



AOS & CICS Newsletter

Fall 2017

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Griffies Elected Fellow of AGU

AOS Faculty Member Stephen Griffies, a physical scientist in GFDL's Climate Sensitivity and Processes Group, has been elected a Fellow of the American Geophysical Union (AGU), the world's largest Earth and space science society. Griffies was cited for his "exceptional and sustained contributions to the understanding of large-scale ocean circulation and physics and seminal advances in ocean modeling." Every year, the AGU Fellows program recognizes members whose visionary leadership and scientific excellence have fundamentally advanced research in their respective fields. Griffies will be among [new fellows](#) honored at the 2017 AGU Fall Meeting in New Orleans in December.



AOS Faculty Member Stephen Griffies, a GFDL physical scientist

"AGU Fellows are recognized for their scientific eminence in the Earth and space sciences. Their breadth of interests and the scope of their contributions are remarkable and often groundbreaking," the announcement read. "They have expanded our understanding of the Earth and space sciences, from volcanic processes, solar cycles, and deep-sea microbiology to the variability of our climate and so much

more." Vetted by a committee of AGU Fellows, honorees represent no more than 0.1 percent of AGU's 60,000 members.

"I am honored and humbled to be elected a fellow of the AGU," Griffies said. "It is deeply satisfying to have one's research recognized through such an esteemed award."

Griffies' research activities include understanding the ocean's role in the global climate system, with special emphasis on Atlantic and Southern Ocean dynamics, sea level, and tracer transport; formulating subgrid-scale parameterizations for turbulent ocean stirring and mixing processes; elucidating novel analysis methods of use for comprehending the ocean as a turbulent fluid with multiple flow regimes; developing consistent numerical algorithms for ocean circulation models; and teaching the fundamentals of geophysical fluid mechanics.

Griffies is active in ocean and climate model development and analysis at GFDL, having co-chaired working groups charged with building IPCC class climate models for the past 17 years. Internationally, he chaired the CLIVAR Working Group on Ocean Model Development (WGOMD); was a member of the CLIVAR/CliC/SCAR Southern Ocean Region Implementation Panel; and presently is a member of the CLIVAR Scientific Steering Group. In 2013, Griffies was awarded the Department of Commerce Silver Medal Award along with nine other GFDL scientists for the development and application of NOAA's first comprehensive Earth System Model that couples the carbon cycle and climate for projection of changes.

Griffies has authored more than 100 scientific publications; contributed to dozens of scholarly journals; written a monograph of ocean climate model

Program in Atmospheric and Oceanic Sciences (AOS) & The Cooperative Institute for Climate Science (CICS)

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<https://transportation.princeton.edu/sites/default/files/inline-files/ForrestalFall2017.pdf>

fundamentals in 2004; and co-edited a volume summarizing the state-of-the-science in ocean climate science as of 2013. In 2014, Griffies was awarded the Fridtjof Nansen Medal by the European Geosciences Union (EGU) “for his outstanding contribution and leadership in ocean general circulation model development and critical insights in the physical nature and parameterization of ocean processes.” In 2012, he was awarded the NOAA Administrator’s Award for scientific vision, leadership, and development of the Modular Ocean Model (MOM4 and MOM5). More recently in 2017, he was recipient of another NOAA Administrator’s Award in recognition of the scientific leadership for the innovation of the versatile community-based Modular Ocean Model MOM6, along with AOS Faculty Member Bob Hallberg.

This past spring, Griffies took part in an eight week cruise on the British *Royal Research Ship (RRS) James Clark Ross* to the Orkney Passage and Scotia Sea, as part of the Dynamics of the Orkney Passage Outflow (DynOPO) project.

Griffies currently teaches AOS 571: Introduction to Geophysical Fluid Dynamics. He holds a Ph.D. in Theoretical Physics from the University of Pennsylvania. He earned his M.S. in Engineering Sciences & Applied Mathematics from Northwestern University and B.S. in Chemical Engineering from Louisiana State University. ■

**GFDL SCIENCE
SYMPOSIUM
NOVEMBER 2ND
8:30 AM TO 5:30 PM**



GFDL Fall Science Symposium to Highlight Next Generation Models

Contributed by Maria Setzer, GFDL Communications Director

The AOS community is invited to a GFDL Science Symposium on Thursday, November 2, 2017 at Princeton University. The Symposium will highlight scientific findings from the lab’s latest research and modeling activities, with emphasis on the integrative aspects of GFDL’s ongoing research. GFDL and AOS/CICS scientists will discuss the development of next-generation models for advancing scientific understanding of the Earth system and for improved predictions and projections across timescales.

