

2015 GEM Summer Workshop Summary Report

Inner Magnetosphere Cross-Energy/Population Interactions (IMCEPI)

Co-conveners:

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Our focus group started its second-year in 2015, receiving a lot more interests from the community since a year ago. We organized one joint session with “Quantitative Assessment of RB modeling” and three individual sessions focusing on “*wave-particle interactions*”, “*plasma-field coupling*” and “*magnetosphere-ionosphere coupling*”, respectively. We had a good number of speakers and attendance in each session, and positive inputs from the discussion with the audience.

(1) Joint session with “Quantitative assessment of radiation belt modeling” FG:

The two FGs shared the same audience and speakers to jointly address the wave particle interactions in the inner magnetosphere populations. A variety of research topics were presented, such as establishing a global time-dependent EMIC amplitude distribution using RAM-SCB outputs (X. Fu) and spatial distributions of EMIC wave from Van Allen Probes observations (A. Saikin). Other studies looked at the excitation of chorus waves in a laboratory plasma (J. Bortnik, X. An) and whistler waves from particle simulations (S. Wu). W. Li modeled the acceleration of radiation belt electrons due to chorus waves in a 3D diffusion model, and C. Wang reported ULF waves from multi-point observations. Y. Shprits presented VERB-4D simulations that can combine the transport of convection and diffusion for radiation belt electrons.

(2) “Wave-particle interactions” Session:

We had a variety of contributions on various waves, including EMIC, ULF, and Chorus waves. We focused on a challenge event on Feb 23, 2014 from coordinated space- and ground- measurements. This included intense EMIC wave activity across a wide range of L-shells and MLTs and subsequent scattering of energetic particles (M. Engebretson), and delayed EMIC activity following tail plasma injections within GEO (J. Lee). We had contributions on ULF waves and their dependence on azimuthal wave number m , and an extension of a previous statistical study from new database (M. Hartinger). Topics on chorus waves included their global distribution as functions of solar wind conditions (A. Homayon), and statistical studies of shock-associated chorus excitation in the dayside magnetosphere due to more homogeneous magnetic field configuration (C. Zhou). In addition to observational contributions, we also had discussions on the modeling effort of global chorus and EMIC wave distribution from the RAM-SCB model (V. Jordanova), as well as forecasting effort on the electron radiation belts (A. Kellerman).

(3) “Plasma-field coupling” Session:

We had again a variety of research topics for the inner magnetosphere coupling between the plasma and electric/magnetic fields. Presentations included investigation of the cause of the post-midnight flux minimum in the near-Earth eV electrons (L. Smith)

by examining the correlation with the equatorial noise, discussion on the subauroral polarization streams (SAPS) electric fields observed by Van Allen probes and their relation with plasma sheet boundaries (S. Califf), and estimation of ring current energy densities using Van Allen Probes observations during geomagnetic storms (H. Zhao). Investigations of the characteristics and formation of heavy ion “trunk” structures (J. Zhang) and the spatial distributions of proton ‘nose’ structures as functions of species and geomagnetic activities (C. Ferradas) were also presented. In addition to these observational studies, we also had contributions of modeling efforts, including the improvements in global models of the inductive electric fields (R. Ilies), the test particle simulations on Landau accelerations of low energy electrons following substorm injections (J. Woodroffe), as well as discussion of an apparent inconsistency between improved diffuse auroral precipitation models (C. Lemon) and their resulting effects on electric feedback between the ionosphere and magnetosphere.

(4) “Magnetosphere-ionosphere coupling” Session:

We focused on the connection between the ionosphere and magnetosphere, by looking into the effects of magnetospheric dynamics in the inner magnetosphere on the ionosphere and vice versa, such as the development of an ionospheric conductivity model from statistical DMSP measured precipitation spectra (R. McGranaghan), ionospheric electron precipitation due to pitch angle scattering in the magnetosphere by plasma waves (Y. Yu), and modeling the feedback loop of ionospheric outflow and its effects on the ring current (D. Welling). Observational studies are devoted to new measurements on pulsating aurora at low energies (M Gillies), and multi-instrument coordination on the waves and associated radiation belt precipitation (A. Janyes). A challenge event on Jan 25, 2015 was extensively discussed by several speakers from different perspectives, such as BARREL observations of energetic electron precipitation by A. Halford, Van Allen Probes analysis of EMIC waves by J. Zhang, and modeling effort on the coupling between the ionosphere and inner magnetosphere by Y. Yu. The audience also provided suggestions to the focus group, including adding more challenge events while elaborating their challenges, and planning a website/server for sharing data with colleagues.