Student Spotlight: Steve Guimond  
(Ph.D., Student, Meteorology)

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During the course of my PhD, I have spent time at NASA Goddard Space Flight Center and Los Alamos National Laboratory as a visiting scientist studying Doppler radar and numerical models. At Los Alamos, I am part of a project that hopes to improve the forecasting of hurricane intensification by using lightning observations from a new dual band array developed and deployed by team members from the lab.

Upon graduation (by mid-late 2010), I hope to become a scientist at one of the laboratories mentioned above with a strong connection to applied research.

Alumnus Spotlight: Annette Samuelsen  
(Ph.D./M.S. Oceanography, 2005/2000)

I work as an oceanographer at the Nansen Environmental and Remote Sensing Center (NERSC), which is a private research institute in Bergen, Norway. After I completed my Ph.D. at COAPS in the spring of 2005, I got a position as a postdoctoral scientist here; this is a lot of fun and I’ve learned a lot from it. Another exciting part of my work is going to international meetings and conferences. This winter, a group of us went to India, which was quite an exotic experience.

In my free time I practice yoga and go surfing on the weekends. Every spring a few of us organize a surf-weekend for the employees.

If you are an alumnus interested in sharing your experiences, please contact Meredith Field (mfield@coaps.fsu.edu).

Family Activity: Make Your Own Thermometer

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Steps:
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3. Put the straw in the bottle, but do not let the straw touch the bottom.
4. Use the modeling clay to seal the neck of the bottle, so the straw stays in place.
5. Now put the bottle somewhere warm and watch what happens. The mixture expands when warmed, and is forced to rise up through the straw.

Source: Colorado State University Extension.

COAPS Newsletter  
Fall 2009

Over the years, measurements of the oceans taken from ships and satellites have helped to fill in some gaps in our understanding of oceanic processes, such as circulation, and properties, such as temperature and salinity, but these methods are often expensive and otherwise limited. Therefore, a new tool has been developed to better comprehend the oceanic state: numerical ocean models. A numerical ocean model is a set of mathematical equations programmed into a computer which, when solved in a process called a model simulation run, describe the ocean circulation. At COAPS, much of our oceanic research is conducted using the HYbrid Coordinate Ocean Model (HYCOM; http://www.hycom.org). HYCOM is a complex tool that combines many of the features of other numerical models, and is better able to capture the essence of all oceanic dynamical processes.

HYCOM is being developed and tested by a large consortium of institutions, including COAPS, the Naval Research Laboratory, and NOAA. One of the primary goals for HYCOM is to depict and forecast the three-dimensional global ocean at a fine resolution (four to eight kilometers on the equator); it is also planned as the next generation operational global ocean nowcast/forecast system for the United States Naval Oceanographic Office.

Many oceanographic institutions around the world use HYCOM in combination with ship and satellite observations to increase our ability to simulate and comprehend oceanic processes, monitor the current ocean state and even predict its evolution. At COAPS, we use HYCOM to: simulate the global ocean circulation and tides; study the Mediterranean outflow and its influence on the Atlantic Ocean circulation; understand the representation of the internal wave dynamics; and understand the Arctic Ocean water masses properties and circulation.

While numerical ocean models such as HYCOM are now universally accepted as tools for research and education, they also have limitations: the mathematical methods used to resolve equations in the model simulations require some approximations, in addition to high performance computing resources. There is also a perpetual need to maintain, develop and test the models. The benefits, however, are well worth the effort, as HYCOM and other ocean models help the oceanography community to increase understanding and knowledge of our oceans.

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The Florida State University Center for Ocean-Atmospheric Prediction Studies performs interdisciplinary research in ocean-atmosphere-land-ice interaction to increase our understanding of the physical, social, and economic consequences of climate variability.

COAPS is located in Tallahassee’s Innovation Park and has a staff of approximately 50, including teaching faculty, research scientists, and students from the fields of meteorology, physical oceanography, statistics, and the computer and information sciences.

COAPS is a NOAA Applied Research Center and is home to the Florida Climate Center (Office of the State Climatologist) and the Research Vessel Data Center.

Sponsors include NASA, NOAA, NRL, NSF, ONR, the State of Florida, USDA, and the U.S. DOE.

HYCOM: The Next Generation Global Ocean Prediction System

by Flavien Gouillon, Ph.D., Student, Oceanography

Navigating the deep waters of ocean science requires sophisticated tools like HYCOM that can simulate the complex interactions between the ocean, atmosphere and land surfaces. HYCOM is a global ocean model that provides a detailed representation of the ocean’s physical processes, including tides, currents, and temperature and salinity patterns. It is a key component of the National Oceanic and Atmospheric Administration’s (NOAA) National Ocean Model (NOM), which is used to forecast ocean conditions and support marine resource management.

HYCOM is unique because it can simulate ocean conditions at high resolution, providing detailed information about the ocean’s behavior on both small and large scales. This capability is particularly important for understanding the impacts of climate change on ocean ecosystems, which are an essential component of our everyday lives. Oceans are a primary source of food and fun activities, and they also help the oceanography community to increase understanding and knowledge of our oceans.

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Climate & Foodborne Illness
by Vassili Moroz, Assistant Professor of Meteorology

COAPS has recently received funding to examine possible links between the waters of the Atlantic, the Caribbean, and the eastern tropical North Atlantic, and the occurrence of a foodborne illness called ciguatera. Ciguatera is caused by eating fish contaminated with a toxin found in many tropical microorganisms. There are an estimated 500,000 cases/year worldwide, and the impact is particularly severe among lower socio-economic groups, who are often dependent on local reef fish as a primary food source. The Caribbean region is especially endemic to ciguatera. Observations suggest that the incidence and symptoms of ciguatera are worsening over time. COAPS will investigate whether changes in environmental conditions (especially sea surface temperatures) can lead to the modulation of Gambierdiscus toxicus, the microalgae implicated as the source for ciguatera-associated toxins.

