

174662: granophyre, Eliza Rocks

(Warakurna Supersuite, Musgrave Province)

Location and sampling

SCOTT (SG 52-6), FINLAYSON (4446)
MGA Zone 52, 356399E 7136167N

Sampled on 23 May 2008

This sample was collected from rounded boulders at Eliza Rocks, approximately 10.2 km west-southwest of Mantamaru (Jamieson) Community, and 2.4 km southeast of Pine Tree Rock.

Tectonic unit/relations

The unit sampled is a granophyre assigned to the Warakurna Supersuite. The granophyre forms a lens-shaped intrusion trending north-northeast. The Warakurna Supersuite intrudes granite and gneiss of the 1345–1293 Ma Wankanki Supersuite and the 1220–1150 Ma Pitjantjatjara Supersuite (Smithies et al., 2010), and includes all intrusive components related to the c. 1075 Ma Giles Event (Smithies et al., 2009). Rocks of this supersuite outcrop across approximately 1.5 million km² of central and western Australia, forming the Warakurna large igneous province (Wingate et al., 2004).

Petrographic description

The sample contains about 40% quartz, 40% alkali feldspar, 10% plagioclase, 8% chlorite, 1% zoisite, <1% opaque oxide minerals, plus minor biotite, apatite and zircon. Quartz occurs as phenocrysts up to 3 mm long with undulose extinction, and also as continuous ribbons. The matrix is principally composed of alkali feldspar up to 1 mm in grain size, which defines a subophitic texture together with chlorite. Clots of biotite are secondary and associated with veins filled with clay minerals. Zircon is mostly found adjacent to, or within, quartz phenocrysts.

Zircon morphology

Zircons isolated from this sample are euhedral, light brown, and up to 500 µm long, with aspect ratios up to 5:1. Cathodoluminescence (CL) images reveal idiomorphic zoning with low CL response grain centres. Some grains display contorted textures, with lobate margins between domains within the same crystal, implying a magmatic resorption process. A CL image of representative zircons is shown in Figure 1.

Analytical details

This sample was analysed on 26–27 March 2010, using SHRIMP-B. Thirteen analyses of the BR266 standard were obtained during the session, which yielded an external spot-to-spot (reproducibility) uncertainty of 0.50% (1σ), and a ²³⁸U/²⁰⁶Pb* calibration uncertainty of 0.15% (1σ). Calibration uncertainties are included in the errors of ²³⁸U/²⁰⁶Pb* ratios and dates listed in Table 1. Common-Pb corrections were applied to all analyses using contemporaneous isotopic compositions determined according to the model of Stacey and Kramers (1975).

Results

Sixteen analyses were obtained from 16 zircons. Results are listed in Table 1, and shown in a concordia diagram (Fig. 2).

Interpretation

The analyses are concordant to slightly discordant. Four analyses are characterized by >5% discordance. The dates obtained from these four analyses (Group D; Table 1) are unreliable, and are not considered geologically significant. The remaining 12 analyses define a single coherent group, based on their ²⁰⁷Pb*/²⁰⁶Pb* ratios.

Group I comprises 12 analyses (Table 1), which yield a concordia age of 1077 ± 6 Ma (MSWD = 1.4).

The date of 1077 ± 6 Ma for the 12 analyses in Group I is interpreted as the magmatic crystallization age of the granophyre.

References

- Smithies, RH, Howard, HM, Evins, PM, Kirkland, CL, Bodorkos, S and Wingate, MTD 2009, The west Musgrave Complex — some new geological insights from recent mapping, geochronology, and geochemical studies: Geological Survey of Western Australia, Record 2008/19, 20p.
- Smithies, RH, Howard, HM, Evins, PM, Kirkland, CL, Kelsey, DE, Hand, M, Wingate, MTD, Collins, AS, Belousova, E and Allchurch, S 2010, Geochemistry, geochronology, and petrogenesis of Mesoproterozoic felsic rocks in the west Musgrave Province, central Australia, and implications for the Mesoproterozoic tectonic evolution of the region: Geological Survey of Western Australia, Report 106, 73p.

