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Liquid effects on the dynamics of granular avalanche YUNG-TA HUANG, FULING YANG, Department of Mechanical Engineering, National Taiwan University — This work examines experimentally how a viscous incompressible liquid modifies the behavior of a granular bulk in avalanche. A large and a small laboratory flume of identical length-to-width ratio have been constructed to initiate granular avalanche. Two types of monatomic spheres were used, preserving the ratio between the particle diameter and the flume width, with or without water to prepare the dry and the immersed mixtures. The bulk motion was monitored from the side by a high-speed digital camera. Quantitative measurements were conducted by integrating the techniques of particle-tracking velocimetry and coarse-grained spatial average. The examined bulk dynamics includes the two-dimensional profiles of bulk velocity and strain as well as the distribution of bulk solid volume fraction and granular temperature. The bulk slip velocity at the flume base and the volume discharge rate of a dry and an immersed mixture were also compared in space and in time throughout the avalanche. Further, a control volume analysis has been performed on the bulk mass, momentum, and energy (granular temperature) transport to extrapolate the stress fields. Finally, the scaling issue on granular flow dynamics will be addressed by comparing the bulk dynamics, on a non-dimensional reference frame, that was measured on the two flumes.

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