



The CEDAR Post

September 2002 <http://cedarweb.hao.ucar.edu/commun/cedarcom.html> Volume 46

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From the Editor

CEDAR pursues the frontiers of science through individual grants and organized collaborative projects. Although guided by published guidelines of the Phase 3 document, we are inspired by the ideas of individual P.I.s and students. Last June's CEDAR Workshop was a shop window for past achievement and new aspirations. This edition of the CEDAR Post provides reports of the workshop with features on some afternoon sessions. This edition contains all workshop reports received. The activities of the workshops demonstrate and evolve the creativity of the CEDAR Program and offer involvement to all who seek to take part. Since CEDAR is a grass-roots organization with ideas and policies emerging from participants as a whole, the various gatherings at the workshop are fertile ground for innovation.

Despite lingering separation anxiety from Boulder because of our relocation to Longmont, it is my observation that the workshop works very well at the Raintree Hotel. Close proximity of the various meetings, the nearby housing and lunch spots provide the kind of convenience that we all appreciate. I think the informal meetings, which are sometimes the most valuable part of any large formal gathering, occurred easily due to the useful layout of the conference center and the excellent planning and support from Louise Beierle and Barbara Emery. Another great feature of this year's workshop was the new program of student activities organized by Pamela Loughmiller. Because of Pamela's hard work, students had excellent opportunities for learning, fun and making new contacts.

I hope all who attended the workshop enjoyed the afternoon workshop sessions as much as I did. It is remarkable that our project produces such a variety of top class new science for presentation. After years of preparation and anticipation, the TIMED project is bearing fruit and excellent new observations are available in original and stimulating graphical forms. This is the first joint program between agencies that CEDAR has undertaken. Its success is becoming evident, but this is yet the beginning. The WACCM workshop was also very stimulating, bringing presentations of an atmospheric model able to simulate the atmosphere from the troposphere to the exosphere. Such an achievement was barely in the dreams of the founders of the CEDAR program. In addition, workshops on optical, radar, high latitude and equatorial phenomena were featured. Considering the new science and the excellent poster sessions, there is much new work to study.

The new CSSC committee, enlarged by the addition of a second student member, will be working this year on the selection and publication of major successes of the CEDAR Program since the inception of Phase 3. Much of this work will take place at our fall meeting on November 4 and 5. You can help in this process by contacting your favorite committee member with your recommendations. The committee will also be making early plans for the workshop next June in Longmont. Members will be pleased to hear your suggestions.

Roger Smith, CSSC Chair

The 2002 CEDAR-WACCM Workshop Longmont, Colorado June 16 - 21

The CEDAR (Coupling, Energetics and Dynamics of Atmospheric Regions) workshop for 2002 was held in conjunction with the WACCM (Whole Atmosphere Community Climate Model) workshop.

We met in the Raintree Plaza Hotel Conference Center in Longmont, Colorado, about 12 miles northwest of Boulder.

We recognized Sunanda Basu's 10 years as the Aeronomy program manager for NSF with a standing ovation after her report on Monday morning. Sunanda will be leaving NSF to work with the new CAWSES (Climate And Weather of the Sun-Earth System, 2004-2008) program of the international SCOSTEP (Scientific Committee On Solar-TERrestrial Physics) community. Thank you, Sunanda, for all your careful management and encouragement!

A total of 319 persons from 78 institutions, 19 outside the United

States and Puerto Rico, attended the 2002 CEDAR-WACCM Workshop.

This year, 109 students came from 28 universities and 4 research labs, including students from Japan (2), Canada (2), the United Kingdom (1), Peru (1), Korea (1), Spain (1) and Italy (1). The total number of students increased by three from last year, although the number of foreign students (9) dropped from a high of 17 last year for CEDAR-SCOSTEP.

Three of the foreign students were brought by WACCM, which brought 25 people total to the meeting. Their workshops were well attended by those interested in the middle and lower atmosphere.

The student workshop on Sunday, organized by the CEDAR student representative Pamela Loughmiller of Cornell University, looked at "Collaborative Campaigns - Instrumentation, Science and Networking." This topic was chosen to introduce students to

collaborative campaigns. Half of the excellent talks were by students.

This year, it was decided to make the CEDAR student representative position a two-year term overlapping with a second student to help share the work. Therefore Pamela will remain as the second term CEDAR student representative, while Lars Dyrud of Boston University will join her as the first term student representative.

