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Particle-induced influences on the spectral TKE budget in wall-bounded turbulence DAVID RICHTER, University of Notre Dame — The phenomenon of turbulence modification in wall-bounded turbulence has been studied extensively in both numerical and experimental contexts, and results from a complex interaction between particle dynamics and turbulent motions. An important question which remains unresolved, however, is the scale over which small particles modify the turbulence, how this is a function of the particle inertia relative to flow timescales, and how this potentially upscale influence should be modeled in subgrid or Eulerian-based models. In this work, data from direct numerical simulations of turbulent planar Couette flow, two-way coupled with Lagrangian point particles, are used to compute spectral energy budgets at several Reynolds (friction Reynolds numbers up to 900) and Stokes (St = [1, 10, 100] based on the centerline Kolmogorov scale) numbers in order to understand the spectral extent of the particle influence on turbulence. It will be shown in this talk that particles modify the surrounding turbulence in two distinct but related ways: (1) through a direct energy source/sink, which is highly wavenumber and Stokes number dependent and (2) through a potentially severe reduction in TKE production across all spatial scales.

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