Ground water discharge into the southern Baltic Sea

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Submarine ground water discharge (SGD) into coastal ecosystems is perceived as an important source of fresh water and solutes in marine biogeochemical cycles. Less is known about its significance for the German coastal zone. We present here the results of hydrogeochemical and stable isotope geochemical studies in an area that is affected by SGD into the southern Baltic Sea.

Anoxic groundwaters emerging as springs at the shore zone of the southern Baltic Sea were investigated on a seasonal base for about five years. The springs emerge in small, geostationary pits yielding discharges of about to 10 L/min each. Surrounding sediments are highly permeable and prone to regular rearrangement due to wind- and wave action. Water samples were analyzed for the concentrations of major and trace elements, pH, and the stable isotope ratios of water, DIC and sulfate. Newly formed precipitates in the stream bed were characterized via SEM-EDX and analyzed for their chemical and stable isotope composition. The ^{2}H and ^{18}O contents of the spring waters indicate the ground water to originate from relatively young mixed meteoric waters. Dating by means of tritium and noble gases (^{3}H, ^{3}He, ^{4}He, Ne) yields an age of the spring waters of about 25-32a.

The springs are hydrogeochemically characterized by dissolved Ca, Mg, Na, bicarbonate, and sulfate, mainly reflecting the water-rock interaction with aquifer material in the recharge area. The oxygen-free ground water is rich in dissolved Fe and P. The above ground draining streams degas CO_2 and take up O_2 in contact with the atmosphere. Iron(oxyhydr)oxide precipitates in the stream beds acting as a sink for dissolved phosphate, thus leading to the formation of SGD essentially free of dissolved iron and phosphate. The formation of Fe-phases in the subterranean estuary is also supposed to take place at depth thereby influencing the release of nutrients and metals into the Baltic Sea coastal ecosystem.

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