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Approximate Bayesian Computation for Parameter Estimation in RANS Turbulence Models OLGA DORONINA, University of Colorado, Boulder, SCOTT MURMAN, NASA Ames Research Center, PETER HAMLINGTON, University of Colorado, Boulder — Traditionally, turbulence model parameters have been determined through either direct inversion of model equations given some reference data or using optimization techniques. However, the former approach becomes complicated for models with many different parameters or when the model consists of partial differential equations. Here, we use an Approximate Bayesian computation (ABC) approach to estimate unknown model parameter values, as well as their uncertainties, in a nonequilibrium anisotropy closure for Reynolds averaged Navier-Stokes (RANS) simulations. ABC does not require direct computation of a likelihood function, thereby enabling substantially faster estimation of unknown parameters as compared to full Bayesian analyses. Details of the ABC approach are described, including the use of a Markov chain Monte Carlo technique as well as the choice of summary statistics and distance function. Unknown model parameters are estimated based on reference data for different homogeneous nonequilibrium test cases. We also discuss the calibration of turbulence models in inhomogeneous flows using forward simulations of an axisymmetric bump.

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