Dynamics in the biogeochemistry of a SGD-impacted coastal aquifer and the impact of storm events

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Submarine groundwater discharge (SGD) is an important process for this element and water exchange between the terrestrial and the marine environment. Biogeochemical transformations may take place, that induce the accumulation of nutrients, metals, carbon dioxide and methane. Here, we followed the water and element exchange and associated biogeochemical transformation processes in front of a rewetted peatland at the southern Baltic Sea. Vertical pore water profiles were retrieved via up to 5 m long multi-port pore water samplers on a seasonal base. Concentration gradients of major and redox-sensitive metals, nutrients and the stable isotope composition (H, C, S, O) of water, dissolved inorganic carbon, and sulfate was followed to characterize the mixing processes and superimposing biogeochemical transformations.

Evidence for a strong control of the bottom-pore water exchange induced by exposed lithology and a high net activity of dissimilatory sulfate-reducing microorganisms in the coastal SGD-impacted sediments were found. An extrodinary storm event in early 2019 not only led to the partial flooding of the peatland with brackish water but also pushed Baltic Sea water into the coastal aquifers allowing to investigate the time-dependent return to previous subterrestrial ‚normal' conditions via SGD-induced freshening.

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