Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

The equilibration of temperature-like variables in jammed granular subsystems[1] KAREN DANIELS, NC State University, JAMES PUCKETT, Yale University — Although jammed granular systems are athermal, several thermodynamic-like descriptions have been proposed which make quantitative predictions about the distribution of volume and stress within a system and provide a corresponding temperature-like variable. We perform experiments with an apparatus designed to generate a large number of independent, jammed, two-dimensional configurations. Each configuration consists of a single layer of photoelastic disks supported by a gentle layer of air. New configurations are generated by alternately dilating and re-compacting the system through a series of boundary displacements. Within each configuration, a bath of particles surrounds a smaller subsystem of particles with a different inter-particle friction coefficient than the bath. The use of photoelastic particles permits us to find all particle positions as well as the vector forces at each inter-particle contact. By comparing the temperature-like quantities in both systems, we find compactivity (conjugate to the volume) does not equilibrate between the systems, while the angoricity (conjugate to the stress) does. Both independent components of the angoricity are linearly dependent on the hydrostatic pressure, in agreement with predictions of the stress ensemble.

[1]Supported by NSF DMR-0644743

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Date submitted: 07 Nov 2012 Electronic form version 1.4