2005 CEDAR and GEM Workshops

Joint CEDAR-GEM Workshops

See plenary handout for details for Sunday Student Workshops.

Tuesday, 2005 June 28, 10:00 a.m. – 12:00 p.m., La Fonda Ballroom

(J1) Electrodynamic M-I coupling at sub-auroral latitudes

Conveners:
Stanislav Sazykin (sazykin@rice.edu), Rice University
Phil Erickson (pje@haystack.mit.edu), MIT Haystack Observatory

Electric fields at subauroral latitudes play an important role in determining global ionospheric plasma density distribution, modify hot ion (ring current) particle behavior, and influence structures in optical emissions of the diffuse aurora and subauroral airglow. The morphology of the electric fields is determined by a complicated combination of the electrodynamic and particle precipitation processes, and the subauroral ionosphere-inner magnetosphere is a strongly coupled system. As a result, during geomagnetic disturbances the usual convection electric field can be amplified in the evening/nighttime subauroral ionosphere leading to strong, poleward, highly dynamic, and possbly structured electric fields confined to narrow regions just equatorward of the diffuse aurora that are termed SubAuroral Polarization Stream (SAPS) events. The term SAPS includes (but is not limited to) SubAuroral Ion Drift (SAID) and Polarization Jet events.

Tentative List of Speakers

- M. Liemohn, TBD (modeling)
- J. Foster, SAPS and Its Effects: An Ionospheric Perspective
- R. Greenwald, Transient Sub-auroral electric fields
- A. Streltsov, SAID inside SAPS (modeling)
- J. Goldstein, Imaging perspecitve of subauroral E-fields
- I. Mann, Intense ULF waves and M-I coupling at mid-latitudes during the Halloween 2003 storm

- P. Puhl-Quinne, Cluster Observations of SAPS electric fields
  Cluster inner-magnetospheric electric field observations thought to be related to the SAPS/SAID phenomenon will be presented.
- A. Maute, Hemispherically asymmetric electric potential solver for M-I coupling
- R. Lysak, Modeling M-I Coupling at Mid-Latitudes
- M. Parkinson, Radar observations of SAPS signatures during substorms
- M. Henderson, SAPS and giant auroral undulations
- M. Meyer, TBD (radar data)
- C. Lin, Satellite observations and modeling of electric fields during magnetic superstorms

Tuesday, June 28th 2005, 1:30 p.m. - 3:30 p.m.

(J2) MI Mass Transfers and Storm Time Plasmasphere

Conveners:
Dennis Gallagher (dennis.l.gallagher@nasa.gov)
Robert Shunk (schunk@cc.usu.edu)
Fred Menk (red.menk@physics.org**)**

This joint CEDAR/GEM session on ionosphere/plasmasphere coupling will be on storm-time plasma redistribution, heating, and other mass coupling topics**.**

Tuesday, June 28th 2005, 1:30 p.m. - 3:30 p.m

(J3) International Polar Year (IPY), International Heliophysical Year (IHY), and Electronic Geophysical Year (eGY)

Convener:
Roger Smith (roger.smith@gi.alaska.edu), University of Alaska

Prompted by the upcoming 50th anniversary of the International Geophysical Year (IGY), several programs are being developed for international coordinated research activity in geophysics. These programs have different focus areas. The International Polar Year (IPY) concentrates its attention on the high latitude zones of Earth. The International Heliophysical Year (IHY) expands the frontier of the IGY to the boundary of the heliosphere with a focus on fundamental processes. The Electronic Geophysical Year (eGY) is a cross-cutting program aimed at the development of optimized and interoperable data and processing systems that can serve the needs of an interdisciplinary research environment.

The purpose of this workshop is to help CEDAR and GEM scientists to benefit from IPY/IHY/eGY and become involved. Come to hear about these scientific programs scheduled for the 50th anniversary of the International Geophysical Year in 2007/8. Apart from the scientific advantages of coordinated international research, there will be opportunities for legacy-building, education and outreach that will strengthen our disciplines and their interaction with external communities.

Schedule

0130-0135: Introduction - Roger Smith
0135-0235: Information
0135-0150: IPY - Roger Smith
0150-0205: IHY - Nikki Fox
0205-0220: eGY - Bill Petersen
0220-0235: NSF/AMISR, other - Rich Behnke
0235-0325: Participation
0235-0245: CAWSES - Duggirala Pallamraju
0245-0255: ICESTAR - Aaron Ridley
0255-0310: Virtual Observatories - Eric Kihn
0310-0325: Other
0325-0330: Conclusion

Wednesday, June 29, 1:30 p.m. - 3:30 p.m. in La Fonda Ballroom
Overflow: Thursday June 30, 1:30p.m. - 3:30 p.m. in La Fonda Ballroom
(J4) Auroral Boundaries: Finding Them in Observations and Model Output Files

Conveners:
Josh Semeter (jls@bu.edu)
Bill Peterson (Bill.Peterson@lasp.colorado.edu)

GEM modeling has progressed to the point where investigators are comfortable tracing field lines and identifying the boundary of the open/closed field lines as the poleward auroral boundary.

With the advent of AMISR and support of the large array of ground and space based instrumentation that simultaneously cover a significant fraction of the auroral oval region it makes sense to start thinking about if and how information about the instantaneous location of the poleward and equatorward auroral boundaries can be derived and used either as ground truth or validation of large scale magnetospheric codes.

Wednesday, 2005 June 29, 4:00-6:00 PM, Eldorado Zia Room
(J5)Distributed and Virtual Observatories

Conveners:
Mark Moldwin (mmoldwin@igpp.uclaedu)
Eric Donovan (eric@phys.ucalgary.ca)

This joint CEDAR and GEM working group session will share descriptions of ongoing VxO efforts and continue ongoing community discussions of the instrument suites needed for solving some of the long standing solar-heliosphere-magnetosphere-ionosphere-atmosphere coupling problems. What strategy should the DASI community follow: global array of inexpensive

instruments or regional array of high-dollar comprehensive systems. What instruments are crucial?

Known Speaker:
Vladimir Papitashvili, vpapita@nsf.gov, Virtual Global Magnetic Observatory VGMO.NET: Concept and Status

Wednesday, 2005 June 29, 4:00 p.m. - 6:00 p.m., Eldorado Anasazi Room
(J6)Modeling and Assimilation

Conveners:
Aaron Ridley (ridley@umich.edu)
Jan Sojka (fasojka@gaim.cass.usu.edu)

Recently, many more data sets in the ionosphere and magnetosphere have become available. For example, the question of continuous month long data sets is becoming the norm rather than the exception. In the magnetosphere, the IMAGE satellite provides synoptic pictures of the plasma distribution. In addition, models of these regions have become much more sophisticated. There is emerging a need to better couple models with data sets. This typically has come in the form of data-model comparisons and validation efforts. Other groups have begun creating data-assimilation models

Wednesday, June 29 01:30 p.m. - 3:30 p.m. in La Fonda Ballroom
Overflow: Thursday June 30, 1:30 p.m. - 3:30 p.m. in La Fonda Ballroom
(J4)Auroral Boundaries: Finding Them in Observations and Model Output Files (See Wednesday Description)

CEDAR Workshops ("j" of interest to GEM)

Monday, 2005 June 27, 1:30 p.m. – 3:30 p.m., Eldorado Zia Room
(C3) Meteors and the upper atmosphere

Conveners:
Lars Dyrud (ldyrud@bu.edu)
Diego Janches (diego.janches@colorado.edu)

Every year approximately 100,000 tons of meteoric material impacts Earth's atmosphere near 100 km altitude. However, many questions remain on this meteor mass and energy flux and the impact of this flux on upper atmospheric chemistry and ionization. Additionally, researchers have used radar reflections from meteor trails to remotely sense winds and temperatures near the mesopause, but with mixed success, and using an unresolved theoretical basis.

Available Abstracts

Observations of the 2002 and 2004 Leonids shower by the Platteville, CO 50 MHz meteor radar.
Santiago de la Pena, CIRES delapena@ucsu.colorado.edu Susan Avery CIRES susan.avery@colorado.edu James Avery University of Colorado james.avery@colorado.edu Diego Janches CORA diego@cora.nwra.com

We present observations of the 2002 and 2004 Leonids shower from the Meteor Echo Detection and Collection (MEDAC) radar system at the Platteville Atmospheric Observatory in Colorado. Distinct observed meteoroid populations, differences between observed shower and sporadic activity, and a method to calculate the radiant flux of the meteors is presented.

Meridional Winds and Tides in the MLT over the South Pole Measured with an Interferometric Meteor Radar
Elias M Lau (Elias.Lau@Colorado.EDU), Susan K. Avery, University of Colorado, Susan.Avery@Colorado.EDU, James P. Avery, University of Colorado, James.Avery@Colorado.EDU, Diego Janches, Colorado Research Associates, diego@cora.nwra.com, Scott E. Palo, University of Colorado, Scott.Palo@Colorado.EDU

Meteor radars are routinely used to measure winds in the mesosphere and lower thermosphere (MLT). A meteor radar system with interferometric capabilities was installed at the Amundsen-Scott station at the South Pole and has been operating with minor interruptions since 2002. We present the measured winds and the diurnal and semidiurnal tides that dominate the horizontal wind field in this polar region.

Monday, 2005 June 27, 1:30 p.m. – 3:30 p.m., Eldorado Anasazi
(C6, j?) High-latitude Joule heating and neutral atmosphere substorm response

Conveners:
James Hecht (james.hecht@aero.org), Aerospace Corporation
Miguel Larsen (mlarsen@clemson.edu), Clemson University

The response of the high-latitude thermosphere/ionosphere system to Joule heating and Lorentz forcing continues to be a topic of considerable interest. Topics for investigation include our ability to specify the forcing accurately due to the scale-size dependence of the Lorentz forcing and especially the Joule heating. The response of the neutral atmosphere to such forcing is also being shown to be more subtle than had previously been appreciated. For example, there is evidence for a strong response in the upper E region even in relatively quiet conditions in the vicinity of stable arcs. In the lower E region, the effects of moderate forcing can sometimes have more impact on the neutral atmosphere than the effects of stronger forcing simply because the height range where the strongest response occurs moves up or down as the strength of the forcing changes. Three recent experiments that have addressed these topics include the HEX, CODA, and JOULE experiments that were carried out at Poker Flat, Alaska.

Agenda

- Introduction (Larsen)
- Ongoing launch opportunities in the sounding rocket program (Hickman)
- Imaging coherent scatter radar results for the HEX/JOULE period (Bahcivan, Hysell)
- Overview of HEX results (Lummerzheim, Conde, Craven)
- Overview of JOULE wind results (Zhan, Observations Of Neutral Wind Gradients In The Auroral Oval During Two Substorm Events)
- GCM modeling results for the HEX/JOULE period (Crowley)
- Joule heating modeling (Deng)
- Rocket E-field and plasma density measurements (Pfaff)
- Suprathermal Ion Imager ion drift measurement results (Sangalli, High-resolution ion drift measurements from the JOULE sounding rocket mission; Knudsen)
- Ionization gauge measurements (Clemmons)
- Analysis of heating results (Slocum, Hecht)
- M-I coupling associated with small-scale structure (Semeter)
- Overview of plans for JOULE 2 and HEX 2 (Larsen et al.)
- Description of AMISR capabilities and support for future experiments (Thayer)

Available Abstracts:

High-resolution ion drift measurements from the JOULE sounding rocket mission

Laureline Sangalli (sangalli@phys.ucalgary.ca), D. J. Knudsen, J. Burchill, R. F. Pfaff, C. Steigies, J. H. Clemmons, and M. F. Larsen

The JOULE sounding rocket mission was designed to investigate structured Joule dissipation in the auroral ionosphere. JOULE was launched March 27, 2003 from Poker Flat, Alaska, into an active substorm. The mission included two instrumented rockets and two chemical release (TMA) rockets in addition to ground-based diagnostics. One of the instrumented payloads carried a Suprathermal Ion Imager (SII) that measured 2-D (energy/angle) distributions of the core (0-8 eV) ion population at a rate of 125 images per second. In this presentation we compare bulk ion drifts derived from the SII with those inferred from DC electric fields. From differences in these two parameters we calculate the local Joule heating rate at a spatial resolution of 8.

