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PRELIMINARY RESULTS OF 14 APATITE FISSION-TRACK ANALYSES OF SAMPLES
FROM THE UMIAT AND COLVILLE RIVER REGION, NORTH SLOPE, ALASKA

By

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CONTENTS

	<u>Page</u>
Contents and Location Map	2
Introduction	3
Sample Information and Track Length Data	4
Fission Track Age Data	5
Confined Track Length Distributions	19

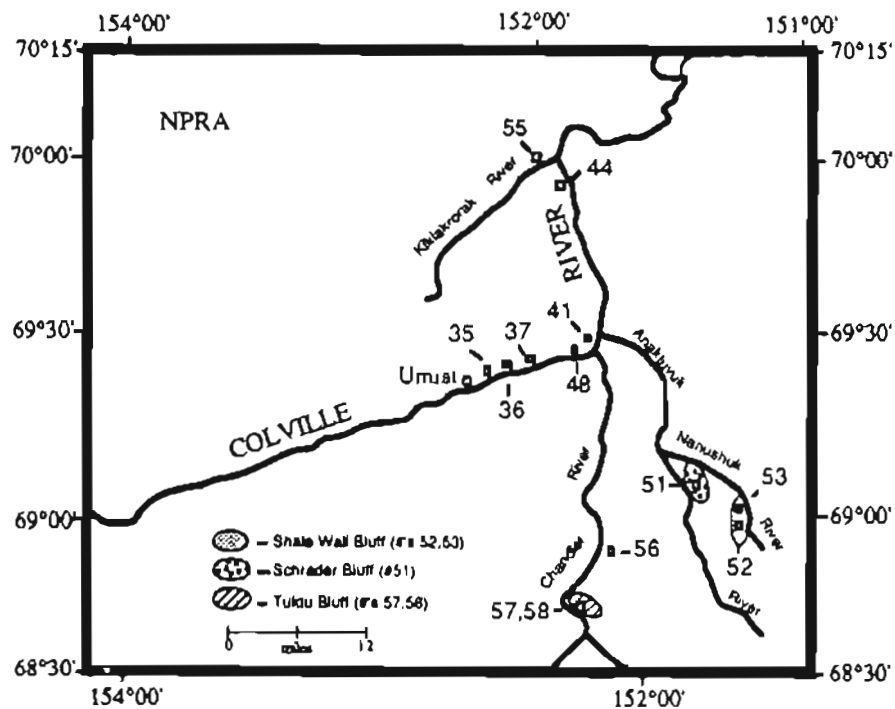


Figure 1: Map showing approximate locations of samples collected for this study.

INTRODUCTION

This is a preliminary report of apatite fission track analysis data of samples from exposures (Late Cretaceous-Early Tertiary) south of Umiat and along the Colville River in Alaska. During 1988, outcrop samples were collected with cooperation from the Alaska State Geological and Geophysical Surveys. Apatite grains were separated from the samples and analyzed in Melbourne Australia at the La Trobe University Fission Track Research Laboratory. All separations and analyses were completed by the author as part of an ongoing PhD project funded by the U.S. Minerals Management Service Continental Margins Program.

Each analysis includes two parts: 1) age report; and 2) track length distributions. The age report shows a listing of the individual grain ages, the resulting age and pertinent information used in determining the age. A guide to read the information is as follows:

<u>POS 63A</u>	-Sample number
Irradiation:	-In-house number for grouping samples from the same irradiation package
Crystal	-Number of each grain counted
NS	-Number of spontaneous tracks counted
NI	-Number of induced tracks counted
NA	-Number of area units counted in grain
Ratio	-Ratio of (NS/NI) for each grain
U(ppm)	-Uranium concentration of each grain
RHOs	-Density of spontaneous tracks (per cm ²)
RHOi	-Density of induced tracks (per cm ²)
F.T.Age(Ma)	-Individual grain ages
CHI Squared	-Statistical test for determining multiple grain populations
p(chi squared)	-probability of less than 5% indicates multiple grain populations
Variance of SQR	-Statistical comparison of values of NS or NI for all grains
NS/NI	-Pooled ratio of (NS/NI). Uses total number of spontaneous and induced tracks counted for whole sample. Value used in age calculation if sample is of a single population
Mean Ratio	-Average ratio of (NS/NI) for grains
Pooled Age	-Age calculated using NS/NI(single population)
Mean Age	-Age calculated Using "Mean Ratio" (multiple populations)

The track length distributions for each sample are histograms showing the relative numbers of tracks measured at a particular length, the mean length of the tracks measured, the standard deviation of the tracks measured, and the total number of tracks measured for the sample (N).

SAMPLE INFORMATION

Fission track ages are typically determined on at least 20 grains of apatite from a single sample and 100 confined tracks are typically measured for each track length distribution. Of 30 original samples, these 14 were chosen as representative for the region.

In every example it was determined that the grains represented a single population and so the pooled age is used for each sample.

Sample No.	Formation	Lengths (#)	Mean Length (μm)	Age (Ma)
88 POS 35A	Seabee	102	13.77 ± 0.12	86.7 ± 5.5
88 POS 36A	Seabee	62	14.08 ± 0.14	94.2 ± 6.6
88 POS 37A	Prince Creek	22	13.98 ± 0.23	94.4 ± 6.2
88 POS 41A	Prince Creek	13	14.05 ± 0.23	113.8 ± 10.8
88 POS 44A	Prince Creek	101	14.19 ± 0.09	140.0 ± 16.8
88 POS 48A	Prince Creek	101	14.52 ± 0.09	78.6 ± 9.4
88 POS 51A	Schrader Bluff	62	13.72 ± 0.20	81.8 ± 8.8
88 POS 52B	Hue Shale	100	14.77 ± 0.11	90.0 ± 4.9
88 POS 53B	Schrader Bluff	73	13.42 ± 0.25	123.4 ± 10.4
88 POS 53C	Schrader Bluff	102	14.47 ± 0.11	87.4 ± 5.9
88 POS 55A	Sagavanirktok	101	14.86 ± 0.10	91.0 ± 6.9
88 POS 56A	Grandstand	14	13.30 ± 0.68	68.1 ± 6.2
88 POS 57A	Tuktu	100	13.88 ± 0.10	58.1 ± 5.4
88 POS 58A	Torok	56	14.08 ± 0.13	57.0 ± 5.4

