Geophysical Research Abstracts
Vol. 18, EGU2016-15452, 2016
EGU General Assembly 2016

Stability of Molasse: TLS for structural analysis in the valley of Gotteron-Fribourg, Switzerland

Mariam Ben Hammouda (1), Michel Jaboyedoff (1), Marc Henri Derron (1), Samir Bouaziz (2), and Benoit Mazotti (3)

(1) University of Lausanne, ISTE-FGSE, Lausanne, Switzerland , (2) University of Sfax, ENIS Sfax, Laboratory 3E, Tunisia , (3) Forest Service and Wildlife (SFF) of Fribourg, Natural Hazards section, Switzerland

The marine molasses of Fribourg (Switzerland) is an area where the cliff collapses and rockfalls are quite frequent and difficult to predict due to this particular lithology, a poorly consolidated greywacke. Because of some recent rockfall events, the situation became critical especially in the valley of Gotteron where a big block has slightly moved down and might destroy a house in case of rupture. The cliff made of jointed sandstone and thin layers of clay and siltstone presents many fractures, joints and massive cross bedding surfaces which increases the possibility of slab failure.

This paper presents a detailed structural analysis of the cliff and the identification of the potential failure mechanisms. The methodology is about combining field observation and terrestrial LiDAR scanning point cloud in order to assess the stability of potential slope instabilities of molasses.
Three LiDAR scans were done i) to extract discontinuity families depending to the dip and the dip direction of joints and ii) to run kinematic tests in order to identify responsible sets for each potential failure mechanisms.

Raw point clouds were processed using IMAlign module of Polyworks and CloudCompare software. The structural analysis based on COLTOP 3D (Jaboyedoff et al. 2007) allowed the identification of four discontinuity sets that were not measured in the field. Two different failure mechanisms have been identified as critical: i) planar sliding which is the main responsible mechanism of the present fallen block and ii) wedge sliding.

The planar sliding is defined by the discontinuity sets J1 and J5 with a direction parallel to the slope and with a steep dip angle. The wedges, defined by couples of discontinuity sets, contribute to increase cracks' opening and to the detachment of slabs.
The use of TLS combined with field survey provides us a first interpretation of instabilities and a very promising structural analysis.