

Abstract Submitted
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A New Hybrid FV/Particle Algorithm for PDF Simulations of Turbulent Reacting Flows¹ REZA MOKHTARPOOR, MRTIN MURADOGLU, Koc University — A new consistent hybrid finite-volume (FV)/particle method is developed for solving the joint PDF equations of turbulent reacting flows. The open source FV package, OpenFOAM, is employed to solve the Favre-averaged mean mass and momentum equations while a particle-based Monte Carlo method is used to solve the fluctuating velocity-turbulence frequency-compositions JPDF transport equation. This work is motivated and designed to eliminate the deficiencies of the hybrid algorithm developed by Muradoglu et al. (1999, 2001). In the earlier hybrid method, a density-based FV algorithm was used to solve the mean flow equations, which has been found to be too dissipative for low-Mach number flows mainly due to the stiffness of the compressible flow equations in this limit. For tackling this problem, the density-based FV solver is replaced with a pressure-based PISO algorithm in the OpenFOAM package. The method is then applied to simulate the Sydney non-swirling and swirling bluff-body stabilized flames and the results are found to be in a good agreement with the experimental data and with the earlier PDF simulations of the same flames.

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