

CME/Flare Mechanisms

Spiro K. Antiochos

Naval Research Laboratory

The most spectacular and most energetic manifestations of solar activity are the giant disruptions of the Sun's magnetic field that are observed as a filament eruption/ coronal mass ejection (CME)/ flare event. CMEs/eruptive flares are also the primary drivers of intense SEP storms and of destructive space weather at Earth. By observing the onset of a CME/flare at the Sun, it is possible to obtain one to three days warning before the ejecta and accompanying shock arrive at Earth or Mars, but the energetic particles often arrive within tens of minutes of event onset. Therefore, a useful warning capability for SEPs requires prediction of CME onset from observations of conditions at the Sun. We discuss the current state of the field for theories and modeling of CME initiation, and describe possible predictions schemes for CME onset based on these models. We also discuss how the upcoming NASA missions, STEREO, Solar-B and SDO, and the planned future missions, Solar Probe and Sentinels, may be able to test some of these prediction schemes.

This work was supported, in part, by NASA and ONR.