AOS & CICS Newsletter

Manabe Shares BBVA Foundation Frontiers of Knowledge Award

AOS Senior Meteorologist Syukuro (Suki) Manabe will share the BBVA Foundation Frontiers of Knowledge Award in the Climate Change category in its ninth edition. He shares the award, established in 2008, with James Hansen of Columbia University's Earth Institute. Manabe and Hansen are recognized for their "fundamental contributions to the development of mathematical models of the climate system, and their pioneering use of these models to understand and project how Earth's climate responds to changing concentrations of atmospheric CO_2 and other perturbations," according to the award citation from the BBVA Foundation. "Their seminal contributions underlie the modeling and analysis frameworks in use today."

AOS Senior Meteorologist Syukuro (Suki) Manabe

In the 1960's, Manabe developed physics-based mathematical models describing the interplay between radiative and convective energy flows, and their interaction with other components of the climate system. These models allowed him to quantify the effect of atmospheric composition and solar perturbations on global temperature. In the mid-1970's, Hansen, who had been studying planetary atmospheres, adapted similar models to begin studying Earth's climate. Calculations by both researchers formed the basis for the first assessment of the sensitivity of Earth's equilibrium surface temperature response to a doubling of atmospheric CO_2. Hansen built upon these approaches to project how surface temperatures would evolve in response to time-varying perturbations. His projections, including one on when warming by CO_2 would leave the envelope of natural variability, have stood the test of time.

"Through painstaking critical analyses," the international jury remarks, "Hansen and Manabe quantified factors controlling the magnitude of the surface temperature response to external perturbations. The analysis methods they developed have become central to identifying the primary sources of remaining uncertainty in predictions of future climate change."

The award will be presented at the formal presentation ceremony of the BBVA Foundation Frontiers of Knowledge Awards on June 15, 2017 in Madrid, Spain.

Manabe joins a prestigious array of former Frontiers of Knowledge Award recipients in the climate change category, including Isaac Held, an AOS faculty member and GFDL senior research scientist, who received the award in 2012.

Manabe is a pioneer in the study of the terrestrial climate system from the standpoint of fundamental physics and in the creation of computational numerical models. This novel approach has become an essential tool to elucidate the mechanisms of climate change and its impact on the global environment.

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

Inside this issue:

TigerTransit/Shuttle Services Operating on Fall/Spring Schedule:
http://www.princeton.edu/transportation/ttroutes/ForrestalF2016.pdf

He has been widely recognized for his contributions, including his election to the U.S. National Academy of Sciences, the Academia Europeae, the Royal Society of Canada and the Japan Academy. His numerous awards and honors include the Bowie Medal (2010), the highest honor of the American Geophysical Union, and the Benjamin Franklin Medal of the Franklin Institute (2015). Notably, Manabe was the first recipient of the Blue Planet Prize (1992), an award established by the Asahi Glass Foundation and presented to individuals or organizations worldwide in recognition of major contributions to solving global environmental problems.

The BBVA has as its core objectives the promotion of scientific knowledge, the transmission to society of scientific and technological culture, and the recognition of talent and excellence across a broad spectrum of disciplines, from science to the arts and humanities. ∎

Philander Recipient of Vetlesen Prize for Unraveling El Niño's Effects

Knox Taylor Professor of Geosciences George Philander, an AOS associated faculty member, will share the 2017 Vetlesen Prize for his work in untangling the complex forces that drive El Niño, the world's most powerful weather cycle.
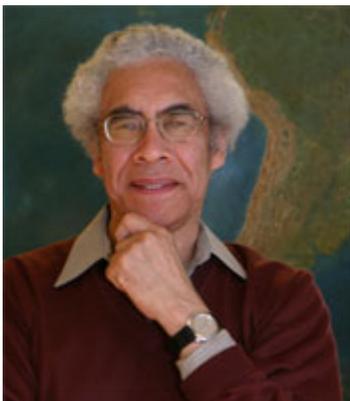
Knox Taylor Professor of Geosciences S. George Philander

Designed to be the Nobel Prize of the Earth sciences and presented by Columbia University's Lamont-Doherty Earth Observatory, the biennial prize is awarded for "scientific achievement resulting in a clearer understanding of the Earth, its history, or its relation to the universe." Philander shares the prize with Mark Cane of the Lamont-Doherty Observatory.

