Large eddy simulation and wind tunnel experiment of turbulent boundary-layer flow around a floor-mounted cube - DTU Orbit (03/01/2019)

Large eddy simulations (LES) are used to numerically simulate the flow around and the surface pressure on a floor-mounted cube in a turbulent boundary layer flow. Both a full LES and an embedded-LES (ELES) approach was used and the simulation results were compared to data from wind tunnel experiments. The computations were performed with the commercial CFD software ANSYS FLUENT at a Reynolds number at the cube height of $Re_h = 1.3 \times 10^5$. The object was to evaluate the numerically generated flow upstream and around the cube and the accuracy of the time-averaged surface pressure on the cube. Furthermore, the fluctuating surface pressure simulated by the ELES is also discussed. The computed time-averaged flow is comparable to the wind tunnel measurements while the frequency spectrum of the upstream flow has deficits in the low and high frequency ranges. The time-averaged surface pressures on the cube reflect the expected characteristic wind load distribution along the streamwise centerline of the cube with relative deviations from -16% to +18%. The fluctuating surface pressure from the ELES shows large deviations at the top face of the cube while the values at the up- and downstream faces are more accurate captured.

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