Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Layer Depth Dependence of Shocks and Patterns in Shaken Granular Systems[1] MICHAEL HOLLOWED, JON BOUGIE, Loyola University Chicago — We simulate shaken granular layers using numerical solutions of continuum equations to Navier-Stokes order and use these simulations to study shocks and patterns in vertically oscillated layers of grains. When the accelerational amplitude of the forced oscillations exceeds that of gravity, the layer leaves the plate at some time during the cycle. When the grains collide with the plate later in the cycle, shocks are formed within the layer. If the accelerational amplitude exceeds a critical value, standing wave patterns also form. We investigate the interactions between shocks and patterns in these systems, as well as their dependence on layer depth. We demonstrate relationships between properties associated with shocks (such as Mach number and pressure gradients across the shock) and properties associated with standing wave patterns (such as pattern wavelength and horizontal flow speed between peaks). Re-scaling these quantities by the depth of the layer yields relationships between dimensionless quantities that are valid across a range of layer depths.

[1]This research was supported by Research Corporation for Science Advancement.

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Date submitted: 05 Aug 2011 Electronic form version 1.4