



The use of stable isotopes in dissolved inorganic carbon (DIC) and trace metals to understand carbon cycling in tidal marshes along an estuarine salinity gradient of the Elbe river (Germany)

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The temporal dynamics of the dissolved carbon system in four tidal marshes under impact of the Elbe river (Germany) were studied along a salinity gradient (0.3 to 30.7) to assess their impact as source/sink areas for DIC, TA, and selected trace elements for the southeastern coastal North Sea. Besides pH, TA, major and trace metals (Sr, Ba, Mn), the concentrations and stable carbon isotope composition DIC were followed in the main creeks of each sampling station over complete tidal cycles at different seasons.

Substantial differences in salinity and tidal responses in concentrations of trace elements and the dissolved inorganic and organic carbon system were observed. Carbon isotope signatures of DIC down to -13.9 ‰ vs. VPDB were observed, with the isotopically most enriched DIC (up to -1.5 ‰ vs. VPDB) found to be associated with the highest salinities. The tidal dynamic in dissolved concentrations of DIC was high, showing an up to 3-fold difference between low and high tide waters. Whereas, Sr was impacted by mixing processes and carbonate dissolution, Ba showed a dependence from sulfate availability, and dissolved Mn was controlled by benthic microbial activity and fluxes across the sediment-water interface. The application of a binary mixing model based on the cationic and stable isotope composition reveal that both carbonate mineral dissolution at all sites and benthic microbial sulfate reduction at the brackish sites are important sources for producing alkalinity.