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A priori analysis of a LES subfilter model for soot-turbulence-chemistry interactions JEFFRY K. LEW, MICHAEL E. MUELLER, Princeton Univ — In a turbulent flame, soot interacts with turbulence and combustion chemistry at the smallest scales. An existing LES subfilter model [Mueller et al. Phys. Fluids 23 (2011)] proposes that soot-turbulence interactions are independent of chemistry due to the time scale separation between slow soot formation and rapid heat-releasing reactions. However, interactions between soot, turbulence, and chemistry occur even after the nucleation of soot from polycyclic aromatic hydrocarbon (PAH) dimers. In fact, the interplay of soot and gas-phase chemistry may be intensified during oxidation and surface growth. To capture these effects, a dependence on the local mixture fraction has been introduced into the subfilter model. This modified model is evaluated a priori using a direct numerical simulation (DNS) database of soot evolution in a turbulent non-premixed n-heptane/air jet flame.

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