# Dual nitrate isotope constraints on the origin of nutrients in Baffin Bay and in the Labrador Sea

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The Canadian Arctic Ocean connects the North Pacific, an area of active denitrification, and the North Atlantic, a region of extensive $N_2$ fixation. Here, we present water column natural abundance nitrogen (N) and oxygen (O) isotope ratios of nitrate ($NO_3^-$) collected throughout the Canadian Archipelago, Baffin Bay and the Labrador Sea. These data shed light on both the origin and internal cycling of $NO_3^-$ in Baffin Bay and in the Labrador Sea.

Benthic coupled nitrification-denitrification on the Bering and Chukchi shelves and remineralization along the transit across the Chukchi shelf impart a pronounced enrichment in $\delta^{15}N$ and a coincident minimum in $\delta^{18}O$ on the cold Pacific-derived halocline waters observed throughout the study region. The Baffin Island Current and the Labrador Current subsequently carry this $^{15}N$ enrichment and relatively low $\delta^{18}O$ southward along the western Baffin Bay and into the western Labrador Sea.

Elevated $\delta^{15}N_{NO3}$ and concurrently low $\delta^{18}O_{NO3}$ in the deep/bottom water of Baffin Bay indicate substantial remineralization of surface ocean export production largely fueled by Pacific-derived nutrients. Nutrients supplied to Baffin Bay are hence stripped from surface waters and trapped at depth over long timescales, where sedimentary denitrification further adds to the N removal capacity of the Arctic Ocean.

The overall trends in $NO_3^-$ isotope ratios will be discussed in the context of regional circulation patterns and N biogeochemistry in the Canadian Archipelago and further downstream in the Baffin Bay and Labrador Sea.