The program will begin with a session featuring presentations about GFDL’s dynamical core (FV3), as well as land, atmospheric, and ocean modeling efforts. The subsequent session will focus on coupled interactions, starting with an overview of GFDL’s latest climate (CM4) and Earth system models (ESM4). A panel discussion about model biases is planned.

In the afternoon, the focus will shift to earth system processes. Presenters will discuss atmosphere-land interactions first, followed by ocean and cryosphere interactions. The symposium will culminate in a panel discussion about GFDL’s efforts to unify modeling of weather, climate, and earth systems for predictions across time scales. GFDL Director V. Ramaswamy will offer closing remarks.

The Symposium will be held at Taylor Auditorium in Princeton University’s Frick Chemistry Building on Washington Road, from 8:30 a.m. to 5:30 p.m. Video streaming is available for remote viewers who register in advance. Please see: <https://register.gotowebinar.com/register/1499966243357403393>. ■

CICS Summer Internship: Broadening Participation in Climate Science

For most students, summer is a time to relax and decompress from the demands of classes, but for many others, summer is also a time to explore interests outside of the classroom. This summer seven students from diverse backgrounds traveled to the Forrester Campus to participate in the Cooperative Institute for Climate Science (CICS) Research Internship Program, a venture initiated in the summer of 2016 to broaden participation in climate science.



2017 CICS Summer Interns: (L to R) Caroline Cardinale, Katie Boaggio, Mick Lee, Daniel Lloveras, Sarah Nickford, Stephanie Lin & Haylie Mikulak

In collaboration with NOAA’s Geophysical Fluid Dynamics Laboratory (GFDL), CICS recruited both undergraduate and graduate students for 8-10 week paid research internships in atmospheric, oceanic and earth system science. Under the mentorship of their GFDL/AOS host, students worked on a focused scientific problem while reaping the benefits of GFDL’s many scientific and technical resources, including access to high performance computing and library facilities. These collaborations gave students professional experience beyond their normal coursework, especially valuable in the field of climate science because of its interdisciplinary nature. Project hosts not only provided insight into the breadth and technical details of science projects, but also explored the value of the research and its broader impact.

The summer program also provided ample opportunity for valuable interaction with scientists and graduate students and for interns to participate in a wide range of seminars and lab social events. The 2017 program included four group lectures, a tutorial on Python led by AOS Postdocs Andrew Shao and Anders Damsgaard, a graduate school information session led by AOS Faculty Member Larry Horowitz and several additional presentation sessions, according to CICS Associate Director Sonya Legg. Graduate students and postdocs served as secondary mentors to help the interns navigate the Princeton/GFDL culture.

Projects were solicited from GFDL staff and the CICS Research Internship Committee, comprised of GFDL Deputy Director Whit Anderson, John Dunne, a GFDL research oceanographer, and AOS Faculty Members Sonya Legg and Yi Ming. Research areas included blocking and winter cold temperature extremes in the United States; climate and commerce; evaluation of the simulated global monsoon in GFDL models; investigating the role of iron on marine ecosystems in GFDL Earth system model simulations; mixing in the Southern Ocean; and recording computational metrics for a GFDL CMIP6 climate model.

The program which aims to increase the diversity of students involved in climate science, by including promising first-generation college students and students from underrepresented backgrounds, echoes a wider movement aimed at developing stronger pathways for broadening participation in STEM disciplines. For students who experience the collaborative and empowering culture of science in GFDL's rich research environment, the opportunity can have a transformative impact.

CICS intern Daniel Lloveras, a senior at the University of Miami majoring in Meteorology and Applied Math, found the internship to be "an awesome learning experience," broadening his horizons beyond the research available at his home institution, and giving him an understanding of the collaborative teamwork involved in NOAA research. Lloveras worked with Xiaosong Yang, a UCAR project scientist housed at GFDL, on a project that concerns the precipitation in the Great Plains and its relationship to the lower level jet, using the GFDL model

FLOR. He is planning to apply to graduate school next year, and beyond that would be very interested in working in a NOAA lab or for another federal agency, he said.

