The CEDAR Post

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INSIDE THIS ISSUE

FY2001 CEDAR FUNDING COMPETITION

DEADLINE: 1 MAY 2001

The CEDAR Program solicits proposals that seek to understand the coupling, energetics, chemistry, and dynamics in the middle atmosphere upward through the thermosphere and ionosphere and into the exosphere,on both regional and global scales.

The current focus of the CEDAR Program is on achieving the goals outlined in the CEDAR Phase III report. These goals comprise four key science areas: Polar aeronomy, Coupling with lower altitudes, Long-term variations, and Solar-terrestrial interactions. The Polar Aeronomy initiative is based on the recognition that limited access to polar regions has prevented an understanding of the fundamental processes that govern the polar atmosphere, where solar wind induced disturbances can drive the energetics and dynamics of the atmospheric system at all other latitudes. Coupling With Lower Altitudes refers to the study of tidal, planetary, and gravity waves which are primarily forced in the troposphere and stratosphere and are now recognized as having profound influences on the ionosphere-thermosphere-mesosphere (ITM) system. The initiative on Long-Term Variations seeks to foster measurements and analyses identifying secular atmospheric variations that can be interpreted through atmospheric models. The Solar-Terrestrial Interactions initiative strives to understand the response of the global ITM system to solar variations and disturbances over a multitude of time scales.

Approximately $1 M is available in this competition. As in the past, proposals which utilize the CEDAR chains and clusters of instruments are encouraged. Awards are made for periods up to three years; typically, award sizes range from $60-90K per year. The proposal title should begin with the word "CEDAR". Information on the CEDAR program and the CEDAR Phase III report can be found at http://www.nsf.gov/geo/egch/gc_solar.html#cedar or http://cedarweb.hao.ucar.edu/commun/cedarcom.html. Questions or comments should be directed to Drs. Sunanda Basu (sbasu@nsf.gov) or Bob Robinson (rmrobins@nsf.gov), both at 703-292-8529. Proposals are due at NSF by May 1, 2001 and must be submitted via NSF's FastLane (http://www.fastlane.nsf.gov/fastlane.htm). The Grant Proposal Guide can be accessed at http://www.nsf.gov/cgi-bin/getpub?gpg

NSF/CEDAR POSTDOCTORAL PROPOSALS

DEADLINE: 1 MAY 2001

The NSF/CEDAR Postdoctoral Program provides grants to recent Ph.D. recipients to conduct middle and upper atmosphere research at a host institution. The goal of the CEDAR Postdoctoral Program is to provide outstanding recent Ph.D. recipients an opportunity to build upon capabilities demonstrated in the dissertation project while enabling them to explore new research directions and to further their professional growth. It also provides a means to enrich the research activities of the host institution.

Up to two postdoctoral awards are made each year. Each postdoctoral award will be for two years at a stipend level of $40,000 per year. An additional amount of $10,000 can be requested to be used for other expenses such as employee benefits, institutional overhead, travel, or publication costs. Although not a review criterion, if cost-sharing possibilities exist at the host institution (through an existing NSF grant, for example), this should be mentioned in a cover letter accompanying the proposal.

Postdoctoral proposals must conform to the format for regular NSF proposals except that the project descriptions are to be 5 pages or less. Either the postdoctoral candidate or his/her advisor may be the principal investigator, but the proposals must be submitted by the host institution. Information on preparing the project description is given below. In addition to the standard NSF proposal material, postdoctoral proposals must include the following:

- A letter from the host institution indicating its interest in and commitment to the proposed project.
- An abstract of the candidate's doctoral thesis.
- Two letters of recommendation.
- A transcript of course work.
- An up-to-date resume.

Because Post-doc proposals must be submitted through FastLane, the documents listed above may be mailed separately to the program office at the address shown below. *Failure to provide these materials will result in disqualification*.

INFORMATION ON PREPARING THE DESCRIPTION OF PROPOSED RESEARCH

The single most important factor in writing a successful NSF/CEDAR postdoctoral proposal is the quality of the science being proposed. The research project description should:

1. Clearly identify the science question or area to be investigated.
2. Indicate why it is important and provide some background on what has been done thus far.
3. Describe the method to be used to address the science question/area: what will be done, with what resources, and what instruments or models or databases will be used. Brief descriptions of these instruments, models, or databases should be included, as well as letters of support to show that they are accessible or available.
4. Demonstrate scientific productivity, i.e. show that the result of the analysis, method, or investigation will yield the information needed to answer the science question identified in step 1.
5. Provide a rough timeline describing what activities will be carried out and when.

It is expected that the postdoctoral candidate will write the project description. It would be extremely beneficial to request critical reading of the proposal by the student's Ph.D. advisor and by scientists at the prospective host institution before submission to NSF.

INFORMATION ON PROPOSAL SUBMISSION

Proposals must be submitted to the Aeronomy Program through FastLane. The title of the proposal should be preceded by the words "CEDAR Postdoc:". Letters of recommendation and other documents that cannot be submitted through FastLane may be sent directly to:

Dr. Sunanda Basu
Director, Aeronomy Program
National Science Foundation
4201 Wilson Blvd., Suite 775
Arlington, VA 22230

NEWS NOTES FROM THE NSF

The CEDAR FY01 funding competition had 21 proposals submitted; 12 were funded for a total of about $840K in first year funding. Six proposals were submitted to the FY01 CEDAR Postdoctoral Program and two awards were made. Details will be provided in the next issue of the Post.

Funding for MAUI-MALT totaled $1.3M, with AFOSR providing about 55% of the funds and CEDAR about 45%. Five two-year awards were made from the seven proposals submitted.

Thirty-nine proposals were submitted to the CEDAR/GEM M-I Coupling competition; the amount available for distribution is $500K with equal contributions from the Aeronomy Program and the Magnetospheric Physics Program. Award sizes will range between $50K and $80K.

NSF's Geosciences Directorate is undertaking an initiative to increase the participation of underrepresented groups in geoscience. Approximately $3M will be available in the first competition which will fund a variety of activities. The program solicitation was posted on the NSF website at http://www.geo.nsf.gov/geo/diversity in mid-December. A deadline of mid-March or later is anticipated at this time. Questions and comments should be directed to Ms. Jewel Prendeville, Staff Associate for Diversity Program Development, at jprendev@nsf.gov, telephone 703.292.8521.

Finally, Dr. John Meriwether's last day as Aeronomy Program Director was December 20. Dr. Sunanda Basu will resume her duties as Program Director in mid-January.

TIMED UPDATE

The launch of NASA's Thermosphere Ionosphere Mesosphere Energetic and Dynamics (TIMED) spacecraft has been delayed again. TIMED is co-manifested with the Jason spacecraft, from the Centre National d'Etudes Spatiale. It was originally scheduled for launch around May 2000; this date most recently slipped to March 7, 2001. In November 2000, the Jason team requested another one- to two-month delay. NASA Headquarters then assigned a No Earlier Than (NET) date of April 21, 2001 (not an official launch date). The TIMED spacecraft and instrument teams have been conducting extensive tests and mission simulations during this delay period. The launch slip so far has not affected the TIMED mission science goals. The latest information on the launch date and the TIMED Program can be found at the TIMED website http://www.timed.jhuapl.edu/home.htm

- Jeng-Hwa Yee, Applied Physics Lab, Johns Hopkins U.

SUMMARY OF FALL 2000 CSSC MEETING

The CEDAR Science Steering Committee (CSSC) met at NSF in Arlington, Virginia on Oct 25 and 26 to discuss various topics of interest to the community and to begin planning the June 2001 meeting.

The CSSC was welcomed by Dr. Jarvis Moyers, Director of the Atmospheric Sciences Division in NSF's Geosciences Directorate. Dr. Moyers spoke of the opportunities for community involvement in the Information Technology Research (ITR) Initiative. In addition, there is a directorate-wide emphasis on diversity for underrepresented groups, probably comprising mainly REU and mentorship opportunities. See the "News Notes from the NSF" for more details.

ITR is one of two cross-cutting programs at NSF of possible interest to CEDAR scientists. Research areas targeted by ITR include applications and extensions of IT across science and engineering. Some examples are: comprehensive modeling of the middle and upper atmosphere, tools for data management, data bases, assimilation, and visualization of coupled models output, and improvements to simulation models.

Biocomplexity, the second cross-cutting program, is focusing on the "intersections of disciplines". John Kelly is leading a small group exploring possible projects focusing on the polar regions since these are

particularly sensitive environmental indicators.

Other topics discussed were:

RAO

In FY00, $2.3 M was allocated for work on the prototype. We are still hoping for funding for the RAO in FY02. The RAO may also include a relocatable observatory for portable instrumentation including optical and radio diagnostics which could be online within a few years. A workshop is planned to explore this idea; see the announcement on page 18.

CEDAR Database

A Database subcommittee was formed, comprising J.-H Yee, E. Kudeki, S. Gonzalez, D. Knipp, and C. Fesen; the primary tasks are to formulate a mission statement for the Database and to provide a bulleted list of action items and milestones to be achieved in the next year. The mission statement should include the following elements: data archiving with well-known formats; easy user-friendly access to data; and interaction with remote databases.

A separate issue is ensuring that data is deposited in the Database. Data deposition should be required of all CEDAR-supported projects.

Class I Facilities

The Upper Atmosphere Facilities (UAF) Program decided that the class I facilities could benefit from regular reviews; the next one may occur within a year or so and may include some ISR representation. Elements of the panel review include evaluation of the facility management, equipment, and status and recommendations for any improvements There's a separate need for a long term plan for the facilities that focuses not on their management and performance but on their goals for the future and how to attain them. Two other questions of concern to the facilities are: how are other instruments supported or funded at the ISR sites? and how can the UAF encourage more use, more community participation?

CSSP Decadal Study

The CSSP (Committee on Solar and Space Physics) is undertaking a community assessment and strategy for the future. The project will survey solar and space physics and recommend priorities for the decade 2003-2013. Five panels will be organized around interdisciplinary science themes; the three science panels are on magnetosphere/ionosphere/atmosphere interactions; solar wind/magnetosphere interactions; and solar and heliospheric physics. CEDAR should strive to ensure NSF and CEDAR representatives are included on the panels. CEDAR can use this opportunity to contemplate what constitutes "CEDAR Phase IV".

CEDAR 2001

Planning for the CEDAR 2001 meeting commenced in earnest. The planning this year is complicated by the fact that this will be a joint meeting with the 10th quadrennial Solar Terrestrial Physics (STP-10) symposium. The meeting will be held at the Raintree Hotel in Longmont, CO from June 17-22. See the articles beginning on page 21 for further details.

Miscellaneous:

- The NSF has requested an evaluation of the operation and management of their middle atmospheric Lidars; an effort to respond to this is currently being led by T. Kane.

- CEDAR will request a special session at the Fall 2001 AGU meeting; C. Fesen and R. Smith will submit the request and organize the session.

