Submarine Groundwater Discharge into Wismar Bay, southern Baltic Sea: A multi-tracer approach.

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Submarine groundwater discharge (SGD) is considered as an important route for water and dissolved material exchange between land and coastal seas. The present study focused on the identification and the spatial variability of SGD into Wismar Bay, southern Baltic Sea. On cross-shore transects covering the bay waters were taken for analysis of Ra isotopes, stable isotopes (H, O, C, S), dissolved inorganic carbon, nutrients, major cations and trace elements. In addition, sediment cores were retrieved at several stations and pore water samples were extracted. The detection of short-living radium isotopes in surface waters of the bay indicate benthic-pelagic coupling via pore water exchange with the water column that may be indicative for SGD. Moreover, enhanced concentration of dissolved manganese and barium, resulted from anoxic pore waters, were found in areas with higher Ra activity. At two sites in the central part of the bay freshening of shallow pore waters with increasing depth was identified associated with steep physico-chemical gradients. This indicates fresh water outflow from a coastal aquifer, with a water isotope composition close to the Modern Local Meteoric Water Line. The accumulation of dissolved substances in the SGD-impacted sediments was even lower when compared to sediments without freshening, but the resultant efflux higher due to an advective upward flow component. Thus, the flow of substances across the sediment-water interface is dominated by early diagenesis and the enhancement by SGD is mostly due to changes in physical flow enhancement.

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