Clouds and rainbow from a recent road trip to New Mexico (Photo by Carlye Calvin.)

Staff Notes monthly

For the people of NCAR, UCAR, and UOP Vol.43 #6 • June 2008

Measuring the Arctic's haze and smoke

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Delphi

Just One Look

Beth Holland (ESSL/ACD) rides to work in style. June is Colorado Bike Month, featuring Bike to Work Day on June 25. More than 100 locations across the Boulder-Denver area will offer free breakfasts, refreshments, and prizes to participants during the morning commute. The UCAR cafeteria is also giving $1 credits to staff for each day of walking, biking, or taking public transportation during the week of June 23–27.

For more information, visit www.fin.ucar.edu/sustainability/events.html.

June 2008

Measuring the Arctic's haze and smoke

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The Arctic is often perceived as a pristine place, located as it is far from the world's smokestacks. And yet its atmosphere serves as a receptor for air pollution from the industrial regions of North America, Europe, and Asia.

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NASA's DC-8 research aircraft casts a shadow on snow and open water near Barrow, Alaska, during the first phase of ARCTAS in April. (Photo by Jane Peterson, National Suborbital Education and Research Center, University of North Dakota.)

This spring and summer, NCAR researchers from ESSL/ACD and EOL are supporting a NASA field project to investigate the chemistry of the Arctic's lower atmosphere. Their objective is to identify how air pollution contributes to climate change in the region and learn more about why the Arctic's climate is changing so rapidly.

"The Arctic is a beacon of global change, having warmed more rapidly than anywhere on the planet over the past 100 years," says Guy Brasseur, director of ESSL. "There's an urgent need for research to better understand changes in the atmospheric composition and climate of this vulnerable place."

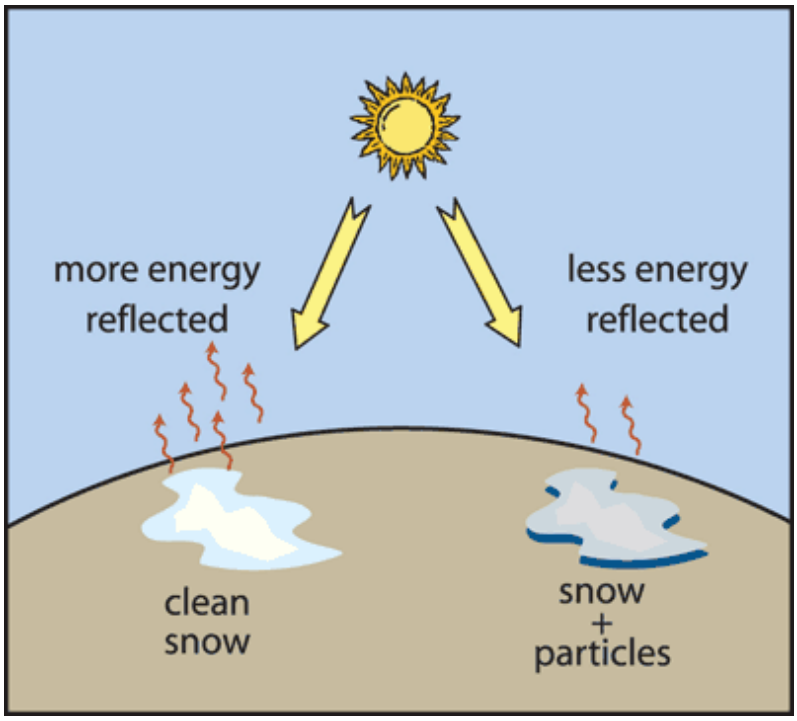
Called ARCTAS (Arctic Research on the Composition of the Troposphere from Aircraft and Satellites), the field project is associated with International Polar Year. It combines atmospheric measurements taken aboard research aircraft with data from NASA satellites and computer modeling. It includes two aircraft deployments, using NASA's DC-8, each three weeks in duration.

During the spring deployment, which took place in April in Fairbanks, Alaska, scientists gathered information about the effects of Arctic haze, stratosphere-troposphere exchange, and sunrise photochemistry (chemical reactions that occur when sunlight returns to the Arctic in spring). During summer deployments scheduled for June 18–25 in Palmdale, California, and June 26–July 12 in Cold Lake, Alberta, the team will investigate how

emissions from northern wildfires affect the Arctic's atmosphere.

Arctic haze and climate change

Atmospheric circulation carries air pollution and wildfire emissions from Earth's northern midlatitudes to the Arctic, where they mix and react with sunlight, producing the ozone and aerosols that compose Arctic haze.



Pollution particles darken snow and ice, reducing albedo (reflectivity) and causing the snow or ice to absorb more sunlight, thereby warming the surface. (Image courtesy Chemical Sciences Division, NOAA Earth System Research Laboratory.)

