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An Inviscid Hamiltonian Shock Regularization Technique for Burgers Equation GREG NORGARD, KAMRAN MOHSENI, University of Colorado at Boulder — While considered an oversimplified model of 1-D fluid dynamics, Burgers equation,$u_t + uu_x = \nu u_{xx}$, shares many of the same properties as Euler and Navier-Stokes equations, namely shocks and turbulence. Both shocks and turbulence can be considered a result of transfer of energy to high frequency wave modes. The uu_x term in Burgers equation is responsible for generating high wave mode as time progresses. In viscous Burgers the accumulation of these high frequency modes is limited by the viscous term. This research proposes limiting the generation of higher wave modes by replacing the convective velocity with a low-pass filtered velocity $\bar{u}$, eliminating the need for a dissipative term, resulting in the equation,$u_t + \bar{u}u_x = 0$. This results in an inviscid regularization of Burgers equation that has a fully Hamiltonian structure. A specific case using the Helmholtz filter, $u = (I - \alpha^2\partial_x^2)\bar{u}$, is examined in detail, with energy decay as well as other characteristics compared favorably with viscous Burgers.

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