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LES of a flow past a square cylinder using localized mixed dynamic SGS model

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Localized mixed dynamic subgrid/subfilter model was tested at large-eddy simulation of turbulent flow past a square cylinder. In this model the spatial-temporal distribution of turbulent viscosity coefficient was calculated using constrained minimization of Germano identity residuals. Fully conservative 4-th order numerical scheme (Morinishi et al., 1998) and second order central-difference scheme were used in various tests. The simulation runs were performed with the minor spatial resolution (11-19 grid-points per the cylinder side). The results were compared with experimental data and the results of simulation with standard Smagorinsky model and localized dynamic model with unconstrained minimization. The invariance of the dynamic model "defiltered" results with respect to spatial resolution is demonstrated. Additional runs were performed with the geometry of the model domain close to the real geometry of closed water channel in experiment (Lyn & Rodi,1994) (all four walls of computational domain were prescribed). It was shown that the structure of large-scale eddies is not completely two-dimensional and that the mean velocity and variability of velocity in wake region strongly depend on the distance from the wall (in direction along cylinder axis).