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Cross validation of a multi-modal dataset describing temperature-induced rock slope dynamics

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PermaSense

Problem

Change in **permafrost condition** can lead to rock slope **destabilization**

Limited stability assessement due to incomplete understanding of precursor signs

Approach

Integrated long-term **monitoring combining** different **measuring systems** and various **analysis methods**

➔ aiming to **reduce misinterpretation**

Findings

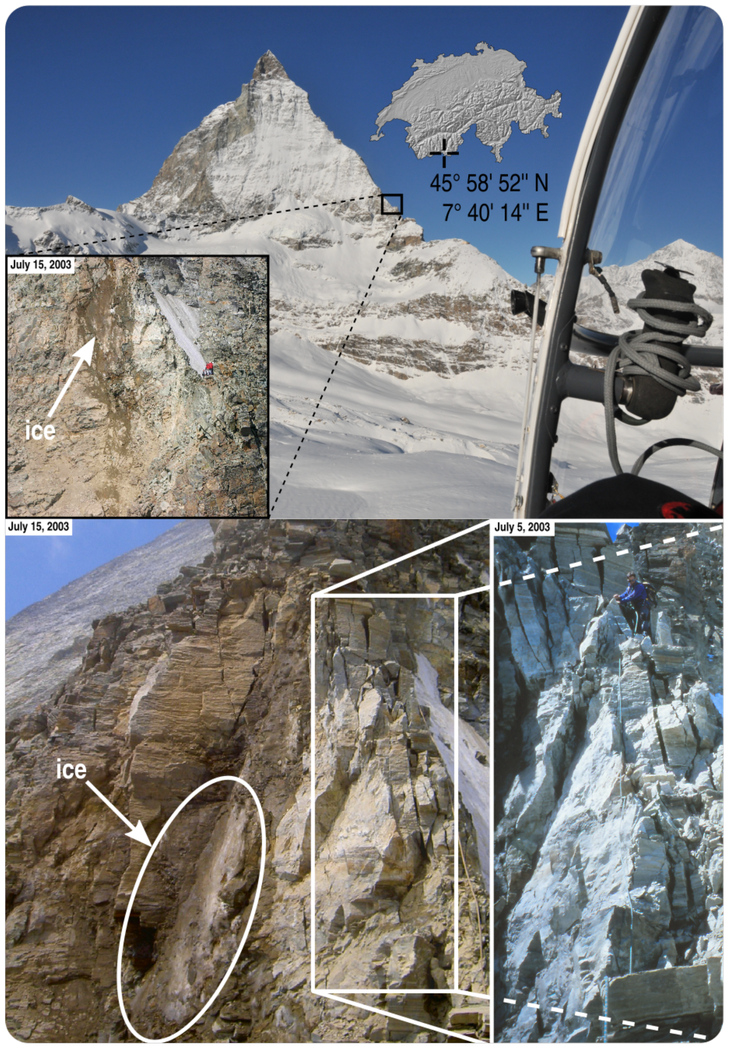
Multi-data cross validation indicates

➔ **temperature-induced** rock slope **dynamics**

➔ seasonal **variations of ice-fill** in fracture

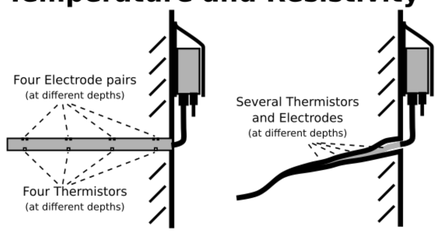
➔ feasibility of **long-term monitoring**

Matterhorn Hörnligrat



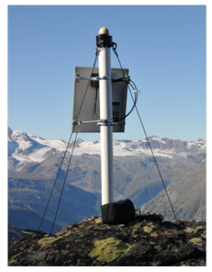
Sensors and Field Installation

Temperature and Resistivity

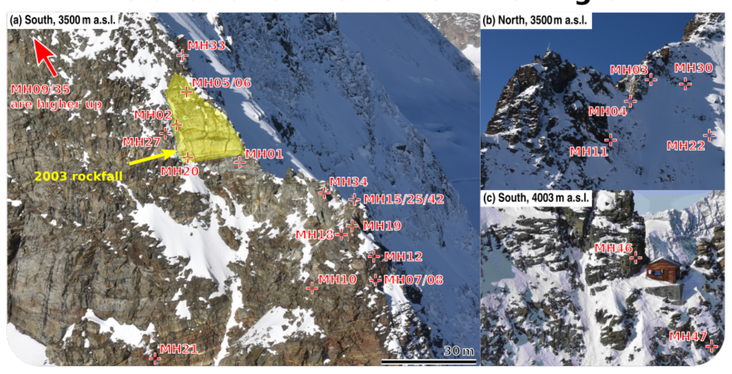


Seismometer

Displacement (relative and absolute)

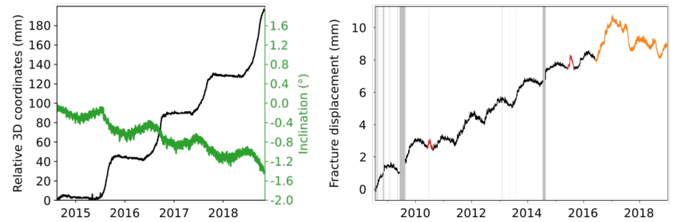


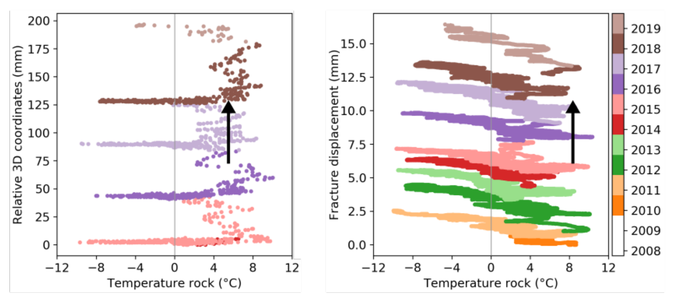
Installation at Matterhorn Hörnligrat



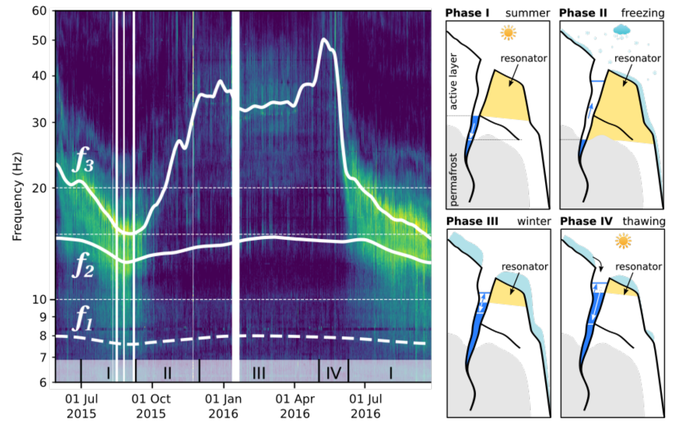
Up to a Decade of Data

Main displacement occurs in thawing period





Monitor ice-fill in fractures (four subseasonal phases)



Reference Weber et al. 2019. A decade of detailed observations (2008–2018) in steep bedrock permafrost at Matterhorn Hörnligrat (Zermatt, CH). Earth System Science Data. DOI: 10.5194/essd-11-1203-2019.
Weber et al. 2018. Ambient seismic vibrations in steep bedrock permafrost used to infer variations of ice-fill in fractures. Earth and Planetary Science Letters. DOI: 10.1016/j.epsl.2018.08.042.

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