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SH31C-1809 ***Poster***

High-Lundquist Number Scaling Analysis on the Parker's Model of Solar Coronal Heating due to Random Photospheric Footpoint Motion

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Parker's model [Parker, Astrophys. J., **174**, 499 (1972)] is one of the most discussed mechanisms for coronal heating and has generated much debate. We have recently obtained new scaling results in a two-dimensional (2D) version of this problem suggesting that the heating rate becomes independent of resistivity in a statistical steady state [Ng and Bhattacharjee, Astrophys. J., **675**, 899 (2008)]. Our numerical work has also been extended to 3D by means of large-scale numerical simulations. Random photospheric footpoint motion is applied for a time much longer than the correlation time of the motion to obtain converged average coronal heating rates. In the high-Lundquist number limit, coronal heating rates obtained so far are consistent with a trend that is independent of the Lundquist number, as predicted by previous analysis as well as 2D simulations. In the same limit the average magnetic energy built up by the random footpoint motion tends to have a much weaker dependence on the Lundquist number than that in the 2D simulations, as well as the scaling obtained by [Longcope and Sudan, Astrophys. J., **437**, 491 (1994)], due to the formation of strong current layers and subsequent disruption when the equilibrium becomes unstable. We will present scaling analysis showing that the Longcope-Sudan scalings become inapplicable when characteristic dissipation time-scales become much larger than the correlation time of the random footpoint motion. In this case, we show that the heating rate tends to become independent of Lundquist number and that the magnetic energy production is also reduced significantly. This work is supported by NASA grants NNX08BA71G, NNX06AC19G, a NSF grant AGS-0962477, and a DOE grant DE-FG02-07ER54832.

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