

From left: Tetsuro Isono (JAMSTEC), Toru Kimoto (JAMSTEC), Yukio Masumoto (JAMSTEC), Masao Fukasawa (JAMSTEC), Brian Taylor (SOEST), Toshihide Fukui (MEXT), Yoshihisa Shirayama (JAMSTEC), Kevin Hamilton (IPRC), Hisashi Dobashi (JAMSTEC), Katsufumi Akazawa (JAMSTEC), Chihiro Baba (JAMSTEC).

## Governing Committee Meets

The IPRC Governing Committee (GC) held its 2012 annual meeting May 10–11 at the JAMSTEC Tokyo Office. The meeting was co-chaired by GC members **Yoshihisa Shirayama** (JAMSTEC Executive Director) and **Brian Taylor** (SOEST Dean, University of Hawai'i). Also participating was GC member **Toshihide Fukui**, Director for Environmental Science and Technology of the Japan Ministry of Educa-

tion, Culture, Sports, Science and Technology (MEXT). GC members **Eric Lindstrom** (NASA Physical Oceanography Program Scientist) and **Howard Diamond** (NOAA Program Manager for the Global Climate Observing System) joined via telephone from Washington. The meeting participants reviewed overall progress at IPRC and considered IPRC's current and future relationships with its Japanese and US supporting agencies.

## IPRC and the APEC Climate Center

The IPRC and the APEC Climate Center (APCC) in Busan, Korea, share a science focus on climate variability in the Asia-Pacific region and have been close partners since the creation of the APCC in 2005. As noted in *IPRC Climate* Vol. 11, no. 2, the IPRC hosted and cosponsored the APCC annual symposium in October 2011, and interactions have continued at a brisk pace in 2012. In February IPRC post-doctoral fellow **Prasanna Venkatraman** took up a position as Researcher at the APCC. In March IPRC faculty member **Bin Wang**, Assistant Researcher **June-Yi Lee** and Postdoctoral Fellow **Baoqiang Xiang** visited APCC. Wang presented the final report of an APCC international research project for the development of an operational extended-range forecast system and for an investigation of high-latitude influences on East Asian climate. During their visit Lee and Xiang worked

to transfer to APCC the model codes for two coupled global climate models developed at IPRC. These models will be used for experimental extended-range forecasts at APCC. Wang returned to Busan April 9–10 to participate in a special APCC Science Advisory Committee meeting aimed at helping develop a new APCC strategic plan. IPRC Director **Kevin Hamilton** visited APCC in May and presented a seminar on modeling climate system cloud feedbacks and discussed possible future IPRC–APCC collaborations.



IPRC Director Kevin Hamilton with former IPRC Postdoctoral Fellow Prasanna Venkatraman at the APEC Climate Center.

## Pusan University and IPRC Partner on Monsoon Studies

Atmospheric scientists at Pusan National University (PNU) and climate modelers at the IPRC are joining forces to study prediction and predictability of the East Asian and global monsoons. The project sponsor is the Global Research Laboratory (GRL) of Korea's Ministry of Education, Science and Technology, which funds joint projects between Korean and foreign universities, with 1/3 of the funding going as a grant to the foreign partner. The PNU-IPRC project was one of 5 selected from over 100 applications and the only project in environmental sciences. Funding will be for 6 years.

The project goals are as follows: to determine whether variations in the monsoons are predictable given the atmospheric changes expected with global warming; to improve predictions of such monsoon-related disasters as extreme rainfall and extreme droughts; and to develop mitigation and adaptation strategies to deal with the consequences of possible changes in the monsoon.

**Kyung-Ja Ha**, Professor of Atmospheric Sciences at Pusan National University is the Korean principal investigator. Joining her are 15 Korean graduate students and professors in meteorology. **Bin Wang**, IPRC faculty member and



Unveiling the Project Plaque: IPRC Director Kevin Hamilton, Professor Kyung-Ja Ha, and Professor Bin Wang.

Chair of the University of Hawai'i Meteorology Department, is the US principal investigator, and his scientific team consists of 5 senior researchers and graduate students. The education of young climate scientists, from high school students to PhD candidates, is a significant aim of the project.

