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Discontinuous Galerkin version of PERSEUS for Studying HED plasma XUAN ZHAO, CHARLES SEYLER, JOHN GREENLY, Cornell University, YANG YANG, Michigan Technological University — The Discontinuous Galerkin(DG) version of Cornell PERSEUS [1,2] code is developed in an effort to reduce the numerical diffusivity of the existing Finite Volume(FV) version of PERSEUS code. A Positivity- Preserving limiter [3] is used instead of TVD limiter to maintain a second order accuracy at smooth extrema. A Structure-Preserving limiter [4] is used when $\nabla \cdot B = 0$ needs to be enforced. The code is tested on several MHD benchmark problems with both resistive MHD and extended-MHD models. The simulation results of compressible magnetic reconnection problem are presented here as an example. Since DG-PERSEUS is better for simulating shocks with less numerical diffusivity, we applied the code for studying the difference between the structures of a shock formed by a super-Alfvenic-supersonic flow and that formed by a sub-Alfvenic-supersonic flow, so that one can tell whether the outflow is super-Alfvenic in a magnetic reconnection experiment. The code is parallelized with MPI, we expect a higher parallel efficiency, since the only information needed to be passed between computation units is the flux through boundary, which is less than the passed information in the FV case.

[1] M.R. Martin, PhD. Thesis
[2] C.E. Seyler, M.R. Martin, 2011
[3] X. Zhang, PhD. Thesis
[4] F. Li, C. Shu, 2006

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