The Cedar Post

May 1993 No. 19

Prospects for Atmospheric Science Research Using the New Air Force Advance Electro-Optic System at Haleakala, Maui

The Advanced Electro-Optic System (AEOS) is a 3.7 m telescope facility currently under development at Haleakala, Maui, by the Air Force Phillips Laboratory. The facility will be operational by mid-1995. Originally AEOS was envisioned to support primarily the Air Force mission in space surveillance. The 3.7 m telescope is designed to scan down to 5° above the horizon at speeds as high as 17° per second and will be equipped with the latest adaptive optics technology to monitor and track orbiting spacecraft and debris during twilight periods. Because the facility would be largely unused during daytime and nighttime, in early 1992 the Air Force initiated discussions with the civilian astronomy and atmospheric sciences communities to assess the feasibility and utility of using the AEOS telescope for scientific purposes. An AEOS Scientific Advisory Board was organized with representatives from both the DoD and civilian communities to provide input on the design of the telescope and to recommend the crucial instruments necessary for scientific observations at the facility.

The AEOS telescope, by virtue of its size, and location at Maui above much of the lower atmosphere and in excellent seeing conditions, will provide a unique measurement capability for the atmospheric sciences. To take full advantage of this capability requires both atmospheric research lidars and a complement of supporting optical and radio diagnostics.

The Air Force requirements that this new facility addresses include: atmospheric density specification and prediction; improved boundary conditions for operational codes providing satellite drag tracking and orbit propagator models; IR background variability and structure; aerosol modeling for atmospheric transmittance codes; upgrade tests and validation of atmospheric emission and transmittance codes; and transmittance and extinction for horizontal incidence through thin layers of sub-visible clouds, aerosols, and turbulence.

National issues which can be addressed by this new facility are tied to environmental issues and global climate change. They bear closely on, or can contribute materially to related programs of several federal agencies including: the NSF and its CEDAR and Middle Atmosphere Research Initiative (MARI); NASA and its UARS and TIMED missions; NOAA interests in ozone depletion, and related species concentrations and transport studies. The DoD has several other unique capabilities that can contribute to these studies as well.

Modern high power laser systems are the obvious complement to the optical telescope being developed for AEOS. Active probing of the atmosphere provides superb temporal and spatial resolution as well as measurement of constituent density, temperature, and other parameters unobtainable by passive sensing techniques. In addition to their importance to Air Force Systems, the physics and chemistry of the atmosphere is obviously of universal concern. Lidar systems are now capable of measuring important atmospheric constituents such as ozone, water vapor, NO_x and SO_x compounds as well as fundamental atmospheric parameters such as wind and temperature. While recent advances in lidar capabilities have been impressive, the accuracy, resolution and sensitivity of many systems are still limited by low signal levels.

A two-day workshop was held on January 21-22, 1993, at the Hanscom Air Force Base to develop an instrumentation plan for atmospheric science research at AEOS. More than 25 participants in attendance at the workshop helped identify the crucial instruments for AEOS. Their recommendations are described in the report "Advanced

Electro-Optical System Instrumentation Plan for the Atmospheric Sciences" recently published by Phillips Laboratory. The key instruments include a Rayleigh/Raman Doppler lidar, a Na Doppler/Temperature lidar, a broadly tunable solid-state lidar, various spectrometers and imagers, an ST radar, an MF radar and a digital ionosonde. The Air Force is currently seeking funding for the instrument package.

The lidars would provide routine measurements of water vapor into the lower stratosphere as well as measurements of numerous important minor species. These observations would establish the current state and variability of the atmosphere above Hawaii and would eventually reveal secular changes related to global atmospheric change.

Unfortunately, the background state of the stratosphere, mesosphere and lower thermosphere has not been well characterized, because until recently, this region was difficult to study observationally. The large Rayleigh and Na lidars proposed for AEOS would, for the first time, enable the temperature structure of the atmosphere, from the ground to the lower thermosphere, to be monitored with superb accuracy and resolution on an almost continuous basis. These measurements, coupled with the simultaneous wind observations, would enable the relationship between the thermal structure, atmospheric tides, planetary waves and gravity waves to be studied in great detail. The data base would also be of unique value in studying global atmospheric change, particularly temperature, density and compositional changes that may be related to the increasing CO_2 and CH_4 levels.

Water vapor would be measured at AEOS by adding a water vapor Raman channel to the proposed Rayleigh lidar. This allows determination of correlative water vapor and temperature profiles. The proposed system should permit routine observations into the lower stratosphere. This would enable detailed studies of the influence of dynamics on water vapor structure and concentration, troposphere/stratosphere exchange and the long-term variability of lower atmosphere water vapor concentrations.

Next to oxygen, water vapor is the most important gas in the atmosphere. Its abundance and distribution influence cloud formation, precipitation and convection. Water vapor is the most important greenhouse gas. Its many infrared bands contain tens of thousand of absorption lines, some so strong that they absorb entire portions of the solar spectrum even well above the earth's surface. Water vapor's role in global climate change is still under intense debate and the lack of understanding of its role in global warming is currently the largest source of uncertainty in the temperature changes predicted to accompany the expected CO_2 and CH_4 increases during the next century.

