

2013 IPRC PUBLIC LECTURE



Meeting Hawai'i colleagues interested in the climate science/policy interface. From left, Victoria Keener (East-West Center), IPRC Director Kevin Hamilton, William Chameides, Zena Grecni (East-West Center), Richard Wallsgrove (Blue Planet Foundation).

For the last several years, the IPRC has sponsored an annual public lecture on climate science and its implications for humanity. Held in the evening on the University of Hawai'i (UH) Mānoa campus, the lecture draws an audience from the local community as well as students and staff from a broad cross section of UH.

The *2013 IPRC Public Lecture in Climate Science* featured **William Chameides**, Dean of the Nicholas School of the Environment at Duke University. A member of the National Academy of Sciences, Chameides has had a career of more than 30 years in academia, and for several years was Chief Scientist at the Environmental Defense Fund. With a long-standing interest in communicating the results of environmental science to the broader public, Chameides has become a prolific blogger at numerous sites, including *Scientific American*, *The Huffington Post*, and *Popular Science*.

Chameides' lecture "Dealing with Climate Change: Are We Flying Blind?" took place on March 11. The lecture opened with a brief history of the concept of greenhouse-gas-induced global

warming as the science developed through the 19th and 20th centuries. The science behind the expectation that global mean temperatures will rise has become more complete and reliable and has naturally stimulated a broad global debate on strategies for coping with global warming and its consequences.

Uncertainties, of course, remain in our understanding and our capacity to project accurately future climate changes. Chameides noted the tendency for some people to use the remaining scientific uncertainties to question the basic premise behind man-made global warming. His response was to suggest that the science of global warming should be viewed not as a rickety building that may collapse if one brick is removed, but rather as a jigsaw puzzle. As we solve a jigsaw

puzzle, we reach a point where enough pieces of the puzzle are in place so that the overall picture is already clear even though a number of individual pieces are still not placed.

"We may not yet have all the pieces to the global warming puzzle," Chameides said, "but that Earth's temperatures are rising due to greenhouse gas emissions is a fact to which we must adapt." Chameides concluded with a brief discussion of options for mitigating global warming and adapting to effects of anticipated climate change.

A lively and wide-ranging discussion followed the lecture, with the audience providing interesting perspectives on the issue of individual responsibility and the role of individual action in dealing with the consequences of global change.

Previous IPRC Public Lectures in Climate Science

2009 *A Tale of Environmental Change*

By Dr. Susan Solomon, Senior Scientist, National Oceanic and Atmospheric Administration

2010 *Changing World, Changing Ocean*

By Dr. Susan Avery, President and Director of Woods Hole Oceanographic Institution

2011 *Climate Change and Development: Avoiding the Unmanageable and Managing the Unavoidable*

By Dr. Rosina Bierbaum, Professor, University of Michigan

WHAT'S NEW AT THE APDRC

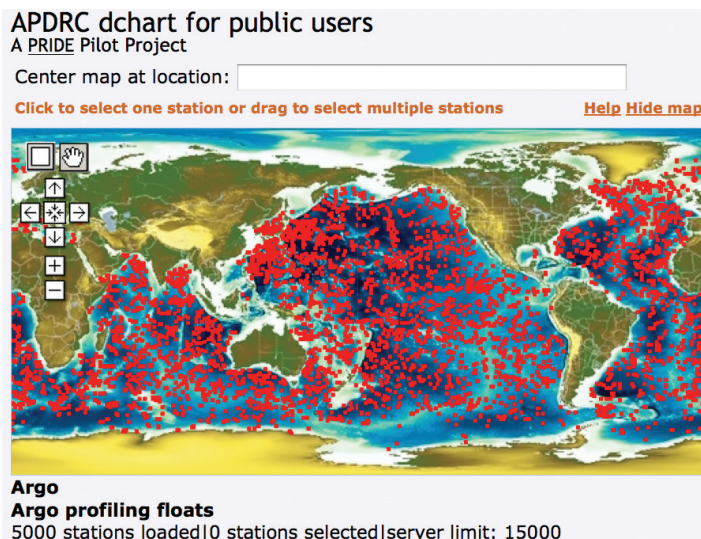
IPRC's Asia-Pacific Data-Research Center (APDRC) acquires and serves a wide variety of products from *in-situ* platforms, satellites, and numerical models. We report here on some developments during the last year.

