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GEOLOGICAL SURVEY

$^{40}Ar/^{39}Ar$ Age-Spectrum Data for Whole Rock Basalts, and Plagioclase and Biotite from Tephra: A Traverse Down the Porcupine River, East-central Alaska

by

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INTRODUCTION

As part of a larger study of climate change a group of samples, primarily basalts from some of the unglaciated basins in the interior of Alaska and the Yukon Territory of Canada, were collected and analyzed using $^{40}Ar/^{39}Ar$ age spectrum and total fusion dating techniques. This publication contains reduced $^{40}Ar/^{39}Ar$ data from a portion of the study area and is intended only to be a preliminary publication of these results, in more detail than can be accommodated in today's professional journals. Also included in this report is information on the location of all samples and a brief description of both the outcrops from which the samples were collected and the individual samples. The data contained herein are not interpreted in a geological context and care should be taken by users unfamiliar with argon isotopic data in the use of these results. No geological meaning is implied for any of the apparent ages presented below and many of the apparent ages are not geologically meaningful. All of the apparent ages are included for use in discussing in subsequent publications. This report is primarily a detailed source document for subsequent publications that will integrate this data into a geological context.

SAMPLING STRATEGY

The area sampled in this study is along the Porcupine River in the Yukon flats basin in east-central Alaska, between the Upper Ramparts, near the Alaska-Yukon Border and the Fish hook bend area to the west (Fig. 1). Because the area is extremely remote and has no roads, access is limited to areas that can be reached by airplane, helicopter or riverboat. All of thesamples were collected from outcrops cut by the Porcupine River and its tributaries in their traverse across the Arctic tundra. Most of the samples collected are basalts that range from fairly fresh to quite weathered. All possible efforts were made to collect only the least altered material at each outcrop, although in several instances all of the basalt from a given outcrop or flow was quite altered. At two outcrops on the western end of the traverse we sampled a tephra layer that was found intercalated in a sedimentary sequence. Plagioclase and biotite separated from these samples were analyzed using $^{40}Ar/^{39}Ar$ dating techniques. Special attention was given to the collection of basalts from stacks of flows that were intercalated with pods, lenses, or beds of forest floor material. Pollen from these organic deposits is a good indicator of the climate in the area and precise $^{40}Ar/^{39}Ar$ dating of the basalts constrain the numerical age of these deposits. Terrestrial microfossils from these types of beds generally have long ranges and are not useful for precise correlation other numerically dated sections.

METHODS

Sample Preparation

All basalt samples were crushed, ground, and sized using 250, 180, 150, 125, and 125 μm mesh sieves. Phenocrysts of various sorts were effectively removed from the samples by working with the 150 to 125 μm size fractions. This material was washed in an Branson model AT 610-6, industrial grade, ultrasonic cleaner for a period of one hour to remove dust particles and then rinsed and dried. The resultant material was then leached in 10% Hcl in a Branson model B220 ultrasonic cleaner until all reactions ceased, and finally washed in acetone, alcohol, and deionized water(X3). Tephras were stripped of biotite using a Frantz magnetic separator. The biotite was then concentrated to greater than 99.9% purity using standard mineral separation techniques including, heavy liquids, additional magnetic separation, light ultrasonic cleaning and paper shaking. Care was taken to exclude all but the densest, most magnetic biotite, in an effort to exclude altered biotite. Plagioclase was concentrated using the same techniques, in addition to heavy duty ultrasonic cleaning. Some quartz was not removed using these techniques and was left in the sample, as it contains no potassium it acts primarily as a dilutant.

Approximately 1000 mg of basalt, 1000 mg of plagioclase and 10-100 mg of biotite of biotite were packaged in tin capsules and sealed under vacuum in quartz tubes. Samples were then irradiated in the central thimble facility at the TRIGA reactor (GSTR) at the U.S. Geological Survey, Denver, Colorado. The monitor mineral was FCT-3 sanidine (Kunk et al., 1985; and Cebula et al.,1986) which has an age of 27.79 Ma compared against Mmhb-1 at 519.4 Ma(Alexander et al.,1978; and Dalrymple et al., 1981). The type of container, and the geometry of samples and standards is similar to that described by Snee et al. (1988).

Sample Analysis

All samples were analyzed on a VG Isotopes, Ltd, Model 1200 B Mass Spectrometer at the U.S. Geological Survey, Reston, using the step heating method. Heating for 10 minutes per step followed a schedule of 8-15 steps per sample. The number and temperature of heating steps was selected to limit the percentage of gas released to less than 20%/step for most samples.

Heating of all samples was done in a small volume molybdenum-lined "low blank" tantalum furnace. Temperature was monitored by a W_5Re-$W_{26}Re$ thermocouple and controlled by a proportional, programmable controller. The furnace and the rear manifold were pumped between steps with a turbo molecular pump. Two isolated ion pumps evacuated the front manifold and the mass spectrometer tube between each incremental step. During normal operation, the gas to be analyzed was purified in the rear manifold by a Saes ST707 Fe-V getter operated at room temperature. Gas was equilibrated with the front manifold with an empty cold finger (in the rear manifold) chilled with liquid N^2 to remove condensables (chiefly water), and cleaned in the front manifold by a Saes ST101 Al-Zr getter operated

at 400°C and a Ti (H_2) getter operated at a constant 350°C. An activated charcoal finger submerged in a constant boiling mixture of dry ice and acetone was used to remove gasses with a molecular weight greater than 60 or 80 (primarily other noble gasses) prior to the admission of the argon dominated gas to the mass spectrometer by expansion. The Argon-rich gas was further purified in the mass spectrometer by a second Saes ST101 active gas getter operated at room temperature. Its successful operation could be monitored by the drop in counts of mass 44 (dominated by CO_2) after the first gas analysis cycle. Argon isotopes with masses 40 through 36 and CO_2, mass 44 were analyzed as a function of time in five analysis cycles. ^{40}Ar, ^{39}Ar, and ^{36}Ar peaks and their baselines, were measured as a series of four, five second integrations in each of the five cycles, that were then averaged. ^{38}Ar and ^{37}Ar peaks, and their baselines, were measured for only one, five second integration per cycle. After the analysis the mass spectrometer was evacuated. If necessary, the fraction of gas remaining in the front manifold could be introduced into the mass spectrometer for a replicate "split" analysis, but with a signal 3.6 x smaller (see tables below). All phases of the sample heating, cleanup, equilibration and sample analysis were preformed under computer control.

Isotopic Data Reduction

All the Ar isotopic data were reduced using an updated version of the computer program ArAr* (Haugerud and Kunk, 1988) and decay constants recommended by Steiger and Jäger (1977). The isotopic measurements made in the five cycle analysis had baseline values subtracted and then were regressed, to time zero, using standard linear regression techniques. These regressed values and associated statistical estimates of analytical uncertainties of the time zero peak values were used in the data reduction. No corrections for furnace blanks were made because blanks were routinely less than 0.1% of sample signal at all temperatures.

Corrections for interfering reactor-produced argon isotopes from Ca, K, and Cl in the sample were made using the production ratios given in Dalrymple et al. (1981). Errors included in calculating ages or ratios include analytical errors in the analysis, decay factor uncertainties, measured atmospheric or calculated initial $^{40}Ar/^{36}Ar$ ratios, the irradiation parameter J, the production ratios of the various reactor induced argon producing reactions, the initial $^{38}Ar/^{36}Ar$ ratio, and the age of the monitor (Haugerud and Kunk, 1988).

The tables and figures below include the identification of plateau ages, isochron ages, minimum ages, fusion ages and total gas ages. Plateau ages are identified where the ages of two or more contiguous steps overlap within experimental error, and whose cumulative $^{39}Ar_K$ comprises greater than 50% of the total potassium derived ^{39}Ar (Fleck et al., 1977; Snee et al., 1988). For all samples analyzed by the $^{40}Ar/^{39}Ar$ age spectrum dating technique, all steps were examined for colinearity on isotope correlation diagrams

to assess if non-atmospheric argon components were trapped in any samples and to calculate an isochron age. In several instances, points that were deemed to be not collinear were deleted from the isotope correlation diagram. Minimum ages are of a single step (except the first step in the age spectrum) and represent the lowest age measured in a U- or L- shaped spectrum. No analytical precision is stated for minimum ages in Table 1. Fusion ages represent the results of a single analysis in which all of the argon was released by melting in a single step. Total gas ages represent the age calculated from the addition of all of the measured argon peaks for all steps in a single sample. The total gas and fusion ages are equivalent to conventional K/Ar ages. No analytical precision is calculated for total gas ages.

SAMPLE DESCRIPTIONS

The locations and descriptions of samples analyzed in this project are given below. This information is organized by site numbers and one or more sample descriptions can be found after information on the location, map unit, and a site description. Stratigraphic relationships between sites are not known, except as noted. Petrographic observations were made on a single thin section for each basalt sample and focus on the degree to which the basalt is altered. Observations on tephras were made from loose grains, using both petrographic and binocular microscopes. In the descriptions that follow, minerals are listed in decreasing order of abundance in the matrix followed those present as phenocrysts.

Site: 90-1

Location: 67°19'51"N, 141°19'48"W

Map Unit: Coleen B-1, T29N,R29E sections 19 and 20

Outcrop description: This outcrop on the south side of the river consists of two basalt flows overlaying a thick conglomeratic sandstone. Both basalts are six to ten meters in thickness. The lower flow is somewhat more variable in its thickness and pinches out entirely for brief intervals due to relief on the upper surface of the sandstone. The lower basalt flow is massive and only slightly altered. In some portions of the outcrop this basalt appears to be composed of three subunits defined by the presence of vesicles at their upper surfaces. The upper flow has horizontal cleavage parallel to the base of the flow with a vertical spacing of ten to thirty cm and is much more pervasively altered than the lower flow. Lenses of peat can be found at the base of the lower flow and in depressions in the upper surface of the lower flow. In one of these lenses between the two flows the charrad remains of an upright tree stump were noted.

K-90-8-17A Lower basalt flow at this site. Sub-site 90-1A.

Description: Gray, slightly vesicular, massive basalt. Slightly altered with some minor iron staining in hand sample. Most vesicles empty with no zeolite or other alteration products lining interior.

The fairly coarse grained groundmass of this basalt is composed of clinopyroxene, plagioclase and opaques. About 40-50% of the basalt was initially

glass. Phenocrysts include fresh plagioclase, olivine with slight alteration to iddingsite and clinopyroxene. One partially zeolite filled vesicle was noted in thin section, however the rest were empty and not lined with any alteration products. Minor iron staining was noted.

K-90-8-17B Upper basalt flow at this site, about two meters above its base where it is somewhat more massive. Near sub-site 90-1E.

Description: Gray basalt that appears pervasively altered in the hand sample and is non vesicular.

In thin section the matrix is very fine grained and composed primarily of clinopyroxene with lesser amounts of plagioclase and opaques. About 40-50% of this basalt is groundmass. Phenocrysts include abundant, fairly fresh, olivine, with only minor alteration to iddingsite, and rare clinopyroxene.

K-90-8-17C Base of the upper basalt flow at sub-site 90-1C.

Description: Medium gray basalt, somewhat altered in hand sample, with some filled vesicles and fractures, and conspicuous iron staining.

In thin section the matrix is composed of clinopyroxene, plagioclase and opaques. About 60-70% of the rock is groundmass. Phenocrysts include olivine, slightly altered to iddingsite and plagioclase. All fractures and most vesicles are filled with alteration products, primarily zeolites and iron oxides.

K-90-8-18A3 Top sub-unit of lower basalt flow, near subsite 90-1E.

Description: Medium gray, non vesicular basalt in hand sample that is the least altered material available in place.

In thin section the matrix of this sample is composed of clinopyroxene, plagioclase, and opaques. The basalt is as much as 60-70% groundmass. This matrix contains phenocrysts of olivine that have been slightly altered to iddingsite and rare clinopyroxene, Some iron staining noted.

Site: 90-2

Location: 67°18'45"N, 141°29'48"W

Map unit: Coleen B-1 T29N, R28E, section 28

Outcrop description: This site is located on the south side of the river immediately to the west of the confluence of the Campbell River with the Porcupine River and is located about 7.3 Km down stream from site 90-1. The outcrop consists of three basalt flows deposited one atop the other. A peat lens was found beneath the lowermost flow. The lowest basalt flow is about ten meters thick and is very similar in appearance to the lower flow at site 90-1. It is gray in color, fairly massive, has a low number of vesicles and is only slightly altered. The middle basalt flow is about six meters in thickness and is very similar in appearance to the upper flow at site 90-1 although it is slightly thinner. It is gray in color, has a platy cleavage with a spacing of ten to thirty cm and is quite altered. The upper flow at this outcrop is about ten meters thick and has no analogue at site 90-1. It is gray in color and fairly massive with little in the way of visible alteration and few vesicles.

K-90-8-19A Lowest basalt flow at this outcrop. Probably part of a large slump block that includes peat lens.

Description: Medium gray, non vesicular basalt in hand sample that appears fairly fresh.

In thin section the matrix of this basalt is composed of clinopyroxene, plagioclase, and opaques. About 30-40% or the rock is groundmass. Phenocrysts include fresh olivine and plagioclase. This was one of the freshest samples dated in this study.

K-90-8-19B Middle basalt flow at this outcrop.

Description: In hand sample this medium gray, somewhat vesicular basalt appears quite altered, with many of its vesicles filled.

In thin section this sample has a very fine grained matrix composed of clinopyroxene, glass, plagioclase and opaques. The matrix accounts for as much as 90% of the rock, 10-20% of which is fresh glass. Small olivine phenocrysts are partially altered to iddingsite, and most cavities are filled with iron stained zeolites.

K-90-8-19C Upper basalt flow at this outcrop.

Description: In hand sample this basalt appears fairly fresh and non vesicular.

In thin section the matrix is composed of plagioclase, clinopyroxene and opaques. The matrix makes up about 30-50% of the rock. Phenocrysts include olivine slightly altered to iddingsite, fresh laths of plagioclase and clinopyroxene. Some minor iron staining was noted.

Site: 90-5

Location: 67°16'15"N, 141°38'48"

Map unit: Coleen B-2 T28N, R28E, section 7

Outcrop description: This outcrop is located on the west (north) side of the Porcupine river about 0.6 downstream of its confluence with the Rapid River. The outcrop consists of a sequence of four basalt flows. The lowermost flow in this stack was deposited on a surface of steeply dipping Paleozoic sediments. A one meter thick paleosoil separates the uppermost two basalt flows. All four of the basalt flows are somewhat massive and variably altered. The stratigraphic relationship of these basalt flows relative to those at the other sample sites is not obvious on the basis of field observations.

K-90-8-22A Top basalt flow at this outcrop. Not dated due to pervasive alteration.

Description: In hand sample this medium gray basalt appears to be fairly unaltered and to contain black phenocrysts of an indeterminate mineral.

In thin section the medium grain size matrix of this basalt is composed of clinopyroxene, plagioclase and opaques. The groundmass makes up about 60-70% of the rock. Phenocrysts include clinopyroxene, olivine, some zoned, strongly altered to iddingsite and altered, zoned plagioclase laths. This is one of the most altered basalts sampled in this study and was not suitable for age dating.

K-90-8-22B Second from the top basalt flow at this outcrop.

Description: In hand sample this medium gray basalt is somewhat vesicular and altered.

In thin section the fine grained matrix is composed of clinopyroxene, plagioclase and opaques.

The groundmass is as much as 80% of the rock This matrix contains small olivine phenocrysts that have been fairly strongly altered to iddingsite and small, fresh, plagioclase laths. Fractures in the rock are filled with alteration products.

K-90-8-22C Third from the top basalt flow at this outcrop.

Description: In hand sample this medium gray, vesicular basalt appears to be somewhat less altered than K-90-8-22B.

In thin section the matrix is composed of fine grained clinopyroxene and orthopyroxene, plagioclase and opaques. About 90% of the rock is groundmass. Phenocrysts include very large poikiolitic plagioclase with inclusions of clinopyroxene and orthopyroxene similar to that found in the matrix, and olivine that is altering to iddingsite. Vesicles and fractures are filled with zeolites. This basalt is the only on collected in our study area that contained orthopyroxene or large poikiolitic plagioclase.

K-90-8-22D Lowest basalt flow in the section at this outcrop.

Description: In hand sample this medium gray basalt appears to be fairly fresh and non vesicular.

In thin section the fine grained matrix is composed of clinopyroxene, plagioclase, and opaques. About 80-90% of the rock is groundmass. Phenocrysts include clinopyroxene, olivine, strongly altered to iddingsite, and altered plagioclase. This sample was not analyzed because it is too altered.

K-90-8-22F Highest basalt flow on opposite side of the river. Not dated due to the degree of alteration.

Description: In hand sample this medium gray, vesicular basalt quite altered.

In thin section the fine grained matrix is composed of clinopyroxene, plagioclase and opaques. About 80-90% of the rock is groundmass. Phenocrysts include olivine, moderately altered to iddingsite, and clinopyroxene. Fractures and vesicles are filled with alteration products, primarily zeolites and iron oxides.

Site 90-6

Location: 67°14'42"N, 141°31'30"

Map unit Coleen A-2 T28N, R28E, section 19

Outcrop description: This outcrop is located on the west side of the Porcupine River, about 2.7 km down stream of Half-Way Pillar and directly across the river from site 90-6b. The outcrop consists of a series of at least five basalt flows, only the lowermost of which is accessible without climbing gear. Only this lower flow was sampled. It is a dark grey to black in the basal ten feet and is somewhat more weathered and lighter grey in color in its upper portions. The lower portion of this basalt is the freshest, least altered and least vesicular of any of the basalts seen at any of the outcrops visited on this trip. the upper portions of this flow are somewhat altered and contains numerous filled vesicles.

K-90-8-19D Lowermost portion of lowermost basalt flow at this outcrop.

Description: The hand sample of this non-vesicular basalt is very dark gray in color and appears to be the freshest material collected.

In thin section the matrix is composed of very fine grained clinopyroxene, plagioclase, and opaques with minor traces of iron oxides as alteration products. About 80-90% of the rock is groundmass. Phenocrysts include fresh olivine and fresh plagioclase laths.

K-90-8-19D1 Upper portion of the lowest basalt flow at this outcrop.

Description: In hand sample this light gray, vesicular basalt is visibly, quite altered with filled vesicles.

In thin section the matrix is composed of clinopyroxene, plagioclase and opaques. About 40-60% of the rock is groundmass. Olivine phenocrysts, contained in this matrix is strongly altered with some grains being completely replaced with iddingsite. Small plagioclase phenocrysts are also somewhat altered. Most vesicles are filled with zeolites.

Site: 90-7

Location: 67°8'48"N, 142°8'24"W

Map unit: Coleen A-3 T27N, R25E, section 24

Outcrop description: This outcrop consists of a sequence of poorly consolidated lake sediments, mostly claystones and siltstones with minor intercalated sandstones. The sediments contain variable amounts of organic

matter. A tephra was located at about 19.9 meters above the base of the outcrop enclosed in an organic rich siltstone. Although, it is quite variable in thickness ranging from a minimum of 0.2 mm to a maximum of 5 cm, the tephra is continuous at this outcrop. This variation in thickness is most probably due to slight reworking of the tephra very shortly after its deposition. Although, the reworking was not great enough to completely mix the tephra into the underlaying sediments, it is variably contaminated with the organic rich claystone in which it is enclosed. The tephra is medium gray in color and weathers to bright white. Biotite is visible in this tephra with the aid of a hand lens. A second possible tephra was noted about 22 meters above the base of the outcrop. It was present in only one small portion of the outcrop. It is quite possible that this represents reworked material from the lower tephra.

K-90-8-21A The bulk of this sample is composed of pumiceous glass with variable degrees of devitification with an admixture of aggregates of silt size material from the enclosing sediments. Primary igneous phenocrysts include plagioclase, quartz, biotite and zircon. The plagioclase is only slightly altered with most grains being pristine. Biotite has a wide range of specific gravity and is clearly variably altered. None of the phenocrysts showed signs of significant transport, and no igneous grains could be identified that were obvious contaminates.

K-90-8-21B Sample is composed mostly of sediments but does contain highly altered biotite and plagioclase (some fairly fresh) as well as quartz. These observations are consistent with this material representing reworked material from the lower tephra. The sample was not suitable for dating.

Site: 90.8

Location: 67°10'10"N, 142°10'00"W

Map Unit: Coleen A3, T27N, R25E, section 14

Outcrop description: This outcrop consists of a sequence of poorly consolidated lake sediments which includes claystones, mudstones and minor sandstones, all with variable organic content. A tephra was located about 20.2 meters above the base of the outcrop. It is medium gray in color, when wet, weathers to a bright

white, and contains visible biotite flakes. The tephra is locally discontinuous in the outcrop with a maximum thickness of about 2.5 cm, due to slight local reworking very shortly after deposition. This reworking also resulted in the addition of some of the host sediments as an admixture to the tephra.

K-90-8-20A This sample is virtually identical to sample K-90-8-21A except the biotite and plagioclase are more altered. The alteration precluded the preparation of an adequate plagioclase mineral separate from this sample.

RESULTS

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

The $^{40}Ar/^{39}Ar$ data presented in this report are presented in two different formats. Data within both formats are arranged in the same order as the section on sample descriptions.

The first of these formats is a condensed tabular form (Table 1). The data presented in this table are organized by site number. These tables summarize the data contained in the succeeding, more detailed individual data sets. Included in this table are: the sample numbers; the material analyzed, the apparent age and its error (see below for a detailed explanation); the percent ^{39}Ar of the total that this apparent age represents; the number of steps / total number of steps that this apparent age represents; the MSWD, for isochron ages; the initial $^{40}Ar/^{36}Ar$ used in calculating the apparent age (or atmos if 295.5 was used and; a comment listing the type of apparent age.

The individual data sets include a series of four tables, as well as three graphical representations of some of the age spectrum data. Total fusion analyses have no figures.

The first table, RAW DATA, includes the computer file number of the individual argon analysis, the temperature of the step, regressed peak values and their precision, the trap current (filament amperage, in microamps) and the manifold splitting option used. The relationship between the trap currents and manifold options can be found in the footnotes of the third table. No corrections have been made to the peak values, these are raw numbers.

The second table, CORRECTIONS, contains calculated corrections for decay of radioactive isotopes of argon, as well as the production of interfering isotopes during irradiation, and a calculated initial ^{38}Ar value. All of these values have been corrected only for the affects of mass discrimination as discerned by measuring atmospheric argon. The measured atmospheric argon value used is listed in the footnote of table three. All tabular data in this table, as well as the two subsequent tables, is indexed by the temperature of the step analyzed.

The third table includes the percent ^{39}Ar of the age spectrum total that each step contains, the radiogenic yield (percentage of ^{40}Ar that is derived from the decay of potassium), calculated apparent K/Ca and K/Cl ratios for each step, a corrected $^{40}Ar/^{39}Ar$ ratio (labeled F) from which the age can be directly calculated, a calculated age for the step, in millions of years and a series of three estimates of the precision of each age. The intra-sample precision includes estimates of the errors that are unique to a single sample and can be used only for comparisons with other steps of the same sample. The intra-package precision includes an estimate of the precision of the irradiation parameter J and can be used to compare total fusion analyses that used the same monitor mineral. This estimate of precision should not be used to compare

steps either within a single age spectrum or between different age spectra. The inter-package precision includes an estimate of the precision of the age of the monitor mineral and should not be used for comparisons of any data contained in this report. Also included, as a footnote, is an estimate of the limit of reproducibility of the mass spectrometer when the sample was analyzed. If an intra-sample error is less than this value times the age of the step, this value should be used when comparing with other steps from the same age spectrum.

The fourth data table lists molar quantities of the indicated argon isotope derived from the sources indicated. The age and the estimate of intra-sample precision are repeated. The J-value and its precision estimate, and sample weight are listed near the top of this table. If an age plateau, as defined above, was found, it is listed at the bottom of this table along with an estimate of its intra-package precision, the percent ^{39}Ar contained in the plateau and the temperatures of the first and last steps on the plateau. All precision estimates, in all tables, are at the one sigma level of confidence.

The first figure with each age spectrum data set includes two graphs. The lower and larger graph plots cumulative percent ^{39}Ar of the steps in the age spectrum against apparent age in millions of years. The precision estimate used to construct the error boxes of each step is two sigma. The upper, smaller graph plots the apparent K/Ca ratio of each step against cumulative ^{39}Ar released. Many times the degree of sample purity or the presence of compositional zoning can be inferred from this figure. Homogeneous samples with no compositional zoning or impurities are reflected by horizontal patterns in this figure, the patterns of those with zoning or impurities typically depart from horizontal.

