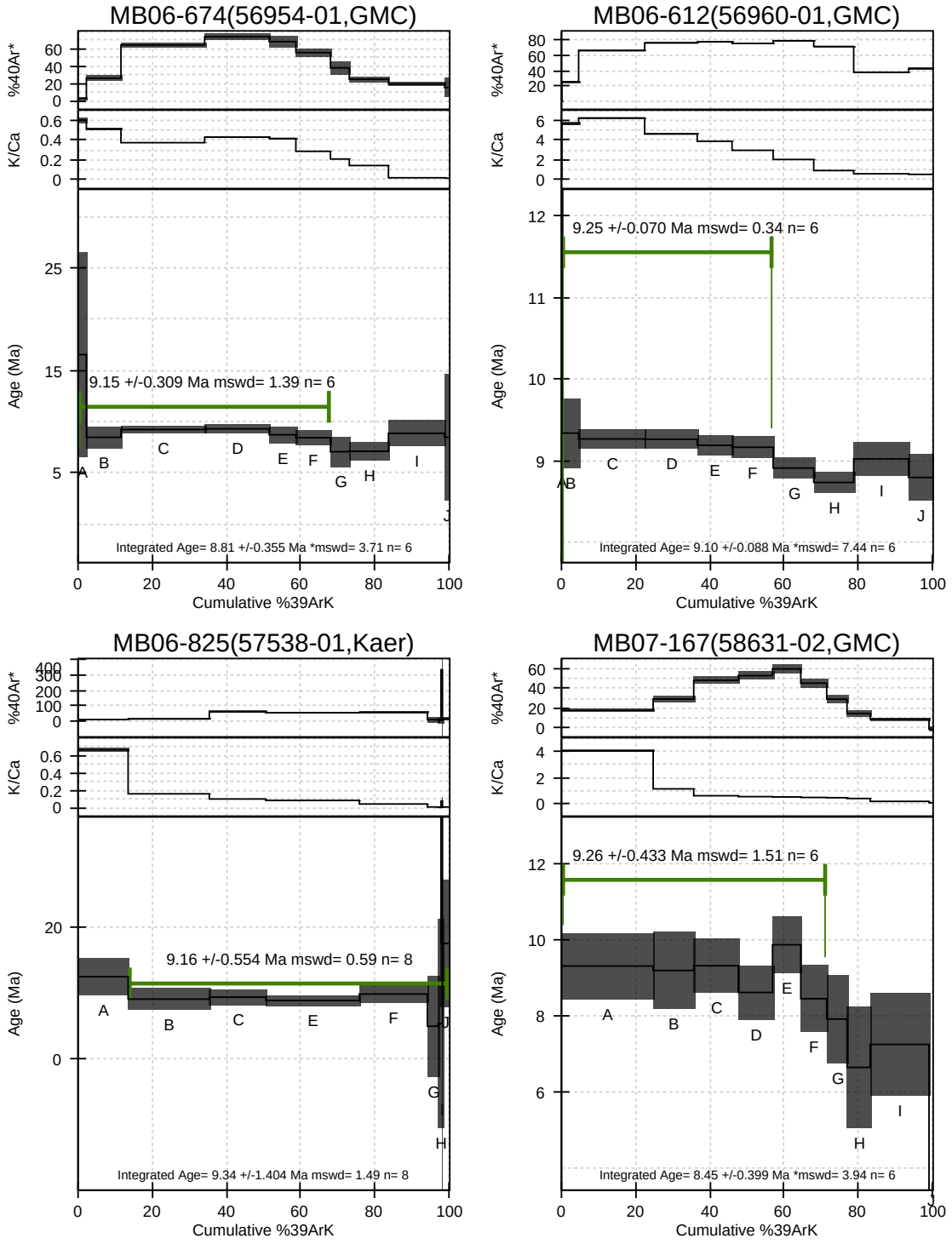
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



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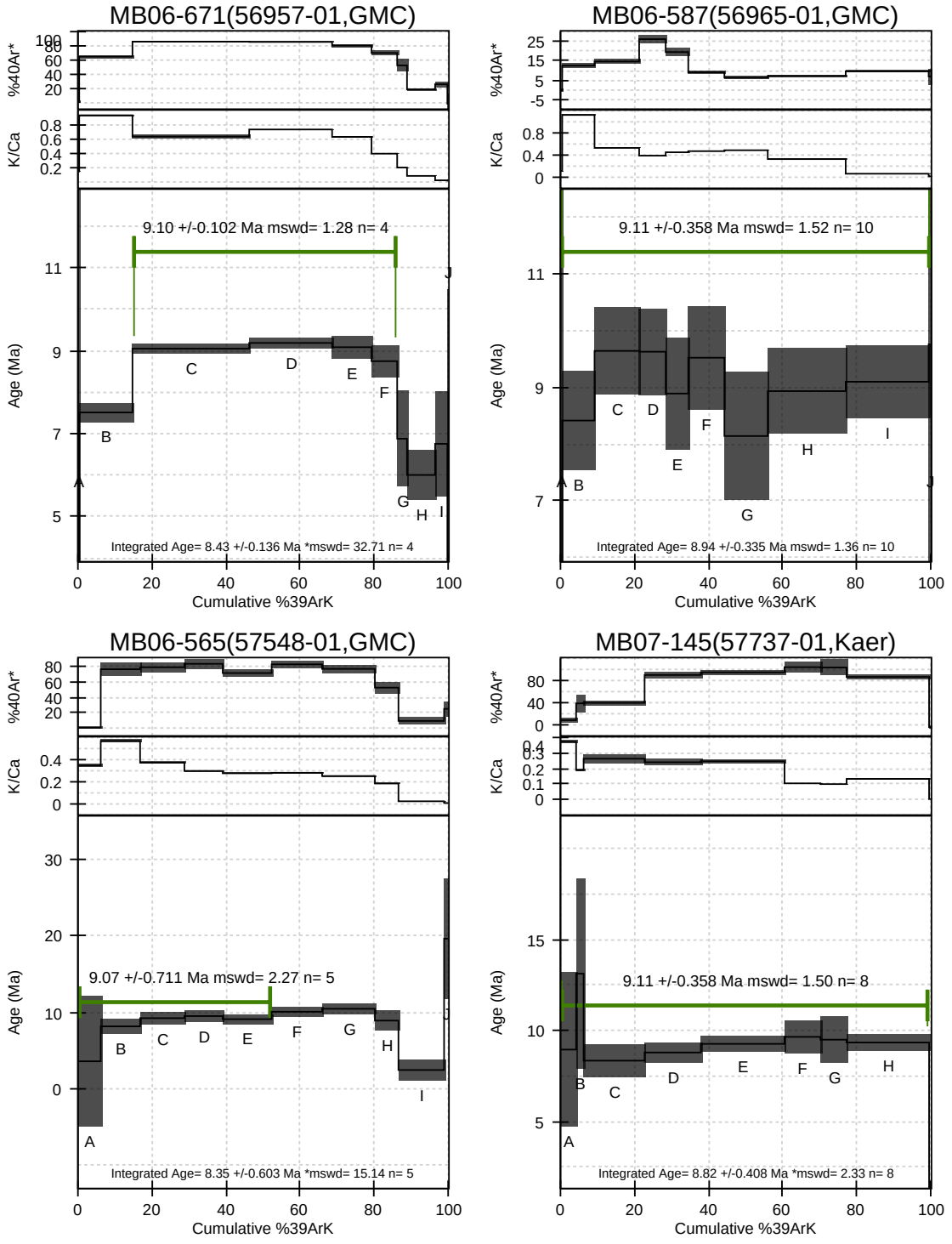
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



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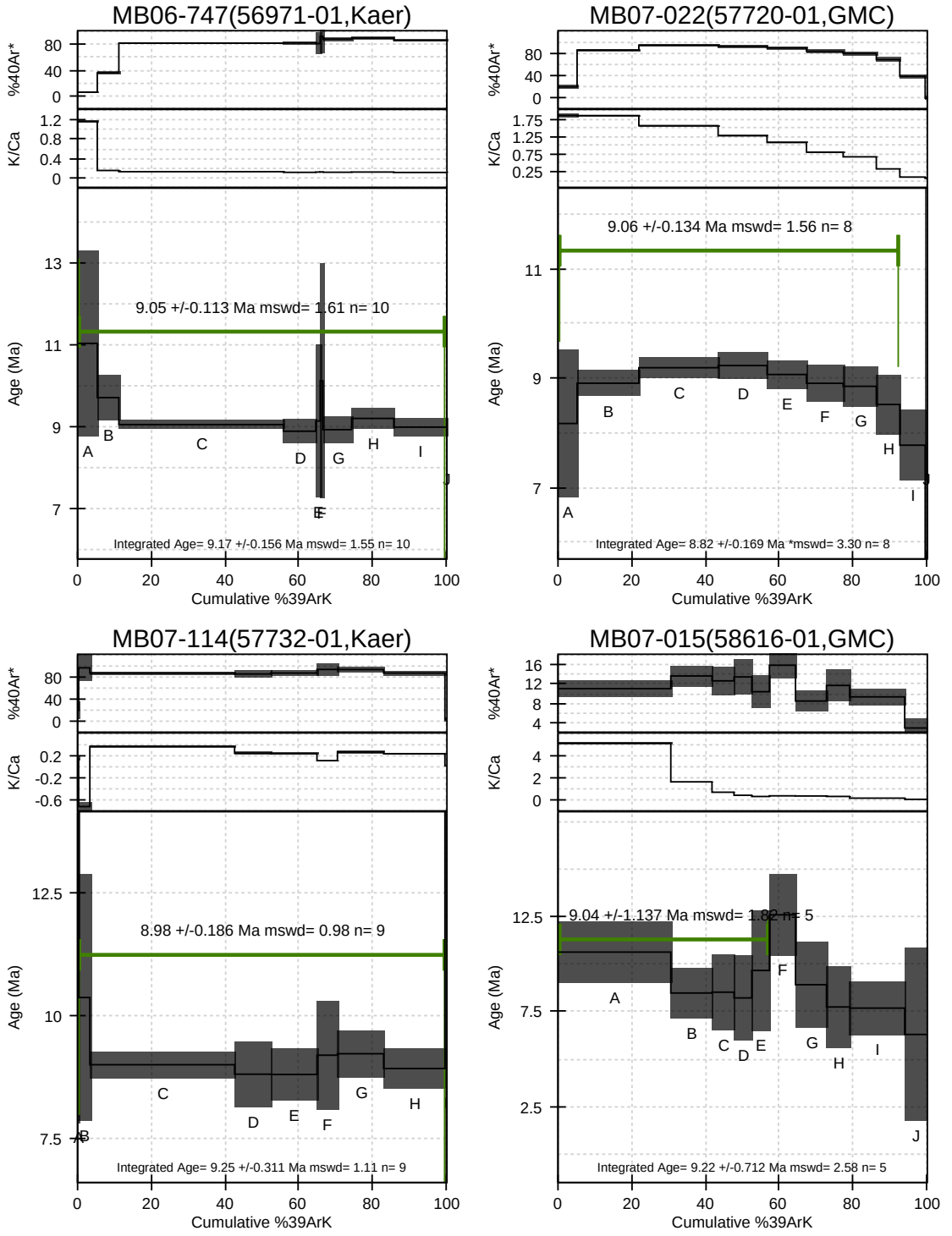
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



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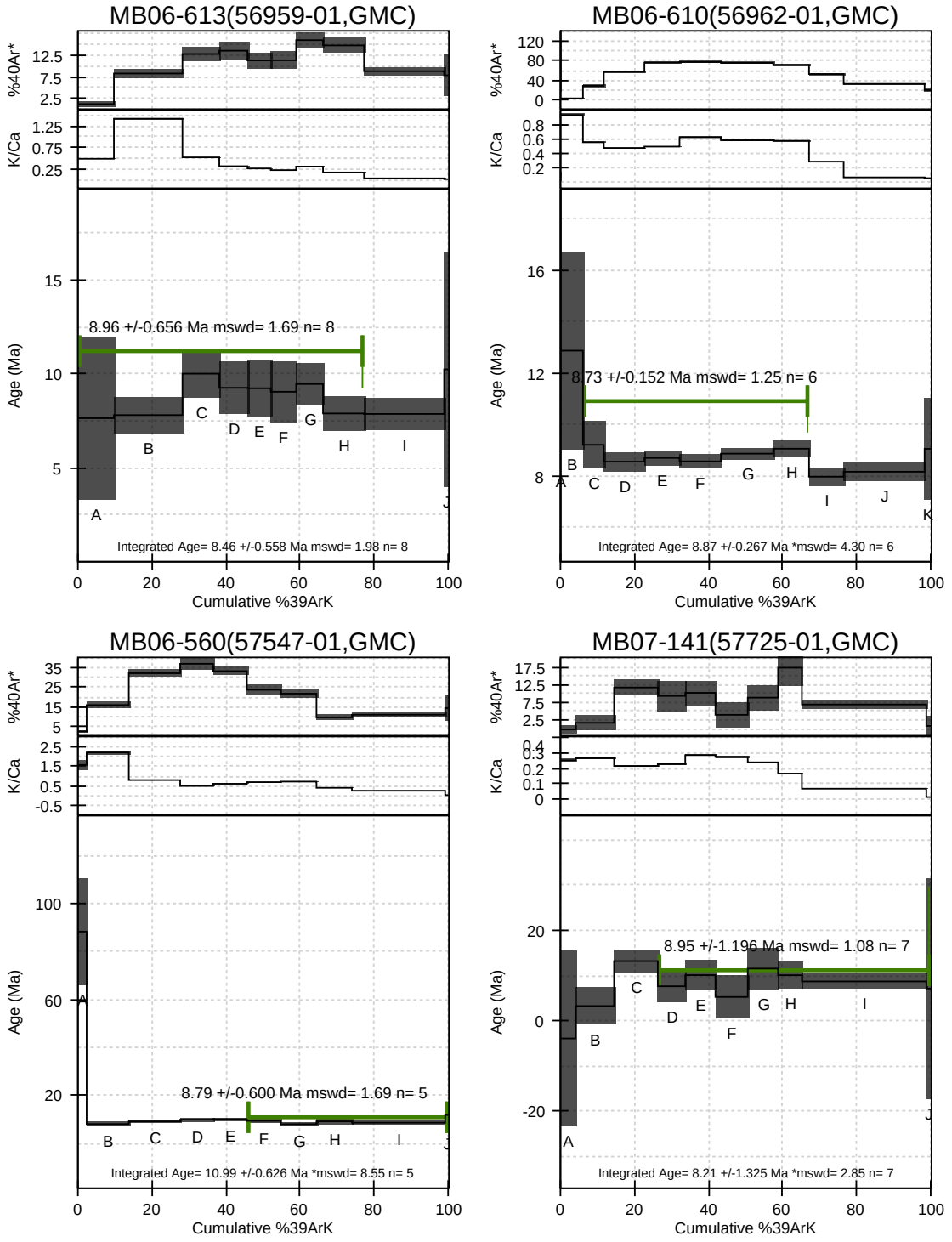
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



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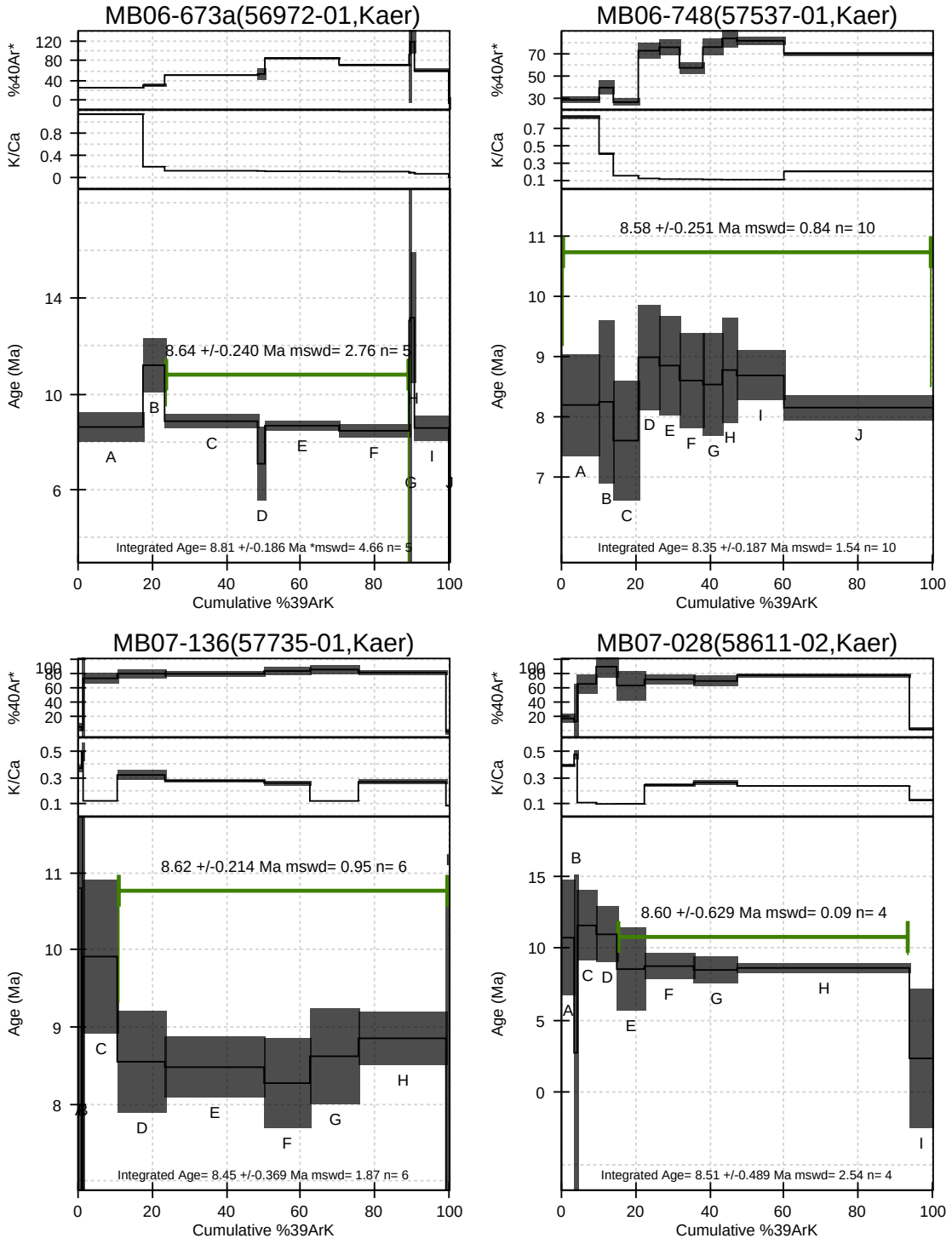
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



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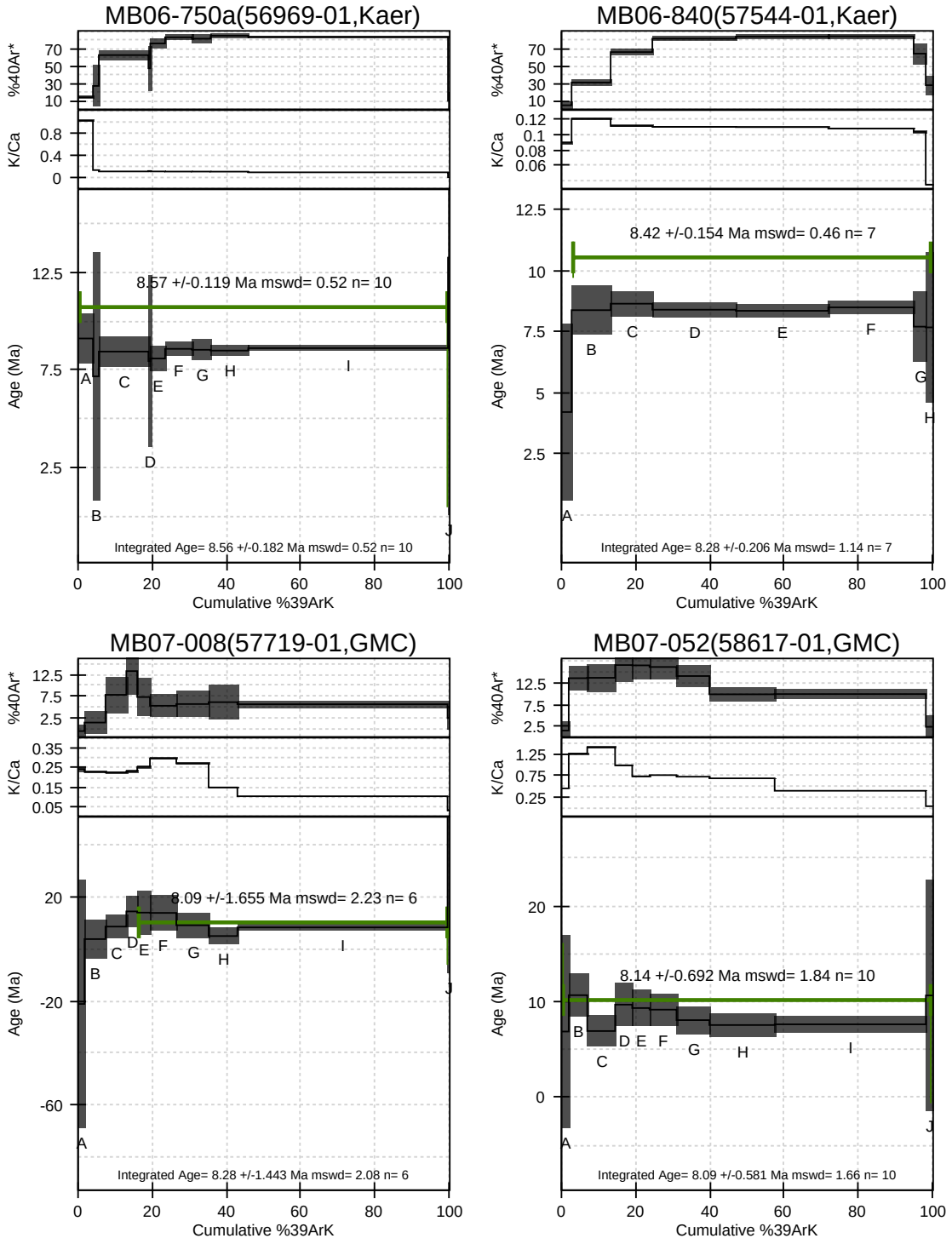

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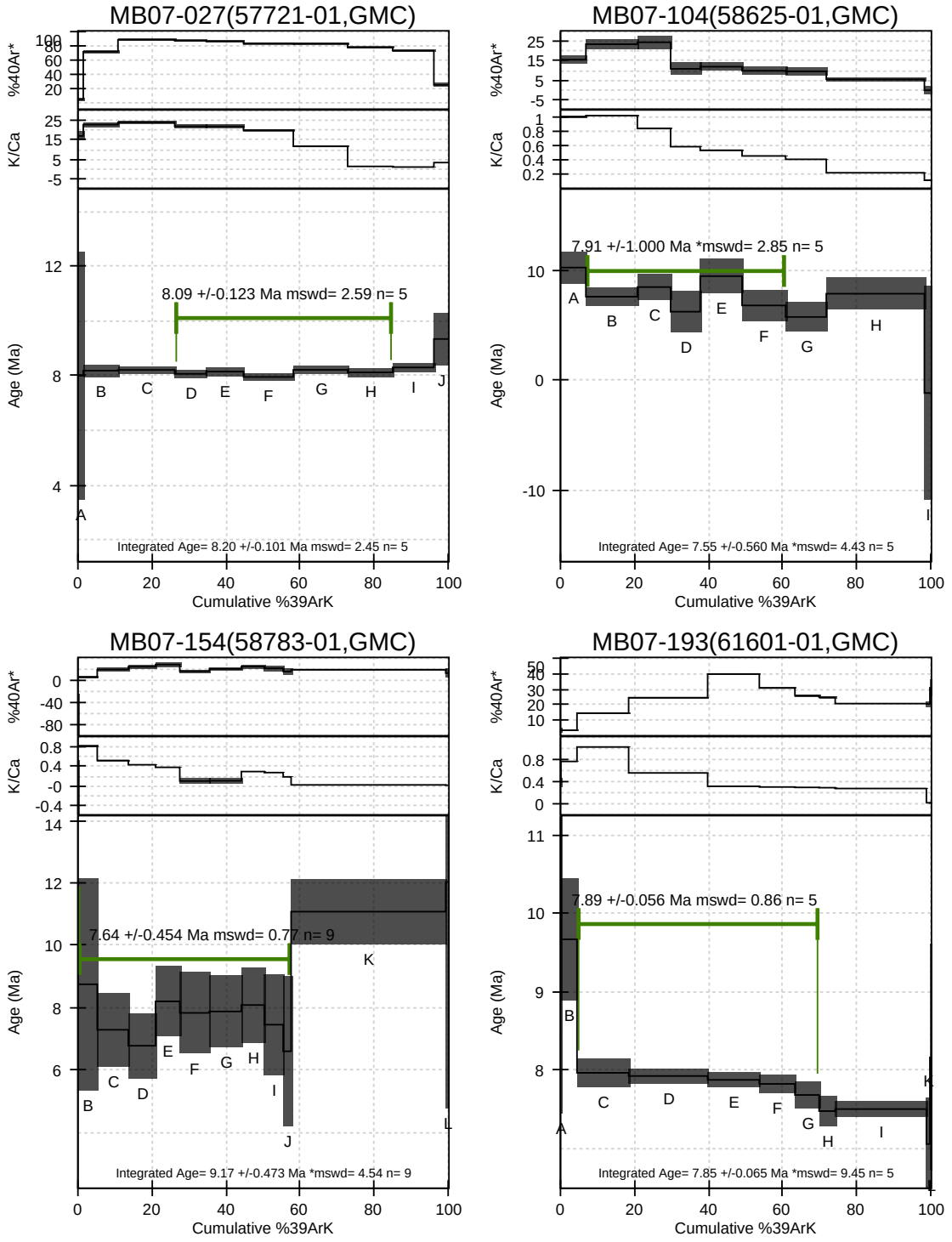
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



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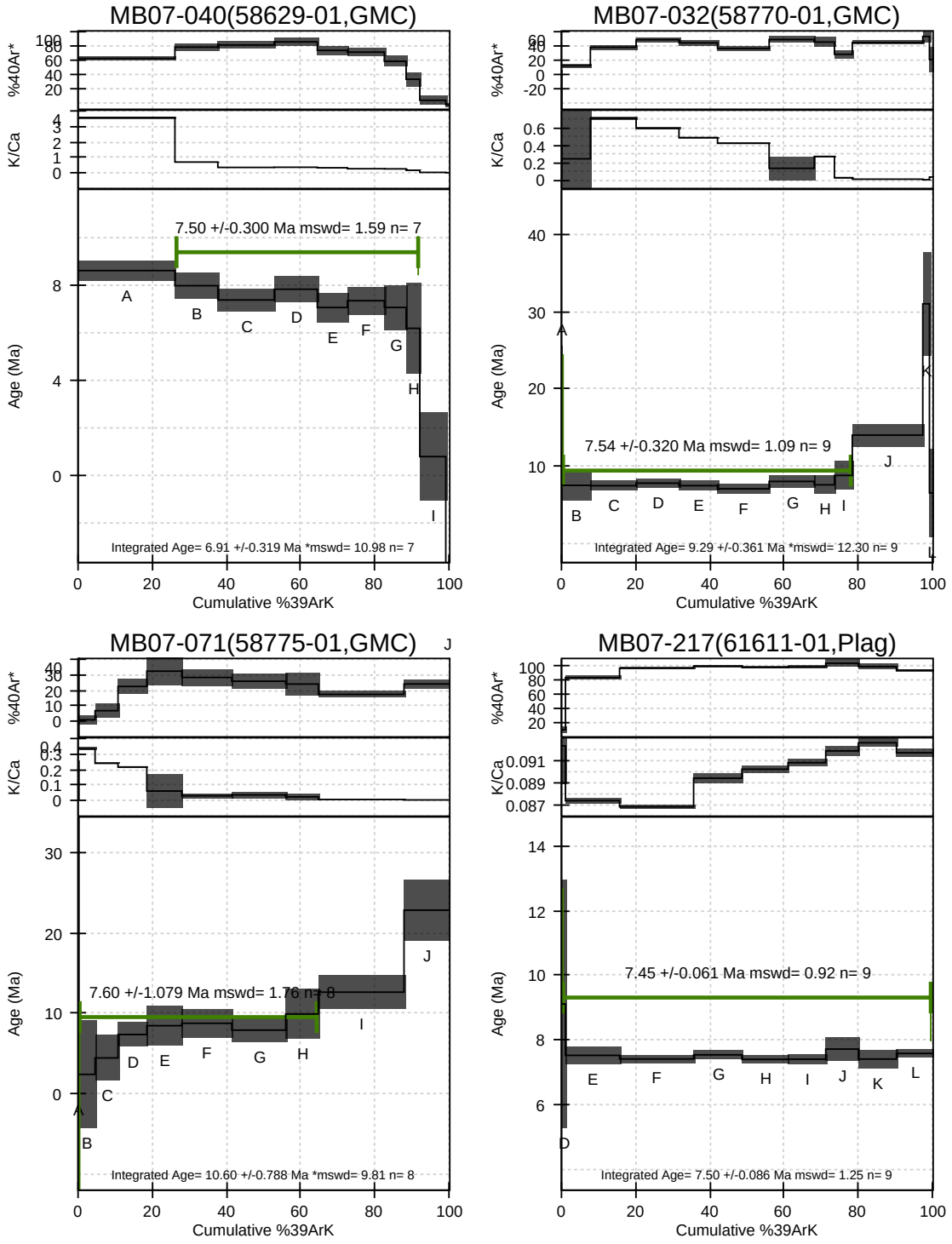
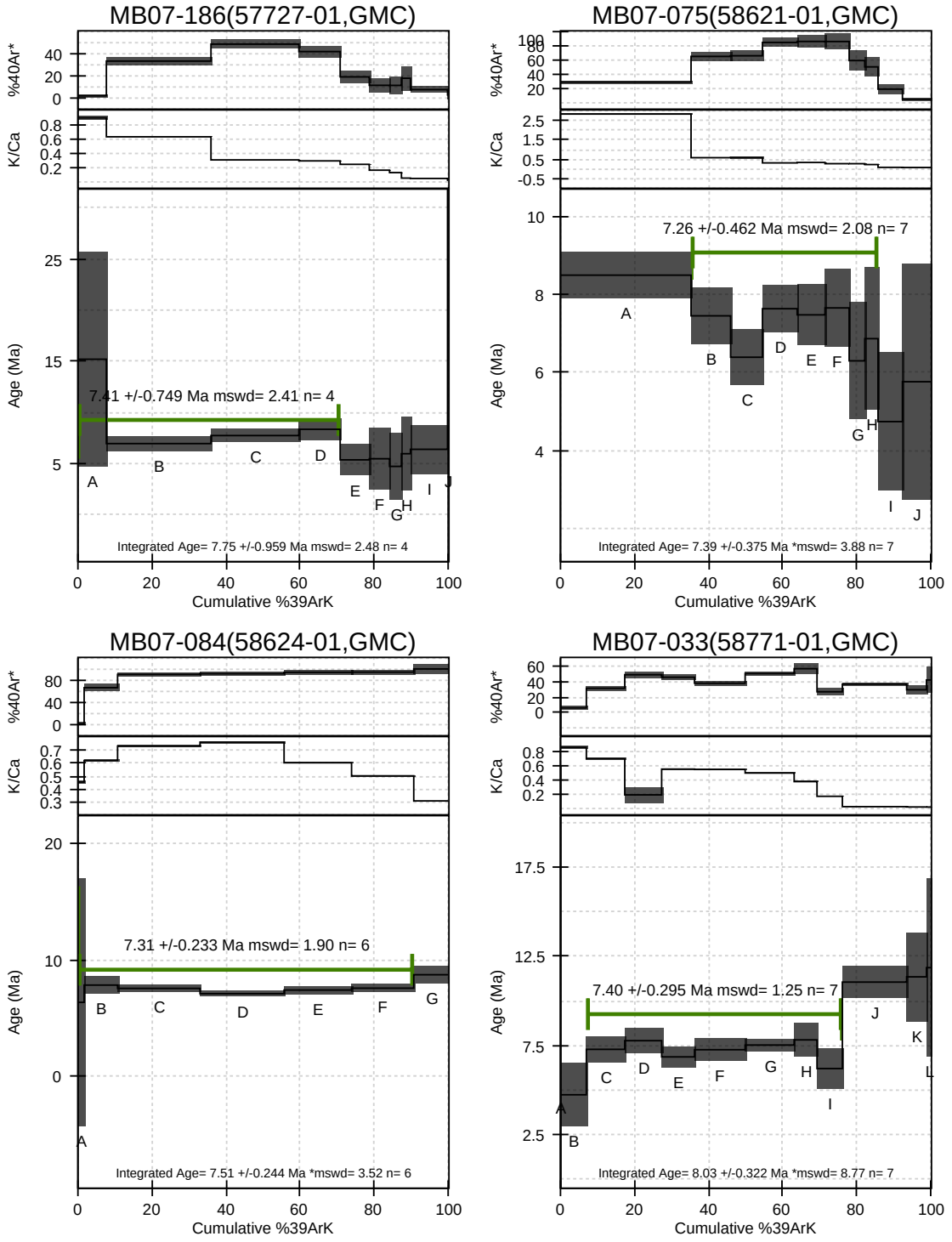
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



Plateau age calculated as weighted mean of plateau steps. Integrated age calculated as isotopic recombination of all steps.
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



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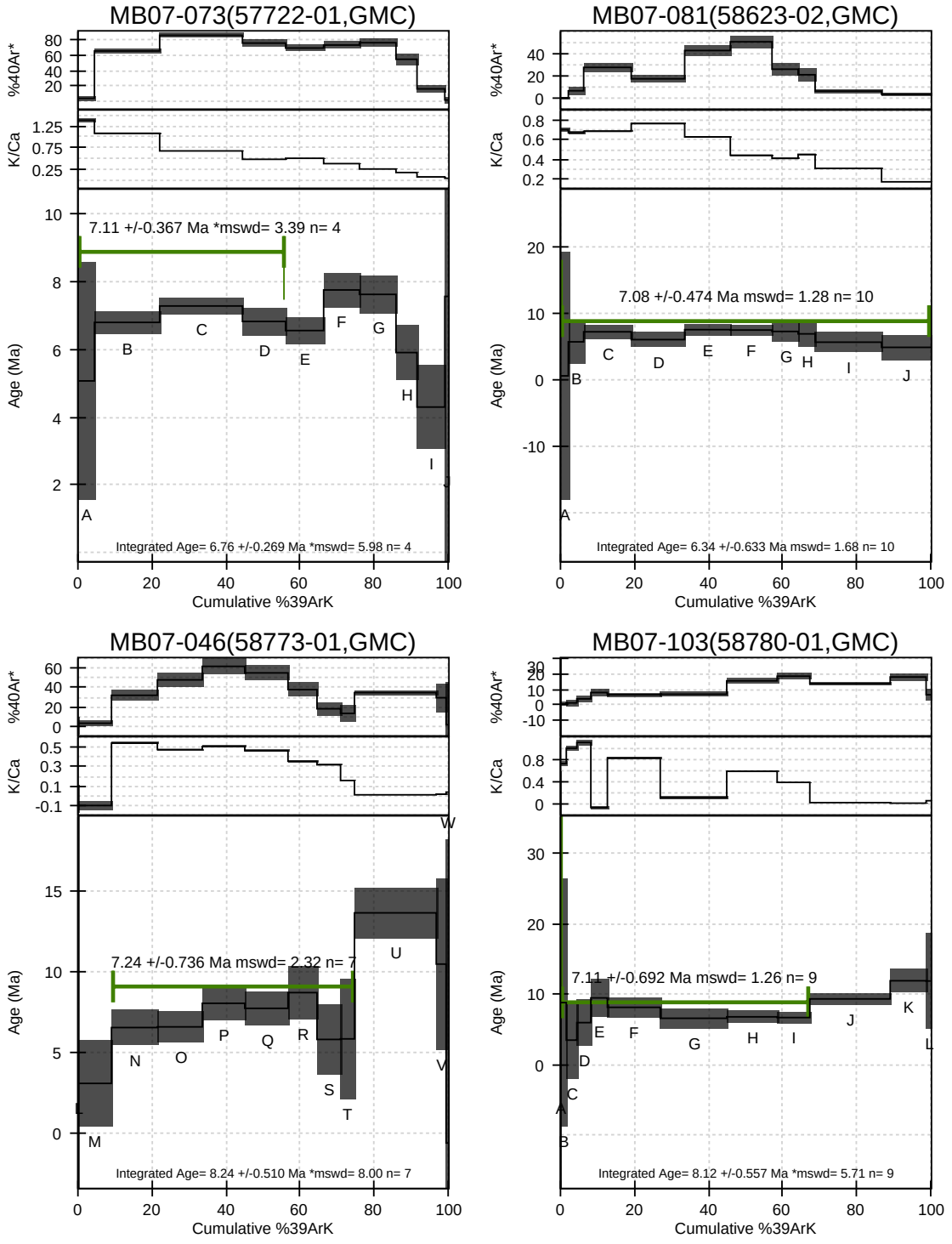
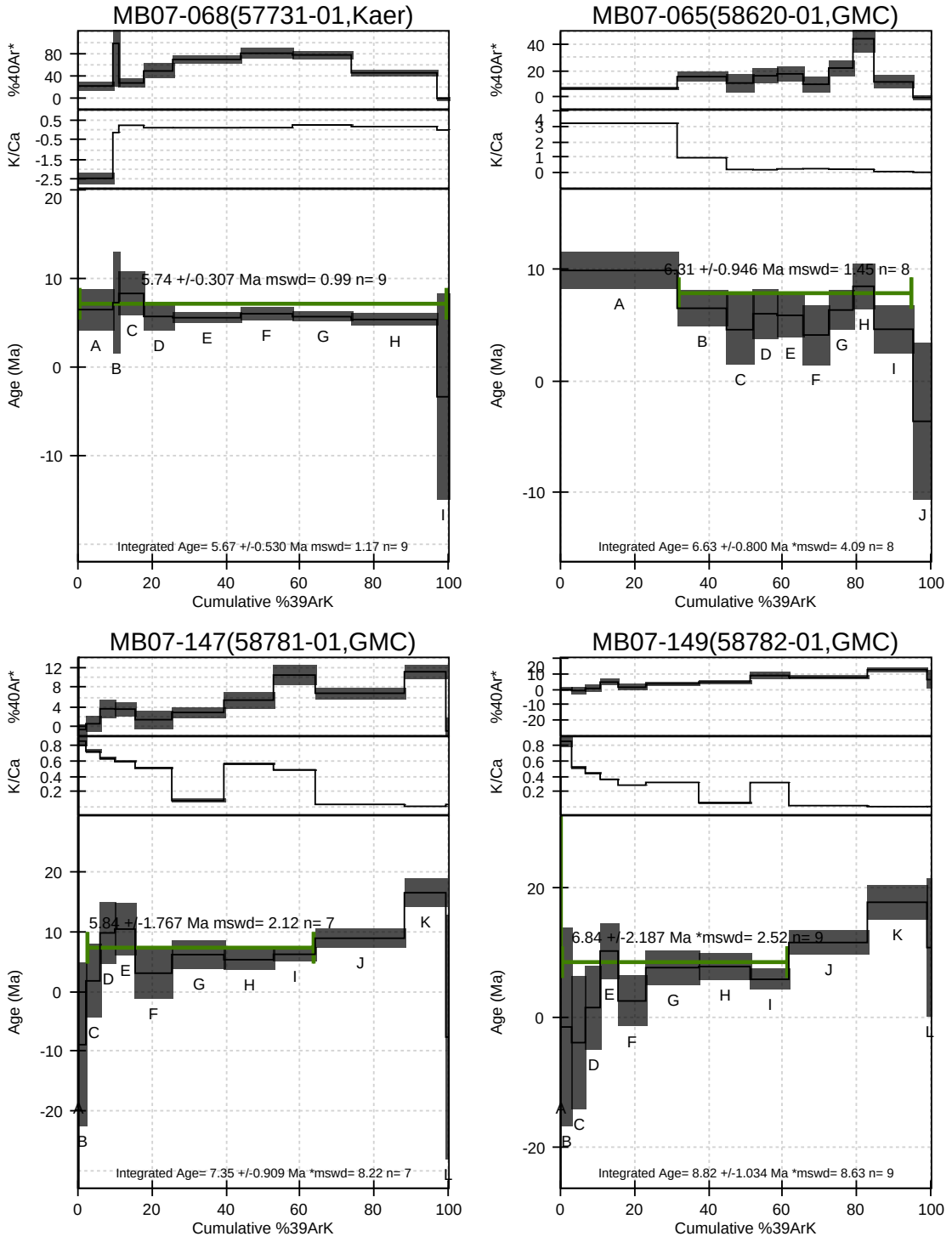
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



Plateau age calculated as weighted mean of plateau steps. Integrated age calculated as isotopic recombination of all steps.
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



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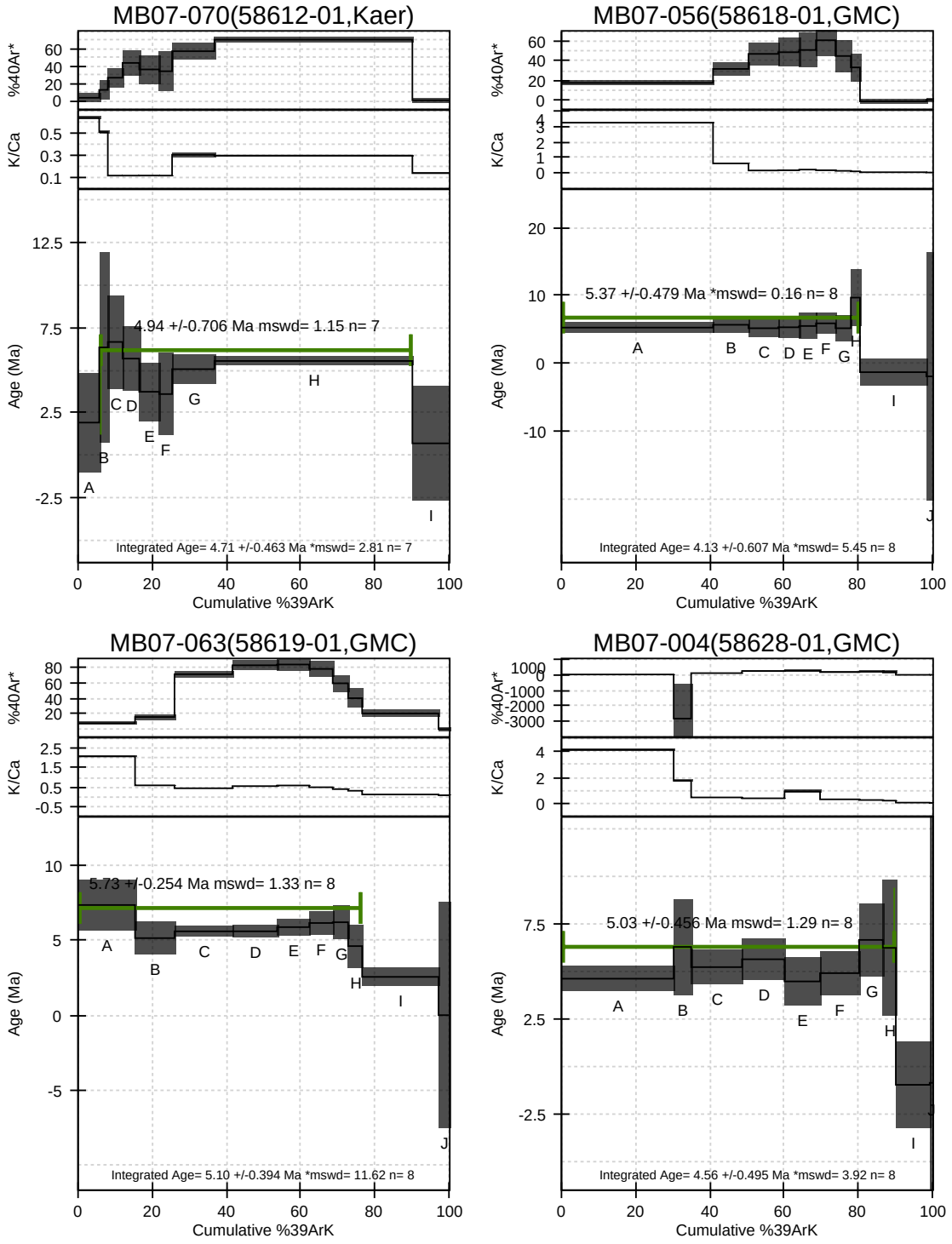
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



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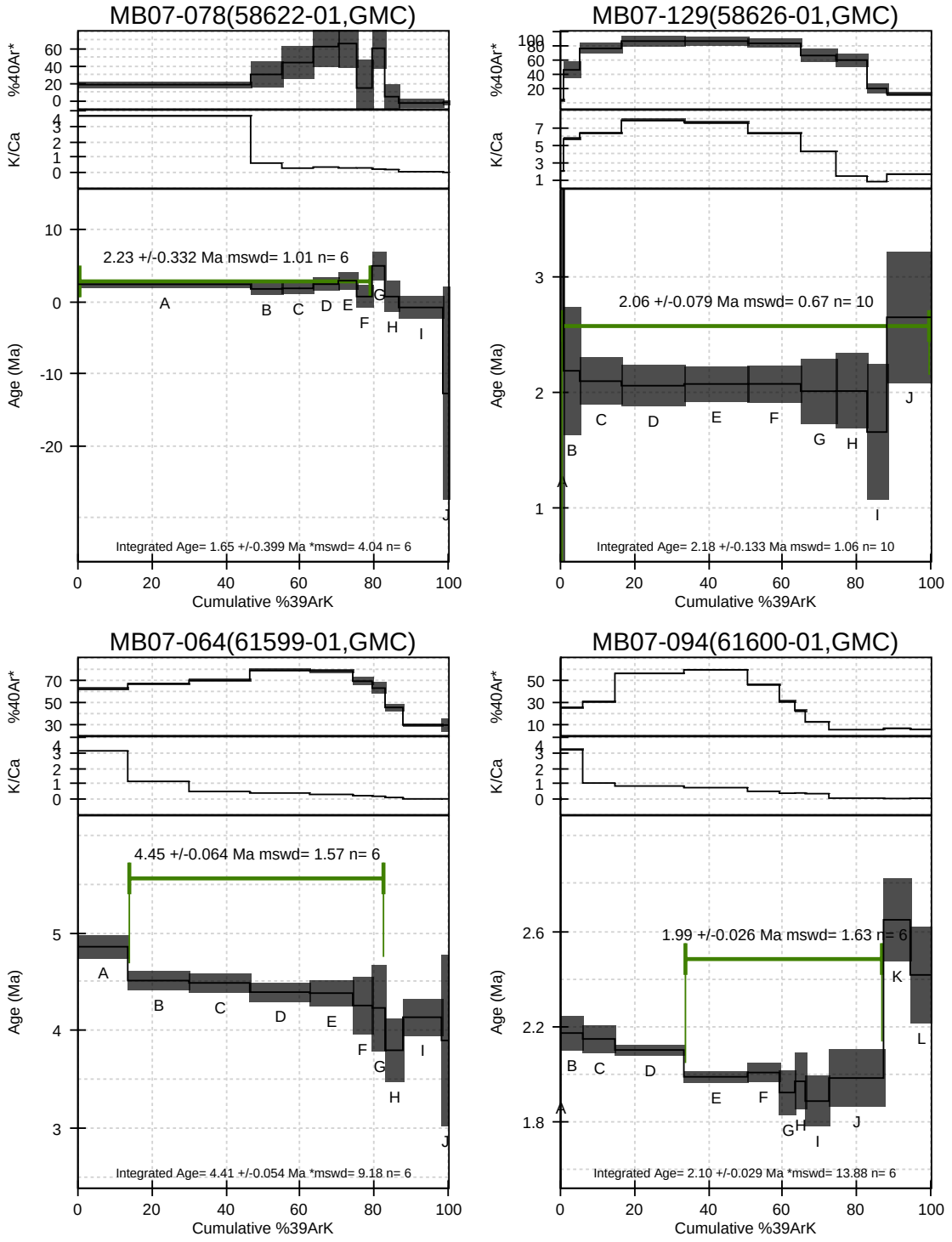
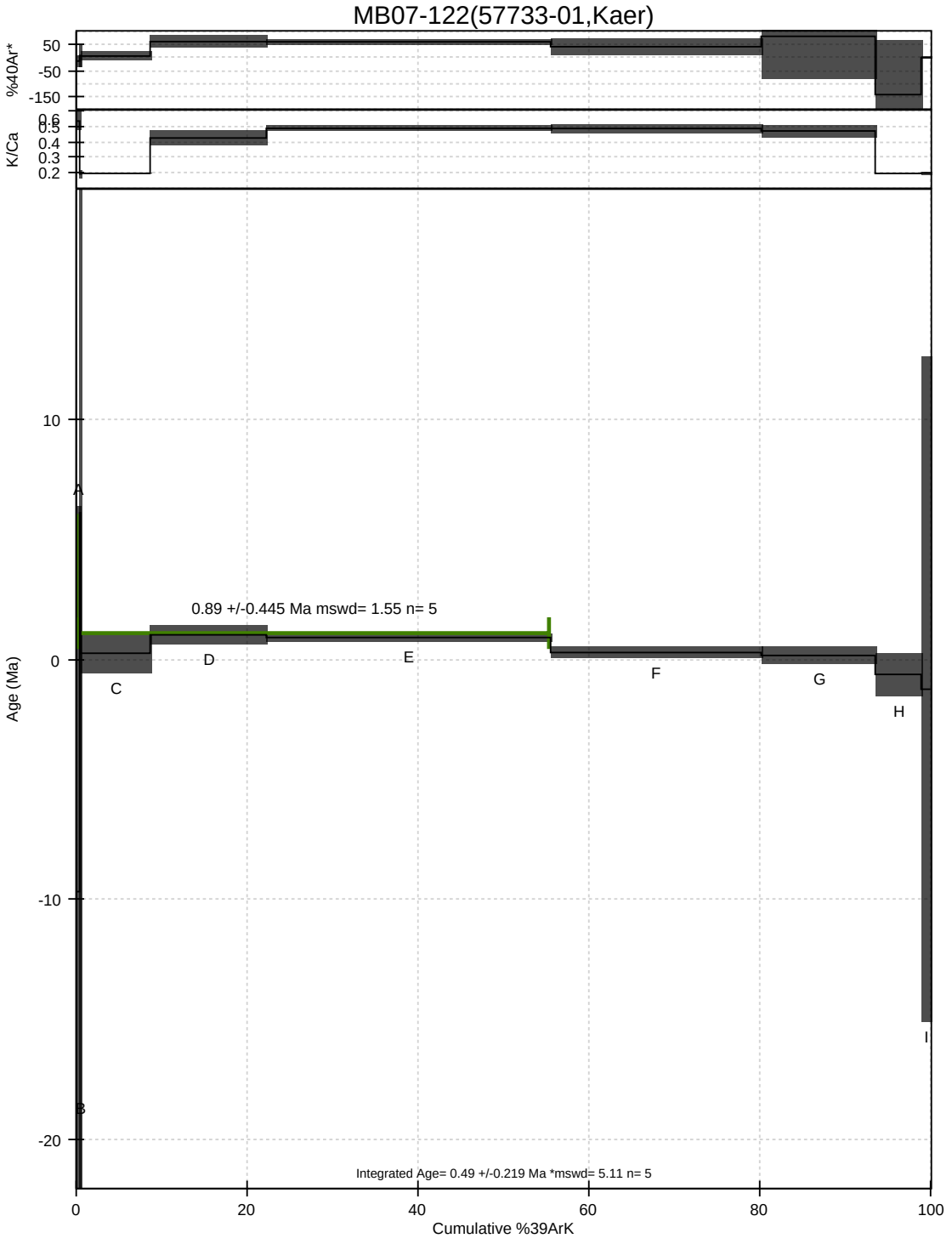
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



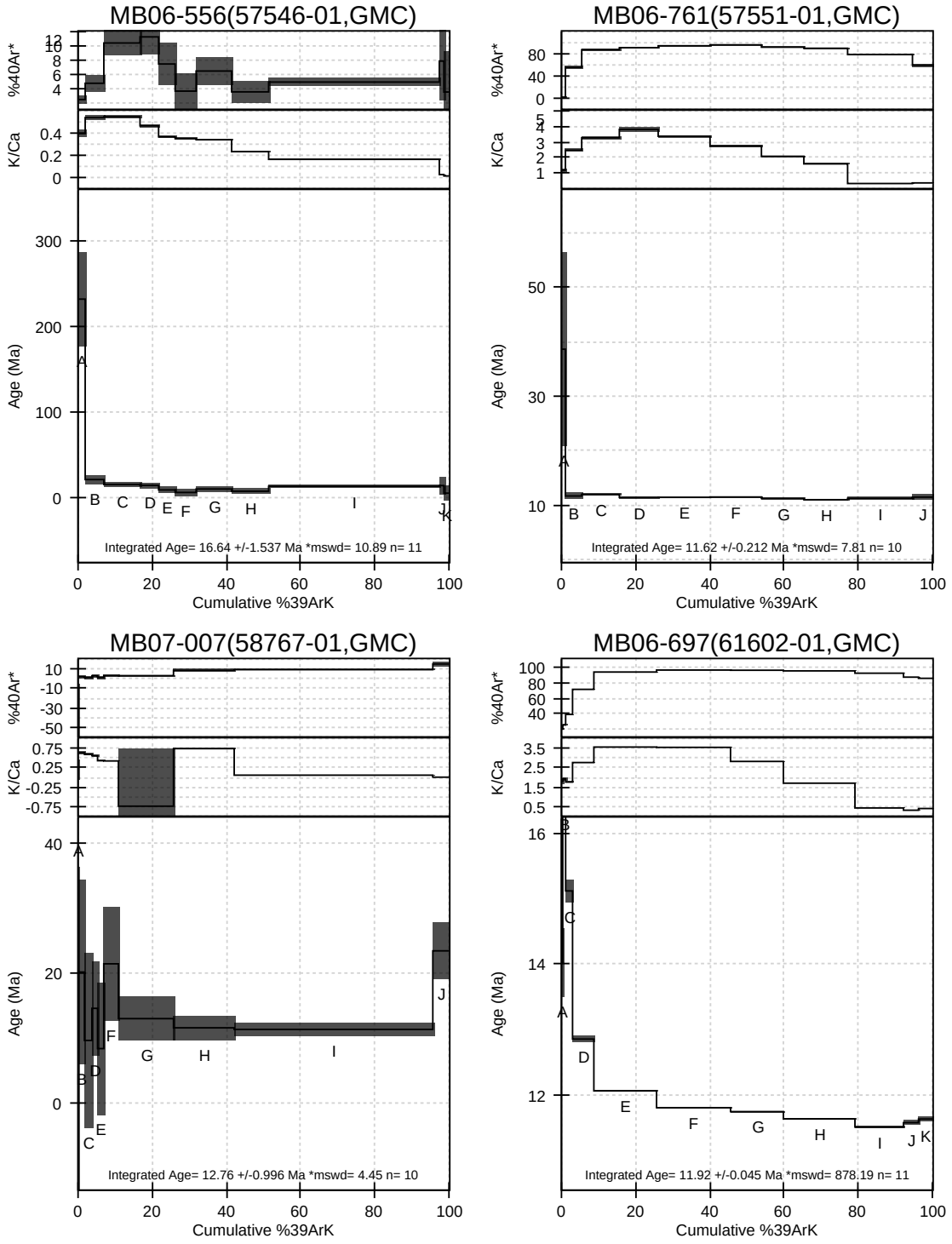
Plateau age calculated as weighted mean of plateau steps. Integrated age calculated as isotopic recombination of all steps.
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



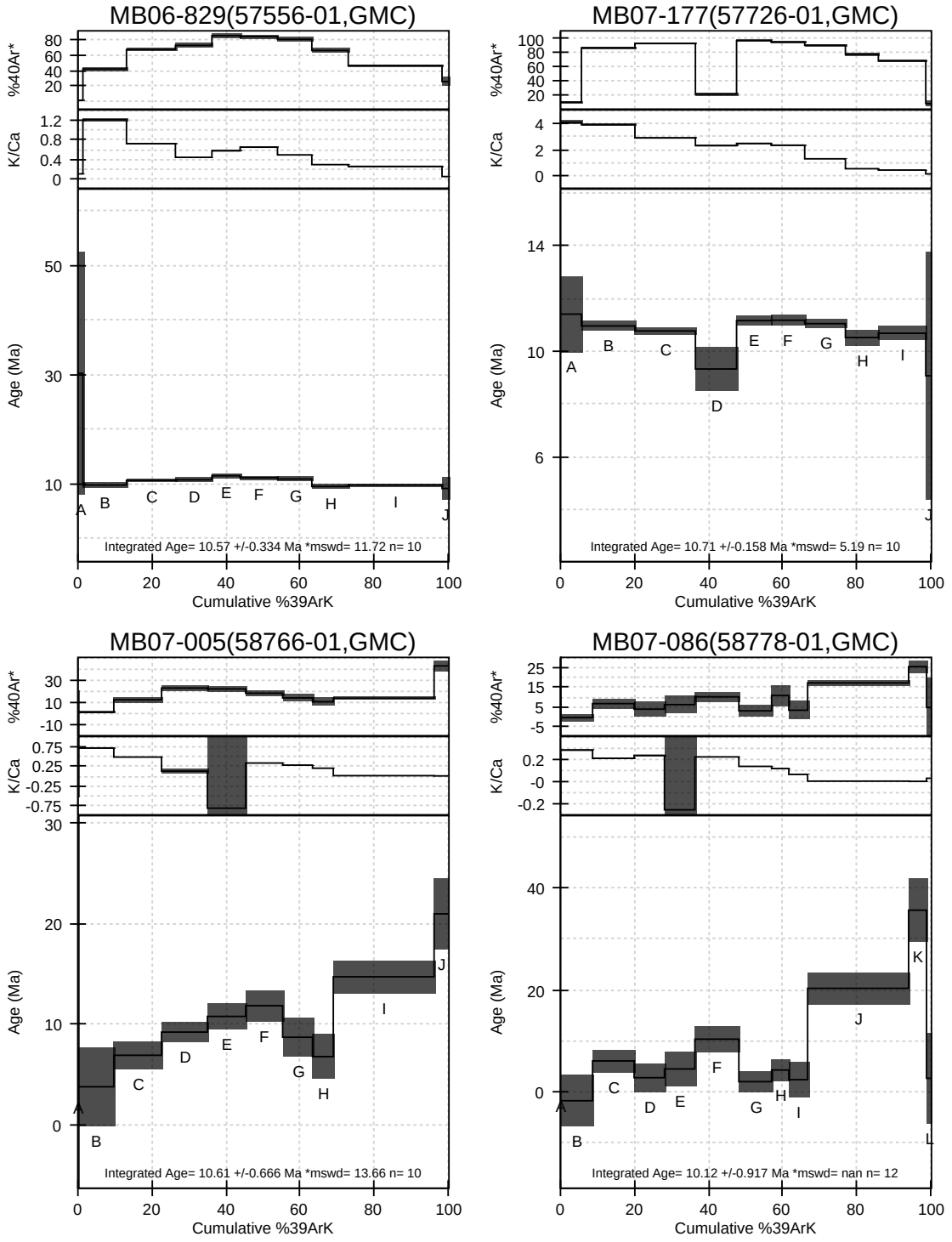
Plateau age calculated as weighted mean of plateau steps. Integrated age calculated as isotopic recombination of all steps.
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase

APPENDIX C

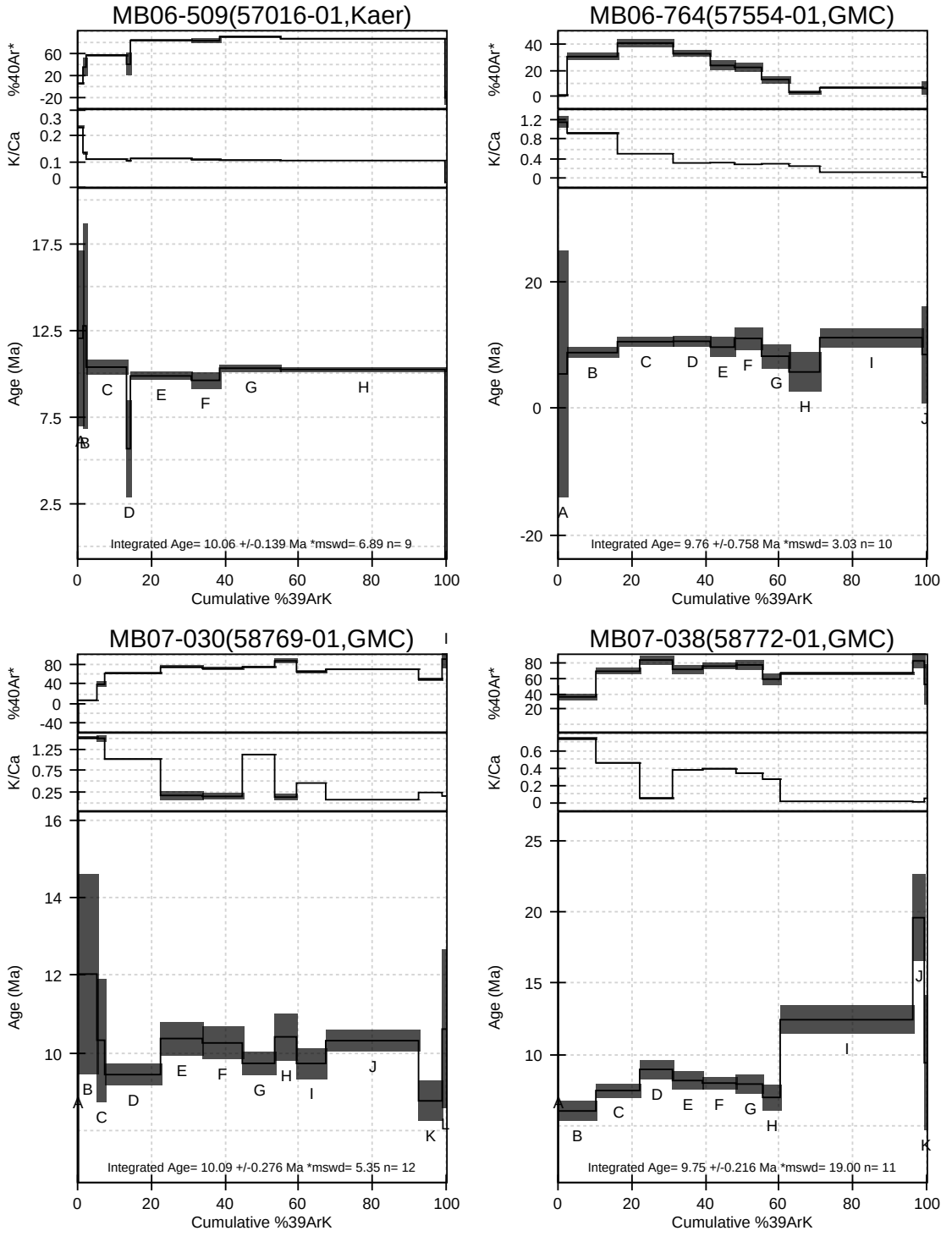
$^{40}Ar/^{39}Ar$ STEP HEAT FIGURES (INTEGRATED)



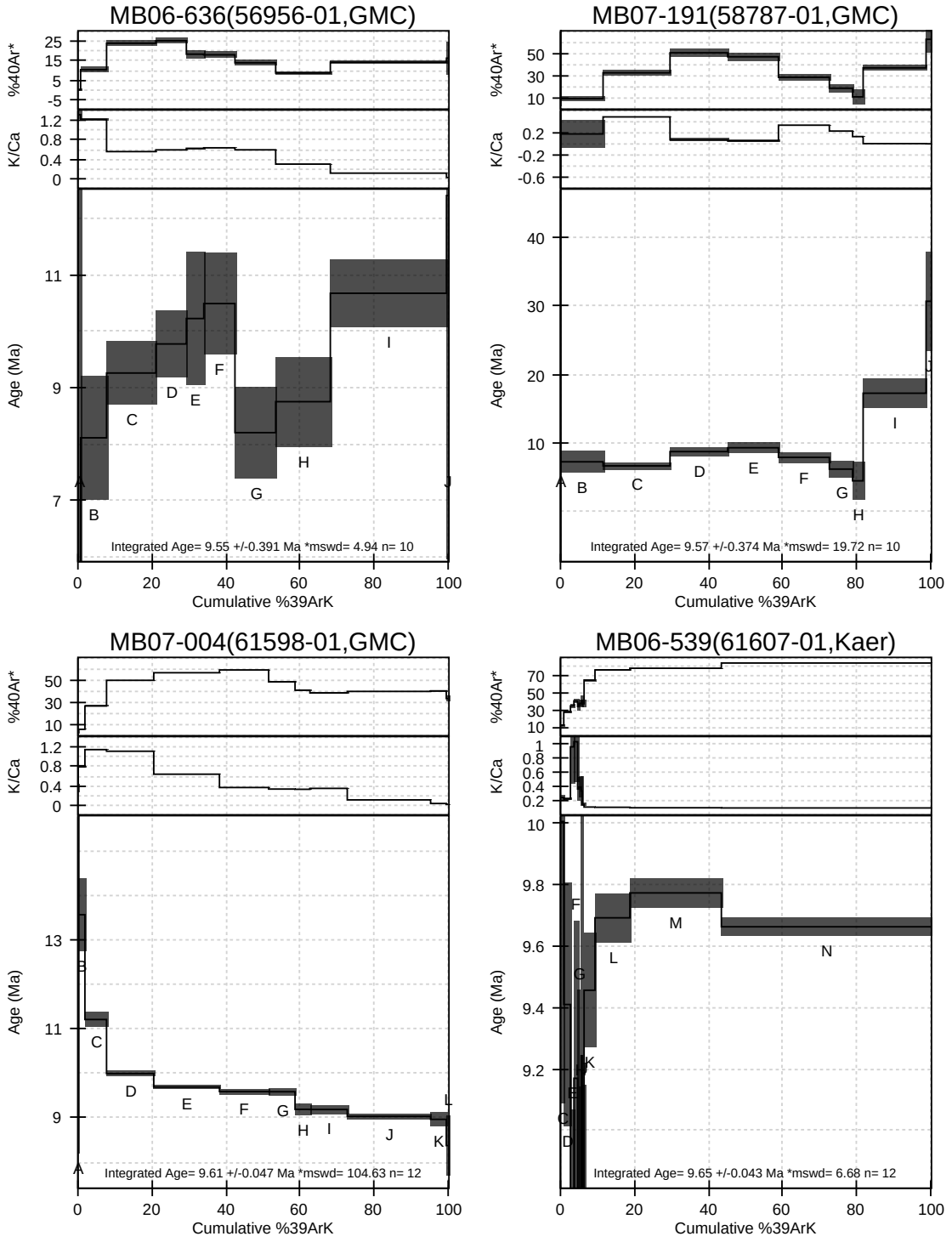
Plateau age calculated as weighted mean of plateau steps. Integrated age calculated as isotopic recombination of all steps.
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



