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Modelling Groundwater-Surface water Exchange and its Implications on Groundwater Quality

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Hydrogeochemical interactions are still posing a significant challenge for the assessment of water quality at the catchment scale. Numerical modelling of water quality is still restricted by computer power and parameter uncertainty at larger scales and is demanding further research regarding the influence of surface water on groundwater resources.
The Selke river is a tributary to the larger Bode river in the surroundings of the Harz mountains in northern Germany. Hydrology and water quality is monitored at a well-equipped field investigation site, which is accompanied by numerical modeling work at different scales. The site consists of approximately two km2 of river, alluvial sediments and gently inclined hillslopes. River stage, water levels and saturation in surface water, unsaturated zone and groundwater were simulated for quasi steady state conditions and a transient, climate-data driven run over the course of a year.
Of particular interest are the observed model results for the hotspots of hydraulic and geochemical interaction, between the river, its alluvial plain and the hyporheic zone. Model results will be used to guide the further instrumentation of the field investigation. Such hotspots of interaction between environmental compartments are discussed, as well as travel time distributions from particle tracking and dispersive approaches. Groundwater nitrate contamination and its removal potential will be linked to the water exchange behavior.