题名 ISWI Newsletter - Vol. 4 No. 58
差出人 George Maeda


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* Editor-in-Chief:  Mr. George Maeda, ICSWSE (maeda[at]serc.kyushu-u.ac.jp)*
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Attachment(s):
(1) "2012 RBSP Mission Conf Collage", 615 KB pdf, one page.
(2) "RBSP_program_cover", 700 KB pdf, 2 pages.
(3) "RBSP_program_contents", 3.8 MB pdf, 51 pages.

: Re:
: RBSP 2012 - Part 1
: International Conference on Radiation Belts
: and Space Weather, Daejeon, Korea.
:

Dear ISWI Participant:

Last week I attended the "International Conference on Radiation Belts and Space Weather" in Daejeon, Korea, and with great pleasure I attach 48 photos (all in one A4-size pdf as a photo collage) and the Final Program of the conference (separated as Cover Sheet and Contents).

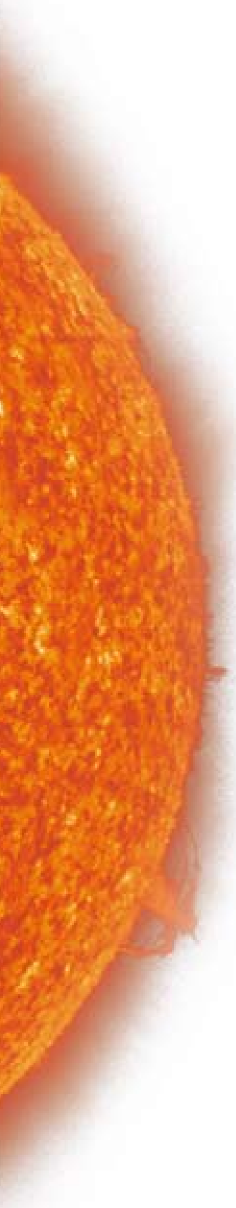
The conference was hosted by KASI (Korean Astronomy and Space Science Institute) -- which is the same institute that hosted the "2009 UN BSS and IHY Workshop" (also in Daejeon).

I will say more about this conference in future issues of this newsletter but for today I would like to say that the hospitality extended to the conference participants was outstanding. So there is special thanks to Dr. Young-deuk Park who was the central organizer of this scientific meeting on radiation belts and space weather. This conference was really a pleasure to attend.

Sincerely,
: George Maeda
: The Editor
: ISWI Newsletter

With warm thanks to Dr Y. K. Park and KASI (Korean Astronomy and Space Science Institute) for wonderful hospitality.

This Photo Collage created by G. Maeda on 3 June 2012.



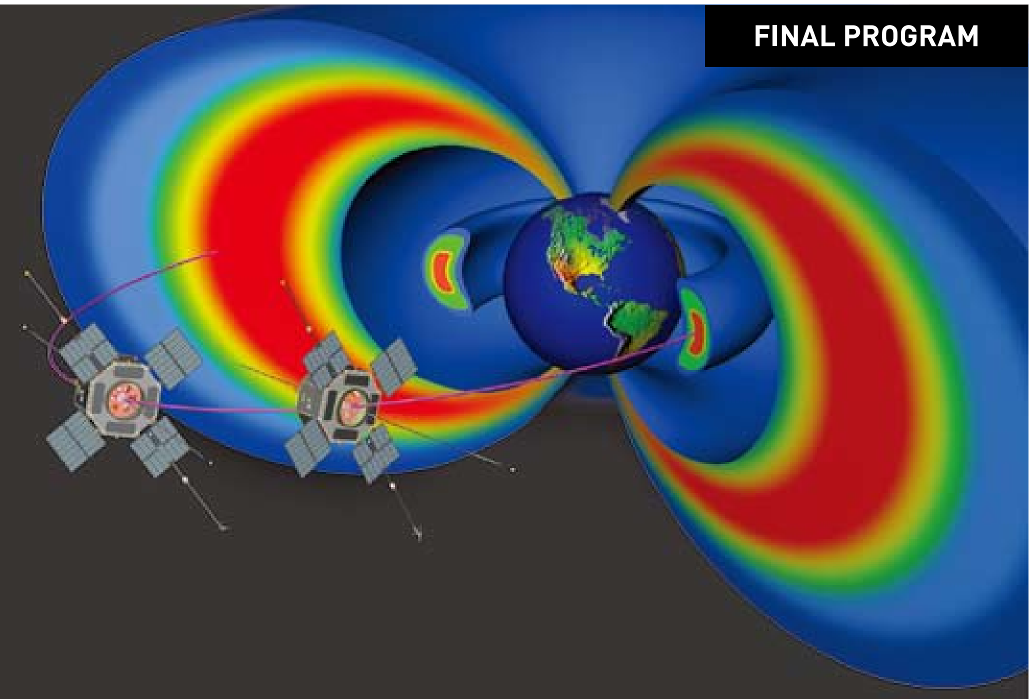
International Conference on
Radiation Belts and Space Weather

New Horizon from RBSP Mission

International Conference on Radiation Belts and Space Weather *New Horizon from RBSP Mission* May 29 ~ June 1, 2012 Hotel INTERCITI, Daejeon, Korea

FINAL PROGRAM

http://rbsp2012.kasi.re.kr/

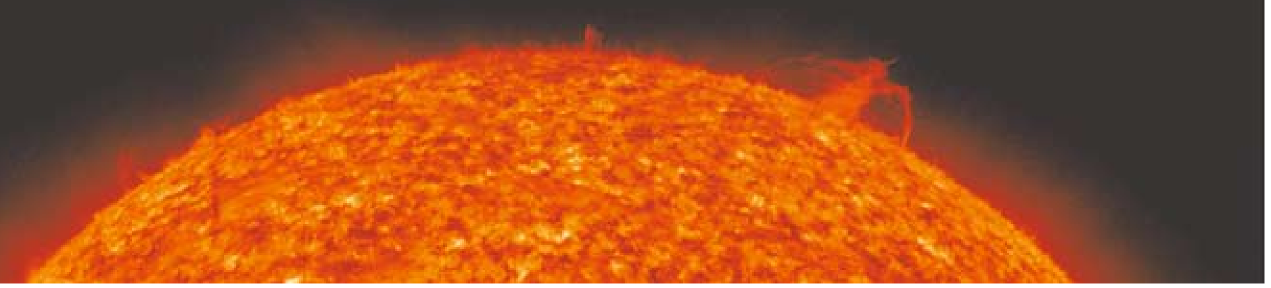


International Conference on Radiation Belts and Space Weather

New Horizon from RBSP Mission

May 29 ~ June 1, 2012

Hotel INTERCITI, Daejeon, Korea



Organized by

- Korea Astronomy and Space Science Institute (KASI)
- Kyung Hee University
- Chungbuk National University Basic Science Research Institute/NSL
- National Meteorological Satellite Center
- National Radio Research Agency / Korean Space Weather Center

Sponsored by

- The Korean Space Science Society
- High Gain Antenna
- Daejeon International Marketing Enterprise

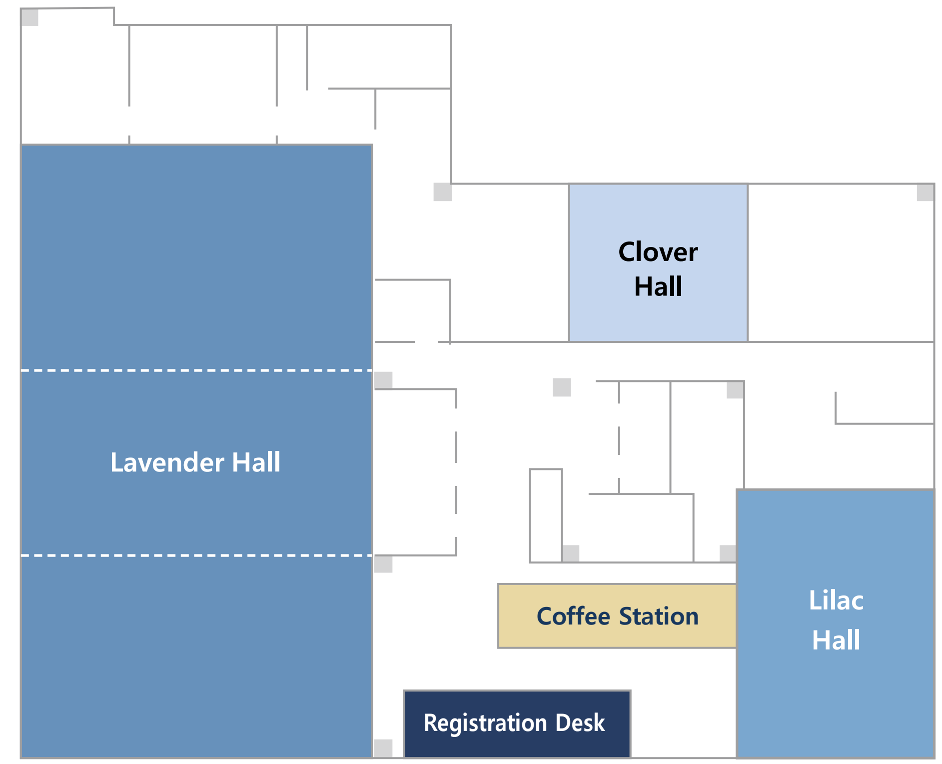
Program at a Glance

	May 29 (Tue.)	May 30 (Wed.)	May 31 (Thu.)	June 1 (Fri.)
09:00~10:00		Opening Ceremony (Lavender Hall, 4F) Special Talk (Lavender Hall, 4F)	Technical Session 4 (Lavender Hall, 4F)	Technical Session 7 (Lavender Hall, 4F)
10:00~11:00		Coffee Break Technical Session 1 (Lavender Hall, 4F)	Coffee Break	Coffee Break
11:00~12:00		Lunch (Emerald Hall, 5F)	Technical Session 5 (Lavender Hall, 4F)	Technical Session 8 (Lavender Hall, 4F)
12:00~13:00			Lunch (Emerald Hall, 5F)	
13:00~14:00		Technical Session 2 (Lavender Hall, 4F)		
14:00~15:00		Coffee Break	Poster Session (Lailac, 4F)	
15:00~16:00		Technical Session 3 (Lavender Hall, 4F)	Coffee Break	
16:00~17:00	Greeting The Ceremony for the RBSP Antenna Completion (KASI)		Technical Session 6 (Lavender Hall, 4F)	
17:00~18:00				
18:00~19:00	Welcome Reception (Emerald Hall, 5F)		Banquet (Emerald Hall, 5F)	
19:00~20:00				

Floor Plan

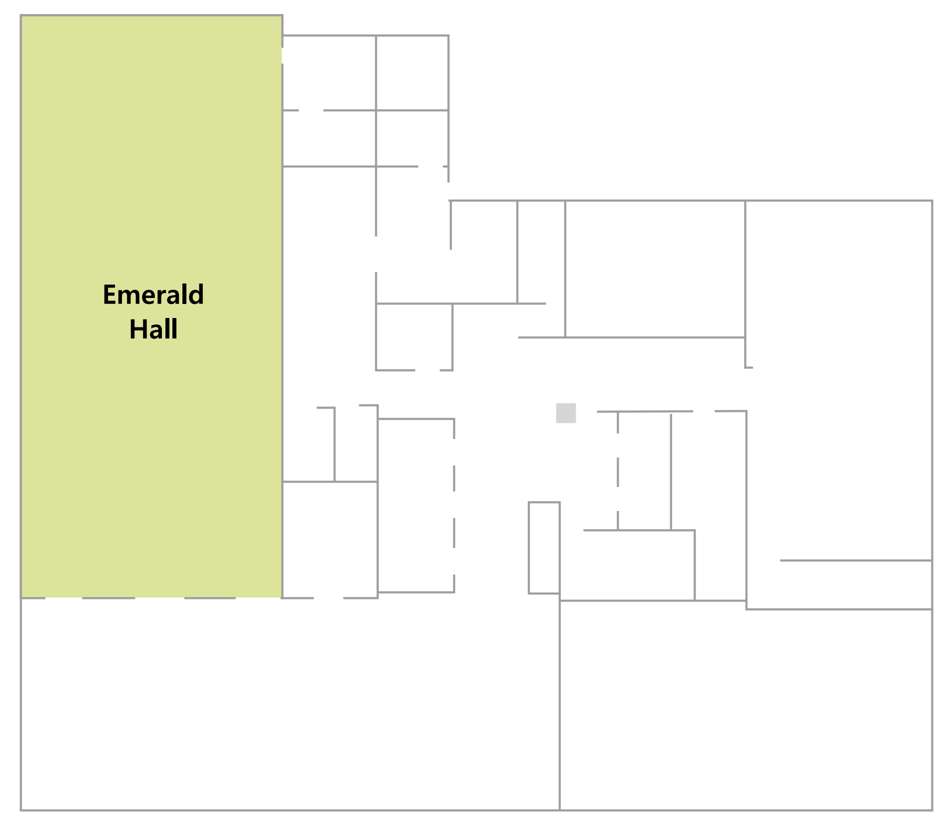
International Conference on Radiation Belts and Space Weather
New Horizon from RBSP Mission

Hotel INTERCITI 4F



Room	Events
Lavender Hall	Opening Ceremony
	Special Talk
	Technical Session
Lilac Hall	Poster Session
Clover Hall	Secretariat
Lobby	Registration
	Coffee Break

Hotel INTERCITI 5F

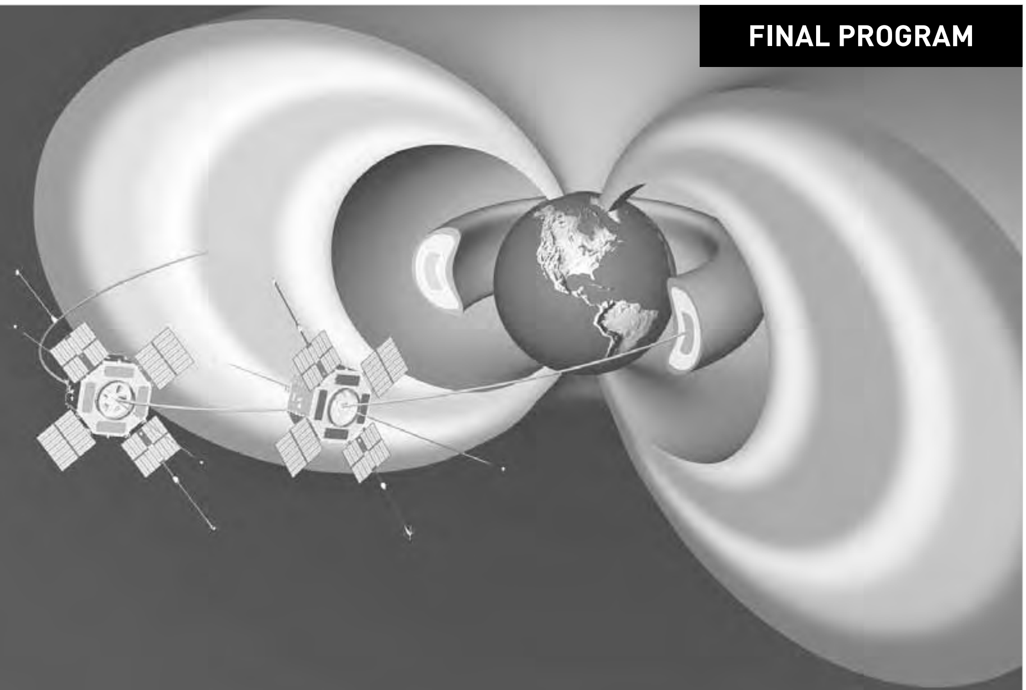


Room	Events
Emerald Hall	Welcome Reception
	Lunch
	Banquet

Korea Astronomy and Space Science Institute · KHU/SSR · Chungbuk National University · National Meteorological Satellite Center · National Radio Research Agency · The Korean Space Science Society · High Gain Antenna · DIME