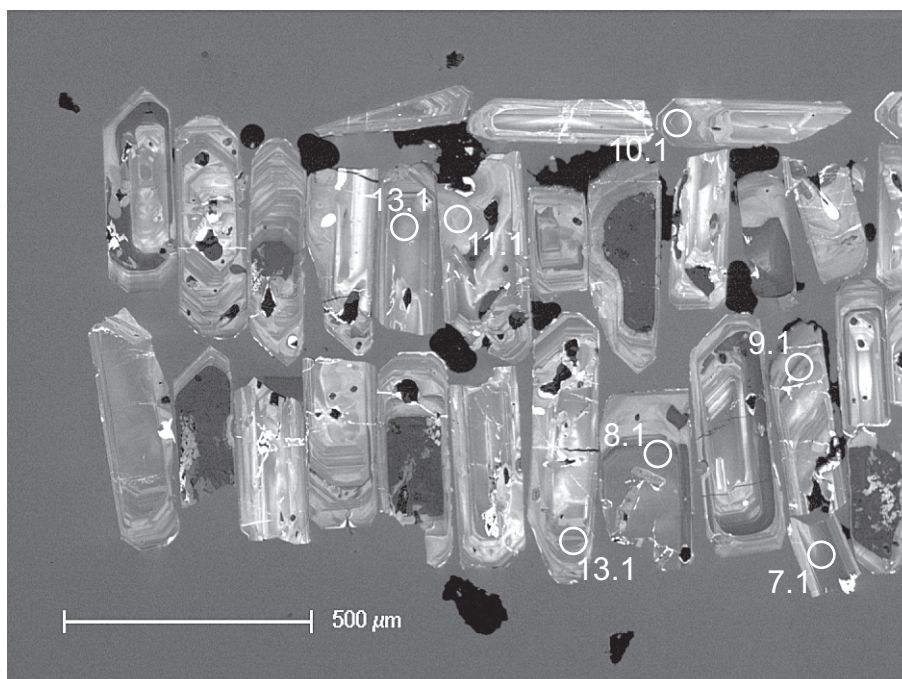


Figure 1. Cathodoluminescence image of representative zircons from sample 174662: granophyre, Eliza Rocks. Numbered circles indicate the approximate positions of analysis sites.

Stacey, JS and Kramers, JD 1975, Approximation of terrestrial lead isotope evolution by a two-stage model: *Earth and Planetary Science Letters*, v. 26, p. 207–221.

Wingate, MTD, Pirajno, F and Morris, PA 2004, Warakurna large igneous province: a new Mesoproterozoic large igneous province in west-central Australia: *Geology*, v. 32, p. 105–108.

Recommended reference for this publication

Kirkland, CL, Wingate, MTD and Howard, HM 2010, 174662: granophyre, Eliza Rocks; *Geochronology Record 909: Geological Survey of Western Australia*, 4p.

Data obtained: 27 March 2010

Data released: 30 June 2010

Table 1. Ion microprobe analytical results for zircons from sample 174662: granophyre, Eliza Rocks

Group ID	Spot no.	Grain. spot	^{238}U (ppm)	^{232}Th (ppm)	$\frac{^{232}\text{Th}}{^{238}\text{U}}$	f_{204} (%)	$\frac{^{238}\text{U}}{^{206}\text{Pb}}$		$\frac{^{207}\text{Pb}}{^{206}\text{Pb}}$		$\frac{^{238}\text{U}}{^{206}\text{Pb}^*}$		$\frac{^{207}\text{Pb}^*}{^{206}\text{Pb}^*}$		Disc. (%)				
							$\pm 1\sigma$	$\pm 1\sigma$	$\pm 1\sigma$	$\pm 1\sigma$	$\pm 1\sigma$	$\pm 1\sigma$							
I	7	7.1	296	381	1.33	0.301	5.546	0.050	0.07707	0.00052	5.563	0.050	0.07454	0.00075	1066	9	1056	20	-0.9
I	13	13.1	135	100	0.76	0.428	5.336	0.062	0.07813	0.00080	5.359	0.062	0.07454	0.00128	1103	12	1056	35	-4.4
I	9	9.1	196	199	1.05	0.395	5.478	0.055	0.07820	0.00065	5.499	0.056	0.07489	0.00100	1077	10	1065	27	-1.1
I	8	8.1	245	239	1.01	0.243	5.586	0.053	0.07716	0.00058	5.600	0.053	0.07512	0.00080	1059	9	1072	21	1.2
I	12	12.1	95	108	1.18	0.801	5.486	0.071	0.08188	0.00096	5.531	0.073	0.07515	0.00187	1071	13	1073	50	0.1
I	4	4.1	124	98	0.82	0.605	5.530	0.064	0.08023	0.00080	5.563	0.065	0.07516	0.00142	1066	12	1073	38	0.7
I	11	11.1	182	223	1.27	0.320	5.412	0.056	0.07792	0.00067	5.429	0.056	0.07523	0.00099	1090	11	1075	26	-1.4
I	2	2.1	1817	1194	0.68	0.039	5.501	0.038	0.07577	0.00024	5.503	0.038	0.07543	0.00025	1076	7	1080	7	0.3
I	3	3.1	141	114	0.83	0.255	5.528	0.061	0.07797	0.00074	5.543	0.062	0.07583	0.00103	1069	11	1091	27	2.0
I	1	1.1	274	353	1.33	0.174	5.560	0.051	0.07814	0.00054	5.570	0.051	0.07667	0.00068	1064	9	1113	18	4.3
I	15	15.1	305	339	1.15	0.093	5.526	0.050	0.07750	0.00051	5.531	0.050	0.07672	0.00059	1071	9	1114	15	3.8
I	6	6.1	97	66	0.70	0.511	5.379	0.068	0.08184	0.00094	5.407	0.069	0.07754	0.00157	1094	13	1135	40	3.6
D	16	16.1	129	99	0.79	1.285	5.457	0.064	0.08270	0.00084	5.528	0.066	0.07196	0.00208	1072	12	985	59	-8.8
D	5	5.1	145	124	0.88	0.636	5.669	0.062	0.08261	0.00078	5.705	0.063	0.07726	0.00138	1041	11	1128	36	7.7
D	10	10.1	160	133	0.86	0.213	5.690	0.061	0.07928	0.00073	5.702	0.061	0.07748	0.00097	1042	10	1134	25	8.1
D	14	14.1	77	53	0.71	0.389	5.486	0.077	0.08511	0.00111	5.507	0.078	0.08181	0.00168	1076	14	1241	40	13.3

