2009 CEDAR Workshop Schedule

Sunday, June 28, 2009

Monday, June 29, 2009

Tuesday, June 30, 2009

Wednesday, July 1, 2009

Thursday, July 2, 2009

Student Workshop - Instrumentation: How Can We Probe the Upper Atmosphere?

Zia, 0900-1600 – Sunday, June 28, 2009

Conveners:
Jonathan Fentzke, University of Colorado, Boulder
Marco Milla, University of Illinois at Urbana-Champaign

09:00-09:10	Student Welcome from NSF	R. Behnke/R. Robinson (NSF)
09:10-09:30	Introduction to the CEDAR Program	J. Thayer (CSSC Chair)
09:30-09:40	Agenda information and organizational details	Jonthan Fentzke and Marco Milla (CEDAR student reps)
09:40-10:40	*Keynote Talk #1*: A Historical Overview on Aeronomy Instrumentation	Mike Kelley (Cornell)
10:40-10:55	--- Break ---	
10:55-11:55	*Student Tutorials 1*	
	Radars: Powerful Tools to Study the Upper Atmosphere **(Zia)**	Jorge Chau (Jicamarca)/Roger Varney (Cornell)
	A New Horizon: LIDAR Exploration of Atmosphere and Space **(Sunset)**	Xinzhao Chu /Wentao Huang (U CO)
	In situ Measurements in the Ionosphere and Thermosphere on Satellites **(Anasazi North)**	Robert Pfaff (GSFC)
11:55-13:30	Lunch on own at area restaurants	
13:30-14:30	*Student Tutorials 2*	
	GPS systems **(Zia)**	Jonathan Makela (U IL)
	Imagers **(Sunset)**	Carlos Martinis (BU)
	Rocket Instrumentation for the Mesosphere and Thermosphere **(Anasazi North)**	Gerald Lehmacher (Clemson)
14:30-14:45	--- Break ---	
14:45-15:45	*Keynote Talk #2*: Next-Generation Instruments for Geospace Science	John Foster (MIT)
15:45	Adjourn	

CEDAR and ITM Strategic Planning

Anasazi South: 1300-1500 – Monday, June 29, 2009

Conveners:
Jeff Thayer, University of Colorado
Larry Paxton, The Johns Hopkins University

The ionosphere / thermosphere / mesosphere community is at a cross roads in how this discipline will evolve over the coming years. There are many changes taking place in the agencies and in the scientific approach to geoscience and geospace research. It is imperative that action be taken to ensure the CEDAR community is properly involved in this new evolution of science and to lead the direction for the CEDAR program. This workshop will invigorate discussion regarding the CEDAR strategic plan and include participation and discussion by a broader ITM group that is spearheading action in other programs.

South American Initiative to Study the Causal Linkage Between Thermospheric Gravity Activity and Equatorial Spread F Development

Anasazi North: 1300-1500 (Part 1) and 1930-2130 (Part 2) – Monday, June 29, 2009

Conveners:
John Meriwether, Clemson University
Dave Fritts, NWRA/CoRA
Michael Mendillo, Boston University
Jonathan Makela, Univ. of Illinois at Urbana-Champaign
Andy Gerrard, New Jersey Institute of Technology
Cesar Valladares, Boston College

A new direction in South American ground-based aeronomy studies is taking shape with the aim of studying the possible causal linkage between thermospheric gravity wave activity and equatorial spread F from not only a local but also a broad-scale perspective. Two bistatic Fabry-Perot observatories are being established in Brazil (near Cariri) and Peru (Huancayo, Arequipa, and Jicamarca) that will measure the meridional and zonal thermospheric neutral wind components within a common volume of 100 km in extent. These results would be combined with simultaneous all-sky imaging of the 630-nm nightglow that would provide diagnostics regarding the development of airglow depletion structure. The combination of the two sets of measurements would provide the opportunity to seek out any causal relationship that might exist between the onset of gravity wave activity and the possible subsequent nightglow depletion structures within the same common volume of the thermosphere. These results would be supplemented with Jicamarca observations of F-region plasma structures, GPS, and TEC measurements regarding the large scale distribution of plasma within the Appleton anomalies. Also contributing would be results from the all-sky imaging of plasma structures from Argentina and Brazil as well as thermospheric wind measurements from Chile, Brazil, and possibly El Leoncito. Twenty-four hours of observations of the thermospheric wind at Huancayo provided by the SOFDI daytime capability for thermospheric neutral wind measurements would provide the important data regarding tidal winds that is necessary to support the analysis of the propagation of gravity waves into the thermosphere from tropospheric sources.

