

Structural and Metamorphic
Conditions of the Lower Burra Group
and Callana Group at Arkaroola,
Northern Flinders Ranges

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THE STRUCTURAL AND METAMORPHIC CONDITIONS OF THE LOWER BURRA GROUP AND CALLANA GROUP AT ARKARoola, FLINDERS RANGES

EVOLUTION OF LOWER ADELAIDEAN, ARKARoola

ABSTRACT

The lowermost Adelaidean sequences exposed to the immediate north of Arkaroola are unusual as they exhibit a localised complexity of deformation and elevated metamorphic grade that is not observed elsewhere in the Adelaide Fold Belt. Deformation and metamorphism in Arkaroola is thought to have formed as part of the Delamerian Orogen approximately 515-490 Ma. The timing of deformation and metamorphism however is poorly constrained in this area. This paper aims to discuss the structural and metamorphic conditions in the area to determine if there was a possibility of a pre or post-Delamerian structural and/or thermal event.

A section was mapped to the North-East of the Arkaroola Homestead to gain an insight into the structural and metamorphic conditions of the area. Samples were collected from the field and used for microstructural analysis. An Electron Microprobe, Laser Ablation Inductively Coupled Plasma Mass Spectrometer and an XRF spectrometer were used for geochemical analysis on the samples. Structural and stratigraphic observations combined with microstructural analysis of samples from the field helped the author create an interpreted geological history of the area.

Graben formation accommodated an initial period of sediment deposition followed by basalt extrusion. Several phases of localised rifting and deposition followed this initial deposition period due to changing fault geometries. A mineral fabric that occurs parallel to bedding is seen throughout the study area. This fabric is overgrown and included in prominent cordierite porphyroblasts that formed during peak metamorphism of ≥ 500 °C at a pressure of approximately ~ 1.30 kbars. These pressure and temperature conditions were primarily due to the burial beneath a thick cover of sediments. A number of faults trending in a NE-SW direction have been identified as splays from the Paralana fault system. The strike-slip movement of the Paralana Fault along with the high heat producing basement of the Mount Painter Inlier has controlled the localised structural complexity and elevated metamorphic grade in the Arkaroola area.

KEYWORDS: STRUCTURAL, METAMORPHIC, DEFORMATION, PORPHYROBLAST, CORDIERITE, FOLD, FABRIC, MANTLING RING

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