

# DEPARTMENT OF ATMOSPHERIC SCIENCE

2017 Newsletter



## AMS Alumni Reception

Please join us for the American Meteorological Society Alumni and Friends Reception at the 98<sup>th</sup> Annual Meeting in Austin, Texas.

**Tuesday, Jan. 9**

6:30-8 p.m.

Hilton Hotel Austin,  
room 410

### Donate

Please consider supporting the Department of Atmospheric Science. Your gift strengthens CSU through the recruitment and retention of world-class students and faculty. It also ensures that our department will continue to be a leader in weather, climate and air quality research.

To contribute, please visit: [advancing.colostate.edu/ATMOS](http://advancing.colostate.edu/ATMOS) or call 970-491-8682.

## Greetings, Alumni and Friends!

2017 was another exciting year here at ATS. While uncertainty re: future federal funding has increased and the value of the work we do has been questioned by some in the political world, we continue to push vigorously forward addressing the climate, weather and air quality challenges of today and tomorrow. This newsletter will give you a taste of some of what's new here in Fort Collins.

Early this year the College of Engineering was renamed in honor of alumnus Walter Scott, Jr., recognizing his tremendous \$53 million gift. As one of five departments in the college, ATS will share in the benefits of this generous donation, including new scholarships for graduate student recruiting and opportunities to seek a new Presidential Faculty Chair.

This summer we honored 2017 ATS Distinguished Alum Maria Assunção Faus da Silva Dias (see p. 10). Maria was the first woman to receive a Ph.D. in our program, and we are proud to recognize the many outstanding accomplishments during her career. The department is a much more diverse place than it was when Maria arrived in 1975.

Today one-third of our faculty are women, including our newest hire Associate Prof. Christine Chiu (see p. 2). Christine, who



Department Head  
Jeff Collett

joins us from a faculty position at the University of Reading, brings added expertise in radiation and remote sensing.

2017 was also the first time our entering class of graduate students included more women than men. There is much more to be done to harness the curiosity, intellect and perspectives of talented

people from all backgrounds, but we are committed to continued progress in this regard.

Another major change this year was the retirement of Colorado Climate Center Director and State Climatologist Nolan Doesken (see p. 13). Nolan retired in August after four decades of service to the university and the state. Associate Prof. Russ Schumacher was selected to succeed Nolan in both roles.

As you will clearly see in the pages that follow, ATS faculty, students, staff and alumni continue to do exceptional work and to be honored for their accomplishments.

I wish you all a happy and prosperous 2018. We look forward to seeing many of you at our AMS reception in Austin or in a future visit to Fort Collins. We also hope that you will keep us apprised of exciting developments in your own lives and careers.



**ATMOSPHERIC SCIENCE**  
COLORADO STATE UNIVERSITY

# FACULTY NEWS

## Department welcomes new faculty member Christine Chiu

Christine Chiu joined the faculty in October as an associate professor.

Christine received her B.S. and M.S. in Atmospheric Physics from the National Central University, Taiwan, and completed her Ph.D. in 2003 at Purdue



University's Department of Earth and Atmospheric Sciences. Prior to joining CSU, she was an Associate Professor at the Department of Meteorology, University of Reading, United Kingdom; a Research Assistant Professor at the

University of Maryland–Baltimore County; and an Associated Scientist at NASA Goddard Space Flight Center.

Christine's primary research interests lie in remote sensing, radiative transfer, and cloud-aerosol-

precipitation-radiation interactions. She has worked extensively on retrievals of cloud optical and microphysical properties that are the prime determinant of the energy budget, but are poorly predicted by

climate models. The main problem in retrieving cloud properties is that clouds are complicated 3D objects that evolve fast. Christine has approached this problem using both passive radiometers and active radar/lidar beams, and is working toward blending observational elements, numerical simulation and model evaluation. This new approach allows us to investigate 3D cloud distributions and their radiative impact, to quantify aerosol impacts on precipitation, and to provide constraints for precipitation formation processes.

## Tom Vonder Haar and Wayne Schubert honored by AMS

Two emeritus professors, Tom Vonder Haar and Wayne Schubert, were honored at the American Meteorological Society's 97th Annual Meeting in Seattle in January.

University Distinguished Professor Emeritus Tom Vonder Haar was inducted as an Honorary Member of the AMS. Tom is also a fellow of AMS and the American Geophysical Union (AGU), and he was previously awarded the AMS Charney Award.

Professor Emeritus Wayne Schubert was selected as the Bernhard Haurwitz Memorial Lecturer for 2017. Wayne presented his talk, "For profound insights into the role of cloud processes in the dynamics of large-scale circulations," at an AMS joint session June 28 in Portland, Oregon. Wayne was the 2016 recipient of the AMS Charney Award.



Emeritus professors Tom Vonder Haar and Wayne Schubert display the certificates they received as AMS honorees.

# FACULTY NEWS

## Sue van den Heever receives AMS Lorenz Teaching Excellence Award

Professor Sue van den Heever was selected as the 2018 recipient of the Edward N. Lorenz Teaching Excellence Award from the American Meteorological Society (AMS). One person is chosen annually for this highly competitive, national teaching award. As stated on the AMS web page listing the 2018 award winners, Sue is being honored “for enduring passion for teaching and mentoring, for engaging students both inside and outside the classroom, and for unrelenting dedication to training future scientists.”



