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Simulating variable-density flows with time-consistent integration of Navier-Stokes equations XIAOYI LU, CARLOS PANTANO, University of Illinois at Urbana Champaign — In this talk, we present several features of a high-order semi-implicit variable-density low-Mach Navier-Stokes solver. A new formulation to solve pressure Poisson-like equation of variable-density flows is highlighted. With this formulation of the numerical method, we are able to solve all variables with a uniform order of accuracy in time (consistent with the time integrator being used). The solver is primarily designed to perform direct numerical simulations for turbulent premixed flames. Therefore, we also address other important elements, such as energy-stable boundary conditions, synthetic turbulence generation, and flame anchoring method. Numerical examples include classical non-reacting constant/variable-density flows, as well as turbulent premixed flames.

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