Observations Of Neutral Wind Gradients In The Auroral Oval During Two Substorm

Tianyu Zhan (tzhan@clemson.edu), Miguel F. Larsen, Clemson University, mlarsen@clemson.edu; I.S. Mikkelsen, Clemson University, ism.al@mail.tele.dk; Geoffrey Crowley, Southwest Researrch Institute, gcrowley@swri.org

Two sounding rocket experiments, CODA 2 and JOULE, were carried out at the Poker Flat Research Range in Alaska on February 21, 2002, and on March 27, 2003, respectively. Three chemical tracer rockets in CODA and one in JOULE were launched successfully as part of the experiments. The trimethyl aluminum (TMA) trails were released on the upleg and downleg portions of the flights between approximately 80 and 180 km altitude, thus providing measurements of the

horizontal neutral wind profiles under different conditions of auroral activity and forcing. The CODA 2 and JOULE launches were both characterized by significant gradients in the plasma drifts, and therefore the forcing, although CODA 2 occurred during a substorm that followed a long period of quiet conditions while the JOULE launches occurred after many hours of active conditions. In CODA 2, the neutral wind had two peaks, namely at 95 to 100 km with 110 m/s southwestward and at 100 to 105 km with 140 m/s northeastward. In JOULE, on the other hand, the largest winds were at 115 to 120 km altitude with speeds of ~200 m/s southwestward. Narrow jet features were observed at the wind peak in both experiments. Typical accuracies are 5-10 m/s over the altitude range covered by the releases. Large shears were found in both experiments, but the strongest shears were at a lower altitude of 95 to 105 km in CODA 2, as compared to 110 to 115km in JOULE. The shears at the bottom side of the jet were highly unstable with the Richardson number close to or less than 0.25. The tip of the wind vector rotated clockwise, with a nearly circular variation in CODA 2, and clockwise but with a more linear polarization in JOULE. The elongated wind hodograph observed in the JOULE experiment is a characteristic of more active conditions when the flow is dominated by plasma forcing. Along with the geophysical conditions measured by ground-based magnetometers, the SuperDARN radars, local all-sky cameras, the GUVI instrument on the TIMED satellite, the CHAMP and Orsted satellite magnetometer measurements, the observed features of the E-region wind field are interpreted as being produced by a combination of the plasma forcing associated with the auroral activity and the tidal forcing. The AMIE procedure and the NCAR TIME-GCM model were used to simulate the conditions of the JOULE experiment. The results show some structure that is similar to the observed winds, but in general, the model winds are much smaller in magnitude and have much weaker gradients than those that were observed.

Monday, 2005 June 27, 1:30 p.m. – 3:30 pm, Eldorado Sunset Room

(C9, j?) Nighttime midlatitude F region structures: What are they and how should we study them?

Conveners:
Jonathan Makela (jmakela@uiuc.edu)
John Mathews (jdmathews@psu.edu)
John Meriwether (john.meriwether@ces.clemson.edu)

For several decades now, nighttime F-region structure over Arecibo has been observed by various research groups using a myriad of instruments. Incoherent scatter radar has shown bands of density enhancement/depletions propagating overhead. Tilting filter photometer measurements have demonstrated intense gradients in 630.0-nm intensity. Allsky images have elucidated the two-dimensional structure while GPS measurements of total electron content show the presence of sharp gradients in electron density.

Depending on who observed each structure and what type of instrument they were using, these nighttime F-region structures over Arecibo have been alternately called "F-layer height bands," "meridional intensity gradients (MIGs)," "mediumscale traveling ionospheric disturbances (MSTIDs)," and "intense midlatitude spread-F." Are all of these the same phenomenon, or are there a variety of processes that can produce structure at the lower midlatitudes?

Previous work has been relegated to studying these phenomena from a single location. Structures are seen to develop both temporally and spatially in a complex fashion. Observations from a single location cannot detail the entire lifecycle of these structures. Thus, it is still unclear what the sourcing region is. Are they locally generated? Do they grow from the equatorial region? How long do the structures last?

2005 June 28, Tuesday, 10:00 a.m. – 12:00p.m., Eldorado Zia Room
(C13) Maui-MALT - New Results and Future Plans

Conveners:
Gary Swenson (swenson1@uiuc.edu)
Mike Taylor (mtaylor@cc.usu.edu)

Background: Maui-MALT is a well-established research program funded jointly by the National Science Foundation (NSF) and the Air Force Office Scientific Research (AFOSR). Its primary goal is to investigate the dynamics of the middle atmosphere at low/equatorial latitudes in unprecedented detail. The program capitalizes on the high quality observing conditions and the excellent facilities available at the USAF AMOS facility located at the 10,000 ft summit of Haleakala Crater, Maui, Hawaii.

Coordinated measurements using a cluster of passive optical and meteor radar instruments were initiated in 2002. The basic mode of operation to date has comprised several focused campaigns (using the lidar facility) for detailed dynamical studies imbedded in 4-year long time series of passive optical and meteor radar measurements. Current instrumentation includes an Na wind/temperature lidar (U of I) utilizing the AMOS 3.7 m telescope, an OH/O2 band temperature mapper (USU), an all-sky OH imager and an OH/O2 band zenith photometer (U of I), a multi-channel airglow imager and a narrow field 630 nm `spread F' imager (Cornell U), a fast IR OH imager (Aerospace Corp), and a meteor radar
(U of I).

Maui-MALT has achieved great success quantifying the low-latitude MLT region, however, we have now reached a stage where new operating scenarios need to be considered due to recent cost increases. The workshop will therefore focus initially on an overview of the program followed by several short presentations highlighting new results (as part of a Special issue of JGR). The second half of the workshop will be an "open forum" discussion on plans for future operations in Hawaii, possibly from other sites and an introduction to the new Maui-MALT Enterprise lidar developments.

Tuesday, 2005 June 28, 10:00 a.m.-12:00 p.m., Eldorado Anasazi Room
(C14) Mesosphere and Lower Thermosphere (MLT) zonal mean and wave variabilities

Conveners:
Elsayed Talaat (elsayed.talaat@jhuapl.edu)
Jeng-Hwa (Sam) Yee (sam.yee@jhuapl.edu)
Scott Palo (palo@colorado.edu)

The coordination of ground-based and satellite observations under the TIMED/CEDAR program has provided unprecedented coverage of the Mesosphere and Lower Thermosphere (MLT) region. The ground-based instruments provide measurements of MLT winds and temperatures at specific geographic locations over many local times and complement the TIMED instruments, which provides similar measurements globally at one or two local times on any given day. These two data sets can be combined to obtain the true mean fields and a higher-time-resolution picture

of atmospheric waves, especially tides. Additionally, over the last few years, different techniques have been developed to address the aliasing in measurements obtained by spaceborne instruments. It is the focus of this workshop to coordinate datasets to study the zonal mean, tides, and planetary waves and causes of their short-term variabilities and foster collaboration between satellite and groundbased teams to identitfy techniques for combining datasets and overcoming aliasing. We encourage people to present specific observations and scientific topics that can be examined through multiple datasets.

Available Abstract:

The Temporal and Vertical Structure of the Diurnal and Semidiurnal Tides Over the Antarctic Polar MLT in 2002 and 2003

Elias.Lau@Colorado.EDU Susan K. Avery, University of Colorado, Susan.Avery@Colorado.EDU James P. Avery, University of Colorado, James.Avery@Colorado.EDU Scott E. Palo, University of Colorado, Scott.Palo@Colorado.EDU

A meteor radar system at the geographic South Pole has been in quasi-continuous operation since 2002. The system measures the horizontal wind field in the mesosphere-lower thermosphere (MLT) to help understand the large scale dynamics of the Antarctic polar region. Using these observations we have been able.

Tuesday, 2005 June 28, 1:30 p.m. -3:30 p.m., Eldorado Sunset Room

(C2) C/NOFS and equatorial ionosphere issues

Conveners:

Odile de La Beaujardiere (odile.delabeaujardiere@hanscom.af.mil), Hanscom AFB
Cheryl Huang (cheryl.huang@hanscom.af.mil), Hanscom AFB
David Hysell (daveh@geology.cornell.edu), Cornell University
Michael Kelley (mck13@cornell.edu), Cornell University
Vincent Eccles (vince.eccles@spacenv.com), Space Environment Corporation
Robert Pfaff (rob.pfaff@gsfc.nasa.gov), Goddard Space Flight Center
Jorge Chau (chau@geo.igp.gob.pe), Jicamarca Radio Observatory

This workshop will address the challenges in forecasting the equatorial ionosphere and irregularities within. The discussions will be related but not limited to the C/NOFS (Communication and Navigation Outage Forecast System) mission.

C/NOFS is a satellite mission dedicated to forecasting ionospheric densities, irregularities and scintillation. It will be launched in 2005, in a 13 degrees inclination, 710 x 375 km orbit. Its instruments will provide plasma parameters, electric & magnetic fields (AC and DC), density fluctuations, and neutral wind. It will also have a GPS receiver, and an RF beacon. Ground-based instruments and models, and space weather products are an integral part of the mission.

The purpose of this workshop is to:

1. Address the main difficulties in forecasting the equatorial ionospheric behaviors
2. Define collaborative projects that involve ground and space measurements
3. Report on CNOFS validation plans and accomplishments

Wednesday, 2005 June 29, 1:30 - 3:30 PM, Eldorado Zia Room

(C8) The EQUIS 2 Kwajalein campaign results

Conveners:
Miguel Larsen (mlarsen@clemson.edu), Clemson University
David Hysell (daveh@geology.geo.cornell.edu), Cornell University

The EQUIS 2 sounding rocket campaign was carried out at Kwajalein atoll in the central Pacific in August and September 2004. The campaign represents the first new sounding rocket measurements in the equatorial region in over a decade. The campaign provided new measurements of both E-region and lower F region electrodynamics and plasma irregularities. In addition to the in situ measurements, the campaign provided an extensive incoherent scatter radar data set obtained with the dual-frequency, fully-steerable ALTAIR radar which operated on approximately half the nights during the campaign period. The workshop will focus on results from the campaign, as well as related results dealing with equatorial dynamics.

