

Geochronology, Geochemistry and Petrogenesis of Mafic Magmatism in the Coompana Province

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ABSTRACT

The Coompana Province between the Gawler Craton in South Australia and the Yilgarn Craton in Western Australia is one of the least understood geological regions in Australia. Recent work by Spaggiari and Smithies (2015) suggests that the known crustal precursors in the Coompana Province originated in a new crustal generation event at ca. 1900 Ma. This new juvenile crustal element then evolved through three distinct reworking and magmatic events at ca. 1610 Ma, ca. 1500 Ma, and between ca. 1192 – 1150 Ma (Wade et al., 2007; Spaggiari and Smithies, 2015). Dating of mafic volcanics underlying the Bight Basin in the south-eastern Coompana Province using the Sm-Nd mineral isochron method has revealed a fourth distinctive episode of mafic magmatism at ca. 860 Ma. The geochemical and Nd-isotopic signatures of ca. 860 Ma mafic magmatism, including Nb and Ti anomalies, LREE enrichment, K-anomalies, and highly evolved $\epsilon\text{Nd}_{(860\text{Ma})}$ values between -9.9 and -12.7 provide evidence for assimilation and reworking of subduction/arc related Coompana Province crust. Magmatism at ca. 860 Ma in the Coompana Province was most likely coeval with widespread magmatism that occurred over Central and Southern Australia between ca. 800 – 830 Ma. Magmatism during this period was associated with the NE-SW directed intracratonic extension that resulted in the Centralian Superbasin, and produced various suites of mafic volcanics and intrusives referred to collectively as the Willouran Basic Province. We suggest that the Willouran Basic Province now be extended to include the ca. 860 Ma mafic volcanics and intrusives in the south-eastern Coompana Province.

KEYWORDS

Neoproterozoic; Coompana Province; Mafic magmatism; Sm-Nd geochronology; Willouran Basic Province

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