In an announcement to the department, Department Head Jeff Collett said, “Those of us here in CSU ATS know well the outstanding job Sue does in both teaching and graduate advising, as evidenced by multiple department teaching awards and a recent university graduate advising award. It is terrific to see Sue also recognized at the national level for her excellence in these endeavors.”

A nomination letter and three supporting letters were required for consideration, with at least one of the supporting letters from a former student. Several of the department’s students and faculty members submitted letters.

Sue will receive the award at the AMS Honors banquet in January in Austin, Texas.



## Dave Randall selected Professor of the Year

Dave Randall was chosen as the 2016-17 Professor of the Year by ATS graduate student representatives, based on teaching evaluations submitted by students over the course of the school year. Dave was presented with the award for teaching excellence at the annual ATS picnic in August.

## Michael Bell receives presidential early-career award

On Jan. 9 then President Barack Obama named CSU Atmospheric Science Associate Professor Michael Bell a recipient of the Presidential Early Career Award for Scientists and Engineers (PECASE). The PECASE award is the highest honor bestowed by the United States Government on science and engineering professionals in the early stages of their independent research careers. 102 recipients were named this year.

Michael is the first CSU PECASE winner in the past five years and one of only five CSU

recipients since the program’s inception in the 1990s.

Michael was nominated for the award by the Office of Naval Research (ONR), with whom he has previously done hurricane and typhoon research. He is using the \$1 million award to supplement a project with the ONR and CSU colleagues, Propagation of Intra-Seasonal Tropical Oscillations (PISTON).

Michael also has received an NSF CAREER Award.



# FACULTY NEWS

## ATS/CIRA bring home 5 college awards 2016-17

ATS made a strong showing at the 2016 and 2017 Walter Scott, Jr. College of Engineering awards.

Associate Professor Jeff Pierce and Assistant Professor Emily Fischer were recognized with outstanding faculty awards at the Walter Scott, Jr. College of Engineering all-college meeting Nov. 14. Pierce received the George T. Abell Outstanding Mid-Career Faculty Award, and Fischer received the Abell Outstanding Early-Career Faculty Award.



In 2016 Assistant Prof. Elizabeth Barnes (center) was recognized with the Abell Outstanding Early-Career Faculty Award, and Department Head and Prof. Jeff Collett (right) received the Abell Outstanding Research Faculty Award. ATS alumnus and CIRA Associate Director Steve Miller (left) received the Outstanding Administrative Professional Staff Research Award.



## Faculty & Staff Milestones (Years of Service)

### 5 years

Paula Brown  
Annette Foster  
Stephen Herbener  
Ying Li

### 10 years

Shannon Irey  
Noel Bryan

### 15 years

Brenda Dolan Cabell  
Sue van den Heever

### 30 years

Mark Branson  
Ross Heikes  
Paul Hein

### 40 years

Paul Ciesielski

## A.R. Ravishankara named University Distinguished Professor

A.R. "Ravi" Ravishankara has been named a University Distinguished Professor, the university's highest honor for faculty.

Ravi joined CSU in January 2014 and holds joint appointments in the chemistry and atmospheric science departments.

Ravi is the fifth Atmospheric Science faculty member to be named a University Distinguished Professor. Previous appointees are Tom Vonder



Haar, Graeme Stephens, Dave Randall and Sonia Kreidenweis.

Ravi has had a long research career spanning both government and university positions. Over four decades, he has studied the chemistry of Earth's atmosphere as it

relates to stratospheric ozone, climate change and regional air quality. His experiments have contributed to deciphering ozone layer depletion

and quantifying the role of chemically active species that affect climate. His research has advanced our understanding of pollutants in the atmosphere.

"There are few faculty on the CSU campus that have achieved the scientific impact and world-wide recognition of Dr. Ravishankara," wrote Department of Chemistry Chair Chuck Henry in his nomination letter. "He is a brilliant scientist and steadfast advocate for science who epitomizes the ideals of the UDP."

# STUDENT AND STAFF NEWS

## Welcome, new students!



Front row, from left: Kathryn Moore, Chelsea Nam, I-Ting Ku, Kirsten Mayer, William McNichols and Joe Messina. Back row, from left: Jhordanne Jones, Erin Dougherty, Kevin Barry, Faith Groff, Ryan Gonzalez and Evie Bangs. Not pictured: Zach Bruick and Ryan Riesenberg.

## Melissa Burt receives AMS Early Career Achievement Award

Melissa Burt has been selected to receive this year's American Meteorological Society Commission on Professional Affairs Award for Early Career Achievement. The award will be presented at the AMS Annual Meeting in January.

According to the selection panel, Melissa's "work across a variety of AMS boards and committees, as a manager for education and diversity at CMMAP, and administration of an REU program, are just small parts of her

already-large-and-growing involvement in our field. She has accomplished all of these things even while completing her doctorate at a top university, which clearly demonstrates, as one of the supporting letters said, 'Dr. Burt really integrates all the aspects of excellence' — research, mentoring, education, and service."