El Niño, long thought to be a remarkably wet season in arid coastal Peru, is now known to periodically influence global weather, impacting agriculture, disease control, and flooding or droughts. Philander and Cane's research has made forecasting of El Niño events now possible, and affected communities are better able to prepare for floods and droughts, make informed farming decisions, and control harmful diseases. Working separately but synergistically, they discovered that permanent weather instability in the tropical Pacific Ocean creates the complex interaction of winds, shallow currents and surface temperatures that create El Niño's seesaw-like extremes in temperature and rainfall. Leading to fundamental advances in oceanography and meteorology, their work has enabled the long-term forecasting of severe seasonal weather phenomena.

It was Philander who popularized the term "La Niña," the state opposite El Niño, when winds pick up again, causing rains to slacken in the Americas, and swell in Asia. Philander also came up with numerical explanations for related phenomena, including why there is more rain immediately north of the equator than to the south.

Philander earned his Ph.D. in applied mathematics from Harvard University in 1970, based on his research into equatorial ocean currents. He joined Princeton's faculty in 1990, after spending 19 years at GFDL. During his tenure, he served 16 years as Director of the AOS Program. He is also the founder of the Applied Centre for Climate and Earth Systems Science, an interagency organization in South Africa that promotes education and research opportunities for students. In 2007, the University of Cape Town awarded him an honorary doctorate. In addition to more than 100 peer-reviewed papers, he is the author of four books, including *Our Affair with El Niño*, and *The Encyclopedia of Global Warming and Climate Change*.

Philander and Cane will receive the 2017 prize, established in 1959, in a ceremony at Columbia University in April. Past Vetlesen laureates have included: geologist J. Tuzo Wilson, a key figure in the theory of plate tectonics; astronomer Jan Oort, who elucidated the architecture of galaxies and the outer solar system; geochemist Wallace Broecker, a father of modern climate science; geologist Walter Alvarez, who linked the extinction of dinosaurs to an extraterrestrial impact; and British volcanologist Stephen Sparks, who won the prize in 2015. ∎

GFDL Hosts Winter Poster Expo

The breadth and diversity of research initiatives undertaken by the broader GFDL community was on full display on Wednesday, February 1st at the GFDL Winter 2017 Poster Expo. This was the fourth installment in a series of Expos whose inaugural event took place in the summer of 2014.

With the goal of fostering transdisciplinary interactions and possible collaboration among its attendees, the event attracted many of GFDL's local partners, including Princeton University, UCAR Visiting Scientists and Engility. The AOS Program and CICS are typically well represented at the event, and this winter was no exception. Over one half of the 27 posters on display were presented by AOS and CICS researchers, both seasoned and new presenters.

L to R: AOS Faculty Member Yi Ming, AOS Director Stephan Fueglistaler and AOS Associate Research Scolar Xi Chen

As in past years, the Expo afforded attendees from the wider GFDL community a snapshot of the presenter's

work, as well as the opportunity for one-on-one dialogue with the researcher. Held in GFDL's Smagorinsky Room, the event also offers presenters an intimate setting to gain confidence in talking about their research and to receive constructive feedback on their research ideas and work in progress. Posters spanned a wide range of topics from tropical cyclones to Arctic sea ice, and even included a prototype model for medium-range weather forecasting.

L to R: GFDL Physical Scientist Paul Ginoux, GFDL Director V. Ramaswamy and GFDL Physical Scientist S-J Lin

"We were very pleased by the continued community support and turnout for the event," said GFDL Physical Scientist Jasmin John who conceived the event in 2014. "An added bonus was seeing several of GFDL's senior scientists and group leaders displaying their own posters, as well as interacting with the poster presenters both within and outside their disciplines."

Approximately 40 colleagues from the local community attended the event, in addition to the 27 presenters, among them GFDL scientists, colleagues from Princeton University and Rutgers, The State University of New Jersey.

Lead Organizer Fanrong Zeng, a GFDL research meteorologist, was joined on the organizing committee by AOS Associate Research Scholar Sulagna Ray, Catherine Raphael, a GFDL scientific illustrator and Dan Ward, an AOS associate research

L to R: AOS Research Scholar Meiyun Lin, PEI Postdoc Stuart Evans and AOS Associate Research Scholar Levi SIlvers

scholar. John, who was the event's lead organizer up until this year, acted as an advisor to the organizing committee. The organizers hope that the one-day event continues to attract presenters and attendees who may not always have the opportunity to interact locally, but through the Expo now have a platform to cross-fertilize ideas and further develop their research.

