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Representing Turbulence Model Uncertainty with Stochastic PDEs TODD OLIVER, ROBERT MOSER, The University of Texas at Austin — Validation of and uncertainty quantification for extrapolative predictions of RANS turbulence models are necessary to ensure that the models are not used outside of their domain of applicability and to properly inform decisions based on such predictions. In previous work, we have developed and calibrated statistical models for these purposes, but it has been found that incorporating all the knowledge of a domain expert—e.g., realizability, spatial smoothness, and known scalings—in such models is difficult. Here, we explore the use of stochastic PDEs for this purpose. The goal of this formulation is to pose the uncertainty model in a setting where it is easier for physical modelers to express what is known. To explore the approach, multiple stochastic models describing the error in the Reynolds stress are coupled with multiple deterministic turbulence models to make uncertain predictions of channel flow. These predictions are compared with DNS data to assess their credibility. This work is supported by the Department of Energy [National Nuclear Security Administration] under Award Number [DE-FC52-08NA28615].

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