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PRELIMINARY RESULTS OF FIVE APATITE FISSION-TRACK ANALYSES OF SAMPLES
FROM THE JAGO RIVER FORMATION EXPOSED IN THE
ARCTIC NATIONAL WILDLIFE REFUGE, NORTH SLOPE, ALASKA

By

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THIS REPORT HAS NOT BEEN REVIEWED FOR
TECHNICAL CONTENT (EXCEPT AS NOTED IN
TEXT) OR FOR CONFORMITY TO THE
EDITORIAL STANDARDS OF DGGs.

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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	10

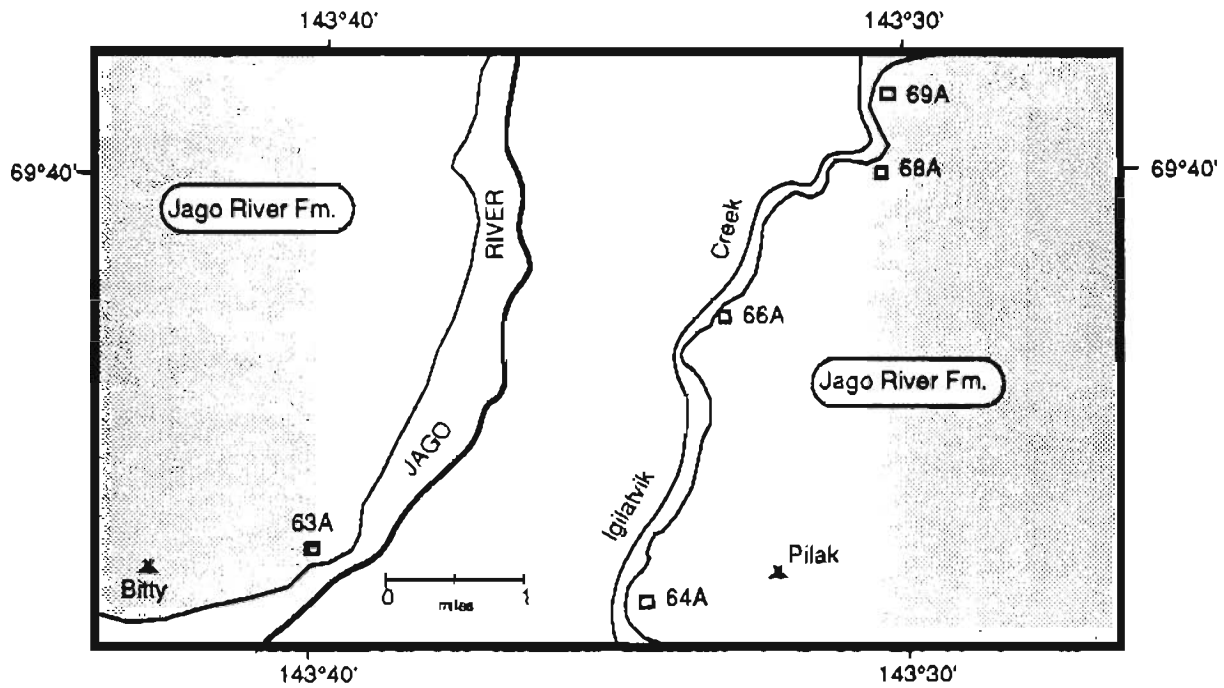


Figure 1: Map showing approximate locations of samples collected for this study.

INTRODUCTION

This is a preliminary report of apatite fission track analysis data of samples from the Jago River Formation (Late Cretaceous-Early Tertiary) exposed along the Jago River in the Arctic National Wildlife Refuge of Alaska. During 1988, nine samples were collected during a traverse along the Jago River. 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 the original 9 samples, only 5 yielded apatite and only 3 yielded adequate amounts for 20 individual grains to be dated. In every example it was determined that the grains represented a single population and so the pooled age is used for each sample. Due to low U-concentrations and very young (reset) apparent apatite fission track ages, no sample contained >40 confined tracks.

