

THE UNIVERSITY OF ADELAIDE

**Evolution of the basal Adelaidean in the northern Flinders Ranges:
deposition, provenance and deformation of the Callanna and lower
Burra Groups**

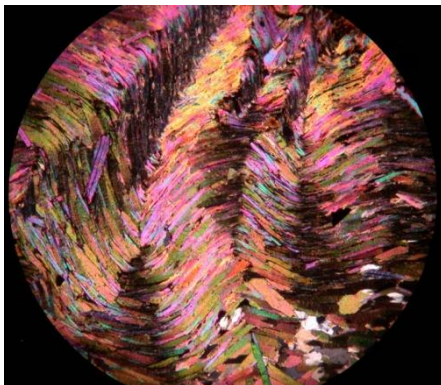
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ABSTRACT

The rift and deformational evolution of the Adelaide Fold Belt's northern-most extent, the northern Flinders Ranges, has received comparatively little attention than that of the southern Adelaide Fold Belt. The Arkaroola area, located in the mid-north northern Flinders Ranges, exposes the lowermost Adelaidean stratigraphy of this rift complex, the Callanna and lower Burra Groups, in a near complete sedimentary sequence. The rift history of this stratigraphy is complex, with deposition being largely controlled by the northeast-southwest orientated Paralana Fault and similarly orientated local growth faults. Locally, the Paralana Fault deviates from its regional orientation and forms a north-south striking segment, which under a considered sinistral strike-slip regime during extension would potentially create localised transtension in a 'releasing bend' environment. Rifting in the Arkaroola area is therefore considered to be analogous to the formation of a pull-apart basin.

U-Pb dating of detrital zircons from the Paralana Quartzite, Humanity Seat Formation and Blue Mine Conglomerate from the Callanna and lower Burra groups yields ages that are comparable to local source regions the Gawler Craton, Mount Painter Basement Complex and the Curnamona Province, and suggest proximal derivation during early rift phases. Sm-Nd bulk rock analysis on the finer grained Woodnamoka Formation implies derivation from the Mount Painter Basement Complex or the upper Willyama Supergroup of the Curnamona Province, the latter of which potentially suggests a more distal provenance region outside of the Australian continent.

Deformation in the northern Flinders Ranges has previously been largely ascribed to the *ca.* 500 Ma Delamerian Orogeny. However, the Arkaroola area exhibits complex deformation not observed in the directly overlying gently folded stratigraphy. Reactivation of pull-apart rift structures during transpression is considered a possible mechanism for producing and localising such deformation. The possibility of an early Neoproterozoic deformational event occurring prior to deposition of the lesser-deformed overlying stratigraphy is also considered, but in lieu of an unequivocal orogenic unconformity, cannot be confidently ascribed. Temporal constraints defined by this study are too broad to accurately define the timing of deformation, and therefore its timing and potential relationship to the Delamerian Orogeny remains largely enigmatic.

Key Words: northern Flinders Ranges, Mount Painter Province, Arkaroola, Adelaidean, Rifting, Deformation, Provenance, Detrital U-Pb, Bulk rock Sm-Nd, Transtension, Transpression