Name of research institute or organization:

WSL Institute for Snow and Avalanche Research SLF

Titles of projects:

1. Influences of the snowcover on thermal processes in steep permafrost rockwalls
2. Long-term permafrost monitoring

Part of this programme:

PermaSense, PERMOS

Project leader and team:

Marcia Phillips (Project leader, permafrost researcher)
Anna Haberkorn (PhD Student)
Hansueli Rhyner (Mountain guide)
Robert Kenner (Geodetics engineer)
Martin Hiller (Electronics engineer)
Marco Collet (Mechanical engineer)

Project description:

1. In the SNF-funded project entitled 'Influences of snow on permafrost rock walls' we investigate the role of snow on the thermal regime and mechanical stability of steep rock walls in collaboration with the Universities of Bonn, Fribourg, Zurich and the ETH Zurich. The research sites include the Sphinx north and south rock walls, which were equipped with various temperature and deformation logging devices by ETH and the University of Zurich in the context of the PermaSense project (www.permasense.ch). The data obtained is available online and ideally complements our data on snowpack characteristics, which is obtained manually in-situ at different times of the year. The properties and distribution of the snow cover in rock walls with contrasting orientations are investigated at the Sphinx and compared with those in other rock walls in the Swiss Alps. Snow cover characteristics are modeled in parallel using the 1D model SNOWPACK, which has been adapted to allow simulation of very steep terrain conditions.

2. The sub-horizontal Jungfrau Ostgrat borehole is located at 3590 m in the north facing wall of the Jungfrau Ostgrat (E ridge). It is 20 m long and equipped with 9 thermistors and a data logger. Rock temperatures vary on a seasonal basis between -4 and -8 °C. The dominant form of heat transfer is conduction. Due to the time lag with depth, the warmest temperatures are registered in December and the coldest ones in May. The high elevation of the borehole and the fact that it is located in a steep, exposed rocky ridge make the data particularly valuable for long-term monitoring. Rock temperature minima measured by the outermost thermistor at 6 m from the rock surface warmed abruptly by 0.9 °C between summer 2013 and summer 2014 (Fig. 1). It will be interesting to see whether this was due to the thick insulating and long-lasting snow cover in winter 2013-2014 or whether a strong warming trend has started. The borehole is part of the PERMOS network (www.permos.ch) and current borehole temperature online data can be obtained at SLF.

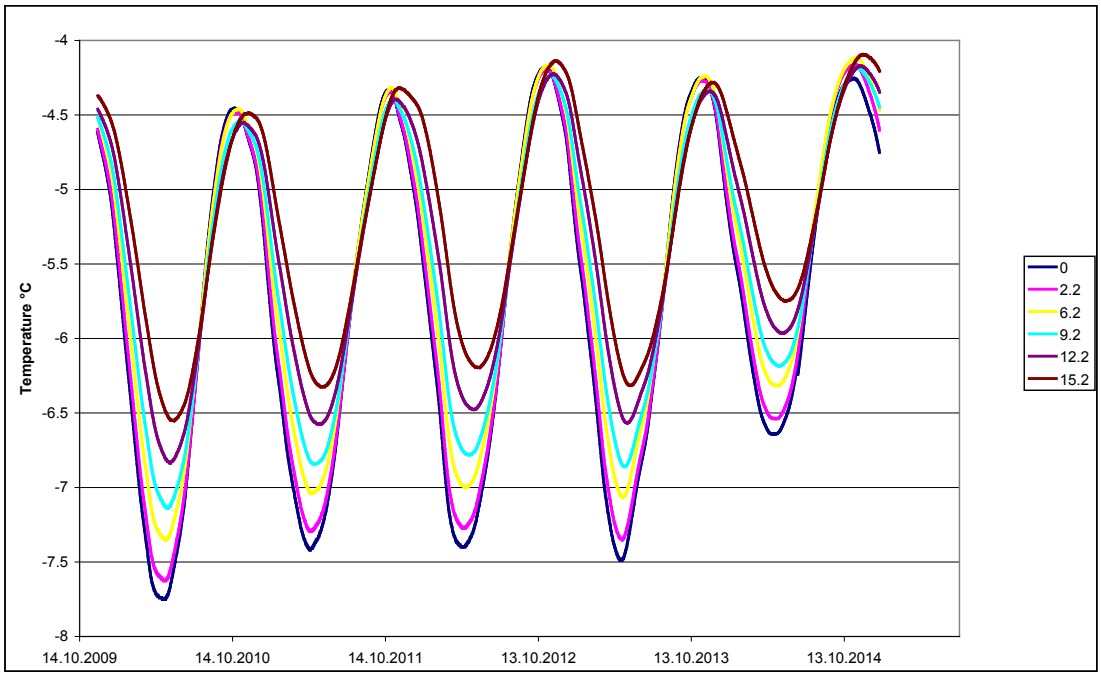

Figure 1. Borehole temperatures in the Jungfrau Ostgrat N borehole (Legend: O is located 6 m from the outer surface of the rockwall).

Key words:

Mountain permafrost, frozen rockwalls, thermal regime, long-term monitoring, snow characteristics

Internet data bases:

www.permos.ch, www.permasense.ch

Collaborating partners/networks:

Universities of Bonn, Fribourg and Zurich, ETH Zurich
PermaSense
PERMOS

Scientific publications and public outreach 2014:

Conference abstracts/posters

Haberkorn, A., M. Phillips, H. Rhyner, M. Hoelzle, The influence of snow cover on thermal and mechanical processes in steep permafrost rock walls – examples of the thermal response in the Swiss Alps, 4th European Conference on Permafrost, Evora, Portugal, June 18 -21, 2014.

Haberkorn, A., M. Phillips, R. Kenner, H. Rhyner, M. Hoelzle, Ground thermal regime and its relation to snow cover in Alpine rock walls, 12th Swiss Geoscience Meeting, Fribourg, Switzerland, November 21-22, 2014.

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