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RANS turbulence model form uncertainty quantification for wind engineering flows CATHERINE GORLE, Stanford University, STEPHANIE ZEOLI, LAURENT BRICTEUX, University of Mons — Reynolds-averaged Navier-Stokes simulations with linear eddy-viscosity turbulence models are commonly used for modeling wind engineering flows, but the use of the results for critical design decisions is hindered by the limited capability of the models to correctly predict bluff body flows. A turbulence model form uncertainty quantification (UQ) method to define confidence intervals for the results could remove this limitation, and promising results were obtained in a previous study of the flow in downtown Oklahoma City. The objective of the present study is to further investigate the validity of these results by considering the simplified test case of the flow around a wall-mounted cube. DNS data is used to determine: 1. whether the marker, which identifies regions that deviate from parallel shear flow, is a good indicator for the regions where the turbulence model fails, and 2. which Reynolds stress perturbations, in terms of the tensor magnitude and the eigenvalues and eigenvectors of the normalized anisotropy tensor, can capture the uncertainty in the flow field. A comparison of confidence intervals obtained with the UQ method and the DNS solution indicates that the uncertainty in the velocity field can be captured correctly in a large portion of the flow field.

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