

DEAN JACQUELINE E. DIXON

ANNUAL REPORT FOR

THE COLLEGE OF MARINE SCIENCE

JANUARY 1 – DECEMBER 31, 2013

Locally Applied, Regionally Relevant, Globally Significant!

TABLE OF CONTENTS

Contents

The View from the Bridge _____	1
Faculty Highlights _____	4
Facilities _____	6
Research _____	7
CMS Ocean Technology (COT) Group _____	16
C-IMAGE: Our Featured Research Project _____	20
Graduate Education and Awards _____	23
Education & Outreach _____	30
Development _____	33
Events _____	35
Publications _____	37
Active Research Awards _____	49

THE VIEW FROM THE BRIDGE

The View from the Bridge



Healthy oceans are more important now than ever. Globally, more than 600 million people currently live within 10 meters of present-day sea level, and this area generates 10% of the world's total Gross Domestic Product (GDP). According to the U.S. Census Bureau (2011), approximately 39% of the U.S. total population lives in coastal shoreline counties. Growing coastal populations are increasingly at risk from the effects of natural and anthropogenic climate change and extreme weather events, and they are putting substantial pressures on the sustainability of coastal ecosystems.

Healthy oceans are at the center of Florida's economy. The Florida Ocean Alliance has presented an analysis of the economic impact of the ocean on Florida's economy that found:

- Florida's coastal counties contributed over \$584 billion in gross regional product to Florida's economy in 2010, or 79% of the state's economy.
- More than 228,000 jobs in Florida are directly created by activities that use ocean resources. When indirect effects are taken into account, the number of jobs supported by ocean resources exceeds 440,000.
- In 2011, about one out of every twenty dollars' worth of Florida's GDP resulted from use of the state's ocean resources.

But continued consumption of resources and emission of greenhouse gases into the atmosphere are putting the oceans and our future economic well-being at risk. The most recent International Panel on Climate Change report (IPCC WGII AR5 Summary for Policymakers) has issued strong warnings about anticipated consequences of continued emission of greenhouse gases. Coastal systems and low-lying areas will experience submergence, coastal flooding and coastal erosion due to sea level rise and local coastal subsidence. Marine systems will experience redistribution of global species and reduction in biodiversity in sensitive regions that will "challenge the sustained provision of fisheries productivity and other ecosystem services." The progressive expansion of oxygen minimum zones and anoxic "dead zones" is projected to

THE VIEW FROM THE BRIDGE

further impact fish habitat. Climate change will add to the threats of over-fishing and other non-climatic stressors, thus complicating marine management regimes. However, it is not just temperature change that will impact the ocean. Increasing concentrations of CO₂ in the atmosphere are changing the chemistry of the ocean by making it more acidic. Ocean acidification poses substantial risks to marine ecosystems, especially polar ecosystems and tropical coral reefs.

The USF College of Marine Science is a leader in applying cutting-edge science to address these challenges to the global ocean through research, service, and the training of future scientists. We strive to recruit and retain world-class faculty. We then surround our faculty with the best and brightest students and supportive staff members. Faculty work shoulder to shoulder with graduate students, showing them how to be the best they can be. Our faculty members are superb citizens, involved at the university level, the local, state and federal government levels, and at the international level.

A part of USF's strategic plan is to increase engagement with the community. Marine science is not now, nor has it ever been, an ivory tower profession. We study the oceans in order to benefit human beings, and this requires that we be engaged with our society in every possible way. Our faculty members, students, and staff are already doing a superb job in this area, and we will continue to improve.

COLLEGE OF MARINE SCIENCE SNAPSHOT AND COMMUNITY IMPACT

The USF College of Marine Science traces its beginnings to 1967 when it started with 3 faculty members. Our "stand alone" PhD Program graduated its first student in 1982. Today CMS has:

- ~26 full time faculty, 34 research associates, 31 technical associates, 20 staff
- ~100 graduate students
 - 68% Doctoral, 32% Master's
 - 57% Female, 43% Male
 - 15% International, 16% US Minority
 - More than 20 Annual College Fellowships averaging \$10,000 - \$22,000 Per Year
 - 50 Graduate Assistants appointed on average per year
- Over \$15 M in endowments
- More than 13 labs in Biological, Chemical, Geological and Physical Oceanography
- ~\$15 M in sponsored research funding

We are strongly engaged with the community as a member of the St. Petersburg Marine Science District, including CMS, the U.S. Geological Survey, The Florida Fish and Wildlife Research Institute, Florida Institute of Oceanography, SRI International, NOAA Fisheries Service, and the Tampa Bay Estuary Program. The Marine Science District contributes to the economic well-being of St. Petersburg through:

- Employment of approximately 800 researchers, engineers, technicians and support staff
- An estimated 75% of those employed have advanced degrees; at least 30% of those at the PhD level

THE VIEW FROM THE BRIDGE

- An estimated annual payroll of \$64M
- Additional (external market) financial impact is estimated at \$30M annually



We have one new partnership that we are extremely excited about. The Blue Ocean Film Festival will be coming to St. Petersburg on November 2-9, 2014. This festival showcasing marine and environmental films will alternate between St. Petersburg, FL and Monaco for the next four years. It will bring international recognition, and hopefully about 25,000 visitors, to St. Petersburg and the college. We are working with festival directors to bring in speakers to address ocean health concerns and hope it is an opportunity to bring faculty, students, staff, and alumni together with the community for a week of learning and entertainment.



FACULTY HIGHLIGHTS

Faculty Highlights

NEW HIRES

We conducted searches in Chemical Oceanography and Paleoceanography in 2013 and succeeded in recruiting three new faculty members. All three joined us in January 2014. Kristen Buck is an expert in biogeochemical cycling of trace metals in marine ecosystems. Brad Rosenheim is an expert in climate and carbon cycling in the recent geologic past using stable and radiogenic isotopic techniques. Eugene Domack is an expert in paleoclimate using sediment facies, biotic changes, and ice adjustments in the Antarctic.

TENURE AND PROMOTION

We carried out the mid-point review for Sang-ik Shin and submitted tenure and promotion files for Kendra Daly (promotion to rank of professor) and Chuanmin Hu (tenure and promotion to rank of professor). The Provost's office has given a positive recommendation for both candidates to the Board of Trustees.

HONORS AND AWARDS

Cameron Ainsworth received a 2013 Sloan Fellowship. The Sloan Research Fellowships seek to stimulate fundamental research by early-career scientists and scholars of outstanding promise. These two-year fellowships are awarded yearly to 126 researchers in recognition of distinguished performance and a unique potential to make substantial contributions to their field. Dr. Ainsworth is one of only two Sloan Fellowships awarded this year in the state of Florida.

The ARCS Collaborative Award Ceremony on February 9, 2013 honored "Catalysts in STEM." **Former Dean Peter Betzer** was honored for his role in generating endowments to support graduate education in marine science. CMS faculty, staff and students were awarded the STEM Collaborative Partnerships Award. Recipients included **William Hogarth, Ethan Goddard, David Naar, David Hollander, Ernst Peebles, John Paul, Robert Walker (FIO), Steve Murawski, Chuanmin Hu, Kendra Daly, Kara Radabaugh, Robert Weisberg,** and **Andrew Remsen.**

Robert Byrne was selected as an American Association for the Advancement of Science (AAAS) Fellow.

Pamela Hallock-Muller was chosen as one of the Top 25 Women Professors in Florida. Dr. Hallock-Muller specializes in the research of human impact on coral reefs (<http://onlineschoolsflorida.com/top-college-professors-in-florida/women/>).

In May 2013, **Frank Muller-Karger** was selected as the *Business Partner of the Year* for the Stewart Middle Magnet school in Hillsborough County, and the USF College of Marine Science was selected to be the *Hillsborough County Secondary Business Partner of the Year!*

FACULTY HIGHLIGHTS

In September 2013, **Mya Breitbart** was selected by *Popular Science* magazine (October issue), as one of their “Brilliant 10”—an annual feature profiling 10 young scientists who are doing truly groundbreaking work in their fields. To identify those individuals that the scientific community feels are the best, brightest, and most worthy of widespread recognition, *Popular Science* magazine polls professional organizations and scientists in the field. Past Brilliant 10 honorees have gone on to win prominent awards in their disciplines, including the Fields Medal and MacArthur Foundation fellowships.

Also in September 2013, **Steve Murawski** was asked to serve on two prestigious appointments. He was appointed as the United States Academic Delegate to the International Council for the Exploration of the Sea (ICES). He will be responsible for representing the United States in the Governing Council and in the Delegates Meetings. He was also appointed a committee member for the Decadal Survey of Ocean Sciences 2015. This survey, managed by the National Academies, will set the science priorities for the next decade in the context of the current state of knowledge, ongoing research activities, and resource availability. In October 13, 2013, he was awarded a USF Faculty Outstanding Research Achievement Award.

In December, **Don Chambers** delivered the Bowie Lecturer for the 2013 American Geophysical Union (AGU) meeting. He spoke on “Using Geodesy to Better Understand Ocean Dynamics”. Quoting from the December 10, 2013 issue of EOS, “Each year nearly 25 individuals are chosen to present lectures under the Bowie Lecture Series as well as the Section and Focus Group Named Lecture Series. The Bowie Lecture was inaugurated in 1989 to commemorate the 50th presentation of the William Bowie Medal, which is AGU’s highest honor and is named for AGU’s first president.



Provost Ralph Wilcox and Dean Jackie Dixon celebrate the achievements of Bob Byrne, Chuanmin Hu, and Cam Ainsworth at the Outstanding Faculty Awards ceremony on March 5, 2014.

Facilities



Joe Donnelly deserves our thanks for overseeing installation of the new elevator in MSL. Thanks Joe!

Maintaining and upgrading our buildings and grounds is essential to carrying out our mission. This has been a busy year, as most of them are, and we will just give a few highlights.

The major renovation of the lab spaces in the north end of the MSL was officially declared to be complete in February of 2013 and the labs are now up and running. The installation of a long needed new elevator in the MSL was completed in September and is a major upgrade to our building. In addition to the enhanced safety and access provided by the new elevator, the building received a thorough paint job in a color scheme personally selected by Dean Dixon. We have also begun the installation of a new clean room in Kristin Buck's laboratory to enable state-of-the-art trace metal analyses.

Many, many other projects were completed as well. For example, a new canopy and lighting over the deck behind the student lounge greatly enhances the appearance and safety of this heavily used area. Offices for two new faculty members were completely refurbished, and two additional office spaces that had not been used for some time were gutted and rebuilt to provide space for five people. We are calling this the Emeritus Suite, as it is presently being shared by several of our faculty emeriti. After the painting of the MSL was finished, new display boards were hung and posters showing recent research results are now available for viewing along the hallways. All of the hallways also received new light switches with motion sensors that allow energy savings without compromising safe use of the building.

Research

OVERVIEW

Research at the CMS focuses on assessing and predicting the health of ocean and the impacts of ocean-human interactions. Our basic aim is to understand these interactions well enough that we can maintain the health of this intimately interconnected system. Our more ambitious goal is to understand these well enough to enable improvements in the future.

The CMS research umbrella covers three areas. The first we call Healthy Ecosystems, which span from ocean chemistry and ocean currents to fisheries and everything in between. Our focus is on how our ocean ecosystem is changing and what it will look like in the future. The second area is Climate Change. The ocean plays a dominant role in determining the Earth's climate – past, present, and future. The third area under our umbrella is what we call the Ocean-Human Interface. This includes oceans and human health and human impacts on the ocean. The latter, among other things, includes pressure on fisheries and consequences of pollution, with the word pollution being defined broadly. All this taken together defines what we call the health of ocean-human interactions.

But simply saying that we are focused on the health of the interactions between society and the sea is probably difficult for many people to understand. What does it mean exactly? Where and how do we do our research?

Where? Our research spans the globe, but also focuses on our own backyard and the Gulf of Mexico region where we live. We do research that is applicable to local problems, research that is relevant to understanding the Gulf of Mexico, the Atlantic and the Caribbean, and research that shows how all of this fits together in the global context. Locally Applied, Regionally Relevant, Globally Significant!

How do we do it? Our faculty and students bring a wide-ranging suite of tools to this research. Observation is the basis of all good science, and we are involved in making observations within Tampa Bay and in our nearby coastal ocean, across the Gulf of Mexico, around the world via ships, and from space by satellites. We have a unique strength in developing new tools to observe the ocean thanks to our CMS Ocean Technology (COT) group. Once we have the observations we apply state of the art quantitative analyses. Ultimately, what we learn from these analyses of the data that we collect is used to build and constrain predictive models of our oceans. The data and analyses allow us to assess the current health of the ocean, human system. The models enable predictions of the future health of the system.

But enough with the generalities - let us illustrate with some examples of our research.

RESEARCH

RESEARCH ACTIVITIES IN THE DEAN'S OFFICE

As a member of the Executive Board of the Consortium for Ocean Leadership our Dean is in DC regularly advocating for ocean research in general and for our college and university as well. This includes meetings with members of Congress to discuss these issues.

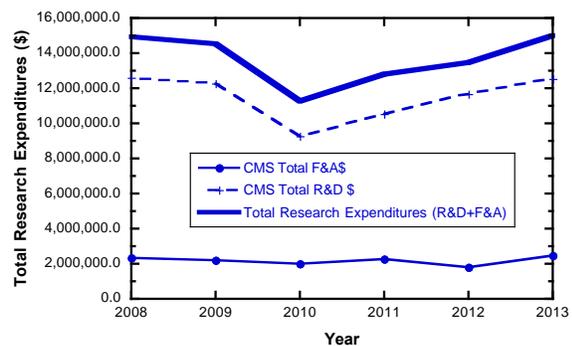
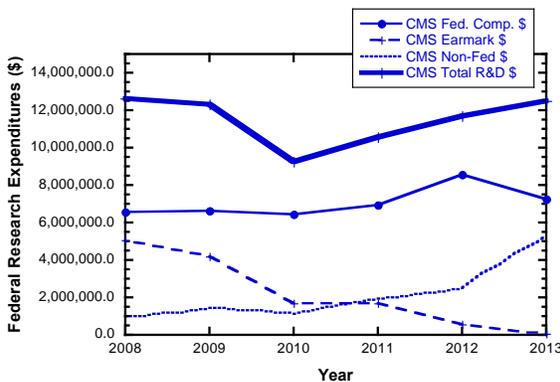
Within the university we have developed relationships with the Deans and Associate Deans for Research in the College of Engineering and the College of Arts and Sciences, and with the Dean of the Patel College of Global Sustainability in search of opportunities for our college. We are confident that these conversations will lead to new proposal partners and new funding sources.

Already the relationship with Arts and Sciences has led to our inclusion in their Natural Hazards Network, and the opportunity to pitch CMS capabilities to General Jacoby, the commander of NorthCom, which is charged with all military responses to disasters such as Hurricane Sandy. Also, we were included in conversations about possible proposals to the private Keck Foundation. The initial round of talks did not result in an invitation for a proposal, but we will try again in the coming year.

In a similar vein, as part of our partnership with the Patel College, our Associate Dean Gary Mitchum represents USF as one of two members of the Florida Climate Institute's executive board. This group is a consortium of six Florida universities who are seeking support from a variety of sources for climate-related research. At present they are preparing a state legislative budget request that, if successful, will benefit our college.

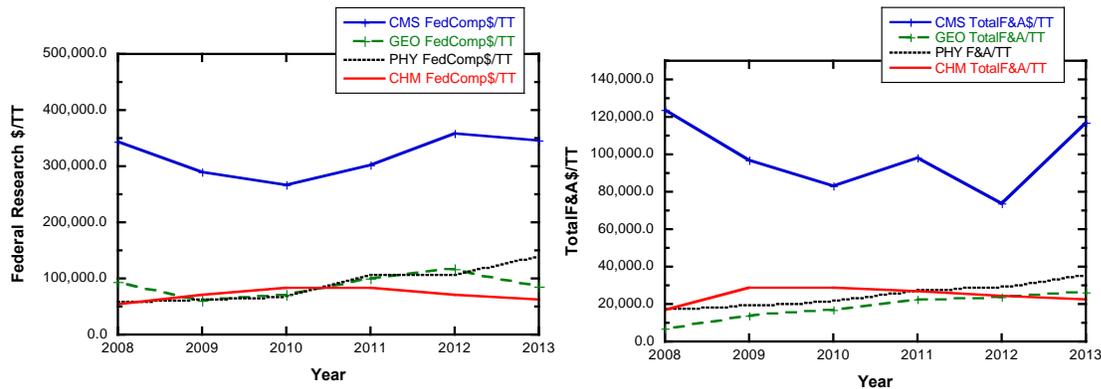
RESEARCH PRODUCTIVITY METRICS

The research profile of the college has grown in spite of increased competition for external grants. In 2013, our total research expenditures were roughly ~\$15 M, with ~\$12.5 M in direct research expenditures and ~\$2 M in indirect. The addition of Anita Thompson as a unit research administrator has helped keep the research enterprise running smoothly.



