MODELLING TOOL OF CONTAMINANTS AT THE INTERFACE BETWEEN GROUNDWATER AND SURFACE WATER – TOOL

RIVER BASIN MANAGEMENT ISSUE

Water Quantity						Water Quality		Alterations		Others
1	2	3	4	5	6	7	8	9	10	
		C, (T)	C, (T)							

(1) Diffuse pollution by agriculture
(2) Salinisation
(3) Contaminated sediment and floodplain soils
(4) Large scale pollution due to past mining / industries activities
(5) Pollution by organic matter
(6) Emerging compounds
(7) Water scarcity
(8) Floods and low flow
(9) Hydromorphological alterations
(10) Soil erosion

C = System Characterisation
T = System Trend
M = System Monitoring
R = System Remediation, Mitigation

RIVER BASIN

Danube	Ebro	Meuse	Elbe	Brévilles	Others
			✓		Not river basin specific

Spec. : Results specific to selected River Basin

KEY FINDING TYPE

Laboratory based	Field based	Modelling
		✓

BENEFITS TO END-USERS

Technical		Management	Policy	
WFD Implementation	Research	River Basin	Compliance	Policy making
✓ - modellers	✓ - modellers			

INTRODUCTION

FLUX 2 addresses the quantification and detailed chemical characterization of dissolved load at the scale of catchments dominated by soil-groundwater intercompartment exchanges. Soil heterogeneity and macro-pores contribute to preferential movement of water and solutes at the field scale. In addition, groundwater- surface water systems are investigated because they are important interconnected systems, with steep process condition gradients at the interface. They are characterized by high diversity in redox conditions, high organic carbon concentrations and turnover rates and highly diverse microbial communities, creating a large variation in biogeochemical activities. The selected river segments for studying these aspects are the floodplain test-site Muldenstein (Elbe catchment, Germany), the Bitterfeld/ Wolfen/Jesnitz test site (Mulde/Elbe region, Germany), the Dommel (Meuse catchment, The Netherlands), and the Brévilles catchment (France).

TOOL SUMMARY

Two contaminant transfer at the interface between surface and groundwater models were developed by Flux 2. One model was developed at bench scale (modelling the mm interface between surface water and groundwater) and the other one was developed at site scale (Schachgraben). The models deal only with groundwater coming from porous aquifer. It has been developed for Monochlorobenzene, can be used for other organic compounds and is currently tested for metals and nitrate. This model can be used by scientists and eventually river basin managers if it is coupled with large scale model.

TNO developed a model based on MODFLOW and RT3D to investigate the groundwater-surface interface processes. Degradation of mobile, aerobically degradable organic pollutants has been shown using this transport and chemical reaction model. Measurements at high resolution are required. The interface between surface water and groundwater, which facilitates degradation, appears to be very thin (at mm scale). Furthermore, the effect of dispersion and diffusion on the concentration profiles is much larger than the effect of degradation which makes it hard to distinguish between both effects.

The purpose of the modelling is to calibrate the parameters that have the most influence, namely the dispersivity and the molecular diffusion coefficient, with experimental data. After calibration of the dispersion, steady state and tidal system calculations were performed.