Geophysical Research Abstracts, Vol. 7, 02842, 2005
SRef-ID: 1607-7962/gra/EGU05-A-02842

Controls on ^{231}Pa and ^{230}Th in waters and sediments of the western Indian Ocean: implications for the use of ^{231}Pa/^{230}Th as a proxy for past ocean circulation

A. L. Thomas (1), G. M. Henderson (1), L.F. Robinson (2)

(1)Department of Earth Science, Parks Road, Oxford, OX1 3PR, United Kingdom, (2) California Institute of Technology, MS 100-23,1200 East California Boulevard, Pasadena, CA 91125, USA (alext@earth.ox.ac.uk)

The use of $(^{231}\mathrm{Pa}_{xs}/^{230}\mathrm{Th}_{xs})^0$ as a proxy for ocean circulation is becoming more widespread (e.g. McManus et al, 2004)..... Most applications of this tool have been conducted in the North Atlantic region where deep waters have recently formed. The behaviour of ^{231}Pa and ^{230}Th in regions where the oceanography is more complex may limit the application of this proxy. Here we assess the controls on water column and sediment ^{231}Pa and ^{230}Th concentrations in the western Indian Ocean. This is an area where several water masses interact, including the remnants of North Atlantic Deep Water, and bottom waters from the Southern Ocean which flow northwards to fill the deep Indian Ocean. The region therefore offers potential to understand ^{231}Paand ^{230}Th behaviour in a region of complex oceanography and, potentially, to use these nuclides to assess the past rate of deep water flow into the Indian Ocean.

We present both water column and sediment data. Five water column profiles of 10 litre unfiltered water samples were collected from 33˚S to 10˚S close to 50˚E on Charles Darwin Cruise 129 (McCave, 2002). ^{230}Th profiles are similar to the global mean with ^{230}Th concentrations increasing with depth, without any indication of the high ^{230}Th seen in Southern Ocean source waters. In contrast, ^{231}Pa concentrations shows significant variation, apparently reflecting the various water masses. To understand paleodata from sediments underlying this region will be complicated by the fact that different water masses have different flow characteristics and ^{231}Pa concentrations. In particular, it is important to understand from what depth in the water column Pa and Th are scavenged from. To assess this we have used a simple 1D particle

scavenging model, involving particle settling, aggregation and disaggregation. The model suggests that the paleo signal is representative of only the bottom few hundred meters of the water column. This is at odds with the common assertion that sediment ($^{231}Pa_{xs}/^{230}Th_{xs}$) represents conditions in the entire overlying water column. In the western Indian Ocean, this results suggests that the sedimentary signal can be used to investigate the history of deep water inflow to the Indian basin. Ongoing ($^{231}Pa_{xs}/^{230}Th_{xs}$) analysis on a 6m kasten core from beneath the northern most water column profile will be used to explore this issue.

.McManus, J.F., Francois, R., Gherardi, J.-M., Keigwin, L. and Brown-Leger, S., 2004. Collapse and rapid resumption of Atlantic meridional circulation linked to deglacial climate changes. Nature, 428: 834-837.