To inaugurate this partnership, a two-day workshop was held at the IPRC on January 9 and 10, 2012. Participants came not only from PNU and the IPRC, but also from Seoul National University, the Korea Ocean Research and Development Institute, the First Institute of Oceanography in Qingdao in China, and McGill University in Canada. A joint workshop will be held every year, alternately in Korea and Hawai'i.



Participants of the workshop *Global Monsoon Variability and Change*.

## The Japan Taskforce on Tsunami Marine Debris

Concerned about the debris that washed into the ocean with the March 2011 tsunami in Tohoku, the Office of Marine Environment of the Japan Ministry of the Environment organized “The Task Force for Nowcast and Forecast of the 3.11 Tsunami Debris Location.” The Task Force coordinates tsunami-debris-related work now underway at JAMSTEC, Kyoto University, the Japan Meteorological Research Institute (MRI), the Japan Atomic Energy Agency, and the Japan Aerospace Exploration Agency (JAXA).

Representatives of this task force, **Toshiyuki Awaji** (Executive Vice President for Education, Kyoto University), **Masafumi Kamachi** (Director, MRI Oceanographic Research Department), and **Hajime Nishimura** (Executive Assistant to the Director-General of the JAMSTEC Data-Research Center for Marine-Earth Sciences) visited the

IPRC in February to exchange information with Senior Researcher **Nikolai Maximenko** and Scientific Programmer **Jan Hafner** about efforts to locate the tsunami debris in the ocean.

Accompanying the Japanese scientific team were **Kazuo Tsukada**, Consul of the Consulate-General of Japan in Hawai'i, **Yuya Yukishima** of the Ministry of the Environment, and **Fujihiko Hayashi** of the Ministry of Foreign Affairs. Representing NOAA was **Ruth Yender**, coordinator of the efforts by the NOAA Marine Debris Program to respond to the tsunami debris. The meeting opened with a warm welcome to the Task Force by University of Hawai'i Mānoa Vice Chancellor **Gary Ostrander** and the Dean of the School of Ocean and Earth Science and Technology (SOEST) **Brian Taylor**.

Professor Awaji, the leader of the visiting team, then described the various ocean, atmospheric, and climate models the Japanese agencies are using in their efforts to locate the debris and

to forecast where the debris is headed. **Maximenko**, **Hafner**, and **Henrieta Dulaiova** discussed tsunami-related research at the University of Hawai'i. **Hafner** presented the development of the diagnostic model used by the IPRC to describe the distribution and motion of the floating tsunami debris. **Maximenko** talked about the tsunami debris work at IPRC, including the most recent survey expedition from Honolulu to beyond Midway.

**Maximenko** showed evidence that if the tsunami had happened on March 11 in another year than in 2011, the debris path and field may have been quite different, since these depend greatly on the prevailing basin-wide ocean-atmosphere conditions.

The scientists hope their partnership will help to locate the debris. The tsunami tragedy may now bring worldwide attention to the long-standing problem of marine debris in the global ocean and help to stimulate rigorous interdisciplinary research on this topic.



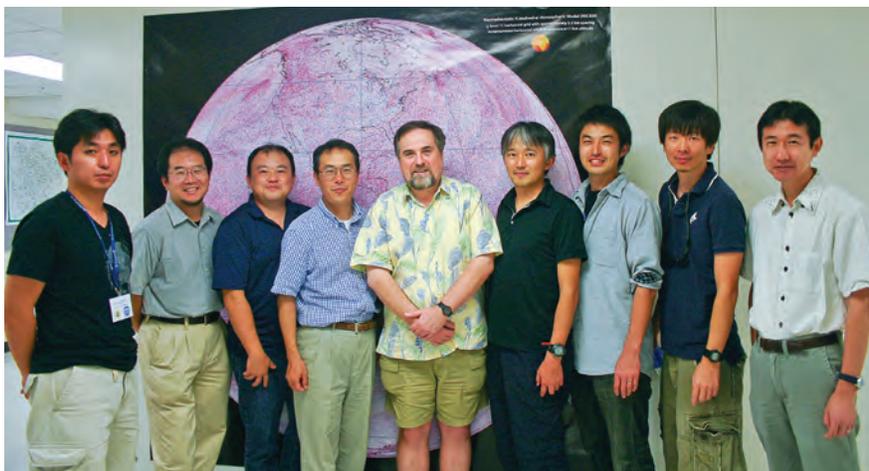
From left front, **Nikolai Maximenko**, **Toshiyuki Awaji**, **Brian Taylor**, **Kazuo Tsukada**. Back row **Hajime Nishimura**, **Masafumi Kamachi**, **Yuya Yukishima**, **Fujihiko Hayashi**, **Ruth Yender**, and **Jan Hafner**.

