Key observations of Coronal Mass Ejections for improving space weather Forecasting

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Coronal mass ejections (CMEs) are key drivers of severe space weather disturbances at Earth. The magnetic field is the most crucial parameter in determining how geoeffective a particular CME will be. Unfortunately, it is currently not possible to measure a CME's magnetic field remotely in the corona or in the heliosphere and in-situ observations of Earth impacting CMEs are only continuously available at the Lagrangian point L1, from where it takes about 30 minutes for the solar wind to reach Earth. This presents a huge limitation for accurate long-lead time space weather forecasting. In this presentation, we discuss indirect observational solar proxies that can be used to estimate a CME's magnetic properties and the current status and challenges for using photospheric magnetograms as the boundary conditions for data-driven coronal or semi-empirical models