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The role of benthic carbon cycling for alkalinity production: An isotope biogeochemical approach in the North Sea

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Marine sediments act as a natural source or sink for carbon, depending on the specific biogeochemical and sedimentological conditions within the ecosystem. Differences in microbial activity and species composition, abundance of electron acceptors and donors may influence the carbon cycling and, therefore, the benthic storage capacity for organic and inorganic carbon in sediments. These processes furthermore impact the release of alkalinity (TA) versus dissolved inorganic carbon (DIC).

The North Sea is a highly dynamic system with shallow tidal areas in the south and a number of fresh water tributaries delivering nutrients and dissolved carbon to the coastal areas. Submarine ground water discharge, furthermore, may impact the coastline of the main land and the islands. The Skagerrak at the connection between the North Sea and the Baltic Sea, is characterized by high sedimentation rates, due to opposed water masses from different sources (Baltic Sea, North Sea and Atlantic water) transporting fine sediment material to this region. Investigations in the Skagerrak allow a comparison of carbon cycling under the impact of different dominant electron acceptors.

In this study we investigate surface sediments from the North Sea comparing the carbon storage capacity in different sediment types. Water column, pore water and sediment samples are investigated to understand the processes controlling the benthic storage and release of carbon. TA and DIC concentrations and the stable carbon isotope composition of dissolved and solid phases are considered to determine the specific biogeochemical processes dominating benthic mineralization and carbonate dissolution.

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