Abstract Submitted
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PDF-Based Simulations of Nonpremixed Turbulent Jet Flames With Advanced Radiation Models[1] G. PAL, M.F. MODEST, University of California-Merced, A. GUPTA, D.C. HAWORTH, The Pennsylvania State University — Transported probability density function (PDF) methods have been adopted as the basis for simulating turbulent reacting flows in both Reynolds-averaged and spatially filtered (large-eddy simulation) contexts. Skeletal gas-phase chemical mechanisms have been implemented for oxidation and pollutant formation in hydrocarbon-air flames, and detailed soot models have been implemented using a method-of-moments for soot aerosol dynamics. Photon Monte Carlo and high-order spherical harmonics radiative transfer equation (RTE) solvers have been coupled with the PDF method to deal with participating-medium radiation and turbulence/radiation interactions. Line-by-line and advanced k-distribution methods have been developed for spectral radiation properties. The result is a comprehensive framework for simulating luminous and nonluminous turbulent flames that accurately captures complex turbulence/chemistry/soot/radiation interactions. Quantitative comparisons with experimental measurements have been made. Systematic parametric studies have been performed to explore the relative importance of the choice of RTE solver versus the spectral radiation model.

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