The APDRC now provides access to Argo-float data (including temperature and salinity) through DChart, allowing browsing and downloading capability: near-real time data are available from Global Data Assembly Centers or GDACs. Until recently, the NOAA Pacific Marine Environmental Laboratory provided this service. The DChart browsing tool is a core data-service of the APDRC and access with DChart of near-real time Argo profiles significantly broadens our capabilities.

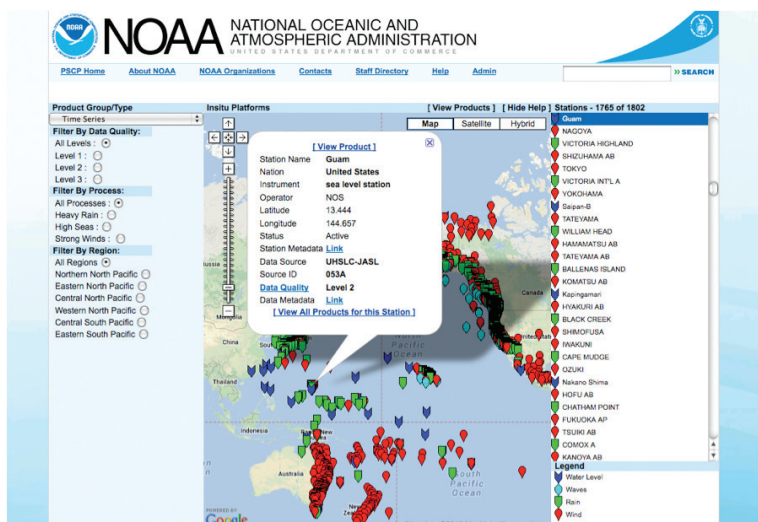
The APDRC has been partnering with the Pacific Climate Information System (PaCIS), a NOAA effort to provide climate-related information and data to users in the US-Affiliated Pacific Islands. The APDRC now hosts, develops, and maintains the PaCIS home web site (<http://www.pacificcis.org/>) and the linked pages for PaCIS projects. The projects include various databases, tools, and information about climate variability and outlooks for the Pacific.

An example is the Pacific Storms Climatology Products site (<http://pacificstormsclimatology.org/>), which provides straightforward analyses of

past high sea-level, rain and wind events to help communities mitigate impacts of future weather extremes. Another web-based resource (PacificIslandsClimate.org, known as PICO), served now by the APDRC, is a searchable archive of climate-related information and events specific to Pacific Islands. Other components of the APDRC/PaCIS partnership are found on the PaCIS site.



The APDRC provides access to all Argo float data with DChart, a web-based data-browsing tool. The figure shows a screen-shot of an example search DChart of all floats at their locations for the period selected: July 1 through July 31, 2013.



Pacific Storm Climatology website.



IPRC's Senior Computer Systems Engineer Sharon DeCarlo and John Marra, NOAA Pacific Regional Climate Services Director and PaCIS Chair, are working together on climate services to the Pacific Islands.



From left, Brian Taylor, Toru Kimoto (JAMSTEC Intl. Affairs Division), Aska Solange Vanroosebeke (JAMSTEC Intl. Affairs Division), Kevin Hamilton (IPRC Director), Yukio Masumoto (JAMSTEC Research Institute for Global Change), Tetsushi Komatsu (Manager, JAMSTEC Intl. Affairs Division), Masao Fukasawa (Research Director, JAMSTEC Research Institute for Global Change), Yoshihisa Shirayama, and Eric Lindstrom.