- C. G. Fesen, U. Texas at Dallas

CEDAR DATA BASE AND DATA SERVICES

Between May and November 2000 we added data sets from new instruments: the Syowa-East and SANAE HF radars, the Wuppertal Spectrometer, the Utah State lidar, and the Utah State imager. Other significant updates included 18 years of DMSP estimates of the hemispheric power in the aurora, 13 LTCS campaign analyses from Millstone Hill, 5 yrs of Halley FPI data, and 3 years of neutral temperature lidar data from the University of Illinois. Regular updates include: geophysical indices, ISR and FPI data, and one multi-site HF radar campaign. Visit http://cedarweb.hao.ucar.edu/instr/new.html for latest updates on data holdings. Also, if you've been sitting on some data, please contact us, or send it to us - we'd like to include it in the CEDAR DB!

Version 3.0 of the CEDARWEB interface is currently in alpha testing (see figure 1 for an example screen shot). It features several advances in the access to all CEDAR web pages and data as well as integrating the search, retrieval, and plotting of data within the CEDARWEB environment. Watch the main web address for details of changes.

Currently, access to the data holdings is available via version 2.1 of CEDARWEB (see figure 2) as well as a new interactive inventory browser. Data retrieval is via a transport interface called DODS (see the Dec. 1997 CEDAR POST) which uses URLs to refer to the data. By clicking on the URL(s) within the web interface, it is possible to return the data to the requester in a number of formats, for example, tab delimited ascii, CEDAR ascii format, etc. We are very interested in hearing in what formats you would like to receive data. The URL(s) can also be saved or cut and pasted in other applications to retrieve the data (e.g. http://cedarweb.hao.ucar.edu/cedarweb1-cgi-bin/nph-cedar/data/stage/aro660714a.cbf.tab?date(1966,0714,0000,0000,1966,0714,1500,5999);parameters(110,180,550,510,560)). For more information on

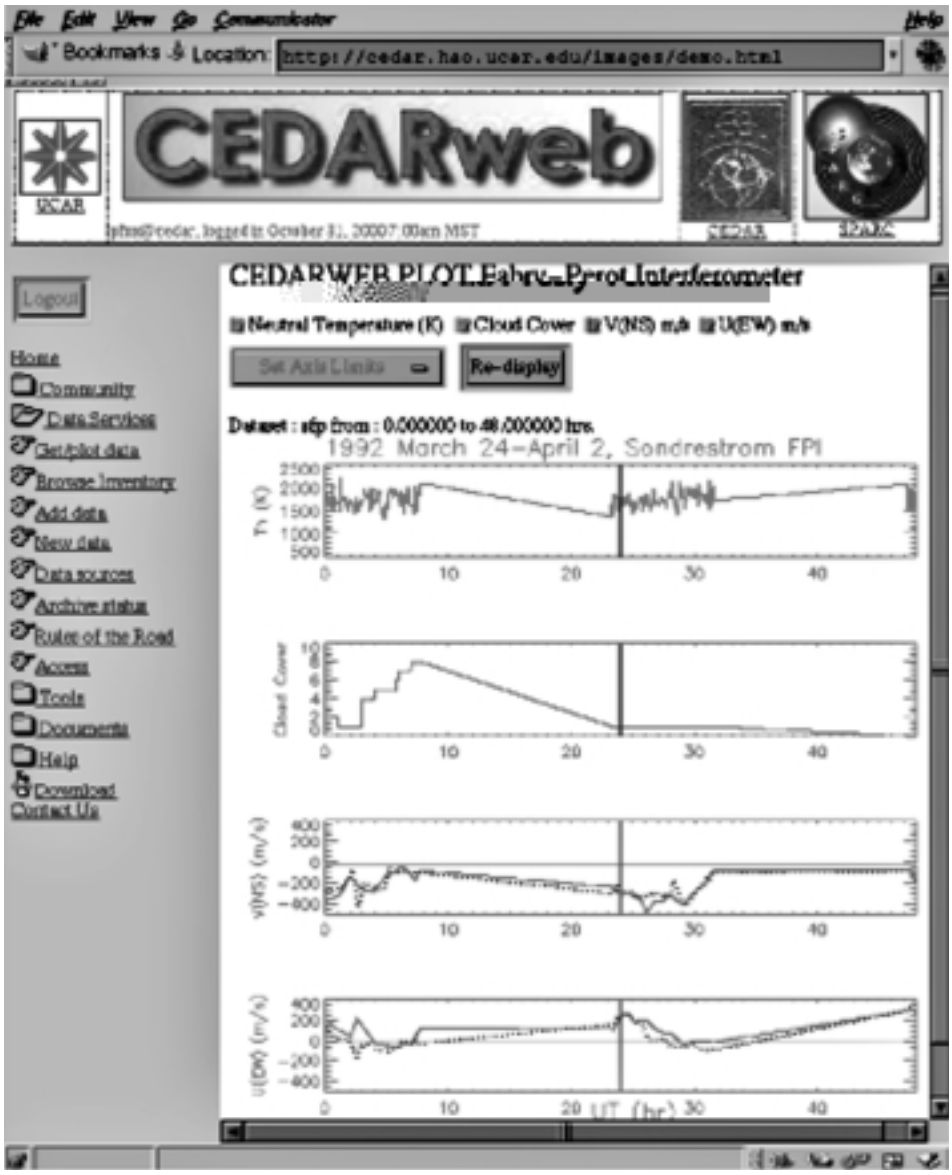


Fig. 1

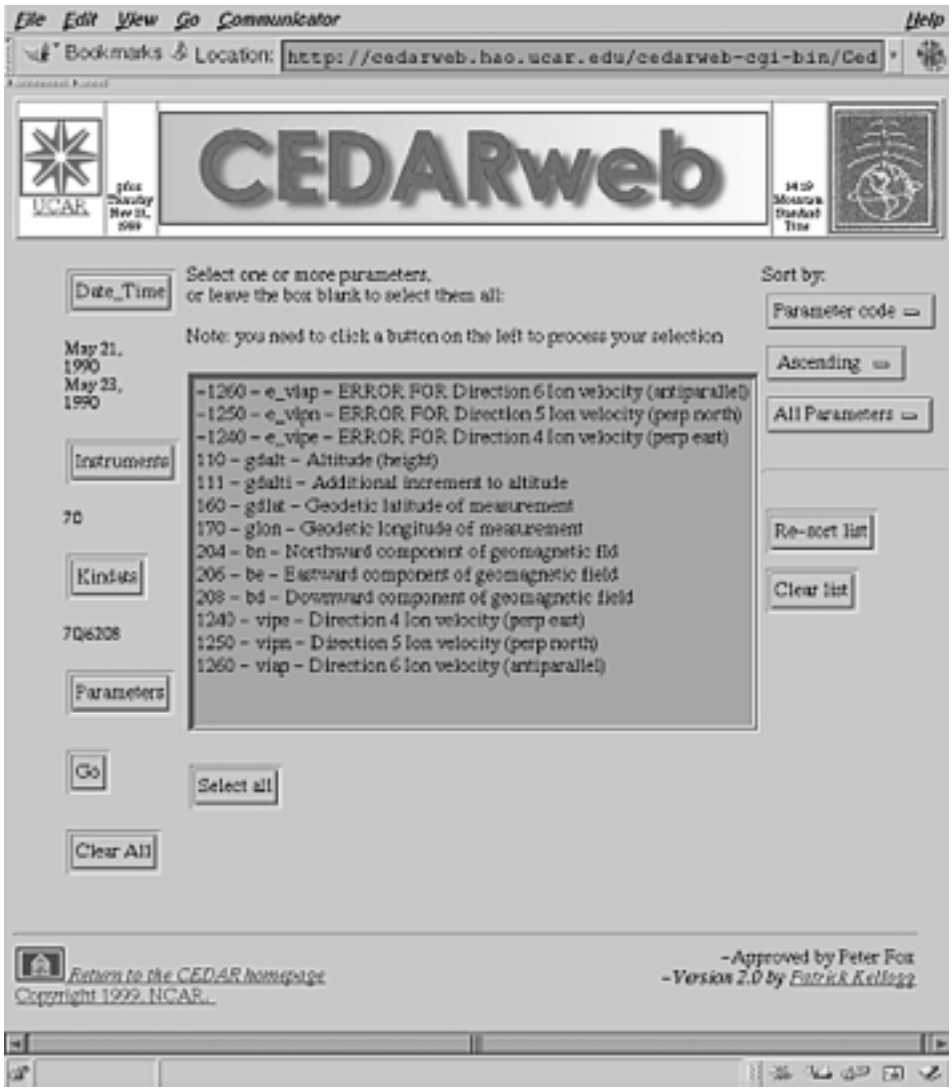


Fig. 2

how to load data directly into these applications, visit the CEDARWEB Program/Documentation pages at http://cedarweb.hao.ucar.edu/docs/.

The DODS interface enables more intelligent selection and subsetting of datasets, for example, by returning only those parameters of interest for a certain instrument, or a particular kind of data, or within a specific time period. Later this year, the present DODS servers will be upgraded so that more sophisticated subsetting (e.g. based on altitude range) will be available as well as data retrieval from a number of instruments and data types in a single return data stream. We are also working to remove references to the CEDAR "numeric" codes from the interface for users who either are not familiar with them or don't care about them. We also support an "expert" level of access to the database so please ask us if you are interested in this.

We are continuing to work with Johns Hopkins University's Applied Physics Lab to support ten CEDAR Ground Based Investigators (GBI) for the TIMED mission. Ingestion and cataloging of data for CEDAR has been cut to meet the 54-hour to two-week turnaround required for TIMED. Watch http://cedarweb.hao.ucar.edu for details.

Do you use the Space Physics and Aeronomy Research Collaboratory (SPARC) (http://intel.si.umich.edu/sparc)? If you do, you can now access all of the CEDAR data holdings from SPARC (go to DataSetDirectory). Are you generating images? Feedback has been solicited from a number of image data providers so that we can include their data in the CEDAR DB. We have developed guidelines on important header information for cataloging images and we will also provide utilities for data providers and prospective data users to work with this type of data. If you have an interest in images, now is the time to contact us if you would like to participate in the testing phase.

- Peter Fox, HAO/NCAR, pfox@ucar.edu

ARECIBO OBSERVATORY: PART OF THE UAF CHAIN

The Arecibo Observatory is part of the Upper Atmosphere Facilities/Incoherent Scatter Radar (UAF/ISR) chain that is funded by the NSF. It is located near Arecibo, Puerto Rico and has the most sensitive ISR in the world. The purpose of this note is to introduce the Observatory to new members of the CEDAR community who may not be familiar with what Arecibo can do and to mention a few new developments to veteran CEDAR Post readers.