Magnetosphere Ionosphere Coupling

Zia: 1300-1500 (Part 1) and 1930-2130 (Part 2) – Monday, June 29 2009

Conveners:
Joshua Semeter, Boston University
Bill Bristow, University of Alaska Fairbanks

The magnetosphere and ionosphere are inexorably connected through electromagnetic, gravitational, and inertial forces. The coupling is particularly strong at high latitudes, where magnetospheric disturbances, guided by the convergent field, serve to radically alter densities, temperatures, and flows in the ionosphere. These responses, in turn, affect the composition and configuration of the magnetosphere via feedback in the form of mass outflow and the neutral wind dynamo. The study of these processes through remote sensing has long been at the core of the CEDAR initiative. Recent years have witnessed significant advances in instrumentation, experimental techniques, and analysis strategies applied to magnetosphere-ionosphere coupling. The purpose of this workshop is to provide a forum for discussion of new science enabled by these efforts. Participation is solicited in the form of brief presentations aimed at provoking discussion among the attendees. If you would like to contribute formally, please email either Josh Semeter (jls@bu.edu) or Bill Bristow (Bill.Bristow@gi.alaska.edu) with a brief description of your topic.

Ionosphere/thermosphere (IT) Modeling

Sunset: 1300-1500 – Monday, June 29, 2009

Conveners:
Joe Huba, Naval Research Laboratory
Aaron Ridley, University of Michigan
Robert Schunk, Utah State University

The workshop will focus on IT modeling of the quiet time, low- to mid-latitude ionosphere. It is hoped that a description of each model will be presented, highlighting (1) basic equations actually solved, (2) numerical techniques, (3) strong and weak points (both physics and numerics), i.e., the good, the bad, and the ugly, and (4) simulation results from a specified day. Results from the different studies can be compared and an ensemble average could be presented and compared to data. Finally, issues that need to be resolved to improve models could be addressed.

CEDAR Electrodynamics Thermosphere Ionosphere Modeling Challenge

Anasazi South, 1930-2130 – Monday, June 29, 2009

Conveners:
Barbara Emery, NCAR HAO
Masha Kuznetsova, NASA Goddard Space Flight Center
Jan Sojka, Utah State University
Aaron Ridley, University of Michigan
John Holt, MIT
Jiuhou Lei, University of Colorado

The International Space Science Institute in Bern, Switzerland, was the host of an ionospheric modeling challenge in 2008 based on the year-long incoherent scatter radar (ISR) runs of EISCAT, Svalbard, and Poker Flat (PFISR) from March 2007 to March 2008. The other ISRs contributed 31 hours per month and PFISR is still making daily observations in a low duty cycle mode. Various global ionospheric models attempted to reproduce the NmF2 and hmF2 for this year of data that is stored in the madrigal Database (http://madrigal.haystack.mit.edu/madrigal) in the CEDAR Community along with an associated wiki page (http://www.haystack.mit.edu/cgi-bin/asg_science/ipy.cgi/). The modelers are invited to show 2-3 plots only of their yearly fits in the first 15 minutes of this workshop as a lead-in to planning for a CEDAR Electrodynamics Thermosphere Ionosphere Modeling Challenge. This challenge will help to evaluate the current state of the space physics modeling capability and to address the differences between various modeling approaches. The Community Coordinated Modeling Center (CCMC) at the Goddard Space Flight Center can support this activity using their experience with the GEM community and the CCMC available interface.

The first part of such a challenge is to assemble modelers and data providers. We anticipate choosing the March 2007 to March 2008 time-frame. We need to agree on physical parameters to be used for the metrics. Some possibilities for the ionosphere which are already in the madrigal DB are: the network of ground-based TEC using Anthea Coster's analysis, hmF2 and NmF2 for all the available ISR sites during this year, altitude profiles of electron density (Ne) from the ISRs. Other possibilities are tomography Ne and COSMIC Ne. (Unfortunately C/NOFS was launched in April 2009 after this period.) Possible metrics for the neutral thermosphere are the CHAMP satellite neutral densities scaled to 400 km altitude and [O/N2] ratios from the GUVI/TIMED satellite. Electrodynamic metrics could be ISR ion drifts and SUPERDarn ion drifts.

We should also choose if the whole year is to be in the challenge, or only selected quiet days or moderately disturbed days, since there are no massive magnetic storms in this solar minimum period. The IT Modeling Workshop by Huba on Monday at 1 PM will also be looking at IT models results for 2 quiet days in this year: April 1 (07091) and June 21 (07172).

Please come prepared to discuss what reliable observations to use and for what time period for this challenge. The chosen observations will be stored both in the madrigal DB and in the CCMC. Model results would be expected to be submitted

to the CCMC twice before the next CEDAR Workshop, perhaps in November 2009 and in May 2010, where the second submissions can demonstrate model improvement. It is not necessary that the models be running in the CCMC, and both empirical and first-principal models are welcome. Similar GEM challenges supported by the CCMC are located at http://ccmc.gsfc.nasa.gov/support/GEM_metrics_08/

Draft Agenda:

- 1930-1935: B Emery (NCAR) Introduction
- 1935-2000: 4-min presentations of ionospheric modeling based on ISRs in the IPY
    - P Richards, Results of the Field Line Interhemispheric Plasma (FLIP) Model
    - M Fedrizzi/T Fuller-Rowell (CIRES/NOAA) Results of the Coupled Thermosphere Ionosphere Plasmasphere (CTIP) Model
    - D Pawlowski (U MI), Results of the Global Ionosphere Thermosphere Model (GITM)
    - G Crowley (ASTRA), Results of the Thermosphere Ionosphere Electrodynamics General Circulation Model (TIEGCM)
    - J Sojka (USU), Results of the Time Dependant Ionospheric Model (TDIM)
- 2000-2010: M. Kuznetsova (CCMC/GSFC), Results of GEM Challenges within the Auspices of the Community Coordinated Modeling Center (CCMC)
- 2010-2130: Open discussion
    - Time period
    - Parameters to test against for the Electrodynamics, Thermosphere, and Ionosphere
    - Data availability
    - Etc

Upper Atmospheric Facilities - Integrating Management, Operations, and Science

Anasazi South, 1300-1500 – Tuesday, June 30, 2009

Conveners:
Tony van Eyken, SRI International
John Foster, MIT Haystack Observatory

Following discussions at the UAF Facilities Meeting at Millstone Hill last September, and at the National URSI Meeting in Boulder in January, we wish to involve the wider community in our planning and in the implementation of practical measures to coordinate the activities of the NSF's Upper Atmosphere Facilities.

There are two main strands to this effort: first, the science strategy and programs and second, measures to develop and extend the application of techniques and skills at individual facilities across the whole program.
This Workshop will address both issues and contributions are welcome in either category.

The document: 'The National Science Foundation's Upper Atmospheric Facilities: Integrating Management, Operations, and Science, 2008' provides a detailed base on which to build the future Science Strategy, but we need to develop a planned program and set ourselves goals for the next five and ten years (and beyond). This Workshop will provide an opportunity for broad community contribution to guide the preparation of this more detailed action plan.

We welcome contributions on all aspects of science planning, whether based on the NSF document or not, and we particularly welcome contributions proposing major scientific studies, and the rationale behind them. Contributions which address the integration of future facilities, including the Antarctic Radar and AMISR relocations, are also welcome.
In the second area, our goal is to enable the community to allow the efficient and rapid exploitation of skills and techniques at individual facilities everywhere.

For example, the advent of the AMISRs with their extreme flexibility offers all sorts of possibilities for the application of ideas and techniques developed at other facilities. Examples might include imaging algorithm developments and processes for deriving additional parameters.

The similarity of transmitter hardware at several facilities lends itself to an effective combined approach to maintenance, development, and eventual replacement. Are their other areas where similar cooperation can be beneficial?
We welcome contributions on all sorts of coordination opportunities ranging from cooperation on hardware issues through to specific experiment details.

The Workshop will take the form of a few formal presentations describing what has been done already and the outline of future plans, contributed presentations, followed by adequate time for community discussion and preparation of future plans.

Help lay the foundations of new scientific success in the future!

Student Description

The research world is changing: society demands that we should show that our work is relevant (maybe because it addresses some important societal problem, maybe because it exciting and challenging and something mankind should be proud to be attempting) and that we are spending the taxpayers' money wisely.

On the other hand, the financial challenges facing the national and World economies provide important opportunities for our research since it involves not only large infrastructure projects but also capacity and expertise building for the future. The Upper Atmosphere Facilities funded by the NSF are working to address these issues through a planned program of coordination covering both the scientific and technical aspects of their work.

This workshop represents the next steps in that process and will try to establish outline goals and programs as the first stage of a continuously evolving strategy for the future.

Student opportunities and participation in the technical and scientific aspects of the UAF program are major elements of the integrated UAF plan. Students are most welcome to attend and contribute to the discussion; the developing plans and strategies will form a framework for your work in the future too!

Ionospheric Electrodynamics and Disturbances at Middle and Low Latitude during Magnetic Storms

Anasazi North, 1300-1500 – Tuesday, June 30, 2009

Conveners:
Chaosong Huang, Boston College
Naomi Maruyama, CIRES, CU and NOAA SWPC
Tim Fuller-Rowell, Space Weather Prediction Center

The equatorial ionosphere is greatly disturbed and becomes extremely turbulent during intense magnetic storms. The dayside ionospheric plasma density and TEC at middle latitudes can be increased by a factor of 5-10. The F-region plasma density in the evening sector can be greatly reduced over ±20 deg magnetic latitudes. Large-scale plasma bubbles with density decrease of 2-3 orders of magnitude occur in the evening equatorial ionosphere during the main phase of magnetic storms, and the occurrence of plasma bubbles is greatly suppressed during the storm recovery phase. Although significant progress has been achieved in recent years, the storm-time equatorial ionospheric electrodynamics has not been well understood. The ionospheric electric fields have two major sources: the dynamo electric field generated by disturbance neutral winds and the penetration electric field originating from the solar wind. The interplanetary magnetic field can be continuously southward for many hours during the storm main phase and produce strong penetration electric fields in the equatorial ionosphere. The dynamo electric fields become important in the equatorial region at later times. In this workshop, we will present the latest observational and simulation results and discuss the following topics:

- How long and how much can the interplanetary electric field penetrate into the equatorial ionosphere during magnetic storms?
- What are the response time and effect of the shielding process?
- What are the response time and characteristics of the storm-time dynamo electric fields?