Melissa is a research scientist with Prof. Dave Randall and the Diversity Manager for the Department of Atmospheric Science and the Walter Scott, Jr. College of Engineering.



# STUDENT AND STAFF NEWS

## New Graduate Students

Name	Degree	Advisor	Previous University	Major
Evie Bangs	M.S.	Jeff Collett	Colorado State University	Chemistry
Kevin Barry	M.S.	Sonia Kreidenweis and Paul DeMott	University of Miami	Meteorology
Zach Bruick	M.S.	Kristen Rasmussen	Valparaiso University	Meteorology
Erin Dougherty	Ph.D.	Kristen Rasmussen	SUNY at Albany	Atmospheric Science
Ryan Gonzalez	M.S.	Chris Kummerow	Texas A&M	Meteorology
Faith Groff	M.S.	Russ Schumacher	Indiana University	Atmospheric Science
Jhordanne Jones	Ph.D.	Michael Bell	University of the West Indies	Climate Studies
I-Ting Ku	Ph.D.	Jeff Collett	National Tsing Hua University, Taiwan	Atmospheric Chemistry
Kirsten Mayer	M.S.	Elizabeth Barnes	University of Wisconsin-Madison	Atmospheric and Oceanic Sciences
William McNichols	M.S.	Christine Chiu	University of Oregon	Physics and Mathematics
Joe Messina	M.S.	Steven Rutledge	Colorado State University	Civil Engineering
Kathryn Moore	M.S.	Sonia Kreidenweis and Paul DeMott	Colby College	Chemistry, concentration in Environmental Science
Chelsea Nam	Ph.D.	Michael Bell	Seoul National University	Atmospheric Sciences
Ryan Riesenber	M.S.	Kristen Rasmussen	Metropolitan State College of Denver; American Military University	Meteorology and Applied Math (B.S.); Space Studies – Planetary Science

## New Postdoctoral Fellows

Name	Research Advisor	Graduate University
Jennifer DeHart	Michael Bell	University of Washington
Ya-Chien Feng	Michael Bell	McGill University
Brody Fuchs	Steven Rutledge	Colorado State University
Stacey Kawecki	Sue van den Heever	University of Michigan
Russell Perkins	Sonia Kreidenweis and Paul DeMott	University of Colorado – Boulder
Veljko Petkovic	Chris Kummerow	Colorado State University
Jun Uetake	Sonia Kreidenweis and Paul DeMott	Tokyo Institute of Technology
Bohar Singh	Eric Maloney	George Mason University

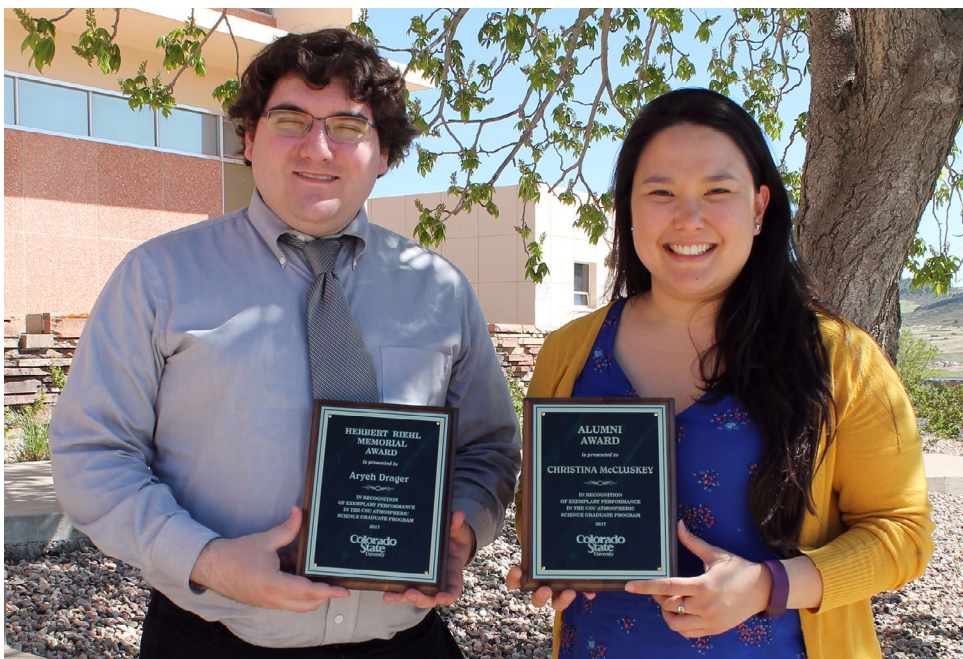
# STUDENT AND STAFF NEWS

## Congratulations, Atmospheric Science Graduates!

Spring 2017	Advisor	
Kathryn Boyd	Ph.D.	Thomas Birner and Meena Balgopal
Janice Bytheway	Ph.D.	Chris Kummerow
Ed Charlesworth	M.S.	Thomas Birner
Renee Curry	M.S.	Scott Denning
David Henderson	Ph.D.	Chris Kummerow
Stephanie Henderson	Ph.D.	Eric Maloney
Todd Jones	Ph.D.	David Randall
Yoonjin Lee	M.S.	Chris Kummerow and Milija Zupanski
Jingyuan Li	M.S.	David Thompson
Veljko Petkovic	Ph.D.	Chris Kummerow
Aaron Pina	Ph.D.	Scott Denning and Dennis Ojima
Brandon Wolding	Ph.D.	Eric Maloney