## JAMSTEC Colleagues Visit IPRC to Discuss Tropical Variability

Six colleagues from the JAMSTEC Research Institute for Global Change (RIGC) and the University of Tokyo visited IPRC in January to discuss recent progress in observations and modeling of tropical intraseasonal variability (ISV), the focus being the recent JAMSTEC-led Cooperative Indian Ocean Experiment on ISV in the Year 2011 (CINDY). The visitors were **Masaki Satoh** (University of Tokyo Professor and Team Leader for Global Cloud-Resolving Modeling Research at RIGC), **Tomoe Nasuno** (Senior Scientist in the Global Cloud-Resolving Modeling Research Team at RIGC), **Kunio Yoneyama** (Team Leader for MJO Research at RIGC),

**Kazuaki Yasunaga** (Senior Scientist in the MJO Research Team at RIGC), **Hiroaki Miura** (University of Tokyo Project Assistant Professor and Scientist in the Global Cloud-Resolving Modeling Research Team at RIGC) and **Tomoki Miyakawa** (University of Tokyo Researcher).

The CINDY field observations were coordinated with model simulations and real-time atmospheric forecasts, including forecasts performed with the Nonhydrostatic ICosahedral Atmospheric Model (NICAM) developed at JAMSTEC and the University of Tokyo by Satoh's research group. During the meeting with IPRC scientists, Nasuno reviewed the success of the NICAM forecasts conducted for CINDY, and Satoh described recent developments and plans for NICAM. IPRC Assistant Researcher **Kazuyoshi Kikuchi** organized and chaired the discussion.



From left: Hiroaki Miura, Kunio Yoneyama, Hiroshi Taniguchi (IPRC), Masaki Satoh, Kevin Hamilton (IPRC), Kazuaki Yasunaga, Tomoki Miyakawa, Kazuyoshi Kikuchi (IPRC), Hisayuki Kubota (JAMSTEC). In the background is a large-format poster prepared by IPRC's Sharon deCarlo showing a snapshot of the horizontal divergence field at 11-km height in an ultrahigh resolution NICAM simulation conducted at JAMSTEC (Miura et al., *Geophys Res. Lett.*, 2007).

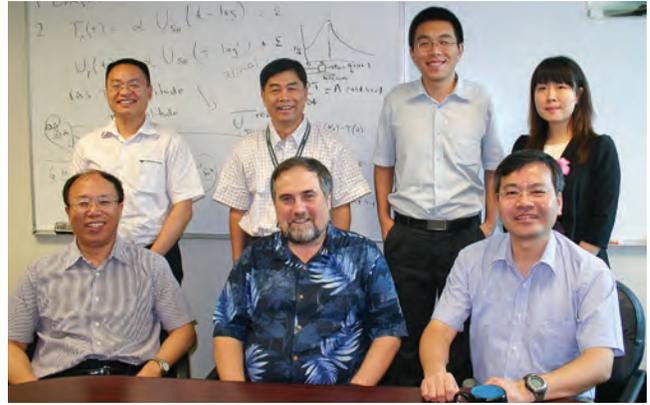


## Bin Wang Named Scientist of the Year

IPRC faculty member **Bin Wang** was named the 2012 Scientist of the Year by the Honolulu Chapter of Achievement Awards for College Scientists (ARCS Foundation, Inc.). He received the award at the foundation's 2012 Scholar Awards Banquet, held on the evening of Monday, May 7, at the Outrigger Canoe Club. The Honolulu Chapter is one of 17 chapters of a national women's organization founded in 1958 to advance science and technology in the United States by providing awards to academically outstanding students in science, engineering, and medicine. Since 1974, the Honolulu Chapter has awarded over \$1.7 million to more than 600 scholars at the University of Hawai'i at Mānoa. Since 1983, the chapter has also made an annual Scientist of the Year award, to a researcher working in Hawai'i.

