Dynamics in the isotope biogeochemistry of a SGD-impacted coastal aquifer after a storm event

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The interface of land and sea Is of particular interest regarding the exchange of elements, like nutrients, carbon and sulfur. Submarine groundwater discharge (SGD) is an important pathway for element exchange from the terrestrial to the marine environment and vice versa. The discharging water can not only consist of the fresh ground water but also of a considerable proportion if recirculated often brackish seawater (Fig. 2).

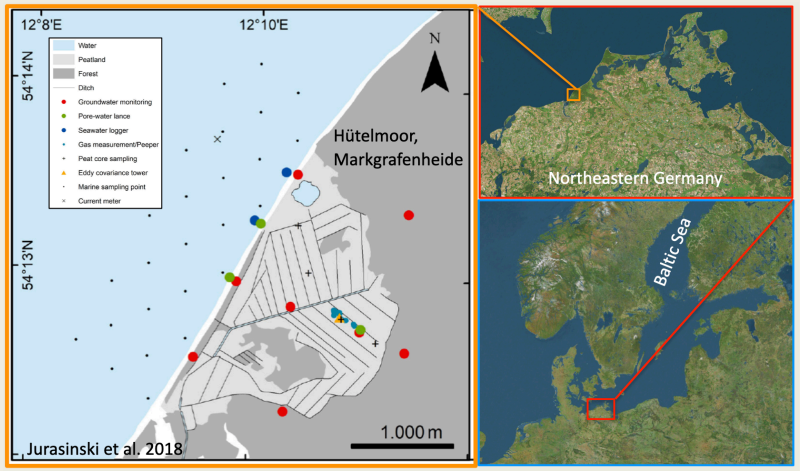

Fig. 1: Study area, a rewetted peatland Hütelmoor, in northeastern Germany. The area has been drained for centuries. Rewetted since 2009.

Fig. 3: Dyke was destroyed by storm event in January 2019. (Pictures: H. Burchard)

An extrodinary storm event in early 2019 not only led to the partial flooding of an associated coastal 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.

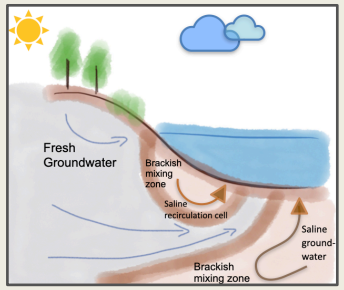

Fig. 2: Schematic of SGD, fig. modified after Bratton (2010).

A: Water isotopes showed heavier signatures right after storm event due to Baltic Sea surface waters been pushed into deeper sediments.
The profiles from February 2020 show lighter signature, indicating influence from terrestrial/ inland waters .
B: Salinity depth profiles are showing gradually freshening of pore water. Fresher, brackish water is pushing out of the coastal aquifer in persistent plume indicating controls by lithology (peat) and the permeability.
C: H2S-concentrations increased shortly after flooding event, suggesting a strong increase in BSR.

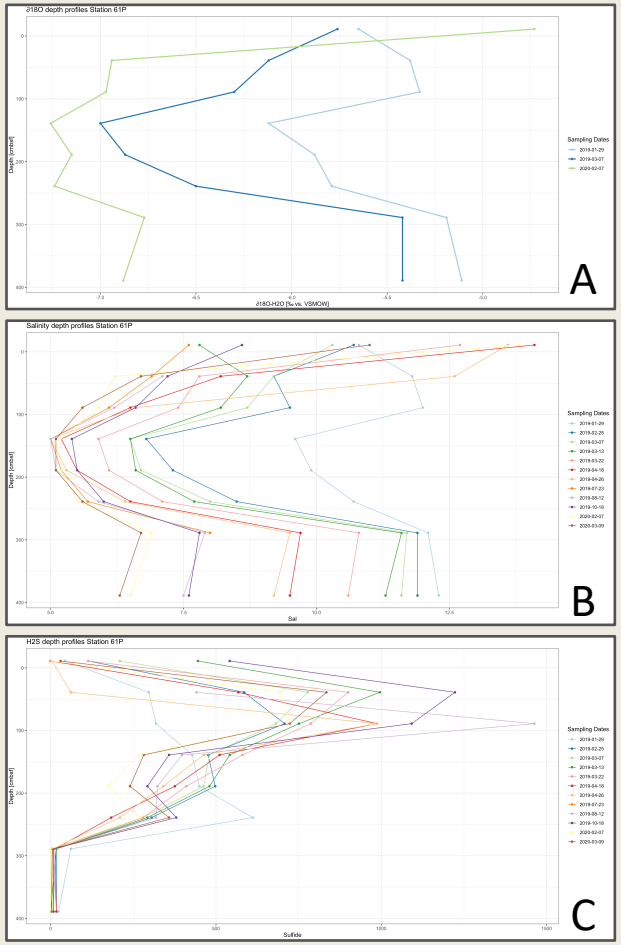

Fig.4: Pore water profiles are showing gradual re-establishment after storm event (Jan 2019).

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