Multiple felsic events within post-10 Ma volcanism, Southeast Australia: Inputs in appraising proposed magmatic models

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Supplementary Table 1 Zircon U–Pb age analyses, central-west Victorian megacrysts.

Locality	$^{206}\text{Pb}/^{238}\text{U}$	$^{206}\text{Pb}/^{238}\text{U}$	$^{208}\text{Pb}/^{232}\text{Th}$	$^{207}\text{Pb}/^{206}\text{Pb}$	$^{238}\text{U}/^{206}\text{Pb}$	$^{207}\text{Pb}/^{206}\text{Pb}$
Sample	Age (Ma)*	Ratio $\pm$ 1 RSE	Ratio $\pm$ 1 RSE	Ratio $\pm$ 1 RSE	Ratio $\pm$ 1 STD	Ratio $\pm$ 1 STD
Sheltons Rd						
W7.1	6.1 $\pm$ 0.2	0.0010 $\pm$ 3.1%	0.0003 $\pm$ 8.5%	0.0569 $\pm$ 10.2%	1040.82 $\pm$ 32.68	0.0569 $\pm$ 0.0058
W7.2	6.1 $\pm$ 0.3	0.0010 $\pm$ 4.4%	0.0003 $\pm$ 14.0%	0.0487 $\pm$ 16.1%	1047.71 $\pm$ 46.54	0.0487 $\pm$ 0.0078
W7.3	6.2 $\pm$ 0.2	0.0010 $\pm$ 3.9%	0.0003 $\pm$ 12.1%	0.0459 $\pm$ 12.4%	1047.71 $\pm$ 40.78	0.0459 $\pm$ 0.0057
W7.4	6.2 $\pm$ 0.2	0.0010 $\pm$ 3.8%	0.0003 $\pm$ 13.9%	0.0507 $\pm$ 15.6%	1029.84 $\pm$ 39.63	0.0507 $\pm$ 0.0079
W7.5	6.2 $\pm$ 0.3	0.0010 $\pm$ 3.8%	0.0004 $\pm$ 14.6%	0.0703 $\pm$ 14.2%	998.85 $\pm$ 38.40	0.0730 $\pm$ 0.0104
W7.6	6.3 $\pm$ 0.2	0.0010 $\pm$ 3.7%	0.0003 $\pm$ 11.1%	0.0516 $\pm$ 12.4%	1023.52 $\pm$ 37.84	0.0516 $\pm$ 0.0064
W7.7	6.3 $\pm$ 0.2	0.0010 $\pm$ 3.7%	0.0003 $\pm$ 11.9%	0.0474 $\pm$ 16.2%	1020.62 $\pm$ 37.35	0.0474 $\pm$ 0.0077
W7.8	6.3 $\pm$ 0.2	0.0010 $\pm$ 2.8%	0.0003 $\pm$ 9.1%	0.0492 $\pm$ 10.3%	1017.62 $\pm$ 27.99	0.0492 $\pm$ 0.0050
W7.9	6.3 $\pm$ 0.3	0.0010 $\pm$ 4.4%	0.0003 $\pm$ 16.8%	0.0430 $\pm$ 18.0%	1022.53 $\pm$ 45.27	0.0430 $\pm$ 0.0078
W7.10	6.4 $\pm$ 0.3	0.0010 $\pm$ 4.0%	0.0003 $\pm$ 10.1%	0.0569 $\pm$ 13.5%	999.78 $\pm$ 39.83	0.0569 $\pm$ 0.0077
W7.11	6.5 $\pm$ 0.2	0.0010 $\pm$ 3.7%	0.0003 $\pm$ 12.6%	0.0437 $\pm$ 13.0%	995.28 $\pm$ 36.72	0.0437 $\pm$ 0.0057