- What is the interplay between the penetration and dynamo electric fields?
- How can the sources of the low-latitude ionospheric electric fields be identified?
- How do magnetic storms affect the generation of equatorial plasma bubbles?
- How do magnetic storms cause the redistribibition of the low-latitude ionospheric plasma?
- What is the solar cycle dependence of storm-time electric fields?

Speakers:

- Michael Kelley (Cornell): Local time dependence of prompt penetrating electric fields and its influence on Convective Ionospheric Storms,
- Chaosong Huang (BC): The maximum duration of penetration electric fields during intense magnetic storms,
- Art Richmond (NCAR): Modeling disturbed equatorial electric fields,
- Wenbin Wang (NCAR): Commonalities in the response of ionosphere to the initial phase of geomagnetic storms,
- Naomi Maruyama (NOAA): Numerical modeling of the storm time ionospheric electrodynamics,
- Dave Anderson (NOAA): Examining the effects of geomagnetic storms on the pre-reversal enhancement in ExB drift velocities and the occurrence of ionospheric bubbles,
- Cesar Valladares (BC): TEC observations in South America during super-storms,
- Hyosub Kil (JHU/APL): Storm-induced big bubbles during the 29–30 October 2003 storm,
- Gang Lu (NCAR): Thermospheric storm effects by neutral wind dynamo.

Meteors and the Upper Atmosphere

Zia, 1300-1500 – Tuesday, June 30, 2009

Conveners:
Lars Dyrud, Center for Remote Sensing
Diego Janches, NWRA/CoRA Div.

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. For example, global yearly mass flux estimates are not constrained to within an order of magnitude. Of particular importance to the CEDAR community is that meteors account for all of the dust, metal neutral and ionized particles in the upper atmosphere (since there is no convection or diffusion of atoms or particles of this size from the ground all the way to 100 km). Further, meteoric dust is also thought to provide the condensation nuclei for polar mesospheric clouds PMC (high altitude clouds near 80 km), which is the focuses of a current NASA mission (AIM). Yet it remains unclear whether variability in meteor flux generates variability in PMC occurrence. Additionally, CEDAR researchers have used radar reflections from meteor trails to remotely sense winds and temperatures near the mesopause (a very difficult place to take meausurements, too high for lidar to low for fabry-perot measurements). With some success for winds but little success for temperatures. To address these issues, we invite presentations on the physics of meteors and their interaction with the atmosphere and ionosphere. Specific discussion is encouraged on the observation of meteors with NSF and CEDAR supported facilities, or the theoretical interpretation of such observations.

We encourage contributions of research attempting to better understand meteors or general aeronomy via meteor observations, including upper atmospheric chemistry and metal layers. We also invite presentations of radar, Lidar and optical observations. Theoretical studies or simulations of the meteors and meteor trail interactions with the atmosphere/ionosphere are also invited.

This year we will also hold a panel discussion on the following topic. "Differential ablation or fragmentation: how do we make sense of non-smooth radar “light curves”?"

This topic has been the result of a number of recent papers, and disagreement between different researchers. We look forward to a very interesting discussion amongst panel members and would also encourage all those that are interested to attend, and those that have data or ideas on the subject are welcome and encouraged to participate in the discussion.

Atomic Hydrogen in the Thermosphere and Exosphere

Sunset, 1300-1500 – Tuesday, June 30, 2009

Convener:
Edwin Mierkiewicz, University of Wisconsin - Madison

The existence of a diffuse "corona" of hydrogen at the top of the Earth's atmosphere was predicted in the mid 19th century. One hundred and fifty years later, the distribution of hydrogen in the upper atmosphere remains poorly understood. These density distributions are needed to test atmospheric photochemical modeling of hydrogen containing molecules. The goal of this workshop will be to summarize the current state of knowledge regarding the hydrogen geocorona, including: observations (satellite and ground-based), modeling and future studies.

The Equatorial Ionosphere During Solar Minimum - C/NOFS and Jicamarca Amigos

Anasazi South, 1930-2130 (Part 1) – Tuesday, June 30, 2009; Sunset, 1300-1500 (Part 2) – Wednesday, July 1, 2009

Conveners:
Odile de la Beaujardiere, Air Force Research Laboratory
David Hysell, Cornell University
Jorge Chau, Instituto Geofisico de Peru

The present solar cycle minimum is the lowest it has been since the beginning of the space age. This workshop will emphasize new observations and modeling related to solar min. conditions at low latitudes. In particular, the both Jicamarca and the Communication/Navigation Forecasting System satellite data are showing remarkable results. For example, the protonospheric transition height is very low, topside temperatures are low except at sunrise, the quiet-time electric field often presents extreme variability associated with lower atmospheric forcing, plasma irregularities are mostly present after midnight, and the neutral density during the June Solstice is also very low. Low-latitude observations and model results related to solar minimum conditions will be presented and discussed during the workshop.

