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LES-informed RANS Predictions[1] MATTIA FABRIZIO CIARLATANI, ZENGRONG HAO, CATHERINE GORL, Wind Engineering Laboratory, Department of Civil and Environmental Engineering, Stanford University — Within the context of data-driven turbulence modeling and uncertainty quantification for Reynolds-averaged Navier-Stokes (RANS) simulations, several studies have used a framework that introduces perturbations to the magnitude, orientation, and anisotropy of the Reynolds stress tensor. The aim of the present work is to investigate if the number of perturbation parameters in this framework could be reduced, by verifying if using accurate knowledge on the Reynolds stress orientation and anisotropy in the transport equations for a RANS turbulence model automatically provides a better prediction for the Reynolds stress magnitude. We focus on a bluff body flow representative of the flow around a high-rise building, and solve the transport equations for the k-ω SST model using a normalized Reynolds stress anisotropy tensor and mean velocity field from a large-eddy simulation (LES) as input. We analyze the discrepancies between the predicted and LES turbulence kinetic energy, and we investigate calibration of a double-scale version of the k-ω SST model to reduce the discrepancies.

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