

**SUPPLEMENTARY FILE 2. DS AFT DATA**

Sample	Area	Mineral	Irradiation	No. grains	Std track density x10000cm-2	ps x10000 cm-2	pi x10000 cm-2	pχ <sup>2</sup>	Age (Ma)	±2σ
					(counted)	(counted)	(counted)			
Kawau 1A	Great South Basin	zircon	eth-38	15	17 (1907)	1900 (2510)	205 (271)	30	260	36
Pukaki 1	Great South Basin	zircon	eth-38	11	16.6 (1907)	1038 (498)	385 (185)	<1	70	20
Tara 1	Great South Basin	zircon	eth-38	14	16.8 (1907)	102 (1204)	38.2 (453)	11	75	11
R06180	Bounty Islands	zircon	eth-13	9	14.2 (1360)	849 (703)	220 (182)	61	92	17
R10721	Bounty Islands	zircon	eth-25	3	15.5 (2109)	1851 (553)	409 (122)	66	117	25
R06182	Bounty Islands	zircon	eth-22	11	12.9 (1090)	1457 (2232)	269 (412)	31	117	26
R10730	Bounty Islands	zircon	eth-22	8	13.7 (1090)	1455 (849)	298 (174)	89	112	21
R10731	Bounty Islands	zircon	eth-25	11	15.6 (2109)	1323 (1534)	345 (400)	99	100	13
R10721	Bounty Islands	apatite	eth-24	8	97.9 (3103)	220 (1028)	471 (2205)	23	81	7
R10730	Bounty Islands	apatite	eth-24	6	94.7 (3103)	142 (348)	307 (753)	48	78	11
Pukaki 1	Great South Basin	apatite	eth-28	10	135 (2510)	13.6 (82)	189 (1138)	2.1	16	4
Pukaki 1	Great South Basin	apatite	eth-28	8	136 (2510)	13.6 (77)	213 (1202)	6.7	15	4
Pakaha 1	Great South Basin	apatite	eth-35	20	123 (3493)	3.2 (40)	408 (5086)	51	1.7	0.6
P80687	Chathams	apatite	VUW011-21	20	11.78 (2350)	13.07 (400)	33.03 (1011)	2.23	79.8	13.6

All ages determined with external detector and a geometry factor of 2.

Samples irradiated at the ANSTO facility, Lucas Heights, Australia except P80687 at Oregon State University reactor facility

Ages calculated using the zeta approach (Hurford & Green 1983)

Zeta = 338±5 for zircon and dosimeter glass NBS612. For apatite and dosimeter glass CNS zeta = 355±5.

Errors calculated according to Green (1981) expressed at the 2σ level

ps and pi represent spontaneous and induced track densities

P(χ<sup>2</sup>) is the probability of obtaining χ<sup>2</sup> for v degrees of freedom where v=no of crystals -1

Central age calculated when p(χ<sup>2</sup>) <5%.

λD = 1.55125 x 10<sup>-10</sup>