

MODELLING PHOSPHOROUS EXPORTS FROM SMALL CATCHMENTS

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In order to administer diffuse nutrient inputs from agricultural areas, management tools are necessary to improve, or at least maintain, the water quality without causing any reduction of agro economic profits. Recent measures for phosphorus input reduction aim to improve the application of mineral fertilizers and organic amendments and simultaneously reduce erosion. Traditionally these measures were based on the assumption that surface runoff and erosion are the main contributing processes. But on the catchment scale contradictory relationships of sediment and phosphorus concentration, respectively yield has been assessed. These accumulation and reduction processes of phosphorus have been explained with the help of different approaches.

The 1.4 km² research catchment of the Schäferbach is located in the lower Harz mountains. Measurements of sediment and phosphorus transport triggered by flood events have been conducted in this catchment since 2001. For varying events different ratios of sediment and phosphorus concentrations respectively yields have been assessed. The main contributing factors identified are: i) the crop rotation, ii) the proximity of the fertilised plot to the catchment outlet iii) the specific sediment source area (catchment or river channel).

Simple accumulation approaches insufficiently depict the variabilities assessed. To establish a more appropriate scheme for phosphorus export the model system IWAN (Integrated Winter Erosion and Nutrient Load Model) has been extended by the process based soil nutrient model ANIMO. This extension allows the simulation of transformation processes of different phosphorus compounds on the field scale. It also allows a more detailed assessment of spatial and temporal variations of source areas. The results highlight the importance of plant coverage formation and variations in soil moisture on phosphorus exports. The model system also sufficiently describes the phosphorus dynamics in time and space.

Based on these results the aim is to develop a process oriented approach to enable the simulation of phosphorus exports by erosion and leaching on the catchment scale.