



AOS & CICS Newsletter

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Institute for
Climate
Science (CICS)*

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GFDL's Leading Role in IPCC

By Maria Setzer, Communications Director, GFDL

When 27 scientists gathered in Paris during an unseasonably warm week in late January to reach agreement on the final wording of the latest Intergovernmental Panel on Climate Change (IPCC) Summary for Policy Makers, 3 GFDL researchers were in their ranks. V. "Ram" Ramaswamy (Acting Director), Isaac Held (Senior Scientist) and Ron Stouffer (Senior Research Meteorologist) all flew to Paris to take part in the meeting, having served in leading roles on the IPCC Working Group 1 (Physical Science Basis). This is the IPCC's fourth comprehensive assessment of the drivers, effects and future projections of climate change.

Diplomats from 131 nations joined the group of distinguished scientists in Paris in January. Participants went through the final draft of the summary report word by word to reach consensus. In the end, participating scientists – not diplomats - had the final say on the science. The Summary for Policy Makers was released in Paris on February 2 and the full report from Working Group 1 was released about 2 weeks later.

A total of 13 GFDL scientists contributed to 7 out of 11 chapters of this assessment, as well as the technical summary and the summary for policy makers. Ram, a Lecturer in the AOS program, was a Coordinating Lead Author of a chapter covering "Changes in Atmospheric Constituents and in Radiative Forcing". Isaac, also a Lecturer in the AOS Program, was a Lead Author of a chapter on "Regional Climate Projections"; and Ron was a Lead Author of Chapter 8, "Climate Models and Their Evaluation". Another 5 GFDL scientists were Contributing Authors of Chapter 8 and 3 GFDL "alumni" also contributed to that chapter. In addition, Ram and Ron were among the Lead Authors of the Technical Summary for the Working Group 1 report.

Ron Stouffer has been involved in all four IPCC WG1 reports, since 1990, when the first was issued. For the last report in 2001, he counted about 35 journalists at the press conference announcing release of the policy-makers summary; this year, he witnessed 600 journalists and 35 TV crews. In the weeks following the Paris press conference this year, GFDL scientists granted interviews to NPR, NBC, CBS, NJN, several national publications and major US newspapers. Climate animations produced by GFDL to demonstrate IPCC results were incorporated into news stories broadcast on CNN, CBS, and on web sites for the New York Times, Wall Street Journal, and others.

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World-wide, more than 1,200 scientists worked on this IPCC report for nearly 6 years. GFDL was one of about a dozen international modeling centers participating in the IPCC, contributing 2 of the models used for climate assessments in the report (CM2.0 and CM2.1). The lab also devoted the equivalent of half a year of supercomputing time to produce climate simulations for the IPCC. GFDL has archived more than 300 terabytes of model output from the IPCC report, some of which is available to researchers on GFDL's Data Portal (<http://data1.gfdl.noaa.gov/>).

The IPCC hasn't formally established preparations for a fifth assessment, but Ron Stouffer is a member of the committee that will determine the input scenarios which will be used for the next report. That committee will have their first meeting in the Netherlands this September. The climate modeling community is expected to have the next generation of models ready by 2008, so that climate model runs may be completed in 2009 and data collection and analysis can be accomplished in 2010. Ron anticipates that his next trip to Paris for an IPCC press conference will be some time in 2013.

GFDL Climate Model Makes NOAA's Top Ten Breakthrough List

In recognition of its 200 year anniversary, NOAA has published an impressive list of top ten Breakthroughs. The list includes the first of its kind general circulation model of the coupled atmosphere-ocean-land system, which was developed by GFDL scientists, Syukuro Manabe and Kirk Bryan in the late 1960's. Unlike earlier approaches which were based purely on theory and observation, this pioneering model enabled scientists to understand how the ocean and atmosphere interact with each other to maintain climate and control its change. During the next few decades, Manabe and Bryan kept improving their model. It was 1989 when they published, in collaboration with Ron Stouffer, another landmark study in *Nature*. Using the greatly improved coupled model, they predicted the response of the coupled atmosphere-ocean-land system to the gradual increase of the CO₂ concentration in the atmosphere. The model used for this study has served as the prototype for the comprehensive climate models, which have been used extensively for the IPCC assessment of climate change.

