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Avalanche dynamics of dry or fully immersed granular mass and temporal evolution of failure structure YUNG-TA HUANG, FULING YANG, Department of Mechanical Engineering, National Taiwan University, Taipei, Taiwan — This work examines the avalanche process of dry and fully immersed granular mass abruptly released down a laboratory flume (of width 15 cm) of smooth bed at fixed inclination experimentally. The granular mass is composed of identical glass spheres (of diameter 1.6 cm) and Newtonian fluids (water or 200 cP glycerol). High-speed imaging technique was applied to capture individual sphere motion from the flume lateral side. The obtained sphere collective motion show distinctive patters in relation with the failure plane which developed during an avalanche. We also estimate instantaneous bulk velocity distribution by area-averaging of individual sphere velocities. It is observed that the interstitial liquid can enhance bulk basal slip due to lubricating effect. The liquid viscosity also gives rise to a unifying effect on bulk dynamics: sharp interface between moving and stationary spheres can be detected in dry mass but not for the liquid-immersed mass. Lastly, we apply the Coulomb failure criterion developed in soil mechanics for homogeneous infinite static mass to predict the failure plane in current finite mass in unsteady motion. It is found that as long as the basal slip is taken into account, the failure plane can be successfully captured in the dry and the water-immersed avalanches.

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