Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

**A Particle-Substrate Model and Its Applications to Cooling and Driven Granular Systems** MEENAKSHI DUTT, University of Cambridge, ROBERT BEHRINGER, Duke University — A complete understanding of the microscopic dynamics of a monolayer of identical spheres moving on a substrate must encompass the effects of collisions and the substrate on the particles. We begin from first principles by considering collections of spherical frictional particles that roll and slip on a flat static substrate. We present a numerical model which accounts for collisional and surface frictional dissipation and their influence on particle dynamics for a quasi 2-dimensional cooling granular material. We apply this model to a simulation of the granular collider experiment (Painter et al., Physica D (2003)), in which collections of particles collided as they moved radially inward on a substrate. We find an agreement between the experimental and numerical results. We extend this model further to study a horizontally vibrated particle-substrate system. We show that the ratio of the substrate acceleration to the particle-substrate static frictional force (Kondic, Phys Rev. E (1999)) dominates the individual particle dynamics and the collision dynamics. We will present results from our numerical experiments which further higlight the critical role of static friction, relative to the driving acceleration.

Meenakshi Dutt
University of Cambridge

Date submitted: 05 Aug 2006 Electronic form version 1.4