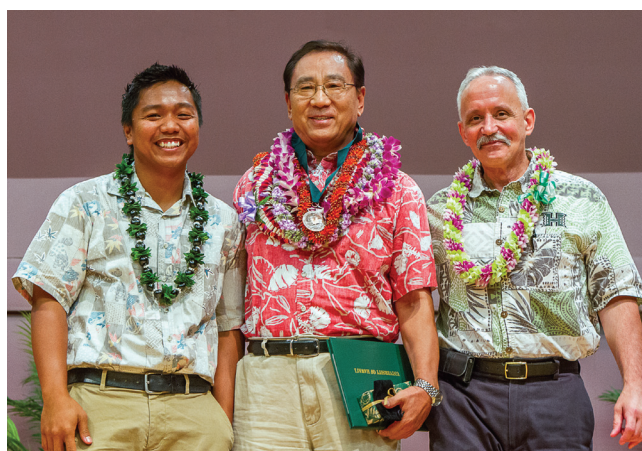
IPRC Governing Committee Meets

The IPRC Governing Committee (GC) held its 2013 annual meeting on May 9 at the IPRC. The meeting was co-chaired by GC members **Yoshihisa Shirayama** (JAMSTEC Executive Director) and **Eric Lindstrom** (NASA Physical Oceanography Program Scientist). Also present was GC member **Brian Taylor** (SOEST Dean and Interim Vice Chancellor for Research, University of Hawai‘i at Mānoa). GC member **Howard Diamond** (NOAA Program Manager for the Global Climate Observing System) joined via telephone from Washington; GC member **Takashi Kiyoura** (Director for Environmental Science and Technology of the Japan Ministry of Education, Culture, Sports, Science and Technology) could not attend and sent a written message for the participants. The meeting participants reviewed overall progress at IPRC and considered IPRC’s current and future relationships with its Japanese and US supporting agencies.

IPRC’s Bin Wang Wins Prestigious Awards

IPRC faculty member **Bin Wang** received two exceptional awards for his scientific achievements spanning his career in meteorology. In April he was honored with the University of Hawai‘i Board of Regents’ Medal for Excellence

in Research. This award recognized Wang’s scientific contributions over his 25 years as a faculty member at UH. More recently Wang has been elected as a 2013 Fellow of the American Geophysical Union (AGU) for “seminal contributions to the advancement of scientific understanding of the dynamics and predictability of monsoon and tropical climate.” Attaining the rank of Fellow is a very high recognition for outstanding research in the geosciences as the AGU accords this honor to only 0.1% of the members each year.



Bin Wang at the 2013 UH Mānoa Awards Ceremony with UH Regent Jeffrey Acido (left) and UH Mānoa Chancellor Tom Apple (right).

Okada Prize Awarded to Hiroki Tokinaga

IPRC Assistant Researcher **Hiroki Tokinaga** received in March the prestigious Okada Prize of the Oceanographic Society of Japan during its Annual Spring Meeting at Tokyo University of Marine Science and Technology. The prize commemorates the late Professor **Takematsu Okada** and is awarded to a young member of the Society who has contributed significantly to the progress of oceanography. Tokinaga

received the prize for his work on detecting long-term tropical ocean climate change accompanied by ocean-atmosphere interaction. As reported in *IPRC Climate* vol. 12, no. 2, in 2012 Tokinaga won the Meteorological Society of Japan Yamamoto-Shyono Medal for research achievement by an early-career meteorologist. He is the first scientist to receive both prizes.



Hiroki Tokinaga presents his winning work on tropical ocean climate change.

Japanese Agencies Partner with Hawai'i on Tsunami Driftage

Concerned about the 2011-tsunami driftage washing up on US beaches, representatives of Japanese governmental and non-governmental agencies—including the Japanese Ministry of Environment, the Japan Environmental Action Network (JEAN) and the Sea Beautification Program—visited Hawai'i in January 2013. With

Chris Woolaway, Director of the Hawai'i International Coastal Cleanup, as their guide, the visitors inspected the presence of likely tsunami driftage that had already arrived on several Hawai'i beaches.

In line with their mission to research, gather and publish reports on marine debris, JEAN members organized a meeting on January 10, 2013, at the Ala Moana Hotel in Honolulu. At the meeting, the Japanese visiting agencies shared their experiences in monitoring and cleaning up tsunami driftage.

IPRC Senior Researcher **Nikolai Maximenko** described the timelines and pathways of different debris types based on the model he has developed at the IPRC. The International Coastal Cleanup groups in Hawai'i and other Hawai'i governmental and non-governmental groups dealing with marine debris gave overviews of their work on coastal cleanup and monitoring.

The groups discussed strategies for monitoring and responding to arrival of tsunami driftage and to the general marine debris problem.



Participants of the Tsunami Driftage meeting in Honolulu.

IPRC–PNU Partnership Continues with the 12th East Asia Climate Workshop

The fruitful IPRC–Pusan National University (PNU) Partnership, described in *IPRC Climate* vol. 12, no. 1, continued this summer with the 12th East Asian Climate Workshop, held during the first three days of July in Busan. The workshop “New Perspectives and Challenges in East Asian Climate Science” was characterized by lively exchange of ideas among scientists on the workshop’s theme and by forging scientific collaborations.

