The role of scavenging on the oceanic distribution of ^{231}Pa, ^{230}Th and ^{10}Be

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^{231}Pa and ^{230}Th in the ocean are produced in situ at a constant ratio by decay of dissolved Uranium species. In contrast, cosmogenic ^{10}Be is produced by nitrogen and oxgyen spallation in the atmosphere and enters the ocean by wet and dry depositions. All three elements have in common the fact that they all have important applications in paleoceanography that depend on their poorly understood scavenging behaviour.

Adsorption of ^{231}Pa and ^{230}Th onto particles removes these tracers differentially, causing a fractionation process that makes it possible to use the elemental ^{231}Pa/^{230}Th ratio of sediments to estimate variations in the strength of the Atlantic Meridional Overturning Circulation. Variations in ^{10}Be production, on the other hand, are related to changes in the solar-magnetic and geomagnetic fields that shield the Earth of the cosmic rays responsible for spallation. ^{10}Be records of geomagnetic paleointensity are useful to date and synchronize ice core records and it has been suggested that the same could be true for ^{10}Be in sediment cores [1].

We here present modeling results that explore how scavenging affects the oceanic distribution of these tracers and their interpretations as proxies. Multiple circulations, particle compositions and distributions are considered in the model (calcium carbonate, opal organic matter and lithogenic particles). A novelty is our inclusion of nepheloid layers.

Our results indicate that sediment records from regions located near the center of oligotrophic gyres are least sensitive to changes in circulation and scavenging. ^{10}Be records from these regions are thus most representative of the true geomagnetic paleointensity variability. Our results also show that simulations that include a nepheloid layer produce vertical ^{231}Pa and ^{230}Th profiles that better fit observations, reinforcing the idea that nepheloid layers play an important role in Pa and Th cycling in the ocean.

[1] Christl (2007) *Geochemistry, Geophysics, Geosystems* **8**(9), doi:10.1029/2007GC001598