Sea-water ^{231}Pa and ^{230}Th measurements, understanding the proxy in the S.E. Atlantic?

A.L. THOMAS AND G.M. HENDERSON

Department of Earth Sciences, South Parks Road, Oxford, OX1 3AN (*correspondence: alext@earth.ox.ac.uk)

A recent paleo record of ^{231}Pa/^{230}Th from the South Atlantic [1], has been interpreted as evidence for reversed flow of deep water at the last glacial maximum relative to the modern circulation. The ability of the ^{231}Pa/^{230}Th proxy to accurately reflect past paleoceanographic conditions is crucial to the interpretation of such down core records, and this accuracy has been questioned in another recent study [2], using an inverse approach to test whether paleo data is consistent with modern circulation. Currently, our understanding of the controls on sedimentary ^{231}Pa/^{230}Th, limits the robustness of our interpretations of this proxy. We present new ^{231}Pa and ^{230}Th measurements from the South Atlantic, collected on a UK-GEOTRACES cruise (D357; GA10) at 40°S, and compare to local sedimentary data to shed light on the regional controls on sedimentary ^{231}Pa/^{230}Th and hence asses the robustness of down core interpretations. By comparison with data from elsewhere in the Atlantic this data indicates the role of water masses and processes such as boundary scavenging on the ^{231}Pa/^{230}Th proxy and therefore points to the robustness of the proxy for past reconstruction.

[1] Negre *et al*. (2010) *Nature* **468**, 84–88. [2] Burke *et al*. (2011) *Paleoceanography* **26** PA1212.

Pre-Sturtian euxinia and ocean chemistry: Evidence from the Coppercap Formation in Northwest Territories, Canada

K. THOMAS[1], C. HALLMANN[1], F. MACDONALD[2], R. SUMMONS[1] AND S. ONO[1]

[1]Massachusetts Institute of Technology, Cambridge, MA (katthomas@mit.edu, hallmann@mit.edu)

[2]Harvard University, Cambridge, MA (fmacdon@fas.harvard.edu)

The mechanisms that lead to the onset of the Late Proterozoic global glaciations are yet unresolved but can be correlated through globally observed chemostratigraphical changes [1]. In interpreting the geochemical evidence from this time period, critical analysis of global versus regional effects [2] comes into play in determining the true extent of marine euxinia. Here we present a geochemical record of paired carbonate associated sulfate ($\delta^{34}S_{CAS}$) and pyrite ($\delta^{34}S_{pyr}$), organic carbon ($\delta^{13}C_{org}$) and carbonate ($\delta^{13}C_{carb}$) along with lipid biomarker analysis of the Coppercap Formation in the Northwest Territories, Canada, which was deposited just prior to the onset of the Sturtian glaciation.

Trimethylarylisoprenoids carotenoid-derived lipids indicative of purple and green sulfur bacteria were found throughout the section and indicate persistent euxinia in the shallow sediments deposited in a syn-rift basin. We observe an average $\Delta^{34}S_{CAS\text{-}Pyr}$ of ~ 25‰ which is typical for Neoproterozoic deposits [3] [4]. Increased burial of organic carbon and sedimentary sulfide is implicated from an isotopic shift in $\delta^{13}C_{carb}$ and $\delta^{34}S_{CAS}$. Severe euxinic conditions mid-section is evidenced from increased concentrations of arylisoprenoids and which coincides with a ~15‰ increase in $\delta^{34}S_{CAS}$, showing an interplay between more restricted conditions and marine ingressions. The implications of these geochemical signals and biomarker distributions are placed into a context of the onset of the Late Proterozoic glaciations.

[1] F. Macdonald *et al*. (2010) *Science* **327** 1241–1243. [2] D. Johnston *et al*. (2010) *EPSL* **290** 64–73. [3] M. Hurtgen *et al*. (2005) *EPSL* **203** 413–429. [4] D. Fike *et al*. (2006) *Nature* **444** 744–747.