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Analytic and Numerical Studies of a Tectonics Model for Solar Coronal Heating

Chung-Sang Ng¹, A. Bhattacharjee¹

¹*University of New Hampshire.*

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Recent observations have shown that the solar surface is covered with a so-called “magnetic carpet”, in which small-scale magnetic flux loops are continually emerging and interacting. The magnetic flux at the photosphere is thus being replaced in every 10-40 hours. This magnetic carpet may have important implication for the heating problem of the solar corona. A tectonics model of coronal heating based on this physical picture has been studied recently [Priest, Heyvaerts and Title, *ApJ* 576, 533 (2002)]. These authors calculated the ohmic heating rate due to the dissipating of strong current sheets along magnetic separatrices. It is shown that the heating rate is inversely proportional to an effective resistivity if the current sheets can reach stationary state in a time shorter than the coherence time of the photospheric motions. Here we present our analytic and simulation results of this model, based on reduced magnetohydrodynamic equations, to quantify how the heating rate depends on resistivity, as well as the photospheric coherence time.

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