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INITIAL ENTRIES

Purpose

Purpose of this investigation is to examine the relationship between faults and volcanic vents in a continental basaltic volcanic field. Our goal is understand the relationship between faults and dikes and to establish the conditions of fault dike-interaction. Because of the small size of the Crater Flat volcanic field, we selected an analog basaltic volcanic field for this investigation. The analog field is the San Francisco volcanic field located on the southwestern edge of the Colorado Plateau in northern Arizona.

San Francisco Volcanic Field

The San Francisco volcanic field (SFVF) covers more than 6200 km^2 on the Colorado Plateau in northern Arizona. Active since about 6 Ma, the field comprises more than 600 basaltic vents and 10 major silicic centers. Of the 600 basaltic vents, the majority are cinder cones, but spatter cones and low shields also crop out in the field. Colson (1932) first noticed the association between vents of the SFVF and local and regional structures. Breed (1964) commented on this association and noted that a number of cinder cones formation commonly started as fissure vents, elongate parallel to regional structures.

Migration patterns in the SFVF were identified by Tanaka et al. (1986). The authors noted that prior to about 2.5 Ma, volcanism of the western SFVF migrated to the northeast. About 2.5 Ma, the locus of migration shifted due east, and volcanism has been largely confined to the north-central and eastern parts of the field. Sparse radiometric dates indicate that silicic volcanism and basaltic volcanism have been broadly coeval.

Regional faults in the area, such as the Mesa Butte fault and the Oak Creek Canyon fault, have been active sporadically since the Precambrian (Shoemaker et al., 1978). Major silicic centers located on or near these faults (including San Francisco Peak, Sigreaves Mtn, and Kendrick Peak) strongly suggest that the faults played an important role in focussing silicic magmas. The role of faults in focussing basaltic magma is less clear, because vent alignments and faults are rarely unambiguously colinear. An exception is the Mesa Butte vent alignment, which is colinear with Mesa Butte fault system.

Initial Investigation

This investigation of fault-dike interaction begins with spatial analysis of basaltic vents of the SFVF. This includes cluster analysis and lineament analysis of vent distribution. The bulk of this work has been reported elsewhere, see Connor et al (1996) summary of work in SFVF. Results are presented here. The initial investigation is followed by a detailed volcanologic/chronologic study of the Mesa Butte vent alignment. Results of $^{40}Ar/^{39}Ar$ analysis from vents and flows will support this portion of the study. The final part of this work constitutes a detailed geologic/chronologic and geochemical investigation into the formation of a single vent cluster, SP Cluster, identified in the first part of this work. Ultimately, this investigation should result in peer-reviewed papers published on these subjects.

Resources

Some of the resouces identified at CNWRA are listed here.

- GIS database of the 1:50000 geologic map series of Wolfe et al., 1987. Data compiled by P. Hunka and is an accurate portrayal of the Wolfe et al., series.
- Aerial Photographs (1:40000, and 1:80,000) of the north-central and east part of the SFVF.
- Geologic maps (1:50000) of the SFVF
- Literature of SFVF and related areas.
- Geochemistry of SFVF basalts from multiple sources: (Wolfe et al., 1987; Mullaney, 1996.
- Paleomagnetic data base of Tanaka et al., 1986, 1991

- SLAR images processed by R. Martin and M. Conway
- 1:24,000 topographic maps of field
- DEM compiled of 1:24,000 maps
- Rocks collected by D. Ferrill and Alan Morris

6 OCT 1997
F. Michael Conway

Location Maps of SFVF

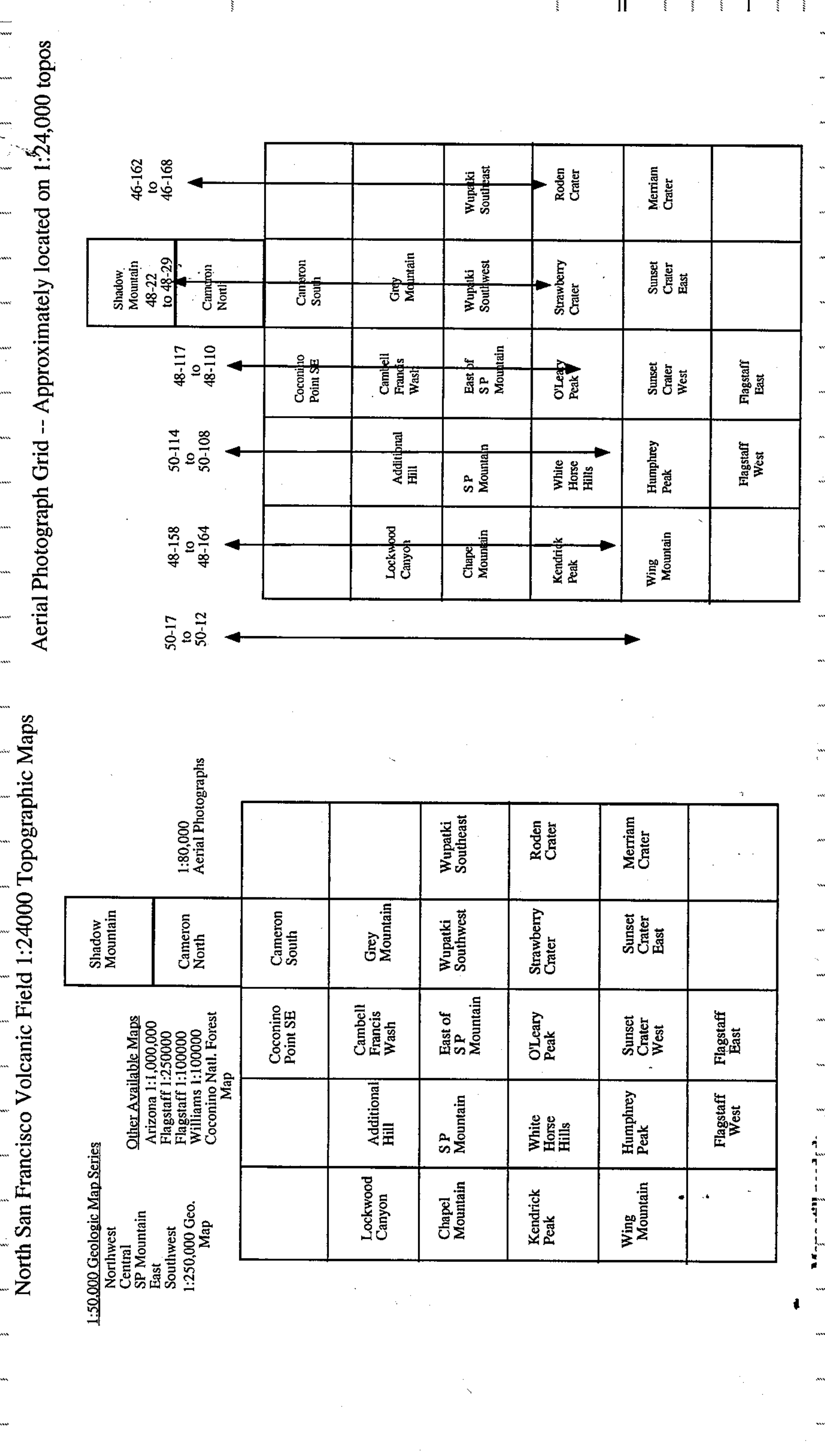
Oct 7 96

[initials]

Information potentially subject to copyright protection was redacted from this location. The redacted material is 2 maps of Arizona, Colorado Plateau for which there is no reference information available.

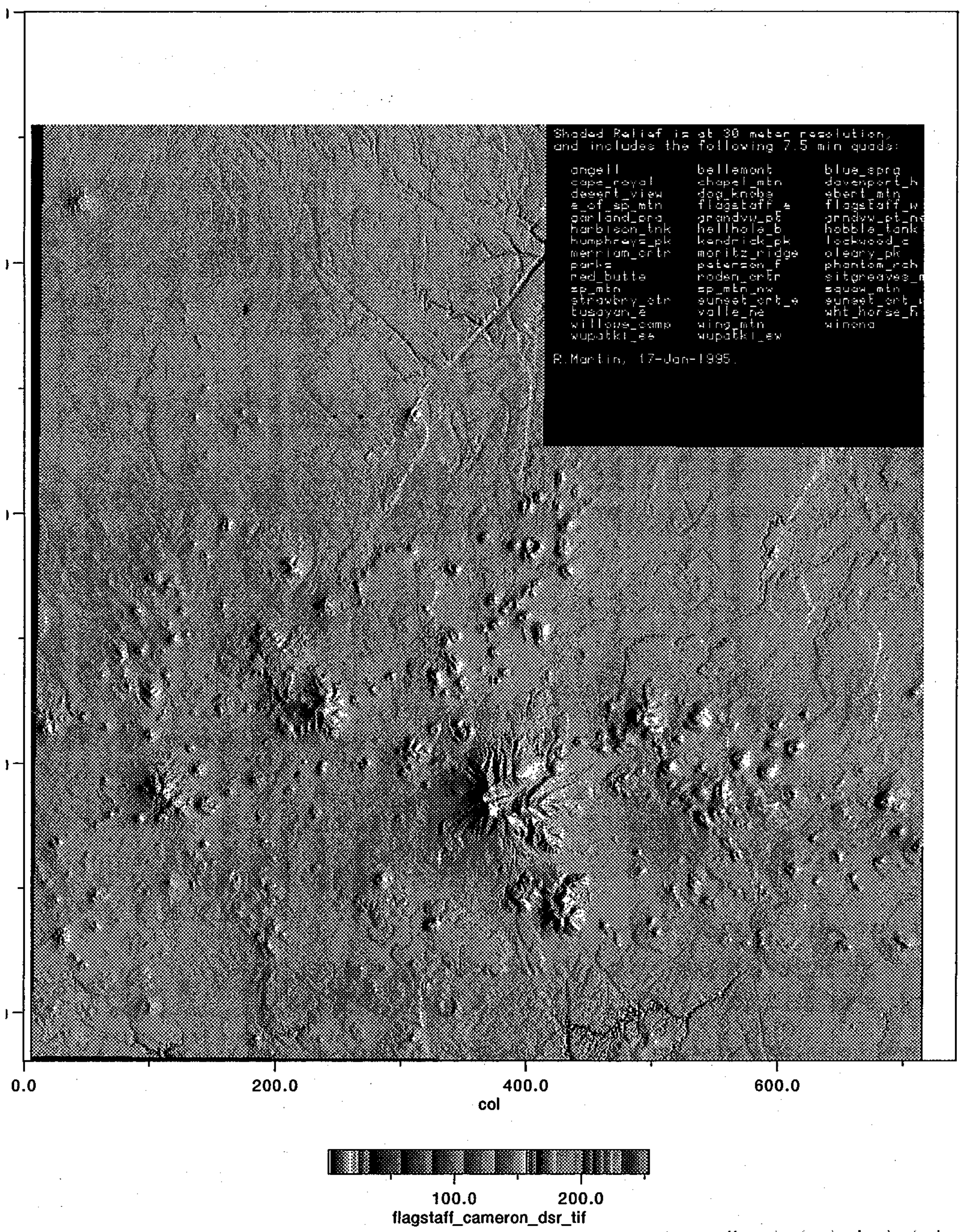
[initials]

Resources : Maps & Aerial photography Oct 8/97



Topo's, Aerial photos, DEM's
1 TM Scene & SLAR image for SFVF

JMC.



SIAR Mosaic of SFVF.
Data from EROS / US Geological Survey

originally put together by
R. Martin
recompiled by M. Conway

Oct 8 97

From 1994 - 1996 P. Hooka digitized ~~to~~ 1:50,000 USGS miscellaneous map series of SFVF.

Ex. of Vent location is given here. PHooka SFVF GIS data base comprise 610 Vents & ≈ 3500 polygons. Include all mapped faults & vents

Rep. data: ungenerated Vent Locs SFVF - 610 Vents

Oct 10, 98

SFVF Vent Locations: 610 Vents digitized by
in distribution pattern analysis of cinder cone

A/I Vent id	Easting	Northing
1	408750	3891900
2	403100	3891250
3	401000	3889200
4	399850	3891400
5	399500	3890800
6	398600	3890350
7	398600	3891400
8	398100	3890800
9	396600	3891450
10	395900	3891600
11	394500	3890500
12	394600	3891000
13	394400	3891600
14	393000	3890950
15	391600	3889650
16	390550	3890700
17	386450	3890350
18	385700	3893150
19	392100	3893600
20	392750	3895050
21	393250	3893150
22	393450	3894350
23	394250	3892900
24	394650	3895850
25	395350	3893700
26	395350	3894550
27	396850	3894450
28	397750	3894350
29	397800	3893100
30	398350	3894150
31	399100	3892200
32	402550	3895600
33	403950	3895750
34	408200	3893800
35	408300	3897350
36	405750	3899500
37	404700	3896900
38	403650	3898950
39	401800	3896250
40	400600	3898000
41	400400	3899950
42	397500	3898800
43	397100	3897250
44	395550	3898900
45	395050	3897350
46	393400	3897050
47	387700	3899950
48	387600	3898450
49	386850	3899700
50	386500	3897950
51	383850	3897400
52	382900	3897550
53	382600	3898150
54	381500	3899050
55	374350	3902550
56	376500	3903950
57	376700	3901450
58	377000	3902650
59	377550	3902250

From 1994 - 1996 P. Hooke digitized
~~to~~ 1:50,000 USGS miscellaneous
map series of SFVF.

Ex. of Vent location is given here.
P Hooke SFVF GIS data base comprises
610 Vents & ≈ 3500 polygons.
Includes all mapped faults & units

60	377950	3903300	
61	378300	3902100	
62	378900	3903350	
63	380250	3900550	
64	382500	3900450	
65	383200	3900550	
66	383600	3900900	
67	383900	3901500	
68	383800	3901950	
69	384900	3902500	
70	384900	3901250	
71	386350	3902600	
72	386450	3900750	
73	386750	3901350	
74	387050	3902050	
75	386950	3901000	
76	387200	3900300	
77	388350	3902150	
78	388800	3901750	
79	389000	3903150	
80	390450	3903800	
81	390700	3900100	
82	395000	3903100	
83	396100	3901500	
84	398600	3903300	
85	398950	3902850	
86	398800	3900200	
87	400050	3901350	
88	401100	3903700	
89	403650	3901800	
90	406050	3900350	
91	406250	3903300	
92	407400	3902500	
93	408200	3902100	
94	409250	3906250	
95	408400	3904950	
96	403650	3905100	
97	402650	3904500	
98	402800	3905350	
99	401000	3907150	
100	400050	3906400	
101	400000	3905300	
102	398450	3904100	
103	397200	3906400	
104	396100	3905350	
105	394950	3905650	
106	391250	3905100	
107	389650	3905175	
108	387000	3907750	
109	386800	3906600	
110	387300	3905250	
111	386800	3904500	
112	385950	3904500	
113	384900	3907400	
114	384900	3906900	
115	384800	3904100	
116	383500	3905850	
117	382800	3905950	
118	381400	3905850	
119	373200	3910400	
120	373300	3909900	
121	374450	3909050	
122	380700	3909350	
123	380950	3909850	
124	381450	3908250	

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Phunk key lithostratigraphic sequence of SFVF consist of 38 units.

Unit Descriptions in Phunk SFVF 620 Histogram

Description	# of Discrete Polygons	% of Total
27: <Landslide depoists	20	0.55
32: <Eolian Basaltic Ash	24	0.66
33: <Alluvial and colluvial Deposits	498	13.63
5: <0'Leary Peak Andesite flows - older Brunhes	6	0.16
24: <0'Leary Peak Rhyo-dacite flows - older Brunhes	10	0.27
17: <San Fran Mtn Andesite flows - older Brunhes	36	0.99
3: <San Fran Mtn Andesite flows - Older Brunhes & Matuyama	57	1.56
7: <San Fran Mtn Rhyo-Dacit flows older Brunhes & Matuyama	30	0.82
8: <San Fran Mtn Rhyo-Dacit flows - older Brunhes	113	3.09
10: <San Francisco Mtn Rhyo-Dacite flows & domes	23	0.63
22: <San Fran Mtn diorite plug - Older Brunhes or Matuyama	3	0.08
28: <San Francisco Mtn Rhyo-Dacite Dome - Gauss	3	0.08
1: <Kendrick Peak - Rhyo Dacite domes - Matuyama	1	0.03
16: <Kendrick Peak Rhyo-dacite - Gauss	1	0.03
30: <Kendrick Peak - Andesite flows and dikes - Matuyama	23	0.63
38: <Kendrick Peak Rhyo-Dacite flows and domes - Matuyama	17	0.47
14: <Sitgreaves Mtn Rhyo-Dacite flows and domes Matuyama	31	0.85
31: <Sitgreaves Mtn Rhyo-Dacite domes - Matuyama or Gauss	2	0.05
26: <Sitgreaves Mtn Rhyo-Dacite - Gauss	20	0.55
29: <Bill Williams Basalt flows - Gauss & Gilbert	3	0.08
6: <Bill Williams Mtn Andesite flows etc. - Gauss	4	0.11
21: <Bill Williams Mtn-Rhyo-Dacite flows -Gauss & Gilbert	43	1.18
9: <Rhyo-dacite domes - Younger Brunhes	2	0.05
36: <Rhyo-dacite dikes flows and vents - older Brunhes	2	0.05
11: <Rhyo-Dacite flows and domes - Matuyama	18	0.49
4: <Rhyo-Dacite domes & flows - Matuyama or Gauss	11	0.30
23: <Rhyo-Dacite flows & domes - undefined	1	0.03
12: <Andesite flows - Matuyama	1	0.03
20: <Andesite cones & flows - Matuyama or older	1	0.03
2: <Basalt flows & cinder cones - undefined	567	15.52
18: <Basalt dikes flows and cinder cones - Brunhes	102	2.79
25: <Basalt flows and cinder cones Older Brunhes or Matuyama	121	3.31
15: <Basalt flows and cinder cones - Matuyama	569	15.57
34: <Basalt dikes flows cinder cones etc. - Older Brunhes	606	16.58
37: <Basalt flows dikes & vents - Matuyama or older	91	2.49
13: <Basalt flows and cinder cones - Gauss or Gilbert	197	5.39
19: <Tapeats SS. SS of McKee and Redwall Limestone	43	1.18
35: <Kaibab-Supai-Toroweap-Chinle & Moenkopi Frm	354	9.69

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Oct 11, 96 Fur.

Lithostratigraphic unit after Wolfe et al 1987

P Hunka Lithostratigraphy

Description	# of Discrete Polygons	% of Total
1: <Kendrick Peak - Rhyo Dacite domes - Matuyama	1	0.03
2: <Basalt flows & cinder cones - undefined	567	15.52
3: <San Fran Mtn Andesite flows - Older Brunhes &	57	1.56
4: <Rhyo-Dacite domes & flows - Matuyama or older	11	0.30
5: <0'Leary Peak Andesite flows - older Brunhes	6	0.16
6: <Bill Williams Mtn Andesite flows etc. - Gauss	4	0.11
7: <San Fran Mtn Rhyo-Dacit flows older Brunhes &	30	0.82
8: <San Fran Mtn Rhyo-Dacit flows - older Brunhes	113	3.09
9: <Rhyo-dacite domes - Younger Brunhes	2	0.05
10: <San Francisco Mtn Rhyo-Dacite flows & domes	23	0.63
11: <Rhyo-Dacite flows and domes - Matuyama	18	0.49
12: <Andesite flows - Matuyama	1	0.03
13: <Basalt flows and cinder cones - Gauss or Gilb	197	5.39
14: <Sitgreaves Mtn Rhyo-Dacite flows and domes	31	0.85
15: <Basalt flows and cinder cones - Matuyama	569	15.57
16: <Kendrick Peak Rhyo-dacite - Gauss	1	0.03
17: <San Fran Mtn Andesite flows - older Brunhes	36	0.99
18: <Basalt dikes flows and cinder cones - Brunhes	102	2.79
19: <Tapeats SS. SS of McKee and Redwall Limestone	43	1.18
20: <Andesite cones & flows - Matuyama or older	1	0.03
21: <Bill Williams Mtn-Rhyo-Dacite flows -Gauss &	43	1.18
22: <San Fran Mtn diorite plug - Older Brunhes or	3	0.08
23: <Rhoy-Dacite flows & domes - undefined	1	0.03
24: <0'Leary Peak Rhyo-dacite flows - older Brunhe	10	0.27
25: <Basalt flows and cinder cones Older Brunhes o	121	3.31
26: <Sitgreaves Mtn Rhyo-Dacite - Gauss	20	0.55
27: <Landslide depoists	20	0.55
28: <San Francisco Mtn Rhyo-Dacite Dome - Gauss	3	0.08
29: <Bill Williams Basalt flows - Gauss & Gilbert	3	0.08
30: <Kendrick Peak - Andesite flows and dikes - Ma	23	0.63
31: <Sitgreaves Mtn Rhyo-Dacite domes - Matuyama o	2	0.05
32: <Eolian Basaltic Ash	24	0.66
33: <Alluvial and colluvial Deposits	498	13.63
34: <Basalt dikes flows cinder cones etc. - Older	606	16.58
35: <Kaibab-Supai-Toroweap-Chinle & Moenkopi Frm	354	9.69
36: <Rhyo-dacite dikes flows and vents - older Bru	2	0.05
37: <Basalt flows dikes & vents - Matuyama or olde	91	2.49
38: <Kendrick Peak Rhyo-Dacite flows and domes - M	17	0.47
Totals	**3654**	**100**

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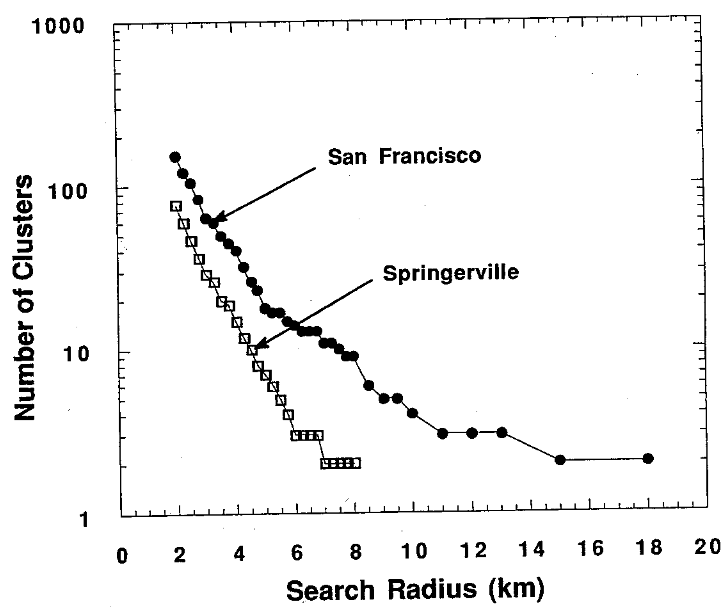
Phonke Geologic Map of SFVF, based on geologic map series of Wolfe et al 1987

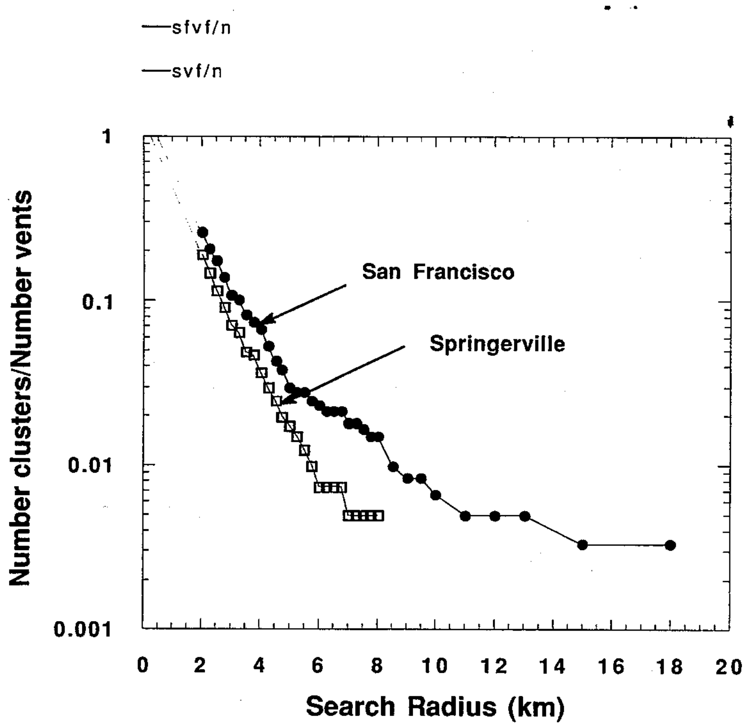
Information potentially subject to copyright protection was redacted from this location. The redacted material (a geologic map) is from the reference listed above. There is no additional information available.

Cluster Analysis Results based on work by C. Connor.

Comparing SFVF cluster size w/ that of nearby Springerville volc field.



Note that as SR (search radius) decrease the # vents per cluster increase



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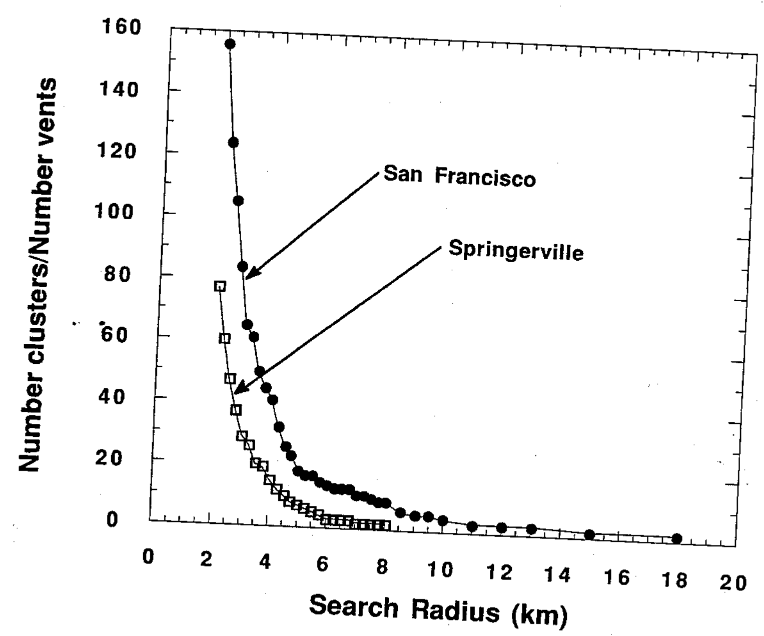
160
140
120
100
80
60
40
20
0
Number clusters/Number vents
San Francisco
Springerville
0 2 4 6 8 10 12 14 16 18 20
Search Radius (km)

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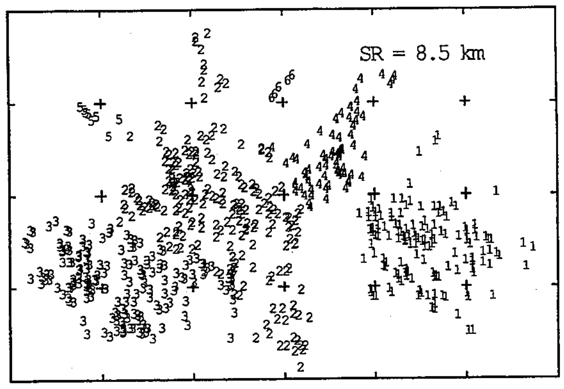
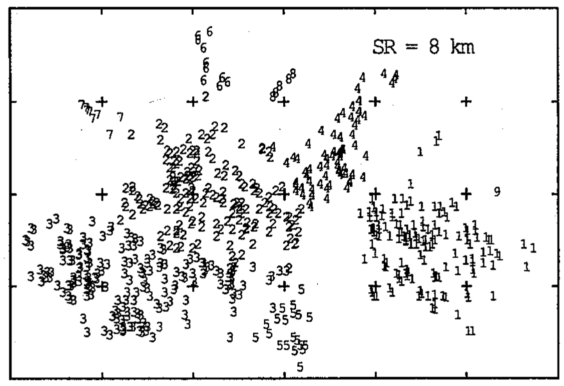
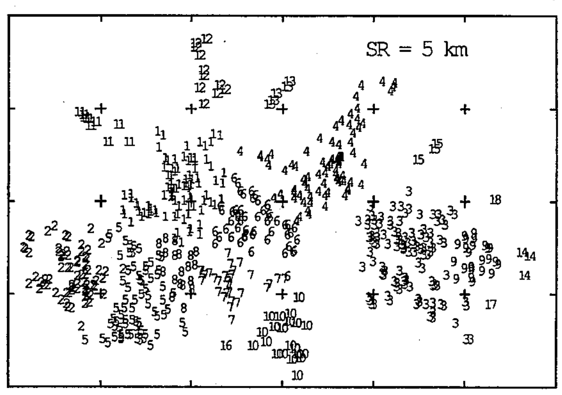
Example of cluster groups as a function of search Radius



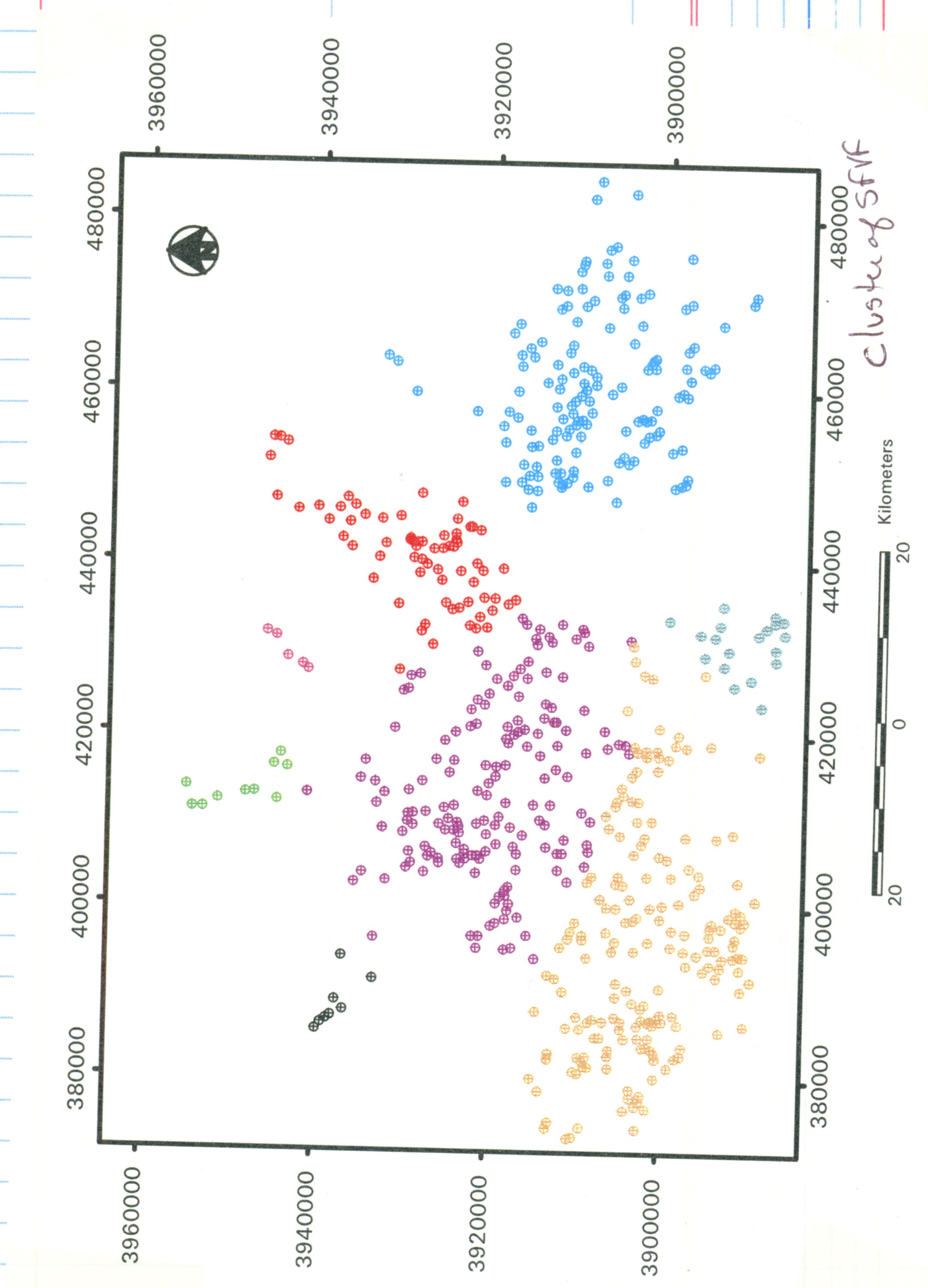
Note corresponding increase in # of cluster w decreasing search Radius





Final Cluster groupings for SFVF search Radius at 8.0 km.

Group 9 consisting of one outlier is dropped from the analysis as indicated.



UTM Projection
Zone 10

TMc

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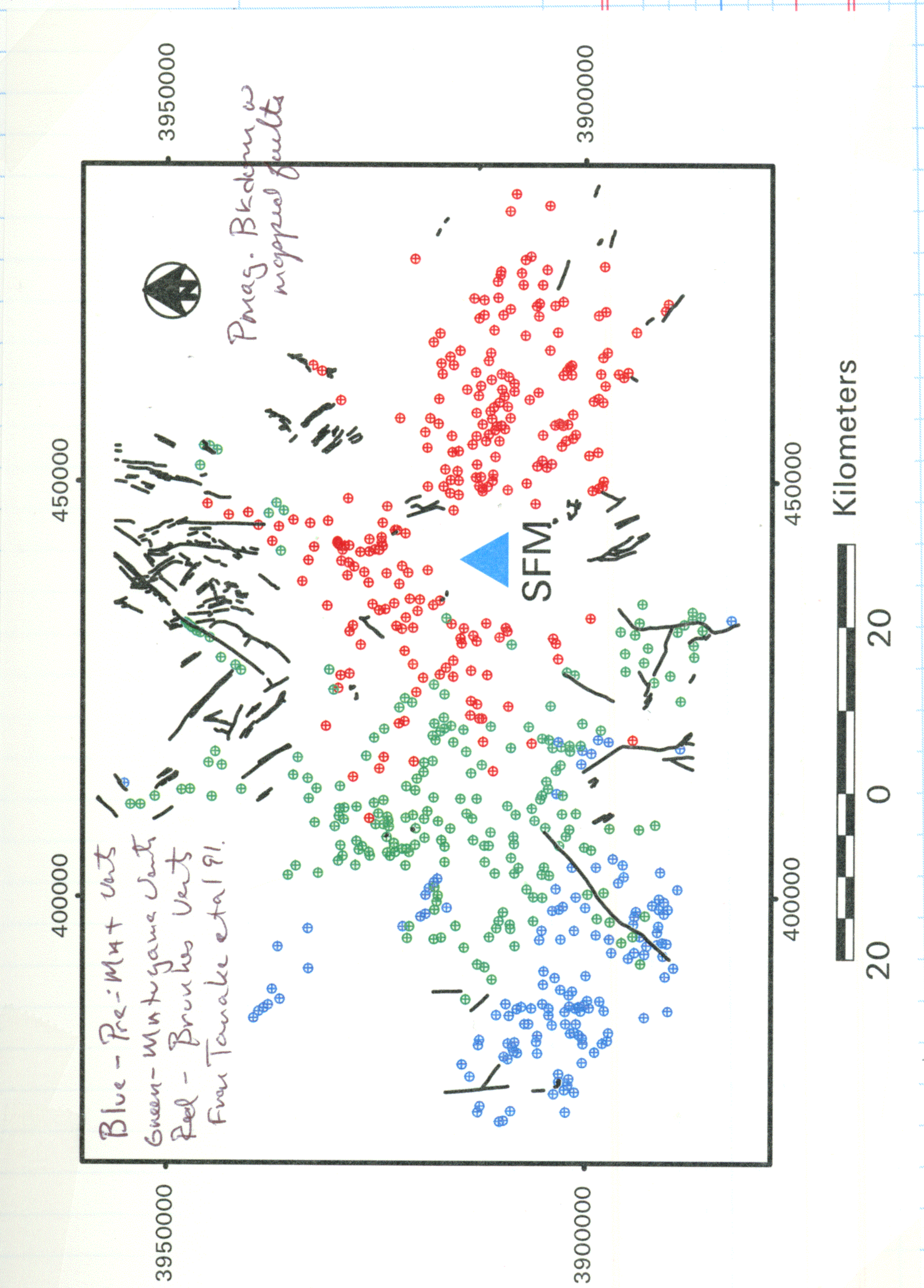
Paleodir breakout of vents ~~Results of Gosta analysis~~ w mapped faults superimposed on Flow + distribution



Faults digitized from USGS 1:50,000 series
Wolfe et 1987*

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Final Vent cluster of SFVF w/ faults superimposed.

Cluster # correspond w Table on next page.

~~Ves~~ Cluster 7 is only 5 vents not include fissure vents N of Mesa Butte cone

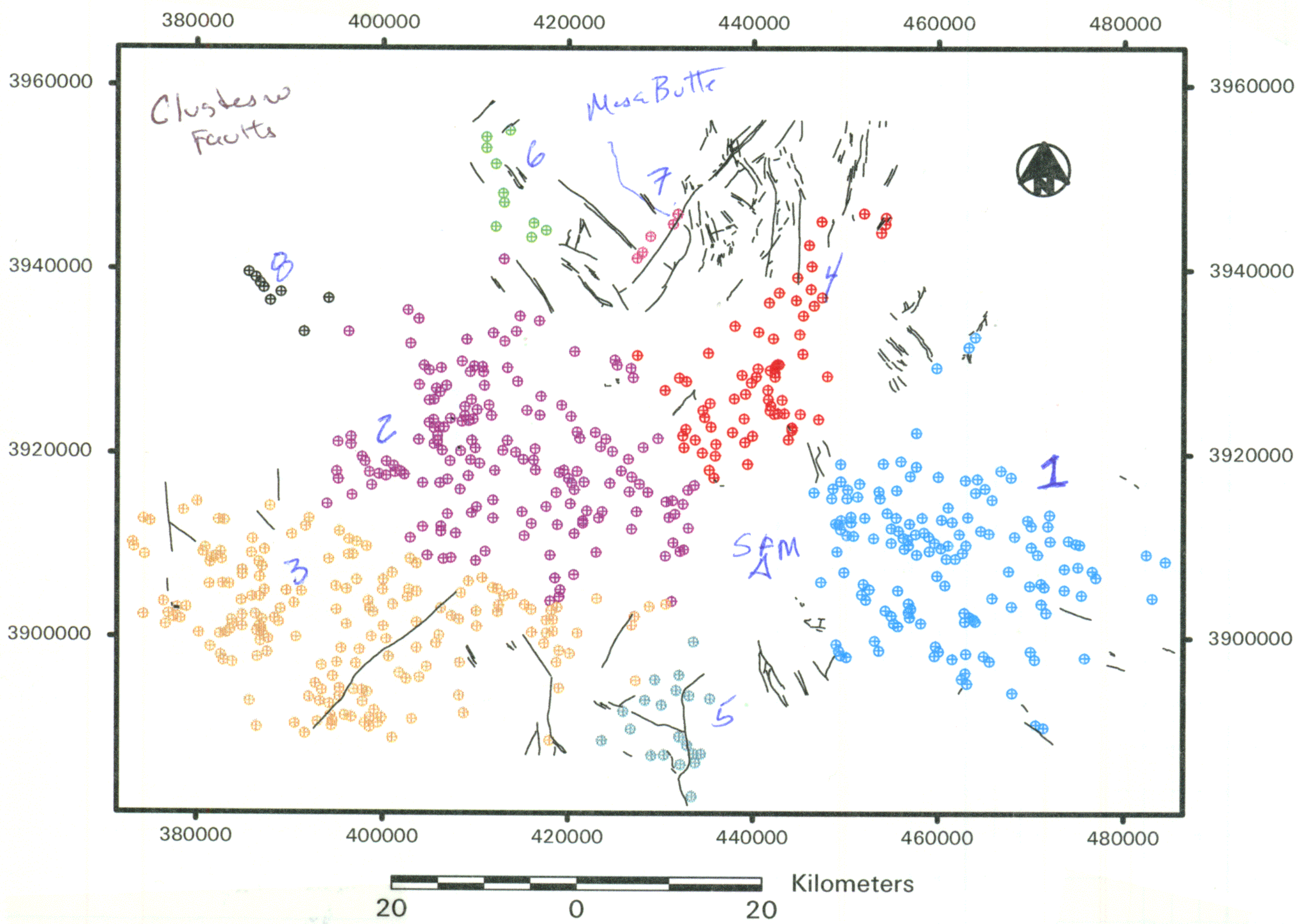

Table 1. Number of Vents, General Age, and trends of associated vent alignment of Cinder Cone Clusters of the SFVF.

Cluster	# of Vents	Paleochron*	# Align.	Align. Trend	% Vents on alignments
1	143	Brunhes.	3	NW^2, WNW	29%
2	166	PreMat to Mat.	6	NE^3, N, NW, WNW	32%
3	179	PreMat to Mat	4	NE^2, N, NW	21%
4	~~70~~ 68	Mat to Brunhes	3	NE^3	54 %
5	21	Matuyama	0	none	NA
6	10	Matuyama	0	none	NA
7	10	Matuyama	1	NE	100
8	8	PreMatuyama	1	NW	75%

Paleochron* is an approximation of cluster age based on paleomagnetic signatures of vents and lava flows (after Tanaka et al., 1991). # Align is the numbe[r of] alignments.

Vent area from average of 4 measurements.

[signature]

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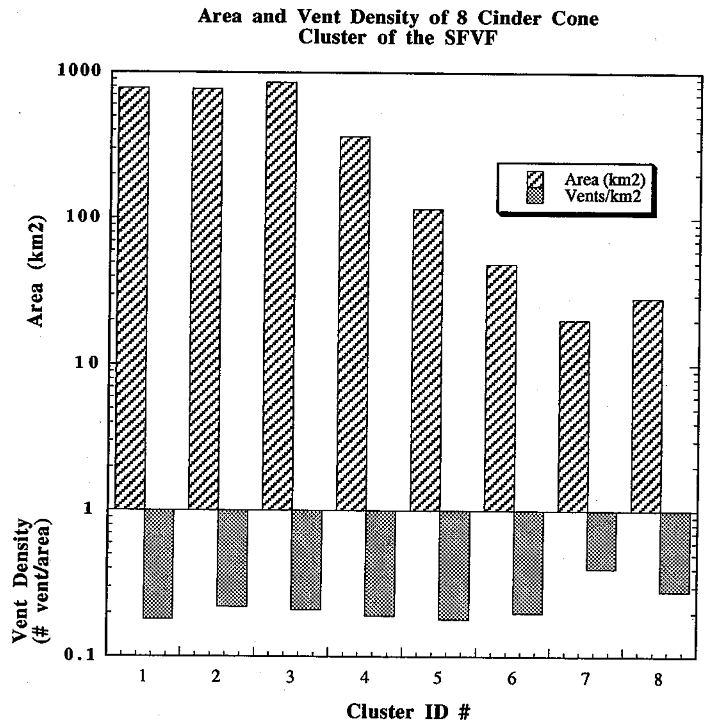

Fig

Excell data

Page #1 - "Clusters_size_vent_dens.data"

	Cluster #	Area (km2)	Vents/km2
0	1	780.30	0.18000
1	2	771.80	0.22000
2	3	857.00	0.21000
3	4	363.80	0.19000
4	5	115.90	0.18000
5	6	48.800	0.20000
6	7	20.200	0.40000
7	8	28.700	0.28000

Data from GIS reevaluated

Cluster	# of Vents	Age[a]	Area (km^2)[b]	Vent Density[c]	# Align.	Align. Trend	% Vents on alignments
1	143	Brunhes.	780	0.18	3	NW[2], WNW	29%
2	166	PreMat to Mat.	771	0.22	6	NE[3], N, NW, WNW	32%
3	179	PreMat to Mat	857	0.21	4	NE[2], N, NW	21%
4	~~70~~ c 8	Mat to Brunhes	364	0.19	3	NE[3]	54 %
5	21	Matuyama	116	0.18	0	none	-----
6	10	Matuyama	49	0.20	0	none	----
7	10	Matuyama	20	0.50	1	NE	100
8	8	PreMatuyama	29	0.28	1	NW	75%

a Age grouping based on paleostratigraphy (Tanaka et al., 1991) and radiometric ages (Damon et al., 1974; Wolfe et al., 1987; Mullhaney, 1996; and Conway et al., 1997).

b Areas determined by averaging 3 separate measurements. In several cases outliers were ignored where they substantially increased the resulting area, but in all cases at least 97 % of the vents were included in this analysis.

c Vent density was calculated by the total number of vents of a cluster by the areal extent.

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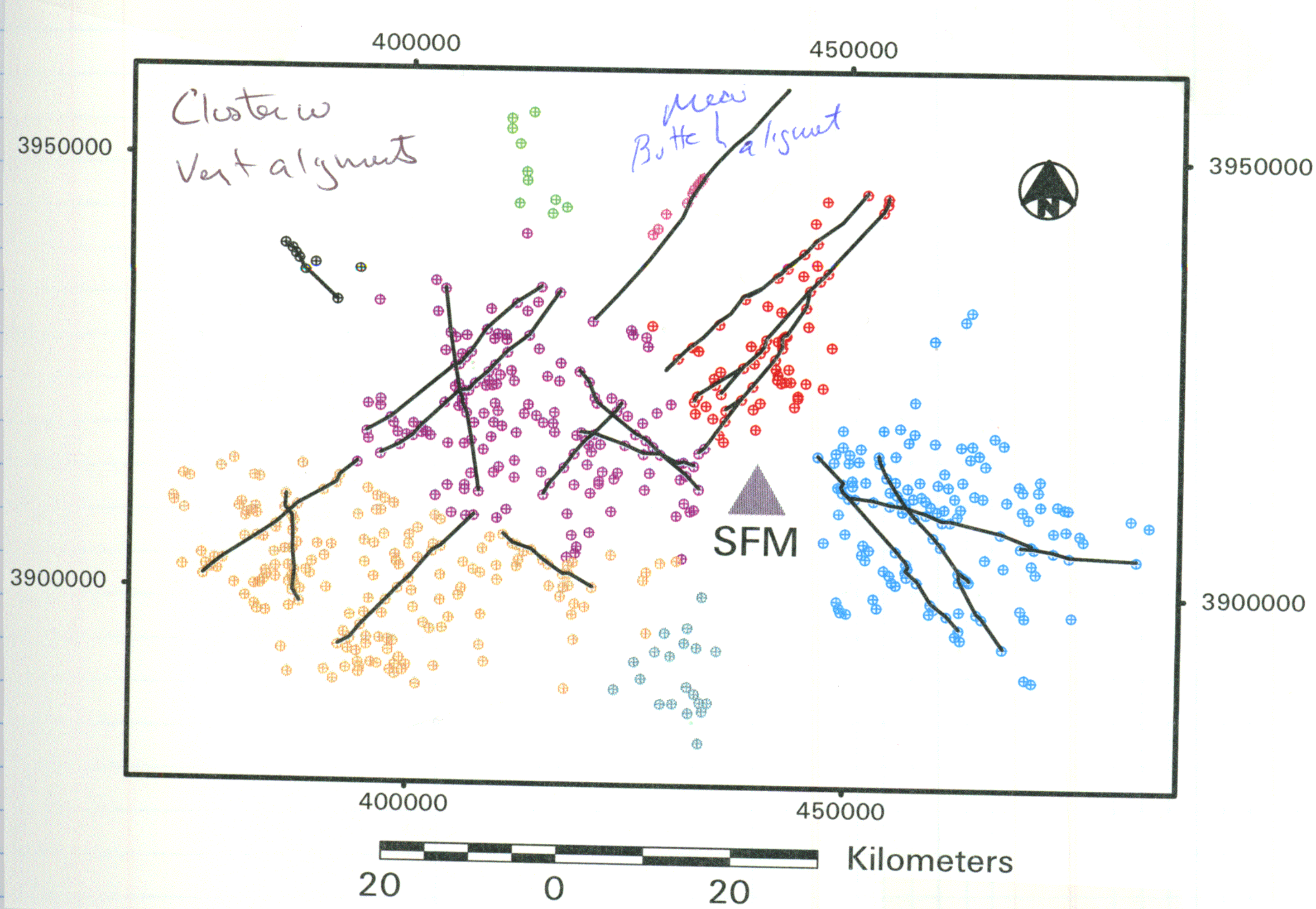
Fig

Results of Vent lineament analysis.

a total 17 alignments identified
a 18th alignment exists in west central part of SFVF and east of Mesa Butte alignment



> Clusters are indicated by different colors
> Vent lineament are shown by thick Black line

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Tabled Results of lineament analysis
Results shown on preceding page

Align.characters

TABLE 2: Characteristics of cinder cone alignments of the San Francisco Volcanic Field

Alignment	Cluster	# Vents	General Orient. NE+,NW	Length km	Spacing vents/km	Polarity Chron	Comments
B	3	10	55	21.9	0.46	PreMat-Mat	
C	3	9	0	12.8	0.70	PreMat	from 6.13 ma
D	3	9	47	21.6	0.42	Premat/Mat-Mat	Adj. MB ft. young N
E	2	9	55	26.2	0.34	Premat to Mat	Youngs to NE
F	2	13	55	28.1	0.46	Chiefly Mat (Prem)	Extension of B?
G	2	9	-10	23.6	0.38	Mat	
H	3	9	-60	12.1	0.74	Mat	
I	2	8	35	13.7	0.58	Mat-Brunhes/mat	
J	2	6	-75	13.6	0.44	Mat - Brunhes/Mat	
K	2	11	-50	19.4	0.57	Mat-Brunhes	youngs to SE
L	1	13	-40	26.4	0.49	Brunhes?	Little data
M	1	15	-35	26.6	0.56	Brunhes?	Sunset at NW end
N	1	12	-75	33.9	0.35	Brunhes	Singular orientation
O	7	6	-45	8.9	0.67	Premat	West end of field
NW WEST	4	9	50	28.8	0.31	Premat to Brunhes	youngs to NE?
WC	4	13	50	32.8	0.40	Mat to Brunhes	Youngs to SW?
East	4	19	37	37.2	0.51	Mat to Brunhes	perim. Mat;Int.Bru
m"	1	14	-40			Brunhes?	branch of M
wc"	4	12	50			Mat to Brunhes	Branch of WC
Mesa Butte		12		62	0.19	Mat to Bruhes	
Total*		**192**		**449.6**	**0.43**		

* Excluding m" and wc"

	Avg. Lth.	Total Lth (km)	Azimuthal Range	Total # of Alignments
NE Alignments	26.3 km	210.3	30 to 60 degrees	9 (incld MB)
NW Alignments	18.7 km	93.4	-30 to -60 degrees	6
WNW Alignments	23.7 km	47.5	-60 to -90 degrees	2
N Alignments	18.2 km	36.4	-15 to 15 degrees	2
Total		**387.6**		

Mean Length of all alignments (excluding Mesa Butte) is 22.8 km +/- 8.6 km

Lineament Analysis

Nov 14 96. [signature]

Statistics of Vent lineaments performed in Excel.

Page #1 - "SFVF-Align.#Vts,Lth,Spc,age"

Stats

	Align I.D.	Cluster	# Vents	Length	Vents/km	Age 1 to 4 (1 oldest)	Vent Orient Az.	Vents/km	Age 1 to 4 (1 oldest)	Vent Orient Az.	Vent Orient Azimuth
0	L	1	13	26.400	0.49000	4	320				
1	M	1	15	26.600	0.56000	4	325				
2	N	1	12	33.900	0.35000	4	285				
3	E	2	9	26.200	0.34000	1	55				
4	F	2	13	28.100	0.46000	2	55				
5	G	2	9	23.600	0.38000	2	350				
6	I	2	8	13.700	0.58000	3	35				
7	J	2	6	13.600	0.44000	3	285				
8	K	2	11	19.400	0.57000	3	310				
9	B	3	10	21.900	0.46000	1	55				
10	C	3	9	12.800	0.70000	1	0				
11	D	3	9	21.600	0.42000	1	47				
12	H	3	9	12.100	0.74000	2	300				
13	NW WEST	4	9	28.800	0.31000	2	50				
14	WC	4	13	32.800	0.40000	3	50				
15	EAST	4	19	37.200	0.51000	3	37				
16	O	7	6	8.9000	0.67000	1	315				
17	9June95										
18											
19											
20	Minimum	1	6	8.9000	0.31000	1	0				
21	Maximum	7	19	37.200	0.74000	4	350				
22	Sum	46	180	387.60	8.3800	40	2874				
23	Points	17	17	17.000	17.000	17	17				
24	Mean	2	10	22.800	0.49294	2	169				
25	Median	2	9	23.600	0.46000	2	55				
26	RMS	3	11	24.206	0.50837	2	216				
27	Std Deviation	1	3	8.3786	0.12810	1	139				
28	Variance	2	10	70.201	0.016410	1	19456				
29	Std Error	0	0	2.0321	0.031069	0	33				
30	Skewness	1	0	-0.068438	0.47381	0	0				
31	Kurtosis	2	0	-1.0412	-0.77553	-1	-1				

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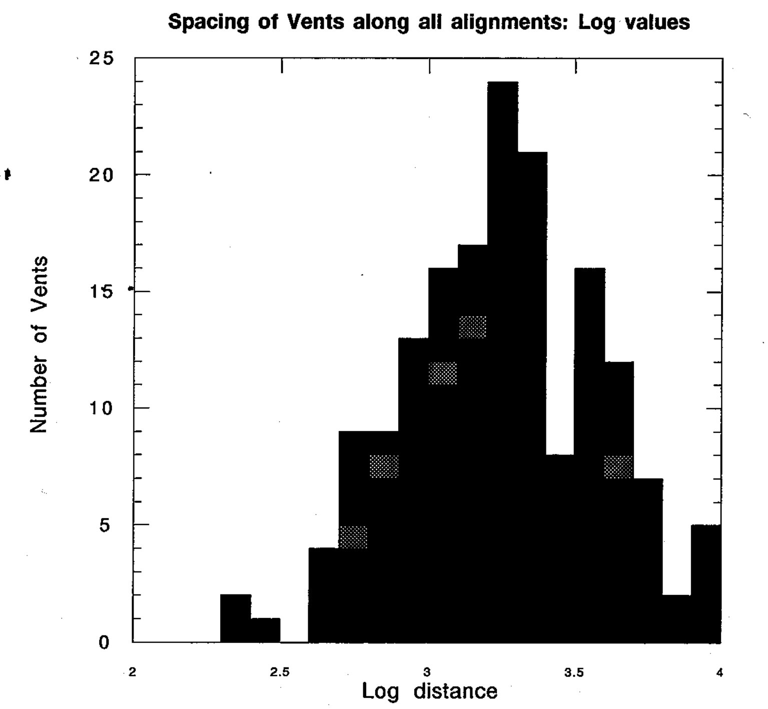
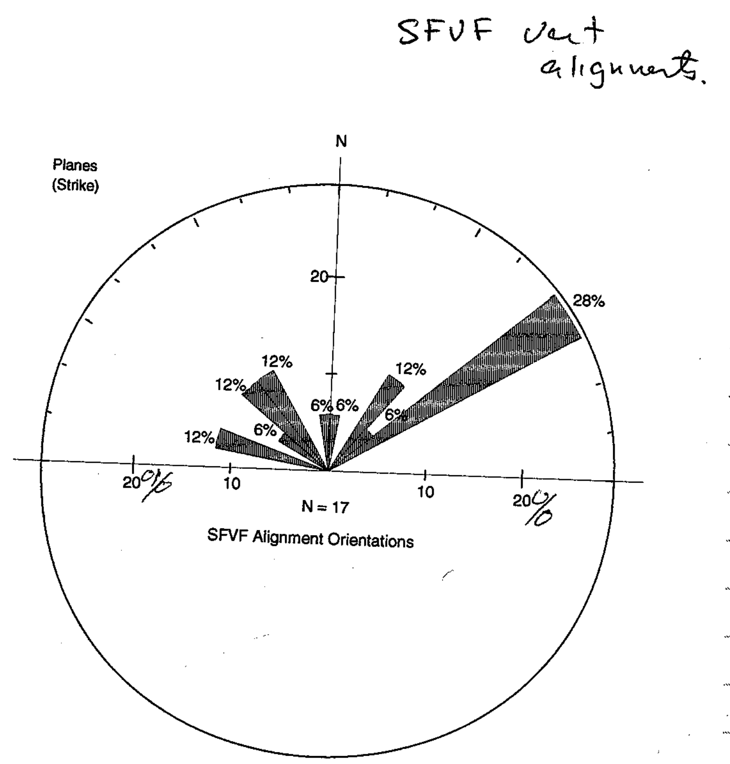


~~Spacing of~~

Histogram showing spacing of vents along Vent alignment of SFVF. Data appear to be log-normally distributed.

Nov 14 96.



Vent Alignment orientation
Plotted in Stereo-project.
N=17 alignments

Clearly NE dominated

Mar 14/96

Information potentially subject to copyright protection was redacted from this location. The redacted material (a map of Northern Mesa Butte Fault) is from the references listed below. No additional information is available.

Ages of ~~S~~ vent of vent alignment of SFVF Trace.

Ages from Tanaka et al 1991, Wolfe et al 1987
Damon 1974, or from Conway & Hall analysis
along Mesa Butte fault.

Nov 14 96.

~~Fault~~

Faults of SFVF.

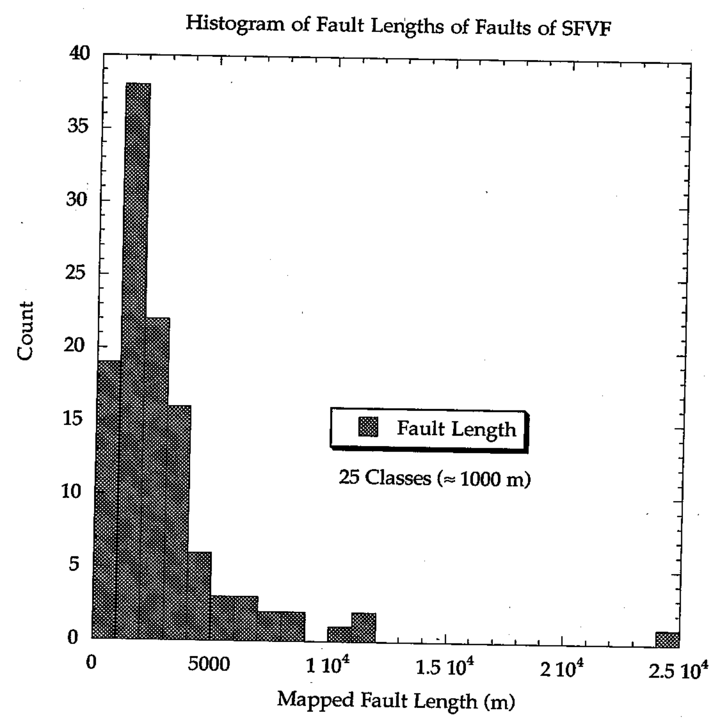
Faults are documented here for future comparison w vent alignment of SFVF

Data on faults largely from Wolfe et al 1987
but also from Shoemaker et al 1978

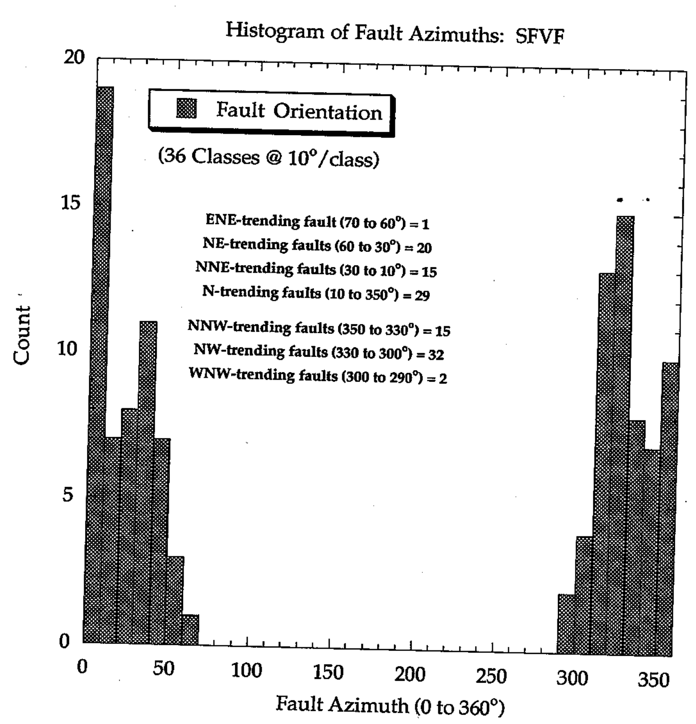
Fault ages based on youngest rock cut by faults.

San Francisco Volcanic Field: Fault Ages

Information potentially subject to copyright protection was redacted from this location. The redacted material is a drawing and is from the reference listed above.



Histograms of mapped fault length
& Fault Azimuth.
Note predominance of NNE to NNW faults

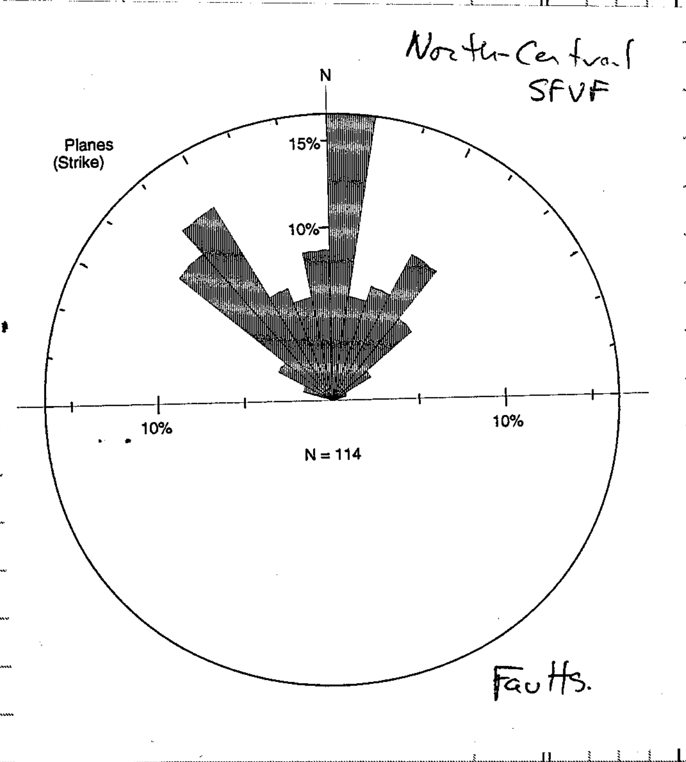


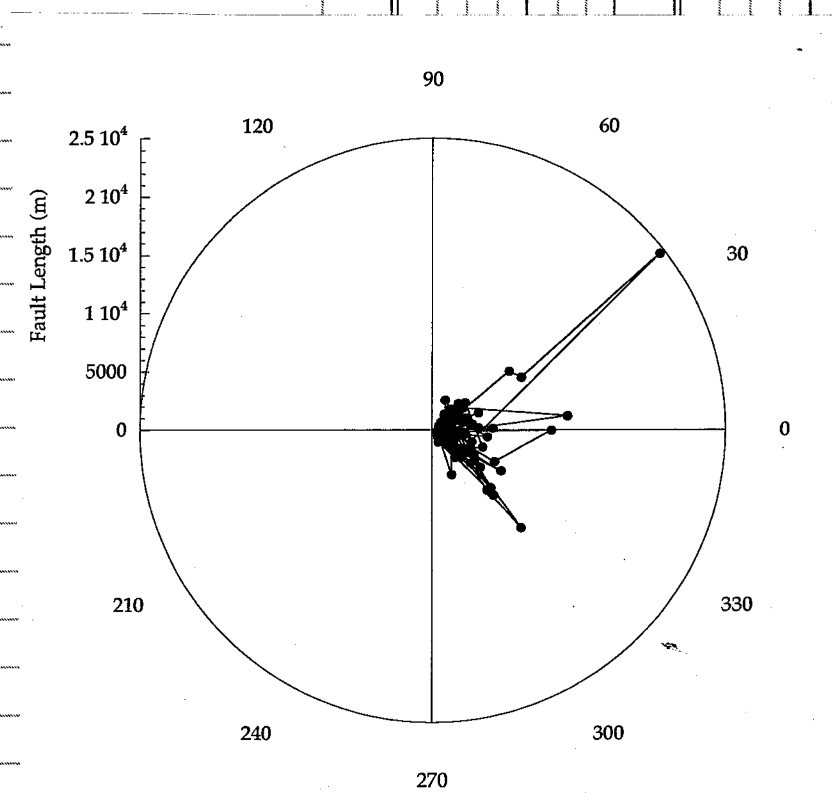
Nov 17, 96

[signature]

Rose diagram shows distribution of 114 faults in N-central field. & N of S Fenton.

Data from GIS ungenerate file
Rose diagram made in 3-d's tress.





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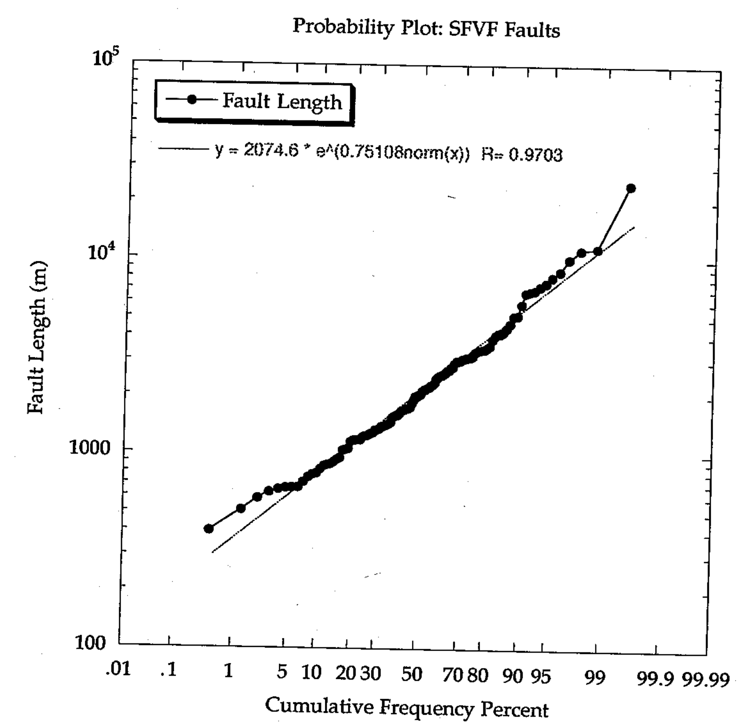
Probability map of fault length of Faults of SFVF. Given nature of curve indicate one population of faults.



Nov 18 96

Breakdown of faults in 10° Azimuth sectors.
Groups are noted at right — Lengths of faults determined in Arc info using dv..? command in Arc Plot

	Data for SFVF_Faults from P. Hunka							
	Data Processed in Rose Viewer in 3D stress							
Mag	Dir Plng							
SX 100 0	90							
SY 50 0	0						Groups	Groups
SZ 5 90	0						**% length**	**Total Lth (km)**
Stike	Shear/normal stress	Long. Cont.		Long. Cumu.		% lgth/tot lth		
0- 10	2.065706	4676.19		64484.07		0.124	North (350 to 20)	North (350 to 20)
10-20	1.929792	858.41		26270.63		0.051		
20- 30	1.614275	1609.92		35547.36		0.069	24.70	128.11
30- 40	1.275339	7090.37		46899.1		0.090		
40- 50	0.989708	2495.78		39367.88		0.076		
50- 60	0.769042	1553.41		18234.05		0.035	Northwest (350 to 300)	Northwest (350 to 300)
60- 70	0.585533	674.2		5057.32		0.010		
70- 80	0.461294	668.03		2520.77		0.005	27.15	140.81
80- 90	0.377594	517.6		2108.31		0.004		
90-100	0.348438	678.77		5887.84		0.011		
100-110	0.377594	1050.78		7338.08		0.014	Northeast (20 to 50)	Northeast (20 to 50)
110-120	0.461294	1042.35		20414.69		0.039		
120-130	0.585533	1335.46		30992.39		0.060	23.49	121.81
130-140	0.769042	1810.29		44408.23		0.086		
140-150	0.989708	5360.04		53142.17		0.102	Remaining Length %	Remaining Length %
150-160	1.275339	1222.4		43258.89		0.083		
160-170	1.614275	3609.42		35324.82		0.068	24.66	127.58
170-180	1.929792	1914.31		37356.79		0.072		
			Total	518613.39	Frac. Lt	1.000		

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Example of ungenerated Fault file taken from ~~the~~ Arc Info Arc coverage of all mapped faults in SFVF

Ungenerated faults SFVF

	Fault ID	Fault Length	Fault Orientation	C	Lths_descend_ord	Az_ascend_ord
0	1	3154.0	45.000		24533	0.0000
1	2	2251.0	51.000		11530	0.0000
2	3	2568.0	324.00		11237	0.0000
3	4	2321.0	322.00		10115	0.0000
4	5	3125.0	322.00		8758.0	0.0000
5	6	1170.0	327.00		8179.0	1.5000
6	7	1564.0	317.00		7607.0	2.0000
7	8	1449.0	321.00		7303.0	2.0000
8	9	1572.0	321.00		6993.0	2.0000
9	10	6784.0	329.00		6896.0	3.0000
10	11	4081.0	329.00		6784.0	3.0000
11	12	7303.0	313.00		5919.0	5.0000
12	13	7607.0	313.00		5156.0	6.0000
13	14	1176.0	304.00		5123.0	6.0000
14	15	4174.0	293.00		4695.0	6.0000
15	16	1715.0	21.000		4467.0	8.0000
16	17	2930.0	17.000		4278.0	8.0000
17	18	2012.0	333.00		4174.0	8.0000
18	19	6896.0	312.00		4174.0	9.0000
19	20	11237	312.00		4081.0	15.000
20	21	3097.0	329.00		3892.0	17.000
21	22	24533	38.000		3618.0	17.000
22	23	8758.0	31.000		3537.0	17.000
23	24	8179.0	38.000		3463.0	18.000
24	25	1407.0	24.000		3451.0	19.000
25	26	1253.0	0.0000		3419.0	19.000
26	27	1380.0	338.00		3399.0	20.000
27	28	3142.0	46.000		3347.0	20.000
28	29	1715.0	1.5000		3191.0	21.000
29	30	1286.0	350.00		3154.0	21.000
30	31	1736.0	350.00		3142.0	23.000
31	32	3077.0	39.000		3125.0	24.000
32	33	5156.0	322.00		3097.0	26.000
33	34	3419.0	326.00		3077.0	27.000
34	35	2025.0	351.00		3019.0	31.000
35	36	4695.0	353.00		3005.0	33.000
36	37	2613.0	15.000		2996.0	34.000
37	38	2107.0	341.00		2930.0	36.000
38	38	1974.0	341.00		2801.0	36.000
39	39	3463.0	343.00		2784.0	37.000
40	40	2784.0	68.000		2710.0	37.000
41	41	1539.0	320.00		2680.0	37.000
42	42	1380.0	320.00		2613.0	38.000
43	43	664.00	20.000		2568.0	38.000
44	44	1175.0	17.000		2547.0	39.000
45	45	713.00	352.00		2534.0	40.000
46	46	885.00	8.0000		2486.0	40.000
47	47	1271.0	8.0000		2433.0	41.000
48	48	2801.0	37.000		2321.0	44.000
49	49	3191.0	36.000		2272.0	44.000
50	50	11530	6.0000		2251.0	45.000
51	51	2149.0	0.0000		2202.0	46.000
52	52	2680.0	351.00		2190.0	51.000
53	53	1581.0	52.000		2149.0	52.000
54	54	951.00	44.000		2142.0	54.000
55	55	2202.0	0.0000		2107.0	68.000
56	56	3537.0	335.00		2025.0	293.00
57	57	5919.0	333.00		2012.0	295.00
58	58	10115	0.0000		1974.0	304.00
59	59	2534.0	357.00		1974.0	304.00
60	60	2710.0	19.000		1896.0	308.00
61	61	3019.0	20.000		1819.0	309.00
62	62	2996.0	18.000		1736.0	311.00

Nov 21 96

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Basalt Sample were collected from vents of Mesa Butte vent alignment for purpose of characterizing basaltic chemistry.

Earliest sample of Mesa Butte & environs collected by D. Ferrill, Alan Morris, and Chris Condit. The essential elements are in Alan Morris's notebook.

What follows is a discussion of Geochem collected in November 1995

Dr. Michael Conway
210 552-6829

8 December 1995

Analytical Services Lab.
Dept. of Geosciences
Texas Tech University

Dear Melanie:

Here are the samples from the San Francisco volcanic field that I promised would arrive immediately after Thanksgiving. I lied! After returning to TX from Flagstaff, I got called to Nicaragua to help out during the recent eruption of Cerro Negro; more fun but distracting. Anyway a list of the samples is below.

As with the first batch that you ran for us, please analyze all samples for major- and select trace-elements using the ICP. I've tried to clean the rocks up and hope that I send a sufficient amount of each sample. This week I'm at AGU, but I'll try and call you from there to confirm delivery.

Samples:

FV-1
SM1-4
CR-3
RM1
TW1-4
CM1-5
CM2-4.

I set this up with our purchase dept. so you should have a P.O. in hand.

We are in a tremendous hurry this time and hope that you can crank these out as quickly as possible.

Thanks and I'll talk with you soon.

Cheers

NOV. 30, 96

Decripto of vents sampled fr Geochem

Mesa Butte Field Trip: 17 Nov 1995 -- 21 Nov 1995

Purpose: To collect samples from previously unsampled vents and flows of the northern part of the Mesa Butte Fault zone. Potential sites are listed below and organized from south to north.

- Red Mountain -- vent, flow, and benmoreite flows
- Tappan Wash -- for chem and dating
- Chapel Mountain vents: 3
  vents & flows: dating, chemistry, petrography
- Mesa Butte south - visit prominent knobs and sample for chem.
- Fissure vent immediately NE of cone 6004
- Shadow Mountain

We should also visit Spider Web Ranch area: could do this on the same day that we visit Shadow Mtn.

Preserve txt

UTM coordinates of Samples collected 18 - 20 November 1995
for Ar/Ar and pmag analysis

Sample ID	Easting**	Northing**
FV-1	433900	3948850
CR-2	433225	3945750
CR-1	433000	3943450
RdMtn 1-4	422000	3932600
CM1 1-5	428000	3942000
CM2 1-4	427600	3941850
TW-1	433475	3938900
CR-3	431800	3941300
Shd-Mtn.	461000	3981375

** Sample site UTM coordinates taken from original sample map.

UTM Coordinates of Samples collected by D. Ferrill, C. Condit, and Alan Morris in August 95 for the the purpose of Ar/Ar analysis

Sample ID	Easting[1]	Northing[1]
MB-01	431744	3945384
MB-02	432904	3943443
MB-03	432227	3946932
MB-04	432484	3946780
MB-05	433171	3945750
MB-06	434963	3948115
MB-07	433905	3945798
MB-08	436146	3942766

1 Sample site UTM coordinates taken from Arc/info file (ar-ar) that was produced by P. Hunka digitization of original sample map supplied by David Ferrill.

2 Dec 95 CC

Dr. Michael Conway
CNWRA
Southwest Research Inst.
6220 Culebra Rd.
San Antonio, TX 78238

5 January 1996

Mineral Optics Lab.
P.O. Box 828
Wilder, Vermont 05088

Dear Sirs:

Enclosed are 7 rock specimens for thin-sectioning. The list below contains sample numbers and the particulars of each sample. In all cases, please make 27*46 mm sections with covers. Most of the samples are in billet form and I understand from a recent price list (received 9/8/95) that the cost is $14.00/section. One sample is uncut and I understand there is an additional $3.00 charge.

Sample List	**Comment**
FV-1	Please cut a section from each enclosed piece; in the one piece please include the large glassy phenocryst.
SM1-4	One billet one section
CR-3	One uncut sample one section
RM-1	Please cut section preserving marked section
TW1-4	Please cut two sections from the 3 enclosed pieces; I leave sample selection to you -- 6 of one 1/2 dozen of another.
CM1-5	Two billets but only one section required; choice is yours
CM2-4	Two billets but only one section required; choice is yours

Total thin sections to be made are 9.
Provisional costs (by my calculation)

8 covered thin sections from billets:	$112.00 @ $14.00 each
1 covered thin-section from rough sample:	$17.00 @ $17.00 each
Total	$129.00 + shipping

I spoke with someone from your shop on Thursday, and he assured me that if the sample arrived by 8 January, we would get the finished sections by 19 January. Please call me if there is a problem with that timetable or if you have questions about the work.

Yours sincerely,

2 Dec 96

Results from Texas Tech for Major & traces of Nov 1995 samples

ICP Geochemical Data from samples collected between 19 - 21 November 1995

Analyzed by Melanie at Texas Tech
Received in January 1996

Sample #	SiO[2]	TiO[2]	Al[2]O[3]	Fe[2]O[3]	MnO	MgO	CaO	Na[2]O	K[2]O	P[2]O[5]	LOI	Totals	Alkalies
BCM	55.18	1.1	15.88	8.42	0.14	5.65	7.12	3.87	2.08	0.43		99.87	5.95
CM2-4	47.24	1.72	13.15	11.13	0.17	13.18	9.32	2.93	1.16	0.48	0.12	100.6	4.09
SM1-4	47.33	1.53	15.71	11.46	0.19	8.68	10.99	2.77	0.44	0.62	-0.24	99.48	3.21
CR-3	51.96	1.57	16.18	12.14	0.27	3.55	6.65	4.6	1.93	0.92	0.46	100.23	6.53
BCM	54.89	1.1	15.82	8.43	0.14	5.64	7.03	3.86	2.07	0.43		99.41	5.93
RM1	47.46	2.46	17.62	13.18	0.19	5.22	8.53	3.97	0.85	0.63	0.02	100.13	4.82
TW1-4	49.46	2.39	16.6	13.66	0.22	4.46	7.06	4.41	1.5	1.19	0.01	100.96	5.91
FV-1	48.16	2.29	16.98	12.35	0.18	6.15	8.6	3.79	1.06	0.49	-0.25	99.8	4.85
BHVO	50.24	2.73	13.79	12.23	0.18	7	11.18	2.23	0.51	0.28		100.37	2.74
CM1-5	46.78	1.79	12.73	11.47	0.18	13.84	9.39	2.87	1.1	0.46	-0.02	100.59	3.97
MHA	61.37	0.86	17.67	6.31	0.11	3.19	6.09	4.19	1.2	0.18		101.17	5.39
BCM	56.15	1.12	15.93	8.6	0.15	5.61	6.99	3.79	2.06	0.46		100.86	5.85

Sample #	Rb	Ba	Sr	V	Cr	Ni	Zr	Sc	Cu	Nb	Zn	Y	Be
BCM		866	701	135	158	93	161	18.5	45	35	73	22.2	1.5
CM2-4	17	520	628	195	792	466	168	23.2	81	46	80	22.6	1.5
SM1-4	13	690	826	244	388	208	113	30.9	66	39	74	23.2	1
CR-3	10	2173	636	72	81	36	187	22.8	20	38	101	30.4	1.5
RM1	6	656	1026	270		11	146	20.8	30	31	93	23.8	1.3
TW1-4	26	745	776	100	48	95	224	14.3	22	40	123	39.1	1.8
FV-1	15	409	747	209	88	37	179	21.8	41	32	99	26.5	1.5
BHVO		132	396	318	288	122	172	32	135	19	101	27.5	1.2
CM1-5	17	445	599	199	865	493	162	23.6	77	43	88	22.7	1.4
MHA		305	556	103	49	21	152	12.9	18	10	67	17	1.2
1.5BCM		1304	1085	211	236	145		28.5	72	53	111	33.2	2.4

4 Dec 96

[initials]

All Mesa Butte Samples & Standards used in analysis
Typically major elements stds precision w/ 1% or less.
Traces 5-10% or less.

