Geophysical Research Abstracts, Vol. 7, 07567, 2005
SRef-ID: 1607-7962/gra/EGU05-A-07567

Erosion and sediment transport processes – from single slopes to macro-scale catchments

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For modeling erosion a large number of models are available which can be applied to simulate the processes at different scales. While models like WEPP, OPUS, EROSION3d are designed for single slopes, catchment models like SWAT and AnnAGNPS are designed for large catchments. Furthermore, for larger catchments often erosion risk is computed using approaches like the USLE and PESERA instead of simulating the processes in a high temporal or spatial resolution. While the concept of simulating single erosive events may be appropriate for small catchments, a continuous simulation is required for large catchments. Not too much studies concentrate on the application of simulation models to different scales. Because temporal and spatial scales are linked and different processes may be important at different scales, a simple solution of the scale dependency may not be expected. It is most important to define the purpose of the modeling exercise in order to be able to choose the right approach.

In this study different model concepts for simulating erosion and sediment transport at meso-scale (55 km^2) and macro-scale (2800 km^2) catchments are analyzed and their applicability evaluated. Model quality is judged by comparing simulated and measured sediment discharge and by analyzing the spatial pattern computed using different erosion models. The uncertainty related to the modeling is discussed.