FLORIDA STATE UNIVERSITY
Center for Ocean-Atmospheric Prediction Studies

Spring 2017 Newsletter

Experiment testing new drifter design in the Gulf of Mexico

In late January, Drs. Steve Morey and Dmitry Dukhovskoy, and oceanography technician Caleb Hudson deployed a set of surface drifters offshore of Orange Beach, AL to test prototypes for a new drifter design developed by Dr. Nico Wienders, Associate Scientist in the FSU Department of Earth, Ocean, and Atmospheric Science. The deployment is part of a research project to develop new technology for observing currents at the ocean surface funded by NOAA and the Cooperative Institute for Marine and Atmospheric Studies (CIMAS).

The goal of the project is to develop the new drifter design for widespread use in observing systems, scientific studies, and practical applications.

"Typically, observations of surface currents are taken at one to several meters depth, which may not be representative of the true surface current," says Steve Morey, a senior research scientist at COAPS and the project's principal investigator. "The current at the very surface of the ocean is important for transporting buoyant materials (oil, fish eggs, etc.) and impacts air-sea fluxes."

(Top row, l-r) Morey and Wienders assemble the drifters in advance of the deployment cruise; Morey assembles the GPS unit that attaches to each drifter base; drifters ready for deployment. (Large photo) Technician Caleb Hudson secures a GPS unit to a drifter prior to deployment in the Gulf of Mexico.(Middle far right) Dukhovskoy prepares to launch one of the drifters deployed on January 24, 2017.(Bottom right) Self-addressed drift cards were also deployed for trajectory tracking via volunteer observers. These cards include instructions for those who find them to indicate where they were picked up, to further help scientists understand how ocean currents transport materials.

Not only is the project developing new technology for measuring surface currents, it will also yield valuable information about the vertical structure of currents near the surface and differences in currents measured by different methods.

For the experiment, 30 drifters with 5 cm hull profiles (extending 4 cm below the surface),

28 drifters with 10 cm hull profiles, and 14 drifters with drogue depth of approximately 1.5m (which are commonly used for surface current studies) were deployed in two groups offshore of Orange Beach, AL. Self-addressed drift cards were also deployed for trajectory tracking via volunteer observers. The drifters were programmed to transmit locations every five minutes via the Globalstar network so they are being tracked as they travel in the Gulf of Mexico (see how the drifters traveled in the Gulf). The deployment location was chosen as it lies within the footprint of a coastal HF (high frequency) radar site, which measures surface currents from roughly 2-3 m depth.

News and Activities

Expanding a 300-year record of marine climate

By Shawn R. Smith and David I. Berry, published in Earth and Space Science (EOS) News

Since the 1600s, mariners have measured the weather and surface ocean conditions as part of daily operations of merchant and naval vessels. Early observations were primarily visual estimates of weather conditions and later included measurements from early versions of weather instrumentation, including thermometers, wind vanes, and barometers. In the latter half of the 20th century, scientists developed new technology, including moored and drifting buoys, gliders, and autonomous profiling floats, to further measure environmental conditions near the ocean surface.

This diverse mix of historical and modern marine measurements provides the basis of our understanding of the climate over the world's oceans and is the foundational data used to model past, present, and future climate. Developing homogeneous collections of weather and surface ocean measurements is critical to support ongoing global climate research. Read the full article.

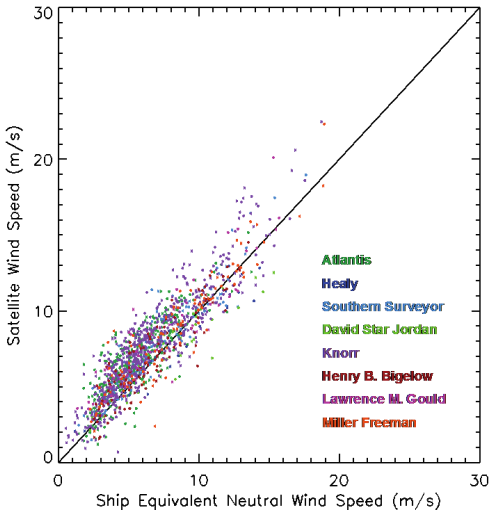
Findings on carbon cycle feed climate research

Source: Florida State University News

FSU researcher and assistant professor **Mike Stukel** is taking a deep dive into the carbon cycle and investigating how carbon moves from the ocean surface to greater

FSU-led DOMS project featured by NASA

The FSU-led DOMS project was highlighted in the NASA Earth Science Technology Office 2016 Annual Report. The Distributed Oceanographic Match-up Service (DOMS) is a web-accessible service tool that will reconcile satellite and in situ datasets. When fully implemented online, DOMS will provide a mechanism for users to input a series of geospatial references for satellite observations (e.g., location, date, and time) and receive the in situ observations that are "matched" to the satellite data within selectable time and space tolerances of the satellite observations. The inverse -- inputting in situ geospatial data (e.g., positions of moorings, floats, or ships) and returning corresponding satellite observations -- will also be supported. The DOMS prototype already includes several datasets and will be readily extendable to other in situ and satellite collections to support additional science disciplines. Visit DOMS online to learn more.