For a listing of the posters presented, please visit the Winter 2017 Poster Expo webpage on the GFDL website: <https://www.gfdl.noaa.gov/poster-expo-program-list/>. ∎

Amy R. Langenhorst Unsung Hero Award Launched

Contributed by Maria Setzer, GFDL Communications Director

NOAA's Office of Oceanic and Atmospheric Research (OAR) recently established the Amy R. Langenhorst Unsung Hero Award, to recognize exceptional work that broadly underpins OAR science yet is often overlooked by traditional research measures and awards. With this award, OAR aims to acknowledge individuals who deserve special recognition for their exceptionally selfless and sustained efforts.

Amy Langenhorst at the GFDL 2015 Winter Poster Expo

The GFDL community was deeply saddened by the unexpected death of colleague Amy R. Langenhorst in March last year. Amy was a conscientious collaborator who embodied the ideal of "mission first, people always" throughout her career at GFDL. She was an exceptional mentor and source of advice to anyone who asked, and was always eager to help find solutions to others' obstacles. Kindness, patience, and good humor were her hallmarks. Amy was also known for being selfless in taking on difficult and often thankless tasks. Over her career, these qualities enabled Amy to build strong foundations to support GFDL's mission and the colleagues with whom she worked. Her leadership and technical abilities remain evident in GFDL's modeling enterprise, and her impact will be felt for years to come.

The Unsung Hero Award will recognize individuals, like Amy, who are often deep on numerous lists of contributors for standard recognition pathways, and whose efforts across diverse aspects of group projects are indispensable. Their work should be integral to the success of NOAA Research. These individuals are often the first thanked when receiving an award, but too rarely the one accepting it. Recipients of this award can be OAR employees or partners (i.e., Cooperative Institute or other NOAA Affiliate). While groups are eligible, larger groups are encouraged to use the Unsung Hero Award as an opportunity to spotlight the accomplishments of a deserving individual. Honorees will be recognized at an OAR Awards Ceremony in Silver Spring, Maryland.

GFDL Research Meteorologist Fanrong Zeng is the first recipient of the Amy Langenhorst Unsung Hero Award in recognition of "her selfless, steadfast, and

exemplary technical contributions that have built strong foundations to support NOAA/OAR mission objectives in climate science and understanding the causes of climate variability and change". Fanrong is a leading subject matter expert at GFDL on the design and execution of climate model experiments. She has also provided crucial assistance in the development of GFDL's new high-resolution models, FLOR and HiFLOR. Her accomplishments are evident in the number of peer-reviewed scientific papers published or accepted over the past year. She is a co-author on 16 papers spanning multiple research areas -- climate modeling, hurricane predictions, and seasonal prediction. ∎

Q&A with V. Balaji, Head of the Modeling System Group at GFDL and Princeton

A "Model Hierarchies Workshop" was held from November 2 – 4, 2016 in McDonnell Hall on Main Campus. The workshop was attended by about 150 participants from relevant communities within the climate science/modeling field. Participants represented a range of perspectives and included research projects in themes spanning tropical convection, stratosphere-troposphere interactions, coupled problems involving oceans and ecosystems, and the general area of climate sensitivities and feedbacks.

Model Hierarchies Workshop Welcome – V. Balaji

In this Q&A, V. Balaji, head of the Modeling System Group at GFDL and Princeton University, discusses the workshop and its outcomes:

Why was the Model Hierarchies Workshop such an important meeting to convene at this point in time?

This is a meeting that has been discussed many times. The idea has been around awhile, most importantly articulated in Isaac Held's famous 2005 essay on the "gap between simulation and understanding" in modeling. The ICTP in Trieste hosted a meeting on "hierarchical modeling" in 2011. More recently, the workshop grew out of conversations between Sandrine Bony of IPSL in Paris and me, when I spent a few months there in 2015. We remarked on the fact that there are many articles using simple models to explain what is going on in complex ones. We felt the time was ripe to put together a workshop on the theme. Later that year (October 2015), the WCRP's Working Group on Coupled Modeling met and agreed to hold its 20th annual meeting (WGCM-20) here in Princeton, and we proposed the Model Hierarchies Workshop as a scientific workshop alongside the WGCM meeting.

Were you surprised by the high level of interest in the workshop?

Indeed we [the Organizing Committee] were! We imagined it was a bit of a "boutique" topic among a well-knit community of 50 or so scientists, but had to scramble when we were overwhelmed with abstract submissions (almost 200). This led to some very hard choices because we had to turn down many very interesting abstracts, owing to lack of space and time. In the end, we were able to accommodate about 30 talks and 60 posters. We still had around 150 people attend ... which means about 60 people came just out of interest in the workshop.

