COMPILATION OF UNPUBLISHED ARIZONA K-Ar DATES FROM THE UNIVERSITY OF ARIZONA LABORATORY OF ISOTOPE GEOCHEMISTRY, 1971-1991

by

Paul E. Damon and M. Shafiqullah
Department of Geosciences, University of Arizona
Tucson, AZ 85719

Raymond C. Harris and Jon E. Spencer
Arizona Geological Survey

Arizona Geological Survey
Open-File Report 96-18

August, 1996
(Updated April, 1997)

Arizona Geological Survey
416 W. Congress, Suite #100, Tucson, Arizona 85701

Includes 53 page text

This report is preliminary and has not been edited
or reviewed for conformity with Arizona Geological Survey standards

Introduction

This compilation reports the results of 296 K-Ar analyses that were done during 1971-1991 on rock samples from Arizona and, for a small number of samples, from bordering areas of adjacent states and from the Pinacate volcanic field of northwestern Sonora, Mexico. All of the reported analyses were done at the Laboratory of Isotope Geochemistry at the Department of Geosciences, University of Arizona. Most of these dates have not been previously published. Those that have been published have not included analytical data. Some of these dates have not been released because, for various reasons, it seemed likely that they did not accurately represent rock age or cooling through the argon closure temperature.

Dates reported here have all been recalculated using IUGS decay and abundance constants (Table 1; Steiger and Jager, 1977; see also Dalrymple, 1979). Potassium was measured by flame photometry using a lithium internal standard. Error in potassium analyses is either sample standard deviation or 0.5%, whichever is greater. Error range of date, representing one standard deviation, was calculated by the method of Cox and Dalrymple (1967) assuming a standard deviation of 0.3% for tracer calibration. Dates reported in the August 1996 version of this report are typically 2-3% older than dates initially calculated by the Laboratory of Isotope Geochemistry (with substantially more difference for very young dates) due to an error in recalculation in which $^{40}K/^{tot}K$ was taken as gm/gm rather than mol/mol (this mistake was made at the Arizona Geological Survey and is irrelevant to other dates reported by the Laboratory of Isotope Geochemistry). The dates presented in this updated version are calculated correctly.

All analyses were done by Damon and Shafiqullah or those working under their supervision. Files were searched and examined and data and associated notes were entered on an Excel spreadsheet by Harris. Ages were recalculated and data was formatted for printing by Spencer. Also included here is a bibliography of published dates from Arizona rocks for the period 1985-1995 (Appendix 1; prepared by Harris). Dates in these cited papers are not in the compilation by Reynolds and others (1986).

Dates are grouped by geographic area using the physiographic names used by the Arizona Geological Survey for various databases (Trapp and Reynolds, 1995). Dates for the San Francisco volcanic field and the Hopi Buttes volcanic field are not reported here and are intended to be released elsewhere. All other unpublished Arizona dates from the Laboratory of Isotope Geochemistry are reported here.

TABLE 1: Decay, Abundance, And Atomic Weight Constants

$\lambda_\varepsilon + \lambda_\varepsilon' = 0.581 \times 10^{-10}\ y^{-1}$

$\lambda_\beta = 4.962 \times 10^{-10}\ y^{-1}$

$^{40}K/^{Total}K = 1.167 \times 10^{-4}$ mol/mol

Atomic weight K = 39.10

References Cited in Introduction

Cox, A., and Dalrymple, G.B., 1967, Statistical analysis of geomagnetic reversal data and the precision of potassium argon dating: Journal of Geophysical Research, v. 72, p. 2603-2614.

Dalrymple, G.B., 1979, Critical tables for conversion of K-Ar ages from old to new constants: Geology, v. 7, p. 558-560.

Reynolds, S.J., Florence, F.P., Welty, J.W., Roddy, M.S., Currier, D.A., Anderson, A.V., and Keith, S.B., 1986, Compilation of radiometric age determinations in Arizona: Arizona Bureau of Geology and Mineral Technology, Bulletin 197, 258 p.

Steiger, R.H., and Jager, E., 1977, Subcommission on geochronology: Convention on the use of decay constants in geo- and cosmochronology: Earth and Planetary Science Letters, v. 36, p. 359-362.

Trapp, R.A., and Reynolds, S.J., 1995, Map showing names and outlines of physiographic areas in Arizona used by the Arizona Geological Survey: Arizona Geological Survey, Open-File Report 95-2a, scale 1:1,000,000.

Abbreviations Used In Compilation

Minerals

Adul	Adularia
Bio	Biotite
Crypt	Cryptomelane
Gar	Garnet
GM	Groundmass feldspar concentrate (older analyses used term WR)
Horn	Hornblende
Jaro	Jarosite
Kspar	Potassium feldspar
Musc	Muscovite
Phlog	Phlogopite
Plag	Plagioclase feldspar
Rosco	Roscoelite
Sani	Sanidine
Seri	Sericite
WR	Whole rock (usually refers to groundmass feldspar concentrate; term superseded by GM)

Affiliation

ABGMT	Arizona Bureau of Geology and Mineral Technology (Now Arizona Geological Survey)
ASU	Arizona State University
BuRec	U.S. Bureau of Reclamation
BYU	Brigham Young University
CSU	California State University/Chico
MNA	Museum of Northern Arizona
NAU	Northern Arizona University
SUNY	State University of New York
UofA	University of Arizona
UNLV	University of Nevada/Las Vegas
UNM	University of New Mexico
USC	University of Southern California
USGS	U.S. Geological Survey
USGS/WRD	U.S. Geological Survey, Water Resources Division

Aguila Mountains

17.00 +/- .41 Ma Bio, andesite, Aguila andesite, Aguila Mountains
UAKA 83-5 Field no.: Loc. code: Quad.: Aguila Mountains SE
Lat. 32 37.49' Lon.113 19.4' T. 9 S. R. 10 W. NE,SW,SE Sec. 19 Maricopa County AZ
40Ar* (picomoles/gram): 177.71 Ar (atmospheric): 27.7% K: 6%
Andesite dike, intrudes mid-Tertiary volcanics and pre-dates basaltic volcanism
Project affiliation: D.J. Lynch, A. Arnold/UofA & A.W.Laughlin/Los Alamos Refs.:

Alpine area

2.77 +/- .11 Ma WR, basalt, Escudillo Mt. basalt, Alpine area
UAKA 74-172 Field no.: Loc. code: Esc Mt Quad.: Nelson Reservoir
Lat. 34 .42' Lon.109 9.62' T. 7 N. R. 30 E. NE Sec. 15 Apache County AZ
40Ar* (picomoles/gram): 3.47 Ar (atmospheric): 71.85% K: .723%
Basalt caps a young terrace surrounding Escudillo Mountain, elevation 7800'
Fine-grained basalt
Project affiliation: W. Breed/MNA & P.E. Damon, M. Shafiqullah/UofA Refs.:

2.78 +/- .29 Ma WR, basalt, Escudillo Mtn. basalt, Alpine area
UAKA 74-158 Field no.: 9/3/74/4 Loc. code: Esc Mt Quad.: Escudilla Mountain
Lat. 33 59.5' Lon.109 6.9' T. 7 N. R. 31 E. NW,NW,NE Sec. 19 Apache County AZ
40Ar* (picomoles/gram): 3.01 Ar (atmospheric): 87.95% K: .623%
Basalt near Mud Springs, elevation 8450'
Project affiliation: W. Breed/MNA & P.E. Damon, M. Shafiqullah/UofA Refs.:

24.55 +/- .51 Ma WR, basalt, Escudillo Mt. basalt, Alpine area
UAKA 74-171 Field no.: 9/4/74/1 Loc. code: Esc Mt Quad.: Escudilla Mountain
Lat. 33 53.82' Lon.109 6.45' T. 6 N. R. 31 E. SE Sec. 19 Apache County AZ
40Ar* (picomoles/gram): 108.03 Ar (atmospheric): 12.23% K: 2.52%
Sample from along roadcut at Terry's Flat, elevation 9825'
Dense, fine-grained basalt (may be a dike??)
Project affiliation: W. Breed/MNA & P.E. Damon, M. Shafiqullah/UofA Refs.:

24.86 +/- .53 Ma WR, basalt, Escudillo Mt. andesite, Alpine area
UAKA 74-167 Field no.: 9/3/74/2 Loc. code: Esc Mt Quad.: Luna Lake
Lat. 33 52.27' Lon.109 5.3' T. 6 N. R. 31 E. Sec. 33 Apache County AZ
40Ar* (picomoles/gram): 98.3 Ar (atmospheric): 13.5% K: 2.265%
Basaltic andesite, overlies Moonstone tuff (UAKA-74-139) and is cut by dike (UAKA-74-171)
Project affiliation: W. Breed/MNA & P.E. Damon, M. Shafiqullah/UofA Refs.:

25.11 +/- .54 Ma Sani, tuff, Escudillo Mt. tuff, Alpine area
UAKA 74-139 Field no.: Loc. code: Esc Mt Quad.: Luna Lake
Lat. 33 52.2' Lon.109 5.3' T. 6 N. R. 31 E. Sec. 33 Apache County AZ
40Ar* (picomoles/gram): 268.3 Ar (atmospheric): 6% K: 6.12%
Correlates with Moonstone tuff (PED-31-76). Sample from SE corner of Escudillo Mt. at 8700'
Light buff colored tuff, overlying sandstones with large crossbeds. Tuff is about 300ft. thick and is overlain by basalt
Project affiliation: W. Breed/MNA & P.E. Damon, M. Shafiqullah/UofA Refs.:

31.56 +/- .64 Ma WR, andesite, Escudillo Mt. andestie, Alpine area
UAKA 75-26 Field no.: 9-3-74-74 Loc. code: Esc Mt Quad.: Escudilla Mountain
Lat. 33 58.88' Lon.109 5.57' T. 7 N. R. 31 E. SE Sec. 20 Apache County AZ
40Ar* (picomoles/gram): 139.13 Ar (atmospheric): 20.06% K: 2.52%
Andesite in the Datil formation which underlies the Moonstone tuff
Project affiliation: W. Breed/MNA & P.E. Damon, M. Shafiqullah, UofA Refs.:

Bagdad area

75.14 +/- 1.72 Ma Bio, diorite, Bagdad diorite, Bagdad area
UAKA 89-80 Field no.: BDP-2; B42 Loc. code: Quad.: Bagdad
Lat. 34 34.1' Lon.113 13.82' T. 14 N. R. 9 W. SE,NW,NW Sec. 8 Yavapai County AZ
40Ar* (picomoles/gram): 903.4 Ar (atmospheric): 5.37% K: 6.79%
Diorite. Biotite slightly altered
Project affiliation: S.R. Titley, J.R. Lang/UofA Refs.: Lang, 1991

76.12 +/- 1.7 Ma Bio, granodiorite, Blue Mountain granodiorite, Bagdad area
UAKA 89-82 Field no.: BGD-2-BMS; B32 Loc. code: Quad.: Big Shipp Mountain
Lat. 34 36.08' Lon.113 6.62' T. 14.5 N. R. 8 W. NW,NW,SW Sec. 33 Yavapai County AZ
40Ar* (picomoles/gram): 954.2 Ar (atmospheric): 4.6% K: 7.077%
Granodiorite of Blue Mountain stock
Project affiliation: S.R. Titley, J.R. Lang/UofA Refs.: Lang, 1991

78.22 +/- 1.81 Ma Bio, granodiorite, Bagdad granodiorite, Bagdad area
UAKA 89-81 Field no.: BGD-2-SWS; B3B1 Loc. code: Quad.: Bagdad
Lat. 34 34.28' Lon.113 14.77' T. 14 N. R. 9 W. NW,SE,NE Sec. 7 Yavapai County AZ
40Ar* (picomoles/gram): 866.3 Ar (atmospheric): 10.88% K: 6.249%
Granodiorite, southwest stock
Project affiliation: S.R. Titley, J.R. Lang/UofA Refs.: Lang, 1991

Beaver Dam Mountains (UT)

137.45 +/- 3.2 Ma Jaro, , Apex Mine mineralization, Beaver Dam Mountains (UT)
UAKA 90-63 Field no.: 1181-T-C86 Loc. code: Quad.: Jarvis Peak
Lat. 37 4.18' Lon.113 48.23' T. 43 S. R. 18 W. Sec. Washington County UT
40Ar* (picomoles/gram): 19.07 Ar (atmospheric): 25.95% K: .077%
Limonite with minor jarosite, Apex Mine area
K-value too low for jarosite
Project affiliation: K. Wenrich/USGS Refs.:

148.67 +/- 4.3 Ma Jaro, , Apex Mine mineralization, Beaver Dam Mountains (UT)
UAKA 90-64J Field no.: 1181-H-C86 Loc. code: Quad.: Jarvis Peak
Lat. 37 4.18' Lon.113 48.23' T. 43 S. R. 18 W. Sec. Washington County UT
40Ar* (picomoles/gram): 1148 Ar (atmospheric): 28.8% K: 4.272%
Jarosite, Apex Mine area
Project affiliation: K. Wenrich/USGS Refs.:

Big Horn Mountains

73.20 +/- 1.7 Ma Musc, granite, Knabe Mine granite, Big Horn Mountains
UAKA 88-58 Field no.: Loc. code: Quad.: Little Horn Peak
Lat. 33 42' Lon.112 12.6' T. 5 N. R. 9 W. SW,NE Sec. 33 La Paz County AZ
40Ar* (picomoles/gram): 986.8 Ar (atmospheric): 10.57% K: 7.617%
Small granite stock intruding Precambrian gneissic and granitic rocks. The stock is intruded by NW trending dike swarm near sample site
Age may be partially reset by dike intrusion(?)
Project affiliation: W. Rehrig/American Cu-Ni Refs.:

Blue River area (NM)

10.40 +/- .29 Ma GM, basalt, Harve Gulch basalt, Blue River area (NM)
UAKA 89-157 Field no.: 249ALME89 Loc. code: Pel Quad.: Alma Mesa
Lat. 33 25.89' Lon.109 .4' T. 10 S. R. 21 W. Sec. unsurveyed Catron County NM
40Ar* (picomoles/gram): 11.74 Ar (atmospheric): 63.3% K: .649%
Basalt of Harve Gulch; overlies extensive conglomerate in the Alma Basin
Date older than others reported for Harve Gulch basalt - compare with Houser, 1987 and Houser, 1994
Project affiliation: J.C. Ratte, B.B. Houser/USGS Refs.: See Houser, 1987; Houser, 1994

Cabeza Prieta Mountains

16.06 +/- .55 Ma GM, basalt, Tordillo Mountain basalt, Cabeza Prieta Mountains
UAKA 83-78 Field no.: DJL 820404 Loc. code: Quad.: Cabeza Prieta Peak
Lat. 32 15.71' Lon.113 52.19' T. 13 S. R. 16 W. Sec. unsurveyed Yuma County AZ
40Ar* (picomoles/gram): 25.31 Ar (atmospheric): 67.63% K: .905%
Basalt flow that preserves old desert canyon 250m above modern desert surface
Project affiliation: D.J. Lynch, A. Arnold/UofA Refs.:

18.21 +/- .48 Ma Horn, latite, Cabeza Prieta latite dike, Cabeza Prieta Mountains
UAKA 83-4 Field no.: DJL 830102 Loc. code: Quad.: Cabeza Prieta Peak
Lat. 32 15.39' Lon.113 47.92' T. 13 S. R. 15 W. Sec. unsurveyed Yuma County AZ
40Ar* (picomoles/gram): 12.79 Ar (atmospheric): 60% K: .403%
Latite dike. Pre-basaltic volcanism
Project affiliation: D.J. Lynch, A. Arnold/UofA & A.W.Laughlin/Los Alamos Refs.:

Canada del Oro

74.26 +/- 1.56 Ma WR, fault gouge, Mogul Fault, Canada del Oro
UAKA 76-128 Field no.: RS-12-76 Loc. code: Quad.: Campo Bonito
Lat. 32 33.02' Lon.110 42.7' T. 10 S. R. 16 E. SE,NW,NW Sec. 21 Pinal County AZ
40Ar* (picomoles/gram): 255.28 Ar (atmospheric): 12.77% K: 1.942%
Sample from third intensely mylonitized zone up the hill
Mylonitized fault zone gouge. Fault separates Oracle granite from Cretaceous(?) American Flag formation. Fault zone close to 150 feet wide
Project affiliation: R.S. Scarborough, P. Kuck/UofA Refs.:

Canelo Hills

72.54 +/- 1.51 Ma WR, tuff, Canelo Hills tuff, Canelo Hills
UAKA 80-46 Field no.: Loc. code: Quad.: O'Donnell Canyon
Lat. 31 32' Lon.110 34' T. 22 S. R. 17 E. SE,SW Sec. 13 Santa Cruz County AZ
40Ar* (picomoles/gram): 390.73 Ar (atmospheric): 15.64% K: 3.044%
Ash flow tuff
Late Jurassic-early Cretaceous rock, age reset
Project affiliation: C. Kluth/UofA Refs.: Kluth, 1982

74.94 +/- 1.7 Ma Bio, andesite, Corral Canyon andesite, Canelo Hills
UAKA 86-68 Field no.: Loc. code: Quad.: Mt, Hughes
Lat. 31 35' Lon.110 45' T. 21 S. R. 16 E. SE Sec. 22 Santa Cruz County AZ
40Ar* (picomoles/gram): 866.5 Ar (atmospheric): 19.5% K: 6.53%
Andesite. Sampled in a tributary which flows north into Corral Canyon. The andesite overlies Ft. Crittenden Formation
Project affiliation: M.J. Hayes/UofA (M.S. thesis) Refs.:

88.65 +/- 1.88 Ma WR, tuff, Canelo Hills tuff, Canelo Hills
UAKA 80-45 Field no.: Loc. code: Quad.: O'Donnell Canyon
Lat. 31 32' Lon.110 34' T. 22 S. R. 17 E. SE,SW Sec. 13 Santa Cruz County AZ
40Ar* (picomoles/gram): 324.1 Ar (atmospheric): 22.11% K: 2.057%
Ash flow tuff
Late Jurassic-early Cretaceous rock, age reset
Project affiliation: C. Kluth/UofA Refs.: Kluth, 1982

98.38 +/- 2.04 Ma WR, tuff, Canelo Hills tuff, Canelo Hills
UAKA 80-44 Field no.: Loc. code: Quad.: O'Donnell Canyon
Lat. 31 32.1' Lon.110 33' T. 22 S. R. 18 E. SW,SE Sec. 18 Santa Cruz County AZ
40Ar* (picomoles/gram): 1220 Ar (atmospheric): 4.46% K: 6.958%
Ash flow tuff
Late Jurassic-early Cretaceous rock, age reset
Project affiliation: C. Kluth/UofA Refs.: Kluth, 1982

Carol Spring area

14.99 +/- .31 Ma WR, basalt, Jones Water basalt, Carol Spring area
UAKA 74-43 Field no.: Loc. code: Quad.: Chrome Butte
Lat. 33 35.26' Lon.110 39.08' T. Unsurveyed. R. . Sec. Gila County AZ
40Ar* (picomoles/gram): 25.89 Ar (atmospheric): 10.2% K: .992%
Flow is situated in small canyon cut into Precambrian Ruin granite
Basalt with sparse altered olivine up to 2mm
Project affiliation: D. Shakel/UofA Refs.:

21.37 +/- .49 Ma GM, basalt, Timber Camp basalt, Carol Spring area
UAKA 85-89 Field no.: Loc. code: Quad.: Chrysotile
Lat. 33 41.35' Lon.110 36.26' T. unsurveyed. R. . Sec. Gila County AZ
40Ar* (picomoles/gram): 74.59 Ar (atmospheric): 19.73% K: 2.001%
Basalt, Timber Camp Mountain
Rock description not given
Project affiliation: Refs.:

Carrizo Embayment

0.81 +/- .025 Ma WR, basalt, Hop Canyon basalt, Carrizo Embayment
UAKA 73-81 Field no.: 4 Loc. code: Quad.: Red Top Mountain
Lat. 34 12.08' Lon.111 11.42' T. 9 N. R. 20 E. center Sec. 11 Navajo County AZ
40Ar* (picomoles/gram): 1.56 Ar (atmospheric): 64.55% K: 1.105%
Sampled about 0.5 mile NNE of intersection of Hop and Cub canyons
Basalt, overlying rim-type gravels and Coconino sandstone. Basalt is exposed on east side of canyon only
Project affiliation: H.W. Peirce/ABGMT & M. Shafiqullah/UofA Refs.:

1.62 +/- .08 Ma WR, basalt, Corduroy Canyon basalt, Carrizo Embayment
UAKA 73-80 Field no.: 3 Loc. code: Quad.: Long Tom Canyon
Lat. 34 2.33' Lon.110 14.5' T. 8 N. R. 20 E. Sec. unsurveyed Navajo County AZ
40Ar* (picomoles/gram): 1.86 Ar (atmospheric): 75.45% K: .661%
Sample from roadcut within basalt flow, NW of hairpin bend in Hwy 60
Basalt, about 50 feet above gravel beds
Lat-Lon approximate
Project affiliation: H.W. Peirce/.ABGMT & M. Shafiqullah/UofA Refs.:

11.74 +/- .94 Ma WR, basalt, Flying V basalt, Carrizo Embayment
UAKA 73-75 Field no.: 1-Black Mesa Loc. code: Quad.: Becker's Butte
Lat. 33 51.72' Lon.110 26.6' T. Unsurveyed. R. . Sec. Gila County AZ
40Ar* (picomoles/gram): 3.84 Ar (atmospheric): 85.35% K: .188%
Sample from elevation 5570' on Black Mesa, 1.5 miles west of Hwy 60
Basalt flow, overlies rim-type gravel, about 400' thick in channels. Gravels overlie Naco beds which dip 4 degrees NE
Project affiliation: H.W. Peirce/ABGMT & M. Shafiqullah/UofA Refs.:

26.76 +/- .99 Ma WR, basalt, Silver Butte basalt, Carrizo Embayment
UAKA 76-111 Field no.: SB#1 Loc. code: Quad.: Cedar Creek
Lat. 33 53.34' Lon.110 11.42' T. Unsurveyed. R. . Sec. Gila County AZ
40Ar* (picomoles/gram): 26.46 Ar (atmospheric): 78.33% K: .566%
Basalt, locally overlies Big A Butte member of Supai Formation
Project affiliation: H.W. Peirce, T.G. McGarvin/ABGMT & M. Shafiqullah/UofA Refs.:

Cave Creek area

21.73 +/- .44 Ma GM, andesite, Cave Creek andesite, Cave Creek area
UAKA 88-187 Field no.: TD-17 Loc. code: Quad.: Cave Creek
Lat. 33 51.8' Lon.111 57.85' T. 6 N. R. 4 E. NW,NE,SE Sec. 17 Maricopa County AZ
40Ar* (picomoles/gram): 90.72 Ar (atmospheric): 8.87% K: 2.393%
Andesite
Project affiliation: T.L. Pewe, P.L. Doorn/ASU Refs.: Doorn, 1989; Doorn and Pewe, 1991

Central Grand Canyon

0.17 +/- .039 Ma GM, basalt, 206 Mile dike, Central Grand Canyon
UAKA 88-53 Field no.: GC6-2 Loc. code: Quad.: Granite Park
Lat. 35 59.45' Lon.113 20.43' T. unsurveyed. R. . Sec. Coconino County AZ
40Ar* (picomoles/gram): .243 Ar (atmospheric): 92.68% K: .805%
Basalt flow
Project affiliation: B. Blackerby/CSU-Fresno Refs.: Wenrich and others, 1995

0.41 +/- .07 Ma GM, basalt, The Cork basalt, Central Grand Canyon
UAKA 85-415 Field no.: The Cork Loc. code: Quad.: Tuckup Canyon
Lat. 36 18.13' Lon.112 48.2' T. unsurveyed. R. . Sec. Mohave County AZ
40Ar* (picomoles/gram): .532 Ar (atmospheric): 94.92% K: .751%
Basalt plug on a knob of Hermit shale, known as The Cork
Project affiliation: G.H. Billingsley/USGS Refs.:

0.55 +/- .032 Ma GM, basalt, Black Ledge lava dam, Central Grand Canyon
UAKA 87-129 Field no.: Loc. code: Quad.: Vulvans Throne
Lat. 36 12' Lon.113 5' T. unsurveyed. R. . Sec. Mohave County AZ
40Ar* (picomoles/gram): 1.234 Ar (atmospheric): 87.6% K: 1.296%
Basalt from remnant of Black Ledge lava dam
Flow originally more than 135 km long; exact sample location undetermined, but probably near Vulcans Throne
Project affiliation: P.E. Damon/UofA & W.K. Hamblin/BYU Refs.: Hamblin, 1984

0.59 +/- .024 Ma GM, basalt, Vulcan's Throne basalt, Central Grand Canyon
UAKA 89-52 Field no.: #3 Loc. code: Quad.: Vulcan's Throne
Lat. 36 13.93' Lon.113 4.89' T. unsurveyed. R. . Sec. Mohave County AZ
40Ar* (picomoles/gram): .919 Ar (atmospheric): 82.47% K: .893%
Basalt, offset by Toroweap Fault
Project affiliation: G. Jackson/UofA Refs.:

0.62 +/- .034 Ma GM, basalt, Upper Prospect lava dam, Central Grand Canyon
UAKA 87-126 Field no.: Loc. code: Quad.: Vulcans Throne
Lat. 36 11.5' Lon.113 4.5' T. 33 N. R. 7 W. Sec. unsurveyed Coconino County AZ
40Ar* (picomoles/gram): 1.252 Ar (atmospheric): 85.4% K: 1.167%
Basalt from remnant of upper Prospect lava dam in Prospect Canyon
Lat-Lon approximate
Project affiliation: P.E. Damon/UofA & W.K. Hamblin/BYU Refs.: Hamblin, 1994

0.76 +/- .081 Ma GM, basalt, Tuckup Canyon basalt, Central Grand Canyon
UAKA 86-202 Field no.: #3 Loc. code: Quad.: Fern Glen Canyon
Lat. 36 20.67' Lon.112 53.33' T. unsurveyed. R. . Sec. Mohave County AZ
40Ar* (picomoles/gram): 1.66 Ar (atmospheric): 89.61% K: 1.257%
Site in Tuckup Canyon due west of Hades Knoll
Base of basalt flow into Tuckup Canyon
Project affiliation: K. Wenrich, G.H. Billingsley/USGS Refs.: Wenrich and others, 1885

0.78 +/- .154 Ma GM, basalt, Yumtheska Point basalt, Central Grand Canyon
UAKA 86-201 Field no.: #2 Loc. code: Quad.: S B Point
Lat. 36 16.5' Lon.112 46.12' T. unsurveyed. R. . Sec. Coconino County AZ
40Ar* (picomoles/gram): .803 Ar (atmospheric): 94.15% K: .594%
Basalt from small flow at the top of a cinder cone
Project affiliation: K. Wenrich, G.H. Billingsley/USGS Refs.: Wenrich and others, 1995

0.99 +/- .097 Ma GM, basalt, Whitmore lava dam, Central Grand Canyon
UAKA 87-128 Field no.: Loc. code: Quad.: Whitmore Rapids
Lat. 36 8.5' Lon.113 12.5' T. 32 N. R. 9 W. Sec. (?) Mohave County AZ
40Ar* (picomoles/gram): 1.251 Ar (atmospheric): 98.2% K: .727%
Basalt from remnant of Whitmore lava dam in Whitmore Canyon
Lat-Lon approximate
Project affiliation: P.E. Damon/UofA & W.K. Hamblin/BYU Refs.: Hamblin, 1994

4.56 +/- .12 Ma GM, basalt, Whitmore Hill basalt, Central Grand Canyon
UAKA 86-203 Field no.: #4 Loc. code: Quad.: Whitmore Rapids
Lat. 36 8.42' Lon.113 13.62' T. 32 N. R. 9 W. NE,SW,SW Sec. 26 Mohave County AZ
40Ar* (picomoles/gram): 9.39 Ar (atmospheric): 47.75% K: 1.187%
Base of small basalt flow that caps a small hill (BM3756), 1.5 miles west of Whitmore Rapids
Project affiliation: K. Wenrich, G.H. Billingsley/USGS Refs.: Wenrich and others, 1995

12.49 +/- .15 Ma GM, basalt, 196 Mile dike, Central Grand Canyon
UAKA 88-52 Field no.: GC8-2 Loc. code: Quad.: Whitmore Point
Lat. 36 5.72' Lon.113 17.65' T. 31 N. R. 9 W. Sec. unsurveyed Coconino County AZ
40Ar* (picomoles/gram): 33.59 Ar (atmospheric): 19.78% K: 1.546%
Basalt dike, south side of river
Project affiliation: B. Blackerby/CSU-Fresno Refs.:

13.47 +/- .3 Ma GM, basalt, 227 Mile basalt, Central Grand Canyon
UAKA 86-204 Field no.: #7 Loc. code: Quad.: Travertine Rapids
Lat. 35 45.88' Lon.113 23.92' T. unsurveyed. R. . Sec. Mohave County AZ
40Ar* (picomoles/gram): 29.41 Ar (atmospheric): 21.3% K: 1.254%
Basalt from small plug and associated sill, 1.5 miles west of Diamond Creek rapids, 1.5 miles NE of Travertine rapids
Project affiliation: K. Wenrich, G.H. Billingsley/USGS Refs.: Wenrich and others, 1995

157.06 +/- 3.6 Ma Rosco, breccia, Ridenour breccia pipe, Central Grand Canyon
UAKA 90-64R Field no.: 223-W-C86 Loc. code: Quad.: Vulcans Throne SW
Lat. 36 5.97' Lon.113 10.45' T. 31 N. R. 8 W. NE,SE Sec. 6 Coconino County AZ
40Ar* (picomoles/gram): 819.8 Ar (atmospheric): 10.1% K: 2.881%
Roscoelite from solution collapse breccia pipe (Ridenour Mine)
Project affiliation: K. Wenrich/USGS Refs.:

Cerbat Mountains

15.82 +/- .34 Ma Sani, tuff, Peach Springs tuff, Cerbat Mountains
UAKA 76-29 Field no.: Loc. code: Quad.: Mt. Tipton
Lat. 35 35' Lon.114 10.5' T. 25 N. R. 18 W. Sec. 2 Mohave County AZ
40Ar* (picomoles/gram): 194.03 Ar (atmospheric): 10.35% K: 7.043%
Porphyritic, welded trachytic tuff at north end end of Cerbat Mountians
Location general
Project affiliation: W.J. Brennan/S.U.N.Y. Refs.:

16.88 +/- .37 Ma Bio, tuff, Bull Mountain tuff, Cerbat Mountains
UAKA 75-56 Field no.: Mt-1 Loc. code: Quad.: Stockton Hill
Lat. 35 16' Lon.114 3.5' T. 22 N. R. 17 W. Sec. 26 Mohave County AZ
40Ar* (picomoles/gram): 161.59 Ar (atmospheric): 20.92% K: 5.493%
Sampled just below Peach Springs tuff
Tuff of Bull Mountain Series
Project affiliation: W.J. Brennan/S.U.N.Y. Refs.:

Deer Creek

82.34 +/- 1.8 Ma Horn, andesite[?], Deer Creek porphyry, Deer Creek
UAKA 75-67 Field no.: PED-15-75 Loc. code: Quad.: Christmas
Lat. 33 2' Lon.110 40' T. 5 S. R. 16 E. NE,NW Sec. 1 Pinal County AZ
40Ar* (picomoles/gram): 102.7 Ar (atmospheric): 13.8% K: .703%
Collected from float of dike on hill; part of N70E dike swarm
Hornblende porphyry containing hornblende crystals up to 2 cm [rock type not given]
Location general
Project affiliation: S. Keith & R. Scarborough/ABGMT & P.E. Damon/UofA Refs.:

Dome Rock Mountains

60.66 +/- 1.39 Ma Bio, metasediment, McCoy Mtns. Formation, Dome Rock Mountains
UAKA 82-58 Field no.: 37636 Loc. code: Quad.: Cunningham Mtn
Lat. 33 31.18' Lon.114 20.4' T. 2 N. R. 20 W. SW,NE,NE Sec. 17 La Paz County AZ
40Ar* (picomoles/gram): 790.22 Ar (atmospheric): 6.17% K: 7.387%
Metasediments of the McCoy Mtns, Formation, in Ehrenberg Wash area
Re-set age
Project affiliation: P.J. Coney, L.E. Harding/UofA Refs.: Harding, 1982

75.04 +/- 1.74 Ma Horn, metasediment, McCoy Mtns. Formation, Dome Rock Mountains
UAKA 82-59 Field no.: 36906 Loc. code: Quad.: Cunningham Mtn
Lat. 33 31.18' Lon.114 20.4' T. 2 N. R. 20 W. SW,NE,NE Sec. 17 La Paz County AZ
40Ar* (picomoles/gram): 45.56 Ar (atmospheric): 24.66% K: .3429%
Metasediments of the McCoy Mtns, Formation, in Ehrenberg Wash area
Re-set age
Project affiliation: P.J. Coney, L.E. Harding/UofA Refs.: Harding, 1982

Donnelly Wash area

19.11 +/- .38 Ma Bio, tuff, Box-O-Wash Tuff, Donnelly Wash area
UAKA 72-68 Field no.: BoxO-1 Loc. code: Quad.: North Butte
Lat. 33 1.56' Lon.111 11.86' T. 5 S. R. 11 E. SW, NE Sec. 2 Pinal County AZ
40Ar* (picomoles/gram): 236.38 Ar (atmospheric): 44.2% K: 7.095%
Tuff is deposited on basal conglomerate overlying Precambrian Oracle granite
Crystal welded tuff, dacitic (?) compostion. Sample represents the first tuffaceous volcanism of intermediate compostion in the Superior-Ray Region
Project affiliation: W. Rehrig/CONOCO Minerals Refs.:

Dos Cabezas Mountains

45.50 +/- .94 Ma Ser, volc breccia, Dos Cabezas volcanic breccia, Dos Cabezas Mountains
UAKA 75-106 Field no.: Loc. code: Quad.: Dos Cabezas
Lat. 32 13.8' Lon.109 35.7' T. 14 S. R. 27 E. Sec. [9?] Cochise County AZ
40Ar* (picomoles/gram): 259.38 Ar (atmospheric): 4.87% K: 3.246%
Sample from Gladys claim group [Elma Mine area, exact location unknown]
Volcanic breccia with secondary sericite along fractures. Breccia contains fragments of Precambrian(?) quartzite
Project affiliation: C.A. Lee/claim owner & P.E. Damon/UofA Refs.:

Dragoon Mountains

24.76 +/- .58 Ma KSpar, rhyolite, Dragoons felsic dike, Dragoon Mountains
UAKA 84-34 Field no.: AWL-2-84 Loc. code: Quad.: Black Diamond Peak
Lat. 31 50.45' Lon.109 54' T. 18 S. R. 24 E. [SE,NE?] Sec. 28[?] Cochise County AZ
40Ar* (picomoles/gram): 270 Ar (atmospheric): 11.1% K: 6.246%
Rhyolite dike on east side of Dragoon Mountains
Location information general
Project affiliation: A.W. Laughlin/Los Alamos Refs.:

Dry Beaver Creek

5.31 +/- .18 Ma WR, basalt, Rattlesnake Canyon basalt, Dry Beaver Creek
UAKA 77-74 Field no.: Loc. code: Quad.: Munds Mountain
Lat. 34 45.94' Lon.111 40.33' T. 16 N. R. 6 E. SW Sec. 24 Yavapai County AZ
40Ar* (picomoles/gram): 4.15 Ar (atmospheric): 69.6% K: .45%
Basalt of topmost flow in Rattlesnake Canyon
Project affiliation: H.W. Peirce/ABGMT Refs.:

8.44 +/- .23 Ma WR, basalt, Rattlesnake Canyon basalt, Dry Beaver Creek
UAKA 77-73 Field no.: Loc. code: Quad.: Munds Mountain
Lat. 34 45.88' Lon.111 41.05' T. 16 N. R. 6 E. SW Sec. 23 Yavapai County AZ
40Ar* (picomoles/gram): 9.84 Ar (atmospheric): 65.21% K: .671%
Basal basalt flow of volcanic sequence, north wall of Rattlesnake Canyon
Project affiliation: H.W. Peirce/ABGMT Refs.:

Duncan area (NM)

35.51 +/- 1.06 Ma Bio, dacite, Virden dacite, Duncan area (NM)
MB 7-66 Field no.: MB-7-66 Loc. code: Quad.: Steeple Rock
Lat. 32 47.5' Lon.108 59' T. 17 S. R. 21 W. Sec. 35 Grant County NM
40Ar* (picomoles/gram): 401.1 Ar (atmospheric): 10% K: 6.45%
Dacite flow in Carlisle Canyon
Project affiliation: P.E. Damon, M. Bikerman/UofA Refs.:

Durham-Suizo area

21.06 +/- .45 Ma WR, basalt, Pantano (??) formation, Durham-Suizo area
UAKA 75-103 Field no.: Loc. code: Quad.: Chief Butte
Lat. 32 37.6' Lon.110 2.5' T. 9 S. R. 12 E(?). Sec. ?sec Pinal County AZ
40Ar* (picomoles/gram): 52.31 Ar (atmospheric): 19.8% K: 1.424%
The sediments are poorly sorted and tilted. Sample from Three Buttes area, Coronado Wash, Tortolita Mountains
Alkali basalt flow conformable within 900m of thick Pantano-like sediments and 700m above base of mid-Tertiary section
Location very approximate. [?Reported in Reynolds and others, 1986 as sample OHB?]
Project affiliation: H.W Peirce/ABGMT & UofA Geoscience Dept Refs.:

East Sunset Mountain

1.59 +/- .23 Ma WR, basalt, East Sunset Mtn. basalt, East Sunset Mountain
UAKA 76-65 Field no.: Loc. code: Quad.: Sunset Pass
Lat. 34 47.56' Lon.110 53.07' T. 16 N. R. 14 E. SE,NW Sec. 8 Coconino County AZ
40Ar* (picomoles/gram): 1.64 Ar (atmospheric): 95.58% K: .594%
Basal basalt flow at SE edge of East Sunset Mtn. The flow covers a terrrace about 200' below top of mountain
Project affiliation: H.W. Peirce/ABGMT & M. Shafiqullah/UofA Refs.:

1.88 +/- .09 Ma WR, basalt, East Sunset Mtn. basalt, East Sunset Mountain
UAKA 76-63 Field no.: Loc. code: Quad.: Sunset Pass
Lat. 34 50.71' Lon.110 53.95' T. 17 N. R. 14 E. N center Sec. 30 Coconino County AZ
40Ar* (picomoles/gram): 2.61 Ar (atmospheric): 84.52% K: .8%
Massive basal basalt flow, elevation 6500'
Project affiliation: H.W. Peirce/ABGMT & M. Shafiqullah/UofA Refs.:

2.83 +/- .07 Ma WR, basalt, East Sunset Mtn. basalt, East Sunset Mountain
UAKA 76-64 Field no.: Loc. code: Quad.: Sunset Pass
Lat. 34 50.46' Lon.110 53.93' T. 17 N. R. 14 E. SE,NE,SW Sec. 30 Coconino County AZ
40Ar* (picomoles/gram): 4.53 Ar (atmospheric): 62.99% K: .921%
Sampled about 50 feet SW of microwave tower, elevation 6800'
Basalt bomb representing yougest volvanic activity at East Sunset Mtn
Project affiliation: H.W. Peirce/ABGMT & M. Shafiqullah/UofA Refs.:

Florence area

5.87 +/- .14 Ma Horn, basalt, Poston Butte copper deposit, Florence area
UAKA 74-127 Field no.: FL-67S Loc. code: Quad.: Florence
Lat. 33 3' Lon.111 25.75' T. 4 S. R. 9 E. NW,NW,SE Sec. 28 Pinal County AZ
40Ar* (picomoles/gram): 13.4 Ar (atmospheric): 45.1% K: 1.315%
Poston Butte (Florence) copper deposit, drill hole DDH 67-S
Core sample of post-mineral black, vesicular, hornblende(?)-pyroxene(?) basalt with calcite-lined vugs
Project affiliation: R.W. Threlkeld/CONOCO Minerals Refs.: Nason et al., 1982; Reynolds et al., 1986 (entry #149)

18.06 +/- .4 Ma Bio, tuff, Poston Butte copper deposit, Florence area
UAKA 73-24 Field no.: 193(1083-86) Loc. code: Quad.: Florence
Lat. 33 3' Lon.111 26.25' T. 4 S. R. 9 E. NW Sec. 28 Pinal County AZ
40Ar* (picomoles/gram): 217.94 Ar (atmospheric): 57.15% K: 6.925%
(Deeper sediments are tilted and covered with flat-lying alluvium and basalt) Sample from core at 1083-1086'
Ash flow tuff with crystals and lithic fragments. Tuff interbedded with thick fluvial sediments
Project affiliation: W. Rehrig/CONOCO Minerals Refs.:

56.81 +/- 1.1 Ma WR, andesite, Poston Butte copper deposit, Florence area
UAKA 74-126 Field no.: FL-373 Loc. code: Quad.: Florence
Lat. 33 3' Lon.111 25.75' T. 4 S. R. 9 E. SE,SE,SW Sec. 28 Pinal County AZ
40Ar* (picomoles/gram): 228.77 Ar (atmospheric): 3.48% K: 2.286%
Poston Butte (Florence) copper deposit
Core sample of gray-green, fine-grained andesite from a post-mineral dike
Project affiliation: R.W. Threlkeld/CONOCO Minerals Refs.: Nason et al., 1982; Reynolds et al, 1986 (entry #1032)

60.35 +/- 1.3 Ma WR, dacite, Poston Butte copper deposit, Florence area
UAKA 74-128 Field no.: FL-70MF Loc. code: Quad.: Florence
Lat. 33 3' Lon.111 25.75' T. 4 S. R. 9 E. SW,NE,SE Sec. 28 Pinal County AZ
40Ar* (picomoles/gram): 246.35 Ar (atmospheric): 4.05% K: 2.315%
Poston Butte (Florence) copper deposit
Core sample of gray latite-dacite porphyry with phenos of plag + K-spar in aphanitic matrix of feld+bio+chl+qtz
Project affiliation: R.W. Threlkeld/CONOCO Minerlas Refs.: Nason et al., 1982; Reynolds et al., 1986 (entry#1089)

Galiuro Mountains

62.12 +/- 1.27 Ma GM, andesite, Glory Hole volcanics, Galiuro Mountains
UAKA 80-113 Field no.: R-UB-1 Loc. code: Quad.: Clark Ranch
Lat. 32 44.7' Lon.110 34.61' T. 8 S. R. 17 E. SW,SW,SE Sec. 11 Pinal County AZ
40Ar* (picomoles/gram): 236.18 Ar (atmospheric): 18.02% K: 2.155%
Sample from drill core, hole DDH-RUB-1, depth 2005-2010'
Andesite, partly altered and brecciated
Project affiliation: P.E. Damon/UofA & J. Hoyt, A. Harvy/Utah International Refs.:

64.38 +/- 1.4 Ma Bio, tuff, Teran Basin tuff, Galiuro Mountains
UAKA 81-26 Field no.: Loc. code: Quad.: Soza Mesa
Lat. 32 17.37' Lon.110 15.45' T. 13 S. R. 20 E. NW Sec. 24 Cochise County AZ
40Ar* (picomoles/gram): 789.51 Ar (atmospheric): 11.86% K: 6.947%
Welded tuff intercalated with very coarse-grained fanglomerate that is overlain by turkey track andesite
Project affiliation: J. Grover/UofA Refs.: Grover, 1982

67.36 +/- 1.6 Ma Bio, tuff, Hot Springs Canyon tuff, Galiuro Mountains
UAKA 84-244 Field no.: Loc. code: Quad.: Soza Mesa
Lat. 32 20.26' Lon.110 19.02' T. 12 S. R. 20 E. SW Sec. 33 Cochise County AZ
40Ar* (picomoles/gram): 791.5 Ar (atmospheric): 22.55% K: 6.65%
Felsic tuff depositionally within unnamed fanglomerate in Hot Springs Canyon
Project affiliation: W.R. Dickinson, R. Mark, T. Goodlin/UofA Refs.: Mark, 1985; Goodlin, 1985; Goodlin and Mark, 1987

74.82 +/- 1.56 Ma GM, andesite, Glory Hole volcanics, Galiuro Mountains
UAKA 80-114 Field no.: R-UB-2 Loc. code: Quad.: Clark Ranch
Lat. 32 44.08' Lon.110 34.18' T. 8 S. R. 17 E. NE,SE,SE Sec. 14 Pinal County AZ
40Ar* (picomoles/gram): 149.16 Ar (atmospheric): 14.79% K: 1.126%
Andesite from drill core, hole DDH-RUB-2, depth 1780-1785'
Project affiliation: P.E. Damon/UofA & J. Hoyt, A. Harvy/Utah International Refs.:

76.51 +/- 1.8 Ma Bio, tuff, Muleshoe Volcanics, Galiuro Mountains
UAKA 84-205 Field no.: Loc. code: Quad.: Soza Mesa
Lat. 32 20.52' Lon.110 17.21' T. 12 S. R. 20 E. SE Sec. 27 Cochise County AZ
40Ar* (picomoles/gram): 864.7 Ar (atmospheric): 10.7% K: 6.38%
Felsic tuff
Project affiliation: W.R. Dickinson, R. Mark, T. Goodlin/UofA Refs.: Mark, 1985; Goodlin, 1985; Goodlin and Mark, 1987

Gila Box

19.12 +/- .41 Ma Sani, tuff, Gila Box ash flow tuff, Gila Box
UAKA 78-93 Field no.: PEL-12 Loc. code: Pel Quad.: Gila Box
Lat. 32 54.97' Lon.109 27.35' T. 6 S. R. 28 E. Sec. unsurveyed Graham County AZ
40Ar* (picomoles/gram): 170.04 Ar (atmospheric): 25.51% K: 5.101%
Unwelded pumice-bearing ash flow interbeded with lithic-crystal-ash air-fall deposits. Occurs within the conglomerate of Bonita Creek
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #A on Richter and others, 1983

23.71 +/- .49 Ma WR, andesite, Gila Box andesite, Gila Box
UAKA 78-94 Field no.: PEL-13 Loc. code: Pel Quad.: Gila Box
Lat. 32 53.81' Lon.109 28.12' T. 6 S. R. 28 E. Sec. unsurveyed Graham County AZ
40Ar* (picomoles/gram): 129.85 Ar (atmospheric): 8.39% K: 3.137%
Sample one mile downstream from UAKA 78-93
Lowest basaltic andesite in this part of the Gila Box
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #D on Richter and others, 1983

Gila Mountains

23.61 +/- .51 Ma WR, andesite, Lone Star andesite, Gila Mountains
UAKA 79-90 Field no.: PEL-25 Loc. code: Pel Quad.: Weber Peak
Lat. 32 55.19' Lon.109 39.12' T. 6 S. R. 26 E. SE,SE Sec. 11 Graham County AZ
40Ar* (picomoles/gram): 77.61 Ar (atmospheric): 34.44% K: 1.883%
Samlpe from small hill 500' east of San Juan mine road, 2 miles souh of San Juan Mine, 2 miles WSW of Lone Star Mine
Basaltic andesite that represents cover rock that preserved the porphyry copper deposits of the Lone Star district
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #A on Houser and others, 1985

24.50 +/- .52 Ma Bio, rhyodacite, Bear Springs rhyodacite, Gila Mountains
UAKA 79-92B Field no.: PEL-27 Loc. code: Pel Quad.: Lone Star Mountain
Lat. 32 58.35' Lon.109 37.22' T. 5 S. R. 27 E. SE,NW,NW Sec. 30 Graham County AZ
40Ar* (picomoles/gram): 244.07 Ar (atmospheric): 25.57% K: 5.706%
Sample from Bear Springs jeep trail, elevation 4800'
Rhyodacite clasts from basal breccia
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #D on Houser and others, 1985

25.89 +/- .55 Ma Horn, dacite, Bear Springs dacite, Gila Mountains
UAKA 79-159 Field no.: 79-DR-45 Loc. code: Pel Quad.: Weber Peak
Lat. 32 59.67' Lon.109 38.55' T. 5 S. R. 26 E. SW,NE,SE Sec. 14 Graham County AZ
40Ar* (picomoles/gram): 27.04 Ar (atmospheric): 29.89% K: .598%
Brecciated base of massive dacite flow, locally vitophyric
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #C on Houser and others, 1985

26.48 +/- .55 Ma Sani, rhyodacite, Bear Springs rhyodacite, Gila Mountains
UAKA 79-92S Field no.: PEL-27 Loc. code: Pel Quad.: Lone Star Mountain
Lat. 32 58.35' Lon.109 37.22' T. 5 S. R. 27 E. SE,NW,NW Sec. 30 Graham County AZ
40Ar* (picomoles/gram): 109.39 Ar (atmospheric): 9.54% K: 2.365%
Sample from Bear Springs jeep trail, elevation 4800'
Rhyodacite clasts from basal breccia
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #D on Houser and others, 1985

26.56 +/- .56 Ma WR, andesite, Bear Springs andesite, Gila Mountains
UAKA 79-94 Field no.: PEL-29 Loc. code: Pel Quad.: Weber Peak
Lat. 32 58.27' Lon.109 37.65' T. 5 S. R. 26 E. center,NE Sec. 25 Graham County AZ
40Ar* (picomoles/gram): 79.77 Ar (atmospheric): 2.84% K: 1.719%
Lower andesite, West Ranch road near Bear Springs
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #B on Houser and others, 1985

26.79 +/- .6 Ma WR, andesite, Midnight Canyon andesite, Gila Mountains
UAKA 79-178 Field no.: PEL-37 Loc. code: Pel Quad.: Bonita Spring
Lat. 33 1.42' Lon.109 32.32' T. 5 S. R. 27 E. NE,SE Sec. 2 Graham County AZ
40Ar* (picomoles/gram): 103.66 Ar (atmospheric): 31.13% K: 2.215%
Site about 0.5 mile east of Midnight Canyon (same site as UAKA 79-177)
Olivine basalt dike that intrudes ash-flow tuff (UAKA 79-177) and low-angle fault. [inconsistent sample description - is called basaltic andesite and olivine basalt]
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.:

28.73 +/- .66 Ma Bio, tuff, Midnight Canyon rhyolite, Gila Mountains
UAKA 79-177 Field no.: PEL-36 Loc. code: Pel Quad.: Bonita Spring
Lat. 33 1.42' Lon.109 32.32' T. 5 S. R. 27 E. NE,SE Sec. 2 Graham County AZ
40Ar* (picomoles/gram): 279.92 Ar (atmospheric): 53.68% K: 5.574%
Site about 0.5 mile east of Midnight Canyon, elevation 4500' (same site as UAKA 79-178)
Ash-flow rhyolite tuff; vertically dipping, faulted
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.:

67.61 +/- 1.43 Ma Horn, andesite, Lone Star andesite, Gila Mountains
UAKA 79-91 Field no.: PEL-26 Loc. code: Pel Quad.: Weber Peak
Lat. 32 57.97' Lon.109 38.29' T. 5 S. R. 26 E. NE,SE Sec. 26 Graham County AZ
40Ar* (picomoles/gram): 54.36 Ar (atmospheric): 19.77% K: .455%
Sample from West Ranch Road, 100m NE of Walnut Springs
Andesite porphyry dike
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #E on Houser and others, 1985

Gran Desierto (Mexico)

61.22 +/- .3 Ma Bio, granite, Sierra del Rosario, Gran Desierto (Mexico)
UAKA 89-35 Field no.: B-13-b or 13-13-10 [??] Loc. code: Pin Quad.: El Sahuaro (Mexico)
Lat. 32 6.3' Lon.114 12.3' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): 780.99 Ar (atmospheric): 7.47% K: 7.232%
Granite of Sierra del Rosario
Project affiliation: W.R. Dickinson, P. Kresan, and others/UofA Refs.:

Grand Wash area

4.70 +/- .07 Ma GM, basalt, Pakoon Springs basalt, Grand Wash area
UAKA 89-23 Field no.: G9-5-79-LN Loc. code: Quad.: Pakoon Springs
Lat. 36 24' Lon.113 56' T. 35 N. R. 15 W. Sec. 19(?) Mohave County AZ
40Ar* (picomoles/gram): 10.194 Ar (atmospheric): 31.95% K: 1.25%
Uppermost basalt flow at Pakoon Springs
Location approximate
Project affiliation: UNLV Refs.:

Granite Wash Mountains

65.32 +/- 1.5 Ma GM, diorite, Granite Wash diorite, Granite Wash Mountains
UAKA 82-51 Field no.: Loc. code: Quad.: East of Utting
Lat. 33 46.95' Lon.113 46.74' T. 5 N. R. 15 W. NW,NW Sec. 13 La Paz County AZ
40Ar* (picomoles/gram): 365.2 Ar (atmospheric): 3.8% K: 3.166%
Microdiorite phase from andesitic to dioritic assemblage interbedded with and intruding the Granite Wash clastic sediments
Re-set or cooling age
Project affiliation: S.J. Reynolds, P. Coney/UofA Refs.:

Harquahala Mountains

32.22 +/- .74 Ma Seri, qtz monzonite, Harquahala quartz monzonite, Harquahala Mountains
UAKA 88-20 Field no.: #85872 Loc. code: Quad.: Socorro Peak
Lat. 33 46.5' Lon.113 28.4' T. 5 N. R. 12 W. NE,NE,NW Sec. 14 La Paz County AZ
40Ar* (picomoles/gram): 86.24 Ar (atmospheric): 45.89% K: 1.53%
Sericite with quartz in a mineralized fault zone in quartz monzonite
Project affiliation: W. Rehrig/American Cu-Ni Refs.:

106.17 +/- 3 Ma Bio, qtz monzonite, Harquahala quartz monzonite, Harquahala Mountains
UAKA 88-21 Field no.: #87853 Loc. code: Quad.: Socorro Peak
Lat. 33 46.3' Lon.113 28.4' T. 5 N. R. 12 W. center Sec. 14 La Paz County AZ
40Ar* (picomoles/gram): 1646 Ar (atmospheric): 6.9% K: 8.68%
Site near San Marcos mine
Post-Jurassic (?) stock intruding Precambrian granite. Sample has suffered alteration
Project affiliation: W. Rehrig/American Cu-Ni Refs.:

Holbrook area

6.26 +/- .29 Ma GM, basalt, Woodruff Butte basalt, Holbrook area
UAKA 85-88 Field no.: Loc. code: Quad.: Woodruff
Lat. 34 47.97' Lon.110 2.44' T. 16 N. R. 22 E. NE,NE,SW Sec. 8 Navajo County AZ
40Ar* (picomoles/gram): 10.87 Ar (atmospheric): 80.67% K: .999%
Monchiquite basalt at top of Woodruff Butte
Project affiliation: Refs.:

Huachuca Mountains

30.30 +/- .91 Ma KSpar, rhyolite, Huachuca Mtns. rhyolite, Huachuca Mountains
UAKA 82-75 Field no.: Loc. code: Quad.: Miller Peak
Lat. 31 28' Lon.110 19' T. 22 S. R. 20 E. SE Sec. 33 Cochise County AZ
40Ar* (picomoles/gram): 600.18 Ar (atmospheric): 5.99% K: 11.326%
Quartz porphyry rhyolite dike. Foliated where found in sliver of of Phanerozoic rock caught in a complex fault zone within Precambrian granite
Project affiliation: B. Krantz, J. Crespi/UofA Refs.:

38.16 +/- .81 Ma WR, andesite, Pyeatt Ranch andesite, Huachuca Mountains
UAKA 77-32 Field no.: RS-10-77 Loc. code: Quad.: Fort Huachuca
Lat. 31 33.31' Lon.110 27.76' T. 22 S. R. 18 E. NE,NE,NW Sec. 1 Santa Cruz County AZ
40Ar* (picomoles/gram): 133.96 Ar (atmospheric): 8.67% K: 2.003%
Sample from small wash within 50 feet south of road about 0.5 mile west of Pyeatt Ranch
Andesite; intruded into Glance Comglomerate at north end of Huachuca Mountains
Project affiliation: R. Dockweiler, R. Scarborough/ABGMT Refs.:

94.59 +/- 1.99 Ma WR, rhyolite, Pyeatt Ranch rhyolite, Huachuca Mountains
UAKA 77-30 Field no.: RS-11-77 Loc. code: Quad.: Fort Huachuca
Lat. 31 33.78' Lon.110 27.18' T. 21 S. R. 19 E. SE,NW,NE Sec. 31 Cochise County AZ
40Ar* (picomoles/gram): 752.07 Ar (atmospheric): 1.55% K: 4.466%
Sample site 0.5 miles NNE of Pyeatt Ranch, along major streambed
Rhyolite; flow-banded. From terrane north of Kino Springs fault, near northernmost exotic block of Paleozoic limestone
Project affiliation: R. Dockweiler, R. Scarborough/ABGMT Refs.:

107.65 +/- 2.5 Ma Feld, andesite, Glance conglomerate, Huachuca Mountains
UAKA 83-135 Field no.: SC-2B Loc. code: Quad.: Huachuca Peak
Lat. 31 27' Lon.110 24.1' T. 23 S. R. 19 E. NW Sec. 11 Cochise County AZ
40Ar* (picomoles/gram): 130.8 Ar (atmospheric): 2.18% K: .68%
Andesite flow in Glance Conglomerate, Sunnyside Canyon
Lat-Lon approximate
Project affiliation: S. May, L. Vedder/UofA Refs.: Vedder, 1984

Hualapai Mountains

66.58 +/- 1.4 Ma Bio, granite, Diamond Joe Stock, Hualapai Mountains
UAKA 81-39 Field no.: Loc. code: Quad.: Gunsight Canyon
Lat. 34 49' Lon.113 44' T. 17 N. R. 14 W. Sec. [26?] Mohave County AZ
40Ar* (picomoles/gram): 809.9 Ar (atmospheric): 18.5% K: 6.886%
Granite, Diamond Joe pluton
Sample location very general
Project affiliation: P.E. Damon.UofA & H.L. Stensrud/CSU-Chico Refs.:

71.90 +/- 1.5 Ma Bio, qtz monzo, Diamond Joe stock, Hualapai Mountains
UAKA 75-92 Field no.: DW-145 Loc. code: Quad.: Gunsight Canyon
Lat. 34 49.39' Lon.113 43.88' T. 17 N. R. 14 W. Sec. 26 Mohave County AZ
40Ar* (picomoles/gram): 967.15 Ar (atmospheric): 10.35% K: 7.603%
Sample from relatively unmineralized SE part of Diamond Joe stock, about 700 feet from contact with Precambrian metamorphic rocks
Quartz monzonite, fresh, unaltered, unmineralized, medium-grained,equigranular
Project affiliation: C.N. Upchurch/Cities Services Minerals Refs.:

71.93 +/- 1.7 Ma Bio, qtz monzonite, Diamond Joe Stock, Hualapai Mountains
UAKA 89-77 Field no.: DJQMP-1 Loc. code: Quad.: Diamond Joe Peak
Lat. 34 50.38' Lon.113 45.87' T. 17 N. R. 14 W. SE,NE,NE Sec. 21 Mohave County AZ
40Ar* (picomoles/gram): 897.7 Ar (atmospheric): 20.13% K: 7.054%
Quartz monzonite from central zone of main mass of Diamond Joe sock
Project affiliation: S.R. Titley, J.R. Lang/UofA Refs.: Lang, 1991

72.05 +/- 1.6 Ma Bio, granodiorite, Diamond Joe Stock, Hualapai Mountains
UAKA 89-78 Field no.: DJGD-4 Loc. code: Quad.: Diamond Joe Peak
Lat. 34 49.65' Lon.113 47.45' T. 17 N. R. 14 W. NW,SW,SW Sec. 29 Mohave County AZ
40Ar* (picomoles/gram): 947.8 Ar (atmospheric): 6.14% K: 7.435%
Granodiorite from the margin of the Diamond Joe stock
Project affiliation: S.R. Titley, J.R. Lang/UofA Refs.: Lang, 1991

73.13 +/- 1.5 Ma Musc, qtz monzo, Diamond Joe stock, Hualapai Mountains
UAKA 75-93 Field no.: DW-146 Loc. code: Quad.: Diamond Joe Peak
Lat. 34 49.85' Lon.113 47.58' T. 17 N. R. 15 W. Sec. 30 Mohave County AZ
40Ar* (picomoles/gram): 1145.35 Ar (atmospheric): 13.05% K: 8.85%
Sample of "Whale vein" system, collected from dump of Leviathan molybdenum mine
Altered and mineralized quartz monzonite with secondary muscovite, with py+moly+chalcopyrite in quartz veins
Project affiliation: C.N. Upchurch/Cities Services Minerals Refs.:

1069.67 +/- 25 Ma Plag, diabase, Wabayuma Peak diabsae, Hualapai Mountains
UAKA 80-29 Field no.: Diabase #1 Loc. code: Quad.: Wabayuma Peak
Lat. 34 56' Lon.113 57' T. 18 N. R. 16 W. Sec. 14 Mohave County AZ
40Ar* (picomoles/gram): 590.9 Ar (atmospheric): 2.5% K: .2334%
Layered diabase, with more mafic minerals at base. Sill about 100 feet thick, dips 15N
Location apprximate
Project affiliation: P.E. Damon.UofA & H.L. Stensrud/CSU-Chico Refs.:

Hualapai Plateau

19.94 +/- .4 Ma GM, basalt, Peach Springs basalt, Hualapai Plateau
UAKA 88-47 Field no.: #10 Loc. code: Quad.: Peach Springs
Lat. 35 32.88' Lon.113 25.5' T. 25 N. R. 11 W. NE,SE,SW Sec. 14 Mohave County AZ
40Ar* (picomoles/gram): 67.61 Ar (atmospheric): 10.23% K: 1.945%
Site 1.3 miles N of Peach Springs
Basalt overlying Peach Springs Tuff
Latitude in Wenrich and others, 1995, Table 1, sample 10-B86 should read 32 minutes, not 23
Project affiliation: G.H. Billingsley/USGS Refs.: Wenrich and others, 1995

Kingman area

20.74 +/- .56 Ma WR, felsite, Bull Mountain felsite, Kingman area
UAKA 76-115 Field no.: 76-9 summit Loc. code: Quad.: Kingman SE
Lat. 35 6.6' Lon.114 1.5' T. 20 N. R. 17 W. [SE?] Sec. 13 Mohave County AZ
40Ar* (picomoles/gram): 121.3 Ar (atmospheric): 63.84% K: 3.354%
Banded felsite dome that intrudes Bull Mtn Series and Peach Springs Tuff
Location general
Project affiliation: W.J. Brennan/S.U.N.Y. Refs.:

Laguna Mountains

63.07 +/- 1.42 Ma GM, andesite, Redbird Formation, Laguna Mountains
UAKA 82-5 Field no.: Loc. code: Quad.: Laguna Dam
Lat. 32 46' Lon.114 22' T. 8 S. R. 21 W. Sec. 4 Yuma County AZ
40Ar* (picomoles/gram): 336.15 Ar (atmospheric): 3.48% K: 3.02%
Basaltic andesite dike in Redbird formation, Laguna Mountains, Adair Park
Sample location general - Lat-Lon does not match section
Project affiliation: P.E. Damon/UofA & J. Faull/Redbird Oil Refs.:

Lake Mead area

3.24 +/- .05 Ma GM, basalt, Grand Wash Bay basalt, Lake Mead area
UAKA 89-24 Field no.: G9-8-80-LN Loc. code: Quad.: Gyp Hills
Lat. 36 16' Lon.113 59' T. 33 N. R. 16 W. Sec. 14(?) Mohave County AZ
40Ar* (picomoles/gram): 5.63 Ar (atmospheric): 46.45% K: 1%
Uppermost basalt flow at Grand Wash Bay
Location approximate
Project affiliation: UNLV Refs.:

12.67 +/- .3 Ma Glass, tuff, Muddy Creek Formation, Lake Mead area
UAKA 76-99 Field no.: RS-3-75 Loc. code: Quad.: Iceburg Canyon
Lat. 36 7.68' Lon.114 2.08' T. 32 N. R. 16 W. Sec. unsurveyed Mohave County AZ
40Ar* (picomoles/gram): 82.07 Ar (atmospheric): 43.66% K: 3.723%
Air-fall ash bed between thin laminated mud beds. Ash may be reworked(?)
Project affiliation: R.S. Scarborough/UofA & Ivo Lucchitta/USGS Refs.:

12.72 +/- .33 Ma Phlog, lamprophyre, Hoover Dam lamprophyre, Lake Mead area
UAKA 85-38 Field no.: AWL-5-85 Loc. code: Quad.: Hoover Dam
Lat. 36 3.21' Lon.114 39.11' T. 31 N. R. 22 W. Sec. unsurveyed Mohave County AZ
40Ar* (picomoles/gram): 138.78 Ar (atmospheric): 39.65% K: 6.268%
Lamprophyre
Location information generalized
Project affiliation: M.J. Alrich, A.W. Laughlin/Los Alamos Refs.: See Mills, 1994

13.27 +/- .34 Ma Phlog, unknown, Hoover Dam rock, Lake Mead area
UAKA 85-39 Field no.: AWL-7-85 Loc. code: Quad.: Boulder Beach
Lat. 36 3' Lon.114 49' T. 22 S. R. 64 E. Sec. [15?] Clark County NV
40Ar* (picomoles/gram): 159.17 Ar (atmospheric): 38.29% K: 6.89%
Rock description not given
Location information generalized, rock type not given
Project affiliation: M.J. Alrich, A.W. Laughlin/Los Alamos Refs.: See Smith, 1984

Lake Mead area (NV)

7.08 +/- .21 Ma GM, basalt, Hoover Dam basalt, Lake Mead area (NV)
UAKA 85-37 Field no.: AWL-4-85 Loc. code: Quad.: Hoover Dam
Lat. 36 .37' Lon.114 44.49' T. 22 S. R. 65 E. Sec. [?] Clark County NV
40Ar* (picomoles/gram): 100.53 Ar (atmospheric): 55.49% K: 8.174%
Basalt dike
Location information generalized
Project affiliation: M.J. Alrich, A.W. Laughlin/Los Alamos Refs.: See Mills, 1994

Lower Verde River area

6.30 +/- .14 Ma WR, basalt, Ikes Backbone, Lower Verde River area
UAKA 73-84 Field no.: 10 Loc. code: Quad.: Verde Hot Spring
Lat. 34 20.53' Lon.111 40.78' T. Unsurveyed. R. . Sec. Yavapai County AZ
40Ar* (picomoles/gram): 7.92 Ar (atmospheric): 42.4% K: .724%
Sample from highest point on ridge NE of microwave tower, between Fossil Creek and Verde River, elev 1323m
Flat-lying basalt overlies pyroclastic rocks and ash. Topmost pyroclastics dip 3 degrees NE and lowermost are folded and faulted
Project affiliation: H.W. Peirce/ABGMT & M. Shafiqullah/UofA Refs.:

Luke Basin

20.65 +/- .5 Ma GM, basalt, Phoenix basin fill, Luke Basin
UAKA 86-72 Field no.: Loc. code: Quad.: Sunnyslope
Lat. 33 35.19' Lon.112 6.43' T. 3 N. R. 2 E. SE,NE,NW Sec. 24 Maricopa County AZ
40Ar* (picomoles/gram): 24.49 Ar (atmospheric): 20.99% K: .68%
Basalt from Phoenix water well
Project affiliation: D. Pool/USGS-WRD Refs.:

23.01 +/- .5 Ma GM, basalt, Phoenix basin fill, Luke Basin
UAKA 86-73 Field no.: Loc. code: Quad.: El Mirage
Lat. 33 31.49' Lon.112 22.03' T. 2 N. R. 1 W. NW,SE,SE Sec. 9 Maricopa County AZ
40Ar* (picomoles/gram): 28.35 Ar (atmospheric): 35.77% K: .706%
Basalt from Phoenix water well
Project affiliation: D. Pool/USGS-WRD Refs.:

Mazatzal Mountains

25.59 +/- .5 Ma GM, basalt, Mazatzal basalt, Mazatzal Mountains
UAKA 89-76 Field no.: MZ-89-1 Loc. code: Quad.: Mazatzal Peak
Lat. 34 4.53' Lon.111 28.19' T. unsurveyed. R. . Sec. Gila County AZ
40Ar* (picomoles/gram): 169.4 Ar (atmospheric): 3.8% K: 3.79%
Basalt, overlying Tertiary gravels
Project affiliation: D. Nations, M. Doe/NAU Refs.: Doe, 1991

McDowell Mountains

13.42 +/- .35 Ma GM, basalt, Lone Mountain basalt, McDowell Mountains
UAKA 88-185 Field no.: TD-60 Loc. code: Quad.: Cave Creek
Lat. 33 50.75' Lon.111 53.22' T. 6 N. R. 5 E. NW,SE,SW Sec. 19 Maricopa County AZ
40Ar* (picomoles/gram): 18.29 Ar (atmospheric): 35.71% K: .783%
Basalt from north side of Lone Mountain, White Eagle Mine area
Project affiliation: T.L. Pewe, P.L. Doorn/ASU Refs.: Doorn, 1989; Doorn and Pewe, 1991

17.42 +/- .41 Ma GM, basalt, Shea Boulevard basalt, McDowell Mountains
UAKA 85-36 Field no.: AWL-2-85 Loc. code: Quad.: Sawik Mountain
Lat. 33 35' Lon.111 45' T. 3 N. R. 6 E. Sec. [?] Maricopa County AZ
40Ar* (picomoles/gram): 42.68 Ar (atmospheric): 15.53% K: 1.406%
Basalt dike
Location information generalized
Project affiliation: M.J. Alrich, A.W. Laughlin/Los Alamos Refs.:

Mineral Mountain area

66.08 +/- 1 Ma Bio, granite, Mineral Mountain granite, Mineral Mountain area
UAKA 72-45 Field no.: 1086.5 Loc. code: Quad.: Florence NE
Lat. 33 9.35' Lon.111 16.63' T. 3 S. R. 10 E. Sec. 24 Pinal County AZ
40Ar* (picomoles/gram): 824.04 Ar (atmospheric): 16.3% K: 7.06%
Fisrt 1022 feet of hole was alluvium or Gila Conglomerate; granite encountered 1022' to TD at 1090'
Equigranular granite from drill core at 1086.5 feet depth
Project affiliation: R.C. Moore/Cities Services Minerals Refs.:

68.64 +/- 2 Ma Bio, granite, Mineral Mountian granite, Mineral Mountain area
UAKA 72-46 Field no.: "shaft" Loc. code: Quad.: Mineral Mtn
Lat. 33 8.8' Lon.111 13.75' T. 3 S. R. 11 E. Sec. 29 Pinal County AZ
40Ar* (picomoles/gram): 558.1 Ar (atmospheric): 61.2% K: 4.6%
Sample from area previously mapped as Precambrian, but rock is not similar to other PreC granites in region
Equigranular granite with fresh biotite
Project affiliation: R.C. Moore/Cities Services Minerals Refs.:

Mogollon Rim (Apache segment)

1.63 +/- .05 Ma WR, basalt, Corduroy Canyon basalt, Mogollon Rim (Apache segment)
UAKA 74-137 Field no.: Loc. code: Quad.: Show Low
Lat. 34 2.33' Lon.110 14.8' T. Unsurveyed. R. . Sec. Navajo County AZ
40Ar* (picomoles/gram): 1.87 Ar (atmospheric): 58.7% K: .662%
Sample from top of flow near hairpin bend at Corduroy Creek, north side of cliff along Hwy 60
Light gray olivine basalt; olivine fairly fresh
Project affiliation: P.E. Damon & M. Shafiqullah/ UofA Refs.:

Mogollon Rim (Tonto segment)

14.25 +/- .74 Ma WR, basalt, Milk Ranch Point basalt, Mogollon Rim (Tonto segment)
UAKA 77-79 Field no.: Loc. code: Quad.: Pine
Lat. 34 22.6' Lon.111 24.95' T. 12 N. R. 9 E. SE Sec. 32 Gila County AZ
40Ar* (picomoles/gram): 7.49 Ar (atmospheric): 85.97% K: .302%
Sampled 100' above contact
Basalt overlying Corduroy member of Supai. Volcanics about 300' thick
Sample locality B on Weisman and Weir, 1990
Project affiliation: H.W. Peirce/ABGMT & M. Shafiqullah/UofA Refs.: Weisman and Weir, 1990

Mogollon Slope

6.27 +/- .19 Ma WR, basalt, Chevlon Butte basalt, Mogollon Slope
UAKA 76-62 Field no.: Loc. code: Quad.: Chevlon Butte
Lat. 34 41.54' Lon.110 50.71' T. 15 N. R. 14 E. SW,NE,NE Sec. 15 Coconino County AZ
40Ar* (picomoles/gram): 3.67 Ar (atmospheric): 68.48% K: .337%
Sampled at northern side, elevation 6800'
Flat-lying basalt of basal flow at Chevlon Butte
Project affiliation: H.W. Peirce/ABGMT & M. Shafiqullah/UofA Refs.:

Mohave Mountains

10.88 +/- 1.56 Ma Plag, rhyodacite, Mohave Mts. rhyolite, Mohave Mountains
UAKA 81-76 Field no.: MOJ-1-WR-81 Loc. code: Quad.: Crossman Peak
Lat. 34 35' Lon.114 17.5' T. 14 N. R. 19 W. Sec. 6 Mohave County AZ
40Ar* (picomoles/gram): 8.33 Ar (atmospheric): 94% K: .4401%
Flat-lying sequence of volcanics overlying tilted andesites (UAKA 81-77). Sample is altered
Sample location uncertain
Project affiliation: P.E. Damon/UofA & W.A. Rehrig/Phillips Petroleum Refs.: See Howard and others, 1990 (unit Tr); see also Nakata

---

21.10 +/- .7 Ma GM, andesite, Mohave Mts. andesite, Mohave Mountains
UAKA 81-77 Field no.: MOJ-2-WR-81 Loc. code: Quad.: Crossman Peak
Lat. 34 35' Lon.114 17.5' T. 14 N. R. 19 W. Sec. 6 Mohave County AZ
40Ar* (picomoles/gram): 51.7 Ar (atmospheric): 59.8% K: 1.405%
Vertically tilted basaltic andesite flow above Precambrian basement
Sample location uncertain
Project affiliation: P.E. Damon/UofA & W.A. Rehrig/Phillips Petroleum Refs.: See Howard and others, 1990 (unit Tfl); see also Nakata

---

91.46 +/- 2.14 Ma Musc, pegmatite, Mohave Mts. pegmatite, Mohave Mountains
UAKA 81-79 Field no.: MOJ-4-WR-81 Loc. code: Quad.: Crossman Peak
Lat. 34 34' Lon.114 11' T. 14 N. R. 18 W. Sec. 7 Mohave County AZ
40Ar* (picomoles/gram): 1376 Ar (atmospheric): 18.5% K: 8.458%
North to NNE quartz vein with polymetallic mineralization in gneissic rocks
Sample location general
Project affiliation: P.E. Damon/UofA & W.A. Rehrig/Phillips Petroleum Refs.:

722.88 +/- 15.7 Ma Horn, diorite, Mohave Mts. diorite, Mohave Mountains
UAKA 81-78 Field no.: MOJ-3-WR-81 Loc. code: Quad.: Standard Wash
Lat. 34 28' Lon.114 9' T. 13 N. R. 18 W. Sec. 16 Mohave County AZ
40Ar* (picomoles/gram): 2541 Ar (atmospheric): 1.65% K: 1.648%
Diorite pluton just south of Mohave Mountain
Sample location general
Project affiliation: P.E. Damon/UofA & W.A. Rehrig/Phillips Petroleum Refs.:

Moon Mountians

11.11 +/- .3 Ma GM, basalt, Copperstone basalt, Moon Mountians
UAKA 90-14 Field no.: #3 Loc. code: Copp Quad.: Moon Mountain SE
Lat. 33 51.5' Lon.114 18.6' T. 6 N. R. 20 W. SE Sec. 14 La Paz County AZ
40Ar* (picomoles/gram): 20.3 Ar (atmospheric): 65.36% K: 1.05%
Sample from plug or cinder cone 0.5 mile SW of Copperstone pit
Olivine basalt, caps hills and encountered in drill holes beneath dunes
Project affiliation: G. L. Kelsey/Cyprus Copperstone Refs.: See Spencer and others, 1988

18.48 +/- .4 Ma GM, basalt, Copperstone basalt, Moon Mountians
UAKA 90-19 Field no.: #8 Loc. code: Copp Quad.: Moon Mountain SE
Lat. 33 52.49' Lon.114 18' T. 6 N. R. 20 W. SW Sec. 12 La Paz County AZ
40Ar* (picomoles/gram): 271.9 Ar (atmospheric): 9.33% K: 8.443%
Mineralized basalt, 830' level of open pit
Project affiliation: G. L. Kelsey/Cyprus Copperstone Refs.: See Spencer and others, 1988

20.46 +/- .5 Ma GM, andesite, Copper Peak andesite, Moon Mountians
UAKA 90-12 Field no.: #1 Loc. code: Copp Quad.: Moon Mountain SE
Lat. 33 51' Lon.114 18.9' T. 6 N. R. 20 W. NW Sec. 23 La Paz County AZ
40Ar* (picomoles/gram): 311.5 Ar (atmospheric): 26.1% K: 8.728%
Basaltic andesite flow, NE side on Copper Peak. Andesite overlies Jrassic latite and Moon Mountain detachment fault
Project affiliation: G. L. Kelsey/Cyprus Copperstone Refs.: See Spencer and others, 1988

33.50 +/- .8 Ma Clay, gouge, Copperstone fault , Moon Mountians
UAKA 90-15 Field no.: #4 Loc. code: Copp Quad.: Moon Mountain SE
Lat. 33 52.5' Lon.114 18' T. 6 N. R. 20 W. SW Sec. 12 La Paz County AZ
40Ar* (picomoles/gram): 178 Ar (atmospheric): 41.25% K: 3.036%
Illite clay from Copperstone fault surface, 680' level, NNW side of open pit
Project affiliation: G. L. Kelsey/Cyprus Copperstone Refs.: See Spencer and others, 1988

35.35 +/- .8 Ma Feld, latite, Copper Peak latite, Moon Mountians
UAKA 90-13 Field no.: #2 Loc. code: Copp Quad.: Moon Mountain SE
Lat. 33 51.2' Lon.114 18.55' T. 6 N. R. 20 W. NW,NE Sec. 23 La Paz County AZ
40Ar* (picomoles/gram): 312.04 Ar (atmospheric): 19.93% K: 5.041%
Site about 0.5 mile NE of Copper Peak
Sample from metamorphosed shear zone in Jurassic quartz latite just above detachment surface and overlying gneiss, limestone, and quartzite. Underlies massive quartz latite
Project affiliation: G. L. Kelsey/Cyprus Copperstone Refs.: See Spencer and others, 1988

Morenci area

19.70 +/- .42 Ma Sani, rhyolite, Enebro Mt. rhyolite, Morenci area
UAKA 75-73 Field no.: Loc. code: Quad.: Coronado Mountain
Lat. 33 11.1' Lon.109 23.33' T. 3 S. R. 29 E. SW Sec. 8 Greenlee County AZ
40Ar* (picomoles/gram): 253.4 Ar (atmospheric): 3.55% K: 7.378%
Sample from near trail #8, Granville Recreation Area
Devitrified rhyolite tuff from series of vitric welded tuffs. (Corresponds to Lindgren's TR3 - Malpais rhyolite)
Project affiliation: P.E. Damon, M. Shafiqullah, and others/UofA Refs.:

27.44 +/- .59 Ma WR, andesite, Clifton Sequence andesite, Morenci area
UAKA 75-74 Field no.: Loc. code: Quad.: Clifton
Lat. 33 6.82' Lon.109 16.95' T. 4 S. R. 30 E. center Sec. 6 Greenlee County AZ
40Ar* (picomoles/gram): 121.6 Ar (atmospheric): 7.2% K: 2.536%
Sample from east bank of San Francisco River near Ash Spring Creek
Lower andesite of Lindgren's Clifton Sequence
Project affiliation: P.E. Damon, M. Shafiqullah, and others/UofA Refs.:

New River area

21.55 +/- .5 Ma Bio, felsite, Gavilan Peak felsite, New River area
UAKA 87-33 Field no.: Loc. code: Quad.: New River
Lat. 33 54.18' Lon.112 7.56' T. 7 N. R. 2 E. Sec. 35 Maricopa County AZ
40Ar* (picomoles/gram): 243.5 Ar (atmospheric): 40.7% K: 6.477%
Felsic plug of Gavilan Peak
Project affiliation: E. Stump, K. Jagiello/ASU Refs.: Jagiello, 1987

Northern Peloncillo Mountains

17.35 +/- .36 Ma Sani, rhyolite, Tollgate Wash rhyolite, Northern Peloncillo Mountains
UAKA 79-176 Field no.: PEL-35 Loc. code: Pel Quad.: Tollgate Tank
Lat. 32 49.73' Lon.109 23.95' T. 7 S. R. 29 E. center Sec. 17 Graham County AZ
40Ar* (picomoles/gram): 113.27 Ar (atmospheric): 11.42% K: 3.747%
Sample from ridge 0.5 mile WNW of VABM "Red"
Flow-banded rhyolite from dome-flow complex
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #J on Richter and others, 1983

19.39 +/- .41 Ma WR, andesite, Zorilla Tank andesite, Northern Peloncillo Mountains
UAKA 79-89 Field no.: PEL-24 Loc. code: Pel Quad.: Gila Box
Lat. 32 52.85' Lon.109 22.55' T. 6 S. R. 29 E. SW,NE,SE Sec. 28 Graham County AZ
40Ar* (picomoles/gram): 152.11 Ar (atmospheric): 6.45% K: 4.5%
Sample from roadcut in old Clifton-Safford road, elevation 5000'
Upper part of basaltic andesite sequence above the pumice-ash flow
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #C on Richter and others, 1983

20.37 +/- .42 Ma WR, andesite, Slickrock Basin andesite, Northern Peloncillo Mountains
UAKA 79-175 Field no.: PEL-34 Loc. code: Pel Quad.: Ash Peak
Lat. 32 49.32' Lon.109 20.55' T. 7 S. R. 29 E. center,SE Sec. 14 Graham County AZ
40Ar* (picomoles/gram): 120.03 Ar (atmospheric): 10.49% K: 3.379%
Site about 2 miles SSW of Thumb Butte
Turkey Track andesite
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #H on Richter and others, 1983

21.16 +/- .44 Ma WR, rhyodacite, Slickrock Basin rhyodacite, Northern Peloncillo Mountains
UAKA 79-86 Field no.: PEL-21 Loc. code: Pel Quad.: Tollgate Tank
Lat. 32 40.4' Lon.109 24.24' T. 7 S. R. 29 E. NW,SW Sec. 20 Graham County AZ
40Ar* (picomoles/gram): 158.48 Ar (atmospheric): 3.9% K: 4.294%
Rhyodacite flow; overlies Big Red latite and Turkey Track porphyry in Slickrock area
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #B on Richter and others, 1983

21.76 +/- .46 Ma WR, andesite, Williams Well andesite, Northern Peloncillo Mountains
UAKA 79-172 Field no.: PEL-31 Loc. code: Pel Quad.: Ash Peak
Lat. 32 47.72' Lon.109 17.1' T. 7 S. R. 30 E. NW,SW Sec. 28 Graham County AZ
40Ar* (picomoles/gram): 107.68 Ar (atmospheric): 22.47% K: 2.837%
Sampled 0.5 mile N of Williams Well
Lower andesite flows; overlie Big Red latite and Turkey Track porphyry
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #G on Richter and others, 1983

22.15 +/- .46 Ma WR, andesite, Tollgate Wash andesite, Northern Peloncillo Mountains
UAKA 80-116 Field no.: PEL-40 Loc. code: Pel Quad.: Ash Peak
Lat. 32 51.02' Lon.109 20.28' T. 7 S. R. 29 E. SW,NW,SW Sec. 1 Graham County AZ
40Ar* (picomoles/gram): 93.13 Ar (atmospheric): 18.29% K: 2.41%
Sample from roadcut along Hwy 666 [now Hwy 191], WNW of Thumb Butte
Basaltic andesite flow
Locality F on Richter and others, 1983
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: Richter and others, 1983

22.61 +/- .47 Ma WR, andesite, Williams Well andesite, Northern Peloncillo Mountains
UAKA 78-92 Field no.: PEL-11 Loc. code: Pel Quad.: Ash Peak
Lat. 32 47.74' Lon.109 16.93' T. 7 S. R. 29 E. SE,NW Sec. 28 Graham County AZ
40Ar* (picomoles/gram): 84.93 Ar (atmospheric): 18.62% K: 2.153%
Platy, red andesite, one of the oldest units in the Williams Well area. It underlies Turkey Track porphyry unit in Guthrie quad
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #E on Richter and others, 1983

22.80 +/- .5 Ma WR, andesite, Slickrock Basin andesite, Northern Peloncillo Mountains
UAKA 79-174 Field no.: PEL-33 Loc. code: Pel Quad.: Ash Peak
Lat. 32 49.29' Lon.109 20.56' T. 7 S. R. 29 E. center,SE Sec. 14 Graham County AZ
40Ar* (picomoles/gram): 125.16 Ar (atmospheric): 8.68% K: 3.146%
Site about 2 miles SSW of Thumb Butte
Turkey track andesite. Five flows below overlying basaltic andesite
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.:

23.10 +/- .49 Ma Bio, rhyolite, Ash Peak divide rhyolite, Northern Peloncillo Mountains
UAKA 79-87B Field no.: PEL-22 Loc. code: Pel Quad.: Ash Peak
Lat. 32 46.59' Lon.109 16.86' T. 7 S. R. 30 E. NE,SE,SW Sec. 33 Graham County AZ
40Ar* (picomoles/gram): 264.53 Ar (atmospheric): 24.07% K: 6.563%
Collected at divide on north side of Hwy 70 opposite abandoned house, 1000 feet N of BM 4398'
Rhyolite flow
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #I on Richter and others, 1983

23.10 +/- .49 Ma Sani, rhyolite, Ash Peak divide rhyolite, Northern Peloncillo Mountains
UAKA 79-87S Field no.: PEL-22 Loc. code: Pel Quad.: Ash Peak
Lat. 32 46.59' Lon.109 16.92' T. 7 S. R. 30 E. NE,SE,SW Sec. 33 Graham County AZ
40Ar* (picomoles/gram): 147.73 Ar (atmospheric): 15.78% K: 3.665%
Collected at divide on north side of Hwy 70 opposite abandoned house, 1000 feet N of BM 4398'
Rhyolite flow
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #I on Richter and others, 1983

23.15 +/- .48 Ma Bio, rhyolite, Ash Peak dome complex, Northern Peloncillo Mountains
UAKA 78-75 Field no.: 78-DR-8 Loc. code: Pel Quad.: Whitlock Mts. NE
Lat. 32 43.13' Lon.109 15.64' T. 8 S. R. 30 E. NW,SW,SE Sec. 22 Graham County AZ
40Ar* (picomoles/gram): 273.59 Ar (atmospheric): 11.21% K: 6.772%
Biotie-bearing, flow-banded rhyolite, informally refered to as Ash Peak dome/flow complex. Overlies and underlies basaltic andesites
Project affiliation: D.H. Richter/USGS Refs.: #C on Richter and others, 1981

23.82 +/- .5 Ma WR, basalt, Flat Top Mesa basalt, Northern Peloncillo Mountains
UAKA 78-88 Field no.: PEL-7 Loc. code: Pel Quad.: Hot Well
Lat. 32 40.82' Lon.109 12.89' T. 9 S. R. 31 E. SW,NW Sec. 6 Graham County AZ
40Ar* (picomoles/gram): 93.8 Ar (atmospheric): 26.58% K: 2.256%
Basalt of Flat Top mesa
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.:

25.32 +/- .58 Ma Bio, rhyolite, Horseshoe Ranch rhyolite, Northern Peloncillo Mountains
UAKA 80-123 Field no.: PEL-47 Loc. code: Pel Quad.: Engine Mountain
Lat. 32 24.76' Lon.109 4.44' T. 12 S. R. 32 E. SE,SE,SE,SE Sec. 4 Cochise County AZ
40Ar* (picomoles/gram): 303.55 Ar (atmospheric): 32.6% K: 6.866%
Site near Horse Shoe Ranch
Rhyolite, part of plug and dike swarm
Locality B on Richter and others, 1990
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: Richter and others, 1990

25.99 +/- .58 Ma Plag, dacite, Tule Wells dacite, Northern Peloncillo Mountains
UAKA 80-118 Field no.: PEL-42 Loc. code: Pel Quad.: Orange Butte
Lat. 32 25.76' Lon.109 8.44' T. 11 S. R. 31 E. NW,SW,SW Sec. 36 Graham County AZ
40Ar* (picomoles/gram): 27.28 Ar (atmospheric): 12.82% K: .601%
Porphyritic hornblende dacite-latite. Part of Horse Camp volcano or possibly part of Orange Butte dome complex
Locality E on Richter and others, 1990
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: Richter and others, 1990

26.48 +/- .59 Ma WR, andesite, Peloncillo andesite, Northern Peloncillo Mountains
UAKA 80-121 Field no.: PEL-45 Loc. code: Pel Quad.: Engine Mountain
Lat. 32 23.08' Lon.109 5.36' T. 12 S. R. 32 E. NE,SW,SW,SW Sec. 16 Cochise County AZ
40Ar* (picomoles/gram): 109.63 Ar (atmospheric): 6.21% K: 2.37%
Site about 1 mile west of BM "POSITIVE 6401"
Basaltic andesite, source unknown
Locality C on Richter and others, 1990
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: Richter and others, 1990

26.58 +/- .6 Ma GM, rhyodacite, Orange Butte rhyodacite, Northern Peloncillo Mountains
UAKA 80-119 Field no.: PEL-43 Loc. code: Pel Quad.: Orange Butte
Lat. 32 24.76' Lon.109 14.36' T. 12 S. R. 30 E. center,SW Sec. 1 Cochise County AZ
40Ar* (picomoles/gram): 175.69 Ar (atmospheric): 26.87% K: 3.784%
Sample from summit of Orange Butte
Rhyodacite of Orange Butte dome-flow complex
Locality F on Richter and others, 1990
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: Richter and others, 1990

26.77 +/- .6 Ma Bio, rhyodacite, Midway Peak rhyolite, Northern Peloncillo Mountains
UAKA 80-124 Field no.: PEL-48 Loc. code: Pel Quad.: Orange Butte
Lat. 32 24.22' Lon.109 10.25' T. 12 S. R. 31 E. NW,NE,SW Sec. 10 Cochise County AZ
40Ar* (picomoles/gram): 289.89 Ar (atmospheric): 27.42% K: 6.198%
Rhyodacite of flows possibly from McKenzie Peak dome-flow complex
Locality D on Richter and others, 1990
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: Richter and others, 1990

28.12 +/- .84 Ma WR, andesite, Flat Top andesite, Northern Peloncillo Mountains
MB 14-66 Field no.: MB-14-66 Loc. code: Quad.: Hot Well
Lat. 32 41' Lon.109 12.28' T. 9 S. R. 31 E. Sec. 5 Greenlee County AZ
40Ar* (picomoles/gram): 110.1 Ar (atmospheric): 31.4% K: 2.24%
Basaltic andesite of Flat Top mesa
Project affiliation: P.E. Damon, M. Bikerman/UofA Refs.:

28.54 +/- .7 Ma Bio, rhyodacite, McKenzie Peak rhyodacite, Northern Peloncillo Mountains
UAKA 80-120 Field no.: PEL-44 Loc. code: Pel Quad.: San Simon
Lat. 32 20.73' Lon.109 9.52' T. 12 S. R. 31 E. NE,NE,SE Sec. 34 Cochise County AZ
40Ar* (picomoles/gram): 343.4 Ar (atmospheric): 40.58% K: 6.884%
Sample from near summit
Rhyodacite of the McKenzie Peak dome
Locality G on Richter and others, 1990
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: Richter and others, 1990

29.28 +/- .66 Ma Bio, rhyolite, Horse Camp Canyon rhyolite, Northern Peloncillo Mountains
UAKA 80-117 Field no.: PEL-41 Loc. code: Pel Quad.: Orange Butte
Lat. 32 27.64' Lon.109 9.84' T. 11 S. R. 31 E. NE,NW,SE Sec. 22 Graham County AZ
40Ar* (picomoles/gram): 353.3 Ar (atmospheric): 17.92% K: 6.902%
Site about 1 mile SW of Winchester Peak
Rhyolite-rhyodacite vent-dome complex in the Horse Camp volcano-tectonic structure
Locality H on Richter and others, 1990
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: Richter and others, 1990

33.55 +/- .75 Ma Bio, tuff, Steins ash-flow, Northern Peloncillo Mountains
UAKA 81-124 Field no.: PEL-51; 80AZ068 Loc. code: Pel Quad.: Mondel
Lat. 32 17.7' Lon.108 59.3' T. 23 S. R. 21 W. NW,NE Sec. 22 Hidalgo County NM
40Ar* (picomoles/gram): 373.25 Ar (atmospheric): 16.04% K: 6.357%
Ash flow in Volcano Draw
Locality N on Richter and others, 1990
Project affiliation: M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: Richter and others, 1990

34.35 +/- .71 Ma Bio, tuff, Roostercomb tuff, Northern Peloncillo Mountains
UAKA 80-125 Field no.: PEL-49; 8F-64 Loc. code: Pel Quad.: Doubtful Canyon
Lat. 32 18.91' Lon.109 6.08' T. 13 S. R. 32 E. SW,NE,SW Sec. 8 Cochise County AZ
40Ar* (picomoles/gram): 428.28 Ar (atmospheric): 12.3% K: 7.122%
Densely welded lithic-crystal tuff from Roostercomb area
Locality K on Richter and others, 1990
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: Richter and others, 1990

35.16 +/- .78 Ma Bio, rhyolite, Steins Peak rhyolite, Northern Peloncillo Mountains
UAKA 80-122 Field no.: PEL-46 Loc. code: Pel Quad.: Doubtful Canyon
Lat. 32 22.41' Lon.109 3.12' T. 12 S. R. 32 E. NW,NE,SW Sec. 23 Cochise County AZ
40Ar* (picomoles/gram): 427.67 Ar (atmospheric): 23.47% K: 6.947%
Site above Little Doubtful Canyon
Rhyolite, part of main flows of Steins Peak volcano
Locality J on Richter and others, 1990
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: Richter and others, 1990

35.24 +/- .76 Ma Bio, vitrophyre, Doubtful Canyon tuff, Northern Peloncillo Mountains
UAKA 81-27 Field no.: PEL-50; 8F-11 Loc. code: Pel Quad.: Doubtful Canyon
Lat. 32 21.25' Lon.109 1.15' T. 22 S. R. 21 W. NW,NE,NE Sec. 32 Hidalgo County NM
40Ar* (picomoles/gram): 408.14 Ar (atmospheric): 27.93% K: 6.613%
Vitrophyric ash-flow tuff (unit Tst)
Locality I on Richter and others, 1990
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: Richter and others, 1990

Northern San Pedro Valley

6.75 +/- .16 Ma Glass, tuff, Quiburis Formation, Northern San Pedro Valley
UAKA 76-97 Field no.: RS-61M-75 Loc. code: Quad.: Clark Ranch
Lat. 32 37.67' Lon.110 31.23' T. 9 S. R. 18 E. NW,NE,NE Sec. 29 Pinal County AZ
40Ar* (picomoles/gram): 42.95 Ar (atmospheric): 47.11% K: 3.664%
Ash bed in Quiburis Formation, stratigraphically highest bed in Camel Canyon
Project affiliation: R.S. Scarborough/UofA Refs.:

Pajarito Mountains

109.22 +/- 2.6 Ma Feld, rhyolite, Walker Canyon rhyolite, Pajarito Mountains
UAKA 84-140 Field no.: AWL-1-84 Loc. code: Quad.: Pena Blanca Lake
Lat. 31 23.25' Lon.111 4.2' T. 23 S. R. 12 E. NW,SW,NE Sec. 36 Santa Cruz County AZ
40Ar* (picomoles/gram): 423.5 Ar (atmospheric): 7.68% K: 2.169%
Site on Ruby-Nogales road about 0.5 km west of Walker Canyon
Rhyolite dike in Mesozoic conglomerate
Project affiliation: M.J. Alrich, A.W. Laughlin/Los Alamos Refs.:

Patagonia Mountains

19.65 +/- .97 Ma Crypt, sediments, Hardshell manto, Patagonia Mountains
UAKA 77-102 Field no.: HDS-58-394/400 Loc. code: Quad.: Harshaw
Lat. 31 27.32' Lon.110 42.71' T. Unsurveyed. R. . Sec. Santa Cruz County AZ
40Ar* (picomoles/gram): 30.76 Ar (atmospheric): 76.43% K: .898%
Sample from drill chips, hole HDS-58, depth 395-400 feet
Cryptomelane in coarse-grained drusy quartz which replaces fine-grained sediments with a volcanic component. The sediments lie 10' above Permian limestone
Project affiliation: F. Koutz, S.R. Davis, S.R. Titley/UofA Refs.: See Koutz, 1974

58.46 +/- 1.19 Ma Adul, tuff, Hermosa Hill rhyolite tuff, Patagonia Mountains
UAKA 77-103 Field no.: HER-OC Loc. code: Quad.: Harshaw
Lat. 31 27.19' Lon.110 42.43' T. Unsurveyed. R. . Sec. Santa Cruz County AZ
40Ar* (picomoles/gram): 1263.04 Ar (atmospheric): 1.23% K: 12.258%
Sample from southernost open cut of Hermosa Mine.
Adularia in rhyolitic tuffaceous agglomerate; replaces the rhyolite along fractures
Project affiliation: F. Koutz, S.R. Titley/UofA Refs.: See Koutz, 1974

71.01 +/- 1.62 Ma WR, andesite, Hermosa Hill andesite, Patagonia Mountains
UAKA 77-27 Field no.: PHK-7-77 Loc. code: Quad.: Harshaw
Lat. 31 27.64' Lon.110 43.5' T. 23 S. R. 16 E. Sec. unsurveyed Santa Cruz County AZ
40Ar* (picomoles/gram): 370.77 Ar (atmospheric): 6.2% K: 2.952%
Collected 25 m north of small dam in Harshaw Creek, 200 m south of road to Trench Camp
Trachyandesite; weakly propylitized outcrop on northern flank of Hermosa Hill
Project affiliation: F. Koutz, R. Scarborough, P. Kuck/UofA Refs.: See Koutz, 1974

82.67 +/- 1.73 Ma WR, dacite, Corral Canyon dacite, Patagonia Mountains
UAKA 77-28 Field no.: PHK-8-77 Loc. code: Quad.: Harshaw
Lat. 31 26.5' Lon.110 42.07' T. 23 S. R. 16 E. Sec. unsurveyed Santa Cruz County AZ
40Ar* (picomoles/gram): 583.82 Ar (atmospheric): 15.84% K: 3.98%
Collected from hillside 0.5 km NW of Farrell Spring in Corral Canyon, 1.5 km NNE of Mowry Mine
Dacite; maroon, fine-grained with quartz phenocrysts. Fisrt flow under the Tertiary tuff
Project affiliation: F. Koutz, R, Scarborough, P. Kuck/UofA Refs.: See Koutz, 1974

Petrified Forest

6.81 +/- .4 Ma WR, basalt, Petrified Forest maar, Petrified Forest
UAKA 74-134 Field no.: Loc. code: Quad.: Petrified Forest
Lat. 35 4.53' Lon.109 48.12' T. 19 N. R. 24 E. NE,NE Sec. 4 Apache County AZ
40Ar* (picomoles/gram): 9.48 Ar (atmospheric): 84.05% K: .801%
Probably related to Hopi Buttes maars
Dense monchiquite basalt with xenoliths of baked sandstone. Maar is about 1 mile in diameter
Project affiliation: J. Baskin; A. Trevena/US Park Service & R. Scarborough; M. Shafiqullah/UofA Refs.:

Picacho Mountains

23.57 +/- 0.5 Ma Musc, granite, Picacho Mtns. granite, Picacho Mountains
UAKA 76-17 Field no.: PM 303 Loc. code: Quad.: Picacho Reservoir
Lat. 32 45.36' Lon.111 25.37' T. 8 S. R. 9 E. center Sec. 4 Pinal County AZ
40Ar* (picomoles/gram): 357.38 Ar (atmospheric): 14% K: 8.685%
Location plotted on Johnson's map, lat and lon determined by JES, 1999
Gneissic granite stock, date from "granite gneiss" of Johnson, plotted as #1
Project affiliation: G.S. Johnson/UofA Refs.: Johnson, 1981

24.57 +/- 0.54 Ma Bio, granodiorite, Picacho Mtns. quartz monzonite, Picacho Mountains
UAKA 76-18 Field no.: PM 304 Loc. code: Quad.: Picacho Reservoir SE
Lat. 32 49.73' Lon.111 22.19' T. 7 S. R. 9 E. center Sec. 12 Pinal County AZ
40Ar* (picomoles/gram): 318.45 Ar (atmospheric): 13.7% K: 7.424%
Location plotted on Johnson's map, lat and lon determined by JES, 1999
Quartz Monzonite, non-foliated. Plotted as #2 by Johnson.
Project affiliation: G.S. Johnson/UofA Refs.: Johnson, 1981

65.08 +/- 1.4 Ma Bio, qtz monzo, Picacho Mtns. quartz monzonite, Picacho Mountains
UAKA 76-19 Field no.: PM 305 Loc. code: Quad.: Picacho Reservoir SE
Lat. 32 51.95' Lon.111 20.12' T. 6 S. R. 10 E. NE,SW,SE Sec. 29 Pinal County AZ
40Ar* (picomoles/gram): 890.8 Ar (atmospheric): 11.1% K: 7.752%
Location plotted on Johnson's map, lat-lon determined by JES, 1999. Sample from most northeasterly outcrop of the Picacho Mountains
Quartz monzonite; locally mineralized, abundant epidote veins. Plotted as #3 by Johnson.
Project affiliation: G.S. Johnson/UofA Refs.: Johnson, 1981

Picacho peak

21.67 +/- .46 Ma WR, latite, Picacho Peak latite dike, Picacho peak
UAKA 76-24 Field no.: Loc. code: Quad.: Newman Peak
Lat. 32 38.53' Lon.111 25.61' T. 9 S. R. 9 E. NW,SW,NW Sec. 16 Pinal County AZ
40Ar* (picomoles/gram): 204.55 Ar (atmospheric): 6.9% K: 5.41%
Latite dike exposed in a wash west of the saddle between the main massif and the low western hills
Project affiliation: D.J. Lynch & M. Shafiqullah/UofA Refs.:

Pinacate Volcanic Field

0.12 +/- .05 Ma WR, basalt, Tres Marias basalt, Pinacate Volcanic Field
UAKA 84-84 Field no.: DJL 840304 Loc. code: Pin Quad.: Volcan el Elegante (Mexico)
Lat. 31 59.22' Lon.113 23.61' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): .247 Ar (atmospheric): 98.6% K: 1.162%
Basalt from "head of fan" flow, presumably related to Tres Marias flow and/or cone
Project affiliation: D.J. Lynch/UofA Refs.:

0.15 +/- .019 Ma WR, basalt, Elegante basalt, Pinacate Volcanic Field
UAKA 76-101 Field no.: Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 51.12' Lon.113 23.5' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): .264 Ar (atmospheric): 89.2% K: 1.019%
Basalt of north rim flow, contemporaneous with the Elegante eruption
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

0.19 +/- .035 Ma WR, basalt, Elegante basalt, Pinacate Volcanic Field
UAKA 84-85 Field no.: 830201 Loc. code: Pin Quad.: Volcan el Elegante (Mexico)
Lat. 31 58.85' Lon.113 27.19' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): .285 Ar (atmospheric): 95.5% K: .848%
Basalt flow west of Elegante
Project affiliation: D.J. Lynch/UofA Refs.:

0.20 +/- .05 Ma WR, basalt, MacDougal maar basalt, Pinacate Volcanic Field
UAKA 79-100 Field no.: Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 58.9' Lon.113 37.57' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): .37 Ar (atmospheric): 94.6% K: 1.091%
Basalt dike on north rim of MacDougal maar. Intrusion was contemporaneous with emplacement of the tuff
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981; Lynch and others, 1993

0.34 +/- .07 Ma WR, basalt, Pinacate basalt, Pinacate Volcanic Field
UAKA 79-181 Field no.: Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 45.87' Lon.113 39.2' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): .687 Ar (atmospheric): 95.5% K: 1.162%
Basalt; south side of CC4639, source of the flow disrupted by Moon Crater
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

0.41 +/- .041 Ma WR, basalt, Pinacate basalt, Pinacate Volcanic Field
UAKA 77-43 Field no.: DJL 77-01-27 Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 46.28' Lon.113 29.49' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): .564 Ar (atmospheric): 94.8% K: .793%
Rootless baslt flow in eroded agglutinate cone that lies between Pinacate Peak and Carnegie flow
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

0.43 +/- .06 Ma GM, basalt, Elegante basalt, Pinacate Volcanic Field
UAKA 79-116 Field no.: Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 50.7' Lon.113 22.8' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): .702 Ar (atmospheric): 94.13% K: .931%
Flow-banded basalt dike
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

0.46 +/- .05 Ma WR, basalt, Crater Elegante basalt, Pinacate Volcanic Field
UAKA 76-120 Field no.: PIN 05AB Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 50.7' Lon.113 22.8' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): .365 Ar (atmospheric): 89.56% K: .462%
Sample from north chill margin of the vent within 50cm of contact
Basalt vent sectioned by Elegante steam blast eruption
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

0.46 +/- .12 Ma WR, basalt, Crater Elegante basalt, Pinacate Volcanic Field
UAKA 76-121 Field no.: PIN 11B Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 50.7' Lon.113 22.8' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): .558 Ar (atmospheric): 95.81% K: .693%
Sample from 10m north of vent (dike) contact
Basalt of oldest exposed flow in Crater Elegante. Flow cut by dike of UAKA 76-120
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

0.47 +/- .029 Ma WR, basalt, Pinacate basalt, Pinacate Volcanic Field
UAKA 77-44 Field no.: DJL 77-01-32 Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 32 4.08' Lon.113 40.82' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): 1.01 Ar (atmospheric): 80.73% K: 1.227%
Sample from eroded end of westernmost lava flow from northwest Hilltop volcano, in stream 0.75 km N of Hwy 2
Basalt flow of Hilltop volcanism surrounding Pinacate Field on north and east
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

0.66 +/- .058 Ma WR, basalt, Pinacate basalt, Pinacate Volcanic Field
UAKA 79-107 Field no.: Loc. code: Pin Quad.: Ajo 1x2
Lat. 32 2.71' Lon.113 28.38' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): 1.36 Ar (atmospheric): 86% K: 1.194%
Basalt of CC 6128A, exposed in raod cut 5.8 km west of Los Vidrios
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

0.75 +/- .019 Ma WR, trachyte, Santa Clara volcano, Pinacate Volcanic Field
UAKA 77-42 Field no.: DJL 77-01-26 Loc. code: Pin Quad.: Sonoyta AMS
Lat. 31 46.3' Lon.113 29.8' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): 4.57 Ar (atmospheric): 65.45% K: 3.515%
Sample from south end of trachyte wall that forms east side of the summit cone
Trachyte from partially buried summit of Santa Clara volcano
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

0.86 +/- .029 Ma WR, basalt, Santa Clara volcano, Pinacate Volcanic Field
UAKA 79-103 Field no.: DJL 78-03-18 Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 45.95' Lon.113 27.29' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): 1.73 Ar (atmospheric): 75.49% K: 1.158%
Basalt flow DU42; covers east flank south of FL517, Santa Clara volcano
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

1.01 +/- .03 Ma WR, basalt, Pinacate basalt, Pinacate Volcanic Field
UAKA 79-105 Field no.: Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 49.42' Lon.113 39.43' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): 3.08 Ar (atmospheric): 70.5% K: 1.757%
Massive basalt plug
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

1.05 +/- .25 Ma WR, basalt, Pinacate basalt, Pinacate Volcanic Field
UAKA 79-101 Field no.: Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 44.55' Lon.113 41.14' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): 1.4 Ar (atmospheric): 93.15% K: .772%
Basalt of Papago Tank, west flank
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

1.07 +/- .08 Ma WR, trachyte, Santa Clara volcano, Pinacate Volcanic Field
UAKA 79-102 Field no.: DJL 78-03-04 Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 46.19' Lon.113 28.47' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): 6.19 Ar (atmospheric): 68.2% K: 3.338%
Massive gray porphyritic trachyte from ridge crest above the 716 spatter vent
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

1.10 +/- .03 Ma WR, basalt, Pinacate basalt, Pinacate Volcanic Field
UAKA 79-104 Field no.: Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 48.7' Lon.113 38.5' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): 3.51 Ar (atmospheric): 50.47% K: 1.839%
Basalt of west peidmont, flow exposed in stream channel
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

1.13 +/- .03 Ma WR, trachyte, Santa Clara volcano, Pinacate Volcanic Field
UAKA 79-110 Field no.: DJL 79-04-40 Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 47.1' Lon.113 29.7' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): 4.72 Ar (atmospheric): 35.1% K: 2.402%
Trachyte flow forming platform at north end of BHR ridge, caps angular unconformity
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981; Lynch and others, 1993

1.14 +/- .03 Ma WR, trachyte, Santa Clara volcano, Pinacate Volcanic Field
UAKA 79-111 Field no.: Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 46.2' Lon.113 27.11' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): 7.97 Ar (atmospheric): 55.8% K: 4.025%
Trachyte exposed on the upper part of the east piedmont
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981; Lynch and others, 1993

1.18 +/- .05 Ma WR, trachyte, Santa Clara volcano, Pinacate Volcanic Field
UAKA 79-109 Field no.: DJL 79-04-37 Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 46.87' Lon.113 29.62' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): 4.59 Ar (atmospheric): 67.65% K: 2.234%
Trachyte from lowest of northward dippng flows beneath Bighorn Ridge
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

1.19 +/- .06 Ma WR, basalt, Santa Clara volcano, Pinacate Volcanic Field
UAKA 79-115 Field no.: Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 46.4' Lon.113 27.45' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): 1.48 Ar (atmospheric): 80.5% K: .718%
Mugearite of lowest flow in small canyon north of Lava Canyon
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

1.23 +/- .03 Ma WR, trachyte, Santa Clara volcano, Pinacate Volcanic Field
UAKA 79-114 Field no.: Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 46.5' Lon.113 27.65' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): 8.85 Ar (atmospheric): 42.8% K: 4.149%
Trachyte of highest flow exposed in Lava Canyon
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

1.35 +/- .04 Ma WR, basalt, Snata Clara volcano, Pinacate Volcanic Field
UAKA 79-106 Field no.: Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 47.47' Lon.113 30.71' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): 6.28 Ar (atmospheric): 27% K: 2.675%
Basalt, northwest amphitheatre
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

1.45 +/- .03 Ma WR, basalt, Santa Clara volcano, Pinacate Volcanic Field
UAKA 79-112 Field no.: Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 46.08' Lon.113 27.7' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): 3.82 Ar (atmospheric): 67.1% K: 1.519%
Mugearite of second highest flow of Lava Canyon
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

1.55 +/- .3 Ma WR, basalt, Sierra Blanca basalt, Pinacate Volcanic Field
UAKA 84-80 Field no.: 84-03-12 Loc. code: Pin Quad.: Sierra Blanca (Mexico)
Lat. 31 32.8' Lon.113 27.81' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): 1.619 Ar (atmospheric): 95.6% K: .601%
Basalt flow, southern margin of eastern lobe, SW of Sierra Blanca. Aphyric flow, few phenocrysts
Project affiliation: W. Bull, D.J. Lynch/UofA Refs.:

1.70 +/- .04 Ma WR, basalt, Santa Clara volcano, Pinacate Volcanic Field
UAKA 79-113 Field no.: Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 46.08' Lon.113 27.71' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): 3.03 Ar (atmospheric): 64% K: 1.025%
Mugearite of lowest exposed flow of Lava Canyon
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981; Lynch and others, 1993

15.06 +/- .32 Ma WR, basalt, Puerto Penasco basalt, Pinacate Volcanic Field
UAKA 80-56 Field no.: DJL 80-05-03 Loc. code: Pin Quad.: Sonoyta 1x2
Lat. 31 15' Lon.113 32.8' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): 33.12 Ar (atmospheric): 24.9% K: 1.263%
Sample from quarry on old cone remnant east of harbor
Basalt from two cones nent to the Gulf at Puert Penasco. Both are "inboard" of the granodiorite of Cerro de la Cholla
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

Point of Pines area

21.53 +/- .46 Ma WR, andesite, Natanes Plateau andesite, Point of Pines area
UAKA 75-80 Field no.: Loc. code: Quad.: Point of Pines East
Lat. 33 18.17' Lon.109 43.27' T. 1 S. R. 26 E. Sec. unsurveyed Graham County AZ
40Ar* (picomoles/gram): 77.1 Ar (atmospheric): 18.01% K: 2.053%
Natanes Plateau on county highway to Point of Pines
Upper andesite, containing large phenocrysts of plagioclase
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & R.C. Berry/Princeton Refs.: See Berry, 1976

25.44 +/- .56 Ma Bio, tuff, Natanes Mt. tuff, Point of Pines area
UAKA 75-79 Field no.: Loc. code: Quad.: Point of Pines West
Lat. 33 17.85' Lon.109 44.27' T. 1 S. R. 25 E. Sec. unsurveyed Graham County AZ
40Ar* (picomoles/gram): 293.8 Ar (atmospheric): 28.35% K: 6.614%
Welded tuff, higher in section from UAKA 75-78. Contains black biotite and fresh sanidine
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & R.C. Berry/Princeton Refs.: See Berry, 1976