We had four tutorial speakers, including Robert Strangeway of the University of California at Los Angeles speaking on "Auroral Acceleration Processes and Their Role in Magnetosphere-Ionosphere Coupling"; Farzad Kamalabadi of the University of Illinois discussing "Statistical Inversion Techniques: Indirect Measurements and Aeronomy"; M. Joan Alexander of Colorado Research Associates (CoRA) talking about "Gravity Wave Sources and Propagation in the Middle Atmosphere"; and Rolando Garcia of the Atmospheric Chemistry Division of the National Center for Atmospheric Research introducing "The Whole Atmosphere Community Climate Model (WACCM)" for the WACCM workshop that was held within the framework of the CEDAR workshop.

All the tutorials are available as files on the web at <http://cedarweb.hao.ucar.edu/wkshp/videolist.html> and are also on video tape. Please contact Barbara Emery (emery@ucar.edu, HAO/NCAR, PO Box 3000, Boulder CO 80307) if interested in obtaining hard copies and/or videos.

A CEDAR prize lecture was not chosen this year because the criteria



The Arecibo Friends Workshop, convened by Sixto Gonzalez, drew a packed house.

2002 CEDAR-WACCM Workshop *continued*

are being reexamined and there were few nominees and missing documentation. Instead, we had two 40-minute science talks. Nestor Aponte of Arecibo Observatory gave the first science talk on Monday on "Correction of the Jicamarca Te/Ti Ratio Problem: Verifying the Effect of Electron Coulomb Collisions on the Incoherent Scatter Spectrum" by Aponte, Sulzer and Gonzalez. This talk is available on the Web at the URL given above, but was not videotaped since the camera was not available.

The second science talk was given by Victor Pasko of Pennsylvania State University on "Electrical Discharge From a Thundercloud Top to the Lower Ionosphere" by Pasko, Stanley, Mathews, Inan and Wood. This talk was videotaped and is also available on the Web.

Both Victor Pasko and Farzad Kamalabadi are the two NSF Aeronomy CAREER awardees for FY 2002. This award is for the CAREER building of young tenure-track faculty. We recognized Victor and Farzad on Monday.

Last year's Aeronomy CAREER awardee, Steven Cummer, was also the FY 2001 PECASE (Presidential Early Career Awards for Scientists and Engineers) winner from the GEO Directorate. All NSF FY 2001 PECASE winners had a reception at NSF on July 11 and one at the White House on July 12, 2002. Congratulations, Steve, Victor and Farzad!

There were 24 workshops, including three student workshops or events, that were available during the afternoons. The WACCM workshops took place during the final two afternoons, with emphasis on the upper and lower regions. There were also five CEDAR-TIMED workshops that grew out of the December launch of the NASA TIMED satellite. Three of



Wednesday evening's poster session in full swing.

the CEDAR postdocs gave reports: Tai-Yin Huang of Clemson University, Takuya Kawahara of Colorado State University and Shinsu University in Japan, and Diego Janches of Arecibo Observatory.

There were about 12 programmatic talks in the morning sessions. There were two evening poster/dinner sessions on Tuesday and Wednesday, where all posters were up the entire time, but only presented one of the two evenings.

The Wednesday evening session was devoted mostly to middle atmosphere topics to coordinate with the WACCM workshop. The food was great and the hotel outdid itself by providing tables and seating for 110 in the room where the food was served. There were 71 posters, 40 by student first authors, of which 32 were in the student poster competition. The posters were of high quality, with three honorable mentions: Wenyi Hu of Duke University, Carlos Martinis of Boston University and Chris Wil-

ford of the University of Sheffield in the UK. The winners received an autographed copy of the recent AGU book edited by Michael Mendillo on "Atmospheres in the Solar Systems - Comparative Aeronomy." The winners were: Naomi Maruyama of Hokkaido University in Japan, Tomoko Matsuo of HAO/NCAR and the State University of New York (an honorable mention in 2001), Licia Ray of Boston University (our very first undergraduate winner), and Anja Stromme of the University of Tromso in Norway who is currently visiting at SRI.

The extracurricular activity for the 2002 CEDAR Workshop was a rehearsal performance of "All in the Timing" and other skits by community theatre at the Longmont Theatre.

The 2003 CEDAR Workshop will take place at the Raintree Plaza Hotel Conference Center (to be renamed Radisson) June 15-20.