While in Princeton this summer, Katie Boaggio, a CICS intern and recent graduate of The College of New Jersey (TCNJ), became interested in research that connects climate variability with impacts on weather, such as extratropical cyclones. Her internship project involved examining the statistics of extratropical cyclone tracks in models and observations, under the supervision of Shannon Rees, a programming scientist at GFDL employed through Engility. Boaggio "enjoyed finding out what work at a government lab entails" and said that she would definitely recommend anyone thinking about working at a NOAA lab to try an internship first.

"Intern hosts and mentors seem to enjoy the summer as much as our interns, who bring enthusiasm and a renewed energy to the lab," said Legg. "The program is an especially effective way to invest in and prepare a talented, diverse group of students for participation in climate-related sciences."

In the final weeks of the internship, students had the opportunity to present their summer research to the GFDL/AOS/CICS community, the culminating event of the experience. Building on the success of the first two years, the program will continue again next year. ■

AOS Alum Geeta Persad Co-Recipient of \$1.5 Million NSF Grant

AOS Alum Geeta Persad, Ph.D. '16, a postdoctoral research scientist at the Carnegie Institution for Science, is co-recipient of one of nine National Science Foundation grants for research on how humans and the environment interact. Persad works with Ken Caldeira, a co-recipient of the award, on global climate effects of localized air pollutants in Carnegie's Department of Global Ecology on the Stanford University campus.



Geeta Persad, a 2016 AOS alumnus

The co-investigators ultimately aim to help countries optimize how they meet their commitments under the Paris Agreement by focusing on short-lived air pollutants, which are co-emitted by many of the same processes that emit the longer-lived carbon dioxide that is the main focus of most countries' Paris commitments. Short-lived pollutants, like soot, affect both climate and air quality and have their own local impacts on human health and agriculture productivity.

"Unlike most of the effects of carbon dioxide, many of the climate and health impacts of shorter-lived pollutants are felt more strongly close to their emissions source" explained Persad, who will be spearheading Carnegie's participation. "This also means that the benefits of mitigating short-lived pollutant emissions can be gained closer to home too, which can allow countries to maximize the local benefit that they get alongside the global benefits of their carbon dioxide reductions."

As part of an overall team-wide goal of understanding the intertwined dynamics of long- and short-lived emissions – both in the environment and in the world of policymaking – Persad and Caldeira will use global atmospheric models to simulate how short-lived pollutants from different sectors and different countries get transported through the atmosphere and the distribution and strength of their climate and air quality effects.

Although long- and short-lived emissions often come from the same processes, studies do not often consider them in sum – neither when measuring how they impact the environment nor when planning mitigation strategies, according to the

researchers. The team, which is led by principal investigator Jennifer Burney and includes Marshall Burke, of Stanford Earth System Science, and Eran Bendavid, of the Stanford Medical School, will combine Persad and Caldeira's model simulations with new estimates of the health and agricultural impacts of different short-lived air pollutants. They will also explore how governments might make different policy decisions if they were to factor these localized impacts into their mitigation planning. By the end of the four-year, \$1.5 million grant, the team plans to build a simulator that will let users estimate how the different choices for carbon dioxide mitigation available to individual countries might lead to different local and global costs and benefits.

"I'm thrilled to have the opportunity to connect the new fundamental physical understanding that our simulations will hopefully reveal with the societal impacts analysis by other group members to create a policy-relevant outcome that is even greater than the sum of the parts," Persad said. "This is the sort of integrative work that my broad training at Princeton inspired and prepared me to do."

As part of this project, Persad will attend the 23rd Conference of the Parties to the United Nations Framework Convention on Climate Change this November in Bonn, Germany as an official observer for her institution. Persad hopes to learn how governments engage with scientific information in the negotiation process to understand how the team can make their research products most accessible and useful to decision-makers.

While at Princeton, Persad was advised by GFDL Director V. Ramaswamy and AOS Faculty Member Yi Ming and completed a STEP Fellowship in the Woodrow Wilson School under AOS Associated Faculty Member Michael Oppenheimer. Her work at Carnegie uses global climate models to study the role of anthropogenic aerosol particles in regional and global climate change, in order to understand how these short-lived human emissions could influence societal decision-making. She is currently focused on analyzing the relative climate impact of regional aerosol emissions to explore the climate implications of past and projected future changes in the geographic distribution of global anthropogenic aerosol emissions. ■

AOS Marks Start of Academic Year with Retreat

The AOS Program kicked off the start of the academic year with its annual retreat at Mountain Lakes House in Princeton, a relatively recent tradition originated in 2012. Held on Tuesday, September 12th, the event was attended by 30 members of the AOS community, including students, postdocs, research staff and faculty, following a morning welcome and introductory session for incoming graduate students at Guyot Hall.

