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A stochastic model of particle dispersion in turbulent reacting gaseous environments GUANGYUAN SUN, DAVID LIGNELL, Brigham Young University, JOHN HEWSON, Sandia National Laboratory — We are performing fundamental studies of dispersive transport and time-temperature histories of Lagrangian particles in turbulent reacting flows. The particle-flow statistics including the full particle temperature PDF are of interest. A challenge in modeling particle motions is the accurate prediction of fine-scale aerosol-fluid interactions. A computationally affordable stochastic modeling approach, one-dimensional turbulence (ODT), is a proven method that captures the full range of length and time scales, and provides detailed statistics of fine-scale turbulent-particle mixing and transport. Limited results of particle transport in ODT have been reported in non-reacting flow. Here, we extend ODT to particle transport in reacting flow. The results of particle transport in three flow configurations are presented: channel flow, homogeneous isotropic turbulence, and jet flames. We investigate the functional dependence of the statistics of particle-flow interactions including (1) parametric study with varying temperatures, Reynolds numbers, and particle Stokes numbers; (2) particle temperature histories and PDFs; (3) time scale and the sensitivity of initial and boundary conditions. Flow statistics are compared to both experimental measurements and DNS data.

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