Magnetopause Location and Geosync. Orbit Crossings team

Team Leads: Y. Collado-Vega (CCMC) and S. Merkin (JHU APL)

Team Members: *M. Collier (NASA GSFC), H. Connor (NASA GSFC), D. Cramer (UNH), K. Garcia-Sage (NASA/GSFC), M. Georgoulis (AOA), H. Hietala (UCLA), I. Honkonen (NASA GSFC), A. Kellerman (UCLA), K. Kuntz (JHU), M. Kuznetsova (CCMC), N. Lugaz (UNH), R. Lopez (UTA),S. Merkin (JHU APL), S. Petrinec (LMCO), J. Raeder (UNH), L. Rastaetter (CCMC), K. Raymer (Leicester), S. Sazykin (RICE), D. Sibeck (NASA GSFC), H. Singer (NOAA), K. Trattner (LASP), B. Walsh (BU), Chih-Ping Wang (UCLA), D. Welling (UMICH), M. Wiltberger (NCAR), K. Winters (USAF)*

Do we know the location of the magnetopause with typical/strong solar wind conditions?

NO!

‘Recent’ observations-based studies of geophysical boundary locations and shapes

Static empirical models:

Bow shock:

- Axially symmetric model: Chao *et al*. [2002]
- 3D asymmetries: Verigin *et al*. [2001]; Merka *et al*. [2005]; Jeřáb *et al*. [2005]
- Influence of Earth’s dipole tilt: Jelínek *et al*. [2008]
- Shock location at far downstream: Liu *et al*. [2016]

Magnetopause:

- Axially symmetric model: Chao *et al*. [2002]
- Asymmetries using high-lat crossings: Šafránková *et al*. [2005]
- Effect of cusp indentations / dipole tilt angle: Lin *et al*. [2010]
- Support vector regression machine: Wang *et al*. [2013]

Boundary distortions in response to solar wind dynamics (observational studies):

Bow shock: Meziane *et al*. [2014]

Magnetopause: Suvorova *et al*. [2010]; Dmitriev and Suvorova [2012]

Magnetopause crossings at GEO: Dmitriev *et al*., [2004, 2005, 2011, 2016]; Suvorova *et al*., [2005]

Some Issues

- Ionospheric conductance effects on magnetopause location under-investigated.
- MP compression events should be well reproduced by MHD models, but we find they do not.
- MHD models give different standoff positions of the dayside magnetopause for the same solar wind conditions.
- The ring current effects should be taken into consideration.
- Sensitivity of the subsolar and flank magnetopause to changes in model parameters.
- Analysis of differences in solar wind propagation algorithms.
- Uncertainty in upstream conditions. Comparison of observations by multiple solar wind monitors.
- Understanding physical processes causing the magnetopause motion change.
- *Magnetopause crossings at geosynchronous orbit immerse satellites in the magnetosheath in a field and plasma environment that is different from normal operations*

How this team relates to other workshop teams:

- Ionospheric conductances are important.
- Radiation belt electron losses from magnetopause
- Magnetopause location for determining the last-closed-drift-shell

Metrics and Analysis quasi-developed and to be:

- RMS, Prediction Efficiency, Cross Correlation, Event-based studies with probability detection
- Database of magnetopause crossings from different missions and Geosync. Orbit crossings
- Possibly developing model/observation comparison tool
- Quantify speed of changing inward and outward motion