



AOS & CICS Newsletter

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Sarmiento Steps Down, Fueglistaler Steps in as AOS Director

After 19 years at the helm of the Atmospheric and Oceanic Sciences Program, Jorge Sarmiento, the George J. Magee Professor of Geoscience and Geological Engineering, has decided to step down as Director. Having served as director from 1980-1990 and from 2006 - 2015, Sarmiento will pass the directorship down to the capable hands of Stephan Fueglistaler, an associate professor of Geosciences.



George J. Magee Professor of Geoscience and Geological Engineering Jorge Sarmiento

With this decision, effective July 1, 2015, Sarmiento hopes to have more time to focus on his dual roles as Director of the Southern Ocean Carbon and Climate Observations and Modeling program (SOCCOM) and Director of the Cooperative Institute for Climate Science (CICS).

An expert in ocean biogeochemistry, Sarmiento has been a member of the AOS faculty for 35 years, teaching, inspiring and mentoring countless young scientists over the years. During his tenure as Director of the Program, he played a pivotal role in

building an impressive rank of faculty and in strengthening communication and the academic ties between AOS faculty, graduate students, and postdocs.

“Jorge has played a vital role in maintaining the stability of the AOS Program during his long tenure as Director, while working to broaden the Program, making it more exciting for students with a variety of interests in ocean, atmosphere, and climate science,” said Isaac Held, an AOS faculty member. “His guiding hand at the helm will be missed.”

“As AOS Director, I have been able to forge close ties with an exceptional group of incredibly talented folks and, in turn, a path for the Program,” Sarmiento said. “I am pleased to pass the torch to Stephan; I leave the Program in good hands.”



Dusenbury University Preceptor of Geological and Geophysical Sciences Stephan Fueglistaler

Fueglistaler joined the AOS Program in March of 2010 as an assistant professor of Geosciences. Prior to arriving at Princeton, he served as a NERC Advanced Fellow in the Department of Applied Mathematics and Theoretical Physics at the University of Cambridge. Fueglistaler’s research interests in atmospheric sciences ranges

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

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TigerTransit/Shuttle Services Operating on Summer Schedule:
<http://www.princeton.edu/transportation/troutes/ForrestalSummer2015.pdf>

from cloud microphysics, radiation, to large-scale dynamics. He is primarily interested in mechanisms of interactions between different processes on different scales, and how this interaction leads to the climate as we know it. Fueglistaler teaches AOS 523 Water in the Atmosphere and GEO 415 Earth's Atmosphere.

Fueglistaler is eager to begin his directorship and looks forward to working closely with everyone in the AOS Program. "It is a great honor for me to follow Jorge Sarmiento as Director of the Princeton AOS Program," said Fueglistaler. "Jorge's guidance and directorship have been of tremendous importance for the AOS program -- a vibrant program with a proud heritage. On the one hand, my objectives are ensuring continuity and maintaining the core strengths of the Program, and on the other hand introducing new elements for a Program that continues to attract the best future scholars."

In addition to his role as Director of the Program, Fueglistaler has also been named the AOS Program's Director of Graduate Studies (DGS) for the upcoming academic year, having served as a committee member since the 2010-2011 academic year. His appointment results from current DGS Isaac Held's resignation at the end of the academic year, after three years of service.

Fueglistaler holds a Ph.D. from the Institute for Atmospheric and Climate Science (IACETH), ETH Zurich, and earned a M.Sc. from the University of Zurich. ■

Griffies Appointed Lecturer in Geosciences and AOS

Steve Griffies has been appointed a Lecturer in the Department of Geosciences and the AOS Program effective July 1, 2015. He will be co-teaching AOS 571 Introduction to Geophysical Fluid Dynamics in the fall of 2015.

A physical scientist in GFDL's Oceans and Climate Group, Griffies' research activities include understanding the ocean's role in the global climate system, formulating

physically and mathematically sound subgrid-scale parameterizations for ocean dynamics, especially those related to ocean mesoscale eddies, developing robust and efficient numerical algorithms for ocean circulation models, articulating/teaching the fundamentals of ocean fluid dynamics and ocean climate models, and developing physically sound methods for analyzing the ocean as a complex hydro-thermodynamic system.



AOS Lecturer Steve Griffies

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 15 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 numerous scientific publications; contributed to dozens of scholarly journals; written a monograph of ocean climate model 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

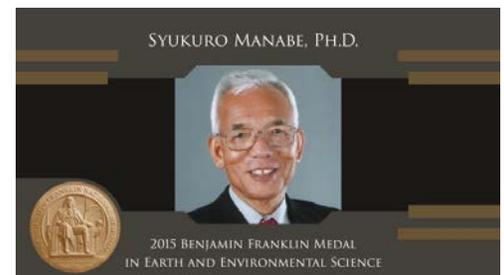
development and critical insights in the physical nature and parameterization of ocean processes."

"We are elated to have Steve join our faculty," AOS Director Jorge Sarmiento said. "Our students and faculty will greatly benefit from his scholarly expertise."

