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Characterizing the movement of grains in a 2D rotating drum with imposed vibrations NORA SWISHER, BRIAN UTTER, James Madison University — We study particle trajectories and surface behavior of photoelastic grains in a 2D circular rotating drum subjected to imposed vertical vibrations. Granular materials are ubiquitous, from industrial processing and pharmaceutical powder mixing to avalanches and sinkholes, yet general equations of flow are not known for these materials. For granular materials, flow is characterized by sudden avalanches, large shear gradients, and history dependence and these characteristics make it difficult to form general equations of flow. This jamming transition is general, occurring in foams, emulsions, and traffic, and can vary significantly with vibration (the "granular temperature").To quantitatively measure the flow, jamming, and mixing properties of the grains, we analyze images to determine each particle's position and velocity for each frame. External vibration leads to increased compaction of the grains, larger rearrangements, and a narrower shear band. Particle tracking allows us to closely analyze the velocity profiles, trajectories of individual grains, and separation and diffusion of originally neighboring grains. We will present results on the stability of the pile as well as the effects on mixing as external vibration is varied.

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