



Different rates of reworking of Little Ice Age lateral moraines in the Kaunertal valley, Austrian Alps: A morphometric and morphodynamic case study using multi-epoch LiDAR surveys

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Little Ice Age (LIA) moraines in the proglacial areas of the Gepatsch and Weißsee glaciers in the Kaunertal valley, Austria reveal different degrees of reworking by gully incision and debris flows. The state and intensity of reworking appears to depend not only on the time since deglaciation, but also on morphometric properties of the respective locations, such as slope gradient and slope length. Moreover, moraine locations with a high morphodynamic intensity are directly connected to the fluvial system. In these areas, where slope processes and fluvial processes overlap, the accumulation zones of the slope processes are prone to fluvial erosion. This leads to a regular disturbance of the slope gradient at the foot of the slopes.

A series of aerial photos, dating back to 1953, was used as a basis for a geomorphological map, where coupling states of the investigated moraine locations are evident from the digitized process areas. Spatial changes of single gullies and headward migration of the upper moraine ridges were also monitored on base of the series of aerial photos. In order to estimate the time since deglaciation for different locations, spatial extents of the glaciers, dating back to 1850 were used to interpolate an age surface grid.

Airborne LiDAR data were acquired and a digital elevation model was derived from the LiDAR point clouds in order to quantify minimum erosion volumes. These LiDAR data are also suitable for analysis of morphometric properties as well as morphodynamic intensities on the moraine locations.

The study presented here is part of the multidisciplinary joint research project PROSA (High-resolution measurements of morphodynamics in rapidly changing PROglacial Systems of the Alps) which deals with the quantification of the sediment budget of the upper Kaunertal valley, with a focus on the proglacial area.