

DEPARTMENT OF

# ATMOSPHERIC SCIENCES

## Welcome to the new Department of Atmospheric Sciences newsletter

The Department of Atmospheric Sciences is launched a new era in its history beginning in May 2017, when we moved into the newly renovated Natural History Building, located adjacent to the Illini Union and the Quad (see “From the Department Head” inside). This move is the latest in a series of milestones, the most important of which is the continuing success of our undergraduate major (now with 75-80 student enrolled). Our undergraduate program’s reputation for quality training in atmospheric and environmental science has grown rapidly as our undergraduate alumni have gone on to graduate schools around the country, and out into the workforce. We now have the largest number of faculty in the Department history, and our faculty are continuing to establish new exciting lines of research (several are currently leading large



*The Department of Atmospheric Sciences home for the last 30 years*



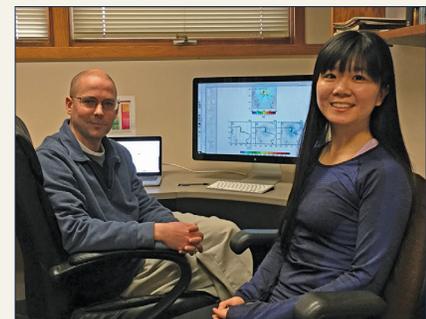
*The Natural History Building is located next to the Illini Union*

field campaigns worldwide). Learn more about our recent happenings inside, and we hope to see you back in Champaign for the grand opening of our new facility! ♦

## FACULTY SPOTLIGHT: Ryan Sriver, assistant professor

New research by Prof. **Ryan Sriver** (left) and PhD student **Hui Li** (right) is pushing the limits of Earth system modeling in order to examine the relationship between tropical cyclones (e.g. hurricanes) and climate. Working with the National Center for Supercomputing Applications, Ryan and Hui are utilizing the peta-scale Blue Waters supercomputer to perform new ultra-high resolutions climate model simulations using the Community Earth System Model. This global model features a general circulation atmosphere model with 1/4 degree horizontal resolution, coupled to a 1 degree dynamic ocean model. At these resolutions, the model can explicitly simulate realistic tropical cyclone-like circulations as well as the local ocean-atmosphere interactions and global climate response. This work has led

to fundamental insights into how the upper-ocean responds to extreme tropical cyclone winds and potential feedbacks on the atmospheric circulations, which in turn can help aid the understanding of how tropical cyclone activity may change in the future. These research efforts represent the cutting edge climate modeling techniques, and pave the way for analyses of tropical cyclones in high-resolution coupled Earth system models. Check out their 2016 papers in *Journal of Geophysical Research-Oceans* for more information! ♦



# From the department head



**The Department of Atmospheric Sciences** started as the Laboratory for Atmospheric Research in 1969. At that time, and on through 1986 when I first interviewed for a faculty position, we were located in the Coordinated Science Laboratory (CSL) on the corner of Goodwin Street and Springfield Avenue. For those of you around in 1986, you may remember that the Department moved out of CSL and briefly occupied space in the Old Veterinary Medicine Building on South Campus while our new building, the Atmospheric Sciences Building on South Gregory Street in Urbana, was constructed. When I arrived on campus, my first office was in the Old Vet Med building. It was in January 1988 that the Department moved into the Atmospheric Sciences Building (ASB). Although this building served us well over the next 29 years, we quickly outgrew ASB and had to overflow into other nearby buildings. Truth be told, none of these overflow spaces were very appealing, and some were pretty bad. The ASB was also located on the very corner of campus, and, as you are aware, didn't have the campus "feel" about it that the rest of the campus has, a detriment to attracting new students and faculty.

Well that has all changed! In May 2017, the Department moved into the newly renovated Natural History Building (NHB), right next to the Illini Union. NHB has undergone a \$72 million renovation, essentially a new building within a historical façade. We are now *on the Quad*, and have great facilities, including a new synoptic laboratory, a data visualization laboratory, an instrumentation laboratory and teaching classroom, and an instrument fabrication lab. We now have access to a wide array of classrooms, some with modern classroom designs that encourage student interaction and active learning. Our undergraduates have a dedicated student hub for study—a remodeled version of the Natural History Museum atrium that once occupied the third floor of the building. We have access to the 300-seat auditorium on the second floor for our large General Education classes. There is space for the entire department—no more satellite buildings. We share the building with the Geology Department and the Geography and Geographic Information Sciences Department, our two sister departments in the School of Earth, Society, and Environment. We fully expect that our research interactions and joint seminars with these departments will expand in the coming years. The School business office is also in the building.

