



Stable isotopes and turnover of nitrate in the German Bight

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The German Bight is a hot-spot of river-induced eutrophication of the North Sea due to nitrate loads discharged into this semi-isolated embayment by several large rivers. We analysed stable isotope signatures of water column nitrate in the area on a grid of stations in winter and early spring 2007. Overall spatial patterns of $\delta^{15}\text{N-NO}_3^-$ and $\delta^{18}\text{O-NO}_3^-$ image the predominant influence of the rivers Rhine and Elbe on the German Bight. On a smaller scale, however, and in offshore stations, nitrate assimilation of an incipient phytoplankton bloom is indicated by parallel enrichment of $\delta^{15}\text{N-NO}_3^-$ and $\delta^{18}\text{O-NO}_3^-$. Intriguingly, the enrichment ratio in ϵ^{18} : ϵ^{15} is 1.5:1, differing from the ratio of 1:1 associated with uptake by marine phytoplankton. These data suggest that the shift in nitrate isotopes is not solely due to beginning phytoplankton assimilation, but that, despite low temperatures, nitrate in the outer regions of the German Bight derives to a considerable extent from nitrification. These novel data mark remineralization in sediments as an important source of DIN and underscore the role of sediments in recharging water column nutrient inventories.