The haze affects the highly reflective Arctic ice sheet in ways that can increase temperatures both in the atmosphere and on Earth's surface. Particles deposited on the surface darken the snow, reducing its albedo (reflectivity) and causing it to absorb more sunlight, warming the surface. Particles may also impact the radiative characteristics of Arctic clouds, making them more effective insulators. Such disruptions to the environment trigger responses that include melting permafrost and ice sheets.

To learn more about the interaction between Arctic pollution and climate change, the ARCTAS team is focusing on four major scientific themes:

• long-range transport of pollution to the Arctic

• the impacts of boreal wildfires on atmosphere and climate

• aerosol radiative forcing from Arctic haze and other air pollution

• chemical processes (ozone, mercury, aerosols, and halogen) related to haze

Chemical weather forecasting

Several ACD researchers are forecasting chemical weather in support of ARCTAS—that is, using satellite observations and model simulations to predict distributions of the aerosols and trace gases that make up air pollution above the Arctic. Their forecasts will show the aircraft team where to fly to sample the pollution.

To produce the forecasts, the researchers use the Data Assimilation Research Testbed (DART) with the NCAR Community Atmosphere Model with Chemistry (CAM-Chem). CAM-Chem couples NCAR's MOZART (Model

for OZone And Related chemical Tracers) with the Community Atmosphere Model for an interactive look at chemistry and climate.

The researchers use near real-time observations to improve the model, including meteorological observations and measurements from MOPITT and MODIS, instruments aboard NASA satellites. MOPITT (Measurements Of Pollution In The Troposphere) retrieves carbon monoxide measurements, while MODIS (Medium Resolution Imaging Spectroradiometer) retrieves measurements of aerosol optical depth.

"One of the nice things about participating in ARCTAS, as well as other field experiments, is that it's a good test for our models," says Louisa Emmons, who's leading ACD's chemical forecasting efforts. "We predict where a pollution plume is going to be and then the aircraft goes off and samples it, so right away we know whether our model was accurate."

After the operational phase of ARCTAS is over, the researchers will switch their focus away from chemical forecasting toward questions related to chemistry and climate.

Airborne measurements

A number of NCAR researchers, in conjunction with university colleagues, are operating instruments during ARCTAS flights aboard the DC-8, measuring formaldehyde, hydrogen oxide radicals, nitrogen oxides, ozone, volatile organic compounds, and atmospheric radiation. The comprehensive suite of instruments portrays Arctic pollution in more detail than ever before.

From ACD, Andrew Weinheimer, David Knapp, and Denise Montzka are measuring nitrogen oxides and ozone; Eric Apel and Alan Hills are looking at a suite of more than 30 volatile organic compounds; and Rick Shetter, Sam Hall, and Kirk Ullmann are observing solar radiation. (Rick is also director of the University of North Dakota's National Suborbital Education and Research Center, which is managing the engineering, data systems, and science on the DC-8.) Chris Cantrell, Lee Mauldin, Becky Anderson, and Ed Kosciuch are measuring hydrogen oxide and peroxy radicals.

From EOL, Alan Fried, Dirk Richter, Petter Weibring, and Jim Walega are deploying a difference frequency generation absorption spectrometer to measure formaldehyde.

A trace gas that plays a role in ozone production, formaldehyde is an example of one gas that is important to ARCTAS, for several reasons. "It's a moderate- to short-lived gas with a lifetime of several hours that reflects localized chemistry, not long-range transport, and as such is one means of deducing how fresh the sampled air is," Alan explains. "If we're seeing high levels of formaldehyde, it's not from long-range transport."

Formaldehyde measurements also offer insight into the unique halogen chemistry that occurs near Arctic ice, which results in significant depletion of the ozone in the Arctic's boundary layer. Sea salt deposited onto the ice surface produces bromine and chlorine compounds in both the gas and aerosol phases, through mechanisms that scientists don't fully understand. Formaldehyde measurements, in conjunction with those of other gases, give clues as to which of these two halogens is dominant.

The large collection of instruments on the DC-8 provides an opportunity for researchers to compare measurements made by different instruments. Chris Cantrell and colleagues, for example, are comparing their measurements of hydrogen oxides, made by a mass spectrometer, to measurements from an instrument from Pennsylvania State University that uses a different technique (laser-induced fluorescence) to measure the

same radicals. The two techniques have never been used during the same airborne mission.

"This gives us a chance to compare how the instruments are working," Chris says. It might also help the team address the fact that other research flights have found discrepancies between observed hydrogen oxide concentrations and values simulated by models.