Needless to say, we are thrilled about the move. Our Department is growing, with 16 faculty, 50 graduate students, and 80 undergraduates, in addition to our research scientist and administrative staff. We are looking forward to great years ahead in NHB. Come visit us, see our new facility, and while you are there, tell us all about your successes and adventures! ♦

## Bob Rauber

*Head, Department of Atmospheric Sciences*

## DAS by the numbers: 2015-2016 BS, MS, and PhD graduates

**2014-15** (August and December 2014, May 2015) = **37 degrees**

Degree	Total
BS	27
MS	5
PHD	5

**2015-16** (August and December 2015, May 2016) = **36 degrees**

Degree	Total
BS	21
MS	10
PHD	4

# DEPARTMENT NEWS

## DAS adds four new faculty members

Four new professors joined the DAS faculty in 2014-2015: pictured from right to left: **Sonia Lasher-Trapp**, **Deanna Hence**, **Francina Dominguez**, and **Jeff Trapp**. Francina is an associate professor who adds expertise in land-atmosphere interactions and associated hydroclimatic processes. She received her PhD in Civil and Environmental Engineering from Illinois. Deanna is an assistant professor, and has research interests that span the atmospheric mesoscale and involve remote sensing applications. She received her PhD in Atmospheric Science at the University of Washington. Sonia and Jeff are both professors who previously had been on the faculty at Purdue University. Sonia brings to the department her unique numerical-modeling and observational skillset, with specific application to cloud microphysics. Finally, Jeff's work focuses on deep convective storms, their hazards, and their interactions with the larger-scale atmosphere. These four faculty members will contribute to the strategic theme of risk. ♦



*Pictured from right to left: Sonia Lasher-Trapp, Deanna Hence, Francina Dominguez, and Jeff Trapp.*

## Success of undergraduate program exceeds all expectations

The Department of Atmospheric Sciences Undergraduate Program has generated more than 120 graduates since its inception in 2008 and boasted a graduating class of 23, the second largest in its short history, in 2016. The current undergraduate enrollment is about 80 students, although, in contrast to nearly all of our peer institutions, the number of students in each graduating class grows from year to year. Part of the success can be attributed to strong advising from Eric Snodgrass, who does his best to ensure that students are proficient in math and physics before beginning our rigorous program. Additionally, with two of the department's 100-level courses consistently seeing enrollments between 400-600 students per semester, along with online courses, thousands of students each year are introduced to the atmospheric sciences. A handful of these go on to become majors or minors. The department has also built a strong reputation in the ROTC organizations on campus, and several students in each graduating class are ROTC members.

Department alums have found success in top graduate programs across the country, private industry, government jobs, and have been commissioned as military officers. An informal survey of recent alums found that their Illinois education often prepared them better than their peers upon beginning their careers or graduate studies. ♦

# Top-5 Ranking

**DAS** has received its third consecutive top-5 ranking amongst nationwide programs offering degrees or majors in Atmospheric Sciences and Meteorology. ([www.collegefactual.com](http://www.collegefactual.com)) ♦



Students (left to right) Angelica Marchi, Devin Chehak, Bryan Engelsen, Chris Johnston (TA), Eli Turasky, Alex Erwin, Troy Zaremba, and Katie Koncel pose in front of a supercell thunderstorm near Coffee Creek, MT, on June 10, 2016. Photo by Jeff Frame.

## ATMS 324: Field Studies of Convection

Every year since 2011 (and twice each spring since 2012), Clinical Assistant Professor **Jeff Frame** has led groups of students to the Great Plains to forecast and observe convective storms. Students who participate in the course often claim to have learned more during the two-week long field course than in any other two-week period in their lives. In 2016, Professor Frame and his students logged more than 13,000 miles in two trips, observed at least 25 supercells from across the supercell spectrum, encountered linear convective systems, and saw a record-breaking fourteen tornadoes. Ten of these occurred with one storm near Dodge City, KS, on May 24 and one of these was an EF-4 wedge tornado that tracked across northeastern Kansas for an hour and a half on May 25. ♦

## System for Characterizing and Measuring Precipitation (SCAMP): The department's new mobile laboratory

**SCAMP was conceived in 2014** in response to a request for proposals by the UI Office of the Vice Chancellor for Research. The grant proposal submitted by Prof. **Sonia Lasher-Trapp** and a team of DAS faculty was awarded in 2015, and, after much hard work and dedication by Sonia and DAS faculty, the procurement and installation of the SCAMP instrumentation was completed in the summer of 2016.

SCAMP is designed to quantitatively characterize the vertical profile of precipitation particles falling from clouds



Graduate students Bryan Engelsen (left) and Jeff Thayer (right) help with SCAMP instrumentation installation.



