

Appendix A

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Detecting Laramide *sensu lato* in southern Mexico

by means of apatite fission-track thermochronology

Detailed AFT (apatite fission-track) results obtained from the Sierra Madre del Sur

Sample EG-1 – single-grain AFT data (augen gneiss, Esperanza Granitoids)

Apatite	Ns	A, μm^2	ρ_s (/cm ²)	²³⁸ U, ppm	tot.uncert.	Age, Ma	1-SE	Cl, wt. %	tot.uncert.
1	38	6570	578387	19.42	0.99	57.3	9.8	0.800	0.070
2	25	6380	391850	14.86	0.73	50.7	10.5	0.700	0.060
3	37	7850	471338	15.59	0.78	58.1	10.0	1.100	0.100
4	26	4530	573951	12.53	0.63	87.8	17.8	0.490	0.070
5	115	5790	1986183	74.16	4.77	51.5	5.9	0.550	0.110
6	49	6660	735736	28.33	1.56	50.0	7.7	0.610	0.090
7	9	4640	193966	6.03	0.11	61.8	20.6	0.665	0.076
8	38	5620	676157	21.78	0.20	59.7	9.7	0.446	0.046

Note: Ns is the number of spontaneous fission tracks registered in the area A; ρ_s is the spontaneous track density (i.e. number of tracks expressed per 1 cm²); ²³⁸U is the uranium-238 content measured with LA–ICP–MS (spot diameter = ~60 μm). The total uncertainty for ²³⁸U includes the analytical errors from LA–ICP–MS measurements and an error generated by the CaO variation of $55 \pm 2\%$. The total uncertainty for Cl includes the analytical error derived from LA–ICP–MS measurement and an error generated by the variation of Cl in the Durango apatite standard of 0.43 ± 0.04 wt. %.

Sample EG-2 – single-grain AFT data (augen gneiss, Esperanza Granitoids)

Apatite	Ns	A, μm^2	ρ_s (/cm ²)	²³⁸ U, ppm	tot.uncert.	Age, Ma	1-SE	Cl, wt.%	tot.uncert.
1	144	5450	2642202	74.93	3.49	67.17	6.41	1.120	0.150
2	151	6650	2270677	55.80	2.60	77.45	7.26	1.190	0.160
3	176	5920	2972973	82.25	3.95	68.84	6.15	0.560	0.100
4	130	5640	2304965	57.07	2.67	76.87	7.64	1.190	0.180
5	197	7600	2592105	62.18	2.98	79.33	6.81	0.390	0.110
6	235	8140	2886978	79.56	4.01	69.11	5.70	0.480	0.090
7	154	5860	2627986	63.84	3.31	78.34	7.51	0.800	0.130
8	143	6460	2213622	71.84	3.41	58.73	5.65	0.870	0.140
9	144	4690	3070362	74.98	3.78	77.94	7.59	0.470	0.100
10	111	6880	1613372	48.23	2.36	63.74	6.81	0.550	0.100
11	158	6080	2598684	65.52	3.26	75.50	7.08	0.310	0.090
12	129	7230	1784232	54.60	3.98	62.27	7.12	0.420	0.100
13	112	4830	2318841	78.48	3.61	56.33	5.92	0.760	0.130
14	115	6460	1780186	51.46	2.41	65.90	6.88	1.040	0.140
15	147	4160	3533654	98.70	4.75	68.19	6.51	0.630	0.120
16	143	4150	3445783	101.57	5.01	64.63	6.28	0.370	0.110
17	83	6130	1353997	36.79	1.82	70.09	8.44	0.360	0.090
18	118	4420	2669683	68.80	3.33	73.88	7.68	0.250	0.080
19	86	5910	1455161	45.71	2.16	60.67	7.14	0.470	0.100
20	222	5670	3915344	99.83	4.87	74.66	6.19	0.730	0.120
21	150	4750	3157895	82.90	4.13	72.53	6.94	0.450	0.090
22	112	5090	2200393	68.46	3.12	61.25	6.43	0.880	0.150
23	105	4160	2524038	77.42	3.67	62.13	6.74	0.620	0.120
24	103	4100	2512195	66.60	3.07	71.83	7.81	0.520	0.110
25	160	4300	3720930	92.86	4.50	76.27	7.07	0.980	0.140
26	107	4210	2541568	82.54	3.84	58.69	6.30	0.590	0.130
27	123	4380	2808219	83.69	4.10	63.93	6.56	0.190	0.100
28	111	5260	2110266	54.74	2.59	73.40	7.78	0.210	0.090
29	149	4060	3669951	87.14	4.02	80.14	7.53	0.720	0.130
30	112	4330	2586605	61.48	2.93	80.06	8.47	0.710	0.120
31	97	4080	2377451	60.55	3.30	74.75	8.61	0.370	0.090
32	50	4000	1250000	33.55	1.60	70.95	10.59	0.240	0.100
33	79	5330	1482176	48.20	2.39	58.61	7.21	0.520	0.110
34	196	4780	4100418	110.56	5.14	70.63	6.02	1.180	0.170
35	92	4120	2233010	62.89	3.04	67.63	7.77	0.500	0.090
36	74	6290	1176471	33.46	1.59	66.98	8.41	0.140	0.070
37	77	4810	1600832	37.08	1.79	82.14	10.17	0.190	0.080

38	147	5250	2800000	76.44	4.26	69.76	6.94	0.270	0.090
39	102	4480	2276786	62.17	2.95	69.74	7.66	0.420	0.110
40	136	4450	3056180	105.36	4.90	55.30	5.39	1.200	0.180
41	146	4770	3060797	73.88	3.58	78.84	7.56	0.560	0.100
42	94	4510	2084257	51.75	2.40	76.66	8.67	0.500	0.110
43	100	4390	2277904	67.54	3.52	64.26	7.25	0.410	0.100
44	124	4640	2672414	83.43	3.97	61.04	6.20	0.600	0.110
45	80	4240	1886792	59.99	2.99	59.94	7.34	0.650	0.110