As an aside, an interesting experiment during this difficult process of selecting out of many worthwhile submissions was in "double-blind" reviewing: author names and affiliations were removed before the abstract was reviewed. I would rate the experiment rather successful: we had approximately 30% abstracts accepted from women, and about 45% from early-career scientists, both numbers above the norm for open workshops of this kind. In addition, three of out the seven invited talks went to women.

An evening poster session encouraged a lively scientific exchange for poster authors and attendees.

Prior to the workshop, you had mentioned that there should be "fodder here for some very interesting debates, scientific and philosophical." Were your expectations met in this regard?

I think so... we noted before the workshop that it is possible to simulate systems without fully understanding how they work, and conversely, even a full understanding of a system doesn't mean you can simulate its behavior. These are intriguing questions that have interested authors and philosophers like Jorge Luis Borges and Stanislaw Lem, for instance, and scientists like Ed Lorenz. At the workshop, we began with a debate between Isaac Held and Tim Palmer, which touched upon various aspects of modeling, both scientific and philosophical. For instance, Tim pointed out that even the most "realistic" of models is very, very far from reality. Isaac gave examples of idealized models that can't be directly compared with observations, but they can be used to "tell stories" about what is happening in the complex models. There were debates on the role of observations, on the role of multiple models that each captures only a part of the story, like in the movie Rashomon. "Truth," one speaker said, "is the intersection of many lies." Some talks saw models as evolving to greater fitness in a Darwinian landscape that rewards realism and understanding.

What do you see as the primary challenges facing the climate modeling field, specifically with regard to the hierarchy of models, and how did the workshop address those challenges?

The primary challenge is, as we stated at the outset, comprehensive models can display behavior as rich as nature itself, and as hard to interpret. The workshop

presented many, many talks, where scientists delicately extracted a signal from a complex model simulation and showed its physical basis in a simpler model. The workshop brought together a large number of people interested in this topic. The side discussions around the talks, over meals, and during breaks were also very much a part of the meeting and gave rise to a number of possible future collaborations. One concrete example is the RCEMIP, the "radiative-convective equilibrium model intercomparison project," a collaboration between one of the field's luminaries, Masaki Satoh, and one of its rising stars, Allison Wing, spurred by a conversation over coffee. This project will assemble models of various levels of complexity, and I expect many "hierarchical" findings to emerge. I hope that's how the workshop will be remembered, as a place where many seeds of future research on model hierarchies were sown.

What lessons came out of the workshop that can help inform whatever comes next? What are your next steps?

First of all, we learned that there is wide interest in the topic and that the basic premise and concern is shared by a wide swath of the community. I was particularly thrilled that there is so much interest in the topic among young and early-career scientists. Several of them are now working on a report for one of the major field journals, such as BAMS or Eos, to share the outcomes of the workshop. I don't believe this will be the last workshop on this theme. The WGCM may in fact do this as a recurring part of the CMIP process to foster more coordinated attempts to use the big global simulations for basic understanding of climate and to use simple models to identify emergent behaviors in the complex models.

The workshop agenda and presentations are available at: <https://www.wcrp-climate.org/gc-model-hierarchies-agenda>. ∎

SOCCOM Project Shedding Light on the Southern Ocean

Contributed by Roberta Hotinski, Project Manager, SOCCOM, PEI

Midway through its third year, the Southern Ocean Carbon and Climate Observations and Modeling (SOCCOM) project directed by Jorge Sarmiento, the George J. Magee Professor of Geoscience and Geological Engineering, is making great progress in both observations and modeling of the harsh and remote region of the ocean south of 30S.

SOCCOM is a multi-institutional project funded by NSF with co-investigators at 13 institutions. Members of the observations team, led by Lynne Talley at Scripps/UCSD, have worked with international partners to deploy 77 biogeochemical floats that are now operating in the Southern Ocean (see figure). Seven more floats are to be deployed in the Pacific by the end of September, bringing the team close to the halfway mark of their goal of ~200 floats deployed in six years. SOCCOM floats have already collected over 83 float years of pH, nitrate, oxygen, chlorophyll and backscatter measurements in over 3000 vertical profiles, all of which are made freely available in near-real time via the SOCCOM website, and which are now also being uploaded to the Argo data system.
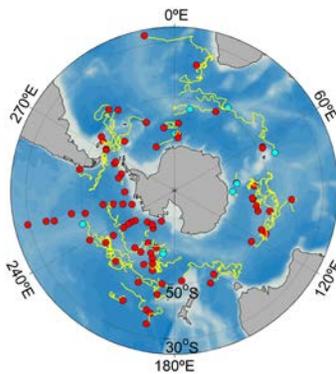
Map of SOCCOM float locations (red=active, blue = inactive) and trajectories since deployment (yellow), February 2017