Example comparing collocated ship and satellite scatterometer wind speed data. This analysis was done during a validation exercise for QuikScat.

depths and then remains there for hundreds of years. Those findings could be critical as scientists work to better understand climate change and how much carbon the Earth's atmosphere and oceans can store.

Michael Stukel, assistant professor of Earth, Ocean and Atmospheric Science

In a paper published in the Proceedings of the National Academy of Sciences (PNAS), Stukel explains how carbon is transported to deeper waters and why it is happening more rapidly in certain areas of the ocean. "Algae in the surface ocean contribute half of the Earth's photosynthesis, but most of the carbon dioxide they take up gets released back to the atmosphere when they die," Stukel said. "The only way for this carbon to stay out of the atmosphere for a long period of time is to get it into the deep ocean. If it's in the deep ocean, it can stay put for hundreds to 1,000 years. As the climate gets warmer, will the ocean take up more carbon dioxide or less? That's what we ultimately need to know. But first we have to figure out how this natural process of oceanic carbon storage works." Read more.

BAMS article: "Climate Process Team on Internal-Wave Driven Ocean Mixing"

An early online release of the article by MacKinnon et al., entitled "Climate Process Team on Internal-Wave Driven Ocean Mixing," has been published by the *Bulletin of the American Meteorology Society (BAMS).* The article summarizes recent advances in our understanding of internal-wave driven turbulent mixing in the ocean interior are summarized. New parameterizations for global climate ocean models and their climate impacts are also introduced. Read here.

Florida wins CoCoRaHS "March Madness" contest

The Community Collaborative Rain, Hail, and Snow (CoCoRaHS) Network is a high-density precipitation-observation network that operates in all 50 states and the District of Columbia, Puerto Rico, Canada, and the Bahamas. Last month, CoCoRaHS had a "March Madness" contest that had the 50 states competing to recruit the most citizen volunteer observers. With a recruitment of 135 new observers, Florida was the winning state in the contest, which tremendously boosts the ability of the network to provide rainfall and hail observations to meteorologists, climatologists, hydrologists, engineers, and many other data users. Florida CoCoRaHS is directed by Danny Brouillette, climatologist in the Florida Climate Center, and Ivetta Abramyan, earth-sciences professor at the Florida State College at Jacksonville. Those who are interested in joining CoCoRaHS should visit cocorahs.org.

Student Achievements

Four COAPS students will have completed their degrees this semester.

- **Jacob Carstens** defended his Honors in the Major thesis in the Department of Earth, Ocean and Atmospheric Science and will graduate summa cum laude with a BS in meteorology. He plans to pursue a master's degree at FSU and specialize in tropical meteorology, including both tropical cyclones and rainfall patterns.
- **Chelsey Laurencin** will graduate this semester with a BS in meteorology. She plans to pursue a doctorate in meteorology with a specialization in tropical meteorology and study tropical cyclone intensity at Penn State.
- **Ian Terry** is graduating magna cum laude with a BS in computer science. He will be moving to Austin to work as a Software Developer for General Motors.
- **Jennifer Yarboro** defended her Honors in the Major thesis in the Applied Mathematics Department. She will graduate cum laude with a BS in computer science and BS in applied mathematics with honors, and plans to join the IT Leadership Program at Harris Corporation in Melbourne, FL following graduation.

Congratulations graduates! (L-R): Jacob Carstens, Chelsey Laurencin, Ian Terry, and Jennifer Yarboro.

Additional congratulations to **Chelsey Laurencin** who received an National Science Foundation (NSF) Graduate Research Fellowship award. Laurencin is a first-generation college student, finishing her degree in just three years. She has been working with Associate Professor **Vasu Misra** on analysis of the North Atlantic tropical cyclone motion.

COAPS in the Community

2017 open house showcases science (and fun!)

