Experimental tests for the analysis of a landslide phenomenon occurred in loose soil covered steep slopes

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Rainfall is the most common cause of landslides, so it is important to know the processes underlying failure or that control the slope stability. For soils heavily conditioned by variably saturated situations, the understanding of the hydrological conditions that govern water flows, the dissipation of pore water pressure, the fluctuation in suction levels as the water content varies, as well as the effects of apparent cohesion, is particularly relevant. By using an instrumented flume (IF), some laboratory tests were carried out involving volcanic soils, evolving in mudflow which caused in the past dangerous mudslides, destroying urban environments and loss of life.

IF is consists of two channels, one for triggering mechanisms and one for the propagation phases.

They are equipped with suitable sensors for monitoring the main physical variables, i.e., spray nozzle systems to apply a specific rainfall intensity; minitensiometers and TDR for measuring, respectively, suction values and water content; miniaturized pressure transducers for pore water pressures; and laser displacement sensors.

To obtain representative values, it is of great importance to carry out a good set-up of the sensors first.

The system made it possible to reproduce situations and conditions similar to the real case, to verify the complexities due to the heterogeneous layers and to formulate hypotheses on the hydraulic behavior of the pumice, typical of such deposits. The experimental result formulations were compared with the data recorded by the in situ monitoring station revealing the interpretative conclusions. This work describes the system, paying particular attention to aspects related to sensor set-up, and the results obtained in different test.

References

Capparelli G, Damiano E., Greco R., Olivares L., Spolverino G. Physical modeling investigation of rainfall infiltration in steep layered volcanoclastic slopes. Journal of Hydrology 580 (2020) 124199.

Greco, R. Soil water content inverse profiling from single TDR waveforms. *J. Hydrol*. 2006, 17, 325–339.

Olivares, L.; Damiano, E.; Greco, R.; Zeni, L.; Picarelli, L.; Minardo, A.; Guida, A.; Bernini, R. An InstrumentedFlume to Investigate the Mechanics of Rainfall-Induced Landslides in Unsaturated Granular soils. *Geotech Test. J*. 2009, 32.

Spolverino G., Capparelli G., Versace P. An instrumented flume for infiltration process modeling, landslide triggering and propagation. *Geosciences*, (2019). vol. 9, ISSN: 2076-3263, doi:10.3390/geosciences9030108.