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Direct numerical simulation of steady state, three dimensional, laminar flow around a wall mounted cube[1] ANASTASIOS LIAKOS, United States Naval Academy, NIKOLAOS MALAMATARIS, George Mason University / TEI W. Macedonia — The topology and evolution of flow around a surface mounted cubical object in three dimensional channel flow is examined for low to moderate Reynolds numbers. Direct numerical simulations were performed via a home made parallel finite element code. The computational domain has been designed according to actual laboratory experimental conditions. Analysis of the results is performed using the three dimensional theory of separation. Our findings indicate that a tornado-like vortex by the side of the cube is present for all Reynolds numbers for which flow was simulated. A horse-shoe vortex upstream from the cube was formed at Reynolds number approximately 1266. Pressure distributions are shown along with three dimensional images of the tornado-like vortex and the horseshoe vortex at selected Reynolds numbers. Finally, and in accordance to previous work, our results indicate that the upper limit for the Reynolds number for which steady state results are physically realizable is roughly 2000.

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