This austral summer, SOCCOM's float deployment activities were documented by outreach partners at Climate Central who accompanied researchers on a cruise from

Punta Arenas, Chile, to McMurdo Station in Antarctica. Blogs and videos from the cruise are already available, and the team will be collaborating with SOCCOM researchers this spring to create a multimedia website focused on the Southern Ocean and its role in Earth's carbon and climate cycles.

Greta Shum of Climate Central interviews Steve Riser of the University of Washington (SOCCOM Observations Co-Lead) about the workings of SOCCOM biogeochemical floats. (Credit: Climate Central)

In addition to its observational efforts, SOCCOM has a modeling team led by Joellen Russell of the University of Arizona that has been developing tools to improve our understanding of controls on Southern Ocean biogeochemistry and predictions of future climate. A biogeochemical state estimate has been developed to provide a physically realistic estimate of Southern Ocean biogeochemistry, and a solution at 1/3 degree resolution for the period 2008 - 2012 is now available at: <http://sose.ucsd.edu/bsose_solution_Iter105.html>. Metrics made available via a Southern Ocean Model Atlas now allow model-data and model-model comparisons of Southern Ocean properties, and planning for a Southern Ocean Model Intercomparison Project (SOMIP) has been completed.

Together SOCCOM data and tools are providing an unparalleled view of Southern Ocean biogeochemistry. Winter-time and under-ice measurements never before available are yielding information on the annual variability of pH and carbonate saturation in the system, net community production, carbon export, air-sea fluxes of CO_2 and O_2, and bloom dynamics. Emerging SOCCOM research results will be presented in a special issue of JGR - Oceans this spring. To learn more about SOCCOM and access data and resources, visit: <http://soccom.princeton.edu>. ∎

Ramaswamy's Contributions to Atmospheric Science Recognized by AAAS

Contributed by Maria Setzer, GFDL Communications Director

GFDL Director V. Ramaswamy

GFDL's Director, V. "Ram" Ramaswamy, has been elected a Fellow by the Council of the American Association for the Advancement of Science (AAAS), in the Section on Atmospheric and Hydrospheric Sciences. Ram is being recognized for "distinguished contributions to the role of atmospheric radiative processes in climate, particularly the effects of greenhouse gases and aerosols in forcing climate change."

Each year, AAAS honors select scientists whose "efforts on behalf of the advancement of science or its applications are scientifically or socially distinguished." Ram and other newly elected Fellows were honored at an induction ceremony at the AAAS annual meeting in Boston, on February 18, 2017. Fellows receive a certificate and blue and gold rosette as a symbol of their distinguished accomplishments, and their names will also be published in the journal *Science*.

Ram's career has been devoted to improving our understanding of atmospheric radiation and incorporating this understanding in climate models. He has been with GFDL since 1987, and has been the lab's Director since 2008. Ram is also a Lecturer in the AOS program with

rank of Professor. His published research includes over 160 papers on climate in refereed journals.

AAAS is an international non-profit organization dedicated to advancing science around the world. It was formed in 1848 and the first AAAS Fellow was elected in 1874. The Council elected 391 members as Fellows in 2016, for meritorious contributions to the advancement of science. ∎

Petrik Wins Best Presentation Award at PICES Conference

AOS Associate Research Scholar Colleen Petrik, a Nereus fellow and member of the Sarmiento Group, won the Science Board Best Presentation Award at the [North Pacific Marine Science Organization (PICES) 2016 annual meeting](#), held in San Diego, from November 2 to 11. She gave a plenary presentation on "The response of fisheries production to natural and anthropogenic forcing: Past, present and future."

The talk presented a mechanistic model to represent immature and mature stages of forage fishes, large pelagic fishes, and large demersal fishes, as well as preliminary results of fish biomass under: pristine non-anthropogenic historical forcing (no anthropogenic CO_2, no fishing); historical climate without fishing; historical climate with fishing; and projected business-as-usual climate and fishing.