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ARCTAS

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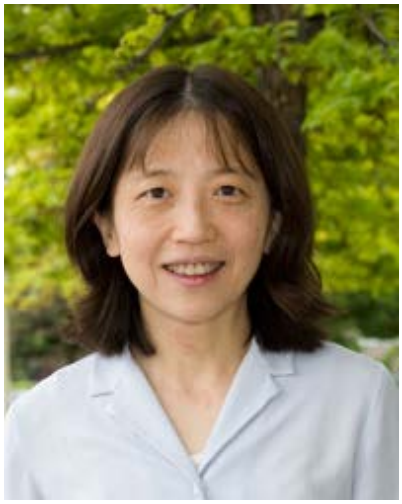
June 2008

NCAR names three new senior scientists

The UCAR Board of Trustees appointed three new senior scientists in May. Senior scientists provide NCAR with long-term scientific leadership. The position is analogous to that of full professor at a tenure-granting university. Selections are based on individual competence in research and activities that enhance NCAR's interaction with scientists in the broader community.

Following are brief profiles of the new senior scientists.



Yuhong Fan.

Yuhong Fan (ESSL/HAO)

Yuhong Fan is a solar physicist focused on helioseismology and the magnetohydrodynamics of the solar interior and corona. Using theoretical and numerical modeling, she studies the emergence of flux tubes in solar active regions and the evolution of the large-scale magnetic fields in the solar corona that result in coronal mass ejections.

Yuhong's research on the rise of active-region flux tubes in the solar interior has led to important insights into the origin of a well-known asymmetric property of solar active regions. Her numerical modeling of the evolution of the coronal magnetic field in response to the emergence of twisted active-region flux tubes has also contributed significantly to understanding the sigmoid-shaped X-ray brightening observed in regions where coronal mass ejections originate.

Alan Fried.

Yuhong holds a bachelor's degree in space physics from China's Peking University and a doctorate in astronomy from the University of Hawaii. Before coming to NCAR in 1998, she did postdoctoral research at the National Solar Observatory in Tucson and was a research associate at CU's Joint Institute of Laboratory Astrophysics. She currently heads HAO's Corona and Heliosphere section.

Steve Tomczyk.

Alan Fried (EOL)

A chemist by training, Alan manages EOL's Technology Development Facility, where he identifies and explores new opportunities for developing state-of-the-art instruments for atmospheric

research. As part of this effort, he maintains a research program dedicated to developing new spectroscopic instruments for airborne platforms and associated measurements of trace gases, with the goal of improving our understanding of atmospheric processes and transformations related to hydrocarbon oxidation.

Alan and his group, in collaboration with atmospheric modelers, have been studying formaldehyde, an important trace gas and radical source, throughout the troposphere and lower stratosphere (see cover story). The studies are uncovering new processes and unexplained results as well as providing key model constraints in hydrocarbon oxidation studies. Most recently, Alan and colleagues have documented the importance of convective transport of formaldehyde and its precursors during summer months in forming radicals and ozone in the upper troposphere and lower stratosphere.

Alan has a doctorate in physical chemistry from Ohio State University. He first came to NCAR in 1977 as a postdoctoral researcher, returning in 1986 as part of ESSL/ACD. He headed the Analytical Photonics and Optoelectronics Laboratory (APOL) group, a joint effort between EOL and ACD, before moving into his current position.

Steven Tomczyk (ESSL/HAO)

Steve is an astronomer whose main interests are observing solar oscillations and developing instrumentation and techniques for studying magnetic fields in the Sun's photosphere and corona.

He leads the development of CoMP, a coronal multichannel polarimeter that has captured landmark imagery of magnetic structures in the solar atmosphere. The instrument is expected to provide the next generation of data on magnetic structures in the solar corona.

Scientists III

Eight NCAR researchers have been promoted to the scientist III level, which is one step below senior - scientist.

Aiguo Dai (ESSL/CGD)
Gokhan Danabasoglu (ESSL/CGD)
Mausumi Dikpati (ESSL/HAO)
Joan Kleypas (RAL/ISSE)
Dan Marsh (ESSL/ACD)
Brian O'Neill (RAL/ISSE)
Laura Pan (ESSL/ACD)
Junhong Wang (EOL)

Using CoMP last year, Steve and colleagues became the first scientists to observe elusive oscillations in the solar corona known as Alfvén waves. The discovery will give researchers more insight into the fundamental behavior of solar magnetic fields, eventually leading to a fuller understanding of how the Sun affects Earth and the solar system.

Steve has a doctorate from the University of California, Los Angeles. He came to NCAR in 1988 as a visiting scientist.

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UCAR readies new financial management tools

FinTools will streamline financial management across programs

For two years, a team of staff from across UCAR, NCAR, and UOP has been defining requirements for a suite of new financial management tools. As a result of this work, FinTools is taking shape.

