Geophysical Research Abstracts
Vol. 12, EGU2010-3437, 2010
EGU General Assembly 2010

Parameterization of a process-based soil erosion model by means of experimental field measurements

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The physically-based hydrological and soil erosion model CATFLOW-SED has been developed with data from a loess area in Germany (Maurer, 1997; Scherer, 2008) and covers the principal processes detachment, transport and deposition. The catchment is divided into slopes on the basis of topography as well as soil and land-use maps. The slopes are further divided into slope segments and the flow-routing is abstractly modeled as slope cross sections connected by a drainage network.
In many process-based soil erosion models, soil erosion is calculated by an interaction of the forces of flowing water and rainfall. In CATFLOW-SED the detachment process is divided into the pulse current of precipitation and the sheer stress of flowing water. The most important parameter concerning detachment is the erosion resistance parameter fcrit.
The described model is parameterized for a small catchment in the Central Spanish Pyrenees with experimental field data from this study area. The mean annual precipitation amount of 1120 mm is rather high but as it is typical of a Mediterranean climate the summer months show a deficit in water balance. Accordingly, a seasonal variation in dominating overland flow generation and soil erosion processes, can be observed particularly for wetland areas that regularly dry out in summer.
The spatial and temporal pattern of overland-flow generation and erosion processes and their intensity in the study area is assessed by means of small plot-scale rainfall experiments in the field. The gained data are the amounts of overland flow and eroded material for intervals of five minutes duration. The gained results are used for the parameterization of the soil specific parameter fcrit in CATFLOW-SED.
In order to cover the seasonal variation in dominating runoff processes, rainfall simulations that were carried out under dry soil moisture conditions in September as well as measurements that were done under moist conditions in March are used for parameterization of the different system conditions.
For spatial discretization, 'Erosion response units' (ERUs) (Märker, 2001) are derived from spatially distributed data on land-use, soil types and a digital terrain model, as well as from the results of the rainfall simulations. The ERUs are used for the delineation of the slopes and slope segments that represent the spatial modeling units in CATFLOW-SED. So each spatial modeling unit can be supposed to have 'homogeneous' (or at least comparable) hydrological and soil erosion properties.

Märker, M. (2001), Regionale Erosionsmodellierung unter Verwendung des Konzepts der Erosion Response Units (ERU) am Beispiel zweier Flusseinzugsgebiete im südlichen Afrika, 226 pp., Chemisch-Geowissenschaftlichen Fakultät der Friedrich-Schiller-Universität Jena.

Maurer, T. (1997), Physikalisch begründete, zeitkontinuierliche Modellierung des Wassertransports in kleinen ländlichen Einzugsgebieten, 252 pp., Fakultät für Bauingenieur- und Vermessungswesen, Universität Fridericiana zu Karlsruhe (TH).

Scherer, U. (2008), Prozessbasierte Modellierung der Bodenerosion in einer Lösslandschaft, 248 pp., Fakultät für Bauingenieur-, Geo- und Umweltwissenschaften, Universität Fridericiana zu Karlsruhe (TH).