Ecological Informatics Applications in Water Management

6-7 November 2002

't Pand, Ghent University
Onderbergen
B-9000 Gent

Abstract book

Peter Goethals & Niels De Pauw

Dynamic in-stream fate modeling of trace organic pollutants: a case study of LAS in the river Lambro

Tolessa Deksissa & Peter A. Vanrolleghem

Department of Applied Mathematics, Biometrics and Process Control (BIOMATH),
Ghent University, Coupure Links 653, B-9000 Gent (Belgium),
tolessa@biomath.rug.ac.be

The current methods of exposure assessment in the European union use local models for air, water and soil compartment to estimate chemical concentrations close to the source and a generic multimedia 'unit world' approach to estimate regional Predicted Environmental Concentrations (PECs). However, these models do not account for the spatial heterogeneity and temporal variability of ecosystem characteristics, and as a result, only an average value or 95th percentile is estimated. This PEC is subsequently compared with the predicted no observed effect concentration (PNEC) in view of risk assessment. In reality, both values vary in time depending on the dynamic processes in the ecosystem and physicochemical characteristics of the toxic chemical under consideration. Thus, the aim of this study is to predict the environmental concentration more accurately by including the inherent temporal variations of the PEC. This was done by developing a dynamic environmental fate model using a multi-compartment model (air, water and benthic sediment). Using conceptual dynamic hydraulic model (continuously stirred tank in series) and first order kinetics, a one-dimensional dynamic in-stream fate model has been developed to assess the short-term fate of trace organic pollutants in a natural river. The processes included in the model are biodegradation (both bulk and biofilm bio-degradation), sorption (to suspended particulates and dissolved organic matter), sedimentation, volatilization and re-suspension. The proposed dynamic model was evaluated on the basis of Linear Alkylbenzene Sulfonates (LAS) case study in the river Lambro (Italy). Based on monitoring data collected in February and May 1998 within the GREAT-ER project, the general trend of simulated data sets shown to agree well with the measured time series.