Geophysical Research Abstracts
Vol. 18, EGU2016-18358-2, 2016
EGU General Assembly 2016

Influence of pore pressure on the successive failures of intact slopes

Chrysoula Voulgari and Stefano Utili
School of Engineering, University of Warwick, United Kingdom

The presence of water can significantly change the stability of a slope and as a result the evolution of a slope in time. In this paper the influence of pore water pressure on the morphological evolution of natural cliffs subject to progressive retreat is investigated. The upper bound theorem of limit analysis is employed to evaluate the stability number and the failure mechanism of successive failures of uniform c, φ slopes with the presence of water. This model extends the existing analytical framework on the evolution of slopes subjected to weathering by accounting for the presence of water. Pore-water pressure is considered in the model by using the coefficient ru, a description of the pore-water pressure distribution that is approximate, but is commonly used in slope stability analyses. To account for the influence of the pore pressure, the work of pore-water pressure on the deformation of the soil along the failure surface had to be included in the model leading to modified analytical expressions of the energy balance equation (the balance between external work and dissipated energy) and as a consequence, of the function whose minimum provides the solution in terms of failure mechanisms and associated values of soil strength. With this model it is possible to relate the evolution of natural slopes with the presence of water by a sequence of rotational sliding block failures to the degradation of material strength properties. Computations were carried out for a wide range of parameters (friction angle φ and initial slope inclination β) and a set of normalized solutions is presented for different values of ru coefficient.