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A New LES/PDF Method for Computational Modeling of Turbulent Reacting Flows[1] HASRET TURKERI, METIN MURADOGLU, Department of Mechanical Engineering, Koc University, Rumelifeneri Yolu, Sariyer 34450 Istanbul, Turkey, STEPHEN B. POPE, Sibley School of Mechanical and Aerospace Engineering, Cornell University, Ithaca, NY, 14853 USA — A new LES/PDF method is developed for computational modeling of turbulent reacting flows. The open source package, OpenFOAM, is adopted as the LES solver and combined with the particle-based Monte Carlo method to solve the LES/PDF model equations. The dynamic Smagorinsky model is employed to account for the subgrid-scale motions. The LES solver is first validated for the Sandia Flame D using a steady flamelet method in which the chemical compositions, density and temperature fields are parameterized by the mean mixture fraction and its variance. In this approach, the modeled transport equations for the mean mixture fraction and the square of the mixture fraction are solved and the variance is then computed from its definition. The results are found to be in a good agreement with the experimental data. Then the LES solver is combined with the particle-based Monte Carlo algorithm to form a complete solver for the LES/PDF model equations. The in situ adaptive tabulation (ISAT) algorithm is incorporated into the LES/PDF method for efficient implementation of detailed chemical kinetics. The LES/PDF method is also applied to the Sandia Flame D using the GRI-Mech 3.0 chemical mechanism and the results are compared with the experimental data and the earlier PDF simulations.

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