Abstract Submitted
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Shock capturing in discontinuous Galerkin spectral elements via the entropy viscosity method[1] JASON HACKL, University of Florida, MRUGESH SHRINGARPURE, Exxon-Mobil, PAUL FISCHER, University of Illinois, SIVARAMAKRISHNAN BALACHANDAR, University of Florida — We present a 3D discontinuous Galerkin spectral element solver for compressible flows with shock waves using artificial viscosity to regularize the solution for representation by nested tensor products of high-order Lagrange polynomials. The viscosity is constructed from a smoothed evaluation of the residual of an entropy inequality, localizing the artificial viscosity around shock waves and other flow features that would otherwise not be representable in spectral elements without thermodynamic violations due to Gibbs oscillations. Applied to the Guermond-Popov (2014) stress tensor, this smoothed, continuous artificial viscosity is easily integrated with the non-symmetric numerical fluxes of Baumann and Oden (1999). The method is implemented on top of nek5000, leveraging an outstanding high-performance spectral element code to solve shocked flows over curved surfaces. The interaction of a Mach 3 shock with a sphere is shown to demonstrate this capability.

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