ISRs are huge radars that deduce a remarkable variety of ionospheric plasma parameters from the exceedingly weak radar signals scattered back from the tiny fluctuations in plasma density caused by the random thermal motions of the charged particles. During an ISR "world day," when all the radars in the NSF chain plus the EISCAT radar in Scandinavia operate simultaneously, Arecibo might, for example, cycle through the following series of measurements: (1) a high resolution power profile measurement that gives electron density profiles from the D region to above the F-region peak (60 km to about 500 km, with a resolution of 600 m); (2) a "MRACF" measurement that effectively splits the transmitted power into 7 separate frequencies to make 7 statistically independent spectral measurements (yielding electron and ion temperatures and line-of-sight plasma velocities) simultaneously throughout the E and F regions; and (3) a long pulse (500 ms) measurement that gives densities, temperatures, and composition in the topside region to altitudes of 2500 km and beyond, with a resolution that can be as good as 75 km. The three modes are repeated cyclically, switching every 10 s, while the beam rotates in azimuth at a zenith angle of 15° from vertical. This rotation allows us to reconstruct vector velocities from the line-of-sight velocities, if certain assumptions are satisfied. From the vector velocities we derive electric fields and neutral wind velocities. The result is a very rich source of data on ionospheric photochemistry and dynamics of all sorts (e.g., tidal phenomena, storm effects, topside helium and hydrogen, E-region layer formation, etc.). Various other operating modes are possible, some of which emphasize high resolution observations of the lower ionosphere. During the nighttime hours optical observations, both passive (airglow) and active (lidar), are added, weather and moon permitting. These provide information on neutral winds and temperatures in the E and F regions, metallic atom layers in the mesosphere, hydrogen and helium in the upper ionosphere, and more.

By combining simultaneous data from all the UAFs, ranging in latitude from the magnetic equator (Jicamarca Observatory), through middle latitudes (Arecibo and Millstone Hill in Massachusetts), to high latitudes (Sondrestromfjord in Greenland and EISCAT in northernmost Scandinavia), one can study global phenomena. UAF and satellite data are nicely complementary: the radars and optical instruments give comprehensive coverage at a few locations, whereas satellites give full global coverage but much less information at each spot. The planned TIMED/UAF collaboration is designed to exploit this complementarity.

A much anticipated new capability at Arecibo, one that we expect will be operational by early 2001, is the ability to split the power of the main 430 MHz ISR into two beams. One beam will use the existing line feed, and the other will use a new feed installed in the Gregorian radome. (Check the Arecibo website (http://www.naic.edu) for some nice photos of the two feeds.) Having two beams will make a huge difference in the quality of plasma drift velocity data, and thereby in virtually all studies involving electric fields and winds, as well as any study in which horizontal gradients are important. Perhaps surprisingly, the data quality in each beam will be nearly as good as it is now (except for the high altitude measurements), because the signal-to-noise ratio will still be high after the transmitted power is split.

The big difference will be that the different azimuth angles will be sampled twice as often as they are now. The mechanical motion of the azimuth arm is quite slow, and with only a single beam, the ionosphere itself can sometimes change substantially between samples at a given azimuth, and when that happens the assumptions underlying the conversion of line-of-sight velocities to velocity vectors are no longer valid. The improvements that the dual beam will provide should often be dramatic, much more so than one might expect.

We had hoped that the dual beam measurements would be available by now, but of course there have been delays --- life is never as simple and easy as one hopes. At the time of writing (October 2000), the transmitter now can deliver power to the Gregorian feed. This was the biggest hardware hurdle; it is no small matter to extract a megawatt or more, with little power reflected, from a curved, slotted waveguide using a device (designed and built in-house) that moves along inside the guide as the Gregorian structure moves in elevation angle. We still need to install a 430 MHz radar receiver and a transmit/receive switch in the Gregorian and write software to handle the two simultaneous data streams. We don't anticipate any substantial problems with either of these tasks.

On the optical side, the recent news is that we are beginning to obtain usable temperature profiles in the mesosphere from resonant lidar scatter from neutral potassium atoms. This is a difficult measurement, done successfully at only a few locations in the world, but we are beginning to be successful after a long period of hard work. We hope to progress to making wind measurements as well in the foreseeable future. Providing nighttime profiles of neutral temperature and wind on a routine basis will make an enormous step forward in our understanding of D and E region phenomena.

We urge the CEDAR community to start thinking about experiments they would like to perform using these new capabilities (and the old ones, too, for that matter). The improvements to our standard synoptic measurements will be substantial, to be sure, but the creative minds of the CEDAR community ought to be able to come up with additional exciting ideas. Vastly more detail about what Arecibo can do and how it does it can be found (1) in a recent long review article (Isham et al., JGR, 105, 18,609-637, 2000) covering both radar and optical observations and (2) at the NAIC web site referenced above. Information on how to submit a proposal to use the Observatory is also given on the website.

There is one final news note to add. As many readers of the Post are aware, there used to be an RF ionospheric heating facility in Puerto Rico, not far from Arecibo. This facility was destroyed by a hurricane (see the December 1998 CEDAR Post) and cannot be rebuilt in its old location, which has been declared a wetland nature preserve. We are currently exploring the possibility of restoring the heating capability by adding a 5 and 8 MHz feed to the large Arecibo Observatory antenna. These will be large structures that will be put up during campaigns and then removed, not a simple thing to do reasonably quickly and repeatedly. We have almost completed detailed feasibility studies for these feeds. If the proposed design is feasible, as seems likely at this point, the next step will be to develop accurate cost estimates for a proposal to the NSF.

- D. T. Farley, Cornell University

A NEW LIDAR IS BORN AT ALOMAR

Global change and space weather and their possible adverse impacts on human activities have become issues not only for scientific study but also of public concern. In view of this urgency and the fact that the Arctic middle and upper atmosphere may provide an early signature for climatic change, the Arctic Lidar Observatory for Middle Atmosphere Research (ALOMAR) was established at Andoya, Norway (69 N, 16 E) in 1994 to perform regular observations with an arsenal of radio and optical equipment as well as rocket and balloon launch facilities nearby. From the beginning, ALOMAR was designed to house three lidars, a Rayleigh-Mie-Raman

(RMR) lidar, an Ozone lidar, and a Sodium (Na) lidar. Both the RMR and the Ozone lidar have been in regular operation since 1995, and the recent birth of a state-of-the-art Sodium lidar has provided the missing link, making ALOMAR an unique observatory for atmospheric dynamics and ozone studies between 10 and 110 km in the auroral zone.

The first Na lidar operation, using one vertical beam and one telescope, was quite successful and the quality of the received signal fully demonstrated the expected performance. The first atmospheric Na signal was detected on 09:50:15 UT, Sunday, August 13, 2000 under daylight, partly cloudy conditions. The first 24 hours observation with 3-frequency operation, providing information on temperature and line-of-sight wind was completed ~1:30 UT, Wednesday, August 16, 2000. Fair weather prevailed at ALOMAR Monday night, and all three lidars operated between 21:00, Aug. 14, and 01:00, Aug. 15, with quality data, demonstrating the potential of clustered lidar observation at ALOMAR. The second beam was installed in early October and off-zenith operation will be initiated in spring-summer, 2001.

The new Sodium lidar was constructed by Chiao-Yao (Joe) She, a Fulbright Researcher in Norway between May and October, 2000, and the lidar group in the Physics Department at Colorado State University (CSU). It is based on innovative sodium resonance technology to foster reliability and daytime measurement capability, developed with CEDAR funding to the CSU Lidar Research group over the past decade. The lidar receiver consists of the existing twin steerable ALOMAR mirrors (each 1.8 meter in diameter), whose focal boxes were recently reconfigured by the German Institute of Atmospheric Physics (IAP) to accept simultaneously both sodium and RMR lidar signals. Over 70% of the new sodium lidar was funded by the U.S. Air Force Office of Scientific Research (AFOSR) under the Defense University Research Instrumentation Program (DURIP). The balance of the funding was secured by the ALOMAR founders, Ulf von Zahn (IAP), Eivind Thrane (Norwegian Defence Research Institute) and Kolbjørn Adolfsen (Andoya Rocket Range), as well as Franz-Josef Luebken (IAP), and Dave Fritts of Colorado Research Associates (CoRA). This U.S. funding represents a major and continued participation of U.S. scientists in ALOMAR, where instruments from German, Norwegian, French, British, and Canadian scientists are already in place. The positive benefit of strong international collaboration in climatic research is being fully demonstrated at ALOMAR.

A large team contributed to the development of this unique instrument. CSU members include faculty member Dave Krueger, postdocs Biff Williams and Zhilin Hu, former graduate students Hans Moosmüller (University of Nevada) and Vince Vasoli (Raytheon), current graduate students Joe Vance, Titus Yuan, and Jim Sherman, as well as undergraduate students Phil Acott and Kam Arnold.

This new instrument is named the "ALOMAR Weber Sodium Lidar", in honor of the late Dr. Edward Weber, an ionospheric physicist at the Air Force Research Laboratory, and the late Louis R. Weber, former Head of the CSU Physics Department from 1939 to 1964. The Weber lidar represents innovative sodium resonance technology. It employs:

1) a new Continuous Wave (CW) laser at the sodium resonance wavelength of 589 nm, achieved via sum-frequency generation for stable narrowband operations;
2) Doppler-free sodium resonance spectroscopy for precision frequency control;
3) tandem acousto-optic modulators for three-frequency wind and temperature measurements; and
4) Faraday filters for narrowband "sky noise" (light contamination) rejection, enabling full daylight operations.

When mated with the large twin steerable ALOMAR mirrors, the ALOMAR Weber Na lidar will achieve its unique measurement capabilities with an averaged transmitter power of only 0.6 W per beam, yielding a power-aperture

product of 1.5 Wm^2 with each telescope. At night at the altitude of peak sodium density (around 92 km), this will enable measurement precision of 0.5 Kelvin for temperature, and 1.5 meters per second for wind velocity averaged over a 1 km depth for 5 minutes (or other averaging combinations yielding equal photon counts). The lidar provides reduced precision at higher and lower altitudes with another factor of ~ 2 reduction during daytime. The Weber lidar is at present the only resonance lidar on Earth capable of nearly-continuous (weather permitting) dual-beam measurements at the base of the ionosphere in the auroral zone. The Na lidar initially will be used for research based on temperature and wind measurements by Joe She of CSU and Dave Fritts of CoRA and their colleagues, under continuing funding from Space Science of AFOSR managed by Paul Bellaire to maximize the benefits to the Air Force of the DURIP investment. Correlative observation with other ALOMAR instrumentation, both passive and active, are anticipated. The Weber lidar will gradually be automated and become a user facility for scientists elsewhere to pursue their research goals.

- *Chiao-Yao She and David A. Krueger, Colorado State University*

REPORT FROM THE GEM PROGRAM

At the GEM 2000 Workshop in Snowmass CO, the Magnetosphere-Ionosphere Working Group began the formal process of transitioning to a GEM Campaign, in preparation for the joint funding initiative with CEDAR that occurred this fall. To accomplish this, two MI Coupling Working Groups were formed. W. K. Peterson and T. E. Moore accepted responsibility for Working Group 1, directed toward "Ionospheric Plasma in the Magnetosphere", and B. Anderson and W. Lotko accepted responsibility for Working Group 2, aimed at understanding the Electrodynamics of M-I Coupling. Each working group held two splinter sessions where critical issues were discussed in their respective areas, and three challenges were identified by each working group. Working Group 1 identified:

a) Mass exchange characterization
b) Impacts of ionospheric plasma
c) Mass-extraction process modeling

as critical issues to be pursued by the campaign. Working Group 2 chose

a) Ionospheric conductance
b) Auroral plasma energization and
c) Multi-scale processes

for study focus by the campaign.

