

Abstract Submitted
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A numerical study of bidisperse particles in cluster-induced turbulence¹ RAVI PATEL, Cornell University, BO KONG, Iowa State University, JESSE CAPECELATRO, University of Michigan, RODNEY FOX, Iowa State University, OLIVIER DESJARDINS, Cornell University — Particle-laden turbulent flow is an important feature of many diverse environmental and industrial systems. To elucidate the mechanics of these types of flows, we study cluster-induced turbulence (CIT), wherein momentum coupling between a carrier fluid and settling particles leads to turbulent-like fluctuations in various quantities of interest. In this work, simulations of CIT with bidisperse particles are presented. The flow of kinetic energy is tracked from its generation due to drag until its dissipation due to fluid viscosity and particle collisions. As suggested by Fox (2014), the particle kinetic energy is separated into a correlated turbulent kinetic energy and an uncorrelated granular energy. An overall energy balance is computed for various exchange terms to determine their relative importance and to understand the underlying physical mechanisms in bidisperse CIT. Additionally, volume fraction and velocity statistics for both particle types and the fluid are presented. From these results, the consequences on closures for Reynolds-averaged stress models of particle-laden flows are discussed.

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