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Scale effect on the water retention curve of a volcanic ash

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During the last decades, a number of flowslides and debris flows triggered by intense rainfall affected a wide mountainous area surrounding the “Campania Plain” (southern Italy). The involved slopes are constituted by shallow unsaturated air-fall deposits of pyroclastic nature, which stability is guaranteed by the contribution of suction on shear strength. To reliably predict the onset of slope failure triggered by critical precipitations, is essential to understand the infiltration process and the soil suction distribution in such granular deposits.
The paper presents the results of a series of investigation performed at different scales to determine the soil water retention curve (SWRC) of a volcanic ash which is an es-sential element in the analysis of the infiltration processes. The soil, a silty sand, was taken at Cervinara hillslope, 30 km East of Naples, just aside an area which had been subjected to a catastrophic flowslide. The SWRC was obtained through:
- standard tests in a suction-controlled triaxial apparatus (SCTX), in a pressure plate and by the Wind technique (1968) on small natural and reconstituted soil samples (sample dimensions in the order of the 1•10-6m3) ;
- infiltration tests on small-scale model slopes reconstituted in an instrumented flume (sample dimensions in the order of 5•10-3m3);
- suction and water content monitoring at the automatic station installed along the Cervinara hillslope.
The experimental points generally were defined by coupling suction measurements through jet-fill tensiometers and water content through TDR probes installed close each others.
The obtained data sets individuate three different curves characterized by different shapes in the transition zone: at larger volume element dimensions correspond curves which exhibit steeper slopes and lower values of the water content in the transition zone. This result confirms the great role of the volume element dimensions in the de-termination of hydraulic characteristics of the soil which cannot be neglected if a reli-able prediction of the slope behaviour has to be done.