FINAL PROGRAM

http://rbsp2012.kasi.re.kr/



International Conference on Radiation Belts and Space Weather

New Horizon from RBSP Mission

May 29 ~ June 1, 2012

Hotel INTERCITI, Daejeon, Korea

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- Korea Astronomy and Space Science Institute (KASI)
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- National Meteorological Satellite Center
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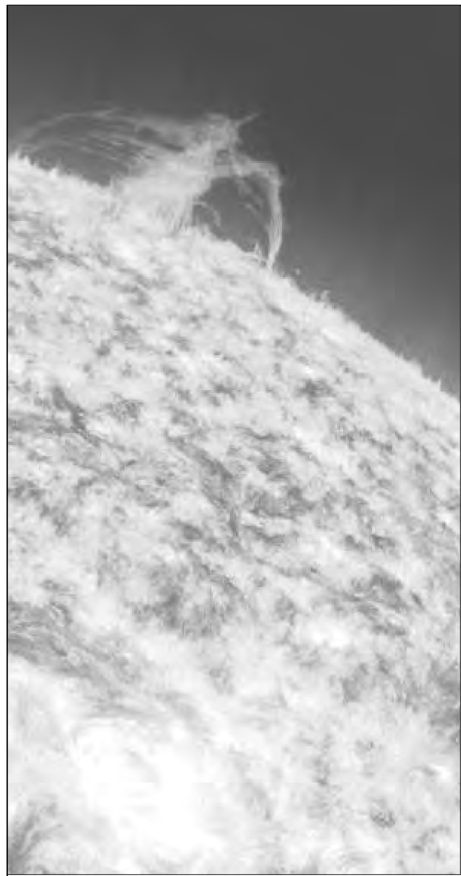
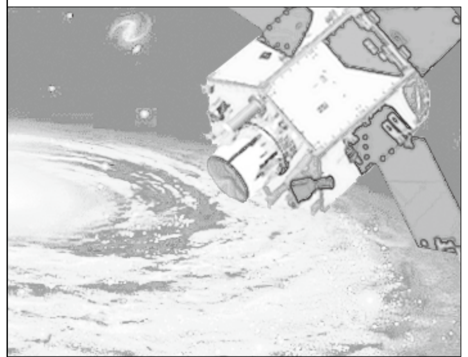
Korea Astronomy and Space Science Institute · KHU/SSR Kyung Hee University School of Space Research · CHUNGBUK NATIONAL UNIVERSITY · National Meteorological Satellite Center · RRA NATIONAL RADIO RESEARCH AGENCY · The Korean Space Science Society · High Gain Antenna · DIME

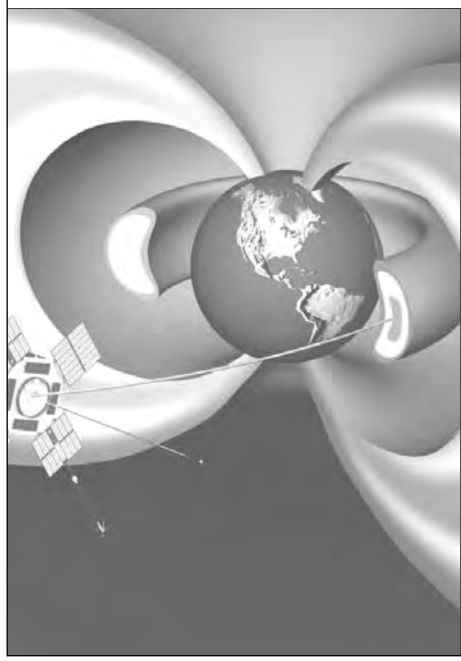
International Conference on
Radiation Belts and Space Weather

New Horizon from RBSP Mission

May 29 ~ June 1, 2012 Hotel INTERCITI, Daejeon, Korea







Contents

Ⅰ. WELCOME MESSAGE

On behalf of the conference committee, it is my great honor and pleasure to invite you to the International Conference on Radiation Belts and Space Weather to be held in Daejeon, Korea in May 2012.

The aim of this conference with theme 'New Horizon from RBSP' is to discuss and review scientific issues in magnetospheric physics and the technical information related to the RBSP (Radiation Belt Storm Probes) Mission.
This conference is indeed a fundamental ground for exchanging expected research outputs for the RBSP and its related areas. I do believe that this will be a fabulous chance for both researchers and practitioners to come together from divergent fields and share the outstanding findings and results.

We, the members of the Organizing Committee, are making all efforts to meet your expectations and to ensure a successful conference. We hope to create an opportunity for old friends and colleagues to get together and, more importantly, to become acquainted with new peers from this field.

We truly hope that you will take this chance to join us in Daejeon, to benefit from this grand event, and to lavish in the wonders of the traditional cultures and customs in this hidden jewel of Asia. Great weather and delicious delicacies mixed with friendly faces and warm welcomes await you.

We would like to thank you in advance for your participation and valuable contributions and look forward to seeing you in Daejeon, Korea in May 2012.

Yours truly,

Youngdeuk Park
Conference Chair of
International conference on radiation belts and space weather
Korea Astronomy and Space Science Institute

Ⅱ. ORGANIZING COMMITTEE

Scientific Organizing Committee	**Chair :**	Dr. Young-Deuk Park (Korea Astronomy and Space Science Institute)
	Members :	Prof. Dong-Hun Lee (Kyung Hee University)
		Prof. Dae-Young Lee (Chungbuk National University)
		Dr. Ae-Sook Suh (National Meteorological Satellite Center)
		Dr. Yuri Shprits (UCLA)
		Dr. Barry Mauk (JHU/APL)
		Dr. David Sibeck (NASA GSFC)
		Prof. Yoshizumi Miyoshi (Nagoya University)
		Mr. Jae-Hyung Lee (Radio Research Agency)

Local Organizing Committee

- **General Chair**
  - Dr. Young-Deuk Park (Korea Astronomy and Space Science Institute)
- **General Chair**
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- **Publicity Committee**
  - Ms. Ji-Hye Baek (Korea Astronomy and Space Science Institute)
  - Dr. Su-Chan Bong (Korea Astronomy and Space Science Institute)
  - Mr. Seogu Lee (Korea Astronomy and Space Science Institute)

Ⅲ. TECHNICAL PROGRAM

1. Information on Technical Program

1) Oral Session

The allocation for presentation is 20 minutes. The presenter will have:

- 15 minutes for the presentation
- 5 minutes for question time from the audience

A LCD projector & computer (Windows OS, MS PowerPoint & Adobe Acrobat Reader) will be available in session room for oral presentation.

2) Preparation of Visuals

Presenters/speakers using computer projections must either bring their own laptop computer with the appropriate presentation software or a memory stick containing the presentation. Files should be uploaded to the local PCs in the lecture rooms during the breaks between the sessions. To avoid software compatibility problems (MS PowerPoint), speakers are advised to save their PowerPoint presentation with the package for USB feature and bring a backup PDF-version of their presentation.
Speakers should arrive in their session rooms 15 minutes BEFORE the start of their sessions to report to the session chair.

3) Poster Session

Authors are required to take away their posted display at the end of their presentation sessions. All posters left behind after the end sessions will be discarded

- The poster board is self-standing
- The poster size should be no more than 0.9m in width and 1.5m in height.
- Each paper's code will be shown on the board.
- Use of double-sided tape is prohibited.
- All presenters are required to preside at their poster panel during the session for anticipated discussion with the audience.

2. Technical Sessions — May 30, 2012 (Wed.)

Lavender Hall (4F)

Session	**Special Talk**
Session Chair	Dr. Jaejin Lee (Korea Astronomy and Space Science Institute)
Date	May 30, 2012 (Wed.)
Time	09:10~10:00

[Invited] Special Talk-1 09:10~09:35

Heliophysics: the science of space weather
Babara Giles (NASA HQ, USA)

[Invited] Special Talk-2 09:35~10:00

International collaboration opportunities
John Lee (NASA HQ, USA)

Lavender Hall (4F)

Session	**Technical Session 1**
Session Chair	Dr. Young-Deuk Park (Korea Astronomy and Space Science Institute)
Date	May 30, 2012 (Wed.)
Time	10:30~11:30

[Invited] Technical Session 1-1 10:30~10:50

Early science endeavors of the Radiation Belt Storm Probes Mission
Mona Kessel (NASA HQ,,USA), Barry Mauk, Nicola Fox (JHU/APL, USA), David Sibeck, and Shri Kanakal (NASA/GSFC, USA)

[Invited] Technical Session 1-2 10:50~11:10

Resolving mysteries of both scientific and practical significance with the Radiation Belt Storm Probes (RBSP) Mission
B. H. Mauk, N. J. Fox (JHU/APL, USA), D. G. Sibeck, S. G. Kanekal (NASA/GSFC, USA), and R. Kessel(NASA HQ, USA)

[Invited] Technical Session 1-3 11:10~11:30

Correlative studies with RBSP
D. G. Sibeck, S. Kanekal (NASA/GSFC, USA), B. Mauk, and N. Fox (JHU/APL, USA)

May 30, 2012 (Wed.)

Lavender Hall (4F)

Session	**Technical Session 2**
Session Chair	Dr. David Sibeck (NASA GSFC)
Date	May 30, 2012 (Wed.)
Time	13:00~14:40

[Invited] Technical Session 2-1 — 13:00~13:20

Overview of the MagEIS electron spectrometers aboard RBSP

J. B. Blake (Aerospace Corporation, USA)

[Invited] Technical Session 2-2 — 13:20~13:40

RBSPICE investigation: science objectives and instrument implementation

Kunihiro Keika, Louis J. Lanzerotti (New Jersey Institute of Technology, USA), and Donald G. Mitchell (JHU/APL)

[Invited] Technical Session 2-3 — 13:40~14:00

Solar wind – radiation belt coupling during the high-speed stream

Y. Miyoshi (Nagoya Univ., Japan), R. Kataoka (Tokyo Institute of Technology, Japan), Y. Kasahara (Kanazawa Univ., Japan), and A. Kumamoto (Tohoku Univ., Japan)

[Invited] Technical Session 2-4 — 14:00~14:20

Acceleration and precipitation of relativistic electrons

G. K. Parks (UC Berkeley, USA), J. J. Lee (KASI, Korea), E. S. Lee (Kyunghee Univ., Korea), J. Sample (UC Berkeley, USA), and M. Mccarthy (Univ. of Washington, USA)

Technical Session 2-5 — 14:20~14:40

Relation between dusk-side precipitation and electron acceleration/loss process in radiation belt

Jaejin Lee, Kyung-Chan Kim, JungA Hwang, Yeon-han Kim, and Young-deuk Park (KASI, Korea)

May 30, 2012 (Wed.)

Lavender Hall (4F)

Session	**Technical Session 3**
Session Chair	Prof. Dong-Hun Lee (Kyung Hee Univ.)
Date	May 30, 2012 (Wed.)
Time	15:10~16:50

Technical Session 3-1 — 15:10~15:30

Stereo ENA imaging of the ring current and multi-point measurements of suprathermal particles and magnetic fields by TRIO-CINEMA

R. P. Lin (Univ. of California, USA), D.-H. Lee (Kyung Hee Univ., USA), T. Horbury (Imperial College London, UK), J. Sample (Univ. of California, USA), H. Jin, J.-H. Seon (Kyung Hee Univ., Korea), T. Immel, L. Wang (Univ. of California, USA), and E. C. Roelof (JHU/APL, USA)

[Invited] Technical Session 3-2 — 15:30~15:50

Modeling of energetic neutral atom emissions for CINEMA/TRIO

Ensang Lee, Hyuck-Jin Kwon, Jong-Sun Park, Jongho Seon, Ho Jin, Khan-Hyuk Kim, Dong-Hun Lee (Kyung Hee Univ., Korea), Linghua Wang, Robert P. Lin, and George K. Parks (Univ. of California, USA)

Technical Session 3-3 — 15:50~16:10

Global dynamics of the ring current, plasmasphere and coupling to the ionosphere: current knowledge and outstanding questions

Pontus C. Brandt (JHU/APL, USA), Kunihiro Keika (New Jersey Institute of Technology, USA), Donald G. Mitchell (JHU/APL, USA), L. J. Lanzerotti (New Jersey Institute of Technology, USA), Aleksandr Y. Ukhorskiy, Mikhail I. Sitnov, and V. Merkin (JHU/APL, USA)

Technical Session 3-4 — 16:10~16:30

Characteristics of trapping boundary of outer radiation belt depending on flux level of outer belt: THEMIS observation

Junga Hwang (KASI, Korea), Dae-Yong Lee (Chungbuk Nat'l Univ., Korea), Kyung-Chan Kim (KASI, Korea), Eunjin Choi (KASI, Korea), Dae-Kyu Shin, Jin-hee Kim, and Jung-Hee Cho (Chungbuk Nat'l Univ., Korea)

[Invited] Technical Session 3-5 — 16:30~16:50

Effects of the ring current and plasmasphere on ULF waves in the inner magnetosphere based on the GEMSIS-RC and RB models

K. Seki (Nagoya Univ., Japan), T. Amano (Univ. of Tokyo, Japan), S. Saito (Nat'l Institute of Information and Communications Technology, Japan), Y. Miyoshi (Nagoya Univ., Japan), Y. Matsumoto (Chiba Univ., Japan), T. Umeda, Y. Miyashita (Nagoya Univ., Japan), and Y. Ebihara (Kyoto Univ., Japan)

May 31, 2012 (Thu.)

Lavender Hall (4F)

Session	**Technical Session 4**
Session Chair	Prof. Danny Summers (Kyung Hee Univ. , Memorial Univ. of Newfoundland)
Date	May 31, 2012 (Thu.)
Time	09:00~10:40

[Invited] Technical Session 4-1 **15:10~15:30**

The electric and magnetic field instrument suite and integrated science on the Radiation Belt Storm Probes

C. A. Kletzing (Univ. of Iowa, USA)

[Invited] Technical Session 4-2 **15:30~15:50**

Chorus properties: importance for wave-particle interaction modeling

Bruce T. Tsurutani (California Institue of Technology, USA), Gurbax S. Lakhina (Indian Institute of Geomagnetism, India), Olga P. Verkhoglyadova (California Institue of Technology, USA), Barbara J. Falkowski (Glendale City College, USA), Jolene S. Pickett (Univ. of Iowa), and Ondrej Santolik (Charles Univ., Czech Republic)

[Invited] Technical Session 4-3 **15:50~16:10**

Eigenmodes and basis functions for pitch-angle diffusion with a partially filled loss cone

Michael Schulz (Lockheed Martin Retiree, USA)

Technical Session 4-4 **16:10~16:30**

Large-amplitude whistler waves and relativistic electron acceleration

Peter Yoon (Univ. of Maryland, USA)

Technical Session 4-5 **16:30~16:50**

Whistler-mode chorus in the radiation belts: effects of wave-normal distribution for electron scattering

O. Agapitov, A. Artemyev, H. Breuillard, V. Krasnoselskikh (LPC2E/CNRS Univ. of Orleans, France), and G. Rolland (CNES, France)

May 31, 2012 (Thu.)

Lavender Hall (4F)

Session	**Technical Session 5**
Session Chair	Prof. Dae-Young Lee (Chungbuk Nat'l Univ.)
Date	May 31, 2012 (Thu.)
Time	11:10~12:50

[Invited] Technical Session 5-1 **11:10~11:30**

Rapid acceleration of radiation belt electrons by nonlinear wave trapping

Danny Summers (Memorial Univ. of Newfoundland), Yoshiharu Omura (Kyoto Univ.), and Rongxin Tang (Memorial Univ. of Newfoundland)

[Invited] Technical Session 5-2 **11:30~11:50**

RBSP & DREAM: science studies and space weather applications

G. D. Reeves, R. H. W. Friedel, M. G. Henderson, S. K. Morley, W. Tu, Y. Yu, and S. Zaharia (Los Alamos Nat'l Laboratory, USA)

Technical Session 5-3 **11:50~12:10**

Wave-particle interaction between whistler chorus and relativistic electrons: GEMSIS-RBW simulation

S. Saito (Nat'l Institute of Information and Communications Technology, Japan), Y. Miyoshi, and K. Seki (Nagoya Univ., Japan)

Technical Session 5-4 **12:10~12:30**

Relativistic radiation belt electron responses to GEM magnetic storms: comparison of CRRES observations with 3-D VERB simulations

Kyung-Chan Kim (KASI, Korea), Yuri Shprits, Dmitriy Subbotin, and Binbin Ni (UCLA, USA)

Technical Session 5-5 **12:30~12:50**

Recent advances on understanding the diffuse auroral precipitation: The role of resonant wave-particle interactions

Binbin Ni and Richard M. Thorne (UCLA, USA)

May 31, 2012 (Thu.)

Lilac Hall (4F)

Session	**Poster Session**
Date	May 31, 2012 (Thu.)
Time	14:10~15:50

Poster Session P-2 14:10~15:50

Strong diffusion limits in realistic magnetic fields: dependence on spatial location and geomagnetic activity

Chen Zhou (Wuhan Univ., China.), Binbin Ni (UCLA, USA), Zhengyu Zhao (Wuhan Univ., China.), Xudong Gu (UCLA, USA), and Run Shi (Polar Research Institute of China, China)

Poster Session P-3 14:10~15:50

THEMIS and WIND observations of ULF wave power transfer through the bow shock

Mi-young Park (Chungbuk Nat'l Univ., Korea), Hee-jeong Kim (UCLA, USA), Dae-Young Lee (Chungbuk Nat'l Univ., Korea), and Kyung-Chan Kim (KASI, Korea)

Poster Session P-4 14:10~15:50

Testing an ionospheric signature anomalies analysis method on khartoum (MS = 5.5) earthquake

Yousif. S. M. (Sudan Univ. of Science and Technology, Sudan) and Elemo. E. O. (African Regional Center for Space Science and Technology Education, Nigeria)

Poster Session P-5 14:10~15:50

Characteristics of magnetic fluctuations during near-Earth plasma sheet dipolarization as observed by THEMIS

Ji-Hee Lee and Dae-Young Lee (Chungbuk Nat'l Univ., Korea)

Poster Session P-6 14:10~15:50

Determination of the radiation belt boundary conditions using THEMIS satellite plasma particle observations.