TRACK LENGTH DATA

Sample Number	Track Length Range (μm)													
	≤5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	≥17
35A	0	1	0	0	0	1	3	3	17	24	42	10	1	0
36A	0	0	0	0	0	0	1	0	8	17	27	8	1	0
37A	0	0	0	0	0	0	1	0	3	5	10	3	0	0
41A	0	0	0	0	0	0	0	0	2	5	3	3	0	0
44A	0	0	0	0	0	0	1	0	9	24	50	17	0	0
48A	0	0	0	0	0	0	0	1	4	19	47	26	4	0
51A	0	0	0	0	0	2	2	2	11	16	17	10	1	1
52B	0	0	0	0	0	0	0	1	2	20	35	30	8	4
53B	0	1	0	1	2	1	1	5	16	19	10	10	7	0
53C	0	0	0	0	0	0	0	2	11	15	37	33	4	0
55A	0	0	0	0	0	0	0	0	2	16	37	35	10	1
56A	0	0	1	0	0	0	0	3	2	1	4	2	1	0
57A	0	0	0	0	0	1	0	2	14	34	39	9	1	0
58A	0	0	0	0	0	0	1	1	4	19	24	6	1	0

FISSION TRACK AGE DATA

88 POS 35A APATITE SEABEE FM.

IRRADIATION LU029

SLIDE NUMBER 9

COUNTED BY: POS

No.	Ns	Ni	Na	RATIO	U (ppm)	RHOs	RHOi	F.T. AGE (Ma)
1	9	59	24	0.153	13.5	4.267E+05	2.797E+06	72.8 ± 26.1
2	39	211	16	0.185	72.3	2.773E+06	1.500E+07	88.1 ± 15.4
3	1	9	21	0.111	2.3	5.418E+04	4.876E+05	53.1 ± 56.0
4	15	94	20	0.160	25.8	8.533E+05	5.348E+06	76.1 ± 21.2
5	4	13	20	0.308	3.6	2.276E+05	7.396E+05	145.9 ± 83.5
6	9	70	30	0.129	12.8	3.413E+05	2.655E+06	61.4 ± 21.8
7	15	90	36	0.167	13.7	4.741E+05	2.844E+06	79.5 ± 22.2
8	3	16	25	0.188	3.5	1.365E+05	7.282E+05	89.3 ± 56.2
9	10	53	18	0.189	16.1	6.321E+05	3.350E+06	89.9 ± 31.0
10	22	146	15	0.151	53.3	1.669E+06	1.107E+07	71.9 ± 16.5
11	7	76	24	0.092	17.4	3.319E+05	3.603E+06	44.0 ± 17.4
12	41	228	24	0.180	52.1	1.944E+06	1.081E+07	85.7 ± 14.6
13	24	80	30	0.300	14.6	9.102E+05	3.034E+06	142.3 ± 33.2
14	4	17	28	0.235	3.3	1.625E+05	6.908E+05	111.9 ± 62.2
15	1	6	16	0.167	2.1	7.111E+04	4.267E+05	79.5 ± 85.8
16	19	104	16	0.183	35.6	1.351E+06	7.396E+06	87.0 ± 21.8
17	12	55	25	0.218	12.1	5.461E+05	2.503E+06	103.8 ± 33.1
18	28	120	30	0.233	21.9	1.062E+06	4.551E+06	111.0 ± 23.4
19	36	202	20	0.178	55.3	2.048E+06	1.149E+07	84.9 ± 15.4
20	2	6	18	0.333	1.8	1.264E+05	3.793E+05	157.9 ± 129.0
301	1655				19.9	7.510E+05	4.129E+06	

Area of basic unit = 8.789E-07 cm-2

CHI SQUARED = 13.676 WITH 19 DEGREES OF FREEDOM

P(chi squared) = 80.2 %

CORRELATION COEFFICIENT = 0.963

VARIANCE OF SQR(Ns) = 2.93

VARIANCE OF SQR(Ni) = 16.08

Ns/Ni = 0.182 ± 0.011

MEAN RATIO = 0.193 ± 0.014

Ages calculated using a zeta of 352.7 ± 3.9 for SRM612 glass

RHO D = 2.720E+06cm-2; ND = 5975

POOLED AGE = 86.7 ± 5.6 Ma

MEAN AGE = 91.9 ± 6.9 Ma

88 POS 36A APATITE SEABEE FM.

IRRADIATION LU029

SLIDE NUMBER 10

COUNTED BY: POS

No.	Ns	Ni	Na	RATIO	U (ppm)	RHOs	RHOi	F.T. AGE (Ma)
1	6	16	12	0.375	7.3	5.689E+05	1.517E+06	177.4 ± 85.0
2	6	43	15	0.140	15.7	4.551E+05	3.262E+06	66.6 ± 29.0
3	3	26	12	0.115	11.9	2.844E+05	2.465E+06	55.1 ± 33.6
4	8	37	16	0.216	12.7	5.689E+05	2.631E+06	102.9 ± 40.2
5	5	22	18	0.227	6.7	3.161E+05	1.391E+06	108.1 ± 53.6
6	9	50	16	0.180	17.1	6.400E+05	3.556E+06	85.8 ± 31.1
7	11	31	40	0.355	4.2	3.129E+05	8.818E+05	168.0 ± 59.0
8	6	26	18	0.231	7.9	3.793E+05	1.643E+06	109.8 ± 49.7
9	8	42	20	0.190	11.5	4.551E+05	2.389E+06	90.7 ± 35.0
10	46	207	30	0.222	37.8	1.745E+06	7.851E+06	105.7 ± 17.3
11	6	35	15	0.171	12.8	4.551E+05	2.655E+06	81.7 ± 36.1
12	9	69	20	0.130	18.9	5.120E+05	3.925E+06	62.3 ± 22.1
13	13	59	32	0.220	10.1	4.622E+05	2.098E+06	104.8 ± 32.2
14	6	31	12	0.194	14.2	5.689E+05	2.939E+06	92.2 ± 41.1
15	31	167	27	0.186	33.9	1.306E+06	7.037E+06	88.4 ± 17.4
16	35	209	30	0.167	38.2	1.327E+06	7.927E+06	79.8 ± 14.6
17	7	34	20	0.206	9.3	3.982E+05	1.934E+06	98.0 ± 40.7
18	5	26	18	0.192	7.9	3.161E+05	1.643E+06	91.6 ± 44.8
19	29	123	15	0.236	44.9	2.200E+06	9.330E+06	112.1 ± 23.2
20	3	21	12	0.143	9.6	2.844E+05	1.991E+06	68.2 ± 42.1
252	1274				17.5	7.204E+05	3.642E+06	

