Abstract Submitted
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Direct numerical simulation of turbulent flow over a surface mounted obstacle[1] NIKOLAOS MALAMATARIS, George Mason University — The direct numerical simulation of turbulent flow over a surface mounted obstacle is studied as a numerical experiment that takes place in a wind tunnel. For this reason, the incompressible, three dimensional, transient Navier-Stokes equations for Newtonian fluids are solved directly using Galerkin finite elements. The Reynolds number defined with respect to the height of the obstacle is in the range of 10^5. The results include instantaneous streamline patterns that show the vortex shedding phenomenon and the flapping of the recirculation bubble downstream the obstacle. Energy spectra are studied along with Eulerian autocorrelation coefficients, longitudinal and lateral coefficients that yield the chaotic behavior of turbulence. The computer code developed for this work is a parallel program written in Fortran 90 that uses the MPI-paradigm and runs in distributed memory systems. Movies are shown where both streaklines and instantaneous streamlines are depicted that clearly demonstrate the transient characteristics of this prototype separated flow.

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