Effect of increased bioenergy crop production on instream water quality in central Germany

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Numerous studies have shown that the changes in land cover/use affect significantly the hydrological regime, which in turn influence the surface water quality. It is known that, at the catchment scale, hydrological modelling is a favourable tool for discharge and nutrients transport (such as Nitrogen and Phosphorus) predictions. The semi-distributed hydrological water quality HYPE (Hydrological Predictions for the Environment) model, has been evaluated for different catchments, and has been shown to reliably reproduce the measured data. The aim of this study was to test the spatio-temporal transferability of the HYPE model in central Germany, and to investigate the effect of increased bioenergy crop production on instream water quality. First, the spatial transferability of the HYPE model was tested using two mesoscale catchments with different physiographical characteristics. To achieve our gaols, the Selke (463 km^2) and Weida (99.5 km^2) catchments, which are two small tributories of the Elbe river basin were utilized. Second, the temporal transferability of the HYPE model was tested in the Weida catchment using different periods, where different patterns of nitrogen leaching were measured due to the difference in the fertilizers applications.

For Selke, the HYPE model reproduced reasonably well the discharge and IN monthly loads (with lowest *NSE* of 0.86 and 0.69 for discharge and IN loads, respectively). Also, results showed that only a *NSE* of 0.30 was obtained for the Weida catchment, in situations where the same best-optimized values from Selke was utilized, reflecting the controlling factors of land use and topography on the runoff generation. However, when the physiographical characteristics of the Weida catchment were considered during the calibration and validation phases (1997-2000 and 2001-2004, respectively), the HYPE model could reasonably predict the measured discharge and IN concentrations with similar performance as the Selke. In addition, the temporal transferability of the HYPE model was tested successfully in the Weida catchment by representing the dynamics of IN concentrations during the periods of 1983-1987 and 1989-1996 by adjusting the fertilizers inputs for both periods, respectively. Also, the HYPE model was used to investigate the impact of different bionergy scanarios on the instream nitrogen leaching. The preliminary results of this study will be discussed and presented.