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Mass balance study of gravitational mass movements in proglacial systems

Joachim Rohn, Lucas Vehling, and Michael Moser
University Erlangen-Nuremberg, Applied Geology, Erlangen, Germany (rohn@geol.uni-erlangen.de, 09131 8529294)

In the framework of the DFG joint research project PROSA (high resoluted measurements of morphodynamics in rapidly changing PROglacial Systems of the Alps), mass movements are investigated geotechnically and process rates will be determined. As result, the actual mass balance for gravitational mass movements will be investigated exemplarily in an alpine glacier foreland in this PROSA sub-project.
Alpine glacier forelands are defined as the area between the edge of the glacier and the moraines of the latest maximum in 1850. Since then, the region has become ice free due to the retreat of the glaciers. Because of this recent development, the glacier foreland differs considerably from the surrounding landscape and exhibits a rapid morphodynamic development. Mass movements like landslides and rock falls contribute a remarkable portion to total sediment transport in this area.
As study area the region between Gepatschferner and Gepatsch backwater was choosen. The study area encompasses 62,5 km^2, lies at altitudes between 1759 and 3539 m a.s.l. and around 30 % are covered by glacier.
Basic prerequisite is the geotechnical inventory-taking including the production of a geotechnical map. All mass balance studies for gravitational mass movements will base on this data collection.
Short term behaviour during extreme meteorological events will be investigated as well, as the long term behaviour of the alpine slopes. The results of repeated high-resolution airborne laser scanning will contribute to a complete area-wide detection of surface changes. Detailed periodical terrestrial laser scanning of steep rock walls and their scree cones, as well as of slopes with soft rock will complete the data set. Spot tests with nets collecting the rock fall material, constructed on elected scree cones, allow the control and verification of the collected data.
Mass movements in hard rock apart from rock fall processes, like rock creep, rock sliding and sagging will be monitored additionally with tape dilatometer measurements. High resolution displacement- and temperature sensors installed in different depth of the rock and combined with electronic data collectors accomplish the data acquisition system.
All these investigations will allow us to determine the actual mass balance of gravitational mass movements in an alpine glacier foreland. In a world with changing climate, this will provide the base for the study of future scenarios.