Summer 2017	Advisor	
Sam Childs	M.S.	Russ Schumacher
Nick Davis	Ph.D.	Thomas Birner
David Duncan	Ph.D.	Chris Kummerow
Ashley Evanski-Cole	Ph.D.	Jeff Collett
Andrea Jenney	M.S.	David Randall
Bryan Mundhenk	Ph.D.	Elizabeth Barnes and Eric Maloney
Casey Patrizio	M.S.	David Randall and David Thompson
Fall 2017	Advisor	
Brody Fuchs	Ph.D.	Steven Rutledge
Chengji Liu	Ph.D.	Elizabeth Barnes
Christina McCluskey	Ph.D.	Sonia Kreidenweis and Paul DeMott
Karly Reimel	M.S.	Steven Rutledge and Steven Miller
Dakota Smith	M.S.	Scott Denning

## Christina McCluskey, Aryeh Drager receive department honors



Christina McCluskey and Aryeh Drager were recognized by the department for outstanding student publications. Christina received the Alumni Award for an outstanding paper based on Ph.D. research. Christina is co-advised by Paul DeMott and Sonia Kreidenweis. Aryeh received the Riehl Memorial Award for an outstanding paper based on M.S. thesis research. Aryeh is advised by Sue van den Heever.

Both Christina and Aryeh first came to CSU as CMMAP summer interns. Christina is one of a handful of students who have received both the Riehl and Alumni awards.

# STUDENT AND STAFF NEWS

## Student Fellowships, Awards and Recognition

Alumni Award	Christina McCluskey
American Meteorological Society Graduate Fellowship	Zach Bruick, Kathryn Moore
Assisting Students, Cultivating Excellence, Nurturing Talent (ASCENT) Award	Jared Brewer
David L. Dietrich Award	Peter Marinescu
Department of Energy Computational Science Graduate Fellowship	Ben Toms
Department of Energy Office of Science Graduate Student Research Award	Christina McCluskey
Engineering Graduate Teaching Fellowship	Aryeh Drager, Zitely Tzompa
Fulbright Scholarship	Jhordanne Jones
Herbert Riehl Memorial Award	Aryeh Drager
Liniger Honor, Service and Commitment Scholarship	Ryan Riesenber
MAC Travel Award	Zach Bruick, Eleanor Delap, Kyle Nardi, Ben Toms, Justin Whitaker, Samantha Wills
National Center for Atmospheric Research (NCAR) Advanced Studies Program Postdoctoral Fellowship	Christina McCluskey
National Science Foundation Bridge to the Doctorate	Jon Martinez
National Science Foundation Graduate Research Fellowship	Sean Freeman, Peter Marinescu, Erik Nielsen
Outstanding Student Paper Award at the 2016 AGU Fall Meeting	Stephanie Henderson and Brandon Wolding
First Place Student Presentation Award at the 2017 AMS Annual Meeting	Christina McCluskey, Ben Toms
Program of Research and Scholarly Excellence (PRSE)	Jhordanne Jones and William McNichols
Rocky Mountain States Section of Air and Waste Management Association Scholarship	Yixing Shao
Shrake-Culler Scholarship	Samantha Wills
SoGES Global Sustainability Leadership	Alexandra Naegele
Student Council Travel Award	Leah Grant
Walter Scott, Jr. Fellowship	Kevin Barry, Zach Bruick, Kirsten Mayer, Kathryn Moore, Jhordanne Jones, Chelsea Nam

# STUDENT AND STAFF NEWS

## Jared Brewer uses ASCENT award to do cutting-edge research

Jared Brewer, advised by Emily Fischer and A.R. Ravishankara, was awarded an ASCENT travel fellowship in March 2017. The fellowship supported his two-month stay last summer in Orleans, France, where he studied atmospheric chemistry at a unique research facility. The Department of Atmospheric Science Assisting Students, Cultivating Excellence, Nurturing Talent (ASCENT) program was founded in fall 2014 to help enrich the graduate experience. One component of ASCENT is an international travel grant that allows students to pursue opportunities for research outside the U.S. ASCENT is supported by donations from alumni and friends of the department.

With the support of the ASCENT award as well as an additional EUROCHAMP-2020 research grant, Jared spent his time at the Institut de Combustion Aérothermique Réactivité et Environnement (ICARE), a CNRS laboratory in Orleans, investigating the quantum yields of the carbonyl species, Methyl Ethyl Ketone (MEK). Like acetone, MEK is important in atmospheric chemistry because it has a sufficiently long lifetime (5 days in the case of MEK) to be lofted into the upper troposphere. Jared performed outdoor chamber experiments using natural sunlight to measure rates of MEK photolysis as well as bench-top experiments to measure UV absorption cross-sections of MEK at atmospherically relevant wavelengths and temperatures. This data will help improve the modeling of these compounds, and therefore our understanding of the upper troposphere radical budget, upper troposphere ozone production, and lifetimes of pollutant and greenhouse gases.