Water vapor also plays an important role in atmospheric photochemistry. It is the main source of OH radical which in turn influences O_3 and NO_x chemistry. The H_2O concentration is highly variable in both time and space, giving rise to atmospheric refractive index variations (i.e. at microwave frequencies) and striations that can have serious effects on microwave propagation and radar reliability. In fact, our knowledge of the detailed structure of these radar anomalies is currently limited by the resolution with which they can be observed, hence the need for high resolution data which can be obtained only with certain types of lidar systems. Lower stratospheric H_2O is produced in part by commercial and military air traffic; thus monitoring of H_2O in the lower stratosphere is of crucial importance to the study of present and future aircraft effluents.

Gravity waves are now known to exert a substantial influence on constituent structure and general circulation throughout the atmosphere. However, gravity wave effects are at best only crudely parameterized in existing global circulation models. This omission is due in part to our lack of a clear understanding of the dominant wave saturation processes and knowledge of the origin and influence of the major gravity wave sources. The instruments proposed for AEOS would provide crucial information on the generation of gravity waves, their propagation into the upper atmosphere and their interaction and influence on the mean flow. These instruments would enable detailed characterizations of gravity wave sources in the lower atmosphere to be obtained as well as measurements of the height distribution and seasonal variations of gravity wave momentum and thermal fluxes. These data should lead to substantial improvements in existing global circulation models by facilitating the development of accurate gravity wave parameterizations.

The central atmospheric science goal at AEOS is to study with necessary spatial and temporal resolution, the structure, composition, chemistry and dynamics of the earth's atmosphere from the troposphere into the lower thermosphere. The approach is to develop a major new observatory for detailed long-term studies of the earth's atmosphere which fully exploits the maturing capabilities of lidar in synergism with correlative radar and passive optical instrumentation.

The key atmospheric sciences issues to be addressed at AEOS are:

- Establish the current state of the atmosphere into the lower thermosphere and begin the acquisition of a high-quality long-term data base to assess variations that may be related to global atmospheric change.

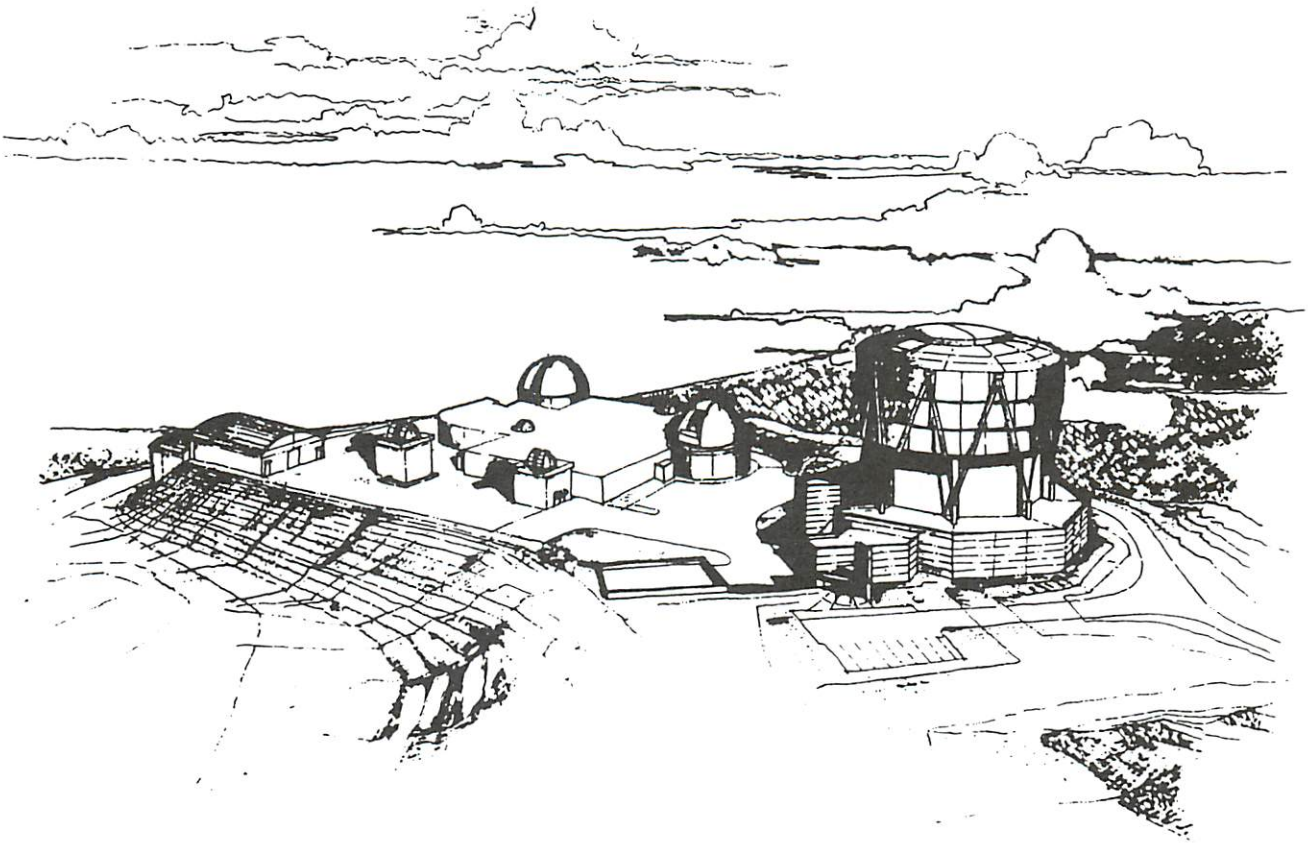
- Define coupling processes throughout the atmosphere at necessary high spatial and temporal resolution, especially the effects of planetary waves, tides, gravity waves and turbulence and their influences on constituent transport and mean flow interactions.

