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Fluctuations and Avalanche Statistics in Sheared Systems of Elliptical Particles¹ SOMAYEH FARHADI, ROBERT P. BEHRINGER, Duke University — We have performed a series of 2D Couette shear experiment on a system of granular particles near jamming. In these experiments, the particles, which are photoelastic ellipses with aspect ratio 2, are confined between an inner rotating wheel and a fixed outer ring. The inner wheel rotation rate was varied between 0.01 and 0.1 rpm. Using photoelastic properties of the particles and two synchronized cameras, we are able to track the position, orientation and contact forces of each particle through the entire experiment. We determined the local mean, fluctuations, and correlations for various system properties, such as density (Voronoi volume), pressure, orientational order parameter and shear rate. A striking finding of this study is the fact that near jamming, the system can exist in an effectively shear jammed metastable state for very long times before relaxing to an unjammed state. We have also studied the dynamics of avalanches by analyzing the time series of global stress. This study gives us insight to the nature of failure in sheared systems of asymmetrical particles.

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Prefer Oral Session
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