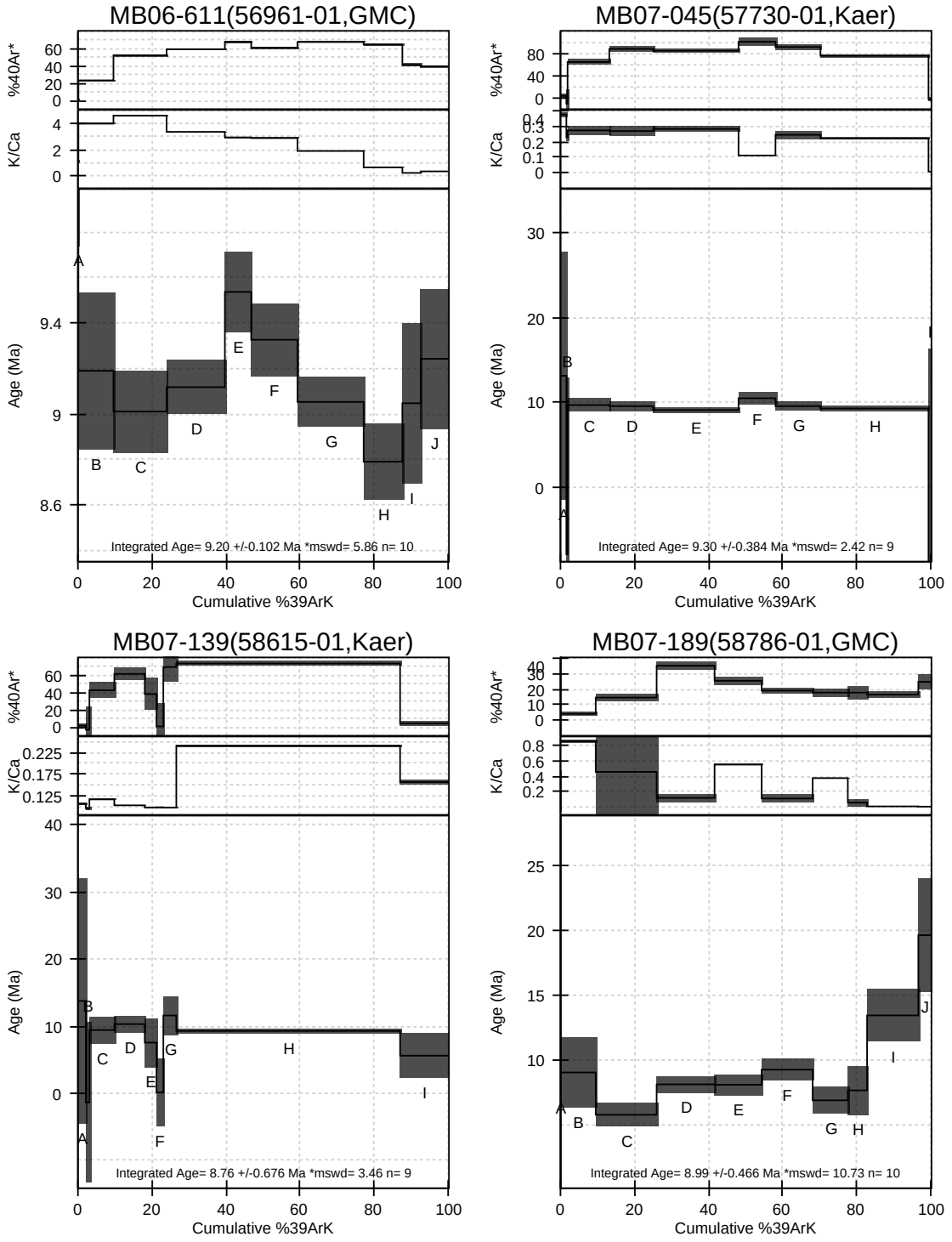
Plateau age calculated as weighted mean of plateau steps. Integrated age calculated as isotopic recombination of all steps.
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



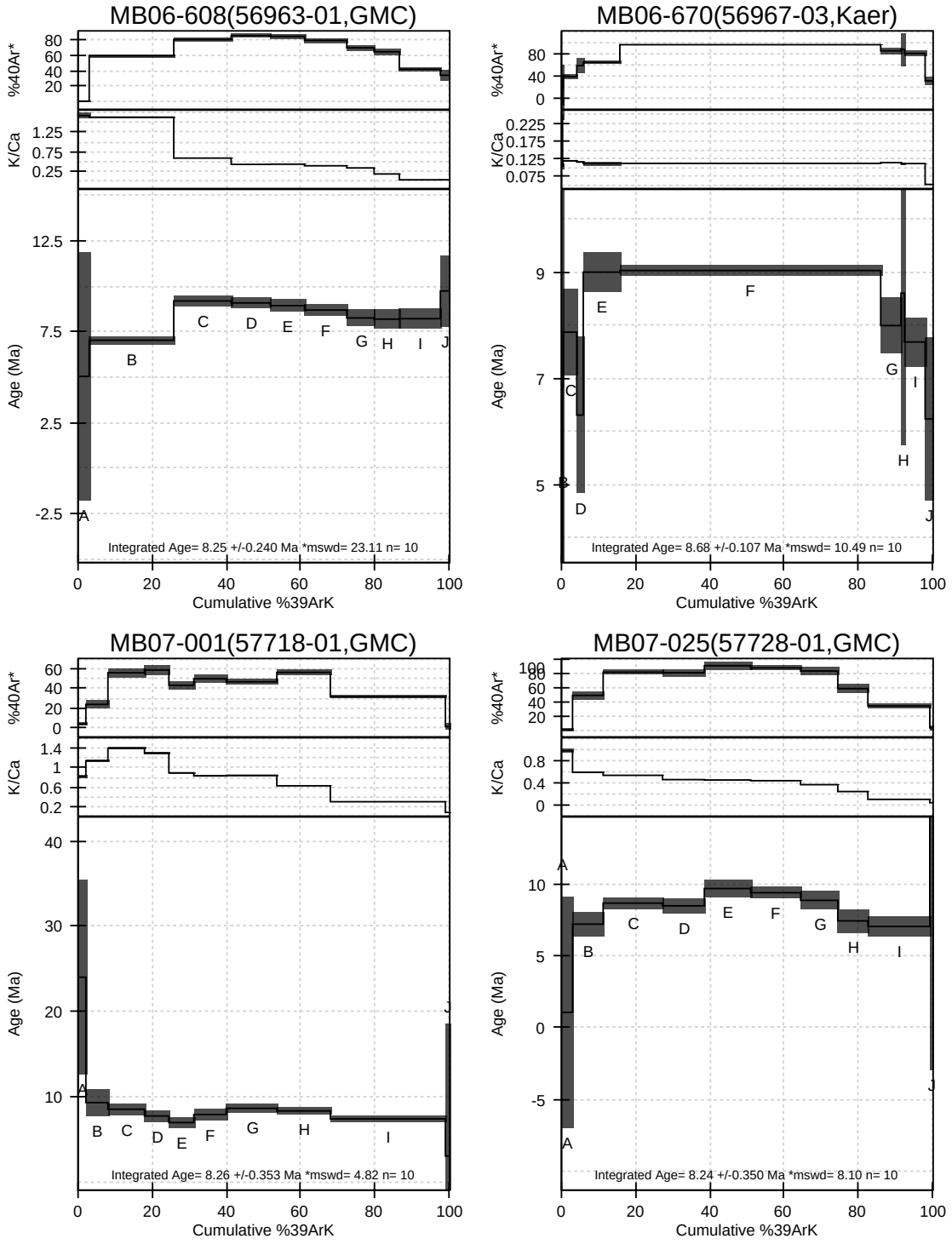
Plateau age calculated as weighted mean of plateau steps. Integrated age calculated as isotopic recombination of all steps.
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



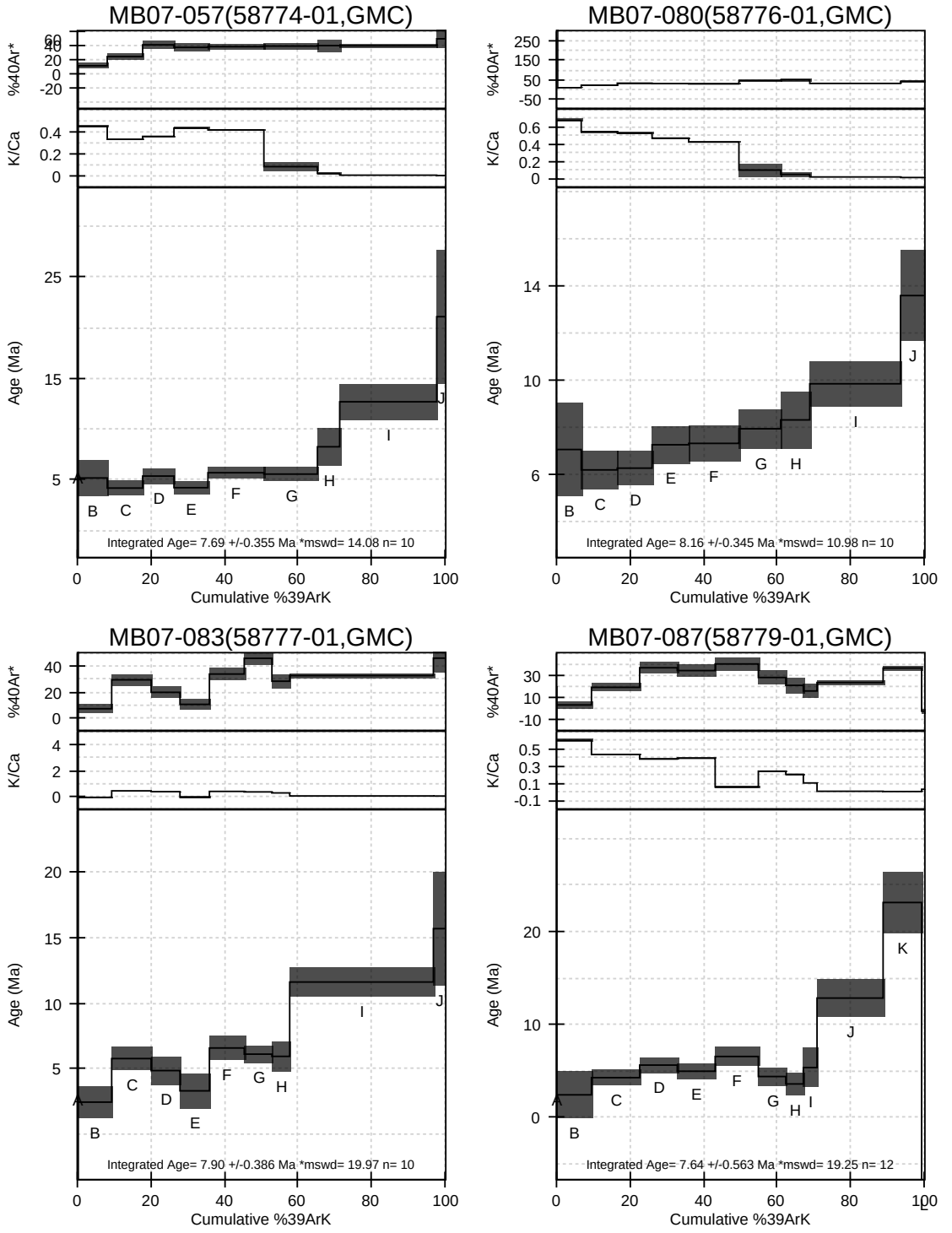
Plateau age calculated as weighted mean of plateau steps. Integrated age calculated as isotopic recombination of all steps.
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



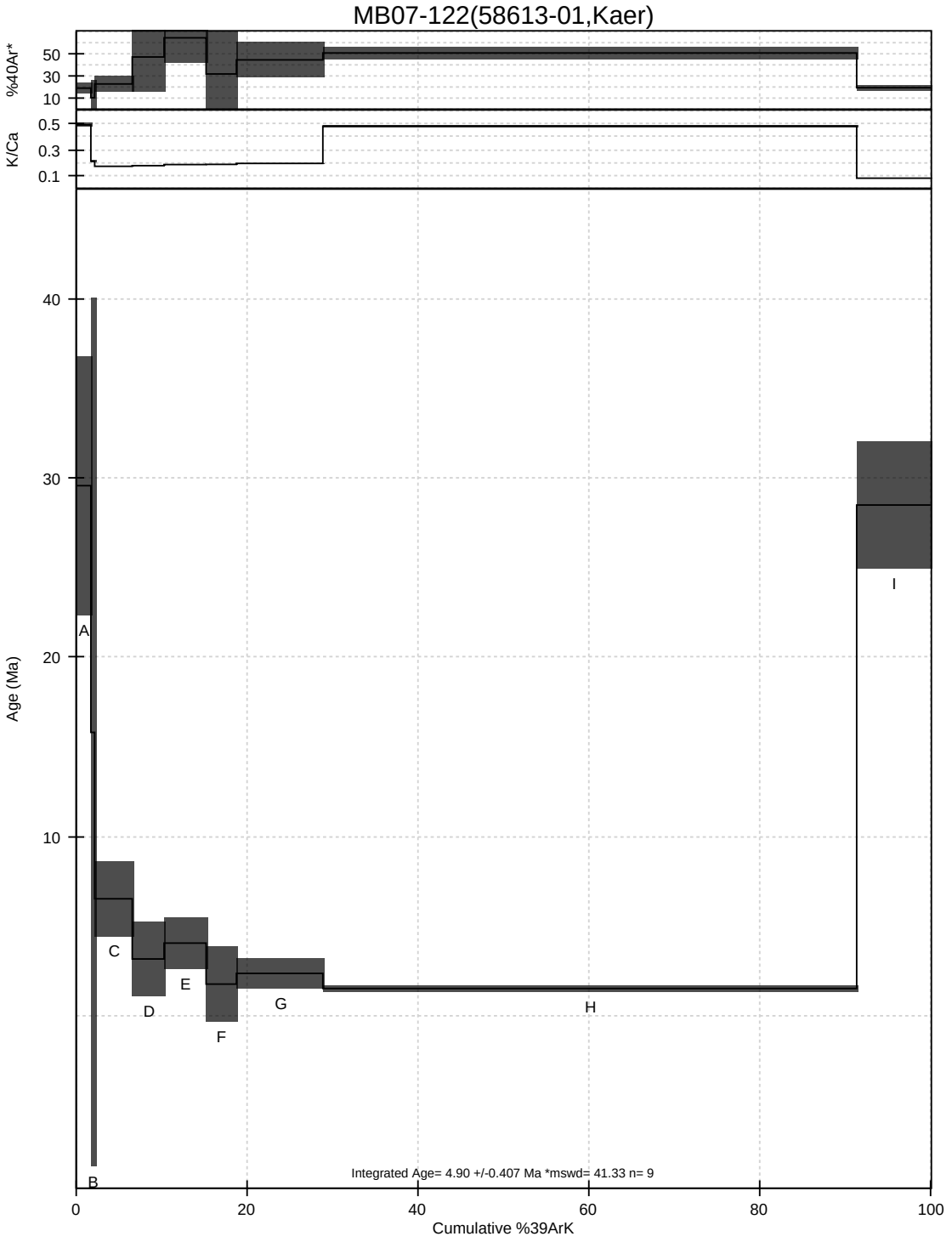
Plateau age calculated as weighted mean of plateau steps. Integrated age calculated as isotopic recombination of all steps.
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



Plateau age calculated as weighted mean of plateau steps. Integrated age calculated as isotopic recombination of all steps.
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



Plateau age calculated as weighted mean of plateau steps. Integrated age calculated as isotopic recombination of all steps.
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase



Plateau age calculated as weighted mean of plateau steps. Integrated age calculated as isotopic recombination of all steps.
Plateau and Integrated Age uncertainties ±2σ.GMC=Groundmass Concentrate, Kaer=Kaersutite, Plag=Plagioclase

APPENDIX D

$^{40}Ar/^{39}Ar$ MAP FUSION DATA TABLE

Table D.1. MAP Fusion $^{40}Ar/^{39}Ar$ Data

Sample: MB06-710 **Lab #**: 56977 **J**: 7.41E-04 ±2.15E-06 **Disc.**: 1.004 ±0.0010

Material: Sanidine **IGSN**: **Spectrometer**: map

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%$^{40}Ar^*$	Age (Ma)	± 1σ
01	2.2	4.605	1.19929	0.00148	0.13735	0.00017	0.00168	0.00001	0.00139	0.00002	0.00004	8.0131E-06	35.26	0.438	99.0	11.69	0.0311
02	2.2	7.392	1.92493	0.00231	0.22183	0.00029	0.00263	0.00002	0.00387	0.00002	0.00005	0.00001	20.46	0.133	99.2	11.64	0.0274
03	2.2	3.108	0.80928	0.00102	0.09276	0.00016	0.00112	0.00002	0.00256	0.00002	0.00004	8.6730E-06	12.93	0.091	98.5	11.61	0.0447
04	2.2	3.757	0.97830	0.00123	0.11122	0.00017	0.00132	0.00002	0.00449	0.00002	0.00004	7.9704E-06	8.83	0.048	98.8	11.75	0.0369
05	2.2	3.325	0.86583	0.00107	0.09917	0.00015	0.00120	0.00002	0.00206	0.00002	0.00001	8.1840E-06	17.16	0.194	99.6	11.75	0.0401
06	2.2	5.969	1.55438	0.00184	0.17808	0.00025	0.00218	0.00002	0.00458	0.00003	0.00005	8.5126E-06	13.87	0.083	99.0	11.68	0.0287
07	2.2	2.535	0.66013	0.00104	0.07519	0.00016	0.00093	0.00002	0.00076	0.00002	0.00002	0.00001	35.23	1.116	99.0	11.75	0.0658
08	2.2	1.968	0.51257	0.00106	0.05867	0.00019	0.00073	0.00001	0.00114	0.00002	0.00003	0.00001	18.30	0.351	98.3	11.61	0.0994
09	2.2	3.088	0.80410	0.00213	0.09183	0.00034	0.00112	0.00002	0.00535	0.00004	0.00002	0.00002	6.11	0.052	99.4	11.76	0.1026
10	2.2	2.147	0.55902	0.00102	0.06356	0.00019	0.00080	0.00001	0.00140	0.00002	0.00003	0.00001	16.17	0.250	98.6	11.71	0.0993
11	2.2	2.030	0.52865	0.00079	0.05669	0.00011	0.00072	0.00001	0.00373	0.00003	0.00013	7.5248E-06	5.41	0.041	92.7	11.68	0.0607
12	2.2	2.356	0.61356	0.00090	0.06998	0.00014	0.00088	0.00001	0.00115	0.00001	0.00005	8.3515E-06	21.73	0.268	97.4	11.54	0.0555
13	2.2	3.528	0.91874	0.00115	0.10536	0.00017	0.00132	0.00001	0.00109	0.00001	0.00004	8.9152E-06	34.32	0.450	98.8	11.64	0.0410
14	2.2	3.625	0.94401	0.00124	0.10711	0.00017	0.00134	0.00001	0.00723	0.00003	0.00006	7.8945E-06	5.27	0.026	98.1	11.69	0.0379
15	2.2	3.321	0.86492	0.00108	0.09358	0.00015	0.00116	0.00002	0.00128	0.00002	0.00018	9.0474E-06	25.94	0.350	93.8	11.72	0.0455
Weighted Mean Age																11.68	±0.036

Sample: MB07-142 **Lab #**: 57743 **J**: 7.37E-04 ±1.58E-06 **Disc.**: 1.004 ±0.0010

Material: Feldspar **IGSN**: **Spectrometer**: map

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%$^{40}Ar^*$	Age (Ma)	± 1σ
01	2.8	1.376	0.25106	0.00061	0.03052	0.00016	0.00036	0.00002	0.00302	0.00005	0.00007	0.00001	3.02	0.051	91.6	10.14	0.2024
02	2.8	1.620	0.29567	0.00070	0.03406	0.00020	0.00043	0.00002	0.00378	0.00005	0.00012	0.00002	2.69	0.039	87.8	10.26	0.1946
03	2.8	0.707	0.12906	0.00040	0.01694	0.00010	0.00024	0.00002	0.00189	0.00004	0.00005	0.00001	2.68	0.058	88.6	9.09	0.3219
04	2.8	2.304	0.42043	0.00086	0.04789	0.00014	0.00063	0.00002	0.00529	0.00006	0.00015	0.00002	2.70	0.031	89.8	10.61	0.1365
05	2.8	1.976	0.36064	0.00085	0.04092	0.00020	0.00052	0.00002	0.00519	0.00005	0.00018	0.00002	2.35	0.025	85.3	10.12	0.1942
06	2.8	1.466	0.26753	0.00069	0.03342	0.00016	0.00041	0.00002	0.00303	0.00004	0.00012	0.00002	3.29	0.051	87.3	9.40	0.1987

Sample: MB07-142 **Lab #**: 57743 **J**: 7.37E-04 ±1.58E-06 **Disc.**: 1.004 ±0.0010

07	2.8	1.218	0.22221	0.00068	0.02708	0.00015	0.00039	0.00002	0.00339	0.00007	0.00003	0.00002	2.38	0.048	95.7	10.56	0.2424
08	2.8	0.733	0.13370	0.00038	0.01616	0.00012	0.00022	0.00002	0.00165	0.00005	0.00005	0.00002	2.92	0.083	88.3	9.83	0.4029
Weighted Mean Age																10.16	±0.076

Sample: MB07-113 **Lab #**: 57741 **J**: 7.41E-04 ±1.66E-06 **Disc.**: 1.004 ±0.0010

Material: Feldspar **IGSN**: **Spectrometer**: map

	N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
X	01	2.8	0.763	0.13924	0.00037	0.01758	0.00014	0.00024	0.00001	0.00250	0.00003	0.00007	0.00002	2.12	0.030	85.0	9.11	0.3876
	02	2.8	1.982	0.36165	0.00095	0.04381	0.00015	0.00059	0.00002	0.00412	0.00005	0.00012	0.00002	3.20	0.038	90.6	10.11	0.1656
	03	2.8	1.012	0.18461	0.00048	0.02347	0.00012	0.00036	0.00002	0.00173	0.00003	0.00004	0.00002	4.08	0.077	94.3	10.03	0.2861
	04	2.8	2.161	0.39442	0.00088	0.04349	0.00023	0.00059	0.00002	0.00328	0.00005	0.00022	0.00002	3.98	0.068	83.8	10.27	0.2033
	05	2.8	1.571	0.28673	0.00069	0.03515	0.00016	0.00044	0.00002	0.00398	0.00006	0.00011	0.00002	2.65	0.041	89.3	9.85	0.1980
	06	2.8	0.950	0.17327	0.00040	0.01945	0.00014	0.00026	0.00002	0.00284	0.00004	0.00011	0.00002	2.06	0.033	81.2	9.78	0.3394
	07	2.8	1.353	0.24685	0.00067	0.02760	0.00014	0.00033	0.00002	0.00468	0.00006	0.00015	0.00002	1.77	0.025	82.2	9.94	0.2541
	08	2.8	1.616	0.29485	0.00086	0.03246	0.00014	0.00043	0.00002	0.00476	0.00006	0.00015	0.00002	2.05	0.026	85.0	10.44	0.2300
	09	2.8	0.597	0.10894	0.00033	0.01323	0.00010	0.00018	0.00002	0.00153	0.00004	0.00002	0.00001	2.60	0.065	94.4	10.51	0.4481
	10	2.8	0.851	0.15529	0.00039	0.01972	0.00014	0.00026	0.00002	0.00149	0.00004	0.00002	0.00002	3.98	0.112	96.4	10.26	0.3215
	11	2.8	1.646	0.30030	0.00073	0.03580	0.00016	0.00044	0.00002	0.00328	0.00005	0.00010	0.00002	3.27	0.050	90.0	10.21	0.1973
	12	2.8	1.297	0.23666	0.00068	0.02917	0.00012	0.00035	0.00002	0.00278	0.00005	0.00009	0.00002	3.15	0.056	88.7	9.73	0.2116
	13	2.8	1.885	0.34399	0.00075	0.04179	0.00016	0.00058	0.00002	0.00316	0.00006	0.00015	0.00002	3.97	0.073	87.6	9.75	0.1902
	14	2.8	1.695	0.30934	0.00078	0.03445	0.00019	0.00044	0.00002	0.00402	0.00006	0.00021	0.00002	2.57	0.042	79.8	9.69	0.2243
X	15	2.8	1.603	0.29247	0.00072	0.02509	0.00015	0.00039	0.00002	0.00428	0.00006	0.00044	0.00002	1.76	0.028	55.8	8.80	0.3752
	16	3.2	3.694	0.67406	0.00110	0.07834	0.00023	0.00103	0.00003	0.00615	0.00006	0.00036	0.00003	3.64	0.038	84.4	9.82	0.1608
	17	3.2	2.404	0.43870	0.00101	0.04851	0.00022	0.00069	0.00002	0.00362	0.00006	0.00027	0.00002	3.83	0.062	82.2	10.05	0.1881
	18	3.2	2.280	0.41601	0.00104	0.04637	0.00022	0.00068	0.00002	0.00523	0.00005	0.00022	0.00002	2.53	0.028	84.4	10.23	0.1891
	19	3.2	2.799	0.51082	0.00088	0.06345	0.00024	0.00083	0.00002	0.00358	0.00004	0.00016	0.00002	5.06	0.066	90.7	9.87	0.1290
	20	3.2	1.550	0.28293	0.00067	0.03288	0.00016	0.00043	0.00002	0.00391	0.00005	0.00015	0.00002	2.40	0.033	85.0	9.89	0.2229
	21	3.2	1.602	0.29231	0.00084	0.03384	0.00017	0.00051	0.00003	0.00680	0.00006	0.00014	0.00002	1.42	0.014	85.8	10.02	0.2053
	22	3.2	3.051	0.55683	0.00097	0.06726	0.00023	0.00089	0.00002	0.00529	0.00006	0.00023	0.00002	3.62	0.045	87.8	9.82	0.1071
	23	3.2	4.450	0.81208	0.00129	0.10147	0.00036	0.00135	0.00003	0.00649	0.00008	0.00023	0.00002	4.46	0.055	91.8	9.93	0.0886
	24	3.2	3.351	0.61145	0.00112	0.07159	0.00025	0.00095	0.00003	0.00683	0.00006	0.00028	0.00002	2.99	0.030	86.7	10.01	0.1249
	25	3.2	3.417	0.62350	0.00117	0.07175	0.00025	0.00092	0.00003	0.00424	0.00004	0.00038	0.00003	4.82	0.047	82.3	9.66	0.1499

Sample: MB07-113 **Lab #**: 57741 **J**: 7.41E-04 ±1.66E-06 **Disc.**: 1.004 ±0.0010

26	3.2	3.002	0.54784	0.00108	0.06289	0.00025	0.00084	0.00003	0.00830	0.00005	0.00026	0.00003	2.16	0.017	86.0	10.13	0.1671
27	3.2	2.406	0.43897	0.00082	0.05187	0.00018	0.00067	0.00003	0.00601	0.00006	0.00021	0.00002	2.46	0.026	86.1	9.85	0.1783
Weighted Mean Age																9.95	±0.041

Sample: MB06-827 **Lab #**: 57493 **J**: 8.03E-04 ±4.90E-07 **Disc.**: 1.003 ±0.0011

Material: Sanidine **IGSN**: **Spectrometer**: map

	N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01	2.3	0.067	0.01246	0.00015	0.00144	0.00003	0.00003	8.7420E-06	0.00410	0.00004	0.00004	0.00001	0.07	0.001	20.0	2.56	3.2435
	02	2.3	0.074	0.01381	0.00015	0.00147	0.00002	0.00002	8.7725E-06	0.00873	0.00006	0.00002	8.7896E-06	0.03	5.5158E-04	70.7	9.85	2.6229
X	03	2.3	0.037	0.00690	0.00014	0.00069	0.00002	9.2649E-07	8.7831E-06	0.00200	0.00002	0.00004	9.5228E-06	0.07	0.002	-50.7	-7.49	6.0419
	04	2.3	0.057	0.01071	0.00015	0.00142	0.00003	0.00002	6.5113E-06	0.01017	0.00007	0.00002	8.2691E-06	0.03	5.4494E-04	67.3	7.55	2.5701
	05	2.3	0.075	0.01397	0.00015	0.00136	0.00002	0.00003	0.00001	0.00358	0.00003	0.00003	9.3617E-06	0.07	0.001	46.7	7.06	3.0003
	06	2.3	0.150	0.02785	0.00016	0.00152	0.00002	0.00006	8.3926E-06	0.00510	0.00004	0.00007	0.00001	0.06	9.8591E-04	24.9	6.73	3.0955
X	07	2.3	0.019	0.00360	0.00014	0.00037	0.00002	0.00002	6.8203E-06	0.00199	0.00003	-2.1809E-0	0.00001	0.04	0.002	113.7	16.52	13.3855
X	08	2.3	0.052	0.00970	0.00013	0.00094	0.00002	0.00004	8.2235E-06	0.00405	0.00004	0.00004	7.7691E-06	0.05	0.001	-8.5	-1.30	3.6233
	09	2.3	0.677	0.12607	0.00026	0.01843	0.00010	0.00023	0.00001	0.00040	0.00001	-1.9600E-0	0.00001	9.07	0.333	100.5	10.07	0.2853
X	10	2.3	0.009	0.00170	0.00015	0.00019	0.00001	0.00002	6.7527E-06	0.00054	0.00002	-7.9995E-0	8.4853E-06	0.07	0.005	245.9	31.65	18.9394
	11	2.3	0.253	0.04717	0.00020	0.00124	0.00003	0.00008	7.7300E-06	0.00363	0.00003	0.00013	0.00001	0.07	0.002	20.9	11.75	5.1738
X	12	2.3	0.035	0.00656	0.00015	0.00064	0.00002	0.00004	7.8766E-06	0.00311	0.00003	-4.9162E-0	7.5282E-06	0.04	0.001	132.4	19.84	5.1082
	13	2.3	0.040	0.00736	0.00015	0.00066	0.00002	0.00001	7.6444E-06	0.00188	0.00002	7.6269E-06	7.9066E-06	0.07	0.003	74.9	12.32	5.2354
	14	2.3	0.025	0.00462	0.00014	0.00044	0.00001	3.1992E-06	0.00001	0.00121	0.00002	6.8954E-06	8.1403E-06	0.07	0.002	61.5	9.49	8.0399
	15	2.3	0.028	0.00529	0.00015	0.00060	0.00002	0.00002	8.5768E-06	0.00299	0.00003	3.5920E-06	9.7682E-06	0.04	0.001	92.1	12.07	7.1420
Weighted Mean Age																	9.95	±0.277

Sample: MB06-830 **Lab #**: 57494 **J**: 8.01E-04 ±4.69E-07 **Disc.**: 1.003 ±0.0011

Material: Sanidine **IGSN**: **Spectrometer**: map

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01	2.3	1.099	0.20468	0.00057	0.02994	0.00009	0.00035	0.00002	0.00105	0.00002	6.7722E-06	0.00001	5.57	0.120	99.1	9.91	0.1534

Sample: MB06-830					**Lab #**: 57494		**J**: 8.01E-04 ±4.69E-07				**Disc.**: 1.003 ±0.0011							
X	02	2.3	0.789	0.14688	0.00032	0.01562	0.00009	0.00021	0.00002	0.00170	0.00003	0.00003	0.00001	1.80	0.029	93.9	12.90	0.3050
	03	2.3	1.094	0.20378	0.00053	0.02829	0.00011	0.00036	0.00001	0.00071	0.00002	0.00004	9.6478E-06	7.77	0.179	94.7	9.97	0.1544
	04	2.3	1.774	0.33029	0.00078	0.04680	0.00017	0.00062	0.00002	0.00165	0.00003	0.00006	0.00001	5.52	0.092	94.9	9.80	0.1170
	05	2.3	1.006	0.18726	0.00048	0.02530	0.00011	0.00034	0.00001	0.00072	0.00002	0.00008	0.00001	6.90	0.153	87.8	9.51	0.2152
X	06	2.3	2.950	0.54939	0.00097	0.05954	0.00018	0.00079	0.00002	0.00021	0.00001	0.00026	0.00001	55.39	3.610	85.8	11.57	0.1146
	07	2.3	1.185	0.22072	0.00048	0.02882	0.00012	0.00038	0.00001	0.00067	0.00002	0.00009	0.00001	8.43	0.235	88.1	9.86	0.1768
	08	2.3	0.851	0.15842	0.00034	0.02176	0.00010	0.00032	0.00001	0.00190	0.00003	0.00004	0.00001	2.23	0.033	92.3	9.83	0.2744
	09	2.3	1.113	0.20732	0.00047	0.02991	0.00011	0.00038	0.00002	0.00069	0.00002	0.00004	0.00001	8.46	0.230	95.0	9.63	0.1650
	10	2.3	1.086	0.20230	0.00049	0.02730	0.00013	0.00037	0.00001	0.00078	0.00002	0.00007	0.00001	6.84	0.144	90.3	9.78	0.1784
	11	2.3	0.904	0.16836	0.00037	0.02275	0.00011	0.00028	9.5425E-06	0.00078	0.00002	0.00005	0.00001	5.66	0.153	91.4	9.89	0.2357
	12	2.3	0.817	0.15216	0.00029	0.02165	0.00010	0.00030	0.00001	0.00057	0.00002	0.00004	0.00001	7.35	0.258	92.9	9.56	0.2130
	13	2.3	0.966	0.17997	0.00042	0.02606	0.00015	0.00028	0.00002	0.00071	0.00002	0.00002	0.00001	7.14	0.166	96.2	9.72	0.2032
X	14	2.3	0.159	0.02969	0.00017	0.00279	0.00003	0.00003	7.3546E-06	0.00032	0.00001	0.00003	8.7206E-06	1.71	0.079	70.5	10.95	1.3540
X	15	2.3	0.142	0.02652	0.00015	0.00132	0.00002	0.00002	9.4507E-06	0.00325	0.00003	0.00007	9.3005E-06	0.08	0.002	19.9	5.88	3.0609
Weighted Mean Age																	9.79	±0.053

Sample: MB07-176			**Lab #**: 57745		**J**: 7.35E-04 ±1.65E-06		**Disc.**: 1.004 ±0.0010		
Material: Feldspar			**IGSN**:		**Spectrometer**: map				

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%$^{40}Ar^*$	Age (Ma)	± 1σ
01	2.8	1.768	0.32268	0.00081	0.04171	0.00016	0.00055	0.00002	0.00487	0.00007	0.00010	0.00002	2.54	0.037	91.4	9.50	0.1670
02	2.8	3.171	0.57858	0.00116	0.06320	0.00020	0.00082	0.00003	0.00489	0.00006	0.00041	0.00002	3.83	0.045	79.3	9.75	0.1489
03	2.8	1.452	0.26497	0.00086	0.03310	0.00018	0.00046	0.00002	0.00378	0.00005	0.00009	0.00001	2.60	0.037	90.2	9.69	0.1843
04	2.8	2.223	0.40559	0.00097	0.05415	0.00020	0.00064	0.00002	0.00294	0.00006	0.00003	0.00001	5.45	0.106	97.6	9.81	0.1124
05	2.8	1.824	0.33278	0.00079	0.04267	0.00014	0.00057	0.00002	0.00399	0.00004	0.00006	0.00002	3.17	0.034	94.6	9.90	0.1784
06	2.8	1.409	0.25714	0.00065	0.03290	0.00015	0.00042	0.00002	0.00422	0.00005	0.00009	0.00002	2.31	0.028	90.2	9.47	0.1991
07	2.8	2.011	0.36689	0.00092	0.04869	0.00021	0.00062	0.00002	0.00539	0.00006	0.00008	0.00002	2.68	0.033	93.8	9.49	0.1608
08	2.8	1.394	0.25445	0.00068	0.03346	0.00017	0.00047	0.00002	0.00376	0.00005	0.00008	0.00002	2.64	0.038	90.8	9.27	0.2173
09	2.8	1.004	0.18323	0.00035	0.02518	0.00014	0.00029	0.00002	0.00150	0.00003	0.00004	0.00001	4.96	0.118	94.2	9.20	0.2136
10	2.8	1.762	0.32146	0.00070	0.04330	0.00020	0.00055	0.00002	0.00301	0.00005	0.00010	0.00002	4.25	0.078	91.0	9.07	0.1741
11	2.8	1.183	0.21580	0.00057	0.02885	0.00013	0.00037	0.00002	0.00242	0.00004	0.00005	0.00002	3.53	0.061	93.7	9.40	0.2308
12	2.8	1.859	0.33915	0.00073	0.04376	0.00018	0.00057	0.00002	0.00355	0.00004	0.00007	0.00001	3.64	0.042	93.8	9.75	0.1419
13	2.8	2.447	0.44654	0.00110	0.05699	0.00019	0.00077	0.00002	0.00339	0.00005	0.00013	0.00002	4.98	0.071	91.2	9.60	0.1259

Sample: MB07-176 **Lab #**: 57745 **J**: 7.35E-04 ±1.65E-06 **Disc.**: 1.004 ±0.0010

14	2.8	1.384	0.25258	0.00074	0.03439	0.00016	0.00044	0.00002	0.00216	0.00003	-0.00001	0.00002	4.70	0.076	101.3	9.99	0.1932
15	2.8	2.864	0.52268	0.00103	0.07042	0.00023	0.00085	0.00003	0.00333	0.00005	0.00007	0.00002	6.25	0.096	95.9	9.55	0.1062
Weighted Mean Age																9.60	±0.046

Sample: MB07-022 **Lab #**: 57739 **J**: 7.41E-04 ±1.58E-06 **Disc.**: 1.004 ±0.0010

Material: Feldspar **IGSN**: **Spectrometer**: map

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01	2.8	2.771	0.50561	0.00098	0.06679	0.00021	0.00089	0.00003	0.00256	0.00004	0.00018	0.00002	7.90	0.121	89.3	9.14	0.1373
02	2.8	1.854	0.33825	0.00082	0.04047	0.00020	0.00050	0.00002	0.00184	0.00005	0.00021	0.00002	6.67	0.177	82.1	9.28	0.2209
05	2.8	0.991	0.18076	0.00051	0.02493	0.00015	0.00033	0.00002	0.00116	0.00003	0.00005	0.00002	6.53	0.160	92.1	9.03	0.3197
06	2.8	0.854	0.15587	0.00036	0.02184	0.00011	0.00025	0.00002	0.00066	0.00003	-5.6075E-0	0.00002	10.08	0.399	101.1	9.76	0.3636
08	2.8	1.125	0.20537	0.00061	0.02770	0.00016	0.00033	0.00006	0.00117	0.00003	0.00006	0.00002	7.16	0.182	91.3	9.16	0.2880
09	2.8	1.632	0.29785	0.00086	0.03745	0.00016	0.00054	0.00006	0.00124	0.00003	0.00015	0.00002	9.17	0.225	84.8	9.12	0.2557
10	2.8	1.305	0.23810	0.00070	0.02942	0.00014	0.00033	0.00006	0.00120	0.00003	0.00016	0.00002	7.40	0.194	79.8	8.74	0.3036
11	2.8	0.785	0.14324	0.00037	0.01899	0.00013	0.00023	0.00002	0.00074	0.00002	0.00003	0.00002	7.80	0.265	93.8	9.57	0.4571
12	2.8	1.008	0.18399	0.00047	0.02480	0.00013	0.00033	0.00002	0.00124	0.00003	0.00006	0.00002	6.05	0.140	91.0	9.13	0.3128
13	2.8	2.271	0.41440	0.00096	0.03752	0.00021	0.00058	0.00002	0.00139	0.00003	0.00050	0.00003	8.17	0.206	64.4	9.63	0.3442
14	2.8	2.326	0.42445	0.00085	0.02974	0.00013	0.00052	0.00002	0.00163	0.00004	0.00077	0.00003	5.51	0.133	46.6	9.00	0.4433
15	2.8	2.106	0.38428	0.00095	0.05097	0.00022	0.00064	0.00003	0.00227	0.00003	0.00012	0.00002	6.78	0.095	90.7	9.25	0.1784
16	3.2	4.518	0.82436	0.00127	0.10589	0.00028	0.00135	0.00002	0.00447	0.00005	0.00029	0.00002	6.80	0.081	89.8	9.46	0.0975
17	3.2	7.236	1.32038	0.00186	0.15477	0.00041	0.00201	0.00004	0.00558	0.00008	0.00082	0.00003	7.97	0.115	81.7	9.43	0.0854
18	3.2	6.055	1.10497	0.00171	0.13072	0.00033	0.00178	0.00003	0.00419	0.00005	0.00055	0.00003	8.95	0.101	85.3	9.76	0.0969
19	3.2	4.017	0.73305	0.00131	0.09745	0.00029	0.00124	0.00003	0.00298	0.00005	0.00021	0.00002	9.39	0.151	91.5	9.31	0.0910
20	3.2	0.899	0.16409	0.00044	0.02140	0.00011	0.00031	0.00002	0.00110	0.00004	0.00002	0.00002	5.55	0.221	97.0	10.06	0.3079
21	3.2	5.896	1.07599	0.00155	0.07641	0.00021	0.00121	0.00002	0.00264	0.00004	0.00177	0.00004	8.31	0.121	51.3	9.77	0.2086
22	3.2	2.323	0.42391	0.00083	0.05759	0.00024	0.00077	0.00002	0.00211	0.00003	0.00010	0.00002	7.82	0.116	93.2	9.28	0.1328
23	3.2	2.925	0.53376	0.00095	0.06648	0.00021	0.00091	0.00003	0.00302	0.00005	0.00023	0.00002	6.31	0.106	87.2	9.47	0.1250
24	3.2	3.058	0.55810	0.00101	0.07379	0.00023	0.00103	0.00002	0.00265	0.00004	0.00018	0.00002	7.98	0.133	90.4	9.25	0.1352
25	3.2	2.405	0.43879	0.00100	0.04392	0.00018	0.00066	0.00002	0.00169	0.00003	0.00050	0.00002	7.43	0.130	66.6	9.01	0.2105
26	3.2	2.465	0.44990	0.00099	0.05932	0.00018	0.00084	0.00002	0.00277	0.00004	0.00011	0.00002	6.12	0.099	92.8	9.52	0.1437
27	3.2	2.116	0.38611	0.00082	0.05061	0.00016	0.00067	0.00002	0.00187	0.00004	0.00011	0.00002	7.74	0.160	91.6	9.46	0.1502
Weighted Mean Age																9.40	±0.038

Sample: MB07-143 **Lab #**: 57744 **J**: 7.36E-04 ±1.58E-06 **Disc.**: 1.004 ±0.0010

Material: Feldspar **IGSN**: **Spectrometer**: map

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01	2.8	1.215	0.22170	0.00062	0.02865	0.00013	0.00044	0.00002	0.00240	0.00005	0.00007	0.00002	3.56	0.080	91.0	9.46	0.2483
02	2.8	0.736	0.13434	0.00035	0.01745	0.00012	0.00027	0.00002	0.00194	0.00004	0.00008	0.00002	2.68	0.053	82.9	8.57	0.3542
03	2.8	0.384	0.07012	0.00023	0.00920	0.00007	0.00012	0.00002	0.00113	0.00003	5.8819E-06	0.00002	2.43	0.066	97.7	10.01	0.7479
04	2.8	0.984	0.17955	0.00045	0.02069	0.00016	0.00029	0.00002	0.00184	0.00004	0.00009	0.00002	3.35	0.082	85.6	9.97	0.4228
05	2.8	1.409	0.25704	0.00067	0.03550	0.00016	0.00041	0.00002	0.00218	0.00003	8.8809E-06	0.00002	4.85	0.080	99.1	9.64	0.2196
06	2.8	1.192	0.21748	0.00057	0.02913	0.00012	0.00035	0.00002	0.00236	0.00003	0.00006	0.00002	3.66	0.051	92.3	9.25	0.2762
07	2.8	0.736	0.13428	0.00040	0.01736	0.00011	0.00023	0.00002	0.00169	0.00004	0.00007	0.00001	3.06	0.078	83.7	8.70	0.3457
08	2.8	1.383	0.25239	0.00078	0.03391	0.00017	0.00044	0.00002	0.00331	0.00005	0.00003	0.00001	3.04	0.048	97.0	9.69	0.1749
09	2.8	1.580	0.28837	0.00064	0.03655	0.00019	0.00049	0.00002	0.00414	0.00004	0.00012	0.00002	2.63	0.032	87.8	9.31	0.2188
10	2.8	0.717	0.13084	0.00034	0.01698	0.00010	0.00021	0.00002	0.00204	0.00003	0.00010	0.00002	2.47	0.034	76.7	7.95	0.4171
11	2.8	1.340	0.24461	0.00061	0.03220	0.00014	0.00044	0.00002	0.00213	0.00004	0.00010	0.00002	4.49	0.078	87.9	8.97	0.1921
13	2.8	1.048	0.19122	0.00046	0.02476	0.00014	0.00036	0.00002	0.00172	0.00004	0.00010	0.00001	4.27	0.098	84.8	8.80	0.2312
14	2.8	0.869	0.15849	0.00038	0.02030	0.00016	0.00028	0.00002	0.00229	0.00004	0.00011	0.00002	2.64	0.050	79.7	8.36	0.3886
15	2.8	1.281	0.23383	0.00074	0.03115	0.00015	0.00042	0.00002	0.00306	0.00004	0.00013	0.00001	3.02	0.038	84.2	8.49	0.1895
16	3.2	0.957	0.17459	0.00034	0.02280	0.00011	0.00036	0.00002	0.00222	0.00003	0.00005	0.00002	2.92	0.042	91.9	9.45	0.3212
17	3.2	1.788	0.32627	0.00074	0.04203	0.00017	0.00060	0.00003	0.00510	0.00007	0.00014	0.00002	2.34	0.034	87.4	9.11	0.2030
18	3.2	2.155	0.39332	0.00085	0.05159	0.00022	0.00068	0.00002	0.00568	0.00006	0.00013	0.00002	2.58	0.030	90.5	9.27	0.1372
Weighted Mean Age																9.16	±0.061

Sample: MB07-134 **Lab #**: 57742 **J**: 7.39E-04 ±1.65E-06 **Disc.**: 1.004 ±0.0010

Material: Feldspar **IGSN**: **Spectrometer**: map

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01	2.8	0.947	0.17278	0.00036	0.02251	0.00012	0.00027	0.00002	0.00222	0.00005	0.00010	0.00002	3.04	0.064	83.8	8.68	0.2948
02	2.8	1.247	0.22752	0.00073	0.02976	0.00014	0.00039	0.00002	0.00300	0.00004	0.00009	0.00002	2.97	0.045	88.9	9.18	0.2299
03	2.8	0.749	0.13667	0.00034	0.01850	0.00012	0.00023	0.00002	0.00178	0.00003	0.00003	0.00002	3.11	0.049	94.0	9.37	0.3788
04	2.8	0.810	0.14778	0.00040	0.01988	0.00012	0.00024	0.00002	0.00203	0.00004	0.00002	0.00002	2.93	0.058	96.9	9.71	0.3404

Sample: MB07-134 **Lab #**: 57742 **J**: 7.39E-04 ±1.65E-06 **Disc.**: 1.004 ±0.0010

05	2.8	1.535	0.28017	0.00067	0.03900	0.00016	0.00049	0.00002	0.00250	0.00004	0.00003	0.00001	4.66	0.080	97.1	9.42	0.1503
06	2.8	1.516	0.27663	0.00072	0.03750	0.00015	0.00049	0.00002	0.00274	0.00004	0.00008	0.00002	4.10	0.063	91.1	9.07	0.1780
07	2.8	1.337	0.24399	0.00069	0.03482	0.00015	0.00048	0.00002	0.00257	0.00005	0.00007	0.00001	4.06	0.079	92.0	8.70	0.1694
08	2.8	1.195	0.21802	0.00065	0.02923	0.00014	0.00039	0.00002	0.00326	0.00006	0.00010	0.00002	2.68	0.047	86.3	8.69	0.2352
09	2.8	0.956	0.17444	0.00043	0.02047	0.00010	0.00030	0.00002	0.00215	0.00004	0.00012	0.00002	2.84	0.056	79.5	9.14	0.3173
10	2.8	0.973	0.17748	0.00039	0.02437	0.00015	0.00035	0.00002	0.00189	0.00003	0.00001	0.00002	3.86	0.061	98.0	9.63	0.3208
12	2.8	1.496	0.27293	0.00063	0.03850	0.00017	0.00050	0.00002	0.00272	0.00003	0.00003	0.00002	4.22	0.054	97.3	9.31	0.1646
13	2.8	0.770	0.14052	0.00040	0.01841	0.00013	0.00027	0.00001	0.00209	0.00003	0.00004	0.00002	2.63	0.046	92.8	9.56	0.3432
14	2.8	0.997	0.18190	0.00040	0.02471	0.00013	0.00026	0.00002	0.00214	0.00003	0.00011	0.00001	3.45	0.058	82.9	8.23	0.2372
15	2.8	0.923	0.16851	0.00042	0.02276	0.00015	0.00025	0.00002	0.00242	0.00003	0.00006	0.00002	2.80	0.043	88.9	8.88	0.3211
16	3.2	1.392	0.25393	0.00072	0.03455	0.00015	0.00047	0.00002	0.00290	0.00005	0.00007	0.00002	3.39	0.058	92.5	9.17	0.2105
17	3.2	1.929	0.35198	0.00091	0.04787	0.00017	0.00062	0.00002	0.00432	0.00005	0.00010	0.00002	3.16	0.041	91.7	9.09	0.1549
18	3.2	1.243	0.22681	0.00061	0.03234	0.00015	0.00044	0.00002	0.00273	0.00006	0.00003	0.00002	3.37	0.070	96.2	9.11	0.2010
19	3.2	2.965	0.54104	0.00117	0.07577	0.00022	0.00094	0.00003	0.00650	0.00006	0.00007	0.00002	3.32	0.032	96.3	9.27	0.1215
20	3.2	2.009	0.36664	0.00089	0.05077	0.00020	0.00068	0.00002	0.00474	0.00007	0.00012	0.00002	3.04	0.047	90.8	8.84	0.1586
21	3.2	1.450	0.26459	0.00069	0.03720	0.00016	0.00049	0.00002	0.00383	0.00005	0.00005	0.00002	2.76	0.036	95.0	9.11	0.1725
22	3.2	1.867	0.34077	0.00089	0.04887	0.00019	0.00061	0.00002	0.00356	0.00005	0.00002	0.00002	3.90	0.059	98.7	9.29	0.1421
23	3.2	1.965	0.35865	0.00088	0.05017	0.00020	0.00068	0.00002	0.00395	0.00005	0.00006	0.00002	3.61	0.049	95.0	9.17	0.1632
24	3.2	2.116	0.38607	0.00092	0.05383	0.00018	0.00067	0.00003	0.00427	0.00005	0.00009	0.00002	3.58	0.046	93.0	9.00	0.1250
25	3.2	4.328	0.78981	0.00145	0.10977	0.00026	0.00140	0.00003	0.00876	0.00008	0.00013	0.00002	3.56	0.032	95.2	9.24	0.0748
26	3.2	4.342	0.79224	0.00147	0.10532	0.00028	0.00142	0.00003	0.00959	0.00008	0.00026	0.00003	3.12	0.029	90.4	9.18	0.1016
27	3.2	3.503	0.63922	0.00133	0.08655	0.00026	0.00112	0.00003	0.00573	0.00008	0.00017	0.00002	4.28	0.059	92.2	9.18	0.1016
28	3.2	4.531	0.82690	0.00147	0.10363	0.00033	0.00137	0.00004	0.01139	0.00007	0.00041	0.00002	2.58	0.017	85.6	9.21	0.0953
29	3.2	4.407	0.80425	0.00132	0.10960	0.00026	0.00140	0.00003	0.00938	0.00008	0.00023	0.00002	3.31	0.029	91.9	9.10	0.0764
30	3.2	4.131	0.75391	0.00126	0.10128	0.00022	0.00139	0.00003	0.01060	0.00009	0.00025	0.00002	2.71	0.023	90.6	9.10	0.0954
Weighted Mean Age																9.14	±0.034

Sample: MB06-826a **Lab #**: 57475 **J**: 7.94E-04 ±1.34E-06 **Disc.**: 1.002 ±0.0010

Material: Sanidine **IGSN**: **Spectrometer**: map

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
02	2.3	0.169	0.03150	0.00024	0.00244	0.00005	0.00007	0.00002	0.00586	0.00008	0.00005	0.00003	0.07	0.002	53.1	9.98	5.0463
04	2.3	0.154	0.02873	0.00016	0.00177	0.00005	0.00005	0.00001	0.00410	0.00007	0.00006	0.00003	0.07	0.002	46.0	10.84	6.2487

Sample: MB06-826a **Lab #**: 57475 **J**: 7.94E-04 ±1.34E-06 **Disc.**: 1.002 ±0.0010

05	2.3	0.163	0.03034	0.00023	0.00251	0.00006	0.00001	0.00001	0.00263	0.00005	0.00002	0.00002	0.16	0.005	83.9	14.71	4.2423
07	2.3	0.264	0.04916	0.00041	0.00249	0.00008	0.00004	0.00002	0.00616	0.00011	0.00014	0.00005	0.07	0.003	21.7	6.25	9.2976
08	2.3	0.173	0.03220	0.00023	0.00252	0.00005	0.00002	0.00001	0.00420	0.00006	0.00007	0.00002	0.10	0.003	41.5	7.71	3.6207
09	2.3	0.247	0.04601	0.00036	0.00433	0.00009	0.00005	0.00002	0.00745	0.00008	6.7304E-06	0.00004	0.10	0.002	99.7	15.39	3.8218
11	2.3	0.097	0.01808	0.00016	0.00158	0.00005	-0.00002	0.00001	0.00340	0.00004	0.00002	0.00002	0.08	0.002	70.5	11.74	5.9693
12	2.3	0.402	0.07484	0.00049	0.00702	0.00016	0.00010	0.00002	0.00449	0.00008	0.00019	0.00004	0.27	0.008	25.3	3.92	2.4463
13	2.3	0.103	0.01925	0.00017	0.00194	0.00004	0.00002	0.00001	0.00479	0.00010	0.00004	0.00003	0.07	0.002	45.1	6.54	5.6781
14	2.3	0.166	0.03100	0.00021	0.00305	0.00006	0.00003	0.00001	0.00617	0.00007	0.00003	0.00002	0.08	0.002	78.9	11.66	3.0559
15	2.3	0.109	0.02026	0.00021	0.00156	0.00005	0.00003	0.00002	0.00436	0.00007	0.00006	0.00003	0.06	0.002	25.0	4.73	7.1170
Weighted Mean Age																9.10	±1.260

Sample: MB06-753 **Lab #**: 56974 **J**: 7.46E-04 ±2.08E-06 **Disc.**: 1.004 ±0.0010

Material: Sanidine **IGSN**: **Spectrometer**: map

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01	2.2	0.811	0.21113	0.00076	0.02941	0.00012	0.00034	0.00001	0.00119	0.00002	0.00009	0.00002	8.97	0.157	87.0	8.51	0.2280
02	2.2	1.075	0.27998	0.00095	0.04297	0.00015	0.00054	0.00001	0.00065	0.00002	0.00002	0.00002	24.24	0.679	98.4	8.73	0.1702
03	2.2	0.759	0.19765	0.00065	0.03021	0.00015	0.00039	0.00001	0.00035	0.00002	-0.00002	0.00002	31.50	1.377	102.4	9.13	0.2271
04	2.2	0.478	0.12443	0.00048	0.01898	0.00008	0.00023	9.2884E-06	0.00070	0.00002	2.3074E-06	0.00001	9.91	0.271	99.5	8.89	0.2886
05	2.2	0.553	0.14391	0.00054	0.02104	0.00013	0.00027	0.00001	0.00377	0.00004	-1.8302E-0	0.00001	2.03	0.023	100.7	9.38	0.2731
06	2.2	1.179	0.30696	0.00076	0.04747	0.00015	0.00056	0.00002	0.00042	0.00002	0.00002	0.00001	40.70	1.949	98.5	8.67	0.1123
07	2.2	1.092	0.28435	0.00071	0.04331	0.00012	0.00054	0.00001	0.00121	0.00002	-1.5706E-0	0.00001	13.04	0.190	100.2	8.96	0.1091
08	2.2	0.860	0.22398	0.00060	0.03451	0.00009	0.00043	9.4329E-06	0.00024	0.00001	2.7334E-06	9.7602E-06	52.08	2.833	99.7	8.81	0.1181
09	2.2	1.186	0.30882	0.00065	0.04673	0.00011	0.00059	8.5752E-06	0.00076	0.00001	0.00001	9.9505E-06	22.45	0.401	98.9	8.90	0.0899
10	2.2	0.663	0.17261	0.00054	0.02672	0.00008	0.00031	8.8599E-06	0.00018	9.8264E-06	0.00001	8.9359E-06	55.44	3.116	98.3	8.65	0.1394
11	2.2	0.899	0.23413	0.00061	0.03611	0.00008	0.00042	0.00001	0.00036	0.00001	-1.4827E-0	9.5975E-06	36.44	1.053	100.2	8.85	0.1107
12	2.2	1.023	0.26642	0.00059	0.03751	0.00010	0.00050	0.00001	0.00042	0.00001	0.00008	9.8567E-06	32.34	0.974	90.7	8.78	0.1103
13	2.2	0.411	0.10714	0.00042	0.01601	0.00007	0.00022	9.4292E-06	0.00239	0.00002	-1.9042E-0	0.00001	2.43	0.026	100.8	9.19	0.2633
14	2.2	0.418	0.10894	0.00044	0.01682	0.00007	0.00021	6.2687E-06	0.00262	0.00002	3.1326E-06	9.1219E-06	2.33	0.023	99.4	8.77	0.2235
15	2.2	1.671	0.43516	0.00077	0.06541	0.00014	0.00079	0.00001	0.00184	0.00002	0.00006	0.00001	12.91	0.134	95.7	8.68	0.0673
Weighted Mean Age																8.80	±0.041

Sample: MB06-750b **Lab #**: 56973 **J**: 7.47E-04 ±2.04E-06 **Disc.**: 1.004 ±0.0010

Material: Sanidine **IGSN**: **Spectrometer**: map

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01	2.2	1.164	0.30308	0.00090	0.04569	0.00016	0.00052	0.00001	0.00588	0.00004	0.00007	0.00002	2.84	0.022	93.2	8.44	0.1437
02	2.2	1.067	0.27787	0.00081	0.03567	0.00017	0.00046	0.00002	0.00544	0.00004	0.00018	0.00002	2.39	0.022	81.4	8.65	0.2221
03	2.2	0.490	0.12750	0.00051	0.01819	0.00012	0.00022	9.2415E-06	0.00145	0.00003	0.00002	0.00001	4.57	0.088	96.2	9.20	0.2855
04	2.2	1.307	0.34024	0.00078	0.04076	0.00020	0.00059	9.3340E-06	0.00693	0.00005	0.00033	0.00001	2.15	0.018	71.4	8.14	0.1471
05	2.2	1.004	0.26140	0.00271	0.03985	0.00014	0.00053	0.00001	0.00074	0.00002	-5.7500E-0	0.00002	19.62	0.442	100.7	9.01	0.2240
06	2.2	0.642	0.16706	0.00063	0.02563	0.00012	0.00030	9.1964E-06	0.00382	0.00003	0.00002	0.00002	2.45	0.024	97.2	8.65	0.2481
07	2.2	1.447	0.37686	0.00095	0.03987	0.00013	0.00061	0.00002	0.00261	0.00004	0.00048	0.00002	5.58	0.089	62.2	8.03	0.2009
08	2.2	1.674	0.43597	0.00103	0.05788	0.00020	0.00071	0.00002	0.00192	0.00002	0.00019	0.00001	11.01	0.111	87.5	8.99	0.1059
09	2.2	0.749	0.19493	0.00062	0.02513	0.00013	0.00033	0.00001	0.00354	0.00003	0.00010	0.00002	2.59	0.028	85.3	9.03	0.2711
10	2.2	1.165	0.30340	0.00091	0.04609	0.00014	0.00056	0.00001	0.00196	0.00002	0.00008	0.00001	8.60	0.108	92.1	8.28	0.1313
12	2.2	0.700	0.18231	0.00067	0.02832	0.00010	0.00032	9.3026E-06	0.00265	0.00003	0.00002	0.00001	3.89	0.046	97.1	8.53	0.1935
13	2.2	0.997	0.25966	0.00100	0.03672	0.00014	0.00044	0.00002	0.00054	0.00001	0.00008	0.00002	24.83	0.682	90.4	8.73	0.2124
14	2.2	1.460	0.38027	0.00080	0.05074	0.00021	0.00064	0.00001	0.00170	0.00003	0.00021	0.00002	10.87	0.225	84.0	8.60	0.1384
15	2.2	0.607	0.15820	0.00061	0.02363	0.00013	0.00029	8.3543E-06	0.00450	0.00004	0.00004	0.00001	1.91	0.021	92.2	8.42	0.2408
Weighted Mean Age																8.59	±0.052

Sample: MB06-673b **Lab #**: 56976 **J**: 7.42E-04 ±2.09E-06 **Disc.**: 1.004 ±0.0010

Material: Sanidine **IGSN**: **Spectrometer**: map

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01	2.2	1.784	0.46445	0.00067	0.07311	0.00013	0.00090	0.00001	0.00031	0.00001	0.00002	8.1469E-06	85.35	3.853	98.6	8.48	0.0485
02	2.2	1.149	0.29922	0.00052	0.04726	0.00011	0.00057	0.00001	0.00084	0.00002	1.0048E-06	7.1778E-06	20.31	0.375	99.9	8.57	0.0656
03	2.2	1.211	0.31534	0.00052	0.04886	0.00010	0.00058	0.00001	0.00042	0.00001	0.00004	8.0960E-06	41.42	1.147	96.2	8.41	0.0698
04	2.2	1.068	0.27825	0.00047	0.04413	0.00009	0.00052	9.3205E-06	0.00057	0.00001	0.00001	7.0704E-06	27.94	0.609	98.6	8.42	0.0676
05	2.2	1.334	0.34746	0.00113	0.05453	0.00016	0.00066	0.00001	0.00086	0.00001	0.00004	8.5290E-06	22.76	0.387	96.6	8.34	0.0727
07	2.2	2.535	0.66015	0.00087	0.10432	0.00017	0.00133	0.00002	0.00093	0.00001	0.00004	8.6712E-06	40.32	0.631	98.2	8.42	0.0377
08	2.2	1.134	0.29543	0.00054	0.04613	0.00010	0.00056	9.5048E-06	0.00042	9.9865E-06	0.00002	8.7053E-06	39.13	0.928	97.7	8.48	0.0791
09	2.2	0.952	0.24782	0.00116	0.03906	0.00016	0.00047	0.00001	0.00060	0.00001	0.00002	7.8695E-06	23.34	0.440	97.4	8.37	0.0966
10	2.2	1.399	0.36424	0.00067	0.05693	0.00011	0.00067	0.00001	0.00057	0.00001	0.00002	7.0666E-06	35.53	0.684	98.1	8.51	0.0547

Sample: MB06-673b **Lab #**: 56976 **J**: 7.42E-04 ±2.09E-06 **Disc.**: 1.004 ±0.0010

11	2.2	1.191	0.31019	0.00053	0.04840	0.00010	0.00062	0.00001	0.00061	0.00001	0.00001	7.7211E-06	28.51	0.517	98.8	8.58	0.0679
12	2.2	1.063	0.27682	0.00049	0.04313	0.00010	0.00055	0.00001	0.00106	0.00002	0.00001	9.0520E-06	14.51	0.215	98.9	8.60	0.0874
13	2.2	1.703	0.44340	0.00068	0.07005	0.00012	0.00084	0.00001	0.00080	0.00001	0.00002	7.2360E-06	31.15	0.493	98.8	8.47	0.0457
14	2.2	1.510	0.39336	0.00060	0.06222	0.00013	0.00076	9.6195E-06	0.00025	9.8873E-06	8.6356E-06	6.9778E-06	88.51	3.484	99.4	8.51	0.0497
15	2.2	1.196	0.31155	0.00051	0.04682	0.00009	0.00058	0.00001	0.00022	9.7418E-06	0.00005	7.8606E-06	75.42	3.312	95.0	8.56	0.0705
16	2.2	0.938	0.24432	0.00050	0.03813	0.00009	0.00047	0.00001	0.00059	0.00001	0.00002	8.3343E-06	22.91	0.458	97.5	8.46	0.0911
Weighted Mean Age																8.48	±0.029

Sample: MB06-746 **Lab #**: 56975 **J**: 7.44E-04 ±2.11E-06 **Disc.**: 1.004 ±0.0010

