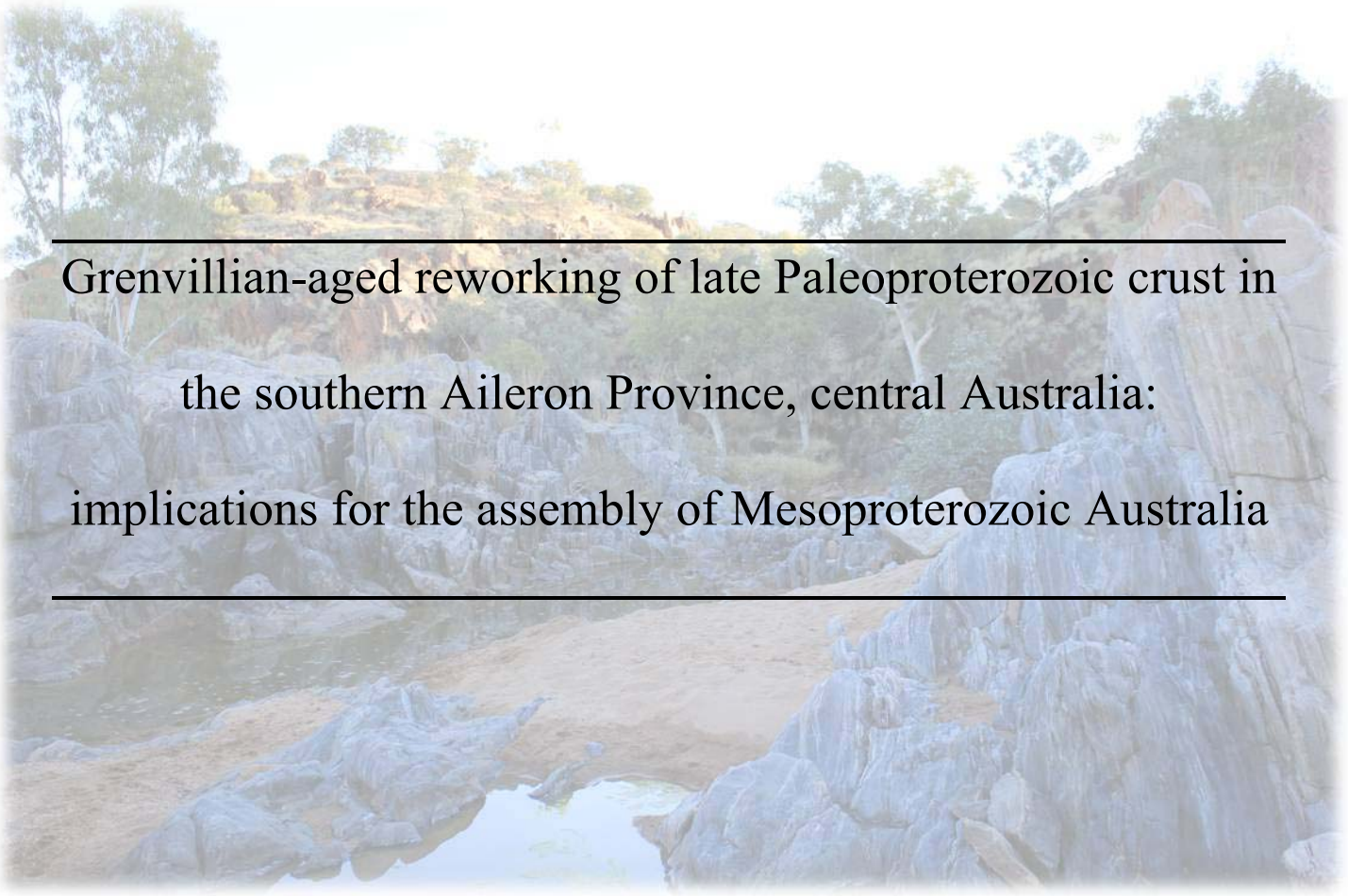

Grenvillian-aged reworking of late Paleoproterozoic crust in the southern Aileron Province, central Australia: implications for the assembly of Mesoproterozoic Australia

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October 2011

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1 ABSTRACT

In situ monazite age dating from granulite facies metapelites along the southern margin of the Aileron Province in the North Australian Craton reveal the presence of a regional-scale Grenvillian (*c.* 1130 Ma) deformation system. Grenvillian-aged deformation has been geochronologically constrained along a strike distance of ~110 km, and includes gneissic rocks within the migmatitic Teapot Complex, which has been previously interpreted to record localised static high-temperature Grenvillian conditions. The Grenvillian ages are identical to recently recognised deformation further south in the southern most Aileron Province and the adjoining eastern Warumpi Province. The deformation produced map-scale E-W trending folds and shear zones, and defines the structural architecture of the interface region between the Aileron and Warumpi Provinces. Folds are generally shallow westerly plunging with deformation associated with partial melting. The structures evolved with time into shear zones and mylonites that record south-side up movement. Phase equlibria modeling on metapelitic assemblages in the central Wigley Block north of Alice Springs indicate that Grenvillian conditions were around 8.5 kbars and 800°C. The development of syn-deformation cordierite-bearing assemblages at the expense of garnet-sillimanite-biotite-bearing associations indicates that decompression accompanied deformation, and is probably a pressure response to the south-up movement recorded in the shear zones. The Grenvillian deformation overprints earlier high-grade metamorphism which occurred at *c.* 1630 Ma, and is recorded by the formation of metamorphic zircon rims in migmatised granitic gneisses, whose protoliths intruded between 1650 and 1630 Ma. The ages of the granites are comparable with those in the Warumpi Province to the south, suggesting that the southern Aileron Province and the Warumpi province may share a magmatic history. This could suggest that the Warumpi Province is not exotic to the North Australian Craton as previously suggested. Metapelites in the Wigley Block also record monazite ages of *c.* 1600 Ma and *c.* 1720 Ma, which could indicate that the Grenvillian event overprinted a complex late Paleoproterozoic metamorphic history. However the complexity in the monazite age data is not easily reconciled with the texturally simple metapelitic assemblages, and potentially these old monazite ages are detrital. Detrital zircons in the metapelites indicate erosion of source regions containing *c.* 1830 Ma and older zircons, but also have a range of concordant ages between *c.* 1590 and 1755 that may represent metamorphically induced partial Pb loss. The Grenvillian deformation belt sits above a lithospheric-scale

structure that that has been imaged dipping southward at ~ 45° to depths of at least 200 km. This feature has previously been interpreted to be a late Paleoproterozoic fossil subduction zone. However the presence of kinematically comparative regional scale Grenvillian deformation in the crust about this feature introduces the possibility that it is a Grenvillian subduction system, with the deformation recording suturing of the North Australian Craton with rocks comprising of the Musgrave Province and the South Australian Craton.

Key words: Grenvillian-aged reworking, Proterozoic Australia, southern Aileron Province, *in situ* monazite geochronology, zircon geochronology, phase equilibra modelling