The CEDAR Post

August 1999 Volume 37

Inside This Issue

FROM THE STEERING COMMITTEE

The 1999 CEDAR meeting was held in Boulder from June 13-18. This issue of the Post provides a summary of the meeting and the afternoon workshops.

The CEDAR meeting is one of the primary responsibilities of the CEDAR Science Steering Committee (CSSC), composed of members from the US aeronomy community who serve three year terms, two international representatives who serve two year terms, and a student representative who serves one year. At the June meeting, several CSSC members completed their terms and we thank them for their energy and input during their time on the committee. The "retiring" members are Joseph Salah (Millstone Hill Observatory), Rod Heelis (U. Texas, Dallas), David Hysell (Clemson U.), Michael Taylor (Utah State U.), Tony van Eycken (EISCAT), and Andrew Stephan (Boston U.). We particularly thank Joe Salah for his able, enthusiastic, and good-humored chairing of the CSSC over the past two years. The new chair of the CSSC is Cassandra Fesen (U. Texas, Dallas).

The CSSC welcomes new members Michael Buonsanto (Millstone Hill Observatory), Timothy Kane (Pennsylvania State U.), John Kelly (SRI International), Jeng-Hwa Yee (Applied Physics Lab, Johns Hopkins U.), Toshitaka Tsuda (Radio Atmospheric Science Center, Kyoto U.), and student representative Monica Angelats i Coll (U. Colorado, Boulder).

The 2000 CEDAR meeting will be held June 25-30 at the National Institute of Standards (NIST) campus in Boulder. For the first time, the meeting will occur after the yearly GEM meeting in Snowmass. Additional details are given in a subsequent article. A special thanks to everyone who replied to the survey on whether the CEDAR meeting should move from Boulder. Over sixty people replied, with the overwhelming majority voting to keep the meeting in Boulder.

The CSSC will meet at NSF on October 22 in order to review CEDAR issues, to begin planning for the annual meeting, and to discuss the joint meeting with STP in June 2001 (see article inside for additional details). Progress on the CEDAR data base will also be reviewed. If you have any input, ideas, or suggestions on any CEDAR-related matter, please contact any one of the CSSC members; their contact information is listed inside this newsletter.

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AWARDS FROM THE FY 1999 CEDAR COMPETITION

The CEDAR FY99 competition included proposals submitted in preparation for the CEDAR-TIMED collaboration. These proposed CEDAR-TIMED investigations were limited to a one year duration. Twenty-four submissions were made to the CEDAR competition and sixteen to CEDAR-TIMED. The list of successful submissions follows.

CEDAR AWARDS

Buonsanto	MIT	Storm study
Codrescu	U. Colorado	Low latitude thermosphere/ionosphere in geomagnetic storms
Collins	U. Alaska	Wave motions in mesopause from lidar measurements
Deehr	U. Alaska	Dayside auroral hydrogen emission
Fesen	U. Texas, Dallas	Electrodynamics with the NCAR TIEGCM
Fritts	NorthWest Research Assoc.	Dynamics in MLT using Hawaii MF radar
Guzdar	U. Maryland	Small scale plasma in high-latitude ionosphere
Heelis	U. Texas, Dallas	Topside ionosphere using multiple radar/satellite data
Hecht	Aerospace Corp.	Climatology of small scale gravity waves
Kane	Pennsylvania State U.	Noctilucent clouds and dynamics
Meriwether	Clemson U.	Mesosphere inversion layer with Starfire and MHO
Roesler	U. Wisconsin	Wisconsin H-alpha mapper FPI and WISCAR
Tsunoda	SRI International	Equatorial electrodynamics in central Pacific

CEDAR-TIMED AWARDS

Bust	U. Texas, Austin	Joule heating and auroral variability campaign
Foster	MIT	Automation of E-region FPI
Lieberman	NorthWest Research Assoc.	Sequential estimator for global wind mapping
Meriwether	Clemson U.	Southern hemisphere mesopause winds, temperatures, airglow
Richmond	NCAR	Ion-neutral coupling in lower thermosphere: contribution of AMIE
She	Colorado State U.	Colorado State sodium lidar update
Taylor	Utah State U.	All-sky imager chain for small-scale gravity waves in the MLT
Thorsen	U. Colorado	Intercomparison of radar/optical wind temperature measurements
Wickwar	Utah State U.	Detectors and data acquisition for USU ALO

UPDATE ON THE RELOCATABLE ATMOSPHERIC OBSERVATORY

The latest word on the Relocatable Atmospheric Observatory (RAO) is cautious optimism. Possible avenues of funding have not been exhausted and are still being explored. We have to continue to be patient while we see how the funding scenarios play out. Now is not the time to lose faith in this project which is so important for the future health and vitality of our field.

–Rich Behnke, National Science Foundation

SUMMARY OF THE

1999 CEDAR Workshop

UNIVERSITY OF COLORADO • JUNE 13-18,1999

The 1999 CEDAR Workshop was held between Sunday June 13 and Friday June 18 at the University of Colorado in Boulder. A total of 305 persons from 73 institutions, 18 outside the United States and Puerto Rico, attended the CEDAR Workshop. This year, 111 students came from 33 universities and nine research labs, including ten students from Canada, the United Kingdom, Taiwan, and for the first time from Japan and Norway. The total number of students increased by 8%, while non-student participation decreased by 4%, leading to an overall increase of 4% in the number of participants compared to 1998. However the number of posters by students increased dramatically by 72%. There were 45 universities represented at the Workshop, 30 research laboratories, and seven small businesses.

The CEDAR Prize lecture was given by Dave Hysell of Clemson University on "A new look at low- and mid-latitude ionospheric irregularities". Tutorial talks on Tuesday, Wednesday, and Thursday were given by Umran Inan of Stanford on Transient disturbances in the nighttime lower ionosphere, Tom Schlatter of the NOAA Forecast Systems Lab on Variational assimilation of meteorological observations: How it works in the lower atmosphere, and by Rick Chappell of Vanderbilt University, on Polar ion outflow - Is there enough to fill the magnetosphere? On Friday, there were three special tutorials on Solar-Terrestrial Coupling Processes (S-TCP) during a joint CEDAR-GEM-SHINE session. The S-TCP speakers were all former UCLA graduate students of S.V. Venkateswaran. Nancy Crooker of Boston University spoke for SHINE on "Solar and heliospheric aspects of solar-terrestrial coupling", Larry Lyons of UCLA and GEM talked about "Magnetospheric interactions with the solar wind and ionosphere", while Arthur Richmond of HAO/NCAR and CEDAR spoke on "Ionosphere/Thermosphere: Response to disturbances". Hard copies of the transparencies are available, as are video tapes of these talks. Please contact Barbara Emery (emery@ucar.edu, HAO/NCAR, PO Box 3000, Boulder CO 80307) if interested in obtaining copies. The tutorials were supplemented by six 20-minute science highlight talks by members of the community and 13 briefings on various programs. The afternoon was devoted to workshops, a total of 21, most of which are summarized in this issue.

