Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Turbulent flow around a wall mounted square cylinder: evaluating the LES and Reynolds Stress turbulence models in predicting the negative turbulence productions upstream the obstacle BEHTASH TAVAKOLI, GOODARZ AHMADI, Department of Mechanical and Aeronautical Engineering Clarkson University, Potsdam NY 13699 — The airflow field around a square cylinder was simulated using the Reynolds Stress Turbulence Model (RSTM) as well as the Large Eddy Simulation (LES). Particular attention was given to the case with Reynolds number of 5610 for which the Direct Numerical Simulation (DNS) data of Yakhot et al (2006) were available. They found that the unsteadiness due to the unstable interaction of the flow at the upstream and the sides of the cube generated the vortex shedding downstream the cube. Also, they argued that the inaccuracy of some of the RANS and LES turbulence models was because of their inability to predict the negative turbulence production in front of the cube, which was the source of the horseshoe vortex. Therefore, in this paper the accuracy of the RSTM and LES turbulence models in predicting the turbulence production at the upstream of the wall mounted square cylinder was investigated. The nature of the 3D wakes behind the cube as well as the vortices in front and at the back of the cube were analyzed. The simulation results were compared with the DNS data and the accuracy of the two turbulence models were underlined.

Behtash Tavakoli
Department of Mechanical and Aeronautical Engineering
Clarkson University, Potsdam NY 13699

Date submitted: 13 Sep 2012 Electronic form version 1.4