Area of basic unit = 8.789E-07 cm²

CHI SQUARED = 10.572 WITH 19 DEGREES OF FREEDOM

P(chi squared) = 93.7 %

CORRELATION COEFFICIENT = 0.971

VARIANCE OF SQR(Ns) = 2.12

VARIANCE OF SQR(Ni) = 10.58

Ns/Ni = 0.198 ± 0.014

MEAN RATIO = 0.205 ± 0.014

Ages calculated using a zeta of 352.7 ± 3.9 for SRM612 glass

RHO D = 2.720E+06cm⁻²; ND = 5975

POOLED AGE = 94.2 ± 6.7 Ma

MEAN AGE = 97.5 ± 7.1 Ma

88 POS 37A APATITE PRINCE CREEK FM.

IRRADIATION LU029

SLIDE NUMBER 11

COUNTED BY: POS

No.	Ns	Ni	Na	RATIO	U (ppm)	RHOs	RHOi	F.T. AGE (Ma)
1	15	47	15	0.319	17.2	1.138E+06	3.565E+06	151.3 ± 44.9
2	23	78	30	0.295	14.2	8.723E+05	2.958E+06	139.9 ± 33.3
3	9	69	25	0.130	15.1	4.096E+05	3.140E+06	62.3 ± 22.1
4	15	95	20	0.158	26.0	8.533E+05	5.404E+06	75.3 ± 21.0
5	10	35	15	0.286	12.8	7.585E+05	2.655E+06	135.6 ± 48.7
6	6	35	18	0.171	10.7	3.793E+05	2.212E+06	81.7 ± 36.1
7	9	49	15	0.184	17.9	6.827E+05	3.717E+06	87.5 ± 31.8
8	9	69	21	0.130	18.0	4.876E+05	3.738E+06	62.3 ± 22.1
9	5	27	15	0.185	9.9	3.793E+05	2.048E+06	88.2 ± 43.0
10	3	21	12	0.143	9.6	2.844E+05	1.991E+06	68.2 ± 42.1
11	30	165	25	0.182	36.2	1.365E+06	7.509E+06	86.6 ± 17.3
12	40	231	40	0.173	31.6	1.138E+06	6.571E+06	82.5 ± 14.2
13	40	130	40	0.308	17.8	1.138E+06	3.698E+06	145.9 ± 26.5
14	18	101	16	0.178	34.6	1.280E+06	7.182E+06	84.9 ± 21.8
15	6	31	12	0.194	14.2	5.689E+05	2.939E+06	92.2 ± 41.1
16	9	50	15	0.180	18.3	6.827E+05	3.793E+06	85.8 ± 31.1
17	26	123	20	0.211	33.7	1.479E+06	6.997E+06	100.6 ± 21.8
18	5	26	18	0.192	7.9	3.161E+05	1.643E+06	91.6 ± 44.8
19	2	6	18	0.333	1.8	1.264E+05	3.793E+05	157.9 ± 129.0
20	9	70	20	0.129	19.2	5.120E+05	3.982E+06	61.4 ± 21.8
	289	1458			19.5	8.020E+05	4.046E+06	

Area of basic unit = 8.789E-07 cm-2

CHI SQUARED = 19.573 WITH 19 DEGREES OF FREEDOM

P(chi squared) = 42.1 %

CORRELATION COEFFICIENT = 0.911

VARIANCE OF SQR(Ns) = 2.06

VARIANCE OF SQR(Ni) = 9.54

Ns/Ni = 0.198 ± 0.013

MEAN RATIO = 0.204 ± 0.015

Ages calculated using a zeta of 352.7 ± 3.9 for SRM612 glass

RHO D = 2.720E+06cm-2; ND = 5975

POOLED AGE = 94.4 ± 6.3 Ma

MEAN AGE = 97.2 ± 7.2 Ma

88 POS 41A APATTTE PRINCE CREEK FM.

IRRADIATION LU029

SLIDE NUMBER 12

COUNTED BY: POS

No.	Ns	Ni	Na	RATIO	U (ppm)	RHOs	RHOi	F.T. AGE (Ma)
1	5	16	16	0.312	5.5	3.556E+05	1.138E+06	148.2 ± 76.0
2	3	16	20	0.188	4.4	1.707E+05	9.102E+05	89.3 ± 56.2
3	14	50	15	0.280	18.3	1.062E+06	3.793E+06	132.9 ± 40.3
4	18	102	15	0.176	37.3	1.365E+06	7.737E+06	84.1 ± 21.5
5	9	17	20	0.529	4.7	5.120E+05	9.671E+05	249.1 ± 102.8
6	38	127	20	0.299	34.8	2.162E+06	7.225E+06	141.9 ± 26.4
7	9	51	16	0.176	17.5	6.400E+05	3.627E+06	84.1 ± 30.4
8	5	28	20	0.179	7.7	2.844E+05	1.593E+06	85.1 ± 41.3
9	6	35	18	0.171	10.7	3.793E+05	2.212E+06	81.7 ± 36.1
10	24	79	30	0.304	14.4	9.102E+05	2.996E+06	144.1 ± 33.7
11	9	64	50	0.141	7.0	2.048E+05	1.456E+06	67.1 ± 23.9
	140	585			13.4	6.637E+05	2.773E+06	