The sixth annual student workshop on Sunday was organized by the CEDAR student representative Andrew Stephan of Boston University with the theme "An introduction to solar-terrestrial programs and waves". The waves tutorial was presented by Chris Meyer of HAO/NCAR and is available in hard copy from Barbara Emery. About 55% of the students attended the Student Workshop and following social at Chautauqua Park. The new CEDAR student representative is Monica Angelats i Coll of the University of Colorado at Boulder.

A total of 83 posters was shown in the Glenn Miller Ballroom of the University Memorial Center Tuesday evening; of these, 50 were student posters, and four of these were by undergraduates. The first place student poster prize was awarded to Olga Kalashnikova of the University of Colorado on "The micrometeorite influx into the upper atmosphere". Second and third prizes went to Laura Peticolas of the University of Alaska and to Eric Rhoden of the University of Colorado. The best undergraduate poster was by S. Daniel Daugherty of the University of Alabama in Huntsville.

–Barbara Emery, HAO/NCAR

OPENING REMARKS

CEDAR MEETING June 1999

Jeff Forbes, University of Colorado

My job here is not chair, ringmaster or leader;
I am a CEDAR welcomer, the University greeter.
I greet everyone that a great greeter greets,
The job of a great greeter, after all, is to greet all that he meets.

Greetings to colleagues, operators of imagers, photometers and lidars,
MST, IS, MF and meteor radars,
theorists, modelers and data analysts too,
not to mention our sponsors – without them what would we do?

Greetings to the students, from schools far and wide
bound to Boulder, poster tubes by their side,
sometimes gawking, gazing and feeling intimidation,
facing acronyms and workshops with great anticipation.
These students, they start out strong, with great zest;
but by mid-week they feel comfort and attendance is less.
Perhaps they get bored or burnt out a lot.
We don't know where they are, only where they're not.

Now a great greeter not only gives welcome and greeting,
but also provides a brief preview of the meeting.
In the session plenary you'll hear from Sunanda, Bob and Mary,
and from Rich, about the relocatable atmospheric observatory.
You'll hear from the post-docs, you'll hear the prize lecture,
You'll hear the tutorials, and some database conjecture.
You'll hear about TIMED-CEDAR and about CEDAR-TIMED,
and by the end of the week, you'll need to unwind!

The workshops, oh the workshops, the workshops galore,
If you sense an AGU session...head out the door!
Workshops is where we discuss the best of the best,
the science we like, the heck with the rest!
You'll hear about OH 8-3, 6-2 and 6-4
...oh what, tell me what, are all these numbers for?
You'll hear about waves that propagate and saturate
duct, seed, migrate and finally dissipate.
You'll hear about some that prefer to Doppler spread,
and about others that don't go up, but go down instead.
At the workshops we find out who's who and what's the score,
what's in and what's out, and what's up and what for.

So, welcome to Math 100, welcome to CU,
welcome to Boulder, I hope you like our views.
Welcome to the engineering center, we're glad you're our guest,
if you get confused, remember the mountains are west.
And if you parked your car and got a ticket,
don't worry, Barbara Emery will fix it.

And so now this great greeter's greeting is done,
I bid you adieu, and good meeting everyone!

* *Inspired by Dr. Seuss*

PLANS FOR CEDAR 2000 WORKSHOP

NIST, Boulder, Colorado
June 25-30, 2000

The CEDAR Workshop for 2000 will be held June 25-30, 2000. The relatively late date for the CEDAR Workshop is partly in response to requests to meet farther away from the Spring AGU meeting and partly due to space availability in Boulder and Snowmass. For the first time, the GEM Workshop will be held the week before CEDAR in Snowmass, Colorado. Possible joint sessions may thus be on Saturday June 24 or Sunday morning June 25.

CEDAR 2000 will convene at the National Institute of Standards and Technology (NIST) at 325 Broadway in Boulder, Colorado. The campus now includes the David Skaggs Research Laboratory, which opened in April 1999 and includes two additional workshop rooms. The extra room makes it possible to convene four simultaneous workshops in the afternoons. The posters can be accommodated in the rooms across from the auditorium. It has always been difficult to see all the posters in the Poster session, especially for the presenters. The additional space at NIST will permit two poster sessions during CEDAR 2000. The winning student posters will be on display outside the auditorium on the last days of the Workshop. Maps and information about the CEDAR 2000 Workshop are available at the web site http://cedarweb.hao.ucar.edu/wkshp/.

–Barbara Emery, HAO/NCAR

MEETINGS CALENDAR

1999

Oct 26-29	UARS Science Team Meeting, Virginia Beach, VA
Nov 16-18	ISTP fall workshop, UCLA
Dec 13-17	AGU fall meeting, San Francisco

2000

Jan 5-8	URSI, Boulder
Feb 8-11	Comparative Aeronomy in the Solar System, Yosemite National Park, CA
Mar 13-17	Ninth Workshop on MST Radar, Toulouse, France
Mar 20-24	Third International School on Atmospheric Radar, Toulouse, France
Mar 20-24	Chapman Conference on Space Weather, Clearwater, FL
Mar or Apr	TIMED-CEDAR meeting with TIMED-CEDAR awardees, JHU/APL
April 25-29	EGS meeting, Nice, France
May 1-5	Space Weather to Operations, Boulder, CO
May 15-17	CEDAR Storm Study workshop, Millstone Hill, MA
May 17-23	International Symposium on Equatorial Aeronomy, Antalya, Turkey
May 23-26	PSMOS Workshop 2000, Toronto, Canada
May 30-June 3	AGU spring meeting, Washington, DC
June 18-23	GEM meeting, Snowmass, CO
June 25-30	CEDAR meeting, Boulder, CO
June 27-30	Western Pacific Geophysics meeting, Tokyo
July 16-23	COSPAR 33rd assembly, Warsaw, Poland
July 24-28	IEEE International Geoscience and Remote Sensing Symposium, Honolulu
July 24-28	COSPAR Colloquium on the Outer heliosphere, Postdam, Germany
Oct 2-6	First S-RAMP conference, Sapporo, Japan
Dec 15-19	AGU fall meeting, San Francisco

2001

May 20-June 2	AGU spring meeting, Boston, MA
Dec 10-14	AGU fall meeting, San Francisco, CA

BRIEF ANNOUNCEMENTS

NATIONAL SPACE WEATHER PROGRAM

Currently, the deadline for submission of proposals to the NSF for National Space Weather Program funding is projected to be January 1, 2000. Please consult the NSF web page for information on the program and proposal submission at http://www.nsf.gov

PLANS FOR CEDAR 2001

In 2001, the CEDAR Workshop is meeting in conjunction with the 10th Quadrennial Solar-Terrestrial Physics (STP) Symposium. The meeting will occur either June 17-22 or June 24-29. Present plans call for some joint plenary sessions with STP, with the CEDAR afternoon workshops unaffected by the collaboration.

