# 174690: rhyolite, Mount Weir

## *(Wururu Rhyolite, Cassidy Group, Bentley Supergroup, Musgrave Province)*

## Location and sampling

TALBOT (SG 52-9), MOUNT EVELINE (4345)
MGA Zone 52, 317681E 7101883N

Sampled on 14 September 20080

This sample was collected from an outcrop on the northwest side of a hill, approximately 3.4 km north of Mount Weir, 3.8 km northeast of the summit of Stewart Hill, and 7.5 km southeast of Mount Eveline.

## Tectonic unit/relations

The unit sampled is the Wururu Rhyolite, which is assigned to the Cassidy Group of the Bentley Supergroup (Werner and Howard, 2010). The Cassidy Group represents a succession of alternating rhyolitic (Wururu, Gombugurra, Thomas, and Hilda Rhyolites) and basaltic (Gurgadi, Warubuyu, and Miller Basalts) lava flows with minor intercalations of sedimentary rocks. The Bentley Supergroup consists of a package of mafic and felsic volcanic rocks, which were extruded during the Giles Event (Glikson et al., 1996). The Giles Event encompasses the intrusion and extrusion of voluminous mafic to felsic magmas in the Musgrave region from >1085 to c. 1026 Ma (Daniels, 1974; Edgoose et al., 2004). At least ten phases of magmatism and deformation can be attributed to this event (Evins et al., 2010). These mafic and felsic extrusive rocks, together with layered mafic–ultramafic intrusions, gabbros, granites, and mafic dykes, form the Warakurna Supersuite. The Warakurna Supersuite in the west Musgrave Province forms a component of the Warakurna Large Igneous Province, which has an areal extent of at least 1.5 million km² in central and western Australia (Wingate et al., 2004; Morris and Pirajno, 2005).

## Petrographic description

The sample is a rhyolite, and contains variable proportions of both plagioclase and K-feldspar phenocrysts, in a groundmass rich in K-feldspar. The feldspar phenocrysts are 3 to 4 mm long, and some appear to be broken fragments. Locally, small aggregates of epidote are developed, which have partial rims of fine-grained quartz. Some aggregates of epidote also contain possible titanite, fine-grained quartz, and microphenocrysts of opaque oxide minerals up to 0.5 mm. Some microcrystalline K-feldspar in the groundmass is enclosed within poikilitic quartz grains. Minor opaque oxide minerals, sericite, and biotite are also disseminated in the groundmass and locally define diffuse lenses. There are no quartz phenocrysts in the thin section examined.

## Zircon morphology

Zircons isolated from this sample are euhedral, colourless to light brown, up to 300 μm long, and equant to elongate, with aspect ratios up to 5:1. Cathodoluminescence (CL) images indicate predominantly oscillatory zoned crystals. Many grains have centres with low CL response. A CL image of representative zircons is shown in Figure 1.

## Analytical details

This sample was analysed on 8–9 April 2010, using SHRIMP-A. Eleven analyses of the BR266 standard were obtained during the session, and indicated an external spot-to-spot (reproducibility) uncertainty of 0.61% (1σ) and a $^{238}U/^{206}Pb^*$ calibration uncertainty of 0.24% (1σ). Calibration uncertainties are included in the errors of $^{238}U/^{206}Pb^*$ 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

Twenty-two analyses were obtained from 20 zircons. Results are listed in Table 1, and shown in a concordia diagram (Fig. 2).

## Interpretation

The analyses are concordant to slightly discordant (Fig. 2). Two analyses are >5% discordant. The dates obtained from these two analyses (Group D; Table 1) are unreliable, and are not considered geologically significant. The remaining 20 analyses define a single coherent group, based on their $^{207}Pb^*/^{206}Pb^*$ and $^{238}U/^{206}Pb^*$ ratios.

Group I comprises 20 analyses (Table 1), which yield a concordia age of 1065 ± 5 Ma (MSWD = 1.6).

The date of 1065 ± 5 Ma for the 20 analyses in Group I is interpreted as the magmatic crystallization age of the rhyolite.