FinTools will integrate with UCAR's existing accounting system (BiTech's Integrated Funds Accounting System) and HR's information system (iVantage), providing state-of-the-art financial management tools that will let managers make informed decisions on how best to allocate resources, maintain the financial health of their programs, and anticipate future opportunities and challenges.

"A couple of years ago, a group of us went to the President's Council to explain the need to develop a suite of tools to improve fiscal management of programs," explains Mike Moran, administrative manager in ESSL. "We wanted to improve the system so that there's consistency and standardization acrossthe organization."

UCAR's budgeting and financial reporting has evolved into a disparate set of processes that vary widely across the organization. Labs, divisions, and programs use unique combinations of online systems of record and offline (shadow) systems, created by individual divisions and programs, to provide the business intelligence they need to make critical decisions.

The current patchwork of systems is not well integrated and requires significant administrative effort to maintain, and the manual nature of some of the processes increases the likelihood of errors. Through the FinTools project, the organization has identified an opportunity to reduce the burden on administrative and support staff, reduce errors, and improve employee work-life balance by providing integrated, enhanced financial management tools to meet the needs of the UCAR community.

"A lot of time and energy has gone into this," says Rena Brasher-Alleva, director of budget and planning for NCAR. "We interviewed administrators, managers, and directors in every program."

Based on these interviews, the FinTools lead team identified the following high-priority areas:

- budget projections and analysis
- staffing projections and analysis
- NCAR Annual Budget Review
- proposals and awards

FinTools Project Team

Rena Brasher-Alleva,
NCAR Product Lead

Hanne Mauriello,
UOP Product Lead

Melissa Miller,
UCAR Product Lead

Mike Moran,
User Education Lead

Barb Schnell
Project Management Office

Karl Werner, Development Lead

Shawn Winkelman,

• purchasing and payments (including travel)

• accounts administration

Project Manager

Justin Young,
Testing Lead

The lead team assembled teams of staff experts with skills in each area to analyze business flows and document system requirements. The hard work of these teams resulted in a business requirements document for each priority area. In May, the lead team held meetings with a broad set of stakeholders and launched an open comment period to gather final input.

The project is now moving into the planning and procurement phase during which UCAR will decide which systems to purchase and which to develop in house, evaluate and select vendors, and refine architectural designs. The President's Council has approved funds to begin the development of FinTools once a more detailed plan is approved. The lead team expects to implement the new system throughout the organization within the next 18–24 months.

On the Web

For more information about FinTools, including a complete project overview, visit
www.wiki.ucar.edu/display/fintools/Financial+Management+Tools+Project

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Bluefire burns hot—with less energy

New supercomputer powerful and efficient

In May, CISL installed a new IBM supercomputer that significantly increases NCAR's computing power. Scientists will use the system, named bluefire (all NCAR computer names are spelled as one word with no capital letters in accordance with Unix operating system protocols), for research on climate change and severe weather.

Bluefire.

Bluefire, a Power 575 Hydro-Cluster, has a peak speed of more than 76 teraflops (76 trillion floating-point operations per second). When fully operational, it is expected to rank among the 25 most powerful supercomputers in the world and will more than triple NCAR's sustained computing capacity.

"Bluefire is on the leading edge of high-performance computing technology," says Tom Bettge, CISL's director of operations and services. "Scientists will be able to conduct breakthrough calculations, study vital problems at much higher resolution and complexity, and get results more quickly than before."

Bluefire will enable scientists from NCAR and the broader atmospheric sciences community to accelerate research into climate change, including future patterns of precipitation and drought around the world, changes to agriculture and growing seasons, and the complex influence of global warming on hurricanes. The supercomputer will also be used to generate climate simulations for the next IPCC report on global warming. In addition, researchers will leverage bluefire to improve weather forecasting models.

The supercomputer, which is the first in a highly energy-efficient class of machines to be shipped anywhere in the world, is three times more energy efficient per rack than its predecessor. It utilizes a water-based cooling system that is 33% more efficient than traditional air-cooled systems. Heat is removed from the electronics by water-chilled copper plates mounted in direct contact with the system's microprocessor chips.

"We're especially pleased that bluefire provides dramatically increased performance with much greater energy efficiency," Tom says.

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Staff Notes monthly

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Researchers study monsoon in Taiwan

About 20 NCAR researchers, led by Wen-Chau Lee (EOL), are in Taiwan at various points this month for the Terrain-influenced Monsoon Rainfall Experiment (TiMREX) field campaign, which runs May 15–June 30.

