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# The impact of submarine ground water discharge on a coastal ecosystem of the southern Baltic Sea: Results from the BONUS+ project AMBER

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Besides direct surface water input of dissolved and particulate compounds (eg nutrients, metals) via rivers into coastal seas, submarine ground water discharge (SGD) is increasingly recognized to be an important factor. In spite of the recognition that many land-sea interfaces of the world are characterised by SGD, it is still unclear how important SGD via springs, seeps, or diffusive outflows is in terms of biogeochemical budgets for the Baltic Sea coastal regions. The main reason that this has not been caught up so far to a precision that is typical for other freshwater inputs is that direct discharge of groundwater into the coastal zone is often difficult to quantify. The influence of SGD is expected to be of particular socio-economic relevance as it influences eutrophication in near-coastal ecosystems and to be under pressure by anthropogenic activity and climate change.
Therefore, the impact of near-shore submarine ground water discharge (SGD) on coastal ecosystems of the southern Baltic Sea is investigated as part of the AMBER project within the BONUS+ initiative.
In AMBER, the quantitative importance of SGD on nutrient, metabolite, and trace metal budgets is investigated for parts of the Baltic Sea. Results will have implications to understand the role of SGD as a nutrient source and will provide data for further implementation into model environments for the prediction of scenarios of future environmental changes. Besides trace metals, nutrients, methane, DIC and metabolites species, a further focus forms the impact of SGD on biota. Stable isotopes (C-13, S-34, O-18) are planed to be used to identify sources, sinks, and abiotic and microbial conversions of dissolved and particulate compounds. Salinity and temperature profiles as well as Ra and Rn isotopes will help to identify and quantify SGD. Sediment structures potentially acting as aquifers are characterized by geochemical, sedimentological, and geophysical methods.
During several sampling campaigns in 2009, seep-type SGD was investigated in the Puck Bay off the Polish coast. It is found that, as one of the potentially different ground water-derived sources, fresh ground waters escape from permeable sediments in form of localized seeps near the shore-line. The geochemical composition and vertical efflux rates of these ground waters are determined by usingpore water lances and seepage meters. Analyses revealed that the ground waters were sulfidic and the source for a number of elements in the water column including DIC and phosphate. Results will be discussed in terms of biogeochemical element transformations and consequences for the element fluxes into the water column.