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Physical perspectives on the investigation of two-way interaction in particle-laden isotropic turbulence ABOU-ELMAGD ABDEL-SAMIE, CHANGHOON LEE, Yonsei University — The two-way coupling interaction in an isotropic turbulence has been investigated in both decaying and stationary turbulence to examine the effect of artificial forcing for the maintenance of stationary turbulence, on turbulence modulation mechanism. Direct numerical simulations (DNS) for stationary and decaying isotropic turbulence have been carried out using 128^3 grids with the Taylor micro-scale, $R_\lambda \simeq 70$, in the presence of 10^6 solid sphere particles whose diameter is smaller than the Kolmogorov length scale. The particles which were released with different Stokes number ($0 < St < 5$), are implemented as a point force approximation in Navier-Stokes equation. Turbulence kinetic energy, acceleration, enstrophy and their spectra have been examined to display the distinctions between decaying and stationary turbulence. A mathematical analysis is provided to support our physical perspectives, where we argued that the stationary turbulence is not appropriate for the study of turbulence modulation by particles with $St < 1$. Furthermore, it is shown that the injection perturbation of the particle, due to coupling, has a significant effect on the turbulence modulation in decaying turbulence. An investigation of correlation between turbulence field zones and the two-way interaction energy has been conducted for a better understanding of the modulation mechanism.

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