Abstract Submitted
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Stochastic model representation of the energy transfers in turbulent channel flow[1] VASSILI KITSIOS, Laboratory For Turbulence Research in Aerospace and Combustion, Monash University, Clayton, Australia, JUAN A. SILLERO, School of Aeronautics, Universidad Politécnica de Madrid, Madrid, Spain, JULIO SORIA, Laboratory For Turbulence Research in Aerospace and Combustion, Monash University, Clayton, Australia, JORGEN S. FREDERIKSEN, CSIRO Marine and Atmospheric Research, Aspendale, Australia — A stochastic model is used to represent the energy transfers in the direct numerical simulation (DNS) of turbulent channel flow. The DNS has a Fourier discretisation in the streamwise and spanwise directions, and a Chebyshev discretisation in the wall normal direction. We spectrally decompose the DNS into large and small horizontal scales, and develop a stochastic subgrid model representing the effect the removal of the small scales has on the large. The stochastic model consists of a deterministic drain dissipation acting on the resolved field and a stochastic backscatter force. Positive values of the drain operator indicate energy sent from the large to the small scales (dissipation), whilst negative values represent energy sent from the small to the large (deterministic backscatter). The variance of the stochastic force quantifies the extent to which the backscatter is random as opposed to deterministic. We are also able to produce large eddy simulations using this stochastic subgrid model that reproduces the time averaged kinetic energy spectra of the DNS within the resolved scales. Results are presented for various Reynolds numbers up to $Re_\tau = 950$.

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