EGU2020-5050
https://doi.org/10.5194/egusphere-egu2020-5050
EGU General Assembly 2020

Pore water pressure dynamics in a rock slope adjacent to a retreating valley glacier

Marc Hugentobler, Simon Loew, and Clément Roques
ETH Zurich, Geological Institute, Earth Sciences, Zürich, Switzerland (marc.hugentobler@erdw.ethz.ch)

Rock slope instabilities normally form through long-term strength degradation of initially stable slopes. The rate of progressive damage accumulation in the rock slope is expected to vary over time depending on the current environmental conditions. It is often assumed that glacial retreat, with its increased dynamics in the thermal and hydraulic boundary conditions in combination with mechanical ice unloading induce stresses that cause increased rock mass damage in adjacent slopes. However, direct field measurements to understand these dynamics and to quantify damage are rare.

In this contribution we present new data of a continuous borehole monitoring system installed in a stable rock slope beside the retreating glacier tongue of the Great Aletsch Glacier (Swiss Alps). Special focus lies on the pore water pressure evolution in order to better understand the origin of the presumably hydro-mechanically forced deformation measured in the study area. We compare data of two borehole pressure sensors installed at 50 m depth in the fractured crystalline rock, pressure fluctuations measured in a sink hole on the glacier close to our study site, and glacial melt water discharge measurements. These data show that the pore pressure variability in the slope is driven by annual snowmelt infiltration cycles, rainfall events, and the connection to the englacial water of the temperate valley glacier. We show that our in-situ measurements provide critical data to improve the understanding of the effects of a retreating valley glacier on the boundary conditions and eventually the stability of an adjacent rock slope.