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Spatial and temporal patterns in oxygen and nutrient fluxes in sediment of German Bight (North Sea)

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The German Bight in the southern North Sea is affected by intensive anthropogenic exploitation. Over a century of intensive use by shipping, fishery, and input by polluted rivers has pushed the coastal ecosystem far from its pristine state. The nutrient load reached a maximum in the early 1990s (Amann et al. 2012), and implementation of environmental protection policies substantially decreased the riverine nutrient load. While the riverine input of pollutants has constantly reduced since then, new forms of sea exploitation emerge. The most noticeable example is the installation of more than 600 wind turbines over the past few years in the German EEZ, and additionally 1,200 are already planned. The impact of these installations on hydrology and biogeochemical cycles is largely unclear.

In a series of monitoring cruises we repeatedly sampled the sediment at a set of monitoring stations, which represent all typical habitats of the German Bight. We deployed benthic landers for in-situ chamber incubations and performed ex-situ whole-core incubations to investigate the benthic fluxes of oxygen and nutrients, and their spatial and temporal variability. Our first results indicate that benthic nutrient recycling is more intense during summer than during winter, which suggests that biological processes contribute substantially to the recycling of nutrients. The fluxes of reactive nitrogen appear lower than observations from 1992 (Lohse et al. 1993), when riverine N loads were at their maximum (Amann et al. 2012). The comparison of our recent measurements with observations from the past decades will enable us to assess the effect of decreasing nutrient discharge into the coastal North Sea. Our results will further set a baseline for elucidating the impact of the massive installation of wind turbines in the near future.

This study contributes to the NOAH project (North Sea; Observation and Assessment of Habitats).

References

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