Agenda

- Introduction (Larsen)
- Sounding rocket program campaign capability overview (Hickman)
- ALTAIR radar observations overview (Kudeki, Hysell)
- Wind observations (Yount)
- Electrodynamics of neutral atmosphere/ionosphere wave coupling (Gelinas)
- Bottomside spread F (Hysell)
- Daytime D and E region turbulence (Lehmacher)
- Equatorial E region electrodyanamics/plasma physics (Pfaff)
- Discussion of possible future launches and other experiments at Kwajalein
    - Possible C/NOFS tie-ins (Beach)
    - Kwajalein as a permanent launch site (Hickman)

Wednesday, 2005 June 29, 1:30 p.m. – 3:30 PM, Eldorado Sunset Room

(C11) Synergistic Mesosphere and Lower Thermosphere (MLT) science study with ground-based and satellite (TIMED and others) observations

Conveners:
Chiao-Yao (Joe) She (joeshe@lamar.colostate.edu), Colorado State University
Qian Wu (qwu@ucar.edu), HAO at the National Center for Atmospheric Research

TIMED science program included ground-based observation from the on-set through TIMED/CEDAR and NASA/NSF collaboration with the expectation of great science enabled via synergy between ground-based and space-borne observations, and model simulation. With TIMED four instruments observing for more than four years, and many improved ground-based CEDAR instrument observing correlatively, many interesting and unexpected science results were made possible because of the synergism between ground-based and TIMED observation. The existing ground-based and past satellite data sets also allow more close examination of long-

term observations in the mesosphere and lower thermosphere (MLT) region by combining current data sets with past observations. The purpose of this workshop is to bring together recent highlights of the collaborated research as well as to discuss more creative synergistic collaborations and long-term MLT studies in the future.

Wednesday, 2005 June 29, 04:00 p.m. – 6:00 p.m., Eldorado Sunset Room
(j2) Introduction to proposal writing

Conveners:
Stan Briczinski (sjb144@psu.edu)
Carlos Martinis (martinis@bu.edu)

For new Ph.D.s entering the academic community, proposal writing can be a daunting task. Join Bob Kerr from the NSF and Phil Richards from NASA for a discussion on what funding agencies are looking for in grant applications. The format of this workshop is intended to be a panel discussion geared toward graduate students interested in academic careers and those who have recently received their Ph.D. Feel free to come with any questions or comments you may have.

Thursday, 2005 June 30, 1:30-3:30 PM, Eldorado Sunset Room
(C1) Mesospheric effects of sudden stratospheric warming events

Conveners:
Irfan Azeem (azeem71d@erau.edu), Embry-Riddle Aeronautical University
Hanli Liu (liuh@ucar.edu), HAO, National Center for Atmospheric Research

Over the last few years, several studies have documented mesospheric response to sudden stratospheric warming (SSW) events. Mesospheric cooling has been observed to precede peak SSW events, and there is evidence of feedback coupling between the stratosphere and mesosphere. Many aspects of the dynamical and chemical state of the mesosphere during these events are still relatively unknown. In this workshop we intend to bring together our current understanding of the effects of sudden stratospheric warming on the mesospheric dynamics and thermal structure. This workshop is expected to provide an opportunity for modelers and experimentalist to bring together their results related to mesospheric manifestation of sudden stratospheric warming events. The workshop will provide on open forum for participants to get together, discuss their data, models results, and plan their collaborative research. If you wish to present your research, please contact one of the conveners with a title and a short abstract.

Available Abstract:
Observations of stratospheric warmings and mesospheric coolings by the falling sphere instrument during the MaCWAVE winter campaign
Ling Wang and David C. Fritts Colorado Research Associates/NorthWest Research Associates lwang@cora.nwra.com dave@cora.nwra.com

The falling sphere temperature measurements during the MaCWAVE winter campaign conducted in the northern Scandinavia during January 2003 are analyzed in this study. It is found that there is a stratospheric warming event at ~ 30 km on January 24-27, which is accompanied by an upper mesospheric cooling during the same period of time. Also, there

appears to be a downward propagation of the upper mesospheric cooling. Similar coupling of stratospheric warmings and mesospheric coolings, although in different time and locations, has also been observed from the TIMED/SABER instrument (Siskind et al. 2005), and has been modeled in two recent studies (Liu and Roble 2002; Coy et al. 2005). The observational and modeling studies suggest the significant impact of the stratospheric warming (and the resultant change of gravity waves that can reach the upper mesosphere) on the mesospheric temperature.

Thursday, 2005 June 30, 1:30 p.m. – 3:30 p.m., Eldorado Anasazi North Room

(j3) Magnetosphere-Ionosphere (M-I) coupling and ionospheric storms

Conveners:

Chaosong Huang (cshuang@haystack.mit.edu), MIT Haystack Observatory
Bela Fejer (bfejer@cc.usu.edu), Utah State University

Magnetic storms represent the largest disturbances in the magnetosphere and ionosphere. Energy input from the magnetosphere into the ionosphere is a major driver of ionospheric storms. It is generally accepted that negative storm phases are caused by neutral composition changes. In contrast, different mechanisms have been proposed to explain the generation of positive storm phases. Penetration of the interplanetary electric field to the ionosphere may play an key role during the first a few hours of magnetic storms. The ionospheric electric field can be very strong and cause increases in the midlatitude F-region electron density by moving the plasma particles upward and decreases in the equatorial F-region electron density by strengthening the fountain effect. The disturbance winds can cause a new atmospheric circulation at low latitudes 2-3 hours after storm commencement, and the dynamo electric field then becomes important. Although significant progress in this area has been made in recent years, a number of outstanding problems are not well understood.

1. What are global ionospheric disturbances during the main phase of magnetic storms?
2. How does global TEC change during magnetic storms?
3. What are the roles played by neutral disturbances and electric fields?
4. What is the mechanism for the generation of long-duration positive storms?
5. What causes the long-duration enhancement of the ionospheric electric field?
6. How well does the shielding/overshielding process work during magnetic storms?
7. How well do the current theories and models describe the phenomenon of electric field penetration?

We will present new observational and simulation results to address the above problems. In particular, we will discuss what causes the ionospheric electric field to enhance continuously for several hours and how the enhanced electric fields and neutral winds produce different ionospheric disturbances and storm phases.

Speakers and topics:

- Bela Fejer (USU), Latitudinal effects of storm-time electric fields,
- Mike Kelley (Cornell), Electric field penetration and ionospheric disturbances
- Chaosong Huang (MIT), Long-duration penetration of the interplanetary electric field to the low-latitude ionosphere
- Joe Huba (NRL), Modeling of storm time penetration electric fields,
- Naomi Maruyama (NCAR), What determines the storm time electric field?
- Mike Keskinen (NRL), Simulation studies of storm electric field effects on equatorial spread F

- Yongliang Zhang (JHU/APL), GUVI storm-time observations of composition changes and ionospheric behavior
- Marlene Colerico (MIT), Storm enhanced density (SED) events during magnetic storms
- John Emmert (NRL), Storm-time thermospheric winds
- Fedrizzi, Mariangel (NOAA/SEC), Contribution of different mechanisms responsible for F-region height changes during geomagnetic storms
- Ray Greenwald (JHU/APL), Initial observations of storm-time penetration electric fields with the SuperDARN Wallops Island radar

2005 June 30, 1:30 p.m. – 3:30 p.m., Eldorado Zia Room
(C10) Optical Calibration Techniques and Issues

Conveners:
Susan Nossal (nossal@wisp.physics.wisc.edu)
Mike Taylor (mtaylor@cc.usu.edu)
Tom Slanger (tom.slanger@sri.com)

Building on the calibration workshop held at last year's CEDAR workshop, we will continue our discussion of strategies for optimizing optical calibration techniques. Calibration is important for comparing observations taken by different instruments, for model-data comparisons, and for acquiring long term data records. We invite workshop participants to describe techniques for absolute and relative optical intensity calibrations and for spectral calibration, including advantages, challenges, and uncertainties associated with the calibration approach. We also encourage discussion of strategies for cross-calibration between instruments. Following the series of short tutorials, we plan to leave 1/3 to 1/2 of the workshop time for discussion.

Presenters:

- Brian Sharpee, Absolute Intensity Calibration using standard stars
- Tom Slanger, Intensity Calibration using the Keck Spectrometer
- Jeff Baumgardner, Intensity Calibration of Boston University Imagers
- Yaj Bhattacharya, Reference Line Center Calibration for a Michelson Interferometer

Sam Yee, Calibration corroboration using solar irradiance observations from several satellite instruments

Thursday, 2005 June 30, 4:00 p.m.—6:00 p.m., Eldorado Sunset Room
(C4) Improving neutral wind specification in the E and F regions

Conveners:
John Emmert (jemmert@gmu.edu)
Doug Drob (douglas.drob@nrl.navy.mil)

Neutral winds are an important component of the coupled ionosphere-thermosphere system, and affect the distribution of ionospheric plasma via numerous processes. Experimental and theoretical studies often require accurate estimates of neutral dynamics, but concurrent wind

data are generally sparse or not available. In these cases, empirical assimilations of past winds measurement can be used to predict large-scale wind patterns for given geophysical conditions.

Currently, the only global empirical model of thermospheric neutral winds is the Horizontal Wind Model (HWM), which was last updated in 1993. Development of an upgraded empirical model is underway, and the current focus is on improving the performance of HWM in the E and F regions, particularly during geomagnetically disturbed conditions. In this workshop, we will discuss large-scale thermospheric wind behavior, the impact of winds on ionospheric properties, and ways to improve empirical wind specification.

We invite contributions of climatological wind results in the E and F regions, and contributions that highlight the important aspects of winds in ionospheric studies. We also welcome results from numerical simulations (especially multi-year studies and investigations of systematic storm effects), which can benefit from and contribute to empirical studies. Following the presentations, we will discuss strategies for the HWM upgrade; comments and suggestions from the community are highly desired.

Thursday, 2005 June 30, 4:00 p.m. – 6:00 p.m., Eldorado Anasazi Room
(j5) Comparative Magnetosphere-Ionosphere Coupling

Conveners:
Aaron Ridley (ridley@umich.edu), University of Michigan
Jackie Schoendorf (jschoendorf@mrcnh.com), Mission Research Corporation

This workshop compares aspects of M/I Coupling on Earth with that of other planets. Its goal is to bring together the variety of expertise we use to understand our own space environment and use this to address outstanding questions related to other planets, and vice-versa. Brief introductions to comparative magnetospheres and aeronomy (of Mars, Saturn, and Jupiter) will be provided for context, followed by an open discussion of similarities and differences between M/I coupling of planetary bodies and Earth. In addition, we will discuss outstanding questions that we as a community would like to address.

Thursday, 2005 June 30, 4:00 p.m. – 6:00 p.m., Eldorado Zia Room
(j6) Scheduling the upper atmospheric facilities for World Day coordinated experiments

Conveners:
Wesley Swartz (wes@ece.cornell.edu), Cornell University

Coordinated experiments (called "World Days") at the Upper Atmospheric Facilities (UAFs) are conducted approximately 21 days each year under the auspices of the URSI Incoherent Scatter Working Group (ISWG). Other ground-based and space based instrument clusters are also encouraged to take data on these days and contribute to the scientific studies. The CEDAR meeting has proven to be a convenient and timely forum for scheduling these experiments. The schedule is finalized by mid-August and then published in the fall as part of the International Geophysical Calendar.

World Days provide for coordinated operations of the incoherent scatter radars for some common scientific objective, and are scattered throughout the calendar year. (e.g., see last year's schedule at http://people.ece.cornell.edu/wes/URSI_ISWG/2004WDschedule.htm.) The data collected during these days are readily available in the CEDAR database and/or through other online databases.

Requests for World Day experiments should:

- Outline the science objectives.
- Describe the measurements required to meet the science objectives (including the parameters to be measured, the altitude range over which the measurements are to be made, and time resolution).
- List which UAFs and which instruments are to be included.
- Include the radar operating modes for each ISR.
- List the dates or seasons, time intervals, number of days, or hours for the observations.
- Name a point person for coordinating the details of the experiments.
- Send your preliminary requests by 2005 May 17 via Email to:
  Dr. Wesley E. Swartz
  Chairman of the URSI ISWG
  wes@ece.cornell.edu
- Your requests can include links to your own web sites for sample data or further explanations. The links can be added to the web page with the preliminary schedule.
- Also bring your requests to the World Day Scheduling Meeting together with project status, sample data, and results etc. from previous related World Day experiments.