25.48 +/- .55 Ma Feld, tuff, Natanes Mt. tuff, Point of Pines area
UAKA 75-78 Field no.: Loc. code: Quad.: Point of Pines West
Lat. 33 17.87' Lon.109 45.27' T. 1 S. R. 25 E. Sec. unsurveyed Graham County AZ
40Ar* (picomoles/gram): 249.38 Ar (atmospheric): 4.04% K: 5.605%
Collected in Barlow Pass
Upper ash flow tuff with welded texture. Underlain and overlain by basaltic andesite
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & R.C. Berry/Princeton Refs.: See Berry, 1976

Prescott area

71.87 +/- 1.51 Ma Bio, qtz monzo, Copper Basin stock, Prescott area
UAKA 76-14 Field no.: JCCB-2; PHK5475 Loc. code: Quad.: Kirkland
Lat. 34 28.77' Lon.112 35.28' T. 13 N. R. 3 W. SW,NE Sec. 29 Yavapai County AZ
40Ar* (picomoles/gram): 932.22 Ar (atmospheric): 8.24% K: 7.332%
Sample collected fromwest side of Copper Basin wash, 2.3 km SSW of Skull Valley-Prescott Road
Quartz monzonite of Copper Basin stock, light gray, fine-grained, 7% pyrite and chalcopyrite
Project affiliation: J.L. Christman, P. Kuck, M. Shafiqullah/UofA Refs.:

Redington Pass

26.57 +/- .62 Ma Horn, lamprophyre, Piety Hill lamprophyre, Redington Pass
UAKA 84-33 Field no.: AWL-3-84 Loc. code: Quad.: Piety Hill
Lat. 32 21.2' Lon.110 32.01' T. 12 S. R. 18 E. Sec. 32 Pima County AZ
40Ar* (picomoles/gram): 24.69 Ar (atmospheric): 35.64% K: .532%
Post-deformational lamprophyre dike in Piety Hill
Project affiliation: A.W. Laughlin/Los Alamos Refs.:

Rincon Mountains

20.97 +/- .46 Ma Illite, gouge, Catalina Fault gouge, Rincon Mountains
UAKA 87-206 Field no.: Loc. code: Quad.: Tanque Verde Peak
Lat. 32 8.73' Lon.110 41' T. 15 S. R. 16 E. NW Sec. 11 Pima County AZ
40Ar* (picomoles/gram): 144.7 Ar (atmospheric): 18.7% K: 3.956%
Site north and east of Loma Alta access road
Illite, <0.1 um size, Catalina Fault gouge. Lower plate is crystalline rock, upper plate rocks are Paleozoic at site
Project affiliation: M. Shafiqullah, P.E. Damon/UofA & H.W. Peirce/ABGMT Refs.:

20.99 +/- .54 Ma Illite, gouge, Catalina Fault gouge, Rincon Mountains
UAKA 87-205 Field no.: Loc. code: Quad.: Tanque Verde Peak
Lat. 32 8.73' Lon.110 41.03' T. 15 S. R. 16 E. NW Sec. 11 Pima County AZ
40Ar* (picomoles/gram): 111.8 Ar (atmospheric): 13.6% K: 3.053%
Site north and east of Loma Alta access road
Illite, <0.1 um size, Catalina Fault gouge. Lower plate is crystalline rock, upper plate rocks are Cretaceous at site
Project affiliation: M. Shafiqullah, P.E. Damon/UofA & H.W. Peirce/ABGMT Refs.:

24.30 +/- .52 Ma WR, basalt, Happy Valley dike, Rincon Mountains
UAKA 74-83 Field no.: Loc. code: Quad.: Happy Valley
Lat. 32 11.5' Lon.110 28.2' T. 14 S. R. 18 E. Sec. 26 Pima County AZ
40Ar* (picomoles/gram): 88.2 Ar (atmospheric): 10.15% K: 2.079%
Basalt dike crosscutting pegmatite pod in deformed Wrong Mountain granite
Reported without analytical data in Reynolds and others, 1986
Project affiliation: E. Frost, G. Davis/UofA Refs.:

Rincon Valley

22.54 +/- .5 Ma WR, rhyolite, Pantano Formation, Rincon Valley
UAKA 75-164 Field no.: Loc. code: Quad.: Tanque Verde Peak
Lat. 32 8.1' Lon.110 41.53' T. 15 S. R. 16 E. SE Sec. 10 Pima County AZ
40Ar* (picomoles/gram): 228.6 Ar (atmospheric): 14.1% K: 5.813%
Large exotic block of rhyolite in deformed Pantano-Rillito conglomerate along Loma Alta Road
Project affiliation: H.W. Peirce/ABGMT Refs.:

Riverside Mountains (CA)

19.60 +/- .48 Ma Bio, rhyolite, Riverside Pass detachment, Riverside Mountains (CA)
UAKA 85-87 Field no.: RP-5 Loc. code: Quad.: Vidal
Lat. 34 1.35' Lon.114 35.5' T. 2 S. R. 23 E. SE,NW Sec. 8 Riverside County CA
40Ar* (picomoles/gram): 225.3 Ar (atmospheric): 26.6% K: 6.592%
Rhyolite dike along and synkinematic with the Whipple Mountain detachment fault in the western Riverside Mountains
Project affiliation: W.H. Wilkinson, M.D. Dennis/NICOR Mineral Ventures Refs.: See Carr and Dickey, 1980

Rose Peak area

23.96 +/- .51 Ma Sani, tuff, Red Mountain tuff, Rose Peak area
UAKA 75-69 Field no.: Loc. code: Quad.: Rose Peak
Lat. 33 27.16' Lon.109 17.6' T. 1 N. R. 29 E. Sec. unsurveyed Greenlee County AZ
40Ar* (picomoles/gram): 250.5 Ar (atmospheric): 2.65% K: 5.99%
Peralkaline tuff from plateau on Red Mountain
Project affiliation: P.E. Damon, M. Sahfiqullah, and others/UofA Refs.:

27.01 +/- .58 Ma Bio, rhyolite, 6K6 Ranch rhyolite tuff, Rose Peak area
UAKA 75-71 Field no.: Loc. code: Quad.: Rose Peak
Lat. 33 22.8' Lon.109 21.45' T. 1 S. R. 29 E. Sec. unsurveyed Greenlee County AZ
40Ar* (picomoles/gram): 335.5 Ar (atmospheric): 15.35% K: 7.11%
Rhyolite of Pine Flat - 6K6 Ranch dome complex
Project affiliation: P.E. Damon, M. Shafiqullah, and others/UofA Refs.:

28.08 +/- .6 Ma WR, andesite, 4 Bar Mesa andesite, Rose Peak area
UAKA 75-72 Field no.: Loc. code: Quad.: Pipestem Mountain
Lat. 33 20.47' Lon.109 20.73' T. 1 S. R. 29 E. Sec. unsurveyed Greenlee County AZ
40Ar* (picomoles/gram): 97.6 Ar (atmospheric): 10.4% K: 1.989%
Sample from road material quarry
Basaltic andesite capping conglomerate of 4 Bar Mesa. Conglomerate locally derived, presumably pre-Gila
Project affiliation: P.E. Damon, M. Shafiqullah, and others/UofA Refs.:

29.03 +/- .61 Ma Horn, latite, Hog Saddle latite, Rose Peak area
UAKA 75-68 Field no.: Loc. code: Quad.: Rose Peak
Lat. 33 24.7' Lon.109 21.45' T. 1 N. R. 29 E. Sec. unsurveyed Greenlee County AZ
40Ar* (picomoles/gram): 36.03 Ar (atmospheric): 21.43% K: .71%
Elevation 7100'
Hornblende biotite latite, interbedded with basaltic andesite.
Project affiliation: P.E. Damon, M. Shafiqullah, and others/UofA Refs.:

Ruby area

24.12 +/- .52 Ma Bio, qtz monzo, Ruby quartz monzonite, Ruby area
UAKA 80-51 Field no.: Loc. code: Quad.: Ruby
Lat. 31 27.1' Lon.111 14' T. 23 S. R. 11 E. SE Sec. 5 Santa Cruz County AZ
40Ar* (picomoles/gram): 47.38 Ar (atmospheric): 23.2% K: 1.125%
Sample from California Gulch, 160m downstream from diorite sample UAKA 80-50
Chloritized biotite from Sidewinder quartz monzonite; 30m wide dike cuts diorite porphyry pluton
Location approximate
Project affiliation: P.E. Damon, M.Shafiqullah/UofA & T. Shuiling, K. Black/Anaconda Copper Refs.:

65.48 +/- 1.23 Ma Horn, diorite, Ruby diorite, Ruby area
UAKA 80-50 Field no.: Loc. code: Quad.: Ruby
Lat. 31 27' Lon.111 14' T. 23 S. R. 11 E. SE Sec. 5 Santa Cruz County AZ
40Ar* (picomoles/gram): 78.51 Ar (atmospheric): 20.52% K: .679%
Overlain by Mid-Tertiary Montana Peak sequence. Sample from California Gulch, 1 mile SW of Ruby
Diorite porphyry, intrudes Cretaceous(?) sediments and Jurassic(?) volcanics. The pluton is cut by quartz monzonite dike (UAKA 80-51) and mineralized faults
Location approximate
Project affiliation: P.E. Damon, M.Shafiqullah/UofA & T. Shuiling, K. Black/Anaconda Copper Refs.:

Safford Basin

2.49 +/- .06 Ma GM, basalt, Black Point basalt, Safford Basin
UAKA 89-156 Field no.: 221BYL84 Loc. code: Pel Quad.: Geronimo
Lat. 33 6.46' Lon.110 5' T. 4 S. R. 22 E. Sec. unsurveyed Graham County AZ
40Ar* (picomoles/gram): 9.263 Ar (atmospheric): 62.5% K: 2.142%
Sample from SE side of diatreme, on north side of Hwy 70, 3.3 miles NW of Geronimo
Basalt from diatreme that intrudes basin-fill sediments in the Safford basin
Project affiliation: B.B. Houser/USGS Refs.:

Salt River Canyon area

14.84 +/- .34 Ma GM, basalt, Black Mesa basalt, Salt River Canyon area
UAKA 83-92 Field no.: 259-Tb Loc. code: Quad.: Dagger Peak
Lat. 33 40.5' Lon.110 52.25' T. 4 N. R. 15 E. Sec. unsurveyed Gila County AZ
40Ar* (picomoles/gram): 28.68 Ar (atmospheric): 25.96% K: 1.11%
Basalt; directly overlies lakebed sediments
Project affiliation: J. Faulds/UofA Refs.: Faulds, 1986

14.84 +/- .35 Ma GM, basalt, Coon Creek basalt, Salt River Canyon area
UAKA 83-91 Field no.: 255-Tbi Loc. code: Quad.: Dagger Peak
Lat. 33 40' Lon.110 50.5' T. 4 N. R. 14 E. Sec. unsurveyed Gila County AZ
40Ar* (picomoles/gram): 30.19 Ar (atmospheric): 28.48% K: 1.168%
Sample from N30E trending dike, 1.3km long, 220m wide where Coon Creek cuts across dike
Basalt dike along Cherry Creek fault zone
Project affiliation: J. Faulds/UofA Refs.: Faulds, 1986

16.12 +/- .39 Ma WR, basalt, Little Butte basalt, Salt River Canyon area
UAKA 75-104 Field no.: Loc. code: Quad.: Haystack Butte
Lat. 32 42.5' Lon.110 40' T. Unsurveyed. R. . Sec. Gila County AZ
40Ar* (picomoles/gram): 28.5 Ar (atmospheric): 9.98% K: 1.015%
Sample caps tertiary gravel (Whitetail equivalent?) and appears to be concordant with surface which lies above Jones Water basalt
Grayish black basalt, aphanitic except 1% iddingsite after olivine to 1mm; non-vesicular
Project affiliation: D. Shakel/UofA Refs.:

16.24 +/- .54 Ma GM, basalt, Coon Creek basalt, Salt River Canyon area
UAKA 83-93 Field no.: 256-Tb (A) Loc. code: Quad.: Dagger Peak
Lat. 33 41' Lon.110 50.25' T. 4 N. R. 15 E. Sec. unsurveyed Gila County AZ
40Ar* (picomoles/gram): 24.13 Ar (atmospheric): 60.73% K: .853%
Basalt; directly underlies lakebed sediments
Project affiliation: J. Faulds/UofA Refs.: Faulds, 1986

San Manuel area

11.85 +/- .32 Ma Bio, tuff, San Manuel Formation, San Manuel area
UAKA 81-125 Field no.: Loc. code: Quad.: Mammoth
Lat. 32 39.68' Lon.110 40' T. 9 S. R. 16 E. SW,SW,NE Sec. 12 Pinal County AZ
40Ar* (picomoles/gram): 48.21 Ar (atmospheric): 52.49% K: 2.338%
Sample from south side of Cottonwood Wash, within 0.5 mile of San Manuel fault
Lenticular, white air-fall tuff bed within San Manuel formation
Project affiliation: W.R. Dickinson, G.H. Davis, J. Hansen, J. Quade/UofA Refs.:

Santa Catalina Mountains

27.46 +/- .7 Ma Bio, dacite, Santa Catalina dacite, Santa Catalina Mountains
UAKA 85-69 Field no.: BDG-10 Loc. code: Quad.: Mt. Bigelow
Lat. 32 29.9' Lon.110 40.7' T. 11 S. R. 16 E. NE,NE Sec. 11 Pima County AZ
40Ar* (picomoles/gram): 325.8 Ar (atmospheric): 35.66% K: 6.79%
Dacite
Project affiliation: Refs.:

46.15 +/- 10.45 Ma Garn, granite, Wilderness Granite, Santa Catalina Mountains
UAKA 71-21 Field no.: Loc. code: Quad.: Agua Caliente Hill
Lat. 32 20.3' Lon.110 41.4' T. 13 S. R. 16 E. Sec. unsurveyed Pima County AZ
40Ar* (picomoles/gram): 3.08 Ar (atmospheric): 93.7% K: .038%
Site near Molina Basin campground
Granite of Catalina Forerange
Reported in Reynolds and others, 1986 without analytical data. Generalized lat-lon
Project affiliation: P.E. Damon, M. Shafiqullah/UofA Refs.:

Santa Rita Mountains

22.96 +/- .48 Ma GM, rhyolite, Box Canyon rhyolite, Santa Rita Mountains
UAKA 80-28G Field no.: WSP-AGE-5 Loc. code: Quad.: Helvetia
Lat. 31 46.8' Lon.110 48' T. 19 S. R. 15 E. SW Sec. 15 Pima County AZ
40Ar* (picomoles/gram): 204.3 Ar (atmospheric): 25.2% K: 5.099%
Sample from center of 60 foot-wide dike
Rhyolite porphyry, Box Canyon dike swarm
Location approximate
Project affiliation: M.A. Koestel/Union Minerals Refs.:

23.91 +/- .52 Ma KSpar, rhyolite, Box Canyon rhyolite, Santa Rita Mountains
UAKA 80-28K Field no.: WSP-AGE-5 Loc. code: Quad.: Helvetia
Lat. 31 46.3' Lon.110 47.3' T. 19 S. R. 15 E. SW Sec. 15 Pima County AZ
40Ar* (picomoles/gram): 236.5 Ar (atmospheric): 36.4% K: 5.667%
Sample from center of 60 foot-wide dike
Rhyolite porphyry, Box Canyon dike swarm
Project affiliation: M.A. Koestel/Union Minerals Refs.:

49.21 +/- 1.03 Ma KSpar, aplite, Greaterville aplite, Santa Rita Mountains
UAKA 80-26K Field no.: WSP-AGE-2 Loc. code: Quad.: Helvetia
Lat. 31 46.5' Lon.110 47.5' T. 19 S. R. 15 E. center,NE Sec. 22 Pima County AZ
40Ar* (picomoles/gram): 450.1 Ar (atmospheric): 8.6% K: 5.203%
Small hill north of Melendrez Pass
Aplite; center of small plug intruding Precambrian Continental Granodiorite
Project affiliation: M.A. Koestel/Union Minerals Refs.:

50.38 +/- 1.05 Ma Ser, aplite, Greaterville aplite, Santa Rita Mountains
UAKA 80-26S Field no.: WSP-AGE-2 Loc. code: Quad.: Helvetia
Lat. 31 46.5' Lon.110 47.5' T. 19 S. R. 15 E. center,NE Sec. 22 Pima County AZ
40Ar* (picomoles/gram): 750.2 Ar (atmospheric): 12.3% K: 8.467%
Small hill north of Melendrez Pass
Aplite; center of small plug intruding Precambrian Continental Granodiorite
Project affiliation: M.A. Koestel/Union Minerals Refs.:

104.20 +/- 2.3 Ma GM, andesite, Fort Crittenden Formation, Santa Rita Mountains
UAKA 82-103 Field no.: Loc. code: Quad.: Mt. Wrightson
Lat. 31 40.3' Lon.110 45.45' T. 20 S. R. 15 E. Sec. unsurveyed Santa Cruz County AZ
40Ar* (picomoles/gram): 289.06 Ar (atmospheric): 5.8% K: 1.554%
Basaltic andesite cobble in Fort Crittenden conglomerate in Adobe canyon
Minimum age; source could be as old as Jurassic
Project affiliation: K.F. Inman/UofA Refs.: Inman, 1982; Inman, 1987

164.95 +/- 4 Ma Plag, dacite, Gardner Canyon dacite, Santa Rita Mountains
UAKA 85-336 Field no.: PED-3 Loc. code: Quad.: Mt. Wrightson
Lat. 31 43.75' Lon.110 46.17' T. 20 S. R. 15 E. Sec. unsurveyed Santa Cruz County AZ
40Ar* (picomoles/gram): 139.88 Ar (atmospheric): 17.33% K: .467%
Dacite on hill near Cave of the Bells
Project affiliation: P.E. Damon, S. May/UofA Refs.:

Secret Mountain area

5.09 +/- .11 Ma WR, basalt, Turkey Butte basalt, Secret Mountain area
UAKA 77-165 Field no.: Loc. code: Quad.: Sycamore Point
Lat. 35 1.93' Lon.111 54.19' T. 19 N. R. 5 E. NW,NE Sec. 18 Coconino County AZ
40Ar* (picomoles/gram): 8.29 Ar (atmospheric): 32.27% K: .937%
Sample near top of butte, elevation 7294'
Basalt with large phenocrysts of ol+plag. Basalt overlies or intrudes Kaibab
Project affiliation: H.W. Peirce/ABGMT & M. Shafiqullah/UofA Refs.:

13.02 +/- .38 Ma WR, basalt, Power Tank basalt, Secret Mountain area
UAKA 77-166 Field no.: Loc. code: Quad.: Sycamore Point
Lat. 35 .93' Lon.111 54.81' T. 19 N. R. 5 E. NW Sec. 19 Coconino County AZ
40Ar* (picomoles/gram): 8.52 Ar (atmospheric): 68.74% K: .376%
Basalt; overlies Kaibab and is below 30-40 feet of gravels
Project affiliation: H.W. Peirce/ABGMT & M. Shafiqullah/UofA Refs.:

Seneca area

21.69 +/- .5 Ma GM, andesite, Haystack Butte andesite, Seneca area
UAKA 81-90 Field no.: Loc. code: Quad.: Haystack Butte
Lat. 33 43.45' Lon.110 38.2' T. unsurveyed. R. . Sec. Gila County AZ
40Ar* (picomoles/gram): 66.91 Ar (atmospheric): 15.5% K: 1.768%
Gray basaltic andesite flow at summit of Haystack Butte
Project affiliation: M. Shafiquallh/UofA Refs.:

22.14 +/- .5 Ma GM, basalt, Haystack Butte basalt, Seneca area
UAKA 81-91 Field no.: Loc. code: Quad.: Haystack Butte
Lat. 33 43.3' Lon.110 38.3' T. unsurveyed. R. . Sec. Gila County AZ
40Ar* (picomoles/gram): 62.67 Ar (atmospheric): 22.2% K: 1.622%
Basalt, "pink" basal flow at SW edge of Haystack Butte, elevation 5600' [4600'??]
Sample location general
Project affiliation: M. Shafiqullah/UofA Refs.:

Sierra Ancha

20.17 +/- .49 Ma Bio, latite, Cherry Creek latite, Sierra Ancha
UAKA 83-94 Field no.: 257-Td Loc. code: Quad.: Dagger Peak
Lat. 33 42' Lon.110 49' T. 4 N. R. 15 E. Sec. unsurveyed Gila County AZ
40Ar* (picomoles/gram): 244.73 Ar (atmospheric): 39.45% K: 6.959%
Sample taken 0.5 mile due west of De Vore Spring
Ash-flow from southermost cliff exposure immediately west of Digger Rach road
Project affiliation: J. Faulds/UofA Refs.: Faulds, 1986

Sierra Prieta

77.03 +/- 1.6 Ma Bio, qtz latite, Copper Creek porphyry, Sierra Prieta
UAKA 76-117 Field no.: Loc. code: Quad.: Wilhoit
Lat. 34 27.5' Lon.112 31' T. 13 N. R. 3 W. SE Sec. 36 Yavapai County AZ
40Ar* (picomoles/gram): 960.2 Ar (atmospheric): 7.91% K: 7.036%
Sample from outcrop in roadcut, SE side of Hwy 89, 7 miles SW of Prescott
Quartz latite porhpyry dike, post-mineral phase of Cu-Mo porhyry, 4 miles SE of Copper Basin
Project affiliation: J.A. Hennessy/Cities Services Minerals Refs.:

77.69 +/- 1.64 Ma Bio, granodiorite, Copper Creek granodiorite, Sierra Prieta
UAKA 76-104 Field no.: Loc. code: Quad.: Wilhoit
Lat. 34 27.01' Lon.112 31.33' T. 12.5 N. R. 3 W. NE Sec. 25 Yavapai County AZ
40Ar* (picomoles/gram): 956.41 Ar (atmospheric): 5.47% K: 6.947%
Sample from drill core at depth 435-465'
Secondary biotite in a Precambrian granodiorite associated with a porphyry Cu-Mo occurrence
Lat-Lon and section given in lab notes do not match
Project affiliation: J.A. Hennessy/Cities Services Minerals Refs.:

78.81 +/- 1.7 Ma Bio, qtz latite, Copper Creek porphyry, Sierra Prieta
UAKA 76-103 Field no.: Loc. code: Quad.: Wilhoit
Lat. 34 27.11' Lon.112 31.23' T. 12.5 N. R. 3 W. NE Sec. 25 Yavapai County AZ
40Ar* (picomoles/gram): 1016 Ar (atmospheric): 27.94% K: 7.273%
Rock is in porphyry copper-type occurrence 4 miles SE of Copper Basin. Sample from 2000' NE of the larger mass of intrusive and center of mineralization
Quartz latite porphyry associated with copper and moly mineralization. Sample from drill core, 220-290' depth. Rock is dike intrusive into Precambrian granodiorite
Lat-Lon and section given in lab notes do not match
Project affiliation: J.A. Hennessy/Cities Services Minerals Refs.:

Sierrita Mountains

51.00 +/- 1.2 Ma GM, rhyolite, Red Boy rhyolite, Sierrita Mountains
UAKA 85-64 Field no.: KR-3 Loc. code: Quad.: Twin Buttes
Lat. 31 52.7' Lon.111 12.23' T. 18 S. R. 11 E. SW,NE Sec. 10 Pima County AZ
40Ar* (picomoles/gram): 196.1 Ar (atmospheric): 11.91% K: 2.186%
Red Boy Rhyolite
Date anomalously low for Red Boy Rhyolite
Project affiliation: L. Anthony, S.R. Titley/UofA Refs.:

58.18 +/- 1.4 Ma Bio, latite, Sierrita quartz latite dike, Sierrita Mountains
UAKA 85-63 Field no.: QL-2 Loc. code: Quad.: Twin Buttes
Lat. 31 53.65' Lon.111 7.4' T. 18 S. R. 12 E. SE,NW Sec. 4 Pima County AZ
40Ar* (picomoles/gram): 732 Ar (atmospheric): 9.5% K: 7.139%
Quartz latite/aplite dike
Project affiliation: L. Anthony, S.R. Titley/UofA Refs.:

Silver Bell Mountains

25.31 +/- .6 Ma Bio, andesite, El Tiro andesite dike, Silver Bell Mountains
UAKA 84-45 Field no.: 5-2-84-3 Loc. code: Quad.: Silver Bell West
Lat. 32 25.14' Lon.111 31.92' T. 12 S. R. 8 E. SE,NW,NW Sec. 4 Pima County AZ
40Ar* (picomoles/gram): 330.8 Ar (atmospheric): 14% K: 7.484%
Sample from north wall of El Tiro pit, at the final toe of the 2590 bench
Post-mineral (hypogene) andesite dike, 3m wide, N25W across El Tiro pit
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D. Sawyer/USGS Refs.:

63.77 +/- 1.6 Ma Bio, qtz monzonite, Oxide Pit quartz monzonite, Silver Bell Mountains
UAKA 84-46 Field no.: 5-2-84-4, 835-OX-1A Loc. code: Quad.: Silver Bell West
Lat. 32 23.83' Lon.111 30.3' T. 12 S. R. 8 E. NE,SW,SE Sec. 11 Pima County AZ
40Ar* (picomoles/gram): 752.2 Ar (atmospheric): 7.5% K: 6.683%
Sample from west wall of Oxide pit, on ramp down to 2420 level
Quartz monzonite porphyry, potassically altered core
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D. Sawyer/USGS Refs.:

63.78 +/- 1.49 Ma Bio, qtz monzonite, El Tiro quartz monzonite, Silver Bell Mountains
UAKA 84-44 Field no.: 5-2-84-2; SB-ET-5 Loc. code: Quad.: Silver Bell West
Lat. 32 24.91' Lon.111 31.72' T. 12 S. R. 8 E. SW,NE Sec. 4 Pima County AZ
40Ar* (picomoles/gram): 761.5 Ar (atmospheric): 5.4% K: 6.764%
Sample from south wall of El Tiro pit, 2550 bench, 100 feet west of UAKA 84-43. Mine coordinates 35880N, 17000E
Quartz monzonite porphyry, main phase, potassicaly altered
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D. Sawyer/USGS Refs.:

63.95 +/- 1.47 Ma Bio, alaskite, Silver Bell dike, Silver Bell Mountains
UAKA 74-92B Field no.: SB-2 Loc. code: Quad.: Silver Bell West
Lat. 32 25' Lon.111 34' T. 12 S. R. 7 E. Sec. [6?] Pima County AZ
40Ar* (picomoles/gram): 774.43 Ar (atmospheric): 7.5% K: 6.86%
Exact location not given; west of El Tiro pit
Alaskite (?) dike
Project affiliation: P. Sigler/ASARCO & P.E. Damon/UofA Refs.:

64.88 +/- 1.48 Ma Bio, qtz monzonite, El Tiro quartz monzonite, Silver Bell Mountains
UAKA 84-43 Field no.: 5-2-84-1 Loc. code: Quad.: Silver Bell West
Lat. 32 24.89' Lon.111 31.7' T. 12 S. R. 8 E. SW,NE Sec. 4 Pima County AZ
40Ar* (picomoles/gram): 821 Ar (atmospheric): 8.7% K: 7.167%
Sample from south wall of El Tiro pit, at the final toe of the 2550 bench. Mine coordinates 35870N, 17120E
Biotite-rich quartz monzinite porphyry from core of potassically altered zone, youngest mineralized phase
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D. Sawyer/USGS Refs.:

68.72 +/- 1.5 Ma KSpar, alaskite, Silver Bell dike, Silver Bell Mountains
UAKA 74-92K Field no.: SB-2 Loc. code: Quad.: Silver Bell West
Lat. 32 25' Lon.111 35' T. 12 S. R. 7 E. Sec. [6?] Pima County AZ
40Ar* (picomoles/gram): 1160.88 Ar (atmospheric): 6% K: 9.557%
Exact location not given; west of El Tiro pit
Alaskite (?) dike
Project affiliation: P. Sigler/ASARCO & P.E. Damon/UofA Refs.:

Skull Valley

11.73 +/- .26 Ma WR, basalt, Skull Valley basalt, Skull Valley
UAKA 76-27 Field no.: JCCB-09 Loc. code: Quad.: Iron Springs
Lat. 34 39.65' Lon.112 39.2' T. 15 N. R. 4 W. SE,NW Sec. 11 Yavapai County AZ
40Ar* (picomoles/gram): 25.3 Ar (atmospheric): 36.1% K: 1.24%
The basalt overlies the projected fault line to the north
Basalt; appears to overlie gravels and caps small rolling hills. The gravels are in foult contact with Precambrian(?) granite
Project affiliation: M. Shafiqullah, P. Kuck, J. Christman, K. Coyner/UofA Refs.:

17.03 +/- .38 Ma WR, basalt, Skull Valley basalt, Skull Valley
UAKA 76-28a Field no.: JCCB-08 Loc. code: Quad.: Kirkland
Lat. 34 25.78' Lon.112 40.47' T. Unsurveyed. R. . Sec. Yavapai County AZ
40Ar* (picomoles/gram): 22.55 Ar (atmospheric): 33.09% K: .76%
Sampled at eastern end of canyon
Basalt; overlies poorly soorted agglomerate tuff. The beds appear to dip 10-20E
Project affiliation: M. Shafiqullah, P. Kuck, J. Christman, K. Coyner/UofA Refs.:

Southern Peloncillo Mountains -NM

34.45 +/- .8 Ma Bio, tuff, Black Mountain tuff, Southern Peloncillo Mountains -NM
UAKA 85-346 Field no.: W-85-25 Loc. code: Pel Quad.: Skull Canyon
Lat. 31 43.92' Lon.109 .17' T. 29 S. R. 21 W. SW,SE,SW Sec. 32 Hidalgo County NM
40Ar* (picomoles/gram): 430.54 Ar (atmospheric): 26.67% K: 7.139%
Sample from Post Office Canyon, just west of a NE-SW fault, south of Miller Ranch
Tuff of Black Mtn., fill of proposed Rodeo caldera
Project affiliation: J. Faulds, W.E. Elston, C.R. Bryan/UMN Refs.:

Springerville Volcanic Field

6.86 +/- .51 Ma WR, basalt, Amos Mountain baslt, Springerville Volcanic Field
UAKA 73-82 Field no.: 5 Loc. code: Quad.: Indian Pine
Lat. 34 2.5' Lon.109 57' T. 8 N. R. 23 E. Sec. [31?] Navajo County AZ
40Ar* (picomoles/gram): 16.45 Ar (atmospheric): 84.2% K: 1.38%
Sample from 7200' elevation, 2 miles south of Amos Mountain
Flat-lying basalt overlying poorly exposed rim gravels and Cretaceous sandstone
Lat-Lon does not match verbal location
Project affiliation: H.W. Peirce/ABGMT & M. Shafiqullah/UofA Refs.:

Steeple Rock area (New Mexico)

31.28 +/- .67 Ma Horn, andesite, Virden dacite, Steeple Rock area (New Mexico)
UAKA 79-118 Field no.: ASU-1 Loc. code: Quad.: Duncan NE
Lat. 32 54.8' Lon.109 2.15' T. 16 S. R. 21 W. NE,SW Sec. 17 Grant County NM
40Ar* (picomoles/gram): 33.27 Ar (atmospheric): 35.27% K: .608%
Sample from south of road up Wampoo Wash, 1 mile south of Twin Peaks
Andesite porphyry. This rock unit is host for most of the alteration/mineralization in the Steeple Rock district
Project affiliation: D. Wahl, R. Wilson/ASU Refs.: Wahl, 1980

Swisshelm Mountains

33.17 +/- .76 Ma GM, andesite, Swisshelm quartz andesite, Swisshelm Mountains
UAKA 82-181 Field no.: Loc. code: Quad.: Swisshelm Mountain
Lat. 31 39.59' Lon.109 31.15' T. 20 S. R. 28 E. NE Sec. 30 Cochise County AZ
40Ar* (picomoles/gram): 116.67 Ar (atmospheric): 20.22% K: 2.01%
Andesite from familty of late mafic dikes
Project affiliation: R.S. Gillette/UofA Refs.: Gillette, 1983

34.59 +/- .8 Ma Bio, rhyolite, Swisshelm rhyolite, Swisshelm Mountains
UAKA 83-139 Field no.: SWAD-4 Loc. code: Quad.: Swisshelm Mountain
Lat. 31 42.51' Lon.109 32.12' T. 20 S. R. 27 E. SE Sec. 1 Cochise County AZ
40Ar* (picomoles/gram): 451.6 Ar (atmospheric): 19% K: 7.457%
Rhyolite crystal vitric tuff, NE Swisshelm Mountains
Project affiliation: R. Gillette/UofA Refs.: Gillette, 1983

34.65 +/- .8 Ma Bio, rhyolite, Swisshelm rhyolite, Swisshelm Mountains
UAKA 83-136 Field no.: SWAD-1 Loc. code: Quad.: Swisshelm Mountain
Lat. 31 39.18' Lon.109 30.25' T. 20 S. R. 28 E. NE Sec. 32 Cochise County AZ
40Ar* (picomoles/gram): 403.4 Ar (atmospheric): 13.8% K: 6.649%
Rhyolite flow is SE Swisshelm Mountains
Project affiliation: R. Gillette/UofA Refs.: Gillette, 1983

35.42 +/- .82 Ma Musc, quartz latite, Swisshelm quartz latite, Swisshelm Mountains
UAKA 82-180 Field no.: Loc. code: Quad.: Swisshelm Mountain
Lat. 31 40.08' Lon.109 31.11' T. 20 S. R. 28 E. NE Sec. 30 Cochise County AZ
40Ar* (picomoles/gram): 499.71 Ar (atmospheric): 14.67% K: 8.057%
Quartz-feldspar porphyry dike along N-S thrust
Project affiliation: R.S. Gillette/UofA Refs.: Gillette, 1983

36.64 +/- .8 Ma Musc, latite, Swisshelm latite, Swisshelm Mountains
UAKA 83-138b Field no.: SWAD-5 Loc. code: Quad.: Swisshelm Mountain
Lat. 31 40' Lon.109 36.1' T. 20 S. R. 28 E. NE Sec. 30 Cochise County AZ
40Ar* (picomoles/gram): 539.7 Ar (atmospheric): 19.5% K: 8.408%
Quartz latite dike, strikes N-S, locally intrudes thrust fault, SE Swisshelm Mountians
Project affiliation: R. Gillette/UofA Refs.: Gillette, 1983

37.19 +/- .8 Ma GM, andesite, Swisshelm andesite, Swisshelm Mountains
UAKA 83-137 Field no.: SWAD-3 Loc. code: Quad.: Swisshelm Mountain
Lat. 31 39.77' Lon.109 31' T. 20 S. R. 28 E. NE Sec. 30 Cochise County AZ
40Ar* (picomoles/gram): 239.3 Ar (atmospheric): 6% K: 3.673%
Andesite from a family of late mafic dikes in eastern Swisshelm Mountains
Project affiliation: R. Gillette/UofA Refs.: Gillette, 1983

Sycamore Canyon

15.08 +/- .4 Ma GM, basalt, Hickey Volcanics, Sycamore Canyon
UAKA 91-70 Field no.: APR 91-10 Loc. code: Quad.: Sycamore Basin
Lat. 34 53.83' Lon.112 2.02' T. unsurveyed. R. . Sec. Yavapai County AZ
40Ar* (picomoles/gram): 16.46 Ar (atmospheric): 46.5% K: .627%
Basal olivine basalt flow in 7-flow sequence capping Black Mountain
Project affiliation: D. Nations, A, Potochnic/NAU Refs.:

Table Top Mountains

70.18 +/- 1.48 Ma Ser, qtz porphyry, Indian Butte quartz porphyry, Table Top Mountains
UAKA 77-153 Field no.: Loc. code: Quad.: Indian Butte
Lat. 32 50.59' Lon.112 6.15' T. 7 S. R. 2 E. Sec. 1 Pinal County AZ
40Ar* (picomoles/gram): 1021.12 Ar (atmospheric): 3.82% K: 8.229%
Sericite from Indian Butte quartz porphyry
Project affiliation: J.L. Christman/Exxon Refs.:

77.79 +/- 1.59 Ma Bio, qtz porphyry, Indian Butte quartz porphyry, Table Top Mountains
UAKA 77-152 Field no.: Loc. code: Quad.: Indian Butte
Lat. 32 48.17' Lon.112 5.32' T. 7 S. R. 3 E. NW Sec. 19 Pinal County AZ
40Ar* (picomoles/gram): 861.3 Ar (atmospheric): 10.53% K: 6.248%
Quartz porphyry of Indian Butte
Project affiliation: J.L. Christman/Exxon Refs.:

Tanque Verde Ridge

22.79 +/- .5 Ma KSpar, granite, Catalina Fault, Tanque Verde Ridge
UAKA 80-32K Field no.: Loc. code: Quad.: Tanque Verde Peak
Lat. 32 14.48' Lon.110 40.87' T. 14 S. R. 16 E. W center Sec. 2 Pima County AZ
40Ar* (picomoles/gram): 417.3 Ar (atmospheric): 13.6% K: 10.492%
Sample from exposure in wash near Tanque Verde Ranch
Pegmatitic granite forming the footwall of Catalina fault
Project affiliation: H.W. Peirce/ABGMT Refs.:

24.93 +/- .6 Ma Musc, granite, Catalina Fault, Tanque Verde Ridge
UAKA 80-32M Field no.: Loc. code: Quad.: Tanque Verde Peak
Lat. 32 14.58' Lon.110 40.87' T. 14 S. R. 16 E. W center Sec. 2 Pima County AZ
40Ar* (picomoles/gram): 378.3 Ar (atmospheric): 21.4% K: 8.69%
Sample from exposure in wash near Tanque Verde Ranch
Pegmatitic granite forming footwall of Catalina Fault; muscovite coexisting with K-spar
Project affiliation: H.W. Peirce/ABGMT Refs.:

26.42 +/- .6 Ma WR, dacite, Pantano Formation, Tanque Verde Ridge
UAKA 75-97 Field no.: Loc. code: Quad.: Tanque Verde Peak
Lat. 32 14.5' Lon.110 41.12' T. 14 S. R. 16 E. NW,NW,SW Sec. 2 Pima County AZ
40Ar* (picomoles/gram): 141.4 Ar (atmospheric): 8.8% K: 3.064%
Dacite clast from a deformed conglomerate in hanging wall of Catalina Fault. No gneissic cobbles in conglomerate
Project affiliation: H.W. Peirce/ABGMT Refs.:

Tinajas Altas Mtns. (Mexico)

8.39 +/- .89 Ma WR, basalt, Mesa de Malpais basalt, Tinajas Altas Mtns. (Mexico)
UAKA 77-41 Field no.: DJL 77-01-33 Loc. code: Pin Quad.: Ajo 1x2
Lat. 32 7.4' Lon.113 51.8' T. N/A. R. . Sec. n/a County Son
40Ar* (picomoles/gram): 3.85 Ar (atmospheric): 88.52% K: .264%
Basalt flow on westernmost basalt-capped mesa within 100m of Mexico Hwy 2
Recollection of UAKA 76-100, reported in Shafiqullah and others, 1980
Project affiliation: D.J. Lynch/UofA Refs.: Lynch, 1981

Tonto Basin

18.55 +/- .56 Ma Bio, tuff, Punkin Center tuff, Tonto Basin
UAKA 87-20 Field no.: TB-20 Loc. code: Quad.: Kayler Butte
Lat. 33 53' Lon.111 19' T. 6 N. R. 10 E. SW,SE Sec. 3 Gila County AZ
40Ar* (picomoles/gram): 212.94 Ar (atmospheric): 74.56% K: 6.586%
Top of measured section #5, butte 0.8 mile NW of Punkin Center
Water laid tuff
Lat-Lon approximate
Project affiliation: BuRec Refs.:

27.16 +/- .6 Ma GM, basalt, Reed Gulch basalt, Tonto Basin
UAKA 91-29 Field no.: SPL1-31-91-1 Loc. code: Quad.: Kayler Butte
Lat. 33 59.25' Lon.111 19.97' T. 8 N. R. 10 E. SE,SE,SE Sec. 33 Gila County AZ
40Ar* (picomoles/gram): 273.22 Ar (atmospheric): 1.69% K: 5.758%
Basalt-capped ridge on SW side of Reed Gulch
Basalt, stratgraphically lowest basalt, interbedded with gravels of basin-fill, north end of Tonto Basin
Project affiliation: D. Brumbraugh, D. Nations/NAU Refs.:

1055.32 +/- 24.6 Ma Horn, andesite, City Creek andesite, Tonto Basin
UAKA 80-60 Field no.: PED-MAZ 1 Loc. code: Quad.: North Peak
Lat. 34 11.69' Lon.111 28.58' T. 10 N. R. 9 E. Sec. unsurveyed Gila County AZ
40Ar* (picomoles/gram): 450.12 Ar (atmospheric): 6.21% K: .181%
Sample from small knob on south side of City Creek
Andesite, appears to be a flow within foliated green chlorite unit that overlies volcanic breccia, lower member of City Creek formation
Project affiliation: Bill Hobbs/NAU Refs.: Hobbs, 1982

Toroweap Valley

0.64 +/- .022 Ma GM, basalt, Toroweap basalt, Toroweap Valley
UAKA 89-51 Field no.: #2 Loc. code: Quad.: Mt. Trumbull NE
Lat. 36 25.98' Lon.113 3.12' T. 35 N. R. 7 W. NW Sec. 16 Mohave County AZ
40Ar* (picomoles/gram): 1.786 Ar (atmospheric): 67.89% K: 1.621%
Basalt, offset by Toroweap Fault
Project affiliation: G. Jackson/UofA Refs.:

Tortilita Mountains

23.97 +/- .6 Ma GM, andesite, Owl Head andesite, Tortilita Mountains
UAKA 85-70 Field no.: BDG-8 Loc. code: Quad.: Desert Peak
Lat. 32 34.83' Lon.111 7.55' T. 10 S. R. 12 E. NE Sec. 8 Pinal County AZ
40Ar* (picomoles/gram): 279 Ar (atmospheric): 12.55% K: 6.669%
Sample from bulldozer cut on southernmost peak of Owl Head Buttes
Andesite of basalt Tertiary unit
Project affiliation: Refs.:

Tortilla Mountains

30.36 +/- .83 Ma Bio, tuff, San Manuel Formation, Tortilla Mountains
UAKA 82-134 Field no.: Loc. code: Quad.: Kearny
Lat. 33 2.07' Lon.110 59.46' T. 4 S. R. 13 E. SE,SW Sec. 35 Pinal County AZ
40Ar* (picomoles/gram): 317.72 Ar (atmospheric): 52.54% K: 5.985%
Air-fall tuff in middle part of sequence in Ripsey Wash
Compare with other dates in Dickinson and Shafiqullah, 1989
Project affiliation: W.R. Dickinson/UofA Refs.:

Tucson Basin

11.63 +/- .3 Ma WR, rhyolite, Tucson Basin fill, Tucson Basin
UAKA 74-85 Field no.: Loc. code: Quad.: Tucson SE
Lat. 32 4.15' Lon.110 50.1' T. 16 S. R. 15 E. NE,SW Sec. 5 Pima County AZ
40Ar* (picomoles/gram): 80.58 Ar (atmospheric): 27% K: 3.982%
Exxon exploratory hole #3311, depth 7890-7930 feet
Rhyolite at top of volcanic sequence and interbedded volcanics and sediments, underlain by conglomerate and andesitic basalts
Project affiliation: H.W. Peirce/ABGMT & Exxon (Humble Oil) Refs.:

20.80 +/- .3 Ma WR, andesite, Tucson Basin fill, Tucson Basin
UAKA 74-86 Field no.: Loc. code: Quad.: Tucson SE
Lat. 32 5' Lon.110 51' T. 16 S. R. 15 E. NE,SW Sec. 5 Pima County AZ
40Ar* (picomoles/gram): 95.25 Ar (atmospheric): 12.2% K: 2.626%
Exxon exploratory hole #3311, depth 9990-10,030 feet
Andesite drill chips from basal volcanics overlying conglomerate, shale, and plutonic rocks. Overlain by conglomerate
Project affiliation: H.W. Peirce/ABGMT & Exxon (Humble Oil) Refs.:

21.66 +/- .5 Ma WR, andesite, Pantano Formation, Tucson Basin
UAKA 75-98 Field no.: Loc. code: Quad.: Sabino Canyon
Lat. 32 19.35' Lon.110 50.57' T. 13 S. R. 15 E. SE,SW Sec. 6 Pima County AZ
40Ar* (picomoles/gram): 89.76 Ar (atmospheric): 27.3% K: 2.375%
Sample from "Whaleback" (mouth of Ventana Canyon), from southern part of bold hump
Basaltic andesite clast in Rillito-Pantano fm conglomerate
Project affiliation: H.W. Peirce/ABGMT Refs.:

24.90 +/- .62 Ma GM, andesite, Martinez Hill andesite, Tucson Basin
UAKA 85-417 Field no.: Loc. code: Quad.: Tucson SW
Lat. 32 5.2' Lon.110 59.2' T. 15 S. R. 13 E. NW,NE,NW Sec. 35 Pima County AZ
40Ar* (picomoles/gram): 73.16 Ar (atmospheric): 15.05% K: 1.683%
Basaltic andesite drill chips, well SX-16, depth 612 feet (volcanic flows 600 - 800 feet)
Lat-Lon approximate
Project affiliation: S.R. Anderson/USGS-WRD Refs.:

27.02 +/- .6 Ma Musc, gneiss, Pantano Formation clast, Tucson Basin
UAKA 80-30 Field no.: Loc. code: Quad.: Sabino Canyon
Lat. 32 19.4' Lon.110 50.97' T. 13 S. R. 15 E. SE,SW Sec. 6 Pima County AZ
40Ar* (picomoles/gram): 403.9 Ar (atmospheric): 39.1% K: 8.555%
The clasts are imbricated, with an northerly source. Sample from the "Whaleback" (mouth of Ventana Canyon)
Catalina augen gneiss, lineated and foliated. The clast is from Rillito-Pantano beds which strike N45W and dip 22SE
Project affiliation: H.W. Peirce/ABGMT Refs.:

27.08 +/- .63 Ma GM, dacite, Martinez Hill andesite, Tucson Basin
UAKA 85-418 Field no.: Loc. code: Quad.: Tucson SW
Lat. 32 5.2' Lon.110 59.2' T. 15 S. R. 13 E. NW,NE,NW Sec. 35 Pima County AZ
40Ar* (picomoles/gram): 111.2 Ar (atmospheric): 14.8% K: 2.35%
Basaltic andesite drill chips, well SX-16, depth 798 feet (volcanic flows 600 - 800 feet)
Lat-Lon approximate
Project affiliation: S.R. Anderson/USGS-WRD Refs.:

1440.52 +/- 30 Ma Bio, granite, Pantano Formation clast, Tucson Basin
UAKA 80-31 Field no.: Loc. code: Quad.: Sabino Canyon
Lat. 32 19.42' Lon.110 50.97' T. 13 S. R. 15 E. SE,SW Sec. 6 Pima County AZ
40Ar* (picomoles/gram): 6821 Ar (atmospheric): 1.6% K: 1.784%
Sample from north cliff of the "Whaleback"
Chloritized biotite from equigranular granite clast in Rillito-Pantano conglomerate
Project affiliation: H.W. Peirce/ABGMT Refs.:

Verde Valley

0.72 +/- .25 Ma Horn, dacite, Verde Formation dacite, Verde Valley
UAKA 82-97 Field no.: W80HM1 Loc. code: Quad.: Horner Mountain
Lat. 34 29.53' Lon.111 51.15' T. 13 N. R. 5 E. NW Sec. 29 Yavapai County AZ
40Ar* (picomoles/gram): 4.99 Ar (atmospheric): 67.3% K: 4%
Sample from 0.3 mile N of North Mine Spring
Dacite within Verde Formation
Project affiliation: P.E. Damon/UofA & E.W. Wolf, G.E. Ulrich/USGS Refs.:

5.46 +/- .18 Ma WR, basalt, Verde Formation basalt, Verde Valley
UAKA 80-61 Field no.: PED V-1 Loc. code: Quad.: Casner Butte
Lat. 34 40.28' Lon.111 44.5' T. 15 N. R. 6 E. SE,SE,SE Sec. 19 Yavapai County AZ
40Ar* (picomoles/gram): 8.73 Ar (atmospheric): 71.08% K: .921%
Sample from ridge 400m west of USFS road 119
Basalt flow interbedded with lacustrine/fluvial sediments of Verde Formation
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D. Nations, R. Hevly/NAU Refs.:

5.66 +/- .17 Ma WR, basalt, Verde Formation basalt, Verde Valley
UAKA 80-62 Field no.: PED V-2 Loc. code: Quad.: Lake Montezuma
Lat. 34 40.58' Lon.111 46.54' T. 15 N. R. 5 E. SE,NE,NE Sec. 23 Yavapai County AZ
40Ar* (picomoles/gram): 7.02 Ar (atmospheric): 70.95% K: .714%
Sample from ridge on SW side of Hog Canyon
Basalt flow interbedded with lacustrine/fluvial sediments of Verde Formation
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D. Nations, R. Hevly/NAU Refs.:

13.18 +/- .36 Ma GM, basalt, House Mountain basalt, Verde Valley
UAKA 87-188 Field no.: Loc. code: Quad.: Page Springs
Lat. 34 47' Lon.111 53' T. 16 N. R. 4 E. SW,NE,NE Sec. 14 Yavapai County AZ
40Ar* (picomoles/gram): 13.86 Ar (atmospheric): 66.82% K: .604%
Base of Tertiary basalt exposed in Oak Creek
Lat-Lon approximate
Project affiliation: D. Nations, W. Ranney/NAU Refs.: Ranney, 1988

14.54 +/- .33 Ma GM, basalt, House Mountain basalt, Verde Valley
UAKA 87-184 Field no.: Loc. code: Quad.: Sedona
Lat. 34 46' Lon.111 50' T. 16 N. R. 5 E. SE Sec. 20 Yavapai County AZ
40Ar* (picomoles/gram): 27.6 Ar (atmospheric): 34.42% K: 1.09%
Basalt from southeast peak of House Mountain volcanic complex, elevation 5029'
Lat-Lon approximate
Project affiliation: D. Nations, W. Ranney/NAU Refs.: Ranney, 1988

Virgin River area

0.26 +/- .021 Ma WR, basalt, Virgin River basalt, Virgin River area
UAKA 74-116 Field no.: Loc. code: Quad.: Hurricane
Lat. 37 9.52' Lon.113 23.62' T. 42 S. R. 14 W. center Sec. 2 Washington County UT
40Ar* (picomoles/gram): .433 Ar (atmospheric): 84.45% K: .975%
Terrace of Virgin River along Hwy 17 west of Berry Springs
Basalt on terrace of Virgin River, from boundary between Hawaiite and alkalic basalt
Project affiliation: P.E. Damon/UofA Refs.:

0.26 +/- .78 Ma WR, basalt, Virgin River basalt, Virgin River area
UAKA 74-115 Field no.: 2 Loc. code: Quad.: Hurricane
Lat. 37 10.03' Lon.113 22.55' T. 42 S. R. 14 W. N center Sec. 1 Washington County UT
40Ar* (picomoles/gram): .372 Ar (atmospheric): 95.85% K: .822%
Sample from boundary between Hawaiin tholeiite and alkali basalt
Basalt flow on terrace of Virgin River
Project affiliation: P.E. Damon/UofA Refs.:

Wagoner area

12.71 +/- .3 Ma GM, basalt, Milk Creek basalt, Wagoner area
UAKA 89-151 Field no.: Loc. code: Quad.: Battleship Butte
Lat. 34 17.75' Lon.112 29.6' T. 11 N. R. 2 W. SE,NW Sec. 17 Yavapai County AZ
40Ar* (picomoles/gram): 10.24 Ar (atmospheric): 53.29% K: .463%
Basalt flow within lowest member of the Milk Creek sequence within the Walnut Grove basin fill
Project affiliation: B. Watson, J. Aiken/US Borax Refs.:

Weaver Mountains

69.05 +/- 1.6 Ma Clay, gouge, Yarnell granite fault gouge, Weaver Mountains
UAKA 90-54 Field no.: Loc. code: Quad.: Yarnell
Lat. 34 12.4' Lon.112 44.95' T. 10 N. R. 5 W. NE,SW,SW Sec. 14 Yavapai County AZ
40Ar* (picomoles/gram): 665.8 Ar (atmospheric): 5.95% K: 5.455%
Gouge from mineralized fault in Yarnell Granite at Yarnell mine. Fault strikes N45E, dips35NW
Project affiliation: J. Malusa/ASARCO Refs.: See Miller and others, 1991; Page and others, 1994

1694.20 +/- 43 Ma Plag, diabase, Weaver Mountains diabase, Weaver Mountains
UAKA 90-73P Field no.: Loc. code: Quad.: Weaver Peak
Lat. 34 18.5' Lon.111 51.42' T. 11 N. R. 6 W. NW Sec. 11 Yavapai County AZ
40Ar* (picomoles/gram): 867.4 Ar (atmospheric): 1.8% K: .178%
Diabase, intrudes Precambrian Weaver Granite. Fracture zones and diabase strike N80W, dip10NW, elevation 4160'
Project affiliation: R.W. Clayton/USC Refs.:

1754.92 +/- 43 Ma Horn, diabase, Weaver Mountains diabase, Weaver Mountains
UAKA 90-73H Field no.: Loc. code: Quad.: Weaver Peak
Lat. 34 18.5' Lon.111 51.42' T. 11 N. R. 6 W. NW Sec. 11 Yavapai County AZ
40Ar* (picomoles/gram): 1086 Ar (atmospheric): 2.6% K: .211%
Diabase, intrudes Precambrian Weaver Granite. Fracture zones and diabase strike N80W, dip10NW, elevation 4160'
Project affiliation: R.W. Clayton/USC Refs.:

Western Grand Canyon

5.24 +/- .26 Ma Horn, andesite, 202 Mile dikes, Western Grand Canyon
UAKA 86-200 Field no.: #6 Loc. code: Quad.: Whitmore Point
Lat. 36 2.75' Lon.113 21.8' T. unsurveyed. R. . Sec. Mohave County AZ
40Ar* (picomoles/gram): 7.21 Ar (atmospheric): 60.5% K: .793%
Site about 2 miles N of Spring Canyon
Basalt from 4-foot wide dike trending NW
Project affiliation: K. Wenrich, G.H. Billingsley/USGS Refs.: Wenrich and others, 1995

6.33 +/- .16 Ma GM, basalt, Parashant dikes, Western Grand Canyon
UAKA 86-105 Field no.: #5 Loc. code: Quad.: Whitmore Point
Lat. 36 11.3' Lon.113 18.83' T. 32 N. R. 10 W. SW,SE,NW Sec. 12 Mohave County AZ
40Ar* (picomoles/gram): 13.62 Ar (atmospheric): 43.13% K: 1.238%
Site about 1 mile NW of Shults Spring
Basalt dike, 4 feet wide, protrudes 10 feet above surface
Project affiliation: K. Wenrich, G.H. Billingsley/USGS Refs.: Wenrich and others, 1995

8.20 +/- .1 Ma GM, basalt, Price Point basalt, Western Grand Canyon
UAKA 88-48 Field no.: #11 Loc. code: Quad.: Price Point
Lat. 35 59.2' Lon.113 25.25' T. 30 N. R. 11 W. SW,NE,NW Sec. 24 Mohave County AZ
40Ar* (picomoles/gram): 12.85 Ar (atmospheric): 27.07% K: .902%
Basalt, basal flow at Price Point
Lat-Lon taken from UofA file map with sample location plotted; Lat-Lon in Wenrich and others does not plot at same location
Project affiliation: G.H. Billingsley/USGS Refs.: Wenrich and others, 1995

9.19 +/- .13 Ma GM, basalt, Fort Garrett basaslt, Western Grand Canyon
UAKA 88-50 Field no.: #13 Loc. code: Quad.: Bat Cave
Lat. 36 6.42' Lon.113 46.83' T. 31 N. R. 14 W. NE,NW,NW Sec. 10 Mohave County AZ
40Ar* (picomoles/gram): 10.51 Ar (atmospheric): 23.91% K: .658%
Basalt dike, SW of Fort Garrett Point, Upper Grand Wash Cliffs, elevation 5000'
Project affiliation: G.H. Billingsley/USGS Refs.: Wenrich and others, 1995

15.25 +/- .24 Ma GM, basalt, Grapevine basalt, Western Grand Canyon
UAKA 88-51 Field no.: #14 Loc. code: Quad.: Grapevine Canyon
Lat. 35 53.95' Lon.113 53.65' T. 29 N. R. 15 W. SE,NW,SE Sec. 16 Mohave County AZ
40Ar* (picomoles/gram): 59.27 Ar (atmospheric): 56.81% K: 2.232%
Top of volcanic vent on the Buck and Doe Road to Bat tower overlook
Basalt flow at Grapevine Canyon
Lat-Lon taken from UofA file map with sample location plotted; Lat-Lon in Wenrich and others does not plot at same point (also, there cannot be 75 seconds in a minute)
Project affiliation: G.H. Billingsley/USGS Refs.: Wenrich and others, 1995