The third figure included is an inverse isotope correlation diagram. In this figure the corrected $^{39}Ar/^{40}Ar$ ratio of each temperature step of an age spectrum is plotted against its corrected $^{36}Ar/^{40}Ar$ ratio. The intercept of the line generated by these points with the X-axis of the graph is the inverse of the $^{40}Ar/^{39}Ar$ ratio of those points included on the line, an age can be directly calculated from this value. The Y-axis intercept is the inverse of the initial $^{40}Ar/^{36}Ar$ ratio of the sample. This value can be used to indicate the presence of excess argon. Values for these intercepts and their inverse ratios as well as their errors can be found either above or below this figure. Also included are an age calculated from the inverse of the X-axis, an MSWD, for the points included in the calculations, a list of points that were not used in the regression and the percent ^{39}Ar included in the line.

For additional information on the sample data sets see Haugerud and Kunk(1988).

TABLE 1. Summary of argon isotopic results from the Porcupine River traverse. Sample column includes field number, the material being dated and, for basalts, its position from the base and the total number in the stack. See text for additional details.

Sample		Age, ±(Ma)	$\%^{39}Ar$	No. Steps total	MSWD	$^{40}Ar/^{36}Ar, \pm$	Comment
SITE 90-1							
K-90-8-17A	Basalt 2/2	15.1,0.1	56.5	3/8		atmos	Plateau age
		15.4,0.2	100	8/8	32.6	308,1	Isochron age
		15.5	100	8/8		atmos	Total gas age
K-90-8-17B	Basalt 1/2	14.3	12.7	1/8		atmos	Minimum age
		14.6,0.1	100	7/7	6.6	308,1	Isochron age
		14.8	100	7/7		atmos	Total gas age
K-90-8-17C	Basalt 1/2	14.1	13.7	1/7			Minimum age
		15.0,0.1	100	7/7	16.8	316,2	Isochron age
		15.1	100	7/7		atmos	Total gas age
K-90-8-18A3	Basalt 2/2	14.9	21.7	1/7		atmos	Minimum age
		15.1,0.1	100	6/6	17.4	324,3	Isochron age
		15.3	100	6/6		atmos	Total gas age
SITE 90-2							
K-90-8-19A	Basalt 1/3	15.2,0.1	51.5	2/6		atmos	Plateau age
		15.2,0.1	100	6/6	1.4	314,4	Isochron age
		15.4	100	6/6		atmos	Total gas age
K-90-8-19B	Basalt 2/3	13.3	4.5	1/7		atmos	Minimum age
		15.2,0.1	76.9	4/7	0.2	313,1	Isochron age
		15.4	100	7/7		atmos	Total gas age
K-90-8-19C	Basalt 3/3	14.5,0.1	92.2	6/7		atmos	Plateau age
		14.3,0.2	100	7/7	0.3	333,14	Isochron age
		14.6	100	7/7		atmos	Total gas age
SITE 90-5							
K-90-8-22B	Basalt 3/4	14.9	12.2	1/7		atmos	Minimum age
		15.2,0.1	100	7/7	3.4	315,3	Isochron age
		15.6	100	7/7		atmos	Total gas age
K-90-8-22C	Basalt 2/4	13.1	5.8	1/8		atmos	Minimum age
		14.9,.1	100	8/8	64.8	295,1	Isochron age
		15.0	100	8/8		atmos	Total gas age
SITE 90-6							
K-90-8-19D	Basalt 1/5	15.8,0.1	51.6	4/7		atmos	Plateau age
		15.6,0.2	100	7/7	0.1	322,7	Isochron age
		16.0	100	7/7		atmos	Total gas age
K-90-8-19D1	Basalt 1/5	15.8	16.2	1/7		atmos	Minimum Age
		15.7,0.1	100	7/7	1.5	322,3	Isochron age
		16.5	100	7/7		atmos	Total gas age
SITE 90-7							
K-90-8-21A	Biotite	6.56,0.42	100	1/1		atmos	Fusion age
	Plagioclase	6.54.0.05	56.2	2/5		atmos	Plateau age
		6.58,0.05	94	4/5	2.2	301,2	Isochron age
		6.65	100	5/5		atmos	Total gas age
SITE 90-8							
K-90-8-20A	Biotite	6.58,0.12	100	1/1		atmos	Fusion age

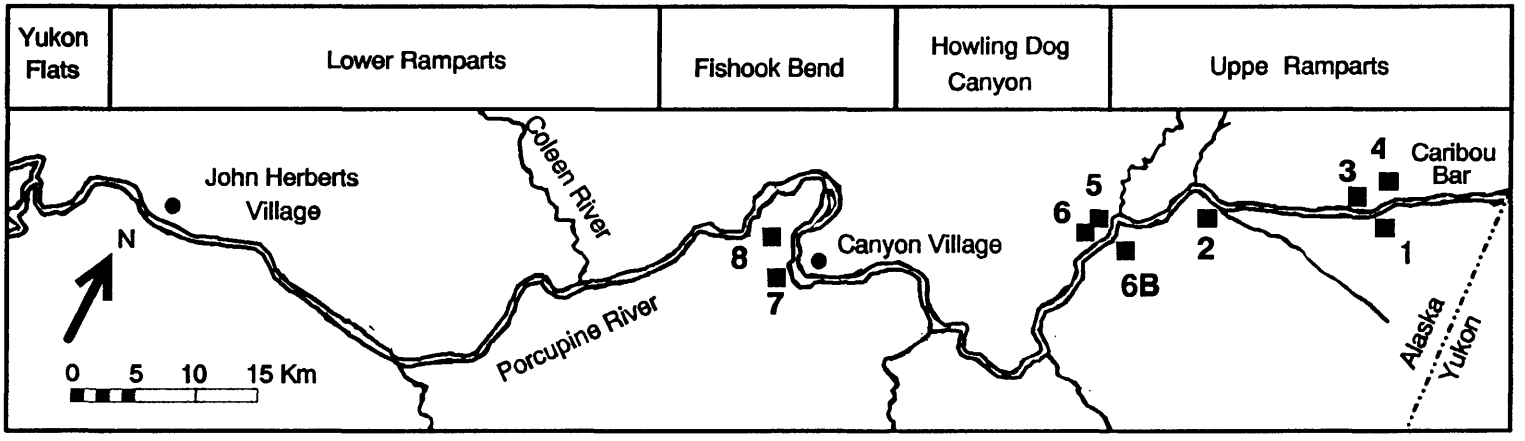


Figure 1. Map showing portions of the Porcupine River and some of its tributaries. Outcrop locations are designated with numbered filled boxes. Box number 1 is site 90-1 etc. No samples were collected at sites 90-3, 90-4 and 90-6B.

Uncertainties in tube blank are included in uncertainties in raw counts.
v 04/05/92 17:05:54 10 Apr 1992

K-90-8-17A WR BASALT #1-3RD76

J = 0.001824 ± 0.50% SAMPLE WT = 0.9991 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
750	4.558E-12	1.495E-13	5.861E-15	1.503E-13	1.258E-14	18.43 ±	.29
850	3.129E-12	5.616E-13	***	2.665E-13	1.261E-15	16.08 ±	.08
950	8.544E-12	1.752E-12	***	5.466E-13	1.377E-15	15.22 ±	.04
1050	7.478E-12	1.558E-12	***	7.700E-13	1.083E-15	15.05 ±	.04
1150	4.789E-12	9.817E-13	***	8.691E-13	8.700E-16	15.13 ±	.09
1250	6.898E-12	1.436E-12	3.846E-15	2.593E-12	9.928E-16	15.08 ±	.05
1450	2.628E-12	4.074E-13	1.353E-15	6.487E-12	1.158E-15	18.37 ±	.16
1650	1.237E-12	1.895E-13	1.024E-15	2.762E-12	9.031E-16	16.77 ±	.34
TOTAL GAS	3.926E-11	7.036E-12	1.263E-14	1.444E-11	2.022E-14	15.50	

56.5% of gas on plateau, steps 1050 through 1250 PLATEAU AGE = 15.07 + .08

Note: all gas quantities are in moles. No blank correction.
* Ages calculated assuming initial 40Ar/36Ar = 295.5 ± 0
** 1-sigma precision estimates are for intra-sample reproducibility.
** 1-sigma precision estimates for plateaux are for intra-irradiation package reproducibility.
*** below detection limit

v 04/05/92

v 04/05/92 K-90-8-17A WR BASALT #1-3RD76 17:05:48 10 Apr 1992

	TEMP C	% TOT 39Ar	RAD YIELD	APP K/Ca	APP K/Cl	F	AGE (Ma)	precision intra-sample	precision intra-package	precision inter-package
A	750	2.1	18.5	.52	62	5.628	18.43 ±	.29	.34	.35
B	850	8.0	88.1	1.10	40575	4.909	16.08 ±	.08	.11	.14
C	950	24.9	95.2	1.67	52004	4.644	15.22 ±	.04	.09	.11
D	1050	22.1	95.7	1.05	8774	4.594	15.05 ±	.04	.09	.12
E	1150	14.0	94.6	.59	0	4.617	15.13 ±	.09	.11	.14
F	1250	20.4	95.7	.29	903	4.601	15.08 ±	.05	.09	.12
G	1450	5.8	87.0	.03	729	5.611	18.37 ±	.16	.18	.21
H	1650	2.7	78.4	.04	448	5.121	16.77 ±	.34	.35	.36

Total gas K/Ca = .9

Precisions are 1 sigma, measured in Ma. Measured 40/36 atm = 297.2 ±.5
J = 0.001824 ± 0.50% (intra-package) ± 0.50% (inter-package)
Trap current factors- 40: 5.66 100: 2.62 200: 1
Manifold factors- ALL: 1 SPLIT 1: 4.2 SPLIT 2: 17.64 SPLIT 3: 74.09
EALL: 2.26 ESPLIT 1: 9.49 ESPLIT 2: 39.87
Sensitivity = 1.344E-17 % Reproducibility = .25 Detection limit = 40 counts
Data reduced assuming initial 40/36 = 295.50 ± 0.00
Ca-factors: 3637=2.6E-04±1.7E-06 3837=3.2E-05±2.4E-07 3937=6.7E-04±3.7E-06
K-factors: 3739=0.0E+00±2.2E-03 3839=1.3E-02±2.4E-04 4039=5.7E-03±4.0E-03

R A W D A T A

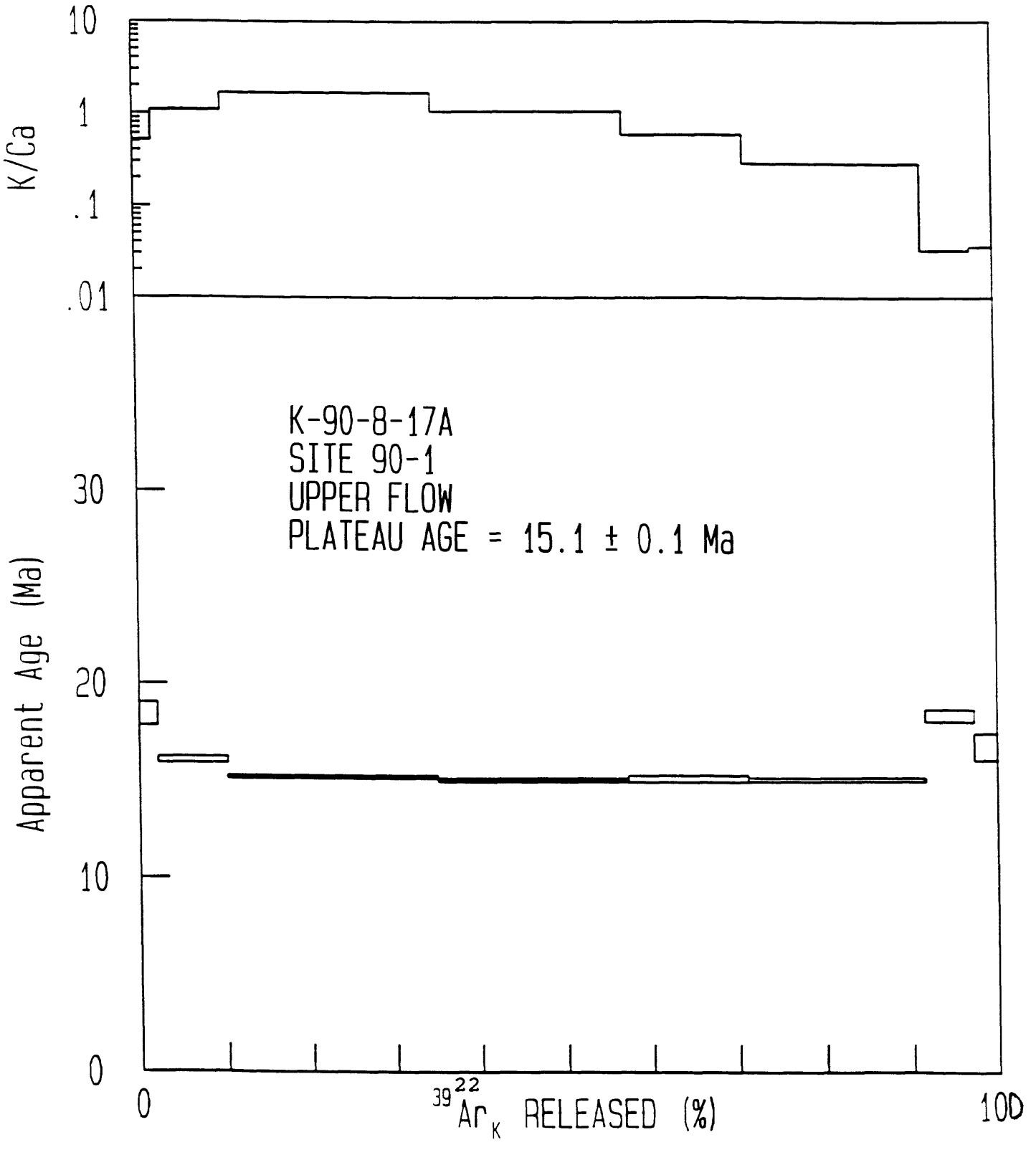
FILE	TEMP	40Ar	39Ar	38Ar	37Ar	36Ar regression	TRAP CURRENT	MANIFOLD OPTION
26685	750	339174	11105	409	1271	933	200	ALL
	±	85	9	7	7	3		
26686	850	233082	41708	544	2250	98	200	ALL
	±	171	26	13	8	3		
26687	950	636469	130105	1730	4613	113	200	ALL
	±	179	39	23	6	5		
26688	1050	557040	115713	1568	6495	95	200	ALL
	±	482	41	8	32	5		
26690	1150	356763	72924	860	7324	81	200	ALL
	±	249	55	18	9	6		
26691	1250	513876	106703	1705	21840	124	200	ALL
	±	283	32	9	18	6		
26692	1450	195721	30569	505	54601	212	200	ALL
	±	66	17	9	36	5		
26693	1650	92128	14203	258	23231	121	200	ALL
	±	65	38	15	17	5		

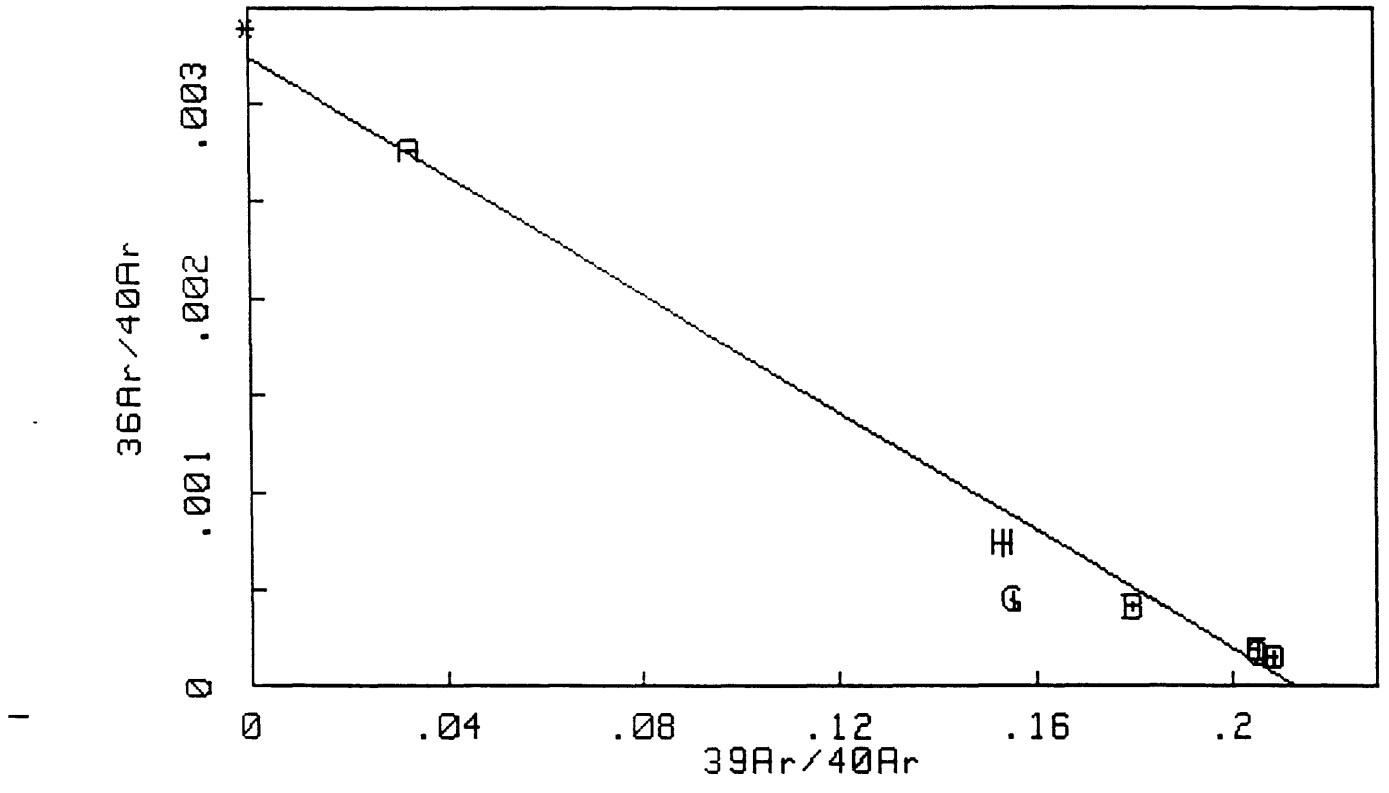
C O R R E C T I O N S

TEMP °C	39Ar Decay	37Ar Decay	-----K-derived---- 40Ar	38Ar	37Ar	----Ca-derived---- 39Ar	38Ar	36Ar	Cl-der 36Ar	Initial 38Ar
750	9	9867	63	149	0	8	0	3	0	175
850	34	17490	237	560	0	13	1	5	0	18
950	105	35882	740	1747	0	27	1	11	0	19
1050	93	50553	659	1554	0	39	2	15	0	15
1150	59	57063	415	979	0	44	2	17	-0	12
1250	86	170275	607	1431	0	130	6	51	0	14
1450	25	426007	172	406	0	325	15	127	0	16
1650	11	181379	80	189	0	138	7	54	0	13

All values in counts, corrected for mass discrimination

v 04/05/92 17:24:03 10 Apr 1992 K-90-8-17A WR BASALT #1-3RD76





8 points regressed out of 8
Mean X = .118E+00 Mean Y = .145E-02 Slope = -.153E-01 + .843E-04
36/40 = .325E-02 + .121E-04 39/40 = .212E+00 + .691E-03
Fit parameters: SUMS = 195.808 MSWD = 32.635
40Ar/36Ar = 308 + 1.15 F = 4.71 + .015 AGE = 15.43 + .09 Ma

Uncertainties in tube blank are included in uncertainties in raw counts.
v 04/05/92 15:31:31 10 Apr 1992

K-90-8-17B WR BASALT #4-6RD76

J = 0.001851 ± 0.50% SAMPLE WT = 1.0029 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
750	7.033E-12	3.604E-13	1.071E-14	1.928E-13	1.769E-14	16.65 ±	.10
875	6.320E-12	1.152E-12	1.325E-15	3.529E-13	3.458E-15	15.30 ±	.14
950	8.987E-12	1.931E-12	1.308E-15	4.744E-13	1.555E-15	14.68 ±	.06
1050	6.836E-12	1.434E-12	2.128E-15	6.750E-13	2.050E-15	14.45 ±	.08
1170	4.541E-12	9.205E-13	2.041E-15	8.369E-13	1.983E-15	14.29 ±	.03
1250	4.115E-12	8.957E-13	4.224E-15	2.187E-12	8.641E-16	14.33 ±	.08
1450	2.877E-12	5.282E-13	7.649E-15	9.701E-12	1.309E-15	15.68 ±	.27
TOTAL GAS	4.071E-11	7.221E-12	2.939E-14	1.442E-11	2.891E-14	14.81	

NO PLATEAU

Note: all gas quantities are in moles. No blank correction.
* Ages calculated assuming initial 40Ar/36Ar = 295.5 ± 0
** 1-sigma precision estimates are for intra-sample reproducibility.
** 1-sigma precision estimates for plateaux are for intra-irradiation package reproducibility.
*** below detection limit

v 04/05/92

	TEMP C	% TOT 39Ar	RAD YIELD	APP K/Ca	APP K/Cl	F	AGE (Ma)	precision intra-sample	precision intra-package	precision inter-package
A	750	5.0	25.7	.97	81	5.010	16.65 ±	.10	.15	.18
B	875	15.9	83.8	1.70	2104	4.600	15.30 ±	.14	.16	.17
C	950	26.7	94.9	2.12	3574	4.416	14.68 ±	.06	.10	.12
D	1050	19.9	91.1	1.10	1630	4.345	14.45 ±	.08	.11	.13
E	1170	12.7	87.1	.57	1091	4.297	14.29 ±	.03	.08	.11
F	1250	12.4	93.8	.21	513	4.310	14.33 ±	.08	.10	.13
G	1450	7.3	86.6	.03	167	4.715	15.68 ±	.27	.28	.29
Total gas K/Ca =				1.2						

Precisions are 1 sigma, measured in Ma. Measured 40/36 atm = 297.2 ±.5
J = 0.001851 ± 0.50% (intra-package) ± 0.50% (inter-package)
Trap current factors- 40: 5.66 100: 2.62 200: 1
Manifold factors- ALL: 1 SPLIT 1: 4.2 SPLIT 2: 17.64 SPLIT 3: 74.09
EALL: 2.26 ESPLIT 1: 9.49 ESPLIT 2: 39.87
Sensitivity = 1.344E-17 % Reproducibility = .25 Detection limit = 40 counts
Data reduced assuming initial 40/36 = 295.50 ± 0.00
Ca-factors: 3637=2.6E-04±1.7E-06 3837=3.2E-05±2.4E-07 3937=6.7E-04±3.7E-06
K-factors: 3739=0.0E+00±2.2E-03 3839=1.3E-02±2.4E-04 4039=5.7E-03±4.0E-03

