Experimental investigation of flow behind the cube for low Reynolds numbers

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The wake behind the cube was experimentally investigated in a water tunnel using LIF visualization and PIV method. Measurements were carried out for a low Reynolds numbers ranging up to 400. Existence of 3 subsequent regimes was depicted. First regime was a steady orthogonally symmetrical flow characterized by 4 pairs of counter-rotative vortices and 4 reflection symmetry planes inclined at 45 degree one to another. Second regime remained steady, however only one symmetry plane was preserved. The presence of two major filaments of vorticity was depicted. Third regime was time-periodic, during which regular hairpins shedding process occurred. Symmetry plane from previous regime remained intact. Values of both onsets (Re=215 and Re=282 respectively) were determined in the framework of Landau instability model. Measured longitudinal vorticity was decomposed into 3 components corresponding to each regime. It was shown that vorticity associated with first regime originated from boundary conditions, in contrast to two others components caused by instability effects. Results of present paper were compared favourably with numerical results. Furthermore experimental investigations of wake behind axisymmetrical bluff bodies depicted the same sequence of transitions as was in the case of cube.

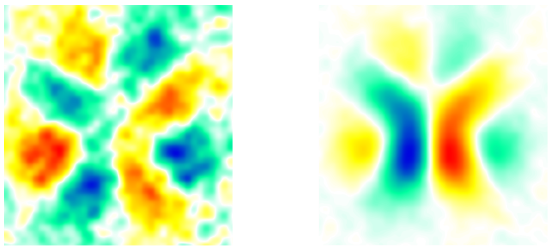

Figure 1: Longitudinal component of vorticity for first and second regime respectively.

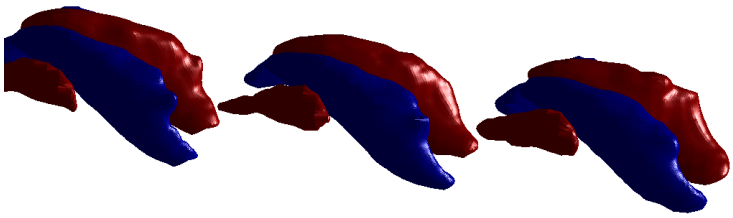

Figure 2: Third regime - isosurface of measured longitudinal component of vorticity.

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