At the time of its development, long term modeling of CO₂ was still in its infancy. Manabe says, "Initially, our study received a little attention. A few of those who read our 1969 paper thought that the model was too complicated to use for the study of climate. Almost four decades have passed since the publication of the paper, and climate models have become very comprehensive, including the detailed parameterizations of many processes that could be important. Now, everybody tells me that the coupled model we had developed is too simplistic, ignoring the many processes that could play critical roles in climate change. I feel fortunate, however, that many of the results we obtained agree reasonably well with the result obtained from the comprehensive models recently constructed. According to him, these comprehensive models have become indispensable to the study of climate

change, in particular that of global warming. *Indispensable*, however, might better describe Manabe and Bryan themselves, who as current AOS Senior Scientists, continue their endeavors some forty years after the introduction of their first climate model.

Ramaswamy Assumes Post as Acting Director of GFDL

Dr. Venkatachalam Ramaswamy, known to all as "Ram," has been serving as the Acting Director for GFDL, since the departure of Ants Leetmaa at the end of January. He will continue to steer the leadership of GFDL while the search process takes its course and a permanent replacement for Ants Leetmaa is found.

Ram has been at GFDL since 1985, when he arrived at Princeton as a Visiting Scientist in the Program of Atmospheric and Oceanic Sciences. Ram remained with the University until he was hired by GFDL in 1995. In 2000, Ram was appointed as one of GFDL's Senior Scientists.

He leads GFDL's Atmospheric Physics and Chemistry Group and is very active on the Intergovernmental Panel on Climate Change (IPCC) and the World Climate Research Program. He is a drafting author of the IPCC's Climate Change 2007: The Physical Science Basis: Summary for Policymakers. He is on the faculty of the Geosciences and the AOS Program where he advises graduate students and post-doctoral scientists. Ram will continue with these responsibilities and his own research efforts throughout his appointment as Acting Director. He holds a Ph.D. in Atmospheric Science from the State University of New York at Albany.



Geosciences/AOS Faculty Search

The Geosciences faculty search continues to move forward with the committee hoping to complete its work this semester. The search began in the fall of 2006 and has resulted in a diverse and highly-qualified applicant pool. Since early February, a number of candidates for the tenure-track faculty position in the area of atmospheric and oceanic sciences have visited and presented Monday afternoon seminars in Geosciences and additional seminars at GFDL. Recognizing that the input of all university stakeholders is important as the search process continues, candidates have interviewed with faculty and students in Guyot Hall, Sayre Hall, and at GFDL. The initial application pool was made up of 75 applicants, before being narrowed down.

Geosciences Advisory Council Review set for Fall

The Department of Geosciences Advisory Council Review is scheduled to take place in the Fall. According to the Office of the Dean of the Faculty Guidelines for Academic Reviews, "The academic review process provides a means by which academic departments and programs can engage in serious self-evaluation, assess program quality and effectiveness, review strategies for development and improvement, and plan for the future." Over two days, Academic Review Committee members will evaluate the department considering both research and teaching activities as well as review departmental plans for future development. Both graduate and undergraduate programs will be evaluated as well as the integration of the AOS Program. The members will also look at the relationship between the department and other groups on campus as well as examine ties with GFDL.

Academic Reviews are generally scheduled every five to ten years as needed. The department was last reviewed in April of 2000. The review will culminate in a report of the Academic Review Committee for the Department of Geosciences outlining the assessment of strengths and weaknesses of the department, a review of plans for future development, examination of graduate and undergraduate programs, faculty issues, and recommendations.

