



Process based simulation of nutrient and pollutant transport into surface waters at regional and catchment scale

Marcus Schindewolf and Jürgen Schmidt

TU Bergakademie Freiberg, Soil- and Water Conservation Unit, Freiberg, Germany (marcus.schindewolf@tbt.tu-freiberg.de)

Complying the aims of the EU-Water Framework Directive great efforts will be necessary in order to reduce the yields of sediments and sediment attached nutrients and pollutants of surface water bodies.

As a result of excessive nutrient and pollutant inputs many water bodies suffer from deleterious eutrophication or toxification.

Soil erosion is an important source of nutrients and pollutants in surface waters. Phosphorus and some heavy metals are transported into the stream network by erosion processes, because there are strongly attached to soil particles. For this reason soil conservation measurements become exceedingly important.

In this regard the study targets to identify the main sediment delivery areas in Saxony and to locate the points at which sediment and sediment attached phosphorus and heavy metals are passed into the surface waters.

Based on the EROSION 3D simulation model the yields of sediment and particle attached phosphorus as well as heavy metals are estimated on catchment scale for two land use scenarios.

Regarding these calculations it has to be considered, that the focused elements are predominantly attached to the fine-grained soil particles. The selective nature of soil erosion conduct to a preferentially transport of this fine particles while less contaminated larger particles remain on site.

Consequently phosphorus as well as heavy metals are enriched in the eroded sediment compared to the origin soil. For this reason it is essential that EROSION 3D provides the grain size distribution (clay, silt and sand) of the transported sediment. Additionally the element concentrations within the grain size fractions has to be known in order to calculate the amount of elements transported into water bodies from sediment yields. For this purpose fifteen erosion sensitive soils of study catchments in Saxony were analyzed regarding their element enrichment ratios in the different soil fractions. Further the availability of regionwide top soil element concentration is realized by the interpolation of official monitoring network data.

The comprehensive application of EROSION 3D in Saxony is based on the availability of a consistent input data set on regional scale which was lacking so far. Therefore, as a first step of the study it was necessary to create an regionwide input data set for Saxony including all relevant relief, soil and land use data. Additionally the GIS-based parameterization interface DPR0C was extended by an interactive catchment selecting tool with a simultaneous data clipping which considerably simplifies the handling of large data sets very much especially in order to parameterize different land use scenarios.

Up to now the EROSION 3D based simulation of phosphorous and heavy metal transport into surface water bodies is successfully validated for several hydrological watersheds in Saxony. The regionwide phosphorus and heavy metal input simulation results can be used for the planning and implementation of an integrated catchment management full filling the aims of the EU-WFD.