A preliminary, World Day schedule for 2006 will be placed at
http://people.ece.cornell.edu/wes/URSI_ISWG/2005WDschedule.htm

Other useful information can be found on the index page at
http://people.ece.cornell.edu/wes/URSI_ISWG

The agenda for the scheduling workshop will include:

- Short reviews of past World Day Experiments--speakers to be assigned.
- Outlines of campaign proposals for the 2006 calendar submitted prior to meeting.
- Proposals from the floor, if any.
- Discussion of non-specific "data-base" days,-- assignment of modes and dates.
- Resolution of conflicts and overlapping objectives.
- Review of any remaining action items.

Known Speaker:
Maria Kuznetsova**,** Community Coordinated Modeling Center support of the upper atmospheric facilities

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Friday, 2005 July 01, 8:00 a.m. - 10:00 a.m. and
10:30 a.m.-12:30 p.m., Eldorado Anasazi Room

(j4) Coupled Geospace: Part 1: Jan 2004 flares, magnetic activity and solar wind voids (Joint ICESTAR-CAWSES campaign), March/April 2004 CAWSES campaign events, High Speed Streams in 2003; Part 2: Magnetic storms and superstorms, other sun-earth events

Conveners:
Larry Paxton (larry.paxton@jhuapl.edu), Applied Physics Laboratory at the John Hopkins University
Janet Kozyra (jukozyra@umich.edu), University of Michigan

The current solar cycle has provided new opportunities to examine the coupled geospace system as it responds to a variety of drivers. Since the launch of the TIMED satellite in late 2001, geospace has been rocked by powerful high speed streams in 2003, four different superstorm events in 2003 and 2004, a variety of magnetic storms, high dynamic pressure hits, and intervals of repeated long-duration flare events, the latest in January 2005, which also produced several post-ejecta regions of extremely low density solar wind. The solar wind void intervals permitted intense up to 10 keV polar rain to enter the polar cap creating strong interhemispheric asymmetries in the ITM system during a magnetically active interval. Evidence is accumulating that:

1. the MLTI response depends on the order of solar and solar wind drivers through preconditioning effects
2. coupling between geospace regions is important in determining even features as fundamental as the polar cap potential
3. disturbances to atmospheric chemistry may be prolonged through interactions with dynamical features in the atmosphere
4. extreme events may modify signatures of ion-neutral coupling

At the same time, a distributed fleet of operating satellite missions Worldwide are viewing elements of the system from sun to Earth. Ground-based observations are becoming more integrative, providing global rather than regional views of the system. New efforts at integrating ground-based observations, through global maps and data assimilation are being pursued as part of the CAWSES program, the ICESTAR program and in preparation for the International Heliophysical Year 2007. This workshop seeks to find new ways of integrating observations from satellites, and ground-based facilities, assimilative models and large-scale simulations to explore the ionosphere and atmosphere as active elements in the geospace system.

Friday, 2005 July 01, 8:00 a.m. – 10:00 a.m., Eldorado Sunset Room

(C12) Recent Advances in Terrestrial Gamma-ray Flash (TGF) and Sprite Research

Conveners:
Mark Stanley (stanleym@lanl.gov), Los Alamos National Laboratory
Victor Pasko (vpasko@psu.edu), The Pennsylvania State University
Mike Taylor (mtaylor@cc.usu.edu), Utah State University

This workshop will focus on recent experimental and theoretical advances in the understanding of terrestrial gamma-ray flashes (TGFs), sprites, and other unusual atmospheric discharge phenomena which influence the stratosphere, mesosphere, and beyond.

Sprites are spectacular luminous glows which occupy volumes in excess of thousands of cubic kilometers in clear air above thunderstorms in the altitude range ~40-90 km. Sprites often exhibit an amorphous non structured glow at their tops, which gradually converts to highly (predominantly vertically) structured breakdown regions at lower altitudes. Sprites are transient in nature and last only a small fraction of a second following intense positive or negative lightning discharges (more than 90% of sprites are associated with positive lightning discharges). Observations from ground and from space indicate that sprites occur over most regions of the globe (in temperate and tropical areas, over the oceans, and over the land).

Terrestrial gamma-ray flashes (TGFs) have been observed by the RHESSI satellite with photon energies exceeding 20 MeV. Recent evidence indicates a strong relationship between TGFs and a certain type of lightning discharge. The gamma rays are almost certainly the result of bremsstrahlung from a high energy electron beam. Unlike sprites, TGFs are focused mainly in the tropics and readily occur during daylight. It has been widely assumed that TGFs occur at high altitude (overlapping with sprites) in order to produce an observable gamma-ray flux in orbit, though recent data is challenging this assumption.

This year's workshop will discuss plans for the summer 2005 campaigns in the USA and elsewhere as well as coordinated observations with RHESSI (TGFs) and FORMOSAT 2 (sprites). New modeling and theoretical studies will also be presented.

Schedule:

0800-0900 AM Four invited talks: 12min each w/ 3min for discussions

1. Stephen Mende -- Results from ISUAL on sprites
2. David Smith / John Sample (presenter) -- RHESSI TGF results
3. Robert Roussel-Dupre -- High-Altitude Discharges and Terrestrial Gamma-Ray Flashes
4. Steven Cummer -- TGF and sprite measurements

0900-0940 AM **SHORT** contributed talks with discussions
0940-1000 AM General Discussions

Available Abstract

High-Altitude Discharges and Terrestrial Gamma-Ray Flashes

Robert A Roussel-Dupre (bobrd@lanl.gov)
Eugene Symbalisty (esymbalisty@lanl.gov)
Laurie Triplett (ltriplett@lanl.gov)

The recent measurements of Terrestrial Gamma-Ray Flashes (TGFs) obtained by the Reuvan-Ramaty High Energy Solar Spectroscopic Imager (RHESSI) show a spectrum that extends from 60 keV to ~ 20 MeV in good agreement with the predictions of runaway breakdown at altitudes extending from 15-30 km. However, the few VLF-ELF measurements that have correlated with TGFs to date are not consistent with large charge moment changes such as those observed in conjunction with high-altitude discharges. This poses a dilemma for current models that associate runaway breakdown with strong sprites. In this paper we present detailed simulations of a high-altitude runaway discharge that is initiated by a slow intra-cloud flash as has been proposed previously [cf., Roussel-Dupre, R., and Gurevich, A.V., JGR. A 101, No. A2, 2297, 1996; Yukhimuk, V., R.A. Roussel-Dupre, and E.M.D. Symbalisty, GRL 25, No. 17, 3289, 1998]. Optical and gamma-ray emissions are calculated for comparison with observations.

Friday, 2005 July 01, 8:00 a.m. – 10:00 a.m., Eldorado Zia Room

(j7) HLPS-Plasma structures in the cusp regions and their electrodynamics and plasma dynamics

Conveners:
Caesar Valladares (valladar@bc.edu), Boston College
Jan Sojka (fasojka@gaim.cass.usu.edu), Utah State University
Lie Zhu (zhu@cc.usu.edu), Utah State University

In the HLPS (High-Latitude Plasma Structures) Working Group of the CEDAR Program, experimentalists, theoreticians, and modelers join their efforts to study various issues of high-latitude plasma processes, including polar cap auroras, plasma patches, and traveling convection vortices. Over the past decade, numerous observational campaigns have been conducted by the group and several special issues of HLPS research progresses have been published.

For the 2005 HLPS workshop, we plan to expand the HLPS study into a new research area: the plasma structures in the cusp regions. This workshop will address recent results on merging, coupling, electrodynamics, and the role of the underlying ionosphere of the cusp region. The cusp can be understood as a region that maps to the magnetopause. The importance of this region resides in the participation of some of the cusp field lines in antiparallel merging. The main effect of the merging process is the generation of convection cells in both polar caps and the transferring of solar wind energy, momentum and particles into the magnetosphere and ionosphere. The ionospheric cusp is also a region where electron and ion precipitation can produce elevated densities. Similarly, the prevailing large electric fields are able to increase recombination rates and decrease the local density. These two mechanisms working in concert can generate unique patterns of enhancement and depletions. Polar cap patches, seen under IMF Bz negative conditions, can be produced by the above mentioned mechanisms, but also by the transient and sporadic nature of the reconnection process. Concurrently, decameter scale-size irregularities are typically observed in the ionospheric cusp. The objective of this session is to better understand the control that the solar wind IMF, the dynamic pressure and magnetic activity exert on the optical displays of the cusp aurora and on the occurrence of plasma structuring seen at the cusp and then at subsequent times convecting throughout the polar cap. Results will be welcome from ground based and satellite borne imagers, scanning photometers, radars, magnetometers, and from modeling/theoretical investigations, on the dynamics,

electrodynamics, and manifestations of cusp coupling processes of the solar wind-magnetosphere-ionosphere system and its conjugacy. The objective is to to unite the CEDAR and GEM communities in a discussion forum of the physics of the cusp region.

The workshop will mainly consist of short-presentations. At the beginning, there will be an introductory talk and at the end, we will hold an informal round-table discussion to plan future HLPS campaigns. Graduate students are especially encouraged to join this workshop.

Agenda

- Nelson Maynard, ATK, Introductory talk
- Mark Engebretson, Augsburg College
- Patrick Newell, JHU, "The Spectral Properties and Source Regions of Dayside Electron Acceleration Events"
- Shen-We Chang, Univ. of Alabama in Huntsville, "Plasma entry at the cusp and LLBL"
- Herb Carlson, AFOSR
- Joran Moen, Univ. of Oslo, Norway, "On the generation of HF radar backscatter irregularities in the auroral cusp"
- Yongliang Zhang, JHU, "Far-Ultraviolet Signature of Polar Cusp During Southward IMF Bz observed by TIMED/GUVI and DMSP"
- Mike Ruohoniemi, JHU, "HF radar observations of convection and plasma structuring in the cusp ionosphere"
- Rob Sheldon, MSFC, "Ionospheric footprint of the high-altitude (>8Re) MeV-electron cusp trap"
- D. Pallamraju (Raju), Boston Univ., "HIRISE Investigation of Daytime Cusplike Emissions: Recent Measurements and Future Experiments"
- Rick Doe, SRI, "Dayside ionospheric structure at Sondrestrom: New measurement and analysis tools"
- Marc Hairston, Univ. of Texas Dallas, "DMSP data availability for HLPS cusp studies"
- Discussion on future HLPS campaigns, chaired by Cesar Valladares and Lie Zhu.

Available Abstracts:
On the generation of HF radar backscatter irregularities in the auroral cusp

J. Moen, Department of Physics, University of Oslo, P. O. Box 1048 Blindern, N-0316 Oslo, Norway Also at Arctic Geophysics, The University Centre in Svalbard, N-9170 Longyearbyen, Norway

The combination of 2-D all-sky camera and CUTLASS Finland radar observations above Svalbard clearly demonstrates that once HF-backscatter has established, the optical cusp is associated with a band of high backscatter power and wide spectral widths. Doppler spectral widths >220 m/s appear to be a robust discriminator of the radar cusp backscatter. The gradient drift instability is regarded as the dominant mode for producing backscatter targets under IMF Bz south conditions. HF radar observations, 630 nm cusp auroral emission, and ionospheric tomography images are compared to investigate the mechanism by which radar cusp echoes are generated. Tomography imaging reveals spatial structures in the ionospheric electron density that map closely to the precipitation, but the large-scale horizontal gradients are insufficient for the rapid growth of irregularities by the gradient-drift mechanism. It is proposed that the initial source of the small-scale features responsible for the backscatter may be fine structure within the precipitation itself. However, subsequent breakdown of longer-lasting intermediate-scale gradients in the plasma convecting from the source region may account for the ongoing backscatter found poleward of the auroral band. A new sounding rocket project of which the scientific objective is to identify the physical mechanism(s) in the cusp ionosphere that generates HF backscatter irregularities will be presented.

