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Velocity fluctuations in dense granular flows JOHN DROZD, COLIN DENNISTON, University of Western Ontario — We use simulations to investigate velocity fluctuations in dry granular flow. Our system is comprised of mono- and poly-disperse sets of spherical grains falling down a vertical chute under the influence of gravity. We find three different classes of velocity distributions depending on factors such as the local density. The class of the velocity distribution depends on whether the grains are in a free-fall, fluid or glassy state. The analytic form of the distributions match those that have been found by other authors in fairly diverse systems. Here, we have all three present in a single system in steady-state. Power-law tails that match recent experiments are also found but in a transition area suggesting they may be an artifact of crossover from one class of velocity distribution to another. By studying both fast and slow flowing systems, we find that the velocity fluctuations are related to collision times by a scaling with the glass transition temperature. We measure collision time distributions along the height of the chute and find that the collision time distributions evolve from exponential tails into power-laws. This suggests that the particles may be forming clusters as they approach the glass state which may correspond to a second order dynamical phase transition.

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