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Computational Analysis of End-of-Injection Transients and Combustion Recession DORRIN JARRAHBASHI, SAYOP KIM, BENJAMIN W. KNOX, CAROLINE L. GENZALE, Georgia Institute of Technology, GEORGIA INSTITUTE OF TECHNOLOGY TEAM — Mixing and combustion of ECN Spray A after end of injection are modeled with different chemical kinetics models to evaluate the impact of mechanism formulation and low-temperature chemistry on predictions of combustion recession. Simulations qualitatively agreed with the past experimental observations of combustion recession. Simulations with the Cai mechanism show second-stage ignition in distinct regions near the nozzle, initially spatially separated from the lifted diffusion flame, but then rapidly merge with flame. By contrast, the Yao mechanism fails to predict sufficient low-temperature chemistry in mixtures upstream of the diffusion flame and combustion recession. The effects of the shape and duration of the EOI transient on the entrainment wave near the nozzle, the likelihood of combustion recession, and the spatiotemporal development of mixing and chemistry in near-nozzle mixtures are also investigated. With a more rapid ramp-down injection profile, a weaker combustion recession occurs. For extremely fast ramp-down, the entrainment flux varies rapidly near the nozzle and over-leaning of the mixture completely suppresses combustion recession. For a slower ramp-down profile complete combustion recession back toward the nozzle is observed.

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