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CLAY CRACKS EFFECT ON SLOPE STABILITY: NUMERICAL INVESTIGATION

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ABSTRACT

The study of a slope stability requires, in addition to site reconnaissance and mechanical characteristics of the soil, a good knowledge of soil behavior in unsaturated conditions, so a good comprehension of the phenomena resulting from hydro-mechanical coupling between the three phases existing in the soil (solid, water and air).

In fact, wetting and drainage cycle due to rainfall/evaporation has a large influence on the hydro-mechanical behavior of the soil. Also, it is at the origin of several phenomena such as capillarity and degree of saturation variations. The hydro-mechanical behavior depends on several factors like the rainfall infiltration rate linked to the soil permeability, field topography, and initial consolidation stress.

The aim of this work is to study the effect of such factors by a numerical model based on the formulation developed by Trabelsi et al. (2010, 2011). A particular attention is given to the effect of evaporation on the crack network development which depends on the soil tensile strength as a function of the suction.

In the other hand, the model links the unsaturated permeability function to the crack network via a macro-porosity function distribution. As a simple example, an idealized topographic slope is considered, and then submitted to wetting and drying cycles. So, cracks are generated and movements of the slope are numerical followed and then analyzed. Finally, we show the effect of the cracks development by desiccation on the infiltration rate and on the stability of the slope.

Keywords: soil mechanics, capillarity, porosity.

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