Area of basic unit = 8.789E-07 cm²

CHI SQUARED = 12.493 WITH 10 DEGREES OF FREEDOM

P(chi squared) = 25.3 %

CORRELATION COEFFICIENT = 0.899

VARIANCE OF SQR(Ns) = 1.75

VARIANCE OF SQR(Ni) = 6.27

Ns/Ni = 0.239 ± 0.023

MEAN RATIO = 0.251 ± 0.034

Ages calculated using a zeta of 352.7 ± 3.9 for SRM612 glass

RHO D = 2.720E+06cm⁻²; ND = 5975

POOLED AGE = 113.8 ± 10.9 Ma

MEAN AGE = 119.1 ± 16.2 Ma

88 POS 44A APATITE PRINCE CREEK FM.

IRRADIATION LU029

SLIDE NUMBER 13

COUNTED BY: POS

No.	Ns	Ni	Na	RATIO U (ppm)	RHOs	RHOi	F.T. AGE (Ma)
1	4	13	16	0.308	4.5	2.844E+05	145.9 ± 83.5
2	30	164	20	0.183	44.9	1.707E+06	87.2 ± 17.4
3	15	51	15	0.294	18.6	1.138E+06	139.6 ± 41.1
4	9	51	15	0.176	18.6	6.827E+05	84.1 ± 30.4
5	12	40	18	0.300	12.2	7.585E+05	142.3 ± 46.9
6	2	6	15	0.333	2.2	1.517E+05	157.9 ± 129.0
7	18	102	16	0.176	34.9	1.280E+06	84.1 ± 21.5
8	15	61	20	0.246	16.7	8.533E+05	116.9 ± 33.7
9	6	35	18	0.171	10.7	3.793E+05	81.7 ± 36.1
10	24	80	30	0.300	14.6	9.102E+05	142.3 ± 33.2
11	45	251	50	0.179	27.5	1.024E+06	85.4 ± 13.9
12	80	265	40	0.302	36.3	2.276E+06	143.2 ± 18.4
13	7	8	12	0.875	3.7	6.637E+05	406.6 ± 210.6
14	10	31	20	0.323	8.5	5.689E+05	152.9 ± 55.7
15	5	28	15	0.179	10.2	3.793E+05	85.1 ± 41.3
16	20	47	50	0.426	5.2	4.551E+05	201.0 ± 53.8
17	16	52	20	0.308	14.2	9.102E+05	145.9 ± 41.8
18	9	65	20	0.138	17.8	5.120E+05	66.1 ± 23.5
19	20	65	30	0.308	11.9	7.585E+05	145.9 ± 37.4
20	3	8	12	0.375	3.7	2.844E+05	177.4 ± 120.1
	350	1423			17.3	8.810E+05	3.582E+06

Area of basic unit = 8.789E-07 cm-2

CHI SQUARED = 30.312 WITH 19 DEGREES OF FREEDOM

P(chi squared) = 4.8 %

CORRELATION COEFFICIENT = 0.928

VARIANCE OF SQR(Ns) = 3.19

VARIANCE OF SQR(Ni) = 14.84

Ns/Ni = 0.246 ± 0.015

MEAN RATIO = 0.295 ± 0.035

Ages calculated using a zeta of 352.7 ± 3.9 for SRM612 glass

RHO D = 2.720E+06cm-2; ND = 5975

POOLED AGE = 116.9 ± 7.3 Ma

MEAN AGE = 140.0 ± 16.9 Ma

IRRADIATION LU028
SLIDE NUMBER 1
COUNTED BY: POS

No.	Ns	Ni	Na	RATIO	U (ppm)	RHOs	RHOi	F.T. AGE (Ma)
1	37	343	56	0.108	33.1	7.518E+05	6.969E+06	52.3 ± 9.1
2	2	15	12	0.133	6.8	1.896E+05	1.422E+06	64.6 ± 48.6
3	9	45	30	0.200	8.1	3.413E+05	1.707E+06	96.6 ± 35.3
4	14	56	40	0.250	7.6	3.982E+05	1.593E+06	120.5 ± 36.1
5	16	52	15	0.308	18.7	1.214E+06	3.944E+06	148.0 ± 42.4
6	1	16	16	0.062	5.4	7.111E+04	1.138E+06	30.3 ± 31.3
7	0	9	30	0.000	1.6	0.000E+00	3.413E+05	0.0 ± 0.0
8	21	224	24	0.094	50.4	9.956E+05	1.062E+07	45.5 ± 10.4
9	3	17	24	0.176	3.8	1.422E+05	8.059E+05	85.3 ± 53.5
10	4	27	24	0.148	6.1	1.896E+05	1.280E+06	71.7 ± 38.4
11	24	146	30	0.164	26.3	9.102E+05	5.537E+06	79.5 ± 17.6
12	10	44	24	0.227	9.9	4.741E+05	2.086E+06	109.7 ± 38.5
13	29	199	20	0.146	53.7	1.650E+06	1.132E+07	70.5 ± 14.1
14	14	71	80	0.197	4.8	1.991E+05	1.010E+06	95.3 ± 27.9
15	8	26	14	0.308	10.0	6.502E+05	2.113E+06	148.0 ± 59.9
16	11	60	40	0.183	8.1	3.129E+05	1.707E+06	88.6 ± 29.1
17	33	273	40	0.121	36.9	9.387E+05	7.765E+06	58.6 ± 10.8
18	0	6	12	0.000	2.7	0.000E+00	5.689E+05	0.0 ± 0.0
19	27	167	50	0.162	18.0	6.144E+05	3.800E+06	78.2 ± 16.3
20	18	69	36	0.261	10.4	5.689E+05	2.181E+06	125.7 ± 33.3
	281	1865			16.3	5.182E+05	3.439E+06	

