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Unsteady effects on Polycyclic Aromatic Hydrocarbons in a turbulent jet flame YUAN XUAN, GUILLAUME BLANQUART, California Institute of Technology — Large Eddy Simulations (LES) have been performed on an ethylene/air piloted turbulent sooting jet flame. The current work focuses on capturing the interaction between turbulent transport and the formation of soot precursors. Particular attention is paid to the formation and transport of Polycyclic Aromatic Hydrocarbons (PAH), for their importance in the nucleation process of soot. Given the large time scale related to PAH formation, these species exhibit substantial unsteady effects when subjected to turbulent perturbations. Therefore, transport equations need to be solved for these species along with the Navier-Stokes equations. The chemical source terms are closed using a recently developed linear relaxation model. All other species are assumed to be in steady state and can be evaluated using chemistry tabulation. The mean and variance of velocity components, temperature, and species mass fractions are compared to experimental measurements. Joint probability density functions of soot volume fraction and temperature are particularly analysed. Additional LES results using full chemistry tabulation for all species including PAH are compared to the previous LES results using the PAH relaxation model, to investigate the importance and influence of turbulence-chemistry interaction.

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