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Wavelet analysis of spectral energy transfer in two-way coupled particle-laden turbulence MIRALIREZA NABAVI BAVIL, Arizona State University, MARIO DI RENZO, Center for Turbulence Research, Stanford University, Stanford, CA 94305, USA, JEONGLAE KIM, Arizona State University — This study investigates the effects of two-way coupling between the carrier and dispersed phases on the spectral transfer of turbulent kinetic energy (TKE) using the wavelet multiresolution analysis (WMRA). Direct numerical simulations of decaying homogeneous isotropic turbulence laden with inertial particles are performed at Stokes numbers $\mathrm{St}_k = 0$, 1 and 10 with the point-particle assumption. TKE decreases monotonically as St_k increases, while this is not the case for the dissipation rate. A multiresolution analysis based on orthonormal wavelet transform is developed to evaluate spectral energy transfer due to different physical mechanisms near particle clouds interacting in two ways with the carrier-phase turbulence. Spectral statistics conditioned on the Eulerian particle number density are examined to understand the physical trends of spectral energy transfer as a function of Stokes number and discuss their significance in modeling.

Miralireza Nabavi Bavil
Arizona State University

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