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Impact of Chemistry Models on Flame-Vortex Interaction SIMON LAPOINTE, BROCK BOBBITT, GUILLAUME BLANQUART, California Institute of Technology — In premixed turbulent combustion, accurate modeling of the fuel chemistry for numerical simulations is a critical component of capturing the relevant physics. Various chemical models are currently being used including detailed chemistry, tabulated chemistry, one-step chemistry, and rate-controlled constrained-equilibrium. However, the differences between these models and their impacts on the fluid dynamics are not well understood. Towards that end, the interaction between a laminar premixed hydrogen flame and a two-dimensional vortex was studied through Direct Numerical Simulations using each of these different chemistry models. In these simulations, the flame thickness, flame speed, viscosity, diffusivity, conductivity, density ratio, and vortex characteristics were held constant providing comparison of the effects of each chemical model alone. A convergence study was performed for each model assessing the numerical requirements of domain size, grid spacing and time step to completely resolve both the fluid dynamics and the chemistry. The converged results from each model were compared by considering the evolution of the flame structure and characteristics of the vortex.

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