Agenda:
Jorge Chau p news – updates and latest results
Dave Hysell – equatorial ionosphere at solar minimum
Marco Milla – MST-ISR2
Ronald Ilma – bottom-type layers
Fabiano Rodrigues – E region densities
Meers Oppenheim – neutral winds from meteor trails
Roger Varney – meteor smoke
Gerald Lehmacher – latest mesospheric results
Larisa Goncharenko – stratospheric warning events
Andy Gerrard – SOFDI
John Meriwether – JRO FPI
All – planning/scheduling discussion

Small-scale Dynamics of the MLT: Observation, Modeling and Theory

Anasazi North, 1930-2130 – Tuesday, June 30, 2009

Conveners:
Jonathan Snively, Utah State University
David Fritts, NWRA/CoRA
Michael Taylor, Utah State University

This workshop will focus on small-scale (<100s km) and short-period (<1 hour) gravity wave and instability dynamics of the mesosphere and lower-thermosphere (MLT) at all latitudes. Smaller-scale features significantly define the local

structure and dynamics of the MLT, including both linear and nonlinear propagating, ducted, and evanescent gravity and acoustic waves, convective and dynamic instability features, and associated turbulence.

Talks will pertain broadly to the small-scale dynamics of the MLT region, including observational techniques, modeling, and theory. Specific topics may include small-scale wave excitation, propagation, trapping, dissipation, breaking, and nonlinearity in the MLT. Small-scale dynamical effects on local and global MLT structure, interaction with photochemistry, and transport/deposition of energy and momentum are of particular interest.

The workshop will be organized as a series of short talks, including ~15 minute invited and ~10 minute contributed short presentations. Talks will present new research, while maintaining a format which is friendly to a broad audience. Student contributions will be welcome and strongly encouraged. Time will be allotted for questions and discussion. Anyone interested to contribute a talk, or to show a few slides during the discussion session, should contact Jonathan Snively by email (jonathan.snively@usu.edu) as soon as convenient.

M-I Coupling at the Plasmasphere Boundary Layer

Zia A, 1930-2130 – June 30, 2009

Conveners:
Anthea Coster, MIT Haystack Observatory
Michael Ruohoniemi, Virginia Tech

This workshop is a continuation of last year's plasmasphere boundary layer (PBL) workshop, and one of its main focuses is to addresses the goal of looking at global phenomena, in this case magnetosphere-ionosphere (MI) coupling, with a more system science approach. The PBL remains a region that is not well understood by the space science community. It is characterized by dynamic interaction between the plasmas of the ionosphere and of the inner and outer (auroral) magnetosphere. During geomagnetic storms, the ionosphere plays a critical role in the development of fast, latitudinally narrow plasma flows into the plasmapause region. The majority of space weather effects in the mid-latitudes, such as the formation of the plume of ionization associated with storm enhanced density or of the irregularities observed by the mid-latitude SuperDARN facilities, are associated with geophysical mechanisms of the PBL. Among the important interactions that occur in this region are the development of electric fields which couple the ionosphere, plasmasphere, and magnetosphere, the structuring and redistribution of thermal plasmas, and the formation of different scale-sizes of irregularities.

In this workshop we will continue to build a framework for understanding this complex region and for interpreting new observations. We also intend to explore the lesser-known processes and effects that accompany M-I coupling at the PBL. With these objectives, the workshop will begin with a few short tutorial background talks. We invite contributions and comments on the theme of M-I coupling in this region including theoretical and modeling studies and observations of phenomena associated with the PBL.

Comparative Meteor Science – The Effects of Meteoroids on Planetary Atmospheres and Ionospheres

Zia B+C, 1930-2130 – Tuesday, June 30, 2009

Conveners:
Paul Withers, Boston University
Meers Oppenheim, Boston University

Low-altitude plasma layers have been observed in the ionospheres of Venus, Earth and Mars. The terrestrial layers have been observed and simulated for decades, and it is well-established that they are produced by the ablation of meteoroids. In contrast, high quality observations of the corresponding layers on Venus and Mars have only recently been obtained and theoretical simulations are relatively immature. These new observations stimulate questions about how changes in atmospheric chemistry, dynamics, rotation rate, and magnetic fields affect the behaviour of metallic species in an atmosphere. The aims of this session are to (A) increase awareness within the CEDAR community to these extra-

terrestrial counterparts to a well-studied terrestrial phenomenon and (B) stimulate comparative studies of the effects of meteoroids on planetary atmospheres and ionospheres.

We encourage contributions of research that address (A) how existing extensive knowledge of terrestrial metallic layers can be used to better understand their extra-terrestrial counterparts and (B) how analyses of extra-terrestrial metallic layers, can be used to test models that, thus far, have only been successfully tested under conditions specific to one planet. This session will begin with several short invited presentations that will give overviews of pertinent topics, will include a range of contributed presentations, and will conclude with a discussion of what observational and/or theoretical efforts are needed.

