Modeling Nitrogen and Phosphorus transport in a small agricultural stream in Eastern Sweden

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In Sweden, environmental monitoring and modeling of nitrogen (N) and phosphorus (P) transport from arable land have been conducted in several scales ranging from soil profiles, experimental plots, single fields, small agricultural catchments to large river basins. At smaller scales (experimental plots, fields), P transport has been modeled with the focus on P chemistry and soil properties as explanatory variables. At larger scales (river basins), the main focus has been on hydrology, with weather parameters and topography as driving forces, while description of N and P cycling on a regional or national scale is simplified by the use of average or generalized export coefficient values that are produced by using process-oriented models driven by input data collected at regional scale. Scarce and inadequate input data is therefore often identified as a main source of uncertainty. This also limits possibilities to test uncertainties coupled to models structure. Consequently, a knowledge gap exists especially at the medium scale (catchments 1-10 km^2), where an equally accurate description of both hydrology and biogeochemistry is needed for proper understanding of especially P mobilization and delivery processes. Additionally, the spatial variability of P losses at this scale is high. Since evaluation of best management practices will take place at this scale it is utterly important to correctly identify critical source areas within these small catchments. A process-oriented, semi-distributed SWAT (Soil and Water Assessment Tool) model has been set-up for a small agricultural catchment (8 km^2) in SE Sweden. The results of a soil survey, GIS maps, regional and national statistic data bases, and yearly catchment-wide questionnaires regarding management practices were used to gather input data for the model. The SWAT model was coupled to SWAT-CUP (SWAT Calibration and Uncertainty Programs) where the GLUE (Generalized Likelihood Uncertainty Estimation) procedure was used to perform uncertainty analysis of model parameters regarding their effect on model prediction. Calibration data includes daily water discharge at the catchment outlet as well as fortnightly concentrations of suspended material and loads of nitrate N and total P, both at catchment outlet and at one central sampling point within a watershed representing area draining to a culverted stream (2.9 km^2) . The modeling period was from 1 October 2002 to 30 September 2008. Satisfying agreement was reached for water discharge (Nush-Sutcliffe coefficient 0.6) but model performance regarding suspended material, nitrate-N and especially P is rather poor. However, it remains to see if we will be able to improve model performance regarding these constituents in ongoing model runs.