Geophysical Research Abstracts
Vol. 14, EGU2012-10703, 2012
EGU General Assembly 2012


# Evaluation of subgrid-scale models in large eddy simulation of flow past a two-dimensional block

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Large eddy simulations (LES) are performed to study flow past a two-dimensional (2D) block. An immersed boundary method (IBM) is developed and implemented to model the block in the simulation. The accuracy of the IBM method and the performance of four subgrid-scale (SGS) models are examined by comparing the results with wind tunnel experimental data from the literature. The SGS models that are tested include (a) the Smagorinsky model, (b) the Lagrangian dynamc model, (c) the scale-dependent Largrangian dynamic model, and (d) the modulated gradient model. Good agreement is observed between the experiments and the results from the scale-dependent Lagrangian dynamic model and the modulated gradient model. These models are able to reproduce the mean wind and turbulence statistics around the block. Moreover, the values of the eddy viscosity coefficient and scale-dependence coefficient obtained with the Lagrangian scale-dependent dynamic model are found to have strong spatial variability. Lower values of the eddy viscosity coefficient are found in regions of the flow with higher shear in order to account for the reduced length scales of the turbulence.