RESEARCH

As expected for a research-intensive unit, our faculty have some of the highest per faculty research performance metrics in the university.



FACULTY RESEARCH HIGHLIGHTS

The heart of our college's research program is, of course, what our individual faculty members accomplish. Here are some highlights of what these very talented people did in 2013.

Cameron Ainsworth

Cam was selected as a Sloan Fellow, which is one of the most competitive awards in the country for researchers. He also broadcasted an ecosystem modeling course to 18 federal employees from 10 NOAA labs across the United States (Beaufort, Sandy Hook, Miami, Stamford, Pascagoula, Galveston, Panama City, Woods Hole, La Jolla, and St. Petersburg) as well as a for-credit UM student in Miami. He served as a Panelist at the 10th Annual Diversity Summit at USF Tampa (Faces of Success panel) and hosted an Atlantis training workshop (7 students from UM and USF).

Mya Breitbart

Mya's marine genomics laboratory, currently consisting of 8 graduate students, 2 postdocs, and 2 undergraduate interns, had an extremely successful year. Her lab continues to lead the way in the field of environmental viral discovery, publishing findings of new viruses in a wide range of organisms, including shrimp, dragonflies, cockroaches, and bats! Especially exciting was the first discovery of viruses in copepods, which are the most abundant animals in the oceans. This study, which has important implications for oceanic food webs and biogeochemistry, was published in Proceedings of the National Academy of Sciences. In 2013, Mya was recognized as one of Popular Science Magazine's "Brilliant Ten" Young Researchers, received Honorable Mention for the USF Outstanding Graduate Mentor Award, and was a highlighted FabFems Role Model. Students from the Breitbart lab performed research and gave presentations all over the world, including Brazil, Bolivia, Scotland, and China. Finally, Mya co-founded the "Tampa Bay's Tiniest Biology" club with Shannon McQuaig from St. Petersburg College to bring together the

microbiology researchers in Tampa Bay. This monthly seminar series has been a huge success, with an average of 75 participants at each meeting!

Bob Byrne

The biggest news here is that Bob was elected in 2013 as an AAAS Fellow, which is a huge honor in our field. He also won the ARCS 2013 STEM Innovation and Research Award. He published a remarkable 14 papers and collected 678 citations for his published work in the past year. To highlight two especially noteworthy efforts, Bob published a manuscript describing the first in situ sensor for dissolved inorganic carbon measurements in seawater, and a manuscript describing a device that will make pH measurements in the coastal zone accessible to high school students and citizen scientists. He also served for 21st consecutive year as an Associate Editor for *GCA*, the world's pre-eminent geochemical journal.

Don Chambers

In 2013 Don finished his duties as a Lead Author for the IPCC Climate Change Assessment Report. Don was one of 60 authors (out of 259) asked to attend to be available to answer questions by Policymakers at the final meeting in Stockholm, Sweden. Don was also asked to be part of a joint NASA/ESA Working Group to write a report on future gravity missions. This report will guide the science requirements of NASA/ESA for gravity missions flown after 2022. He was one of only four U.S. scientists asked to participate in the preparation of this report. Finally, Don was asked to give the Bowie Lecture in the Geodesy Section at the 2013 Fall Meeting of the American Geophysical Union (AGU). This named lecture is the premier scientific activity of the Geodesy section held during the AGU Fall Meeting.

Kendra Daly

Kendra published eight papers and completed 20 cruises (2010-2013) in the Gulf of Mexico as part of the Deepwater Horizon Oil Spill response. As part of a NSF grant Kendra completed three months of logistically complex field work on the Antarctic fast ice offshore of McMurdo base in the Ross Sea. She chaired the U.S. Ocean Carbon and Biogeochemistry (OCB) Steering Committee, which was established in 2006 as one of the major activities of the U.S. Carbon Cycle Science Program. The OCB-SSC was created jointly by NSF, NASA and NOAA to provide critical leadership to the OCB community by helping to identify research priorities and promote, plan, and coordinate collaborative, multidisciplinary research opportunities in ocean biogeochemistry. Kendra helped to organize three community workshops: the OCB Summer Workshop, Gulf of Mexico Coastal Carbon Synthesis Workshop, and the Ocean Acidification PI meeting. She is a member of the Gulf of Mexico Research Initiative funded inter-consortia working group, Marine Oil Snow Sedimentation and Flocculant Accumulation (MOSSFA) and helped organize a community workshop. This is significant because an estimated 3 to 25% of the 200 million gallons of oil released during the 2010 oil spill accumulated on the Gulf of Mexico seafloor due to MOSSFA related processes, which was not accounted for in the Oil Budget Calculator.

Boris Galperin

Boris and his students had an excellent year. Esa-Matti Tastula published a paper in the Journal of Geophysical Research: Atmospheres, wrote another paper to be submitted to Atmospheric Science Letters,

is finishing another and was awarded the prestigious Knight Fellowship. Jesse Hoemann has been working on a manuscript that analyzes data obtained at the University of Rome that proposes a new way of looking at the conglomerate of anisotropic quasi-geostrophic turbulence and Rossby waves. This work may have a profound effect on the entire field of Geophysical Fluid Dynamics. Boris published a paper in a prestigious Philosophical Transactions A of the Royal Society of London and co-authored another with scientists from Israel and Oxford University in *Icarus*, a central journal for planetary physics. In the latter paper, Boris and his colleagues document the presence of the regime of zonostrophic turbulence in the atmosphere of Jupiter, which could be a major break-through in both planetological science and fluid dynamics. Finally, Boris made 6 presentations at various national and international forums, 3 of which were invited.

Pam Hallock Muller

Pam modestly says of her research that she has mostly lived vicariously through the data her students have generated that she gets to help them interpret and prepare for publication. Two papers were published by her current or former graduate students and a third by a colleague's postdoctoral associate. In the latter case, Pam was a collaborator on the supporting grant, provided experimental specimens and advised on culture methods, data analyses and interpretation. In another collaboration, a Brazilian reef researcher asked her to assist with a manuscript and she discovered by reanalyzing his multi-year data set that the La Nina signal was as significant as the El Nino signal, which he had not discovered. One book chapter first authored by a former student is in press and her own book chapter is close to publication. In the past year Pam was asked to continue for another three-year term on the International Scientific Advisory Board for the ZMT in Bremen, Germany, and also served on the Scientific Organizing Committee for FORAMS 2014, which was held in Concepcion, Chile in January 2014.

Al Hine

After publishing a book last year (Hine, A.C., *Geologic History of Florida—Events that Shaped the Sunshine State*: Gainesville, FL, University Press of Florida, 229 pgs.), Al started on his next one. His new book proposal has been accepted by University Press of Florida and a reviewable draft is due to the University of Florida Press on 1 August 2014.

David Hollander

In 2013 David's group focused on 4 major scientific areas: 1) paleoclimate and paleohydrologic research based on the analyses of waters and sediments from the Cariaco Basin, Venezuela, the Amazon river delta offshore Brazil, the Pigmy and the Orca Basin, NGoM, 2) biogeochemistry of actively-accreting microbialites from Cuatro Ciénegas and Laguna Bacalar, Mexico, 3) chemical ecology/ecosystem-based research on the structure, function and food-web dynamics of Florida estuaries and the west Florida Shelf, and 4) molecular organic geochemical research assessing the deposition, degradation, fate and impacts of hydrocarbons associated with the Deepwater Horizon (DWH) oil-well blowout event. David is currently the PI or co-PI on 6 grants related to the Deep Water Horizon disaster that, cumulatively, have generated more than \$13 million dollars of funding to the CMS. In addition, he is also PI or co-PI on 4 federal proposals focusing on paleoenvironmental/paleoclimate and chemical ecology research that account for an additional \$650K in funding. In 2013 David has been involved with 16 manuscripts (3 published, 11 in press, 2 in review) and

has made 19 presentations at national/international meetings in 2013. He has also given 2 keynote lectures and was an invited seminar speaker at 5 different academic institutions.

Chuanmin Hu

Chuanmin received a Gulf Guardian Award from the U.S. EPA in 2013 and was involved with a remarkable 20 papers submitted to refereed journals. Three of these papers are particularly noteworthy. In the first Chuanmin and his co-workers showed for the first time that NASA's SeaWiFS and MODIS missions had met their design goals. In the second paper, they showed a close relationship between weather fluctuations and Tampa Bay's phytoplankton biomass. In the third, Chuanmin and his colleagues demonstrated a human impact (i.e., the construction of the Three Gorges Dam in China) on downstream water quality. Also, Chuanmin served as an associate editor at Applied Optics, which is one of the premier journals of the Optical Society of America.

Mark Luther

In the past year Mark has been working to start a new area of emphasis of the College of Marine Science. Specifically, his current research interest is aimed at what we might call Sustainable Ports. He has established a Center for Maritime and Port Studies through partnerships with the Tampa Port Authority, the National Association of Waterfront Employers, the NOAA Coastal Service Center, and others. Mark is also the USF and CMS lead on a Port Sustainability initiative being undertaken as part of the Florida Climate Institute.

Gary Mitchum

Gary co-authored a paper with a student in 2013 that may turn out to be extremely important for understanding climate change. A major question in this field has always been how human activities might be changing storm patterns. In this paper, which was written in late-2012 and appeared in December 2013, Gary and his student showed that the severe storm pattern we saw this past winter, which has been all over the news and attributed to the "Polar Vortex", has become about much more frequent during the 20th century. And note that this paper was written before this, supposedly unusual, past winter happened.

Frank Muller-Karger

In 2013 the CARIACO Ocean Time Series project that Frank created and continues to lead celebrated its 18th year of monthly cruises and continued funding from the NSF and the Venezuelan government. Frank and his colleagues have recently received notice of an additional 3 years of support from the National Science Foundation. Frank also received a grant from the Belmont Forum to initiate an international program with Brazil and the UK focused on understanding people values in coastal communities that may help adapt to climate change scenarios. This is an excellent example of the type of international projects that our college is hoping to become involved with in the future.

Steve Murawski

Steve, working with the COT and his students, developed and tested an innovative towed camera system (C-BASS – Camera-Based Assessment Survey System) capable of assessing the abundance and habitat

requirements for reef fish populations on the West Florida Shelf, and elsewhere. Also, working with partners in the C-IMAGE consortium and students, Steve documented the declining prevalence of skin lesions and other diseases affecting fishes in the northern Gulf of Mexico, proximate to the Deepwater Horizon spill. His team also documented declining oil contamination in red snapper, consistent with an episodic pollution event, and the similarity of oil composition in Gulf fishes to the oil from the DWH well. Continuing in this theme, Steve and his colleagues at the Mote Marine Laboratory, along with USF students, documented the increase in pyrogenic hydrocarbons in red snapper after the Hercules Gas well blowout and fire off the Louisiana Coast. Finally, working with David Hollander and Sheryl Gilbert, Steve managed the C-IMAGE (Center for Integrated Modeling and Analysis of Gulf Ecosystems) project, an \$11 million, 3-year grant to USF and 12 other institutional partners aimed at a better understanding of marine oil spill pollution impacts.

David Naar

David co-published one paper, "Modeling the spatial distribution of commercially important reef fishes on the West Florida Shelf," in Volume 143 in the *Journal of Fisheries Research*. The first author of this paper was a PhD student from RSMAS at the University of Miami and the manuscript formed a chapter of his dissertation. Another paper is in press for 2014. This was first-authored with a previous non-degree seeking CMS student, Mark Mueller, who now works at the Gulf of Mexico Fishery Management Council. Two other manuscripts were submitted in 2013. These were first-authored by two PhD graduates of CMS, David Mallinson and Carrie Bell. All four manuscripts were related to benthic habitat and seafloor mapping projects completed over the past decade by David's Seafloor Mapping Laboratory. In addition, David was invited to make a presentation regarding, "A full summary of the past decade of seafloor mapping surrounding Florida" at the Workshop on the Interrelationships Between Coral Reefs and Fisheries, hosted by the Gulf of Mexico Fishery Management Council in May of 2013.

John Paul

In 2013, JP hosted, organized, and executed an international conference, Aquatic Virus Workshop 7. He also published a DWH oil spill paper in *Environmental Science and Technology* that was truly controversial, which is a good thing in science. JP also reports work on determining patterns of transcription of phytoplankton in the Amazon River Plume and has reached a rather remarkable count of 160 refereed articles.

Ernst Peebles

Ernst and his students and colleagues discovered reproducible isotopic patterns within fish eye lenses that indicate the lenses provide lifetime histories for ^{13}C and ^{15}N . Lifetime isotopic histories are useful for reconstructing changes in geographic location (movement/site-fidelity/migration) and trophic position of individual fish. The only other vertebrate tissue known to have these properties is the surficial cartilage of elasmobranch (shark and ray) vertebrae, but eye lens isotopes have a more universal application that likely extends to all vertebrates. In another area, after years of extensive testing and development, the students and staff in Ernst's lab have produced a straightforward method for detecting oil exposure histories in fish. A manuscript describing the method is being prepared. Finally, state and federal environmental agencies,

specifically the US EPA, have been criticized for basing aquatic ecosystem health on water quality alone. Ernst and his students are, however, developing a broadly applicable, biology-based, numeric criterion for assessing the trophic state of water bodies.

Amelia Shevenell

In 2013 Amelia received new NSF funding in a very competitive funding environment. She has had a paper accepted in a high impact journal and two additional papers have been submitted for publication. Amelia also assembled a diverse team of researchers from two USF colleges and attained one of two USF-wide instrument acquisition slots for an NSF MRI proposal. Although this was not funded, few people reach this level and it is a noteworthy accomplishment. She delivered two invited international talks, including one at the 11th International Conference on Paleooceanography, Stiges, Spain (September, 2013). Invited speakers for this conference are typically up-and-coming young researchers selected by the organizing committee, so this is a once in a career opportunity. We are also extremely pleased that Amelia has been selected by Ocean Leadership (via peer nomination) as an IODP Distinguished Lecturer for 2014-2015. We will also note that Amelia accomplished all of this while spending 56 days at sea on two NSF-funded US Antarctic Program research cruises to Antarctica!

Sang-ik Shin

Recent analyses of ocean bottom pressure (OBP) derived from the Gravity Recovery and Climate Experiment (GRACE) and ocean general circulation models reveal substantial low frequency variability in the North Pacific. Although the low frequency OBP variability is known to correlate well with strong El Niño/Southern Oscillation (ENSO) events such as one that occurred in 1997/98, the overall correlation is relatively weak. Previous studies attributed such weak correlation to the substantial low-frequency variability of surface winds beyond ENSO timescales. **To further test the relationship between ENSO and OBP variability and understand the underlying mechanisms of such link**, Shin developed an empirical model for low-frequency OBP variability by using the 20-year (1993-2012) NASA JPL ECCO simulation. This “pattern” based separation of ENSO-related and ENSO-unrelated OBP variability indicates that the low frequency OBP variability over the North Pacific can be explained by ENSO (periods less than 8 yrs) and North Pacific Gyre Oscillation (NPGO; periods longer than 8 yrs). The ENSO-related OBP signals in the subtropical North Pacific propagate following the characteristics of both barotropic and 1st baroclinic Rossby waves in the ocean as suggested in the previous studies, but the Rossby wave propagation in the subpolar North Pacific is too fast to be considered as the 1st baroclinic Rossby waves. A further diagnosis resolves this dilemma.

Chris Stallings

The work of Chris' group on Goliath Grouper will provide the most extensive data on the population in Florida waters, which is showing initial signs of recovery. Their non-lethal methods are a great advancement over traditional methods and will be of keen interest to ecologists, fisheries managers and those interested in rehabilitating species. His group's study on Lionfish is the most spatially and temporally extensive to date and will provide managers with a prescriptive starting point to inform their Lionfish mitigation plans. Chris has teamed with researchers at FWRI to determine whether and how different data

sources used to conduct stock assessments can be reconciled. Chris and his group are also testing a novel, “hybrid” approach, which blends aspects of the traditional methodologies. This study has the potential to be a game changer in how fisheries data are collected in the US and abroad and importantly, it facilitates greater stakeholder involvement in the fisheries management process. Finally, Chris’ group is also using passive acoustic monitoring to quantify the ecosystem services provided by artificial versus natural reefs in the eastern GOM and linking these data to the structure and diversity of fish communities that use these habitats. We should also note that Chris has had two students in two years awarded a highly competitive NSF Graduate Research Fellowship.

