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LES Subfilter Modeling of Soot-Turbulence Interactions MICHAEL MUELLER, Stanford University, HEINZ PITSCH, Stanford University; RWTH Aachen University — The evolution of soot in turbulent reacting flows is driven by the small-scale interactions between turbulence, chemistry, and soot. Due to an infinite Schmidt number, soot is confined to thin structures which are stretched by turbulent eddies. In addition, soot is formed from Polycyclic Aromatic Hydrocarbons which are present only in regions of low scalar dissipation rate resulting in a spatially and temporally intermittent soot field. In this work, soot-turbulence interactions are modeled with a presumed soot subfilter PDF approach. Based on the characteristics of soot fields in turbulent flows, a double delta distribution is proposed with one of the delta peaks fixed at zero soot in the internal phase space. The distribution is validated *a priori* using a recent two-dimensional Direct Numerical Simulation of soot formation and growth in a non-premixed flame subjected to decaying isotropic turbulence. The analysis shows that the proposed soot subfilter PDF leads to substantial improvement in predictions of total intermittency as well as soot-soot correlations in the soot source terms compared to using simply the mean values of the soot scalars (i.e. a single delta distribution). The double delta distribution requires one parameter in addition to the mean values of the soot scalars, and several approaches for specifying the parameter are evaluated with the DNS data.

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