



AOS & CICS Newsletter

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Stock Awarded Prestigious PECASE Award

Charlie Stock, Visiting Research Collaborator in the AOS Program, was honored with the Presidential Early Career Award for Scientists and Engineers, the U.S. government's most prestigious award for early-career scientists. Award winners were announced in a White House press release on November 5, 2010.



AOS Visiting Research Collaborator and GFDL Research Oceanographer Charlie Stock

The award recognizes Stock's efforts to enhance our understanding of interactions between marine ecosystems and climate, including work to develop innovative ways of applying climate and earth system models to assess impacts of climate change on living marine resources at global and regional scales.

The Presidential Award is the highest

honor bestowed by the U.S. government to recognize and support the extraordinary achievements of young professionals at the outset of their independent research careers in science and technology. In nominating Stock, NOAA cited his research "at the forefront of understanding how climate change and marine ecosystems interact."

"Science and technology have long been at the core of America's economic strength and global leadership," President Obama said in announcing the awards. "I am confident that these individuals, who have shown such tremendous promise so early in their careers, will go on to make breakthroughs and discoveries that will continue to move our nation forward in the years ahead."

Stock came to the Cooperative Institute for Climate Science as an AOS postdoctoral research associate in 2007. Currently a research oceanographer in the Climate and Ecosystems Group at GFDL, his work involves developing marine ecosystem models capable of capturing both the influence of marine ecosystems on global-scale biogeochemical cycles and the impacts of climate on marine food webs. His efforts include analysis of the impact of climate on the energy flow between phytoplankton and larger organisms - such as fish - that provide the bulk of our harvested marine resources.

Stock has emerged as a leader in interdisciplinary efforts between the climate modeling community and living marine resource scientists, including the organization of an international effort to publish a comprehensive synthesis on the use of climate and earth system models to assess the impact of climate on living marine resources. He plans to use the PECASE award to build upon these efforts. "Receiving this award is a great honor, privilege, and most importantly, a

tremendous opportunity to strengthen the cross-disciplinary collaborations vital for understanding climate and ecosystem dynamics," according to Stock.

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

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TigerTransit/Shuttle Services
Operating on Spring Schedule
<http://www.princeton.edu/transportation/ForrestalSpring11.pdf>

“The AOS community was enormously proud, but not surprised, to hear about this prestigious honor. The PECASE Award reflects the quality, breadth, and depth of Charlie’s research; it is well deserved,” said AOS Director Jorge Sarmiento.

A Princeton graduate, Stock holds a Ph.D. in Civil, Environmental and Ocean Engineering from the MIT/Woods Hole Oceanographic Institution Joint Program and a Masters in Environmental Fluid Mechanics and Hydrology from Stanford University.

Charlie is the fourth PECASE award recipient at GFDL, joining Arlene Fiore, Gabriel Vecchi, and Yi Ming. The Presidential awards were established by President Clinton in 1996 and are coordinated by the Office of Science and Technology Policy at the White House. Nine federal agencies, including the National Oceanic and Atmospheric Administration (NOAA), recommend recipients to the White House. ■

BP Extends Research Partnership with Carbon Mitigation Initiative

Princeton’s Carbon Mitigation Initiative (CMI) recently received a commitment of \$11 million from BP as an extension of their research partnership which first began in 2000. Extended in October of 2008 and again this past fall, the now 15-year partnership between Princeton University and BP will run from 2011-2015 and will continue its mission of leading the way to a compelling and sustainable solution of the carbon and climate change problem.

CMI is part of the Princeton Environmental Institute (PEI), the University’s interdisciplinary center for environmental research, education and outreach, and is led by Co-Directors Stephen Pacala, the director of PEI and the Frederick D. Petrie Professor of Ecology and Evolutionary Biology, and Robert Socolow, a professor of mechanical and aerospace engineering.

AOS Director and Lead Project PI for CMI’s Science Group Jorge Sarmiento is grateful for BP’s extended financial support. “The renewal is a true testament to the success of the collaborative efforts of so many folks who are deeply committed to solving the world’s climate problem.”

