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Large-Eddy Simulations of Reacting Liquid Spray THOMAS LEDERLIN, Stanford University, MARLENE SANJOSE, LAURENT GICQUEL, BENEDICTE CUENOT, CERFACS, HEINZ PITSCH, Stanford University, THIERRY POINSOT, CNRS-IMFT — Numerical simulation, which is commonly used in many stages of aero-engine design, still has to demonstrate its predictive capability for two-phase reacting flows. This study is a collaboration between Stanford University and CERFACS to perform LES of a realistic spray combustor installed at ONERA, Toulouse. The experimental configuration is computed on the same unstructured mesh with two different solvers: Stanford's CDP code and CERFACS's AVBP code. CDP uses a low-Mach, variable-density solver with implicit time advancement. Droplets are tracked in a Lagrangian point-particle framework. The combustion model uses a flamelet approach, based on two transported scalars, mixture fraction and reaction progress variable. AVBP is a fully compressible solver with explicit time advancement. The liquid phase is described with an Eulerian method. The flame-turbulence interaction is modeled using a dynamically-thickened flame. Results are compared with experimental data for three regimes: purely gaseous non-reacting flow, non-reacting flow with evaporating droplets, reacting flow with droplets. Both simulations show a good agreement with experimental data and also stress the difference and relative advantages of the numerical methods.

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