Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Liquid effect on a granular avalanche: experiments and discrete element simulation using a liquid-modified contact model F.-L. YANG, ME, National Taiwan University, W.T. CHANG, C.S. CHEN, S.H. HSIEH, Y.T. HUANG, SOLID-LIQUID TWO-PHASE FLOW LAB TEAM, COMPUTER-AIDED ENGINEERING GROUP TEAM — This work extends a conventional Discrete-Element method to simulate the avalanche process and the subsequent bulk motion of a wet granular mixture, composed of identical solid spheres fully-immersed in a viscous liquid. A linear soft-sphere contact model is developed for interactions between dry surfaces to reproduce both the Hertzian contact time and the overall energy loss, characterized a measured coefficient of restitution. The contact model is modified for liquid dissipation effects according to previous experimental data. To assign parameters for tangential interactions, this works uses the measured bulk dynamic behavior, differing from most existing schemes. The simulated mixture motions are compared to experimental data, conducted on a lab-scale flume, at both flow and particle scales. General agreement is obtained on the whole granular avalanche process and the early stages of the subsequent downstream bulk motion. The validated simulation results are further employed to extrapolate bulk dynamics difficult to measure in the experiments, including 3D profiles of bulk velocity, strain, and granular temperature. The obtained results will be adopted to stress how liquid modifies the unsteady behavior of a granular mixture.

Fu-Ling Yang
Mechanical Engineering, National Taiwan University

Date submitted: 06 Aug 2009 Electronic form version 1.4