Sample No.	Formation	Lengths (#)	Mean Length (μm)	Age (Ma)
88 POS 63A	Jago River	5	14.91 ± 0.39	19.3 ± 4.8
88 POS 64A	Jago River	7	14.65 ± 0.46	24.6 ± 3.6
88 POS 66A	Jago River	40	14.72 ± 0.14	22.7 ± 3.0
88 POS 68A	Jago River	15	14.17 ± 0.53	24.8 ± 2.8
88 POS 69A	Jago River	5	14.02 ± 0.34	21.4 ± 2.4

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
63A	0	0	0	0	0	0	0	0	0	0	2	2	1	0
64A	0	0	0	0	0	0	0	0	1	0	4	0	2	0
66A	0	0	0	0	0	0	0	0	1	10	13	14	2	0
68A	0	0	0	0	0	0	0	0	1	4	6	4	0	0
69A	0	0	0	0	0	0	0	0	0	2	3	0	0	0

FISSION TRACK AGE DATA

88 POS 63A APATTTE SABBATH CREEK

IRRADIATION LU028
SLIDE NUMBER 5
COUNTED BY: POS

No.	Ns	Ni	Na	RATIO U (ppm)	RHOs	RHOi	F.T. AGE (Ma)	
1	2	29	35	0.069	4.5	6.502E+04	9.427E+05	33.5 ± 24.5
2	0	59	49	0.000	6.5	0.000E+00	1.370E+06	0.0 ± 0.0
3	2	46	36	0.043	6.9	6.321E+04	1.454E+06	21.1 ± 15.3
4	1	15	12	0.067	6.8	9.482E+04	1.422E+06	32.4 ± 33.4
5	0	17	12	0.000	7.6	0.000E+00	1.612E+06	0.0 ± 0.0
6	12	261	60	0.046	23.5	2.276E+05	4.949E+06	22.3 ± 6.6
	17	427			11.3	9.482E+04	2.382E+06	

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

CHI SQUARED = 4.113 WITH 5 DEGREES OF FREEDOM

P(chi squared) = 53.3 %

CORRELATION COEFFICIENT = 0.964

VARIANCE OF SQR(Ns) = 1.63

VARIANCE OF SQR(Ni) = 20.87

Ns/Ni = 0.040 ± 0.010

MEAN RATIO = 0.038 ± 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 = 19.3 ± 4.8 Ma

MEAN AGE = 18.2 ± 6.1 Ma

88 POS 64A APATITE SABBATH CREEK

IRRADIATION LU028
SLIDE NUMBER 7
COUNTED BY: POS

No.	Ns	Ni	Na	RATIO	U (ppm)	RHOs	RHOi	F.T. AGE (Ma)
1	0	10	20	0.000	2.7	0.000E+00	5.689E+05	0.0 ± 0.0
2	0	49	40	0.000	6.6	0.000E+00	1.394E+06	0.0 ± 0.0
3	2	51	30	0.039	9.2	7.585E+04	1.934E+06	19.1 ± 13.7
4	3	39	30	0.077	7.0	1.138E+05	1.479E+06	37.3 ± 22.4
5	2	79	21	0.025	20.3	1.084E+05	4.280E+06	12.3 ± 8.8
6	6	69	50	0.087	7.5	1.365E+05	1.570E+06	42.2 ± 18.0
7	5	57	45	0.088	6.8	1.264E+05	1.441E+06	42.6 ± 19.9
8	0	27	20	0.000	7.3	0.000E+00	1.536E+06	0.0 ± 0.0
9	12	207	70	0.058	16.0	1.950E+05	3.365E+06	28.2 ± 8.4
10	6	107	60	0.056	9.6	1.138E+05	2.029E+06	27.2 ± 11.4
11	0	26	30	0.000	4.7	0.000E+00	9.861E+05	0.0 ± 0.0
12	2	47	20	0.043	12.7	1.138E+05	2.674E+06	20.7 ± 14.9
13	1	37	20	0.027	10.0	5.689E+04	2.105E+06	13.1 ± 13.3
14	3	36	20	0.083	9.7	1.707E+05	2.048E+06	40.4 ± 24.3
15	2	29	20	0.069	7.8	1.138E+05	1.650E+06	33.5 ± 24.5
16	5	97	50	0.052	10.5	1.138E+05	2.207E+06	25.0 ± 11.5
	49	967			9.6	1.021E+05	2.015E+06	