Mesa Butte Geochemical Data: Final Data

Data Received from Texas Tech in Sept 1995 & January 1996
Processed 21 Sept. 1995 and 30 January 1996
Last modified 24 July 96 — M. Conway

Sample #	C. Hall 40Ar/39Ar Sample #	Episode	Geo Unit	Descriptive Comment	SIO[2]	TIO[2]	Al[2]O[3]	Fe[2]O[3]	MnO	MgO	CaO	Na[2]O	K[2]O	P[2]O[5]	LOI	Totals	Alkalies	FeO*	Mg #
TW1-4	TW1-4	5	Qbmb	Tappan Wash Flow	49.46	2.39	16.6	13.66	0.22	4.46	7.06	4.41	1.5	1.19	0.01	100.96	5.91	12.29	39.28
RM1	RM1	4	Qbmb	Red Mountain	47.46	2.46	17.62	13.18	0.19	5.22	8.53	3.97	0.85	0.63	0.02	100.13	4.82	11.86	43.96
Rd Mtn 5528	No analysis	4	Qbmbn	USGS Analy:And. flow	61.53	0.75	17.23	5.59	0.14	1.41	3.26	5.44	3.14	0.42	--	98.91	8.58	5.59	31.02
CM2-4	CM2-4	1	QTmb	Chapel Mountain	47.24	1.72	13.15	11.13	0.17	13.18	9.32	2.93	1.16	0.48	0.12	100.6	4.09	10.01	70.11
CM1-5	CM1-5	1	QTmb	V6619a	46.78	1.79	12.73	11.47	0.18	13.84	9.39	2.87	1.1	0.46	-0.02	100.59	3.97	10.32	70.50
V6618	No analysis	1	QTmb	USGS analysis	46.52	1.8	14.5	11.25	0.18	9.96	10.15	2.92	1.15	0.44	--	98.91	4.07	11.25	61.21
CR-3	CR-3	2	Qmb	MB south flow I	51.96	1.57	16.18	12.14	0.27	3.55	6.65	4.6	1.93	0.92	0.46	100.23	6.53	10.92	36.68
MB-2	MB02	2	Qmb 6609	MB south flow II	49.07	1.99	16.53	11.88	0.19	5.59	8.67	3.76	1.06	0.65	-0.05	99.34	4.82	10.69	48.24
MB1	MB01	3	V6609	MB Vent Sam	48.29	2.3	17.12	12.19	0.18	4.91	8.36	4.16	1.37	0.58	0.16	99.62	5.53	10.97	44.38
MB-5	MB05	3	Qmb 6609	MB lava1 km E	47.75	2.49	17.27	12.67	0.18	5.66	8.38	3.94	1.12	0.55	-0.24	99.77	5.06	11.40	46.95
MB-6	MB06	3	Qmb 6609	Site of 1.39 m.y.	47.84	2.28	17.11	11.97	0.17	5.22	8.85	4.14	1.28	0.55	0.24	99.65	5.42	10.77	46.35
MB-7	MB07	3	Qmb 6609	MB lava 2.5 km E	46.99	2.03	17.15	11.278	0.17	7.47	9.49	3.24	0.91	0.42	-0.29	98.86	4.15	10.15	56.75
MB-8	MB08	3	Qmb 6609	MB lava 7 km ESE	49.27	2.45	17.38	12.39	0.18	5.07	7.99	4.21	1.31	0.63	-0.63	100.25	5.52	11.15	44.77
MB-3	MB03	3	V6604	Flow field of 6604	47	2.07	17.54	11.656	0.17	7.59	9.63	3.32	0.87	0.37	-0.28	99.94	4.19	10.49	56.33
MB-4	MB04	3	Qmbf	Fissure vent	47.24	2.13	17.22	11.54	0.17	7.53	9.78	3.49	1	0.44	-0.41	100.13	4.49	10.38	56.38
FV-1	FV-1	3	Qmbf	Fissure vent	48.16	2.29	16.98	12.35	0.18	6.15	8.6	3.79	1.06	0.49	-0.25	99.8	4.85	11.11	49.66
SM1-4	SM1-1	5	Qbb	Shadow Mountain	47.33	1.53	15.71	11.46	0.19	8.68	10.99	2.77	0.44	0.62	-0.24	99.48	3.21	10.31	60.01

Sample #	Episode	Rb	Ba	Sr	V	Cr	Ni	Zr	Sc	Cu	Nb	Zn	Y	Be		Y/Nb	Zr/Nb	Ba/Zr	Ba/Rb
TW1-4	5	26	745	776	100	48	95	224	14.3	22	40	123	39.1	1.8	TW1-4	0.98	5.60	3.33	28.65
RM1	4	6	656	1026	270		11	146	20.8	30	31	93	23.8	1.3	RM1	0.77	4.71	4.49	109.33
CM2-4	1	17	520	628	195	792	466	168	23.2	81	46	80	22.6	1.5	CM2-4	0.49	3.65	3.10	30.59
CM1-5	1	17	445	599	199	865	493	162	23.6	77	43	88	22.7	1.4	CM1-5	0.53	3.77	2.75	26.18
CR-3	2	10	2173	636	72	81	36	187	22.8	20	38	101	30.4	1.5	CR-3	0.80	4.92	11.62	217.30
MB-2	2	16	761	726	196	172	69	157	22.2	172	33	94	25.7		MB-2	0.78	4.76	4.85	47.56
MB1	3	18	528	796	246	413	187	190	18.2	26	36	101	27.6		MB1	0.77	5.28	2.78	29.33
MB-5	3	15	475	819	189	55	40	171	20	31	32	94	26.3		MB-5	0.82	5.34	2.78	31.67
MB-6	3	18	504	807	180	67	38	185	19.1	23	39	105	28.1		MB-6	0.72	4.74	2.72	28.00
MB-7	3	13	310	645	210	175	109	147	24.1	39	29	92	23.6	1.24	MB-7	0.81	5.07	2.11	23.85
MB-8	3	18	532	847	167	45	21	194	18.2	23	36	99	28		MB-8	0.78	5.39	2.74	29.56
MB-3	3	12	288	650	217	156	112	138	24.1	44	26	94	23.3	1.1	MB-3	0.90	5.31	2.09	24.00
MB-4	3	13	324	659	206	155	83	152	23	41	28	96	24.2	1.33	MB-4	0.86	5.43	2.13	24.92
FV-1	3	15	409	747	209	88	37	179	21.8	41	32	99	26.5	1.5	FV-1	0.83	5.59	2.28	27.27
SM1-4	5	13	690	826	244	388	208	113	30.9	66	39	74	23.2	1	SM1-4	0.59	2.90	6.11	53.08

FeO = FeO + Fe2O3 ().8998 from Mulhaney 96
MG# = 100 *(MgO/40.31)/(Mgo/40.31 + FeO*/71.85)
Major element error on the order of +/- 1 %.
Trace element errors are typically 5% or less, as large as 10% near the level of detection.

Replicate Samples and Standard Analysis

Sample #	Geo Unit	Comment	L	SIO[2]	TIO[2]	Al[2]O[3]	Fe[2]O[3]	MnO	MgO	CaO	Na[2]O	K[2]O	P[2]O[5]	LOI	Totals	Alkalies
MB-9	Qmb 6609	= MB-7		46.6	2.15	16.91	12.1	0.17	7.46	9.93	3.42	0.9	0.38	-0.24	99.78	4.32
MB-10	Qmb 6609	= MB-2		49.05	2.01	16.57	11.97	0.19	5.57	8.49	3.73	1.09	0.66	-0.1	99.23	4.82
MB-11	V6604	=MB-3		46.78	2.01	17.5	11.282	0.17	7.79	9.69	3.19	0.81	0.37	-0.34	99.25	4

Sample #	Geo Unit	Comment	Rb	Ba	Sr	V	Cr	Ni	Zr	Sc	Cu	Nb	Zn	Y	Be
MB-9	Qmb 6609	= MB-7	13	300	657	219	203	268	149	24.7	40	29	96	24.3	
MB-10	Qmb 6609	= MB-2	15	742	735	200	173	87	162	22.2	39	34	93	25.7	
MB-11	V6604	=MB-3	12	281	668	214	160	90	134	23.9	45	25	99	23.1	

USGS Analysis of Vents from Mesa Butte Alignment

Sample #	Geo Unit	Comment	L	SIO[2]	TIO[2]	Al[2]O[3]	Fe[2]O[3]	MnO	MgO	CaO	Na[2]O	K[2]O	P[2]O[5]	LOI	Totals	Alkalies
Rd Mtn 5531	Qbmb	basalt lavas		47.17	2.03	17.27	12.52	0.16	7.59	9.2	3.26	0.72	0.49		100.41	3.98
Rd Mtn 5528	Qbmbn	Benmoreite		61.53	0.75	17.23	5.59	0.14	1.41	3.26	5.44	3.14	0.42		98.91	8.58
Shadow Mtn	Shad. Mtn	Basalt lavas		45.5	1.3	14.9	10.8	0.1	8.5	12.3	3.5	0.5	0.5			4
Chapel Mtn	QTmb	Picritic Basalt		45.17	1.65	12.4	11.18	0.16	14.2	8.9	2.81	1.06	0.4		97.93	3.87
V6618	QTmb	Cpx-Ol Basalt		46.52	1.8	14.5	11.25	0.18	9.96	10.15	2.92	1.15	0.44		98.91	4.07
Rd Mtn 5531	Qbmb	No Trace elements														

6 Dec 96
[illegible]

All Mesa Butte Samples & Standards used in analysis
Typically major elements stds precision w/ 1% or less.
Traces 5-10% or less.

Rd Mtn 5528	Qbmbn	No Trace elements
Shadow Mtn	Shad. Mtn	No Trace elements
Chapel Mtn	QTmb	No Trace elements
V 6619A	QTmb	No Trace elements
V6618	QTmb	No Trace elements

Standard Analysis from 19-21 November1995 Batch

Sample #	SIO[2]	TIO[2]	AI[2]O[3]	Fe[2]O[3]	MnO	MgO	CaO	Na[2]O	K[2]O	P[2]O[5]	LOI	Totals	Alkalies
BCM	55.18	1.1	15.88	8.42	0.14	5.65	7.12	3.87	2.08	0.43		99.87	5.95
BCM	54.89	1.1	15.82	8.43	0.14	5.64	7.03	3.86	2.07	0.43		99.41	5.93
BHVO	50.24	2.73	13.79	12.23	0.18	7	11.18	2.23	0.51	0.28		100.37	2.74
MHA	61.37	0.86	17.67	6.31	0.11	3.19	6.09	4.19	1.2	0.18		101.17	5.39
BCM	56.15	1.12	15.93	8.6	0.15	5.61	6.99	3.79	2.06	0.46		100.86	5.85

Sample #	Rb	Ba	Sr	V	Cr	Ni	Zr	Sc	Cu	Nb	Zn	Y	Be
BCM		866	701	135	158	93	161	18.5	45	35	73	22.2	1.5
BHVO		132	396	318	288	122	172	32	135	19	101	27.5	1.2
MHA		305	556	103	49	21	152	12.9	18	10	67	17	1.2
1.5BCM		1304	1085	211	236	145		28.5	72	53	111	33.2	2.4

6 Dec 96
Ffw

$^{40}Ar/^{39}Ar$ dating of Mesa Butte basalts

Purpose: to characterize timing of volcanism on the Alignment.

Initial samples are from Ferrill - Mario & Condit work -

After some discussion settled on Chall. Labs. at Univ of Michigan

Sample nomenclature

From: Mike Conway
To: David Ferrill

Project: Ar/Ar dating of Mesa Butte basalts
Date: 6 July 1995

Received rocks from Mesa Butte area from Chris Condit and Karen Mullaney (U Mass) on 5 July. I cataloged the rocks on 6 July and noted location descriptions.

Sample list

Sample	Amount	Comments
MB 15.8.94.01	≈ 7 lbs	No location description
MB 18.8.94.02	≈ 12 lbs	6609 Qmb NE corner, SW quad Sect. 15, SE of Mesa Butte
MB 17.8.94.03	≈ 15 lbs	6604 Qmb
MB 18.8.94.04	≈ 8 lbs	Qmbf Fissure eruption
MB 18.8.94.05	Thin Sec. Chips	Fissure E of Mesa Butte cone
MB 18.8.94.06	≈ 1-2 lbs	Qmb 6609 at 1.38 Ma date origin
MB 18.8.94.07	≈ 5 - 7 lbs	Qmb flow, SW corner, Sec. 2 BM 6088 (APM-35)
MB 18.8.94.08	≈ 8 lbs	No location description

We also received thin section chips for each sample.

7-Dec 96

The University of Michigan

DEPARTMENT OF GEOLOGICAL SCIENCES

1006 C. C. LITTLE BUILDING
ANN ARBOR, MICHIGAN 48109-1063

(313) 764-1435
FAX: (313) 763-4690

September 25, 1995

Michael Conway
CNWRA
Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78238-5166

Dear Mike:

Here are the data from the volcanic samples that you sent us. I have enclosed a 2 page set of notes explaining the rest of the data. All of this information can be made available in machine readable form. Let me know if you would like to have the files, and I can arrange for you to get them (probably via FTP). If you have any questions, don't hesitate to ask.

Yours sincerely,

Chris

Chris M. Hall
Ass't Research Scientist

8 Dec 96

Sample results

Mesa Butte $^{40}Ar/^{39}Ar$ Results

The enclosed pages present our analytical results for the nine Mesa Butte samples provided by SWRI. My general impression is that 8 of the 9 samples erupted in a fairly narrow time window, probably between about 700 to 850 ka. One sample (MB02) appears to be significantly older than the others, with an apparent age of about 1 Ma. I have organized these notes to match the order of the accompanying tables and figures. All of the results are corrected for fusion system blanks, which were measured once every 5 or 6 samples. The mass spectrometer was calibrated daily for mass discrimination by running an atmospheric argon volume of about 2.5×10^{-9} mlSTP. All data have been corrected for interference reactions due to Ca, K and Cl, as well as for the decay of ^{37}Ar and ^{39}Ar.

1. **Integrated (Total Gas) Data.** This table gives the total gas ages for the 22 different $^{40}Ar/^{39}Ar$ analyses performed on the Mesa Butte samples. In all tables and figures, the error estimates are quoted at the 1σ level. I have also included the total gas $^{40}Ar/^{36}Ar$ ratios which demonstrate some of the difficulties that are inherent in working with material this young. Atmospheric argon has a ratio of 295.5, and the total gas ages are calculated assuming an atmospheric initial argon ratio. When the $^{40}Ar/^{36}Ar$ ratio is very low, as it is with many of these samples, precise dates are difficult to achieve. The ages in this table should be equivalent to conventional K-Ar ages.

2. **Plateau Ages.** For multiple fraction step-heating runs, I tried to find plateau segments for each age spectrum. A plateau segment was defined as a portion of the age spectrum with at least 3 consecutive fractions that account for at least 50% of the ^{39}Ar released, and which, when combined in an error weighted average, yield a mean squared weighted deviate (MSWD) of no more than 2. As with the total gas ages, the individual fraction ages and the plateau ages assume an initial $^{40}Ar/^{36}Ar$ ratio of 295.5.

3. **Isochron Results.** This table displays the results of attempting to fit our data to a straight line "isochron" in a standard $^{36}Ar/^{40}Ar$ *vs* $^{39}Ar/^{40}Ar$ diagram (sometimes called an argon isotope correlation diagram). This approach has the advantage that one can combine replicate analyses and one can test the assumption that the initial argon composition is truly atmospheric. All of the runs yielded reasonable linear arrays, with only 2 data sets exceeding an MSWD of 2. In most cases the apparent initial argon isotopic composition is within error of being the same as the atmospheric value, but there is a trend towards slightly low values. There are several possible reasons for this. One might be that there is a small contribution to mass 36 which is not argon (possibly HCl?) which escaped our normal gas clean up procedures. Alternatively, a slight degree of ^{40}Ar loss at low retentivity sites could yield an erroneously low apparent initial $^{40}Ar/^{36}Ar$. I think this rather unlikely, however, as most of the low individual fraction ages are at the highest release temperatures. It may also be possible that there are subtle effects due to differential recoil of calcium-derived ^{36}Ar and ^{37}Ar, causing inappropriate corrections for Ca interference reactions. In this case, total gas ages would be more reliable than either the plateau ages or the isochron ages. Finally, the low apparent initial ratios may be due to mass fractionation of argon during the incorporation of argon at the time of sample formation. Indeed, the range of initial ratios are compatible to the range found for historic lava flows. If these ratios are correct, or if they are due to a non-argon component, the isochron ages would be the most reliable.

4. **Histogram of Age Results.** This diagram summarizes all of the 3 kinds of age data. In a normal histogram, a data point is represented by a square. In this diagram, the ages are represented by a Gaussian probability density function scaled in the *x* direction by each measurement's error estimate. The area under the "Integrated Ages" graph is the highest because it includes more numbers, such as single step fusions. In all cases, the MB02 ages are distinctly higher than the other apparent ages. The plateau ages cluster more tightly than the integrated ages, and the isochron results are the tightest grouping of all. If the isochron ages are accurate, then it suggests that 8 of the 9 samples were erupted in a relatively narrow time range of about 750 to 900 ka. It is difficult to resolve age differences between the units, with the notable exception of MB02. Paleomagnetic data would be useful in this case, as the Brunhes-Matuyama transition should occur somewhere within this age window.

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5. **Age Spectra (19 pages).** These diagrams show the age spectra and the corresponding Ca/K spectra for the 19 step-heated analyses. All error boxes are $\pm 1\sigma$.

6. **Argon Isochron (Correlation) Diagrams, 9 pages.** These diagrams show all of the data in $^{36}Ar/^{40}Ar$ *vs* $^{39}Ar/^{40}Ar$ diagrams. Fitted lines are shown and the data symbols are keyed to the different sample runs. Error ellipses are drawn at the 1σ level, and they include the effects of error correlation. All data are blank corrected.

7. **Age Program Printouts (4 pages).** This condensed printout shows the basic data reduction program output. All "masses" are listed as 1 g so that the measured volumes come out as absolute values of mlSTP. Real masses (which were not measured) would have ranged fro a few mg to a few tens of mg. All analyses were performed by laser step-heating and the "temp" field actually refers to laser power in mW.

8. **Isochron Progam Printouts (3 pages).** These show the details of the isochron fitting program.

C8a,MB01

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.86866E-04 +/- 9.95573E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	4.04167E+01	1.04010E-01	2.79900E+07	3.86866E-04	9.95573E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
C8a-400 9-6-199	1.77998E-02	-1.33115E-03	1.81126E-03	-1.46378E+00	1.37832E+00	-1.02192E+06	9.62524E+05
C8a-800 9-6-199	1.26937E-01	-1.43570E-03	2.64794E-02	1.37589E+00	1.95887E-01	9.60028E+05	1.36644E+05
C8a-1200 9-6-19	2.95925E-01	-1.28059E-03	5.79054E-02	9.32764E-01	6.90238E-02	6.50892E+05	4.81568E+04
C8a-2000 9-6-19	5.95252E-01	-1.30708E-03	6.17202E-02	1.03787E+00	4.36472E-02	7.24221E+05	3.04507E+04
C8a-3200 9-6-19	8.32718E-01	-1.94251E-03	3.91289E-02	1.10139E+00	7.44893E-02	7.68535E+05	5.19666E+04
C8a-5000 9-6-19	1.00000E+00	-2.82903E-03	2.76992E-02	7.65148E-01	1.54819E-01	5.33946E+05	1.08022E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
C8a-400 9-6-199	4.00000E+02	1.03105E+02	2.05369E+00	2.31030E-02	2.86601E+02	8.13323E+00	2.15605E-10
C8a-800 9-6-199	8.00000E+02	8.07063E+01	2.21499E+00	1.38841E-02	3.66143E+02	1.24197E+01	1.56521E-10
C8a-1200 9-6-19	1.20000E+03	7.15262E+01	1.97569E+00	1.15638E-02	4.13135E+02	1.20759E+01	9.86573E-11
C8a-2000 9-6-19	2.00000E+03	6.83054E+01	2.01656E+00	8.83978E-03	4.32616E+02	8.39453E+00	1.66815E-10
C8a-3200 9-6-19	3.20000E+03	8.25876E+01	2.99690E+00	1.06855E-02	3.57802E+02	5.07502E+00	3.09104E-10
C8a-5000 9-6-19	5.00000E+03	9.31206E+01	4.36463E+00	1.93955E-02	3.17330E+02	4.73576E+00	4.31735E-10

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.47953E+02 +/- 3.03786E+00
37CA/39K = 2.65756E+00 +/- 5.43916E-03
F1 = -1.72256E-03 F2 = 3.28941E-02
TOTAL ATMOS 40 VOL = 1.37844E-09 CCNTP/G
TOTAL 39K VOL = 2.49209E-10 CCNTP/G
40*/39K = 9.81931E-01 +/- 4.84667E-02
AGE = 6.85195E+05 +/- 3.38597E+04 Y

C8b MB01

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.86866E-04 +/- 9.95573E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	4.04167E+01	1.04010E-01	2.79900E+07	3.86866E-04	9.95573E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
C8b-600 9-12-19	2.39370E-02	-1.39084E-03	2.70465E-03	2.54505E-01	6.84695E-01	1.77620E+05	4.77826E+05
C8b-1000 9-12-1	1.53033E-01	-1.49567E-03	2.71185E-02	1.11270E+00	6.81008E-02	7.76425E+05	4.75095E+04
C8b-1400 9-12-1	3.04166E-01	-1.23002E-03	6.41483E-02	1.10795E+00	5.42498E-02	7.73111E+05	3.78467E+04
C8b-1800 9-12-1	5.38005E-01	-1.14288E-03	6.75042E-02	1.07436E+00	2.72811E-02	7.49682E+05	1.90326E+04
C8b-2400 9-12-1	7.59610E-01	-1.29662E-03	5.58003E-02	1.10579E+00	5.26105E-02	7.71605E+05	3.67031E+04
C8b-3200 9-12-1	8.76616E-01	-1.74079E-03	3.40173E-02	9.66196E-01	4.75907E-02	6.74217E+05	3.32029E+04
C8b-5000 9-12-1	1.00000E+00	-2.56188E-03	2.45236E-02	1.10434E+00	1.25981E-01	7.70595E+05	8.78893E+04

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
C8b-600 9-12-19	6.00000E+02	9.93505E+01	2.14578E+00	1.91335E-02	2.97432E+02	5.22935E+00	5.38950E-10
C8b-1000 9-12-1	1.00000E+03	8.40088E+01	2.30752E+00	1.56805E-02	3.51749E+02	3.96312E+00	4.36397E-10
C8b-1400 9-12-1	1.40000E+03	6.46233E+01	1.89767E+00	1.00801E-02	4.57265E+02	1.21271E+01	1.76865E-10
C8b-1800 9-12-1	1.80000E+03	6.24206E+01	1.76323E+00	1.01501E-02	4.73401E+02	6.86205E+00	2.41289E-10
C8b-2400 9-12-1	2.40000E+03	6.90300E+01	2.00042E+00	8.38508E-03	4.28075E+02	9.06101E+00	3.15831E-10
C8b-3200 9-12-1	3.20000E+03	8.48365E+01	2.68569E+00	1.01815E-02	3.48317E+02	3.03430E+00	3.65754E-10
C8b-5000 9-12-1	5.00000E+03	9.05694E+01	3.95247E+00	1.09572E-02	3.26269E+02	3.86905E+00	7.56753E-10

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.59631E+02 +/- 2.13526E+00
37CA/39K = 2.29358E+00 +/- 4.53397E-03
F1 = -1.48664E-03 F2 = 3.22833E-02
TOTAL ATMOS 40 VOL = 2.83184E-09 CCNTP/G
TOTAL 39K VOL = 5.78341E-10 CCNTP/G
40*/39K = 1.06277E+00 +/- 2.93645E-02
AGE = 7.41593E+05 +/- 2.05748E+04 Y

d9a MB02

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.94941E-04 +/- 8.96478E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	3.95903E+01	8.98663E-02	2.79900E+07	3.94941E-04	8.96478E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
D9a-600 9-8-199	1.23946E-02	-2.05849E-03	4.00571E-03	1.09992E+00	2.53354E+00	7.83524E+05	1.80437E+06
D9a-1200 9-8-19	3.96803E-01	-1.18014E-03	1.10387E-01	1.46436E+00	4.69724E-02	1.04306E+06	3.34487E+04
D9a-1800 9-8-19	7.39796E-01	-9.47090E-04	1.00184E-01	1.33501E+00	3.67475E-02	9.50952E+05	2.61690E+04
D9a-2800 9-8-19	9.20709E-01	-2.66750E-03	5.01948E-02	1.18888E+00	9.57882E-02	8.46881E+05	6.82174E+04
D9a-5000 9-8-19	1.00000E+00	-7.52746E-03	4.20180E-02	1.09009E+00	3.57758E-01	7.76528E+05	2.54794E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
D9a-600 9-8-199	6.00000E+02	9.72477E+01	3.17583E+00	8.29688E-02	3.03863E+02	1.98059E+01	7.54740E-11
D9a-1200 9-8-19	1.20000E+03	4.24852E+01	1.82072E+00	9.27461E-03	6.95536E+02	2.97896E+01	6.51283E-11
D9a-1800 9-8-19	1.80000E+03	4.20483E+01	1.46117E+00	6.96929E-03	7.02763E+02	2.59679E+01	5.20404E-11
D9a-2800 9-8-19	2.80000E+03	8.22508E+01	4.11542E+00	2.66366E-02	3.59267E+02	6.18930E+00	1.56147E-10
D9a-5000 9-8-19	5.00000E+03	9.38830E+01	1.16134E+01	6.98559E-02	3.14754E+02	6.71957E+00	2.07827E-10

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 4.06610E+02 +/- 5.77138E+00
37CA/39K = 2.90581E+00 +/- 8.27884E-03
F1 = -1.88346E-03 F2 = 5.56595E-02
TOTAL ATMOS 40 VOL = 5.56616E-10 CCNTP/G
TOTAL 39K VOL = 1.56688E-10 CCNTP/G
40*/39K = 1.33596E+00 +/- 5.07505E-02
AGE = 9.51627E+05 +/- 3.62053E+04 Y

d9b MB02

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.94941E-04 +/- 8.96478E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	3.95903E+01	8.98663E-02	2.79900E+07	3.94941E-04	8.96478E-07

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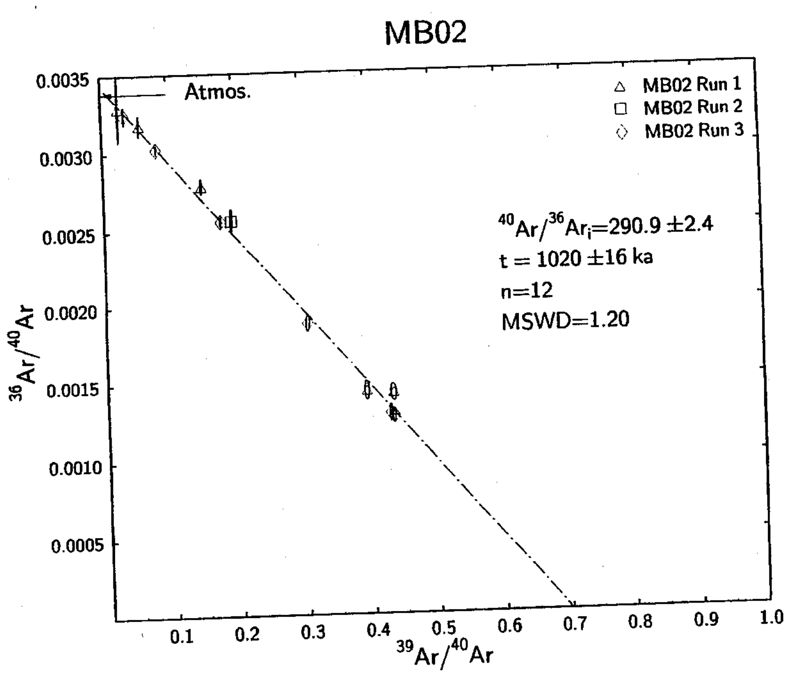
Isochron Results

Sample	n	MSWD	$^{40}Ar/^{36}Ar_i$	Age (ka)
MB01	13	1.68	292 ± 3	764 ± 25
MB02	12	1.20	290.4 ± 2.4	1020 ± 16
MB03	12	1.21	292.5 ± 1.3	799 ± 39
MB04	20	2.69	274 ± 9	881 ± 42
MB05	12	1.35	281 ± 6	821 ± 30
MB06	12	1.12	288 ± 7	827 ± 42
MB07	9	2.07	277 ± 10	845 ± 51
MB08	11	1.37	284 ± 11	851 ± 28
MB11	12	0.79	276 ± 4	845 ± 22

Integrated (Total Gas) Data

Sample	Age (ka)	$^{40}Ar/^{36}Ar$
MB01 (C8)	685 ± 34	348 ± 3
	742 ± 21	359 ± 2
MB02 (D9)	952 ± 36	407 ± 6
	898 ± 85	391 ± 12
	1005 ± 19	416 ± 3
MB03 (D2)	675 ± 79	350 ± 7
	652 ± 119	336 ± 8
	530 ± 215	298 ± 1
	725 ± 38	330 ± 2
MB04 (C7)	579 ± 76	416 ± 22
	678 ± 52	430 ± 15
	811 ± 23	449 ± 6
MB05 (D5)	668 ± 39	379 ± 6
	757 ± 22	459 ± 7
MB06 (D8)	829 ± 36	415 ± 7
	755 ± 20	405 ± 4
MB07 (C6)	732 ± 35	406 ± 7
	683 ± 45	410 ± 10
MB08 (D7)	773 ± 24	538 ± 13
	830 ± 14	586 ± 10
MB11 (B8)	692 ± 27	400 ± 5
	761 ± 21	434 ± 6

Isochron plots



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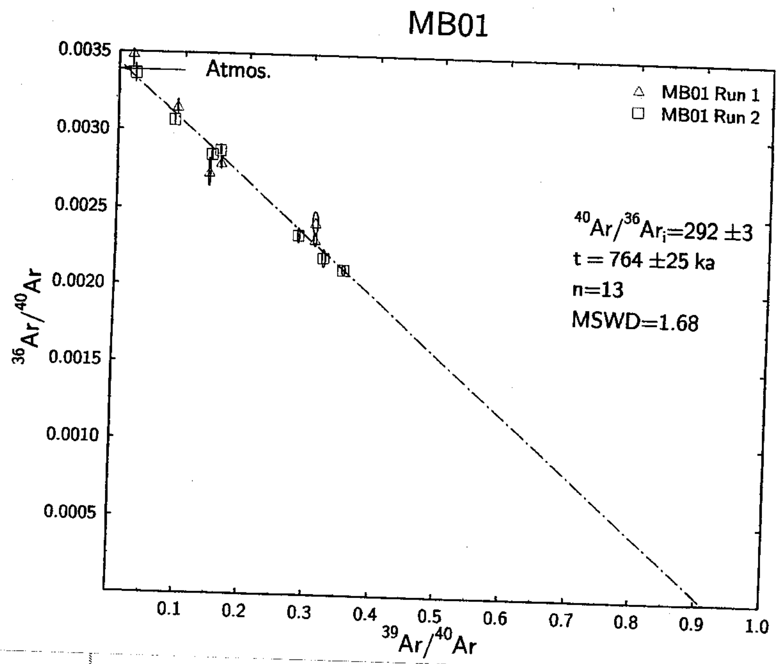

Sample Prep at Univ of Mich

Appendix I

Sample Preparation and 40Ar/39Ar Stepwise Heating of Basalts erupted along the Mesa Butte Fault Zone.

Information potentially subject to copyright protection was redacted from this location. The redacted material is a sample preparation as referenced above. No additional information is known.

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STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	4.08813E+01	1.10764E-01	2.79900E+07	3.82469E-04	1.03626E-06

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
D2c-5000 9-7-19	1.00000E+00	-3.05423E-03	1.77906E-03	7.68044E-01	3.11281E-01	5.29876E+05	2.14722E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
D2c-5000 9-7-19	5.00000E+03	9.89519E+01	4.71206E+00	1.78561E-02	2.98630E+02	1.27881E+00	3.42020E-09

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 2.98630E+02 +/- 1.27881E+00
37CA/39K = 4.71206E+00 +/- 1.78561E-02
F1 = -3.05423E-03 F2 = 1.77906E-03
TOTAL ATMOS 40 VOL = 3.42020E-09 CCNTP/G
TOTAL 39K VOL = 4.71700E-11 CCNTP/G
40*/39K = 7.68044E-01 +/- 3.11281E-01
AGE = 5.29876E+05 +/- 2.14727E+05 Y

D2d MB03

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.82469E-04 +/- 1.03626E-06

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	4.08813E+01	1.10764E-01	2.79900E+07	3.82469E-04	1.03626E-06

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
D2d-600 9-14-19	1.83535E-02	-3.06799E-03	1.48299E-04	-2.71004E+00	1.16002E+00	-1.87091E+06	8.01246E+05
D2d-1000 9-14-1	1.52272E-01	-1.95559E-03	8.73667E-03	8.91866E-01	1.56102E-01	6.15286E+05	1.07675E+05
D2d-1400 9-14-1	3.51972E-01	-1.13580E-03	3.00996E-02	1.18121E+00	1.06543E-01	8.14855E+05	7.34822E+04
D2d-2000 9-14-1	5.75659E-01	-1.31144E-03	4.21270E-02	1.17717E+00	8.31746E-02	8.12066E+05	5.73650E+04
D2d-3200 9-14-1	8.05502E-01	-3.45794E-03	5.99049E-02	1.21848E+00	1.25510E-01	8.40560E+05	8.65622E+04
D2d-5000 9-14-1	1.00000E+00	-5.15901E-03	7.66865E-02	1.03694E+00	1.23851E-01	7.15349E+05	8.54238E+04

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
D2d-600 9-14-19	6.00000E+02	1.02535E+02	4.73330E+00	6.46744E-02	2.88195E+02	3.06587E+00	6.31508E-10
D2d-1000 9-14-1	1.00000E+03	9.58961E+01	3.01708E+00	1.28073E-02	3.08146E+02	2.29707E+00	8.75896E-10
D2d-1400 9-14-1	1.40000E+03	7.74375E+01	1.75232E+00	7.77176E-03	3.81598E+02	1.00019E+01	2.54066E-10
D2d-2000 9-14-1	2.00000E+03	7.38488E+01	2.02329E+00	5.85470E-03	4.00142E+02	9.98334E+00	2.33342E-10
D2d-3200 9-14-1	3.20000E+03	8.28766E+01	5.33490E+00	2.25589E-02	3.56554E+02	7.56508E+00	4.25330E-10
D2d-5000 9-14-1	5.00000E+03	8.65803E+01	7.95933E+00	6.81864E-02	3.41302E+02	6.21584E+00	4.08272E-10

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.29947E+02 +/- 2.02188E+00
37CA/39K = 4.06770E+00 +/- 1.15913E-02
F1 = -2.63657E-03 F2 = 2.99817E-02
TOTAL ATMOS 40 VOL = 2.82841E-09 CCNTP/G
TOTAL 39K VOL = 3.13850E-10 CCNTP/G
40*/39K = 1.05064E+00 +/- 5.56877E-02
AGE = 7.24803E+05 +/- 3.84595E+04 Y

C7a MB04

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.77586E-04 +/- 1.09780E-06

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	4.14100E+01	1.20396E-01	2.79900E+07	3.77586E-04	1.09780E-06

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
C7-a-200 9-5-19	4.21950E-03	-2.46346E-03	5.92161E-03	-1.20047E+01	7.44896E+00	-8.19615E+06	5.09723E+06
C7-a-600 9-5-19	2.03656E-01	-1.45967E-03	8.50941E-02	6.69436E-01	1.78081E-01	4.55959E+05	1.21277E+05
C7-a-1000 9-5-1	5.32094E-01	-8.73636E-04	1.45600E-01	1.22135E+00	1.41404E-01	8.31787E+05	9.62790E+04
C7-a-1600 9-5-1	7.20681E-01	-9.52350E-04	7.39663E-02	6.97029E-01	1.54645E-01	4.74750E+05	1.05315E+05
C7-a-2400 9-5-1	8.23645E-01	-2.54134E-03	8.20841E-02	2.64611E-01	3.67470E-01	1.80243E+05	2.50293E+05
C7a-3200 9-5-19	8.97047E-01	-4.51810E-03	1.37548E-01	1.50910E+00	6.29044E-01	1.02770E+06	4.28257E+05
C7a-4000 9-5-19	9.62089E-01	-8.09720E-03	1.38798E-01	8.31119E-01	6.43016E-01	5.66065E+05	4.37882E+05
C7a-5000 9-5-19	1.00000E+00	-1.06162E-02	1.54219E-01	1.14193E+00	1.15613E+00	7.77706E+05	7.87207E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
C7-a-200 9-5-19	2.00000E+02	1.55664E+02	3.80062E+00	2.55229E-01	1.89832E+02	4.23340E+01	1.03519E-11
C7-a-600 9-5-19	6.00000E+02	7.25980E+01	2.25198E+00	2.59957E-02	4.07036E+02	4.07367E+01	2.58428E-11
C7-a-1000 9-5-1	1.00000E+03	3.24152E+01	1.34785E+00	7.43303E-03	9.11611E+02	2.19555E+02	1.40532E-11
C7-a-1600 9-5-1	1.60000E+03	6.60013E+01	1.46929E+00	2.77383E-02	4.47719E+02	5.04998E+01	1.86447E-11
C7-a-2400 9-5-1	2.40000E+03	9.22927E+01	3.92078E+00	2.71365E-02	3.20177E+02	3.71169E+01	2.38365E-11
C7a-3200 9-5-19	3.20000E+03	6.76297E+01	6.97053E+00	1.37629E-01	4.36938E+02	8.67396E+01	1.69047E-11
C7a-4000 9-5-19	4.00000E+03	8.67823E+01	1.24924E+01	1.56025E-01	3.40507E+02	4.00877E+01	2.59247E-11
C7a-5000 9-5-19	5.00000E+03	8.45759E+01	1.63787E+01	3.07512E-01	3.49390E+02	6.44470E+01	1.73381E-11

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 4.15625E+02 +/- 2.21170E+01
37CA/39K = 3.53374E+00 +/- 1.72600E-02
F1 = -2.29047E-03 F2 = 1.09707E-01
TOTAL ATMOS 40 VOL = 1.52897E-10 CCNTP/G
TOTAL 39K VOL = 7.30813E-11 CCNTP/G
40*/39K = 8.50810E-01 +/- 1.11713E-01
AGE = 5.79474E+05 +/- 7.60922E+04 Y

c7b MB04

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.77586E-04 +/- 1.09780E-06

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	4.14100E+01	1.20396E-01	2.79900E+07	3.77586E-04	1.09780E-06

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
C7b-600 9-5-199	1.79185E-01	-1.61749E-03	8.46671E-02	1.04362E+00	2.65182E-01	7.10760E+05	1.80570E+05
C7b-1000 9-5-19	5.73865E-01	-9.40466E-04	1.21804E-01	1.11632E+00	7.34303E-02	7.60272E+05	4.99993E+04
C7b-1600 9-5-19	7.71377E-01	-2.12745E-03	1.10875E-01	1.28921E+00	1.55523E-01	8.77991E+05	1.05890E+05
C7b-2400 9-5-19	8.97965E-01	-5.87054E-03	1.24099E-01	6.62905E-01	1.71807E-01	4.51511E+05	1.17005E+05
C7b-4000 9-5-19	9.77761E-01	-8.72326E-03	1.41861E-01	3.53670E-01	3.11983E-01	2.40902E+05	2.12493E+05
C7b-5000 9-5-19	1.00000E+00	-7.75608E-03	1.39054E-01	3.95037E-02	1.26424E+00	2.69095E+04	8.61183E+05

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INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 4.59104E+02 +/- 7.22388E+00
37CA/39K = 2.44400E+00 +/- 8.13097E-03
F1 = -1.58413E-03 F2 = 8.06540E-02
TOTAL ATMOS 40 VOL = 8.33058E-10 CCNTP/G
TOTAL 39K VOL = 4.09343E-10 CCNTP/G
40*/39K = 1.12704E+00 +/- 3.25995E-02
AGE = 7.56587E+05 +/- 2.20190E+04 Y

D8a MB06

WEIGHTED AVERAGE OF J FROM STANDARDS = 4.01691E-04 +/- 8.03183E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	3.89250E+01	7.78306E-02	2.79900E+07	4.01691E-04	8.03183E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
D8a-600 9-6-199	3.19152E-01	-1.03660E-03	3.55630E-02	1.15187E+00	7.37753E-02	8.34544E+05	5.34389E+04
D8a-1000 9-6-19	6.14104E-01	-9.07292E-04	5.83751E-02	1.23526E+00	8.05033E-02	8.94948E+05	5.83104E+04
D8a-1600 9-6-19	8.11569E-01	-1.29872E-03	6.44031E-02	1.12025E+00	1.14166E-01	8.11642E+05	8.26969E+04
D8a-2800 9-6-19	9.37101E-01	-3.88936E-03	6.91574E-02	8.85511E-01	1.80703E-01	6.41600E+05	1.30906E+05
D8a-5000 9-6-19	1.00000E+00	-4.46938E-03	8.16247E-02	1.27536E+00	2.85419E-01	9.23994E+05	2.06732E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
D8a-600 9-6-199	6.00000E+02	7.31610E+01	1.59927E+00	1.62782E-02	4.03904E+02	9.20949E+00	1.92306E-10
D8a-1000 9-6-19	1.00000E+03	5.72843E+01	1.39977E+00	7.89024E-03	5.15848E+02	2.48880E+01	9.37572E-11
D8a-1600 9-6-19	1.60000E+03	6.54895E+01	2.00367E+00	1.76967E-02	4.51217E+02	2.41130E+01	8.05494E-11
D8a-2800 9-6-19	2.80000E+03	8.37847E+01	4.76626E+00	2.50390E-02	3.52690E+02	1.38967E+01	1.10208E-10
D8a-5000 9-6-19	5.00000E+03	8.11215E+01	6.89537E+00	6.01820E-02	3.64268E+02	1.89366E+01	6.61384E-11

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 4.15029E+02 +/- 7.20542E+00
37CA/39K = 2.35096E+00 +/- 8.42523E-03
F1 = -1.52383E-03 F2 = 5.68609E-02
TOTAL ATMOS 40 VOL = 5.42959E-10 CCNTP/G
TOTAL 39K VOL = 1.91924E-10 CCNTP/G
40*/39K = 1.14455E+00 +/- 4.96299E-02
AGE = 8.29245E+05 +/- 3.59876E+04 Y

D8b MB06

WEIGHTED AVERAGE OF J FROM STANDARDS = 4.01691E-04 +/- 8.03183E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	3.89250E+01	7.78306E-02	2.79900E+07	4.01691E-04	8.03183E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
D8b-600 9-11-19	6.84313E-02	-1.26195E-03	2.25040E-02	1.07101E+00	1.49955E-01	7.75973E+05	1.08623E+05
D8b-1000 9-11-1	3.87336E-01	-1.00856E-03	4.03737E-02	1.03063E+00	4.95135E-02	7.46726E+05	3.58667E+04
D8b-1400 9-11-1	6.35382E-01	-9.51872E-04	5.00972E-02	1.03650E+00	4.41439E-02	7.50974E+05	3.19770E+04
D8b-1800 9-11-1	7.80473E-01	-9.38063E-04	7.18314E-02	1.11812E+00	4.57943E-02	8.10099E+05	3.31715E+04
D8b-2400 9-11-1	8.63476E-01	-1.37873E-03	5.64212E-02	1.03867E+00	1.01136E-01	7.52552E+05	7.32607E+04
D8b-3200 9-11-1	9.16706E-01	-2.50185E-03	5.24862E-02	8.26832E-01	1.34062E-01	5.99091E+05	9.71198E+04
D8b-5000 9-11-1	1.00000E+00	-3.01548E-03	6.93771E-02	1.07896E+00	1.44613E-01	7.81732E+05	1.04753E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
D8b-600 9-11-19	2.50000E+01	8.47812E+01	1.94694E+00	2.28306E-02	3.48544E+02	8.56467E+00	2.08827E-10
D8b-1000 9-11-1	1.00000E+03	7.22877E+01	1.55600E+00	1.73690E-02	4.08783E+02	6.91705E+00	4.38482E-10
D8b-1400 9-11-1	1.40000E+03	6.62653E+01	1.46855E+00	1.25506E-02	4.45935E+02	9.25898E+00	2.58280E-10
D8b-1800 9-11-1	1.80000E+03	5.51583E+01	1.44724E+00	7.26120E-03	5.35731E+02	1.75826E+01	1.02049E-10
D8b-2400 9-11-1	2.40000E+03	7.13541E+01	2.12710E+00	1.28426E-02	4.14132E+02	1.61221E+01	1.09825E-10
D8b-3200 9-11-1	3.20000E+03	8.57006E+01	3.85985E+00	2.06672E-02	3.44805E+02	9.29902E+00	1.34904E-10
D8b-5000 9-11-1	5.00000E+03	8.05064E+01	4.65220E+00	2.62500E-02	3.67052E+02	1.18607E+01	1.89805E-10

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 4.04628E+02 +/- 3.86931E+00
37CA/39K = 1.97322E+00 +/- 7.74816E-03
F1 = -1.27899E-03 F2 = 4.83373E-02
TOTAL ATMOS 40 VOL = 1.44217E-09 CCNTP/G
TOTAL 39K VOL = 5.11508E-10 CCNTP/G
40*/39K = 1.04139E+00 +/- 2.80226E-02
AGE = 7.54517E+05 +/- 2.03549E+04 Y

c6a MB07

WEIGHTED AVERAGE OF J FROM STANDARDS = 4.04896E-04 +/- 8.32796E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	3.86169E+01	7.94277E-02	2.79900E+07	4.04896E-04	8.32796E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
C6a-600 9-7-199	1.41379E-01	-1.56794E-03	4.86946E-02	6.75114E-01	1.45988E-01	4.93079E+05	1.06610E+05
C6a-1200 9-7-19	5.85240E-01	-9.37884E-04	9.55320E-02	1.16084E+00	4.13020E-02	8.47753E+05	3.01554E+04
C6a-1800 9-7-19	7.57716E-01	-1.45270E-03	7.09389E-02	8.85865E-01	9.48433E-02	6.46977E+05	6.92548E+04
C6a-2800 9-7-19	8.54679E-01	-5.01013E-03	8.48835E-02	9.60539E-01	2.44238E-01	7.01503E+05	1.78338E+05
C6a-5000 9-7-19	1.00000E+00	-6.27964E-03	1.10161E-01	1.00154E+00	1.85219E-01	7.31443E+05	1.35241E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
C6a-600 9-7-199	6.00000E+02	8.34788E+01	2.41902E+00	2.68249E-02	3.53982E+02	1.50594E+01	9.18994E-11
C6a-1200 9-7-19	1.20000E+03	4.65450E+01	1.44697E+00	6.93324E-03	6.34869E+02	2.53371E+01	8.54769E-11
C6a-1800 9-7-19	1.80000E+03	7.07535E+01	2.24123E+00	1.04048E-02	4.17647E+02	1.83972E+01	7.04290E-11
C6a-2800 9-7-19	2.80000E+03	8.59227E+01	7.72962E+00	5.69563E-02	3.43914E+02	1.43013E+01	1.08308E-10
C6a-5000 9-7-19	5.00000E+03	8.46338E+01	9.68822E+00	6.55908E-02	3.49151E+02	1.16668E+01	1.52718E-10

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 4.06387E+02 +/- 7.26531E+00
37CA/39K = 3.52820E+00 +/- 1.18527E-02
F1 = -2.28688E-03 F2 = 8.75286E-02
TOTAL ATMOS 40 VOL = 5.08831E-10 CCNTP/G
TOTAL 39K VOL = 1.90583E-10 CCNTP/G
40*/39K = 1.00217E+00 [illegible].81132E-02

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B8a-1200 9-6-19	4.95395E-01	-9.66462E-04	8.20420E-02	1.10227E+00	4.38880E-02	7.76991E+05	3.09301E+04
B8a-1800 9-6-19	7.38315E-01	-1.41674E-03	7.93429E-02	1.03182E+00	7.44536E-02	7.27341E+05	5.24726E+04
B8a-2800 9-6-19	8.82525E-01	-4.46607E-03	1.07583E-01	7.68282E-01	8.85090E-02	5.41599E+05	6.23849E+04
B8a-5000 9-6-19	1.00000E+00	-6.80500E-03	1.10956E-01	9.14737E-01	1.58202E-01	6.44823E+05	1.11501E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
B8a-600 9-6-199	6.00000E+02	8.86790E+01	2.61484E+00	2.79962E-02	3.33224E+02	9.84884E+00	1.09881E-10
B8a-1200 9-6-19	1.20000E+03	5.27089E+01	1.49106E+00	9.27447E-03	5.60626E+02	1.96483E+01	9.97850E-11
B8a-1800 9-6-19	1.80000E+03	6.42765E+01	2.18575E+00	1.51251E-02	4.59733E+02	1.82884E+01	9.09552E-11
B8a-2800 9-6-19	2.80000E+03	8.41821E+01	6.89026E+00	6.21655E-02	3.51025E+02	7.50510E+00	1.18905E-10
B8a-5000 9-6-19	5.00000E+03	8.65879E+01	1.04987E+01	8.93397E-02	3.41272E+02	9.08489E+00	1.39896E-10

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 4.00150E+02 +/- 5.35386E+00
37CA/39K = 3.60074E+00 +/- 1.43102E-02
F1 = -2.33390E-03 F2 = 8.60592E-02
TOTAL ATMOS 40 VOL = 5.59423E-10 CCNTP/G
TOTAL 39K VOL = 2.01733E-10 CCNTP/G
40*/39K = 9.82362E-01 +/- 3.75368E-02
AGE = 6.92485E+05 +/- 2.65093E+04 Y

B8b MB11

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.90811E-04 +/- 9.54295E-07

STANDARDS NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	4.00087E+01	9.76944E-02	2.79900E+07	3.90811E-04	9.54295E-07

FRACTIONS NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
B8b-600 9-12-19	2.51436E-02	-2.25680E-03	1.88275E-02	6.84506E-01	5.87952E-01	4.82549E+05	4.14427E+05
B8b-1000 9-12-1	1.90772E-01	-1.45814E-03	7.33347E-02	1.14702E+00	6.67711E-02	8.08532E+05	4.70561E+04
B8b-1400 9-12-1	4.68428E-01	-9.71981E-04	9.32845E-02	1.11557E+00	3.48274E-02	7.86363E+05	2.45445E+04
B8b-1800 9-12-1	6.66472E-01	-9.09191E-04	8.76954E-02	1.15858E+00	5.07282E-02	8.16679E+05	3.57499E+04
B8b-2400 9-12-1	8.25637E-01	-1.69586E-03	8.78031E-02	1.07392E+00	4.99518E-02	7.57015E+05	3.52039E+04
B8b-3600 9-12-1	9.28924E-01	-4.52886E-03	1.03091E-01	9.12186E-01	8.29655E-02	6.43025E+05	5.84743E+04
B8b-5000 9-12-1	1.00000E+00	-5.73441E-03	1.05148E-01	9.60103E-01	2.09597E-01	6.76797E+05	1.47722E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
B8b-600 9-12-19	6.00000E+02	9.46341E+01	3.48179E+00	4.22889E-02	3.12255E+02	1.51895E+01	1.18257E-10
B8b-1000 9-12-1	1.00000E+03	6.44191E+01	2.24962E+00	1.55944E-02	4.58715E+02	1.45051E+01	1.33981E-10
B8b-1400 9-12-1	1.40000E+03	4.90693E+01	1.49957E+00	6.02245E-03	6.02210E+02	1.93001E+01	1.16236E-10
B8b-1800 9-12-1	1.80000E+03	4.81541E+01	1.40270E+00	7.19914E-03	6.13655E+02	2.86629E+01	8.30087E-11
B8b-2400 9-12-1	2.40000E+03	6.49135E+01	2.61638E+00	1.79888E-02	4.55221E+02	1.12462E+01	1.23178E-10
B8b-3600 9-12-1	3.60000E+03	8.26277E+01	6.98713E+00	8.02651E-02	3.57628E+02	6.51358E+00	1.74535E-10
B8b-5000 9-12-1	5.00000E+03	8.47112E+01	8.84705E+00	1.12167E-01	3.48832E+02	1.35973E+01	1.47262E-10

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 4.34137E+02 +/- 5.54041E+00
37CA/39K = 2.92123E+00 +/- 1.02954E-02
F1 = -1.89346E-03 F2 = 8.46694E-02
TOTAL ATMOS 40 VOL = 8.96458E-10 CCNTP/G
TOTAL 39K VOL = 3.89622E-10 CCNTP/G
40*/39K = 1.07977E+00 +/- 2.98997E-02
AGE = 7.61138E+05 +/- 2.11537E+04 Y

mb01 all

CURRENT BLANK ERROR= 5.0000E-08 COUNTS

36/40 VS 39/40

J0= 3.8686603191E-04 +/- 9.9557332932E-07

	X	DX	Y	DY	R
C8a-400 9-6-199	2.12127E-02	2.60510E-04	3.48917E-03	9.90205E-05	6.59194E-02
C8a-800 9-6-199	1.40227E-01	1.51048E-03	2.73118E-03	9.28279E-05	-1.95521E-02
C8a-1200 9-6-19	3.05262E-01	4.13759E-03	2.42052E-03	7.17882E-05	-1.27904E-01
C8a-2000 9-6-19	3.05381E-01	2.40443E-03	2.31152E-03	4.54994E-05	-1.39109E-01
C8a-3200 9-6-19	1.58095E-01	8.90153E-04	2.79484E-03	3.97362E-05	-6.64601E-03
C8a-5000 9-6-19	8.99088E-02	5.00719E-04	3.15129E-03	4.70372E-05	3.86231E-02
C8b-600 9-12-19	2.55193E-02	2.04593E-04	3.36212E-03	5.91117E-05	1.03372E-01
C8b-1000 9-12-1	1.43715E-01	1.10427E-03	2.84294E-03	3.20824E-05	1.88901E-01
C8b-1400 9-12-1	3.19300E-01	2.46982E-03	2.18691E-03	5.84962E-05	-6.58659E-02
C8b-1800 9-12-1	3.49782E-01	2.43667E-03	2.11237E-03	3.11498E-05	-1.08511E-02
C8b-2400 9-12-1	2.80071E-01	1.52011E-03	2.33604E-03	4.96072E-05	-1.21452E-02
C8b-3200 9-12-1	1.56940E-01	8.51759E-04	2.87095E-03	2.50954E-05	9.42543E-03
C8b-5000 9-12-1	8.53955E-02	3.12629E-04	3.06496E-03	3.63517E-05	3.11700E-02

	RESX	RESY
C8a-400 9-6-199	-2.83092E-05	-1.42068E-04
C8a-800 9-6-199	1.14159E-04	1.68855E-04
C8a-1200 9-6-19	-7.15239E-04	-1.36580E-04
C8a-2000 9-6-19	-9.75788E-05	-3.03485E-05
C8a-3200 9-6-19	6.64961E-05	3.83276E-05
C8a-5000 9-6-19	-5.16417E-05	-6.18439E-05
C8b-600 9-12-19	-1.25594E-05	-3.12275E-05
C8b-1000 9-12-1	4.56530E-04	4.27211E-05
C8b-1400 9-12-1	1.62148E-04	4.10622E-05
C8b-1800 9-12-1	3.76887E-05	1.69920E-06
C8b-2400 9-12-1	1.23884E-04	3.92620E-05
C8b-3200 9-12-1	-1.51278E-04	-3.26271E-05
C8b-5000 9-12-1	2.24263E-05	4.11476E-05

SLOPE= -3.7519776162E-03 +/- 1.2058060000E-04
Y INTERCEPT= 3.4265890073E-03 +/- 2.5664885060E-05
SUMS S= 1.8529991844E+01 XBAR= 1.8970284102E-01 YBAR= 2.7148281941E-03
MODIFIED ERRORS
SLOPE= 1.5650157481E-04 INTERCEPT= 3.3310457316E-05

RECIPROCAL OF Y INTERCEPT= 2.9183540771E+02 +/- 2.1858244976E+00
MODIFIED +/- = 2.8369818706E+00

X INTERCEPT= 9.1327543974E-01 +/- 2.3355272409E-02
MODIFIED ERROR= 3.0312853076E-02

RECIPROCAL OF X INTERCEPT= 1.0949599173E+00 +/- 2.8001505388E-02
MODIFIED +/- = 3.6343207814E-02

AGE = 7.6405034093E+05 +- 1.9633650302E+04
MODIFIED +- = 2.5430593640E+04

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4rac

mb02 d9a

CURRENT BLANK ERROR= 3.0000E-08 COUNTS

36/40 VS 39/40

J0= 3.9494066823E-04 +/- 8.9647759980E-07

	X	DX	Y	DY	R
D9a-600 9-8-199	2.50231E-02	6.05118E-04	3.29095E-03	2.14509E-04	9.17395E-03
D9a-1200 9-8-19	3.92765E-01	3.20187E-03	1.43774E-03	6.29884E-05	-1.60765E-01
D9a-1800 9-8-19	4.34091E-01	4.21886E-03	1.42295E-03	5.51206E-05	-2.32001E-01
D9a-2800 9-8-19	1.49293E-01	1.17609E-03	2.78345E-03	4.80657E-05	2.04739E-02
D9a-5000 9-8-19	5.61148E-02	4.20140E-04	3.17709E-03	6.78336E-05	5.56776E-02
D9b-5000 9-8-19	1.93361E-01	1.23681E-03	2.55954E-03	7.77592E-05	-6.99140E-03
D9c-600 9-13-19	3.40907E-02	2.70974E-04	3.24350E-03	5.66703E-05	1.80472E-01
D9c-1000 9-13-1	3.05447E-01	2.47297E-03	1.88065E-03	5.48854E-05	7.49849E-02
D9c-1400 9-13-1	4.34580E-01	1.93723E-03	1.27188E-03	4.51560E-05	-5.79341E-02
D9c-2000 9-13-1	4.29562E-01	1.77519E-03	1.29164E-03	5.34845E-05	-4.07193E-02
D9c-3200 9-13-1	1.77271E-01	5.67415E-04	2.55528E-03	3.16173E-05	4.32544E-02
D9c-5000 9-13-1	8.12860E-02	3.91836E-04	3.02302E-03	3.11693E-05	1.58370E-01

	RESX	RESY
D9a-600 9-8-199	1.52530E-06	2.34558E-05
D9a-1200 9-8-19	3.10484E-04	6.55973E-05
D9a-1800 9-8-19	-1.38999E-03	-1.14600E-04
D9a-2800 9-8-19	-2.72288E-04	-7.91879E-05
D9a-5000 9-8-19	-8.32326E-06	-1.56243E-05
D9b-5000 9-8-19	-8.28669E-05	-7.30547E-05
D9c-600 9-13-19	2.54182E-05	2.61686E-05
D9c-1000 9-13-1	6.65443E-04	5.06053E-05
D9c-1400 9-13-1	1.75356E-04	2.63599E-05
D9c-2000 9-13-1	1.29124E-04	3.15203E-05
D9c-3200 9-13-1	[illegible]31701E-05	9.85085E-06

	X	DX	Y	DY	R
[illegible]	1.35071E-01	7.30367E-03	2.86213E-03	[illegible]	[illegible]
C7b-600 9-5-199	3.31563E-01	7.46450E-03	2.21311E-03	5.28604E-04	-3.18662E-02
C7b-1000 9-5-19	5.29160E-01	8.19402E-03	1.38507E-03	2.96933E-04	-2.11220E-02
C7b-1600 9-5-19	3.11200E-01	5.92760E-03	2.02639E-03	1.31719E-04	-1.24788E-01
C7b-2400 9-5-19	1.91913E-01	3.55537E-03	2.95357E-03	1.62984E-04	-4.82347E-02
C7b-4000 9-5-19	1.64800E-01	3.98415E-03	3.18685E-03	1.10991E-04	3.81824E-02
C7b-5000 9-5-19	1.89828E-01	1.54008E-02	3.35872E-03	1.73539E-04	8.13890E-02
C7c-600 9-13-19	2.14430E-01	2.21758E-03	2.62137E-03	8.12143E-04	-2.85108E-04
C7c-1000 9-13-1	4.72838E-01	2.90133E-03	1.33692E-03	8.75417E-05	-1.71030E-02
C7c-1400 9-13-1	4.33308E-01	3.35690E-03	1.46330E-03	7.81696E-05	-1.00822E-01
C7c-2000 9-13-1	2.83606E-01	1.99911E-03	2.19781E-03	7.74915E-05	-1.59261E-01
C7c-3200 9-13-1	1.59626E-01	1.49207E-03	2.80140E-03	8.43099E-05	-6.84889E-02
C7c-5000 9-13-1	1.70820E-01	2.45490E-03	2.88819E-03	7.71747E-05	1.10893E-01
					1.73254E-01

	RESX	RESY
C7-a-200 9-5-19	-3.52859E-03	-1.82151E-03
C7-a-600 9-5-19	-6.09174E-03	-7.11740E-04
C7-a-1000 9-5-1	-1.49042E-04	-5.99032E-05
C7-a-1600 9-5-1	-1.84289E-02	-8.00476E-04
C7-a-2400 9-5-1	-3.93062E-03	-8.31130E-04
C7a-3200 9-5-19	3.78193E-04	3.45521E-04
C7a-4000 9-5-19	-3.72438E-05	-3.88280E-05
C7a-5000 9-5-19	6.85678E-05	1.48462E-04
C7b-600 9-5-199	-3.15307E-04	-1.28259E-04
C7b-1000 9-5-19	-2.43157E-03	-2.22985E-04
C7b-1600 9-5-19	6.78607E-04	1.49895E-04
C7b-2400 9-5-19	-1.23739E-03	-2.05135E-04
C7b-4000 9-5-19	-1.33854E-03	-3.09951E-04
C7b-5000 9-5-19	-1.01780E-03	-6.01479E-04
C7c-600 9-13-19	3.83542E-05	1.47447E-05
C7c-1000 9-13-1	2.20635E-04	7.85027E-05
C7c-1400 9-13-1	2.80408E-04	1.38448E-04
C7c-2000 9-13-1	1.15625E-04	1.11387E-04
C7c-3200 9-13-1	4.41088E-04	9.15212E-05
C7c-5000 9-13-1	-4.40729E-04	-4.39550E-05

SLOPE= -4.7205580191E-03 +/- 2.1813096045E-04
Y INTERCEPT= 3.6485250320E-03 +/- 6.9173507068E-05
SUMS S= 4.8358411899E+01 XBAR= 2.9468982587E-01 YBAR= 2.2574246113E-03
MODIFIED ERRORS
SLOPE= 3.5753377475E-04 INTERCEPT= 1.1338081052E-04

RECIPROCAL OF Y INTERCEPT= 2.7408336005E+02 +/- 5.1964306336E+00
MODIFIED +/- = 8.5173579021E+00

X INTERCEPT= 7.7290121575E-01 +/- 2.2672585694E-02
MODIFIED ERROR= 3.7179232199E-02

RECIPROCAL OF X INTERCEPT= 1.2938264032E+00 +/- 3.7953608303E-02
MODIFIED +/- = 6.2237542507E-02

AGE = 8.8113245620E+05 +- 2.5967786072E+04
MODIFIED +- = 4.2452511750E+04

mb05 all

CURRENT BLANK ERROR= 5.0000E-08 COUNTS

36/40 VS 39/40

JO= 3.7218114776E-04 +/- 1.2171991978E-06

	X	DX	Y	DY	R
D5a-600 9-7-199	1.70537E-01	1.72045E-03	2.77875E-03	5.01154E-05	1.48013E-01
D5a-1000 9-7-19	3.52251E-01	7.43624E-03	2.11064E-03	1.13417E-04	-9.14231E-02
D5a-1800 9-7-19	1.92234E-01	2.65802E-03	2.82485E-03	8.84463E-05	1.16891E-01
D5a-2800 9-7-19	3.24736E-01	9.32902E-03	2.12974E-03	1.68067E-04	-1.68782E-01
D5a-5000 9-7-19	2.67501E-01	9.51181E-03	2.64402E-03	2.50145E-04	-9.03446E-02
D5b-600 9-11-19	1.14907E-01	9.48679E-04	2.98159E-03	7.89281E-05	7.27429E-02
D5b-800 9-11-19	3.74611E-01	3.88939E-03	1.85021E-03	5.91487E-05	6.17743E-02
D5b-1000 9-11-1	5.37200E-01	7.38525E-03	1.17051E-03	1.01957E-04	-2.35797E-01
D5b-1400 9-11-1	4.29788E-01	6.14694E-03	1.65556E-03	8.02004E-05	-2.75719E-01
D5b-2000 9-11-1	2.62146E-01	5.76262E-03	2.53568E-03	1.76509E-04	-9.67083E-02
D5b-3200 9-11-1	3.08350E-01	3.67432E-03	2.32001E-03	9.64377E-05	-8.34800E-02
D5b-5000 9-11-1	3.33151E-01	5.95913E-03	2.40556E-03	1.25418E-04	-9.84728E-02

	RESX	RESY
D5a-600 9-7-199	3.57049E-04	3.57412E-05
D5a-1000 9-7-19	-1.05622E-03	-8.08927E-05
D5a-1800 9-7-19	-7.33459E-04	-1.00040E-04
D5a-2800 9-7-19	6.27372E-05	1.48898E-05
D5a-5000 9-7-19	-7.16279E-04	-2.46884E-04
D5b-600 9-11-19	1.13943E-04	7.60925E-05
D5b-800 9-11-19	1.58965E-03	7.07015E-05
D5b-1000 9-11-1	3.00677E-04	4.83485E-05
D5b-1400 9-11-1	1.53616E-04	3.14468E-05
D5b-2000 9-11-1	-1.76675E-04	-1.17586E-04
D5b-3200 9-11-1	-3.25689E-04	-1.02365E-04
D5b-5000 9-11-1	-1.52703E-03	-2.90632E-04

RESY
.27500E-04
.08867E-04
.56123E-04
.45442E-05
.08941E-04
.13859E-05
.37695E-04
.26284E-04
.07161E-05

7357132641E-04
/- 8.8768130413E-05
3.0813526112E-01 YBAR= 2.3264809080E-03

PT= 1.2761513834E-04

55360147E+02 +/- 6.7891547840E+00

/- 3.6151089420E-02

72947700E+00 +/- 4.8418281422E-02

)3962369E+04

COUNTS

8 Dec 96
PRC

JO= 3.9880010613E-04 +/- 8.3425099154E-07

	X	DX	Y	DY	R
D7a-600 9-8-199	4.24989E-01	7.02622E-03	1.92417E-03	8.81603E-05	-1.31981E-01
D7a-1200 9-8-19	5.45703E-01	6.05044E-03	1.30057E-03	7.05133E-05	-2.20903E-01
D7a-1800 9-8-19	4.47667E-01	7.70232E-03	1.74419E-03	1.09150E-04	-2.06869E-01
D7a-2800 9-8-19	3.02787E-01	5.89561E-03	2.27338E-03	1.38346E-04	-8.81307E-02
D7a-5000 9-8-19	2.43904E-01	5.75785E-03	2.61200E-03	1.66764E-04	-5.12586E-02
D7b-600 9-14-19	3.02787E-01	4.63876E-03	2.12832E-03	7.33404E-05	-7.39864E-02
D7b-1000 9-14-1	5.16719E-01	5.50528E-03	1.28125E-03	6.40967E-05	-2.33183E-01
D7b-1400 9-14-1	5.59106E-01	4.76690E-03	1.14878E-03	5.75517E-05	-2.38443E-01
D7b-2000 9-14-1	4.77100E-01	3.12516E-03	1.56767E-03	5.40058E-05	-1.22686E-01
D7b-3200 9-14-1	3.53139E-01	3.53696E-03	1.99819E-03	8.14042E-05	-8.21035E-02
D7b-5000 9-14-1	3.09705E-01	3.58890E-03	2.29491E-03	9.62155E-05	-6.16167E-03

	RESX	RESY
D7a-600 9-8-199	-2.73358E-03	-1.64395E-04
D7a-1200 9-8-19	-6.52760E-04	-5.15303E-05
D7a-1800 9-8-19	-5.70975E-04	-8.77218E-05
D7a-2800 9-8-19	-6.33678E-05	-1.64247E-05
D7a-5000 9-8-19	-3.49930E-04	-1.08938E-04
D7b-600 9-14-19	1.49034E-03	1.22186E-04
D7b-1000 9-14-1	9.49529E-04	8.16868E-05
D7b-1400 9-14-1	3.84767E-04	4.01992E-05
D7b-2000 9-14-1	-2.46091E-04	-3.49749E-05
D7b-3200 9-14-1	2.09656E-04	4.82038E-05
D7b-5000 9-14-1	-3.64227E-04	-6.54791E-05

SLOPE= -4.1593242959E-03 +/- 2.5227880458E-04
Y INTERCEPT= 3.5160833386E-03 +/- 1.1266460052E-04
SUMS S= 1.2319745918E+01 XBAR= 4.5333406796E-01 YBAR= 1.6305199356E-03
MODIFIED ERRORS
SLOPE= 2.9516195976E-04 INTERCEPT= 1.3181568837E-04

RECIPROCAL OF Y INTERCEPT= 2.8440736572E+02 +/- 9.1131634717E+00
MODIFIED +/- = 1.0662248041E+01

X INTERCEPT= 8.4534965020E-01 +/- 2.3591134390E-02
MODIFIED ERROR= 2.7584002274E-02

RECIPROCAL OF X INTERCEPT= 1.1829424662E+00 +/- 3.3012321812E-02
MODIFIED +/- = 3.8599752977E-02

AGE = 8.5088641248E+05 +- 2.3806653757E+04
MODIFIED +- = 2.7815106255E+04

MB11 all

CURRENT BLANK ERROR= 5.0000E-08 COUNTS

36/40 VS 39/40

JO= 3.9081116339 +/- 9.5429450543E-07

C7a-4000 9-5-19	1.59035E-01	5.99204E-03	2.93680E-03	3.46100E-04	-2.64436E-02
C7a-5000 9-5-19	1.35071E-01	7.30367E-03	2.86213E-03	5.28604E-04	-3.18662E-02
C7b-600 9-5-199	3.31563E-01	7.46450E-03	2.21311E-03	2.96933E-04	-2.11220E-02
C7b-1000 9-5-19	5.29160E-01	8.19402E-03	1.38507E-03	1.31719E-04	-1.24788E-01
C7b-1600 9-5-19	3.11200E-01	5.92760E-03	2.02639E-03	1.62984E-04	-4.82347E-02
C7b-2400 9-5-19	1.91913E-01	3.55537E-03	2.95357E-03	1.10991E-04	3.81824E-02
C7b-4000 9-5-19	1.64800E-01	3.98415E-03	3.18685E-03	1.73539E-04	8.13890E-02
C7b-5000 9-5-19	1.89828E-01	1.54008E-02	3.35872E-03	8.12143E-04	-2.85108E-04
C7c-600 9-13-19	2.14430E-01	2.21758E-03	2.62137E-03	8.75417E-05	-1.71030E-02
C7c-1000 9-13-1	4.72838E-01	2.90133E-03	1.33692E-03	7.81696E-05	-1.00822E-01
C7c-1400 9-13-1	4.33308E-01	3.35690E-03	1.46330E-03	7.74915E-05	-1.59261E-01
C7c-2000 9-13-1	2.83606E-01	1.99911E-03	2.19781E-03	8.43099E-05	-6.84889E-02
C7c-3200 9-13-1	1.59626E-01	1.49207E-03	2.80140E-03	6.63935E-05	1.10893E-01
C7c-5000 9-13-1	1.70820E-01	2.45490E-03	2.88819E-03	7.71747E-05	1.73254E-01

	RESX	RESY
C7-a-200 9-5-19	-3.52859E-03	-1.82151E-03
C7-a-600 9-5-19	-6.09174E-03	-7.11740E-04
C7-a-1000 9-5-1	-1.49042E-04	-5.99032E-05
C7-a-1600 9-5-1	-1.84289E-02	-8.00476E-04
C7-a-2400 9-5-1	-3.93062E-03	-8.31130E-04
C7a-3200 9-5-19	3.78193E-04	3.45521E-04
C7a-4000 9-5-19	-3.72438E-05	-3.88280E-05
C7a-5000 9-5-19	6.85678E-05	1.48462E-04
C7b-600 9-5-199	-3.15307E-04	-1.28259E-04
C7b-1000 9-5-19	-2.43157E-03	-2.22985E-04
C7b-1600 9-5-19	6.78607E-04	1.49895E-04
C7b-2400 9-5-19	-1.23739E-03	-2.05135E-04
C7b-4000 9-5-19	-1.33854E-03	-3.09951E-04
C7b-5000 9-5-19	-1.01780E-03	-6.01479E-04
C7c-600 9-13-19	3.83542E-05	1.47447E-05
C7c-1000 9-13-1	2.20635E-04	7.85027E-05
C7c-1400 9-13-1	2.80408E-04	1.38448E-04
C7c-2000 9-13-1	1.15625E-04	1.11387E-04
C7c-3200 9-13-1	4.41088E-04	9.15212E-05
C7c-5000 9-13-1	-4.40729E-04	-4.39550E-05

SLOPE= -4.7205580191E-03 +/- 2.1813096045E-04
Y INTERCEPT= 3.6485250320E-03 +/- 6.9173507068E-05
SUMS S= 4.8358411899E+01 XBAR= 2.9468982587E-01 YBAR= 2.2574246113E-03
MODIFIED ERRORS
SLOPE= 3.5753377475E-04 INTERCEPT= 1.1338081052E-04

RECIPROCAL OF Y INTERCEPT= 2.7408336005E+02 +/- 5.1964306336E+00
MODIFIED +/- = 8.5173579021E+00

X INTERCEPT= 7.7290121575E-01 +/- 2.2672585694E-02
MODIFIED ERROR= 3.7179232199E-02

RECIPROCAL OF X INTERCEPT= 1.2938264032E+00 +/- 3.7953608303E-02
MODIFIED +/- = 6.2237542507E-02

AGE = 8.8113245620E+05 +- 2.5967786072E+04
MODIFIED +- = 4.2452511750E+04

mb05 all

CURRENT BLANK ERROR= 5.0000E-08 COUNTS

36/40 VS 39/40

J0= 3.7218114776E-04 +/- 1.2171991978E-06

	X	DX	Y	
D5a-600 9-7-199	1.70537E-01	1.72045E-03	2.77875E-03	5.
D5a-1000 9-7-19	3.52251E-01	7.43624E-03	2.11064E-03	1.
D5a-1800 9-7-19	1.92234E-01	2.65802E-03	2.82485E-03	8.
D5a-2800 9-7-19	3.24736E-01	9.32902E-03	2.12974E-03	1.
D5a-5000 9-7-19	2.67501E-01	9.51181E-03	2.64402E-03	2.
D5b-600 9-11-19	1.14907E-01	9.48679E-04	2.98159E-03	7.
D5b-800 9-11-19	3.74611E-01	3.88939E-03	1.85021E-03	5.
D5b-1000 9-11-1	5.37200E-01	7.38525E-03	1.17051E-03	1.
D5b-1400 9-11-1	4.29788E-01	6.14694E-03	1.65556E-03	8.
D5b-2000 9-11-1	2.62146E-01	5.76262E-03	2.53568E-03	1.
D5b-3200 9-11-1	3.08350E-01	3.67432E-03	2.32001E-03	9.
D5b-5000 9-11-1	3.33151E-01	5.95913E-03	2.40556E-03	1.