–Barbara Emery, HAO/NCAR

COMMENTS ON CEDAR DATABASE, PLEASE!

The CSSC will devote part of its next meeting in October 1999 to discussions and evaluation of the CEDAR Database. We would very much appreciate comments and suggestions! Please check out the Database and tell us what you think. The Database can be accessed through the CEDAR homepage at http://cedarweb.hao.ucar.edu/index.html.

Comparisons with other sites which provide data access such as SPARC (http://www.crew.umich.edu/UARC/) and Madrigal (http://w3.haystack.edu/ madrigal/index.html) are also welcome.

Comments may be emailed to C. G. Fesen at fesen@tides.utdallas.edu and/or to Peter Fox at pfox@hao.ucar.edu; Peter oversees the project at NCAR.

THE NEXT CEDAR POST

The next issue of the CEDAR Post is scheduled for December or January. Contributions - in the form of articles, announcements, "op-ed" pieces - are always appreciated. Please send any items of possible interest to fesen@tides.utdallas.edu

Workshop Reports

STUDENT WORKSHOP REPORT: INTRODUCTION TO SOLAR-TERRESTRIAL PROGRAMS AND WAVES

Convenor: A.W. Stephan
(astephan@bu.edu)

The 1999 Student Workshop held on Sunday, June 13 was attended by 93 CEDAR members. Many of the students participating were attending their first or second CEDAR meeting. The afternoon session was divided into two sections. The first section included an introduction to the NSF-sponsored CEDAR, GEM, and SHINE communities. The intent was to provide a basis for the Friday joint session between the three communities. The second half focused on atmospheric waves and tides as a scientific topic of interest to a broad range of CEDAR scientists. The day ended with what is becoming a customary evening social.

The first speaker of the afternoon was Vic Pizzo, representing SHINE. He gave an entertaining discussion of the evolution of the state of solar and heliospheric observations, leading to the formation of what is now the SHINE collaboration. Moving slightly closer to Earth, Terry Onsager reported on the GEM community efforts. In particular, he focused on the modular modeling approach being used by members of GEM to create a global geospace circulation model (GGCM). Finally, Bob Robinson discussed the more familiar CEDAR program from the less familiar NSF perspective, within the context of all three programs together.

After a brief break, Chris Meyer gave a tutorial on atmospheric waves, focusing mainly on neutral atmospheric waves and tides. He presented the basic physics of the current research being conducted on these phenomena while using a minimal amount of mathematics. He included a comprehensive overview on the different types of patterns seen, including the differences and the interactions between waves of different periodicities. Copies of his transparencies can be obtained by contacting Barbara Emery (emery@hao.ucar.edu). After this broader overview, four CEDAR students or recent graduates presented work they have been doing, primarily in the optical detection of gravity waves. Larry Gardner presented results from the airglow imager and temperature mapper being used at Utah State. Steve Smith showed images and discussed some of the research being conducted at Boston University. Monica Angelats i Coll highlighted the physics of her airglow model at University of Colorado and showed good comparisons to data. John Leko from the University of Alabama-Huntsville showed a different aspect to airglow modeling, using the perspective of a satellite or space-based imager.

The evening social was again held at Chautauqua Park. Approximately 65 people attended. Chris Meyer and Barbara Emery managed to find time in their busy schedules to order and pick up the large assortment of subs, chips, and beverages (thanks again!), which were enjoyed by everyone. After eating, some braved the trails, others went off to play frisbee, and the rest sat and got acquainted with one another. The overall response to the day's events was positive, with a few lessons learned, as always, for how to improve next year.

GLOBAL CLIMATOLOGY OF METEORIC METALS IN THE UPPER ATMOSPHERE

Convenor: Dave Bedey
(hd2170@usma.edu)

The occurrence and distribution of metals (e.g., iron and sodium) in the Earth's upper atmosphere is a fascinating and complicated subject which is governed by the meteoric deposition of the metals, chemical processes, and dynamics. The objectives of this session were to introduce the field to persons not familiar with it and to provide a forum for scientists actively engaged in related research to discuss their results. A diverse group of researchers shared their perspectives on a variety of topics. The emphasis was on the exposition of results and their interpretations rather than the description of experimental procedures or numerical techniques. Titles of the presentations are listed below, with the presenter indicated in brackets:

Metals in the upper atmosphere: An Introduction (Dave Bedey); Meteoric deposition of metals and subsequent transport of metal ions in the E-region (John Mathews); Model seasonal variations in metals due to meteoric input (Bill McNeil); Mesospheric metal layers over Arecibo (Jonathan Friedman); Annual trends in the Na layer and results from Starfire (Tim Kane); Long-lived meteor trail observations at Starfire Optical Range (Mike Kelley); Auroral effects on the chemistry of meteoric metals (Craig Heinselman); Simultaneous sudden sodium and sporadic E layers over Sondrestrom (Brent Watkins); Global distribution of Fe+ (Jeff Forbes); Ionospheric meteor metals - GLO observations (Jim Gardner)

As indicated by the above list, the scheduled presentations spanned a broad spectrum of topics. Much useful discussion was stimulated, and it can be reasonably asserted that the workshop's objectives were met. Although (as expected) a complete and comprehensive "global climatology of meteoric metals in the upper atmosphere" continues to remain beyond our reach, workshops of this type are valuable for enabling cross-fertilization of ideas between the many people who examine this class of phenomena from a variety of viewpoints. The convenor, Dave Bedey, can be contacted by telephone at (914) 938-5012 or via email at hd2170@usma.edu.

NASA/NSF COQUI 2 SOUNDING ROCKET CAMPAIGN: DATA ANALYSIS

Convener: M. F. Larsen
(mlarsen@clemson.edu)

The Coqui 2 sounding rocket campaign was carried out in Puerto Rico in the period from January through April 1998 as a joint NASA and NSF project. In all, eight sounding rockets were launched to make in situ measurements of the properties of turbulent layers, sporadic E layers, sudden sodium layers, and intermediate layers in the D and E region. Ground-based support included extended measurements throughout the campaign period by the Arecibo Observatory lidar and incoherent scatter radar, as well as VHF and HF coherent scatter radar measurements from several locations on the island. The purpose of the workshop was to summarize the results obtained from the data analysis carried out so far and to facilitate more detailed intercomparisons of the various data sets in future analyses. A brief summary of some of the science highlights from the workshop follows. The key speakers were:

M. Larsen (Clemson University);
J. Friedman (Arecibo Observatory);
S. Collins (Cornell University);
M. Kelley (Cornell University);
G. Earle and R. Bishop (University of Texas at Dallas);
D. Hysell (Clemson University);
W. Swartz (Cornell University);
and R. Tsunoda (SRI International).