Griffies holds a Ph.D. in Theoretical Physics from the University of Pennsylvania. He earned his M.A. in Engineering Sciences & Applied Mathematics from Northwestern University. ■

Symposium Held in Manabe's Honor

A symposium in Syukuro (Suki) Manabe's honor was held on Monday, April 20, 2015 in the Friend Center on Main Campus. The symposium was held to celebrate the lifetime achievements of Manabe, a pioneer in the use of computers to simulate global climate change and natural climate variations, and to commemorate his 2015 Benjamin Franklin Institute Medal in Earth and Environmental Science.



(Credit: The Franklin Institute)

CEE Chair James Smith, the William and Edna Macaleer Professor of Engineering and Applied Science, opened the symposium and introduced Manabe before a packed house of graduate students, postdocs, faculty, and GFDL scientists. "There were 130 seats; at the end of Suki's talk, there were approximately twenty people standing," Smith said. This would not come as a surprise to anyone who is familiar with Manabe's career. He was a mentor to several generations of scientists who are now working at the University, GFDL, and around the globe.

In his talk "Global climate change," Manabe presented some of the highlights from the modeling study of global warming

that he participated in during the last several decades. Several presentations by esteemed colleagues followed Manabe's, illustrating the impact of his pioneering work. Talks examined the advances that have been made in the understanding of climate variability and methods for predicting future climate change. Speakers included: Ronald Stouffer (GFDL) "Are climate models reliable?," Thomas Delworth (AOS/GFDL) "The role of the Atlantic meridional overturning circulation in the climate system," Thomas Knutson (GFDL) "Tropical cyclones and climate change," and Isaac Held (AOS/GFDL) "Some outstanding problems and future prospects."

The symposium was an opportunity for those in attendance to personally reflect on the remarkable contributions that Manabe has made during his decades-long career, both to science and the scientific community. These include a seminal paper he coauthored in 1967 in the *Journal of Atmospheric Sciences* that demonstrated that increasing atmospheric carbon dioxide concentrations would increase the altitude at which Earth radiated heat to space, and the first published simulations of Earth's climate with coupled ocean and atmosphere models (with AOS Senior Meteorologist Kirk Bryan), establishing the role of oceanic heat transport in determining global climate. Another landmark paper in 1975 refined the earlier models by representing additional elements of the atmosphere-land-ocean climate system, and demonstrated an even higher rate of global warming given increasing atmospheric CO₂. Newer climate models, such as those that formed the basis of recent Intergovernmental Panel on Climate Change (IPCC) reports, reinforce the warnings that Manabe first articulated over 40 years ago.

"All of what we do has roots in Suki's early work; we in the scientific community, and the world over, owe him a debt of gratitude," AOS Director Jorge Sarmiento said. As for Manabe, the feeling seems to be mutual. "It was an overwhelming joy to talk about global warming in front of such an eager audience."

Manabe was formally presented his medal at a ceremony on April 23, 2015 at The Franklin Institute in Center City, Philadelphia. One of the oldest and most prestigious comprehensive science awards in the world, The Franklin Institute Awards

Program has honored the greatest minds in science, engineering, technology and business for more than 190 years, and now Manabe, who can reasonably be considered the father of climate modeling, joins their ranks. ■

GFDL Marks 60th Anniversary with Scientific Symposium in November 2015

Contributed by Maria Setzer, GFDL Communications Director

In 1955, a gallon of gas cost 23 cents, and average yearly wages were \$4,130 in the U.S. It was the year that Albert Einstein died and Bill Gates was born. Dwight D. Eisenhower was President. It was also the year that GFDL was founded, in a small office on Pennsylvania Avenue just a couple of blocks from the White House. This year, GFDL will mark its 60th anniversary with a symposium that will look back at the lab's impact on the climate community and society at large. The history of GFDL is closely intertwined with the history of the computer, numerical weather prediction, and climate modeling.



Joseph Smagorinsky (standing) and Roderick Graham check output from the IBM STRETCH computer, in the computer room of the Weather Bureau's General Circulation Research Laboratory in Washington, D.C. in 1962. By 1967, the lab had moved to Princeton and was renamed Geophysical Fluid Dynamics Laboratory.

To be held on November 2nd and 3rd, the symposium will focus on past accomplishments, current research frontiers, and the future of climate modeling. Speakers from academic

institutions around the country will offer their perspectives about what GFDL has contributed to the greater community. Many of the invited speakers spent time at GFDL as graduate students, post-docs, or visiting scientists over the past six decades, and they will also offer their reflections about the role GFDL played in their careers.

The symposium will take place at Princeton University's Taylor Auditorium. As more information becomes available, such as the agenda and information about hotel arrangements, it will be published at <https://www.gfdl.noaa.gov/60th-anniversary>. ■

SOCOM Annual Meeting Held on Main Campus

In mid-May, a group of international cross-disciplinary experts from the Southern Ocean Carbon Climate Observations and Modeling (SOCOM) program came together to review the progress of the past year and plan for the second year of a NSF sponsored, six-year initiative that focuses on unlocking the mysteries of the Southern Ocean and determining its influence on climate. The annual meeting was held May 12-14, 2015 in Jadwin Hall on Main Campus.



