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Direct numerical simulations of temporally developing turbulent reacting liquid-fueled jets SHASHANK SHASHANK, HEINZ PITSCH, Stanford University — Liquid fueled engines are ubiquitous in the transportation industry because liquid fuel minimizes the weight and volume of propulsion systems. The combustion that occurs in these engines is an inherently multi-physics process, involving fuel evaporation, reaction kinetics, and high levels of turbulence. A desire for high fidelity data that explains complex interaction between different physical mechanisms motivates the consideration of direct numerical simulation (DNS) as an investigation tool. In this study three-dimensional DNS of a reacting n-heptane liquid fueled temporal jet have been performed to study auto-ignition and subsequent burning in conditions that are representative of a diesel engine environment. In these simulations the continuous phase is described using an Eulerian representation whereas Lagrangian particle tracking is used to model the dispersed phase. The results of this study will demonstrate the importance of unsteady effects, and of accounting for the interaction between different modes of combustion, when simulating spray combustion.

Shashank Shashank
Stanford University

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