Numerical simulation of the June 24th 2017 Xinmo Landslide with Savage-Hutter model coupling basal entrainment

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A large landslide disaster occurred at Xinmo village of Mao County, Sichuan Province, China on June 24, 2017, and killed 83 persons. The landslide is characterized with high-speed, flow-like movement and strong basal entrainment. A 2-D depth-averaged model based on the Savage-Hutter equations incorporating a basal entrainment relation-ship is developed to stimulate the landslide process. The entrainment relationship is derived from discontinuity formula between the moving mass and the static bed sediment, and the entrainment rate is expressed as a function of the basal shear stress and the bed material resistance. A second-order leap-frog scheme constructed in a staggered grid system is applied to numerically solve the 2D model with high-resolution DEM. An artificial diffusion limiter is introduced on the right-hand side of the continuity equation to keep computational stability. Dry and wet boundary treatment is used to deal with the moving boundary. The simulation results show a good agreement with the on-spot investigation and UAV image interpretation.