Geophysical Research Abstracts
Vol. 14, EGU2012-12331-1, 2012
EGU General Assembly 2012

Structural analysis and stability assessment of the West face of the Drus (3733m, Mont Blanc massif)

B. Matasci (1), L. Ravanel (2), M. Jaboyedoff (1), and P Deline (2)

(1) University of Lausanne, IGAR-FGSE, Lausanne, Switzerland (battista.matasci@unil.ch), (2) EDYTEM Lab., University of Savoie - CNRS, Le Bourget du Lac, France

The Petit Dru is an iconic peak of the Mont Blanc massif (France). The west face in particular is famous for alpinists and takes part in the attractiveness of the Chamonix valley. During the last decades, the west face was affected by large rockfalls, especially in 1997, 2003, 2005 and 2011. In June 2005 the entire Bonatti pillar collapsed leading to the main event occurred in this area since the end of the Little Ige Age ($\sim$ 1860), with an estimated volume of more than 260 000 m3 and a dust cloud that reached the Montenvers railway top station located 3 km far on the west.

The climate warming in the Alps during the 20th Century, that exceeded 1.25°C, is actually thought to explain this high activity through permafrost degradation. In the October 2011 rockfall scar, remnants of massive ice observed along a primary discontinuity is good evidence of the role of the permafrost on the stability of high alpine rock faces.

Nevertheless, climatic aspects alone cannot explain the recent rockfall activity of the Drus. Rockfall locations are strongly linked to the geological and structural regional features and to geometrical and mechanical characteristics of local discontinuity sets. For the west face of the Drus, a complete structural analysis was performed based on field observations and terrestrial laser scanning (TLS) data. The failure mechanisms of the most recent rockfalls were investigated in detail, especially for the September and October 2011 events. First results show that large wedge structures play a major role in the destabilization process. The formation of great roofs is another important aspect leading to local high rockfall activity. Moreover, areas located near very persistent discontinuities exhibit a higher fracture density and are shown to be more susceptible to rockfalls. The volumes of the different rockfall events were reconstructed in detail using very accurate TLS point clouds and the software PolyWorks (Innovmetric).

Coupling new remote sensing techniques (TLS) and traditional field surveys greatly improves quantitative characterization of rockfall source areas and increases our understanding of the structural settings and destabilizing processes leading to rockfalls in high mountain rock walls. This approach enables locating the most probable future rockfall sources and provides key elements needed to evaluate the potential volume and run-out distance of rockfall blocks.