A brief summary of some of the science highlights from the workshop is as follows:

• The in situ turbulent layer measurements show that the vertical diffusion is organized by the large-scale wind and wind shear structure. The source of the turbulence is likely to be small-scale gravity wave instabilities, but the occurrence of the instabilities is modulated or controlled by the background winds, including the tidal components.

• The extensive lidar and

incoherent scatter radar data obtained during the campaign show a strong correlation between the occurrence of mesospheric ionization layers and sudden sodium layers.

• Calculations of the neutral wind speeds required to explain the diffusive separation of metallic ions observed in situ during a sporadic E layer event imply large wind speeds exceeding 100 m/s near the turbopause. Such large wind speeds are in agreement with the values measured directly by the chemical tracer releases on other days during the campaign.

The last half of the workshop focused on the similarities and differences between the coherent scatter sporadic E layer and quasi-periodic (QP) echo measurements from four different locations, including measurements from two different locations in Puerto Rico, from South Carolina, and from California. The observations all show the occurrence of QP echoes, and many of the characteristics of those echoes are similar, such as the range/time rates, the distribution of Doppler shifts, and the dynamic range of the echoes. There are also important differences between the echo characteristics at each of the sites, including the typical number of striations, the frequency of occurrence, and the altitudes and altitude extent. The combined data set offers potentially important clues about the mechanism responsible for the QP structure which is still poorly understood.

LATEST RESULTS FROM LOW LATITUDES

Convenors: D. L. Hysell and M. C. Kelley
(dhysell@clemson.edu; mikek@anise.ee.cornell.edu)

This workshop was intended to provide a forum for discussing new developments and latest results from our investigation of the low latitude atmosphere and ionosphere. It was held in lieu of the MISETA and Friends of Jicamarca workshops with the hope of appealing to their traditional audience but also to a more inclusive one. The contemporary emphasis on space weather has led to renewed, broad interest in equatorial plasma instabilities and irregularities and their effects on communication systems, and this workshop was called to address those issues in particular. Approximately 60 individuals attended the workshop.

Twelve presentations were made, covering topics including recent and planned equipment upgrades in the American sector, participation in international campaigns, new experimental efforts and techniques, and theoretical investigations into space plasmas. John Meriwether (Clemson U.) began the workshop with a review of recent observations from the Arequipa Fabry Perot interferometer and introduced the idea of moving the device to another location with more favorable optical conditions. Meers Oppenheim (Boston U.) presented early results from a computational investigation of E region plasma instabilities forming on meteor trails. This work takes on special significance in light of the importance of meteor radar wind measurements for CEDAR MLT wind studies. David Hysell and Joel Burcham (Clemson U.) described new E region electric field measurements being made with the JULIA radar at Jicamarca and described the new JULIA WWW data server. Moving to the F region, Bela Fejer (Utah State U.) described his recent work establishing a causal link between zonal ionospheric electric fields and the formation of F region plasma irregularities. Cesar Valladares (Boston College) discussed how the condition of the midlatitude anomalies can be used as a proxy for identifying conditions favorable for spread F. These last two presentations in particular suggest that the community is making progress toward the goal of eventually being able to forecast spread F with skill.

Jorge Chau (Jicamarca) presented observations made jointly from Jicamarca and Piura, where he is pioneering ionospheric investigations using the Piura University wind profiler system. (Does this mean there is a Jicamarca cluster?) Ronald Woodman (Peruvian Geophysical Institute, Jicamarca) reported on the international EPIC program, which has lately undertaken its own serious investigation of the spread F forecast problem. Ben Balsley (Colorado U.) then proposed a new series of radar experiments intended finally to

establish the role played by internal gravity waves in the upper atmosphere over the Andes. Marlene Colerico (Boston U.) gave an update of the status of the Boston University imaging chain and on research into the brightness wave. Santimay Basu (AFRL) discussed plans for investigating low-latitude ionospheric irregularities from the ground and from space, and Vadym Paznukhov (U. Mass. Lowell) gave an update on the PREASA initiative.

Finally, Michael Kelley (Cornell U.) led a discussion regarding the National Space Weather Program and the contribution that our community might make to it. It was agreed that, while numerous small individual research projects are underway, there has been no coordinated effort to bring experimenters, theorists, and modelers together so as to formulate a practical means of forecasting spread F and the associated scintillation events that constitute the last link of the space weather chain of events. There was a sense that such an effort would be welcome and that the time has come for us to either demonstrate that meaningful prediction is possible or, failing that, to move on to something else. However, most of those attending also felt that the time was not yet right to organize a campaign or create a new CEDAR acronym.

After the meeting, several people expressed their interest in meeting informally again. One possible forum for such a meeting is the National Radio Science Meeting held annually in Boulder. The purpose of another meeting would be to define what is meant by a forecast and finally to come to consensus about the most important influences that control the occurrence of equatorial spread F. We could then assemble theoretical and numerical forecast models that reflect these influences realistically and then determine what new and existing instrumentation is necessary to initialize and specify them. Having fleshed out the requirements for making a forecast, we could ultimately move toward the planning of a campaign.

Readers who are interested in the low-latitude aspects of space weather and who might like to participate in a follow-up meeting to the CEDAR workshop are asked to contact the conveners.

CEDAR DATABASE ACCESS

Convenors: Roy Barnes and Patrick Kellogg
(bozo@ucar.edu; pkellogg@hao.ucar.edu)

The Database workshop was held each afternoon from Monday-Thursday, June 14-17, from 1–3 p.m. The workshops were informational and hands-on with several handouts on access, guidelines for data suppliers, and possible image formats. There were short demos each day of the proposed web page interface to the Distributed Oceanographic Data System (DODS) middleware access to the CEDAR Database presented by Patrick Kellogg. Roy Barnes and Patrick showed the present cmenu access, both via the web and via logins. Peter Fox (HAO/NCAR, head of HAO data services) was available most days and spent time with imager scientists discussing with them their data sets and showing a demo of a Utah State PMIS image converted to netCDF and FITS. Peter also showed the interface between the data via DODS and plots using the Interactive Data language (IDL). Discussions were also held with Jeng-Hwa Yee of TIMED to coordinate possible data ingest of ground-based instruments via the CEDAR Database. Guidelines for data suppliers addressed TIMED issues as well as general ingest issues. Approximately 20 people a day came to one of the four afternoon workshops, staying about an hour each; a little more than half were students. The CEDAR URL is http://cedarweb.hao.ucar.edu/

UAF/ISR FACILITIES: NEW DEVELOPMENTS AND HIGHLIGHTS

Convener: D. T. Farley
(donf@ee.cornell.edu)

We began with six brief (~10 minute) summaries of highlights by Tony van Eyken (EISCAT), Jeff Thayer (Sondrestrom), John Foster (Millstone Hill), Phil Erickson (Kharkov and Irkutsk), Craig Tepley

(Arecibo), and Ron Woodman (Jicamarca). This was a change from the half hour presentations on each observatory of last year. We felt that most of the audience probably knew the basics about each observatory and did not need a full description every year. The next portion of the workshop was devoted to five very short science presentations, namely (1) First use of alternating codes at Jicamarca (D. Hysell), (2) POLITE comparisons (P. Erickson), (3) Electron collision corrections for Jicamarca (W. Swartz), (4) Auroral energetics at Sondrestrom (R. Doe), and (5) A search for "comets" at Jicamarca (J. Mathews). The workshop concluded with 15-20 minutes of general discussion led by Jeff Thayer on the involvement of the UAFs with TIMED.