SOCOM Annual Meeting Participants

Housed at Princeton under the Directorship of CICS Director Jorge Sarmiento, SOCOM draws on the strengths of teams of investigators across the U.S. as well as participates in international observational and simulation efforts. Earlier this year, the first 10 of a newly developed set of Argo floats equipped with sensors to measure pH and concentrations of nutrients and chlorophyll were released into the Southern Ocean. Another 200 or so are planned to be deployed in the region over

the next six years under the SOCCOM project with support from NSF's Division of Polar Programs, NOAA, and NASA. The SOCCOM floats are designed to provide near real-time monitoring of ocean carbon storage and changes in nutrient supply. The data will be used to improve recently developed high-resolution Earth-system models that will heighten our understanding of the Southern Ocean and allow for better projections of Earth's climate and biogeochemical trajectory.

Twelve SOCCOM-funded BGC-floats were deployed in December 2014 and January 2015 on a cruise of the Alfred Wegener Institute's R/V Polar stern from Cape Town, South Africa to Neumayer Station, Antarctica and back. Two additional floats were deployed by Australia Marine National Facility's new research vessel Investigator in late March as part of a cruise to deploy a full set of Southern Ocean Time Series moorings.

"We are deeply committed to the initiative and excited about the masses of data that will be the end result," Sarmiento said. "It really is going to transform our understanding of the Southern Ocean and its role in climate change and biogeochemistry."

SOCCOM co-investigators were highly visible at the annual meeting and played a key role in setting the agenda. Along with these institutional partners, scientists from Princeton and GFDL used the opportunity to evaluate year one progress on observations, modeling, and the broader impacts of the Program, as well as to discuss year two planning. The meeting included numerous science presentations on topics ranging from floats and float data to climate model simulations of the Southern Ocean, poster sessions, and topical discussions. SOCCOM Director Jorge Sarmiento, Carolina Dufour (AOS), Ivy Frenger (AOS), Alison Gray (AOS), Roberta Hotinski (PEI), Steve Griffies (GFDL), Bob Key (AOS), V. Ramaswamy (GFDL), and Mike Winton (GFDL), among others, were all on hand to lend their expertise to the conversation.

"The initiative is truly a collaborative effort in every sense," said Sarmiento. "It is extraordinary to be part of it."

SOCCOM is a collaboration of senior researchers from Princeton, Monterey Bay Aquarium Research Institute (MBARI),

Scripps Institution of Oceanography (SIO), University of Washington (UW), University of Arizona, Climate Central, University of Miami Rosenstiel School of Marine and Atmospheric Science (RSMAS), Oregon State University (OSU), NOAA Atlantic Oceanographic and Meteorological Laboratory (AOML), NOAA Geophysical Fluid Dynamics Laboratory (GFDL), and NOAA Pacific Marine Environmental Laboratory (PMEL). ■

PEI-STEP Fellowship Awarded to Baldwin

AOS Graduate Student Jane Baldwin has been awarded a 2015 PEI-STEP Environmental Policy Fellowship by the Princeton Environmental Institute (PEI). Baldwin will join fellow 2015 Awardees Ryan Edwards (Civil and Environmental Engineering), Jack Hoang Lu (Chemical and Biological Engineering), and Andrew Tilman and Timothy Treuer (Ecology and Evolutionary Biology) in addressing the environmental policy implications of their thesis research through supplementary coursework and policy-oriented research over the course of the next two years.



Jane Baldwin, Perkins Fellow

Using a combination of dynamical climate models and atmospheric observations to elucidate the ties between global and regional climate with the goal of improving predictions of climate change at regional levels, Baldwin will focus her research on the "Correlated Risk of Climate Extremes with Global Warming and its Implications for Catastrophe Insurance," under the advisement of Michael Oppenheimer,

Albert G. Milbank Professor of Geosciences and International Affairs, Woodrow Wilson School.

Inspired by previous study in China and interests in environmental policy and history, Baldwin is currently studying the extratropical arid regions that stretch across interior Asia. She hopes to improve understanding of the controls on this region's basic climate, as a prerequisite to examining its environmental change.

"For my PEI-STEP project, I will use several models to quantify how the correlated risk of heat waves and drought over the United States may vary with climate change. I will then explore the policy implications of these results, particularly for Federal crop insurance policies," said Baldwin.

Baldwin joins an impressive group of PEI-STEP Fellows, many of whom have gone on to pursue positions of environmental leadership in academic, government, nonprofit, and industry sectors following their time at Princeton, including former AOS Graduate Students Curtis Deutsch and Ian Lloyd who were awarded the Fellowship in 2000 and 2009 respectively, former Geosciences Graduate Student Bryan Mignone who was awarded the Fellowship in 2001, former AOS Graduate Student Joe Majkut who was awarded the fellowship in 2011, and current AOS Graduate Student Geeta Persad who was awarded the fellowship in 2013. ■

Three Students Accept Offers of Admission

In a year with a near-record number of applications to the AOS Program, three graduate students accepted offers of admission to the Program for the 2015-2016 academic year. This was the second largest applicant pool in the Program's history.

"We continue to be really impressed with the caliber of students who apply to our Program, and this year was certainly no exception," AOS Director Jorge Sarmiento said.

The University and the AOS Program continues to be a very attractive place for students from all over the world for graduate study, which extended a trend of rising application totals in recent years. Applications to the Program came from around the globe, with 74% of the applicant pool comprised of international students. In addition to international students, the Program continued to attract top students from around the United States. The new students hail from Cornell University, Marshall University, and the University of South Carolina.

“They are a remarkable group; I am confident they will energize our campus and AOS community,” said Sarmiento.