*Barbara Emery
HAO/NCAR*

*Conveners: Matt Heavner, Victor
Pasko, Mike Taylor*

The Transient Optical Emissions
workshop began with a brief overview

TIMED Data System and CEDAR Ground-Based Data Support Workshop

Convener: Peter Fox

Stuart Nylund of JHU/APL reported (see his presentation at http://www.timed.jhuapl.edu/mdc/docs/meetings/CEDAR/CEDAR_2002_Workshop-TIMED_SDS/) that there are only significant amounts of some SEE (Solar Extreme Ultraviolet Experiment) TIMED data presently available at <http://www.timed.jhuapl.edu>. The SEE team used their e-mail list developed as part of the user registration process to inform their community. The planned and as-flown timelines are being merged. A calendar of data availability is on the to-do list since

the timelines don't show what data are in the DB. Jim Russell of SABER said that the TIMED Coincidence Planner has been of use to the SABER team and their GBI (Ground-Based Investigator) colleagues.

Peter Fox and Barbara Emery of HAO/NCAR showed the status of the CEDAR DB GBI support in terms of Web pages and data from the Web site at <http://cedarweb.hao.ucar.edu> via the DODS calendar, browse summary plots and inventory methods. Images will be in FITS format.

The metadata are under discussion with imagers. Gary Swenson of the

University of Illinois pointed to plots from their lidar, imager and other instruments at various locations at <http://conrad.csl.uiuc.edu/Data>. Other data sites were also looked at such as the Millstone Hill Madrigal Database at <http://www.haystack.edu> for ISR and other data. The TIMED support page of the CEDAR Database is at <http://cedarweb.hao.ucar.edu/timed/timed.html>, and will be kept up to date for links and information about data, suppliers and access.

Workshop attendance was approximately 20 people.

Barbara Emery, HAO/NCAR

CEDAR-TIMED Storm Studies Workshop

Conveners: Joe Salah (MIT), Janet Kozyra (U. Michigan), Larry Paxton (JHU/APL)

A coordinated storm-alert campaign was successfully conducted under the CEDAR-TIMED program to investigate the response of the Earth's ionosphere and thermosphere to geomagnetic storms that occurred during the period of 17-24 April 2002. Data were collected by over 40 ground-based radars and optical instruments during these events, including eight Incoherent Scatter Radars, the SuperDarn Network, MF and Meteor Wind radars, imagers, FPIs and lidars. Measurements were also simultaneously made by instruments aboard the TIMED satellite as well as other satellites observing the Sun, the solar wind, and the Earth's magnetosphere, including ACE, DMSP, FAST, GOES, IMAGE, POES, and POLAR, SAMPEX, SOHO and TRACE.

The goals of the workshop were to: (1) make a first assessment of the

data collected by the various ground and space instruments, and (2) develop plans for the joint analysis of the data by the community and for the study of this event through global models. Both goals were successfully achieved by the group of about 80 scientists and students who participated in the workshop. A large amount of preliminary data from the various instruments was shown to illustrate the wealth of information gathered during this campaign, and to highlight specific interesting features of the storm events. Modelers described their plans for the simulation of the storm events. A follow-on workshop at APL on 7-8 August 2002 was announced for further in-depth discussions of the observations and study of the storms and their effects.

Janet Kozyra outlined the characteristics of the storm events during 17-24 April 2002 based on satellite observations. The principal storm driver was solar active region 9906

which produced two halo CMEs as it traversed the solar disk. As the active region approached the Sun's limb, an X-class flare and solar particle event accompanied by a CME were seen by SOHO and TRACE. The first interplanetary CME triggered a magnetic storm (minimum Dst ~100 nT) on April 17 which did not fully recover before the second CME hit on April 19 producing a second magnetic storm (minimum Dst ~150 nT). On April 23, the magnetosphere was clipped by the third CME which produced only weak magnetic activity levels (minimum Dst ~50 nT). After this series of events, evidence from POLAR and NOAA POES suggests that the proton and electron radiation belts were modified, providing a long-lived source of high-energy precipitating particles for the MLTI region.

