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Measuring effective temperatures in sheared, athermal systems at fixed normal load NING XU, Yale University, COREY O'HERN — We perform molecular dynamics simulations of repulsive athermal systems sheared at fixed normal load to study the effective temperature T_L defined from time-dependent fluctuation- dissipation relations for density. We show that these systems possess two distinct regimes as a function of the ratio T_S/V of the granular temperature to the potential energy per particle. At small T_S/V, these systems are pressure-controlled and T_L is set by the normal load. In contrast, they behave as quasi-equilibrium systems with $T_L \approx T_S$ that increases with shear rate at large T_S/V. The fact that T_L is slaved to the pressure at small T_S/V indicates that the variables T_L, pressure, and density are not sufficient to describe dense, slowly-sheared athermal systems. Another important implication for systems at small T_S/V is that T_L for two systems placed in contact will not equilibrate when a pressure gradient is maintained between them. Thus, T_L does not behave as a thermodynamic temperature variable in the pressure-controlled regime and new definitions of effective temperature should be explored.

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