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Rheology of dense granular mixtures: Particle size distributions, boundary conditions, and collisional time scales KIMBERLY HILL, BEREKET YOHANNES, SAFL, Department of Civil Engingeering, University of Minnesota — We computationally investigate the dependence of the rheology of dense sheared granular mixtures on their particle size distribution. We find that the variation of the rheology with the particle size distribution depends on the boundary conditions. For example, under constant pressure conditions the effective friction coefficient μ^* (the ratio between shear and pressure stresses at the boundary) increases mildly with the average particle size. On the other hand, under constant volume conditions, μ^* has a non-monotonic dependence on the average particle size that is related to the proximity of the system solids fraction to the maximum packing fraction. Somewhat surprisingly, then, μ^* scales with a dimensionless shear rate (a generalized inertial number) in the same way for either boundary condition. We show that, for our system of relatively hard spheres, these relationships are governed largely by the ratio between average collision times and mean free path times, also independent of boundary conditions.

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