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Turbulence drag modulation by combined effect of solid particles injection and synthetic roughness[1] CARLOS DUQUE-DAZA, Universidad Nacional de Colombia, JESUS RAMIREZ-PASTRAN, Universidad Santo Tomas — The combined effect of prescribing geometrical perturbations at one of the walls and injecting spherical solid particles on the behaviour of an incompressible turbulent channel flow at low friction Reynolds number ($Re_\tau = 180$) was investigated through numerical simulations. The effect of the presence of spherical solid particles was explored from the perspective of the particles-mass-fraction (PMF), whereas spanwise ribs-like and cavity-like geometrical alterations were prescribed as synthetic large scale roughness elements in one of the walls. Values of particle-volumetric-fraction (PVF or ϕ_v) and particle to fluid density ratio of $\phi_v = 10^{-3}$ and $\frac{\rho_f}{\rho_p} = 2700$, respectively, were employed to allow the use of a two-way coupling approach between the particles and the carrier phase. It is shown that, regardless of the type of geometric perturbation prescribed, the injection of solid particles exhibited a strong attenuating effect of the turbulent intensity of the flow, as well as a turbulent skin friction drag reduction. These findings reinforce the concept of a selective stabilising effect induced by the solid particles. In this case, the PMF played an important role on the seemingly selective modulation of the turbulent activity.

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