D.-K. Shin, D.-Y. Lee (Chungbuk Nat'l Univ., Korea), J. A. Hwang, K.-C. Kim (KASI, Korea), J.-H. Kim, J.-H. Cho, and Y.-H. Lee (Chungbuk Nat'l Univ., Korea)

May 31, 2012 (Thu.)

Poster Session P-7 14:10~15:50

Dependency on solar polar magnetic field at solar minimum for geomagnetic indices and HPe power

Suyeon Oh, Yu Yi (Chungnam Nat'l Univ., Korea), and Barbara Emery (HAO/NCAR, USA)

Poster Session P-8 14:10~15:50

Dipolarization associated with current disruption as a source of space Pi1B

Hyuck-Jin Kwon, Khan-Hyuk Kim, Dong-Hun Lee, Ensang Lee (Kyung Hee Univ., Korea), and K. Shiokawa (Nagoya Univ., Japan)

Poster Session P-9 14:10~15:50

Nightside geosynchronous magnetic field responses to interplanetary shocks

Jong-Sun Park, Khan-Hyuk Kim, Dong-Hun Lee, Ensang Lee, and Ho Jin (Kyung Hee Univ., Korea)

Poster Session P-10 14:10~15:50

The statistical analysis of Pi2 pulsations observed at low-latitude Bohyun ground station

Chae-Woo Jun, Khan-Hyuk Kim, Hyuck-Jin Kwon, Dong-Hun Lee, Ensang Lee (Kyung Hee Univ., Korea), Young-Deuk Park, and Junga Hwang (KASI, Korea)

Poster Session P-11 14:10~15:50

Non-simultaneous forbush decrease events observed at middle latitude neutron monitor stations

Seongsuk Lee, Suyeon Oh, and Yu Yi (Chungnam Nat'l Univ., Korea)

Poster Session P-12 14:10~15:50

Effects of intermediate scale variations on pronton temperature anisotropy vs beta inverse correlation in the solar wind near 1 AU

Jung Joon Seough (Kyung Hee Univ., Korea), Peter Yoon (Univ. of Maryland, USA), Khan-Hyuk Kim, Ensang Lee, and Dong-Hun Lee (Kyung Hee Univ., Korea)

Poster Session P-13 14:10~15:50

Study of statistical characteristics of magnetic polarity inversion lines in solar active regions

Eo-Jin Lee (Chungnam Nat'l Univ.), Sung-Hong Park (KASI, Korea), Suyeon Oh, and Yu Yi (Chungnam Nat'l Univ., Korea)

May 31, 2012 (Thu.)

Poster Session P-14 14:10~15:50

Study of magnetic helicity injection in the active regions NOAA 9236 producing multiple CME events

Sung-Hong Park (KASI, Korea)

Poster Session P-15 14:10~15:50

Development of data integration system for ground-based space weather observation facilities

J.-H. Baek, Seonghwan Choi, J.-J Lee, Y.-H. Kim, Y.-D. Park, K.-S. Cho, Y.-S. Kwak, S.-C. Bong, J. Hwang, B.-H. Jang, K.-C. Choi, T.-Y. Yang, J.-E. Hwangbo, I.-H. Cho, S.-H. Park, and J.-W. Cho (KASI, Korea)

Poster Session P-16 14:10~15:50

FISS observations of chrompsheric transient brightnenings associated with canceling magnetic features

Soyoung Park (KASI, Korea)

Poster Session P-17 14:10~15:50

Ionospheric response on EIA during a geomagnetic storm of 7-8 May 2005

Malni Aggarwal (KASI, Korea), H. P. Joshi, K. N. Iyer (Saurashtra Univ., India), and Y. S. Kwak (KASI, Korea)

Poster Session P-18 14:10~15:50

Solar cycle dependence of the hemispheric asymmetry of the equatorial ionization anomaly

Young-Sil Kwak (KASI, Korea), Hyosub Kil (JHU/APL, USA), Wookyoung Lee (Univ. Corporation for Atmospheric Research, USA), and Tae-Yong Yang (KASI, Korea)

May 31, 2012 (Thu.)

Lavender Hall (4F)

Session	**Technical Session 6**
Session Chair	Dr. Geoff Reeves (LANL)
Date	May 31, 2012 (Thu.)
Time	16:20~18:00

[Invited] Technical Session 6-1 16:20~16:40

Oxygen flux variation during a stormtime substorm on May 6, 1988

Kazue Takahashi (JHU/APL, USA), Masahito Nosé (Kyoto Univ., Japan), Kunihiro Keika (New Jersey Institute of Technology, USA), Aleksandr Ukhorskiy (JHU/APL, USA), and Lynn Kistler (Univ. of New Hampshire, USA)

Technical Session 6-2 16:40~17:00

Magnetospheric and ionospheric responses to the passage of solar wind discontinuity on 24 November 2008

K.-H. Kim, J.-S. Park, D.-H. Lee, E. Lee (Kyung Hee Univ., Korea), V. Angelopoulos (Univ. of California, USA), Y.-D. Park, J. Hwang (KASI, Korea), N. Nishitani, T. Hori, K. Shiokawa (Nagoya Univ., Japan), K. Yumoto (Kyushu Univ., Japan), and D. G. Baishev (Yu. G. Shafer Institute of Cosmophysical Research and Aeronomy, Russia)

Technical Session 6-3 17:00~17:20

Global evolution of the earth's magnetosphere in response to a sudden ring current injection

G. S. Choe (Kyung Hee Univ., Korea) and Geunseok Park (Korea Meteorological Administration, Korea)

[Invited] Technical Session 6-4 17:20~17:40

On earthward penetration of near-tail disturbance as observed by THEMIS spacecraft

Dae-Young Lee (Chungbuk Nat'l Univ., Korea)

Technical Session 6-5 17:40~18:00

Statistical investigation of the behavior of plasma and field parameters with geomagnetic index during geomagnetic storm of April 2010

Babatunde Rabiu (Federal Univ. of Technology, Nigeria), Olawumi Kaka (Afe Babalola Univ., Nigeria), and Olawale Bello (Federal Univ. of Technology, Nigeria)

June 1, 2012 (Fri.)

Lavender Hall (4F)

Session	**Technical Session 7**
Session Chair	Prof. Yoshizumi Miyoshi (Nagoya Univ.)
Date	June 1, 2012 (Fri.)
Time	09:00~10:40

Technical Session 7-1 — 09:00~09:20

Radial diffusion of outer radiation belt electrons - the importance of ULF wave electric fields

L. G. Ozeke, I. R. Mann, K. Murphy, I. J. Rae, and D. K. Milling (Univ. of Alberta, Canada)

[Invited] Technical Session 7-2 — 09:20~09:40

Properties of electromagnetic ion cyclotron waves in the outer magnetosphere

Jeongwoo Lee and Kyungguk Min (New Jersey Institute of Technology, USA)

Technical Session 7-3 — 09:40~10:00

Dipole tilt control of the magnetopause for southward IMF from global magnetohydrodynamic simulations

Z.-Q Liu (Graduate Univ. of Chinese Academy of Science, China), J. Y. Lu (China Meteorological Administration, China), and K. Kabin (Royal Military College of Canada, Canada)

Technical Session 7-4 — 10:00~10:20

Energetic electron and Pc 5 ULF wave interactions during great geomagnetic storms.

E. A. Lee, I. R. Mann, L. G. Ozeke, and J. Paral (Univ. of Alberta, Canada)

Technical Session 7-5 — 10:20~10:40

A global MHD simulation study for transient magnetic field and plasma flow variations in the magnetosphere boundary under steady solar wind and IMF conditions

Kyung Sun Park, Khan-Hyuk Kim (Kyung Hee Univ., Korea), Tatsuki Ogino (Nagoya Univ., Japan), and Dong-Hun Lee (Kyung Hee Univ., Korea)

TECHNICAL PROGRAM | Technical Sessions

June 1, 2012 (Fri.)

Lavender Hall (4F)

Session	**Technical Session 8**
Session Chair	Prof. Peter H Yoon (Univ. of Maryland)
Date	June 1, 2012 (Fri.)
Time	11:10~12:50

Technical Session 8-1 — 11:10~11:30

Japanese geospace exploration project: ERG

Y. Miyoshi (Nagoya Univ., Japan), T. Ono (Tohoku Univ., Japan), T. Takashima, K. Asamura (ISAS/JAXA, Japan), M. Hirahara (Nagoya Univ., Japan), Y. Kasaba (Tohoku Univ., Japan), A. Kumamoto (Tohoku Univ., Japan), A. Matsuoka (ISAS/JAXA, Japan), H. Kojima (Kyoto Univ., Japan), K. Shiokawa, K. Seki (Nagoya Univ., Japan), M. Fujimoto (ISAS/JAXA, Japan), and T. Nagatsuma (Nat'l Institute of Information and Communication Technology, Japan)

Technical Session 8-2 — 11:30~11:50

Space environment during solar minimum of CS-23

Ahmed A. Hady (Cairo Univ., Egypt)

Technical Session 8-3 — 11:50~12:10

MAGDAS project activities under ISWI

G. Maeda, K. Yumoto, H. Kawano, A. Yoshikawa, H. Liu, M. Watanabe, S. Abe, T. Uozumi, and A. Ikeda (Kyushu Univ., Japan)

Technical Session 8-5 — 12:10~12:30

Satellite anomaly information system (SIAS) for identifying the satellite operation disturbance

Neflia Neflia and Nizam Ahmad (Nat'l Institute of Aeronautics and Space, Indonesia)

Special Talk-1

Heliophysics: The Science of Space Weather

Dr. Barbara Giles
Director, Heliophysics Division, NASA Headquarters

Heliophysics helps us understand the Sun, our own protective magnetized environment, and their effects on the Earth and solar system. The payoff in achieving this understanding will be predictions of how human society, technological systems, and the habitability of planets are affected by solar variability. Because it is a complex system, we tend to study individual "disciplines" or "components;" therefore, efforts to mitigate space weather effects have placed more urgency on the need to understand the Sun, heliosphere, geospace, and other planetary environments as a single connected system.

We make advances by extending the sparsely-sampled measurements, provided by the Heliophysics System Observatory, through modeling and theory to achieve system-wide understanding. In time, as the physics-based models mature from the domain of the researcher, they will be transitioned into operational settings where heliophysics becomes the applied science called "space weather," which has real societal impacts.

The transition of scientific knowledge, usually incorporated in models and simulations, to organizations that could use that knowledge is a challenge in the field of space weather. The interface between the scientific community and the community responsible for the operation of space systems, air transportation systems, and other operators is at the end of the line for the scientific investigator and upstream for the operators dealing with day-to-day issues. The National Aeronautics and Space Administration (NASA) will continue efforts to transition new scientific knowledge in heliophysics to operational use within the Agency and by other agencies and institutions.

The Radiation Belt Storm Probes (RBSP) mission is being designed to help us understand the Sun's influence on Earth and Near-Earth space by studying the Earth's radiation belts on various scales of space and time. Each RBSP spacecraft will also be equipped with a Space Weather Beacon that will enable research to operations by transmitting key space weather measurement parameters to anyone willing to receive them. Strengthening the technical teamwork between the U.S. and our international partners permits activities and advancements that could not be achieved separately. RBSP Beacon data will be available for various uses including input to models, for validation, and for prototyping of real-time operational space weather modeling.

Special Talk-2

International collaboration opportunities

John Lee (NASA HQ,,USA)

NASA Science programs offer many opportunities for collaborative relationships with scientists from different parts of the world. While most space-bound missions are complex, expensive, and often difficult to co-develop, there are other collaborative opportunities that can lead to productive and meaningful scientific results. The recent NASA /KASI collaboration is a great example.

Early Science Endeavors of the Radiation Belt Storm Probes Mission

Mona Kessel[1], Barry Mauk[2], Nicola Fox[2], David Sibeck[3], and Shri Kanekal[3]
[1]NASA HQ, [2]JHU/APL, [3] NASA GSFC

The primary science objective of the RBSP mission is to provide understanding, ideally to the point of predictability, of how populations of relativistic electrons and penetrating ions in space form or change in response to variable inputs of energy from the Sun. The RBSP mission will achieve this objective by identifying and quantifying the processes that cause the acceleration, global distribution, and variability of hazardous electrons and ions in the inner magnetosphere. Hazardous refers here to relativistic radiation belt electrons with energies greater than several hundred keV and radiation belt ions with energies greater than several MeV. Early science endeavors will focus on the following topics. (1) What issues can be resolved about strong and weak whistler mode interactions and their roles in electron energization and loss in the first 3 months? (2) What issues can be resolved about the large scale dynamics and structure with just the first few major geomagnetic storms? (3) What issues can be resolved about the source, structure, and dynamics of the inner (L<2) ion and electron belts in the first 3 months? Each instrument team has begun preparing to answer some or all of these questions. We will present a sample of each instrument team's early science goals including background of the science topic and resources needed to accomplish the goal.

Resolving mysteries of both scientific and practical significance with the Radiation Belt Storm Probes (RBSP) Mission

B. H. Mauk[1], N. J. Fox[1], D. G. Sibeck[2], S. G. Kanekal[2], R. Kessel[3]
[1]The Johns Hopkins University Applied Physics Laboratory, Maryland USA
[2]NASA Goddard Space Flight Center, Maryland USA
[3]NASA Headquarters, Washington DC USA

Here we provide an overview and status of NASA's Radiation Belt Storm Probes mission (RBSP) and discuss the role that it will play both in resolving longstanding fundamental mysteries regarding the creation and variability of Earth's radiation belts and in providing near-real-time space weather information about the conditions of the belts. RBSP comprises two spacecraft making in situ measurements for at least 2 years in nearly the same highly elliptical, low inclination orbits (1.1 x 5.8 RE, 10 degrees). The orbits are slightly different so that 1 spacecraft laps the other spacecraft about every 2.5 months, allowing separation of spatial from temporal effects over spatial scales ranging from ~0.1 to 5 RE. The spacecraft are identically populated with unusually comprehensive and capable suites of instruments, measuring all of the particle (electrons, ions, ion composition), fields (E and B), and wave distributions (dE and dB) needed to tackle the most critical science questions. RBSP will launch later this year with the first opportunity opening on 15 August 2012. We present specific examples of scientific mysteries to be addressed and how the unique capabilities of the RBSP mission will resolve those mysteries. We also present the RBSP capability of broadcasting in real time a limited set of radiation belt measurements and the plans for making both that data, and information extracted from that data, available to the world-wide community of interested parties.

Correlative Studies with RBSP

D. G. Sibeck[1], S. Kanekal[1], B. Mauk[2], and N. Fox[2]
[1]NASA/GSFC, Greenbelt, MD 20770, [2]JHU/APL, Laurel, MD 20723

A host of space- and ground-based observations will be available throughout the RBSP era. This talk examines the broad range of correlative studies that these assets will enable, with a special emphasis on those that can be conducted in conjunction with NASA's THEMIS mission. Topics to be considered include the role of ion and electron injections, the relative importance of EMIC and chorus wave interactions, the causes and properties of ULF waves, and the response of the radiation belts to solar wind pressure pulses, shocks, and the Kelvin-Helmholtz instability at the magnetopause. With respect to ground-based observations, topics include riometer observations of injected electrons, optical observations of aurora associated with substorm onset, ground radar observations of SAPS and steady and unsteady ionospheric convection, ground magnetometer observations of ULF waves, and GPS observations of plasmaspheric plumes.

Overview of the MagEIS Electron Spectrometers Aboard RBSP

J. B. Blake
For the Aerospace MagEIS Team
The Aerospace Corporation, Los Angeles

An overarching objective of the RBSP mission is to obtain a deep understanding of the physics of the acceleration of electrons to relativistic energies in the radiation belts of the Earth. To this end a suite of four magnetic electron spectrometers aboard each of the two spacecraft will measure the differential fluxes, energies, and angular distributions of electrons from 20 keV to 5 MeV. (The instrument acronym is MagEIS for Magnetic Electron Ion Spectrometers.) They have been designed to make these measurements with only a small, determinable and correctible background during an extreme event such as occurred during March 1991, and to do so with significant margin. In addition to the prime scientific data, these spectrometers will output a subset of data for direct space weather purposes. This talk will outline key features of the MagEIS instruments and present some representative calibration results to give some understanding of the instrument capabilities.

RBSPICE Investigation: Science Objectives and Instrument Implementation

Kunihiro Keika[1], Louis J. Lanzerotti[1], and Donald G. Mitchell[2]

For many decades a ring current has been understood to be a critical part of the magnetosphere environment and magnetosphere dynamics. The generation of the hot plasma that comprises the ring current remains a major unknown in space plasma physics. Therefore the effects of this plasma environment on radiation belt particles are quite poorly understood. As one of the five instrument investigations, the Radiation Belt Storm Probes Ion Composition Experiment (RBSPICE) makes critical contributions to the three overarching science questions of the Radiation Belt Storm Probes (RBSP) mission:

(a) which physical processes produce radiation belt enhancement events?
(b) what are the dominant mechanisms for relativistic electron loss?
(c) how do ring current and other geomagnetic processes affect radiation belt behavior?

