Title: CME Evolution from the Low Solar Corona to L1: EUV Diagnostics and Ion Composition

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Abstract:

A case study of a filament eruption associated with a geo-effective ICME is presented. Multi-instrument remote-sensing and in-situ observations are employed in an empirical analysis of the evolution of the filament plasma's properties for the first hour of its journey through the low solar corona. The time evolution of density and temperature are presented, measured using absorption diagnostics on SDO/AIA multi-wavelength images. Kinematics of the filament eruption using white-light observations from twin-STEREO spacecraft are discussed. The Michigan Ionization Code was used to compute the ionization history of the CME core before freeze-in, allowing us to relate the low solar corona observations to in-situ measurements from ACE/SWICS near the time of Earth-intercept. Composition estimates also assist in testing ionization equilibrium approximations for CME core plasmas in the low solar corona.

A fundamental limitation of current plasma diagnostic techniques is the need to neglect either emission or absorption contributions in certain wavelength channels. This limits our ability to use numerous observations available to us, and increases uncertainties in the measurements made. A new diagnostic technique is introduced that uses EUV and UV observations and notably allows for contributions from both absorption and emission to be considered. The results of this investigation allow for a more robust examination of the behavior of CME core dynamics at high-cadence, and determine the time evolution of the CME core energetics in the low solar corona.