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Large-eddy simulation of a coaxial-jet combustor with convective heat-losses[1] LEE SHUNN, PARVIZ MOIN, Dept. of Mechanical Engineering, Stanford University — In this study numerical simulations of non-premixed methane-air combustion are conducted to investigate the effects of convective heat-losses in a coaxial-jet combustor. The turbulent flow field is simulated via large-eddy simulation (LES) on a structured, orthogonal mesh using a conservative discretization of the transport equations. The effects of thermal-losses on the combustor are evaluated by comparing the results from simulations with adiabatic and isothermal wall-conditions, respectively. In the adiabatic simulations, turbulence/chemistry interactions are described using the flamelet/progress-variable approach of Pierce and Moin (J. Fluid Mech. 504, 73-97, 2004) in which filtered transport equations are solved for the mixture fraction and a reaction progress variable. For the heat-transfer case, the flamelet/progress-variable method is extended by a thermally-quenched flamelet library and a filtered energy equation to describe heat transfer to the confinement. The resulting velocity, species concentration, and temperature fields are compared to the experimental values of Spadaccini, et al. (U.S. EPA Rep. EPA-600/2-76-247a, 1976).

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