The RBSPICE instrument will investigate how space weather creates the storm-- time ring current around Earth, how that ring current supplies and supports the creation of the radiation belt populations, and how the ring current can also quickly reduce radiation belt particle intensities.

The RBSPICE instrument is a time--of--flight (ToF) versus energy measurement system that covers the energy of 10--5000keV for protons, 25--10000keV for He ions, and 40--10000keV for CNO group. The instrument also measures electrons in the energy range 25--1000keV in order to understand background conditions for the ion measurements. The RBSPICE instrument has a mass of 6.6kg (without thermal blankets), uses about 2W power for science operations (thermal considerations require up to 3W to 4W more power in some configurations), and has a telemetry data rate of 5.4kbps (daily total data download of 0.467Gbits).

Solar wind – radiation belt coupling during the high-speed stream

Y. Miyoshi[1], R. Kataoka[2], Y. Kasahara[3], and A. Kumamoto[4]

[1]STEL Nagoya University, Japan, [2]Tokyo Institute of Technology, Japan,
[3]Kanazawa University, Japan, [4]Tohoku University, Japan

We investigate the solar wind-radiation belt coupling process during high speed solar wind streams (HSS). Flux enhancements of the outer belt depend on the IMF Bz; the large flux enhancements tend to occur during the HSS with the predominantly southward interplanetary magnetic field (IMF). The internal acceleration process by whistler mode wave-particle interactions is investigated as a working model. We show clear differences of key parameters of the internal acceleration process between the southward and northward dominant IMF; hot electrons for the free-energy source for whistler mode waves, thermal plasma distribution, sub-relativistic electrons for the seed population of MeV electrons, and convection/substorms. Considering these observational results, a model of solar-wind radiation belt coupling is proposed, in which whistler mode wave-particle interactions driven by continuous hot electron injections play an important role for the flux enhancements. In this model, the southward IMF of HSS plays a key role for the flux enhancement of outer belt electrons.

Acceleration and Precipitation of Relativistic Electrons

G. K. Parks[1], J. J. Lee[2], E. S. Lee[3], J. Sample[1] and M. McCarthy[4]

The existence of energetic electrons in the Earth's magnetosphere has been known since the first days of the space age. However, the mechanisms that can accelerate electrons to relativistic energies on a relatively short time scale still remain not well understood. Years of balloon-borne and polar orbiting satellite observations have shown that relativistic electrons precipitating on the morning side consist of short (~1s) bursts called microbursts while the afternoon and evening hour precipitation varies on time scales of minutes. This talk will discuss what is known and unknown about acceleration and precipitation of relativistic electrons and discuss how to resolve some of the outstanding issues.

1. UC Berkeley
2. KASI, Korea
3. Kyunghee University
4. University of Washington

Relation between Dusk-side Precipitation and Electron Acceleration/Loss Process in Radiation Belt

Jaejin Lee, Kyung-Chan Kim, JungA Hwang, Yeon-han Kim, Young-deuk Park
Korea Astronomy and Space Science Institute

Since the discovery of Earth's radiation belt by Van Allen in 1958, the electron acceleration/loss process has been one of main issues in the field of space plasma physics. To study the origin of charged energetic particles in the radiation belts, RBSP(Radiation Belt Storm Probes) mission will be launched in 2012 by NASA. In our presentation, we show > 1MeV electron flux on GEO orbit has good correlation with electron precipitation into polar region. To estimate total number of electrons precipitated into Earth's atmosphere, we analyzed six NOAA-POES satellite data. In our analysis, we note most electron precipitation occurred on the dusk-side where EMIC wave activity is high and wave-particle interaction has been considered as a main mechanism of electron dropout events. POES satellite data clearly shows the dusk-side precipitation is not associated with only loss process but acceleration process. Measuring simultaneously precipitating electrons and trapped particles interacting with waves on equatorial radiation belt might give a clue to understand how electrons are accelerated and lost from radiation belt. RBSP mission will provide such data.

Technical Session 3-1

Stereo ENA imaging of the ring current and multi-point measurements of suprathermal particles and magnetic fields by TRIO-CINEMA

R. P. Lin[1,2,3], D.-H. Lee[3], T. Horbury[4], J. Sample[1,2], H. Jin[3], J.-H. Seon[3], T. Immel[1], L. Wang[1], E.C. Roelof [5]

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The TRIO (Triplet Ionospheric Observatory) - CINEMA (Cubesat for Ions, Neutrals, Electrons, & Magnetic fields) mission consists of three identical cubesats to provide high sensitivity, high cadence, stereo measurements of Energetic Neutral Atoms (ENAs) from the Earth's ring current with ~1 keV FWHM energy resolution from ~4 to ~200 keV, as well as multi-point *in situ* measurements of magnetic fields and suprathermal electrons (~2 -200 keV) and ions (~ 4 -200 keV) in the auroral and ring current precipitation regions in low Earth orbit (LEO). A Suprathermal Electron, Ion, Neutral (STEIN) instrument, based on the STEREO STE (SupraThermal Electron) silicon semiconductor detector, with the addition of an electrostatic deflection system, separates the ENAs from ions and from electrons. In addition, inboard and outboard (on an extendable 1m boom) magnetoresistive sensor magnetometers will provide high cadence 3-axis magnetic field measurements. The first CINEMA (funded by NSF and already delivered for an August 2012 launch into a 65 deg. inclination LEO) has its spin axis perpendicular to the ecliptic so STEIN sweeps across the sky, providing the spatial variation of ENAs with magnetic local time every 15 s. Two more identical CINEMAs are being developed by Kyung Hee University (KHU) in Korea under the World Class University (WCU) program, for launch in October 2012 into a Sun-synchronous LEO to enable stereo ENA imaging and multi-point *in situ* measurements. A fourth CINEMA is being developed for a 2013 launch. The TRIO-CINEMA measurements are thus highly complementary to RBSP.

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Technical Session 3-2

Modeling of Energetic Neutral Atom Emissions for CINEMA/TRIO

Ensang Lee[1], Hyuck-Jin Kwon[1], Jong-Sun Park[1], Jongho Seon[1], Ho Jin[1], Khan-Hyuk Kim[1], Dong-Hun Lee[1], Linghua Wang[2], Robert P. Lin[2], and George K. Parks[2]

[1]School of Space Research, Kyung Hee University, [2]Space Sciences Laboratory, University of California, Berkeley

The CINEMA/TRIO mission consists of three identical cubesats, which will be launched in 2012 into low-altitude orbits in a constellation. The STEIN instrument onboard each cubesat will measure energetic neutral atoms (ENAs) with energies from ~4 keV to ~20 keV by a high-sensitivity silicon semiconductor sensor, as well as suprathermal electrons and ions. The instrument has ~1 keV FWHM energy resolution and uniform response up to ~100 keV. The time resolution is 15 s. Thus, STEIN will provide very good energy spectrum of ENAs. To acquire ion distributions from the ENA measurements it is needed to understand the characteristics of the ENA emissions from various distributions of energetic ions and neutrals. In this study we model the ENA emissions to be measured by STEIN. The ENA generation is simulated in various regions, including ring current, auroral region, and magnetotail. Various models for energetic ions and geocoronal neutral profiles are used. We will discuss the relative contribution of ring current, auroral region, and magnetotail to the expected ENA measurements. Also, the advantages of stereoscopic measurement and high resolutions of energy and time will be discussed.

Global Dynamics of the Ring Current, Plasmasphere and Coupling to the Ionosphere: Current Knowledge and Outstanding Questions

Pontus C. Brandt[1], Kunihiro Keika[2], Donald G. Mitchell[1], L. J. Lanzerotti[2], Aleksandry Y. Ukhorskiy[1], Mikhail I. Sitnov[1] and V. Merkin[1]
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[2]New Jersey Institute of Technology, Newark, NJ, USA.

The two RBSP spacecraft in their unique orbits will cut through the core of the ring current, where the Radiation Belt Storm Probes Ion Composition Experiment (RBSPICE) will provide important insight in to how plasma is heated to the equivalent of solar coronal temperatures, and how that affects space weather in the inner magnetosphere. In this paper, we review the current state-of-the-art knowledge of the ring current to provide a global context for the upcoming science analysis of the RBSP data. Using observations by the AMPTE/CCE, Cluster, THEMIS and the IMAGE missions we review current knowledge and discuss the outstanding open questions that RBSPICE will address.

First, during geomagnetic storms and substorms, protons, He^+ and O^+ are heated and transported from the magnetotail in to the inner magnetosphere, leading to an enhanced plasma pressure on the night side in the energy range of about 10-300 keV in the radial range of L=2-6. Global Energetic Neutral Atom (ENA) observations by IMAGE have revealed that the location of the pressure peak is not at dusk for large storms, but can even be located on the dawn side and that the ring current distribution can completely change in response to solar wind variability in just ten minutes. Models have suggested several hypotheses for the unexpected ring current morphology, which RBSP is equipped to constrain in detail.

Second, during substorms, the O+ ions are dramatically energized compare to the protons, an effect that has been attributed to the breaking of the first and second adiabatic invariants in the rapid field reconfiguration. Although it is clear that the substorm energization of heavy ions is substantial, there are numerous unsolved question that RBSP is designed to address. For example, it is unclear where the most efficient ion heating takes place and what the role of substorm energization is in enhancing the plasma pressure of the inner magnetosphere.

Third, the coupled ring current, plasmasphere, ionosphere system govern several important space weather phenomena. The storm-time plasma pressure cause severe distortions of the magnetic field of the entire inner magnetosphere that have dramatic consequences for the global loss of the outer belt electrons. The closure of the ring current system through the ionosphere modifies the ionospheric flows and electric fields that influences magnetospheric dynamics. The large-scale distribution of hot ion anisotropies of the ring current and the cold plasma density of the plasmasphere determine the growth rates and distribution of electromagnetic ion cyclotron (EMIC) waves that are critical for local electron loss. While some of the underlying processes of the individual phenomena are understood, others are not. In particular, the global, spatial and temporal distribution of the ring current and plasmasphere is not sufficiently well understood to model the impact on radiation belt dynamics. We end by reviewing some of the promising empirical modeling efforts that can provide important global context for the RBSP mission.

Characteristics of trapping boundary of outer radiation belt depending on flux level of outer belt: THEMIS observation

Junga Hwang[1], Dae-Young Lee[2], Kyung-Chan Kim[1], Eunjin Choi[1,3], Dae-Kyu Shin[2], Jin-Hee Kim[2], and Jung-Hee[2]
[1] Korea Astronomy and Space science Institute
[2] Chungbuk National University
[3] Korea Advanced and Institute of Science and Technology

Geosynchronous electron flux dropouts are most likely due to fast drift loss of the particles to the magnetopause (or equivalently, the “magnetopause shadowing effect”). A possible effect related to the drift loss is the radial diffusion of PSD due to gradient of PSD set by the drift loss effect at an outer L region. This possibly implies that the drift loss can affect the flux levels even inside the trapping boundary. We recently investigated the details of such diffusion process by solving the diffusion equation with a set of initial and boundary conditions set by the drift loss. Motivated by the simulation work, we have examined observationally the energy spectrum and pitch angle distribution near trapping boundary during the geosynchronous flux dropouts. For this work, we have first identified a list of geosynchronous flux dropout events for 2007-2010 from GOES satellite electron measurements and solar wind pressures observed by ACE satellite. We have then used the electron data from the Time History of Events and Macroscale Interactions during Substorms (THEMIS) spacecraft measurements to investigate the particle fluxes. The five THEMIS spacecraft sufficiently cover the inner magnetospheric regions near the equatorial plane and thus provide us with data of much higher spatial resolution. In this paper, we report the results of our investigations on the energy spectrum and pitch angle distribution near trapping boundary during the geosynchronous flux dropout events and discuss implications on the effects of the drift loss on the flux levels at inner L regions.

Technical Session 3-5

Effects of the ring current and plasmasphere on ULF waves in the inner magnetosphere based on the GEMSIS-RC and RB models

K. Seki[1], T. Amano[2], S. Saito[3], Y. Miyoshi[1], Y. Matsumoto[4], T. Umeda[1], Y. Miyashita[1], and Y. Ebihara[5].

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[2]Graduate School of Science, University of Tokyo,
[3]National Institute of Information and Communications Technology (Japan),
[4]Graduate School of Science, Chiba University,
[5]Research Institute for Sustainable Humanosphere, Kyoto University, Japan

Electron acceleration mechanisms to cause drastic variation of the Earth's outer radiation belt is one of key issues of the geospace researches. While the radial diffusion of the electrons driven by ULF waves has been considered as one of the candidate mechanisms, efficiency of the mechanism under realistic ULF characteristics and distribution is far from understood. GEMSIS (Geospace Environment Modeling System for Integrated Studies) of STEL, Nagoya University, is the observation-based modeling project for understanding energy and mass transportation from the Sun to the Earth in the geospace environment. Aiming at understanding the dynamics of the inner magnetosphere during the geospace storms, the GEMSIS-Magnetosphere working team has developed a new physics-based model for the global dynamics of the ring current (GEMSIS-RC model). The GEMSIS-RC model is a self-consistent and kinetic numerical simulation code solving the five-dimensional collisionless drift-kinetic equation for the ring-current ions in the inner-magnetosphere coupled with Maxwell equations.

We applied the GEMSIS-RC model for simulation of global distribution of ULF waves to test its capability of describing fast time scale phenomena like SCs and ULF waves. Two cases of background profile, i.e., cases without/with plasmapause in the simulation domain, are compared. The result shows that existence of plasmapause strengthens ULFs outside the plasmapause and widens the MLT region where the E_r (toroidal) component is excited from initially-given E_phi (poloidal) component. Comparison between runs with/without ring current ions show that the existence of hot ring current ions can deform and amplify the original sinusoidal waveforms. The deformation causes the energy cascade to higher frequency range (Pc4 and Pc3 ranges). The cascade is more pronounced in the high beta case. Combination with GEMSIS-RB model reproduced rapid radial transport by the drift resonance for ions with drift period of 600 seconds as theoretically expected.

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Technical Session 4-1

The Electric and Magnetic Field Instrument Suite and Integrated Science on the Radiation Belt Storm Probes

C. A. Kletzing

Department of Physics and Astronomy, The University of Iowa, Iowa City, IA

The physics of the creation, loss, and transport of radiation belt particles is intimately connected to the electric and magnetic fields which mediate these processes. A large range of field and particle interactions are involved in this physics from ions and ring current magnetic fields to microscopic kinetic interactions such as whistler-mode chorus waves with energetic electrons. To measure these kinds of radiation belt interactions, NASA will launch the two-satellite Radiation Belt Storm Probes (RBSP) mission in 2012. As part of the mission, the Electric and Magnetic Field Instrument Suite and Integrated Science (EMFISIS) investigation is an integrated set of instruments consisting of a tri-axial fluxgate magnetometer (MAG) and a Waves instrument which includes a tri-axial search coil magnetometer. These wave measurements include AC electric and magnetic fields from 10Hz to 400 kHz. Examples of key wave science such as the interactions of radiation belt particles with various wave modes such as VLF hiss, magnetosonic equatorial noise, electromagnetic ion cyclotron waves, and chorus are presented along with overall mission and instrument complement. We will present instrument capabilities, data products, and space weather parameters.

Chorus Properties: Importance for Wave-Particle Interaction Modeling

Bruce T. Tsurutani[1], Gurbax S. Lakhina[2], Olga P. Verkhoglyadova[1,3], Barbara J. Falkowski[1,4], Jolene S. Pickett[5], and Ondrej Santolik[6,7]

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[4]Glendale City College, Glendale, CA, [5]University of Iowa, Iowa City, IA, [6]Institute of Atmospheric Physics, Prague, Czech Republic, [7]Charles University, Prague, Czech Republic

Chorus is a right-hand, circularly-polarized electromagnetic planar whistler mode wave generated by 5-100 keV anisotropic electrons. We will discuss the time scales of chorus element groupings, of the elements themselves and of subelements, and the issue of wave coherency in light of cyclotron resonance with energetic electrons. Arguments will be presented for why: 1) electron pitch angle scattering of microburst electrons occurs close to the magnetic equator, 2) the mechanism of off-axis cyclotron resonance may be difficult for the scattering of relativistic microbursts, 3) microbursts are not detected in the midnight sector, 4) microbursts may have substructures, and 5) 5-15 s micropulsations are probably an ionospheric phenomenon.

Other topics such as Gendrin mode chorus, dayside minimum B pockets and plasmaspheric hiss will be touched upon if time permits.

Eigenmodes and Basis Functions for Pitch-Angle Diffusion with a Partially Filled Loss Cone

Michael Schulz[1]
[1]Lolckheed Martin Retiree, 1037 Twin Oaks Court, Redwood City, CA 94061 (U.S.A.)