The meeting celebrated the 25th anniversary of PICES with the theme of looking at the past 25 years and imagining the next 25. Former AOS Associate Research Scholar Ryan Rykaczewski, assistant professor at the University of South Carolina, was the keynote speaker, discussing "Projecting ecosystem consequences of climate variability and change: Aspirations for the next 25 years of PICES" and also presenting on "Wind stress, stratification, and source waters: How will eastern boundary current upwelling processes respond to climate change?"

AOS Associate Research Scholar Colleen Petrik

Some other topics of interest included coastal ecosystem stressors, loss or changes of marine biodiversity, changing productivity and species distributions in response to climate change, developing outlooks or forecasts of future ocean ecosystems, and examining climate change impacts on ocean ecosystems and human society.

PICES, an intergovernmental scientific organization, was established in 1992 to promote and coordinate marine research in the northern North Pacific and adjacent seas. ∎

University at Albany Alumni Association Recognizes Ramaswamy's Accomplishments

Contributed by Maria Setzer, GFDL Communications Director

The University at Albany Alumni Association has chosen GFDL's Director, V. "Ram" Ramaswamy, to receive the 2017 Excellence in Science & Technology Award. This award pays tribute to University at Albany alumni for extraordinary distinction in science or technology.

The Alumni Association will present the award to Ram, as well as other award recipients, in a ceremony on April 29, 2017. Ram completed his graduate studies at State University of New York at Albany, obtaining a Ph.D. in Atmospheric Science. He is a Fellow of both AGU and AMS; he was the 2016 AMS Walter Orr Roberts Lecturer, and the recipient of many other distinguished awards. ∎

Baldwin Selected as Top Student Paper Presenter at AMS Conference on Environment and Health

AOS Graduate Student Jane Baldwin

AOS Graduate Student Jane Baldwin was recently selected as a top student paper presenter at the (AMS) Eighth Conference on Environment and Health for her oral presentation entitled "Quantifying the Risk of Compound Heat Wave Events." Her winning presentation analyzed heat-wave events and their probabilities in the present and projected future. The conference took place at the 97th AMS Annual Meeting in January in Seattle, Washington.

Baldwin's research interests focus on how large-scale atmospheric dynamics influence regional climate, with an eye to climate change and policy applications. Advised by Gabe Vecchi, professor of Geosciences and the Princeton Environmental Institute (PEI), her dissertation research examines the impacts of mountains on precipitation features including deserts and monsoons.

Baldwin also researches the risk of heat waves with Albert G. Milbank Professor of Geosciences and International Affairs Michael Oppenheimer, professor of Geosciences and International Affairs; and director, STEP, through her PEI-STEP fellowship.

The top student paper award included $200 to assist with the expenses of participating in the conference and a certificate of achievement from the AMS. The AMS' Board on Environment and Health advances the understanding of Earth's environmental influences on human health.

The Conference on Environment and Health is held as part of the AMS Annual Meeting, the world's largest annual gathering for the weather, water and climate community. ∎

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 Postdoctoral Research Associate Natasha Henschke who spent nearly two years in the AOS Program.]

Natasha Henschke joined the AOS program in May 2015 as a postdoctoral research associate and Nereus fellow, working under the joint supervision of AOS Faculty Member Jorge Sarmiento and Charlie Stock, a research oceanographer at GFDL. Natasha's research was primarily focused on the response of jellyfish populations to climate change.

AOS Postdoctoral Research Associate Natasha Henschke

In particular, the focus of Natasha's research was to resolve the perception that the frequency and magnitude of jellyfish blooms are increasing globally. While jellyfish blooms are a natural feature of healthy pelagic ecosystems, they have the potential to benefit from climate change as warmer waters promote increased growth, reproduction and feeding rates. This may lead to a shift from a traditionally fish-dominated system to a jellyfish-dominated system, which could be detrimental for tourism or food security in many regions. However, it has been difficult to substantiate the concept that jellyfish have increased due to insufficient spatial and temporal datasets; jellyfish are difficult to catch in traditional nets, and historically when they were caught, they were often ignored as they were considered to be unimportant components of marine systems.

