Geophysical Research Abstracts, Vol. 7, 05596, 2005
SRef-ID: 1607-7962/gra/EGU05-A-05596


# Estimation of groundwater fluxes on a local scale via streambed temperature measurements

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This work is part of a multidisciplinary research project on the fundamental exchange processes in river ecosystems. The overall research aim is to study the diverse physical and biological processes in margins and inundation areas of water courses and how their interactions determine the exchange of water, dissolved compounds and particulate matter.

The coupling of different models and model descriptions for margins and inundation areas form the methodological challenge in this project. A GIS is used for data management and serves as a platform for integrating different models, such as MODFLOW, WetSpa(ss), etc. Regional groundwater and transport models are able to solve most of the common questions in groundwater hydrology. However they are insufficient in dealing with the transport and biological transform processes which appear in an exchange zone between groundwater and surface water on a local scale. Therefore, a high spatial resolution groundwater and hydraulic model capturing regional and local flow processes will be coupled with local transport and transformation models.

Three study sites have been selected for studying different interaction zones. Two of them are located in Flanders, Belgium the other one is located in the Biebrza national park in eastern Poland. The fieldwork should lead to a delineation and quantification of the ground water discharge on a local scale primarily by using streambed temperatures. Measuring ground water fluxes through streambed temperatures is a simple, quantitative, relative unobtrusive and inexpensive method, capable of characterizing the spatial variation. A combination of longitudinal, cross sectional and vertical stream bed temperature profiles have been used on a bi-monthly basis, to asses the vertical

and spatial variability in the groundwater to surface water exchange. The survey was performed on a 1.4 km long river stretch for almost one year with a simple hand held temperature probe pushed up to 80 cm deep into the river bottom sediments.

The results of the surveys show a clear spatial variability of the groundwater exchange along the observed river stretch, areas of lower and higher fluxes can easily be assessed. The streambed temperature survey does not directly lead to an estimation of groundwater flux. Additional information like heat conduction processes and advection of water is still necessary. The current temperature measurements will be extended with a network of continuous streambed temperature measurements, which should also provide the temporal distribution of the groundwater- surface water exchange.