# LBM-DEM simulation of sheared dense granular suspensions

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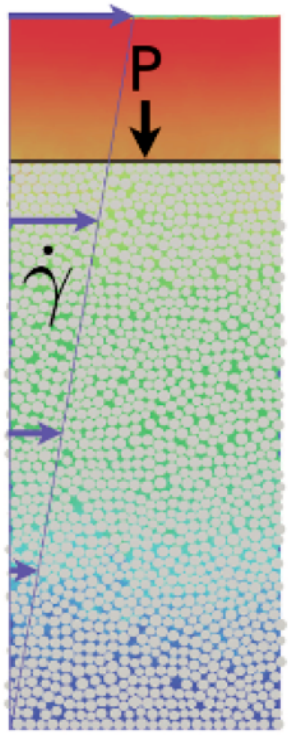
## ABSTRACT

Non-brownian suspensions of hard particles in a viscous fluid are characterized by their effective normal and shear viscosities classically measured in steady shear at constant volume [1]. Recently, it was experimentally shown by Boyer et al. [2] that, in the limit of low Stokes numbers, the frictional description of granular materials can be mapped into the viscous description of dense suspensions, predicting thus successfully the scaling of viscous divergence. We investigate the shear flow of dense granular materials composed of circular particles immersed in a viscous fluid by means of molecular dynamics simulations interfaced with the Lattice Boltzmann Method [3]. A homogeneous flow of the suspension is obtained through periodic boundary conditions and by directly applying a confining pressure on the granular phase and shearing the fluid phase. The stead-state rheology may be described in terms of effective friction coefficient and packing fraction of the suspension as a function of the ratio of viscous shear stress to confining pressure (frictional description), on the one hand, and in terms of normal and shear viscosities of the suspension as a function of the packing fraction (viscous description), on the other hand. We show that the simulation data are consistent with both descriptions and in close agreement with the corresponding scaling laws observed in recent experiments. This dual description implies that the friction coefficient is a function only of the packing fraction only. Indeed, we find that all our friction data versus packing fraction for different values of fluid viscosity collapse on the same curve.




## REFERENCES

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