Supplement – Tracking the $^{26}\text{Al}/^{10}\text{Be}$ source-area signal in sediment-routing systems of arid central Australia

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Figure A1. ^{10}Be depth profiles of a fan in the Upper Hugh catchment from A) upper fan deposits (samples UHugh199, UHugh299) and B) lower fan deposits (samples UHugh499, UHugh399, Be122p); all uncertainties are $\pm 2\sigma$. A1) Depth-variation in ^{10}Be abundance (diamonds), with model-generated exponential curves (grey) and the lowest chi-squared fit (black dashes). A2) Age versus chi-squared plot for ^{10}Be , with minimum chi-squared age (dashed line). A3), A4), and A5) Smoothed chi-squared (black) and Bayesian probability density (red) functions for depositional age, erosion rate, and ^{10}Be inheritance, respectively. All calculations follow Hidy et al. (2010, version 1.2), with full model parameters given in Table A2.

Table A1: Thermoluminescence deposition age results.

Sample ID	Latitude	Longitude	Elevation [m a.s.l.]	Plateau region	Analysis temperature	Palaeo-dose [Grays]	K content [% by AES]	Rb content [ppm]	Moisture content [weight %]	Specific activity [Bq/kg U+Th]	Cosmic contribution (assumed) [μ Gy/yr]	Annual radiation dose [μ Gy/yr]	TL age [k.y.]
<i>MACUMBA catchment</i>													
TL1-40	-27.1729	134.3548	225	300-500	375	110 $\pm$ 9	0.865 $\pm$ 0.05	100 $\pm$ 25	5.7 $\pm$ 3	68.8 $\pm$ 1.7	150 $\pm$ 25	2354 $\pm$ 60	46.6 $\pm$ 4.2
TL1-100	-27.1729	134.3548	225	300-500	375	263 $\pm$ 18	0.865 $\pm$ 0.05	100 $\pm$ 25	4.0 $\pm$ 3	58.3 $\pm$ 1.5	150 $\pm$ 25	2194 $\pm$ 61	120 $\pm$ 9
TL1-160	-27.1729	134.3548	225	300-500	375	>191 $\pm$ 16	0.730 $\pm$ 0.05	100 $\pm$ 25	6.2 $\pm$ 3	58.4 $\pm$ 1.5	140 $\pm$ 25	1997 $\pm$ 59	>95.5 $\pm$ 8.6
TL2-125	-27.1683	134.3703	223	300-500	375	64.7 $\pm$ 4.6	0.945 $\pm$ 0.05	100 $\pm$ 25	3.8 $\pm$ 3	84.9 $\pm$ 2.7	150 $\pm$ 25	2805 $\pm$ 68	23.1 $\pm$ 1.7

Specific activity was measured by means of calibrated thick source alpha counting over a 42 mm scintillation screen. Values shown assume secular equilibrium for both U and Th decay chains. Uncertainties are expressed at 1- σ level.

Table A2: Parameters used for Monte Carlo modelling of fan deposition ages (Fig. A1).

Site-specific information	Upper fan deposit	Lower fan deposit
Latitude [°S]	-23.8110	-23.8097
Longitude [°E]	133.1850	133.1921
Elevation [m a.s.l.]	789	765
Shielding		
Topographic shielding	1	1
Cover	1	1
¹⁰Be and ²⁶Al production rate		
Spallation production rate [atoms g ⁻¹ yr ⁻¹]	5.37	5.27
Muonic production		
Depth of muon fit [m]	5	5
Slow muon surface production [%]	0.135	0.134
Fast muon surface production [%]	0.101	0.100
Bulk material density		
Minimum density [g cm ⁻³]	1.5	1.5
Maximum density [g cm ⁻³]	1.9	1.9
Monte Carlo parameters^(a)		
Chi ² value	2 ^(b)	16 ^(b)
Number of profiles	100000	100000
Min age [yr]	750000	500000
Max age [yr]	2250000	900000
Min erosion rate [cm/k.y.]	0	0
Max erosion rate [cm/k.y.]	1	1
Min total erosion threshold [cm]	0	0
Max total erosion threshold [cm]	50	50
Min inheritance [atoms/g]	0	0
Max inheritance [atoms/g]	1300000	450000
Neutrons (mean value)	160	160
Neutrons (standard deviation)	5	5

a) For detailed explanation of parameters see Hidy et al. (2010).

b) No solutions were found for lower chi² values.

Table A3: Cosmogenic nuclided data from bedrock and hillslopes within the study area published in Struck et al. (2018).

