Geophysical Research Abstracts
Vol. 18, EGU2016-1661, 2016
EGU General Assembly 2016

Planar magnetic structures in coronal mass ejection-driven sheath regions

Erika Palmerio (1), Emilia Kilpua (1), Neel Savani (2,3)

(1) University of Helsinki, Department of Physics, Helsinki, Finland (erika.palmerio@helsinki.fi), (2) Goddard Planetary Heliophysics Institute (GPHI), University of Maryland, Baltimore County, Maryland, USA, (3) NASA Goddard Space Flight Center, Greenbelt MD 20771, USA

Coronal Mass Ejections (CMEs) often travel in the interplanetary space faster than the ambient solar wind. When their relative velocities exceed the local magnetosonic speed, a shock wave forms. The region between the shock front and the leading edge is known as sheath region. Sheaths are compressed regions characterized by turbulent magnetic field and plasma properties and they can cause significant space weather disturbances. Moreover, sheaths often exhibit a complex internal structure, which makes understanding their formation and predicting their geoeffectivity particularly difficult.

Planar magnetic structures (PMSs) are frequently reported in CME-driven sheath regions. The magnetic field vectors in a PMS are characterized by abrupt changes in direction and magnitude, but they all remain for a time interval of several hours nearly parallel to a single plane that includes the interplanetary magnetic field (IMF) spiral direction but is inclined to the ecliptic plane.

We present the study of PMSs in the sheath region of CMEs for a sample of 95 events observed in situ by the ACE and Wind spacecraft in the period 1997-2015. The presence of planar structures is detected with an automated method and evaluated through the minimum variance analysis (MVA), needed for determining the normal vector to the PMS-plane. We relate the occurrence and location of the PMSs to various shock, sheath and CME properties. We show in addition the dependence of the angle between the IP shock and PMS plane normals with respect to the PMS location within the sheath. Finally, we study the amount of strongly southward magnetic fields in planar and non-planar parts of the sheath, aiming at determining whether either feature is more likely to drive magnetospheric activity.