



Tracking the magnetic structure of flux ropes from eruption to in-situ detection

Erika Palmerio (1), Emilia Kilpua (1), Lucie Green (2), Alexander James (2), Jens Pomoell (1), and Gherardo Valori (2)

(1) University of Helsinki, Department of Physics, Finland (erika.palmerio@helsinki.fi), (2) University College London, Mullard Space Science Laboratory, UK

Coronal Mass Ejections (CMEs) are spectacular explosions from the Sun where huge amounts of plasma and magnetic flux are ejected into the heliosphere. CMEs are built at the Sun as a force-free ($\mathbf{J} \times \mathbf{B} = 0$) magnetic flux rope. It is well-established that CMEs are the main drivers of intense magnetic storms and various space weather effects at the Earth. One of the most significant problems for improving the long lead-time space weather predictions is that there is no method to directly measure the structure of CME magnetic fields, neither in the onset process nor during the subsequent propagation from the solar surface to the Earth. The magnetic properties of the CME flux rope (magnetic helicity sign, the flux rope tilt and the direction of the flux rope axial field) can be estimated based on the properties of the source active region and characteristics of the related structures, such as filament details, coronal EUV arcades and X-ray sigmoids. We present here a study of two CME flux ropes. We compare their magnetic structure using the synthesis of these indirect proxies based on multi-wavelength remote sensing observations with the structure detected in-situ near the orbit of the Earth.