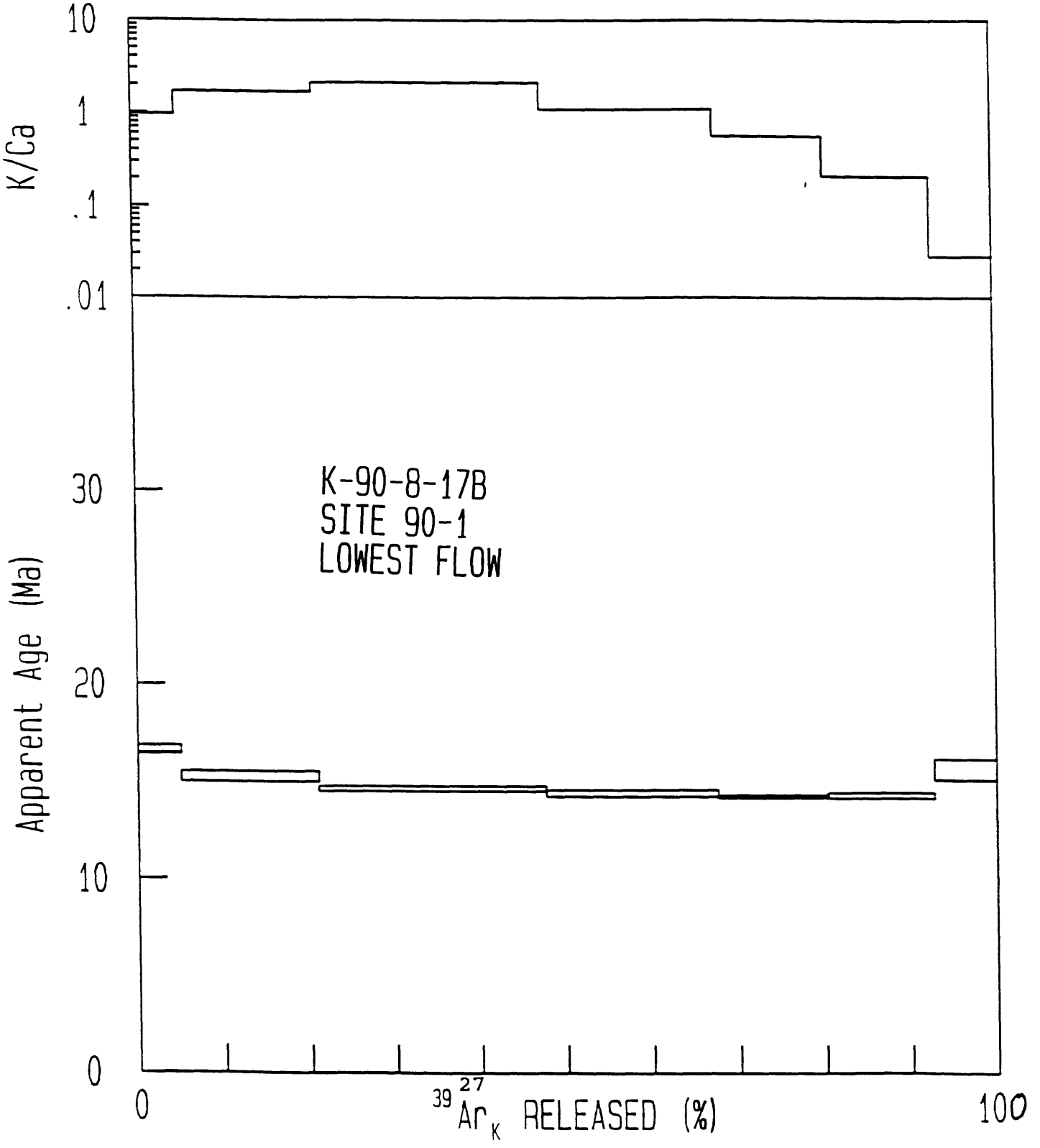
R A W D A T A

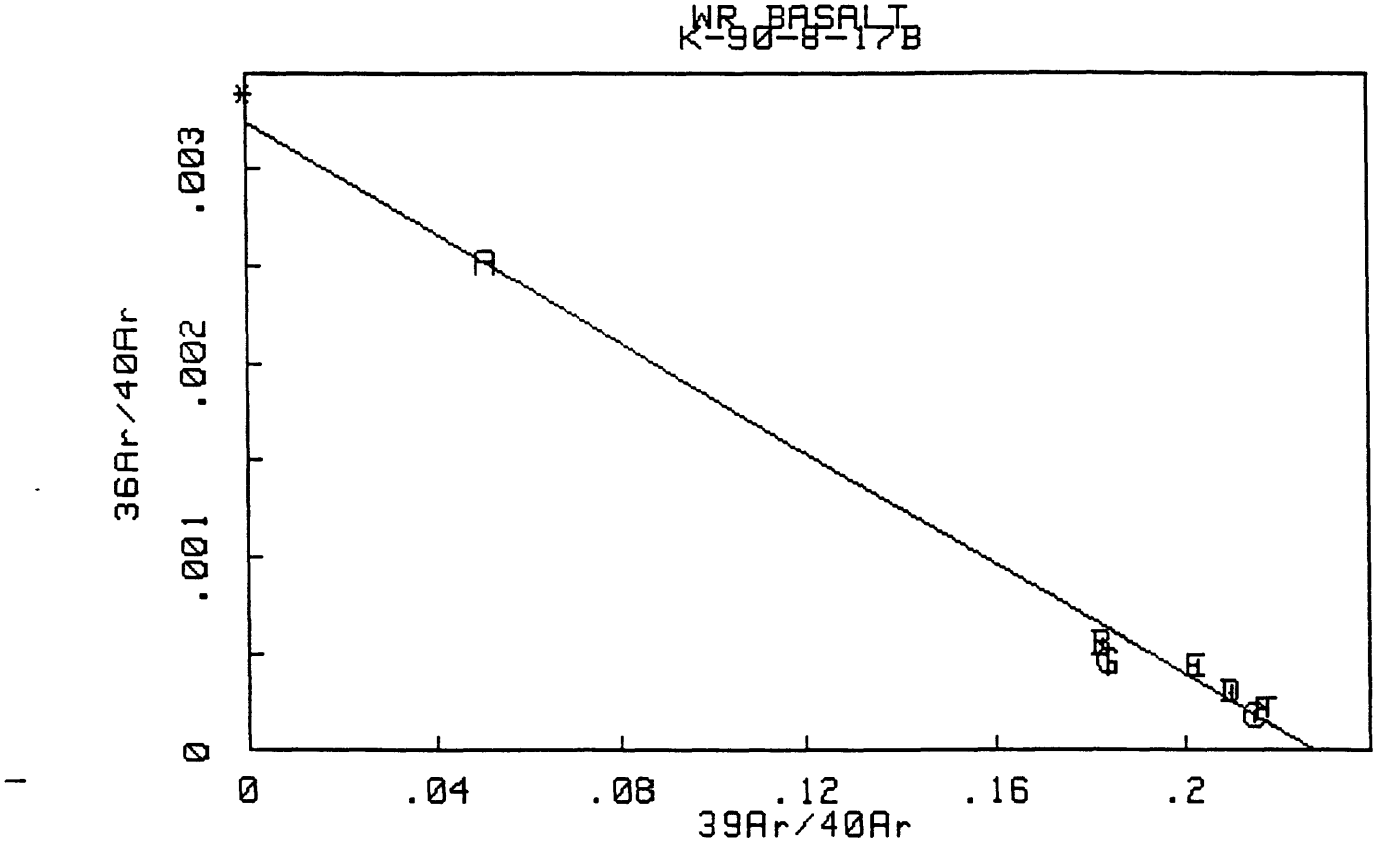
FILE	TEMP	40Ar	39Ar	38Ar	37Ar	36Ar regression	TRAP CURRENT	MANIFOLD OPTION
26696	750	523442	26768	908	1597	1313	200	ALL
	±	329	6	5	19	2		
26697	875	470689	85515	1196	2922	263	200	ALL
	±	201	63	18	21	12		
26698	950	669484	143393	1997	3926	124	200	ALL
	±	544	74	12	11	9		
26700	1050	509226	106478	1557	5581	165	200	ALL
	±	192	88	5	12	9		
26701	1170	338294	68378	1041	6915	163	200	ALL
	±	75	47	15	10	2		
26702	1250	306580	66602	1197	18063	107	200	ALL
	±	68	38	17	4	5		
26703	1450	214316	39694	1097	80055	286	200	ALL
	±	69	26	12	70	11		

C O R R E C T I O N S

TEMP °C	39Ar Decay	37Ar Decay	-----K-derived---- 40Ar	38Ar	37Ar	----Ca-derived---- 39Ar	38Ar	36Ar	Cl-der 36Ar	Initial 38Ar
750	22	12684	152	359	0	10	0	4	0	246
875	69	23222	487	1148	0	18	1	7	0	48
950	116	31222	816	1925	0	24	1	9	0	22
1050	87	44428	606	1430	0	34	2	13	0	29
1170	56	55084	389	918	0	42	2	16	0	28
1250	54	143997	379	893	0	110	5	43	0	12
1450	32	638623	223	527	0	486	23	191	0	18

All values in counts, corrected for mass discrimination


10
1
.1
.01
K/Ca
30
20
10
0
Apparent Age (Ma)
K-90-8-17B
SITE 90-1
LOWEST FLOW
0
$^{39}Ar_K$ RELEASED (%)
100



7 points regressed out of 7
Mean X = .692E-01 Mean Y = .226E-02 Slope = -.143E-01 + .967E-04
36/40 = .325E-02 + .820E-05 39/40 = .227E+00 + .112E-02
Fit parameters: SUMS = 32.931 MSWD = 6.586
40Ar/36Ar = 308.04 + .78 F = 4.399 + .022 AGE = 14.63 + .1 Ma

Uncertainties in tube blank are included in uncertainties in raw counts.
v 04/05/92 17:31:15 10 Apr 1992

K-90-8-17C WR BASALT #7-9RD76

J = 0.001868 ± 0.50% SAMPLE WT = 0.9984 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
750	6.288E-12	2.996E-13	9.275E-15	1.460E-13	1.594E-14	17.65 ±	.30
885	8.143E-12	1.630E-12	1.288E-15	3.936E-13	1.722E-15	15.72 ±	.07
950	8.709E-12	1.878E-12	***	5.042E-13	1.404E-15	14.82 ±	.05
1050	4.810E-12	1.044E-12	***	7.175E-13	8.357E-16	14.67 ±	.10
1180	4.057E-12	8.751E-13	***	1.080E-12	1.280E-15	14.11 ±	.09
1270	2.293E-12	4.712E-13	1.804E-15	4.137E-12	8.640E-16	14.51 ±	.20
1450	1.395E-12	1.918E-13	9.089E-16	5.980E-12	1.606E-15	16.11 ±	.28
TOTAL GAS	3.570E-11	6.389E-12	1.328E-14	1.296E-11	2.365E-14	15.08	

NO PLATEAU

Note: all gas quantities are in moles. No blank correction.
* Ages calculated assuming initial 40Ar/36Ar = 295.5 ± 0
** 1-sigma precision estimates are for intra-sample reproducibility.
** 1-sigma precision estimates for plateaux are for intra-irradiation package reproducibility.
*** below detection limit

v 04/05/92

v 04/05/92 K-90-8-17C WR BASALT #7-9RD76 17:30:46 10 Apr 1992

	TEMP C	% TOT 39Ar	RAD YIELD	APP K/Ca	APP K/Cl	F	AGE (Ma)	intra-sample	precision intra-package	precision inter-package
A	750	4.7	25.1	1.07	78	5.262	17.65 ±	.30	.33	.34
B	885	25.5	93.8	2.15	3061	4.685	15.72 ±	.07	.11	.13
C	950	29.4	95.2	1.94	0	4.417	14.82 ±	.05	.09	.12
D	1050	16.3	94.9	.76	0	4.370	14.67 ±	.10	.12	.14
E	1180	13.7	90.7	.42	0	4.204	14.11 ±	.09	.11	.13
F	1270	7.4	88.9	.06	632	4.324	14.51 ±	.20	.21	.22
G	1450	3.0	66.0	.02	511	4.801	16.11 ±	.28	.29	.31

Total gas K/Ca = 1.4

Precisions are 1 sigma, measured in Ma. Measured 40/36 atm = 297.2 ±.5
J = 0.001868 ± 0.50% (intra-package) ± 0.50% (inter-package)
Trap current factors- 40: 5.66 100: 2.62 200: 1
Manifold factors- ALL: 1 SPLIT 1: 4.2 SPLIT 2: 17.64 SPLIT 3: 74.09
EALL: 2.26 ESPLIT 1: 9.49 ESPLIT 2: 39.87
Sensitivity = 1.344E-17 % Reproducibility = .25 Detection limit = 40 counts
Data reduced assuming initial 40/36 = 295.50 ± 0.00
Ca-factors: 3637=2.6E-04±1.7E-06 3837=3.2E-05±2.4E-07 3937=6.7E-04±3.7E-06
K-factors: 3739=0.0E+00±2.2E-03 3839=1.3E-02±2.4E-04 4039=5.7E-03±4.0E-03

v 04/05/92 K-90-8-17C WR BASALT #7-9RD76 17:30:45 10 Apr 1992

R A W D A T A

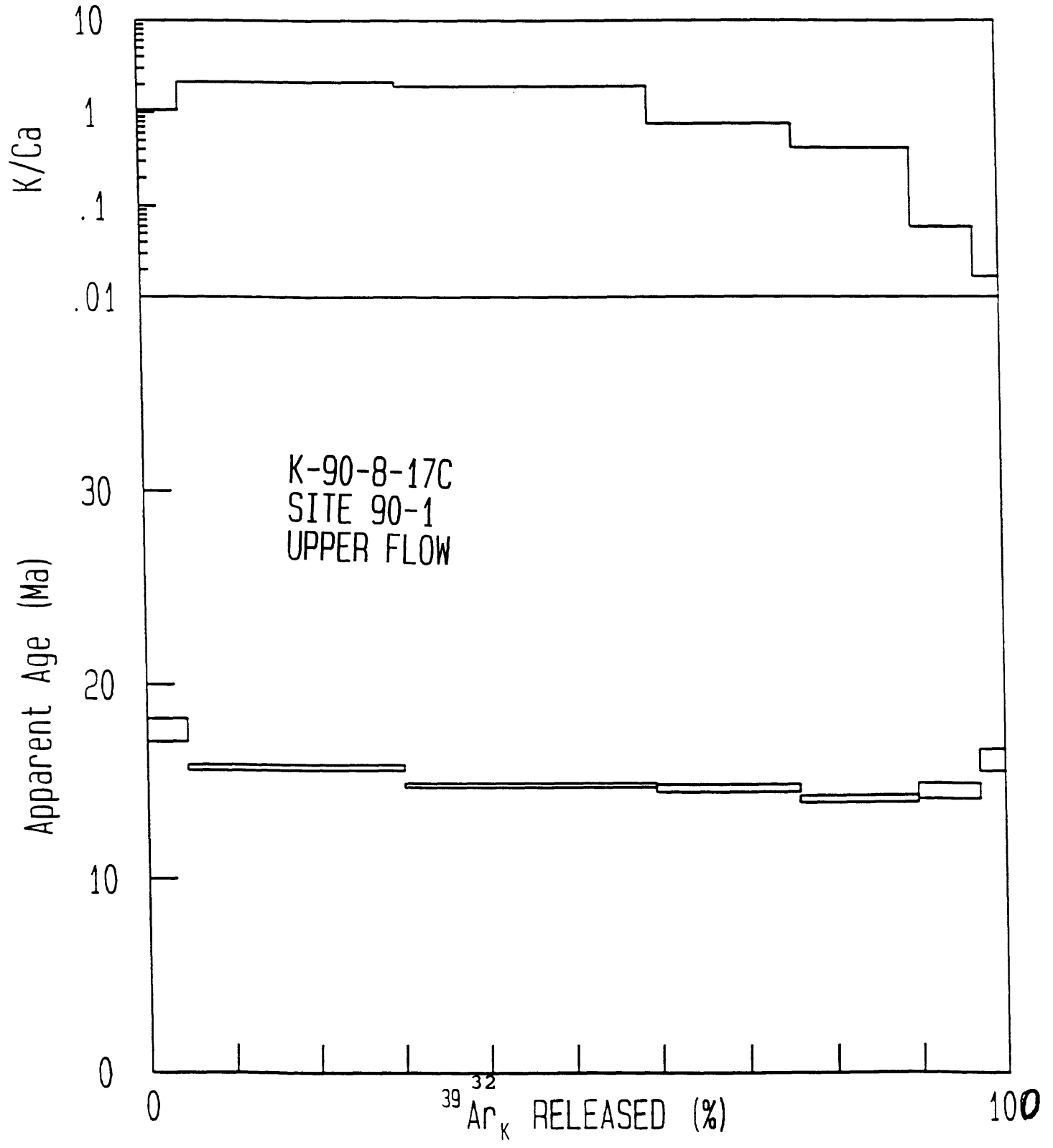
FILE	TEMP	40Ar	39Ar	38Ar	37Ar	36Ar regression	TRAP CURRENT	MANIFOLD OPTION
26707	750	467966	22250	765	1186	1182	200	ALL
	±	396	13	10	10	7		
26708	885	606591	121002	1693	3195	135	200	ALL
	±	145	111	14	7	9		
26710	950	648763	139426	1847	4090	114	200	ALL
	±	293	78	12	5	7		
26711	1050	358338	77559	853	5816	76	200	ALL
	±	169	53	29	18	7		
26712	1180	302223	65022	846	8750	116	200	ALL
	±	68	29	11	17	6		
26713	1270	170801	35185	600	33489	145	200	ALL
	±	71	18	20	31	7		
26714	1450	103905	14540	250	48383	236	200	ALL
	±	38	9	9	25	4		

C O R R E C T I O N S

TEMP °C	39Ar Decay	37Ar Decay	-----K-derived---- 40Ar	38Ar	37Ar	----Ca-derived---- 39Ar	38Ar	36Ar	Cl-der 36Ar	Initial 38Ar
750	18	9633	127	299	0	7	0	3	0	222
885	99	25962	689	1625	0	20	1	8	0	24
950	114	33266	794	1872	0	25	1	10	-0	20
1050	64	47341	441	1041	0	36	2	14	-0	12
1180	53	71271	370	873	0	54	3	21	-0	18
1270	29	272979	199	470	0	207	10	81	0	12
1450	12	394659	81	191	0	299	14	117	0	22

All values in counts, corrected for mass discrimination

v 04/05/92 17:45:59 10 Apr 1992 K-90-8-17C WR BASALT #7-9RD76

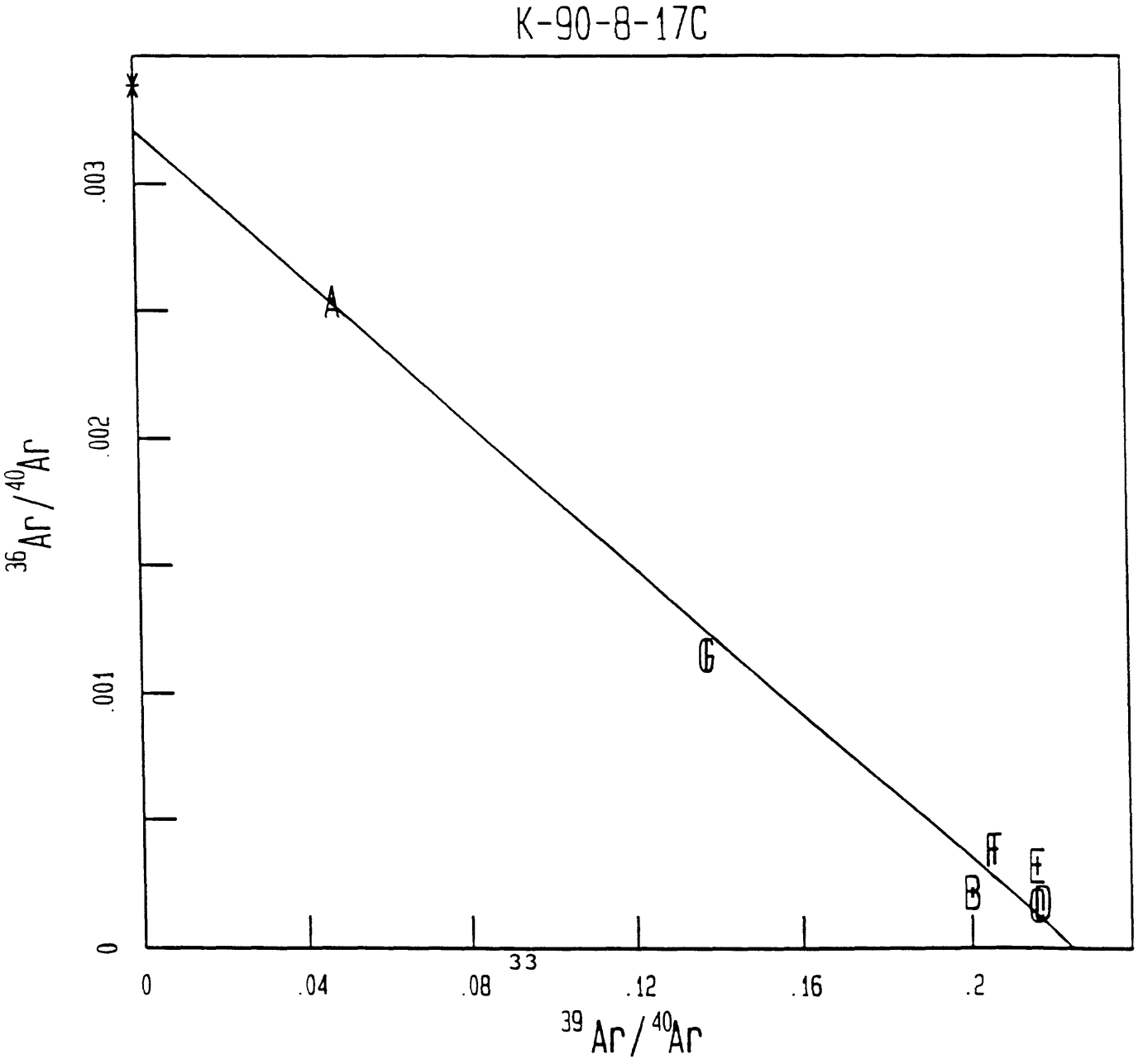


v 04/05/92

(40/36in = 295.5

v 04/05/92 17:48:22 10 Apr 1992 K-90-8-17C WR BASALT #7-9RD76

7 points regressed out of 7
Mean X = .140E+00 Mean Y = .121E-02 Slope = -.143E-01 + .118E-03
36/40 = .321E-02 + .190E-04 39/40 = .225E+00 + .960E-03
Fit parameters: SUMS = 84.289 MSWD = 16.858
40Ar/36Ar = 311.67 + 1.85 F = 4.454 + .019 AGE = 14.95 + .1 Ma



Uncertainties in tube blank are included in uncertainties in raw counts.
v 04/05/92 17:54:56 10 Apr 1992

K-90-8-18A3 WR BASALT #10-12RD76

J = 0.001846 ± 0.50% SAMPLE WT = 1.0030 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
875	3.672E-12	3.025E-13	3.281E-15	2.155E-13	7.220E-15	16.85 ±	.18
935	5.334E-12	1.009E-12	***	3.784E-13	2.021E-15	15.57 ±	.03
1050	1.178E-11	2.424E-12	5.462E-16	1.162E-12	2.355E-15	15.16 ±	.03
1180	6.777E-12	1.388E-12	***	1.326E-12	1.893E-15	14.85 ±	.06
1270	4.801E-12	9.683E-13	***	3.810E-12	1.420E-15	15.01 ±	.02
1450	2.194E-12	3.106E-13	1.049E-15	5.909E-12	2.087E-15	16.83 ±	.04
TOTAL GAS	3.455E-11	6.403E-12	4.876E-15	1.280E-11	1.700E-14	15.30	

NO PLATEAU

Note: all gas quantities are in moles. No blank correction.
* Ages calculated assuming initial 40Ar/36Ar = 295.5 ± 0
** 1-sigma precision estimates are for intra-sample reproducibility.
** 1-sigma precision estimates for plateaux are for intra-irradiation package reproducibility.
*** below detection limit

v 04/05/92

v 04/05/92 K-90-8-18A3 WR BASALT #10-12RD76 17:54:25 10 Apr 1992

	TEMP C	% TOT 39Ar	RAD YIELD	APP K/Ca	APP K/Cl	F	AGE (Ma)	precision intra-sample	precision intra-package	precision inter-package
A	875	4.7	41.9	.73	223	5.084	16.85 ±	.18	.20	.22
B	935	15.8	88.8	1.39	0	4.696	15.57 ±	.03	.08	.12
C	1050	37.9	94.1	1.08	10741	4.570	15.16 ±	.03	.08	.11
D	1180	21.7	91.7	.54	0	4.479	14.85 ±	.06	.10	.12
E	1270	15.1	91.3	.13	0	4.525	15.01 ±	.02	.08	.11
F	1450	4.9	71.9	.03	717	5.079	16.83 ±	.04	.10	.13
Total gas K/Ca =				.8						

