



Modelling-based investigation of geomorphic coupling in high-mountain geosystems

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The coupled or uncoupled state of geomorphic subsystems, e.g. on hillslopes, between hillslopes and channels or between channel reaches has been investigated mostly by geomorphological mapping. Area-wide coverage of large regions is problematic; therefore, (semi-)automatic approaches are needed that are capable of delineating the sediment pathways along which sediments are transferred from subsystem to subsystem by multiple geomorphic processes – if the respective subsystems are coupled with respect to sediment transport.

Several approaches have been used to automatically derive the spatial distribution of geomorphic processes, including statistical models and the use of remote sensing data. Only few of them are capable of delineating sediment pathways, rather than just the presence or absence of geomorphic features indicating the activity of a geomorphic process (or process combination). The research project outlined here aims at combining different models to delineate the spatial distribution of erosion, transport and deposition by various geomorphic processes and at overlaying the results to identify linkages in high-mountain geomorphic systems. Among these models are so-called disposition models (indicating potential starting zones for mass movements), models to delineate sediment contributing areas for small channels on hillslopes, and process models simulating the downslope and lateral movement of mass movements.

The linkages identified by the overlay of model results make it possible to investigate functional relationships between processes (e.g. debris flows initiating in sediments provided by rock fall) as well as the system structure of sediment cascades determining

if sediments are mostly redistributed within a catchment or exported from it.

This approach could be made suitable for sediment management purposes, e.g. by identifying sediment sources and pathways. It could also be a useful tool for explaining differences in the medium-term sediment delivery ratio of (sub-)catchments with different properties and/or on different spatial scales.