With a focus on scientific dialogue, camaraderie and friendly competition, the day was packed with team-building activities designed to foster social interaction and create community among the attendees. The event also provided an opportunity for the Program to welcome its newest members --AOS Graduate Students Juho Iipponen and Houssam Yassin.

Following breakfast, participants were broken into teams for "Whodunnit," an activity in which team members were tasked with determining which of four faculty members had hypothetically smashed the GFDL computers and why. To solve the "mystery," each team visited the stations of the four faculty members, where they were introduced to their research and found relevant clues towards the identity of the guilty party and the motive. According to AOS Graduate Student Xin Rong Chua, a member of the organizational committee, some of the enlisted faculty really got into their roles and could be heard loudly proclaiming their innocence while accusing the others of being deceitful. In the end, "public opinion" was split between three of the four faculty members, and although the guilty party escaped suspicion, everyone who participated enjoyed the collaborative effort.

"We hoped that the element of mystery would facilitate interactions within the group as they discussed the various pieces of evidence, and teams certainly seemed to be engaged in solving the various puzzles and debating over the answer," said Chua.

Since AOS scientists spend countless hours at their computers, the afternoon activities

capitalized on the outdoor setting for the hands-on component of constructing "climate extremes" (separate hot and cold chambers) and building a "bridge over troubled (sea) water."



Bridge over troubled (sea) water winning team

AOS Graduate Student Sarah Schlunegger, a co-organizer of the event, explained that the goal was to create the largest temperature gradient between the chambers and build a long, strong bridge which connects the chambers. Given foil, popsicle sticks, a glue gun, ice, rubber bands, saran-wrap, construction paper, foam balls and cups, and pipe-cleaners, the teams worked furiously for one and a half hours. The largest temperature gradient created was ~60F, and the longest bridge was about two meters, and held the weight of two packages of dominoes. As for the designs, two groups harvested solar energy to create the hot box, and two groups used the heat generated by the glue gun. Rubber-band suspension bridges were constructed by two groups, and proved to be the most successful at joint optimization of length and strength.



AOS Graduate Students Rob Nazarian, Juho Iipponen and team members building a hot box

“Mostly, I think we proved that climate scientists can also be great engineers!” said Schlunegger.

To round out the afternoon, a light-hearted “talent” competition was held in which teams vied for the “AOS Program’s Got Talent” title. Groups were asked to add a climate/AOS twist to a song of their choice and perform it for their peers. “This can be thought of as a fun exercise in scientific communication, or simply viewing our scientific work from a creative angle,” Chua said. In the end, the audience favorite (based on creativity, scientific accuracy and delivery) was the group whose play on words in “I’m a coupled model” (“I’m a little teapot”) and “All the ice is melting down” (“London Bridge is falling down”) not only met the criteria, but was a source of great hilarity.

As in years past, the day’s festivities wrapped up with a friendly but competitive game of AOS-themed Apples to Apples, now cleverly renamed “Graupel to Graupel” – the wintery precipitation many outside of the atmospheric science community never heard of.

“I had a great time at the retreat,” said HoussamYassin, a first-year graduate student in AOS. “What I found to be especially enjoyable was working alongside other students and faculty to complete the various challenges that the organizers had planned for the day.”

The retreat’s organizational committee comprised of graduate students, faculty members, and staff was central to the success of the event. In addition to Chua and Schlunegger, committee members included AOS Faculty Members Stephan Fueglistaler and Steve Garner, who served on the committee every year since the inaugural event, and AOS Graduate Administrator Anna Valerio.

The 2017 retreat was a tremendous success, in large part to all those who attended. “I think the retreat achieved its goal of allowing everyone in the AOS community to have fun while interacting informally with students/postdocs/faculty, especially those that they do not encounter on a regular basis,” said Chua. “I’m also glad that everyone was very sporting, particularly the faculty enlisted as suspects.” ■

Legg Co-Leads 2017 Pattullo Conference

For early-career scientists, a little mentoring goes a long way. This principle holds true particularly for the retention of junior women in STEM fields. With this in mind, the sixth biennial Pattullo Conference was held from October 1-4, 2017 at the Airlie Center in Warrenton, Virginia.

