



The CEDAR Post

May 2002

<http://cedarweb.hao.ucar.edu/commun/cedarcom.html>

Volume 45

Inside This Issue

The Gakona Observatory	2-3
UA Facility Awards	4
Aeronomy Awards.....	5
2002 CEDAR Workshop: Agenda	6-9
PARS Summer School ..	10
CEDAR Meetings Calendar	11
CSSC Members.....	12

From the Editor

I would like to give you a summary tour of the June workshop. It promises to be an exciting event beginning with a student workshop on Sunday, June 16th. Pamela Loughmiller has organized a great day of presentation that ends with an evening social.

Monday features plenary talks with Nestor Aponte on the electron temperature ratio problem with incoherent scatter radars and Sam Yee on the TIMED project. The afternoon workshop topics include the TIMED satellite mission and transient optical phenomena such as sprites and jets.

On Tuesday, Bob Strangeway will give a tutorial on auroral acceleration mechanisms. Program reports will include news on the RAO, NASA programs, Upper Atmosphere Facilities, CEDAR work on M-I Coupling and the CEDAR database. There will be workshops on CEDAR/TIMED, high latitude variability and equatorial aeronomy.

Wednesday brings a science feature by Victor Pasko on the direct electrical connection between a thundercloud and the ionosphere and a tutorial on statistical inversion techniques from Farzad Kamalabadi. Workshops on Wednesday afternoon include some of our well-known productive activities such as HLPS, GIFT and LTCS.

On Thursday, we begin a two-day feature on the Whole Atmosphere Community Circulation Model (WACCM) with a tutorial from Rolando Garcia and an afternoon workshop expanding the theme. In addition, there will be news of the winners of the student poster competition, the ionospheric MURI program, the Gakona Observatory in Alaska and new members of the CEDAR Steering Committee. Other afternoon workshop topics include daytime optical aeronomy and equatorial ionospheric scintillations and bubbles.

On Friday, Joan Alexander will round out our set of four tutorials with her presentation on gravity wave sources and propagation into the middle atmosphere. Afternoon workshops feature meteors and the continuation of the WACCM meetings from the previous day.

Take a good look at the full program in this issue that your steering committee, along with Barbara Emery and Louise Bierle, has put together. Come ready to enjoy it.

Roger Smith, CSSC Chair

CEDAR Phase Three Review

The CEDAR Science Steering Committee has noted that the CEDAR program is well established and has approached greater maturity than most grass-roots programs at the National Science Foundation. This long life can only be sustained productively if there is a continual process of renewal.

The committee reviewed indicators of decline. It was felt by many that there is some loss of momentum and that the program may be flagging. One

sign is that the number of ionosphere papers published in *JGR Blue* appears to have diminished. Another is a discernible reduction in proposal pressure for our program at NSF.

On the other hand, it is clear that CEDAR science achievements are the stimulus for exciting new programs, for example the TIMED mission (Joint NASA/NSF) and the planning for the ionospheric part of NASA's Living With A Star. Undoubtedly there are

major stimuli to the CEDAR program in the pipeline, with the launch of TIMED in December last year and the expected approval and funding of the RAO proposal.

Please come to the workshop prepared to comment on the state of health of our phase three program and to offer suggestions for improvements or new directions for the steering committee to consider.

Roger Smith, CSSC Chair

The Gakona Observatory

Introduction

Gakona, Alaska is the location of the High-frequency Active Auroral Research Program (HAARP) ionospheric observatory that includes a 960 kW HF radio transmitter and antenna array and a suite of diagnostic instrumentation. The Air Force Research Laboratory and the Office of Naval Research jointly support the observatory.



The Gakona Observatory and HAARP site at Gakona, Alaska.

Research at HAARP began with the commissioning of the 960 kW transmitter in March 1999 and has gained momentum since then. There have been 18 scientific campaigns carried out at HAARP since the commissioning. The most recent campaign, which was organized by Stanford graduate student Elizabeth Gerken, centered around observations of air glow generated in the RF-heated ionosphere. A new activity associated with the observatory is the Polar Aeronomy and Radio Science (PARS) program, which includes the PARS Ionospheric Summer School.

HAARP is a scientific endeavor aimed at studying the properties and behavior of the ionosphere, with particular emphasis on understanding its response to high-power radio waves, and their use to enhance communications and surveillance systems for both civilian and defense purposes.