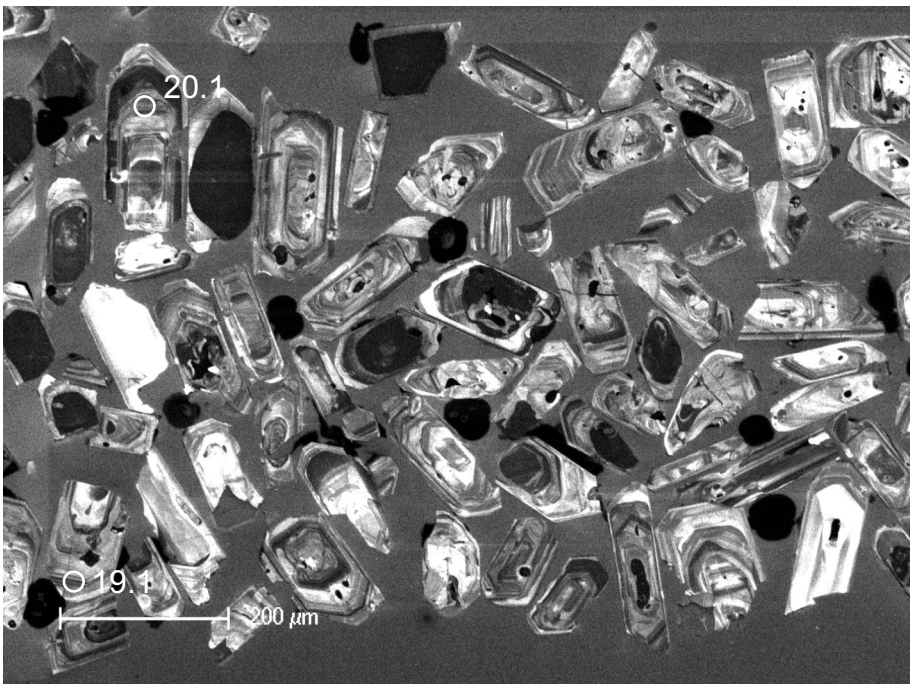


**Figure 1. Cathodoluminescence image of representative zircons from sample 174690: rhyolite, Mount Weir. Numbered circles indicate the approximate positions of analysis sites.**

## References

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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, Howard, HM, Smithies, RH and Werner, M 2011, 174690: rhyolite, Mount Weir; Geochronology Record 995: Geological Survey of Western Australia, 4p.