There were several interesting features in the auroral oval during this sequence of storms. The auroral emissions and particle precipitation

CEDAR-TIMED Storm Studies Workshop *continued*

observed by FAST had unusual fine-scale structure. During April 18 and possibly other intervals, sawtooth oscillations were observed by the LANL geosynchronous satellites. IMAGE and TIMED captured the intensification of broad regions of the auroral oval which appear to be associated with these sawtooth oscillations. The strong driving of auroral activity resulted in a double oval configuration clearly seen by IMAGE, FAST and TIMED. Dramatic perturbations in NO, mesospheric ozone, atmospheric composition and heating were documented by TIMED, and these were described by Larry Paxton and Marty Mlynczak. Stan Solomon showed the neutral winds in the mesosphere obtained from the TIDI molecular oxygen emission that suggested large enhancements in the dynamics below 100 km.

Shengpan Zhang reviewed the magnetic indices recorded for the various storm events (peak Kp ~ 6-7), and presented the time coverage of the measurements by the eight ISRs and their overlap with the TIMED overflights. Initial quick-look reports were presented by each of the radar groups on the observed variations of

the Earth's ionospheric plasma densities, temperatures, ion drifts, and thermospheric neutral winds. Tony van Eyken presented data from the EISCAT radar at Svalbard showing the response of electron density and temperature to the April 17 storm event. Jeff Thayer and Irfan Azeem showed preliminary results from the Sondrestrom radar, which indicate the presence of ~150 mV/m electric fields resulting in large Joule heating at the peak time of the storm on April 17, and up to 500 m/s southward neutral winds. Larisa Goncharenko illustrated the response to the storms as seen at Millstone Hill, as well as at Kharkov and Irkutsk based on data provided by Vitaly Taran and Boris Shpynev at these radars. Nestor Aponte showed some of the E-region winds analyzed by Qihou Zhou at Arecibo, which revealed a long-wavelength tidal structure. Koki Chau, Mike Kelley and Bela Fejer discussed the initial results from Jicamarca, where oscillations in the perturbation electric fields are seen coincident with similar oscillations in satellite and magnetometer data.

Mike Ruohoniemi outlined the data coverage from the SuperDARN network and the data reduction in

progress for the storm period. Ron Clark and Scott Palo showed some samples of meteor wind and MF radar data collected from the global MLT network. There is an indication of the presence of a large planetary wave oscillation coincident with the storm event suggesting that care must be taken in isolating potential storm effects in the mesosphere during this time period. Ray Roble, Gang Lu, Tim Fuller-Rowell outlined their plans for simulating the April 2002 events using their general circulation models, and Geoff Crowley showed some initial results of his TIGCM runs.

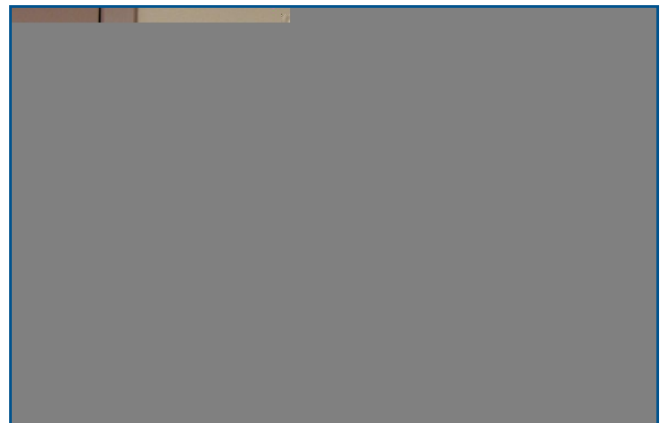
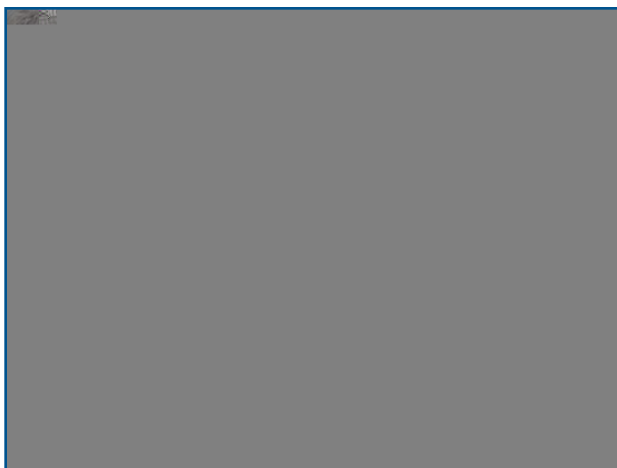
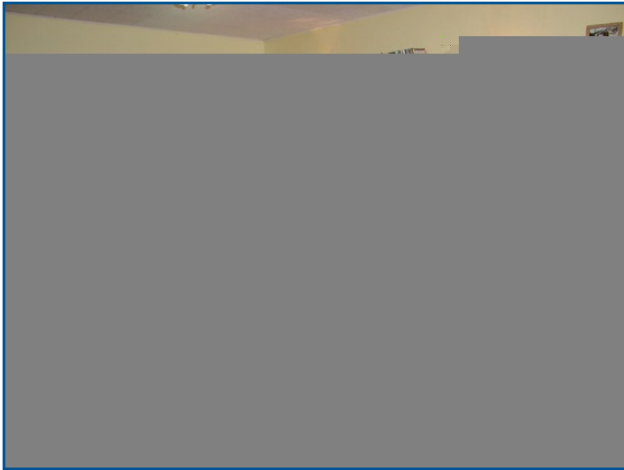
Overall, it was agreed that the large data set constitutes a unique and valuable opportunity for a strong collaborative effort amongst researchers using ground-based instrumentation, satellite observations, and models, in order to investigate the response of the Earth's upper atmosphere to geomagnetic storms. Processing of the initial exciting data glimpsed at the workshop will continue by various groups, and studies of the storm effects will be pursued in more detail at future workshops.

