Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

New subgrid-scale model for large-eddy simulation of turbulent flows CHANGPING YU, XINLIANG LI, LHD, Institute of Mechanics, Chinese Academy of Sciences, Beijing 100190, China, ZUOLI XIAO, SHIYI CHEN, State Key Laboratory for Turbulence and Complex Systems, College of Engineering, Peking University, Beijing 100871,China — Based on the theory of energy and helicity cascades, a new subgrid-scale (SGS) stress model is proposed for large eddy simulation of turbulent flows. The new SGS model is a type of eddy-viscosity model, and the eddy-viscosity is proportional to the magnitude of the mean product of the large-scale strain rate tensor and symmetric vorticity gradient tensor. The new SGS model is first tested *a priori* and *a posteriori* in homogeneous and isotropic helical turbulence, and the statistical results show that the new model can predict most of the results better than Smagorinsky model and the mixed helical model. Then, we apply the present model to simulate the channel flows, and also our model can support satisfied simulating results of mean velocity, turbulent stress and skin-friction coefficients, etc. The surprising findings is that the new model can describe much more realistic flow structures than DES-SA model and reproduce the skin friction force much more accurately than the Smagorinsky model. The new SGS model is proved to be universal model in large eddy simulation of turbulent flows.

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Date submitted: 11 Jul 2014 Electronic form version 1.4