Wind Energy: How Much Power Can Florida’s Winds Provide?
by Mark Powell, NOAA Scientist stationed at COAPS, Shawn Smith, Research Associate, and Steve Cocks, Associate Scholar Scientist

With all the discussion on the climate bill and a national renewable energy standard, all sources of renewable energy are on the table: wind, photovoltaic solar, solar thermal, biofuels, biomass, and ocean currents. The U.S. is a world leader in wind energy, but what about Florida? Do we have enough wind to support a new industry and the jobs and revenue that could come with it? COAPS scientists are launching a pilot study to examine offshore and coastal wind potential in our state. According to previous research conducted by the Lawrence Berkeley National Laboratory and Navigant Consulting at the request of Florida’s Public Service Commission, offshore wind has “large technical potential” in Florida, and certain sections off the northeast and northwest panhandle are economically sustainable. About 40,000 Megawatts (MW) of offshore power potential were identified, enough to power ~2.6 million homes and about four times the current installed capacity of wind energy in the U.S. Coastal wind (within 360 m of the coast) was also recognized as a marginally economically viable wind resource, with a potential of 186 MW (~120,000 homes).

However, this study and similar research have largely been based on climate data from surface and upper air stations, and little information is known about offshore wind power and its dependence on mesoscale processes or the impact of coastal circulations, like sea and land breezes, on coastal wind power. A map of coastal and offshore Florida wind measurement stations by Melissa Griffin at COAPS suggests that we may have sufficient data to explore potential wind resources in further detail. In particular, tower N7 – instrumented by FSU as part of the Northern Gulf of Mexico Institute - is uniquely sited, and can collect wind measurements at a height similar to most standard offshore turbines.

In our pilot study supported by The Florida State University’s Institute for Energy Systems, Economics, and Sustainability (IESES), we will examine the climate data to compute the annual wind resource and its seasonal variability at selected stations. We will compute the wind power density by summing the product of the air density and the cube of the hourly wind speed. The hourly wind speed is estimated at the turbine hub height so we will be using stability-dependent surface layer wind-height relationships that were developed by Prof. Mark Bourassa for the FSU marine flux program at COAPS. Once that is completed the next step will be to evaluate regional scale models to see how well they capture the wind climate at the station locations. If the pilot study shows potential based on selected stations, a full-scale study will be proposed.

Youth Scholars Assist with Research for the Northern Gulf Institute
by Shaw Smith, Research Associate

This summer, three high school students taking part in Florida State’s Young Scholars Program (YSP) worked with scientists at COAPS on a research project for the Northern Gulf Institute (NGI). YSP is a six-week residential science and math program for Florida high school juniors and seniors with significant potential for careers in the sciences, engineering, and health professions (http://bio.fsu.edu/yisp/).

The three YSP students - Ylin “Linda” Cao, Danielle Howard, and Janaki Perera - spent two days a week at COAPS, working with Shawn Smith, Steve Morey, Austin Todd, and Jacob Retting to analyze meteorological and oceanographic data collected at NGI tower N7 in the northern Gulf of Mexico. The students identified differences between the meteorological sensors that could be attributed to the exposure of the instruments and blockage of the airflow around the tower from specific wind directions. Using the best-exposed instruments, Janaki searched for evidence of a nocturnal increase in easternly winds over Apalachee Bay, a feature that has been observed by recreational fisherman in the region. Her preliminary results showed evidence of these nocturnal easterlies during the spring months.

Danielle and Linda collaborated to associate variations in the vertical structure of ocean water temperature and salinity at N7 with occurrences of strong winds. In addition, the students identified an occurrence of increased fresh water in the upper ocean at N7 that may be associated with the propagation of flood water from the Susanne River in late April 2009.

The students presented their research findings at the YSP poster session held on 22 July 2009 at Florida State’s King Life Sciences Building. NGI is a National Oceanic & Atmospheric Administration (NOAA) Cooperative Institute studying coastal hazards, climate change, water quality, ecosystem management, coastal wetlands and pollution in the northern Gulf of Mexico. Florida State is one of five academic institutions participating in the NGI consortium. Preliminary analysis completed by the YSP students will support ongoing research by Austin Todd into the life cycle of the gag grouper. For more information on NGI research at COAPS, please visit http://coaps.fsu.edu/ngi/.

Improving Crop Yield Forecasts

COAPS scientists Dong-Wook Shin, Young-Keun Lim, Steve Cocks, Tim LaRow, and James O’Brien recently participated in a study assessing crop yield simulations using various seasonal climate data. For the study, the scientists evaluated the predictability of a crop model to different seasonal climate data for maize and peanut yield simulations. They found that dynamically and statistically downscaled climate data improved the crop yield simulations in comparison to the commonly used El Niño Southern Oscillation (ENSO)-based historical data. The scientists are now working to further improve crop yield predictions through the inclusion of more accurate rainfall data and the development of a coupled climate-crop model system.

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(Ph.D. M.S. Oceanography, 2005/2000)

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My work consists of using and developing computer models for plankton in the ocean, as well as the topic of my dissertation at COAPS. The models we develop are used to learn about how ocean currents, temperature, and climate influence the growth and abundance of plankton in the ocean. This knowledge is one piece of the puzzle that we need to understand how climate influences the productivity of fish and other large organisms. I also help supervise some of the graduate students here; this is a lot of fun and I’ve learned a lot from them. Another exciting part of my work is going to international meetings and conferences. This winter, a group of us went to India, which was quite an exciting experience.

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Center for Ocean-Atmospheric Prediction Studies

Newsletter Fall 2009

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