John Walsh

In 2013 John presented a global analysis of 110 oil spills in relation to poisoned copepod grazers and subsequent asthma and pneumonia morbidities and mortalities as part of the validation of a numerical model of toxins released by harmful algal blooms (HABs) that were no longer significantly grazed by the herbivores over the last 45 years on the West Florida shelf [1965-2010]. As shown by a set of follow-on 350 repeated worldwide physician-supervised surveys of asthma prevalence among sea-side school children after such oil spills, the aerosolized brevetoxins led to asthma episodes in 130 coastal cities within 350 km of the sea shore, depending upon the speed of prevailing winds of daily sea breezes and seasonal monsoons. A manuscript has been submitted describing these findings. A related study suggests that as much as 28% of the annual global asthma attacks of 235 million people during 2004 might have been the result of wind-borne, sea-spray HAB poison asthma triggers, as a consequence of zooplankton killed by regional combinations of overfishing, oil spills, pesticide applications, radionuclide dispersions, and heavy metal releases.

Robert Weisberg

Bob and his group are experts in observing and modeling the coastal ocean of west Florida. Three related applications establish the importance of the coastal ocean circulation for anything of an ecological nature on the continental shelf. The first application explains why there was no red tide on the 2012 WFS in 2012. Anomalously prolonged and intensified upwelling resulted in elevated inorganic nutrients that favored diatoms over dinoflagellates. The paper concluded that both the physics of the ocean circulation and the biology of the organism are each necessary conditions, but neither alone are sufficient conditions for a red tide bloom. The second application was to fish lesions found on the WFS subsequent to the DWH oil spill. Bob and his co-authors suggest that hydrocarbons of DWH origin transited to the WFS sight unseen beneath the surface. The mechanism was a prolonged and intensified upwelling. By deploying a passive tracer in our West Florida Coastal Ocean Model (WFCOM) where surface oil was observed along Florida's northern coastline, with the assumption that some small portion of this surface oil was incorporated in the water column, we tracked where the hydrocarbons would have gone. The tracer pattern overlaid the fish lesion observations very well. The third application concerns the conundrum of Gag Grouper larvae transport from offshore spawning to near shore settlement sites. The take away message from these three applications is that by studying coastal ocean ecology in a truly multidisciplinary way we begin to unravel many mysteries regarding our living marine resources.

CMS Ocean Technology (COT) Group

Budget challenges at the federal, state and university levels inevitably resulted in challenges to our COT group along with everyone else. In order to maintain the full capabilities of this talented group of people we have adopted a two-fold strategy. First, we will decrease costs by supporting more salary via external grants and contracts, and second, we will increase income by increasing the number of external funded projects. This required a major sea change in the way that the COT operates and substantial progress has been made in this transition. The COT engineers and staff are commending for the way that they have tackled these challenges head-on.

One major change in 2013 was streamlining the management structure by eliminating the COT Director position, which allows Jim Patten to return full-time to Software Engineering. The supervision is now by the Associate Dean with support from Monica Dufault. We have also successfully implemented a project approval and tracking system. In this system, each project has a COT lead engineer, who is responsible for keeping projects on time and on budget, as well as a project management plan maintained by Monica. The status of each project, including costs and timelines, are reviewed on a monthly basis by a group consisting of the Associate Dean, Monica Dufault, all COT personnel and any faculty members who wish to attend.

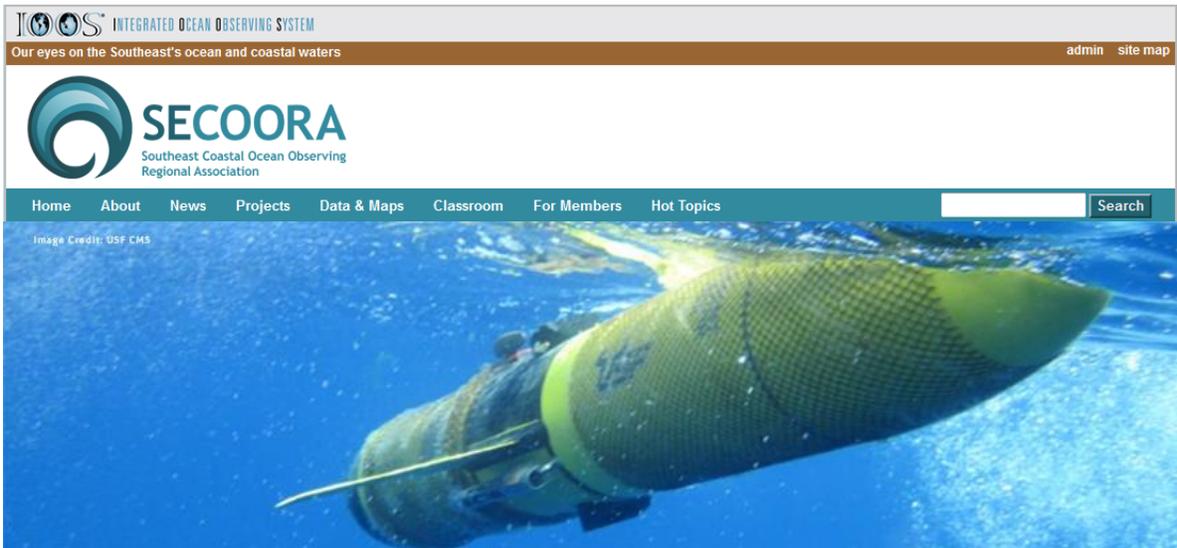
We have not yet generated substantial salary charges to grants, but a number of proposals have now gone out that include such salary charges in the budgets. We will have to see how many of these proposals are successful, but with a reasonable success rate we will be able to put COT on a stable footing. To be more specific, the following numbers describe our progress during 2013. At beginning of 2013 there were six active projects, two of which were in support of externally funded grants and contracts. Two of these projects were completed in 2013, and four are ongoing. During 2013 ten new projects were initiated. Five were completed in 2014, and five are ongoing. Of the completed projects, eight were in support of externally funded grants and contracts. Finally, three proposals were submitted in 2013 that have not yet resulted in new projects. Two of these are still pending at the funding agency and one was declined. All three of these proposals were in support of externally funded projects.

Several projects are in the planning stage for submittal in 2014. First, several faculty members met with the Associate Dean to brainstorm a climate-oriented proposal aimed at developing new observational tools for use in the extreme conditions encountered in high-latitude regions. This proposal will be submitted to the Vetlesen Foundation, and we will be asking for \$1.5M over 5 years. Second, we are actively searching for funding for expanded glider operations, in particular, and for the eastern Gulf of Mexico observing system, in general. Both of these activities could provide substantial support for the COT. Third, as an example of looking for new partners, we are talking with colleagues in the College of Arts and Sciences about developing the capability to measure underwater crustal deformation associated with volcanism. This is a new area for us, but certainly utilizes strengths that we have in the COT. Finally, we are in an ongoing discussion with the FWC laboratory next door to fund operations of our video tow sled and bottom mapping capabilities.

CMS OCEAN TECHNOLOGY (COT) GROUP

We will conclude this section with two brief examples of what our COT group does. The material just below is adapted from the news item published by Southeast Coastal Ocean Observing Regional Association (SECOORA). The material following that article is a brief description of the latest technological innovation, C-BASS, enabled by the interaction between our faculty members and the COT engineers.

OCEAN OBSERVING USING GLIDERS

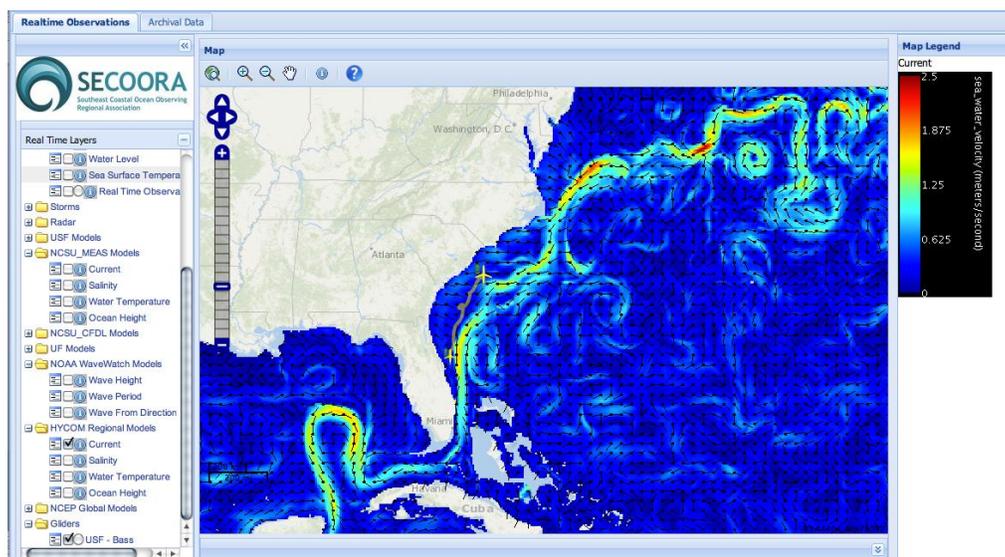


Ocean Glider Released and Recovered off Southeast Coast

CMS OCEAN TECHNOLOGY (COT) GROUP

A glider was deployed early in March off the Atlantic coast of Florida with the mission to detect hotspots of reef fish activity in and around marine protected areas using funding provided by NOAA's Southeast Fisheries Science Center (SEFSC). Just recently, the glider was retrieved off the North Carolina coast.

For this deployment the University of South Florida's Teledyne Webb Research Slocum Glider is equipped with two passive acoustic recording systems developed by Loggerhead Instruments and a Vemco VMT tag receiver provided by the Ocean Tracking Network at Dalhousie University. The resulting data sets will be used to augment NOAA Fisheries SEFSC and NOAA Ocean Service (NCCOS) collaborative research on reef fish spawning aggregations and will contribute to their coral reef fish monitoring programs. The glider traveled north along the continental shelf edge using the Gulf Stream to transport it until it reached South Carolina, where the glider attempted to transit onshore to about the 50m isobath. For the remainder of its mission it traversed along shore in the Edisto and North Charleston Marine Protected Areas.



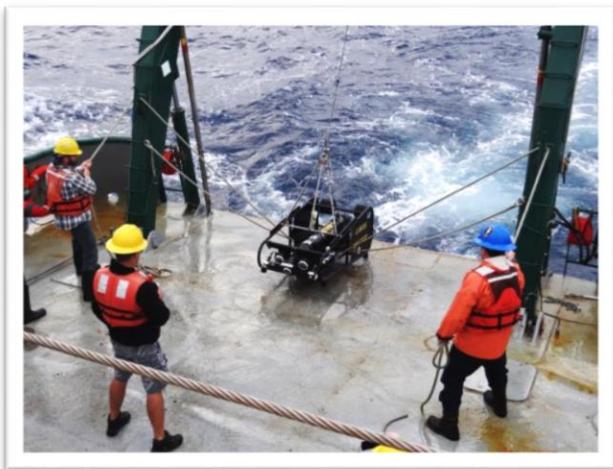
THE CAMERA-BASED ASSESSMENT SURVEY SYSTEM (C-BASS)

With support from the National Oceanic and Atmospheric Administration, National Marine Fisheries Service, scientists and technicians from the College of Marine Science and its Center for Ocean Technology, led by Steve Murawski and Chad Lembke, have developed a unique towed camera array system (C-BASS) to allow high resolution sampling of reef fishes and simultaneous habitat evaluations. The primary motivation for the development of C-BASS is to develop absolute abundance estimates of reef fishes such as red snapper for use in setting fishery total allowable catch quotas.

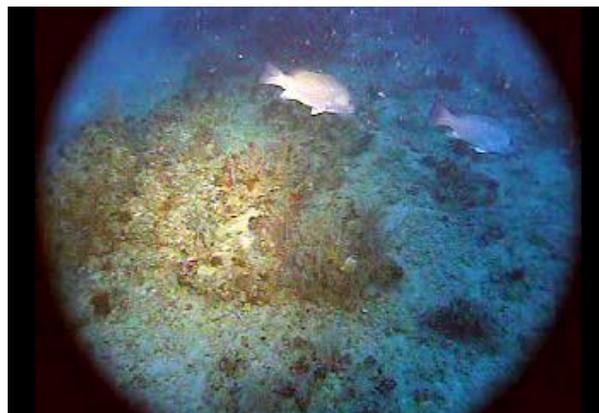
CMS OCEAN TECHNOLOGY (COT) GROUP

Our system is equipped to process and record video from both analog and digital video cameras and currently 6 cameras are filming simultaneously. Environmental and system data sampled from an altimeter, compass, CTD, and fluorometer are also recorded. There is a laser system used to calibrate size measurements of the scenes being filmed and a Didson forward-looking sonar to detect fish movements in response to the C-BASS. The system was designed to operate in up to 250 meters of water (about 800 feet) but with modifications can be used much deeper. Two custom manufactured Bridgelux 85 watt array LED lights provide illumination for the video cameras during low light deployments. Scientific sensors, including a WETLabs FLNTU fluorometer and a Falmouth Scientific 2" Micro-CTD are installed on the frame in order to better understand the environmental aspects of the assessment. An altimeter is also mounted to the frame to ensure proper platform height above the seabed.

Initial trials and experiments with C-BASS have indicated that this system is highly capable of imaging reef fishes and assessing the habitat requirements of fishes encountered. This system has the potential to revolutionize the assessment and management of fisheries for reef fishes in Florida and throughout tropical areas of the world.



Deploying the C-BASS system from the R/V Weatherbird II.



Gray snapper imaged by the C-BASS system

C-IMAGE: OUR FEATURED RESEARCH PROJECT

C-IMAGE: Our Featured Research Project

C-IMAGE: THE CENTER FOR THE INTEGRATED MODELING AND ANALYSIS OF THE GULF ECOSYSTEM, DR. STEVEN MURAWSKI, PI

As you will see in the final section of this report, our college faculty members have a large number of active research grants and contracts. This year we will highlight one of these, C-IMAGE, for several reasons. First, this project is one of the largest both in terms of dollars and in the number of institutions and investigators involved. Second, we are approaching the end of this project and are in the process of submitting a renewal proposal. This project has received excellent reviews and we hope to expand the scope of the project in the future.

In 2011, University of South Florida received an \$11 million dollar grant from the Gulf of Mexico Research Initiative (GoMRI) Research Board to study the Deepwater Horizon incident and associated impacts on the environment and public health. The project is led by the College of Marine Science, but includes universities in four states as well as Canada, the Netherlands, and Germany. Within the college, seven of our faculty are partnered as co-investigators with Steve, the lead investigator. The following paragraphs give a brief technical update on this project. Research is focused on two themes that can be viewed as characterizing the oil that escaped and its evolution over time (Theme 2), and quantifying the environmental impacts of the oil (Theme 3).

GoMRI THEME 2: Chemical evolution and biological degradation of the petroleum/dispersant systems and subsequent interaction with coastal, open-ocean, and deep-water ecosystems.

The initial conditions at the well head related to droplet size distributions are perhaps the most important unknowns when modeling the near field plume dynamics. At the close of 2012, our modeling group published a paper highlighting results from simulating the effects of both the circulation and dispersants on the transport of subsea oil from the Macondo well blowout (Paris et al., 2012). This study focuses on the oil droplet size estimates as the subsea plume varies in time and space and suggests that the use of dispersant had little impact on the amount of oil that made its way to the surface. A comment paper from Adams et al. (2013) suggest the Paris et al. paper assumed initial droplet sizes that were unrealistically small based on observations from the DeepSpill experiment. Aman and Paris (2013) followed up on this comment and cautioned against model scale-up without further data collection.

The high pressure research taking place in Hamburg and Calgary directly addresses this issue of model initialization with particle sizes. Experiments study the formation of the gas/liquid jet at high pressure and low temperature, particle size distributions (PSDs) in the jet, and how the droplets/bubbles break up and coalesce and partition as they rise in the plume. In 2012, experiments found that rising velocity of methane bubbles decrease with increasing pressure and decreases with decreasing temperature. Initial PSDs in the

C-IMAGE: OUR FEATURED RESEARCH PROJECT

single phase methane jet (mean particle size 350 um) and single phase oil jet (mean particle size 147 um) are completed. Single oil jet experiments are completed with diesel oil, light crude, and a low emulsification oil. Other types of oil and multiphase jet experiments are planned for 2014.

To foster communications between our experimental and modeling groups, we initiated a student exchange opportunity between Texas A&M University and Hamburg University of Technology.

High pressure biodegradation experiments were performed with deep sediments taken from the Gulf of Mexico by our Penn State and West Florida partners. We found that the strains of bacteria that are present and actively degrading methane are highly dependent on pressure. In particular, experiments in high pressure reactors and low pressure control reactors showed a negative impact of high pressure on the growth of a naphthalene-degrading bacterium. When these biodegradation rates are incorporated into the far-field model, the model results show better agreement with field data (Lindo et al. 2014).

GoMRI THEME 3: Environmental effects of the petroleum/dispersant system on the sea floor, water column, coastal waters, beach sediments, wetlands, marshes, and organisms; and the science of ecosystem recovery.