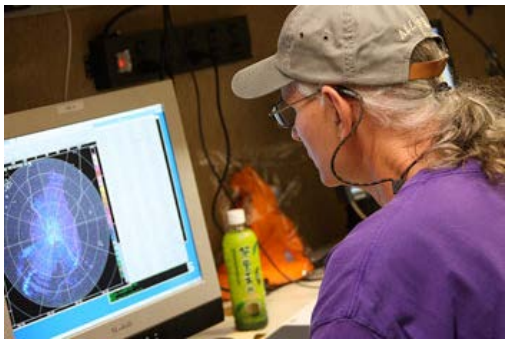
A dragon graces the roof of a temple near Kaohsiung, Taiwan.

TiMREX is a joint U.S.-Taiwan project conducted on the plains and in the western mountain slope region of southern Taiwan. The research focuses on the physics of heavy rain and flood-producing convective systems—and the difficulty of forecasting such events—in a complex environment. Influences include the southwesterly summer monsoon, land-sea contrasts, mountainous terrain, and the mei-yu front (a persistent east-west zone of disturbed weather during spring stretching from the east China coast across Taiwan and eastward into the Pacific).

“There are places in Taiwan that typically have heavy rainfall, but it varies from year to year and from storm to storm,” explains Tammy Weckwerth (EOL), one of the project’s investigators. “What we’re trying to do with TiMREX is understand the processes better so that we can better predict where that rain is goi ng to fall.”

UCAR photographer Carlye Calvin spent a week in Taiwan documenting the

field project. Here are a few of her shots. For more, see www.ucar.edu/communications/slideshows/timrex.



Mike Dixon (RAL) evaluates output from S-Pol.

S-Pol, NCAR's transportable, ground-based Doppler radar, on site in Taiwan.

Temple

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Random Profile

Greg Byrd

Every other month, Staff Notes Monthly spotlights a staff member selected from the phone directory.This month we profile Greg Byrd in COMET.

Greg Byrd.

Staff Notes: Tell me about your job, Greg.

Greg: I'm a senior project manager. I've been in COMET for 14 years—hard to believe, but I guess time flies when you're having fun. COMET is a very project management-based organization, with over 50 online distance-learning projects. I'm in charge of between 20 and 25 of these projects. I supervise a staff of meteorologists and instructional designers. For the most part I do the project management, but in addition to that I'm able to get my hands on some projects myself to do content development. I really like having this flexibility. Most recently, I worked on a webcast on frontogenesis and stability, and I also worked on a Skew-T module.

Staff Notes: What's a Skew-T?

Greg: It's a thermodynamic diagram on which you plot rawinsonde data from weather balloons. The data consist of temperature, humidity, and wind information, and it lets you evaluate the stability, potential for thunderstorms, and all sorts of other atmospheric phenomena. We basically converted an old Air Force Skew-T hardcopy instructional manual to an interactive multimedia module on the Web. It was a vintage 1950s document that we brought up to date.

Staff Notes: What do you like best about your job?

Greg: I like the people I work with. I take a lot of satisfaction in being able to guide people in producing what I feel are very high quality—world-class, if you will—instructional modules.

Staff Notes: What is the most challenging part?

Greg: The challenge is managing a multitude of projects and trying to coordinate the various resources that you bring to those projects. COMET has a staff of about 38, with 55 different projects running. We need to very carefully stage things and prioritize.

Staff Notes: Tell me about your professional life prior to COMET.

Greg: I got my Ph.D. in meteorology from the University of Oklahoma, my master's degree at CSU, and bachelor's at Penn State. And I spent eight years at the State University of New York College at Brockport, as a faculty member. So I've been all over the place.

Staff Notes: Where do you live now?

Greg: I live in Longmont. My wife, Mary, is a speech-language pathologist. I have a daughter, Lizzy, who is 17, just finishing up her junior year at Niwot High School. She's really into arts and performance and has been in several plays and is in three choirs. She also plays golf. And I have a son, Charlie, 14, who goes to school in Lyons. His first love is ice hockey, and he runs cross-country.

Staff Notes: Rumor has it that, when you're not shuttling back and forth between concerts and hockey games, you play golf. Tell me about your golf game.

Greg: [chuckling] This is how I describe my golf game: The average golf course is four miles long. If you play golf like I do, you walk eight miles.

Staff Notes: Sounds like good exercise. What else do you for fun?

Greg: We like to spend time in the mountains and have a place in Winter Park, where we go hiking and skiing.Staff Notes: Do you have a favorite weather phenomenon?

Greg: I consider my expertise to be in winter weather—mesoscale features associated with winter storms. When I was at SUNY, I did a lot of work on lake-effect snowstorms, so I guess that's my favorite.

Staff Notes: How did you first get interested in weather?

