Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Hysteresis and competition between disorder and crystallization in sheared and vibrated granular flow KAREN E. DANIELS, ROBERT P. BEHRINGER, Dept. of Physics and Center for Nonlinear and Complex Systems, Duke University — Experiments in a 3D annular shear cell vibrated from below and sheared from above show a hysteretic freezing/melting transition. Under sufficient vibration a crystallized state is observed, which can be melted by sufficient shear. The critical line for this transition coincides with equal kinetic energies for vibration and shear. The force distribution is double-peaked in the crystalline state and single-peaked with an approximately exponential tail in the disordered state. A linear relation between pressure and volume ($dP/dV > 0$) exists for a continuum of partially and/or intermittently melted states over a range of parameters. This work has been supported by the NASA microgravity program, grant NNC04GB08G.

Karen E. Daniels
Duke University

Date submitted: 06 Dec 2004 Electronic form version 1.4