Area of basic unit = 8.789E-07 cm²

CHI SQUARED = 11.942 WITH 15 DEGREES OF FREEDOM

P(chi squared) = 68.3 %

CORRELATION COEFFICIENT = 0.903

VARIANCE OF SQR(Ns) = 1.07

VARIANCE OF SQR(Ni) = 6.95

Ns/Ni = 0.051 ± 0.007

MEAN RATIO = 0.044 ± 0.008

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

RHO D = 2.760E+06cm⁻²; ND = 6058

POOLED AGE = 24.6 ± 3.6 Ma

MEAN AGE = 21.4 ± 4.0 Ma

88 POS 66A APATITE SABBATH CREEK

IRRADIATION LU028

SLIDE NUMBER 9

COUNTED BY: POS

No.	Ns	Ni	Na	RATIO U (ppm)	RHOs	RHOi	F.T. AGE (Ma)	
1	0	17	25	0.000	3.7	0.000E+00	7.737E+05	0.0 ± 0.0
2	1	33	21	0.030	8.5	5.418E+04	1.788E+06	14.7 ± 15.0
3	6	208	42	0.029	26.7	1.625E+05	5.635E+06	14.0 ± 5.8
4	3	25	40	0.120	3.4	8.533E+04	7.111E+05	58.1 ± 35.5
5	9	203	24	0.044	45.7	4.267E+05	9.624E+06	21.5 ± 7.3
6	6	117	24	0.051	26.3	2.844E+05	5.547E+06	24.9 ± 10.4
7	0	16	32	0.000	2.7	0.000E+00	5.689E+05	0.0 ± 0.0
8	0	5	28	0.000	1.0	0.000E+00	2.032E+05	0.0 ± 0.0
9	6	65	35	0.092	10.0	1.950E+05	2.113E+06	44.8 ± 19.1
10	4	63	50	0.063	6.8	9.102E+04	1.434E+06	30.8 ± 15.9
11	0	37	60	0.000	3.3	0.000E+00	7.016E+05	0.0 ± 0.0
12	12	182	36	0.066	27.3	3.793E+05	5.752E+06	32.0 ± 9.6
13	1	15	18	0.067	4.5	6.321E+04	9.482E+05	32.4 ± 33.4
14	2	19	36	0.105	2.8	6.321E+04	6.005E+05	51.0 ± 37.9
15	2	43	30	0.047	7.7	7.585E+04	1.631E+06	22.6 ± 16.4
16	0	20	36	0.000	3.0	0.000E+00	6.321E+05	0.0 ± 0.0
17	5	45	54	0.111	4.5	1.054E+05	9.482E+05	53.9 ± 25.4
18	0	27	30	0.000	4.9	0.000E+00	1.024E+06	0.0 ± 0.0
19	3	39	36	0.077	5.8	9.482E+04	1.233E+06	37.3 ± 22.4
20	0	72	20	0.000	19.4	0.000E+00	4.096E+06	0.0 ± 0.0
21	0	7	24	0.000	1.6	0.000E+00	3.319E+05	0.0 ± 0.0
22	0	25	36	0.000	3.8	0.000E+00	7.901E+05	0.0 ± 0.0
	60	1283			9.4	9.263E+04	1.981E+06	

Area of basic unit = 8.789E-07 cm²

CHI SQUARED = 24.778 WITH 21 DEGREES OF FREEDOM

P(chi squared) = 25.7 %

CORRELATION COEFFICIENT = 0.839

VARIANCE OF SQR(Ns) = 1.36

VARIANCE OF SQR(Ni) = 12.59

Ns/Ni = 0.047 ± 0.006

MEAN RATIO = 0.041 ± 0.009

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

RHO D = 2.760E+06cm⁻²; ND = 6058

POOLED AGE = 22.7 ± 3.0 Ma

MEAN AGE = 19.9 ± 4.3 Ma

88 POS 68A APATTTE SABBATH CREEK

IRRADIATION LU028
SLIDE NUMBER 11
COUNTED BY: POS

No.	Ns	Ni	Na	RATIO U (ppm)	RHOs	RHOi	F.T. AGE (Ma)	
1	2	52	30	0.038	9.4	7.585E+04	1.972E+06	18.7 ± 13.5
2	2	66	42	0.030	8.5	5.418E+04	1.788E+06	14.7 ± 10.6
3	2	81	40	0.025	10.9	5.689E+04	2.304E+06	12.0 ± 8.6
4	7	76	49	0.092	8.4	1.625E+05	1.765E+06	44.7 ± 17.7
5	5	53	36	0.094	8.0	1.580E+05	1.675E+06	45.8 ± 21.4
6	0	55	50	0.000	5.9	0.000E+00	1.252E+06	0.0 ± 0.0
7	0	9	21	0.000	2.3	0.000E+00	4.876E+05	0.0 ± 0.0
8	6	91	45	0.066	10.9	1.517E+05	2.301E+06	32.0 ± 13.5
9	0	11	25	0.000	2.4	0.000E+00	5.006E+05	0.0 ± 0.0
10	24	302	40	0.079	40.8	6.827E+05	8.590E+06	38.6 ± 8.2
11	1	89	50	0.011	9.6	2.276E+04	2.025E+06	5.5 ± 5.5
12	5	52	18	0.096	15.6	3.161E+05	3.287E+06	46.6 ± 21.8
13	1	62	40	0.016	8.4	2.844E+04	1.764E+06	7.8 ± 7.9
14	6	93	35	0.065	14.3	1.950E+05	3.023E+06	31.3 ± 13.2
15	3	164	48	0.018	18.5	7.111E+04	3.887E+06	8.9 ± 5.2
16	12	196	60	0.061	17.6	2.276E+05	3.717E+06	29.7 ± 8.9
17	0	39	25	0.000	8.4	0.000E+00	1.775E+06	0.0 ± 0.0
18	0	7	21	0.000	1.8	0.000E+00	3.793E+05	0.0 ± 0.0
19	1	15	24	0.067	3.4	4.741E+04	7.111E+05	32.4 ± 33.4
20	6	114	50	0.053	12.3	1.365E+05	2.594E+06	25.6 ± 10.7
	83	1627			11.7	1.261E+05	2.472E+06	

