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Hydrodynamic Simulations of Density Inversion in Granular Layers[1] VERONICA POLICHT, JON BOUGIE, Physics Department, Loyola University Chicago, JENNIFER KREFT PEARCE, Department of Chemistry, University of Texas at Tyler — We model density inversion in vertically shaken granular layers using a proposed set of three-dimensional, time-dependent granular hydrodynamics equations. For a range of shaking amplitudes and frequencies, we numerically solve time-dependent equations derived to Navier-Stokes order for mono-disperse, frictionless, nearly elastic particles. For shaking at high frequency and accelerational amplitude, these simulations exhibit steady state behavior in which a high density layer is supported by a lower density granular gas. At lower shaking frequencies and accelerational amplitudes, density profiles display time-dependence in which density inversion is not maintained throughout the entire cycle. Results from these simulations are directly compared to molecular dynamics simulations to test the ability of these continuum simulations to accurately model both the time-dependent and steady-state phenomena found in experiments and molecular dynamics simulations.

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