This brief fulfills ICOOS Act requirement [12304(c)(3)(L)] for NOAA as the lead federal agency to report annually to the IOOC “... on the accomplishments, operational needs, and performance of the System to contribute to the annual and long-term plans....”

I’ll discuss IOOS accomplishments in CY2013. I’ll identify priorities for 2014 and seek to have a discussion on areas of collaboration for 2014.
Table of Contents

• FY2013 Accomplishments by IOOS Subsystem
• IOOS Works in the Regions
• IOOS Works across Federal Agencies
• FY2014 Priorities
• Glossary of Acronyms
I will addresses IOOS accomplishments by subsystem.
The IOOS Advisory Committee (IOOS AC) began a discussion which will continue into 2014 on how to optimize a business model for U.S. IOOS, resulting in recommendations to the NOAA Administrator and the IOOC likely in 2014.

David Legler (as IOOC Co-Chair), Linda Lillycrop and Brian Melzian (as IOOC members) served as Ex Officio Committee members in 2013 per the IOOS AC Committee bylaws.

Meetings are open to the public, and we encourage you to attend if you’re able.

The committee’s next meeting is April 15-16, 2014 in Washington, DC.
The ICOOS Act expired in 2013. While the Act is still undergoing reauthorization consideration, the status of requirements completed through 2013 is posted on the IOOS website.

Specifically, we made great progress in developing and vetting the final rule for certification of RICEs, and expect the rule to be published shortly.
The document *US IOOS: A Blueprint for Full Capability* defines 37 core functional areas that are required for a fully capable IOOS.

These capabilities all relate to the management of IOOS as a national endeavor, so they focus on “central functions” as defined in the ICE. While many of these functions are currently performed by the IOOS Program Office, the blueprint is agnostic as far as who performs the function. So, any participating partner who performs the function for the national system that is US IOOS counts towards full capability.

We performed an assessment of our capabilities in March of 2012 and again in October 2013. You see in the table that we improved the number of Core Functional Areas rated as “full capability” as well as reduced the number of CFAs where we had no capability. These improvements were based on three factors:

- Work efforts that demonstrated a new or improved capability such as the COMT, the Glider Plan, DMAC SOS Version 1 and RICE Certification
- An improved understanding of the strength of the RA efforts in education and their role in bringing IOOS customers together in their specific geographic areas
- Better understanding of what will be required at “full capability.” In 2012 we were cautious in our ratings in some cases, because we were unsure that we had the resources to preform some functions in a fully built-out IOOS. We now know a lot more about workloads and we were able to increase some ratings.
National or across US IOOS Community –

- **Ocean Acidification Program (OAP)** - The partnership expanded, along with the investment by IOOS and OAP in OA monitoring and monitoring technologies nationwide. Regional networks are emerging in the Northeast (NECAN) and Chesapeake Bay (CBAN). Developing a program-level agreement, OAP investment in the RAs.

- **Marine Biodiversity Observation Network (Marine BON)** - NOPP FFO published in August; proposals were received in December. Extensive interagency negotiations expected after proposals are ranked. FFO sought proposals for projects that demonstrate how an operational Marine Biodiversity Observation Network (Marine BON) could be developed for the nation by establishing one or more prototype networks in U.S. coastal waters, the Great Lakes, and the EEZ.
  - Continuing to brief inside NOAA and with interagency partners to expand funding. Interest is growing: NOAA Administrator requested a brief in August 2013. Discussions underway with Smithsonian’s Tennenbaum Observatories about how Marine GEO and Marine BON are complementary.

- **IOOC Organizational Network (ION)** – Progress was made toward the goals of documenting the comprehensive network of ocean observing organizations that operate regionally, nationally, and globally, and identifying gaps to leverage coordination opportunities to enhance GOOS/IOOS efforts.
• **Post-Summit work** continued as the IOOC Post-Summit Task Team reviewed priority recommendations, and prepared approaches to accomplish priorities. Work will continue in 2014.

