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Momentum transfer and particle stress in polydisperse, particle-laden flow DAVID RICHTER, OMAR GARCIA, CHRISTOPHER ASTEPHEN, University of Notre Dame — Direct numerical simulations are performed in combination with two-way coupled Lagrangian point particles to study the effects of polydispersity on particle-induced modifications to momentum transfer in turbulent wall-bounded flow. Turbulent Couette flow is chosen as an idealized testbed for this purpose since total momentum flux is uniform in the wall-normal direction. Monodisperse simulations are first used to characterize momentum flux modification and particle stress as a function of particle Stokes number, and from this understanding bidisperse and continuously polydisperse mixtures of particle Stokes number are simulated. A simple model is then constructed to predict the total particle stress of these particle mixtures. While in the dilute limit particle stresses are nearly linearly additive, the entire mixture cannot simply be modeled by a single monodisperse particle with an effective Stokes number.

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