As Sarmiento has noted in the past, the AOS admissions process is both thorough and rigorous. “I would be remiss if I didn’t thank our faculty for their tireless dedication to the process, particularly Isaac Held, our DGS, and Graduate Work Committee Members Stephan Fueglistaler and Larry Horowitz,” Sarmiento said. “Their efforts resulted in another outstanding class.”

A new student orientation is being planned for early fall. ■

3rd Annual AOS Program Workshop Announced

The AOS Program will be hosting the “Challenges in applying present atmospheric models to study extreme climate scenarios” workshop from August 5-7, 2015, marking the third straight year the Program will host a workshop generously funded by Isaac Held’s BBVA Foundation award.

According to AOS Graduate Students Tsung-Lin Hsieh, Jaya Khanna, and Nick Lutsko, members of the Workshop Planning Committee, this year’s speakers were chosen to provide complementary perspectives on how to tackle a range of extreme climate scenarios. “The aim of the workshop is to have a discussion about the challenges of modeling extreme climates (from Earth’s past or on other planets), particularly how this challenges our intuition which is tuned to the present day

climate of Earth, and then ask how this can help us to understand the Earth’s climate,” Lutsko said.

Confirmed invited speakers for the three-day event include: Matthew Huber, University of New Hampshire; Natalie Burls, George Mason University; and Robin Wordsworth, Harvard University. Huber’s research interests focus on modeling warm climates in the past and estimating climate sensitivity using paleo records. Burls’ research encompasses ocean-atmosphere interactions on geological time scales, and Wordsworth conducts research in the areas of atmospheres of exoplanets, Mars, and the early Earth.

Following a slightly different format than the past two years, each speaker will give a public seminar, a “theoretical” tutorial on the theory/background of their work, an “observational” tutorial on how they use observations in their research, and a hands-on session in which they may lead a paper discussion, discuss some of their code, etc. Open to the entire AOS/GFDL community, the public seminars will be held in GFDL’s Smagorinsky Room on each day of the workshop.

Beyond these formal events, the workshop will include numerous opportunities for causal interaction among the speakers and AOS students and faculty. Building on the success of the first two workshops, the third workshop hopes to connect expert climate scientists from outside of the University with AOS students and to foster collaboration and community within the AOS and GFDL community and beyond.

The Planning Committee will be finalizing the workshop agenda and logistical details over the summer months. Questions related to the Workshop may be directed to committee members. ■

Fisheries and Climate Scientists Converge on Main Campus

More than sixty fisheries and climate scientists converged on Main Campus from June 3-5, 2015 to assess the utility of present seasonal to decadal climate

predictions for marine resource management, and to develop new and innovative applications of these prediction systems. The workshop was sponsored by the Cooperative Institute for Climate Science (CICS) and was held in Lewis Library on Main Campus.

According to Charlie Stock (GFDL) and Desiree Tommasi (AOS), the workshop’s co-organizers, talks and discussions began early Wednesday morning, providing an overview of climate effects on fisheries and the fisheries management framework. The talks also focused on communicating the capabilities of present seasonal to decadal prediction systems, and presenting a synthesis of the predictive skill of seasonal to decadal climate predictions for ecosystem-relevant physical climate variables.

“The workshop was intended to gather experts from the fisheries and climate sciences to discuss the utility and challenges of including seasonal to decadal climate forecasts into the management of living marine resources,” Tommasi said.

GFDL and AOS scientists were among the presenters. AOS Lecturer Gabe Vecchi discussed the design, output streams, strengths, and limitations of present seasonal to interannual climate prediction systems. Stock discussed the prediction of SST anomalies in coastal ecosystems, and Rym Msadek (UCAR/GFDL) described seasonal predictions of Arctic sea ice.

Thursday morning focused on presenting examples of successful implementation of seasonal forecasts in marine management and identifying further proof of concept applications to assess the utility of seasonal climate predictions for marine resource management. Barbara Muhling, an AOS associate research scholar, discussed the spatial management of bluefin tuna in the Gulf of Mexico and Tommasi presented a talk on incorporating seasonal climate forecasts into a harvest guideline control rule for Pacific sardine.

The final day of the workshop presented some of the future challenges facing the use of seasonal climate predictions for marine resource management. GFDL’s Keith Dixon described the challenge of scale: downscaling techniques to help refine seasonal predictions and Tom Delworth, an AOS lecturer, reported on decadal climate prediction: physical

underpinnings and future prospects. Tommasi facilitated the workshop's final discussion session which explored the benefits and limitations of downscaled projections with regard to fisheries environmental data needs, discussed the kinds of information decadal forecasts can provide fisheries managers, and considered the best practices to apply seasonal climate forecast information into the marine resource management framework.

In addition to daily discussion sessions, a poster session and reception was held on the first day of the workshop which provided a focus for informal discussion. Further discussion and brainstorming took place during the ensuing two days of the workshop during meals and breaks.

