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Towards a thermo-mechanical model of permafrost-related rock wall instabilities at high risk sites in Norway.

Benjamin Jacobs (1), Michael Krautblatter (1), Kristin S. Myhra (2), and Bernd Etzelmüller (2)

(1) Chair of Landslide Research, Technical University of Munich, Munich, Germany (benjamin.jacobs@tum.de), (2) Deptartment of Geosciences, University of Oslo, Oslo, Norway

We present first result of a thermo-mechanical model for two designated high risk sites in Norway: Mannen (Møre og Romsdal) and Gamanjunni (Troms). The classification of high risk sites in Norway is based on the combination of a high hazard score and serious anticipated consequences. We hypothesize that historic, recent and potential massive rock slope failures in deeply incised fjords and valleys are linked not only to glacial debuttressing but also to high altitude permafrost degradation. An increase in rockwall temperature is proven to have a significant effect on rock mass parameters, such as uniaxial compressive strength, tensile strenght, angle of repose and cohesion, which directly control rock wall stability.

In this study, critical rock mass parameters will be derived from temperature-controlled rock mechanical testing and are subsequently fed into a mechanical model (RS2/UDEC). Since the test sites are fully instrumented and monitored, current movement rates can be used to calibrate the mechanical model. To account for stability changes related to degrading permafrost a recent model of the thermal rock wall regime throughout the late Pleistocene and Holocene is utilized to derive the extend of high altitude permafrost at the test sites. The aim is to combine regional time slices of the thermal model with a multi stage rock-ice mechanical model to (i) simulate the current state of rock wall stability and (ii) gain mechanical insight into spatio-temporal dynamics of rock slope failures after deglaciation in Scandinavia.