Geophysical Research Abstracts
Vol. 19, EGU2017-13410-1, 2017
EGU General Assembly 2017

Testing the effects of different agricultural measures on stream water quality

Seifeddine Jomaa, Xiaoqiang Yang, and Michael Rode

Department of Aquatic Ecosystem Analysis and Management, Helmholtz Centre for Environmental Research (UFZ), Magdeburg, Germany (seifeddine.jomaa@ufz.de, xiaoqiang.yang@ufz.de, michael.rode@ufz.de)

It is well known that eutrophication is a serious environmental problem. Nutrient loads from agriculture are one of the major drivers. It remains very unclear, which nutrient mitigation measures and to what levels are appropriate to achieve water quality improvements. To this end, the semi-distributed hydrological water quality HYPE (Hydrological Predictions for the Environment) model was applied to test the effect of different agricultural measures on reducing nutrient loads in the Selke catchment (456 km2) located in lower mountain ranges in Eastern Germany. First, the baseline simulations of nutrient loads (N and P) were conducted in the period 2004-2015. Second, the impacts of different agricultural measures on stream water quality were evaluated using scenarios-based approach. Mainly four different measures were tested: introduction of 10 m buffer strips close the watercourses, reduced tillage, contour ploughing and 20% reduction of fertiliser applications. Three gauging stations with different dominant topography, soil and land use characteristics were used for calibration and validation of the model. Also, the model performance was tested against two different temporal resolutions: grab sample (bi-weekly to monthly) and high-resolution (daily aggregated from15 min time interval) records.
Results showed that the baseline simulations of discharge and nutrients (nitrate-N (NO_3-N) and total phosphorus (TP)) loads for the period 2004-2015 were reproduced well by the HYPE model (the lowest NSE were 0.78 and 0.72 for daily NO_3-N and TP loads, respectively). Moreover, results revealed that the phosphorus-limited measures (such as buffer strips, reduced tillage and contour ploughing) reduced significantly the TP mainly in summer periods through reducing the mobilisation and increasing deposition of suspended particles in the terrestrial part. However, the introduction of 20% reduction of fertiliser application decreased only slightly the NO_3-N concentrations, reflecting the long-time retention feature of nitrogen leaching from soil column.