Geophysical Research Abstracts
Vol. 19, EGU2017-1942, 2017
EGU General Assembly 2017

Flare-CME characteristics from Sun to Earth combining observations and modeling

Manuela Temmer (1), Julia K. Thalmann (1), Karin Dissauer (1), Astrid M. Veronig (1), Johannes Tschernitz (1), Jürgen Hinterreiter (1), and Luciano Rodriguez (2)

(1) University of Graz, Institute of Physics, IGAM-Kanzelhöhe Observatory, Graz, Austria (manuela.temmer@uni-graz.at),
(2) SolarTerrestrial Center of Excellence, SIDC, Royal Observatory of Belgium, Belgium

We analyze the well observed flare-CME event from October 1, 2011 (SOL2011-10-01T09:18) covering the complete chain of action – from Sun to Earth – for a better understanding of the dynamic evolution of the CME and its embedded magnetic field. We study in detail the solar surface and atmosphere from SDO and ground-based instruments associated to the flare-CME and also track the CME signature offlimb from combined EUV and white-light data with STEREO. By applying 3D reconstruction techniques (GCS, total mass) to stereoscopic STEREO-SoHO coronagraph data, we track the temporal and spatial evolution of the CME in interplanetary space and derive its geometry and 3D-mass. We combine the GCS and Lundquist model results to derive the axial flux and helicity of the MC from in situ measurements (Wind). This is compared to nonlinear force-free (NLFF) model results as well as to the reconnected magnetic flux derived from the flare ribbons (flare reconnection flux) and the magnetic flux encompassed by the associated dimming (dimming flux). We find that magnetic reconnection processes were already ongoing before the start of the impulsive flare phase, adding magnetic flux to the flux rope before its final eruption. The dimming flux increases by more than 25% after the end of the flare, indicating that magnetic flux is still added to the flux rope after eruption. Hence, the derived flare reconnection flux is most probably a lower limit for estimating the magnetic flux within the flux rope. We obtain that the magnetic helicity and axial magnetic flux are reduced in interplanetary space by $\sim$50% and 75%, respectively, possibly indicating to an erosion process. A mass increase of 10% for the CME is observed over the distance range from about 4–20 Rs. The temporal evolution of the CME associated core dimming regions supports the scenario that fast outflows might supply additional mass to the rear part of the CME.