	RESX	RESY
D5a-600 9-7-199	3.57049E-04	3.57412E-05
D5a-1000 9-7-19	-1.05622E-03	-8.08927E-05
D5a-1800 9-7-19	-7.33459E-04	-1.00040E-04
D5a-2800 9-7-19	6.27372E-05	1.48898E-05
D5a-5000 9-7-19	-7.16279E-04	-2.46884E-04
D5b-600 9-11-19	1.13943E-04	7.60925E-05
D5b-800 9-11-19	1.58965E-03	7.07015E-05
D5b-1000 9-11-1	3.00677E-04	4.83485E-05
D5b-1400 9-11-1	1.53616E-04	3.14468E-05
D5b-2000 9-11-1	-1.76675E-04	-1.17586E-04
D5b-3200 9-11-1	-3.25689E-04	-1.02365E-04
D5b-5000 9-11-1	-1.52703E-03	-2.90632E-04

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[illegible]

	RESX	RESY
C6a-600 9-7-199	-1.34633E-03	-2.27500E-04
C6a-1200 9-7-19	1.18208E-03	1.08867E-04
C6a-1800 9-7-19	-9.25068E-04	-1.56123E-04
C6a-2800 9-7-19	9.34567E-05	9.45442E-05
C6a-5000 9-7-19	2.07179E-04	1.08941E-04
C6b-600 9-14-19	2.24805E-04	6.13859E-05
C6b-1200 9-14-1	-1.58911E-03	-2.37695E-04
C6b-2400 9-14-1	-4.86025E-04	-1.26284E-04
C6b-5000 9-14-1	-4.94338E-05	-2.07161E-05

SLOPE= -4.1847033048E-03 +/- 2.7357132641E-04
Y INTERCEPT= 3.6159355535E-03 +/- 8.8768130413E-05
SUMS S= 1.4467326575E+01 XBAR= 3.0813526112E-01 YBAR= 2.3264809080E-03
MODIFIED ERRORS
SLOPE= 3.9329253080E-04 INTERCEPT= 1.2761513834E-04

RECIPROCAL OF Y INTERCEPT= 2.7655360147E+02 +/- 6.7891547840E+00
MODIFIED +/- = 9.7602475453E+00

X INTERCEPT= 8.6408409155E-01 +/- 3.6151089420E-02
MODIFIED ERROR= 5.1970721342E-02

RECIPROCAL OF X INTERCEPT= 1.1572947700E+00 +/- 4.8418281422E-02
MODIFIED +/- = 6.9606007785E-02

AGE = 8.4516467989E+05 +- 3.5393962369E+04
MODIFIED +- = 5.0850607556E+04

MB08 all

CURRENT BLANK ERROR= 5.0000E-08 COUNTS

36/40 VS 39/40

J0= 3.9880010613E-04 +/- 8.3425099154E-07

	X	DX	Y	DY	R
D7a-600 9-8-199	4.24989E-01	7.02622E-03	1.92417E-03	8.81603E-05	-1.31981E-01
D7a-1200 9-8-19	5.45703E-01	6.05044E-03	1.30057E-03	7.05133E-05	-2.20903E-01
D7a-1800 9-8-19	4.47667E-01	7.70232E-03	1.74419E-03	1.09150E-04	-2.06869E-01
D7a-2800 9-8-19	3.02787E-01	5.89561E-03	2.27338E-03	1.38346E-04	-8.81307E-02
D7a-5000 9-8-19	2.43904E-01	5.75785E-03	2.61200E-03	1.66764E-04	-5.12586E-02
D7b-600 9-14-19	3.02787E-01	4.63876E-03	2.12832E-03	7.33404E-05	-7.39864E-02
D7b-1000 9-14-1	5.16719E-01	5.50528E-03	1.28125E-03	6.40967E-05	-2.33183E-01
D7b-1400 9-14-1	5.59106E-01	4.76690E-03	1.14878E-03	5.75517E-05	-2.38443E-01
D7b-2000 9-14-1	4.77100E-01	3.12516E-03	1.56767E-03	5.40058E-05	-1.22686E-01
D7b-3200 9-14-1	3.53139E-01	3.53696E-03	1.99819E-03	8.14042E-05	-8.21035E-02
D7b-5000 9-14-1	3.09705E-01	3.58890E-03	2.29491E-03	9.62155E-05	-6.16167E-03

	RESX	RESY
D7a-600 9-8-199	-2.73358E-03	-1.64395E-04
D7a-1200 9-8-19	-6.52760E-04	-5.15303E-05
D7a-1800 9-8-19	-5.70975E-04	-8.77218E-05
D7a-2800 9-8-19	-6.33678E-05	-1.64247E-05
D7a-5000 9-8-19	-3.49930E-04	-1.08938E-04
D7b-600 9-14-19	1.49034E-03	1.22186E-04
D7b-1000 9-14-1	9.49529E-04	8.16868E-05
D7b-1400 9-14-1	3.84767E-04	4.01992E-05
D7b-2000 9-14-1	-2.46091E-04	-3.49749E-05
D7b-3200 9-14-1	2.09656E-04	4.82038E-05
D7b-5000 9-14-1	-3.64227E-04	-6.54791E-05

SLOPE= -4.1593242959E-03 +/- 2.5227880458E-04
Y INTERCEPT= 3.5160833386E-03 +/- 1.1266460052E-04
SUMS S= 1.2319745918E+01 XBAR= 4.5333406796E-01 YBAR= 1.6305199356E-03
MODIFIED ERRORS
SLOPE= 2.9516195976E-04 INTERCEPT= 1.3181568837E-04

RECIPROCAL OF Y INTERCEPT= 2.8440736572E+02 +/- 9.1131634717E+00
MODIFIED +/- = 1.0662248041E+01

X INTERCEPT= 8.4534965020E-01 +/- 2.3591134390E-02
MODIFIED ERROR= 2.7584002274E-02

RECIPROCAL OF X INTERCEPT= 1.1829424662E+00 +/- 3.3012321812E-02
MODIFIED +/- = 3.8599752977E-02

AGE = 8.5088641248E+05 +- 2.3806653757E+04
MODIFIED +- = 2.7815106255E+04

MB11 all

CURRENT BLANK ERROR= 5.0000E-08 COUNTS

36/40 VS 39/40

J0= 3.9081116339 +/- 9.5429450543E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
D9b-5000 9-8-19	1.00000E+00	-1.98033E-03	5.31241E-02	1.26011E+00	1.19051E-01	8.97612E+05	8.47818E+04

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
D9b-5000 9-8-19	5.00000E+03	7.56343E+01	3.05525E+00	1.73115E-02	3.90696E+02	1.18555E+01	1.73210E-10

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.90696E+02 +/- 1.18555E+01
37CA/39K = 3.05525E+00 +/- 1.73115E-02
F1 = -1.98033E-03   F2 = 5.31241E-02
TOTAL ATMOS 40 VOL = 1.73210E-10 CCNTP/G
TOTAL 39K VOL = 4.42893E-11 CCNTP/G
40*/39K = 1.26011E+00 +/- 1.19051E-01
AGE = 8.97612E+05 +/- 8.48063E+04 Y

d9c MB02

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.94941E-04 +/- 8.96478E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	3.95903E+01	8.98663E-02	2.79900E+07	3.94941E-04	8.96478E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
D9c-600 9-13-19	2.83579E-02	-1.93818E-03	5.93914E-03	1.21865E+00	4.93061E-01	8.68083E+05	3.51139E+05
D9c-1000 9-13-1	1.93688E-01	-1.27661E-03	7.34545E-02	1.45448E+00	5.52434E-02	1.03603E+06	3.93385E+04
D9c-1400 9-13-1	4.45552E-01	-1.01089E-03	1.17557E-01	1.43623E+00	3.09997E-02	1.02303E+06	2.20749E+04
D9c-2000 9-13-1	7.00515E-01	-8.65752E-04	9.99428E-02	1.43942E+00	3.70304E-02	1.02530E+06	2.63693E+04
D9c-3200 9-13-1	9.03601E-01	-1.81137E-03	4.48777E-02	1.38158E+00	5.30795E-02	9.84110E+05	3.77987E+04
D9c-5000 9-13-1	1.00000E+00	-3.92328E-03	3.56506E-02	1.31263E+00	1.14483E-01	9.35010E+05	8.15272E+04

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
D9c-600 9-13-19	6.00000E+02	9.58455E+01	2.99023E+00	2.72510E-02	3.08309E+02	5.38667E+00	4.78676E-10
D9c-1000 9-13-1	1.00000E+03	5.55732E+01	1.96955E+00	1.48612E-02	5.31731E+02	1.54579E+01	1.80558E-10
D9c-1400 9-13-1	1.40000E+03	3.75841E+01	1.55961E+00	7.97161E-03	7.86236E+02	2.76375E+01	1.30727E-10
D9c-2000 9-13-1	2.00000E+03	3.81680E+01	1.33568E+00	3.81660E-03	7.74209E+02	3.18472E+01	1.35971E-10
D9c-3200 9-13-1	3.20000E+03	7.55086E+01	2.79459E+00	9.01944E-03	3.91346E+02	4.83840E+00	5.19297E-10
D9c-5000 9-13-1	5.00000E+03	8.93302E+01	6.05283E+00	2.58224E-02	3.30795E+02	3.41023E+00	6.35976E-10

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 4.15756E+02 +/- 3.03841E+00
37CA/39K = 2.29481E+00 +/- 4.36611E-03
F1 = -1.48743E-03   F2 = 4.55825E-02
TOTAL ATMOS 40 VOL = 2.08121E-09 CCNTP/G
TOTAL 39K VOL = 6.00401E-10 CCNTP/G
40*/39K = 1.41088E+00 +/- 2.58254E-02
AGE = 1.00497E+06 +/- 1.85313E+04 Y

D2a MB03

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.82469E-04 +/- 1.03626E-06

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	4.08813E+01	1.10764E-01	2.79900E+07	3.82469E-04	1.03626E-06

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
D2a-800 9-5-199	2.55327E-01	-1.35508E-03	1.68499E-02	9.04254E-01	2.83471E-01	6.23031E+05	1.95529E+05
D2a-1600 9-5-19	6.33484E-01	-1.46254E-03	6.08012E-02	9.80279E-01	1.42576E-01	6.76270E+05	9.83414E+04
D2a-2400 9-5-19	8.25092E-01	-4.31173E-03	7.85256E-02	8.90685E-01	2.33955E-01	6.14471E+05	1.61375E+05
D2a-5000 9-5-19	1.00000E+00	-6.73243E-03	9.62251E-02	1.18006E+00	3.06561E-01	8.14060E+05	2.11433E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
D2a-800 9-5-199	8.00000E+02	9.02986E+01	2.09185E+00	2.30304E-02	3.27248E+02	1.09870E+01	1.41094E-10
D2a-1600 9-5-19	1.60000E+03	7.21212E+01	2.25641E+00	1.65565E-02	4.09727E+02	2.29656E+01	6.29536E-11
D2a-2400 9-5-19	2.40000E+03	8.60918E+01	6.65213E+00	4.84234E-02	3.43238E+02	1.45295E+01	6.93442E-11
D2a-5000 9-5-19	5.00000E+03	8.52000E+01	1.03868E+01	7.01508E-02	3.46831E+02	1.56388E+01	7.79900E-11

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.49528E+02 +/- 7.43227E+00
37CA/39K = 4.47872E+00 +/- 1.79828E-02
F1 = -2.90298E-03   F2 = 5.59519E-02
TOTAL ATMOS 40 VOL = 3.51381E-10 CCNTP/G
TOTAL 39K VOL = 6.56594E-11 CCNTP/G
40*/39K = 9.78643E-01 +/- 1.14151E-01
AGE = 6.75141E+05 +/- 7.87567E+04 Y

D2b MB03

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.82469E-04 +/- 1.03626E-06

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	4.08813E+01	1.10764E-01	2.79900E+07	3.82469E-04	1.03626E-06

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
D2B-5000 9-7-19	1.00000E+00	-2.90630E-03	4.38592E-02	9.46371E-01	1.72234E-01	6.52882E+05	1.18799E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
D2B-5000 9-7-19	5.00000E+03	8.78307E+01	4.48384E+00	4.53584E-02	3.36443E+02	8.35717E+00	3.37591E-10

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.36443E+02 +/- 8.35717E+00
37CA/39K = 4.48384E+00 +/- 4.53584E-02
F1 = -2.90630E-03   F2 = 4.38592E-02
TOTAL ATMOS 40 VOL = 3.37591E-10 CCNTP/G
TOTAL 39K VOL = 4.94322E-11 CCNTP/G
40*/39K = 9.46371E-01 +/- 1.72234E-01
AGE = 6.52882E+05 +/- 1.18812E+05 Y

D2c MB03

'IGHTED AVERAGE OF J FROM STANDARDS = 3.82469E-04 +/- 1.03626E-06

+/-	(40/36)S	+/-	VOL ATMOS 40/G
.00404E-02	4.51853E+02	6.04832E+01	3.93951E-11
.28701E-02	7.21987E+02	6.74024E+01	3.40229E-11
.05526E-02	4.93489E+02	3.93907E+01	4.23580E-11
.10158E-01	3.38573E+02	1.27038E+01	6.41604E-11
.86785E-01	3.13769E+02	1.70932E+01	5.08140E-11
.64702E-01	2.97733E+02	7.19920E+01	1.29580E-11

:-06

+/-	AGE	J	+/-
1396E-01	2.79900E+07	3.77586E-04	1.09780E-06

40*/39K	+/-	AGE	+/-
1.05109E+00	1.20942E-01	7.15855E+05	8.23526E+04
1.27938E+00	4.86910E-02	8.71297E+05	3.31521E+04
1.30991E+00	5.22005E-02	8.92085E+05	3.55412E+04
1.23603E+00	8.76810E-02	8.41782E+05	5.97000E+04
1.07869E+00	1.24430E-01	7.34650E+05	8.47268E+04
8.57051E-01	1.36182E-01	5.84269E+05	9.27363E+04

	+/-	(40/36)S	+/-	VOL ATMOS 40/G
	1.99227E-02	3.81480E+02	1.27097E+01	1.02858E-10
	5.29947E-03	7.47989E+02	4.33357E+01	8.01094E-11
	5.64277E-03	6.83388E+02	3.55984E+01	6.21381E-11
	5.90147E-03	4.54997E+02	1.73838E+01	1.03883E-10
.309E+	6.17165E-02	3.56965E+02	6.45380E+00	1.96292E-10
J4996E+00	1.02757E-01	3.46237E+02	9.24400E+00	1.40182E-10

TOTAL ATMOS 40 VOL = 6.85462E-10 CCNTP/G
TOTAL 39K VOL = 2.97994E-10 CCNTP/G
40*/39K = 1.19214E+00 +/- 3.30404E-02
AGE = 8.11899E+05 +/- 2.26203E+04 Y

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d5a MB05

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.72181E-04 +/- 1.21720E-06

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	4.20114E+01	1.37396E-01	2.79900E+07	3.72181E-04	1.21720E-06

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
D5a-600 9-7-199	3.06125E-01	-1.04395E-03	2.32982E-02	1.04891E+00	8.90216E-02	7.04147E+05	5.97496E+04
D5a-1000 9-7-19	5.24905E-01	-8.97912E-04	5.42342E-02	1.06829E+00	9.57533E-02	7.17154E+05	6.42674E+04
D5a-1800 9-7-19	7.92665E-01	-1.71378E-03	4.17587E-02	8.59669E-01	1.37855E-01	5.77127E+05	9.25320E+04
D5a-2800 9-7-19	9.19274E-01	-3.13055E-03	1.53965E-01	1.14142E+00	1.50903E-01	7.66238E+05	1.01280E+05
D5a-5000 9-7-19	1.00000E+00	-3.72620E-03	1.24643E-01	8.17538E-01	2.75228E-01	5.48847E+05	1.84744E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
D5a-600 9-7-199	6.00000E+02	8.21122E+01	1.61060E+00	1.42582E-02	3.59874E+02	6.47450E+00	2.46809E-10
D5a-1000 9-7-19	1.00000E+03	6.23694E+01	1.30530E+00	2.06428E-02	4.73798E+02	2.50060E+01	6.48570E-11
D5a-1800 9-7-19	1.80000E+03	8.34742E+01	2.64402E+00	3.20224E-02	3.54001E+02	1.10715E+01	1.94678E-10
D5a-2800 9-7-19	2.80000E+03	6.29339E+01	4.82962E+00	6.13251E-02	4.69540E+02	3.63127E+01	4.10661E-11
D5a-5000 9-7-19	5.00000E+03	7.81300E+01	5.74879E+00	5.09705E-02	3.78212E+02	3.55956E+01	3.94661E-11

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.79425E+02 +/- 6.20359E+00
37CA/39K = 2.57966E+00 +/- 1.40723E-02
F1 = -1.67206E-03   F2 = 5.03982E-02
TOTAL ATMOS 40 VOL = 5.86876E-10 CCNTP/G
TOTAL 39K VOL = 1.67458E-10 CCNTP/G
40*/39K = 9.95514E-01 +/- 5.03324E-02
AGE = 6.68308E+05 +/- 3.92133E+04 Y

d5b MB05

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.72181E-04 +/- 1.21720E-06

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	4.20114E+01	1.37396E-01	2.79900E+07	3.72181E-04	1.21720E-06

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
D5b-600 9-11-19	8.73440E-02	-1.37882E-03	1.87937E-02	1.03510E+00	2.03776E-01	6.94880E+05	1.36771E+05
D5b-800 9-11-19	4.22371E-01	-1.04247E-03	7.49124E-02	1.20996E+00	4.90628E-02	8.12236E+05	3.29281E+04
D5b-1000 9-11-1	6.04946E-01	-8.35037E-04	1.29011E-01	1.21764E+00	5.46157E-02	8.17389E+05	3.66547E+04
D5b-1400 9-11-1	7.37754E-01	-1.06025E-03	9.57568E-02	1.18845E+00	5.30346E-02	7.97802E+05	3.55940E+04
D5b-2000 9-11-1	7.89535E-01	-2.12822E-03	7.68002E-02	9.56362E-01	1.98042E-01	6.42029E+05	1.32926E+05
D5b-3200 9-11-1	9.14204E-01	-3.09505E-03	1.35277E-01	1.01974E+00	9.22030E-02	6.84569E+05	6.10856E+04
D5b-5000 9-11-1	1.00000E+00	-3.79764E-03	1.66691E-01	8.67947E-01	1.10798E-01	5.82684E+05	7.43703E+04

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
D5b-600 9-11-19	6.00000E+02	8.81060E+01	2.11490E+00	1.41099E-02	3.35392E+02	8.87481E+00	2.74128E-10
D5b-800 9-11-19	8.00000E+02	5.46736E+01	1.60832E+00	1.56326E-02	5.40480E+02	1.71466E+01	2.00103E-10
D5b-1000 9-11-1	1.00000E+03	3.45806E+01	1.28829E+00	9.10735E-03	8.54328E+02	7.16183E+01	4.80982E-11
D5b-1400 9-11-1	1.40000E+03	4.89217E+01	1.63575E+00	7.69731E-03	6.04026E+02	2.79446E+01	6.18617E-11
D5b-2000 9-11-1	2.00000E+03	7.49293E+01	2.28342E+00	1.80771E-02	3.94372E+02	2.73049E+01	6.05693E-11
D5b-3200 9-11-1	3.20000E+03	6.85562E+01	4.77505E+00	2.64352E-02	4.31033E+02	1.77961E+01	1.13407E-10
-5000 9-11-1	5.00000E+03	7.10842E+01	5.85900E+00	4.25636E-02	4.15704E+02	2.14929E+01	7.48889E-11

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
D9b-5000 9-8-19	1.00000E+00	-1.98033E-03	5.31241E-02	1.26011E+00	1.19051E-01	8.97612E+05	8.47818E+04

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
D9b-5000 9-8-19	5.00000E+03	7.56343E+01	3.05525E+00	1.73115E-02	3.90696E+02	1.18555E+01	1.73210E-10

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.90696E+02 +/- 1.18555E+01
37CA/39K = 3.05525E+00 +/- 1.73115E-02
F1 = -1.98033E-03 F2 = 5.31241E-02
TOTAL ATMOS 40 VOL = 1.73210E-10 CCNTP/G
TOTAL 39K VOL = 4.42893E-11 CCNTP/G
40*/39K = 1.26011E+00 +/- 1.19051E-01
AGE = 8.97612E+05 +/- 8.48063E+04 Y

d9c MB02

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.94941E-04 +/- 8.96478E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	3.95903E+01	8.98663E-02	2.79900E+07	3.94941E-04	8.96478E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
D9c-600 9-13-19	2.83579E-02	-1.93818E-03	5.93914E-03	1.21865E+00	4.93061E-01	8.68083E+05	3.51139E+05
D9c-1000 9-13-1	1.93688E-01	-1.27661E-03	7.34545E-02	1.45448E+00	5.52434E-02	1.03603E+06	3.93385E+04
D9c-1400 9-13-1	4.45552E-01	-1.01089E-03	1.17557E-01	1.43623E+00	3.09997E-02	1.02303E+06	2.20749E+04
D9c-2000 9-13-1	7.00515E-01	-8.65752E-04	9.99428E-02	1.43942E+00	3.70304E-02	1.02530E+06	2.63693E+04
D9c-3200 9-13-1	9.03601E-01	-1.81137E-03	4.48777E-02	1.38158E+00	5.30795E-02	9.84110E+05	3.77987E+04
D9c-5000 9-13-1	1.00000E+00	-3.92328E-03	3.56506E-02	1.31263E+00	1.14483E-01	9.35010E+05	8.15272E+04

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
D9c-600 9-13-19	6.00000E+02	9.58455E+01	2.99023E+00	2.72510E-02	3.08309E+02	5.38667E+00	4.78676E-10
D9c-1000 9-13-1	1.00000E+03	5.55732E+01	1.96955E+00	1.48612E-02	5.31731E+02	1.54579E+01	1.80558E-10
D9c-1400 9-13-1	1.40000E+03	3.75841E+01	1.55961E+00	7.97161E-03	7.86236E+02	2.76375E+01	1.30727E-10
D9c-2000 9-13-1	2.00000E+03	3.81680E+01	1.33568E+00	3.81660E-03	7.74209E+02	3.18472E+01	1.35971E-10
D9c-3200 9-13-1	3.20000E+03	7.55086E+01	2.79459E+00	9.01944E-03	3.91346E+02	4.83840E+00	5.19297E-10
D9c-5000 9-13-1	5.00000E+03	8.93302E+01	6.05283E+00	2.58224E-02	3.30795E+02	3.41023E+00	6.35976E-10

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 4.15756E+02 +/- 3.03841E+00
37CA/39K = 2.29481E+00 +/- 4.36611E-03
F1 = -1.48743E-03 F2 = 4.55825E-02
TOTAL ATMOS 40 VOL = 2.08121E-09 CCNTP/G
TOTAL 39K VOL = 6.00401E-10 CCNTP/G
40*/39K = 1.41088E+00 +/- 2.58254E-02
AGE = 1.00497E+06 +/- 1.85313E+04 Y

D2a MB03

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.82469E-04 +/- 1.03626E-06

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	4.08813E+01	1.10764E-01	2.79900E+07	3.82469E-04	1.03626E-06

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
D2a-800 9-5-199	2.55327E-01	-1.35588E-03	1.68499E-02	9.04254E-01	2.83471E-01	6.23831E+05	1.95529E+05
D2a-1600 9-5-19	6.33484E-01	-1.46254E-03	6.08012E-02	9.80279E-01	1.42576E-01	6.76270E+05	9.83414E+04
D2a-2400 9-5-19	8.25092E-01	-4.31173E-03	7.85256E-02	8.90685E-01	2.33955E-01	6.14471E+05	1.61375E+05
D2a-5000 9-5-19	1.00000E+00	-6.73243E-03	9.62251E-02	1.18006E+00	3.06561E-01	8.14060E+05	2.11433E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
D2a-800 9-5-199	8.00000E+02	9.02986E+01	2.09185E+00	[illegible]	[illegible]		
D2a-1600 9-5-19	1.60000E+03	7.21212E+01	2.25				
D2a-2400 9-5-19	2.40000E+03	8.60918E+01	6.65				
D2a-5000 9-5-19	5.00000E+03	8.52000E+01	1.03				

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.49528E+02 +/- 7.43227E+00
37CA/39K = 4.47872E+00 +/- 1.79828E-02
F1 = -2.90298E-03 F2 = 5.59519E-02
TOTAL ATMOS 40 VOL = 3.51381E-10 CCNTP/G
TOTAL 39K VOL = 6.56594E-11 CCNTP/G
40*/39K = 9.78643E-01 +/- 1.14151E-01
AGE = 6.75141E+05 +/- 7.87567E+04 Y

D2b MB03

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.82469E-04 +/

STANDARDS

NAME	F1	F2	40*/3
J function	0.00000E+00	0.00000E+00	4.08813

FRACTIONS

NAME	CUM 39K	F1	
D2B-5000 9-7-19	1.00000E+00	-2.90630E-03	4.38

NAME	TEMP	% ATMOS	37C
D2B-5000 9-7-19	5.00000E+03	8.78307E+01	4.48

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.36443E+02 +/- 8.35717E+00
37CA/39K = 4.48384E+00 +/- 4.53584E-02
F1 = -2.90630E-03 F2 = 4.38592E-02
TOTAL ATMOS 40 VOL = 3.37591E-10 CCNTP/G
TOTAL 39K VOL = 4.94322E-11 CCNTP/G
40*/39K = 9.46371E-01 +/- 1.72234E-01
AGE = 6.52882E+05 +/- 1.18812E+05 Y

D2c MB03

IGHTED AVERAGE OF J FROM STANDARDS = 3.82469E-04 +/

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NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
C7b-600 9-5-199	6.00000E+02	6.53974E+01	2.49547E+00	4.00404E-02	4.51853E+02	6.04832E+01	3.93951E-11
C7b-1000 9-5-19	1.00000E+03	4.09287E+01	1.45095E+00	1.28781E-02	7.21987E+02	6.74024E+01	3.40229E-11
C7b-1600 9-5-19	1.00000E+03	5.98797E+01	3.28223E+00	4.05526E-02	4.93489E+02	3.93907E+01	4.23580E-11
C7b-2400 9-5-19	2.40000E+03	8.72780E+01	9.05707E+00	1.10158E-01	3.38573E+02	1.27038E+01	6.41604E-11
C7b-4000 9-5-19	4.00000E+03	9.41715E+01	1.34582E+01	1.86785E-01	3.13789E+02	1.70832E+01	5.08140E-11
C7b-5000 9-5-19	5.00000E+03	9.92501E+01	1.19661E+01	1.64702E-01	2.97733E+02	7.19920E+01	1.29580E-11

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 4.29993E+02 +/- 1.50218E+01
37CA/39K = 4.15464E+00 +/- 2.31274E-02
F1 = -2.69292E-03 F2 = 1.21648E-01
TOTAL ATMOS 40 VOL = 2.43708E-10 CCNTP/G
TOTAL 39K VOL = 1.11498E-10 CCNTP/G
40*/39K = 9.95241E-01 +/- 7.69558E-02
AGE = 6.77825E+05 +/- 5.24387E+04 Y

c7b MB04

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.77586E-04 +/- 1.09780E-06

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	4.14100E+01	1.20396E-01	2.79900E+07	3.77586E-04	1.09780E-06

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
C7c-600 9-13-19	9.55650E-02	-1.71665E-03	5.01675E-02	1.05109E+00	1.20942E-01	7.15855E+05	8.23526E+04
C7c-1000 9-13-1	4.17467E-01	-1.10386E-03	1.30888E-01	1.27938E+00	4.86910E-02	8.71297E+05	3.31521E+04
C7c-1400 9-13-1	6.26487E-01	-8.71180E-04	9.04073E-02	1.30991E+00	5.22005E-02	8.92085E+05	3.55412E+04
C7c-2000 9-13-1	7.78754E-01	-1.57029E-03	7.16083E-02	1.23603E+00	8.76810E-02	8.41782E+05	5.97000E+04
C7c-3200 9-13-1	9.05812E-01	-4.74014E-03	9.07886E-02	1.07869E+00	1.24430E-01	7.34650E+05	8.47268E+04
C7c-5000 9-13-1	1.00000E+00	-5.21776E-03	1.02521E-01	8.57851E-01	1.36182E-01	5.84269E+05	9.27363E+04

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
C7c-600 9-13-19	6.00000E+02	7.74615E+01	2.64844E+00	1.99227E-02	3.81480E+02	1.27097E+01	1.02858E-10
C7c-1000 9-13-1	1.00000E+03	3.95859E+01	1.70304E+00	6.29947E-03	7.47989E+02	4.33357E+01	8.01094E-11
C7c-1400 9-13-1	1.40000E+03	4.32404E+01	1.34406E+00	5.64277E-03	6.83388E+02	3.55984E+01	6.21381E-11
C7c-2000 9-13-1	2.00000E+03	6.49454E+01	2.42264E+00	6.90147E-03	4.54997E+02	1.73803E+01	1.03883E-10
C7c-3200 9-13-1	3.20000E+03	8.27813E+01	7.31309E+00	6.17165E-02	3.56965E+02	8.45380E+00	1.96292E-10
C7c-5000 9-13-1	5.00000E+03	8.53461E+01	8.04996E+00	1.02757E-01	3.46237E+02	9.24400E+00	1.40182E-10

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 4.48601E+02 +/- 6.35137E+00
37CA/39K = 3.13853E+00 +/- 9.97449E-03
F1 = -2.03431E-03 F2 = 9.04064E-02
TOTAL ATMOS 40 VOL = 6.85462E-10 CCNTP/G
TOTAL 39K VOL = 2.97994E-10 CCNTP/G
40*/39K = 1.19214E+00 +/- 3.30404E-02
AGE = 8.11899E+05 +/- 2.26203E+04 Y

d5a MB05

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.72181E-04 +/- 1.21720E-06

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	4.20114E+01	1.37396E-01	2.79900E+07	3.72181E-04	1.21720E-06

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
D5a-600 9-7-199	3.06125E-01	-1.04395E-03	2.32982E-02	1.04891E+00	8.90216E-02	7.04147E+05	5.97496E+04
D5a-1000 9-7-19	5.24905E-01	-8.97912E-04	5.42342E-02	1.06829E+00	9.57533E-02	7.17154E+05	6.42674E+04
D5a-1800 9-7-19	7.92665E-01	-1.71378E-03	4.17587E-02	8.59669E-01	1.37855E-01	5.77127E+05	9.25320E+04
D5a-2800 9-7-19	9.19274E-01	-3.13055E-03	1.53965E-01	1.14142E+00	1.50903E-01	7.66238E+05	1.01280E+05
D5a-5000 9-7-19	1.00000E+00	-3.72620E-03	1.24643E-01	8.17538E-01	2.75228E-01	5.48847E+05	1.84744E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
D5a-600 9-7-199	6.00000E+02	8.21122E+01	1.61060E+00	1.42582E-02	3.59874E+02	6.47450E+00	2.46809E-10
D5a-1000 9-7-19	1.00000E+03	6.23694E+01	1.38530E+00	2.06428E-02	4.73790E+02	2.50060E+01	6.48570E-11
D5a-1800 9-7-19	1.80000E+03	8.34742E+01	2.64402E+00	3.28224E-02	3.54001E+02	1.10715E+01	1.94678E-10
D5a-2800 9-7-19	2.80000E+03	6.29339E+01	4.82982E+00	6.13251E-02	4.69540E+02	3.63127E+01	4.10661E-11
D5a-5000 9-7-19	5.00000E+03	7.81308E+01	5.74879E+00	5.09705E-02	3.78212E+02	3.55956E+01	3.94661E-11

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.79425E+02 +/- 6.20359E+00
37CA/39K = 2.57966E+00 +/- 1.40723E-02
F1 = -1.67286E-03 F2 = 5.03982E-02
TOTAL ATMOS 40 VOL = 5.86876E-10 CCNTP/G
TOTAL 39K VOL = 1.67458E-10 CCNTP/G
40*/39K = 9.95514E-01 +/- 5.83324E-02
AGE = 6.68308E+05 +/- 3.92133E+04 Y

d5b MB05

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.72181E-04 +/- 1.21720E-06

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	4.20114E+01	1.37396E-01	2.79900E+07	3.72181E-04	1.21720E-06

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
D5b-600 9-11-19	8.73440E-02	-1.37082E-03	1.87937E-02	1.03510E+00	2.03776E-01	6.94880E+05	1.36771E+05
D5b-800 9-11-19	4.22371E-01	-1.04247E-03	7.49124E-02	1.20996E+00	4.90628E-02	8.12236E+05	3.29281E+04
D5b-1000 9-11-1	6.04946E-01	-8.35037E-04	1.29011E-01	1.21764E+00	5.46157E-02	8.17389E+05	3.66547E+04
D5b-1400 9-11-1	7.37754E-01	-1.06025E-03	9.57568E-02	1.18845E+00	5.30346E-02	7.97802E+05	3.55940E+04
D5b-2000 9-11-1	7.89535E-01	-2.12822E-03	7.68802E-02	9.56362E-01	1.98042E-01	6.42029E+05	1.32926E+05
D5b-3200 9-11-1	9.14204E-01	-3.09505E-03	1.35277E-01	1.01974E+00	9.22030E-02	6.84569E+05	6.18856E+04
D5b-5000 9-11-1	1.00000E+00	-3.79764E-03	1.66691E-01	8.67947E-01	1.10798E-01	5.82684E+05	7.43703E+04

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
D5b-600 9-11-19	6.00000E+02	8.81060E+01	2.11490E+00	1.41090E-02	3.35392E+02	8.87481E+00	2.74128E-10
D5b-800 9-11-19	8.00000E+02	5.46736E+01	1.60832E+00	1.56326E-02	5.40480E+02	1.71466E+01	2.00105E-10
D5b-1000 9-11-1	1.00000E+03	3.45886E+01	1.28829E+00	8.10735E-03	8.54328E+02	7.16183E+01	4.80982E-11
D5b-1400 9-11-1	1.40000E+03	4.89217E+01	1.63575E+00	7.69731E-03	6.04026E+02	2.79446E+01	6.18617E-11
D5b-2000 9-11-1	2.00000E+03	7.49293E+01	3.28342E+00	1.80771E-02	3.94372E+02	2.73049E+01	6.05693E-11
D5b-3200 9-11-1	3.20000E+03	6.85562E+01	4.77505E+00	2.64352E-02	4.31033E+02	1.77961E+01	1.13407E-10
-5000 9-11-1	5.00000E+03	7.10842E+01	5.85900E+00	4.25636E-02	4.15704E+02	2.14929E+01	7.48889E-11

AGE = 7.31902E+05 +/- 3.51630E+04 Y

c6b MB07

WEIGHTED AVERAGE OF J FROM STANDARDS = 4.04896E-04 +/- 8.32796E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	3.86169E+01	7.94277E-02	2.79900E+07	4.04896E-04	8.32796E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
C6b-600 9-14-19	1.76659E-01	-1.70489E-03	7.32645E-02	1.06203E+00	1.48394E-01	7.75609E+05	1.08350E+05
C6b-1200 9-14-1	5.25296E-01	-9.30968E-04	9.75454E-02	9.63067E-01	8.81664E-02	7.03349E+05	6.43773E+04
C6b-2400 9-14-1	7.56307E-01	-1.64695E-03	8.52657E-02	9.25975E-01	1.25650E-01	6.76265E+05	9.17488E+04
C6b-5000 9-14-1	1.00000E+00	-5.13834E-03	1.03596E-01	8.12216E-01	1.52657E-01	5.93198E+05	1.11474E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
C6b-600 9-14-19	6.00000E+02	6.95222E+01	2.63031E+00	3.02288E-02	4.25044E+02	2.59103E+01	4.91378E-11
C6b-1200 9-14-1	1.20000E+03	5.04535E+01	1.43630E+00	5.82722E-03	5.85688E+02	5.25186E+01	3.92532E-11
C6b-2400 9-14-1	2.40000E+03	6.82720E+01	2.54092E+00	1.12033E-02	4.32827E+02	2.72511E+01	5.28466E-11
C6b-5000 9-14-1	5.00000E+03	8.57043E+01	7.92743E+00	5.84552E-02	3.44790E+02	1.07730E+01	1.36226E-10

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 4.09849E+02 +/- 1.04958E+01
37CA/39K = 3.48425E+00 +/- 1.30740E-02
F1 = -2.25840E-03 F2 = 9.49576E-02
TOTAL ATMOS 40 VOL = 2.77464E-10 CCNTP/G
TOTAL 39K VOL = 1.14844E-10 CCNTP/G
40*/39K = 9.35220E-01 +/- 6.21159E-02
AGE = 6.83016E+05 +/- 4.53780E+04 Y

d7a MB08

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.98800E-04 +/- 8.34251E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	3.92072E+01	8.20177E-02	2.79900E+07	3.98800E-04	8.34251E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
D7a-600 9-8-199	2.16375E-01	-8.62018E-04	6.81533E-02	1.01511E+00	6.13813E-02	7.30186E+05	4.41439E+04
D7a-1200 9-8-19	6.04915E-01	-6.79721E-04	9.92528E-02	1.12824E+00	3.74621E-02	8.11545E+05	2.69406E+04
D7a-1800 9-8-19	7.99329E-01	-1.05551E-03	9.43817E-02	1.08249E+00	7.05886E-02	7.78644E+05	5.07642E+04
D7a-2800 9-8-19	9.19381E-01	-3.22109E-03	1.40257E-01	1.08398E+00	1.34806E-01	7.79720E+05	9.69465E+04
D7a-5000 9-8-19	1.00000E+00	-4.02734E-03	1.24107E-01	9.35427E-01	2.02117E-01	6.72882E+05	1.45362E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
D7a-600 9-8-199	6.00000E+02	5.68591E+01	1.32992E+00	1.38579E-02	5.19706E+02	2.32077E+01	7.32199E-11
D7a-1200 9-8-19	1.20000E+03	3.84318E+01	1.04867E+00	5.45057E-03	7.68895E+02	3.99522E+01	6.92026E-11
D7a-1800 9-8-19	1.80000E+03	5.15407E+01	1.62844E+00	1.10598E-02	5.73333E+02	3.48479E+01	5.66089E-11
D7a-2800 9-8-19	2.80000E+03	6.71785E+01	4.96950E+00	5.22686E-02	4.39873E+02	2.65073E+01	6.73507E-11
D7a-5000 9-8-19	5.00000E+03	7.71846E+01	6.21338E+00	7.97327E-02	3.82848E+02	2.43293E+01	6.45141E-11

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 5.38057E+02 +/- 1.34728E+01
37CA/39K = 2.10932E+00 +/- 9.33489E-03
F1 = -1.36720E-03 F2 = 1.06012E-01
TOTAL ATMOS 40 VOL = 3.30896E-10 CCNTP/G
TOTAL 39K VOL = 2.52987E-10 CCNTP/G
40*/39K = 1.07401E+00 +/- 3.32293E-02
AGE = 7.72546E+05 +/- 2.39517E+04 Y

d7b MB08

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.98800E-04 +/- 8.34251E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	3.92072E+01	8.20177E-02	2.79900E+07	3.98800E-04	8.34251E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
D7b-600 9-14-19	7.99181E-02	-1.12725E-03	5.76596E-02	1.22556E+00	7.26410E-02	8.81530E+05	5.22372E+04
D7b-1000 9-14-1	2.53758E-01	-7.94370E-04	1.10106E-01	1.20257E+00	3.58992E-02	8.65001E+05	2.58159E+04
D7b-1400 9-14-1	4.82108E-01	-6.83363E-04	1.13951E-01	1.18141E+00	2.96743E-02	8.49786E+05	2.13396E+04
D7b-2000 9-14-1	7.48075E-01	-7.95227E-04	8.53175E-02	1.12504E+00	3.33569E-02	8.09244E+05	2.39884E+04
D7b-3200 9-14-1	8.82448E-01	-1.44319E-03	8.89478E-02	1.15970E+00	6.81541E-02	8.34172E+05	4.90119E+04
D7b-5000 9-14-1	1.00000E+00	-2.14933E-03	9.94608E-02	1.03923E+00	9.25153E-02	7.47533E+05	6.65341E+04

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
D7b-600 9-14-19	6.00000E+02	6.28918E+01	1.73913E+00	1.86115E-02	4.69855E+02	1.58643E+01	9.37708E-11
D7b-1000 9-14-1	1.00000E+03	3.78609E+01	1.22555E+00	8.06835E-03	7.80488E+02	3.72419E+01	7.19402E-11
D7b-1400 9-14-1	1.40000E+03	3.39465E+01	1.05429E+00	4.56309E-03	8.70487E+02	4.16964E+01	7.83030E-11
D7b-2000 9-14-1	1.40000E+03	4.63245E+01	1.22688E+00	3.55623E-03	6.37891E+02	2.15923E+01	1.45866E-10
D7b-3200 9-14-1	3.20000E+03	5.90464E+01	2.22655E+00	1.37444E-02	5.00453E+02	2.01934E+01	1.26904E-10
D7b-5000 9-14-1	5.00000E+03	6.78146E+01	3.31598E+00	2.87167E-02	4.35747E+02	1.81917E+01	1.45381E-10

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 5.86376E+02 +/- 9.82190E+00
37CA/39K = 1.60808E+00 +/- 4.07647E-03
F1 = -1.04231E-03 F2 = 9.17785E-02
TOTAL ATMOS 40 VOL = 6.62164E-10 CCNTP/G
TOTAL 39K VOL = 5.64998E-10 CCNTP/G
40*/39K = 1.15399E+00 +/- 1.99858E-02
AGE = 8.30067E+05 +/- 1.44770E+04 Y

B8a MB11

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.90811E-04 +/- 9.54295E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	4.00087E+01	9.76944E-02	2.79900E+07	3.90811E-04	9.54295E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
600 9-6-199	9.26649E-02	-1.69487E-03	3.04377E-02	7.50477E-01	1.74603E-01	5.29049E+05	1.23068E+05

·04
.3057E-05
50E-01 YBAR= 2.3491368074E-03

223388E-05

2 +/- 2.2068964841E+00

35532E-03

0 +/- 2.0471872444E-02

4

		Y	DY	R
	54412E-0	3.05579E-03	1.02660E-04	3.18682E-02
	39933E-	2.44065E-03	1.38088E-04	-1.15106E-01
	252E	2.91343E-03	1.23746E-04	-5.40497E-02
		2.88325E-03	1.30355E-04	-6.24341E-02
		2.97228E-03	7.38543E-05	1.99121E-01
		3.34862E-03	1.43397E-05	2.55972E-01
D2c-5000 9-7-19	[illegible]	3.46987E-03	3.69138E-05	2.31201E-01
D2d-600 9-14-19	9.35252E-03 9.91426E-05	3.24521E-03	2.41929E-05	1.57980E-01
D2d-1000 9-14-1	4.60148E-02 2.22493E-04	2.62056E-03	6.88058E-05	-2.33625E-02
D2d-1400 9-14-1	1.91012E-01 1.24802E-03	2.49911E-03	6.25419E-05	-4.68301E-02
D2d-2000 9-14-1	2.22154E-01 1.40315E-03	2.80462E-03	5.95387E-05	2.30012E-02
D2d-3200 9-14-1	1.40531E-01 7.46005E-04	2.92996E-03	5.33872E-05	1.61012E-01
D2d-5000 9-14-1	1.29417E-01 1.22043E-03			

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	RESX	RESY
D2a-800 9-5-199	-8.39429E-05	-6.11472E-05
D2a-1600 9-5-19	-3.45275E-04	-1.46466E-04
D2a-2400 9-5-19	-1.91264E-04	-1.11905E-04
D2a-5000 9-5-19	9.36657E-06	3.92087E-05
D2B-5000 9-7-19	-3.37408E-04	-6.10014E-05
D2c-5000 9-7-19	1.64837E-05	1.65055E-05
D2d-600 9-14-19	-5.66538E-05	-8.74378E-05
D2d-1000 9-14-1	-1.45129E-05	-8.16408E-06
D2d-1400 9-14-1	3.69813E-05	4.19856E-05
D2d-2000 9-14-1	3.79523E-05	4.00792E-05
D2d-3200 9-14-1	5.25424E-05	5.78035E-05
D2d-5000 9-14-1	-1.29180E-04	-2.27915E-05

SLOPE= -3.9607873252E-03 +/- 1.8618780989E-04
Y INTERCEPT= 3.4192479165E-03 +/- 1.3575363580E-05
SUMS S= 1.2087146103E+01 XBAR= 4.5132349854E-02 YBAR= 3.2404882772E-03
MODIFIED ERRORS
SLOPE= 2.0469777838E-04 INTERCEPT= 1.4924966179E-05

RECIPROCAL OF Y INTERCEPT= 2.9246197539E+02 +/- 1.1611552441E+00
MODIFIED +/- = 1.2765921624E+00

X INTERCEPT= 8.6327480769E-01 +/- 3.8512112851E-02
MODIFIED ERROR= 4.2376938109E-02

RECIPROCAL OF X INTERCEPT= 1.1583796852E+00 +/- 5.1677228114E-02
MODIFIED +/- = 5.6863218747E-02

AGE = 7.9910978265E+05 +- 3.5707382865E+04
MODIFIED +- = 3.9278173463E+04

mb04 all

CURRENT BLANK ERROR= 3.0000E-08 COUNTS

36/40 VS 39/40

JO= 3.7758621380E-04 +/- 1.0978028286E-06

	X	DX	Y	DY	R
C7-a-200 9-5-19	4.63684E-02	8.04109E-03	5.26782E-03	1.21143E-03	2.62917E-01
C7-a-600 9-5-19	4.09329E-01	1.28161E-02	2.45679E-03	2.47378E-04	-8.26962E-02
C7-a-1000 9-5-1	5.53361E-01	1.37407E-02	1.09696E-03	2.69872E-04	-1.93759E-01
C7-a-1600 9-5-1	4.87767E-01	2.03863E-02	2.23355E-03	2.55493E-04	-9.88764E-02
C7-a-2400 9-5-1	2.91270E-01	1.20858E-02	3.12327E-03	3.62222E-04	-1.61239E-02
C7a-3200 9-5-19	2.14501E-01	1.02611E-02	2.28865E-03	4.56633E-04	-5.76650E-02

AGE = 7.31902E+05 +/- 3.51630E+04 Y

c6b MB07

WEIGHTED AVERAGE OF J FROM STANDARDS = 4.04896E-04 +/- 8.32796E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	3.86169E+01	7.94277E-02	2.79900E+07	4.04896E-04	8.32796E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
C6b-600 9-14-19	1.76659E-01	-1.70489E-03	7.32645E-02	1.06203E+00	1.48394E-01	7.75689E+05	1.08350E+05
C6b-1200 9-14-1	5.25296E-01	-9.30968E-04	9.75454E-02	9.63067E-01	8.81664E-02	7.03349E+05	6.43773E+04
C6b-2400 9-14-1	7.56307E-01	-1.64695E-03	8.52657E-02	9.25975E-01	1.25650E-01	6.76265E+05	9.17488E+04
C6b-5000 9-14-1	1.00000E+00	-5.13834E-03	1.03596E-01	8.12216E-01	1.52657E-01	5.93198E+05	1.11474E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
C6b-600 9-14-19	6.00000E+02	6.95222E+01	2.63031E+00	3.02288E-02	4.25044E+02	2.59103E+01	4.91378E-11
C6b-1200 9-14-1	1.20000E+03	5.04535E+01	1.43630E+00	5.82722E-03	5.85688E+02	5.25186E+01	3.92532E-11
C6b-2400 9-14-1	2.40000E+03	6.82720E+01	2.54092E+00	1.12033E-02	4.32827E+02	2.72511E+01	5.28466E-11
C6b-5000 9-14-1	5.00000E+03	8.57043E+01	7.92743E+00	5.84552E-02	3.44790E+02	1.07730E+01	1.36226E-10

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 4.09849E+02 +/- 1.04958E+01
37CA/39K = 3.48425E+00 +/- 1.30740E-02
F1 = -2.25840E-03 F2 = 9.49576E-02
TOTAL ATMOS 40 VOL = 2.77464E-10 CCNTP/G
TOTAL 39K VOL = 1.14844E-10 CCNTP/G
40*/39K = 9.35220E-01 +/- 6.21159E-02
AGE = 6.83016E+05 +/- 4.53780E+04 Y

d7a MB08

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.98800E-04 +/- 8.34251E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	3.92072E+01	8.20177E-02	2.79900E+07	3.98800E-04	8.34251E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
D7a-600 9-8-199	2.16375E-01	-8.62018E-04	6.81533E-02	1.01511E+00	6.13813E-02	7.30186E+05	4.41439E+04
D7a-1200 9-8-19	6.04915E-01	-6.79721E-04	9.92528E-02	1.12824E+00	3.74621E-02	8.11545E+05	2.69406E+04
D7a-1800 9-8-19	7.99329E-01	-1.05551E-03	9.43817E-02	1.08249E+00	7.05886E-02	7.78644E+05	5.07642E+04
D7a-2800 9-8-19	9.19381E-01	-3.22109E-03	1.40257E-01	1.08398E+00	1.34806E-01	7.79720E+05	9.69465E+04
D7a-5000 9-8-19	1.00000E+00	-4.02734E-03	1.24107E-01	9.35427E-01	2.02117E-01	6.72882E+05	1.45362E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
D7a-600 9-8-199	6.00000E+02	5.68591E+01	1.32992E+00	1.38579E-02	5.19706E+02	2.32077E+01	7.32199E-11
D7a-1200 9-8-19	1.20000E+03	3.84318E+01	1.04867E+00	5.45057E-03	7.68895E+02	3.99522E+01	6.92026E-11
D7a-1800 9-8-19	1.80000E+03	5.15407E+01	1.62844E+00	1.10598E-02	5.73333E+02	3.48479E+01	5.66089E-11
D7a-2800 9-8-19	2.80000E+03	6.71785E+01	4.96950E+00	5.22686E-02	4.39873E+02	2.65073E+01	6.73507E-11
D7a-5000 9-8-19	5.00000E+03	7.71846E+01	6.21338E+00	7.97327E-02	3.82848E+02	2.43293E+01	6.45141E-11

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 5.38057E+02 +/- 1.34728E+01
37CA/39K = 2.10932E+00 +/- 9.33489E-03
F1 = -1.36720E-03 F2 = 1.06012E-01
TOTAL ATMOS 40 VOL = 3.30896E-10 CCNTP/G
TOTAL 39K VOL = 2.52987E-10 CCNTP/G
40*/39K = 1.07401E+00 +/- 3.32293E-02
AGE = 7.72546E+05 +/- 2.39517E+04 Y

d7b MB08

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.98800E-04 +/- 8.34251E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	3.92072E+01	8.20177E-02	[illegible]	[illegible]	

FRACTIONS

NAME	CUM 39K	F1	F2
D7b-600 9-14-19	7.99181E-02	-1.12725E-03	5.76596E-
D7b-1000 9-14-1	2.53758E-01	-7.94370E-04	1.10106E-
D7b-1400 9-14-1	4.82108E-01	-6.83363E-04	1.13951E-
D7b-2000 9-14-1	7.48075E-01	-7.95227E-04	8.53175E-
D7b-3200 9-14-1	8.82448E-01	-1.44319E-03	8.89478E-
D7b-5000 9-14-1	1.00000E+00	-2.14933E-03	9.94608E-

NAME	TEMP	% ATMOS	37CA/39K
D7b-600 9-14-19	6.00000E+02	6.28918E+01	1.73913E+
D7b-1000 9-14-1	1.00000E+03	3.78609E+01	1.22555E+
D7b-1400 9-14-1	1.40000E+03	3.39465E+01	1.05429E+
D7b-2000 9-14-1	1.40000E+03	4.63245E+01	1.22688E+
D7b-3200 9-14-1	3.20000E+03	5.90464E+01	2.22655E+
D7b-5000 9-14-1	5.00000E+03	6.78146E+01	3.31598E+

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 5.86376E+02 +/- 9.82190E+00
37CA/39K = 1.60808E+00 +/- 4.07647E-03
F1 = -1.04231E-03 F2 = 9.17785E-02
TOTAL ATMOS 40 VOL = 6.62164E-10 CCNTP/G
TOTAL 39K VOL = 5.64998E-10 CCNTP/G
40*/39K = 1.15399E+00 +/- 1.99858E-02
AGE = 8.30067E+05 +/- 1.44770E+04 Y

B8a MB11

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.90811E-04 +/- 9..

STANDARDS

NAME	F1	F2	40*/39K
J function	0.00000E+00	0.00000E+00	4.00087E+01

FRACTIONS

NAME	CUM 39K	F1	F2
500 9-6-199	9.26649E-02	-1.69487E-03	3.04377E-0

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Fue

D9c-5000 9-13-1 3.93484E-05 1.43519E-05

SLOPE= -4.9207088069E-03 +/- 1.0023994679E-04
Y INTERCEPT= 3.4375479584E-03 +/- 2.6078313057E-05
SUMS S= 1.2009127738E+01 XBAR= 2.2118991260E-01 YBAR= 2.3491368074E-03
MODIFIED ERRORS
SLOPE= 1.0984911430E-04 INTERCEPT= 2.8578223388E-05

RECIPROCAL OF Y INTERCEPT= 2.9090503234E+02 +/- 2.2068964841E+00
MODIFIED +/- = 2.4184532404E+00

X INTERCEPT= 6.9858796635E-01 +/- 9.9907885532E-03
MODIFIED ERROR= 1.0948001823E-02

RECIPROCAL OF X INTERCEPT= 1.4314589546E+00 +/- 2.0471872444E-02
MODIFIED +/- = 2.2433273975E-02

AGE = 1.0196312662E+06 +- 1.4760519228E+04
MODIFIED +- = 1.6141452681E+04

MB03 all

CURRENT BLANK ERROR= 5.0000E-08 COUNTS

36/40 VS 39/40

J0= 3.8246930042E-04 +/- 1.0362635734E-06

	X	DX	Y	DY	R
D2a-800 9-5-199	1.07286E-01	1.54412E-03	3.05579E-03	1.02660E-04	3.18682E-02
D2a-1600 9-5-19	2.84397E-01	5.89933E-03	2.44065E-03	1.38088E-04	-1.15106E-01
D2a-2400 9-5-19	1.56151E-01	3.54252E-03	2.91343E-03	1.23746E-04	-5.40497E-02
D2a-5000 9-5-19	1.25418E-01	2.46810E-03	2.88325E-03	1.30355E-04	-6.24341E-02
D2B-5000 9-7-19	1.28589E-01	1.48787E-03	2.97228E-03	7.38543E-05	1.99121E-01
D2c-5000 9-7-19	1.36468E-02	5.31126E-05	3.34862E-03	1.43397E-05	2.55972E-01
D2d-600 9-14-19	9.35252E-03	9.91426E-05	3.46987E-03	3.69138E-05	2.31201E-01
D2d-1000 9-14-1	4.60148E-02	2.22493E-04	3.24521E-03	2.41929E-05	1.57980E-01
D2d-1400 9-14-1	1.91012E-01	1.24802E-03	2.62056E-03	6.88058E-05	-2.33625E-02
D2d-2000 9-14-1	2.22154E-01	1.40315E-03	2.49911E-03	6.25419E-05	-4.68301E-02
D2d-3200 9-14-1	1.40531E-01	7.46005E-04	2.80462E-03	5.95387E-05	2.30012E-02
D2d-5000 9-14-1	1.29417E-01	1.22043E-03	2.92996E-03	5.33872E-05	1.61012E-01

	RESX	RESY
D2a-800 9-5-199	-8.39429E-05	-6.11472E-05
D2a-1600 9-5-19	-3.45275E-04	-1.46466E-04
D2a-2400 9-5-19	-1.91264E-04	-1.11905E-04
D2a-5000 9-5-19	9.36657E-06	3.92087E-05
D2B-5000 9-7-19	-3.37408E-04	-6.10014E-05
D2c-5000 9-7-19	1.64837E-05	1.65055E-05
D2d-600 9-14-19	-5.66538E-05	-8.74378E-05
D2d-1000 9-14-1	-1.45129E-05	-8.16408E-06
D2d-1400 9-14-1	3.69813E-05	4.19856E-05
D2d-2000 9-14-1	3.79523E-05	4.00792E-05
D2d-3200 9-14-1	5.25424E-05	5.78035E-05
D2d-5000 9-14-1	-1.29180E-04	-2.27915E-05

SLOPE= -3.9607873252E-03 +/- 1.8618780989E-04
Y INTERCEPT= 3.4192479165E-03 +/- 1.3575363580E-05
SUMS S= 1.2087146103E+01 XBAR= 4.5132349854E-02 YBAR= 3.2404882772E-03
MODIFIED ERRORS
SLOPE= 2.0469777838E-04 INTERCEPT= 1.4924966179E-05

RECIPROCAL OF Y INTERCEPT= 2.9246197539E+02 +/- 1.1611552441E+00
MODIFIED +/- = 1.2765921624E+00

X INTERCEPT= 8.6327480769E-01 +/- 3.8512112851E-02
MODIFIED ERROR= 4.2376938109E-02

RECIPROCAL OF X INTERCEPT= 1.1583796852E+00 +/- 5.1677228114E-02
MODIFIED +/- = 5.6863218747E-02

AGE = 7.9910978265E+05 +- 3.5707382865E+04
MODIFIED +- = 3.9278173463E+04

mb04 all

CURRENT BLANK ERROR= 3.0000E-08 COUNTS

36/40 VS 39/40

J0= 3.7758621380E-04 +/- 1.0978028286E-06

	X	DX	Y	DY	R
C7-a-200 9-5-19	4.63684E-02	8.04109E-03	5.26782E-03	1.21143E-03	2.62917E-01
C7-a-600 9-5-19	4.09329E-01	1.28161E-02	2.45679E-03	2.47378E-04	-8.26962E-02
C7-a-1000 9-5-1	5.53361E-01	1.37407E-02	1.09696E-03	2.69872E-04	-1.93759E-01
C7-a-1600 9-5-1	4.87767E-01	2.03863E-02	2.23355E-03	2.55493E-04	-9.88764E-02
C7-a-2400 9-5-1	2.91270E-01	1.20858E-02	3.12327E-03	3.62222E-04	-1.61239E-02
C7a-3200 9-5-19	2.14501E-01	1.02611E-02	2.28865E-03	4.56633E-04	-5.76650E-02

SLOPE= -4.3524472216E-03 +/- 2.1308493781E-04
Y INTERCEPT= 3.5583027386E-03 +/- 6.4924228259E-05
SUMS S= 1.3495127937E+01 XBAR= 2.8679560270E-01 YBAR= 2.3100400144E-03
MODIFIED ERRORS
SLOPE= 2.4753764517E-04 INTERCEPT= 7.5421523187E-05

RECIPROCAL OF Y INTERCEPT= 2.8103286130E+02 +/- 5.1276810817E+00
MODIFIED +/- = 5.9567518624E+00

X INTERCEPT= 8.1754069777E-01 +/- 2.5945993265E-02
MODIFIED ERROR= 3.0140893542E-02

RECIPROCAL OF X INTERCEPT= 1.2231806964E+00 +/- 3.8819643103E-02
MODIFIED +/- = 4.5095931312E-02

AGE = 8.2110987374E+05 +- 2.6191305276E+04
MODIFIED +- = 3.0384440035E+04

mb06 all

CURRENT BLANK ERROR= 5.0000E-08 COUNTS

36/40 VS 39/40

J0= 4.0169142850E-04 +/- 8.0318257876E-07

	X	DX	Y	DY	R
D8a-600 9-6-199	2.33004E-01	2.53051E-03	2.47584E-03	5.67715E-05	5.69079E-02
D8a-1000 9-6-19	3.45804E-01	4.07684E-03	1.93856E-03	9.47833E-05	-1.23583E-01
D8a-1600 9-6-19	3.08061E-01	4.75802E-03	2.21623E-03	1.19582E-04	-1.06548E-01
D8a-2800 9-6-19	1.83118E-01	2.67640E-03	2.83535E-03	1.11954E-04	-3.26488E-02
D8a-5000 9-6-19	1.48025E-01	3.40168E-03	2.74523E-03	1.43362E-04	-7.75239E-02
D8b-600 9-11-19	1.42098E-01	1.79505E-03	2.86908E-03	7.05948E-05	1.89256E-01
D8b-1000 9-11-1	2.68887E-01	2.85604E-03	2.44628E-03	4.14811E-05	2.54090E-01
D8b-1400 9-11-1	3.25469E-01	2.90778E-03	2.24248E-03	4.68389E-05	6.91556E-02
D8b-1800 9-11-1	4.01046E-01	4.21458E-03	1.86661E-03	6.29023E-05	-1.73592E-01
D8b-2400 9-11-1	2.75793E-01	3.44310E-03	2.41469E-03	9.46406E-05	-8.45330E-02
D8b-3200 9-11-1	1.72941E-01	2.13217E-03	2.90019E-03	7.83978E-05	-2.77031E-02
D8b-5000 9-11-1	1.80671E-01	1.74075E-03	2.72441E-03	8.81699E-05	2.92468E-03

	RESX	RESY
D8a-600 9-6-199	7.61074E-04	7.37232E-05
D8a-1000 9-6-19	3.41852E-04	1.64677E-04
D8a-1600 9-6-19	7.90598E-05	3.79495E-05
D8a-2800 9-6-19	-1.25699E-04	-8.41411E-05
D8a-5000 9-6-19	5.77822E-05	1.44631E-04
D8b-600 9-11-19	3.13610E-04	4.33058E-05
D8b-1000 9-11-1	-1.08361E-03	-3.19062E-05
D8b-1400 9-11-1	-1.02264E-03	-5.30662E-05
D8b-1800 9-11-1	1.17720E-04	1.81142E-05
D8b-2400 9-11-1	-7.01488E-05	-3.17666E-05
D8b-3200 9-11-1	-2.36867E-04	-1.08120E-04
D8b-5000 9-11-1	5.74630E-05	3.57920E-05

SLOPE= -3.9715994082E-03 +/- 2.7372874738E-04
Y INTERCEPT= 3.4779844956E-03 +/- 7.4998682655E-05
SUMS S= 1.1207925179E+01 XBAR= 2.6698212244E-01 YBAR= 2.4176384561E-03
MODIFIED ERRORS
SLOPE= 2.8978975090E-04 INTERCEPT= 7.9399221940E-05

RECIPROCAL OF Y INTERCEPT= 2.8752284585E+02 +/- 6.2000951125E+00
MODIFIED +/- = 6.5638849972E+00

X INTERCEPT= 8.7571382159E-01 +/- 4.1899996116E-02
MODIFIED ERROR= 4.4359080156E-02

RECIPROCAL OF X INTERCEPT= 1.1419255644E+00 +/- 5.4637343314E-02
MODIFIED +/- = 5.7843974135E-02

AGE = 8.2734356801E+05 +- 3.9611107574E+04
MODIFIED +- = 4.1931917527E+04

MB07 all

CURRENT BLANK ERROR= 5.0000E-08 COUNTS

36/40 VS 39/40

J0= 4.0489644095E-04 +/- 8.3279590972E-07

	X	DX	Y	DY	R
C6a-600 9-7-199	2.44717E-01	4.62857E-03	2.82500E-03	1.20508E-04	-6.82105E-03
C6a-1200 9-7-19	4.60485E-01	5.03707E-03	1.57513E-03	6.51567E-05	-1.91767E-01
C6a-1800 9-7-19	3.30147E-01	6.04252E-03	2.39436E-03	1.06880E-04	-1.35129E-01
C6a-2800 9-7-19	1.46556E-01	2.25416E-03	2.90771E-03	1.21093E-04	-2.48999E-02
C6a-5000 9-7-19	1.53425E-01	1.80041E-03	2.86409E-03	9.58341E-05	2.27925E-02
C6b-600 9-14-19	2.86977E-01	7.57596E-03	2.35270E-03	1.45648E-04	-1.49555E-01
C6b-1200 9-14-1	5.14465E-01	1.17276E-02	1.70740E-03	1.57627E-04	-2.27863E-01
C6b-2400 9-14-1	3.42644E-01	7.88856E-03	2.31039E-03	1.47452E-04	-1.54426E-01
-5000 9-14-1	1.76009E-01	2.28078E-03	2.90031E-03	9.07752E-05	-1.02725E-02

	DY	R
E-03	8.88607E-05	8.35926E-03
E-03	6.42213E-05	-1.64356E-01
E-03	8.77974E-05	-1.28238E-01
E-03	6.12648E-05	-1.13574E-02
E-03	7.81574E-05	1.81185E-02
E-03	1.55805E-04	4.10100E-02
E-03	6.96667E-05	-6.17004E-02
E-03	5.47038E-05	-1.89765E-01
E-03	7.81483E-05	-1.92547E-01
E-03	5.53516E-05	-1.23636E-01
E-03	5.11577E-05	2.01169E-01
E-03	1.11863E-04	9.58498E-02

·633744)5
)2124E-(YBAR= 2.3181492092E-03
177990 ·05
1.2697036268E+00

MODIFIED +/- = 3.[illegible]

X INTERCEPT= 8.3461075585E-01 +/- 2.1859088516E-02
MODIFIED ERROR= 1.9400331962E-02

RECIPROCAL OF X INTERCEPT= 1.1981633270E+00 +/- 3.1380806008E-02
MODIFIED +/- = 2.7851026512E-02

AGE = 8.4457154306E+05 +- 2.2210698466E+04
MODIFIED +- = 1.9735271962E+04

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SLOPE= -4.3524472216E-03 +/- 2.1308493781E-04
Y INTERCEPT= 3.5583027386E-03 +/- 6.4924228259E-05
SUMS S= 1.3495127937E+01 XBAR= 2.8679560270E-01 YBAR= 2.3100400144E-03
MODIFIED ERRORS
SLOPE= 2.4753764517E-04 INTERCEPT= 7.5421523187E-05

RECIPROCAL OF Y INTERCEPT= 2.8103286130E+02 +/- 5.1276810817E+00
MODIFIED +/- = 5.9567518624E+00

X INTERCEPT= 8.1754069777E-01 +/- 2.5945993265E-02
MODIFIED ERROR= 3.0140893542E-02

RECIPROCAL OF X INTERCEPT= 1.2231806964E+00 +/- 3.8819643103E-02
MODIFIED +/- = 4.5095931312E-02

AGE = 8.2110987374E+05 +- 2.6191305276E+04
MODIFIED +- = 3.0384440035E+04

mb06 all

CURRENT BLANK ERROR= 5.0000E-08 COUNTS

36/40 VS 39/40

J0= 4.0169142850E-04 +/- 8.0318257876E-07

	X	DX	Y	DY	R
D8a-600 9-6-199	2.33004E-01	2.53051E-03	2.47584E-03	5.67715E-05	5.69079E-02
D8a-1000 9-6-19	3.45804E-01	4.07684E-03	1.93856E-03	9.47833E-05	-1.23583E-01
D8a-1600 9-6-19	3.08061E-01	4.75802E-03	2.21623E-03	1.19582E-04	-1.06548E-01
D8a-2800 9-6-19	1.83118E-01	2.67640E-03	2.83535E-03	1.11954E-04	-3.26488E-02
D8a-5000 9-6-19	1.48025E-01	3.40168E-03	2.74523E-03	1.43362E-04	-7.75239E-02
D8b-600 9-11-19	1.42098E-01	1.79505E-03	2.86908E-03	7.05948E-05	1.89256E-01
D8b-1000 9-11-1	2.68887E-01	2.85604E-03	2.44628E-03	4.14811E-05	2.54090E-01
D8b-1400 9-11-1	3.25469E-01	2.90778E-03	2.24248E-03	4.68389E-05	6.91556E-02
D8b-1800 9-11-1	4.01046E-01	4.21458E-03	1.86661E-03	6.29023E-05	-1.73592E-01
D8b-2400 9-11-1	2.75793E-01	3.44310E-03	2.41469E-03	9.46406E-05	-8.45330E-02
D8b-3200 9-11-1	1.72941E-01	2.13217E-03	2.90019E-03	7.83978E-05	-2.77031E-02
D8b-5000 9-11-1	1.80671E-01	1.74075E-03	2.72441E-03	8.81699E-05	2.92468E-03

	RESX	RESY
D8a-600 9-6-199	7.61074E-04	7.37232E-05
D8a-1000 9-6-19	3.41852E-04	1.64677E-04
D8a-1600 9-6-19	7.90598E-05	3.79495E-05
D8a-2800 9-6-19	-1.25699E-04	-8.41411E-05
D8a-5000 9-6-19	5.77822E-05	1.44631E-04
D8b-600 9-11-19	3.13610E-04	4.33058E-05
D8b-1000 9-11-1	-1.08361E-03	-3.19062E-05
D8b-1400 9-11-1	-1.02264E-03	-5.30662E-05
D8b-1800 9-11-1	1.17720E-04	1.81142E-05
D8b-2400 9-11-1	-7.01488E-05	-3.17666E-05
D8b-3200 9-11-1	-2.36867E-04	-1.08120E-04
D8b-5000 9-11-1	5.74630E-05	3.57920E-05

SLOPE= -3.9715994082E-03 +/- 2.7372
Y INTERCEPT= 3.4779844956E-03 +/-
SUMS S= 1.1207925179E+01 XBAR= 2.6
MODIFIED ERRORS
SLOPE= 2.8978975090E-04 INTERCEPT=

RECIPROCAL OF Y INTERCEPT= 2.875228
MODIFIED +/- = 6.5638849972E+00

X INTERCEPT= 8.7571382159E-01 +/- 4
MODIFIED ERROR= 4.4359080156E-02

RECIPROCAL OF X INTERCEPT= 1.1419255
MODIFIED +/- = 5.7843974135E-02

AGE = 8.2734356801E+05 +- 3.9611107
MODIFIED +- = 4.1931917527E+04

MB07 all

CURRENT BLANK ERROR= 5.0000E-08 COUN

36/40 VS 39/40

J0= 4.0489644095E-04 +/- 8.3279590972

	X	DX
C6a-600 9-7-199	2.44717E-01	4.62857
C6a-1200 9-7-19	4.60485E-01	5.03707
C6a-1800 9-7-19	3.30147E-01	6.04252
C6a-2800 9-7-19	1.46556E-01	2.25416
C6a-5000 9-7-19	1.53425E-01	1.80041
C6b-600 9-14-19	2.86977E-01	7.57596
C6b-1200 9-14-1	5.14465E-01	1.17276
C6b-2400 9-14-1	3.42644E-01	7.88856
-5000 9-14-1	1.76009E-01	2.28078

	X	DX	Y	DY	R
B8a-600 9-6-199	1.50851E-01	2.46685E-03	3.00098E-03	8.88607E-05	8.35926E-03
B8a-1200 9-6-19	4.29034E-01	4.67469E-03	1.78372E-03	6.42213E-05	-1.64356E-01
B8a-1800 9-6-19	3.46219E-01	4.73736E-03	2.17518E-03	8.77974E-05	-1.28238E-01
B8a-2800 9-6-19	2.05887E-01	2.98814E-03	2.84880E-03	6.12648E-05	-1.13574E-02
B8a-5000 9-6-19	1.46622E-01	1.94407E-03	2.93022E-03	7.81574E-05	1.81185E-02
B8b-600 9-12-19	7.83904E-02	1.40035E-03	3.20251E-03	1.55805E-04	4.10100E-02
B8b-1000 9-12-1	3.10202E-01	3.38380E-03	2.18000E-03	6.96667E-05	-6.17004E-02
B8b-1400 9-12-1	4.56546E-01	3.61124E-03	1.66055E-03	5.47038E-05	-1.89765E-01
B8b-1800 9-12-1	4.47494E-01	4.99853E-03	1.62958E-03	7.81483E-05	-1.92547E-01
B8b-2400 9-12-1	3.26713E-01	3.46802E-03	2.19673E-03	5.53516E-05	-1.23636E-01
B8b-3600 9-12-1	1.90446E-01	2.70829E-03	2.79620E-03	5.11577E-05	2.01169E-01
B8b-5000 9-12-1	1.59241E-01	2.53285E-03	2.86671E-03	1.11863E-04	9.58498E-02

	RESX	RESY
B8a-600 9-6-199	-1.04260E-04	-2.91431E-05
B8a-1200 9-6-19	-2.35701E-04	-2.02002E-05
B8a-1800 9-6-19	-3.04224E-04	-5.14723E-05
B8a-2800 9-6-19	-1.09667E-03	-1.11818E-04
B8a-5000 9-6-19	1.84056E-04	5.87434E-05
B8b-600 9-12-19	5.99959E-05	8.35032E-05
B8b-1000 9-12-1	7.04479E-04	9.58346E-05
B8b-1400 9-12-1	-1.15983E-04	-1.71072E-05
B8b-1800 9-12-1	2.96727E-04	5.14085E-05
B8b-2400 9-12-1	9.63236E-05	9.99488E-06
B8b-3600 9-12-1	6.20711E-05	2.84475E-06
B8b-5000 9-12-1	2.91698E-04	6.69478E-05

SLOPE= -4.3456546507E-03 +/- 1.7750464738E-04
Y INTERCEPT= 3.6269301127E-03 +/- 5.6166337443E-05
SUMS S= 7.8766179317E+00 XBAR= 3.0117002124E-01 YBAR= 2.3181492092E-03
MODIFIED ERRORS
SLOPE= 1.5753592888E-04 INTERCEPT= 4.9847799883E-05

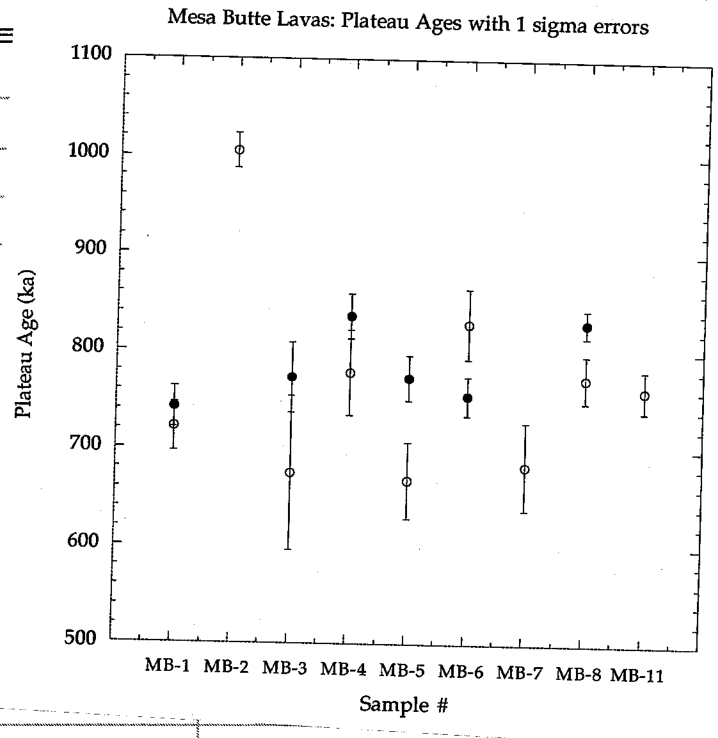
RECIPROCAL OF Y INTERCEPT= 2.7571526579E+02 +/- 4.2697036268E+00
MODIFIED +/- = 3.7893753027E+00

X INTERCEPT= 8.3461075585E-01 +/- 2.1859088516E-02
MODIFIED ERROR= 1.9400331962E-02

RECIPROCAL OF X INTERCEPT= 1.1981633270E+00 +/- 3.1380806008E-02
MODIFIED +/- = 2.7851026512E-02

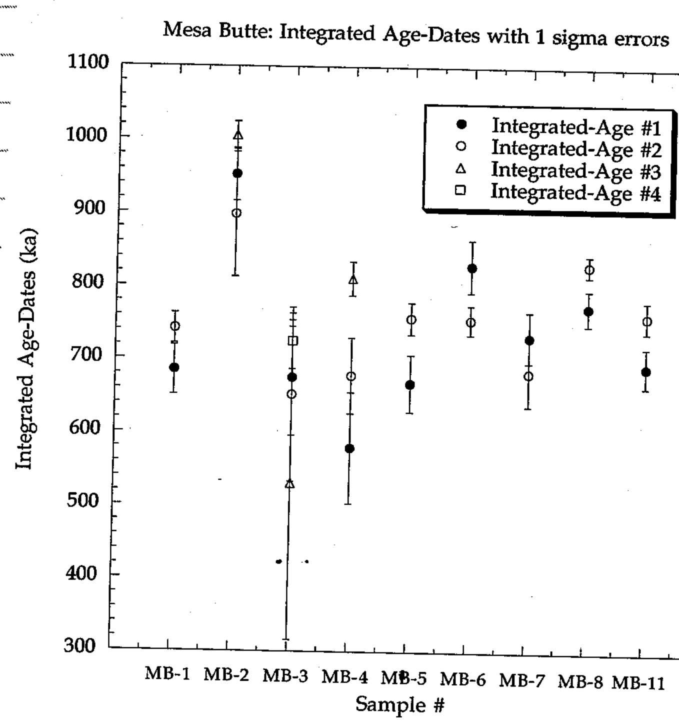
AGE = 8.4457154306E+05 +- 2.2210698466E+04
MODIFIED +- = 1.9735271962E+04

11 Dec 96



Plots of Mesa Butte lava Ages

13 Dec 96



T-Test of Age Dates of Mesa Butte

12-Oct-95

Formulae
t=(x1-x2)/Se
Se=Sp(sqrt(1/n+1n2))
Sp=((n1-1)Ssq+(n2-1)S2sq))/(n+n2-2)

Ho u1=u2

Davis p. 65

APPROACH 1

Sample	Age	1 Sigma (s.d.)	N	N-1	X1-X2	Std Pool **2	Pool std. dev	T-test value	Comment*
Mb-1	764	25	13	12					
Mb-3	799	39	12	11	35	1053.52	421.746228	0.08298829	Can't reject
Mb-06	827	42	12	11	63	1169.74	468.270418	0.13453765	Can't reject
Mb-05	821	30	12	11	57	756.52	302.851074	0.18821132	Can't reject
Mb-04	881	42	20	19	117	1323.10	471.369965	0.24821268	Can't reject
MB-02	1020	16	12	11	256	448.52	179.552395	1.42576767	Reject
Mb-05&02					199	578.00	183.108233	1.10831159	Can't reject
TOTAL MEAN	836	14.28	4	3	55	305.46	264.537246	0.20791023	can't reject
MEAN YOUNGU	781	24.7	2	1					

*Can't reject indicates that the null hypothesis of equal means for two ages is acceptable at the 10% level of significance.
* Reject indicates significantly different means at 10% level of significance

APPROACH # 1 using ischron data and 1sigma approach probably invalid because of lousy assumption thus not useful

Approach #1 using calculated means for older and younger values is pbl valid but naive.

Approach #2 — Calculating a mean age for the lava flow field using the ages of north and east field to determine a mean age and a mean standard deviation.

Sample	Age
MB-5	821
MB-6	827
MB-7	845
MB-8	851
MB-1	764
MB-3	799

One-tailed t-test of differenc of MB-1 & mean of older samples
-10.084034 Reject

One-tailed t-test of differenc of MB-1 & mean of older samples
-3.1142857

Approach 2 appears valid if somewhat naive

F-test Result (varian1/varian2)
1.732493
Passes F-test so can move onto T-test

Column1		*Column1*	
Mean	836	Mean	781.5
Standard Error	7.14142843	Standard Error	17.5
Median	836	Median	781.5
Mode	#NUM!	Mode	#NUM!
Standard Devia	14.2828569	Standard Devia	24.7487373
Sample Varianc	204	Sample Varianc	612.5
Kurtosis	-4.3391003	Kurtosis	#NUM!
Skewness	-1.48E-16	Skewness	#NUM!
Range	30	Range	35

T test of Age of Mesa Butte sample
MB 1 – MB 08 –
T test confirms significant difference
in most ages for isochron age!

[illegible signature]

19 Dec 96.

Ages, polarits, & Petrology of Mesa Butte units.

$^{40}Ar/^{39}Ar$ Ages, Magnetic Polarities, and Petrology of Mesa Butte Basalts

Ar/Ar age dates: Univ of Michigan
Geochemistry: ICP Texas Tech
Red Mountain geochemistry from Wolfe et al., 1987
Paleomagnetic data from Wolfe et al. (1987), Ulrich and Bailey (1987), and Tanaka et al. (1991)

Sample # or Vent #	Map Unit	Comment	Polarity	$^{40}Ar/^{39}Ar$ Age Date	Lithology	
MB1	V6609	MB Vent Sam	R	764+/-25	Plag-Ol Basalt	Hawaiite
MB-2	Qmb 6609	USGS1.04 m.y.-6622	N?	1020+/-16	Plag-Ol Basalt	Hawaiite
MB-3	V6604	Flow field of 6604	R	799+/-39	Plag-Ol Basalt	Hawaiite
MB-3 Rep.				845 +/- 22		
MB-4	Qmbf	Fissure basalt	R	881+/-42	Plag-Ol Basalt	Hawaiite
MB-5	Qmb 6609	1 km E of MB cone	ND	821+/-30	Plag-Ol Basalt	Hawaiite
MB-6	Qmb 6609	Site of 1.39 m.y. age	ND	827+/-42	Plag-Ol Basalt	Hawaiite
MB-7	Qmb 6609	2.5 km E of Mb cone	ND	845+/-51	Plag-Ol Basalt	Hawaiite
MB-8	Qmb 6609	7 km ESE of MB cone	ND	851+/-28	Plag-Ol Basalt	Hawaiite
Rd Mtn 5531	Red Mtn	Basalt lava flow	N	< 0.97 Ma	Plag-Ol Basalt	Hawaiite
Rd Mtn 5528	Red Mtn	Benmoreite	N?	<0.97 Ma	Benmoreite	Benmoreite
Shadow Mtn	Shadow M	Basalt	ND	0.62+/-0.23?	Ol Basalt	Alkali Olivine Basalt
Chapel Mtn	QTmb	Align. W of MB	R	Unk.	Picritic Basalt	Picritic Basalt
V6619A	QTmb	Align. W of MB	R	Unk.	Picritic Basalt	Picritic Basalt
V6618	QTmb	Align. W of MB	R	Unk	CPX-Ol-Basalt	Alkali Olivine Basalt

19 Dec 96 JHC

Map Units, Magnetic Polarity, Geochemistry, and Petrology of Eruptive of the MBF

Sample # or Vent #	Map Unit	Areas & Volumes	Polarity	$^{40}Ar/^{39}Ar$ Age Date	SiO_2 (wt. %)	MgO (wt. %)	Total wt. % alkalies	Petrology
MB1	V6609 •		R	764 ± 25	48.29	4.91	5.53	Hwi
MB-2	Qmb 6609		N?	1020 ± 16	49.07	5.59	4.82	Hwi
MB-3	V6604		R	799 ± 39	47	7.59	4.19	Hwi
MB-3 Rep.				845 ± 22	46.78	7.79	4	Hwi
MB-4	Qmbf		R	881 ± 42	47.24	7.53	4.49	Hwi
MB-5	Qmb 6609		ND	821 ± 30	47.75	5.66	5.06	Hwi
MB-6	Qmb 6609		ND	827 ± 42	47.84	5.22	5.42	Hwi
MB-7	Qmb 6609		ND	845 ± 51	46.99	7.47	4.15	Hwi
MB-8	Qmb 6609		ND	851 ± 28	49.27	5.07	5.52	Hwi
Rd Mtn 5531	Red Mtn		N	< 1049	47.17	7.59	3.98	Hwi
Rd Mtn 5528	Red Mtn		N?	< 1049	61.53	1.41	8.58	Ben
Shadow Mtn	Shadow M		ND	620±230	45.5	8.5	4	AOB
Tappan Wash								
Chapel Mtn	QTmb		R	Unk.	45.17	14.2	3.87	Pic
V6619A	QTmb		R	Unk.				Pic
V6618	QTmb		R	Unk	46.52	9.96	4.07	AOB

Petrologic Abbreviations: Hwi - hawaiite; Ben - benmoreite; AOB - alkali olivine basalt; Pic - picritic basalt

Ar/Ar age dates: Univ of Michigan

Geochemistry: ICP Texas Tech

Red Mountain geochemistry from Wolfe et al., 1987

Paleomagnetic data from Wolfe et al. (1987), Ulrich and Bailey (1987), and Tanaka et al. (1991)

20 Dec 96 [illegible]

Age data for November 1995 3 sample described previously.
Samples analyzed by C. Hall Univ of Mich.
Methodology identical to 1st angels/s

Dr. Michael Conway
(210) 522-6829

8 December 1995

Dr. Chris Hall
Dept. of Geological Science
1066 CC Little Building
University of Michigan
Ann Arbor, MI 48109

Dear Chris:

Enclosed are samples from the remaining undated vents outcropping along the Mesa Butte fault zone in the San Francisco volcanic field. Once these rocks are dated we will have ages and geochemistry for nearly all the vents comprising a major vent alignment in the SFVF. A list of the samples is below. I know I promised to include a copy of the Mesa Butte manuscript but I've been more out then in the past several weeks and still have some serious polishing to do on it; last week was a trip to Cerro Negro volcano in Nicaragua.

As before, the rocks are generally porphyritic olivine basalts with phenocrysts of olivine, cpx, and plagioclase. The rocks labeled CM1-5 and CM2-4 are picrites with 12 to 20% olivine.

Samples:

FV-1
SM1-4
CR-3
RM1
TW1-4
CM1-5
CM2-4.

I'll be at AGU this week, but will get back with you early the following week.

Cheers,

Michael Conway

21 Dec 96 Rec.

From: MX%"chall@geo.lsa.umich.edu" 21-FEB-1996 10:30:35.10
To: MCONWAY
CC:
Subj: Preliminary Results

Return-Path: <@swri.edu:chall@geo.lsa.umich.edu>
Received: from swri.edu by ctcvax.ccf.swri.edu (MX V3.3 VAX) with SMTP; Wed, 21 Feb 1996 10:30:30 CST
Received: from geo.lsa.umich.edu (jeffreys.geo.lsa.umich.edu) by swri.edu (4.1/25-EPR) id AA07793; Wed, 21 Feb 96 10:30:23 CST
Received: from james.geo.lsa.umich.edu by geo.lsa.umich.edu (8.7.1/2.2) id LAA10341; Wed, 21 Feb 1996 11:30:13 -0500 (EST)
Date: Wed, 21 Feb 1996 11:30:11 -0500 (EST)
From: Chris Hall <chall@geo.lsa.umich.edu>
To: mconway@swri.edu
CC: mwj@umich.edu
Subject: Preliminary Results
Message-ID: <Pine.SUN.3.91.960221112807.11740A-100000@james.geo.lsa.umich.edu>
MIME-Version: 1.0
Content-Type: TEXT/PLAIN; charset=US-ASCII

Mike:

We have run replicates on all 7 of the samples that you sent us. I'm including the reduced data in this e-mail message and I'll shortly start writing up the results to mail to you.

My programs always produce errors at the 1 sigma level (easier for calculation), so you need to double them to get 95% confidence intervals. All ages are given in ka.

In the 1st table, I list total gas ages (or integrated ages) which assume that the initial Ar isotopic composition matches the atmospheric 40/36 ratio of 295.5. For some samples, however, the initial argon is an extremely large percentage of the total, so the calculated ages are rather sensitively dependent on this assumption. This is particularly true for packet S0 (sample SM1-4) which was low in K and high in 36Ar. So in the second table, I've included the results of isochron analysis which uses the data to estimate the initial 40/36 ratio. Plateau ages are calculated as error weighted averages over a plateau segment, so there can be a slight difference from the total gas ages which add up all the gas. I also include Mean Squared Weighted Deviates (MSWD).

I'm always looking for patterns, and it seems that samples TW1-4 and SM1-4 are the youngest. TW1-4 seems to be about 300 ka old, and SM1-4 is either the same age (isochron) or about 500 ka (assuming 40/36i=295.5). RM1 is about 700 ka and both FV1 and CR3 are between 900 and 1000 ka. The oldest samples are CM2-4 and CM1-5 with ages of about 1400-1500 ka.

Let me know if this makes any sense. We have some material left which can be loaded if necessary, but I suspect that we won't be able to refine things too much, as the precision is mostly determined by the samples themselves.

I'm also including the printouts of our basic data reduction package.

Let me know what you think.

