Geophysical Research Abstracts,
Vol. 10, EGU2008-A-11041, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-11041
EGU General Assembly 2008


# Capillary barriers and stability of sloping layered pyroclastic covers

D. Mancarella, **V. Simeone**

Politecnico di Bari, Facoltà di Ingegneria di Taranto, Viale del Turismo 8, 74100 Taranto(v.simeone@poliba.it)

A literature review regarding the catastrophic landslides occurred in the area of Sarno (Campania, Italy) on May 1998 reveals that the triggering mechanism which lead to the event is not yet completely clear. The landslides took place after an extremely prolonged and continuous rainfall, however, not considered extraordinary in terms of return time or intensity if compared to other case histories. The catastrophe originated from the movement of shallow initial debris slides on the pyroclastic covers laying over Pizzo D'Alvano relief that subsequently incorporated other material and water and evolved into debris flows and avalanches, some canalized and fluidized inside watery drainage pathways. The hydraulic underpressure model can represent only one of the possible triggering mechanisms, certainly not an exhaustive explanation for all the numerous failures surveyed on the covers. The precarious stability of these covers, laying over very steep versants, characterized by heterogeneity and discontinuities often due to artificial road cuts, is supplied in some places by the soil suction, especially in the finer horizons. The authors believe that the presence of retention mechanisms of infiltrating waters due to the occurrence of capillary barrier phenomena in the interface between fine and coarser pyroclastic layers play a role in the saturation of finer soils. In order to investigate the influence of such phenomena on the stability of the sloping layered covers of Pizzo D'Alvano relief, both laboratory and numerical tests have been performed. Real scale column infiltration tests on local layered pyroclastic materials were performed in the laboratory to assess the presence of capillary barriers. Experimental data were then used to calibrate numerical column infiltration models. Slope models have been set up to reproduce two-dimensional and slope effects on

the inclined covers. Laboratory tests confirmed the possibility that capillary barrier effects may occur at the interface between finer and coarser soils. The more uniform and coarse the lower soil layer is, the more effective the capillary barrier. This effect can come as a consequence of rainfall events characterized by low intensity but long duration that appear more dangerous because they can lead favor a higher water storage in the more superficial layers and cause suction head to drop down. A consequence is the strong decrease and eventually the total loss of suction tension. Diversion effects of infiltrating water flows due to the inclination of the layers might cause further localized increase in water content. A first semi-quantitative estimation of the influence of capillary barriers on slope stability has shown that these phenomena might affect the safety factor up to 25 %. It is not the total amount of rainfall event itself to determine the level of danger related to slope instability but also the peculiarity of such an event, extraordinary constant and continuous in time.