Geophysical Research Abstracts
Vol. 17, EGU2015-10027, 2015
EGU General Assembly 2015

Analysis of a high-alpine steep rockfall – the case of the southeastern face of the Piz Lischana (Grisons, Switzerland)

Susanna Büsing (1), Antoine Guerin (1), Dario Carrea (1), Michel Jaboyedoff (1), Marc-Henri Derron (1), and Marcia Phillips (2)

(1) Risk Analysis Group, Institute of Earth Sciences, University of Lausanne, Switzerland (susanna.busing.1@unil.ch), (2) WSL Institute for Snow and Avalanche Research SLF, Davos Dorf

Specific studies concerning permafrost degradation and slope instabilities in high mountain environments are rare because of the challenging access and the unpredictability of slope failures. However, it is important to better understand the relationship between permafrost melting and slope instabilities, particularly considering the expected increase of air temperature in the Alps in the coming decades.

On 31 July 2011, a rockfall with an estimated volume of 3000 m3 occurred at an altitude of 3050m on the southeastern side of the Lischana mountain, located in the Lower Engadin valley. Luckily the rockfall event was filmed and ice could be observed on the failure plane after analysis of the images. Due to the fact that another crack was opened next to the Lischana summit and to protect the about 1200 mountaineers who climb the mountain in-between the months of July – October, the access to the summit was prohibited by the municipality and the official mountain peak with the visitors book displaced of 50 m.
In autumn 2014 at least three rockfalls, including the expected one with the opened crack since 2011, occurred on different slope orientations of the mountain. Two of them took place within 24 hours at the end of September, the third occurred in October. Again ice could be observed on one slope failure, oriented northeast at 2800 m, and thus it is very probable that permafrost has an important role for these observed rockfalls.

In order to characterize these events, two 3D high density point clouds have been made by photogrammetry, using the Agisoft Photoscan software; one before and one after the rockfall of September 2014 (situated southeast, next to the Lischana summit). 120 photos were taken during a helicopter flight in July 2014 to produce the first point cloud, and more than 400 photos were taken at the end of September on a ridge to produce the second point cloud. The comparison of the two point clouds allow calculating the volume of the southeastern situated rockfall. A structural analysis for this rockfall is made and compared to the geological structures of the whole southeastern face, in order to increase our understanding of the failure mechanisms. Moreover, we were able to extract valuable information about the translational and rotational velocity from the filmed rockfall event (toppling), using Matlab, as well as to calculate its volume adjusting planes on the topography. These analyses combined with monitoring of the air temperature, rainfall and sun radiation improve our understanding concerning the triggering factors and the influence of permafrost degradation on slope instabilities in steep high-alpine rock faces.