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Effect of corner rounding on the flow around a 5:1 rectangular cylinder. A paradox explained? BENEDETTO ROCCHIO, ALESSANDRO MARIOTTI, MARIA VITTORIA SALVETTI, DICI, University of Pisa — The high Reynolds number flow around a rectangular cylinder, having chord-to-depth ratio equal to 5, is the object of the benchmark BARC, collecting several experimental and numerical results. This configuration is characterized, in particular, by flow separation at the upstream corners and reattachment on the cylinder side. A large dispersion was observed in the numerical predictions of the flow features and quantities on the cylinder lateral sides. Sensitivity studies carried out by the BARC contributors were not conclusive and in some cases controversial. In particular, in LES perfomed by different groups it was found that increasing grid resolution or decreasing subgrid-scale dissipation leads to a deterioration of the agreement with the experiments with a too short mean recirculation region on the cylinder side. We show that this paradox can be explained by the fact that the upstream corners in the numerical simulations are perfectly sharp while they have a certain degree of roundness in experiments. Indeed, highly-resolved LES are presented showing that even very small values of the corner curvature radius have a dramatic impact on the numerical solution on the cylinder sides leading to a very good agreement with experimental data.

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