Material: Sanidine **IGSN**: **Spectrometer**: map

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
02	2.2	0.209	0.05441	0.00021	0.00874	0.00004	0.00011	7.7623E-06	0.00011	9.0379E-06	0.00002	7.3907E-06	28.30	2.293	89.6	7.57	0.3422
03	2.2	1.084	0.28239	0.00057	0.04619	0.00010	0.00056	9.5434E-06	0.00044	0.00001	0.00004	8.2000E-06	38.03	1.261	96.2	7.99	0.0749
04	2.2	0.580	0.15106	0.00085	0.02459	0.00012	0.00032	8.7285E-06	0.00043	0.00001	9.1630E-06	7.5431E-06	20.54	0.493	98.2	8.20	0.1376
05	2.2	0.357	0.09300	0.00024	0.01523	0.00005	0.00019	7.9883E-06	0.00016	8.1637E-06	0.00001	7.9808E-06	33.56	1.676	96.5	8.00	0.2129
06	2.2	0.898	0.23377	0.00148	0.03792	0.00020	0.00046	0.00001	0.00036	0.00001	0.00001	7.7167E-06	37.68	1.142	98.6	8.26	0.1063
07	2.2	0.449	0.11694	0.00026	0.01870	0.00006	0.00024	7.4516E-06	0.00010	7.8333E-06	0.00002	7.3999E-06	70.65	5.797	94.5	8.02	0.1618
08	2.2	0.518	0.13489	0.00030	0.02142	0.00007	0.00027	8.9958E-06	0.00031	9.5361E-06	0.00002	7.9022E-06	24.54	0.747	96.1	8.22	0.1512
09	2.2	0.759	0.19771	0.00043	0.03211	0.00009	0.00038	8.1702E-06	0.00055	0.00001	0.00001	7.9167E-06	21.18	0.414	98.2	8.21	0.1027
10	2.2	0.557	0.14499	0.00031	0.02347	0.00007	0.00029	7.4269E-06	0.00054	0.00001	0.00001	7.5356E-06	15.69	0.357	98.0	8.22	0.1320
11	2.2	0.825	0.21490	0.00044	0.03491	0.00009	0.00043	6.8468E-06	0.00049	9.9228E-06	-9.4743E-0	7.4609E-06	25.83	0.531	101.3	8.47	0.0900
12	2.2	0.663	0.17257	0.00041	0.02835	0.00006	0.00034	9.5384E-06	0.00037	8.0549E-06	6.7086E-07	7.7927E-06	27.53	0.601	99.9	8.26	0.1133
13	2.2	0.354	0.09217	0.00027	0.01477	0.00006	0.00018	6.6990E-06	0.00026	0.00001	0.00003	8.3305E-06	20.51	0.814	91.1	7.73	0.2292
14	2.2	0.707	0.18421	0.00041	0.03006	0.00008	0.00035	7.3792E-06	0.00039	0.00001	-9.0008E-0	7.7824E-06	27.82	0.875	101.5	8.45	0.1077
15	2.2	0.452	0.11782	0.00028	0.01916	0.00006	0.00025	6.5148E-06	0.00029	0.00001	9.5410E-06	6.5585E-06	23.92	0.874	97.6	8.15	0.1409
Weighted Mean Age																8.20	±0.040

Sample: MB07-089 **Lab #**: 57740 **J**: 7.42E-04 ±1.65E-06 **Disc.**[1]: 1.004 ±0.0010

Material: Feldspar **IGSN**: **Spectrometer**: map

Sample: MB07-089 **Lab #**: 57740 **J**: 7.42E-04 ±1.65E-06 **Disc.**[1]: 1.004 ±0.0010

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%$^{40}Ar^*$	Age (Ma)	± 1σ
02	2.8	0.310	0.05662	0.00017	0.00895	0.00007	0.00013	0.00002	0.00623	0.00007	0.00006	0.00002	0.43	0.006	70.1	6.02	0.8196
04	2.8	0.212	0.03866	0.00019	0.00617	0.00005	0.00011	0.00001	0.00418	0.00004	0.00004	0.00002	0.45	0.006	71.7	6.09	1.1184
05	2.8	0.373	0.06804	0.00029	0.01116	0.00009	0.00017	0.00001	0.00508	0.00005	0.00007	0.00002	0.66	0.008	70.0	5.79	0.6712
06	2.8	0.803	0.14661	0.00038	0.02652	0.00013	0.00036	0.00002	0.00435	0.00006	0.00007	0.00002	1.84	0.028	86.6	6.49	0.2675
07	2.8	0.490	0.08950	0.00027	0.01597	0.00011	0.00021	0.00001	0.00386	0.00003	0.00003	0.00002	1.25	0.014	91.5	6.94	0.4979
08	2.8	0.320	0.05844	0.00019	0.01026	0.00007	0.00010	0.00002	0.00466	0.00006	-4.8607E-0	0.00001	0.66	0.009	103.6	7.99	0.4837
09	2.8	0.303	0.05536	0.00019	0.00980	0.00007	0.00012	0.00002	0.00593	0.00006	-0.00002	0.00001	0.50	0.006	112.0	8.57	0.4541
10	2.8	0.175	0.03184	0.00016	0.00511	0.00005	0.00004	0.00001	0.00864	0.00007	0.00004	0.00001	0.18	0.002	70.9	6.00	1.1242
11	2.8	0.830	0.15145	0.00033	0.01694	0.00010	0.00021	0.00002	0.00872	0.00008	0.00015	0.00002	0.58	0.006	71.7	8.69	0.4735
12	2.8	0.599	0.10939	0.00033	0.01964	0.00012	0.00023	0.00002	0.00503	0.00005	0.00004	0.00002	1.18	0.014	91.1	6.87	0.3159
13	2.8	1.331	0.24280	0.00084	0.01789	0.00013	0.00032	0.00002	0.00703	0.00005	0.00046	0.00002	0.77	0.008	44.6	8.20	0.5226
14	2.8	0.701	0.12798	0.00039	0.02051	0.00010	0.00033	0.00002	0.00824	0.00006	0.00008	0.00001	0.75	0.007	82.3	6.96	0.2909
15	2.8	1.072	0.19555	0.00054	0.03215	0.00014	0.00040	0.00002	0.00756	0.00005	0.00011	0.00002	1.28	0.011	84.5	6.96	0.2203
17	3.2	1.471	0.26836	0.00064	0.04592	0.00022	0.00063	0.00003	0.01353	0.00008	0.00006	0.00002	0.97	0.008	94.0	7.44	0.1614
18	3.2	1.000	0.18244	0.00040	0.03179	0.00014	0.00045	0.00002	0.00670	0.00008	0.00008	0.00002	1.36	0.017	87.3	6.79	0.2015
19	3.2	0.857	0.15632	0.00037	0.02598	0.00016	0.00044	0.00002	0.01304	0.00009	0.00006	0.00002	0.57	0.005	89.3	7.28	0.2562
22	3.2	2.389	0.43594	0.00095	0.03907	0.00017	0.00068	0.00003	0.00931	0.00008	0.00080	0.00003	1.20	0.011	46.0	6.95	0.2976
23	3.2	1.200	0.21900	0.00063	0.02900	0.00016	0.00039	0.00002	0.00735	0.00008	0.00019	0.00002	1.13	0.013	74.8	7.66	0.3028
24	3.2	1.034	0.18865	0.00049	0.02730	0.00016	0.00037	0.00002	0.00823	0.00007	0.00017	0.00002	0.95	0.009	73.7	6.90	0.2345
Weighted Mean Age																7.14	±0.072

Average blanks for CO_2 : (1.103, 0.003, 0.001, 0.011, 0.005), x10^{-18} for Ar^{40}, Ar^{39}, Ar^{38}, Ar^{37}, Ar^{36} respectively

Disc.[1] : 1 amu discrimination

Constants used

Atmospheric argon ratios

$(^{40}Ar/^{36}Ar)_A$	295.5 ±0.5	Nier (1950)
$(^{40}Ar/^{38}Ar)_A$	1575.0 ±2.0	Nier (1950)

Interferring isotope production ratios

$(^{40}Ar/^{39}Ar)_K$	0.0 ±0.0004
$(^{38}Ar/^{39}Ar)_K$	0.0108 ±0.0
$(^{37}Ar/^{39}Ar)_K$	0.0 ±0.0
$(^{39}Ar/^{37}Ar)_{Ca}$	0.0007 ±5.0000E-05
$(^{38}Ar/^{37}Ar)_{Ca}$	0.0001 ±0.0

$(^{36}Ar/^{37}Ar)_{Ca}$	0.0003 ±2.0000E-05
Decay constants	
^{40}K $\lambda\varepsilon$	5.4630E-10 ±9.3000E-13 a^{-1}
^{40}K $\lambda\beta$	0.0 ±1.6000E-13 a^{-1}
^{39}Ar	7.0680E-06 ±0.0 a^{-1}
^{37}Ar	0.0198 ±0.0 a^{-1}

APPENDIX E

$^{40}Ar/^{39}Ar$ MAP STEP HEAT DATA TABLE

Table E.1. MAP Step Heat $^{40}Ar/^{39}Ar$ Data

Sample: MB06-556 **Lab #**: 57546 **J**: 7.85E-04 ±8.22E-07 **Disc.**: 1.002 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	579.2	58.85678	0.08560	0.00817	0.00018	0.03706	0.00016	0.00165	0.00006	0.19443	0.00051	0.4	0.02	2.4	231.49	27.3526
01B	625.0	65.8	6.69119	0.00851	0.02141	0.00019	0.00453	0.00007	0.00318	0.00005	0.02159	0.00013	0.5	0.01	4.7	20.94	2.6793
01C	700.0	41.9	4.25846	0.01162	0.04154	0.00019	0.00310	0.00006	0.00608	0.00006	0.01292	0.00012	0.5	6.0E-03	10.4	15.25	1.3254
01D	750.0	18.5	1.88205	0.00270	0.02133	0.00014	0.00136	0.00005	0.00366	0.00005	0.00566	0.00008	0.5	7.6E-03	11.3	14.22	1.5866
01E	800.0	15.6	1.58425	0.00236	0.01899	0.00013	0.00115	0.00004	0.00414	0.00006	0.00497	0.00008	0.4	5.7E-03	7.4	8.88	1.7928
01F	875.0	27.3	2.77844	0.01004	0.02407	0.00018	0.00203	0.00006	0.00548	0.00006	0.00908	0.00012	0.4	4.7E-03	3.6	5.93	2.1185
01G	975.0	43.4	4.41338	0.01111	0.04078	0.00021	0.00314	0.00005	0.00957	0.00006	0.01399	0.00014	0.3	2.7E-03	6.4	9.96	1.5114
01H	1075.0	61.8	6.27631	0.00897	0.04253	0.00025	0.00439	0.00005	0.01458	0.00009	0.02053	0.00016	0.2	2.0E-03	3.5	7.36	1.6531
01I	1250.0	362.2	36.81260	0.04805	0.19622	0.00083	0.02477	0.00017	0.09578	0.00145	0.11869	0.00033	0.2	2.6E-03	4.9	13.08	0.7985
01J	1300.0	6.4	0.65496	0.00139	0.00533	0.00012	0.00060	0.00004	0.01598	0.00012	0.00207	0.00006	2.6297E-02	6.1E-04	7.8	13.96	4.9739
01K	1700.0	5.9	0.59535	0.00125	0.00594	0.00009	0.00054	0.00004	0.03399	0.00017	0.00201	0.00006	1.3608E-02	2.3E-04	3.5	5.09	4.2878

Weighted Mean Age 12.18492 ±0.49356

Integrated 16.63879 ±0.76867

Plateau **Steps**

Isochron 7.66924 ±0.00805

Sample: MB07-007 **Lab #**: 58767 **J**: 9.75E-04 ±8.69E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	-2.7013E-0	-0.02855	0.00021	-0.00012	0.00004	-0.00004	0.00001	-0.00004	0.00002	-0.00014	0.00002	0.2	0.13	-47.5	-207.95	122.1422
01B	625.0	10.2	10.72941	0.01350	0.01959	0.00016	0.00703	0.00009	0.00190	0.00005	0.03556	0.00026	0.6	0.02	2.1	20.24	7.0993
01C	700.0	9.9	10.46489	0.01304	0.02279	0.00021	0.00674	0.00007	0.00236	0.00005	0.03500	0.00029	0.6	0.01	1.2	9.71	6.7472
01D	750.0	4.5	4.74360	0.00663	0.01723	0.00012	0.00319	0.00004	0.00190	0.00004	0.01558	0.00012	0.6	0.01	3.0	14.66	3.6138
01E	800.0	7.2	7.63979	0.01113	0.01895	0.00017	0.00525	0.00006	0.00272	0.00005	0.02556	0.00018	0.4	8.5E-03	1.2	8.46	5.0846
01F	875.0	16.0	16.90341	0.02171	0.04478	0.00024	0.01099	0.00010	0.00651	0.00006	0.05538	0.00037	0.4	4.6E-03	3.2	21.51	4.3867
01G	975.0	37.6	39.70567	0.05613	0.16799	0.00057	0.02610	0.00011	-0.01389	0.01385	0.13015	0.00050	-0.7	0.74	3.1	13.07	1.6743

Sample: MB07-007 **Lab #**: 58767 **J**: 9.75E-04 ±8.69E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01H	1075.0	13.4	14.19394	0.03545	0.18532	0.00062	0.01067	0.00009	0.01538	0.00012	0.04396	0.00031	0.7	6.2E-03	8.6	11.65	0.9298
01I	1250.0	39.7	41.91340	0.05159	0.60983	0.00139	0.03167	0.00014	0.66792	0.04611	0.13024	0.00053	5.5699E-02	3.9E-03	9.3	11.41	0.5015
01J	1700.0	4.1	4.30664	0.00629	0.05337	0.00028	0.00337	0.00006	0.73547	0.01322	0.01408	0.00016	4.1065E-03	8.3E-05	15.2	23.50	2.1827

Weighted Mean Age 12.11724 ±0.42531

Integrated 12.76342 ±0.49783

Plateau **Steps**

Isochron 11.42612 ±0.10178

Sample: MB06-712 **Lab #**: 56964 **J**: 7.55E-04 ±6.69E-07 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	0.0	26.37603	0.03130	0.00708	0.00010	0.01673	0.00008	0.00363	0.00004	0.08842	0.00025	0.3	5.0E-03	0.9	47.81	15.0975
	01B	625.0	0.0	2.31722	0.00262	0.03404	0.00012	0.00179	0.00003	0.00619	0.00004	0.00718	0.00006	0.8	5.9E-03	8.5	7.95	0.7370
P	01C	700.0	0.0	2.85405	0.00362	0.08173	0.00019	0.00244	0.00003	0.02472	0.00010	0.00725	0.00006	0.5	2.2E-03	25.2	12.10	0.3192
P	01D	750.0	0.0	1.53844	0.00240	0.04694	0.00016	0.00140	0.00002	0.02425	0.00010	0.00378	0.00006	0.3	1.5E-03	27.8	12.58	0.5132
P	01E	800.0	0.0	1.51739	0.00198	0.04114	0.00010	0.00131	0.00002	0.01814	0.00008	0.00385	0.00005	0.3	1.5E-03	25.3	12.88	0.4651
P	01F	875.0	0.0	1.19964	0.00141	0.02748	0.00010	0.00098	0.00002	0.01514	0.00007	0.00325	0.00004	0.3	1.5E-03	20.3	12.20	0.5344
	01G	975.0	0.0	0.52236	0.00086	0.01261	0.00009	0.00046	0.00002	0.01007	0.00005	0.00149	0.00003	0.2	1.5E-03	16.5	9.41	0.9931
	01H	1075.0	0.0	0.22352	0.00061	0.01134	0.00007	0.00029	0.00001	0.02000	0.00008	0.00051	0.00003	7.9299E-02	5.7E-04	34.8	9.49	0.9892
	01I	1250.0	0.0	3.11478	0.00387	0.09123	0.00019	0.00288	0.00003	0.30382	0.00145	0.00827	0.00008	4.1809E-02	2.2E-04	24.4	11.59	0.3699
	01J	1700.0	0.0	0.56358	0.00087	0.01187	0.00008	0.00046	0.00002	0.04605	0.00014	0.00169	0.00003	3.5828E-02	2.6E-04	13.9	9.16	1.1568

Weighted Mean Age 11.71308 ±0.17264

Integrated 12.17459 ±0.34575

Plateau **Steps** C-F 12.39828 ±0.23442

Isochron 11.53818 ±0.01033

Sample: MB06-595 **Lab #**: 57549 **J**: 7.87E-04 ±1.07E-06 **Disc.**: 1.002 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	207.5	21.08503	0.02516	0.02235	0.00017	0.01353	0.00013	0.01605	0.00012	0.07053	0.00033	0.1	1.2E-03	1.2	16.27	6.5095
P	01B	625.0	15.9	1.61238	0.00243	0.08209	0.00028	0.00169	0.00006	-0.00257	0.00007	0.00300	0.00007	-2.5	0.07	45.0	12.67	0.3596
P	01C	700.0	17.1	1.73535	0.00286	0.16145	0.00048	0.00235	0.00005	-0.00052	0.00007	0.00131	0.00005	-24.7	3.38	77.7	11.97	0.1326
P	01D	750.0	15.1	1.53037	0.00205	0.16533	0.00043	0.00235	0.00005	0.00436	0.00008	0.00049	0.00004	3.0	0.05	90.6	12.03	0.0973
P	01E	800.0	17.6	1.79055	0.00309	0.19537	0.00056	0.00262	0.00007	0.00526	0.00007	0.00053	0.00004	2.9	0.04	91.4	12.01	0.0869
P	01F	875.0	18.4	1.87470	0.00305	0.20641	0.00043	0.00273	0.00004	0.00613	0.00009	0.00056	0.00004	2.7	0.04	91.3	11.89	0.0928
P	01G	975.0	17.8	1.80687	0.00260	0.18210	0.00053	0.00241	0.00006	0.00923	0.00009	0.00090	0.00004	1.6	0.02	85.5	12.17	0.1014
P	01H	1075.0	18.0	1.83413	0.00282	0.19079	0.00046	0.00256	0.00005	0.00937	0.00007	0.00088	0.00004	1.6	0.01	86.0	11.87	0.0981
P	01I	1250.0	40.0	4.06083	0.00998	0.36991	0.00133	0.00529	0.00006	0.06137	0.00024	0.00354	0.00007	0.5	2.6E-03	75.0	11.82	0.0994
P	01J	1700.0	12.8	1.29785	0.00307	0.09408	0.00028	0.00157	0.00004	0.01624	0.00011	0.00187	0.00005	0.5	3.3E-03	58.1	11.51	0.2367

Weighted Mean Age 11.96160 ±0.04020

Integrated 12.01432 ±0.09994

Plateau **Steps** A-J 11.97273 ±0.04062

Isochron 11.95461 ±0.01622

Sample: MB06-761 **Lab #**: 57551 **J**: 7.90E-04 ±1.18E-06 **Disc.**: 1.002 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	299.4	30.42807	0.03676	0.01908	0.00015	0.01949	0.00012	0.00127	0.00005	0.10123	0.00039	1.2	0.05	1.7	38.64	8.9244
01B	625.0	11.3	1.15325	0.00234	0.07938	0.00036	0.00137	0.00002	0.00253	0.00004	0.00174	0.00005	2.5	0.04	55.5	11.62	0.2826
01C	700.0	17.1	1.73281	0.00289	0.18332	0.00054	0.00245	0.00006	0.00441	0.00006	0.00075	0.00005	3.3	0.05	87.4	11.90	0.1130
01D	750.0	16.1	1.63301	0.00225	0.18901	0.00049	0.00257	0.00006	0.00390	0.00007	0.00050	0.00004	3.8	0.07	91.1	11.34	0.0879
01E	800.0	20.7	2.10480	0.00557	0.25241	0.00101	0.00326	0.00008	0.00589	0.00006	0.00040	0.00003	3.4	0.04	94.6	11.36	0.0778
01F	875.0	20.3	2.06279	0.00436	0.25035	0.00086	0.00322	0.00008	0.00718	0.00009	0.00027	0.00004	2.7	0.04	96.3	11.43	0.0781
01G	975.0	17.1	1.73951	0.00263	0.20648	0.00049	0.00276	0.00006	0.00781	0.00008	0.00048	0.00004	2.1	0.02	92.0	11.17	0.0828
01H	1075.0	17.6	1.79418	0.00271	0.21306	0.00055	0.00273	0.00007	0.01052	0.00010	0.00062	0.00003	1.6	0.02	90.1	10.93	0.0748

Sample: MB06-761 **Lab #**: 57551 **J**: 7.90E-04 ±1.18E-06 **Disc.**: 1.002 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01I	1250.0	30.6	3.11520	0.01044	0.31606	0.00152	0.00443	0.00006	0.07615	0.00024	0.00238	0.00007	0.3	1.9E-03	78.7	11.19	0.1190
01J	1700.0	12.7	1.28950	0.00197	0.09699	0.00033	0.00164	0.00004	0.02088	0.00009	0.00181	0.00005	0.4	2.0E-03	59.5	11.40	0.2391

Weighted Mean Age 11.29659 ±0.03641

Integrated 11.62385 ±0.10595

Plateau **Steps**

Isochron 11.28139 ±0.01691

Sample: MB06-596 **Lab #**: 57550 **J**: 7.88E-04 ±1.18E-06 **Disc.**: 1.002 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	426.2	43.31318	0.05574	0.02713	0.00020	0.02747	0.00013	0.00246	0.00005	0.14362	0.00045	0.9	0.02	2.0	45.99	7.4236
	01B	625.0	30.9	3.13705	0.01339	0.08324	0.00034	0.00275	0.00007	0.00421	0.00006	0.00866	0.00010	1.6	0.02	18.5	10.02	0.5739
	01C	700.0	43.0	4.36675	0.00959	0.31946	0.00131	0.00481	0.00008	0.01176	0.00008	0.00572	0.00009	2.1	0.02	61.4	12.07	0.1331
P	01D	750.0	23.8	2.41461	0.00804	0.22973	0.00129	0.00331	0.00008	0.00836	0.00009	0.00195	0.00006	2.2	0.03	76.4	11.54	0.1318
P	01E	800.0	32.0	3.25144	0.01195	0.27619	0.00152	0.00404	0.00006	0.01321	0.00009	0.00360	0.00007	1.6	0.01	67.5	11.43	0.1408
P	01F	875.0	28.9	2.93766	0.00997	0.21475	0.00094	0.00356	0.00006	0.01328	0.00008	0.00395	0.00006	1.3	9.8E-03	60.5	11.91	0.1443
P	01G	975.0	33.7	3.42552	0.01125	0.26643	0.00126	0.00403	0.00008	0.01687	0.00011	0.00433	0.00009	1.2	0.01	62.9	11.63	0.1606
P	01H	1075.0	23.2	2.35452	0.00683	0.22187	0.00089	0.00324	0.00006	0.01952	0.00010	0.00187	0.00006	0.9	5.9E-03	76.9	11.74	0.1252
P	01I	1250.0	60.0	6.09748	0.00809	0.48527	0.00126	0.00757	0.00008	0.12410	0.00037	0.00776	0.00010	0.3	1.2E-03	63.5	11.48	0.0972
P	01J	1700.0	21.8	2.22022	0.00395	0.12961	0.00045	0.00244	0.00006	0.04016	0.00016	0.00389	0.00007	0.3	1.4E-03	49.2	12.12	0.2360

Weighted Mean Age 11.67183 ±0.05070

Integrated 12.04969 ±0.10794

Plateau **Steps** D-J 11.60038 ±0.05521

Isochron 11.58333 ±0.01741

Sample: MB06-546 **Lab #**: 57545 **J**: 7.87E-04 ±9.12E-07 **Disc.**: 1.002 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	162.3	16.49223	0.01849	0.04246	0.00023	0.01076	0.00010	0.00602	0.00006	0.05462	0.00025	0.6	6.4E-03	2.1	11.97	2.5909
	01B	625.0	11.4	1.16174	0.00189	0.08575	0.00036	0.00133	0.00006	0.00048	0.00003	0.00144	0.00004	14.2	0.80	63.4	12.32	0.2292
	01C	700.0	19.1	1.94522	0.00368	0.20893	0.00059	0.00269	0.00005	0.00105	0.00004	0.00069	0.00004	16.1	0.55	89.5	11.96	0.0997
	01D	750.0	18.5	1.88092	0.00264	0.21363	0.00062	0.00270	0.00005	0.00097	0.00004	0.00053	0.00003	17.7	0.73	91.7	11.58	0.0733
	01E	800.0	23.5	2.39221	0.00734	0.26771	0.00102	0.00343	0.00006	0.00195	0.00006	0.00083	0.00004	11.0	0.32	89.8	11.51	0.0845
	01F	875.0	19.6	1.99077	0.00327	0.21753	0.00065	0.00280	0.00004	0.00056	0.00004	0.00066	0.00004	31.1	2.27	90.3	11.85	0.0865
P	01G	975.0	24.9	2.52633	0.00827	0.27066	0.00109	0.00361	0.00006	0.00104	0.00004	0.00118	0.00005	21.0	0.91	86.2	11.54	0.0980
P	01H	1075.0	34.9	3.54684	0.01035	0.38306	0.00151	0.00511	0.00006	0.00631	0.00007	0.00176	0.00006	4.9	0.06	85.5	11.35	0.0856
P	01I	1250.0	68.1	6.92447	0.00870	0.67847	0.00149	0.00934	0.00007	0.02191	0.00007	0.00514	0.00009	2.5	0.01	78.2	11.45	0.0622
P	01J	1300.0	7.6	0.77132	0.00177	0.06937	0.00025	0.00102	0.00004	0.00226	0.00004	0.00082	0.00003	2.5	0.05	68.7	10.95	0.2190
	01K	1700.0	5.4	0.54932	0.00118	0.04624	0.00026	0.00068	0.00003	0.00435	0.00007	0.00047	0.00004	0.9	0.02	75.2	12.81	0.3530

Weighted Mean Age			11.58627 ±0.03292
Integrated			11.59087 ±0.05927
Plateau	**Steps**	G-J	11.44295 ±0.04670
Isochron			11.58582 ±0.01345

Sample: MB06-763 **Lab #**: 57553 **J**: 7.88E-04 ±1.18E-06 **Disc.**: 1.002 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	416.2	42.34404	0.05727	0.01568	0.00016	0.02713	0.00021	0.00116	0.00005	0.14209	0.00046	1.0	0.04	0.8	32.59	13.3459
	01B	625.0	21.0	2.13170	0.00459	0.07636	0.00030	0.00202	0.00006	0.00329	0.00005	0.00495	0.00008	1.7	0.03	31.5	12.62	0.4517
P	01C	700.0	21.0	2.14087	0.00544	0.17876	0.00046	0.00271	0.00006	0.00611	0.00008	0.00231	0.00007	2.1	0.03	68.3	11.75	0.1631
P	01D	750.0	17.1	1.73476	0.00263	0.18456	0.00052	0.00261	0.00005	0.00617	0.00007	0.00098	0.00004	2.2	0.03	83.5	11.28	0.0979
P	01E	800.0	11.2	1.13746	0.00251	0.12503	0.00038	0.00176	0.00004	0.00491	0.00009	0.00051	0.00004	1.9	0.03	86.9	11.36	0.1460
P	01F	875.0	15.8	1.60795	0.00233	0.18100	0.00042	0.00231	0.00006	0.00817	0.00009	0.00059	0.00004	1.6	0.02	89.4	11.42	0.0926
P	01G	975.0	13.1	1.33195	0.00215	0.14596	0.00046	0.00192	0.00004	0.00907	0.00007	0.00062	0.00004	1.2	9.9E-03	86.7	11.37	0.1155
	01H	1075.0	8.7	0.88126	0.00192	0.10072	0.00030	0.00139	0.00004	0.01359	0.00011	0.00045	0.00003	0.5	4.5E-03	85.6	10.78	0.1415

Sample: MB06-763 **Lab #**: 57553 **J**: 7.88E-04 ±1.18E-06 **Disc.**: 1.002 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01I	1250.0	31.8	3.23133	0.01121	0.23042	0.00097	0.00406	0.00007	0.07250	0.00028	0.00507	0.00007	0.2	1.3E-03	55.0	11.09	0.1607
01J	1700.0	9.3	0.94335	0.00161	0.04104	0.00024	0.00096	0.00005	0.01028	0.00008	0.00214	0.00006	0.3	2.8E-03	33.5	11.07	0.5754

Weighted Mean Age 11.31758 ±0.04883

Integrated 11.64610 ±0.17708

Plateau **Steps** C-G 11.40347 ±0.05971

Isochron 11.29674 ±0.01700

Sample: MB06-762 **Lab #**: 57552 **J**: 7.90E-04 ±1.07E-06 **Disc.**: 1.002 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	453.2	46.10480	0.06215	0.02907	0.00021	0.02900	0.00019	0.00052	0.00004	0.15405	0.00050	4.4	0.37	1.3	28.81	7.7971
P	01B	625.0	23.8	2.42278	0.00733	0.18755	0.00054	0.00310	0.00006	0.00170	0.00005	0.00330	0.00007	8.7	0.26	59.7	11.12	0.1658
P	01C	700.0	30.8	3.13454	0.01190	0.35371	0.00166	0.00463	0.00006	0.00265	0.00005	0.00109	0.00005	10.5	0.20	89.7	11.45	0.0965
P	01D	750.0	19.5	1.98568	0.00341	0.23730	0.00074	0.00314	0.00006	0.00191	0.00005	0.00038	0.00003	9.7	0.28	94.4	11.37	0.0718
P	01E	800.0	20.1	2.04471	0.00467	0.24609	0.00103	0.00341	0.00005	0.00212	0.00004	0.00039	0.00004	9.1	0.18	94.5	11.31	0.0849
P	01F	875.0	26.1	2.65439	0.00860	0.32339	0.00150	0.00421	0.00006	0.00318	0.00005	0.00039	0.00004	8.0	0.14	95.7	11.31	0.0811
P	01G	975.0	27.5	2.79400	0.00940	0.33643	0.00163	0.00448	0.00007	0.00405	0.00007	0.00056	0.00004	6.5	0.11	94.1	11.26	0.0869
	01H	1075.0	15.2	1.54750	0.00238	0.18622	0.00048	0.00250	0.00005	0.00862	0.00006	0.00049	0.00004	1.7	0.01	90.9	10.88	0.0883
	01I	1250.0	26.7	2.71613	0.00982	0.27320	0.00127	0.00396	0.00005	0.03191	0.00016	0.00224	0.00005	0.7	4.5E-03	76.2	10.92	0.1086
	01J	1700.0	18.0	1.82884	0.00258	0.17355	0.00042	0.00262	0.00005	0.01317	0.00011	0.00171	0.00006	1.0	8.9E-03	72.7	11.04	0.1466

Weighted Mean Age 11.22498 ±0.03478

Integrated 11.43341 ±0.10613

Plateau **Steps** B-G 11.34226 ±0.04273

Isochron 11.21887 ±0.01517

Sample: MB06-833 **Lab #**: 57543 **J**: 7.86E-04 ±8.22E-07 **Disc.**: 1.002 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	950.0	8.0	0.80918	0.00181	0.01213	0.00014	0.00052	0.00004	0.00659	0.00006	0.00262	0.00006	0.1	2.2E-03	4.8	4.61	2.1006
P	01B	1140.0	18.2	1.85236	0.00295	0.11464	0.00035	0.00221	0.00006	0.07610	0.00023	0.00336	0.00006	0.1	5.3E-04	48.6	11.29	0.2172
P	01C	1170.0	5.4	0.54861	0.00135	0.06254	0.00026	0.00089	0.00004	0.04518	0.00020	0.00041	0.00003	0.1	6.8E-04	82.2	10.37	0.2442
P	01D	1200.0	3.2	0.32069	0.00096	0.03736	0.00023	0.00057	0.00002	0.02955	0.00013	0.00024	0.00003	0.1	7.8E-04	82.4	10.18	0.3891
P	01E	1225.0	5.8	0.59025	0.00134	0.06851	0.00027	0.00097	0.00003	0.05506	0.00019	0.00034	0.00003	0.1	5.3E-04	87.9	10.89	0.2145
P	01F	1250.0	2.5	0.25900	0.00084	0.02825	0.00016	0.00047	0.00003	0.02745	0.00016	0.00021	0.00003	8.2831E-02	6.8E-04	81.2	10.72	0.4525
P	01G	1275.0	0.1	0.01506	0.00026	0.00020	0.00006	0.00003	0.00002	0.00220	0.00006	0.00008	0.00002	6.9754E-03	2.4E-03	-40.1	-46.25	52.4723
P	01H	1700.0	1.3	0.12752	0.00049	0.00213	0.00009	0.00014	0.00002	0.02540	0.00014	0.00041	0.00004	6.4129E-03	2.9E-04	16.3	14.76	7.7895

Weighted Mean Age 10.79061 ±0.11886

Integrated 10.59179 ±0.15157

Plateau **Steps** B-H 10.80938 ±0.11907

Isochron 10.79435 ±0.01149

Sample: MB07-139 **Lab #**: 58627 **J**: 2.22E-03 ±6.27E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	32.7	50.44126	0.07251	0.04290	0.00032	0.25767	0.00089	0.01051	0.00009	0.16970	0.00057	0.5	5.5E-03	0.6	28.91	17.0497
P	01B	625.0	4.4	6.75339	0.01014	0.14485	0.00048	0.09000	0.00027	0.01846	0.00013	0.02139	0.00024	0.9	7.0E-03	6.5	12.36	1.9609
P	01C	700.0	3.0	4.63022	0.00656	0.26185	0.00096	0.02409	0.00017	0.02428	0.00016	0.01342	0.00016	1.3	9.5E-03	14.5	10.41	0.7605
P	01D	750.0	1.6	2.48143	0.00520	0.31695	0.00098	0.00779	0.00011	0.02717	0.00014	0.00562	0.00013	1.4	8.3E-03	33.3	10.59	0.5020
P	01E	800.0	2.0	3.13683	0.00487	0.41779	0.00114	0.01179	0.00010	0.03974	0.00017	0.00678	0.00012	1.2	6.3E-03	36.4	11.10	0.3484
P	01F	875.0	1.9	2.90157	0.00455	0.45712	0.00120	0.01041	0.00008	0.04516	0.00023	0.00572	0.00013	1.2	6.9E-03	42.2	10.86	0.3393
P	01G	975.0	1.2	1.84206	0.00295	0.35832	0.00093	0.00807	0.00007	0.03030	0.00015	0.00313	0.00010	1.4	7.9E-03	50.1	10.46	0.3512
P	01H	1075.0	1.0	1.61590	0.00258	0.44290	0.00113	0.00810	0.00009	0.04175	0.00014	0.00160	0.00008	1.3	5.2E-03	71.3	10.56	0.2243
	01I	1250.0	4.0	6.14076	0.00829	1.21741	0.00238	0.02308	0.00014	0.17737	0.00119	0.01091	0.00011	0.8	5.7E-03	48.3	9.90	0.1111
	01J	1700.0	3.1	4.77660	0.00707	0.26138	0.00084	0.00753	0.00009	0.07039	0.00135	0.01450	0.00016	0.4	8.6E-03	10.8	7.98	0.7390

Weighted Mean Age 10.17178 ±0.09111

Sample: MB07-139 **Lab #**: 58627 **J**: 2.22E-03 ±6.27E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
Integrated													10.52666	±0.23312			
Plateau											**Steps**	A-H	10.77564	±0.18218			
Isochron													10.13102	±0.02858			

Sample: MB07-177 **Lab #**: 57726 **J**: 7.57E-04 ±7.58E-07 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	7.8	6.98596	0.00821	0.08410	0.00028	0.00516	0.00007	0.00435	0.00007	0.02129	0.00015	4.1	0.07	9.9	11.40	0.7167
01B	625.0	2.2	1.95339	0.00278	0.21448	0.00056	0.00268	0.00004	0.01162	0.00012	0.00086	0.00005	3.9	0.04	87.1	10.95	0.0922
01C	700.0	2.3	2.03032	0.00275	0.24269	0.00068	0.00320	0.00004	0.01779	0.00012	0.00048	0.00004	2.9	0.02	93.1	10.76	0.0708
01D	750.0	5.8	5.22284	0.00680	0.16508	0.00044	0.00466	0.00006	0.01525	0.00010	0.01392	0.00017	2.3	0.02	21.3	9.32	0.4142
01E	800.0	1.3	1.14714	0.00184	0.13812	0.00038	0.00179	0.00004	0.01186	0.00008	0.00012	0.00003	2.5	0.02	97.2	11.15	0.0910
01F	875.0	1.3	1.14790	0.00194	0.13520	0.00036	0.00167	0.00006	0.01229	0.00011	0.00019	0.00003	2.3	0.02	95.2	11.17	0.0993
01G	975.0	1.6	1.43934	0.00243	0.16329	0.00036	0.00217	0.00005	0.02708	0.00012	0.00047	0.00003	1.3	6.3E-03	90.7	11.04	0.0881
01H	1075.0	1.4	1.29241	0.00210	0.13222	0.00041	0.00180	0.00003	0.05466	0.00018	0.00101	0.00005	0.5	2.3E-03	77.8	10.51	0.1490
01I	1250.0	2.4	2.14679	0.00335	0.19031	0.00047	0.00296	0.00006	0.09848	0.00138	0.00236	0.00006	0.4	5.8E-03	68.5	10.68	0.1322
01J	1700.0	1.8	1.65625	0.00249	0.01983	0.00015	0.00111	0.00003	0.03808	0.00017	0.00519	0.00011	0.1	9.7E-04	7.8	9.06	2.3478
Weighted Mean Age													10.91986	±0.03747			
Integrated													10.71356	±0.07884			
Plateau											**Steps**						
Isochron													10.94121	±0.01096			

Sample: MB07-005 **Lab #**: 58766 **J**: 9.82E-04 ±9.64E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	-3.3756E-0	-0.03568	0.00020	-0.00011	0.00003	-0.00004	0.00001	-0.00002	0.00002	-0.00014	0.00002	0.4	0.48	-16.3	-102.02	124.3478
01B	625.0	14.1	14.94592	0.01692	0.07874	0.00036	0.01029	0.00006	0.00670	0.00008	0.05002	0.00028	0.7	9.1E-03	1.1	3.84	1.9533
01C	700.0	3.1	3.25528	0.00526	0.10469	0.00039	0.00322	0.00005	0.01315	0.00009	0.00967	0.00013	0.5	3.9E-03	12.5	6.95	0.6772
01D	750.0	2.1	2.24657	0.00338	0.10072	0.00031	0.00240	0.00005	0.04828	0.01128	0.00596	0.00009	0.1	0.03	23.1	9.24	0.5027
01E	800.0	2.1	2.26840	0.00398	0.08379	0.00031	0.00216	0.00005	-0.00624	0.00968	0.00595	0.00010	-0.8	1.28	22.3	10.79	0.6476
01F	875.0	2.8	2.91783	0.00468	0.08112	0.00030	0.00268	0.00006	0.01484	0.00009	0.00809	0.00012	0.3	2.3E-03	18.4	11.85	0.7749
01G	975.0	2.1	2.25057	0.00423	0.06548	0.00030	0.00217	0.00004	0.01423	0.00011	0.00657	0.00012	0.3	2.5E-03	14.2	8.73	0.9476
01H	1075.0	1.5	1.61964	0.00254	0.04568	0.00021	0.00161	0.00003	0.01384	0.00010	0.00493	0.00009	0.2	1.8E-03	10.7	6.82	1.1026
01I	1250.0	12.4	13.07521	0.01847	0.22801	0.00083	0.01123	0.00012	1.27789	0.01004	0.04107	0.00026	1.0638E-02	9.5E-05	13.9	14.71	0.8156
01J	1700.0	0.8	0.83735	0.00163	0.03328	0.00019	0.00090	0.00003	0.44446	0.01055	0.00265	0.00007	4.2615E-03	1.1E-04	43.1	20.93	1.7511

Weighted Mean Age 10.02101 ±0.28287

Integrated 10.61469 ±0.33313

Plateau **Steps**

Isochron 10.55567 ±0.10358

Sample: MB06-829 **Lab #**: 57556 **J**: 8.19E-04 ±6.95E-07 **Disc.**: 1.002 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	207.0	21.06105	0.02514	0.01329	0.00017	0.01368	0.00009	0.00989	0.00008	0.07038	0.00033	9.7144E-02	1.4E-03	1.3	30.23	11.1367
01B	625.0	17.8	1.81008	0.00304	0.11587	0.00034	0.00217	0.00004	0.00692	0.00008	0.00358	0.00007	1.2	0.01	41.8	9.76	0.2599
01C	700.0	13.6	1.38034	0.00215	0.13010	0.00037	0.00194	0.00004	0.01309	0.00010	0.00157	0.00004	0.7	5.9E-03	66.9	10.61	0.1434
01D	750.0	9.5	0.96358	0.00166	0.09707	0.00033	0.00134	0.00004	0.01604	0.00008	0.00094	0.00004	0.4	2.6E-03	72.2	10.72	0.2086
01E	800.0	6.7	0.67897	0.00132	0.07506	0.00023	0.00104	0.00004	0.00950	0.00008	0.00037	0.00003	0.6	5.0E-03	84.8	11.46	0.1951
01F	875.0	8.7	0.88174	0.00174	0.09935	0.00035	0.00133	0.00004	0.01109	0.00008	0.00051	0.00004	0.6	5.1E-03	83.6	11.09	0.1697
01G	975.0	8.2	0.82959	0.00161	0.09132	0.00031	0.00129	0.00003	0.01351	0.00009	0.00059	0.00004	0.5	3.6E-03	80.0	10.87	0.1984
01H	1075.0	9.2	0.93652	0.00152	0.09694	0.00034	0.00151	0.00003	0.02436	0.00012	0.00113	0.00005	0.3	1.7E-03	65.7	9.50	0.2117
01I	1250.0	34.5	3.51425	0.00991	0.24957	0.00110	0.00478	0.00008	0.07177	0.00160	0.00653	0.00007	0.3	5.7E-03	46.3	9.75	0.1395

Sample: MB06-829 **Lab #**: 57556 **J**: 8.19E-04 ±6.95E-07 **Disc.**: 1.002 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01J	1700.0	3.8	0.38876	0.00111	0.01641	0.00012	0.00044	0.00003	0.02798	0.00015	0.00103	0.00004	4.2071E-02	3.9E-04	25.6	9.13	1.0317

Weighted Mean Age 10.47033 ±0.06418

Integrated 10.57254 ±0.16700

Plateau **Steps**

Isochron 10.48424 ±0.00899

Sample: MB07-163 **Lab #**: 58784 **J**: 1.00E-03 ±4.48E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	-2.0025E-0	-0.02117	0.00017	-0.00007	0.00002	-0.00001	0.00001	-6.5771E-0	0.00002	-0.00010	0.00002	0.6	1.82	-46.3	-277.21	196.3886
	01B	625.0	10.6	11.23464	0.01533	0.10998	0.00039	0.00873	0.00009	0.00073	0.00004	0.03597	0.00025	8.9	0.43	5.4	10.11	1.2319
	01C	700.0	5.3	5.55612	0.00698	0.25750	0.00065	0.00638	0.00007	0.00155	0.00004	0.01370	0.00014	9.9	0.27	27.2	10.73	0.2944
	01D	750.0	4.6	4.90905	0.00656	0.33161	0.00083	0.00645	0.00006	0.00210	0.00004	0.00989	0.00012	9.3	0.19	40.5	10.98	0.1946
P	01E	800.0	4.9	5.21789	0.00785	0.37315	0.00113	0.00685	0.00008	0.00291	0.00005	0.01066	0.00013	7.6	0.13	39.7	10.16	0.1898
P	01F	875.0	7.5	7.91924	0.00969	0.55112	0.00108	0.01008	0.00008	0.00497	0.00006	0.01606	0.00014	6.6	0.08	40.1	10.55	0.1457
P	01G	975.0	7.6	8.04089	0.01033	0.60243	0.00118	0.01094	0.00008	-0.00809	0.01033	0.01522	0.00015	-4.4	5.63	44.0	10.75	0.1431
P	01H	1075.0	5.2	5.52275	0.00817	0.52176	0.00113	0.00828	0.00008	0.00978	0.00008	0.00850	0.00011	3.2	0.03	54.7	10.59	0.1200
	01I	1250.0	8.1	8.55392	0.01049	0.59625	0.00123	0.01060	0.00008	0.21762	0.01024	0.01687	0.00017	0.2	7.6E-03	43.5	11.45	0.1637
	01J	1700.0	5.0	5.32236	0.00752	0.34382	0.00106	0.00660	0.00007	0.02770	0.00018	0.01134	0.00015	0.7	5.2E-03	37.4	10.60	0.2424

Weighted Mean Age 10.72413 ±0.07607

Integrated 10.74356 ±0.08703

Plateau **Steps** E-H 10.54030 ±0.10148

Isochron 10.72995 ±0.04789

Sample: MB07-017 **Lab #**: 57729 **J**: 7.52E-04 ±1.56E-06 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	950.0	0.4	0.32684	0.00088	0.00216	0.00005	0.00026	0.00001	0.00187	0.00004	0.00104	0.00004	0.2	7.3E-03	6.0	12.50	7.1744
P	01B	1050.0	3.4492E-02	0.03107	0.00017	0.00060	0.00003	0.00002	0.00001	0.00095	0.00003	0.00009	0.00002	0.1	7.0E-03	13.1	9.37	12.4137
P	01C	1120.0	0.4	0.39909	0.00080	0.03888	0.00017	0.00059	0.00002	0.03282	0.00135	0.00042	0.00003	0.2	9.6E-03	70.5	9.93	0.3241
P	01D	1130.0	0.3	0.30873	0.00085	0.03649	0.00016	0.00047	0.00002	0.02821	0.00139	0.00009	0.00003	0.3	0.01	93.7	10.88	0.2864
P	01E	1145.0	0.6	0.55117	0.00119	0.06630	0.00024	0.00090	0.00003	0.05357	0.00139	0.00019	0.00003	0.2	6.4E-03	91.7	10.47	0.1883
P	01F	1150.0	0.3	0.23461	0.00069	0.02892	0.00016	0.00041	0.00002	0.01963	0.00131	0.00005	0.00003	0.3	0.02	95.7	10.66	0.3706
P	01G	1160.0	0.3	0.23618	0.00069	0.02895	0.00015	0.00041	0.00002	0.02120	0.00131	0.00002	0.00003	0.3	0.02	99.0	11.09	0.3572
P	01H	1200.0	0.4	0.39655	0.00099	0.04495	0.00018	0.00063	0.00003	0.04878	0.00136	0.00028	0.00003	0.2	5.1E-03	81.5	9.88	0.2915
P	01I	1700.0	1.5	1.32529	0.00193	0.00173	0.00007	0.00091	0.00003	0.03239	0.00017	0.00451	0.00008	1.0116E-02	4.0E-04	4.6791E-02	0.51	18.8401

Weighted Mean Age			10.45976 ±0.11614
Integrated			10.38231 ±0.18591
Plateau	**Steps**	A-I	10.46013 ±0.11614
Isochron			10.47553 ±0.02179

Sample: MB06-582 **Lab #**: 56966 **J**: 7.57E-04 ±1.56E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	0.0	13.56314	0.01486	0.01223	0.00010	0.00870	0.00005	0.00173	0.00003	0.04549	0.00015	1.1	0.02	0.9	13.68	5.2565
P	01B	625.0	0.0	1.29017	0.00167	0.07447	0.00018	0.00140	0.00002	0.00473	0.00005	0.00248	0.00003	2.4	0.03	43.4	10.38	0.1923
P	01C	700.0	0.0	2.44876	0.00298	0.27662	0.00053	0.00369	0.00004	0.01671	0.00007	0.00122	0.00003	2.5	0.01	85.5	10.45	0.0470
P	01D	750.0	0.0	1.90383	0.00230	0.23296	0.00049	0.00311	0.00003	0.01690	0.00006	0.00049	0.00002	2.1	9.1E-03	92.7	10.46	0.0449
P	01E	800.0	0.0	1.01177	0.00144	0.11936	0.00019	0.00161	0.00002	0.00992	0.00006	0.00038	0.00002	1.8	0.01	89.1	10.43	0.0835
P	01F	875.0	0.0	1.02741	0.00138	0.10996	0.00023	0.00152	0.00002	0.01038	0.00006	0.00066	0.00002	1.6	0.01	81.2	10.48	0.0921
P	01G	975.0	0.0	1.40738	0.00176	0.15443	0.00031	0.00212	0.00002	0.01820	0.00008	0.00081	0.00003	1.3	6.3E-03	83.4	10.50	0.0727
	01H	1075.0	0.0	1.58302	0.00199	0.18040	0.00029	0.00244	0.00003	0.02994	0.00008	0.00086	0.00003	0.9	2.9E-03	84.4	10.23	0.0668
	01I	1250.0	0.0	3.19250	0.00385	0.30576	0.00059	0.00431	0.00003	0.13755	0.00138	0.00322	0.00004	0.3	3.5E-03	71.4	10.31	0.0597
	01J	1700.0	0.0	0.39515	0.00069	0.03021	0.00014	0.00050	0.00001	0.02725	0.00010	0.00060	0.00002	0.2	1.0E-03	57.3	10.37	0.3178

Sample: MB06-582 **Lab #**: 56966 **J**: 7.57E-04 ±1.56E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
Weighted Mean Age													10.41128	±0.03127			
Integrated													10.42371	±0.05698			
Plateau											**Steps**	A-G	10.45349	±0.03571			
Isochron													10.40876	±0.02151			

Sample: MB06-508 **Lab #**: 56968 **J**: 7.56E-04 ±1.56E-06 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	950.0	0.0	0.98997	0.00159	0.00659	0.00007	0.00065	0.00002	0.00294	0.00003	0.00312	0.00005	0.4	5.2E-03	7.1	14.68	2.9088
P	01B	1050.0	0.0	0.36621	0.00081	0.01543	0.00008	0.00036	0.00001	0.02021	0.00008	0.00085	0.00003	0.1	7.8E-04	33.1	10.86	0.7454
P	01C	1100.0	0.0	0.68733	0.00128	0.06249	0.00021	0.00096	0.00003	0.09175	0.00019	0.00081	0.00003	0.1	4.4E-04	68.8	10.46	0.1776
P	01D	1110.0	0.0	4.51652	0.00538	0.53350	0.00082	0.00743	0.00005	0.79084	0.00167	0.00241	0.00004	0.1	2.9E-04	88.7	10.39	0.0510
P	01E	1250.0	0.0	0.16230	0.00071	0.01139	0.00008	0.00020	0.00002	0.02212	0.00008	0.00033	0.00004	8.0946E-02	6.7E-04	44.1	8.71	1.4040
P	01F	1700.0	0.0	0.11583	0.00059	0.00327	0.00008	0.00011	0.00001	0.01165	0.00006	0.00028	0.00004	4.3907E-02	1.1E-03	30.2	14.87	5.3491
Weighted Mean Age														10.40132	±0.05342			
Integrated														10.45021	±0.06771			
Plateau												**Steps**	A-F	10.40095	±0.05342			
Isochron														10.36461	±0.02146			

Sample: MB06-832 **Lab #**: 57542 **J**: 7.84E-04 ±9.12E-07 **Disc.**: 1.002 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	950.0	15.5	1.57103	0.00429	0.00817	0.00012	0.00107	0.00005	0.00213	0.00005	0.00515	0.00008	0.3	8.4E-03	3.1	8.65	3.9587
P	01B	1140.0	42.3	4.29422	0.01203	0.18622	0.00052	0.00433	0.00006	0.10672	0.00023	0.01018	0.00010	0.1	5.0E-04	31.3	10.34	0.2576
P	01C	1170.0	7.9	0.80180	0.00149	0.09198	0.00039	0.00138	0.00004	0.05977	0.00022	0.00065	0.00004	0.1	7.0E-04	80.1	10.02	0.1900
P	01D	1200.0	7.0	0.70802	0.00139	0.07762	0.00038	0.00110	0.00003	0.05549	0.00020	0.00059	0.00004	0.1	7.0E-04	79.5	10.41	0.2190
P	01E	1225.0	15.8	1.61015	0.00226	0.17620	0.00050	0.00256	0.00005	0.12706	0.00036	0.00131	0.00004	0.1	4.5E-04	80.1	10.50	0.1115
P	01F	1250.0	0.6	0.06348	0.00044	0.00304	0.00012	0.00007	0.00002	0.00488	0.00010	0.00018	0.00003	5.0168E-02	2.2E-03	22.2	6.69	4.2128
P	01G	1275.0	4.7596E-02	0.00484	0.00032	-0.00198	0.00009	0.00004	0.00002	0.00048	0.00007	0.00004	0.00003	-0.3	0.05	-130.9	4.57	5.3704
P	01H	1700.0	1.1	0.11322	0.00063	-0.00087	0.00011	0.00006	0.00002	0.02225	0.00014	0.00051	0.00004	-3.5189E-0	4.0E-04	-23.3	38.68	16.6923

Weighted Mean Age 10.37547 ±0.08416

Integrated 10.27254 ±0.12947

Plateau **Steps** A-H 10.37477 ±0.08416

Isochron 10.40839 ±0.01211

Sample: MB07-144 **Lab #**: 57736 **J**: 7.51E-04 ±1.64E-06 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	950.0	0.6	0.56506	0.00112	0.00269	0.00006	0.00039	0.00002	0.00448	0.00007	0.00179	0.00006	0.1	3.2E-03	6.8	19.42	8.3993
P	01B	1050.0	0.7	0.58832	0.00120	0.06415	0.00020	0.00092	0.00003	0.03690	0.00133	0.00044	0.00003	0.3	0.01	79.3	9.97	0.2121
P	01C	1120.0	1.5	1.34887	0.00206	0.15925	0.00042	0.00217	0.00003	0.09674	0.00138	0.00055	0.00004	0.3	4.6E-03	89.5	10.39	0.1029
P	01D	1130.0	0.1	0.09541	0.00052	0.01129	0.00010	0.00017	0.00002	0.01692	0.00013	9.9448E-06	0.00002	0.1	1.5E-03	100.8	11.70	0.8926
P	01E	1145.0	8.9766E-02	0.08087	0.00038	0.00911	0.00011	0.00008	0.00002	0.01468	0.00011	0.00004	0.00002	0.1	1.7E-03	88.6	10.81	1.0086
P	01F	1150.0	7.8816E-02	0.07101	0.00040	0.00822	0.00009	0.00013	0.00002	0.01348	0.00013	0.00003	0.00002	0.1	1.7E-03	92.1	10.93	1.0266
	01G	1160.0	0.3	0.29354	0.00080	0.03270	0.00018	0.00045	0.00002	0.05269	0.00024	0.00011	0.00002	0.1	8.7E-04	92.8	11.44	0.2806
	01H	1200.0	0.1	0.09984	0.00050	0.00442	0.00010	0.00005	0.00002	0.00732	0.00009	0.00003	0.00002	0.1	3.0E-03	92.8	28.64	2.1961
	01I	1700.0	1.6	1.40735	0.00208	0.00223	0.00006	0.00093	0.00003	0.00382	0.00008	0.00490	0.00009	0.1	4.0E-03	-2.7	-23.95	17.0473

Weighted Mean Age 10.47200 ±0.08971

Integrated 10.59759 ±0.18154

Sample: MB07-144 **Lab #**: 57736 **J**: 7.51E-04 ±1.64E-06 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
Plateau											**Steps**	A-F	10.33407	±0.09440			
Isochron													10.47496	±0.02293			

Sample: MB06-828 **Lab #**: 57540 **J**: 7.80E-04 ±9.54E-07 **Disc.**: 1.002 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	950.0	17.8	1.80807	0.00617	0.05160	0.00023	0.00160	0.00003	0.00599	0.00007	0.00479	0.00008	0.7	8.9E-03	21.9	10.95	0.7104
	01B	1140.0	21.1	2.14191	0.00557	0.09336	0.00032	0.00224	0.00005	0.05037	0.00018	0.00510	0.00008	0.2	7.5E-04	30.8	10.09	0.3867
	01C	1170.0	8.9	0.90507	0.00144	0.05921	0.00030	0.00114	0.00004	0.03922	0.00018	0.00148	0.00004	0.1	8.4E-04	53.8	11.73	0.3146
P	01D	1200.0	18.4	1.87312	0.00275	0.15709	0.00042	0.00255	0.00006	0.11373	0.00034	0.00266	0.00005	0.1	4.5E-04	61.2	10.41	0.1517
P	01E	1225.0	8.5	0.86358	0.00135	0.06849	0.00030	0.00115	0.00004	0.05807	0.00018	0.00140	0.00005	9.5946E-02	5.2E-04	55.6	10.01	0.2875
P	01F	1250.0	4.2	0.42991	0.00095	0.03126	0.00018	0.00059	0.00003	0.03759	0.00016	0.00082	0.00004	6.7529E-02	4.8E-04	48.1	9.47	0.5113
P	01G	1275.0	1.3	0.12797	0.00045	0.00506	0.00008	0.00013	0.00002	0.02176	0.00010	0.00041	0.00003	1.8610E-02	3.2E-04	13.3	4.88	2.7765
P	01H	1300.0	1.0	0.10353	0.00048	0.00271	0.00006	0.00009	0.00002	0.02344	0.00014	0.00035	0.00004	9.0999E-03	2.3E-04	11.2	6.34	5.9938
P	01I	1400.0	1.1	0.11573	0.00037	0.00202	0.00006	0.00010	0.00002	0.02565	0.00014	0.00042	0.00003	6.0849E-03	2.0E-04	5.5	4.75	7.0408
P	01J	1700.0	1.3	0.13545	0.00063	0.00176	0.00007	0.00012	0.00003	0.02999	0.00015	0.00054	0.00004	4.4328E-03	1.8E-04	-7.2	-8.53	9.5593
Weighted Mean Age														10.44712	±0.11372			
Integrated														10.28467	±0.15132			
Plateau												**Steps**	D-J	10.25533	±0.13021			
Isochron														10.46437	±0.01289			

Sample: MB06-834 **Lab #**: 57557 **J**: 8.19E-04 ±6.95E-07 **Disc.**: 1.002 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	403.0	40.99998	0.05631	0.00899	0.00018	0.02603	0.00014	0.00432	0.00008	0.13661	0.00041	0.2	4.1E-03	1.5	102.83	21.1370
	01B	625.0	14.8	1.50273	0.00226	0.02012	0.00014	0.00126	0.00005	0.00383	0.00005	0.00456	0.00008	0.4	6.0E-03	10.5	11.75	1.8171
	01C	700.0	12.5	1.27576	0.00198	0.04423	0.00019	0.00127	0.00004	0.00692	0.00007	0.00346	0.00008	0.5	5.3E-03	20.2	8.72	0.8055
	01D	750.0	6.2	0.62780	0.00124	0.04700	0.00021	0.00086	0.00004	0.00498	0.00006	0.00118	0.00004	0.7	8.5E-03	45.1	9.02	0.4106
P	01E	800.0	8.2	0.83842	0.00170	0.08097	0.00028	0.00118	0.00003	0.00853	0.00009	0.00097	0.00003	0.7	7.7E-03	66.3	10.27	0.1863
P	01F	875.0	10.8	1.09587	0.00205	0.09857	0.00033	0.00146	0.00005	0.01199	0.00013	0.00149	0.00005	0.6	6.8E-03	60.5	10.07	0.2468
P	01G	975.0	8.8	0.89979	0.00165	0.07347	0.00029	0.00123	0.00004	0.01235	0.00010	0.00133	0.00005	0.4	3.9E-03	57.0	10.44	0.2806
P	01H	1075.0	5.6	0.56926	0.00124	0.04663	0.00024	0.00073	0.00003	0.01126	0.00011	0.00086	0.00004	0.3	3.2E-03	56.3	10.29	0.4046
	01I	1250.0	33.8	3.43568	0.01130	0.08496	0.00033	0.00302	0.00007	0.06885	0.00277	0.01016	0.00010	8.8634E-02	3.6E-03	13.8	8.40	0.5791
	01J	1700.0	23.9	2.43605	0.00655	0.02101	0.00018	0.00178	0.00004	0.07395	0.00022	0.00803	0.00012	2.0134E-02	1.8E-04	4.4	7.76	2.5313

Weighted Mean Age			10.05607 ±0.11581
Integrated			11.29450 ±0.42249
Plateau	**Steps**	E-H	10.25258 ±0.13166
Isochron			9.96120 ±0.00854

Sample: MB07-174 **Lab #**: 57738 **J**: 7.51E-04 ±1.56E-06 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	950.0	0.4	0.35285	0.00088	0.00068	0.00004	0.00021	0.00002	0.00300	0.00012	0.00122	0.00005	4.3072E-02	3.1E-03	-1.9	-13.83	29.1712
P	01B	1050.0	0.2	0.18417	0.00074	0.01522	0.00013	0.00025	0.00002	0.01315	0.00014	0.00024	0.00003	0.2	3.1E-03	62.7	10.41	0.7308
P	01C	1120.0	1.3	1.19135	0.00183	0.13562	0.00033	0.00191	0.00004	0.07486	0.00165	0.00066	0.00004	0.3	7.7E-03	85.1	10.26	0.1314
P	01D	1130.0	0.2	0.18096	0.00075	0.02427	0.00016	0.00032	0.00002	0.03756	0.00016	6.3962E-07	0.00003	0.1	9.7E-04	104.5	10.70	0.5012
P	01E	1145.0	0.2	0.13954	0.00047	0.01881	0.00013	0.00027	0.00002	0.03046	0.00018	-1.3376E-0	0.00003	0.1	1.1E-03	104.8	10.68	0.5819
P	01F	1150.0	0.2	0.22129	0.00086	0.02870	0.00015	0.00039	0.00003	0.04726	0.00018	0.00005	0.00003	0.1	7.4E-04	97.7	10.35	0.4272
P	01G	1160.0	0.4	0.32569	0.00095	0.04056	0.00016	0.00055	0.00003	0.02638	0.00111	0.00015	0.00003	0.3	0.01	88.1	9.71	0.3121
P	01H	1200.0	6.7729E-02	0.06102	0.00040	0.00811	0.00008	0.00011	0.00001	0.01356	0.00009	-0.00002	0.00003	0.1	1.4E-03	115.6	11.94	1.3366
P	01I	1700.0	1.6	1.45439	0.00213	0.00084	0.00005	0.00093	0.00003	0.00166	0.00005	0.00478	0.00007	9.5927E-02	6.9E-03	3.0	70.05	34.6448

Sample: MB07-174 **Lab #**: 57738 **J**: 7.51E-04 ±1.56E-06 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
Weighted Mean Age													10.24556	±0.11180			
Integrated													10.43886	±0.18161			
Plateau											**Steps**	A-I	10.24496	±0.11180			
Isochron													10.21749	±0.02136			

Sample: MB06-831 **Lab #**: 57541 **J**: 7.78E-04 ±1.06E-06 **Disc.**: 1.002 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	950.0	26.1	2.64942	0.00796	0.02022	0.00015	0.00182	0.00005	0.00394	0.00006	0.00839	0.00010	0.4	6.8E-03	6.5	12.17	2.1605
P	01B	1140.0	48.5	4.92562	0.00886	0.44665	0.00134	0.00690	0.00011	0.11626	0.00147	0.00610	0.00008	0.3	4.1E-03	64.6	10.12	0.0828
P	01C	1170.0	4.5	0.45329	0.00108	0.05697	0.00025	0.00074	0.00004	0.03905	0.00015	0.00016	0.00003	0.1	7.0E-04	94.1	10.65	0.2232
P	01D	1200.0	4.4	0.44656	0.00108	0.05406	0.00026	0.00075	0.00004	0.04134	0.00018	0.00021	0.00003	0.1	6.9E-04	91.2	10.72	0.2474
P	01E	1225.0	2.0	0.20092	0.00084	0.02334	0.00017	0.00036	0.00003	0.01869	0.00015	0.00017	0.00003	0.1	1.1E-03	79.4	9.73	0.4796
P	01F	1250.0	-2.2000E-0	-0.00224	0.00026	-0.00158	0.00008	-0.00006	0.00003	-0.00008	0.00008	0.00004	0.00002	1.6	1.71	649.4	13.05	5.9662
P	01G	1275.0	-1.7112E-0	-0.00174	0.00027	-0.00192	0.00007	-0.00003	0.00003	0.00016	0.00008	0.00006	0.00002	-1.0	0.50	1062.2	13.60	5.0604
P	01H	1300.0	0.2	0.01527	0.00028	-0.00063	0.00008	-0.00003	0.00003	0.00242	0.00009	0.00004	0.00002	-2.1495E-0	2.6E-03	21.2	-7.20	14.5727
P	01I	1400.0	0.4	0.03609	0.00038	-0.00025	0.00010	-0.00004	0.00003	0.00334	0.00010	0.00008	0.00003	-6.4509E-0	2.4E-03	42.7	-84.54	59.7592
P	01J	1700.0	1.0	0.10608	0.00040	-0.00165	0.00009	0.00003	0.00003	0.02059	0.00015	0.00045	0.00003	-6.8522E-0	3.6E-04	-14.3	12.41	6.4465
Weighted Mean Age													10.22459	±0.07447			
Integrated													10.31433	±0.11205			
Plateau											**Steps**	A-J	10.22431	±0.07448			
Isochron													10.21818	±0.01444			