Workshop host was Professor **Kyung-Ja Ha**, the Korean principal investigator of the PNU–IPRC project, a 6-year program of Korea’s Global Research Laboratory designed to promote international collaborative research between Korean and foreign laboratories.

In his welcoming address, PNU Vice-President Prof. **Ho-Hwan Chun** stressed that the Northwest Passage will soon be open. “This will change trade patterns, and special attention is needed on arctic climate research.” Professor **Soon-Chang Yoon** from Seoul National University and Chairman of the Asia-Pacific Climate Center Board charged the participants with decreasing the large uncertainty remaining in forecasts of climate change and its environmental impact.

The workshop had four major topics: Aerosol–Cloud–Precipitation; Atmosphere–Ocean–Land Interaction; Mon-

soon Variability; and Climate Changes, Modeling, and Prediction. Over 120 international guests participated and gave 53 talks. The 19 poster presentations given by junior scientists and graduate students point to the successful education of young climate scientists, a mission of the PNU–IPRC partnership.

The IPRC was well represented, with several talks by Profs. **Bin Wang** (the IPRC principal investigator of the PNU–IPRC project) and **Tim Li**, and also by associate researchers **Xiouhua Fu** and **June-Yi Lee**. IPRC long-term visitors **Andrea Alessandri** from Italy and **Soon-Yon Kim** from Korea also presented. The papers by the IPRC participants dealt mostly with promising advances in monsoon prediction: Alessandri reported on using ensemble dynamical seasonal forecasts to refine prediction of the Indian monsoon onset; Fu spoke about how air-sea coupling in the University of Hawai’i model extends skillful forecasting of monsoon wet and dry spells as validated against CINDY/DYNAMO field observations; Lee and Wang introduced the “predictable mode analysis,” a new method that includes information about atmospheric patterns for more accurate Asian summer monsoon forecasts. Wang also talked about advancing East Asian monsoon rainfall and tropical cyclone forecasts by taking advantage of the predictability of the western Pacific Subtropical High.

The agenda is at <http://gmcl.pusan.ac.kr/EAC12/>.



UH Hosts Pacific Islands Climate Science Symposium

The US Department of Interior (DOI) has recently created regional partnerships with academic institutions and community stakeholders as a strategy to include the effects of climate variation and change in its mission to protect the nation's natural and cultural resources. Specifically, a network of 22 Landscape Climate Cooperatives and 8 regional Climate Science Centers was established across the US. Hawai'i and the US affiliated Pacific islands are served by the Pacific Islands Climate Science Center (PICSC) and the Pacific Islands Climate Change Cooperative (PICCC).

The PICSC and PICCC fund several projects of IPRC scientists. Founded last year, the PICSC is a partnership among the DOI, the University of Hawai'i at Mānoa and at Hilo, the University of Guam, and several other institutions. The IPRC is closely connected with the PICSC as IPRC Director **Kevin Hamilton** is University Director of the PICSC.



The PICSC and PICCC held the *First Annual PICSC/PICCC Science Review Symposium* on July 15 on the UH Mānoa campus. World-renowned biogeochemist and ecologist **Peter Vitousek** of Stanford University gave the opening keynote address titled “Atmospheric and Geological Sources of Nutrients for Forests and for Traditional Agriculture: Thresholds and Irreversibilities Associated with Climate and Climate Change.”

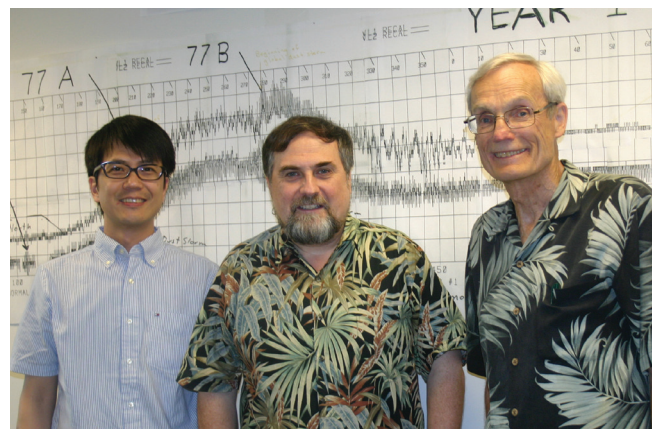
Presentations summarizing the achievements of 24 individual projects funded by the PICSC or PICCC then followed. All talks dealt with climate change and variability and its effects on the Pacific islands, spanning a broad range of physical and biological science issues. Organized by IPRC Director Kevin Hamilton, PICSC federal Interim Director **David Helweg** and PICCC Science Coordinator **Jeff Burgett**, the meeting attracted an audience of nearly 100.



