Geophysical Research Abstracts
Vol. 16, EGU2014-9830, 2014
EGU General Assembly 2014

A simple distributed sediment delivery approach for rural catchments

Lucas Reid and Ulrike Scherer

KIT Karlsruhe Institute of Technology, Institute for Water and River Basin Management, Karlsruhe, Germany (ulrike.scherer@kit.edu)

The transfer of sediments from source areas to surface waters is a complex process. In process based erosion models sediment input is thus quantified by representing all relevant sub processes such as detachment, transport and deposition of sediment particles along the flow path to the river. A successful application of these models requires, however, a large amount of spatially highly resolved data on physical catchment characteristics, which is only available for a few, well examined small catchments. For the lack of appropriate models, the empirical Universal Soil Loss Equation (USLE) is widely applied to quantify the sediment production in meso to large scale basins. As the USLE provides long-term mean soil loss rates, it is often combined with spatially lumped models to estimate the sediment delivery ratio (SDR). In these models, the SDR is related to data on morphological characteristics of the catchment such as average local relief, drainage density, proportion of depressions or soil texture. Some approaches include the relative distance between sediment source areas and the river channels. However, several studies showed that spatially lumped parameters describing the morphological characteristics are only of limited value to represent the factors of influence on sediment transport at the catchment scale. Sediment delivery is controlled by the location of the sediment source areas in the catchment and the morphology along the flow path to the surface water bodies. This complex interaction of spatially varied physiographic characteristics cannot be adequately represented by lumped morphological parameters.
The objective of this study is to develop a simple but spatially distributed approach to quantify the sediment delivery ratio by considering the characteristics of the flow paths in a catchment. We selected a small catchment located in in an intensively cultivated loess region in Southwest Germany as study area for the development of the SDR approach. The flow pathways were extracted in a geographic information system. Then the sediment delivery ratio for each source area was determined using an empirical approach considering the slope, morphology and land use properties along the flow path. As a benchmark for the calibration of the model parameters we used results of a detailed process based erosion model available for the study area. Afterwards the approach was tested in larger catchments located in the same loess region.