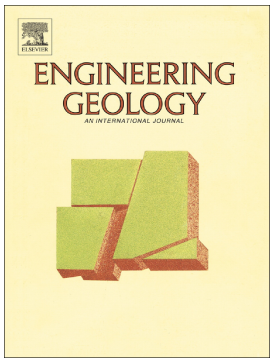

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PII: S0013-7952(17)31358-3
DOI: doi:10.1016/j.enggeo.2018.05.021
Reference: ENGEO 4853

To appear in: *Engineering Geology*

Received date: 16 September 2017
Revised date: 22 May 2018
Accepted date: 23 May 2018

Please cite this article as: Khanh Pham, Dongku Kim, Hyun-Jun Choi, In-Mo Lee, Hangseok Choi , A numerical framework for infinite slope stability analysis under transient unsaturated seepage conditions. Engeo (2017), doi:10.1016/j.enggeo.2018.05.021

A numerical framework for infinite slope stability analysis under transient unsaturated seepage conditions

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Abstract: This paper presents a simple numerical framework for infinite slope stability analysis under transient unsaturated seepage conditions. The advantage of the proposed framework, from the practical point of view, is to predict the variability in stability of partially saturated slope along with rainfall data. Moreover, the presented framework is adaptable to different types of soil-water characteristic curve (SWCC) models, hydraulic boundary conditions, and heterogeneity in soil properties. A series of stability analyses for hypothetical hillslopes under various conditions was performed to scrutinize the potential failure mechanisms induced by rainfall. The examined factors include the soil texture, rainfall intensity, heterogeneity in soil properties and hydraulic boundary conditions. Also, four widely used SWCC models were applied to assess the influence of this component. The SWCC model was demonstrated to strongly dominate the results of the infinite slope stability analysis under transient unsaturated seepage conditions. For homogeneous hillslopes with a fixed water table, when the rainfall intensity (q) equals the saturated hydraulic conductivity (K_s), slope failure was expected to occur after a short time of rainfall with a relatively shallow slip depth. In contrast, for heterogeneous hillslopes or hillslopes with impermeable bedrock, the failure could take place when q is less than K_s, and the potential failure surface was close to the discontinuity interface or at the bottom of the hillslope. Finally, three case studies of

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