Water column data, sediment cores, and biological samples were collected in 2013 on 21 field excursions. Results from the sediment work recognize a spatial and temporal offset between the surface oil coverage during DwH and the foot-print on poly-aromatic hydrocarbon (PAH) concentrations on the seafloor (Romero et al., 2014, submitted). In tracking down the mechanisms that might be responsible for this offset, C-IMAGE co-created the Marine Oil Snow Sedimentation and Flocculant Accumulation (MOSSFA) working group with ECOGIG and Deep-C (<http://www.marine.usf.edu/c-image/index.php/research-areas/mossfa>). This working group is coordinating research addressing the mechanisms for oil-mineral aggregation, river influence, mechanisms that impact accumulation rates on the seafloor, and ecosystem consequences.

Geochronologies in sediment cores recovered in 2010-2013 reveal that the sediment mass accumulation rates peaked right after the DwH blowout event but may be returning to pre-event conditions (Brooks et al., 2014, submitted; Hastings et al., 2014, submitted). Benthic foraminifera populations were analyzed at 3 locations in depths ranging from ~1000m to 1500m and show a die off in mid-2010 corresponding to an increase in total PAH concentration. Some sites show the benthic foraminifera communities returning after 2011, but other sites are not showing recovery (Schwing et al., 2014; Romero et al., 2014, submitted).

Fish surveys were conducted collocated with sediment coring activities to look at fish disease occurrence. We are now asking whether burrowing species like tilefish and king snake eel show any impact.

Acoustic and camera-based datasets have also been collected to study deep diving cetacean responses to natural and anthropogenic forces and to determine shifts in community structure in reef fish. Sperm whales populations correlate positively with sea surface temperature, sea surface height anomalies, and wind, and

C-IMAGE: OUR FEATURED RESEARCH PROJECT

negatively with oil. (Merkens, 2013, PhD Dissertation). In our water samples, we found mutagenic water in the northern transect of our West Florida Shelf cruises as well as a few in the Southern Transect in June of 2011 (pre-C-IMAGE). At this time we also detected high levels of mutagenicity in the sediments on the slope of the Florida shelf. Finally a consistent level of mutagenicity was found in the waters of the Southern Transect across the WFS in November 2011. These results indicate that toxic water containing DNA damaging agents like PAHs may have been pushed across the WFS, which was predicted from current model observations and simulations (Paul et al., 2013).

Armed with results from sea surface drifters deployed by our colleagues aboard the R/V *Acadiana* cruise a month earlier, C-IMAGE researchers on the *Weatherbird IV* (August 2013) chose to sample primarily to the south and east of the failed rig. Starting at a location as close as safety would allow, sampling was conducted in three phases at 0, 5 and 10 nautical miles from ground zero. The first equipment deployed was the CTD, providing surface-to-bottom temperature and salinity profiles and water samples at various depths from the surface to the bottom (44 meters below) to characterize the microbial community diversity next to the well and to search for enhanced levels of methane-consuming bacteria. Additional water samples were collected in serum vials by Samantha Bosman of Jeff Chanton's Florida State University laboratory to test for elevated methane levels in seawater.

Following the deployment of the CTD, scientists and technicians from Steve Murawski's laboratory set 5 miles of longline fishing gear to sample the fishes in a continuous line to the southeast of the well. A total of 508 baited hooks (100 per nautical mile) was set along the track. A total of 64 fishes, including red snapper, king snake eel and a variety of sharks were caught. Sub-sampling of the 26 red snapper included collection of fish bile, which yields sensitive biomarker of recent hydrocarbon (PAH) contamination.

The final equipment deployed at 0, 5 and 10 miles from the well was the multicorer sediment sampling system from David Hollander's laboratory at the University of South Florida. The multicorer collects 8 simultaneous 4" diameter sediment tubes that provide a chronological record of sediment type, grain size and contaminant loads. By analyzing for the decay of radionuclides of thorium and lead, the sediments in various levels of the core can be accurately dated. These cores will be analyzed for traces of hydrocarbons at the top of the core indicating recent contamination.

There have so far been 24 publications as part of the C-IMAGE project. There are listed at the end of the publication list towards the end of this report. These are in a separate section, but note that 2013 publications with CMS authors or co-authors are included in both lists.

GRADUATE EDUCATION AND AWARDS

Graduate Education and Awards

STUDENTS GRADUATING IN 2013

Masters (6)

Jessica Makowski advised by Don Chambers, Fall, "Understanding Transport Variability Of the Antarctic Circumpolar Current Using Ocean Bottom Pressure"

Brendan O'Connor advised by Frank Muller Karger, Summer, "Impacts of Mississippi River Diversions on Phytoplankton Blooming in the Northeastern Gulf of Mexico in August 2010"

Heidi Toomey advised by Pam Hallock Muller, Fall, "Chlorophyll Fluorescence as an Indicator of Thermal Stress in *Archaias angulatus* (Class Foraminifera)"

Sky Williams advised by Kendra Daly and Ernst Peebles (Co-Chairs), Fall, "Use of Stable Isotope and Trace Metal Signatures to Track the Emigration of Female Blue Crabs, *Callinectes sapidus*, from Tampa Bay"

Catherine Hayslip advised by Ernst Peebles, Fall, "Investigation of condition effects on batch fecundity of the Common Snook, *Centropomus undecimalis*, in Tampa Bay, Florida"

Beverly Sauls advised by Ernst Peebles, Fall, "Relative Survival of Gags *Mycteroperca microlepis* Released Within a Recreational Hook-and-Line Fishery: Application of the Cox Regression Model to Control for Heterogeneity in a Large-Scale Mark-Recapture Study"

Ph.D. (14)

Ana Arellano advised by Paula Coble, Fall, "Investigation of Colored Dissolved Organic Matter (CDOM) Optical Properties, Nutrients, and Salinity: Springshed to Estuaries"

Brian Barnes advised by Chuanmin Hu, Fall, "The combined effects of light and temperature on coral bleaching: A case study of the Florida Reef Tract using satellite data"

Regina Easley advised by Bob Byrne, Summer, "The Spectrophotometric Analysis of Lead Carbonate Complexation and Carbonate Saturation States in Seawater"

Daniel Greenhow advised by David Mann, Spring, "Hearing and Echolocation in Stranded and Captive Odontocete Cetaceans"

Lara Henry advised by Joseph Torres and Pamela Hallock Muller, Fall, "Metabolism in corals from Antarctica, the deep sea, and the shallow subtropics: contrasts in temperature, depth, and light"

Eloy Martinez advised by Joseph Torres, Spring, "Biochemical aspects on the thermal sensitivity and energy balance of polar, tropical and subtropical teleosts"

GRADUATE EDUCATION AND AWARDS

Luis Miranda advised by Bob Byrne, Spring, “Development of novel nano-composite membranes as introduction systems for mass spectrometers: Contrasting nano-composite membranes and conventional inlet systems”

Christin Murphy advised by David Mann, Spring, “Structure and Function of Pinniped Vibrissae”

Erica Ombres advised by Jose Torres, Spring, “Gradients in season, latitude and sea-ice: Their effect on metabolism and stable isotopic composition of Antarctic micronekton”

Kara Radabaugh advised by Ernst Peebles, Summer, “Light-environment control and basal resource use of planktonic and benthic primary production”

Candice Simmons advised by Ted Van Vleet and Pamela Hallock Muller, Fall, “Polybrominated Diphenyl Ethers in Sediments within the Hillsborough Bay Watershed”

Inia Soto Ramos advised by Frank Muller-Karger, Summer, “Harmful Algal Blooms of the West Florida Shelf and Campeche Bank: Visualization and Quantification using Remote Sensing Methods”

Paul Suprenand advised by Joseph Torres and Pamela Hallock Muller, Spring, “Investigations for utilizing pteropods as bioindicators of environmental change along the western Antarctic Peninsula”

Monica Wilson advised by Mark Luther, Fall, “Synoptic to interannual variability in volumetric flushing in Tampa Bay, FL using observational data and a numerical model”



From left to right: Mark Luther, Dean Jackie Dixon, Pam Hallock Muller, Candice Simmons (the happy new Ph.D.), Foday Jaward, Ted Van Vleet, and Henry Alegria

GRADUATE EDUCATION AND AWARDS

DIVERSITY

During the 2013 calendar year, half of the Ph. D. degrees were awarded to under-represented minority students (7 out of 14 students). The percentage of URM students in the USF College of Marine Science program over the past 13 years has grown to ~15%, which is nearly double the ~8% national average in Oceanography (based on graduate school surveys by the Consortium of Ocean Leadership). This is due to the initial funding support by grant awards to USF at the College of Engineering and Marine Science from the National Science Foundation, and private donors including the Alfred P. Sloan Foundation. Faculty and administration leaders at USF including Ashanti Johnson, Peter Betzer, Jacqueline Dixon, Frank Muller-Karger, and Bernard Batson from the College of Engineering led these efforts.

The Marine Science faculty members are fully engaged as mentors and recruiters. We have seen an increasing trend toward better-qualified URM students applying. Over the past year 50% of the spring candidates were URM students (2 out of 4). For the recent annual recruitment weekend, 5 out of 16 student invitees were URM. This is in part due to our links to the NSF LSAMP and similar programs.



Dillard and Xavier University students on the bow of the R/V Weatherbird II with Rob Walker of FIO, on a field trip studying barrier islands and beach erosion, learning about coral reef indicators in Pam Hallock-Muller's lab, and having dinner with students and faculty of our College.

GRADUATE EDUCATION AND AWARDS

In April 2013, through a funding partnership with Woods Hole Oceanographic Institution, we hosted six underrepresented minority undergraduates, Alexa, Joya, Joy, Larry, James, and Lyndon, from Dillard and Xavier Universities from the New Orleans area. For some of these students, their visit to our College was the first time they had travel far from home and the first time on an airplane. Many partners from the United States Geological Survey, Florida Institute of Oceanography, and NOAA, met with the students to discuss graduate school opportunities and careers in Oceanography. This program was so successful that we will be repeating it during the Fall Semester of 2014.

UNDERGRADUATE INTERACTIONS

Our College reached out to many undergraduates (~ 150 students in total) on the Tampa Campus and at USFSP, in the form of teaching, lab interns, watch standers on scientific cruises, and general tours to various groups including Honor Students interested in Marine Biology from the Provost Scholars.



Top: Provost's scholars with Dean Jackie Dixon and graduate students of the College. Bottom: photos taken by the Marine Biology students in the Advanced Undergraduate Oceanography on a field trip to Weedon Island, Pinellas County, during the Spring Semester of 2013.

GRADUATE EDUCATION AND AWARDS

STUDENT SUCCESS

Graduates finding employment in their field of study is a good measure of their success. The college has routinely had over 80% of their Master's students and over 90% of their PhD students finding work in academia, government, and industry. Details of the recent graduates in 2013 are still being tabulated, but the trend so far is consistent with previous years. In addition, some of our current students are actively serving as Teaching Assistants at USFSP and as instructors at nearby educational institutions. Not only does this provide good training and experience for the students but documents another way that USF gives back to the local community in terms of education.

STUDENT AND POST-DOC AWARDS TOTALED OVER \$ 138,000 OF EXTERNAL FUNDING!

Student Awards



Adrienne George – NSF East Asia and Pacific Summer Institutes Fellowship



Benjamin Ross – GSA's Geology and Society Division's Best Student Oral Presentation Award



Brittany Hall – Fish Florida Scholarship for Graduate Studies



Carlie Williams – Geological Society of America Graduate Student Research Award



Dinorah Chacin – NSF Graduate Research Fellowship Program Fellowship

GRADUATE EDUCATION AND AWARDS



Dominika Wojcieszek – Geological Society of America Graduate Student Research Award



Elizabeth Brown – NSF USSP Scholarship from the NSF Geoscience Divisions and the Office of International Science and Engineering
- Jones-O'Neill Student Research Award from the North American Micropaleontology Section of the Society of Sedimentary Geology
- 2-month Research Fellowship from GLOMAR-Bremen International Graduate School for Marine Sciences
- TAKKEN Travel Award



Erica Ombres – National Sea Grant College Program Dean John A. Knauss Marine Policy Fellowship



Ileana Freytes Ortiz – NSF Graduate Research Fellowship Program Fellowship



Karyna Rosario – 2013 Career Development Grant for Postdoctoral Women from the American Society for Microbiology



Kristina Deak – Fish Florida Scholarship for Graduate Studies

GRADUATE EDUCATION AND AWARDS



Lara Henry – National Academies Christine Mirzayan Science & Technology Policy Graduate Fellow



Michelle Guitard – NSF Graduate Research Fellowship Program Fellowship – Honorable Mention Designation



Natasha Mendez-Ferrer – Mayor’s Hispanic Advisory Council Fellowship from the University of South Florida



Regina Easley – National Research Council Postdoc Fellowship



Tasha Snow – NSF Graduate Research Fellowship Program Fellowship
- Geological Society of America Graduate Student Research Award

Education & Outreach

Teresa Greely leads the college's education and outreach (E&O) activities. The E&O year in review reflects a diversity of programs and events that have advanced ocean literacy and research amongst K-12 teachers (140 directly) and their students (17,000), undergraduate (56) and graduate students (30), and the general public. The following highlights 2013 E&O activities.

1. Through NOAA funding E&O launched a new program to bring Florida teachers together to explore and experience Tampa Bay's coastal environments like a scientist. This resulted in a Marine Science Field Sampling course for 10 Florida teachers through a series of 6 research based field explorations and training to conduct environmental monitoring protocols. This video captures the experience <http://www.youtube.com/watch?v=INO8LWmEWE>.
2. The 9th annual Spoonbill Bowl hosted 144 participants (70 advanced high school students and 24 teachers) from the Panhandle to the Everglades. Recruited and trained 50 volunteers from FWCC, Eckerd College, USGS, Clearwater Aquarium, FMSEA, FL Sea Grant, Florida Aquarium, Ocean Optics, Pier Aquarium, USFSP, and USF Tampa (Marine Science).
3. Through C-IMAGE funding, E&O hosted 4 Teachers at Sea during research expeditions in the Gulf in February, May and August. While aboard, hosted 30 Ship to Shore Skype events and posted 52 blogs entries to engage students on shore with the research happening at sea; blog metrics tracked over 1000 new visitors during the expeditions.
4. In partnership with NOAA Ocean Exploration, 50 Florida teachers participated in the How and Why We Explore the Oceans professional development series as part of the *Okeanos Explorer*, the first US ship dedicated to ocean explorations.
5. Summer 2013 continued the 23rd annual Oceanography Camp for Girls, a Pre-college STEM program that encourages teenagers to consider careers in the sciences while developing a positive sense of self, science and the environment. Participants included 30 young ladies, representing 21 Pinellas county schools, 24 college students, other professional staff, and 20 participating scientists from FWCC, USGS, USFSP.
6. GLOBE teacher professional development series provided 50 Florida teachers with training for K-12 students to be citizen scientists by monitoring their local environments and collecting data for scientists. Teachers learned how to monitor Hydrology, Atmosphere and Soils.
7. Offered 4 courses outside of the College to include marine sciences content and research as part of the Honors College and USFSP College of Education.
8. Through C-IMAGE funding and Open Mind Media, 4 podcasts were completed as outreach to public radio listeners. The first 3 episodes were an episode of Florida Matters titled The GoM Three Years after the BP Oil Spill that aired on WUSF 6 times between 2 stations and remains on WUSF web site, reaching 299,400 listeners each week. Portions of the first 3 episodes were edited and incorporated into the NPR program, *Living on Earth*, reaching 80% US population.
9. 3rd annual St. Petersburg Science Festival, a College-wide outreach, brought ~ 20K visitors to campus to experience the research and E&O programs taking place in the Marine Sciences.
10. Two OCG alumnae selected as 2013 Ambassadors in Takamatsu Japan representing the City of St. Petersburg.

EDUCATION & OUTREACH

11. USF STEM Precollege programs included two marine science coastal fieldtrips .



GLOBE students learning coastal geology and cruise trawling.

OTHER OUTREACH ACTIVITIES

In addition, many faculty and students engaged with the community in creative ways. For example, Karyna Rosario and Erin Symonds from the Breitbart lab recently conducted a two-day outreach activity in the Laura Mercado Secondary School located in a rural area in San Germán, Puerto Rico to teach seventh graders about the world of viruses. The students learned about viruses and insects and had the opportunity to be virus hunters for a day. The outreach activity was supported by an NSF Assembling the Tree of Life grant and conducted in collaboration with Dr. José L. Agosto Rivera, a professor at the University of Puerto Rico, Río Piedras Campus.



EDUCATION & OUTREACH

Mya Breitbart works with the local Girl Scouts of America to bring marine science education to the community. Below are some recent pictures.



Development

FELLOWSHIPS

On October 11, 2013, CMS recognized fellowship award recipients and their generous supporters at the Second Annual College of Marine Science Fellowship Luncheon held at the Hilton St. Petersburg Bayfront. Through the leadership of Dean Jacqueline Dixon and former Deans Peter Betzer and William Hogarth, our \$16.7M endowment provides ~\$300K/yr for endowed fellowships to CMS graduate students. The luncheon provides an opportunity for fellowship recipients to meet the individuals and families who have helped to make it possible for these students to pursue a degree at the College of Marine Science.

