



Reconstruction of the Nitrogen Cycle in the German Bight/South East North Sea by means of Stable Nitrogen Isotopes in surface sediments, suspended matter and nitrate - A Model Study.

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Recent distributions of stable nitrogen isotope ratios ($\delta^{15}\text{N}$) of surface sediments in the central and southern North Sea ($51 - 57^\circ \text{N}$, $0 - 4^\circ \text{E}$) exhibit a significant increase from marine (background-) values of 5-6 per mil in the northern basin to values above 11 per mil in the German Bight/South East North Sea. This signal is caused by anthropogenic nitrogen loads via rivers and the atmosphere enriched in ^{15}N .

The 3d-biogeochemical model ECOHAM including a ^{15}N isotope module is applied to the study area. After checking the mass fluxes of nitrogen, the most relevant parameters to reproduce experimental $\delta^{15}\text{N}$ are the corresponding ratios of the sources (e.g. river, atmosphere) and the fractionating factors of the internal processes, in particular the phytoplankton uptake and the sedimentation. Both simulation results and observational data show that maximum $\delta^{15}\text{N}$ values do not occur directly in front of the Elbe river mouth but along the North Frisian coast. In a scenario with reduced nitrogen river loads, this maximum migrates towards the river mouth indicating the area of complete biological turnover of the loadings.

Pre-industrial measured surface sediment $\delta^{15}\text{N}$ ratios show reduced values as

a consequence of low anthropogenic nitrogen loads. The successful application of the model to these conditions will help to quantify the pristine, undisturbed nitrogen loadings which were not measured.