Greg: I've loved weather since I was seven years old, and knew then that I wanted to be a meteorologist. When I was about five I wanted to be a train engineer, and when I was six it was deep-sea diver because "Sea Hunt" with Lloyd Bridges was the big show. And then the meteorology bug bit me.

Staff Notes: Do you have any advice for aspiring atmospheric scientists?

Greg: An essential thing for young scientists coming along is going to be advocacy, since the reality is that we're in a situation where funding is tight and everyone is competing for dollars. Scientists need to understand how the system works on the congressional level and be advocates for the sciences.

Staff Notes: Last question. What would you do if you won the lottery?

Greg: Well, I'd play a lot more golf. But I'd probably continue to work in my profession, with a lot more flexibility. I'm delighted to be in this field and it's really great to work with such a wonderful group of people at COMET. Sometimes I catch myself thinking, "Wow, what am I doing here among all these great people?"

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Delphi Questions

PayFlex, space guidelines, severe weather alerts

Delphi Question #587 (received April 7): I have a question about PayFlex. Does UCAR have a policy in place whereby it routinely reviews the service levels provided by FSA (Flexible Spending Administration) providers such as PayFlex?

I personally, and several of my colleagues, have experienced nothing but problems with PayFlex. This was not the case with Denver Reserve. For example, it now seems that PayFlex requires receipts on literally every charge. They routinely lose the paperwork, requiring employee time to resend it. Finding a real, live, and helpful person on the other end of the phone is always an adventure in frustration. Even after receiving the paperwork, the folks at PayFlex often turn around and dispute the charges (for example, monthly payments for my daughter's braces).

PayFlex will only provide one card (whereas Denver Reserve provided two), which makes it a huge hassle to "share" the card in the case of families. It always seems that the card is with the wrong person at the time that it is needed, such as when taking a sick child to the doctor.

Perhaps the last straw for us came this past week. PayFlex waited until the yearly deadline had passed, then sent us a bill for a disputed charge with my daughter's braces. This was the only communication that we received from them, and now we are spending hours trying to clear up the mess.

To put it simply, the service from PayFlex is horrible. Surely there must be a better FSA available to UCAR?

Response (received April 15): Thank you for your question. We also have seen that the service level provided by PayFlex is not as good as Denver Reserve. (Uunfortunately, Denver Reserve was acquired by PayFlex.) Because of the service concerns about PayFlex, the UCAR Benefits office interviewed several other companies that provide flexible spending administration. PayFlex offers better services and more benefits (such as debit cards) than any of the other companies. We will continue to look for vendors, and if you hear of a good one from a colleague or friend, please let us know.

We have expressed our concerns to PayFlex with its customer service shortcomings. They have assured us that they are working on improving response time.

With regard to your other points, PayFlex is required by IRS regulation to obtain receipts on a quarterly basis whenever a claim is paid with your debit card. The debit card charge must be verified as a qualified expense. If you pay your insurance co-pay with your debit card you should not receive a request for a receipt of that transaction. All other card transactions will require a copy of the receipt. If you have been asked for a copy of your claim, be sure that it includes the service that was provided, the date of the service, and the amount. If you have not sent this to PayFlex, your debit card will be inactivated until the receipt has been submitted to PayFlex.

Participants can order additional cards in the name of their spouse and/or dependents for no additional charge either by calling customer service

(800-284-4885) or by logging in to their accounts at mypayflex.com, clicking on “debit cards,” then clicking on “card order” and filling out the online form.

We apologize for the problems with PayFlex and are working on resolving them. Please contact Cyd Perrone or Konnie Carrillo in Human Resources with any problems you encounter with PayFlex. We can help get the issue resolved.

—Cyd Perrone
Human Resources Benefits Administrator

Delphi Question #588 (received May 21): I have become aware that the Space Planning Committee worked on a master plan and space guidelines for three years. The plan was accepted, but never implemented by NCAR. What was the reason for the change?

Response (received May 27): The guidelines, which dealt with things like how many square feet a visitor’s office should occupy, were accepted by the President’s Council shortly after they were proposed. There was no master plan in the sense of space assignments to specific organizations. Those are handled by the relevant entities: NCAR, UOP, and UCAR.

—Larry Winter
NCAR Deputy Director

Delphi Question #589 (received May 23): I would like to know why UCAR/NCAR does not have a method in place for notifying staff of extreme weather events along the Front Range in near real time.

I was very surprised that staff were not informed about the severe weather conditions outside of the Boulder area on May 22, the date six tornadoes touched down in Colorado. A message was circulated in the afternoon that Boulder was under a tornado warning. However, many NCAR employees live outside of Boulder in the communities to the north that were directly impacted by these severe storms, yet no information was provided about the magnitude of these systems. Primary methods for communicating such information to the public are through television and radio broadcasts, which many of us do not have immediate access to in the workplace. I would like to know the feasibility of implementing a system similar to reverse 911 that notifies employees by phone when events such as these occur.

