Separating surface runoff from tile drainage flow in agricultural lowland catchments based on diatoms to improve modeled runoff components and phosphorous transport

Integrated water resources management in an ecologically and economically adequate way is receiving more and more attention when it comes to the development of sustainable strategies in either developed or developing countries. Ecohydrological models like the SWAT model are widely applied tools for sustainable management of water resources at river basin scale. Nevertheless it is still not clearly understood, how river basin management drives changes in the hydrological balance and the water quality of catchments. This is especially apparent in lowland catchments characterized by low hydraulic gradients, flat topography, high potential for water retention, a large amount of tile drainages and a close interaction of surface- and groundwater.

The objective of this project is thus to test the applicability of a biological tracer (i.e. diatoms) for the detection of surface runoff and drainage flow in the example case of the Kielstau catchment (50 km^2) in northern Germany. Based on the diatom and water quality analyses of daily mixed, rain event based river and tile drainage samplings, we aim to

1) quantify the contribution of surface runoff to total river discharge in lowlands,
2) separate surface runoff from tile drainage flow based on different diatom concentration of each flow component and determine the entry pathways of phosphorus into the river, and
3) implement the detected runoff generation and phosphorous transport processes into the newly introduced tile-drainage routine of the ecohydrological SWAT model to improve the routine structure and the model performance.