



THE UNIVERSITY OF ADELAIDE

Department of Geology and Geophysics

**Proterozoic tectonic models with application
to the Mount Painter Inlier**

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Abstract

Since many features of Proterozoic orogenic belts are difficult to reconcile with classical plate tectonic theory, alternative mechanisms have been developed to explain phenomena such as high-temperature–low-pressure metamorphism and distinctive intracratonic geochemistry, as seen in the Mount Painter Inlier and other Proterozoic orogenic belts. Delamination of part or all of the mantle lithosphere may play an important role in initiating, localising or terminating convergent deformation in ensialic (intracratonic) settings. The ‘thin sheet’ model presented here investigates the mechanical plausibility and consequences of ensialic mantle lithosphere delamination. Results indicate that mantle lithosphere delamination will initiate and localise convergent deformation given sufficient tectonic driving forces. Mantle lithosphere delamination from a thickened lithosphere may lead to extensional collapse.

Two discrete Proterozoic tectonothermal events were recognised in the Mount Painter Inlier. Syn-post kinematic, high-temperature metamorphism and plutonism indicates heating may have post-dated deformation and that mantle lithosphere delamination may have occurred in response to thickening.