W7.12	6.5 $\pm$ 0.3	0.0010 $\pm$ 3.9%	0.0003 $\pm$ 13.2%	0.0485 $\pm$ 14.4%	979.85 $\pm$ 38.66	0.0485 $\pm$ 0.0070
Deep Creek						
D17926.1	6.0 $\pm$ 0.3	0.0009 $\pm$ 4.5%	0.0004 $\pm$ 10.5%	0.0622 $\pm$ 15.6%	1056.85 $\pm$ 47.51	0.0622 $\pm$ 0.0097
D17926.2	6.0 $\pm$ 0.3	0.0009 $\pm$ 4.4%	0.0003 $\pm$ 19.5%	0.0560 $\pm$ 13.8%	1058.01 $\pm$ 46.93	0.0560 $\pm$ 0.0077
D17926.3	6.0 $\pm$ 0.2	0.0009 $\pm$ 3.9%	0.0003 $\pm$ 7.5%	0.0569 $\pm$ 11.9%	1056.01 $\pm$ 40.83	0.0569 $\pm$ 0.0068
D17926.4	6.0 $\pm$ 0.1	0.0009 $\pm$ 1.8%	0.0003 $\pm$ 4.2%	0.0503 $\pm$ 5.0%	1063.34 $\pm$ 19.27	0.0503 $\pm$ 0.0025
D17926.5	6.1 $\pm$ 0.3	0.0010 $\pm$ 4.9%	0.0004 $\pm$ 9.5%	0.0844 $\pm$ 13.4%	1003.25 $\pm$ 49.52	0.0844 $\pm$ 0.0113
D17926.6	6.1 $\pm$ 0.2	0.0010 $\pm$ 2.7%	0.0003 $\pm$ 5.7%	0.0553 $\pm$ 7.5%	1041.58 $\pm$ 28.10	0.0553 $\pm$ 0.0042
D17926.7	6.1 $\pm$ 0.1	0.0010 $\pm$ 1.9%	0.0004 $\pm$ 4.2%	0.1026 $\pm$ 4.0%	974.69 $\pm$ 18.09	0.1026 $\pm$ 0.0041
D17926.8	6.3 $\pm$ 0.2	0.0010 $\pm$ 3.3%	0.0003 $\pm$ 16.3%	0.0456 $\pm$ 13.2%	1025.91 $\pm$ 34.07	0.0456 $\pm$ 0.0060
D17926.9	6.4 $\pm$ 0.2	0.0010 $\pm$ 3.0%	0.0003 $\pm$ 15.3%	0.0548 $\pm$ 8.3%	1001.54 $\pm$ 30.36	0.0548 $\pm$ 0.0046
D17926.10	6.4 $\pm$ 0.3	0.0010 $\pm$ 4.1%	0.0003 $\pm$ 17.0%	0.0549 $\pm$ 11.7%	992.54 $\pm$ 40.89	0.0549 $\pm$ 0.0064
D17926.11	6.5 $\pm$ 0.2	0.0010 $\pm$ 4.1%	0.0003 $\pm$ 17.7%	0.0420 $\pm$ 19.4%	989.01 $\pm$ 40.40	0.0420 $\pm$ 0.0081
Rat Hole						
B97.1	5.3 $\pm$ 0.4	0.0009 $\pm$ 6.4%	0.0003 $\pm$ 16.9%	0.0785 $\pm$ 20.5%	1161.67 $\pm$ 74.20	0.0785 $\pm$ 0.0161
B97.2	5.5 $\pm$ 0.6	0.0009 $\pm$ 10.3%	0.0003 $\pm$ 42.4%	0.1085 $\pm$ 28.5%	1074.67 $\pm$ 111.16	0.1085 $\pm$ 0.0389
B97.3	5.6 $\pm$ 0.2	0.0009 $\pm$ 3.3%	0.0003 $\pm$ 7.8%	0.0487 $\pm$ 9.8%	1155.83 $\pm$ 38.38	0.0487 $\pm$ 0.0048
B97.4	5.6 $\pm$ 0.2	0.0009 $\pm$ 4.2%	0.0003 $\pm$ 10.5%	0.0589 $\pm$ 13.3%	1136.42 $\pm$ 47.20	0.0589 $\pm$ 0.0078