- Study the neutral and ionic chemistry of important minor species such as ozone, water vapor, OH and mesospheric metals to better define their role in global atmospheric change.

- Explore applications of chemical releases and atmospheric modification using lasers, and radars to answer key questions by minor perturbation techniques.

• To study the chemistry and dynamics of planetary atmospheres at high spatial and temporal resolution as a test bed of comparative atmospheres, and to test and validate understanding of global transport processes and solar influences on global circulation.

Chet Gardner, University of Illinois
Herb Carlson, Phillips Laboratory



Architectural drawing of the AEOS 3.7 m telescope facility currently being developed at Haleakala, Maui, by the Air Force Phillips Laboratory.

Richard Doe Awarded CEDAR Post Doc

After finishing up a few loose ends in his work with Mike Mendillo at Boston University, Rick Doe will join SRI International as its newest CEDAR Post Doc. He will continue his optical observations at Sondre Stromfjord and his comparisons with the incoherent scatter radar. Congratulations, Rick!

CEDAR Storm Study Workshop

A very successful workshop, funded by a grant from the NSF CEDAR Program, was held March 24-26, 1993 at Millstone Hill in Westford, Massachusetts and attended by 30 participants in the CEDAR Storm Study. The purpose of the CEDAR Storm Study is to focus the attention of scientists involved in the study of the ionosphere and thermosphere on specific disturbed intervals with good data coverage. Two periods have been chosen so far. These included the Incoherent Scatter Coordinated Observation Day Periods of March 20- 21, 1990 and June 11-12, 1991.

The workshop start was delayed by over an hour due to a snowstorm. During the first day, a series of brief presentations brought us up-to-date on the status of the various projects on the March, 1990 storm period. Tim Yeoman from Leicester University in England summarized the study of the magnetospheric/ionospheric convection response being carried out by his group. While good overall agreement was reported with the expected convection pattern for B_y negative, both the time and position of substorm onsets need to be known to understand the details of the convection response. Jim Scali of U. Massachusetts Lowell reported results from the Digisondes at Goose Bay, Argentina, and Millstone Hill and related the observed trough positions to convection. Eileen MacKenzie of Boston College presented scintillation results at Thule and Sondrestromfjord and related them to polar cap patches observed by DMSP. Delores Knipp showed preliminary AMIE results for this period. She and Barbara Emery are continuing to seek additional magnetometer and incoherent scatter data for input to the analysis. Cassandra Fesen presented TIGCM results, and Mihail Codrescu results of CTIM. Both models showed strong wind surges, and both Cassandra and Mihail invited participants in the study to request model outputs for their particular locations. Xiaoqing Pi of Boston University compared SAR Arc observations with modeling results for March 22, 1990. John Foster related this SAR Arc to DMSP and Millstone Hill incoherent scatter drift and other observations. Michael Buonsanto showed how the effects of electric fields and the disturbance winds could be separated by comparing drifts, winds and hmF2 in March 21, 1990 Arecibo nighttime data. Bela Fejer discussed the ionospheric electrodynamic effects due to magnetospheric storms, emphasizing Jicamarca and Arecibo data. Phil Richards showed results of his FLIP model for Millstone Hill and Arecibo. Excellent results were found at Millstone. At Arecibo, however, the agreement is not quite as good, but it is helped by inclusion of vibrationally excited N2. Horng-Yu Wu of Utah State showed how electric fields as well as neutral winds may be estimated from simultaneous changes in hmF2 at conjugate locations. Tomoyuki Takami, now at Boston University, presented the Kyoto MU Radar data for the March, 1990 interval. Pat Doherty of Boston College presented results of the Phillips Lab Model for Jicamarca. The model electron density agrees well with DMSP measurements near 800 km. Mike Ruohoniemi reported on the Goose Bay and Halley Bay coherent radar data, which showed the dayside generation of patches, and clear transitions in convection velocities associated with transitions in B_y.

On Thursday morning Bill Oliver discussed his estimates of atomic oxygen densities and exospheric temperatures at Millstone Hill and Arecibo. Michael Buonsanto summarized the Sondrestrom data supplied to him by John Kelly, who unfortunately was grounded in Greenland. With the presentations completed, individuals working on various projects helped update the following list of projects completed or underway:

Specific Studies/Collaborations on March, 1990 Storm

1. Observations From Millstone Hill During the Geomagnetic Disturbances of March and April 1990 - Buonsanto, Foster, Sipler, *J. Geophys. Res., 97,* 1225-1243, 1992.
2. Neutral Atomic Oxygen Density From Nighttime Radar and Optical Wind Measurements at Millstone Hill - Buonsanto, Tung, Sipler, *J. Geophys. Res., 97,* 8673-8679, 1992.
3. Effects of Magnetospheric Electric Fields and Neutral Winds on the Low-Middle Latitude Ionosphere During the March 20-21, 1990 Storm - Buonsanto, Foster [submitted to *J. Geophys. Res.*, 1992].
4. Coordinated SAR Arc Observations: Relationship to Plasma Convection - Foster, Buonsanto, Rich, Denig, Mendillo, Nottingham [about to be submitted].
5. Dayside F Region Patches, Transport from Dayside and Scintillation - Crowley, Ruohoniemi, Greenwald, Basu, MacKenzie et al. [to be submitted, 1993].
6. Transformation of Patches Into Blobs on the Nightside - Crowley, Ruohoniemi, Greenwald et al. [to be submitted, 1993].
7. Winds from hmF2 and Electric Field Penetration - Wu, Miller [to be submitted, 1993].
8. FLIP Model at Millstone and Arecibo - Richards [to be submitted, 1993].
9. Experimental Study of Stormtime Convection - Taylor, Yeoman, Lester [to be submitted, 1993].
10. Electric Fields and Auroral Indices - Riley, Fejer et al. [to be submitted, 1993].
11. Thermospheric Winds and Electric Field Effects at Low Latitude - Fejer et al. [to be submitted 1994].
12. Low Latitude Model, Drifts, and N_e - Anderson, Doherty [to be submitted, 1994].
13. Neutral Atmosphere (daytime) - Oliver [to be submitted, 1994].
14. AMIE - Knipp, Emery [to be submitted, 1994].
15. CTIM - Codrescu
16. TIGCM - Fesen
17. Low Latitude Trough - Foster et al. [new study].

Afterward, individuals working on the various projects got together for detailed discussions, which lasted for the remainder of the morning.

On Thursday afternoon, short presentations on the June, 1991 storm were given. Tim Yeoman reported on

EISCAT and subauroral SAMNET data. Roger Smith showed optical data from South Pole and Mount John, New Zealand. Strong surges in the meridional winds as well as strong vertical winds and IMF B_y effects were seen. Jim Scali reported on the Digisonde observations from Goose Bay, Argentina, and Millstone Hill. Very disturbed ionograms were recorded, which included persistence of the "G" condition due to absorption, especially at Goose Bay. Bill Oliver presented his atomic oxygen and exospheric temperature results. Michael Buonsanto summarized the Millstone Hill data, including electric fields and winds versus latitude derived from the nighttime data during June 12, 13, and 14. Xiaoqing Pi summarized briefly the available SAR Arc observations collected at Millstone Hill. Cassandra Fesen presented her TIGCM simulations. Qihou Zhou showed Arecibo incoherent scatter and FPI data. These showed the dominance of wind dynamo effects on the electron density variations. Horng-Yu Wu presented his results on winds and electric fields from hmF2. Tomoyuki Takami showed the MU radar observations which revealed strong excursions in the north-south electric fields at Kyoto. Bela Fejer summarized the Jicamarca data, which showed a good correlation between the E-W electric fields and magnetometer data. Pat Doherty presented Phillips Lab Model results which revealed a strong poleward shift of the equatorial anomaly to as far as 28 degrees dip latitude. This coincided with a large increase seen in total electron content at Ramey, Puerto Rico. TEC data at higher latitude stations revealed large depletions on some nights of the interval. Ron Clark reported MLT radar data for the June, 1991 disturbances. On Friday morning Bill Denig gave an overview of the DMSP particle and field data for the June, 1991 period. This final presentation was followed by an excellent discussion, in which we first identified some additional data sets needed for the various projects and individuals who would seek these out. We then formed working groups for specific studies of the June, 1991 storms. The list is as follows:

Specific Studies/Collaborations on June, 1991 Storm

1. Experimental study of stormtime convection - Yeoman, Taylor, Denig, Smith
2. E region microphysics - Greenwald, Ruohoniemi
3. Midlatitude magnetosphere/ionosphere coupling - Foster, Ling, Buonsanto
4. Frictional heating, atomic oxygen and exospheric temperature at Millstone Hill and Arecibo - Oliver
5. Winds from hmF2 and electric field penetration - Wu, Miller
6. FLIP model at Millstone and Arecibo - Richards
7. Penetration of electric fields and disturbance winds to low and middle latitudes - Fejer, Buonsanto, Zhou, Takami
8. Low latitude model, drifts, and N_e - Anderson, Doherty
9. Lower/Upper thermosphere coupling during June, 1991 storm - Clark, Salah
10. AMIE - Knipp, Emery
11. CTIM - Codrescu
12. TIGCM - Fesen

A tour of the Millstone Hill Radar by Millstone staff and a CEDAR database demonstration by Steve Cariglia rounded out the morning. After lunch we discussed future plans. It was reported that 20 papers had been submitted for our special Ionosphere/Thermosphere Storm Session at the Spring AGU in Baltimore. It was decided to request a three-hour workshop at the upcoming CEDAR Meeting in Boulder. Brief presentations by spokesmen/women for each project will allow us to touch base with the larger CEDAR Community and encourage their participation in the study. At the conclusion of these discussions the newly-formed June, 1991 working groups met for the first time, and continued their work until the workshop adjourned at 3 pm.