"The workshop brought together a diverse group of scientists with a common interest in applying short-term climate predictions toward sustainable marine resource management," Stock said. "The pioneering applications presented gave reason for considerable optimism, and the workshop identified concrete steps for addressing remaining challenges." ■

AOS/GFDL Scientists Turn Out for Ocean Fun Days 2015

AOS and GFDL scientists joined forces with fellow scientists and environmentalists from around the state to promote the wise use of New Jersey's marine and coastal resources during the twelfth annual celebration of Ocean Fun Days at the Jersey Shore. The 2015 event was held on Saturday, May 16th, and Sunday, May 17th in Island Beach State Park and Sandy Hook, and provided interactive activities for school-aged children and their families.

Despite an ominous sky and some early rain, Rebecca Asch (AOS), Alison Gray (AOS), Karen Paffendorf (AOS), Alon Stern (AOS), Ben Mater (AOS), and Hannah Zanowski (AOS) joined AOS Faculty Member Sonya Legg, who coordinated the outreach effort, on Saturday at Island State Beach Park. The researchers conducted three experiments

with the children and their families: "ocean acidification in a cup," "iceberg melting," and "taste the difference between the bay and the ocean."

"A few of the kids were brave enough to try the latter, but some spat it out quickly!" Legg said. "We had a continuous stream of children with their parents at our table, which was one of the few exhibits where kids could actually do the experiment."



AOS Postdoctoral Research Fellow Ivy Frenger & CICS Director Sonya Legg, an AOS faculty member

Sunday brought sunnier skies, a warmer temperature, and Scientists Stuart Evans (PEI), Ivy Frenger (AOS), Jasmin John (GFDL), Rob Nazarian (AOS), to Sandy Hook, where they joined Legg and her eldest daughter, Amelia, to lead the hands-on activities before a large crowd.



AOS Graduate Student Rob Nazarian and Stuart Evans (PEI)

In addition to the educational displays and exhibits, eco-friendly activities included seining lessons, coastal crafts, an energy-saving scavenger hunt, youth fishing clinics, face painting, touch tanks, a student science fair competition and the New Jersey Sea Grant Consortium's fiddler crab races. A clamming the bay activity was also held at Island Beach State Park. As in past years, the Sandy Hook location also included guided tours of many of Sandy Hook's historic sites and an open house at the NOAA/James J. Howard Marine Sciences Laboratory.

With nearly 50 exhibitors participating in the event, attendees were given the opportunity to learn firsthand from marine scientists, researchers, and environmentalists how to protect our natural resources, and Princeton and GFDL volunteers, and their families, were able to take turns visiting other exhibits, the beach, as well as the NOAA Lab at Sandy Hook.

"Ocean Fun Days was a great experience to introduce New Jersey families to some oceanographic and climate topics in a relaxed beachside environment," AOS Graduate Student Rob Nazarian said. "It was also a great learning experience for the student and postdoc volunteers, as it provided an opportunity for us to get out of the modeling mindset to perform simple tabletop experiments."

"It was a good opportunity for our students and postdocs to hone their communication skills and have some fun at the same time," said Legg.

The New Jersey Sea Grant Consortium, which sponsors the event in coordination with the state Department of Environmental Protection, is an affiliation of colleges, universities and other groups dedicated to advancing knowledge and stewardship of New Jersey's marine and coastal environment and meets its mission through innovative research, education and extension programs. Nearly 30,000 participants; students, their families, teachers, Scouts and the general public take part annually in the Consortium's Education Programs and special events. ■

Southeast Atmosphere Studies Workshop 2015

From June 8-10, 2015, the atmospheric modeling community came together at GFDL to evaluate, diagnose, and improve climate and air quality modeling of different temporal and spatial scales for improved representation of fundamental atmospheric processes. More than sixty leading scientists from across the nation attended the Southeast Atmosphere Studies Workshop which focused on using the data collected in 2013 during the Southeast

Atmosphere Studies (SAS) to investigate biosphere-atmosphere interactions and the formation of secondary organic aerosol (SOA) in the atmosphere. The workshop was co-sponsored by the Cooperative Institute for Climate Science (CICS).

The effort focused primarily on models that simulate the formation of SOA and other trace species in the troposphere over the Southeast US, with the ultimate goal of understanding the radiative impacts of these species. The workshop addressed questions that are important for gaining a better understanding of air quality and climate in the Southeast US. To answer key questions concerning the role of anthropogenic and biogenic emissions in contributing to high ozone and particulate matter concentrations over the Southeast US and to develop the best strategy for modeling SOA over this region, a group of national experts presented talks and led discussions surrounding four key themes: gas phase chemistry, aerosol chemistry, regional climate and chemistry interactions, and natural and anthropogenic emissions.



SAS Workshop 2015 Participants

Among the attendees were federal scientists (from NOAA, NASA, and EPA) and academic researchers, from over a dozen universities, including Co-organizers Jingqiu Mao (AOS/CICS) and Larry Horowitz (AOS/GFDL), Songmiao Fan (GFDL), Paul Ginoux (GFDL), Tom Knutson (GFDL), Jingyi Li (AOS), Vaishali Naik (GFDL), Fabien Paulot (AOS/CICS), and V. Ramaswamy (GFDL).

“Laboratory chemists, field observationalists, and regional and global chemistry-climate modelers presented their findings relevant to air quality and climate over the Southeast US,” said Horowitz, an AOS lecturer and GFDL physical scientist. “The workshop attempted to synthesize information from the Southeast

Atmosphere Studies across this wide range of perspectives in order to best inform, constrain, and evaluate processes in atmospheric chemistry models.”