*Joe Salah
MIT-Haystack*

End Workshop Reports

2002 CEDAR Workshop Pictorial

Clockwise from top: CSSC Chair Roger Smith opens the workshop sessions; Louise Beierle (left) and Liz Hoswell attend the registration table; Roger Smith appreciates his "towers of support", Louise Beierle (left) and Barbara Emery; CEDAR students gather 'round the grill during the student barbeque on Sunday, June 16; CSSC members take a moment for the camera during the CSSC meeting at Lucile's Creole Café in Longmont, Colorado.



The 3rd Polar Aeronomy and Radio Science Summer School



PARS students and faculty pose near the HAARP antenna array in Gakona, Alaska.

The third Polar Aeronomy and Radio Science (PARS) summer school was held in Alaska July 29 to August 7, 2002. The school brought together students from Cornell University, the Massachusetts Institute of Technology, Polytechnic University of New York, Stanford University, the University of California Los Angeles, the University of Massachusetts Lowell, and the University of Alaska Fairbanks for an intensive period of lectures and experiments. About 30 students and 20 faculty members took part in the school this year, making it the largest PARS summer school yet.

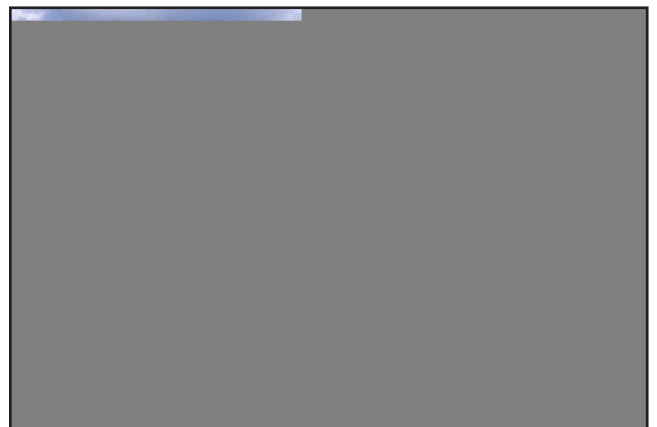
This year's focus was on radar techniques for observing Earth's upper atmosphere. Radar facilities in Alaska were used for demonstrations, tours, and experiments to provide hands-on experience for the students. As in previous years, the school started with a week in Fairbanks for lectures at the Geophysical Institute and tours of the various experiment facilities around Fairbanks. Then, the group

relocated to the HAARP Ionospheric Observatory at Gakona, Alaska for the remainder of the school. Tours this year included the Geophysical Institute itself, the Poker Flat Research Range, the HIPAS ionospheric heating facility, the HAARP facility, and the NOAA wind profiler at Glenallen.

