



Lithological and structural control of the deep seated gravitational sliding of the "Les Pics" mountain

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The "Les Pics" area, located in the Rhône valley (Wallis, Switzerland), is a complex unstable system, composed by a deep-seated gravitational slide (DSGS) and minor landslides inside the deformed mass. The different factors that led to the DSGS formation have been investigated in this study. The morpho-structural analysis of a high resolution Laser-DEM, show that gravitational lineaments have two preferential orientations, which correspond to the orientation of two major discontinuity sets. In the largest part of the north facing DSGS, lineaments are oriented N-S, whereas in the NW side the structures have a NE-SW direction. The main scarp shows differences in earlier dislocations. In comparison to the whole DSGS, higher displacements are found in the NW side due to the NE-SW discontinuities that influence the gravitational movement. The evolution of the slope during the glacial retreat was simulated with a 2D finite difference model. This simulation shows the formation of minor landslides inside the deformed mass. The model suggests that the DSGS is triggered by the removal of glacial confinement about 15'00-17'000 years ago. This caused an important unloading of the slope, leading to the formation of the failure surface and the reactivation of pre-existing discontinuities. The sloping local base level (SLBL) method is used to estimate the position of the failure surface, the volumes of the whole DSGS (130 mio of m³) and of two minor "sackung" (25 mio of m³).

The results of the two simulations and the field observations are in good agreement, since the reactivation of pre-existing vertical discontinuities and the formation of tension cracks in the upper part have been recognized. The location of the DSGS is probably controlled by the presence and the dissolution of gypsum and corneule at the base of the slope, as suggested by the geological cross section and chemical analysis of groundwater.