

On the Initiation of Coronal Mass Ejections, Their Evolution, and Propagation into the Heliosphere: Recent progress and outstanding questions

Lynch, Benjamin J., blynch@ssl.berkeley.edu, Space Sciences Laboratory, University of California, Berkeley, CA, USA.

With the combination of remote and in situ observations from SDO, STEREO, SOHO, and ACE, we now observe with unprecedented detail almost every aspect of CME initiation and evolution: from the magnetic topology and configuration of the CME source region, to plasma and temperature structure of the prominence and cavity system, to the dynamics of the eruptive flare ribbons and arcade loops during impulsive rapid energy release and gradual post-flare relaxation phases of the eruption, through the CME/ICME coronal and heliospheric propagation, and finally to the direct measurement of the ICME magnetic field and plasma signatures at 1 AU. We are truly entering a period of comprehensive Sun-to-Earth System science that requires an integrated modeling, data analysis, and numerical simulation approach. We will discuss recent advances in the MHD modeling of CME initiation and our efforts to relate these to observational signatures as well as utilizing insight gained from simulation results to help interpret and simplify complex eruption scenarios.