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

Further, dissolved $^{231}Pa_{xs}$ and $^{230}Th_{xs}$ concentrations in the Nansen basin are lower compared to concentrations measured 20 years ago[1]. This might reflect changes in particle flux and/or changes in circulation patterns.

[1]Scholten, J., Rutgers van der Loeff, M., 1995. Distribution of ^{230}Th and ^{231}Pa in the water column in relation to the ventilation of the deep Arctic basins. Deep. Res. Part II 42, 1519–1531.