Sample: MB06-634 **Lab #**: 56970 **J**: 7.57E-04 ±1.41E-06 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	950.0	0.0	1.76717	0.00261	0.00829	0.00010	0.00120	0.00002	0.00276	0.00004	0.00558	0.00009	0.4	7.9E-03	6.8	20.00	4.6387
	01B	1050.0	0.0	0.07429	0.00027	0.00333	0.00004	0.00008	0.00001	0.00222	0.00003	0.00013	0.00002	0.2	4.1E-03	48.2	14.85	2.1293
P	01C	1120.0	0.0	0.82195	0.00124	0.07722	0.00017	0.00116	0.00003	0.11300	0.00147	0.00093	0.00003	0.1	1.3E-03	70.6	10.40	0.1591
P	01D	1140.0	0.0	0.86046	0.00112	0.08849	0.00019	0.00132	0.00002	0.13128	0.00153	0.00082	0.00003	9.9491E-02	1.2E-03	76.1	10.25	0.1423
P	01E	1160.0	0.0	0.69943	0.00102	0.08775	0.00019	0.00116	0.00002	0.12769	0.00132	0.00031	0.00003	0.1	1.1E-03	92.0	10.16	0.1313
P	01F	1180.0	0.0	2.19270	0.00297	0.26790	0.00049	0.00354	0.00003	0.39795	0.00137	0.00116	0.00003	9.9303E-02	3.9E-04	89.5	10.15	0.0698
P	01G	1220.0	0.0	0.28017	0.00068	0.03127	0.00011	0.00044	0.00001	0.07313	0.00134	0.00027	0.00002	6.2922E-02	1.2E-03	79.2	9.85	0.3233
P	01H	1320.0	0.0	0.00609	0.00024	0.00060	0.00002	-3.4461E-0	8.6846E-06	0.01594	0.00008	0.00004	0.00002	5.1827E-03	2.3E-04	-33.0	-4.99	15.8881
P	01I	1700.0	0.0	0.09156	0.00033	0.00041	0.00003	0.00006	8.7037E-06	0.01161	0.00006	0.00034	0.00002	4.9111E-03	3.5E-04	-6.0	-19.90	26.6524

Weighted Mean Age			10.18796 ±0.05586
Integrated			10.32207 ±0.09157
Plateau	**Steps**	C-I	10.18397 ±0.05588
Isochron			10.11332 ±0.01888

Sample: MB07-086 **Lab #**: 58778 **J**: 9.97E-04 ±3.49E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	-5.2759E-0	-0.05577	0.00023	4.6544E-06	0.00002	-0.00007	0.00001	0.00001	0.00002	-0.00017	0.00002	2.3142E-02	0.11	10.5	0.0	0.0
01B	625.0	5.2	5.53946	0.00767	0.03637	0.00019	0.00396	0.00007	0.00731	0.00006	0.01888	0.00017	0.3	2.7E-03	-0.6	-1.79	2.5123
01C	700.0	2.2	2.36930	0.00419	0.04710	0.00021	0.00204	0.00005	0.01279	0.00012	0.00752	0.00010	0.2	2.2E-03	6.6	6.03	1.1275
01D	750.0	1.3	1.39049	0.00242	0.03441	0.00019	0.00124	0.00004	0.00827	0.00006	0.00455	0.00009	0.2	2.2E-03	3.7	2.74	1.4119
01E	800.0	1.3	1.39661	0.00218	0.03443	0.00019	0.00132	0.00003	-0.00774	0.01027	0.00442	0.00010	-0.3	0.34	6.0	4.46	1.6743
01F	875.0	2.6	2.80022	0.00489	0.04983	0.00022	0.00232	0.00005	0.01273	0.00009	0.00855	0.00012	0.2	1.9E-03	10.1	10.32	1.2758
01G	975.0	1.3	1.40308	0.00230	0.03717	0.00022	0.00136	0.00004	0.01537	0.00013	0.00465	0.00007	0.1	1.4E-03	2.8	1.96	1.0106
01H	1075.0	0.4	0.42231	0.00087	0.01954	0.00012	0.00045	0.00002	0.00942	0.00007	0.00130	0.00004	0.1	1.1E-03	10.7	4.24	1.0445
01I	1175.0	0.8	0.86677	0.00180	0.02142	0.00016	0.00085	0.00003	0.01867	0.00016	0.00289	0.00007	6.5122E-02	7.4E-04	3.2	2.35	1.7340
01J	1250.0	7.0	7.41277	0.00929	0.12355	0.00038	0.00645	0.00008	1.51563	0.01136	0.02455	0.00018	4.3017E-03	3.8E-05	17.3	20.30	1.5480

Sample: MB07-086 **Lab #**: 58778 **J**: 9.97E-04 ±3.49E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01K	1450.0	1.5	1.56282	0.00208	0.02314	0.00016	0.00131	0.00003	0.46689	0.01121	0.00510	0.00008	2.4784E-03	7.0E-05	25.6	35.66	3.1238
01L	1700.0	0.1	0.14794	0.00080	0.00477	0.00008	0.00014	0.00001	0.00885	0.00010	0.00050	0.00004	3.0362E-02	6.4E-04	4.6	2.62	4.4433

Weighted Mean Age nan ±nan

Integrated 10.12232 ±0.45833

Plateau **Steps**

Isochron 1.41972 ±0.00497

Sample: MB07-030 **Lab #**: 58769 **J**: 9.50E-04 ±9.64E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	-2.8647E-0	-0.03028	0.00029	-0.00021	0.00006	-0.00002	0.00001	-0.00009	0.00002	-0.00015	0.00003	0.2	0.05	-50.8	-131.27	77.3710
01B	625.0	12.2	12.94608	0.01987	0.11787	0.00036	0.00960	0.00007	0.00479	0.00006	0.04105	0.00029	1.5	0.02	6.3	12.03	1.2893
01C	700.0	0.7	0.71865	0.00190	0.04719	0.00023	0.00096	0.00004	0.00193	0.00005	0.00149	0.00007	1.5	0.04	39.1	10.32	0.7949
01D	750.0	2.8	2.98566	0.00457	0.34030	0.00108	0.00519	0.00005	0.02059	0.00015	0.00389	0.00009	1.0	8.0E-03	62.0	9.43	0.1390
01E	800.0	1.9	2.02323	0.00396	0.25512	0.00075	0.00384	0.00007	0.09637	0.03056	0.00192	0.00007	0.2	0.05	75.2	10.37	0.2161
01F	875.0	1.9	1.99852	0.00349	0.24409	0.00078	0.00360	0.00008	0.10735	0.02698	0.00214	0.00007	0.1	0.03	72.0	10.25	0.2118
01G	975.0	1.4	1.46760	0.00253	0.19700	0.00048	0.00276	0.00006	0.01076	0.00008	0.00125	0.00006	1.1	8.4E-03	75.3	9.72	0.1499
01H	1075.0	0.9	0.91009	0.00171	0.13347	0.00041	0.00189	0.00004	0.06654	0.02109	0.00053	0.00006	0.1	0.04	87.8	10.41	0.3039
01I	1175.0	1.4	1.52346	0.00251	0.17797	0.00037	0.00268	0.00006	0.02405	0.00014	0.00184	0.00007	0.5	2.8E-03	65.4	9.72	0.1984
01J	1250.0	4.5	4.78084	0.00701	0.56838	0.00135	0.00842	0.00006	0.55677	0.02165	0.00611	0.00010	6.1830E-02	2.4E-03	70.3	10.31	0.1374
01K	1450.0	1.4	1.45766	0.00271	0.14354	0.00043	0.00234	0.00009	0.03799	0.00016	0.00257	0.00007	0.2	1.2E-03	49.6	8.76	0.2582
01L	1700.0	0.2	0.16599	0.00086	0.02488	0.00019	0.00036	0.00003	0.01031	0.00011	0.00007	0.00005	0.1	1.9E-03	91.5	10.61	1.0265

Weighted Mean Age 9.87526 ±0.11863

Integrated 10.09216 ±0.13803

Plateau **Steps**

Isochron 9.89956 ±0.10041

Sample: MB06-509 **Lab #**: 57016 **J**: 7.12E-04 ±6.91E-07 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	950.0	0.0	1.47048	0.00190	0.00842	0.00007	0.00103	0.00003	0.00567	0.00005	0.00472	0.00006	0.2	2.8E-03	5.3	12.03	2.5297
01B	1050.0	0.0	0.13739	0.00071	0.00496	0.00008	0.00018	0.00002	0.00579	0.00006	0.00031	0.00004	0.1	2.6E-03	35.3	12.75	2.9540
01C	1120.0	0.0	0.88114	0.00132	0.06343	0.00016	0.00111	0.00002	0.09106	0.00119	0.00136	0.00003	0.1	1.5E-03	57.2	10.36	0.2079
01D	1130.0	0.0	0.06517	0.00036	0.00610	0.00007	0.00007	0.00002	0.00931	0.00005	0.00014	0.00002	0.1	1.3E-03	40.5	5.66	1.4021
01E	1140.0	0.0	0.86426	0.00119	0.09571	0.00017	0.00129	0.00004	0.13425	0.00112	0.00060	0.00003	0.1	9.6E-04	83.7	9.86	0.1114
01F	1150.0	0.0	0.39160	0.00101	0.04432	0.00018	0.00059	0.00003	0.06456	0.00125	0.00028	0.00003	0.1	2.1E-03	83.3	9.60	0.2362
01G	1160.0	0.0	0.83537	0.00116	0.09555	0.00019	0.00124	0.00003	0.14230	0.00169	0.00040	0.00002	0.1	1.3E-03	90.4	10.30	0.1073
01H	1200.0	0.0	2.32958	0.00311	0.25847	0.00051	0.00348	0.00004	0.38885	0.00135	0.00138	0.00003	0.1	4.2E-04	87.0	10.23	0.0661
01I	1700.0	0.0	0.11122	0.00042	0.00183	0.00006	0.00006	0.00002	0.01499	0.00006	0.00047	0.00002	1.8889E-02	6.2E-04	-20.5	-16.56	5.1695

Weighted Mean Age 10.14995 ±0.04877

Integrated 10.06279 ±0.06972

Plateau **Steps**

Isochron 10.15961 ±0.00987

Sample: MB07-119 **Lab #**: 57723 **J**: 7.63E-04 ±1.52E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	12.5	11.23105	0.01428	0.00932	0.00011	0.00731	0.00009	0.00190	0.00004	0.03760	0.00021	1.1	0.03	1.1	18.02	9.3687
P	01B	625.0	4.7	4.26563	0.00657	0.04491	0.00024	0.00314	0.00006	0.01190	0.00010	0.01337	0.00016	0.8	8.0E-03	7.4	9.80	1.4573
P	01C	700.0	2.1	1.89125	0.00250	0.04861	0.00020	0.00158	0.00004	0.01143	0.00009	0.00528	0.00009	0.9	8.3E-03	17.7	9.56	0.7232
P	01D	750.0	0.8	0.72758	0.00145	0.02149	0.00012	0.00066	0.00003	0.00631	0.00007	0.00189	0.00005	0.7	8.7E-03	23.3	10.98	1.0322
P	01E	800.0	1.2	1.07067	0.00209	0.02648	0.00016	0.00091	0.00002	0.01026	0.00009	0.00298	0.00007	0.6	5.7E-03	18.0	10.16	1.0395
P	01F	875.0	2.5	2.24620	0.00371	0.04118	0.00019	0.00176	0.00003	0.01627	0.00012	0.00652	0.00011	0.5	4.7E-03	14.4	10.93	1.1055
P	01G	975.0	2.2	2.01282	0.00312	0.04389	0.00020	0.00173	0.00004	0.02152	0.00014	0.00565	0.00011	0.4	3.5E-03	17.3	11.04	1.0082
P	01H	1075.0	2.8	2.53450	0.00378	0.04632	0.00021	0.00202	0.00005	0.03665	0.00020	0.00750	0.00011	0.3	1.9E-03	12.8	9.77	0.9509

Sample: MB07-119 **Lab #**: 57723 **J**: 7.63E-04 ±1.52E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01I	1250.0	18.0	16.22603	0.01943	0.18506	0.00048	0.01199	0.00010	0.27180	0.00154	0.05087	0.00026	0.1	9.1E-04	7.7	9.41	0.5879
P	01J	1700.0	1.8	1.60961	0.00245	0.00264	0.00008	0.00109	0.00005	0.01773	0.00011	0.00528	0.00009	3.1457E-02	9.3E-04	3.3	28.50	14.5412

Weighted Mean Age 10.01372 ±0.31585

Integrated 10.17672 ±0.39164

Plateau **Steps** A-J 10.00503 ±0.31592

Isochron 9.82503 ±0.01957

Sample: MB06-615 **Lab #**: 56958 **J**: 7.57E-04 ±1.63E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	0.0	23.30402	0.02717	0.00278	0.00006	0.01474	0.00007	0.01303	0.00006	0.07822	0.00023	3.1741E-02	7.5E-04	0.8	95.64	35.4821
	01B	625.0	0.0	5.18785	0.00596	0.05402	0.00014	0.00373	0.00002	0.01032	0.00005	0.01604	0.00009	0.8	4.2E-03	8.7	11.50	0.7088
	01C	700.0	0.0	1.14467	0.00159	0.05265	0.00014	0.00118	0.00002	0.00759	0.00004	0.00248	0.00004	1.0	6.4E-03	36.1	10.84	0.3080
P	01D	750.0	0.0	0.62339	0.00099	0.03397	0.00011	0.00070	0.00002	0.00641	0.00005	0.00128	0.00003	0.8	6.9E-03	39.8	10.10	0.3237
P	01E	800.0	0.0	0.23403	0.00060	0.01192	0.00007	0.00025	9.8477E-06	0.00298	0.00003	0.00050	0.00002	0.6	7.8E-03	36.8	10.00	0.7448
P	01F	875.0	0.0	1.71878	0.00201	0.04531	0.00012	0.00139	0.00002	0.01211	0.00006	0.00465	0.00006	0.6	3.0E-03	20.3	10.65	0.5003
P	01G	975.0	0.0	1.40409	0.00191	0.03746	0.00010	0.00117	0.00003	0.01267	0.00006	0.00392	0.00005	0.4	2.6E-03	17.7	9.17	0.5535
P	01H	1075.0	0.0	2.26274	0.00296	0.04243	0.00013	0.00187	0.00003	0.02577	0.00010	0.00675	0.00005	0.2	1.3E-03	12.2	9.01	0.5103
P	01I	1250.0	0.0	18.77418	0.02142	0.20295	0.00038	0.01377	0.00006	0.63021	0.00162	0.05914	0.00018	4.8004E-02	1.5E-04	7.9	10.12	0.3928
P	01J	1700.0	0.0	0.52522	0.00089	0.00522	0.00005	0.00042	0.00002	0.04101	0.00012	0.00170	0.00003	1.8746E-02	1.8E-04	6.4	9.09	2.6615

Weighted Mean Age 10.23096 ±0.15661

Integrated 10.70805 ±0.29097

Plateau **Steps** D-J 9.92398 ±0.18715

Isochron 10.03648 ±0.02167

Sample: MB06-826b **Lab #**: 57539 **J**: 7.83E-04 ±1.06E-06 **Disc.**: 1.002 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	950.0	-0.3	-0.02776	0.00021	9.6199E-06	0.00003	-0.00002	0.00002	-0.00038	0.00004	-0.00008	0.00002	-2.4341E-0	6.4E-03	14.7	-612.20	2271.8887
	01B	1140.0	25.3	2.57097	0.01151	0.10206	0.00045	0.00243	0.00004	0.06237	0.00026	0.00605	0.00009	0.1	8.2E-04	31.7	11.41	0.4166
	01C	1170.0	8.8	0.89591	0.00146	0.07626	0.00026	0.00126	0.00005	0.05043	0.00014	0.00118	0.00005	0.1	5.5E-04	64.0	10.76	0.2989
P	01D	1200.0	11.4	1.16270	0.00274	0.11919	0.00034	0.00177	0.00004	0.08160	0.00023	0.00122	0.00005	0.1	4.8E-04	72.7	10.15	0.1754
P	01E	1225.0	23.9	2.42679	0.00893	0.25775	0.00110	0.00373	0.00006	0.08508	0.00195	0.00237	0.00005	0.2	5.8E-03	72.9	9.82	0.1116
P	01F	1250.0	3.4	0.35051	0.00084	0.03478	0.00021	0.00048	0.00002	0.03278	0.00017	0.00043	0.00003	8.6591E-02	6.8E-04	68.3	9.86	0.4321
P	01G	1275.0	0.8	0.07756	0.00039	0.00561	0.00009	0.00008	0.00002	0.00840	0.00007	0.00015	0.00003	5.4396E-02	1.0E-03	47.1	9.36	2.5678
P	01H	1300.0	0.4	0.03835	0.00029	0.00220	0.00006	0.00004	0.00003	0.00522	0.00007	0.00011	0.00003	3.4150E-02	1.0E-03	19.7	4.96	5.5549
P	01I	1400.0	0.6	0.06597	0.00033	0.00133	0.00007	0.00003	0.00002	0.00671	0.00007	0.00025	0.00003	1.5921E-02	9.2E-04	-4.8	-3.45	10.7431
P	01J	1700.0	1.3	0.12778	0.00047	0.00129	0.00006	0.00009	0.00002	0.02359	0.00013	0.00048	0.00004	4.1356E-03	2.0E-04	-2.4	-3.70	13.2044

Weighted Mean Age			10.04094 ±0.08703
Integrated			10.18853 ±0.11579
Plateau	**Steps**	D-J	9.90674 ±0.09289
Isochron			9.71264 ±0.01324

Sample: MB07-009 **Lab #**: 58768 **J**: 9.60E-04 ±9.64E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	-3.1274E-0	-0.03306	0.00029	-0.00021	0.00006	-0.00002	0.00001	-0.00002	0.00002	-0.00010	0.00002	0.8	0.89	14.0	38.96	61.8201
	01B	625.0	26.5	28.00902	0.03872	0.06503	0.00030	0.01849	0.00013	0.00370	0.00007	0.09321	0.00048	1.1	0.02	1.7	12.63	3.9788
	01C	700.0	4.3	4.59057	0.00645	0.02919	0.00021	0.00317	0.00006	0.00192	0.00005	0.01543	0.00017	0.9	0.03	0.7	1.86	3.1156
P	01D	750.0	6.0	6.31418	0.00823	0.09418	0.00038	0.00491	0.00006	0.00750	0.00009	0.01981	0.00018	0.8	9.6E-03	7.4	8.65	1.0241
P	01E	800.0	2.0	2.15113	0.00431	0.04647	0.00023	0.00174	0.00004	0.00702	0.00011	0.00640	0.00012	0.4	6.9E-03	12.4	10.03	1.3965
P	01F	875.0	3.8	3.97245	0.00558	0.06404	0.00028	0.00311	0.00005	0.01239	0.00008	0.01221	0.00013	0.3	2.4E-03	9.4	10.22	1.0309
P	01G	975.0	6.4	6.81081	0.00924	0.09971	0.00033	0.00520	0.00007	0.01367	0.00009	0.02100	0.00018	0.4	3.3E-03	9.0	10.80	0.9636
P	01H	1075.0	3.3	3.44487	0.00513	0.07046	0.00028	0.00292	0.00005	0.01011	0.00009	0.01038	0.00013	0.4	4.0E-03	11.2	9.57	0.9400
P	01I	1175.0	14.9	15.73791	0.01991	0.14339	0.00038	0.01156	0.00009	0.17489	0.03260	0.05020	0.00029	4.9795E-02	9.3E-03	6.5	12.58	1.1171

Sample: MB07-009 **Lab #**: 58768 **J**: 9.60E-04 ±9.64E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01J	1250.0	38.8	41.01198	0.05385	0.33733	0.00110	0.02860	0.00012	0.94563	0.03393	0.13117	0.00059	2.1465E-02	7.9E-04	7.1	15.29	0.9994
01K	1450.0	3.0	3.19024	0.00505	0.03470	0.00020	0.00246	0.00006	0.56431	0.02892	0.01030	0.00014	3.4116E-03	1.9E-04	16.9	29.73	2.9755
01L	1700.0	0.6	0.62236	0.00130	0.01247	0.00015	0.00054	0.00003	0.09245	0.03253	0.00197	0.00007	7.8945E-03	2.9E-03	16.7	15.19	4.6237

Weighted Mean Age			11.25873 ±0.40132
Integrated			12.71484 ±0.51770
Plateau	**Steps**	D-I	9.85171 ±0.47586
Isochron			9.37629 ±0.09417

Sample: MB07-169 **Lab #**: 58785 **J**: 9.96E-04 ±4.04E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	-2.0765E-0	-0.02195	0.00025	-0.00016	0.00003	-0.00002	0.00001	-0.00004	0.00003	-0.00005	0.00002	0.2	0.15	29.1	69.99	67.3215
P	01B	625.0	3.9	4.13568	0.00602	0.19678	0.00051	0.00442	0.00005	0.00102	0.00003	0.01058	0.00013	11.5	0.37	24.4	9.33	0.3554
P	01C	700.0	3.6	3.85711	0.00681	0.43831	0.00104	0.00672	0.00007	0.00192	0.00004	0.00509	0.00007	13.5	0.30	61.0	9.76	0.0968
P	01D	750.0	3.1	3.24334	0.00476	0.42012	0.00102	0.00627	0.00007	0.00176	0.00005	0.00324	0.00008	14.1	0.38	70.5	9.90	0.1067
P	01E	800.0	3.3	3.48264	0.00584	0.48140	0.00135	0.00745	0.00007	0.00219	0.00005	0.00309	0.00007	13.0	0.28	73.8	9.71	0.0891
P	01F	875.0	3.5	3.73269	0.00528	0.56316	0.00134	0.00834	0.00006	0.02314	0.01084	0.00246	0.00007	1.4	0.67	81.0	9.76	0.0745
P	01G	975.0	2.9	3.02137	0.00482	0.45087	0.00095	0.00635	0.00006	0.00333	0.00005	0.00192	0.00006	8.0	0.11	81.3	9.91	0.0768
P	01H	1075.0	3.0	3.19332	0.00595	0.40391	0.00115	0.00572	0.00008	0.00491	0.00007	0.00353	0.00007	4.9	0.07	67.5	9.70	0.1047
	01I	1250.0	8.0	8.45694	0.01093	0.72738	0.00137	0.01258	0.00009	0.02534	0.00013	0.01497	0.00016	1.7	9.1E-03	47.9	10.13	0.1192
	01J	1700.0	3.8	4.04690	0.00577	0.42176	0.00102	0.00667	0.00007	0.01189	0.00012	0.00582	0.00012	2.1	0.02	57.7	10.07	0.1545

Weighted Mean Age			9.82683 ±0.05216
Integrated			9.85061 ±0.05906
Plateau	**Steps**	A-H	9.79805 ±0.05524
Isochron			9.78900 ±0.03968

Sample: MB06-501 **Lab #**: 57536 **J**: 7.77E-04 ±1.06E-06 **Disc.**: 1.002 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	950.0	17.7	1.80086	0.00376	0.00402	0.00008	0.00127	0.00005	0.00297	0.00005	0.00593	0.00008	0.1	3.0E-03	2.8	17.63	8.6471
	01B	1050.0	0.9	0.09522	0.00034	0.00083	0.00004	0.00005	0.00003	0.00054	0.00003	0.00025	0.00003	0.1	0.01	22.3	35.86	15.9082
	01C	1100.0	0.5	0.05052	0.00026	0.00120	0.00004	0.00003	0.00003	0.00090	0.00004	0.00016	0.00002	0.1	6.6E-03	8.8	5.28	8.6000
	01D	1110.0	0.4	0.03563	0.00027	0.00166	0.00004	0.00005	0.00002	0.00127	0.00005	0.00003	0.00002	0.1	4.5E-03	77.9	23.71	5.3626
	01E	1120.0	0.4	0.03631	0.00026	0.00359	0.00005	0.00010	0.00002	0.00269	0.00005	-3.7697E-0	0.00002	0.1	2.6E-03	106.8	15.31	2.4686
	01F	1130.0	0.9	0.09359	0.00043	0.01000	0.00012	0.00017	0.00002	0.00745	0.00007	0.00002	0.00003	0.1	1.7E-03	97.1	12.92	1.2451
P	01G	1140.0	1.5	0.15512	0.00055	0.01604	0.00014	0.00019	0.00003	0.01268	0.00011	0.00015	0.00003	0.1	1.3E-03	76.0	10.45	0.8025
P	01H	1150.0	1.5	0.15619	0.00059	0.01708	0.00014	0.00026	0.00002	0.01365	0.00010	0.00014	0.00003	0.1	1.1E-03	78.4	10.19	0.6972
P	01I	1200.0	13.9	1.40984	0.00225	0.17997	0.00044	0.00235	0.00007	0.06691	0.00166	0.00070	0.00003	0.2	5.6E-03	87.8	9.76	0.0864
P	01J	1700.0	25.9	2.63009	0.00957	0.33924	0.00147	0.00444	0.00006	0.13450	0.00196	0.00122	0.00004	0.2	3.2E-03	88.8	9.77	0.0813

Weighted Mean Age			9.78534 ±0.06025
Integrated			10.01390 ±0.09909
Plateau	**Steps**	G-J	9.77168 ±0.08631
Isochron			9.75910 ±0.01331

Sample: MB06-764 **Lab #**: 57554 **J**: 8.19E-04 ±6.95E-07 **Disc.**: 1.002 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	203.8	20.73200	0.02392	0.01321	0.00016	0.01343	0.00011	0.00084	0.00004	0.07000	0.00028	1.2	0.06	0.2	5.45	9.7547
01B	625.0	13.8	1.40878	0.00222	0.07282	0.00027	0.00170	0.00004	0.00574	0.00007	0.00333	0.00007	0.9	0.01	30.5	8.82	0.4150
01C	700.0	13.7	1.38925	0.00227	0.08061	0.00028	0.00164	0.00003	0.01185	0.00009	0.00280	0.00007	0.5	4.0E-03	40.9	10.55	0.3891
01D	750.0	11.5	1.17004	0.00280	0.05395	0.00025	0.00117	0.00004	0.01286	0.00009	0.00269	0.00005	0.3	2.6E-03	32.7	10.62	0.4232
01E	800.0	9.4	0.95737	0.00175	0.03483	0.00017	0.00093	0.00003	0.00811	0.00007	0.00249	0.00006	0.3	3.2E-03	23.6	9.69	0.7928
01F	875.0	13.0	1.31931	0.00230	0.03937	0.00022	0.00115	0.00004	0.01036	0.00007	0.00350	0.00008	0.3	2.5E-03	22.1	11.06	0.8888
01G	975.0	17.1	1.73905	0.00271	0.03980	0.00017	0.00150	0.00003	0.01002	0.00008	0.00516	0.00009	0.3	2.6E-03	12.6	8.25	0.9520
01H	1075.0	63.1	6.42198	0.00784	0.04460	0.00022	0.00474	0.00006	0.01349	0.00008	0.02118	0.00016	0.2	1.8E-03	2.7	5.76	1.5601

Sample: MB06-764 **Lab #**: 57554 **J**: 8.19E-04 ±6.95E-07 **Disc.**: 1.002 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01I	1250.0	173.7	17.67030	0.02060	0.14857	0.00041	0.01288	0.00013	0.09434	0.00187	0.05623	0.00025	0.1	2.3E-03	6.3	11.19	0.7692
01J	1700.0	6.3	0.63884	0.00137	0.00658	0.00010	0.00051	0.00003	0.02750	0.00014	0.00209	0.00006	1.7088E-02	2.7E-04	5.8	8.53	3.8395

Weighted Mean Age 9.97106 ±0.20374

Integrated 9.75953 ±0.37884

Plateau **Steps**

Isochron 10.03944 ±0.00855

Sample: MB07-064 **Lab #**: 58630 **J**: 2.24E-03 ±4.55E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	7.0	10.74674	0.01755	0.22191	0.00086	0.06133	0.00024	0.02249	0.00014	0.03393	0.00028	1.1	8.0E-03	6.8	13.45	1.5280
P	01B	625.0	1.0	1.54549	0.00253	0.38927	0.00092	0.04393	0.00019	0.04155	0.00019	0.00215	0.00007	1.0	5.4E-03	59.7	9.70	0.2282
P	01C	700.0	0.8	1.19359	0.00220	0.29669	0.00088	0.02982	0.00016	0.07065	0.00024	0.00177	0.00006	0.5	2.1E-03	58.2	9.59	0.2681
P	01D	750.0	0.5	0.74710	0.00157	0.13113	0.00040	0.01340	0.00011	0.04139	0.00019	0.00149	0.00005	0.4	1.9E-03	43.0	10.04	0.4775
P	01E	800.0	0.5	0.73694	0.00185	0.09613	0.00028	0.00919	0.00008	0.03672	0.00019	0.00173	0.00008	0.3	1.7E-03	32.4	10.17	0.9935
P	01F	875.0	0.6	0.87669	0.00150	0.08205	0.00032	0.00813	0.00007	0.03555	0.00015	0.00231	0.00007	0.3	1.5E-03	23.8	10.41	1.0869
P	01G	975.0	0.4	0.61522	0.00146	0.05490	0.00029	0.00510	0.00007	0.02339	0.00016	0.00158	0.00006	0.3	2.3E-03	25.5	11.70	1.3278
P	01H	1075.0	0.4	0.65743	0.00152	0.04408	0.00021	0.00466	0.00005	0.03576	0.00015	0.00203	0.00008	0.1	8.6E-04	10.6	6.51	2.1385
	01I	1250.0	4.4	6.70430	0.00956	0.35643	0.00098	0.04318	0.00023	0.32973	0.00151	0.02108	0.00017	0.1	6.5E-04	8.9	6.89	0.5965
	01J	1700.0	2.5	3.76702	0.00547	0.01773	0.00013	0.00345	0.00006	0.04320	0.00107	0.01251	0.00016	4.5454E-02	1.2E-03	2.3	20.22	10.6968

Weighted Mean Age 9.58993 ±0.15305

Integrated 9.76089 ±0.29356

Plateau **Steps** B-H 9.75343 ±0.15949

Isochron 9.60942 ±0.01950

Sample: MB07-038 **Lab #**: 58772 **J**: 9.90E-04 ±3.59E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	-2.5772E-0	-0.02724	0.00018	-0.00012	0.00003	-0.00002	0.00001	-0.00005	0.00002	-0.00009	0.00002	0.1	0.07	3.0	12.04	96.2699
01B	625.0	0.8	0.85657	0.00152	0.09162	0.00030	0.00163	0.00004	0.00744	0.00009	0.00188	0.00006	0.7	9.0E-03	35.8	6.05	0.3460
01C	700.0	0.6	0.63445	0.00114	0.10582	0.00032	0.00172	0.00004	0.01383	0.00010	0.00070	0.00005	0.5	3.5E-03	68.9	7.48	0.2382
01D	750.0	0.4	0.47058	0.00108	0.07982	0.00030	0.00113	0.00004	0.09967	0.01123	0.00050	0.00004	4.8005E-02	5.5E-03	83.5	8.96	0.3361
01E	800.0	0.4	0.45700	0.00112	0.07222	0.00032	0.00098	0.00003	0.01154	0.00012	0.00047	0.00004	0.4	4.2E-03	71.5	8.18	0.3254
01F	875.0	0.4	0.47560	0.00118	0.08119	0.00032	0.00103	0.00003	0.01243	0.00010	0.00042	0.00003	0.4	3.4E-03	75.5	8.00	0.2191
01G	975.0	0.3	0.36598	0.00089	0.06442	0.00022	0.00089	0.00002	0.01137	0.00011	0.00031	0.00004	0.3	3.4E-03	77.2	7.93	0.3270
01H	1075.0	0.3	0.27915	0.00098	0.04241	0.00021	0.00058	0.00003	0.00945	0.00008	0.00041	0.00004	0.3	2.7E-03	58.7	7.00	0.4564
01I	1250.0	3.1	3.32104	0.00457	0.32963	0.00077	0.00586	0.00009	1.63721	0.00969	0.00765	0.00009	1.1793E-02	7.7E-05	66.4	12.43	0.4897
01J	1450.0	0.3	0.36552	0.00102	0.02947	0.00019	0.00060	0.00003	0.30527	0.01205	0.00094	0.00005	5.4720E-03	2.3E-04	82.4	19.57	1.5222
01K	1700.0	5.2233E-02	0.05521	0.00024	0.00555	0.00006	0.00010	0.00001	0.00701	0.00007	0.00011	0.00002	4.7337E-02	7.1E-04	52.0	9.41	2.3584

Weighted Mean Age 8.03444 ±0.11290

Integrated 9.75038 ±0.10801

Plateau **Steps**

Isochron 4.89217 ±0.01784

Sample: MB06-765 **Lab #**: 57555 **J**: 8.19E-04 ±6.27E-07 **Disc.**: 1.002 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	267.6	27.21898	0.03492	0.00840	0.00015	0.01786	0.00012	0.00600	0.00007	0.09081	0.00032	0.1	2.2E-03	1.4	68.44	17.3200
	01B	625.0	41.8	4.25422	0.01027	0.02530	0.00014	0.00302	0.00006	0.00403	0.00006	0.01385	0.00014	0.5	7.1E-03	3.8	9.60	2.5659
	01C	700.0	31.8	3.23060	0.01244	0.04400	0.00026	0.00241	0.00005	0.00673	0.00007	0.00974	0.00010	0.5	5.8E-03	11.0	12.08	1.1077
	01D	750.0	18.4	1.87224	0.00272	0.03789	0.00018	0.00163	0.00005	0.00640	0.00007	0.00520	0.00009	0.4	5.3E-03	18.1	13.34	1.0821
P	01E	800.0	10.3	1.05186	0.00190	0.02554	0.00015	0.00090	0.00004	0.00454	0.00007	0.00310	0.00007	0.4	6.6E-03	13.3	8.20	1.1889
P	01F	875.0	19.9	2.02173	0.00357	0.04828	0.00022	0.00176	0.00005	0.00981	0.00008	0.00591	0.00009	0.4	3.3E-03	13.9	8.74	0.8099
P	01G	975.0	26.9	2.73491	0.00904	0.06321	0.00023	0.00225	0.00006	0.01219	0.00010	0.00779	0.00009	0.4	3.4E-03	16.1	10.43	0.6413
P	01H	1075.0	19.5	1.98028	0.00384	0.05954	0.00025	0.00175	0.00006	0.01275	0.00008	0.00526	0.00009	0.3	2.6E-03	21.9	10.87	0.6588

Sample: MB06-765 **Lab #**: 57555 **J**: 8.19E-04 ±6.27E-07 **Disc.**: 1.002 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01I	1250.0	156.7	15.94075	0.01933	0.22184	0.00083	0.01201	0.00012	0.10448	0.00185	0.04947	0.00022	0.2	2.8E-03	8.7	9.34	0.4655
P	01J	1700.0	16.2	1.64637	0.00239	0.03363	0.00017	0.00144	0.00006	0.06611	0.00021	0.00477	0.00008	3.6577E-02	2.2E-04	16.7	12.31	1.0910

Weighted Mean Age		10.24157 ±0.26505
Integrated		11.07381 ±0.38736
Plateau	**Steps** E-J	9.72555 ±0.29392
Isochron		9.55745 ±0.00737

Sample: MB06-524 **Lab #**: 57018 **J**: 7.12E-04 ±6.64E-07 **Disc.**: 1.005 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	02A	950.0	0.0	4.02862	0.00468	0.00831	0.00006	0.00264	0.00003	0.01874	0.00006	0.01341	0.00007	0.1	8.2E-04	1.7	10.85	3.2155
	02B	1050.0	0.0	0.13275	0.00042	0.00193	0.00003	0.00013	0.00001	0.01434	0.00007	0.00035	0.00002	3.1568E-02	6.0E-04	24.8	22.41	4.4830
P	02C	1120.0	0.0	0.48799	0.00100	0.02297	0.00007	0.00050	0.00002	0.05874	0.00012	0.00114	0.00002	9.2531E-02	3.3E-04	33.3	9.23	0.3963
P	02D	1130.0	0.0	0.81477	0.00128	0.08782	0.00018	0.00122	0.00002	0.10243	0.00165	0.00057	0.00002	0.2	3.3E-03	81.4	9.83	0.0909
P	02E	1140.0	0.0	1.53909	0.00184	0.18234	0.00031	0.00243	0.00002	0.22140	0.00183	0.00076	0.00002	0.2	1.6E-03	88.0	9.67	0.0540
P	02F	1150.0	0.0	0.85087	0.00113	0.09804	0.00019	0.00130	0.00002	0.12163	0.00154	0.00047	0.00002	0.2	2.5E-03	86.3	9.75	0.0750
P	02G	1160.0	0.0	0.29762	0.00060	0.02891	0.00012	0.00040	0.00001	0.07819	0.00016	0.00034	0.00002	8.7388E-02	4.1E-04	70.6	9.47	0.2533
P	02H	1200.0	0.0	0.50832	0.00098	0.03679	0.00011	0.00065	0.00001	0.07683	0.00186	0.00088	0.00003	0.1	2.8E-03	51.6	9.28	0.2678
P	02I	1700.0	0.0	0.30607	0.00065	0.00262	0.00003	0.00025	0.00002	0.16683	0.00032	0.00107	0.00003	3.3791E-03	4.8E-05	6.1	10.14	4.9240

Weighted Mean Age		9.70244 ±0.03948
Integrated		9.72658 ±0.08027
Plateau	**Steps** C-I	9.70132 ±0.03948
Isochron		9.69968 ±0.00906

Sample: MB07-191 **Lab #**: 58787 **J**: 9.73E-04 ±4.48E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	-1.9680E-0	-0.02080	0.00018	-0.00009	0.00003	-0.00002	9.4260E-06	9.6559E-06	0.00002	-0.00003	0.00002	-0.6	1.06	57.3	218.01	122.3399
01B	625.0	4.2	4.40408	0.00594	0.10270	0.00031	0.00402	0.00006	0.03341	0.02277	0.01357	0.00014	0.2	0.12	9.5	7.25	0.8032
01C	700.0	1.7	1.83931	0.00271	0.16112	0.00050	0.00293	0.00007	0.01937	0.00012	0.00423	0.00008	0.5	3.4E-03	32.8	6.66	0.2551
01D	750.0	1.3	1.33916	0.00250	0.13914	0.00031	0.00233	0.00005	0.10885	0.02214	0.00249	0.00006	7.4794E-02	0.02	50.9	8.74	0.3161
01E	800.0	1.3	1.35316	0.00205	0.12296	0.00034	0.00219	0.00003	0.12951	0.02595	0.00273	0.00006	5.5449E-02	0.01	47.3	9.30	0.3932
01F	875.0	1.8	1.89375	0.00269	0.12253	0.00036	0.00244	0.00007	0.02121	0.00013	0.00462	0.00009	0.3	2.3E-03	28.7	7.90	0.3988
01G	975.0	1.0	1.03022	0.00168	0.05594	0.00021	0.00122	0.00004	0.01409	0.00010	0.00286	0.00006	0.2	1.9E-03	18.9	6.19	0.5973
01H	1075.0	0.5	0.57542	0.00137	0.02543	0.00018	0.00068	0.00003	0.01118	0.00008	0.00176	0.00007	0.1	1.4E-03	11.1	4.48	1.3747
01I	1250.0	3.7	3.95422	0.00584	0.16018	0.00039	0.00465	0.00005	1.49640	0.01954	0.01204	0.00016	5.9373E-03	8.3E-05	37.2	17.24	1.0689
01J	1700.0	0.3	0.30586	0.00076	0.01238	0.00013	0.00035	0.00002	0.21441	0.01781	0.00090	0.00005	3.0426E-03	2.8E-04	63.1	30.63	3.6005

Weighted Mean Age 7.91751 ±0.15517

Integrated 9.57410 ±0.18717

Plateau **Steps**

Isochron 7.09098 ±0.03265

Sample: MB06-636 **Lab #**: 56956 **J**: 7.58E-04 ±1.81E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	0.0	25.93310	0.03077	0.00604	0.00008	0.01655	0.00008	0.00069	0.00002	0.08779	0.00025	1.3	0.04	-3.7385E-0	-2.23	18.3749
01B	625.0	0.0	3.31122	0.00378	0.05861	0.00014	0.00267	0.00002	0.00727	0.00006	0.01005	0.00008	1.2	0.01	10.4	8.11	0.5478
01C	700.0	0.0	3.09804	0.00400	0.11124	0.00025	0.00288	0.00003	0.03025	0.00009	0.00800	0.00008	0.6	2.1E-03	24.0	9.26	0.2821
01D	750.0	0.0	1.92103	0.00231	0.06884	0.00018	0.00182	0.00003	0.01759	0.00008	0.00487	0.00005	0.6	3.0E-03	25.3	9.77	0.2944
01E	800.0	0.0	1.58096	0.00197	0.03932	0.00015	0.00130	0.00003	0.00953	0.00006	0.00438	0.00006	0.6	4.5E-03	18.4	10.22	0.5904
01F	875.0	0.0	2.95408	0.00378	0.07031	0.00018	0.00241	0.00004	0.01675	0.00009	0.00821	0.00008	0.6	3.9E-03	18.0	10.49	0.4513
01G	975.0	0.0	3.91419	0.00452	0.09195	0.00021	0.00324	0.00003	0.02343	0.00008	0.01143	0.00009	0.6	2.4E-03	13.9	8.20	0.4046
01H	1075.0	0.0	9.02362	0.00984	0.12340	0.00025	0.00694	0.00004	0.06236	0.00016	0.02796	0.00012	0.3	9.8E-04	8.6	8.75	0.3987
01I	1250.0	0.0	14.23877	0.01533	0.26279	0.00058	0.01150	0.00007	0.35330	0.00129	0.04168	0.00018	0.1	4.8E-04	14.2	10.67	0.2989

Sample: MB06-636 **Lab #**: 56956 **J**: 7.58E-04 ±1.81E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01J	1700.0	0.0	0.20624	0.00052	0.00381	0.00005	0.00018	0.00001	0.02522	0.00009	0.00061	0.00003	2.2487E-02	3.0E-04	16.3	12.40	3.2162

Weighted Mean Age 9.55393 ±0.13228

Integrated 9.55373 ±0.19548

Plateau **Steps**

Isochron 9.67050 ±0.02312

Sample: MB06-507 **Lab #**: 56955 **J**: 7.60E-04 ±1.63E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	0.0	10.00560	0.01062	0.00852	0.00006	0.00645	0.00006	0.04091	0.00010	0.03416	0.00015	3.1332E-02	2.5E-04	-0.8	-12.73	7.7755
P	01B	625.0	0.0	5.56389	0.00622	0.07452	0.00019	0.00416	0.00003	0.00339	0.00003	0.01706	0.00010	3.3	0.03	9.4	9.75	0.5432
P	01C	700.0	0.0	3.14562	0.00365	0.15019	0.00029	0.00324	0.00004	0.01035	0.00005	0.00712	0.00007	2.2	0.01	33.2	9.65	0.1943
P	01D	750.0	0.0	3.76528	0.00458	0.30574	0.00056	0.00503	0.00004	0.01335	0.00006	0.00559	0.00005	3.5	0.02	56.2	9.61	0.0709
P	01E	800.0	0.0	1.50652	0.00208	0.13432	0.00026	0.00220	0.00002	0.00626	0.00004	0.00200	0.00003	3.3	0.02	60.9	9.48	0.0965
P	01F	875.0	0.0	2.96892	0.00388	0.20819	0.00035	0.00384	0.00003	0.01083	0.00006	0.00513	0.00005	2.9	0.02	49.0	9.70	0.1090
P	01G	975.0	0.0	2.89977	0.00390	0.22018	0.00046	0.00380	0.00004	0.01016	0.00006	0.00466	0.00005	3.3	0.02	52.6	9.61	0.0898
P	01H	1075.0	0.0	3.51028	0.00427	0.30661	0.00070	0.00462	0.00003	0.02812	0.00010	0.00488	0.00005	1.7	6.8E-03	59.1	9.39	0.0737
P	01I	1250.0	0.0	5.36884	0.00619	0.41249	0.00063	0.00662	0.00004	0.07111	0.00121	0.00861	0.00007	0.9	0.02	53.0	9.57	0.0716
	01J	1700.0	0.0	3.62409	0.00450	0.26644	0.00047	0.00439	0.00003	0.03181	0.00010	0.00596	0.00005	1.3	4.5E-03	51.6	9.75	0.0780

Weighted Mean Age 9.58261 ±0.03665

Integrated 9.50749 ±0.05466

Plateau **Steps** B-I 9.54877 ±0.04236

Isochron 9.62910 ±0.02069

Sample: MB06-525 **Lab #**: 57017 **J**: 7.12E-04 ±6.70E-07 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	02A	950.0	0.0	0.94085	0.00147	0.00106	0.00003	0.00061	0.00002	0.00200	0.00002	0.00317	0.00004	8.0644E-02	2.2E-03	0.5	5.87	13.7538
P	02B	1050.0	0.0	0.03380	0.00021	0.00036	0.00002	0.00002	9.8461E-06	0.00030	0.00001	0.00013	0.00002	0.2	0.01	-9.4	-11.44	19.9899
P	02C	1120.0	0.0	0.09374	0.00026	0.00363	0.00004	0.00009	0.00001	0.00461	0.00003	0.00023	0.00002	0.1	1.7E-03	27.6	9.29	2.1341
P	02D	1130.0	0.0	0.02649	0.00019	0.00109	0.00002	0.00003	9.1461E-06	0.00246	0.00002	0.00007	0.00002	6.7773E-02	1.7E-03	25.0	7.93	5.8929
P	02E	1145.0	0.0	0.14266	0.00037	0.01632	0.00007	0.00023	0.00001	0.02054	0.00007	0.00011	0.00002	0.1	7.0E-04	82.2	9.36	0.3655
P	02F	1150.0	0.0	0.51165	0.00091	0.06591	0.00019	0.00084	0.00002	0.08551	0.00095	0.00018	0.00002	0.1	1.4E-03	94.5	9.56	0.1099
P	02G	1155.0	0.0	0.01457	0.00018	0.00194	0.00003	3.4807E-06	8.4027E-06	0.00242	0.00003	0.00002	0.00001	0.1	2.2E-03	68.4	6.70	2.8131
P	02H	1160.0	0.0	0.00142	0.00017	0.00037	0.00002	6.2516E-06	7.2905E-06	0.00049	0.00002	0.00002	0.00001	0.1	7.9E-03	-270.4	-13.75	15.8580
P	02I	1200.0	0.0	0.07553	0.00028	0.00943	0.00006	0.00013	8.6156E-06	0.01237	0.00006	0.00004	0.00001	0.1	9.5E-04	90.5	9.44	0.6122
P	02J	1700.0	0.0	0.11616	0.00032	0.00692	0.00006	0.00014	9.6678E-06	0.02433	0.00009	0.00025	0.00002	4.3272E-02	3.9E-04	42.3	9.30	1.0648

Weighted Mean Age		9.52823 ±0.10344
Integrated		9.23670 ±0.22855
Plateau	**Steps** A-J	9.53036 ±0.10393
Isochron		9.53462 ±0.00952

Sample: MB07-121 **Lab #**: 57724 **J**: 7.60E-04 ±7.58E-07 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	5.3	4.74549	0.00604	0.02173	0.00017	0.00339	0.00006	0.00419	0.00005	0.01572	0.00013	1.1	0.02	2.2	6.55	2.5229
	01B	625.0	0.8	0.69941	0.00134	0.06401	0.00027	0.00096	0.00003	0.02100	0.00010	0.00108	0.00005	0.7	4.2E-03	54.8	8.31	0.3067
P	01C	700.0	0.7	0.61349	0.00131	0.06897	0.00028	0.00101	0.00003	0.03385	0.00014	0.00057	0.00004	0.4	2.6E-03	73.4	9.07	0.2204
P	01D	750.0	0.4	0.33744	0.00099	0.03206	0.00018	0.00046	0.00002	0.02093	0.00010	0.00037	0.00004	0.3	2.4E-03	69.0	10.08	0.4573
P	01E	800.0	0.4	0.35981	0.00086	0.03696	0.00015	0.00052	0.00002	0.00923	0.00136	0.00035	0.00003	0.9	0.13	72.0	9.73	0.3510
P	01F	875.0	0.5	0.42703	0.00089	0.04611	0.00021	0.00061	0.00003	0.02676	0.00008	0.00035	0.00003	0.4	2.1E-03	77.1	9.92	0.2905
P	01G	975.0	0.4	0.33779	0.00088	0.03650	0.00019	0.00047	0.00003	0.01997	0.00011	0.00031	0.00003	0.4	2.9E-03	74.3	9.55	0.3476
P	01H	1075.0	0.6	0.52861	0.00105	0.04065	0.00019	0.00077	0.00002	0.03047	0.00017	0.00099	0.00006	0.3	2.1E-03	45.9	8.29	0.6006
	01I	1250.0	1.2	1.07330	0.00166	0.04680	0.00021	0.00125	0.00004	0.17708	0.00170	0.00309	0.00006	5.5981E-02	6.0E-04	18.2	5.82	0.5724

Sample: MB07-121 **Lab #**: 57724 **J**: 7.60E-04 ±7.58E-07 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01J	1700.0	1.7	1.53106	0.00200	0.00098	0.00005	0.00098	0.00003	0.01010	0.00006	0.00502	0.00009	2.0275E-02	1.0E-03	3.2	69.79	37.0246

Weighted Mean Age			9.11955 ±0.11969
Integrated			8.77996 ±0.21242
Plateau	**Steps**	C-H	9.51773 ±0.13692
Isochron			9.19926 ±0.00933

Sample: MB07-133 **Lab #**: 57734 **J**: 7.53E-04 ±1.56E-06 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01H	950.0	1.1	1.01051	0.00148	0.00656	0.00008	0.00072	0.00003	0.00331	0.00004	0.00317	0.00007	0.4	7.0E-03	7.3	15.42	4.5286
P	01I	1050.0	0.1	0.11089	0.00037	0.00205	0.00005	0.00010	0.00002	0.00192	0.00003	0.00029	0.00003	0.2	6.6E-03	22.8	16.93	5.7554
P	01J	1120.0	0.5	0.42225	0.00094	0.03535	0.00021	0.00062	0.00002	0.06210	0.00020	0.00062	0.00003	0.1	7.5E-04	59.5	9.80	0.4076
P	01K	1130.0	0.4	0.32186	0.00089	0.04094	0.00018	0.00058	0.00002	0.03018	0.00148	0.00019	0.00003	0.3	0.01	85.0	9.20	0.2736
P	01L	1145.0	0.5	0.49349	0.00110	0.06313	0.00022	0.00089	0.00003	0.04861	0.00153	0.00025	0.00003	0.3	7.9E-03	87.4	9.40	0.1821
P	01M	1150.0	0.2	0.19618	0.00076	0.02599	0.00014	0.00036	0.00002	0.04537	0.00023	0.00008	0.00003	0.1	8.2E-04	93.7	9.74	0.4432
P	01N	1160.0	0.3	0.25473	0.00076	0.03410	0.00018	0.00047	0.00002	0.02471	0.00137	0.00010	0.00003	0.3	0.01	90.8	9.33	0.3625
P	01O	1200.0	0.7	0.61586	0.00119	0.07834	0.00028	0.00109	0.00003	0.07913	0.00126	0.00045	0.00003	0.2	3.1E-03	81.4	8.81	0.1744
	01P	1700.0	1.6	1.40900	0.00224	0.00115	0.00005	0.00086	0.00003	0.03611	0.00141	0.00496	0.00008	5.7991E-03	3.5E-04	-3.4	-61.83	32.2811

Weighted Mean Age			9.20968 ±0.10425
Integrated			9.20934 ±0.19492
Plateau	**Steps**	A-H	9.42131 ±0.12819
Isochron			9.22271 ±0.01913

Sample: MB07-045 **Lab #**: 57730 **J**: 7.53E-04 ±1.63E-06 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	950.0	1.3	1.20977	0.00197	0.00505	0.00007	0.00089	0.00003	0.00263	0.00003	0.00393	0.00009	0.4	7.3E-03	4.0	13.14	7.3127
01B	1050.0	6.3580E-02	0.05728	0.00025	0.00102	0.00003	0.00006	0.00001	0.00087	0.00003	0.00021	0.00003	0.2	1.0E-02	-10.2	-7.92	10.4046
01C	1120.0	0.4	0.38651	0.00082	0.03575	0.00017	0.00059	0.00003	0.02555	0.00130	0.00047	0.00003	0.3	0.01	65.2	9.69	0.3777
01D	1130.0	0.3	0.29423	0.00086	0.03757	0.00015	0.00053	0.00002	0.02728	0.00158	0.00013	0.00003	0.3	0.02	88.8	9.56	0.2879
01E	1145.0	0.6	0.56617	0.00099	0.07316	0.00026	0.00095	0.00004	0.05055	0.00159	0.00032	0.00003	0.3	9.0E-03	85.5	9.10	0.1750
01F	1150.0	0.3	0.23756	0.00075	0.03174	0.00015	0.00043	0.00003	0.05551	0.00021	0.00003	0.00003	0.1	6.8E-04	101.7	10.49	0.3660
01G	1160.0	0.3	0.29016	0.00077	0.03853	0.00015	0.00049	0.00003	0.03073	0.00165	0.00010	0.00003	0.2	0.01	92.3	9.56	0.2684
01H	1200.0	0.9	0.81874	0.00135	0.09262	0.00032	0.00129	0.00005	0.08191	0.00145	0.00072	0.00003	0.2	4.0E-03	76.3	9.28	0.1522
01I	1700.0	1.6	1.48505	0.00220	0.00196	0.00006	0.00099	0.00003	0.04586	0.00024	0.00516	0.00009	7.9994E-03	2.6E-04	-2.0	-22.02	19.1938

Weighted Mean Age 9.39250 ±0.09494

Integrated 9.29505 ±0.19176

Plateau **Steps**

Isochron 9.42632 ±0.02043

Sample: MB07-167 **Lab #**: 58631 **J**: 2.25E-03 ±4.55E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	02A	550.0	4.4	6.82116	0.00940	0.51903	0.00140	0.25957	0.00076	0.01421	0.00011	0.01913	0.00018	4.0	0.03	17.3	9.32	0.4339
P	02B	625.0	1.2	1.77454	0.00251	0.22963	0.00071	0.06414	0.00021	0.02288	0.00017	0.00429	0.00009	1.1	8.9E-03	29.0	9.20	0.5030
P	02C	700.0	0.8	1.18621	0.00181	0.25236	0.00084	0.02461	0.00019	0.04820	0.00017	0.00213	0.00007	0.6	2.8E-03	48.3	9.33	0.3540
P	02D	750.0	0.5	0.76721	0.00162	0.19411	0.00050	0.00798	0.00010	0.04210	0.00017	0.00127	0.00006	0.5	2.5E-03	53.1	8.62	0.3566
P	02E	800.0	0.4	0.63962	0.00137	0.15970	0.00052	0.00516	0.00008	0.03651	0.00016	0.00091	0.00005	0.5	2.7E-03	60.1	9.88	0.3693
P	02F	875.0	0.4	0.66721	0.00144	0.14705	0.00042	0.00493	0.00009	0.03651	0.00017	0.00128	0.00005	0.4	2.4E-03	45.4	8.46	0.4396
	02G	975.0	0.5	0.76913	0.00162	0.11499	0.00036	0.00570	0.00007	0.02986	0.00015	0.00189	0.00005	0.4	2.5E-03	28.8	7.93	0.5803
	02H	1075.0	1.0	1.50316	0.00221	0.13140	0.00046	0.00868	0.00010	0.03978	0.00016	0.00441	0.00009	0.4	2.0E-03	14.2	6.66	0.7962
	02I	1250.0	4.7	7.15621	0.00874	0.33369	0.00099	0.03057	0.00016	0.25857	0.00162	0.02255	0.00018	0.1	9.9E-04	8.2	7.26	0.6717
	02J	1700.0	2.2	3.39096	0.00532	0.01917	0.00017	0.00348	0.00005	0.06093	0.00144	0.01177	0.00013	3.4371E-02	8.7E-04	-1.9	-14.04	8.3965

Sample: MB07-167 **Lab #**: 58631 **J**: 2.25E-03 ±4.55E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
Weighted Mean Age													8.88140 ±0.15116				
Integrated													8.44710 ±0.19967				
Plateau											**Steps**	A-F	9.26420 ±0.17657				
Isochron													9.32777 ±0.01888				

Sample: MB06-612 **Lab #**: 56960 **J**: 7.60E-04 ±7.42E-07 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	0.0	11.95281	0.01335	0.00248	0.00005	0.00767	0.00004	0.00401	0.00005	0.04034	0.00014	9.2060E-02	2.2E-03	0.3	17.99	24.8832
P	01B	625.0	0.0	2.52862	0.00323	0.09574	0.00021	0.00235	0.00003	0.00252	0.00003	0.00638	0.00005	5.7	0.08	25.5	9.34	0.2134
P	01C	700.0	0.0	3.85565	0.00472	0.37827	0.00068	0.00551	0.00004	0.00900	0.00005	0.00450	0.00005	6.3	0.04	65.6	9.27	0.0583
P	01D	750.0	0.0	2.66525	0.00337	0.30102	0.00067	0.00411	0.00004	0.00972	0.00006	0.00222	0.00004	4.6	0.03	75.4	9.26	0.0584
P	01E	800.0	0.0	1.71804	0.00212	0.19951	0.00035	0.00272	0.00004	0.00767	0.00004	0.00135	0.00003	3.9	0.02	76.9	9.19	0.0623
P	01F	875.0	0.0	2.08088	0.00263	0.23564	0.00052	0.00317	0.00003	0.01194	0.00005	0.00178	0.00004	2.9	0.01	74.8	9.17	0.0666
	01G	975.0	0.0	1.90546	0.00221	0.23244	0.00043	0.00312	0.00003	0.01735	0.00006	0.00141	0.00003	2.0	8.2E-03	78.4	8.91	0.0636
	01H	1075.0	0.0	2.03086	0.00253	0.22886	0.00056	0.00330	0.00004	0.03985	0.00010	0.00204	0.00003	0.9	3.0E-03	70.9	8.73	0.0642
	01I	1250.0	0.0	5.41942	0.00601	0.31440	0.00058	0.00629	0.00004	0.08971	0.00153	0.01151	0.00008	0.5	9.0E-03	37.7	9.02	0.1035
	01J	1700.0	0.0	2.03626	0.00254	0.13663	0.00028	0.00251	0.00003	0.04379	0.00011	0.00400	0.00005	0.5	1.5E-03	42.5	8.80	0.1410
Weighted Mean Age														9.09041 ±0.02565				
Integrated														9.09945 ±0.04404				
Plateau												**Steps**	A-F	9.24564 ±0.03514				
Isochron														9.08533 ±0.00887				

Sample: MB06-611 **Lab #**: 56961 **J**: 7.60E-04 ±6.69E-07 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	0.0	10.53231	0.01154	0.00256	0.00005	0.00684	0.00005	0.00035	0.00002	0.03526	0.00016	1.1	0.06	1.1	60.33	25.2933
01B	625.0	0.0	5.07066	0.00594	0.17942	0.00033	0.00474	0.00005	0.00667	0.00004	0.01314	0.00007	4.0	0.03	23.4	9.19	0.1725
01C	700.0	0.0	3.37166	0.00418	0.27193	0.00054	0.00426	0.00004	0.00876	0.00005	0.00544	0.00006	4.6	0.03	52.4	9.01	0.0900
01D	750.0	0.0	3.29625	0.00413	0.29860	0.00056	0.00463	0.00004	0.01318	0.00006	0.00453	0.00004	3.4	0.02	59.5	9.12	0.0592
01E	800.0	0.0	1.36093	0.00176	0.13477	0.00026	0.00190	0.00002	0.00682	0.00005	0.00148	0.00003	2.9	0.02	68.1	9.54	0.0882
01F	875.0	0.0	2.59972	0.00323	0.23709	0.00047	0.00356	0.00004	0.01221	0.00008	0.00341	0.00004	2.9	0.02	61.3	9.33	0.0796
01G	975.0	0.0	3.25505	0.00389	0.33879	0.00057	0.00483	0.00003	0.02668	0.00009	0.00356	0.00004	1.9	7.0E-03	67.9	9.05	0.0544
01H	1075.0	0.0	1.93638	0.00226	0.19843	0.00034	0.00300	0.00004	0.04760	0.00011	0.00235	0.00004	0.6	1.7E-03	64.9	8.79	0.0835
01I	1250.0	0.0	1.47228	0.00171	0.09352	0.00019	0.00177	0.00003	0.07355	0.00192	0.00299	0.00004	0.2	5.0E-03	41.4	9.05	0.1760
01J	1700.0	0.0	2.36630	0.00278	0.14118	0.00028	0.00272	0.00003	0.06806	0.00141	0.00489	0.00005	0.3	6.4E-03	39.7	9.24	0.1536

Weighted Mean Age 9.12594 ±0.02903

Integrated 9.19533 ±0.05078

Plateau **Steps**

Isochron 9.07781 ±0.00799

Sample: MB06-825 **Lab #**: 57538 **J**: 7.81E-04 ±1.06E-06 **Disc.**: 1.002 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	950.0	15.5	1.57123	0.00452	0.02120	0.00015	0.00118	0.00004	0.00261	0.00004	0.00469	0.00007	0.7	0.01	11.8	12.48	1.3923
P	01B	1140.0	13.7	1.39168	0.00215	0.03446	0.00019	0.00115	0.00004	0.01783	0.00011	0.00400	0.00007	0.2	1.3E-03	15.7	9.08	0.8118
P	01C	1170.0	2.5	0.25472	0.00070	0.02396	0.00016	0.00038	0.00004	0.01988	0.00011	0.00036	0.00003	9.8901E-02	8.7E-04	61.7	9.38	0.5910
P	01E	1225.0	4.4	0.44480	0.00095	0.03981	0.00016	0.00058	0.00003	0.03946	0.00020	0.00074	0.00004	8.2662E-02	5.4E-04	55.4	8.87	0.3991
P	01F	1275.0	3.4	0.34240	0.00106	0.02903	0.00017	0.00059	0.00003	0.05786	0.00018	0.00059	0.00004	4.0931E-02	2.7E-04	58.1	9.85	0.6552
P	01G	1300.0	1.4	0.13818	0.00065	0.00478	0.00009	0.00018	0.00003	0.05814	0.00018	0.00052	0.00004	6.4093E-03	1.4E-04	11.4	4.98	3.8093
P	01H	1400.0	1.1	0.10981	0.00044	0.00222	0.00007	0.00013	0.00003	0.08327	0.00033	0.00049	0.00003	1.8450E-03	6.5E-05	6.4	5.36	7.8958
P	01I	1700.0	-0.1	-0.01278	0.00141	-0.00063	0.00019	2.4753E-06	0.00003	-0.00069	0.00004	0.00010	0.00022	7.5226E-02	0.02	332.6	94.36	146.6948
P	01J	1700.0	2.5	0.25234	0.00078	0.00355	0.00007	0.00138	0.00003	0.04418	0.00015	0.00079	0.00004	6.2580E-03	1.4E-04	16.4	17.50	4.8182

Sample: MB06-825 **Lab #**: 57538 **J**: 7.81E-04 ±1.06E-06 **Disc.**: 1.002 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
Weighted Mean Age													9.30954 ±0.27115				
Integrated													9.34376 ±0.70180				
Plateau											**Steps**	B-I	9.15745 ±0.27686				
Isochron													8.93184 ±0.01222				

Sample: MB06-674 **Lab #**: 56954 **J**: 7.61E-04 ±1.81E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	0.0	2.22776	0.00277	0.00498	0.00004	0.00146	0.00002	0.00126	0.00003	0.00734	0.00006	0.6	0.01	2.7	16.53	4.9905
P	01B	625.0	0.0	0.48275	0.00092	0.02073	0.00010	0.00046	0.00002	0.00615	0.00004	0.00121	0.00003	0.5	4.4E-03	26.1	8.46	0.5227
P	01C	700.0	0.0	0.51543	0.00081	0.05017	0.00015	0.00081	0.00002	0.02052	0.00008	0.00064	0.00002	0.4	1.8E-03	64.6	9.22	0.1834
P	01D	750.0	0.0	0.34917	0.00056	0.03871	0.00014	0.00054	0.00002	0.01374	0.00006	0.00032	0.00002	0.4	2.4E-03	74.1	9.28	0.2227
P	01E	800.0	0.0	0.14642	0.00034	0.01599	0.00008	0.00024	9.4458E-06	0.00585	0.00004	0.00016	0.00002	0.4	3.7E-03	68.4	8.71	0.4135
P	01F	875.0	0.0	0.22543	0.00051	0.02076	0.00011	0.00029	0.00001	0.01114	0.00005	0.00035	0.00002	0.3	2.0E-03	55.8	8.42	0.3581
	01G	975.0	0.0	0.15044	0.00033	0.01129	0.00006	0.00019	0.00001	0.00840	0.00005	0.00032	0.00002	0.2	1.6E-03	38.0	7.05	0.7313
	01H	1075.0	0.0	0.48148	0.00089	0.02352	0.00010	0.00057	0.00001	0.02600	0.00012	0.00125	0.00003	0.1	8.4E-04	24.9	7.10	0.4505
	01I	1250.0	0.0	1.10777	0.00153	0.03471	0.00010	0.00118	0.00002	0.46255	0.00163	0.00346	0.00004	1.1081E-02	5.3E-05	19.4	8.85	0.6284
	01J	1700.0	0.0	0.10341	0.00029	0.00270	0.00004	0.00010	0.00001	0.05129	0.00012	0.00034	0.00002	7.6597E-03	1.2E-04	15.2	8.46	3.0848
Weighted Mean Age														8.87872 ±0.11614				
Integrated														8.81239 ±0.17755				
Plateau												**Steps**	A-F	9.14625 ±0.13152				
Isochron														8.88150 ±0.02120				

