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Stress, strain rate, and free volume in dense granular flow CHRIS RYCROFT, KEN KAMRIN, MARTIN BAZANT, Massachusetts Institute of Technology — There have been many attempts to describe dense granular flow with continuum models, but a complete theory is still lacking. Often, these models make assumptions about microscopic quantities (such as shear stress, strain rate, and local density) and here we present Discrete Element Method (DEM) simulations to directly measure these in a variety of different non-homogeneous granular flows. Motivated by previous work, we compute these quantities on a mesoscopic length scale of several particle diameters, and examine both spatial distributions, and correlations between the variables. We investigate the validity of the commonly-used Mohr-Coulomb incipient yield hypothesis, which states that the ratio of shear stress to normal stress should be everywhere constant in a flowing granular material. Our results also show some striking correlations between strain rate and local density, which suggest a phase transition between static and flowing granular materials.

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