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Dynamics of kinetic energy transfer in homogeneous bidisperse gas-solid flow using particle-resolved direct numerical simulation MOHAMMAD MEHRABADI, SHANKAR SUBRAMANIAM, Iowa State University — While considerable insight has been gained into the dynamics of energy transfer in monodisperse gas-solid flows, much less is known about polydisperse systems where particles have a size distribution. For instance, the conservation of interphase turbulent kinetic energy transfer (ITKET) principle for monodisperse gas-solid flow (Xu and Subramaniam, Phys. Fluids, 2007) states that the power provided by the mean pressure gradient to sustain a mean slip velocity between the fluid phase and solid phase is equal to the mixture ITKET of the suspension, which is then partitioned into sources of velocity fluctuations in the gas and solid phases. As a first step towards understanding the dynamics of energy transfer in polydisperse suspensions, we analyze the extension of this conservation principle to a bidisperse suspension. Here the mixture ITKET is partitioned into sources of velocity fluctuations of the fluid phase as well as the large and small particle size classes. PR-DNS results of homogeneous bidisperse gas-solid flow are then used to verify this extended conservation principle. With these insights we can begin to answer interesting questions such as the role of energy transfer in promoting segregation or mixing of particle sizes.

Mohammad Mehrabadi
Iowa State University

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