The 2013-2014 Endowed Fellowships were provided to the following students:

Joshua L. Breithaupt - St. Petersburg Downtown Partnership Fellowship in Coastal Science
Elizabeth A. Brown - Carl Riggs Fellowship in Marine Science
Joseph Curtis - Von Rosenstiel Endowed Fellowship
Lindsey Dornberger - The Wells Fargo Fellowship in Marine Science
Devon Firesinger - Von Rosenstiel Endowed Fellowship
Ileana Freytes-Ortiz - Bridge to the Doctorate & Alfred P. Sloan Fellowship
Jennifer Ganneman - Paul Getting Endowed Memorial Fellowship
Alisha Gray - Sanibel-Captiva Shell Club / Mary & Al Bridell Memorial Fellowship
Michelle Guitard - Bridge to the Doctorate & Alfred P. Sloan Fellowship
Lara Henry - Mahaffey Family Graduate Fellowship
Jesse Hoemann - Tampa Bay Parrot Head Fellowship in Marine Science
Timothy Seung-chul Lee - George Lorton Fellowship in Marine Science
Brittany A. Leigh - Southern Kingfish Association's Fellowship
Amanda Paiz - Von Rosenstiel Endowed Fellowship
Mark Patsavas - William and Elsie Knight Endowed Fellowship for Marine Science
Holly Rolls - The Jack and Katharine Ann Lake Fellowship in Marine Science
Benjamin J. Ross - Linton Tibbetts Fellowship
Tasha Snow - The Jack and Katharine Ann Lake Fellowship in Marine Science
Susan Snyder - William Hogarth Marine Mammal Fellowship
Orian Tzadik - The Jack and Katharine Ann Lake Fellowship in Marine Science
Esa-Matti Tastula - William and Elsie Knight Endowed Fellowship for Marine Science
Robert M. Ulrich - C. W. Bill Young Fellowship
Mengqiu Wang - Von Rosenstiel Endowed Fellowship
Katie Wirt - Gulf Oceanographic Charitable Trust Endowed Fellowship in Marine Science
Dominika Wojcieszek - Garrels Memorial Fellowship in Marine Science
Bo Yang - Gulf Oceanographic Charitable Trust Endowed Fellowship in Marine Science

DEVELOPMENT

FUNDRAISING

In addition to fellowship support, alumni, faculty, staff and friends donated \$218,000 in support for current and new endowment funds and \$40,000 for current operations. Three new endowments were established in 2013 to include the **Abby Sallenger Memorial Endowment**, the **Renate E. Bernstein Outstanding Authorship Award** and the **Thomas E. Pyle Memorial Fellowship in Marine Science**.

While the college currently has many of the basic components in place for achieving preeminence among oceanographic institutions, it seeks to create critical masses of intellectual capital in specific areas necessary to ensure advancement into the next level of national and international prominence. Funding from state government appropriations and student tuition are limited. Private financial support has become a major and growing source of revenue to fill critical faculty positions, provide state of the art technology and infrastructure, and enable us to attract and adequately support the best and brightest graduate students and postdoctoral associates. To reach its true potential, to become truly unstoppable, the college must seek private support.

Specifically, we seek support in the following areas:

Graduate Excellence: The College of Marine Science strives to attract and retain the best and brightest graduate students, while also ensuring that its educational programs are available to all qualified students without regard to financial circumstances. The market for highly qualified students is extremely competitive, with many top scholars making decisions based not simply upon the merits of the school, but upon a school's ability to support them. The college seeks to continue to grow our financial assistance opportunities to make CMS competitive among the nation's top universities.

Postdoctoral Fellowship Program: Postdoctoral research fellow programs are a long-standing tradition at the nation's best research universities and oceanographic institutions. Postdoctoral fellows bring cutting edge expertise to the college and serve as role models to graduate students. Implementation of a successful postdoctoral research program is pivotal to the success of the college. We hope to create one new postdoctoral position for 24 months in duration.

Endowed Chairs and Professorships: To further enhance its ability to undertake fundamental research, CMS seeks to attract and retain key faculty operating on the frontiers of their respective fields. The college's plan is to fill new faculty positions with world-class scientists, through the use of endowed chairs and professorships. We are seeking support for one new endowed chair.

NEW HIRE

E. Howard Rutherford was hired in December 2013 as the new CMS Development officer.



Events

SPECIAL EVENTS

Eminent Scholar Lecture Series, Glacial Melting – Past Present and Future: How Much, How Fast and What Impacts? Tribute to Ben Flower, April 4 to 5, 2013

Guest speakers:

James Kennett, University of California, Santa Barbara, “The YDB Cosmic Impact as cause for the Younger Dryas climatic, biotic and cultural anomalies”

Ian Howat, Ohio State University, “Are the ice sheets collapsing (and would we be able to tell if they are?)”

Michael Meredith, British Antarctic Survey, United Kingdom, “Rapid change at the Antarctic Peninsula: causes and consequences”

George Hunt, University of Washington, “The contradictory roles of sea ice in fish production”

Robert Gagosian, President and CEO Consortium for Ocean Leadership, toured the college and FIO in April 2013. He met with USF, FIO, and St. Petersburg Ocean Team leadership, had lunch and conversation with students and Ocean Policy Class, and gave a public seminar on the future of ocean science funding.

Also in April, **Chad Lembke**, was awarded the 2013 David K. **Costello Award for Interdisciplinary Engineering**. This award “recognizes the ability to develop engineering devices having interdisciplinary applications; leadership in writing peer-reviewed publications and/or proposals: and facilitation of the technical education of students enrolled in the College”. Chad was awarded \$1000 and a commemorative plaque, which is funded by the David K. Costello Award for Interdisciplinary Engineering Endowment.

Annual **CMS Graduate Student Symposium** was held on April 19. The high quality of presentation reflects the additional mentoring we are providing students through the Presentation Bootcamps.

The **CMS Fellowship Luncheon** was held on October 11 at the St. Petersburg Downtown Hilton. Twenty-five students received CMS fellowships for a total of \$325,000 for academic year 2013/14.

CMS faculty and students participated in the 3rd **St. Petersburg Science Festival** on Oct. 18th. Howard Rutherford was once again co-chair of the event and did a great job making science relevant to the lives of the public. Over 20,000 people attended.

EVENTS



Karyna Rosario from the Breitbart lab teaching kids (and the dean) how to make virus necklaces at the 2013 St. Petersburg Science Festival.



Mayor Bill Foster, Dean Dixon and Theresa Burress (Festival Co-Chair) kicking off the 2013 St. Petersburg Science Festival with "foamworks" eruptions with Mr. Science.

Publications

CMS JOURNAL PUBLICATIONS (92)

1. Anderson, J. C., J. Wang, J. Zeng, G. Leptoukh, M. Petrenko, C. Ichoku, and **C. Hu** (2013) Long-term Statistical Assessment of Aqua-MODIS Aerosol Optical Depth over Coastal Regions: Bias Characteristics and Uncertainty Sources. *Tellus B* 65, 20805. <http://dx.doi.org/10.3402/tellusb.v65i0.20805>.
2. Astor, Y. M., L. Lorenzoni, R. Thunell, R. Varela, **F. Muller-Karger**, L. Troccoli, G. T. Taylor, M. I. Scranton, E. Tappa, and D. Rueda (2013) Interannual variability in sea surface temperature and fCO₂ changes in the Cariaco Basin. *Deep-Sea Research II*, special issue of Ocean Biogeochemistry Time Series Research, doi 10.1016/j.dsr2.2013.01.002.
3. Ballerini, T., E. E. Hofmann, D. G. Ainley, **K. L. Daly**, M. Marrari, C. Ribic, W. O. Smith, Jr., and J. H. Steele (2013) Productivity and Linkages of the Food Web of the Southern Region of the Western Antarctic Peninsula. *Progress in Oceanography*, <http://dx.doi.org/10.1016/j.pocean.2013.11.007>.
4. Barnes, B. B., **C. Hu**, B. A. Schaeffer, Z. Lee, D. A. Palandro, and J. C. Lehrter (2013) MODIS-derived spatiotemporal water clarity patterns in optically shallow Florida Keys waters: a new approach to remove bottom contamination. *Remote Sens. Environ.* 134, 377-391.
5. Barnes, B. B., and **C. Hu** (2013) A hybrid cloud detection algorithm to improve MODIS sea surface temperature data quality and coverage over the eastern Gulf of Mexico. *IEEE Trans. Geosci. Remote Sensing*, doi:10.1109/TGRS.2012.2223217.
6. Barón-Aguilar, C. C., N. R. Rhody, N. P. Brennan, K. L. Main, **E. B. Peebles** and **F. E. Muller-Karger** (2013) Influence of temperature on yolk resorption in common snook *Centropomus undecimalis* (Bloch, 1792) larvae. *Aquaculture Research*, doi: 10.1111/are.12323.
7. Batchelder, H. P., **K. L. Daly**, C.S. Davis, R. Ji, M. D. Ohman, W. T. Peterson, and J. A. Runge (2013) Climate Impacts on Zooplankton Populations Dynamics in Coastal Marine Systems. *Oceanography* 26 (4), 34-51.
8. **Bonin, J.** and **D. P. Chambers** (2013) Uncertainty Estimates of GRACE Inversion Modeling Technique over Greenland Using a Simulation. *Geophys. J. Intl.*, doi: 10.1093/gji/ggt091.
9. Bout-Roumazielles, V., A. Riboulleau, E. Armynot du Châtelet, L. Lorenzoni, N. Tribovillard, R. W. Murray, **F. Müller-Karger**, and Y. M. Astor (2013) Clay mineralogy of surface sediments as a tool for deciphering river contributions to the Cariaco Basin (Venezuela). *Journal of Geophysical Research*, DOI: 10.1002/jgrc.20079.

PUBLICATIONS

10. Burghart, S. E., D. L. Jones and **E. B. Peebles** (2013) Variation in estuarine consumer communities along an assembled eutrophication gradient; Implications for food web instability. *Estuaries and Coasts* 36, 951-965.
11. Calafat, F. M., and **D. P. Chambers** (2013) Quantifying recent acceleration in sea level unrelated to internal climate variability. *Geophys. Res. Lett.* 40, 1-6, doi:10.1002/grl.50731.
12. Calafat, F. M., **D. P. Chambers**, and M. N. Tsimplis (2013) Inter-annual to decadal sea-level variability in the coastal zones of the Norwegian and Siberian Seas: The role of atmospheric forcing. *J. Geophys. Res. Oceans* 118, doi:10.1002/jgrc.20106.
13. **Cannizzaro, J. P.**, P. R. Carlson Jr., L. A. Yarbro, and **C. Hu** (2013) Optical variability along a river plume gradient: Implications for management and remote sensing. *Estuarine, Coastal and Shelf Science* 131, 149-161. <http://dx.doi.org/10.1016/j.ecss.2013.07.012>.
14. **Cannizzaro, J. P.**, **C. Hu**, K. L. Carder, C. R. Kelble, N. Melo, E. M. Johns, G. A. Vargo, and C. A. Heil (2013) On the accuracy of SeaWiFS ocean color data products on the West Florida Shelf. *J. Coastal Res.*, DOI: 10.2112/JCOASTRES-12-00223.1.
15. Cardenas-Valencia, A. M., L. Adornato, R. Bell, **R. H. Byrne**, and R. T. Short (2013) Evaluation of reagentless pH modification for in situ ocean analysis: determination of dissolved inorganic carbon using mass spectrometry. *Rapid Communications in Mass Spectrometry* 27, 1-8, DOI: 10.1002/rcm.6487.
16. Church, M. J., M. W. Lomas, and **F. Muller-Karger** (2013) Sea Change: Charting the course for biogeochemical ocean time series research in a new millennium. *Deep-Sea Research II*, special issue of Ocean Biogeochemistry Time Series Research, 93:2-15. ISSN 0967-0645, <http://dx.doi.org/10.1016/j.dsr2.2013.01.035>.
17. **Coble, P. G.** (2013) Colored Dissolved Organic Matter, p. 98-118, in: *Subsea Optics and Imaging*, Watson, J & Zielinski, O., eds. Woodhead Publishing, Cambridge.
18. Cross, J. N., J. T. Mathis, N. R. Bates and **R. H. Byrne** (2013) Conservative and non-conservative variations of total alkalinity on the southeastern Bering Sea shelf. *Marine Chemistry* 154, 100-112. <http://dx.doi.org/10.1016/j.marchem.2013.05.012>
19. Dayaram, A., K. A. Potter, A. B. Moline, D. D. Rosenstein, M. Marinov, J. E. Thomas, **M. Breitbart**, K. Rosario, G. R. Arguello-Astorga, and A. Varsani (2013) High global diversity of cycloviruses amongst dragonflies. *Journal of General Virology* 94, 1827-1840.

PUBLICATIONS

20. **Drexler, M.**, and **C. H. Ainsworth** (2013) Generalized Additive Models Used to Predict Species Abundance in the Gulf of Mexico: An Ecosystem Modeling Tool. *PLoS ONE*, 8(5), e64458, doi:10.1371/journal.pone.0064458.
21. **Drexler, M. D.**, M. L. Parker, S. P. Geiger, W. S. Arnold, and **P. Hallock** (2013) Population biology of the Eastern Oyster (*Crassostrea virginica*) inhabiting reef, mangrove, seawall, and restoration substrates. *Estuaries and Coasts*, DOI 10.1007/s12237-013-9727-8.
22. **Dunlap, D. S.**, T. F. F. Ng, K. Rosario, J. G. Barbosa, **A. M. Greco**, **M. Breitbart**, and I. Hewson (2013) Molecular and microscopic evidence of viruses in marine copepods. *Proceedings of the National Academy of Sciences USA* 110, 1375-1380.
23. Dwivedi, B., B. Xue, D. Lundin, R. A. Edwards, and **M. Breitbart** (2013) A bioinformatics analysis of ribonucleotide reductase genes in phage genomes and metagenomes. *BMC Evolutionary Biology* 13, 33.
24. **Easley, R. A.**, **M. C. Patsavas**, **R. H. Byrne**, X. Liu, R. A. Feely, and J. T. Mathis (2013) Spectrophotometric Measurements of Calcium Carbonate Saturation States in Seawater. *Environmental Science and Technology* 47, 1468–1477, doi:10.1021/es303631g.
25. Feng, L., **C. Hu**, X. Chen, and X. Zhao (2013) Dramatic inundation changes of China's largest freshwater lakes linked to the Three Gorges Dam. *Environmental Science and Technology* 47, 9628-9634.
26. Hewson, I., G. Ng, W. F. Li, B. A. LaBarrel, I. Aguirre, J. G. Barbosa, **M. Breitbart**, **A. W. Greco**, C. M. Kearns, A. Looil, L. R. Schaffner, P. D. Thompson, and N. G. Hairston Jr (2013) Metagenomic identification, seasonal dynamics and potential transmission mechanisms of a Daphnia-associated single-stranded DNA virus in two temperate lakes. *Limnology and Oceanography* 58, 1605-1620.
27. **Hine, A. C.** (2013) Offshore oil drilling—why we have no choice but to continue to do so: Greenwood Press. Invited 10 page opinion op-ed essay. "Is Offshore Oil Drilling Worth the Environmental Risk?" *World Geography: Understanding a Changing World*. ABC-CLIO. Web. 31 Dec. 2013; <http://worldgeography2.abcclio.com/Ideas/Display/1813691?cid=1813691&terms=offshore+oil+drilling>; <http://worldgeography2.abcclio.com/Ideas/Display/1813691?cid=1813693>.
28. **Hine, A. C.**, **S. Dunn**, and **S. D. Locker** (2013) Geologic Beginnings of the Gulf of Mexico with Emphasis on the Formation of the De Soto Canyon; *DEEP-C publication*; <http://deep-c.org/news-and-multimedia/in-the-news/geologic-beginnings-of-the-gulf-of-mexico-with-emphasis-on-the-formation-of-the-de-soto-canyon>.

