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Dynamical heterogeneities and long-lived stress: signatures of jamming in a dense granular flow ALLISON FERGUSON, BULBUL CHAKRABORTY, Martin Fisher School of Physics, Brandeis University — Recent interest in understanding the dynamical arrest leading to a fluid → solid transition in both thermal and athermal systems has led to questions about the nature of these jamming transitions (PRL **86**, 111 (2001), Nature **411**, 772 (2001)). It is believed that these jamming transitions are dependent on the influence of extended structures on the dynamics of the system (Science **287**, 627 (2000)). Is it possible to construct a simple model of a driven, dissipative system in which these structures are seen to form? Simulations of steady-state gravity-driven flows of inelastically colliding hard disks show the formation of large-scale linear chains of particles with a high collision frequency even at flow velocities well above the jamming transition (EPL **66**, 277 (2004)). These chains can be shown to carry much of the collisional stress in the system due to a dynamical correlation that develops between the momentum transfer and time between collisions in these "frequently-colliding" particles. The lifetime of these chains is seen to grow as the flow velocity decreases towards jamming, leading to slowly decaying stress correlations reminiscent of the slow dynamics observed in supercooled liquids. Long-lived stress chains seem to be precursors to force chains in static granular piles and understanding the dynamical principles behind their formation and decay can lead to increased insight into the mechanism of dynamical arrest.

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