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Avalanches and local force evolution in a granular stick-slip experiment[1] AGHIL ABED ZADEH, Duke University, JONATHAN BARES, Montpellier University, ROBERT BEHRINGER, Duke University — We perform a stick-slip experiment to characterize avalanches for granular materials. In our experiment, a constant speed stage pulls a slider which rests on a vertical bed of circular photoelastic 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 PDF of energy release and slip size, avalanche shape in time, and other seismicity laws during slip avalanches. We analyze the power spectrum of the force signal and probability distributions to understand the effect of the loading speed and of the spring stiffness on the statistical behavior of the system. From a more local point of view and by using a high speed camera and the photoelastic properties of our particles, we characterize the local stress change and flow of particles during avalanches. By image processing we detect the avalanches, as connected components in space and time, and the energy dissipation inside the granular medium and their PDFs. The PDFs of avalanches obey power laws both at global and local scales, but with different exponents. We try to understand the distribution and correlation of local avalanches in space and the way they coarse grain to the global avalanches.

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