Precisions are 1 sigma, measured in Ma. Measured 40/36 atm = 297.2 ±.5
J = 0.001846 ± 0.50% (intra-package) ± 0.50% (inter-package)
Trap current factors- 40: 5.66 100: 2.62 200: 1
Manifold factors- ALL: 1 SPLIT 1: 4.2 SPLIT 2: 17.64 SPLIT 3: 74.09
EALL: 2.26 ESPLIT 1: 9.49 ESPLIT 2: 39.87
Sensitivity = 1.344E-17 % Reproducibility = .25 Detection limit = 40 counts
Data reduced assuming initial 40/36 = 295.50 ± 0.00
Ca-factors: 3637=2.6E-04±1.7E-06 3837=3.2E-05±2.4E-07 3937=6.7E-04±3.7E-06
K-factors: 3739=0.0E+00±2.2E-03 3839=1.3E-02±2.4E-04 4039=5.7E-03±4.0E-03

v 04/05/92 K-90-8-18A3 WR BASALT #10-12RD76 17:54:24 10 Apr 1992

R A W D A T A

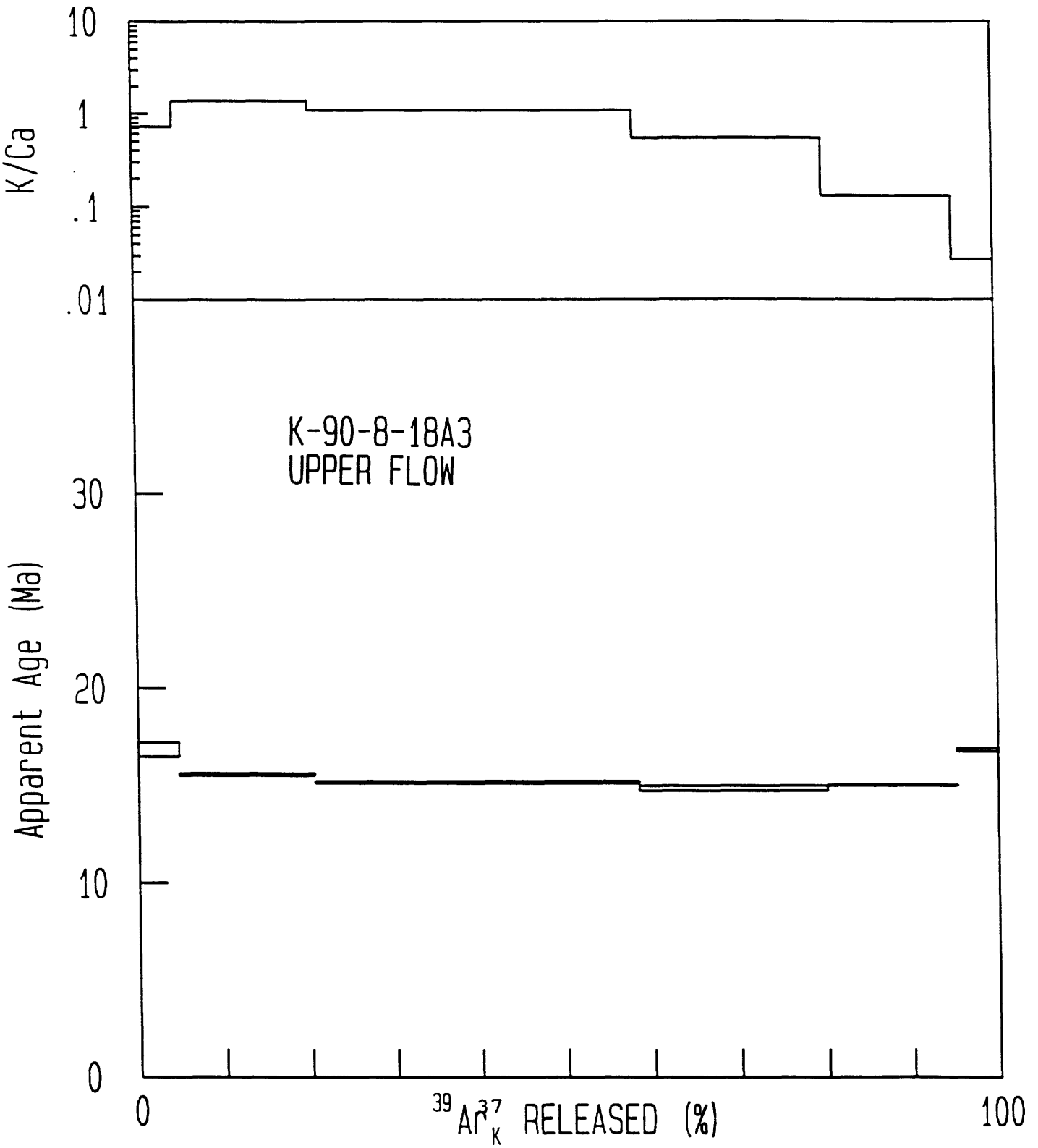
FILE	TEMP	40Ar	39Ar	38Ar	37Ar	36Ar regression	TRAP CURRENT	MANIFOLD OPTION
26719	875	273311	22467	445	1617	538	200	ALL
	±	125	13	11	13	4		
26720	935	397314	74906	881	2838	157	200	ALL
	±	126	51	9	5	3		
26721	1050	877198	180023	2421	8710	197	200	ALL
	±	673	152	4	14	4		
26722	1180	504851	103125	1224	9927	166	200	ALL
	±	306	94	13	11	7		
26723	1270	357633	72073	934	28513	179	200	ALL
	±	136	31	18	23	1		
26724	1450	163398	23355	372	44197	270	200	ALL
	±	56	10	8	7	1		

C O R R E C T I O N S

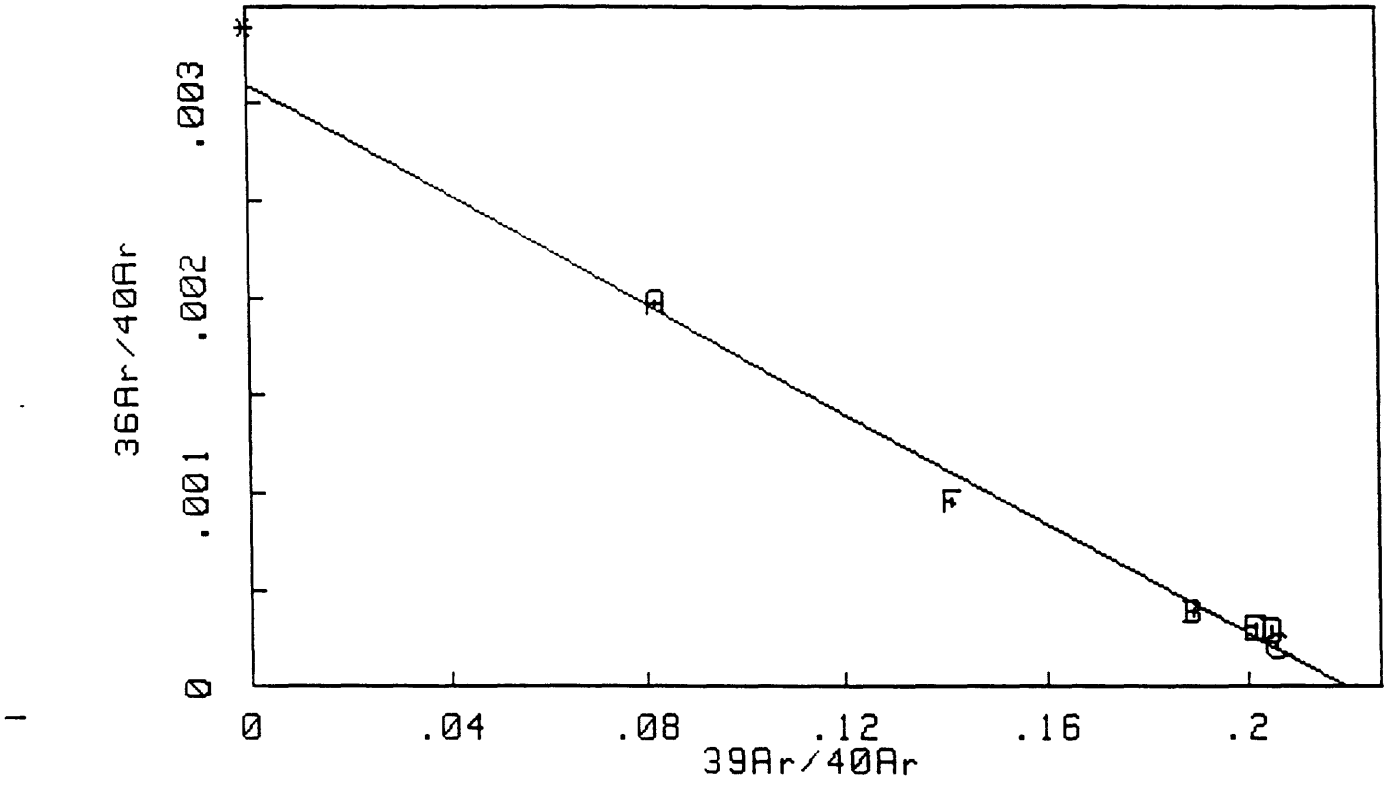
TEMP °C	39Ar Decay	37Ar Decay	-----K-derived---- 40Ar	38Ar	37Ar	----Ca-derived---- 39Ar	38Ar	36Ar	Cl-der 36Ar	Initial 38Ar
875	19	14351	128	302	0	11	1	4	0	100
935	64	25199	426	1006	0	19	1	7	-0	28
1050	153	77404	1025	2417	0	58	3	23	0	33
1180	88	88278	587	1384	0	66	3	26	-0	26
1270	61	253749	409	965	0	191	9	75	-0	20
1450	20	393600	131	310	0	296	14	116	0	29

All values in counts, corrected for mass discrimination

v 04/05/92 18:00:38 10 Apr 1992 K-90-8-18A3 WR BASALT #10-12RD76



v 04/05/92 (40/36in = 295.5)



6 points regressed out of 6
Mean X = .164E+00 Mean Y = .784E-03 Slope = -.141E-01 + .150E-03
36/40 = .309E-02 + .257E-04 39/40 = .219E+00 + .803E-03
Fit parameters: SUMS = 69.727 MSWD = 17.432
40Ar/36Ar = 323.52 + 2.69 F = 4.56 + .017 AGE = 15.12 + .09 Ma

Uncertainties in tube blank are included in uncertainties in raw counts.
v 04/05/92 18:08:21 10 Apr 1992

K-90-8-19A WR BASALT #13-15RD76

J = 0.001846 ± 0.50% SAMPLE WT = 1.0056 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
875	6.120E-12	5.513E-13	2.671E-15	5.147E-13	1.151E-14	16.36 ±	.25
935	9.325E-12	1.810E-12	***	1.034E-12	3.046E-15	15.44 ±	.05
1015	1.337E-11	2.781E-12	***	1.679E-12	1.994E-15	15.24 ±	.02
1100	4.664E-12	9.210E-13	***	7.593E-13	1.556E-15	15.14 ±	.04
1200	3.401E-12	6.838E-13	***	8.780E-13	1.081E-15	14.95 ±	.12
1450	3.845E-12	4.338E-13	1.953E-15	7.722E-12	5.854E-15	16.16 ±	.25
TOTAL GAS	4.073E-11	7.180E-12	4.624E-15	1.259E-11	2.504E-14	15.39	

51.6% of gas on plateau, steps 1015 through 1100 PLATEAU AGE = 15.22 + .08

Note: all gas quantities are in moles. No blank correction.

* Ages calculated assuming initial 40Ar/36Ar = 295.5 ± 0

** 1-sigma precision estimates are for intra-sample reproducibility.

** 1-sigma precision estimates for plateaux are for intra-irradiation package reproducibility.

*** below detection limit

v 04/05/92

v 04/05/92 K-90-8-19A WR BASALT #13-15RD76 18:07:12 10 Apr 1992

	TEMP C	% TOT 39Ar	RAD YIELD	APP K/Ca	APP K/Cl	F	AGE (Ma)	precision intra-sample	precision intra-package	precision inter-package
A	875	7.7	44.4	.56	500	4.935	16.36 ±	.25	.27	.28
B	935	25.2	90.3	.91	0	4.656	15.44 ±	.05	.09	.12
C	1015	38.7	95.6	.86	0	4.597	15.24 ±	.02	.08	.11
D	1100	12.8	90.1	.63	0	4.565	15.14 ±	.04	.09	.12
E	1200	9.5	90.6	.40	0	4.506	14.95 ±	.12	.14	.16
F	1450	6.0	55.0	.03	537	4.876	16.16 ±	.25	.26	.28

Total gas K/Ca = .7

Precisions are 1 sigma, measured in Ma. Measured 40/36 atm = 297.2 ±.5
J = 0.001846 ± 0.50% (intra-package) ± 0.50% (inter-package)
Trap current factors- 40: 5.66 100: 2.62 200: 1
Manifold factors- ALL: 1 SPLIT 1: 4.2 SPLIT 2: 17.64 SPLIT 3: 74.09
EALL: 2.26 ESPLIT 1: 9.49 ESPLIT 2: 39.87
Sensitivity = 1.344E-17 % Reproducibility = .25 Detection limit = 40 counts
Data reduced assuming initial 40/36 = 295.50 ± 0.00
Ca-factors: 3637=2.6E-04±1.7E-06 3837=3.2E-05±2.4E-07 3937=6.7E-04±3.7E-06
K-factors: 3739=0.0E+00±2.2E-03 3839=1.3E-02±2.4E-04 4039=5.7E-03±4.0E-03

v 04/05/92 K-90-8-19A WR BASALT #13-15RD76 18:07:10 10 Apr 1992

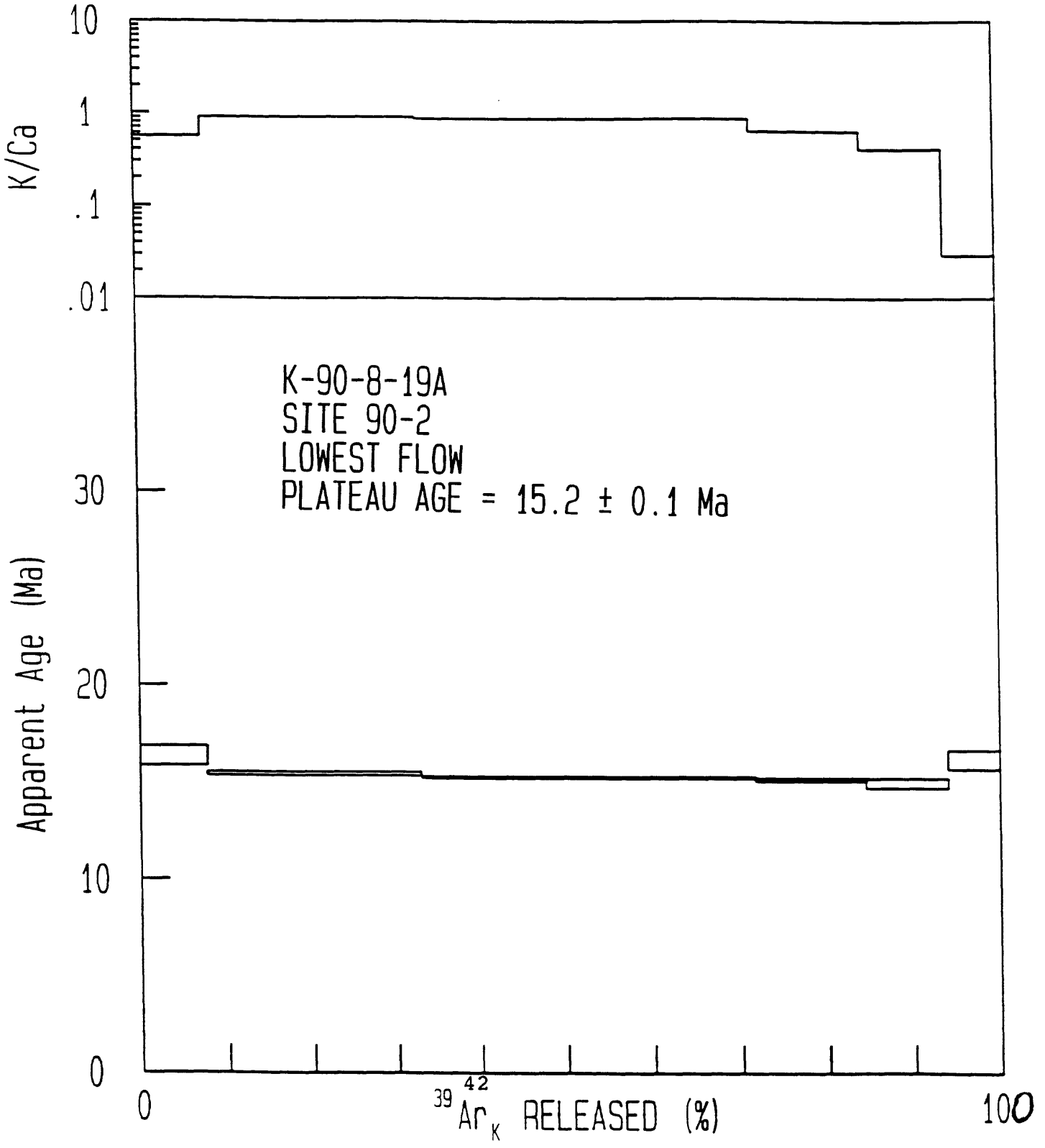
R A W D A T A

FILE	TEMP	40Ar	39Ar	38Ar	37Ar	36Ar regression	TRAP CURRENT	MANIFOLD OPTION
26728	875	455612	40948	588	3787	861	200	ALL
	±	107	30	11	6	11		
26729	935	694599	134390	1756	7604	246	200	ALL
	±	260	84	14	12	6		
26730	1015	996017	206507	2696	12342	180	200	ALL
	±	548	160	12	11	4		
26731	1100	347446	68407	718	5576	130	200	ALL
	±	119	40	27	10	3		
26732	1200	253333	50804	607	6445	97	200	ALL
	±	195	14	15	16	6		
26733	1450	286257	32585	513	56639	584	200	ALL
	±	245	23	9	31	8		

C O R R E C T I O N S

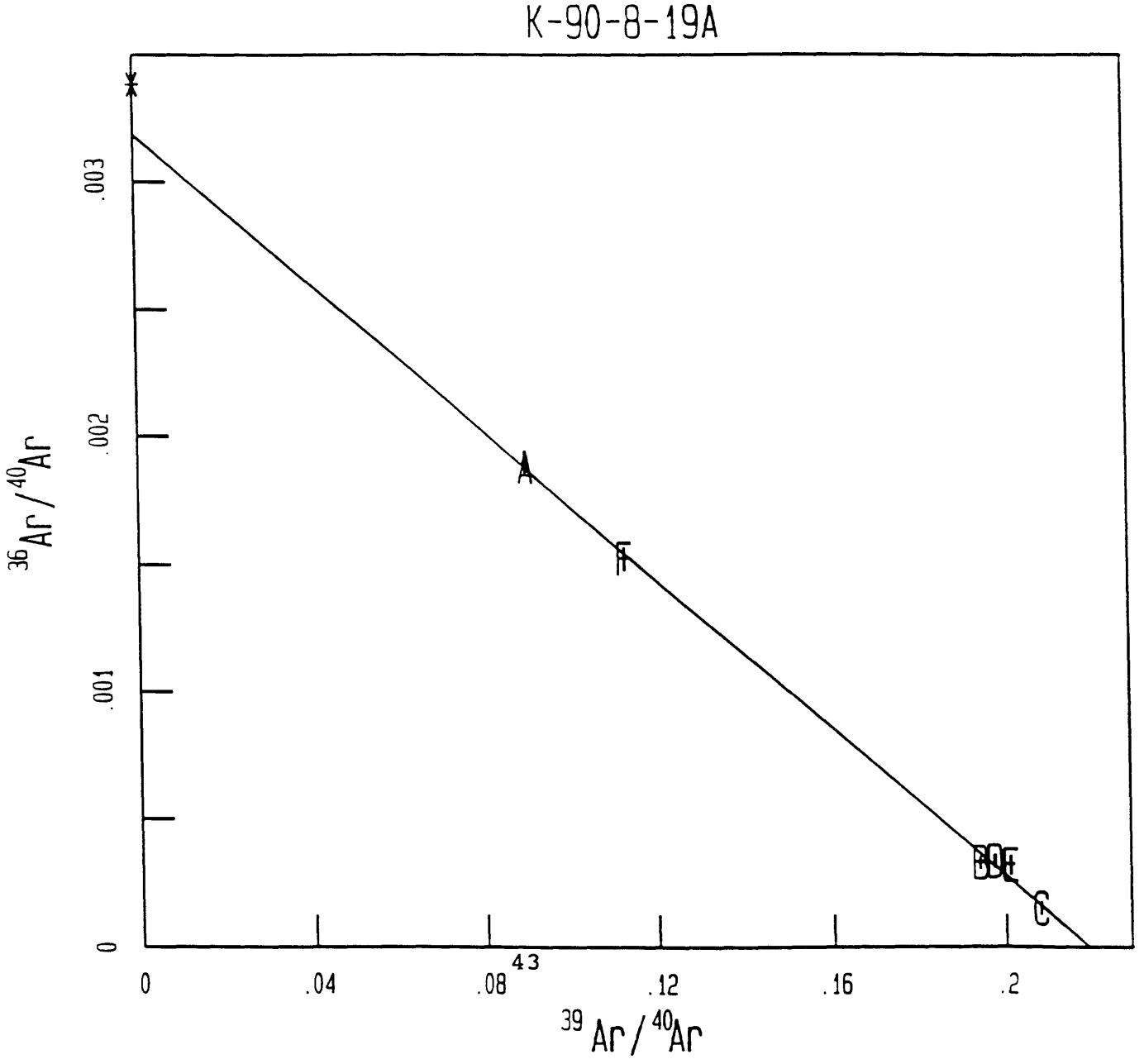
TEMP °C	39Ar Decay	37Ar Decay	-----K-derived---- 40Ar	38Ar	37Ar	----Ca-derived---- 39Ar	38Ar	36Ar	Cl-der 36Ar	Initial 38Ar
875	35	34343	233	550	0	26	1	10	0	160
935	115	69000	765	1804	0	52	2	20	-0	42
1015	177	112068	1175	2772	0	84	4	33	-0	28
1100	59	50676	389	918	0	38	2	15	-0	22
1200	44	58605	289	682	0	44	2	17	-0	15
1450	28	515412	183	432	0	387	18	152	0	81

All values in counts, corrected for mass discrimination


10
1
.1
.01
K/Ca
K-90-8-19A
SITE 90-2
LOWEST FLOW
PLATEAU AGE = 15.2 ± 0.1 Ma
30
20
10
0
Apparent Age (Ma)
0
$^{39}Ar_K$ ^{42} RELEASED (%)
100

v 04/05/92 13:17:50 10 Apr 1992 K-90-8-19A WR BASALT #13-15RD76

6 points regressed out of 6
Mean X = .168E+00 Mean Y = .741E-03 Slope = -.146E-01 + .236E-03
36/40 = .319E-02 + .412E-04 39/40 = .219E+00 + .114E-02
Fit parameters: SUMS = 5.438 MSWD = 1.36
40Ar/36Ar = 313.92 + 4.06 F = 4.568 + .024 AGE = 15.15 + .11 Ma



Uncertainties in tube blank are included in uncertainties in raw counts.
v 04/05/92 18:26:08 10 Apr 1992

K-90-8-19B WR BASALT #16-18RD76

J = 0.001847 ± 0.50% SAMPLE WT = 1.0011 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
650	1.079E-11	6.286E-13	4.147E-14	8.051E-14	2.534E-14	17.41 ±	.14
750	1.440E-11	1.990E-12	8.364E-14	1.765E-13	1.696E-14	15.64 ±	.04
870	1.165E-11	1.897E-12	6.727E-14	1.998E-13	9.519E-15	15.47 ±	.06
950	7.805E-12	1.340E-12	3.844E-14	2.834E-13	5.470E-15	15.32 ±	.04
1050	4.833E-12	8.793E-13	2.168E-14	2.836E-13	3.223E-15	14.65 ±	.05
1150	2.844E-12	5.441E-13	1.273E-14	2.861E-13	1.889E-15	13.94 ±	.12
1250	1.773E-12	3.395E-13	8.094E-15	1.467E-12	1.388E-15	13.32 ±	.34
TOTAL GAS	5.409E-11	7.618E-12	2.733E-13	2.777E-12	6.379E-14	15.35	

