

Submitted Abstract

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Abstract

Rock slope destabilization due to warming or degrading permafrost poses a risk to the safety of local communities and infrastructures in populated mountain regions. In-situ observations are crucial to advance our knowledge of the acting processes. Collecting reliable, consistent and high-quality data in steep mountain terrain is challenging so that common techniques often can not be applied directly. In 2006, the first wireless sensors were developed and installed at the Matterhorn Hörnligrat, Switzerland, motivated by a rock slope failure in summer 2003. Starting with a few thermistors and crackmeters, the Matterhorn Hörnligrat field site has successively been extended and ended up in a full-fledged, continuously maintained natural laboratory - the 'Matterhorn Cryosphere Observatory'. In the meantime, 17 different sensor types were used at almost 40 distinct sensor locations distributed over the altitude from 3400 m a.s.l. up to the summit at 4478 m a.s.l. contribute to hazard assessment and climate impact research in high mountain environments.

Equally important than the capability to obtain long-term in-situ observations is the curation, quality control and open data access. A standardized and open data infrastructure has proven to be very successful in enabling a multitude of data access needs simultaneously based on a common infrastructure and methodology. A web front-end allows users to access both primary sensor data as well as secondary data products incorporating metadata, value conversion or data cleaned from systematic artifacts. All data on the PermaSense data repository can be accessed in real-time streaming formats as well as using full historic data digests.

The Matterhorn Cryosphere Observatory with its multi-modal observations over a long time period provides the basis for the analysis of phenomena and processes leading to rock slope destabilization but can also be used to validate and verify different modeling approaches.

Data set: <https://doi.org/10.1594/PANGAEA.932578>

Seismic data set: <https://networks.seismo.ethz.ch/networks/1i/>

Data manager:

https://gitlab.ethz.ch/tec/public/permasense/permasense_damgr