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Effects of Finite Volume Fraction on the Lift and Drag Forces in a Linear Shear Flow.[1] GEORGES AKIKI, Notre Dame University - Louaize, S. BALACHANDAR, University of Florida — Eulerian-Lagrangian (EL) and Eulerian-Eulerian (EE) methods are indispensable tools for multiphase flow simulations with large number of particles where fully-resolved simulations are not possible using todays technology. The accuracy of these methods is directly related to the accuracy of the particle-fluid sub-grid interaction coupling model used. For a uniform flow in non-dilute systems, even at low volume fractions, several studies have shown a significant increase in drag compared to a drag on a single sphere at the same Reynolds number. In this study, we perform fully-resolved Direct Numerical Simulations of random distribution of monodisperse spheres subject to a linear shear flow at a volume fraction of $\phi = 0.2$ and Reynolds number $3.5 \leq Re \leq 9$. The aim of this study is to address three main questions; i) Is the drag in a linear shear flow equal to the drag in a uniform flow at the same volume fraction and Reynolds number? ii) Does the shear-induced lift exhibit an increase due to finite volume fraction similar to the increase in drag? iii) How significant is the lift force variation within the random array of spheres compared to the mean lift?

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