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The role of statistical fluctuations on the stability of shockwaves through gases with activated inelastic collisions[1] NICK SIRMAS, MATEI RADULESCU, University of Ottawa — The present study addresses the stability of piston driven shock waves through a system of hard particles subject to activated inelastic collisions. Molecular Dynamics (MD) simulations have previously revealed an unstable structure for such a system in the form of high density non-uniformities and convective rolls within the shock structure. The work has now been extended to the continuum level by considering the Euler and Navier-Stokes equations for granular gases with a modified cooling rate to include an impact threshold necessary for inelastic collisions. We find that the pattern formations produced in MD can be reproduced at the continuum level by continually perturbing the incoming density field. By varying the perturbation amplitude and wavelength, we find that fluctuations consistent with the statistical fluctuations seen in MD yield similar instabilities to those previously observed. While the inviscid model predicts a highly chaotic structure from these perturbations, the inclusion of viscosity and heat conductivity yields equivalent wavelengths of pattern formations to those seen in MD, which is equal to the relaxation length scale of the dissipative shock structure.

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