Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

**GPU Accelerated Reduced MHD Simulations: An Application to Magnetic Island Coalescence in 3D Line-Tied Geometry**[1] LIWEI LIN, University of New Hampshire, CHUNG-SANG NG, University of Alaska Fairbanks, AMITAVA BHATTACHARJEE, University of New Hampshire — We present a comprehensive re-programming of a 3D reduced MHD code for hardware acceleration using graphics processing units (GPUs) with Nvidia CUDA. The code (pseudo-spectral semi-implicit) is tailored for the study of a 3D model of coronal heating [Arxiv:1106.0515]. We discuss our general porting strategy and report code performance and detailed code tracing on GPU accelerated supercomputers (NCSA/Forge, NICS/Keeneland). At $2048^2 \times 256$, the highest resolution tested, the chip-to-chip speedup is $18\times$ comparing Xeon Nehalem QC and Nvidia Fermi. Scaling well up to 256 GPUs, the code effectively gives a speedup of $46\times$ compared with our original code on a conventional CPU cluster. A test case is presented in which magnetic island coalescence is studied in 3D line-tied geometry, where very large Lundquist numbers are used to induce magnetic flux-tube sloshing. Results are compared with existing 2D simulations and the advantages of the GPU implementation are emphasized.

[1]This work is supported by NASA: NNX08BA71G, NNX06AC19G, DOE: DE-FG02-07ER54832, NSF: AGS-096247, and NSF TeraGrid grants at NCSA (TG-PHY100057) and NICS (UT-NTNL0092).

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Date submitted: 15 Jul 2011 Electronic form version 1.4