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Lindenmaier,F., Zehe, E., Dittfurth, A., Ihringer,J. (2005): Process identification at a slow-moving landslide in the Vorarlberg Alps. Hydrological Processes 19 (8), 1635-1651.

Abstract

A fine-grained slope that exhibits slow movement rates was investigated to understand how geohydrological processes contribute to a consecutive development of mass movements in the Vorarlberg Alps, Austria. For that purpose intensive hydrometeorological, hydrogeological and geotechnical observations as well as surveying of surface movement rates were conducted during 1998-2001. Subsurface water dynamics at the creeping slope turned out to be dominated by a three-dimensional pressure system. The pressure reaction is triggered by fast infiltration of surface water and subsequent lateral water flow in the south-western part of the hillslope. The related pressure signal was shown to propagate further downhill, causing fast reactions of the piezometric head at 5 5 m depth on a daily time scale. The observed pressure reactions might belong to a temporary hillslope water body that extends further downhill. The related buoyancy forces could be one of the driving forces for the mass movement. A physically based hydrological model was adopted to model simultaneously surface and subsurface water dynamics including evapotranspiration and runoff production. It was possible to reproduce surface runoff and observed pressure reactions in principle. However, as soil hydraulic functions were only estimated on pedotransfer functions, a quantitative comparison between observed and simulated subsurface dynamics is not feasible. Nevertheless, the results suggest that it is possible to reconstruct important spatial structures based on sparse observations in the field which allow reasonable simulations with a physically based hydrological model.