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Towards a quantification of sedimentary connectivity in a Central Alpine catchment

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Many studies on sediment budgets show that the sediment delivery ratio may behave inconsistently for different spatial scales. This variability is a consequence of the geomorphic configuration of catchments, e.g. geomorphic process activity, distribution of sediment storages, etc. The concept of sediment connectivity may provide an explanation for this variability.

Sedimentary connectivity can be defined as the potential of a sediment particle to move through a catchment. In an alpine area, for example, a fully connected sediment pathway may lead from the sediment source (e.g. a rock wall) to a talus slope, from where the sediment is remobilized by debris flows that finally reach the channel network. While previous studies have analyzed the coupling state of geomorphic systems using geomorphological field maps, we employ a model-based approach to produce a semi-automated geomorphological map which contains the spatial domains (erosion, transport, deposition) for multiple geomorphic processes. The application of "predictive geomorphological maps" could be a solution to the problems of area-wide detailed field mapping, especially for larger areas; it is necessary, however, that the models correctly reproduce the spatial pattern of process domains. This is checked by validation in the field.

Based on a model-supported geomorphological map of a central alpine catchment in Austria, this study explores the feasibility of a simple index for the quantification and analysis of connectivity on different spatial scales (hillslope, sub-catchment, catchment). The approach is discussed with respect to different concepts of connectivity, e.g. in biogeography or hydrology , and potential applications.