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Dynamics near shear-jamming for a dense granular system[1] JIE REN, JOSHUA DIJKSMAN, ROBERT BEHRINGER, Duke University — This talk will present several systematic experimental studies of a two-dimensional, frictional dense granular system subjected to simple shear deformation. The first experiment consists of linear shear for densities smaller than the isotropic jamming point, and examines both the evolution of the average stress and the evolution of force network. These measures reveal three distinguishable regimes of the granular system with increasing shear strain: unjammed, fragile, and shear-jammed regimes. The second experiment uses small amplitude cyclic shear to probe the dynamical response of the states from the first experiment. For fragile or jammed regimes, cyclic shear drives the system through transient states that evolve towards relatively stable forces networks and system-averaged stress. The timescale of the transient increases rapidly as the system moves deeper into the fragile, or shear-jammed regimes. These experiments also involve particle tracking (displacements and rotations) to search for and characterize non-affine motion and spatial heterogeneity. There is a clear increase in particle diffusion with increasing density and shear strain amplitude, even when the system is still unjammed and experiences only minimal stress. When the system is fragile or jammed, the heterogeneity of particle displacements reveals subtle correlations with the force network.

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