Measurement and Modeling of Neutral Winds in the MLT and IT Regions

Sunset, 1930-2130 – Tuesday, June 30, 2009

Conveners:
Geoff Crowley, ASTRA
Aaron Ridley, University of Michigan
Mile Kelley, Cornell University
John Meriwether, Clemson University
Doug Drob, Naval Research Laboratory
Greg Earle, University of Texas at Dallas
Cheryl Huang, Air Force Research Laboratory

The purpose of this workshop is to discuss all aspects of neutral winds in the upper atmosphere. The neutral winds are a great mystery. Their basic structure is generally understood, but such details as the magnitude of flows and their dynamical behavior during even mildly disturbed time periods are not well described at all.

Measurements of the neutral winds are sparse, and yet knowledge of the wind is often necessary to understand the detailed mechanisms that produce observed behaviors in the neutral and ionized components. We will review existing measurement techniques, and available data sets, both ground-based and space-based. We will discuss the spatial and temporal distribution of existing data. We will review modeling capabilities. Finally, the workshop will identify a way forward in developing a better scientific understanding of the winds, and how the community might obtain more measurements.

Presentations on scientific questions, instruments, datasets, and models, are welcomed.

Passive Optical Calibration Techniques and Error Assessment

Anasazi South, 1300-1500 (Part 1) and 1600-1800 (Part 2) – Wednesday, July 1, 2009

Conveners:
Susan Nossal, University of Wisconsin-Madison
Jeffrey Baumgardner, Boston University

Accurate calibration and error assessment are important for comparing observations taken by different instruments, for model-data comparisons, and for acquiring long-term data records. We welcome contributions and discussion on a broad range of topics relating to passive optics including absolute and relative intensity calibration, line center calibration, inter-calibration of instruments, methods of error assessment, and approaches and tools for accounting for the influence of factors such as tropospheric scattering and viewing geometry. We also invite updates on new instruments. Please contact Jeff Baumgardner (jeffreyb@bu.edu; 617-353-5639) or Susan Nossal (nossal@physics.wisc.edu; 608-262-9107) if you would like to contribute a short presentation or agenda item for discussion.

GOLD Community Interactions Workshop

Anasazi North, 1300-1500 – Wednesday, July 1, 2009

Conveners:
Alan Burns, NCAR
Richard Eastes, University of Central Florida

The Global-scale Observations of the Limb and Disk (GOLD) team proposes to hold a workshop at CEDAR to discuss potential interactions between the GOLD team, ground based observers and theoretical modelers. GOLD will fly in a geostationary orbit on board a commercial communication satellite. It will provide disk images of O/N2 and temperature during the daytime from a nominal altitude of 160 km. At night GOLD will measure O+ densities. Additionally it will investigate O+ and N2 densities on the limb, and use occultations to study O2 profiles. These data will be also be available for ingestion by nowcast and forecast assimilation models.

The GOLD team foresees extensive possible interactions with ground-based observers both to validate the GOLD data and to improve and develop the science produced from a combination of the GOLD observations, ground-based observations and theoretical models. The aim of the GOLD workshop will be twofold. First, the GOLD team will describe the GOLD observations and provide an update of the current status of the mission. Second, the team will request input into possible ways to foster and improve GOLD science through collaborations with other members of the CEDAR community.

Ionosphere and Mesosphere Polar Aeronomy Campaign (IMPAC) 2009

Zia, 1300-1500 – Wednesday, July 1, 2009

Conveners:
Qian Wu, NCAR HAO
Wenbin Wang, NCAR HAO

With imminent arrival of the Advanced Modula Incoherent Scatter Radar (AMISR) at Resolute, polar aeronomy will enter a new era with more powerful observation capability. The Resolute AMISR will be able address many pressing issues related to the thermosphere-ionosphere interaction and ionosphere-magnetosphere coupling. Optical observations will be an important of part of future collaborative research. While ISR has more centralized operation and data processing, optical observations are more distributed and decentralized. To facilitate joint research effort, we organize this optical observation campaign to study substorm effect on the thermospheric winds in the polar cap. Through this effort we will also build an organizational infrastructure.

We have built a wiki page (http://cedarweb.hao.ucar.edu/wiki/index.php/User:Qwu) for this collaborative research and welcome others to contribute their data and model results for joint study. During this workshop we will present and discuss optical and other observations. We also plan to provide TIEGCM model results for comparison with observations. We expect that all participants will follow rule of road of the CEDAR database, when using others data for their research.

Estimating Physical Drivers from Ionospheric Imaging and Data Assimilation

Anasazi North, 1600-1800 – Wednesday, July 1, 2009

Conveners:
Gary Bust, ASTRA
Attila Komjathy, NASA JPL/Caltech

With the large number of ionospheric data sets now available, and the advances made in capabilities of ionospheric data assimilation and imaging algorithms, it has for the first time become possible to use global estimations of the four-dimensional electron density field to characterize the physical model parameters of the system. For example, it has been recently shown that neutral winds can be successfully estimated from four-dimensional imaging. This workshop will

focus on recent results, the current status and future directions of estimating physical drivers from data assimilation and ionospheric imaging.