## First Institute of Oceanography Delegation

In January **Deyi Ma**, Director-General of China's State Oceanic Administration (SOA) First Institute of Oceanography (FIO) in Qingdao, **Bo Lei**, SOA Deputy Director-General of the Department of Science and Technology, and **Weidong Yu**, Director of the FIO Laboratory for Ocean-Atmosphere Interaction and Climate Change, visited IPRC together with several scientists and staff from their institute. In recent years IPRC has hosted a number of scientists from FIO. Discussions focused on ways to enhance the scientific connections between FIO and IPRC.



From left front row: Deyi Ma, Kevin Hamilton, Bo Lei; back row: Honxia Chen, Weidong Yu, Lei Feng, Baonan Sun.



Cutting the ribbon to inaugurate the new expanded office suite.

## Renovation Expands Office Space

In April the sounds of construction were heard for the first time at the IPRC since the move to the Pacific Ocean Sciences and Technology (POST) Building in the year 2000. The renovations by contractor Kokea Construction connected existing spaces into a large, light-filled office that can accommodate up to 6 scientists. IPRC now occupies almost the whole fourth floor of the POST Building and can accommodate a total of 86 faculty, staff, and visitors at any one time.

## IPRC Director Visits JAMSTEC and JAXA

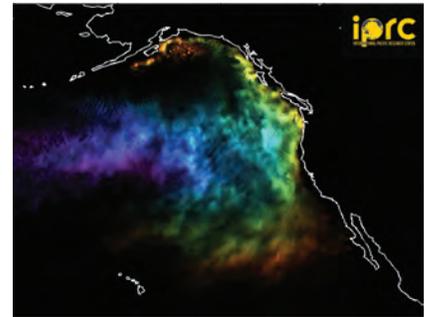
IPRC Director **Kevin Hamilton** was kindly invited by **Masao Fukasawa**, Director-General of JAMSTEC's Research Institute for Global Change (RIGC), to participate in the *RIGC Annual Review Symposium* held on February 9 in Yokosuka. Hamilton presented a talk describing IPRC research highlights that focused on joint projects with JAMSTEC colleagues. The following day Hamilton, along with JAMSTEC International

Affairs Division Manager **Katsufumi Akazawa** and International Affairs Coordinator **Toru Kimoto** visited the Japan Aerospace Exploration Agency (JAXA) Tokyo Office. They met with JAXA Associate Executive Director **Toshio Doura** and Director of the JAXA Earth Observation Research Center **Toru Fukuda** and discussed the possibilities for collaboration among JAMSTEC, JAXA and IPRC scientists.

## IPRC Model Now Tracks Lighter Tsunami Debris

The IPRC Model for tracking the Japan tsunami debris across the Pacific has been extended to reflect the effects of wind on the movement of debris with varying fractions of surface exposed above water. The original model was based on data from scientific drifting buoys with large drogues extending 18 meters below the surface. Three levels of windage have been added by Senior Scientist **Nikolai**

**Maximenko** and Scientific Computer Programmer **Jan Hafner**, providing a more complete simulation of the debris field and a more accurate estimate of the present location of various types of debris. In the new versions, the greater the fraction of a piece floating above water and exposed to the wind, the faster it travels downwind, and items with high windage started to arrive on the West Coast at the end of 2011.

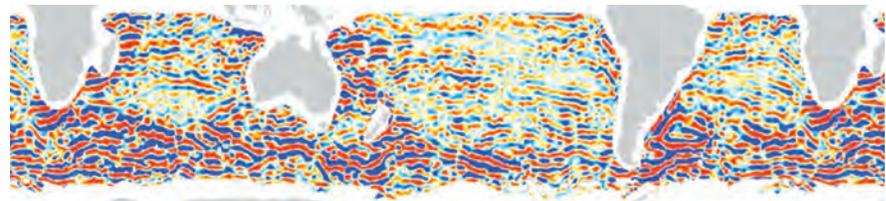


The new animations generated by the model are available to the public at [tinyurl.com/IPRCdebrisnews](http://tinyurl.com/IPRCdebrisnews).