Being situated at about 62° magnetic latitude, the Gakona observatory provides a variety of ionospheric conditions depending on the level of geomagnetic activity. It is located below the ionospheric trough during times of low geomagnetic activity; at medium activity, it is under the auroral electrojet; when activity is very high, the observatory may be in the polar cap. It has proven to be an advantage to the observatory to experience such a wide range of conditions. Observation of the processes resulting from the use of the high power HF array in a controlled manner provides scientists with a means to study processes that occur continuously under the natural stimulation of the sun.

Scientific instruments installed at the Gakona Observatory (see Table 1) are also useful for a variety of investigations that may not require the use of the high-power HF array. These studies include ionospheric characterization using an ionosonde or satellite beacons, telescopic observation of the fine structure in the aurora, and documentation of long-term variations in the ozone layer.

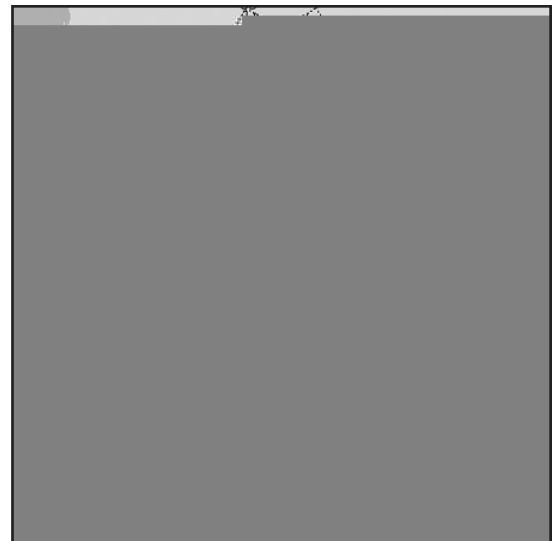
Neighboring observatories SuperDARN, the High Power Auroral Stimulation observatory (HIPAS) and Poker Flat Research Range observe regions farther north and facilitate important collaborative programs. HIPAS and Poker Flat have similar sets of basic ionospheric and auroral diagnostics, however HIPAS is equipped with a heater transmitter of similar power to HAARP and Poker Flat has a rocket range and a wider range of optical in-

strumentation. The PARS ionospheric summer schools and scientific campaigns in 2000 and 2001 have provided opportunities for coordinated operations of all three observatories directed to the same scientific goal.

Relationship to CEDAR

CEDAR has a 17-year history of scientific investigation of the high latitude ionosphere and ionospheric heating. Many of the scientists and students who participate in the PARS campaigns are well known in the CEDAR program. These scientists and students can help to enrich CEDAR science by taking advantage of opportunities provided by PARS and the Gakona Observatory. Likewise, PARS needs to work in concert with the CEDAR program to optimize the effectiveness of its activities.

As stated above, the Air Force and the Navy fund PARS. It has an important scientific mission, but not the level of funding or breadth of community to match CEDAR. Active coordination and sharing of opportunities, however, will enhance



Map showing the location of the HAARP site in relation to other sites of interest in Alaska and Canada.

The Gakona Observatory *continued*

the prospects for scientific success for both groups. The NSF, the Air Force and the Navy have a good record of working together. PARS/CEDAR is one more example where the scientific community will benefit from their joint efforts.

The Gakona Observatory is already providing data for our use through its website <http://www.haarp.alaska.edu/haarp/data.fcgi>. The ionosonde, magnetometer, riometer and all-sky camera are of general use to all interested in high latitude auroral and aeronomic studies. ELF and VLF receivers provide additional observations of interest to those working in ionospheric propagation. A new plan with funds provided by the Air Force and Navy is designed to provide a modular incoherent-scatter radar diagnostic at Gakona for the study of plasma phenomena stimulated by the heater. Working with the Stanford Research Institute, the Gakona Observatory expects to purchase panels similar to those being manufactured for the Relocatable Atmospheric Observatory to build a facility smaller than the NSF Advanced Modular Incoherent Scatter

