

O11.8

Biogeochemical carbon-sulfur-metal-water cycling after flooding of a coastal wetland and its underlying aquifer

Michael E. Böttcher^{1,2,3}, Anna-K. Jenner¹, Luz Fernández-Fernández¹, Mary A. Zeller¹, Denise Otto¹, Lucas Winski¹, Cátia M.E. von Ahn¹, Benjamin Rach¹, Bo Liu⁴, Franziska Koebsch³

¹Leibniz Institute for Baltic Sea Research, Germany. ²University of Greifswald, Germany. ³University of Rostock, Germany. ⁴Alfred Wegener Institute Bremerhaven, Germany

Abstract

Land-ocean interactions in the coastal zone are of particular interest regarding the exchange of substances, like nutrients, carbon, sulfur, metals, and water. We present new results on the biogeochemistry of coastal sediments and an adjacent recently rewetted wetland in the southern Baltic Sea, that are under impact of dynamic water exchange. Sequential pore water samplers were applied to follow the dynamics of the seasonal pore water composition in the coastal sediments. Sediment cores on transects within the Huetelmoor were investigated for the pore water and soil composition. The fractions in the soils were analyzed for the elemental composition, mineral micro-textures, and the hydrogen, oxygen, carbon and sulfur isotope composition of different fractions to understand the water and biogeochemical carbon-sulfur cycles.

Flooding events with brackish water add sulfur to the peatland and the isotope signals and metal contents of peatland surface waters indicate an impact exchange with underlying anoxic solutions. Water isotopes indicate seasonal evapotranspiration and mixing processes. A recent massive storm-induced flooding event led to the salinization of the surface peatland as well as the underlying aquifer.

The peat cores were found to reflect the activity of sulfate-reducing bacteria and the associated formation of pyrite with different textures, as well as isotope evidence for sulfurization of organic matter. Sedimentary sulfur fractions and their stable isotope signatures are controlled by the availability of dissolved organic matter or methane, reactive iron, and in particular dissolved sulfate and, thereby, from the relative position to the coast line and the given lithology. The sulfur isotope compositions of the iron sulfide fraction are controlled by the availability of sulfate and vary in agreement with spatial and temporal dynamics in the impact by salt-bearing solutions. Further mechanistic investigations consider the role of DOS upon changing sulfur substrate availability.

Acknowledgement for support by BALTIC TRANSCOAST, DAAD, ERASMUS

Keywords

Wetland, Submarine Ground water discharge, Flooding, Isotope Biogeochemistry