NO PLATEAU

Note: all gas quantities are in moles. No blank correction.
* Ages calculated assuming initial 40Ar/36Ar = 295.5 ± 0
** 1-sigma precision estimates are for intra-sample reproducibility.
** 1-sigma precision estimates for plateaux are for intra-irradiation package reproducibility.
*** below detection limit

v 04/05/92

v 04/05/92 K-90-8-19B WR BASALT #16-18RD76 18:25:58 10 Apr 1992

	TEMP C	% TOT 39Ar	RAD YIELD	APP K/Ca	APP K/Cl	F	AGE (Ma)	precision intra-sample	precision intra-package	precision inter-package
A	650	8.3	30.6	4.06	37	5.250	17.41 ±	.14	.18	.20
B	750	26.1	65.2	5.86	58	4.715	15.64 ±	.04	.09	.12
C	870	24.9	75.9	4.94	68	4.662	15.47 ±	.06	.10	.13
D	950	17.6	79.3	2.46	84	4.619	15.32 ±	.04	.09	.12
E	1050	11.5	80.3	1.61	98	4.414	14.65 ±	.05	.09	.11
F	1150	7.1	80.4	.99	103	4.201	13.94 ±	.12	.14	.16
G	1250	4.5	76.9	.12	102	4.013	13.32 ±	.34	.35	.36
Total gas K/Ca =				3.8						

Precisions are 1 sigma, measured in Ma. Measured 40/36 atm = 297.2 ±.5
J = 0.001847 ± 0.50% (intra-package) ± 0.50% (inter-package)
Trap current factors- 40: 5.66 100: 2.62 200: 1
Manifold factors- ALL: 1 SPLIT 1: 4.2 SPLIT 2: 17.64 SPLIT 3: 74.09
EALL: 2.26 ESPLIT 1: 9.49 ESPLIT 2: 39.87
Sensitivity = 1.344E-17 % Reproducibility = .25 Detection limit = 40 counts
Data reduced assuming initial 40/36 = 295.50 ± 0.00
Ca-factors: 3637=2.6E-04±1.7E-06 3837=3.2E-05±2.4E-07 3937=6.7E-04±3.7E-06
K-factors: 3739=0.0E+00±2.2E-03 3839=1.3E-02±2.4E-04 4039=5.7E-03±4.0E-03

v 04/05/92 K-90-8-19B WR BASALT #16-18RD76 18:25:56 10 Apr 1992

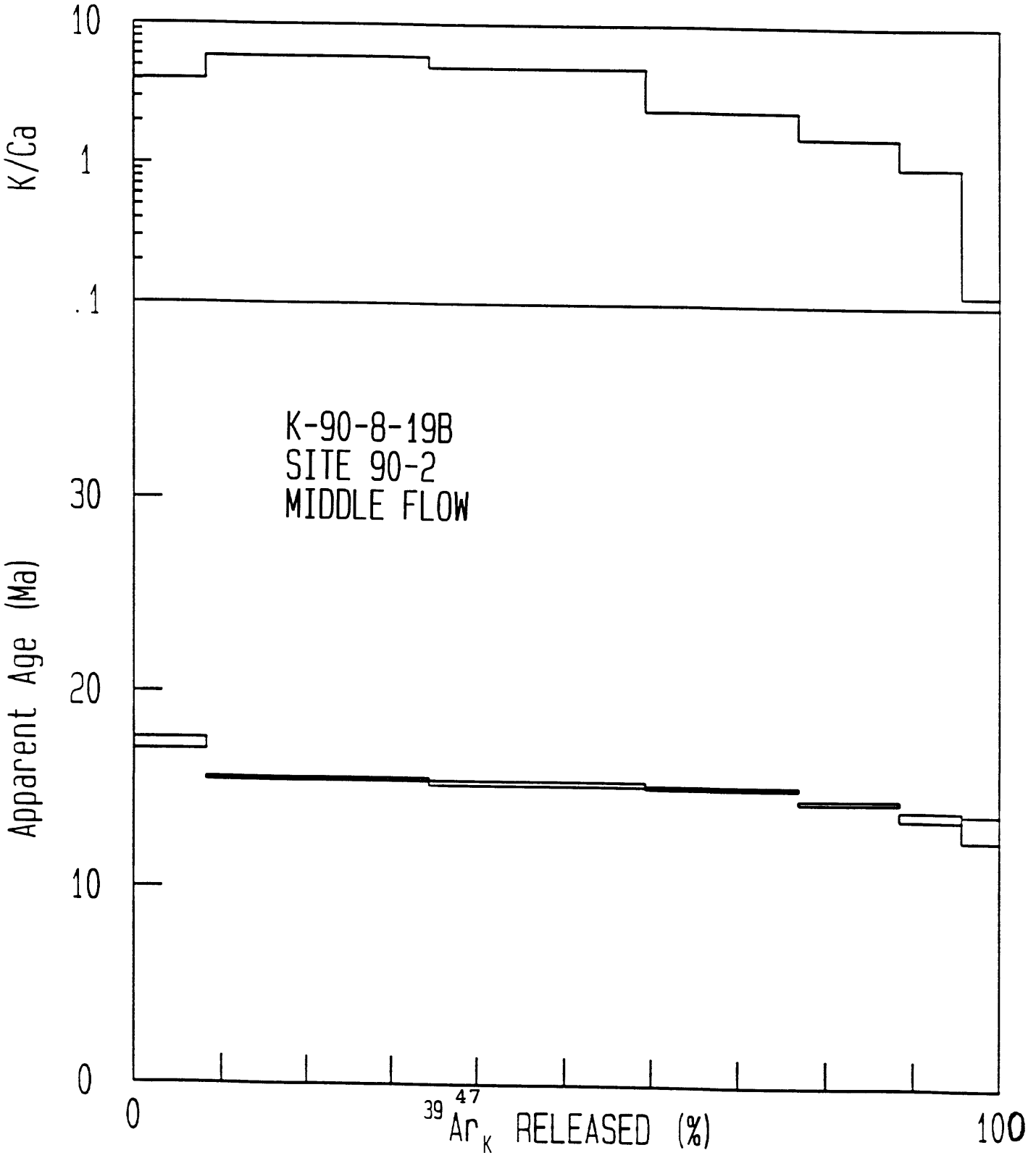
R A W D A T A

FILE	TEMP	40Ar	39Ar	38Ar	37Ar	36Ar regression	TRAP CURRENT	MANIFOLD OPTION
26873	650	802910	46665	3350	497	1877	200	ALL
	±	413	47	18	14	7		
26874	750	1071960	147734	7949	1088	1260	200	ALL
	±	606	109	9	5	6		
26875	870	867936	140786	6744	1231	709	200	ALL
	±	233	63	9	16	9		
26876	950	581313	99475	4109	1744	411	200	ALL
	±	112	74	28	14	4		
26877	1050	360002	65283	2438	1744	244	200	ALL
	±	288	59	22	14	3		
26878	1150	211833	40404	1460	1759	146	200	ALL
	±	192	31	18	3	5		
26879	1250	132040	25276	922	9016	131	200	ALL
	±	66	16	8	10	9		

C O R R E C T I O N S

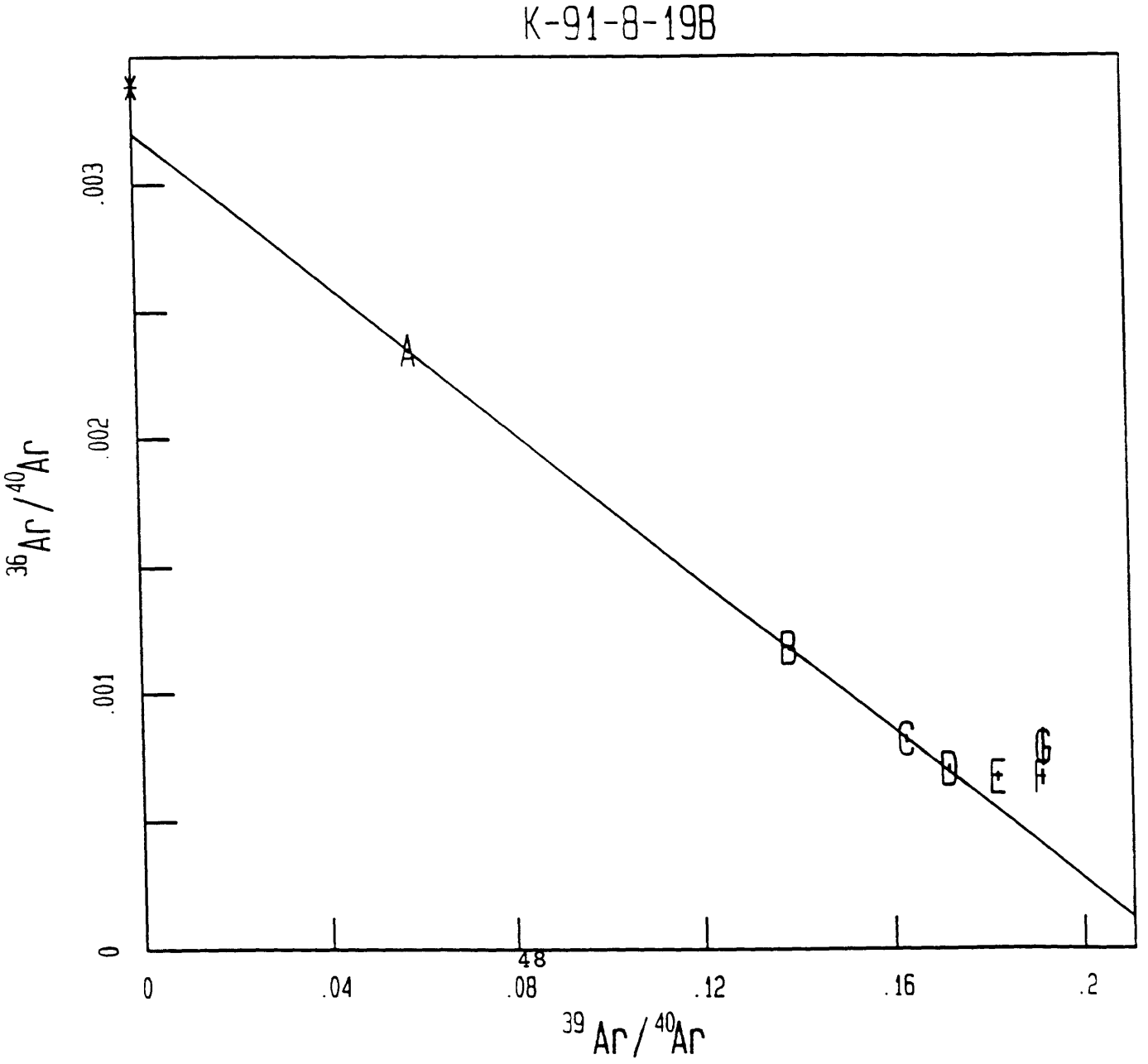
TEMP °C	39Ar Decay	37Ar Decay	-----K-derived---- 40Ar	38Ar	37Ar	----Ca-derived---- 39Ar	38Ar	36Ar	Cl-der 36Ar	Initial 38Ar
650	43	5468	266	627	0	4	0	2	1	352
750	136	11989	841	1984	0	9	0	3	2	236
870	130	13572	801	1891	0	10	0	4	1	132
950	92	19250	566	1336	0	14	1	6	1	76
1050	60	19263	372	877	0	14	1	6	0	45
1150	37	19438	230	543	0	14	1	6	0	26
1250	23	99701	143	339	0	73	3	29	0	19

All values in counts, corrected for mass discrimination


10
1
.1
K/Ca
K-90-8-19B
SITE 90-2
MIDDLE FLOW
30
20
10
0
Apparent Age (Ma)
0
39 47
Ar K RELEASED (%)
100

v 04/05/92 18:41:04 10 Apr 1992 K-90-8-19B WR BASALT #16-18RD76

Points EFG deleted;
4 points regressed out of 7 includes 76.9 % of 39Ar
Mean X = .110E+00 Mean Y = .159E-02 Slope = -.146E-01 + .120E-03
36/40 = .320E-02 + .144E-04 39/40 = .219E+00 + .972E-03
Fit parameters: SUMS = .468 MSWD = .234
40Ar/36Ar = 312.54 + 1.41 F = 4.566 + .02 AGE = 15.15 + .1 Ma



W/O POINTS EFG

Uncertainties in tube blank are included in uncertainties in raw counts.
v 04/05/92 09:47:40 13 Apr 1992

K-90-8-19C WR BASALT #19-21RD76

J = 0.001827 ± 0.50% SAMPLE WT = 1.0012 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma
870	2.665E-12	4.291E-13	1.618E-15	3.653E-13	2.378E-15	15.01 ±
950	4.992E-12	9.903E-13	***	6.829E-13	2.077E-15	14.51 ±
1050	6.385E-12	1.324E-12	***	9.247E-13	1.873E-15	14.45 ±
1150	4.826E-12	9.918E-13	***	8.543E-13	1.371E-15	14.63 ±
1250	3.729E-12	7.667E-13	***	9.424E-13	1.185E-15	14.47 ±
1450	3.359E-12	6.473E-13	***	4.870E-12	1.581E-15	14.66 ±
1650	2.018E-12	3.796E-13	***	3.105E-12	9.043E-16	15.14 ±
TOTAL GAS	2.797E-11	5.529E-12	1.661E-15	1.174E-11	1.137E-14	14.61

92.2% of gas on plateau, steps 950 through 1650 PLATEAU AGE = 14.53

Note: all gas quantities are in moles. No blank correction.
* Ages calculated assuming initial 40Ar/36Ar = 295.5 ± 0
** 1-sigma precision estimates are for intra-sample reproducibility.
** 1-sigma precision estimates for plateaux are for intra-irradiation pa
reproducibility.
*** below detection limit

v 04/05/92

v 04/05/92 K-90-8-19C WR BASALT #19-21RD76 09:47:34 13 Apr 1992

	TEMP C	% TOT 39Ar	RAD YIELD	APP K/Ca	APP K/Cl	F	AGE (Ma)		precision intra-sample	precision intra-package	in pa
A	870	7.8	73.6	.61	642	4.573	15.01	±	.12	.14	.1
B	950	17.9	87.7	.75	0	4.421	14.51	±	.14	.16	.1
C	1050	24.0	91.3	.74	0	4.403	14.45	±	.07	.10	.1
D	1150	17.9	91.6	.60	0	4.458	14.63	±	.10	.13	.1
E	1250	13.9	90.6	.42	0	4.407	14.47	±	.16	.18	.1
F	1450	11.7	86.1	.07	67519	4.467	14.66	±	.16	.17	.1
G	1650	6.9	86.8	.06	46245	4.612	15.14	±	.39	.40	.4

Total gas K/Ca = .5

Precisions are 1 sigma, measured in Ma. Measured 40/36 atm = 297.2 ±.5
J = 0.001827 ± 0.50% (intra-package) ± 0.50% (inter-package)
Trap current factors- 40: 5.66 100: 2.62 200: 1
Manifold factors- ALL: 1 SPLIT 1: 4.2 SPLIT 2: 17.64 SPLIT 3: 74.09
EALL: 2.26 ESPLIT 1: 9.49 ESPLIT 2: 39.87
Sensitivity = 1.344E-17 % Reproducibility = .25 Detection limit = 40 co
Data reduced assuming initial 40/36 = 295.50 ± 0.00
Ca-factors: 3637=2.6E-04±1.7E-06 3837=3.2E-05±2.4E-07 3937=6.7E-04±3.7E-06
K-factors: 3739=0.0E+00±2.2E-03 3839=1.3E-02±2.4E-04 4039=5.7E-03±4.0E-03

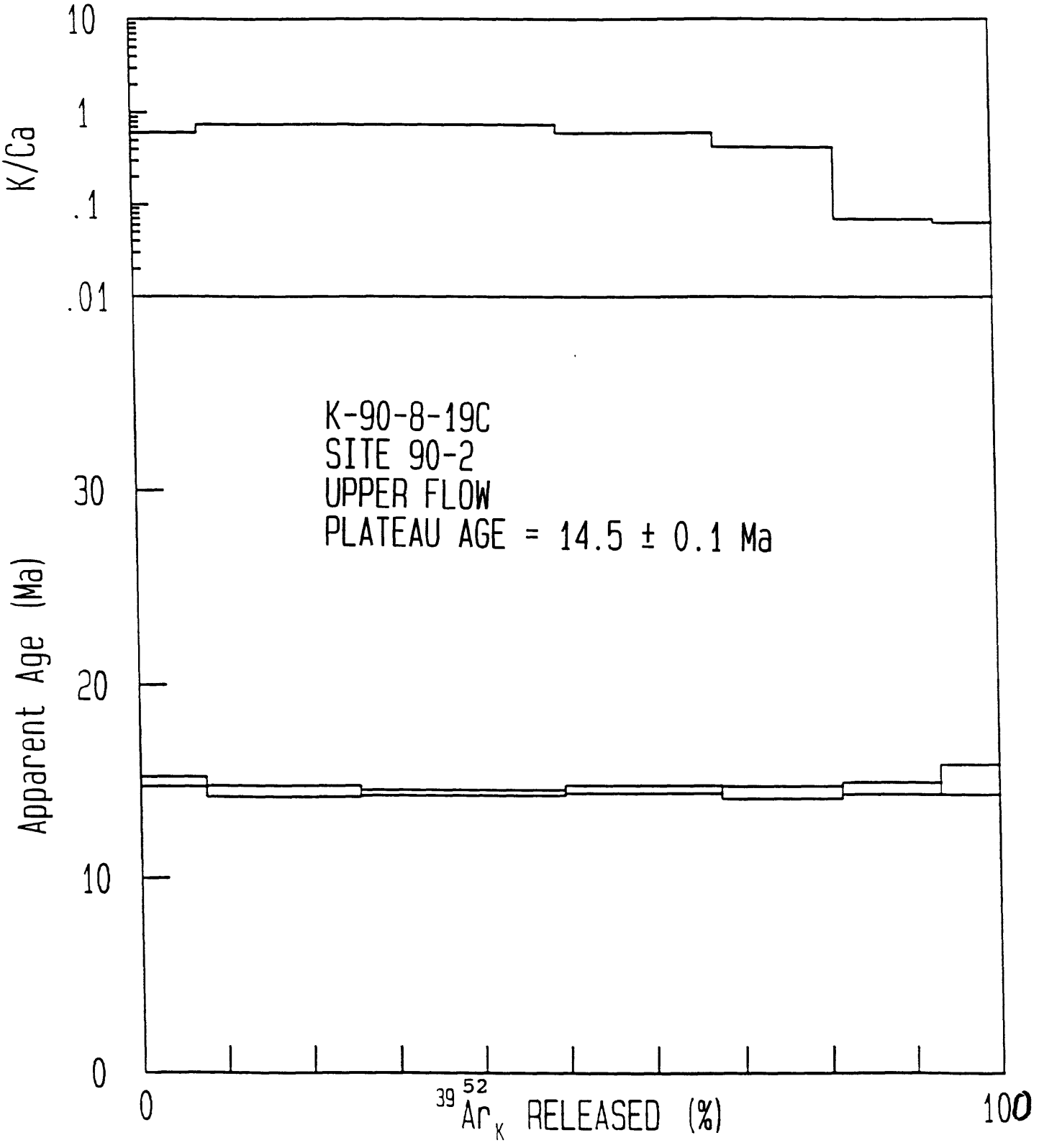
R A W D A T A

FILE	TEMP	40Ar	39Ar	38Ar	37Ar	36Ar regression	TRAP CURRENT	MANII OPTIC
26884	870	198452	31869	515	2206	183	200	ALL
	±	101	23	17	9	4		
26885	950	371859	73542	903	4122	167	200	ALL
	±	244	39	7	9	11		
26886	1050	475622	98351	1099	5578	157	200	ALL
	±	320	70	22	13	7		
26888	1150	359502	73662	834	5149	118	200	ALL
	±	274	36	21	6	8		
26889	1250	277813	56962	668	5676	106	200	ALL
	±	189	41	23	8	10		
26890	1450	250187	48292	635	29315	212	200	ALL
	±	133	15	21	21	8		
26891	1650	150308	28332	374	18679	128	200	ALL
	±	105	30	12	18	11		

C O R R E C T I O N S

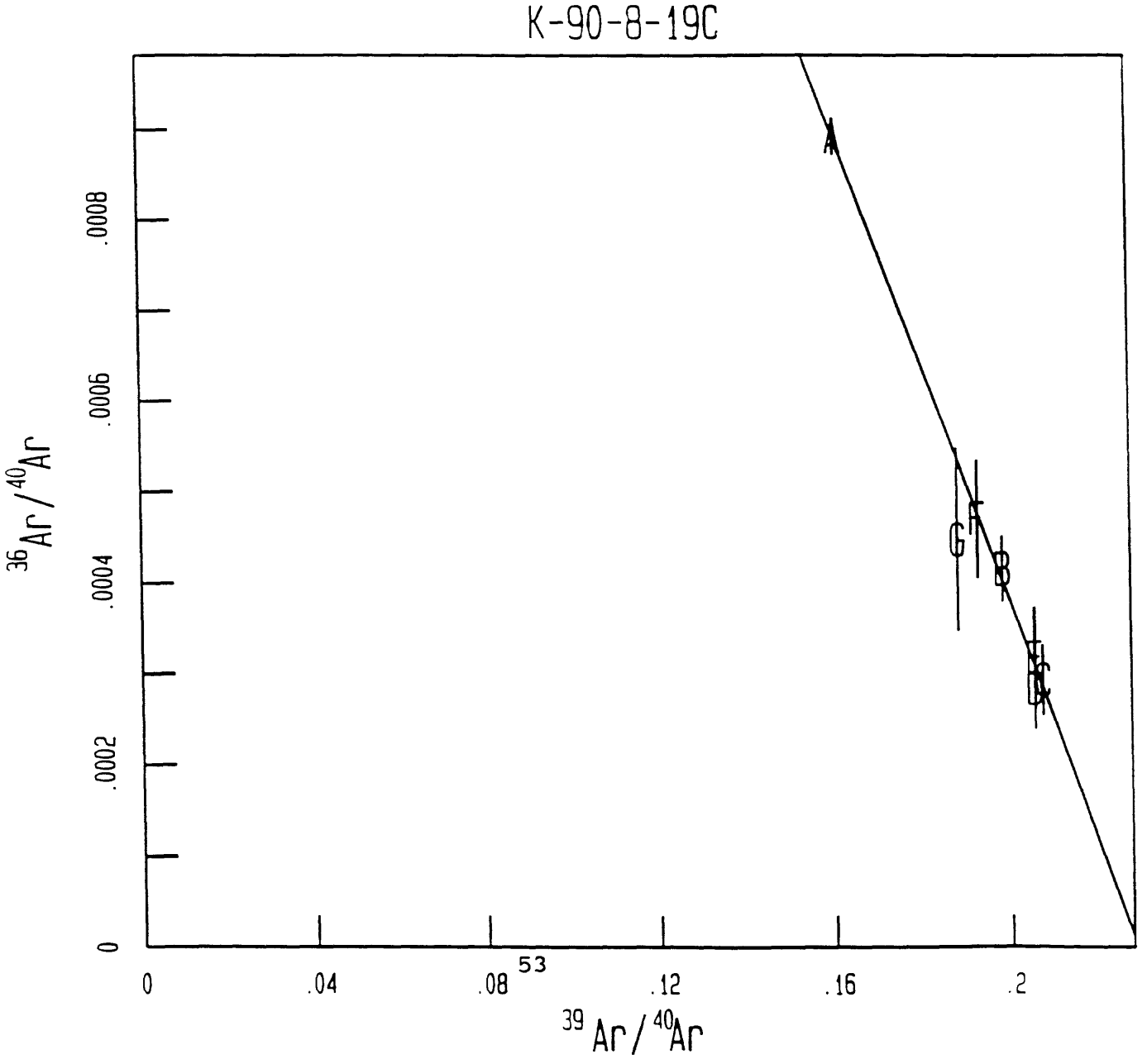
TEMP °C	39Ar Decay	37Ar Decay	-----K-derived---- 40Ar	38Ar	37Ar	----Ca-derived---- 39Ar	38Ar	36Ar	Cl-der 36Ar	Init 38A
870	30	24855	181	428	0	18	1	7	0	3
950	68	46471	419	987	0	34	2	13	-0	2
1050	91	62929	560	1320	0	46	2	18	-0	2
1150	69	58145	419	989	0	43	2	17	-0	1
1250	53	64139	324	764	0	47	2	19	-0	1
1450	45	331487	274	645	0	244	11	96	0	2
1650	26	211359	160	378	0	155	7	61	0	1

All values in counts, corrected for mass discrimination


10
1
.1
.01
K/Ca
K-90-8-19C
SITE 90-2
UPPER FLOW
PLATEAU AGE = 14.5 ± 0.1 Ma
30
20
10
0
Apparent Age (Ma)
0
$^{39}Ar_K$ RELEASED (%)
100

v 04/05/92 09:57:04 13 Apr 1992 K-90-8-19C WR BASALT #19-21RD76

Point deleted;
7 points regressed out of 7
Mean X = .182E+00 Mean Y = .612E-03 Slope = -.131E-01 + .681E-03
36/40 = .300E-02 + .125E-03 39/40 = .229E+00 + .267E-02
Fit parameters: SUMS = 1.333 MSWD = .267
40Ar/36Ar = 333.39 + 13.9 F = 4.365 + .051 AGE = 14.33 + .18 Ma



v 04/05/92 12:01:15 13 Apr 1992

K-90-8-22B WR BASALT #28-30RD76

J = 0.001822 ± 0.50% SAMPLE WT = 1.0049 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
870	6.143E-12	5.323E-13	5.935E-15	1.451E-13	1.169E-14	16.54 ±	.13
950	6.682E-12	9.553E-13	1.990E-15	2.160E-13	6.925E-15	15.88 ±	.05
1050	5.491E-12	8.876E-13	***	3.030E-13	4.188E-15	15.68 ±	.12
1150	3.886E-12	6.582E-13	7.840E-16	4.164E-13	2.785E-15	15.23 ±	.06
1250	2.847E-12	4.996E-13	1.853E-15	1.095E-12	1.959E-15	14.86 ±	.14
1450	2.093E-12	3.455E-13	2.016E-15	4.312E-12	1.592E-15	15.37 ±	.36
1650	1.442E-12	2.105E-13	1.808E-15	3.280E-12	1.585E-15	15.15 ±	.28
TOTAL GAS	2.858E-11	4.089E-12	1.439E-14	9.767E-12	3.072E-14	15.61	

NO PLATEAU

25.8% of gas released in steps 1250 through 1650 average age = 14.97 + .10

Note: all gas quantities are in moles. No blank correction.