This work provides a matrix method for constructing mutually orthogonal basis functions and eigenfunctions for a rather general class of models for the pitch-angle diffusion operator through the transition between the limits of weak diffusion (such that the eigenfunctions vanish at the edge of the loss cone) and strong diffusion (such that the equatorial pitch-angle distribution is isotropic). The purpose is to generate a means for efficiently representing pitch-angle distributions observed in space and for performing related theoretical calculations. The method invokes (as its first step) the construction of mutually orthogonal basis functions tailored to the functional form of the diffusion coefficient (vs equatorial pitch angle) and respectively matched at the edge of the loss cone so as to make their logarithmic derivatives continuous there (and zero at the center of the loss cone: i.e., at 0-deg and 180-deg equatorial pitch angles). The basis functions themselves are constructed through a generalization of the WKB (phase-integral) method involving Bessel functions (ordinary and modified) of general fractional (not necessarily half-integer) order so as to make the diffusion current go to zero at 90-deg equatorial pitch angle (so that particles are neither created nor lost by having their mirror points diffuse into or across the magnetic equator). The matrix elements themselves are calculated by methods analogous to those used in quantum mechanics, and the resulting matrix representation of the pitch-angle diffusion problem is diagonalized through expansion of its characteristic determinant by minors (as in P S Epstein's perturbation theory). The diagonalization procedure has been found to "converge" quite rapidly for model pitch-angle diffusion operators tried thus far and to yield exact analytical results for particular functional forms of the pitch-angle diffusion coefficient (vs equatorial pitch angle).

Technical Session 4-4

Large-Amplitude Whistler Waves and Relativistic Electron Acceleration

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A recent observation [*Cattell et al.*, 2008] shows that large-amplitude whistler waves propagating in oblique directions with respect to the ambient magnetic field may be responsible for energizing the radiation belt electrons to relativistic energies within a time scale as short as a fraction of a second. Test-particle simulations available in the literature invariably adopt simple model waveforms for the oblique whistlers. Solutions of fully nonlinear warm electron fluid equation show that oblique whistlers not only undergo steepening but also large-amplitude whistlers are unstable to nonlinear decay instability. The physics of whistler wave steepening and nonlinear decay processes as well as their impact on particle interaction will be discussed. Relativistic test particle simulation shows that a population of initially low energy electrons can be accelerated in a few seconds to $O(10)$ MeV energies.

Technical Session 4-5

Whistler-mode Chorus in the Radiation Belts: Effects of Wave-Normal Distribution for Electron Scattering

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VLF waves play a crucial role in the dynamics of radiation belts, and are responsible for the loss and the acceleration of energetic electrons. Modeling wave-particle resonant interactions requires the best possible knowledge of wave energy and wave-normal directions in L-shells for different magnetic latitudes and magnetic activity conditions. In this work, we performed a statistical study for VLF emissions using a whistler frequency range for ten years (2001-2010) of Cluster measurements. We utilized data from the STAFF-SA experiment, which spans the frequency range from 8.8 Hz to 3.56 kHz and present distributions of wave magnetic and electric field amplitude and wave-normals in dependence on MLat, MLT, L-shell and geomagnetic activity in a form of probability levels, which were directly applied for calculation of the electrons diffusion coefficients in the outer radiation belt. The propagation direction of chorus waves rapidly deflects from the magnetic field with the increase of latitude. The width of the distribution increases also. These results were proved by use of numerical ray tracing simulation. Distributions for the diffusion coefficients for day and night sectors and for different geomagnetic activity regimes are obtained. These diffusion coefficients are compared with coefficients calculated under assumption of whistler parallel propagation with constant value of variance and wave amplitude along magnetic field line. The increase of the mean value and the variance of the wave vector distribution with latitude results in important growth of the pitch-angle diffusion rates due to intensification of higher order cyclotron resonances, which is most efficient for electrons with small equatorial pitch-angles in the close vicinity of loss-cone.

Rapid acceleration of radiation belt electrons by nonlinear wave trapping

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A fundamental problem in magnetospheric physics is to explain the creation of electron radiation belts. The basic mechanism for generating a radiation belt is generally considered to be radial transport from an outer particle-source. In this process the first and second adiabatic invariants are conserved and the third is violated. Typical electron energies in Earth's outer radiation belt are 400 keV–10 MeV. Various studies have established that radial transport alone cannot explain the observed relativistic electron fluxes at Earth. It has been further shown that local acceleration due to electron cyclotron resonance with whistler-mode chorus, associated with the violation of the first adiabatic invariant, can explain the peaks in relativistic electron phase space density observed near L=4. Here, we describe a recently formulated electron acceleration mechanism called ultra-relativistic acceleration (URA). URA consists of electron energization due to a special form of nonlinear phase trapping by a coherent whistler-mode wave for electrons with an initial energy exceeding a specified critical value. We demonstrate that radiation belt electrons that encounter a combination of relativistic turning acceleration (RTA) followed by multiple URA interactions can undergo significant energy increase. For instance, under ideal conditions, at L=4, several-hundred-keV electrons can be energized to several MeV within a few seconds. The URA mechanism can play a prominent role in generating the several-MeV electrons observed in Earth's outer zone following intense geomagnetic activity.

RBSP & DREAM: Science Studies and Space Weather Applications

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The RBSP mission will deliver an unprecedented new set of observations for testing theories and understanding the physical processes that control the structure and dynamics of the radiation belts. Global models such as DREAM, the Dynamic Radiation Environment Assimilation Model will enhance the scientific return from RBSP by providing a global context for interpretation of results and tools for testing the effects of competing mechanisms. This talk will present a brief overview of the DREAM model. We will discuss calculation of magnetic invariants along the satellite orbits, conversion of flux to phase space density, the mechanics of data assimilation, and the data products from DREAM and RBSP that will be available to the scientific community. The RBSP Space Weather broadcast provides a unique opportunity to demonstrate real-time radiation belt forecasting for space weather applications and for scientific analysis. We will discuss plans for running DREAM with the SWx broadcast data, with the full science data. Each has advantages and disadvantages (speed vs completeness) and should provide an excellent opportunity to study how much data quality and model sophistication is needed for various applications. Many of the science objectives of RBSP rely on producing detailed phase space density maps of the radiation belts – particularly two-satellite radial profiles of PSD. We will discuss some of the scientific questions that remain outstanding and how PSD maps will help us to understand where and when specific processes dominate radiation belt dynamics. We will also discuss how those same maps can help distinguish individual processes that are likely embedded in a "zoo" of simultaneous – and sometimes competing – processes. The RBSP science investigation teams and the DREAM project are all committed to providing easy access to data and model results to make scientific collaboration as seamless and productive as possible so this talk will also include information on access to data and analysis tools through the RBEP-ECT Team science operations center.

Technical Session 5-3

Wave-particle interaction between whistler chorus and relativistic electrons: GEMSIS-RBW simulation

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Relativistic electrons are precipitated bursty into the atmosphere with very short duration (about a hundred msec), particularly during geomagnetic storms. There are some mechanisms proposed to explain the precipitation of relativistic electrons. Electromagneitc ion cyclotron (EMIC) waves can scatter relativistic electron close to the loss cone around the magnetic equator, causing precipitation of MeV electrons into the atmosphere. Large curvature of magnetic field line, which could appear in the night side region due to the field line stretching, is proposed as a cause of pitch angle scattering of relativistic electrons.

Whistler chorus wave is also linked to the relativistic electron precipitations. While the EMIC wave and the curvature effect precipitate the relativistic electrons through pitch angle scattering at the equator, the whistler chorus scatters relativistic electrons near the loss cone at the off-equatorial regions. Each scattering process is fairly different from the other. Thus property of precipitated electrons may imply important information for flux decrease of the outer belt.

We have developed GEMSIS-RBW (Geospace Environment Modeling System for Integrated Studies – Radiation Belt with Wave-particle interaction module) code, which calculates guiding center position of energetic electron, and pitch angle and energy changes through interaction between the parallel propagating whistler wave and electrons. We will show the relativistic electron scattering process in the dipole magnetic field model due to wave-particle interactions between whistler chorus and relativistic electrons. We will discuss relationship between relativistic electron microbursts and whistler chorus emissions. Further, we focus on pitch angle distribution of relativistic electrons scattered by whistler chorus propagating from the magnetic equator along the field line.

Technical Session 5-4

Relativistic Radiation Belt Electron Responses to GEM Magnetic Storms: Comparison of CRRES Observations with 3-D VERB Simulations

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Understanding the dynamics of relativistic electron acceleration, loss, and transport in the Earth's radiation belt during magnetic storms is a challenging task. The U.S. National Science Foundation's Geospace Environment Modeling (GEM) has identified five magnetic storms for in-depth study that occurred during the second half of the Combined Release and Radiation Effects Satellite (CRRES) mission in the year 1991. In this study, we show the responses of relativistic radiation belt electrons to the magnetic storms by comparing the time-dependent 3-D Versatile Electron Radiation Belt (VERB) simulations with the CRRES MEA 1 MeV electron observations in order to investigate the relative roles of the competing effects of previously proposed scattering mechanisms at different storm phases, as well as to examine the extent to which the simulations can reproduce observations. The major scattering processes in our model are radial transport due to Ultra Low Frequency (ULF) electromagnetic fluctuations, pitch-angle and energy diffusion including mixed diffusion by whistler mode chorus waves outside the plasmasphere, and pitch-angle scattering by plasmaspheric hiss inside the plasmasphere. The 3-D VERB simulations show that during the storm main phase and early recovery phase the estimated plasmapause is located deep in the inner region, indicating that pitch-angle scattering by chorus waves can be a dominant loss process in the outer belt. We have also confirmed the important role played by mixed energy-pitch angle diffusion by chorus waves, which tends to reduce the fluxes enhanced by local acceleration, resulting in comparable levels of computed and measured fluxes. However, we cannot reproduce the more pronounced flux dropout near the boundary of our simulations during the main phase, which indicates that non-adiabatic losses may extend to *L*-shells lower than our simulation boundary. We also provide a detailed description of simulations for each of the GEM storm events.

Technical Session 5-5

Recent Advances on Understanding the Diffuse Auroral Precipitation : The Role of Resonant Wave-Particle Interactions

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Diffuse auroral precipitation provides the major source for energy input into high-latitude regionsand behaves as an essentiallinkage that affectsthe magnetosphere-ionosphere coupling. Recently, a number of important advances have been achievedto better understand the origin of the diffuse aurora, in which resonant wave-particle interactions play a fundamentalrole. We will firstly show the results that clearly demonstrate that whistler-mode chorus other than ECH waves is the major contributor to the most intense nightside diffuse auroral precipitation in the inner magnetosphere.Since chorus waves are generally very weak beyond ~ 8 Re, we will also show the results that indicate that ECH waves could be more important and even dominant in driving nightside diffuse auroral precipitation at higher L-shells. Finally, we suggest that dayside chorus waves should be the major cause for the dayside diffuse auroral precipitation. The recently improvedknowledgeabout the diffuse auroral precipitation helps a lot explain the global morphology of the occurrence of diffuse aurora under different solar wind / geomagnetic conditions, however, more work needs to be done to reacha complete closure to the origin of the diffuse aurora.

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Poster Session P-2

Strong Diffusion Limits in Realistic Magnetic Fields: Dependence on Spatial Location and Geomagnetic Activity

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We present the results of strong diffusion limit in realistic magnetic fields. Four empirical magnetic field models (dipole, T89, T96, T2001s) are adopted. Different typical solar wind and geomagnetic conditions are considered to compute strong diffusion rates as a function of L-shell, MLT, and electron energy. Our results indicate that strong diffusion coefficients are strongly dependent on the level of geomagnetic activity and the adoption of ambient magnetic field model, besides spatial location and kinetic energy. Under the strong diffusion limit, particles can be scattered into the loss cone on timescales comparable to a quarter bounce period and therefore the loss cone can be fully filled to cause enhanced precipitation loss. This study demonstrates that reliable background magnetic field configuration is required to accurately evaluate the strong diffusion rate, which can provide important information of electron trapping and upper limit for wave-induced resonant scattering.

Poster Session P-3

THEMIS and WIND observations of ULF wave power transfer through the bow shock

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Recently studies showed that, Interplanetary Magnetic Field (IMF) Ultra Low Frequency (ULF) wave power can substantially enhance the ionospheric convection, suggesting it may be an additional driver in the solar wind energy transfer to the magnetosphere-ionosphere system. However, the magnetosheath, as the interface between undisturbed solar wind and the magnetosphere, plays an important role in the transfer of solar wind plasma and IMF to the magnetopause. So, it is important to know how ULF wave power can vary as solar wind passes through the sheath. The properties of plasma and magnetic field in the magnetosheath will vary for quasi-parallel shock region or quasi-perpendicular shock region. Therefore we statistically examined ULF Pc 3-5 wave power in the regions of undisturbed upstream solar wind, quasi-parallel shock (and foreshock), quasi-perpendicular shock, and the magnetosheath to understand how and to what extent the wave power changes as the solar wind propagates to the magnetosheath. For this study, we used the magnetic field data from the THEMIS spacecraft and Wind (as shifted to the bow shock nose) for May-November in 2008 and 2009, and calculated ULF wave power of magnetic files using Short Time Fourier Transform (STFT) technique. The statistical results show that, in the case of the Pc5 wave power, the sheath power is roughly proportional to the upstream power for both quasi-parallel (and foreshock) and quasi- perpendicular shock regions. Also we identified undisturbed upstream condition from WIND as being well away from foreshock region, and found that the sheath power can be larger for quasi-parallel shock region by a factor of 5-15 than for quasi-perpendicular shock region. In the cases of Pc 3 and Pc4 waves, we found the higher sheath power when associated with the foreshock than with the quasi-perpendicular shock region.

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Poster Session P-4

Testing an Ionospheric Signature Anomalies Analysis Method on Khartoum (MS = 5.5) Earthquake

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In this paper an ionospheric precursor's analysis method is applied to the earthquake event of Khartoum, took place on July 31, 1993 at 21:20:40 UT, which of magnitude ($M_S = 5.5$). The precursor anomaly was checked out via a statistical method where bounds were calculated. In addition, the daily variation of the ionospheric parameter under study (**f_0F_2**) is delineated such that the percentage deviation of the ionospheric parameter is detected from being increase from the upper bound and decreasing from the lower bound. The resultant precursor is found to occur 8 days before the peak shock of the event of the earthquake took place in Khartoum. It is also found that the size or the magnitude of the detected ionospheric anomaly has a specific characteristic in that, it is much bigger than the one found on the literature's similar study. It is found that the size of the anomaly is (46.3 MHz), and its corresponding value of the percentage deviation is (612.30%).

Poster Session P-5

Characteristics of magnetic fluctuations during near-Earth plasma sheet dipolarization as observed by THEMIS

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Magnetic dipolarization at the near tail often accompanies fluctuations over a broad range of frequency. In this paper, we examine the power spectrum of magnetic fluctuations of near-tail dipolarization. For this purpose, we identify a total of 128 magnetic dipolarization events from the first (2008) to second (2009) tail seasons of the inner tail probes of the THEMIS mission. For the identified events, we estimate the spectral indices for the frequency range of ~0.001 Hz to 0.15 Hz, and find that they range from ~1.2 to ~2.7. Most interestingly, we find a statistical trend that the spectral indices of the power spectral density are smaller closer to the magnetic equator than away from the equator, and in the pre-midnight/near-midnight MLT region than in the post-midnight MLT region. This suggests that the contribution of higher frequency fluctuations as compared to lower frequency fluctuations remains more significant close to the equator and in the pre-midnight/near-midnight MLT region. Therefore any mechanism exciting high frequency fluctuations during dipolarization should activate more preferably in a weak magnetic field region. It is also found that the intensity of the power spectral densities is overall larger closer to the equator and in the pre-midnight/near-midnight MLT region. Additionally, we find that the power spectrum is less anisotropic between the perpendicular and parallel directions than the homogeneous MHD turbulence prediction.

Poster Session P-6

Determination of the radiation belt boundary conditions using THEMIS satellite plasma particle observations

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The structure and evolution of the radiation belts are subject to the conditions in the plasma sheet outside the outer belt. In this study, we determined the boundary conditions of the electron flux of the outer radiation belt for 2007 – 2010 using the THEMIS ESA and SST particle data. The boundary is taken to be r = 7-8 R_E, and we limited only to near-equatorial region on the nightside. We performed this study for three different modes of the radiation belts according to the > 2 MeV flux level at geosynchronous orbit: the quite time, flux dropout time, and geosynchronous relativistic electron event time showing an elevated flux level. We have determined the energy spectra of the omni-directional flux and pitch angle distribution at the boundary and. For the energy spectra, we have also determined best fit functions. Using the fit functions, we have performed the radial diffusion simulations and have compared the results among the three modes and with those obtained using the CRRES observations.

