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Postglacial trends of hillslope development in two glacially formed mountain valleys in western Norway

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Although rockfall talus slopes occur in all regions where rock weathering products accumulate beneath rock faces and cliffs, they are particularly common in glacially formed mountain landscapes. The retreat of glacier ice from glaciated valleys which have probably experienced oversteepening of rock slopes by glacial erosion causes paraglacial destabilization of the valley sidewalls related to stress-relief, unloading, frost weathering and / or degradation of mountain permafrost.

Large areas of the Norwegian fjord landscapes are occupied by hillslopes which are owned by the influences of the glacial inheritance of the last glacial maximum (LGM). This study focuses on Postglacial trends of hillslope development in two glacially formed mountain valleys in western Norway (Erdalen and Bødalen). The research is part of a doctoral thesis, which is integrated in the Norwegian Research Council (NFR) funded SedyMONT-Norway project within the ESF TOPO-EUROPE SedyMONT (Timescales of sediment dynamics, climate and topographic change in mountain landscapes) Programme.

The main aspects addressed in this study are: (i) the spatio-temporal variability of denudative slope processes over the Holocene and (ii) the Postglacial modification of the glacial relief. The applied process-based approach includes detailed geomorphological fieldmapping combined with terrestrial laser scans (LIDAR) of slope deposits in order to identify possible deposition processes and their spatial variability, relative dating techniques (tree rings and lichens) to analyze subrecent temporal variations, detailed surface mapping with additional geophysical subsurface investigations to estimated regolith thicknesses as well as CIR- and orthophoto delineation combined with GIS and DEM computing for calculating estimates of average valley-wide rockwall retreat rates.

Results show Holocene rockwall retreat rates for the two valleys which are in a comparable range with other estimates of rockwall retreat rates in other cold mountain environments worldwide. Further on the results indicate probably higher accumulation rates of slope deposits mainly throughout an enhanced rockfall activity shortly after the glacier retreat (at about 10.000 yr BP) as compared to subrecent and contemporary rates.
The overall tendency of landscape development is a Postglacial modification of the defined U-shaped valley morphometry (valley widening) throughout rockwall retreat and connected accumulation of debris material beneath these rockwalls. Active fluvial material removal at the base of slopes is almost negligible due to a very limited hillslope-channel coupling in both valleys. So far, the glacially sculptured relief has not adapted to the denudative surface processes occurring under recent environmental conditions.