The conference, originated in 2008 and considered the centerpiece of the Mentoring Physical Oceanography Women to Increase Retention (MPOWIR) Program, was co-led by CICS Associate Director Sonya Legg and brought together 27 junior women in the physical oceanography community and 12 senior scientists, both men and women, for two and a half days of professional development and mentoring sessions. With sunny skies overhead, the sprawling grounds of the Airlie Center provided the perfect backdrop for small research-focused group discussions, two-minute “speed mentoring” sessions, a junior scientist led Q&A, and long one-on-one chats, according to Legg.



2017 Pattullo Conference Q&A Session

“The two-minute speed mentoring is a great way for junior scientists to briefly meet every senior scientist, and is complemented by the in-depth discussion that takes place in small group and one-on-one sessions,” said Legg. “My favorite session is the Q&A when the junior scientists ask important topical questions about managing a career and life in science, and senior scientists do their best to be honest and open.”

A conference highlight was the negotiations and networking workshop led by Geri Richmond of the COACH organization, a grass-roots organization that is working to increase the number and

career success of women scientists and engineers through innovative programs and strategies. Topics included the importance of negotiation to advance research and career objectives, necessary elements of a successful negotiation, techniques for handling difficult people and conversations, and the importance of listening and appreciating different viewpoints.



Geri Richmond of the COACH organization

Through a series of exercises and role playing scenarios the workshop also provided training in effective mentoring techniques and guidelines on networking and the different types of networks that are essential for career advancement at all career levels and aspirations.

A new feature of the conference this year, Legg noted, was the introduction of several senior scientists who are using their physical oceanography PhDs outside of the traditional academic and government research careers. Included among them were Holly Dail at Climate Corporation, Veronique Bugnion at ClearlyEnergy, Inc., and Heather Deese at the Island Institute non-profit, as well as others in government policy and liberal arts teaching positions, exposing the junior scientists to the wide variety of careers available to them.

According to Legg and her co-lead organizers Colleen Mouw from the University of Rhode Island and MPOWIR Coordinator Sarah Clem, established researchers, recently graduated Ph.D.s, and graduate students were all well represented at the conference. Former AOS Graduate Student Hannah Zanoski, Ph.D. ‘16, a JISAO postdoctoral fellow at the University of Washington, was among the workshop’s participants.

“Now that MPOWIR and Pattullo conferences have been operating for a decade, we are beginning to be able to evaluate the impact of these programs,” Legg said. “A recent survey of former participants showed that of those former

participants receiving PhDs between 2006 and 2011, 34% are now in faculty positions, while 80% are in some form of university, government or non-profit research positions. MPOWIR is therefore succeeding in its goal of reducing the attrition of women from the field of physical oceanography.”

The conference was named for June Pattullo, the first woman in the United States to receive a Ph.D. in physical oceanography. Since Pattullo, the number of women obtaining PhDs in physical oceanography has dramatically increased; however, as in other science and engineering fields, the balance of female principal investigators has lagged behind. By providing transformative mentoring and networking experiences for women along the science pipeline – through conferences like Pattullo – that statistic is changing. If Legg and her MPOWIR colleagues have any say in the matter, gender equity in physical oceanography is not only conceivable but possible. To learn more, visit the MPOWIR website <http://mpowir.org>. ■

Three Graduate Students Selected for PECS Group

AOS Graduates Student Michelle Frazer, Aaron Match and Sarah Schlunegger are three of 11 recently-selected students to join the Princeton Energy and Climate Scholars Program (PECS) for a two-year fellowship beginning this fall.

Founded in 2008, PECS brings together a select group of talented and engaged Princeton Ph.D. students with wide-ranging research expertise from a broad range of disciplines. The group enhances the research experience of the scholars by encouraging them to transcend the boundaries of their fields and provides a platform for Ph.D. students working on any aspect of energy and climate research to interact, collaborate, and gain firsthand understanding of research areas outside of their own disciplines. The group is student-led, though a core group of faculty provides supervision and sponsorship.



Students meet once a month to share research results and to introduce their work to one another. In these informal discussions, students often probe topics that are remote from their own research. They also meet a second time each month over dinner with the PECS faculty board. These dinners either highlight the research of a faculty board member or dovetail with outside visitors' time on campus. PECS fellows also participate in several outreach initiatives, including participating in career-oriented and science-education based events at high schools and other local colleges. At the end of the year, the students engage in a collaborative project where each student has an opportunity to contribute their own expertise and insight.



