Geophysical Research Abstracts
Vol. 13, EGU2011-13069, 2011
EGU General Assembly 2011

From Sackung to rock avalanche: the example of Sierre landslide (Switzerland)

Andrea Pedrazzini, Michel Jaboyedoff, and Alexandre Loye
IGAR, Faculty of Geosciences, Lausanne, Switzerland (andrea.pedrazzini@unil.ch)

Sackung is a widespread post-glacial morphological feature affecting Alpine valley sides and creating typical geomorphological expressions that could be detected on the topography. Hazard posed by this type of slope instability is generally very low if no velocity accelerations occur. However, over long time evolution internal deformation can drastically increase leading to the formation rapid creeping phenomenon as a rock-slide or rock avalanches.
In this study, we present a detailed description of the Sierre rock-avalanche area located in south-western Switzerland. This convex-shaped landslide is one of the larger rock-avalanche in the Alps, involving more than 1 billion of m3 with a run out distance of about 14 km an extremely low Farböschung angle (5-6°). Detailed field survey on both source and deposit areas have been carried out to asses the main predisposing factor leading to failure. Precise pre-failure topography reconstruction, based on 3D high resolution digital elevation model and geomorphological constraint was performed. Based on these data, preliminary numerical modelling using finite element analysis was run to test the stability pre-failure geometry and to evaluate the sensibility to progressive glacial unloading and rock mass damage.
Detailed mapping of the scar area indicates the great influence of both ductile and brittle tectonics structures on the geometry and the extension of the failed mass. In the lower potion of the slope, fold and faulting affecting both bedrock and post-glacial sediments were discovered. The presence of this type of structures leading to suppose important pre-failure slope deformations, that represent the expression of a large sackung developed after the glacial retreat. In the upper portion of the slope, behind the rock-avalanche scar, important gravitational deformation features are observed. This indicates that pre-failure gravitation processes affected a more important area that the failed zone. The western portion of the failure surface is partially covered by a large landslide taking place after that the rock-avalanche occurs.
These observations imply that the study area was affected by at least three distinct generations of slope deformations creating a complete changing in post-glacial morphology.
Numerical modelling results indicate that important stress concentrations are located close to the main topographic inflection points. These results are confirmed by field evidences indicating that location both scar and basal limit of the rock-avalanche corresponds to changing on bedding planes attitude.