The Spectral Properties and Source Regions of Dayside Electron Acceleration Events

P. T. Newell, S. Wing,, and C-I. Meng The Johns Hopkins University Applied Physics Laboratory Laurel, Maryland, 20723 (patrick.newell@jhuapl.edu)

Abstract. Eleven years of DMSP particle data (1984-1994) were used to investigate electron acceleration events on the dayside. Specifically, the characteristic energy (spectral flux peak), total energy flux, and probability of observing acceleration events was studied as a function of the type of dayside precipitation region (cusp, mantle, etc.). Most dayside electron acceleration events are latitudinally smaller than the events found premidnight, so that it is usually possible to identify the type of precipitation which surrounds dayside events. All dayside regions contain embedded electron acceleration events, with such instances most common in the dayside BPS, and least common in the mantle and polar rain. Electron acceleration events in the cusp are not particularly rare, but the acceleration involved is quite mild. This is consistent with findings that large nightside potentials do not form in regions with a large ambient electron population. Based on the fraction of spectra which are accelerated (number of accelerated spectra divided by the total number of spectra measured), the dayside regions can be ordered as follows, with the acceleration probability in parenthesis: mantle prenoon (2.4%), mantle postnoon (3.0%), cusp (4.2%), open LLBL (5.0%), closed LLBL prenoon (6.0%), closed LLBL postnoon (7.2%), BPS prenoon (8.2%), and finally BPS postnoon (8.6%). The total precipitating energy flux from electron acceleration has the same order, thus more dayside auroral luminosity is associated with the BPS than with any other region. When these regions are ordered by the spectral flux peak in acceleration events, the order changes, as follows: cusp (201 eV), open LLBL (234 eV), closed LLBL prenoon (390 eV), mantle prenoon (414 eV), closed LLBL postnoon (459 eV), mantle prenoon (463 eV), BPS prenoon (572 eV), and BPS postnoon (725 eV)
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Friday, 2005 July 01, 10:30 a.m. – 12:30 p.m., Eldorado Sunset Room

(C5) Middle atmospheric forecasting techniques

Convener:
Andrew Gerrard (agerrar@clemson.edu), Clemson University

It is well known that the success or failure of any forecast yields important information on our understanding of the system under study. To wit, as our basic knowledge of the middle atmosphere becomes more complete (i.e., moving from basic science to application), it becomes time to evaluate our understanding by making testable predictions of various phenomena and of the atmospheric state. For example, one may ask: Will mesospheric clouds form over northern Norway tonight? How intense will the display be? What will be the phase and amplitude of the semidiurnal tide throughout the evening? Will synoptic gravity waves be present? Will there be a MIL present? Of what amplitude?

Friday, 2005 July 01, 10:30 a.m. -12:30 p.m., Eldorado Zia Room

(C7, j?) Collaborative research using the low and mid-latitude facilities

Conveners:
David Hysell (daveh@geology.geo.cornell.edu), Cornell University
Mike Sulzer (sulzer@naic.edu), Arecibo Observatory

This session will address problems in low- and mid-latitude aeronomy and plasma physics, seeking strategies for resolving them by utilizing the facilities at Arecibo and Jicamarca. Projects and campaigns involving instruments at both facilities are of particular interest. A number of collaborative projects are already underway, including investigations into topside composition, F region thermal balance, Coulomb collisions, solar physics, and a range of meteor-related studies. Other projects are just beginning or being proposed, such as systematic studies of prompt penetration and the effects on ionospheric stability, the connections between mid-latitude and equatorial spread F, gravity wave seeding of ionospheric irregularities, E region plasma instabilities, bottomside F region composition, and D and E region aeronomy. The goal of the

workshop will be to highlight and facilitate existing work and to help coordinate the collaborate studies being proposed or planned.

Speakers:

- M. V. Codrescu (1) and T. J. Fuller-Rowell (2), GCM validation and verification: On the data needs. (1) Cooperative Institute for Research in Environmental Sciences, University Of Colorado, (2) Space Environment Center, National Oceanic and Atmospheric Administration.
- Marc Swisdak, Response of the ionosphere to different electric fields. Naval Research Laboratory.
- Naomi Maruyama (1), Dave Anderson (2), Adela Anghel (2), Stan Sazykin (3), Larisa Goncharenko (4), The latitude dependence of daytime, promptly penetrating electric fields. (1) NCAR/HAO, (2) Univ. of Colorado/CIRES; NOAA/SEC, (3) Rice University, (4) MIT Haystack Observatory.
- J. L. Chau, D and E region Incoherent Scatter Radar measurements of plasma densities and spectra over Jicamarca. Radio Observatorio de Jicamarca, Instituto Geofisico del Peru, Lima.
- Ronald Ilma, Jicamarca database holdings and issues. Radio Observatorio de Jicamarca, Instituto Geofisico del Peru, Lima.
- Marco Milla (1), Erhan Kudeki (1), and Jorge Chau (2), F-region density estimations using a Kalman Filter approach at Jicamarca. (1) University of Illinois at Urbana-Champaign, (2) Jicamarca Radio Observatory, Lima, Perú.
- Esayas Shume, Zonal MLT wind estimates from Jicamarca. Earth and Atmospheric Science, Cornell University, Ithaca, NY.
- L. Guo (1), G. Lehmacher (1), E. Kudeki (2), R. Sheth (2), M. Milla (3), P. Reyes (3), J. Chau (3), M. Sarango (3), R. Woodman (4), Progress of Recent Studies in the Tropical Mesosphere Using Jicamarca Radar Data. (1) Physics and Astronomy, Clemson University, (2) University of Illinois at Urbana-Champaign, (3) Jicamarca Radio Observatory, Lima, Perú, (4) Instituto Geofisico del Peru.
- A. Bhatt (1), E. A. Gerken (2), M. C. Kelley (1), M. P. Sulzer (3), E. B Shume (1), Gyro line observations in E and F regions during dawn at Arecibo. (1) Cornell University, (2) SRI International, (3) Arecibo Observatory.
- M. Oppenheim, Numerical simulations of Farley Buneman instabilities, Astronomy/ Center for Space Physics, Boston University.
- Michael Farve, New results from the upgrade of the Fabry-Perot interferometer at Arequipa. Physics and Astronomy, Clemson University.
- John Meriwether, Application of a miniaturized Fabry-Perot interferometer at Arecibo, PR this summer. Physics and Astronomy, Clemson University.
- Andy Gerrard, Development of a triple-etalon Fabry-Perot interferometer (SOFDI) for day and night observations of thermospheric winds: Application to Huancayo. Physics and Astronomy, Clemson University.

Available Abstracts:
Gyro line observations in E and F regions during dawn at Arecibo

A. N. Bhatt, Cornell University, anb22@cornell.edu E. A. Gerken, SRI International, egerken@gmail.com M. C. Kelley, Cornell University, mikek@ece.cornell.edu M. P. Sulzer, Arecibo Observatory, msulzer@naic.edu E. B. Shume, Cornell University, ebs27@cornell.edu

Experiments performed during PARS Summer School at Arecibo in August 2004 show evidence of gyro line in the incoherent radar spectra in the presence of photo-electrons. The gyro line is caused by the tail of the electron distribution, which at Arecibo latitudes consists of photo-electrons. We present here the experimental results and a comparison with theoretical model by Trulsen and Bjorna [1978], which shows a very good correlation. From this comparison, we think that by combining gyro line and plasma line techniques, we can make more difficult electron temperature measurement. At this point, we have no theory to explain the magnitude of the gyro lines that we have.. N. Bhatt, Cornell University, anb22@cornell.edu E. A. Gerken, SRI International, egerken@gmail.com M. C. Kelley, Cornell University, mikek@ece.cornell.edu M. P. Sulzer, Arecibo Observatory, msulzer@naic.edu E. B. Shume, Cornell University, ebs27@cornell.edu

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Progress of Recent Studies in the Tropical Mesosphere Using Jicamarca Radar Data

L. Guo (lguo@clemson.edu, Clemson Univ.), G. Lehmacher (glehmac@CLEMSON.EDU, Clemson Univ.) E. Kudeki (erhan@uiuc.edu, UIUC), R. Sheth (UIUC), M. Milla (mmilla@uiuc.edu, UIUC) P. Reyes (preyes@jro.igp.gob.pe, JRO), J. Chau (jchau@jro.igp.gob.pe, JRO), M. Sarango (msarango@jro.igp.gob.pe, JRO), R. Woodman(ronw@geo.igp.gob.pe, JRO)

Recent energy dissipation rate studies using 2002-2004 Jicamarca data will be shown. The spectral widths calculated from the spectrum for days in March 2003, May 2003 and July 2002, 2004 have been used to compute the mean kinetic energy dissipation rate D and eddy diffusivity K due to atmospheric turbulence following the method by Weinstock [1981]. The daily median D and K as well as the monthly median D and K are calculated. The contamination due to the beam broadening caused by a small beamwidth of 0.7 deg has been removed. Comparisons with the similar studies at different geographic locations are made. K and D values increase with height which is consistent with the result of Fukao et al. [1994]. An outlook of the currently active MST-ISR program will be presented including the discussion of future opportunities, such as the calculation of absolute reflectivities, ideas for interferometry and imaging, and joint observations with SOUSY.

Friday, 2005 July 01, 8:00 a.m.-10:00 a.m. and 10:30 a.m.-12:30 p.m., Eldorado Anasazi Room

(j4) Coupled Geospace: Part 1: Jan 2004 flares, magnetic activity and solar wind voids (Joint ICESTAR-CAWSES campaign), March/April 2004 CAWSES campaign events, High Speed Streams in 2003; Part 2: Magnetic storms and superstorms, other sun-earth events
(See earlier description.)

GEM Magnetosphere-Ionosphere Coupling Breakouts (MIC)

Monday, 2005, June 27, 10:30 AM-12:00 PM in La Terraza
Global Ion outflows and the polar wind

Conveners:
Robert Winglee
Bill Peterson

Specifying the global outflow of ions of all energies and validating them observations is necessary for progress in global magnetospheric models. This session is a follow on to the challenge issued in a joint session with GGCM campaign at the 2004 summer workshop. An interval (14:30 on 3/18/97 to 02:00 on 3/19/97) with well defined solar wind conditions and mass resolved ion outflow data fromAkebono, Polar, and FAST was identified as an example. Data for this interval is available at the URL: ftp://willow.colorado.edu/pub/exchange/GEM/
We are interested in hearing from modelers who have used this or other event data to validate their large scale simulations.
We are also interested in hearing about recent global average observations of the polar wind, energetic ions, and especially observations on the altitude the rate of energy gain as a function of altitude in the auroral zone.
Other presentations related to ionospheric outflows/polar wind and their interaction in the magnetosphere and/or plasmasphere are also welcomed.
Please notify the conveners: Robert Winglee winglee@geophys.washington.edu and Bill Peterson Bill.Peterson@lasp.colorado.edu of your intention to participate. Please give them a short description of what you plan to say and how long you will need to say it. We want to encourage discussion so we, strongly encourage short focused presentations.

