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Stress and Velocity Correlations in Granular Flow BIDITA J. TITHI, SHUBHA TEWARI, Mount Holyoke College, ALLISON FERGUSON, BULBUL CHAKRABORTY, Brandeis University — We report on studies of gravity-driven, dense, granular flow via simulations of two-dimensional, inelastic, bidisperse hard disks in a vertical tube geometry. We have previously reported (Europhys. Lett. **66**, 277 (2004)) the formation of linear chain-like structures of particles undergoing frequent collisions. In order to understand the effect of these transient structures on the long-wavelength behavior of the system, we have analyzed the flow in terms of coarse-grained velocity and stress fields, and their two-point correlation functions. We find that spatial correlation of the stress increases only modestly as the flow rate decreases, yet this leads to a marked increase in the spatial correlation of the velocity. This reinforces the idea that a small fraction of the particles can play an important role in the kinematics of flow. We present data on the change in the length scale of correlations as jamming is approached. We further analyze the flow in terms of four-point correlation functions of the stress analogous to those used to characterize dynamical heterogeneities in supercooled liquids.

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