Sample EG-3 – single-grain AFT data (augen gneiss, Esperanza Granitoids)

Apatite	Ns	A, μm^2	ρ_s (/cm ²)	²³⁸ U, ppm	tot.uncert.	Age, Ma	1-SE	Cl, wt. %	tot.uncert.
1	67	4440	1509009	40.27	1.92	72.0	9.5	0.757	0.092
2	40	4960	806452	19.09	0.93	81.1	13.4	0.734	0.100
3	35	5170	676983	25.08	1.46	51.9	9.3	0.726	0.092
4	69	4600	1500000	38.98	1.85	73.9	9.6	0.979	0.122
5	45	4930	912779	24.39	1.31	71.9	11.4	0.970	0.126
6	34	5630	603908	19.69	1.15	59.0	10.7	0.631	0.063
7	62	5210	1190019	36.06	1.70	63.4	8.6	0.546	0.068
8	78	5250	1485714	34.53	1.59	82.6	10.1	0.759	0.097
9	25	5240	477099	15.33	0.72	59.8	12.3	0.871	0.103
10	70	4470	1565996	45.76	2.19	65.7	8.5	0.666	0.084
11	50	5310	941620	22.65	1.36	79.8	12.3	0.655	0.081
12	24	5790	414508	13.95	0.73	57.1	12.1	0.696	0.083
13	16	4650	344086	10.96	0.57	60.3	15.4	0.587	0.078
14	43	5570	771993	15.27	0.70	96.9	15.5	0.472	0.058
15	12	5980	200669	10.19	0.49	37.9	11.1	0.615	0.072
16	39	4450	876404	25.46	1.28	66.1	11.1	0.624	0.071
17	34	4760	714286	23.26	1.26	59.0	10.6	0.635	0.077

Sample EG-4 – single-grain AFT data (augen gneiss, Esperanza Granitoids)

Apatite	Ns	A, μm^2	ρ_s (/cm ²)	²³⁸ U, ppm	tot.uncert.	Age, Ma	1-SE	Cl, wt. %	tot.uncert.
1	47	4430	1060948	39.47	2.54	51.7	8.3	0.460	0.110
2	23	5490	418944	13.66	0.80	59.0	12.8	0.450	0.110
3	12	4060	295567	12.03	0.63	47.3	13.9	0.570	0.100
4	31	5520	561594	13.87	0.81	77.7	14.7	0.380	0.090

5	28	4670	599572	17.78	0.84	64.8	12.6	0.490	0.110
6	133	5360	2481343	68.32	3.49	69.8	7.1	0.620	0.120
7	46	5180	888031	36.56	2.10	46.7	7.4	0.600	0.130
8	20	5770	346620	14.60	0.79	45.7	10.5	0.540	0.110
9	116	6430	1804044	49.94	3.00	69.4	7.7	0.760	0.130
10	28	5580	501792	23.83	3.25	40.5	9.5	0.480	0.100
11	16	4610	347072	12.23	1.32	54.6	14.9	0.740	0.120
12	7	6210	112721	3.94	0.21	55.0	21.0	0.630	0.110
13	22	4120	533981	20.64	1.03	49.8	10.9	0.650	0.120
14	61	7400	824324	19.87	1.08	79.6	11.1	0.650	0.110
15	90	4680	1923077	71.45	3.35	51.8	6.0	0.560	0.068
16	108	4600	2347826	64.77	2.98	69.6	7.5	0.266	0.030
17	50	5960	838926	25.44	1.47	63.4	9.7	0.444	0.053
18	85	4040	2103960	77.15	3.67	52.4	6.2	0.357	0.042
19	45	6400	703125	21.56	1.03	62.7	9.8	0.271	0.031
20	162	4090	3960880	112.57	5.06	67.6	6.2	0.498	0.061
21	36	7410	485830	19.08	0.91	49.0	8.5	0.549	0.062
22	157	4590	3420479	107.90	6.02	60.9	6.0	0.365	0.045

Sample AM-X – single-grain AFT data (sandstone, Agua de Mezquite formation)

Apatite	Ns	A, μm^2	ρ_s ($/\text{cm}^2$)	^{238}U , ppm	tot.uncert.	Age, Ma	1-SE	Cl, wt. %	tot.uncert.
1	55	5090	1080550	36.18	2.20	57.4	8.5	1.229	0.101
2	85	9380	906183	26.06	1.58	66.8	8.3	2.115	0.165
3	41	6490	631741	17.93	1.80	67.7	13.0	0.462	0.041
4	72	5400	1333333	36.83	2.22	69.5	9.2	1.035	0.086
5	53	10170	521141	22.29	1.41	45.0	6.8	1.202	0.100
6	73	4930	1480730	57.76	3.52	49.3	6.5	0.458	0.042
7	26	10830	240074	7.47	0.46	61.8	13.0	0.135	0.018
8	87	11250	773333	25.98	1.56	57.2	7.0	0.613	0.052
9	47	6030	779436	33.78	2.16	44.4	7.1	0.502	0.047
10	183	5530	3309222	90.60	8.78	70.1	8.5	0.633	0.055
11	50	6700	746269	31.05	1.95	46.2	7.2	0.275	0.029
12	49	6500	753846	31.40	2.23	46.2	7.4	0.518	0.046
13	131	4950	2646465	70.50	6.68	72.1	9.3	0.551	0.048
14	50	5720	874126	34.96	2.19	48.1	7.4	0.440	0.044
15	163	4560	3574561	101.03	6.13	68.0	6.7	0.593	0.055
16	37	5230	707457	17.85	1.74	76.1	15.0	0.719	0.063
17	141	5180	2722008	100.12	6.02	52.3	5.4	0.400	0.040
18	61	9730	626927	16.11	1.00	74.7	11.0	0.456	0.041
19	116	7520	1542553	47.38	2.86	62.6	6.9	0.772	0.066