PUBLICATIONS

29. **Hine, A. C.**, D. Nummedal, and J. C. Boothroyd (2013) Glacial outwash plain shoreline; south-central Iceland: *Coastalcare.org publication* (reviewed; <http://coastalcare.org/2013/07/glacial-outwash-plain-shoreline-south-central-iceland/http://coastalcare.org>).
30. **Hu, C.**, L. Feng, and Z. Lee (2013) Uncertainties of SeaWiFS and MODIS remote sensing reflectance: Implications from clear water measurements. *Remote Sens. Environ.* 133, 163-182.
31. **Huang, Y., R. H. Weisberg, and L. Zheng** (2013) Gulf of Mexico hurricane wave simulations using SWAN: Bulk formula based drag coefficient sensitivity for Hurricane Ike. *J. Geophys. Res.-Oceans* 118, 1-23, doi:10.1002/jgrc.20283.
32. Johnson, G. F., and **D. P. Chambers** (2013) Ocean Bottom Pressure Seasonal Cycles and Decadal Trends from GRACE Release-05: Ocean Circulation Implications. *J. Geophys. Res. Oceans* 118, doi:10.1002/jgrc.20307.
33. Kelmo, F., and **P. Hallock** (2013) Responses of foraminiferal assemblages to ENSO climate patterns on bank reefs of northern Bahia, Brazil: A 17-year record. *Ecological Indicators* 30, 148-157. DOI:10.1016/j.ecolind.2013.02.009.
34. Kerr, P. C., A. S. Donahue, J. J. Westerink, R. A. Luettich Jr., **L. Y. Zheng, R. H. Weisberg, Y. Huang, H. V. Wang, Y. Teng, D. R. Forrest, A. Roland, A. T. Haase, A. W. Kramer, A. A. Taylor, J. R. Rhome, J. C. Feyen, R. P. Signell, J. L. Hanson, M. E. Hope, R. M. Estes, R. A. Dominguez, R. P. Dunbar, L. N. Semeraro, H. J. Westerink, A. B. Kennedy, J. M. Smith, M. D. Powell, V. J. Cardone, and A. T. Cox** (2013) U.S. IOOS coastal and ocean modeling testbed: Inter-model evaluation of tides, waves, and hurricane surge in the Gulf of Mexico. *J. Geophys. Res.-Oceans* 118, 5129-5172. doi:10.1002/jgrc.20376.
35. **Le, C.**, and **C. Hu** (2013) A hybrid approach to estimate chromophoric dissolved organic matter in turbid estuaries from satellite measurements: A case study for Tampa Bay. *Opt Express* 21, 18849-18871, doi:10.1364/OE.21.018849.
36. **Le, C., C. Hu, J. Cannizzaro, and H. Duan** (2013) Long-term distribution patterns of remotely sensed water quality parameters in Chesapeake Bay. *Estuarine, Coastal and Shelf Science* 128, 93-103. doi: 10.1016/j.bbr.2011.03.031.
37. **Le, C., C. Hu, J. Cannizzaro, D. English, and C. Kovach** (2013) Climate-driven chlorophyll a changes in a turbid estuary: Observation from satellites and implications for management. *Remote Sens. Environ.* 130, 11-24.
38. **Le, C., C. Hu, J. Cannizzaro, D. English, F. Muller-Karger, and Z. Lee** (2013) Evaluation of chlorophyll-a remote sensing algorithms for an optically complex estuary. *Remote Sens. Environ.* 129, 75-89.

PUBLICATIONS

39. **Le, C., C. Hu, D. English, J. Cannizzaro, Z. Chen, L. Feng, R. Boler, and C. Kovach** (2013) Towards a long-term chlorophyll-a data record in a turbid estuary using MODIS observations. *Progress in Oceanography* 109, 90-103.
40. **Le, C., C. Hu, D. English, J. Cannizzaro, Z. Chen, C. Kovach, C. J. Anastasiou, J. Zhao, and K. L. Carder** (2013) Inherent and apparent optical properties of the complex estuarine waters of Tampa: What controls light? *Estuarine, Coastal and Shelf Science* 117, 54-69.
41. **Lee, Z., C. Hu, S. Shang, K. Du, M. Lewis, R. Arnone, and R. Brewin** (2013) Penetration of UV-Visible solar radiation in the global oceans: Insights from ocean color remote sensing. *J. Geophys. Res. Oceans* 118, doi:10.1002/jgrc.20308.
42. **Lenes, J. M., J. J. Walsh, and B. P. Darrow** (2013) Simulating cell death in the termination of *Karenia brevis* blooms: Implications for predicting aerosol toxicity vectors to humans. *Mar. Ecol. Progr. Ser.* 492, 71-81.
43. **Levin, P. S., C. R. Kelble, R. L. Shuford, C. H. Ainsworth, Y. deReynier, R. Dunsmore, M. J. Fogarty, K. Holsman, E. A. Howell, M. E. Monaco, S. A. Oakes, and F. Werner** (2013) Guidance for implementation of integrated ecosystem assessments: a US perspective. *ICES Journal of Marine Science*, doi:10.1093/icesjms/fst112.
44. **Liu, X., R. H. Byrne, L. Adornato, K. K. Yates, E. Kaltenbacher, X. Ding and B. Yang** (2013) In situ spectrophotometric measurement of dissolved inorganic carbon in seawater. *Environmental Science and Technology* 47, 11106-11114. dx.doi.org/10.1021/es4014807.
45. **Lorenzoni, L., G. T. Taylor, C. Benitez-Nelson, D. Hansell, R. Masserini, E. Montes, K. Fanning, R. Varela, Y. Astor, L. Guzmán, and F. E. Muller-Karger** (2013) Spatial and seasonal variability of dissolved organic matter in the Cariaco Basin. *Journal of Geophysical Research – Biogeosciences* 118, 951–962. DOI: 10.1002/jgrg.20075.
46. **Luther, M. E., G. Meadows, E. Buckley, S. A. Gilbert, H. Purcell, and M. Tamburri** (2013) Verification of Wave Measurement Systems. *J. Mar. Tech.* 47, 104-116.
47. **McDaniel, L. D., K. Rosario, M. Breitbart, and J. H. Paul** (2013) Comparative metagenomics: Natural populations of induced prophages demonstrate highly unique, lower diversity viral sequences. *Environmental Microbiology*, doi: 10.1111/1462-2920.12184.
48. **McIntyre-Wressnig, A., J.M. Bernhard, D.C. McCorkle, and P. Hallock** (2013) Non-lethal effects of ocean acidification on the symbiont-bearing benthic foraminifera *Amphistegina gibbosa*. *Marine Ecology Progress Series* 472, 45-60. DOI:10.3354/meps09918.

49. Merrifield, M. A., P. Thompson, R. S. Nerem, **D. P. Chambers**, **G. T. Mitchum**, M. Menéndez, E. Leuliette, L. Miller, J. J. Marra, W. Sweet, and S. Holgate (2013) Sea level variability and change, in “State of the Climate in 2012”. *Bull. Amer. Met. Soc.* 94, 68-72.
50. **Meyers, S.**, A. J. Linville, and **M. E. Luther** (2013) Alteration of residual circulation due to large-scale infrastructure in a drowned riverbed estuary. *Estuaries and Coasts*, doi:10.1007/s12237-013-9691-3.
51. Miranda, L. D., **R. H. Byrne**, R. T. Short and R. J. Bell (2013) Calibration of membrane inlet mass spectrometric measurements of dissolved gasses: Differences in the responses of polymer and nano-composite membranes to variations in ionic strength. *Talanta* 116, 217-222, <http://dx.doi.org/10.1016/j.talanta.2013.05.014>
52. **Montes, E.**, M. Altabet, **F. Muller-Karger**, M. Scranton, **L. Lorenzoni**, and Y. Astor (2013) Biogenic nitrogen gas production at the oxic-anoxic interface in the Cariaco Basin, Venezuela. *Biogeosciences* 10, 267-279 doi:10.5194/bg-10-267-2013.
53. **Montes, E.**, R. Thunell, **F. E. Muller-Karger**, E. Tappa, **L. Lorenzoni**, L. Troccoli, Y. Astor, and R. Varela (2013) Sources of $\delta^{15}\text{N}$ variability in sinking particulate nitrogen in the Cariaco Basin, Venezuela. *Deep Sea Research Part II: Topical Studies in Oceanography*, 93, 96–107. <http://dx.doi.org/10.1016/j.dsr2.2013.01.006>.
54. Morzaria-Luna H. N., **C. H. Ainsworth**, I. C. Kaplan, P. S. Levin, and E. A. Fulton (2013) Indirect Effects of Conservation Policies on the Coupled Human-Natural Ecosystem of the Upper Gulf of California. *PLoS ONE* 8, e64085, doi:10.1371/journal.pone.0064085.
55. **Muller-Karger, F.** (2013) Remote Sensing Applications to Ocean and Human Health. *Encyclopedia of Sustainability Science and Technology*.
56. **Muller-Karger, F.**, M. Roffer, N. Walker, M. Oliver, O. Schofield, M. Abbott, H. Graber, R. Leben, and G. Goni (2013) Satellite Remote Sensing in Support of an Integrated Ocean Observing System. *Geoscience and Remote Sensing Magazine* 1, 8,18, <http://dx.doi.org/10.1109/MGRS.2013.2289656>.
57. **Murawski, S. A.**, and W. T. Hogarth (2013) Enhancing the ocean observing system to meet restoration challenges in the Gulf of Mexico. *Oceanography* 26, 10–16, <http://dx.doi.org/10.5670/oceanog.2013.12>.
58. Mutshinda, C. M., L. Troccoli-Ghinaglia, Z. V. Finkel, **F. E. Muller-Karger**, and A. J. Irwin (2013) Environmental control of the dominant phytoplankton in the Cariaco basin: a hierarchical Bayesian approach. *Marine Biology Research* 9, 247-261. <http://dx.doi.org/10.1080/17451000.2012.731693>.

PUBLICATIONS

59. Ng, T. F. F., S. Alavandi, A. Varsani, **S. Burghart, and M. Breitbart** (2013) Metagenomic identification of a nodavirus and a circular ssDNA virus in semi-purified viral nucleic acids from the hepatopancreas of healthy *Farfantepenaeus duorarum* shrimp. *Diseases of Aquatic Organisms* 105, 237-242.
60. Ng, T. F. F., C. Driscoll, R. Myers, D. Limpert, R. Schmieder, B. Dwivedi, J. Wong, Y. Cha, K. Feldman, S. Head, **M. Breitbart**, and E. Delwart (2013) Distinct lineage of vesiculovirus from big brown bats in the USA. *Emerging Infectious Diseases*, doi: 10.3201/eid1912.12150.
61. Olson, M. B. and **K. L. Daly** (2013) Micro-grazer biomass, composition and distribution across prey resource and dissolved oxygen gradients in the far eastern tropical north Pacific Ocean. *Deep-Sea Research I* 75, 28-38.
62. Otremba, Z., O. Zielinski, and **C. Hu** (2013) Optical contrast of oil dispersed in seawater under windy conditions. *J. Europ. Opt. Soc. Rap. Public.* 8, 13051, doi: <http://dx.doi.org/10.2971/jeos.2013.13051>.
63. Padilla-Rodriguez, M., K. Rosario, and **M. Breitbart** (2013) Discovery of a novel cyclovirus found in a Florida Woods Cockroach (*Eurycotis floridana*). *Archives of Virology* 158, 1389-1392.
64. **Patsavas, M. C., R. H. Byrne and X. Liu** (2013) Physical-chemical characterization of purified cresol red for spectrophotometric pH measurements in seawater. *Marine Chemistry* 55, 158-164, <http://dx.doi.org/10.1016/j.marchem.2013.06.007>.
65. **Patsavas, M. C., R. H. Byrne, and X. Liu** (2013) Purification of meta cresol purple and cresol red by flash chromatography: procedures for ensuring accurate spectrophotometric seawater pH measurements. *Marine Chemistry* 150, 19-24, <http://dx.doi.org/10.1016/j.marchem.2013.01.004>.
66. **Paul, J. H., D. Hollander, P. Coble, K. L. Daly, S. Murawski, D. English, J. Basso, J. Delaney, L. McDaniel, and C. Kovach** (2013) Toxicity and Mutagenicity of Gulf of Mexico Waters During and After The Deepwater Horizon Oil Spill. *Environmental Science & Technology* 47, 9651-9659, doi: 10.1021/es401761h.
67. Peloquin, J., C. Swan, N. Gruber, M. Vogt, H. Claustre, J. Ras, J. Uitz, R. Barlow, M. Behrenfeld, R. Bidigare, H. Dierssen, G. Ditullio, E. Fernandez, C. Gallienne, S. Gibb, R. Goericke, L. Harding, E. Head, P. Holligan, S. Hooker, D. Karl, M. Landry, R. Letelier, C.A. Llewellyn, M. Lomas, M. Lucas, A. Mannino, J-C. Marty, B. G. Mitchell, **F. Muller-Karger**, N. Nelson, C. O'Brien, B. Prezelin, D. Repeta, W. O. Jr. Smith, D. Smythe-Wright, R. Stumpf, A. Subramaniam, K. Suzuki, C. Trees, M. Vernet, N. Wasmund, and S. Wright (2013) The MAREDAT global database of high performance liquid chromatography marine pigment measurements. *Earth Syst. Sci. Data* 5, 109-123, doi:10.5194/essd-5-109-2013.

68. Piñones, A., E. E. Hofmann, **K. L. Daly**, M. S. Dinniman, and J. M. Klinck (2013) Modeling environmental controls on the transport and fate of early life history stages of Antarctic krill (*Euphausia superba*) on the western Antarctic Peninsula continental shelf. *Deep-Sea Research I* 82, 17-31.
69. Piñones, A., E. E. Hofmann, **K. L. Daly**, M. S. Dinniman, and J. M. Klinck (2013) Modeling the remote and local connectivity of Antarctic krill (*Euphausia superba*) populations along the western Antarctic Peninsula. *Marine Ecology Progress Series* 481, 69-92.
70. Pitcher, T. J., M. Lam, **C. H. Ainsworth**, A. Martindale, K. Nakamura, I. Perry, and T. Ward (2013) Improvements to Rapfish: a rapid evaluation technique for fisheries integrating ecological and human dimensions. *Journal of Fish Biology*, Doi: 10.1111/jfb.12122.
71. Powell, K. J., P. L. Brown, **R. H. Byrne**, T. Gajda, G. Hefter, A-K. Leuz, S. Sjoberg, and H. Wanner (2013) Chemical speciation of environmentally significant metals with inorganic ligands. Part 5: The $Zn^{2+} + OH^-$, Cl^- , CO_3^{2-} , SO_4^{2-} , and PO_4^{3-} systems (IUPAC Technical Report) *Pure Appl. Chem.* 85, 2249-2341, <http://dx.doi.org/10.1351/PAC-REP-13-06-03>.
72. **Radabaugh, K. R., D. J. Hollander and E. B. Peebles** (2013) Seasonal $\delta^{13}C$ and $\delta^{15}N$ isoscapes of fish populations along a continental shelf trophic gradient. *Continental Shelf Research* 68, 112-122.
73. Robbins, L. L., J. G. Wynn, J. T. Lisle, K. K. Yates, P. O. Knorr, **R. H. Byrne, X. Liu, M. C. Patsavas, K. Azetsu-Scott and T. Takahashi** (2013) Baseline monitoring of the western Arctic Ocean estimates 20% of Canadian Basin surface waters are undersaturated with respect to Aragonite. *PLoS ONE*, 8:e73796, Doi:10.1371/journal.pone.0073796.
74. **Rosario, K.**, M. Padilla-Rodriguez, S. Kraberger, D. Stainton, D. P. Martin, **M. Breitbart**, and A. Varsani (2013) Discovery of a novel mastrevirus and alphasatellite-like circular DNA in dragonflies (Epirocta) from Puerto Rico. *Virus Research* 171, 231-237.
75. Saul, S. E., J. F. Walter III, D. J. Dike, **D. F. Naar**, and **B. T. Donahue** (2013) Modeling the spatial distribution of commercially important reef fishes on the West Florida Shelf. *Fisheries Research* 143, 12-20. <http://dx.doi.org/10.1016/j.fishres.2013.01.002>.
76. Soli, A. L., B. J. Pav and **R. H. Byrne** (2013) The effect of pressure on meta-Cresol Purple protonation and absorbance characteristics for spectrophotometric pH measurements in seawater. *Marine Chemistry* 157, 162-169, <http://dx.doi.org/10.1016/j.marchem.2013.09.003>.
77. Sukoriansky, S. and **B. Galperin** (2013) An analytical theory of the buoyancy - Kolmogorov subrange transition in turbulent flows with stable stratification. *Philos. Trans. Royal Soc. A – Math. Phys. Eng. Sci.* 371, doi: 10.1098/rsta.2012.0212.

