Abstract Submitted
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A flamelet-based approach for combustion systems with convective heat-losses[1] LEE SHUNN, PARVIZ MOIN, Stanford University — A new flamelet method is proposed for modeling turbulence/chemistry interactions in large-eddy simulations (LES) of non-premixed combustion with convective heat-losses. The new method is based on the flamelet/progress-variable approach of Pierce & Moin (2004) and extends that work to include the effects of thermal-losses on the combustion chemistry. In the new model, chemistry databases are constructed by solving 1D diffusion/reaction equations which have been constrained by scaling the enthalpy of the system between the adiabatic state and a thermally-quenched reference state. The solutions are parameterized and tabulated as a function of the mapping variables: mixture fraction, progress-variable, and normalized enthalpy. The model is implemented in a LES solver which computes the filtered values of the mapping variables, and interpolates other pertinent quantities (such as density and reaction rates) from the chemistry database. The new model is applied to LES of non-premixed methane-air combustion in a coaxial-jet geometry with isothermal wall-conditions to describe heat transfer to the confinement. The resulting velocity, species concentration, and temperature fields are compared to the experiment of Spadaccini, *et al.* (1976) and numerical results from the adiabatic model.

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