Geochronological and Structural insights into the evolution of the Lower Burra and Callana Groups near Arkaroola: Structural mapping and U-Pb metamorphic monazite dating.

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William J. Morphett

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LOWER ADELADIAN: STRUCTURE AND METAMORPHISM

ABSTRACT

The lowermost sediments of the Adelaide Supergroup near Arkaroola display pronounced structural complexity and anomalously high metamorphic grade. The timing of the structures, fabrics and metamorphism in the region remain unconstrained, although all are currently interpreted to have occurred during the Delamerian Orogeny. Monazite U/Pb geochronology provides a useful technique for dating amphibolites facies rocks and, combined with map scale and micro structural observations, suggests the peak metamorphism and at least one deformation event occurred significantly earlier than the Delamerian Orogeny. Monazite derived $^{206}Pb/^{238}U$ age estimates place the timing of peak metamorphism at 705.2±7.4 Ma with observations from thin section revealing a bedding parallel fabric pre-dating peak metamorphism. U/Pb analysis also reveals a second monazite growth event at 644.2±8 Ma the cause of which is hypothesised to be fluid related. Regional folding and axial planar fabric generation post-dates this metamorphism and can be seen to overprint the earlier fabric and wrap the cordierite porphyroblasts. This final deformation event remains largely unconstrained as in situ dating of monazite was not possible in this study. The inferred parasitic relationship between the folds within the studied region and the Arkaroola Syncline which folds the youngest sediments in the Adelaidian Sequence allows for the deposition to be constrained subsequent to the conclusion of the Adelaide Rift Complex.

KEYWORDS

Geochronology, structural geology, Burra Group, Callana Group, metamorphism, monazite, LA-ICP-MS, amphibolites, Arkaroola, Paralana.

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