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**Velocity fluctuations in hopper flow near the clogging transition** CHARLES THOMAS, DOUGLAS DURIAN, University of Pennsylvania — Dynamic arrest in granular systems continues to elude a comprehensive description. We consider granular flow from a hopper as a quintessential example of a system which can spontaneously evolve from a freely flowing state to a jammed state. With a large enough opening of size D, grains flow out freely. When D is smaller, however, grains flow for a period and then stop, and the entire hopper has clogged. A critical opening size Dc is defined as the smallest D for which the flow will never clog, and marks the clogging transition. We systematically investigate the grain motion in a quasi-2D hopper as a function of D when D ¿ Dc. Using a high-speed camera, we track the particles and find their instantaneous velocities. We report on the fluctuations of these particle velocities relative to their time-averaged velocity. In other systems, this has been seen to grow on approach to jamming. Additionally, we describe the time scales associated with the intermittency of the flow. Diverging time scales are also a key characteristic of a system near jamming. Furthermore, a clog can be considered an intermittent event of indefinite duration. The similarities and contrasts between the clogging and the jamming transitions will further illuminate systems which undergo dynamic arrest.

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