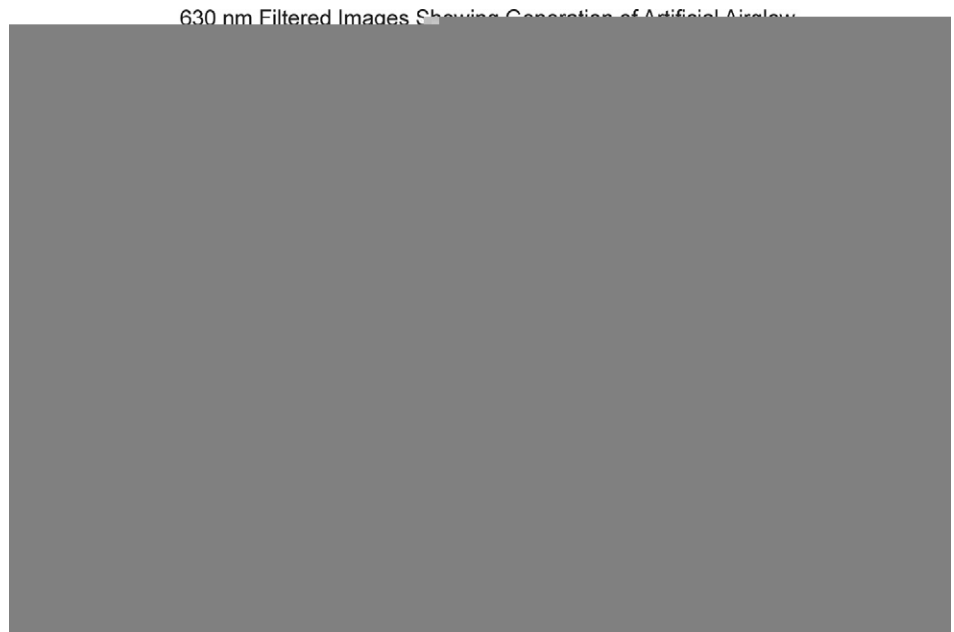


Figure 2

ter Radar (AMISR) but interestingly compatible with it. The initial aim will be to receive plasma line echoes from the heated ionosphere.

The Recent Optical Campaign

In Spring 2002, the high power HF array was used in a novel experiment to investigate the efficiency of electron heating dependent on the angle between the transmitted wave-vector and the geomagnetic field. Us-

ing a conical beam-scanning pattern, heating was applied to the ionosphere making a circular pattern. At one azimuth in the circle, the wave vector was parallel to the field. The experiment demonstrated that, over a very small angular range close to parallel, electron heating or acceleration was greatly increased as demonstrated by the appearance of 630nm red line emission of atomic oxygen. Figure 2 shows an example of the images obtained at 630nm. At high transmitter power, 558nm green line emission was also observed. On a few occasions, 777 and 846nm emissions of oxygen were seen. These new results are of intense interest to aeronomers and provide a new and important reason for CEDAR and PARS programs to work together closely.

Table 1.

Equipment	Function
HF Stimulated Emissions Receiver	Receiver for SEE from the electrojet generated by the high power HF array.
HF Broadband Receiving Antenna	2.8-30 MHz High Angle; 5.6-30 MHz Low Angle.
Imaging Riometer	16 element line array
Digisonde	HF Vertical Incidence Sounder
ELF Receiver	Dave Sentman's ELF system
VLF Receiver	2-loop equilateral triangle antennas
Fluxgate Magnetometer	Three-axis
Induction Magnetometer	0.1 – 3Hz, Three-axis
VHF Radar (139 MHz)	Frank Djuth's Radar
VHF/UHF coherent receiver for TEC	NWRA ITS10 Coherent Radio Receiver
VHF/UHF scintillation system	8-helical antenna SATSIN system
All-sky Imager	Intensified low-light monochromatic ccd fisheye camera

How Can I Learn More?

Dave Sentman will present results of the recent HAARP optical campaign at the CEDAR workshop. Also see the PARS article on page 10.

*Roger Smith & Bill Bristow,
GI-UAF*

The following tables list National Science Foundation awards made to aeronomy projects and facilities.

Upper Atmosphere Facilities Awards

RK	ƙƨvkvvwkqp	Vkvng
Valladares	Boston College	Studies of the Dynamics of Equatorial F-region Irregularities Using Scintillation and Global Positioning System (GPS) Receivers and a Numerical Model
Wickwar	Utah State University	New Opportunities for Mesosperic and Lower Thermospheric Research at Atmospheric Lidar Observatory (ALO)
Mendillo	Boston University	Optical Measurements of Mesospheric Gravity Waves and their Relationship to the Occurrence of In-Situ Temperature Inversions and Vertical Wind Shears
Chilson	University of Colorado Boulder	Collaborative Research: CEDAR Studies of Radio Wave Scatter and Dynamical Processes in the Polar Summer Mesopause Region
Collins	University of Alaska Fairbanks	Ground-based Optical Imaging of Sporadic Sodium Clouds Near the Summer Mesopause Using Resonantly Scattered Sunlight
Palmer	University of Nebraska Lincoln	Collaborative Research: CEDAR Studies of Radio Wave Scatter and Dynamical Processes in the Polar Summer Mesopause Region