The GEM and CEDAR Steering Committees jointly issued a call for proposals in August which incorporated themes suggested by the CEDAR community (see http://www-ssc.igpp.ucla.edu/gem/Welcome.html, for the July 27, 2000 issue of the GEM Messenger, or the September 2000 Scostep Newsletter). Selection was made in the fall, and we in the GEM community are excited about this opportunity for collaborative research with the CEDAR community in an area which is clearly of common interest.

The GEM Inner Magnetosphere/Storms Campaign is in full swing in its third year of funding. A joint GEM/CEDAR/SHINE workshop was held at the Spring AGU Meeting in Washington, DC, with 25 people in attendance, and focused on three storm periods selected for common interest by the three communities: May 15, 1997, September 25, 1998 and October 19, 1998 (identified by the peak geomagnetic response). Janet Kozyra was instrumental in bringing the three communities together. Geoff Reeves has created a web page for these and related GEM storms at http://leadbelly.lanl.gov/GEM_Storms/GEMstorms.html, which contains a wealth of data. Investigators from all three communities are invited to contribute data to this web site and to participate in collaborative meetings. A GEM/CEDAR/SHINE mini-workshop, along with other GEM campaign mini-workshops, was held December 14 prior to the Fall AGU Meeting. At the June 2001 GEM and SHINE meetings, SHINE is planning to organize a session on solar magnetic effects on climate, of common interest to all three communities.

The GEM Tail/Substorm Campaign continues to bear fruitful

discussion, with the organization of two working group splinter sessions at the GEM Snowmass meeting in June, on Substorm Onset Timing and on Near-Earth Substorm Processes, by the observation working group chaired by Shin Ohtani. Other working groups focused on theory/modeling comparisons with observational signatures of substorm onset, as well as comparisons with steady magnetospheric convection.

The GEM goal of developing a Geospace General Circulation Model analogous to that in the atmospheric community remains a major and important challenge on which significant progress has been made. The most striking contribution to come out of GEM, in terms of deciding what crucial physics must be included in a comprehensive model, has been the Reconnection Challenge comparative study of the two-dimensional rate of magnetic reconnection included in a variety of codes used to model magnetospheric processes (ideal MHD, two-fluid, hybrid and full particle simulations). A series of papers with overview led by Jim Drake is forthcoming in JGR. The important underlying physics discovered in this GEM study was the subject of a New York Times Science Section report on October 24, 2000. The GEM community is proud to share the importance of this result, and appreciative that it was made possible by the workshop atmosphere of our meetings and the willingness of participants to test their codes on a common problem.

- Mary Hudson, Dartmouth College; Chair, GEM Steering Committee

2000 SHINE WORKSHOP SUMMMARY

The SHINE 2000 summer workshop was held June 14-17 at Caesar's Palace, Lake Tahoe, immediately preceding the meeting of the Solar Physics Division of the American Astronomical Society. Undeterred by the long walk through the gaming tables between the hotel rooms and the conference rooms, 72 solar and heliospheric physicists participated in a number of lively sessions. Barbara Thompson (GSFC) kept the poster previews on schedule with the threat of her dart gun, in spite of competing drummers in the next room, and later, competition between the two working groups was heightened with bribes of beer and nachos and a Jeep Cherokee door prize. The competition between the working groups has since continued on the internet, where each is vying for the flashiest web page (click on SHINE 2000 at http://www.sec.noaa.gov/shine).

Scientifically the workshop was highly successful. As introductory material, excellent reviews on coronal mass ejection (CME) observations, theory, and terrestrial linkages were given by Joan Burkepile (HAO), Spiro Antiochos (NRL), and Chris Russell (UCLA). Most of the time thereafter was devoted to sessions of the two working groups: Working Group 1 on CMEs, led by Jim Klimchuk (NRL) and Joe Gurman (GSFC) and Working Group 2 on Interplanetary Connections, led by Thomas Zurbuchen (UMich) and Pete Riley (SAIC).

The working group sessions were as unstructured as possible, allowing ample time for discussion. Perhaps the most surprising outcome of this format is the perception that an extraordinary amount of backtracking must be done to reach a consensus view. A participant comes to the table with a level of understanding on a certain issue which s/he assumes is shared by the community and discovers that often this is not at all true. Finding the common level was deemed a necessary step backwards in order to make forward progress.

Working Group 1 addressed three main questions: 1) What is the observational evidence for multiple classes of CMEs; 2) what are the fundamental physical differences among the various CME initiation models that have been proposed; and 3) what are the key observations that can discriminate among the models?

The first question turned out to be an excellent example of how much backtracking is needed to reach a consensus view. Published observational studies [e.g., Sheeley et al., 1999; Andrews and Howard, 2000] provided what was thought by some to be smoking-gun evidence that there are two kinds of CMEs, a view first proposed during the Skylab era: those that start slowly and accelerate through the coronagraph (SOHO/LASCO) field of view and those that pass through at constant speed. Participants

in the working group sessions on this topic, however, were bombarded with exceptions to and arguments against the two-class rule.

Leading the discussion of the second two questions (which are knottier) required arduous labor on the part of Jim Klimchuk. Under his persevering guidance, however, the group came up with a workshop product in the form of the table below. In essence it is a communication from theorists to observers to indicate what kinds of measurements are needed to discriminate between models for CME initiation. A variety of models have been proposed, and they can be classified in several different ways based on their physical attributes [e.g., Forbes, 2000; Klimchuk, 2000]. The table presents one such classification of five distinct model types:

1) Breakout [e.g., Antiochos, 1998; Antiochos, DeVore, and Klimchuk, 1999];

2) Flux Rope [Forbes and Isenberg, 1991; Amari et al., 2000; Wu et al., 2000];

3) Tether Cutting [Sturrock et al. 1984; Moore et al. 2000];

4) Flux Injection [Chen, 1989; Krall, Chen, and Santoro, 2000]; and

5) Mass Loading [Wolfson and Saran, 1998; Low, 1999].

The table columns list observables that can be used to test the models. Some questions that arise are:

1) Is a multipolar magnetic field required, or is a simple bipolar field sufficient?

2) Does the pre-eruption configuration necessarily contain a flux rope?

3) Must the field be appreciably sheared near the neutral line?

4) Must there be a converging flow toward the neutral line in the period leading up to the eruption?

5) Is reconnection required, and if so, does it occur before or after the onset of the eruption? (This refers to vigorous reconnection with strong heating.)

6) Does the reconnection take place above or below the sheared core field/flux rope/prominence?

7) Are there requirements on the existence and/or distribution of mass?

From the Working Group 1 discussion came the most memorable SHINE 2000 quote, obviously from a theorist: "Don't be fooled by what you see!"

Following the example of the GEM community, each working group set challenges for the coming year. For Working Group 1 these are: 1) Determine observationally whether there are two distinct classes of CMEs, as possibly suggested by acceleration profiles, 2) Better define and quantify the observational predictions of the models, and 3) Devise and execute focused observational studies to test the models.

OBSERVATIONAL TESTS OF CME INITIATION MODELS

(Y = "yes," NR = "not required")

Model	Multi Polar	Flux Rope	Sheared NL	Converging Flow	Recon. Timing	Recon. Location	Mass Distribution
Breakout	Y	NR	Y	NR	at/before	above	NR
Flux Rope	NR	Y	Y	Y(1) NR(2)	after(1) at/after(2)	below	NR
Tether Cutting	NR	NR	Y	NR	at/before	below	NR
Flux Injection	NR	Y	NR	NR	NR	NR	NR
Mass Loading	NR	NR	NR	NR	NR	NR	cavity and/or prominence

(1) - Forbes and Isenberg [(1991]
(2) - Amari et al. [2000]

A separate challenge was issued by Ron Turner (ANSER), who announced an "All Clear Competition." To emphasize the importance of accurate forecasts of geomagnetically calm conditions, Ron will award a prize (a tube of Clearasil) to the person who can correctly forecast the most clear days over the period of the competition. This might sound easy: since most days are clear, why not predict that every day will be storm free? The catch is that any storm occurring on a day forecast to be clear means immediate disqualification from the competition! Interested competitors should contact Ron at turnerr@anser.org.

Working Group 2 began with a brainstorming session to gauge interests. A wide variety of questions were raised, nearly one for each participant. These were broadly grouped into five topics:

1) solar cycle anomalies;

2) global connectivity and morphology;

3) CME evolution to 1 AU;

4) signatures of interplanetary CMEs (ICMEs); and

5) CME geoeffectiveness.

The first topic reflected the question the group advertised well in advance of the workshop, "Is this solar cycle misbehaving?" Why do we not see more geomagnetic activity at Earth given the apparently large number of CMEs at the Sun and ICMEs detected in space? Participants were asked to prepare their responses in advance and, as a result, the matter was dispatched in record time. Most agreed that the observations were within the bounds of the range of past solar cycle patterns and that the apparent disparity may just reflect our improved ability to detect CMEs and ICMEs.

Working Group 2 quickly moved on to the remaining topics, repeatedly backtracking to find common ground. At the last session they agreed upon two challenges in the form of questions to the community for the coming year: 1) What is different about the solar sources of simple ICMEs, like magnetic clouds, compared to complex ICMEs; and 2) Are there two classes of ICMEs which reflect the two apparent classes of CMEs (accelerating and constant speed)? Both of these challenges reflect the surprisingly provocative idea discussed in Working Group 1 that CMEs can be classified into distinct types.

SHINE 2000 closed with some agency reports and discussion of joint activities with CEDAR and GEM. Both groups have been warmly supportive of SHINE's fledgling efforts, and the SHINE community looks forward to future joint efforts.

