MONTE CARLO SIMULATION OF RADIATIVE HEAT TRANSFER AND TURBULENCE INTERACTIONS IN METHANE/AIR JET FLAMES

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ABSTRACT. A Phton Monte Carlo method combined with a composition probability-density-function (PDF) method is employed to model radiative heat transfer in combustion applications. Turbulence–radiation interactions (TRI) can be fully taken into account using the proposed method. Sandia's Flame D and artificial flames derived from it are simulated and good agreement with experimental data is found. The effects of different TRI components are investigated. It is shown that, to predict the radiation field accurately, emission TRI must be taken into account, while, as expected, absorption TRI is negligible in the considered nonsooting methane/air jet flames if the total radiation quantities are concerned, but non-negligible for evaluation of local quantities. The influence of radiation on the turbulent flow field is also discussed.

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