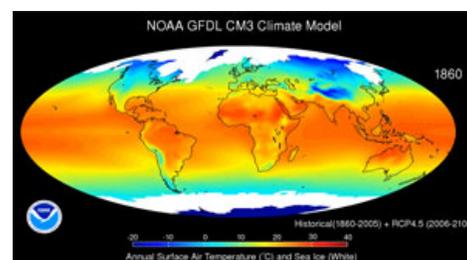
Working within four main research groups – Capture, Storage, Science and Policy & Integration, 16 faculty members and more than 70 postdocs and students from over 10 departments and research units on campus are actively engaged in overcoming the challenges of carbon mitigation. “Stabilization wedges,” one of the initiative’s best known contributions, is fast becoming a paradigm in the carbon mitigation field and is a direct result of such collaboration. The wedges concept, first published by Pacala and Socolow in a 2004 issue of *Science*, introduces 15 existing technologies, each representing a so-called stabilization wedge, proposes that any combination of seven wedges could prevent global emissions of greenhouse gases from rising for the next 50 years. At its heart, the wedges concept suggests that the world must avoid emitting about 200 billion tons of carbon, or eight 25 billion ton wedges, over the next 5 decades in order to get on course to avoid dramatic climate change.

Under the new agreement, CMI researchers will continue to identify the most credible methods of capturing and sequestering a large fraction of carbon emissions from fossil fuels used in electricity, hydrogen and synthetic fuel production and to explore emerging methods of lessening the impact of climate change. Scientists will further develop and analyze data from the oceans, atmosphere, ice cores and the land biosphere to study natural sources and sinks of carbon and impacts of emissions on future climate, and continue to explore the policy implications of carbon mitigation strategies. During the renewal period, CMI will continue to dedicate a portion of its funds to support research in emerging areas and will retain its emphasis on communicating its insights to industry, government, nongovernmental organizations and the general public. ■

GFDL Completes First Set of Climate Experiments for Next IPCC Report

Contributed by Maria Setzer, GFDL Communications Director

GFDL has reached a milestone in the lab’s preparations for the next IPCC report, AR5, expected to be published in 2013. In early January, GFDL completed the required suite of simulations with its new atmosphere-ocean climate model, CM3, to be included in experiments for the upcoming AR5.



During the past year, GFDL completed over 6500 years of model integrations using approximately 13 million CPU-hours of supercomputer time. The lab performed historical simulations using five ensemble members, and a pre-industrial control simulation of more than 850 years. Based on satisfactory results, future climate projections using four different scenarios were also completed, as well as simulations for attribution of climate change to individual forcing agents. Finally, idealized simulations, including over 800 years of doubled-CO2 conditions, were done.

The next steps will be to analyze the results for scientific publications and to process the model output for contribution to the Program for Climate Model Diagnosis and Intercomparison (PCMDI) data archive, which has been designated as the public source for AR5 data. GFDL anticipates supplying this model output to the PCMDI by fall 2011, and it should be publicly available shortly after that. We also plan to make this data available directly through the lab’s own Data Portal <<http://data1.gfdl.noaa.gov/>>.

GFDL has committed to performing all the required experiments for AR5, using both CM3 and the lab’s two Earth System

Models (ESM). CM3 emphasizes the physical climate and chemistry, while the ESMs emphasize the carbon cycle. AR5 will be the first IPCC report to include experiments from any Earth System Models. Two additional new models developed by GFDL (CM2.5 for decadal prediction, and hiRAM for high-resolution atmosphere) will be used for limited sets of IPCC experiments.

GFDL Scientists Leo Donner and Bruce Wyman led the effort to develop the new atmospheric model used in CM3, with a large contingent of GFDL and AOS scientists. Donner is a lecturer in the AOS Program. Research Scientists Andrew Wittenberg and Mike Winton provided leadership, in coupling the atmospheric and land components to the ocean model (from GFDL's previous-generation model, CM2.1). Subsequently, CM3 was configured and tested by a third group of scientists, led by Larry Horowitz. This team ran the experiments and performed quality assurance for CM3. Horowitz is a lecturer in the AOS Program, teaching Atmospheric Chemistry this semester. ■

Climate Process Team Workshop Held at GFDL

In late October, a two day workshop brought together members of the Internal Waves and Mixing Climate Process Team, a multi-institutional collaboration whose overall goal is the development of ocean mixing parameterizations for use in representing internal wave driven mixing in climate simulations. The team consists of more than 15 PIs from leading institutions, with combined expertise in modeling, observational analysis, and theoretical work.