Sample: MB06-587 **Lab #**: 56965 **J**: 7.57E-04 ±7.42E-07 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	0.0	9.30029	0.01010	0.00354	0.00006	0.00592	0.00004	0.00443	0.00004	0.03156	0.00012	0.1	2.2E-03	-0.3	-9.85	14.6313
P	01B	625.0	0.0	3.22428	0.00373	0.06599	0.00015	0.00272	0.00003	0.00823	0.00004	0.00956	0.00007	1.1	6.1E-03	12.5	8.41	0.4389
P	01C	700.0	0.0	4.35709	0.00518	0.09112	0.00019	0.00361	0.00006	0.02413	0.00012	0.01262	0.00008	0.5	2.8E-03	14.6	9.64	0.3854
P	01D	750.0	0.0	1.44305	0.00179	0.05414	0.00014	0.00146	0.00002	0.01944	0.00007	0.00363	0.00005	0.4	1.8E-03	26.1	9.63	0.3801
P	01E	800.0	0.0	1.52500	0.00194	0.04614	0.00012	0.00126	0.00002	0.01434	0.00006	0.00417	0.00006	0.5	2.4E-03	19.4	8.89	0.4935
P	01F	875.0	0.0	5.64372	0.00614	0.07375	0.00019	0.00425	0.00003	0.02191	0.00010	0.01740	0.00008	0.5	2.4E-03	9.0	9.52	0.4575
P	01G	975.0	0.0	8.29029	0.00905	0.08849	0.00017	0.00607	0.00004	0.02539	0.00009	0.02632	0.00012	0.5	2.0E-03	6.3	8.14	0.5632
P	01H	1075.0	0.0	14.39522	0.01523	0.15921	0.00030	0.01068	0.00005	0.06799	0.00128	0.04531	0.00014	0.3	6.2E-03	7.1	8.93	0.3786
P	01I	1250.0	0.0	11.68676	0.01237	0.17023	0.00033	0.00915	0.00006	0.37342	0.00137	0.03616	0.00012	6.3432E-02	2.6E-04	9.5	9.10	0.3212
P	01J	1700.0	0.0	0.42987	0.00079	0.00425	0.00005	0.00031	0.00001	0.03659	0.00010	0.00139	0.00003	1.5909E-02	2.0E-04	6.8	9.76	2.8924

Weighted Mean Age			9.11471 ±0.14510
Integrated			8.93975 ±0.16750
Plateau	**Steps**	A-J	9.11309 ±0.14528
Isochron			9.53035 ±0.00934

Sample: MB07-145 **Lab #**: 57737 **J**: 7.50E-04 ±1.63E-06 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	950.0	0.9	0.81980	0.00148	0.01061	0.00010	0.00066	0.00003	0.00545	0.00006	0.00254	0.00006	0.4	5.1E-03	8.5	8.96	2.1155
P	01B	1050.0	0.1	0.12597	0.00048	0.00509	0.00007	0.00011	0.00002	0.00514	0.00007	0.00027	0.00003	0.2	3.7E-03	38.7	13.13	2.6128
P	01C	1120.0	0.7	0.63442	0.00119	0.04139	0.00016	0.00081	0.00003	0.03011	0.00161	0.00132	0.00005	0.3	0.01	39.7	8.35	0.4448
P	01D	1130.0	0.3	0.27201	0.00074	0.03818	0.00015	0.00049	0.00002	0.03039	0.00121	0.00011	0.00003	0.2	9.6E-03	90.0	8.80	0.2781
P	01E	1145.0	0.4	0.40506	0.00093	0.05679	0.00019	0.00074	0.00002	0.04407	0.00117	0.00010	0.00003	0.2	6.6E-03	94.8	9.27	0.2156
P	01F	1150.0	0.2	0.16497	0.00057	0.02444	0.00015	0.00033	0.00002	0.04472	0.00019	0.00001	0.00003	0.1	7.8E-04	104.1	9.66	0.4497
P	01G	1160.0	0.1	0.11861	0.00038	0.01776	0.00011	0.00026	0.00003	0.03404	0.00012	0.00001	0.00003	9.9547E-02	6.9E-04	103.5	9.50	0.6371
P	01H	1200.0	0.5	0.44148	0.00103	0.05607	0.00025	0.00081	0.00002	0.08044	0.00132	0.00026	0.00003	0.1	2.3E-03	86.5	9.35	0.2282
	01I	1700.0	1.6	1.42768	0.00214	0.00122	0.00005	0.00098	0.00003	0.07002	0.00123	0.00509	0.00007	2.9891E-03	1.5E-04	-4.2	-77.09	28.9296

Sample: MB07-145 **Lab #**: 57737 **J**: 7.50E-04 ±1.63E-06 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
Weighted Mean Age													9.17501 ±0.12425				
Integrated													8.81631 ±0.20375				
Plateau											**Steps**	A-H	9.10738 ±0.14679				
Isochron													9.24608 ±0.02013				

Sample: MB06-671 **Lab #**: 56957 **J**: 7.57E-04 ±1.81E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	0.0	3.35800	0.00399	0.00250	0.00004	0.00218	0.00003	0.00270	0.00003	0.01134	0.00007	0.1	2.5E-03	0.2	3.72	11.4736
	01B	625.0	0.0	0.86219	0.00131	0.10247	0.00025	0.00151	0.00002	0.01653	0.00008	0.00105	0.00003	0.9	4.9E-03	64.6	7.51	0.1147
P	01C	700.0	0.0	1.71399	0.00202	0.22474	0.00055	0.00305	0.00003	0.05348	0.00126	0.00087	0.00003	0.6	0.02	85.8	9.05	0.0566
P	01D	750.0	0.0	1.24249	0.00161	0.15958	0.00029	0.00211	0.00003	0.03277	0.00010	0.00065	0.00002	0.7	2.7E-03	85.4	9.18	0.0655
P	01E	800.0	0.0	0.62178	0.00104	0.07591	0.00016	0.00106	0.00002	0.01817	0.00008	0.00043	0.00003	0.6	3.1E-03	80.2	9.08	0.1372
P	01F	875.0	0.0	0.44807	0.00082	0.04938	0.00012	0.00069	0.00002	0.01901	0.00009	0.00048	0.00002	0.4	2.2E-03	69.7	8.74	0.1915
	01G	975.0	0.0	0.18058	0.00058	0.01895	0.00010	0.00032	0.00001	0.01463	0.00005	0.00031	0.00003	0.2	1.2E-03	52.1	6.88	0.5755
	01H	1075.0	0.0	1.30494	0.00162	0.05431	0.00015	0.00160	0.00002	0.10714	0.00125	0.00372	0.00004	7.6044E-02	9.1E-04	18.0	6.00	0.2995
	01I	1250.0	0.0	0.45468	0.00092	0.02421	0.00009	0.00070	0.00001	0.26246	0.00147	0.00140	0.00003	1.3553E-02	9.3E-05	25.4	6.75	0.6315
	01J	1700.0	0.0	0.09573	0.00038	0.00153	0.00004	0.00010	0.00001	0.02610	0.00010	0.00036	0.00002	8.5079E-03	2.3E-04	-2.3	-2.07	6.2802
Weighted Mean Age														8.85477 ±0.04293				
Integrated														8.43302 ±0.06815				
Plateau												**Steps**	C-F	9.10330 ±0.04634				
Isochron														8.93501 ±0.02142				

Sample: MB06-565 **Lab #**: 57548 **J**: 7.86E-04 ±1.18E-06 **Disc.**: 1.002 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	98.7	10.03337	0.01152	0.01942	0.00017	0.00695	0.00008	0.00445	0.00007	0.03380	0.00019	0.3	6.6E-03	0.5	3.62	4.2616
P	01B	625.0	2.5	0.25094	0.00086	0.03349	0.00019	0.00051	0.00004	0.00468	0.00006	0.00021	0.00004	0.6	7.6E-03	76.0	8.18	0.4740
P	01C	700.0	3.0	0.30905	0.00095	0.03769	0.00022	0.00060	0.00004	0.00803	0.00007	0.00024	0.00003	0.4	4.0E-03	78.5	9.25	0.3915
P	01D	750.0	2.6	0.26082	0.00069	0.03264	0.00021	0.00045	0.00003	0.00868	0.00007	0.00017	0.00003	0.3	3.1E-03	83.0	9.52	0.3780
P	01E	800.0	3.7	0.37223	0.00093	0.04169	0.00025	0.00053	0.00003	0.01194	0.00009	0.00039	0.00003	0.3	2.6E-03	71.1	9.12	0.3112
	01F	875.0	3.6	0.36636	0.00098	0.04294	0.00022	0.00059	0.00003	0.01211	0.00008	0.00024	0.00003	0.3	2.3E-03	82.3	10.09	0.3059
	01G	975.0	4.2	0.42845	0.00090	0.04494	0.00022	0.00068	0.00003	0.01412	0.00012	0.00037	0.00004	0.3	2.5E-03	76.5	10.47	0.3439
	01H	1075.0	2.3	0.23875	0.00081	0.02008	0.00015	0.00038	0.00003	0.00863	0.00010	0.00040	0.00003	0.2	2.5E-03	52.2	8.93	0.6563
	01I	1250.0	7.1	0.71715	0.00144	0.03937	0.00020	0.00109	0.00003	0.12709	0.00215	0.00243	0.00006	2.4227E-02	4.4E-04	9.3	2.48	0.6727
	01J	1700.0	1.9	0.18982	0.00077	0.00358	0.00007	0.00027	0.00002	0.03129	0.00014	0.00054	0.00003	8.7345E-03	1.9E-04	24.9	19.63	3.9182

Weighted Mean Age			9.24387 ±0.13925
Integrated			8.34799 ±0.30159
Plateau	**Steps**	A-E	9.07269 ±0.23591
Isochron			9.29141 ±0.01426

Sample: MB07-022 **Lab #**: 57720 **J**: 7.64E-04 ±1.52E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	1.4	1.29885	0.00194	0.04320	0.00023	0.00130	0.00004	0.00504	0.00006	0.00354	0.00007	1.8	0.02	19.5	8.17	0.6738
P	01B	625.0	1.1	1.03377	0.00183	0.13970	0.00035	0.00185	0.00005	0.01633	0.00009	0.00049	0.00004	1.8	0.01	86.3	8.91	0.1186
P	01C	700.0	1.4	1.24233	0.00188	0.17930	0.00042	0.00233	0.00003	0.02482	0.00016	0.00022	0.00004	1.6	0.01	95.1	9.19	0.0954
P	01D	750.0	0.9	0.78681	0.00148	0.11066	0.00033	0.00143	0.00003	0.01878	0.00010	0.00020	0.00003	1.3	7.5E-03	93.0	9.23	0.1222
P	01E	800.0	0.7	0.64375	0.00150	0.08920	0.00029	0.00117	0.00004	0.01782	0.00011	0.00023	0.00003	1.1	7.3E-03	90.0	9.06	0.1286
P	01F	875.0	0.7	0.62946	0.00150	0.08296	0.00029	0.00100	0.00003	0.02224	0.00016	0.00035	0.00003	0.8	6.5E-03	84.1	8.90	0.1672
P	01G	975.0	0.7	0.59547	0.00133	0.07506	0.00024	0.00102	0.00003	0.02414	0.00011	0.00042	0.00003	0.7	3.7E-03	79.9	8.85	0.1823
P	01H	1075.0	0.5	0.46999	0.00102	0.05315	0.00024	0.00075	0.00003	0.03506	0.00021	0.00052	0.00003	0.3	2.5E-03	69.0	8.52	0.2706
	01I	1250.0	0.9	0.83089	0.00151	0.05759	0.00022	0.00115	0.00003	0.13276	0.00121	0.00182	0.00004	9.3149E-02	9.2E-04	38.5	7.77	0.3223

Sample: MB07-022 **Lab #**: 57720 **J**: 7.64E-04 ±1.52E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01J	1700.0	1.9	1.69139	0.00255	0.00314	0.00006	0.00115	0.00004	0.01176	0.00010	0.00578	0.00011	5.7093E-02	1.2E-03	-0.9	-7.01	14.2716

Weighted Mean Age			9.01227 ±0.05311
Integrated			8.82098 ±0.08453
Plateau	**Steps**	A-H	9.06210 ±0.05458
Isochron			9.08183 ±0.01804

Sample: MB06-747 **Lab #**: 56971 **J**: 7.57E-04 ±1.56E-06 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	950.0	0.0	4.96839	0.00577	0.03527	0.00011	0.00344	0.00003	0.00472	0.00004	0.01587	0.00010	1.2	9.6E-03	5.7	11.02	1.1314
P	01B	1050.0	0.0	0.76006	0.00123	0.03870	0.00011	0.00082	0.00002	0.04022	0.00012	0.00169	0.00003	0.2	6.2E-04	35.7	9.70	0.2749
P	01C	1100.0	0.0	2.35449	0.00317	0.29530	0.00060	0.00412	0.00004	0.36750	0.00200	0.00178	0.00003	0.1	7.3E-04	81.9	9.04	0.0552
P	01D	1110.0	0.0	0.45324	0.00089	0.05812	0.00016	0.00081	0.00001	0.08122	0.00155	0.00035	0.00002	0.1	2.2E-03	82.2	8.88	0.1463
P	01E	1120.0	0.0	0.06473	0.00032	0.00798	0.00007	0.00013	0.00001	0.01063	0.00008	0.00005	0.00002	0.1	1.4E-03	81.2	9.13	0.9305
P	01F	1130.0	0.0	0.03925	0.00028	0.00497	0.00006	0.00007	8.5352E-06	0.00642	0.00006	0.00002	0.00002	0.1	1.8E-03	92.5	10.11	1.4304
P	01G	1140.0	0.0	0.37528	0.00079	0.05141	0.00016	0.00069	0.00001	0.07053	0.00152	0.00022	0.00002	0.1	2.5E-03	88.1	8.92	0.1643
P	01H	1150.0	0.0	0.55956	0.00100	0.07572	0.00020	0.00107	0.00002	0.10026	0.00120	0.00029	0.00002	0.1	1.4E-03	89.8	9.19	0.1255
P	01I	1200.0	0.0	0.71072	0.00112	0.09443	0.00022	0.00131	0.00002	0.13433	0.00130	0.00046	0.00002	0.1	1.1E-03	86.1	8.98	0.1123
P	01J	1700.0	0.0	0.11150	0.00039	-0.00041	0.00004	0.00008	8.8622E-06	0.00798	0.00008	0.00042	0.00002	-8.3850E-0	8.5E-04	-9.0	32.17	21.9222

Weighted Mean Age			9.04811 ±0.04584
Integrated			9.16503 ±0.07802
Plateau	**Steps**	A-J	9.04802 ±0.04584
Isochron			9.01498 ±0.01864

Sample: MB07-015 **Lab #**: 58616 **J**: 2.19E-03 ±2.86E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	9.3	14.33503	0.01717	0.59306	0.00124	0.07661	0.00024	0.01445	0.00010	0.04316	0.00040	5.1	0.04	11.0	10.63	0.8040
P	01B	625.0	2.2	3.36789	0.00485	0.21657	0.00066	0.01831	0.00013	0.01655	0.00014	0.00985	0.00012	1.6	0.01	13.7	8.47	0.6631
P	01C	700.0	1.3	1.95443	0.00320	0.11579	0.00038	0.00980	0.00009	0.02086	0.00014	0.00580	0.00010	0.7	5.2E-03	12.6	8.52	0.9935
P	01D	750.0	0.9	1.42819	0.00248	0.09340	0.00041	0.00909	0.00011	0.02790	0.00016	0.00421	0.00009	0.4	3.0E-03	13.5	8.22	1.1191
P	01E	800.0	1.4	2.16274	0.00460	0.09284	0.00033	0.01430	0.00010	0.03756	0.00019	0.00660	0.00012	0.3	1.9E-03	10.4	9.66	1.5831
	01F	875.0	1.8	2.73062	0.00488	0.13735	0.00039	0.02109	0.00011	0.04679	0.00021	0.00782	0.00012	0.4	2.0E-03	15.9	12.60	1.0698
	01G	975.0	2.8	4.29727	0.00635	0.16283	0.00047	0.01193	0.00010	0.05735	0.00022	0.01337	0.00016	0.4	1.7E-03	8.5	8.91	1.1336
	01H	1075.0	1.3	2.01307	0.00352	0.12152	0.00036	0.00597	0.00007	0.04852	0.00019	0.00607	0.00011	0.3	1.5E-03	11.7	7.74	1.0743
	01I	1250.0	3.9	5.98244	0.00746	0.29049	0.00090	0.01730	0.00014	0.22978	0.00145	0.01861	0.00017	0.2	1.1E-03	9.3	7.68	0.7030
	01J	1700.0	4.1	6.31675	0.00844	0.11570	0.00041	0.01032	0.00008	0.28053	0.00151	0.02108	0.00022	5.1183E-02	3.3E-04	2.9	6.29	2.2759

Weighted Mean Age		8.93124 ±0.30499	
Integrated		9.21598 ±0.35624	
Plateau	**Steps** A-E	9.03733 ±0.42153	
Isochron		8.75005 ±0.01145	

Sample: MB07-189 **Lab #**: 58786 **J**: 9.81E-04 ±4.48E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	-2.0140E-0	-0.02129	0.00021	-0.00012	0.00004	-0.00005	0.00001	-0.00003	0.00002	-0.00008	0.00002	0.2	0.13	-6.9	-22.98	92.5920
01B	625.0	11.8	12.42541	0.01730	0.10110	0.00037	0.00898	0.00006	0.00702	0.00007	0.04033	0.00025	0.8	9.5E-03	4.1	9.07	1.3584
01C	700.0	3.7	3.87094	0.00561	0.17464	0.00042	0.00431	0.00006	0.02264	0.01711	0.01124	0.00014	0.5	0.34	14.6	5.80	0.4445
01D	750.0	2.0	2.14722	0.00433	0.16638	0.00043	0.00318	0.00006	0.08228	0.01745	0.00491	0.00009	0.1	0.03	35.2	8.15	0.3142
01E	800.0	2.3	2.40040	0.00381	0.13492	0.00035	0.00291	0.00004	0.01450	0.00013	0.00609	0.00010	0.5	5.0E-03	25.5	8.12	0.3947
01F	875.0	3.7	3.96372	0.00575	0.14649	0.00043	0.00391	0.00007	0.07767	0.01833	0.01104	0.00010	0.1	0.03	19.1	9.28	0.4216
01G	975.0	2.1	2.18060	0.00388	0.10085	0.00027	0.00237	0.00004	0.01588	0.00010	0.00610	0.00010	0.4	2.6E-03	17.8	6.92	0.5094
01H	1075.0	1.3	1.32985	0.00212	0.05550	0.00028	0.00140	0.00003	0.05637	0.02278	0.00384	0.00008	5.7645E-02	0.02	17.8	7.68	0.9360
01I	1250.0	6.3	6.69503	0.00822	0.15243	0.00040	0.00603	0.00009	0.95467	0.03097	0.02123	0.00021	9.0536E-03	3.1E-04	16.5	13.47	1.0159

Sample: MB07-189 **Lab #**: 58786 **J**: 9.81E-04 ±4.48E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01J	1700.0	1.5	1.57416	0.00283	0.03748	0.00017	0.00146	0.00003	0.35629	0.03513	0.00487	0.00010	5.8454E-03	6.1E-04	24.7	19.66	2.1896

Weighted Mean Age 8.06257 ±0.17552

Integrated 8.98746 ±0.23294

Plateau **Steps**

Isochron 7.36667 ±0.03364

Sample: MB07-114 **Lab #**: 57732 **J**: 7.54E-04 ±1.63E-06 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	950.0	0.1	0.12399	0.00042	0.00093	0.00004	0.00004	0.00002	0.00124	0.00013	0.00034	0.00003	0.1	0.02	19.9	36.09	14.1416
P	01B	1050.0	8.2200E-02	0.07405	0.00038	0.00951	0.00010	0.00011	0.00002	-0.00257	0.00013	6.1979E-06	0.00003	-0.7	0.04	96.8	10.36	1.2568
P	01C	1120.0	1.0	0.92442	0.00168	0.12339	0.00033	0.00168	0.00003	0.06488	0.00149	0.00045	0.00004	0.4	8.6E-03	87.1	8.99	0.1377
P	01D	1130.0	0.3	0.22910	0.00068	0.03071	0.00019	0.00041	0.00002	0.02393	0.00142	0.00013	0.00002	0.2	0.01	85.6	8.80	0.3344
P	01E	1145.0	0.3	0.28895	0.00077	0.03953	0.00019	0.00052	0.00002	0.03182	0.00130	0.00015	0.00003	0.2	1.0E-02	87.3	8.79	0.2651
P	01F	1150.0	0.1	0.12401	0.00045	0.01749	0.00012	0.00021	0.00003	0.03021	0.00017	0.00005	0.00002	0.1	9.8E-04	93.9	9.19	0.5555
P	01G	1160.0	0.3	0.28123	0.00080	0.03937	0.00018	0.00048	0.00002	0.02847	0.00136	0.00008	0.00002	0.3	0.01	93.6	9.22	0.2413
P	01H	1200.0	0.4	0.38762	0.00090	0.05231	0.00017	0.00073	0.00003	0.04263	0.00120	0.00020	0.00003	0.2	6.8E-03	87.3	8.91	0.2052
P	01I	1700.0	1.6	1.43199	0.00191	0.00105	0.00005	0.00096	0.00003	0.00971	0.00010	0.00471	0.00009	2.0622E-02	1.1E-03	2.9	55.20	32.9707

Weighted Mean Age 8.98407 ±0.09308

Integrated 9.24948 ±0.15561

Plateau **Steps** A-I 8.98372 ±0.09308

Isochron 8.94626 ±0.01938

Sample: MB06-613 **Lab #**: 56959 **J**: 7.59E-04 ±1.81E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	0.0	19.91592	0.02186	0.04254	0.00014	0.01297	0.00006	0.01315	0.00008	0.06662	0.00021	0.5	3.3E-03	1.2	7.64	2.1683
P	01B	625.0	0.0	5.49884	0.00669	0.08089	0.00018	0.00435	0.00004	0.00857	0.00005	0.01708	0.00009	1.4	8.1E-03	8.3	7.80	0.4769
P	01C	700.0	0.0	2.45341	0.00349	0.04351	0.00012	0.00197	0.00003	0.01260	0.00005	0.00725	0.00007	0.5	2.4E-03	12.8	10.01	0.6336
P	01D	750.0	0.0	1.63798	0.00201	0.03331	0.00013	0.00134	0.00002	0.01598	0.00006	0.00481	0.00006	0.3	1.8E-03	13.6	9.25	0.6940
P	01E	800.0	0.0	1.61941	0.00192	0.02753	0.00010	0.00125	0.00002	0.01585	0.00009	0.00488	0.00005	0.3	1.7E-03	11.3	9.23	0.7496
P	01F	875.0	0.0	1.72154	0.00205	0.02997	0.00011	0.00140	0.00002	0.02026	0.00009	0.00518	0.00006	0.2	1.3E-03	11.3	9.04	0.8111
P	01G	975.0	0.0	1.35102	0.00171	0.03174	0.00010	0.00111	0.00002	0.01559	0.00008	0.00385	0.00004	0.3	1.9E-03	16.0	9.46	0.5529
P	01H	1075.0	0.0	1.86126	0.00220	0.04850	0.00015	0.00165	0.00002	0.04342	0.00011	0.00541	0.00005	0.2	6.5E-04	14.8	7.89	0.4568
	01I	1250.0	0.0	6.08285	0.00700	0.09561	0.00018	0.00483	0.00003	0.46801	0.00162	0.01922	0.00009	3.0190E-02	1.2E-04	8.8	7.86	0.4247
	01J	1700.0	0.0	0.44223	0.00072	0.00485	0.00004	0.00030	0.00001	0.05917	0.00012	0.00144	0.00004	1.1893E-02	1.1E-04	7.9	10.23	3.1275

Weighted Mean Age			8.53862 ±0.19647
Integrated			8.45929 ±0.27891
Plateau	**Steps**	A-H	8.96368 ±0.25290
Isochron			8.70098 ±0.02080

Sample: MB07-141 **Lab #**: 57725 **J**: 7.60E-04 ±6.83E-07 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	11.8	10.66517	0.01234	0.00878	0.00011	0.00696	0.00006	0.00743	0.00010	0.03618	0.00020	0.3	4.6E-03	-0.2	-3.88	9.7027
	01B	625.0	3.6	3.20477	0.00472	0.02259	0.00017	0.00221	0.00006	0.01812	0.00010	0.01068	0.00011	0.3	2.5E-03	1.7	3.28	2.0572
	01C	700.0	2.3	2.08414	0.00272	0.02558	0.00015	0.00163	0.00004	0.02532	0.00013	0.00625	0.00008	0.2	1.7E-03	11.7	13.21	1.2710
P	01D	750.0	1.1	0.95248	0.00188	0.01608	0.00015	0.00074	0.00003	0.01503	0.00013	0.00293	0.00007	0.2	2.9E-03	9.3	7.65	1.7403
P	01E	800.0	1.4	1.26421	0.00204	0.01765	0.00011	0.00098	0.00003	0.01315	0.00009	0.00385	0.00007	0.3	2.6E-03	10.2	10.11	1.6900
P	01F	875.0	2.0	1.82652	0.00258	0.01891	0.00014	0.00125	0.00002	0.01469	0.00012	0.00595	0.00011	0.3	3.0E-03	3.9	5.28	2.3728
P	01G	975.0	1.9	1.67772	0.00246	0.01774	0.00012	0.00123	0.00004	0.01579	0.00010	0.00519	0.00010	0.2	2.2E-03	8.8	11.56	2.2918
P	01H	1075.0	0.7	0.58581	0.00144	0.01395	0.00012	0.00051	0.00003	0.01787	0.00009	0.00165	0.00005	0.2	1.6E-03	17.3	10.10	1.4784
P	01I	1250.0	7.4	6.66242	0.00799	0.07307	0.00025	0.00506	0.00005	0.22514	0.00201	0.02115	0.00014	6.8642E-02	6.6E-04	6.9	8.72	0.8114

Sample: MB07-141 **Lab #**: 57725 **J**: 7.60E-04 ±6.83E-07 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01J	1700.0	1.9	1.67341	0.00247	0.00260	0.00007	0.00115	0.00003	0.03661	0.00013	0.00564	0.00008	1.4775E-02	4.1E-04	0.8	7.15	12.1601

Weighted Mean Age		9.24236 ±0.50661	
Integrated		8.20997 ±0.66234	
Plateau	**Steps** D-J	8.94691 ±0.57505	
Isochron		10.45231 ±0.00948	

Sample: MB06-560 **Lab #**: 57547 **J**: 7.84E-04 ±9.12E-07 **Disc.**: 1.002 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	591.3	60.08728	0.08527	0.02122	0.00026	0.03770	0.00016	0.00107	0.00009	0.19881	0.00050	1.6	0.13	2.2	88.28	11.0783
	01B	625.0	36.4	3.69534	0.01192	0.10254	0.00040	0.00352	0.00006	0.00369	0.00009	0.01053	0.00010	2.2	0.05	15.8	8.16	0.4610
	01C	700.0	24.7	2.50973	0.00858	0.12483	0.00039	0.00282	0.00008	0.01254	0.00014	0.00578	0.00008	0.8	9.0E-03	32.2	9.27	0.2761
	01D	750.0	14.9	1.50965	0.00246	0.08016	0.00033	0.00175	0.00006	0.01310	0.00011	0.00324	0.00008	0.5	4.6E-03	37.1	10.00	0.4181
	01E	800.0	17.2	1.74769	0.00252	0.08208	0.00029	0.00177	0.00004	0.01085	0.00010	0.00396	0.00006	0.6	5.9E-03	33.3	10.15	0.3326
P	01F	875.0	22.5	2.28966	0.00570	0.08161	0.00034	0.00211	0.00005	0.00944	0.00007	0.00593	0.00009	0.7	5.7E-03	23.7	9.51	0.5011
P	01G	975.0	22.5	2.28765	0.00544	0.08756	0.00028	0.00230	0.00005	0.00974	0.00007	0.00608	0.00009	0.7	5.4E-03	21.7	8.12	0.4347
P	01H	1075.0	58.5	5.94028	0.00921	0.08612	0.00033	0.00459	0.00008	0.01736	0.00012	0.01824	0.00014	0.4	3.1E-03	9.4	9.31	0.6919
P	01I	1250.0	125.7	12.77390	0.01476	0.22687	0.00067	0.01031	0.00009	0.07395	0.00190	0.03868	0.00019	0.2	6.3E-03	10.8	8.74	0.3683
P	01J	1700.0	4.2	0.42199	0.00111	0.00735	0.00010	0.00048	0.00003	0.03333	0.00014	0.00128	0.00005	1.7199E-02	2.5E-04	14.3	11.96	2.8189

Weighted Mean Age		9.25011 ±0.13982	
Integrated		10.99417 ±0.31304	
Plateau	**Steps** F-J	8.79145 ±0.23125	
Isochron		8.73552 ±0.01019	

Sample: MB07-139 **Lab #**: 58615 **J**: 2.16E-03 ±1.31E-06 **Disc.**: 1.001 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	950.0	2.7	4.20483	0.00641	0.02103	0.00018	0.00479	0.00007	0.02171	0.00011	0.01401	0.00016	0.1	1.0E-03	1.7	13.77	9.1279
01B	1050.0	7.0411E-02	0.10799	0.00076	0.00945	0.00012	0.00049	0.00004	0.01088	0.00012	0.00039	0.00005	9.4608E-02	1.6E-03	-3.0	-1.35	5.9660
01C	1120.0	0.2	0.36762	0.00110	0.06611	0.00029	0.00490	0.00007	0.06215	0.00017	0.00079	0.00006	0.1	6.0E-04	42.8	9.44	0.9975
01D	1130.0	0.2	0.34086	0.00120	0.08086	0.00029	0.00613	0.00007	0.08622	0.00025	0.00055	0.00004	0.1	4.8E-04	61.8	10.32	0.6183
01E	1145.0	0.1	0.15449	0.00077	0.03115	0.00020	0.00229	0.00005	0.03492	0.00015	0.00037	0.00005	9.7043E-02	7.5E-04	38.4	7.55	1.8081
01F	1150.0	5.4519E-02	0.08362	0.00051	0.01814	0.00015	0.00128	0.00003	0.02023	0.00011	0.00031	0.00004	9.7539E-02	9.8E-04	0.8	0.15	2.5263
01G	1160.0	9.4366E-02	0.14473	0.00077	0.03446	0.00020	0.00229	0.00005	0.03871	0.00011	0.00020	0.00004	9.6804E-02	6.3E-04	69.7	11.60	1.4322
01H	1200.0	1.2	1.88639	0.00257	0.59284	0.00148	0.04102	0.00026	0.26874	0.00131	0.00200	0.00009	0.2	1.3E-03	73.9	9.30	0.1800
01I	1700.0	2.7	4.18338	0.00570	0.12740	0.00041	0.01145	0.00010	0.08879	0.00158	0.01366	0.00018	0.2	2.8E-03	4.3	5.62	1.6677

Weighted Mean Age 9.30951 ±0.16718

Integrated 8.76491 ±0.33801

Plateau **Steps**

Isochron 9.36240 ±0.00573

Sample: MB06-610 **Lab #**: 56962 **J**: 7.58E-04 ±7.42E-07 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	800.0	0.0	0.01310	0.00022	0.00013	0.00006	0.00002	0.00001	0.00026	0.00001	-8.7810E-0	0.00002	6.8103E-02	0.03	120.4	165.91	102.7679
	01B	550.0	0.0	14.04269	0.01549	0.03408	0.00014	0.00914	0.00005	0.00514	0.00005	0.04645	0.00015	0.9	9.5E-03	2.3	12.87	1.9186
P	01C	625.0	0.0	0.75204	0.00118	0.03173	0.00013	0.00076	0.00002	0.00814	0.00005	0.00184	0.00004	0.6	4.0E-03	28.1	9.22	0.4621
P	01D	700.0	0.0	0.66827	0.00104	0.06174	0.00016	0.00096	0.00002	0.01854	0.00009	0.00099	0.00003	0.5	2.6E-03	57.1	8.56	0.1876
P	01E	750.0	0.0	0.44093	0.00071	0.05342	0.00014	0.00075	0.00002	0.01540	0.00005	0.00037	0.00002	0.5	2.1E-03	76.2	8.71	0.1426
P	01F	800.0	0.0	0.50443	0.00088	0.06292	0.00015	0.00090	0.00002	0.01429	0.00006	0.00040	0.00002	0.6	3.1E-03	77.3	8.57	0.1388
P	01G	875.0	0.0	0.67599	0.00105	0.07955	0.00021	0.00113	0.00002	0.01940	0.00010	0.00058	0.00002	0.6	3.4E-03	75.5	8.87	0.1090
P	01H	975.0	0.0	0.50179	0.00087	0.05453	0.00015	0.00078	0.00002	0.01344	0.00007	0.00050	0.00002	0.6	3.5E-03	71.2	9.06	0.1607
	01I	1075.0	0.0	0.57743	0.00085	0.05264	0.00013	0.00091	0.00002	0.02677	0.00007	0.00095	0.00002	0.3	1.0E-03	52.5	7.98	0.1734
	01J	1250.0	0.0	2.26116	0.00287	0.12379	0.00026	0.00262	0.00003	0.32039	0.00170	0.00552	0.00005	5.4320E-02	3.1E-04	32.1	8.17	0.1740

Sample: MB06-610 **Lab #**: 56962 **J**: 7.58E-04 ±7.42E-07 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01K	1700.0	0.0	0.31407	0.00060	0.00933	0.00006	0.00030	0.00001	0.02995	0.00008	0.00089	0.00002	4.3703E-02	3.2E-04	19.3	9.06	0.9882

Weighted Mean Age			8.64034 ±0.05614
Integrated			8.87186 ±0.13353
Plateau	**Steps**	C-H	8.72994 ±0.06821
Isochron			8.60351 ±0.00848

Sample: MB06-670 **Lab #**: 56967 **J**: 7.56E-04 ±1.41E-06 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
03A	950.0	0.0	0.23076	0.00058	0.00162	0.00003	0.00022	7.8717E-06	0.00101	0.00002	0.00083	0.00002	0.2	6.5E-03	-6.6	-13.17	5.3585
03B	1050.0	0.0	0.02199	0.00018	0.00074	0.00002	0.00002	5.1040E-06	0.00110	0.00002	0.00006	0.00002	0.1	3.8E-03	16.7	6.83	8.9408
03C	1120.0	0.0	0.29792	0.00058	0.02043	0.00008	0.00042	0.00001	0.02649	0.00010	0.00064	0.00002	0.1	6.8E-04	39.0	7.87	0.4047
03D	1130.0	0.0	0.07540	0.00029	0.00973	0.00006	0.00019	9.4706E-06	0.01298	0.00005	0.00012	0.00002	0.1	8.4E-04	58.8	6.31	0.7352
03E	1145.0	0.0	0.55003	0.00103	0.05465	0.00016	0.00078	0.00002	0.07567	0.00188	0.00073	0.00002	0.1	2.8E-03	64.6	9.00	0.1870
03F	1150.0	0.0	2.63289	0.00355	0.38973	0.00063	0.00498	0.00004	0.53696	0.00130	0.00081	0.00002	0.1	3.3E-04	96.5	9.03	0.0493
03G	1155.0	0.0	0.20448	0.00043	0.03031	0.00010	0.00046	0.00001	0.04096	0.00011	0.00014	0.00002	0.1	5.0E-04	85.5	7.99	0.2636
03H	1160.0	0.0	0.03559	0.00022	0.00504	0.00004	0.00008	8.8151E-06	0.00700	0.00006	0.00002	0.00002	0.1	1.4E-03	88.0	8.61	1.4293
03I	1200.0	0.0	0.21330	0.00058	0.03105	0.00012	0.00050	0.00001	0.04293	0.00013	0.00018	0.00002	0.1	5.3E-04	80.8	7.69	0.2320
03J	1700.0	0.0	0.15498	0.00041	0.01083	0.00007	0.00027	9.0770E-06	0.03199	0.00009	0.00039	0.00002	5.1742E-02	3.7E-04	31.4	6.24	0.7669

Weighted Mean Age		8.90905 ±0.04840
Integrated		8.67909 ±0.05333
Plateau	**Steps**	
Isochron		9.02731 ±0.01697

Sample: MB06-673a **Lab #**: 56972 **J**: 7.47E-04 ±1.91E-06 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	950.0	0.0	1.79268	0.00220	0.06970	0.00015	0.00214	0.00003	0.00953	0.00005	0.00459	0.00005	1.1	6.3E-03	24.5	8.62	0.3040
	01B	1050.0	0.0	0.65026	0.00113	0.02329	0.00009	0.00066	0.00002	0.01868	0.00007	0.00157	0.00003	0.2	1.0E-03	29.4	11.20	0.5647
P	01C	1100.0	0.0	1.28653	0.00186	0.10011	0.00020	0.00167	0.00002	0.12824	0.00170	0.00228	0.00003	0.1	1.6E-03	50.4	8.86	0.1438
P	01D	1110.0	0.0	0.07681	0.00032	0.00784	0.00006	0.00018	0.00003	0.01034	0.00007	0.00013	0.00001	0.1	1.2E-03	52.8	7.08	0.7693
P	01E	1120.0	0.0	0.59053	0.00085	0.07986	0.00020	0.00106	0.00003	0.11107	0.00163	0.00039	0.00002	0.1	1.7E-03	85.7	8.67	0.1026
P	01F	1130.0	0.0	0.64882	0.00113	0.07547	0.00016	0.00112	0.00003	0.10944	0.00124	0.00072	0.00002	0.1	1.2E-03	71.9	8.46	0.1370
P	01G	1140.0	0.0	0.01128	0.00025	0.00109	0.00007	0.00005	0.00003	0.00210	0.00006	4.7946E-06	0.00002	8.0511E-02	6.0E-03	92.5	13.07	7.0476
	01H	1150.0	0.0	0.03798	0.00025	0.00469	0.00008	0.00012	0.00003	0.00810	0.00008	-0.00002	0.00002	8.9483E-02	1.7E-03	118.9	13.19	1.3707
	01I	1200.0	0.0	0.38648	0.00078	0.03702	0.00012	0.00058	0.00003	0.08700	0.00138	0.00061	0.00002	6.5667E-02	1.1E-03	59.9	8.57	0.2639
	01J	1700.0	0.0	0.08968	0.00031	0.00038	0.00005	0.00008	0.00003	0.04287	0.00013	0.00037	0.00002	1.0188E-03	1.7E-04	-7.5	-32.93	28.5565

Weighted Mean Age			8.68482 ±0.06994
Integrated			8.81060 ±0.09295
Plateau	**Steps**	C-G	8.64459 ±0.07434
Isochron			8.56572 ±0.02186

Sample: MB07-136 **Lab #**: 57735 **J**: 7.52E-04 ±1.63E-06 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	950.0	0.6	0.50467	0.00116	0.00277	0.00006	0.00036	0.00002	0.00144	0.00004	0.00164	0.00005	0.4	0.01	4.3	10.80	7.2784
	01B	1050.0	1.4507E-02	0.01307	0.00022	0.00127	0.00003	0.00002	0.00002	0.00049	0.00003	0.00004	0.00003	0.5	0.04	2.7400E-02	3.8673E-03	8.2017
	01C	1120.0	0.3	0.27022	0.00090	0.02738	0.00017	0.00045	0.00002	0.04455	0.00018	0.00028	0.00003	0.1	8.9E-04	73.0	9.92	0.4979
P	01D	1130.0	0.3	0.29824	0.00095	0.03816	0.00018	0.00054	0.00003	0.02307	0.00139	0.00022	0.00003	0.3	0.02	79.6	8.55	0.3297
P	01E	1145.0	0.7	0.61902	0.00114	0.07963	0.00028	0.00106	0.00003	0.05595	0.00104	0.00047	0.00004	0.3	5.2E-03	79.4	8.48	0.1980
P	01F	1150.0	0.3	0.26491	0.00086	0.03669	0.00020	0.00051	0.00002	0.02753	0.00102	0.00017	0.00003	0.3	9.7E-03	83.4	8.27	0.2918
P	01G	1160.0	0.3	0.28565	0.00086	0.03894	0.00017	0.00058	0.00002	0.06362	0.00025	0.00019	0.00003	0.1	7.0E-04	85.4	8.62	0.3111
P	01H	1200.0	0.6	0.55697	0.00097	0.07023	0.00029	0.00101	0.00002	0.05104	0.00170	0.00039	0.00003	0.3	8.9E-03	81.3	8.85	0.1731
P	01I	1700.0	1.6	1.39647	0.00235	0.00243	0.00005	0.00099	0.00003	0.00575	0.00006	0.00485	0.00009	8.0951E-02	2.0E-03	-2.6	-21.01	15.9869

Sample: MB07-136 **Lab #**: 57735 **J**: 7.52E-04 ±1.63E-06 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
Weighted Mean Age													8.66891 ±0.10472				
Integrated													8.44984 ±0.18451				
Plateau											**Steps**	D-I	8.61540 ±0.10697				
Isochron													8.70777 ±0.01890				

Sample: MB07-028 **Lab #**: 58611 **J**: 2.17E-03 ±1.31E-06 **Disc.**: 1.001 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	02A	950.0	0.3	0.51445	0.00133	0.03073	0.00016	0.00927	0.00006	0.00862	0.00011	0.00147	0.00005	0.4	5.3E-03	16.1	10.70	2.0036
	02B	1050.0	2.9017E-02	0.04451	0.00049	0.00765	0.00010	0.00086	0.00003	0.00177	0.00006	0.00013	0.00004	0.5	0.02	11.8	2.73	6.1698
	02C	1120.0	0.1	0.20656	0.00077	0.04632	0.00024	0.00357	0.00007	0.04859	0.00020	0.00031	0.00005	0.1	7.0E-04	65.1	11.55	1.2099
	02D	1130.0	0.1	0.15457	0.00085	0.05038	0.00024	0.00364	0.00005	0.05842	0.00014	0.00013	0.00004	9.4681E-02	5.1E-04	89.5	10.93	0.9701
P	02E	1145.0	0.1	0.22982	0.00140	0.06741	0.00035	0.00445	0.00007	0.07754	0.00027	0.00039	0.00008	9.5429E-02	6.0E-04	62.8	8.53	1.4303
P	02F	1150.0	0.2	0.36921	0.00102	0.11998	0.00045	0.00745	0.00007	0.05473	0.00130	0.00042	0.00005	0.2	5.8E-03	71.4	8.73	0.4460
P	02G	1160.0	0.2	0.32621	0.00109	0.10609	0.00032	0.00637	0.00005	0.04470	0.00142	0.00039	0.00004	0.3	8.3E-03	69.3	8.47	0.4666
P	02H	1200.0	0.8	1.17748	0.00204	0.42047	0.00112	0.02549	0.00013	0.19772	0.00126	0.00115	0.00006	0.2	1.6E-03	77.3	8.61	0.1702
	02I	1700.0	2.1	3.18405	0.00493	0.05628	0.00029	0.00529	0.00006	0.05010	0.00167	0.01073	0.00011	0.1	4.2E-03	1.0	2.34	2.4123
Weighted Mean Age														8.68523 ±0.14622				
Integrated														8.51321 ±0.24458				
Plateau												**Steps**	E-H	8.60225 ±0.31459				
Isochron														8.76354 ±0.00548				

Sample: MB06-748 **Lab #**: 57537 **J**: 7.79E-04 ±9.54E-07 **Disc.**: 1.002 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	950.0	12.2	1.24000	0.00240	0.06133	0.00027	0.00149	0.00003	0.00612	0.00007	0.00301	0.00006	0.8	0.01	28.5	8.19	0.4237
P	01B	1050.0	3.4	0.34170	0.00092	0.02330	0.00017	0.00042	0.00003	0.00479	0.00007	0.00071	0.00004	0.4	6.8E-03	39.5	8.24	0.6768
P	01C	1100.0	8.1	0.82347	0.00149	0.04085	0.00021	0.00100	0.00004	0.02264	0.00015	0.00209	0.00005	0.1	1.3E-03	26.5	7.60	0.4971
P	01D	1110.0	2.9	0.29675	0.00072	0.03428	0.00017	0.00050	0.00003	0.02409	0.00010	0.00031	0.00004	0.1	7.6E-04	72.8	8.98	0.4358
P	01E	1120.0	2.7	0.26944	0.00075	0.03298	0.00019	0.00045	0.00003	0.02478	0.00015	0.00026	0.00003	0.1	9.3E-04	76.0	8.85	0.4107
P	01F	1130.0	4.0	0.40317	0.00092	0.03838	0.00021	0.00059	0.00003	0.02894	0.00018	0.00063	0.00004	0.1	9.2E-04	57.4	8.60	0.3933
P	01G	1140.0	2.4	0.24843	0.00061	0.03159	0.00018	0.00041	0.00002	0.02458	0.00016	0.00024	0.00003	0.1	9.2E-04	76.1	8.53	0.4262
P	01H	1150.0	1.7	0.17396	0.00063	0.02371	0.00018	0.00032	0.00003	0.01883	0.00013	0.00013	0.00002	0.1	1.1E-03	83.9	8.77	0.4354
P	01I	1200.0	5.7	0.57671	0.00125	0.07745	0.00029	0.00108	0.00003	0.06140	0.00020	0.00046	0.00004	0.1	5.1E-04	81.8	8.68	0.2062
P	01J	1700.0	19.5	1.97998	0.00412	0.24267	0.00088	0.00355	0.00006	0.10116	0.00150	0.00217	0.00005	0.2	3.0E-03	70.2	8.15	0.1028

Weighted Mean Age			8.32297 ±0.08012
Integrated			8.34561 ±0.09336
Plateau	**Steps**	A-J	8.58188 ±0.12569
Isochron			8.42373 ±0.01046

Sample: MB06-750a **Lab #**: 56969 **J**: 7.56E-04 ±1.56E-06 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	950.0	0.0	1.01501	0.00162	0.02158	0.00009	0.00078	0.00002	0.00331	0.00003	0.00296	0.00003	1.0	0.01	14.0	9.11	0.6414
P	01B	1050.0	0.0	0.16242	0.00041	0.00851	0.00005	0.00018	0.00001	0.01001	0.00006	0.00041	0.00007	0.1	1.2E-03	27.1	7.17	3.1714
P	01C	1100.0	0.0	0.70013	0.00117	0.07222	0.00017	0.00107	0.00003	0.10373	0.00187	0.00097	0.00007	0.1	2.0E-03	62.9	8.44	0.3834
P	01D	1110.0	0.0	0.03210	0.00029	0.00266	0.00004	-1.5185E-0	0.00001	0.00356	0.00004	0.00006	0.00001	0.1	2.3E-03	47.6	7.95	2.1867
P	01E	1120.0	0.0	0.16486	0.00053	0.02156	0.00008	0.00026	0.00002	0.03099	0.00010	0.00016	0.00002	0.1	5.2E-04	76.4	8.08	0.3177
P	01F	1130.0	0.0	0.29030	0.00071	0.03911	0.00016	0.00046	0.00001	0.05719	0.00017	0.00021	0.00002	0.1	5.5E-04	83.5	8.58	0.1843
P	01G	1140.0	0.0	0.20470	0.00064	0.02720	0.00010	0.00034	0.00002	0.03989	0.00012	0.00016	0.00002	0.1	5.2E-04	81.9	8.53	0.2635
P	01H	1150.0	0.0	0.39261	0.00077	0.05463	0.00016	0.00066	0.00002	0.08084	0.00117	0.00027	0.00002	0.1	1.6E-03	85.3	8.49	0.1386
P	01I	1200.0	0.0	2.15624	0.00278	0.29088	0.00056	0.00390	0.00003	0.48791	0.00105	0.00162	0.00004	9.2988E-02	2.7E-04	83.9	8.61	0.0717

Sample: MB06-750a **Lab #**: 56969 **J**: 7.56E-04 ±1.56E-06 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01J	1700.0	0.0	0.13237	0.00035	0.00147	0.00004	0.00008	0.00001	0.04956	0.00010	0.00045	0.00002	4.2881E-03	1.3E-04	9.9	13.24	6.5789

Weighted Mean Age			8.56777 ±0.05951
Integrated			8.55502 ±0.09098
Plateau	**Steps**	A-J	8.56742 ±0.05952
Isochron			8.55913 ±0.01774

Sample: MB06-840 **Lab #**: 57544 **J**: 7.87E-04 ±9.12E-07 **Disc.**: 1.002 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	950.0	9.2	0.93680	0.00193	0.01514	0.00011	0.00082	0.00004	0.01369	0.00008	0.00305	0.00006	8.8913E-02	8.3E-04	4.7	4.21	1.8068
P	01B	1140.0	10.7	1.09246	0.00180	0.05845	0.00024	0.00132	0.00004	0.03924	0.00019	0.00262	0.00007	0.1	7.7E-04	31.1	8.37	0.4979
P	01C	1170.0	5.6	0.56469	0.00118	0.06249	0.00030	0.00088	0.00004	0.04541	0.00018	0.00072	0.00004	0.1	6.9E-04	66.3	8.64	0.2594
P	01D	1200.0	8.7	0.88850	0.00153	0.12502	0.00034	0.00178	0.00003	0.09172	0.00032	0.00071	0.00004	0.1	4.9E-04	81.9	8.39	0.1525
P	01E	1225.0	9.4	0.95125	0.00182	0.13837	0.00039	0.00195	0.00004	0.10182	0.00024	0.00069	0.00004	0.1	4.0E-04	84.2	8.34	0.1390
P	01F	1250.0	8.8	0.89033	0.00141	0.12787	0.00037	0.00171	0.00004	0.09561	0.00025	0.00063	0.00004	0.1	4.2E-04	84.6	8.49	0.1340
P	01G	1275.0	1.5	0.14954	0.00068	0.01807	0.00012	0.00025	0.00003	0.01408	0.00011	0.00020	0.00003	0.1	1.1E-03	64.5	7.70	0.7146
P	01H	1700.0	1.9	0.18946	0.00071	0.01002	0.00012	0.00024	0.00002	0.02276	0.00012	0.00050	0.00004	3.5116E-02	4.6E-04	28.0	7.67	1.5348

Weighted Mean Age			8.41104 ±0.07687
Integrated			8.27706 ±0.10309
Plateau	**Steps**	B-H	8.42040 ±0.07703
Isochron			8.48702 ±0.00984

Sample: MB07-001 **Lab #**: 57718 **J**: 7.66E-04 ±1.52E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	8.4	7.54654	0.00961	0.01427	0.00016	0.00509	0.00007	0.00380	0.00005	0.02471	0.00020	0.8	0.01	3.3	24.00	5.7132
01B	625.0	1.3	1.14012	0.00187	0.04035	0.00019	0.00104	0.00003	0.00768	0.00008	0.00296	0.00008	1.1	0.01	23.5	9.29	0.7801
01C	700.0	0.8	0.72562	0.00138	0.06686	0.00025	0.00108	0.00005	0.01037	0.00008	0.00109	0.00005	1.4	0.01	56.1	8.51	0.3373
01D	750.0	0.5	0.41780	0.00098	0.04462	0.00021	0.00065	0.00003	0.00745	0.00007	0.00059	0.00004	1.3	0.01	58.9	7.72	0.3407
01E	800.0	0.6	0.52510	0.00114	0.04565	0.00020	0.00073	0.00004	0.01110	0.00008	0.00102	0.00004	0.9	7.7E-03	43.2	6.95	0.3246
01F	875.0	0.7	0.66884	0.00141	0.05918	0.00026	0.00092	0.00004	0.01546	0.00009	0.00114	0.00005	0.8	6.0E-03	49.9	7.89	0.3286
01G	975.0	1.4	1.22172	0.00182	0.09271	0.00032	0.00160	0.00003	0.02390	0.00012	0.00222	0.00006	0.8	5.2E-03	46.8	8.62	0.2525
01H	1075.0	1.1	1.03036	0.00178	0.09788	0.00032	0.00156	0.00004	0.03392	0.00019	0.00154	0.00005	0.6	4.0E-03	56.5	8.32	0.2168
01I	1250.0	3.9	3.53498	0.00473	0.21063	0.00042	0.00426	0.00005	0.15338	0.00167	0.00831	0.00009	0.3	3.3E-03	31.4	7.38	0.1840
01J	1700.0	2.4	2.14053	0.00390	0.00654	0.00009	0.00141	0.00004	0.01815	0.00012	0.00721	0.00012	7.7724E-02	1.1E-03	0.7	3.02	7.7625

Weighted Mean Age 7.92081 ±0.09916

Integrated 8.25679 ±0.17642

Plateau **Steps**

Isochron 7.78721 ±0.01545

Sample: MB06-608 **Lab #**: 56963 **J**: 7.55E-04 ±7.42E-07 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	0.0	8.92027	0.01016	0.01376	0.00009	0.00593	0.00005	0.00116	0.00002	0.03002	0.00011	1.7	0.04	0.6	5.05	3.4096
01B	625.0	0.0	0.90374	0.00130	0.10441	0.00025	0.00155	0.00002	0.00900	0.00005	0.00127	0.00003	1.6	0.01	58.9	7.03	0.1162
01C	700.0	0.0	0.59203	0.00093	0.07095	0.00016	0.00104	0.00002	0.01714	0.00008	0.00042	0.00002	0.6	2.9E-03	79.9	9.19	0.1413
01D	750.0	0.0	0.37419	0.00067	0.04825	0.00016	0.00065	0.00002	0.01606	0.00006	0.00021	0.00002	0.4	2.2E-03	84.9	9.08	0.1492
01E	800.0	0.0	0.32643	0.00071	0.04230	0.00013	0.00054	0.00001	0.01396	0.00005	0.00019	0.00002	0.4	2.1E-03	84.0	8.93	0.1712
01F	875.0	0.0	0.41809	0.00068	0.05221	0.00014	0.00068	0.00002	0.01904	0.00007	0.00032	0.00002	0.4	1.8E-03	78.7	8.69	0.1614
01G	975.0	0.0	0.29221	0.00061	0.03379	0.00012	0.00047	0.00001	0.01436	0.00006	0.00032	0.00002	0.3	1.7E-03	69.2	8.26	0.2289
01H	1075.0	0.0	0.28897	0.00050	0.03122	0.00010	0.00042	0.00001	0.02496	0.00009	0.00038	0.00002	0.2	8.6E-04	64.1	8.19	0.2642
01I	1250.0	0.0	0.72479	0.00091	0.05135	0.00013	0.00103	0.00002	0.27667	0.00147	0.00171	0.00003	2.5820E-02	1.5E-04	41.7	8.22	0.2741

Sample: MB06-608 **Lab #**: 56963 **J**: 7.55E-04 ±7.42E-07 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Power (W)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01J	1700.0	0.0	0.22122	0.00052	0.01072	0.00007	0.00023	0.00001	0.05576	0.00017	0.00055	0.00003	2.6743E-02	1.8E-04	33.8	9.74	0.9788

Weighted Mean Age 8.36925 ±0.05935

Integrated 8.24987 ±0.12017

Plateau **Steps**

Isochron 8.39688 ±0.00836

Sample: MB07-025 **Lab #**: 57728 **J**: 7.55E-04 ±6.83E-07 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	3.6	3.22751	0.00475	0.01234	0.00012	0.00222	0.00006	0.00266	0.00004	0.01089	0.00012	1.0	0.02	0.3	1.06	4.0382
01B	625.0	0.4	0.36515	0.00096	0.03413	0.00020	0.00060	0.00003	0.01222	0.00008	0.00064	0.00004	0.6	5.1E-03	48.9	7.21	0.4299
01C	700.0	0.6	0.51023	0.00110	0.06626	0.00025	0.00095	0.00003	0.02607	0.00010	0.00033	0.00003	0.5	2.8E-03	81.7	8.68	0.1931
01D	750.0	0.4	0.35423	0.00092	0.04662	0.00022	0.00060	0.00003	0.02142	0.00011	0.00024	0.00003	0.5	3.3E-03	81.0	8.49	0.2605
01E	800.0	0.4	0.39881	0.00097	0.05158	0.00022	0.00069	0.00003	0.02404	0.00013	0.00014	0.00004	0.5	3.1E-03	91.0	9.70	0.3035
01F	875.0	0.5	0.43380	0.00102	0.05580	0.00022	0.00069	0.00003	0.02676	0.00017	0.00020	0.00003	0.4	3.3E-03	87.7	9.40	0.1966
01G	975.0	0.4	0.32006	0.00076	0.04147	0.00021	0.00052	0.00002	0.02375	0.00011	0.00020	0.00003	0.4	2.5E-03	83.3	8.87	0.3188
01H	1075.0	0.3	0.30972	0.00083	0.03359	0.00016	0.00052	0.00003	0.02897	0.00011	0.00046	0.00003	0.2	1.5E-03	58.4	7.44	0.4051
01I	1250.0	1.2	1.04256	0.00173	0.06924	0.00020	0.00143	0.00004	0.14183	0.00176	0.00243	0.00006	0.1	1.3E-03	33.8	7.05	0.3494
01J	1700.0	1.5	1.31792	0.00208	0.00289	0.00007	0.00092	0.00003	0.01430	0.00011	0.00434	0.00007	4.2290E-02	1.0E-03	2.8	17.76	10.3640

Weighted Mean Age 8.67450 ±0.09660

Integrated 8.24269 ±0.17478

Plateau **Steps**

Isochron 8.75732 ±0.00801

Sample: MB07-080 **Lab #**: 58776 **J**: 9.67E-04 ±3.24E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	-2.1281E-0	-0.02250	0.00018	-0.00012	0.00004	-0.00002	0.00001	-0.07741	0.04075	-0.00006	0.00002	-2.5571E-0	5.6E-05	265.2	-349.57	114.4812
01B	625.0	3.4	3.58253	0.00556	0.06626	0.00025	0.00298	0.00004	0.00582	0.00007	0.01124	0.00012	0.7	8.7E-03	7.4	7.06	0.9908
01C	700.0	1.6	1.68368	0.00292	0.09714	0.00034	0.00214	0.00003	0.01061	0.00011	0.00457	0.00008	0.5	6.1E-03	20.2	6.19	0.4114
01D	750.0	1.0	1.07822	0.00167	0.09370	0.00034	0.00170	0.00003	0.01057	0.00010	0.00255	0.00007	0.5	5.2E-03	30.8	6.27	0.3653
01E	800.0	1.3	1.39543	0.00232	0.09864	0.00037	0.00184	0.00005	0.01249	0.00010	0.00338	0.00007	0.5	4.1E-03	29.1	7.26	0.3957
01F	875.0	2.0	2.06438	0.00333	0.13537	0.00039	0.00259	0.00004	0.01898	0.00011	0.00513	0.00010	0.4	2.8E-03	27.2	7.32	0.3812
01G	975.0	1.1	1.14313	0.00185	0.11280	0.00034	0.00178	0.00004	0.06912	0.02716	0.00232	0.00006	9.6913E-02	0.04	44.2	7.94	0.4172
01H	1075.0	0.7	0.76791	0.00151	0.07896	0.00029	0.00123	0.00004	0.10191	0.02914	0.00159	0.00005	4.5818E-02	0.01	48.1	8.32	0.6069
01I	1250.0	4.4	4.60296	0.00712	0.24953	0.00082	0.00581	0.00005	0.89515	0.02635	0.01311	0.00015	1.6258E-02	4.9E-04	29.7	9.86	0.4788
01J	1700.0	1.2	1.21729	0.00190	0.06569	0.00022	0.00156	0.00003	0.38724	0.02188	0.00339	0.00008	9.7549E-03	5.7E-04	40.2	13.61	0.9691

Weighted Mean Age 7.53297 ±0.15713

Integrated 8.15830 ±0.17268

Plateau **Steps**

Isochron 7.35963 ±0.02464

Sample: MB07-052 **Lab #**: 58617 **J**: 2.18E-03 ±2.58E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	3.2	4.96236	0.00691	0.04223	0.00025	0.05746	0.00025	0.01187	0.00010	0.01656	0.00018	0.4	4.5E-03	1.5	6.88	5.0436
P	01B	625.0	1.4	2.13359	0.00399	0.10807	0.00042	0.02893	0.00013	0.01080	0.00010	0.00625	0.00010	1.2	0.01	13.6	10.68	1.1151
P	01C	700.0	1.3	2.06685	0.00389	0.16235	0.00037	0.01284	0.00011	0.01452	0.00011	0.00605	0.00011	1.4	0.01	13.7	6.94	0.8035
P	01D	750.0	0.9	1.46344	0.00244	0.09992	0.00029	0.00781	0.00006	0.01273	0.00011	0.00414	0.00010	1.0	8.9E-03	16.7	9.70	1.1284
P	01E	800.0	0.9	1.43011	0.00267	0.10096	0.00035	0.00921	0.00008	0.01738	0.00010	0.00405	0.00008	0.7	5.0E-03	16.6	9.34	0.9389
P	01F	875.0	1.5	2.24135	0.00448	0.15751	0.00043	0.01473	0.00011	0.02612	0.00012	0.00638	0.00011	0.8	4.0E-03	16.2	9.17	0.8310
P	01G	975.0	1.8	2.75616	0.00458	0.19152	0.00054	0.01564	0.00010	0.03337	0.00016	0.00804	0.00012	0.7	4.0E-03	14.1	8.08	0.7338
P	01H	1075.0	4.8	7.33223	0.01050	0.38083	0.00083	0.03396	0.00016	0.07008	0.00021	0.02243	0.00020	0.7	2.5E-03	9.9	7.57	0.6157
P	01I	1250.0	11.1	17.05951	0.02217	0.88231	0.00179	0.09275	0.00027	0.28273	0.00143	0.05230	0.00032	0.4	2.1E-03	9.9	7.64	0.4404

Sample: MB07-052 **Lab #**: 58617 **J**: 2.18E-03 ±2.58E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01J	1700.0	2.8	4.35589	0.00595	0.03845	0.00028	0.00576	0.00008	0.15377	0.00147	0.01457	0.00019	3.0802E-02	3.7E-04	2.3	10.65	6.0397

Weighted Mean Age		8.14463	±0.25470
Integrated		8.08927	±0.29029
Plateau	**Steps** A-J	8.14016	±0.25492
Isochron		8.24090	±0.00975

Sample: MB07-008 **Lab #**: 57719 **J**: 7.66E-04 ±1.37E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	10.5	9.46316	0.01135	0.00409	0.00011	0.00609	0.00008	0.00366	0.00006	0.03223	0.00023	0.2	7.3E-03	-0.6	-21.18	23.8215
	01B	625.0	3.0	2.65991	0.00447	0.01339	0.00012	0.00187	0.00005	0.01269	0.00010	0.00889	0.00012	0.2	2.6E-03	1.3	3.72	3.7013
	01C	700.0	1.2	1.04303	0.00157	0.01332	0.00012	0.00075	0.00003	0.01281	0.00012	0.00326	0.00007	0.2	3.0E-03	7.8	8.51	2.2744
	01D	750.0	0.6	0.53744	0.00133	0.00695	0.00008	0.00037	0.00002	0.00650	0.00007	0.00158	0.00005	0.2	3.6E-03	13.3	14.33	2.9454
P	01E	800.0	1.2	1.11112	0.00187	0.00811	0.00009	0.00076	0.00003	0.00692	0.00006	0.00349	0.00008	0.3	3.7E-03	7.2	13.87	4.1767
P	01F	875.0	3.5	3.17126	0.00497	0.01682	0.00014	0.00217	0.00005	0.01221	0.00008	0.01018	0.00014	0.3	3.3E-03	5.2	13.76	3.4200
P	01G	975.0	2.6	2.36470	0.00453	0.02061	0.00012	0.00163	0.00005	0.01639	0.00009	0.00756	0.00012	0.3	2.3E-03	5.6	9.03	2.3954
P	01H	1075.0	1.2	1.05542	0.00178	0.01839	0.00014	0.00083	0.00003	0.02680	0.00012	0.00337	0.00007	0.1	1.3E-03	6.1	4.88	1.5940
P	01I	1250.0	15.6	14.09337	0.01640	0.13441	0.00037	0.01022	0.00011	0.28220	0.00157	0.04522	0.00020	0.1	6.4E-04	5.6	8.20	0.6273
P	01J	1700.0	2.1	1.90920	0.00267	0.00090	0.00006	0.00130	0.00003	0.00637	0.00006	0.00631	0.00009	3.0304E-02	2.2E-03	2.4	69.57	39.3874

Weighted Mean Age		8.21715	±0.52462
Integrated		8.28077	±0.72127
Plateau	**Steps** E-J	8.08795	±0.55470
Isochron		8.05958	±0.01440

Sample: MB07-027 **Lab #**: 57721 **J**: 7.61E-04 ±1.52E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	5.1	4.58595	0.00595	0.03184	0.00019	0.00336	0.00007	0.00040	0.00003	0.01490	0.00017	17.0	1.18	4.0	8.00	2.2642
	01B	625.0	1.9	1.70455	0.00242	0.20690	0.00063	0.00288	0.00005	0.00195	0.00005	0.00165	0.00005	22.8	0.60	71.5	8.19	0.1088
	01C	700.0	2.5	2.26017	0.00398	0.33820	0.00075	0.00430	0.00005	0.00303	0.00005	0.00089	0.00005	24.0	0.39	88.4	8.21	0.0629
P	01D	750.0	1.4	1.25167	0.00198	0.18760	0.00043	0.00246	0.00004	0.00184	0.00004	0.00055	0.00003	22.0	0.49	87.0	8.07	0.0769
P	01E	800.0	1.7	1.51264	0.00222	0.22262	0.00059	0.00310	0.00005	0.00218	0.00004	0.00070	0.00004	21.9	0.44	86.3	8.15	0.0834
P	01F	875.0	2.3	2.04146	0.00324	0.29705	0.00081	0.00390	0.00006	0.00320	0.00003	0.00116	0.00004	19.9	0.22	83.3	7.96	0.0651
P	01G	975.0	2.6	2.30669	0.00412	0.32367	0.00080	0.00432	0.00006	0.00599	0.00006	0.00133	0.00005	11.6	0.13	83.0	8.22	0.0734
P	01H	1075.0	2.2	2.02406	0.00286	0.26844	0.00088	0.00370	0.00006	0.04485	0.00018	0.00157	0.00005	1.3	6.6E-03	77.5	8.12	0.0812
	01I	1250.0	2.2	2.01479	0.00266	0.24603	0.00072	0.00351	0.00004	0.05547	0.00019	0.00188	0.00004	1.0	4.3E-03	72.9	8.30	0.0788
	01J	1700.0	2.6	2.34071	0.00391	0.08509	0.00030	0.00237	0.00003	0.00562	0.00007	0.00599	0.00010	3.3	0.04	24.4	9.34	0.4753

