Geophysical Research Abstracts, Vol. 9, 06140, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-06140

Modelling alpine sediment cascades: Process interaction and landscape connectivity

V. Wichmann, **T. Heckmann**, F. Haas and M. Becht

Physical Geography, Catholic University of Eichstaett-Ingolstadt, Germany
(volker.wichmann@ku-eichstaett.de, tobias.heckmann@ku-eichstaett.de)

Regarding the sediment budget of a catchment as the result of a cascading system implies that geomorphic processes transfer sediments from one subsystem to another. The calculation of sediment budgets therefore requires the knowledge of both a) the rate of sediment erosion, transport and deposition by different geomorphic processes and b) the spatial distribution of their activity including the location of erosion, sediment pathways and areas of deposition.

Within the SEDAG project (SEDiment cascades in Alpine Geosystems), results from field measurements carried out since the year 2000 are combined with spatial simulation models in order to analyse the properties of the cascading system.

Process domains (i.e. the area where a geomorphic process is effective) and their respective subdomains (representing the type of activity: erosion, transport or deposition) are delineated using simulation models for a number of geomorphic processes (for the time being: rock fall, slope- and torrent bed-type debris flows; further processes can easily be included). Each simulation model couples a disposition model, a process model which is used to simulate the downslope and lateral movement as well as the run-out length and a module classifying the process subdomains. By overlaying the maps of multiple process domains, geomorphic process units (GPUs) are delineated which are characterised by a specific combination of process activity (e.g. deposition by rockfall and erosion by slope-type debris flows).

In this paper, we describe how spatial modelling of process domains can be used to analyse the interaction of geomorphic processes within a cascading system, for example the connectivity of landscape (sub-)units with respect to sediment transport. GPUs characterised by predominant deposition by multiple processes are likely to act

as sediment storage. Where deposition subdomains of some processes overlap with the erosion and/or transport subdomains of others, the respective landscape unit may constitute a temporary storage and acts as a link to areas further downslope. An explicit representation of a sediment cascade can be generated by analysing the distribution of process subdomains along a downslope profile. For a catchment, the interaction of geomorphic processes can be summarised by a table containing the areal proportion of the different GPUs. Finally, we discuss how sediment transport rates measured in the field could complement the spatial and functional analysis.