Chris
cmhall@umich.edu

Table 1 Ages assuming 40/36i=295.5

3 Jan 97

[illegible]

Package No.	Sample	Tot. Gas Age	+/-	Plateau	+/-	% Gas in plat.	MSWD
S0	SM1-1	574	82	529	83	100	1.27
		468	64	-			
S1	CM2-4	1596	68	1592	43	100	1.34
		1443	25	1397	22	82	0.82
S2	RM1	729	46	739	45	90	1.06
		656	54	686	43	100	0.20
S3	CR3	969	21	962	19	100	0.76
		1060	23	1037	20	77	1.02
S4	FV1	924	94	932	70	100	0.32
		922	32	917	26	100	0.28
S5	TW1-4	281	32	260	26	100	1.50
		347	27	311	17	100	0.72
S6	CM1-5	1511	22	1512	29	59	1.38
		1413	20	1437	24	88	1.81

Table 2 Isochron results

Package No.	Sample	n	MSWD	40/36i	+/-	Age	+/-
S0	SM1-1	12	1.19	302.2	2.0	268	51
S1	CM2-4	12	2.60	332.5	21.5	1311	90
S2	RM1	13	0.82	293.5	2.2	742	55
S3	CR3	15	1.66	298.0	1.7	972	24
S4	FV1	11	0.27	296.3	1.4	904	37
S5	TW1-4	14	0.91	299.4	1.9	275	18
S6(P<2000)	CM1-5	10	1.20	303.6	4.5	1409	36
S6(all)	CM1-5	18	3.16	305.5	7.2	1388	60

Table 3 Data reduction printouts:

SMI-4 Basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.09707E-04 +/- 8.72602E-07

STANDARDS NAME	F1	F2	40*/39K	+/-	AGE
J function	0.00000E+00	0.00000E+00	5.04859E+01	1.42244E-01	2.79900E+

FRACTIONS NAME	CUM 39K	F1	F2	40*/39K	+/
s0-SMI-4 2-13-1	1.55618E-01	-4.32050E-03	2.07423E-03	2.04813E+00	4.8641
s0-600-SMI-4 2-	2.59884E-01	-2.52070E-03	1.25626E-02	1.21930E+00	4.7499
s0-1000-SMI-4 2	4.59953E-01	-3.55017E-03	3.79773E-02	9.62908E-01	2.9263

3 Jan 97

s0-1400-SMI-4 2	6.33543E-01	-6.77496E-03	1.02021E-01	6.08298E-01	4.01970E-01	3.39846E+05	2.24553E+05
S0-2000-SM1-4 2	7.89350E-01	-1.14928E-02	1.24498E-01	9.72415E-01	2.78051E-01	5.43241E+05	1.55310E+05
S0-3200-SM1-4 2	9.67146E-01	-1.70604E-02	1.60773E-01	7.40228E-01	2.39427E-01	4.13544E+05	1.33746E+05
S0-5000-SM1-4 2	1.00000E+00	-1.84939E-02	1.99509E-01	7.41072E-03	1.14810E+00	4.14063E+03	6.41481E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
s0-SMI-4 2-13-1	4.00000E+02	9.74254E+01	6.66567E+00	2.47371E-02	3.03309E+02	1.90308E+00	7.52048E-10
s0-600-SMI-4 2-	6.00000E+02	9.39603E+01	3.88893E+00	1.72179E-02	3.14494E+02	7.87398E+00	1.23322E-10
s0-1000-SMI-4 2	1.00000E+03	9.07561E+01	5.47721E+00	1.87716E-02	3.25598E+02	1.00773E+01	1.17926E-10
s0-1400-SMI-4 2	1.40000E+03	9.13547E+01	1.04524E+01	4.44970E-02	3.23464E+02	2.02269E+01	6.95522E-11
S0-2000-SM1-4 2	2.00000E+03	8.97398E+01	1.77310E+01	9.32069E-02	3.29285E+02	1.07613E+01	8.25927E-11
S0-3200-SM1-4 2	3.20000E+03	9.25940E+01	2.63208E+01	1.22251E-01	3.19135E+02	8.25407E+00	1.02538E-10
S0-5000-SM1-4 2	5.00000E+03	9.99052E+01	2.85324E+01	3.28856E-01	2.95781E+02	4.35028E+01	1.59786E-11

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.10476E+02 +/- 2.24992E+00
37CA/39K = 1.27328E+01 +/- 2.13426E-02
F1 = -8.25304E-03 F2 = 3.68196E-02
TOTAL ATMOS 40 VOL = 1.26396E-09 CCNTP/G
TOTAL 39K VOL = 6.23559E-11 CCNTP/G
40*/39K = 1.02746E+00 +/- 1.46939E-01
AGE = 5.73988E+05 +/- 8.20897E+04 Y

SMI-4 Basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.09707E-04 +/- 8.72602E-07

STANDARDS NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	5.04859E+01	1.42244E-01	2.79900E+07	3.09707E-04	8.72602E-07

FRACTIONS NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
S0-400-SM4 2-18	1.24184E-01	-4.97251E-03	3.91692E-03	1.88201E+00	6.85625E-01	1.05124E+06	3.82860E+05
S0-1000-SM4 2-1	3.63835E-01	-2.62292E-03	4.35453E-02	9.26051E-01	1.85205E-01	5.17343E+05	1.03451E+05
S0-2000-SM4 2-1	7.03113E-01	-7.31950E-03	1.15800E-01	4.22675E-01	8.90837E-02	2.36148E+05	4.97677E+04
S0-3000-SM4 2-1	8.89613E-01	-8.75341E-03	1.19517E-01	8.89432E-01	1.77870E-01	4.96889E+05	9.93549E+04
S0-5000-SM-4 2-	1.00000E+00	-1.24338E-02	1.08886E-01	6.55158E-01	3.62127E-01	3.66023E+05	2.02292E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
S0-400-SM4 2-18	4.00000E+02	9.71454E+01	7.67159E+00	3.79123E-02	3.04183E+02	3.25592E+00	6.28209E-10
S0-1000-SM4 2-1	1.00000E+03	8.70883E+01	4.04663E+00	1.17189E-02	3.39311E+02	1.00587E+01	1.18216E-10
S0-2000-SM4 2-1	2.00000E+03	9.34622E+01	1.12925E+01	2.52631E-02	3.16171E+02	4.66002E+00	1.61857E-10
S0-3000-SM4 2-1	3.00000E+03	8.85916E+01	1.35048E+01	3.64961E-02	3.33553E+02	8.58671E+00	1.01698E-10
S0-5000-SM-4 2-	5.00000E+03	9.41259E+01	1.91829E+01	7.50888E-02	3.13941E+02	1.08283E+01	9.14954E-11

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.13238E+02 +/- 2.54359E+00
37CA/39K = 1.03900E+01 +/- 1.37415E-02
F1 = -6.73448E-03 F2 = 4.62034E-02
TOTAL ATMOS 40 VOL = 1.10148E-09 CCNTP/G
TOTAL 39K VOL = 7.89854E-11 CCNTP/G
40*/39K = 8.37249E-01 +/- 1.13273E-01
AGE = 4.67740E+05 +/- 6.32867E+04 Y

CM2-4 Basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.06214E-04 +/- 8.43779E-07

STANDARDS NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	5.10618E+01	1.40702E-01	2.79900E+07	3.06214E-04	8.43779E-07

FRACTIONS

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JLC

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
S1-400-CM2-4 2-	4.24050E-01	-5.21341E-04	2.95344E-02	2.82261E+00	8.92411E-02	1.55863E+06	4.92572E+04
S1-600-CM2-4 2-	5.79000E-01	-6.65534E-04	4.40370E-02	2.53457E+00	3.68793E-01	1.39964E+06	2.03575E+05
S1-1200-CM2-4 2	8.46773E-01	-4.05252E-03	8.00206E-02	3.18567E+00	2.03245E-01	1.75901E+06	1.12170E+05
S1-2000-CM2-4 2	9.77297E-01	-4.53741E-03	1.14894E-01	3.31051E+00	3.74032E-01	1.82791E+06	2.06419E+05
S1-4800-CM2-4 2	1.00000E+00	-4.39927E-03	2.34379E-02	7.18090E-01	3.09541E+00	3.96653E+05	1.70963E+06

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
S1-400-CM2-4 2-	4.00000E+02	4.06717E+01	8.04326E-01	4.06427E-03	7.26549E+02	3.33418E+01	4.41599E-11
S1-600-CM2-4 2-	6.00000E+02	3.92274E+01	1.02679E+00	4.75211E-03	7.53300E+02	1.69747E+02	1.36422E-11
S1-1200-CM2-4 2	1.20000E+03	6.15402E+01	6.25223E+00	3.11966E-02	4.80174E+02	1.90808E+01	7.34463E-11
S1-2000-CM2-4 2	2.00000E+03	5.38661E+01	7.00031E+00	4.01822E-02	5.48582E+02	5.29937E+01	2.71441E-11
S1-4800-CM2-4 2	4.80000E+03	9.61097E+01	6.78719E+00	9.85361E-02	3.07461E+02	5.36465E+01	2.16755E-11

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 5.50805E+02 +/- 2.01165E+01
37CA/39K = 3.24215E+00 +/- 7.13698E-03
F1 = -2.10147E-03 F2 = 6.53683E-02
TOTAL ATMOS 40 VOL = 1.80068E-10 CCNTP/G
TOTAL 39K VOL = 5.38231E-11 CCNTP/G
40*/39K = 2.89110E+00 +/- 1.22386E-01
AGE = 1.59644E+06 +/- 6.76936E+04 Y

CM2-4 Basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.06214E-04 +/- 8.43779E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	5.10618E+01	1.40702E-01	2.79900E+07	3.06214E-04	8.43779E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
S1-400-CM2-4 2-	2.29450E-01	-6.58574E-04	2.63516E-02	2.55685E+00	6.29868E-02	1.41193E+06	3.47688E+04
S1-600-CM2-4 2-	4.09618E-01	-4.06131E-04	4.02061E-02	2.52148E+00	6.39565E-02	1.39241E+06	3.53045E+04
S1-1000-CM2-4 2	5.70276E-01	-8.94069E-04	5.48637E-02	2.38896E+00	1.25814E-01	1.31926E+06	6.94533E+04
S1-1400-CM2-4 2	6.80178E-01	-2.77644E-03	1.16952E-01	2.77928E+00	1.92625E-01	1.53472E+06	1.06322E+05
S1-2000-CM2-4 2	8.15928E-01	-4.19636E-03	1.42296E-01	2.47209E+00	1.55952E-01	1.36515E+06	8.60878E+04
S1-3000-CM2-4 2	9.18100E-01	-4.20358E-03	1.83167E-01	2.81504E+00	1.47962E-01	1.55445E+06	8.16690E+04
S1-4800-CM2-4 2	1.00000E+00	-3.89965E-03	2.07908E-01	3.17242E+00	1.82998E-01	1.75170E+06	1.00996E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
S1-400-CM2-4 2-	4.00000E+02	5.16274E+01	1.01605E+00	2.79418E-03	5.72370E+02	1.31430E+01	1.29341E-10
S1-600-CM2-4 2-	6.00000E+02	3.04377E+01	6.26578E-01	2.35617E-03	9.70834E+02	5.60700E+01	4.10595E-11
S1-1000-CM2-4 2	1.00000E+03	4.21704E+01	1.37937E+00	4.92248E-03	7.00729E+02	5.05096E+01	5.78086E-11
S1-1400-CM2-4 2	1.40000E+03	4.58563E+01	4.28350E+00	1.40177E-02	6.44405E+02	5.26727E+01	5.34211E-11
S1-2000-CM2-4 2	2.00000E+03	5.33245E+01	6.47414E+00	1.44978E-02	5.54154E+02	3.05711E+01	7.91619E-11
S1-3000-CM2-4 2	3.00000E+03	4.28015E+01	6.48529E+00	2.31784E-02	6.90396E+02	4.83748E+01	4.44317E-11
S1-4800-CM2-4 2	4.80000E+03	3.45728E+01	6.01638E+00	1.80784E-02	8.54718E+02	9.31844E+01	2.83400E-11

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 6.63324E+02 +/- 1.44492E+01
37CA/39K = 3.07261E+00 +/- 3.31008E-03
F1 = -1.99158E-03 F2 = 9.65282E-02
TOTAL ATMOS 40 VOL = 4.33564E-10 CCNTP/G
TOTAL 39K VOL = 2.06585E-10 CCNTP/G
40*/39K = 2.61324E+00 +/- 4.58234E-02
AGE = 1.44306E+06 +/- 2.56046E+04 Y

RM1 Basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.02527E-04 +/- 8.23008E-07
STANDARDS

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NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	5.16842E+01	1.40604E-01	2.79900E+07	3.02527E-04	8.23008E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
S2-400-RM1 2-14	1.28801E-01	-1.37412E-03	1.11122E-02	1.65628E+00	2.51653E-01	9.03742E+05	1.37279E+05
S2-600-RM1 2-14	3.17442E-01	-1.44214E-03	1.89386E-02	1.19780E+00	1.34186E-01	6.53618E+05	7.32096E+04
S2-1000-RM1 2-1	5.21637E-01	-1.52484E-03	2.25020E-02	1.31680E+00	1.73758E-01	7.18544E+05	9.47961E+04
S2-1400-RM1 2-1	6.81004E-01	-2.28494E-03	2.51624E-02	1.62715E+00	2.14003E-01	8.87848E+05	1.16742E+05
S2-2000-RM1 2-1	7.22852E-01	-2.32121E-03	2.05138E-02	1.72657E+00	5.03853E-01	9.42082E+05	2.74850E+05
S2-3200-RM1 2-1	8.96194E-01	-5.14675E-03	1.81401E-02	1.23261E+00	2.27215E-01	6.72608E+05	1.23963E+05
S2-5000-RM1 2-1	1.00000E+00	-6.59828E-03	2.21112E-02	7.94131E-01	2.98871E-01	4.33370E+05	1.63079E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
S2-400-RM1 2-14	4.00000E+02	8.83080E+01	2.12000E+00	6.83392E-03	3.34624E+02	6.72978E+00	2.23633E-10
S2-600-RM1 2-14	6.00000E+02	8.69486E+01	2.22493E+00	7.39417E-03	3.39856E+02	5.71094E+00	2.08922E-10
S2-1000-RM1 2-1	1.00000E+03	8.44125E+01	2.35253E+00	8.03286E-03	3.50067E+02	8.52466E+00	2.02094E-10
S2-1400-RM1 2-1	1.40000E+03	8.51479E+01	3.52520E+00	1.06388E-02	3.47043E+02	7.95984E+00	2.06330E-10
S2-2000-RM1 2-1	2.00000E+03	8.68918E+01	3.58116E+00	2.78845E-02	3.40078E+02	1.49640E+01	6.64730E-11
S2-3200-RM1 2-1	3.20000E+03	9.52913E+01	7.94041E+00	2.17696E-02	3.10102E+02	2.82377E+00	6.00124E-10
S2-5000-RM1 2-1	5.00000E+03	9.70178E+01	1.01798E+01	2.93737E-02	3.04583E+02	3.52328E+00	3.72197E-10

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.24645E+02 +/- 2.01496E+00
37CA/39K = 4.31795E+00 +/- 5.23661E-03
F1 = -2.79877E-03 F2 = 2.04684E-02
TOTAL ATMOS 40 VOL = 1.87977E-09 CCNTP/G
TOTAL 39K VOL = 1.38799E-10 CCNTP/G
40*/39K = 1.33583E+00 +/- 8.40933E-02
AGE = 7.28927E+05 +/- 4.59209E+04 Y

RM1 Basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.02527E-04 +/- 8.23008E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	5.16842E+01	1.40604E-01	2.79900E+07	3.02527E-04	8.23008E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
S2-400-RM1 2-17	1.49263E-01	-1.50259E-03	8.80627E-03	1.25556E+00	1.82667E-01	6.85131E+05	9.96583E+04
S2-600-RM1 2-17	3.52422E-01	-1.32119E-03	3.67889E-02	1.09036E+00	2.82167E-01	5.95000E+05	1.53951E+05
S2-1000-RM1 2-1	6.21963E-01	-1.38455E-03	3.04268E-02	1.31378E+00	1.13001E-01	7.16897E+05	6.16492E+04
S2-1400-RM1 2-1	7.79027E-01	-2.66446E-03	2.59991E-02	1.19871E+00	2.14897E-01	6.54117E+05	1.17244E+05
S2-2000-RM1 2-1	8.54956E-01	-4.85547E-03	1.79895E-02	1.29984E+00	3.50903E-01	7.09291E+05	1.91441E+05
S2-4800-RM1 2-1	1.00000E+00	-7.77681E-03	1.74695E-02	1.04709E+00	3.79499E-01	5.71392E+05	2.07058E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
S2-400-RM1 2-17	4.00000E+02	9.29711E+01	2.31820E+00	6.45527E-03	3.17841E+02	3.49396E+00	3.80562E-10
S2-600-RM1 2-17	6.00000E+02	7.78777E+01	2.03832E+00	1.45610E-02	3.79441E+02	2.78856E+01	1.19709E-10
S2-1000-RM1 2-1	1.00000E+03	7.86882E+01	2.13608E+00	5.85794E-03	3.75533E+02	8.74133E+00	2.00717E-10
S2-1400-RM1 2-1	1.40000E+03	8.96718E+01	4.11073E+00	7.15346E-03	3.29535E+02	6.80343E+00	2.50943E-10
S2-2000-RM1 2-1	2.00000E+03	9.48606E+01	7.49102E+00	3.31759E-02	3.11510E+02	4.55439E+00	2.79661E-10
S2-4800-RM1 2-1	4.80000E+03	9.70782E+01	1.19981E+01	2.95555E-02	3.04394E+02	3.32019E+00	7.74668E-10

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.22676E+02 +/- 2.44812E+00
37CA/39K = 4.29057E+00 +/- 6.85374E-03
F1 = -2.78103E-03 F2 = 2.11628E-02
TOTAL ATMOS 40 VOL = 2.00626E-09 CCNTP/G
TOTAL 39K VOL = 1.53529E-10 CCNTP/G
40*/39K = 1.20189E+00 +/- 9.91787E-02
AGE = 6.55849E+05 +/- 5.41396E+04 Y

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CR3 Basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 2.99034E-04 +/- 8.13151E-07

STANDARDS NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	5.22879E+01	1.42185E-01	2.79900E+07	2.99034E-04	8.13151E-07

FRACTIONS NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
S3-400-CR3 2-15	1.82308E-01	-6.94803E-04	3.83977E-03	1.85658E+00	8.30324E-02	1.00131E+06	4.47694E+04
S3-600-CR3 2-15	3.50594E-01	-4.94474E-04	2.59686E-02	1.85605E+00	9.55634E-02	1.00103E+06	5.15259E+04
S3-1000-CR3 2-1	5.95147E-01	-5.55275E-04	2.16150E-02	1.75144E+00	5.07972E-02	9.44619E+05	2.73897E+04
S3-1400-CR3 2-1	7.41186E-01	-9.73283E-04	2.17175E-02	1.80306E+00	1.12001E-01	9.72454E+05	6.03897E+04
S3-2000-CR3 2-1	8.42738E-01	-1.33106E-03	1.97533E-02	1.66426E+00	1.19332E-01	8.97613E+05	6.43449E+04
S3-3200-CR3 2-1	9.40308E-01	-1.38856E-03	1.89661E-02	1.95513E+00	1.77972E-01	1.05445E+06	9.59559E+04
S3-4800-CR3 2-1	1.00000E+00	-1.06523E-03	1.96215E-02	1.57406E+00	2.30698E-01	8.48972E+05	1.24398E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
S3-400-CR3 2-15	4.00000E+02	9.04309E+01	1.07194E+00	3.65217E-03	3.26769E+02	1.54193E+00	6.27741E-10
S3-600-CR3 2-15	6.00000E+02	5.29894E+01	7.62875E-01	3.14802E-03	5.57659E+02	2.54468E+01	6.90903E-11
S3-1000-CR3 2-1	1.00000E+03	6.16604E+01	8.56678E-01	2.90257E-03	4.79238E+02	8.59860E+00	1.35181E-10
S3-1400-CR3 2-1	1.40000E+03	7.27903E+01	1.50158E+00	4.61186E-03	4.05961E+02	9.41316E+00	1.38235E-10
S3-2000-CR3 2-1	2.00000E+03	8.10399E+01	2.05356E+00	7.19563E-03	3.64635E+02	6.11034E+00	1.41763E-10
S3-3200-CR3 2-1	3.20000E+03	7.97355E+01	2.14227E+00	6.85843E-03	3.70600E+02	8.56840E+00	1.47299E-10
S3-4800-CR3 2-1	4.80000E+03	7.86627E+01	1.64343E+00	8.36151E-03	3.75654E+02	1.49270E+01	6.79764E-11

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.73978E+02 +/- 2.17141E+00
37CA/39K = 1.26826E+00 +/- 1.68438E-03
F1 = -8.22052E-04 F2 = 1.29683E-02
TOTAL ATMOS 40 VOL = 1.32729E-09 CCNTP/G
TOTAL 39K VOL = 1.96255E-10 CCNTP/G
40*/39K = 1.79619E+00 +/- 3.93405E-02
AGE = 9.68745E+05 +/- 2.13749E+04 Y

CR3 Basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 2.99034E-04 +/- 8.13151E-07

STANDARDS NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	5.22879E+01	1.42185E-01	2.79900E+07	2.99034E-04	8.13151E-07

FRACTIONS NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
S3-2800 2-18-19	7.25389E-02	-1.45649E-03	2.09828E-02	1.81314E+00	1.12428E-01	9.77889E+05	6.06200E+04
S3-400-CR3 2-18	1.83753E-01	-8.21782E-04	1.84786E-03	2.41714E+00	2.17633E-01	1.30353E+06	1.17324E+05
S3-600-CR3 2-18	3.01892E-01	-6.19990E-04	1.54107E-02	1.99637E+00	9.58682E-02	1.07668E+06	5.16881E+04
S3-1000-CR3 2-1	5.40197E-01	-4.73224E-04	2.71653E-02	1.84183E+00	5.90063E-02	9.93353E+05	3.18152E+04
S3-1400-CR3 2-1	7.06336E-01	-6.99486E-04	2.19579E-02	1.96315E+00	6.65424E-02	1.05877E+06	3.58772E+04
S3-1800-CR3 2-1	8.35513E-01	-1.28550E-03	2.34983E-02	1.90401E+00	1.32721E-01	1.02688E+06	7.15596E+04
S3-2160-CR3 2-1	9.42456E-01	-1.40398E-03	1.80071E-02	2.10152E+00	1.62758E-01	1.13337E+06	8.77497E+04
S3-5000 2-18-19	1.00000E+00	-1.14130E-03	1.59917E-02	1.61616E+00	1.57351E-01	8.71673E+05	8.48468E+04

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
S3-2800 2-18-19	2.80000E+01	8.01141E+01	2.24707E+00	7.27436E-03	3.68849E+02	5.66939E+00	1.73667E-10
S3-400-CR3 2-18	4.00000E+02	9.35946E+01	1.26784E+00	4.19477E-03	3.15723E+02	1.94449E+00	1.28748E-09
S3-600-CR3 2-18	6.00000E+02	6.86773E+01	9.56521E-01	2.79083E-03	4.30273E+02	9.41153E+00	1.69491E-10
S3-1000-CR3 2-1	1.00000E+03	5.09698E+01	7.30090E-01	2.41343E-03	5.79755E+02	1.78489E+01	1.49545E-10
S3-1400-CR3 2-1	1.40000E+03	6.38727E+01	1.07917E+00	3.00038E-03	4.62639E+02	8.85135E+00	1.88998E-10
S3-1800-CR3 2-1	1.80000E+03	7.53563E+01	1.98326E+00	4.25169E-03	3.92137E+02	8.93358E+00	2.46498E-10
S3-2160-CR3 2-1	2.16000E+03	7.95292E+01	2.16606E+00	6.38354E-03	3.71561E+02	7.40223E+00	2.86172E-10
S3-5000 2-18-19	5.00000E+03	8.23389E+01	1.76080E+00	4.62010E-03	3.58882E+02	7.48986E+00	1.42112E-10

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CR3 Basalt

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.67481E+02 +/- 1.92016E+00
37CA/39K = 1.35944E+00 +/- 1.34482E-03
F1 = -8.81151E-04 F2 = 1.15304E-02
TOTAL ATMOS 40 VOL = 2.64396E-09 CCNTP/G
TOTAL 39K VOL = 3.27777E-10 CCNTP/G
40*/39K = 1.96496E+00 +/- 4.21820E-02
AGE = 1.05975E+06 +/- 2.29247E+04 Y

FV1 Basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 2.94764E-04 +/- 8.14575E-07

STANDARDS NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	5.30453E+01	1.46590E-01	2.79900E+07	2.94764E-04	8.14575E-07

FRACTIONS NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
s4-400-FV1 2-14	1.26715E-01	-1.05835E-03	3.32801E-04	1.70900E+00	5.78024E-01	9.08578E+05	3.07225E+05
s4-600-FV1 2-14	2.89937E-01	-8.02775E-04	1.01743E-03	1.75649E+00	6.68011E-01	9.33818E+05	3.55049E+05
s4-1000-FV1 2-1	6.23342E-01	-2.17529E-03	1.26246E-02	1.88650E+00	1.79303E-01	1.00292E+06	9.52964E+04
s4-1400-FV1 2-1	8.39056E-01	-2.85570E-03	3.39517E-02	1.52928E+00	2.40411E-01	8.13052E+05	1.27788E+05
s4-2000-FV1 2-1	9.37294E-01	-3.88411E-03	3.53782E-02	1.52774E+00	6.80616E-01	8.12236E+05	3.61773E+05
s4-4800-FV1 2-1	1.00000E+00	-4.64009E-03	5.04348E-03	2.01270E+00	9.37818E-01	1.06999E+06	4.98414E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
s4-400-FV1 2-14	4.00000E+02	9.80826E+01	1.63283E+00	1.62291E-02	3.01277E+02	1.99139E+00	4.74802E-10
s4-600-FV1 2-14	6.00000E+02	9.66480E+01	1.23852E+00	8.90912E-03	3.05749E+02	4.03198E+00	3.54313E-10
s4-1000-FV1 2-1	1.00000E+03	8.98404E+01	3.35603E+00	1.17586E-02	3.28917E+02	3.53014E+00	2.38381E-10
s4-1400-FV1 2-1	1.40000E+03	8.49256E+01	4.40578E+00	2.15527E-02	3.47952E+02	9.69080E+00	7.96497E-11
s4-2000-FV1 2-1	2.00000E+03	8.77752E+01	5.99240E+00	2.74046E-02	3.36656E+02	2.08865E+01	4.61826E-11
s4-4800-FV1 2-1	4.80000E+03	9.64575E+01	7.15873E+00	6.20167E-02	3.06353E+02	5.24158E+00	1.47287E-10

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.11923E+02 +/- 1.76762E+00
37CA/39K = 3.51594E+00 +/- 7.41724E-03
F1 = -2.27893E-03 F2 = 6.04561E-03
TOTAL ATMOS 40 VOL = 1.34062E-09 CCNTP/G
TOTAL 39K VOL = 4.28618E-11 CCNTP/G
40*/39K = 1.73840E+00 +/- 1.77328E-01
AGE = 9.24203E+05 +/- 9.42851E+04 Y

FV1 Basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 2.94764E-04 +/- 8.14575E-07

STANDARDS NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	5.30453E+01	1.46590E-01	2.79900E+07	2.94764E-04	8.14575E-07

FRACTIONS NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
S4-600-FV1 2-18	2.02639E-01	-1.03856E-03	2.63005E-03	1.77389E+00	1.61246E-01	9.43066E+05	8.57020E+04
S4-1400-FV1 2-1	5.68646E-01	-1.66486E-03	1.71515E-02	1.70262E+00	1.04319E-01	9.05188E+05	5.54467E+04
S4-2400-FV1 2-1	8.38898E-01	-2.48864E-03	3.85727E-02	1.70746E+00	6.30643E-02	9.07758E+05	3.35193E+04
S4-4000-FV1 2-1	9.81169E-01	-3.54868E-03	2.90025E-02	1.85638E+00	1.56996E-01	9.86911E+05	8.34410E+04
S4-5000-FV1 2-1	1.00000E+00	-4.78939E-03	4.07840E-02	1.34557E+00	8.47426E-01	7.15400E+05	4.50463E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
S4-600-FV1 2-18	6.00000E+02	9.48177E+01	1.60229E+00	3.02535E-03	3.11651E+02	1.54785E+00	1.01985E-09
S4-1400-FV1 2-1	1.40000E+03	8.54463E+01	2.56855E+00	5.09192E-03	3.45831E+02	3.60676E+00	5.67314E-10
S4-2400-FV1 2-1	2.40000E+03	7.96866E+01	3.83947E+00	7.78329E-03	3.70828E+02	3.48381E+00	2.80665E-10

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CR3 Basalt

S4-4000-FV1 2-1	4.00000E+03	8.67633E+01	5.47490E+00	1.80996E-02	3.40582E+02	4.39056E+00	2.68424E-10
S4-5000-FV1 2-1	5.00000E+03	8.95960E+01	7.38907E+00	4.63301E-02	3.29814E+02	2.41157E+01	3.38313E-11

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.32103E+02 +/- 1.41689E+00
37CA/39K = 3.22048E+00 +/- 3.70351E-03
F1 = -2.08742E-03 F2 = 1.48039E-02
TOTAL ATMOS 40 VOL = 2.17008E-09 CCNTP/G
TOTAL 39K VOL = 1.55068E-10 CCNTP/G
40*/39K = 1.73352E+00 +/- 5.97450E-02
AGE = 9.21611E+05 +/- 3.18567E+04 Y

TW1-4 Basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 2.92047E-04 +/- 8.23180E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	5.35387E+01	1.50907E-01	2.79900E+07	2.92047E-04	8.23180E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
S5-400-TW1-4 2-	2.22347E-01	-1.07720E-03	1.38511E-02	7.31174E-01	1.91008E-01	3.85196E+05	1.00616E+05
S5-600-TW1-4 2-	3.53383E-01	-6.15592E-04	4.72194E-02	2.49418E-01	1.20681E-01	1.31407E+05	6.35790E+04
S5-1000-TW1-4 2	6.51366E-01	-8.38231E-04	4.54950E-02	5.26760E-01	7.06356E-02	2.77516E+05	3.72105E+04
S5-1400-TW1-4 2	8.82666E-01	-1.58796E-03	5.34160E-02	4.74259E-01	1.12119E-01	2.49858E+05	5.90648E+04
S5-2000-TW1-4 2	9.36947E-01	-2.31930E-03	4.67372E-02	7.99039E-01	2.41428E-01	4.20945E+05	1.27173E+05
S5-4800-TW1-4 2	1.00000E+00	-3.52132E-03	4.18736E-02	4.40198E-01	3.41346E-01	2.31915E+05	1.79824E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
S5-400-TW1-4 2-	4.00000E+02	9.17946E+01	1.66190E+00	4.55368E-03	3.21914E+02	7.51606E+00	2.63244E-10
S5-600-TW1-4 2-	6.00000E+02	8.49645E+01	9.49736E-01	4.56679E-03	3.47792E+02	2.97705E+01	2.67291E-11
S5-1000-TW1-4 2	1.00000E+03	7.90281E+01	1.29322E+00	5.46012E-03	3.73918E+02	1.32988E+01	8.56041E-11
S5-1400-TW1-4 2	1.40000E+03	8.68829E+01	2.44991E+00	6.56527E-03	3.40113E+02	1.21366E+01	1.05154E-10
S5-2000-TW1-4 2	2.00000E+03	8.66374E+01	3.57822E+00	2.74898E-02	3.41077E+02	1.58864E+01	4.06977E-11
S5-4800-TW1-4 2	4.80000E+03	9.50999E+01	5.43269E+00	2.31578E-02	3.10726E+02	1.24139E+01	7.79618E-11

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.33534E+02 +/- 4.96632E+00
37CA/39K = 1.98277E+00 +/- 2.88948E-03
F1 = -1.28518E-03 F2 = 3.32021E-02
TOTAL ATMOS 40 VOL = 5.99391E-10 CCNTP/G
TOTAL 39K VOL = 1.44747E-10 CCNTP/G
40*/39K = 5.33047E-01 +/- 6.16787E-02
AGE = 2.80828E+05 +/- 3.25016E+04 Y

s5b TW1-4 Basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 2.92047E-04 +/- 8.23180E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	5.35387E+01	1.50907E-01	2.79900E+07	2.92047E-04	8.23180E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
S5-400-TW1-4 2-	1.57534E-01	-1.07788E-03	1.94583E-03	9.50617E-01	2.59117E-01	5.00787E+05	1.36484E+05
S5-600-TW1-4 2-	2.83122E-01	-7.30019E-04	4.49755E-02	5.22666E-01	8.97140E-02	2.75359E+05	4.72609E+04
S5-800-TW1-4 2-	3.82662E-01	-5.86637E-04	5.40954E-02	6.22713E-01	1.21027E-01	3.28062E+05	6.37544E+04
S5-1200-TW1-4 2	5.99943E-01	-7.71331E-04	6.05264E-02	5.94152E-01	7.58707E-02	3.13017E+05	3.99675E+04
S6-1600-TW1-4 2	7.99633E-01	-1.29829E-03	5.59968E-02	5.52537E-01	4.99168E-02	2.91095E+05	2.62957E+04
S6-2000-TW1-4 2	8.90928E-01	-1.66471E-03	5.54921E-02	6.83944E-01	1.03147E-01	3.60317E+05	5.43347E+04
S6-3000-TW1-4 2	9.67262E-01	-2.57828E-03	4.25467E-02	6.66198E-01	1.62700E-01	3.50969E+05	8.57057E+04
S6-5000-TW1-4 2	1.00000E+00	-3.88636E-03	4.80772E-02	8.50035E-01	2.80515E-01	4.47807E+05	1.47760E+05

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NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
S5-400-TW1-4 2-	4.00000E+02	9.77284E+01	1.66296E+00	4.17470E-03	3.02369E+02	1.91567E+00	1.87898E-09
S5-600-TW1-4 2-	6.00000E+02	7.70367E+01	1.12627E+00	3.77672E-03	3.83583E+02	1.96207E+01	6.42150E-11
S5-800-TW1-4 2-	8.00000E+02	6.51960E+01	9.05064E-01	4.06802E-03	4.53249E+02	4.70111E+01	3.38580E-11
S5-1200-TW1-4 2	1.20000E+03	6.95783E+01	1.19001E+00	2.63980E-03	4.24701E+02	2.37082E+01	8.60968E-11
S6-1600-TW1-4 2	1.60000E+03	8.16519E+01	2.00301E+00	4.32469E-03	3.61902E+02	7.34317E+00	1.43177E-10
S6-2000-TW1-4 2	2.00000E+03	8.22172E+01	2.56831E+00	8.97250E-03	3.59414E+02	1.17169E+01	8.41807E-11
S6-3000-TW1-4 2	3.00000E+03	9.04207E+01	3.97777E+00	9.35029E-03	3.26806E+02	8.45384E+00	1.39976E-10
S6-5000-TW1-4 2	5.00000E+03	9.05905E+01	5.99588E+00	2.87077E-02	3.26193E+02	1.11758E+01	7.81269E-11

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 3.18102E+02 +/- 1.89866E+00
37CA/39K = 1.88646E+00 +/- 1.78292E-03
F1 = -1.22275E-03 F2 = 1.48742E-02
TOTAL ATMOS 40 VOL = 2.50861E-09 CCNTP/G
TOTAL 39K VOL = 2.91649E-10 CCNTP/G
40*/39K = 6.57937E-01 +/- 5.13486E-02
AGE = 3.46617E+05 +/- 2.70668E+04 Y

CM1-5 Basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 2.88360E-04 +/- 8.44065E-07

STANDARDS NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	5.42233E+01	1.58718E-01	2.79900E+07	2.88360E-04	8.44065E-07

FRACTIONS NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
S6-400-CMI-5 2-	1.32127E-01	-7.46537E-04	8.01497E-03	2.76010E+00	1.30919E-01	1.43530E+06	6.80529E+04
S6-600-CMI-5 2-	2.54238E-01	-4.63941E-04	8.82915E-03	2.82557E+00	1.31099E-01	1.46933E+06	6.81451E+04
S6-1000-CMI-5 2	4.03544E-01	-4.95125E-04	1.32917E-02	2.85017E+00	1.01040E-01	1.48212E+06	5.25203E+04
S6-1400-CMI-5 2	4.88519E-01	-1.47062E-03	1.35639E-02	3.11545E+00	1.54174E-01	1.62000E+06	8.01327E+04
S6-1800-CMI-5 2	5.85854E-01	-2.65439E-03	3.97712E-02	3.07410E+00	1.26996E-01	1.59851E+06	6.60079E+04
S6-2200-CMI-5 2	6.63777E-01	-3.11943E-03	6.12602E-02	2.49275E+00	1.38980E-01	1.29632E+06	7.22485E+04
S6-2800-CMI-5 2	7.64152E-01	-3.48955E-03	8.05974E-02	3.27917E+00	1.20077E-01	1.70510E+06	6.24078E+04
S6-3600-CMI-5 2	9.15787E-01	-3.50956E-03	1.03172E-01	2.71647E+00	8.85534E-02	1.41262E+06	4.60315E+04
S6-4000-SMI-5 2	9.58656E-01	-4.21396E-03	1.31223E-01	3.51222E+00	2.20975E-01	1.82621E+06	1.14840E+05
S6-5000-CMI-5 2	1.00000E+00	-4.16073E-03	1.27789E-01	2.93571E+00	2.64379E-01	1.52658E+06	1.37420E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
S6-400-CMI-5 2-	4.00000E+02	7.78768E+01	1.15176E+00	2.65435E-03	3.79445E+02	5.10620E+00	3.99287E-10
S6-600-CMI-5 2-	6.00000E+02	6.68109E+01	7.15767E-01	2.60685E-03	4.42293E+02	1.01700E+01	2.16034E-10
S6-1000-CMI-5 2	1.00000E+03	5.88332E+01	7.63879E-01	3.00477E-03	5.02267E+02	1.24253E+01	1.89159E-10
S6-1400-CMI-5 2	1.40000E+03	7.80708E+01	2.26887E+00	5.87091E-03	3.78503E+02	5.25364E+00	2.93143E-10
S6-1800-CMI-5 2	1.80000E+03	6.91973E+01	4.09520E+00	6.25552E-03	4.27039E+02	7.84313E+00	2.09050E-10
S6-2200-CMI-5 2	2.20000E+03	6.77158E+01	4.81265E+00	1.19700E-02	4.36382E+02	1.15838E+01	1.26700E-10
S6-2800-CMI-5 2	2.80000E+03	5.72190E+01	5.38368E+00	1.31792E-02	5.16437E+02	1.41010E+01	1.36893E-10
S6-3600-CMI-5 2	3.60000E+03	5.55251E+01	5.41455E+00	4.36103E-03	5.32192E+02	1.38835E+01	1.59898E-10
S6-4000-SMI-5 2	4.00000E+03	4.69407E+01	6.50130E+00	1.89638E-02	6.29517E+02	4.47115E+01	4.14129E-11
S6-5000-CMI-5 2	5.00000E+03	5.18515E+01	6.41918E+00	2.26337E-02	5.69897E+02	4.76112E+01	4.06373E-11

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 4.42894E+02 +/- 3.18271E+00
37CA/39K = 3.22557E+00 +/- 2.37453E-03
F1 = -2.09073E-03 F2 = 3.76025E-02
TOTAL ATMOS 40 VOL = 1.81221E-09 CCNTP/G
TOTAL 39K VOL = 3.11043E-10 CCNTP/G
40*/39K = 2.90646E+00 +/- 4.19470E-02
AGE = 1.51137E+06 +/- 2.22475E+04 Y

CM1-5 Basalt

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WEIGHTED AVERAGE OF J FROM STANDARDS = 2.88360E-04 +/- 8.44065E-07

STANDARDS NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	5.42233E+01	1.58718E-01	2.79900E+07	2.88360E-04	8.44065E-07

FRACTIONS NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
S6-400-CM1-5 2-	2.48725E-01	-6.29753E-04	2.30738E-02	2.80222E+00	6.57539E-02	1.45719E+06	3.41791E+04
S6-600-CM1-5 2-	3.91388E-01	-4.73406E-04	3.07481E-02	2.63728E+00	1.05650E-01	1.37145E+06	5.49196E+04
S6-1000-CM1-5 2	5.03882E-01	-1.64273E-03	3.62156E-02	2.57889E+00	1.83717E-01	1.34110E+06	9.55026E+04
S6-1400-CM1-5 2	6.75712E-01	-3.34823E-03	8.81826E-02	2.78945E+00	8.27392E-02	1.45056E+06	4.30083E+04
S6-2000-CM1-5 2	8.31882E-01	-3.90934E-03	1.20174E-01	2.89200E+00	7.78714E-02	1.50386E+06	4.04768E+04
S6-2400-CM1-5 2	8.97566E-01	-4.45890E-03	1.22692E-01	2.52563E+00	1.68774E-01	1.31342E+06	8.77363E+04
S6-3000-CM1-5 2	9.57355E-01	-4.44881E-03	1.16557E-01	2.42629E+00	1.40569E-01	1.26177E+06	7.30763E+04
S6-4800-CM1-5 2	1.00000E+00	-4.25927E-03	1.12808E-01	2.62942E+00	2.02018E-01	1.36737E+06	1.05015E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
S6-400-CM1-5 2-	4.00000E+02	5.15666E+01	9.71583E-01	2.65207E-03	5.73046E+02	1.25923E+01	1.45350E-10
S6-600-CM1-5 2-	6.00000E+02	3.90457E+01	7.30371E-01	3.29673E-03	7.56806E+02	4.72062E+01	4.72061E-11
S6-1000-CM1-5 2	1.00000E+03	6.50844E+01	2.53440E+00	1.01581E-02	4.54026E+02	1.73381E+01	1.05918E-10
S6-1400-CM1-5 2	1.40000E+03	5.78858E+01	5.16564E+00	1.10270E-02	5.10488E+02	1.09827E+01	1.29013E-10
S6-2000-CM1-5 2	2.00000E+03	5.24214E+01	6.03132E+00	1.07649E-02	5.63702E+02	1.37262E+01	9.74342E-11
S6-2400-CM1-5 2	2.40000E+03	5.83371E+01	6.87920E+00	2.20620E-02	5.06539E+02	2.41208E+01	4.54816E-11
S6-3000-CM1-5 2	3.00000E+03	6.06112E+01	6.86362E+00	2.23467E-02	4.87534E+02	1.83271E+01	4.37090E-11
S6-4800-CM1-5 2	4.80000E+03	5.85254E+01	6.57121E+00	3.71009E-02	5.04909E+02	2.73812E+01	3.09829E-11

INTEGRATED RESULTS
MASS= 1.00000000 G
(40/36)S = 5.39270E+02 +/- 6.40872E+00
37CA/39K = 3.60293E+00 +/- 3.61874E-03
F1 = -2.33532E-03 F2 = 7.31940E-02
TOTAL ATMOS 40 VOL = 6.45095E-10 CCNTP/G
TOTAL 39K VOL = 1.95886E-10 CCNTP/G
40*/39K = 2.71738E+00 +/- 3.92375E-02
AGE = 1.41309E+06 +/- 2.08111E+04 Y

3 Jun 97 [illegible]

The University of Michigan

DEPARTMENT OF GEOLOGICAL SCIENCES

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March 7, 1996

Mike Conway
CNWRA
Southwest Research Institute
6220 Culebra Road
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Here are the set of figures from the new batch of data. In addition to the data that I e-mailed to you, we ran 2 more samples, one of SM1-4 and one of CR3. I'm including copies of the print-outs for these 2 runs. The 3rd SM1-4 sample gives an integrated age of 369±125 ka with a plateau covering 65% of the gas release giving an error weighted average of 257±110 ka (MSWD=0.75). The isochron through all SM1-4 points gives an age of 288±111 ka. As you can see from the isochron plot, this sample is very low in radiogenic argon which is why the age is relatively poorly constrained. I'm using ±2σ in this note, but the computer print-outs always use ±1σ.

The third CR3 sample gives a total gas age of 960±32 and an error weighted plateau age over 100% of the gas release of 951±27 (MSWD=0.85). The isochron through all CR3 points gives an age of 952±33 ka.

Hope the diagrams help. Let me know if you need any more information.

Chris

Chris Hall

3 Jan 97 Fine

s3c CR3 Basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 2.99034E-04 +/- 8.13151E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	5.22879E+01	1.42185E-01	2.79900E+07	2.99034E-04	8.13151E-07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
s3-400 3-1-1996	4.72054E-02	-7.85420E-04	6.84824E-04	2.27203E+00	3.15887E-01	1.22530E+06	1.70299E+05
s3-480 3-1-1996	7.92906E-02	-6.70365E-04	7.16026E-03	1.62059E+00	2.06016E-01	8.74064E+05	1.11088E+05
s3-700 3-1-1996	1.53349E-01	-6.41246E-04	1.16061E-02	1.68449E+00	7.74167E-02	9.08520E+05	4.17437E+04
s3-1100 3-1-199	2.25725E-01	-5.43272E-04	1.92955E-02	1.72942E+00	1.06901E-01	9.32746E+05	5.76413E+04
s3-1600 3-1-199	4.94126E-01	-6.76598E-04	1.95752E-02	1.82919E+00	4.78483E-02	9.86539E+05	2.57991E+04
s3-1800 3-1-199	6.24882E-01	-9.42929E-04	2.34854E-02	1.77745E+00	5.31078E-02	9.58645E+05	2.86354E+04
s3-1880 3-2-199	6.97882E-01	-1.02438E-03	2.13094E-02	1.60794E+00	1.00093E-01	8.67242E+05	5.39722E+04
s3-2160 3-2-199	8.01623E-01	-1.08296E-03	2.04642E-02	1.72566E+00	9.37164E-02	9.30717E+05	5.05320E+04
s3-2320 3-2-199	8.61679E-01	-1.12425E-03	2.43685E-02	1.71862E+00	9.71963E-02	9.26924E+05	5.24085E+04
s3-2800 3-2-199	9.14816E-01	-1.12250E-03	2.26152E-02	1.74575E+00	1.28902E-01	9.41549E+05	6.95040E+04
s3-3600 3-2-199	9.70881E-01	-1.25602E-03	2.38918E-02	1.81725E+00	1.12634E-01	9.80101E+05	6.07309E+04
s3-5000 3-2-199	1.00000E+00	-1.06890E-03	1.36895E-02	1.83780E+00	2.27692E-01	9.91185E+05	1.22768E+05

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
s3-400 3-1-1996	4.00000E+02	9.64297E+01	1.21175E+00	5.82654E-03	3.06441E+02	1.57729E+00	1.75595E-09
s3-480 3-1-1996	4.80000E+02	8.57727E+01	1.03424E+00	7.48325E-03	3.44515E+02	7.25931E+00	1.90022E-10
s3-700 3-1-1996	7.00000E+02	7.79319E+01	9.89315E-01	2.42700E-03	3.79177E+02	4.92568E+00	2.67049E-10
s3-1100 3-1-199	1.10000E+03	6.40938E+01	8.38160E-01	3.02823E-03	4.61043E+02	1.59375E+01	1.35438E-10
s3-1600 3-1-199	1.60000E+03	6.73032E+01	1.04385E+00	1.54652E-03	4.39058E+02	5.57431E+00	6.12593E-10
s3-1800 3-1-199	1.80000E+03	7.09104E+01	1.45475E+00	3.05302E-03	4.16723E+02	5.08955E+00	3.43425E-10
s3-1880 3-2-199	1.88000E+03	7.62418E+01	1.58041E+00	4.18912E-03	3.87583E+02	7.50826E+00	2.28334E-10
s3-2160 3-2-199	2.16000E+03	7.66322E+01	1.67079E+00	5.14123E-03	3.85608E+02	6.38055E+00	3.55874E-10
s3-2320 3-2-199	2.32000E+03	7.42121E+01	1.73449E+00	5.02606E-03	3.98183E+02	7.81269E+00	1.80051E-10
s3-2800 3-2-199	2.80000E+03	7.52674E+01	1.73179E+00	6.77776E-03	3.92600E+02	9.51138E+00	1.71125E-10
s3-3600 3-2-199	3.60000E+03	7.55130E+01	1.93778E+00	5.66468E-03	3.91323E+02	7.85578E+00	1.90455E-10
s3-5000 3-2-199	5.00000E+03	8.17119E+01	1.64909E+00	5.49305E-03	3.61636E+02	1.00224E+01	1.44943E-10

INTEGRATED RESULTS
MASS= 1.0000000000E+00 G
(40/36)S = 3.65201E+02 +/- 1.43783E+00
37CA/39K = 1.33625E+00 +/- 1.11761E-03
F1 = -8.66122E-04 F2 = 1.21642E-02
TOTAL ATMOS 40 VOL = 4.57526E-09 CCNTP/G
TOTAL 39K VOL = 6.06176E-10 CCNTP/G
40*/39K = 1.78031E+00 +/- 2.97438E-02
AGE = 9.60187E+05 +/- 1.62487E+04 Y

s0c SMI-4 Basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 3.09707E-04 +/- 8.72602E-07

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE	J	+/-
J function	0.00000E+00	0.00000E+00	5.04859E+01	1.42244E-01	2.79900E+07	3.09707E-04	8.72602E-07

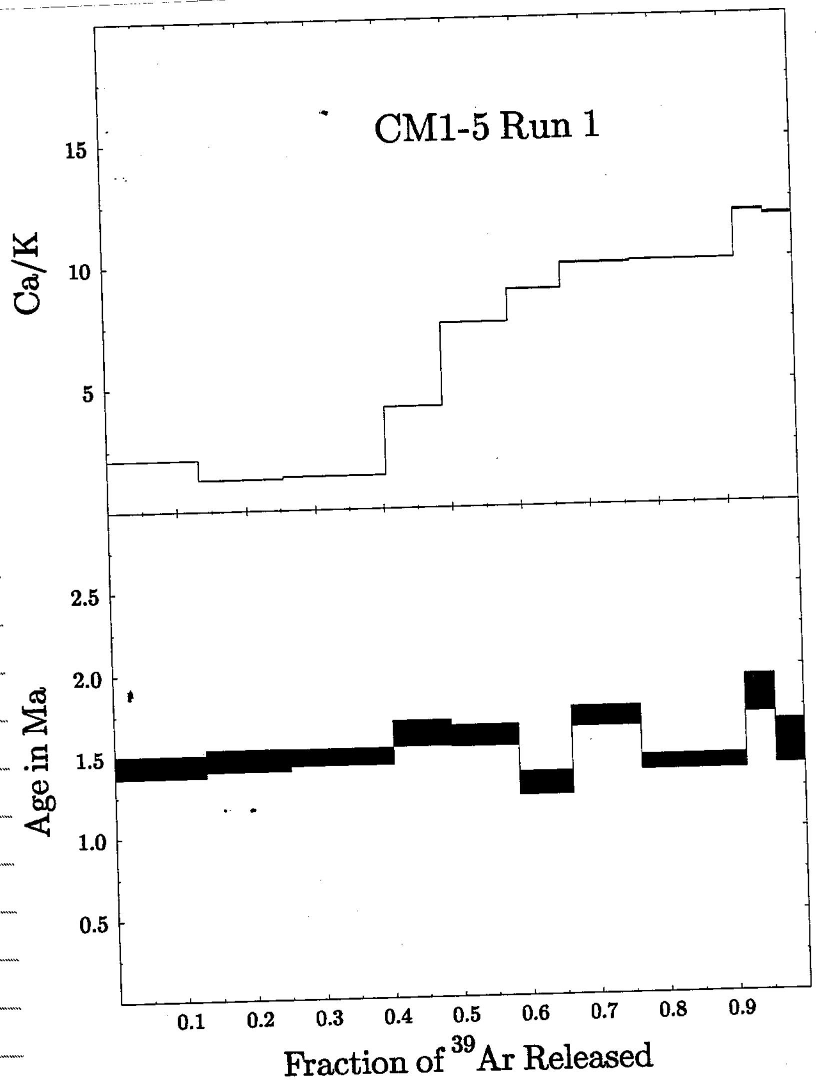
FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-	AGE	+/-
s0-400 3-2-1996	5.24773E-02	-5.84884E-03	-2.85856E-03	2.24255E+00	1.18539E+00	1.25256E+06	6.61858E+05
s0-600 3-2-1996	1.23629E-01	-4.65755E-03	3.19976E-03	6.02530E-02	5.47308E-01	3.36652E+04	3.05795E+05
s0-1000 3-2-199	3.29471E-01	-2.80869E-03	9.51166E-03	1.08841E+00	2.10737E-01	6.08028E+05	1.17707E+05
s0-1400 3-2-199	5.13233E-01	-5.23475E-03	4.61872E-02	7.03195E-01	2.70558E-01	3.92858E+05	1.51137E+05
s0-2000 3-3-199	6.97457E-01	-8.22137E-03	1.08024E-01	4.99461E-01	1.75621E-01	2.79045E+05	9.81105E+04
s0-2560 3-3-199	8.13786E-01	-1.06717E-02	1.06760E-01	4.17307E-01	1.94145E-01	2.33149E+05	1.08462E+05
s0-3000 3-3-199	9.23096E-01	-1.16745E-02	1.21829E-01	2.49472E-01	1.95418E-01	1.39384E+05	1.09179E+05
s0-4000 3-3-199	9.75801E-01	-1.46647E-02	7.05791E-02	9.33397E-01	4.88091E-01	5.21447E+05	2.72635E+05
s0-4800 3-3-199	1.00000E+00	-1.64948E-02	2.80970E-02	-1.34784E+00	5.65720E-01	-7.53244E+05	3.16220E+05

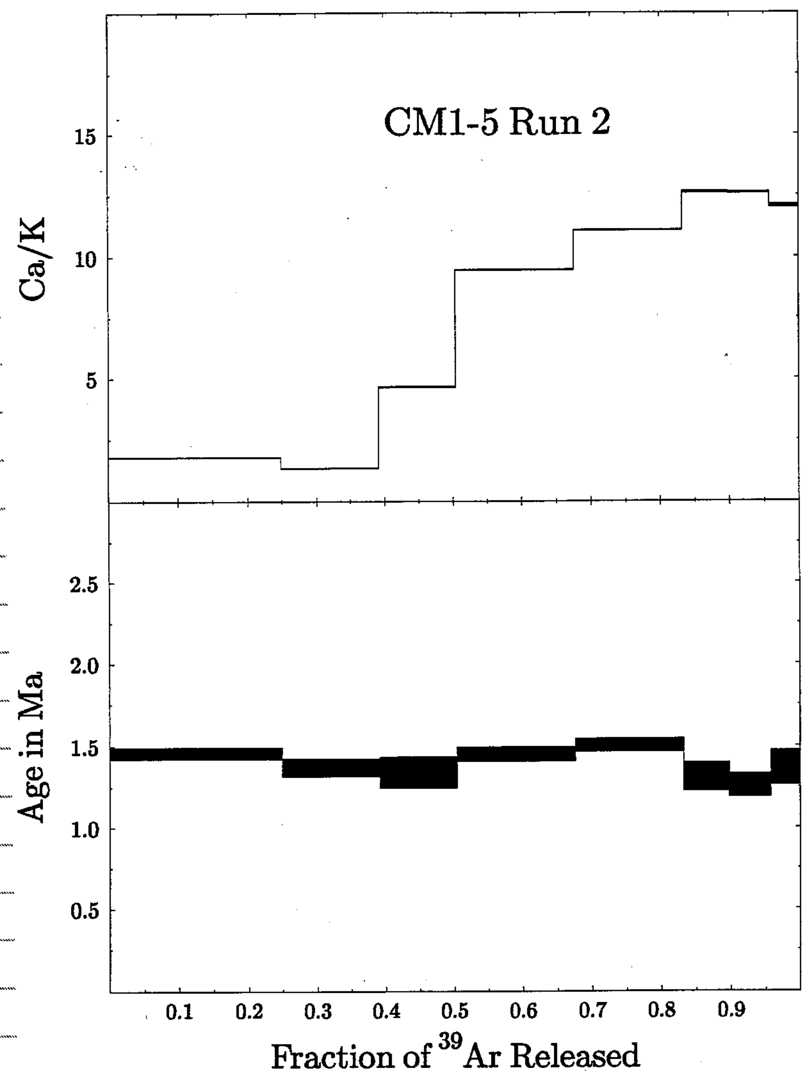
NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S	+/-	VOL ATMOS 40/G
s0-400 3-2-1996	4.00000E+02	9.90152E+01	9.02358E+00	3.22439E-02	2.98439E+02	1.56885E+00	1.58652E-09
s0-600 3-2-1996	6.00000E+02	9.99114E+01	7.18566E+00	2.62419E-02	2.95762E+02	2.38327E+00	6.47971E-10
s0-1000 3-2-199	1.00000E+03	9.59755E+01	4.33324E+00	1.24705E-02	3.07891E+02	2.49944E+00	7.16374E-10
s0-1400 3-2-199	1.40000E+03	9.40732E+01	8.07617E+00	2.80383E-02	3.14117E+02	7.61392E+00	2.75006E-10
s0-2000 3-3-199	2.00000E+03	9.35561E+01	1.26839E+01	4.30767E-02	3.15853E+02	7.64817E+00	1.79120E-10
s0-2560 3-3-199	2.56000E+03	9.57191E+01	1.64643E+01	4.82567E-02	3.08716E+02	6.42210E+00	1.45539E-10
s0-3000 3-3-199	3.00000E+03	9.72516E+01	1.80114E+01	5.49530E-02	3.03851E+02	6.72572E+00	1.29378E-10
s0-4000 3-3-199	4.00000E+03	9.51669E+01	2.26247E+01	1.37661E-01	3.10507E+02	8.24450E+00	1.29883E-10
s0-4800 3-3-199	4.80000E+03	1.03371E+02	2.54482E+01	1.24836E-01	2.85862E+02	3.91333E+00	1.34090E-10

INTEGRATED RESULTS
MASS= 1.0000000000E+00 G
(40/36)S = 3.02127E+02 +/- 1.15295E+00
37CA/39K = 1.13899E+01 +/- 1.42204E-02
F1 = -7.38263E-03 F2 = 2.08665E-02
TOTAL ATMOS 40 VOL = 3.94388E-09 CCNTP/G
TOTAL 39K VOL = 1.34082E-10 CCNTP/G
40*/39K = 6.59635E-01 +/- 1.12257E-01
AGE = 3.68524E+05 +/- 6.27180E+04 Y

3 Jun 97 [illegible]



Plateau Plot of Moo Butte basalts



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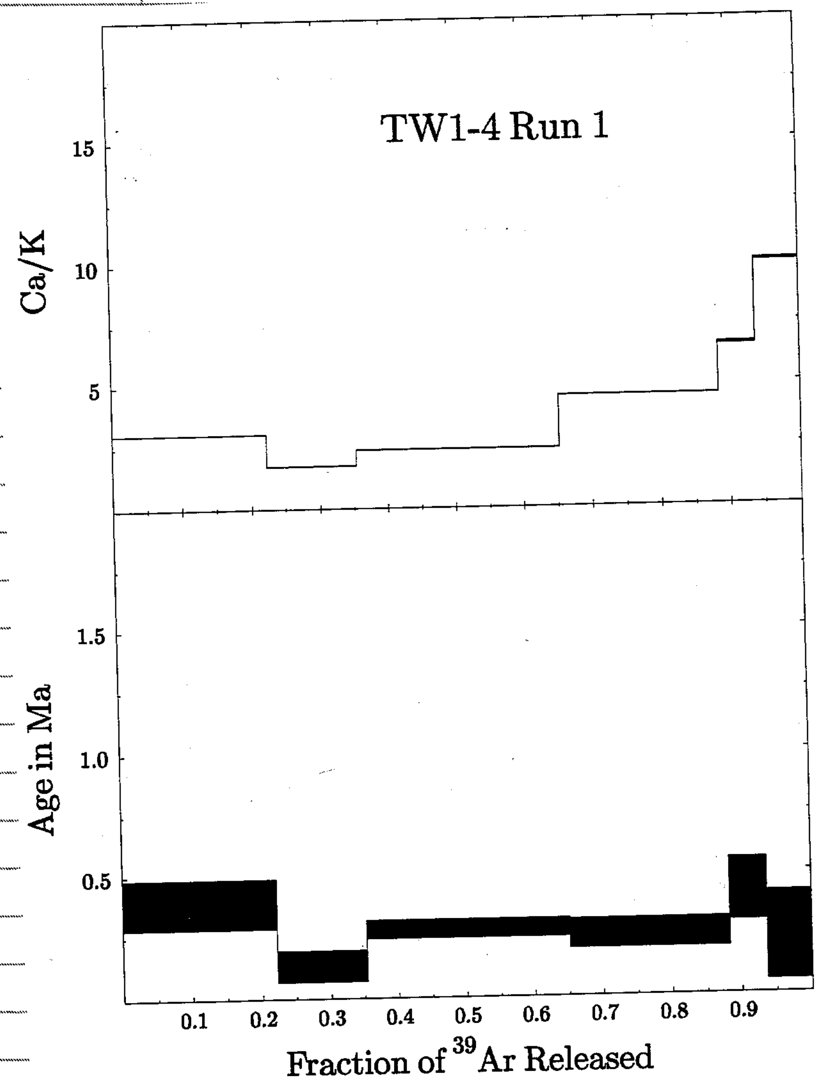

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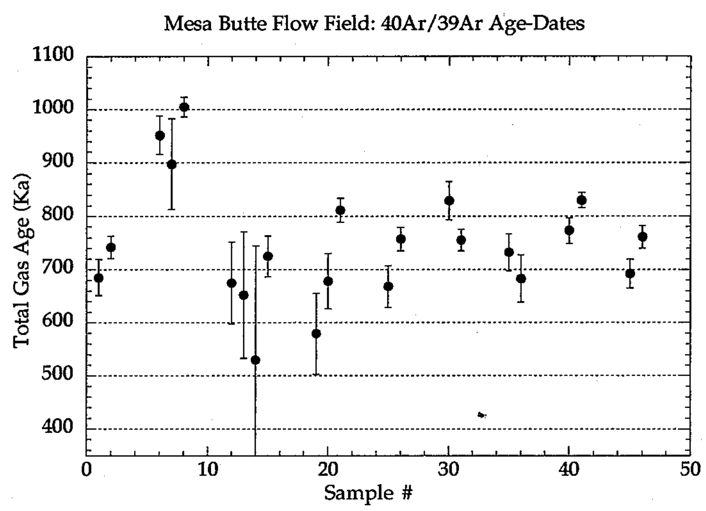
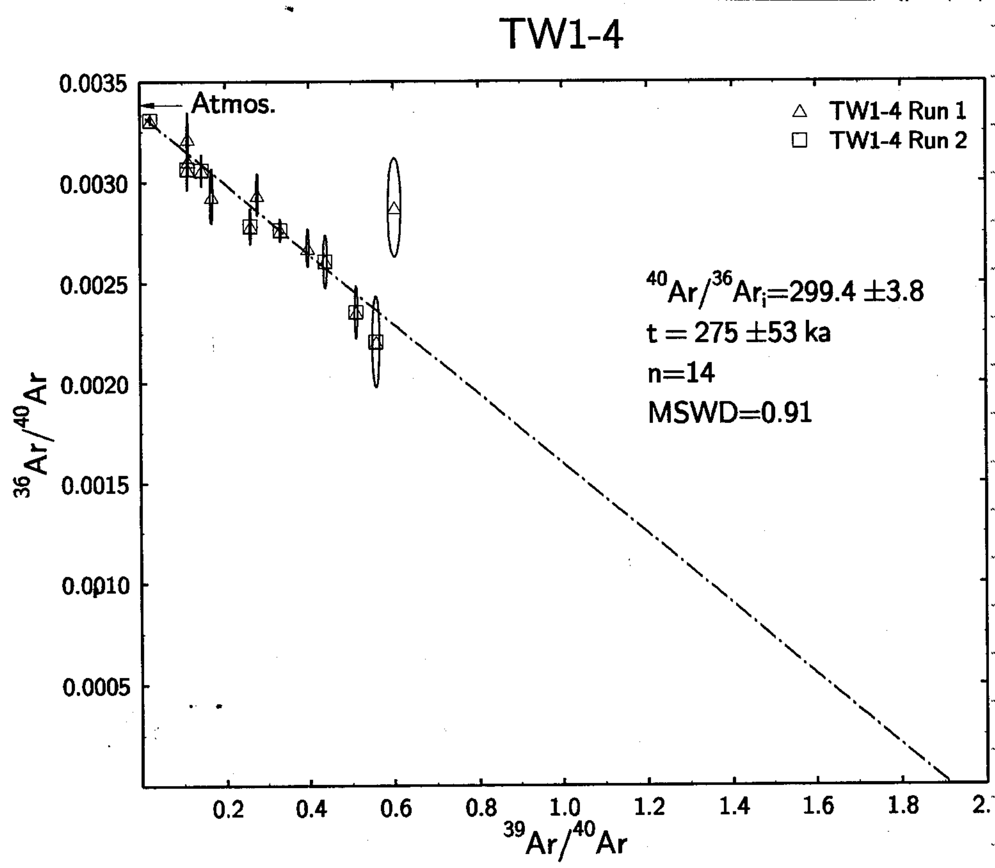
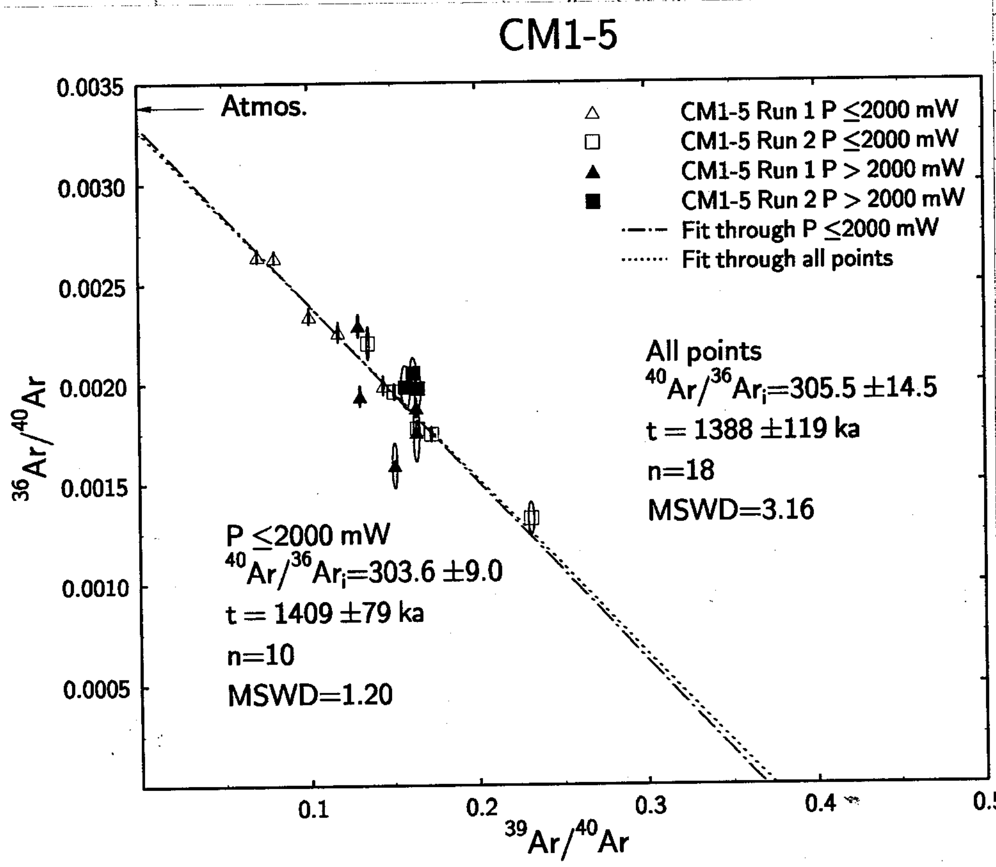
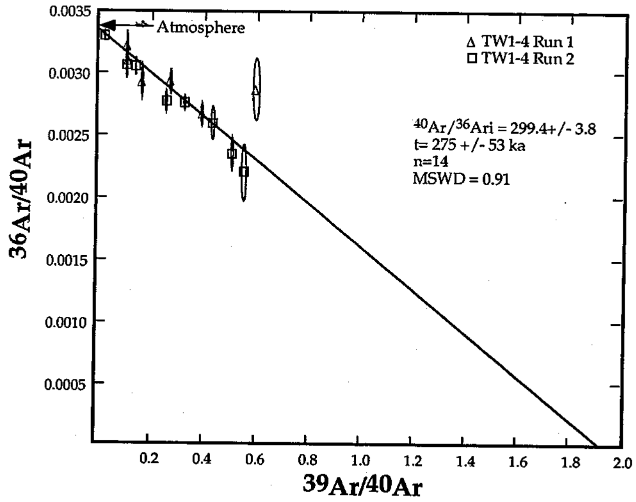
All samples total gas ages

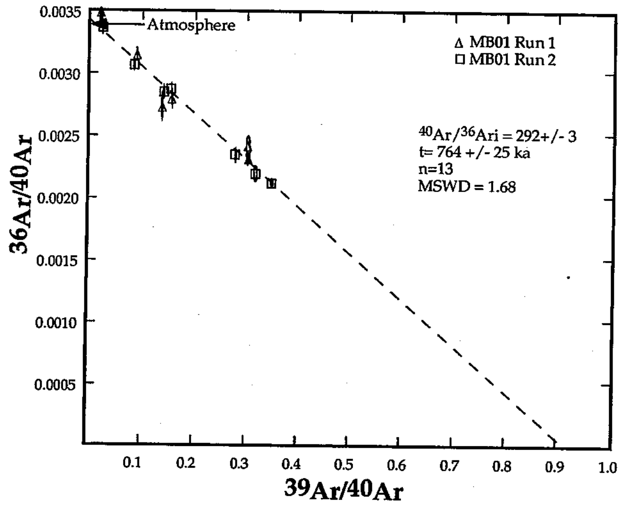


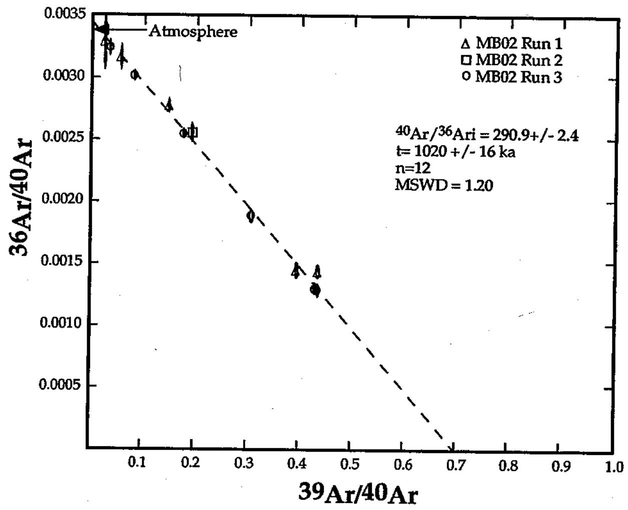

TW1-4
Atmos.
TW1-4 Run 1
TW1-4 Run 2
$^{40}Ar/^{36}Ar_i$=299.4 ±3.8
t = 275 ±53 ka
n=14
MSWD=0.91
$^{36}Ar/^{40}Ar$
$^{39}Ar/^{40}Ar$

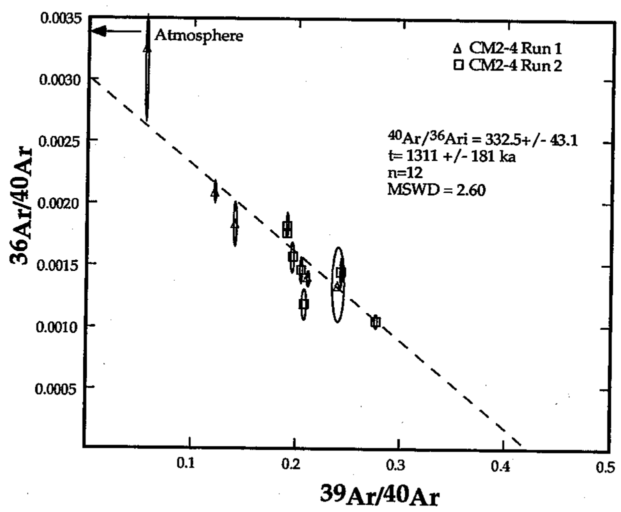

CM1-5
Atmos.
CM1-5 Run 1 P ≤2000 mW
CM1-5 Run 2 P ≤2000 mW
CM1-5 Run 1 P > 2000 mW
CM1-5 Run 2 P > 2000 mW
Fit through P ≤2000 mW
Fit through all points
All points
$^{40}Ar/^{36}Ar_i$=305.5 ±14.5
t = 1388 ±119 ka
n=18
MSWD=3.16
P ≤2000 mW
$^{40}Ar/^{36}Ar_i$=303.6 ±9.0
t = 1409 ±79 ka
n=10
MSWD=1.20
$^{36}Ar/^{40}Ar$
$^{39}Ar/^{40}Ar$

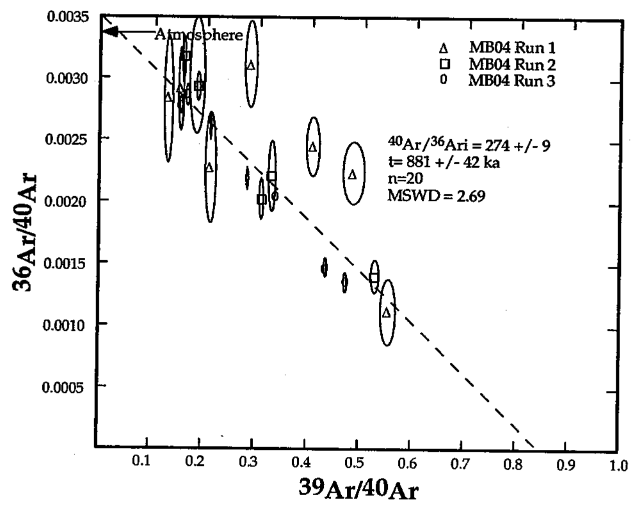
Isochron plots for all analysis
Isochron plots for 2nd MB
Batch of samples for C. Hall

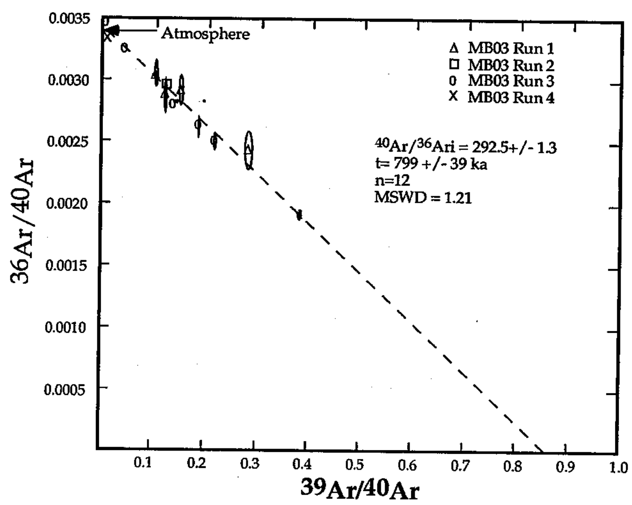












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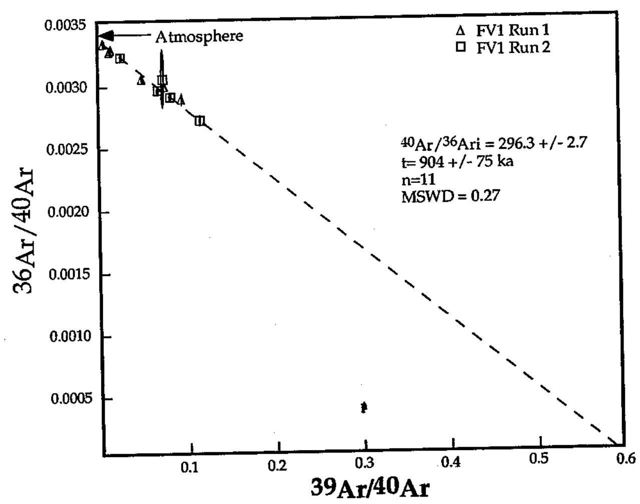
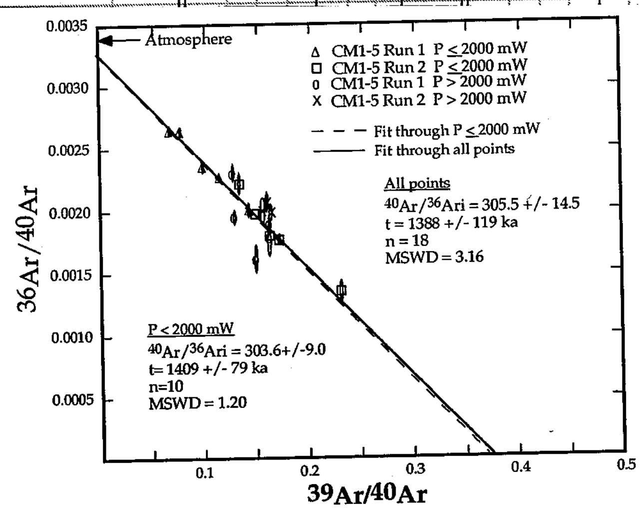
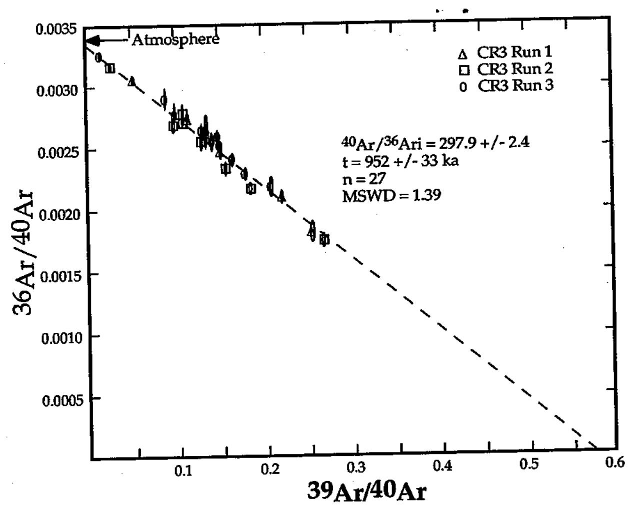
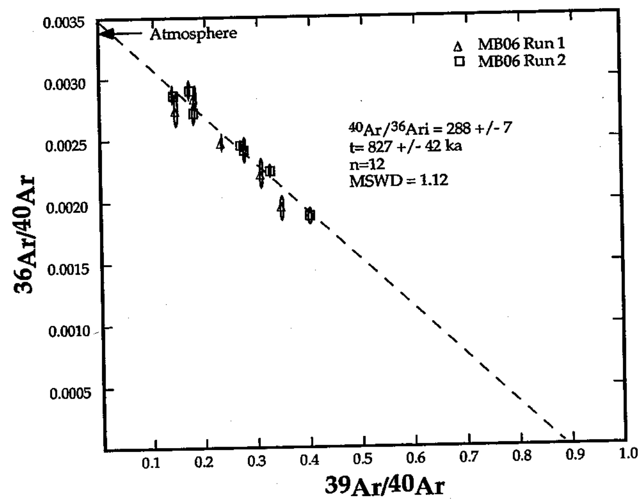
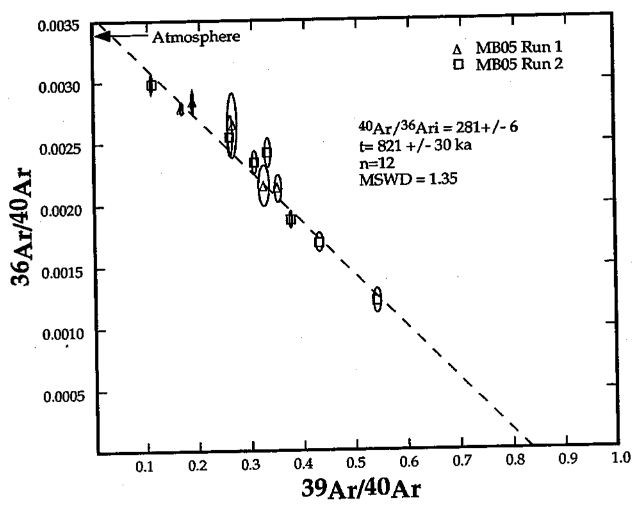
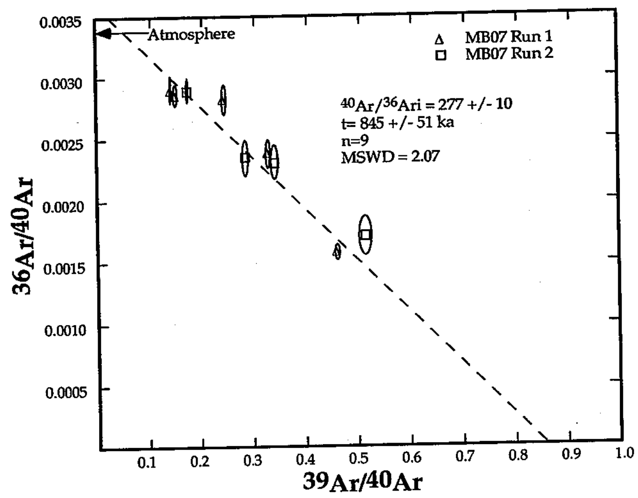

Atmosphere
Δ FV1 Run 1
□ FV1 Run 2
40Ar/36Ari = 296.3 +/- 2.7
t= 904 +/- 75 ka
n=11
MSWD = 0.27
36Ar/40Ar
39Ar/40Ar


Atmosphere
Δ CM1-5 Run 1 P ≤ 2000 mW
□ CM1-5 Run 2 P ≤ 2000 mW
o CM1-5 Run 1 P > 2000 mW
X CM1-5 Run 2 P > 2000 mW
Fit through P ≤ 2000 mW
Fit through all points
All points
40Ar/36Ari = 305.5 +/- 14.5
t = 1388 +/- 119 ka
n = 18
MSWD = 3.16
P < 2000 mW
40Ar/36Ari = 303.6+/-9.0
t= 1409 +/- 79 ka
n=10
MSWD = 1.20
36Ar/40Ar
39Ar/40Ar

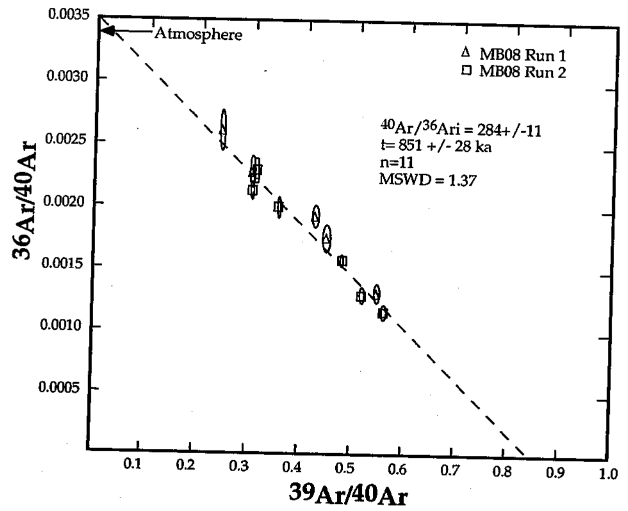

Atmosphere
Δ CR3 Run 1
□ CR3 Run 2
o CR3 Run 3
40Ar/36Ari = 297.9 +/- 2.4
t = 952 +/- 33 ka
n = 27
MSWD = 1.39
36Ar/40Ar
39Ar/40Ar

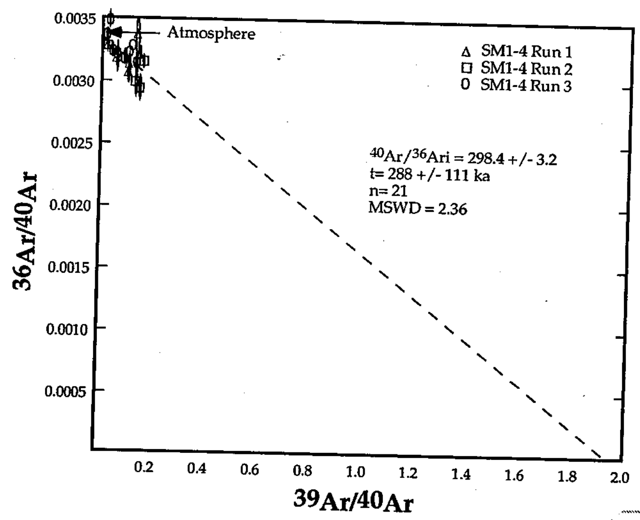

Atmosphere
Δ MB06 Run 1
□ MB06 Run 2
40Ar/36Ari = 288 +/- 7
t= 827 +/- 42 ka
n=12
MSWD = 1.12
36Ar/40Ar
39Ar/40Ar

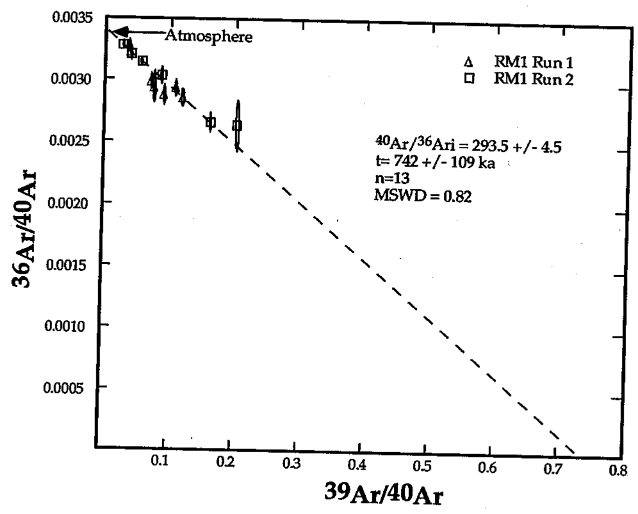

Atmosphere
Δ MB05 Run 1
□ MB05 Run 2
40Ar/36Ari = 281+/- 6
t= 821 +/- 30 ka
n=12
MSWD = 1.35
36Ar/40Ar
39Ar/40Ar


Atmosphere
Δ MB07 Run 1
□ MB07 Run 2
40Ar/36Ari = 277 +/- 10
t= 845 +/- 51 ka
n=9
MSWD = 2.07
36Ar/40Ar
39Ar/40Ar

10 Jan 97 [illegible]







From: Michael Conway
5 September 1996

RE: Justification for using Univ. of Michigan Isotope Laboratory to obtain $^{40}Ar/^{39}Ar$ ages of volcanics from the San Francisco volcanic field

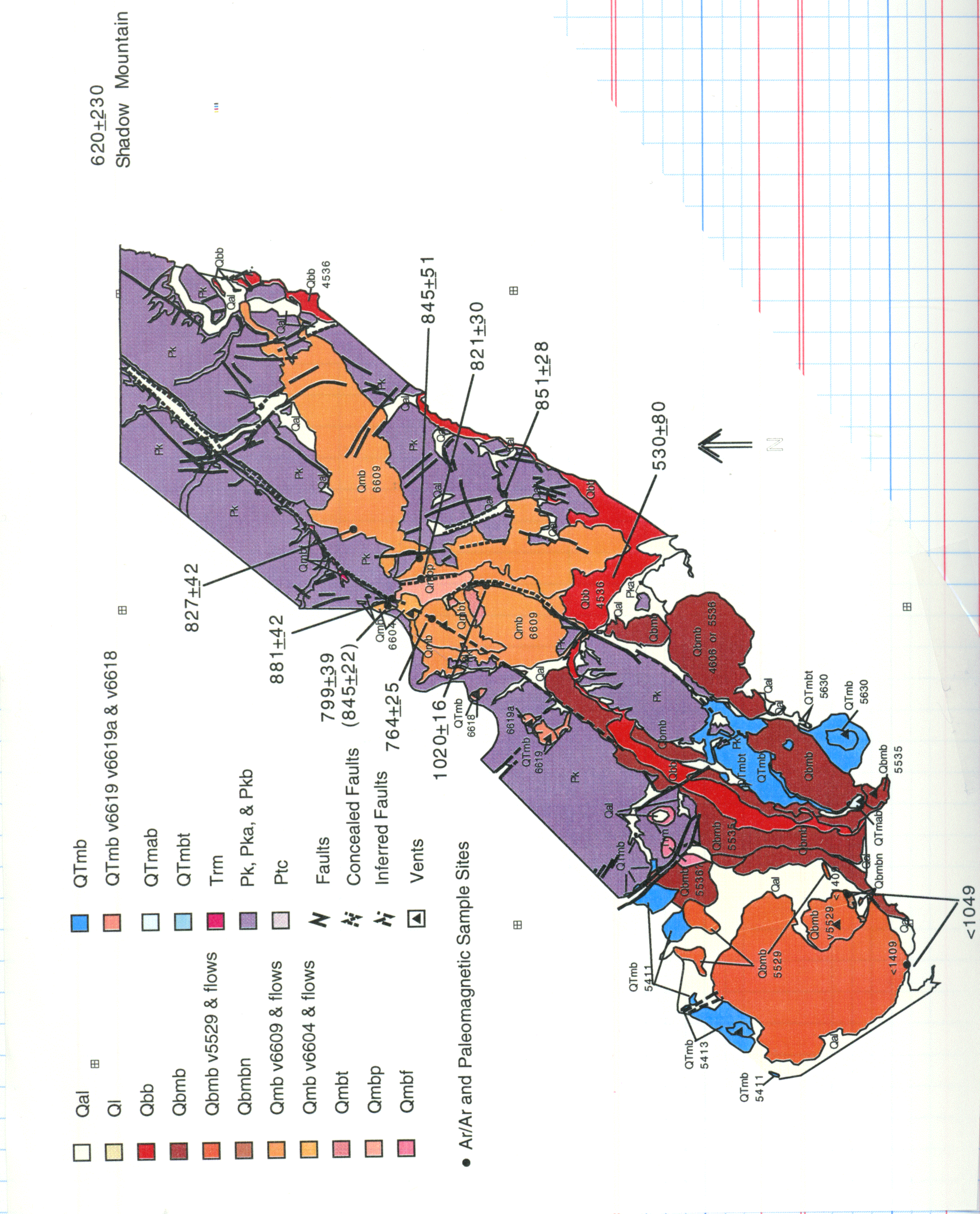
Acquiring 5 more $^{40}Ar/^{39}Ar$ dates of Quaternary basalts erupted in the SP vent cluster of the San Francisco volcanic field will complement geologic mapping and provide excellent stratigraphic constraints for vents and lava flow fields erupted in the cluster. This data will than provide a critical test site for evaluating probability models of spatial-temporal trends of volcanic activity used to calculate probability of volcanism in the area of Crater Flat.

