LES of a turbulent channel flow with a predictive wall model

MICHIU INOUE, DALE PULLIN, California Institute of Technology, IVAN MARUSIC, ROMAIN MATHIS, University of Melbourne — Large-eddy simulations (LES) of turbulent channel flow are presented. These LES combine the stretched-vortex, subgrid-scale (SGS) model with a near-wall model (Chung & Pullin JFM 2009) that here provides a plane-averaged, wall-shear stress together with a plane-averaged slip velocity at a raised or “virtual” wall. Instantaneous stream-wise fluctuations are then added to this slip velocity using an empirical inner-outer wall model (Mathis et al, JFM 2011) driven by a velocity time-series obtained from within the log-layer of the outer flow. This spatially fluctuating slip velocity is used as a boundary condition for the outer LES. Results using several variations of this wall model are described for turbulent channel flow at Reynolds numbers $Re_\tau$ up to $2.2 \times 10^4$.

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