SCAMP during a recent deployment by students in ATMS 510, Precipitation Physics.

and storms, including the particle size distributions and surface precipitation, and document the scavenging of air particulates by the falling precipitation. The cornerstone of the system is a Micro Rain Radar (MRR), a vertically pointing Doppler radar with a 1.24 cm wavelength. The MRR is complemented by an OTT Parsivel Optical Disdrometer, an MPS Particle Spectrometer, a Geonor T-200B Precipitation Gauge, a TSI Optical Particle Sizer, and a Lufft Ultrasonic Weather Station. All of these instruments are mounted on a flatbed trailer, and transported by a new Ford Cargo Van, both of which were purchased by the Department.

SCAMP is a unique facility that will enhance the faculty's participation in government-sponsored field campaigns, as well as offer opportunities for local data collection efforts. SCAMP is also providing DAS students the exciting opportunity to collect and analyze data with state-of-the-art equipment in undergraduate and graduate courses alike. ♦

## DAS faculty and students key contributors to Plains Elevated Convection At Night (PECAN)

The Plains Elevated Convection At Night (PECAN) campaign was a large, intensive field project conducted in the Great Plains region of the U.S. from June 1 to July 15, 2015. A key goal of PECAN was to determine how the nocturnal thunderstorms within elevated mesoscale convective systems (MCSs) maintain their structure and intensity over long time periods in the absence of surface-based convective available potential energy, and presumably without a balance between the MCS cold pool and environmental wind shear. Profs. Bob Rauber and Greg McFarquhar, Brian Jewett, and graduate students Dan Stechman, Jessica Choate, Bethany Fay, Wei Wu, Shichu Zhu, and Tyra Brown were part of the large international group of scientists participating in PECAN.

The DAS faculty and students are studying how microphysical cooling processes in developing and mature stratiform regions of MCSs force downdraft circulations that create bore and mesoscale gravity wave features on the stable nocturnal boundary layer that in turn focus, organize and maintain future convective activity. ♦



*Clockwise from top: The NOAA P-3 aircraft at sunset<sup>1</sup>, precipitation core from the perspective of the P-3<sup>2</sup>, CSWR mobile mesonet<sup>3</sup>, and NCAR SPolKa radar<sup>4</sup>. Photos by <sup>1</sup>Dan Stechman, <sup>2</sup>Bethany Fay, and <sup>3</sup>Jake DeFlicht.*

## Dan Stechman, my PECAN experience

During the summer of 2015, several DAS graduate students and I were stationed in central Kansas for 7 weeks assisting in data collection and forecasting for the PECAN field campaign. This was an outstanding opportunity to partake in the collection of the data at the heart of my PhD research. I spent most of my time assisting with the transport and operation of the Center for Severe Weather Research Doppler on Wheels mobile radars. During each mission, we would deploy to any number of locations on the Great Plains (and at times, even the Midwest) and wait for MCSs to form and eventually traverse over the radar. I was also fortunate to participate in a single mission aboard the NOAA P-3 aircraft, on which we collected data describing the sizes and shapes of hydrometeors. Flying or driving into an MCS is not something most people would ever want to do, but this gave me a truly unique perspective on the weather phenomena I'm studying. Participating in PECAN was an unforgettable experience, and I am excited to have the opportunity to work with such

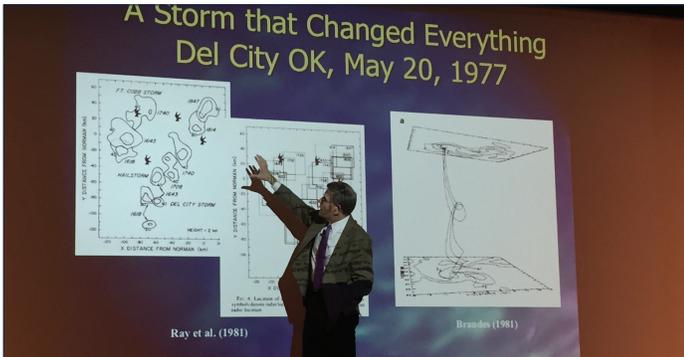
a unique and rich dataset, the likes of which may prove transformative in our understanding of elevated MCSs. ♦



*Dan Stechman (left) and Tyra Brown (right) in front of the NOAA P-3 during PECAN.*

# ALUMNI NEWS

## DAS Distinguished Alumni for 2015 and 2016



Prof. **Kelvin Droegemeier**, Vice President for Research at the University of Oklahoma, was named the 2015 DAS Distinguished Alumnus. Prof. Droegemeier received his MS and PhD degrees in atmospheric science in 1982 and 1985, respectively. Under the mentorship of Prof. Bob Wilhelmson, his research on thunderstorm outflow led to multiple publications, an unprecedented video, and a 695-page dissertation! He joined the University of Oklahoma's faculty in 1985 as an assistant professor within the School of Meteorology. Prof. Droegemeier's many accomplishments at the University of Oklahoma include co-founding, and then later directing the Center for the Analysis and Prediction of Storms, which was an NSF Science and Technology Center. He has served the meteorological community in roles such as a trustee of the University Corporation for Atmospheric Research, and broader science community as a member of the U.S. National Science Board under Presidents Bush and Obama. ♦



