

Abstract Submitted  
for the MAR17 Meeting of  
The American Physical Society

**Pull out experiment in a granular material**<sup>1</sup> YUE ZHANG, ROBERT BEHRINGER, Duke Univ — For 2D impact experiments by Clark et al., collisions between the intruder and “force chains” provided the major drag on an impacting intruder until the intruder was nearly at rest. As a complement to the impact experiment, we consider controlled pre-failure experiments where a buried intruder remains in a granular material under upward loading, and pull-out or failure experiments where a buried intruder is pulled out of a material, starting from rest. We use 2D photoelastic disks, from which circular intruders of different radii are pulled, to visualize this pulling process. We have found a relaxation process of the granular system under constant upward drag force in the pre-failure experiments. During pull-out, we observed that the velocity and acceleration of the intruder follow a linear relationship, as the velocity increases exponentially with time. The curvature of each force chain can be calculated, and those curvatures are found to follow the same distribution function for different intruder sizes and in both the first and last halves of experimental runs.

<sup>1</sup>We would like to acknowledge NASA grant NNX15AD38G, NSF grants DMR1206351 and DMS124807, and the William M. Keck Foundation for the support of this research.

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Date submitted: 07 Nov 2016

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