In Orleans, Jared worked with his advisor, Ravishankara, as well as the director of ICARE, Abdelwahid Mellouki. The work enhanced his graduate research experience by giving him the opportunity to get practical research knowledge in a laboratory setting, rather than solely through computer modeling.

“As someone with no chemistry lab experience prior to this study, the opportunity to do cutting-edge research using a one-of-a-kind atmospheric chamber was hugely valuable to my progress as a researcher,” Jared said. “The insights into experimental methods that I gained by first-hand laboratory experience will make me a better modeler and more



From left, Abdelwahid Mellouki, Jared Brewer and A.R. Ravishankara at ICARE in Orleans, France.

complete atmospheric chemist going forward.”

Ravishankara said the ASCENT program benefits both the visiting student and host scientists.

“ASCENT is an amazing catalyst that enables our students to experience a very diverse and different learning environment and produce cutting-edge science. Not only did Jared learn from his experience by doing experimental work, he also gave a lot to the students and post-docs in Orleans by teaching them how to use the Master Chemical Mechanism codes (MCM),” he said.

Ravishankara added that there are other, intangible benefits to the program:

“The social aspect of this is immeasurable. I am sure that this two-month stay will be with Jared for life, and the people in Orleans got a lot from his presence there – an experience they will keep forever. It really builds international collaboration and cooperation.”

## Maria Silva Dias chosen as 2017 ATS Outstanding Alum

Prof. Maria Assunção Faus da Silva Dias of the University of Sao Paulo, Brazil, was selected as the 2017 CSU ATS Outstanding Alum. Maria received her Ph.D. from CSU's Department of Atmospheric Science in 1979. She was the first woman to graduate with a Ph.D. from the program.

Following her bachelor's degree, Maria was tasked with developing the recently created Department of Meteorology at the University of Sao Paulo. Maria, along with her husband, Pedro da Silva Dias, came to CSU in 1975 to pursue graduate studies in the department. Following completion of her Ph.D., Maria returned to Brazil and served as one of the main pillars in the development of that country's best atmospheric science undergraduate and graduate programs.

Maria is well known for her atmospheric science research in Brazil and internationally. She has led numerous major field campaigns in Brazil, especially in the Amazon. Many of these have focused on improved understanding of the complex coupling between forest landscapes and rivers, aerosols and biomass burning, clouds and precipitation, and South American climate. Her research has examined mesoscale circulations and cloud and rain organization, the role of clouds in transporting gases and particles, the diagnosis of severe storms in Brazil, and effects of climate change on precipitation.

Maria has served as president of the Brazilian Meteorological Society, is a fellow member of the Brazilian Academy of Science and an AMS fellow, among other acknowledgments. In addition to her academic leadership at USP, Maria served for several years as director of the Center for Weather Forecasting and Climate Studies of the Brazilian National Institute for Space Research.

### **A note from Maria:**

I thank the CSU Department of Atmospheric Science for the great honor of being selected as 2017 CSU ATS Outstanding Alum!

The subject I will present here is how I see a bit of the history of tropical meteorology in moving from chaos to order.



The advent of satellite images in the 1950s provided the first clues that there might be some sort of order in tropical weather systems. As opposed to weather in mid-latitudes where frontal systems were seen as the main cause of changing patterns of rainfall and temperature, weather in the tropics resembled chaos. Except for tropical cyclones and hurricanes, the changing rainfall patterns were seen as random manifestations of nature.

From a large-scale point of view, Herbert Riehl was the first to point to the role of cumulonimbus clouds, the so-called hot towers, in being fundamental to maintain the Hadley circulation. The paper describing the role of tropical cumulonimbus in transporting latent and sensible heat was published in the late 1950s. Today, about 60 years later, we take for granted that the tropical easterly waves, the

*Continued on page 12*

## Updates from Alumni

**Bob Grossman** (Ph.D. '73) remains active in atmospheric research since retirement in 2002 from the University of Colorado Atmospheric and Oceanic Sciences Department. He is finishing a project to characterize the evaporation potential for the major Colorado River Basin reservoirs and recently started a project involving the impact of the cooling of the Arabian Sea on off-shore convection and its influence on the large-scale dynamics of the South West Monsoon.

**Jim Fleming** (M.S. '73) will present the Tyndall History of Global Environmental Change Lecture sponsored by the Global Environmental Change Focus Group at the American Geophysical Union annual meeting in New Orleans this month. His topic is "Gordian Knots of Prevision: The lessons of history."

**Margie Klitch** (M.S. '82) founded and runs Klitch Environmental, specializing in air quality modeling and permitting. She also has been secretary of the Air & Waste Management Association's Rocky Mountain States Section since 2012. She lives in Fort Collins and has three grown children.

**Dave Matthews** (M.S. '71, Ph.D. '83) published his first book, *Weather or Not: Meteorological Decision Sources - Make your own weather and climate related decisions*, on Amazon.com. He also visited the Environmental Agency of the Republic of Slovenia's new state-of-the-art radar facility and automatic weather station.

