$^{231}$Pa and $^{230}$Th in the Barents Sea and the Nansen basin: implications for shelf-basin interactions and changes in particle flux

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In seawater, particle reactive $^{231}$Pa and $^{230}$Th are uniformly produced by decay of soluble $^{235}$U and $^{234}$U. Due to differences in particle reactivity, $^{230}$Th tends to be removed to the sediment close to its production site, while $^{231}$Pa is more prone to lateral transport and is removed to the sediments in areas of high particle flux (i.e. boundary scavenging). Due to a combination of perennial ice cover, large shelf areas and river runoff, boundary scavenging in the Arctic Ocean strongly impacts the distribution of $^{231}$Pa and $^{230}$Th in the water column.

Here, $^{231}$Pa and $^{230}$Th were analyzed in seawater and particles from the Arctic GEOTRACES section GN04 along the Barents shelf and in the Nansen basin. Key observations include lower concentrations of dissolved $^{231}$Pa and $^{230}$Th on the Barents shelf compared to the Nansen basin, indicating enhanced removal of $^{231}$Pa and $^{230}$Th near the margin.

The particulate nuclide/total nuclide ratio increases from the surface (0.2% for $^{231}$Pa and 0.7% for $^{230}$Th) to the seafloor (11% for $^{231}$Pa and 71% for $^{230}$Th), highlighting the role of deep scavenging. The fractionation factor between $^{231}$Pa and $^{230}$Th ($F_{\text{Th/Pa}}$) ranges from ~3 to 25 and generally increases with depth. Comparison between suspended particles and sediments will be provided.

Further, dissolved $^{231}$Pa and $^{230}$Th concentrations in the Nansen basin are lower compared to concentrations measured 20 years ago. This might reflect changes in particle flux and/or changes in circulation patterns.