PACIFIC ISLANDS
CLIMATE CHANGE COOPERATIVE

Tropical Weather Prediction Pioneer Visits

Russell Elsberry, Distinguished Research Professor at the Department of Meteorology of the Naval Postgraduate School in California, visited the IPRC on April 12. During his nearly half-century scientific career, Elsberry has been a leader in developing and applying numerical models for tropical cyclone forecasting. Elsberry was accompanied by National Research Council Postdoctoral Fellow **Hsiao-Chung Tsai**. Elsberry and Tsai held discussions with several colleagues at the IPRC and the UH Meteorology Department and presented a joint seminar “Progress in Tropical Cyclone Forecasting and Research (1963-2013).”



From left, Hsiao-Chung Tsai, IPRC Director Kevin Hamilton and Russell Elsberry.

Toshio Yamagata Visits

In April, the IPRC welcomed University of Tokyo Emeritus Professor **Toshio Yamagata**. Yamagata was the leader among the Japanese scientists who conceived of a joint US–Japan research enterprise to study climate and climate change. His efforts were crucial to the founding of IPRC in 1997. From 1997 to 2004 Yamagata was the JAMSTEC Program Director responsible for the IPRC.

Yamagata retired from the University of Tokyo in 2012 as Professor of Earth and Planetary Sciences and Dean of Science after a distinguished career spanning Kyushu University, Princeton University and the University of Tokyo. Currently he is Director of the Application Laboratory at JAMSTEC. An innovator in the field of large-scale atmosphere–ocean interaction and tropical interannual variability, Yamagata has won the highest award of the Japan Meteorological Society, the Sverdrup Medal of the American Meteorological Society, and the Medal with Purple Ribbon from the Emperor of Japan.

During his visit, Yamagata gave a seminar titled “Predictability of the Subtropical Dipole Modes in the Atlantic

and Indian Oceans.” He took this opportunity to describe results of a multiyear project led by the University of Tokyo and JAMSTEC with South African partners. The project is conducted under the aegis of Japan’s Science and Technology Research Partnership for Sustainable Development.

During Yamagata’s visit an informal session of presentations by some of IPRC’s more junior scientists was arranged which led to lively discussions.

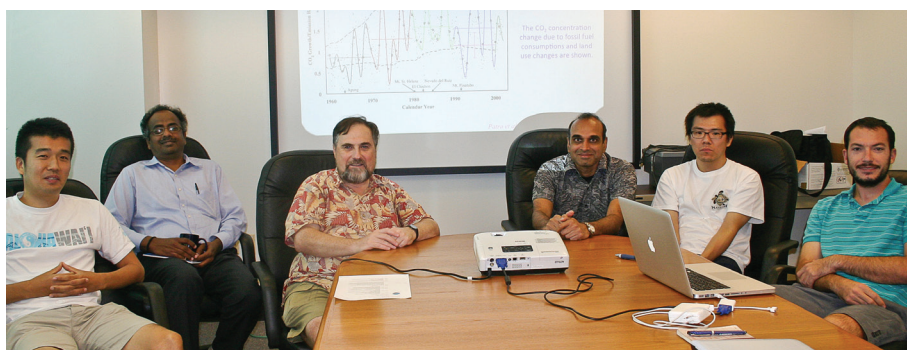


IPRC Postdoctoral Fellow Baoqiang Xiang with Toshio Yamagata.

JAMSTEC Atmospheric Chemists Visit

Three colleagues from the Atmospheric Geochemical Cycle research team of JAMSTEC’s Research Institute for Global Change gathered at the IPRC in December 2012, when **Ryu Saito** and **Prabir Patra** joined **Kazuyuki Miyazaki** in the middle of his six-month visit. During their visit, the three experts made presentations and discussed with IPRC colleagues their project on representing the observed carbon cycle in the atmosphere. Recent advances in

global observations (notably the Japanese Greenhouse gases Observing SATellite or GOSAT) and in data assimilation techniques open the possibility of using atmospheric data to infer accurately the detailed map of CO₂ surface fluxes over the globe. Such a product could have wide ranging implications for understanding the oceanic and terrestrial carbon cycles and even for formulating strategies to mitigate global CO₂ emissions.

