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Numerical and experimental analysis of the near wake flow over a square cylinder ERIC SERRE, M2P2 UMR6181 CNRS Aix-Marseille Université, Marseille, MATTHIEU MINGUEZ, Seal Engineering, Centre Atria, Nîmes, CHRISTOPHE BRUN, LEGI, UMR CNRS 5519, Université Joseph Fourier, Grenoble, RICHARD PASQUETTI, Laboratoire J.-A. Dieudonné, UMR CNRS 6621, Université de Nice-Sophia Antipolis, Nice — The flow that develops behind a cylinder is very complex because it is fully three-dimensional, unsteady, including transition regions to turbulence as well as flow separations along the sidewall. The formation of a vortex street is generally considered to be the result of a coupling between Kelvin-Helmholtz instabilities within the separated shear layers and the Karman instability in the near wake. In the present paper we propose a joint experimental / numerical study in order to investigate the flow features in the near wall region of a square cylinder at Re = 21400 (ERCOFTAC benchmark). The interaction between KH vortical structures in the separating shear layer and Karman vortex shedding in the near wake will be discussed based on both visualisations and frequency analysis. In particular, the dependency with Reynolds number of the ratio from the shear layer frequency to the fundamental Karman frequency by Bloor (1964) will be investigated for the square cylinder. The controversial resulting square root law discussed by Rajagopalan and Antonia (2005) will be focused for the square cylinder case as well.

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