A new benthic Mg/Ca temperature calibration to reconstruct thermocline temperature variability in the Indonesian archipelago

E. LO GIUDICE CAPPELLI[1] *, A. HOLBOURN[1], W. KUHNT[1] AND M. REGENBERG[1]

[1] Institute of Geosciences, Christian-Albrechts-University, Kiel, Germany
(*correspondence: elgc@gpi.uni-kiel.de)
(ah@gpi.uni-kiel.de)
(wk@gpi.uni-kiel.de)
(regenberg@gpi.uni-kiel.de)

23 Multi-corer core tops representing a range of modern bottom water temperature (BWT) between 3°C and 8°C and covering a water depth between 500 and 2000 m were retrieved from the Makassar Strait (Indonesia) and the Timor Sea to produce a regional BWT calibration. Mg/Ca ratios of the benthic foraminifer *Hoeglundina elegans* show an exponential relation with temperature ($Mg/Ca=0.21e^{(0.23BWT)}$ $R^2=0.91$). This relationship differs significantly from previous calibrations [1, 2], but shows similarity to a later re-calibration [3]. We applied our calibration to sediment core SO18471, retrieved within the lower thermocline of the Indonesian Throughflow (ITF) outflow into the Timor Sea (9°21.987' S, 129°58.983' E, 485 m water depth, 13.5 m length). In core SO18471, we measured Mg/Ca ratios in ~10 tests of *H. elegans* in 10 cm intervals (~1-2 kyr time resolution) to reconstruct thermocline temperature variability. We based the age model on 5 AMS ^{14}C dates and on correlation of our benthic oxygen isotope curve to the Antarctic EDML1 ice core [4]. Preliminary results show that BWT varied from 5 to 10°C over the last 140 kyr (present day BWT is 8°C). During periods of relatively high sea level, thermocline waters cooled and freshened, suggesting a gradual shift from surface to thermocline dominated ITF. In contrast, during sea level lowstands, thermocline temperatures increased, supporting the hypothesis of a reduced thermocline flow during glacials. Although sea level variations appear to be the main control on ITF variability, changes in the global thermohaline circulation and the Australian-Asian monsoon were also influential. Our data suggest that cooling events in the Northern Hemisphere during MIS 3 led to a reduction in ITF intensity, resulting in higher thermocline temperatures in the Timor Strait.

[1] Rosenthal *et al*.. (2006) *Paleoceanography* **21**, PA 1007. [2] Reichart *et al*.. (2003) *Geology* **31**, 355-358. [3] Ní Fhlaithearta *et al*.. (2010) *Paleoceanography* **25**, PA4225. [4] Ruth *et al*.. (2007) *Clim. Past Discuss*. **3**, 349-574.

Biogeochemical cycle of dissolved zinc and cobalt in the South Atlantic

M.C LOHAN[1*], N.J. WYATT[1], A.MILNE[2] AND E.M. WOODWARD[3],

[1]Marine Institute, Univeristy of Plymouth, Plymouth, Pl4 8AA, U.K. (*correspondence: maeve.lohan@plymouth.ac.uk
[2]SoGEES, University of Plymouth, Plymouth, Pl4 8AA
[3]Plymouth Marine Laboratories, Plymouth, PL1 3DH, U.K.

We report the first comprehensive dataset of dissolved zinc and cobalt along the South Atlantic 40ºS transect as part of the UK GEOTRACES programme. To date there is little understanding of the supply of Zn and Co which are essential requirement for phytoplankton growth, to this highly productive region. Surface concentrations of zinc and cobalt were extremely low with a pronounced subsurface minima (25pM and 10pM respectively) reflecting the biological uptake in this highly productive region. Prochlorococcus has an absolute cellular requirement for cobalt. Where the phytoplankton biomass was dominated by prochlorococcus, highest concentrations of cobalt were observed below chlorophyll max, indicating a biological control on the vertical flux of cobalt.

The vertical distributions of Zn and Co were similar to soluble reactive phosphorus. The ecological stoichiometry for dissolved Co and Zn ($Co:PO_4^{3-}/Zn:PO_4^{3-}$ ratio 1:1) suggests that both Zn and Co are influencing phytoplankton diversity.

A strong correlation was observed between zinc and silicate across the entire study region ($R^2 = 0.97$, $n = 460$). By utilizing Si* as a tracer for Subantarctic Mode Water, our data indicate that the preferential removal of Zn in the Southern Ocean prevented a direct return path for dissolved Zn to the surface waters of the South Atlantic at 40ºS, and potentially the thermocline waters of the South Atlantic subtropical gyre.

www.minersoc.org
DOI:10.1180/minmag.2013.077.5.12