Poster Session P-7

Dependency on solar polar magnetic field at solar minimum for geomagnetic indices and HPe power

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Auroral activity levels can be determined by the electron hemispheric power (HPe) carried into the Earth's atmosphere by measuring the precipitation of auroral charged particles in the polar region. The HPe has been observed by the NOAA and DMSP satellites over three decades. We examine whether or not the seasonal variation of auroral activity shows similar variations of geomagnetic activity and whether or not such activity in the equinoxes is different in the periods of opposite solar magnetic polarity. The HPe during each solar minimum is therefore compared for the periods when solar magnetic polarity remains in opposite dipole conditions. The HPe data were used for each of the three years surrounding the solar minimum years of solar cycle (SC) 21 to 22 (1985-1987), 22 to 23 (1995-1997), and 23 to 24 (2007-2009). Solar magnetic polarity is parallel with the Earth's polarity in the solar minimum years of SC 21 to 22 and of SC 23 to 24, and anti-parallel in the solar minimum years of SC 22 to 23. The HPe shows seasonal variation of the power being higher at the equinoxes than at the solstices, similar to the geomagnetic Ap and Aa indices. The HPe shows a solar magnetic polarity dependency of being stronger in February-April when the Earth reaches maximum southern heliolatitude with the parallel polarity. Similarly, HPe is stronger with the anti-parallel polarity during August-October when the Earth attains maximum northern heliolatitude. The mid-latitude geomagnetic linear indices such as daily Ap and daily Aa also show the same trends.

Poster Session P-8

Dipolarization associated with current disruption as a source of space Pi1B

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It has been suggested that magnetic pulsations in the Pi1B band (periods from 1 to 40 sec) are associated with a substorm onset. However, the source of Pi1B pulsations remains controversial. We examined the characteristics of Pi1B observed on the ground and in space using ground magnetometer data from Athabasca (L = 4.7) and space magnetic field data from GOES-11 and THEMIS probes during January to March 2008. 80 Pi1B pulsations are selected on the ground, and they are compared with space data. More than 50% of ground Pi1B pulsations occurred with space Pi1Bs observed GOES-11 and/or THEMIS. Two mechanisms for Pi1B excitation have been considered; one is earthward flow bursts, and the other is magnetic dipolarization. We compared onset times of Pi1B, earthward flow burst, and dipolarization and found that most of Pi1B events occurred with dipolarization and earthward flow bursts. About 30% of the events occurred with the flow burst less than 100 km/s. Our observations support the dipolatization for and excitation source of space Pi1B.

Nightside geosynchronous magnetic field responses to interplanetary shocks

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When an interplanetary (IP) shock passes over the Earth's magnetosphere, the geosynchronous magnetic field strength near the noon is always enhanced, while the geosynchronous magnetic field near the midnight decreases or increases. In order to understand what determines the positive or negative magnetic field response at nightside geosynchronous orbit to sudden increases in the solar wind dynamic pressure, we have examined 120 sudden commencements using magnetic field data from the GOES spacecraft near the midnight (MLT = 2200~0200) and found the following magnetic field perturbation characteristics. (1) There is a strong seasonal dependence of geosynchronous magnetic field perturbations during the passage of IP shocks. That is, the SC-associated geosynchronous magnetic field near the midnight increases (a positive response) in summer and decreases (a negative response) in winter. (2) These field perturbations are dominated by the radial magnetic field component rather than the north-south magnetic field component at nightside geosynchronous orbit. (3) The magnetic elevation angles corresponding to positive and negative responses decreases and increases, respectively. These field perturbation properties can be explained by the location of the cross-tail current enhancement during SC interval with respect to geosynchronous spacecraft position.

The statistical analysis of Pi2 pulsations observed at low-latitude Bohyun ground station

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We statistically investigated the properties of Pi2 pulsations observed at low-latitude Bohyun (BOH, L = 1.35) station in 2008. For this 1-year interval, 1212 Pi2 events were identified when BOH was in the nightside from 1800 to 0600 local times (LT). We found the following Pi2 characteristics. (1) The Pi2 pulsations most frequently occur in 2200 LT. (2) The Pi2 power increases as the solar wind speed increases. (3) The Pi2 power also has a positive correlation with the variance of the interplanetary magnetic field fluctuations. (4) We determined the time interval (Δt) between Pi2 onsets for every consecutive pair of Pi2s. From a statistical analysis of Δt values, we find that the most probable-time between Pi2 onsets is Δt ~ 30 min. This is interpreted to be the period between Pi2 pulsations when they occur cyclically. We discuss what have influenced on the recurrence time of Pi2 pulsations.

Poster Session P-11

Non-simultaneous Forbush Decrease events Observed at Middle Latitude Neutron Monitor Stations

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The variations of galactic cosmic ray (GCR) are related to space weather and seem to be useful parameters for interplanetary disturbances driven by coronal mass ejections (CMEs). The Forbush decrease (FD) events are typical examples of shielding effect by an interplanetary CME. The FD events are recorded as the abrupt decrease of GCR intensity on the ground neutron monitor (NM) stations. They are considered to be associated with the magnetic structures around the Earth. The associated magnetic structures are the magnetic clouds and interplanetary shocks originated from the CMEs. Oh et al. [2008] and Oh and Yi. [2009] reported that the FD events are observed globally simultaneous or non-simultaneous at different NM stations at the high latitude. We use the cosmic ray data of Climax, Irkutsk, and Jungfraujoch NM stations during the solar maximum period (1998-2002). Those NM stations have the cutoff rigidities of 3-6 GV and are located in the middle latitude. Previous studies before Oh et al. [2008] have mainly focused on the simultaneous FD events. Thus, the aim of this study is to investigate the statistical properties of the simultaneous and non-simultaneous FD events at the middle latitude and to compare with FD events configured by Oh et al. [2008] and Oh and Yi [2009]. Most FD events are observed simultaneous in universal time(UT) at each NM station regardless of the longitudinal location. On the other hand, the other FD events are not globally simultaneous but locally simultaneous in local time(LT). The stronger FD events tend to be simultaneous events, but the weaker FD events are non-simultaneous. There is a difference in GCR intensity variation during the main phase due to the cutoff rigidity in comparison with the FD events observed at high latitude.

Poster Session P-12

Effects of Intermediate Scale Variations on Proton Temperature Anisotropy vs Beta Inverse Correlation in the Solar Wind near 1 AU

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The proton temperature anisotropy versus beta inverse correlation near 1 AU based upon in-situ observations shows that it is best described by instability threshold conditions corresponding to mirror and oblique fire hose modes. In the Earth`s magnetosheath, these anisotropy versus beta relations have been studied, since the compression of the solar wind plasma in the downstream region of the quasi-perpendicular shock leads to the excessive perpendicular temperature anisotropy. For perpendicular temperature anisotropy, proton cyclotron and mirror instabilities are simultaneously excited. According to the prediction of the linear kinetic theory, proton cyclotron instability should dominate over the mirror mode for low beta regime, while for high betas the opposite should be true. However, observations do not always seem to support such a prediction in that it is well aligned with mirror mode threshold even for low beta regime. Furthermore, in the low-beta regime, although the solar wind anisotropy seems to be dictated by the mirror mode threshold, the observed weak magnetic compressibility is consistent with proton cyclotron mode. In the present paper we show that the pervasive intermediate spatio-temporal scale variations in the magnitude of the magnetic field near 1 AU can lead to the modification of the threshold conditions for proton cyclotron and mirror instabilities. It is shown that the observed proton temperature anisotropy versus beta inverse correlation associated with the magnetic fluctuation and magnetic compressibility can be accounted for under suitable models of the B-field variation.

Poster Session P-13

Study of Statistical Characteristics of Magnetic Polarity Inversion Lines in Solar Active Regions

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Magnetic polarity inversion lines (MPILs), often called neutral lines, are defined as the line separating areas of opposite magnetic polarity on the Sun. From many previous studies, it is well known that the lengths of MPILs in solar active regions have a good correlation with the probability of occurrence of solar eruptions such as solar flares and coronal mass ejections. In this respect, MPILs can be considered as an important tool for space weather forecasting. However, physical properties of MPILs and their spatial/temporal evolution have not been sufficiently understood yet. In this study, we therefore examined statistical characteristics of MPILs in solar active regions during solar cycle 23 using SOHO/MDI line-of-sight magnetogram data.

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Poster Session P-14

Study of Magnetic Helicity Injection in the Active Regions NOAA 9236 Producing Multiple CME Events

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The main objective of this study is to inquire of how the temporal variation and spatial distribution of magnetic helicity injection in a CME-producing solar active region are related to a precondition and trigger mechanism for CME initiation. We therefore investigate long-term (a few days) variation of magnetic helicity injection in the active region NOAA 9236 which produced multiple CME events using SOHO/MDI line-of-sight magnetogram data. As a result, it is found that the CMEs originated from this active region are involved with the interaction of two magnetic field systems characterized by opposite signs of helicity.

Poster Session P-15

Development of Data Integration System for Ground-Based Space Weather Observation Facilities

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We have developed a data integration system for ground-based space weather observation facilities in KASI (Korea Astronomy and Space Science Institute). The data integration system is necessary to operate ground-based space weather observation facilities efficiently, which consists of observation systems and data monitoring systems. The observation systems involve solar telescopes, magnetometers, ionospheric observation systems, control computers, and observation programs. The data monitoring systems are data collecting and processing applications and data servers. In addition, we operate the Space Weather Monitoring Lab (SWML). In SWML, we can monitor real-time space weather data and our ground-based observing facilities. We expect that this data integration system will be used for highly efficient operation of the current and future space weather observation systems at KASI.

Poster Session P-16

FISS Observations of Chromopsheric Transient Brightnenings associated with Canceling Magnetic Features

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Canceling magnetic features (CMFs) are likely to be a result of magnetic reconnection in the lower atmosphere. CMFs are often related with chromospheric phenomena such as brightening or jets. In order to observe the fine-scale and highly dynamical structures in the chromospheres, Fast Imaging Solar Spectrograph (FISS) was developed and installed at 1.6 m New Solar Telescope at Big Bear Solar Observatory. This FISS records spectral lines at two spectral bands in the chromosphere, the H-alpha and the Ca II 8542, simultaneously. Using the FISS data we have studied chromospheric brightenings associated with magnetic elements including CMFs. As a result, the chromospheric brightenings related with CMFs have stronger shock waves than one of other regions such as internetwork regions or unipolar magnetic elements.

Poster Session P-17

Ionospheric response on EIA during a geomagnetic storm of 7-8 may 2005

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The electrodynamics and neutral dynamics of the equatorial ionosphere undergo significant changes during geo-magnetically disturbed period due to the coupling between high and low latitude electro-dynamics. Such changes may even trigger the plasma instabilities that may lead to the generation of plasma-irregularities and scintillations even at the L-band frequencies. In the current investigation, we studied the response of a geomagnetic storm occurred on 7-8 May 2005 (SSC:1920 UT on 7 May; Sym-H minimum ~-112 nT around 1600 UT on 8 May) on the EIA region of the ionosphere using dual frequency signals of GPS. These signals were acquired from a near EIA crest region, Rajkot (Geog. 22.29^{0}N, 70.74^{0}E, Geomag.14^0), India. We found that the amplitude level of the TEC variation tends to increase during the first 24 hour of storm (upto 170 %) and then decrease below its usual-day level on the second day during the recovery period of the magnetic storm. On the geomagnetic disturbed night of 8 May, ionospheric plasma bubbles were observed during pre-reversal enhancement (PRE) period which may be due to an unusual uplifting of the F-region. The unusual uplifting of the F-region during PRE was possibly associated with prompt penetration of electric field of magnetospheric origin. During the same night of 8 May, the TEC fluctuations with moderate scintillations (S4~0.47) after sunset hours and strong scintillations (S4~0.72) during postmidnight period are observed. The results of the observations will be discussed.

Poster Session P-18

Solar cycle dependence of the hemispheric asymmetry of the equatorial ionization anomaly

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During the solar minimum, the equatorial ionization anomaly (EIA) shows an opposite hemispheric asymmetry in the morning and afternoon during solstices. This phenomenon is explained by the combined effects of the fountain process and interhemispheric wind. However, the proposed mechanism has not yet been tested with observations during other periods of the solar cycle. We examine the variability of the hemispheric asymmetry of the EIA in 2001–2008 by using the measurements of the electron density by the CHAllenging Minisatellite Payload (CHAMP) satellite and the total electron content maps provided by the ground global positioning system network. In general, a stronger EIA appears in the winter hemisphere in the morning during both the solar minimum and maximum. In the afternoon, the occurrence hemisphere of a stronger EIA transits from the winter hemisphere to the summer hemisphere following the declining of the solar cycle. The creation of a stronger EIA in the winter hemisphere in the morning is explained by the occurrence of a strong fountain effect and the promotion of the equatorial plasma diffusion into the winter hemisphere by the summer-to-winter wind. These mechanisms are seen to be effective in the afternoon during the solar maximum and maintain a stronger EIA in the winter hemisphere. The reversal of the hemispheric asymmetry in the afternoon during the solar minimum is explained by the weakening of the fountain effect.

Technical Session 6-1

Oxygen Flux Variation During a Stormtime Substorm on May 6, 1988

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[3]New Jersey Institute of Technology, [4]University of New Hampshire

The flux of O+ ions is known to increase in the inner magnetosphere during geomagnetically active periods, but the mechanism for the flux change is not well understood. To gain insight into the mechanism we examine the variation of the O+ flux observed with the Charge-Energy-Mass Spectrometer (CHEM) on the AMPTE/CCE spacecraft in association with a substorm on May 6, 1988. The substorm onset occurred at ~0607 UT during the main phase of a geomagnetic storm that reached the Dst minimum of -160 nT. The fluxgate magnetometer on CCE detected a clear magnetic field dipolarization (delta-B ~ 140 nT over delta-T ~ 60 s) at L ~ 4.0, magnetic latitude ~ 6 degrees, and magnetic local time ~ 20 hr. After the dipolarization, the power spectral density of broadband magnetic field variation in the Pc1 band was ~1.5 orders of magnitude higher than the pre-onset level. In addition, there was a brief period of narrowband pulsation at a frequency about one half of the local proton cyclotron frequency. Across the dipolarization the O+ flux increased by 0.5-1.0 orders of magnitude at energies below 100 keV. No flux enhancement was observed for O+ at energies above 100 keV and there was no obvious flux change for H+ over the entire energy band, 0.3-300 keV, covered by the CHEM instrument. We add magnetic field observations by the nearby satellites GOES-6, GOES-7, and DE-1 to discuss possible mechanism(s) for the O+ enhancement. We also discuss how similar events can be studied with the RBSP spacecraft.

Technical Session 6-2

Magnetospheric and ionospheric responses to the passage of the interplanetary shock on 24 November 2008

K.-H. Kim[1], J.-S. Park[1] , D.-H. Lee[1], E. Lee[1] , V. Angelopoulos[2], Y.-D. Park[3], J. Hwang[3], N. Nishitani[4], T. Hori[4], K. Shiokawa[4], K. Yumoto[5], and D. G. Baishev[6]

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The passage of the interplanetary (IP) shock was detected by Wind, ACE, Geotail, and THEMIS-B in the solar wind on November 24, 2008. From the propagation time of the IP shock and relative positions of the spacecraft, it is estimated that the discontinuity front is aligned with the Parker spiral and strikes the postnoon dayside magnetopause first. Using coordinated multi-point measurements (THEMIS, GOES, and ETS) at or in geosynchronous orbit, we observed a tailward propagating sudden commencement (SC) front, excited by the IP shock, with its front normal aligned with the IP shock normal. We found that the SC front normal speed is much smaller than the local Alfven speed. The SC event appears a step-like increase in the H at low-latitude Bohyun station and negative-then-positive variation in the H component at high latitude Chokurdakh (CHD) in the prenoon sector. During the positive deflection at CHD, the SuperDARN Hokkaido radar detected the downward motion of the ionosphere, implying westward electric field enhancement, at subauroral latitudes near CHD meridian. In our study we will discuss magnetospheric and ionospheric responses to the passage of the solar wind discontinuity using multi-point observations in space and on the ground.

Global Evolution of the Earth's Magnetosphere in Response to a Sudden Ring Current Injection

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The dynamical evolution of the Earth's magnetosphere loaded with a transiently enhanced ring current is investigated by global magnetohydrodynamic simulations. Two cases with different values of the primitive ring current are considered. In one case, the initial ring current is strong enough to create a magnetic island in the magnetosphere. The magnetic island readily reconnects with the earth-connected ambient field and is destroyed as the system approaches a steady equilibrium. In the other case, the initial ring current is not so strong, and the initial magnetic field configuration bears no magnetic island, but features a wake of bent field lines, which is smoothed out through the relaxing evolution of the magnetosphere. The relaxation time of the magnetosphere is found to be about five to six minutes, over which the ring current is reduced to about a quarter of its initial value. Before reaching a steady state, the magnetosphere is found to undergo an overshooting expansion and a subsequent contraction. Fast and slow magnetosonic waves are identified to play an important role in the relaxation toward equilibrium. Our study suggests that a sudden injection of the ring current can generate an appreciable global pulsation of the magnetosphere.

