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Model Calibration and Forward Uncertainty Quantification for Large-Eddy Simulation of Turbulent Flows COSMIN SAFTA, MYRA BLAYLOCK, JEREMY TEMPLETON, STEFAN DOMINO, Sandia National Labs — Large Eddy Simulation (LES) has the potential to significantly impact the engineering design process, but requires model calibration and error estimation for appropriate simulations to be affordable on the design time-scale. In this study we highlight a Bayesian calibration approach followed by a forward uncertainty quantification study for LES. First, we employ forced isotropic turbulence data from the Johns Hopkins Turbulence Database to calibrate parameters for a subgrid scale turbulence kinetic energy model. We discuss the effects of filter size, prior information, and error models on the posterior probability densities of model parameters. These densities are then propagated forward through LES of canonical channel flow to obtain probability densities for several Quantities of Interest (QoI). For this study we employ non-intrusive Polynomial Chaos expansion techniques for an efficient propagation of uncertainties from input model parameters to output QoI resulted from LES of channel flow.

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