*Story Ideas?
We'd love to hear
from you! Please
send your
suggestions to:*

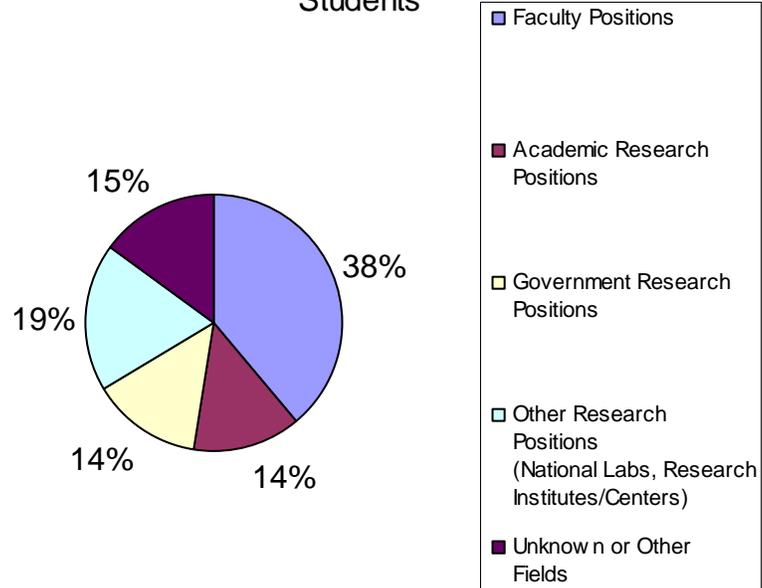
jcurcio@princeton.edu

AOS Alumni . . . Where are they now?

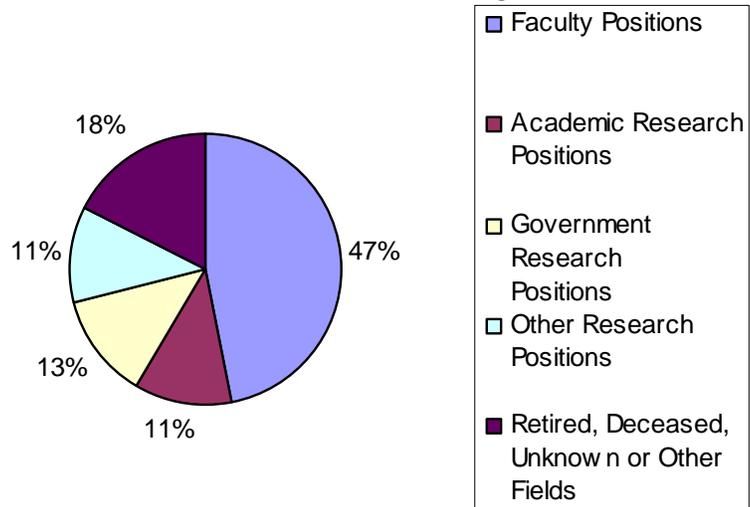
As part of his continuing series of summaries focusing on the AOS Program and in preparation for the upcoming "Geosciences Advisory Council Review" scheduled for this Fall, Prof. Sarmiento has asked his administrative staff to compile statistics that many of you may find of interest. The figures on the following page demonstrate the employment patterns of past graduates, postdocs, research staff, and visiting fellows, many of whom go on to top postdoctoral fellowships, prestigious faculty and research positions, as well as careers in a wide variety of fields in the private sector and government.

The first pie chart illustrates the career paths of our former graduate students, over one third of whom are currently in faculty positions and nearly one half of whom are in research positions. The second chart indicates that almost one half of our former postdocs, research staff, and visiting fellows are presently in faculty positions and over one third are in research positions. Since its inception forty years ago, the AOS Program has been home to 80 graduate students and almost 200 postdocs, research staff, and visiting fellows.

Positions Held by Former AOS Graduate Students



Positions Held by Former Postdocs, Research Staff, and Visiting Fellows



*In future issues,
we'd like to
include a column
dedicated to
Alumni News.
Please send your
news, or news of
friends and
colleagues, to:
jcurcio@princeton
.edu*



Director's Corner

As Director of CICS and AOS, I feel fortunate to work with a remarkably talented group of scientists. In this column, I would like to tell you a little about our CICS oceanographers, who are conducting research in the areas of ocean model development, parameterization of small-scale ocean processes, studies of the large-scale ocean circulation, and coastal and regional ocean modeling.

Physical oceanographers in CICS include AOS faculty members Geoff Vallis and Sonya Legg and research oceanographer Alistair Adcroft; postdocs Laura Jackson, Rongrong Zhao, and Riccardo Farnetti; and graduate students Neven Fuckar, Arno Hammann, and Chris Little. Also funded through CICS are several researchers at other institutions including Tom Haine at Johns Hopkins University; Dale Haidvogel at Rutgers; Eli Tziperman and Geoffrey Gebbie at Harvard; and Brian Arbic at the University of Texas at Austin who provide expertise not found at GFDL/Princeton that is necessary to achieve our overall goals.