Prof. **Ming Cai**, Program Director of the Climate and Large-scale Dynamics, and Physical and Dynamic Meteorology Programs of the National Science Foundation, and Professor of Atmospheric Sciences at Florida State University, has been named the 2016 DAS Distinguished Alumnus. In 1985 and 1990, respectively, Prof. Cai received his MS and PhD degrees under Prof. Mankin Mak. His graduate research focused on low frequency variability and the dynamics of storm tracks. After the completion of his degrees, he held positions with the University of Maryland,

and Boeing. He joined the faculty at Florida State University within the Department of Meteorology in 2003, and was promoted to Professor in 2009. He has published extensively on topics involving the general circulation, large-scale atmospheric dynamics, and the dynamics and physics of climate variability and climate change. Prof. Cai is currently applying this wide expertise through his duties as an NSF Program Director, a post he has held since 2016. Prof. Cai is married to **Jin Huang**, who also received her MS and PhD degrees from DAS. ♦

## Annual Ogura Lecture Series

The Annual Ogura Lecture Series is possible through the generosity of Emeritus Professor and Department Founder Yoshi Ogura. The lecture on April 20, 2016 featured Dr. **Ken Caldeira**, Climate Scientist with the Carnegie Institution for Science, Department of Global Ecology. His seminar was entitled: "Climate Change and Ocean Acidification: Physical Science at the Edge of Public Policy." ♦

### Ogura Awards for 2016

#### Outstanding Senior:

Amanda Murphy

#### Outstanding Research Paper:

Hui Li

#### Outstanding Teaching Assistant:

Jake Mulholland

#### Outstanding Undergraduate Research:

Brian Greene

Andrew Huang

Alexis Hunzinger

Andrew Lammers

Lisa Michalowski

Amanda Murphy

Carson Soch

Charles White

## Alumni in the spotlight



### Harold Brooks, PhD, '90

*Dr. Harold Brooks was awarded the Nikolai Dotzek Award in 2015 from the European Severe Storms community.*

### What have you been up to since your time at DAS?

I had an NRC post-doc at the National Severe Storms Lab and joined the federal staff in 1992. I've worked on the forecasting and impacts of severe thunderstorms, tornadoes and flash floods and on the quality and value of weather forecasts. I worked in the early stages of short-range ensemble forecasting, the understanding of severe thunderstorms in the climate setting, and the interaction between physical and social sciences in meteorology.

### How have you benefited from your degree in Atmospheric Sciences from the University of Illinois?

One of the benefits of Illinois was the chance to play with things that weren't directly in my PhD (forecast evaluation, interactions with forecasters.) The degree opened doors, but the experience allowed me to do a variety of things once I was in those doors.

### What's next for you?

There are still a lot of questions I'd like to know the answer to. I'm doing some basic work on how to structure and communicate weather forecasts a decade from now and trying to figure out how large scale climate change impacts severe thunderstorm occurrence. ♦



### Hilary Minor, BS, '07; MS, '10

*Hilary Minor is currently an Atmospheric Scientist at Sonoma Technology, Inc., where she is the lead analyst on STI's air pollution health effect studies. Her research involves measurements, data*

*analysis, and modeling of air pollution exposures and human time-activity.*

### What have you been up to since your time at DAS?

After graduating, I moved to California and joined Sonoma Technology, Inc. as an Atmospheric Scientist. I forecast air quality and research the impacts of poor air quality on public health. I enjoy working on all phases of these projects, including planning the study, being in the field, validating and interpreting the collected data, and producing the final report. Outside of STI, you can find me cycling, running, and hiking amid the beautiful scenery of Sonoma County.

### How have you benefited from your degree in Atmospheric Sciences from the University of Illinois?

My degrees in Atmospheric Sciences gave me the foundation needed to solve complex applied meteorological and air quality problems. ♦

## ALUMNI UPDATES

**Lauren Carter (BS, '15)** is now pursuing a MS in atmospheric sciences at Plymouth State University in Plymouth, New Hampshire.

**Joe Clark (MS, '07)** is currently a Service Meteorologist at that National Weather Service Forecast Office in Detroit, Michigan.

**Julie Malmberg (Baur) (MS, '03)** is currently a Project Manager at the Globe Project at the University Corporation for Atmospheric Research in Boulder, CO.

Prof. **Navin Ramankutty (MS, '94)** is currently a Professor at the Liu Institute for Global Issues and Institute for Resources, Environment, & Sustainability at the University of British Columbia, Vancouver, British Columbia, Canada.

Dr. **Jin Huang (PhD, '91)** is currently the Director of the Climate Test Bed at the Climate Prediction Center, National Oceanic and Atmospheric Administration in College Park, MD. ♦



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