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Transport of micropollutants in a riverbank filtration system

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Groundwater locations at alluvial backwaters are essential for public water supply. Riverbank filtration (RBF) systems are widely used as a means of obtaining public water supplies. Riverbank filtration is an effective way to remove micropollutants from the receiving surface water. The efficiency of the RBF system strongly depends on the residence time of the water in the aquifer and on the soil properties (Ray, 2011). In order to understand all bio- and geochemical processes within the hyporheic zone (e.g. the region were mixing of surface water and groundwater occurs), exchange rates and flow patterns need to be quantified.

The main study area covers the porous groundwater aquifer study site (PGWA) - an urban floodplain extending on the left bank of the River Danube downstream of the City of Vienna. It is one of the main groundwater bodies in Austria. Groundwater quality in the PGWA is influenced by a combination of anthropogenic activities, industry, wastewater treatment plants, heavy precipitation events and floodings.
The upper layer of the DPA is impermeable, preventing pollution originating from the surface. The upper layer consists of silt. The underlying confined aquifer consists of sand and gravel layers. Hydraulic conductivities range from 5 x 10-2 m/s up to 5 x 10-5 m/s. Underneath the aquifer are alternating sand an clay/silt layers.

Samples are taken from two transects in the DPA. These transects consist of four piezometers in the first few meters of the groundwater aquifer. Several other piezometers are placed downstream from the river-groundwater interface. The behaviour of the micropollutants in the hyporheic zone can therefore be studied intensively.

The transport behaviour of several micropollutants is modeled using carbamazepine (CBZ) and acesulfame (ACE) as natural tracers. Furthermore, temperature and electrical conductivity data was used for modeling. The micropollutants are measured using an in house developed online SPE-HPLC-MS/MS method. In total a mixture of 10 compounds is measured, including hormones and pharmaceuticals.

Ray, C. (2011). Riverbank filtration concepts and applicability to desert environments. In Riverbank filtration for water security in desert countries (pp. 1–4). NATO Public Diplomacy Division.