The Transpolar Drift influence on the silicon cycle in the Arctic Ocean

B.T.P. LIGUORI[1*], C. EHLERT[1], E.-M. NOETHIG[2], K. PAHNKE[1].

[1]Max Planck Research Group for Marine Isotope Geochemistry, ICBM, University of Oldenburg, Germany. (*bianca.liguori@uni-oldenburg.de)

[2]Alfred Wegener Institute for Polar and Marine Research, Germany.

Globally, diatoms contribute around 20% of primary production and play a major role in the silicon (Si) cycle, which is closely coupled to the global carbon cycle. In the Arctic Ocean (AO), seasonal sea ice conditions and light availability largely control primary productivity. Additionally, nutrient conditions can differ significantly depending on the location within the Arctic and the relative influence of Pacific, Atlantic, and river water input. The aim of this study is to understand the Si cycle in the central AO, specifically the influence of the Transpolar Drift (TPD).

Here, we present the first study on the stable Si isotope composition in waters ($\delta^{30}Si(OH)_4$) and particles ($\delta^{30}Si\text{-}bSiO_2$) from surface waters in the Nansen, Amundsen, and Makarov Basins. Samples were taken in summer 2015 along a transect in the central AO during GEOTRACES cruise PS94 (GN04, TransArc II) with German *R/V Polarstern*. In general, the sampling coincided with the season of low sea ice concentration, high primary production, and relatively high river input.

The three basins studied are influenced by different biogeochemical conditions. The Nansen Basin is characterized by low dissolved Si concentrations ($[Si(OH)_4]$) (3.7 µmol L^{-1}), high biogenic Si concentrations [$bSiO_2$] (0.13 µmol L^{-1}), and $\delta^{30}Si(OH)_4$ of around 1.95‰. The Nansen Basin is influenced by inflow of Atlantic water and during sampling, the sea ice edge was located here. At the sea ice edge, the biological productivity strongly increases due to light availability, which is reflected in the low $[Si(OH)_4]$, high [$bSiO_2$], and elevated $\delta^{30}Si(OH)_4$. Surface $[Si(OH)_4]$ in the Amundsen Basin was intermediate (6.3 µmol L^{-1}), low [$bSiO_2$] (0.05 µmol L^{-1}), and intermediate $\delta^{30}Si(OH)_4$ of around 1.73‰. In the Makarov Basin, higher $[Si(OH)_4]$ (10 µmol L^{-1}), lower [$bSiO_2$] (0.03 µmol L^{-1}), and $\delta^{30}Si(OH)_4$ around 1.8‰ were found. The Amundsen and Makarov Basins are influenced by the TPD, which transports waters with a higher $[Si(OH)_4]$ and lower, potentially more terrestrially influenced, $\delta^{30}Si(OH)_4$ from the Siberian shelves and the Pacific to the central Arctic. Through this nutrient input, the TPD might stimulate productivity but it potentially also transports particulate material from the shelves, which we will further study using particulate $\delta^{30}Si\text{-}bSiO_2$.