Schedule:

- Winglee
- Discussion about model data comparisons
- Horwitz
- Ergun
- Discussion
- Chappell
- Peterson

Monday, 2005 June 27, 1:30 p.m. - 3:30 p.m. in La Terraza
Investigating the Auroral Acceleration Gap

Conveners:
Josh Semeter (jls@bu.edu)
Bill Lotko (w.lotko@dartmouth.edu)
Bill Peterson (Bill.Peterson@lasp.colorado.edu)

Large scale magnetospheric models currently account for the electromagnetic decoupling of the magnetosphere and ionosphere (associated with the auroral acceleration, or 'GAP' region) by invoking the ``Knight relation'' and the "Robinson formulas". These relations, however, constitute crude approximations that apply only to the upward current region. Acceleration processes and associated decoupling also occur in downward current regions and in Alvenic acceleration on auroral field lines.

There is a strong need for practical parameterizations of this 'gap region'. In this session we seek to approach the problem from a system identification perspective; we solicit contributions that address the question: What are the critical inputs and outputs required to characterize the gap region for global models?

Please notify the conveners: Josh Semeter () and Bill Peterson of your intention to participate. Please give them a short description of what you plan to say and how long you will need to say it. We want to encourage discussion so we, strongly encourage short focused presentations.

Schedule:

- Bob Ergun
- Bill Lotko
- Bob Strangeway
- Discussion
- Jim Horwitz
- Shin Ohtani
- Discussion
- Erik Lund
- Jan Song
- Discussion

Monday, 2005, June 27, 4:00 p.m.- 6:00 p.m

Small scale structuring of the ionosphere and its Influence on M-I coupling

Convener:
Josh Semeter (jls@bu.edu)

The structure and composition of the polar ionosphere are altered not only by direct forcing (e.g., precipitation, wave heating, convection, solar production), but also indirectly as a result of plasma instabilities (e.g., gradient-drift, Farley-Buneman). This induced variability influences M-I coupling in two broad ways. First, structure is commensurate with density gradients which, in turn, lead to polarization fields when currents are present, affecting the rate and distribution of Joule dissipation. Second, any process which affects composition affects the reservoir of ions available for magnetospheric extraction. Plasma transport across an open-close field line boundary is such a process.
The purpose of this session is to explore physical connections between processes that structure the high latitude ionosphere and models of magnetosphere-ionosphere coupling at all scales.

Schedule:

- Joshua Semeter
- Lars Dyrud
- Anatoly Streltsov
- Bob Lysak
- Kristina Lynch
- Miguel Larson

Tuesday, 2005, June 28, 1:30 p.m. - 3:00 p.m. & 4:00-6:00 p.m.

Global MI Coupling: Energy deposition and partitioning

Convener:
David Murr (David.Murr@Dartmouth.edu)

The GEM MI Coupling campaign has added a new working group this year to focus on global-scale observations and modeling of distributions of currents, electric fields, and ionospheric conductance. An associated topic is the amount, distribution, and partitioning of energy deposition in the MI system. Recent global observations have provided some of the first quasi-instantaneous and quasi-global measurements of the Poynting flux flowing through the MI interface [e.g., Waters et al., 2004; Korth et al., 2005]. These observations supplement existing capabilities of estimating the global precipitating particle energy flux into the ionosphere. Both of these quantities and their relative amplitudes and distributions are critical to global models that now couple to the ITM system. Poynting flux has also been found to be a useful parameter for characterizing ionospheric outflow processes [Strangeway et al., 2005].

We solicit contributions concerning the observation and modeling of global patterns of Poynting flux (at both DC and AC frequencies) and precipitating particle energy flux as a function of solar wind andIMF driving. We also solicit presentations that illustrate how these drive or effect MI coupling processes such as ionospheric outflow or thermospheric heating. Since this is the first session of a new working group, we are particularly interested in brief presentations and ones that explore or advocate possible future "GEM challenges" in this area.

Wednesday, 2005, June 2, 4:00 p.m. - 6:00 p.m

MI Coupling Campaign Breakout: Call for Participants: How well do Global Circulation Models (GCMs) reproduce fluctuations on all scales?

Conveners:
Mervyn Freeman (MPF@bas.ac.uk)

David Murr (david.murr@dartmouth.edu)
This session will challenge modellers and experimenters to characterise the statistical properties of fluctuations in the M-I system (e.g., power spectra in time and space, probability distributions of fluctuations (e.g., velocity differences) at varying separations in time and space, etc.) and to compare these properties in order to answer specific questions:

Are there preferred time and space scales?
Is the M-I system turbulent?
Are fluctuations the same in models and data?
What are the limiting scales of models and data?
Can we parameterise fluctuations on sub-grid scales? (for models and experiments)
How does our ability to model and measure structure at different scales
affect space weather prediction? (e.g., contribution of small-scale
structure to Joule heating, coupling between kinetic and MHD scales in
reconnection and substorms and aurora, etc.)

The challenge to modellers and experimenters is to look at much larger quantities of data than usual in order to access varying scales and get good statistics. How do we do this? Do we need new instruments, computers, technologies?

GEM Inner Magnetosphere and Storms (IM/S) Breakouts

Monday, 2005, June 27, 10:30 - 12:00
(WG1 and WG3) Assessment Challenge: Plasmasphere

Conveners:
Dennis Gallagher (dennis.l.gallagher@nasa.gov)
Brian Fraser (Brian.Fraser@newcastle.edu.au)

This IM/S plasmasphere modeling challenge session will be held on Monday,June 27, from 10:30AM to 12:00PM. This session is focused on plasmaspheric modeling results for the IM/S storms. The plasmaspheric modeling results sought of course include modeling where the plasmasphere is coupled to the ionosphere, ring current or radiation belts. Information about the storms and the IM/S assessment challenge can be found at http://csem.engin.umich.edu/GEM_IMS/. Measurements in support of model-data comparisons for the challenge storms can be found at ftp://ftp.nsstc.org/GEM.

Monday, 2005, June 27, 10:30 a.m. - 12:00 p.m
(WG2) Observational Evidence for Local Acceleration and Theoretical Modeling"

Conveners:
Richard Thorne (rmt@atmos.ucla.edu)
Danny Summers (dsummers@math.mun.ca)

This session is about observational evidence for or against the concept of local acceleration,together with theoretical and modeling studies of electron acceleration events.

Monday, 2005 June 27, 1:30 p.m. - 3:00 p.m.
IMS Assessment Challenge: Ring Current

Conveners:
Mike Liemohn (liemohn@umich.edu)
Vania Jordanova (vania.jordanova@unh.edu)

The Inner Magnetosphere/Storms (IM/S) Campaign will have a session dedicated to ring current results for the IM/S Assessment Challenge (IMSAC). There is a website for the IMSAC with more information about the challenge:

http://csem.engin.umich.edu/GEM_IMS/

There is also an ftp site for IMSAC, where one can find the relevant data for the plasmasphere, ring current, and radiation belt components of the challenge:

ftp://ftp.nsstc.org/gem/

Speakers and Preliminary Titles:

- Mike Liemohn: "Analyzing electric field morphology through ring current data-model comparisons"
- Mick Denton: "Modeled ring current distributions and comparison with MENA images"
- Sorin Zaharia: "Self-consistent ring current modeling: An iterative approach and application to the April 2001 Storm"
- Natalia Ganushkina: "TBD: Ring current results for the GEM Challenge Events"
- Pontus Brandt: "Global and a bit more quantitative ring current distributions during storms from IMAGE/HENA and Cluster/CIS"
- Vania Jordanova: "Ring current simulations with UNH-RAM of the GEM challenge events"

Monday,2005, June 27, 1:30p.m. - 3:00 p.m.
(WG-2 and WG-3) Electron Variability Caused by Radial Diffusion

Conveners:
Yuri Shprits (yshprits@atmos.ucla.ed)
Scot Elkington (Scot.Elkington@lasp.colorado.edu)

This session encourages a broad range of contributions related to the quantification of the effect of radial diffusion in the outer radiation belts. The focus of this session will include methods and results in radial diffusion modeling, calculation and characteristics of radial diffusion coefficients, comparison of electron variability with ULF wave measurements, and observations of boundary and source populations contributing to radial diffusion in the radiation belts. Other topics of interest include measurements or statistics of ULF waves in space and on the ground, MHD modeling of ULF phenomena, and validity of the quasilinear diffusion approximation.

Available Abstracts:

Identification of two distinct loss mechanism in the Nov 20th 2003 sharp radiation belt flux decrease event

Jacob Bortnik (jbortnik@gmail.com) Richard M. Thorne (rmt@atmos.ucla.edu) Yuri Y. Shprits (yshprits@atmos.ucla.edu) All from UCLA, Dept. of Atmospheric and Oceanic Sciences Paul O'Brien (paul.obrien@aero.org) The Aerospace Corporation

We examine HEO data of trapped energetic electrons in the outer radaition belt on Nov. 20th 2003 and show the development of two distinct regions of rapid electron depletion. The outer region (occurring at higher L-shells) suggests an outward diffusion toward the magnetopause, and an inner region (occurring at lower L-shells) showing a minimum energy below which electrons are not depleted consistent with EMIC wave scattering. A second set of data from the SAMPEX satellite shows the development of intense electron precipitation bands predominantly in the dusk sector, supports our hypothesis of EMIC scattering in the inner region.

Sources and Losses of the Relativistic Electrons due to Radial Diffusive Transport.

Y. Shprits(1) yshprits@atmos.ucla.edu, R. Thorne(1) rmt@atmos.ucla.edu, R. Friedel(2) rfriedel@lanl.gov, G. Reeves (2)reeves@lanl.gov (1) UCLA (2) LANL

We present a detailed analysis of individual storms as well as comparison of data and model for 200 CRRES. Relativistic electrons fluxes are derived as a functions of the Roederer L* using various field models. The rate of radial diffusion has been parameterized by the Kp with the loss time as an adjustable parameter. We find that radial diffusion is capable of redistributing relativistic electrons in the radiation belts. We also find that radial diffusion model with L* derived boundary conditions is capable of reproducing main phase depletions in the outer radiation belts, which shows that outward radial diffusion driven by losses to magnetopause may be a significant loss of relativistic electrons.

Monday, 2005. June 27,4:00 p.m.- 6:00 p.m.

(WG2 & WG3) IM/S Assessment Challenge: Radiation Belts

Conveners:
Reiner Friedel (friedel@lanl.gov)
Joe Fennell (Joseph.F.Fennell@aero.org)
Sasha Ukhorskiy (aleksandr.ukhorskiy@jhuapl.edu)

While the challenge specified two GEM storms for study, this session is open to anyone or any event that addresses an assessment of radiation belt model performance using in situ data. In particular contributions on advanced magnetic field modeling for these events are sought.

Details of the IM/S Assessment Challenge can be found at:
http://csem.engin.umich.edu/GEM_IMS/
Assessment Challenge Defined (from previous GEM messenger announcement):
The challenge consists of five interlinked parts, applied to two storm periods:
1.) Provide the highest possible fidelity in-situ data for relativistic electrons in the inner magnetosphere. The correct "map" for these measurements is produced in point 2.).
2.) Provide the best possible dynamic magnetic field model:
a) Using the PSD matching technique developed at LANL
b) Using the T89 modifications developed at FMI or elsewhere
c) MHD code models
d) Other
3.) Perform model runs for the selected storms. These runs may produce their own global magnetic field or use the provided dynamic fields.
Anticipated models that will be used:

a) UNH-RAM code, Vania Jordanova
b) Mei Ching Fok's ring current model
c) Margaret Chen's model
d) Salammbo pure
e) Salammbo data assimilation mode
4.) Comparison of particle data between model and data, using the magnetic field coordinate mappings using the best dynamic fields of 2.).
5.) Comparison of model-produced magnetic fields with fields of point 2.) .
Two storm periods have been selected for this challenge:
October 21-23, 2001
September 4-9, 2002
The October 21-23, 2001 has been chosen since it is already being used for the ring current challenge. The September 4-9, 2002 storm has been chosen for the existence of geosynchronous pitch angle data and because it is not an extreme event.

