Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Experiments with a particle film: Evidence for force chain buckling ANDREW B. CROLL, BEKELE J. GURMESSA, North Dakota State University, DAVID CAREY, ANTOINETTE TORDESILLAS, University of Melbourne — Granular materials are a unique state of matter that, when loaded, focus stress on a small subset of their total volume. Accurate modeling of the regions of high stress, the force chains, is critical to understanding the overall material behaviour. Progress in modeling the transition from static to fluid has recently been made by considering the onset of the transition as originating with the buckling and failure of a force chain. There is currently little direct experimental evidence for such behaviour. Here we use a simplified model system in which a set of solid particles, packed into a monolayer, is adhered to a soft substrate and compressed. We observe buckling and the emergence of a single dominant lengthscale, much in analogy to the well known "wrinkling" instability of a continuum plate. However, several tests show the behaviour observed in our system to be uniquely granular in nature. Finally, we show how many features of our experiment are in agreement with recent predictions of the force chain buckling model.

Andrew Croll
North Dakota State University

Date submitted: 08 Nov 2012 Electronic form version 1.4