# Driving currents for solar coronal mass ejections: implications for CME eruption energetics

Prasad Subramanian[1] and Angelos Vourlidas[2]

[1] *Indian Institute of Science Education and Research, Pune, India*
[2] *Naval Research Laboratory, Washington, DC, USA*

Subramanian & Vourlidas (2009) have given one of the few observationally based estimates of currents in the solar corona. They have used measurements for the forces propelling flux rope coronal mass ejections (CMEs) using data from the LASCO coronograph aboard SOHO in the height range of $\sim 2$ – $20$ $R_\odot$. Assuming that the Lorentz self-force propels these CMEs, they found that the upper limits on currents enclosed by such CMEs is around $10^{10}$ Amperes.

Other estimates of currents in the solar atmosphere are: photospheric currents from magnetogram data ($\sim 10^{12}$ Amperes), and currents inferred from prominence dynamics in the lower corona ($\sim 10^{11}$ Amperes). There thus seems to be a clear decrease in the current magnitude with height in the solar atmosphere: $10^{12}$ Amperes near the photosphere, $10^{11}$ Amperes in the lower corona and $10^{10}$ Amperes in the upper corona. It is generally accepted that CMEs are propelled by the dissipation of free energy that is stored in stressed pre-eruption magnetic field configurations. We examine how the distinct decrease in coronal currents with height fits in with the picture of dissipation of free magnetic energy that is used for CME eruption. This approach to the problem of CME eruption energetics invokes a circuit description of the solar corona, and is related to similar models for solar flares. It offers some distinct advantages, and also has the potential to constrain the effective anomalous resistivity of the coronal plasma.

Keywords: Coronal mass ejections; magnetic energy; MHD.

## References

[1] P. Subramanian and A. Vourlidas, *ApJ* **693**, 1219 (2009).
**25**, L527 (1992).