Marine Carbonates as Paleoceanographic Indicators: A test of the hypothesis

A. SHUSTER[1*], M. WALLACE[1] AND A. VS HOOD[2]

[1]School of Earth Sciences, University of Melbourne, Parkville, VIC 3010, Australia (*correspondance: ashuster@student.unimelb .edu.au)

[2]210 Whitney Ave, New Haven, CT 06511, USA (ashleigh.hood@yale.edu)

Marine carbonates are not generally considered as reliable indicators of ancient ocean chemistry because of their susceptibility to diagenetic alteration. Shale geochemistry is often considered a more robust method. Here, we investigate the use of Neoproterozoic marine carbonates as indicators of paleoceanography.

We collected and analysed Tonian carbonates from the Beck Spring Dolomite, Death Valley, U.S.A. Petrographic and geochemical examination reveal well-preserved marine dolomite cements with synsedimentary dolomitization of depositional constituents.

The degree of detrital contamination was determined by laser ablation analysis, in both depositional constituents (microbialites and ooids) and in marine cements. Concentrations of Al, Th and total rare earth elements (REE_T) where used as indicators of contamination from silicates and oxides. Well-preserved marine cements contain very low levels of detrital clastic material (low concentrations of Al, Th and REE_T) and their chemical composition represents a window into early Neoproterozoic ocean chemistry.

We find that ocean oxygenation can be tracked using redox sensitive REEs such as Ce. Our results suggest anoxia in the Neoproterozoic, with negligible Ce anomalies present (mean Ce/Ce^*_N of 1.0) and MREE enrichment. Positive Eu anomalies (mean Eu/Eu^*_N of 1.94) appear to be marine in origin and are perhaps related to global anoxia.