Geophysical Research Abstracts
Vol. 15, EGU2013-13406, 2013
EGU General Assembly 2013

A soil water budget model for precipitation-induced shallow landslides

Hsin-Fu Yeh (1) and Cheng-Haw Lee (2)

(1) Department of Resources Engineering, National Cheng Kung University, Tainan 701, Taiwan, ROC., (2) Department of Resources Engineering, National Cheng Kung University, Tainan 701, Taiwan, ROC.

Precipitation infiltration influences both the quantity and quality of slope systems. Knowledge of the mechanisms leading to precipitation-induced slope failures is of great importance to the management of landslide hazard. In this study, a soil water balance model is developed to estimate soil water flux during the process of infiltration from rainfall data, with consideration of storm periods and non-storm periods. Two important assumptions in this study are given: (1) instantaneous uniform distribution of the degree of effective saturation and (2) a linear relationship between evapotranspiration and the related degree of saturation degree. For storm periods, the Brooks and Corey model estimates both the soil water retention curve (SWRC) and soil water parameters. The infiltration partition is employed by an infinite-series solution of Philip in conjunction with the time compression approximation (TCA). For none-storm periods, evapotranspiration can be derived for the moisture depletion of soil water. This study presents a procedure for calculating the safety factor for an unsaturated slope suffering from precipitation infiltration. The process of infiltration into a slope due to rainfall and its effect on soil slope behavior are examined using modified Mohr-Coulomb failure criterion in conjunction with a soil water balance model. The results indicate that the matric suction, which is closely related to slope stability, is affected by the effective degree of saturation controlled by rainfall events.