The SAS workshop was a great success, according to Mao, an AOS associate research scholar. “Top-notch scientists from across the country gathered to share their understanding of the interactions between human activities, terrestrial vegetation, air quality, and climate over the Southeast US. This region has experienced large increases in population and large changes in air pollutant emissions over the past decades, and has exhibited a poorly understood “warming hole” over the past century,” Mao said. “Experimentalists and modelers have identified several outstanding gaps between measurements and models that can be addressed using data from the Southeast Atmosphere studies.”

Workshop findings and recommendations will be presented in a final report to be delivered to the larger atmospheric chemistry and climate community, according to Horowitz and Mao. ■

CICS & AOS Scientists Reach Out to Young Women at 2015 Conference

On March 19, 2015, CICS and AOS scientists took part in the 14th annual Young Women’s Conference in Science, Technology, Engineering and Mathematics along with prominent scientists and engineers from around the region. Hosted by the Princeton Plasma Physics Laboratory, the event attracted nearly 500 students from 60 middle and high schools throughout New Jersey, Pennsylvania, and Maryland as a means of cultivating girls’ interest in STEM subjects and career paths.

AOS Postdoctoral Research Associate Rebecca Asch, Ivy Frenger, an AOS postdoctoral research fellow, Alison Gray, a postdoctoral research associate, AOS Graduate Student Anna Trugman, and CICS Scientist Hannah Zanowski joined CICS Associate Director Sonya Legg in



L to R: CICS Scientist Hannah Zanowski, AOS Colleagues Ivy Frenger, Anna Trugman, Rebecca Asch, and Alison Gray

offering hands-on demonstrations and experiments to the middle and high school aged girls in attendance as a way of immersing them in science, in addition to introducing them to women scientists and the wide breadth of careers available to them in STEM fields.

About 25 exhibitors were set up inside the Frick building, showcasing everything from 3-D printers to hydrogen gas-powered model cars. The CICS interactive displays included an experiment exploring ocean acidification, a salinity taste test (students tasted water of different salinities and ordered them from least salty to saltiest -- the salinities of the water were designed to be comparable to ocean salinities from various parts of the world), and an “ice-berg” experiment. In this last experiment, CICS/AOS scientists placed dyed ice cubes into beakers containing either fresh water or salt water. Based on the behavior of the meltwater from the ice cube in each, which floated on top of the salty water, but convectively mixed into the fresh water, the students tried to guess which beaker had the salt water. The experiment demonstrated how both temperature and salinity determine the density of sea water, and showed how the supply of heat from the ocean influences the rate of melt of ice-bergs and ice-shelves.

The annual event was launched in 2001 with about 200 students from 26 schools in attendance, and has grown steadily over the years. Surveys of young women attending the Conference show that attending the conference helps change their ideas about women and science. ■

*GFDL Summer 2015
Blood Drive....
Monday, August 3, 2015
11 am – 2 pm*

Sarah Kapnick Receives AGU Cryosphere Early Career Award

Contributed by Maria Setzer, GFDL
Communications Director

Sarah Kapnick has been recognized by AGU with the Cryosphere Early Career Award for 2015. As a Physical Research Scientist in the Climate Change, Variability, and Predictions Group at GFDL, Dr. Kapnick's research focuses on the mechanisms controlling extreme storms and mountain snowpack. She uses data from both observations and models to shed light on how the climate system has varied in the past, and what we might expect in the future.

In a short period, Dr. Kapnick has made unique contributions to climate science by combining the use of very high-resolution models with observations, to provide critical new insights into the sensitivity of high-elevation cryospheric processes to climate variability and change. Her work examines snowpack changes in mountainous regions, and the underlying processes that drive the seasonal cycle of snowpack. Her ongoing research is expanding into the role of atmospheric rivers in hydro-climate variability and change, including their impact on western U.S. snowpack.



GFDL Physical Research Scientist
Sarah Kapnick

Dr. Kapnick's contributions to the field extend beyond her outstanding scientific research. As a post-doctoral research fellow at GFDL, Dr. Kapnick was one of the founders of Princeton Women in Geosciences, a group dedicated to promoting and supporting women in

geosciences. Recently, she served as an expert for the U.S. Fish and Wildlife Service, on a panel investigating whether the wolverine should be listed as Threatened under the Endangered Species Act.

AGU established the Cryosphere Early Career Award in 2004, to be given annually to one honoree in recognition of significant early career contributions to cryospheric science and technology. The award will be announced in Eos and Sarah will be recognized at the AGU Fall Meeting. ■

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 Fellow Gregory de Souza who spent almost three years in the AOS Program.]

Gregory de Souza joined the AOS Program in April 2012 as a Swiss National Science Foundation Postdoctoral Research Fellow to work with Jorge Sarmiento on the marine cycle of silicon, a vital nutrient for the group of ocean phytoplankton known as diatoms.



