Seasonal nutrient supply and uptake in the Barents Sea

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Rapid warming has been observed across the Arctic region in recent decades, resulting in a significant reduction in sea ice extent and duration which is most pronounced in the marginal ice zone. These sea ice changes and the resultant changes in ocean mixing are affecting nutrient supply, uptake and cycling and are predicted to have large-scale consequences for the distribution and magnitude of primary production throughout the Arctic Ocean. The objective of this study is to quantify the uptake of inorganic and organic nitrogen in the Barents Sea marginal ice zone during winter, spring and summer 2018, in the context of the seasonal transition in sea ice coverage and upper ocean dynamics.

We conducted three cruises in January, April and June 2018 along a 30 °E transect covering the full range of sea ice conditions and water masses observed in the Barents Sea. We measured the concentration of inorganic and organic nitrogen compounds throughout the water column and conducted nitrogen uptake experiments on water samples taken from the euphotic zone using $^{15}$N-labelled nitrate, ammonium, urea and amino acids.

These uptake rates are used to calculate nitrate-based new production and regenerated production based on ammonium, urea and amino acids, and these calculations are used to estimate the f-ratio. Here we will present initial results on the supply of inorganic and organic nitrogen forms and their uptake rates by different phytoplankton communities at different times of year. These rates and the derived f-ratio provide a measure for productivity of the ecosystem over the winter to summer transition. We will discuss the effects of sea ice cover and water mass structure with respect to the polar front on new production and phytoplankton community composition, which play an important role in regulating the magnitude of primary production in the Barents Sea. These results will contribute to our understanding of how biological and biogeochemical processes in the Arctic may respond to ongoing changes in the physical environment as climate change proceeds.