Aeronomy Awards

RK	ƙƨvkvvwkqp	Vkvng
Ng	University of California Davis	Absolute State-selected Cross Sections for Reactions Between Atmospheric Ions and Oxygen Atoms
Krivorutsky	University of Alabama Huntsville	Toward a Complete Kinetic Description of Ionosphere Magnetosphere Coupling
Berkey	Utah State University	SGER: Medium Frequency (MF) Radar Measurements in Support of the Thermosphere, Ionosphere, Mesosphere, Energetics and Dynamics (TIMED) Satellite Mission
Whitney	National Academy of Sciences	Travel Support for the World Space Conference 2002; Houston, Texas; October 10-19, 2002
Kappenman	Metatech Corporation	SGER: An Assessment of US Electric Power Grid Geomagnetic Disturbance Hazard Risk Due to SSC, SI and Related Magnetospheric Shock Disturbances
Kamalabadi	University of Illinois Urbana-Champaign	CAREER: Integrated Optical and Radio Ionospheric Remote Sensing and Imaging
Pasko	Penn State University U. Park	CAREER: Large-scale Electrodynamic Coupling Between the Troposphere, Mesosphere and Ionosphere due to Lightning in Weather Systems
Taylor	Utah State University	CEDAR PostDoc Alok Taori: Investigations of Gravity Wave Propagation and Dissipation in the Mesosphere and Lower Thermosphere Region and Associated OH/02 Temperature Signatures

Aeronomy Awards continued

RK	Kpuvkvwkqp	Vkvng
Meriwether	Clemson University	Fabry-Perot Studies of Equatorial Thermospheric Dynamics and Composition
Wright	University of Colorado Boulder	Irregularity Diagnostics by Digital Ionosondes
Kane	Penn State University U. Park	CEDAR PostDoc <i>Rob Wilson</i> : An Arecibo Observational Study of Seasonal Metal Layer Dynamics and Irregularities Associated with Mid-Latitude Sporadic E
Slanger	SRI International	Nightglow Emissions at Solar Maximum
Marschall	SRI International	Heterogeneous Atom Oxygen Reactions on Mesospheric Dust and Ice Surfaces
Pasko	Penn State University	Mesospheric Gravity Waves Generated by Tropospheric Convection
Lieberman	Northwest Research Associates Inc.	CEDAR: Intraseasonal and Interannual Variations in Diurnal Tropospheric Heating and in Mesospheric and Lower Thermospheric Tides
Guzdar	University of Maryland College Park	CEDAR: Mesoscale Structuring of the High Latitude Plasma Patches
Fesen	University of Texas Dallas	CEDAR: Low-Latitude Energetics, Dynamics and Variability
Hecht	Aerospace Corporation	CEDAR: Studies of Trapped, High Frequency Acoustic-Gravity Waves Near the Mesopause
Marschall	SRI International	Oxygen Atom Chemistry on Mesospheric Ice Surfaces
Salby	Atmospheric Systems and Analysis	Structure, Amplification and Nonlinearity of the 2-day Wave
Broadfoot	University of Arizona	A Study of Temporal Variability of the Night Airglow

2002 CEDAR Workshop Agenda

Radisson Hotel Conference Center

Longmont, Colorado

June 16 - 21

Sunday, June 16

morning	Student Workshop (Front-Range Theatre)
afternoon	Student Workshop (Front-Range Theatre)
	Chair: Pamela Loughmiller, (Cornell University)
evening	Student Social, Golden Ponds Park

Monday, June 17 (Summit South)

