Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Two particle contact lifetime distribution in gravity driven granular flow[1] ROBERT BREWSTER, UCLA, LEONARDO SILBERT, University of Chicago, GARY GREST, Sandia National Laboratories, ALEX LEVINE, UCLA
— The distribution of two particle contact life times for gravity driven granular flow down an inclined plane are determined from large-scale, three-dimensional discrete element simulations. Results are presented for both cohesive and non-cohesive particles for Hertzian and Hookean contact forces. The distribution of lifetimes is analyzed as a function of height from the surface for different strength k_n of the normal force, coefficient of restitution e_n and coefficient of friction μ. In addition a generalized form of the Bagnold constitutive relation in which the shear stress depends on a sum of terms that are linear and quadratic in the shear rate is proposed for cohesive granular flows. The linear term represents a new mode of momentum transport made possible through the long lived contacts in the network while the quadratic term represents the usual Bagnold contribution from short time scale collisions. For non-cohesive grains, the strength of the linear term disappears as strength of the normal interaction k_n increased.

[1]Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under Contract No. DE-AC04-94AL85000.

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Date submitted: 06 Jan 2006 Electronic form version 1.4