Geophysical Research Abstracts, Vol. 7, 02389, 2005
SRef-ID: 1607-7962/gra/EGU05-A-02389

Pa/Th as paleo-circulation proxy: Separating the effects of particle scavenging and circulation

R. Schlitzer (1), O. Marchal (2) and M. Siddall (3)

(1) Alfred Wegener Institute for Polar and Marine Research, Bremerhaven (rschlitzer@awi-bremerhaven.de), (2) Woods Hole Oceanographic Institution, Woods Hole (omarchal@whoi.edu), (3) Physics Institute, University of Bern (siddall@climate.unibe.ch)

The radioisotopes 231Pa and 230Th are produced in the ocean in well-known and nearly constant rates and ratios. Both isotopes are removed from the water column by adsorption onto particles and subsequent deposition in the sediments (scavenging). In general, Pa is less effectively scavenged than Th, and a larger fraction of Pa (relative to Th) remains in the dissolved phase. Ocean transport (advection and diffusion), therefore, leads to preferential lateral exports of Pa and can cause a decrease of 231Pa/230Th ratios in local sediments. Changes in the 231Pa/230Th isotope ratios are documented in sediment cores from the western North Atlantic, and have recently been interpreted as variations of the strength of the North Atlantic meridional overturning circulation during the last deglaciation.

Here we present results from three different ocean models that include the effects of equilibrium particle scavenging in addition to the effects of circulation and mixing. These models allow us to separate physical from biogeochemical processes. More specifically, comparisons between the simulated radioisotope distributions (dissolved and particulate phases) and available data allow us to test different hypotheses about particle affinity and circulation patterns and strengths. Topics addressed in the talk include the role of different particle types (dust, opal, CaCO3, POC) and the effect of changes in the strength and location of ocean currents.