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An ODT-Based Multiscale Radiative Transport Model in Participating (absorbing-emitting) gray media YAJUVENDRA SHEKHAWAT, TAREK ECHEKKI, North Carolina State University — A multiscale formulation for thermal radiation transport in participating (absorbing-emitting) gray media is developed. The model is based on a grid topology using the one-dimensional turbulence (ODT) model framework and the photon Monte-Carlo (PMC) method for radiative transport. The formulation is implemented within the context of large-eddy simulation (LES). The ODT solution for the evolution of temperature field are based on, (a) a deterministic implementation for diffusion, advection and reaction, and (b) a stochastic implementation for LES subgrid scale advective transport. Specific rules for ray tracing and the modeling of emission and absorption processes are designed to capture turbulence-radiation interactions and account for subgrid scale contribution due to residual temperature fluctuations. The model is implemented for turbulent premixed flame problem and compared with DNS. The results yield excellent agreement between the LES-ODT model for radiative transport and DNS predictions.

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