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Shock and turbulence simulations using observable Euler and Navier-Stokes equations KAMRAN MOHSENI, DOUG LIPINSKI, University of Florida — The observable divergence theorem enables a systematic derivation of high-wavenumber regularized PDEs from conservation laws. Application of this theorem to the conservation of mass, momentum, and energy produces the inviscidly regularized observable Euler equations or, after adding physical dissipation, the observable Navier-Stokes equations. This talk will first present the derivation of the observable Euler equations from basic principles and then we report results for performance of the observable Euler and observable Navier-Stokes equations in several canonical problems involving multi-dimensional shocks and/or turbulence and their interactions. The results were compared with several previously published data using Stan, Stan-I, hybrid, WENO, ADPDIS3D, and shock fitting techniques. The observable equations consistently performs as well as the best methods.

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