20	24	8200	292683	7.54	0.47	74.5	16.0	0.335	0.032
21	25	11090	225428	6.81	0.44	63.6	13.0	1.247	0.105
22	72	7000	1028571	35.04	2.13	56.4	7.5	0.557	0.049
23	76	6650	1142857	32.47	1.95	67.6	8.8	0.339	0.034
24	80	6410	1248050	50.20	3.00	47.8	6.1	0.355	0.033
25	34	19600	173469	5.40	0.34	61.7	11.0	0.669	0.061
26	35	11250	311111	12.68	0.78	47.2	8.5	0.808	0.072
27	60	4500	1333333	47.28	2.83	54.2	7.7	0.428	0.041
28	42	5570	754039	22.15	1.35	65.4	11.0	1.640	0.132
29	56	7460	750670	21.11	1.32	68.3	10.0	0.226	0.027
30	55	7710	713359	17.77	1.12	77.1	11.0	1.264	0.106
31	81	7300	1109589	34.54	2.23	61.7	7.9	0.395	0.038
32	25	9300	268817	11.14	0.79	46.4	9.9	0.423	0.039
33	80	6200	1290323	32.40	2.78	76.4	11.0	0.278	0.029
34	86	4390	1958998	65.37	4.12	57.6	7.2	0.547	0.050
35	83	6900	1202899	36.33	2.28	63.6	8.0	0.632	0.055
36	49	5840	839041	26.06	1.60	61.9	9.6	1.003	0.086
37	24	4280	560748	14.25	0.88	75.5	16.0	1.057	0.093
38	80	4520	1769912	57.58	3.49	59.1	7.5	0.691	0.060
39	117	6040	1937086	73.38	4.38	50.8	5.6	1.002	0.085
40	30	4330	692841	27.89	1.71	47.8	9.2	1.248	0.107

Sample MF-1 – single-grain AFT data (sandstone, Matzitzi Formation)

Apatite	Ns	A, μm^2	ρ_s ($/\text{cm}^2$)	^{238}U , ppm	tot.uncert.	Age, Ma	1-SE	Cl, wt.%	tot.uncert.
1	57	4330	1316397	48.30	3.66	52.4	8.0	1.228	0.103
2	31	4000	775000	23.86	1.50	62.4	12.0	1.074	0.093
3	118	4020	2935323	103.30	6.32	54.6	6.0	1.167	0.101
4	65	4340	1497696	47.04	3.20	61.2	8.7	0.879	0.078
5	26	4120	631068	20.07	1.23	60.4	12.0	1.283	0.106
6	29	4930	588235	13.83	0.85	81.6	16.0	1.195	0.102
7	40	6080	657895	18.54	1.13	68.2	12.0	0.790	0.074
8	36	4250	847059	31.33	2.24	52.0	9.4	0.994	0.087
9	97	4420	2194570	78.10	4.69	54.0	6.4	0.945	0.082
10	36	10100	356436	14.65	0.94	46.8	8.4	0.761	0.068
11	88	5170	1702128	53.08	3.31	61.6	7.6	0.684	0.064
12	66	5140	1284047	46.61	2.94	53.0	7.3	0.650	0.063
13	63	7220	872576	22.62	1.41	74.1	10.0	1.371	0.114
14	158	9570	1650993	51.43	3.12	61.7	6.2	1.125	0.094
15	66	6700	985075	29.89	1.84	63.3	8.7	0.419	0.045
16	56	6000	933333	30.98	1.90	57.9	8.5	1.766	0.143

17	70	4810	1455301	56.63	3.90	49.4	6.8	0.585	0.053
18	35	6670	524738	13.15	0.90	76.6	14.0	0.331	0.035
19	84	4850	1731959	64.55	4.11	51.6	6.5	0.620	0.059
20	37	6380	579937	16.81	1.08	66.3	12.0	0.921	0.079
21	72	5930	1214165	42.60	2.73	54.8	7.4	0.594	0.058
22	77	8000	962500	32.15	1.97	57.6	7.4	0.702	0.063
23	59	7720	764249	19.05	1.20	77.0	11.0	0.482	0.046
24	48	5660	848057	22.79	1.43	71.5	11.0	0.396	0.039
25	167	4360	3830275	125.00	7.98	58.9	5.9	0.697	0.061
26	63	4000	1575000	45.50	3.08	71.6	11.0	0.780	0.068
27	80	8000	1000000	41.09	2.65	50.4	7.3	0.635	0.056
28	66	8660	762125	27.25	1.77	57.9	9.0	0.578	0.052
29	41	8000	512500	14.62	0.91	72.5	13.0	1.364	0.111
30	33	9650	341969	12.45	0.77	56.9	11.0	0.923	0.079
31	76	4200	1809524	53.46	3.81	70.0	11.0	1.066	0.091
32	30	8000	375000	9.80	0.62	79.1	16.0	0.817	0.069
33	71	8000	887500	25.13	1.54	73.0	11.0	1.080	0.091
34	36	12000	300000	14.67	1.09	42.4	8.2	0.553	0.050
35	30	12000	250000	7.12	0.52	72.6	15.0	0.653	0.058
36	127	4450	2853933	103.36	6.18	57.2	7.2	1.143	0.097
37	40	8000	500000	14.22	0.88	72.7	13.0	2.361	0.191
38	110	8000	1375000	50.92	3.15	55.9	7.4	1.078	0.092
39	65	4000	1625000	75.96	4.62	44.3	6.8	0.737	0.066
40	68	4210	1615202	48.32	3.15	69.2	11.0	0.842	0.073
41	40	4020	995025	33.08	2.10	62.3	11.0	0.826	0.072
42	59	8000	737500	23.17	1.40	65.9	10.0	1.243	0.104
43	64	4050	1580247	71.83	4.28	45.6	7.0	1.135	0.096
44	31	9270	334412	10.40	0.74	66.5	14.0	0.741	0.064
45	46	8000	575000	17.96	1.10	66.3	11.0	1.364	0.110
46	109	4000	2725000	98.04	5.80	57.6	7.5	0.500	0.046
47	43	8300	518072	14.34	0.88	74.7	13.0	0.787	0.066
48	48	4000	1200000	48.58	2.98	51.2	8.7	0.727	0.064
49	60	4000	1500000	65.36	3.92	47.6	7.5	0.714	0.064
50	169	4000	4225000	142.20	8.61	61.5	7.3	0.682	0.059
51	105	8000	1312500	38.59	2.39	70.4	9.4	1.003	0.085
52	69	8000	862500	40.39	2.75	44.3	6.8	0.465	0.045
53	48	8000	600000	25.15	1.53	49.4	8.4	1.109	0.092
54	116	8000	1450000	42.77	2.73	70.1	9.2	0.708	0.062
55	42	9800	428571	13.84	0.89	64.1	12.0	0.940	0.083
56	49	4000	1225000	50.11	2.97	50.6	8.5	1.103	0.091
57	55	8820	623583	18.53	1.34	69.6	12.0	0.660	0.056
58	48	4000	1200000	39.50	2.46	62.9	11.0	0.834	0.072
59	74	4000	1850000	62.06	3.75	61.7	9.1	0.946	0.083
60	55	4000	1375000	43.53	3.25	65.4	11.0	0.638	0.056
61	68	4080	1666667	62.61	3.77	55.1	8.3	0.710	0.062