AOS Graduate Student Michelle Frazer

Frazer's research focuses on the role of clouds in the climate system, a chief source of uncertainty in climate modeling. She uses idealized and complex atmospheric general circulation models to isolate physical mechanisms connecting moisture distributions and clouds and improve understanding of cloud effects. She is also pursuing a certificate in Science, Technology, and Environmental Policy (STEP) as a STEP-PEI fellow. Her STEP project is considering the policy implications of regional climate responses to stratospheric aerosol albedo modification, a form of solar geoengineering. Frazer is advised by AOS Faculty Member Yi Ming.



AOS Graduate Student Aaron Match

Match, who is advised by AOS Director Stephan Fueglistaler, studies the global circulation of Earth's atmosphere, with a focus on how interactions among radiation, dynamics, and chemistry lead to variability in the stratosphere. He seeks to apply understanding of the stratospheric response to different forcings – from theory and idealized climate model simulations to observational records from satellites and reanalysis datasets – in order to advance theoretical understanding of the stratospheric response to forcings, gain insights into the stratospheric dynamics of idealized climate models, and constrain observed stratospheric variability.



AOS Graduate Student Sarah Schlunegger

Schlunegger's work uses Earth System Models to predict the timing, sequence and inter-dependence of emerging anthropogenic signals in the ocean, with a focus on the ocean's acquisition of anthropogenic carbon and heat. The ocean provides a climate service by absorbing the atmosphere's excess carbon and heat but at a cost, namely acidification and warming which deteriorates marine habitats. Her primary research goal is to identify when and where changes in these heat/carbon sinks and their resulting impacts will be detectable in the ocean. She is advised by AOS Faculty Member Jorge

Sarmiento, George J. Magee Professor of Geosciences and Geological Engineering.

Frazer, Match and Schlunegger join an outstanding group of AOS PECS alumni, including Jane Baldwin (2014-2016), Spencer Hill (2012-2013), Joe Majkut (2011-2013), Geeta Persad (2011-2013), Ilissa Ocko (2010-2011), and Ian Lloyd (2009-2011). To date, 90 graduate students representing 17 Princeton departments and schools have participated in PECS. ■

QUEST Summer Program Extends Outreach

“It is food for a teacher’s soul to come and be revitalized,” said a participating teacher of the QUEST summer institute held on Main Campus from July 10-14, 2017. The Cooperative Institute for Climate Science (CICS) co-sponsored the longstanding institute, a summer professional development program designed for teachers of grades K-8 to deepen their content knowledge in science through self-directed investigation and hands-on laboratory experiments.



L to R; SOCCOM Project Manager Roberta Hotinski & Quest Instructor Steve Carson

Led by content experts Steve Carson, a middle school teacher and former GFDL researcher, and Danielle Schmitt, manager of the Geosciences undergraduate lab, teachers learned about the many important roles the ocean plays in our climate and how to translate the science for their classrooms in line with the Next Generation Science Standards (NGSS), newly adopted in New Jersey. Participants performed experiments as well as discussed pedagogy and underlying content

with colleagues and the faculty, developing skills for instructing inquiry based science.

Teachers explored isotope fractionation and the rainout effect, using fossils in sediment cores as a climate proxy, and the greenhouse effect, according to Anne Catena, director of professional development initiatives in Princeton’s Program in Teacher Preparation. Together, they worked to better understand the effect of warming ocean temperatures on organisms and ecosystems; the ocean’s role in mediating the climate; heat transfer and thermal expansion of the ocean; and atmospheric and oceanic circulation and their impact on climate. The teachers also planned NGSS aligned lessons and engaged in practices of science, including developing and using models; analyzing and interpreting data, and engaging in argument from evidence.

The week-long institute, which was co-facilitated by elementary and high school lead teachers from two local districts, drew 14 teachers from seven New Jersey school districts, including Burlington Township, Hillsborough Township, Hopewell Valley, Manalapan Englishtown, Ocean City, Trenton, and West-Windsor Plainsboro, as well as three private schools. The institute provided the resources and knowledge teachers need to generate new and exciting standards-based science lessons to approximately 1700 students throughout New Jersey, among them historically underserved student populations.



Greta Shum, formerly of Climate Central and now a digital media specialist at the Andlinger Center for Energy and the Environment

Following the institute, feedback from the participants was overwhelmingly positive, according to Catena, as was the response to guest speakers SOCCOM Project Manager Roberta Hotinski and Greta Shum, formerly of Climate Central and now a digital media specialist at the Andlinger Center for Energy and the Environment, who gave an overview of the research project and its adopt-a-float program that pairs researchers at sea with classrooms on land. Participating teachers are able to return to their classrooms in the fall with confidence in their enhanced content knowledge and renewed enthusiasm for science instruction, a win-win proposition for both students and teachers.

