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Studies of Plasma Instabilities using Discontinuous Galerkin Method with Artificial Viscosity, Limiters and Filters YANG SONG, BHUVANA SRINIVASAN, Virginia Tech, AMMAR HAKIM, Princeton Plasma Physics Laboratory — The discontinuous Galerkin (DG) method is employed in this work to study plasma instabilities using high-order accuracy. The DG method has the advantage of resolving shocks and sharp gradients that occur in neutral fluids and plasmas. Artificial viscosity, limiters and filters are explored along with the DG method to mitigate numerical instabilities in the region of discontinuities. Artificial viscosity works in a simultaneous sense by adding a viscous term to the system to damp higher modes. Limiters are expected to reduce the numerical order one by one in regions of sharp gradients so that smooth solutions can be obtained while a fairly good numerical accuracy is maintained. Filters work physically the same as artificial viscosity but mathematically in a sequential way which will only filter the solution at the end of each time-step or at intermediate stages of a time-step. Computational tests are performed in one and two dimensions. Results are presented for Kelvin-Helmholtz and Rayleigh-Taylor unstable plasmas using the code Gkeyll.

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