Coupling a distributed hydrological model with a vegetated slope stability model

F. Preti (1), A. Dani (1), and G.B. Chirico (2)

(1) University of Florence, Ingegneria Agraria Forestale, ITALY, Italy (federico.preti@unifi.it), (2) DIAAT, Division Water Resources and Biosystems Engineering, University of Naples Federico II

Vegetation significantly influences the hydrological and mechanical properties which are relevant for the stability of shallow soils along sloping surfaces. In view of the complexity of soil plant hydrological interactions, the quantification of root mechanical reinforcement remains a challenge. In this paper we couple root reinforcement models with a quasi-dynamic wetness index (QDI), which is specifically designed for estimating the local wetness conditions by accounting for the character of the upslope topography and the time of the lateral soil moisture distribution. The overall modelling strategy can be effectively employed for assessing the relative hazard of shallow landslides accounting for vegetation patterns and dominant forest management practices. The methodology is applied to an area located in Northern Tuscany to assess the effect of root degradation after tree logging on the spatial occurrence of shallow landslides during extreme rainfall events.