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(Im)mobilization of heavy metals in the interface between groundwater and surface water: site characterization

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The aim of this research is to gain an insight into the (im)mobilization of heavy metals in the interface between ground and surface water. The hyporheic zone is a mixing zone in which there are gradients in concentrations of oxidized and reduced species, pH, and temperature. Furthermore the interaction between ground and surface water in the hyporheic zone is inherently dynamic both in space and time. The ultimate fate of heavy metals in the hyporheic zone is thus affected by hydrological, geochemical and microbiological processes. A field site was selected in the Campine Region (in the north of Belgium), where former smelters have caused a severe historical contamination of heavy metals in soil and ground water. The selected site is located at a brook receiving a groundwater plume of cadmium and zinc. Concentrations of heavy metals were measured in soil, groundwater, sediment, and surface water. Also, the hydrological, microbiological and physico-chemical characteristics of the site were determined in order to get a first assessment of the importance of different processes in the (im)mobilization of heavy metals in the groundwater-surface water interface.

The role of the microbiological community and of physico-chemical factors such as temperature, pH, redox conditions and available electron donor and acceptor concentrations in (im)mobilizing heavy metals in the hyporheic zone will further be studied by means of batch tests. Subsequently, column tests will be conducted to integrate the foregoing batch observations with dynamical 1-D hydrological conditions. The results will be used as input in a coupled geochemical-hydrological model to unravel

the complex interaction between selected processes. Ultimately, the improved knowledge on the (im)mobilization of heavy metals in the hyporheic zone will lead to more reliable risk models and therefore to more cost-efficient remediation techniques.