* Ages calculated assuming initial 40Ar/36Ar = 295.5 ± 0

** 1-sigma precision estimates are for intra-sample reproducibility.

** 1-sigma precision estimates for plateaux are for intra-irradiation package reproducibility.

*** below detection limit

v 04/05/92

Uncertainties in tube blank are included in uncertainties in raw counts.
v 04/05/92 11:01:03 13 Apr 1992

K-90-8-22B WR BASALT #28-30RD76

J = 0.001822 ± 0.50% SAMPLE WT = 1.0049 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
870	6.143E-12	5.323E-13	5.935E-15	1.451E-13	1.169E-14	16.54 ±	.13
950	6.682E-12	9.553E-13	1.990E-15	2.160E-13	6.925E-15	15.88 ±	.05
1050	5.491E-12	8.876E-13	***	3.030E-13	4.188E-15	15.68 ±	.12
1150	3.886E-12	6.582E-13	7.840E-16	4.164E-13	2.785E-15	15.23 ±	.06
1250	2.847E-12	4.996E-13	1.853E-15	1.095E-12	1.959E-15	14.86 ±	.14
1450	2.093E-12	3.455E-13	2.016E-15	4.312E-12	1.592E-15	15.37 ±	.36
1650	1.442E-12	2.105E-13	1.808E-15	3.280E-12	1.585E-15	15.15 ±	.28
TOTAL GAS	2.858E-11	4.089E-12	1.439E-14	9.767E-12	3.072E-14	15.61	

NO PLATEAU

Note: all gas quantities are in moles. No blank correction.
* Ages calculated assuming initial 40Ar/36Ar = 295.5 ± 0
** 1-sigma precision estimates are for intra-sample reproducibility.
** 1-sigma precision estimates for plateaux are for intra-irradiation package reproducibility.
*** below detection limit

v 04/05/92

v 04/05/92 K-90-8-22B WR BASALT #28-30RD76 11:00:55 13 Apr 1992

	TEMP C	% TOT 39Ar	RAD YIELD	APP K/Ca	APP K/Cl	F	AGE (Ma)	intra-sample	precision intra-package	precision inter-package
A	870	13.0	43.8	1.91	217	5.054	16.54 ±	.13	.16	.18
B	950	23.4	69.4	2.30	1162	4.852	15.88 ±	.05	.09	.12
C	1050	21.7	77.5	1.52	0	4.792	15.68 ±	.12	.14	.16
D	1150	16.1	78.8	.82	2032	4.653	15.23 ±	.06	.10	.12
E	1250	12.2	79.7	.24	652	4.540	14.86 ±	.14	.16	.18
F	1450	8.4	77.5	.04	415	4.697	15.37 ±	.36	.37	.38
G	1650	5.1	67.5	.03	282	4.627	15.15 ±	.28	.29	.30

Total gas K/Ca = 1.3

Precisions are 1 sigma, measured in Ma. Measured 40/36 atm = 297.2 ±.5
J = 0.001822 ± 0.50% (intra-package) ± 0.50% (inter-package)
Trap current factors- 40: 5.66 100: 2.62 200: 1
Manifold factors- ALL: 1 SPLIT 1: 4.2 SPLIT 2: 17.64 SPLIT 3: 74.09
EALL: 2.26 ESPLIT 1: 9.49 ESPLIT 2: 39.87
Sensitivity = 1.344E-17 % Reproducibility = .25 Detection limit = 40 counts
Data reduced assuming initial 40/36 = 295.50 ± 0.00
Ca-factors: 3637=2.6E-04±1.7E-06 3837=3.2E-05±2.4E-07 3937=6.7E-04±3.7E-06
K-factors: 3739=0.0E+00±2.2E-03 3839=1.3E-02±2.4E-04 4039=5.7E-03±4.0E-03

v 04/05/92 K-90-8-22B WR BASALT #28-30RD76 11:00:54 13 Apr 1992

R A W D A T A

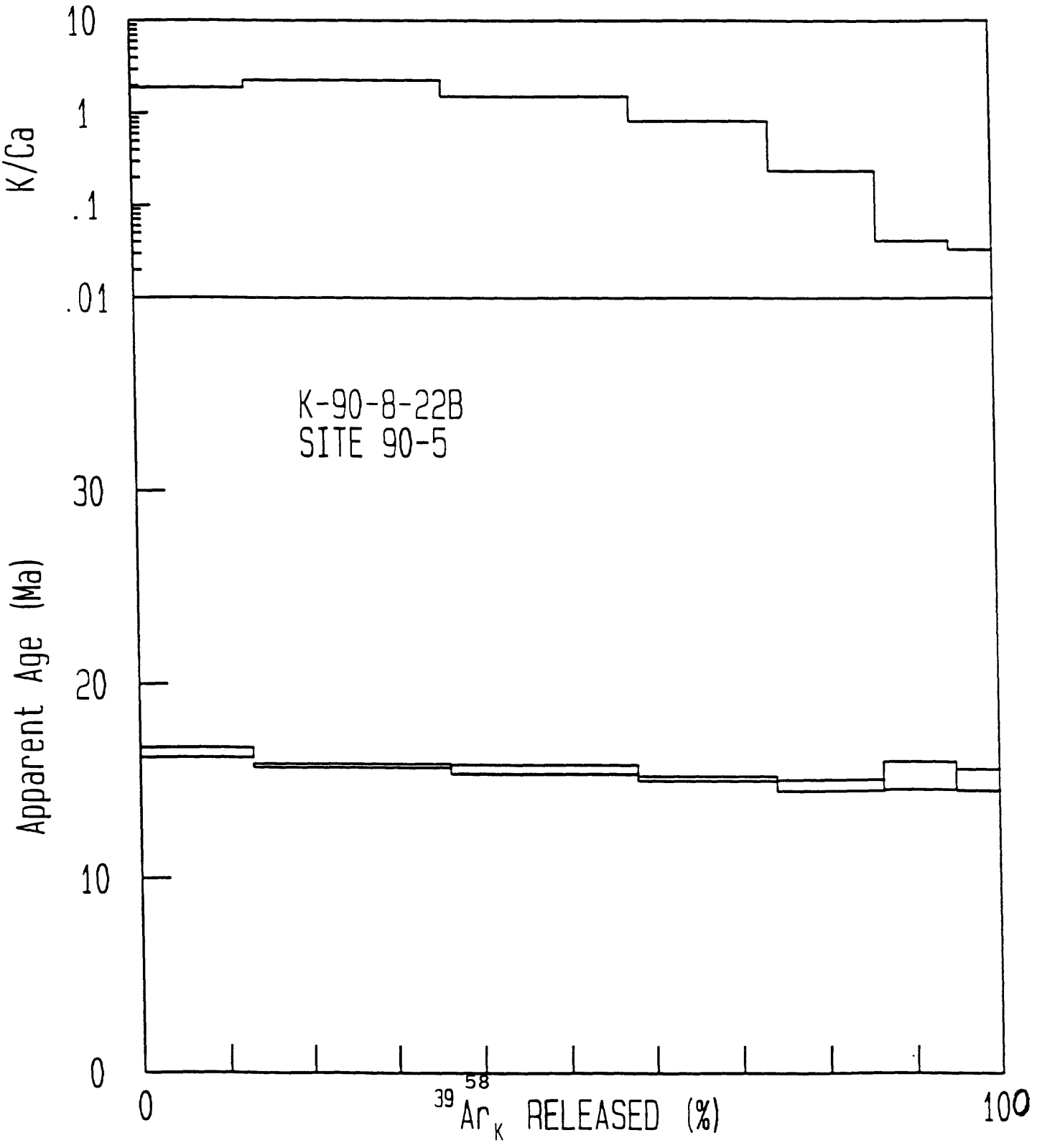
FILE	TEMP	40Ar	39Ar	38Ar	37Ar	36Ar regression	TRAP CURRENT	MANIFOLD OPTION
26915	870	457329	39516	808	778	868	200	ALL
	±	260	18	6	6	5		
26916	950	497559	70918	1002	1158	517	200	ALL
	±	479	48	16	18	3		
26917	1050	408936	65897	801	1623	316	200	ALL
	±	388	40	12	15	8		
26918	1150	289390	48876	675	2229	214	200	ALL
	±	158	46	15	6	3		
26919	1250	212041	37138	610	5860	166	200	ALL
	±	97	25	7	11	5		
26920	1450	155902	25861	481	23056	202	200	ALL
	±	102	27	13	11	10		
26921	1650	107411	15789	329	17528	181	200	ALL
	±	74	13	11	20	5		

C O R R E C T I O N S

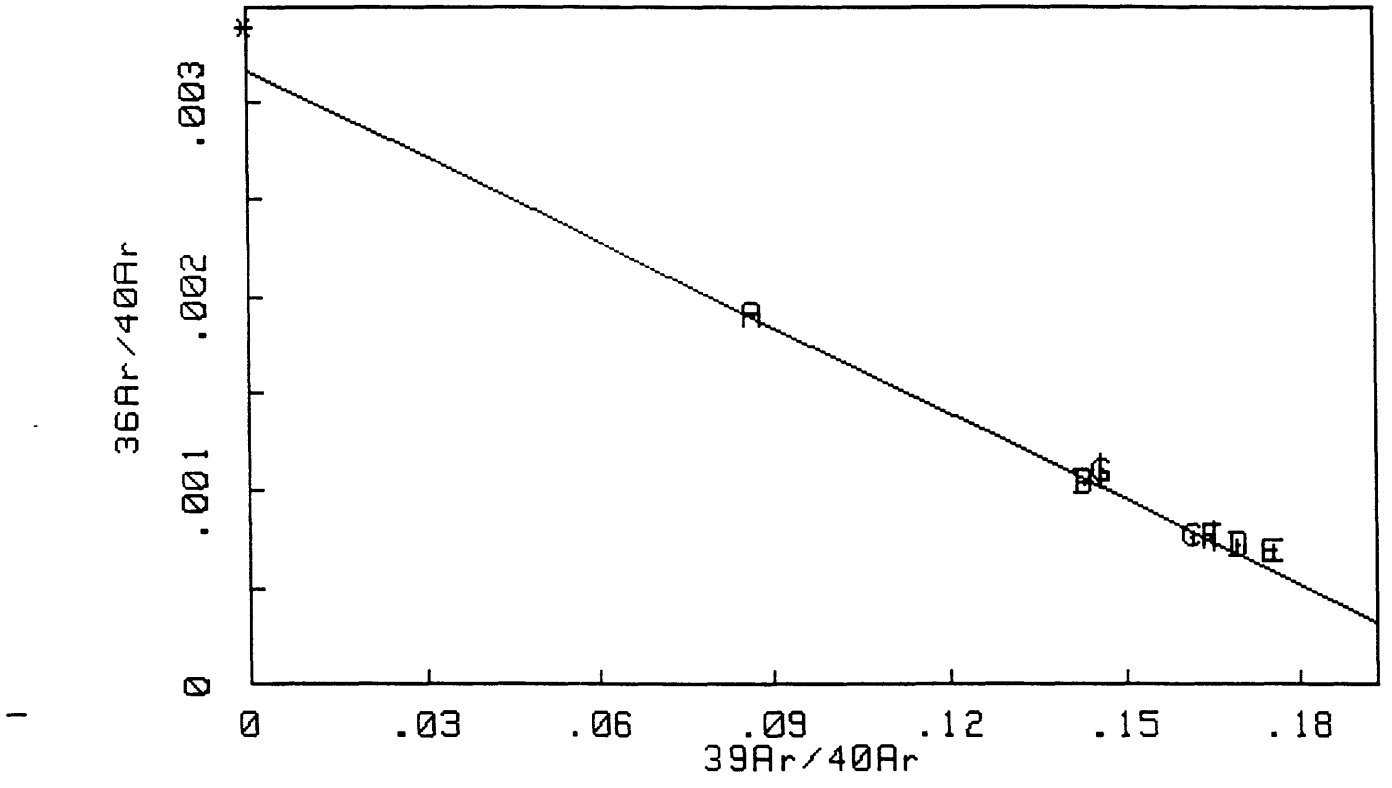
TEMP °C	39Ar Decay	37Ar Decay	-----K-derived---- 40Ar	38Ar	37Ar	----Ca-derived---- 39Ar	38Ar	36Ar	Cl-der 36Ar	Initial 38Ar
870	38	9970	225	531	0	7	0	3	0	163
950	69	14846	404	952	0	11	1	4	0	96
1050	64	20823	375	885	0	15	1	6	-0	58
1150	48	28617	278	656	0	21	1	8	0	39
1250	36	75275	211	498	0	55	3	22	0	27
1450	25	296376	146	344	0	216	10	85	0	22
1650	15	225476	89	210	0	164	8	64	0	22

All values in counts, corrected for mass discrimination

v 04/05/92 11:56:21 13 Apr 1992 K-90-8-22B WR BASALT #28-30RD76



v 04/05/92 (40/36in = 295.



7 points regressed out of 7
Mean X = .124E+00 Mean Y = .134E-02 Slope = -.147E-01 + .223E-03
36/40 = .317E-02 + .288E-04 39/40 = .215E+00 + .147E-02
Fit parameters: SUMS = 17.197 MSWD = 3.439
40Ar/36Ar = 315.41 + 2.86 F = 4.644 + .032 AGE = 15.2 + .13 Ma

v 04/05/92 12:13:30 13 Apr 1992

K-90-8-22C WR BASALT #32RD76

J = 0.001776 ± 0.50% SAMPLE WT = 0.3343 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
650	6.950E-11	8.636E-13	1.047E-13	4.830E-13	2.232E-13	13.16 ±	.94
750	2.914E-11	3.725E-12	4.652E-14	9.119E-13	3.458E-14	16.20 ±	.09
870	4.904E-11	8.715E-12	1.767E-14	1.410E-12	2.223E-14	15.55 ±	.03
950	2.940E-11	5.254E-12	1.056E-14	1.585E-12	1.557E-14	15.06 ±	.02
1050	1.937E-11	3.131E-12	1.780E-14	2.161E-12	1.689E-14	14.65 ±	.06
1150	1.078E-11	1.844E-12	2.293E-14	2.054E-12	9.419E-15	13.84 ±	.07
1250	1.083E-11	1.972E-12	4.427E-14	6.992E-12	8.320E-15	13.55 ±	.04
1450	1.081E-11	1.556E-12	9.774E-14	7.054E-11	1.498E-14	13.10 ±	.11
TOTAL GAS	2.289E-10	2.706E-11	3.622E-13	8.614E-11	3.451E-13	14.96	

NO PLATEAU

Note: all gas quantities are in moles. No blank correction.

* Ages calculated assuming initial 40Ar/36Ar = 295.5 ± 0

** 1-sigma precision estimates are for intra-sample reproducibility.

** 1-sigma precision estimates for plateaux are for intra-irradiation package reproducibility.

*** below detection limit

v 04/05/92

v 04/05/92 K-90-8-22C WR BASALT #32RD76 12:13:28 13 Apr 1992

	TEMP C	% TOT 39Ar	RAD YIELD	APP K/Ca	APP K/Cl	F	AGE (Ma)	intra-sample	precision intra-package	precision inter-package
A	650	3.2	5.1	.93	20	4.123	13.16 ±	.94	1.03	1.03
B	750	13.8	64.9	2.12	194	5.079	16.20 ±	.09	.12	.15
C	870	32.2	86.6	3.22	1193	4.873	15.55 ±	.03	.08	.12
D	950	19.4	84.4	1.72	1205	4.719	15.06 ±	.02	.08	.11
E	1050	11.6	74.2	.75	426	4.591	14.65 ±	.06	.10	.12
F	1150	6.8	74.2	.47	195	4.337	13.84 ±	.07	.10	.12
G	1250	7.3	77.3	.15	108	4.245	13.55 ±	.04	.08	.11
H	1450	5.8	59.1	.01	39	4.105	13.10 ±	.11	.13	.17

Total gas K/Ca = 1.8

Precisions are 1 sigma, measured in Ma. Measured 40/36 atm = 297.2 ±.5
J = 0.001776 ± 0.50% (intra-package) ± 0.50% (inter-package)
Trap current factors- 40: 5.66 100: 2.62 200: 1
Manifold factors- ALL: 1 SPLIT 1: 4.2 SPLIT 2: 17.64 SPLIT 3: 74.09
EALL: 2.26 ESPLIT 1: 9.49 ESPLIT 2: 39.87
Sensitivity = 1.344E-17 % Reproducibility = .25 Detection limit = 40 counts
Data reduced assuming initial 40/36 = 295.50 ± 0.00
Ca-factors: 3637=2.6E-04±1.7E-06 3837=3.2E-05±2.4E-07 3937=6.7E-04±3.7E-06
K-factors: 3739=0.0E+00±2.2E-03 3839=1.3E-02±2.4E-04 4039=5.7E-03±4.0E-03

v 04/05/92 K-90-8-22C WR BASALT #32RD76 12:13:26 13 Apr 1992

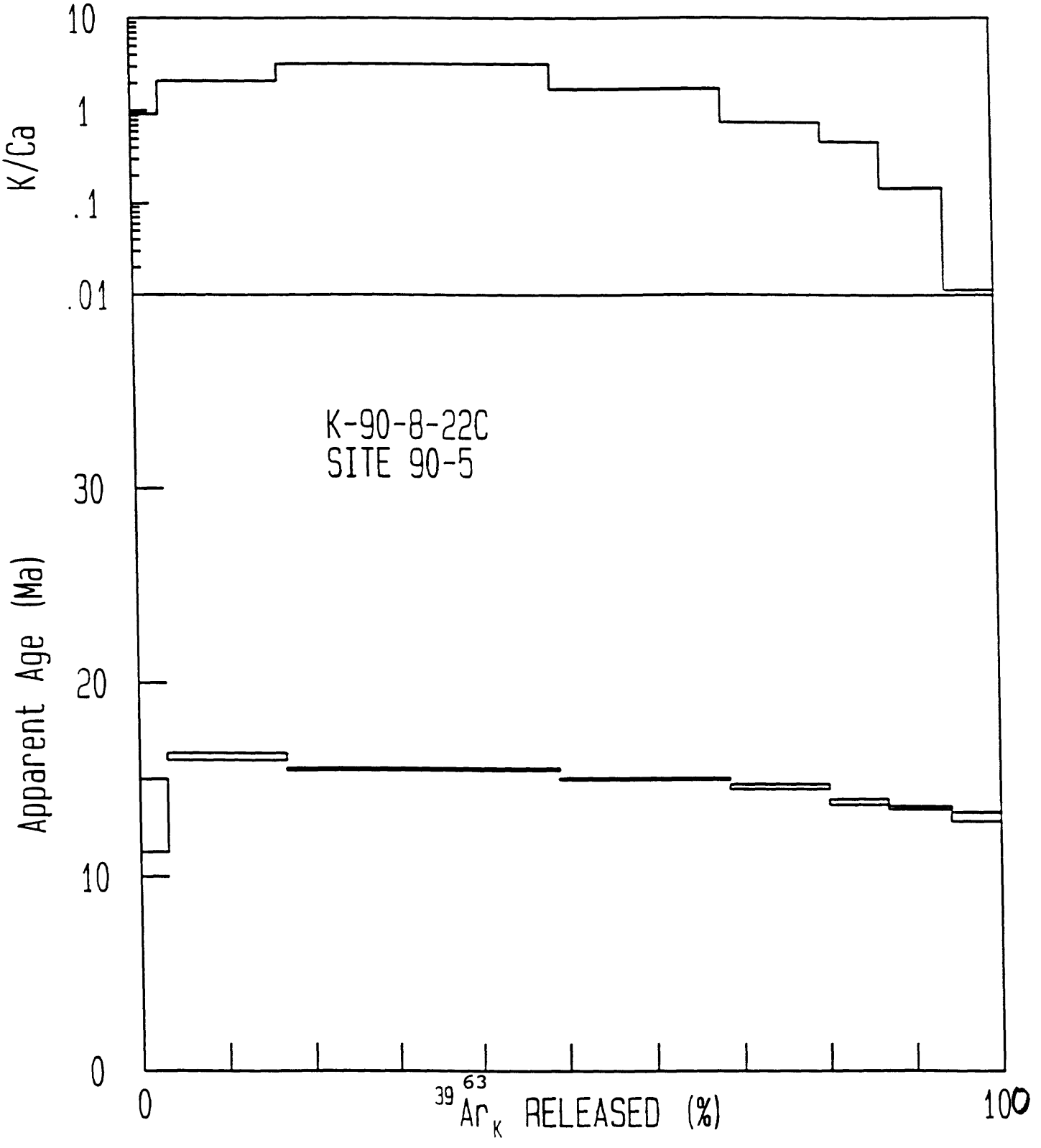
R A W D A T A

FILE	TEMP	40Ar	39Ar	38Ar	37Ar	36Ar regression	TRAP CURRENT	MANIFOLD OPTION
27481	650	2288326	28368	2449	598	7310	200	EALL
	±	2833	14	19	5	27		
27482	750	959995	122337	2954	1129	1140	200	EALL
	±	728	84	22	13	11		
27483	870	1616103	286202	4279	1745	740	200	EALL
	±	867	111	18	23	9		
27484	950	968759	172562	2564	1961	523	200	EALL
	±	301	66	18	10	4		
27485	1050	638230	102861	1860	2673	572	200	EALL
	±	645	126	19	19	7		
27486	1150	355265	60595	1508	2540	326	200	EALL
	±	475	39	22	4	4		
27487	1250	356931	64904	2277	8643	333	200	EALL
	±	471	75	9	26	3		
27488	1450	356282	52658	3874	87173	1101	200	EALL
	±	596	45	12	82	6		

