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Stress fluctuations in dense granular suspensions QIN XU, HEINRICH JAEGER, Department of Physics and James Frank Institute, University of Chicago — We experimentally investigate the temporal stress response during steady state shear in dense granular (non-Brownian) suspensions, where the solvent viscosity is varied to tune the frictional and viscous interactions in the system. We focus on the limit where packing fraction is close to the jamming point. For low viscosity suspending liquids, we show that, in the shear thickening regime, shear and normal stresses are highly coupled and exhibit significant fluctuations with time. As shear rate increases, the stress distributions evolve from Gamma to Gaussian distributions. By contrast, for highly viscous solvents, stress fluctuations are greatly reduced and only show Gaussian distributions at different shear rates. Moreover, the fluctuation behaviors are associated with various relaxation modes of the system and therefore lead to different scalings of the power spectral density. By combining the fluctuation analysis in different regimes, we quantitatively show how the interactions between grains affect the suspension dynamics and provide a explanation of why shear thickening becomes weaker in highly viscous solvent.

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