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**Analysing the influence of preferential flow on pressure propagation and landslide triggering**

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Rainfall-induced shallow landslides are among the most frequent natural hazards in mountainous areas. Slope instability is often initiated by fast pore water pressure response to precipitation or snow melt events that reduce the suction stress and shear strength of the slope. The mechanism of pressure propagation in saturated and unsaturated zones is rather different. The pressure propagation in saturated zone is nearly instant due to the low compressibility of the saturated soil, while in an unsaturated zone, the fast pressure response might also be induced by preferential flow that bypasses the adjacent soil matrix and directly reaches deeper soil. The diffusion wave model has been proposed to simulate the instant pressure waves in near-saturated soil, yet it cannot simulate the infiltrating water flow in unsaturated soil. In most hydro-mechanical models, pore water pressure is calculated based on a single-permeability assumption, and consequently, the effects of preferential flow on pressure wave propagation and landslide-triggering under high-intensity rainstorms are rarely quantified.

In this study, a hydro-mechanical model was developed by integrating a 1D dual-permeability model with an infinite slope stability approach. The dual-permeability model uses two modified Darcy-Richards equations to simulate the matrix flow and preferential flow within a hillslope. The hydrological results are sequentially coupled with soil mechanics to investigate the influence of preferential flow on pressure propagation and slope stability in a heterogeneous hillslope. A synthetic experiment was conducted to simulate pressure responses and landslide-triggering in a predefined heterogeneous hillslope, which is parameterized with typical soil hydraulic and mechanic properties. The results highlight the soil hydrological conditions which control water and pressure wave propagations in the case of a dual-permeability subsurface, and will further detail on the importance of preferential flow in pressure wave propagation and thus slope stability assessment.