Geophysical Research Abstracts
Vol. 12, EGU2010-12426, 2010
EGU General Assembly 2010

Numerical analysis for the establishment of shallow landslide rainfall thresholds

Alessio Ferrari and Lyesse Laloui

Soil Mechanics Laboratory, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland (alessio.ferrari@epfl.ch, lyesse.laloui@epfl.ch)

For a proper quantitative hazard assessment, it is often required to provide indications on the proneness of a given slope to fail under different rainfall patterns. Considerations on climatic changes can lead to consider rainfall events which can significantly differ from the historical ones, on the base of which rainfall thresholds are often elaborated by statistical analyses.

An example of application of advanced numerical analyses for the establishment of rainfall thresholds is presented. A coupled hydro-mechanical formulation is used in order to analyse the triggering of shallow landslides induced by different rainfall patterns. Advanced concepts of unsaturated soil mechanics implemented in a finite element modelling framework are used to simulate the infiltration processes. This allows to take explicitly into account the effects of the evolution of saturation degree and suction within the slope, such as the changes in permeability as a function of the saturation degree and the effects of suction variations on shear strength and stiffness

Series of parametric studies have been performed in order to highlight the relative importance of several involved factors such as slope geometry, material parameters and initial conditions resulting from antecedent rainfalls. Retention property of the soil has been identified as a key factor determining the failure time for a given rainfall event. The results of the numerical analyses have been finally used in order to corroborate some rainfall thresholds which have been proposed for the Alpine regions.