COAPS' annual open house is designed to stimulate public knowledge about science, particularly the kind of science being conducted at COAPS. This year's open house was attended by more than 500 visitors and featured something for everyone... hands-on science fun, self-guided tours, and the chance to meet and interact with our scientists. Attendees learned how robots can be programmed to help with scientific research, how drones are used to observe the earth, about rising seas, marine data, and how COAPS researchers are modelling the ocean and atmosphere. Thanks to our friends at FSU Biology Department's Sea-to-See Program for bringing out their mobile sea creatures display, student members of the FSU Thalassic Society for helping to educate people about extreme weather events, and the FSU Weather team for setting up an awesome station where folks were able to try their hand at being a TV meteorologist.

COAPS welcomes 2017 WIMSE students

COAPS was pleased to host members of FSU's Women in Math, Science, and Engineering (WIMSE) Program. The WIMSE community provides a supportive environment for undergraduate female students in a mathematics, science, or engineering curriculum. Students participating in WIMSE have the chance to meet and interact with FSU scientists and researchers, and tour FSU research facilities.

FSU Coastal and Marine Lab Open House

The April 22 FSU Coastal and Marine Lab Open House held in St. Teresa, FL, provided

the perfect opportunity to demonstrate how a new drifter (see first article) is being used to measure ocean currents.

Left: Oceanography technician Caleb Hudson and COAPS senior scientist Steve Morey talk about how surface drifters are used to observe ocean currents. Middle: Oceanography technician John Easton demonstrates how GIS is used to track the drifters once deployed at sea. Right: Nicolas Wienders, FSU EOAS associate research scientist, designed this unique drifter to better track and monitor the ocean currents at the surface. Graduate student Renee Richardson also helped man the information station.

FSU Day at the Capitol

Representatives from the FSU COAPS Marine Data Center and the Florida Climate Center, both housed at COAPS, were on hand for this year's "FSU Day at the Capitol" held April 4 in Tallahassee. The annual event showcases the university's accomplishments over the past year to legislators during the Legislative Session.

Pictured (left to right): Shawn Smith, Danny Brouillette, Jeremy Rolph, and Kris Suchdeve.

Recent Publications

*COAPS authors are in **bold**.*

Dukhovskoy, D.S., M.A. Bourassa, G.N. Petersen, and **J. Steffen**, 2017. Comparison of the ocean surface vector winds from atmospheric reanalysis and scatterometer-based wind products over the Nordic Seas and the northern North Atlantic and their application for ocean modeling. J. Geophys. Res. Oceans, 122, 1943-1973, DOI: 10.1002/2016JC012453

Glinton, M.R., S. L. Gray, **J.M. Chagnon,** and C.J. Morcrette, 2017: Modulation of precipitation by conditional symmetric instability release. *Atmospheric Research*, 185, 186-201, DOI:10.1016/j.atmosres.2016.10.013.

Krishnamurti, T.N., S. Dubey, V. Kumar, R. Deepa, and **A. Bhardwaj**, 2017: Scale Interaction during an extreme rain event over South-East India. *Q.J.R. Meteorol. Soc.*. Accepted Author Manuscript. DOI:10.1002/qj.3016

MacKinnon, J.A., M.H. Alford, J.K. Ansong, B.K. Arbic, A. Barna, B.P. Briegleb, F.O. Bryan, M.C. Buijsman, **E.P. Chassignet**, G. Danabasoglu, S. Diggs, S.M. Griffies, R.W. Hallberg, S.R. Jayne, M. Jochum, J.M. Klymak, E. Kunze, W.G. Large, S. Legg, B. Mater, A.V. Melet, L.M. Merchant, R. Musgrave, J.D. Nash, N.J. Norton, A. Pickering, R. Pinkel, K. Polzin, H.L. Simmons, L.C. St. Laurent, O.M. Sun, D.S. Trossman, A.F. Waterhouse, C.B. Whalen, and Z. Zhao, 2017: Climate Process Team on Internal-Wave Driven Ocean Mixing. *Bull. Amer. Meteor. Soc.*, Published onlineDOI, : 10.1175/BAMS-D-16-0030.1.

Misra, V., A. Mishra, and **A. Bhardwaj**, 2017: High-resolution regional-coupled ocean-atmosphere simulation of the Indian Summer Monsoon. *Int. J. Climatol*. DOI:10.1002/joc.5034

Shin, D.W., Baigorria, G.A., Romero, C.C., **Cocke, S.**, Oh, J.H., and Kim, B.M., 2017: Assessing crop yield simulations driven by the NARCCAP regional climate models in the southeast United States. *J. Geophys. Res. Atmospheres*. 122(5), 2549-2558. DOI: 10.1002/2016JD025576

http://coaps.fsu.edu
contact@coaps.fsu.edu