

Coupling Among Radiation Belts, Ring Current, and Plasmasphere: *Session Summary and Future Goals*

Discussion Leaders: Yuri Shprits and Jerry Goldstein.

Session Details and Summary

There were two plenary sessions (9:00-10:30 & 11:00-12:30) and one splinter session (16:00-17:00), each of which featured a selected number of brief presentations designed specifically to stimulate group discussion.

Plenary I: Inner Magnetospheric Electric Fields

Jerry Goldstein: *Overview I*

Mike Liemohn: *New HEIDI modeling results showing dynamic meso- & fine-scale inner magnetospheric electric fields.*

Iannis Dandouras: *Detection of plasmaspheric wind by the Cluster spacecraft.*

Most of the session was spent discussing how solar-wind-driving of the magnetosphere is modified by inner magnetospheric electric fields created by ring-current-ionosphere coupling. Mike's HEIDI model includes both known features (such as SAPS, shielding, and a pre-dawn concentration of westward-pointing azimuthal E-field) and new model results showing highly structured radial and azimuthal E-fields created by the self-consistent RC-ionosphere interaction. The fields were at low L-value, several mV/m, and of azimuthal scale sizes of under 1 RE. Mike related these to strong, variable E-fields seen in CRRES data in both case studies and statistical studies. We discussed at length how to sensibly interpret statistical results [Rowland & Wygant '98] that showed high E-fields at "low L". The observations are overall consistent with self-consistent results like RCM and HEIDI, although some of the details may differ on a case-by-case basis. The temporal persistence of some of the fine-scale features was discussed. Tuija Pulkkinen wondered how RC on open drift trajectories could maintain unmoving ("static") fine-scale E-fields, and discussed the importance of including inductive E-fields. Stan Sazykin also mentioned that interchange effects are important to consider at the PRC outer edge. Jerry Goldstein suggested that modelers ought to get together and more closely compare model results & collaborate to provide to the community the best picture of all the important physics of E-fields in the inner magnetosphere.

Conclusions:

- (1) Though ultimately driven by the solar wind, the PRC-ionosphere coupling exerts a controlling influence on IM E-fields.
- (2) E-fields several mV/m in magnitude have been and are observed in the IM during storms and disturbance.
- (3) Models such as RCM and HEIDI (formerly RAM) that couple the ionosphere to the PRC (so-called "self-consistent" models) predict that:
 - (a) shielding is imperfect, and there should indeed be strong stormtime "penetration" E-fields in the IM;
 - (b) SAPS is a major stormtime feature, created by the global pressure gradients in the PRC;

- (c) time-dependent, structured E-fields are created by meso- and fine-scale structure in the PRC, coupled to the variable-conductivity ionosphere;
- (d) interchange instability at the outer edge of the PRC can create structure in the PRC that contributes to its structure.
- (4) The results from different models should be more collaboratively (rather than competitively) compared to provide the most physical insight to the community.
- (5) Observational studies of E-field (both statistical and case-studies) should be viewed with the known global features (such as SAPS & shielding) in mind, as global context.

Plenary II: Radiation Belt Acceleration & Loss

Yuri Shprits: *Overview II*

Jay Albert: *Simple analytical calculation of decay lifetimes.*

Robyn Millan: *Balloon observations relevant to determining EMIC loss rate.*

Shri Kanekal: (for Joe Fennell) *Energetic Electron Loss rates in different regions of inner magnetosphere.*

Summary.

Splinter: Brief Talks & Future Goals

Mark Engebretson: *EMIC wave observations & implications for RB losses.*

Jerry Goldstein: *Preliminary results of empirical plume model.*

Dennis Gallagher: *Electric fields determined from IMAGE EUV.*

Summary.