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Kinetic Energy-Preserving Discretization Schemes for High Reynolds Number Propulsive Applications[1] AYABOE EDOH, ANN KARAGOZIAN, University of California, Los Angeles — The overarching goal of this project is to explore numerical approaches for the study of turbulent flows and to use them to explore the fundamental physics of combustion processes relevant to airbreathing and rocket propulsion systems. The present studies involve an investigation of kinetic energy-preserving discretization schemes that enable multiple ways for tracking acoustic versus particle waves in a compressible flowfield. Semi-discretized schemes have been explored, with a comparison of collocated and staggered grids and alternative multi-stage ODE schemes for time integration. The energy behavior of Crank-Nicolson collocated schemes is similarly explored, for example, for the scalar, inviscid Burger's equation and for the 1D compressible Euler equations. Comparisons of accuracy for different order codes with different dissipation coefficients and using different types of boundary conditions are made, including schemes that demonstrate the lack of requirement for artificial dissipation and strong energy preservation.

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