ISR SCHEDULING FOR 2000

Convenor: Tony van Eyken
(Tony.van.Eyken@eiscathq.irf.se)

The goal of this annual workshop is to resolve outstanding problems in the proposed calendar of co-ordinated incoherent scatter observations for the following year. This calendar is developed under the auspices of the URSI Commission G Incoherent Scatter Working Group (ISWG) and takes into account the input and wishes of all the incoherent scatter radars. Nevertheless, many of the World's instruments are represented here (this year, eight out of ten) and this workshop traditionally plays a major role in establishing the eventual calendar.

The convenor, also presently the chairman of the URSI ISWG, had previously solicited input from the community and presented a strawman proposal, captioned "The Y2K Problem?", based on the input received. The main problem was that the demand far exceeded the resources available (about 20 or 21 days per year), but that is the sort of problem one is happy to have.

There followed a lively discussion, mainly centered on the exact demands that the availability of the TIMED satellite would place on the radar schedules. Since the result of funding requests would not be known until well into the calendar year under discussion, this argument could not be resolved to everyone's entire satisfaction but a general agreement was reached which provided for substantial coverage in the latter part of 2000. It was noted that considerably more coverage might also be possible outside the co-ordinated observation intervals.

Various adjustments, consolidations of similar program requests and general tinkering with dates and times led to an acceptable revised draft schedule which can be previewed at http://www.eiscat.uit.no/URSI_ISWG/2000_schedule.html

The meeting closed at about 1630; apparently the Y2K schedule wasn't a problem after all.

LIDAR/OPTICAL OBSERVATIONS DURING THE TIMED MISSION

Convenor: Tim Kane
(tjk7@psu.edu)

The status and operational strategies of the various NSF-related lidar and airglow projects which will be active during the upcoming TIMED mission were discussed. An emphasis was placed on those aspects of TIMED which overlap or complement ground-based optical measurements as well as how these combined data can be applied to the goals of the mission.

Speakers included Gary Swenson, University of Illinois; Mike Taylor, Utah State University; Vince Wickwar, Utah State University; Andy Gerrard, Penn State; Dorothy Gibson-Wilde, Colorado Research Associates; Doug Drob, Naval Research Lab; and Tim Kane, Penn State. Their talks addressed the following topics:

- Capabilities of the clustered instruments at Starfire Optical Range,
- An all-sky imaging chain through the Rockies, coupled with various lidars,
- An update on the Utah State Rayleigh Lidar system,
- An overview of Polar Science pertinent to combined ground-based/TIMED data,
- A Na Doppler lidar system to be installed at ALOMAR (Norway),
- Discussion of modeling and data assimilation efforts valuable to this mission,

• Efforts to organize a global Lidar network in support of TIMED and beyond.

The session was well attended and the active audience participation served to tie together the various talks. It became apparent that the ground-based optical community is to play a vital role in the scientific mission of TIMED and, reciprocally, that the TIMED data will prove invaluable to this community's ongoing investigations.

LOWER THERMOSPHERE COUPLING STUDY (LTCS)

Conveners: R. M. Johnson and C. G. Fesen
(rmjohnsn@engin.umich.edu; fesen@utdallas.edu)

The Lower Thermosphere Coupling Study (LTCS) is dedicated to coordinated investigation of the mesosphere/thermosphere region using a combination of observations and modeling efforts. LTCS conducts campaigns involving simultaneous observations by a variety of instruments globally distributed over periods of several consecutive days. The most recent CEDAR LTCS workshop focused on the three areas of interest identified at last year's meeting: TIMED/CEDAR collaborative studies; Geomagnetic activity; and Climatologies. Some of the topics discussed were: analysis of the LTCS 11 campaign from May 1995, for which there is WINDII data, which could be used as a prototype of how to combine satellite and groundbased data in preparation for CEDAR/TIMED; the difficulty of analyzing geomagnetic activity effects in datasets, since observations from prior and succeeding days are necessary to establish context; intercomparison of campaigns, especially the winter campaigns since LTCS 2, from December 1988, in particular, is very unlike all other winter campaigns; and South Pole data over a period of 10 days, which exhibited very interesting 10 hour oscillations and the occurrence and disappearance of the semidiurnal tides in the 10 day period. Further details on the LTCS working group can be found at http://www.dartmouth.edu/~cfesen/ltcs

GLO-TIMED-CEDAR

Conveners: Lyle Broadfoot and Ian McDade
(lyleb@vega.lpl.arizona.edu; mcdade@canott.dan.sp-agency.ca)

The Arizona Airglow experiments (GLO) have served the purpose of their primary sponsor and are now available for general use. It has become clear through previous shuttle flight activity that the experiment is very productive and needs a larger science team and a well-defined mission to take advantage of the GLO data product. A new plan is being developed for continued use of the GLO instruments in a supporting role to ground based observers. A group of Canadian aeronomers has agreed to join a US team to present the GLO's capabilities to NASA and the Canadian Space Agency as an international program. The proposal will be to continue flight on the Shuttle in a campaign mode in collaboration with ground based observers. The follow-on plan is to deploy the GLO on the International Space Station (ISS). The Shuttle flights will give an opportunity to examine the effectiveness of the overflight data in complementing ground based programs. These studies would be used to define the most effective use of the GLO facility when it is deployed on the ISS.

The ISS orbit is inclined at 51° to the equator, with a precession of about 70 days. This is a good orbit for many aeronomical observations. From the ISS/Shuttle altitude the limb tangent height of 100 km is depressed about 18° from the horizontal. This means that useful collaborative observations can be made with ground stations up to 69° latitude, well inside the auroral zone for half of the day. This will allow overflight of most of the airglow, lidar, and radar ground stations.

