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Modeling distortion of HIT by an Actuator Disk in a periodic domain[1] ADITYA GHATE, NIRANJAN GHAISAS, SANJIVA LELE, Stanford University — We study the distortion of incompressible, homogeneous isotropic turbulence (HIT) by a dragging actuator disk with a fixed thrust coefficient (under the large Reynolds number limit), using Large Eddy Simulation (LES). The HIT inflow is tailored to ensure that the largest length scales in the flow are smaller than the actuator disk diameter in order to minimize the meandering of the turbulent wake and isolate the length scales that undergo distortion. The numerical scheme (Fourier collocation with dealiasing) and the SGS closure (anisotropic minimum dissipation model) are carefully selected to minimize numerical artifacts expected due to the inviscid assumption. The LES is used to characterize the following 3 properties of the flow a) distortion of HIT due to the expanding streamtube resulting in strong anisotropy, b) turbulent pressure modulation across the actuator disk, and the c) turbulent wake state. Finally, we attempt to model the initial distortion and the pressure modulation using a WKB variant of RDT solved numerically using a set of discrete Gabor modes.

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