Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

High-Lundquist Number Numerical Simulations of Coronal Heating: Reduced MHD via GPGPUs LIWEI LIN, AMITAVA BHATTACHARJEE, University of New Hampshire, CHUNG-SANG NG, Geophysical Institute, University of Alaska Fairbanks — In the last few years, we have performed a number of numerical simulations of a coronal heating model based on three-dimensional (3D) reduced magnetohydrodynamics (RMHD), which is generalized from our 2D model [C. S. Ng and A. Bhattacharjee, Astrophys. J., 675, 899 (2008)]. In this model, random photospheric footpoint motion is applied to obtain converged average coronal heating rates. In the high-Lundquist number limit, we find that the heating rate is independent of the Lundquist number, with average magnetic energy saturating at a constant level due to the formation of strong current layers and subsequent disruptions. The computational loads required for adequately resolving such current layers renders any extension of our analysis towards even higher Lundquist numbers exceedingly difficult on conventional parallel architectures. We present here initial results from a port of our RMHD code to Nvidia CUDA (Compute Unified Device Architecture) for hardware acceleration using general purpose graphics processing units (GPGPUs). We report code performance on a dedicated research workstation and well as larger scale distributed memory GPU equipped machines. This work is supported by NASA NNX08BA71G, NNX06AC19G, NSF AGS-0962477, and DOE DE-FG02-07ER54832.

LiWei Lin
University of New Hampshire

Date submitted: 16 Jul 2010 Electronic form version 1.4