62	54	4000	1350000	55.88	3.36	50.1	8.2	0.503	0.047
63	67	5620	1192171	31.75	1.98	77.6	12.0	0.535	0.052
64	33	5300	622642	22.71	1.38	56.8	11.0	1.396	0.117
65	81	4340	1866359	61.21	3.87	63.1	9.1	1.261	0.106
66	45	4200	1071429	42.11	2.61	52.7	9.2	0.485	0.046
67	83	4360	1903670	74.24	4.50	53.1	7.6	0.774	0.070
68	45	4840	929752	25.75	1.91	74.7	13.0	0.437	0.043
69	40	11000	363636	14.86	0.91	50.7	9.2	0.328	0.033
70	65	4430	1467269	61.58	3.94	49.4	7.6	0.604	0.055
71	57	8000	712500	20.62	1.67	71.5	12.0	0.413	0.041
72	39	12000	325000	11.64	0.79	57.8	11.0	0.905	0.074
73	101	4600	2195652	81.13	4.85	56.0	7.5	0.658	0.062
74	53	8800	602273	19.25	1.18	64.8	11.0	1.080	0.093
75	42	4740	886076	36.77	2.33	49.9	9.0	0.576	0.051
76	45	5050	891089	32.26	1.93	57.2	10.0	0.777	0.068
77	46	8000	575000	26.91	1.78	44.3	7.8	0.686	0.060
78	47	8100	580247	22.75	1.39	52.8	9.1	0.478	0.045

Sample MF-2 – single-grain AFT data (sandstone, Matzitzi Formation)

Apatite	Ns	A, μm^2	ρ_s (/cm ²)	²³⁸ U, ppm	tot.uncert.	Age, Ma	1-SE	Cl, wt. %	tot.uncert.
1	32	5840	547945	16.21	1.12	64.9	12.0	0.243	0.027
2	94	5900	1593220	49.19	3.01	62.2	7.5	0.756	0.069
3	70	4410	1587302	50.73	3.67	60.1	8.4	0.995	0.084
4	75	4650	1612903	51.39	3.06	60.3	7.8	0.602	0.053
5	128	4420	2895928	97.21	5.93	57.3	6.2	0.566	0.050
6	93	5020	1852590	59.34	3.60	60.0	7.2	0.560	0.049
7	127	5820	2182131	70.21	4.33	59.7	6.5	0.433	0.040
8	51	5780	882353	25.62	1.71	66.2	10.0	0.866	0.075
9	155	4760	3256303	114.73	6.89	54.6	5.5	1.306	0.105
10	64	6440	993789	29.75	1.81	64.2	8.9	0.320	0.030
11	110	4400	2500000	63.18	3.83	76.0	8.6	0.578	0.050
12	45	4040	1113861	36.95	2.28	57.9	9.3	1.053	0.090
13	62	5490	1129326	25.67	1.61	84.4	12.0	0.755	0.066
14	26	6420	404984	10.38	0.65	74.9	15.0	1.286	0.105
15	41	5200	788462	24.96	1.51	60.7	10.0	0.654	0.058
16	80	4460	1793722	68.12	4.06	50.6	6.4	0.782	0.068
17	80	4860	1646091	69.53	4.13	45.6	5.8	0.625	0.054
18	161	4510	3569845	122.06	7.59	56.2	5.6	0.878	0.075
19	71	5200	1365385	32.87	2.22	79.7	11.0	0.851	0.072
20	33	4460	739910	27.21	1.69	52.3	9.7	0.771	0.066

21	43	6040	711921	24.34	1.52	56.2	9.3	0.347	0.035
22	100	4770	2096436	52.16	3.40	77.1	9.2	1.047	0.089
23	63	4350	1448276	56.05	3.75	49.7	7.1	0.701	0.062
24	98	5030	1948310	58.62	3.74	63.9	7.6	0.729	0.064
25	120	4400	2727273	85.84	5.25	61.1	6.7	0.547	0.050
26	42	6340	662461	26.08	1.59	48.9	8.1	0.826	0.068
27	68	6200	1096774	38.65	2.28	54.6	7.4	0.965	0.081
28	65	5580	1164875	39.65	2.35	56.5	7.8	1.666	0.137
29	94	6680	1407186	34.42	2.23	78.5	9.6	0.807	0.067
30	119	4440	2680180	78.47	4.66	65.6	7.2	0.547	0.048
31	53	8550	619883	19.14	1.25	62.2	9.5	1.024	0.087

Sample OC-X – single-grain AFT data (granulite gneiss, Grenvillian Oaxacan Complex)

