Geophysical Research Abstracts
Vol. 21, EGU2019-19179, 2019
EGU General Assembly 2019


# Integrated micromechanical model for slope stability analysis

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Advances in supercomputing hardware have made it possible to handle highly complex geomechanical analysis with large data. Thus, particle-based methods are gaining an ever-increasing interest with massively parallel programs being developed. These methods have been applied to the analysis of failure mechanisms and scenarios such as mass movement in landslides, avalanches under static, dynamic or seismic loading condition. They provide deep insights into the meso and micro-scale mechanisms leading to macroscopic instabilities. This contribution describes a micromechanical model for stability analysis and simulation in natural or man-made slopes under complex loading and boundary conditions. Based on the micromechanics of loose granular and compacted geomaterial, microstructural change, viscoelastic deformations, fracture, and healing are explicitly integrated into a coupled discrete particle and beam lattice model. Stress-based failure criteria and energy based dissipation and frictional contact are employed. Both gravity increase and strength reduction methods have been employed to evaluate the Factor of Safety (FoS) and potential failure surface and compared. With an emphasis on the impact of the microstructure and its spatial variability on stress-induced microcracks and crack propagation, this study outlines material models and properties relevant to stability analysis. Special focus has been put on layered slopes which present varying shear strength along the depth formed over time according to pressure, temperature, and moisture such as snowpack. This microstructural approach unifies geometrical and material information and allows the structural assembling layers of different strength.