Nitrogen fixation in the Northeast Atlantic Ocean

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The biological carbon pump is one of the main processes to store atmospheric CO_2 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^{3-} concentrations are often below the detection limit of 0.1µM. Together with internal cycling and nutrients from upwellings, the incorporation of new atmospheric N_2 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_2-fixation, stable ^{15}N an ^{13}C isotope incubations were performed during a nine days cruise south of the Azores archipelago. For the N_2-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_2 gas directly in the incubation seawater, low nutrient seawater in which enriched N_2 gas was dissolved was used. The samples taken on the cruise will be further analyzed during the following months.

References

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