In the area of core ocean model development, Adcroft, in particular, is working with GFDL researchers to develop the next generation of GFDL ocean model. This new model, expected to be operational by the end of this year, employs a generalized vertical coordinate formulation allowing the use of hybrid coordinates as well as the more traditional height, terrain-following or isopycnal coordinates. The most appropriate vertical coordinate for each region of the ocean may then be used. Other innovative aspects of the new model include new advection schemes, the use of thin wall and porous barrier algorithms to represent narrow topography, and mosaic algorithms to allow nesting of high resolution regions within the large-scale model. When ready, the model will represent the state-of-the-art in ocean modeling

Many processes occurring below the grid-scale may have a climatically important role: for example mesoscale eddy transports, mixing in overflows, shear-driven mixing and mixing due to tides. Researchers in CICS are actively involved in investigating these processes, and developing physically based parameterizations in order to improve simulations and predictions of large-scale circulation and climate. For example, Vallis and Zhao are examining mesoscale eddy parameterizations and eddy-mixing layer interactions as part of the Eddy-Mixed Layer interaction Climate Process Team. Jackson, Legg, and the GFDL ocean group members are participants in the Gravity Current Entrainment Climate Process Team, which aims to improve parameterizations of dense overflows in ocean models, and Legg and Arbic are investigating many different processes involved in converting tidal energy to mixing in the ocean interior. Many of these investigations have already led to new and improved parameterization schemes, and with the development of the new GFDL ocean model emphasis will be given to their implementation in the large-scale model and to investigation of their effects on the larger-scale circulation and climate system as a whole.

AOS Launches Newly Designed Website

After undergoing a major redesign, the AOS website will reveal its anticipated makeover in early May, featuring new content, enhanced navigation tools, sharper graphics, and user-friendly menu bars. Boasting an entirely new look, the website better showcases the important research going on in the AOS Program, and reflects a major reorganization of the content and links. AOS Director Jorge Sarmiento is excited to launch the web site as yet another avenue to introduce the AOS Program to prospective students and reacquaint current students, faculty, and alumni with Program offerings and happenings.



Homepage of revamped AOS website

In addition to a collection of profiles and web pages for AOS faculty, research staff, and graduate students, the site contains updated research synopses as well as new Program descriptions. Prospective students can also access the materials needed to apply to the AOS Program, while Program alumni can use the site to keep abreast of the goings-on in and around the Program. Jorge Sarmiento expresses his sincere appreciation to Web Designer, Jonathan Sarmiento, and Committee Members, Sonya Legg, Cynthia Randles, Neven Fuckar, Yi Huang, Laura Jackson, Sara Mikaloff-Fletcher, Whit Anderson, Sandy Clark, Laura Rossi, Anna Valerio, and Joanne Curcio for their contributions to the redesign. The site will be frequently updated with latest AOS news, events, and Program information. Well worth bookmarking for periodic visits, it will be located at: <http://www.aos.princeton.edu>.

AOS & CICS Research in Action

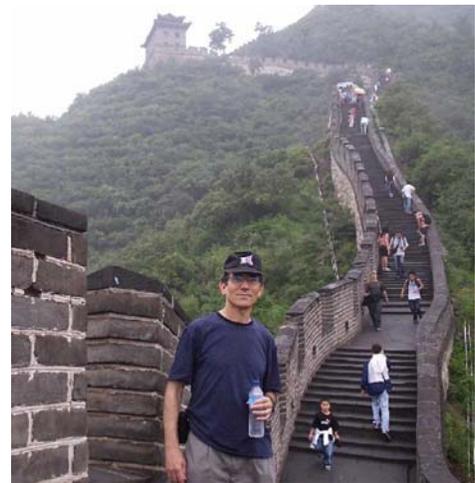
[This column is intended to focus on AOS & CICS research accomplishments and milestones, past, present, and future. In this issue, we highlight the accomplishments of Tal Ezer who has been a fixture in the AOS program for over 17 years.]