A web site has been established for the interchange of data related to this challenge:

http://csem.engin.umich.edu/GEM_IMS/IMSAC_RBdetails.html

Available Abstracts:

The Phase Space Density Distribution of Relativistic Electrons in Two GEM/IMS Selected Storms

Y. Chen, cheny@lanl.gov R. H. W. Friedel, fridel@lanl.gov G.D. Reeves, reeves@lanl.gov Los Alamos National Lab ISR-1 PO Box 1663, MS, D466 Los Alamos, NM 87545

What physics processes govern the behavior of relativistic electrons in the Earth's radiation belts in geomagnetic storm times is of keen interest to the space weather community. To address this question, two magnetic storms, during October 21-23, 2001 and September 4-9, 2002, have been selected for a thorough data and model study by the Geospace Environment Modeling (GEM) program as part of the Inner Magnetosphere/Storm (IMS) assessment challenge. This study will conduct a survey of the temporal evolving phase space density (PSD) distribution of relativistic electrons at fixed phase space coordinates in the two storms. Data used in this work include pitch-angle resolved electron and magnetic field measurements from multiple spacecraft, which are the LANL geosynchronous satellites, GOES satellites, POLAR and CLUSTER. With orbits going through all key inner magnetospheric areas, those satellites form a constellation which provides simultaneous measurements at multiple locations so that spatial factor can be easily separated from temporal one. Additionally, the fact that detected electrons have a wide range of adiabatic invariants, covering both equatorial and off-equatorial regions throughout L*~2-9, allows tracing a specified electron population across the adiabatic phase space. To provide the highest fidelity, the errors in the PSD calculation are constrained by employing the Liouvilleâ€™s Theorem to check the reliabilities of the calibrations and optimize the dynamic magnetic field model. This work will establish the PSD distribution map as a function of both universal time and local time, which can be compared later with model output and serve as the reference of differentiating physics mechanisms associated with acceleration, transport and loss of relativistic electron during storm phases.

Monday, 2005 June 27, 4:00 p.m. - 6:00 p.m

Inner Magnetosphere/Storms WG1 Session on Recent Advances in Ring Current Understanding

Conveners:
Margaret Chen (mchen@aero.org)
Paul O'Brien (Paul.Obrien@notes.aero.org

This session will focus on recent developments in understanding the ring current. Topics to be discussed include physical processes regarding ionospheric and plasma sheet sources, electrodynamics (e. g., feedback of the ring current induced field to magnetospheric fields), particle transport, particle loss, and wave-particle interactions

Speakers and Titles:

- Shin Ohtani, "Statistical diagnosis of the storm-time ring current with IMAGE/HENA data"
- Jichun Zhang *et al* ., "Superposed epoch analyses of solar wind sources and hot-ion bulk properties at geosynchronous orbit during super-storms (1999-2004)"
- Paul O'Brien *et al* ., "A systematic search for direct ionosphere to ring current"
- Colby Lemon, "An observational peek at the specific entropy during ring current injection intervals"
- Margaret Chen *et al* ., "Magnetically self-consistent ring current simulations for the GEM storm of 19 October 1998 storm"
- George Khazanov, "Ring Current-Electromagnetic Ion Cyclotron Waves Coupling "
- Cheryl Huang, "Observations of ring current injection effects during magnetic storms"
- Lin Chin, "Modeling of ring current injection effects during magnetic storms"
- Wendell Horton,"Analysis of the October 4-6 2000 GEM storm with the WINDMI model"

Available Abstract:

Analysis Of The October 4-6 2000 GEM Storm With The WINDMI Model

W. Horton (horton@physics.utexas.edu, IFS, UT Austin), E. Spencer (espencer@ece.utexas.edu, IFS, UT Austin), I. Doxas (CIPS, UC Boulder), J. Kozyra (UM Ann Arbor)

The eight dimensional physics model WINDMI is used to analyze the large Geomagnetic Storm from October 4th through October 6th 2000 using solar wind input data from the ACE satellite. The model predicts the occurrence of eight substorms during the 24 hour period on the 4th of October, in agreement with the measured AL indices. The model also describes the geomagnetic Dst index through the main phase and recovery phase of the storm. In addition the model gives the time history of eight key energy components in the coupled magnetosphere ionosphere system and the power dissipated in the ring current.

Tuesday, 2005, June 28th 2005, 10:00 a.m.- 12:00 p.m.

(WG focus: WG2 & WG3) Quantitative Analysis of Precipitation Loss during Storms

Conveners:
Terry Onsager (terry.onsager@noaa.gov)
Jacob Bortnik (jbortnik@gmail.com)

This session focuses on the loss of energetic radiation-belt electrons during geomagnetically disturbed conditions from both experimental and theoretical studies that quantify and assess the roles played by various loss mechanisms including drift resonance with ULF waves, cyclotron resonance with ELF/VLF waves, loss to the magnetopause, loss of adiabaticity due to field-line stretching, and so on.

Available Abstracts:

Numerical modeling of chorus-driven relativistic electron microbursts

Jacob Bortnik (jbortnik@gmail.com) Richard M. Thorne (rmt@atmos.ucla.edu) Both from UCLA, Dept. of Atmospheric and Oceanic Sciences

Using numerical raytracing and a wave-particle interaction code, we model the relativistic electron microbursts that have been recently reported in association with enhanced chorus activity. Our results show good agreement with the observations and indicate the need to include the full non-linear charateristics of the interaction in future work.

Testing Loss Mechanisms Capable of Rapidly Depleting the Relativistic Electron Flux of Earth's Outer Radiation Belt

J. C. Green, T. G. Onsager, T. P. Oâ€™Brien, B. J. Fraser, H. J. Singer, A. J. Smith, D. N. Baker, S. G. Kanekal, E. J. Rigler, R. H. Friedel

Decades of electron flux measurements from satellites probing Earthâ€™s outer Van Allen belt depict a highly variable radiation environment that researchers have been challenged to explain. The erratic flux changes induced by geomagnetic activity suggest that acceleration processes are often countered by profuse loss. Thus, to predict flux variations both processes must be understood. Some acceleration mechanisms have been proposed and tested. However, the conditions and processes that remove electrons from the magnetosphere are still uncertain. Recent work suggests that scattering into the atmosphere may be the dominant process responsible for some flux depletions [Green et al., 2004].

We use a superposed epoch analysis of multi-satellite data to demonstrate how scattering into the atmosphere contributes to flux depletions in the outer radiation belt. We identify waves responsible for scattering the electrons by comparing the local time of precipitating electrons to the local time of observed electromagnetic ion cyclotron (EMIC) and whistler waves. Finally, we examine how changes in the high density plasmasphere enhance or inhibit the growth of these waves and their ability to interact with high energy electrons, thus, indirectly dictating radiation belt electron flux levels.

Tuesday, 2005,June 28, 1:30 p.m. - 3:30 p.m.
(WG2 & WG1) Radial Profiles of Electron PSD during Different Phases of a Storm

Conveners:
Janet Green (Janet.Green@lasp.colorado.edu)
Geoff Reeves (reeves@lanl.gov)

This session will discuss methods for obtaining electron phase space density from satellite flux measurements and what the phase space density gradients reveal about acceleration and loss processes in the radiation belts during storms.

Available Abstracts:

What did we learn from the phase space density radial distribution of outer radiation belt electrons?
Yue Chen, Geoff Reeves, Reiner Friedel, Tom Cayton, LANL

The study of phase space density (PSD) can help to remove the adiabatic effect from observations. This talk will show you how to do the phase space density calcuatlion, what we can learn about teh electron acceleration mechanisms from the PSD radial distribution and some result achieved based on the multi-point PSD calculation over ~200 days.

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Tues, 2005, June 28, 4:00 p.m. – 6:00 p.m.
(WG1 & WG3) Recent Advances in Plasmaspheric Understanding

Conveners:
Maria Spasojevic (maria@nova.stanford.edu)
Mark Moldwin (mmoldwin@igpp.ucla.edu)

We plan to discuss new advances in plasmaspheric modeling as well as new observational findings that have yet to be fully captured in simulation. Topics to be discussed include subcorotation, shielding, formation of global/ meso-scale azimuthal features (plumes, shoulders, notches), refilling, heavy ion composition, etc.

Tuesday, 2005 June 28, 4:00 p.m. – 6:00 p.m.
(WG2) Statistical and Empirical Models for the Radiation Belts

Conveners:
Reiner Friedel (friedel@lanl.gov)
Paul O'Brien (Paul.OBrien@aero.org)

This session will focus on issues associated with building statistical and empirical models of radiation belt particle fluxes. During the session, we will survey existing data and recent developments in data calibration and statistical methods.

This session will also solicit input to the COSPAR Panel on Radiation Belt Environment Modeling (PRBEM,
http://wwwe.onecert.fr/craterre/prbem/Working_group.html#progress).

The working group consists of the following members:

B. Blake, Aerospace Corp., USA
C. Underwood, Univ. of Surrey, UK
S. Bourdarie, ONERA, France (Chairman)
R. Friedel, LANL, USA
M. Panasyuk, MSL, Russia
J. Cao, CSSAR, China
Y. Mijushi, Stelab, Japan

Upcoming actions of the working group are:

1. Agree on a set of user needs definition (radiation belt model specification)
2. Data processing and analysis guidelines.

Available Abstracts:

Radiation Belt Data Assimilation and Parameter Estimation

Josef Koller, jkoller@lanl.gov, Los Alamos National Lab Reiner Friedel, friedel@lanl.gov, Los Alamos National Lab

The radiation belt with its highly energetic electron environment is receiving new attention because deep dielectric charging in hardware is a major reason for spacecraft failure beween medium earth orbit (MEO) and geostationary orbit (GEO). Competing processes of acceleration, gain and losses need a better understanding. The combination of a physical model, e.g. a diffusion code, and actual radiation belt data can help us to increase our understanding of all competing processes. Data assimilation methods, in particular the Kalman filter, are such model-data combinations that provide us with the tools to gain new insights into the physics of the radiation belt in unprecedented detail. We show here how the assimilation of data with the Kalman filter could potentially pin-down the temporal and spacial evolution of the diffusion parameters. These parameters are a proxy for the physics that plays a role in the radiation belt. If we know the actual diffusion coefficients in greater detail then we can also determine the physical processes with an increased confidence.

Wednesday, June 29th 2005, 1:30 p.m. - 3:00 p.m.
(WG1, WG2, and WG3) Requirements for the Development of Inner Magnetosphere Modules for the GGCM

Conveners:
Aaron Ridley (ridley@umich.edu)
Mary Hudson (mary.hudson@dartmouth.edu)
Richard M. Thorne (rmt@atmos.ucla.edu)
Richard Denton (richard.denton@dartmouth.edu).

A key objective of GEM is the development of a Geosciences General Circulation Model, which is capable of modeling the interaction between solar disturbances and the Earth's magnetospheric environment. Global MHD codes have already been developed to simulate changes in the global structure of the magnetosphere and such codes have recently been coupled to codes that more properly treat ring current development. What is still needed are modules for the inner magnetosphere that are capable of treating energetic particle dynamics and can be coupled with existing large-scale codes.