B97.5	5.6 ± 0.2	0.0009 ± 3.6%	0.0003 ± 8.6%	0.0454 ± 20.0%	1152.96 ± 40.95	0.0454 ± 0.0091
B97.6	5.7 ± 0.3	0.0009 ± 4.5%	0.0003 ± 13.2%	0.0627 ± 16.8%	1110.08 ± 50.44	0.0627 ± 0.0105
B97.7	5.8 ± 0.2	0.0009 ± 4.1%	0.0003 ± 10.6%	0.0607 ± 14.2%	1098.38 ± 44.68	0.0607 ± 0.0086
B97.8	5.8 ± 0.2	0.0009 ± 3.6%	0.0003 ± 9.9%	0.0440 ± 14.2%	1106.10 ± 39.39	0.0440 ± 0.0063
B97.9	5.9 ± 0.3	0.0009 ± 4.9%	0.0003 ± 11.3%	0.0407 ± 18.9%	1106.35 ± 53.89	0.0407 ± 0.0077
B97.10	5.9 ± 0.2	0.0009 ± 3.0%	0.0003 ± 7.3%	0.0506 ± 10.7%	1078.00 ± 32.29	0.0506 ± 0.0054
B97.11	6.0 ± 0.4	0.0009 ± 5.9%	0.0003 ± 17.3%	0.0491 ± 29.6%	1078.06 ± 63.53	0.0491 ± 0.0145
B97.12	6.0 ± 0.3	0.0010 ± 4.3%	0.0003 ± 13.7%	0.0659 ± 16.6%	1032.95 ± 44.08	0.0659 ± 0.0110
Daylesford						
D52261.1	2.0 ± 0.2	0.0003 ± 8.5%	0.0001 ± 15.8%	0.0719 ± 44.6%	3116.96 ± 265.51	0.0719 ± 0.0321
D52261.2	1.7 ± 0.2	0.0003 ± 7.7%	0.0001 ± 12.2%	0.1112 ± 34.4%	3426.71 ± 264.30	0.1112 ± 0.0382
D52261.3	2.0 ± 0.4	0.0004 ± 18.6%	0.0005 ± 25.0%	0.1392 ± 36.4%	2812.27 ± 524.03	0.1392 ± 0.0507
D52261.4	1.8 ± 0.2	0.0003 ± 11.0%	0.0002 ± 14.4%	0.0771 ± 45.5%	3400.34 ± 372.74	0.0771 ± 0.0351
D52261.5	1.8 ± 0.5	0.0003 ± 22.8%	0.0004 ± 28.1%	0.1195 ± 43.2%	3164.51 ± 721.48	0.1195 ± 0.0561
Bullenmerri						
D47123.1	0.14 ± 0.03	0.00004 ± 15.9%	0.0000 ± 8.8%	0.3933 ± 17.4%	25362 ± 4020	0.3933 ± 0.0684
D47123.2	0.15 ± 0.03	0.00006 ± 11.5%	0.0000 ± 7.3%	0.4989 ± 11.3%	17903 ± 2054	0.4989 ± 0.0566
D47123.3	0.16 ± 0.13	0.00015 ± 13.3%	0.0003 ± 9.6%	0.7087 ± 14.8%	6611 ± 882	0.7087 ± 0.1047
D47123.4	0.17 ± 0.04	0.00006 ± 11.9%	0.0001 ± 7.0%	0.5144 ± 11.5%	15856 ± 1894	0.5144 ± 0.0591
D47123.5	0.18 ± 0.09	0.00007 ± 16.2%	0.0001 ± 9.4%	0.5301 ± 29.1%	14025 ± 2270	0.5301 ± 0.1541
D47123.6	0.19 ± 0.02	0.00004 ± 9.1%	0.0000 ± 5.5%	0.1809 ± 15.9%	28426 ± 2599	0.1809 ± 0.0288
D47123.7	0.19 ± 0.04	0.00006 ± 12.5%	0.0000 ± 7.8%	0.4177 ± 14.2%	17501 ± 2196	0.4177 ± 0.0592
D47123.8	0.21 ± 0.04	0.00006 ± 12.9%	0.0001 ± 7.1%	0.4221 ± 14.2%	16143 ± 2085	0.4221 ± 0.0598
D47123.9	0.23 ± 0.04	0.00006 ± 13.3%	0.0001 ± 6.4%	0.3559 ± 16.5%	17221 ± 2284	0.3559 ± 0.0587
D47123.10	0.29 ± 0.04	0.00005 ± 13.1%	0.0001 ± 12.9%	0.1973 ± 27.1%	18262 ± 2401	0.1973 ± 0.0536
D47123.11	87.59 ± 2.39	0.0139 ± 2.7%	0.0050 ± 3.1%	0.0603 ± 5.9%	72 ± 2	0.0603 ± 0.0035
D47123.12	99.96 ± 2.53	0.0160 ± 2.5%	0.0075 ± 4.2%	0.0641 ± 6.7%	63 ± 2	0.0641 ± 0.0043