PUBLICATIONS

78. Tastula, E.-M., T. Vihma, E. Andreas, and **B. Galperin** (2013) Validation of the diurnal cycles in atmospheric reanalyses over Antarctic sea ice. *Journal of Geophysical Research – Atmospheres* 118, 4194-4204, doi:10.1002/jgrd.50336.
79. **Thompson, P., G. T. Mitchum**, C. Vonesch and J. Li (2013) Storminess Changes in the Southeastern United States during the 20th Century. *J. Climate* 26, 9713-9726.
80. Tolley, S. G., B. M. Bachelor and **E. B. Peebles** (2013) Recruitment of the crabs *Eurypanopeus depressus*, *Rhithropanopeus harrisi* and *Petrolisthes armatus* to oyster reefs: The influence of freshwater inflow. *Estuaries and Coasts* 36, 820–833.
81. Tsimplis, M. N., F. M. Calafat, M. Marcos, G. Jorda, D. Gomis, L. Fenoglio-Marc, M. V. Struglia, S. A. Josey, and **D. P. Chambers** (2013) The effect of the NAO on sea level and on mass changes in the Mediterranean Sea. *J. Geophys. Res. Oceans* 118, 944–952, doi:10.1002/jgrc.20078.
82. **Ulrich, R. M.**, D. E. John, G. W. Barton, **G. S. Hendrick, D. P. Fries, and J. H. Paul** (2013) Ensuring seafood identity: Grouper identification by real-time nucleic acid sequence-based amplification (RT-NASBA). *Food Control* 31, 337-344.
83. Wahl, T., F. M. Calafat, and **M. E. Luther** (2013) Rapid changes in the seasonal sea level cycle along the US Gulf coast from the late 20th century. *Geophys. Res. Lett.* 41, doi:10.1002/2013GL058777.
84. Wang, Z. A., R. Wanninkhof, W.-J. Cai, **R. H. Byrne**, X. Hu, T.-H. Peng, and W.-J. Huang (2013) The marine inorganic carbon system along the Gulf of Mexico and Atlantic coasts of the United States: insights from a transregional coastal carbon study. *Limnology and Oceanography* 58, 325-342. doi:10.4319/lo.2013.58.1.0325.
85. **Weisberg, R. H., L. Zheng, Y. Liu, S. Murawski, C. Hu and J. Paul** (2013). Did Deepwater Horizon hydrocarbons transit to the West Florida continental shelf? *Deep Sea Research Part II: Topical Studies in Oceanography* (published online).
86. **Wirt, K., P. Hallock Muller**, D. Palandro, and **K. L. Daly** (2013) Potential Habitat of *Acropora* spp. on Florida Reefs. *Applied Geography* 39, 118-127.
87. Wishner, K. F., D. Outram, B. Seibel, **K. L. Daly**, and R. L. Williams (2013) Zooplankton in the Eastern Tropical North Pacific: Boundary Effects of Oxygen Minimum Zone Expansion. *Deep-Sea Research I* 79, 122-140, 10.1016/j.dsr.2013.05.012.
88. Yu, K., and **C. Hu** (2013) Changes in vegetative coverage of the Hongze Lake national wetland nature reserve: a decade-long assessment using MODIS medium-resolution data. *J. Appl. Remote Sens.* 7, 073589, doi:10.1117/1.JRS.7.073589.

PUBLICATIONS

89. **Zhao, J., B. Barnes, N. Melo, D. English, B. Lapointe, F. Muller-Karger, B. Schaeffer, and C. Hu** (2013) Assessment of satellite-derived diffuse attenuation coefficients and euphotic depths in south Florida coastal waters. *Remote Sensing of Environment* 131, 38-50, <http://dx.doi.org/10.1016/j.rse.2012.12.009>.
90. **Zhao, J., C. Hu, B. Lapointe, N. Melo, E. M. Johns, and R. H. Smith** (2013) Satellite-observed black water events off Southwest Florida: Implications for coral reef health in the Florida Keys National Marine Sanctuary. *Remote Sens.* 5, 415-431, doi:10.3390/rs510415.
91. **Zhao, J., C. Hu, J. M. Lenes, R. H. Weisberg, C. Lembke, D. English, J. Wolny, L. Zheng, J. J. Walsh, and G. Kirkpatrick** (2013) Three-dimensional structure of a *Karenia brevis* bloom: observations from gliders, satellites, and field measurements. *Harmful Algae.* 29, 22–30, <http://dx.doi.org/10.1016/j.hal.2013.07.004>.
92. **Zheng, L., R.H. Weisberg, Y. Huang, et al.,** (2013) Implication from the comparisons between two- and three-dimensional model simulations of the Hurricane Ike storm surge. *J. Geophys. Res.-Oceans* 118, 3350–3369, doi:10.1002/jgrc.20248.

C-IMAGE publications (some of these are listed above as well, and these are not all from 2013)

Allison, J. G., Wagner, M. E., McAllister, M., Ren, A, K. J., Snyder, R. A. (2013) Sand bottom microalgal production and benthic nutrient fluxes on the northeastern Gulf of Mexico nearshore shelf, *Gulf and Caribbean Research*, 25, 1-8.

Aman, Z. M. and C.B. Paris (2013) Response to comment on "Evolution of the Macondo Well Blowout: Simulating the Effects of the Circulation and Synthetic Dispersants on the Subsea Oil Transport, *Environmental Science and Technology*, 47(20), 11906-11907.

Cannizzaro, J.P., Hu, C., Carder, K.L., Kelble, C.R., Melo, N., Johns, E.M., Vargo, G.A., and Heil, C.A. (2013) On the Accuracy of SeaWiFS Ocean Color Data Products on the West Florida Shelf, *Journal of Coastal Research*.

Drexler, M., Ainsworth, C. (2013) The use of zero-inflated generalized additive models to predict species abundance distributions in the Gulf of Mexico: a tool for ecosystem modeling, *PLOS ONE*.

Fefilatyev, S., Kramer, K., Hall, L., Goldgof, D., Kasturi, R., **Remsen, A., Daly, K.** (2011) Detection of Anomalous Particles from the Deepwater Horizon Oil Spill Using the SIPPER3 Underwater Imaging Platform, *Proceedings of 11th International Conference on Data Mining Workshops*, 741-748, 10.1109.

PUBLICATIONS

Fefilat'yev, S., M. Shreve, K. Kramer, L. Hall, D. Goldgof, R. Kasturi, **K. Daly, A. Remsen**, H. Bunke (2012) Label-Noise Reduction with Support Vector Machines, *21st International Conference on Pattern Recognition (ICPR 2012)*, November 11-15, 2012.

Garcia-Pineda, O., MacDonald, I., **Hu, C.** (2013) Detection of floating oil anomalies from the Deepwater Horizon oil spill with synthetic aperture radar, *Oceanography*, (26)2:124-137, <http://dx.doi.org/10.5670/oceanog.2013.38>.

Hu, C., Feng, L., Lee, Z. (2013) Uncertainties of SeaWiFS and MODIS remote sensing reflectance: Implications from clear water measurements, *Remote Sensing of the Environment*, 133, 168-182.

Le Henaff, M., Kourafalou, V., Paris, C.B., Helgers, J., Aman, Z.M., Hogan, P., Srinivasan, A.N. Surface (2012) Evolution of the Deepwater Horizon Oil Spill Patch: Combined Effects of Circulation and Wind-Induced Drift, *Environmental Science and Technology*, 46, 7267-7273.

Lenes, J. M., Walsh, J. J., Darrow, B. P. (2013) Simulating cell death in the termination of *Karenia brevis* blooms: implications for predicting aerosol toxicity vectors to humans, *Marine Ecology Progress Series*, 493: 71-81.

Lindo-Atichati, D., Paris, C. B., Le Henaff, M., Schedler, M., Valladares-Juarez, A. G., Muller, R. (in press) Simulating the effects of droplet size, high pressure biodegradation, and variable flow rate on the subsea evolution of deep plumes from the Macondo blowout, *Deep Sea Research*, Special Issue "The Gulf of Mexico Ecosystem: Before During, and After the Deep Water Horizon Oil Spill".

Malone, K., Seemann, R., Krause, D. (in press) Realisierung komplexer Versuchsaufbauten in Hochdrucktestumgebungen (Realization of complex experimental setups in high-pressure test environments), *Symposium Design for X*.

Merkins, K. (2013) Deep-diving cetaceans of the Gulf of Mexico: Acoustic ecology and response to natural and anthropogenic forces including the Deepwater Horizon oil spill, Ph.D. Dissertation.

Murawski, S.A., Hogarth, W.T. (2013) Enhancing the ocean observing to meet restoration challenges in the Gulf of Mexico, *Oceanography*, 26, 1, 10-16.

Murawski, S.A., Hogarth, W.T., Peebles, E.B., Stein, J.E., Ylitalo, G.M., Barbeiri, L. (in press) Prevalence of external skin lesions on PAH concentrations in Gulf of Mexico fishes, post-Deepwater Horizon, *Transactions of the American Fisheries Society*.

Paris, C. B., Henaff, M., Aman, Z. M., Subramanian, A., Helgers, J., Wang, D. P., Kourafalou, V. H., Srinivasan, A. (2012) Evolution of the Macondo Well Blowout: Simulating the Effects of the Circulation and synthetic Dispersants on the Subsea Oil Transport, *Environmental Science and Technology*.

PUBLICATIONS

Paris, C. B., Aman, A. M. (2013) Response to Comment on "Evolution of the Macondo Well Blowout: Simulating the Effects of the Circulation and Synthetic Dispersants on the Subsea Oil Transport", *Environmental Science and Technology*.

Paul, J. H., Hollander, D., Coble, P., Daly, K., Murasko, S., English, D. Basso, J., Delaney, J., McDaniel, L., Kovach, C. W. (2013) Toxicity and Mutagenicity of Gulf of Mexico Waters During and After The Deepwater Horizon Oil Spill, *Environmental Science and Technology*, 47, 9651-9659

Sirovic, A., Bassett, Hr. R., Johnson, S., Wiggins, S. M., Hildebrand, J. A. (2013) Bryde's whale calls recorded in the Gulf of Mexico, *Marine Mammal Science*.

Snyder, R. A., Vestel, A., Barnes, G., Pelot, R., Ederington-Hagy, M., Hileman, F. Coquina (2013) (*Donax* spp.) as an indicator of oil spill impact to sandy beach shorelines, *Marine Pollution Bulletin*.

Weisberg, R. H., Zheng, L., Liu, Y., Lembke, C., Lenes, J. M., Walsh, J. J. (2013) Why a red tide was not observed on the West Florida Continental Shelf in 2010, *Harmful Algae*.

Weisberg, R. H., Zheng, L., Liu, Y., Murawski, S., Hu, C., Paul, J. (2014) Did Deepwater Horizon Hydrocarbons Transit to the West Florida Continental Shelf? *Deep Sea Research II*, <http://dx.doi.org/10.1016/j.dsr2.2014.02.002>.

Zhang, M., Hu, C., Amu, G. (in press) Real-world problem solving in software development: A case study on the Deepwater Horizon oil spill, *Frontiers in Education Conference. Oct 23 – 26, 2013*.

Zhao, J., Hu, C., Lenes, J. M., Weisberg, R. H., Lembke, C., English, D., Wolny, J., Zheng, L., Walsh, J. J., Kirkpatrick, G. (2013) Three-dimensional structure of a *Karenia brevis* bloom: Observations from gliders, satellites, and field measurements, *Harmful Algae*, 29, 22-30.

ACTIVE RESEARCH AWARDS

Active Research Awards

Award PI Name	Sponsor Name	Direct Costs	Indirect Costs	Transfers	Total Costs	Begin Date	End Date
Ainsworth	Florida Sea Grant College	\$31,842	\$13,343	\$0	\$45,186	2/1/2012	9/30/2014
Breitbart	National Science Foundation	-\$843	\$869	\$0	\$26	8/15/2007	8/31/2012
Breitbart	National Science Foundation	\$95,745	\$44,191	\$0	\$139,936	4/15/2009	3/31/2014
Breitbart	National Science Foundation	\$0	\$1,390	\$0	\$1,390	4/15/2009	3/31/2014
Breitbart	National Science Foundation	\$56,367	\$26,493	\$0	\$82,859	9/1/2010	8/31/2014
Breitbart	National Science Foundation	\$35,006	\$16,453	\$0	\$51,459	10/1/2010	9/30/2013
Breitbart	National Science Foundation	\$208	\$1,155	\$0	\$1,363	10/1/2010	9/30/2013
Breitbart	US Environmental Protection Agency NV	\$13,700	\$0	\$0	\$13,700	8/1/2011	7/31/2014
Breitbart	National Science Foundation	\$21,302	\$67	\$0	\$21,369	12/1/2012	11/30/2017
Byrne	National Science Foundation	\$133,466	\$58,088	\$0	\$191,554	8/15/2009	7/31/2013
Byrne	Natl Oceanic & Atmospheric Admin	\$115,282	\$24,156	\$0	\$139,438	9/1/2009	8/31/2014
Byrne	National Science Foundation	\$28,042	\$12,500	\$0	\$40,542	9/1/2010	8/31/2013
Byrne	Pinch A Penny, Inc.	\$4,918	\$497	\$0	\$5,415	7/22/2010	7/21/2013
Byrne	University of Southern Mississippi	\$79,913	\$39,158	\$0	\$119,071	10/1/2011	9/30/2014
Byrne	St. Petersburg Downtown Partnership	\$2,013	\$987	\$0	\$3,000	1/16/2012	1/15/2013
Byrne	National Science Foundation	\$44,626	\$17,140	\$0	\$61,765	9/15/2012	8/31/2016
Chambers	California Institute of Technology	\$19,531	\$9,179	\$0	\$28,710	11/23/2009	9/30/2013
Chambers	University of California	\$64,762	\$30,438	\$0	\$95,201	5/11/2009	5/10/2013
Chambers	NASA Jet Propulsion Laboratory	\$32,888	\$12,433	\$0	\$45,321	3/22/2010	2/28/2014
Chambers	European Commission	\$9,317	\$932	\$0	\$10,249	6/15/2011	6/14/2014
Chambers	University of Colorado	\$12,600	\$4,369	\$0	\$16,968	8/8/2011	8/7/2014
Chambers	University of Colorado	\$28,508	\$12,186	\$0	\$40,694	8/8/2011	8/7/2014
Chambers	National Aeronautics & Space Admin	\$24,057	\$6,471	\$0	\$30,527	8/6/2012	8/5/2016
Chambers	National Aeronautics & Space Admin	\$38,405	\$16,239	\$0	\$54,644	8/6/2012	8/5/2016
Daly	National Science Foundation	\$12,665	\$5,953	\$0	\$18,618	9/1/2008	8/31/2012
Daly	National Science Foundation	\$50,531	\$23,749	\$0	\$74,280	6/1/2011	11/30/2014
Daly	University of Washington	\$11,495	\$2,989	\$0	\$14,484	5/1/2012	8/31/2012
Daly	University of Washington	\$17,441	\$4,535	\$0	\$21,976	5/1/2013	8/31/2013

ACTIVE RESEARCH AWARDS

Dixon	National Science Foundation	\$615,283	\$0	\$0	\$615,283	8/15/2010	7/31/2013
Dixon	US Geological Survey	\$0	-\$11,028	\$0	-\$11,028	5/1/2011	4/30/2012
Dixon	US Geological Survey	\$12,636	\$2,527	\$0	\$15,163	12/1/2011	12/31/2012
Dixon	US Geological Survey	\$16,199	\$3,240	\$0	\$19,439	12/1/2011	12/31/2012
Dixon	US Geological Survey	\$11,679	\$5,781	\$0	\$17,460	8/1/2012	7/31/2017
Dixon	US Geological Survey	\$1,019,885	\$0	\$0	\$1,019,885	8/1/2012	7/31/2017
Dixon	US Geological Survey	\$35,022	\$13,114	\$0	\$48,136	1/2/2013	12/31/2013
Dixon	US Geological Survey	\$0	\$2,167	\$0	\$2,167	2/18/2013	12/31/2013
Fanning	Florida Fish and Wildlife Conservation	-\$17	\$0	\$0	-\$17	10/4/2011	6/1/2012
Fanning	Moss Landing Marine Laboratories	\$314	\$155	\$0	\$469	1/30/2013	6/1/2013
Fries	Office of Naval Research	\$16,385	\$4,260	\$0	\$20,645	5/1/2010	11/30/2012
Fries	National Science Foundation	\$57,093	\$26,834	\$0	\$83,927	8/15/2010	7/31/2013
Galperin	Department of the Army	\$58,422	\$22,106	\$0	\$80,528	10/1/2008	5/31/2013
Galperin	Univ Corp for Atmospheric Research	-\$532	-\$250	\$0	-\$782	1/27/2010	5/31/2012
Galperin	Office of Naval Research	\$43,449	\$6,321	\$0	\$49,770	2/1/2010	3/31/2013
Gonzalez	Office of Naval Research	\$23,350	\$6,071	\$0	\$29,421	5/1/2009	11/30/2012
Greely	SRI International	\$8,637	\$4,059	\$0	\$12,697	10/9/2009	7/31/2013
Greely	National Marine Sanctuary Foundation	\$868	\$0	\$0	\$868	8/1/2010	7/31/2012
Greely	Consortium for Ocean Leadership	\$3,997	\$0	\$0	\$3,997	9/1/2011	6/30/2012
Greely	Natl Oceanic & Atmospheric Admin	\$41,967	\$9,288	\$0	\$51,256	7/1/2012	11/30/2014
Greely	National Marine Sanctuary Foundation	\$4,386	\$0	\$0	\$4,386	10/15/2012	10/14/2014
Greely	Consortium for Ocean Leadership	\$13,000	\$0	\$0	\$13,000	10/1/2012	6/30/2013
Hine	University of North Carolina Chapel Hill	\$26,396	\$0	\$49	\$26,445	2/28/2012	9/30/2012
Hogarth	British Petroleum	\$35,827	\$0	\$0	\$35,827	8/13/2010	8/12/2012
Hogarth	British Petroleum	\$33,616	\$0	\$0	\$33,616	8/13/2010	8/12/2012
Hogarth	British Petroleum	\$21,099	\$0	\$0	\$21,099	8/13/2010	8/12/2012
Hogarth	British Petroleum	\$143,922	\$0	\$0	\$143,922	8/13/2010	8/12/2012
Hogarth	British Petroleum	\$108,947	\$0	\$0	\$108,947	8/13/2010	8/12/2012
Hogarth	British Petroleum	\$19,184	\$0	\$0	\$19,184	8/13/2010	8/12/2012
Hollander	National Science Foundation	\$2,252	\$1,058	\$0	\$3,310	9/15/2008	8/31/2013
Hollander	National Science Foundation	\$7,090	\$2,003	\$0	\$9,093	9/1/2010	8/31/2012
Hollander	National Science Foundation	\$38,516	\$18,102	\$0	\$56,618	9/1/2010	8/31/2013
Hollander	Comer Science and Education Foundation	\$20,836	\$0	\$0	\$20,836	10/25/2010	10/24/2013
Hollander	Florida Fish and Wildlife Conservation	\$45,535	-\$11,554	\$84,958	\$118,939	9/26/2011	6/30/2012
Hollander	Florida Fish and Wildlife Conservation	\$62,306	\$11,553	\$0	\$73,859	9/26/2011	3/31/2013

