Geophysical Research Abstracts,
Vol. 10, EGU2008-A-03824, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-03824
EGU General Assembly 2008

Uncertainty analysis of pollutant dispersal during extreme floods

O. Buettner (1), M. Schulz (2), M. Matthies (2), M.Boehme (1), M.Rode (1)

(1) Helmholtz Centre for Environmental Research UFZ, Brueckstr. 3a, 39114 Magdeburg, Germany, (2) Institute of Environmental Systems Research (USF), University of Osnabrueck, Barbarastrasse 12, 49076 Osnabrueck, Germany

The predicted climate change will probably increase the frequency and size of severe extreme flood events. Hence in November 2006, the EU parliament formulated a directive to evaluate and manage high water risks within the member states of the EU. The envisaged risk analysis will focus on potential adverse effects of future high waters on human health and environment. During the disastrous flood event of the Rivers Elbe and Mulde (Germany) in August 2002, beside mechanical damages there was also high contamination of flood water and suspended sediments, especially in the lower course of River Mulde. Therefore a new integrative and modular model system to simulate pollutant dispersal during flood events was developed by the project SARISK (funded by the Federal Ministry of Education and Research of Germany). Here, we introduce the new system and present a comprehensive uncertainty analysis of the model system.

The dispersal of soluble and particle-associated pollutants was modelled using TELEMAC-System for the study area of 25 km2. The spatial resolution of the model grid varied between few meters in urban areas and 50 m in non-settled floodplain areas. The hydraulic model was calibrated by means of high water marks. For the transport model we used a soil contamination database provided by the local authorities. Boundary concentrations were taken from data measured during a flood event of River Mulde in March 2006. We quantified the variation of the two-dimensional model results exemplifying the extreme flood scenario of the abovementioned 2002 flood. The uncertainty analyses were carried out calculating Monte Carlo simulations of the hy-

draulic and transport models. We considered the uncertainties of the digital elevation model (DEM, Laser scan data with an absolute error of 15 cm), water levels (assumed mean absolute error of 15 cm), normally distributed initial soil concentrations and boundary concentrations (soluble pollutant, particle-associated pollutant). Finally, we statistically analysed the uncertainties of selected model results (water levels; flow velocities; soluble and particulate arsenic, mercury, zinc, and HCH) caused by varying input data. Modelled water levels varied in the same range as assumed errors in the DEM (15 cm). The uncertainty of calculated flow velocities decreased with the increase of the spatial resolution of the model grid. Uncertainties of modelled soluble and particulate pollutants revealed high spatial variability. Particulate pollutants were very sensitive to their variable initial and boundary concentrations. The mean percentage error of modelled particulate pollutants amounted to 75 % for varying initial concentrations. In contrast soluble pollutants showed low sensitivities (2 % for varying initial conditions). Model results will feed into a risk analysis, which will be part of a case specific decision support system (DSS).