The structure of the workshop will be as follows: The first hour will start with a short tutorial discussing our overall objectives and methodology, followed by brief 10-15 minute presentations of the current status of methods to estimate the model drivers. The second hour will be devoted to an open discussion of where the research is, and what the current issues are. Finally we will discuss the possibility of carrying out an experiment and/or a simulation designed to allow comparison of different methods of estimating physical drivers.

Thermospheric and Ionospheric Effects of Solar Wind Shocks and Pressure Pulses during the Declining Phase of Solar Cycle 23

Zia, 1600-1800 – Wednesday, July 1, 2009

Conveners:
Cheryl Huang, Air Force Research Laboratory
Delores Knipp, NCAR HAO

During the declining phase of solar cycle 23, a number of new Ionosphere-Thermosphere (I-T) phenomena have been noted - high-speed streams in the solar wind leading to periodic fluctuations in the thermosphere, magnetic storms which have little, limited or unusual Dst signature, etc. This workshop solicits observational and modelling reports of the I-T system response to solar activity in the approach to solar minimum. We invite presentations and comparisons of the I-T response during the commencement, main and recovery storm phase. We are particularly interested in the role that traveling ionospheric and atmospheric disturbances play in storm time. For example are I-T disturbances more likely to develop if the magnetospheric storm is preceded by a solar wind shock?

Examples of other questions that may be fruitfully addressed are:

1) What is the role of northward and/or in-the-ecliptic components of the interplanetary magnetic field (IMF) on I-T disturbances?
2) What fraction of the energy deposition to the upper atmosphere is related to cusp region dynamics?
3) What are the roles and relative contributions of particles and Poynting flux deposition to the upper atmosphere?
4) How does localized, intense Poynting flux input affect the global thermosphere?
5) Can we offer better characterization of upper atmosphere energization than that provided by ground-based indices?

World Day Planning

Sunset, 1600-1800 – Wednesday, July 1, 2009

Convener:
Ingemar Haggstrom, EISCAT Scientific Association

World Day planning session -- Workshop to discuss the proposed coordinated incoherent-scatter radar observations for 2010.

The URSI Incoherent Scatter Working Group (ISWG) will have its usual planning meeting at CEDAR to coordinate the World Day experiments involving the world's upper atmospheric observatories. The procedures for scheduling World Day observations are described at: http://www.eiscat.se/Members/ingemar/skedule/RequestingWD.htm, and the other links referenced therein which include a sample proposal.

Written proposals are requested for meeting specific research needs using the World Day observations. These proposals should be submitted by 5 June. The planning meeting is for the ISWG and UAF staffs to review all the proposals submitted and determine how the global network of ISRs can best satisfy the approved observational requests. The proposer's presence during this discussion is not required, but all are welcome, especially students.

Please feel free to consult with any facility staff member or the ISWG chair for clarification on the process for requesting ISR observing time within the World Day program.

Arecibo Friends

Anasazi South, 1230-1430 (Part 1) and 1500-1700 (Part 2) – Thursday, July 2, 2009

Convener:
Mike Sulzer, Arecibo Observatory

As opposed to previous years I intend to briefly present the highlights for the last year, plans for the near future and then after briefly describing the latest news the Arecibo budget recompetition situation, have a panel discussion to brainstorm and list alternatives for the future of atmospheric science at Arecibo/NAIC.

The preliminary agenda looks like this:
Arecibo Friends Draft Agenda 6/5/09 4:41 PM
Arecibo Friends session 1
25 minutes state of the observatory, SAS program highlights, NAIC news and recompetition (Sixto)
35 min. HF facility and new 430 hardware improvements and techniques M. Sulzer
60 minutes roundtable/panel discussion and dialogue about the Arecibo budget situation and NAIC recompetition
Break
Arecibo Friends session 2 - Highlights by our users, maybe 10 minutes or so each, so far I have commitments from the following:

(1) Eliana Nossa, Cornell University,
Sporadic E layer observations over Arecibo; Searching for the source of QP echoes. A 30 MHz imaging radar located on St. Croix detected intense, structured coherent backscatter from postsunset sporadic E layers over Arecibo during the fall of 2008. Neutral wind shears near the layers are thought to be able to trigger the so-called QP echoes through the action of neutral Kelvin- Helmholtz (KH) instability (Larsen, 2002). The talk investigates this hypothesis by evaluating the Richardson number criterion in the MLT region using temperature and velocity profiles derived from Arecibo observations made concurrently. We find that the criterion was satisfied frequently and also that the observed wind direction pattern was consistent with the idea of neutral overturning leading to sporadic E layer structuring.

