Geophysical Research Abstracts,
Vol. 11, EGU2009-9164-1, 2009
EGU General Assembly 2009


# Assessing uncertainties in solute transport models: Upper Narew case study

M. Osuch, R. Romanowicz, and J.J. Napiórkowski

Institute of Geophysics Polish Academy of Sciences, Hydrology and Hydrodynamics, Warsaw, Poland (marz@igf.edu.pl)

This paper evaluates uncertainties in two solute transport models based on tracer experiment data from the Upper River Narew. Data Based Mechanistic and transient storage models were applied to Rhodamine WT tracer observations. We focus on the analysis of uncertainty and the sensitivity of model predictions to varying physical parameters, such as dispersion and channel geometry.

An advection-dispersion model with dead zones (Transient Storage model) adequately describes the transport of pollutants in a single channel river with multiple storage. The applied transient storage model is deterministic; it assumes that observations are free of errors and the model structure perfectly describes the process of transport of conservative pollutants. In order to take into account the model and observation errors, an uncertainty analysis is required. In this study we used a combination of the Generalized Likelihood Uncertainty Estimation technique (GLUE) and the variance based Global Sensitivity Analysis (GSA). The combination is straightforward as the same samples (Sobol samples) were generated for GLUE analysis and for sensitivity assessment. Additionally, the results of the sensitivity analysis were used to specify the best parameter ranges and their prior distributions for the evaluation of predictive model uncertainty using the GLUE methodology.

Apart from predictions of pollutant transport trajectories, two ecological indicators were also studied (time over the threshold concentration and maximum concentration). In particular, a sensitivity analysis of the length of "over the threshold" period shows an interesting multi-modal dependence on model parameters. This behavior is a result of the direct influence of parameters on different parts of the dynamic response of the system.

As an alternative to the transient storage model, a Data Based Mechanistic approach was tested. Here, the model is identified and the parameters are estimated from available time series data using system identification techniques. This technique also provides estimates of the modeling errors and the uncertainty of the model parameters. The dynamics of the dispersion process identified by the ADZ model are second order, indicating the existence of slow and fast dispersion components in the River Narew reach studied.