Area of basic unit = 8.789E-07 cm²

CHI SQUARED = 33.349 WITH 19 DEGREES OF FREEDOM

P(chi squared) = 2.2 %

CORRELATION COEFFICIENT = 0.931

VARIANCE OF SQR(Ns) = 3.30

VARIANCE OF SQR(Ni) = 22.66

Ns/Ni = 0.151 ± 0.010

MEAN RATIO = 0.162 ± 0.019

Ages calculated using a zeta of 352.7 ± 3.9 for SRM612 glass

RHO D = 2.760E+06cm⁻²; ND = 6058

POOLED AGE = 72.9 ± 4.8 Ma

MEAN AGE = 78.6 ± 9.4 Ma

88 POS 51A APATITE SCHRADER BLUFF FM.

IRRADIATION LU019

SLIDE NUMBER 2

COUNTED BY: POS

No.	Ns	Ni	Na	RATIO	U (ppm)	RHOs	RHOi	F.T. AGE (Ma)
1	7	19	50	0.368	2.3	1.593E+05	4.324E+05	155.8 ± 68.9
2	4	11	24	0.364	2.8	1.896E+05	5.215E+05	153.8 ± 89.8
3	4	26	56	0.154	2.9	8.127E+04	5.283E+05	65.5 ± 35.2
4	0	5	42	0.000	0.7	0.000E+00	1.354E+05	0.0 ± 0.0
5	0	3	100	0.000	0.2	0.000E+00	3.413E+04	0.0 ± 0.0
6	8	25	56	0.320	2.7	1.625E+05	5.079E+05	135.5 ± 55.1
7	24	146	64	0.164	14.0	4.267E+05	2.596E+06	70.0 ± 15.5
8	8	38	64	0.211	3.6	1.422E+05	6.756E+05	89.5 ± 34.8
9	0	2	49	0.000	0.2	0.000E+00	4.644E+04	0.0 ± 0.0
10	1	2	70	0.500	0.2	1.625E+04	3.251E+04	210.5 ± 257.9
11	7	43	42	0.163	6.3	1.896E+05	1.165E+06	69.3 ± 28.3
12	5	25	100	0.200	1.5	5.689E+04	2.844E+05	85.0 ± 41.7
13	0	13	60	0.000	1.3	0.000E+00	2.465E+05	0.0 ± 0.0
14	1	5	50	0.200	0.6	2.276E+04	1.138E+05	85.0 ± 93.2
15	6	37	60	0.162	3.8	1.138E+05	7.016E+05	69.0 ± 30.4
16	6	41	50	0.146	5.0	1.365E+05	9.330E+05	62.3 ± 27.3
17	5	15	30	0.333	3.1	1.896E+05	5.689E+05	141.1 ± 72.9
18	8	31	50	0.258	3.8	1.820E+05	7.054E+05	109.5 ± 43.5
19	6	34	70	0.176	3.0	9.752E+04	5.526E+05	75.1 ± 33.3
20	4	20	56	0.200	2.2	8.127E+04	4.064E+05	85.0 ± 46.6
104	541				2.9	1.035E+05	5.385E+05	

Area of basic unit = 8.789E-07 cm-2

CHI SQUARED = 13.374 WITH 19 DEGREES OF FREEDOM

P(chi squared) = 81.9 %

CORRELATION COEFFICIENT = 0.952

VARIANCE OF SQR(Ns) = 1.57

VARIANCE OF SQR(Ni) = 5.98

Ns/Ni = 0.192 ± 0.021

MEAN RATIO = 0.196 ± 0.030

Ages calculated using a zeta of 352.7 ± 3.9 for SRM612 glass

RHO D = 2.427E+06cm-2; ND = 5333

POOLED AGE = 81.8 ± 8.9 Ma

MEAN AGE = 83.3 ± 13.0 Ma

88 POS 52B APATITE HUE SHALE TUFF

IRRADIATION LU028

SLIDE NUMBER 2

COUNTED BY: POS

No.	Ns	Ni	Na	RATIO	U (ppm)	RHOs	RHOi	F.T. AGE (Ma)
1	9	51	20	0.176	13.8	5.120E+05	2.901E+06	85.3 ± 30.9
2	28	155	60	0.181	14.0	5.310E+05	2.939E+06	87.3 ± 18.0
3	26	149	48	0.174	16.8	6.163E+05	3.532E+06	84.4 ± 18.0
4	14	46	25	0.304	9.9	6.372E+05	2.094E+06	146.5 ± 44.8
5	21	152	40	0.138	20.5	5.973E+05	4.324E+06	66.9 ± 15.6
6	11	44	40	0.250	5.9	3.129E+05	1.252E+06	120.5 ± 40.7
7	23	138	60	0.167	12.4	4.362E+05	2.617E+06	80.6 ± 18.2
8	24	125	42	0.192	16.1	6.502E+05	3.386E+06	92.8 ± 20.7
9	40	181	45	0.221	21.7	1.011E+06	4.576E+06	106.7 ± 18.7
10	58	291	90	0.199	17.5	7.332E+05	3.679E+06	96.3 ± 13.9
11	32	161	42	0.199	20.7	8.669E+05	4.362E+06	96.0 ± 18.7
12	20	80	35	0.250	12.3	6.502E+05	2.601E+06	120.5 ± 30.2
13	8	25	24	0.320	5.6	3.793E+05	1.185E+06	153.9 ± 62.6
14	8	48	32	0.167	8.1	2.844E+05	1.707E+06	80.6 ± 30.8
15	22	112	40	0.196	15.1	6.258E+05	3.186E+06	94.9 ± 22.2
16	11	91	50	0.121	9.8	2.503E+05	2.071E+06	58.6 ± 18.7
17	4	45	25	0.089	9.7	1.820E+05	2.048E+06	43.1 ± 22.5
18	17	115	70	0.148	8.9	2.763E+05	1.869E+06	71.6 ± 18.6
19	24	131	60	0.183	11.8	4.551E+05	2.484E+06	88.6 ± 19.7
20	27	153	50	0.176	16.5	6.144E+05	3.482E+06	85.3 ± 17.9
	427	2293			13.8	5.410E+05	2.905E+06	