• **Industry Partnerships** – Marine Industry Study being conducted. Industry Workshop planned for April 2014. Partnerships with:
  - San Francisco Exploratorium
  - Xprize - XPRIZE – affordable pH sensors: XPRIZE (www.xprize.org), the global leader in incentivized prize competitions, announced the launch of its next major competition: the $2 million Wendy Schmidt Ocean Health XPRIZE. On the heels of the successful Wendy Schmidt Oil Cleanup XCHALLENGE, the Wendy Schmidt Ocean Health XPRIZE aims to spur global innovators to develop accurate and affordable ocean pH sensors that will ultimately transform our understanding of ocean acidification, one of the gravest problems associated with the rise in atmospheric carbon dioxide (CO2). http://oceanhealth.xprize.org
  - The Maritime Alliance - Zdenka spoke at the 5th Annual Blue Tech & Blue Economy Summit sponsored by The Maritime Alliance
  - CODAR
  - MTS Tech Surge: MTS/NOS hosted TechSurge in Crystal City, VA. In our view, Superstorm Sandy provided an excellent example of a US IOOS led integrated effort (Fed and non-Fed) with key regional partners that optimized the effectiveness and efficiencies of NOAA’s National Ocean Service and National Weather Service products and services.

**International -**

**Ocean Tracking Network (OTN)** – Collaborative work with this Canadian research group is ongoing to develop the Animal Telemetry Network (ATN).

**GOOS Regional Alliances** – IOOS Program Office Director chairs the Global Ocean Observing System Regional Council and has been asked by the GOOS Regional Alliances to continue on as the Chair of the council for an additional 2 year term. In 2013, the GOOS Regional Council:

• completed the first ever assessment of the GOOS Regional Alliances; and,
• wrote a new GOOS Regional Alliance policy that was approved by the Intergovernmental Oceanographic Commission General Assembly meeting in June.

In her role as the GOOS Regional Council Chair, IOOS Program Office Director attends the GOOS Steering Committee meetings and also attended the first meeting of the First Technical Expert Workshop for the GOOS Biology and Ecosystem, and GOOS Biogeochemistry Panels in Townsville, Australia in Nov. 2013.
Group on Earth Observations (GEO) / US GEO

IOOS Program Office Director is 1 of 3 Vice Chairs for US GEO along with Vice Chairs from NASA and USGS.

- Vice Chairs support the Senior Steering Committee for US GEO, the members of which are at the Assistant Secretary level from NASA, USGS & NOAA. Vice Chairs also:
  - Provide staff support to the US delegation to GEO
  - Participate on the White House Task Force on Earth Observations

- Internationally, for GEO, the US is 1 of 4 Co-Chairs who lead the GEO leading the plenary and Executive Committee. Co-Chair countries are:
  - USA – Dr. Sullivan, Asst Secretary of Commerce & Acting Under Secretary for Oceans and Atmosphere (NOAA Administrator)
  - China, South Africa and European Union.

Advisory roles to international groups:

- Ocean Tracking Network – IOOS Program Office Director is a member of the advisory board and has aided in developing relationships with OTN and IOOS partners, including IOOS RAs (OTN sponsored gliders during Gliderpalooza and also works with PacIOOS on animal tagging projects), and international partners such as IMOS and the UK. In February 2014, Zdenka will speak on an OTN panel at the American Association for the Advancement of Science (AAAS) Annual Meeting. She will give a talk on “Animal Telemetry as a Key Part of Ocean Observing Systems”.

- International Advisor to the EU’s Gliders for Research, Ocean Observation, and Management (GROOM) Program. GROOM is a European Union funded design study to evaluate the requirements for a sustainable glider infrastructure. The program will greatly advance the operational and scientific use of profiling gliders. As a member of the GROOM international advisory board, the IOOS Director participated in the general assembly meeting held in June 2013 in Trieste, Italy. At that meeting, U.S. IOOS, GROOM, and Australia’s IMOS were able to agree on two joint glider data management efforts:
  - To harmonize use of netCDF for global variables within 6-8 months
  - To address the BUFR template for distribution on the World Meteorological Organization – Global Telecommunications System (GTS), through the JCOMM Data Management – Task Team on Table Driven Codes.
FY2013 Accomplishments

Governance and Management
Data Management and Communications
Observations
Modeling and Analysis
Research and Development
Education and Outreach
Data management under IOOS grew in 2013.

