Redox conditions in the latest Mesoproterozoic

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There are still gaps in our understanding of Mesoproterozoic (~1.8 – 0.8 Ga) redox conditions. To provide new constraints in this critical interval, we have investigated the Arctic Bay formation in Arctic Canada. The Arctic Bay formation of the Borden Basin, northern Baffin Island, is a black shale unit of latest Mesoproterozoic age (~ 1092 Ga) [1]. We determined the iron speciation trace element enrichments, and chromium and Mo isotopes values to improve our understanding of atmospheric and marine redox conditions just prior to the diversification of complex life. Iron speciation data indicate deposition under primarily anoxic conditions. These constraints, independent from trace element data, allow use of redox sensitive trace element concentrations (Mo, U, and V) to track the extent of global marine redox, Trace element concentrations reveal enrichments of redox sensitive Mo and U similar to other anoxic to euxinic Proterozoic basins [2] [3]. Mo values indicate 1 – 10% of the seafloor was euxinic at the Meso-Neoproterozoic [2], while the U record is consistent with Mesoproterozoic values indicating persistent and widespread reducing conditions [3]. Cr isotope data fall within bulk crustal values indicating < 0.1% PAL, consistent with Proterozoic ironstone data [4]. However, we found strong vanadium enrichments. A drawdown of the marine V reservoir would be expected under the widespread anoxic conditions, yet the opposite is observed. This pattern of V enrichment may be linked to widespread suboxic marine conditions, which can act as a source for V, allowing buildup in the marine reservoir [5].

[1] Turner & Kamber (2012), *Precamb. Res* [2] Reinhard *et al.* (2013), *PNAS* [3] Partin *et al.* (2013), *EPSL* [4] Planavsky, *et al.* (2014), *Science*. [5] Thomson *et al.* (2015), *Precamb. Res.*