We selected The University of Michigan Isotope Lab to perform the analysis because of their international reputation for dating young basalts. Additionally, Alex Halliday and Chris Hall of the Isotope Lab worked with us to date 15 Quaternary basalts from the Mesa Butte vent alignment in the San Francisco volcanic field. The results were excellent and led to a manuscript that has been accepted by the *Journal of Geophysical Research* for publication, pending revisions. Their cost per $^{40}Ar/^{39}Ar$ date is approximately $850.00 and is competitive with other labs in the U.S.

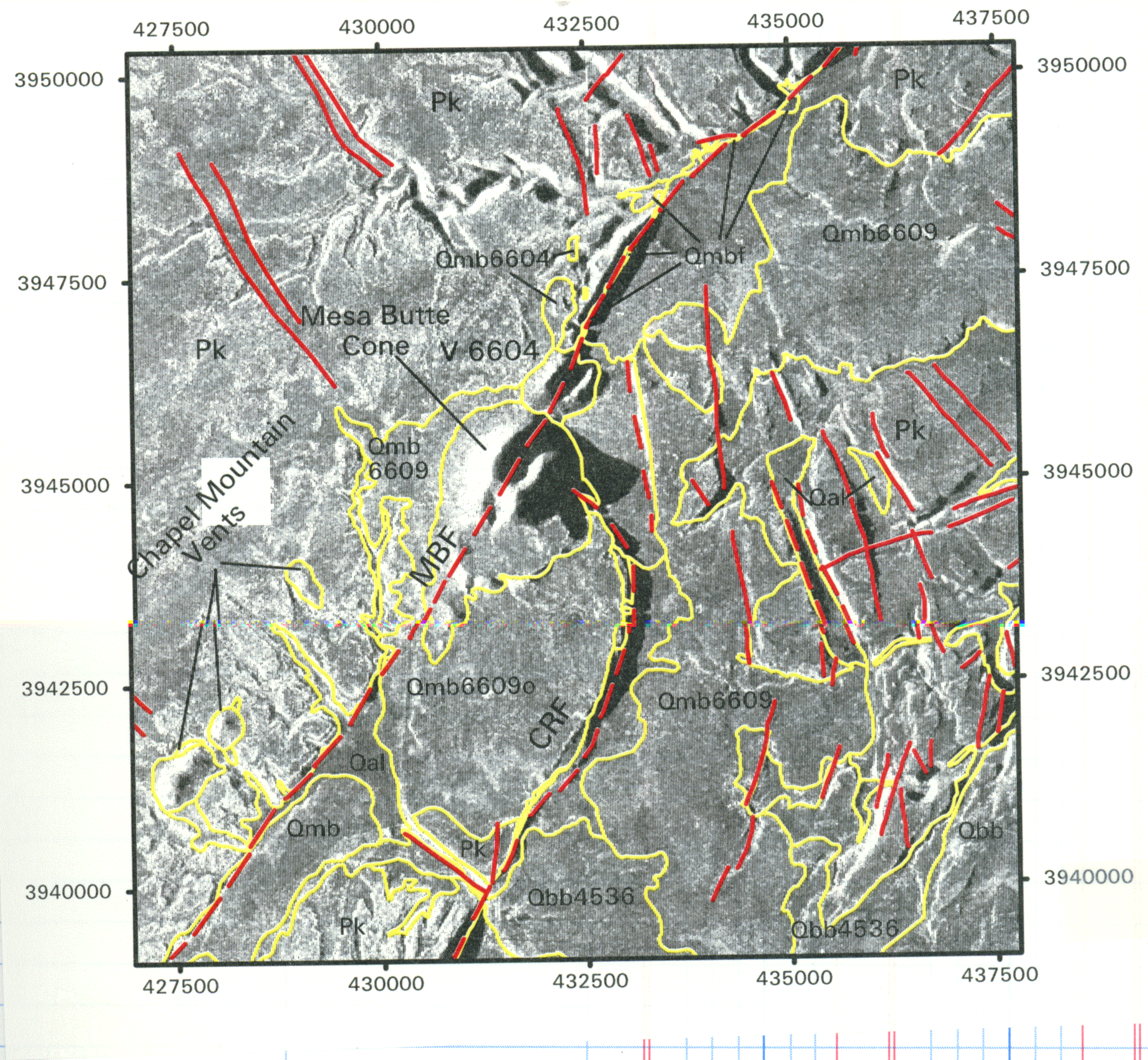
12 Jan 97
RAE

Mesa Butte map - Arc/Info coverage

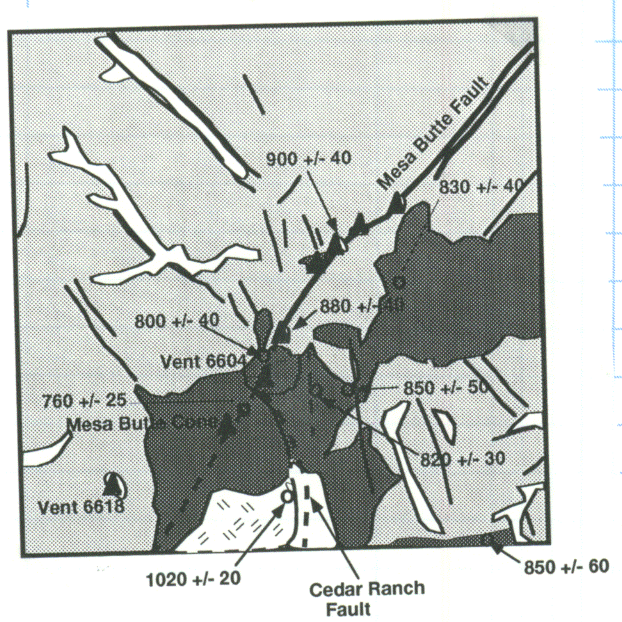
Map w



Map showing Loc. & age of Mesa Butte UTM, basalts 15 Jan 94



Shaw image – 12 m-grid-cell resolution
17 Jan 97
PWC



15 Jan 97
PWC

Inset map near Mesa Butte Cone.

Addition information on Ar/Ar analysis provided by C. Hall.

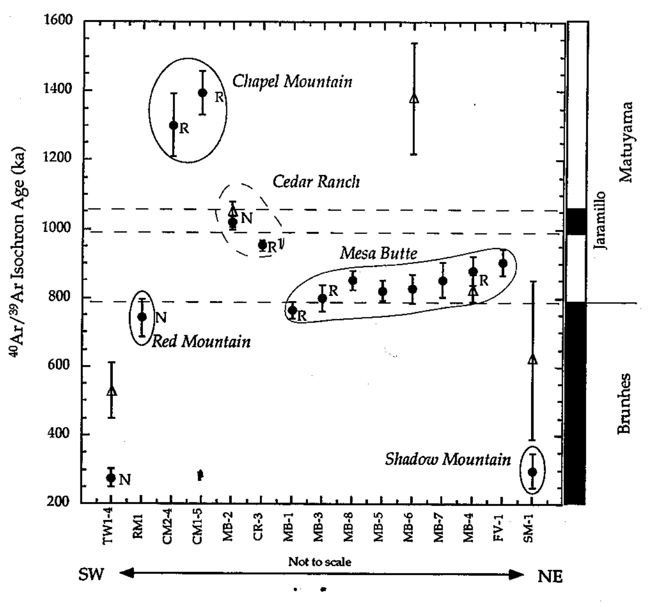
Analysis courtesy of C. Hall

Information potentially subject to copyright protection was redacted from this location. The redacted material (Table 1: Weight percent K2O, total gas age, and mass values...) is from C. Hall.. No additional information is known.

[signature] 18 Jan 97

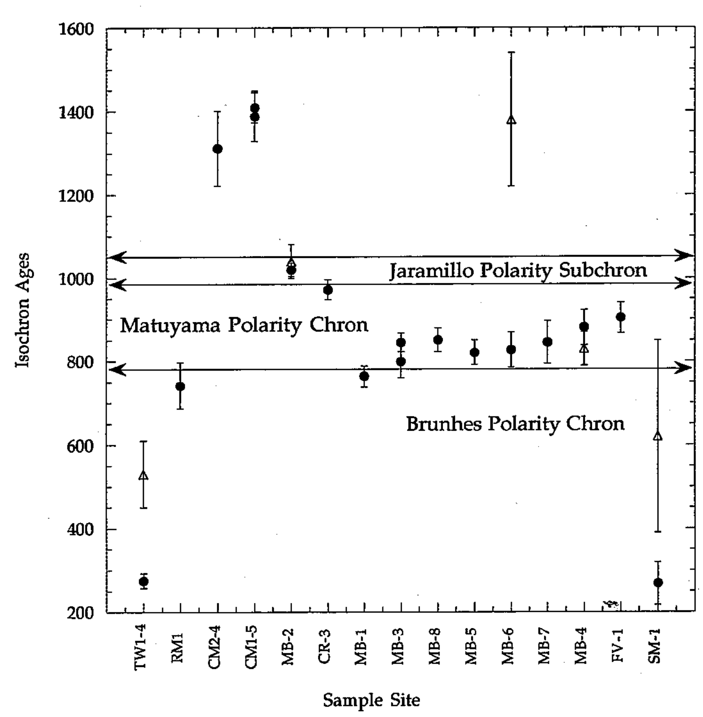
18 Feb.
Jan 97.

Summary of $^{40}Ar/^{39}Ar$ Ages.



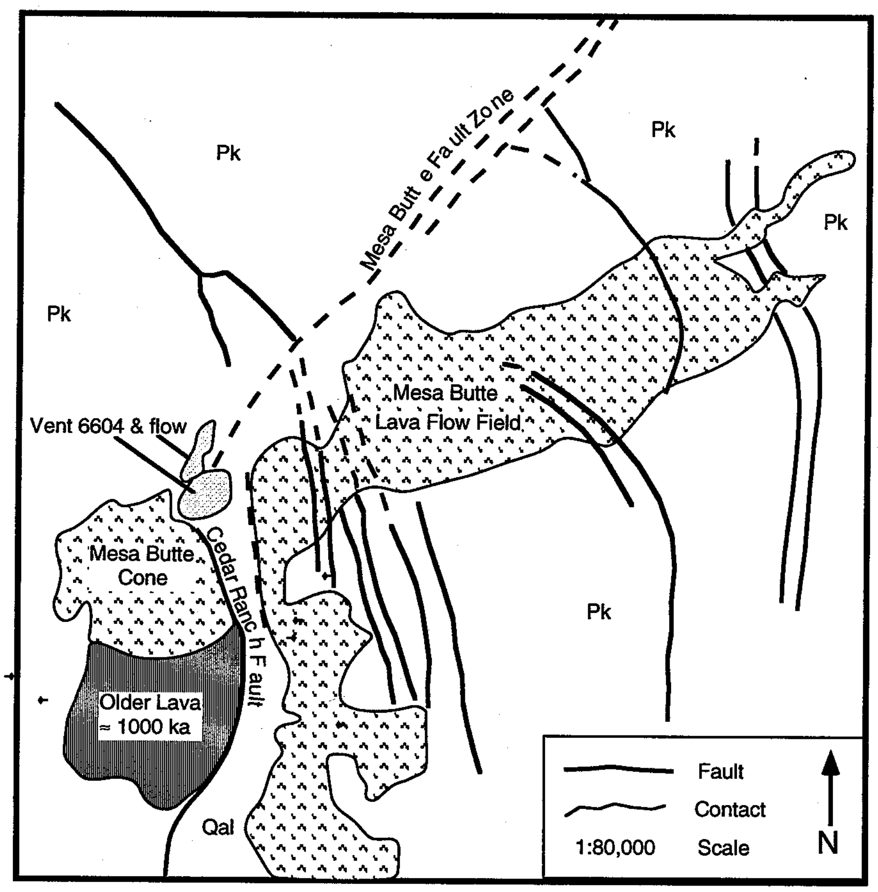
Ages of Mesa Butte unit showing groupings of volcanic episodes.

JMc. 21 Jan 97



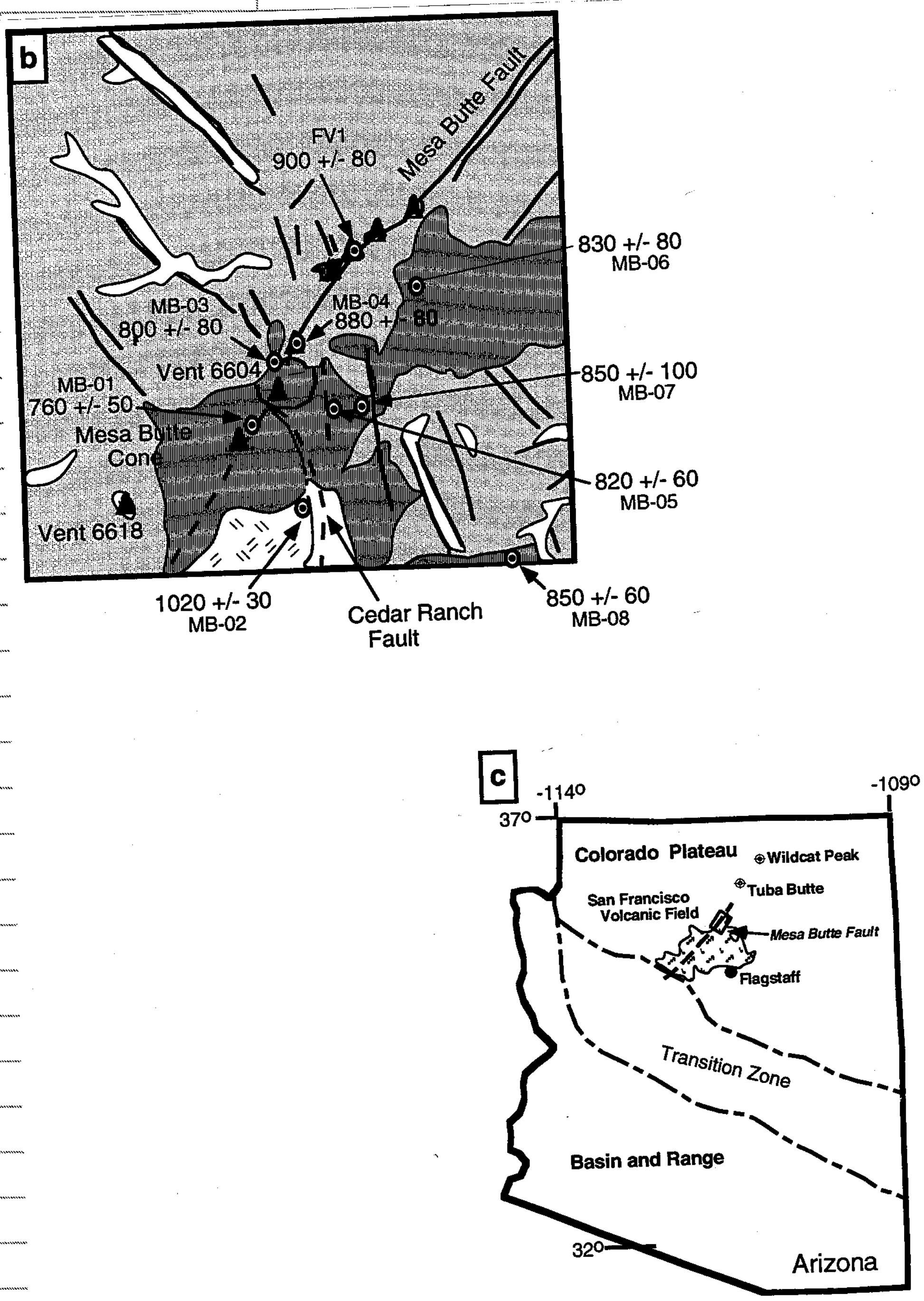
Simplified Geologic map of Mesa Butte area.

Geologic Map of the Mesa Butte Cinder Cone and Environs



Mapping based on Wolfe et al (1987) Geologic Map Series and Photointerpretation of 1:80,000 HAP Black & White Aerial Photos.

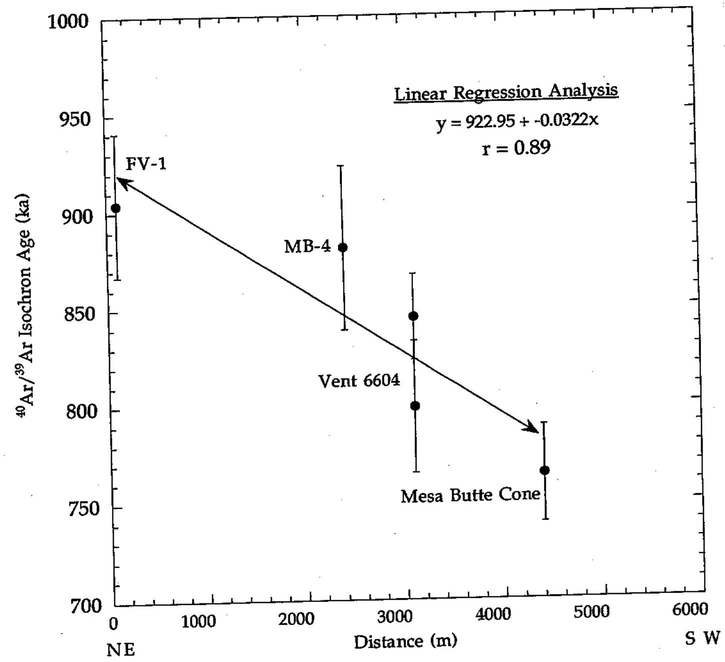
PMC 21 Jun 97



Maps showing general loc of SFVF in Arizona.

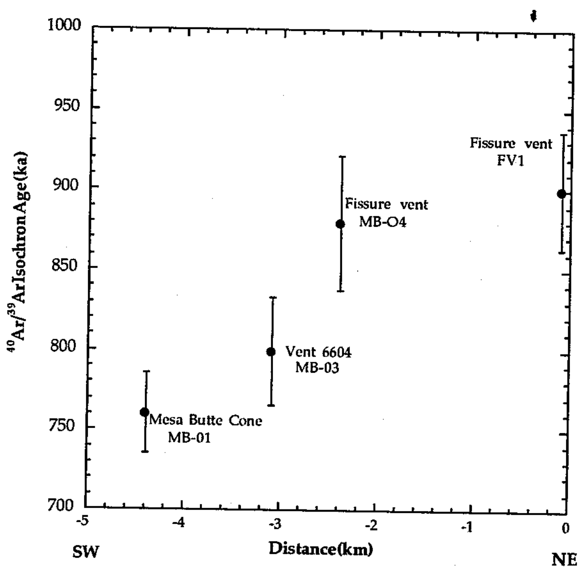
23 Jan 97

Linear Regression of Ages along Mesa Butte written segment



	Sample #	Distance	Ar/Ar	std error
0	FV-1	0.10000	904.00	37.000
1	MB-4	2.4000	881.00	42.000
2	Vent 6604	3.1000	799.00	34.000
3	vent 6604	3.1000	845.00	22.000
4	Mesa Butte	4.4000	764.00	25.000

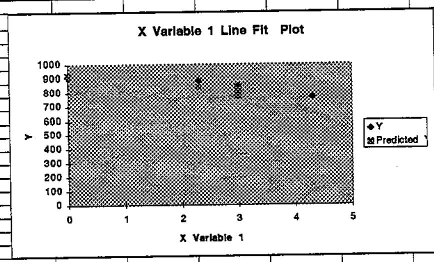
Trends in Mesa Butte ~~bees~~ units in area of fissure eruption at Northern terminus



23 Jan 97

Linear Regression of Basalts on the Central Part of the Mesa Butte Fault Zone

Vent	Dist. SW (kr	Age (ka)	Std. Dev.
FV-1	0	904	37
MB-4	2.3	881	42
vent 6604	3	845	22
Vent 6604	3	799	34
Mesa Butte	4.3	764	25



Testing correlation (R) with student T-Test

Ho = 0 or no correlation
Hoo >< 0 or correlation exists

t=(r*(n-2)1/2 / (1-r2)1/2 p. 67 Davis

t-test calc value
3.12127425

For 2df and 90% confid level (2-tail test) Crit T = 2.92

Conclusion: correlation is significant and slope is significantly < O

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.91120395
R Square	0.83029264
Adjusted R Sq	0.74543896
Standard Error	33.4648901
Observations	4

ANOVA

	df	SS	MS	F	Significance F
Regression	1	10958.2023	10958.2023	9.78499269	0.08879605
Residual	2	2239.79774	1119.89887		
Total	3	13198			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	917.501027	30.698185	29.8897412	0.00111745	785.42591	1049.57614	785.42591	1049.57614
X Variable 1	-33.542094	10.7228424	-3.1280973	0.08879605	-79.678794	12.594605	-79.678794	12.594605

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	917.501027	-13.501027
2	840.354209	40.6457906
3	816.874743	-17.874743
4	773.270021	-9.2700205

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.88575222
R Square	0.784557
Adjusted R Sq	0.71274267
Standard Error	30.8461091
Observations	5

ANOVA

	df	SS	MS	F	Significance F
Regression	1	10394.7527	10394.7527	10.924797	0.04555325
Residual	3	2854.44735	951.482449		
Total	4	13249.2			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	919.733546	28.1573931	32.6640163	6.3066E-05	830.12407	1009.34302	830.12407	1009.34302
X Variable 1	-32.195852	9.74076864	-3.3052681	0.04555325	-63.195354	-1.1963494	-63.195354	-1.1963494

With regard to F Test of slope parameter rho (i.e., slope coeff), where null hypothesis is rho=0 ie slope is not signif different then 0
these 5 points appear to be significantly different then 0 at 95 % level of confidence.

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	919.733546	-15.733546
2	845.683087	35.3169126
3	823.145991	21.8540088
4	823.145991	-24.145991
5	781.291384	-17.291384

Testing correlation (R) with student T-Test

Ho = 0 or no correlation
Hoo >< 0 or correlation exists

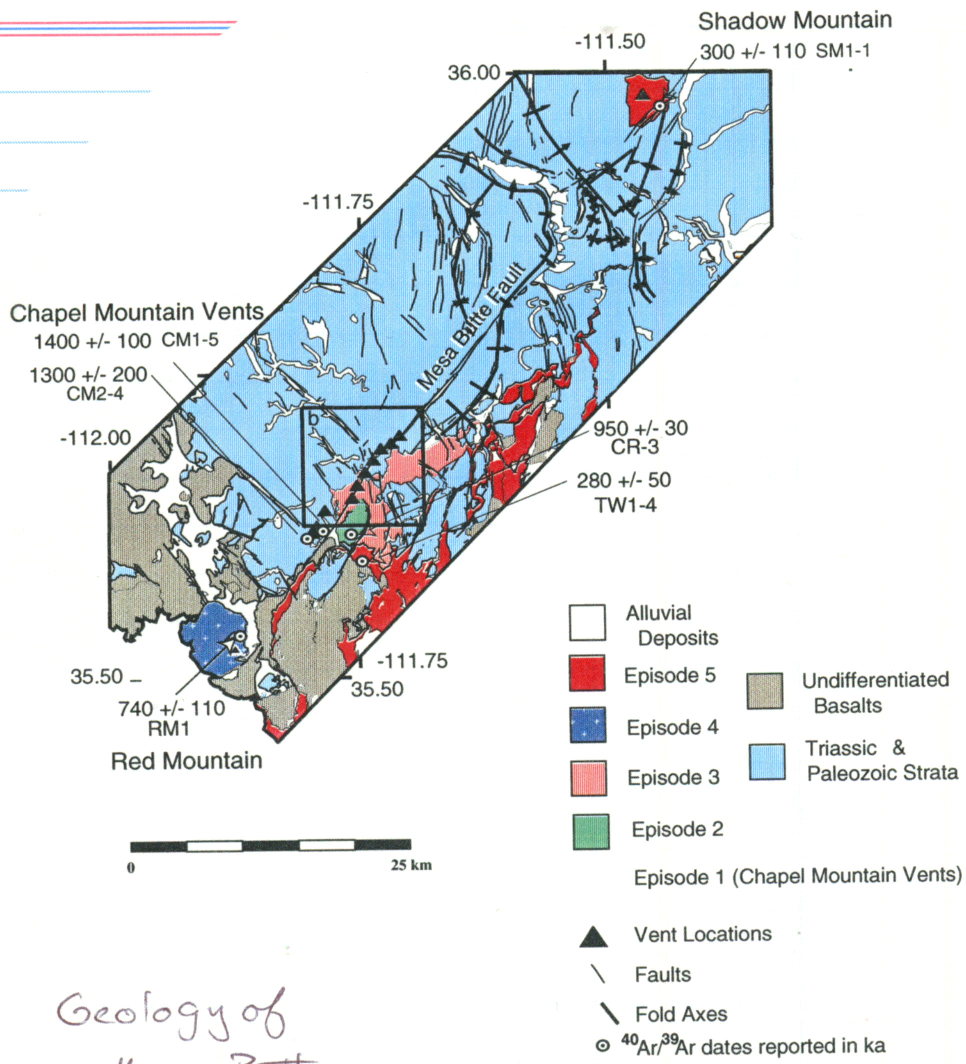
t=(r*(n-2)1/2 / (1-r2)1/2 p. 67 Davis

t-test calc value
3.29820027

For 3df and 90% confid level (2-tail test) Crit T = 2.353

Conclusion: correlation is significant and slope is significantly < O

Linear Regression of MB Basalt
3 Feb 97



Geology of Mesa Butte.

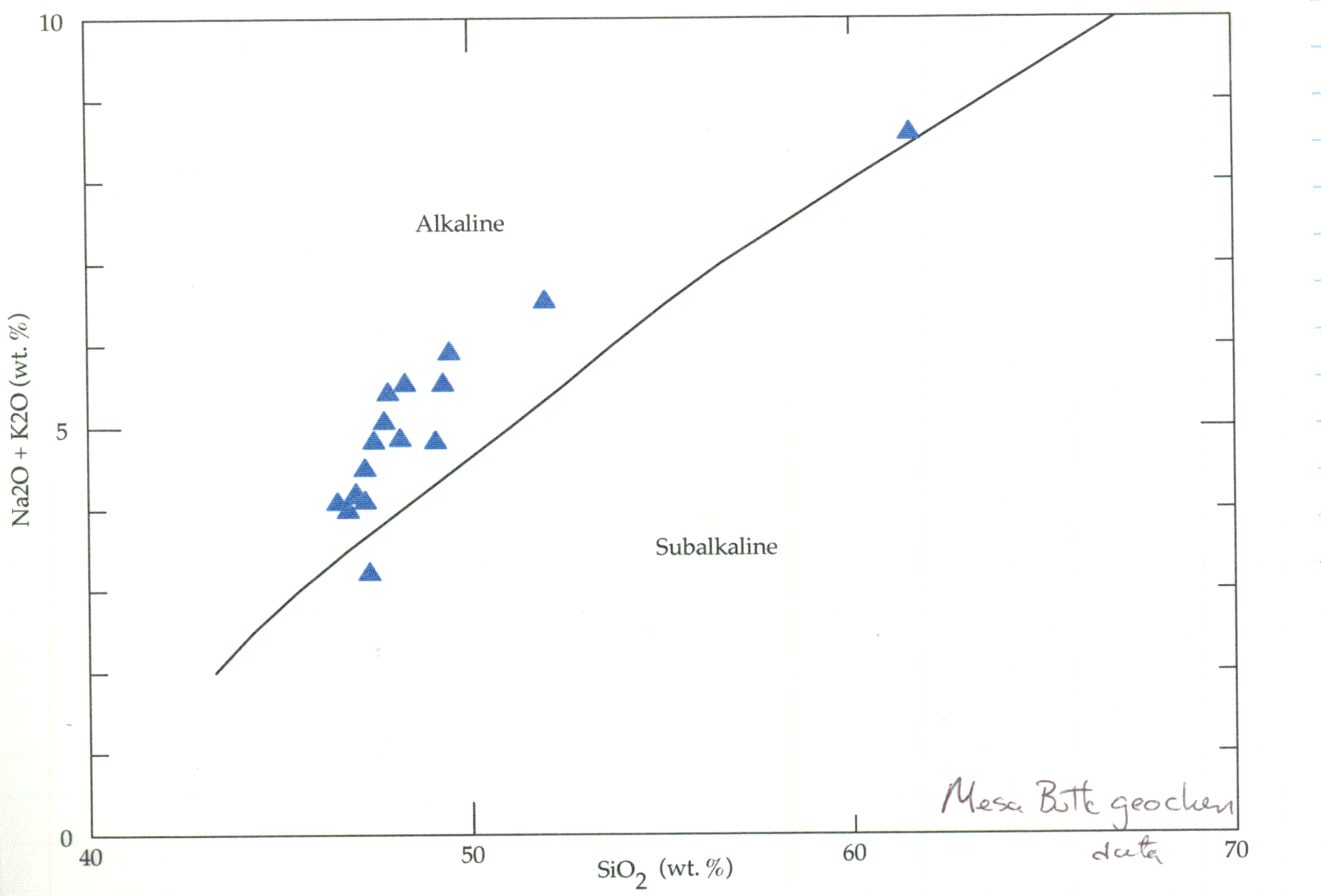
3 Feb 97

Geochem classification of Mesa Butte basalts
data presented earlier

Information potentially subject to copyright protection was redacted from this location. The redacted material is a diagram of Mesa Butte geochem data and is from the reference listed below..

Geochem Major Element diagram
Classification showing MB Basalts
& Field of SFVF Basalts.
Field from Wolfe et al 87

6 Feb 97



total Alkali vs SiO_2 for
MB Basalts - Texas Ed

7 Feb 97

Volumes of lava erupted along Mesa Butte
Calc using Arc/Info command.

Listing for Mike Conway — Thu Aug 8 16:43:47 1996 — Page 1

Report on Volumes from the Mesa Butte Cone Area
San Francisco Volcanic Field Arizona

M. Conway 8 August 1996

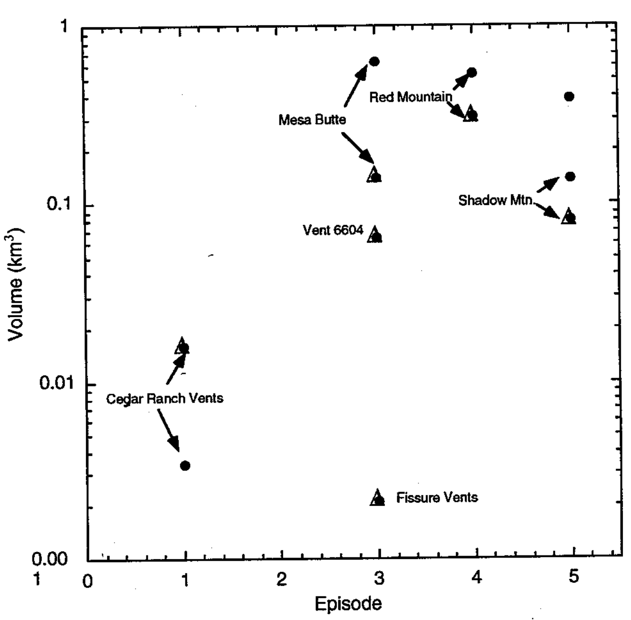
The following volumes were calculated by
1) Creating a polygon coincident with a particular cone.
2) Creating a datum polygon with a single propogated through each cell (ie., Mesa Butte cone Datum value = 1970 m
3) Using cutfill command in ARC/INFO to calc. volume and area.

```
--------------------------Mesa Butte Cone --------------------------------

        DATUM elevation = 1970

        Arc: list mb_cone_vcov.cf
               1
CUT_VOL                 =     195807600.000    ≃ 0.195 km³
FILL_VOL                =        346500.000
BALANCE_VOL             =     195461100.000
CUT_AREA                =       3087900.000
FILL_AREA               =         76500.000
GRADED_AREA             =       3164400.000
NOT_GRADED              =         13500.000
TOTAL_AREA              =       3177900.000    ≃ 3.17 km²
______________________________End of Mesa Butte Cone______________


-----------------------Vent 6618-----------------------------------------

        DATUM elevation = 1955

        Arc: list v6618_vcov.cf
               1
CUT_VOL                 =       1629000.000    0.0016 km³
FILL_VOL                =         30600.000
BALANCE_VOL             =       1598400.000
CUT_AREA                =        141300.000
FILL_AREA               =         10800.000
GRADED_AREA             =        152100.000
NOT_GRADED              =          3600.000
TOTAL_AREA              =        155700.000    0.155 km²
------------------------end of Vent 6618----------------------------------
----
```

Vent 6604: Because the vent straddles the Mesa Butte Fault and is thus erupted over highly uneven ground, it is difficult to justify using a single ele vation value as a datum. The results would clearly be in error. Another metho d using a sloping or irregular elevation datum grid must first be determined.

mesa butte volumes

Volumes of Vents and lava flows of the Mesa Butte Alignment



Volumes calc. in Arc/Info using calc command.

5 Feb 97

[initials]

M. Conway CNWRA 8 August 1996

Report on Chapel Mountain Volumes

Results of the Chapel Mtn "CUTFILL"analysis of the Chapel Mountain vents is included here, beginning with the Chapel Mountain -- the southwestern-most cone.

------------ Chapel Mountain ----------------

DATUM Elevation = 1960

Arc: list cpmtn_sw_vcov.cf

1

CUT_VOL	=	11726100.000	≃ 0.0117 km³
FILL_VOL	=	192600.000	
BALANCE_VOL	=	11533500.000	
CUT_AREA	=	423000.000	
FILL_AREA	=	38700.000	
GRADED_AREA	=	461700.000	
NOT_GRADED	=	6300.000	
TOTAL_AREA	=	468000.000	≃ 0.468 km²

_____ End of Results of Chapel Mountain ________

------------ V6619a -----------------------

DATUM Elevation = 1960

Arc: list cpmtn_ne_vcov.cf

1

CUT_VOL	=	1730700.000	≃ 0.0017 km³
FILL_VOL	=	326700.000	
BALANCE_VOL	=	1404000.000	
CUT_AREA	=	116100.000	
FILL_AREA	=	47700.000	
GRADED_AREA	=	163800.000	
NOT_GRADED	=	3600.000	
TOTAL_AREA	=	167400.000	≃ 0.167 km²

_____ End of Results of Vent 6619A _______ _______

See Mesa_Butte_volumes for Volume results of V6618

The following is the initial result of subtracting a red mountain grid from a red mountain datum using cut fill commands in Arc/Info:

cutfill redmtn_only redmtn_datum out_lattice out_coverage

where redmtn_only is the original unaltered data
redmtn_datum is a datum grid where all cells are normalized to 2150
and the results go into out_lattice and out_lattice.

Results

CUT_VOL	=	245268000.000	≃ 0.245 km³
FILL_VOL	=	9162000.000	
BALANCE_VOL	=	236106000.000	
CUT_AREA	=	2610900.000	
FILL_AREA	=	414900.000	
GRADED_AREA	=	3025800.000	
NOT_GRADED	=	9900.000	
TOTAL_AREA	=	3035700.000	

Red Mtn

Work completed on 8 August 1996, Mconway.

5 Feb 97

PLC

Vent Name	$^{40}Ar/^{39}Ar$ Age[1]	Area (km^2)	Estimated Volume (km^3)	App. Flow Thick.	Distance (km)*
Tappan Wash Flow	280 +/- 50	48.4	0.39	8-m	
Shadow Mountain	300 +/- 110	2.97	0.08		62.5
Shadow Mtn. Flows	300 +/- 110	9.14	0.14	15-m	
Red Mountain	740 +/- 110	2.7	0.31		0
Red Mtn Basalt flows	740 +/- 110	26.6	0.53	20-m	
Red Mtn Andesites	740 +/- 110	0.18	0.005	25-m	
Mesa Butte	760 +/- 50	3.24	0.14		17.7
Mesa Butte Flows	≈ 820	41.9	0.63	15-m	
Vent 6604 & flow	799+/-78	0.86	0.06	10-m	18.8
Fissure Vents*	≈ 900	0.21	0.002	10-m	≈ 21
Cedar Ranch Flows	≈ 1000	?	?		≈ 17-18
Chapel Mtn. Vents					
V6619	1300 +/- 200	0.44	0.012		11.7
Flows of V6619	1300 +/- 200	0.22	0.003	15-m	
V6619a	1400 +/- 100	0.16	0.002		12.5
Flows of V6619a	1400 +/- 100	0.03	0.0005	15-m	
V6618	?	0.14	0.002		14.5

[1] 40Ar/39Ar dates are reported here with 2 sigma errors (Conway et al., 1997).
* Vent Distance is normalized to 0.0 km for Red Mountain at the southwest terminus of the alignment.
Volumes of vents calculated by generating TIN in Arc/Info and using CUT-FILL function.
Lava flow areas digitized from 1:50,000 geologic maps and volumes calculated using average flow thickness.

Summary of MB. ~~Basalt~~ vent data
7 Feb 97

Radiometric date Chall
Area – Planimeter Arc/Info
Volume – estimated
Distance taken from Arc/Info coverage

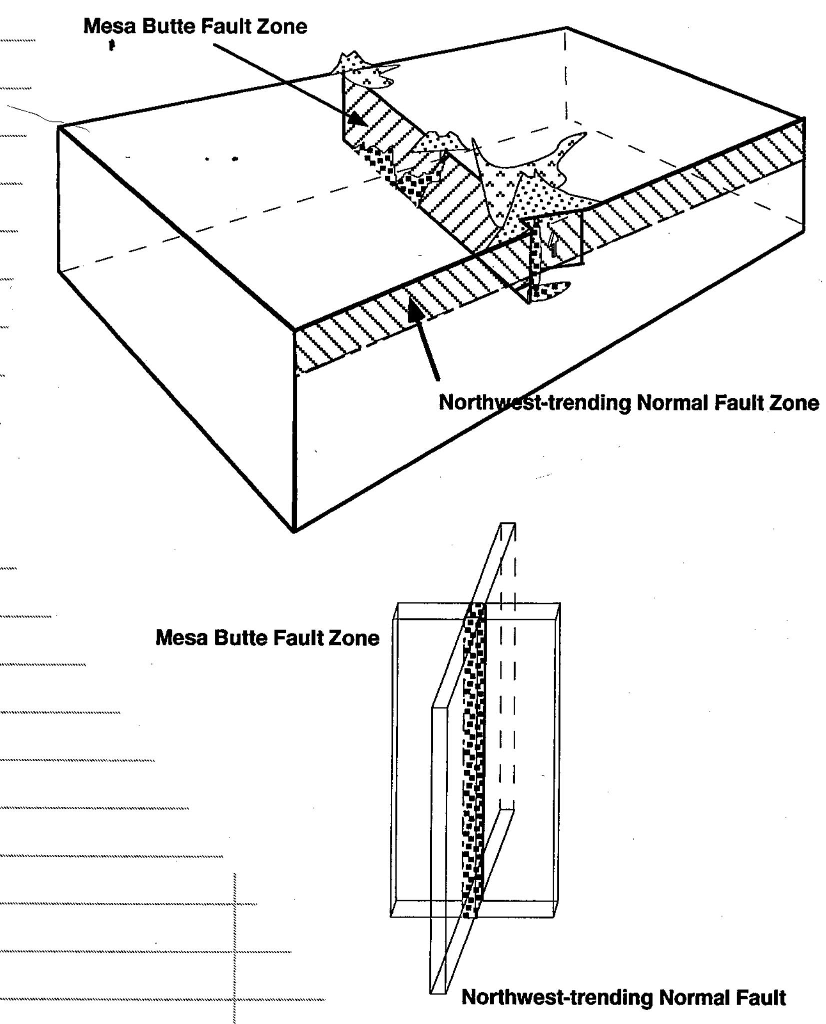
FMC.

Mesa Butte Vent Alignment: Areas & Volumes of Vents and Flows

Vent	Comment	Unit	Perimeter (m) from Arc/Info	Areas (km2) from Arc/Info	Estimated Volume (km3)	Assumption for volume calculation	Vent dimensions Diameter	height
Red Mountain								
	Vent	V 5529	7701	2.7	0.31	right-circ.con	Av dia = 2.075	ht = 282 m
	Bas lava flow	5529-Qbmb	36162	26.6	0.3990	15 m thick		
	Sil. lava flow	5529-Qbmbn	3164	0.18	0.0036	20-m-thick		
Tappan Wash								
	Lava flow	4536 - Qbb	199642	48.4	0.7260	15-m-thick		
Mesa Butte								
	Vent	V 6609-Qmb	9978	3.24	0.14	Cone-shaped		
	Lava flows	6609 - Qmb	109890	41.9	0.6285	15-m-thick		
Vent 6604								
	Vent	V6604 - Qmb	5155	0.82	0.0622			
	Lava flows	6604-Qmb	1769	0.04	0.0004	10-m-thick		
Spatter Vents *								
	Vents	Qmbf	7004	0.21	0.0021	10-m-thick		
	* Includes total of five vents							
Chapel Mtn Vents								
	Vent	V6619 QTmb	2685	0.44	0.0122	right-circ.con	Av Dia = 0.875 k	height = 61 m
	Lava flows	6619 - QTmb	3714	0.22	0.0033	15-m-thick		
	Vent	V 6619a QTmb	1465	0.16	0.0026	right circ con	Av Dia = 0.5 km	ht = 39 m
	Lava flows	6619a QTmb	1002	0.03	0.0005	15-m-thick		
	Vent	V6618 QTmb	1570	0.14	0.0016	right circ con	Av dia = 0.5 km	ht = 25
Shadow Mountain								
	Vent	Vent - Qby	6943	2.97	0.08			
	Flows	Flows - Qby	22613	9.14	0.1371	15-m-thick		

Calculated in Arc Info
PLC 9 Feb 97

Model of dike propagating along Mesa Butte fault where faulted & intersected of NW-trending flt.



11 Feb 97

Summary Sheet MB - unit ages + dens

Descriptive Geochemical, Paleomagnetic, Ar/Ar Age-date, and Petrography of Mesa Butte Basalts

Geochemistry: ICP Texas Tech
Ar/Ar age dates: Univ of Michigan

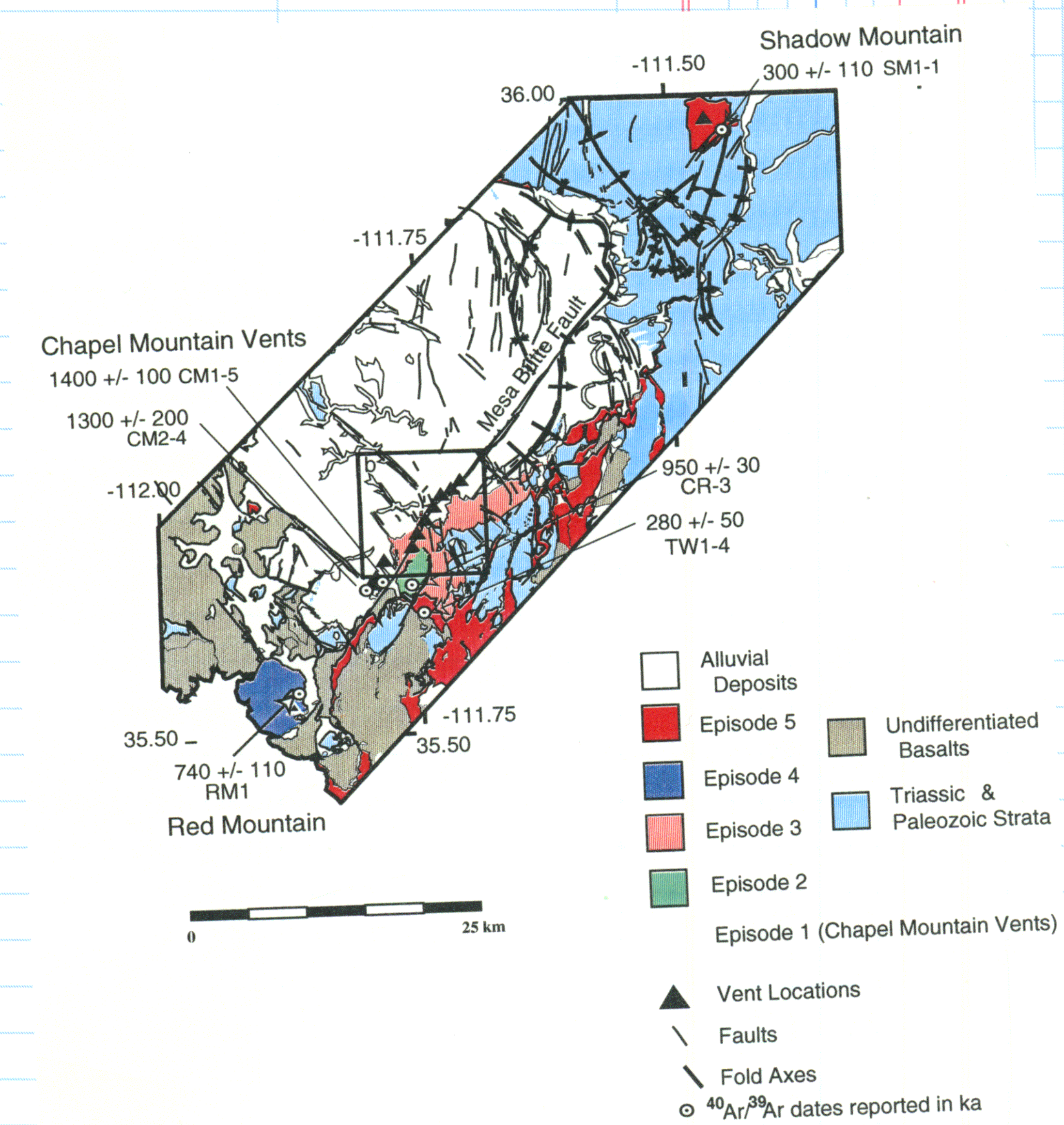
Red Mountain geochemistry from Wolfe et al., 1987
Paleomag data from Wolfe et al. and Tanaka et al. (1991)

Petrographic Abbreviations
P=porphyritic
H=holocrystalline
I=Intergranular
V=vesicular
T=trachytic
Groundmass Size
C=coarse-grn.
F=Fine-grained

Sample #	Geo Unit	Comment	SiO_2	Al_2O_3	MgO	Na_2O	K_2O		Polarity	Ar/Ar Age	Petrography	Texture	Est % Plag , Oliv ( )	Comments
MB1	V6609	MB Vent Sam	48.29	17.12	4.91	4.16	1.37		R	764+/-25	Plg-Ol Basalt	P, F, H, V	≈10-15%(1-2%)	w biotite & vesicles
MB-2	Qmb 6609	USGS1.04 m.y.-6622	49.07	16.53	5.59	3.76	1.06		N?	1020+/-16	Plag-Ol Basalt	P, H, I?, C	70% (25%)	Gdms included
MB-3	V6604	Flow field of 6604	47	17.54	7.59	3.32	0.87		R	799+/-39	Ol Basalt	P, C, I, H	20% (5-7%)	
MB-4	Qmbf	Fissure basalt	47.24	17.22	7.53	3.49	1		R	881+/-42	Plag-Ol Basalt	P, ml, C	≈35% (5-10%)	Phenos & microphen
MB-5	Qmb 6609	1 km E of MB	47.75	17.27	5.66	3.94	1.12		ND	821+/-30	Plg-Ol Basalt	P, S, F	≈12% (2-4%)	
MB-6	Qmb 6609	Site of 1.39 m.y.	47.84	17.11	5.22	4.14	1.28		ND	827+/-42	Plg-Ol Basalt	P, I, F	≈8% (3-5%)	
MB-7	Qmb 6609	2.5 km E of Mb	46.99	17.15	7.47	3.24	0.91		ND	845+/-51	Plag-Ol Basalt	P,V,F	≈8-10% (2-5%)	
MB-8	Qmb 6609	basalt spit 7 km ESE	49.27	17.38	5.07	4.21	1.31		ND	851+/-28	Plg-Ol Basalt	P, C, T, H	≈30% (2-4%)	
MB-9	Qmb 6609	= MB-7	46.6	16.91	7.46	3.42	0.9				No Ts			
MB-10	Qmb 6609	= MB-2	49.05	16.57	5.57	3.73	1.09				No Ts			
MB-11	V6604	=MB-3	46.78	17.5	7.79	3.19	0.81			845+/-22	No Ts			
Rd Mtn 5531	Red Mtn	Basalt lava flow	47.17	17.27	7.59	3.26	0.72		N	< 0.97 Ma	Plg-Ol Basalt?	sP, F	Phenos < 1%	
Rd Mtn 5528	Red Mtn	Benmoreite	61.53	17.23	1.41	5.44	3.14		N?	<0.97 Ma	Benmoreite	P, T	Plag-Hb-Ol	
Shadow Mtn	Shadow M	Basalt	45.5	14.9	8.5	3.5	0.5			0.62+/-0.23?	Condit data			Alkali Ol Basalt
Sample #			Rb	Ba	Sr	V	Cr	Ni	Zr	Sc				
MB1	V6609	MB Vent Sam	18	528	796	246	413	187	190	18.2				
MB-2	Qmb 6609	Site of 1.04 m.y.	16	761	726	196	172	69	157	22.2				
MB-3	V6604	Flow field of 6604	12	288	650	217	156	112	138	24.1				
MB-4	Qmbf	Fissure basalt	13	324	659	206	155	83	152	23				
MB-5	Qmb 6609	1 km E of MB	15	475	819	189	55	40	171	20				
MB-6	Qmb 6609	Site of 1.39 m.y.	18	504	807	180	67	38	185	19.1				
MB-7	Qmb 6609	2.5 km E of Mb	13	310	645	210	175	109	147	24.1				
MB-8	Qmb 6609	basalt spit 7 km ESE	18	532	847	167	45	21	194	18.2				
MB-9	Qmb 6609	= MB-7	13	300	657	219	203	268	149	24.7				
MB-10	Qmb 6609	= MB-2	15	742	735	200	173	87	162	22.2				
MB-11	V6604	=MB-3	12	281	668	214	160	90	134	23.9				

11 Feb 82

Mesa Butte geology after Ulrich & Bailey 1987.



Final version of map.
12 Feb 97 [illegible].

SP Cluster situated in NE section of SFVF. Purpose is to characterize volcanism & look for spatio-temporal patterns of cluster development.

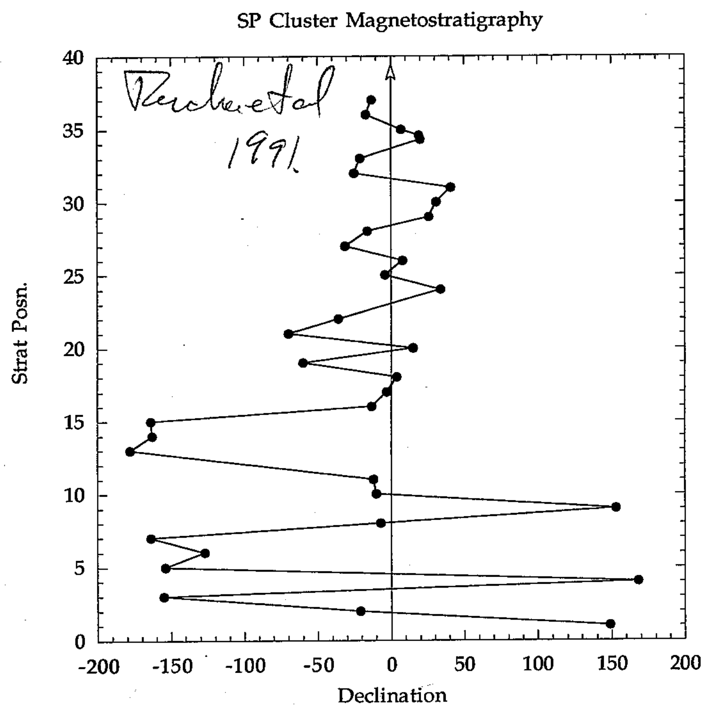
Vents of SP Cluster w UTM coordinates (Arc/info coverage

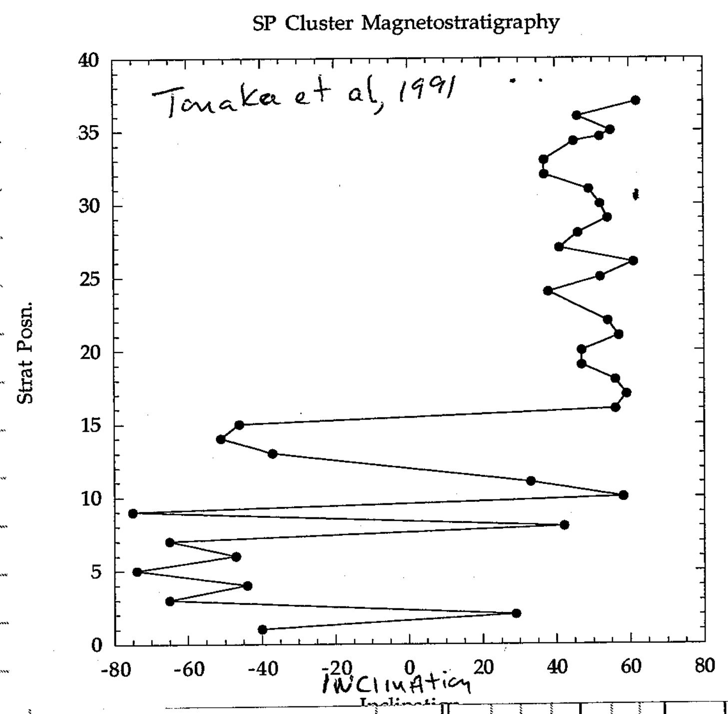
Vent Location of vents of the SP Crater Cluster: from P. Hunka files (m. Conway)
18-Jun-96

Vent	V4715B	V5734E	V5718	V6725	V4626	V4624	V4635	V4625
Easting	442250	442800	438000	446300	433661.62	435246.5	434551.15	435809.31
Northing	3924500	3929850	3934050	3940550	3921290.75	3922319.75	3919980.25	3920904.75
Vent	V4614A	V4614	V4613	V4707	V4609	V4603A	V4603	V5626
Easting	434687.21	434601.1	435453.5	437976.7	430079	432088	432996.5	435205
Northing	3923881.5	3924490.7	3925202.2	3925804.7	3926052.2	3928206.2	3927313.2	3931047
Vent	V4606	V5732	V4704	V5733	V5733A	V4703	V4708	V5734G
Easting	427085	438620	439753.6	440448.5	440592.8	441447.8	438916.2	442280.3
Northing	3928214.7	3928440	3927500.7	3927909.5	3929432.5	3926769.5	3926302.2	3928170.5
Vent	V5734	V5734A	V5734B	V5734C	V5734D	V4714	V4715C	V4715
Easting	442195.2	442352.9	442300	442551.8	442691.5	443026.2	442505.8	441716.6
Northing	3929348.7	3928904	3929531	3929723	3929852.2	3924109.5	3924168.2	3924415.5
Vent	V4715A	V4710	V4711	V5831	V5725	V5713	V5715	V5716
Easting	441714.5	441490.6	443016	447856	445228	445057.6	442437.9	440650.7
Northing	3924988.5	3925777	3925482.2	3928312	3931072	3932962.7	3933528	3933249.2
Vent	V5712	V5704	V5703	V5702	V5701	V6736	V6807	V6735
Easting	445155.2	441912.7	442800	444649.6	446557	446228.3	447333	444780
Northing	3934934	3937011.2	3937635.7	3936821.7	3936271.2	3937986.2	3945358	3939390.7
Vent	V5806	V6803	V6802	V6811A	V6811	V4719	V4720	V6713
Easting	447585.9	451990	454443.5	454321.2	453813.3	437711.62	438872	445918.7
Northing	3937165	3946263.2	3945835.75	3945126.7	3944244.5	3922078	3923603.5	3942801
Vent	V4729	V4728	V3705	V3606	V4726	V4713		
Easting	438844.1	439669.7	439323.2	426854.3	443652.8	444911.4		
Northing	3921079	3921728	3918690.7	3917360.7	3921377.2	3924127.2		

15 Feb 97 [illegible]

Magnetostratigraphy of SP Cluster based on Magnetic data of Tanaka & Ulrich & Baily Stratigraphy





17 Feb 97

Too little variation to be useful in magneto strat. of vents not constrained by stratigraphy

Age data from Mulhaney thesis courtesy of C. Condit.

	Ar/Ar age data from K. Mulhaney and C. Condit					
	Analyses by Dan Lux at Univ. of Maine at Orono					
		All ages reported with 2 sigma error				
Sample #	Vent #		Plateau Age	2 sigma error	Total Age	2 sigma error
KV6802c	V6802		1.71	0.42		
Kv4715b	V4715				1.55	0.84
K5714a	V5713				0.44	0.62
Kv5711a	V5712				3.87	0.47
K5623a	V5626		0.45	0.03		
K5728a	V5725				14.61	2.09
Kv4602a	V4603		1.62	0.4		
Kv4625a	V4625		0.36	0.12		
K4717b	V4720		0.42	0.17		
K5719b	V5718				0.45	0.54
Kv5719c	V5718				0.61	0.21
Kv5733a	V5734				1.26	0.48
K6819a	V6725				0.85	1.29
Kv5734ab	V5734A				0.62	0.71

19 Feb 97
RMC.

Table above is summary.

Raw data from K. Mullaney's $^{40}Ar/^{39}Ar$ ages analyses from Univ of Maine at Orono.

DMC 19 Feb 97

°C	$^{40}Ar/^{39}Ar$	$^{37}Ar/^{39}Ar$	$^{36}Ar/^{39}Ar$	MOLES $^{39}Ar^*$	%TOTAL ^{39}Ar	% RAD ^{40}Ar	K/Ca	AGE (Ma)
		KV6802C				J =	.006266	
670	2.64	0.9757	0.0084	131.0	12.1	7.9	0.502	2.35 ± 0.43
785	1.19	0.9797	0.0038	205.8	19.0	11.7	0.500	1.58 ± 0.16
880	0.91	1.0358	0.0030	161.9	15.0	8.3	0.473	0.86 ± 1.27
975	0.84	1.1333	0.0026	122.5	11.3	16.0	0.432	1.52 ± 0.83
1055	0.94	1.4697	0.0030	105.7	9.8	16.9	0.333	1.78 ± 0.65
1130	1.12	2.5656	0.0038	159.8	14.8	15.5	0.191	1.97 ± 0.35
FUSE	1.71	4.6128	0.0065	195.4	18.1	8.1	0.106	1.57 ± 0.40
TOTAL				1082.0	100.0			1.63 ± 0.55
PLATEAU AGE								1.71 ± 0.42
		KV4715B				J =	.006523	
670	5.33	2.8589	0.0182	49.3	7.9	3.0	0.171	1.90 ± 1.55
785	1.19	2.1209	0.0042	200.8	32.3	8.2	0.231	1.14 ± 0.35
880	0.87	2.8642	0.0034	181.6	29.2	7.8	0.171	0.80 ± 0.47
975	0.92	4.1135	0.0036	102.1	16.4	17.7	0.119	1.92 ± 2.06
1090	0.77	2.6123	0.0024	59.9	9.6	33.9	0.187	3.07 ± 0.65
FUSE	4.38	41.9800	0.0249	27.7	4.5	8.0	0.011	4.26 ± 1.45
TOTAL				621.5	100.0			1.55 ± 0.84
		K5714A				J =	.006508	
660	8.69	1.3578	0.0291	69.6	7.8	2.0	0.361	2.02 ± 1.16
785	1.73	1.5874	0.0061	261.9	29.4	0.9	0.308	0.19 ± 0.50
880	1.28	1.8540	0.0048	263.2	29.5	0.1	0.264	0.02 ± 0.37
975	1.43	2.3693	0.0053	140.5	15.8	3.2	0.206	0.55 ± 0.88
1050	1.95	3.0922	0.0071	69.7	7.8	4.0	0.158	0.92 ± 0.69
1130	3.24	3.6029	0.0118	32.6	3.7	1.0	0.136	0.37 v 0.75
FUSE	4.34	23.6980	0.0208	53.9	6.0	1.6	0.020	0.82 ± 0.84
TOTAL				891.3	100.0			0.44 ± 0.62

Raw data from K. Mullaney's 40Ar/39Ar ages analyses from Univ of Maine at Orono.

DMC 19 Feb 97

°C	$^{40}Ar/^{39}Ar$	$^{37}Ar/^{39}Ar$	$^{36}Ar/^{39}Ar$	MOLES $^{39}Ar^*$	%TOTAL ^{39}Ar	% RAD ^{40}Ar	K/Ca	AGE (Ma)
		KV5711A				J =	.006508	
660	7.89	1.8390	0.0261	72.6	7.8	4.0	0.266	3.66 ± 0.80
785	1.73	1.6113	0.0056	278.0	29.8	11.6	0.304	2.37 ± 0.19
880	1.22	1.6788	0.0037	236.5	25.4	19.8	0.292	2.84 ± 0.27
975	1.43	1.9244	0.0040	129.8	13.9	26.3	0.254	4.43 ± 0.61
1050	2.15	2.7304	0.0061	74.1	7.9	26.2	0.179	6.62 ± 1.18
1130	2.98	3.3259	0.0085	43.4	4.6	23.7	0.147	8.28 ± 2.15
FUSE	3.49	21.1550	0.0157	98.4	10.5	14.5	0.023	6.03 ± 0.09
TOTAL				932.7	100.0			3.87 ± 0.47
		K5623A				J =	.006409	
660	5.84	0.3504	0.0196	81.9	5.6	0.8	1.398	0.55 ± 1.19
785	1.41	0.9339	0.0048	330.1	22.4	2.8	0.524	0.46 ± 0.47
880	0.84	1.0116	0.0029	413.4	28.0	4.7	0.484	0.45 ± 0.17
975	0.68	1.1731	0.0024	368.9	25.0	5.5	0.417	0.43 ± 0.30
1050	1.11	1.6401	0.0041	212.6	14.4	1.4	0.298	0.18 ± 0.23
FUSE	1.64	2.2661	0.0060	69.1	4.7	2.0	0.216	0.38 ± 2.03
TOTAL				1476.1	100.0			0.41 ± 0.42
PLATEAU AGE								0.45 ± 0.03
		K5728A				J =	.006409	
660	29.97	1.4922	0.0994	72.1	9.7	2.3	0.328	7.88 ± 2.22
785	6.65	1.5196	0.0221	169.1	22.8	3.4	0.322	2.62 ± 0.36
880	4.36	9.9980	0.0099	183.7	24.7	50.8	0.049	25.60 ± 3.40
975	16.07	2.4108	0.0523	119.4	16.1	4.8	0.203	8.99 ± 1.15
1050	25.83	2.8944	0.0832	81.9	11.0	5.6	0.169	16.81 ± 1.59
1130	45.73	3.4991	0.1481	58.1	7.8	4.8	0.140	25.52 ± 5.14
FUSE	34.40	18.8420	0.1155	58.5	7.9	5.1	0.026	20.59 ± 2.45
TOTAL				742.7	100.0			14.61 ± 2.09

Raw data from K. Mullaney's 40Ar/39Ar ages analyses from Univ of Maine at Orono

DMC 19 Feb 97

°C	$^{40}Ar/^{39}Ar$	$^{37}Ar/^{39}Ar$	$^{36}Ar/^{39}Ar$	MOLES $^{39}Ar*$	%TOTAL ^{39}Ar	% RAD ^{40}Ar	K/Ca	AGE (Ma)
		KV4602A				J =	.006533	
660	5.81	1.1938	0.0191	120.2	8.9	4.0	0.410	2.76 ± 0.75
785	2.47	1.0420	0.0082	210.7	15.7	4.2	0.470	1.22 ± 0.35
880	1.44	1.0723	0.0049	228.4	17.0	4.4	0.457	0.75 ± 0.34
975	1.15	1.2786	0.0038	207.0	15.4	10.4	0.383	1.41 ± 0.76
1130	1.11	1.5715	0.0036	384.8	28.6	12.6	0.311	1.66 ± 0.82
1130	1.16	1.9519	0.0039	81.2	6.0	13.2	0.251	1.80 ± 1.04
FUSE	2.29	5.2536	0.0085	112.1	8.3	7.4	0.093	2.02 ± 0.35
TOTAL				1344.3	100.0			1.53 ± 0.62
PLATEAU AGE								1.62 ± 0.40
		K4625A				J =	.006364	
500	4.55	1.3719	0.0147	16.6	1.0	6.3	0.357	3.28 ± 1.04
665	1.51	1.4511	0.0052	834.1	48.6	4.8	0.337	0.84 ± 0.46
775	0.55	1.2515	0.0020	226.1	13.2	6.3	0.391	0.40 ± 0.40
870	0.54	1.4279	0.0021	174.7	10.2	4.5	0.343	0.28 ± 0.94
950	0.62	1.6772	0.0024	114.9	6.7	4.5	0.292	0.32 ± 0.39
1060	0.81	2.2349	0.0031	107.7	6.3	4.4	0.219	0.41 ± 0.48
1080	0.85	5.6998	0.0042	100.9	5.9	4.3	0.086	0.42 ± 1.43
FUSE	0.76	9.7441	0.0049	142.4	8.3	8.9	0.050	0.78 ± 0.61
TOTAL				1717.5	100.0			0.66 ± 0.57
PLATEAU AGE								0.36 ± 0.12
		K4717B				J =	.006246	
500	1.59	1.6383	0.0052	47.1	5.2	10.6	0.299	1.90 ± 0.45
655	0.59	1.5242	0.0022	221.4	24.5	5.6	0.321	0.37 ± 0.31
775	0.44	1.8324	0.0018	238.8	26.5	10.3	0.267	0.51 ± 0.55
870	0.48	2.0377	0.0020	156.5	17.3	6.7	0.240	0.36 ± 0.39
950	0.57	2.3565	0.0022	103.7	11.5	12.9	0.208	0.83 ± 0.23
1060	0.72	3.4012	0.0032	73.9	8.2	3.5	0.144	0.28 ± 0.62
FUSE	1.00	13.5300	0.0068	61.0	6.8	3.0	0.036	[illegible]
TOTAL				902[illegible]	[illegible]			[illegible]
PLATEAU AGE								[illegible]

"Raw data from K. Mullaney's 40Ar/39Ar ages analyses from Univ of Maine at Orono.

DWC 19 Feb 97

°C	$^{40}Ar/^{39}Ar$	$^{37}Ar/^{39}Ar$	$^{36}Ar/^{39}Ar$	MOLES $^{39}Ar^*$	%TOTAL ^{39}Ar	% RAD ^{40}Ar	K/Ca	AGE (Ma)
		K5719B				J =	.006246	
500	1.59	1.6383	0.0052	431.9	5.2	10.2	0.299	1.83 ± 0.58
655	0.59	1.5254	0.0023	2031.3	24.5	3.8	0.321	0.26 ± 0.14
705	0.44	1.8324	0.0018	2190.5	26.5	10.3	0.267	0.51 ± 0.55
870	0.48	2.0377	0.0020	1435.9	17.3	3.2	0.240	0.18 ± 0.63
950	0.57	2.3584	0.0023	951.0	11.5	11.6	0.207	0.75 ± 0.37
1060	0.72	3.4012	0.0032	677.7	8.2	2.1	0.144	0.17 ± 0.87
FUSE	1.00	13.5300	0.0068	560.0	6.8	3.0	0.036	0.34 ± 1.53
TOTAL				8278.3	100.0			0.45 ± 0.54
		KV5719C				J =	.006255	
500	6.83	0.5875	0.0223	28.0	1.7	3.9	0.834	2.99 ± 0.83
655	1.42	0.8898	0.0048	160.3	9.5	3.9	0.550	0.62 ± 0.31
775	0.59	1.0803	0.0020	331.4	19.6	11.1	0.453	0.74 ± 0.26
870	0.42	1.1172	0.0016	372.2	22.0	7.4	0.438	0.35 ± 0.11
950	0.43	1.0874	0.0016	184.3	10.9	6.2	0.450	0.30 ± 0.22
1060	0.41	1.0835	0.0014	204.9	12.1	17.3	0.452	0.81 ± 0.17
1180	0.45	1.5658	0.0018	171.2	10.1	7.9	0.313	0.40 ± 0.06
FUSE	0.48	2.7962	0.0021	242.5	14.3	13.8	0.175	0.75 ± 0.30
TOTAL				1 694.8	100.0			0.61 ± 0.21
		KV5733A				J =	.006365	
500	1.83	2.1140	0.0061	80.9	11.2	9.3	0.231	1.96 ± 0.35
655	1.25	2.1057	0.0043	91.8	12.7	10.0	0.232	1.44 ± 0.37
775	0.63	2.1096	0.0023	164.1	22.8	17.0	0.232	1.23 ± 0.42
870	0.69	2.2492	0.0026	146.1	20.3	10.6	0.218	0.84 ± 0.23
1060	0.90	2.9000	0.0034	78.5	10.9	10.5	0.169	1.09 ± 0.32
1180	1.25	5.7205	0.0055	63.7	8.8	5.2	0.085	0.75 ± 0.55
1290	1.70	9.4517	0.0078	48.0	6.7	8.3	0.051	1.64 ± 0.28
FUSE	2.73	20.6710	0.0143	47.8	6.6	5.3	0.023	1.70 ± 2.17
TOTAL				720.9	100.0			

Raw data from K. Mullanys 40Ar/39Ar age analyses from Univ of Maine at Orono.

DMC 19 Feb 97

°C	$^{40}Ar/^{39}Ar$	$^{37}Ar/^{39}Ar$	$^{36}Ar/^{39}Ar$	MOLES ^{39}Ar*	%TOTAL ^{39}Ar	% RAD ^{40}Ar	K/Ca	AGE (Ma)
		K5719B				J =	.006246	
500	1.59	1.6383	0.0052	431.9	5.2	10.2	0.299	1.83 ± 0.58
655	0.59	1.5254	0.0023	2031.3	24.5	3.8	0.321	0.26 ± 0.14
705	0.44	1.8324	0.0018	2190.5	26.5	10.3	0.267	0.51 ± 0.55
870	0.48	2.0377	0.0020	1435.9	17.3	3.2	0.240	0.18 ± 0.63
950	0.57	2.3584	0.0023	951.0	11.5	11.6	0.207	0.75 ± 0.37
1060	0.72	3.4012	0.0032	677.7	8.2	2.1	0.144	0.17 ± 0.87
FUSE	1.00	13.5300	0.0068	560.0	6.8	3.0	0.036	0.34 ± 1.53
TOTAL				8278.3	100.0			0.45 ± 0.54
		KV5719C				J =	.006255	
500	6.83	0.5875	0.0223	28.0	1.7	3.9	0.834	2.99 ± 0.83
655	1.42	0.8898	0.0048	160.3	9.5	3.9	0.550	0.62 ± 0.31
775	0.59	1.0803	0.0020	331.4	19.6	11.1	0.453	0.74 ± 0.26
870	0.42	1.1172	0.0016	372.2	22.0	7.4	0.438	0.35 ± 0.11
950	0.43	1.0874	0.0016	184.3	10.9	6.2	0.450	0.30 ± 0.22
1060	0.41	1.0835	0.0014	204.9	12.1	17.3	0.452	0.81 ± 0.17
1180	0.45	1.5658	0.0018	171.2	10.1	7.9	0.313	0.40 ± 0.06
FUSE	0.48	2.7962	0.0021	242.5	14.3	13.8	0.175	0.75 ± 0.30
TOTAL				1 694.8	100.0			0.61 ± 0.21
		KV5733A				J =	.006365	
500	1.83	2.1140	0.0061	80.9	11.2	9.3	0.231	1.96 ± 0.35
655	1.25	2.1057	0.0043	91.8	12.7	10.0	0.232	1.44 ± 0.37
775	0.63	2.1096	0.0023	164.1	22.8	17.0	0.232	1.23 ± 0.42
870	0.69	2.2492	0.0026	146.1	20.3	10.6	0.218	0.84 ± 0.23
1060	0.90	2.9000	0.0034	78.5	10.9	10.5	0.169	1.09 ± 0.32
1180	1.25	5.7205	0.0055	63.7	8.8	5.2	0.085	0.75 ± 0.55
1290	1.70	9.4517	0.0078	48.0	6.7	8.3	0.051	1.64 ± 0.28
FUSE	2.73	20.6710	0.0143	47.8	6.6	5.3	0.023	1.70 ± 2.17
TOTAL				720.9	100.0			

Raw data from K. [illegible] $^{40}Ar/^{39}Ar$ ages analyzes from Univ of Maine at Orono.

