STRUCTURAL, GEOCHEMICAL AND ISOTOPIC INVESTIGATION OF GRANITOIDS WITHIN THE CENTRAL AREA OF THE EASTERN WEEKEROO INLIER, OLARY DOMAIN, SOUTH AUSTRALIA.

Damian Brett (B. Sc.)

Department of Geology and Geophysics
University of Adelaide

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ABSTRACT

In the central part of the eastern Weekeroo Inlier, Olary Domain, two types of granite have been identified. This thesis explores both granite types in order to explain possible tectonic environments and geological evolution during the Proterozoic.

The A-type Walter Outalpa granite is characterised by high SiO_2, Zr, Nb, Y, rare earth elements (REE) and low MgO, CaO, TiO_2, P_2O_5 and light field strength elements (LFSE). High zircon saturation temperatures differentiate this fractionated A-type granite from potential fractionated I-type granites. The peraluminous granite is characterised by high SiO_2, Al_2O_3, Rb, U, Th, and low MgO, CaO, TiO2, Sr and light REE. It displays strong geochemical similarities to the Bimbowrie S-type granite.

Consistent geochemical and isotopic characteristics for the Walter Outalpa granite and other similar A-type granites across the Olary Domain indicate a single regional crustal plus mantle source. Partial melting of lower Archaean crust due to lithospheric thinning is proposed. Geochemistry and isotopic analysis of the peraluminous granites suggest varying infracrustal sources for loosely grouped S-type granites in the Olary Domain.

Previous interpretations for the depositional environment of the Willyama Supergroup metasediments in a continental rift setting are supported by comagmatic A-type volcanics and granites within the central part of the eastern Weekeroo Inlier. An extensional environment during emplacement is consistent with evidence for shallow level emplacement such as graphic texture, and the absence of a contact aureole for the Walter Outalpa granite.

There is foliation development and evidence of folding for three deformation events during the Proterozoic Olarian Orogeny. Timing relationships between granitoids and metasediments in this area have constrained relative timing of emplacement. Low temperature solid state deformation affected the A-type Walter Outalpa granite after emplacement into Willyama Supergroup metasediments. Crosscutting relationships between the peraluminous granite and adjacent deformed metasediments imply a late to post D_2 emplacement for this granite.

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