Abstract Submitted
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Effect of inlet spatial resolution on the direct numerical simulation of turbulent channel flow[1] EZHILSABAREESH KANNADASAN, CALLUM ATKINSON, LTRAC, DMAE, Monash University, ADRIAN LOZANO-DURAN, Center for Turbulence Research, Stanford University, PETER SCHMID, Department of Mathematics, Imperial College London, JAVIER JIMENEZ, Ingenieros Aeronauticos, Universidad Politecnica de Madrid, JULIO SORIA, LTRAC, DMAE, Monash University — Direct numerical simulation (DNS) of turbulent flows requires a large computational domain and a long simulation time to capture and evolve the large-scale structures and attain a statistically stationary state. In contrast, experimental measurements can relatively easily capture the large-scale structures, but struggle to resolve the dissipative flow scales. This study investigates the spatial extent required for the DNS of a turbulent channel flow to recover turbulent fluctuations and energy when using experimental inlet data which is typically unable to capture fluctuations down to the viscous sub-layer or the smallest viscous scales (i.e. Kolmogorov scales). Synthetic experimental fields from streamwise periodic channel flow at $Re_\tau = 180$ and 550 are used as an inlet for a channel flow DNS with inlet-outlet boundary conditions. The effect of limited spatial resolution on DNS is examined by filtering the small scales at the inlet. The influence of limited inlet spatial resolution on the convergence of mean and streamwise fluctuating velocity profiles are less significant. However, the spanwise fluctuations are slightly weakened.

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