Geophysical Research Abstracts
Vol. 19, EGU2017-217-1, 2017
EGU General Assembly 2017

Adsorption modelling of pollutants in a river using a particle size-based conceptual sediment simulator coupled with a conceptual pollutant transport simulator

Befekadu Taddesse Woldegiorgis (1), Ann van Griensven (1,2), and Willy Bauwens (1)

(1) Department of hydrology and hydraulic engineering, Vrije Universiteit Brussel,Brussels, Belgium, (2) UNESCO-IHE Institute for Water Education, ,Delft, Netherlands(a.vangriensven@unesco-ihe.org)

The transport of pollutants that show affinity to sediments is affected by the dynamics of the fine sediment fraction. Therefore, modelling the dynamics of such pollutants requires the estimation of the sediment deposition and resuspension processes in the river and the distinction of the fine sediment fraction. Conventional adsorption models in simplified pollutant transport simulators lack information on the dynamics of the fine sediment fraction and thus might not provide a realistic representation of the sediment-bound pollutant transport.
In this paper, we present a new method for adsorption modelling of pollutants that uses a recently developed conceptual sediment transport simulator that can simulate the dynamics of the fine fraction of the sediments that is integrated in a QUAL-based conceptual quasi-analytical pollutant transport simulator. The sediment transport simulator uses a probability density function to represent the particle size distribution and imposes a critical condition for sediment entrainment. Hereby, the Langmuir equation is used to simulate the adsorption-desorption processes to/from the fine sediment fraction. Deposition of the pollutants is determined based on the mass of the fine sediment settling to the bottom and the amount of the pollutant attached to it. The resuspension of the pollutants is determined based on the resuspension of the fine sediments and the accumulated pollutant load on the river bottom. Application of this method provided a better spatial representation of orthophosphate along the Zenne river (Belgium) as compared to the conventional approach. These results confirm the importance of representing the fine fractions of sediments in sediment-bound pollution modelling.