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**Time-Dependent Continuum and Molecular Dynamics Simulations of Density Inversion in Shaken Granular Layers**[1] JON BOUGIE, VERONICA POLICHT, Physics Department, Loyola University Chicago, JENNIFER KREFT PEARCE, Department of Chemistry, University of Texas at Tyler
— We investigate density inversion in vertically oscillated granular layers using continuum and molecular dynamics simulations. Layers of grains atop a plate that is shaken sinusoidally in the direction of gravity will leave the plate at some time in the cycle if the maximum acceleration of the plate $a_{max}$ exceeds the acceleration of gravity $g$. For some values of shaking frequency $f$ and accelerational amplitude $a_{max}$, a small region near the plate displays time-dependence in response to the sinusoidal shaking, while the bulk of the layer reaches a steady-state. In certain cases, the system exhibits a "density inversion" in which a low density granular gas supports a higher density layer of grains. We use three-dimensional simulations of time-dependent continuum equations as well as molecular dynamics simulations to study both the time-dependent and the steady-state regions of the flow.

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