The State-of-play of geochronology and provenance in the Neoproterozoic Adelaide Rift Complex

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The Adelaide Rift Complex is a large sedimentary superbasin in South Australia that formed resultant of Rodinia’s breakup and subsequent evolution of the Australian passive margin of the Pacific basin. It holds a globally significant and exceptionally well-preserved Neoproterozoic–early Cambrian succession. Much work has been done over the last century describing the lithostratigraphy and sedimentology of this vast basin. The rift complex contains evidence for major changes in Earth’s systems, yet, the rocks are poorly dated, and the sediment provenance, and link with tectonic evolution, is remarkably poorly known.

This work provides a centralised database of the currently available, and previously unpublished, detrital zircon geochronology for the Neoproterozoic of the Adelaide Rift Complex, highlighting where the available data is from, and the stratigraphic and spatial gaps in our knowledge. By subjecting the U–Pb detrital zircon data to data analytical techniques, we provide a first look overview of the change in provenance, and subsequently (generalised) palaeo-tectonogeography that this suggests during the Neoproterozoic. These data show a change from dominantly local sources in the middle Tonian, to dominantly far-field sources as the rift-basin develops over time. The Cryogenian icesheets punctuate this with an ephemeral return to more local sources from nearby rift shoulders. This effect is particularly apparent during the Sturtian Glaciation than in the younger Marinoan Glaciation. In the Ediacaran, we see an increasingly stronger influence of younger (<700 Ma) detrital zircons from an enigmatic source that we interpret to be from southern (i.e. Antarctic) sources. We also note that we see a slight shift in the late Mesoproterozoic age peaks, from ca. 1170 Ma to ca. 1090 Ma, with a corresponding decrease in older ca. 1600 Ma detritus.

This work forms the basis of continuing work to improve our understanding of the geochronology, provenance and palaeo-tectonogeography of the Adelaide Rift Complex.