



## **Geomorphic system analysis and paraglacial landform adjustment in two glacier forefields (Pasterze & Obersulzbachkees, Hohe Tauern, Austria)**

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It has been recognised that glacier forefields are often characterised by large volumes of sediment stored in unconsolidated, loose, and potentially unstable landforms referred to as glacially conditioned sediment availability. Glacier forefields are landscapes in the process of recovering from disturbance and paraglacial adjustment of moraine slopes occurs within a few decades. Thus, they are susceptible to rapid topographic modifications compared to the paraglacial deformation of rock slopes that may take several millennia. The major objective of this paper is the qualitative and quantitative analysis of paraglacial landform adjustment within the glacier forefields of Pasterze and Obersulzbachkees by means of the sediment budget approach.

Detailed geomorphological field mapping was carried out in both catchments identifying sediment sources, storages and transfer processes. These data represent an inventory of the current geomorphological composition and serve as a basis for the development of site specific sediment cascades and flux models.

Debris flows, and to minor extent avalanches, are the main sediment reworking processes on the slopes. In many places, till mantled slopes and moraine ridges are incised producing a complex microtopography of gullies at the upper parts of the slopes with coalescing debris and avalanche cones at the footslopes. Reworking of glacial deposits is characteristic for many slopes within the catchments. In some places sediment entrainment in the valley floor indicates a certain degree of subsystem coupling. However, this material is currently not removed by meltwater streams. Sediment output from the forefields is mainly suspended load produced by glacial erosion. In this regard, slope processes seem to play a negligible role for sediment output from the catchments. Based on these findings, two conceptual models representing the sediment storages and processes of the sediment cascade of the Pasterze and Obersulzbachkees landsystem are presented.

Geomorphological maps, however, represent a status quo and the temporal information is restricted to the mapping period. With regard to the transient and transitional state of paraglacial landsystems like glacier forefields, multi-temporal aerial image and orthophoto interpretation is applied to create time series maps of the spatial and temporal evolution of landforms. At first, a reconstruction of particular glacial landforms (e.g. moraines) and the subsequent analyse of landform succession from primary glacial to non-glacial landforms (e.g. debris cones) was carried out. Furthermore, the approach enables the quantification of erosional and depositional landforms and shows spatial and temporal patterns where debris has been eroded, transferred and deposited.

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