Plenary-04

Dense Granular Flow of Frictional Particles

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A jamming scenario of frictional particles is discussed and interpreted in terms of a nonequilibrium first order phase transition (1). Results of numerical simulations will be presented and analyzed in the framework of a simple model which can account for both, the continuous frictionless case and the discontinuous frictional case. The most important features of the frictional phase diagram are reentrant behavior and a critical jamming point at finite stress. In the simulations, we observe that small systems settle into a stationary state, whereas large systems do not relax to a stationary state on the timescale of observation, but rather display chaotic time dependence. We propose a hydrodynamic model which couples stress relaxation to a scalar variable accounting for the microstructure of the packing. Linear stability analysis reveals an extended phase diagram which in addition to regions of stationary flow and jammed states displays chaos.

References

1. M. Grob, C. Heussinger, and A. Zippelius, Phys. Rev. E**89**, 050201 (R) (2014).