Area of basic unit = 8.789E-07 cm²

CHI SQUARED = 14.951 WITH 19 DEGREES OF FREEDOM

P(chi squared) = 72.6 %

CORRELATION COEFFICIENT = 0.953

VARIANCE OF SQR(Ns) = 1.78

VARIANCE OF SQR(Ni) = 9.11

Ns/Ni = 0.186 ± 0.010

MEAN RATIO = 0.193 ± 0.013

Ages calculated using a zeta of 352.7 ± 3.9 for SRM612 glass

RHO D = 2.760E+06cm⁻²; ND = 6058

POOLED AGE = 90.0 ± 5.0 Ma

MEAN AGE = 93.1 ± 6.2 Ma

88 POS 53B APATITE SCHRADER BLUFF FM.

IRRADIATION LU028

SLIDE NUMBER 3

COUNTED BY: POS

No.	Ns	Ni	Na	RATIO	U (ppm)	RHOs	RHOi	F.T. AGE (Ma)
1	2	17	28	0.118	3.3	8.127E+04	6.908E+05	57.0 ± 42.6
2	3	12	12	0.250	5.4	2.844E+05	1.138E+06	120.5 ± 77.8
3	3	9	15	0.333	3.2	2.276E+05	6.827E+05	160.2 ± 106.9
4	5	9	6	0.556	8.1	9.482E+05	1.707E+06	264.9 ± 147.8
5	39	139	21	0.281	35.7	2.113E+06	7.531E+06	135.1 ± 24.6
6	8	22	12	0.364	9.9	7.585E+05	2.086E+06	174.6 ± 72.1
7	2	8	18	0.250	2.4	1.264E+05	5.057E+05	120.5 ± 95.3
8	0	4	14	0.000	1.5	0.000E+00	3.251E+05	0.0 ± 0.0
9	3	16	20	0.188	4.3	1.707E+05	9.102E+05	90.6 ± 57.0
10	61	225	20	0.271	60.8	3.470E+06	1.280E+07	130.6 ± 19.0
11	5	26	15	0.192	9.4	3.793E+05	1.972E+06	92.9 ± 45.4
12	8	38	10	0.211	20.5	9.102E+05	4.324E+06	101.7 ± 39.6
13	4	11	12	0.364	5.0	3.793E+05	1.043E+06	174.6 ± 102.0
14	5	17	15	0.294	6.1	3.793E+05	1.289E+06	141.6 ± 72.1
15	1	8	15	0.125	2.9	7.585E+04	6.068E+05	60.6 ± 64.2
16	5	16	16	0.312	5.4	3.556E+05	1.138E+06	150.3 ± 77.1
17	5	29	40	0.172	3.9	1.422E+05	8.249E+05	83.4 ± 40.4
18	4	9	20	0.444	2.4	2.276E+05	5.120E+05	212.8 ± 127.9
19	13	64	25	0.203	13.8	5.916E+05	2.913E+06	98.1 ± 29.9
20	5	28	30	0.179	5.0	1.896E+05	1.062E+06	86.3 ± 41.9
181		707			10.5	5.658E+05	2.210E+06	

Area of basic unit = 8.789E-07 cm-2

CHI SQUARED = 10.084 WITH 19 DEGREES OF FREEDOM

P(chi squared) = 95.1 %

CORRELATION COEFFICIENT = 0.992

VARIANCE OF SQR(Ns) = 3.01

VARIANCE OF SQR(Ni) = 10.31

Ns/Ni = 0.256 ± 0.021

MEAN RATIO = 0.255 ± 0.028

Ages calculated using a zeta of 352.7 ± 3.9 for SRM612 glass

RHO D = 2.760E+06cm-2; ND = 6058

POOLED AGE = 123.4 ± 10.5 Ma

MEAN AGE = 123.1 ± 13.4 Ma

88 POS 53C APATITE SCHRADER BLUFF FM.

IRRADIATION LU019

SLIDE NUMBER 5

COUNTED BY: POS

No.	Ns	Ni	Na	RATIO U (ppm)		RHOs	RHOi	F.T. AGE (Ma)
1	8	35	24	0.229	9.0	3.793E+05	1.659E+06	97.1 ± 38.1
2	16	85	45	0.188	11.6	4.045E+05	2.149E+06	80.1 ± 21.9
3	8	42	12	0.190	21.5	7.585E+05	3.982E+06	81.0 ± 31.3
4	9	32	16	0.281	12.3	6.400E+05	2.276E+06	119.3 ± 45.0
5	3	17	20	0.176	5.2	1.707E+05	9.671E+05	75.1 ± 47.0
6	33	212	36	0.156	36.2	1.043E+06	6.700E+06	66.3 ± 12.5
7	24	94	24	0.255	24.1	1.138E+06	4.456E+06	108.4 ± 24.9
8	22	89	40	0.247	13.7	6.258E+05	2.532E+06	104.9 ± 25.1
9	24	117	28	0.205	25.7	9.752E+05	4.754E+06	87.2 ± 19.6
10	5	17	32	0.294	3.3	1.778E+05	6.044E+05	124.7 ± 63.5
11	30	139	15	0.216	56.9	2.276E+06	1.054E+07	91.7 ± 18.5
12	6	25	20	0.240	7.7	3.413E+05	1.422E+06	101.9 ± 46.4
13	7	30	20	0.233	9.2	3.982E+05	1.707E+06	99.1 ± 41.6
14	8	41	15	0.195	16.8	6.068E+05	3.110E+06	83.0 ± 32.1
15	15	90	40	0.167	13.8	4.267E+05	2.560E+06	70.9 ± 19.8
16	11	66	30	0.167	13.5	4.172E+05	2.503E+06	70.9 ± 23.1
17	6	28	20	0.214	8.6	3.413E+05	1.593E+06	91.1 ± 41.0
18	17	78	21	0.218	22.8	9.211E+05	4.226E+06	92.6 ± 24.8
19	23	104	36	0.221	17.7	7.269E+05	3.287E+06	94.0 ± 21.7
20	6	25	18	0.240	8.5	3.793E+05	1.580E+06	101.9 ± 46.4
281		1366			16.4	6.244E+05	3.036E+06	