Apatite	Ns	A, μm^2	ρ_s (/cm 2)	^{238}U , ppm	tot.uncert.	Age, Ma	1-SE	Cl, wt. %	tot.uncert.
1	20	5120	390625	13.75	0.64	51.90	12.29	0.647	0.062
2	45	5930	758853	21.21	1.01	65.30	11.00	0.403	0.040
3	30	5000	600000	17.70	0.83	61.88	12.28	0.571	0.056
4	34	9630	353063	13.31	0.62	48.48	9.13	0.251	0.024
5	16	8070	198265	5.20	0.24	69.56	18.21	0.582	0.056
6	29	5820	498282	12.66	0.58	71.80	14.44	0.462	0.046
7	61	5580	1093190	29.90	1.37	66.72	9.98	0.368	0.038
8	28	6700	417910	11.63	0.54	65.58	13.40	0.647	0.059
9	22	6770	324963	9.70	0.46	61.16	13.89	0.276	0.027
10	17	6640	256024	6.27	0.30	74.47	18.98	0.540	0.054
11	25	5700	438596	12.61	0.65	63.49	13.69	0.909	0.085
12	21	6730	312036	8.30	0.39	68.60	15.90	0.633	0.061
13	27	8560	315421	10.57	0.58	54.51	11.42	0.478	0.046
14	14	6850	204380	7.37	0.38	50.67	14.15	0.549	0.052
15	21	5730	366492	10.07	0.49	66.42	15.41	0.678	0.063
16	19	4700	404255	11.03	0.50	66.88	16.18	0.756	0.072
17	15	5940	252525	6.34	0.35	72.65	19.71	0.717	0.073
18	14	6790	206186	7.38	0.57	51.05	14.55	0.659	0.066
19	15	6460	232198	8.76	0.42	48.44	13.07	0.661	0.064
20	18	12840	140187	5.40	0.25	47.45	11.77	0.552	0.052
21	12	7190	166898	4.82	0.25	63.21	18.95	0.369	0.037
22	18	6080	296053	9.41	0.58	57.45	14.45	0.641	0.061
23	21	7670	273794	8.46	0.42	59.09	13.73	0.518	0.053
24	32	5380	594796	15.02	0.70	72.23	13.95	0.643	0.063
25	16	10640	150376	4.94	0.24	55.60	14.58	0.623	0.061
26	22	6510	337942	11.59	0.54	53.27	12.09	0.576	0.055

Sample CF-1 – single-grain AFT data (sandstone, Chivillas Formation)

Apatite	Ns	A, μm^2	ρ_s ($/\text{cm}^2$)	^{238}U , ppm	tot.uncert.	Age, Ma	1-SE	Cl, wt.%	tot.uncert.
1	80	9360	854701	36.52	2.25	43.09	6.47	0.809	0.081
2	75	9130	821468	23.03	2.37	65.56	11.39	0.240	0.034
3	23	8190	280830	10.57	0.77	48.90	11.47	0.174	0.029
4	21	9780	214724	6.64	0.43	59.47	14.33	0.281	0.038
5	17	7000	242857	6.96	0.45	64.14	16.88	0.302	0.042
6	38	6800	558824	33.61	2.32	30.64	5.92	0.232	0.033
7	17	6620	256798	9.76	0.80	48.43	12.97	0.293	0.040
8	18	10460	172084	7.64	0.48	41.48	10.63	0.147	0.023
9	34	8900	382022	16.63	1.13	42.30	8.49	0.274	0.034
10	18	16320	110294	6.07	0.44	33.48	8.67	0.136	0.025
11	41	10140	404339	18.38	1.12	40.51	7.51	0.694	0.066
12	14	11340	123457	3.98	0.26	57.05	16.33	0.207	0.029
13	24	6230	385233	14.88	1.17	47.65	11.08	0.308	0.041
14	11	8270	133011	7.53	0.48	32.55	10.36	0.306	0.040
15	14	13620	102790	4.88	0.32	38.80	11.11	0.292	0.037
16	14	8800	159091	5.09	0.33	57.49	16.45	0.282	0.039
17	8	7300	109589	4.89	0.32	41.27	15.19	0.323	0.042
18	11	6800	161765	6.85	0.66	43.48	14.18	0.365	0.044
19	17	5910	287648	13.66	0.85	38.79	10.18	0.187	0.031
20	19	6020	315615	16.67	1.00	34.88	8.72	0.336	0.040
21	15	5970	251256	8.10	0.60	57.05	15.97	0.364	0.048
22	17	9850	172589	5.11	0.33	62.10	16.34	0.200	0.030
23	13	12560	103503	3.52	0.25	54.09	16.07	0.284	0.041
24	45	5990	751252	42.28	2.79	32.74	5.93	0.683	0.070
25	24	6630	361991	22.46	1.58	29.71	6.83	0.417	0.046
26	8	8520	93897	3.17	0.22	54.49	20.10	0.405	0.051
27	12	8880	135135	6.03	0.42	41.27	12.68	0.342	0.050
28	13	12300	105691	3.74	0.25	52.00	15.39	0.285	0.038
29	14	5560	251799	7.86	0.56	58.91	16.95	0.502	0.063
30	10	12820	78003	5.47	0.65	26.29	9.12	0.317	0.043
31	17	4090	415648	15.85	1.06	48.27	12.73	0.548	0.064
32	36	4940	728745	30.93	1.89	43.38	8.43	0.904	0.089
33	10	5810	172117	11.30	0.76	28.08	9.34	0.718	0.077
34	47	6730	698366	28.16	1.71	45.65	8.06	0.964	0.093
35	28	5720	489510	27.17	1.69	33.20	7.11	0.882	0.085
36	6	7000	85714	4.54	0.31	34.79	14.66	0.373	0.049
37	10	9300	107527	5.16	0.32	38.38	12.74	0.264	0.035