[illegible] 19 Feb 97

°C	$^{40}Ar/^{39}Ar$	$^{37}Ar/^{39}Ar$	$^{36}Ar/^{39}Ar$	MOLES ^{39}Ar*	%TOTAL ^{39}Ar	% RAD ^{40}Ar	K/Ca	AGE (Ma)
	K6819A					J =	.006263	
350	11.65	1.3582	0.0394	313.5	2.5	0.9	0.360	1.15 ± 7.45
575	4.69	1.3762	0.0157	567.6	4.5	2.9	0.356	1.55 ± 1.29
720	1.88	1.0938	0.0063	1305.3	10.4	4.2	0.448	0.89 ± 0.47
810	0.97	0.9948	0.0034	2164.3	17.3	3.2	0.492	0.34 ± 1.50
890	0.74	1.0570	0.0024	2408.9	19.2	11.4	0.463	0.95 ± 0.21
980	0.75	1.2499	0.0026	1813.5	14.5	9.5	0.392	0.81 ± 0.74
1040	0.89	1.5197	0.0032	1246.8	9.9	3.3	0.322	0.33 ± 0.98
1110	1.12	1.8175	0.0037	867.4	6.9	12.9	0.269	1.63 ± 3.90
1200	1.47	2.4788	0.0055	674.1	5.4	2.6	0.197	0.43 ± 2.79
FUSE	2.57	7.0049	0.0101	1170.0	9.3	4.8	0.070	1.39 ± 0.77
TOTAL				12531.4	100.0			0.85 ± 1.29
	KV5734AB					J =	.006247	
500	3.78	1.6959	0.0129	523.4	8.7	2.2	0.289	0.93 ± 1.30
655	1.49	1.7979	0.0051	1159.0	19.3	6.8	0.272	1.15 ± 0.85
775	0.94	2.7014	0.0037	1541.5	25.6	4.0	0.181	0.42 ± 0.19
870	0.98	2.9259	0.0039	1042.5	17.3	3.4	0.167	0.37 ± 0.38
950	1.05	3.1876	0.0041	727.7	12.1	8.1	0.153	0.96 ± 1.10
1060	1.16	3.4260	0.0048	535.6	8.9	0.3	0.143	0.03 ± 0.92
1120	1.37	3.7724	0.0055	473.9	7.9	1.6	0.130	0.24 ± 1.25
FUSE	1.64	8.3481	0.0073	9.5	0.2	7.7	0.058	1.43 ± 1.02
TOTAL				6013.1	100.0			0.62 ± 0.71

* x $5E^{-14}$

Stratigraphic queries in ~~SR~~ SP Cluster: the purpose of which is to ID vents that, once dated, provide the greatest [illegible] in [illegible] per ~~page~~ date

Cone Morphology -- relatively intact to more commonly greatly modified (I.e, V5831, V 4625)
vegetation -- generally well vegetated
Drainage about base -- significant to minor

Lava flows
Flow Margin -- occ. distinct and well-defined to poorly defined and indistinct
Flow surface -- generally smooth, occ rough, typ cut by drainage and contain drainage along length
Vegetated -- typically well-vegetated.

*Age of 220 ka for V5831 is highly suspect, this cone is probably nearer 400 ka in age based on morphological and morphomet considerations. V5831 is not considered in calculating morphometric statistics.

<u>Dated Cones erupted from about 650 to 400 ka</u>

Includes: V3835, V3018, V5626 (Miss. bill hill), V4624
Basal Elevation Range -- 7850-5900 (avg. elevation 6858)
Avg. Cone Ht/Width Ratio = 0.137
Crater width to cone width ratio (2 cones) = 0.347
Avg. Max. Slope = 22
2 vents examined on aerial phots (V5626 & V4624); the vents are morphologically quite different --

	V5626	V4624
Cone degradation --	moderate	high
Crater Rim --	rounded	eroded non-existant
Crater infill --	pbl major but crater still intact	Fill complete
Rilling --	Ubiq	Ubiq
Channels or Gullies --	Common and broad N-NW	Cut ax cone
Cone Morphology --	Intact but modified	Highly modified and sculpted
vegetation --	Both cone vegetated	
Drainage about base --	Minor	Minor
Associated Lava flows		
Flow Margin --	gen. distinct	indistinct
Flow surface --	smooth	rough? -secondary
Vegetated --	vegetated	vegetated

Vent 5626 clearly much younger than V4624 in good accord with ages

<u>Dated Cones erupted from about 700 to 900</u>

Includes: Red Mtn, Mesa butte, V6713, V6725
Basal Elevation Range -- 6900to 5800 (avg. elevation 6212)
Avg. Cone Ht/Width Ratio =0.118
Crater width to cone width ratio -- no craters intact
Avg. Max. Slope = 22.6

Cone degradation -- moderate to highly degraded
Crater Rim -- generally non-existant and breached and modifed where it exists
Crater infill -- no primary crater left
Rilling -- Ubiq Ubiq
Channels or Gullies -- Common and abundant and cut ax cone
Cone Morphology -- always modified and range from rel. intact to destroyed
vegetation -- minor to heavily vegetated (Red Cone_
Drainage about base -- common but minor cutting of cone base -- drainage on cone base abundant
Aprons -- generally more extensive than younger cones

Associated Lava flows
Flow Margin -- distinct (where superpos. on Kaibab) to indistinct
Flow surface --typ smooth but rough on thick Red Mtn. cone
Vegetated -- minor to heavily

[illegible] 1997 SMC

Stratigraphic queries in ~~SA~~ SP Cluster: the purpose of which is to ID vents that, once dated, provided the greatest ... in ... per ~~page~~ date

Morphologic and Morpometric Characteristics of Cinder cones

We bracketed cinder cones of the SFVF into several distinct age groups using a floating 100-200 ka window, on the basis of radiometric ages, volcanic stratigraphy, morphometric data, and morphology (Table (age-bracket criteria). Pre-existing radiometric ages of volcanics are sparse in the SFVF, but we recently bolstered these ages with new high-precision ages from vents distributed widely thoughout the SP cluster and from the nearby Mesa Butte vent alignment. Morphometric and morphologic factors from dated cones and lava flows were used to establish criteria for roughly bracketing ages of undated vents and lava flows. Morphometric factors include aspect ratio (cone height to average cone width), crater width to cone width, and maximum slope value as determined from at least 3 separate locations on the upper flanks of the cone above obvious cone apron facies. Morphologic characteristics factored into age bracketing include: cone condition (I.e. extend and degree of erosional modification), extent of rilling and gullying of cone slopes, crater conditions (I.e., infilling, crater rim deterioration, erosional breaching), condition of associated lava flows (whether flow contacts are sharp and distinct, flow surface roughness, presence of drainages on flows, extent of vegetation, etc.).

__Dated Cones erupted over past 200 ka__

Includes: Sunset Crater, Vent 4626*, SP Crater, V5734a, Merriam Crater, Strawberry Crater
Basal Elevation Range -- 8100 to 5600 m (Avg. Elevation = 6675)
Avg. Cone Ht/Width ratio = 0.179
Avg. Crater Wdth/Cone Width = 0.234
Avg. Max Slope = 30.6

__Observations from aerial photos (1:80,000)__

Cone degradation -- generally low to non-existant
Crater Rim -- sharp and well-defined to slightly rounded & well defined, unbreached
Crater infill -- apparently minor - crater is intact on all cones
Rilling -- non-existant to minor rilling on NW slopes of V4626
Channels or Gullies -- non-existant
Cone Morphology -- generally observed intact with only minor erosional modification.
vegetation -- minor to moderately vegatated to well vegetated (V4626)
Drainage about base -- minor to non-existant

Associated Lava Flows:
Flow Margin -- sharp and distinct
Individual lobes -- easily discerned
Flow surface -- Very rough, flow ridges apparent in large lava flow units
Drainage on Flows -- Rare
Vegetated -- typically minor, V4626 is highly vegetated.

*V4626 appears older than the 16 ka age cited by Tanaka et al.

__Dated Cones erupted from about 200 ka to 400 ka__

Includes: Shadow Mtn, V2019, V3022, V4720, V5831*, V4536, V4625
Basal Elevation Range -- 8050 to 6300 m, (Avg. elevation = 6900 m)
Avg. Cone Ht/Width Ratio = 0.126
Crater width to cone width ratio (3 cones) = 0.174
Avg. Max. Slope = 23.6

Cone degradation -- Moderate to high
Crater Rim -- rounded to breached or non-existant
Crater infill -- major infill to complete and no crater
Rilling -- ubiq.
Channels or Gullies -- ubiq. on lower and upper slopes, large broad gullies
Cones occ. sculpted

20 Feb 1997 SMC.

Stratigraphic queries in ~~SFF~~ SP Cluster: the purpose of which is to ID vents that, once dated, provided the greatest ensuing in few per ~~page~~ data

STRATIGRAPHIC QUERIES IN THE SFVF

Last Revised 17 August 1996

V5733 & V5725F in T25N, R8E, Sec 29 -- 5725 flow appears fresher with more easily distinquished flow margins and obvious flow features (I.e., pressure ridges)

Analysis: Examining the 1:40,000 aerial photos show that flow from 5725f has a fresher appearance then 5733f. Moreover, 5725f course apparently determined by pre-existing 5733f.

V5713F & V5712F T25N, R8E, sec13 -- visit west side of 5713 to examine contact of 5713F with V5712.

Analysis: Examining the 1:40,000 aerial photos shows that V5712 > V5713 > V 5725, so of these 3 vents there is a clear younging trend to the south.

Collect sample: From middle vent lava flow V5713.

V3705 Flow petrography (optional - just curious)

Visit Indian Flat Area and ascertain Re. Age (Merriam Assign.) of V4710, V4715A, V4715C & V4714, too. Also check lava pile just south of V4711, which are mapped as 4711f, for possible vent structures.

Visit Antelope Hill and check strat relship bet V5718 & V4708F.

V4717F and V4720F, sec 17 -- establish age relship between flows; aerial photo provide little information here and perhaps an impossible task, but in middle of highland vents so little time lost.

Visit Merriam age V5734 series and pay especial attention to V5734G (Qbmb) (petro and vent condition), it looks to be same age as V5734 Series vents.

Visit several dated cones, notably Antelope Hill;

- Vent 5831
- Vent 4625
- Vent 4720
- Vent 6736
- Strawberry Crater (e of HY 89).

to examine the cones and summarize features that influence criteria used for comparion with other cones; notably % agglutinate in crater walls, presence of interbedded lava flows, presence of agglutinate along crater rim, etc.

Visit the "V" spatter cone and try to catalog it in some age group.

Vents Selected for Possible 40Ar/39Ar ages

V4708 -- provide further constraints on important age-window 200 to 450 ka. Could prove useful in constraining minimal age of Antelope Hill which yields a ? age of 600 +/- 100 ka.

V4726 -- provide further constraints on important age-window of 500 to 800 ka. Would also provide maximum age for V4723 and V 4723A. In addition, V4726 appears to be one of the oldest vents in the southern portion of the SP cluster.

V5733 -- This is one of most heavily dissected vents in the SP cluster uplands. Dating this vent could provide some constraints on maximum possible age of V4704, V5734G (I think), Vent 5831, and Vent 5725.

V5713 -- One of four vents, intermediate age, of similar size and apperance (I.e. penecontemporaneous). The other vents include: V5713, V5725, V5715 (Colton Crater). Either this vent or V5713 is an important vent to date. **Note**: C. Condit attempted to date V5712 unsuccessfully (3870 =/- 470 ka)

V5732 -- Probably emplaced between 150 to 350 ka. Clearly younger than V4708 and V4707 and thus would provide minimal age for these vents.

V4715C or V4714 (Qbb) -- Both vents are small and apparently well-weathered. Because they have no associated flows they provide few stratigraphic constraints. However, it is possible they are considerably older than surrounding vents in what is clearly a tight cluster of vents. If this is so dating one or both of these vents could provide minimal time constraints on the duration of activity in this cluster. We would need to confirm the apparently older age for these vents before considering dating one or both.

V5831 -- Dated by Damon et al. (1974) at 220 +/- 50 ka. On the basis of morphology and morphometry, it seems considerably older than 222 ka. This might help with minumum age for V5733, but otherwise would not be of much help. If redating yielded an older age, the results when coupled with the new, young age for the Tappan Wash flow that the K-Ar ages produced in the early 70's were of dubious quality. Probalby not reason enough for dating.

~~20 Aug~~ 1997 FMC

Stratigraphic queries in ~~SA~~ SP Cluster: the purpose of which is to ID vents that, once dated, provided the greatest [illegible] in [illegible] per ~~page~~ data

Dates cones erupted from 1000 ka to 1400 ka.

Includes: V5734; V6811; Chapel Mtn vents; V6736

Cone degradation -- highly degraded and dissected, typically only lava lake and agglutinate remains and commonly narrow, bifurcating dikes exposed on edifice.
Crater rim -- non-existant, totally destroyed
Gullying and rilling -- cones severely gullied and rilled
Drainage frequently undercut base
Aprons -- wide but strongly modifed and in some cases eroded away
These center frequently lack any fine cinders and only coarse dense scoria and bombs remain on the cone.

Lava flows --
Flow Margins -- indistinct
Flow surface -- smooth and covered by loose sediments aeolian sands etc.
Vegetated -- moderate to highly vegetated

[illegible] 1997 [illegible]

Notes from SP Cluster Field Trip: 19 August through 27 August

Purpose: To clarify stratigraphic relationships of vents and lava flow fields erupted in the SP Cluster of the San Francisco Volcanic Field.

Method: We visited Flagstaff, Az from 19 to 27 August and spent 7 days involved in fieldwork in the SP Cluster. One additional day was set aside to visit well-dated cinder cones in the eastern part of to determine whether these cones could be used along with dated cones of the SP Cluster to develop morphological-based age criteria.

Results: Field investigations involved visits to most of the vents and lava flow fields in the cluster. The SP Cluster comprises about 45 vents ranging in age from 1.7 Ma to 16 ka. The majority of vents are normally polarized and erupted during the Brunhes chron. Although exceptions exist -- notably the SP Cone and Vent 5735 --, the SP Cluster shows a general younging of vents southward from the north perimeter of the field.

During fieldwork, we were able to clarify stratigraphic relationships among a number of vents and lava flow fields. When combined with K-Ar ages and $^{40}Ar/^{39}Ar$ ages of dated vents, the result was a vastly improved volcanic stratigraphy for the SP Cluster (Fig. 1). Additionally, we identified areas where the volcanic stratigraphy was weakest and sampled, for future $^{40}Ar/^{39}Ar$ analysis, vents and lava flows in this area that would critically improve the stratigraphy. With an additional 5 high-precision $^{40}Ar/^{39}Ar$ ages ages, we believe that the stratigraphy of the SP cluster will be suitably well-established for testing probability models of volcanic vent emplacement trends.

Table 1. Vents considered critical for establishing needed stratigraphic control in the SP Cluster.

Vent	Clarification
V4626	Prev. dated at 16 ka (**Pbl.** may be too young)
V4710	1 of several pre_Merriam age vents
V4703	Provide constraints on V4711 and impt. addition for morphological analysis of undated cones.
V4708	Constrains min. age for V4707 & V4708a and V5732. Also important for morphological analysis.
V4726	Constrains max. age for V4625 -- impt stratigraphic marker --, V 4723, and V4723a
V5713	Provides max. and min. age constraints on V5725 and V5712, respectively.

21 Feb 97   [illegible]

SP Cluster basalts collected in the field
August 19, 1996

Dr. Chris Hall
Dept. of Geological Science
1066 CC Little Building
University of Michigan
Ann Arbor, MI 48109

Dear Chris:

Alex Halliday should have P.O.s in hand for analyzing both the San Francisco volcanic field (SFVF) basalts and the Yucca Mountain pumice. So I've enclosed the hand samples: five basalts from the SP Mountain vent cluster of the San Francisco field, and one sample from a reworked pumice fall deposit in Crater Flat. The pumice sample (72696-5) was previously dated at ≈ 6.3 Ma by zircon fission track. There is some rather ambiguous stratigraphic evidence that makes us question the validity of this date.

As per our discussion, and as noted on the P.O., analysis of the pumice fall deposit includes sample preparation and hand-picking sanidine phenocrysts. I got my first look at the sample today and was singularly impressed with the crystal-poor nature of the pumice. Feel free to call should you need more sample! This sample is rather precious, so please save any uncrushed sample as well as the pulp for return to us. We would, of course, like to see all the results as soon as possible, but please give the Yucca Mountain pumice your highest priority.

The San Francisco basalts are generally fresh olivine basalts gathered from lava flows on or immediately adjacent to the vent. To the best of our knowledge, these samples represent vents that erupted during the Brunhes Normal Chron. The second page of this letter contains a brief description of each sample.

Lastly, I've enclosed a sixth basalt sample, SP-Crater, from the SFVF. This basalt was dated previously at 71 ± 4 ka by [1]Baski (1974). SP Crater is a pristine cinder cone (slopes ≈ 32°) and is one of the most photographed cones in the world appearing in many Physical Geology and Volcanology texts. A new Ar/Ar date for this cone would be of great interest to many scientists working on the southwestern Colorado Plateau. (I've been approached by 3 or 4 geologists and soil scientists from the USGS (Flagstaff) and Northern Arizona University about the importance of dating the cone). Unfortunately, we don't have the money for a new analysis, despite its rather strategic location at the heart of the 50 cinder cones comprising the SP Mountain vent cluster. Nonetheless, I urge you to date this rock if at all possible. If necessary, we could probably pay for irradiating the rock via some creative invoicing. Let me know what you think.

Good luck with the work and let me know if I can be of any help.

<u>Sample List of San Francisco Volcanic Field Basalts</u>:

MCBH 4708 -- Fine-grained olivine basalt. Basalt is unaltered and was collected from lava flow erupted from Vent 4708.
MCBH-4710 -- Microvesicular, sparsely porphyritic olivine basalt. Sample collected at Vent 4710
MCBH-4726 -- Very sparsely vesicular, porphyritic olivine basalt with rare plagioclase phenocrysts. Olivine is typically fresh but altered phenocrysts with a copperish tint are also observed. Sample collected at cliff-forming basalt lava flow erupted from Vent 4726.
MCBH-5713 -- Very sparsely porphyritic olivine basalt. Some alteration evident along shear planes that cut the rock. The mottled reddish color of some samples suggests deuteric alteration. Olivine phenocrysts are generally fresh and unaltered. Basalt sample collected at lava flow that issued from bocca on north end of Vent 5713.
MCBH - 4703 -- Vesicular olivine basalts with rare plagioclase xenocrysts (?). Amydules of calcite observed in some hand samples but rock is generally fresh in appearance and olivine phenocrysts are fresh and unaltered. Basalt collected from Vent 4703.
SP-Crater -- Black, glassy, sparsely porphyritic to aphanitic olivine basalt. Olivine crystals are brilliant green, clear, and unaltered. Collected from non-vesicular, agglutinate on rim of SP Crater.

<u>Yucca Mountain/Crater Flat Pumice</u>
72696-5 -- Phenocryst-poor, fresh and unaltered pumice. Supposedly, sanidine phenocryts occur at just less than 1 modal percent.

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1 Baski AK, K-Ar study of the SP flow: Canadian Journal of Earth Science, v. 11, no 10, p. 1350-1356, 1974.

TMc 23 Feb 97

Results of C Hall $^{40}Ar/^{39}Ar$ dating program in SP[illegible]

cc:Mail for: Mike Conway

Subject: SFVF basalts
From: cmhall@umich.edu at Internet 2/24/97 3:31 PM
To: Mike Conway at CNWRA
To: mconway@swri.edu at Internet

Mike:

I've done a marathon graphing session and have placed the data on my public access ftp directory. You should be able to use anonymous ftp (or Netscape) to access the files. The site address is hall.geo.lsa.umich.edu (using Netscape it's **ftp://hall.geo.lsa.umich.edu**).

1 FTP

The .out files are plain text and are the printout files from our primary data reduction program. The .cor files are also plain text and contain the results of fitting isochrons. The .hgl files are HPGL and the .dxf files are hpgl converted to autocad. I've also included postscript and encapsulated postscript (.ps and .eps) files, which are publication quality. You can print the .ps files raw on a postscript printer, or include the .eps files into a document for printing on a postscript printer. You probably won't see the files on the screen, but they should print.

The error estimates in the printouts are 1 sigma, but I've made them 2 sigma in the plots. Let me know if the plots work.

Chris

Chris M. Hall
Assistant Research Scientist
Dept. of Geological Sciences
University of Michigan
2534 C.C. Little Building
Ann Arbor, MI 48109-1063

e-mail: cmhall@umich.edu fax: 313-763-4690

FTP these.

cc:Mail for: Mike Conway

Subject: Re[2]: SFVF mcbh5713 isochron
From: cmhall@umich.edu at Internet 3/14/97 4:26 PM
To: Mike Conway at CNWRA
To: mconway@swri.edu at Internet

Mike:

There is no contradiction and the numbers on the plot are correct. The .out file is the print out from our standard data reduction program, which assumes that fractions are part of a step heating run. Normally that is correct, but not in this instance. Sample f5 consisted of a series of single grain total fusions at 5000 mW power each (hence the identical "temperatures"). The total gas age is what we would have got if we had run all 12 grains in one step. Remember, my programs always print 1 sigma errors, but on the plots I use 2 sigma in the text (1 sigma error boxes - there's a good reason for that which I won't bore you with now).

So the total gas age would be 9.03+/-.30 from the .out file. This assumes that the initial 40/36 ratio is EXACTLY 295.5, so this error esitmate is higher than for the isochron age (.cor file) where the initial ratio is allowed to vary. Note the plot's error is 2 sigma (twice the value in the .cor file).

If we did a weighted average (ignoring J error) for the 12 samples we'd get a weighted mean of 9.06 +/- .34 (2 sigma) MSWD= 1.58. But again this assumes 40/36 initial of 295.5.

Does this make sense (I put the .cor and .out files in the ftp directory again)?

We did things this way to check for xenocrystic contamination. There is no evidence for contamination by an older component.

Chris

Done 23 Feb 98

In <9702148583.AA858378318@smtp.cnwra.swri.edu>, on 03/14/97 at 12:12 PM, "Mike Conway" <mconway@swri.edu> said:

>Chris:

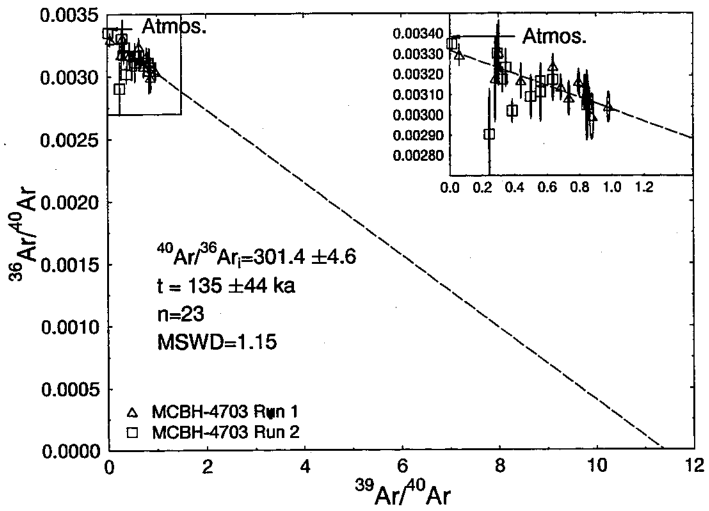
>Thanks! I got the plots. There seem to be some disagreement between the
>plots and the data (*.cor or out files). For instance, plot for 72696-5
>Feldspar gives a date of 9.24 =/- 0.87 Ma, while the .cor file for
>72696-5 gives a date of 9.02 +/- 1.50. That same file lists a single
>temp, 5.0000e3 for each heating increment! I'm lost that dosen't seem
>right.

>I apologize for being a nuisance, but could you drop the *.cor and *.out
>files onto your FTP site as well.

>Thanks,
>Mike

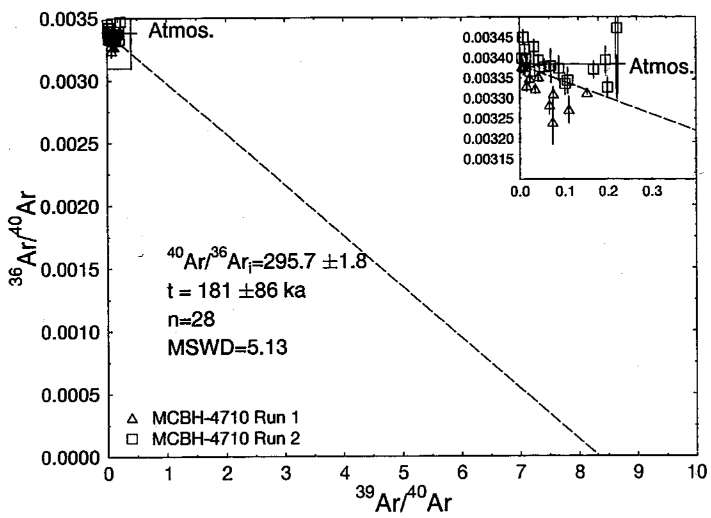
Isochron Plots

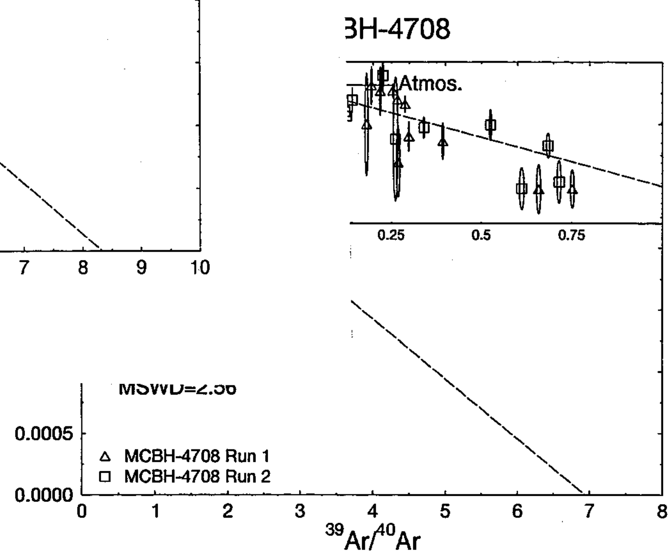
MCBH-4703



Isochron plots clearly more reliable than plateau diagrams according to C. Hall

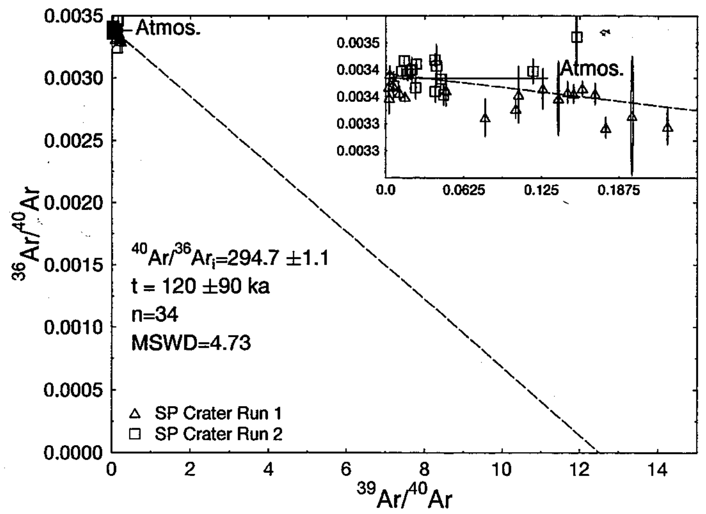
MCBH-4710





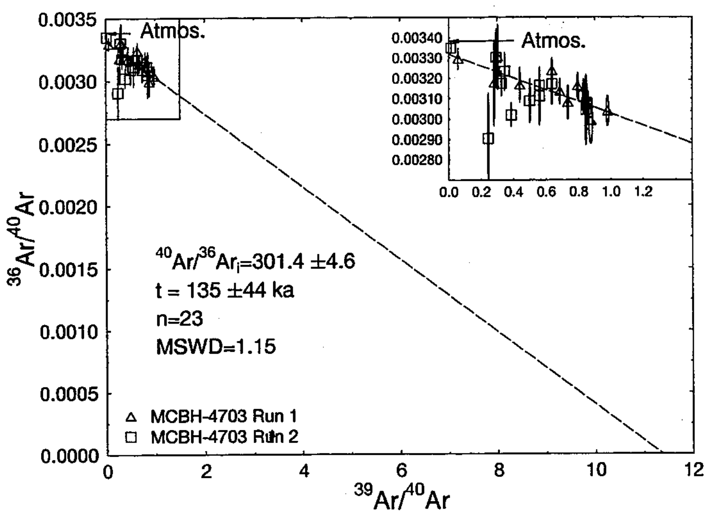
Isochron Plots
from C. Hall analyses
25 Feb 97

SP Crater



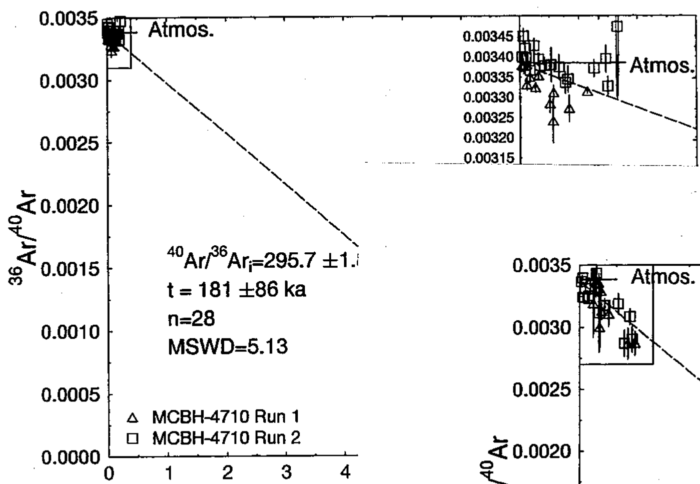
Isochron Plots

MCBH-4703

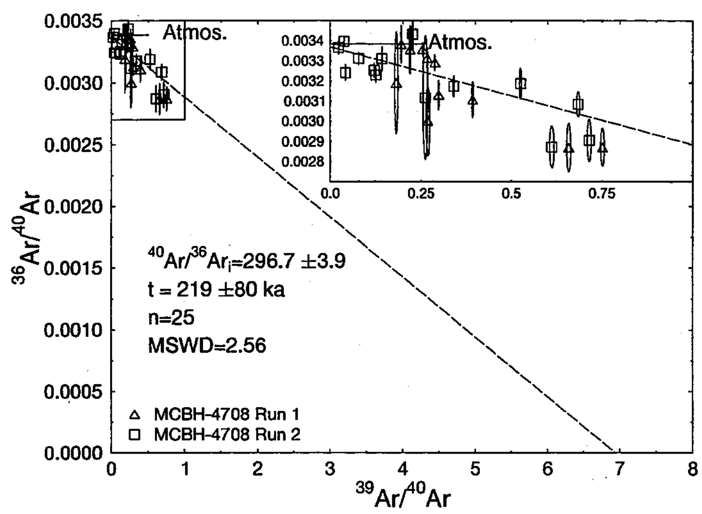


Isochron plots clearly more reliable than plateau diagrams according to C. Hall

MCBH-4710

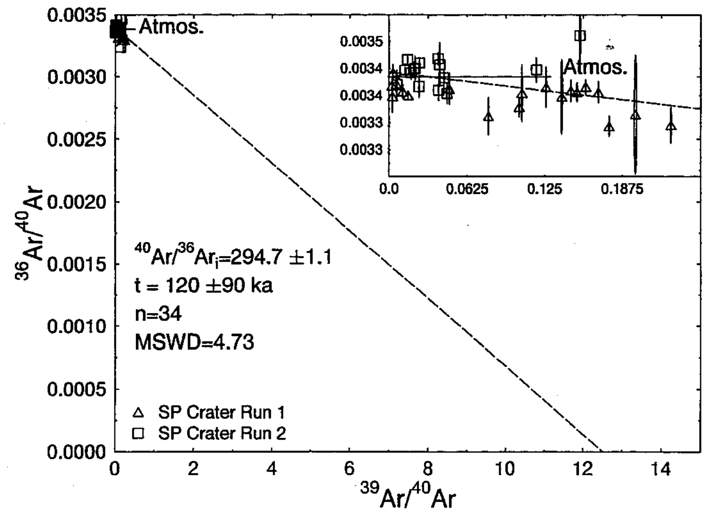


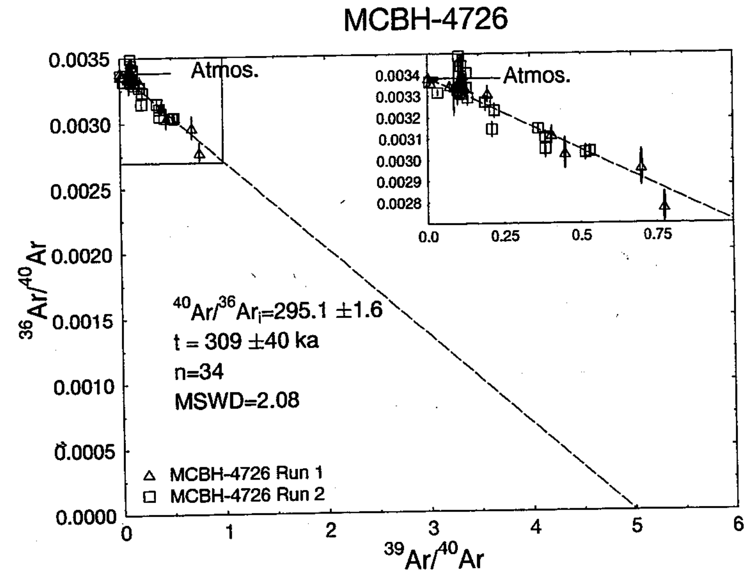
MCBH-4708

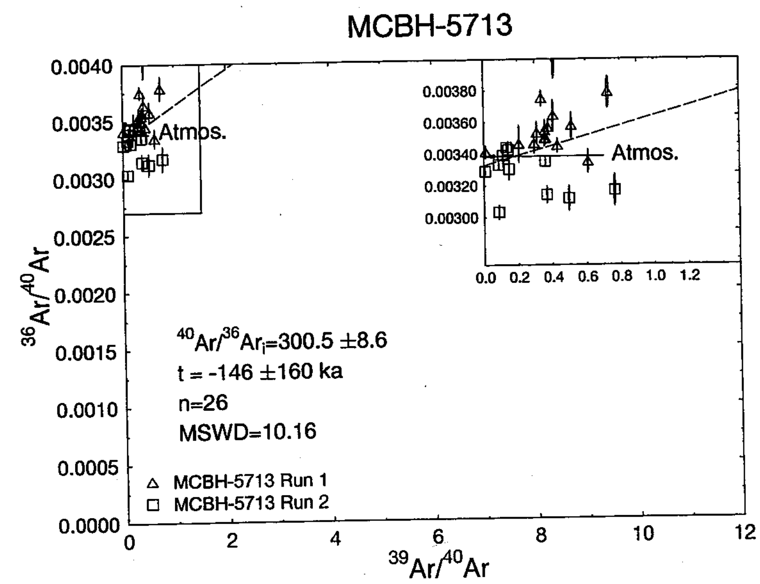


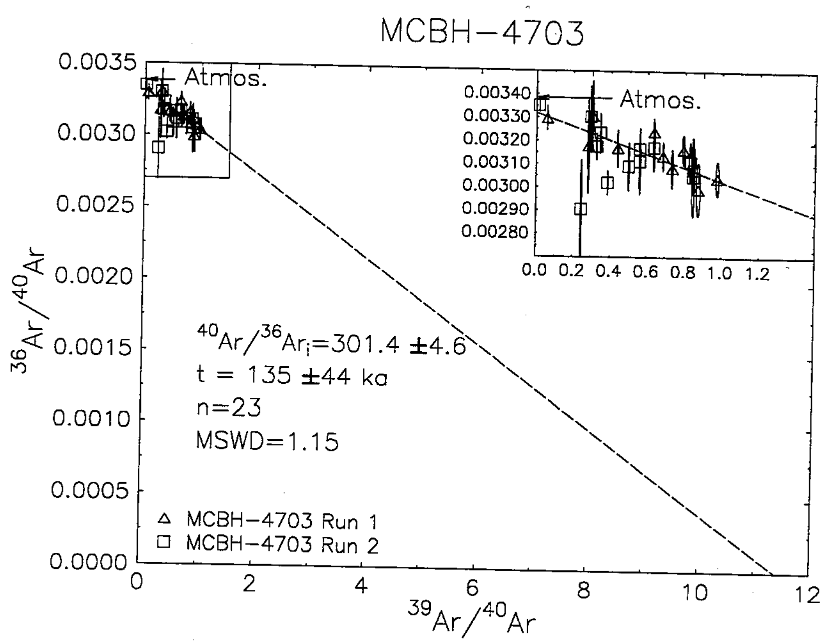
Isochron Plots
from C. Hall analyses
25 Feb 97

SP Crater

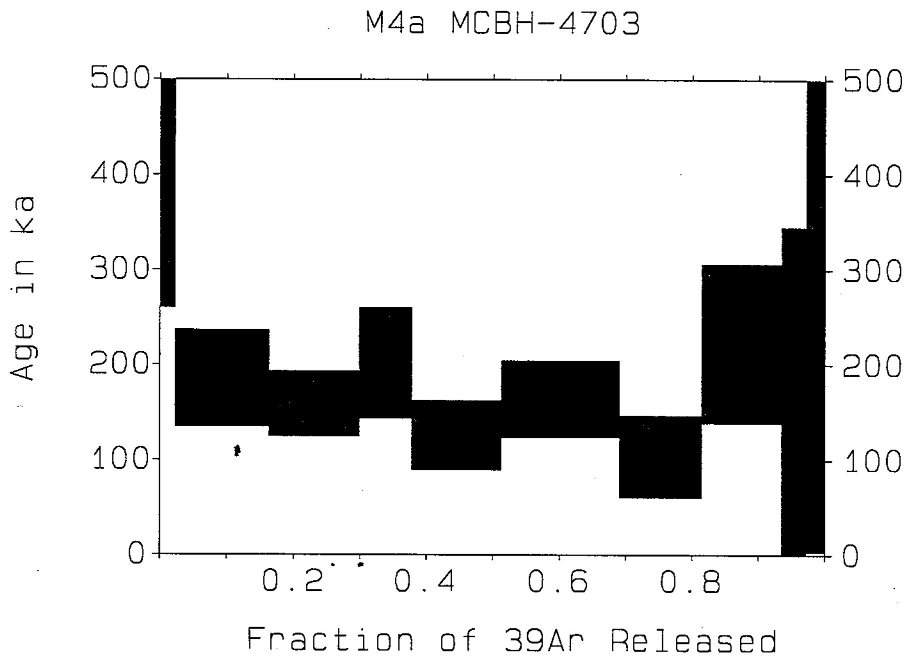



MCBH-4726
Atmos.
Atmos.
$^{40}Ar/^{36}Ar_i$=295.1 ±1.6
t = 309 ±40 ka
n=34
MSWD=2.08
MCBH-4726 Run 1
MCBH-4726 Run 2
$^{36}Ar/^{40}Ar$
$^{39}Ar/^{40}Ar$

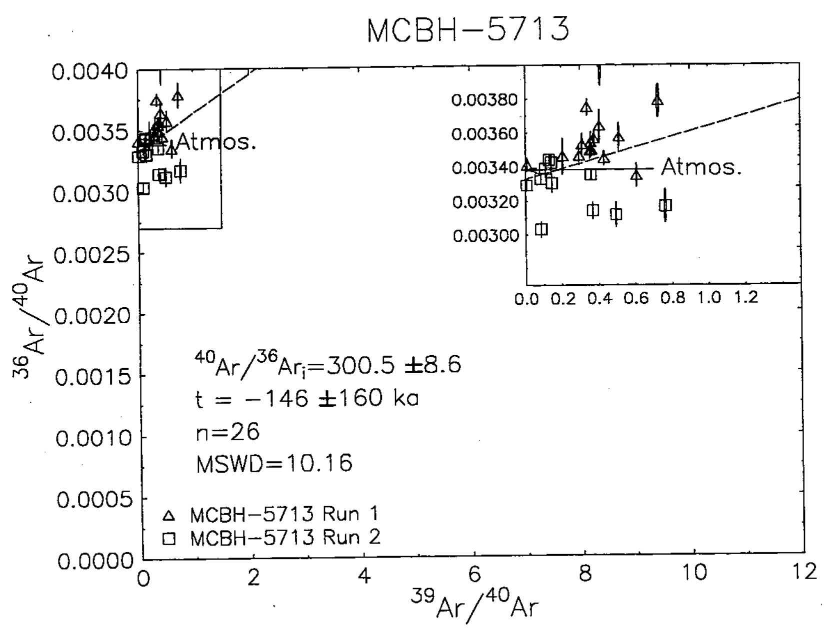

MCBH-5713
Atmos.
Atmos.
$^{40}Ar/^{36}Ar_i$=300.5 ±8.6
t = -146 ±160 ka
n=26
MSWD=10.16
MCBH-5713 Run 1
MCBH-5713 Run 2
$^{36}Ar/^{40}Ar$
$^{39}Ar/^{40}Ar$


MCBH-4703
Atmos.
Atmos.
$^{40}Ar/^{36}Ar_i$=301.4 ±4.6
t = 135 ±44 ka
n=23
MSWD=1.15
MCBH-4703 Run 1
MCBH-4703 Run 2
$^{36}Ar/^{40}Ar$
$^{39}Ar/^{40}Ar$

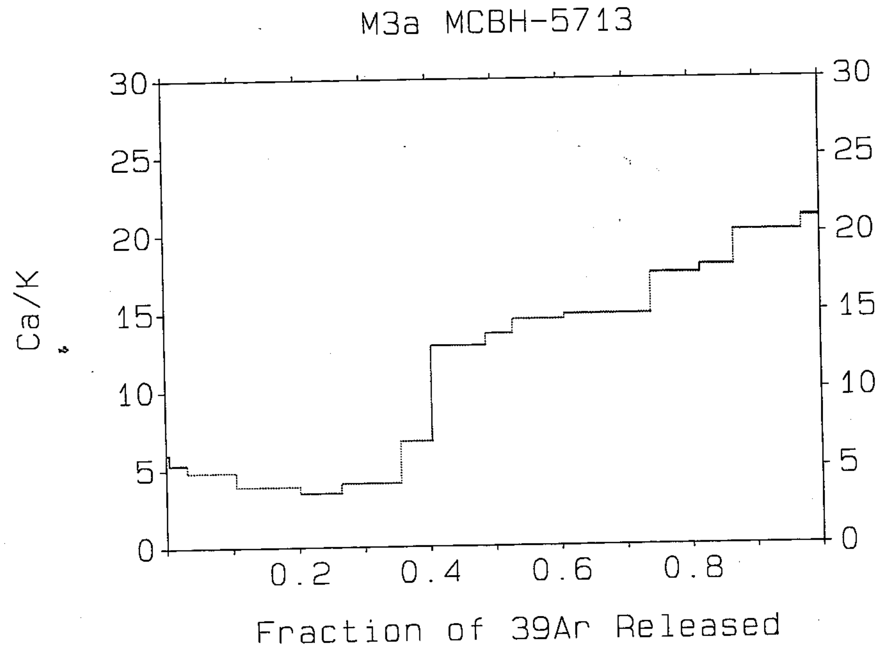
Plateau diagrams SP Cluster Basalts

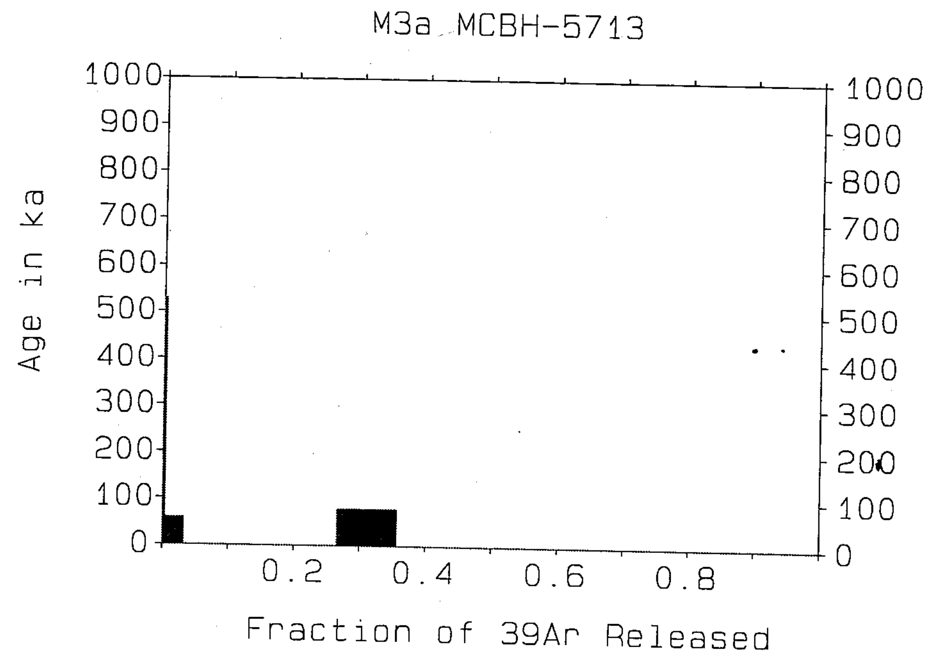


From Chris Hall analyses —

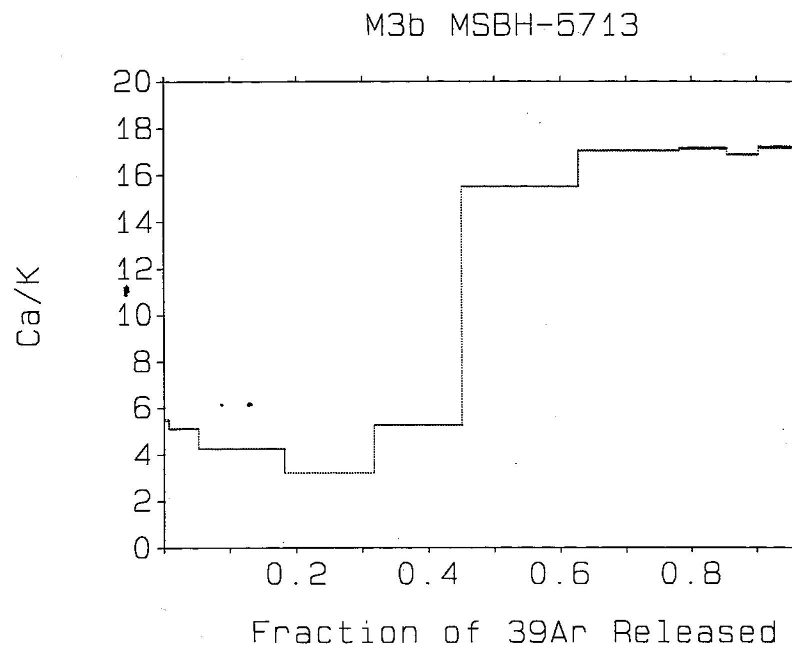


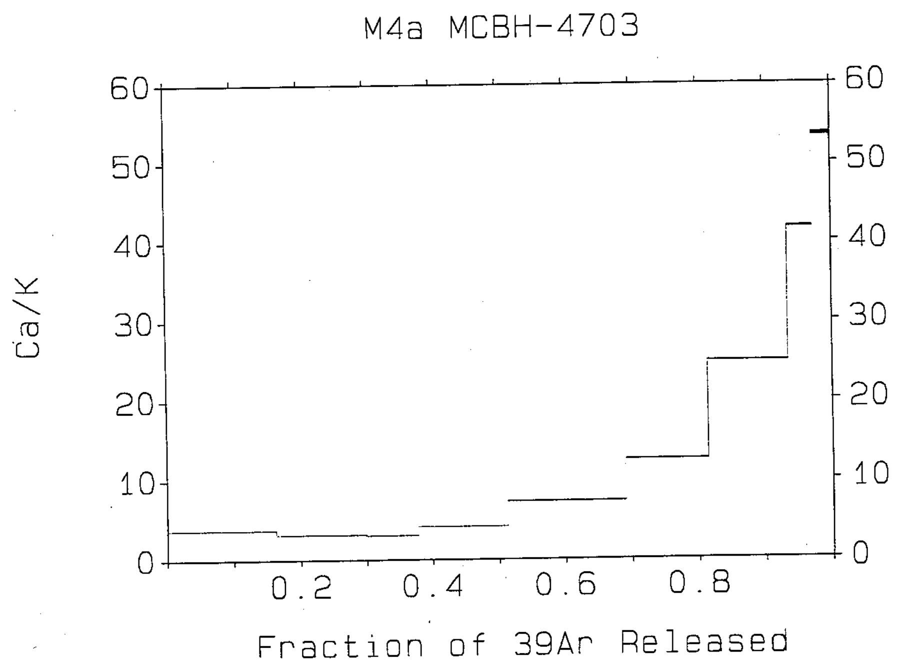
25 Feb 97 FMc


M3a MCBH-5713
Ca/K
30
25
20
15
10
5
0
0.2
0.4
0.6
0.8
Fraction of 39Ar Released


M3a MCBH-5713
Age in ka
1000
900
800
700
600
500
400
300
200
100
0
0.2
0.4
0.6
0.8
Fraction of 39Ar Released

25 feb 92


M3b MSBH-5713
Ca/K
Fraction of 39Ar Released
0.2 0.4 0.6 0.8
0 2 4 6 8 10 12 14 16 18 20


M4a MCBH-4703
Ca/K
Fraction of 39Ar Released
0.2 0.4 0.6 0.8
0 10 20 30 40 50 60

25 Feb 97.

m5b MCBH-4710 basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 8.35385E-04 +/- 2.58575E-06

STANDARDS NAME	F1	F2	40*/39K	+/-	AGE

m5a MCBH-4710 basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 8.35385E-04 +/- 2.58575E-06

STANDARDS NAME	F1	F2	40*/39K	+/-	AGE
J function	0.00000E+00	0.00000E+00	1.87169E+01	5.79341E-02	2.79900E+07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-
M5a-200 12-17-1	1.65869E-02	-9.46668E-04	-4.63120E-04	4.08000E-01	1.07928E+0
M5a-400 12-17-1	8.07323E-02	-1.37161E-03	-3.72416E-05	2.66927E-01	6.76769E-0
M5a-500 12-17-1	1.32528E-01	-1.82296E-03	1.44273E-03	1.02387E+00	2.89318E-0
M5a-600 12-17-1	1.83004E-01	-2.13842E-03	3.29698E-03	4.65792E-01	1.92668E-0
M5a-800 12-17-1	2.62564E-01	-2.57914E-03	7.83014E-03	5.15311E-01	1.06079E-0
M5a-1200 12-17-	3.59099E-01	-2.66263E-03	1.02121E-02	2.15871E-01	8.07633E-0
M5a-1800 12-17-	5.01370E-01	-2.66455E-03	1.81747E-02	4.42476E-01	1.02222E-0
M5a-2400 12-17-	6.16953E-01	-4.12208E-03	3.14697E-02	2.84660E-01	6.85666E-0
M5a-3600 12-17-	9.02271E-01	-4.46872E-03	6.99341E-02	1.36657E-01	8.93067E-0
M5a-5000 12-17-	9.78698E-01	-8.80787E-03	9.61277E-02	2.98480E-01	7.16911E-0
M5a-5001 12-17-	1.00000E+00	-1.79064E-02	1.22387E-01	5.69300E-01	2.22293E-0

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S
M5a-200 12-17-1	2.00000E+02	9.98191E+01	1.46052E+00	8.49362E-03	2.96035E+0
M5a-400 12-17-1	4.00000E+02	9.97746E+01	2.11612E+00	1.57696E-02	2.96168E+0
M5a-500 12-17-1	5.00000E+02	9.84272E+01	2.81246E+00	7.20292E-03	3.00222E+0
M5a-600 12-17-1	6.00000E+02	9.89772E+01	3.29915E+00	7.82452E-03	2.98554E+0
M5a-800 12-17-1	8.00000E+02	9.82091E+01	3.97910E+00	7.25295E-03	3.00889E+0
M5a-1200 12-17-	1.20000E+03	9.90909E+01	4.10791E+00	7.95768E-03	2.98211E+0
M5a-1800 12-17-	1.80000E+03	9.70250E+01	4.11087E+00	5.66855E-03	3.04561E+0
M5a-2400 12-17-	2.40000E+03	9.78400E+01	6.35955E+00	8.29692E-03	3.02024E+0
M5a-3600 12-17-	3.60000E+03	9.79161E+01	6.89435E+00	6.15066E-03	3.01789E+0
M5a-5000 12-17-	5.00000E+03	9.66907E+01	1.35888E+01	2.17559E-02	3.05614E+0
M5a-5001 12-17-	5.00100E+03	9.57658E+01	2.76260E+01	1.23930E-01	3.08565E+0

INTEGRATED RESULTS
MASS= 0.02350000 G
(40/36)S = 2.99037E+02 +/- 5.89228E-01
37CA/39K = 6.09933E+00 +/- 3.71011E-03
F1 = -3.95342E-03 F2 = 1.22262E-02
TOTAL ATMOS 40 VOL = 9.30022E-07 CCNTP/G
TOTAL 39K VOL = 3.35232E-08 CCNTP/G
40*/39K = 3.32053E-01 +/- 5.46758E-02
AGE = 5.00368E+05 +/- 8.23935E+04 Y

Feb 25 94 DAC

m5b MCBH-4710 basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 8.35385E-04 +/- 2.58575E-06

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE
J function	0.00000E+00	0.00000E+00	1.87169E+01	5.79341E-02	2.79900E+07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-
M5B-200 1-2-199	1.63874E-02	-8.48846E-04	-2.65332E-04	-7.37007E-01	4.68480E-0
M5B-240 1-2-199	2.77972E-02	-7.68864E-04	-9.51681E-05	-2.50495E+00	7.50731E-0
M5B-320 1-2-199	5.27465E-02	-1.18359E-03	3.80510E-04	-9.08331E-01	4.96109E-0
M5B-360 1-2-199	6.91743E-02	-1.13052E-03	6.11056E-04	-3.04590E-01	2.97103E-0
M5B-440 1-2-199	1.04925E-01	-1.83676E-03	3.03450E-03	2.36026E-01	3.59200E-0
M5B-520 1-2-199	1.44074E-01	-2.12493E-03	5.50789E-03	-3.95939E-01	1.74738E-0
M5B-600 1-2-199	1.83338E-01	-2.38399E-03	9.09116E-03	-6.52867E-02	1.13042E-0
M5B-720 1-2-199	2.29307E-01	-2.62949E-03	1.40605E-02	3.53676E-02	1.06036E-0
M5B-920 1-2-199	2.82085E-01	-2.71951E-03	1.89132E-02	1.90942E-02	1.77302E-0
M5B-1200 1-2-19	3.45037E-01	-2.56001E-03	2.29666E-02	3.36574E-02	1.04992E-0
M5B-1600 1-2-19	4.24795E-01	-2.45559E-03	2.61600E-02	1.38709E-01	7.94910E-0
M5B-2000 1-2-19	5.03263E-01	-2.91534E-03	3.26234E-02	1.09602E-01	9.17384E-0
M5B-2800 1-2-19	6.67139E-01	-3.65699E-03	6.25768E-02	2.37335E-02	3.13524E-0
M5B-3600 1-2-19	8.19496E-01	-5.14710E-03	9.84765E-02	-1.56663E-02	4.58200E-0
M5B-5000 1-2-19	9.48407E-01	-6.16990E-03	1.20256E-01	8.54786E-02	3.33776E-0
M5B-5001 1-2-19	9.81327E-01	-8.70225E-03	1.38123E-01	-2.64348E-01	8.48462E-0
M5B-5002 1-2-19	1.00000E+00	-1.10071E-02	2.05568E-01	-1.18217E-01	2.30261E-0

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S
M5B-200 1-2-199	2.00000E+02	1.00443E+02	1.30960E+00	1.04627E-02	2.94198E+0
M5B-240 1-2-199	2.40000E+02	1.01946E+02	1.18620E+00	1.19240E-02	2.89858E+0
M5B-320 1-2-199	3.20000E+02	1.01056E+02	1.82604E+00	9.55253E-03	2.92413E+0
M5B-360 1-2-199	3.60000E+02	1.00410E+02	1.74416E+00	9.70782E-03	2.94293E+0
M5B-440 1-2-199	4.40000E+02	9.94568E+01	2.83375E+00	8.22925E-03	2.97114E+0
M5B-520 1-2-199	5.20000E+02	1.01260E+02	3.27835E+00	1.18446E-02	2.91824E+0
M5B-600 1-2-199	6.00000E+02	1.00277E+02	3.67801E+00	9.45069E-03	2.94685E+0
M5B-720 1-2-199	7.20000E+02	9.98023E+01	4.05677E+00	1.04547E-02	2.96085E+0
M5B-920 1-2-199	9.20000E+02	9.98655E+01	4.19566E+00	8.90871E-03	2.95898E+0
M5B-1200 1-2-19	1.20000E+03	9.97021E+01	3.94959E+00	7.22726E-03	2.96383E+0
M5B-1600 1-2-19	1.60000E+03	9.85766E+01	3.78849E+00	8.35956E-03	2.99767E+0
M5B-2000 1-2-19	2.00000E+03	9.88128E+01	4.49778E+00	7.33669E-03	2.99050E+0
M5B-2800 1-2-19	2.80000E+03	9.96027E+01	5.64200E+00	6.04605E-03	2.96679E+0
M5B-3600 1-2-19	3.60000E+03	1.00305E+02	7.94095E+00	1.50451E-02	2.94601E+0
M5B-5000 1-2-19	5.00000E+03	9.82975E+01	9.51891E+00	1.48842E-02	3.00618E+0
M5B-5001 1-2-19	5.00100E+03	1.04714E+02	1.34258E+01	2.05911E-02	2.82197E+0
M5B-5002 1-2-19	5.00200E+03	1.02614E+02	1.69818E+01	6.26575E-02	2.87973E+0

INTEGRATED RESULTS
MASS= 0.02570000 G
(40/36)S = 2.94637E+02 +/- 4.99040E-01
37CA/39K = 5.91555E+00 +/- 3.24057E-03
F1 = -3.83429E-03 F2 = 2.04376E-02
TOTAL ATMOS 40 VOL = 6.01663E-07 CCNTP/G
TOTAL 39K VOL = 3.38271E-08 CCNTP/G
40*/39K = -5.19229E-02 +/- 3.01276E-02
AGE = -7.82547E+04 +/- 4.54079E+04 Y

Feb 25 97 DAC

m7b MCBH-4708 basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 8.45798E-04 +/- 2.99651E-06

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE
J function	0.00000E+00	0.00000E+00	1.84865E+01	6.54943E-02	2.79900E+07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-
M7b-200 1-3-199	1.28711E-02	-2.18800E-03	6.45123E-02	3.02170E-01	3.45248E-0
M7b-400 1-3-199	8.60386E-02	-1.75932E-03	1.25574E-01	2.47629E-01	4.99319E-0
M7b-600 1-3-199	2.08570E-01	-1.60940E-03	1.32149E-01	1.97537E-01	4.38905E-0
M7b-800 1-3-199	3.29063E-01	-1.56250E-03	1.17432E-01	1.28999E-01	2.66276E-0
M7b-1200 1-3-19	4.54737E-01	-1.61998E-03	9.25780E-02	1.10134E-01	4.25020E-0
M7b-1800 1-3-19	5.45152E-01	-2.65724E-03	9.71603E-02	1.81423E-01	4.40489E-0
M7b-2400 1-3-19	5.93270E-01	-4.40321E-03	9.76365E-02	-6.41498E-02	1.05131E-0
M7b-3600 1-3-19	7.02467E-01	-6.66628E-03	9.44153E-02	1.51155E-01	1.06928E-0
M7b-5000 1-3-19	8.10014E-01	-7.04535E-03	8.68898E-02	3.15939E-01	7.38615E-0
M7b-5001 1-3-19	8.74301E-01	-7.07020E-03	9.08532E-02	3.57685E-01	7.97208E-0
M7b-5002 1-3-19	9.27687E-01	-7.22815E-03	5.53225E-02	2.75477E-01	9.15683E-0
M7b-5003 1-3-19	9.68263E-01	-7.29452E-03	2.38381E-02	-1.05343E-01	1.89673E-0
M7b-5004 1-3-19	9.90572E-01	-7.19715E-03	2.81927E-02	9.94375E-01	2.82552E-0
M7b-5005 1-3-19	1.00000E+00	-7.08005E-03	1.13345E-02	2.24133E-01	4.57793E-0

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S
M7b-200 1-3-199	2.00000E+02	9.21097E+01	3.37564E+00	2.43522E-02	3.20813E+0
M7b-400 1-3-199	4.00000E+02	8.48675E+01	2.71427E+00	5.11465E-03	3.48190E+0
M7b-600 1-3-199	6.00000E+02	8.58685E+01	2.48298E+00	5.37038E-03	3.44131E+0
M7b-800 1-3-199	8.00000E+02	9.11713E+01	2.41063E+00	3.91867E-03	3.24115E+0
M7b-1200 1-3-19	1.20000E+03	9.42156E+01	2.49931E+00	2.67353E-03	3.13642E+0
M7b-1800 1-3-19	1.80000E+03	9.38379E+01	4.09959E+00	9.52113E-03	3.14905E+0
M7b-2400 1-3-19	2.40000E+03	1.01454E+02	6.79327E+00	2.23252E-02	2.91265E+0
M7b-3600 1-3-19	3.60000E+03	9.78457E+01	1.02847E+01	1.61556E-02	3.02006E+0
M7b-5000 1-3-19	5.00000E+03	9.61416E+01	1.08696E+01	2.04609E-02	3.07359E+0
M7b-5001 1-3-19	5.00100E+03	9.54741E+01	1.09079E+01	1.72374E-02	3.09508E+0
M7b-5002 1-3-19	5.00200E+03	9.78518E+01	1.11516E+01	2.30638E-02	3.01987E+0
M7b-5003 1-3-19	5.00300E+03	1.00402E+02	1.12540E+01	3.23030E-02	2.94316E+0
M7b-5004 1-3-19	5.00400E+03	9.58065E+01	1.11038E+01	4.16674E-02	3.08434E+0
M7b-5005 1-3-19	5.00500E+03	9.94897E+01	1.09231E+01	6.32446E-02	2.97016E+0

INTEGRATED RESULTS
MASS= 0.02280000 G
(40/36)S = 3.05403E+02 +/- 1.17183E+00
37CA/39K = 6.24436E+00 +/- 3.35206E-03
F1 = -4.04742E-03 F2 = 6.95481E-02
TOTAL ATMOS 40 VOL = 1.69872E-07 CCNTP/G
TOTAL 39K VOL = 2.88866E-08 CCNTP/G
40*/39K = 1.97121E-01 +/- 2.25716E-02
AGE = 3.00759E+05 +/- 3.44524E+04 Y

Feb 25 92 Duc.

m7a MCBH-4708 basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 8.45798E-04 +/- 2.99651E-06

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE
J function	0.00000E+00	0.00000E+00	1.84865E+01	6.54943E-02	2.79900E+07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-
M7a-200 12-18-1	1.10380E-02	-2.38831E-03	4.81197E-02	3.12623E-01	4.06244E-0
M7a-400 12-18-1	1.19635E-01	-1.81432E-03	1.37847E-01	2.31289E-01	5.40763E-0
M7a-600 12-18-1	2.64977E-01	-1.45486E-03	1.27726E-01	2.01709E-01	3.69741E-0
M7a-800 12-18-1	4.12873E-01	-8.87104E-04	2.45454E-02	3.09749E-02	3.80948E-0
M7a-1200 12-18-	5.11974E-01	-1.88763E-03	8.30912E-02	2.08550E-01	6.64746E-0
M7a-1800 12-18-	5.53016E-01	-4.13092E-03	8.10751E-02	3.18920E-03	1.36457E-0
M7a-2400 12-18-	5.93239E-01	-7.46048E-03	1.53296E-01	3.77428E-02	1.56563E-0
M7a-3600 12-18-	7.08956E-01	-7.75713E-03	1.89108E-01	7.80611E-02	5.56469E-0
M7a-5000 12-18-	8.41716E-01	-7.25477E-03	2.06246E-01	2.50352E-01	7.01505E-0
M7a-5001 12-18-	9.80828E-01	-7.19453E-03	1.90947E-01	9.40465E-02	3.86971E-0
M7a-5002 12-18-	1.00000E+00	-7.63359E-03	2.03721E-01	4.21177E-01	1.88595E-0

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S
M7a-200 12-18-1	2.00000E+02	9.43020E+01	3.68468E+00	2.47742E-02	3.13355E+0
M7a-400 12-18-1	4.00000E+02	8.47709E+01	2.79913E+00	3.98312E-03	3.48587E+0
M7a-600 12-18-1	6.00000E+02	8.48446E+01	2.24456E+00	3.43998E-03	3.48284E+0
M7a-800 12-18-1	8.00000E+02	9.92143E+01	1.36862E+00	3.53317E-03	2.97840E+0
M7a-1200 12-18-	1.20000E+03	9.18208E+01	2.91224E+00	7.00696E-03	3.21823E+0
M7a-1800 12-18-	1.80000E+03	9.99378E+01	6.37318E+00	1.64551E-02	2.95684E+0
M7a-2400 12-18-	2.40000E+03	9.91713E+01	1.15100E+01	3.41957E-02	2.97969E+0
M7a-3600 12-18-	3.60000E+03	9.79189E+01	1.19677E+01	2.12464E-02	3.01780E+0
M7a-5000 12-18-	5.00000E+03	9.25285E+01	1.11927E+01	2.17276E-02	3.19361E+0
M7a-5001 12-18-	5.00100E+03	9.72904E+01	1.10997E+01	1.94823E-02	3.03730E+0
M7a-5002 12-18-	5.00200E+03	8.86995E+01	1.17771E+01	5.05032E-02	3.33147E+0

INTEGRATED RESULTS
MASS= 0.01790000 G
(40/36)S = 3.10432E+02 +/- 2.11617E+00
37CA/39K = 6.52713E+00 +/- 3.84558E-03
F1 = -4.23071E-03 F2 = 1.38592E-01
TOTAL ATMOS 40 VOL.= 9.84800E-08 CCNTP/G
TOTAL 39K VOL = 3.35919E-08 CCNTP/G
40*/39K = 1.48210E-01 +/- 1.99971E-02
AGE = 2.26137E+05 +/- 3.05200E+04 Y

Feb 25 97 JMc.

m8a SP Crater basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 8.35452E-04 +/- 3.96937E-06

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE
J function	0.00000E+00	0.00000E+00	1.87154E+01	8.89200E-02	2.79900E+07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-
M8a-200 1-7-199	1.58204E-03	-1.86064E-04	-1.19880E-04	-7.48852E-01	1.50514E+0
M8a-400 1-7-199	7.94907E-03	-1.96219E-04	-1.43533E-04	2.01494E+00	1.99824E+0
M8a-520 1-7-199	1.48012E-02	-2.17685E-04	-1.49604E-04	3.96965E+00	3.29570E+0
M8a-600 1-7-199	2.29905E-02	-2.38930E-04	-8.47817E-05	6.65374E-01	8.13353E-0
M8a-680 1-7-199	3.56200E-02	-2.73540E-04	7.01944E-05	7.35290E-01	3.35843E-0
M8a-800 1-7-199	5.33782E-02	-3.15879E-04	2.38372E-04	6.65924E-01	1.06446E-0
M8a-960 1-7-199	7.26537E-02	-3.44265E-04	1.56722E-03	1.33627E-01	1.83723E-0
M8a-1200 1-7-19	9.70745E-02	-3.79205E-04	3.16250E-03	2.67953E-01	1.20941E-0
M8a-1600 1-7-19	1.30378E-01	-4.41453E-04	4.99315E-03	8.27927E-02	1.34105E-0
M8a-2000 1-7-19	1.70546E-01	-4.71212E-04	6.35284E-03	4.44304E-02	8.04628E-0
M8a-2500 1-7-19	3.11735E-01	-6.85864E-04	7.62814E-03	1.58547E-01	4.23695E-0
M8a-3000 1-7-19	4.51577E-01	-6.97456E-04	1.09765E-02	5.19528E-02	3.57988E-0
M8a-3500 1-8-19	6.09275E-01	-7.48986E-04	1.27607E-02	3.44725E-02	2.31119E-0
M8a-4000 1-8-19	7.28744E-01	-8.07982E-04	1.31618E-02	5.47894E-02	3.19350E-0
M8a-5000 1-8-19	8.36100E-01	-7.73224E-04	1.40898E-02	4.95968E-02	3.27452E-0
M8a-5001 1-8-19	9.01498E-01	-8.23208E-04	2.07115E-02	1.15883E-01	4.21323E-0
M8a-5002 1-8-19	9.66214E-01	-9.58192E-04	1.86885E-02	1.52006E-01	3.10067E-0
M8a-5003 1-8-19	9.85333E-01	-1.11257E-03	2.41085E-02	1.03486E-01	1.61911E-0
M8a-5004 1-8-19	1.00000E+00	-1.13988E-03	1.69345E-02	7.83232E-02	1.42829E-0

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S
M8a-200 1-7-199	2.00000E+02	1.00232E+02	2.87060E-01	1.40293E-02	2.94815E+0
M8a-400 1-7-199	4.00000E+02	9.95316E+01	3.02727E-01	8.47410E-03	2.96891E+0
M8a-520 1-7-199	5.20000E+02	9.89316E+01	3.35844E-01	7.24146E-03	2.98691E+0
M8a-600 1-7-199	6.00000E+02	9.96280E+01	3.68622E-01	4.61914E-03	2.96603E+0
M8a-680 1-7-199	6.80000E+02	9.92025E+01	4.22018E-01	5.24553E-03	2.97875E+0
M8a-800 1-7-199	8.00000E+02	9.89935E+01	4.87338E-01	2.99737E-03	2.98504E+0
M8a-960 1-7-199	9.60000E+02	9.93577E+01	5.31133E-01	2.36802E-03	2.97410E+0
M8a-1200 1-7-19	1.20000E+03	9.78626E+01	5.85038E-01	3.09915E-03	3.01954E+0
M8a-1600 1-7-19	1.60000E+03	9.91167E+01	6.81074E-01	3.08671E-03	2.98133E+0
M8a-2000 1-7-19	2.00000E+03	9.94398E+01	7.26986E-01	2.44707E-03	2.97165E+0
M8a-2500 1-7-19	2.50000E+03	9.83431E+01	1.05815E+00	1.46174E-03	3.00479E+0
M8a-3000 1-7-19	3.00000E+03	9.92409E+01	1.07604E+00	2.26740E-03	2.97760E+0
M8a-3500 1-8-19	3.50000E+03	9.94551E+01	1.15553E+00	1.72941E-03	2.97119E+0
M8a-4000 1-8-19	4.00000E+03	9.91718E+01	1.24655E+00	2.59606E-03	2.97968E+0
M8a-5000 1-8-19	5.00000E+03	9.91658E+01	1.19293E+00	1.68554E-03	2.97986E+0
M8a-5001 1-8-19	5.00100E+03	9.73777E+01	1.27004E+00	1.88358E-03	3.03458E+0
M8a-5002 1-8-19	5.00200E+03	9.73113E+01	1.47830E+00	4.24863E-03	3.03665E+0
M8a-5003 1-8-19	5.00300E+03	9.79516E+01	1.71648E+00	6.37586E-03	3.01680E+0
M8a-5004 1-8-19	5.00400E+03	9.89129E+01	1.75861E+00	4.60074E-03	2.98748E+0

INTEGRATED RESULTS
MASS= 0.02120000 G
(40/36)S = 2.98144E+02 +/- 5.52481E-01
37CA/39K = 1.09453E+00 +/- 7.01616E-04
F1 = -7.09441E-04 F2 = 4.24740E-03
TOTAL ATMOS 40 VOL = 1.55311E-06 CCNTP/G
TOTAL 39K VOL = 9.48064E-08 CCNTP/G
40*/39K = 1.46567E-01 +/- 3.03589E-02
AGE = 2.20895E+05 +/- 4.57640E+04 Y

Feb 25/97 Sue.

m8b SP Crater basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 8.35452E-04 +/- 3.96937E-06

STANDARDS

NAME	F1	F2	40*/39K	+/-	AGE
J function	0.00000E+00	0.00000E+00	1.87154E+01	8.89200E-02	2.79900E+07

FRACTIONS

NAME	CUM 39K	F1	F2	40*/39K	+/-
M8b-200 1-22-19	2.59078E-03	-1.86648E-04	-5.46303E-05	6.88291E-01	1.30293E+0
M8b-400 1-22-19	1.78583E-02	-2.07049E-04	7.44193E-04	-1.68342E-01	2.66541E-0
M8b-800 1-22-19	7.06323E-02	-2.94510E-04	3.68044E-03	-3.26572E-02	5.36424E-0
M8b-1000 1-22-1	1.08387E-01	-3.59696E-04	5.80907E-03	-1.47788E-01	9.55435E-0
M8b-1400 1-22-1	1.58768E-01	-4.07468E-04	1.45196E-03	1.82032E-01	1.50839E-0
M8b-1600 1-22-1	2.02809E-01	-4.68449E-04	3.11111E-04	-6.59651E-01	1.10399E-0
M8b-1700 1-22-1	2.40716E-01	-4.99712E-04	2.27681E-04	-2.96413E-01	1.55845E-0
M8b-1800 1-22-1	2.79806E-01	-5.63697E-04	5.57508E-04	-1.32656E-01	2.13761E-0
M8b-1900 1-22-1	3.44324E-01	-5.39485E-04	9.42875E-04	-3.17665E-01	8.51839E-0
M8b-2000 1-22-1	3.85841E-01	-5.66621E-04	6.87416E-04	-2.22073E-01	2.13370E-0
M8b-2500 1-22-1	5.16492E-01	-6.96506E-04	9.44081E-04	-2.26652E-01	2.83293E-0
M8b-3000 1-22-1	6.67715E-01	-7.32285E-04	1.26752E-03	2.18802E-01	2.16728E-0
M8b-4000 1-22-1	8.19096E-01	-8.78692E-04	3.80218E-03	1.95186E-01	1.20571E-0
M8b-5000 1-22-1	9.19201E-01	-7.94450E-04	3.17506E-03	1.00231E-02	6.95261E-0
M8b-5001 1-22-1	1.00000E+00	-8.30082E-04	2.84677E-03	-2.58033E-01	7.38464E-0

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S
M8b-200 1-22-19	2.00000E+02	9.95783E+01	2.87961E-01	1.99580E-02	2.96751E+0
M8b-400 1-22-19	4.00000E+02	1.00678E+02	3.19436E-01	4.56192E-03	2.93510E+0
M8b-800 1-22-19	8.00000E+02	1.00386E+02	4.54370E-01	3.26733E-03	2.94363E+0
M8b-1000 1-22-1	1.00000E+03	1.02268E+02	5.54939E-01	4.57939E-03	2.88946E+0
M8b-1400 1-22-1	1.40000E+03	9.92815E+01	6.28642E-01	2.22691E-03	2.97639E+0
M8b-1600 1-22-1	1.60000E+03	1.00964E+02	7.22723E-01	3.30994E-03	2.92677E+0
M8b-1700 1-22-1	1.70000E+03	1.00377E+02	7.70955E-01	3.13317E-03	2.94391E+0
M8b-1800 1-22-1	1.80000E+03	1.00230E+02	8.69672E-01	2.31406E-03	2.94821E+0
M8b-1900 1-22-1	1.90000E+03	1.00766E+02	8.32318E-01	2.97688E-03	2.93254E+0
M8b-2000 1-22-1	2.00000E+03	1.00430E+02	8.74182E-01	3.60735E-03	2.94236E+0
M8b-2500 1-22-1	2.50000E+03	1.00467E+02	1.07457E+00	8.69490E-03	2.94126E+0
M8b-3000 1-22-1	3.00000E+03	9.94822E+01	1.12977E+00	7.92498E-03	2.97038E+0
M8b-4000 1-22-1	4.00000E+03	9.91002E+01	1.35565E+00	1.03090E-02	2.98183E+0
M8b-5000 1-22-1	5.00000E+03	9.99563E+01	1.22568E+00	2.58069E-03	2.95629E+0
M8b-5001 1-22-1	5.00100E+03	1.01007E+02	1.28065E+00	4.41034E-03	2.92553E+0

INTEGRATED RESULTS
MASS= 0.01510000 G
(40/36)S = 2.95004E+02 +/- 4.60328E-01
37CA/39K = 1.00990E+00 +/- 2.19108E-03
F1 = -6.54588E-04 F2 = 1.41645E-03
TOTAL ATMOS 40 VOL = 3.09585E-06 CCNTP/G
TOTAL 39K VOL = 8.53317E-08 CCNTP/G
40*/39K = -6.09298E-02 +/- 5.66122E-02
AGE = -9.18370E+04 +/- 8.53326E+04 Y

Feb 25/97 [illegible]

m4all

CURRENT BLANK ERROR= 5.0000E-08 COUNTS

36/40 VS 39/40

J0= 8.4905547900E-04 +/- 2.1722388047E-06

	X	DX	Y	DY	R
M4a-200 12-16-1	5.92578E-02	2.41843E-04	3.29591E-03	5.40498E-05	2.97173E-03
M4a-400 12-16-1	7.33912E-01	4.28483E-03	3.08162E-03	8.23782E-05	-4.39364E-04
M4a-600 12-16-1	9.78550E-01	7.55939E-03	3.03916E-03	7.42307E-05	-3.25959E-02
M4a-800 12-16-1	8.74970E-01	1.05360E-02	2.99207E-03	1.12681E-04	-2.94335E-02
M4a-1200 12-16-	7.93929E-01	5.13751E-03	3.16197E-03	6.37408E-05	-7.91384E-03
M4a-1800 12-16-	6.84648E-01	2.94430E-03	3.13512E-03	6.11326E-05	-3.30861E-03
M4a-2400 12-16-	6.35366E-01	3.64229E-03	3.23751E-03	6.05959E-05	-6.96883E-03
M4a-3600 12-16-	4.39646E-01	1.89241E-03	3.16737E-03	8.12203E-05	9.51742E-04
M4a-5000 12-16-	3.03524E-01	2.69196E-03	3.30545E-03	1.53095E-04	-1.69531E-03
M4a-5001 12-16-	2.80958E-01	3.18287E-03	3.17750E-03	2.04092E-04	-4.36771E-03
M4b-200 1-2-199	1.43636E-02	5.40193E-05	3.34983E-03	2.84375E-05	5.40461E-03
M4b-400 1-2-199	3.25629E-01	1.38537E-03	3.17516E-03	5.71753E-05	-1.00709E-03
M4b-600 1-2-199	8.50910E-01	5.67392E-03	3.07634E-03	9.84231E-05	-1.38875E-02
M4b-800 1-2-199	8.46716E-01	7.03074E-03	3.04617E-03	1.70148E-04	-9.56562E-03
M4b-1200 1-2-19	8.31452E-01	5.04652E-03	3.11040E-03	8.52299E-05	-1.16093E-02
M4B-1600 1-2-19	5.59370E-01	2.95646E-03	3.16518E-03	8.82613E-05	-2.57413E-03
M4B-2000 1-2-19	6.35304E-01	4.35290E-03	3.17164E-03	1.00120E-04	-6.13268E-03
M4B-2400 1-2-19	5.59341E-01	3.64099E-03	3.11186E-03	1.39784E-04	3.37518E-03
M4B-2800 1-2-19	4.98905E-01	3.11093E-03	3.08876E-03	1.03629E-04	-1.53374E-02
M4B-3600 1-2-19	3.85616E-01	1.24606E-03	3.01939E-03	5.24390E-05	-8.71973E-03
M4B-5000 1-2-19	3.45413E-01	1.34875E-03	3.23344E-03	8.52301E-05	5.54287E-03
M4B-5001 1-2-19	2.93358E-01	1.96652E-03	3.30179E-03	1.33788E-04	4.31363E-04
M4B-5002 1-2-19	2.44499E-01	3.42684E-03	2.90467E-03	2.14389E-04	-2.34292E-02

	RESX	RESY
M4a-200 12-16-1	9.73790E-08	5.08940E-06
M4a-400 12-16-1	1.73715E-05	2.26808E-05
M4a-600 12-16-1	1.83084E-06	-6.17999E-06
M4a-800 12-16-1	-1.44644E-05	7.11184E-05
M4a-1200 12-16-	-9.43907E-05	-7.51316E-05
M4a-1800 12-16-	-8.50270E-06	-1.64481E-05
M4a-2400 12-16-	-6.62811E-05	-1.04458E-04
M4a-3600 12-16-	4.10148E-06	2.27297E-05
M4a-5000 12-16-	-4.56520E-06	-7.56703E-05
M4a-5001 12-16-	1.64306E-07	5.88651E-05
M4b-200 1-2-199	-4.04600E-07	-3.57469E-05
M4b-400 1-2-199	7.06996E-06	4.81719E-05
M4b-600 1-2-199	-1.03388E-06	-6.14176E-06
M4b-800 1-2-199	2.58914E-06	2.52500E-05
M4b-1200 1-2-19	-1.15587E-05	-3.45251E-05
M4B-1600 1-2-19	-2.40665E-06	-9.99021E-06
M4B-2000 1-2-19	-1.09767E-05	-3.85856E-05
M4B-2400 1-2-19	1.23833E-05	4.33428E-05
M4B-2800 1-2-19	-1.66207E-05	8.40634E-05
M4B-3600 1-2-19	-7.94060E-06	1.86459E-04
M4B-5000 1-2-19	-2.55003E-06	-1.58664E-05
M4B-5001 1-2-19	-4.78652E-06	-6.90401E-05
M4B-5002 1-2-19	-1.02719E-04	3.42347E-04

SLOPE= -2.9154192960E-04 +/- 4.6530527245E-05
Y INTERCEPT= 3.3182732371E-03 +/- 2.3595652417E-05
SUMS S= 2.4221591246E+01 XBAR= 3.9388145174E-01 YBAR= 3.2034402787E-03
MODIFIED ERRORS
SLOPE= 4.9972337186E-05 INTERCEPT= 2.5340995869E-05

RECIPROCAL OF Y INTERCEPT= 3.0136156023E+02 +/- 2.1429286013E+00

25 Feb 97 [illegible]

m4all

CURRENT BLANK ERROR= 5.0000E-08 COUNTS

36/40 VS 39/40

J0= 8.4905547900E-04 +/- 2.1722388047E-06

	X	DX	Y	DY	R
M4a-200 12-16-1	5.92578E-02	2.41843E-04	3.29591E-03	5.40498E-05	2.97173E-03
M4a-400 12-16-1	7.33912E-01	4.28483E-03	3.08162E-03	8.23782E-05	-4.39364E-04
M4a-600 12-16-1	9.78550E-01	7.55939E-03	3.03916E-03	7.42307E-05	-3.25959E-02
M4a-800 12-16-1	8.74970E-01	1.05360E-02	2.99207E-03	1.12681E-04	-2.94335E-02
M4a-1200 12-16-	7.93929E-01	5.13751E-03	3.16197E-03	6.37408E-05	-7.91384E-03
M4a-1800 12-16-	6.84648E-01	2.94430E-03	3.13512E-03	6.11326E-05	-3.30861E-03
M4a-2400 12-16-	6.35366E-01	3.64229E-03	3.23751E-03	6.05959E-05	-6.96883E-03
M4a-3600 12-16-	4.39646E-01	1.89241E-03	3.16737E-03	8.12203E-05	9.51742E-04
M4a-5000 12-16-	3.03524E-01	2.69196E-03	3.30545E-03	1.53095E-04	-1.69531E-03
M4a-5001 12-16-	2.80958E-01	3.18287E-03	3.17750E-03	2.04092E-04	-4.36771E-03
M4b-200 1-2-199	1.43636E-02	5.40193E-05	3.34983E-03	2.84375E-05	5.40461E-03
M4b-400 1-2-199	3.25629E-01	1.38537E-03	3.17516E-03	5.71753E-05	-1.00709E-03
M4b-600 1-2-199	8.50910E-01	5.67392E-03	3.07634E-03	9.84231E-05	-1.38875E-02
M4b-800 1-2-199	8.46716E-01	7.03074E-03	3.04617E-03	1.70148E-04	-9.56562E-03
M4b-1200 1-2-19	8.31452E-01	5.04652E-03	3.11040E-03	8.52299E-05	-1.16093E-02
M4B-1600 1-2-19	5.59370E-01	2.95646E-03	3.16518E-03	8.82613E-05	-2.57413E-03
M4B-2000 1-2-19	6.35304E-01	4.35290E-03	3.17164E-03	1.00120E-04	-6.13268E-03
M4B-2400 1-2-19	5.59341E-01	3.64099E-03	3.11186E-03	1.39784E-04	3.37518E-03
M4B-2800 1-2-19	4.98905E-01	3.11093E-03	3.08876E-03	1.03629E-04	-1.53374E-02
M4B-3600 1-2-19	3.85616E-01	1.24606E-03	3.01939E-03	5.24390E-05	-8.71973E-03
M4B-5000 1-2-19	3.45413E-01	1.34875E-03	3.23344E-03	8.52301E-05	5.54287E-03
M4B-5001 1-2-19	2.93358E-01	1.96652E-03	3.30179E-03	1.33788E-04	4.31363E-04
M4B-5002 1-2-19	2.44499E-01	3.42684E-03	2.90467E-03	2.14389E-04	-2.34292E-02

	RESX	RESY
M4a-200 12-16-1	9.73790E-08	5.08940E-06
M4a-400 12-16-1	1.73715E-05	2.26808E-05
M4a-600 12-16-1	1.83084E-06	-6.17999E-06
M4a-800 12-16-1	-1.44644E-05	7.11184E-05
M4a-1200 12-16-	-9.43907E-05	-7.51316E-05
M4a-1800 12-16-	-8.50270E-06	-1.64481E-05
M4a-2400 12-16-	-6.62811E-05	-1.04458E-04
M4a-3600 12-16-	4.10148E-06	2.27297E-05
M4a-5000 12-16-	-4.56520E-06	-7.56703E-05
M4a-5001 12-16-	1.64306E-07	5.88651E-05
M4b-200 1-2-199	-4.04600E-07	-3.57469E-05
M4b-400 1-2-199	7.06996E-06	4.81719E-05
M4b-600 1-2-199	-1.03388E-06	-6.14176E-06
M4b-800 1-2-199	2.58914E-06	2.52500E-05
M4b-1200 1-2-19	-1.15587E-05	-3.45251E-05
M4B-1600 1-2-19	-2.40665E-06	-9.99021E-06
M4B-2000 1-2-19	-1.09767E-05	-3.85856E-05
M4B-2400 1-2-19	1.23833E-05	4.33428E-05
M4B-2800 1-2-19	-1.66207E-05	8.40634E-05
M4B-3600 1-2-19	-7.94060E-06	1.86459E-04
M4B-5000 1-2-19	-2.55003E-06	-1.58664E-05
M4B-5001 1-2-19	-4.78652E-06	-6.90401E-05
M4B-5002 1-2-19	-1.02719E-04	3.42347E-04

SLOPE= -2.9154192960E-04 +/- 4.6530527245E-05
Y INTERCEPT= 3.3182732371E-03 +/- 2.3595652417E-05
SUMS S= 2.4221591246E+01 XBAR= 3.9388145174E-01 YBAR= 3.2034402787E-03
MODIFIED ERRORS
SLOPE= 4.9972337186E-05 INTERCEPT= 2.5340995869E-05

RECIPROCAL OF Y INTERCEPT= 3.0136156023E+02 +/- 2.1429286013E+00

25 Feb 97 [illegible]

Radiometric Ages for SP Cluster / Mesa Butte P

These data include all available age dates for the volcanoes of the north-central & east part of SFVF

Sel_ar/ar_ages_N_SFVF_4.excel

Radiometric Ages for the north-central SFVF -- SP Cluster and Mesa Butte Alignment

Ar/Ar age data from K. Mulhaney and C. Condit
Analyses by Dan Lux at Univ. of Maine at Orono

All ages reported with 2 sigma error

Sample #	Vent #	Plateau Age (k	2 sigma error	Total Age (ka)	2 sigma error	Source
KV6802c	V6802	1710	420			K. Mulhaney
K5623a	V5626	450	30			C. Condit
Kv4602a	V4603	1620	400			C. Condit
Kv4625a	V4625	360	120			C. Condit
K4717b	V4720	420	170			C. Condit
Kv5719c	V5718			610	210	C. Condit
Kv5733a	V5734			1260	480	C. Condit
K6819a	V6725			850	1290	C. Condit
Kv5734ab	V5734A			620	710	C. Condit

K-Ar Data from Tanaka et al., 1991

Vent	K-Ar Age (Ma	Error (Ma)	Source
V4624	660	40	Tanaka 1991
V6811	1200	50	Tanaka 1991
V6736	1040	140	Tanaka 1991
V6713	770	40	Tanaka 1991
V5703	71	40	Tanaka 1991
V5831	222	50	Tanaka 1991

Ar / Ar Data from Conway et al., 1996

Vent	Ar/Ar Age (ka	2 Sig error (ka	n	MSWD	
					Conway et al
Shadow Mtn	300	110	21	2.36	Conway et al
Tappan Wash	280	50	14	0.91	Conway et al
Red Mountain	740	110	13	0.82	Conway et al
Mesa Butte	760	50	13	1.68	Conway et al
MB-03	800	80	12	1.21	Conway et al
MB-05	820	60	12	1.35	Conway et al
MB-06	830	80	12	1.12	Conway et al
MB-07	850	100	9	2.07	Conway et al
MB-04	880	80	20	2.69	Conway et al
MB-08	850	60	11	1.37	Conway et al
FV1	900	80	11	0.27	Conway et al
CR3	950	30	27	1.39	Conway et al
MB-02	1020	30	12	1.2	Conway et al
Chapel Mtn	1300	200	12	2.6	Conway et al
Chapel Mtn N	1400	100	18	3.16	Conway et al

Ar / Ar Data from Conway & Hill

Sample #	Vent	Ar/Ar Age (ka	2 Sig error (ka	n	MSWD	
MCBH-4703	V4703	135	44	23	1.15	Conway&Hill
MCBH-4710	V4710	181	86	28	5.13	Conway&Hill
MCBH-4708	V4708	219	80	25	2.56	Conway&Hill
SP Crater	SP crater	120	90	34	4.73	Conway&Hill
MCBH-4726	V4726	309	40	34	2.08	Conway&Hill

MSWD= mean standard weighted deviate
n = number of measured points

Authors names noted.

