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Variability of annual primary production in the North Sea from 1983 to 2014: diatoms and non-diatoms show different trends

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Nitrogen and phosphorus inputs via rivers entering the North Sea showed maxima in the early 1980s. This led to eutrophication phenomena near the coast with high primary production and further negative consequences for the North Sea ecosystem.

Recent simulations with the ecosystem model ECOHAM for the North Sea, nested in the model NEMO-ERSEM for the Northwest European continental shelf, show that diatom and non-diatom driven productions behave differently with respect to decreasing eutrophication. In the southern and central North Sea, non-diatom production including calcifiers has indeed responded to the changes in nutrient supply via the rivers. However, diatom production in this region mostly remained stable and even increased in some cases.

A different picture emerges in the northern North Sea, where the reversal of the winter NAO index from high to lower values (1995/1996) was followed by a drastic collapse in the inflow of North Atlantic water. This also led to a cut in the nutrient supply. Here, both phytoplankton groups reacted similarly: from 1996, the primary production of both species declined and then recovered again from 1999.

Our results confirm the hypothesis of Desmit et al. (2019) that in the southern North Sea primary productivity responds to reduction in nutrient inputs with shifts in community structure, and in the northern North Sea with decrease in total productivity rates.

Reference:

Desmit, X., A. Nohe, A. V. Borges, T. Prins, K. De Cauwer, R. Lagring, D. Van der Zande and K. Sabbe (2019). Changes in chlorophyll concentration and phenology in the North Sea in relation to de-eutrophication and sea surface warming. *Limnology and Oceanography* 9999. DOI: 10.1002/lno.11351.