38	27	10680	252809	11.13	0.86	41.83	9.28	0.251	0.041
39	14	4800	291667	11.17	0.76	48.06	13.79	0.288	0.042
40	14	6140	228013	13.95	1.25	30.13	8.82	0.389	0.049
41	7	4820	145228	6.18	0.41	43.27	16.95	0.564	0.062
42	32	4560	701754	19.95	1.34	64.66	13.25	0.523	0.061
43	6	15650	38339	2.48	0.22	28.50	12.12	0.272	0.039
44	8	8590	93132	3.98	0.26	43.09	15.86	0.194	0.029
45	28	5130	545809	40.20	2.47	25.03	5.35	0.597	0.065
46	10	5730	174520	7.36	0.48	43.66	14.51	0.646	0.068
47	33	5850	564103	27.37	1.68	37.96	7.62	1.210	0.112
48	6	11920	50336	2.03	0.15	45.65	19.28	0.590	0.065
49	15	6660	225225	10.24	0.64	40.51	11.23	0.430	0.056
50	5	5620	88968	5.03	0.35	32.59	14.97	0.712	0.074
51	6	6350	94488	4.23	0.35	41.14	17.44	0.592	0.072
52	10	6420	155763	4.69	0.31	61.07	20.31	0.346	0.047
53	15	5670	264550	18.74	1.19	26.03	7.22	0.452	0.057
54	5	15760	31726	1.41	0.10	41.43	19.05	0.451	0.054
55	12	12700	94488	3.58	0.28	48.58	15.03	0.644	0.075
56	5	6840	73099	3.90	0.27	34.53	15.86	0.539	0.066
57	75	4890	1533742	82.28	5.17	34.35	5.27	0.405	0.048
58	16	5560	287770	17.52	1.13	30.27	8.17	0.553	0.066
59	15	9520	157563	4.83	0.32	59.99	16.68	0.632	0.066
60	6	9360	64103	3.75	0.25	31.50	13.27	0.307	0.042
61	5	6490	77042	3.38	0.21	41.97	19.24	0.203	0.032
62	40	7730	517464	30.89	1.91	30.87	5.78	0.973	0.088
63	43	6570	654490	45.34	2.81	26.61	4.86	1.161	0.099
64	23	6710	342772	19.15	1.34	32.98	7.71	0.422	0.050
65	18	7980	225564	18.19	1.17	22.87	5.87	0.381	0.047
66	8	6710	119225	3.94	0.26	55.66	20.50	0.397	0.047
67	8	7920	101010	3.71	0.30	50.10	18.60	0.261	0.031
68	14	6430	217729	10.80	0.76	37.14	10.67	0.551	0.059
69	20	9810	203874	5.96	0.37	62.89	15.42	0.255	0.037
70	13	9450	137566	10.56	0.98	24.02	7.28	0.394	0.045
71	5	5560	89928	5.50	0.36	30.14	13.83	0.504	0.060
72	9	11880	75758	3.42	0.23	40.79	14.24	0.184	0.027
73	13	8260	157385	7.47	0.50	38.81	11.49	0.158	0.023
74	17	15180	111989	4.49	0.29	45.91	12.08	0.136	0.021
75	8	12420	64412	3.71	0.24	32.00	11.77	0.595	0.065
76	30	6290	476948	28.49	1.77	30.85	6.43	0.506	0.053
77	13	6230	208668	10.72	0.73	35.86	10.63	0.300	0.042
78	5	6180	80906	4.91	0.33	30.37	13.94	0.478	0.057
79	12	6100	196721	12.64	0.77	28.69	8.76	0.854	0.078
80	6	7700	77922	6.41	0.42	22.42	9.44	0.216	0.031
81	52	6790	765832	24.02	1.48	58.63	10.03	0.512	0.052
82	9	7000	128571	5.96	0.42	39.73	13.90	0.183	0.027

83	30	4950	606061	39.04	2.39	28.62	5.96	0.465	0.048
84	15	4700	319149	14.01	0.97	41.95	11.69	0.414	0.049

Sample CF-2 – single-grain AFT data (sandstone, Chivillas Formation)

Apatite	Ns	A, μm^2	ρ_s (/cm ²)	²³⁸ U, ppm	tot.uncert.	Age, Ma	1-SE	Cl, wt.%	tot.uncert.
1	82	9820	835031	38.20	2.31	40.05	5.75	0.746	0.074
2	10	12800	78125	3.40	0.23	42.10	13.92	0.665	0.066
3	44	5860	750853	24.71	1.50	55.61	9.82	0.769	0.075
4	10	11840	84459	3.76	0.26	41.16	13.62	0.677	0.068
5	23	4570	503282	23.88	1.75	38.62	8.94	0.569	0.058
6	6	10120	59289	2.87	0.19	37.86	15.88	0.621	0.059
7	28	8220	340633	12.47	0.78	50.01	10.54	0.771	0.080
8	36	6910	520984	16.56	1.03	57.57	10.99	0.763	0.073
9	7	14580	48011	2.99	0.20	29.45	11.48	0.693	0.073
10	120	7340	1634877	58.65	3.53	51.03	6.60	0.884	0.085
11	8	21800	36697	1.97	0.13	34.15	12.51	0.567	0.058
12	46	5600	821429	40.26	2.39	37.39	6.48	0.861	0.082
13	21	7480	280749	13.06	0.81	39.39	9.34	0.807	0.080
14	88	7570	1162483	66.87	4.03	31.87	4.48	0.731	0.071
15	18	18780	95847	6.12	0.39	28.72	7.29	0.548	0.060
16	8	6010	133111	4.04	0.27	60.28	22.09	0.658	0.066
17	15	6190	242326	16.46	1.08	27.00	7.43	0.600	0.064
18	39	10420	374280	23.91	1.55	28.71	5.34	0.633	0.069
19	9	6240	144231	7.10	0.45	37.23	12.89	0.656	0.068
20	16	6080	263158	14.44	0.90	33.41	8.91	0.803	0.080
21	28	7210	388350	24.88	1.55	28.63	6.03	0.613	0.063
22	54	8950	603352	25.52	1.53	43.31	7.10	0.768	0.075
23	17	6170	275527	13.23	0.82	38.17	9.91	0.572	0.065
24	17	7730	219922	8.35	0.74	48.23	12.89	0.654	0.068
25	56	11560	484429	22.23	1.39	39.93	6.51	0.700	0.071
26	16	7460	214477	8.45	0.52	46.48	12.39	0.827	0.088
27	27	7140	378151	17.11	1.06	40.50	8.65	0.593	0.057
28	48	9290	516685	26.92	1.66	35.18	6.03	0.626	0.063
29	19	6950	273381	13.01	0.81	38.51	9.53	0.759	0.078
30	60	7520	797872	39.27	2.41	37.24	5.91	0.841	0.081
31	16	7340	217984	6.85	0.49	58.23	15.67	0.716	0.071
32	12	7090	169252	9.79	0.62	31.70	9.62	0.535	0.056
33	45	7000	642857	27.14	1.66	43.39	7.61	0.542	0.062
34	85	7060	1203966	65.26	3.98	33.82	4.81	0.473	0.051
35	27	7470	361446	14.30	0.98	46.29	9.98	0.618	0.062

