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Hydromechanical modelling of slope stability at Dollendorfer Hardt, Germany, using the Local- Factor-of-Safety concept

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Rainfall-induced landslides are one of the most important natural hazards that endanger human life and infrastructure all around the world. Different model concepts have been developed to consider the effect of soil hydrology on the mechanical balance and to predict the stability of hillslopes. One state-of-the-art modelling approach for coupled hydromechanical slope stability analysis is based on the Mohr-Coulomb concept that allows evaluating the stability at each point within a hillslope using the so-called Local-Factor-of-Safety (LFS) approach. However, the LFS approach has so far mainly been used to analyze in silico experiments with relatively simple slope geometry. Therefore, this study aims to apply the LFS concept to a slope with complex morphology and spatially distributed material properties that are expected to have a strong influence on flow orientation, water content, stress distribution, and slope stability. Our study site is located at Dollendorfer Hardt, Germany, and has been investigated in a range of previous studies. The slope geometry was obtained from a high resolution digital elevation model, and the subsurface layering was derived from geophysical site characterization. The results of the hydromechanical simulations will be compared to available soil water content monitoring data obtained using a wireless sensor network and time-lapse electrical resistivity tomography. In a final step, slope stability will be evaluated for several hypothetical rainfall scenarios to determine conditions for potential slope movement.