The ALOHA/ ANLC-93 campaigns observed signatures of dynamic changes in the nightglow, and the spectacular gravity wave event described by Taylor et al. (1995) appears to be consistent with the sharp changes recorded often in GLO

data. Taylor observed a transition in OH Meinel emission exhibiting a 50% jump in intensity in less than four minutes. The progress of the intensity pulse across the nightglow scene was estimated at 76 ms^{-1}. This pulse occurred in about 18 kilometers of lateral distance, not unlike the scale suggested by GLO observations. Notable wind shear in the persistent sodium layer near 90 km was reported during the ALOHA-93 campaign (Gardner et al., 1995). These dynamic changes suggest that the only way to complement the data from a ground site is to operate in "snapshot mode" to stop the action. All of the relevant data must be acquired in a single overhead pass of the spacecraft and, for now, only the Shuttle is sufficient to the task because of the high data rate available to its instrumentation. Although there would be only one pass over each optical ground station per night, the nightglow layer could be characterized by GLO above many ground sites. Complementary Shuttle orbits on either side of the ground site would supplement the integrated picture.

There was considerable interest in the program concept. Subsequently a proposal was submitted to the MITM Suborbital Program for a near-term flight opportunity. A broader based submission is planned for the University Earth System Science (UnESS) program (http://uness.larc.nasa.gov/uness/) in which case international participation and endorsement will be welcome.

TRANSIENT OPTICAL EMISSIONS IN THE UPPER ATMOSPHERE

Conveners: Matt Heavner and Mike Taylor
(heavner@gi.alaska.edu; mtaylor@cc.usu.edu)

This workshop was proposed to provide a forum for the discussion of the detailed morphology of sprites, jets, and elves. Matt Heavner provided a brief overview of the past decade of sprite, jet, and elve observations. Dana Moudry presented a detailed discussion of the morphology of specific sprites. Many specific sprites were used to develop a description of sprites which proceeded from simple columniform sprites to very complex events with rebrightening in some spatial regions of the sprites. Many of the examples were chosen to provide a "challenge to the modeler and theorist" because most current theories cannot describe the detailed structure observed in many sprites. Roxanne Dial presented observations and analysis of low altitude "Palm Trees" including one triangulated example extending up to only 56 km as well as several untriangulated examples. Mike Taylor discussed recent observations, including a meteor/sprite joint event illustrating luminosity (seemingly attached to a sprite) traveling back up a meteor trail, and observation and analysis of elves including the result of a trend of ~.9 km/kA in the plot of reported current vs. maximum observed diameter from the National Lightning Detection Network (NLDN). Christopher Barrington-Leigh provided a brief discussion of streamer charge and propagation characteristics, sprites associated with negative cloud-to-ground lightning, and comments on recent NLDN/elve observations indicating that NLDN-reported cloud-to-ground lightning (both polarities) with current greater than 60 kA are strongly associated with elves. Gary Swenson presented theoretical work suggesting that a high energy runaway electron was the source electron for a process which then cleared out a column of ambient electrons. The "refilling" time constant confines the repetition rate for sprites.

Overall the workshop was informal, with constant discussion between the presenter and the other workshop attendees. This was an atmosphere which was conducive to detailed discussions such as is not generally possible at AGU or other more formal meetings and created a very productive discussion.

In part, this first CEDAR workshop on Transient Optical Emissions in the Upper Atmosphere was proposed to measure the CEDAR community's interest in the recently discovered phenomena of sprites, jets, and elves (one decade has passed since the first recorded

sprite observation (Franz, Nemzek and Winckler, 1990). The strong attendance (more than double that expected) and the fact that over half the attendees stayed more than 40 minutes beyond the scheduled end of the workshop to continue discussions indicate a strong in interest in sprites, jets, and elves from the CEDAR community. Therefore, we hope to continue having CEDAR workshops as an informal gathering for the discussion of current analysis, observations, and theoretical work, as well as the coordination of upcoming or currently ongoing observational campaigns. Please contact Matt Heavner (heavner@gi.alaska.edu) with any questions about the 1999 CEDAR workshop, or with any questions or comments for future CEDAR workshops.

PROTON WORKSHOP

Convenor: Marina Galand
(mgaland@sec.noaa.gov)

The Proton Workshop focused on the incident keV protons precipitating into the high latitude ionosphere. Roger Smith first gave a short overview of the 1994 CEDAR Proton Aurora Workshop. Discussion then turned to the incident proton flux; information on the incident protons can be inferred from satellite measurements, such as from UARS data (Jim Sharber).

From these data, statistical patterns can be derived which are very useful for obtaining a global picture of the incoming protons over the auroral ovals, as shown by M. Codrescu with TIROS data (http://sec.noaa.gov/~codrescu/part.html). Next we discussed dayside rocket campaigns, such as SCIFFER and CAPER (C. Deehr). We need high energy proton spectra measurements for the next dayside campaigns. Other topics were:

- Indirect measurements, H emissions: Ground-based observations can be used as an ionospheric signature of magnetospheric processes (C. Deehr); from space, they can provide a global picture of proton energy input over the auroral ovals. STP78-1 and MSX data were shown; TIMED and DMSP missions were discussed (L. Paxton). The blue half-width of the Doppler H profiles seems to be a relevant parameter to use to infer information on the incident protons (D. Lummerzheim).
- Modeling of proton transport: If the physics of the problem is understood, the modeling capability is limited by uncertainties in the inputs such as cross sections and incident proton flux (B. Basu). M. Galand showed the importance of proton precipitation in the ionospheric and thermospheric composition.

The workshop concluded with a discussion, the main points of which were the needs to

- learn more about incident protons
- continue to investigate and to evaluate the role protons play as a source of ionospheric perturbations
- work further on the analysis of auroral emissions to get information on magnetospheric processes from the ground and to infer information on proton input in a large field of view from space.

What next after this workshop? Perhaps a special issue of JASTP with a submission deadline of Nov. 15, 1999. A more comprehensive report can be obtained by request to mgaland@sec.noaa.gov.

RELOCATABLE ATMOSPHERIC OBSERVATORY

Convenor: Michael P. Sulzer
(msulzer@naic.edu)

The workshop occurred on Thursday afternoon in the first time slot in Math 100. People came and left according to their interests in the topics under discussion, and no exact count was kept, but the total number was in excess of 100. The convener began with a brief introduction to incoherent scatter and its measurement capabilities. John Kelly of SRI international gave a talk on possible hardware configurations, based on earlier plans for the Polar Cap Observatory, suitably modified for a relocatable radar. He answered a number of technical questions from members of the incoherent scatter community, and some useful discussion followed.

Next were three talks concerning the scientific uses of the RAO at high, middle, and low

latitudes. These were given by Brent Watkins, John Foster, and Dave Hysell. The second half of the workshop consisted of a panel discussion with extensive audience participation. Two topics discussed were the siting of the RAO and how to make it a complete atmospheric observatory rather than just a radar. Rich Behnke of NSF discussed the funding agency's plans and fielded a number of difficult questions concerning funding issues.