* ²⁰⁷Pb corrected ages, with 1σ errors. Analyst S. Meffre.

Supplementary Table 2 Analyses of selected elements (ppm) on age-analysed zircon spots.

Sample	Hf	Zr/Hf	Th	U	Th/U	Pb	Ti	T°C
Sheltons Rd (W7)								
W7.1	7640	63.52	1265	970	1.31	1.2	9	735
W7.2	7309	66.40	381	536	0.71	0.6	3	645
W7.3	9186	54.83	533	773	0.69	0.8	3	645
W7.4	7248	66.95	461	622	0.74	0.7	3	645
W7.5	10013	48.47	384	721	0.53	0.8	2	615
W7.6	9552	50.80	549	854	0.64	0.9	2	615
W7.7	7569	64.11	629	670	0.94	0.8	5	685
W7.8	8817	55.04	1233	1471	0.84	1.6	(14)	NA
W7.9	9546	50.84	236	566	0.42	0.6	2	615
W7.10	7601	63.84	755	731	1.03	0.9	7	715
W7.11	9508	51.04	565	875	0.65	0.9	2	615
W7.12	7324	66.26	424	582	0.73	0.6	3	685
Av.	8443	57.48	618	781	0.79	0.9	3.7	655
Deep Creek (DR17926)								
DR17926.1	6726	72.15	273	340	0.80	0	6	700
DR17926.2	10412	46.61	2599	3272	0.79	4	7	715
DR17926.3	6720	72.22	644	525	1.23	1	8	725
DR17926.4	6861	70.73	3992	2101	1.87	3	8	725
DR17926.5	6888	70.45	292	312	0.96	0	11	745
DR17926.6	6874	70.60	1035	879	1.18	1	15	780
DR17926.7	6840	70.95	3272	1789	1.83	3	(400)	NA
DR17926.8	6893	70.96	8524	5823	1.46	7	8	725
DR17926.9	7431	65.31	1449	7796	1.86	11	12	755
DR17926.10	6704	72.39	8327	3444	1.07	6	(33)	NA
DR17926.11	8301	58.46	3951	3289	1.20	4	11	745
Av.	7332	66.19	4306	2688	1.28	4	10	735
Rat Hole (B97)								
B97.1	6068	79.97	243	274	0.89	0.3	3	645
B97.2	6362	76.28	42	93	0.45	0.1	1	575
B97.3	6274	77.35	1861	1126	1.65	1.4	1	575
B97.4	6020	80.61	623	722	0.86	0.8	1	575
B97.5	6098	79.58	1482	926	1.60	1.1	2	615
B97.6	6063	80.04	438	570	0.77	0.6	(0)	NA
B97.7	5960	81.42	724	668	1.08	0.7	1	575
B97.8	6008	80.77	845	750	1.13	0.8	1	575
B97.9	5961	81.41	637	494	1.29	0.6	4	665
B97.10	6015	80.68	2680	1355	2.01	1.8	2	615
B97.11	6131	79.15	251	330	0.76	0.3	2	615
B97.12	5916	82.03	658	622	1.06	0.7	1	575
Av.	6073	79.97	874	659	1.13	0.8	1.7	600
Daylesford (D52261)								
D52261.1	5912	82.08	293	380	0.77	0.1	1	575
D52261.2	5859	82.83	481	521	0.92	0.2	2	615
D52261.3	6355	76.36	45	92	0.49	0.1	1	575
D52261.4	5939	81.71	247	335	0.74	0.1	2	615
D52261.5	6380	76.06	47	96	0.49	0.0	1	575
Av.	6095	79.62	223	285	0.68	0.1	1.3	590
Bullenmerri (D47123a, b)								