## IPRC Scientists Active in the Climate Research Community

### *Lead Authors Meet for Next IPCC Climate Assessment*

As lead authors of Working Group 1 for the upcoming Fifth Assessment Report by the Intergovernmental Panel on Climate Change, IPRC's **Shang-Ping Xie** and **Axel Timmermann** travelled in April to Marrakesh, Morocco, for the Third Lead Author Meeting, where they planned the next draft that addresses the comments of the expert reviewers on the previous draft and incorporates the latest research in the field. Xie's team deals with "Climate Phenomena and their Relevance for Future Regional Climate Change," and Timmermann's with "Information from Paleoclimate Archives." Xie stayed on in Marrakesh to work with the Technical Summary writing team, a subgroup of Working Group 1, to distill the huge report into a short "Summary for Policy Makers." The next lead author meeting will be in January in Australia.



### *Ocean Striations at AGU 2011 Fall Meeting*

Quasi-zonal jet-like features, called also striations, are ubiquitous in observations and eddy-resolving models of the global ocean. As an important part of the large-scale ocean circulation, they impact sea surface temperature and probably also the marine ecosystems. Their dynamics, though, remain unexplained. To review the recent science in this field, which lies at the crossroads of oceanography, geophysical fluid dynamics, and climate science, IPRC Postdoctoral Fellow, **Ali Belmadani**, JAMSTEC Earth Simulator Center Scientist **Bunmei Taguchi**, IPRC Faculty Member **Niklas Schneider** and Senior Researcher **Nikolai Maximenko** convened a special session on "Beta-plane Dynamics: Jets, Eddies, Waves, and Plumes" at the 2011 American Geophysical Union Fall Meeting, in San Francisco. With about 300 attend-

ees, the session was so successful that Belmadani and Maximenko are proposing a session on the broader topic "Mesoscale Ocean Processes" for the 2012 AGU Fall Meeting.

### *Marine Debris Research*

**Nikolai Maximenko** and **Jan Hafner** are members of the Working Group "Marine Debris: Scale and Impact of Trash in Ocean Ecosystems" of the National Center for Ecological Analysis and Synthesis (<http://www.nceas.ucsb.edu/>). The group's mission is to (1) construct a theory of marine debris and (2) to determine the type of activities needed to: quantify the extent of the problem, understand what drives the behavior and paths of different types of debris, and develop efficient methods, technology, and policies to cope with and prevent this form of ocean pollution.

## IPRC Scientists Active in the Community

### *IPRC Holds Public Forum at Bishop Museum: Climate Change Past and Future*

Over millions of years, Earth has seen dramatic climate changes, which left clues to their causes and their impacts in ice cores, ocean sediments, cave records, and rock formations. Will understanding these events provide clues to how sensitive the climate is to change? Can lessons from the past be applied to current conditions and inform us about how the climate is likely to change in response to the rise in greenhouse gases and global warming? These were among the questions a panel of leading experts on long-term climate change discussed at a free, public forum co-organized by IPRC's **Axel Timmermann** at Honolulu's Bishop Museum on the evening of March 1, 2012. The very animated forum was a standing-room-only success with a spirited exchange between audience and scientists.



**Axel Timmermann addresses audience at Bishop Museum Public Forum.**

### *Symposium for Pacific Island High School Students*

Every year, the *Pacific Symposium for Science and Sustainability* brings high school students from the far-flung Pacific Islands together at the University of Hawai'i at Manoa. During this year's symposium in December 2011, 50 students presented their research projects. Topics ranged from studying better ways for controlling mosquitoes in American Samoa, to climate impacts on shoreline erosion in Hawai'i, to developing better optics with computer artificial-intelligence-routines for image recognition. Manager of IPRC's Asia-Pacific Data-Research Center, **Jim Potemra**, joined six other judges to evaluate the projects. The top ten projects were presented again in a plenary session, with a prize awarded to the most outstanding project.

