VISITING SCHOLARS

IPRC Alumni Return

“IPRC has grown so much! Scientists have to share offices now,” exclaimed IPRC founding scientist Takuji Waseda when he returned to the IPRC in June. “I was one of the five scientists that JAMSTEC sent in 1997 to the University of Hawai‘i at Mānoa, and Leland Jameson and I were the first to arrive in Honolulu to ‘launch’ the IPRC.”

Since those early IPRC days, Waseda has accomplished much. He returned to Japan in 2004 to take a teaching position at the University of Tokyo. Now as associate professor in the Department of Ocean Technology, Policy, and Environment at the University of Tokyo, he mentors eight graduate students and studies the mysterious and feared “freak waves” with experiments in his wave tank as well as in direct reports of their occurrence.

During an IPRC lunchtime discussion, Waseda and two of his graduate students presented their latest research findings. How the strong Kuroshio generates a vortex in the ocean after flowing around Miyake Island was the topic of Tsubasa Kodaira’s talk; how cargo ships could be wind powered in the future by routing ships to take advantage of the most favorable winds was Tomoya Nishida’s topic. Waseda described his innovative GPS-based system that can record the actual conditions in the ocean under which freak wind-driven waves arise. This system is a huge step forward since direct observations of such waves are sparse and the conditions under which they arise are difficult to measure accurately. These GPS-based observations show that freak waves tend to form when there is a strong atmospheric pressure gradient. Ocean currents and wind gusts probably contribute to their formation.

Yuko Okumura, former IPRC-sponsored student from Japan and now postdoctoral fellow at NCAR, wants to research the topic of why some observations in the tropical Pacific show no clear-cut weakening of the Walker Circulation over the 20th century while most climate models do show such a weakening. In May she returned to the IPRC to discuss with her PhD mentor, Shang-Ping Xie, the kind of experiments she might run with the NCAR atmospheric model. She wants to also explore whether millennium simulations with the NCAR climate model can help answer another long-standing conundrum: what causes the swings in El Niño amplitude and its other properties over decades? While at the IPRC, Okumura gave a seminar on her analyses of recent high-resolution ice-core records in Antarctica. These show that sea surface temperature variations in the tropics, particularly the tropical Pacific, impact Antarctic climate, a finding with serious implication for stability of the Antarctic ice sheets and associated change in global sea level.

Hyoun-Woo Kang, who worked with Jay McCreary and Tangdong Qu as a postdoctoral fellow from 2001 to 2003 and is now at the Korea Ocean Research and Development Institute (KORDI), visited the IPRC from July 20 to 27. He came to discuss collaborations in oceanography and climate-related research between the U.S. and Korea in general, and between IPRC and KORDI, specifically. A partnership with Qu and Ryo Furue on the western Pacific circulation and climate already exists under a Joint Project Agreement among NOAA and the Ministry of Land, Transport and Maritime Affairs.
(MLTM), and the Ministry for Food, Agriculture, Forestry and Fisheries (MIFAFF) of the Republic of Korea with funding from the KORDI. The project called “Modeling study on ocean dynamics and its role in climate in the Pacific,” has Kang and Young-Ho Kim (KORDI) as the Korean principal investigators and Furue and Qu as the US investigators. The project is two-pronged: Qu and Kang are studying the western Pacific current variability and climate dynamics, while Kim and Furue are focusing on the sensitivity of climate model performance to the ocean-mixing parameterization employed.

Tommy Jensen was also one of the first scientists at the IPRC, coming in May 1998. He is now at the Naval Research Laboratory, Stennis Space Center, Mississippi. He visited the IPRC in September to give several talks: “Wave-current Interaction in the Florida Current in a Coupled Atmosphere–Ocean-wave Model” and “Coupled Modeling of Air-sea Interaction in the Indian Ocean during an MJO.”