ACTIVE RESEARCH AWARDS

Hotaling	Clarkson University	\$26,789	\$7,020	\$0	\$33,808	1/16/2010	12/31/2012
Hotaling	Rutgers University	\$28,476	\$7,404	\$0	\$35,879	1/15/2010	8/31/2013
Hu	National Aeronautics & Space Admin	\$51,897	\$21,020	\$0	\$72,917	1/10/2009	7/9/2013
Hu	National Aeronautics & Space Admin	\$306	\$144	\$0	\$450	1/10/2009	7/9/2013
Hu	National Aeronautics & Space Admin	\$18,885	\$8,876	\$0	\$27,760	8/21/2009	8/20/2014
Hu	National Aeronautics & Space Admin	\$52,551	\$22,036	\$0	\$74,587	9/1/2009	12/31/2012
Hu	Florida Fish and Wildlife Conservation	\$8,605	\$15,461	\$0	\$24,066	4/5/2010	6/30/2014
Hu	Florida Fish and Wildlife Conservation	\$8,275	\$0	\$56,795	\$65,069	4/12/2010	12/31/2012
Hu	National Aeronautics & Space Admin	\$137,126	\$64,449	\$0	\$201,575	9/1/2010	9/30/2013
Hu	Florida Fish and Wildlife Conservation	\$70,896	\$10,635	\$0	\$81,530	9/19/2010	8/9/2013
Hu	Harbor Branch Oceanographic Institute	\$19,832	\$9,321	\$0	\$29,153	12/1/2009	11/30/2012
Hu	National Aeronautics & Space Admin	\$15,759	\$7,722	\$0	\$23,480	7/1/2011	6/30/2013
Hu	UAV Collaborative	\$58,372	\$34,341	\$0	\$92,713	10/1/2011	9/30/2014
Hu	Texas A & M Research Foundation	\$16,696	\$6,805	\$0	\$23,501	6/1/2012	6/30/2013
Hu	Florida State University	\$1,868	\$925	\$0	\$2,793	8/17/2012	8/16/2015
Hu	National Aeronautics & Space Admin	\$3,635	\$1,799	\$0	\$5,434	1/1/2013	12/31/2014
Kloske	Office of Naval Research	-\$41	\$2,427	\$0	\$2,386	5/1/2003	5/31/2006
Lembke	Office of Naval Research	-\$1	-\$1	\$0	-\$2	6/1/2004	4/30/2011
Locker	Florida Fish and Wildlife Conservation	\$103,814	\$40,039	\$0	\$143,853	5/31/2011	3/31/2014
Luther	Greater Tampa Marine Advisory Council	\$38,493	\$0	\$0	\$38,493	4/9/2004	3/6/2019
Luther	Florida Fish and Wildlife Conservation	-\$31,395	\$0	\$0	-\$31,395	5/15/2007	8/14/2011
Luther	SRI International	-\$42	\$0	\$0	-\$42	1/15/2008	6/30/2011
Luther	University of Maryland	\$18,713	\$8,795	\$0	\$27,508	6/1/2011	5/31/2014
Luther	Florida Fish and Wildlife Conservation	\$0	-\$9,919	\$31,395	\$21,476	10/5/2011	3/31/2012
Luther	Texas A & M Research Foundation	\$46,078	\$21,657	\$0	\$67,734	6/1/2011	5/31/2016
Luther	Florida Fish and Wildlife Conservation	\$30,201	\$14,799	\$0	\$45,000	5/25/2012	9/30/2012
Mann	National Science Foundation	\$847	\$381	\$0	\$1,228	8/15/2007	7/31/2012
Mann	National Science Foundation	\$8,528	\$1,318	\$0	\$9,846	8/15/2007	7/31/2012
Mann	National Science Foundation	\$13,465	\$2,856	\$0	\$16,321	4/15/2010	3/31/2014
Merz	Southeast Coastal Ocean Observing Region	\$24,083	\$8,856	\$0	\$32,939	6/1/2011	11/30/2012
Merz	Southeast Coastal Ocean Observing Region	\$22,014	\$10,897	\$0	\$32,911	9/1/2012	8/31/2013

ACTIVE RESEARCH AWARDS

Mitchum	University of Colorado	\$824	\$383	\$0	\$1,206	6/26/2007	6/25/2012
Mitchum	University of Colorado	\$0	\$0	\$0	\$0	6/26/2007	6/25/2012
Mitchum	National Aeronautics & Space Admin	\$2,610	\$1,227	\$0	\$3,836	7/12/2008	7/11/2014
Mitchum	Earth and Space Research	\$19,947	\$2,906	\$0	\$22,853	10/1/2008	9/30/2013
Mitchum	University of Colorado	\$13,567	\$3,585	\$0	\$17,152	10/1/2008	9/30/2013
Mitchum	University of Colorado	\$56,559	\$22,960	\$0	\$79,520	10/1/2008	9/30/2013
Mitchum	US Geological Survey	\$4,965	\$8,278	\$0	\$13,243	7/15/2012	7/14/2017
Muller	University of Puerto Rico	\$0	-\$1,995	\$0	-\$1,995	2/1/2008	1/31/2011
Muller	Environmental Protection Agency	-\$8,669	\$0	\$0	-\$8,669	8/26/2008	2/28/2011
Muller	Florida Fish and Wildlife Conservation	\$57,660	\$8,649	\$0	\$66,310	10/4/2010	6/30/2014
Muller	Florida Sea Grant College	\$29,868	\$0	\$0	\$29,868	1/15/2012	1/31/2013
Muller	Consortium for Ocean Leadership	\$3,764	\$3,091	\$0	\$6,855	2/3/2012	1/31/2014
Muller-Karger	National Science Foundation	\$244,568	\$50,886	\$0	\$295,454	7/31/2009	11/30/2014
Muller-Karger	National Science Foundation	\$8,329	\$2,291	\$0	\$10,620	7/31/2009	11/30/2014
Muller-Karger	Roffers Ocean Fishing Forecasting Srvc	\$0	\$0	\$5,070	\$5,070	6/1/2009	5/31/2012
Muller-Karger	National Aeronautics & Space Admin	\$189,764	\$81,937	\$0	\$271,701	11/1/2009	10/31/2014
Muller-Karger	University of Central Florida	\$9,987	\$0	\$595	\$10,582	10/1/2010	12/31/2011
Muller-Karger	UAV Collaborative	\$45,717	\$17,288	\$0	\$63,005	10/1/2011	9/30/2013
Muller-Karger	Roffers Ocean Fishing Forecasting Srvc	\$22,127	\$10,842	\$0	\$32,970	9/1/2011	8/31/2015
Muller-Karger	Conabio-FFB	\$223	\$9,804	\$76,877	\$86,904	8/13/2011	10/9/2012
Muller-Karger	Environmental Protection Agency	\$79,579	\$38,014	\$0	\$117,593	6/1/2012	5/31/2015
Muller-Karger	Exxon Mobile Corporation	\$10,224	\$32,886	\$56,890	\$100,000	4/1/2012	12/31/2012
Muller-Karger	National Aeronautics & Space Admin	\$20,688	\$0	\$0	\$20,688	9/1/2012	8/31/2015
Murawski	Natl Oceanic & Atmospheric Admin	\$37,337	\$6,534	\$0	\$43,872	6/1/2011	12/31/2013
Murawski	Natl Oceanic & Atmospheric Admin	\$23,571	\$0	\$0	\$23,571	6/1/2011	12/31/2013
Murawski	Natl Oceanic & Atmospheric Admin	\$180,116	\$25,369	\$0	\$205,486	10/1/2011	9/30/2014
Murawski	Gulf of Mexico Research Initiative	\$1,487,416	\$133,256	\$0	\$1,620,672	9/1/2011	9/17/2015
Murawski	Gulf of Mexico Research Initiative	\$14,173	\$6,945	\$0	\$21,118	9/1/2011	9/17/2015
Murawski	Gulf of Mexico Research Initiative	\$190,901	\$93,541	\$0	\$284,442	9/1/2011	9/17/2015
Murawski	Gulf of Mexico Research Initiative	\$90,319	\$44,256	\$0	\$134,575	9/1/2011	9/17/2015
Murawski	Gulf of Mexico Research Initiative	\$134,474	\$59,512	\$0	\$193,986	9/1/2011	9/17/2015

ACTIVE RESEARCH AWARDS

Murawski	Gulf of Mexico Research Initiative	\$150,814	\$41,474	\$0	\$192,288	9/1/2011	9/17/2015
Murawski	Gulf of Mexico Research Initiative	\$103,593	\$50,761	\$0	\$154,353	9/1/2011	9/17/2015
Murawski	Gulf of Mexico Research Initiative	\$48,652	\$23,839	\$0	\$72,491	9/1/2011	9/17/2015
Murawski	Gulf of Mexico Research Initiative	\$93,635	\$36,674	\$0	\$130,310	9/1/2011	9/17/2015
Murawski	Gulf of Mexico Research Initiative	\$104,617	\$51,262	\$0	\$155,879	9/1/2011	9/17/2015
Murawski	Gulf of Mexico Research Initiative	\$113,137	\$55,437	\$0	\$168,575	9/1/2011	9/17/2015
Murawski	University of Miami	\$24,966	\$0	\$0	\$24,966	8/1/2012	12/31/2012
Murawski	University of Miami	\$72,747	\$19,980	\$0	\$92,726	9/1/2012	8/31/2014
Patten	University of North Carolina	\$7,294	\$0	\$274	\$7,567	4/20/2010	12/31/2012
Paul	University of Georgia	\$24,889	\$3,111	\$0	\$28,000	1/8/2010	7/31/2014
Paul	Florida Sea Grant College	\$40,055	\$18,486	\$0	\$58,542	2/1/2010	1/31/2013
Paul	Office of Naval Research	\$6,366	\$1,655	\$0	\$8,021	5/1/2010	11/30/2012
Paul	Gulf & South Atlantic Fisheries Foundati	\$0	\$0	\$0	\$0	8/1/2010	12/1/2013
Paul	Mote Marine Laboratory	\$215	\$105	\$0	\$320	5/1/2011	4/30/2014
Paul	University of Georgia	\$40,080	\$5,010	\$0	\$45,090	11/6/2011	7/31/2014
Paul	Mote Marine Laboratory	\$15,036	\$7,443	\$0	\$22,479	5/1/2012	4/30/2013
Paul	National Science Foundation	\$0	-\$204	\$0	-\$204	10/1/2002	9/30/2007
Paul	National Science Foundation	\$0	\$313	\$0	\$313	10/1/2002	9/30/2007
Peebles	Post, Buckley, Schuh & Jernigan, Inc.	\$72,000	\$0	\$0	\$72,000	1/12/2009	2/28/2013
Peebles	Natl Oceanic & Atmospheric Admin	\$102,754	\$25,689	\$0	\$128,442	8/1/2010	7/31/2014
Peebles	Natl Oceanic & Atmospheric Admin	\$20,422	\$3,574	\$0	\$23,996	8/1/2010	10/31/2012
Peebles	University of Miami	\$177,937	\$39,344	\$0	\$217,281	8/1/2012	7/31/2014
Peebles	University of Miami	\$24,359	\$9,744	\$0	\$34,103	7/31/2012	7/31/2014
Peebles	Atkins North America, Inc.	\$68,887	\$138,229	\$0	\$207,116	10/1/2012	2/28/2017
Peebles	Scheda Ecological Associates, Inc.	\$0	\$3,500	\$0	\$3,500	2/26/2013	3/31/2013
Rhodes	Southwest Florida Water Management	\$0	\$0	\$11,112	\$11,112	3/24/2010	5/30/2012
Rhodes	National Aeronautics & Space Admin	\$49,663	\$17,052	\$0	\$66,715	8/23/2010	11/22/2014
Rhodes	University of Miami	\$121	\$57	\$0	\$178	11/1/2010	10/31/2012
Rhodes	University of Miami	\$7,953	\$2,831	\$0	\$10,784	7/1/2011	6/30/2013
Rhodes	University of Miami	\$13,005	\$5,202	\$0	\$18,207	7/1/2011	6/30/2013

ACTIVE RESEARCH AWARDS

Ryan	National Science Foundation	\$55,434	\$20,034	\$0	\$75,468	9/15/2010	8/31/2014
Sanberg	Florida Board of Governors	\$31,515	\$0	\$0	\$31,515	8/1/2008	6/30/2014
Shevenell	Consortium for Ocean Leadership	\$24,950	\$0	\$0	\$24,950	8/1/2012	9/30/2013
Shevenell	National Science Foundation	\$1,522	\$753	\$0	\$2,275	4/1/2013	3/31/2016
Stallings	Florida State University	\$4,288	\$1,072	\$0	\$5,360	9/1/2011	8/31/2014
Stallings	Department of Commerce	\$68,610	\$17,152	\$0	\$85,762	9/1/2012	8/31/2014
Stallings	Florida Sea Grant College	\$8,556	\$4,235	\$0	\$12,791	10/1/2012	9/30/2014
Stallings	Florida State University	\$4,347	\$435	\$0	\$4,781	3/1/2013	1/31/2014
Stallings	Florida Fish and Wildlife Conservation	\$5,335	\$6,855	\$0	\$12,190	4/10/2013	9/30/2015
Subramanian	GKSS Research Centre	\$0	\$537	\$22,548	\$23,085	4/6/2010	12/31/2010
Torres	National Science Foundation	\$6,321	\$2,845	\$0	\$9,166	8/1/2007	8/31/2013
Torres	National Science Foundation	\$3,756	\$1,765	\$0	\$5,521	9/1/2008	8/31/2013
Torres	Florida Sea Grant College	\$18,019	\$0	\$0	\$18,019	12/21/2012	1/31/2014
Weisberg	FL Department Environmental Protection	\$0	\$229	\$0	\$229	8/10/2006	8/9/2007
Weisberg	Southeast Coastal Ocean Observing Region	\$62,351	\$30,552	\$0	\$92,903	6/1/2011	11/30/2012
Weisberg	Southeast Coastal Ocean Observing Region	\$71,187	\$6,684	\$0	\$77,871	6/1/2011	11/30/2012
Weisberg	Southeast Coastal Ocean Observing Region	\$0	\$0	\$0	\$0	6/1/2011	5/31/2012
Weisberg	Southeastern Universities Research Assoc	\$800	\$200	\$0	\$1,000	8/1/2011	4/30/2013
Weisberg	Florida State University	\$204,780	\$100,342	\$0	\$305,122	10/1/2011	12/31/2014
Weisberg	Florida State University	\$147,336	\$76,222	\$0	\$223,558	10/1/2011	12/31/2014
Weisberg	Florida State University	\$97,111	\$47,230	\$0	\$144,341	10/1/2011	12/31/2014
Weisberg	Southeast Coastal Ocean Observing Region	\$109,728	\$31,318	\$0	\$141,046	9/1/2012	11/30/2013
Weisberg	Southeast Coastal Ocean Observing Region	\$87,326	\$43,226	\$0	\$130,553	9/1/2012	5/31/2013
Weisberg	National Aeronautics & Space Admin	\$35,140	\$17,394	\$0	\$52,534	1/10/2013	1/9/2017