Geophysical Research Abstracts
Vol. 19, EGU2017-11747, 2017
EGU General Assembly 2017

Modeling the Sun-To-Earth Evolution of the Magnetic Structure of Coronal Mass Ejections with EUHFORIA

Jens Pomoell (1), Emilia Kilpua (1), Christine Verbeke (2), Erkka Lumme (1), Stefaan Poedts (2), Erika Palmerio (1), and Alexey Isavnin (1)

(1) University of Helsinki, Finland, (2) KU Leuven, Belgium

Unraveling the formation and evolution of coronal mass ejections (CMEs) from the Sun to Earth remains one of the outstanding goals in current solar-terrestrial physics and space weather research. In particular, capturing the dynamical evolution of the magnetic field configuration of CMEs from initiation to in-situ detection is of key importance in order to determine the geo-effectiveness of the impinging structure. We are in the process of developing a data-driven modeling pipeline designed to advance our capability to accurately model this evolution on a routine basis.

Our modeling scheme consists of two major building-blocks: A non-potential time-dependent model of the coronal magnetic field driven by a time-sequence of vector magnetograms and a magnetohydrodynamics model that computes the dynamics in the inner heliosphere from 0.1 AU up to the orbit of Mars (EUHFORIA). The two models are coupled using a flux rope model, wherein coronagraph observations are employed to constrain the kinematics and morphological parameters of the flux rope, while the magnetic structure is obtained from the coronal model.

In this work, we present our Sun-to-Earth modeling approach to determine the evolution of the magnetic field structure of CMEs. In addition, we showcase results of the modeling using well-observed case studies and comparisons with in-situ observations and discuss future horizons for our modeling approach.