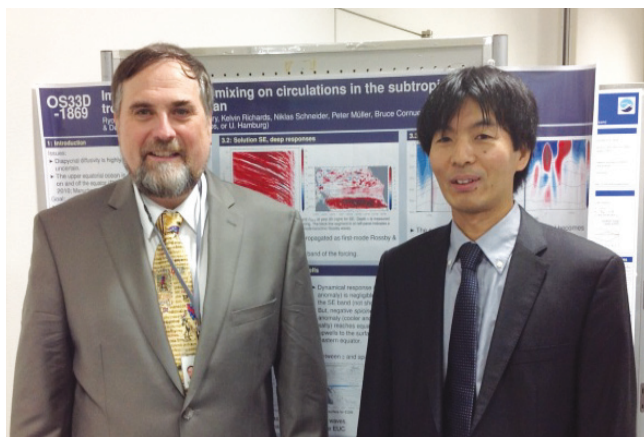


From left, Kazuyuki Miyazaki, IPRC Senior Researcher H. Annamalai, IPRC Director Kevin Hamilton, Prabir Patra, Ryu Saito, and IPRC Postdoctoral Fellow Matthew Widlansky.

IPRC Scientists Active in the Research Community

IPRC at the RIGC Annual Symposium

Masao Fukasawa, Research Director of JAMSTEC's Research Institute for Global Change (RIGC) invited IPRC participation in the *RIGC Annual Review Symposium* held at Yokosuka headquarters on March 28. Director **Kevin Hamilton** and Assistant Researcher **Ryo Furue** represented the IPRC, summarizing highlights of IPRC–JAMSTEC collaborative research during the 2012–2013 period. Furue also presented two posters describing his work on ocean mixing and ocean current structure near Australia.



Kevin Hamilton and Ryo Furue in front of one of Furue's posters at the *RIGC Annual Review Symposium*.

IPRC Participates in the Fifth Climate Assessment Report of the IPCC

As the writing of the Fifth Assessment Report (AR5) of the International Panel on Climate Change entered its final stage, **Axel Timmermann** worked long hours as a lead author of the chapter, "Information from Paleoclimate Archives" in *Climate Change 2013: The Physical Science Basis*, the report of Working Group 1. The chapter describes the current state of our knowledge of the past climate system, going back 55 million years, with a focus on the last 2 million years. The chapter includes the newest information about how the climate system has responded to external forcing such as greenhouse gases as reflected in ice- and sediment-cores, tree-rings, and other proxy records. The Working Group 1 Report was published on September 30, in Stockholm, Sweden.

Scientific Appointments

IPRC faculty member **Yuqing Wang** has recently been appointed an editor of *Advances in Atmospheric Sciences*, a journal of Springer Publishing. He joins these new duties to continuing service as an editor of *Weather and Forecasting*, published by the American Meteorological Society, and as an editor of the *Journal of the Meteorological Society of Japan*.

IPRC Director **Kevin Hamilton** has been appointed to the inaugural Editorial Advisory Board for *Progress in Earth and Planetary Science* (PEPSci), a new journal of the Japan Geoscience Union. Hamilton joins this new duty to his service on the editorial board for the American Geophysical Union's *Journal of Advances in Modeling Earth Systems* and as an associate editor of the Canadian journal *Atmosphere-Ocean*.

Senior Researcher **H. Annamalai** has been appointed by the CLIVAR Scientific Steering Group to the Asian-Australian Monsoon Panel, where he will contribute to the direction of future monsoon research across the projects of the World Climate Research Programme.



IPRC Scientists Active in the Community

IPRC Scientists Participate in Science Fairs

The *Pacific Symposium for Science and Sustainability* (PSSS) is a trans-Pacific science fair and serves as a regional competition of the national *Junior Science and Humanities Symposium*. IPRC faculty member **Jim Potemra** has assisted for several years with the PSSS and this past year served as Chief Judge. Also acting as judges were IPRC faculty **Niklas Schneider** and **Kevin Hamilton**. The fair, which was held from November 30 to December 2, 2012, on the UH Mānoa campus, drew 87 high school students from Hawai'i, American Samoa, and the Federated States of Micronesia. The top four students from the PSSS received invitations and travel funds to participate in the national competition held in May 2013 in Dayton, Ohio.