D47123a.1	6092	79.66	315	334	0.94	0	1	575
D47123a.2	6451	75.23	782	468	1.67	0	3	645
D47123a.3	5838	83.12	138	170	0.81	0	3	645
D47123a.4	5831	83.22	493	454	1.087	0	1	575
D47123a.5	5663	85.69	175	193	0.91	0	4	665
D47123a.6	6313	76.87	1536	758	2.027	0	2	615
D47123a.7	5384	90.13	527	430	1.23	0	1	575
D47123a.8	5347	90.30	454	378	1.20	0	1	575
D47123a.9	5090	95.34	224	247	0.91	0	2	615
D47123a.10	5362	90.50	195	243	0.80	0	1	575
Av.	5737	84.59	484	368	1.16	0	2.1	605
D47123b.1	5745	84.47	15	29	0.52	6	6	700
D47123b.2	6206	78.20	5	17	0.29	7	6	700
Av.	5976	81.21	10	23	0.41	6.5	6	700

Zr/Hf based on Zr value of 485 282 ppm for zircon standard. 91500. T°C* based on Ti-in-zircon thermometry, after Ferry & Watson (2007).

Supplementary Table 3 Analyses (LA-ICP-MS, ppm)*. Bullenmerri zircon (core to rim).

Zone	1	2	3	4	5	6	7	8
Zr	452118	454514	455340	450366	444700	445773	446497	450814
Hf	5891	5876	5883	5910	5795	5916	5831	6574
Y	831	1187	1435	611	1076	753	773	239
Th	61	271	180	82	177	49	43	7
U	109	231	203	112	182	92	74	24
Nb	2.9	6.8	7.0	2.3	5.7	2.3	2.9	0.7
Ta	1.31	2.26	2.19	1.01	1.94	1.10	1.06	0.47
Al	3.5	2.7	3.4	3.0	3.6	3.6	2.7	5.3
P	51	65	65	60	65	52	54	39
Ti	2.7	2.5	1.9	2.1	1.7	1.5	2.2	1.2
La	0.01	0.01	0.02	0.01	0.00	0.01	0.00	0.02
Ce	5.8	12.0	12.4	4.6	9.9	4.8	5.1	1.0
Pr	0.10	0.15	0.21	0.05	0.11	0.07	0.06	0.02
Nd	1.4	2.9	3.4	1.1	2.2	1.0	1.4	0.2
Sm	3.8	6.5	8.5	2.7	5.6	2.9	3.8	0.6
Eu	3.3	5.1	6.4	2.0	4.3	2.7	3.1	0.6
Gd	23.3	36.9	44.9	15.4	30.3	18.3	21.8	4.7
Tb	8.5	12.8	15.6	5.8	10.8	6.8	8.1	1.9
Dy	98.3	139.6	171.8	68.0	122.2	80.1	87.9	23.2
Ho	32.8	44.4	54.7	22.5	40.2	27.4	28.7	8.4
Er	124.6	161.8	199.6	85.7	150.2	107.2	108.7	35.5
Tm	22.5	27.3	33.6	15.4	26.1	20.1	19.4	7.1
Yb	167.2	203.5	242.4	116.3	196.2	153.2	149.9	59.2
Lu	25.8	29.7	35.5	18.0	29.6	23.7	22.7	10.0

* Si-normalised (15284 ppm)

Supplementary Table 4 $^{40}\text{Ar}/^{39}\text{Ar}$ geochronology feldspar fraction (413), Niggl Rd trachyte.