Michael Buonsanto, MIT Haystack Observatory

Greenfield Succeeds Bierly as NSF Atmospherics Director

In February, Dr. Richard S. Greenfield was appointed Director of the Division of Atmospheric Sciences at the National Science Foundation. He was director of the Lower Atmospheric Research Section from 1988 to the present and previously directed the Grant Programs Section, a position he held for eight years. Dr. Greenfield replaced Dr. Eugene Bierly, who is now Director of Education and Research with the American Geophysical Union after 13 years with NSF.

Greenfield received his Ph.D. in meteorology from New York University in 1966 and was a senior research scientist at the Center for the Environment and Man for eight years. He began his career at NSF in 1974 as program director for the Global Atmospheric Research Program. When in 1980 Greenfield became head of the Grant Programs Section, he coordinated all grant activity in the Atmospheric Science Division. When the division was reorganized in 1988 due to overall growth of the grant programs, Greenfield was then put in charge of the Lower Atmospheric Research Section, a position he held until his recent appointment.

Approximately 50% of all basic atmospheric research funded by government funds is supported by the Division of Atmospheric Sciences, with an annual budget of around $125 million.

CEDAR 1993 Workshops - May 3, 1993

	Title	Main Organizer	Short Description
1.	PRIMO	Dave Anderson	Ionospheric modelling efforts during LTCS-2 and -6
2.	STS-53 Airglow	Lyle Broadfoot	Shuttle airglow observ. with AZ Imager/Spect, Dec 1992
3.	Storms	Michael Buonsanto	Current analysis & future planning of storm studies
4.	GISMOS	Odile de la Beaujardiere	Global magnetic substorm studies
5.	ISR Techniques	Frank Djuth	New ISR data acquisition/analysis methods
6.	Database	Barbara Emery	Hands-on NCAR database operations
7.	Jicamarca	Don Farley	Jicamarca activities
8.	LTCS	Jeff Forbes	MLT dynamics during LTCS-2 and LTCS-6
9.	CCCP/FSU	John Foster	Opportunities: present/future Russian collaborations
10.	CADRE	Dave Fritts	Experiment/modelling of equatorial dynamics
11.	CAT	Maura Hagan	Thermospheric signatures during LTCS-2 and LTCS-6
12.	World Day Scheduling	John Holt	Scheduling World Days of observations
13.	Jan 93 10-Day Run	Mike Kelley	Preliminary "World Week 1/2" data analysis
14.	Resonance Lidar	Mike Kelley	New technology impact & future lidar coordination
15.	MLT Struc/Dynamics	Miguel Larsen	Structure of molecular/eddy diffusion transitions, Future rocket campaign planning
16.	ARIA II	Miguel Larsen	February 1994 Alaska rocket campaign planning
17.	ATLAS	Daniel Melendez	Shuttle ATLAS experiment results & coordination
18.	Planetary ATSB	Michael Mendillo	Atmospheres of terrestrial size bodies (ATSB)
19.	MISETA	John Meriwether	Equatorial experimental aeronomy
20.	NLC/PMC	Jerry Romick	Noctilucent & polar mesospheric cloud experiments
21.	High Lat. Models	Mike Ruohoniemi	High latitude/global convection modelling
22.	Joule Heating	Robert Sears	High latitude joule heating/MSX coordination
23.	HLPS	Jan Sojka	High latitude plasma structure exper. & modelling
24.	CORN	Gary Swenson	Coordinated nightglow/lidar observations @ Illinois
25.	Auroral Arcs	Gary Swenson	Wintertime Sondrestrom campaigns & future planning
26.	Arecibo Friends	Craig Tepley	Current status and future upgrade plans at Arecibo

Probable Workshop Schedule and Room Assignments

Monday (1:30-4:30) - NIST and Mesa:

1) PRIMO - *NIST Rm 1007*
2) High Lat Models - *NIST Rm 1003-1005*
3a,b) ISR Tech (1:30-3:00) / CCCP/FSU (3:00-4:30) - *Mesa Fleischmann*
4) Planetary ATSB - *Mesa East Cafeteria*

Tuesday (1:30-5:30) - Foothills (FL):

1) ATLAS - *FL Auditorium*
2a,b) Jan 93 10-day (1:30-4:30) / World Day Scheduling (4:30-5:30) - *FL 1001*
3) HLPS - *FL 3-2072*
4) NLC/PMC - *FL 1003*
5) Database - *FL 1002* (sign-up for 1 hour each)

Wednesday (1:30-5:30) - Foothills (FL):

1) CAT - *FL Auditorium*
2) Joule Heating - *FL 1001*
3) ARIA II - *FL 3-2072*
4) Arecibo Friends - *FL 1003*
5b) STS-53 Airglow (3:30-5:30) - *FL 1-2133*
6) Database - *FL 1002* (sign-up for 1 hour each)

Thursday (2:00-6:00) - Foothills (FL):

1) LTCS - *FL Auditorium*
2) Auroral Arcs - *FL 1001*
3) GISMOS - *FL 1003*
4a,b) MISETA (1:30-3:30) / Jicamarca (3:30-5:30) - *FL 3-2072*
5) Resonance Lidar - *FL 3107*
6) Database - *FL 1002* (sign-up for 1 hour each)

Friday (1:30-5:30) - Foothills (FL):

1) CADRE - *FL Auditorium*
2) CORN - *FL 1001*
3) Storms - *FL 3-2072*
4) MLT Structures - *FL 1003*
5) Database - *FL 1002* (sign-up for 1 hour each)

Correction

Please note that on page 6 of Issue 18, totals for CEDAR funding should read $13M for 1992 and $18M for 1993, rather than $18M for 1992 as listed.