Potemra also acted as a judge during the Hawai'i State Science Fair held April 7–9, 2013, at the Hawai'i Convention Center in Honolulu. This statewide event attracted over 200 high school and middle school students.

IPRC Scientists Contribute to Earth Week Celebrations

Joining in the 2013 Earth Week celebrations, IPRC's **Axel Timmermann** gave a talk, answering "Fifteen Frequently Asked Questions on Climate Change," such as how much of the recent warming can be attributed to human activities? what are the biggest uncertainties in scientists' predictions of Global Warming? and how will the Hawaiian Islands be impacted by future climate change, sea level rise and ocean acidification? Timmermann presented on three consecutive days at the Hawai'i State Capitol Auditorium, University of Hawai'i (UH) Mānoa Campus, and UH West Oahu. The Mānoa Campus talk was broadcast to all UH campuses.



Axel Timmermann answers frequent climate-change questions during Earth Week. Credit Richard Figliuzzi.

Scientific Computer Programmer **Jan Hafner** represented the IPRC at the US Navy's Earth Day celebration, which took place on the Navy Exchange Mall in Pearl Harbor.



Jan Hafner displays IPRC research efforts on tracking marine debris.

Hafner set up a display to educate the public on the huge marine debris problem in Hawai'i. Among his display items, he had debris samples from Kamilo Beach on the Island of Hawai'i and an oyster buoy that is almost certainly from the 2011 tsunami in Japan. The public was fascinated by his display, learning about marine debris and about IPRC research activities. The event was broadcast on the Navy's TV channel.

IPRC at the Pacific Islands Climate Services Forum

The *Pacific Islands Climate Services Forum* took place January 21–25, 2013, at the University of the South Pacific (USP) Laucala Campus in Suva, Fiji. Organized by the Pacific Climate Information System through the National Oceanic and Atmospheric Administration (NOAA) and by the USP Pacific Centre for Environment and Sustainable Development, the Forum brought together over 200 participants from the Pacific islands and the world. The organizing committee included IPRC faculty member **Jim Potemra** as well as IPRC Governing Committee member and NOAA Program Manager **Howard Diamond**.

The intent of the Pacific Islands Climate Services Forum was to advance the use of climate services among Pacific Islanders by familiarizing and engaging Forum participants in a dialogue about available regional climate services. The Forum was also intended to strengthen and build new relationships between producers and users of climate services and included training sessions on using the existing online climate information resources. Potemra led one of these training sessions. A final report of the meeting is available at <http://tinyurl.com/IPRCpacis>.



Students at a training session in the Pacific Islands Climate Services Forum.

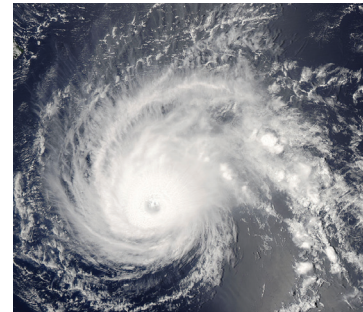
IPRC Research in the News

The media frequently feature scientific studies published by IPRC scientists. Below is a selection of such work. More information is available on the IPRC News webpage at tinyurl.com/IPRCnews.

More Hurricanes for Hawai'i?

Hawai'i, fortunately, has been largely free of hurricanes in the recent past. Now a study by IPRC's **Hiroyuki Murakami** and **Bin Wang**, and by **Akio Kitoh** at the Japan Meteorological Research Institute projects a two-to-

threefold increase in tropical cyclones approaching Hawai'i in the last quarter of this century. The study, published in the May 5, 2013, online issue of *Nature Climate Change*, was featured on *Hawai'i News Now*.



Global Monsoon Rainfall Intensifies

An international team of scientists around **Bin Wang** at the International Pacific Research Center found that natural swings in the climate have significantly intensified Northern Hemisphere monsoon rainfall in recent years. These swings must there-

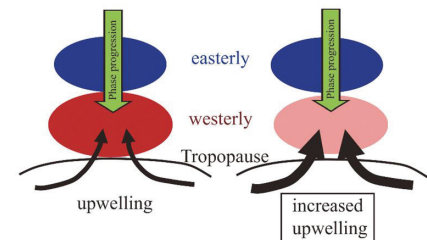
fore be taken into account in climate projections. Published in the March 18 online *Proceedings of the National Academy of Sciences*, the findings were featured in the Dot Earth blog of the *New York Times*.



