

Abstract Submitted  
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**Impact of uncertainties in free stream conditions on the aerodynamics of a rectangular cylinder** ALESSANDRO MARIOTTI, DIC1 - University of Pisa, PEJMAN SHOEIBI OMRANI, Fluid Dynamics Division, Netherlands Organization for Applied Scientific Research (TNO), JEROEN WITTEVEEN, Scientific Computing Group, Center for Mathematics and Computer Science (CWI), MARIA VITTORIA SALVETTI, DIC1 - University of Pisa — The BARC benchmark deals with the flow around a rectangular cylinder with chord-to-depth ratio equal to 5. This flow configuration is of practical interest for civil and industrial structures and it is characterized by massively separated flow and unsteadiness. In a recent review of BARC results, significant dispersion was observed both in experimental and numerical predictions of some flow quantities, which are extremely sensitive to various uncertainties, which may be present in experiments and simulations. Besides modeling and numerical errors, in simulations it is difficult to exactly reproduce the experimental conditions due to uncertainties in the set-up parameters, which sometimes cannot be exactly controlled or characterized. Probabilistic methods and URANS simulations are used to investigate the impact of the uncertainties in the following set-up parameters: the angle of incidence, the free stream longitudinal turbulence intensity and length scale. Stochastic collocation is employed to perform the probabilistic propagation of the uncertainty. The discretization and modeling errors are estimated by repeating the same analysis for different grids and turbulence models. The results obtained for different assumed PDF of the set-up parameters are also compared.

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