**Frank P. Kelly** (M.S. '83, Ph.D. '88) is director of the USGS Earth Resources Observation and Science (EROS) Center in Sioux Falls, SD, and the 2017 Chair of the Committee on Earth Observation Satellites (CEOS). He chaired the 31st Plenary of CEOS, where representatives from 60 national and international agencies with over 150 active satellites worldwide met in Rapid City, SD, to promote international collaboration to make satellite data ready for systematic analysis.

**Tom Greenwald** (Ph.D. '94) was recently awarded a 2-year NASA grant for the Joint Center for Satellite Data Assimilation (JCSDA) to investigate ways to improve the speed and efficiency of radiative transfer models used in global forecast systems that assimilate satellite observations of clouds and precipitation.

**David O. Blanchard** (M.S. '83, Ph.D. '94) retired in 2014 after almost four decades (1976-2014) as a meteorologist with NOAA, NCAR and OU/CIMMS with a focus on thunderstorms, tornadoes and mesoscale convective systems. Despite retirement, he still found time to be a forecaster for PECAN in 2015. He currently lives in Flagstaff, AZ, where they "most definitely have four seasons."

**Carl McElroy** (M.S. '96) was a Senior Forecaster at the Guam Weather Forecast Office from 2004 until March of 2016, when he transferred to the Tropical Analysis and Forecast Branch of the National Hurricane Center, where he is working as a Journeyman Forecaster.

**Liz Page** (M.S. '90, Ph.D. '07) is the new director of the COMET Program, part of the UCAR Community Programs. She also serves on the Board of Directors for the National Weather Association Foundation.

**Katie Boyd** (M.S. 2011) has earned a second master's degree in ecology, with a focus on science education and communication research. She now works as a research coordinator at the Exploratorium science museum in San Francisco.

**Caitlin Fine** (M.S. 2015) is a lieutenant in the U.S. Navy and serves as a Typhoon Duty Officer at the Joint Typhoon Warning Center in Pearl Harbor, Hawaii, providing tropical cyclone forecasts and products for systems in the Pacific and Indian Oceans, and tsunami decision support to Department of Defense assets worldwide.

## Updates from Alumni

**Vandana Jha** (Ph.D. 2016) received a NASA Post-Doctoral Program fellowship award (2016-19). She works at the NASA Ames Research Center in Mountain View, CA. Her research is on evaluations of global model predictions of dust and water cycle interactions on the climate of Mars and investigating the role of cloud formation processes on dust deposition, vertical distribution and lifting.

**Gavin Roy** (Ph.D. 2016) served as a Portuguese translator in the Departamento de Ciências Atmosféricas at the University of São Paulo and founded a YouTube channel that teaches English to Brazilians. SmallAdvantages is now the largest English-language YouTube channel in Brazil, with over 1 million subscribers.

**Leah Lindsey** (M.S. 2016) is an ORISE participant in the Large Marine and Aviation Center at the U.S. EPA Office of Transportation and Air Quality in Ann Arbor, MI.

## A note from Outstanding Alum Maria Silva Dias, continued

*Continued from page 10*

Madden and Julian oscillation, and tropical-extratropical interactions provide some degree of predictability to the tropics. What were the main turning points in this process and what can we learn from the past to draw a path to the future?

Predictability of weather in the tropics was not really a major concern until the impact that it could have on weather in mid-latitudes was seen as a result of the theory of chaos proposed in the late 1960s. When the European Center for Medium Range Weather Forecast was created in the late 1970s, medium range forecasts had as a baseline a global model that had to work well everywhere, including the tropics, where the origins of disturbances in the second week of forecast could be found.

In the late 1960s and 1970s several field campaigns were devised to measure and quantify the cloud scale interaction with the large scale in the tropics. Starting in the Western Pacific islands and moving on to the Tropical Atlantic, the results of these field campaigns were an understanding of the role of an ensemble of clouds in the evolution of the large scale and also the large-scale control on the cloud scale. Theories that formed the basis of cumulus parameterization for use on numerical models were the main outcome. We can say for certain that without cumulus parameterization, it would have been impossible to improve weather forecasting in all latitudes, but it also meant that

there was some hope to understand and model the weather in the tropics.

When we look at high-resolution satellite loops over tropical regions, say the Amazon Basin during the wet season, we still ask the question: is there some organization that is happening in smaller scales? Is there some hidden order that we are not capturing? Satellite cloud loops, with very high resolution, indicate obvious controls on cloud organization related to topography, to land-water boundaries and to landscape transitions. But there are developments that seem to be related to previous convective activity that the very high-resolution models still cannot predict. Large-scale waves and the interaction with convection provided a considerable improvement in understanding the weather in the tropics that translated into better, although far from perfect, predictions. When convection is active, the local perturbations are carried out by fast-moving three-dimensional internal gravity waves. Is that what we are missing in the initial conditions of numerical models?

It was said in the past that there is no hope in improving rainfall forecasts on a smaller scale in the tropics because of the very nature of small-scale convection, non-linear and chaotic. Is there some order hidden in the evolution of sets of internal gravity waves triggered by clouds that our observations are not capturing? What can the new observations tell us about the lifecycle of cloud ensembles? This is a present-day, long-term challenge of tropical meteorology.

