Analysis of hydrological processes on a tidal sand bank

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In our days, emerging tidal banks are frequently discussed with respect to coastal protection issues as well as for nature protection. Thereby the future development strongly depends on sedimentation and plant colonisation. The latter depends on the hydraulic sediment properties and hydrological processes governing the nutrient status. In the presented study, interactions of different hydrological and geophysical processes of an emerging tidal bank are investigated focusing the example of Kachelot Plate located SW of Juist Island, southern North Sea. Measurements of groundwater levels, groundwater salinity, hydraulic conductivity of the sediment and the retention curve as well as the analysis of available data such as tide gauges and precipitation stations of adjacent islands enable to develop a perceptual model of the dominant hydrological processes. Main hydrological features are (i) the dilution of the brackish groundwater caused by the positive water balance, (ii) the infiltration of salt water due to sporadic inundation events during storm tides and (iii) the limited lateral flow processes between sea water and groundwater driven by tidal conditions. Hence, from the hydrological point of view the future development of the Kachelot tidal bank strongly depends on the inundation frequency of the tidal bank affecting the development of a freshwater lens and of an environmental milieu suitable for plant development and therefore sediment stabilisation.