**DMAC workshop held in September** - DMAC coordinators from the 11 Regional Associations, Federal data management experts from 7 NOAA offices, USACE, USGS, BOEM, and MMC discussed progress-to-date in FY13 and activities in FY14. Highlights included:

- Implementation of SOS services (i.e. THREDDS, 52N and ncSOS) that IOOS data providers are setting up;
- Discussion on the Systems Integration Test the IOOS Program Office plans for FY14. Test is tied to an IOOS Summit Recommendation and also support’s the National Ocean Service priority for Coastal Intelligence;
- IOOS Biological Data Services Enrollment Procedures describe the publication process of biological data via web services. Philip Goldstein (USGS / OBIS-USA) and Hassan Moustahfid (U.S. IOOS) showed the different types and steps for making data available through this process.
- Steve Rutz (NOAA’s National Oceanographic Data Center) led a discussion about setting up an automated process to archiving data at NODC.
- John Kerfoot, MARACOOS discussed the IOOS Glider Data Assembly Center (DAC) design and plans.
- Tony Lavoi, NOAA’s Geospatial Information Officer discussed the national geospatial landscape, marine planning, and IOOS and geospatial coordination.
- Discussion on certification, quality control, and data management plans;
- Anna Milan, from NOAA’s National Geophysical Data Center, talked about the IOOS registration process and its components. Registering your data is critical to making it discoverable.
- Jamie Kinney (Amazon) led a discussion about Amazon Web Services and the valuable features and capabilities that can be ascertained from working in the cloud.
DMAC Achievements in 2013 include at a national scale:

- 11 IOOS Regions (or RAs) with Data Access Services;
- Functional and useful Catalog;
- Critical mass of client software;
- First implementation by a private company of IOOS Sensor Observation Service (SOS): Satlantic is the first private company to offer data access through a Sensor Observation Service (SOS). Satlantic is an advanced ocean technology company that develops optical sensors and systems for aquatic research and water quality monitoring.
- QARTOD Manuals published for Temp/Salinity and Quality Flags.

All 11 IOOS regions increased data availability and access in 2013. For example:

PacIOOS – released a mobile device-friendly version of Voyager.

PacIOOS Hawai‘i Tiger Shark Tracking Page:

In an effort to explain the recent shark attacks around Maui, researchers at the University of Hawai‘i Institute of Marine Biology (HIMB) tagged several tiger sharks in late 2013. Funded by the State of Hawai‘i Department of Land and Natural Resources (DLNR) Division of Aquatic Resources (DAR), the satellite SPOT tags were attached to the sharks’ dorsal fins and obtain data when they breach the ocean surface. PacIOOS presents this data on both PacIOOS Voyager and the newly developed Hawai‘i Tiger Shark Tracking project page. After choosing a shark ID number on the left sidebar, users can watch the animation of each tagged shark's voyage. Hovering over specific points provides the time and date that the event took place. The purpose of the study is to examine whether Maui sharks are more "site-attached" and whether they exhibit greater use of inshore habitats than other sharks tagged around Hawai‘i.

PacIOOS tracks Marine Life: Voyager's "fish and wildlife" category now includes a new "tracking" folder where users can plot or animate the motion of various marine life over time. This includes Hawaiian monk seals, loggerhead turtles, Galapagos sharks, and tiger sharks. While the loggerhead turtles can be followed across the Pacific Ocean, the seals and sharks were located in Hawaiian waters. This records the path of an individual over a certain time period and can provide insights about its habitat and behavior. Data were provided by NOAA's Pacific Islands Fisheries Science Center (PIFSC) (seals and turtles) and the UH Hawai‘i Institute of Marine Biology (HIMB) (Galapagos and tiger sharks).
PaciOOS Serves Data on Radionuclide Levels around Hawai‘i following Fukushima Accident: PaciOOS collaborated with researchers from the University of Hawai‘i at Mānoa to make the results of a study on the radionuclide levels around the Hawaiian Islands after the Fukushima Da-ichi nuclear power plant accident widely available to the public. The researchers, funded by the National Science Foundation, concluded that Hawai‘i’s surface ocean is safe from significant radiocesium footprints from the March 2011 Fukushima power plant explosion. Due to short half-lives, the uniformity of distribution, and Kuroshio extension currents, radioactive cesium levels have not been detected in the Main Hawaiian Islands.