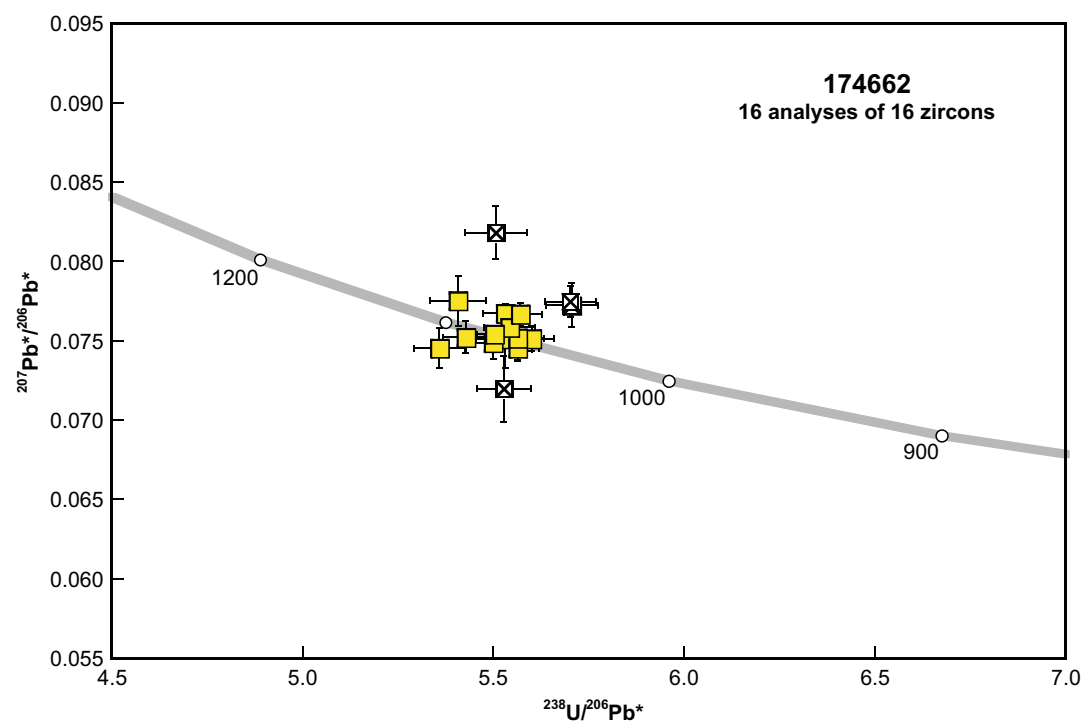


Figure 2. U–Pb analytical data for zircons from sample 174662: granophyre, Eliza Rocks. Yellow squares indicate Group I (magmaic zircons); crossed squares indicate Group D (discordance >5%).