Response (received May 23): The questioner brings up an ongoing notification issue concerning how much and how best to provide emergency information. We do have the capability to put out an all-staff voicemail, similar to but not exactly a reverse 911. A message is nested in each UCAR phone and the message light is activated. However, it still requires the employee to notice the light and access voicemail. We have used this on numerous occasions, though usually associated with building closures.

In the incident with the tornadoes, we decided to utilize e-mail and the UCAR Safety and Security hotline at ext. 1100. The information was released as soon as we became aware and were able to get it posted. Typically, we take our cue from local area emergency agencies. If they were to recommend reverse 911 system activation, then we would have used our voicemail system. There were no local recommendations and we didn’t activate our system.

In retrospect, I should have utilized our existing voicemail system. Every emergency situation is a learning situation. In this case, I’ve learned to expand my thinking to include notifications that go beyond just the local

area. I believe our current voicemail system is adequate for emergency notifications; I just have to use what is available. Thanks for an excellent suggestion.

—Steve Sadler
Director, Safety and Site Services

In this issue...

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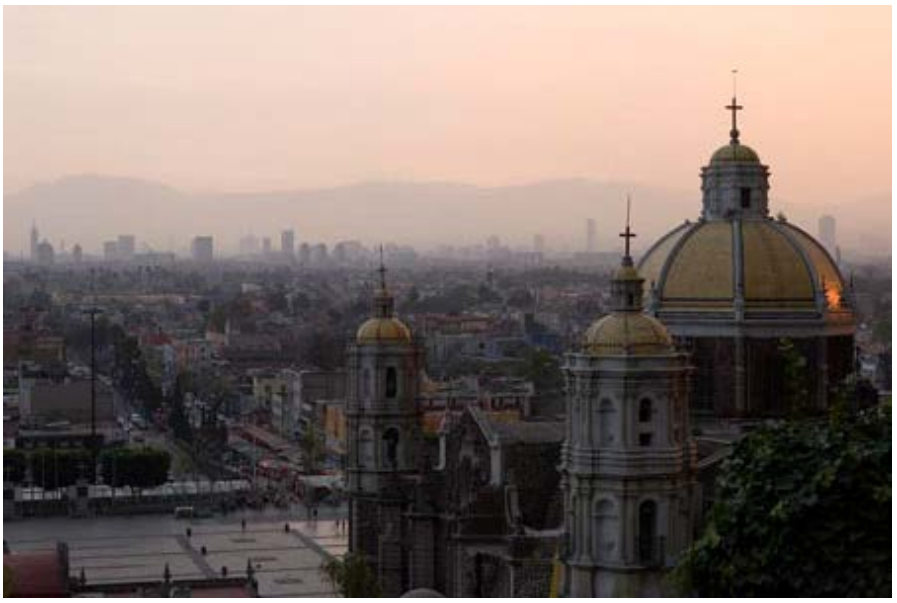
Staff Notes monthly

June 2008

short takes

An overview of projects throughout the organization

Tropospheric ozone and climate. Helen Worden (ESSL/ACD) and colleagues at the Jet Propulsion Laboratory (JPL) recently published a satellite-based analysis of the role played by tropospheric ozone in boosting the greenhouse effect. The results, which appeared online in Nature Geoscience on April 20, help clarify a significant uncertainty in the climate-change picture.



A team of researchers in ESSL/CGD is developing a model to study the effects of global warming on cities. The model appears to do a good job of simulating solar radiation, heat fluxes, and temperatures in Mexico City, shown here.

Along with its ill effects on human health, ozone in the troposphere—the lowest atmospheric layer—also acts as an important greenhouse gas, ranking third behind carbon dioxide and methane. However, it varies dramatically by region and over time, and it's unclear how much tropospheric ozone existed before the industrial era.

In 2007, the Intergovernmental Panel on Climate Change estimated that, on average, changes in tropospheric ozone from human activities have increased the radiation trapped by the atmosphere anywhere from 0.25 to 0.65 watts per square meter, roughly the same as the radiative forcing from methane and several times less than that from carbon dioxide.

Helen and her collaborators drew on recent data from the Tropospheric Emissions Spectrometer, launched in 2004 on NASA's Aura satellite. They found that the radiative forcing from tropospheric ozone (from both natural and human sources) between the latitudes 45°S and N averaged between 0.34 and 0.62 watts per square meter. The analysis focused on clear-sky radiances observed over the ocean in these latitudes. Although not directly comparable to IPCC estimates for anthropogenic radiative forcing, this measurement provides confirmation that the IPCC understanding of the impact of tropospheric ozone on climate change is essentially correct.