NOAA Benthic Habitat Layers for Insular Pacific Now in PacIIOOS Voyager: To supplement the main Hawaiian islands, Voyager's "benthic habitats" category now contains NOAA shallow-water benthic habitat maps for other PacIIOOS regions throughout the Insular Pacific, including islands in American Samoa, the Commonwealth of the Northern Mariana Islands (CNMI), Guam, and Palau. Layers provided by NOAA National Centers for Coastal Ocean Science (NCCOS).

PaciOOS Voyager – New Data Layers inclue:

- Hawai‘i Beach Water Quality Monitoring- coastal water quality measurements sampled by the Beach Monitoring Quality Assurance Program of the State of Hawai‘i Department of Health (DOH) Clean Water Branch (CWB);
- Hawai‘i Beach Safety - nearshore and offshore safety conditions based on the popular Hawai‘i Beach Safety website;
- Spatial Distribution of Tagged Tiger Sharks - for more information, please visit Carl Meyer and Kim Holland's Shark Research page at HIMB, Aquarius Sea Surface Salinity;
- Weekly and monthly global sea surface salinity from NASA's Aquarius mission and using updates by NOAA OceanWatch;
- Spatial Distribution of Coral Reefs - "fish & wildlife" category now includes a global spatial distribution map for coral reefs. Compiled in 2010 from numerous data sources by UNEP-WCMC and the WorldFish Center in collaboration with the World Resources Institute and The Nature Conservancy, this is the highest resolution global coral reef dataset to date; the majority (85%) of the data mapped at 30-meter resolution; and;
- Samoa region high resolution wave models.

NANOOS (IOOS Region in Pacific Northwest)

NANOOS exposing new Canadian real-time data: NANOOS is now serving up a new in-situ near-real-time asset on NVS from Vancouver Island University (VIU), a NANOOS member located in Nanaimo, BC (Canada). The monitoring site is at the Deep Bay Marine Field Station in Baynes Sound, part of the VIU Centre for Shellfish Research (CSR). From their web site: "The Deep Bay Marine Field Station supports both pure and applied coastal and marine research activities related to: sustainable shellfish aquaculture development; preservation of coastal ecosystems; and inter-disciplinary projects involving local communities." Thanks to station manager, Brian Kingzett, for first approaching (cont next page)
NANOOS about this collaboration in 2012 and overcoming the challenges that came up. Brian and his tech Ben Al worked with NANOOS to put all the data streaming pieces in place and populate NVS metadata. Accomplishing this was made easier by the NANOOS-Pacific Coast Shellfish Growers Association monitoring partnership in Washington and Oregon, which resulted in common recommendations for sensors, sensor software, and data streaming protocols within the Pacific NW shellfish growing community.

**NANOOS released new version of NANOOS Visualization Service (NVS):** NVS provides users with a simple interface in which to access observations, forecasts and satellite overlays from a wide range of ocean and coastal assets. With the release of NVS v3, NANOOS is now in a position to transition to the development of dedicated web-based applications (web apps) that can be directed at the needs of any user group, accessible through an intuitive “app” like an interface on a user's PC, Mac, or LINUX based machine.

**GLOS (IOOS Region in the Great Lakes)**

**Data Portal – Serving up EPA Data:** The GLOS Data Portal is the central repository for Great Lakes data hosted by GLOS. The Data Portal provides access to a large number of datasets including a few that are not accessible via the map interface that appears when the tool is accessed. One of these datasets is STORET which is managed by EPA.

- As EPA states: “The STORET (short for STOrage and RETrieval) Data Warehouse is a repository for water quality, biological, and physical data and is used by state environmental agencies, EPA and other federal agencies, universities, private citizens, and many others.” In order to access STORET and other datasets, Data Portal users should make use of the Search function which is located in the upper right-hand corner of the Portal interface.

