Nitrogen cycling in the warming Arctic Ocean

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The Arctic Ocean is key in maintaining the global salt and nutrient balance. Nevertheless, this basin is warming twice as fast as the rest of the globe. The subsequent loss of permanent sea-ice and northward migration of open water and seasonal sea-ice boundaries alter vital biogeochemical processes like the cycling of nutrients. As a result, the processes that control nutrient budgets and fluxes on a Pan-Arctic scale and their sensitivity to climate change remain unclear.

By combining the isotopic composition of nitrate ($\delta^{15}N$, $\delta^{18}O$) with ancillary biogeochemical and hydrographic GEOTRACES and NPI data collected in 2015-2016 we document nitrogen supply, uptake and recycling in the central and southeast Arctic Ocean. The vast study area covers the Eurasian and Makarov basins, Fram Strait, Barents Sea Opening and includes Arctic settings from permanent ice cover to seasonal sea-ice and stratified open water.

High $\delta^{15}N(NO3)$ in surface waters indicate extensive nitrogen utilisation, yet differences occur between distinct sea-ice regimes. Using the dual isotopes of nitrate we characterize N uptake and remineralisation throughout the water column and its evolution on a latitudinal transect from 90°N to 60°N relative to sea-ice regimes. We further identify distinct $\delta^{15}N(NO3)$ signatures in deep water masses from the Makarov and Eurasian basins which are a result of the interplay between N cycle processes.

The implications of these findings for basin biogeochemistry and the nutrient inventory will be discussed.