

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Crackling to periodic transition in a granular stick-slip experiment¹ AGHIL ABED ZADEH, Duke University, JONATHAN BARS, Universit de Montpellier, ROBERT BEHRINGER, Duke University — We perform a stick-slip experiment to characterize avalanches in time and space for granular materials. In our experiment, a constant speed stage pulls a slider which rests on a vertical bed of circular photo-elastic particles in a 2D system. The stage is connected to the slider by a spring. We measure the force on the spring by a force sensor attached to the spring. We study the avalanche size statistics, and other seismicity laws of slip avalanches. Using the power spectrum of the force signal and avalanche statistics, we analyze the effect of the loading speed and of the spring stiffness and we capture a transition from crackling to periodic regime by changing these parameters. From a more local point of view and by using a high speed camera and the photo-elastic properties of our particles, we characterize the local stress change and flow of particles during slip avalanches. By image processing, we detect the local avalanches as connected components in space and time, and we study the avalanche size probability density functions (PDF). The PDF of avalanches obey power laws both at global and local scales, but with different exponents. We try to understand the correlation of local avalanches in space and the way they coarse grain to the global avalanches.

¹NSF grant DMR-1206351, NASA grant NNX15AD38G, and the William M. Keck Foundation

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Date submitted: 07 Nov 2016

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