

Name of research institute or organization:

Computer Engineering and Networks Lab, ETH Zurich

Title of project:

PermaSense

Part of this program:

PERMOS

Project leader and team:

Dr. Jan Beutel, ETH Zurich, project leader

Tonio Gsell, Lukas Sigrist, Reto da Forno, Matthias Meyer, Romain Jacob, Dominic Bernath, ETH Zurich

Alessandro Cicoira, Samuel Weber, University of Zurich

Project description:

Topic: Process understanding and monitoring of mountain permafrost, development of wireless sensors

The operation of the basic PermaSense monitoring infrastructure at Jungfrauoch has been continued throughout the reporting timeline. For this, maintenance work was necessary at the end of 2015 and in the fall of 2016. Apart from general servicing work, some relict equipment not in use any more has been dismantled and returned to the valley, especially from the rock faces above and east of the research station roof.

A new project, focusing on the generation of electric energy from thermal gradients between the rock face and the atmosphere (TEG-based energy harvesting) has been started. The energy harvested is expected to power the wireless sensors used for environmental monitoring. After initial developments and test of a suitable energy-harvesting unit in the lab in the context of a master thesis by Dominic Bernath at ETH Zurich, three prototype units have been installed at Jungfrauoch. Two units are situated on the south face above the research station roof and one unit is situated on the north face, east of the Sphinx terrace. This experimental work is expected to continue throughout 2017. A paper submission including the field experiment is currently in preparation.

First work to jointly implement a PERMOS thermal monitoring reference site by combining the efforts of PERMOS and PermaSense were undertaken. For this, wireless sensors have replaced some of the data loggers used on the Jungfrau East ridge above the former Swisscom station. This activity is expected to continue in 2017.

Consulting work has been undertaken concerning the stability of the south facing rock slopes above the research station. For this, we have exchanged data and observations with Geotest AG.

Key words:

Mountain permafrost, wireless sensor networks, rock mechanics, thermal monitoring, energy harvesting

Internet data bases:

<http://www.permasense.ch>

<http://data.permasense.ch>

Collaborating partners/networks:

Dr. David Amitrano, ISTerre, CNRS / Université J. Fourier, Grenoble, France

Dr. Marcia Phillips, SLF Davos, Switzerland

Dr. Hugo Raetzo, Bundesamt fuer Umwelt, Bern, Switzerland

Dr. Jeannette Noetzli, PERMOS and SLF Davos, Switzerland

Dr. Martin Luethi, Department of Geography, University of Zürich

Prof. Dr. Stephan Gruber, Carleton University, Ottawa, Canada

Scientific publications and public outreach 2016:

Theses

Bernath, D., TEG-based Energy Scavenging Platform, Master thesis, ETH Zurich, MA-2016-50, October, 2016.

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