

Are water column signatures of the NW German backbarrier tidal flat influenced by microbial activity?

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Intertidal areas play an important role as an interface between the terrestrial and marine environment. To date they are still poorly understood particularly regarding the flow of minor and nutrient elements to the open ocean. The Wadden Sea Research Group, which was established at the Oldenburg institute, focuses on the interplay between biological, physical and chemical parameters in this very dynamic coastal system.

Microbial activity is seen in time series measurements of physical and chemical water column parameters, both on tidal and seasonal scales. Strong tidal variations in redox sensitive elements like Mn are related to the contribution of pore waters draining from the flats during low tide, accompanied by variations in alkalinity. The importance of pulsed fresh water inflow through small rivers is still under debate, but may be of importance, too. The small DOC-rich tributaries of Northern Germany are characterized by significant particulate and dissolved Mn and Fe concentrations. Completely unknown is the role of the subterranean estuary system, which may inject ground waters directly into the backbarrier area.

On a seasonal scale significant differences are seen in particulate matter composition. Whereas comparably low Mn/Al-ratios are characteristic for the winter situation, maximum values are attained in late summer. This possibly reflects several microbially induced effects:

- a) enhanced Mn release with higher microbial activity owing to the availability of metabolizable organic matter (spring blooms) and parallel temperature increases
- b) change in particle characteristics from more mineral (clay) dominated to biogenic
- c) particle transformation due to elevated radiation and parallel photo-oxidation effects.

For Fe such a relationship is not seen, presumably because the interaction with DOC is very pronounced. Despite of the reducing and sulfidic character of the tidal flats, significant dissolved and particulate Fe loads are still available in the water column. But in contrast to Mn a pore water origin of this Fe is much less likely. Therefore a terrestrial/fluvial origin of this element is indicated.

Our very preliminary results clearly demonstrate, that integrated geochemical, physical and microbiological approaches are required to fully understand this important bioreactor located at the boundary between the terrestrial and marine regime.