- Nancy Crooker, Boston University

WORKSHOP SUMMMARY:

FREQUENT AND PERSISTENT UNSTABLE LAYERS IN THE MESOSPHERE AND LOWER THERMOSPHERE

Mesospheric Inversion Layers (MIL's) were discovered in rocketsonde data more than 20 years ago, but it is only recently that improvements in lidar temperature measurement capabilities have shown such layers to be frequent and persistent at altitudes between 60 and 100 km. The example in Figure 1 [Dao et al., GRL, 22, 2825, 1995] shows two inversions, near 65 km

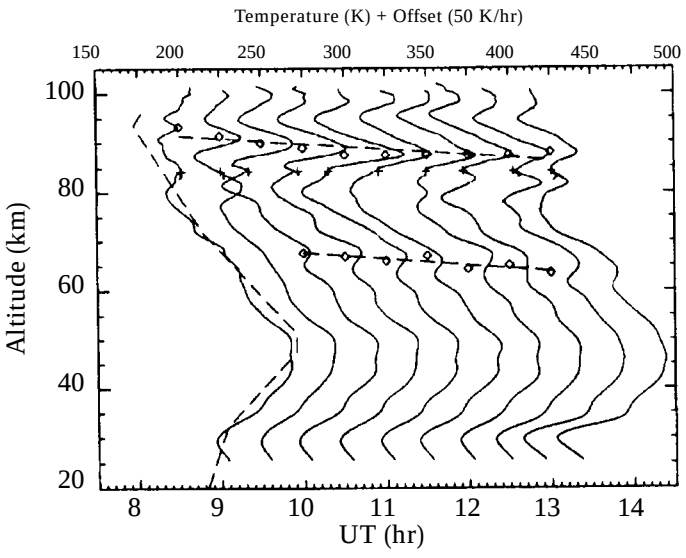


Figure 1: *Lidar measurements of temperature profiles. From Dao et al, 1995.*

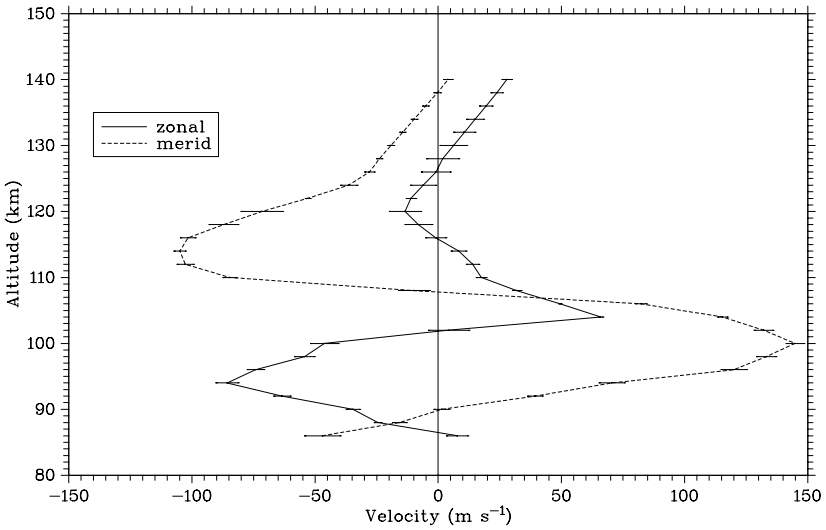


Figure 2: *Winds measured by rocket chemical release. From Larsen, 2000.*

and 85 km, that move downward in altitude during the night at rates comparable to those expected for tidal motions. The name given to the layers focuses on the inversion, i.e., the stable region, but the layer immediately above the inversion is often characterized by a temperature lapse rate that is adiabatic or close to adiabatic, i.e., unstable or close to convective instability. In such a layer, vertical mixing is expected to be strong. If the layers persist for many hours, they are likely to have important consequences for the chemistry, dynamics, and electrodynamics of the region.

Independent of the MIL temperature studies, recent analysis of an extensive existing database of over 350 sounding rocket chemical release wind measurements has shown that large winds exceeding 100 m/s are a common feature between 90 and 110 km. The example in Figure 2 [Larsen, GRL, 27, 445, 2000] shows a wind exceeding 140 m/s near 100 km and a region of large shear located below the maximum. The shears are often unstable or close to instability in the Richardson number sense. Sequences of wind profiles from the same night show that the features persist and propagate downward slowly at speeds comparable to those expected for tidal motions. As with the unstable layers associated with the MIL's, strong vertical mixing is expected in the regions of shear instability with significant effects on the dynamics and chemistry.

A workshop attended by more than 40 participants was held at Clemson University on September 25-26, 2000, to evaluate these recent results and to discuss the broad implications of the existence of persistent unstable layers. Presentations at the meeting summarized and compared the observational database, assessed the various theoretical explanations, and discussed the possible effects on the background atmosphere.

Overviews of the MIL and chemical release wind shear observations were presented by John Meriwether and Miguel Larsen (both from Clemson). By far the most detailed observations have come from lidars, but evidence for the existence of these features is also found in UARS satellite data (William Ward, York Univ.). Further evidence is provided by occultation measurements, dropsonde and chaff measurements, and sodium lidar Doppler measurements.

Gary Swenson (Univ. of Illinois) presented an overview of a dataset accumulated with the Starfire Optical Range lidar in New Mexico, again showing that the unstable layers are common and persistent in the mesosphere. In addition, layers with lapse rates close to adiabatic often occur in altitude ranges with large shears although not always. Mike Taylor (Utah State) summarized ground-based imager observations showing both wave and instability structures.

Roberta Johnson (NCAR) described results from Lower Thermosphere Coupling Study ISR measurements of neutral winds and Jeff Thayer (SRI) discussed the uncertainties associated with the technique. There has been evidence of large winds and wind shears in some of the radar measurements, but the height resolution can be a limiting factor in resolving features of the

type shown in Figure 2. Improvements in the ISRS' height and time resolution should enable resolving these dynamical features in the future.

The theory reviews focused primarily on interactions between gravity waves (GW) and tides as the most likely explanation for the generation of the layers. Dave Fritts (Colorado Research Associates) and Colin Hines (Univ. of Toronto) described various aspects of mesospheric GW characteristics. Dave Fritts also described characteristics of convective and shear instabilities. Richard Walterscheid (Aerospace Corp.) reviewed the generation of pseudo-tides by GW acceleration of the tidal winds. Such interactions may account for the development of the unstable layers and may explain why they are sustained over extended periods. Ed Dewan (AFRL) suggested that modes other than gravity waves can contribute significantly to mesosphere dynamics. In particular, what appear to be bores have been observed in imager data on several occasions. The impact of such phenomena is unknown but may be significant.

Large-scale models now appear capable of modeling the interactions relevant to the unstable layers. Maura Hagan (NCAR) presented results from the tidal mode/GW interaction model developed by Han-Li Liu (NCAR) and showed that the model can produce realistic MIL's with appropriate tuning of model parameters. Cassandra Fesen (U. Texas, Dallas) showed recent results from the NCAR TIME-GCM with wind structure with vertical scale sizes similar to those observed although the magnitudes are still only 50 to 60% of those observed. The NCAR model incorporates analyzed winds and thermodynamic fields from the lower atmosphere as part of the model initialization; these fields appear to be a critical input with significant effects on the mesosphere and lower thermosphere (MLT) winds and tides. Hans Mayr (NASA/Goddard) showed results from his general circulation model and Chris Meyer (NCAR) showed results from a tidal mode/GW interaction model that suggested the type of variability that variations in the GW forcing can produce.

Several intriguing possibilities of the layers' effects on the atmosphere were discussed at the workshop. A simple modeling study by Mike Hickey (Clemson) showed the possible effects on the mesosphere airglow and chemistry. Steve Eckerman (NRL) showed results from his eikonal wave propagation model and summarized results from other studies which emphasize that characteristics of the background atmosphere are critical in determining which waves reach the upper atmosphere.

Mike Kelley (Cornell) suggested that the unstable layers may be a key factor in generating MLT atom and ionization layers, as suggested by observations taken during the Coqui II sounding rocket campaign. Dave Hysell (Clemson) showed that wind profiles of the type observed with the chemical release technique can produce significant electric fields in the E region which can map into the F region for the right combination of scale sizes. The strong shear layers may therefore be capable of generating ionization irregularities both in the E and F regions.

The geographical, altitudinal, and seasonal distributions of the layers are still largely open questions. The mechanisms responsible for generating and maintaining the layers are unknown although GW forcing appears to be an important factor. Further progress will require a combination of observational techniques including lidar, radars, imagers, and sounding rockets. A specific recommendation is to combine global-scale observations of the type made in the Lower Thermosphere Coupling Study campaigns with observations at several highly instrumented sites in order to specify both the large-scale background flow along with the local gravity wave and other types of forcing. Lidar temperature and wind observations are critical to understanding the layer phenomena. A relocatable lidar with wind and temperature capabilities would be especially useful since it enables concurrent observations with incoherent scatter radars and sounding rockets at various locations.

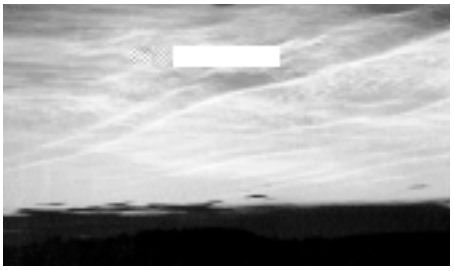
- M. F. Larsen, Clemson U.

NASA SMEX SELECTIONS IN AERONOMY

In September, NASA announced selections in the Small Explorers (SMEX) Program and Missions of Opportunity. Seven SMEX proposals and one Mission of Opportunity proposal were selected for concept studies and one Mission of Opportunity proposal was selected for flight out of the 46 proposals submitted. Three aeronomy-related proposals were among the successful proposals. Two of these are described below.

THE AERONOMY OF ICE IN THE MESOSPHERE (AIM)

One of the missions selected for a Phase A definition study is the Aeronomy of Ice in the Mesosphere (AIM). The scientific purpose of this mission is focused on the study of Polar Mesospheric Clouds (PMCs) that form about 83 km above the Earth's surface in summer and mostly in the polar regions (see the figure). The overall goal is to resolve why PMCs form and why they vary. AIM will measure PMCs and the thermal, chemical, and dynamical environment in which they form. This will allow the connection to be made between these clouds and the meteorology of the polar mesosphere. This connection is important because variability in the yearly number of noctilucent clouds (NLCs), one manifestation of PMCs, has been suggested as an indicator of global change. The body of data collected by AIM will provide the basis for a rigorous validation of predictive models that can be reliably used to study past PMC changes, present trends, and their relationship to global change. In the end, AIM will provide the basis for the study of long-term variability in the mesospheric climate.



NCLs above Torsta, Sweden (63.15N, 14.2 E) on August 11, 1958, photographed by G. Witt, Stockholm University.

This mission is especially timely in view of the heightened scientific and public interest in these beautiful high altitude clouds. In the summer of 1999, PMCs attained the highest degree of U.S. public awareness in history, with the remarkable sighting on June 22-23 of a huge NLC at locations such as Colorado and Utah where they have never been seen before. While PMCs are often observed in the polar summer mesosphere, the sudden occurrence of such a dramatic low latitude display was unexpected. Dozens of accounts appeared in the media. The fact that people in highly populated areas can now view NLCs, coupled with their potential relationship to global change, highlights the importance of understanding their formation.

The AIM scientific objectives will be achieved by measuring near simultaneous PMC abundances, PMC spatial distributions, cloud particle size distributions, gravity wave activity, cosmic dust influx to the atmosphere needed to study the role of these particles as nucleation sites, and precise vertical profile measurements of temperature, H2O, OH, CH4, O3, CO2, NO, and aerosols. The AIM mission includes four instruments: SOFIE (Solar Occultation For Ice Experiment), an IR solar occultation differential absorption radiometer being built by the Space Dynamics Laboratory of Utah State University; SHIMMER (Spatial Heterodyne IMager for Mesospheric Radicals), an imaging UV interferometer being built by the Naval Research Laboratory; CIPS (Cloud Imaging and Particle Size experiment), a panoramic UV imager, and CDE (Cosmic Dust Experiment), an in-situ dust detector, both being built by the Laboratory for Atmospheric and Space Physics (LASP) of the University of Colorado. Ball Aerospace and Technologies Corporation will build the spacecraft and GATS, Inc., Newport News, VA, will lead the data management effort.

