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How much does a very active rock slope contribute to the sediment budget of an alpine glacier?

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The ongoing glacier retreat since the mid of the 19th century has significant influence on rock slope stability in alpine high mountain areas. Due to oversteepening by glacial erosion, cold climate weathering processes and debuttressing as a consequence of stress redistribution, rock slopes adjacent to shrinking glaciers generally show an enhanced geotechnical activity. Regarding the glacier sediment budget, the rockfall material deposited on a glacier is particular important, because the debris material can be transported directly and without any intermediate storage. Therefore, gravitational mass movements contribute in a substantial way to the sediment budget of a glacier, especially as rockfall material can easily reach en- or subglacial areas through crevasses and thus affect the subglacial sediment transport and glacial erosion.

Here we present the first results regarding the geotechnical rock slope activity of “Schwarze Wand”. The “Schwarze Wand” is located at 2400 – 2800 m.a.s.l., right above the tongue of the Gepatschferner, which is one of the largest glaciers in Tyrol (Austria) and contemporarily affected by a high retreat rate. The rock mass consists of strong foliated paragneisses which are dissected by large joint sets. These joint sets provide sliding planes, which favor slope failures. To monitor the rock slope activity at the “Schwarze Wand”, multitemporal terrestrial laser scans were carried out in 2012 and 2013 to detect and quantify mass movements. Additional, high resoluted multitemporal airborne laser scan data (10 points/m^2) are available to trace larger scale rock slope deformations. The investigations are conducted by the DFG- joint research project PROSA (High-resolution measurements of morphodynamics in rapidly changing PROglacial Systems of the Alps).

Our LiDAR data as well as field observations are showing enhanced rock fall activity at the scarp in the last years which is assumed to be the consequence of an activation of a larger deep-seated gravitational slope deformation towards the glacier which comprises at least several 100 Mio. m^3.