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# Selectively targeting authigenic and detrital components in impure chemical sedimentary rocks of the 1.85 Ga Duck Creek Dolomite, Western Australia

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Chemical sedimentary rocks, and specifically Archean and Paleoproterozoic iron-formations, have been extensively studied for their capacity to record past seawater redox conditions, tracking the fluctuations leading up to and following the c. 2.4 Ga Great Oxidation Event. One problem in this quest, however, is that even small amounts of admixed continental material would obscure authigenic signals due to the mostly low concentrations of redox-sensitive elements in seawater.

Here we combine sedimentological and stratigraphic information with geochemical data from the upper part of the c. 1.85 Ga Duck Creek Dolomite in Western Australia. This unit consists of stromatolitic and abiogenic bedded dolomites, carbonate-rich hematitic ironstones and jaspillites with high Al and Th concentrations indicating significant detrital contamination. All lithologies return mostly flat, elevated rare-earth element patterns rendering them unsuitable for traditional redox investigations. Hence, we applied classic isotope-geochemical approaches to target the detrital component and constrain its composition, age and source, while testing for potentially remaining authigenic information using the Rb-Sr isotope system.

Bulk rock Rb-Sr isotope systematics plot on an errorchron of 1824±65 Ma, similar to the stratigraphically extrapolated depositional age and within error of the U-Pb zircon age of 1799±8 Ma [1] from the overlying June Hill Volcanics. This errorchron either represents syn-depositional closure of the Rb-Sr system or a metamorphic resetting caused by the June Hill Volcanic event. The initial $^{87}Sr/^{86}Sr$ ratio of 0.7077 lies close to the proposed seawater evolution curve at this time interval [2], but does not allow to confirm or exclude either of the possibilities.

Sm-Nd are mainly sourced from continental, detrital minerals with a narrow range in $\varepsilon Nd_{1.85Ga}$ values from -5.5 to -4.4, revealing a homogenous composition with little variation in the source(s) lithology. The mean $T_{DM}(Nd)$ is 2.65 Ga, indicating the approximate age of the source(s).

Our study showcases that through careful consideration of individual elements and use of targeted isotopic systems, data may still be gathered from detritally contaminated chemical sedimentary rocks regarding depositional environment and provenance.

[1] Evans, D. et al. (2003), *Australian Journal of Earth Sciences* 50, 853–864

[2] Chen, X. et al. (2022), *Earth-Science Reviews* 224, 103869