After more than 17 years as a resident of Sayre Hall, Tal Ezer is leaving AOS this year to accept a faculty position at the Department of Ocean, Earth and Atmospheric Sciences of Old Dominion University (ODU) in Norfolk, Va. The new appointment is in affiliation with ODU's Center for Coastal Physical Oceanography (CCPO) and the new Virginia Modeling, Analysis & Simulation Center (VMASC). For the next year or so Tal will remain as AOS research collaborator with a temporary office in Sayre Hall, as he continues his collaboration with Leo Oey's group on coastal forecasting, as well as his

collaboration with GFDL as part of the Climate Process Team project.

A native of Israel, Tal studied Mathematics and Physics (B.Sc.) and then Atmospheric sciences (M.Sc.) at the Hebrew university of Jerusalem, but started a lively career in oceanography by studying the Dead Sea! In the early 1980s, he developed the first 3D numerical model for this saltiest (~250 ppt) and lowest (surface water more than 400 m below sea level) body of water on earth. In 1985, Tal moved to the U.S. to pursue a Ph.D. degree in Physical Oceanography at Florida State University, focusing his research on turbulence and bottom boundary layer modeling. In 1989, Tal joined the AOS program, working with George Mellor (now Professor Emeritus) on the development of high-resolution Gulf Stream models, data assimilation methods, and Atlantic Ocean variability. The research led to interesting findings on the Gulf Stream separation and how bottom topography, recirculation gyres and surface forcing affect Gulf Stream models. With Mellor, Tal was involved in the implementation of the first operational coastal ocean forecast system for the U.S. east coast at NOAA/NCEP.

During the last decade, Tal managed and supported the Princeton Ocean Model (POM) users group that grew from a dozen U.S. users in the early 1990s to over 3000 modelers from over 70 countries today. While more complex models are now rapidly being developed, POM remains popular for its simplicity and robustness. During recent years, Tal collaborated with Leo Oey on various studies of dynamic mechanisms and prediction skill assessment for eddies and the Loop Current in the Gulf of Mexico, as well as the development of inundation model for Cook Inlet, Alaska.



As a convener of modeling sessions at the 2006 Western Pacific Geophysical Meeting, Tal had the opportunity to visit the Great Wall of China.

In collaboration with the Climate Process Team - Gravity Current Entrainment group, Tal is studying mixing processes in overflows; his research shows the important role of sill topography, and how the deep water properties resulting from the Denmark Strait and the Faroe Bank Channel overflows may be affected by mixing processes. Using a generalized coordinate version of POM, comparisons of various vertical grids demonstrate how sensitive model mixing is to the grid choice (e.g., terrain-following, z-level or isopycnal) and to mixing parameterizations.

At ODU, Tal plans to teach ocean modeling and physical oceanography courses and continue the research in regions such as the Gulf of Alaska, the North Atlantic and the Caribbean Sea, but also focus on new areas of local interest such as prediction of floods in the southern Chesapeake Bay. Tal would like to thank all the colleagues and friends from AOS and GFDL who made the past 17 years productive, enjoyable, and fun. One thing he is not going to miss while jogging on Virginia Beach is New Jersey snow and ice. All of us in the AOS Program wish Tal continued success minus the winter weather advisories!

Some recent publications:

- Ezer, T., (2005) Entrainment, diapycnal mixing and transport in three-dimensional bottom gravity current simulations using the Mellor-Yamada turbulence scheme, *Ocean Modelling*, 9(2), 151-168.
- Ezer, T., (2006) Topographic influence on overflow dynamics: Idealized numerical simulations and the Faroe Bank Channel overflow, *J. Geophys. Res.*, doi: 10.1029/2005JC003195.
- Ezer, T., D. V. Thattai and B. Kjerfve, (2005) On the variability of the flow along the Meso-American Barrier Reef System: A numerical model study of the influence of the Caribbean Current and eddies. *Ocean Dynamics*, 55 (5-6), 458-475.
- Oey, L.-Y., T. Ezer, G. Forristall, C. Cooper, S. DiMarco and S. Fan, (2005) An exercise in forecasting Loop Current and eddy frontal positions in the Gulf of Mexico, *Geophys. Res. Lett.*, 32, L12611, 2005GL023253.
- Oey, L.-Y., T. Ezer, D.-P. Wang, S.-J. Fan and X.-Q. Yin (2006) Loop current warming by Hurricane Wilma, *Geophys. Res. Lett.*, 33, L08613, doi: 10.1029/2006GL025873.
- Oey, L.-Y., T. Ezer, D.-P. Wang, X.-Q. Yin and S.-J. Fan (2007) Hurricane-induced motions and interaction with ocean currents, *Cont. Shelf Res.*, In Press.
- Oey, L.-Y., T. Ezer, C. Hu and F. Muller-Karger, (2007) Baroclinic tidal flows and inundation processes in Cook Inlet, Alaska: Numerical modeling and satellite observations, *Ocean Dynamics*, In Press.

AOS & CICS News

Congratulations to **Laura Rossi**, Program Manager in the AOS Program, who was granted a special performance award for her outstanding contributions to the external review of the Cooperative Institute for Climate Science (CICS).

BIRTHS

Congratulations to **Jennifer Simeon** and her husband, Francois, on the birth of their daughter, Clara Simeon Baratange – 7 lbs. 8 oz., who was born on Friday, March 23rd.

ARRIVALS AND DEPARTURES

New Arrivals:

Anna Pirani arrived April 4, 2007 and is working for International CLIVAR (www.clivar.org) Hosted by Stephen Griffies/GFDL, Anna is responsible for coordinating the activities of the CLIVAR Working Group on Seasonal to Interannual Prediction, the Working Group on Coupled Modelling, the Working Group on Ocean Model Development, and the PAGES-CLIVAR Intersection Panel. It is anticipated that her stay will last one to two years.

Pablo Zurita-Gotor will arrive on May 1, 2007 for 5 months to work with Geoff Vallis and Isaac Held on large-scale atmospheric dynamics. He is on leave from Universidad Complutense de Madrid, Facultad de Ciencias Fisicas.

Chau-Ron Wu will arrive August 1, 2007 for a one year sabbatical from the National Taiwan Normal University to work with Leo Oey on mathematical modeling and observational data syntheses of circulation and wave dynamics

on the Western Pacific oceans.

Departures:

After 2 years at AOS/GFDL working with John Wilson and V. Ramaswamy on modeling and analysis of large datasets on dynamical climatology and assessing gravity wave drag parameterizations, (as of June 1, 2007) **Feng Li** has accepted a position as an assistant research scientist at the Goddard Earth Sciences & Technology Center at the University of Maryland Baltimore County.

After a year sabbatical at AOS/GFDL, **John Edwards** returned to his position in the MET Office in England as of April 2, 2007. He worked with Leo Donner examining the behavior of the planetary boundary layer with special emphasis on its parameterization in the GFDL atmospheric general circulation model.

SAYRE HALL'S 4th IRON CHEF COMPETITION



Sara Mikaloff-Fletcher's winning entry, "To Russia with Love"

Once again, **Sara Mikaloff-Fletcher** has been crowned AOS Program's "Iron Chef" edging out runners up, Cyril Crevoisier and Anna Valerio. The "*James Bond: Bold flavors with Style and Panache!*" themed winning entry was Sara's "*To Russia with Love*" -- frozen vodka and lime terrine with iced raspberry vodka sauce. According to Sara, this dish has a noteworthy origin. It was developed by Roland Mesnier, the executive pastry chef at the White House from Carter to Bush. When former President Reagan decided to throw a ball at the Russian Embassy, he asked Mesnier to create a

dessert spectacular enough for such an affair, but which could still be made at the White House, transported all the way to Russia on Air Force One, and finished by local chefs at the embassy. From the White House, to Russia, to Sayre Hall, this delectable dessert has certainly set the bar high for the next date of spirited competition tentatively scheduled for **early June** (details will follow). The theme is: "*Italian*" -- *No secret ingredient required – a simple "Buon Appetito" will suffice!* All are welcome!



Anna Valerio's vodka rigatoni – martini style



Iron Chef Runner up, Cyril Crevoisier's 007 chocolate coconut cake

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