The institute was made possible by funding from CICS, with additional support from the Program in Teacher Preparation. ■

AOS & CICS Research in Action

[This column is intended to focus on AOS & CICS research accomplishments and milestones, past, present, and future. In this issue, we highlight the accomplishments of AOS Associate Research Scholar Dan Ward who spent 2½ years in the AOS Program.]

Associate research scholar Dan Ward left Princeton in September after two and a half years with the AOS program. Dan collaborated with Elena Shevliakova, Sergey Malyshev and John Dunne on development of a fire model within the GFDL Earth system model and the coupling of fire emissions from the land surface to the atmosphere.



AOS Associate Research Scholar Dan Ward

Wildfires are often in the national news, threatening property and burning millions of acres per year in the western United States where they are projected to increase with warming temperatures. But global fire trends are less studied and our recognition of an anthropogenic signal in global fire activity is obscured by variations in natural fire drivers, such as drought. Dan worked on isolating the impacts of humans and climate on fires using model simulations to address questions of attribution and also what we can expect from future wildfires.

Simulations of the industrial time period using an updated version of the GFDL fire model showed that the early 20th century was probably a more active time period for fires than the present. Since that time, the spread of agricultural land and increased population density has reduced fire spread and the subsequent release of smoke. Dan also combined long preindustrial control simulation output with satellite and charcoal sediment data to improve our understanding of fires' response to modes of climate variability including ENSO and the Atlantic Meridional Oscillation.

Wildfires inspire compelling scientific questions because they both impact, and are impacted by, global climate. Despite their importance in both roles, the global climate modeling community had yet to produce a scheme that simulates the entire cycle from fire to smoke to impacts on climate and back to changes in the fires themselves. Together with Paul Ginoux, Dan developed a system within the GFDL ESM to complete this cycle. Smoke predicted by the land model component is injected into the atmosphere model component at an elevation that depends on the intensity of the fire. The trace gases and aerosols that comprise the smoke then interact with the model climate. In this way we are now able to simulate feedbacks between fires and climate.

Dan accepted a position as Senior Meteorologist at Karen Clark & Company, located in Boston, where he will be responsible for developing risk models of atmospheric catastrophes including European windstorms and landfalling hurricanes. The new position brings Dan back to his roots, both geographically and with regards to his education in meteorology. He plans to continue collaborations with scientists at GFDL on the role of fires both in the Earth system model and in our future climate. ■

AOS & CICS News



AOS Director **Stephan Fueglistaler** is among the ten people newly appointed to PEI's associated faculty, a group of more than 120 Princeton

professors and researchers whose work crosses into the realms of the environment, ecology, climate and energy. PEI associated faculty are based in all of Princeton's areas of study — the natural sciences, policy and the social sciences, the humanities, and engineering and applied science.

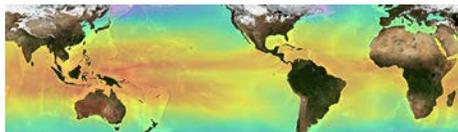


Fall 2017 GFDL Science Symposium, Thursday, November 2, 2017

GFDL will be hosting a **Fall Science Symposium** at the Frick Chemistry Building in Taylor Auditorium on **November 2nd** from 8:30am to 5:30pm.

Research Computing Day Tuesday, November 7, 2017

Open to everyone on campus, [Research Computing Day](#) is Princeton's annual showcase of computational research by graduate students and postdocs from all disciplines, plus talks by PICSciE and OIT-Research Computing staff, poster sessions and open discussions.



It's a great way to get inspired by current projects and learn about the wide array of research computing support, services, and infrastructure available to the campus community.



