Geophysical Research Abstracts
Vol. 18, EGU2016-4487, 2016
EGU General Assembly 2016

CrossWater – Modelling micropollutant loads from different sources in the Rhine basin

Andreas Moser, Hans-Peter Bader, Fabrizio Fenicia, Ruth Scheidegger, and Christian Stamm
Eawag, Uchem, Zürich, Switzerland (andreas.moser@eawag.ch)

The pressure on rivers from micropollutants (MPs) originating from various sources is a growing environmental issue and requiring political regulations. The challenges for the water management are numerous, particularly for international water basins. Spatial knowledge of MP sources and the water quality are prerequisites for an effective water quality policy. In this study we analyze the sources of MPs in the international Rhine basin in Europe, and model their transport to the streams. The spatial patterns of MP loads and concentrations from different use classes are investigated with a mass flow analysis and compared to the territorial jurisdictions that shape the spatial arrangement of water management.

The source area of MPs depends on the specific use of a compound. Here, we focus on i) herbicides from agricultural land use, ii) biocides from material protection on buildings and iii) human pharmaceuticals from households. The total mass of MPs available for release to the stream network is estimated from statistical application and consumption data. The available mass of MPs is spatially distributed to the catchments areas based on GIS data of agricultural land use, vector data of buildings and wastewater treatment plant (WWTP) locations, respectively. The actual release of MPs to the stream network is calculated with empirical loss rates related to river discharge for agricultural herbicides and to precipitation for biocides. For the pharmaceuticals the release is coupled to the human metabolism rates and elimination rates in WWTP.

The released loads from the catchments are propagated downstream with hydraulic routing. Water flow, transport and fate of the substances are simulated within linked river reaches. Time series of herbicide concentrations and loads are simulated for the main rivers in the Rhine basin. Accordingly the loads from the primary catchments are aggregated and constitute lateral or upstream input to the simulated river reaches. Pronounced differences in the spatial patterns of concentrations in the aquatic system are observed between the different compounds. The comparison with measurements from monitoring stations along the Rhine yield satisfactory results.