Wednesday, June 29th 2005, 4:00 p.m. - 6:00 p.m.

(WG1, WG2 and WG3)- GEM IM/S Campaign: What is left to do?

Conveners:
Mike Liemohn and the Working Group Chairs

GEM Global Interactions (GI)

Wed, 29 June 2005, 01:30 - 03:00 PM and 4:00 p.m. – 6:00 p.m.

Solar Wind Pre-conditioning in the Foreshock, Bow Shock and Magnetosheath

Convener:
Nick Omidi <omidi@solanasci.com>

As part of the new GI campaign, two afternoon sessions will be devoted to observational and modeling presentations on how solar wind field and plasma conditions are modified in the foreshock, bow shock and magnetosheath. A number of planned presentations will focus on Hot Flow Anomalies, wave-particle interactions in the foreshock, magnetosheath turbulence and plasma consequences.

Speakers – Part I:

1. Michelle Thomsen
2. David Sibeck
3. N. Omidi

Speakers – Part II:

1. Peter Gary
2. Xochitl Blanco-Cano

Thursday, 30 June 2005, 1:30 p.m. – 10:30a.m. – 12:00 pm.

Origin and transport of plasma in the plasma sheet,

Conveners:
Terry Onsager
Antonius Otto

- Chih-Ping Wang - Statistical Distribution of the Plasma Sheet
- Aaron Ridley - MHD Modeling of the Plasma Sheet - October 22-23, 2003
- Zong - Cusp and Cold Dense Plasma Sheet During the 18 April, 2002 and 21/22 March, 2001 Events
- Yongli Wang - Propagation and Dynamics of Bubbles in the Plasma Sheet
  Simon Wing, Dawn-dusk asymmetries and ion sources in the northward IMF plasma sheet
- Jay Johnson - Investigation of Competing Transport Mechanisms in the Plasma Sheet

- Benoit Lavraud, Characteristics and evolution of dense plasma access to geosynchronous orbit Nicky Fox - The Plasma Sheet as a Source for the Outer Electron Radiation Belt Shin Ohtani - Plasma Sheet Expansion
- Maria Kuznetsova, Magnetotail Current Sheet Thinning and Fast Magnetic Reconnection in Global MHD Simulations
- Wendel Horton, Firehose Turbulence as the Source of Pi2 Precursors to Dipolarization Events

Available Abstracts:

Characteristics and evolution of dense plasma access to geosynchronous orbit

B. Lavraud, M. H. Denton, M. F. Thomsen, J. E. Borovsky, and R. H. W. Friedel Space Science and Applications, Los Alamos National Laboratory, New Mexico, USA K. Seki Solar-Terrestrial Environment Laboratory, Nagoya University, Aichi, Japan J. Weygand IGPP, UC Los Angeles, California, USA

We present a superposed epoch analysis of 1464 events of dense (> 2 cm-3 at onset) plasma observed by the MPA instruments onboard the Los Alamos geosynchronous satellites, for the period 1990-2002. The results allow us to study the temporal evolution of various plasma parameters as a function of local time. We show that dense plasma access to geosynchronous orbit mostly occurs near local midnight. This dense plasma population is shown to be freshly injected from the mid-tail region, colder than the typical plasma sheet and composed of a relatively small O+ component. This population is thus probably the result of cold, dense plasma sheet (CDPS) injection from the mid-tail region. We investigate the correlation of such observations with external (IMF and ram pressure) and internal (Kp and Dst) parameters.

Firehose Turbulence as the Source of Pi2 Precursors to Dipolarization Events

W. Horton (horton@physics.utexas.edu), and V. Wong. Institute for Fusion Studies, The University of Texas at Austin

The nonlinear dynamics of the firehose instability provides a possible explanation for the onset of the magnetic fluctuations associated with bursty bulk flows and substorms. The Pi2 geomagnetic pulsations are observed as precursors to the dipolarization events associated with substorms and sawtooth injections [Kepko and Kivelson, JGR 2001 and Sigsbee et al., JGR 2002]. Following Ji and Wolf [JGR 2003], a scenario of rapid Earthward flux tube motion producing a parallel ion pressure anisotropy triggering the firehose instability is given. Kinetically corrected MHD theory is required to describe the nonlinear magnetic fluctuations. Strong magnetic fluctuations are associated with substorms and start a few minutes before the arrival of the dipolarization pulse. Secondary current driven instabilities are considered and may also be seen in the data at ion cyclotron and lower hybrid frequencies. W. Horton, B.-Y. Xu, H. V. Wong, and J. W. Van Dam, Nonlinear dynamics of the firehose instability in a magentic dipole geotail, JGR 109, 2004. This work was supported by National Science Foundation Grant ATM-0229863.

Thursday, 30 June 2005, 1:30 p.m. - 3:30 p.m. and 04:00-06:00 PM

Magnetopause Processes and The Mangetopause

Convener:

Jean Berchem (jberchem@ucla.edu)

As part of the new GI campaign, this afternoon session will be devoted to observational and modeling presentations related to the magnetopause. Planned topics include: - Kinetic modeling of magnetopause reconnection - Component/Antiparallel merging at the magnetopause - Electron measurements at the magnetopause - Flux transfer events - Solar wind entry and plasma sheet formation

Speakers:

1. Kinetic modeling of magnetopause reconnection (Michael Hess)

2. Component merging at the magnetopause (John Dorelli)
3. Electron measurements at the magnetopause (Benoit Lavraud)
4. Flux transfer events (Yongli Wang)
5. Solar wind entry and plasma sheet formation (Wenhui Li)

Available Abstracts:

Evidence for newly closed magnetosheath field lines at the dayside magnetopause under northward IMF

B. Lavraud,1 M. F. Thomsen,1 B. Lefebvre,2 S. J. Schwartz,2 K. Seki,3 T. D. Phan,4 Y. L. Wang,1 A. Fazakerley,5 H. Rème,6 and A. Balogh2
1 Space Science and Applications, Los Alamos National Laboratory, P.O. Box 1663, MS D466, Los Alamos, NM87545, USA
2 The Blackett Laboratory, Imperial College, London SW7 2AZ, UK
3 Solar-Terrestrial Environment Laboratory, University of Nagoya, 442- 8507 Aichi, Japan
4 Space Science Laboratory, UC Berkeley, CA 94720, USA
5 Mullard Space Science Laboratory, Surrey RH5 6NT, UK
6 Centre d'Etude Spatiale des Rayonnements, 31028 Toulouse, France

We analyze the structure of the high-latitude magnetopause under steady interplanetary magnetic field (IMF). We use 56 magnetopause encounters of Cluster spacecraft from 2001 to 2003 to explore the statistical properties of the magnetosheath electron boundary layer, observed outside the high-latitude dayside magnetopause. We focus on the occurrence of low absolute parallel electron heat flux in this layer and its dependence on the presence of heated magnetosheath electrons and magnetic field clock angle simultaneously measured by Cluster. The results show that the combined occurrence of low electron heat fluxes and heated electrons in the magnetosheath electron boundary layer is primarily observed when the local magnetic field is northward. The low absolute parallel heat fluxes result from the presence of bidirectional heated electrons and are interpreted as the signature of newly closed magnetosheath field lines.

Roles of the K-H instability and double-lobe reconnection in LLBL and CDPS formation during a prolonged northward-IMF period (Presented by B. Lavraud)

K. Seki (1), Y. Matsumoto (1), B. Lavraud (2), M. F. Thomsen (2), R. C. Elphic (2), M. Hirahara (3), Y. Saito (4), T. Mukai (4), H. Reme (5), and A. Fazakerley (6) (seki@stelab.nagoya-u.ac.jp)
(1) Solar-Terrestrial Environment Laboratory, Nagoya University, Honohara 3-13, Toyokawa, Aichi 442-8507, Japan
(2) Space Science and Applications, Los Alamos National Laboratory, P.O. Box 1663, MS D466, Los Alamos, NM87545, USA
(3) Rikkyo University, Toshima, Tokyo 171-8501 Japan
(4) ISAS, JAXA, Sagamihara, Kanagawa 229-8510 Japan
(5) Centre dâ€™Etude Spatiale des Rayonnements, 31028 Toulouse cedex 4, France
(6) Mullard Space Science Laboratory, Surrey RH5 6NT, UK

The Kelvin-Helmholtz (K-H) instability driven by the velocity shear at the magnetopause has been proposed as a possible mechanism of magnetosheath plasma entry through the LLBL. Double lobe reconnection, i.e., reconnection of a magnetosheath flux tube with lobe field at the high-latitude magnetopause in both hemispheres, thereby becoming closed, is also an important candidate process for the dense, thick LLBL formation during northward IMF periods. On the basis of evolution of electron and ion phase space densities (PSDs) from the dayside to the nightside magnetosphere observed by Cluster, GEOTAIL, and LANL-MPA spacecraft during a northward IMF interval on March 16, 2002, we examine the relative importance of the K-H instability and double lobe reconnection for formation of the CDPS. In particular, we focus on GEOTAIL observation of wavy structures in the dusk LLBL and compare those with results from numerical kinetic simulation of the K-H instability. The evolution of PSDs in the LLBL suggests that the wavy structure is responsible for the selective plasma entry into the inner LLBL region.

Friday, 2005, July 1, 10:30 a.m. – 12:00 p.m.-
The Cusp

Convener:
Karlheinz Trattner (trattner@mail.spasci.com)

As part of the new GEM/GI campaign, this morning breakout session will be devoted to observational and modeling presentations related to the cusp. A number of scheduled presentations will address energetic ions and electrons in the cusp and their possible source regions. Additional contributions, also covering other aspects ofthe cusp, are hereby solicited. Interested contributors may send a title to Karlheinz Trattner (trattner@mail.spasci.com) to be included in the speakers list or show up directly at the session. Contributions will be included as time allows.

Speakers:

1. Ted Fritz: The possible role of the cusp in magnetospheric processes
2. K. Trattner: Energetic ions in the Cusp
3. J. Chen: Source of energetic ions in the Cusp
4. S-W Chang: Shock Acceleration and Cusp Acceleration
5. R. Sheldon: On the Trapping and Leakage of relativistic electrons in the cusp
6. D. Sibeck: Magnetospheric Source

Available Abstracts:

Energetic Ions In the Cusp
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The GEM program has recently announced the start of a new initiative, the Global Interaction (GI) Campaign, to focus upon the processes by which solar wind plasma is energized and transported into and through the Earth's magnetosphere to subsequently form the hot tenuous and cold dense plasma sheet. The first phase of this study addresses a long standing debate within the magnetospheric community about the source region of energetic ions observed in the cusp (local acceleration versus distant bow shock source). By using the model by Kobel and Flueckiger [1994], interplanetary magnetic field lines (IMF) draped around the magnetopause are traced back to the bow shock to establish if those field lines connect to the quasi-parallel shock region, a well known source for energetic ions. Some of these fully draped field lines around the magnetopause will reconnect with geomagnetic field lines and allow magnetosheath and bow shock accelerated ions to enter the cusp region. The occurrence of cusp energetic particles (CEP) events in Polar/TIMAS, CAMMICE data will be correlated with the connection of these draped field lines to the quasi-parallel bow shock region.

On the trapping and escape of relativistic electrons from the cusp

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We have traced thousands of relativistic electrons through a Tsygnanko96 cusp using a highly accurate Bulirsch-Stoer tracing algorithm, and report on the limits of trapping and the cusp adiabatic invariants. We also report on the leakage of electrons and their resulting equatorial distribution.

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GI: Summary and Future Plans