Data obtained: 9 April 2010
Data released: 30 June 2011

**Table 1. Ion microprobe analytical results for zircons from sample 174690: rhyolite, Mount Weir**

| Group ID | Spot no. | Grain spot | $^{238}U$ (ppm) | $^{232}Th$ (ppm) | $\frac{^{232}Th}{^{238}U}$ | f204 (%) | $^{238}U/^{206}Pb$ | ± 1 σ | $^{207}Pb/^{206}Pb$ | ± 1 σ | $^{238}U/^{206}Pb^*$ | ± 1 σ | $^{207}Pb^*/^{206}Pb^*$ | ± 1 σ | $^{238}U/^{206}Pb^*$ date (Ma) | ± 1 σ | $^{207}Pb^*/^{206}Pb^*$ date (Ma) | ± 1 σ | Disc. (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | 21 | 19.1 | 180 | 189 | 1.08 | 0.226 | 5.580 | 0.061 | 0.07502 | 0.00077 | 5.592 | 0.061 | 0.07313 | 0.00106 | 1061 | 11 | 1018 | 29 | -4.2 |
| I | 18 | 17.1 | 194 | 193 | 1.03 | 0.228 | 5.573 | 0.060 | 0.07574 | 0.00078 | 5.586 | 0.061 | 0.07383 | 0.00106 | 1062 | 11 | 1037 | 29 | -2.4 |
| I | 8 | 8.1 | 143 | 123 | 0.88 | 0.197 | 5.489 | 0.062 | 0.07593 | 0.00087 | 5.500 | 0.063 | 0.07428 | 0.00114 | 1077 | 11 | 1049 | 31 | -2.7 |
| I | 9 | 9.1 | 422 | 424 | 1.04 | 0.083 | 5.485 | 0.047 | 0.07508 | 0.00051 | 5.489 | 0.047 | 0.07438 | 0.00058 | 1079 | 9 | 1052 | 16 | -2.6 |
| I | 19 | 17.2 | 1917 | 2275 | 1.23 | 0.018 | 5.499 | 0.039 | 0.07458 | 0.00024 | 5.500 | 0.039 | 0.07443 | 0.00025 | 1077 | 7 | 1053 | 7 | -2.3 |
| I | 10 | 10.1 | 134 | 119 | 0.92 | 0.173 | 5.673 | 0.066 | 0.07589 | 0.00090 | 5.683 | 0.066 | 0.07444 | 0.00116 | 1045 | 11 | 1053 | 31 | 0.8 |
| I | 13 | 13.1 | 104 | 156 | 1.54 | 0.356 | 5.573 | 0.072 | 0.07749 | 0.00108 | 5.593 | 0.073 | 0.07451 | 0.00163 | 1060 | 13 | 1055 | 44 | -0.5 |
| I | 1 | 1.1 | 152 | 139 | 0.94 | 0.176 | 5.568 | 0.061 | 0.07626 | 0.00082 | 5.578 | 0.062 | 0.07479 | 0.00105 | 1063 | 11 | 1063 | 28 | 0.0 |
| I | 16 | 16.1 | 2240 | 3479 | 1.60 | 0.030 | 5.448 | 0.038 | 0.07512 | 0.00022 | 5.449 | 0.038 | 0.07486 | 0.00023 | 1086 | 7 | 1065 | 6 | -2.0 |
| I | 11 | 11.1 | 163 | 140 | 0.89 | 0.000 | 5.693 | 0.065 | 0.07491 | 0.00084 | 5.693 | 0.065 | 0.07491 | 0.00084 | 1043 | 11 | 1066 | 23 | 2.2 |
| I | 5 | 5.1 | 140 | 131 | 0.96 | -0.041 | 5.479 | 0.064 | 0.07458 | 0.00087 | 5.477 | 0.064 | 0.07493 | 0.00094 | 1081 | 12 | 1067 | 25 | -1.4 |
| I | 22 | 20.1 | 196 | 218 | 1.15 | 0.255 | 5.716 | 0.061 | 0.07714 | 0.00145 | 5.730 | 0.061 | 0.07500 | 0.00164 | 1037 | 10 | 1068 | 44 | 3.0 |
| I | 15 | 15.1 | 168 | 195 | 1.20 | 0.000 | 5.568 | 0.063 | 0.07504 | 0.00084 | 5.568 | 0.063 | 0.07504 | 0.00084 | 1065 | 11 | 1069 | 22 | 0.4 |
| I | 20 | 18.1 | 145 | 141 | 1.01 | 0.125 | 5.571 | 0.065 | 0.07631 | 0.00090 | 5.578 | 0.065 | 0.07526 | 0.00108 | 1063 | 12 | 1075 | 29 | 1.2 |
| I | 4 | 4.1 | 134 | 138 | 1.06 | 0.085 | 5.600 | 0.066 | 0.07610 | 0.00090 | 5.605 | 0.066 | 0.07538 | 0.00103 | 1058 | 12 | 1079 | 28 | 1.9 |
| I | 7 | 7.1 | 226 | 219 | 1.00 | 0.025 | 5.607 | 0.056 | 0.07579 | 0.00070 | 5.609 | 0.056 | 0.07557 | 0.00073 | 1058 | 10 | 1084 | 19 | 2.4 |
| I | 3 | 3.1 | 264 | 270 | 1.05 | 0.095 | 5.726 | 0.055 | 0.07639 | 0.00068 | 5.732 | 0.055 | 0.07558 | 0.00079 | 1037 | 9 | 1084 | 21 | 4.4 |
| I | 14 | 14.1 | 974 | 1211 | 1.28 | -0.012 | 5.532 | 0.042 | 0.07558 | 0.00034 | 5.532 | 0.042 | 0.07568 | 0.00034 | 1071 | 8 | 1087 | 9 | 1.4 |
| I | 12 | 12.1 | 162 | 311 | 1.99 | 0.195 | 5.595 | 0.061 | 0.07736 | 0.00079 | 5.606 | 0.062 | 0.07573 | 0.00104 | 1058 | 11 | 1088 | 27 | 2.7 |
| I | 17 | 16.2 | 122 | 98 | 0.83 | 0.219 | 5.529 | 0.070 | 0.07782 | 0.00104 | 5.541 | 0.071 | 0.07597 | 0.00139 | 1070 | 13 | 1094 | 37 | 2.3 |
| D | 2 | 2.1 | 175 | 159 | 0.94 | 0.224 | 5.573 | 0.059 | 0.07477 | 0.00077 | 5.585 | 0.059 | 0.07290 | 0.00105 | 1062 | 11 | 1011 | 29 | -5.0 |
| D | 6 | 6.1 | 258 | 215 | 0.86 | 0.023 | 5.629 | 0.055 | 0.07695 | 0.00067 | 5.630 | 0.055 | 0.07676 | 0.00070 | 1054 | 10 | 1115 | 18 | 5.5 |