26 Feb 97 [illegible]

m3b MCBH-5713 basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 8.62335E-04 +/- 2.67857E-06

STANDARDS NAME	F1	F2	40*/39K	+/-	AGE
J function	0.00000E+00	0.00000E+00	1.81320E+01	5.63213E-02	2.79900E+07

FRACTIONS NAME	CUM 39K	F1	F2	40*/39K	+/-
M3b-200 1-3-199	7.68447E-03	-1.93875E-03	-2.31017E-04	3.66510E+00	1.04309E+0
M3b-400 1-3-199	5.22125E-02	-1.80943E-03	1.76287E-02	1.21532E+00	1.59166E-0
M3b-680 1-3-199	1.81841E-01	-1.50800E-03	8.39189E-02	1.57933E-01	4.56246E-0
M3b-1000 1-3-19	3.17562E-01	-1.13457E-03	9.51407E-02	8.27305E-02	3.80713E-0
M3b-1800 1-3-19	4.50465E-01	-1.85728E-03	7.61027E-02	1.94066E-01	4.08577E-0
M3b-3200 1-3-19	6.27415E-01	-5.47969E-03	1.80950E-01	2.49840E-02	2.42437E-0
M3b-5000 1-3-19	7.81561E-01	-6.02392E-03	7.67828E-02	-1.28258E-01	6.38442E-0
M3b-5001 1-3-19	8.54391E-01	-6.05286E-03	8.36636E-02	-9.03725E-02	7.78626E-0
M3b-5002 1-3-19	9.03113E-01	-5.96430E-03	5.04930E-02	1.81442E-01	9.79026E-0
M3b-5003 1-3-19	9.58136E-01	-6.06511E-03	6.58036E-02	-1.60229E-02	1.41851E-0
M3b-5004 1-3-19	1.00000E+00	-6.40275E-03	9.37101E-02	1.59217E-01	1.11912E-0

NAME	TEMP	% ATMOS	37CA/39K	+/-	(40/36)S
M3b-200 1-3-199	2.00000E+02	9.72688E+01	2.99110E+00	2.28178E-02	3.03797E+0
M3b-400 1-3-199	4.00000E+02	8.96365E+01	2.79160E+00	8.08544E-03	3.29665E+0
M3b-680 1-3-199	6.80000E+02	9.21691E+01	2.32654E+00	4.28559E-03	3.20606E+0
M3b-1000 1-3-19	1.00000E+03	9.36774E+01	1.75041E+00	3.82103E-03	3.15444E+0
M3b-1800 1-3-19	1.80000E+03	9.28761E+01	2.86542E+00	5.62194E-03	3.18166E+0
M3b-3200 1-3-19	3.20000E+03	9.91053E+01	8.45407E+00	7.84772E-03	2.98168E+0
M3b-5000 1-3-19	5.00000E+03	1.01689E+02	9.29370E+00	1.01880E-02	2.90591E+0
M3b-5001 1-3-19	5.00100E+03	1.01288E+02	9.33835E+00	1.54324E-02	2.91742E+0
M3b-5002 1-3-19	5.00200E+03	9.84508E+01	9.20173E+00	1.92036E-02	3.00150E+0
M3b-5003 1-3-19	5.00300E+03	1.00177E+02	9.35725E+00	2.50472E-02	2.94978E+0
M3b-5004 1-3-19	5.00400E+03	9.76661E+01	9.87816E+00	3.31765E-02	3.02561E+0

INTEGRATED RESULTS
MASS= 0.01980000 G
(40/36)S = 3.02306E+02 +/- 1.12562E+00
37CA/39K = 6.05264E+00 +/- 3.16854E-03
F1 = -3.92315E-03 F2 = 6.90717E-02
TOTAL ATMOS 40 VOL = 2.18126E-07 CCNTP/G
TOTAL 39K VOL = 3.79352E-08 CCNTP/G
40*/39K = 1.32465E-01 +/- 2.14163E-02
AGE = 2.06067E+05 +/- 3.33202E+04 Y

m3a MCBH-5713 basalt

WEIGHTED AVERAGE OF J FROM STANDARDS = 8.62335E-04 +/- 2.67857E-06

STANDARDS NAME	F1	F2	40*/39K	+/-	AGE
J function	0.00000E+00	0.00000E+00	1.81320E+01	5.63213E-02	2.79900E+07

FRACTIONS NAME	CUM 39K	F1	F2	40*/39K	+/-
M3a-200 12-20-1	4.23359E-03	-2.11771E-03	3.68637E-04	-8.50957E-01	1.19026E+0
M3a-400 12-20-1	3.21268E-02	-1.88209E-03	3.96694E-02	-1.16124E-01	1.54170E-0
M3a-600 12-20-1	1.05436E-01	-1.70617E-03	8.52047E-02	-1.12227E-01	4.66608E-0
M3a-800 12-20-1	2.02190E-01	-1.37000E-03	6.08787E-02	-4.68441E-02	2.91378E-0
M3a-1000 12-20-	2.65363E-01	-1.22128E-03	8.23057E-02	-1.64953E-01	4.02597E-0
M3a-1400 12-20-	3.56733E-01	-1.44031E-03	9.09929E-02	1.57741E-02	3.49836E-0
M3a-1800 12-20-	4.04089E-01	-2.39742E-03	7.47916E-02	-3.23637E-01	4.27086E-0
M3a-2400 12-20-	4.87416E-01	-4.54769E-03	1.26411E-01	-8.31919E-02	5.60357E-0
M3a-2800 12-20-	5.28565E-01	-4.81916E-03	1.36809E-01	-1.41962E-01	6.37374E-0
M3a-3600 12-20-	6.07699E-01	-5.14201E-03	1.63872E-01	-9.43545E-02	3.90522E-0
M3a-5000 12-20-	7.39968E-01	-5.24948E-03	1.69763E-01	-9.53431E-02	3.00425E-0
M3a-5001 12-20-	8.15701E-01	-6.16445E-03	1.96479E-01	-1.45780E-01	3.56861E-0
M3a-5002 12-20-	8.67791E-01	-6.34037E-03	2.10403E-01	-1.89165E-01	6.83189E-0

20 Feb 97
JMc

Some Raw data for basalt details. C. Hall.

m3 all

CURRENT BLANK ERROR= 5.0000E-08 COUNTS

36/40 VS 39/40

J0= 8.6233525680E-04 +/- 2.6785736521E-06

	X	DX	Y	DY	R
M3a-200 12-20-1	1.03072E-02	3.65427E-05	3.41378E-03	4.15175E-05	7.85943E-03
M3a-400 12-20-1	2.04750E-01	1.25685E-03	3.46456E-03	1.06826E-04	7.23004E-03
M3a-600 12-20-1	5.12269E-01	2.75365E-03	3.57865E-03	8.09109E-05	2.67011E-02
M3a-800 12-20-1	4.29367E-01	1.50332E-03	3.45216E-03	4.23407E-05	1.50909E-02
M3a-1000 12-20-	7.25984E-01	6.23830E-03	3.78935E-03	9.89877E-05	3.98614E-02
M3a-1400 12-20-	6.08289E-01	3.13916E-03	3.35162E-03	7.20126E-05	7.18374E-03
M3a-1800 12-20-	3.35620E-01	1.83353E-03	3.75167E-03	4.85669E-05	5.04214E-02
M3a-2400 12-20-	2.93775E-01	8.95524E-04	3.46680E-03	5.57129E-05	1.90594E-02
M3a-2800 12-20-	3.09186E-01	1.78802E-03	3.53263E-03	6.67027E-05	2.19000E-02
M3a-3600 12-20-	3.53390E-01	1.26732E-03	3.49693E-03	4.67097E-05	2.15132E-02
M3a-5000 12-20-	3.61372E-01	8.45649E-04	3.50069E-03	3.67443E-05	2.13566E-02
M3a-5001 12-20-	3.75381E-01	1.53104E-03	3.56928E-03	4.53510E-05	3.21583E-02
M3a-5002 12-20-	4.05526E-01	2.57101E-03	3.64369E-03	9.37857E-05	2.65017E-02
M3a-5003 12-20-	3.56715E-01	1.05788E-03	3.54814E-03	6.02112E-05	1.96233E-02
M3a-5004 12-20-	4.10463E-01	4.76609E-03	4.01134E-03	1.33492E-04	6.91540E-02
M3b-200 1-3-199	7.45186E-03	2.54586E-05	3.29167E-03	2.62988E-05	1.14327E-02
M3b-400 1-3-199	8.52737E-02	2.35666E-04	3.03339E-03	4.59239E-05	-2.94960E-03
M3b-680 1-3-199	4.95836E-01	2.19575E-03	3.11909E-03	7.65463E-05	6.92189E-04
M3b-1000 1-3-19	7.64242E-01	4.67567E-03	3.17013E-03	9.84643E-05	-7.98237E-03
M3b-1800 1-3-19	3.67085E-01	1.25818E-03	3.14302E-03	5.07410E-05	9.44677E-03
M3b-3200 1-3-19	3.58128E-01	8.64992E-04	3.35382E-03	2.93798E-05	2.78891E-02
M3b-5000 1-3-19	1.31720E-01	1.80707E-04	3.44127E-03	2.84599E-05	1.59910E-02
M3b-5001 1-3-19	1.42530E-01	3.43035E-04	3.42768E-03	3.75578E-05	1.87430E-02
M3b-5002 1-3-19	8.53836E-02	2.20512E-04	3.33167E-03	2.82871E-05	8.72253E-03
M3b-5003 1-3-19	1.10541E-01	3.60899E-04	3.39009E-03	5.30639E-05	8.87502E-03
M3b-5004 1-3-19	1.46586E-01	7.04360E-04	3.30511E-03	5.55131E-05	2.66107E-03

	RESX	RESY
M3a-200 12-20-1	-5.50062E-07	-8.24014E-05
M3a-400 12-20-1	-3.02317E-06	-7.23706E-05
M3a-600 12-20-1	-4.93615E-05	-9.03003E-05
M3a-800 12-20-1	1.45478E-06	1.02759E-05
M3a-1000 12-20-	-2.97716E-04	-2.34241E-04
M3a-1400 12-20-	-4.68867E-05	1.66755E-04
M3a-1800 12-20-	-4.64878E-04	-3.18701E-04
M3a-2400 12-20-	-1.05513E-05	-4.67749E-05
M3a-2800 12-20-	-3.90636E-05	-1.07795E-04
M3a-3600 12-20-	-2.05990E-05	-5.82664E-05
M3a-5000 12-20-	-1.94004E-05	-5.95273E-05
M3a-5001 12-20-	-9.02778E-05	-1.23760E-04
M3a-5002 12-20-	-9.27832E-05	-1.88742E-04
M3a-5003 12-20-	-2.69198E-05	-1.08435E-04
M3a-5004 12-20-	-1.15030E-03	-5.55173E-04
M3b-200 1-3-199	4.18192E-07	3.88134E-05
M3b-400 1-3-199	-7.51260E-06	3.21433E-04
M3b-680 1-3-199	-8.64712E-05	3.64106E-04
M3b-1000 1-3-19	-4.30296E-04	3.96901E-04
M3b-1800 1-3-19	1.25837E-05	2.99945E-04
M3b-3200 1-3-19	4.75082E-05	8.63550E-05
M3b-5000 1-3-19	-6.39587E-06	-7.19210E-05
M3b-5001 1-3-19	-7.97499E-06	-5.49593E-05
M3b-5002 1-3-19	1.13603E-06	2.31880E-05
M3b-5003 1-3-19	-1.25595E-06	-2.73656E-05
M3b-5004 1-3-19	-1.14244E-06	6.88825E-05

SLOPE= 3.1274790551E-04 +/- 5.2596610858E-05

26 Dec 97.
Raw data for C. Hall for

Some Raw data for basalt dated to C Hall.

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Y INTERCEPT=  3.3281518690E-03 +/-  1.5062647854E-05
SUMS S=  2.4391085914E+02 XBAR=  2.2995104163E-01 YBAR=  3.4000685757E-03
MODIFIED ERRORS
SLOPE=  1.6767476554E-04 INTERCEPT=  4.8018796386E-05

RECIPROCAL OF Y INTERCEPT=  3.0046705780E+02 +/-  1.3598626690E+00
MODIFIED +/- =  4.3351586817E+00

X INTERCEPT= -1.0641643990E+01 +/-  1.8287274205E+00
MODIFIED ERROR=  5.8298538608E+00

RECIPROCAL OF X INTERCEPT= -9.3970443002E-02 +/-  1.6148475367E-02
MODIFIED +/- =  5.1480198967E-02

AGE = -1.4619756365E+05 +-  2.5128636154E+04
MODIFIED +- =  8.0096521522E+04
```

26 Dec 97.

Raw data for C Hall for

Same Raw data for basalt dated to C. Hall.

m5 all

CURRENT BLANK ERROR= 5.0000E-08 COUNTS

36/40 VS 39/40

J0= 8.3538511950E-04 +/- 2.5857485508E-06

	X	DX	Y	DY	R
M5a-200 12-17-1	4.43351E-03	5.66315E-06	3.37797E-03	1.61928E-05	3.89581E-03
M5a-400 12-17-1	8.44388E-03	4.43326E-05	3.37647E-03	1.93378E-05	1.92357E-02
M5a-500 12-17-1	1.53615E-02	3.67093E-05	3.33087E-03	1.50379E-05	1.32060E-02
M5a-600 12-17-1	2.19584E-02	4.33024E-05	3.34948E-03	1.43161E-05	1.04890E-02
M5a-800 12-17-1	3.47539E-02	5.07442E-05	3.32349E-03	1.24746E-05	1.21845E-02
M5a-1200 12-17-	4.21124E-02	7.42782E-05	3.35333E-03	1.15085E-05	2.15287E-02
M5a-1800 12-17-	6.72359E-02	8.24987E-05	3.28342E-03	2.32582E-05	3.47397E-03
M5a-2400 12-17-	7.58804E-02	1.00052E-04	3.31100E-03	1.76048E-05	1.95025E-02
M5a-3600 12-17-	1.52489E-01	1.53524E-04	3.31357E-03	4.59854E-06	1.33654E-01
M5a-5000 12-17-	1.10872E-01	2.29154E-04	3.27210E-03	2.68960E-05	6.91105E-03
M5a-5001 12-17-	7.43757E-02	4.25115E-04	3.24081E-03	5.59409E-05	3.68626E-03
M5B-200 1-2-199	6.00506E-03	1.45896E-05	3.39907E-03	9.52041E-06	4.72659E-03
M5B-240 1-2-199	7.77030E-03	4.07868E-05	3.44996E-03	1.97386E-05	2.46412E-03
M5B-320 1-2-199	1.16220E-02	3.03237E-05	3.41982E-03	1.95122E-05	4.40316E-03
M5B-360 1-2-199	1.34648E-02	4.73618E-05	3.39797E-03	1.35383E-05	1.10128E-02
M5B-440 1-2-199	2.30163E-02	4.54537E-05	3.36571E-03	2.79776E-05	7.01648E-03
M5B-520 1-2-199	3.18177E-02	9.48504E-05	3.42673E-03	1.88151E-05	5.95251E-03
M5B-600 1-2-199	4.23754E-02	7.70618E-05	3.39346E-03	1.62111E-05	3.75037E-02
M5B-720 1-2-199	5.58945E-02	1.25888E-04	3.37740E-03	2.00566E-05	2.65997E-02
M5B-920 1-2-199	7.04402E-02	1.48191E-04	3.37954E-03	4.22645E-05	1.44591E-02
M5B-1200 1-2-19	8.85193E-02	1.81108E-04	3.37401E-03	3.14506E-05	2.68502E-02
M5B-1600 1-2-19	1.02618E-01	2.13579E-04	3.33593E-03	2.76033E-05	1.31746E-02
M5B-2000 1-2-19	1.08324E-01	1.92469E-04	3.34392E-03	3.36289E-05	3.25941E-03
M5B-2800 1-2-19	1.67411E-01	2.06977E-04	3.37065E-03	1.77618E-05	2.67308E-02
M5B-3600 1-2-19	1.94866E-01	4.15613E-04	3.39443E-03	3.02160E-05	1.01588E-02
M5B-5000 1-2-19	1.99177E-01	4.16593E-04	3.32648E-03	2.24947E-05	2.11446E-02
M5B-5001 1-2-19	1.78329E-01	9.26811E-04	3.54362E-03	5.12141E-05	2.12044E-02
M5B-5002 1-2-19	2.21094E-01	2.53121E-03	3.47255E-03	1.72288E-04	8.45065E-03

	RESX	RESY
M5a-200 12-17-1	3.24004E-09	2.29439E-06
M5a-400 12-17-1	1.00410E-07	2.17188E-06
M5a-500 12-17-1	1.55818E-06	4.49604E-05
M5a-600 12-17-1	8.38850E-07	2.36690E-05
M5a-800 12-17-1	2.50264E-06	4.44657E-05
M5a-1200 12-17-	1.81360E-06	1.16362E-05
M5a-1800 12-17-	1.24370E-06	7.13478E-05
M5a-2400 12-17-	4.98950E-06	4.02551E-05
M5a-3600 12-17-	3.21746E-05	6.55848E-06
M5a-5000 12-17-	5.73783E-06	6.49392E-05
M5a-5001 12-17-	5.71547E-06	1.11059E-04
M5B-200 1-2-199	-1.59367E-07	-1.94423E-05
M5B-240 1-2-199	-4.84960E-07	-7.10505E-05
M5B-320 1-2-199	-3.32275E-07	-4.24707E-05
M5B-360 1-2-199	-9.29632E-07	-2.13730E-05
M5B-440 1-2-199	8.74335E-08	7.01093E-06
M5B-520 1-2-199	-2.32196E-06	-5.75784E-05
M5B-600 1-2-199	-5.35977E-06	-2.85943E-05
M5B-720 1-2-199	-3.29896E-06	-1.80327E-05
M5B-920 1-2-199	-1.45227E-06	-2.60783E-05
M5B-1200 1-2-19	-4.68713E-06	-2.78877E-05
M5B-1600 1-2-19	5.64553E-07	4.47194E-06
M5B-2000 1-2-19	-1.86507E-07	-5.83638E-06
M5B-2800 1-2-19	-2.07317E-05	-5.65536E-05
M5B-3600 1-2-19	-1.98095E-05	-9.14794E-05
M5B-5000 1-2-19	-1.34213E-05	-2.52862E-05
M5B-5001 1-2-19	-1.20852E-04	-2.33921E-04
M5B-5002 1-2-19	-3.81743E-05	-1.80242E-04

26 Dec 97.

Raw data for C. Hall for

Same Raw data for basalt dated to Chall.

```
SLOPE= -4.0607309011E-04 +/-  4.2935742471E-05
Y INTERCEPT=  3.3820680839E-03 +/-  4.5973982393E-06
SUMS S=  1.3333158211E+02 XBAR=  8.4563916800E-02 YBAR=  3.3477289529E-03
MODIFIED ERRORS
SLOPE=  9.7229671765E-05 INTERCEPT=  1.0410988516E-05

RECIPROCAL OF Y INTERCEPT=  2.9567707544E+02 +/-  4.0192723277E-01
MODIFIED +/- =  9.1017997283E-01

X INTERCEPT=  8.3287175790E+00 +/-  8.7223154958E-01
MODIFIED ERROR=  1.9752009308E+00

RECIPROCAL OF X INTERCEPT=  1.2006650370E-01 +/-  1.2574059761E-02
MODIFIED +/- =  2.8474428099E-02

AGE =  1.8094306450E+05 +-  1.8956730072E+04
MODIFIED +- =  4.2913140185E+04
```

26 Dec 97.

Raw data for C. Hall for

Some Raw data for basalt dated b. C Hall.

m7 all

CURRENT BLANK ERROR= 5.0000E-08 COUNTS

36/40 VS 39/40

J0= 8.4579798600E-04 +/- 2.9965097374E-06

	X	DX	Y	DY	R
M7a-200 12-18-1	1.82264E-01	4.17817E-03	3.19127E-03	2.50579E-04	-1.06170E-02
M7a-400 12-18-1	6.58443E-01	5.38444E-03	2.86873E-03	1.20549E-04	-3.04347E-02
M7a-600 12-18-1	7.51348E-01	5.28407E-03	2.87122E-03	9.40515E-05	-3.02621E-02
M7a-800 12-18-1	2.53673E-01	6.60906E-04	3.35750E-03	3.26993E-05	4.63105E-02
M7a-1200 12-18-	3.92194E-01	2.22529E-03	3.10730E-03	8.82210E-05	-5.27407E-03
M7a-1800 12-18-	1.95149E-01	1.31011E-03	3.38199E-03	9.01163E-05	2.07661E-03
M7a-2400 12-18-	2.19559E-01	1.72680E-03	3.35605E-03	1.16326E-04	5.19986E-03
M7a-3600 12-18-	2.66602E-01	9.54535E-04	3.31367E-03	5.02030E-05	5.96319E-03
M7a-5000 12-18-	2.98441E-01	1.04249E-03	3.13125E-03	7.08483E-05	-5.83227E-03
M7a-5001 12-18-	2.88110E-01	9.32362E-04	3.29240E-03	3.77277E-05	1.51125E-03
M7a-5002 12-18-	2.68307E-01	5.14664E-03	3.00168E-03	1.71329E-04	-3.35837E-02
M7b-200 1-3-199	2.61121E-01	6.51588E-03	3.11708E-03	3.05111E-04	-1.55368E-02
M7b-400 1-3-199	6.11095E-01	6.33032E-03	2.87200E-03	1.03343E-04	-4.14407E-02
M7b-600 1-3-199	7.15384E-01	5.22735E-03	2.90587E-03	1.06285E-04	-2.49295E-02
M7b-800 1-3-199	6.84401E-01	4.81721E-03	3.08532E-03	6.16871E-05	-2.43385E-02
M7b-1200 1-3-19	5.25217E-01	2.74440E-03	3.18834E-03	7.55381E-05	-2.63319E-03
M7b-1800 1-3-19	3.39654E-01	1.61400E-03	3.17556E-03	5.06227E-05	-1.61757E-03
M7b-2400 1-3-19	2.26663E-01	1.46350E-03	3.43330E-03	8.06434E-05	1.05072E-02
M7b-3600 1-3-19	1.42526E-01	3.08876E-04	3.31119E-03	5.15725E-05	5.80975E-03
M7b-5000 1-3-19	1.22126E-01	2.78838E-04	3.25352E-03	3.05211E-05	1.10208E-02
M7b-5001 1-3-19	1.26532E-01	3.49891E-04	3.23094E-03	3.41301E-05	7.88255E-03
M7b-5002 1-3-19	7.79800E-02	2.07898E-04	3.31140E-03	2.41617E-05	8.49831E-03
M7b-5003 1-3-19	3.81886E-02	1.07570E-04	3.39771E-03	2.45127E-05	1.44556E-02
M7b-5004 1-3-19	4.21722E-02	1.74314E-04	3.24218E-03	4.03187E-05	2.22123E-03
M7b-5005 1-3-19	2.27691E-02	1.32343E-04	3.36682E-03	3.52739E-05	2.56274E-03

	RESX	RESY
M7a-200 12-18-1	-3.78087E-06	9.01008E-05
M7a-400 12-18-1	-7.07967E-05	1.81336E-04
M7a-600 12-18-1	-2.23046E-05	1.33683E-04
M7a-800 12-18-1	-1.25605E-04	-1.10767E-04
M7a-1200 12-18-	1.26904E-05	7.20706E-05
M7a-1800 12-18-	-1.42001E-05	-1.06874E-04
M7a-2400 12-18-	-1.70960E-05	-9.27938E-05
M7a-3600 12-18-	-2.11726E-05	-7.32626E-05
M7a-5000 12-18-	1.81444E-06	9.36747E-05
M7a-5001 12-18-	-2.08593E-05	-6.24444E-05
M7a-5002 12-18-	-1.35808E-04	2.37956E-04
M7b-200 1-3-199	-1.38899E-05	1.25984E-04
M7b-400 1-3-199	-1.44080E-04	2.01105E-04
M7b-600 1-3-199	-5.93776E-06	1.16497E-04
M7b-800 1-3-199	-5.08962E-05	-4.78795E-05
M7b-1200 1-3-19	-4.01418E-05	-7.35705E-05
M7b-1800 1-3-19	1.29742E-05	2.93345E-05
M7b-2400 1-3-19	-6.08291E-05	-1.73473E-04
M7b-3600 1-3-19	-5.49148E-07	-1.05158E-05
M7b-5000 1-3-19	8.05823E-06	5.70584E-05
M7b-5001 1-3-19	1.02198E-05	7.75034E-05
M7b-5002 1-3-19	2.25066E-06	2.06316E-05
M7b-5003 1-3-19	-3.37337E-06	-4.63442E-05
M7b-5004 1-3-19	2.00374E-06	1.07244E-04
M7b-5005 1-3-19	-1.31146E-07	-7.97066E-06

SLOPE= -4.8582133840E-04 +/- 5.7026152422E-05
Y INTERCEPT= 3.3699156375E-03 +/- 1.3770391080E-05
SUMS S= 5.8950241941E+01 XBAR= 1.7482452730E-01 YBAR= 3.2849821517E-03

26 Dec 97.

Raw data for C. Hall for

Some Raw data for basalt dated b. C. Hall.

m8 all

CURRENT BLANK ERROR= 5.0000E-08 COUNTS

36/40 VS 39/40

J0= 8.3545222975E-04 +/- 3.9693711879E-06

	X	DX	Y	DY	R
M8a-200 1-7-199	3.10126E-03	2.00596E-05	3.39195E-03	1.57964E-05	2.94085E-03
M8a-400 1-7-199	2.32458E-03	1.20159E-05	3.36824E-03	1.57189E-05	1.70432E-03
M8a-520 1-7-199	2.69131E-03	2.48635E-05	3.34794E-03	3.00114E-05	8.37050E-03
M8a-600 1-7-199	5.59121E-03	1.26268E-05	3.37151E-03	1.53893E-05	8.46635E-03
M8a-680 1-7-199	1.08455E-02	2.10284E-05	3.35711E-03	1.23256E-05	8.12993E-03
M8a-800 1-7-199	1.51143E-02	2.33925E-05	3.35003E-03	5.44216E-06	4.04972E-02
M8a-960 1-7-199	4.80676E-02	1.01976E-04	3.36236E-03	2.98848E-05	1.12026E-02
M8a-1200 1-7-19	7.97670E-02	2.30464E-04	3.31176E-03	3.26445E-05	7.12368E-03
M8a-1600 1-7-19	1.06683E-01	2.14582E-04	3.35420E-03	4.84150E-05	9.63204E-03
M8a-2000 1-7-19	1.26080E-01	1.94315E-04	3.36514E-03	3.43307E-05	2.61925E-03
M8a-2500 1-7-19	1.04504E-01	8.64117E-05	3.32802E-03	1.49827E-05	2.86646E-02
M8a-3000 1-7-19	1.46110E-01	1.29313E-04	3.35841E-03	1.77003E-05	1.40108E-02
M8a-3500 1-8-19	1.58078E-01	1.45922E-04	3.36565E-03	1.23636E-05	5.40632E-03
M8a-4000 1-8-19	1.51155E-01	2.06578E-04	3.35607E-03	1.63352E-05	7.63600E-03
M8a-5000 1-8-19	1.68197E-01	2.09924E-04	3.35586E-03	1.86378E-05	1.65942E-02
M8a-5001 1-8-19	2.26293E-01	3.87749E-04	3.29535E-03	3.22631E-05	8.58668E-03
M8a-5002 1-8-19	1.76883E-01	2.79868E-04	3.29311E-03	1.85540E-05	3.93277E-02
M8a-5003 1-8-19	1.97942E-01	9.05035E-04	3.31477E-03	1.08456E-04	1.73770E-03
M8a-5004 1-8-19	1.38792E-01	6.11676E-04	3.34731E-03	6.70831E-05	8.47554E-03
M8b-200 1-22-19	6.12693E-03	4.36119E-05	3.36982E-03	2.70144E-05	4.22264E-03
M8b-400 1-22-19	4.02687E-02	1.72897E-04	3.40704E-03	3.63234E-05	1.12660E-02
M8b-800 1-22-19	1.18304E-01	2.01626E-04	3.39717E-03	2.14764E-05	2.30919E-02
M8b-1000 1-22-1	1.53471E-01	4.05736E-04	3.46085E-03	4.96238E-05	1.37231E-02
M8b-1400 1-22-1	3.94709E-02	4.64067E-05	3.35978E-03	2.01473E-05	2.59813E-02
M8b-1600 1-22-1	1.46212E-02	2.13378E-05	3.41673E-03	5.46281E-06	1.09749E-02
M8b-1700 1-22-1	1.27138E-02	1.29411E-05	3.39685E-03	6.70533E-06	1.35336E-02
M8b-1800 1-22-1	1.73529E-02	2.78784E-05	3.39188E-03	1.25531E-05	1.64413E-02
M8b-1900 1-22-1	2.41096E-02	1.16545E-05	3.41001E-03	6.95054E-06	3.73566E-02
M8b-2000 1-22-1	1.93496E-02	3.75895E-05	3.39864E-03	1.39717E-05	3.64798E-03
M8b-2500 1-22-1	2.06064E-02	1.14719E-04	3.39990E-03	1.97551E-05	1.63232E-03
M8b-3000 1-22-1	2.36645E-02	1.11129E-04	3.36657E-03	1.73559E-05	1.87361E-03
M8b-4000 1-22-1	4.61012E-02	2.47161E-04	3.35364E-03	1.88091E-05	2.82035E-03
M8b-5000 1-22-1	4.35867E-02	5.00966E-05	3.38262E-03	1.02552E-05	1.26042E-02
M8b-5001 1-22-1	3.90336E-02	5.73420E-05	3.41818E-03	9.75649E-06	3.97608E-02

	RESX	RESY
M8a-200 1-7-199	7.97389E-11	1.91132E-08
M8a-400 1-7-199	3.49832E-08	2.39397E-05
M8a-520 1-7-199	3.14340E-07	4.41436E-05
M8a-600 1-7-199	1.41104E-07	1.97925E-05
M8a-680 1-7-199	4.80315E-07	3.27643E-05
M8a-800 1-7-199	6.92645E-06	3.86788E-05
M8a-960 1-7-199	7.20830E-07	1.74179E-05
M8a-1200 1-7-19	3.79116E-06	5.94135E-05
M8a-1600 1-7-19	4.64475E-07	9.67288E-06
M8a-2000 1-7-19	-1.53351E-07	-6.52152E-06
M8a-2500 1-7-19	6.35322E-06	3.64424E-05
M8a-3000 1-7-19	-6.10233E-07	-5.22320E-06
M8a-3500 1-8-19	-1.59661E-06	-1.57161E-05
M8a-4000 1-8-19	-5.95274E-07	-4.25372E-06
M8a-5000 1-8-19	-1.91908E-06	-8.67166E-06
M8a-5001 1-8-19	5.13692E-06	3.60810E-05
M8a-5002 1-8-19	3.38685E-05	5.17214E-05
M8a-5003 1-8-19	8.12992E-07	2.43497E-05
M8a-5004 1-8-19	7.84721E-07	7.86052E-06
M8b-200 1-22-19	1.60475E-07	2.13286E-05
M8b-400 1-22-19	-1.50281E-06	-2.51431E-05
M8b-800 1-22-19	-8.77094E-06	-3.64415E-05
M8b-1000 1-22-1	-1.42921E-05	-1.09660E-04

26 Dec 97.

Raw data for C. Hall for

Some Raw data for basalt dated by C. Hall.

M8b-1400	1-22-1	1.36829E-06	2.23276E-05
M8b-1600	1-22-1	-1.31078E-06	-2.78853E-05
M8b-1700	1-22-1	-2.02987E-07	-7.48206E-06
M8b-1800	1-22-1	-1.42979E-07	-3.77743E-06
M8b-1900	1-22-1	-1.50497E-06	-2.37377E-05
M8b-2000	1-22-1	-1.30385E-07	-1.10704E-05
M8b-2500	1-22-1	-2.36082E-07	-1.26751E-05
M8b-3000	1-22-1	4.58243E-07	1.98228E-05
M8b-4000	1-22-1	2.23710E-06	2.66654E-05
M8b-5000	1-22-1	-1.10540E-07	-1.62457E-06
M8b-5001	1-22-1	-8.73736E-06	-3.59501E-05

```
SLOPE= -2.7124036737E-04 +/-  4.6874947957E-05
Y INTERCEPT=  3.3928142156E-03 +/-  2.8205536629E-06
SUMS S=  1.5153931463E+02 XBAR=  3.7543756099E-02 YBAR=  3.3826308334E-03
MODIFIED ERRORS
SLOPE=  1.0200664615E-04 INTERCEPT=  6.1379314964E-06

RECIPROCAL OF Y INTERCEPT=  2.9474057123E+02 +/-  2.4502715003E-01
MODIFIED +/- =  5.3321441154E-01

X INTERCEPT=  1.2508515043E+01 +/-  2.1552689253E+00
MODIFIED ERROR=  4.6912186557E+00

RECIPROCAL OF X INTERCEPT=  7.9945540822E-02 +/-  1.3774947646E-02
MODIFIED +/- =  2.9982936524E-02

AGE =  1.2049152073E+05 +-  2.0768385585E+04
MODIFIED +- =  4.5191499290E+04
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26 Dec 97.
Raw data for C. Hall for

Some Raw data for basalt dated to. C hall.

M6b-2000	1-21-1	3.67146E-05	1.01213E-04
M6b-2500	1-21-1	1.93798E-06	7.86014E-06
M6b-3000	1-21-1	-2.87081E-05	-3.73778E-05
M6b-3500	1-21-1	-1.59472E-05	-1.04871E-04
M6b-4000	1-21-1	2.00663E-06	4.60699E-06
M6b-4500	1-21-1	1.01294E-06	3.30486E-06
M6b-5000	1-21-1	-5.58349E-06	-2.80370E-05
M6b-5001	1-21-1	-3.53308E-07	-4.68933E-06
M6b-5002	1-21-1	-3.81482E-05	-1.26915E-04
M6b-5003	1-21-1	-1.73716E-05	-1.68583E-04
M6b-5004	1-21-1	-5.46540E-05	-2.00994E-04

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SLOPE= -6.7777985313E-04 +/-  3.1586253156E-05
Y INTERCEPT=  3.3890268667E-03 +/-  6.1972000712E-06
SUMS S=  6.6684710161E+01 XBAR=  1.3003557866E-01 YBAR=  3.3008913713E-03
MODIFIED ERRORS
SLOPE=  4.5596998623E-05 INTERCEPT=  8.9460982192E-06

RECIPROCAL OF Y INTERCEPT=  2.9506995351E+02 +/-  5.3956714090E-01
MODIFIED +/- =  7.7890346977E-01

X INTERCEPT=  5.0001882633E+00 +/-  2.2703556307E-01
MODIFIED ERROR=  3.2771828293E-01

RECIPROCAL OF X INTERCEPT=  1.9999246975E-01 +/-  9.0807386820E-03
MODIFIED +/- =  1.3107744216E-02

AGE =  3.0927365785E+05 +-  1.4068006641E+04
MODIFIED +- =  2.0286803941E+04
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26 ~~Aug~~ 97.

Raw data for C. Hall for

Some Raw data for basalt dated by C Hall.

m6 all

CURRENT BLANK ERROR= 5.0000E-08 COUNTS

36/40 VS 39/40

J0= 8.5725769470E-04 +/- 2.3932028403E-06

	X	DX	Y	DY	R
M6a-200 1-20-19	2.40771E-03	1.01001E-05	3.38705E-03	1.80565E-05	5.70609E-03
M6a-400 1-20-19	9.93449E-03	2.87756E-05	3.36523E-03	1.30776E-05	1.98125E-03
M6a-600 1-20-19	7.25136E-02	5.64513E-05	3.34860E-03	1.32259E-05	3.37867E-02
M6a-800 1-20-19	4.04074E-01	8.18726E-04	3.11726E-03	4.02824E-05	4.19462E-03
M6a-1000 1-20-1	7.73474E-01	3.03706E-03	2.77704E-03	7.28010E-05	-9.22097E-03
M6a-1200 1-20-1	6.97974E-01	3.54415E-03	2.96492E-03	8.53497E-05	-1.67226E-02
M6a-1400 1-20-1	4.48426E-01	2.40198E-03	3.03232E-03	7.22334E-05	-1.64355E-02
M6a-2000 1-20-1	1.95474E-01	4.34238E-04	3.31074E-03	3.33996E-05	3.58588E-02
M6a-2500 1-20-1	1.21041E-01	2.73452E-04	3.34173E-03	3.94781E-05	6.44400E-03
M6a-3000 1-20-1	1.06279E-01	1.95057E-04	3.37865E-03	2.42224E-05	2.80111E-02
M6a-3500 1-20-1	1.09265E-01	2.27417E-04	3.35340E-03	2.50745E-05	1.35231E-02
M6a-4000 1-20-1	1.14853E-01	2.50735E-04	3.39834E-03	3.68735E-05	1.40396E-02
M6a-5000 1-20-1	1.02823E-01	4.16338E-04	3.46202E-03	5.62895E-05	1.37615E-02
M6a-5001 1-20-1	8.73260E-02	9.54727E-04	3.34209E-03	1.21431E-04	4.01894E-03
M6b-200 1-20-19	6.53235E-03	3.49631E-05	3.36631E-03	1.72035E-05	3.20190E-03
M6b-400 1-20-19	3.35626E-02	5.59308E-05	3.31713E-03	1.57074E-05	9.08170E-03
M6b-600 1-20-19	1.88545E-01	2.45358E-04	3.27184E-03	3.12674E-05	1.63087E-02
M6b-800 1-20-19	3.60671E-01	6.22440E-04	3.14763E-03	2.22824E-05	1.28749E-03
M6b-1000 1-21-1	5.29828E-01	1.35764E-03	3.04005E-03	2.87499E-05	-9.17225E-03
M6b-1200 1-21-1	5.15641E-01	1.34409E-03	3.03565E-03	3.40755E-05	-8.43885E-03
M6b-1400 1-21-1	3.84763E-01	6.99348E-04	3.05298E-03	3.75809E-05	-5.09997E-05
M6b-1600 1-21-1	3.84076E-01	9.60751E-04	3.10686E-03	3.02624E-05	-7.86168E-03
M6b-1800 1-21-1	2.17989E-01	4.63706E-04	3.23273E-03	2.90614E-05	2.29614E-02
M6b-2000 1-21-1	2.10322E-01	7.13096E-04	3.14524E-03	3.38565E-05	2.94757E-03
M6b-2500 1-21-1	1.30958E-01	2.37992E-04	3.29240E-03	2.76901E-05	2.28652E-02
M6b-3000 1-21-1	1.26373E-01	2.83140E-04	3.34077E-03	2.83631E-05	7.02089E-02
M6b-3500 1-21-1	1.25911E-01	3.68834E-04	3.40857E-03	4.80970E-05	1.46335E-02
M6b-4000 1-21-1	1.09752E-01	3.23106E-04	3.31003E-03	2.14784E-05	1.87633E-02
M6b-4500 1-21-1	1.03273E-01	3.43373E-04	3.31573E-03	2.48073E-05	1.27645E-02
M6b-5000 1-21-1	1.11025E-01	3.58614E-04	3.34182E-03	3.23991E-05	1.04913E-02
M6b-5001 1-21-1	9.91837E-02	3.81912E-04	3.32649E-03	5.52516E-05	6.21530E-03
M6b-5002 1-21-1	1.09209E-01	7.46481E-04	3.44195E-03	7.55044E-05	2.37069E-02
M6b-5003 1-21-1	1.01654E-01	8.63658E-04	3.48872E-03	1.27626E-04	1.06414E-02
M6b-5004 1-21-1	1.16518E-01	1.47462E-03	3.51108E-03	1.78622E-04	2.73475E-02

	RESX	RESY
M6a-200 1-20-19	1.16656E-09	3.42722E-07
M6a-400 1-20-19	1.30403E-07	1.70661E-05
M6a-600 1-20-19	-1.36502E-06	-8.71981E-06
M6a-800 1-20-19	-7.67294E-07	-2.10092E-06
M6a-1000 1-20-1	6.97239E-05	8.76928E-05
M6a-1200 1-20-1	-2.32262E-05	-4.89451E-05
M6a-1400 1-20-1	1.07129E-05	5.27697E-05
M6a-2000 1-20-1	-3.14541E-05	-5.41757E-05
M6a-2500 1-20-1	-2.68062E-06	-3.47446E-05
M6a-3000 1-20-1	-1.66115E-05	-6.16434E-05
M6a-3500 1-20-1	-6.85545E-06	-3.84300E-05
M6a-4000 1-20-1	-1.10501E-05	-8.71466E-05
M6a-5000 1-20-1	-1.98110E-05	-1.42675E-04
M6a-5001 1-20-1	-9.00481E-07	-1.22525E-05
M6b-200 1-20-19	1.70192E-07	1.82870E-05
M6b-400 1-20-19	2.01173E-06	4.91497E-05
M6b-600 1-20-19	-1.80003E-06	-1.06073E-05
M6b-800 1-20-19	-1.72592E-06	-3.05563E-06
M6b-1000 1-21-1	-1.09216E-05	-1.01257E-05
M6b-1200 1-21-1	2.80228E-06	3.88216E-06
M6b-1400 1-21-1	1.75904E-05	7.52478E-05
M6b-1600 1-21-1	9.47226E-06	2.18447E-05
M6b-1800 1-21-1	4.60382E-06	8.54457E-06

26 Dec 97.

Raw data for C. Hall for

For otherwise undated vents of SP Cluster the following criteria are used for comparative morphology — Comparison is with dated vents.

3 March 97
PWC

Cinder Cone Evaluation of SFVF: Parameters

1) Put together literature

2) Flow morphology:
- flow edge morphology (diffuse, sharp, lobate, digitate, etc.)
- flow surface roughness (brightness on SLAR: see LUP table and average??)
- % mantled by vegetation
- levees and levee condition
- relief of flow front
- drainage development
- evidence of constructional features

3) Cone Morphology:
- Cone shape
- Degree of degradation (low, med, high)
- Cone slope (average of 4 or 5; from summit to apron)
- Relief
- Aspect Ratio
- Crater (present, infilled, degee of degradation; look for multiple crater)
- Erosional breach (presence, direction, width, etc)
- % Spatter
- Cone Apron (cont., discont, slope, extent, degree of development)
- % cone covered by vegetation
- Cone classification: cinder cone, fissure-fed cone, lava cone, shield
- Rilling (degree, morphology: V-shaped or U-shaped, separation apparent depth, etc.)
- Evidence of crater rim degradation (increasing width I.e., Jorullo)
- Increased erosional effects of mantling of cinders from nearby cone (Ollier & Brown, Wood)

4) Geographical Zone of individual Cone
- Ponderosa Pine (high H20 flux, high erosion)
- Grasslands (low H2O flux, low erosion rate, influx of aeolian fines (?), caliche dev., etc.)

Begin analysis by using dated cones that used as controls on cone evolution

5) Quantitative Measurements (from 1:24,000 & 1:50,000 geologic map):
- Cone height (relief)
- Cone basal width (from geologic map)
- Maximum slope
- Aspect ratio (height vs width) take average of maximum and minumum values
- Depth & width of crater (at mouth) if pertinent.

Rule of thumb — all morphometric measurement made on 1:24,000 — 20 + 40 ft contour maps publ by U.S.G.S. → 3-5 individual measurement made in each case (eg: for slope) and average together.

Morphometric Analysis of Cinder cones of SP Cluster

M. Conway: 25 June 1996

Morphometric data for Vents of the SP Clusters and for radiometrically dated vents.

Vent ID	Age (ka)	Cone Max Ht. (ft	Cone Avg. Ht	Cone ax. Ht (m)	Cone Max (m)	Width Min	Width Avg	Crater Width (m)	Crater Depth (ft)	Crater Depth (m)	Maximum Slope (degrees) 1	2	3	4	Cone Ht/width	Crater crat wdth/ cone wdth	Avg Max Slope	Basal Elevation	Comment
Sunset Crater	1 ka	1039	940	317	1600	1600	1600	400	439	134	31.4	31.4	30.1		0.198	0.25	31.0	7100	Ponderosa
Merriam Crater	Qbyb	1313		400	1900	1250	1575	420			31.4	31.4	30.1		0.254	0.26667	31.0	5600	Grassland
Strawberry Crate	46+/-46	170		52	800	600	700	xx			30				0.074		30.0	6050	Harwood 93
V2019	170+/-60	460		140	1400	1200	1300	400			26.93	26.9	25.1		0.108	0.30769	26.3	6300	Data from 1:50,000 map (slope questionable)
V3835	550+/-120	200		61	560	460	510	xx			24.5	14.2	12.5		0.120		17.1	6980	Ponderosa
V3018	490+/-110	720		220	1720	1250	1485	700	500	152	26.9	23.5	26.9		0.148	0.47138	25.8	5900	Grassland
V3022	340+/-70	240		73	620	600	610	xx			26	26.9	23.5		0.120		25.5	5600	Grassland
V3705				67	500	350	425				19.5	24	22				21.8		
V5701				160	850	500	675				9.5	14.2					11.9		
V5716		920	860	280	1400	1700	1550	xx			25.1	27.9	26.9		0.181		26.6	6600	
V5732		693		211	1500	1600	1550	320	140	43	24	25	27		0.136	0.20645	25.3	7100	
V4606		281		86	850	700	775	xx			17	15.5			0.111		16.3		
V4613		618	580	188	2000	1200	1600	400	180	55	26.9	26.9	24.6		0.118	0.25	26.1	7500	
V4614		480		146	1400	1200	1300	xx			24.6	22	24.6	23.5	0.113		23.7	7800	
V4624		900		274	2500	1700	2100	xx			20.3	21.7	20.9		0.131		21.0	7850	
V4625		412		126	1100	960	1030	xx			18.7	23.5	19.2		0.122		20.5	7850	
V4626		780	770	238	2300	1500	1900	340	280	85	28.6	29	29.7		0.125	0.17895	29.1	8100	
V4635		296		90	880	780	830	xx			19.6	20.9	18.7		0.109		19.7	7950	
V4636		220		67	520	480	500	xx			18.7	21.2	18.4		0.134		19.4	7800	
V4703	135+/-44	600	550	183	1900	1360	1630	450	250	76	28.3	26.9	26.9		0.112	0.27607	27.4	7100	
V4704		317		97	800	780	790	90			21	21	20		0.122	0.11392	20.7	7100	
V4707		285		87	1000	1000	1000	xx			17.8	17	19.7		0.087		18.2	7150	
V4708	219+/-80	680	660	207	1450	1300	1375	350	120	37	26.9	28.2	29		0.151	0.25455	28.0	7150	
V4710	181+/-86																		
V4711		660		201	1450	1800	1625	xx			21.6	25.1	25.1		0.124		23.9		
V4713																			Too small for analysis
V4714																			Too small for analysis
V4717				42	500	400	300				16.7	18.7					17.7		
V4719				60	680	460	570				20.8	18.6	17				18.8		
V4720	420+/-85	530		162	1200	1140	1170	100			25.1	22	19.2	19.7	0.138	0.08547	21.5	7300	
V4726	309+/-40																		
V4728		423		129	1200	1050	1125	xx			18.7	23.9	29	18.7	0.115		22.6	7250	
V4729		400		122	1100	1100	1100	xx			23.5	21	23.5		0.111		22.7	7350	
V4819		343		105	880	700	790	xx			19.6	24.6	20.9		0.132		21.7	6600	
MBillHill (V5626	450+/-15	670	655	204	1400	1300	1350	300	260	79	27	23	26		0.151	0.22222	25.3	6700	
SP C. (V5703)	70+/-40	841		256	1200	1100	1150	340	280	85	31	30	33		0.223	0.29565	31.3	6250	
Ant Hill (V5718)	450+/-540	600	500	183	1100	840	970	240	60	18	26.5	25	27		0.189	0.24742	26.2	6400	
Colton Crater				200	2300	2100	2200				31	26.9	22	26.8			26.6		
V5702		466		142	1050	1000	1025	xx			22.1	15.5	22.12		0.139		19.9	6200	
V5733		580		177	1800	2100	1950	xx			26.9	22.6	22.6	22.6	0.091		23.7	7100	
V5734A	Merriam	520		159	880	700	790	140	80	24	28.4	27.9	34	33.6	0.201	0.17722	31.0	6950	
2 summit craters								100	40	12									
V5725	<800+/-110	800		244	1440	1380	1410	250	220	67	29.7	26.9	26	26.9	0.173	0.1773	27.4	6600	
V5713	440+/-310	780		238	2100	2000	2050	350	220	67	25	26	24	23.5	0.116	0.17073	24.6	6400	
V5712		800		244	2300	1580	1940	300	300	91	25.7	24.5	26.9	26.9	0.126	0.15464	26.0	6300	
V5806		200		61	1100	600	850				15.5	14.2	15.5		0.072		15.1	5950	
V5831	220+/-50	241		73	900	900	900	breached			20.1	26.9	15.5		0.082		20.8	6300	age is suspect
V6713	770+/-40	373		114	1100	900	1000	xx			23.5	20.1	23.5		0.114		22.4	5650	
V6725	≈770	204		62	850	850	850	xx			20.9	18.4	20.1		0.073		19.8	5800	
V6736	1040+/-140	270		82	1020	740	880	220 (?)	100	30	21.2	21.1	16.9	14.2	0.094		18.4	5900	breached crater
V6807		260		79	750	600	675	xx			16.9	23.1	16.9		0.117		19.0	5500	
V6811	1200+/-50	64		20	400	200	300	xx			9.4	9.4			0.065		9.4	5400	
	Mesa Butte Vents																		
V4536 (Tapp W)	280	440		134	950	900	925	345	120		25	25	24.5	23.5	0.145	0.37297	24.5	8050	
Red Mtn	740	1025		313	2000	1500	1750	xx			19.7	22.1	26.9	25.1	0.179		23.5	6900	
V6619 (Chap Mtı	1300	200		61	820	500	660	xx			17	20.9	23.5	14	0.092		18.9	6450	
V6619a	1300	155		47	400	400	400	xx			11.5	15.2	12.3		0.118		13.0	6450	
Mesa B (V6609)	780	652		199	2200	1450	1825	xx			26.9	25.1	23.5	26.3	0.109		25.5	6500	
Shadow Mtn.	300	250		76	2000	1600	1800	xx			19.2	23.5			0.042		21.4		Big spatter?

Morphometric measurements made from 1:50000 MI Geologic Map Series and 1:24,000 topographic base maps.
The 1:50,000 geologic maps were generally used to determine cone width.
The 1:24,000 topographic maps were used to determine: cone relief, crater width and depth, and maximum slope.
Photogeologic interpretation of HAP 1:80,000 aerial photographs supplemented geologic mapping and provided additional constraints on primary versus secondary features.
Slope measurements were made from at least 3 separate and representative areas on the upper maximum slope region of each cone.
Care was taken to avoid breached areas or areas where primary slope features were overprinted by erosive processes.
Slope = arctan of (rise/run)
Basal elevations are estimates of the elevation of the surface on which the cone erupted (+/- 100 ft error in most cases).

Morphometric Parameter and Analysis of Vents dating between about 650 and 400 ka.

####### M. Conway

Vent ID	Age (ka)	Cone Max Ht. (f	Cone Avg. Ht (f	Cone ax. Ht (m	Cone Max (m)	Width Min	Width Avg	Crater Width (m)	Crater Depth (ft)	Crater Depth (m)	Maximu Slope (degrees) 1	2	3	Cone Ht/width	Crater crat wdth/ cone wdth	Avg Max Slope	Basal Elevation	Comment	Vent ID
V3835	550+/-120	200		61	560	460	510	xx			24.5	14.2	12.5	0.120		17.1	6980	Ponderosa	V3835
V3018	490+/-110	720		220	1720	1250	1485	700	500	152	26.9	23.5	26.9	0.148	0.47138	25.8	5900	Grassland	V3018
MBillHill (V56	450+/-15	670	655	204	1400	1300	1350	300	260	79	27	23	26	0.151	0.222222	25.3	6700		MBillHill (V5626
V4624	660+/-40	900		274	2500	1700	2100	xx			20.3	21.7	20.9	0.131		21.0	7850		V4624
Average				190			1361	500	380	116				0.137	0.347	22	6858		

Vents V5713 (440=/-310) and V5718 (Antelope Hill) (450+/-540) were not included in analysis because the errors are insufficient to constrain ages to the period of interest.

3 March 97
RRC.

Morphometric Characteristics of Vents of SP Cluster

		Morphometric Characteristics of Merriam-Age Cinder Cones																		
			Cones < 150 ka																	
			02-Jul-96																	
																Crater				
		Cone	Cone	Cone	Cone	Width	Width	Crater	Crater	Crater	Max.	Slope (degrees)			Cone	crat wdth/	Avg Max	Basal	Comment	
Vent ID	Age (ka)	Max Ht. (ft)	Avg. Ht (ft)	ax. Ht (m)	Max (m)	Min	Avg	Width (m)	Depth (ft)	Depth (m)	1	2	3	4	Ht/width	cone wdtl	Slope	Elevation		Vent ID
Sunset Crater	1 ka	1039	940	317	1600	1600	1600	400	439	134	31.4	31.4	30.1		0.198	0.25	31.0	7100	Ponderosa	Sunset Crater
Strawberry C	46+/-46	170		52	800	600	700	xx			30				0.074		30.0	6050	Harwood 93	Strawberry Crater
V4626		780	770	238	2300	1500	1900	340	280	85	28.6	29	29.7		0.125	0.1789	29.1	8100		V4626
SP C. (V5703	70+/-40	841		256	1200	1100	1150	340	280	85	31	30	33		0.223	0.2957	31.3	6250		SP C. (V5703)
Merriam Crat	Qbyb	1313		400	1900	1250	1575	420			31.4	31.4	30.1		0.254	0.2667	31.0	5600	Grassland	Merriam Crater
V5734A	Merriam	520		159	880	700	790	140	80	24	28.4	27.9	34	33.6	0.201	0.1772	31.0	6950		V5734A
avg values		777.1667		236.94			1285.8	328		82.2409	30.133	29.94	31.38		0.1792	0.2337	30.5569	6675		

		Morphometric Parameter and Analysis of Vents dating between about 650 and 400 ka.																
			###### M. Conway															
															Crater			
		Cone	Cone	Cone	Cone	Width	Width	Crate	Crate	Crate	Maximu	Slope (degrees)		Cone	crat wdt	Avg Max	Basal	Comment
Vent ID	Age (ka)	Max Ht. (f	Avg. Ht	ax. Ht (m	Max (m)	Min	Avg	Width	Depth	Depth	1	2	3	Ht/width	cone wd	Slope	Elevation	Vent ID
Red Mtn	740	1025		313	2000	1500	1750	xx			19.7	22.1	26.9	0.179		22.9	6900	Red Mtn
Mesa B (V66	780	652		199	2200	1450	1825	xx			26.9	25.1	23.5	0.109		25.2	6500	Mesa B (V6609)
V6713	770+/-40	373		114	1100	900	1000	xx			23.5	20.1	23.5	0.114		22.4	5650	V6713
V6725	≈770	204		62	850	850	850	xx			20.9	18.4	20.1	0.073		19.8	5800	V6725
Averages							1356.3							0.1186		22.55833	6212.5	

5 March 97 [initials]

Morphometric Parameters and Characteritics of Cones erupted between 400 ka and 200 ka in SFVF

02-Jul-96

Vent ID	Age (ka)	Cone Max Ht. (ft)	Cone Avg. Ht (ft)	Cone ax. Ht (m)	Cone Max (m)	Width Min	Width Avg	Crater Width (m)	Crate Dept	Crater Depth	Maxim Slope (degrees) 1	2	3	4	Cone Ht/width	Crater crat wdt cone wd	Avg Ma Slope	Basal Elevation	Comment	Vent ID	
V2019	170+/-60	460		140	1400	1200	1300	400			26.93	26.9	25.1		0.108	0.3077	26.3	6300	Data from 1:5	V2019	
V3022	340+/-70	240		73	620	600	610	xx			26	26.9	23.5		0.120		25.5	5600	Grassland	V3022	
V4720	420+/-85	530		162	1200	1140	1170	100			25.1	22	19.2	19.7	0.138	0.0855	21.5	7300		V4720	
V4536 (Tapp	280	440	900	134	950	925	938	120			25	25	24.5	23.5	0.143	0.1279	24.5	8050		V4536 (Tapp W)	
V4625		412		126	1100	960	1030	xx				18.7	23.5	19.2	0.122		20.5	7850			V4625
Averages				**127**			**1010**								**0.126**	**0.174**	**23.65**	**7020**			
Shadow Mtn.	300	250	2000	76	1600	1800	1700	xx			19.2	23.5			0.045		21.4		Big spatter?	Shadow Mtn.	
V5831	220+/-50	241		73	900	900	900	breached			20.1	26.9	15.5		0.082		20.8	6300	age is suspec	V5831	

5 March 97 Plec.

Ages & Morphometric Char. of dated cones

Page #1 - "radio_ages_morph.kdata"

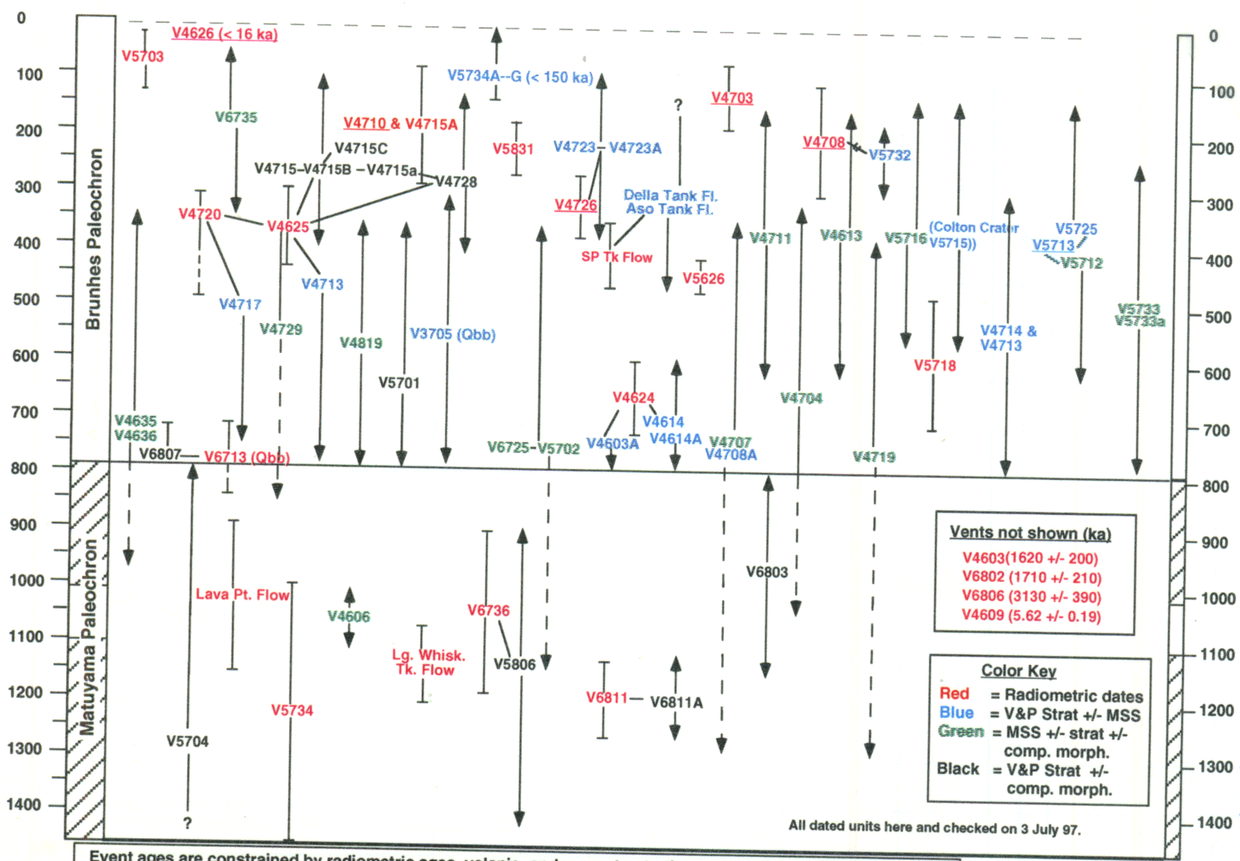
	Vent ID	Age w std dev (ka)	Date (ka)	1 std dev (ka)	2 std dev (ka)	Cone Height (m)	Avg. Wdth. (m)	Ht/wdth (m)	Avg. Slope	Basal Ele
0	Sunset Crater	1 ka	1.0000			317.00	1600.0	0.19800	31.000	7100.0
1	Merriam Crater	Qbyb	100.00			400.00	1575.0	0.25400	31.000	5600.0
2	Strawberry Crater	46+/-46	46.000	23.000	46.000	52.000	700.00	0.074000	30.000	6050.0
3	SP C. (V5703)	70+/-40	70.000	20.000	40.000	256.00	1150.0	0.22300	31.300	6250.0
4	V5734A	Merriam	100.00	25.000	50.000	159.00	790.00	0.20100	31.000	6950.0
5	V4703	135+/-44	135.00	22.000	44.000	183.00	1630.0	0.11200	27.400	7100.0
6	V2019	170+/-60	170.00	30.000	60.000	140.00	1300.0	0.10800	26.300	6300.0
7	V4710	181+/-86	181.00	43.000	86.000					
8	V4708	219+/-80	219.00	40.000	80.000	207.00	1375.0	0.15100	28.000	7150.0
9	V5831	220+/-50	220.00	25.000	50.000	73.000	900.00	0.082000	20.800	6300.0
10	V4536 (Tapp W)	280+/-50	280.00	25.000	50.000	134.00	925.00	0.14500	24.500	8050.0
11	Shadow Mtn.	300+/-110	300.00	55.000	110.00	76.000	1800.0	0.042000	21.400	
12	V4726	309+/-40	309.00	20.000	40.000					
13	V3022	340+/-70	340.00	35.000	70.000	73.000	610.00	0.12000	25.500	5600.0
14	V4625	360+/-120	360.00	60.000	120.00	126.00	1030.0	0.12200	20.500	7850.0
15	V4720	420+/-85	420.00	42.000	84.000	162.00	1170.0	0.13800	21.500	7300.0
16	V5713	440+/-310	440.00	155.00	310.00	238.00	2050.0	0.11600	24.600	6400.0
17	MBillHill (V5626	450+/-15	450.00	15.000	30.000	204.00	1350.0	0.15100	25.300	6700.0
18	V3018	490+/-110	490.00	55.000	110.00	220.00	1485.0	0.14800	25.800	5900.0
19	V3835	550+/-120	550.00	60.000	120.00	61.000	510.00	0.12000	17.100	6980.0
20	Ant Hill (V5718)	610+/-210	610.00	105.00	210.00	183.00	970.00	0.18900	26.200	6400.0
21	V4624	660+/-40	660.00	20.000	40.000	274.00	2100.0	0.13100	21.000	7850.0
22	Red Mtn	740+/-110	740.00	55.000	110.00	313.00	1750.0	0.17900	23.500	6900.0
23	V6713	770+/-40	770.00	20.000	40.000	114.00	1000.0	0.11400	22.400	5650.0
24	Mesa B (V6609)	760+/-50	760.00	25.000	50.000	199.00	1825.0	0.10900	25.500	6500.0
25	V6736	1040+/-140	1040.0	70.000	140.00	82.000	880.00	0.094000	18.400	5900.0
26	V6811	1200+/-50	1200.0	25.000	50.000	20.000	300.00	0.065000	9.4000	5400.0
27	V5734	1260+/-480	1260.0	240.00	480.00					
28	V6619 (Chap Mtn)	1300+/-200	1300.0	100.00	200.00	61.000	660.00	0.092000	18.900	6450.0
29	V6619a	1400+/-100	1400.0	50.000	100.00	47.000	400.00	0.11800	13.000	6450.0
30	V4603	1620+/-200	1620.0	100.00	200.00					

Radiometric Dates and morphometric characteristics of Late Quaternary Cinder Cones
San Francisco Volcanic Field, northern Arizona
M. Conway 6 February 1997

Vent ID	Age (ka) w/2 std Dev.	Cone Max. Ht meters	Cone Width Maxim meters	Cone Width Minum meters	Cone Width Averg meters	Crater Width (m)	Crater Depth (m)	Cone Ht/width	Crat Wdth/ cone wdth	Mean Max Slope	Basal Elevation
Sunset Crater	1 ka	317	1600	1600	1600	400	134	0.198	0.250	31.0	7100
Merriam Crater	Qbyb	400	1900	1250	1575	420		0.254	0.267	31.0	5600
Strawberry Crater	46+/-46	52	800	600	700	xx		0.074		30.0	6050
SP C. (V5703)	70+/-40	256	1200	1100	1150	340	85	0.223	0.296	31.3	6250
V5734A	Merriam	159	880	700	790	140	24	0.201	0.177	31.0	6950
V4703	135+/-44	183	1900	1360	1630	450	76	0.112	0.276	27.4	7100
V2019	170+/-60	140	1400	1200	1300	400		0.108	0.308	26.3	6300
V4710	181+/-86	55	400	300	350			0.157		29.6	7100
V4708	219+/-80	207	1450	1300	1375	350	37	0.151	0.255	28.0	7150
V4536 (Tapp W)	280+/-50	134	950	900	925	345		0.145	0.373	24.5	8050
V4726	309+/-40	136	1000	1700	1350			0.100		25.0	6750
V3022	340+/-70	73	620	600	610	xx		0.120		25.5	5600
V4625	360+/-120	126	1100	960	1030	xx		0.122		23.0	7850
V4720	420+/-85	162	1200	1140	1170	100		0.138	0.085	21.5	7300
V5713	440+/-310	238	2100	2000	2050	350	67	0.116	0.171	24.6	6400
MBillHill (V5626	450+/-15	204	1400	1300	1350	300	79	0.151	0.222	25.3	6700
V3018	490+/-110	220	1720	1250	1485	700	152	0.148	0.471	25.8	5900
V3835	550+/-120	61	560	460	510	xx		0.120		17.1	6980
Ant Hill (V5718)	610+/-210	183	1100	840	970	240	18	0.189	0.247	26.2	6400
V4624	660+/-40	274	2500	1700	2100	xx		0.131		21.0	7850
Red Mtn	740+/-110	313	2000	1500	1750	xx		0.179		23.5	6900
V6713	770+/-40	114	1100	900	1000	xx		0.114		22.4	5650
Mesa B (V6609)	760+/-50	199	2200	1450	1825	xx		0.109		25.5	6500
V6736	1040+/-140	82	1020	740	880	220 (?)	30	0.094		18.4	5900
V6811	1200+/-50	20	400	200	300	xx		0.065		9.4	5400
V5734	1260+/-480	97	2200	800	1500			0.065		15.0	
V6619 (Chap Mtn)	1300+/-200	61	820	500	660	xx		0.092		18.9	6450
V6619a	1400+/-100	47	400	400	400	xx		0.118		13.0	6450

Several dated cinder cones were excluded from this survey because of one or more of the following:
1) high degree of agglutinate cover;
2) extensive breaching;
3) questions regarding the quality of the radiometric date; or
4) and in the case of early Pliestocene cones, pervasive destruction of primary cone structures.

11 March 97 / [illegible]



Event ages are constrained by radiometric ages, volanic- and magneto-stratigraphy, radiometrically-calibrated models of mean maximum slope and rarely comparitive morphology. The latter is used in cases where vents are proximal to one another (i.e., within several kilometers) and where vent morphology is similar. The following table list MMS of vents and the accompanying age range derived from Figure xxxx.

Mean max slope was bracketed using empirical curves on figure of mean max slope
Age ranges based on interpolation from empirical dashed line.
Midpoint value is a graphical value midway bet min. and max. age

MMS	Min. (ka)	Midpt (ka)	Max age (ka)
27	130	350	575
26	150	375	625
25	190	450	700
24	240	500	780
23	260	550	850*
22	280	600	930*
21	315	670	1050*
20	350	750	1150*
19	380	840	1300*

Below 19 degrees use of slope envelope breaks down.
* In most cases paleomagnetic data constrains event age to < 780 ka.

Final stratigraphy using – dates; magnetic & volcanic stratigraphy & morphometric slope analysis described later in notebook.

13 March 97 FAC. [illegible?]

Page #1 - "Cum_area_vs_time2.kdat"

	Vent ID	Age	Cum. Area (m2)	D
0	V4626	13.000	2.2500e+08	2.2500e+08
1	V5703	70.000	2.2400e+08	2.2400e+08
2	V5734A	80.000	2.1200e+08	
3	V5734c	80.000	2.1200e+08	
4	V5734D	80.000	2.1200e+08	
5	V5734e	80.000	2.1200e+08	
6	V5734G	80.000	2.1200e+08	
7	V4703	135.00	2.1200e+08	
8	V4710	181.00	2.1200e+08	2.1200e+08
9	V4715a	181.00	2.1100e+08	
10	V5732	211.00	2.1100e+08	2.1100e+08
11	V4708	219.00	2.0200e+08	2.0200e+08
12	V5831	220.00	1.9800e+08	1.9800e+08
13	V4723	222.00	1.9500e+08	
14	V4723a	222.00	1.9500e+08	
15	V4715	257.00	1.9500e+08	
16	V4715B	257.00	1.9500e+08	
17	V4715C	257.00	1.9500e+08	
18	V4728	257.00	1.9500e+08	1.9500e+08
19	V4726	309.00	1.9400e+08	
20	Della Tank Fl	350.00	1.9400e+08	1.9400e+08
21	V5715	350.00	1.9200e+08	1.9200e+08
22	V5716	350.00	1.8300e+08	1.8300e+08
23	V5725	350.00	1.8200e+08	1.8200e+08
24	V4625	360.00	1.7300e+08	1.7300e+08
25	V4711	375.00	1.6500e+08	1.6500e+08
26	V4613	375.00	1.6200e+08	1.6200e+08
27	V5712	375.00	1.6100e+08	
28	Aso Ranch Fl	400.00	1.6100e+08	1.6100e+08
29	V4720	420.00	1.5300e+08	1.5300e+08
30	V5713	450.00	1.4900e+08	1.4900e+08
31	V5626	450.00	1.4600e+08	1.4600e+08
32	Sp Tank Flow	460.00	1.3400e+08	1.3400e+08
33	V5733	500.00	1.2600e+08	1.2600e+08
34	V5733A	500.00	1.2000e+08	
35	V4714	540.00	1.2000e+08	
36	V4713	540.00	1.2000e+08	
37	V3705	540.00	1.2000e+08	1.2000e+08
38	V4729	550.00	1.1000e+08	
39	V4819	600.00	1.1000e+08	1.1000e+08
40	V5718	610.00	1.0800e+08	1.0800e+08
41	V4624	660.00	1.0100e+08	1.0100e+08
42	V4704	670.00	8.5400e+07	
43	V4603A	700.00	8.5400e+07	
44	V4614	700.00	8.5400e+07	8.5400e+07
45	V4614A	700.00	8.3300e+07	
46	V4635	750.00	8.3300e+07	
47	v4636	750.00	8.3300e+07	
48	V4719	750.00	8.3300e+07	
49	V5702	750.00	8.3300e+07	8.3300e+07
50	V6725	750.00	8.3100e+07	8.3100e+07
51	V4707	770.00	8.1000e+07	8.1000e+07
52	V4708a	770.00	7.9600e+07	
53	V6807	770.00	7.9600e+07	
54	V6713	770.00	7.9600e+07	7.9600e+07
55	V6735			
56	V5701			
57	V6803	965.00		
58	Lava Pt. Flow	1010.0	7.1200e+07	7.1200e+07
59	V6736	1040.0	4.9000e+07	
60	V4606	1050.0	4.9000e+07	
61	Lg. Whik. Flow	1090.0	4.9000e+07	4.9000e+07
62	V6811	1200.0	3.6900e+07	3.6900e+07
63	V6811A	1200.0	3.5800e+07	3.5800e+07
64	V5734	1260.0	3.5600e+07	
65	V5806	1400.0	3.5600e+07	3.5600e+07
66	V4603	1620.0	1.9500e+07	1.9500e+07
67	V6802	1710.0	2.3500e+06	2.3500e+06
68	V5704	2000.0	2.2589e+06	2.2589e+06

Stratigraphy of SP Cluster Based on Ages, magnetic & volcanic stratigraphy & computer morphology.