Heating Step	$^{40}\text{Ar}^*/^{39}\text{Ar}$	$^{40}\text{Ar}/^{39}\text{Ar}$	$^{38}\text{Ar}/^{39}\text{Ar}$	$^{37}\text{Ar}/^{39}\text{Ar}$	^{39}Ar (10^{-10}cm^3)	% $^{40}\text{Ar}^*$	Age (Ma) $\pm 1\sigma$
Step 1	0.174 $\pm$ 0.006	0.240 $\pm$ 0.001	0.012 $\pm$ 0.000	0.067 $\pm$ 0.002	1.25 $\pm$ 0.00	72.6	2.07 $\pm$ 0.08
Step 2	0.179 $\pm$ 0.001	0.288 $\pm$ 0.000	0.012 $\pm$ 0.000	0.069 $\pm$ 0.001	7.12 $\pm$ 0.00	62.3	2.13 $\pm$ 0.02
Step 3	0.185 $\pm$ 0.001	0.230 $\pm$ 0.000	0.012 $\pm$ 0.000	0.069 $\pm$ 0.001	13.40 $\pm$ 0.00	80.4	2.20 $\pm$ 0.01
Step 4	0.183 $\pm$ 0.001	0.224 $\pm$ 0.000	0.012 $\pm$ 0.000	0.051 $\pm$ 0.000	10.50 $\pm$ 0.00	81.9	2.18 $\pm$ 0.01
Step 5	0.190 $\pm$ 0.001	0.232 $\pm$ 0.000	0.012 $\pm$ 0.000	0.067 $\pm$ 0.000	11.10 $\pm$ 0.00	82.8	2.26 $\pm$ 0.01
Step 6	0.193 $\pm$ 0.000	0.232 $\pm$ 0.000	0.012 $\pm$ 0.000	0.063 $\pm$ 0.000	5.74 $\pm$ 0.00	62.3	2.29 $\pm$ 0.01
Step 7	0.193 $\pm$ 0.002	0.253 $\pm$ 0.000	0.012 $\pm$ 0.000	0.045 $\pm$ 0.001	4.59 $\pm$ 0.00	76.5	2.30 $\pm$ 0.02
Step 8	0.201 $\pm$ 0.003	0.289 $\pm$ 0.000	0.012 $\pm$ 0.000	0.055 $\pm$ 0.001	2.70 $\pm$ 0.00	69.5	2.39 $\pm$ 0.04
Step 9	0.193 $\pm$ 0.001	0.270 $\pm$ 0.000	0.012 $\pm$ 0.000	0.048 $\pm$ 0.001	2.72 $\pm$ 0.00	71.3	2.29 $\pm$ 0.02
Step 10	0.201 $\pm$ 0.001	0.376 $\pm$ 0.000	0.012 $\pm$ 0.000	0.048 $\pm$ 0.000	3.82 $\pm$ 0.00	53.3	2.39 $\pm$ 0.02

Niggl Road, 413 Feldspar. Values rounded to first, second and third decimal places. Weighted mean (steps 6–10) = 2.32 $\pm$ 0.06 Ma (2 σ). Total fusion age = 2.25 $\pm$ 0.20 Ma (2 σ). J value = 0.006510 $\pm$ 0.000032. Irradiation standard HB-B1 biotite (24.21 $\pm$ 0.32). Analysts J.-A. Wartho, H. Zwingmann.