

Thermal fluctuations and related rock slopes activities

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Context

Daily thermal fluctuations in rock slopes can be important (up to 50°C amplitude). But how these fluctuations affect progressive failures and rockfall activity is poorly documented and understood up to now. Recent terrestrial remote sensing techniques (laser scanning, infrared thermal imaging) make possible to image deformations and rockfall activity related to these variations of temperature. However, no correct procedure has been proposed for this kind of investigation yet. Such a procedure should couple remote sensing acquisitions with groundtruth measurements of temperature, insolation and deformation, independent estimations of rock thermal properties (conductivity, emissivity, etc.) and a precise characterization of the rock mass geometry and fracturing.

Objectives and Methods

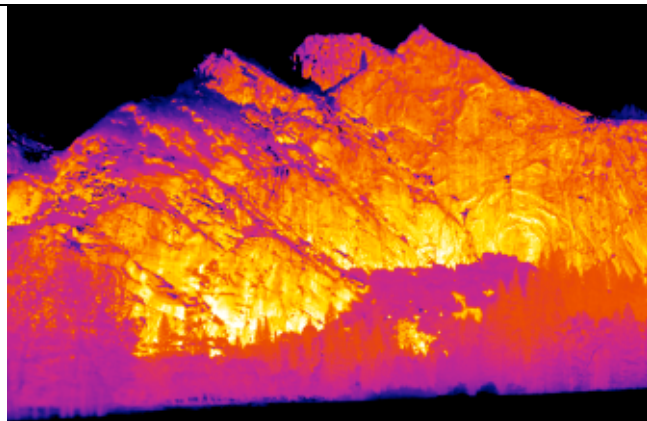
The main objective is to better understand the effects of temperature on rock strain and rupture by monitoring simultaneously thermal fluctuations and rock slope activity of one or two sites. A better detection of rock bridges, a key point in cliff stability assessment, will be investigated too. Regular LiDAR and IRT acquisitions will be done, including 24 hours continuous monitoring, as well as in-situ measurements. Rock surface and thermal properties will be acquired in the lab. Finally, collected data will be used to constrain simple numerical models (Matlab or Comsol) for temperature – strain relationships.

Literature

Baroň, I., Bečkovský, D., & Míča, L. 2014. Application of infrared thermography for mapping open fractures in deep-seated rockslides and unstable cliffs. *Landslides*, 11(1), 15-27.

Collins B. & Stock G. 2016: Rockfall triggering by cyclic thermal stressing of exfoliation fractures. *Nature Geosciences*, 9, 395-400.

Mazzanti, P., Brunetti, A., & Bretschneider, A. (2015). A new approach based on terrestrial remote-sensing techniques for rock fall hazard assessment. In *Modern Technologies for Landslide Monitoring and Prediction* (pp. 69-87). Springer Berlin Heidelberg.



WEB sites

<https://www.usgs.gov/news/hot-days-can-trigger-yosemite-rockfalls>

Choice of orientation :

3) Geological Risks