Weighted Mean Age 8.14765 ±0.03137

Integrated 8.19670 ±0.05046

Plateau **Steps** D-H 8.08548 ±0.04027

Isochron 8.11497 ±0.01618

Sample: MB07-104 **Lab #**: 58625 **J**: 2.22E-03 ±6.27E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	625.0	1.7	2.59128	0.00416	0.15963	0.00048	0.07470	0.00021	0.01875	0.00014	0.00743	0.00009	1.0	8.1E-03	15.5	10.20	0.7134
P	01B	700.0	1.7	2.56406	0.00398	0.32332	0.00096	0.02173	0.00013	0.03738	0.00018	0.00667	0.00011	1.0	5.8E-03	23.5	7.56	0.4170
P	01C	750.0	1.1	1.77303	0.00285	0.20885	0.00059	0.00742	0.00008	0.02935	0.00015	0.00456	0.00010	0.8	4.9E-03	24.5	8.43	0.5848
P	01D	800.0	1.7	2.62961	0.00489	0.18583	0.00045	0.00853	0.00010	0.03747	0.00015	0.00798	0.00014	0.6	2.8E-03	10.8	6.20	0.9339
P	01E	875.0	3.3	5.14134	0.00770	0.26325	0.00087	0.01363	0.00009	0.05808	0.00029	0.01539	0.00017	0.5	3.3E-03	11.9	9.42	0.7858
P	01F	975.0	3.0	4.66391	0.00612	0.27383	0.00097	0.01231	0.00009	0.07106	0.00026	0.01431	0.00016	0.5	2.3E-03	9.8	6.77	0.7034
	01G	1075.0	2.5	3.80146	0.00529	0.25567	0.00095	0.01153	0.00009	0.07403	0.00032	0.01173	0.00014	0.4	2.3E-03	9.5	5.72	0.6597
	01H	1250.0	14.4	22.20058	0.02547	0.61698	0.00142	0.05649	0.00023	0.33329	0.00149	0.07148	0.00036	0.2	1.1E-03	5.4	7.83	0.7283
	01I	1700.0	3.0	4.62187	0.00767	0.03970	0.00022	0.00509	0.00006	0.04115	0.00143	0.01573	0.00016	0.1	4.0E-03	-0.2	-1.17	4.8347

Sample: MB07-104 **Lab #**: 58625 **J**: 2.22E-03 ±6.27E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
Weighted Mean Age													7.73697	±0.22663			
Integrated													7.54914	±0.28000			
Plateau											**Steps**	B-F	7.90844	±0.29648			
Isochron													7.92296	±0.02240			

Sample: MB07-083 **Lab #**: 58777 **J**: 9.83E-04 ±3.59E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	-2.0270E-0	-0.02143	0.00018	-0.00007	0.00003	-0.00004	0.00001	-9.3435E-0	0.00002	-0.00007	0.00002	4.3	99.83	1.3	7.69	145.5903
01B	625.0	1.2	1.27491	0.00191	0.06413	0.00025	0.00162	0.00004	-0.04048	0.01088	0.00392	0.00007	-9.4602E-0	0.03	6.9	2.46	0.6100
01C	700.0	0.8	0.80920	0.00162	0.07402	0.00030	0.00147	0.00004	0.01071	0.00008	0.00196	0.00006	0.4	3.4E-03	29.4	5.78	0.4397
01D	750.0	0.7	0.74314	0.00150	0.05405	0.00025	0.00118	0.00003	0.00920	0.00008	0.00204	0.00005	0.3	3.4E-03	19.7	4.86	0.5342
01E	800.0	0.9	0.99092	0.00154	0.05502	0.00023	0.00127	0.00003	-0.03737	0.01617	0.00292	0.00006	-8.7876E-0	0.04	10.3	3.32	0.6648
01F	875.0	0.7	0.70544	0.00148	0.06531	0.00025	0.00110	0.00004	0.01056	0.00009	0.00160	0.00006	0.4	3.3E-03	33.9	6.58	0.4641
01G	975.0	0.4	0.38261	0.00087	0.05192	0.00024	0.00072	0.00002	0.00937	0.00011	0.00072	0.00003	0.3	4.1E-03	46.2	6.11	0.3235
01H	1075.0	0.4	0.38979	0.00104	0.03340	0.00014	0.00059	0.00002	0.00795	0.00009	0.00096	0.00004	0.2	3.1E-03	28.3	5.94	0.5691
01I	1250.0	5.0	5.33276	0.00680	0.27663	0.00075	0.00675	0.00007	1.25788	0.01070	0.01517	0.00018	1.2715E-02	1.2E-04	32.7	11.61	0.5517
01J	1700.0	0.4	0.41050	0.00106	0.02292	0.00015	0.00050	0.00002	0.20855	0.02382	0.00125	0.00005	6.1801E-03	7.5E-04	46.3	15.68	2.1568
Weighted Mean Age													6.09903	±0.17191			
Integrated													7.90324	±0.19295			
Plateau											**Steps**						
Isochron													4.35423	±0.01593			

Sample: MB07-057 **Lab #**: 58774 **J**: 9.66E-04 ±3.59E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	-2.0112E-0	-0.02126	0.00015	-0.00008	0.00003	-0.00004	0.00001	-8.9732E-0	0.00002	-0.00010	0.00002	0.5	1.27	-39.2	-199.51	156.3444
01B	625.0	1.5	1.63401	0.00234	0.06057	0.00024	0.00175	0.00004	0.00807	0.00008	0.00495	0.00010	0.5	4.8E-03	10.9	5.17	0.8930
01C	700.0	0.7	0.70652	0.00140	0.07177	0.00025	0.00136	0.00003	0.01293	0.00009	0.00185	0.00005	0.3	2.5E-03	24.0	4.17	0.3689
01D	750.0	0.4	0.47191	0.00112	0.06342	0.00030	0.00109	0.00004	0.01058	0.00009	0.00097	0.00005	0.4	3.6E-03	40.8	5.36	0.3771
01E	800.0	0.4	0.44181	0.00104	0.06880	0.00025	0.00105	0.00003	0.00948	0.00009	0.00096	0.00004	0.4	4.2E-03	37.1	4.21	0.3196
01F	875.0	0.9	0.95649	0.00155	0.11338	0.00031	0.00186	0.00005	0.01623	0.00011	0.00204	0.00006	0.4	3.0E-03	38.2	5.69	0.2755
01G	975.0	0.8	0.87462	0.00159	0.10885	0.00033	0.00173	0.00003	0.07712	0.01922	0.00199	0.00005	8.4256E-02	0.02	39.0	5.55	0.3414
01H	1075.0	0.5	0.53100	0.00106	0.04577	0.00020	0.00084	0.00003	0.11974	0.02271	0.00137	0.00005	2.2560E-02	4.3E-03	39.7	8.25	0.9308
01I	1250.0	3.4	3.58917	0.00527	0.20664	0.00055	0.00509	0.00007	1.77330	0.02434	0.01159	0.00013	6.6347E-03	9.8E-05	39.4	12.68	0.8911
01J	1700.0	0.4	0.40514	0.00094	0.01832	0.00013	0.00053	0.00002	0.28183	0.03145	0.00137	0.00005	3.5466E-03	4.4E-04	49.4	21.08	3.2876

Weighted Mean Age 5.35393 ±0.14325

Integrated 7.68500 ±0.17733

Plateau **Steps**

Isochron 2.43787 ±0.00907

Sample: MB07-154 **Lab #**: 58783 **J**: 9.89E-04 ±3.49E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	-2.2158E-0	-0.02325	0.00022	-0.00017	0.00004	-0.00002	0.00002	0.00002	0.00002	-0.00014	0.00002	-0.4	0.48	-76.9	-205.97	91.4960
P	01B	625.0	4.1	4.32909	0.00642	0.05244	0.00028	0.00332	0.00004	0.00362	0.00005	0.01380	0.00017	0.8	0.01	5.9	8.75	1.6974
P	01C	700.0	1.7	1.73238	0.00251	0.08408	0.00029	0.00191	0.00004	0.00903	0.00010	0.00474	0.00009	0.5	6.3E-03	19.6	7.29	0.5919
P	01D	750.0	1.1	1.12015	0.00193	0.07377	0.00027	0.00148	0.00004	0.00955	0.00008	0.00288	0.00007	0.4	4.1E-03	24.7	6.78	0.5216
P	01E	800.0	1.0	1.04360	0.00190	0.06559	0.00026	0.00128	0.00003	0.00966	0.00009	0.00255	0.00007	0.4	3.8E-03	28.5	8.20	0.5605
P	01F	875.0	2.0	2.11674	0.00351	0.08037	0.00033	0.00210	0.00004	0.04573	0.01416	0.00610	0.00009	9.8283E-02	0.03	16.4	7.83	0.6531
P	01G	975.0	1.7	1.82111	0.00238	0.08680	0.00034	0.00201	0.00004	0.04690	0.01252	0.00501	0.00009	0.1	0.03	20.7	7.88	0.5778
P	01H	1075.0	1.1	1.11402	0.00189	0.06212	0.00023	0.00130	0.00005	0.01186	0.00012	0.00286	0.00007	0.3	3.2E-03	24.9	8.08	0.6050
P	01I	1175.0	0.9	0.96826	0.00185	0.05118	0.00020	0.00121	0.00003	0.01052	0.00008	0.00259	0.00008	0.3	2.2E-03	21.8	7.45	0.8101

Sample: MB07-154 **Lab #**: 58783 **J**: 9.89E-04 ±3.49E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01J	1250.0	0.5	0.49059	0.00107	0.02151	0.00016	0.00052	0.00003	0.00655	0.00006	0.00141	0.00005	0.2	2.2E-03	16.0	6.60	1.2028
	01K	1450.0	12.6	13.26091	0.02216	0.42625	0.00129	0.01342	0.00009	1.29836	0.01228	0.03950	0.00033	1.8053E-02	1.8E-04	19.4	11.08	0.5232
	01L	1700.0	0.3	0.33856	0.00098	0.00684	0.00011	0.00031	0.00002	0.03261	0.00864	0.00108	0.00004	1.1412E-02	3.1E-03	13.1	12.03	3.6298

Weighted Mean Age 8.14811 ±0.20582

Integrated 9.17210 ±0.23668

Plateau **Steps** B-J 7.64447 ±0.22717

Isochron 6.61122 ±0.02333

Sample: MB07-087 **Lab #**: 58779 **J**: 9.89E-04 ±3.15E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	550.0	-3.3712E-0	-0.03564	0.00017	-0.00003	0.00003	-8.2177E-0	0.00001	0.00002	0.00002	-0.00014	0.00002	-8.0798E-0	0.10	-12.3	-242.65	410.3849
01B	625.0	2.4	2.55676	0.00471	0.05972	0.00024	0.00225	0.00004	0.00565	0.00008	0.00839	0.00014	0.6	8.7E-03	3.2	2.44	1.2501
01C	700.0	1.0	1.01679	0.00181	0.08225	0.00026	0.00154	0.00004	0.01073	0.00011	0.00281	0.00006	0.4	4.6E-03	19.2	4.28	0.4161
01D	750.0	0.5	0.54076	0.00113	0.06417	0.00026	0.00103	0.00003	0.00951	0.00009	0.00118	0.00005	0.4	4.1E-03	37.0	5.63	0.4097
01E	800.0	0.5	0.51763	0.00116	0.06471	0.00026	0.00102	0.00003	0.00936	0.00010	0.00117	0.00005	0.4	4.4E-03	34.4	4.97	0.4098
01F	875.0	0.6	0.66186	0.00159	0.07412	0.00026	0.00117	0.00004	0.07441	0.00961	0.00152	0.00006	5.6318E-02	7.3E-03	40.4	6.56	0.5067
01G	975.0	0.4	0.40601	0.00095	0.04689	0.00019	0.00077	0.00003	0.01104	0.00011	0.00102	0.00004	0.2	2.6E-03	28.1	4.41	0.4951
01H	1075.0	0.3	0.28516	0.00095	0.02999	0.00019	0.00053	0.00002	0.00833	0.00009	0.00078	0.00003	0.2	2.6E-03	21.0	3.61	0.5976
01I	1175.0	0.4	0.43749	0.00100	0.02341	0.00017	0.00056	0.00002	0.01278	0.00010	0.00128	0.00005	0.1	1.1E-03	15.9	5.37	1.0466
01J	1250.0	3.2	3.40450	0.00494	0.11866	0.00037	0.00373	0.00004	0.97852	0.00865	0.01127	0.00011	6.5448E-03	6.5E-05	23.6	12.83	0.9991
01K	1450.0	2.2	2.29873	0.00342	0.07199	0.00026	0.00244	0.00005	1.02839	0.00960	0.00751	0.00008	3.6304E-03	4.0E-05	36.7	23.08	1.6342
01L	1700.0	6.0	6.33105	0.00896	0.00426	0.00012	0.00410	0.00006	0.00799	0.00006	0.02199	0.00022	2.9953E-02	8.6E-04	-2.5	-69.98	29.4071

Weighted Mean Age 5.39623 ±0.17930

Integrated 7.64183 ±0.28158

Plateau **Steps**

Sample: MB07-087 **Lab #**: 58779 **J**: 9.89E-04 ±3.15E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
Isochron													4.75033 ±0.01512				

Sample: MB07-071 **Lab #**: 58775 **J**: 9.58E-04 ±3.59E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	-1.9627E-0	-0.02075	0.00017	-0.00009	0.00002	-0.00002	0.00001	-0.00004	0.00002	-0.00005	0.00002	0.1	0.06	24.1	91.88	104.0228
P	01B	625.0	3.0	3.14257	0.00502	0.02325	0.00016	0.00226	0.00005	0.00416	0.00005	0.01054	0.00015	0.3	4.6E-03	1.0	2.37	3.3416
P	01C	700.0	1.1	1.14404	0.00176	0.03128	0.00016	0.00110	0.00004	0.00778	0.00008	0.00362	0.00009	0.2	2.7E-03	6.9	4.42	1.4103
P	01D	750.0	0.7	0.73010	0.00156	0.03923	0.00022	0.00086	0.00003	0.01082	0.00008	0.00194	0.00006	0.2	2.0E-03	22.5	7.33	0.7612
P	01E	800.0	0.7	0.70986	0.00124	0.04791	0.00021	0.00092	0.00003	0.04620	0.04073	0.00174	0.00005	6.1674E-02	0.05	32.3	8.43	1.2247
P	01F	875.0	1.1	1.19916	0.00191	0.06874	0.00029	0.00143	0.00003	0.12978	0.03153	0.00322	0.00008	3.1322E-02	7.7E-03	28.3	8.73	0.8753
P	01G	975.0	1.2	1.27715	0.00186	0.07404	0.00023	0.00157	0.00003	0.11890	0.03466	0.00349	0.00006	3.6871E-02	0.01	25.9	7.88	0.7500
P	01H	1075.0	1.0	1.04415	0.00162	0.04502	0.00020	0.00114	0.00002	0.10853	0.04648	0.00294	0.00006	2.4438E-02	0.01	24.0	9.88	1.5428
	01I	1250.0	4.6	4.83210	0.00656	0.12205	0.00037	0.00448	0.00005	0.93329	0.04259	0.01574	0.00013	7.4653E-03	3.6E-04	17.4	12.60	1.0367
	01J	1700.0	3.1	3.32182	0.00532	0.06584	0.00023	0.00290	0.00004	0.81107	0.04658	0.01048	0.00013	4.5014E-03	2.8E-04	24.1	22.80	1.8868

Weighted Mean Age			8.88116 ±0.36191
Integrated			10.59976 ±0.39393
Plateau	**Steps**	A-H	7.59768 ±0.40694
Isochron			7.18451 ±0.02693

Sample: MB07-032 **Lab #**: 58770 **J**: 9.58E-04 ±8.69E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	-2.3781E-0	-0.02514	0.00020	-0.00017	0.00004	-0.00003	0.00001	-0.00005	0.00002	-0.00012	0.00002	0.2	0.10	-38.6	-102.41	63.9644
P	01B	625.0	2.2	2.29165	0.00363	0.06201	0.00026	0.00210	0.00004	0.01537	0.02895	0.00689	0.00009	0.2	0.46	11.6	7.53	0.9828
P	01C	700.0	1.0	1.10585	0.00196	0.09784	0.00033	0.00168	0.00003	0.00833	0.00008	0.00235	0.00006	0.7	7.5E-03	37.8	7.48	0.3085
P	01D	750.0	0.8	0.84112	0.00157	0.09169	0.00035	0.00142	0.00003	0.00931	0.00008	0.00148	0.00005	0.6	5.6E-03	48.7	7.81	0.2918
P	01E	800.0	0.8	0.79782	0.00162	0.08240	0.00029	0.00126	0.00004	0.01020	0.00008	0.00153	0.00005	0.5	4.1E-03	44.2	7.48	0.3242
P	01F	875.0	1.2	1.23231	0.00187	0.11040	0.00036	0.00185	0.00003	0.01578	0.00010	0.00270	0.00007	0.4	3.0E-03	36.2	7.07	0.3123
P	01G	975.0	0.9	0.90646	0.00178	0.09671	0.00035	0.00145	0.00003	0.04345	0.02201	0.00167	0.00005	0.1	0.07	48.9	8.03	0.4007
P	01H	1075.0	0.4	0.41306	0.00099	0.04316	0.00022	0.00072	0.00003	0.00961	0.00009	0.00079	0.00005	0.3	3.0E-03	45.3	7.59	0.5921
P	01I	1175.0	0.7	0.68935	0.00158	0.03871	0.00017	0.00090	0.00002	0.08900	0.01481	0.00189	0.00006	2.6056E-02	4.4E-03	27.9	8.80	0.9330
	01J	1250.0	2.6	2.71504	0.00451	0.15658	0.00046	0.00357	0.00005	1.03729	0.01141	0.00753	0.00011	8.8157E-03	1.0E-04	44.6	14.02	0.7202
	01K	1450.0	0.5	0.47691	0.00107	0.01631	0.00013	0.00054	0.00003	0.36485	0.01794	0.00161	0.00005	2.3665E-03	1.4E-04	53.3	31.00	3.3361
	01L	1700.0	0.1	0.11344	0.00045	0.00630	0.00011	0.00014	0.00002	0.01140	0.00013	0.00033	0.00003	3.3173E-02	7.0E-04	20.6	6.54	2.8511

Weighted Mean Age			7.83144	±0.15195
Integrated			9.28522	±0.18040
Plateau	**Steps**	A-I	7.54429	±0.15448
Isochron			6.05374	±0.05492

Sample: MB07-040 **Lab #**: 58629 **J**: 2.24E-03 ±4.10E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	0.9	1.42939	0.00192	0.42255	0.00111	0.01058	0.00009	0.01327	0.00010	0.00183	0.00007	3.6	0.03	62.1	8.60	0.2063
P	01B	625.0	0.3	0.46622	0.00120	0.18726	0.00050	0.00924	0.00010	0.02972	0.00015	0.00038	0.00004	0.7	4.0E-03	78.1	7.97	0.2722
P	01C	700.0	0.4	0.54616	0.00137	0.24625	0.00074	0.01333	0.00008	0.07611	0.00028	0.00044	0.00005	0.4	1.7E-03	81.1	7.37	0.2396
P	01D	750.0	0.3	0.41975	0.00095	0.18809	0.00044	0.00655	0.00010	0.05645	0.00027	0.00027	0.00004	0.4	2.0E-03	85.5	7.82	0.2683
P	01E	800.0	0.2	0.30780	0.00087	0.13141	0.00043	0.00282	0.00004	0.04341	0.00019	0.00033	0.00003	0.3	1.8E-03	73.5	7.05	0.3102
P	01F	875.0	0.3	0.40667	0.00099	0.16131	0.00046	0.00294	0.00006	0.06494	0.00022	0.00048	0.00004	0.3	1.2E-03	71.0	7.34	0.2924
P	01G	975.0	0.2	0.28191	0.00087	0.09509	0.00029	0.00209	0.00004	0.03956	0.00016	0.00045	0.00004	0.3	1.4E-03	58.0	7.06	0.4689

Sample: MB07-040 **Lab #**: 58629 **J**: 2.24E-03 ±4.10E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01H	1075.0	0.2	0.27612	0.00106	0.05976	0.00022	0.00204	0.00005	0.03764	0.00015	0.00068	0.00005	0.2	9.6E-04	32.6	6.18	0.9477
	01I	1250.0	0.5	0.78257	0.00176	0.11426	0.00033	0.00769	0.00008	0.30186	0.00145	0.00296	0.00008	4.2026E-02	2.4E-04	2.8	0.79	0.9218
	01J	1700.0	2.1	3.18508	0.00515	0.01408	0.00013	0.00275	0.00005	0.07175	0.00113	0.01125	0.00014	2.1617E-02	4.0E-04	-3.5	-33.76	12.9995

Weighted Mean Age			7.66733 ±0.10238
Integrated			6.91443 ±0.15935
Plateau	**Steps**	B-H	7.49922 ±0.11911
Isochron			7.83398 ±0.01435

Sample: MB07-186 **Lab #**: 57727 **J**: 7.54E-04 ±7.58E-07 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	12.9	11.57797	0.01316	0.02124	0.00016	0.00770	0.00009	0.00500	0.00006	0.03839	0.00027	0.9	0.01	2.0	15.21	5.2515
P	01B	625.0	1.3	1.17974	0.00180	0.07809	0.00024	0.00151	0.00005	0.02622	0.00010	0.00268	0.00007	0.6	3.0E-03	33.4	6.96	0.3641
P	01C	700.0	0.8	0.75730	0.00142	0.06568	0.00025	0.00112	0.00003	0.04591	0.00022	0.00135	0.00005	0.3	1.9E-03	48.7	7.74	0.3232
P	01D	750.0	0.5	0.44501	0.00110	0.03083	0.00014	0.00055	0.00003	0.02258	0.00015	0.00089	0.00004	0.3	2.3E-03	42.0	8.36	0.5257
	01E	800.0	0.5	0.44246	0.00107	0.02176	0.00013	0.00050	0.00002	0.01919	0.00015	0.00122	0.00004	0.2	2.3E-03	19.1	5.37	0.7672
	01F	875.0	0.6	0.52159	0.00095	0.01516	0.00014	0.00045	0.00003	0.02041	0.00011	0.00158	0.00006	0.2	1.7E-03	11.5	5.48	1.4988
	01G	975.0	0.3	0.26592	0.00085	0.00890	0.00010	0.00024	0.00002	0.01533	0.00009	0.00081	0.00004	0.1	1.6E-03	11.4	4.73	1.6297
	01H	1075.0	0.2	0.16273	0.00046	0.00678	0.00008	0.00024	0.00002	0.03223	0.00016	0.00047	0.00003	4.4125E-02	5.7E-04	17.9	5.97	1.7991
	01I	1250.0	1.9	1.68595	0.00242	0.02792	0.00014	0.00152	0.00004	0.14941	0.00103	0.00537	0.00008	3.9146E-02	3.4E-04	7.6	6.40	1.2030
	01J	1700.0	1.4	1.29946	0.00203	0.00046	0.00005	0.00089	0.00002	0.00622	0.00005	0.00428	0.00009	1.5285E-02	1.6E-03	2.8	109.56	74.7922

Weighted Mean Age			7.28816 ±0.20303
Integrated			7.75052 ±0.47955
Plateau	**Steps**	A-D	7.41482 ±0.24158
Isochron			7.19973 ±0.00731

Sample: MB07-033 **Lab #**: 58771 **J**: 9.73E-04 ±9.64E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	-2.2187E-0	-0.02345	0.00019	-0.00005	0.00003	-0.00003	0.00001	-0.00002	0.00002	-0.00010	0.00002	0.2	0.22	-20.0	-190.41	340.1634
	01B	625.0	2.9	3.02714	0.00490	0.06703	0.00030	0.00265	0.00004	0.00474	0.00006	0.00965	0.00011	0.9	0.01	5.9	4.74	0.8830
P	01C	700.0	1.2	1.30395	0.00241	0.09939	0.00028	0.00180	0.00004	0.00863	0.00007	0.00306	0.00007	0.7	6.3E-03	31.2	7.28	0.3675
P	01D	750.0	0.8	0.85628	0.00153	0.09558	0.00026	0.00151	0.00004	0.03147	0.00937	0.00156	0.00006	0.2	0.05	48.7	7.77	0.3485
P	01E	800.0	0.7	0.72263	0.00128	0.08508	0.00033	0.00131	0.00003	0.00938	0.00008	0.00136	0.00005	0.5	5.3E-03	45.4	6.86	0.2875
P	01F	875.0	1.3	1.41954	0.00262	0.13104	0.00042	0.00223	0.00005	0.01457	0.00011	0.00303	0.00008	0.5	4.3E-03	37.7	7.26	0.3145
P	01G	975.0	1.0	1.06951	0.00152	0.12688	0.00024	0.00192	0.00005	0.01556	0.00010	0.00184	0.00004	0.5	3.3E-03	50.2	7.52	0.1723
P	01H	1075.0	0.4	0.46052	0.00107	0.05919	0.00025	0.00096	0.00003	0.00963	0.00007	0.00070	0.00005	0.4	3.1E-03	56.5	7.81	0.4658
P	01I	1175.0	0.8	0.85690	0.00162	0.06573	0.00027	0.00133	0.00004	0.02433	0.00017	0.00218	0.00007	0.2	1.3E-03	26.7	6.20	0.5646
	01J	1250.0	2.7	2.83288	0.00486	0.16978	0.00037	0.00373	0.00005	0.61895	0.00804	0.00755	0.00009	1.6245E-02	2.2E-04	36.5	11.05	0.4511
	01K	1450.0	1.1	1.12032	0.00205	0.05283	0.00025	0.00127	0.00004	0.26361	0.03046	0.00330	0.00008	1.1772E-02	1.4E-03	29.3	11.34	1.2469
	01L	1700.0	0.2	0.17399	0.00058	0.01127	0.00011	0.00022	0.00002	0.06138	0.01326	0.00049	0.00004	1.0749E-02	2.4E-03	41.9	11.86	2.4997

Weighted Mean Age			7.56288 ±0.13116
Integrated			8.03430 ±0.16105
Plateau	**Steps**	C-I	7.40071 ±0.13604
Isochron			7.39616 ±0.07327

Sample: MB07-084 **Lab #**: 58624 **J**: 2.21E-03 ±6.27E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	1.7	2.67453	0.00442	0.02986	0.00015	0.14078	0.00043	0.00803	0.00009	0.00892	0.00013	0.5	5.5E-03	1.7	6.32	5.3553
P	01B	625.0	0.3	0.46467	0.00123	0.16031	0.00048	0.01499	0.00011	0.03152	0.00016	0.00056	0.00005	0.6	3.7E-03	66.8	7.81	0.3709
P	01C	700.0	0.5	0.81242	0.00209	0.39521	0.00122	0.01017	0.00010	0.06584	0.00028	0.00032	0.00005	0.7	3.9E-03	90.7	7.53	0.1537
P	01D	750.0	0.5	0.76749	0.00129	0.40303	0.00094	0.00703	0.00009	0.06446	0.00028	0.00027	0.00004	0.8	3.7E-03	91.9	7.07	0.1278
P	01E	800.0	0.4	0.62587	0.00145	0.32361	0.00092	0.00523	0.00007	0.06543	0.00019	0.00018	0.00005	0.6	2.4E-03	94.5	7.38	0.1727
P	01F	875.0	0.4	0.58740	0.00159	0.29825	0.00089	0.00460	0.00005	0.07245	0.00023	0.00018	0.00004	0.5	2.2E-03	94.9	7.54	0.1734

Sample: MB07-084 **Lab #**: 58624 **J**: 2.21E-03 ±6.27E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01G	975.0	0.2	0.35355	0.00126	0.16499	0.00053	0.00293	0.00004	0.06528	0.00024	0.00006	0.00005	0.3	1.5E-03	100.6	8.71	0.3815

Weighted Mean Age			7.40506 ±0.07657
Integrated			7.51297 ±0.12194
Plateau	**Steps**	A-F	7.31146 ±0.08578
Isochron			7.40324 ±0.02102

Sample: MB07-075 **Lab #**: 58621 **J**: 2.19E-03 ±2.86E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	3.0	4.66485	0.00718	0.62341	0.00154	0.50054	0.00100	0.02716	0.00013	0.01138	0.00016	2.8	0.02	28.3	8.50	0.2995
P	01B	625.0	0.4	0.54191	0.00143	0.18891	0.00049	0.41101	0.00108	0.04030	0.00021	0.00073	0.00006	0.6	3.4E-03	64.8	7.45	0.3624
P	01C	700.0	0.2	0.36914	0.00107	0.15228	0.00036	0.09448	0.00034	0.03213	0.00121	0.00047	0.00005	0.6	0.02	65.7	6.39	0.3567
P	01D	750.0	0.2	0.37282	0.00112	0.16579	0.00041	0.01074	0.00008	0.06593	0.00031	0.00027	0.00004	0.3	1.6E-03	84.6	7.64	0.3017
P	01E	800.0	0.2	0.28844	0.00107	0.13310	0.00041	0.00530	0.00005	0.04937	0.00016	0.00019	0.00004	0.3	1.5E-03	86.0	7.48	0.3884
P	01F	875.0	0.2	0.25626	0.00098	0.11540	0.00042	0.00306	0.00005	0.05276	0.00025	0.00018	0.00005	0.3	1.6E-03	85.9	7.66	0.4987
P	01G	975.0	0.1	0.19873	0.00087	0.07469	0.00030	0.00192	0.00005	0.03429	0.00021	0.00031	0.00005	0.3	2.0E-03	59.0	6.30	0.7516
P	01H	1075.0	0.1	0.21668	0.00086	0.06329	0.00025	0.00169	0.00004	0.03481	0.00018	0.00041	0.00005	0.2	1.4E-03	50.0	6.87	0.9149
	01I	1250.0	0.5	0.74850	0.00173	0.11710	0.00043	0.00522	0.00006	0.18368	0.00136	0.00228	0.00009	7.8086E-02	6.5E-04	18.4	4.74	0.8889
	01J	1700.0	3.2	4.91577	0.00635	0.13552	0.00046	0.00885	0.00008	0.23113	0.00124	0.01624	0.00017	7.1770E-02	4.6E-04	3.9	5.76	1.5146

Weighted Mean Age			7.44153 ±0.13780
Integrated			7.38509 ±0.18729
Plateau	**Steps**	B-H	7.26313 ±0.16065
Isochron			7.38783 ±0.00968

Sample: MB07-046 **Lab #**: 58773 **J**: 9.81E-04 ±3.24E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01L	550.0	-0.4	-0.38596	0.00132	0.00002	0.00004	-0.00027	0.00002	-0.00004	0.00002	-0.00130	0.00006	-3.7141E-0	0.07	0.8	-269.48	1671.8286
	01M	625.0	3.6	3.76301	0.00662	0.06799	0.00026	0.00331	0.00005	-0.03904	0.00861	0.01225	0.00017	-0.1	0.02	3.1	3.04	1.3393
P	01N	700.0	1.0	1.06277	0.00225	0.09342	0.00033	0.00174	0.00004	0.01002	0.00009	0.00247	0.00010	0.5	5.2E-03	31.9	6.51	0.5522
P	01O	750.0	0.7	0.69812	0.00206	0.09139	0.00035	0.00148	0.00004	0.01116	0.00008	0.00126	0.00008	0.5	3.7E-03	47.8	6.55	0.4858
P	01P	800.0	0.6	0.62562	0.00191	0.08640	0.00032	0.00127	0.00004	0.00990	0.00010	0.00083	0.00008	0.5	5.6E-03	61.8	8.01	0.5198
P	01Q	875.0	0.6	0.68709	0.00194	0.08796	0.00031	0.00118	0.00004	0.01102	0.00011	0.00107	0.00009	0.5	4.7E-03	55.0	7.70	0.5237
P	01R	975.0	0.7	0.75649	0.00215	0.05906	0.00024	0.00104	0.00005	0.00966	0.00012	0.00162	0.00009	0.4	4.6E-03	37.8	8.67	0.8284
P	01S	1075.0	0.8	0.85677	0.00239	0.04795	0.00020	0.00109	0.00003	0.00874	0.00009	0.00240	0.00010	0.3	3.4E-03	18.0	5.77	1.0902
P	01T	1150.0	0.7	0.69377	0.00196	0.02838	0.00019	0.00080	0.00004	0.01051	0.00010	0.00206	0.00010	0.2	1.9E-03	13.2	5.80	1.8634
	01U	1250.0	3.5	3.65555	0.00550	0.17294	0.00044	0.00441	0.00008	1.11301	0.00979	0.01082	0.00014	8.6717E-03	8.3E-05	34.7	13.62	0.7787
	01V	1450.0	0.4	0.39677	0.00169	0.02044	0.00014	0.00049	0.00003	0.07786	0.01656	0.00114	0.00009	1.4889E-02	3.2E-03	29.4	10.44	2.6520
	01W	1700.0	-9.4714E-0	-0.10012	0.00146	0.00424	0.00009	3.9636E-06	0.00003	0.00668	0.00006	-0.00032	0.00007	3.6534E-02	8.1E-04	1.5	-0.66	9.4197

Weighted Mean Age			7.65202 ±0.22608
Integrated			8.23636 ±0.25495
Plateau	**Steps**	C-I	7.24148 ±0.24256
Isochron			7.74494 ±0.02558

Sample: MB07-073 **Lab #**: 57722 **J**: 7.60E-04 ±1.37E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	2.6	2.35070	0.00395	0.02582	0.00017	0.00176	0.00003	0.00401	0.00006	0.00764	0.00011	1.4	0.02	4.0	5.07	1.7584
P	01B	625.0	0.9	0.76761	0.00158	0.10190	0.00030	0.00149	0.00004	0.02031	0.00012	0.00092	0.00004	1.1	7.3E-03	65.0	6.80	0.1675
P	01C	700.0	0.9	0.79577	0.00136	0.12942	0.00033	0.00172	0.00003	0.04158	0.00016	0.00042	0.00004	0.7	3.2E-03	85.3	7.29	0.1240
P	01D	750.0	0.5	0.44023	0.00114	0.06738	0.00028	0.00088	0.00003	0.03051	0.00015	0.00039	0.00003	0.5	3.1E-03	75.2	6.83	0.2045
	01E	800.0	0.5	0.40849	0.00108	0.05958	0.00024	0.00080	0.00003	0.02569	0.00010	0.00045	0.00003	0.5	2.8E-03	68.9	6.56	0.2002
	01F	875.0	0.5	0.42978	0.00103	0.05592	0.00023	0.00081	0.00004	0.03211	0.00015	0.00042	0.00003	0.4	2.3E-03	72.7	7.76	0.2540
	01G	975.0	0.5	0.41504	0.00088	0.05723	0.00024	0.00076	0.00003	0.04939	0.00015	0.00037	0.00004	0.2	1.3E-03	75.7	7.63	0.2773

Sample: MB07-073 **Lab #**: 57722 **J**: 7.60E-04 ±1.37E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01H	1075.0	0.3	0.25735	0.00075	0.03294	0.00016	0.00050	0.00003	0.04231	0.00017	0.00043	0.00003	0.2	1.1E-03	54.4	5.91	0.4083
01I	1250.0	0.9	0.83038	0.00172	0.04364	0.00017	0.00107	0.00004	0.14212	0.00147	0.00245	0.00006	6.5465E-02	7.3E-04	16.2	4.30	0.6178
01J	1700.0	1.7	1.52878	0.00228	0.00528	0.00009	0.00099	0.00004	0.03365	0.00015	0.00510	0.00010	3.3281E-02	6.0E-04	1.9	7.57	7.8063

Weighted Mean Age 7.01565 ±0.07421

Integrated 6.75774 ±0.13430

Plateau **Steps** A-D 7.11204 ±0.10031

Isochron 7.09241 ±0.01277

Sample: MB07-103 **Lab #**: 58780 **J**: 9.73E-04 ±3.49E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	-3.0604E-0	-0.03235	0.00021	-0.00007	0.00003	-0.00003	0.00001	-0.00002	0.00002	-0.00012	0.00002	0.2	0.20	-9.0	-75.35	169.9227
P	01B	625.0	17.0	17.95891	0.02443	0.01990	0.00023	0.01174	0.00009	0.00155	0.00004	0.06044	0.00032	0.7	0.02	0.6	8.85	8.8079
P	01C	700.0	5.2	5.50857	0.00768	0.03583	0.00016	0.00391	0.00004	0.00202	0.00004	0.01841	0.00019	1.0	0.02	1.3	3.51	2.7479
P	01D	750.0	3.9	4.11834	0.00601	0.04760	0.00024	0.00318	0.00005	0.00243	0.00005	0.01340	0.00015	1.1	0.02	3.9	6.00	1.6413
P	01E	800.0	3.6	3.78692	0.00555	0.05595	0.00025	0.00296	0.00004	-0.04919	0.00986	0.01167	0.00014	-6.4855E-0	0.01	8.0	9.51	1.3432
P	01F	875.0	12.0	12.68896	0.01876	0.17976	0.00052	0.00984	0.00009	0.01227	0.00011	0.04017	0.00024	0.8	8.0E-03	6.5	8.18	0.7105
P	01G	975.0	11.6	12.24646	0.01701	0.22658	0.00075	0.01018	0.00008	0.11365	0.01207	0.03888	0.00030	0.1	0.01	6.9	6.62	0.7147
P	01H	1075.0	4.0	4.24719	0.00650	0.17150	0.00046	0.00454	0.00006	0.01649	0.00012	0.01219	0.00014	0.6	4.5E-03	15.5	6.82	0.4231
P	01I	1175.0	2.1	2.27217	0.00369	0.11119	0.00036	0.00265	0.00005	0.01614	0.00011	0.00631	0.00008	0.4	2.9E-03	18.5	6.72	0.3953
	01J	1250.0	9.9	10.50653	0.01318	0.27709	0.00081	0.00970	0.00007	0.63965	0.01447	0.03229	0.00017	2.4188E-02	5.6E-04	13.7	9.37	0.4036
	01K	1450.0	4.3	4.57497	0.00588	0.12503	0.00037	0.00425	0.00006	0.47797	0.01041	0.01390	0.00017	1.4464E-02	3.3E-04	18.0	11.95	0.8297
	01L	1700.0	1.5	1.60124	0.00252	0.01569	0.00017	0.00125	0.00004	0.01504	0.00015	0.00510	0.00010	5.8698E-02	8.7E-04	6.5	11.91	3.3841

Weighted Mean Age 7.87380 ±0.20328

Integrated 8.11627 ±0.27851

Plateau **Steps** A-I 7.11097 ±0.30826

Sample: MB07-103 **Lab #**: 58780 **J**: 9.73E-04 ±3.49E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
Isochron													7.81277 ±0.02804				

Sample: MB07-081 **Lab #**: 58623 **J**: 2.21E-03 ±5.65E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	02A	550.0	11.8	18.23801	0.02208	0.03590	0.00022	0.09849	0.00024	0.00596	0.00008	0.06172	0.00027	0.7	1.0E-02	2.9464E-02	0.60	9.3434
P	02B	625.0	1.0	1.50701	0.00254	0.07013	0.00031	0.00855	0.00009	0.01219	0.00012	0.00478	0.00010	0.7	7.4E-03	6.6	5.73	1.6211
P	02C	700.0	0.9	1.40919	0.00230	0.21753	0.00076	0.00485	0.00008	0.03696	0.00018	0.00348	0.00010	0.7	4.2E-03	27.7	7.24	0.5292
P	02D	750.0	1.4	2.11073	0.00414	0.24457	0.00083	0.00608	0.00008	0.03726	0.00013	0.00594	0.00012	0.8	3.8E-03	17.4	6.07	0.5749
P	02E	800.0	0.6	0.91226	0.00163	0.20880	0.00055	0.00380	0.00005	0.03872	0.00018	0.00180	0.00007	0.6	3.4E-03	42.9	7.57	0.4258
P	02F	875.0	0.5	0.69817	0.00162	0.19070	0.00046	0.00322	0.00006	0.05049	0.00023	0.00122	0.00006	0.4	2.3E-03	50.8	7.51	0.4071
P	02G	975.0	0.5	0.82754	0.00132	0.11936	0.00040	0.00304	0.00006	0.03412	0.00014	0.00211	0.00008	0.4	2.2E-03	26.1	7.30	0.7829
P	02H	1075.0	0.4	0.63459	0.00140	0.07785	0.00031	0.00263	0.00004	0.02020	0.00013	0.00172	0.00006	0.5	3.5E-03	21.1	6.94	0.9791
P	02I	1250.0	4.4	6.81458	0.00898	0.30419	0.00097	0.01778	0.00015	0.11621	0.00120	0.02175	0.00019	0.3	3.3E-03	6.3	5.68	0.7678
P	02J	1700.0	5.2	7.95425	0.01089	0.22509	0.00073	0.01366	0.00008	0.15685	0.00134	0.02618	0.00018	0.2	1.5E-03	3.4	4.90	0.9585
Weighted Mean Age														6.98277 ±0.20492				
Integrated														6.33878 ±0.31667				
Plateau												**Steps**	A-J	7.08168 ±0.20972				
Isochron														7.24480 ±0.01855				

Sample: MB07-149 **Lab #**: 58782 **J**: 9.74E-04 ±3.15E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	-2.4259E-0	-0.02546	0.00022	-0.00006	0.00004	-0.00003	0.00002	-0.00003	0.00002	-0.00011	0.00002	0.1	0.14	-24.1	-205.95	242.2410
P	01B	625.0	14.0	14.66450	0.01765	0.02265	0.00021	0.00956	0.00008	0.00150	0.00006	0.04969	0.00032	0.8	0.03	-0.1	-1.47	7.6707
P	01C	700.0	6.4	6.67561	0.00865	0.02776	0.00020	0.00459	0.00007	0.00305	0.00006	0.02280	0.00027	0.5	0.01	-0.9	-3.89	5.1371
P	01D	750.0	4.7	4.88026	0.00651	0.03019	0.00019	0.00354	0.00006	0.00390	0.00005	0.01644	0.00018	0.4	6.3E-03	0.5	1.53	3.2446
P	01E	800.0	4.4	4.57927	0.00617	0.03635	0.00021	0.00330	0.00008	0.00571	0.00007	0.01480	0.00015	0.4	5.1E-03	4.6	10.26	2.1589
P	01F	875.0	6.0	6.28451	0.00836	0.05637	0.00027	0.00458	0.00005	0.01120	0.00005	0.02102	0.00021	0.3	1.9E-03	1.3	2.55	1.9694
P	01G	975.0	12.7	13.28828	0.01947	0.10740	0.00037	0.00972	0.00014	0.01898	0.00013	0.04344	0.00026	0.3	2.5E-03	3.5	7.70	1.3267
P	01H	1075.0	9.5	9.97316	0.01202	0.10510	0.00039	0.00738	0.00007	0.10598	0.01055	0.03245	0.00020	5.5465E-02	5.6E-03	4.6	7.87	1.0442
P	01I	1175.0	2.8	2.94777	0.00481	0.07863	0.00032	0.00283	0.00006	0.01396	0.00010	0.00913	0.00012	0.3	2.6E-03	8.8	5.90	0.7968
	01J	1250.0	12.9	13.54770	0.02177	0.16219	0.00049	0.01044	0.00011	0.47097	0.01160	0.04353	0.00026	1.9025E-02	4.8E-04	7.7	11.58	0.9250
	01K	1450.0	9.2	9.62459	0.01269	0.12741	0.00039	0.00753	0.00008	1.06681	0.01500	0.03118	0.00023	6.3694E-03	9.7E-05	12.6	17.80	1.3158
	01L	1700.0	0.7	0.76022	0.00150	0.00809	0.00010	0.00054	0.00003	0.05996	0.01139	0.00257	0.00007	7.2374E-03	1.4E-03	6.2	10.80	5.3424

Weighted Mean Age			8.76533 ±0.42873
Integrated			8.82161 ±0.51698
Plateau	**Steps**	A-I	6.84086 ±0.68920
Isochron			10.20945 ±0.03298

Sample: MB07-065 **Lab #**: 58620 **J**: 2.20E-03 ±2.58E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	9.7	14.93408	0.01805	0.35400	0.00085	0.62971	0.00103	0.01369	0.00011	0.04765	0.00024	3.2	0.03	5.9	9.92	0.8359
P	01B	625.0	1.0	1.60588	0.00258	0.14962	0.00045	0.58138	0.00104	0.01907	0.00010	0.00469	0.00010	1.0	6.0E-03	15.2	6.53	0.8106
P	01C	700.0	0.6	0.90427	0.00186	0.08071	0.00033	0.04378	0.00016	0.04684	0.00018	0.00280	0.00011	0.2	1.2E-03	10.2	4.60	1.5715
P	01D	750.0	0.4	0.69191	0.00140	0.07297	0.00025	0.00569	0.00007	0.04630	0.00018	0.00202	0.00007	0.2	1.0E-03	15.8	6.03	1.1184
P	01E	800.0	0.4	0.67036	0.00165	0.07912	0.00026	0.00503	0.00007	0.03926	0.00025	0.00192	0.00007	0.2	1.8E-03	17.3	5.89	1.0069
P	01F	875.0	0.6	0.86648	0.00170	0.07807	0.00030	0.00449	0.00006	0.03656	0.00023	0.00270	0.00009	0.3	2.0E-03	9.3	4.13	1.3427
P	01G	975.0	0.3	0.53637	0.00111	0.07377	0.00030	0.00334	0.00006	0.03932	0.00021	0.00146	0.00005	0.2	1.6E-03	21.8	6.37	0.8844

Sample: MB07-065 **Lab #**: 58620 **J**: 2.20E-03 ±2.58E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01H	1075.0	0.2	0.30251	0.00104	0.06359	0.00031	0.00236	0.00005	0.03523	0.00012	0.00061	0.00005	0.2	1.3E-03	44.5	8.50	1.0210
P	01I	1250.0	0.8	1.23906	0.00191	0.11911	0.00037	0.00688	0.00008	0.19048	0.00132	0.00395	0.00011	7.6826E-02	5.8E-04	11.1	4.64	1.0759
	01J	1700.0	3.1	4.85817	0.00620	0.05443	0.00027	0.00702	0.00009	0.22163	0.00129	0.01686	0.00016	2.9945E-02	2.3E-04	-1.0	-3.62	3.5193

Weighted Mean Age			6.63591 ±0.33565
Integrated			6.63417 ±0.39991
Plateau	**Steps**	B-I	6.30520 ±0.39215
Isochron			6.08988 ±0.00717

Sample: MB07-147 **Lab #**: 58781 **J**: 9.65E-04 ±3.49E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	550.0	-2.5109E-0	-0.02654	0.00020	-0.00010	0.00004	-0.00005	0.00001	-0.00001	0.00002	-0.00008	0.00002	0.4	0.54	11.3	53.07	106.5636
	01B	625.0	15.0	15.81541	0.01879	0.02285	0.00020	0.01040	0.00009	0.00152	0.00006	0.05391	0.00029	0.9	0.03	-0.7	-8.93	6.8286
P	01C	700.0	8.1	8.53923	0.01041	0.04049	0.00022	0.00602	0.00005	0.00318	0.00005	0.02877	0.00024	0.7	0.01	0.5	1.75	3.0783
P	01D	750.0	6.2	6.57349	0.00880	0.04213	0.00020	0.00457	0.00009	0.00379	0.00005	0.02146	0.00021	0.6	8.6E-03	3.6	9.77	2.5942
P	01E	800.0	9.4	9.89880	0.01242	0.05851	0.00031	0.00685	0.00011	0.00563	0.00006	0.03234	0.00024	0.6	7.4E-03	3.5	10.41	2.1833
P	01F	875.0	13.1	13.75049	0.04236	0.10518	0.00057	0.00951	0.00013	0.01173	0.00015	0.04595	0.00041	0.5	7.0E-03	1.3	3.04	2.1655
P	01G	975.0	17.7	18.57361	0.02627	0.14975	0.00052	0.01367	0.00009	0.09998	0.01316	0.06135	0.00033	8.4266E-02	0.01	2.8	6.15	1.1962
P	01H	1075.0	7.6	7.98063	0.00981	0.14218	0.00047	0.00659	0.00009	0.01443	0.00014	0.02560	0.00023	0.6	5.6E-03	5.3	5.29	0.8639
P	01I	1175.0	3.8	3.99929	0.00559	0.11976	0.00036	0.00384	0.00006	0.01404	0.00010	0.01215	0.00014	0.5	3.8E-03	10.5	6.19	0.5972
	01J	1250.0	18.2	19.05950	0.02430	0.25804	0.00097	0.01497	0.00011	0.41317	0.00951	0.06118	0.00037	3.4904E-02	8.2E-04	6.8	8.88	0.7903
	01K	1450.0	9.5	9.94558	0.01214	0.12285	0.00040	0.00763	0.00009	0.67250	0.01478	0.03159	0.00024	9.9611E-03	2.3E-04	11.2	16.50	1.1991
	01L	1700.0	2.7	2.87391	0.00471	0.00675	0.00012	0.00198	0.00005	0.01104	0.00007	0.00985	0.00013	3.4149E-02	6.6E-04	-1.0	-7.65	10.2226

Weighted Mean Age			7.47459 ±0.35800
Integrated			7.34781 ±0.45450
Plateau	**Steps**	C-I	5.83881 ±0.60715

Sample: MB07-147 **Lab #**: 58781 **J**: 9.65E-04 ±3.49E-06 **Disc.**: 1.004 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
Isochron														7.95941 ±0.02879				

Sample: MB07-068 **Lab #**: 57731 **J**: 7.53E-04 ±1.64E-06 **Disc.**: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	950.0	0.5	0.42964	0.00111	0.01987	0.00015	0.00044	0.00002	-0.00156	0.00009	0.00113	0.00006	-2.5	0.15	21.9	6.51	1.1640
P	01B	1050.0	2.0182E-02	0.01818	0.00028	0.00337	0.00005	0.00005	0.00001	-0.00526	0.00007	-2.9767E-0	0.00002	-0.1	2.5E-03	98.6	7.29	2.8787
P	01C	1120.0	0.3	0.31416	0.00099	0.01417	0.00012	0.00039	0.00002	0.01107	0.00014	0.00078	0.00004	0.2	3.8E-03	27.3	8.34	1.2464
P	01D	1130.0	0.2	0.14071	0.00038	0.01658	0.00013	0.00026	0.00002	0.02583	0.00012	0.00026	0.00003	0.1	1.1E-03	49.0	5.73	0.8095
P	01E	1145.0	0.3	0.22525	0.00088	0.03874	0.00018	0.00055	0.00002	0.06080	0.00016	0.00028	0.00003	0.1	6.8E-04	69.7	5.59	0.3042
P	01F	1150.0	0.2	0.15951	0.00044	0.02952	0.00017	0.00040	0.00002	0.04493	0.00017	0.00014	0.00003	0.1	9.0E-04	81.0	6.04	0.3730
P	01G	1160.0	0.2	0.17863	0.00060	0.03355	0.00018	0.00035	0.00002	0.02453	0.00153	0.00015	0.00002	0.3	0.02	77.9	5.71	0.2683
P	01H	1200.0	0.5	0.41822	0.00093	0.04885	0.00021	0.00074	0.00002	0.05215	0.00139	0.00081	0.00004	0.2	4.9E-03	45.6	5.39	0.3608
P	01I	1700.0	1.8	1.57982	0.00249	0.00673	0.00008	0.00113	0.00004	0.20997	0.00148	0.00555	0.00009	5.9056E-03	9.0E-05	-1.0	-3.36	5.8271
Weighted Mean Age														5.73229 ±0.15366				
Integrated														5.66720 ±0.26505				
Plateau												**Steps**	A-I	5.73858 ±0.15372				
Isochron														5.77930 ±0.01269				

Sample: MB07-063 **Lab #**: 58619 **J**: 2.19E-03 ±2.86E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	4.9	7.55784	0.00979	0.31432	0.00116	0.47227	0.00098	0.01877	0.00010	0.02368	0.00022	2.1	0.01	7.7	7.37	0.8397

Sample: MB07-063 **Lab #**: 58619 **J**: 2.19E-03 ±2.86E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01B	625.0	1.2	1.79313	0.00268	0.21785	0.00063	0.31322	0.00091	0.04605	0.00022	0.00520	0.00010	0.6	3.3E-03	15.7	5.16	0.5530
P	01C	700.0	0.4	0.63387	0.00160	0.31981	0.00095	0.04896	0.00022	0.09064	0.00034	0.00073	0.00005	0.4	2.1E-03	70.7	5.61	0.1751
P	01D	750.0	0.3	0.42008	0.00110	0.24631	0.00070	0.01004	0.00012	0.05577	0.00013	0.00031	0.00004	0.5	2.0E-03	82.2	5.61	0.2091
P	01E	800.0	0.2	0.31426	0.00097	0.17759	0.00047	0.00631	0.00006	0.03791	0.00019	0.00022	0.00004	0.6	3.3E-03	83.2	5.89	0.2792
P	01F	875.0	0.2	0.25712	0.00096	0.12938	0.00042	0.00351	0.00007	0.03276	0.00017	0.00023	0.00004	0.5	2.9E-03	77.6	6.16	0.3974
P	01G	975.0	0.1	0.22348	0.00075	0.08491	0.00029	0.00246	0.00005	0.02671	0.00013	0.00034	0.00004	0.4	2.3E-03	59.0	6.21	0.5599
P	01H	1075.0	0.1	0.22450	0.00091	0.07753	0.00028	0.00232	0.00004	0.03111	0.00013	0.00049	0.00005	0.3	1.7E-03	39.9	4.62	0.7175
	01I	1250.0	0.9	1.33752	0.00205	0.42245	0.00103	0.02551	0.00012	0.44263	0.00157	0.00411	0.00010	0.1	5.1E-04	20.2	2.57	0.3076
	01J	1700.0	3.1	4.74454	0.00662	0.05789	0.00028	0.00606	0.00007	0.09185	0.00133	0.01616	0.00018	7.7677E-02	1.2E-03	5.4069E-03	0.02	3.7679

Weighted Mean Age			5.35318 ±0.10278
Integrated			5.09598 ±0.19707
Plateau	**Steps**	A-H	5.73110 ±0.11033
Isochron			5.33322 ±0.00698

Sample: MB07-056 **Lab #**: 58618 **J**: 2.18E-03 ±2.86E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	2.3	3.55395	0.00587	0.46491	0.00114	0.12942	0.00040	0.01785	0.00014	0.00997	0.00015	3.2	0.03	17.2	5.24	0.3837
P	01B	625.0	0.3	0.48876	0.00127	0.10888	0.00033	0.02671	0.00017	0.02181	0.00010	0.00115	0.00006	0.6	3.5E-03	31.6	5.66	0.5980
P	01C	700.0	0.2	0.24997	0.00100	0.09123	0.00032	0.01308	0.00010	0.06846	0.00021	0.00052	0.00005	0.2	7.8E-04	47.1	5.15	0.6456
P	01D	750.0	0.1	0.17522	0.00086	0.06454	0.00025	0.00446	0.00007	0.04502	0.00020	0.00035	0.00004	0.2	1.0E-03	48.8	5.29	0.7874
P	01E	800.0	8.9922E-02	0.13877	0.00070	0.05164	0.00023	0.00236	0.00005	0.02892	0.00011	0.00026	0.00004	0.2	1.3E-03	51.1	5.48	0.9560
P	01F	875.0	9.3533E-02	0.14434	0.00081	0.05998	0.00028	0.00158	0.00004	0.04149	0.00021	0.00024	0.00004	0.2	1.2E-03	61.2	5.87	0.7814
P	01G	975.0	8.7690E-02	0.13532	0.00071	0.04714	0.00024	0.00129	0.00004	0.04142	0.00018	0.00030	0.00004	0.1	9.6E-04	44.9	5.15	0.9454
P	01H	1075.0	0.1	0.20616	0.00101	0.02821	0.00020	0.00136	0.00004	0.03219	0.00019	0.00050	0.00005	0.1	1.0E-03	33.2	9.67	2.0959
	01I	1250.0	2.5	3.89694	0.00643	0.20494	0.00056	0.02695	0.00015	0.49035	0.00153	0.01398	0.00017	5.1573E-02	2.2E-04	-1.8	-1.34	0.9990
	01J	1700.0	2.6	3.98287	0.00604	0.01863	0.00014	0.00478	0.00009	0.06531	0.00130	0.01358	0.00014	3.5080E-02	7.5E-04	-0.2	-1.96	9.1638

Sample: MB07-056 **Lab #**: 58618 **J**: 2.18E-03 ±2.86E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
Weighted Mean Age													5.05530 ±0.23139				
Integrated													4.13345 ±0.30370				
Plateau											**Steps**	A-H	5.36711 ±0.23949				
Isochron													5.65273 ±0.00746				

Sample: MB07-004 **Lab #**: 58628 **J**: 2.25E-03 ±4.55E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	1.6	2.51018	0.00429	0.45529	0.00115	0.01599	0.00012	0.01303	0.00012	0.00676	0.00012	4.1	0.04	20.4	4.62	0.3279
P	01B	625.0	-2.4972E-0	-0.00385	0.00127	0.07090	0.00029	0.00348	0.00006	0.00479	0.00011	-0.00038	0.00007	1.7	0.04	-2818.9	6.29	1.2564
P	01C	700.0	0.2	0.24472	0.00136	0.20652	0.00060	0.01780	0.00013	0.05415	0.00020	-7.7120E-0	0.00008	0.4	2.1E-03	107.4	5.23	0.4561
P	01D	750.0	6.3403E-02	0.09784	0.00129	0.17283	0.00046	0.00936	0.00008	0.05336	0.00026	-0.00041	0.00008	0.4	2.1E-03	242.6	5.64	0.5376
P	01E	800.0	3.8800E-02	0.05988	0.00136	0.14415	0.00041	0.00529	0.00008	0.01843	0.00124	-0.00031	0.00007	0.9	0.06	262.5	4.48	0.6276
P	01F	875.0	7.1167E-02	0.10983	0.00141	0.15878	0.00036	0.00363	0.00006	0.06198	0.00022	-0.00020	0.00008	0.3	1.3E-03	172.8	4.91	0.5774
P	01G	975.0	4.8988E-02	0.07560	0.00132	0.09636	0.00032	0.00226	0.00004	0.04552	0.00022	-0.00022	0.00008	0.2	1.5E-03	206.5	6.66	0.9585
P	01H	1075.0	2.7656E-02	0.04268	0.00129	0.05275	0.00029	0.00194	0.00005	0.03088	0.00014	-0.00009	0.00008	0.2	1.4E-03	187.6	6.24	1.7847
	01I	1250.0	0.8	1.22603	0.00228	0.13854	0.00044	0.01201	0.00010	0.35079	0.00207	0.00468	0.00012	4.5941E-02	3.1E-04	-2.6	-0.94	1.1352
	01J	1700.0	2.0	3.02444	0.00471	0.01099	0.00015	0.00277	0.00006	0.05694	0.00143	0.01031	0.00015	2.2268E-02	6.4E-04	-7.3182E-0	-0.84	17.1480
Weighted Mean Age														4.86894 ±0.19666				
Integrated														4.55778 ±0.24758				
Plateau												**Steps**	A-H	5.03406 ±0.20094				
Isochron														5.02580 ±0.01026				

Sample: MB07-070 **Lab #**: 58612 **J**: 2.17E-03 ±1.31E-06 **Disc.**: 1.001 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	950.0	0.6	0.89790	0.00184	0.06296	0.00024	0.03620	0.00018	0.01086	0.00011	0.00295	0.00008	0.6	7.0E-03	3.4	1.92	1.4542
P	01B	1050.0	0.2	0.32731	0.00110	0.02563	0.00016	0.00355	0.00005	0.00552	0.00007	0.00098	0.00006	0.5	6.9E-03	12.5	6.34	2.7988
P	01C	1120.0	0.2	0.27631	0.00107	0.04393	0.00019	0.00450	0.00006	0.04117	0.00018	0.00074	0.00005	0.1	7.2E-04	26.6	6.66	1.3709
P	01D	1130.0	0.1	0.16235	0.00090	0.04979	0.00023	0.00318	0.00004	0.04663	0.00018	0.00037	0.00004	0.1	7.1E-04	43.8	5.68	0.9411
P	01E	1145.0	0.1	0.15339	0.00077	0.05937	0.00024	0.00303	0.00005	0.05539	0.00017	0.00040	0.00004	0.1	6.1E-04	36.3	3.73	0.8578
P	01F	1150.0	6.6773E-02	0.10241	0.00075	0.03873	0.00023	0.00172	0.00003	0.03624	0.00018	0.00027	0.00004	0.1	9.2E-04	34.1	3.59	1.2028
P	01G	1160.0	0.2	0.27999	0.00109	0.12604	0.00039	0.00527	0.00004	0.04532	0.00156	0.00046	0.00005	0.3	0.01	57.4	5.06	0.4297
P	01H	1200.0	0.8	1.16304	0.00225	0.58978	0.00120	0.02303	0.00012	0.21718	0.00155	0.00142	0.00006	0.3	2.2E-03	70.8	5.54	0.1295
	01I	1700.0	2.4	3.72463	0.00569	0.10903	0.00035	0.00654	0.00006	0.08599	0.00124	0.01265	0.00015	0.1	2.1E-03	0.5	0.70	1.6816

Weighted Mean Age			5.41210 ±0.11978
Integrated			4.70643 ±0.23166
Plateau	**Steps**	B-H	4.93964 ±0.32870
Isochron			5.56306 ±0.00341

Sample: MB07-122 **Lab #**: 58613 **J**: 2.17E-03 ±1.36E-06 **Disc.**: 1.001 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	950.0	0.6	0.94028	0.00189	0.02378	0.00015	0.00493	0.00006	0.00531	0.00007	0.00258	0.00007	0.5	7.4E-03	19.0	29.57	3.6123
01B	1050.0	0.2	0.23805	0.00101	0.00617	0.00008	0.00065	0.00003	0.00323	0.00006	0.00073	0.00006	0.2	4.9E-03	10.3	15.80	12.1219
01C	1120.0	0.3	0.44071	0.00117	0.06114	0.00028	0.00293	0.00005	0.03933	0.00018	0.00120	0.00005	0.2	1.1E-03	22.7	6.51	1.0446
01D	1130.0	5.6808E-02	0.08713	0.00050	0.05177	0.00024	0.00200	0.00004	0.03234	0.00014	0.00020	0.00005	0.2	1.1E-03	47.1	3.15	1.0347
01E	1145.0	7.0322E-02	0.10786	0.00072	0.06837	0.00022	0.00257	0.00004	0.04073	0.00016	0.00018	0.00004	0.2	9.3E-04	64.4	4.03	0.7215
01F	1150.0	4.4469E-02	0.06820	0.00045	0.04932	0.00021	0.00176	0.00005	0.02916	0.00016	0.00019	0.00004	0.2	1.3E-03	31.8	1.75	1.0543
01G	1160.0	0.1	0.18637	0.00092	0.14057	0.00041	0.00469	0.00006	0.07985	0.00031	0.00045	0.00005	0.2	9.4E-04	44.5	2.34	0.4215
01H	1200.0	0.4	0.64674	0.00158	0.86726	0.00181	0.02869	0.00017	0.19713	0.00150	0.00131	0.00006	0.5	3.8E-03	50.7	1.50	0.0841
01I	1700.0	2.9	4.48082	0.00657	0.12051	0.00034	0.00643	0.00006	0.16816	0.00143	0.01244	0.00018	7.8057E-02	7.0E-04	19.4	28.49	1.7730

Weighted Mean Age 1.67752 ±0.08108

Sample: MB07-122 **Lab #**: 58613 **J**: 2.17E-03 ±1.36E-06 **Disc.**: 1.001 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
Integrated													4.89855 ±0.20338				
Plateau											**Steps**						
Isochron													1.22423 ±0.00077				

Sample: MB07-078 **Lab #**: 58622 **J**: 2.21E-03 ±6.27E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	1.6	2.45588	0.00449	0.77089	0.00168	0.20031	0.00042	0.02589	0.00017	0.00680	0.00015	3.7	0.03	18.4	2.38	0.2399
P	01B	625.0	0.1	0.19653	0.00070	0.13927	0.00039	0.08094	0.00034	0.02742	0.00013	0.00050	0.00005	0.6	3.4E-03	30.3	1.73	0.4317
P	01C	700.0	9.1977E-02	0.14194	0.00092	0.13985	0.00045	0.01699	0.00011	0.05758	0.00025	0.00033	0.00005	0.3	1.6E-03	44.1	1.81	0.3976
P	01D	750.0	6.8802E-02	0.10618	0.00075	0.11233	0.00032	0.00359	0.00007	0.03750	0.00018	0.00017	0.00004	0.4	2.0E-03	62.6	2.40	0.4511
P	01E	800.0	5.6834E-02	0.08771	0.00069	0.08172	0.00032	0.00230	0.00005	0.03238	0.00018	0.00014	0.00004	0.3	2.1E-03	66.1	2.88	0.6179
P	01F	875.0	5.1282E-02	0.07914	0.00043	0.06912	0.00026	0.00191	0.00004	0.02707	0.00014	0.00026	0.00004	0.3	2.0E-03	14.5	0.68	0.7771
	01G	975.0	7.3373E-02	0.11323	0.00068	0.05644	0.00030	0.00170	0.00004	0.02968	0.00018	0.00018	0.00005	0.2	1.9E-03	60.7	4.93	0.9741
	01H	1075.0	0.1	0.22898	0.00097	0.06219	0.00030	0.00199	0.00004	0.03683	0.00018	0.00078	0.00005	0.2	1.4E-03	4.5	0.67	1.0621
	01I	1250.0	0.9	1.41563	0.00222	0.19837	0.00050	0.01112	0.00009	0.35793	0.00139	0.00534	0.00013	6.7618E-02	3.1E-04	-2.9	-0.83	0.7827
	01J	1700.0	2.2	3.34958	0.00490	0.02412	0.00015	0.00359	0.00008	0.12338	0.00144	0.01173	0.00014	2.3614E-02	3.2E-04	-2.2	-12.76	7.3711
Weighted Mean Age														2.07322 ±0.15469				
Integrated														1.65425 ±0.19961				
Plateau												**Steps**	A-F	2.22524 ±0.16541				
Isochron														2.30273 ±0.00654				

Sample: MB07-129 **Lab #**: 58626 **J**: 2.23E-03 ±5.65E-06 **Disc.**: 1.001 ±0.0010