**SECOORA (IOOS Region in the Southeast)**

**Enhancing access to National Center for Coastal Ocean Sciences data through IOOS services:** The IOOS Program (Rob and Hassan), NCCOS (Kirk Yedinak) and SECOORA (Vembu Subramanian) are collaborating on an effort to make NCCOS chemical, physical and biological data available from SECOORA's ERDDAP service.
This slide describes the data integration strategy under development within NOAA/OAR’s Climate Observation Division, which manages a significant proportion of the US contribution to the Global Ocean Observing System, which is the blue water ocean component of US IOOS.

How it Works:

• Real time data flows from in situ ocean sensors through the WMO Global Telecommunications Service (GTS) into the OSMC database.

• From there, we use a popular server called ERDDAP (developed at NOAA/NMFS) to provide "REST" services to access and discover the data. REST (REpresentational State Transfer) refers to a very flexible approach to data access, in which the URL describes the desired data and its format. For ocean data a REST request can produce a custom data subset, pre-formatted to the needs of an application (e.g. KML format for Google Earth) as well as metadata, images, and analyzed results.

• Users are able to access the data directly through their preferred science applications (see right hand side of slide); they never see a "file" nor concern themselves with file formats.

(click the slide animation) The same data integration strategy is being used for the Climate Observation Division-designated Data Archive Centers (DACs), which provide climate-quality, QC’d versions of the same data.
FY2013 Accomplishments

Governance and Management
Data Management and Communications
Observations
Modeling and Analysis
Research and Development
Education and Outreach
Thanks to the efforts of the international community developed over the last 2 decades, we are now observing the surface and global upper ocean systematically for the first time in history.

Argo floats are yellow triangles, blue circles are surface drifters, red boxes are surface moorings.

Thanks to the efforts of OAR’s Climate Program Office, and NOAA’s many international partners, in any given 3-day period, over 1.8M in-situ obs (complemented by satellites) give us a coarse estimate of the global ocean state. International programs such as Argo, GLOSS (sea-level), Oceansites (ocean sentinel moorings), along with satellites from NASA and NOAA now allow us to describe historical variability and provide up-to-date conditions of the global oceans – next slides.

- However, we have far less information about the subsurface, as well as regionally specific conditions (e.g.) polar regions.
- Remotely sensed mostly limited to atmosphere and upper meters of the ocean
- Satellite observations need validation and calibration from one mission-to-another

JCOMMOPS provides technical coordination of global in-situ ocean observing and cooperates closely with the OSMC - Observing System Monitoring Center - to develop near real-time monitoring tools for use by observing system managers. While JCOMMOPS maintains each individual platform metadata and provides the status of each network, the OSMC focuses on reporting the state of the ocean by demonstrating how the requirements are met in terms of variables and timeframes across all in situ ocean observing systems. I invite you to visit these websites and use these tools.
While most of the regional effort went into sustaining existing assets, IOOS Regions did add observing capacity in 2013. Examples follow:

**SECOORA**

- The USACE Field Research Facility (FRF), in conjunction with Scripps Institute of Oceanography, has deployed two Waverider buoys in southeastern NC. Data is available through the SECOORA data portal.
- The Acoustic Doppler Current Profiler (ADCP) Lab at Florida Institute of Technology (SECOORA member institution) has resumed real-time meteorological, wave, and current measurements at Sebastian Inlet State Park, FL.
- Through funding from SECOORA IOOS, water level measurement was recently restored at the USF COMPS Shell Point in-shore coastal meteorological/tidal station. The water level data, in conjunction with the meteorological data, are a valuable resource for state and local emergency managers and National Weather Service personnel.

**Federal Assets in the Southeast**

- Panama City Beach Tide Station: CO-OPS has installed a new tide station at Panama City Beach, Florida (Russell's Pier).
- Charleston Harbor PORTS® Declared Operational: On May 20th, 2013 a new Physical Oceanographic Real Time System (PORTS®) in Charleston Harbor, SC was declared operational and data made available to the public.
**SECOORA**

New Water Quality Stations: Florida Atlantic University (FAU), Harbor Branch Oceanographic Institute (HBOI) has installed two real-time water quality monitoring stations in the Indian River Lagoon to support the long term multi-disciplinary ecosystem based approach to monitoring of the lagoon. HBOI will acquire and deliver high-accuracy and high-resolution physical, chemical and biological data in near real-time (e.g. air-temperature, wind speed and direction, relative humidity, salinity, chlorophyll, nitrates, phosphates, water temperature, turbidity). Work is underway to publish and provide access to the data via FAU and SECOORA websites.