### *IPRC Scientists Sought as Speakers on Tsunami Debris*

Because of their work on tracking the tsunami debris with their Surface Current Diagnostic Model, Senior Scientist **Nikolai Maximenko** and Scientific Computer Programmer **Jan Hafner** have been asked to speak to sundry organizations worried about how much debris is still floating, where it is headed, and how dangerous it is.

Thus, on December 10, 2011 Maximenko spoke at the "Japanese Tsunami Marine Debris Conference" sponsored by the Kaua'i Community College Marine Option Program and the Surfriider Foundation, a non-profit organization with over 50,000 members worldwide dedicated to the protection and enjoyment of our world's oceans, waves and beaches. He spoke on January 12, 2012, at the Winter Conference of the Association of Pacific Ports, a trade and information association founded to increase efficiency and effectiveness of Pacific ports. On February 7, Maximenko addressed the Hawai'i and American Samoa Area Maritime Security, Committee General Membership Meeting.

Just before the first anniversary of the Japanese earthquake and tsunami, on February 28, Maximenko participated in *Ocean Conservancy's Japanese Tsunami Debris Webinar*, giving an update on the most recent tsunami debris modeling results. He was joined at the webinar by **Ruth Yender**, NOAA's Japan Tsunami Marine Debris Coordinator, and by Ocean Conservancy's Deputy Director **Leo Viana**, and Conservation Biologist **Nicholas Mallos**.

Jan Hafner was invited to speak at this year's Maui Whale Festival, "Weekend with the Experts," which featured a group of noted researchers, scientists, marine experts and photographers from across the U.S. The three-day event was hosted by the Pacific Whale Foundation, a nonprofit organization founded in 1980 to save whales from extinction. Hafner also spoke about the work of the IPRC marine debris researchers to the Hawaiian Ocean Safety Team (HOST), a non-profit organization that provides a forum for government, industry, and the public to identify problems, propose solutions, and develop safe operating procedures to protect Hawai'i's marine environment and ensure marine safety. HOST sees itself as the response center for protecting Hawai'i waters and beaches from possible onslaught of the tsunami debris.



## IPRC Scientists in the News

### *Swampy Tales Give Clues About Hawai'i's Climate Past*

The adventures of IPRC's **Axel Timmermann** in extracting soil cores from Hawai'i's mountain swamps in order to draw up a history of Hawai'i's climate reaching thousands of years back in time, was featured in the February *University of Hawai'i System*

*News*. Until about 14,500 years ago, Hawai'i was much cooler than today, with a glacial ice cap of more than 27 square miles sitting on top of Mauna Kea, which is now the home of numerous astronomy observatories. Timmerman's partner in this work is geography department colleague **David Beilman**.

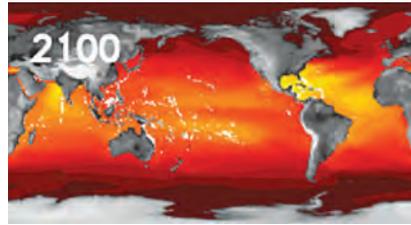


### *Unprecedented, Man-made Trends in Ocean's Acidity*

Recent carbon dioxide emissions have pushed the level of seawater acidity far above the range of the natural variability that existed for thousands of years. This acidification is affecting the calcification rates of shell-forming organism, according to a study of a team of scientists led by IPRC's **Tobias**

**Friedrich** and **Axel Timmermann**.

Their findings, published in the January 22 online issue of *Nature*



*Climate Change*, was featured widely in such media as *USA Today*; *Environmental News Network*; *Honolulu Star-Advertiser*. They have created a striking animation of the increase in the ocean's acidity that can be viewed at [tinyurl.com/IPRCacid](http://tinyurl.com/IPRCacid) (see also research story on p. 3 this issue).

