Geophysical Research Abstracts, Vol. 7, 06309, 2005
SRef-ID: 1607-7962/gra/EGU05-A-06309

Softening and instability of shallow sloping covers in overconsolidated clay

L. Picarelli (1), G. Urciuoli (2), A. Mandolini (1), M. Ramondini (2), L. Olivares (1)

(1) Department of Civil Engineering, Second University of Naples, Italy (picarell@unina.it / fax: +39 081 5037370 / phone: +39 081 5010213), (2) Department of Geotechnical Engineering, Federico II University of Naples, Italy

Mechanical weakening of shallow sloping covers is a typical phenomenon occurring in overconsolidated clay, that in the long term leads to slope instability. Several factors contribute to weakening and subsequent instability. Weathering, swelling associated to stress release, strain softening, creep, destructuration caused by cycles of wetting-drying or of freezing-thawing, are all physical and mechanical phenomena that are often invoked to justify soil weakening. In contrast, the effects of changes of the soil structure due to osmotic phenomena have been investigated to a lesser extent. The paper deals with shallow landslides occurring in highly plastic overconsolidated clay of marine origin. The key idea is that weakening can be caused by infiltration of fresh water and consequent osmotic phenomena leading to a transformation of the clay structure and decrease of cohesion, dilation angle and friction angle. Some available data suggest that these phenomena are very active in highly plastic clays. The instability phenomena occurring in the Bisaccia Clay are described and discussed within this framework. Either steep slopes caused by fast erosion or gentle slopes are present in the same deposits. Slides mostly occur along steep slopes as a consequence of suction decrease, but the material accumulated at the foot of them quickly softens giving rise to mudslides. Gentle slopes are mainly subjected to mudslides that develop as a consequence of pore pressure fluctuations. In both cases, soil weakening appears to be an additional cause of instability. In fact, a number of laboratory tests show that swelling induced by stress release and facilitated by opening of fissures is dramatically enhanced if distilled water is provided to specimens: hence, osmotic phenomena are likely to occur. A number of CPTU and of tests carried out with an environmental cone in the same sections, shows a strong variation of the shear strength with depth,

associated with a similar variation of pH. This confirms that softening could be associated with a change of the features of the internal structure of clay as a consequence of adsorption of fresh water from the ground surface.