

LARGE SCALE MODELING OF PRECIPITATION INDUCED LANDSLIDES

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ABSTRACT

Landslides are commonly caused by changes in the interaction between water and soil particles on sloping ground. The water can reduce the strength of the soil by causing pore water pressures to increase resulting in lower effective stresses and lower shear strength.

The objective of this research is to collect experimental data that can be used to initiate development of a model to predict impending rainfall-induced landslides. The scope of the research included in this thesis is the construction, instrumentation and testing of three soil slopes subjected to rainfall-induced failure. Negative and positive pore water pressures, slope angle, precipitation, deformation and drainage are measured for each slope. The stability of each slope is analyzed for various positions of the water (wetting) front as it moves through the soil in the slope by using a mathematical model.

The experimental results from this study showed different characteristics of slope failures occurring under saturated and unsaturated conditions. In the case of the saturated slope, the failure initiated close to the toe due to infiltration and seepage that reduced suction in the soil; resulting in higher pore pressures and lower effective stress in this region. The unsaturated slope was stable at higher angles and unlike the saturated slope failed suddenly and moved rapidly.

This study demonstrated that monitoring pore pressures in unsaturated slopes can provide insight into the changing stability conditions and may ultimately provide the basis for an early-warning failure system.