Posters • Talks • Performances • Art

Exhibitions • Digital Presentations

Thursday, May 10, 2018

Frist Campus Center

Apply beginning December 1, 2017.

researchday.princeton.edu

#PRD18

[How Global Warming is Drying up the North American Monsoon](#)

Researchers have struggled to accurately model the changes to the abundant summer rains that sweep across the southwestern United States and northwestern Mexico, known to scientists as the "North American monsoon." In a [study](#) published Oct. 9 in the journal *Nature Climate Change*, a team of Princeton and National Atmospheric and Oceanic Administration (NOAA) researchers, led by AOS Associate Research Scholar **Salvatore Pascale**, have applied a key factor in improving climate models – correcting for sea surface temperatures – to the monsoon. AOS Faculty Member **Tom Delworth**, GFDL Physical Scientist **Sarah Kapnick '04**, a former AOS postdoc, AOS Associate Research Scholar **Hiroyuki Murakami**, and AOS Faculty Member **Gabe Vecchi** are among the paper's coauthors.

[Ocean Dynamics May Drive North Atlantic Temperature Anomalies](#)

Although the Atlantic Multidecadal Oscillation (AMO) is well documented, the underlying mechanism that drives it is unknown and remains up for debate. In a recent study, AOS Faculty Member **Rong Zhang** presents compelling findings in support of the idea that ocean dynamics play a central role in the AMO. The [paper](#), published in *Geophysical Research Letters*, was selected for an AGU Research Spotlight, published [online](#) October 9th.

[Projected Precipitation Increases are Bad News for Water Quality](#)

Several studies show that changes in precipitation can amplify the effects of nitrogen input on coastal ecosystems. **V. Balaji**, head of the modeling system group at GFDL and Princeton, is the coauthor of a [study published July 28](#) in *Science* that examines the implication of future nitrogen loading for the future of these ecosystems, when combined with projections of future precipitation over the next decades. The authors find that future precipitation changes alone will drive large and robust increases in watershed-scale nitrogen fluxes by 2100 following the "business-as-usual" scenario for large portions of the continental United States.

Arrivals

The AOS community welcomes new graduate students: **Juho Iipponen** and **Houssam Yassin**.

Li (Alex) Zhang arrived in early September from the University of Hong Kong to work with Meiyun Lin as a postdoc.

Yujin Zeng arrived in early September from the Institute of Atmospheric Physics, Chinese Academy of Sciences to work with Elena Shevliakova as a postdoc.

Feiyu Lu arrived in early September to work Tom Delworth as a postdoc. He comes to Princeton from the University of Wisconsin, Madison.

Yohai Kaspi arrived in early September for a sabbatical. He is from the Weizmann Institute of Science and is hosted by Isaac Held.

Laure Zanna arrived in early September for a sabbatical. She is from the University of Oxford and is hosted by Steve Griffies.

Jian He, a former NRC research associate at the EPA, will be arriving in early November to work with Larry Horowitz and Vaishali Naik as a postdoc.

Yongqiang Sun will be arriving at the end of November to work with S-J Lin and Lucas Harris as a postdoc. He comes to us from Penn State University.

Hoi Ga (Veronica) Chan will be arriving in early December from the British Antarctic Survey and Royal Holloway, University of London. She will be working with Sarah Kapnick and Paul Ginoux as a postdoc.

Departures

AOS Postdoc **Nadir Jeevanjee** left the AOS Program at the end of July. He remains at Princeton, working in the Department of Geosciences as a Hess Fellow.

AOS Postdoc **Jonghun Kam** left the AOS Program in mid-August. He accepted a tenure-track faculty position at the University of Alabama, Tuscaloosa.

Colleen Petrik, an AOS associate research scholar, accepted a research faculty position at Texas A&M. She continued her affiliation with Princeton through the end of August.

AOS Associate Research Scholar **Sulagna Ray** left the AOS Program at the end of August.

Charlotte Laufkotter, an AOS postdoc, left the AOS Program at the end of August. She accepted a postdoctoral position at the University of Bern, effective November.

AOS Postdoc **Jordan Schnell** accepted a postdoc position at Northwestern University. He left the AOS Program at the beginning of September.

AOS Postdoc **Marjolein van Huijgevoort** accepted a scientific researcher position at KWR, a research institute in the Netherlands. She left the AOS Program in early September.

Marianne Haseloff accepted a postdoctoral research position at Oxford University. She left the AOS Program in mid-September.

Dan Ward, an associate research scholar, left the AOS Program at the end of September. He accepted a senior meteorologist position at Karen Clark and Company in Boston.

Jianjun Yin, who has been working with Steve Griffies since July, will end his six-month sabbatical at the end of December.

Birth Announcements

Congratulations to former AOS Postdocs **Jan-Huey Chen**, a UCAR scientist, and **Lucas Harris**, a GFDL physical scientist, on the birth of their son, Leon Honglun Lucas, on August 9, 2017.

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