17.43 +/- .3 Ma GM, basalt, Grand Pipe basalt, Western Grand Canyon
UAKA 88-49 Field no.: #12 Loc. code: Quad.: Columbine Falls
Lat. 36 6.93' Lon.113 52.67' T. unsurveyed. R. . Sec. Mohave County AZ
40Ar* (picomoles/gram): 58.41 Ar (atmospheric): 49.48% K: 1.923%
Basalt from small vent on ring fracture, south side of Grand Pipe, Sanup Plateau, elevation 4600'
Project affiliation: G.H. Billingsley/USGS Refs.: Wenrich and others, 1995

19.03 +/- .44 Ma GM, basalt, Separation Hill basalt, Western Grand Canyon
UAKA 86-205 Field no.: #8 Loc. code: Quad.: Separation Canyon
Lat. 35 47.2' Lon.113 35.83' T. 28 N. R. 12 W. SW,NW Sec. 29 Mohave County AZ
40Ar* (picomoles/gram): 113.73 Ar (atmospheric): 14.08% K: 3.429%
Basalt from base of flow that caps small hill (BM 4936) of Tertiary gravel
Project affiliation: K. Wenrich, G.H. Billingsley/USGS Refs.: Wenrich and others, 1995

Whetstone Mountains

96.68 +/- 2.4 Ma Illite, mudstone, Turney Ranch mudstone, Whetstone Mountains
UAKA 86-16 Field no.: WTR-1 Loc. code: Quad.: Apache Peak
Lat. 31 47' Lon.110 30' T. 19 S. R. 18 E. Sec. 15 Pima County AZ
40Ar* (picomoles/gram): 300.2 Ar (atmospheric): 32.5% K: 1.743%
Illite from mudstone near Turney Ranch
Lat-Lon approximate
Project affiliation: W.R. Dickinson, M. Klute/UofA Refs.:

97.73 +/- 2.2 Ma Illite, mudstone, Apache Canyon mudstone, Whetstone Mountains
UAKA 86-15 Field no.: WAC-2 Loc. code: Quad.: Apache Peak
Lat. 31 48' Lon.110 27' T. 19 S. R. 18 E. Sec. 1 Pima County AZ
40Ar* (picomoles/gram): 872.5 Ar (atmospheric): 12% K: 5.01%
Illite from black mudstone in Apache Canyon
Lat-Lon approximate
Project affiliation: W.R. Dickinson, M. Klute/UofA Refs.:

White Mountains

9.83 +/- .21 Ma WR, latite, Mt. Baldy volcanics, White Mountains
UAKA 75-77 Field no.: Loc. code: Quad.: Hawley Lake East
Lat. 33 59.6' Lon.109 43' T. 7 N. R. 25 E. Sec. unsurveyed Apache County AZ
40Ar* (picomoles/gram): 38.4 Ar (atmospheric): 19.14% K: 2.246%
Site 0.51 km N13W from SE part of Earl PeakTank
Lowest member of Mt. Baldy volcanics [no rock description given]
Location general
Project affiliation: P.E. Damon, M. Shafiqullah /UofA & R.C. Berry/Princeton Refs.: See Berry, 1976

White River area

0.60 +/- .1 Ma WR, basalt, White River basalt, White River area
UAKA 73-77 Field no.: 8 Loc. code: Quad.: White River
Lat. 33 49' Lon.109 58.75' T. 5 N. R. 22 E. NW Sec. 24 Navajo County AZ
40Ar* (picomoles/gram): .98 Ar (atmospheric): 93.85% K: .948%
Sample at bridge on White River, elevation 5120', south of town of White River
Basalt
Project affiliation: H.W. Peirce/ABGMT & M. Shafiqullah/UofA Refs.:

3.25 +/- .08 Ma WR, basalt, White River basalt, White River area
UAKA 73-74 Field no.: 7 Loc. code: Quad.: White River
Lat. 33 50.17' Lon.109 58.75' T. 5 N. R. 22 E. SE corner Sec. 11 Navajo County AZ
40Ar* (picomoles/gram): 4.85 Ar (atmospheric): 43.6% K: .86%
Sample is from the cliff on the road to the radio tower at elevation 6000'
Basalt, overlies rim-type gravel which overlies Apache member of Supai and caps hills near radio facility at White River
Project affiliation: H.W. Peirce/ABGMT & M. Shafiqullah/UofA Refs.:

24.76 +/- .48 Ma GM, basalt, Trout Creek basalt, White River area
UAKA 87-185 Field no.: Loc. code: Quad.: McNary
Lat. 34 .47' Lon.109 47.47' T. 7 N. R. 24 E. NE,NE Sec. 15 Apache County AZ
40Ar* (picomoles/gram): 86.5 Ar (atmospheric): 8.79% K: 2.001%
Basalt from stratigraphically lowest flow in volcaniclastic section overlying Mogollon Rim gravels
Project affiliation: A. Potochnic/UofA Refs.: Potochnic, 1989

37.51 +/- .8 Ma Bio, tuff, Trout Creek tuff, White River area
UAKA 87-5 Field no.: Loc. code: Quad.: McNary
Lat. 34 .99' Lon.109 48.05' T. 7 N. R. 24 E. NE,SW Sec. 10 Apache County AZ
40Ar* (picomoles/gram): 370.2 Ar (atmospheric): 17.66% K: 5.632%
Air-fall tuff intercallated in upper part of "rim" gravels
Project affiliation: A. Potochnic/UofA Refs.: Potochnic, 1989

37.58 +/- .8 Ma Bio, tuff, Deep Creek tuff, White River area
UAKA 87-4 Field no.: Loc. code: Quad.: Corn Creek Plateau
Lat. 33 51' Lon.109 46.43' T. unsurveyed. R. . Sec. Apache County AZ
40Ar* (picomoles/gram): 451.31 Ar (atmospheric): 4.4% K: 6.854%
Sample from about 200m up canyon from Deep Creek quarry
Mid-basal section of the Mid-Tertiary volcaniclastic sequence in east-central AZ. Tuff is intercalated in upper portion of an erosional scarp
Project affiliation: A. Potochnic/UofA Refs.: Potochnic, 1989

Whitlock Mountains

16.23 +/- .34 Ma GM, basalt, Whitlock Mts. basalt, Whitlock Mountains
UAKA 78-90G Field no.: PEL-9 Loc. code: Pel Quad.: Whitlock Mts. NE
Lat. 32 42.29' Lon.109 22.41' T. 8 S. R. 29 E. SE,NE,SE Sec. 28 Graham County AZ
40Ar* (picomoles/gram): 44.78 Ar (atmospheric): 17.03% K: 1.584%
Sample from hill on north edge of Whitlock Mountains
Youngest basaltic andesite in Whitlock Mountains
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #A on Richter and others, 1981

16.56 +/- .4 Ma Plag, basalt, Whitlock Mts. basalt, Whitlock Mountains
UAKA 78-90P Field no.: PEL-9 Loc. code: Pel Quad.: Whitlock Mts. NE
Lat. 32 42.29' Lon.109 22.41' T. 8 S. R. 29 E. SE,NE,SE Sec. 28 Graham County AZ
40Ar* (picomoles/gram): 9.78 Ar (atmospheric): 28.5% K: .339%
Sample from hill on north edge of Whitlock Mountains
Youngest basaltic andesite in Whitlock Mountains
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #A on Richter and others, 1981

22.85 +/- .49 Ma WR, basalt, Whitlock Mts. basalt, Whitlock Mountains
UAKA 78-87 Field no.: PEL-6 Loc. code: Pel Quad.: Whitlock Mts. NE
Lat. 32 31.78' Lon.109 17.04' T. 8 S. R. 30 E. SW,SW,SW Sec. 33 Graham County AZ
40Ar* (picomoles/gram): 103.15 Ar (atmospheric): 14.97% K: 2.587%
Basalt from hills at north end of Whitlock Valley
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #B on Richter and others, 1981

24.86 +/- .5 Ma Bio, rhyolite, Powerline Pass rhyolite, Whitlock Mountains
UAKA 78-76 Field no.: 78-DR-75 Loc. code: Pel Quad.: Dry Mountain
Lat. 32 38.07' Lon.109 24.15' T. 9 S. R. 29 E. NE,NW,SW Sec. 20 Graham County AZ
40Ar* (picomoles/gram): 208.33 Ar (atmospheric): 11.35% K: 4.8%
Biotite-bearing , flow-banded rhyolite from dome/flow complex in central Whitlock Mts
Latitude incorrect in Reynolds and others, 1986, sample #R81:D
Project affiliation: D.H. Richter/USGS Refs.: #D on Richter and others, 1981

25.60 +/- .5 Ma WR, andesite, Javelina Peak basalt, Whitlock Mountains
UAKA 78-86 Field no.: PEL-5 Loc. code: Pel Quad.: Whitlock Cienega
Lat. 32 33.67' Lon.109 22.04' T. 10 S. R. 29 E. SW,NE,SW Sec. 15 Graham County AZ
40Ar* (picomoles/gram): 100.47 Ar (atmospheric): 24.4% K: 2.247%
Basaltic andesite from small hill SE of Javelina Peak
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #E on Richter and others, 1981

25.89 +/- .6 Ma WR, andesite, Javelina Peak andesite, Whitlock Mountains
UAKA 78-85 Field no.: PEL-4 Loc. code: Pel Quad.: Javelina Peak
Lat. 32 34.88' Lon.109 23.72' T. 10 S. R. 29 E. NE,SW,NE Sec. 8 Graham County AZ
40Ar* (picomoles/gram): 94.83 Ar (atmospheric): 20.77% K: 2.097%
Sample from near top of Javelina Peak, just below top flow
Basaltic andesite
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #F on Richter and others, 1981

26.76 +/- .5 Ma GM, andesite, Javelina Peak andesite, Whitlock Mountains
UAKA 78-82G Field no.: PEL-1 Loc. code: Pel Quad.: Javelina Peak
Lat. 32 33.37' Lon.109 23.68' T. 10 S. R. 29 E. SE,NE,SE Sec. 17 Graham County AZ
40Ar* (picomoles/gram): 167.67 Ar (atmospheric): 29.3% K: 3.586%
Turkey track basaltic andesite at base of section, south of Javelina Peak, elevation 3440'
Project affiliation: P.E. Damon, M. Shafiqullah/UofA & D.H. Richter/USGS Refs.: #G on Richter and others, 1981

28.71 +/- .6 Ma Plag, andesite, Javelina Peak andesite, Whitlock Mountains
UAKA 78-82P Field no.: PEL-1 Loc. code: Pel Quad.: Javelina Peak
Lat. 32 33.37' Lon.109 23.68' T. 10 S. R. 29 E. SE,NE,SE Sec. 17 Graham County AZ
40Ar* (picomoles/gram): 50.49 Ar (atmospheric): 31.2% K: 1.006%
Turkey track basaltic andesite at base of section, south of Javelina Peak, elevation 3440'
Project affiliation: D.H. Richter/USGS Refs.: #G on Richter and others, 1981

Wickenburg Mountains

12.34 +/- .3 Ma Sani, rhyolite, Calamity Wash rhyolite, Wickenburg Mountains
UAKA 87-123 Field no.: J-85 Loc. code: Quad.: Wickenburg
Lat. 33 59.5' Lon.112 41.25' T. 8 N. R. 4 W. SE Sec. 32 Maricopa County AZ
40Ar* (picomoles/gram): 83.62 Ar (atmospheric): 25.47% K: 3.893%
Rhyolite vitrophyre, represents first rhyolite flow erupted in area
Project affiliation: S. Reynolds, J. Stimac/ABGMT Refs.:

References cited

Berry, R.C., 1976, Mid-Tertiary volcanic history and petrology of the White Mountains volcanic province, southeastern Arizona: Princeton University, unpublished Ph.D. dissertation, 317 p.

Carr, W.J., and Dickey, D.D., 1980, Geologic map of the Vidal, California, and Parker SW, California-Arizona quadrangles: U.S. Geological Survey Miscellaneous Investigations Series Map I-1125, scale1:24,000.

Doe, M.F., 1991, Structural geology of a proterozoic foreland thrust-system in the vicinity of Barnhardt Canyon, central Mazatzal Mountains, central Arizona: Northern Arizona University unpublished M.S. thesis, 91 p.

Doorn, P.L., 1989, Geologic and gravimetric investigations of the Carefree Basin, Maricopa County, Arizona: Arizona State University unpublished M.S. thesis, 306 p.

Doorn, P.L., and Pewe, T.L., 1991, Geologic and gravimetric investigations of the Carefree Basin, Maricopa County, Arizona: Arizona Geological Survey Special Paper 8, 187 p.

Faulds, J.E., 1986, Tertiary geologic history of the Salt River Canyon region, Gila County, Arizona: University of Arizona unpublished M.S. thesis, 319 p.

Gillette, R.S., 1983, Geology and mineralization of the east-central and southeastern Swisshelm Mountains, Cochise County, Arizona: University of Arizona unpublished M.S. thesis, 94 p.

Goodlin, T.C., 1985, Stratigraphic and structural relations of the area south of Hot Springs Canyon, Galiuro Mountains, Arizona: University of Arizona unpublished M.S. thesis, 101 p.

Goodlin, T.C., and Mark, R.A., 1987, Tectonic implications of stratigraphy and structure of Cretaceous rocks and overlying mid-Tertiary cover in Hot Springs Canyon, Galiuro Mountains, southeastern Arizona, *in* Dickinson, W.R., and Klute, M.A., eds., Mesozoic rocks of southern Arizona and adjacent areas: Arizona Geological Society Digest Volume 18, p. 177-188.

Grover, J.A., 1982, The geology of the Teran Basin, Cochise County, Arizona: University of Arizona unpublished M.S. thesis, 73 p.

Hamblin, W.K., 1994, Late Cenozoic lava dams in the Grand Canyon: Geological Society of America Memoir 183, 139 p.

Harding, L.E., 1982, Tectonic significance of the McCoy Mountains Formation, southeastern California and Southwestern Arizona: University of Arizona unpublished Ph.D. dissertation, 197 p.

Harwood, R.D., 1989, Cinder cone breaching events at Strawberry and O'Neill Craters, San Francisco Volcanic Field area: Northern Arizona University unpublished M.S. thesis, 104 p.

Hobbs, W.H., 1982, The geology of the City Creek area, Gila County, Arizona: Northern Arizona University unpublished M.S. thesis, 94 p.

Holm, R.F., 1988 Geologic map of San Francisco Mountain, Eldon Mountain, and Dry Lake Hills, Coconino County, Arizona: U.S. Geological Survey Miscellaneous Investigations Series Map I-1663, scale 1:24,000.

Houser, B.B., 1987, Geologic map of the Alma quadrangle, Catron County, New Mexico: U.S. Geological Survey Geologic Quadrangle Map GQ-1610, scale 1:24,000.

Houser, B.B., 1994, Geology of the Late Cenozoic Alma Basin, New Mexico and Arizona, *in* Chamberlin, R.M., Kues, B.S., Cather, S.M., Barker, J.M., and McIntosh, W.C., eds., Mogollon Slope, west-central New Mexico and east-central Arizona: New Mexico Geological Society 45th Field Conference Guidebook, p. 121-124.

Houser, B.B., Richter, D.H., and Shafiqullah, M., 1985, Geologic map of the Safford quadrangle, Graham County, Arizona: U.S. Geological Survey Miscellaneous Investigations Series Map I-1617, scale 1:48,000.

Howard, K.A., Nielson, J.E., Wilshire, H.G. Nakata, J.K., Goodge, J.W., Reneau, B.E., and Hansen, V.L., 1990, Preliminary geologic map of the Mohave Mountains area, Mohave County, western Arizona: U.S. Geological Survey Open File Report 90-684, scale 1:48,000.

Inman, K.F., 1982, Depositional environments and sandstone petrography of Upper Cretaceous sedimentary rocks, Adobe Canyon, Santa Rita Mountains, southeast Arizona: University of Arizona unpublished M.S. thesis, 41 p.

Inman, K.F., 1987, Depositional environments and sandstone petrography of Cretaceous sedimentary rocks, Adobe Canyon, Santa Rita Mountains, southeastern Arizona, in Dickinson, W.R., and Klute, M.A., eds., Mesozoic rocks of southern Arizona and adjacent areas: Arizona Geological Society Digest 18, p. 301-314.

Jagiello, K.J., 1987, Structural evolution of the Phoenix Basin, Arizona: Arizona State University unpublished M.S. thesis, 157 p.

Johnson, G.S., 1981, The geology and geochronology of the northern Picacho Mountains, Pinal County, Arizona: University of Arizona unpublished M.S. thesis, 65 p.

Kluth, C.F., 1974, Geology of the Eldon Mountain area, Coconino County, Arizona: Northern Arizona University unpublished M.S. thesis, 89 p.

Koutz, F.L., 1974, The Hardshell silver, base-metal, manganese oxide deposit, Patagonia Mountains, Santa Cruz County, Arizona in Wilkins, J., Jr., ed., Gold and silver deposits of the Basin and Range Province, western U.S.A.: Arizona Geological Society Digest 15, p. 199-217.

Lang, J.R., 1991, Isotopic and geochemical characteristics of Laramide igneous rocks in Arizona: University of Arizona unpublished Ph.D. dissertation, 201 p.

Lynch, D.J., 1981, Genesis and geochronology of alkaline volcanism in the Pinacate Volcanic Field, northwestern Sonora, Mexico: University of Arizona unpublished Ph.D. dissertation, 248 p.

Lynch, D.J., Musselman, T.E., Gutman, J.T, and Patchett, P.J., 1993, Isotopic evidence for the origin of Cenozoic volcanic rocks in the Pinacate Volcanic Field, northwestern Mexico: Lithos, v. 29, nos. 3/4, p. 295-302.

Mark, R.A., 1985, Structural and sedimentary geology of the area north of Hot Springs Canyon, southern Galiuro Mountains, Cochise County, Arizona: University of Arizona unpublished M.S. thesis, 96 p.

Miller, M.A., Page, T.C., and Sell, J.D, 1991, Geology and mineralization at the Yarnell gold deposit, Yavapai County, Arizona, in Karlstrom, K.E., Proterozoic Geology and ore deposits of Arizona: Arizona Geological Society Digest 19, p. 301-308.

Mills, J.G., Jr., 1994, Geologic map of the Hoover Dam quadrangle, Arizona and Nevada: Nevada Bureau of Mines and Geology Map 102, scale 1:24,000.

Moore, R.B., and Wolfe, E.W., 1987, Geologic map of the east part of the San Francisco Volcanic field, north-central Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-1960, scale 1:50,000.

Nason, P.W., Shaw, A.V., and Aveson, K.D., 1982, Geology of the Poston Butte porphyry copper deposit, in Titley, S.R., ed., Advances in geology of the porphyry copper deposits, southwestern North America: Tucson, University of Arizona Press, p. 375-385.

Newhall, C.G, Ulrich, G.E., and Wolfe, E.W., 1987, Geologic map of the southwest part of the San Francisco Volcanic Field, north-central Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-1958, scale 1:50,000.

Page, T.C., Miller, M.A., Gibson, P.C., and Sell, J.D., 1994, Geology and geochemistry of the Yarnell gold deposit: Mining Engineering, v. 46, no. 9, p. 1061-1064.

Potochnic, A.R., 1989, Depositional styles and tectonic implications of the Mogollon Rim formation: University of Arizona unpublished M.S. thesis, 62 p.

Ranney, W., 1988, Geologic history of the House Mountain area, Yavapai County, Arizona: Northern Arizona University unpublished M.S. thesis, 94 p.

Reynolds, S.J., Florence, F.P., Welty, J.W., Roddy, M.S., Currier, D.A., Anderson, A.V., and Keith, S.B., 1986, Compilation of radiometric age determination in Arizona: Arizona Bureau of Geology and Mineral Technology Bulletin 197, 258 p.

Richter, D.H., Shafiqullah, M., and Lawrence, V.A., 1981, Geologic map of the Whitlock Mountains and vicinity, Graham County, Arizona: U.S. Geological Survey Miscellaneous Investigations Series Map I-1302, scale 1:24,000.

Richter, D.H., Houser, B.B., and Damon, P.E., 1983, Geologic map of the Guthrie quadrangle, Graham and Greenlee Counties, Arizona: U.S. Geological Survey Miscellaneous Investigations Series Map I-1455, scale 1:48,000.

Richter, D.H., Lawrence, V.A., Drewes, H., Young, T.H., Enders, M.S., Damon, P.E., and Thorman, C.H., 1990, Geologic map of the San Simon quadrangle and parts of the Summit Hills and Mondel quadrangles, Cochise, Graham, and Greenlee Counties, Arizona, and Hidalgo County, New Mexico: U.S. Geological Survey Miscellaneous Investigations Series Map I-1951, scale 1:48,000.

Shafiqullah, M., Damon, P.E., Lynch, D.J., Reynolds, S.J., Rehrig, W.A., and Raymond, R.H., 1980, K-Ar geochronology and geologic history of southwestern Arizona and adjacent areas, in Jenny, J.P., and Stone, C., eds., Studies in western Arizona: Arizona Geological Society Digest Volume 12, p. 201-260.

Smith, E.I., 1984, Geologic map of the Boulder Beach quadrangle, Nevada: Nevada Bureau of Mines and Geology Map 81, scale 1:24,000.

Ulrich, G.E., and Bailey, N.G., 1987, Geologic map of the S P Mountain part of the San Francisco Volcanic Field, north-central Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF- 956, scale 1:50,000.

Vedder, L.K., 1984, Stratigraphic relationship between the late Jurassic Canelo Hills volcanics and the Glance Conglomerate, southeastern Arizona: University of Arizona unpublished M.S. thesis, 129 p.

Wahl, D.E., Jr., 1980, Mid-Tertiary volcanic geology in parts of Greenlee County, Arizona, Grant and Hidalgo Counties, New Mexico: Arizona State University unpublished Ph.D. dissertation, 147 p.

Weisman, M.K., and Weir, G.W., 1990, Geologic map of the Pine 7.5' quadrangle, Coconino and Gila Counties, Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-2123, scale 1:24,000.

Wenrich, K,J., Billingsley, G.H., and Blackerby, B.A., 1995, Spatial migration and compositional changes of Miocene-Quaternary magmatism in the western Grand Canyon: Journal of Geophysical Research, v. 100, no. B6, p. 10,417-10,440.

Wolfe, E.W., Ulrich, G.E., Holm, R.F., Moore, R.B., and Newhall, C.G., 1987, Geologic map of the central part of the San Francisco Volcanic Field, north-central Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-1959, scale 1:50,000.□

APPENDIX 1

Bibliography of Published Dates for Arizona, 1985-1995

Alibert, C., Michard, A., and Albarede, F., 1986, Isotopic and trace element geochemistry of Colorado Plateau volcanics: Geochimica et Cosmochimica Acta, v. 50, no. 12, p. 2735-2750.

Anderson, L.W., Piety, L.A., and Hansen, R.A., 1986, Seismotectonic investigation, Stewart Mountain Dam, Salt River Project, Arizona: U.S. Bureau of Reclamation Seismotectonic Report 86-2, 67 p.

Anderson, L.W., Piety, L.A., and LaForge, R.C., 1987, Seismotectonic investigation, Theodore Roosevelt Dam, Salt River Project, Arizona, with appendix, Stratigraphy and tectonic significance of Cenozoic basin-fill sediments, by J.D. Nations: U.S. Bureau of Reclamation Seismotectonic Report 87-5, 95 p.

Anthony, E.Y., and Titley, S.R., 1988, Progressive mixing of isotopic reservoirs during magma genesis at the Sierrita porphyry copper deposit, Arizona - Inverse solutions: Geochimica et Cosmochimica Acta, v. 52, no. 9, p. 2235-2249.

Asmerom, Y., Zartman, R.E., Damon, P.E., and Shafiqullah, M., 1988, Zircon U-Th-Pb and whole-rock Rb-Sr age patterns of lower Mesozoic igneous rocks in the Santa Rita Mountains, southeast Arizona: Implications for Mesozoic magmatism and tectonics in the southern Cordillera: Geological Society of America Bulletin, v. 102, no. 7, p. 961-968.

Bagby, W.C., Haxel, G.B., Smith, D.B., Koch, R.D., Grubensky, M.J., Sherrod, D.R., and Pickthorn, L.G., 1987, Mineral resource assessment of the Kofa National Wildlife Refuge, Arizona: U.S. Geological Survey Open-File Report 87-609, 82 p.

Barnes, C.W., 1989, Early Proterozoic rocks of Grand Canyon, Arizona, *in* Elston, D.P., Billingsley, G.H., and Young, R.A., eds., Geology of Grand Canyon, northern Arizona (with Colorado River guides: American Geophysical Union, international Geological Congress, 28th, Field Trip Guidebook T115/315, p. 90-93.

Beard, L.S., and Lucchitta, I., 1993, Geologic map of the Valentine Southeast quadrangle, Mohave County, Arizona: U.S. Geological Survey Geologic Quadrangle Map GQ-1711, scale 1:24,000.

Billingsley, G.H., 1993, Geologic map of the Russell Spring quadrangle, northern Mohave County, Arizona: U.S. Geological Survey Open-File Report 93-717, 17 p., 1 sheet, scale 1:24,000.

Billingsley, G.H., 1994, Geologic map of the Moriah Knoll quadrangle, northern Mohave County, Arizona: U.S. Geological Survey Open-File Report 94-634, scale 1:24,000.

Billingsley, G.H., 1994, Geologic map of Sullivan Draw and vicinity, Mohave County, northwestern Arizona: U.S. Geological Survey Miscellaneous Investigations Series Map I-2396, scale 1:31,680.

Bradshaw, T.K., Hawkesworth, C.J., and Gallagher, K., 1993, Basaltic volcanism in the southern Basin and Range: no role for a mantle plume: Earth and Planetary Science Letters, v. 116, p. 45-62.

Bryan, C.R., 1989, Mid-Tertiary volcanism in the eastern Chiricahuas: The Portal caldera, *in* Chapin, C.E. , and Zidek, J., eds., Field excursions to volcanic terranes in the western United States, Volume 1: Southern Rocky Mountain region: New Mexico Bureau of Mines and Mineral Resources Memoir 46, p. 153-157.

Bryant, B., 1992, Geologic map of the Poachie Range, Mohave and Yavapai Counties, Arizona: U.S. Geological Survey Miscellaneous Investigations Series Map I-2198, scale 1:25,000.

Bryant, B., and Naeser, C.W., 1987, Fission-track dating across the transition between the Basin and Range Province and the Colorado Plateau, west-central Arizona: Geological Society of America Abstracts with Programs, v. 19, no. 7, p. 604.

Bryant, B., Naeser, C.W., and Fryxell, J.E., 1991, Implications of low-temperature cooling history on a transect across the Colorado Plateau-Basin and Range boundary, west central Arizona: Journal of Geophysical Research, v. 96, no. B7, p. 12,375-12,388.

Buising, A.V., and Beratan, K.K., 1993, Preliminary reevaluation of Upper Tertiary units, Osborne Wash area, La Paz County, Arizona, *in* Sherrod, D.R., and Nielson, J.E, eds., Tertiary stratigraphy of highly extended terranes, California, Arizona, and Nevada: U.S. Geological Survey Bulletin 2053, p. 159-163.

Carpenter, D.G., and Carpenter, J.G., 1990, New K-Ar age determinations from syntectonic deposits (Oligocene and Miocene), *in* southern Nevada and northwest Arizona: Isochron/West, no. 55, p. 10-12.

Chamberlain, K.R., and Bowring, S.A., 1990, Proterozoic geochronologic and isotopic boundary in NW Arizona: Journal of Geology, v. 98, no. 3, p. 399-416.

Condit, C.D., 1991, Lithologic map of the western part of the Springerville Volcanic Field, east-central Arizona: U.S. Geological Survey Miscellaneous Investigations Series Map I-1993, scale 1:50,000.

Cook, S.S., III, 1994, The geologic history of supergene enrichment in the porphyry copper deposits of southwestern North America: University of Arizona, unpublished Ph.D. dissertation, 163 p.

Cooper, J.L., Aronson, J.L., Condit, C.D., and Hart, W.K., 1990, New K-Ar ages of lavas from the Colorado Plateau-Basin and Range transition zone, east-central Arizona: Isochron/West, no. 55, p. 28-31.

Dann, J.C., Chamberlain, K.R., and Bowring, S.A., 1989, An Early Proterozoic ophiolite, central Arizona: U-Pb constraints on its structure and development: Geological Society of America Abstracts with Programs, v. 21, no. 6, p. 23.

