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**Large-eddy simulations of real-fluid effects in rocket engine combustors** PETER C. MA, JEAN-PIERRE HICKEY, MATTHIAS IHME, Stanford University — This study is concerned with the LES-modeling of real-fluid effects in rocket combustors. The non-ideal fluid behavior is modeled using the Peng-Robinson equation of state, and high-pressure effects on the thermo-viscous transport properties are also considered. An efficient and robust algorithm is developed to evaluate the thermodynamic state-vector. The highly non-linear coupling of the primitive thermodynamic variables in regions near the critical point requires special consideration to avoid spurious numerical oscillations. To avoid these non-physical oscillations, a second-order essentially non-oscillatory (ENO) scheme is applied in regions that are identified by a density-based sensor. The resulting algorithm is applied in LES to a coaxial rocket-injector, and super- and transcritical operating conditions are considered. Simulation results and comparisons with experimental data will be presented, and the influence of boundary conditions on the mixing characteristics will be discussed.

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