The AIM satellite will be launched into a 550 km, circular sun-synchronous, noon orbit by a Pegasus rocket. Dr. James M. Russell III of Hampton University is the Principal Investigator and Mr. Michael T. McGrath of LASP is the Project Manager.

- *James M. Russell III, Hampton University*

THE COUPLED ION-NEUTRAL DYNAMICS INVESTIGATION (CINDI)

The Coupled Ion-Neutral Dynamics Investigation (CINDI) is a mission of opportunity that will

enhance the measurement capability of the Communications/Navigation Outage Forecast System (C/NOFS), a satellite program managed by the US Air Force. The overall objective of C/NOFS is to determine when ionospheric structures will appear, over what spatial extent they will exist, and how severe the effects of such structures will become. CINDI extends the scope of the program to investigate the physical connections between the ion and neutral gases that lead to and promote the growth of equatorial plasma structure.

It is well recognized that the tropical ionosphere represents a significant source of space weather. At this location however, unlike the situation at high latitudes, many space weather phenomena are not directly driven by solar disturbances, but rather indirectly by ion-neutral interactions in the presence of large-scale plasma density gradients. These ion-neutral interactions in fact dominate the behavior of both constituents. Two important questions related to ion-neutral interactions and their influence on the generation and evolution of ionospheric structure will be addressed:

• What are the relationships between the behavior of F-region neutral winds and the daily variability of ExB drifts?

• How do F-region neutral winds and ExB drifts influence the evolution of irregularities?

The C/NOFS satellite will be launched into a slightly elliptical orbit with perigee near 400 km and apogee near 700 km with an inclination of 12°.

The satellite will carry a full complement of instrumentation to measure the electric and magnetic fields, the ion drifts, the local ion density, and the density profiles inferred from TEC occultation measurements of the GPS satellite signals. Dr. Rod Heelis, from the University of Texas at Dallas, is the Principal Investigator for CINDI, which will additionally provide space-borne sensors capable of measuring the neutral wind vector and the thermal ion drift vector at the satellite location. The proposed instrumentation and science analysis will allow the effects of ion-neutral interactions to be determined over the altitude and latitude range covered by the satellite. In this region ion-neutral interactions are responsible for the generation of large-scale electric fields and for the production of smaller scale irregularities resulting from the presence of large-scale spatial gradients in the ion density. The inclusion of the proposed instrumentation on the C/NOFS mission will allow its scientific scope to be expanded to include not only the description of ionospheric irregularities but also the large-scale dynamics of the plasma in which they are embedded. An open data policy will allow participation by the broad science community with many opportunities to collaborate in meeting the challenge of making and interpreting the measurements.

- R. A. Heelis, W.B. Hanson Center for Space Sciences, University of Texas at Dallas

NEW BOOK ON IONOSPHERES

A new book on "Ionospheres: Physics, Plasma Physics and Chemistry" was recently published by Cambridge University Press. The authors are Robert W. Schunk and Andrew F. Nagy. "Ionospheres" provides a comprehensive description of the physical, plasma, and chemical processes controlling the behavior of ionospheres in general.

The relevant transport equations and related coefficients are derived in detail and their applicability and limitations are described. Relevant wave processes are outlined and the important ion chemical processes and reaction rates are presented. The various energy deposition and transfer mechanisms are described in some detail, and a chapter is devoted to the various processes controlling the upper atmosphere and exosphere. Current understanding of the structure, chemistry, dynamics, and energetics of the terrestrial ionosphere, as well as that of other solar system bodies, is presented in the second half of the book. The final chapter describes ionospheric measurement techniques. Appendices provide information about physical constants, mathematical formulas, transport coefficients, and important parameters such as solar EUV intensities and cross sections that are needed for ionospheric calculations. The book also contains extensive student problem sets, and an answer book is available for instructors.

- R. Schunk, Utah State University

UPCOMING WORKSHOPS

Relocatable Optical and Radiowave Measurement Techniques
The Penn Stater Conference Center
State College, PA, USA
1-2 March 2001
(http://www.pshs.psu.edu/html/pennstater.html)

The concept of the Relocatable Atmospheric Observatory (RAO) has been based upon possible relocation of one or more faces of the RAO incoherent scatter radar to geographical locations of interest to aeronomy and space weather. The RAO development plan also includes support for both passive and active optics as well as radiowave instruments. These would be Class I instruments that reflect current technological development and also contribute to the science underlying the operations of the incoherent scatter radar. This NSF-sponsored workshop is to provide a forum for the discussion of the science objectives, development strategy, and representative budgets for relocatable instrumentation associated with the RAO. A secondary objective is to discuss and formulate a management plan by which these instruments might be deployed as part of CEDAR campaigns to collect measurements needed to achieve science objectives proposed by a prospective principal investigator. The outcome of the workshop will be a report summarizing the important science goals that can be achieved utilizing the relocatability aspects of these instruments as well as the key issues of RAO instrument development and management. It is expected that a competition would be held within the next two years for the selection of several of these instruments. Another competition may be held several years later to complete the suite of RAO ancillary instruments.

Up to date information on the workshop can be found at http://asll.ee.psu.edu/RW/. Additional information is available by contacting:

Tim Kane
Penn State
121 Electrical Engineering East
University Park, PA 16802 USA
814-863-8727 -8457 (F)
tjk7@psu.edu

- Tim Kane, The Pennsylvania State University

RELOCATABLE OPTICAL AND RADIOWAVE MEASUREMENT TECHNIQUES

Name _____

Full Mailing Address _____

_____

Telephone with International code_____ Fax _____

e-mail address _____

I am interested in presenting a paper(s) Yes No
I am interested in receiving further information Yes No
Please return the form to Tim Kane by 15 January, 2001

International Workshop on Layered Phenomena in the Mesopause Region
Asilomar Conference Center
Monterey, California, USA
10-12 October 2001
http://isr.sri.com/nlc2001

The International Working Group on Layered Phenomena in the Mesopause Region holds a workshop every two to three years to bring together researchers in noctilucent clouds (NLC), Polar Mesospheric Clouds (PMC) and Polar Mesospheric Summertime Echoes (PMSE). It offers opportunities to young scientists, research students, and new entrants to the field for close interaction with more experienced researchers. The major topics of the workshop deal with ground-based lidar measurements of noctilucent clouds and their dynamical and thermal environment; radar observations of PMSE; in situ probing of PMSE, including charged aerosols, and their atmospheric and electrical environment; satellite observations of PMC, the space counterparts of NLC; and modeling of the high-latitude summertime mesopause region and of the microphysics of ice particle evolution.

The workshop is presently sponsored by its parent association, the International Association of Middle Atmospheric Science (IAMAS). The International Working Group on Layered Phenomena in the Mesopause Region is chaired by Profs. Gary Thomas and Franz-Josef Luebken. The local organization is under J. Thayer (SRI). The conference web

page is available at http://isr.sri.com/nlc2001. Anyone interested in obtaining further notices about the meeting should email J. Thayer (thayer@sri.com) with his/her contact information.

Organizers:
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- Jeff Thayer, SRI

2000 CEDAR MEETING SURVEY RESULTS

Sixty-seven people responded to the survey published after the 2000 CEDAR meeting. There were 48 non-student and 14 student replies; five people did not classify themselves as one or the other. Many thanks to all who replied! The following summarizes the responses.

The single most important factor in determining whether to attend the CEDAR meeting was the workshops. The other meeting element identified as most useful/important was the tutorials; students also rated the poster sessions as very important. About half the respondents selected "other" for factors determining meeting attendance. For many of these, that factor was funding. Both groups identified the programmatic talks and the Prize Lecture as the least important/useful of the meeting elements.

There was overwhelming support for (i.e., more than 2/3 of the respondents favored): retaining the poster sessions; judging the student posters; 2 hours as the default length for workshops; and one hour afternoon breaks.

About half the respondents found the CEDAR database presentations helpful and a majority of respondents found the data provider demos given at the 2000 meeting to be helpful.

About half also favored the following:

- CU as the meeting venue
- having two poster sessions
- having "outstanding poster" awards rather than ranking the posters
- limiting the number of workshops
- providing free time

The support for these latter items was somewhat partisan. The non-students more strongly favor limiting the numbers of workshops while the students more strongly favor more free time; eliminating an afternoon session was their preferred means.

As usual, the afternoon workshops elicited a lot of comments. There was no objection to "AGU-like" workshops as long as they are specifically identified as such. An example is the highly successful "Neutral Dynamics" workshop organized by Tim Kane at the 2000 meeting. Otherwise, there was nearly universal disdain for highly structured and tightly scheduled workshops that do not allow for any discussion or interactions. Nearly all those who made suggestions mentioned things like limiting the number of viewgraphs or presenters or time allotted for formal presentations. As many respondents noted, this is something that is up to the *workshop convener,* not the meeting organizers. The workshop conveners are typically provided with a list of guidelines but of course compliance is optional.

Many respondents (and the CSSC) strongly disagree with the idea of limiting the number of workshops. CEDAR has always been a grass roots organization and the afternoon workshops are one of the

meeting's hallmarks. It is perhaps the only national meeting where anyone can convene a workshop on any CEDAR topic. It was anticipated that some of these could be tightly focused with very few participants. The workshops were never intended to appeal to the majority of the meeting attendees.

To most respondents, the "best thing about CEDAR" is the opportunity to attend a meeting attracting many colleagues but in a friendly, informal atmosphere, one that mixes lectures and workshops and one that includes students along with professionals. One person said, "For some reason, people seem to be in a good mood at CEDAR: happy and relaxed." As many respondents noted, much credit for this goes to Barbara Emery, the main meeting organizer (and survey implementer, receiver, and compiler); many thanks, Barbara!

- C. G. Fesen, U. Texas at Dallas

1999 CEDAR TUTORIALS IN JASTP

The August 2000 Journal of Atmospheric and Solar-Terrestrial Physics (Vol 62, No. 12) contains five of the seven 1999 CEDAR Workshop tutorials, as well as the CEDAR Prize Lecture. The citations are:

D. L. Hysell, An overview and synthesis of plasma irregularities in equatorial spread F, J. Atmos. Solar-Terr. Phys., 62, 1037-1056, 2000.

T. W. Schlatter, Variational assimilation of meteorological observations in the lower atmosphere: A tutorial on how it works, J. Atmos. Solar-Terr. Phys., 62, 1057-1070, 2000.

N. U. Crooker, Solar and heliospheric geoeffective disturbances, J. Atmos. Solar-Terr. Phys., 62, 1071-1085, 2000.

L. R. Lyons, Geomagnetic disturbances: Characteristics of, distinction between types, and relations to interplanetary conditions, J. Atmos. Solar-Terr. Phys., 62, 1087-1114, 2000.

