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Velocity Correlations in Gravity-driven Dense Granular Flows
OLEH BARAN, DENIZ ERTAS, ExxonMobil Research and Engineering, GARY S. GREST, Sandia National Laboratories, THOMAS C. HALSEY, ExxonMobil Research and Engineering — We report numerical results on velocity correlations in dense granular flows on inclined planes. The velocity is obtained from the displacement of individual grains (spheres) over some averaging time δt. For the grains on the surface layer, our results are consistent with experimental measurements reported by Pouliquen [Phys. Rev. Lett. **93**, 248001 (2004)]. We show that the correlation structure within planes parallel to the surface shows similar behavior in the bulk of the flow. The two-point velocity correlation function exhibits exponential decay for small to intermediate values of the separation between spheres. The correlation lengths identified by exponential fits to the data show nontrivial dependence on the averaging time δt used to determine grain velocities. We discuss the correlation length dependence on averaging time, incline angle, pile height, depth of the layer, system size and grain stiffness, and we relate the results to other length scales associated with the rheology of the system.

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