Geophysical Research Abstracts
Vol. 12, EGU2010-4749, 2010
EGU General Assembly 2010

Analysis of hydrological triggered clayey landslides by small scale experiments

A. Spickermann (1,2,3), J.-P. Malet (2), T.W.J. van Asch (1,3), and T. Schanz (4)

(1) Faculty of Geosciences, Department of Physical Geography, Utrecht University, Utrecht, Netherlands (a.spickermann@geo.uu.nl / anke.spickermann@eost.u-strasbg.fr), (2) School and Observatory of Earth Sciences, Institute of Earth Physics, CNRS UMR 7516, University of Strasbourg, Strasbourg, France, (3) Faculty of Civil Engineering and Geosciences, Water Resources Section, Delft University of Technology, Delft, Netherlands, (4) Chair for Foundation Engineering, Soil and Rock Mechanics, Ruhr-University Bochum, Bochum, Germany

Hydrological processes, such as slope saturation by water, are a primary cause of landslides. This effect can occur in the form of e.g. intense rainfall, snowmelt or changes in ground-water levels. Hydrological processes can trigger a landslide and control subsequent movement. In order to forecast potential landslides, it is important to know both the mechanism leading to failure, to evaluate whether a slope will fail or not, and the mechanism that control the movement of the failure mass, to estimate how much material will move in which time. Despite numerous studies which have been done there is still uncertainty in the explanation of the processes determining the failure and post-failure. Background and motivation of the study is the Barcelonnette area that is part of the Ubaye Valley in the South French Alps which is highly affected by hydrological-controlled landslides in reworked black marls. Since landslide processes are too complex to understand it only by field observation experiments and computer calculations are used.

The main focus of this work is to analyse the initialization of failure and the post-failure behaviour of hydrological triggered landslides in clays by small-scale experiments, namely by small-scale flume tests and centrifuge tests. Although a lot of effort is made to investigate the landslide problem by either small-scale or even large-scale slope experiments there is still no optimal solution. Small-scale flume tests are often criticised because of their scale-effect problems dominant in dense sands and cohesive material and boundary problems. By means of centrifuge tests the scale problem with respect to stress conditions is overcome. But also centrifuge testing is accompanied with problems.

The objectives of the work are 1) to review potential failure and post-failure mechanisms, 2) to evaluate small-scale experiments, namely flume and centrifuge tests in the analysis of the failure behaviour in clayey slopes and 3) to interpret the failure behaviour and possible mechanisms in tests on Zoelen clay and black marls by numerical calculations.

After a general view of mechanisms that might initialise failure and mechanisms that might determine post-failure motion relevant for landslides occurring in non-cohesive and cohesive slopes, the performed tests on reworked black marls are presented. The problems and restrictions of both test methods are explained and discussed strategies for future tests given. The assumed mechanisms that might trigger failure and control post-failure motion that have been observed in the tests are examined by numerical modelling. It is shown that the results of the numerical simulation give an important contribution to the interpretation of the experimental observations and to the evaluation of the small-scale experiments.