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An Investigation of a Hybrid Mixing Timescale Model for PDF Simulations of Turbulent Premixed Flames[1] HUA ZHOU, Center for Combustion Energy, Tsinghua University, MIKE KURON, Department of Mechanical Engineering, University of Connecticut; Computer Aided Engineering Associates, Inc., ZHUYIN REN, Center for Combustion Energy and School of Aerospace Engineering, Tsinghua University, TIANFENG LU, Department of Mechanical Engineering, University of Connecticut, JACQUELINE H. CHEN, Combustion Research Facility, Sandia National Laboratories — Transported probability density function (TPDF) method features the generality for all combustion regimes, which is attractive for turbulent combustion simulations. However, the modeling of micromixing due to molecular diffusion is still considered to be a primary challenge for TPDF method, especially in turbulent premixed flames. Recently, a hybrid mixing rate model for TPDF simulations of turbulent premixed flames has been proposed, which recovers the correct mixing rates in the limits of flamelet regime and broken reaction zone regime while at the same time aims to properly account for the transition in between. In this work, this model is employed in TPDF simulations of turbulent premixed methane-air slot burner flames. The model performance is assessed by comparing the results from both direct numerical simulation (DNS) and conventional constant mechanical-to-scalar mixing rate model.

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