Geophysical Research Abstracts
Vol. 13, EGU2011-13302, 2011
EGU General Assembly 2011

The analysis of nitrogen sources in a meso-scale basin

Marta Martinkova (1), Cornelia Hesse (2), and Valentina Krysanova (2)

(1) T. G. M. Water Research Institute, Czech Republic (marta_martinkova@vuv.cz), (2) 2 Potsdam Institute for Climate Impact Research, P.O. Box 601203, Telegrafenberg, 14412 Potsdam, Germany

Water quality models could provide a valuable support for the assessment and analysis of pollution sources in river catchments; in addition, they could evaluate potential measures for improvement of water quality. They can also provide information on potential future changes in water quality under climate change by using the outputs of climate change models.

The impact of agriculture as one of the major sources of nitrates in the Czech Republic could be expected to decline: the consequential decrease in nitrate concentrations in surface waters has been observed in previous studies and was assigned to the lower fertilization rates. In contrast to this positive development, the nitrogen is still important pollutant in the rivers of the Czech Republic.

The information about the nutrient sources is essential for water resource management but is often difficult to obtain. Moreover, water resource management is challenged by upcoming land use and climate changes and associated uncertainties (e.g. in climate change scenarios).

In present study, the eco-hydrological model SWIM (Soil and Water Integrated Model) was applied in order to analyze nitrogen loads and sources in a meso-scale catchment of the Jizera river (Czech Republic). The SWIM model simulates water and nutrient fluxes in soil and vegetation, as well as transport of water and nutrients to and within the river network. There are 144 sewage treatment plants in the Jizera catchment. The information on nitrogen concentration in discharged water and on the volume of discharged wastewater were used in the study. Fertilization data for both the organic and the mineral fertilizers typical for the Jizera catchment were also incorporated in the model. The prevailing crops in the Jizera catchment are spring barley, winter wheat and cole seed.

The contribution of different pathways of nitrate nitrogen to the total load was assessed by comparison of three fluxes: surface flow, interflow and baseflow. The modeling period was 1992-2001. Distinct seasonality was observed comparing the winter (October-March) and the summer (April-September) fluxes.

The influence of point sources is higher in summer than in winter, probably because these sources are relatively stable during the year and are independent of water flows. Interflow based loads are less important in summer than in winter. Baseflow is more important in summer due to higher evaporation.

The climate change impact on composition of nitrogen sources was assessed by using the outputs from the regional climate models (RCMs): statistical RCM STAR, (three realizations) and dynamical RCM REMO (one realization). The obtained results correspond well with changes in discharge and nitrate nitrogen loads as projected by the RCMs. The systematic differences are probably caused by different structure of RCMs.