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Investigation of different anaerobic respiratory pathways and their impacts on the release ratio of DIC/alkalinity at selected North Sea regions

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Coastal sediments play a crucial role in carbon metabolism, which decreases with increasing distance from the shoreline. The North Sea, a NW European shelf sea, represents a relatively shallow, well-ventilated (on annual timescales) system, connected to the Baltic Sea and the North Atlantic. Especially the southern part of the North Sea receives a large amount of organic matter (OM), both from riverine input and internal North Sea sources. After the depletion of oxygen due to aerobic OM respiration, anaerobic metabolic activities become dominant in the sediment. In the absence of oxygen, electron acceptors, such as NO_3^-, Fe^{3+}, Mn^{4+} and SO_4^{2-}, facilitate not only the release of respired CO_2, but also of alkalinity, furthermore enhanced by potential dissolution of sedimentary carbonates. Therefore, under these conditions, benthic-pelagic coupling may impact on the potential to absorb CO_2 from the atmosphere.

To investigate the described processes, porewater and sediment samples, collected from six different stations in the German Bight (North Sea) during the RV Heincke cruise HE541 in September 2019, have been analyzed for their vertical concentration profiles of nutrients, various trace metals, sulfur, DIC and alkalinity.

Benthic oxic and anoxic zones have been identified based on the vertical concentration gradients. Furthermore, alkalinity and DIC are set in relation to anaerobic metabolic activities. Finally, active

reworking and ventilation becomes pivotal in areas such as the North Sea. Thus, the influence of bioturbation on anaerobic respiration is also considered.

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