36	37	9570	386625	14.17	0.87	49.96	9.42	0.691	0.066
37	39	7470	522088	27.96	1.76	34.23	6.35	0.655	0.063
38	36	8770	410490	16.73	1.04	44.94	8.58	0.803	0.078
39	17	7490	226969	14.10	1.00	29.52	7.73	0.706	0.074
40	30	7830	383142	21.91	1.34	32.06	6.56	0.672	0.064
41	63	9560	658996	29.78	1.86	40.55	6.35	0.485	0.052
42	35	9420	371550	12.29	0.79	55.33	10.71	0.660	0.067
43	11	7560	145503	7.64	0.51	34.91	11.05	0.475	0.055
44	37	8800	420455	17.58	1.14	43.81	8.31	0.489	0.055
45	59	8630	683662	25.39	1.59	49.30	7.90	0.786	0.085
46	116	4850	2391753	108.63	6.64	40.34	5.28	0.447	0.051
47	39	11000	354545	11.91	0.74	54.49	10.09	0.568	0.062
48	8	12280	65147	2.24	0.16	53.24	19.55	0.504	0.053
49	58	7460	777480	31.45	1.96	45.28	7.29	0.625	0.065
50	25	9460	264271	11.59	0.73	41.77	9.22	0.565	0.056
51	209	4750	4400000	176.75	10.53	45.59	5.22	0.805	0.076
52	248	7480	3315508	144.99	8.92	41.89	4.70	0.795	0.079
53	53	8960	591518	19.35	1.20	55.94	9.28	0.775	0.076
54	80	7670	1043025	38.23	2.69	49.95	7.45	0.731	0.070
55	10	10000	100000	2.83	0.19	64.62	21.36	0.504	0.059
56	263	9520	2762605	131.26	8.07	38.57	4.29	0.570	0.058
57	105	11350	925110	41.57	2.52	40.77	5.47	0.467	0.049
58	104	8280	1256039	58.47	4.34	39.36	5.55	0.704	0.074
59	13	5630	230906	6.17	0.39	68.42	20.03	0.618	0.062
60	23	8670	265283	10.23	0.63	47.49	10.83	0.520	0.053
61	29	7280	398352	17.98	1.11	40.59	8.43	0.561	0.060
62	170	6960	2442529	113.18	6.96	39.54	4.75	0.527	0.055
63	25	5930	421585	17.30	1.06	44.64	9.83	0.740	0.069
64	12	24700	48583	1.95	0.14	45.63	13.94	0.536	0.055
65	22	11530	190807	5.78	0.49	60.39	14.47	0.826	0.077
66	10	11800	84746	3.50	0.23	44.35	14.65	0.460	0.050
67	120	4060	2955665	151.44	9.06	35.77	4.62	0.724	0.071
68	95	8510	1116334	58.63	3.60	34.90	4.82	0.752	0.078
69	53	14650	361775	20.38	1.24	32.55	5.38	0.746	0.075
70	42	6620	634441	29.61	1.98	39.26	7.14	0.522	0.060
71	54	8010	674157	32.22	1.97	38.34	6.31	0.711	0.071
72	49	11060	443038	23.96	1.45	33.90	5.76	0.617	0.063

Sample EG-2

track length measurements (only TINT-type confined tracks were tested, n = 153)

Number of track	Length, μm
1	15.55
2	12.24
3	12.50
4	13.20
5	11.87
6	14.06
7	13.33
8	12.48
9	12.74
10	13.71
11	13.72
12	14.70
13	11.57
14	13.45
15	13.80
16	12.85
17	14.33
18	13.83
19	12.52
20	12.16
21	12.00
22	12.74
23	13.56
24	13.54
25	13.04
26	12.07
27	13.40
28	10.56
29	15.42
30	9.90
31	13.86
32	14.03
33	12.37
34	15.14
35	12.87
36	12.28
37	14.90
38	13.20
39	12.11

40	14.90
41	10.59
42	13.35
43	13.94
44	11.21
45	13.58
46	13.20
47	14.59
48	14.87
49	9.88
50	13.10
51	13.41
52	13.98
53	13.26
54	13.25
55	14.15
56	10.02
57	12.61
58	13.26
59	12.63
60	11.34
61	13.28
62	10.34
63	11.59
64	14.48
65	11.90
66	12.44
67	14.93
68	10.61
69	9.28
70	13.77
71	12.33
72	15.21
73	12.77
74	10.63
75	13.81
76	12.70
77	11.30
78	14.28
79	10.32
80	13.68
81	13.04
82	12.55
83	12.44
84	13.45

