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Characteristics and volumes of sediment storages in the periglacial zone of the Turtmann valley, Switzerland

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Sediment storage is one major component of sediment flux systems. In high alpine environments sediment is mainly stored in sediment bodies created by gravitative, periglacial, glacial and fluvial processes. Resulting landforms like talus slopes, debris cones, rock glaciers or moraine deposits dominate the high alpine landscape and store large amounts of fine and coarse sediment. Processes and sediment storages are often coupled in cascading systems resulting in interconnected routing and storing of debris. However, periglacial conditions in elevated areas, land surface morphology as a result of past glaciation, e.g. hanging valleys, and current process activity and effectiveness hamper the sediment removal from the upper parts of alpine catchments.

Information on volume and thickness of sediment storages in alpine regions is scarce and often based on estimations only. Various attempts have been made to estimate sediment volumes of different landforms using geometrical and geomorphometrical approaches. Few localised studies quantified sediment thicknesses using geophysical methods, like refraction seismics, resistivity or ground penetrating radar.

This poster presents the modelling approach and first results of a project studying the distribution, characteristics and volumes of sediment storages in the Turtmann valley, Switzerland. The modelling approach operates at two scales. In a first step the sediment storages within the periglacial zone of the entire Turtmann valley (area appr. 120 km^2) have been identified and classified employing detailed geomorphological mapping, interpretation of high-resolution (HRSC) - air photos and geomorphometrical analysis of high-resolution DEM data. Classification is based on process type, surface structure, sediment characteristics, location, and geometry.

On a smaller scale, geophysical surveys, refraction seismics, 2-D DC resistivity to-

mography and ground penetrating radar, have been be applied to different single storages in several parts of the Turtmann valley to gain information about the depth of the debris – bedrock boundary and the sediment thickness. The geophysical data is then used to calculate volumes.

By analysing (1) the sediment storage type, (2) the location, (3) the geomorphometrical characteristics of the sediment sources, and (4) the calculated volumes of the local sites, a general model will be developed to estimate volumes of all sediment bodies in the periglacial zone of the Turtmann valley.

532 sediment storages have been mapped on a 1:10.000 scale and in more detail on digital air photos. Seven classes of storage types are distinguished: Talus slopes, debris cones, rectilinear slopes, rock glaciers, moraines, landslide debris, alluvial accumulation. Analysis of the location of the different storages within the valley shows distinct pattern of distribution and strong relations to elevation, aspect and geology induced land surface structure.

Sediment thicknesses gathered by geophysical surveys show average values of 5-20 metres and reach a maximum of more than 40 metres on a large debris cone.

This study focuses on the understanding of the role of storage in high alpine sediment flux systems characterised by a strong impact of periglacial processes. The modelling approach aims at a rapid procedure to assess the volumes of sediment stored in different types of landforms within meso scale alpine catchments.