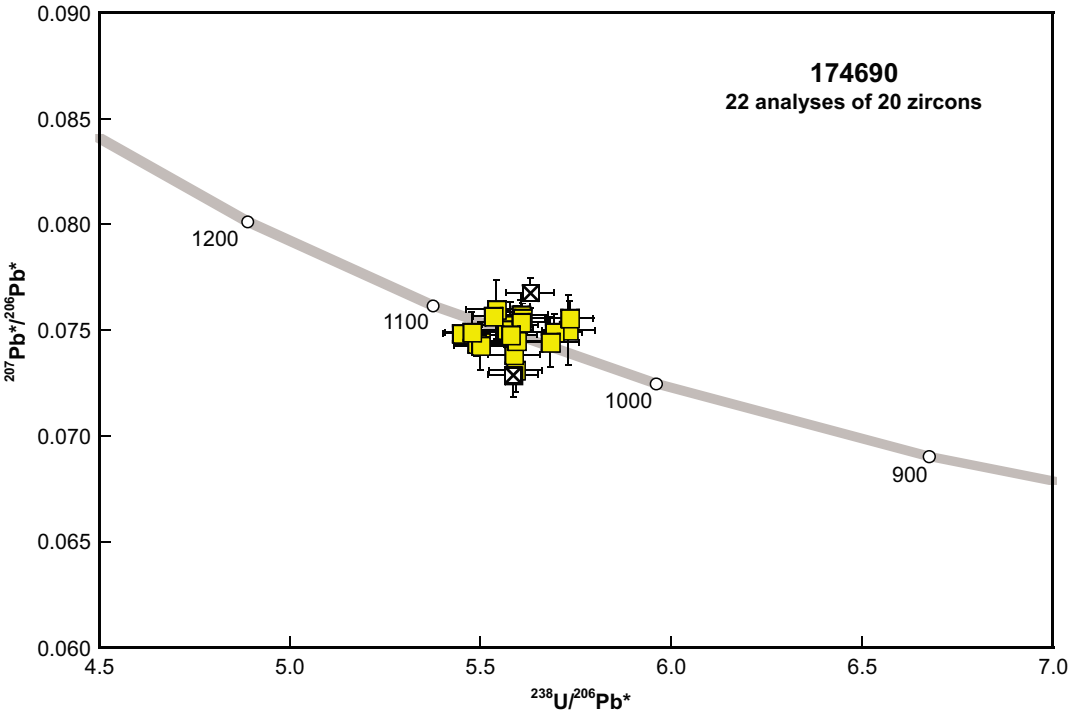


**Figure 2. U–Pb analytical data for sample 174690: rhyolite, Mount Weir. Yellow squares indicate Group I (magmatic zircons); crossed squares indicate Group D (discordance >5%).**