Geophysical Research Abstracts
Vol. 13, EGU2011-12979, 2011
EGU General Assembly 2011

Analysis of predisposing factors and slope activity of rockfall prone areas based on terrestrial laser scanner and time laps photography

Andrea Pedrazzini (1), Kerry Leith (2), Sarrasin Nicolas (), Jeffrey Moore (2), and Michel Jaboyedoff (1)

(1) IGAR, Faculty of Geosciences, Lausanne, Switzerland (andrea.pedrazzini@unil.ch), (2) Geological Institute, Engineering Geology, ETH, Zürich, Switzerland

Rockfall events typically occur in response to environmental phenomena acting on hillslopes structurally predisposed to failure, and as a result, may be widely distributed in both space and time. In order to reduce this uncertainty, site specific investigations into rockfall susceptibility aim to characterize key structural features of a rock mass through field investigation, and semi-quantitative geomorphological and structural analysis. In this paper, we present semi-automated approaches to identifying structural predisposition based on high resolution point clouds obtained by a terrestrial laser scanner (TLS). The selected study sites are located within periglacial geomorphic environments in the Matter and Saas valleys (Canton Valais, Switzerland).

We present initial results from a complete structural characterization including discontinuity set orientation, persistence, spacing and roughness based on point cloud data, and compare to a field analysis undertaken using classical techniques. We find a good correlation between discontinuity sets orientation spacing and small scale rugosity, though some differences in persistence and waviness results. Geomorphometric characterisation of the investigated slope including slope gradient, slope curvatures and slope roughness indicates qualitatively that in short time rockfall sensitivity area are located in more rough convexes and steep portions of the slope. Geomorphometric analyses reveal an important dependence of the initial DEM resolution on the final quality of geomorphic descriptors.

Based on this information, we aim to undertake kinematic analysis of rockfall susceptibility across the slope using Matterocking software to incorporate the TLS DEM with detailed structural characteristics obtained by COLTOP3D software. This analysis will allow us to identify specific failure modes, and structural controls on associated erosional processes affecting the slope. Results may then be compared to field observations of geomorphic domains displaying varying degrees of rockfall sensitivity or activity, and a rockfall inventory provided through daily time lapse photography and repeat laser scans from summer 2009 and 2010. The structural, mechanical and geomorphic metrics will then be combined using a bivariate approach to create a preliminary susceptibility map. A first quantitative validation of the susceptibility map will be proposed based on the rockfall monitoring results.