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Intermittent Flow of Granular Matter in an Annular Geometry

TED BRZINSKI, KAREN E. DANIELS, NC State University — Granular solids can be subjected to a finite stress below which the response is elastic. Above this yield stress, however, the material fails catastrophically, undergoing a rapid plastic deformation. In the case of a monotonically increasing stress the material exhibits a characteristic stick-slip response. We investigate the statistics of this intermittent failure in an annular shear geometry, driven with a linear-ramp torque in order to generate the stick-slip behavior. The apparatus is designed to allow visual access to particle trajectories and inter-particle forces (through the use of photoelastic materials). Additionally, twelve piezoelectric sensors at the outer wall measure acoustic emissions due to the plastic deformation of the material. We vary volume fraction, and use both fixed and deformable boundaries. We measure how the distribution of slip size and duration are related to the bulk properties of the packing, and compare to systems with similar governing statistics.

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