

Geophysical Research Abstracts,
Vol. 10, EGU2008-A-03986, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-03986
EGU General Assembly 2008
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Bank-side extraction well field tests to investigate water exchanges and physico-chemical conditions in the hyporheic zone

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The natural attenuation of pollutants by biochemical processes in the hyporheic zone is recognized by the scientific community. Nevertheless, the different factors controlling these processes, especially the influence of hydrodynamic conditions on biodegradation are not fully understood. An innovative experiment is described in which controlled long-term extraction from a bank-side well installed adjacent to the River Tame, Birmingham, UK is used to modify the hydrodynamic conditions locally within the hyporheic zone. Extraction induces a decrease in the vertical components of flows from groundwater to surface water increasing their residence time within this interface as well as, potentially, increasing the river / ground water mixing depths. The resulting temporal evolution of hydrodynamic and chemical conditions is monitored using a network of riverbed minipiezometers and multilevel samplers. This allows a better understanding of the processes involved in surface water and groundwater mixing and in conditions of possible changes in biodegradation processes. A 3D hydrogeological model based on preliminary field data is developed to relate the heterogeneous hydraulic properties and morphologies of the sediment to the water flows at this interface.