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Characterisation of the Montset instability, Valais, Switzerland

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The present study focuses on the rock slope of Montset, a 2622 m high summit in the Penninic Alps, in Switzerland. Different features (morpho-structure, size of the phenomenon, present-day rate of displacement, and ancient collapse of the lower part of the slope) suggest that it is a deep-seated slope deformation (DSGSD).

The detection and the monitoring of movements are important to understand the deformation mechanisms, the type, and the geometry of rock slope failure and to assess its stability. Terrestrial laser scanning (TLS) provides high resolution point clouds of the topography which is used for structural analysis including an assessment of the discontinuity sets and a detailed geometrical characterization of the study area. Two TLS acquisition were conducted in July and October 2012. The scans are treated and analyzed using PolyWorks software to be first aligned and georeferenced. The alignment of the scans taken at different epochs enables the detection and quantification of slope movements, like rockfalls or sliding area.

No significant movements were detected; however, some localized movements such as rockfalls or creep due to permafrost meltdown were shown. Furthermore, forward movement is detected in the upper part of the instability. The comparison between the discontinuity sets from both sides of the fault which is assumed to delimit the instability shows rotational movements. Several more active areas are identified, based on field observations. Based on the recognition of common structural features with a stable reference area, we can compute the rotation or the toppling that characterize the discontinuity planes of the unstable area. Once the movements are detected, quantified and localized, a 3D model of the instability can be proposed. This is realized using Move, modeling software which can integrate various geological data.