In the absence of considerable datasets, Natasha has explored trends in jellyfish bloom dynamics through numerical modeling. While at Princeton, she developed the first mechanistic jellyfish population model that incorporates both benthic and pelagic life history stages. This model can be run in conjunction with global biogeochemical models produced at GFDL to explore regional and global projections of jellyfish biomass. Natasha's research identified that jellyfish bloom dynamics are strongly linked to changes in food supply, with larger blooms of jellyfish occurring in anomalously high zooplankton years. High food years result in two main benefits for jellyfish populations: enhanced reproduction, which allows for the release of more jellyfish into the system, and increased growth rates, which results in larger and more successful blooms. Natasha's model provides a framework to forecast the occurrence and magnitude of jellyfish blooms and examine how future jellyfish populations might respond to climate change. While regional increases in jellyfish populations have occurred, this model suggests the global biomass of jellyfish has not increased and is unlikely to increase based on temperature change alone.

Regarding her experiences at Princeton, Natasha particularly enjoyed participating in outreach programs such as the Young Women's Conference for budding female scientists, and the Prison Teaching Initiative. "Princeton is an amazing place, not just to do research, but because it offers

several opportunities for community outreach," said Henschke. "I would highly recommend participating in the Prison Teaching Initiative as it is a worthwhile program for both us as teachers, and the students," she said. "Research-wise, it's as good as the reputation suggests, and what you learn is invaluable. You are surrounded by many great and diverse minds that help to expand the scope of what can usually be quite focused research. I've particularly enjoyed the encouragement given by Jorge and Charlie to design my own research projects and the breadth of knowledge and expertise that they have contributed to my research here."

"The quantitative models of jellyfish dynamics that Natasha developed will play an important role in understanding jellyfish blooms in today's ocean, and in predicting future changes," said Stock. "She tackled this notoriously difficult problem with admirably steady tenacity and enthusiasm, and left us with a much greater appreciation for how complex a seemingly simple jellyfish can be!"

Natasha is headed to the University of British Columbia, where she will continue her research on gelatinous zooplankton population dynamics, adopt a dog and enjoy snowboarding with her husband Josh after work. She will miss the interesting lunchtime discussions and having beers with her colleagues and friends. ∎

AOS & CICS News

Congratulations to **Hannah Zanowski** who successfully defended her Ph.D. Thesis, "The Influence of Antarctic Open-Ocean Polynyas on the Abyssal Ocean," on December 2, 2016.

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Improved Management of Small Pelagic Fisheries through Seasonal Climate Prediction

AOS Associate Research Scholar **Desiree Tommasi** recently published a paper about forecasting the Pacific sardine. GFDL Research Oceanographer **Charlie Stock** and **Gabe Vecchi**, professor of Geosciences and PEI who worked on the research while at GFDL, are among the study's coauthors. The paper was published recently in *Ecological*

Applications. NOAA Q&A with Desiree Tommasi

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Regional Dry-season Climate Changes due to Three Decades of Amazonian Deforestation

A substantial portion of the clouds and precipitation in the Amazon rainforest are generated locally by the forest itself, making it a unique biome capable of self-supporting its ecosystems to some extent; however, deforestation has affected about 20% of this rainforest. A new study led by former AOS Graduate Student **Jaya Khanna** (University of Texas, Austin) shows that contemporary deforestation, occurring at scales of a few hundreds of kilometers, has resulted in a spatial redistribution of precipitation which can have contrasting impacts on vegetation dynamics in the upwind and downwind parts of the forest clearing. The study, coauthored by Former AOS/GEO Faculty Member **David Medvigy** (Notre Dame), AOS Director **Stephan Fueglistaler**, and Robert Walko (University of Miami), was published February 20 in the journal *Nature Climate Change*.

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Reconciling Fisheries Catch and Ocean Productivity

Phytoplankton provide the energy that sustains marine fish populations. The relationship between phytoplankton productivity and fisheries catch, however, is complicated by uncertainty in catch estimates, fishing effort, and marine food web dynamics. The researchers of a recent study, published January 23 in the *Proceedings of the National Academy of Sciences (PNAS)* and led by GFDL Research Oceanographer **Charlie Stock**, enlist global data sources and a high-resolution earth system model to address these uncertainties. **Jasmin John** (GFDL), **Ryan Rykaczewski** and **Rebecca Asch** (formerly AOS), **John Dunne** (GFDL) and **Jorge Sarmiento** (AOS) are among the paper's coauthors.
GFDL Research Highlights

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Climate Change to Alter Global Pattern of Mild Weather