A. D. Richmond and G. Lu, Upper-atmospheric effects of magnetic storms: A brief tutorial, J. Atmos. Solar-Terr. Phys., 62, 1115-1127, 2000.

A complete list of all the CEDAR Tutorials and Prize lectures is available at http://cedarweb.hao.ucar.edu/wkshp/videolist.html.

- Barbara Emery, HAO/NCAR

THE CEDAR POST
is now online
(http://cedarweb.hao.ucar.edu/commun/cedarcom.html)
Send email to
fesen@tides.utdallas.edu
if you don't want to receive a paper copy.

2001 CEDAR WORKSHOP AND SCOSTEP STP-10 SYMPOSIUM

RAINTREE PLAZA HOTEL, LONGMONT, COLORADO
17-22 JUNE 2001

The CEDAR (Coupling, Energetics and Dynamics of Atmospheric Regions) Workshop for 2001 will be held in conjunction with the SCOSTEP (Scientific Committee on Solar-Terrestrial Physics) 10th Quadrennial Solar Terrestrial Physics Symposium (STP-10) in the Raintree Plaza Hotel Conference Center in Longmont, Colorado, about 12 miles NW of Boulder along Hwy 119 (the Diagonal Highway). The Raintree Plaza Hotel Conference Center is the only reasonably priced conference center in the area that can accommodate the estimated 600 participants (300 each from CEDAR and SCOSTEP) with room for workshops and posters.

SCOSTEP currently comprises four programs: STEP-Results, Applications and Modeling Phase (S-RAMP) covering all STP program areas from STEP (1990-1997) plus the topic of Space Weather and a new working group on long-term relations in sun-Earth climate; Planetary Scale Mesopause Observing System (PSMOS) on the middle atmosphere; Equatorial Processes Including Coupling (EPIC) on equatorial aeronomy; and International Solar Cycle Studies (ISCS) on solar physics and impacts of solar activity on Earth and near-Earth space. Each of these programs has its own website which may be linked from the SCOSTEP website. For more information on SCOSTEP visit http://www.ngdc.noaa.gov/stp/SCOSTEP/scostep.html. SCOSTEP symposia usually include tutorial lectures, invited speakers, contributed papers, and posters.

CEDAR has four science initiatives identified in the CEDAR Phase III Report (1997). These initiatives are Coupling with Lower Altitudes, Solar-Terrestrial Interactions, Polar Aeronomy, and Long-Term Variations. The CEDAR website (http://cedarweb.hao.ucar.edu) can provide more information on these initiatives and on the CEDAR program.

Since the initiatives and programs in both groups strongly overlap, it was decided to have joint morning sessions for all attendees. In the afternoons, CEDAR will sponsor a variety of workshops as it has in the past, while SCOSTEP will continue with oral sessions and/or posters.

The general CEDAR Workshop and SCOSTEP's STP-10 Symposium will occur Monday through Friday June 18 to 22. There will be a single registration fee of $200 for all attendees and a common web site at http://cedarweb.hao.ucar.edu/wkshp/ Maps, lodging, and other information are available on the web page.

The CEDAR Student Workshop will occur Sunday, June 17. See the article on page 22 for further details.

The full-day SCOSTEP Bureau meeting will occur on Saturday, 16 June, in conference facilities at NCAR's Mesa Lab. The second Bureau meeting will be on Tuesday evening, 19 June, at the Raintree Plaza Hotel. The SCOSTEP General Meeting will be on Sunday, 17 June, at NCAR's Mesa Lab in the main auditorium. This session is for the adherent representatives of SCOSTEP, scientific discipline representatives, and others who are interested.

The SCOSTEP program ISCS will hold its 2001 meeting at the same hotel (the Raintree) between Wednesday June 13 and Saturday June 16. The agenda for ISCS_2001 is linked on the CEDAR-SCOSTEP web page mentioned above.

The GEM Workshop will be held concurrently between Sunday, June 17 and Friday, June 22 in Snowmass, Colorado. The SHINE Workshop will also take place in Snowmass from June 17-21, adjacent to GEM. The GEM Student Workshop will probably be on Sunday, June 17. The GEM and SHINE url's are: http://www-ssc.igpp.ucla.edu/gem and http://www.sec.noaa.gov/shine

Scientists and students from developing countries and the former Soviet Union can apply for limited SCOSTEP funding from Joe Allen

by January 31, 2001 at jallen@ngdc.noaa.gov.

All students, whether international or from US institutions, will receive free registration. All CEDAR students will receive free lodging. Lodging funds for SCOSTEP students may become available but are not certain at this time. Free student housing is either on the University of Colorado campus in Boulder in dormitory double rooms (students pay extra for a single room), or in the Raintree Plaza hotel. Students staying at the Raintree will be housed three to a room in the hotel's large three-bed suites. Round trip air fare or the equivalent is also available to CEDAR students from US institutions. Students must apply for funding on the web and register **by March 1, 2001.** Further funding details are on the web. Students who wish to attend GEM should apply for funding from GEM.

Students or others who wish to share rooms in the Raintree Plaza Hotel should apply for roommate matching by **April 30, 2001** via the web form at http://cedarweb.hao.ucar.edu/wkshp/raintreeform01.html. The web form at http://cedarweb.hao.ucar.edu/wkshp/dormform01.html. must be submitted by **May 25** for all dormitory reservations. Those who stay in Boulder hotels or dorms must commute about 25 minutes to Longmont via car or bus. Information on lodging, airport transportation, and RTD bus schedules is provided on the CEDAR website and in the following articles. The blocks of hotel rooms are available until May 18, 2001.

- Barbara Emery, HAO/NCAR

2001 CEDAR STUDENT WORKSHOP

Exciting plans are underway for the 2001 CEDAR Student Workshop which occurs Sunday June 17 before the regular CEDAR meeting begins. For undergraduates and new graduate student participants, the workshop will have a two hour session before lunch focusing on general atmospheric and CEDAR facilities information. In the afternoon, the traditional presentations will be augmented with a panel discussion where students can ask questions ranging from the day's presentations to general questions about the field. The student social will again follow the afternoon workshop session. More details will follow in the next CEDAR Post.

This year's workshop theme is "Exploring the Mesosphere, Lower Thermosphere, and Ionosphere (MLTI) Region". The theme has been chosen to coincide with the launch of the TIMED satellite mission in the spring of 2001. The afternoon session will include general presentations on topics that the TIMED mission may investigate. Any student currently performing research involving the MLTI region who would like to be a speaker at this year's student workshop should contact Rebecca Bishop (rbishop@utdallas.edu) as soon as possible. Any other general suggestions or ideas for improving the student workshop are also welcome.

- Rebecca Bishop, U. of Texas at Dallas

CALL FOR WORKSHOPS

DEADLINE: 1 MARCH 2001

This year's CEDAR afternoon workshops are being organized by Sixto Gonzalez, Tim Kane, and Jeng-Hwa Yee. Please contact them if you wish to host an afternoon workshop during the CEDAR meeting. Note that this is a firm deadline in order to organize and publish the workshop list in the May CEDAR Post.

Workshops are typically two hours in length. Longer workshops (of 4 hours) need to be well justified with a clear rationale. All workshops are scheduled in the afternoons, Monday through Friday, from roughly 1:15 to 3:15 PM or 4 to 6 PM.

For planning purposes please submit the following required information to sixto@naic.edu:

- title and a short summary of the proposed workshop;
- any special requests, e.g. possible scheduling conflicts or special equipment needed;
- the type of workshop being proposed; e.g. campaign planning, special topics, or mature science as well as an estimate of the number of

expected attendees.

The workshop schedule will be completed in mid to late April. A more detailed description of the proposed workshop should be submitted to Barbara Emery (emery@ucar.edu) by June 1 for inclusion in the registration materials distributed to all meeting participants. Descriptions will also appear on the CEDAR web page.

Each workshop convener must provide a written summary of the workshop for publication in the August 2001 CEDAR Post. The summary should be sent to Roger Smith (roger.smith@gi.alaska.edu) within two weeks after the CEDAR Workshop.

- *Sixto Gonzalez, NAIC/Arecibo, Tim Kane, The Pennsylvania State University, and Jeng-Hwa Yee, Applied Physics Lab, Johns Hopkins U.*

CALL FOR POSTERS

ABSTRACT DEADLINE: 1 MARCH 2001

Note the deadline is much earlier than it has been for previous CEDAR workshops.

The CEDAR-SCOSTEP meeting will include two evening poster sessions. Students who are the first author and presenter of a poster may elect to compete in the 2001 CEDAR-SCOSTEP Poster Competition. Prizes will be awarded for a number of outstanding posters. Complete descriptions of the poster sessions, poster guidelines, the web abstract form, and judging criteria for student posters are at: http://cedarweb.hao.ucar.edu/wkshp/submission01.html

Abstracts should be submitted on the web. If this is not possible, please send an abstract with title, authors, e-mail and institution of first and presenting author(s), and indications of whether or not the first author is a student and wishes to be a part of the student poster competition, to Barbara Emery (emery@ucar.edu; fax: +1 303 497 1589; NCAR-HAO, P.O. Box 3000, Boulder, CO 80307-3000). All abstracts should be received by March 1. Accepted abstracts will be posted on the web by April 23.

2001 CEDAR Poster Committee:

- *Leroy Cogger, University of Calgary, Delores Knipp, US Air Force Academy Art Richmond, HAO/NCAR, and Toshitaka Tsuda, Kyoto University*

CEDAR PRIZE LECTURE NOMINATIONS

DEADLINE: 6 APRIL 2001

The CEDAR Prize Lecture has been awarded since 1989 to recognize outstanding scientific contributions to the CEDAR program during the previous year. Nominations are solicited from the community and are based on a research paper presented, submitted, or published during the previous year by a member of the CEDAR community. Selection is made by the CEDAR Science Steering Committee. The successful candidate presents an invited 30 minute lecture at the annual CEDAR workshop.

Deadline for nominations for the 2001 CEDAR Prize Lecture is April 6. Nominations should include a citation for or a preprint of the paper being submitted for consideration and a brief statement of why the research is important.

New this year, nominations can be made via the CEDAR website at http://cedarweb.hao.ucar.edu/wkshp/cedarprize.html or to C. G. Fesen (fesen@tides.utdallas.edu)

CEDAR-SCOSTEP 2001 LODGING AND LOCAL TRANSPORTATION

LODGING FOR CEDAR-SCOSTEP 2001

http://cedarweb.hao.ucar.edu/wkshp/hotels.html and dorm.html

The hotels listed below have blocked rooms for workshop participants between the nights of June 16-24, 2001. The blocks of rooms at special workshop rates are only being held until May 18, 2001. Specifically mention the CEDAR-SCOSTEP Workshop to obtain listed rates. Reservations must be accompanied by a credit card charge number or a deposit for the first night of lodging; Visa, MasterCard, American Express, and Discover credit cards are accepted at most of the hotels. Cancellations must be made 24 hours in advance to avoid being charged

for the first night of lodging. (The government rate for 2001 in Boulder and Longmont is $90.) Most hotels include breakfast as part of their rates, but it will also be available in the conference center as part of the registration fee.