"These are the first global observations to partition the role of tropospheric ozone in the greenhouse effect," says Helen, who spent 14 years at JPL before joining ACD last year. "These measurements provide new observational constraints for climate models, and we are working to extend the analysis beyond clear-sky ocean radiances to cloud and land scenes, where models have the largest uncertainties."

Cities and climate change. Because of the large number of people who live in urban areas, scientists want to examine the likely impacts of global warming on cities. But cities are not represented in climate models, both because they are too small for the

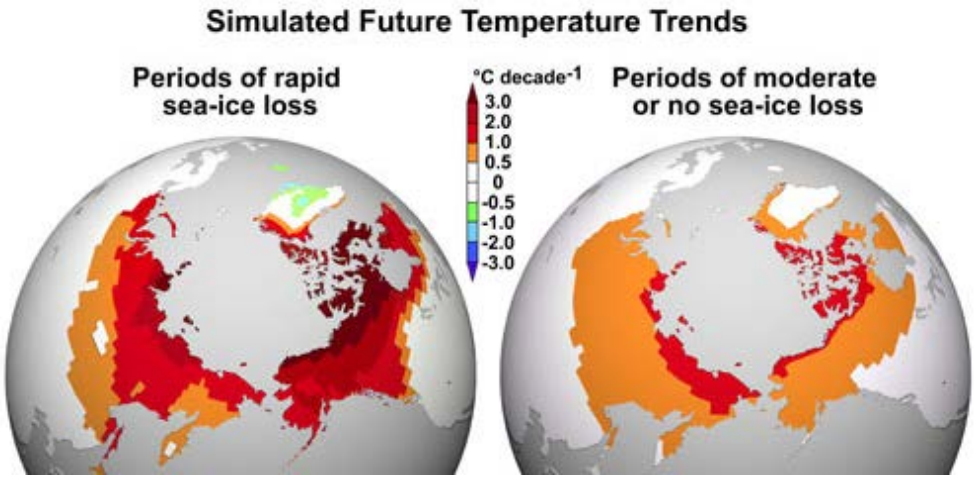
coarse resolution of these models and because urban surfaces respond to the atmosphere in different ways than undeveloped areas.

A team of scientists, led by Keith Oleson in ESSL/CGD, is making important progress toward adding an urban component to the Community Climate System Model. The team has created a model that represents an urban canyon, consisting of roofs, sunlit and shaded walls, and a canyon floor that is divided into both pervious surfaces such as lawns and impervious surfaces such as roads. One of the most difficult aspects of creating such a model is to correctly account for the trapping and reflection of solar radiation by various urban surfaces.

Testing has revealed that the model appears to do a good job of simulating solar radiation, heat fluxes, and temperatures in two cities—one based on the architecture of Mexico City, and the other on Vancouver. The team is continuing to refine the model, focusing on the height-to-width ratios of city buildings and the thermal properties of various surfaces. In the next year or so, they hope to integrate the model into CCSM, enabling researchers to study the effect of a warming world on different urban areas.

The research is summarized in two recent papers that appeared in the April issue of the Journal of Applied Meteorology and Climatology.

Permafrost and sea ice. A study led by David Lawrence (ESSL/CGD) has found that the rate of climate warming over northern Alaska, Canada, and Russia could more than triple during periods of rapid sea ice loss. The research raises concerns about the thawing of permafrost (permanently frozen soil), which has potential consequences for sensitive ecosystems, human infrastructure, and greenhouse gas emissions.



Accelerated Arctic warming. [ENLARGE] *(Image by Steve Deyo, ©UCAR.)*

"Our study suggests that if sea ice continues to contract rapidly over the next several years, Arctic land warming and permafrost thaw are likely to accelerate," David says.

The research was spurred in part by events last summer, when the extent of Arctic sea ice shrank to more than 30% below average, setting a modern-day record. From August to October, air temperatures over land in the western Arctic were also unusually warm, reaching more than 3.6°F (2°C) above the 1978–2006 average and raising the question of whether or not the unusually low sea-ice coverage and warm land temperatures were related. To investigate the question, David and colleagues generated climate change simulations with the Community Climate System Model.

The image below shows simulated autumn temperature trends during periods of rapid sea-ice loss, which can last for 5 to 10 years. The accelerated warming signal reaches nearly 1,000 miles inland. In contrast, the image at right shows the comparatively milder but still substantial warming rates associated with rising amounts of greenhouse gases in the atmosphere and the moderate sea-ice retreat that is expected during the

21st century. Most other parts of the globe still experience warming, but at a lower rate of less than 0.9°F (0.5°C) per decade. (Image by Steve Deyo, COMET).

For more about the study, visit www.ucar.edu/news/releases/2008/permafrost.jsp.

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