Material: Groundmass concentrate **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	550.0	3.3	5.14227	0.00741	0.04788	0.00026	0.43957	0.00079	0.00286	0.00006	0.01702	0.00021	2.0	0.04	2.5	10.79	5.1907
P	01B	625.0	0.2	0.30182	0.00104	0.25682	0.00060	0.33459	0.00075	0.00532	0.00007	0.00059	0.00006	5.7	0.08	45.7	2.19	0.2785
P	01C	700.0	0.3	0.44805	0.00135	0.66199	0.00137	0.27450	0.00066	0.01227	0.00012	0.00038	0.00006	6.4	0.06	76.2	2.10	0.1030
P	01D	750.0	0.4	0.58143	0.00139	0.99545	0.00176	0.16602	0.00045	0.01498	0.00015	0.00027	0.00007	7.9	0.08	86.6	2.06	0.0890
P	01E	800.0	0.4	0.59547	0.00152	1.01186	0.00200	0.12292	0.00029	0.01577	0.00015	0.00027	0.00006	7.6	0.08	86.6	2.07	0.0768
P	01F	875.0	0.3	0.51287	0.00125	0.83939	0.00158	0.07768	0.00018	0.01565	0.00013	0.00029	0.00006	6.4	0.06	83.4	2.07	0.0808
P	01G	975.0	0.3	0.41786	0.00121	0.55907	0.00142	0.04979	0.00018	0.01554	0.00012	0.00048	0.00007	4.3	0.04	66.1	2.01	0.1421
P	01H	1075.0	0.3	0.40966	0.00114	0.49403	0.00132	0.02288	0.00013	0.04144	0.00018	0.00060	0.00007	1.4	7.1E-03	59.6	2.01	0.1627
P	01I	1250.0	0.4	0.65756	0.00160	0.31397	0.00100	0.01929	0.00013	0.04806	0.00151	0.00184	0.00008	0.8	0.02	19.4	1.66	0.2939
P	01J	1700.0	2.6	4.00940	0.00655	0.69685	0.00136	0.05728	0.00029	0.05006	0.00121	0.01207	0.00016	1.7	0.04	11.3	2.65	0.2843

Weighted Mean Age			2.07199 ±0.03907
Integrated			2.18489 ±0.06641
Plateau	**Steps**	A-J	2.06102 ±0.03943
Isochron			2.05051 ±0.00521

Sample: MB07-122 **Lab #**: 57733 **J**: 7.54E-04 ±1.56E-06 **Disc.**[1]: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

	N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01A	950.0	0.1	0.10066	0.00041	0.00199	0.00006	0.00011	0.00002	0.00072	0.00003	0.00039	0.00004	0.5	0.03	-13.8	-9.67	8.0406
P	01B	1050.0	3.6590E-02	0.03296	0.00027	0.00057	0.00003	0.00003	0.00001	0.00057	0.00002	0.00010	0.00002	0.2	0.01	7.7	6.13	17.5770
P	01C	1120.0	0.2	0.14177	0.00056	0.04020	0.00021	0.00053	0.00003	0.03969	0.00017	0.00048	0.00004	0.2	1.3E-03	5.5	0.27	0.4100
P	01D	1130.0	9.1444E-02	0.08238	0.00035	0.06717	0.00024	0.00083	0.00003	0.03071	0.00169	0.00013	0.00003	0.4	0.02	61.3	1.04	0.1984
P	01E	1145.0	0.2	0.18192	0.00064	0.16431	0.00043	0.00216	0.00004	0.06551	0.00115	0.00029	0.00003	0.5	8.6E-03	60.7	0.93	0.0858
	01F	1150.0	7.0424E-02	0.06345	0.00034	0.12177	0.00034	0.00146	0.00003	0.04858	0.00146	0.00016	0.00003	0.5	0.01	41.7	0.30	0.1162
	01G	1160.0	1.1485E-02	0.01035	0.00022	0.06587	0.00018	0.00091	0.00002	0.02718	0.00113	0.00003	0.00003	0.5	0.02	81.9	0.18	0.1780
	01H	1200.0	9.1086E-03	0.00821	0.00023	0.02658	0.00011	0.00038	0.00002	0.02626	0.00009	0.00009	0.00003	0.2	1.1E-03	-143.7	-0.61	0.4496
	01I	1700.0	1.4	1.29661	0.00186	0.00548	0.00008	0.00091	0.00004	0.00535	0.00008	0.00441	0.00009	0.2	4.3E-03	-0.4	-1.23	6.9408

Sample: MB07-122 **Lab #**: 57733 **J**: 7.54E-04 ±1.56E-06 **Disc.**[1]: 1.004 ±0.0010

Material: Kaersutite **IGSN**: **Spectrometer**: map

N	Temp (C)	^{40}Ar (10^{-16} mol)	^{40}Ar	± 1σ	^{39}Ar	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
Weighted Mean Age													0.64252	±0.06002			
Integrated													0.49076	±0.10935			
Plateau											**Steps**	A-E	0.88732	±0.17856			
Isochron													0.64008	±0.00135			

Average blanks for Furnace: (3.398, 0.013, 0.002, 0.025, 0.013), x10^{-18} for Ar^{40}, Ar^{39}, Ar^{38}, Ar^{37}, Ar^{36} respectively

Disc.[1]: 1 amu discrimination, P: plateau step

Constants used

Atmospheric argon ratios

$(^{40}Ar/^{36}Ar)_A$	295.5 ±0.5	Nier (1950)
$(^{40}Ar/^{38}Ar)_A$	1575.0 ±2.0	Nier (1950)

Interferring isotope production ratios

$(^{40}Ar/^{39}Ar)_K$	0.0 ±0.0004
$(^{38}Ar/^{39}Ar)_K$	0.0108 ±0.0
$(^{37}Ar/^{39}Ar)_K$	0.0 ±0.0
$(^{39}Ar/^{37}Ar)_{Ca}$	0.0007 ±5.0000E-05
$(^{38}Ar/^{37}Ar)_{Ca}$	0.0001 ±0.0
$(^{36}Ar/^{37}Ar)_{Ca}$	0.0003 ±2.0000E-05

Decay constants

^{40}K λε	5.4630E-10 ±9.3000E-13 a^{-1}
^{40}K λβ	0.0 ±1.6000E-13 a^{-1}
^{39}Ar	7.0680E-06 ±0.0 a^{-1}
^{37}Ar	0.0198 ±0.0 a^{-1}

APPENDIX F

$^{40}Ar/^{39}Ar$ ARGUS FUSION DATA TABLE

Table F.1. Argus Fusion $^{40}Ar/^{39}Ar$ Data

Sample: MB06-727 **Lab #**: 61604 **J**: 4.83E-03 ±1.16E-06 **IC**: 1.068 ±0.0008

Material: Sanidine **IGSN**: **Spectrometer**: jan

	N	Power (W)	^{40}Ar (10^{-17} mol)	^{40}Ar (10^{3} fA)	± 1σ	^{39}Ar (10^{3} fA)	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ (10^{-2} fA)	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
X	01	3.0	465.469	0.10075	0.17029	0.07416	0.03161	6.92494	0.02486	1.99272	0.02440	0.02128	0.18648	2.28	0.028	94.8	11.35	0.0685
	02	3.0	575.332	0.12453	0.05540	0.09256	0.02767	1.82375	0.02695	0.34851	0.02552	0.00480	0.07686	16.30	1.194	98.5	11.67	0.0225
	03	3.0	277.118	0.05998	0.05012	0.04491	0.02221	0.64804	0.02260	0.40962	0.02556	0.00126	0.03916	6.73	0.420	99.2	11.68	0.0256
	05	3.0	1346.260	0.29140	0.08324	0.21711	0.03654	4.65638	0.02316	1.67862	0.02492	0.01154	0.10787	7.93	0.118	98.6	11.66	0.0135
	06	3.0	1063.502	0.23020	0.07580	0.16838	0.03303	3.72871	0.02820	1.13898	0.02380	0.02033	0.11597	9.06	0.189	97.2	11.70	0.0185
	07	3.0	739.193	0.16000	0.06090	0.11932	0.03169	2.24224	0.02852	0.55999	0.02597	0.00281	0.08263	13.06	0.606	99.1	11.71	0.0188
X	08	3.0	339.989	0.07359	0.23138	0.05594	0.03366	8.23166	0.02513	0.64845	0.02306	0.01572	0.23047	5.29	0.188	94.2	10.92	0.1132
	09	3.0	465.748	0.10081	0.05741	0.07482	0.02561	1.35452	0.02773	0.68517	0.02438	0.00486	0.07874	6.69	0.238	98.5	11.69	0.0285
X	10	3.0	89.768	0.01943	0.04385	0.01392	0.01980	0.06974	0.02485	0.39134	0.02515	0.00368	0.04813	2.17	0.140	95.2	11.70	0.0960
	11	3.5	135.614	0.02935	0.03841	0.02173	0.02076	0.21172	0.02965	0.07801	0.02510	0.00117	0.04160	16.99	5.467	98.4	11.71	0.0537
	12	3.5	260.036	0.05628	0.04565	0.04170	0.02167	0.50104	0.02384	0.33788	0.02697	0.00260	0.04476	7.53	0.601	98.4	11.71	0.0304
	13	3.5	122.854	0.02659	0.03784	0.01967	0.01709	0.18056	0.02691	0.33070	0.02442	0.00071	0.04331	3.63	0.268	99.4	11.84	0.0609
X	14	3.5	59.332	0.01284	0.03933	0.00940	0.01505	0.06539	0.02410	0.09575	0.02447	0.00011	0.04215	5.99	1.530	99.6	11.99	0.1245
	15	3.5	343.212	0.07429	0.04411	0.05511	0.02440	0.68208	0.02442	0.29892	0.02345	0.00100	0.04393	11.24	0.882	99.3	11.79	0.0226
X	16	3.5	31.247	0.00676	0.03892	0.00486	0.01543	0.00866	0.02334	0.04435	0.02338	0.00066	0.04161	6.68	3.521	96.9	11.88	0.2377
	17	3.5	330.427	0.07152	0.04001	0.05338	0.02109	0.59551	0.02555	0.55948	0.02457	0.00169	0.04364	5.81	0.255	99.2	11.71	0.0229
	22	3.0	544.605	0.11788	0.04961	0.08684	0.02396	1.61016	0.02583	1.85746	0.02581	0.01090	0.07898	2.84	0.040	97.8	11.69	0.0244
	23	3.0	277.034	0.05996	0.03976	0.04425	0.02069	0.53281	0.02274	0.93009	0.02390	0.00440	0.04842	2.89	0.074	98.3	11.74	0.0302
	24	3.0	322.201	0.06974	0.04448	0.05149	0.02122	0.67399	0.02232	0.06779	0.02354	0.00277	0.05064	46.17	16.032	98.3	11.73	0.0272
	25	3.0	264.231	0.05719	0.05552	0.04259	0.02165	2.07364	0.02539	0.93037	0.02350	0.00499	0.09614	2.78	0.070	98.1	11.60	0.0601
	26	3.0	424.140	0.09181	0.04860	0.06715	0.02072	1.61076	0.02480	2.04939	0.02429	0.01209	0.09044	1.99	0.024	97.1	11.69	0.0358
	27	3.0	344.789	0.07463	0.04466	0.05505	0.02065	0.70982	0.02310	0.06828	0.02370	0.00270	0.04771	48.98	16.999	98.4	11.75	0.0241
	28	3.0	374.957	0.08116	0.04747	0.05996	0.02211	0.78099	0.02359	0.91262	0.02313	0.00546	0.05000	3.99	0.101	98.2	11.71	0.0233
	29	3.0	1254.233	0.27148	0.06521	0.20284	0.03233	3.48305	0.02705	0.90019	0.02241	0.00442	0.08334	13.68	0.340	99.2	11.69	0.0112
	30	3.0	1627.627	0.35230	0.06608	0.26185	0.03125	3.35489	0.02616	0.85172	0.02388	0.00708	0.05552	18.66	0.523	99.0	11.73	0.0061
	31	3.0	1240.259	0.26845	0.06210	0.19963	0.03449	2.93932	0.02509	0.33484	0.02440	0.00660	0.07506	36.18	2.636	98.8	11.70	0.0104
	32	3.0	288.225	0.06239	0.04573	0.04632	0.01939	0.60320	0.02405	1.07045	0.02436	0.00322	0.04639	2.62	0.060	99.0	11.75	0.0280
	33	3.0	528.374	0.11437	0.04636	0.08514	0.02437	1.08258	0.02445	0.65052	0.02309	0.00153	0.04416	7.93	0.282	99.4	11.76	0.0148
Weighted Mean Age																	11.72	±0.005

Sample: MB06-734 **Lab #**: 61605 **J**: 4.83E-03 ±1.17E-06 **IC**: 1.067 ±0.0011

Material: Sanidine **IGSN**: **Spectrometer**: jan

	N	Power (W)	^{40}Ar (10^{-17} mol)	^{40}Ar (10^{3} fA)	± 1σ	^{39}Ar (10^{3} fA)	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ (10^{-2} fA)	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
X	01	3.0	1058.224	0.22905	0.05613	0.17001	0.03216	2.18828	0.02424	0.52183	0.02177	0.02430	0.05986	19.75	0.824	96.4	11.45	0.0099
	02	3.0	1129.736	0.24453	0.05122	0.18155	0.03167	2.30448	0.02624	0.73745	0.02365	0.01325	0.05108	14.92	0.478	98.0	11.63	0.0080
	03	3.0	1557.892	0.33721	0.06449	0.25095	0.03485	3.20611	0.02536	0.44219	0.02284	0.01770	0.05985	34.39	1.776	97.9	11.60	0.0068
X	04	3.0	1656.037	0.35845	0.06461	0.22837	0.02921	3.06708	0.02448	2.74709	0.02289	0.18866	0.14621	5.03	0.042	84.5	11.68	0.0169
	05	3.0	4821.746	1.04367	0.10042	0.77851	0.06487	9.68653	0.02712	1.68863	0.02470	0.02053	0.06126	27.91	0.408	98.9	11.69	0.0026
	06	3.0	1845.854	0.39954	0.06464	0.29628	0.04231	3.77622	0.02658	1.68178	0.02342	0.02596	0.06988	10.66	0.149	97.8	11.62	0.0067
	07	3.0	1541.219	0.33360	0.05885	0.24720	0.03697	3.19331	0.02460	3.12987	0.02408	0.03156	0.07359	4.78	0.037	97.2	11.56	0.0082
	08	3.0	1379.740	0.29865	0.06223	0.22175	0.03616	2.80223	0.02472	0.49774	0.02502	0.01089	0.05230	26.96	1.355	98.4	11.68	0.0069
	09	3.0	1741.969	0.37705	0.06717	0.27897	0.04030	3.68155	0.02689	2.12364	0.02441	0.02295	0.06741	7.94	0.091	98.0	11.67	0.0069
	10	3.0	4912.619	1.06334	0.11137	0.78901	0.06647	10.03399	0.02470	1.91715	0.02388	0.04949	0.08583	24.89	0.310	98.1	11.65	0.0033
	11	3.0	3517.962	0.76146	0.08715	0.54731	0.05391	7.39511	0.02419	2.73200	0.02522	0.12043	0.12308	12.11	0.112	95.0	11.65	0.0061
X	12	3.0	1607.024	0.34784	0.06408	0.25583	0.03494	3.27796	0.02583	0.52232	0.02363	0.02047	0.06453	29.60	1.339	97.8	11.71	0.0071
X	13	3.0	2785.774	0.60298	0.08431	0.33437	0.04642	4.51473	0.02276	5.86600	0.02388	0.55160	0.22558	3.44	0.014	73.2	11.63	0.0177
	14	3.0	5318.776	1.15125	0.10990	0.86200	0.07287	10.99170	0.02546	4.82051	0.02257	0.03784	0.07298	10.80	0.051	98.7	11.62	0.0027
	15	3.0	2131.183	0.46130	0.06737	0.33754	0.03897	4.34924	0.02573	0.69899	0.02462	0.03819	0.08078	29.16	1.027	97.1	11.69	0.0066
	16	3.0	1494.954	0.32358	0.06471	0.24018	0.03646	3.13412	0.02400	2.02981	0.02252	0.01559	0.06015	7.14	0.079	98.4	11.68	0.0072
	17	3.0	519.109	0.11236	0.05325	0.08290	0.02472	1.12059	0.02553	1.56093	0.02506	0.01028	0.05322	3.21	0.051	97.6	11.66	0.0180
	18	3.0	3110.688	0.67331	0.07878	0.50027	0.05207	6.37294	0.02494	1.19077	0.02402	0.02215	0.06787	25.35	0.512	98.5	11.69	0.0040
	19	3.0	2526.233	0.54680	0.07345	0.40344	0.04777	5.18014	0.02438	3.61711	0.02489	0.04855	0.07828	6.73	0.046	97.2	11.61	0.0055
	20	3.0	2635.724	0.57050	0.07936	0.42445	0.04811	5.37589	0.02546	0.75605	0.02327	0.01968	0.06026	33.86	1.042	98.5	11.66	0.0043
	21	3.0	1376.117	0.29786	0.06586	0.22187	0.03536	2.92043	0.02312	0.75709	0.02448	0.01984	0.06159	17.67	0.571	97.6	11.55	0.0079
	22	3.0	1888.238	0.40871	0.06812	0.30662	0.04116	3.83095	0.02505	1.90687	0.02387	0.01575	0.05552	9.69	0.121	98.6	11.58	0.0054
	23	3.0	4013.212	0.86866	0.09859	0.60649	0.05935	7.88542	0.02398	1.95838	0.02364	0.21785	0.15766	18.66	0.225	92.2	11.63	0.0070
	24	3.0	2053.364	0.44445	0.06978	0.32760	0.04340	4.17778	0.02574	4.03832	0.02429	0.03412	0.06530	4.89	0.029	97.8	11.69	0.0058
	25	3.0	3483.806	0.75407	0.07649	0.55909	0.05582	7.00646	0.02595	1.34295	0.02437	0.03370	0.07571	25.07	0.455	98.2	11.67	0.0039

Weighted Mean Age 11.65 ±0.003

Sample: MB06-704 **Lab #**: 61603 **J**: 4.83E-03 ±1.11E-06 **IC**: 1.068 ±0.0007

Material: Sanidine **IGSN**: **Spectrometer**: jan

	N	Power (W)	^{40}Ar (10^{-17} mol)	^{40}Ar (10^{3} fA)	± 1σ	^{39}Ar (10^{3} fA)	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ (10^{-2} fA)	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
X	01	3.0	383.385	0.08298	0.06894	0.06556	0.04480	0.83503	0.03934	0.12452	0.03740	-0.01180	0.06510	32.50	9.763	103.7	11.55	0.0287
X	02	3.0	454.576	0.09839	0.04275	0.07736	0.02591	0.98347	0.03659	0.20022	0.03751	-0.01182	0.04485	23.85	4.468	103.0	11.54	0.0165
X	03	3.0	822.661	0.17807	0.06019	0.13711	0.03221	1.68995	0.03428	0.73026	0.03046	-0.00915	0.05317	11.59	0.483	101.2	11.57	0.0112
X	04	3.0	774.214	0.16758	0.05335	0.12937	0.02922	1.58349	0.03361	0.51490	0.03039	-0.01066	0.04994	15.50	0.915	101.5	11.57	0.0111
	05	3.0	805.827	0.17442	0.05631	0.13128	0.02635	1.63822	0.02756	0.34943	0.02479	0.00298	0.04027	23.18	1.644	99.0	11.58	0.0092
	06	3.0	626.825	0.13568	0.04708	0.10211	0.02429	1.32105	0.02646	0.40420	0.02387	0.00220	0.03697	15.58	0.920	99.1	11.59	0.0107
	07	3.0	724.271	0.15677	0.05128	0.11799	0.02652	1.52660	0.02638	0.39343	0.02402	0.00296	0.03540	18.49	1.129	99.0	11.58	0.0091
	08	3.0	599.148	0.12969	0.04921	0.09766	0.02599	1.28323	0.02396	0.30243	0.02381	0.00272	0.03596	19.90	1.567	98.9	11.56	0.0111
	09	3.0	688.329	0.14899	0.04963	0.11243	0.02607	1.44956	0.02536	0.38017	0.02319	0.00159	0.03576	18.23	1.112	99.2	11.58	0.0096
	10	3.0	564.453	0.12218	0.05477	0.09222	0.02427	1.19930	0.02422	0.31677	0.02365	0.00263	0.04145	17.91	1.338	98.9	11.54	0.0132
	11	3.0	671.918	0.14544	0.05343	0.10971	0.03183	1.44932	0.02592	0.32386	0.02533	0.00308	0.04082	20.84	1.630	98.9	11.54	0.0112
	12	3.0	515.619	0.11161	0.05345	0.08420	0.02439	1.07491	0.02376	0.31206	0.02366	0.00360	0.04211	16.60	1.259	98.6	11.51	0.0146
	13	3.0	849.843	0.18395	0.05405	0.13797	0.02854	1.75433	0.02761	0.41495	0.02459	0.00370	0.04142	20.45	1.212	99.0	11.61	0.0089
	14	3.0	709.251	0.15352	0.05175	0.11550	0.02465	1.46141	0.02812	0.44649	0.02323	0.00366	0.03781	15.91	0.828	98.9	11.57	0.0098
	15	3.0	881.895	0.19089	0.05799	0.14346	0.02916	1.77339	0.02599	0.43220	0.02418	0.00431	0.04127	20.40	1.141	98.9	11.58	0.0087
	16	3.0	1199.197	0.25957	0.06004	0.19554	0.03016	2.46454	0.02365	0.53284	0.02294	0.00517	0.03856	22.55	0.971	98.9	11.56	0.0061
	17	3.0	551.429	0.11936	0.04653	0.08958	0.02465	1.14682	0.02550	0.64272	0.02407	0.00342	0.04126	8.56	0.321	98.9	11.60	0.0133
	18	3.0	446.789	0.09671	0.04556	0.07281	0.02523	0.93271	0.02706	0.27973	0.02464	0.00215	0.03557	15.99	1.409	98.9	11.56	0.0145
	19	3.0	663.027	0.14351	0.05290	0.10726	0.02775	1.38928	0.02592	0.33338	0.02483	0.00408	0.04437	19.76	1.472	98.7	11.62	0.0120
	20	3.0	709.492	0.15357	0.05152	0.11487	0.02729	1.46611	0.02583	0.27508	0.02396	0.00434	0.04564	25.64	2.233	98.7	11.61	0.0115
X	21	3.0	46.201	0.01000	0.04283	0.00743	0.01719	0.03257	0.02390	0.01834	0.02580	0.00126	0.04526	24.82	34.913	95.8	11.34	0.1692
	22	3.0	244.034	0.05282	0.04171	0.03989	0.02059	0.47840	0.02417	0.10490	0.02503	0.00073	0.04565	23.29	5.556	99.1	11.55	0.0319
X	23	3.0	35.776	0.00774	0.03883	0.00575	0.01516	0.01209	0.02459	-0.02054	0.02504	0.00091	0.04315	-17.14	20.899	95.7	11.35	0.2073
	24	3.0	521.772	0.11294	0.04454	0.08446	0.02528	1.02018	0.02398	0.20754	0.02379	0.00415	0.04907	24.91	2.855	98.4	11.59	0.0162
X	25	3.0	126.368	0.02735	0.03901	0.02049	0.01875	0.23495	0.02639	0.03766	0.02390	-0.00035	0.04410	33.28	21.119	99.9	11.73	0.0597
X	26	3.0	48.051	0.01040	0.03679	0.00766	0.01703	0.05373	0.02419	0.02573	0.02333	0.00022	0.04342	18.21	16.514	98.9	11.82	0.1562
	27	3.0	248.807	0.05385	0.03883	0.04066	0.02142	0.55723	0.02501	0.15187	0.02309	0.00053	0.04035	16.38	2.490	99.3	11.57	0.0280
X	28	3.0	64.442	0.01395	0.03923	0.01048	0.01755	0.14935	0.02214	0.04529	0.02462	-0.00014	0.04367	14.15	7.691	99.9	11.70	0.1155
	29	3.0	348.361	0.07540	0.04337	0.05656	0.02027	0.61664	0.02387	0.12163	0.02386	0.00177	0.04069	28.39	5.568	98.8	11.59	0.0204
Weighted Mean Age																	11.58	±0.004

Sample: MB06-741 **Lab #**: 61606 **J**: 4.83E-03 ±1.16E-06 **IC**[1]: 1.067 ±0.0011

Material: Sanidine **IGSN**: **Spectrometer**: jan

	N	Power (W)	^{40}Ar (10^{-17} mol)	^{40}Ar (10^{3} fA)	± 1σ	^{39}Ar (10^{3} fA)	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ (10^{-2} fA)	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	02	3.0	664.538	0.14384	0.05187	0.12933	0.02728	1.66054	0.02647	0.21378	0.02436	0.00127	0.04374	36.42	4.149	99.1	9.71	0.0098
	03	3.0	2586.506	0.55985	0.08344	0.50082	0.05651	6.41509	0.02555	1.03945	0.02542	0.01464	0.05762	29.00	0.709	98.6	9.71	0.0036
	04	3.0	1336.893	0.28937	0.06080	0.25961	0.03542	3.25347	0.02449	2.11645	0.02327	0.00681	0.04933	7.38	0.081	99.1	9.73	0.0056
	05	3.0	993.502	0.21504	0.05742	0.18868	0.03341	2.44293	0.02489	1.21803	0.02317	0.02147	0.05339	9.32	0.177	96.7	9.71	0.0081
	06	3.0	593.220	0.12840	0.05046	0.11502	0.02516	1.47155	0.02657	0.28416	0.02349	0.00253	0.04209	24.34	2.013	98.8	9.72	0.0106
	07	3.0	554.657	0.12006	0.05000	0.10768	0.02774	1.35962	0.02633	0.31023	0.02278	0.00231	0.04287	20.87	1.532	98.9	9.71	0.0115
	09	3.0	1202.331	0.26024	0.06073	0.23316	0.03535	3.07205	0.02511	1.59083	0.02371	0.00894	0.05317	8.81	0.131	98.7	9.70	0.0066
X	10	3.0	952.007	0.20606	0.05329	0.18403	0.03536	2.39471	0.02626	0.28813	0.02594	0.00353	0.04455	38.36	3.453	98.9	9.75	0.0071
	11	3.0	947.922	0.20518	0.05857	0.18390	0.03029	2.36892	0.02682	0.40270	0.02507	0.00346	0.04353	27.42	1.707	98.9	9.72	0.0070
	12	3.0	559.244	0.12105	0.04999	0.10863	0.02709	1.43771	0.02473	0.41120	0.02583	0.00238	0.04238	15.86	0.996	98.9	9.71	0.0113
	13	3.0	729.552	0.15791	0.04905	0.13930	0.03151	1.92325	0.02558	0.42321	0.02448	0.01297	0.05331	19.76	1.143	97.0	9.69	0.0107
	14	3.0	842.341	0.18232	0.06020	0.16307	0.03327	2.21327	0.02507	0.42669	0.02318	0.00432	0.05143	22.93	1.246	98.7	9.73	0.0091
	15	3.0	608.367	0.13168	0.04717	0.11743	0.02879	1.59669	0.02666	0.40688	0.02382	0.00484	0.04217	17.31	1.014	98.4	9.72	0.0103
X	16	3.0	883.728	0.19128	0.05070	0.17127	0.02911	2.18428	0.02594	0.34886	0.02395	0.00090	0.04292	29.44	2.021	99.3	9.77	0.0073
	17	3.0	1031.538	0.22328	0.05503	0.19716	0.03279	2.56847	0.02368	0.36487	0.02352	0.01444	0.05323	32.39	2.088	97.5	9.73	0.0077
	18	3.0	450.431	0.09750	0.04261	0.08777	0.02523	1.16475	0.02228	0.24009	0.02323	0.00054	0.04390	21.91	2.120	99.3	9.72	0.0141
	19	3.0	639.930	0.13851	0.05087	0.11868	0.02898	1.63177	0.02452	0.20598	0.02170	0.02228	0.06437	34.52	3.636	94.7	9.73	0.0148
	20	3.0	666.668	0.14430	0.04952	0.12844	0.02611	1.78472	0.02658	0.89514	0.02407	0.00768	0.04722	8.59	0.231	98.1	9.71	0.0104
	21	3.0	730.061	0.15802	0.05029	0.14104	0.03034	1.81201	0.02551	0.23506	0.02279	0.00545	0.04683	35.93	3.484	98.4	9.71	0.0095
	22	3.0	307.816	0.06663	0.04244	0.05981	0.02338	0.72979	0.02332	0.40164	0.02361	0.00161	0.03970	8.92	0.524	99.0	9.71	0.0189
	23	3.0	583.228	0.12624	0.04916	0.11365	0.02691	1.45177	0.02548	0.63052	0.02444	0.00135	0.04418	10.79	0.418	99.3	9.72	0.0111
	24	3.0	768.726	0.16639	0.04955	0.14883	0.02954	1.86609	0.02594	1.20985	0.02527	0.00611	0.04509	7.36	0.154	98.7	9.72	0.0087
Weighted Mean Age																	9.72	±0.003

Average blanks for CO_2: (1.103, 0.003, 0.001, 0.011, 0.005), x10^{-18} for Ar^{40}, Ar^{39}, Ar^{38}, Ar^{37}, Ar^{36} respectively

IC Factor[1]: H1/CDD intercalibration

Constants used

Atmospheric argon ratios

$(^{40}Ar/^{36}Ar)_A$	295.5 ±0.5	Nier (1950)
$(^{40}Ar/^{38}Ar)_A$	1575.0 ±2.0	Nier (1950)

Interferring isotope production ratios

$(^{40}Ar/^{39}Ar)_K$	0.0081 ±6.8000E-05
$(^{38}Ar/^{39}Ar)_K$	0.0130 ±0.0
$(^{37}Ar/^{39}Ar)_K$	0.0 ±0.0
$(^{39}Ar/^{37}Ar)_{Ca}$	0.0007 ±7.8000E-06
$(^{38}Ar/^{37}Ar)_{Ca}$	4.0000E-05 ±2.0000E-06
$(^{36}Ar/^{37}Ar)_{Ca}$	0.0003 ±2.0000E-07
Decay constants	
^{40}K $\lambda\varepsilon$	5.4630E-10 ±9.3000E-13 a^{-1}
^{40}K $\lambda\beta$	0.0 ±1.6000E-13 a^{-1}
^{39}Ar	7.0680E-06 ±0.0 a^{-1}
^{37}Ar	0.0198 ±0.0 a^{-1}

APPENDIX G

$^{40}Ar/^{39}Ar$ ARGUS STEP HEAT DATA TABLE

Table G.1. Argus Step Heat $^{40}Ar/^{39}Ar$ Data

Sample: MB06-697 **Lab #**: 61602 **J**: 4.80E-03 ±3.18E-06 **IC**: 1.023 ±0.0012

Material: Groundmass concentrate **IGSN**: **Spectrometer**: obama

N	Power (W)	^{40}Ar (10^{-17} mol)	^{40}Ar (10^{3} fA)	± 1σ	^{39}Ar (10^{3} fA)	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ (10^{-2} fA)	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	17.5	76.8	0.16619	0.05335	0.02086	0.02057	5.48588	0.02373	1.17585	0.04585	0.45094	0.21101	1.8	0.07	20.1	14.02	0.2619
01B	18.0	164.3	0.35556	0.07798	0.04698	0.02396	6.13873	0.02599	2.46071	0.04907	0.90114	0.36935	1.9	0.04	25.3	16.76	0.2028
01C	18.5	230.6	0.49920	0.07585	0.11261	0.03138	9.14228	0.02399	6.47795	0.04561	1.03747	0.36899	1.8	0.01	39.0	15.11	0.0846
01D	19.0	330.7	0.71578	0.09581	0.34705	0.05383	19.04408	0.02521	12.69471	0.04531	0.70649	0.33946	2.8	9.9E-03	71.2	12.85	0.0254
01E	19.5	695.0	1.50423	0.10891	1.02067	0.07880	38.62945	0.02519	28.95849	0.04517	0.34350	0.21070	3.6	5.6E-03	93.6	12.06	0.0055
01F	20.0	781.7	1.69200	0.12781	1.20506	0.08967	39.45176	0.02643	34.32880	0.04638	0.24064	0.19083	3.5	4.8E-03	96.1	11.81	0.0043
01G	20.5	557.1	1.20591	0.11140	0.86108	0.07783	28.75724	0.02344	30.82931	0.04300	0.19031	0.15787	2.8	3.9E-03	95.9	11.75	0.0050
01H	22.0	753.3	1.63060	0.13024	1.16543	0.09472	29.58577	0.02495	69.22250	0.04607	0.33972	0.22019	1.7	1.1E-03	95.0	11.64	0.0051
01I	24.0	522.0	1.12988	0.10111	0.79123	0.06880	14.63025	0.02341	188.91116	0.05549	0.54369	0.24337	0.4	1.3E-04	92.1	11.51	0.0081
01J	26.0	171.8	0.37196	0.07541	0.24475	0.03571	5.66380	0.02278	80.63608	0.04792	0.26898	0.17928	0.3	1.9E-04	87.0	11.58	0.0192
01K	30.0	162.2	0.35099	0.07090	0.22578	0.04255	6.20103	0.02381	57.79691	0.04502	0.24686	0.16481	0.4	3.2E-04	85.5	11.63	0.0192

Weighted Mean Age 11.78712 ±0.00815

Integrated 11.92329 ±0.02235

Plateau **Steps**

Isochron 11.69755 ±0.00776

Sample: MB06-547 **Lab #**: 61610 **J**: 4.81E-03 ±1.17E-06 **IC**: 1.023 ±0.0013

Material: Plagioclase **IGSN**: **Spectrometer**: obama

	N	Power (W)	^{40}Ar (10^{-17} mol)	^{40}Ar (10^{3} fA)	± 1σ	^{39}Ar (10^{3} fA)	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ (10^{-2} fA)	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01C	19.5	263.3	0.56987	0.08613	0.01875	0.02356	3.64480	0.03632	77.34016	0.07436	1.96646	0.54152	2.3860E-02	3.8E-05	3.6	9.81	0.7602
	01D	20.5	96.7	0.20922	0.11540	0.07125	0.05812	1.80486	0.03430	155.77538	0.07630	0.66364	0.72214	4.5331E-02	4.3E-05	36.7	9.54	0.2650
P	01E	22.0	72.0	0.15585	0.05055	0.08494	0.03119	1.29120	0.03891	147.18075	0.07720	0.39339	0.22830	5.7284E-02	3.7E-05	63.9	10.36	0.0705
P	01F	25.0	66.3	0.14357	0.05326	0.04621	0.02446	0.76127	0.03463	82.96972	0.07551	0.41799	0.24329	5.5258E-02	5.9E-05	37.5	10.31	0.1378
P	01G	30.0	93.9	0.20332	0.05217	0.02477	0.02174	0.48949	0.03246	48.65136	0.10103	0.66291	0.29184	5.0484E-02	1.1E-04	13.4	9.74	0.3081
P	01H	35.0	23.7	0.05125	0.07679	0.01619	0.03690	0.31441	0.02715	30.82088	0.06328	0.15421	0.32049	5.2089E-02	1.6E-04	35.7	9.98	0.5181
P	01I	40.0	17.9	0.03870	0.09064	0.01285	0.04291	0.24791	0.03148	23.46298	0.05470	0.11154	0.33374	5.4293E-02	2.2E-04	39.6	10.54	0.6804

Sample: MB06-547 **Lab #**: 61610 **J**: 4.81E-03 ±1.17E-06 **IC**: 1.023 ±0.0013

Material: Plagioclase **IGSN**: **Spectrometer**: obama

N	Power (W)	^{40}Ar (10^{-17} mol)	^{40}Ar (10^{3} fA)	± 1σ	^{39}Ar (10^{3} fA)	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ (10^{-2} fA)	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01J	45.0	6.1	0.01329	0.03469	0.00500	0.01749	0.13486	0.03483	9.52789	0.05944	0.04030	0.07397	5.2007E-02	3.7E-04	39.7	9.33	0.3941
01K	50.0	5.0	0.01080	0.03922	0.00326	0.02005	0.08708	0.03370	6.36982	0.07077	0.03432	0.07773	5.0705E-02	6.5E-04	30.2	8.85	0.6379
01L	60.0	6.5	0.01404	0.04113	0.00368	0.01888	0.10687	0.03415	7.27833	0.05951	0.04563	0.07198	5.0016E-02	4.9E-04	25.2	8.50	0.5253
01M	75.0	15.4	0.03327	0.03955	0.01205	0.01940	0.28006	0.03288	21.82269	0.06790	0.09668	0.09112	5.4686E-02	1.9E-04	40.9	9.99	0.2009
01N	80.0	7.8	0.01698	0.03463	0.00493	0.04764	0.13107	0.03333	9.11281	0.05768	0.05315	0.19689	5.3577E-02	6.2E-04	29.4	8.96	1.0471

Weighted Mean Age 10.20465 ±0.05557

Integrated 9.97031 ±0.09926

Plateau **Steps** C-G 10.32051 ±0.06113

Isochron 10.26993 ±0.00251

Sample: MB06-539 **Lab #**: 61607 **J**: 4.82E-03 ±1.11E-06 **IC**: 1.022 ±0.0003

Material: Kaersutite **IGSN**: **Spectrometer**: obama

N	Power (W)	^{40}Ar (10^{-17} mol)	^{40}Ar (10^{3} fA)	± 1σ	^{39}Ar (10^{3} fA)	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ (10^{-2} fA)	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01C	17.5	23.8	0.05151	0.03434	0.00558	0.01730	0.45606	0.01981	0.53490	0.03896	0.15597	0.09463	0.2	0.02	12.3	10.01	0.4580
01D	18.0	20.3	0.04386	0.03392	0.01136	0.01699	0.52732	0.02048	1.18406	0.03975	0.11417	0.08232	0.2	7.6E-03	27.7	9.41	0.1982
01E	18.25	7.6	0.01648	0.03371	0.00590	0.01679	0.33562	0.01980	0.14406	0.03882	0.03720	0.05635	1.0	0.26	34.6	8.52	0.2738
01F	18.75	7.5	0.01617	0.03389	0.00627	0.01732	0.43553	0.02002	0.14233	0.03935	0.03337	0.05572	1.0	0.29	40.4	9.17	0.2560
01G	19.0	3.5	0.00763	0.03357	0.00270	0.01685	0.17431	0.01989	0.17342	0.03858	0.01806	0.04586	0.4	0.08	33.9	8.44	0.5086
01H	19.5	3.9	0.00840	0.03297	0.00335	0.01702	0.17605	0.02003	0.20053	0.03802	0.01891	0.05004	0.4	0.07	37.5	8.27	0.4362
01I	19.75	2.2	0.00470	0.03275	0.00181	0.01650	0.10897	0.01966	0.12601	0.03853	0.01019	0.04675	0.3	0.10	40.4	9.24	0.7697
01J	20.0	3.6	0.00780	0.03303	0.00311	0.01775	0.20812	0.02012	0.49710	0.03990	0.01949	0.04944	0.1	0.01	37.1	8.21	0.4701
01K	20.5	14.2	0.03077	0.03571	0.01855	0.01706	1.46951	0.01977	3.93628	0.03948	0.05999	0.06026	0.1	1.1E-03	64.6	9.46	0.0928
01L	21.0	39.5	0.08543	0.03628	0.05941	0.01978	4.56082	0.02037	12.98007	0.04007	0.14453	0.08662	0.1	3.3E-04	76.4	9.69	0.0399
01M	22.0	101.7	0.22004	0.04222	0.15571	0.02492	10.24215	0.01974	36.33084	0.03898	0.37453	0.13743	0.1	1.1E-04	78.3	9.77	0.0236
01N	25.0	213.4	0.46201	0.05375	0.35634	0.03320	21.13567	0.02034	85.34138	0.04146	0.74443	0.19575	9.7792E-02	4.9E-05	84.4	9.66	0.0148

Weighted Mean Age 9.68292 ±0.01200

Integrated 9.64844 ±0.02164

Sample: MB06-539 **Lab #**: 61607 **J**: 4.82E-03 ±1.11E-06 **IC**: 1.022 ±0.0003

Material: Kaersutite **IGSN**: **Spectrometer**: obama

N	Power (W)	^{40}Ar (10^{-17} mol)	^{40}Ar (10^{3} fA)	± 1σ	^{39}Ar (10^{3} fA)	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar (10^{-2} fA)	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
Plateau											**Steps**						
Isochron													9.70720 ±0.00225				

Sample: MB06-539 **Lab #**: 61612 **J**: 4.82E-03 ±1.11E-06 **IC**: 1.023 ±0.0013

Material: Plagioclase **IGSN**: **Spectrometer**: obama

	N	Power (W)	^{40}Ar (10^{-17} mol)	^{40}Ar (10^{3} fA)	± 1σ	^{39}Ar (10^{3} fA)	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar (10^{-2} fA)	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	19.0	60.6	0.13108	0.04813	0.04671	0.02298	2.75911	0.03163	14.34524	0.06347	0.30638	0.20044	0.3	1.4E-03	35.2	8.71	0.1120
P	01B	20.0	81.4	0.17621	0.09573	0.15352	0.06998	2.08435	0.03325	55.68599	0.06586	0.10119	0.21494	0.3	3.5E-04	95.4	9.65	0.0371
P	01C	21.0	33.7	0.07284	0.07832	0.06439	0.04572	0.84209	0.02789	24.01312	0.05802	0.04069	0.19770	0.3	6.7E-04	96.5	9.61	0.0808
P	01D	22.0	20.0	0.04320	0.04035	0.03839	0.02136	0.49174	0.03179	14.35842	0.06682	0.02455	0.07376	0.3	1.2E-03	96.3	9.54	0.0514
P	01E	25.0	20.1	0.04347	0.04180	0.03791	0.02232	0.46740	0.03521	14.72048	0.06367	0.02633	0.07661	0.3	1.1E-03	95.4	9.64	0.0540
P	01F	30.0	14.8	0.03214	0.03727	0.02753	0.01932	0.37815	0.03316	10.98859	0.06469	0.02017	0.07763	0.2	1.5E-03	95.0	9.77	0.0750
P	01G	35.0	9.2	0.01993	0.07841	0.01692	0.03821	0.21141	0.02785	7.13358	0.05810	0.01574	0.14523	0.2	2.0E-03	90.8	9.43	0.2280
	01H	40.0	6.1	0.01330	0.07538	0.01146	0.03319	0.12719	0.03061	5.15778	0.06383	0.00642	0.12897	0.2	2.8E-03	101.1	10.34	0.2999
	01I	45.0	5.7	0.01239	0.03359	0.00893	0.04155	0.21113	0.03030	4.11869	0.06394	0.01362	0.13917	0.2	3.5E-03	80.8	9.87	0.4094
	01J	50.0	4.0	0.00868	0.03484	0.00733	0.01600	0.11854	0.03335	3.43727	0.06567	0.00736	0.05559	0.2	4.1E-03	90.7	9.46	0.2050
	01K	75.0	18.7	0.04044	0.03638	0.03022	0.01991	0.40995	0.03357	14.08214	0.06517	0.04297	0.07819	0.2	9.9E-04	82.5	9.73	0.0688
Weighted Mean Age														9.60909 ±0.02178				
Integrated														9.55849 ±0.03192				
Plateau												**Steps**	B-G	9.63385 ±0.02381				
Isochron														9.67248 ±0.00225				

Sample: MB07-004 **Lab #**: 61598 **J**: 4.80E-03 ±3.53E-06 **IC**: 1.023 ±0.0007

Material: Groundmass concentrate **IGSN**: **Spectrometer**: obama

N	Power (W)	^{40}Ar (10^{-17} mol)	^{40}Ar (10^{3} fA)	± 1σ	^{39}Ar (10^{3} fA)	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ (10^{-2} fA)	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01A	17.0	0.0	0.08219	0.05052	0.00157	0.02141	0.22174	0.02302	0.46506	0.05236	0.26980	0.19806	0.3	0.04	3.2	14.73	3.2634
01B	17.5	0.0	1.34489	0.14236	0.05024	0.02750	6.10244	0.02372	6.54012	0.04886	4.29590	0.79306	0.8	5.9E-03	5.8	13.56	0.4076
01C	18.0	0.0	0.76469	0.10311	0.16044	0.03874	15.84462	0.02459	14.41206	0.04857	1.90978	0.50891	1.1	3.9E-03	26.9	11.21	0.0821
01D	18.5	0.0	0.79812	0.10057	0.35005	0.05172	31.26613	0.02621	32.38844	0.04706	1.38727	0.42618	1.1	1.6E-03	50.0	9.99	0.0316
01E	19.0	0.0	0.94782	0.11044	0.48749	0.06511	39.40197	0.02582	78.49872	0.04918	1.48036	0.41759	0.6	4.1E-04	56.9	9.69	0.0223
01F	19.5	0.0	0.67170	0.08943	0.36477	0.05470	26.60615	0.02370	102.98958	0.05040	1.05513	0.42549	0.4	1.9E-04	59.4	9.59	0.0303
01G	20.0	0.0	0.44029	0.08118	0.19597	0.03998	14.46962	0.02231	60.66310	0.04783	0.84327	0.30024	0.3	2.7E-04	48.7	9.59	0.0398
01H	20.5	0.0	0.28177	0.06926	0.11056	0.03042	8.26604	0.02432	34.70500	0.04749	0.60626	0.26435	0.3	4.6E-04	41.1	9.19	0.0621
01I	22.0	0.0	0.75164	0.09217	0.27699	0.04795	21.71622	0.02547	82.22952	0.05391	1.66768	0.52509	0.3	2.3E-04	38.6	9.19	0.0491
01J	24.0	0.0	1.59187	0.14607	0.61974	0.06881	51.31499	0.02544	584.86980	0.09573	4.01270	0.76936	0.1	2.2E-05	40.0	9.03	0.0323
01K	26.0	0.0	0.29452	0.07355	0.11769	0.03158	10.37895	0.02401	348.42133	0.06844	1.06346	0.35068	3.4371E-02	1.2E-05	40.5	8.97	0.0784
01L	30.0	0.0	0.03897	0.04334	0.01396	0.02065	1.19011	0.02371	83.51537	0.05034	0.20062	0.17583	1.6831E-02	2.7E-05	33.6	8.38	0.3341

Weighted Mean Age 9.58239 ±0.01411

Integrated 9.61395 ±0.02369

Plateau **Steps**

Isochron 9.39528 ±0.00691

Sample: MB07-193 **Lab #**: 61601 **J**: 4.80E-03 ±3.53E-06 **IC**: 1.023 ±0.0007

Material: Groundmass concentrate **IGSN**: **Spectrometer**: obama

	N	Power (W)	^{40}Ar (10^{-17} mol)	^{40}Ar (10^{3} fA)	± 1σ	^{39}Ar (10^{3} fA)	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ (10^{-2} fA)	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	17.0	30.6	0.06623	0.04316	0.00162	0.01736	0.41241	0.01977	0.42509	0.04399	0.21680	0.16210	0.4	0.04	3.5	12.66	2.6047
	01B	17.5	1070.2	2.31636	0.16377	0.07403	0.02577	9.65737	0.02153	9.90291	0.04297	7.57492	1.10998	0.8	3.3E-03	3.5	9.67	0.3880
P	01C	18.0	681.0	1.47402	0.12694	0.23633	0.04921	23.52692	0.02178	23.56868	0.04582	4.28991	0.83943	1.0	2.0E-03	14.6	7.97	0.0920
P	01D	18.5	615.4	1.33198	0.11611	0.36185	0.05108	31.72012	0.02231	66.32541	0.04807	3.48513	0.66374	0.6	4.1E-04	24.5	7.93	0.0476
P	01E	19.0	246.6	0.53381	0.08287	0.23678	0.04347	18.48722	0.02167	76.71428	0.04700	1.18755	0.42145	0.3	2.0E-04	39.8	7.88	0.0462
P	01F	19.5	218.4	0.47265	0.08381	0.16316	0.04024	12.89989	0.02125	54.93698	0.05082	1.17914	0.36624	0.3	2.9E-04	30.8	7.83	0.0583
P	01G	20.0	173.6	0.37567	0.07844	0.11071	0.03119	9.06170	0.02195	38.18616	0.04787	0.99342	0.36457	0.3	3.8E-04	25.8	7.69	0.0855

Sample: MB07-193 **Lab #**: 61601 **J**: 4.80E-03 ±3.53E-06 **IC**: 1.023 ±0.0007

Material: Groundmass concentrate **IGSN**: **Spectrometer**: obama

N	Power (W)	^{40}Ar (10^{-17} mol)	^{40}Ar (10^{3} fA)	± 1σ	^{39}Ar (10^{3} fA)	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ (10^{-2} fA)	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
01H	20.5	117.2	0.25375	0.06846	0.07371	0.02937	6.06736	0.02144	25.86639	0.04676	0.68017	0.27455	0.3	5.4E-04	24.7	7.48	0.0969
01I	22.0	796.3	1.72363	0.14387	0.41792	0.05516	36.17001	0.02134	154.45012	0.06014	4.82736	0.78676	0.3	1.1E-04	20.7	7.51	0.0489
01K	26.0	29.2	0.06321	0.04242	0.01643	0.01990	2.03416	0.02088	89.89261	0.04818	0.29265	0.18461	1.8280E-02	2.5E-05	20.5	7.06	0.2979
01L	30.0	5.0	0.01085	0.03686	0.00369	0.01697	0.44524	0.02031	25.61864	0.04413	0.06033	0.09934	1.4336E-02	7.2E-05	30.9	8.17	0.7212

Weighted Mean Age			7.77702 ±0.02306
Integrated			7.85074 ±0.03249
Plateau	**Steps**	C-G	7.89156 ±0.02811
Isochron			7.66291 ±0.00563

Sample: MB07-217 **Lab #**: 61611 **J**: 4.82E-03 ±1.16E-06 **IC**: 1.023 ±0.0013

Material: Plagioclase **IGSN**: **Spectrometer**: obama

	N	Power (W)	^{40}Ar (10^{-17} mol)	^{40}Ar (10^{3} fA)	± 1σ	^{39}Ar (10^{3} fA)	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ (10^{-2} fA)	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01D	22.0	17.1	0.03691	0.06550	0.00364	0.03860	0.35620	0.03051	3.90575	0.06071	0.11760	0.26689	9.2341E-02	1.7E-03	10.2	9.11	1.9184
P	01E	25.0	23.1	0.04989	0.09093	0.04914	0.04753	0.66252	0.03041	55.73773	0.06264	0.10383	0.25391	8.7398E-02	1.3E-04	83.9	7.52	0.1358
P	01F	30.0	26.8	0.05800	0.04112	0.06729	0.02390	0.85638	0.03457	76.79922	0.06502	0.11083	0.15354	8.6837E-02	8.0E-05	97.4	7.41	0.0599
P	01G	35.0	17.3	0.03736	0.03986	0.04388	0.02422	0.51625	0.03459	48.62494	0.11452	0.06653	0.11287	8.9424E-02	2.2E-04	100.3	7.54	0.0683
P	01H	40.0	16.4	0.03559	0.03873	0.04186	0.02113	0.55377	0.03123	45.96827	0.08370	0.06497	0.09456	9.0232E-02	1.7E-04	98.6	7.40	0.0600
P	01I	45.0	13.4	0.02902	0.03975	0.03432	0.02103	0.39068	0.03530	37.43864	0.06336	0.05229	0.10067	9.0821E-02	1.6E-04	99.2	7.40	0.0775
P	01J	50.0	11.5	0.02487	0.08464	0.02969	0.04277	0.33766	0.03373	32.00450	0.06443	0.04035	0.20386	9.1881E-02	2.3E-04	104.4	7.72	0.1810
P	01K	60.0	13.5	0.02912	0.07072	0.03455	0.04060	0.45163	0.02788	36.94132	0.06157	0.05125	0.18690	9.2618E-02	1.9E-04	99.6	7.41	0.1424
P	01L	75.0	13.7	0.02969	0.03518	0.03262	0.02027	0.42543	0.03099	35.21710	0.06658	0.05412	0.07918	9.1713E-02	1.8E-04	94.4	7.58	0.0646

Weighted Mean Age			7.47224 ±0.02768
Integrated			7.50387 ±0.04287
Plateau	**Steps**	A-I	7.44760 ±0.03060
Isochron			7.46816 ±0.00183

Sample: MB07-064 **Lab #**: 61599 **J**: 4.80E-03 ±3.18E-06 **IC**: 1.023 ±0.0007

Material: Groundmass concentrate **IGSN**: **Spectrometer**: obama

	N	Power (W)	^{40}Ar (10^{-17} mol)	^{40}Ar (10^{3} fA)	± 1σ	^{39}Ar (10^{3} fA)	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar (10^{-2} fA)	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	17.5	0.0	0.24387	1.22482	0.27438	0.04896	4.57800	0.01841	9.06578	0.03188	0.31628	0.47119	3.1	0.01	62.3	4.86	0.0593
P	01B	18.0	0.0	0.25906	1.22478	0.33740	0.05397	14.66146	0.01939	30.12005	0.03449	0.32288	0.46838	1.2	1.3E-03	66.9	4.51	0.0481
P	01C	18.5	0.0	0.24402	1.22535	0.33472	0.04596	22.22156	0.01942	67.86498	0.03732	0.33188	0.48069	0.5	2.9E-04	70.1	4.49	0.0492
P	01D	19.0	0.0	0.20844	1.22478	0.32992	0.04754	12.01848	0.01805	83.44379	0.03902	0.25175	0.46302	0.4	2.0E-04	79.1	4.39	0.0489
P	01E	19.5	0.0	0.15126	1.22430	0.23807	0.03921	5.67742	0.01828	77.34228	0.03626	0.20831	0.44480	0.3	1.6E-04	78.5	4.38	0.0663
P	01F	20.0	0.0	0.07473	1.22445	0.10693	0.03520	2.35750	0.01663	46.47719	0.05955	0.13767	0.44593	0.2	3.1E-04	69.3	4.26	0.1478
P	01G	20.5	0.0	0.05442	1.22424	0.07125	0.02982	1.68093	0.01765	37.25448	0.03643	0.11662	0.44206	0.2	2.1E-04	63.0	4.23	0.2208
	01H	22.0	0.0	0.09335	1.22440	0.09856	0.03472	2.85953	0.01838	84.06697	0.04037	0.28312	0.45706	0.1	7.2E-05	45.5	3.80	0.1627
	01I	26.0	0.0	0.33721	1.22526	0.21510	0.04428	13.11641	0.01976	777.03860	0.12537	1.84755	0.64347	2.8207E-02	7.5E-06	29.7	4.14	0.0939
	01J	30.0	0.0	0.05497	1.22418	0.03715	0.02344	2.42510	0.01850	128.27641	0.04159	0.30343	0.46444	2.9515E-02	2.1E-05	29.6	3.90	0.4396

Weighted Mean Age			4.47147 ±0.02255	
Integrated			4.41249 ±0.02681	
Plateau	**Steps**	B-G	4.44627 ±0.02566	
Isochron			4.53305 ±0.00300	

Sample: MB07-094 **Lab #**: 61600 **J**: 4.81E-03 ±3.53E-06 **IC**[1]: 1.023 ±0.0007

Material: Groundmass concentrate **IGSN**: **Spectrometer**: obama

	N	Power (W)	^{40}Ar (10^{-17} mol)	^{40}Ar (10^{3} fA)	± 1σ	^{39}Ar (10^{3} fA)	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar (10^{-2} fA)	± 1σ	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
	01A	17.0	-0.2	-0.00043	0.03959	-0.00002	0.01990	0.00347	0.02118	-0.05123	0.04576	-0.00096	0.06484	4.4564E-02	0.06	39.3	66.14	94.9575
	01B	17.5	57.8	0.12506	0.04610	0.12891	0.03023	2.09011	0.02087	4.13205	0.04492	0.31751	0.17993	3.2	0.03	25.5	2.17	0.0364
	01C	18.0	68.7	0.14873	0.05276	0.18699	0.03517	4.80254	0.02141	18.23574	0.04591	0.36863	0.20958	1.1	2.7E-03	30.7	2.15	0.0292
	01D	18.5	78.6	0.17019	0.04819	0.40034	0.05090	7.13804	0.02177	47.78101	0.06743	0.30624	0.17214	0.9	1.2E-03	56.2	2.10	0.0113
P	01E	19.0	64.8	0.14025	0.04672	0.36933	0.04602	5.59636	0.02190	50.21191	0.05116	0.25004	0.17489	0.8	7.7E-04	59.6	1.99	0.0124
P	01F	19.5	42.1	0.09118	0.04889	0.18485	0.03633	3.12527	0.02165	36.65257	0.04856	0.21061	0.14385	0.5	6.9E-04	46.3	2.01	0.0204
P	01G	20.0	29.5	0.06381	0.03946	0.09008	0.02978	2.07632	0.02236	23.33653	0.04561	0.17866	0.16112	0.4	7.8E-04	30.9	1.92	0.0467
P	01H	20.5	27.6	0.05965	0.04065	0.06038	0.02637	1.84226	0.02257	15.03688	0.04771	0.17500	0.13766	0.4	1.3E-03	22.7	1.97	0.0596

Sample: MB07-094 **Lab #**: 61600 **J**: 4.81E-03 ±3.53E-06 **IC**[1]: 1.023 ±0.0007

Material: Groundmass concentrate **IGSN**: **Spectrometer**: obama

	N	Power (W)	^{40}Ar (10^{-17} mol)	^{40}Ar (10^{3} fA)	± 1σ	^{39}Ar (10^{3} fA)	± 1σ	^{38}Ar	± 1σ	^{37}Ar	± 1σ	^{36}Ar	± 1σ (10^{-2} fA)	K/Ca	± 1σ	%^{40}Ar*	Age (Ma)	± 1σ
P	01I	22.0	109.8	0.23773	0.05428	0.13745	0.03244	4.84436	0.02126	38.38403	0.04695	0.75353	0.27881	0.4	4.6E-04	12.4	1.89	0.0528
P	01J	24.0	603.2	1.30572	0.11255	0.31846	0.04391	15.83612	0.02241	425.46616	0.06845	4.74787	0.73057	7.6348E-02	1.6E-05	5.5	1.98	0.0600
	01K	26.0	317.0	0.68622	0.07474	0.15571	0.02862	8.32433	0.02300	301.28931	0.06075	2.57090	0.51584	5.2592E-02	1.4E-05	6.8	2.65	0.0868
	01L	30.0	268.4	0.58095	0.08263	0.11965	0.02722	7.00668	0.02088	172.97924	0.05348	2.08797	0.46465	7.0493E-02	2.7E-05	5.6	2.42	0.1016

Weighted Mean Age			2.05387 ±0.00717
Integrated			2.09665 ±0.01436
Plateau	**Steps**	E-J	1.98661 ±0.01009
Isochron			2.03721 ±0.00150

Average blanks for Furnace: (3.398, 0.013, 0.002, 0.025, 0.013), x10^{-18} for Ar^{40}, Ar^{39}, Ar^{38}, Ar^{37}, Ar^{36} respectively

IC Factor[1]: H1/CDD intercalibration, P: plateau step

Constants used

Atmospheric argon ratios

$(^{40}Ar/^{36}Ar)_A$	295.5 ±0.5	Nier (1950)
$(^{40}Ar/^{38}Ar)_A$	1575.0 ±2.0	Nier (1950)

Interferring isotope production ratios

$(^{40}Ar/^{39}Ar)_K$	0.0081 ±6.8000E-05
$(^{38}Ar/^{39}Ar)_K$	0.0130 ±0.0
$(^{37}Ar/^{39}Ar)_K$	0.0 ±0.0
$(^{39}Ar/^{37}Ar)_{Ca}$	0.0007 ±7.8000E-06
$(^{38}Ar/^{37}Ar)_{Ca}$	4.0000E-05 ±2.0000E-06
$(^{36}Ar/^{37}Ar)_{Ca}$	0.0003 ±2.0000E-07

Decay constants

^{40}K λε	5.4630E-10 ±9.3000E-13 a^{-1}
^{40}K λβ	0.0 ±1.6000E-13 a^{-1}
^{39}Ar	7.0680E-06 ±0.0 a^{-1}
^{37}Ar	0.0198 ±0.0 a^{-1}

APPENDIX H

XRF DATA

Name	MB06-501 PT	MB06-517 Basanite	MB06-518 TP	MB06-524 PT	MB06-525 Basanite	MB06-527 Basanite	MB06-533 TP	MB06-537 Trachyte
	Unnormalized Major Elements (Weight %):							
SiO2	48.27	42.80	50.16	47.08	45.27	44.78	51.90	57.74
TiO2	2.414	3.274	1.338	2.455	2.910	2.867	0.977	0.350
Al2O3	17.87	15.45	19.82	17.59	16.92	15.28	19.53	18.81
FeO*	9.24	10.71	6.25	9.50	10.20	10.32	6.94	5.10
MnO	0.214	0.203	0.190	0.215	0.205	0.195	0.232	0.201
MgO	3.50	6.77	1.45	3.51	4.79	6.38	1.08	0.21
CaO	7.48	10.44	4.81	7.78	8.94	9.40	3.97	1.60
Na2O	5.54	4.39	6.74	5.23	4.91	5.04	6.93	7.06
K2O	2.38	1.40	3.51	2.83	2.31	1.14	3.97	4.99
P2O5	0.704	1.007	0.485	0.776	0.905	0.792	0.348	0.113
Sum	97.61	96.44	94.74	96.96	97.36	96.19	95.87	96.18
LOI (%)	2.53	2.52	4.54	2.21	2.01	2.91	3.23	3.18
Cl >/=	0.08	0.05	0.08	0.18	0.12	0.09	0.01	0.00
	Unnormalized Trace Elements (ppm):							
Ni	25	89	5	20	44	93	3	2
Cr	25	191	1	28	70	238	3	3
Sc	10	21	2	12	17	22	1	0
V	133	242	29	160	196	233	6	3
Ba	765	605	951	770	712	623	974	1098
Rb	54	29	56	76	61	27	97	134
Sr	1073	1112	1269	1087	1149	931	979	339
Zr	433	301	510	375	369	377	578	541
Y	33	32	32	32	34	31	31	25
Nb	124.7	93.4	160.4	114.8	112.9	96.8	159.0	169.6
Ga	20	19	21	21	21	19	22	23
Cu	18	43	8	22	37	39	5	4
Zn	102	89	84	102	93	89	109	92
Pb	3	3	6	5	3	4	6	10
La	83	66	86	78	76	63	91	104
Ce	152	126	159	141	149	128	159	164
Th	9	6	12	10	9	8	14	23
Nd	61	56	59	56	60	53	52	44
U	3	2	2	2	2	2	3	1
sum tr.	3126	3125	3451	3112	3216	3075	3291	2780
in %	0.31	0.31	0.35	0.31	0.32	0.31	0.33	0.28
sum m+tr	97.92	96.75	95.09	97.27	97.68	96.50	96.20	96.46
w/LOI, Cl	100.60	99.40	99.78	99.73	99.88	99.58	99.50	99.71
if Fe3+	101.63	100.58	100.47	100.78	101.01	100.73	100.27	100.27

Name	MB06-539 Phonolite	MB06-543 TP	MB06-546 Phonolite	MB06-576 Basanite	MB06-588 Basanite	MB06-589 Basanite	MB06-634 PT	MB06-635 Basanite
	Unnormalized Major Elements (Weight %):							
SiO2	57.97	52.38	57.59	42.09	43.94	43.33	47.81	46.00
TiO2	0.346	0.979	0.264	3.594	3.332	3.375	2.447	2.837
Al2O3	18.84	19.56	18.76	13.39	15.82	14.75	17.74	15.90
FeO*	4.81	6.98	4.96	10.85	10.86	10.39	9.42	10.34
MnO	0.198	0.234	0.198	0.174	0.194	0.178	0.227	0.201
MgO	0.31	1.17	0.43	10.74	5.89	8.97	3.23	6.60
CaO	1.70	3.91	1.37	11.24	10.48	10.67	7.73	9.24
Na2O	7.66	6.58	7.15	3.32	3.84	3.58	5.97	4.73
K2O	5.14	3.95	5.54	0.94	1.98	1.32	2.20	2.13
P2O5	0.111	0.338	0.054	0.723	0.931	0.758	0.809	0.760
Sum	97.08	96.08	96.31	97.06	97.27	97.32	97.58	98.74
LOI (%)	1.84	2.90	2.67	2.29	1.97	2.25	1.58	1.10
Cl >/=	0.17	0.02	0.01	0.02	0.07	0.04	0.09	0.09
	Unnormalized Trace Elements (ppm):							
Ni	2	2	3	226	67	132	19	82
Cr	2	1	2	514	160	265	29	221
Sc	1	2	2	32	19	28	12	20
V	4	8	2	294	242	278	165	207
Ba	1117	966	65	384	576	514	774	665
Rb	134	72	142	23	46	17	38	61
Sr	367	966	139	759	1020	873	1094	985
Zr	595	523	991	260	318	305	456	374
Y	25	31	67	29	32	31	34	31
Nb	145.9	159.9	283.7	62.2	91.6	78.8	118.9	103.7
Ga	22	23	32	20	21	20	22	20
Cu	4	8	3	71	39	42	29	37
Zn	90	110	149	81	96	88	103	94
Pb	10	6	12	2	2	3	5	3
La	100	97	150	45	63	55	77	73
Ce	161	166	332	92	120	108	154	135
Th	21	15	29	4	5	6	10	9
Nd	45	55	104	47	55	49	60	55
U	1	8	1	2	1	2	2	2
sum tr.	2847	3217	2506	2947	2975	2894	3202	3178
in %	0.28	0.32	0.25	0.29	0.30	0.29	0.32	0.32
sum m+tr	97.37	96.40	96.56	97.36	97.57	97.61	97.90	99.06
w/LOI, Cl	99.44	99.39	99.30	99.75	99.67	99.97	99.64	100.32
if Fe3+	99.97	100.17	99.85	100.96	100.88	101.12	100.68	101.47