CEDAR STORM STUDY

Convenor: Michael Buonsanto
(mjb@haystack.mit.edu)

A CEDAR Storm Study workshop was held at the University of Colorado, Boulder on June 16, 1999. Total attendance was about 60. This was the 19th in a series of Workshops/Sessions held since 1990. The convenor, Michael Buonsanto, began the CEDAR Storm Study workshop with a brief introduction. This was followed by presentations and discussion of specific projects and data sets related to the six storm intervals, as follows:

1. March 16-23, 1990 Storm Interval
   - Tom Immel reported on a trajectory package which uses AMIE electric fields to follow the motion and evolution of F region ionization patches.
2. June 5-14, 1991 Storm Interval
   - Phil Richards compared observations with results from the FLIP model for the June 25-28, 1990 quiet interval and the June, 1991 storm period.
   - Andrei Litvin described a study of the heat balance above Millstone Hill during the June, 1991 storm.
3. November 3-11, 1993 National Space Weather Interval
   - Tom Immel compared conductances obtained with the AMIE technique with those derived from Sondrestrom incoherent scatter data and DMSP data.
4. May 1-5, 1995 Storm Interval
   - Michael Buonsanto described Millstone Hill observations and simulations with the Millstone Hill Ionospheric Model.
5. January 6-11, 1997 Storm Interval
   - John Foster described coordinated Millstone Hill ISR observations of the strong Te enhancement seen near 0800 UT on January 10.
   - Gang Lu showed a comparison of TIEGCM results with data from the TOPEX/Poseidon satellite and GPS-MET low earth orbiting satellite occultation data.
   - Phil Richards compared FLIP model simulations of NmF2 and hmF2 with Millstone Hill incoherent scatter data and results from a chain of Digisondes in eastern North America.
6. April 10-11, 1997 Storm Interval
   - Ingo Mueller-Wodarg compared results from the CTIP model with GPS TEC data during the April, 1997 storm.

Next followed four talks of great interest, though not specifically related to one of the CEDAR Storm Study intervals.

- Barbara Emery reported on AMIE/TIEGCM simulations of the January 12-16, 1988 storm period. These showed electron temperature (Te) enhancements every night, and illustrated that Te is very sensitive to the upper boundary heat flux.
- Tim Fuller-Rowell described results from operational runs of the CTIM global model which were driven by near real-time (available within a few hours) NOAA/TIROS satellite auroral particle data.
- Nestor Aponte described the large nighttime NmF2 enhancement seen at Arecibo during the February 17-18, 1999 storm.
- Stanislav Sazykin spoke about recent upgrades to the Rice Convection Model (RCM).

Following this, a discussion ensued about additional storm intervals which might be chosed as CEDAR Storm Study periods. Based on discussion at the workshop, the following new intervals have been chosen:

- Sept. 21 - Oct. 1, 1998
- Oct. 18 - 31, 1998

A three-day CEDAR Storm Workshop is being planned for May 15-17, 2000. For a more complete version of this report or further information about the CEDAR Storm Study visit our web site:
http://www.haystack.mit.edu/css/
or contact Michael J. Buonsanto,
mjb@haystack.mit.edu,
tel: 1-781-981-5628.

WAVES SPECTRA IN THE MIDDLE ATMOSPHERE: THE NECESSARY EULERIAN TAIL AND RELATED MATTERS

Convenor: Colin O. Hines
(hines@windic.yorku.ca).

The workshop began with a 12-min video tape taken from the 1997 CEDAR meeting, in which Dave Fritts summarized the pros and cons of several theories of middle-atmosphere wave saturation, as he saw them.

After a brief response by Hines to the alleged cons of the Doppler Spread Theory (DST), the main business began. This was a tutorial by Hines in which the nonlinearities of waves of the middle-atmosphere spectrum were assessed both in Eulerian and in Lagrangian coordinates. It was shown that the most important nonlinearity, that arising from the v•del term of the Eulerian equations acting on a chosen wave, had no counterpart in the Lagrangian system. An immediate inference was that alleged diffusive damping via this nonlinearity does not exist. Moreover, transformation from a Lagrangian description to an Eulerian description necessarily gives rise to a "tail" spectrum, differently behaved for different observables. Ignorance or neglect of it might then give rise to misinterpretation of data. The physical origins were shown to lie in vertical displacements distorting an otherwise linearized waveform, in the fashion illustrated by Eckermann (GRL, Jan. 15, 1999). The necessary existence of such a tail was beyond dispute: only its observational relevance remained to be determined.

After 20 minutes of discussion and clarification between the two inanimates, the floor and the chair, Fritts pressed the case against the DST as he continued to see it, being challenged on occasion from both floor and chair as to the numbers and the physics he was choosing to employ. No final conclusions were reached.

ATMOSPHERES OF TERRESTRIAL SIZE BODIES (ATSB)

Convenors: Michael Mendillo and Andrew Nagy
(mendillo@bu.edu;
anagy@umich.edu)

This workshop dealt with the fact that the solar system contains a rich variety of atmospheres on planets and moons comparable in size to the Earth. Yet, because of their various distances from the sun and other local differences, these atmospheres differ in ways far more complex than one might expect. The observational and modeling techniques applied so successfully in terrestrial aeronomy are also well-suited to the study of similar processes on other worlds.

Participants in the ATSB workshop explored common themes, major differences, and varied experimental techniques needed to achieve a comprehensive understanding of how the terrestrial atmosphere fits into the general context of ionosphere-thermosphere-mesosphere science in the solar system.

The workshop began with Ray Roble (NCAR) describing a less well known but important application of the NCAR GCM to Venus and Mars, showing simulation results for the ITM regions on all three planets. Jeff Forbes (CU) then described his new study of atmospheric dynamics on Mars, and Ingo Mueller-Wodarg (UCL and BU) presented results of using the UCL thermospheric model applied to Saturn's giant moon Titan where the atmosphere is dominated by nitrogen, as on Earth. In areas of applying CEDAR-type instruments to planetary topics, Fred Roesler (Wisconsin) described use of FPI systems to study Jupiter's moon Io, Xiaoqing Pi (JPL) and Michael Mendillo (BU) presented ideas on using a GPS-like satellites system at Mars to study ionospheric structure and tropospheric water vapor, and Steve Smith (BU) presented new results of using an all-sky imager to observe the extremely extended tail of sodium gas streaming from the Earth's moon. The workshop concluded with some comments from Dr. Mary Mellott and Dr. Sunanda Basu on NASA and NSF approaches to supporting comparative studies of ITM science in the solar system.

The ATSB Workshop had 140 CEDAR scientist sign its attendance list, showing considerable interest in the topic. The next major meeting

devoted to this type of work will be the "Comparative Aeronomy in the Solar System" conference at Yosemite, 8-11 February 2000. An announcement appeared in the June 15, 1999 EOS, and a second call for papers will be issued in the fall.

