

Understanding salt dynamics for a restored coastal wetland at the Baltic Sea in Germany

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Coastal fens like the nature reserve „Hütelmoor und Heiligensee“ (north-eastern Germany) are important landscape elements along the southern Baltic coast, which exchange fresh water and brackish water with the Baltic Sea. These exchange processes can be understood as experiments with a natural tracer, which may be used to investigate the hydrologic behaviour of these fen systems.

With the establishment of coastal protection measures such as dunes and dikes, the installation of surface drainage and, more recently, also nature conservation measures, the hydrologic regime of these coastal wetlands constantly altered over the last centuries. The rehabilitated wetland „Hütelmoor und Heiligensee“ is suitable for an analysis of hydrologic change as it was monitored over the time period since nature conservation measures started in the 1990s. Collected data sets include observation of groundwater levels and electrical conductivities, weather data as well as discharge at the outlet of the drainage catchment.

In this study, we identified processes and quantify process magnitudes that govern the salt balance of the study area including its variability in space and time. We found that - over the period of rehabilitation - salt water entered the catchment with episodic storm surges by wave overtopping of dunes. The intruded brackish water was then diluted, which is a slow process occurring over decades. It is governed by local groundwater recharge from precipitation and the inflow of relatively fresh groundwater from the hinterland. It is concluded that salt inputs from the Baltic Sea provide a natural tracer of hydrological processes, which can be readily monitored via electrical conductivity measurements.