(2) F. T. Djuth (GRI), L. D. Zhang, S. M. Smith, D. J. Livneh, I. Seker, M. P., Sulzer, J. D. Mathews, R. L. Walterscheid, Arecibo's Thermospheric Gravity Waves and the Case for an Ocean Source Wave-like disturbances in electron density have been observed in the thermosphere above Arecibo Observatory, Puerto Rico throughout its 45-year history. However, only recently has it become evident that these waves are continuously present in the Arecibo thermosphere. The wave characteristics are fairly constant between day and night and from season to season. High-resolution electron density measurements obtained by applying the coded long pulse radar technique to photoelectron-enhanced Langmuir waves are presented. These new observations strongly suggest that the perturbations in electron density are the result of internal acoustic gravity waves (AGWs) propagating through the Arecibo thermosphere. Most of the wave energy is at periods greater than the Brunt-Väisälä period, and the change in vertical wavelength with altitude is consistent with theoretical expectations for waves that are damped by viscosity/thermal conduction. The AGW source appears to produce AGWs that are broad banded in wavenumber space. The downward phase trajectories of the electron density perturbations between 400 km and 120 km combined with the horizontal phase velocities obtained from airglow measurements support the idea that the AGWs are not ducted but rather are locally produced. In addition, the altitudes at which major peaks in electron density fluctuations are observed follow theoretical estimates for non-ducted waves. The nominal period of the AGW wave packet is ~60 min at 250 km altitude, but periods of ~20 min are also evident at lower altitudes. Classic sources of AGWs do not appear to be consistent with the observations. Ray tracing of the AGWs combined with 630.0- nm airglow observations point to a source location in the Atlantic Ocean that is ~570 km east-northeast of Arecibo.

(3) Diana Prado (UPR-Mayaguez/AO,
Magnetic storm effects on the topside composition during solar minimum

(4) Pedrina Terra (Arecibo),
7320 O+ and H_alpha FPI observations at Arecibo

(5) Christiano Brum (Arecibo),
Oxygen densities derived from Arecibo ISR (or MSIS vs. Burnsider Factor and alternative hypothesis for the O-O+ cross section adjustment)

(6) Lars Dyrud (CRS) et al.,
Modeling sporadic E irregularities (with Julio)
GPS-TEC projects (with Nestor)
(7) Wes Swartz (Cornell), Nestor et al
(8) Jonathan Fentzke (U CO) et al.
(9) Diego Janches (CoRA/NWRA) et al.,
Micrometeor differential ablation

Cubesats Constellations and Communications Workshop

Anasazi North, 1230-1430 (Part 1) and 1500-1700 (Part 2) – Thursday, July 2, 2009

Conveners:
Gary Swenson, Univ. of Illinois at Urbana-Champaign
David Klumpar, Montana State University

The workshop will have three aspects with will include:

1. (30 minutes) Descriptions of 2 NSF Cubesat development projects
2. (90 minutes) Discussion of 'Multi-satellite or Constellation' missions. The discussions will include dynamic, electrodynamic, and aeronomy problems and constellation methods in addressing these problems, where at least one 'example' mission will be described in each area.
3. (90 minutes) A major consideration in technology to address methods in two involves the technology of satellite communication, both satellite to ground and inter satellite. Methods of communication involving increased bandwidth from traditional communications with increased bandwidth with lower power technologies will be discussed.
4. (30 minutes) A summary discussion describing the major findings of the workshop's items 2) and 3) above.

Science Rationale for an Antarctic ISR

Zia, 1230-1430 (Part 1) and 1500-1700 (Part 2) – Thursday, July 2, 2009

Conveners:
Anja Stromme, EISCAT Scientific Association
Tony van Eyken, SRI International
John Kelly, SRI International
Robert Clauer, Virginia Tech
Ennio Sanchez, SRI International

Our understanding of the Sun-Earth connection at high latitudes originates largely from observations made in the Arctic, and traditionally global models are using input only from the northern hemisphere, implicitly assuming hemispherical symmetry.

There are now several well-known asymmetries between the two polar atmospheres and ionospheres caused by, among other things, the different landmass distribution and hence atmospheric circulation patterns and temperatures, and the different offsets between the geographic and magnetic poles, resulting in very different geomagnetic regions being exposed to similar solar input at any given time of day and season. How large these effects are in the upper atmosphere

and ionosphere region and their coupling to the magnetosphere and the solar wind are not very well known. Only by long semi-continuous observations of the variability in the high latitude southern hemisphere can one potentially gain new insight into these questions.

Only now, with the advent of easily reproducible AMISR technology which is designed for unmanned remote operation in extreme locations, does the possibility exist to make such an observing program in Antarctica a reality.
In this workshop we would like to invite speakers and open discussion on topics related to interhemispheric studies, potential biases in global models due to the strong northern hemisphere biased input, and general aeronomy unique to the high south.

Ionospheric and Thermospheric Response to Large Stratospheric Changes

Sunset, 1230-1430 (Part 1) and 1500-1700 (Part 2) – Thursday, July 2, 2009

Conveners:
Larisa Goncharenko, MIT Haystack Observatory
Jorge Chau, Instituto Geofisico del Peru
Hanli Liu, National Center for Atmospheric Research

Recent research efforts indicated that during sudden stratospheric warmings significant variations appear at higher altitudes, in the upper thermosphere and ionosphere, and over a large range of latitudes. This workshop will provide a forum where researchers can present their experimental and modeling results and address the SSW coupling challenges.