Former AOS Postdoctoral Research
Fellow Greg de Souza

"When I arrived in Princeton, I always referred to myself as an isotope geochemist. Now, three years later, every once in a while I catch myself saying I'm an oceanographer. Mission accomplished!" said de Souza. By moving to the AOS Program, Gregory hoped to better understand what processes governed the isotopic observations he'd made during his Ph.D. at ETH Zurich (Switzerland), and learn a lot about oceanography in the

process. "I knew it was going to be a challenge to replace my observationalist's hat with a modeler's, but I felt I had to in order to really make progress. And I'm so glad I did – working with Jorge has finally allowed me to gain mechanistic insight into observations that previously I could only puzzle over. And having the expertise of Rick Slater at AOS and John Dunne at GFDL simplified my move into the world of model code," he said. In a paper published in *Earth and Planetary Science Letters* last year, Gregory and his co-authors used the coarse-resolution GCM MOM3 to explain how ocean physics and biology combine to produce the silicon isotope distribution he observed in the deep ocean.

A second focus of Gregory's work in Princeton has been adding a representation of Si cycling to the biogeochemical model BLING, originally developed at AOS by former post-doc Eric Galbraith. "In order to study the marine Si cycle in the current generation of GFDL's ocean models, we needed a prognostic model of the silicon cycle that reproduces the key observational features of the oceanic Si distribution, specifically the circumpolar band of negative Si* values in the Southern Ocean to which the ocean biogeochemistry world's attention was drawn by Jorge's Nature paper in 2004," said de Souza. "With this addition to BLING, we now have that tool." His immediate plans for using this tool include an in-depth study of thermocline silicon isotope systematics in the GFDL model MOM5.

In addition to his focus on oceanic silicon biogeochemistry, being at AOS has allowed de Souza to broaden his horizons and collaborate with oceanographers in the Sarmiento group on a wide range of subjects, such as the physical processes that transport nutrients and carbon in the Southern Ocean (a study led by Carolina Dufour) and the drivers of water mass transformation in ocean models and its consequences for ocean carbon uptake and storage (with Ivy Frenger), as well as collaborating with former AOS post-doc Jaime Palter on diagnosing nutrient transport in the subarctic Pacific. "I've really enjoyed the challenge of thinking about the ocean like a physical oceanographer, and I've learned an immense amount from my colleagues at AOS. I hope we continue to span the physical-biogeochemical divide in the future!"

More broadly, Gregory says his time at Princeton has “really helped me grow as an academic: in these years, I’ve had the chance to gain experience in writing grant proposals, mentoring undergraduates, developing lab modules and guiding ocean biogeochemistry practicals in addition to doing research, and I now feel better prepared for a career in science.”

“Greg is an exceptional scientist and has a promising career ahead of him,” Sarmiento said. “He has been a valuable asset to our group and I am delighted to be continuing our collaboration.”

In early 2015, Gregory moved to the ETH Zurich, in order to continue his research on the oceanic silicon isotope distribution, and to set up new observation-modeling collaborations with the isotope geochemistry and chemical oceanography communities. ■

AOS & CICS News

Congratulations to **Rebecca Asch**, a NEREUS fellow and a postdoc in the Sarmiento Group, who was awarded the best early career scientist presentation for her talk titled "Projected Mismatches Between the Phenology of Phytoplankton Blooms and Fish Spawning Based on the GFDL Earth System Model (ESM2M)" at the Third International Symposium on the Effects of Climate Change on the World's Oceans. The conference took place in late March in Santos, Brazil.

AOS Graduate Student **Rob Nazarian** was recently selected as an inaugural Graduate Learning Fellow for the McGraw Center for Teaching. In this position he will work with the McGraw Center, the University and the four other Graduate Learning Fellows to implement new teaching strategies in undergraduate curricula, plan undergraduate academic workshops and seminars, and oversee the undergraduate tutoring center, among other smaller responsibilities.

Congratulations to **Andrew Ballinger** who successfully defended his Ph.D. Thesis “Tropical Cyclone Activity in an Aquaplanet General Circulation Model” on May 8, 2015.

GFDL Director V. Ramaswamy announced that **Whit Anderson**, a GFDL oceanographer, has been selected as Acting Deputy Director of GFDL. His appointment became effective June 14, 2015.

[A Daily Global Mesoscale Ocean Eddy Dataset from Satellite Altimetry](#)

Eddies play a significant role in the mixing and transport of heat, salt, and biogeochemical tracers across the global oceans, and eddies have been shown to influence near-surface winds, clouds, and rainfall within their vicinity as well as marine ecosystems. A new paper coauthored by AOS Postdoctoral Research Fellow **Ivy Frenger** presents a dataset of ocean mesoscale eddies detected and tracked globally based on daily sea level height anomaly observations over two decades. The dataset can be used to investigate ocean eddy characteristics and effects, and the software used to create the eddy dataset is published in a repository. The [paper](#) was published June 9 in *Scientific Data*.

[Emergence of multiple ocean ecosystem drivers in a large ensemble suite with an Earth system model](#)

Marine ecosystems are increasingly stressed by human-induced changes. Marine ecosystem drivers that contribute to stressing ecosystems – including warming, acidification, deoxygenation and perturbations to biological productivity– can co-occur in space and time, but detecting their trends is complicated by the presence of noise associated with natural variability in the climate system. A new paper led by AOS Research Scholar **Keith Rodgers** considers emergence characteristics for the four individual and combined drivers. The results underscore the importance of sustained multi-decadal observing systems for monitoring multiple ecosystem drivers. The [study](#) was recently published in *Biogeosciences*.

