

# Nitrogen fixation in the Northeast Atlantic Ocean

Roukaerts Arnout and Frank Dehairs

Laboratorium Analytische en Milieuchemie, Vrije Universiteit Brussel (VUB), Pleinlaan 2, B-1050  
Elsene, Belgium

E-mail: [arnout.roukaerts@vub.ac.be](mailto:arnout.roukaerts@vub.ac.be)

The biological carbon pump is one of the main processes to store atmospheric CO<sub>2</sub> in the deep sea. In order to keep this process going, organisms need nitrogen since it is an essential element to all life forms. To biota in oligotrophic open ocean environments, this nitrogen is often a limiting nutrient as large amounts disappear to the deep sea. Especially in the North Atlantic ocean where surface waters cool and sink to the ocean floor, the NO<sub>3</sub><sup>-</sup> concentrations are often below the detection limit of 0.1 μM. Together with internal cycling and nutrients from upwellings, the incorporation of new atmospheric N<sub>2</sub> by nitrogen fixation is a source of nitrogen for biota. It is a vital aspect in understanding the mechanisms that control our oceans and thus its impact on climate change. Yet little is known about the importance of this nitrogen fixation to the primary production. The subtropical North Atlantic is an interesting region to study this fixation of new nitrogen because of low nutrient concentrations and the availability of iron, originating from Sahara desert storms. It is thought that this extra iron supports the production of new nitrogen, available to marine organisms, by nitrogen fixation. The objective of my master thesis is to determine the rates of nitrogen fixation and its contribution to the primary production. To obtain the absolute contribution of N<sub>2</sub>-fixation, stable <sup>15</sup>N and <sup>13</sup>C isotope incubations were performed during a nine days cruise south of the Azores archipelago. For the N<sub>2</sub>-spiking a new method was used since recent papers reported a significant underestimation of the fixation rates with previous techniques. Instead of injecting N-15 enriched N<sub>2</sub> gas directly in the incubation seawater, low nutrient seawater in which enriched N<sub>2</sub> gas was dissolved was used. The samples taken on the cruise will be further analyzed during the following months.

## References

- Benavides M. 2011. Nitrogen fixation by Trichodesmium and small diazotrophs in the subtropical northeast Atlantic. *Aquatic Microbial Ecology* 65:43-53.
- Mohr W. 2010. Methodological underestimation of oceanic nitrogen fixation rates. *PLoS ONE* 5(9).
- Montoya J.P. 2002. Nitrogen fixation and nitrogen isotope abundances in zooplankton of the oligotrophic North Atlantic. *Limnology and Oceanography* 47(6):1617-1628.
- Moore C.M. 2009. Large-scale distribution of Atlantic nitrogen fixation controlled by iron availability. *Nature Geoscience* 2:867-871.