



Sediment storage in alpine basins – quantification and geomorphic (de)coupling

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The spatial and temporal storage of sediment in alpine valleys is still rather fragmentarily understood. A better knowledge of sediment deposits and related geomorphic processes may significantly improve our understanding of mountain topography and landform evolution. In several studies in upper alpine catchments (< 30 km²) of the European Alps and the Colorado Front Range spatial information of storage types was achieved by geomorphologic mapping, airphoto-interpretation, and GIS-analysis.

The sediment volume of landforms and valley fillings was calculated using a combination of field geophysics (ground-penetrating radar, DC-resistivity, seismic refraction) and generated DEMs of the bedrock. Temporal information was derived from concepts on paraglacial slope adjustments, multi-temporal airphoto-interpretation, and geomorphologic mapping of erosion and sedimentation. Dating results (¹⁴C) obtained from sediment cores allowed the calculation of sedimentation rates.

The sediment storage of the valley fill deposits and adjacent talus slopes thicknesses varies in our study sites (Northern Alps, Dolomites, Colorado Front Range) generally between 10 and 50 m.

At present, all upper alpine catchments show generally a low to moderate sediment transfer activity (input, remobilisation, output). However, in contrast to the mean values of the catchments, specific sediment storage types (alluvial fans, talus cones, river banks) differ significantly from the total surface area with respect to their sediment transfer activity. Sediment availability controls, however, the effectiveness of rain-storm events.

Many of the sediment storage types (especially talus sheets) are recently decoupled geomorphic sediment cascade. Major sediment sinks (e.g. large alluvial plains and debris cones) in the valleys are frequently located behind natural dams (e.g. rockfall deposits). The trapped sediment demonstrates the possibility of rapid refills of almost closed sediment sinks in upper alpine catchments.