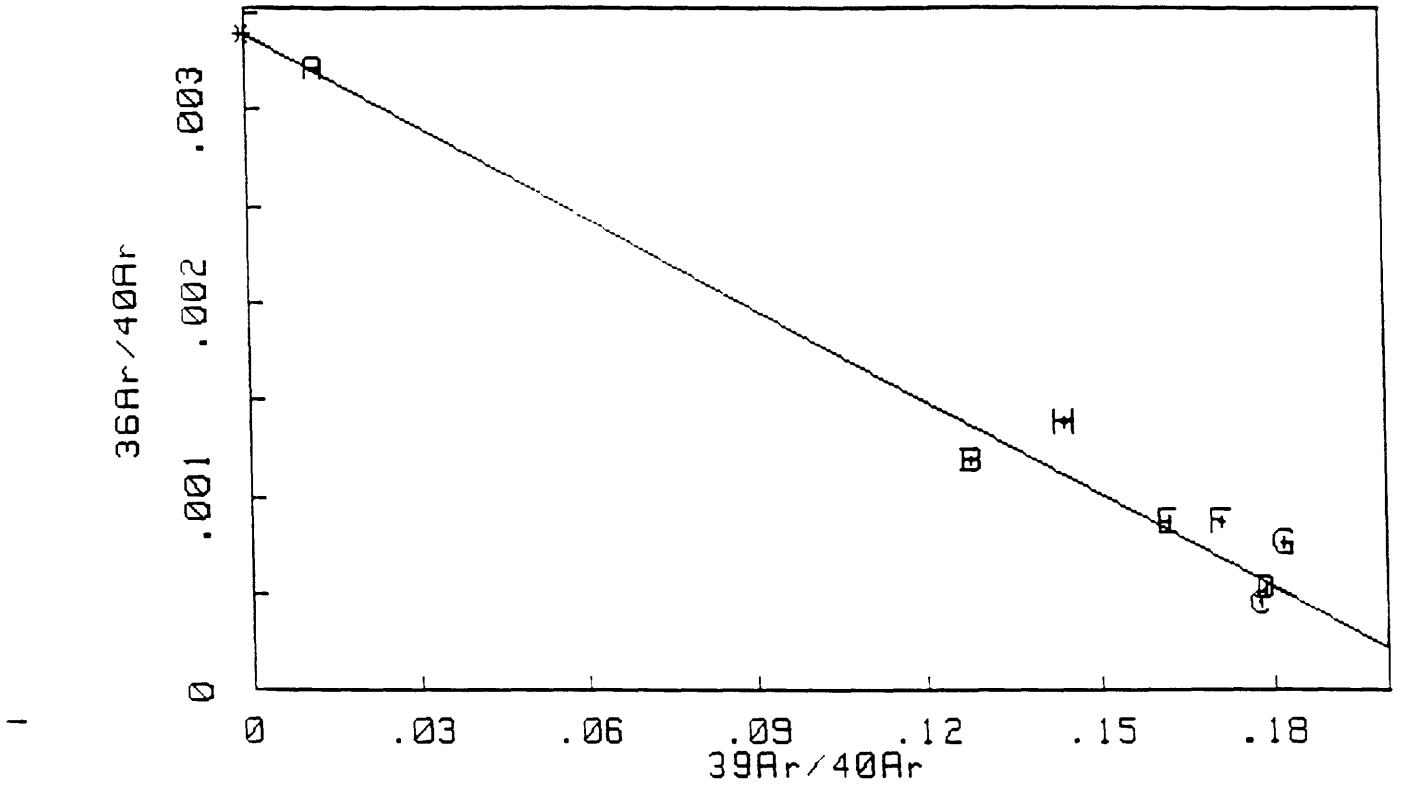
C O R R E C T I O N S

TEMP °C	39Ar Decay	37Ar Decay	-----K-derived---- 40Ar	38Ar	37Ar	----Ca-derived---- 39Ar	38Ar	36Ar	Cl-der 36Ar	Initial 38Ar
650	34	15235	161	381	0	11	1	4	1	1373
750	149	28762	697	1643	0	20	1	8	0	213
870	348	44462	1630	3845	0	31	1	12	0	137
950	210	49988	983	2318	0	35	2	14	0	96
1050	125	68162	586	1381	0	48	2	19	0	104
1150	74	64781	345	814	0	46	2	18	0	58
1250	79	220555	369	870	0	155	7	61	0	51
1450	64	2225354	291	687	0	1563	74	613	1	92

All values in counts, corrected for mass discrimination


10
1
.1
.01
K/Ca
K-90-8-22C
SITE 90-5
30
20
10
0
Apparent Age (Ma)
0
$^{39}Ar_K$ RELEASED (%)
100

v 04/05/92, SAMPLE K-90-8-22C WR BASALT #32RD76 12:14:09 13 Apr 1992



8 points regressed out of 8
Mean X = .118E+00 Mean Y = .153E-02 Slope = -.158E-01 + .958E-04
36/40 = .339E-02 + .132E-04 39/40 = .215E+00 + .729E-03
Fit parameters: SUMS = 389.023 MSWD = 64.837
40Ar/36Ar = 295.06 + 1.15 F = 4.661 + .016 AGE = 14.87 + .09 Ma

Uncertainties in tube blank are included in uncertainties in raw counts.
v 04/05/92 10:01:11 13 Apr 1992

K-90-8-19D WR BASALT #22-24RD76

J = 0.001804 ± 0.50% SAMPLE WT = 1.0025 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
870	5.418E-12	5.239E-13	2.658E-15	2.563E-13	8.986E-15	17.08 ±	.30
950	7.351E-12	1.130E-12	***	4.259E-13	5.809E-15	16.16 ±	.13
1050	7.242E-12	1.236E-12	***	6.378E-13	4.002E-15	15.89 ±	.06
1150	5.986E-12	1.061E-12	***	7.711E-13	2.669E-15	15.86 ±	.09
1250	5.139E-12	9.346E-13	***	1.211E-12	2.064E-15	15.70 ±	.07
1450	3.966E-12	6.870E-13	2.241E-15	4.541E-12	1.946E-15	15.99 ±	.13
1650	2.354E-12	3.970E-13	1.422E-15	3.007E-12	1.359E-15	15.93 ±	.14
TOTAL GAS	3.746E-11	5.969E-12	6.798E-15	1.085E-11	2.684E-14	16.03	

57.4% of gas on plateau, steps 950 through 1150 PLATEAU AGE = 15.91 + .09
51.6% of gas on plateau, steps 1150 through 1650 PLATEAU AGE = 15.81 + .09

Note: all gas quantities are in moles. No blank correction.
* Ages calculated assuming initial 40Ar/36Ar = 295.5 ± 0
** 1-sigma precision estimates are for intra-sample reproducibility.
** 1-sigma precision estimates for plateaux are for intra-irradiation package reproducibility.
*** below detection limit

v 04/05/92

v 04/05/92 K-90-8-19D WR BASALT #22-24RD76 10:00:52 13 Apr 1992

	TEMP C	% TOT 39Ar	RAD YIELD	APP K/Ca	APP K/Cl	F	AGE (Ma)	precision intra-sample	precision intra-package	precision inter-package
A	870	8.8	51.0	1.06	477	5.274	17.08 ±	.30	.31	.32
B	950	18.9	76.6	1.38	0	4.988	16.16 ±	.13	.15	.17
C	1050	20.7	83.7	1.01	0	4.903	15.89 ±	.06	.10	.13
D	1150	17.8	86.8	.72	0	4.896	15.86 ±	.09	.12	.14
E	1250	15.7	88.1	.40	4745	4.847	15.70 ±	.07	.10	.13
F	1450	11.5	85.5	.08	742	4.936	15.99 ±	.13	.15	.17
G	1650	6.7	82.9	.07	676	4.917	15.93 ±	.14	.16	.18
Total gas K/Ca =				.8						

Precisions are 1 sigma, measured in Ma. Measured 40/36 atm = 297.2 ±.5
J = 0.001804 ± 0.50% (intra-package) ± 0.50% (inter-package)
Trap current factors- 40: 5.66 100: 2.62 200: 1
Manifold factors- ALL: 1 SPLIT 1: 4.2 SPLIT 2: 17.64 SPLIT 3: 74.09
EALL: 2.26 ESPLIT 1: 9.49 ESPLIT 2: 39.87
Sensitivity = 1.344E-17 % Reproducibility = .25 Detection limit = 40 counts
Data reduced assuming initial 40/36 = 295.50 ± 0.00
Ca-factors: 3637=2.6E-04±1.7E-06 3837=3.2E-05±2.4E-07 3937=6.7E-04±3.7E-06
K-factors: 3739=0.0E+00±2.2E-03 3839=1.3E-02±2.4E-04 4039=5.7E-03±4.0E-03

v 04/05/92 K-90-8-19D WR BASALT #22-24RD76 10:00:51 13 Apr 1992

R A W D A T A

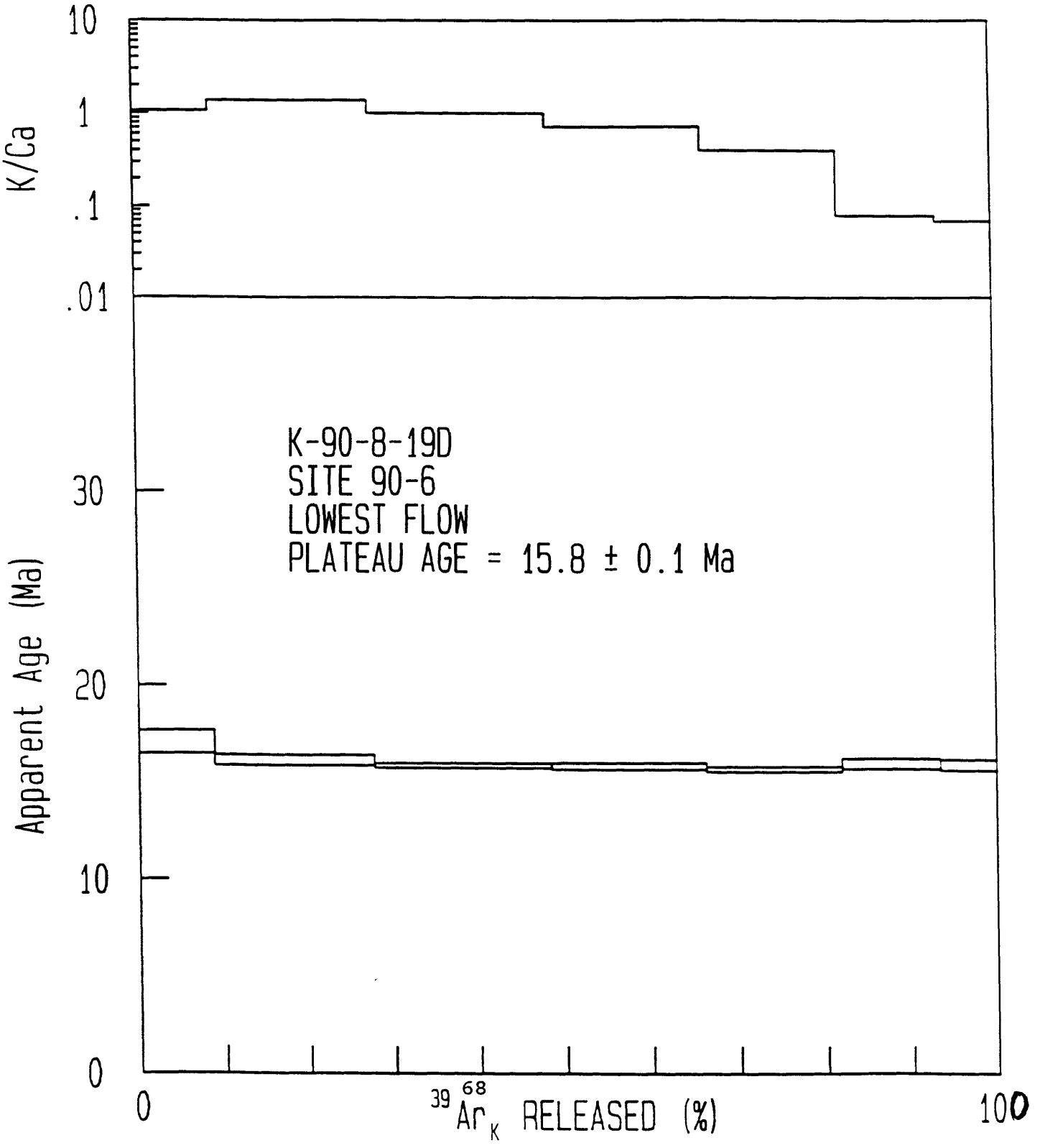
FILE	TEMP	40Ar	39Ar	38Ar	37Ar	36Ar regression	TRAP CURRENT	MANIFOLD OPTION
26895	870	403383	38902	594	1429	670	200	ALL
	±	60	29	10	7	12		
26896	950	547404	83868	984	2374	438	200	ALL
	±	475	72	11	5	11		
26897	1050	539326	91761	1070	3552	309	200	ALL
	±	229	53	18	8	6		
26898	1150	445826	78828	990	4292	213	200	ALL
	±	220	32	9	6	7		
26899	1250	382791	69431	939	6737	176	200	ALL
	±	114	48	10	9	5		
26900	1450	295388	51222	833	25243	233	200	ALL
	±	132	9	3	13	7		
26901	1650	175301	29622	488	16706	159	200	ALL
	±	86	23	14	13	4		

C O R R E C T I O N S

TEMP °C	39Ar Decay	37Ar Decay	-----K-derived---- 40Ar	38Ar	37Ar	----Ca-derived---- 39Ar	38Ar	36Ar	Cl-der 36Ar	Initial 38Ar
870	37	17556	221	522	0	13	1	5	0	125
950	80	29179	477	1126	0	21	1	8	-0	81
1050	88	43697	522	1232	0	32	2	13	-0	56
1150	76	52835	449	1058	0	39	2	15	-0	37
1250	67	82993	395	932	0	61	3	24	0	29
1450	49	311162	290	685	0	227	11	89	0	27
1650	28	206070	168	396	0	151	7	59	0	19

All values in counts, corrected for mass discrimination

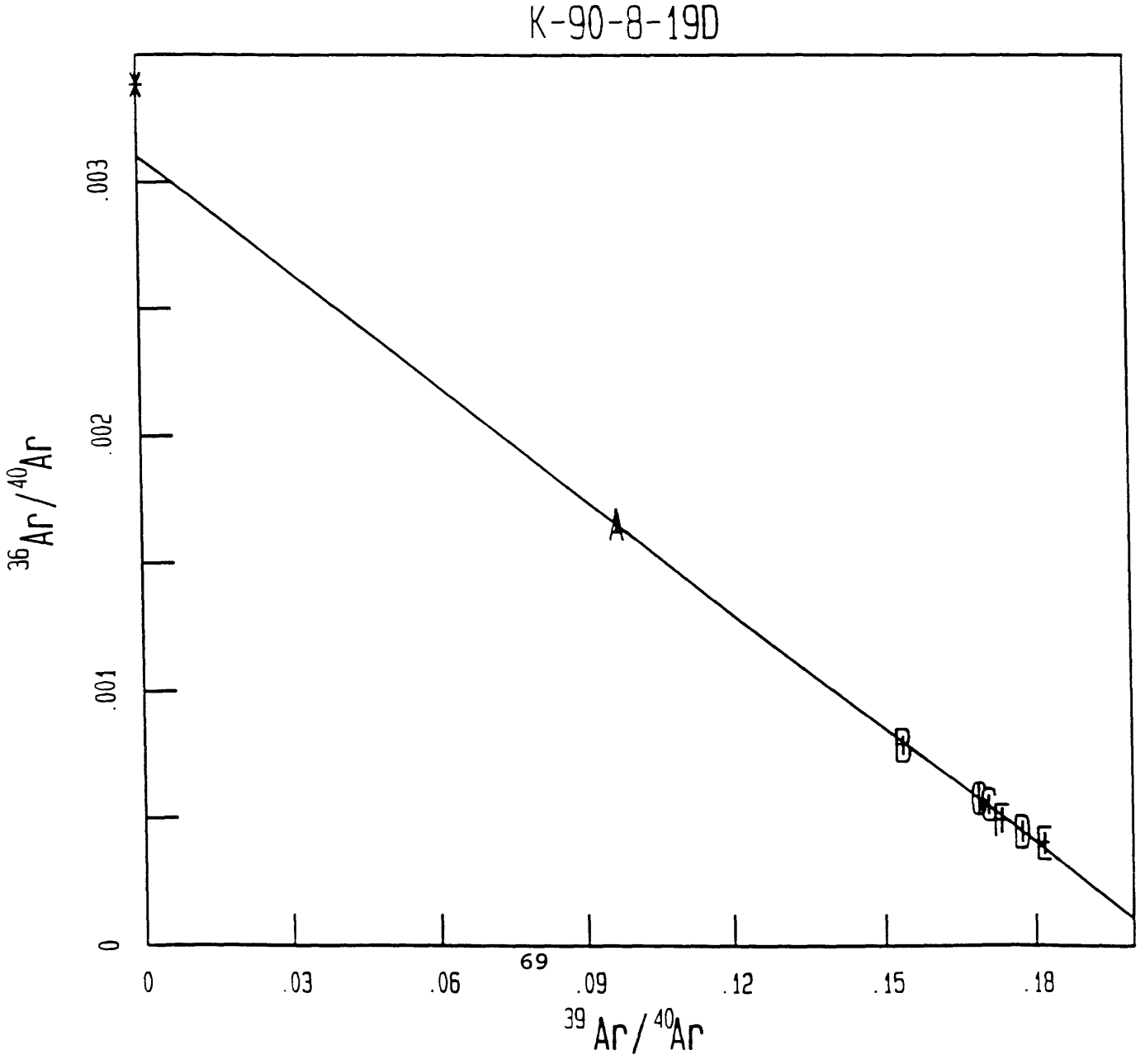
v 04/05/92 10:05:06 13 Apr 1992 K-90-8-19D WR BASALT #22-24RD76



v 04/05/92 (40/36in = 295.5

v 04/05/92 10:44:04 13 Apr 1992 K-90-8-19D WR BASALT #22-24RD76

7 points regressed out of 7
Mean X = .152E+00 Mean Y = .833E-03 Slope = -.150E-01 + .462E-03
36/40 = .310E-02 + .716E-04 39/40 = .207E+00 + .199E-02
Fit parameters: SUMS = .516 MSWD = .103
40Ar/36Ar = 322.26 + 7.44 F = 4.825 + .046 AGE = 15.63 + .17 Ma



Uncertainties in tube blank are included in uncertainties in raw counts.
v 04/05/92 10:49:55 13 Apr 1992

K-90-8-19D1 WR BASALT #25-27RD76

J = 0.001869 ± 0.50% SAMPLE WT = 1.0000 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
870	9.198E-12	6.582E-13	6.158E-15	2.527E-13	1.910E-14	18.11 ±	.17
950	9.162E-12	1.097E-12	1.597E-15	3.308E-13	1.224E-14	16.96 ±	.09
1050	8.172E-12	1.135E-12	***	4.774E-13	9.007E-15	16.30 ±	.14
1150	7.408E-12	1.177E-12	***	6.946E-13	5.895E-15	16.16 ±	.06
1250	6.045E-12	1.016E-12	***	1.286E-12	4.316E-15	15.76 ±	.09
1450	4.591E-12	7.621E-13	***	4.452E-12	3.141E-15	16.13 ±	.04
1650	2.732E-12	4.406E-13	***	2.784E-12	2.194E-15	15.88 ±	.22
TOTAL GAS	4.731E-11	6.286E-12	8.067E-15	1.028E-11	5.589E-14	16.44	

NO PLATEAU

Note: all gas quantities are in moles. No blank correction.
* Ages calculated assuming initial 40Ar/36Ar = 295.5 ± 0
** 1-sigma precision estimates are for intra-sample reproducibility.
** 1-sigma precision estimates for plateaux are for intra-irradiation package reproducibility.
*** below detection limit

v 04/05/92

v 04/05/92 K-90-8-19D1 WR BASALT #25-27RD76 10:49:48 13 Apr 1992

	TEMP C	% TOT 39Ar	RAD YIELD	APP K/Ca	APP K/Cl	F	AGE (Ma)	precision intra-sample	precision intra-package	precision inter-package
A	870	10.5	38.6	1.35	259	5.397	18.11 ±	.17	.20	.22
B	950	17.5	60.5	1.72	1662	5.055	16.96 ±	.09	.13	.15
C	1050	18.1	67.4	1.24	14022	4.856	16.30 ±	.14	.16	.18
D	1150	18.7	76.5	.88	0	4.814	16.16 ±	.06	.10	.13
E	1250	16.2	78.9	.41	24493	4.696	15.76 ±	.09	.12	.14
F	1450	12.1	79.8	.09	0	4.806	16.13 ±	.04	.09	.12
G	1650	7.0	76.3	.08	70999	4.730	15.88 ±	.22	.24	.25

Total gas K/Ca = .9

Precisions are 1 sigma, measured in Ma. Measured 40/36 atm = 297.2 ±.5
J = 0.001869 ± 0.50% (intra-package) ± 0.50% (inter-package)
Trap current factors- 40: 5.66 100: 2.62 200: 1
Manifold factors- ALL: 1 SPLIT 1: 4.2 SPLIT 2: 17.64 SPLIT 3: 74.09
EALL: 2.26 ESPLIT 1: 9.49 ESPLIT 2: 39.87
Sensitivity = 1.344E-17 % Reproducibility = .25 Detection limit = 40 counts
Data reduced assuming initial 40/36 = 295.50 ± 0.00
Ca-factors: 3637=2.6E-04±1.7E-06 3837=3.2E-05±2.4E-07 3937=6.7E-04±3.7E-06
K-factors: 3739=0.0E+00±2.2E-03 3839=1.3E-02±2.4E-04 4039=5.7E-03±4.0E-03

v 04/05/92 K-90-8-19D1 WR BASALT #25-27RD76 10:49:47 13 Apr 1992

R A W D A T A

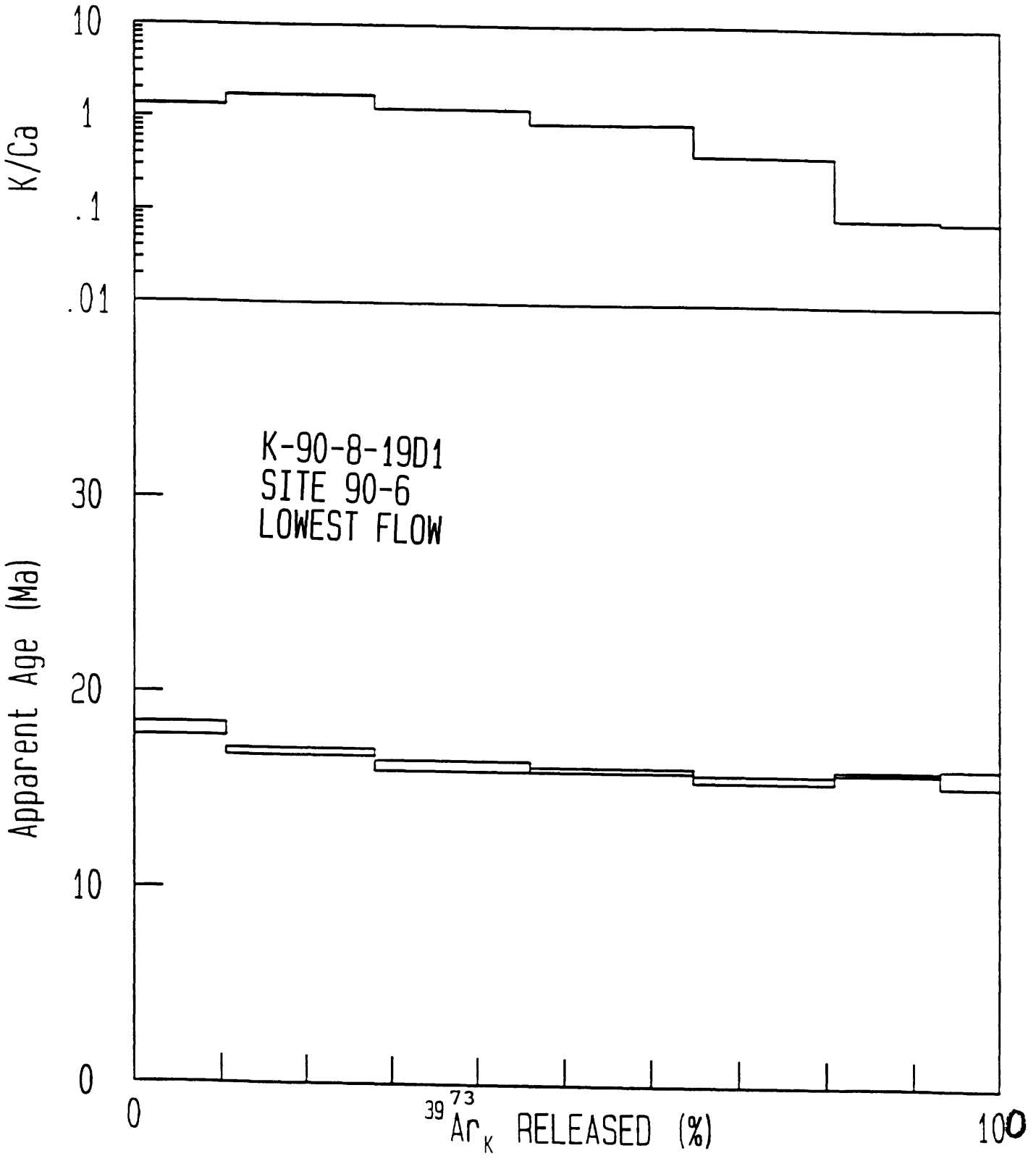
FILE	TEMP	40Ar	39Ar	38Ar	37Ar	36Ar regression	TRAP CURRENT	MANIFOLD OPTION
26905	870	684621	48866	847	1382	1418	200	ALL
	±	391	31	16	8	8		
26906	950	682151	81451	1040	1808	912	200	ALL
	±	180	39	11	5	7		
26907	1050	608534	84255	1019	2608	676	200	ALL
	±	504	25	13	9	11		
26908	1150	551694	87402	1025	3791	450	200	ALL
	±	549	71	36	9	5		
26909	1250	450212	75462	960	7013	344	200	ALL
	±	269	49	3	7	7		
26910	1450	341893	56788	712	24270	319	200	ALL
	±	99	52	20	22	2		
26911	1650	203472	32843	415	15165	217	200	ALL
	±	126	17	24	7	7		