A new report led by former AOS Postdoctoral Research Associate **Karin**

van der Wiel (Royal Netherlands Meteorological Institute) includes the first global analysis of how climate change may affect the frequency of mild-weather days, which are defined as having temperatures between 64 and 86 degrees Fahrenheit (18 and 30 degrees Celsius) with low rain and humidity. The current global average of 74 mild days a year will drop by 10 days by 2100, with mid-latitude areas such as the United States experiencing more mild days and tropical areas seeing more hot and humid days. The paper, published January 18 in the journal *Climatic Change*, is coauthored by GFDL Physical Scientist **Sarah Kapnick**, a former AOS postdoctoral research fellow, and **Gabe Vecch**i, professor of Geosciences and PEI, who worked on the research while at GFDL. NOAA Release

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The Fire through the Smoke: Working for Transparency in Climate Projections

To help policymakers more confidently prepare for the effects of climate change, a group of preeminent climate scientists, including AOS Associated Faculty Member **Michael Oppenheimer**, evaluated the scientific work and expert judgments behind the most recent projections from the Intergovernmental Panel on Climate Change regarding the potential ecological, social, economic and meteorological repercussions of climate change. The report was published on January 4 in the journal *Nature Climate Change*.

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This fall MPOWIR will host the 6th bi-annual Pattullo Conference in Warrenton, Virginia October 1-4, 2017. The conference brings together about 30 junior participants and 15 senior scientists for three days of professional development and mentoring sessions. Leaders are drawn from research, academic and industry careers. Attendees participate in a variety of research and professional development sessions including: negotiations, proposal writing, and one-on-one opportunities with senior scientists.

Registration is currently open. To learn more or to register, visit:
http://mpowir.org/get-involved/pattullo/

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Hurricane Symposium, honoring the retirement of Morris Bender from Federal service and the almost simultaneous 'retirement' of the GFDL Operational Hurricane model that has been part of the National Hurricane Center's operational hurricane forecast suite for almost two decades. The Symposium is planned for May.

GFDL Science Symposium, featuring the latest research activities at the Lab. The Symposium is planned for the first week in November.

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Upcoming Event: Princeton University Geosciences Society (PUGS) **2nd Annual "Theresa's Trails" 5K Run/Walk – ALS Saturday, April 29, 2017**
For more information and to register, visit: <http://theresastrails.kintera.org>

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Princeton Women in Geosciences (PWiGS) *Upcoming Event:*
Date: Thursday, March 30, 2017, 5:00pm to 7:00pm

Join PWiGS for dinner and informal conversation with Dr. Anna Michalak, from the Department of Global Ecology at the Carnegie Institution for Science.

This event is open to all graduate students and early-career scientists in GEO and AOS.

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Arrivals

Maximilien Bolot arrived in mid-December from France. Maximilien is working in Stephan Fueglistaler's group as an associate research scholar.

Salvatore Pascale, a visiting scientist at GFDL from Caltech, began his AOS appointment on January 12th. Salvatore is working with Gabe Vecchi and Sarah Kapnick as an associate research scholar.

Departures

AOS Associate Research Scholar **Liwei Jia** accepted position at NOAA's Climate Prediction Center in Maryland. She left the Program at the end of November.

AOS Associate Research Scholar **Barbara Muhling** accepted a new position, effective November 28, 2016. She is presently working as a contractor at the NOAA Fisheries/Southwest Fisheries Science Center, through the University of California.

Karen Paffendorf, a software engineer in the Modeling Systems Group, left Princeton on December 2nd.

Natasha Henschke, a Nereus fellow and member of the Sarmiento Group, left the Program at the end of the January. Natasha accepted a postdoctoral position at the University of British Columbia, effective February 1st.

Desiree Tommasi, an AOS associate research scholar, accepted a research scientist position at the Cooperative Institute for Marine Ecosystems and Climate (CIMEC), University of California, Santa Cruz. She will be stationed at the NOAA Southwest Fisheries Science Center in La Jolla, California.

AOS Postdoctoral Research Associate **Usama Anber** has accepted a new position. He will be leaving Princeton in early March to work as a research associate at Brookhaven National Laboratory.

Birth Announcements

Congratulations to AOS Visiting Postdoctoral Research Associate **Alison Gray** and her husband, David, on the birth of their daughter, Cordelia Marie, on November 2, 2016.

Congratulations to AOS Associate Research Scholar **Levi Silvers** and his wife, Brittany, on the birth of their daughter, Adelaide, on November 13, 2016.

Congratulations to AOS Associate Research Scholar **Liping Zhang** and her husband, Jian Zhao, on the birth of their son, Owen Zhao, on November 26, 2016.

Congratulations to AOS Postdoctoral Associate **Jonghun Kam** and his wife, Young-Hee Ryu, on the birth of their son, Theo, on January 27, 2017.