Geophysical Research Abstracts
Vol. 13, EGU2011-3303, 2011
EGU General Assembly 2011
© Author(s) 2011

Hydrological and geochemical characterization of the hyporheic zone of a eutrophic lowland stream impacted by a wastewater treatment plant

Steffi Schuchort (1,2), Jörg Lewandowski (1), and Gunnar Nützmann (1)

(1) Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Department Ecohydrology, (2) University of Potsdam, Department of Earth- and Environmental Science, Institute of Geoecology

The region of riverbeds where surface water and groundwater mix is called hyporheic zone (hz). The ongoing processes influence the stream water body and its quality. The hz is mainly responsible for the so-called self-purification capacity of streams and is a ban for pollution of near-surface aquifers which provide the most important source for humans: drinking water.
In this study the complex exchange processes and their spatial and temporal variability were investigated by means of geochemical and hydrological measurements.
The Erpe, also known as Neuenhagener Mühlenfließ, is a tributary to the Spree and located at the eastern border of Berlin (Germany). On the one hand it is influenced by diffuse emissions of the mainly agricultural used catchment area. On the other hand the most important nutrient inputs derive from several septic tank spillways and private and municipal waste water treatment plants (WWTP). The biggest impact is caused by the large WWTP Münchehofe which has a dry water capacity of 42,500m3/day which equates a capacity of 220,000 population equivalents.
The three study sites are located (1) upstream, (2) 150 m downstream and (3) 2 km downstream of the site where treated wastewater of the WWTP Münchehofe is discharged into the Erpe river.
To determine the hydraulics of groundwater surface water interactions, temperature depth profiles were taken in the hz at all three study sites. This was done in winter when the temperature gradients were highest. The estimation of water fluxes can be done by fitting an analytical solution of the heat conduction-advection equation to the observed vertical temperature profiles. With this method fluxes between stream water and groundwater can be identified which are main control factors for geochemical
processes.
For the ascertainment of geochemical conditions and gradients one-and two-dimensional pore water samplers (so called “peeper”) were installed at each study site. The field work was done in October and the samples were analysed concerning soluble reactive phosphorus (SRP), ammonium an iron. The SRP concentrations show distinct differences between the study sites. The lowest concentrations were measured at site 1with a maximum of 2.1 mg/l SRP within the depth profile. In contrast the maximum at site 2 was 7.8 mg/l. At site 3 measurements revealed values between those of the other two locations with a maximum value of 4.5 mg/l. The other parameters show similar results like SRP. Thus, the geochemical conditions in the hyporheic zone are impacted by the effluent of the WWTP as well as by the hydraulics of groundwater-surface water-interactions.