Name	MB06-636 Basanite	MB06-652 Basanite	MB06-653 Basanite	MB06-659 Phonolite	MB06-661 PT	MB06-663 Basanite	MB06-664 TP	MB06-669 Phonolite
	Unnormalized Major Elements (Weight %):							
SiO2	43.38	45.11	45.60	56.95	47.92	44.15	53.42	55.67
TiO2	3.284	2.956	2.963	0.742	2.476	3.156	0.831	0.257
Al2O3	15.53	15.51	17.14	19.30	18.09	15.00	19.94	21.19
FeO*	11.12	10.52	10.54	5.31	9.42	10.71	6.91	4.23
MnO	0.202	0.199	0.207	0.198	0.214	0.197	0.238	0.200
MgO	7.18	6.17	4.32	0.82	2.45	7.41	0.91	0.31
CaO	10.42	9.71	8.84	2.73	7.47	9.53	3.50	1.46
Na2O	3.89	4.90	5.57	7.30	5.32	4.51	8.42	9.42
K2O	1.80	1.15	1.90	4.74	2.82	2.05	4.56	5.71
P2O5	0.985	0.804	0.986	0.249	0.874	0.903	0.291	0.101
Sum	97.79	97.02	98.05	98.34	97.06	97.61	99.03	98.54
LOI (%)	1.74	2.74	1.52	0.86	2.09	1.80	0.29	0.64
Cl >/=	0.08	0.10	0.10	0.15	0.14	0.10	0.22	0.27
	Unnormalized Trace Elements (ppm):							
Ni	91	91	41	5	9	111	5	3
Cr	202	228	61	7	9	201	4	4
Sc	24	24	15	2	7	25	3	0
V	247	252	196	28	109	218	23	13
Ba	609	613	733	1221	737	679	911	138
Rb	47	25	30	99	75	56	129	176
Sr	1095	933	1177	528	1204	1045	750	111
Zr	310	375	397	575	488	369	593	776
Y	33	30	34	29	39	32	30	25
Nb	95.6	99.6	118.3	158.3	137.6	102.7	153.5	119.4
Ga	21	20	22	24	22	20	24	28
Cu	47	44	28	5	14	40	10	8
Zn	90	90	97	96	115	90	118	131
Pb	3	4	4	7	4	3	8	11
La	65	66	81	90	92	68	103	89
Ce	129	125	152	162	179	132	171	145
Th	7	9	8	13	11	7	19	24
Nd	56	51	66	52	74	57	52	35
U	2	3	1	3	5	3	4	6
sum tr.	3173	3082	3260	3106	3330	3260	3111	1842
in %	0.32	0.31	0.33	0.31	0.33	0.33	0.31	0.18
sum m+tr	98.11	97.33	98.38	98.65	97.39	97.94	99.34	98.72
w/LOI, Cl	100.00	100.24	100.07	99.73	99.69	99.92	99.91	99.68
if Fe3+	101.24	101.41	101.24	100.32	100.73	101.11	100.68	100.15

Name	MB06-671 Basanite	MB06-673 Phonolite	MB06-674 Basanite	MB06-703 Basanite	MB06-704 Phonolite	MB06-710 Phonolite	MB06-727 Trachyte	MB06-728 PT
	Unnormalized Major Elements (Weight %):							
SiO2	43.85	55.77	43.66	44.06	57.31	56.33	58.74	51.13
TiO2	3.622	0.223	3.419	2.891	0.244	0.694	0.506	2.346
Al2O3	15.58	21.23	14.73	15.68	18.63	18.53	18.20	16.98
FeO*	11.20	4.24	11.30	10.23	4.96	5.39	4.89	8.49
MnO	0.189	0.202	0.189	0.186	0.220	0.202	0.210	0.234
MgO	7.78	0.24	8.99	6.79	0.15	0.71	0.54	2.70
CaO	10.75	1.36	11.60	9.35	1.06	2.24	1.39	5.95
Na2O	3.84	9.94	3.42	3.10	8.49	7.38	7.17	5.79
K2O	1.89	5.70	1.37	2.19	5.40	4.96	5.29	2.98
P2O5	0.779	0.089	0.741	0.846	0.045	0.218	0.108	0.958
Sum	99.49	99.00	99.41	95.32	96.52	96.66	97.05	97.56
LOI (%)	0.11	0.24	0.00	4.00	2.77	2.05	2.05	1.61
Cl >/=	0.08	0.34	0.02	0.05	0.28	0.17	0.11	0.09
	Unnormalized Trace Elements (ppm):							
Ni	80	4	135	100	4	1	5	5
Cr	182	5	327	190	2	2	2	0
Sc	28	1	32	20	0	2	2	10
V	305	13	302	206	3	16	4	109
Ba	565	85	474	600	21	817	571	1177
Rb	42	183	34	67	147	127	100	67
Sr	900	77	869	949	4	326	100	962
Zr	312	714	261	348	1008	805	773	520
Y	31	27	30	31	50	44	49	46
Nb	83.9	121.4	72.1	92.6	260.2	204.3	200.2	128.3
Ga	20	30	21	20	31	27	29	23
Cu	47	6	55	36	3	3	1	5
Zn	91	129	88	96	138	119	126	117
Pb	3	10	3	2	12	8	6	4
La	57	90	51	67	139	114	100	88
Ce	114	143	100	125	238	204	194	183
Th	6	25	5	7	27	14	17	9
Nd	53	33	49	53	78	73	70	79
U	1	4	1	3	4	3	4	4
sum tr.	2920	1698	2908	3012	2170	2907	2354	3535
in %	0.29	0.17	0.29	0.30	0.22	0.29	0.24	0.35
sum m+tr	99.78	99.17	99.70	95.62	96.74	96.95	97.28	97.91
w/LOI, Cl	100.04	99.80	99.80	99.75	99.84	99.24	99.51	99.69
if Fe3+	101.29	100.27	101.05	100.88	100.39	99.83	100.05	100.63

Name	MB06-746 Phonolite	MB06-747 TP	MB06-750 TP	MB06-753 Phonolite	MB06-761 TP	MB06-762 Phonolite	MB06-763 TP	MB06-764 Basanite
	Unnormalized Major Elements (Weight %):							
SiO2	54.10	53.22	51.16	56.15	51.75	54.63	51.46	43.35
TiO2	0.887	1.217	1.781	0.418	1.200	0.515	1.256	3.280
Al2O3	19.63	19.68	18.55	20.47	19.01	19.58	19.01	14.49
FeO*	6.18	6.53	8.47	4.60	7.25	5.89	7.33	10.92
MnO	0.209	0.198	0.221	0.193	0.237	0.234	0.240	0.201
MgO	1.22	1.48	2.38	0.31	1.88	0.74	1.67	7.84
CaO	3.36	4.35	5.85	1.90	4.33	2.33	4.29	11.44
Na2O	8.11	7.74	6.66	8.74	6.87	7.17	6.93	3.35
K2O	4.78	4.23	3.38	5.73	3.79	5.13	2.83	1.60
P2O5	0.250	0.386	0.621	0.104	0.504	0.203	0.557	0.866
Sum	98.73	99.04	99.07	98.63	96.81	96.44	95.57	97.35
LOI (%)	0.36	0.27	0.04	0.68	2.30	2.84	3.24	1.80
Cl >/=	0.23	0.23	0.11	0.29	0.17	0.19	0.15	0.06
	Unnormalized Trace Elements (ppm):							
Ni	8	9	12	4	3	2	3	120
Cr	8	6	16	3	0	1	1	325
Sc	5	5	6	1	2	1	2	26
V	55	60	84	10	17	4	19	257
Ba	429	864	1047	553	1297	1319	1226	586
Rb	137	129	81	158	75	126	53	35
Sr	359	817	969	258	1053	573	1070	984
Zr	628	572	466	745	468	491	464	287
Y	30	30	34	28	31	27	32	32
Nb	122.8	140.7	131.7	147.9	146.5	148.1	155.6	85.7
Ga	24	23	23	27	22	23	22	19
Cu	9	10	18	5	5	3	6	56
Zn	115	100	108	117	104	111	105	87
Pb	8	7	5	5	6	8	6	2
La	89	90	81	92	89	91	89	59
Ce	148	154	152	157	167	156	163	116
Th	18	16	10	22	11	15	13	5
Nd	46	51	59	40	58	46	58	55
U	5	4	3	6	2	1	3	4
sum tr.	2243	3087	3304	2377	3556	3145	3492	3138
in %	0.22	0.31	0.33	0.24	0.36	0.31	0.35	0.31
sum m+tr	98.95	99.35	99.40	98.86	97.16	96.75	95.92	97.66
w/LOI, Cl	99.59	99.91	99.63	99.89	99.70	99.84	99.38	99.60
if Fe3+	100.28	100.63	100.57	100.40	100.51	100.49	100.19	100.81

Name	MB06-765 Basanite	MB06-782 Mugaerite	MB06-784 Trachyte	MB06-788 Trachyte	MB06-790 Basanite	MB06-791 Hawaiite	MB06-809 Hawaiite	MB06-813 PT
	Unnormalized Major Elements (Weight %):							
SiO2	43.72	47.76	56.69	58.58	46.12	45.95	46.30	46.73
TiO2	3.262	2.700	0.631	0.498	2.717	2.973	2.846	2.665
Al2O3	14.54	17.56	18.17	18.19	15.80	18.42	17.47	16.69
FeO*	11.11	8.54	5.65	4.69	9.79	9.02	9.39	9.68
MnO	0.202	0.200	0.220	0.196	0.188	0.187	0.201	0.224
MgO	8.33	3.35	0.70	0.54	6.22	3.34	2.96	3.04
CaO	11.15	8.57	2.23	1.24	8.47	9.97	8.24	7.27
Na2O	3.69	4.51	6.11	6.17	4.34	4.24	4.62	4.29
K2O	1.46	2.48	5.21	5.75	2.18	1.79	1.82	2.93
P2O5	0.868	0.998	0.169	0.091	0.907	1.236	1.253	1.194
Sum	98.33	96.67	95.79	95.95	96.73	97.14	95.10	94.71
LOI (%)	1.26	2.44	3.24	2.74	2.24	1.60	3.64	4.36
Cl >/=	0.05	0.05	0.01	0.12	0.02	0.06	0.08	0.03
	Unnormalized Trace Elements (ppm):							
Ni	127	24	1	2	92	21	9	6
Cr	324	21	3	2	194	23	4	1
Sc	28	14	1	2	19	14	10	9
V	256	184	2	4	173	185	144	130
Ba	600	904	1642	545	713	508	749	773
Rb	42	54	115	118	53	43	54	54
Sr	984	1204	619	87	1101	1418	1218	1351
Zr	289	362	491	756	396	306	429	350
Y	32	37	37	50	32	32	40	38
Nb	87.2	102.8	156.9	203.1	106.1	83.8	119.8	111.8
Ga	19	23	24	28	19	22	24	23
Cu	43	19	1	2	36	22	28	8
Zn	89	100	114	125	85	88	105	108
Pb	3	4	6	8	4	3	3	3
La	59	74	96	101	75	64	83	79
Ce	124	151	171	199	139	127	167	160
Th	5	7	8	17	8	6	9	7
Nd	58	68	62	71	59	60	76	72
U	3	2	2	1	4	2	2	1
sum tr.	3172	3353	3552	2321	3307	3027	3274	3284
in %	0.32	0.34	0.36	0.23	0.33	0.30	0.33	0.33
sum m+tr	98.65	97.00	96.14	96.18	97.06	97.44	95.43	95.04
w/LOI, Cl	100.04	99.56	99.46	99.10	99.40	99.17	99.22	99.50
if Fe3+	101.27	100.51	100.09	99.62	100.49	100.17	100.26	100.57

Name	MB06-822 benmoreite	MB06-829 Basanite	MB06-830 TP	MB06-831 Phonolite	MB06-840 TP	MB06-517 Basanite	MB06-517 Basanite	MB06-728 PT
	Unnormalized Major Elements (Weight %):							
SiO2	54.65	45.75	52.34	53.30	51.97	42.80	42.80	51.13
TiO2	1.597	2.953	1.756	0.643	1.485	3.274	3.279	2.346
Al2O3	17.22	18.49	18.34	20.08	18.90	15.45	15.50	16.98
FeO*	7.22	10.03	7.96	6.72	7.58	10.71	10.96	8.49
MnO	0.212	0.202	0.231	0.233	0.216	0.203	0.203	0.234
MgO	2.06	3.45	1.95	0.75	2.24	6.77	6.75	2.70
CaO	4.43	8.51	5.39	2.88	5.26	10.44	10.39	5.95
Na2O	6.00	5.78	6.50	8.11	7.19	4.39	4.42	5.79
K2O	3.75	2.73	3.65	4.97	3.90	1.40	1.41	2.98
P2O5	0.603	1.202	0.705	0.276	0.406	1.007	1.009	0.958
Sum	97.76	99.11	98.83	97.97	99.14	96.44	96.72	97.56
LOI (%)	1.31	0.23	0.47	1.42	0.13	2.52	2.52	1.61
Cl >/=	0.09	0.11	0.12	0.27	0.21	0.05	0.07	0.09
	Unnormalized Trace Elements (ppm):							
Ni	5	19	3	2	11	89	87	5
Cr	4	21	3	2	17	191	189	0
Sc	9	8	3	1	7	21	22	10
V	71	133	73	12	99	242	243	109
Ba	1763	860	834	1006	567	605	605	1177
Rb	68	72	89	118	109	29	29	67
Sr	611	1322	878	668	566	1112	1116	962
Zr	411	359	508	501	527	301	303	520
Y	37	37	36	28	30	32	33	46
Nb	106.6	131.2	161.7	155.6	117.3	93.4	94.9	128.3
Ga	23	21	23	23	24	19	20	23
Cu	8	42	6	9	17	43	44	5
Zn	99	94	104	114	158	89	88	117
Pb	4	2	6	8	6	3	2	4
La	78	81	97	93	82	66	64	88
Ce	153	157	189	166	143	126	127	183
Th	8	8	11	15	14	6	7	9
Nd	65	67	73	50	48	56	58	79
U	2	4	2	3	5	2	1	4
sum tr.	3527	3440	3100	2973	2545	3125	3133	3535
in %	0.35	0.34	0.31	0.30	0.25	0.31	0.31	0.35
sum m+tr	98.11	99.46	99.14	98.26	99.40	96.75	97.03	97.91
w/LOI, Cl	99.58	99.87	99.79	100.02	99.80	99.40	99.69	99.69
if Fe3+	100.38	100.98	100.68	100.76	100.64	100.58	100.91	100.63

Name	MB06-728 PT	MB06-504 Phonolite	MB06-507 Phonolite	MB06-508 TP	MB06-556 Basanite	MB06-560 Basanite	MB06-564 Basanite	MB06-565 Basanite
	Unnormalized Major Elements (Weight %):							
SiO2	51.26	56.85	55.56	50.72	43.51	46.38	43.59	43.24
TiO2	2.347	0.416	0.831	1.384	3.277	2.567	3.143	3.729
Al2O3	17.00	18.53	18.68	20.11	14.76	16.68	14.61	13.83
FeO*	8.60	4.61	5.59	6.17	11.00	9.44	11.04	11.02
MnO	0.234	0.184	0.198	0.194	0.190	0.202	0.197	0.181
MgO	2.70	0.45	0.88	1.29	8.02	4.83	8.46	10.88
CaO	5.96	1.67	2.75	4.69	11.05	8.51	10.76	11.67
Na2O	5.81	6.88	7.06	7.07	3.78	5.13	2.84	3.21
K2O	2.97	5.38	4.58	3.34	1.00	2.59	1.39	1.45
P2O5	0.957	0.122	0.255	0.493	0.790	0.730	0.761	0.741
Sum	97.85	95.09	96.38	95.45	97.38	97.06	96.79	99.94
LOI (%)	1.61	3.25	1.94	3.52	2.27	2.11	2.44	-0.12
Cl >/=	0.09	0.10	0.13	0.01	0.01	0.11	0.04	0.03
	Unnormalized Trace Elements (ppm):							
Ni	5	0	0	1	141	43	158	222
Cr	0	0	1	2	342	117	349	523
Sc	11	1	2	3	26	17	23	31
V	106	0	4	20	248	171	238	306
Ba	1174	1130	1241	960	541	744	514	403
Rb	66	139	123	73	23	72	33	31
Sr	965	294	710	1284	941	1023	923	789
Zr	519	649	726	603	287	405	271	274
Y	46	24	26	34	31	30	30	30
Nb	128.3	159	156	163	80	110	76	62
Ga	24	22	22	21	18	19	18	17
Cu	6	4	6	8	47	34	49	67
Zn	117	89	87	89	90	92	94	86
Pb	4	10	9	5	3	6	2	2
La	89	94	99	91	55	76	51	45
Ce	186	152	170	164	121	140	111	94
Th	11	22	18	12	5	9	4	3
Nd	81	43	52	59	52	56	51	48
U	3	2	6	4	2	3	3	4
sum tr.	3541	2834	3456	3592	3051	3166	2999	3036
in %	0.35	0.28	0.35	0.36	0.31	0.32	0.30	0.30
sum m+tr	98.20	95.38	96.73	95.81	97.68	97.37	97.09	100.25
w/LOI, Cl	99.98	98.34	98.32	98.97	99.65	99.17	99.23	99.82
if Fe3+	100.93	98.85	98.94	99.66	100.87	100.21	100.45	101.04

Name	MB06-566 Basanite	MB06-581 TP	MB06-582 TP	MB06-587 Basanite	MB06-595 Benmoreite	MB06-596 Mugaerite	MB06-598 Benmoreite	MB06-606 Basanite
	Unnormalized Major Elements (Weight %):							
SiO2	45.29	50.49	50.85	43.59	52.95	50.81	53.87	45.12
TiO2	2.695	1.356	1.382	3.335	1.377	2.117	1.603	3.200
Al2O3	15.79	20.08	20.18	15.97	17.56	17.23	16.99	16.51
FeO*	9.79	6.06	6.16	10.98	7.37	7.81	7.29	10.25
MnO	0.201	0.192	0.196	0.208	0.232	0.225	0.216	0.211
MgO	6.43	1.51	1.40	6.48	1.75	2.72	2.04	4.54
CaO	8.93	4.92	4.85	10.50	4.06	5.47	4.54	8.85
Na2O	5.44	7.00	6.74	4.24	5.72	5.10	5.33	4.40
K2O	1.51	3.50	3.77	1.70	4.03	3.37	3.83	1.80
P2O5	0.742	0.468	0.478	1.018	0.534	0.786	0.574	1.196
Sum	96.82	95.58	96.01	98.02	95.58	95.65	96.28	96.07
LOI (%)	2.05	3.19	3.18	1.01	2.85	3.02	2.43	2.82
Cl >/=	0.10	0.16	0.07	0.06	0.06	0.07	0.01	0.05
	Unnormalized Trace Elements (ppm):							
Ni	69	0	1	67	0	0	3	23
Cr	183	2	0	148	1	1	6	40
Sc	17	2	3	20	4	9	9	14
V	192	17	20	238	24	85	68	210
Ba	672	941	953	638	1607	1495	1739	597
Rb	40	92	58	45	83	72	57	43
Sr	980	1313	1282	1168	880	1067	702	1165
Zr	376	496	489	312	523	404	495	399
Y	30	33	32	34	39	43	36	35
Nb	102	158	158	96	134	128	108	97
Ga	19	21	21	19	23	23	22	20
Cu	34	7	6	45	1	4	5	21
Zn	93	86	88	92	112	110	97	102
Pb	5	5	6	3	4	5	5	4
La	70	90	92	68	87	92	80	72
Ce	137	162	159	136	158	173	150	147
Th	11	13	13	6	10	8	8	8
Nd	54	57	55	60	64	76	62	66
U	3	4	3	4	1	3	5	3
sum tr.	3088	3500	3438	3198	3755	3797	3657	3065
in %	0.31	0.35	0.34	0.32	0.38	0.38	0.37	0.31
sum m+tr	97.13	95.93	96.36	98.34	95.95	96.03	96.65	96.38
w/LOI, Cl	98.87	98.77	99.19	99.03	98.42	98.67	98.71	98.89
if Fe3+	99.96	99.44	99.88	100.25	99.24	99.54	99.52	100.03

Name	MB06-607 Benmoreite	MB06-610 Basanite	MB06-611 TP	MB06-612 Phonolite	MB06-613 Basanite	MB06-614 Basanite	MB06-615 Basanite	MB06-616 Basanite
	Unnormalized Major Elements (Weight %):							
SiO2	54.40	43.35	52.51	54.69	43.40	42.42	42.31	42.86
TiO2	1.565	3.784	1.305	0.783	3.575	3.529	3.167	3.242
Al2O3	17.11	16.26	19.69	19.97	15.06	14.77	13.55	13.72
FeO*	7.20	11.24	6.35	5.92	10.72	10.62	10.80	10.85
MnO	0.210	0.199	0.183	0.203	0.190	0.183	0.190	0.192
MgO	1.97	5.59	1.45	0.70	8.21	7.99	10.87	10.82
CaO	4.38	10.63	4.70	3.13	10.63	10.34	10.78	11.02
Na2O	5.72	4.12	7.37	8.47	3.75	3.97	3.50	3.31
K2O	3.69	1.99	3.91	4.33	1.77	1.40	1.08	1.57
P2O5	0.605	1.019	0.441	0.218	0.738	0.738	0.797	0.794
Sum	96.85	98.18	97.90	98.42	98.05	95.97	97.04	98.39
LOI (%)	2.32	1.26	0.81	0.70	1.27	3.03	2.64	1.28
Cl >/=	0.05	0.07	0.12	0.20	0.03	0.05	0.02	0.04
	Unnormalized Trace Elements (ppm):							
Ni	4	39	3	0	109	107	202	206
Cr	6	82	4	3	263	263	410	423
Sc	9	19	3	1	27	26	30	30
V	72	275	48	8	272	266	248	261
Ba	1752	634	831	815	561	547	509	505
Rb	63	45	94	118	42	33	19	37
Sr	604	1134	997	788	932	924	846	846
Zr	374	307	951	716	321	314	284	286
Y	35	34	33	26	32	31	29	31
Nb	108	90	131	157	81	80	74	75
Ga	20	20	22	23	19	20	17	18
Cu	5	38	7	7	54	47	48	53
Zn	98	96	92	109	91	91	80	83
Pb	5	3	7	9	4	2	4	2
La	78	63	83	90	59	58	55	53
Ce	153	128	147	155	114	116	102	105
Th	6	6	21	21	6	5	5	5
Nd	65	57	50	45	50	53	48	49
U	1	3	5	5	3	3	2	1
sum tr.	3459	3072	3528	3095	3039	2984	3011	3067
in %	0.35	0.31	0.35	0.31	0.30	0.30	0.30	0.31
sum m+tr	97.19	98.49	98.25	98.73	98.35	96.27	97.34	98.70
w/LOI, Cl	99.16	99.45	98.71	99.11	99.32	99.01	99.67	99.67
if Fe3+	99.96	100.69	99.42	99.77	100.51	100.19	100.87	100.87

Name	MB06-685 Trachyte	MB06-686 Phonolite	MB06-687 Basanite	MB06-689 TP	MB06-690 Basanite	MB06-692 TP	MB06-697 TP	MB06-698 Basanite
	Unnormalized Major Elements (Weight %):							
SiO2	57.14	54.51	43.80	51.63	46.37	53.66	52.42	42.44
TiO2	0.235	0.474	3.350	1.469	2.652	1.376	1.674	3.831
Al2O3	18.84	20.18	13.90	18.11	17.86	18.12	17.94	16.68
FeO*	4.48	6.00	11.08	7.21	9.06	6.42	7.02	11.10
MnO	0.222	0.235	0.187	0.219	0.191	0.204	0.208	0.209
MgO	0.33	0.49	10.65	1.53	3.23	1.52	1.91	3.37
CaO	1.07	2.53	12.05	3.70	8.40	3.62	4.47	10.04
Na2O	6.27	8.45	3.29	7.01	4.32	6.37	6.32	3.59
K2O	5.86	4.58	1.34	3.53	2.25	4.38	3.91	1.74
P2O5	0.037	0.126	0.737	0.460	0.977	0.391	0.522	1.283
Sum	94.48	97.57	100.39	94.86	95.32	96.06	96.40	94.29
LOI (%)	3.88	1.61	-0.28	4.17	4.01	2.74	2.59	4.84
Cl >/=	0.16	0.27	0.04	0.11	0.03	0.10	0.10	0.02
	Unnormalized Trace Elements (ppm):							
Ni	0	0	192	0	14	0	0	13
Cr	3	2	471	2	28	1	1	3
Sc	1	0	34	4	13	5	6	12
V	1	2	290	10	136	14	36	214
Ba	54	1045	424	1117	665	1102	1020	639
Rb	141	116	33	95	37	103	96	33
Sr	12	620	821	712	1334	749	874	1202
Zr	848	570	276	697	398	639	575	344
Y	42	27	29	46	34	42	44	35
Nb	223	156	67	186	98	172	160	90
Ga	26	24	18	25	21	23	23	19
Cu	4	8	62	7	21	2	3	73
Zn	113	115	85	116	92	109	108	99
Pb	9	10	4	7	3	6	5	3
La	126	100	49	105	72	99	98	67
Ce	212	163	99	198	144	186	180	133
Th	23	20	5	16	6	14	10	7
Nd	69	45	47	75	65	69	71	62
U	1	3	4	5	2	4	3	3
sum tr.	1905	3027	3011	3422	3181	3341	3313	3047
in %	0.19	0.30	0.30	0.34	0.32	0.33	0.33	0.30
sum m+tr	94.67	97.87	100.69	95.20	95.64	96.39	96.73	94.59
w/LOI, Cl	98.37	99.18	100.11	99.03	99.33	98.80	98.99	99.13
if Fe3+	98.86	99.84	101.34	99.83	100.33	99.52	99.77	100.36

Name	MB06-741 Phonolite	MB06-745 Phonolite	MB06-748 Phonolite	MB06-825 PT	MB06-826 TP	MB06-827 Phonolite	MB06-828 PT	MB06-832 Phonolite
	Unnormalized Major Elements (Weight %):							
SiO2	52.19	57.08	55.29	50.34	52.89	53.38	50.06	53.12
TiO2	0.433	0.273	0.695	2.130	0.783	0.667	2.155	0.735
Al2O3	18.11	19.97	19.39	18.10	20.00	20.10	18.05	20.33
FeO*	5.00	4.58	5.75	8.92	7.04	6.88	8.86	6.49
MnO	0.214	0.204	0.232	0.231	0.235	0.237	0.234	0.217
MgO	0.52	0.19	0.84	2.45	0.89	0.74	2.55	0.76
CaO	3.87	1.86	2.91	6.42	3.34	2.95	6.50	2.83
Na2O	7.40	8.30	8.34	6.26	8.27	8.63	6.18	8.69
K2O	5.01	5.78	5.02	3.41	4.63	4.82	3.36	5.18
P2O5	0.139	0.075	0.208	0.804	0.310	0.273	0.820	0.250
Sum	92.89	98.31	98.68	99.07	98.39	98.68	98.78	98.60
LOI (%)	5.99	0.58	0.33	0.25	0.60	0.43	0.21	0.61
Cl >/=	0.27	0.26	0.22	0.11	0.19	0.21	0.11	0.22
	Unnormalized Trace Elements (ppm):							
Ni	2	0	1	4	0	0	4	0
Cr	5	0	4	7	1	2	8	1
Sc	1	1	3	5	1	2	5	2
V	19	3	34	88	13	12	94	3
Ba	466	875	321	883	1019	1010	861	1061
Rb	132	144	136	70	124	127	68	138
Sr	200	322	295	1121	818	699	1112	609
Zr	804	647	721	484	557	640	477	618
Y	42	27	32	38	31	29	37	33
Nb	200	133	133	148	155	155	143	183
Ga	23	25	25	22	22	24	21	22
Cu	6	17	6	11	14	17	7	11
Zn	126	116	128	104	113	113	104	102
Pb	10	9	9	6	6	8	4	7
La	126	96	103	96	95	99	91	100
Ce	218	143	168	183	159	168	171	172
Th	23	18	20	10	17	18	9	18
Nd	68	41	49	74	52	52	72	55
U	6	3	4	4	4	5	3	3
sum tr.	2477	2617	2188	3357	3200	3179	3288	3139
in %	0.25	0.26	0.22	0.34	0.32	0.32	0.33	0.31
sum m+tr	93.13	98.57	98.89	99.41	98.71	99.00	99.11	98.91
w/LOI, Cl	98.87	98.89	99.00	99.32	98.99	99.12	99.00	99.21
if Fe3+	99.43	99.40	99.64	100.31	99.77	99.88	99.98	99.93

Name	MB06-833 TP	MB06-834 Hawaiite	MB06-507 Phonolite	MB06-507 Phonolite	MB06-686 Phonolite	MB06-686 Phonolite	MB07-001 Hawaiite	MB07-004 Basanite
	Unnormalized Major Elements (Weight %):							
SiO2	52.19	43.50	55.56	55.80	54.51	54.17	45.99	44.10
TiO2	1.324	3.121	0.831	0.834	0.474	0.471	3.306	2.773
Al2O3	19.31	15.19	18.68	18.75	20.18	20.18	16.80	13.45
FeO*	7.19	10.59	5.59	5.56	6.00	5.92	11.07	10.01
MnO	0.238	0.201	0.198	0.199	0.235	0.235	0.195	0.186
MgO	1.41	5.96	0.88	0.91	0.49	0.48	4.97	11.62
CaO	4.61	10.50	2.75	2.76	2.53	2.52	8.12	10.00
Na2O	7.63	3.48	7.06	7.09	8.45	8.40	3.67	3.25
K2O	3.95	1.30	4.58	4.61	4.58	4.56	1.84	1.54
P2O5	0.394	0.896	0.255	0.257	0.126	0.126	0.963	0.596
Sum	98.24	94.74	96.38	96.77	97.57	97.06	96.93	97.52
LOI (%)	0.50	4.34	1.94	1.94	1.61	1.61	2.19	1.65
Cl >/=	0.16	0.01	0.13	0.13	0.27	0.20	0.02	0.05
	Unnormalized Trace Elements (ppm):							
Ni	4	76	0	0	0	0	11	278
Cr	10	167	1	1	2	1	15	654
Sc	3	23	2	2	0	1	12	27
V	35	234	4	2	2	4	194	222
Ba	840	704	1241	1243	1045	1043	493	408
Rb	107	23	123	124	116	115	36	37
Sr	921	1040	710	713	620	618	1203	745
Zr	602	309	726	728	570	565	321	304
Y	33	32	26	26	27	26	28	27
Nb	155	95	156	155	156	156	87.7	69.3
Ga	23	18	22	21	24	23	18	18
Cu	10	35	6	3	8	7	22	54
Zn	112	91	87	90	115	115	77	91
Pb	7	2	9	8	10	9	2	3
La	98	66	99	96	100	100	65	49
Ce	173	130	170	165	163	165	128	100
Th	15	6	18	19	20	19	7	8
Nd	59	59	52	51	45	44	62	44
U	5	3	6	6	3	3	1	2
sum tr.	3211	3111	3456	3452	3027	3011	2783	3139
in %	0.32	0.31	0.35	0.35	0.30	0.30	0.28	0.31
sum m+tr	98.56	95.05	96.73	97.12	97.87	97.36	97.21	97.83
w/LOI, Cl	98.74	99.08	98.32	98.71	99.18	98.67	99.46	99.57
if Fe3+	99.54	100.26	98.94	99.33	99.84	99.32	100.69	100.68

Name	MB07-005 Basanite	MB07-006 Basanite	MB07-007 Basalt	MB07-008 Basanite	MB07-009 Basanite	MB07-015 Basanite	MB07-017 Basanite	MB07-019 Basanite
	Unnormalized Major Elements (Weight %):							
SiO2	42.84	42.58	43.70	42.94	41.07	42.28	47.15	42.10
TiO2	3.572	3.543	2.912	3.223	3.200	3.767	2.885	3.593
Al2O3	15.04	14.40	14.81	14.01	13.65	14.24	17.77	13.85
FeO*	11.15	11.07	9.99	10.47	10.57	10.69	9.27	11.38
MnO	0.204	0.191	0.184	0.185	0.191	0.184	0.206	0.188
MgO	7.56	9.07	9.37	10.47	9.22	9.53	3.48	10.61
CaO	10.78	11.27	10.43	10.62	10.32	10.98	8.19	11.59
Na2O	3.50	2.92	2.38	3.26	3.10	3.44	4.69	2.93
K2O	1.67	1.52	1.66	0.68	1.61	1.47	2.77	1.39
P2O5	0.867	0.940	0.704	0.733	0.811	0.847	0.790	0.821
Sum	97.20	97.51	96.14	96.59	93.74	97.42	97.19	98.44
LOI (%)	1.68	1.20	3.42	2.93	5.93	2.35	1.59	-0.24
Cl >/=	0.06	0.02	0.01	0.00	0.02	0.03	0.06	0.02
	Unnormalized Trace Elements (ppm):							
Ni	85	133	150	187	163	147	16	192
Cr	219	327	330	379	329	310	19	400
Sc	23	28	28	31	26	30	11	32
V	275	284	245	259	249	277	176	296
Ba	508	395	429	434	438	485	651	391
Rb	37	31	30	20	39	34	67	28
Sr	910	880	775	785	803	875	1042	779
Zr	302	283	286	288	292	309	413	245
Y	31	29	28	28	29	32	32	30
Nb	78.6	71.5	68.0	68.8	70.4	73.1	110.3	58.6
Ga	20	20	20	17	18	19	21	18
Cu	39	54	48	52	53	52	23	64
Zn	101	93	89	89	92	90	100	87
Pb	3	3	3	2	4	3	5	0
La	58	56	50	49	51	52	76	44
Ce	116	112	100	102	103	107	140	90
Th	7	6	6	6	9	6	10	6
Nd	52	55	46	47	50	49	59	47
U	3	2	5	3	1	2	1	3
sum tr.	2868	2861	2732	2845	2820	2950	2973	2809
in %	0.29	0.29	0.27	0.28	0.28	0.30	0.30	0.28
sum m+tr	97.48	97.79	96.41	96.88	94.02	97.72	97.49	98.72
w/LOI, Cl	99.23	99.07	99.90	99.89	100.03	100.14	99.14	98.56
if Fe3+	100.47	100.30	101.01	101.05	101.20	101.33	100.17	99.82

Name	MB07-022 Basanite	MB07-025 Basanite	MB07-027 Phonolite	MB07-028 Mugaerite	MB07-030 Mugaerite	MB07-032 Basanite	MB07-033 Basanite	MB07-035 Basanite
	Unnormalized Major Elements (Weight %):							
SiO2	47.10	45.77	57.31	51.65	50.76	43.62	47.35	43.81
TiO2	3.083	3.141	0.162	1.983	1.949	3.813	3.025	3.663
Al2O3	17.65	17.64	20.29	18.09	17.90	13.98	17.46	15.10
FeO*	10.14	10.85	4.51	8.50	8.58	11.12	10.86	11.96
MnO	0.226	0.222	0.235	0.219	0.227	0.204	0.221	0.202
MgO	3.65	4.25	0.18	2.49	2.52	10.17	4.12	7.83
CaO	8.34	9.01	1.52	6.03	6.07	11.12	8.37	10.55
Na2O	5.47	5.02	9.02	5.37	5.27	3.50	4.94	3.57
K2O	2.64	2.06	5.71	3.15	3.07	1.45	1.99	1.36
P2O5	0.981	0.890	0.063	0.711	0.680	0.911	1.266	0.768
Sum	99.27	98.86	99.00	98.20	97.04	99.89	99.61	98.82
LOI (%)	0.22	0.34	0.68	1.56	2.38	-0.36	-0.23	0.32
Cl >/=	0.08	0.14	0.27	0.07	0.06	0.03	0.03	0.00
	Unnormalized Trace Elements (ppm):							
Ni	9	14	0	5	4	180	10	78
Cr	7	7	1	4	2	442	13	193
Sc	13	13	0	7	7	29	11	25
V	163	185	2	84	79	276	177	264
Ba	762	647	254	842	736	405	543	367
Rb	63	52	170	68	62	31	53	31
Sr	1156	1196	99	982	1029	881	1163	908
Zr	476	389	860	477	557	355	447	317
Y	36	34	37	31	32	31	31	28
Nb	123.5	106.4	171.8	124.0	128.4	77.2	103.6	68.9
Ga	22	21	28	19	21	19	21	21
Cu	23	29	1	20	14	53	18	44
Zn	113	108	138	97	100	98	108	103
Pb	4	3	13	6	6	4	2	2
La	90	70	121	87	89	54	79	50
Ce	169	142	185	164	167	119	150	102
Th	9	8	27	14	12	9	11	6
Nd	71	63	53	61	63	58	66	50
U	4	4	6	4	4	3	4	3
sum tr.	3314	3092	2165	3094	3112	3123	3010	2662
in %	0.33	0.31	0.22	0.31	0.31	0.31	0.30	0.27
sum m+tr	99.60	99.17	99.21	98.51	97.35	100.20	99.91	99.09
w/LOI, Cl	99.89	99.58	99.95	100.13	99.79	99.93	99.75	99.47
if Fe3+	101.02	100.79	100.45	101.08	100.75	101.16	100.96	100.80

Name	MB07-038 Basanite	MB07-040 Basanite	MB07-042 Basanite	MB07-043 Basanite	MB07-045 Basanite	MB07-046 Basanite	MB07-047 Basanite	MB07-050 Basanite
	Unnormalized Major Elements (Weight %):							
SiO2	45.19	44.66	44.15	42.47	43.55	44.05	42.72	42.38
TiO2	3.583	3.519	3.874	3.719	3.920	3.235	3.871	3.196
Al2O3	15.61	14.88	15.50	14.15	14.17	13.92	13.63	13.58
FeO*	11.47	10.82	11.49	11.71	11.96	11.59	11.69	9.96
MnO	0.204	0.202	0.202	0.196	0.204	0.208	0.198	0.181
MgO	7.51	9.16	7.63	10.44	9.98	10.39	10.39	9.77
CaO	10.62	10.76	10.82	11.57	10.66	10.50	11.51	10.50
Na2O	3.70	3.73	4.04	3.28	3.41	3.50	3.12	3.45
K2O	1.51	1.59	1.69	1.48	1.45	1.44	1.21	1.33
P2O5	0.737	0.873	0.879	0.778	0.811	0.764	0.946	0.694
Sum	100.14	100.19	100.27	99.80	100.13	99.60	99.29	95.06
LOI (%)	-0.48	-0.37	-0.33	-0.02	-0.36	0.30	-0.19	4.47
Cl >/=	0.01	0.04	0.04	0.03	0.01	0.03	0.03	0.02
	Unnormalized Trace Elements (ppm):							
Ni	84	162	91	222	184	179	183	219
Cr	208	311	208	282	342	418	386	404
Sc	26	27	24	33	29	27	31	28
V	285	272	287	326	295	263	290	257
Ba	426	434	514	425	396	517	352	427
Rb	34	34	39	37	36	37	28	25
Sr	899	972	928	740	833	846	807	780
Zr	333	359	309	283	349	286	312	279
Y	27	31	32	28	29	28	29	27
Nb	75.1	82.9	76.8	70.2	76.5	71.5	65.2	68.7
Ga	19	20	22	18	19	18	17	19
Cu	40	46	26	76	55	57	56	58
Zn	99	100	107	98	105	91	98	87
Pb	3	2	3	2	3	3	3	2
La	50	57	54	51	55	54	49	47
Ce	112	126	109	102	114	105	100	99
Th	7	7	7	7	6	8	7	7
Nd	52	63	53	50	55	50	54	47
U	1	1	2	3	2	2	0	2
sum tr.	2781	3106	2892	2853	2983	3059	2866	2881
in %	0.28	0.31	0.29	0.29	0.30	0.31	0.29	0.29
sum m+tr	100.42	100.50	100.56	100.09	100.43	99.91	99.58	95.34
w/LOI, Cl	100.01	100.22	100.31	100.14	100.15	100.28	99.47	99.89
if Fe3+	101.29	101.42	101.58	101.44	101.48	101.57	100.77	100.99

Name	MB07-052 Basanite	MB07-053 Basanite	MB07-056 Basanite	MB07-063 Basanite	MB07-064 Basanite	MB07-065 Basanite	MB07-068 Basanite	MB07-070 Basanite
	Unnormalized Major Elements (Weight %):							
SiO2	42.51	42.99	42.43	43.24	43.08	43.11	40.71	41.81
TiO2	3.803	3.420	4.498	4.174	3.705	3.708	5.084	4.832
Al2O3	14.49	13.01	14.93	15.46	14.47	13.90	14.73	15.30
FeO*	11.86	12.17	12.26	11.85	12.27	11.44	13.13	12.43
MnO	0.199	0.201	0.210	0.214	0.219	0.189	0.194	0.190
MgO	8.79	13.25	7.67	7.19	9.30	10.46	7.98	7.34
CaO	10.38	9.91	12.02	11.04	10.71	11.58	11.94	11.20
Na2O	3.35	3.18	3.61	3.94	3.63	3.01	3.17	3.58
K2O	1.84	1.20	1.29	1.53	1.44	1.24	1.56	1.74
P2O5	0.912	0.721	0.899	1.113	0.984	0.645	0.862	0.833
Sum	98.14	100.04	99.82	99.74	99.80	99.28	99.36	99.25
LOI (%)	0.93	-0.55	-0.49	-0.42	-0.45	0.42	-0.28	-0.09
Cl >/=	0.05	0.01	0.02	0.04	0.04	0.03	0.03	0.05
	Unnormalized Trace Elements (ppm):							
Ni	116	297	81	65	138	193	50	41
Cr	246	490	155	161	228	398	76	65
Sc	27	24	28	21	25	31	34	31
V	289	261	334	273	275	314	402	373
Ba	515	366	428	491	477	380	450	497
Rb	41	27	29	33	33	27	30	37
Sr	856	933	1122	1378	1147	782	896	920
Zr	285	269	294	296	296	250	309	349
Y	29	24	28	29	28	26	30	30
Nb	75.1	60.3	70.3	76.6	77.4	61.1	74.3	83.9
Ga	20	18	21	19	20	18	21	22
Cu	44	50	45	30	52	72	55	47
Zn	92	102	102	105	101	92	105	101
Pb	3	0	1	3	2	2	4	3
La	59	50	49	59	61	43	53	59
Ce	109	97	111	121	123	92	108	120
Th	8	5	7	7	7	6	6	9
Nd	48	46	57	55	57	46	60	59
U	3	2	2	2	3	1	3	3
sum tr.	2861	3121	2964	3224	3150	2833	2765	2847
in %	0.29	0.31	0.30	0.32	0.32	0.28	0.28	0.28
sum m+tr	98.42	100.35	100.11	100.06	100.12	99.57	99.64	99.54
w/LOI, Cl	99.43	99.89	99.70	99.72	99.75	100.07	99.43	99.52
if Fe3+	100.74	101.24	101.06	101.04	101.11	101.34	100.89	100.90

Name	MB07-071 Basalt	MB07-073 Basanite	MB07-074 Basanite	MB07-075 Basanite	MB07-081 Basanite	MB07-083 Basanite	MB07-085 Basanite	MB07-087 Basanite
	Unnormalized Major Elements (Weight %):							
SiO2	45.63	45.98	42.76	45.55	45.66	42.48	43.06	43.03
TiO2	3.216	3.447	4.028	3.452	3.288	4.459	3.959	4.114
Al2O3	14.70	16.29	14.19	15.86	16.23	16.20	14.19	14.36
FeO*	10.41	11.37	12.81	11.10	11.45	12.47	12.41	12.37
MnO	0.197	0.207	0.201	0.204	0.205	0.244	0.196	0.192
MgO	8.87	6.52	9.88	7.26	5.78	5.31	10.03	9.70
CaO	10.99	9.69	11.58	10.11	9.00	10.36	11.94	11.70
Na2O	3.12	4.00	3.11	3.94	4.17	4.34	2.87	3.06
K2O	1.27	1.47	0.88	1.52	1.55	1.96	0.83	1.05
P2O5	0.693	0.960	0.537	0.787	0.979	1.535	0.492	0.594
Sum	99.09	99.94	99.96	99.77	98.31	99.36	99.97	100.17
LOI (%)	0.64	-0.42	-0.60	-0.26	0.46	-0.38	-0.45	-0.56
Cl >/=	0.01	0.02	0.02	0.04	0.00	0.06	0.00	0.01
	Unnormalized Trace Elements (ppm):							
Ni	140	54	150	61	39	9	149	142
Cr	360	130	237	169	92	7	251	258
Sc	29	20	30	23	17	16	34	32
V	251	241	346	266	188	251	352	361
Ba	417	411	277	417	429	580	259	315
Rb	47	29	18	36	35	44	17	20
Sr	854	1015	905	958	1047	1339	837	997
Zr	345	329	222	320	337	391	206	221
Y	27	28	24	28	29	37	22	23
Nb	78.5	74.4	46.6	75.0	76.2	104.2	42.5	49.9
Ga	19	18	19	18	18	21	19	19
Cu	68	32	57	28	18	21	60	54
Zn	106	96	102	91	93	121	99	99
Pb	4	1	2	3	3	3	2	1
La	58	56	37	53	61	76	34	41
Ce	116	123	71	112	114	163	70	78
Th	6	6	6	6	7	8	6	6
Nd	53	56	34	52	55	78	37	39
U	2	1	0	1	3	2	1	0
sum tr.	2979	2719	2582	2715	2659	3269	2495	2753
in %	0.30	0.27	0.26	0.27	0.27	0.33	0.25	0.28
sum m+tr	99.39	100.21	100.21	100.04	98.58	99.68	100.22	100.44
w/LOI, Cl	100.11	99.86	99.68	99.85	99.10	99.37	99.84	99.96
if Fe3+	101.26	101.12	101.10	101.09	100.37	100.76	101.22	101.33

Name	MB07-088 Basanite	MB07-089 Basanite	MB07-099 Basanite	MB07-101 Basanite	MB07-103 Hawaiite	MB07-104 Basanite	MB07-108 Basanite	MB07-110 Basanite
	Unnormalized Major Elements (Weight %):							
SiO2	45.31	46.15	42.57	43.07	45.44	42.15	47.00	42.58
TiO2	3.537	3.531	3.733	3.497	3.300	4.253	2.858	3.481
Al2O3	15.00	15.83	14.90	14.22	16.01	15.29	16.50	14.16
FeO*	10.88	10.89	11.51	11.49	10.69	12.06	10.18	11.56
MnO	0.209	0.221	0.202	0.191	0.196	0.205	0.225	0.193
MgO	8.07	6.19	7.56	9.60	5.97	6.36	4.51	9.59
CaO	10.09	9.27	10.61	11.27	8.93	10.55	8.10	11.14
Na2O	3.94	4.41	3.44	2.76	3.65	3.52	4.16	2.92
K2O	1.60	1.98	0.84	1.33	1.84	1.74	2.51	1.22
P2O5	0.815	0.980	0.934	0.753	0.967	0.975	1.008	0.752
Sum	99.45	99.46	96.30	98.17	96.99	97.11	97.04	97.59
LOI (%)	0.00	-0.14	2.78	1.53	1.77	1.18	2.13	1.58
Cl >/=	0.04	0.03	0.02	0.01	0.03	0.03	0.04	0.03
	Unnormalized Trace Elements (ppm):							
Ni	130	76	89	135	57	38	33	136
Cr	256	158	260	333	135	82	86	326
Sc	24	19	23	30	18	22	13	29
V	238	205	277	298	201	298	153	287
Ba	436	526	413	372	481	412	550	378
Rb	37	46	18	26	42	37	48	24
Sr	923	1073	989	795	1045	1021	1074	819
Zr	472	530	289	244	381	363	495	260
Y	32	36	29	27	30	32	33	27
Nb	80.1	96.4	70.9	59.9	85.5	80.8	114.0	60.0
Ga	19	23	17	18	19	21	20	17
Cu	46	36	38	46	36	36	26	47
Zn	104	122	100	93	96	110	113	94
Pb	2	3	2	4	3	2	5	2
La	58	67	50	49	65	57	86	45
Ce	120	150	115	92	133	123	168	91
Th	7	8	6	6	8	7	10	6
Nd	60	71	57	48	62	65	71	49
U	4	2	3	2	3	2	3	2
sum tr.	3046	3247	2845	2677	2898	2808	3099	2698
in %	0.30	0.32	0.28	0.27	0.29	0.28	0.31	0.27
sum m+tr	99.75	99.78	96.58	98.44	97.28	97.39	97.35	97.86
w/LOI, Cl	99.83	99.72	99.44	100.04	99.12	98.65	99.55	99.51
if Fe3+	101.04	100.93	100.71	101.32	100.30	99.98	100.68	100.79

Name	MB07-113 TP	MB07-114 Phonolite	MB07-115 Basanite	MB07-119 Basanite	MB07-121 Basanite	MB07-122 Basanite	MB07-129 Phonolite	MB07-133 Hawaiite
	Unnormalized Major Elements (Weight %):							
SiO2	52.78	53.29	45.24	43.71	43.41	40.91	57.60	46.85
TiO2	0.512	0.691	3.024	3.146	3.538	4.528	0.527	2.812
Al2O3	18.79	19.25	17.40	14.34	14.21	14.51	20.01	17.66
FeO*	5.84	4.76	9.93	10.61	11.28	12.83	3.87	9.53
MnO	0.224	0.175	0.208	0.195	0.200	0.220	0.214	0.171
MgO	0.76	0.60	4.12	9.89	10.04	7.92	0.98	3.31
CaO	3.14	2.27	8.60	10.31	10.16	11.28	3.19	7.77
Na2O	6.17	6.94	4.62	3.47	3.79	3.81	8.93	3.79
K2O	4.97	4.70	2.63	1.67	1.81	1.95	4.26	2.38
P2O5	0.194	0.165	1.038	0.772	0.731	1.160	0.093	0.841
Sum	93.38	92.83	96.81	98.11	99.17	99.12	99.67	95.12
LOI (%)	6.01	7.08	2.50	1.42	0.04	-0.26	0.38	3.75
Cl >/=	0.00	0.00	0.09	0.02	0.06	0.07	0.26	0.03
	Unnormalized Trace Elements (ppm):							
Ni	0	0	12	166	153	72	7	17
Cr	2	2	7	324	316	101	19	21
Sc	1	2	13	27	28	26	4	12
V	14	18	187	240	292	324	26	170
Ba	725	456	697	598	569	558	1129	714
Rb	134	149	56	38	43	40	135	58
Sr	366	419	1181	855	893	1061	1045	1145
Zr	565	607	425	299	300	334	941	481
Y	30	27	35	29	30	34	39	33
Nb	137.3	146.6	115.4	77.3	78.2	91.4	216.5	115.8
Ga	26	25	20	18	17	19	27	23
Cu	5	5	28	56	37	43	10	21
Zn	120	106	103	89	93	98	124	103
Pb	9	10	5	3	3	2	11	5
La	92	97	82	53	51	70	154	79
Ce	161	152	165	108	106	139	254	154
Th	21	23	10	8	6	8	28	11
Nd	42	43	67	49	52	65	73	62
U	2	1	3	3	3	2	7	5
sum tr.	2451	2288	3211	3039	3069	3089	4247	3231
in %	0.25	0.23	0.32	0.30	0.31	0.31	0.42	0.32
sum m+tr	93.63	93.06	97.13	98.41	99.48	99.43	100.10	95.45
w/LOI, Cl	99.69	100.19	99.70	99.91	99.60	99.24	100.58	99.27
if Fe3+	100.34	100.72	100.80	101.09	100.85	100.67	101.01	100.33

Name	MB07-134 Phonolite	MB07-136 Basanite	MB07-139 PT	MB07-140 Basanite	MB07-141 Basanite	MB07-142 Phonolite	MB07-143 Phonolite	MB07-144 TP
	Unnormalized Major Elements (Weight %):							
SiO2	56.95	40.13	47.87	45.05	43.32	52.16	55.01	52.53
TiO2	0.364	4.322	2.314	3.201	3.043	0.500	0.351	0.617
Al2O3	20.11	14.04	17.62	16.91	14.30	18.68	19.34	19.75
FeO*	4.01	11.82	9.41	10.09	10.78	5.81	3.84	6.57
MnO	0.183	0.182	0.242	0.205	0.194	0.221	0.178	0.229
MgO	0.15	8.62	3.53	4.40	9.95	0.74	0.33	0.80
CaO	1.44	11.45	7.00	8.75	11.36	2.85	1.41	2.37
Na2O	8.52	3.04	5.34	4.36	3.53	7.02	7.16	6.15
K2O	5.62	1.29	2.50	2.46	0.78	4.96	5.44	5.35
P2O5	0.055	0.787	0.794	1.035	0.719	0.164	0.054	0.250
Sum	97.40	95.69	96.61	96.46	97.97	93.12	93.11	94.61
LOI (%)	2.55	3.18	2.87	2.59	1.80	6.52	6.90	4.64
Cl >/=	0.22	0.00	0.00	0.04	0.01	0.00	0.00	0.16
	Unnormalized Trace Elements (ppm):							
Ni	0	81	16	27	171	7	0	0
Cr	1	190	37	38	440	27	2	1
Sc	0	31	8	13	28	3	0	1
V	2	362	115	190	270	8	2	7
Ba	733	450	845	649	437	862	715	1013
Rb	177	21	49	56	41	128	181	142
Sr	150	744	1227	1104	799	422	145	696
Zr	674	213	417	339	236	609	548	496
Y	26	29	34	33	28	29	19	30
Nb	143.8	54.3	124.0	98.5	63.7	158.0	147.3	141.6
Ga	26	16	21	20	17	22	25	24
Cu	3	56	19	32	60	6	2	7
Zn	107	87	113	100	86	113	102	113
Pb	13	1	4	3	2	7	14	8
La	98	39	84	67	47	94	94	92
Ce	137	86	164	140	88	160	151	156
Th	33	5	10	8	6	19	12	30
Nd	39	45	65	62	45	48	37	48
U	2	0	4	3	1	4	1	2
sum tr.	2364	2508	3354	2982	2865	2726	2197	3006
in %	0.24	0.25	0.34	0.30	0.29	0.27	0.22	0.30
sum m+tr	97.64	95.95	96.95	96.76	98.26	93.39	93.33	94.91
w/LOI, Cl	100.24	99.19	99.89	99.42	100.14	99.97	100.28	99.60
if Fe3+	100.68	100.50	100.93	100.54	101.34	100.61	100.71	100.33

Name	MB07-145 PT	MB07-147 Basanite	MB07-149 Basanite	MB07-153 Basanite	MB07-154 Hawaiite	MB07-161 Phonolite	MB07-163 Phonolite	MB07-166 Phonolite
	Unnormalized Major Elements (Weight %):							
SiO2	48.90	44.05	44.13	43.20	45.71	54.79	54.73	55.55
TiO2	2.231	3.553	3.583	3.590	2.994	0.514	0.517	0.316
Al2O3	18.89	15.01	15.05	15.51	15.76	20.39	20.28	20.49
FeO*	8.31	11.06	11.11	11.94	10.94	6.49	6.51	5.11
MnO	0.209	0.192	0.193	0.209	0.213	0.243	0.244	0.225
MgO	2.58	7.95	7.91	6.78	6.85	0.61	0.58	0.33
CaO	7.08	10.13	10.21	9.79	9.49	2.63	2.67	1.90
Na2O	6.15	3.44	3.50	3.30	3.95	8.82	8.34	8.95
K2O	2.92	1.64	1.51	1.62	1.66	3.81	4.80	5.47
P2O5	0.782	0.795	0.791	1.077	0.794	0.195	0.188	0.119
Sum	98.06	97.83	97.99	97.01	98.36	98.49	98.87	98.44
LOI (%)	1.44	1.63	1.34	1.71	0.93	1.58	0.96	1.03
Cl >/=	0.12	0.04	0.03	0.03	0.04	0.15	0.15	0.30
	Unnormalized Trace Elements (ppm):							
Ni	5	105	106	79	94	0	0	0
Cr	3	235	242	146	200	3	3	3
Sc	6	25	24	20	20	1	2	1
V	113	262	260	237	216	2	2	4
Ba	794	424	426	437	451	1029	1026	922
Rb	72	38	34	31	32	110	94	152
Sr	1219	930	942	1044	934	691	665	381
Zr	497	345	341	343	383	456	580	602
Y	32	26	27	31	28	25	28	26
Nb	126.4	76.1	75.4	78.2	82.8	140.8	143.1	137.1
Ga	22	20	19	20	21	23	24	26
Cu	16	45	49	42	40	6	7	4
Zn	101	92	90	106	102	121	121	119
Pb	4	2	2	3	1	7	8	8
La	88	53	57	60	64	92	93	88
Ce	159	110	116	133	127	146	163	146
Th	13	7	6	6	7	16	19	23
Nd	63	51	54	63	58	46	46	38
U	5	3	5	1	4	0	5	6
sum tr.	3339	2849	2876	2878	2863	2916	3029	2685
in %	0.33	0.28	0.29	0.29	0.29	0.29	0.30	0.27
sum m+tr	98.39	98.11	98.28	97.30	98.65	98.78	99.17	98.71
w/LOI, Cl	99.90	99.82	99.70	99.08	99.64	100.42	100.20	99.80
if Fe3+	100.82	101.05	100.93	100.40	100.86	101.14	100.92	100.37

Name	MB07-167 Basanite	MB07-169 Phonolite	MB07-171 Phonolite	MB07-174 TP	MB07-176 Bemoreite	MB07-177 PT	MB07-186 Basanite	MB07-189 Basanite
	Unnormalized Major Elements (Weight %):							
SiO2	44.60	56.13	53.08	53.61	54.78	48.73	43.06	44.43
TiO2	3.365	0.417	0.473	0.568	0.853	2.213	3.762	3.425
Al2O3	16.25	19.95	18.37	20.09	18.42	18.33	14.86	15.46
FeO*	10.79	4.68	4.97	6.42	6.17	8.95	11.69	11.05
MnO	0.209	0.216	0.211	0.234	0.221	0.228	0.210	0.207
MgO	6.68	0.72	0.61	0.60	1.36	2.90	7.66	6.80
CaO	10.30	1.96	3.58	2.87	2.81	6.86	11.00	9.93
Na2O	4.12	8.95	7.09	7.15	5.12	6.52	3.35	3.72
K2O	1.94	5.41	5.02	5.14	4.89	3.30	1.59	1.65
P2O5	0.868	0.141	0.154	0.230	0.250	0.708	0.917	1.011
Sum	99.13	98.59	93.56	96.89	94.88	98.74	98.09	97.67
LOI (%)	0.57	0.42	5.64	3.00	4.33	0.19	0.78	1.37
Cl >/=	0.06	0.35	0.25	0.05	0.07	0.13	0.05	0.05
	Unnormalized Trace Elements (ppm):							
Ni	63	6	0	0	8	13	86	83
Cr	128	15	5	3	20	16	271	229
Sc	23	2	3	1	6	9	24	20
V	278	28	20	6	47	123	284	237
Ba	626	249	533	1020	711	891	418	472
Rb	44	160	127	137	111	89	32	36
Sr	988	185	232	673	309	1025	933	987
Zr	335	838	803	694	550	460	337	375
Y	32	36	42	30	34	33	31	29
Nb	89.1	184.8	197.2	153.0	187.3	137.2	80.4	89.0
Ga	20	27	22	23	23	22	19	19
Cu	52	8	3	8	11	19	45	43
Zn	99	122	126	115	109	108	105	103
Pb	4	10	10	8	6	4	2	3
La	64	120	120	97	108	87	59	64
Ce	122	198	218	164	195	163	120	129
Th	7	26	22	21	15	12	7	8
Nd	53	55	67	48	68	61	57	60
U	2	4	6	4	6	3	2	3
sum tr.	3028	2274	2556	3205	2520	3274	2910	2987
in %	0.30	0.23	0.26	0.32	0.25	0.33	0.29	0.30
sum m+tr	99.43	98.82	93.81	97.21	95.13	99.07	98.38	97.97
w/LOI, Cl	100.07	99.30	99.51	100.28	99.51	99.33	99.24	99.42
if Fe3+	101.27	99.82	100.06	100.99	100.20	100.32	100.54	100.64

Name	MB07-191 Basanite	MB07-193 Basanite	MB07-180 PT	MB07-182 Trachyte	MB07-182 Basanite	MB07-183 PT	MB07-184 TP	MB07-185 PT
	Unnormalized Major Elements (Weight %):							
SiO2	43.11	42.46	47.33	59.73	40.05	48.17	51.71	47.97
TiO2	3.248	3.685	2.121	0.390	4.297	2.358	1.613	2.420
Al2O3	14.18	14.51	17.83	19.06	16.96	17.61	18.72	17.69
FeO*	10.92	11.50	8.74	4.98	11.66	9.54	7.80	9.92
MnO	0.191	0.208	0.285	0.183	0.199	0.218	0.217	0.226
MgO	9.66	7.82	2.72	0.30	5.83	3.61	2.47	3.56
CaO	10.91	10.96	7.24	2.18	12.63	7.69	5.54	7.87
Na2O	3.18	3.30	5.79	6.54	3.56	5.80	6.93	5.99
K2O	1.52	1.42	3.57	5.99	1.18	2.70	3.94	2.53
P2O5	0.722	0.897	0.659	0.123	1.974	0.600	0.424	0.653
Sum	97.65	96.76	96.28	99.50	98.34	98.30	99.36	98.82
LOI (%)	1.05	1.69	2.36	0.21	0.29	0.61	0.19	0.30
Cl >/=	0.05	0.04	0.14	0.06	0.03	0.10	0.18	0.02
	Unnormalized Trace Elements (ppm):							
Ni	163	93	12	1	1	13	12	12
Cr	393	286	16	1	0	20	21	13
Sc	28	25	8	0	12	13	8	11
V	259	282	117	2	202	150	107	157
Ba	413	399	862	1951	556	759	592	798
Rb	32	29	89	87	16	61	100	48
Sr	844	902	984	352	1418	829	569	887
Zr	253	327	468	346	201	377	506	363
Y	27	30	34	23	42	29	30	30
Nb	65.1	78.1	136.7	188.5	76.6	103.0	114.1	105.6
Ga	18	20	21	19	17	22	22	22
Cu	59	47	24	14	20	23	17	19
Zn	89	103	113	61	101	116	115	145
Pb	4	2	5	5	2	3	7	3
La	46	59	88	73	62	68	78	72
Ce	92	122	161	129	142	124	143	135
Th	7	6	13	10	4	9	14	9
Nd	45	56	60	49	78	53	50	55
U	3	2	4	3	0	3	3	2
sum tr.	2838	2868	3216	3314	2949	2774	2507	2886
in %	0.28	0.29	0.32	0.33	0.29	0.28	0.25	0.29
sum m+tr	97.93	97.05	96.60	99.83	98.63	98.58	99.61	99.11
w/LOI, Cl	99.06	98.81	99.03	100.10	98.99	99.25	99.86	99.48
if Fe3+	100.27	100.09	100.00	100.65	100.28	100.31	100.72	100.58

Name	MB07-004 Basanite	MB07-004 Basanite	MB07-047 Basanite	MB07-047 Basanite	MB07-104 Basanite	MB07-104 Basanite	MB07-154 Hawaiite	MB07-154 Hawaiite
	Unnormalized Major Elements (Weight %):							
SiO2	44.10	44.36	42.72	43.08	42.15	42.48	45.71	45.80
TiO2	2.773	2.797	3.871	3.865	4.253	4.279	2.994	2.991
Al2O3	13.45	13.54	13.63	13.68	15.29	15.42	15.76	15.75
FeO*	10.01	10.10	11.69	11.66	12.06	12.23	10.94	10.95
MnO	0.186	0.187	0.198	0.198	0.205	0.208	0.213	0.213
MgO	11.62	11.72	10.39	10.43	6.36	6.44	6.85	6.87
CaO	10.00	10.08	11.51	11.54	10.55	10.63	9.49	9.50
Na2O	3.25	3.26	3.12	3.15	3.52	3.55	3.95	3.96
K2O	1.54	1.54	1.21	1.22	1.74	1.76	1.66	1.67
P2O5	0.596	0.603	0.946	0.947	0.975	0.982	0.794	0.794
Sum	97.52	98.20	99.29	99.76	97.11	97.98	98.36	98.50
LOI (%)	1.65	1.65	-0.19	-0.19	1.18	1.18	0.93	0.93
Cl >/=	0.05	0.05	0.03	0.03	0.03	0.03	0.04	0.03
	Unnormalized Trace Elements (ppm):							
Ni	278	282	183	183	38	38	94	93
Cr	654	663	386	389	82	81	200	200
Sc	27	28	31	29	22	24	20	21
V	222	224	290	293	298	301	216	216
Ba	408	411	352	362	412	415	451	453
Rb	37	37	28	28	37	36	32	31
Sr	745	751	807	807	1021	1024	934	938
Zr	304	308	312	312	363	363	383	387
Y	27	28	29	29	32	34	28	29
Nb	69.3	69.7	65.2	65.3	80.8	80.9	82.8	83.6
Ga	18	19	17	20	21	22	21	21
Cu	54	55	56	57	36	35	40	41
Zn	91	94	98	100	110	110	102	103
Pb	3	3	3	3	2	2	1	3
La	49	48	49	48	57	58	64	62
Ce	100	92	100	102	123	127	127	129
Th	8	8	7	7	7	6	7	6
Nd	44	44	54	53	65	67	58	56
U	2	2	0	2	2	2	4	4
sum tr.	3139	3165	2866	2889	2808	2826	2863	2878
in %	0.31	0.32	0.29	0.29	0.28	0.28	0.29	0.29
sum m+tr	97.83	98.52	99.58	100.05	97.39	98.27	98.65	98.79
w/LOI, Cl	99.57	100.26	99.47	99.94	98.65	99.52	99.64	99.79
if Fe3+	100.68	101.38	100.77	101.24	99.98	100.88	100.86	101.01

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Geochronology of Southern McMurdo Sound and development of Pychron: A $^{40}Ar/^{39}Ar$ data collection and processing software suite

by

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