**PacIOOS**

American Samoa Water Quality Sensor Reporting Data in Near-Real-Time (Nov. 2013): Thanks to a great partnership with the NOAA’s Center for Operational Oceanographic Products and Services (NOAA CO-OPS), the American Samoa Nearshore Sensor is back in the water and is serving near-real-time data. The sensor collects local water quality data every four minutes and measures water temperature, salinity, chlorophyll, turbidity (cloudiness), and water pressure. These data are essential for a variety of users including agencies, planners, mariners, and the general public. Data from the American Samoa sensor is available via PacIOOS Voyager and the PacIOOS Water Quality Platforms webpage.

Mokapu Wave Buoy Re-Deployed

A break in the weather allowed PacIOOS researchers aboard UH Kilo Kai to successfully re-deploy the wave buoy off Mokapu, O’ahu on November 18, 2013.

PacIOOS Wave Buoys Re-Deployed in Ipan, Guam and and Lāna’i, Hawai’i: PacIOOS teamed up with Cabras Marine Corporation to re-deploy the Waverider Directional Wave Buoy in Ipan in early August. In addition, Young Brothers, Ltd. helped get the Kaumalapau Wave Buoy back in the water off Lāna’i.

New PacIOOS Wave Buoy: With the assistance of Young Brothers, Ltd., PacIOOS successfully deployed a new wave buoy off Hanalei, Kaua’i. Check out the data, directional spectra plots, and forecasts on the PacIOOS website.

**CariCOOS**

CariCOOS deploys buoy #5 (Sept. 2013): The Caribbean Coastal Ocean Observing System (CariCOOS), worked with the U.S. Coast Guard to deploy the buoy in time for what is typically the busiest part of hurricane season. The buoy measures wave heights, wave direction, wind speed, wind direction, air temperature, salinity, barometric pressure, and ocean currents in Vieques Sound. Vieques Sound hosts a large recreational boating community and the buoy placement comes in response to consultations with the U.S. Coast Guard, as well as recreational and local government stakeholders.
NERACOOS

New Buoy in Long Island Sound – NERACOOS/EPA partnership: Every summer, parts of Long Island Sound experience hypoxia or low oxygen conditions that can be harmful to marine life. Last year, the NERACOOS funded buoys in the Sound recorded one of the earliest occurrences of hypoxia in the last 20 years. The buoy array was expanded this year though an EPA funded project at the University of Connecticut to deploy an ARTG buoy in a part of the Sound that is not as severely impacted by hypoxia. The site of this important new addition to the NERACOOS array was chosen by scientists and managers so that it will be the first to detect the improvements to water quality expected from regulations adopted by New York and Connecticut.

NERACOOS Buoys Support Red Tide Forecast in 2013: The spring and summer red tide of 2013 in New England is expected to be "moderate" according to the forecast released by Woods Hole Oceanographic Institution (WHOI). Ocean and weather data from the Gulf of Maine buoys play an important role in this forecasting effort.

GCOOS

Louisiana Universities Marine Consortium (LUMCON) Upgrades Environmental Monitoring Stations: LUMCON, a GCOOS data provider, is upgrading the environmental monitoring systems at its Marine Center in Cocodrie and in the middle of Terrebonne Bay. A substantial investment in new equipment, logging capabilities and software started last spring.

GLOS

GLOS Weather Buoy to Aid Forecasters: GLOS coordinates the Nearshore Network which provides critical data used by NOAA National Weather Service forecasters in their challenging work. Funded by NOAA's Coastal Storms Program, GLOS is pleased to join with NOAA and LimnoTech in announcing the 2013 deployment of a buoy off Michigan’s west coast that will increase the availability of observation data used by the National Weather Service in Grand Rapids.