The workshop was held at GFDL and was attended by several members of GFDL's ocean group, including AOS Lecturer and Research Oceanographer Sonya Legg. According to Legg, the group's work will focus on three developments: the maturing of near-field parameterizations accounting for mixing processes at internal wave generation sites, a new parameterization for the mixing resulting from the breakdown of near inertial energy transported in the wave

field, and a parameterization for the breakdown of internal wave energy in the ocean interior far away from sources. As part of the initiative, Postdoc Angelique Melet will arrive in June from the Laboratoire des Ecoulements Géophysiques et Industriels (LEGI) in Grenoble, France to take the lead in encapsulating developing parameterizations into GFDL's coupled-climate and global ocean models.

The collaboration is funded by NSF and will employ a combination of data-based relations for wave physics, radiation balance formulations, and process resolving models of the high-resolution and global-resolution classes. Jennifer MacKinnon of Scripps Institution of Oceanography will oversee the management of the team and was the facilitator of the October workshop. ■

Smith named AMS Robert E. Horton Lecturer in Hydrology in 2011

AOS Affiliated Faculty member and Professor of Civil and Environmental Engineering James A. Smith has been selected as the Robert E. Horton Lecturer in Hydrology for 2011 by the American Meteorological Society (AMS). Smith, whose work is partially supported by CICS, was selected "for outstanding



AOS Affiliated Faculty Member and Professor of Civil and Environmental Engineering James A. Smith

contributions to the study of radar-based rainfall estimation, the scaling properties of rainfall and basin runoff response, and the hydrometeorology of extreme floods."

The purpose of the lectureship is to encourage and foster an interchange of ideas between meteorologists and hydrologists. It is named for Robert E. Horton (1875–1945), who made significant contributions to the study of the hydrologic cycle.

A formal presentation took place at the Annual Awards Banquet on January 26, 2011 in Seattle, Washington. Smith presented a lecture, titled "What Robert Horton Did Not Know about Floods" at the annual meeting. ■

AOS Grad. Student Gains Insight on Climate-Related Issues through Policy Workshop

Reducing radiative forcing within decades is certainly no small task, but that doesn't stop AOS Associated Faculty Denise Mauzerall and a committed group of Princeton graduate students from setting out to do so.

This fall, AOS Graduate Student Ilissa Ocko got a rare, first-hand opportunity to develop policy recommendations for the U.S. Department of Energy (DOE) and the Environmental Protection Agency (EPA) that describe actions that can be implemented in the near-term by targeting non-CO₂ climate forcers to reduce radiative forcing. This unique opportunity arose out of a Woodrow Wilson School Policy Workshop, led by Mauzerall, entitled "Post-Copenhagen Climate Change Initiatives."

The workshop is a collective effort which, in addition to initial background readings, lectures, discussions, an introductory meeting with the DOE and EPA clients in Washington D.C., and informal briefings by pertinent governmental and scientific experts, consists of teams of students traveling to various domestic and foreign destinations to seek out experts, conduct



AOS Graduate Student Ilissa Ocko at the 22nd Montreal Protocol Meeting of the Parties in Bangkok

interviews, and gather information relevant to near-future climate change mitigation. Groups traveled to Washington D.C., California, Beijing, Shanghai, Brussels, Berlin, and Bangkok.

In November, Ocko attended the 22nd Montreal Protocol Meeting of the Parties in Bangkok, where she and two graduate students from Geosciences and Civil and Environmental Engineering, had the opportunity to interview about 30 climate experts and observe the international meeting.



From Left to Right: Brian Ellis (CEE), Jenna Losh (Geosciences), and Ilissa Ocko (AOS)

“It was really incredible to work on climate-related issues with such a diverse group of students. All of our individual expertise was critical to our dynamic discussions,” Ocko noted. “This project is very timely, since conversations at the recent Cancun climate talks turned toward non-CO₂ climate forcers,” she added.

On January 7th, students presented their findings and policy recommendations to the DOE. A final report entitled “Complements to Carbon: Opportunities for Near-Term Action on Non-CO₂

Climate Forcers” will be available in late January. ■

GEO/AOS Department Retreat

For two days in early February, following oral research presentations by 3rd and 5th year GEO/AOS graduate students and a lunchtime poster session showcasing 2nd and 4th year graduate student research as well as that of interested postdocs, members of the Geosciences Department and AOS Program will take to the slopes at Hunter Mountain in the Catskills.