08:30-08:55	Opening Address	R. Smith (CSSC) R. Behnke (NSF) T. Killeen (NCAR)
08:55-09:05	Report on Student Workshop	P. Loughmiller
09:05-09:10	Introduction of Students by Institution	P. Loughmiller
09:10-09:50	Science Feature: <i>Electron Temperature Ratio Problem</i>	N. Aponte
09:50-10:20	Break	
10:20-10:40	NSF CEDAR Report	S. Basu
10:40-11:10	TIMED	S. Yee
11:10-11:30	Program Report: <i>Phase 3 Accomplishments and Feedback</i>	R. Smith
11:30-01:00	Lunch on your own	
01:00-03:00	WORKSHOPS: <i>TIMED General</i> (Front Range Theater) <i>Transient Optical Emissions</i> (Silverthorne)	Talaat, Yee Heavner, Pasko, Taylor
03:00-03:30	Break	
03:30-05:30	WORKSHOPS: <i>TIMED General</i> (Front Range Theater) <i>Student Professional Development</i> (Silverthorne)	Paxton, Yee Loughmiller
06:00-?	CSSC dinner meeting at Lucile's Creole Cafe	

Tuesday, June 18 (morning session in Summit South)

08:30-09:00	Program Report (AMISR/RAO)	R. Behnke, J. Kelly
09:00-10:00	Tutorial #1, <i>Auroral Acceleration Mechanisms</i>	R. Strangeway
10:00-10:30	Break	
10:30-10:45	Program #1: <i>NASA Program Report</i>	M. Mellott
10:45-11:00	Program #2: <i>Report on MI Coupling</i>	J. Foster
11:00-11:15	NSF UA Facilities Update	R. Robinson
11:15-11:30	Program #3: <i>Update on CEDAR Database and TIMED/GBI</i>	P. Fox, B. Emery
11:30-01:00	Lunch on your own	
01:00-03:00	WORKSHOPS: <i>CEDAR-TIMED Science Topics I: General Studies</i> (Front Range) <i>Variability at High Latitudes</i> (Silverthorne)	Palo, Taylor Ruohoniemi, Shepherd, Codrescu
03:00-03:30	Break	
03:30-05:30	WORKSHOPS: <i>CEDAR-TIMED Science Topics II: Storm Studies</i> (Front Range Theater) <i>CNOFS Ambient Equatorial Ionosphere</i> (Silverthorne)	Salah, Kozyra, Paxton de la Beaujardiere, Eccles
06:00-09:00	Poster Session #1 (Summit North)	

Wednesday, June 19 (morning session in Summit South)

08:30-09:10	Science Feature: <i>Electrical Discharge from a Thundercloud Top to the Lower Ionosphere</i>	V. Pasko
09:10-10:10	Tutorial #2: <i>Statistical Inversion Techniques</i>	F. Kamalabadi
10:10-10:50	Break	
10:50-11:10	Program Report: <i>Starshine</i>	G. Moore
11:10-11:30	Program Report: <i>CISM Program</i>	T. Killeen
11:30-01:00	Lunch on your own	

Wednesday, June 19 *continued*

01:00-03:00	WORKSHOPS: <i>HLPS</i> (Front Range Theater) <i>Topside</i> (Silverthorne) <i>An Aeronomy Facility for the International Space Station</i> (Apache Group)	Valladares Kerr, Noto, Gonzalez Broadfoot
03:00-03:30	Break	
03:30-05:30	WORKSHOPS: <i>LTCS</i> (Front Range Theater) <i>TIMED-CEDAR Database</i> (Silverthorne) <i>GIFT</i> (Apache Group)	Johnson, Azeem Fox, Yee, Emery Anderson, Fuller- Rowell, Sojka
06:00-09:00	Poster session #2 (Summit North)	

Thursday, June 20 (morning session in Summit South)

08:30-08:50	CEDAR PostDoc Report #1: <i>Gravity Wave Studies in the Mesospheric Region</i>	T.-Y. Huang
08:50-09:10	CEDAR PostDoc Report: <i>Wintertime Mesopause Temperatures Observed by Lidar Measurements Over Syowa Station (69S, 39E), Antarctica</i>	T. Kawahara
09:10-10:10	Tutorial #3: <i>The Whole Atmosphere Community Climate Model: Motivation, Development and Initial Results (WACCM)</i>	R. Garcia
10:10-10:40	Break	
10:40-10:55	Program Report: <i>Update on MURI on Data Assimilation</i>	Bellaire nominee
10:55-11:10	Program Report: <i>Polar Aeronomy & Radio Science (PARS) Program</i>	B. Bristow
11:10-11:25	Program Report #4: <i>Student Poster Prize Winners</i>	Kelly/Yee
11:25-11:30	Announce New CSSC Members	R. Smith
11:30-01:00	Lunch on your own	
01:00-03:00	WORKSHOPS: <i>WACCM #1: MLT</i> (Front Range Theater) <i>Daytime Optical Aeronomy</i> (Silverthorne) <i>CNOFS Equatorial Scintillation and Bubbles</i> (Apache Group)	Garcia, Boville, Roble Pallamraju, Conde Basu, Groves, Kelley

