HYDRO-MECHANICAL CONTINUUM MODELLING OF AN EXPERIMENTAL SLOPE WITH A MATERIAL STABILITY CRITERION

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ABSTRACT

In the case of hydrologically driven slope instability, the behaviour of the variably saturated soil is closely related not only to the distribution of pore-water pressure, but also to the stress state during rainfall infiltration. This phenomenon involves both mechanical and hydrological processes. The aim of the scientific community focuses on the development of powerful models capable of a reliable prediction of the landslide initiation. Multiphysics numerical modelling approaches can account for these complex processes including increased saturation, fluid flow and inelastic solid deformation.

To this end, a physics based framework is presented in this work for the continuum modeling of an experimental slope subjected to rainfall infiltration. The geometrically linear finite element code Comes-Geo for non-isothermal elasto-plastic multiphase solid porous materials is used for this scope, as developed by [1]. The failure mechanism is assessed, also by the use of the second order work criterion [2], [3]. The rainfall induced deformation is quantified and the evolution of the pore water pressure is compared with the in situ measurements.

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REFERENCES

[1] L. Sanavia, F. Pesavento, and B. A. Schrefler, "Finite element analysis of non-isothermal multiphase geomaterials with application to strain localization simulation", *Computational Mechanics*, **37**, no. 4, 331-348, (2006).

[2] R. Hill, "A general theory of uniqueness and stability in elastic-plastic solids," *Journal of the Mechanics and Physics of Solids*, **6**, no. 3, 239-249, (1958).

[3] F. Laouafa and F. Darve, "Modelling of slope failure by a material instability mechanism," *Computers and Geotechnics*, **29**, no. 4, 301-325, (2002).