Area of basic unit = 8.789E-07 cm²

CHI SQUARED = 6.738 WITH 19 DEGREES OF FREEDOM

P(chi squared) = 99.5 %

CORRELATION COEFFICIENT = 0.955

VARIANCE OF SQR(Ns) = 1.42

VARIANCE OF SQR(Ni) = 8.16

Ns/Ni = 0.206 ± 0.013

MEAN RATIO = 0.217 ± 0.008

Ages calculated using a zeta of 352.7 ± 3.9 for SRM612 glass

RHO D = 2.427E+06cm⁻²; ND = 5333

POOLED AGE = 87.4 ± 5.9 Ma

MEAN AGE = 92.1 ± 3.9 Ma

IRRADIATION LU019

SLIDE NUMBER 6

COUNTED BY: POS

No.	Ns	Ni	Na	RATIO	U (ppm)	RHOs	RHO _i	F.T. AGE (Ma)
1	9	49	60	0.184	5.0	1.707E+05	9.292E+05	78.1 ± 28.4
2	4	20	40	0.200	3.1	1.138E+05	5.689E+05	85.0 ± 46.6
3	2	10	64	0.200	1.0	3.556E+04	1.778E+05	85.0 ± 65.9
4	24	88	81	0.273	6.7	3.371E+05	1.236E+06	115.7 ± 26.7
5	12	60	36	0.200	10.2	3.793E+05	1.896E+06	85.0 ± 26.9
6	4	23	40	0.174	3.5	1.138E+05	6.542E+05	74.0 ± 40.1
7	14	43	100	0.326	2.6	1.593E+05	4.892E+05	137.9 ± 42.5
8	8	49	100	0.163	3.0	9.102E+04	5.575E+05	69.5 ± 26.5
9	11	51	60	0.216	5.2	2.086E+05	9.671E+05	91.7 ± 30.5
10	7	21	80	0.333	1.6	9.956E+04	2.987E+05	141.1 ± 61.6
11	36	216	40	0.167	33.2	1.024E+06	6.144E+06	70.9 ± 12.8
12	4	23	40	0.174	3.5	1.138E+05	6.542E+05	74.0 ± 40.1
13	12	61	36	0.197	10.4	3.793E+05	1.928E+06	83.7 ± 26.5
14	14	45	90	0.311	3.1	1.770E+05	5.689E+05	131.8 ± 40.4
15	11	49	60	0.224	5.0	2.086E+05	9.292E+05	95.4 ± 31.9
16	7	35	30	0.200	7.2	2.655E+05	1.327E+06	85.0 ± 35.2
17	3	15	50	0.200	1.8	6.827E+04	3.413E+05	85.0 ± 53.8
18	13	50	70	0.260	4.4	2.113E+05	8.127E+05	110.3 ± 34.4
19	18	74	60	0.243	7.6	3.413E+05	1.403E+06	103.3 ± 27.2
20	8	50	60	0.160	5.1	1.517E+05	9.482E+05	68.1 ± 26.0
	221	1032			5.3	2.101E+05	9.809E+05	

Area of basic unit = 8.789E-07 cm²

CHI SQUARED = 9.891 WITH 19 DEGREES OF FREEDOM

P(chi squared) = 95.6 %

CORRELATION COEFFICIENT = 0.938

VARIANCE OF SQR(Ns) = 1.22

VARIANCE OF SQR(Ni) = 6.08

Ns/Ni = 0.214 ± 0.016

MEAN RATIO = 0.220 ± 0.012

Ages calculated using a zeta of 352.7 ± 3.9 for SRM612 glass

RHO D = 2.427E+06cm⁻²; ND = 5333

POOLED AGE = 91.0 ± 6.9 Ma

MEAN AGE = 93.6 ± 5.4 Ma

IRRADIATION LU028

SLIDE NUMBER 4

COUNTED BY: POS

No.	Ns	Ni	Na	RATIO U (ppm)		RHOs	RHOi	F.T. AGE (Ma)
1	1	8	20	0.125	2.2	5.689E+04	4.551E+05	60.6 ± 64.2
2	7	30	12	0.233	13.5	6.637E+05	2.844E+06	112.6 ± 47.3
3	1	7	14	0.143	2.7	8.127E+04	5.689E+05	69.2 ± 73.9
4	0	3	24	0.000	0.7	0.000E+00	1.422E+05	0.0 ± 0.0
5	11	120	16	0.092	40.5	7.822E+05	8.533E+06	44.5 ± 14.0
6	0	10	16	0.000	3.4	0.000E+00	7.111E+05	0.0 ± 0.0
7	6	37	18	0.162	11.1	3.793E+05	2.339E+06	78.4 ± 34.6
8	11	68	20	0.162	18.4	6.258E+05	3.868E+06	78.3 ± 25.5
9	0	4	15	0.000	1.4	0.000E+00	3.034E+05	0.0 ± 0.0
10	18	113	18	0.159	33.9	1.138E+06	7.143E+06	77.1 ± 19.6
11	1	5	8	0.200	3.4	1.422E+05	7.111E+05	96.6 ± 105.9
12	2	14	18	0.143	4.2	1.264E+05	8.849E+05	69.2 ± 52.3
13	41	267	20	0.154	72.1	2.332E+06	1.519E+07	74.3 ± 12.5
14	17	162	9	0.105	97.2	2.149E+06	2.048E+07	50.9 ± 13.0
15	0	5	12	0.000	2.2	0.000E+00	4.741E+05	0.0 ± 0.0
16	4	16	12	0.250	7.2	3.793E+05	1.517E+06	120.5 ± 67.4
17	0	3	12	0.000	1.4	0.000E+00	2.844E+05	0.0 ± 0.0
18	3	13	9	0.231	7.8	3.793E+05	1.643E+06	111.4 ± 71.3
19	9	69	32	0.130	11.6	3.200E+05	2.453E+06	63.2 ± 22.4
20	10	55	15	0.182	19.8	7.585E+05	4.172E+06	87.9 ± 30.3
	142	1009			17.0	5.049E+05	3.588E+06	

