

Permafrost in steep slopes in Norway

B. ETZELMÜLLER¹, K. S. MYHRA¹, C. STEIGER¹ AND S. WESTERMANN¹

¹*Department of Geosciences, University of Oslo, P.O. Box 1047, Blindern, 0316 Oslo, NORWAY.*

(correspondence: bernde@geo.uio.no)

The warming and degradation of mountain permafrost within alpine areas is an important process influencing the stability of steep slopes and rock faces. A more systematic approach to evaluate both the potential spatial distribution of steep rock faces in permafrost in Norway, and the thermal regime of those along has recently been launched.

To better estimate the thermal state of permafrost in steep rock walls in Norway, five temperature loggers were already installed in 2009 and 2010 (Hipp et al., 2014), measuring the near-surface rock wall temperatures in vertical rock faces. Surface temperatures in rock walls in Norway are on average higher than the ambient air temperature, about 1°C in shaded faces to more than 3°C in the other aspects. In 2015, we installed 15 additional rock wall loggers in both southern and northern Norway.

To address the thermal regime in entire rock faces a 2D transient thermal model has been developed. As forcing, we have used temperature and snow data interpolated from meteorological observations to the study sites. The analysis demonstrate how steep slopes with no or limited snow act as a cooling area, influencing the thermal regime of adjacent areas such as mountain plateaus etc. The spatial distribution of potential steep slopes in permafrost is evaluated by combining a high-resolution digital elevation model with gridded temperature data (“seNorge”). This analysis shows a widespread abundance of rock faces in permafrost in Norway.

The presentation provides an concept and overview about the topic, along with first results from temperature observations, thermal and spatial distribution modelling of steep permafrost slopes.

References:

Hipp, T., Etzelmüller, B., and Westermann, S., 2014, Permafrost in Alpine Rock Faces from Jotunheimen and Hurrungane, Southern Norway: Permafrost and Periglacial Processes, v. 25, no. 1, p. 1-13.

Myhra, K. S., Westermann, S., and Etzelmüller, B., in press, Modelled distribution and temporal evolution of permafrost in steep rock walls along a latitudinal transect in Norway by CryoGrid 2D: Permafrost and Periglacial Processes.