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Blurring the boundary between rapid granular flow and dense granular flow regimes: Evidence from DEM simulations[1] ANURAG TRIPATHI, MAHESH PRASAD, Indian Institute of Technology Kanpur, PUNEET KUMAR, Cognizant Technology Solutions — The saturation of the effective friction coefficient for granular flows at high inertial numbers has been assumed widely by researchers, despite little simulation/experimental evidence. In contrast, a recent simulation study of plane shear flows by Mandal and Khakhar, Phys. Fluids. 28, 103301(2016) suggests that the effective friction coefficient becomes maximum and then starts to decrease with increase in the inertial number for $I > 0.5$. In order to investigate whether such a dip at higher inertial numbers is indeed a feature of granular rheology, we perform DEM simulations of chute flow of highly inelastic disks. We show that steady, fully developed flows are possible at inclinations much higher than those normally reported in literature. At such high inclinations, the flow is characterised by a significant slip at the base; the height of the layer increases by more than 300% and kinetic energy of the layer increases by nearly 5 orders of magnitude. We observe, for the first time, steady chute flows at inertial number $I \approx 2$ and show that the dip at higher inertial numbers can be observed in case of chute flow as well. The predictions of modified $\mu - I$ rheology, however, seem to remain valid in the bulk of the layer for packing fractions as low as 0.2.

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