



Mountain permafrost conditions near a debris slide detachment zone in Signaldalen, Northern Norway

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During the last decade there has been an increased interest to monitor mountain permafrost slopes. Climatically-driven permafrost warming and degradation may be potential triggers for rock fall and rockslides, and pose a risk to people and infrastructure. In July 2008 a rock slide detached in the north-slope of Polvartinden; a 1275 m high mountain peak in Signaldalen in Troms, Northern Norway. The volume of the rock slide was estimated to be approximately 500'000 m³. Since September 2009 ground surface temperatures were measured with miniature temperature data loggers at different localities along the NNW-ridge of Polvartinden and in the valley ground. Six temperature loggers were installed in different aspects in vertical rock faces on rock outcrops and along small cliffs and four loggers were placed directly into the soil material of vegetated parts of the ridge. An additional logger was installed in the valley floor in order to monitor air temperature.

Here, we report about the first available two-year series of temperature data. The lower altitudinal limit of permafrost is estimated at 600-650 m a.s.l which corresponds to the upper limit of the detachment zone. Visible in-situ ice was observed in the detachment zone just after the rock slide. A coupling of our in-situ data with regional climate data since 1948 suggests a general warming and that the highest mean near surface temperatures on record occurred the year before the Signaldalen rock slide detached. This is in congruence with recent studies in northern Scandinavia and data collected in nearby permafrost boreholes. We therefore suspect that permafrost in and near the detachment zone is presently subject to degradation.

North of the Arctic Circle, the amount of direct observations about the influence of solar radiation on near surface temperatures in different aspects of steep mountain walls is limited. Our results indicate a difference of 1.0-1.5 °C in mean near surface temperatures between northerly and southerly aspects. Due to our small sample size this is, however, just a tentative estimate.