[New Research will Help Forecast Bad Ozone Days over the Western U.S.](#)

A new study led by AOS Associate Research Scholar **Meiyun Lin** uses observations and numerical simulations to

demonstrate a strong connection between high ozone days in the western U.S. during late spring and La Niña, an ocean-atmosphere phenomenon that affects global weather patterns. This linkage is important for developing seasonal forecasts with a few months of lead time to aid in western U.S. air quality planning and for effective implementation of U.S. ozone standards. AOS Faculty Member **Larry Horowitz** is a coauthor of the [study](#) recently published in *Nature Communications*. [GFDL Research Highlights](#)

[Dissecting the Ocean's Unseen Waves to Learn Where the Heat, Energy and Nutrients Go](#)

CICS Associate Director **Sonya Legg**, an AOS senior research oceanographer, and colleagues from collaborating institutions (including **Maarten Buijsman**, a former AOS postdoc and now an assistant professor of physical oceanography at the University of Southern Mississippi) created the first “cradle to grave” model of the world’s most powerful internal ocean waves. The [study](#) was published online in late April in *Nature*. [Washington Post article](#)

Arrivals

Jonghun Kam comes to us from Princeton's Department of Civil and Environmental Engineering. Jonghun began working with Tom Knutson and Gabe Vecchi as a postdoc in April.

Natasha Henschke, a postdoc and Nereus Fellow, arrived in late May from the University of New South Wales. She is working in the Sarmiento Group with Charlie Stock and Jorge Sarmiento.

Minjin Lee is from Princeton’s Department of Civil and Environmental Engineering. She began working with Charlie Stock and Elena Shevliakova as a postdoc in June.

Adrien Deroubaix comes to us from École Polytechnique, France. He arrived in June to work with Paul Ginoux as a postdoc.

Benjamin Sulman, a former postdoctoral researcher at Indiana University, began working remotely with John Dunne and Elena Shevliakova as an associate research scholar in June.

Henri Drake arrived in June, from Haverford College, to work with Adele Morrison and Alison Gray as a research assistant in the Sarmiento Group.

2015 summer undergraduates: **Alex Dominguez** who will be working with Ivy Frenger, Magdalena Carranza (Scripps), and Rebecca Asch; **Maricela Coronado** who will be working with Keith Rodgers and Ivy; **Joanna Sobolewska** who will be working with Rebecca; **Lauren Santi** who will be working with Alison Gray; **Kate Begland** who will be working with Carolina Dufour and Alison; **Paul Yi** who will be working with Sonya Legg and Rob Nazarian; and **Alicia Menendez**, an undergraduate from Stanford, who will be working with Keith and Sarah Schlunegger.

2015 summer intern with an AOS appointment working over at GFDL: **Shaun Howe**, an undergraduate from Cornell University who will be working with Vaishali Naik.

Gustavo Marques arrived in late June from the University of Miami. He will be working with Bob Hallberg as a postdoctoral research associate.

Nathaniel Chaney comes to us from Princeton's Department of Civil and Environmental Engineering. He will be working with Elena Shevliakova as a postdoc beginning in July.

Honghai Zhang is arriving in July from RSMAS, Miami to work as a postdoc with Tom Delworth.

Max Popp is arriving in July from the Max Planck Institute for Meteorology in Germany. He will be working with Isaac Held as a postdoc.

Levi Silvers is arriving in July from the Max Planck Institute for Meteorology in Germany. He will be working with Chris Golaz, Yi Ming, and Ming Zhao as an associate research scholar.

Aaron Match, one of our incoming graduate students, will arrive from Cornell in July to work with Stephan Fueglistaler.

Marianne Haseloff is arriving in July from the University of British Columbia. She will be working with Bob Hallberg and Olga Sergienko as a postdoc.

Lionel Arteaga is arriving in August from GEOMAR. He will be working in the Sarmiento Group as a postdoc.

Haidi Chen is arriving from the University of Wisconsin in August. She will be working in the Sarmiento Group as a postdoc.

Colleen Petrik is arriving in August from NOAA's National Marine Fisheries Service (NMFS). She will be working with Jorge Sarmiento and Charlie Stock as an associate research scholar.

Mitch Bushuk is arriving in September from the Courant Institute of Mathematical Sciences. He will be working with Rym Msadek, Gabe Vecchi, and Mike Winton as a postdoc.

Seth Bushinsky is arriving in September from the University of Washington. He will be working in the Sarmiento Group as a postdoc.

Welcome Back!

Pablo Zurita-Gotor, a returning faculty member from the Universidad Complutense de Madrid, arrived in June. Pablo will be working with Isaac Held.

Gabriel Lau, a former faculty member and GFDL scientist of 35 years, will arrive in July to work with his AOS/GFDL colleagues for the summer months.

Departures

Philip Pika, who worked in the Sarmiento Group for a few months, returned to ETH Zurich in April.

Mei-Ling Tang, a visiting student from National Chung Hsing University, returned to Taiwan at the end of April.

Jonas Nycander, a visiting faculty member from Stockholm University, returned to his home institution at the end of June.

Birth Announcements

Congratulations to **Sarah Kapnick**, a former AOS Postdoctoral Research Fellow, and her husband, Andrew, on the birth of their daughter, Anne Mai, on May 5, 2015. Sarah is presently a GFDL physical scientist.

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