1993 Annual CEDAR Meeting Agenda
Sponsored by NSF, HAO/NCAR, U. of CO, and NIST

Monday, June 21, 1993 - NIST Auditorium

8:30 - 9:15 Introduction and Welcome - M. Kelley (NCAR, HAO - T. Holzer, students, post-docs)

9:15 - 9:30 NASA Space Physics Division - G. Withbroe

9:30 - 10:15 Tutorial Lecture #1
J. Forbes - Tides and Global Oscillations

10:15 - 10:45 Break

10:45 - 11:00 HAARP Diagnostics: A Possible Role for CEDAR Sciences in Alaska - H. Carlson

11:00 - 11:15 Polar Cap Initiative - M. Kelley

11:15 - 11:30 Canadian Network for Space Research - L. Cogger

11:30 - 12:00 Project 1: Middle Atmosphere Study (30-100 km) - R. Lowe

12:00 - 1:30 Lunch

1:30 - 4:15 Workshops at NIST and at NCAR Mesa Lab

4:30 - 6:30 Poster Session A at NCAR Mesa Lab

5:30 - 7:00 Reception at NCAR Mesa Lab

Tuesday, June 22, 1993

8:30 - 9:00 NSF/CEDAR Issues - Rich Behnke

9:00 - 9:45 Tutorial Lecture #2
R. Meier - UV Spectroscopy

9:45 - 10:00 Break

10:00 - 11:15 CEDAR 10th Anniversary
M. Biondi - Chairman and Conception
G. Romick - Early Days
T. Killeen - Growth of Program
J. Thayer - From Student to CEDAR Awardee
M. Kelley - Present Days

11:15 - 12:15 Campaign Summaries
LTCS - J. Salah
GISMOS - O. de la Beaujardiere
GTMS ETS GTS GITCAD CADITS CAT - A Retrospective of Collaborative Thermospheric Studies - M. Hagan
AIDA - Retrospective Goals and Achievements - J. Meriweather

12:15 - 1:30 Lunch

1:30 - 5:30 Workshops at Foothills

Wednesday, June 23, 1993

8:30 - 9:00 CEDAR Prize Lecture

9:00 - 9:45 Tutorial Lecture #3
R. Walterschied - Gravity Waves

9:45 - 10:00 Break

10:00 - 12:15 Poster Session B at NIST

12:15 - 1:30 Lunch

1:30 - 5:30 Workshops at Foothills

6:00 - 8:30 Barbecue at NCAR Mesa Lab

Thursday, June 24, 1993

8:30 - 9:15 Various Reports from CEDAR Post-Docs (J. Sahr, C. Peymirat, D. Senft)

9:15 - 10:00 Tutorial Lecture #4
G. Rostoker - Geomagnetic Substorms

10:00 - 10:15 Break

10:15 - 10:30 Large Atmospheric Observatory - C. Gardner

10:30 - 12:30 UARS Reports (30 minutes each)
Solar UV Variations - G. Rottman
PEM - D. Winningham
HRDI - P. Hays
WINDII - G. Shepherd

12:30 - 2:00 Lunch

2:00 - 5:30 Workshops at Foothills

Friday, June 25, 1993

8:30 - 9:15 Various Reports
F. Marcos - ADS
R. Meier - RAIDS
T. Killeen - TIMED
L. Cogger - FREJA

9:15 - 10:00 Tutorial Lecture #5
D. Torr - The Photochemistry of the Lower Thermosphere and Mesosphere: What Has Been Achieved and What Remains to Be Done

10:00 - 10:15 Break

10:15 - 11:00 Various Reports
G. Hernandez - Optical Observations of Southern Hemisphere Dynamics
GEM report
Other reports as requested

11:00 - 11:15 CEDAR Data Base Report - B. Emery

11:15 - 12:00 Poster Prize Awards
Future Plans for CEDAR
Concluding Remarks

12:00 - 1:30 Lunch

1:30 - 5:30 Workshops at Foothills

Saturday, June 26, 1993 - Data Analysis School in the NIST Auditorium

9:00 - 4:30 School on Data Analysis Techniques in the Geospace Sciences - J. Forbes (organizer)

School on Time Series Analysis

A One-Day Data Analysis School
Saturday, June 26, 1993
NIST Auditorium, Boulder, CO

Sponsored by the CEDAR Workshop
and In Conjunction with
The GEM Workshop (June 28-July 1, 1993)

Tutorial lectures will be given on analyses of data time series from a practitioner's point of view. Time limitations preclude an exhaustive treatment of this extensive subject; however, for those without formal training in digital signal processing who are (or plan to be) engaged in analyses of data time series (perhaps using commercially-available software packages), this course will provide insight into the power and pitfalls of several popular methodologies. A common geophysical data set will be analyzed by all speakers to illustrate various points. A tentative syllabus and list of speakers is given below; this is subject to some modification prior to June 26.