Vent	Radiometric Age (ka)	2 sigma error (ka)	Dating Method	Source
V4626	< 16 ka		^{14}C	Wolfe et al., 1987
V5703	71	40	K-Ar	Tanaka 1991
V4703	135	44	$^{40}Ar/^{39}Ar$	this report
V4710	181	86	$^{40}Ar/^{39}Ar$	this report
V4708	219	80	$^{40}Ar/^{39}Ar$	this report
V5831	222	50	K-Ar	Tanaka 1991
V4726	309	40	$^{40}Ar/^{39}Ar$	this report
V4625	360	120	$^{40}Ar/^{39}Ar$	Mulaney, 1996
V4720	420	170	$^{40}Ar/^{39}Ar$	Mulaney, 1996
V5626	450	30	$^{40}Ar/^{39}Ar$	Mulaney, 1996
SP Tank Flow	460	50	K-Ar	Ulrich and Bailey, 1987
V5718	610	210	$^{40}Ar/^{39}Ar$	Mulaney, 1996
V4624	660	40	K-Ar	Wolfe et al., 1987
V6713	770	40	K-Ar	Ulrich and Bailey, 1987
V6736	1040	140	K-Ar	Ulrich and Bailey, 1987
Lava Point Flow	1010	130	K-Ar	Ulrich and Bailey, 1987
Lg. Whiskey Flow	1090	30	K-Ar	Ulrich and Bailey, 1987
V6811	1200	50	K-Ar	Ulrich and Bailey, 1987
V5734	1260	480	$^{40}Ar/^{39}Ar$	Mulaney, 1996
V4603	1620	200	$^{40}Ar/^{39}Ar$	Ulrich and Bailey, 1987
V6802	1710	420	$^{40}Ar/^{39}Ar$	K. Mulhaney
V6806	3130	390	K-Ar	Ulrich and Bailey, 1987
V4609	5620	190	K-Ar	Ulrich and Bailey, 1987

see accompanying sheet Sel_ar/ar_ages_n_sfvf

13 March 97
PMC

SP Cluster : Data for Probability Stndy
M. Conway 13 March 97 & modified on 3 July 97

Data chiefly used to conStratin ages of cones inclnde:
P=pmag, Sl = slope, Strat=Stratigraphy, Ra=radiometric, CM= Comp. Morph.
Comparitive morphology used as last resort and generally limited to
older cones on the northeastern edge of cluster.

Total # vents inclnding 5 major lava flow units as discrete vents = 70
Given vents erupted over past 1700 ka; simple recurrance rate is 70 vents /1700 ka
or 1 vent / 24 ka. However, broadly speaking two pulses occurred.
The first pulse occurred between 1700 and about 1000 ka and characterized by
episodic volcanism.
The second pulse occurred between 780 and Holocene and appears to
have been more steady state.

780ka to present volcanism comprisese at least 57 vents or if evenly distb. through time
consists of 1 vent per 13.7 ka.

Classification as Brunhes-age is based on magnetostratigraphy of Tanaka et al., 1991

Brunhes Age Vents

Vent ID	Easting	Northing	Area (m2)	Lava Flow Cumul AREA (m2)	Mean Maximum Slope	Best Estimate of Minimum & Maximum Vent Age: Best Est. Age (ka)	Min. Age (ka)	Max. Age (ka)	Dating Method	Best Est Age
V4626	433661	3921291	9.68E+05	2.25E+08	29.1	13	10	16	^{14}C & best est.	^{14}C & best est.
V5703	442800	3937636	1.21E+07	2.24E+08	31.3	70	30	110	K-Ar	K-Ar
V5734A	442353	3928904	0.00E+00	2.12E+08	31	80	70	150	Tanaka et al.	mid-range
V5734c	442450	3929750	1.80E+05	2.12E+08	nd	80	70	150	Tanaka et al.	mid-range
V5734D	442692	3929852	0.00E+00	2.12E+08	nd	80	70	150	Tanaka et al.	mid-range
V5734e	442300	3929500	0.00E+00	2.12E+08	nd	80	70	150	Tanaka et al.	mid-range
V5734G	442280	3928171	8.72E+04	2.12E+08	nd	80	70	150	Strat, CM	Cp w/ V5734a
V4703	441448	3926770	2.97E+04	2.12E+08	27.4	135	91	179	$^{40}Ar/^{39}Ar$	
V4710	441491	3925777	1.18E+05	2.12E+08	nd	181	95	276	$^{40}Ar/^{39}Ar$	
V4715a	441714	3924988	3.15E+05	2.11E+08	25.5	181	95	276	Strat=4710	
V5732	438620	3928440	9.41E+06	2.11E+08	25.3	245	190	299	Sl, P, Strat	mid-range
V4708	438916	3926302	4.12E+06	2.02E+08	28	219	139	299	$^{40}Ar/^{39}Ar$	
V5831	447856	3928312	2.71E+06	1.98E+08	20.8	220	170	270	K-Ar	
V4723	444194	3923051	0.00E+00	1.95E+08	nd	222	95	349	Strat, CM	mid-range
V4723a	444194	3922750	0.00E+00	1.95E+08	nd	222	95	349	Strat, CM	mid-range
V4715	441717	3924416	3.05E+04	1.95E+08	nd	257	95	420	Strat, CM	mid-range
V4715B	442250	3924500	0.00E+00	1.95E+08	nd	257	95	420	Strat, CM	mid-range
V4715C	442506	3924168	0.00E+00	1.95E+08	nd	257	95	420	Strat, CM	mid-range
V4728	439669	3921728	5.38E+05	1.95E+08	22.6	257	95	420	Strat, CM	mid-range
V4726	443653	3921377	7.47E+05	1.94E+08	25	309	269	349	$^{40}Ar/^{39}Ar$	
Della Tank Fl	444914	3945038	1.77E+06	1.94E+08	lava	350		460	Strat	arbitrary but consistent with strat
V5715	442438	3933528	8.80E+06	1.92E+08	26.6	350	130	575	Sl, P, Strat	mid-pt slope curve
V5716	440650	3933249	7.48E+05	1.83E+08	26.6	350	130	575	SL, P,	mid-pt slope curve
V5725	445228	3931072	9.15E+06	1.82E+08	27.4	350	130	575	Sl, P, Strat	mid-pt slope curve
V4625	435809	3920905	8.39E+06	1.73E+08	23	360	240	480	$^{40}Ar/^{39}Ar$	
V4711	443016	3925482	2.96E+06	1.65E+08	25.7	375	150	625	Sl, P	mid-pt slope curve
V4613	435453	3925202	7.15E+05	1.62E+08	26.1	375	150	625	Sl, P	mid-pt slope curve
V5712	445155	3934934	0.00E+00	1.61E+08	26	375	150	625	SL, P,	mid-pt slope curve
Aso Ranch Fl	438528	3932780	8.49E+06	1.61E+08	lava	400		< 460	Strat	arbitrary but consistent with strat
V4720	438872	3923604	3.76E+06	1.53E+08	21.5	420	336	504	$^{40}Ar/^{39}Ar$	
V5713	445058	3932963	2.60E+06	1.49E+08	24.6	450	190	700	Sl, P, Strat	mid-pt slope curve
V5626	435205	3931047	1.19E+07	1.46E+08	25.3	450	420	480	$^{40}Ar/^{39}Ar$	
Sp Tank Flow	439923	3939386	7.81E+06	1.34E+08	lava	460	410	510	Ulrich & Bailey K-Ar	
V5733	440449	3927910	6.54E+06	1.26E+08	23.7	500	240	780	Sl & P	mid-pt slope curve
V5733A	440593	3929433	4.67E+04	1.20E+08	nd	500	240	780	CM, P	mid-pt slope curve
V4717						500	336	780	CM, P	
V4714	443026	3924110	0.00E+00	1.20E+08	nd	540	300	780	Strat, P, SL	mid-pt slope curve
V4713	444911	3924127	0.00E+00	1.20E+08	nd	540	300	780	Strat, P, SL	mid-pt slope curve
V3705	439323	3918691	9.45E+06	1.20E+08	nd	540	300	780	Strat, P, SL	
V4729	438844	3921079	0.00E+00	1.10E+08	22.7	550	260	850*	Sl, Strat	mid-pt slope curve
V4819	446922	3923440	2.40E+06	1.10E+08	21.7	600	280	850*	Sl, P, Strat	mid-pt slope curve
V5718	438000	3934050	6.61E+06	1.08E+08	26.2	610	400	820	$^{40}Ar/^{39}Ar$	
V4624	435247	3922320	1.60E+07	1.01E+08	21	660	620	700	$^{40}Ar/^{39}Ar$	
V4704	439754	3927501	0.00E+00	8.54E+07	20.7	670	315	1050*	P, SL	mid-pt slope curve
V4603A	432088	3928206	0.00E+00	8.54E+07	nd	700	620	780	Strat & P	mid-range
V4614	434601	3924491	2.12E+06	8.54E+07	nd	700	620	780	Strat, P	mid-range
V4614A	434687	3923882	0.00E+00	8.33E+07	nd	700	620	780	Strat, P	mid-range
V4635	434551	3919980	0.00E+00	8.33E+07	19.7	750	350	1150*	P, SL	mid-pt slope curve
v4636	435900	3920000	0.00E+00	8.33E+07	19.4	750	380	1300*	P, SL	mid-pt slope curve, arbitrary
V4719	437712	3922078	0.00E+00	8.33E+07	18.8	750	380	1300*	SL	mid-pt slope curve, arbitrary
V5702	444650	3936822	1.50E+05	8.33E+07	19.9	750	350	1150*	Sl, P, Strat	mid-pt slope curve, arbitrary
V6725	446300	3940550	2.17E+06	8.31E+07	19.8	750	350	1150*	Sl, P	mid-pt slope curve, arbitrary
V4707	437977	3925805	1.41E+06	8.10E+07	18.2	770	380	1300*	P, Sl	mid-pt slope curve, arbitrary
V4708a	438287	3925336	1.10E+03	7.96E+07	nd	770	380	1300*	Strat, CM	
V6807	447333	3945358	0.00E+00	7.96E+07	19	770	380	1300*	Strat, CM	mid-pt slope curve, arbitrary
V6713	445919	3942801	8.36E+06	7.96E+07	22.4	770	720	820	Ulrich & Bailey; K-Ar	
V6735	444780	3939391	0.00E+00		nd		V-cone	780	P	
V5701	446557	3936271	0.00E+00		nd		240	780	P, CM	
Matuyama and Older Vents										
V6803	451990	3946263	0.00E+00		nd	965	780	1150	P	Consistent w/ strat
Lava Pt. Flow	450896	3937331	2.22E+07	7.12E+07	lava	1010	880	1140	Ulrich & Bailey; K-Ar	
V6736	446228	3937986	0.00E+00	4.90E+07	18.4	1040	900	1180	Ulrich & Bailey; K-Ar	
V4606	427085	3928214	0.00E+00	4.90E+07	16.3	1050	523	1100	SL, P, CM	
Lg. Whik. Flow	447704	3948084	1.21E+07	4.90E+07	lava	1090	1060	1120	Ulrich & Bailey; K-Ar	
V5806	447586	3937165	1.61E+07	3.56E+07	15.1	1090	780	1400	Strat, P	arbitrary but consistent with strat
V6811	453813	3944245	1.10E+06	3.69E+07	9.4	1200	1150	1250	K-Ar	
V6811A	454321	3945127	1.71E+05	3.58E+07	nd	1200	1150	1250	P, CM V6811	
V5734	442195	3929349	0.00E+00	3.56E+07	15	1260	780	1740	$^{40}Ar/^{39}Ar$	
V4603	432997	3927313	1.72E+07	1.95E+07	nd	1620	1420	1820	K-Ar	
V6802	454444	3945836	8.80E+04	2.35E+06	nd	1710	1500	1920	$^{40}Ar/^{39}Ar$	
V5704	441913	3937011	2.26E+06	2258858	nd	2000	780		Strat, P, CM	arbitrary but consistent with strat
V6806					nd	3130	2740	3520	K-Ar	
V4609	430079	3926052	7.37E+06	7372280	nd	5620	5430	5810	K-Ar	

nd indicates that mean maximum slope was not determined, generally because the cone was too small to allow for slope measurement.

ob indicates that slope is outside the bounds of the model.

Best Age Estimate incorporates, in decreasing order of influence, radiometric ages,volcanic Stratigraphy, paleomagnetic data, age estimate from slope analysis, and to a lesser extent, comparitive geomorphology (i.e., degree of crater infilling, rounding of crater rim, cone aspect ratio, lava flow morphology, rill development on cone slopes.

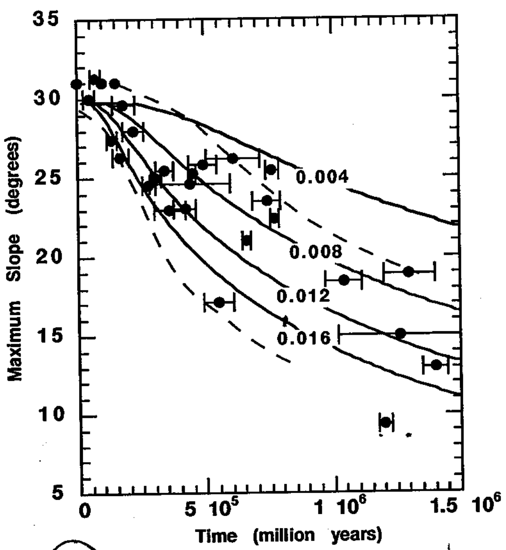
* Maximum possible age listed is based on slope analysis. In each case, lavas are normally polarized indicating that the event is Brunhes Age. Best estimate age of 750 ka is arbitrary, but is consistent with field relationships and morphometric evidence suggesting an early Brunhes event.

17 March 97
[illegible]

Age ranges based on interpolation from empirical dashed line.
Midpoint value is a graphical value midway bet min. and max. age

28			
27	130	350	575
26	150	375	625
25	190	450	700
24	240	500	780
23	260	550	850*
22	280	600	930*
21	315	670	1050*
20	350	750	1150*
19	380	840*	1300*
18	425		

Below 19 degrees use of slope envelope breaks down.



Results of model plotted
~~against the dated cones~~

Erode a cone analysis

Diffusion calculation to estimate rate of cone slope degradation. α (creep) values supported by Hooper (95) work on cinder cones of SFVF & Hanks et al (85) work on fault scarps in unconsolidated alluvium in Basin Range.

Results support construction of empirical curves shown by dashed lines

May 15 97
[initials]

Erodo cone

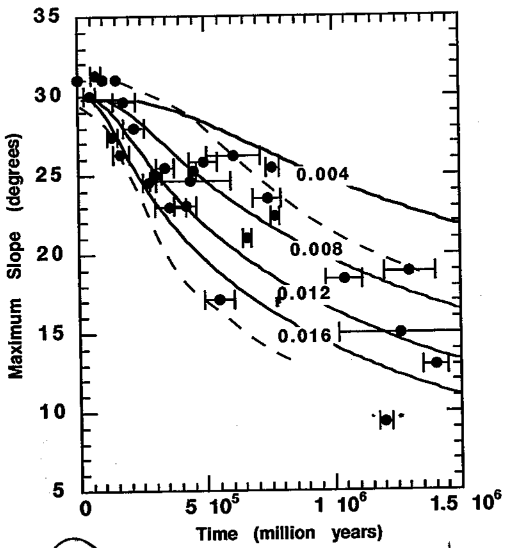
creep

```
!generalized diffusion in one -dimension

open #2: name "erodo.out", create newold
erase #2

dim mtx(100), new_h(100), slope (20000,2)

let timleng = 1.5e6
let timstep = 200
let creep = 0.01
let del_r = 10
let totalpts = 100

open #1: screen 0.2,0.8,0.2,0.8
set window 0,1000,0,880

plot 25*del_r,0;25*del_r,800
!set up the cone geometry
for x = 1 to 9
let mtx(x) = 100 + x*del_r * sin(30*pi/180)
next x

for x = 10 to 100
let mtx(x) = mtx(9) - (x*del_r - 9*del_r)*sin(35*pi/180)
if mtx(x) < 0 then let mtx(x) = 0
next x

for x = 1 to 100
plot x*del_r, mtx(x);
next x
plot
!run simulation

for timer = 1 to timleng step timstep

for cont1 = 2 to totalpts-1
let dum1 = (mtx(cont1+1) - 2*mtx(cont1) + mtx(cont1-1))/del_r^2
let dum3 = (mtx(cont1-1)-mtx(cont1))/del_r

let new_h(cont1) = creep*timstep*(dum1 + dum2) + mtx(cont1)
next cont1

let new_h(1) = new_h(2)
let new_h(totalpts) = new_h(totalpts-1)
```

Age ranges based on interpolation from empirical dashed line.
Midpoint value is a graphical value midway bet min. and max. age

28			
27	130	350	575
26	150	375	625
25	190	450	700
24	240	500	780
23	260	550	850*
22	280	600	930*
21	315	670	1050*
20	350	750	1150*
19	380	840*	1300*
18	425		

Below 19 degrees use of slope envelope breaks down.



Results of model plotted against time & dated cones

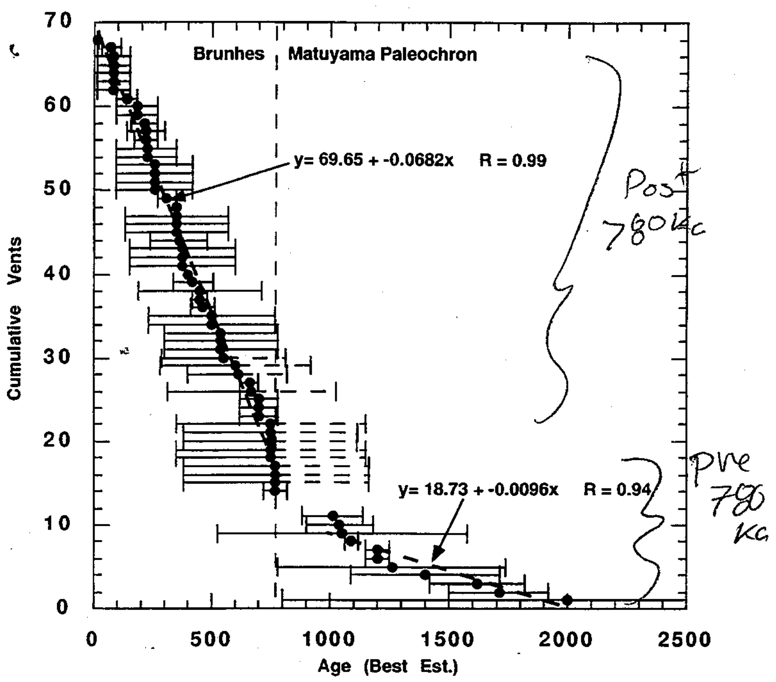
Evolve a cone analysis

Diffusion calculation to estimate rate of coneslope degradation. α (creep) values supported by Hooper (95) work on cinder cones of SFVF & Hanks et al (85) work on fault scarps in unconsolidated alluvium in Basin Range.

Results support construction of empirical curves shown by dashed lines

May 15 97
[illegible]

```
mat mtx = new_h

!plot
!let count = 0
!for x = 1 to 100
!plot x*del_r, mtx(x);
!next x
!plot
!end if

let count = count + 1
if count = 100 then

let kount = kount + 1
let slope(kount,1) = timer

let max_slope = -1e10
for xcount = 2 to 100

let sloper = new_h(xcount-1) - new_h(xcount)
if sloper > max_slope then let max_slope = sloper
next xcount
let slope(kount,2) = atn(max_slope/del_r)*180/pi
!print slope(kount,2)
print timer,slope(kount,2)
let count = 0
end if
next timer

for x  = 1 to kount
print#2: slope(x,1),slope(x,2)
next x

end
```



Cumulative vents vs time -- july 15 97 68 vents

SP Cluster:
Cumulative vents
vs Age (estimated)

Rate from Slope
is 15 vents per
1000 ka (post 780ka)

P 1 vent/ (pre 780ka).
104ka. 1000 years

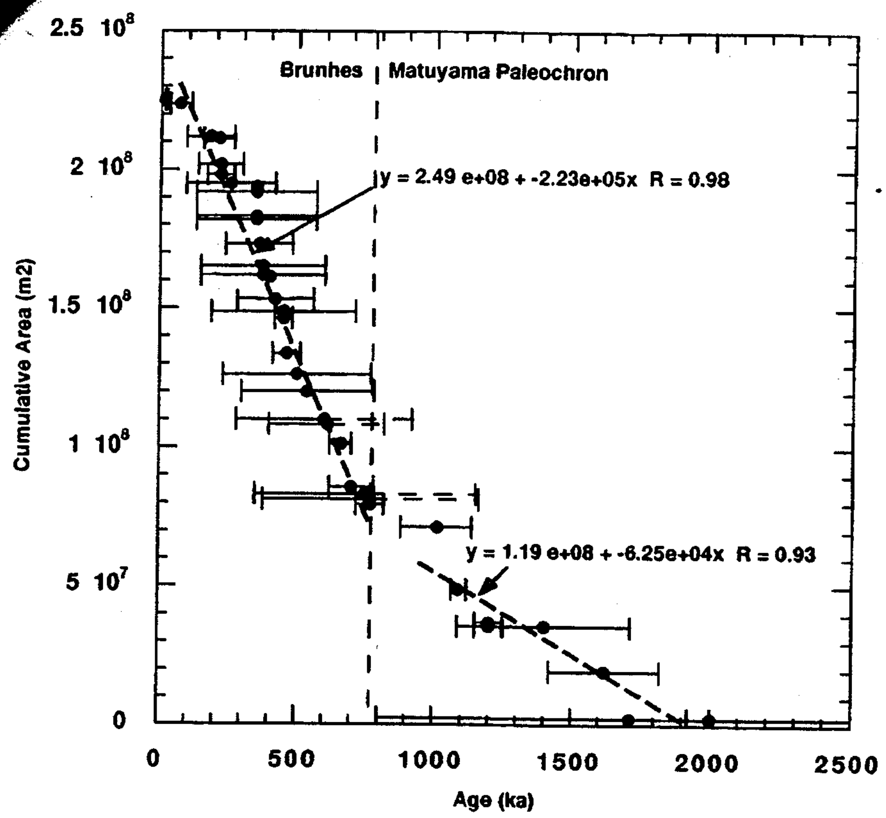
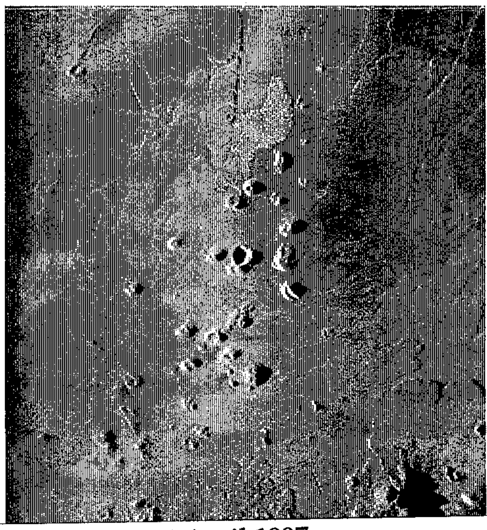


Fig 4: Cumulative area vs age

SP Cluster -
areas of
lava flows
from vents w/
effusive history.

Nov 17 97

FMC



Slu image.

Results of 2-4 April 1997
Reset the Sample box size for the SP Cluster building in a 1 to 2 km buffer zone around the vents. This seems a reasonable approach and produced very good results with the entire data set.

A summary of runs follows: n = # of vents,

#	Age Range	N	RRr	Srch Radius	Dist.	Results
1	all data	70	8.997	2 km	333 m	Excellent
2	> 900 ka	12	8.30671 4 km		333 m	excellent
3	>600&<900	7	8.8074	4 km	333 m	excellent
4	>360&<900	30	8.80277 4 km		333 m	good
5	<360	25	8.9645	4 km	333 m	good
6	<350	25	9.00792 3 km		333 m	excellent
7	<350	28	9.01784 2 km		333 m	excellent
8)	>350&<900	30	9.00998 2 km		333 m	excellent
9	>600&<900	7	8.9544	3 km	333 m	excellent
10	> 900 ka	12	8.66052 3 km		333 m	excellent

RRr is regional recurrence rate.
On 11 April, final 3 vents were added to the data file used in probability runs. The three vents were all younger than 360 ka. The two effected models (all data now at 70 points, and < 360 at 28 points) were rerun at 2 km searc radius.

Preliminary Interpretation:
Results are good and while the area is small, nonetheless results from one episode of volcanism tends to suggest the whereabouts of the next episode.

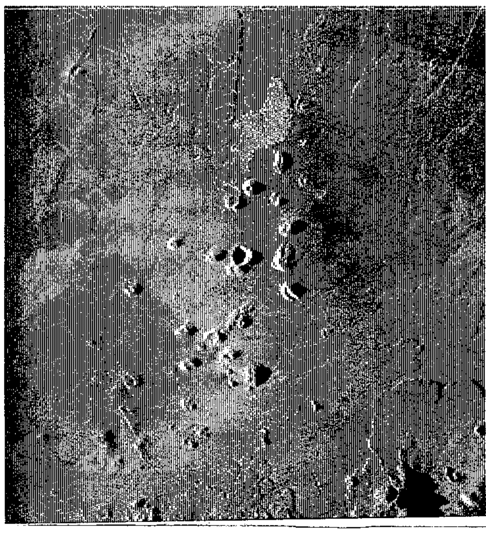
Trials to acess most useful search radius.

Table Search Radius.

Search Radius	Step	Regional Recurrence Rate	Evaluation
18 km	333 m	2.64191	Coarse, poor result
6 km	333 m	7.04345	Coarse, poor result
3 km	333 m	8.18057	Better, still coarse
2 km	333 m	8.44648	Good result, struct. app.
1 km	250	15.3234	Poor result, cones app.

---

20 May 97 fhc.



Slar image

Probability Distribution Function Analysis of the SP Cluster:

A total of 67 events were included in a probability study of events of the SP Cluster. Fifty-seven events involve cinder cone emplacement and the remaining 5 events involve effusion of well-dated, relatively large-volume basalt lava flows. Events range from less than 16 ka to 1710 +/- 210 ka. The two oldest events of the SP Cluster, V4609 (5.62 +/- 0.19) and V6806 (3130 =/- 390), were excluded from the data set because they are significantly older than the vast majority of events and in all likelyhood represent pre-cluster formation volcanism. There exists, of course, the possibility that older, buried or eroded vents remain unaccounted for. In the central and eastern part of the Cluster, where Paleozoic outcrops becoming increasingly common, it is unlikely that buried vents exist. In the south-central part of the Cluster, which hosts the youngest cones and where Paleozoic outcrops are rare, we are less certain that all vents are accounted for. However, projecting Paleozoic sedimentary rock under the SP Cluster at the regional dip of 1-2 degrees, suggests that the basaltic pile here is relatively thin and in all likelyhood conceals few hidden vents.

Probability analysis was performed on 31 March 1997 using code provided by C. Connor. A guassian kernel was used and a number of experiments were run. Given the high density of cones in the area (≈ 1 cone/5 km), a large search radius was incapable of resolving structure in the data. Thus, experiments with large search radius (18 to 6 km) yielded poor, broad-brush results. Fine search radii, 3km, 2 km, in contrast, revealed insight into the probability distribution of cinder cones; 1-km search radii proved too fine and was unduly influenced by individual cones. On the basis of these experiments, it was clear that a 2-km to 3-km search radius was most favorable for providing insight into probability distribution of the cinder cones of the SP Cluster.

The oldest events of the SP Cluster occur along the north perimeter or in the central portion of the cluster. In general, vents young progressively to the south, with the youngest vent, Vent 4626, cropping out along the SW perimeter of the cluster. An experimental run that included all 70 events of the SP Cluster resulted in a plot of relatively-high probability zone trending north-northeast. This geometry is consistent with local vent alignment trends and apparently reflects structural control on vent locations (Fig. aaa). The highest probability zone on this plot occurs in the south-central portion of the Cluster, where the youngest and greatest concentration of cinder cones occur.

Volcanic events of the SP Cluster were grouped into 4 broad age groups. A series of experiments were then run to investigate the nature and geometry of probability distribution of the SP Cluster as a function of these groupings. The results of individual experiments were compared with that of preceding and following age groups to see what, if any, insight into future events was provided.

Results of probability models are shown in Figure ??. From oldest (> 900 ka) to youngest (< 360 ka), they tend to show a progressive migration of high-probability zones to the south from the north-northeast. For events older than 900 ka, the zone of highest probability is clearly in the north and northcentral part of the field. Between 900 ka and 600 ka there is an obvious migration of high-probability zone to the southwest. From 600 ka to 360 ka, the locus of high-probability events migrated about 5 km due east. After 360 ka, the highest probability zone moved slightly to the north and east. It appears clear from these plots that the locus of volcanism in the SP Cluster has stableized in the south-south-central portion of the cluster, and it is here that in all likelyhood that future events are most likely.

Table aa. Age Groups used in Probability Modeling:

Age Range	# of Vents
0 ka - 1710 ka	70
> 900 ka	12
600 ka - 900 ka	7
360 ka - 900 ka*	30
< 360 ka	28

Overlap between age groups reflects the large error range in age estimates of vents. In all cases the mean age of the vent was used in modelling. The age range of individual groups was selected to isolate events of significantly

30 May 97 PMC

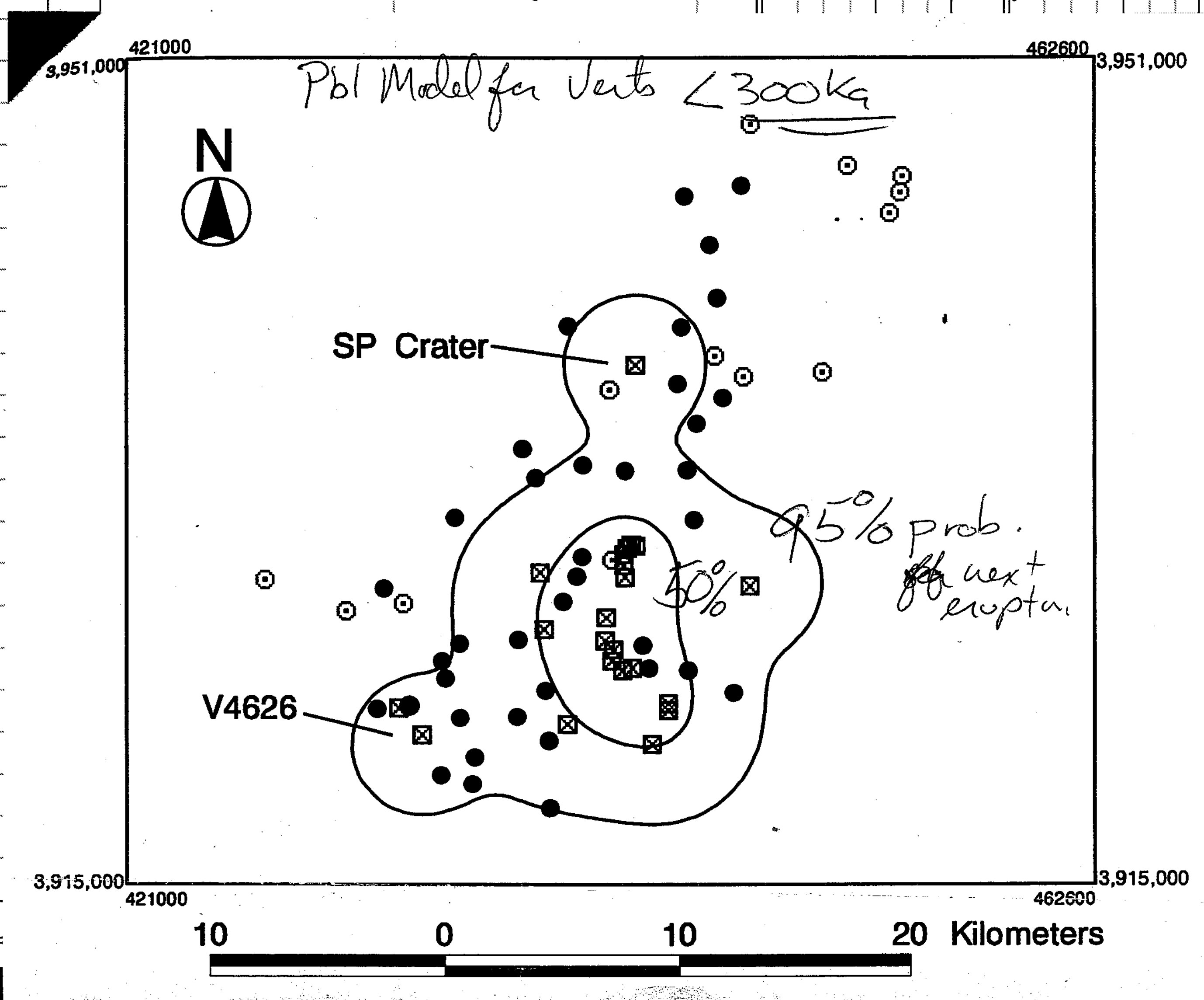
Spatio-temporal
Pbl analysis

```
DIM x(68),y(68)

LET agecut1 = 900000
LET agecut2 = 2000000
Let h = 2


OPEN #1: name "new_strat2_dsv"
DO while more #1

   INPUT #1: xx,yy,age

   IF age => agecut1 and age <= agecut2 then
      LET i = i + 1
      LET x(i) = xx/1000
      LET y(i) = yy/1000
   END IF

LOOP
LET n = i
print n


Open #2: name "1.out", create newold
erase #2



for repox = 421.923 to 460.548 step 0.333
for repoy = 3914.490 to 3950.775 step 0.333

    LET sumn = 0

    FOR i = 1 to n

        LET dist1 = (repox - x(i))^2 + (repoy-y(i))^2
        LET dist2 = dist1/(h^2)


     ! Guassian kernel
        LET ku = 1/(2*pi) * exp(-.5*dist2)
      LET sumn = sumn + (1/(h^2))*ku

 ! Epanechnikov kernel
```

Pbl. code ex. data output

421923.	3.93414e+6	9.7996e-20
421923.	3.93447e+6	4.01539e-20
421923.	3.9348e+6	1.73859e-20
421923.	3.93514e+6	7.9849e-21
421923.	3.93547e+6	3.85168e-21
421923.	3.9358e+6	1.91618e-21
421923.	3.93613e+6	9.64859e-22
421923.	3.93647e+6	4.84475e-22
421923.	3.9368e+6	2.40145e-22
421923.	3.93713e+6	1.16775e-22
421923.	3.93747e+6	5.55005e-23
421923.	3.9378e+6	2.57281e-23
421923.	3.93813e+6	1.16194e-23
421923.	3.93847e+6	5.10962e-24
421923.	3.9388e+6	2.18762e-24
421923.	3.93913e+6	9.12177e-25
421923.	3.93946e+6	3.70829e-25
421923.	3.9398e+6	1.47336e-25
421923.	3.94013e+6	5.75077e-26
421923.	3.94046e+6	2.22832e-26
421923.	3.9408e+6	8.74259e-27
421923.	3.94113e+6	3.58719e-27
421923.	3.94146e+6	1.6025e-27
421923.	3.9418e+6	8.01589e-28
421923.	3.94213e+6	4.46369e-28
421923.	3.94246e+6	2.67266e-28
421923.	3.94279e+6	1.65455e-28
421923.	3.94313e+6	1.02942e-28
421923.	3.94346e+6	6.33238e-29
421923.	3.94379e+6	3.81869e-29
421923.	3.94413e+6	2.2482e-29
421923.	3.94446e+6	1.28965e-29
421923.	3.94479e+6	7.20152e-30
421923.	3.94513e+6	3.91291e-30
421923.	3.94546e+6	2.0683e-30
421923.	3.94579e+6	1.06346e-30
421923.	3.94612e+6	5.31872e-31
421923.	3.94646e+6	2.58738e-31
421923.	3.94679e+6	1.22427e-31
421923.	3.94712e+6	5.63453e-32
421923.	3.94746e+6	2.52231e-32
421923.	3.94779e+6	1.09825e-32
421923.	3.94812e+6	4.65116e-33
421923.	3.94846e+6	1.91595e-33
421923.	3.94879e+6	7.67657e-34
421923.	3.94912e+6	2.99165e-34
421923.	3.94945e+6	1.134e-34
421923.	3.94979e+6	4.18098e-35
421923.	3.95012e+6	1.49935e-35
421923.	3.95045e+6	5.22983e-36
422256	3.91449e+6	5.32679e-13
422256	3.91482e+6	9.25414e-13
422256	3.91516e+6	1.56375e-12
422256	3.91549e+6	2.57015e-12
422256	3.91582e+6	4.10875e-12
422256	3.91615e+6	6.38884e-12
422256	3.91649e+6	9.6626e-12
422256	3.91682e+6	1.42143e-11
422256	3.91715e+6	2.03386e-11

Probability Analysis – Spatio Temporal for SP Cluster

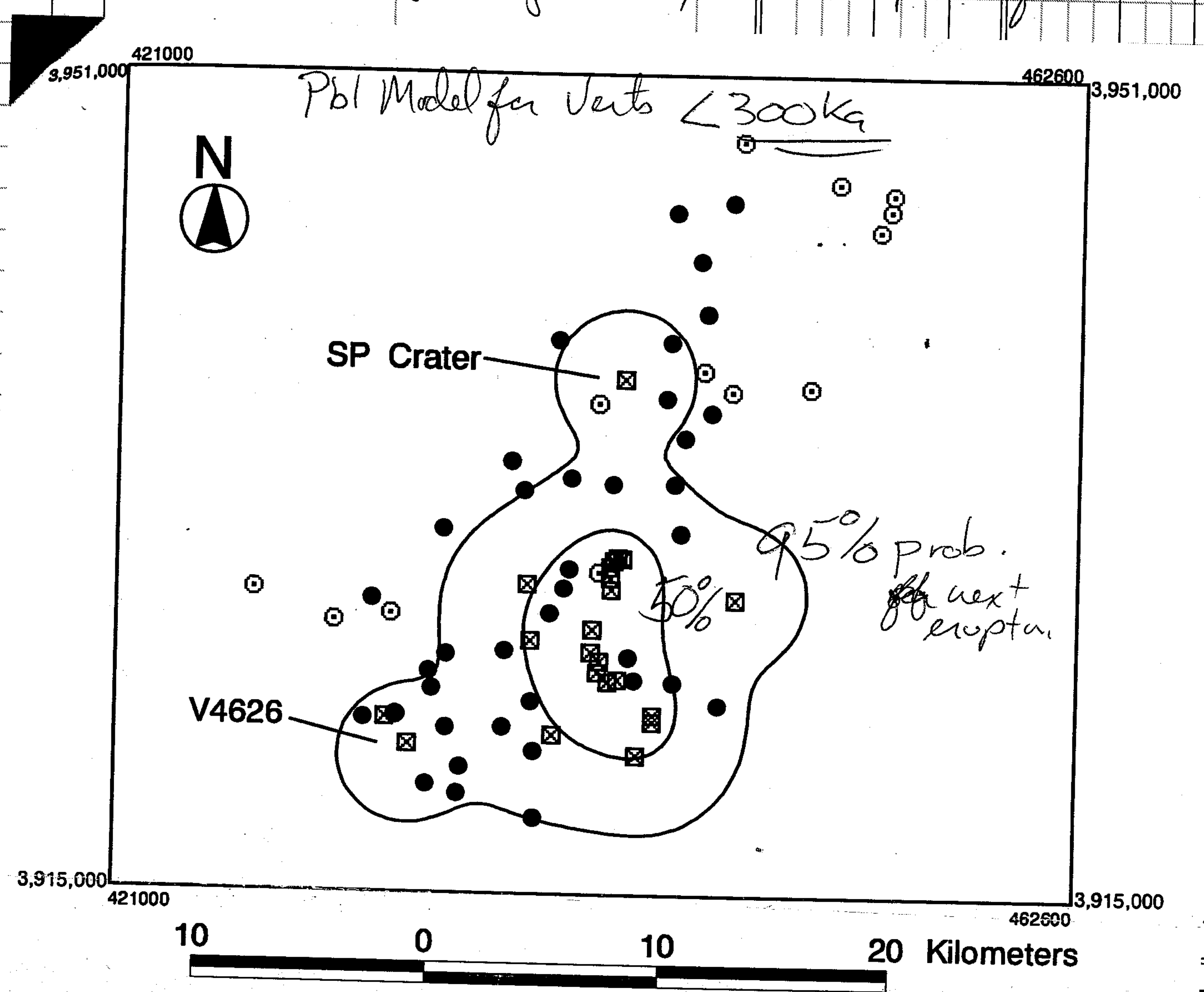


```
!        IF dist2 < 1 then
!            LET ku = 2/pi * (1-dist2)
!            LET summ = summ + (1/(h^2))*ku
!        END IF

    NEXT i

    LET lambda = summ/n

    PRINT#2: repox*1000,repoy*1000,lambda
  let sumlam = sumlam + lambda*1

next repoy
next repox

PRINT n
print "regional recurrence rate = ";sumlam
END
```

421923.	3.93414e+6	9.7996e-20
421923.	3.93447e+6	4.01539e-20
421923.	3.9348e+6	1.73859e-20
421923.	3.93514e+6	7.9849e-21
421923.	3.93547e+6	3.85168e-21
421923.	3.9358e+6	1.91618e-21
421923.	3.93613e+6	9.64859e-22
421923.	3.93647e+6	4.84475e-22
421923.	3.9368e+6	2.40145e-22
421923.	3.93713e+6	1.16775e-22
421923.	3.93747e+6	5.55005e-23
421923.	3.9378e+6	2.57281e-23
421923.	3.93813e+6	1.16194e-23
421923.	3.93847e+6	5.10962e-24
421923.	3.9388e+6	2.18762e-24
421923.	3.93913e+6	9.12177e-25
421923.	3.93946e+6	3.70829e-25
421923.	3.9398e+6	1.47336e-25
421923.	3.94013e+6	5.75077e-26
421923.	3.94046e+6	2.22832e-26
421923.	3.9408e+6	8.74259e-27
421923.	3.94113e+6	3.58719e-27
421923.	3.94146e+6	1.6025e-27
421923.	3.9418e+6	8.01589e-28
421923.	3.94213e+6	4.46369e-28
421923.	3.94246e+6	2.67266e-28
421923.	3.94279e+6	1.65455e-28
421923.	3.94313e+6	1.02942e-28
421923.	3.94346e+6	6.33238e-29
421923.	3.94379e+6	3.81869e-29
421923.	3.94413e+6	2.2482e-29
421923.	3.94446e+6	1.28965e-29
421923.	3.94479e+6	7.20152e-30
421923.	3.94513e+6	3.91291e-30
421923.	3.94546e+6	2.0683e-30
421923.	3.94579e+6	1.06346e-30
421923.	3.94612e+6	5.31872e-31
421923.	3.94646e+6	2.58738e-31
421923.	3.94679e+6	1.22427e-31
421923.	3.94712e+6	5.63453e-32
421923.	3.94746e+6	2.52231e-32
421923.	3.94779e+6	1.09825e-32
421923.	3.94812e+6	4.65116e-33
421923.	3.94846e+6	1.91595e-33
421923.	3.94879e+6	7.67657e-34
421923.	3.94912e+6	2.99165e-34
421923.	3.94945e+6	1.134e-34
421923.	3.94979e+6	4.18098e-35
421923.	3.95012e+6	1.49935e-35
421923.	3.95045e+6	5.22983e-36
422256	3.91449e+6	5.32679e-13
422256	3.91482e+6	9.25414e-13
422256	3.91516e+6	1.56375e-12
422256	3.91549e+6	2.57015e-12
422256	3.91582e+6	4.10875e-12
422256	3.91615e+6	6.38884e-12
422256	3.91649e+6	9.6626e-12
422256	3.91682e+6	1.42143e-11
422256	3.91715e+6	2.03386e-11

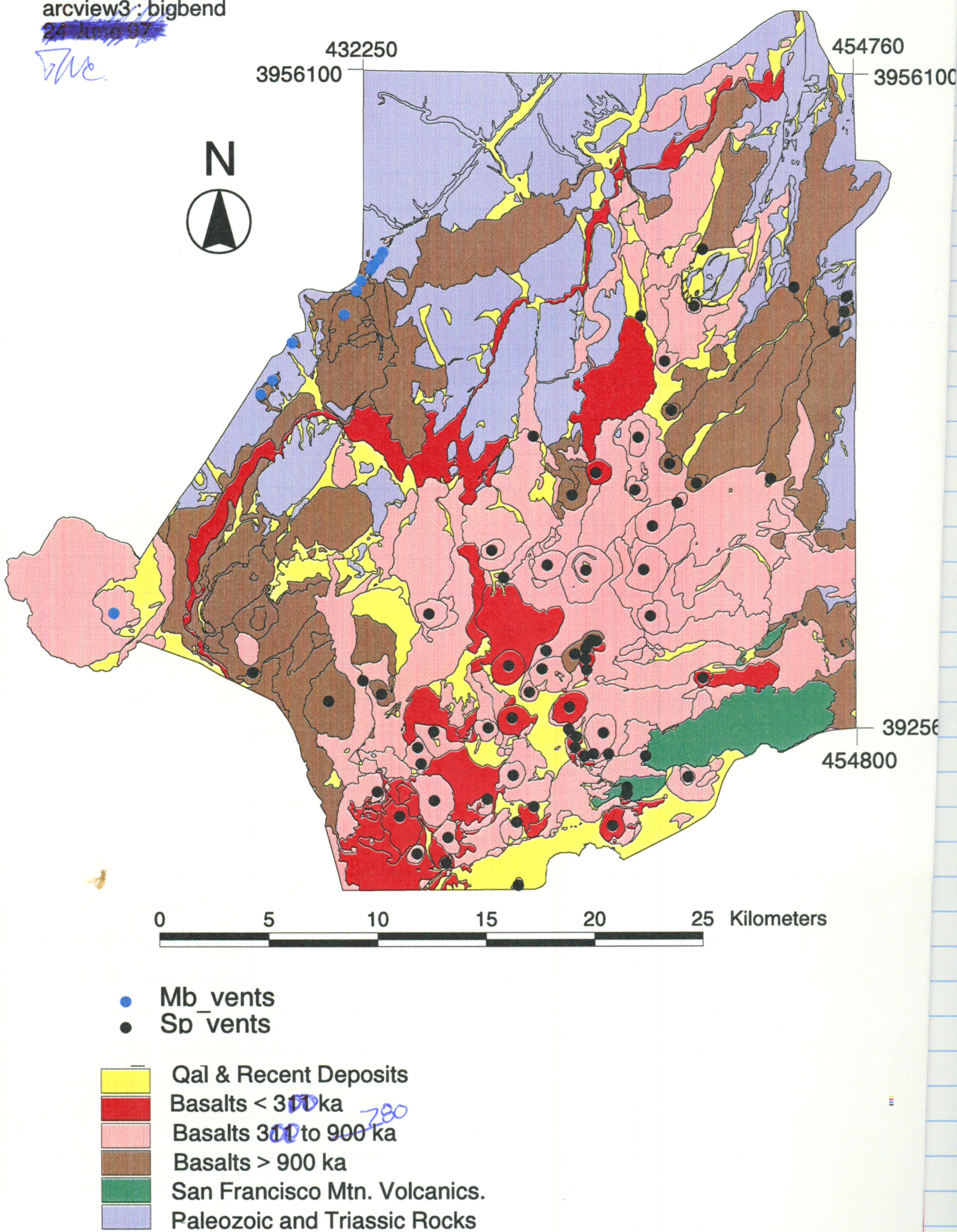
Pbl. code ex. data output

Probability Analysis – Spatio Temporal for SP Cluster

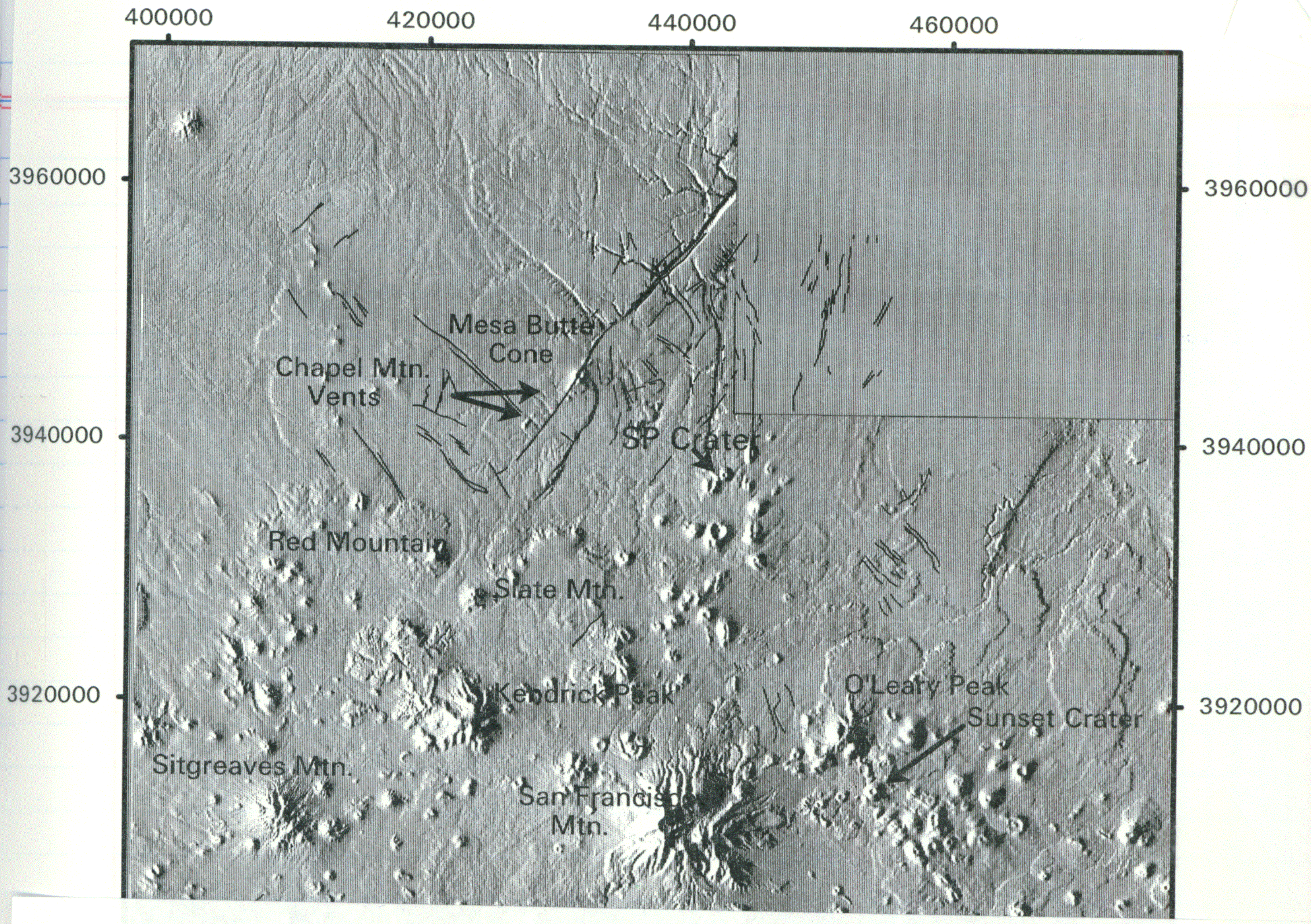


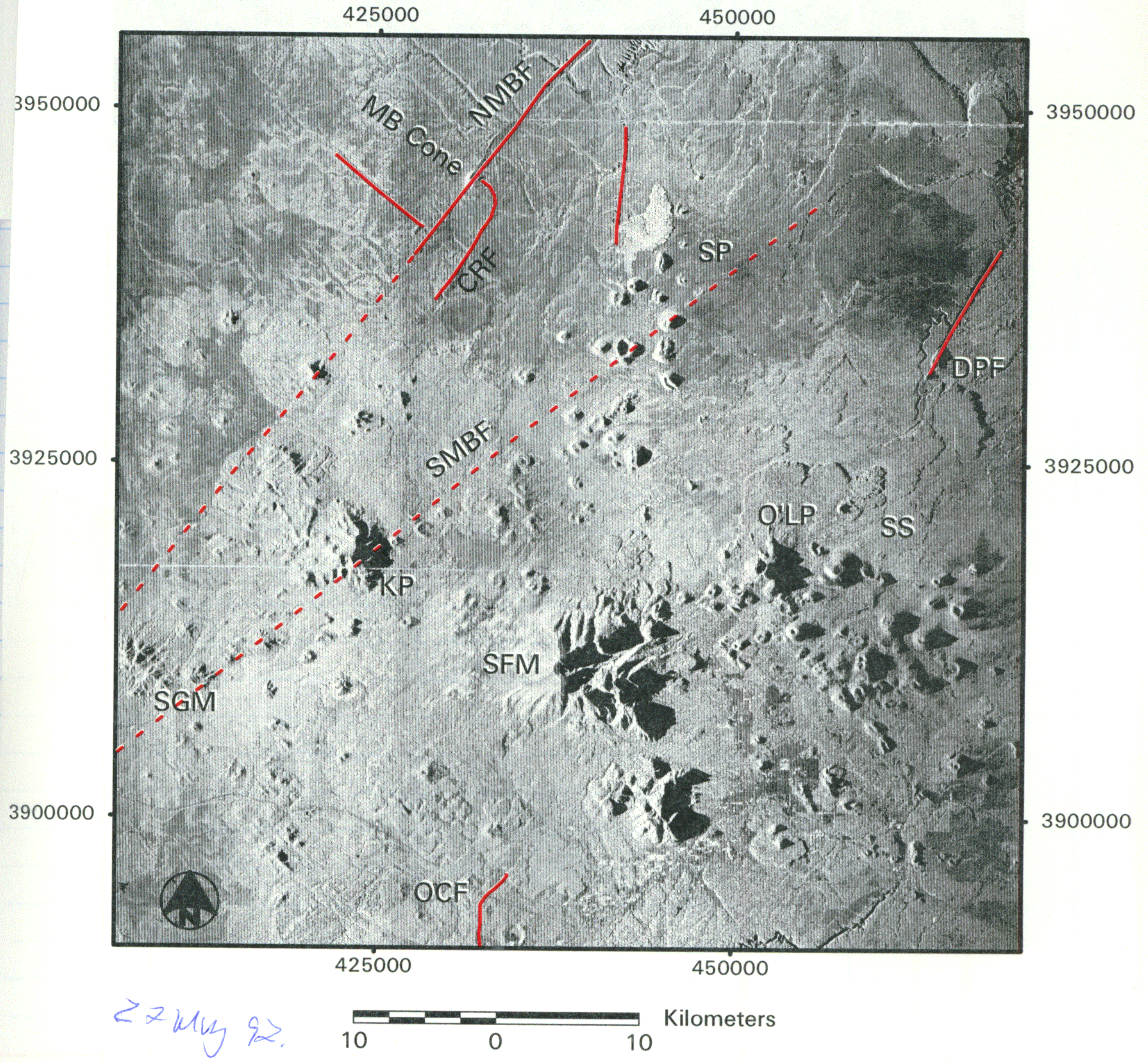
Final Geologic Map SP Cluster 1

SP Cluster Map_2
SP_Clus_Map
arcview3 : bigbend
[redacted]
TMc.



25 May 97 TMc.


400000
420000
440000
460000
3960000
3940000
3920000
Mesa Butte Cone
Chapel Mtn. Vents
SP Crater
Red Mountain
Slate Mtn.
Kendrick Peak
O'Leary Peak
Sunset Crater
Sitgreaves Mtn.
San Francisco Mtn.


425000
450000
3950000
3925000
3900000
NMBF
MB Cone
CRF
SP
DPF
SMBF
O'LP
SS
KP
SFM
SGM
OCF
10
0
10
Kilometers

22 May 92.

Condit Chemistry data -

27-May-97
SFVF: Chris Condit and K. Mulhaney's geochemical data
Age-groups are from the final version of my correlation chart (27 May 97).
Age Group Key: 1 > 900 ka
2 600 to 900 ka
3 360 to 900 ka but largely 360 to 780 ka
4 < 360 ka

53 geochemical samples
age group 1 10 samples
age group 2 5 samples
age group 3 18 samples
2 unknowns
age group 4 18 samples

1	assoc. vent id	Age-Group	SiO2	TiO2	Al2O3	Fe2O3	FeO (N/A)	MnO	MgO	CaO	Na2O	K2O	P2O5
2	V3705	3	48.02	2.60	17.35	12.95	0.00	0.18	5.18	7.46	4.43	1.34	0.66
3	V4603	1	48.41	2.69	17.54	12.59	0.00	0.18	4.48	7.19	4.71	1.27	0.59
4	V4603A	3	45.96	1.99	16.49	11.86	0.00	0.18	7.13	10.58	3.56	0.94	0.77
5	V4609	1	49.56	1.33	14.67	11.45	0.00	0.16	8.69	10.04	3.14	0.66	0.36
6	V4614	2	52.39	1.97	17.10	10.83	0.00	0.19	3.09	5.80	5.47	1.96	1.14
7	V4614A	2	54.37	1.61	17.08	9.84	0.00	0.18	2.29	5.39	5.50	2.14	1.20
8	V4624	2	46.45	1.97	16.56	11.65	0.00	0.19	7.58	10.57	3.54	0.96	0.76
9	V4625	3	46.91	1.97	16.75	11.75	0.00	0.18	7.21	10.12	3.57	0.99	0.78
10	V4703	4	46.82	1.88	14.52	11.52	0.00	0.18	9.42	11.14	2.99	0.82	0.52
11	V4704	3	48.20	2.28	17.92	12.06	0.00	0.18	5.47	8.50	4.02	0.94	0.40
12	V4707	3	45.76	2.19	14.90	12.04	0.00	0.18	8.97	11.64	2.73	0.08	0.58
13	V4708	4	46.54	1.91	15.21	11.79	0.00	0.18	9.01	11.21	2.89	0.65	0.78
14	V4710	4	48.55	1.24	15.20	10.16	0.00	0.18	9.15	11.24	2.82	0.79	0.77
15	V4713	3	55.48	1.51	17.26	9.08	0.00	0.18	2.55	5.10	5.50	2.11	0.90
16	V4714	3	47.11	1.77	17.12	11.97	0.00	0.18	7.33	0.26	3.38	0.52	0.69
17	V4715	4	47.05	1.71	16.60	11.66	0.00	0.19	7.73	10.34	3.26	0.63	0.63
18	V4715B	4	47.00	1.81	17.28	12.10	0.00	0.18	7.08	10.28	3.38	0.52	0.67
19	V4715C	4	46.97	1.78	17.15	11.96	0.00	0.18	7.15	10.28	3.47	0.51	0.67
20	V4720	3	47.45	1.85	16.86	11.80	0.00	0.20	7.15	9.70	3.39	0.93	0.72
21	V4719	3	49.23	2.92	17.64	13.05	0.00	0.18	4.14	5.65	4.77	1.47	0.66
22	V4720	3	47.09	1.83	16.61	11.83	0.00	0.20	7.57	9.90	3.40	0.90	0.73
23	V4726	4	45.37	2.27	13.87	11.96	0.00	0.18	10.41	11.10	3.13	1.01	0.66
24	V4818	unk	46.76	2.02	16.54	11.08	0.00	0.18	6.79	11.20	3.60	1.05	0.89
25	V5626	3	51.88	1.37	14.65	9.22	0.00	0.15	7.70	9.05	3.55	1.57	0.44
26	V5626	3	48.34	1.45	13.91	10.20	0.00	0.17	9.63	11.77	2.74	0.97	0.62
27	V5702	3	46.16	2.13	14.72	11.66	0.00	0.18	9.16	10.97	3.29	1.03	0.69
28	V5704	1	47.10	1.69	15.47	11.15	0.00	0.17	9.69	10.96	2.77	0.63	0.37
29	V5715	4	52.09	1.80	16.59	9.50	0.00	0.14	5.35	8.17	4.04	1.62	0.60
30	V5712	4	46.31	1.84	13.79	11.31	0.00	0.19	10.81	11.59	2.76	0.89	0.60
31	V5713	4	47.33	1.69	14.71	10.84	0.00	0.18	8.76	11.74	3.06	0.97	0.68
32	V5718	3	54.82	1.45	16.33	8.94	0.00	0.15	4.38	6.86	4.36	1.78	0.50
33	V5725	4	47.60	1.67	14.73	10.72	0.00	0.17	8.74	11.76	2.89	0.99	0.69
34	V5725	4	51.66	1.39	14.73	9.35	0.00	0.16	7.92	9.26	3.39	1.54	0.45
35	V5715	4	47.66	1.51	13.93	10.49	0.00	0.17	9.75	11.88	2.83	0.90	0.61
36	V5733	3	47.27	1.81	16.31	11.34	0.00	0.17	8.53	10.44	3.08	0.82	0.39
37	V5733	3	47.32	1.86	16.46	11.44		0.17	8.22	10.32	3.20	0.85	0.41
38	V5733A	3	48.77	1.37	17.24	10.64	0.00	0.16	5.95	10.36	3.69	0.85	0.46
39	V5734	1	48.31	1.61	18.16	11.43	0.00	0.19	6.15	9.22	3.89	0.83	0.49
40	V5734A	4	48.24	1.61	18.11	11.37	0.00	0.18	5.93	9.25	3.83	0.81	0.49
41	V5734D	4	48.21	1.60	17.94	11.38	0.00	0.17	6.05	9.23	3.83	0.80	0.53
42	V5734G	4	48.30	1.63	18.45	11.54		0.18	5.98	9.31	3.72	0.76	0.50

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43	V5806	1	46.98	2.25	17.09	12.70	0.00	0.18	6.68	9.71	3.47	0.70	0.58
44	V5806	1	47.14	2.18	17.26	12.36	0.00	0.18	6.45	9.74	3.51	0.73	0.78
45	V6735	4	46.65	1.60	13.75	10.84	0.00	0.18	10.45	12.53	2.69	0.74	0.63
46	V5703	4	56.15	0.97	15.02	7.46	0.00	0.14	5.34	8.00	3.80	2.32	0.67
47	V6802	1	47.64	2.88	16.92	13.03	0.00	0.17	5.44	8.10	4.33	1.25	0.59
48	V6803	1	50.52	1.95	17.23	11.61	0.00	0.17	4.68	7.90	4.23	1.44	0.52
49	V6807	2	47.95	2.46	17.12	12.48	0.00	0.17	5.34	8.98	3.88	1.19	0.45
50	V6811A	1	47.62	2.89	16.79	13.04	0.00	0.18	5.46	8.03	4.40	1.21	0.61
51	V6811	1	47.63	2.86	16.76	13.01	0.00	0.18	5.32	8.09	4.28	1.26	0.61
52	V6713	2	48.63	2.29	17.12	12.44	0.00	0.17	4.81	8.19	4.13	1.25	0.55
53	V6725	3	48.55	2.34	17.09	12.70	0.00	0.17	4.89	7.76	4.19	1.25	0.57

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TOTALS	Na2O+K2O	XMg	Nb	Zr	Sr	Zn	Ni	Cr	Fe	V	TiO2 (%)	Ce
100.17	5.76	44.19	41.92	225.93	966.49	90.66	28.41	1.34	131.07	168.27	2.60	70.06
99.63	5.98	41.32	42.67	212.69	1033.80	78.22	17.58	-3.05	132.00	160.06	2.74	73.44
99.47	1.72	63.85	51.21	174.92	1042.65	95.68	76.65	79.19	136.74	219.62	1.98	104.81
100.06	3.79	60.05	16.43	105.82	688.88	92.15	162.56	424.49	133.90	158.74	1.23	65.41
99.93	7.43	36.10	42.95	270.01	1030.71	97.66	11.87	-3.91	126.04	41.06	1.87	105.83
99.60	7.64	31.55	46.76	303.18	1043.14	108.64	3.98	-9.33	120.86	29.77	1.59	112.20
100.23	4.50	56.32	50.09	169.54	1017.33	97.13	80.05	85.91	136.61	224.82	2.01	109.02
100.22	4.56	54.84	49.81	197.83	1049.24	92.98	69.24	66.17	135.97	201.90	1.95	105.27
99.79	3.80	61.82	34.18	154.33	700.36	91.93	153.40	432.46	137.49	218.47	1.88	71.55
99.97	4.96	47.31	36.21	170.82	1075.37	81.40	29.63	-3.00	130.33	191.41	2.24	53.78
99.79	2.81	59.60	44.15	177.68	806.11	88.78	120.24	265.56	139.24	258.37	2.18	76.65
100.18	3.54	60.23	45.20	155.40	983.69	90.30	124.40	400.46	136.82	244.02	1.97	114.20
100.11	3.61	64.07	43.73	147.77	828.66	86.75	103.54	117.90	135.82	214.05	1.27	129.92
99.66	7.60	35.72	42.56	264.21	1042.36	89.29	9.79	-2.32	123.65	34.90	1.48	111.19
100.32	3.90	54.80	40.79	133.51	966.46	80.63	71.82	119.35	133.68	228.03	1.80	100.98
99.78	3.88	56.75	35.41	142.48	920.06	78.22	71.17	131.00	135.66	211.77	1.69	89.67
100.31	3.90	53.69	40.72	138.26	980.86	82.95	56.57	101.00	134.12	228.18	1.84	102.84
100.12	3.98	54.23	39.70	131.20	982.94	76.41	60.49	110.77	133.30	216.68	1.78	92.33
100.04	4.32	54.55	50.08	185.40	1033.90	87.93	63.43	78.37	134.03	202.25	1.74	110.40
99.71	6.24	38.60	41.76	216.62	1069.53	100.28	9.77	-7.48	126.77	96.19	2.95	60.88
100.04	4.30	55.88	50.04	164.61	985.69	96.90	76.37	109.53	135.87	225.48	1.88	104.71
99.96	4.14	63.30	53.63	197.36	815.40	92.69	219.41	515.61	137.87	238.93	2.30	77.69
100.11	4.65	54.82	55.75	207.18	1071.06	97.77	54.66	53.78	138.53	236.09	2.06	114.15
99.58	5.12	62.32	42.00	205.51	617.05	86.84	127.76	403.09	134.58	168.14	1.43	84.57
99.79	3.70	65.17	42.96	213.30	624.37	92.76	136.49	419.52	132.05	173.00	1.45	80.86
99.98	4.32	60.88	54.75	196.50	883.90	88.81	149.07	398.16	138.71	234.52	2.16	84.40
99.98	3.40	63.26	27.94	114.43	651.68	82.38	154.42	379.60	134.76	232.44	1.69	54.00
99.91	5.66	52.72	41.84	218.19	974.86	99.08	62.78	129.68	131.28	162.50	1.84	72.11
100.08	3.65	65.44	47.05	171.89	760.66	87.60	221.40	602.61	138.94	241.49	1.90	82.50
99.94	4.03	61.55	49.79	169.90	806.39	84.15	117.77	317.24	140.10	236.29	1.73	89.56
99.57	6.14	49.25	42.69	209.65	780.88	90.08	37.17	48.41	128.03	123.64	1.47	90.50
99.94	3.87	61.75	49.63	165.05	807.62	86.06	124.09	335.87	140.64	238.05	1.71	91.56
99.84	4.93	62.66	45.71	170.87	763.54	89.80	148.15	457.18	137.93	232.81	1.52	101.15
99.74	3.74	64.80	43.90	146.50	744.88	83.65	153.92	442.12	139.36	228.13	1.54	94.10
100.16	3.90	59.84	26.41	139.54	705.20	82.09	111.15	215.20	135.43	211.47	1.80	49.87
100.24	1.26	64.12	28.28	146.55	714.60	98.32	111.41	217.09	135.85	212.71	1.84	50.39
99.48	4.54	52.54	19.95	131.60	1015.05	102.38	127.72	99.49	131.38	159.02	1.38	55.17
100.27	4.72	51.59	33.40	150.48	1095.47	96.60	38.22	13.95	131.34	201.61	1.58	74.28
99.82	4.64	50.81	33.65	135.96	1099.10	102.05	38.15	21.33	133.40	206.12	1.63	76.54
99.74	4.63	51.27	32.45	134.85	1085.52	90.03	34.36	15.56	132.10	187.90	1.59	73.74
100.37	1.26	61.52	34.41	157.79	1103.14	104.76	41.94	15.36	130.95	208.98	1.64	78.39

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100.34	4.17	51.04	21.11	117.52	765.60	83.60	50.23	57.49	134.79	213.11	2.10	44.10
100.32	4.25	50.84	21.83	114.95	816.20	85.19	54.79	50.46	133.91	160.75	2.10	49.75
100.06	3.43	65.63	45.47	147.05	769.06	83.76	159.92	496.46	141.53	238.99	1.59	91.03
99.86	6.11	58.63	54.56	240.50	805.06	72.84	64.88	91.44	132.28	142.11	1.01	151.82
100.37	5.58	45.23	37.84	176.97	1054.25	71.12	32.86	35.36	132.12	156.35	2.63	53.04
100.28	5.66	44.41	32.68	186.17	808.72	103.03	20.08	3.07	130.47	215.57	1.90	78.23
100.03	5.07	45.85	32.65	185.06	707.21	93.31	34.48	36.11	135.73	211.16	2.39	53.05
100.24	5.62	45.31	37.54	172.95	1048.22	72.91	34.08	37.70	132.62	189.67	2.77	54.27
100.00	5.53	44.75	39.16	197.46	1048.49	78.68	38.20	32.30	131.48	135.51	2.71	55.92
99.57	5.38	43.38	28.76	191.01	801.10	89.69	29.43	-1.59	131.43	173.07	2.23	60.60
99.52	5.44	43.27	28.68	190.46	795.22	97.46	31.63	-0.09	132.29	193.33	2.34	61.80

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Ba	La	total ppm	
564.19	31.47	2322.41	0.19
675.57	35.06	2460.78	0.20
943.39	53.90	2980.74	0.29
807.75	36.23	2693.59	0.16
844.26	51.61	2619.96	0.16
907.97	53.61	2722.37	0.15
941.88	61.31	2975.70	0.30
977.39	54.60	3002.35	0.25
619.26	33.63	2648.94	0.22
709.75	27.74	2505.68	0.21
703.69	37.47	2720.12	0.25
1022.20	57.83	3376.49	0.29
1092.60	69.98	2971.99	0.30
1020.02	55.88	2793.01	0.16
839.33	56.13	2772.51	0.31
884.51	211.26	2912.90	0.25
847.93	55.57	2770.84	0.29
882.08	52.19	2779.87	0.30
1050.11	55.64	3053.28	0.27
559.30	30.45	2307.02	0.19
945.87	56.06	2953.01	0.30
645.99	41.07	3037.95	0.27
1086.26	59.53	3176.82	0.27
888.93	43.82	2803.72	0.20
839.27	42.91	2798.94	0.20
770.09	42.81	3043.88	0.28
522.39	28.37	2384.10	0.24
874.77	34.03	2802.96	0.19
644.05	41.33	3041.42	0.27
996.68	46.15	3055.75	0.29
1106.15	48.92	2707.59	0.20
997.24	48.59	3086.11	0.30
1008.40	47.90	3204.96	0.27
963.97	48.31	3090.38	0.30
373.56	23.68	2075.40	0.19
389.99	25.14	2132.17	0.19
638.37	24.10	2505.61	0.15
733.99	41.46	2612.38	0.22
756.62	37.07	2641.62	0.25
760.24	36.92	2585.26	0.24
746.45	39.75	2663.56	0.22

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425.94	19.93	1935.52	0.18
478.65	21.91	1990.49	0.19
938.82	43.44	3157.12	0.31
1438.81	83.07	3278.38	0.23
463.72	23.83	2240.09	0.21
767.79	36.97	2384.68	0.18
412.45	22.76	1926.36	0.18
477.36	24.45	2284.54	0.22
464.84	26.59	2251.34	0.20
475.82	26.32	2007.87	0.15
500.66	27.44	2061.22	0.15

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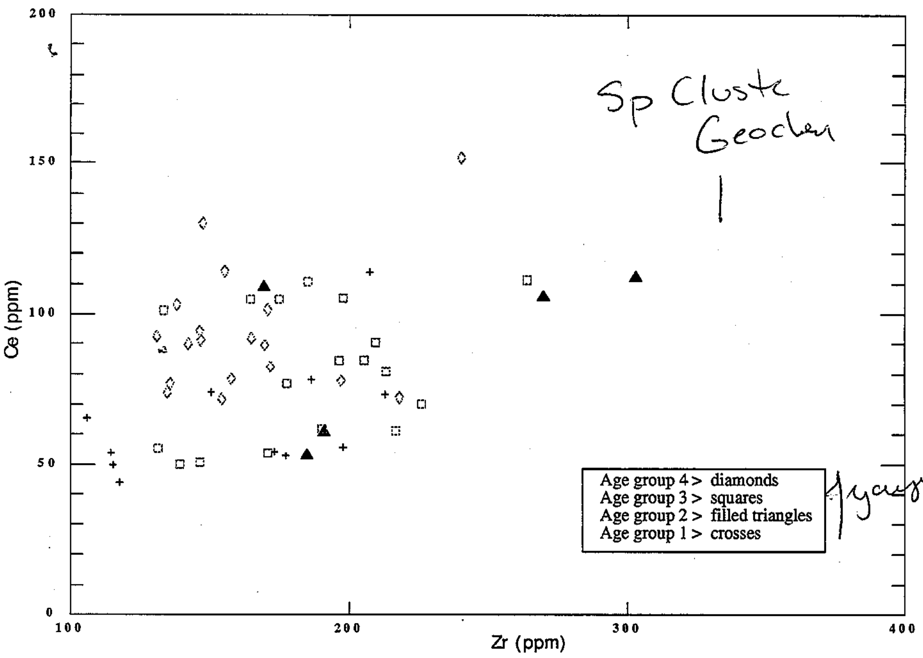

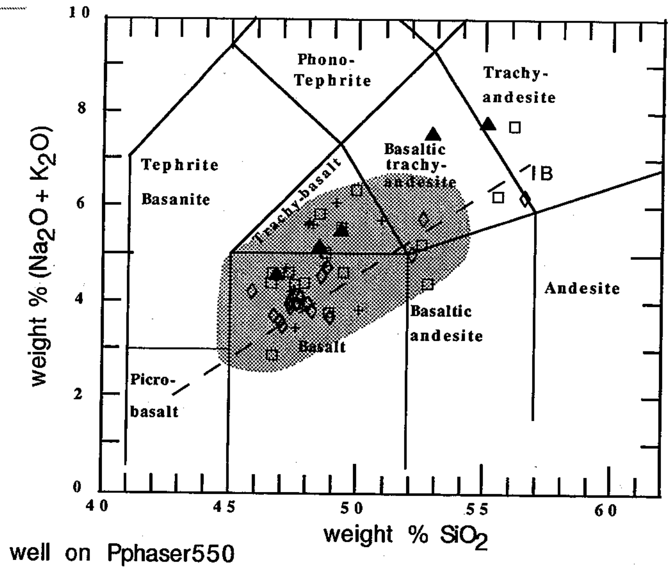

Prints well on Pphaser550

Age group 4 > diamonds
Age group 3 > squares
Age group 2 > filled triangles
Age group 1 > crosses

IB is Irvine and Baragar discriminant boundary between alkalic and tholeiitic fields.

Shaded zone reflects the range in mafic geochemistry from the type suite of SFVF mafic rocks produced by Arculus and Gust (1996)

Major & Trace
Element Plot
of Geochem of
SP Cluster data.

Results indicate
that variability of
SP Cluster is similar
to that basalts
geochem of entire field.
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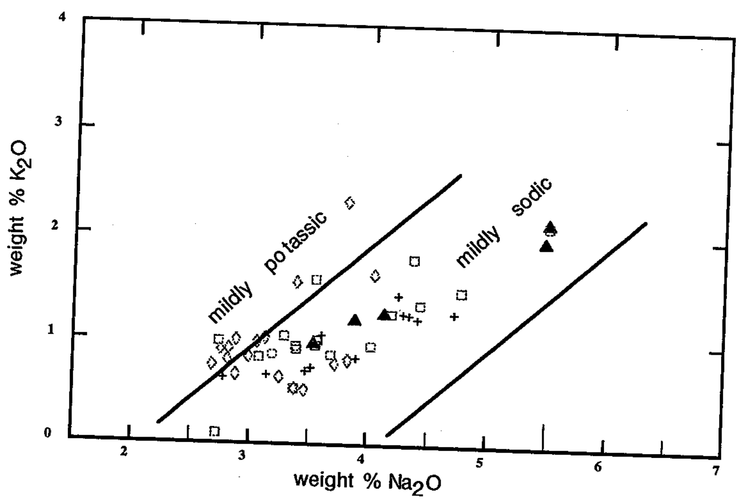
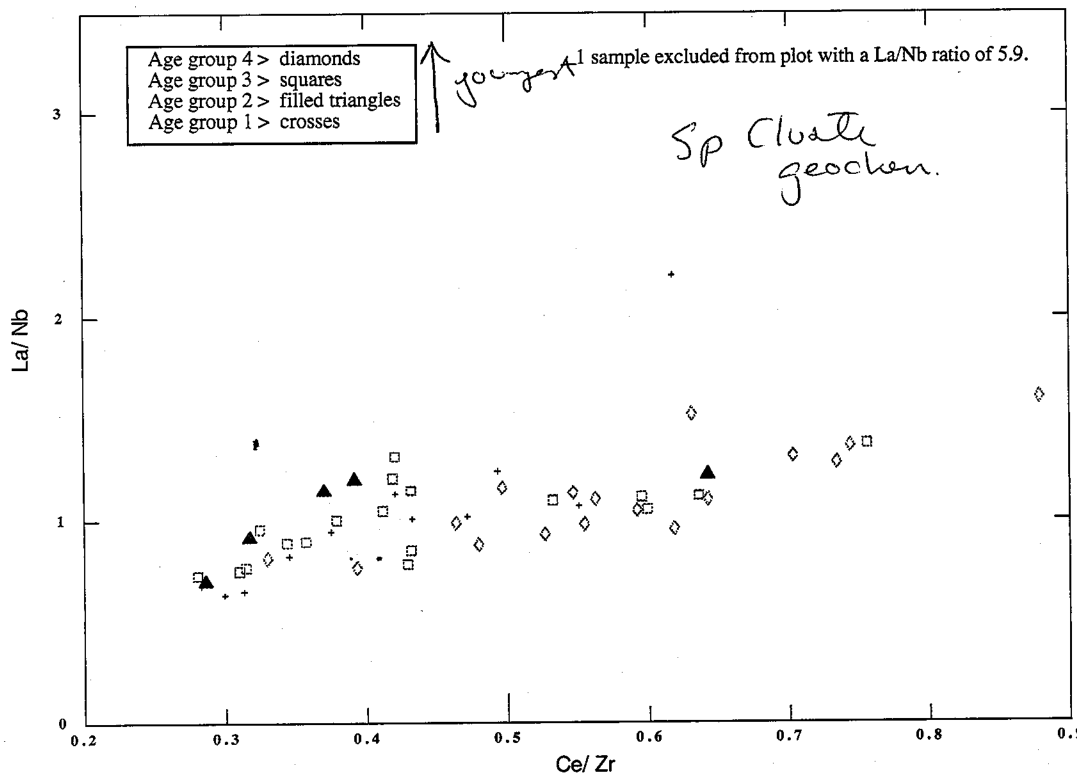
5 Jun 97.



Wt % K2O vs Na2O for SP Cluster Basalts with sodic-alkalic boundaries of Le Bas et al. (1986).

Age group 4 > diamonds
Age group 3 > squares
Age group 2 > filled triangles
Age group 1 > crosses



Jun 5 June 97
see preceding pg

Final entry in this scientific notebook
Dr. Malcolm Carney
7 Aug 97

(#187)

I HAVE REVIEWED THIS SCIENTIFIC NOTEBOOK, AND FIND IT IN COMPLIANCE WITH QAP-001. THERE IS SUFFICIENT INFORMATION REGARDING PROCEDURES USED FOR ANALYSIS THAT ANOTHER QUALIFIED INDIVIDUAL COULD REPEAT THIS ACTIVITY. THIS ACTIVITY INVESTIGATED THE RELATIONSHIP BETWEEN FAULTS AND VOLCANIC VENTS IN THE SAN FRANCISO VOLCANIC FIELD, AZ. THIS SCIENTIFIC NOTEBOOK IS TO BE CLOSED OUT AND ARCHIVED EFFECTIVE 3/5/98

H. Lawrence McKague
3/5/98