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Variables Impacting ^{230}Th and ^{231}Pa Scavenging in Resuspended Sediments

ANNE LEAL[1], ROBERT ANDERSON[1], MARTY FLEISHER[1], CHRISTOPHER T HAYES[2], ERIN E BLACK[3], NEIL REDMOND[4], R. LAWRENCE EDWARDS[5] AND PHOEBE LAM[6]

[1]Lamont-Doherty Earth Observatory
[2]University of Southern Mississippi
[3]University of Rochester
[4]University of Connecticut
[5]University of Minnesota
[6]University of California, Santa Cruz

Thorium-230 (^{230}Th) and protactinium-231 (^{231}Pa) are long-lived radionuclides that can act as constant flux proxies. These radionuclides both have well-known source functions from uranium decay; and once produced, these radionuclides are rapidly removed via reversible scavenging onto particles in the water column before ultimately being deposited onto the seafloor. Therefore, changes in ^{230}Th and ^{231}Pa concentrations in both the water column and underlying sediments can be used to quantify mass fluxes. While this constant flux proxy method is well established, questions remain regarding scavenging behavior in regions with atypical particle composition, particularly within benthic nepheloid layers (BNLs).

Here, we present water column dissolved and particulate ^{230}Th and ^{231}Pa data alongside underlying sediment data from US GEOTRACES GA03 in the North Atlantic and US GEOTRACES GP15 in the North Pacific. The North Atlantic has previously been shown to have persistent, thick BNLs, while the North Pacific has much weaker sediment resuspension. Including particulate matter composition and concentrations at these sites, we are able to evaluate the impacts from variability in nepheloid layer thickness, near bottom particle concentrations, and resuspended sediment composition. Previous studies have shown intense near-bottom enhanced scavenging within intense BNLs along GA03, associated with sediment resuspension of primarily lithogenic material [1]. In the North Pacific, there is evidence of enhanced near-bottom scavenging, even in regions with much weaker BNLs. However, along GP15, the enhanced scavenging is associated primarily with manganese oxide and iron oxide particles. Additionally, the depletion of ^{230}Th and ^{231}Pa in the water column occurs at a depth above the BNL in both the Atlantic and Pacific. In this study, we provide evidence for enhanced scavenging from resuspended sediments in both strong and weak BNLs, investigate the impacts of resuspended sediment composition and extent on local scavenging behavior, and discuss the implications for interpreting ^{230}Th and ^{231}Pa as constant flux proxies.

[1] ^{230}Th Normalization: New Insights on an Essential Tool for Quantifying Sedimentary Fluxes in the Modern and Quaternary Ocean, Costa, K. M. *et al. (2020), Paleoceanography and Paleoclimatology* **35**, e2019PA003820.