Failure-flow process simulation of landslides triggered by earthquakes

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Abstract

Landslides have been the most important and catastrophic phenomena, especially rock avalanches with long runout, which is responsible for property damage, destruction of infrastructures and casualties, therefore, it plays an important role in the disaster prevention and mitigation project to predict long travel distance of rock avalanches. The process of landslides triggered by earthquakes is very complex and can be divided into two aspects: the failure process of the earthquake and flow process. A numerical model was developed in this paper to simulate the failure-flow process of slope under earthquake ground motion, and to estimate the potentially travel distance, which combined with a finite difference method (FDM) and smoothed particle hydrodynamics (SPH). The failure process is simulated using FDM, while flow process is simulated by SPH. The FDM and SPH are connected by the critical sliding surface and velocity. Its specific steps including: firstly, the stress and strain are calculated by the FDM software. Secondly, critical sliding surface is established by searching the positions where have the largest shear strain increment in the FDM simulation according to Mohr-Coulomb yield criterion, sliding velocity is determined following. Then the sliding body is discretized into a series of smooth particles with specific velocity according to volume equivalence. Finally, lagrangian particle method(SPH) is used to evaluate travel distance. The proposed model is verified a field case induced by the Wenchuan Earthquake.

Keywords: **Failure-Flow Process, Earthquakes, Landslides, Numerical Simulation**