The retreat, held annually, provides an informal forum to present the work of graduate students in a setting that fosters a department wide -- and thus interdisciplinary -- scientific discourse and encourages and facilitates social and scientific interactions and discussion among department/program members. Fifteen minutes will be allotted for oral presentations followed by a brief Q&A period, with the emphasis on student dialogue. A poster session and lunch will follow in the Great Hall of Guyot.

Over 50 graduate students, postdocs, and faculty are expected to attend. In addition to the science, winter activities will include: downhill skiing, snowboarding, cross country skiing, and snowshoeing. ■

GFDL Blood Drive

Monday, February 14,

2011

11 am – 2 pm

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 Hung-Fu Lu who spent nearly a year in Leo Oey’s group.]

After more than nearly a year working in Leo Oey’s group, Visiting Associate Professional Specialist Hung-Fu Lu will be returning to Taiwan to work with Dr. Chau-Ron Wu at National Taiwan Normal University as an assistant researcher in the Department of Earth Sciences.



Visiting Associate Professional Specialist Hung-Fu Lu’s first snowfall

While at Princeton, Hung-Fu has been working with Oey to develop a high-resolution model of the Pacific Ocean based on mpiPOM - a very fast and efficient version of the Princeton Ocean Model originally developed by George Mellor, Leo Oey, and other colleagues. At present, the model is driven by six-hourly satellite/NCEP-based winds and climatological data, but Hung-Fu has plans to further develop it implementing rivers and data assimilation. He is using the model to study the Indonesian and South China Sea throughflows and hopes to better understand how these relate to western boundary currents and large-scale wind forcing of the Pacific Ocean.

“Working with Dr. Oey and his group, I learn new things every day, not only about science, but also the rigorous and correct attitude of doing research. Dr. Oey also teaches me a lot about GFD and ocean modeling, based on his profound modeling experiences. I’ve really enjoyed the time I’ve spent here and appreciate all the help from the group. The entire period must be the most wonderful memory I have ever had.”

“It was a joy working with Hung-Fu. He not only contributed a lot to testing the new mpiPOM and setting up the western Pacific Ocean Model, but he also almost single-handedly built up RAIDS on our group's multi-nodes machines. I will miss his wide-ranging contributions, and hope to continue collaborating with him on various research in the Pacific,” Oey added.

In his new position, Lu's research will focus on the development of a better regional model compared to the one currently in use in Taiwan. He plans to continue his collaboration with Oey, using what he's learned about the mpiPOM at Princeton and applying it to the Pacific and the northwestern Pacific Oceans. ■

France to work with Sonya Legg and Robert Hallberg as a Postdoctoral Research Associate. As a member of the Climate Process Team, her research will focus on internal wave driven mixing in global ocean models.

Departures

Stefan Gerber – November 2010 Assistant Professor, University of Florida, Gainesville

Hung-Fu Lu – February 2011 Assistant Researcher, National Taiwan Normal University

AOS & CICS News

AOS Associated Faculty Member and Albert G. Milbank Professor of Geosciences and International Affairs **Michael Oppenheimer** has been named as a fellow for 2011 by The American Association for the Advancement of Science. He is being honored by AAAS for his leadership in environmental and climate change policy and will be recognized for his contributions to science and technology at the Fellows Forum to be held on February 19, 2011 during the AAAS Annual Meeting in Washington, D.C.

Arrivals

Cindy Kandell arrived in December and is the AOS Program's new grants manager. She will assist our Principal Investigators on the grant application process, prepare budgets and other documentation for new proposals, and work with ORPA on their submission. Additionally, she will oversee sponsor reporting requirements on funded proposals, monitor spending, and prepare monthly projections.

Martin Jucker will arrive in April from Swiss Federal Institute of Technology Lausanne, Switzerland to work with Geoff Vallis as a Postdoctoral Research Fellow. His research focuses on the variability of the atmosphere by applying ideas from the theories of jets and turbulence.

Angelique Melet will be arriving in June from the Laboratory of Geophysical and Industrial Flow (LEGI) in Grenoble,

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