Sample ID	AMS ID	Latitude ^(a)	Longitude ^(a)	Elevation ^(a,b)	Depth below surface	Topographic shielding	Sample mass	¹⁰ Be/ ⁹ Be ^(c,d,e)	⁹ Be carrier mass ^(f)	¹⁰ Be conc. ^(e)	²⁶ Al/ ²⁷ Al ^(c,g,h,i)	ICP conc.	²⁶ Al conc. ^(e)	²⁶ Al/ ¹⁰ Be ratio ^(e)
	(Be / Al)	[°S]	[°E]	[m a.s.l.]	[cm]		[g qtz]	[10 ⁻¹⁵]	[mg]	[10 ³ at. g ⁻¹]	[10 ⁻¹⁵]	[ppm]	[10 ³ at. g ⁻¹]	
Mt MARGARET (Neales catchment)														
NIL-TS0	B6059/A2785	-28.477696	136.018166	407	0	1.0000	40.214	2353 ± 18 ^(2,C)	0.302 ^(G)	1333 ± 31	1661 ± 85 ^(H)	179	6622 ± 472	4.97 ± 0.37
NIL-TS4	B6060/A431	-28.478241	136.016897	405	0	1.0000	41.610	1863 ± 18 ^(2,C)	0.302 ^(G)	1019 ± 25	1075 ± 38 ^(H)	192	4598 ± 247	4.51 ± 0.27
NIL-TS6	B5945/A2678	-28.478486	136.016399	403	0	1.0000	40.337	2355 ± 35 ^(1,A)	0.317 ^(F)	1348 ± 36	2553 ± 193 ^(I)	126	7190 ± 651	5.33 ± 0.50
NIL-TS8	B6061/A432	-28.478696	136.015943	397	0	1.0000	40.464	1851 ± 24 ^(2,C)	0.303 ^(G)	1044 ± 27	1033 ± 36 ^(H)	192	4432 ± 237	4.25 ± 0.25
NIL-BR1	B5944/A2677	-28.478932	136.015858	391	0	0.9992	40.136	2511 ± 29 ^(1,A)	0.317 ^(F)	1443 ± 36	4125 ± 131 ^(I)	92	8435 ± 499	5.85 ± 0.38
NIL-TS10	B5946/A465	-28.478856	136.015606	387	0	1.0000	40.096	1115 ± 26 ^(1,A)	0.317 ^(F)	643 ± 21	1716 ± 46 ^(J)	97	3702 ± 181	5.76 ± 0.34
NIL-BR2	B6058/-	-28.478985	136.015451	380	0	0.9779	41.973	770 ± 14 ^(2,C)	0.300 ^(G)	415 ± 12	-	-	-	-
NIL-TOP-0	B5942/A2675	-28.479819	136.017803	406	0	1.0000	40.292	4888 ± 37 ^(1,A)	0.308 ^(F)	2722 ± 64	3675 ± 208 ^(I)	132	10796 ± 816	3.97 ± 0.31
NIL-TOP-70	B5943/A2676	-28.479819	136.017803	406	70	1.0000	40.044	2137 ± 26 ^(1,A)	0.317 ^(F)	1230 ± 31	1515 ± 121 ^(I)	152	5146 ± 486	4.18 ± 0.41
COONGRA (Macumba catchment)														
TD-BR	B5949/A2682	-27.179882	134.394553	275	0	1.0000	40.146	9231 ± 75 ^(1,A)	0.310 ^(F)	5189 ± 123	13050 ± 773 ^(I)	64	18667 ± 1447	3.60 ± 0.29
TD-TS1	B5950/A2683	-27.180339	134.391464	270	0	1.0000	40.127	9578 ± 118 ^(1,A)	0.311 ^(F)	5399 ± 138	12341 ± 280 ^(I)	60	16420 ± 902	3.04 ± 0.18
TD-TS4	B6230/A2737	-27.174990	134.386994	237	0	1.0000	11.065	2379 ± 27 ^(1,B)	0.297 ^(F)	4817 ± 121	12324 ± 631 ^(H)	68	18642 ± 1334	3.87 ± 0.29
TD-TS9	B6030/A2738	-27.166352	134.378727	201	0	1.0000	40.122	9602 ± 52 ^(1,B)	0.296 ^(F)	5331 ± 123	13120 ± 183 ^(H)	65	19175 ± 995	3.60 ± 0.20
PIONEER (Finke catchment)														
PfO-BR	B6062/A2788	-23.712295	132.787099	715	0	0.9995	42.327	1163 ± 13 ^(2,C)	0.301 ^(G)	623 ± 16	658 ± 32 ^(H)	232	3406 ± 239	5.47 ± 0.41
PfO-TS5	B6183/A436	-23.711949	132.786910	707	0	1.0000	40.293	1425 ± 14 ^(1,D)	0.301 ^(F)	802 ± 19	1641 ± 47 ^(H)	136	4974 ± 247	6.21 ± 0.34
PfO-TS7	B6063/A2789	-23.711771	132.786813	705	0	1.0000	40.795	1372 ± 13 ^(2,C)	0.302 ^(G)	766 ± 19	1141 ± 59 ^(H)	197	5031 ± 361	6.56 ± 0.50
PfO-TS9	B6180/A433	-23.711548	132.786719	704	0	1.0000	40.525	2409 ± 72 ^(1,D)	0.299 ^(F)	1338 ± 50	2451 ± 73 ^(H)	148	8111 ± 410	6.06 ± 0.38
PfO-TS11/DP0	B6064/A2790	-23.711174	132.786723	703	0	0.9996	41.336	2714 ± 20 ^(2,C)	0.303 ^(G)	1497 ± 35	2498 ± 109 ^(H)	154	8585 ± 569	5.73 ± 0.40
PfO-TS13	B6181/A434	-23.710823	132.786700	702	0	1.0000	40.621	3298 ± 59 ^(1,D)	0.298 ^(F)	1821 ± 52	3119 ± 72 ^(H)	149	10379 ± 486	5.70 ± 0.30
PfO-TS17	B6065/A2791	-23.710096	132.786775	700	0	1.0000	40.534	3411 ± 24 ^(2,C)	0.303 ^(G)	1922 ± 45	3854 ± 94 ^(H)	126	10798 ± 601	5.62 ± 0.34
PfO-TS18	B6184/A441	-23.709762	132.786800	699	0	1.0000	40.517	3950 ± 52 ^(1,D)	0.301 ^(F)	2213 ± 58	4370 ± 100 ^(H)	130	12664 ± 592	5.72 ± 0.31
PfO-DP30	B6182/A435	-23.711174	132.786723	703	30	0.9996	40.413	2018 ± 19 ^(1,D)	0.299 ^(F)	1126 ± 27	2164 ± 65 ^(H)	131	6251 ± 322	5.64 ± 0.32
PfO-DP60	B6186/A442	-23.711174	132.786723	703	60	0.9996	40.169	1646 ± 13 ^(1,D)	0.301 ^(F)	930 ± 22	2038 ± 61 ^(H)	104	4714 ± 239	5.07 ± 0.28
PfO-DP100	B6066/A2792	-23.711174	132.786723	703	100	0.9996	40.401	1577 ± 15 ^(2,C)	0.303 ^(G)	892 ± 22	1690 ± 80 ^(H)	131	4945 ± 340	5.54 ± 0.40
PfO-DP150	B6187/A443	-23.711174	132.786723	703	150	0.9996	40.497	1239 ± 12 ^(1,D)	0.301 ^(F)	694 ± 17	1101 ± 36 ^(H)	130	3203 ± 167	4.61 ± 0.27
PfO-DP200	B6188/A444	-23.711174	132.786723	703	200	0.9996	40.343	961 ± 28 ^(1,D)	0.301 ^(F)	541 ± 20	872 ± 27 ^(H)	148	2885 ± 147	5.33 ± 0.34
PfO-DP250	B6189/A445	-23.711174	132.786723	703	250	0.9996	40.185	913 ± 13 ^(1,D)	0.301 ^(F)	515 ± 14	731 ± 25 ^(H)	146	2385 ± 128	4.63 ± 0.28
PfO-DP285	B6190/A2827	-23.711174	132.786723	703	285	0.9996	40.326	924 ± 14 ^(1,D)	0.302 ^(F)	521 ± 14	715 ± 37 ^(H)	156	2489 ± 180	4.78 ± 0.37