## IPRC's Marine Debris Scientists Make Headlines Again

### *Maximenko and Jan Hafner Hold Press Conference*

On the upcoming anniversary of the Great Tohoku Earthquake and its tsunami, IPRC's marine debris scientists were once more swamped with requests for interviews. Thus on February

28, 2012, **Nikolai Maximenko** and **Jan Hafner** held a press conference at the IPRC for the local media and updated the press on their most recent activities and findings. Lengthy portions of the interview were broadcast on KHNO2,

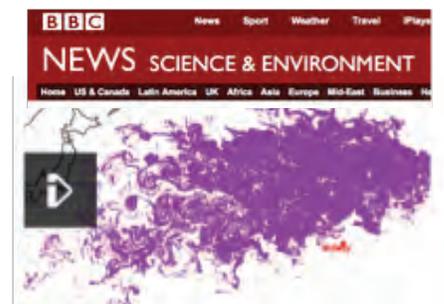


KITV, Hawai'i News Now, and also featured in Honolulu's daily newspaper.

### *BBC Features the IPRC Tsunami Debris Modeling Work*

At this year's Ocean Sciences Meeting in Salt Lake City, Maximenko and Hafner gave an update of their modeling results on the tsunami debris field. Hafner was interviewed by **Jonathan Amos**, science correspondent for

the BBC News. Their work and their Surface Current Diagnostic (SCuD) model animation showing the spread of the Japanese tsunami debris field since March 2011 were featured on BBC News on February 22, 2012.



## NASA Archives SCuD Model on Earth Observatory

Permission to use the animations from **Nikolai Maximenko's** and **Jan Hafner's** Surface Currents from Diagnostic (SCuD) model was frequently requested by news agencies, who at times re-colored the animations. The most exciting and impressive request came from NASA's Earth Observatory. The

observatory's image version is posted at [earthobservatory.nasa.gov/IOTD/view.php?id=77489](http://earthobservatory.nasa.gov/IOTD/view.php?id=77489).



Requests by the media to use Maximenko's and Hafner's Statistical Model, which estimates the tsunami debris dispersion over 15 years based on the average movement of drifters in the North Pacific, were also frequent. For instance, *USA Today* posted it at <http://usatoday.tumblr.com/post/25087603926/debris-from-the-2011-earthquake-and-tsunami-in>.

## Survey for Tsunami Debris Northwest of Midway

By late September 2011, the Surface Current Diagnostic Model showed that the Japan tsunami debris was only about 400 miles northwest of Midway, a location confirmed by observations of STS Pallada. There was concern that dangerous debris might wash up on the Papahānaumokuākea Marine National Monument. Therefore in Fall 2011, IPRC's **Nikolai Maximenko** participated with the Ocean Recovery Alliance and Scripps Institution of Oceanography, in launching a survey into the region. Horizon Lines shipped equipment from California and Nobeltec

provided navigational software. This endeavor was featured extensively in University of Hawaii News ([tinyurl.com/IPRCuhstory](http://tinyurl.com/IPRCuhstory)).

About the same time an oceanic front, however, started to develop just northwest of Midway. The current associated with the front has been channeling the tsunami debris toward the northeast, north of the monument. This front has held, and until now has protected the sanctuary. As of yet no confirmed Japan tsunami debris has been reported from the atoll. According to the new model versions, which include different levels of windage (see p. 24),

the greatest concentration of tsunami debris has already passed Midway to the north.



Only old debris was spotted during the survey.

## Marine Debris from the March 11, 2011, Tsunami: One Year After the Disaster

To accommodate the many media requests for interviews on the eve of the anniversary of the great Tohoku earthquake and tsunami, IPRC's Senior Scientist **Nikolai Maximenko** recorded a presentation reviewing the activities at the IPRC and other agencies. In his talk he discussed the current knowledge of the extent of the debris field and its potential dangers and cleared up some of the exaggerated media reports of the amount of debris floating toward the west coast. He also explained that light objects of the debris could be arriving at the West Coast much earlier than the

IPRC SCuD model projections because the basic SCuD model had been developed based on the trajectories of drifters with drogues at 15-m depth. At the time of the talk in March 2011 the model did yet not reflect the effects of the wind on debris. His talk is available at [tinyurl.com/IPRCdebrisnews](http://tinyurl.com/IPRCdebrisnews).