Area of basic unit = 8.789E-07 cm²

CHI SQUARED = 27.061 WITH 19 DEGREES OF FREEDOM

P(chi squared) = 10.3 %

CORRELATION COEFFICIENT = 0.885

VARIANCE OF SQR(Ns) = 1.71

VARIANCE OF SQR(Ni) = 13.64

Ns/Ni = 0.051 ± 0.006

MEAN RATIO = 0.041 ± 0.008

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

RHO D = 2.760E+06cm⁻²; ND = 6058

POOLED AGE = 24.8 ± 2.8 Ma

MEAN AGE = 19.7 ± 3.8 Ma

88 POS 69A APATITE SABBATH CREEK

IRRADIATION LU028
SLIDE NUMBER 12
COUNTED BY: POS

No.	Ns	Ni	Na	RATIO U (ppm)	RHOs	RHOi	F.T. AGE (Ma)	
1	3	36	30	0.083	6.5	1.138E+05	1.365E+06	40.4 ± 24.3
2	6	210	21	0.029	54.0	3.251E+05	1.138E+07	13.9 ± 5.8
3	2	57	35	0.035	8.8	6.502E+04	1.853E+06	17.1 ± 12.3
4	0	27	21	0.000	6.9	0.000E+00	1.463E+06	0.0 ± 0.0
5	0	15	48	0.000	1.7	0.000E+00	3.556E+05	0.0 ± 0.0
6	7	155	60	0.045	14.0	1.327E+05	2.939E+06	21.9 ± 8.5
7	15	367	90	0.041	22.0	1.896E+05	4.640E+06	19.9 ± 5.2
8	0	43	25	0.000	9.3	0.000E+00	1.957E+06	0.0 ± 0.0
9	7	129	30	0.054	23.2	2.655E+05	4.892E+06	26.4 ± 10.2
10	2	56	30	0.036	10.1	7.585E+04	2.124E+06	17.4 ± 12.5
11	4	92	40	0.043	12.4	1.138E+05	2.617E+06	21.1 ± 10.8
12	4	53	56	0.075	5.1	8.127E+04	1.077E+06	36.6 ± 19.0
13	0	17	26	0.000	3.5	0.000E+00	7.439E+05	0.0 ± 0.0
14	2	76	35	0.026	11.7	6.502E+04	2.471E+06	12.8 ± 9.2
15	6	69	40	0.087	9.3	1.707E+05	1.963E+06	42.2 ± 18.0
16	1	15	25	0.067	3.2	4.551E+04	6.827E+05	32.4 ± 33.4
17	0	41	40	0.000	5.5	0.000E+00	1.166E+06	0.0 ± 0.0
18	6	127	70	0.047	9.8	9.752E+04	2.064E+06	23.0 ± 9.6
19	0	7	30	0.000	1.3	0.000E+00	2.655E+05	0.0 ± 0.0
20	21	361	90	0.058	21.7	2.655E+05	4.564E+06	28.3 ± 6.4
	86	1953			12.5	1.162E+05	2.639E+06	

Area of basic unit = 8.789E-07 cm²

CHI SQUARED = 15.470 WITH 19 DEGREES OF FREEDOM

P(chi squared) = 69.2 %

CORRELATION COEFFICIENT = 0.944

VARIANCE OF SQR(Ns) = 1.82

VARIANCE OF SQR(Ni) = 21.90

Ns/Ni = 0.044 ± 0.005

MEAN RATIO = 0.036 ± 0.007

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

RHO D = 2.760E+06cm⁻²; ND = 6058

POOLED AGE = 21.4 ± 2.4 Ma

MEAN AGE = 17.7 ± 3.2 Ma

CONFINED TRACK LENGTH DISTRIBUTIONS