Students and others who wish to share rooms in the Raintree Plaza hotel should apply for lodging via the web form before **April 30, 2001.** The web form must be used for all dormitory reservations. The University of Colorado at Boulder dormitory rooms are in Williams Village which is air conditioned. The dorm package is for 5 nights between Sunday June 17 to Thursday June 22. Additional nights are possible. The package core rates are in effect even if the stay is for a shorter period of time. The University of Colorado accepts VISA and MasterCard. Parking permits can be purchased at the dorm. CEDAR students are eligible for free lodging in a double at the dorm, a triple at the Raintree Plaza hotel, or about $30/night elsewhere, and must apply for funds on the web before **March 1, 2001.**

All Longmont hotels have shuttle stops for the Airport Express from the Denver International Airport (DIA). Boulder hotels and dorms are stops for the SuperShuttle Boulder. See the meeting website for detailed instructions on how to reach a particular hotel.

Raintree Plaza Hotel
1900 Ken Pratt Blvd
Longmont, CO 80501
1-800-843-8240 or (303) 776-2000;
FAX: (303) 682-2190
Single/Double $90, 90 rooms, 6.95% tax, pool/breakfast at conference Register via web to get roommate matching. Required for CEDAR students who wish to stay at the Raintree.

Hampton Inn (Corner of Ken Pratt Blvd (Hwy 119) and Main (Hwy 287) - 5 min drive)
850 S. Main Street
Longmont, CO 80501
(303) 772-2554;
FAX: (303) 772-2698
Single $90, Double $96, 15 rooms, 6.95% tax, pool/spa/breakfast

Comfort Inn (At Hwy 119 and I-25, exit 240 - 15 min drive)
10811 Turner Blvd
Longmont, CO 80504
(303) 684-6779;
FAX: (303) 684-6779
Single/Double $80, 30 rooms, 3.0% tax, pool/spa/breakfast

Super 8 Twin Peaks (At Hwy 66 and Main/Hwy 287 - 10 min drive)
2446 N. Main Street
Longmont, CO 80501
(303) 772-0888;
FAX: (303) 772-3717
Single/Double $80, 45 rooms, 6.95% tax, Longmont Athletic Club/breakfast

Days Inn (At Hwy 119 and I-25, exit 240 - 15 min drive)
3820 Hwy 119
Longmont, CO 80504
(303) 651-6999;
FAX: (303) 651-1708
Single $77, Double $84, 15 rooms, 3.0% tax, pool/spa/breakfast

Niwot Inn (Off Hwy 119 on 2nd Ave near Niwot Road - 10 min drive)
342 2nd Ave
Niwot, CO 80544
(303) 652-8452;
FAX: (303) 652-4289
Single/Double $129, 6 rooms, 4.7% tax, breakfast

The Broker Inn (near U of CO - 25 min drive)
555 30th Street
Boulder, CO 80303
(800) 338-5407 or (303) 444-3330;
FAX: (303) 444-6444
Single/Double $90, 40 rooms, 9.7% tax, pool/spa/breakfast

Days Inn (at Hwy 36 and Foothills Parkway - 25 min drive)
5397 South Boulder Road
Boulder, CO 80303
(303) 499-4422;
FAX: (303) 494-0269
Single $84, Double $89, 20 rooms, 9.7% tax, pool/breakfast

Ramada Inn, Boulder (across from U of CO - 25 min drive)
(formerly the Holiday Inn)
800 - 28th Street
Boulder, CO 80303
(303) 443-3322;
FAX: (303) 443-0397
Single/Double $83, 30 rooms, 9.7% tax, pool/spa

University of Colorado Williams Village Dorms (25 min drive)
Register via web only
60 Singles: ~$258/person (June 17-21) + ~$50/person each extra night + 9.7% tax
40 Doubles: ~$137/person (June 17-21) + ~$25/person each extra night + 9.7% tax

TRANSPORTATION FROM THE DENVER INTERNATIONAL AIRPORT TO LONGMONT OR BOULDER

http://cedarweb.hao.ucar.edu/wkshp/maps01.html

To Longmont:

The Airport Express [303-772-5466] provides direct transportation between Denver International Airport (DIA) and the Longmont Raintree Plaza Hotel where the 2001 CEDAR-SCOSTEP Workshop will be held. All other Longmont hotels are also served by this shuttle. Fares are $13 one way, cash only. Reservations are recommended, but note that there is no counter area at the airport to make reservations. Travel time from the Raintree to DIA is about 80 minutes. The buses are labeled either "Airport Express" or "Express Charter". To take the bus from the airport, go out the West Door #504 in the baggage area or the East Door #505 and proceed to the 4th traffic lane/island. The bus leaves the West Door #504 at 5 minutes before the hour from 5:55 AM to 7:55 PM and the East Door #505 5 minutes past the hour from 6:05 AM to 8:05 PM. The last bus leaves the West Door at 9:30 PM and the East Door at 9:45 PM.

The bus will stop in Longmont to discharge those passengers going to Longmont hotels. The stop/transfer point is at Exit 240 on I-25 at a Conoco station; transfer to vans for the Raintree, Hampton Inn, or Super 8 hotels. The other Longmont hotels near this exit are within easy walking distance.

Reservations are also recommended when leaving the hotels to go to DIA. Airport Express leaves every hour from 5:45 AM to 7:45 PM from the drop off point at I-25 and Hwy 119. Vans pick up at the hotels every hour from about 6:20 AM to 6:20 PM. (From Main St Super-8, 20 minutes after the hour; from the Raintree, 25 minutes after the hour; and from the Hampton 30 minutes after the hour.) Again, cash only is accepted for payment.

To Boulder:

The SuperShuttle Boulder [303 444 0808], formerly the Boulder Airporter, provides direct transportation between Denver International Airport (DIA) and Boulder hotels. The fare is $18 one way; major credit cards are accepted. Check in at the SuperShuttle counter in the baggage claim area, level 5 of the main terminal, across from the Hertz counter. A regular hotel stop is The Broker Inn, just across the street from the Williams Village dormitories. Other hotels and dormitories can be requested or are regular stops. The SuperShuttle leaves from The Broker Inn on the hour between 5 AM and 9 PM, arriving at DIA in 65 min.

The RTD AB bus is another alternative to getting to Boulder. Board the AB bus in Lane 3 outside the East Terminal Door #511 at 20 minutes past the hour from 6:20 AM to 11:20 PM. Fares are $8.00 one way. The bus stops in front of NIST on Broadway and at other sites farther north on Broadway near the campus of the University of Colorado in Boulder.

- Barbara Emery, HAO/NCAR

BILL FASTIE - A TRIBUTE

Bill Fastie of Johns Hopkins University died this year on the 14th of July, 2000 after a long illness. His seminal contributions to aeronomy of the 1950s and 60s may not be well appreciated in this new millenium. Perhaps his foremost contribution to aeronomy was his re-invention of the Ebert spectrometer; he essentially "discovered" it independently of Ebert's work in the late 1800s. More importantly, he improved the spectrometer's throughput by including long curved slits (now generally known as Fastie slits) as part of the spectrometer design while maintaining high spectral resolution. In spite of the need to rotate the grating to scan the airglow or auroral emission spectrum, this instrument was superior to the spectrograph of the day because a phototube detector is about 200 times more sensitive than a photographic plate. The resulting instrument configuration was very well suited for inclusion on rocket payloads. Bill made use of this to fly a spectrometer into the aurora in 1959, becoming the first person to detect the auroral UV emissions. He went on to fly one of his instruments on the Apollo 17 mission to the moon. Others have made use of this instrument for studying the spectroscopic emissions from planetary atmospheres. Bill was instrumental in persuading NASA to organize airborne missions for global remote sensing of airglow and polar auroral processes.

Bill had a long lasting impact upon many of us beginning our aeronomy careers several decades ago. He was well known for his generosity and fellowship. JM well remembers encounters with Bill at the Laurel Ridge Airglow Observatory in Pennsylvania and at the Churchill rocket range in his first outing to the polar region as a graduate student with his advisor Bill Benesch (a close friend and sailing partner of Bill's). AS notes with considerable pride that he is the one and only graduate student that Bill mentored directly. This was largely because Bill couldn't spare the time to earn a PhD during his active and busy career. But he involved graduate students as well as postdoctoral fellows in many of his projects.

Bill went on to shape an outstanding career in astrophysics in which he and his colleagues at John Hopkins studied the UV emissions of various sources in the universe using rockets and satellites. One of his major successes was to obtain measurements of the ultraviolet emissions from Comet Kohoutek. Later, he participated in the development of the concept for the Hubble Space Telescope which has proved to be an outstanding achievement in spite of its early problems. There are many other similar highlights in Bill Fastie's career. Both aeronomy and astrophysics will miss him.

- *Abas Sivjee, Embry Riddle Aeronautical University, and John Meriwether, Clemson U*

MEETINGS CALENDAR

2001

Mar 12-16	Chapman Conference: Storm-Substorm Relationship, Leonvala, India
Mar 25-30	European Geophysical Society, Nice, France
Apr 8-12	European Union of Geosciences, Strasbourg, France
Apr 16-21	Chapman Conference: Low Latitude Boundary Layer, New Orleans, LA
May 29-June 2	AGU spring meeting, Boston, MA
June 3-6	Beacon Satellite Symposium, Boston College, MA
June 7-8	Space Weather Effects on Communications and Navigation Signals, Boston, MA
June 13-16	International Solar Cycle Study, Longmont, CO
June 17-21	SHINE meeting, Snowmass, CO
June 17-22	CEDAR Workshop, Longmont, CO
June 17-23	GEM meeting, Snowmass, CO
June 25-29	URSI/COSPAR International Reference Ionosphere Workshop, Saõ Jose dos Campos, Brazil
June 25-30	Jupiter: Planets, Satellites, and Magnetosphere, Boulder, CO
July 8-13	Joint 2001 AP-S International Meeting and 2001 URSI Meeting, Boston, MA
July 10-18	International Association of Meteorology and Atmospheric Sciences (IAMAS), Innsbruck, Austria
Aug 6-10	Meteoroids 2001, Kiruna, Sweden
August 18-31	IAGA 9th Scientific Assembly and 30th IASPEI General Assembly, Hanoi
Sep 4-8	European Conference on Radar Meteorology, Bologna, Italy
Sep 10-12	Solar Terrestrial Magnetic Activity and Space Environment, Beijing, China
Sep 10-15	International School for Space Plasma Simulations, Garching, Germany
Oct 10-12	International Conference on Layered Phenomena in the Mesopause Region, Asilomar, CA
Dec 10-14	AGU fall meeting, San Francisco, CA

2002

May 28-June 1	AGU spring meeting, Washington, DC
July 9-12	Western Pacific Geophysical Meeting, New Zealand
Dec 6-10	AGU fall meeting, San Francisco

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