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Dynamics in the concentration and the isotopic composition of dissolved inorganic carbon in tidal areas of the North Sea

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In the frame of the German BIOACID project, we investigate the spatial gradients and temporal dynamics of the dissolved inorganic carbonate system in tidal areas of the southern North Sea. We aim for an understanding of the impact of benthic processes on production of alkalinity and its subsequent export to the open North Sea, as well as the role of benthic processes, e.g. the interaction (destruction, formation) of surface pore waters with sedimentary calcium carbonate. These processes in turn have the potential to modify the pore water and the bottom water composition that exchanges with the shallow North Sea. It is expected, that the absolute and relative importance of the benthic and pelagic processes may change in the future as the North Sea will face increasing pCO2, decreasing pH, and changes in nutrient levels.

Results are presented from geochemical field investigations including total alkalinity, dissolved inorganic carbon (DIC), pH, salinity, temperature, the stable carbon isotope composition of DIC, and major, minor, and trace elements, demonstrate pronounced tidal, spatial, and seasonal variability in the pelagic compartment. This variability is governend by benthic and pelagic processes as well as by contributions (mixing) from coastal freshwater input. The carbon isotopic composition is measured to characterize the relevant sources, sinks, and transformation processes for DIC. Results from the East-Frisian Wadden Sea are compared to measurements in the North-Frisian Wadden Sea system.

Field data will be integrated into and compared to the modelling environment of the North Sea carbonate system to balance the impact of the Wadden Sea system for the open North Sea.