Time	Topic	Speaker
8:30	I. Introduction to the Fourier Transform -Fourier series -Continuous transform -Discrete transform -Autocorrelation functions and power spectra -Windowing	Prof. R. Clark U. New Hampshire
10:00	Break	
10:30	II. Error Analysis and Other Topics -Periodogram -Confidence and significance limits -Cross-correlation and cross-spectra	Prof. S. Avery U. Colorado
12:00	Lunch	
1:30	III. Filtering -Types of filters -Problems and pitfalls (ringing, phase distortion, etc.) -Complex demodulation -Sliding FFT	Prof. R. Vincent U. Adelaide
3:00	Break	
3:30	IV. Nonstationary Time Series -One or more of the following topics: Wavelets Multispectral analysis	Dr. F. Vial CNRS/LMD
5:00	Panel Discussion	
5:30	Adjourn	

Registration Fee: For CEDAR registrants, there is no extra fee; however, registration is required. All others, including GEM registrants, are required to pay a $20 registration fee to cover the costs of snacks and photocopying of lecture notes, etc. The registration fee is waived for students. Students still need to register, and should register before **May 31**, or will be liable for a late fee of $2. Late registrants (after May 31) for the Data School only will be charged $25.

Registration: Registration is required. To register, fill in the CEDAR Registration Form available in this issue of the CEDAR Post, and check off the parts pertaining to the Data Analysis School (2,4a-c). Checks should be made payable to NCAR, and forms and fees sent to: Dr. Barbara Emery, NCAR/HAO, P.O. Box 3000, Boulder, CO, 80303; emery@ncar.ucar.edu; tel. (303) 497-1596; fax (303) 497-1589.

Other Information: For other information on the School, contact Prof. Jeff Forbes, Coordinator, School on Time Series Analysis, NCAR/HAO, P.O. Box 3000, Boulder, CO, 80303, jforbes@ncar.ucar.edu; tel.(303) 497-1512; fax (303) 497-1589.

Boulder Lodging and Local Transportation Information

1993 Eighth Summer CEDAR Workshop
June 21–26, 1993

The facilities listed below have blocked rooms for workshop participants between the nights of June 19-June 27, 1993. Reservations must be accompanied by a credit card charge number or a deposit for the first night's lodging; Visa, MasterCard, American Express, and Discover credit cards are accepted at most of the hotels. Cancellations must be made before 4:00 PM on the arrival day to avoid being charged for the first night's lodging. The blocks of rooms at special workshop rates are only being held until the dates indicated below and they may fill up early. MAKE ALL RESERVATIONS AS SOON AS POSSIBLE AND SPECIFICALLY MENTION THE CEDAR WORKSHOP HOSTED BY NCAR (if using a Travel Agent, have them identify you in the same manner). Participating hotels and rates for June 19-June 27, 1993, are:

Hotel	Single*	Double*	Deadline	No. of Rooms
Days Inn 5397 S. Boulder Road Boulder, CO 80303 (303) 499-4422; FAX: (303) 494-0269	$49	$54 (Up to 4 People)	May 19	50
Holiday Inn of Boulder 800 - 28th Street Boulder, CO 80303 (303) 443-3322 or 1-800-542-0304	$63	$63	May 19	25
Homewood Suites Hotel 4950 Baseline Road Boulder, CO 80303 (303) 499-9922 or 1-800-225-5466; FAX: (303) 499-6702	$72 for a Suite w/ Kitchen (will accommodate 3-4 people; 1 bed is a sofa sleeper)		May 1	15
Courtyard By Marriott 4710 Pearl East Circle Boulder, CO 80301 (303) 440-4700 or 1-800-321-2211; FAX: (303) 440-8975	$66	$66	June 4	20

RESERVE ROOMS BEFORE DEADLINES TO ASSURE LOWER RATES

All hotels have comfortable accommodations and all of them, except the Courtyard, can provide shuttle service to local meetings if requested by individuals *in advance* (based on availability). The Days Inn and Homewood Suites provide free continental breakfasts with lodging. Homewood Suites also has a free social hour Monday through Thursday. Checkout times are 12:00 noon. All hotels have swimming pools. We were unable to book blocks of rooms at the Broker Inn or the Clarion due to a solar convention, but some individual rooms may be available.

*Hotel rates do not include 9.5% sales tax.

University of Colorado Dormitory Rooms & Meals:

	Single	Double	No. of Rooms
Main Campus Conf. Housing Area 142 Cheyenne-Arapaho Hall Boulder, CO 80310 NOTE: FOR EMERGENCIES ONLY: (303) 492-6885 (Suzy Campbell or her secretary)	$130.87	$106.23 (per person)	50(S), 50(D)

Rates for the campus package include a Dorm Room from 6/20 to 6/24 and breakfast every day from 6/21 to 6/25. Breakfast for $4.27, lunches at $5.34 and dinners for $6.41 are available to anyone on an a-la-carte basis. Early arrivals (6/19) and late departures (6/25-27) will pay an extra $21.90/night (single) or $16.97/night (double, per person). NO PHONE-IN RESERVATIONS ACCEPTED. PLEASE SEND THE REGISTRATION FORM PROVIDED HEREIN TO THE MAIN CAMPUS CONFERENCE HOUSING AREA. Also, have only ONE individual in charge of each group from each university. CU accepts VISA and MasterCard. The above prices include the 9.5% sales tax. Please check in at Hallett Hall. Parking permits for a week will be sold for $12.50 Monday morning.

