Abstract Submitted
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On free-stream correction methods for particle-laden flows[1]
JEREMY HORWITZ, ALI MANI, Stanford University — We examine the numerical implementation of point-particle drag laws for two-way coupled particle-laden flows. The Stokes drag formula is assumed to be valid for particles smaller than the smallest fluid scales and particle Reynolds numbers less than unity. Numerical implementations however can result in large errors in the computed drag force when the mesh size is comparable to the particle size. We present a quantification of this error and show that its source is rooted in estimation of the "free-stream" velocity. While the Stokes drag formula requires this "free-stream" velocity to be measured away from the particle, current numerical methods use sampling of fluid velocity at the location of the particle. We propose simple extrapolation procedures that estimate the true free-stream velocity in such systems. Investigations on test problems show that the proposed procedures successfully eliminate the steady-state drag error.

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