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# Tracing the pathways of Atlantic Waters in the Santa Anna Trough using $^{129}I$, $^{236}U$ and neodymium isotopic composition

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The rapid warming of the Arctic has a direct impact on Arctic ecosystems and human livelihoods, as well as on global climate. Part of this warming is attributed to an increased advection of ‘’warm’’ Atlantic Waters (AW) into the Arctic basin. This process, known as Atlantification, causes a reduction in the water-column stratification, resulting in increased heat exchange between the ocean subsurface and the atmosphere, and hence a loss of sea ice during summer.

There are two main pathways of Atlantic waters into the Arctic Ocean, each transporting approximatively 50% of the net Atlantic flow. One enters the Arctic through the largely ice-free Fram Strait, and the second through the Barents Sea (BS) along the Novaya Zemlya archipelago, turning North before entering the deep Eurasian basin. However, the exact pathways of both branches are not completely constrained, particularly at the St. Anna Trough (SAT), where they both meet.

In this study we propose a novel approach that combines the determination of $^{129}I$, $^{236}U$ and neodymium isotopic composition ($\varepsilon_{Nd}$) in samples collected during the Arctic Century expedition, to accurately track the pathways and modifications of Atlantic waters along its transit through the SAT.

Our preliminary results, confirm that Fram Strait Brach Waters (FSBW; with the lowest $^{129}I$ concentrations) enter the SAT below the surface-water layers, and follow a cyclonic trajectory. $^{129}I$ data also indicate that they intrude further South than previously reported, reaching almost the coast of Novaya Zemlya. At most stations, the BS originated waters, marked with the highest $^{129}I$ concentrations, seem to flow northwards towards the Eurasian basin always below the FSBW. This indicates that before entering the SAT, waters flowing through the BS sink due to ice-freezing and atmospheric cooling processes.

Further analysis of $^{236}U$ will help to further discriminate the waters masses between the Fram Strait and the Barents Sea, while $\varepsilon_{Nd}$ will provide insight into the processes controlling the distribution and properties of surface waters. This work represents an improvement to the way ocean-circulation is studied in the Arctic because the $\varepsilon_{Nd}$ helps overcome the limitations of the $^{129}I/^{236}U$ system and vice versa.