## Nolan Doesken retires after 11 years as state climatologist

Nolan Doesken retired in August after 40 years of service to CSU, 11 of those as Colorado's state climatologist. He was recognized by the department with a retirement celebration Aug. 9 that brought former department members, National Weather Service employees, and state and local officials to ATS campus.

Nolan's impact as state climatologist was lauded on local, state and national levels. The American Association of State Climatologists wrote a letter of thanks to Nolan that was read by Becky Bolinger. Taryn Finessey from the Colorado Water Conservation Board read a letter from Gov. John Hickenlooper, thanking Nolan for his service and expertise in helping to craft a leading drought mitigation plan.

Nolan thanked Professor Emeritus



**Nolan Doesken spent his last day on the job assembling hail pads.**

and former State Climatologist Tom McKee and others who were not in attendance for hiring him for the position of assistant state climatologist, even though, he claimed, he was "not qualified." Nolan said the job description called for five years of

mountain meteorology experience, and he had about 19 days experience in the Colorado Rocky Mountains.

Though his love for weather may have started in his home state of Illinois, Nolan has made a name for himself and deep connections in Colorado, where he has long been known as the top authority on the state's weather and climate. Nolan's legacy includes CoCoRaHS, the Community Collaborative Rain, Hail and Snow network, which was born in the aftermath of the 1997 Fort Collins flood. CoCoRaHS volunteers record and report daily precipitation amounts and significant weather events. The program has expanded to every state in the U.S., Canada and the Bahamas, counting more than 20,000 volunteers.

We thank you for your service and wish you the best in retirement, Nolan!

## Russ Schumacher selected to lead Colorado Climate Center

CSU Atmospheric Science Associate Professor Russ Schumacher has been chosen as the next Colorado State Climatologist and director of the Colorado Climate Center. His appointment began Oct. 6. Russ maintains his academic position while taking on the added, vast responsibility of key statewide climate expert and spokesperson.



Russ brings an extensive research background, teaching prowess, and intimate familiarity with Colorado's climate to his new position. In his role as state climatologist, Russ will be a key resource to public and private

stakeholders within Colorado and beyond as they seek expert information regarding the weather and climate of the state. He will lead the Colorado Climate Center, the CSU-based office that provides climate monitoring and research for the benefit of scientists, educators and the general public. The center's long list of activities includes drought monitoring for the National Integrated Drought Information System; operation of the Colorado Agricultural Meteorological Network; and administration of the Community Collaborative Rain, Hail and Snow Network.

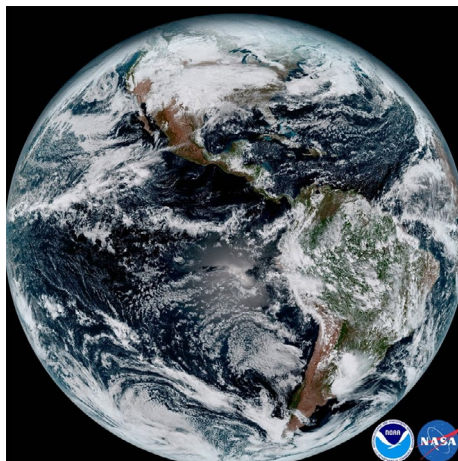
Coming from the academic side of weather and climate, Schumacher hopes his dual role can forge stronger connections between the department and the activities of the climate center. That might include more integration of department graduate students with climate center outreach and research, for example.

Schumacher's CSU and Colorado roots are well established. He first came to Colorado as a graduate student in the department in Fall 2001, completing his M.S. in 2003 and Ph.D. in 2008. He became a faculty member in 2011 following a postdoctoral stint at the National Center for Atmospheric Research in Boulder and two years as an assistant professor at Texas A&M.

## CIRA satellite imaging team wins CO-LABS Governor's Award

CIRA team and ATS alumni Steven Miller, Curtis Seaman and Dan Lindsey have been recognized with the CO-LABS Governor's award for high impact research. This highly competitive and prestigious award was given in recognition of the team's development of an algorithm allowing data from the new GOES-16 satellite to be turned into true-color imagery – a breakthrough that symbolizes a new era in what we can see from geostationary satellites. The award was presented to the team by Gov. John Hickenlooper at an Oct. 5 gala at the Denver Museum of Nature and Science.

The Advanced Baseline Imager (ABI) instrument aboard NOAA's GOES-16 satellite has only two visible channels – red and blue – but does not contain a green channel needed



True-color image produced by CIRA

to make a complete full-color image. The CIRA team devised a novel technique to generate a synthetic green channel using additional ABI data, restoring true-color capabilities to the satellite. This allows for vivid, intuitive color imagery that is vital for

operational forecasters and the public to relate satellite imagery to everyday experiences.

True-color imagery from GOES-16 has been used by NOAA and NASA to improve forecasting capabilities, as well as to capture the imagination of the public by providing stunning images of our home planet from space.

Steven Miller (Ph.D. 2000) is the Deputy Director of CIRA, where Curtis Seaman (Ph.D. 2009) works as a research scientist. Dan Lindsey (Ph.D. 2008) also is based at CIRA, where he works for the NOAA Regional and Mesoscale Meteorology Branch. CO-LABS is a nonprofit organization dedicated to informing the public about breakthroughs and impacts from the 24 federal labs in Colorado.