The Tropical Upper Atmosphere "Fingerprint" of Global Warming

The winds of the quasi-biennial oscillation in the tropical upper atmosphere have greatly weakened at some altitudes over the last six decades, according to a study by IPRC's **Kevin Hamilton** and JAMSTEC's **Yoshio Kawatani**. Published in *Nature* on May

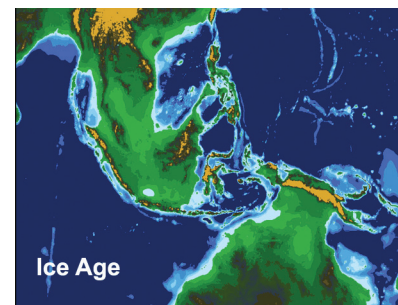
23, 2013, the finding agrees with computer model projections of how the upper atmosphere responds to global warming induced by increased greenhouse gas concentrations, and was featured in several Japanese national newspapers including the *Asahi Shimbun*.



Sea Level Impact on Indo-Pacific Climate during Glacial Times

Young Investigator **Pedro DiNezio** at the IPRC and **Jessica Tierney** at Woods Hole Oceanographic Institution studied preserved geological clues (called "proxies") of rainfall patterns during the last ice age when the planet was dramatically colder than today.

Comparing these patterns with computer model simulations, they found that the exposed Sunda Shelf during the last ice age shifted rainfall and convection westward. The study, published in the May 19 online issue of *Nature Geoscience*, was featured in *redOrbit*.



El Niño Unusually Active in the Late 20th Century

How El Niño responds to global warming has been difficult to forecast reliably because El Niño varies naturally over decades and centuries. Instrumental records, thus, are too short to determine whether recent changes are natural or attributable to increased greenhouse gases. An international team of scientists, spearhead-

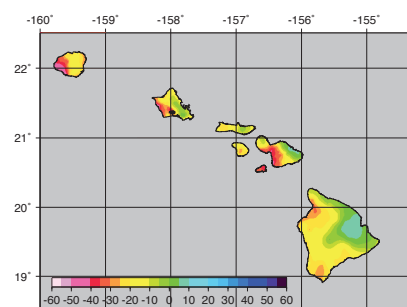
ed by **Jinbao Li** and **Shang-Ping Xie** while at the IPRC, now has shown that recent El Niño activity is the highest for the past 700 years, possibly in response to global warming. Their work, published in the June 30, 2013, online issue of *Nature Climate Change*, was featured in the *Christian Science Monitor*.



Less rainfall expected for the Hawaiian Islands

Almost imperceptibly, rainfall over the Hawaiian Islands has been declining since 1978, and this trend is likely to continue with global warming through the end of this century, according to a team of scientists led by IPRC's **Oliver Ellison Timm** and colleagues at the

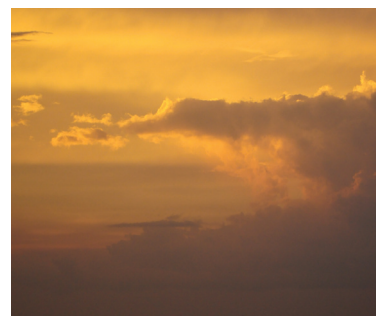
University of Hawai'i at Mānoa and the University of Colorado at Boulder. The study, published in the March 13, 2013, online issue of the *Journal of Geophysical Research*, was featured on the KITV evening news.



Change in Seasonal Patterns of Tropical Rainfall from Global Warming

Projections of rainfall changes from global warming have been very uncertain because scientists could not determine how two different mechanisms will impact rainfall. The two mechanisms turn out to complement each other and together shape the spatial dis-

tribution of seasonal rainfall in the tropics, according to IPRC's **Shang-Ping Xie** and Chinese colleagues. Published in the April 14 online issue of *Nature Geoscience*, their study was featured in the *Summit County Citizens Voice*.



New Research Could Lead to Improved El Niño Forecasting

Why El Niño peaks in boreal winter and ends quickly in February to April has been a long-standing mystery. The answer is that El Niño conditions and the annual cycle act upon each other to generate an unusual wind pattern in the tropical Pacific with a 15-month period, according to

a study by IPRC's **Axel Timmermann** and **Malte Stuecker** and **Fei-Fei Jin** at the UH Mānoa Meteorology Department. The study, which could lead to improved El Niño forecasting, was published in the May 26 online issue of *Nature Geoscience* and featured in *TopNews Arab Emirates*.