On earthward penetration of near-tail disturbance as observed by THEMIS spacecraft

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The near-Earth tail of r < 12 R_E is a critical region where plasma flows, magnetic dipolarization, and energetic particle injections often occur in association with substorms. It is also the source of the seed electrons that can become energetic particles inside the radiation belt. The three inner probes of THEMIS have routinely covered this region since their launch in 2007 and in this work we have analyzed the data of the magnetic field and plasma to understand how deep the effects of dipolarization and associated plasma flows can penetrate earthward. First we find that the overall occurrence rate of the fast flows (including both earthward and tailward flows) noticeably decreases earthward. The earthward flows can seldom penetrate inside of 7-8 R_E. Second, dipolarization of the magnetic field at the near-Earth tail is usually associated with the local reduction of $pV^{5/3}$ compared to that of the background, hence a bubble, which can propagate earthward by the interchange process. We examined how deep such a bubble can penetrate earthward by comparing near-tail observations of THEMIS with geosynchronous magnetic observations. We find a statistical trend that geosynchronous disturbance is more likely to occur when associated with (or when hit by) an earthward moving tail bubble with a more-depleted $pV^{5/3}$. However, for all the events studied here, the bubble equilibrium positions where the bubble's $pV^{5/3}$ is equal to that of the background are still outside geosynchronous altitude. These two results imply that additional physics between the bubbles' equilibrium positions and geosynchronous altitudes must play a role.

Technical Session 6-5

Statistical Investigation of the Behaviour of Plasma and Field Parameters with Geomagnetic Index during Geomagnetic Storm of April 2010

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This research is a communication of investigating the following field parameters: (B*z*, B*y*, E*y*) with the geomagnetic index: (A*p*, K*p*, D*st*, A*e*) and the plasma parameters (T, P and V). The relationship between the field parameters, GI and plasma parameters with disturbance storm time index (D*st*) was studied. A correlative study between the geomagnetic indices and the peak values of various plasma and field parameters during the geomagnetic storm of April 2010 were also presented. Our study shows that while some of the parameters play active role in D*st* morphology, some do not. Mechanisms of the interplay between the parameters are also discussed.

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Technical Session 7-1

Radial Diffusion of Outer Radiation Belt Electrons - The Importance of ULF Wave Electric Fields

L. G. Ozeke, I. R. Mann, K. Murphy, I. J. Rae, and D. K. Milling

MeV energy electrons are thought to be transported inwards from the plasma sheet into the radiation belts under the action of radial diffusion. Waves in the ultra-low frequency (ULF) band have frequencies which can be drift resonant with these electrons in the outer zone suggesting the potential for strong interactions, and enhanced radial diffusion. In the usual situation, where the plasma sheet acts as a source of phase space density, the radial diffusion transports particles inward - these particles also conserving their first invariant and being energized as they move inwards towards higher magnetic fields. The diffusion coefficients depend on the power spectral density (PSD), of the waves electric and magnetic fields in space in the equatorial plane. Due to the small number of satellite missions which have passed through the equatorial plane of the outer radiation belts with ULF wave electric and magnetic field instruments these PSD measurements have only been taken over short time periods or narrow L-shell ranges. Here ULF wave electric field diffusion coefficients will be presented which are determined from over 10 years of ground-based magnetometer measurements from $L<4$ to $L>7$. These electric field diffusion coefficients are determined using a guided Alfven wave mapping technique to estimate the electric field PSD in space in the equatorial plane from the magnetic field PSD measured by the ground-based magnetometers. In-situ measurements of the magnetic field PSD in space are also used to determine the magnetic diffusion coefficients. These diffusion coefficients are compared to those previously obtained from CRRES measurements and from the analytic expressions. In addition, radial diffusion simulations of electrons transported by these diffusion coefficients will be presented, illustrating that electric field diffusion coefficients play a more important role in the dynamics and energization of the Earth's outer radiation belt region than the magnetic diffusion term.

Properties of electromagnetic ion cyclotron waves in the outer magnetosphere

Jeongwoo Lee and Kyungguk Min
(New Jersey Institute of Technology, USA)

Electromagnetic ion cyclotron (EMIC) waves play an important role in scattering and loss of the hot plasma in the magnetosphere, and their global distribution is of great interest. Thanks to the long term observations with the Time History of Events and Macroscale Interactions during Substorms (THEMIS) spacecraft, we were able to determine physical properties of the EMIC waves over a broad range of the magnetosphere: $6 < L < 14$ in all magnetic local times. Our results for wave power and polarization of the EMIC waves are in good agreement with those of Anderson et al. obtained in 1990-1992 from the observations with Active Magnetosphere Particle Tracer Explorer/Charge Composition Explorer (AMPTE/CCE), which were, however, limited to $L < 9.25$. Our extended investigation is therefore particularly useful for the study of dawn-side waves of which maximum power is found to be located at $10 < L < 12$. It appears that the wave power of the hydrogen band emission at dawn is almost as strong as that of the helium band waves at dusk and that the linear polarization at dawn is dominant in the helium band. These results will hopefully provide a guide to future studies of EMIC waves during the Radiation Belt Storm Probes (RBSP) mission.

Dipole Tilt Control of the Magnetopause for Southward IMF from Global Magnetohydrodynamic Simulations

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Numerical results from a physics-based global magnetohydrodynamic (MHD) model are used to examine the effect of the dipole tilt angle (ψ) on the location and shape of the magnetopause. Identification of the magnetopause location in the simulation domain is automated using criteria based on the current density and the shape of the streamlines. These data are fitted with a three dimensional surface controlled by ten configuration parameters which allow description of the cusp geometry as well as the asymmetry in the Z direction and the azimuthal asymmetry of the magnetopause. Effects of dipole tilt angle on the configuration parameters are analyzed from a series of simulations for southward IMF and different dipole tilt angle values. It is found that dipole tilt angle has little impact on the equatorial magnetopause, but significantly affects the cusp locations and the degree of asymmetry between northern/southern hemispheres and equatorial/meridional plane. The results are shown to be consistent with three frequently used empirical models derived from satellite observations.

Technical Session 7-4

Energetic Electron and Pc 5 ULF wave interactions during great geomagnetic storms

E. A. Lee[1, 2] I. R. Mann[1] L. G. Ozeke[1] and J. Paral[1]

[1]University of Alberta, [2]Grant MacEwan University

The dynamics of the outer zone radiation belt has received a lot of attention mainly due to the correlation between the occurrence of enhanced relativistic electron flux and spacecraft operation anomalies or even failures [e.g., Baker et al, 1994]. Relativistic electron events are often observed during great storms associated with ULF waves. However, the dominant processes which accelerate magnetospheric radiation belt electrons to MeV energies are not well understood.

We observed Pc 5 ultra low frequency (ULF) waves and electron flux simultaneously oscillating with the same frequencies in the time domain during selected geomagnetic storms. The mechanisms for the observed electron flux modulations are examined using ground-based magnetometer and in-situ LANL and CRRES satellite energetic particle observations. We also numerically calculate the trajectories and energy change of charged particles under the influence of model ULF wave electric fields. This modeling work is used to help to explain our observations and support the suggested modulation mechanisms such as advection of flux gradients or coherent drift resonance.

Technical Session 7-5

A global MHD simulation study for transient magnetic field and plasma flow variations in the magnetosphere boundary under steady solar wind and IMF conditions

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Using a three-dimensional magnetohydrodynamic simulation, we investigate transient variations in the magnetic field and plasma flow just inside the magnetopause during intervals with a uniform solar wind dynamic pressure and southward interplanetary magnetic field (IMF). Under the steady solar wind and southward IMF conditions, we find that a well-defined vortical plasma motion occurs around the morning and afternoon sector inside the magnetopause and that it recurs on a time scale of ~9 min. The flow vortex rotates counterclockwise (clockwise) in the afternoon (in the morning) and propagates tailward. During the passage of the vortex, the magnetopause undulates. Inside the vortex, total magnetic field is enhanced with a bipolar magnetic field perturbation in the field component normal to the magnetopause, but depressed near the center of the vortex. In this study we discuss how the vortex is quasi-periodically generated under the steady solar wind and southward IMF conditions. In addition, we discuss the difference between the vortical flow motion associated with Kelvin-Helmholtz instability under northward IMF and the vortical motion in our simulation under southward IMF.

Technical Session 8-1

Japanese Geospace Exploration Project: ERG

Y. Miyoshi[1] , T. Ono[2] , T. Takashima[3], K. Asamura[3] , M. Hirahara[1]
Y. Kasaba[2], A. Kumamoto[2], A. Matsuoka[3], H. Kojima[4], K. Shiokawa[1]
K. Seki[1], M. Fujimoto[3], T. Nagatsuma[5], and ERG working group

[1]STEL Nagoya University, Japan, [2]Tohoku University, Japan,
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The ERG (Energization and Radiation in Geospace) is a geospace exploration mission in Japan for the solar maximum and subsequent declining phase of solar cycle 24. The mission is especially focusing on the relativistic electron acceleration mechanism in the context of the cross-energy coupling via wave-particle interactions as well as the dynamics of space storms. The project consists of the satellite observation team, the ground-based observation team, and integrated-data analysis/simulation team, as well as the science working team and the project science team. The comprehensive instruments for plasma/particles, field and waves are installed in the SPRING-B/ERG satellite to elucidate the electron acceleration processes. The Japanese ground-network teams including magnetometer, SuperDARN radar, optical imager, VLF, etc. join the ERG project, which are very powerful tool for geospace remote sensing. The integrated data analysis and simulation team is now developing the simulation tools which can be compared directly with the observations. In this paper, we will present the current status of the ERG project and possible collaborations with THEMIS and RBSP missions as well as other ground networks and simulation/data analysis.

International Conference on Radiation Belts and Space Weather
New Horizon from RBSP Mission May 29 ~ June 1, 2012 Hotel INTERCITI, Daejeon, Korea

Technical Session 8-2

Space Environment during Solar Minimum of CS-23

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Geomagnetic and solar storms and their occurrence rate with respect to the solar activity cycle is an important topic of space environment research. The minimum of solar activity during the solar cycle number23 (SC-23) have detectable effects on the space environments, where the monthly mean of sunspot number and solar proton events effecting the space environment and produced many of Geophysical effects. A detailed study of the centers of activity produced the proton events are carried out. The electromagnetic emissions at the different bands during the impulsive phase of the flare are tabulated and discussed. The different Geophysical effects due to the events are studied. Conclusions about the proton solar events at minimum activity are presented

MAGDAS Project Activities under ISWI

Authors:
G. Maeda[1], K. Yumoto[1], H. Kawano[1], A. Yoshikawa[1], H. Liu[1],
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The **MAGDAS Project** (PI: Prof. K. Yumoto of Kyushu University) believes that ISWI (*International Space Weather Initiative* – conducted under the auspices of the United Nations) is extremely important for space weather science (and, ultimately, for routine space weather nowcasting and forecasting) because the entire space science community must have the ground data (e.g., data from magnetometers and ionospheric radars) that can only be gathered from terrestrial regions outside of industrialized nations. Anyone who believes that good space weather science can be achieved without this hard-to-get data is seriously misinformed about the difficulties faced by space weather research as a whole. For example, this data cannot be acquired by Earth-orbiting satellites. In short, there is no substitute for getting observatories inside of developing nations.

Accordingly, this project has massively supported ISWI -- and before that IHY -- morally, technically, and politically. This paper outlines this support, and how this support will expand in scope by institutionalizing space weather science and education, as requested in the *Abuja ISWI Resolution* of **UN/ Nigeria Workshop on ISWI (2011)**. The United Nations is heavily engaged in ISWI for some political reasons: The UN seeks to have more Member States involved in space science so that a large "space divide" is not created between rich members and poor members.

To reduce this divide, the MAGDAS Project is actively engaged in Capacity Building. We have a basic premise: To secure the long-term and sustainable cooperation of developing nations for data acquisition, it is nearly essential to train their scientists on how to use the collected data. *Hence, this is Capacity Building:* (1) teach them how to run instruments, (2) teach them how to analyze the data from the instruments, and (3) teach them how to do science with the data. Capacity Building is conducted in several ways: (1) Convening MAGDAS Schools, (2) bringing young people to SERC for training, (3) getting some of them to go through a complete Phd (doctoral course) program at SERC, (4) installing MAGDAS units all over the world, and (5) freely providing data and technical assistance to those who take care of our MAGDAS units in the field.

The above abstract was written by G. Maeda of SERC on 30 March 2012.

Satellite Anomaly Information System (SIAS) for Identifying The Satellite Operation Disturbance

Neflia[1] and Nizam Ahmad[1]
[1]National Institute of Aeronautics and Space (LAPAN)

Space weather tends to cause destructive effects on satellites which are placed at Low Earth Orbit (LEO) and Geosynchronous Orbit (GEO). The failures of satellite operation in space can affect the system and sub system of satellite. The level of failures varies from temporary malfunction on its intrument which can be recovered by using special technique within a certain time to serious damages that can cause the instument can't be used forever (total loss). Recently, Indonesia has one microsatellite at LEO (LAPAN TUBSAT) and several communication satellites at GEO (Palapa and Telkom). All these satellites have propability experience failures during their operation in orbit. In the interest of anticipating and reducing of damages on Indonesian satellites due to space weather phenomena, it's important to have such a kind of information system that can give an early warning related to satellite problems in space. This system named as Satellite Anomaly Information System (Sistem Informasi Anomali Satelit - SIAS) that uses orbit propagation model (SGP4) and contains data base of satellite orbit and space weather parameters such as SSN, F10.7 index, Kp and Dst indices including energy and flux of particles derived from satellites such as NOAA and GOES. SIAS has been used to analyze some problems on satellite system at low earth orbit and this result will be used to identify the probability of failures on Indonesian satellites caused by space weather phenomena

Ⅵ. CONFERENCE INFORMATION

1. REGISTRATION

▪ **The registration desk will be open at the Lobby of 4F of The Hotel INTERCITI during the following hours;**

Date	Time
May 29, 2012 (Tue.)	16:00 ~ 18:00
May 30, 2012 (Wed.)	08:00 ~ 18:00
May 31, 2012 (Thu.)	08:00 ~ 18:00
June 1, 2012 (Fri.)	08:00 ~ 12:00

▪ **Registration Fee**

Type	Advanced Registration	On-Site Registration
Regular Registration	$200	$250
Student Registration	$150	$200
Accompanying Person	$100	$150

• **Regular Registration includes**
- Admission to all Sessions, Refreshments, Welcome Reception, Lunch, Banquet, Program Book

• **Student Registration includes**
- Admission to all Sessions, Refreshments, Welcome Reception, Lunch, Banquet, Program Book

• **Accompanying Person includes**
- Welcome Reception, Banquet

▪ **Name Tag**

Participants are required to wear their name tag in the session room, which are given upon registration.

2. OPENING CEREMONY

Opening ceremony will be held at Lavender Hall on Wednesday, May 30, 2012 from 09:00 to 09:10.

3. SOCIAL PROGRAMS

We hope these programs will offer you a good opportunity to promote friendship and to create new ones with colleagues all over the world.

▪ **Welcome Reception**

All participants are invited to attend the Welcome Reception to be held on Tuesday, May 29, 2012 at 18:00 in the Emerald Hall(5F), Light refreshment will be served.

Date & Time	May 29, 2012 (Tuesday) / 18:00~20:00
Place	Emerald Hall(5F), Hotel INTERCITI
Fee	Free to all Conference Registrants

▪ **Banquet**

The banquet takes place at the Emerald Hall(5F), Hotel INTERCITI.

Date & Time	May 31, 2012 (Thursday) / 18:00~20:00
Place	Emerald Hall(5F), Hotel INTERCITI
Fee	Included in Conference Registration Fee.

4. VENUE

HOTEL INTERCITI *Conference Venue!*

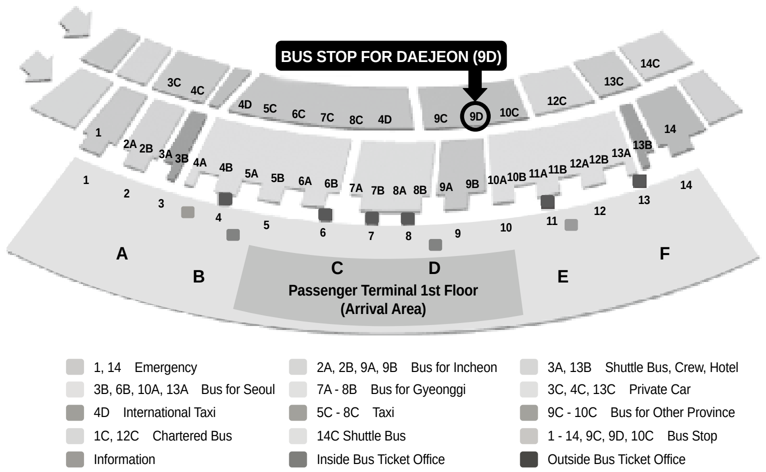
Interciti is a top-rated hotel which puts prior to customer's satisfaction. The hotel pursues, externally, internationalization and differentiation and efficiency internally.

The hotel has a very good view that customers can see the whole branch of Geumgang and convenience for business. As the hotel is located in the center of Yuseong, which is a hot spring area, customers can enjoy spa and leisure.

5. Transportation

01. Incheon Int'l Airport ⇒ Daejeon Government Complex

- Take an Airport Limousine Bus from Incheon Int'l Airport to Daejeon.

