



Effect of suction-dependent soil deformability on landslide susceptibility maps

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This contribution presents a physically-based, spatially-distributed model for shallow landslides promoted by rainfall infiltration. The model features a set of Factor of Safety values aimed to capture different failure mechanisms, namely frictional slips with limited mobility and flowslide events associated with the liquefaction of the considered soils. Indices of failure associated with these two modes of instability have been derived from unsaturated soil stability principles. In particular, the propensity to wetting-induced collapse of unsaturated soils is quantified through the introduction of a rigid-plastic model with suction-dependent yielding and strength properties. The model is combined with an analytical approach (TRIGRS) to track the spatio-temporal evolution of soil suction in slopes subjected to transient infiltration. The model has been tested to reply the triggering of shallow landslides in pyroclastic deposits in Sarno (1998, Campania Region, Southern Italy). It is shown that suction-dependent mechanical properties, such as soil deformability, have important effects on the predicted landslide susceptibility scenarios, resulting on computed unstable zones that may encompass a wide range of slope inclinations, saturation levels, and depths. Such preliminary results suggest that the proposed methodology offers an alternative mechanistic interpretation to the variability in behavior of rainfall-induced landslides. Differently to standard methods the explanation to this variability is based on suction-dependent soil behavior characteristics.