# 2016 Workshop: MIT Coupling Drivers and Impacts

Long title
Magnetospheric energy/momentum input and its role in the Magnetosphere – Ionosphere – Thermosphere Coupling
CEDAR-GEM
Conveners
Hyunju Kim Connor
Cheryl Huang
Yanshi Huang
Haje Korth
Binzheng Zhang
Gang Lu
Description

The magnetosphere is one of the major energy sources that drive the Earth's upper atmosphere. During storm times, the magnetosphere deposits significant energy into the ionosphere and thermosphere (IT) in the form of auroral particle precipitation and Poynting flux. The subsequent high-latitude ionization, ionospheric electric field variations, Joule heating, and ion-drag forcing alter the global ionosphere – thermosphere dynamics. Current IT models (e.g. CTIPe, TIEGCM, and GTIM) drive the ionosphere – thermosphere using empirically calculated magnetospheric input. Since these input models (e.g. Weimer electrodynamics model and Hardy and/or Newell aurora statistics) average over decades of observations, they can provide fast solutions for any activity levels and any locations. However, they cannot sufficiently capture the spatiotemporal dynamics of magnetospheric energy sources during strong geomagnetic activities, thus limiting the predictive capability of IT models when it is most needed. More realistic calculation of magnetospheric energy input is necessary. Global magnetosphere MHD models (e.g. OpenGGCM, LFM, and BATSRUS) or Assimilative Mapping of Ionospheric Electrodynamics (AMIE) technique could help specify magnetospheric energy input. In recent years, the coupled magnetosphere – ionosphere thermosphere (MIT) models, such as OpenGGCM-CTIM, LFM-TIEGCM, BATSRUS-GTIM, and AMIE-TIEGCM, have been gradually matured to the point to revisit the extensive

ground/space observations and to investigate the complex coupling of the MIT system. Several groups are already working on numerical simulations and conducting extensive data analysis using DMSP, AMPERE, CHAMP, GRACE, etc. Therefore, it is the proper time to gather these recent efforts and foster discussion for better understanding the MIT coupling physics.

Agenda

***Session 1 on Tuesday (Jun 21)***

Chair - Hyunju Connor and Yanshi Huang

1. 1:30 – 1:32pm - Hyunju Connor: Introductory Remarks (pdf)

2. 1:32 – 1:47pm - Delores Knipp: Updated estimates of global energy deposition to the upper atmosphere (pdf)

3. 1:47 – 1:55pm - Gang Lu: Partitioning of high-latitude energy input: Polar cap vs. Auroral zone (pdf)

4. 1:55 – 2:03pm - Cheryl Huang: Small-scale effects during magnetic storms (pdf)

5. 2:03 – 2:11pm - Denny Oliveira: Superposed epoch analysis of the thermosphere time response to geomagnetic storms (pdf)

6. 2:11 – 2:19pm - Tomoko Matsuo: AMIE NextGen - extending capabilities for the assimilative mapping of ionospheric electrodynamics (AMIE) procedure (pdf)

7. 2:19 – 2:27pm - Yue Deng: Poynting flux and particle precipitation in the high-latitudes during geomagnetic storms (pdf)

8. 2:27 – 2:35pm - Olga Verkhoglyadova: Comparison of IT responses to complex solar wind driving during March storms in 2013 and 2015 (pdf)

9. 2:35 – 2:43pm - Katelynn Greer: TEC Enhancements Dependence on Storm UT Onset Time (pdf)

10. 2:43 – 2:51pm - Richard Walterscheid: Auroral Effects of Precipitating Electrons on the Thermosphere for the March 17, 2013 Storm Observed by the GOCE Satellite and Simulated by the TIEGCM with Fluxes Predicted by the RCME (pdf)

11. 2:51 – 2:59pm - Joseph Jensen: Can Particle Precipitation in the Ionosphere Affect the Magnetic Reconnection Rate? (pdf)

12. 2:59 – 3:07pm - Roger Varney: Ion Outflow, Magnetosphere-Ionosphere Feedback Loops, and Sawtooth Oscillations

13. 3:07 – 3:15pm - Bin Zhang: Impacts of ionospheric O+ outflow on storm-time F-region thermospheric mass density  modeling (pdf)

14. 3:15 – 3:23pm - Robert Gillies: Ion heating event caused by fast azimuthal flows near the cusp: RISR-C radar observations (pdf)

***Session 2 on Wednesday (Jun 22)***

Chair - Binzheng Zhang, Yanshi Huang

1. 1:30 – 1:32pm - Introductory Remarks (pdf)

2. 1:32 – 1:40pm - Steven Kaeppler: Combined optical and incoherent scatter specification of high latitude electron flux and conductance (pdf)

3. 1:40 – 1:48pm - Yakov Dimant: Magnetosphere-Ionosphere-Thermosphere coupling through anomalous ionospheric conductivity (pdf)

4. 1:48 – 1:56pm - Jing Liu: Anomalous electron heating effects on the E region ionosphere in TIEGCM (pdf)

5. 1:56 – 2:04pm - George Khazanov: SE coupling in the region of diffuse aurora (pdf)

6. 2:04 – 2:12pm - Hyunju Connor: The role of superthermal electron MI coupling physics in the calculation of ionospheric conductance (pdf)

7. 2:12 – 2:20pm - Michael Mendillo: Stable Auroral Red (SAR) Arcs: Complex modes of inner-magnetosphere-ionosphere coupling (pdf)

8. 2:20 – 2:28pm - Jun Liang: Strong electron temperature enhancement in the upper F-region ionosphere associated with pulsating auroras: A Swarm survey (pdf)

9. 2:28 – 2:36pm - Haje Korth: Storm-time large-scale Birkeland currents: Comparison of AMPERE observations with model results (pdf)

10. 2:36 – 2:44pm - Jiannan Tu: Dynamics of Field-aligned Current Propagation and Pedersen Current Formation (pdf)

11. 2:44 – 2:52pm - Kyoung-Joo Hwang: KH Vortex-generated field-aligned currents (pdf)

12. 2:52 – 3:00pm - Chigomezyo Ngwira: Multi-instrument analysis of surface geoelectric field drivers (pdf)

13. 3:00 – 3:08pm - Yang Lu: Observations of Poynting flux in the dayside cusp region at different altitudes (pdf)

14. 3:08 – 3:16pm - Michael Wiltberger: Effect of Anomalous electron heating in Coupled LFM-RCM Simulations of the March 17-18, 2013 geomagnetic storm (pdf)

15. 3:16 – 3:24pm - Yongliang Zhang: Auroral features from FUV observations

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