a) Coordinates determined using hand held GPS and referenced to WGS84 Datum.

b) Ridge top elevation determined using hand held GPS and elevation of subsequent points downslope determined using laser rangefinder.

c) ¹⁰Be/⁹Be ratios were normalised to standards: 1) SRM KN-5-2 (nominal ratio 8,558 x 10⁻¹⁵), and 2) KN-5-3 (nominal ratio 6,320 x 10⁻¹⁵) (Nishizumi et al., 2007).

d) Corrected for batch procedural blanks: A) 7.83 ± 2.10 x 10⁻¹⁵, B) 5.77 ± 0.56 x 10⁻¹⁵, C) 4.15 ± 1.06 x 10⁻¹⁵, D) 3.59 ± 0.85 x 10⁻¹⁵, E) 1.69 ± 0.92 x 10⁻¹⁵.

e) Uncertainties expressed at 1-σ level.

f) Concentrations of ⁹Be solutions are: F) 1090 ± 15 ppm, and G) 1128 ± 22 ppm.

g) ²⁶Al/²⁷Al ratios marked with * were blank-corrected using the respective blank's ²⁶Al count rate.

h) ²⁶Al/²⁷Al ratios were normalised to SRM KN-4-2 with a nominal ratio of 30,960 x 10⁻¹⁵ (Nishizumi, 2004).

i) Corrected for batch procedural blanks of: H) 22.06 ± 5.35 x 10⁻¹⁵, I) 10.36 ± 3.76 x 10⁻¹⁵, J) 13.57 ± 2.36 x 10⁻¹⁵.

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