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Application of Pareto-efficient combustion modeling framework to large eddy simulations of turbulent reacting flows HAO WU, MATTHIAS IHME, Stanford University — The modeling of turbulent combustion requires the consideration of different physico-chemical processes, involving a vast range of time and length scales as well as a large number of scalar quantities. To reduce the computational complexity, various combustion models are developed. Many of them can be abstracted using a lower-dimensional manifold representation. A key issue in using such lower-dimensional combustion models is the assessment as to whether a particular combustion model is adequate in representing a certain flame configuration. The Pareto-efficient combustion (PEC) modeling framework was developed to perform dynamic combustion model adaptation based on various existing manifold models. In this work, the PEC model is applied to a turbulent flame simulation, in which a computationally efficient flamelet-based combustion model is used in together with a high-fidelity finite-rate chemistry model. The combination of these two models achieves high accuracy in predicting pollutant species at a relatively low computational cost. The relevant numerical methods and parallelization techniques are also discussed in this work.

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