Geophysical Research Abstracts
Vol. 17, EGU2015-12436, 2015
EGU General Assembly 2015


# The role of Soil Water Retention Curve in slope stability analysis in unsaturated and heterogeneous soils.

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The mechanisms of rainwater infiltration causing slope instability had been analyzed and reviewed in many scientific works. Rainwater infiltration into unsaturated soil increases the degree of saturation, hence affecting the shear strength properties and thus the probability of slope failure. It has been widely proved that the shear strength properties change with the soil water suction in unsaturated soils; therefore, the accuracy to predict the relationship between soil water content and soil water suction, parameterized by the soil-water characteristic curve, has significant effects on the slope stability analysis.
The aim of this study is to investigate how the characterization of SWRC of differently structured unsaturated soils affects the slope stability on a simple infinite slope. In particular, the unimodal and bimodal distributions of the soil pore size were compared. Samples of 40 soils, highly different in terms of structure and texture, were collected and used to calibrate two bimodal SWRCs, i.e. Ross and Smettem (1993) and Dexter et al., (2008). The traditional unimodal van Genuchten (1980) model was also applied for comparison. Slope stability analysis was conducted in terms of Factor of Safety (FS) by applying the infinite slope model for unsaturated soils. In the used formulation, the contribution of the suction effect is tuned by a parameter 'chi' in a rate proportional to the saturation conditions. Different parameterizations of this term were also compared and analyzed.

Results indicated that all three SWRC models showed good overall performance in fitting the sperimental SWRCs. Both the RS and DE models described adequately the water retention data for soils with a bimodal behavior confirmed from the analysis of pore size distribution, but the best performance was obtained by DE model confirmed. In terms of FS, the tree models showed very similar results as soil moisture approached to the saturated condition; however, within the residual zone, the DE model denoted an anomalous behavior depending on the used formulation for the 'chi' parameter, with decreasing FS as soil moisture decreases.