Dann, J.C., 1991, Early Proterozoic ophiolite, central Arizona: Geology, v. 19, no. 6, p. 590-593.

Dann, J.C., Bowring, S.A., and Coleman, D.S., 1993, Geochronologic, isotopic and structural constraints on the evolution of an Early Proterozoic intra-arc basin, central Arizona [abs.]: Geological Society of America Abstracts with Programs, v. 25, no. 6, p. 237-238.

DeWitt, E., Thorson, J.P., and Smith, R.C., 1986, Geology and gold deposits of the Oatman District, northwestern Arizona: U.S. Geological Survey Open-File Report 86-638, 34 p.

DeWitt, E., Thorson, J.P., and Smith, R.C., 1986, Geology and gold deposits of the Oatman District, northwestern Arizona, (Epithermal Gold deposits - Part II, Chapter I) *in* Shawe, D.R., and Ashley, R.P., eds., Geology and resources of gold in the United States: U.S. Geological Survey Bulletin 1857-I, 48 p.

Dickinson, W.D., and Shafiqullah, M., 1989, K-Ar and F-T ages for syntectonic Mid-Tertiary volcanosedimentary sequences associated with the Catalina Core Complex and San Pedro Trough in southern Arizona: Isochron/West, no. 52, p. 15-27.

Drewes, H., 1988, Geologic map and cross sections of the Dragoon Mountains, southeastern Arizona: U.S. Geological Survey Miscellaneous Investigations Series Map I-1662, scale 1:24,000.

Drewes, H., and Brooks, W.E., 1988, Geologic map and cross sections of the Pedregosa Mountains, Cochise County, Arizona: U.S. Geological Survey Miscellaneous Investigations Series Map I-1827, scale 1:48,000.

Drewes, H., Houser, B.B., Hedlund, D.C., Richter, D.H., Thorman, C.H., and Finnel, T.L., 1985, Geologic map of the Silver City 1° x 2° Quadrangle, New Mexico and Arizona: U.S. Geological Survey Miscellaneous Investigations Series Map I-1310-C, scale 1:250,000.

Drewes, H., du Bray, E.A., and Pallister, J.S., 1995, Geologic map of the Portal quadrangle and vicinity, Cochise County, southeast Arizona: U.S. Geological Survey Miscellaneous Investigations Series Map I-2450, scale 1:24,000.

du Bray, E.A., and Pallister, J.S., 1991, An ash flow caldera in cross section: Ongoing field and geochemical studies of the Mid-Tertiary Turkey Creek caldera, Chiricahua Mountains, SE Arizona: Journal of Geophysical Research, v. 96, no. B8, p. 13,435-13,457.

du Bray, E.A., and Pallister, J.S., 1994, Geologic map of the Chiricahua Peak quadrangle, Cochise County, Arizona: U.S. Geological Survey Geologic quadrangle Map GQ-1733, scale 1:24,000.

Dumitru, T.A., Duddy, I.R., and Green, P.F., 1994, Mesozoic-Cenozoic burial, uplift, and erosion history of the west-central Colorado Plateau: Geology, v. 22, no. 6, p. 499-502.

Elder, W.P., 1988, Geometry of Upper Cretaceous bentonite beds: Implications about volcanic source areas and paleowind patterns, western interior, United States: Geology, v. 16, no. 9, p. 835-838.

Elston, D.P., Young, R.A., McKee, E.H., and Dennis, M.L., 1989, Paleontology, clast ages, and paleomagnetism of Upper Paleocene and Eocene gravel and limestone deposits, Colorado Plateau and Transition Zone, northern and central Arizona, *in* Elston, D.P., Billingsley, G.H., and Young, R.A., eds., Geology of Grand Canyon, northern Arizona (with Colorado River guides: American Geophysical Union, International Geological Congress, 28th, Field Trip Guidebook T115/315, p. 155-165.

Erickson, R.C., and Bowring, S.A., 1990, Petrology and geochronology of the Sommer Gneiss, Dos Cabezas Mountains, Arizona; Dating the Mazatzal Orogeny: Geological Society of America Abstracts with Programs, v. 22, no. 3, p. 21.

Falkner, C.M., Miller, C.F., Wooden, J.L., and Heizler, M.T., 1995, Petrogenesis and tectonic significance of the calc-alkaline, bimodal Aztec Wash pluton, Eldorado Mountains, Colorado River extensional corridor: Journal of Geophysical Research, v. 100, no. B6, p. 10,453-10,476.

Farmer, G.L., and DePaolo, D.J., 1987, Nd and Sr isotope study of hydrothermally altered granite at San Manuel, Arizona: Implications for element migration paths during the formation of porphyry copper ore deposits: Economic Geology, v. 82, no. 5, p. 1142-1151.

Faulds, J.E., 1993, Miocene stratigraphy of the central Black Mountains, northwestern Arizona: Variations across a major accommodation zone, *in* Sherrod, D.R., and Nielson, J.E, eds., Tertiary stratigraphy of highly extended terranes, California, Arizona, and Nevada: U.S. Geological Survey Bulletin 2053, p. 37-43.

Faulds, J.E., Geissman, J.W., and Mawer, C.K., 1990, Structural development of a major extensional accommodation zone in the Basin and Range Province, northwestern Arizona and southern Nevada; Implications for kinematic models of continental extension, *in* Wernicke, B.P., ed., Basin and Range extensional tectonics near the latitude of Las Vegas, Nevada: Geological Society of America Memoir 176, p. 37-76.

Faulds, J.E., Geissman, J.W., and Shafiqullah, M., 1992, Implications of paleomagnetic data on Miocene extension near a major accommodation zone in northwestern Arizona and southern Nevada: Tectonics, v. 11, no. 2, p. 204-227.

Faulds, J.E., Feuerbach, D.L., Reagan, M.K., Metcalf, R.V., Gans, P., and Walker, J.D., 1995, The Mount Perkins block, northwestern Arizona: An exposed cross section of an evolving, preextensional to synextensional magmatic system: Journal of Geophysical Research, v. 100, no. B8, p. 15,249-15,266.

Feuerbach, D.L., Smith, E.I., Shafiqullah, M., and Damon, P.E., 1991, New K-Ar dates for late Miocene to early Pliocene mafic volcanic rocks in the Lake Mead area, Nevada and Arizona: Isochron/West, no. 57, p. 17-20.

Feuerbach, D.L., Smith, E.I., Walker, J.D., and Tangeman, J.A., 1993, The role of the mantle during crustal extension of volcanic rocks in the Lake Mead area, Nevada and Arizona: Geological Society of America Bulletin, v. 105, no. 12, p. 1561-1575.

Foster, D.A., Harrison, T.M., Miller, C.F., and Howard, K.A., 1990, The 40Ar/39Ar thermochronology of the eastern Mojave Desert, California, and adjacent western Arizona with implications for the evolution of metamorphic core complexes: Journal of Geophysical Research, v. 95, no. B12, p. 20,005-20,024.

Foster, D.A., and Spencer, J.E., 1992, Apatite and zircon fission-track dates from the northern Plomosa Mountains, La Paz County, west-central Arizona: Arizona Geological Survey Open-File Report 92-9, 11 p.

Foster, D.A., Gleadow, A.J.W., Reynolds, S.J., and Fitzgerald, P.G., 1993, Denudation of metamorphic core complexes and the reconstruction of the Transition Zone, west central Arizona: Constraints from apatite fission track thermochronology: Journal of Geophysical Research, v. 98, no. B2, p. 2167-2185.

Gehrels, G.E., and Smith, C.H., 1991, U-Pb geochronologic constraints on the age of thrusting, crustal extension, and peraluminous plutonism in the Little Rincon Mountains, southern Arizona: Geology, v. 19, no. 3, p. 238-241.

Glazner, A.F., Nielson, J.E., Howard, K.A., and Miller, D.M., 1986, Correlation of the Peach Springs Tuff, a large-volume Miocene ignimbrite sheet in California and Arizona: Geology, v. 14, no. 10, p. 840-843.

Gray, F., Miller, R.J., Hassemer, J.R., Hanna, W.F., and Brice, J.C., III, 1987, Mineral resources of the Big Horn Mountains Wilderness Study Area, Maricopa County, Arizona: U.S. Geological Survey Bulletin 1701-A, 14 p.

Grubensky, M.J., Haxel, G.B., and Koch, R.D., 1993, Geologic map of the Castle Dome Mountains, southwestern Arizona: U.S. Geological Survey Miscellaneous Investigations Series Map I-2138, scale 1:62,500.

Grubensky, M.J., Haxel, G.B., and Demsey, K.A., 1995, Geologic map of the southwestern Kofa Mountains and western Tank Mountains, southwestern Arizona: U.S. Geological Survey Miscellaneous Investigations Series Map I-2454, scale 1:62,500.

Gust, D.A., and Arculus, R.J., 1986, Petrogenesis of alkalic and calkalkalic volcanic volcanic rocks of Mormon Mountain Volcanic Field, Arizona: Contributions to Mineralogy and Petrology, v. 94, p. 416- 426.

Hagstrum, J.T., Cox, D.P., and Miller, R.J., 1987, Structural reinterpretation of the Ajo mining district, Pima County, Arizona, based on paleomagnetic and geochronologic studies: Economic Geology, v. 82, no. 5, p. 1348-1361.

Hamblin, W.K., 1989, Pleistocene volcanic rocks of the western Grand Canyon, Arizona, *in* Elston, D.P., Billingsley, G.H., and Young, R.A., eds., Geology of Grand Canyon, northern Arizona (with Colorado River guides: American Geophysical Union, International Geological Congress, 28th, Field Trip Guidebook T115/315, p. 190-204.

Hamblin, W.K., 1994, Late Cenozoic lava dams in the Grand Canyon: Geological Society of America Memoir 183, 139 p.

Hardy, J.J., Jr., 1987, The structural evolution of the Arrastre Gulch window, south-central Harquahala Mountains, west-centra Arizona [abs.]: Geological Society of America Abstracts with programs, v. 19, no. 7, p. 693.

Hawkins, D.P., Bowring, S.A., and Karlstrom, K.E., 1993, U-Pb geochronologic constaints on Early Proterozoic crustal evolution, upper Granite Gorge, Grand Canyon, Arizona [abs.]: Geological Society of America Abstract with Programs, v. 25, no. 6, p. 238.

Hedlund, D.C., 1993, Geologic map of the Tillie Hall Peak quadrangle, Greenlee County, Arizona, and Grant County, New Mexico: U.S. Geological Survey Geologic Quadrangle Map GQ-1715, scale 1:24,000.

Hereford, R., Thompson, H.S., Burke, K.J., and Fairley, H.C., 1995, Late Holocene debris fans and alluvial chronology of the Colorado River, eastern Grand Canyon, Arizona: U.S. Geological Survey Open-File Report 95-57, 28 p.

Hodges, K.V., and Bowring, S.A., 1995, 40Ar/39Ar thermochronology of isotopically zoned micas: Insights from the southwestern USA Proterozoic orogen: Geochimica et Cosmochimica Acta, v. 59, no. 15, 3205-3220.

Holm, R.F., and Shafiqullah, M., 1994, K-Ar ages of Late Cenozoic basaltic rocks in the northern part of the Mormon Volcanic Field, north-central Arizona: Isochron/West, no. 61, p. 21-24.

Howard, K.A., Nielson, J.E., Wilshire, H.G., Nakata, J.K., Goodge, J.W., Reneau, B.E., and Hansen, V.L., 1990, Preliminary geologic map of the Mohave Mountains area, Mohave County, western Arizona: U.S. Geological Survey Open File Report 90-684, scale 1:48,000.

John, B.E., and Foster, D.A., 1993, Structural and thermal constraints on the initiation angle of detachment faulting in the southern Basin and Range: The Chemehuevi Mountains case study: Geological Society of America Bulletin, v. 105, no.8, p. 1091-1108.

Karlstrom, K.E., Bowring, S.A., and Conway, C.M., 1987, Tectonic significance of an Early Proterozoic two-province boundary in central Arizona: Geological Society of America Bulletin, v. 99, no. 4, p. 529-538.

Karlstrom, K.E., Doe, M.F., Wessels, R.L., Bowring, S.A., Dann, J.C., and Williams, M.L., 1990, Juxtaposition of Proterozoic crustal blocks: 1.65-1.60 Ga Mazatzal Orogeny, *in* Gehrels, G.E., and Spencer, J.E., eds., Geologic excursions through the Sonoran Desert region, Arizona and Sonora: Arizona Geological Survey Special Paper 7, p. 115-123.

Kempton, P.D., Dungan, M.A., and Blanchard, D.P., 1987, Petrology and geochemistry of xenolith- bearing alkalic basalts from the Geronimo Volcanic Field, southeast Arizona; Evidence for polybaric fractionation and implications for mantle heterogeneity, *in* Morris, E.M., and Pastoris, J.D., eds., Mantle metasomatism and alkaline magmatism: Geological Society of America Special Paper 215, p. 347-370.

Kempton, P.D., and Dungan, M.A., 1989, Geology and petrology of basalts and included mafic, ultramafic, and granulite xenoliths of the Geronimo volcanic field, southeastern Arizona, *in* Chapin, C.E., and Zidek, J., eds.,

Field excursions to volcanic terranes in the western United States, Volume 1: Southern Rocky Mountain region: New Mexico Bureau of Mines and Mineral Resources Memoir 46, p. 161-173.

Knapp, J.H., 1983, Structural development, thermal evolution, and tectonic significance of a Cordilleran basement thrust terrane, Maria Fold and Thrust Belt, west-central Arizona: Massachusetts Institute of Technology Ph.D. dissertation, 262 p.

Knapp, J.H., and Heizler, M.T., 1990, Thermal history of crystalline nappes of the Maria fold and thrust belt, west central Arizona: Journal of Geophysical Research, v. 95, no. B12, p. 20,049-20,073.

Larsen, L.L., and Smith, E.I., 1990, Mafic enclaves in the Wilson Ridge Pluton, northwestern Arizona: Implications for the generation of a calc-alkaline intermediate pluton in an extensional environment: Journal of Geophysical Research, v. 95, no. B11, p. 17,693-17,716.

Larson, E.E., Patterson, P.E., Amini, M.H., and Rosenbaum, J., 1986, Petrology, chemistry, and revised age of the Late Precambrian Cardenas lava, Grand Canyon, Arizona [abs,]: Geological Society of America Abstracts with Programs, v. 18, no. 5, p. 389-390.

Laughlin, A.W., Aldrich, M.J., Shafiqullah, M., and Husler, J., 1986, Tectonic implications of the age, composition, and orientation of lamprophyre dikes, Navajo volcanic field, Arizona: Earth and planetary Science Letters, v. 76, p. 361-374.

Lerch, M.F., Patchett, P.J., and Reynolds, S.J., 1991, Sr and Nd isotopic studies of proterozoic rocks in west-central Arizona: Implications for Proterozoic tectonics, *in* Karlstrom, K.E., ed., Proterozoic Geology and Ore Deposits of Arizona: Arizona Geological Society Digest 19, p. 51-56.

Lipman, P.W., 1993, Geologic map of the Tucson Mountains caldera, southern Arizona: U.S. Geological Survey Miscellaneous Investigations Series Map MF-2205, scale 1:24,000.

Long, K.B., Baldwin, S.L., and Gehrels, G.E., 1995, Tectonothermal evolution of the Pinaleno-Jackson Mountain core complex, southeast Arizona: Geological Society of America Bulletin, v. 107, no. 10, p. 1231-1240.

Love, D.W., Bidahochi Formation: An interpretive summary, *in* Anderson, O.J., Lucas, S.G., Love, D.W., and Cather, S.M., eds., Southeastern Colorado Plateau: New Mexico Geological Society 40th Field Conference Guidebook, p. 273-280.

Lucchitta, I., and Suneson, N.H., 1993, Stratigraphic section of the Casteneda Hills-Signal Hill area, Arizona, *in* Sherrod, D.R., and Nielson, J.E, eds., Tertiary stratigraphy of highly extended terranes, California, Arizona, and Nevada: U.S. Geological Survey Bulletin 2053, p. 137-144.

Lucchitta, I., and Suneson, N.H., 1994, Geologic map of the Signal quadrangle, Mohave County, Arizona: U.S. Geological Survey Geologic Quadrangle Map GQ-1709, scale 1:24,000.

Lucchitta, I., and Suneson, N.H., 1994, Geologic map of the Centennial Wash quadrangle, Mohave and La Paz Counties, Arizona: U.S. Geological Survey Geologic Quadrangle Map GQ-1718, 7 p., 1 sheet, scale 1:24,000.

Ludwig, K.R., and Simmons, K.R., 1988, Progress in U/Pb isotope studies of collapse-breccia pipes in the Grand Canyon region, northern Arizona [abs]: Geological Society of America Abstracts with Programs, v. 20, no. 7, p. 139.

Luedke, R.G., 1993, Maps showing distribution, composition, and age of early and middle Cenozoic volcanic centers in Arizona, New Mexico, and west Texas: U.S. Geological Survey Miscellaneous Investigations Series Map I-2291-A, 16 p., 2 sheets, scale 1:1,000,000.

Machette, M.N., and Rosholt, J.N., 1989, Quaternary terraces in Marble Canyon and eastern Grand Canyon, Arizona, *in* Elston, D.P., Billingsley, G.H., and Young, R.A., eds., Geology of Grand Canyon, northern Arizona (with Colorado River guides: American Geophysical Union, International Geological Congress, 28th, Field Trip Guidebook T115/315, p. 205-211.

Marvin, R.F., Naeser, C.W., Bikerman, M., Mehnert, H.H., and Ratte, J.C., 1987, Isotopic ages of post-Paleocene igneous rocks within and bordering the Clifton 1° x 2° Quadrangle, Arizona - New Mexico: New Mexico Bureau of Mines and Mineral Resources Bulletin 118, 63 p.

Marvin, R.F., Mehnert, H.H., and Naeser, C.W., 1988, U.S. Geological Survey radiometric ages - Compilation "C" Part two: Arizona and New Mexico: Isochron/West, no. 51, p. 5-13.

McCandless, T.E., and Ruiz, J., Rhenium-osmium evidence for regional mineralization in southwestern North America: Science, v. 261, p. 1282-1286.

McIntosh, W.C., Chapin, C.E., Ratte, J.C., and Sutter, J.F., 1992, Time-stratigraphic framework for the Eocene-Oligocene Mogollon-Datil volcanic field, southwest New Mexico: Geological Society of America Bulletin, v. 104, no. 7, p. 851-871 [ages are in New Mexico, but very close to Arizona border].

Miller, R.J., Gray, F., Tosdal, R.M., and McKee, E.H., 1988, K-Ar ages of volcanic rocks near Ajo, Pima and Maricopa Counties, southwestern Arizona, *in* Gray, F., compiler, Abstracts of the symposium of the geology and mineral deposits of the Ajo and Lukeville 1° x 2° Quadrangles, Arizona: U.S. Geological Survey Open-File Report 88-217, 31 p.

Moore, R.B., 1993, Geologic map of the Tombstone volcanic center, Cochise County, Arizona: U.S. Geological Survey Miscellaneous Investigations Series Map I-2420, scale 1:50,000.

Moyer, T.C., 1990, Generalized geologic map of the Kaiser Spring Volcanic Field, Mohave County: Arizona Geological Survey Contributed Map CM-90-C, scale 1:50,000.

Moyer, T.C., and Esperanca, S., 1989, Geochemical and isotopic variations in a bimodal magma system: The Kaiser Spring volcanic field, Arizona: Journal of Geophysical Research, v. 94, no. B6, p. 7841- 7859.

Naeser, C.W., Duddy, I.R., Elston, D.P., Dumitru, T.A., and Green, P.F., 1989, Fission-track dating: Ages for Cambrian strata and Laramide and post-Middle Eocene cooling events from the Grand Canyon, Arizona, *in* Elston, D.P., Billingsley, G.H., and Young, R.A., eds., Geology of Grand Canyon, northern Arizona (with Colorado River guides: American Geophysical Union, International Geological Congress, 28th, Field Trip Guidebook T115/315, p. 139-144.

Nakata, J.K., Pernokas, M.A., Howard, K.A., Nielson, J.E., and Shannon, J.R., 1990, K-Ar and fission-track ages (dates) of volcanic, intrusive, altered, and metamorphic rocks in the Mohave Mountains area, west-central Arizona: Isochron/West, no. 56, p. 8-20.

Nakata, J.K., Pernokas, M.A., Howard, K.A., Nielson, J.E., and Shannon, J.R., 1991, K-Ar and fission-track ages (dates) of volcanic, intrusive, altered, and metamorphic rocks in the Mohave Mountains area, west-central Arizona: Isochron/West, no. 57, p. 21-32.

Nealy, L.D., and Unruh, D.M., 1991, Geochemistry and isotopic characteristics of deep crustal xenoliths from Tule Tank, San Francisco Volcanic Field, northern Arizona, *in* Karlstrom, K.E., ed., Proterozoic Geology and Ore Deposits of Arizona: Arizona Geological Society Digest 19, p. 153-163.

Nielson, J.E., Lux, D.R., Dalrymple, G.B., and Glazner, A.F., 1990, Age of the Peach Springs Tuff, southeastern California and western Arizona: Journal of Geophysical Research, v. 95, no. B1, p. 571- 580.

Nishizumi, K., Kohl, C.P., Shoemaker, E.M., Arnold, J.R., Klein, J., Fink, D., and Middleton, R., 1990, *in* situ 10Be-26Al exposure ages at Meteor Crater, Arizona: Geochimica et Cosmochimica Acta, v. 55, no. 9, p. 2699-2703.

Pallister, J.S., du Bray, E.A., Rosenbaum, J.G., Snee, L.W., and Yager, D.B., 1990, Calderas in 3-D, Chiricahua Mountains, southeastern Arizona, *in* Gehrels, G.E., and Spencer, J.E., eds., Geologic excursions through the Sonoran Desert region, Arizona and Sonora: Arizona Geological Survey Special Paper 7, p. 31-40.

Pallister, J.S., du Bray, E.A., and Latta, J.S., IV., 1994, Geologic map of the Rustler Park quadrangle, Cochise County, Arizona: U.S. Geological Survey Geologic Quadrangle Map GQ-1696, scale 1:24,000.

Pallister, J.S., and du Bray, E.A., 1994, Geologic map of the Fife Peak quadrangle, Cochise County, Arizona: U.S. Geological Survey Geologic Quadrangle Map GQ-1708, scale 1:24,000.

Ratte, J.C., and Brooks, W.E., 1995, Preliminary geologic map of the Big Lue Mountains 15-minute quadrangle, Greenlee County, Arizona, and Catron and Grant Counties, Mew Mexico: U.S. Geological Survey Open-File Report 95-263, scale 1:48,000.

Reynolds, S.J., Spencer, J.E., and DeWitt, E., 1987, Stratigraphy and U-Th-Pb geochronology of Triassic and Jurassic rocks in west-central Arizona, *in* Dickinson, W.D., and Klute, M.A., eds., Mesozoic rocks of southern Arizona and adjacent areas: Arizona Geological Society Digest 18, p. 65-80.

Reynolds, S.J., Spencer, J.E., Asmerom, Y., DeWitt, E., and Laubach, S.E., 1989, Early Mesozoic uplift in west-central Arizona and southeastern California: Geology, v. 17, no. 3, p. 207-211.

Richard, S.M., Fryxell, J.E., and Sutter, J.F., 1990, Tertiary structure and thermal history of the Harquahala and Buckskin Mountains, west-central Arizona: Implications for denudation by a major detachment fault system: Journal of Geophysical Research, v. 95, no. B12, p. 19,973-19,987.

Riggs, N.R., and Haxel, G.B., 1990, The early to middle Jurassic magmatic arc in southern Arizona:Plutons to sand dunes,in Gehrels, G.E., and Spencer, J.E., eds., Geologic excursions through the Sonoran Desert region, Arizona and Sonora: Arizona Geological Survey Special Paper 7, p. 90-103.

Riggs, N.R., Mattison, J.M., and Busby, C.J., 1993, Correlation of Jurassic eolian strata between the magmatic arc and the Colorado Plateau: New U-Pb geochronologic data from southern Arizona: Geological Society of America Bulletin, v. 105, no. 9, p. 1231-1246.

Scott, R.B., Unruh, D.M., Snee, L.W., Harding, A.E., Nealey, L.D., Blank, H.R., Jr., Budahn, J.R., and Mehnert, H.H., 1995, Relation of peralkaline magmatism to heterogeneous extension during the middle Miocene, southeastern Nevada: Journal of Geophysical Research, v. 100, no. B6, p. 10.381- 10,401.

Shafiqullah, M., Pierce, H.W., and Damon, P.E., 1988, Illite K-Ar dating and the Catalina detachmentfault [abs.]: Geological Society of America Abstracts with Programs, v. 20. no. 7, p. 230-231.

Sherrod, D.R., Koch, R.D., and Grubensky, M.J., 1990, Geologic map of the Vicksburg quadrangle, La Paz County, Arizona: U.S. Geological Survey Quadrangle Map GQ-1684, scale 1:62,500.

Simmons, A.M., and Ward, A.W., 1992, Preliminary geologic map of the Mohon Mountains volcanic field, Mohave and Yavapai Counties, Arizona: U.S. Geological Survey Open-File Report 92-198, scale 1:50,000.

Spencer, J.E., Shafiqullah, M., Miller, R.J., and Pickthorn, L.G., 1989, K-Ar geochronology of Miocene extension, volcanism, and potassium metasomatism in the Buckskin and Rawhide Mountains, *in* Spencer, J.E., and Reynolds, S.J., eds., Geology and mineral resources of the Buckskin and Rawhide Mountains, west-central Arizona: Arizona Geological Survey Bulletin 198, p. 184-189.

Spencer, J.E., Richard, S.M., Reynolds, S.J., Miller, R.J., Shafiqullah, M., Gilbert, W.G., and Grubensky, M.J., 1995, Spatial and temporal relationships between mid-Tertiary magmatism and extension in southwestern Arizona: Journal of Geophysical Research, v. 100, no. B6, p. 10,321-10,351.

Szabo, B.J., and Winograd, I.J., 1995, Paleoclimatic, paleohydrolgic and tectonic applications of uranium-series dating of travertine and calcite vein samples from southern Great Basin and Grand Canyon areas: U.S. Geological Survey Open-File Report 95-37, 26 p.

Tanaka, K.L., Shoemaker, E.M., Ulrich, and Wolfe, E.W., 1986, Migration of volcanism in the San Francisco Volcanic Field, Arizona: Geological Society of America Bulletin, v. 97, no. 2, p. 129-141.

Theodore, T.G., Blair, W.N., Nash, J.T., McKee, E.H., Antweiler, J.C., and Campbell, W.L., 1987, Geology and gold mineralization of the Gold Basin-Lost Basin Mining Districts, Mohave County, Arizona: U.S. Geological Survey Professional Paper 1361, 167 p.

Tosdal, R.M., 1990, Constraints on the tectonics of the Mule Mountains thrust system, southeast California and southwest Arizona: Journal of Geophysical Research, v. 95, no. B12, p. 20.025-20,048.

Tosdal, R.M., and Stone, P., 1994, Stratigraphic relations and U-Pb geochronology of the Upper Cretaceous McCoy Mountains Formation, southwestern Arizona: Geological Society of America Bulletin, v. 106, no. 4, p. 476-491.

Weber, M.E., and Smith, E.I., 1987, Structural and geochemical constraints on the reassembly ofdisrupted mid-Miocene volcanoes in the Lake Mead-Eldorado Valley area of southern Nevada: Geology, v. 15, no. 6, p. 553-556 (Supplementary Data, Table 1).

Weisman, M.K., and Weir, G.W., 1990, Geologic map of the Pine 7.5' quadrangle, Coconino and Gila Counties, Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-2123, scale 1:24,000.

Wenrich, K.J., Billingsley, G.H., and Blackerby, B.A., 1995, Spatial migration and compositional changes of Miocene-Quaternary magmatism in the western Grand Canyon: Journal of Geophysical Research, v. 100, no. B6, p. 10,417-10,440.

White, D.C., 1989, Geology of the Vulture Mine: Society for Mining, Metallurgy, and Exploration, Inc., Transactions, v. 285, p. 1,119-1,122.

White, D.C., 1989, Geology of the Vulture Mine: Mining Engineering, v. 41, no. 11, p. 1,119-1,122.

Young, R.A., 1989, Paleogene-Neogene deposits of western Grand Canyon, Arizona, *in* Elston, D.P., Billingsley, G.H., and Young, R.A., eds., Geology of Grand Canyon, northern Arizona (with Colorado River guides: American Geophysical Union, International Geological Congress, 28th, Field Trip Guidebook T115/315, p. 166-173.