HLPS (HIGH LATITUDE PLASMA STRUCTURE)

Convenor: Cesar E. Valladares
(cesar@dl5000.bc.edu)

The first topic of the Agenda was to present early results of the January 99 Patch campaign. Valladares indicated that in the last six years, it has been demonstrated that at least five different mechanisms can produce patches. The purpose of the Jan 99 campaign was to make more detailed and more global measurements of the auroral oval and polar cap. The goal of the campaign was to determine metrics that could be used by other instruments operating routinely to determine the importance of these five mechanisms in forming patches. Pedersen informed the group that the Sondrestrom and Svalbard radars operated between Jan. 12 and Jan. 25, 1999 and that, during this campaign, a daytime airglow imager was used at Sondrestrom to measure densities near noon. This is the region where patches are created. The imager belongs to BU, with Chakrabarti as PI of the project. Pedersen showed data corresponding to January 20 when Bz was mainly southward. Several density structures and some channels containing large flows were seen at Sondrestrom. Ruohoniemi concluded that the Velocity from the SuperDARN radars corresponding to Jan 20 was one of the most impressive he has seen. It is possible to deduce that the channels of large flows extend from Sondrestrom, across several of the coherent radars, and probably reach longitudes near Svalbard. More processing is needed to recover the polar cap convection pattern from the line of sight radar velocities. McEwen and Doe presented data from the imagers located in Canada that well complemented the radar measurements. They discussed data from other days of the campaign and outlined the use of imaging tomographic techniques to reconstruct altitude variation of the aurora. Guzdar presented recent results from his 3-dimensional modeling of patches. It seems that the three dimensionality of the patches (this is considering the vertical elongation of the irregularities embedded within the patches) act to confine and slow the growth of near 1-km irregularities.

There was a short discussion about the use of the new imagers presently deployed inside or near the boundary of the polar cap to conduct more detailed observations of polar cap and transpolar arcs. The opportunity to use ground-based measurements in correlation with Polar and/or FAST satellites was mentioned. The need to combine measurements in the northern hemisphere with satellites at the south was stressed to understand the conjugacy of the polar cap aurora.

At the end, it was suggested to carry out another Patch campaign in December 1999 or January 2000.

The HLPS web site is at http://cc.usu.edu/~zhu/hlps/index.html. The web site provides various information relevant to the working group, including the scientific goals and history of HLPS; lists of workshops; past and current campaigns; and most recent research activities. For more detailed information about the HLPS web site as well as how to be involved in HLPS research, please contact Dr. Lie Zhu (Utah State University) at zhu@cc.usu.edu.

GIFT

Convenor: D. Anderson
(danderson@sec.noaa.gov)

The GIFT (Global Ionospheric Forecasting Techniques) workshop was well attended by about 40 scientists. The theme of this year's GIFT workshop addressed the question of "how best to combine observations and models to realistically specify and forecast the equatorial ionosphere". The convenors of GIFT are Dave Anderson, Tim Fuller-Rowell and Jan Sojka. In the first half of the workshop, the discussion focused on ionospheric

observations by a variety of sensors. Ten-minute talks were given by Bodo Reinisch, Roland Tsunoda, Bela Fejer and Terry Bullett. Emphasis was on the day-to-day variability of the ambient ionosphere as well as observations of ionospheric irregularities and scintillation activity. The second half of the workshop discussed the various first-principles ionospheric models which are being developed and how well they can account for the low latitude/equatorial observations. Dwight Decker, Dave Anderson, Vince Eccles, Cassandra Fesen and George Millward gave these ten-minute presentations. The workshop was deemed a success since it ran well past the 5:30 adjourn time.

WIDE-LATITUDE SUBSTORM STUDY (WLS)

Convenor: John Foster
(jcf@haystack.mit.edu)

The WLS observing periods have contributed significantly to the joint-study periods chosen for ISTP and CEDAR/GEM analyses. WLS coordinates observations and, in this way, provides an operational component to the STORM working group. The WLS working group is to be continued. A brief overview of recent WLS experiments was followed by a discussion of the use of "floating" World Days to maximize the opportunity of running coordinated observations during disturbed conditions. This concept received support and it was recommended that two WLS intervals be requested for 2000 (one a "floating" experiment interval).

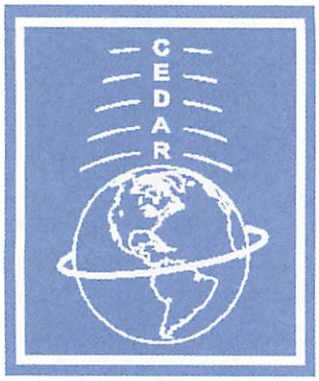
UPPER THERMOSPHERIC AND EXOSPHERIC IONS AND NEUTRALS AND THE PROCESSES THAT EXCITE THEM

Convenors: John Noto, Sixto Gonzalez, and Phil Erickson
(noto@sci-sol.com; sixto@naic.edu; pje@hyperion.haystack.edu)

The workshop was attended by about 25 people. Phil Richards started by discussing the limitations of current photoelectron models when used to model the excitation of oxygen and helium in the thermosphere. James Bishop presented recent modeling results of exospheric Balmer alpha emission and discussed the modeling of the helium 1083.0 nm emission. A lively discussion concerning differences between the GLOW, FLIP, and R. Link photoelelectron models focused on interpretation of new OI 844.6 nm and He 1083.0 nm data gathered by Bob Kerr and John Noto at Arecibo. Jonathan Wrotny, a student of John Meriwether, spoke about the work he has done to observe conjugate photoelectrons by observing the 630 nm airglow. Susan Nossal presented data samples and the prospectus of the WHAM (AZ) and Pine Bluff (WI) geocoronal programs and indicated that detector sensitivities now make H-beta observations possible from Pine Bluff. The prospects for a new photometer chain including Cerro Tololo Chile, Arecibo PR, Clemson SC, and Millstone Hill MA was discussed within the context of coordinated OI and H-alpha observations. Sixto Gonzalez and Mike Sulzer underscored the renewed capabilities of Jicamarca for topside light ion composition measurements.

A workshop to focus the continuing POLITE campaign, the Arecibo topside program, and the U. Wisconsin geocoronal program on data products most useful to modelers was tentatively scheduled for the winter. Close interaction between photoelectron models, exospheric models, and topside ionospheric models is an immediate goal of that workshop and of this community.

Special thanks to everyone who contributed to this issue, especially the workshop convenors for their summaries. Several people were particularly helpful and their assistance is greatly appreciated; they are Heidi Johnson, Dave Hysell, Matt Heavner, Umran Inan, Tim Kane, and Miguel Larsen.



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