85	12.10
86	13.65
87	13.76
88	14.38
89	12.07
90	10.23
91	9.16
92	13.83
93	13.50
94	14.50
95	11.45
96	9.69
97	14.82
98	13.99
99	10.12
100	12.85
101	14.55
102	10.84
103	11.53
104	13.70
105	12.80
106	15.30
107	14.25
108	12.41
109	12.37
110	11.73
111	9.08
112	13.93
113	15.20
114	13.01
115	12.02
116	13.80
117	15.63
118	12.00
119	10.58
120	13.29
121	10.24
122	14.71
123	12.75
124	14.03
125	12.66
126	11.56
127	12.35
128	14.32
129	14.42

130	13.57
131	11.64
132	11.36
133	10.65
134	12.62
135	11.48
136	14.07
137	13.53
138	12.29
139	13.14
140	10.57
141	11.71
142	14.08
143	14.00
144	13.39
145	11.76
146	13.04
147	11.42
148	14.61
149	13.80
150	11.50
151	13.44
152	9.32
153	13.33

Sample EG-4

track length measurements (only TINT-type confined tracks were tested, n = 55)

Number of track	Length, μm
1	12.60
2	14.75
3	12.94
4	13.73
5	11.82
6	14.49
7	11.00
8	12.80
9	13.81
10	10.86
11	13.34

12	10.59
13	13.13
14	13.56
15	13.23
16	12.50
17	11.82
18	11.93
19	15.51
20	14.41
21	11.40
22	12.04
23	13.48
24	14.40
25	11.68
26	13.69
27	13.63
28	12.88
29	13.59
30	13.44
31	14.20
32	13.08
33	14.44
34	16.71
35	14.81
36	14.50
37	14.73
38	13.52
39	10.84
40	12.44
41	11.85
42	15.60
43	11.94
44	12.00
45	11.67
46	13.75
47	11.62
48	11.43
49	13.04
50	12.76
51	10.62
52	13.79
53	13.26
54	13.47
55	13.89

Sample AM-X

track length measurements (only TINT-type confined tracks were tested, n = 69)

Number of track	Length, μm
1	10.13
2	13.09
3	15.68
4	13.97
5	13.61
6	11.92
7	14.79
8	12.37
9	12.75
10	12.61
11	10.67
12	11.25
13	11.08
14	11.05
15	12.72
16	13.07
17	13.36
18	10.07
19	11.51
20	12.90
21	13.66
22	15.22
23	13.69
24	13.82
25	13.23
26	15.35
27	12.07
28	13.44
29	14.09
30	12.75
31	10.72
32	15.64
33	12.10
34	12.94
35	13.74
36	14.21
37	11.09

38	13.87
39	13.09
40	12.68
41	13.89
42	15.09
43	11.73
44	13.37
45	12.55
46	14.02
47	13.91
48	12.07
49	16.16
50	13.93
51	11.66
52	14.01
53	14.82
54	13.29
55	12.66
56	12.07
57	13.30
58	13.39
59	13.36
60	13.85
61	12.66
62	15.20
63	14.45
64	11.88
65	12.35
66	13.08
67	15.33
68	15.12
69	12.33

Sample MF-2

track length measurements (only TINT-type confined tracks were tested, n = 64)

Number of track	Length, μm
1	14.70
2	12.89
3	15.15

4	13.36
5	12.87
6	13.11
7	14.30
8	13.62
9	14.25
10	11.37
11	12.32
12	13.79
13	14.05
14	13.88
15	13.55
16	13.38
17	10.33
18	13.07
19	14.79
20	12.02
21	12.22
22	13.07
23	12.87
24	10.11
25	14.29
26	14.13
27	14.63
28	11.91
29	14.31
30	13.51
31	14.08
32	12.50
33	14.51
34	13.97
35	12.39
36	11.60
37	12.94
38	11.76
39	12.15
40	14.37
41	12.91
42	11.76
43	13.76
44	14.15
45	13.73
46	13.59
47	12.95
48	13.73

49	13.45
50	13.46
51	12.86
52	13.26
53	14.10
54	11.21
55	12.77
56	14.93
57	12.90
58	14.25
59	12.73
60	11.70
61	12.97
62	12.52
63	11.33
64	13.10

Sample CF-1

track length measurements (only TINT-type confined tracks were tested, n = 44)

Number of track	Length, μm
1	15.26
2	13.57
3	14.55
4	14.68
5	12.77
6	14.01
7	10.62
8	11.74
9	15.28
10	13.79
11	13.30
12	11.65
13	9.56
14	12.63
15	13.48
16	13.35
17	13.83
18	13.52
19	12.38

20	15.95
21	12.88
22	14.64
23	13.20
24	11.21
25	14.17
26	15.40
27	11.88
28	14.50
29	12.93
30	14.68
31	11.94
32	11.60
33	13.00
34	13.29
35	11.21
36	14.11
37	13.20
38	12.74
39	13.62
40	14.75
41	13.91
42	14.30
43	13.18
44	13.04

Sample CF-2

track length measurements (only TINT-type confined tracks were tested, n = 65)

Number of track	Length, μm
1	15.48
2	13.47
3	14.50
4	14.28
5	11.23
6	13.40
7	13.02
8	12.83
9	11.39
10	13.75

11	11.76
12	13.21
13	10.23
14	12.35
15	14.49
16	14.51
17	13.56
18	12.46
19	13.18
20	13.03
21	12.73
22	9.03
23	15.21
24	12.94
25	13.60
26	11.77
27	13.59
28	13.57
29	13.88
30	14.29
31	13.23
32	12.37
33	14.08
34	13.28
35	13.17
36	14.25
37	11.64
38	10.93
39	12.94
40	13.22
41	13.81
42	12.46
43	14.11
44	12.77
45	12.89
46	15.20
47	13.27
48	13.26
49	14.04
50	14.23
51	12.08
52	13.14
53	12.42
54	14.03
55	12.26

56	10.81
57	12.81
58	13.73
59	13.10
60	11.97
61	12.34
62	9.88
63	14.56
64	14.40
65	15.01
