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Can we achieve statistically stationary Homogeneous Shear Turbulence? CHANDRU DHANDAPANI, GUILLAUME BLANQUART, California Institute of Technology — Homogeneous shear turbulence (HST) is an idealized version of the shear turbulence observed in practical free shear flows, and can be simulated using simple computational domains. One of the numerically efficient configurations to simulate turbulent flows is to use triply periodic domains. However, owing to the mean stream-wise velocity being non-homogeneous, periodic boundary conditions cannot be used along one of the directions. Several studies included shear periodic boundary conditions in the cross-stream direction. However, in these simulations, the turbulence statistics grew exponentially with time, whereas the turbulence observed in free shear flows is statistically stationary. The authors fixed this problem earlier by performing HST simulations with only shear production and neglected shear convection, thereby obtaining statistically stationary shear turbulence. The current study improves upon the previous simulations by including shear convection, by introducing an inflow/outflow in the cross-stream direction. The turbulence statistics reach a statistically stationary state, and the Reynolds shear stress and the anisotropy values agree very well with the results from experiments and simulations of mixing layers, planar jets, and round jets.

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