Thursday, June 20 *continued*

03:00-03:30	Break	
03:30-05:30	WORKSHOPS: WACCM#1: <i>MLT</i> (Front Range Theater) <i>Arecibo Friends</i> (Silverthorne) <i>PSAT</i> (Apache Group)	Garcia, Boville, Roble Gonzalez Mishin
07:30-09:30	Comedy at Longmont Theatre - doors open 07:00, talk with actors after (hotel van or carpool ~5:45 to restaurants, and ~7:15 to theatre)	

Friday, June 21 (morning session in Summit South)

08:30-08:50	Program #5: <i>Report from Lidar Review Group</i>	Tim Kane's nominee
08:50-09:10	CEDAR PostDoc #3: <i>An Arecibo/EISCAT Observational Investigation of the Effects of the Meteor Mass Flux on the 80-120 km Atmosphere/Ionosphere</i>	D. Janches
09:10-10:10	Tutorial #4: <i>Gravity Wave Sources and Propagation into the Middle Atmosphere</i>	M.J. Alexander
10:10-10:40	Break	
10:40-10:55	Program Report: <i>Aeronomy and Ice in the Mesosphere</i>	S. Bailey
10:55-11:30	Science Feature: <i>Optical Patches at HAARP</i>	D. Sentman
11:30-01:00	Lunch on your own	
01:00-03:00	WORKSHOPS: WACCM #2: <i>Interactions with the Lower Atmosphere</i> (Front Range Theater) <i>Meteors</i> (Silverthorne)	Garcia, Boville, Roble Janches, Matthews, Zhou
03:00-03:30	Break	
03:00-03:30	WORKSHOPS: WACCM #2: <i>Interactions with the Lower Atmosphere</i> (Front Range Theater) <i>ISR World Day Schedule</i> (Silverthorne)	Garcia, Boville, Roble van Eyken

Workshop End

The Geophysical Institute of the University of Alaska Fairbanks will hold a Polar Aeronomy and Radio Science (PARS) Summer School in August 2002, which will provide instruction and hands-on experimental experience for students and their graduate supervisors.

The school is supported by the Ionospheric Physicsñ □ ysi che e

CEDAR Meetings Calendar 2002 - 2004

Date		Time	Location	Topic
[Redacted Content]				

CEDAR Science Steering Committee

Roger Smith (Chair)
Geophysical Institute, UAF
907 474 7416
roger.smith@gi.alaska.edu

Delores Knipp (GEM Liaison)
US Air Force Academy
719 333 2560
delores.knipp@usafa.af.mil

Leroy Cogger (International Rep.)
University of Calgary
403 220 5386
cogger@phys.ucalgary.ca

Graham Bailey (International Rep.)
University of Sheffield
44 114 222 3744
g.bailey@sheffield.ac.uk

Sunanda Basu (Ex-Officio)
National Science Foundation
703 292 8529
sbasu@nsf.gov

Robert Robinson (Ex-Officio)
National Science Foundation
703 292 8519
rmrobins@nsf.gov

Richard Behnke (Ex-Officio)
National Science Foundation
703 292 8518
rbehnke@nsf.gov

Pamela Loughmiller (Student Rep.)
Cornell University
607 255 8298
demi@ee.cornell.edu

Sixto Gonzalez
NAIC Arecibo Observatory
787 878 2612
sixto@naic.edu

John Foster
MIT Haystack Observatory
781 981 5621
jcf@haystack.mit.edu

Timothy Kane
Pennsylvania State Univsity
814 863 8727
tjk7@psu.edu

John Kelly
SRI International
650 859 3749
kelly@sri.com

Erhan Kudeki
University of Illinois
217 333 4153
e-kudeki@uiuc.edu

Art Richmond
National Center for Atmospheric Research
303 497 1570
richmond@ucar.edu

Jeng-Hwa Yee
Johns Hopkins University
240 228 6206
jeng-hwa_yee@jhupl.edu

Jan Sojka
Utah State University, CASS
435 797 2964
fasojka@gaim.cass.usu.edu