Other Visitors

South Pacific Rainband and Global Warming

The South Pacific Convergence Zone (SPCZ) is the rainband that is so important for agriculture in northern Australia and in the South Pacific Islands, making that region one of the wettest on Earth. What will happen with global warming to this rainband? This is a question a team of scientists from University of New South Wales (NSW) and the IPRC is looking into. Matthew England, co-director, Climate Change Research Centre at UNSW, visited the IPRC during part of his sabbatical in July – August 2011 to work with IPRC’s Axel Timmermann and Postdoctoral Fellow Matt Widlansky. Shayne McGregor, a former IPRC postdoctoral fellow and now at UNSW, joined them for a week in August.

Current climate models used in the IPCC projections of the later 21st century suggest that the SPCZ will become stronger, which would mean more rainfall for Northern Australia and such South Pacific Islands as Fiji. Timmermann and his colleagues, however, are finding that current climate models do not produce a realistic SPCZ, and actually simulate present-day temperatures that are up to 5°C higher than those measured in the eastern South Pacific. Once the bias is corrected, the present-day SPCZ becomes more realistic. When this correction, however, is used in model simulations for climate projections, it appears that the SPCZ will get weaker with warming, and these regions will become drier than today. The reason, the scientists say, is that the South Pacific will warm less than equatorial regions, weakening convection and thus rainfall. Should this come to pass, it would mean less rain for northern Australia.
Partnerships in Global Atmospheric Modeling

Two of IPRC’s longstanding partners and frequent visitors came for extended stays to the IPRC during August in order to continue their collaborations on comprehensive global modeling of atmospheric circulation.

Masaki Satoh of the University of Tokyo and JAMSTEC worked with IPRC faculty member Yuqing Wang and IPRC postdoctoral fellows Chunxi Zhang and Hiroshi Taniguchi on the analysis of ultrahigh-resolution global atmospheric simulations. The work with Wang and Zhang focuses on improving aspects of the subgrid-scale parameterizations in Satoh’s global nonhydrostatic atmospheric model. Satoh’s collaboration with Taniguchi involves diagnosing tropical intraseasonal variability in his high-resolution model simulations.

On August 26, Satoh presented some of his group’s exciting recent results in a seminar titled “Global Nonhydrostatic Simulations by a Nonhydrostratic Icosahedral Atmospheric Model, NICAM: Intraseasonal Oscillations and Tropical Cyclones.”

During his month-long visit, Yoshio Kawatani from JAMSTEC’s Research Institute for Global Change continued his work with IPRC Director Kevin Hamilton on simulation of the tropical middle atmosphere (see story on page 6 in this issue). New directions that were discussed during Kawatani’s visit included further diagnosis of the mechanisms involved in climate change influence on the tropical middle atmosphere, analysis of the effects of the quasibiennial oscillation on atmospheric thermal tides, and simulation of the large-scale flow in the equatorial mesosphere and lower thermosphere.

The Latest on Bomb Cyclones

Koki Iwao is on a year-long visit to the IPRC on a “study-abroad-year” from Kumamoto National College of Technology, where he is associate professor in the Faculty of Liberal Studies. A 2004 doctoral graduate of Kyushu University, Iwao worked as a postdoctoral researcher at the University of Tokyo with Masahide Kimoto before beginning his current faculty position in 2007.

Iwao’s sabbatical visit to IPRC has allowed him to focus on his research and to take up again his collaboration with Kimoto on the subject of explosive cyclogenesis. In a typical year, the western North Pacific sees the formation of 7 or 8 rapidly developing “bomb” cyclones (i.e., storms with central pressures falling by more than 1 hPa/hour for at least 24 hours). In his research, Iwao has found the frequency of bomb cyclones increased over the western North Pacific from the winter periods 1979/80 – 94/95 to the winter periods 95/96 – 2010/11. Dynamical analysis suggested that the increase was probably due to an increase in humidity associated with rising sea surface temperature, which results in more condensational heating and thus in more disturbances that develop very rapidly into cyclones.