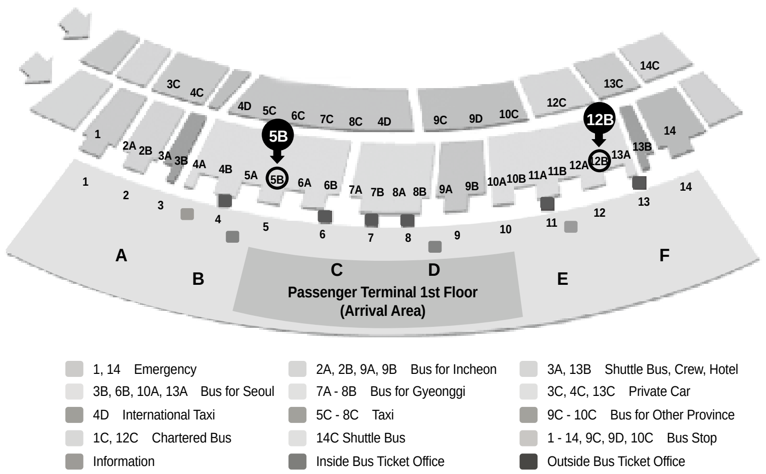


02. Incheon Int'l Airport ⇒ Seoul Station ⇒ Daejeon Station ⇒ Daejeon Government Complex

Incheon Int'l Airport ⇒ Seoul Station

1) By Airport limousine bus

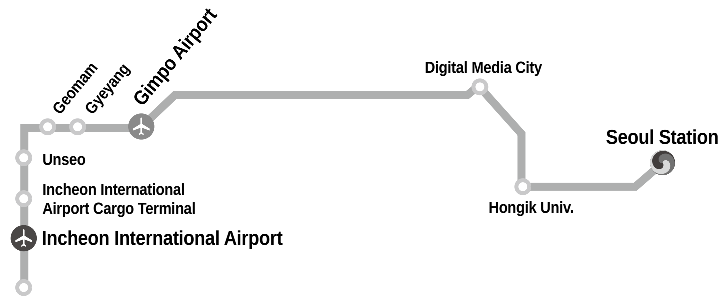
Purchasing Limousine Bus tickets, and also can get information at Bus Ticketing Office: Exit 4, 9 (Indoors), Exit 4, 6, 7, 8, 11, 13 and 9C (Outdoors). Please take a Limousine Bus at Bus stop 6A, 12B for standard Limousine and 4A 10B for Deluxe Limousine.



Bus stop	Bus	First Departure	Last Departure	Operation Hour	Interval	Fare (KRW)
6A, 12B	Limousine (Standard) (6001)	5:00	20:00	75 mins.	20~30mins	14,000
4A, 10B	Limousine (Deluxe)	5:20	21:40	65 mins.	10~15mins	15,000

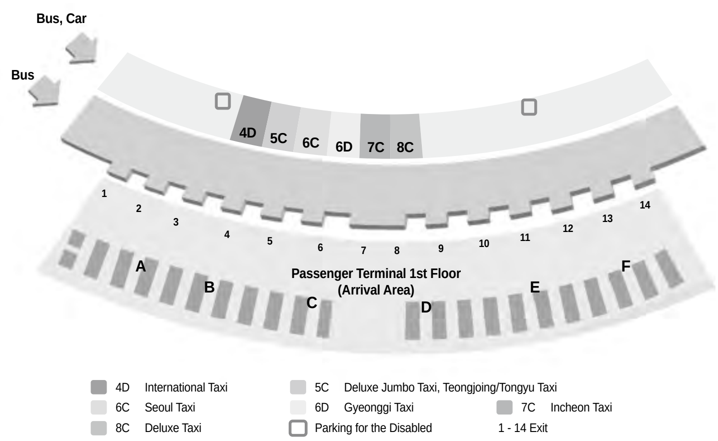
2) By Subway

Please take AREX(Airport Railroad train) at Incheon International Airport Station, then take off the Train at Seoul Station (KTX)



3) By Taxi

Alternatively, participants can take a regular taxi or a deluxe taxi to Seoul Station. To take a taxi, please use the taxi stop in front of the passenger terminal of Incheon Int'l Airport



6. GENERAL INFORMATION

▪ About Korea

Tucked away in northeast Asia, Korea is a nation that boasts a fast growing economy and a lifestyle that brings together the old and the new. Once known simply as a quiet nation in the East, the peninsula now hardly sleeps as it pulsates with life and commerce. Numerous branch offices of international corporations and businesses can be found throughout the country as well as most western franchises. Despite all such enthusiasm for modernization and globalization, Koreans still greatly value their 5,000 years for history. Numerous global events take place here every year.

▪ Location

Korea lays in the northeastern part of the Asian continent. It is located between 33 degrees and 43degrees in Northern Latitude, and 125 degrees and 132 degrees in Eastern Longitude. China, Russia, and Japan are adjacent to Korea. Local time is nine hours ahead of GMT.

▪ About Daejeon

The city's name comes from the Chinese characters 大(dae) and 田(jeon), which means "great field" Daejeon is the fifth largest city in Korea after Seoul, Busan, Daegu, and Incheon with a population of approximately 1.5 million people on an area of 540㎢(the total area of the Korean peninsula is 222,154㎢). Daejeon was formerly the capital of Chungcheongnam-do (province), which still maintains its administrative head office in the city. It was upgraded to a metropolitan city in 1995. Currently there are 7 metropolitan cities in Korea. Located in the center of Korea, Daejeon serves as a hub of transportation. Major expressways and railways connecting the country from the north to south converge in Daejeon. With this wonderful transportation network, it is possible to travel to anywhere in the country within half a day from Daejeon.

▪ Climate

Korea's climate is regarded as a continental climate from a temperate standpoint and a monsoon climate from a precipitation standpoint. The climate of Korea is characterized by four distinct seasons. Spring and autumn are rather short, summer is hot and humid, and winter is cold and dry with abundant snowfall. Temperatures differ widely from region to region within Korea, with the average being between 6 °C (43°F) and 16 °C (61°F).

< Monthly Temperature >

Month	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Temperature	-4	0	5	12	17	22	26	28	17	10	0	-4

▪ Language

Koreans use Korean. However, many of them can communicate in English. Hangeul, Korean written language characters set, was invented in 1443, during the reign of King Sejong. 'The unminjeongeum,' a historical document which provides instructions to educate people using Hangeul, is registered with UNESCO. UNESCO awards a 'King Sejong Literacy Prize, 'every year in memory of the inventor of Hangeul.

English	Korean (Hangeul)	Korean Pronunciation
How are you?	안녕하세요?	Annyeong-haseyo?
Thank you.	감사합니다.	Gamsa-hamnida.
Yes.	예.	Ye.
No.	아니오.	Aniyo.
I am sorry	미안합니다.	Mian-hamnida.
I enjoyed the meal.	잘 먹었습니다.	Jal meogeot-sseumnida.
Please give me some more of this.	이것 더 주세요.	Igeot deo juseyo.
The check, please.	계산서 주세요.	Gyesanseo juseyo.
Do you take credit cards?	카드로 계산할 수 있습니까?	Kadeuro gyesan halsu isseumnikka?
How much is it?	얼마입니까?	Eolma-imnikka?
It is _________won.	___________원입니다.	_________won imnida.
5,000	오천	O-cheon
10,000	만	Man
15,000	만오천	Man-o-cheon
20,000	이만	I-man
30,000	삼만	Sam-man
Where is the rest room?	화장실 어디입니까?	Hwajangsil oedi-imnikka?
Goodbye.	안녕히 계세요	Annyeonghi gyeseyo.

▪ **Currency**

The unit of Korean currency is the Won (₩). Coin denominations are ₩10, ₩50, ₩100 and ₩500. Banknotes are ₩1,000, ₩5,000, ₩10,000, and ₩50,000, the exchange rate is approximately USD 1 to KRW 1,150

Currency Exchange	Foreign banknotes and traveler's check can be exchanged at foreign exchange banks and other authorized moneychangers.
Credit Cards	Diners Club, Visa, American Express and MasterCard are widely accepted in major hotels, shops and restaurants. Check with your credit card company for details of merchant acceptability and other services which may be available.
Traveler's Check	Accepted, but may be difficult to change in smaller towns. To avoid additional exchange rate charges, travelers are advised to take Traveler's check in US Dollars.
Banking Hours	Monday to Friday 09:30 ~ 16:00.

▪ **Electricity**

In Korea, an outlet for 220 volt is available. Overseas delegates bringing laptop computers and other electrical appliances are advised to check whether a transformer is required.

▪ **Tipping**

Tipping is not customary in Korea. Service charges are included in your bill on the price of rooms, meals, and other services at hotels and restaurants. Sometimes, expensive restaurants and luxury hotels may add a service charge of 10%.

▪ **Insurance and Emergency**

The organizing committee will not be responsible for medical expenses, accidents, and losses or other unexpected occurrences. Participants are advised to arrange their own insurance that they regard necessary. Emergency call numbers are 112 for police and 119 for fire / rescue and hospital services.

▪ **Telephone Calls**

Cell-phone Rental Services are available at Incheon International Airport. This service must be ordered in advance. Online-Reservation is possible on www.Tour2Korea.com.

▪ **Public Phone**

There are three types of public telephones in Korea: coin-operated telephones, card phones, and credit card phones. A local call costs 70 won (US$0.06) for three minutes. Intercity calls cost considerably more. Coin phones return coins that are not charged, but do not return change for partially used 100 won coins. Card telephones can be used to make international calls as well as local and intercity calls. Telephone cards come in 2,000, 3,000, 5,000, and 10,000 denominations and are on sale in shops close t telephone boxes and in banks. There are also credit card phones, which accept use with major credit cards.

※ **How to make a International Call in Korea**

001 - <Country Code> - <Area Code> - <Telephone No.>

※ **How to make a call to Korea**

<International calling service number> + 82 - <Area Code> - <Telephone No.>

▪ **Korea Travel Phone 1330**

When you need English assistance or travel information, just dial 1330, and a bilingual operator will offer you detailed information on tourist sites, transportation, restaurants, etc. If you want information about areas outside of Seoul, enter the area code of that region before pressing 1330.

Ⅴ. AUTOR INDEX


New Horizon from RBSP Mission
http://rbsp2012.kasi.re.kr/


International Conference on
Radiation Belts and Space Weather
May 29 ~ June 1, 2012 Hotel INTERCITI, Daejeon, Korea

TECHNICAL PROGRAM | Technical Sessions

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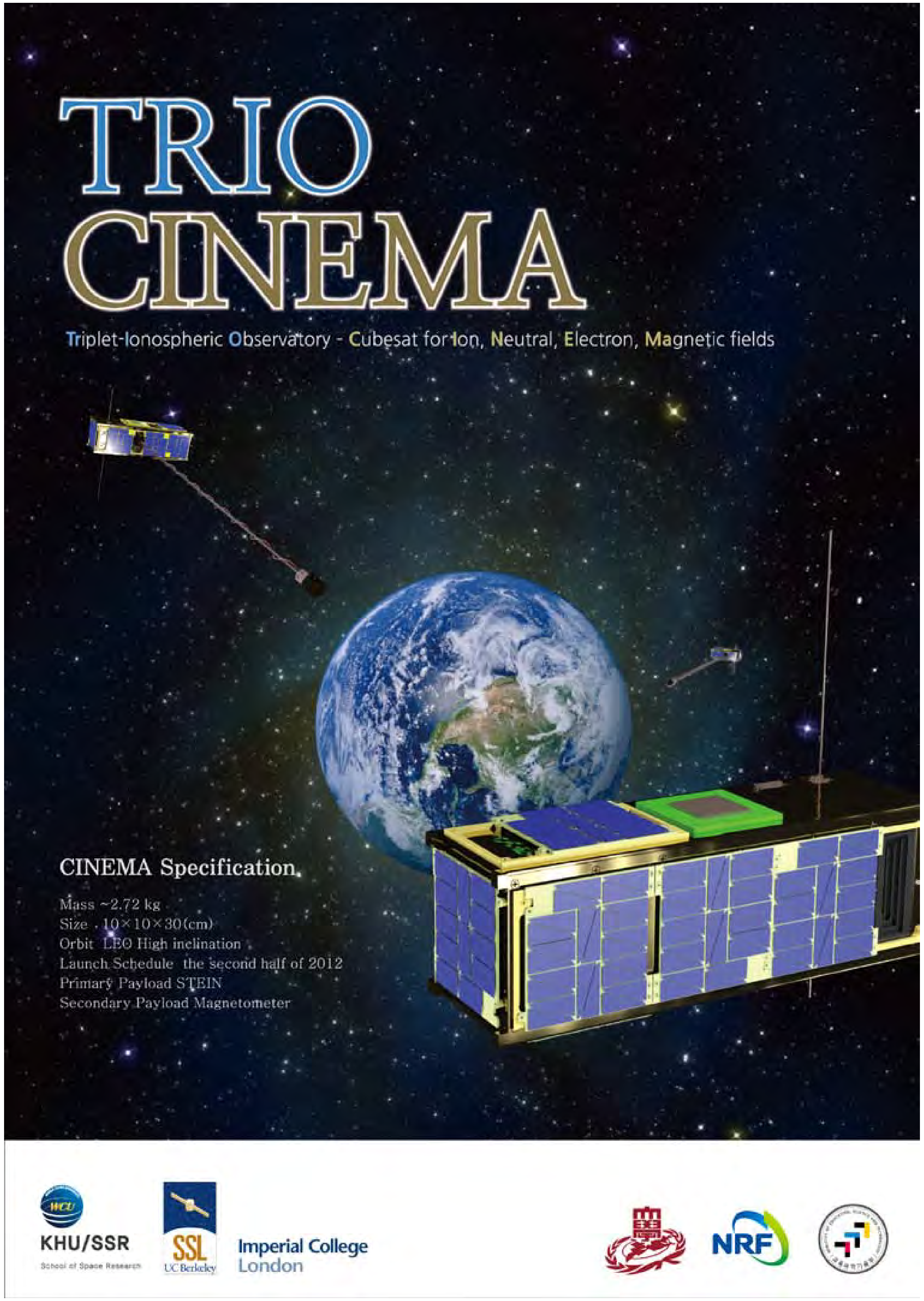

우주전파센터 예·경보 서비스 안내

우주전파센터 홈페이지(www.spaceweather.go.kr)에서는 현재의 우주전파환경 상황을 한눈에 볼 수 있는 종합상황판을 제공하며, **예·경보 알림 서비스를 신청하면 태양활동에 대한 예보와 경보 서비스를 이메일과 문자 메시지(SMS)를 통하여 알려 드립니다.**

"우주전파 재난 걱정 없는 안전한 대한민국,
우주전파환경을 책임지는 국가 대표기관이 되겠습니다!"

〈우주전파센터 찾아오시는 길〉

695-922 제주시 한림읍 귀덕로 198-6
TEL. 064-797-7012, FAX. 064-797-7019

* 공항–우주전파센터는 약 25km 정도로 자동차로 약 40분 정도 소요

우주전파센터 설명회 및 국제 컨퍼런스에 관계자 여러분을 초대합니다.

국립전파연구원 우주전파센터에서는 태양흑점 폭발현상에 대비하기 위해 우주전파환경 예·경보 서비스에 대한 인식을 제고하고 국내외 협력체계 구축 및 우주전파환경 피해사례 대응방안 논의를 위한 **설명회 및 국제 컨퍼런스**를 개최하오니 많은 관심과 참석을 부탁드립니다.

우주전파센터 설명회 행사

- 일 시 : 2012. 6. 21(목) 10:30 - 18:00
- 장 소 : 우주전파센터 대회의실 (제주시 한림읍 귀덕로 198-6)
- 사전등록 : 2012. 6. 8(금)까지, e-mail - zzang4208@kcc.go.kr
- 일정계획

시 간	주 요 내 용
11:00 - 11:30	우주전파센터 소개
11:30 - 15:00	우주전파환경 강의 (1층 대회의실) · 태양흑점 폭발현상 개요 · 태양흑점 폭발로 인한 대표적 피해사례 현황 · 우주전파환경 지역경보센터 현황
15:00 - 15:40	우주전파센터 관측 시설 현황
15:40 - 16:20	오늘의 우주전파 환경 예·경보 브리핑 및 예보상황실 견학
16:40 - 17:40	관측시설 견학 / 예보관 전문 교육

우주전파환경 국제컨퍼런스 행사

- 일 시 : 2012. 10. 11(목) 10:00 - 18:00
- 장 소 : 우주전파센터 대회의실 (제주시 한림읍 귀덕로 198-6)
- 일정계획

시 간	주 요 내 용
10:30 - 11:00	Opening (축사/환영사)
11:00 - 12:00	우주전파환경 해외 대응현황
13:30 - 15:20	우주전파환경 국내 대응현황
15:40 - 16:40	우주전파환경 수요기관 대응현황
17:00 - 18:00	우주전파환경 예·경보 R&D 현황

RRA NATIONAL RADIO RESEARCH AGENCY 국립전파연구원