The format of the school was a mixture of lecture and discussion periods, tours, demonstrations, and experiments. Lectures covered a variety of topics relating to the upper atmosphere and radar detection of its properties. The lecture topics and discussion leaders were:

- The Ionosphere – Dirk Lummerzheim
- Incoherent-scatter radar theory – Craig Heinselman
- Incoherent-scatter radar practice – Mike Sulzer

- Radio wave propagation in an ionized medium – Bill Bristow
- Ionosondes – Bodo Reinisch
- TEC and ionospheric tomography – Mark Conde
- Coherent-scatter radars – Wes Swartz
- Radar hardware – Wes Swartz
- Radar sensing of the non-ionized atmosphere – Brenton Watkins
- Wind profilers – Doug van de Kamp
- Lidars – Richard Collins
- Sounding the magnetosphere from space: The RPI instrument – Bodo Reinisch
- Synthetic Aperture Radar – Jeremy Nicoll
- The HAARP facility – Paul Kossey
- Software radars – Suman Ganguly
- The Gakona 138 MHz radar – Frank Djuth
- Radar diagnostics of the heated ionosphere – Mike Sulzer
- The AMISR test set – Craig Heinselman
- Modeling of the AMISR antenna – Marat Davidovitz
- Measurements of the AMISR antenna pattern – Livio Poles



Students view a sounding rocket at Poker Flat.

2002 PARS Summer School *continued*

- Near-field calibration of radar antennas – Lt. Ryan Thomas

A true high point of the school was an after-dinner lecture given by Dr. Bill Gordon on his experience in the construction of the Arecibo Ionospheric Observatory. Bill is known as the father of Arecibo. His lecture provided an inspirational picture of what it takes to make a scientist's dreams become reality.

School participants enjoyed evenings at some of Alaska's fine tourist venues, including the Chena Hot Springs Resort, where most enjoyed a dip in the hot springs. On the weekend between the time in Fairbanks and that in Gakona, the group stayed in Valdez, Alaska, which is a small town located at the north end of beautiful Prince William Sound. Nearly everybody spent the day Saturday on a six-hour boat tour of the Sound observing the landscape, waterfalls, glaciers, and a variety of wildlife.

Each student participant proposed an experiment to be carried

- Stanford ELF/VLF interferometer – Jeff Chang, Katie Braden, Tim Chevalier and Umrn Inan

- Implementation of drift observations on the HAARP Digisonde – Vadym Paznukhov and Bodo Reinisch

- PMSE Multi-Frequency Experiments – Camilo Ramos and Mike Kelley

- Polar mesosphere summer echoes (PMSE) at 28 MHz – Johanna Velez, Jennifer Owens, and Wes Swartz.

- Modulation schemes for generation of ELF – Sanghun Lee, George Palafox, and Spenser Kuo.

- Corrugation effects of gravity waves on PMSE layers – Hasan Bachivan and Mike Kelley.

- Observation of D-region collision frequency – Bill Peter and Tim Bell.

- Observations of ELF/VLF echo from conjugate hemisphere – Greg Wjentjes and Umrn Inan.

- HAARP-induced electron precipitation – Rob Moore and Umrn Inan.

- VLF generation through swept frequency heating – Katherine Koziar, Jackie Pau and Al Wong.

- Determination of the source region altitude for ELF/VLF radiation.

- Generated by the HAARP Heater – Blair C. Connelly, Chinwe Nyenke and Min Chang Lee.



HAARP Engineer Helio Zwi (left) explains the operation of the HAARP transmitter to students as faculty member Suman Ganguly (middle) looks on.

- Satellite observations of VLF waves generated by the HAARP ionospheric heater – Manuel Platino and Umrn Inan.

- Study of the VLF radiation gain pattern of the modulated electrojet antenna – Daniel E. Hernandez, Jonathan Varsanik, and Min Chang Lee.

- Determination of the vertical distribution of modulated electrojet current – Lowery Duvall, Blair C. Connelly, and Min Chang Lee.

- Using the AMISR test panels as a wind profiler – Rudy Cuevas and Craig Heinselman.

- Creation of a plasma lens in the lower ionosphere in order to focus a higher frequency wave at a greater height – Kristjan Stone, Jackie Pau, and Al Wong.

- Observations of HAARP induced field-aligned irregularities using the Kodiak SuperDARN radar – Todd Parris and Bill Bristow.



Students learn about the Lidar Center at Poker Flat.

out during the school. Acceptance to the school was based upon the students' experiment proposals. The experiments and the students and advisors who carried them out were:

*Bill Bristow
GI-UAF*

CEDAR Meetings Calendar 2002 - 2004

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The CEDAR Post is published three times a year and
is mailed to more than 1200 scientists worldwide.

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