Area of basic unit = 8.789E-07 cm²

CHI SQUARED = 11.428 WITH 19 DEGREES OF FREEDOM

P(chi squared) = 90.9 %

CORRELATION COEFFICIENT = 0.970

VARIANCE OF SQR(Ns) = 3.09

VARIANCE OF SQR(Ni) = 17.63

Ns/Ni = 0.141 ± 0.013

MEAN RATIO = 0.124 ± 0.019

Ages calculated using a zeta of 352.7 ± 3.9 for SRM612 glass

RHO D = 2.760E+06cm⁻²; ND = 6058

POOLED AGE = 68.1 ± 6.2 Ma

MEAN AGE = 59.8 ± 9.1 Ma

88 POS 57A APATITE TUKTU FM.

IRRADIATION LU019

SLIDE NUMBER 8

COUNTED BY: POS

No.	Ns	Ni	Na	RATIO	U (ppm)	RHOs	RHOi	F.T. AGE (Ma)
1	2	11	18	0.182	3.8	1.264E+05	6.953E+05	77.4 ± 59.5
2	1	10	24	0.100	2.6	4.741E+04	4.741E+05	42.7 ± 44.7
3	4	47	25	0.085	11.5	1.820E+05	2.139E+06	36.3 ± 18.9
4	19	121	30	0.157	24.8	7.206E+05	4.589E+06	66.9 ± 16.5
5	0	2	20	0.000	0.6	0.000E+00	1.138E+05	0.0 ± 0.0
6	2	12	30	0.167	2.5	7.585E+04	4.551E+05	70.9 ± 54.2
7	0	1	16	0.000	0.4	0.000E+00	7.111E+04	0.0 ± 0.0
8	2	12	25	0.167	2.9	9.102E+04	5.461E+05	70.9 ± 54.2
9	6	60	20	0.100	18.4	3.413E+05	3.413E+06	42.7 ± 18.3
10	1	7	12	0.143	3.6	9.482E+04	6.637E+05	60.9 ± 65.1
11	4	21	40	0.190	3.2	1.138E+05	5.973E+05	81.0 ± 44.2
12	25	168	50	0.149	20.6	5.689E+05	3.823E+06	63.4 ± 13.6
13	2	14	50	0.143	1.7	4.551E+04	3.186E+05	60.9 ± 46.0
14	2	13	48	0.154	1.7	4.741E+04	3.082E+05	65.5 ± 49.8
15	8	67	30	0.119	13.7	3.034E+05	2.541E+06	50.9 ± 19.1
16	25	189	90	0.132	12.9	3.161E+05	2.389E+06	56.4 ± 12.0
17	5	28	30	0.179	5.7	1.896E+05	1.062E+06	76.0 ± 36.9
18	8	62	25	0.129	15.2	3.641E+05	2.822E+06	55.0 ± 20.7
19	9	71	30	0.127	14.5	3.413E+05	2.693E+06	54.0 ± 19.1
20	11	81	50	0.136	9.9	2.503E+05	1.843E+06	57.9 ± 18.6
136		997			9.2	2.334E+05	1.711E+06	

Area of basic unit = 8.789E-07 cm²

CHI SQUARED = 3.564 WITH 19 DEGREES OF FREEDOM

P(chi squared) = 100.0 %

CORRELATION COEFFICIENT = 0.988

VARIANCE OF SQR(Ns) = 2.04

VARIANCE OF SQR(Ni) = 13.64

Ns/Ni = 0.136 ± 0.012

MEAN RATIO = 0.128 ± 0.012

Ages calculated using a zeta of 352.7 ± 3.9 for SRM612 glass

RHO D = 2.427E+06cm⁻²; ND = 5333

POOLED AGE = 58.1 ± 5.4 Ma

MEAN AGE = 54.5 ± 5.0 Ma

88 POS 58A APATITE TOROK FM.

IRRADIATION LU019

SLIDE NUMBER 9

COUNTED BY: POS

No.	Ns	Ni	Na	RATIO	U (ppm)	RHOs	RHOi	F.T. AGE (Ma)
1	3	20	20	0.150	6.1	1.707E+05	1.138E+06	63.9 ± 39.6
2	12	85	30	0.141	17.4	4.551E+05	3.224E+06	60.1 ± 18.6
3	1	7	25	0.143	1.7	4.551E+04	3.186E+05	60.9 ± 65.1
4	1	7	20	0.143	2.1	5.689E+04	3.982E+05	60.9 ± 65.1
5	4	34	20	0.118	10.4	2.276E+05	1.934E+06	50.2 ± 26.5
6	15	85	48	0.176	10.9	3.556E+05	2.015E+06	75.1 ± 21.1
7	2	14	50	0.143	1.7	4.551E+04	3.186E+05	60.9 ± 46.0
8	17	134	60	0.127	13.7	3.224E+05	2.541E+06	54.1 ± 14.0
9	20	140	80	0.143	10.7	2.844E+05	1.991E+06	60.9 ± 14.6
10	2	15	50	0.133	1.8	4.551E+04	3.413E+05	56.8 ± 42.8
11	3	25	16	0.120	9.6	2.133E+05	1.778E+06	51.2 ± 31.3
12	1	7	12	0.143	3.6	9.482E+04	6.637E+05	60.9 ± 65.1
13	13	102	30	0.127	20.9	4.930E+05	3.868E+06	54.3 ± 16.0
14	6	55	20	0.109	16.9	3.413E+05	3.129E+06	46.5 ± 20.0
15	7	44	20	0.159	13.5	3.982E+05	2.503E+06	67.7 ± 27.6
16	3	15	30	0.200	3.1	1.138E+05	5.689E+05	85.0 ± 53.8
17	14	131	60	0.107	13.4	2.655E+05	2.484E+06	45.6 ± 12.8
18	0	10	25	0.000	2.5	0.000E+00	4.551E+05	0.0 ± 0.0
19	1	7	30	0.143	1.4	3.793E+04	2.655E+05	60.9 ± 65.1
20	2	12	60	0.167	1.2	3.793E+04	2.276E+05	70.9 ± 54.2
	127	949			8.3	2.047E+05	1.529E+06	

Area of basic unit = 8.789E-07 cm²

CHI SQUARED = 4.185 WITH 19 DEGREES OF FREEDOM

P(chi squared) = 100.0 %

CORRELATION COEFFICIENT = 0.977

VARIANCE OF SQR(Ns) = 1.63

VARIANCE OF SQR(Ni) = 11.14

Ns/Ni = 0.134 ± 0.013

MEAN RATIO = 0.135 ± 0.009

Ages calculated using a zeta of 352.7 ± 3.9 for SRM612 glass

RHO D = 2.427E+06cm⁻²; ND = 5333

POOLED AGE = 57.0 ± 5.5 Ma

MEAN AGE = 57.3 ± 3.8 Ma