## C3LOUD-Ex drones take researchers inside storm clouds

Armed with drones, weather balloons, and a healthy sense of adventure, scientists led by Sue van den Heever are peering into storm clouds as they form, in a manner never done before. Their goal: bolster prediction models with cutting-edge observational data and, ultimately, provide a clear picture of exactly how storms gather strength.

The CSU Convective CLOUD Outflows and UpDrafts Experiment (C<sup>3</sup>LOUD-Ex) and its results could one day change how forecasters call the play-by-play of storms. Supported by van den Heever's Monfort Professorship, the project's aim is to capture hard-to-collect data from thunderstorms as they're happening. Specifically, the researchers are making direct



observations of storm phenomena called updrafts and cold pools, employing a signature technology of unmanned aerial vehicles, or drones.

Needing to get ahead of storms as they were forming, the field campaign last spring tracked daily weather minute by minute, employing the help of a forecasting and operations team at the CSU-CHILL radar facility

in Greeley. A sub-team was in charge of launching weather balloons the morning of each field day to get a read on the region's storm potential. Guided by their observations, the forecasting and operations team, and a little bit of luck, C3LOUD-Ex covered thousands of miles throughout northeastern Colorado, southern Wyoming and sometimes Nebraska. They raced ahead of storms so they could be in the right place at the right time.

With the field campaign wrapped up, van den Heever is now leading analysis of the data. They're hoping for definitive insights into how updrafts and cold pools impact storm intensity, and the subsequent severe weather they produce.

# RESEARCH

## Press calls on ATS for expertise during active hurricane season

2017 has been a record-breaking year for storms with many significant landfalls. From Franklin to Ophelia, ten hurricanes developed in 10 weeks, consecutively, tying a record from 1893 for most hurricanes in a row.

Of the 10 hurricanes, five of them became major — Category 3 or stronger on the Saffir-Simpson scale — and three were present in the Atlantic for more than 12 days. The season produced two Category 5 hurricanes, Irma and Maria. Only five other known seasons have had two or more Category 5s, the most recent of which were 2005 and 2007. This is the first season on record with two Category 4 continental U.S. hurricane landfalls (Harvey and Irma).

With such an active hurricane season, the press turned to ATS experts for insight. CSU was mentioned more than 9,000 times in media outlets around the world, commenting about the hurricane season. Philip Klotzbach, primary author of the seasonal forecasts, logged 36 hours of phone interviews with the media from late August to late September. He also garnered 30 million Twitter impressions and picked up 9,000 followers on Twitter. Tropical



GOES-16 full-color image by RAMMB/CIRA

Meteorology Project co-author Michael Bell also gave several interviews, and so did Kate Musgrave, Chris Slocum, Andrea Schumacher and John Knaff. GOES-16 full-color satellite imagery, developed by CIRA, was featured regularly throughout the storm coverage.

## SEA-POL, world's most advanced shipborne radar, deployed

In mid-October Professor Steven Rutledge led a CSU team on a five-week research voyage to the intertropical convergence zone near the equator, where they tested a new weather radar. After more than two years of planning and construction at the CSU-CHILL National Radar Facility in Greeley, the team deployed the most advanced shipborne radar in the world.

SEA-POL (short for “seafaring polarimetric”) was built through a \$1.3 million grant from the National Science Foundation awarded to Rutledge and V. “Chandra” Chandrasekar, professor in CSU’s Department of Electrical and Computer Engineering. The ship deployment was funded by an additional \$300,000 from NASA and



Members of SEA-POL team with radar

the National Science Foundation. The SEA-POL mission is part of a larger NASA experiment to understand the fate of rainwater that falls on the sea surface.

The SEA-POL radar uses pulsed

microwave energy to measure ocean rainfall over an approximately 75-mile radius. Its signature technology is called dual polarization, which transmits both horizontal and vertical electromagnetic waves to collect rainfall estimates and other detailed information about clouds. The deployment of SEA-POL is the first U.S.-based experiment using dual polarization shipborne radar.

Dual polarization was jointly pioneered in the 1990s by CSU scientists at CSU-CHILL and researchers at the National Severe Storms Lab in Oklahoma. Today, dual polarization is used in more than 150 ground-based radars operated by the National Weather Service and is instrumental in modern severe-weather forecasting.



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# OUTREACH

## FORTCAST hosts inaugural Colorado Weatherfest at ATS

Fort Collins Atmospheric Scientists (FORTCAST) hosted the inaugural Colorado Weatherfest on June 24 at the Department of Atmospheric Science. Featuring a weather balloon launch and drone demonstration, the event – open to all ages – was intended to introduce weather and climate principles through hands-on activities.

Dozens of scientists from across Colorado participated, including representatives from the department, the Cooperative Institute for Research in the Atmosphere (CIRA), Colorado Climate Center, Earth System Modeling and Education Institute (ESMEI), CSU's Little Shop of Physics, the Denver-Boulder National Weather Service, WeatherNation, Ball Aerospace, Center for Severe Weather Research, and the University of Colorado Department of Atmospheric and Oceanic Sciences.



Weatherfest featured a weather balloon launch.