GROUND TRANSPORTATION (Airport)

The Boulder Airporter Limousine Service (303/321-3222) and the Stapleton Supercoach (303/499-1951) will take reservations for direct transportation between the hotels, University and Denver's Stapleton Airport. Their schedules are staggered so you may find one more convenient for your arrival/departure.

DAY CARE

For child care while you attend the workshop, Children's World at 5377 Manhattan Circle in Boulder will accept children on a drop-in basis (based on availability). Children's World also offers summer field-trip programs. If you're interested, please call Karen Roux at (303) 494-3694. Many other daycare facilities are listed in the Boulder telephone directory under "Child Care."

Registration Form
1993 Eighth Summer NSF CEDAR Workshop
June 21–26, 1993

National Institute of Standards and Technology – NIST
National Center for Atmospheric Research –NCAR

1. PLEASE PRINT

   Name: _____

   Institution: _____

   Address: _____

   _____

   Telephone: (_____)_____ FAX: (_____)_____

   E-mail: _____ Citizenship: _____

   Are you a: Student ( ) Tutorial Speaker ( )

NOTE: Students registering after **May 31** will be charged a $5.00 late fee.

2. I plan to attend the Data Analysis School on Saturday, June 26 _____.

3. I plan to present a poster at the meeting _____.
   NOTE: Send the title and author list to Dr. James Hecht by **May 31** in order to be considered. (For address, please see "Call for Poster Papers".) Also, please indicate whether the first author is a student. Students will be given preference if there are space limitations.

4. (a) Enclosed is my registration fee of $70.00 _____.
   (Fee includes reception and barbecue. Due **May 31** for $15.00 discount.)
   NOTE: 1) Foreign registrants can pay $70.00 on arrival provided this registration form is in by **May 31**.
   I will take this option _____.
   2) FEE WAIVED FOR STUDENTS AND TUTORIAL SPEAKERS.
   ($5.00 late fee charged for students registering after **May 31.)**

   (b) Enclosed is my late registration fee of $85.00 _____. (Due after **May 31.**)

   (c) Enclosed is my registration fee for the Data Analysis School **only** of $20 _____, $25 if after **May 31** _____.
   NOTE: FEE WAIVED FOR STUDENTS REGISTERING BEFORE **MAY 31**. Late fee of $2 ____ after **May 31**.

5. (a) I plan to attend the barbecue at NCAR on Wednesday, June 23 _____.

   (b) I am bringing _____ guest(s) to the barbecue at NCAR Wednesday, June 23, and enclose $15.00/guest (indicate amount enclosed) _____.

NOTE: If registration payment is not enclosed with this form, please be certain that checks sent separately identify you and the workshop. Checks for workshop (and guests for the barbecue) should be made payable to NCAR. Foreign registrants can pay on arrival provided they mail their registration forms in early. Please send correspondence to:

Barbara Emery
HAO/NCAR
P. O. Box 3000
Boulder, CO 80307-3000
(303) 497-1596
FAX Number: (303) 497-1589
Internet: emery@ncar.ucar.edu
SPAN: 9580::"emery@ncar.ucar.edu"

****STUDENTS** Please also complete the housing application form.**

University of Colorado Summer Conference Housing Application
Main Campus

COMPLETE THE INFORMATION REQUESTED BELOW AND SEND TO THE ADDRESS INDICATED AT THE BOTTOM OF THE FORM.

Name of Conference: NSF CEDAR Meeting, Summer 1993

Participant's Name: _____ Sex: _____
(last) (first)

First Night's Lodging: _____ Last Night's Lodging: _____
(date) (date)

Address: _____ City: _____ State: _____ Zip: _____

Telephone: (Home) _____ (Business) _____

Please request one of the following:

*Single Room _____ Double Room _____ (Roommate Preference if Any) _____

Special Requests (Smoker/Nonsmoker, etc.) _____

*There are a limited number of single rooms. If a single room is unavailable, you will share a double room with another conference participant.

Complete if Accompanied by Spouse and/or Family:

Spouse's Name _____ First Night's Lodging _____ Last Night's Lodging_____

Child's Name _____ Age ____ Sex____ Dbl ____ Sngl ____ 1st Night____ Last Night_____

" Name _____ Age ____ Sex____ Dbl ____ Sngl ____ 1st Night____ Last Night_____

" Name_____ Age ____ Sex____ Dbl ____ Sngl ____ 1st Night____ Last Night_____

Will a rollaway bed be needed? _____ Crib? _____ **Total Number in Party** _____

PAYMENT IS DUE AT CHECK-IN. Cash, traveler's checks, personal checks, VISA and MasterCard will be accepted. DO NOT SEND MONEY IN ADVANCE. PHONE-IN REGISTRATIONS ARE NOT BEING ACCEPTED, BUT IN CASE OF ANY QUESTIONS OR EMERGENCIES, THE AREA MANAGER'S TELEPHONE NUMBER IS (303) 492-6885.

MAIL TO: Main Campus Conference Housing Area
142 Cheyenne-Arapaho Hall
Boulder, CO 80310

The Cedar Post

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Address correction requested.

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HAO/NCAR
P.O. Box 3000
Boulder, CO 80307

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