PROVENANCE OF METASEDIMENTARY ROCKS IN THE WESTERN GAWLER CRATON: GEOCHEMICAL, ZIRCON U-PB, LU-HF AND WHOLE-ROCK SM-ND ISOTOPIC CONSTRAINTS

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The Fowler Domain defines a prominent geophysical belt in the far western Gawler Craton, Southern Australia. Due to the paucity of outcrop, the tectonic history of the Fowler Domain is largely unknown. However, its role in Proterozoic Australia has been discussed in a number of papers, most of which suggest that the Fowler Domain records deformation close to the leading edge of a microcontinent that in some way accreted to older rocks of either the Proto Gawler Craton or the Yilgarn Craton. Presently there are few constraints on the timing of deformation within the Fowler Domain or the origin of the metasedimentary rocks that comprise parts of the structural blocks.

Here we present LA-ICPMS U-Pb age data, MC-ICPMS Lu – Hf data and Nd isotopic data from metasedimentary units intersected in drill core in the central and northeastern Fowler Domain that constrain the provenance of sedimentary rocks, the timing of deposition, and regional high-grade metamorphism.

U-Pb data from detrital zircons from the central Fowler Domain provide maximum depositional ages between 1760 and 1700 Ma, with rare older detrital components ranging in age up to 3130 Ma. In the bulk of metasedimentary samples, $\varepsilon_{Nd\ (1700Ma)}$ values range from -4.3 to -3.8. The combination of data suggests comparatively evolved source regions which provide restricted aged zircons. Hf isotopic data from the ca. 1700 Ma aged zircons provide a wide range of values ($\varepsilon_{Hf\ (1700Ma)}$ +6 to -6) indicating derivation from a mixture of mantle and crustal material.

Metamorphic monazite U-Pb ages from the transitional granulite-grade metasedimentary rocks are between 1690 to 1670 Ma, suggesting that the Fowler Domain records the latter stages of the Craton-wide Kimban Orogeny. The timing of tectonism provides minimum depositional age constraints and brackets the time of basin development for some areas of the Fowler Domain to between ca. 1700-1690 Ma. These constraints indicate that basin development may have been in part synchronous with the Kimban Orogeny and immediately preceded medium to high grade metamorphism.

The timing of basin development and metamorphism in the Fowler Domain coincides with that in the northern and eastern Gawler Craton, suggesting protoliths to the rocks within the Fowler Domain may have originally formed part of a large c. 1750-1730 Ma basin system in the southern Australian Proterozoic. In this case, there is no compelling case that the Fowler Domain represents a microcontinental domain that was accreted to the Gawler Craton.