Geophysical Research Abstracts, Vol. 9, 10000, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-10000

Performance of dynamic subgrid-scale models in large-eddy simulations of turbulent flow over two-dimensional sinusoidal hills

F. Wan and F. Porte-Agel

Saint Anthony Falls Laboratory, University of Minnesota, Minneapolis, USA
(fporte@umn.edu)

Large-eddy simulation (LES) is used to simulate turbulent boundary-layer flow over rough two-dimensional sinusoidal hills. Three different subgrid-scale (SGS) models were tested: (a) the standard Smagorinsky model with a wall-matching function, (b) the Lagrangian dynamic model, and (c) the recently developed scale-dependent Lagrangian dynamic model (Stoll and Porté-Agel 2006). The simulation results obtained with the different models are compared with turbulence statistics obtained from wind tunnel experiments. We find that the scale-dependent dynamic model is able to account, without any tuning, for the local changes in the eddy-viscosity model coefficient. It can also capture the scale dependence of the coefficient associated with regions of the flow with strong mean shear and flow anisotropy. As a result, the scale-dependent dynamic model yields results that are more realistic than the ones obtained with the scale-invariant Lagrangian dynamic models.