



Pore pressure regime leading to shallow failures in a mountain slope: monitoring and interpretation by soil-atmosphere coupled model.

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The study deals with the onset of debris flows in the “El Rebaixader” basin, located in South Central Pyrenees. The initiation area of debris flows is located on a lateral moraine with a thickness of tens of meters, in which torrential processes and other shallow mass movements have generated a large scarp with steep slopes. To follow slope evolution towards shallow failure, different sensors have been installed to monitor meteorological data and hydraulic variables at shallow depths (positive and negative pore pressure, water content). Measurements are interpreted by means of a thermo-hydro-mechanical coupled Finite Element code provided with a specific boundary condition to model water mass and heat flux exchanged between the ground and the atmosphere, including infiltration, evaporation, sensible heat and solar radiation. Results evidence the different modes of pore regime variation imposed, on the one hand, by surface infiltration and evaporation and, on the other hand, by the settlement of a slope parallel flow in a loose layer at some decimetres depth. As a conclusion, the analysis highlights the strong dependency of slope stability to the water regime taking place in slightly more permeable horizons connected to the top of the catchment area rather than to surficial climatic input. On this basis, some keys about debris flow mitigation are finally put forward.