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Stochastic sensitivity analysis to grid resolution and modeling in LES of the flow around a rectangular cylinder MARIA VITTORIA SALVETTI, LORENZO SICONOLFI, ALESSANDRO MARIOTTI, University of Pisa
— Systematic analysis of the impact of discretization and numerical errors in large eddy simulations (LES) of complex flows is a challenging task. We investigate the sensitivity to grid resolution and modeling of LES results for the flow around a 5:1 rectangular cylinder, which is the object of an international benchmark (BARC) collecting experimental and numerical flow realizations. The related flow is complex, being turbulent with separation from the upstream corners and reattachment on the cylinder side and vortex shedding from the rear corners. Significant dispersion of the BARC results was observed, also for LES, and deterministic sensitivity analyses were not conclusive. LES are carried out here by using the spectral element code Nek5000. An explicit quadratic low-pass filter in the modal space is used, characterized by a cut-off value and by a weight function, which provides dissipation of the modes higher than the cut off and acts as a SGS dissipation. The uncertain parameters are the size of the spectral elements in the spanwise direction and the weight of the explicit filter. The impact of the uncertainty in these parameters is evaluated through generalized polynomial chaos. The stochastic variance of the results is compared to the overall dispersion of the BARC results.

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