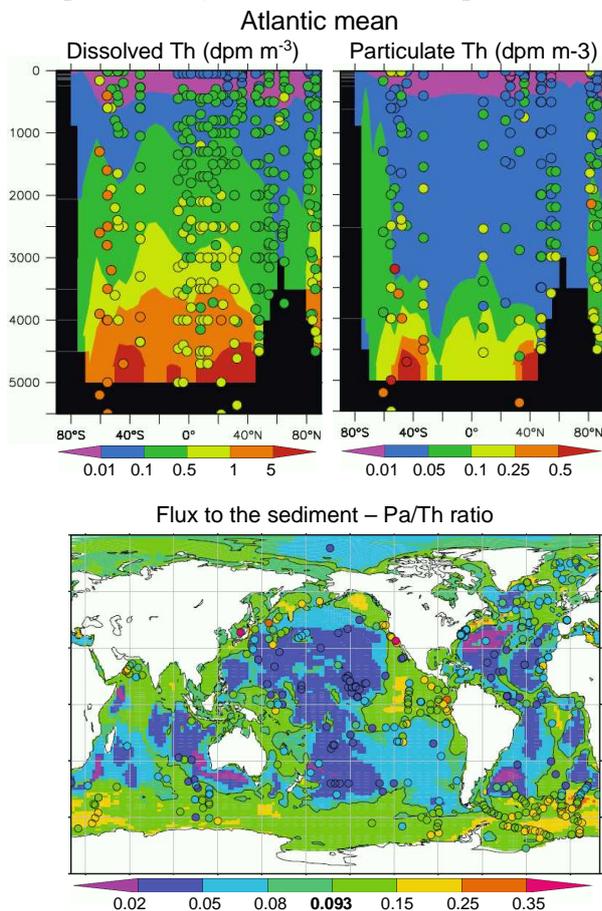


GEOMAR SHEET#11, PARTICLE CYCLES ^{231}Pa AND ^{230}Th SIMULATION WITH A GLOBAL COUPLED BIOGEOCHEMICAL-OCEAN GENERAL CIRCULATION MODEL
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The oceanic distributions of ^{231}Pa and ^{230}Th are simulated with the global coupled biogeochemical-ocean general circulation model NEMO-PISCES. These natural non-conservative tracers, which are removed from the water column by reversible scavenging onto particles have been used to study modern and past ocean circulation. The model includes three different types of particles: particulate organic matter (POM), calcium carbonate (CaCO_3), and biogenic silica (BSi). It also considers two particle classes: small particles (POM) that sink slowly (3 m/d) and large particles (POM, CaCO_3 , BSi) that sink much more rapidly (50 m/d to 200 m/d) in the water column. ^{231}Pa and ^{230}Th are simulated with a reversible scavenging model that uses partition coefficients between dissolved and particulate phases that depend on particle type and size. Model results are then compared with ^{231}Pa and ^{230}Th observations in the water column and modern sediments.

A preliminary evaluation of the particle fields simulated by the PISCES model has revealed



that particle concentrations are well estimated at the surface but largely underestimated in the deep ocean. In the water column, ^{231}Pa and ^{230}Th fluxes are mainly controlled by the slowly sinking particles. Partition coefficients need to be parameterized as a function of particle flux, as suggested by observations. Considering discrepancies between the model particle fields and those observed, we were forced to use exaggerated values for partition coefficients in order to get realistic tracer distributions. These ^{231}Pa and ^{230}Th simulations have provided an opportunity to propose some future developments of the PISCES model, in order to make progress in the simulation of trace elements. Assigning calcium carbonate, biogenic silica, and aluminosilicates to the small particle pool represents a valuable approach to increase its concentration and subsequently simulate realistic tracer distributions in the water column using reasonable values for the partition coefficients, as well as a realistic fractionation in the sediments at all depths.

Dutay J.-C., Lacan F, Roy Barman M., Bopp L. (2009) Influence of particle size and type on ^{231}Pa and ^{230}Th simulation with a global coupled biogeochemical-ocean general circulation model: A first approach. *Geochemistry, Geophysics, and Geosystems*, 10, Q01011, doi:10.1029/2008GC002291.

