



## **Mid-summer nitrogen fixation and its impact on the concentration of molecular nitrogen in the surface water of the central Baltic Sea**

Oliver Schmale, Mattis Karle, Michael Glockzin, Stefan Otto, and Bernd Schneider

Leibniz Institute for Baltic Sea Research, Marine Chemistry, Rostock, Germany (oliver.schmale@io-warnemuende.de)

Mid-summer blooms of nitrogen-fixing cyanobacteria are a common feature in the central Baltic Sea. Different approaches have been used in the past to identify nitrogen fixation in surface waters and to estimate its contribution to the nitrogen budget of the Baltic Sea. In the present study we used the nitrogen/argon approach that was previously applied to quantify denitrification rates in oxygen deficient waters. For these analyses, we coupled an equilibrator system, supplied with a continuous flow of water from a depth of about 3 m, with an electron impact quadrupole mass spectrometer. The setup allows for a quasi-continuous measurement of N<sub>2</sub> and Ar concentrations in surface waters. We used this device on a research cruise in August 2015 in the central Baltic Sea and found that (1) surface water nitrogen concentrations are nearly in equilibrium with the atmosphere during rough weather conditions and (2) that nitrogen depletion occurred during calm weather periods. This is explained by the growth of nitrogen fixing cyanobacteria that is favored at low mixing because of more efficient exposure to solar radiation. The results are compared with other methodological approaches that were previously used to estimate the mid-summer net community production and nitrogen fixation in the central Baltic Sea (e.g. pCO<sub>2</sub> measurements). Altogether, our data show that the nitrogen/argon method is a useful tool to map nitrogen deficits in the surface water and to identify regions affected by cyanobacteria driven nitrogen fixation.