C O R R E C T I O N S

TEMP °C	39Ar Decay	37Ar Decay	-----K-derived---- 40Ar	38Ar	37Ar	----Ca-derived---- 39Ar	38Ar	36Ar	Cl-der 36Ar	Initial 38Ar
870	47	17340	278	656	0	13	1	5	0	266
950	79	22699	464	1094	0	17	1	6	0	170
1050	81	32764	480	1131	0	24	1	9	0	125
1150	85	47669	497	1174	0	35	2	14	-0	82
1250	73	88241	429	1013	0	64	3	25	0	60
1450	55	305573	322	760	0	223	11	87	-0	44
1650	32	191059	186	439	0	139	7	55	0	31

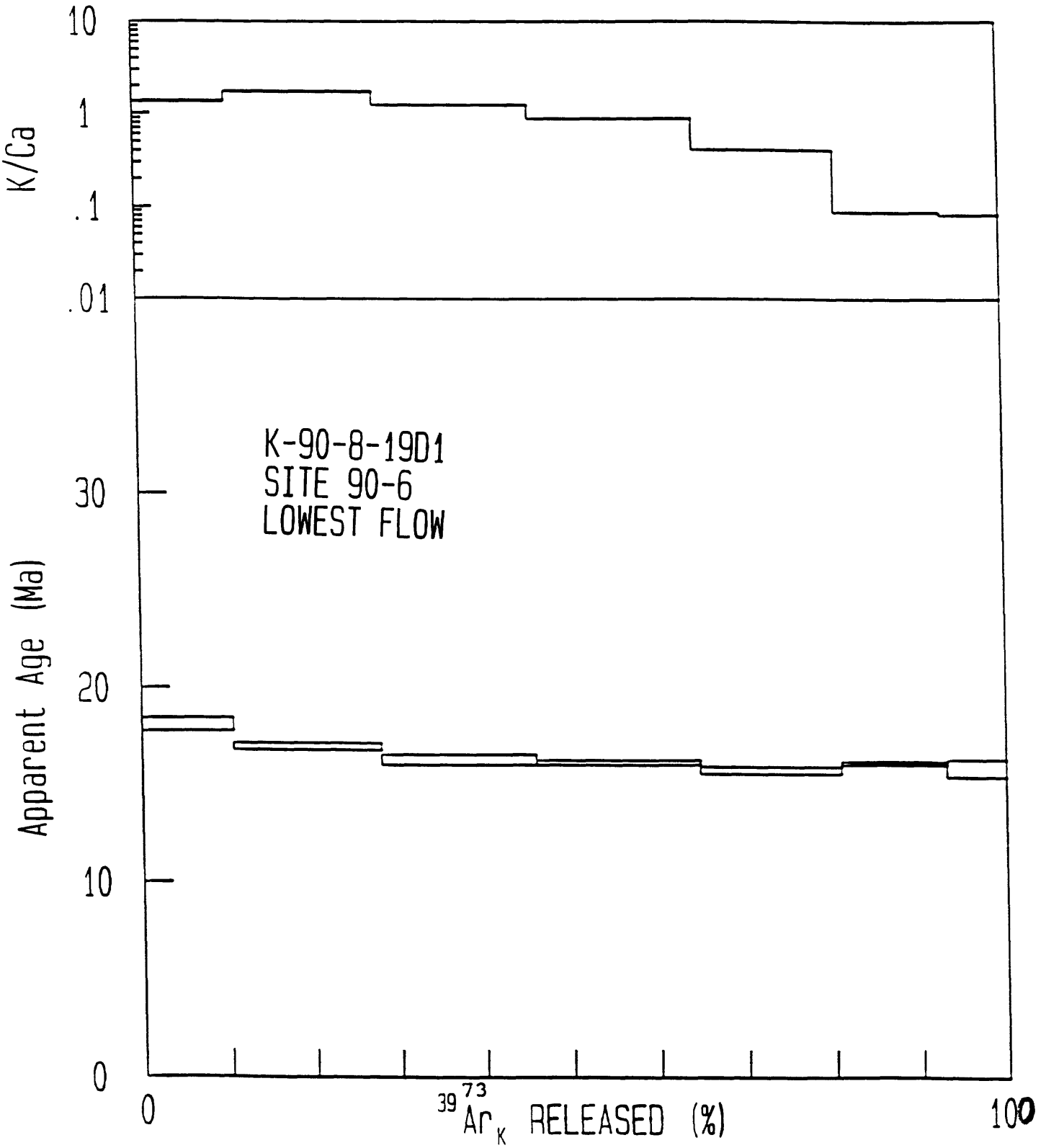
All values in counts, corrected for mass discrimination

v 04/05/92 10:55:02 13 Apr 1992 K-90-8-19D1 WR BASALT #25-27RD76



v 04/05/92

(40/36in = 295.


10
1
.1
.01
K/Ca
K-90-8-19D1
SITE 90-6
LOWEST FLOW
30
20
10
0
Apparent Age (Ma)
0
39 73
Ar K RELEASED (%)
100

v 02/05/91 K-90-8-21A BIOTITE #95RD76 15:03:11 4 Nov 1991

R A W D A T A

FILE	TEMP	40Ar	39Ar	38Ar	37Ar	36Ar *	TRAP CURRENT	MANIFOL OPTION
26239	850	107914	28812	1036	42	172	200	ALL
	+	79	23	14	7	12		

* 36Ar peak values less than 50 are means those above 50 are from linear regressions

C O R R E C T I O N S

TEMP °C	39Ar Decay	37Ar Decay	-----K-derived---- 40Ar	38Ar	37Ar	----Ca-derived---- 39Ar	38Ar	36Ar	Cl-der 36Ar	Initial 38Ar
850	10	69	164	387	0	0	0	0	0	32

All values in counts, corrected for mass discrimination

	TEMP C	% TOT 39Ar	RAD YIELD	APP K/Ca	APP K/Cl	F	AGE (Ma)	intra-sample	precision intra-package	inter-packac
A	850	100.0	52.7	134.92	102	1.968	6.56 +	.41	.42	.42

Total gas K/Ca = 134.9

Precisions are 1 sigma, measured in Ma. Measured 40/36 atm = 296.5 +.5
J = 0.001852 + 0.25% (intra-package) + 0.50% (inter-package)
Trap current factors- 40: 5.66 100: 2.62 200: 1
Manifold factors- ALL: 1 SPLIT 1: 3.3 SPLIT 2: 10.89 SPLIT 3: 35.937
EALL: 2 ESPLIT 1: 6.6 ESPLIT 2: 21.78
Sensitivity = 1.000E-17 % Reproducibility = .25 Detection limit = 40 count
Data reduced assuming initial 40/36 = 295.50 + 0.00
Ca-factors: 3637=2.6E-04+1.7E-06 3837=3.2E-05+2.4E-07 3937=6.7E-04+3.7E-06
K-factors: 3739=0.0E+00+2.2E-03 3839=1.3E-02+2.4E-04 4039=5.7E-03+4.0E-03

J = 0.001852 + 0.25% SAMPLE WT = 0.0101 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
850	1.077E-12	2.885E-13	6.832E-15	1.112E-15	1.725E-15	6.56 +	.41

Note: all gas quantities are in moles. No blank correction.
* Ages calculated assuming initial 40Ar/36Ar = 295.5 + 0
** 1-sigma precision estimates are for intra-sample reproducibility.
** 1-sigma precision estimates for plateaux are for intra-irradiation packag reproducibility.
*** below detection limit

Uncertainties in tube blank are included in uncertainties in raw counts.
v 04/05/92 13:00:59 13 Apr 1992

K-90-8-21A PLAGIOCLASE #79-82RD76

J = 0.001865 ± 0.50% SAMPLE WT = 1.6701 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
1100	4.385E-12	3.443E-13	1.030E-14	4.929E-13	1.232E-14	7.26 ±	.19
1100	5.559E-12	2.638E-12	***	4.149E-12	1.195E-15	6.63 ±	.03
1240	6.511E-12	3.220E-12	***	5.009E-12	9.158E-16	6.51 ±	.04
1340	2.672E-12	1.219E-12	***	1.800E-12	8.191E-16	6.69 ±	.10
1380	1.188E-12	4.715E-13	***	7.297E-13	5.908E-16	7.22 ±	.29
TOTAL GAS	2.032E-11	7.892E-12	1.030E-14	1.218E-11	1.584E-14	6.65	

56.2% of gas on plateau, steps 1240 through 1340 PLATEAU AGE = 6.54 + .04

Note: all gas quantities are in moles. No blank correction.
* Ages calculated assuming initial 40Ar/36Ar = 295.5 ± 0
** 1-sigma precision estimates are for intra-sample reproducibility.
** 1-sigma precision estimates for plateaux are for intra-irradiation package reproducibility.
*** below detection limit

v 04/05/92

v 04/05/92 K-90-8-21A PLAGIOCLASE#79-82RD76 13:00:54 13 Apr 1992

R A W D A T A

FILE	TEMP	40Ar	39Ar	38Ar	37Ar	36Ar regression	TRAP CURRENT	MANIFOLD OPTION
26230	1100	326394	25594	937	13911	921	200	ALL
	±	228	18	12	36	5		
26231	1100	414736	196118	2591	117039	169	200	ALL
	±	181	53	11	85	7		
26233	1240	485846	239388	3117	141162	166	200	ALL
	±	124	174	13	74	9		
26234	1340	199314	90618	1137	50688	96	200	ALL
	±	86	38	21	37	9		
26235	1380	88603	35058	428	20543	58	200	ALL
	±	48	30	31	23	10		

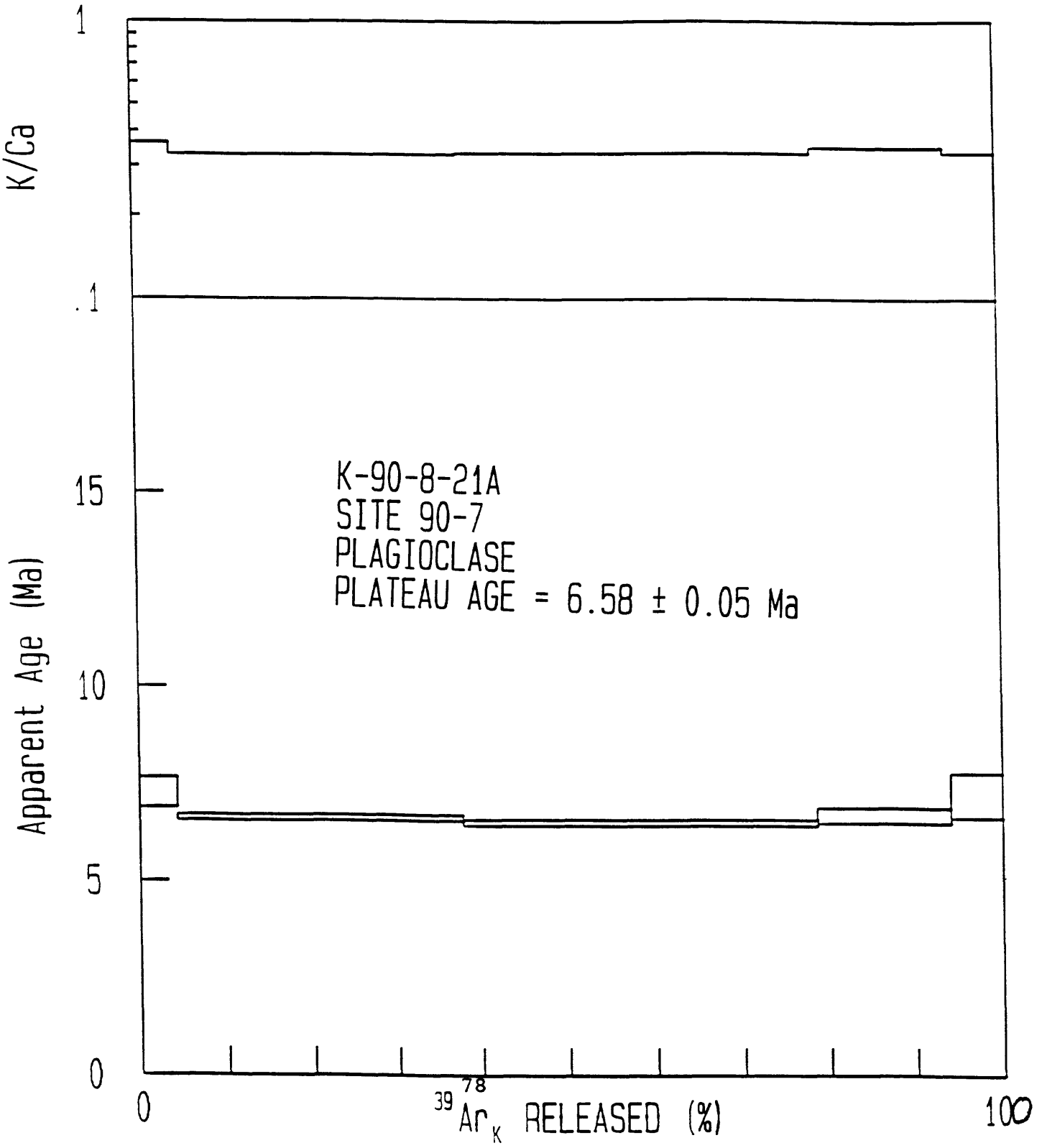
C O R R E C T I O N S

TEMP °C	39Ar Decay	37Ar Decay	-----K-derived---- 40Ar	38Ar	37Ar	----Ca-derived---- 39Ar	38Ar	36Ar	Cl-der 36Ar	Initial 38Ar
1100	9	22605	145	343	0	25	1	10	0	171
1100	70	190358	1115	2630	0	208	10	82	-0	17
1240	86	229909	1361	3210	0	251	12	98	-0	13
1340	32	82634	515	1215	0	90	4	35	-0	11
1380	13	33519	199	470	0	37	2	14	-0	8

All values in counts, corrected for mass discrimination

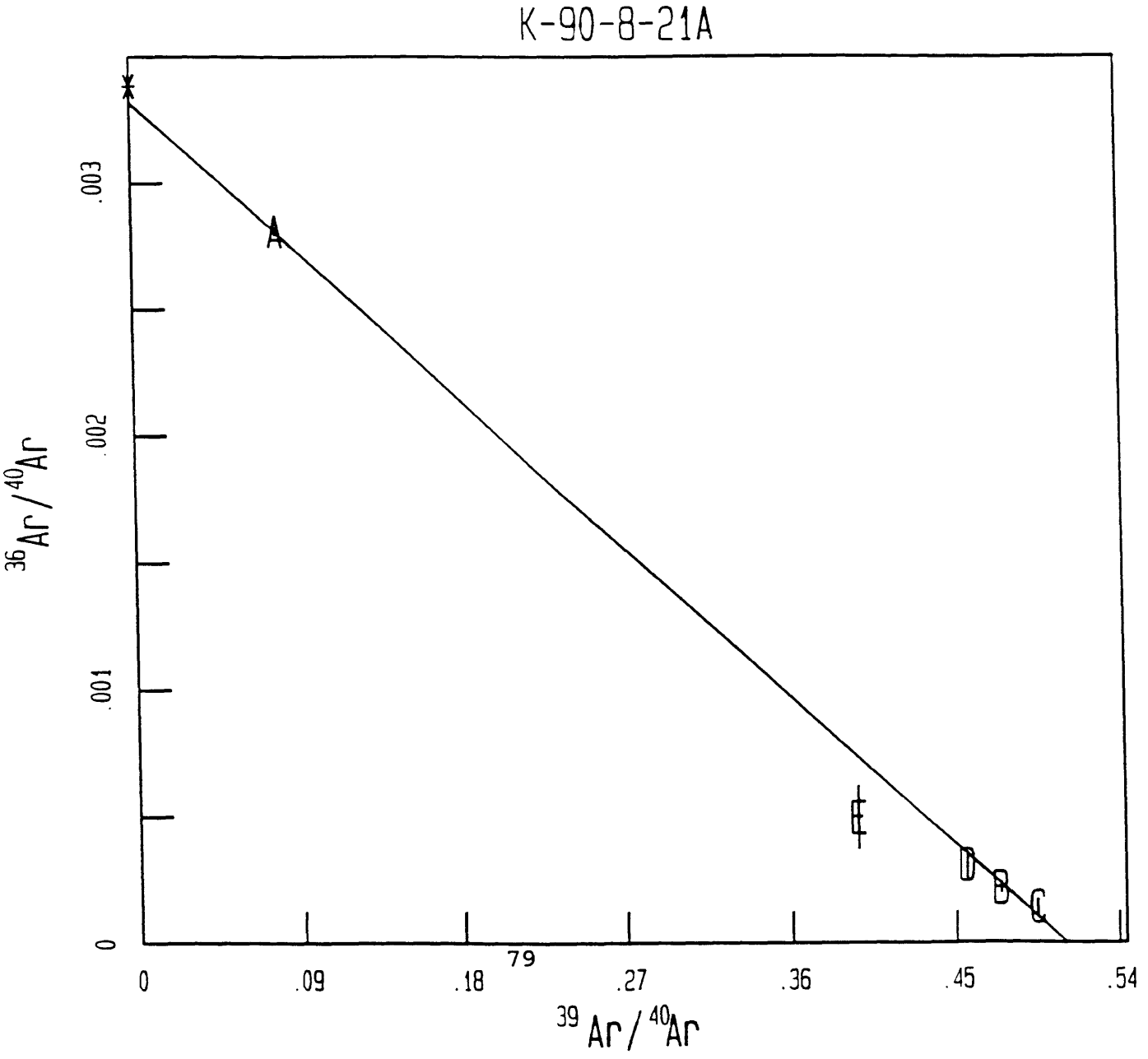
TEMP C	% TOT 39Ar	RAD YIELD	APP K/Ca	APP K/Cl	F	AGE (Ma)	precision intra-sample	precision intra-package	precision inter-package
A 1100	4.4	17.0	.36	81	2.163	7.26 ±	.19	.21	.21
B 1100	33.4	93.6	.33	0	1.974	6.63 ±	.03	.05	.06
C 1240	40.8	95.8	.33	0	1.938	6.51 ±	.04	.05	.06
D 1340	15.4	90.9	.35	0	1.993	6.69 ±	.10	.10	.11
E 1380	6.0	85.3	.34	0	2.149	7.22 ±	.29	.29	.29
Total gas K/Ca =			.3						

Precisions are 1 sigma, measured in Ma. Measured 40/36 atm = 297.2 ±.5
J = 0.001865 ± 0.50% (intra-package) ± 0.50% (inter-package)
Trap current factors- 40: 5.66 100: 2.62 200: 1
Manifold factors- ALL: 1 SPLIT 1: 4.2 SPLIT 2: 17.64 SPLIT 3: 74.09
EALL: 2.26 ESPLIT 1: 9.49 ESPLIT 2: 39.87
Sensitivity = 1.344E-17 % Reproducibility =77.25 Detection limit = 40 counts
Data reduced assuming initial 40/36 = 295.50 ± 0.00
Ca-factors: 3637=2.6E-04±1.7E-06 3837=3.2E-05±2.4E-07 3937=6.7E-04±3.7E-06
K-factors: 3739=0.0E+00±2.2E-03 3839=1.3E-02±2.4E-04 4039=5.7E-03±4.0E-03


1
K/Ca
.1
15
Apparent Age (Ma)
10
5
0
K-90-8-21A
SITE 90-7
PLAGIOCLASE
PLATEAU AGE = 6.58 ± 0.05 Ma
0
$^{39}Ar_K$ RELEASED (%)
100

v 04/05/92 13:08:01 13 Apr 1992 K-90-8-21A PLAGIOCLASE #79-82RD76

Point E deleted;
4 points regressed out of 5 includes 94 % of 39Ar
Mean X = .257E+00 Mean Y = .164E-02 Slope = -.651E-02 + .574E-04
36/40 = .332E-02 + .187E-04 39/40 = .510E+00 + .284E-02
Fit parameters: SUMS = 2.92 MSWD = 1.46
40Ar/36Ar = 301.22 + 1.7 F = 1.961 + .011 AGE = 6.58 + .05 Ma



W/O POINTS E

v 02/05/91 K-90-8-20A BIOTITE #95RD76 15:08:01 4 Nov 1991

R A W D A T A

FILE	TEMP	40Ar	39Ar	38Ar	37Ar	36Ar *	TRAP CURRENT	MANIFOL OPTION
26240	450	121762	31648	1111	31	201	200	ALL
	+	17	20	8	6	4		

* 36Ar peak values less than 50 are means those above 50 are from linear regressions

C O R R E C T I O N S

TEMP °C	39Ar Decay	37Ar Decay	-----K-derived---- 40Ar	38Ar	37Ar	----Ca-derived---- 39Ar	38Ar	36Ar	Cl-der 36Ar	Initial 38Ar
450	11	51	180	425	0	0	0	0	0	38

All values in counts, corrected for mass discrimination

	TEMP C	% TOT 39Ar	RAD YIELD	APP K/Ca	APP K/Cl	F	AGE (Ma)	precision intra-sample	intra-package	inter packa
A	450	100.0	51.0	202.17	106	1.958	6.58 +	.12	.12	.13
Total gas K/Ca =				202.2						

Precisions are 1 sigma, measured in Ma. Measured 40/36 atm = 296.5 +.5
J = 0.001865 + 0.25% (intra-package) + 0.50% (inter-package)
Trap current factors- 40: 5.66 100: 2.62 200: 1
Manifold factors- ALL: 1 SPLIT 1: 3.3 SPLIT 2: 10.89 SPLIT 3: 35.937,
EALL: 2 ESPLIT 1: 6.6 ESPLIT 2: 21.78
Sensitivity = 1.000E-17 % Reproducibility = .25 Detection limit = 40 count.
Data reduced assuming initial 40/36 = 295.50 + 0.00
Ca-factors: 3637=2.6E-04+1.7E-06 3837=3.2E-05+2.4E-07 3937=6.7E-04+3.7E-06
K-factors: 3739=0.0E+00+2.2E-03 3839=1.3E-02+2.4E-04 4039=5.7E-03+4.0E-03

J = 0.001865 + 0.25% SAMPLE WT = 0.0106 g

TEMP C	Initial & radiogenic 40Ar	Potassium derived 39Ar	Chlorine derived 38Ar	Calcium derived 37Ar	Initial 36Ar	AGE* in Ma	**
450	1.216E-12	3.169E-13	7.263E-15	8.150E-16	2.015E-15	6.58 +	.12

Note: all gas quantities are in moles. No blank correction.
* Ages calculated assuming initial 40Ar/36Ar = 295.5 + 0
** 1-sigma precision estimates are for intra-sample reproducibility.
** 1-sigma precision estimates for plateaux are for intra-irradiation packag reproducibility.
*** below detection limit

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