GLOS/GLERL Weather Buoy to Aid Forecasters in West Michigan: The buoy has been relocated halfway between two of the busiest boating and beach communities on the Great Lakes, the Grand Haven and Holland areas. The buoy is the first of its kind in the Great Lakes to be outfitted with a webcam that is capable of transmitting high resolution images and video clips over the internet on a regular basis.
• 130 HF Radars operating in the network now. Includes 2 HF Radars on the East Coast of Canada operated by the Canadian Coast Guard.

• Oil Spill Response: Operationally used for Cosco Busan, 2007; Deepwater Horizon, 2010.

• Search and Rescue (SAR): Integrated into the operational US Coast Guard SAR operations (SAROP) program; deployed in the mid-Atlantic in 2009 – Extension Nationwide in 2011-2012.

• Emerging Homeland Security needs: The Maritime Security Technology Program (MTP) of DHS S&T includes a project to expand the use of HF Radar to provide increased Maritime Domain Awareness (MDA) and Homeland Security.

As part of the international Group on Earth Observation work plan 2012-2015 we have launched the global HF radar task. We have held 2 meetings to date and have 10 countries signed up. See www.ioos.gov for more information.
Anticipated Outcomes

Long Term Goals:

- Make HF radar data available in a single standardized format in near real time
- Develop a Worldwide QA/QC standard
- Develop easy-to-use standard products
- Assure HF radar data assimilation in ocean and ecosystem modelling
- Develop emerging uses of HF radar in the areas of ecosystem, tsunami, and climate.

Short Term Actions:

- Form working groups to address specific HF radar network topics
- Create an assets map to display the locations of existing HF radar sites and collect the websites where HF radar data is available
- Create a GEO Global HF Radar page at U.S. IOOS website that can be linked to by multiple participants with access from multiple websites. **COMPLETED.**
Launch of the GEO HFR portal. Radars from US, Canada, Australia, Spain, and Korea

**Advances in High Frequency Radar:**
Years of work to transition the U.S. HFR network to an operational system succeeded in moving from a system of individual radars to a comprehensive national network tied together through a common data architecture, set of practices, and national plan. The IT infrastructure is scalable to go global, and is something we can pursue. Other nations are now starting to use HFR operationally in the areas of navigation, oil spill, search and rescue and harmful algal bloom forecasting and working together we will be able to share best practices. Working together will accelerate research in emerging uses, including ingest into models and informing ecosystem and climate research.

**Global HF Radar Task:**
U.S. IOOS' HF Radar Program manager is a co-chair for the Global HF Radar network task within GEO’s Blue Planet Initiative and the GEO 2012-2015 Workplan. The workplan endorses the task of advancing a Global HF Radar Network for data sharing and delivery and to help expand HF radar networks for surface current and wave measurements. Three working groups have been established under the task – Data Management, Applications, and Deployment. A townhall meeting was held in Bergen, Norway in June in conjunction with the MTS Ocean Sciences meeting which focused on the three topics of the Working Groups plus Radio Frequency Sharing. The working groups have held three training webinars this year. To date, 19 countries are participating in the Global HF Radar effort.
Some Examples of Glider Missions: Supports Fisheries management

The California Cooperative Oceanic Fisheries Investigations (CalCOFI) are a unique partnership of the California Department of Fish and Game, NOAA Fisheries Service and Scripps Institution of Oceanography. The organization was formed in 1949 to study the ecological aspects of the sardine population collapse off California. Today our focus has shifted to the study of the marine environment off the coast of California, the management of its living resources, and monitoring the indicators of El Nino and climate change. CalCOFI conducts quarterly cruises off southern & central California, collecting a suite of hydrographic and biological data on station and underway. The gliders are able to occupy the lines continuously therefore we can get a more complete picture of what is going on in the ecosystem. Gliders helps us understand the onset of El Nino and La Nina.

The Atlantic sturgeon, which is one of the world’s oldest species of fish, can live up to 60 years, reaching a length of 15 feet (4.6 meters) and a weight of over 800 pounds (360 kg). It’s also endangered, due to past overfishing for its caviar. In order to protect the sturgeon that are left, it’s important to keep fishermen from catching them accidentally. That’s why researchers at the University of Delaware and Delaware State University are calling upon satellites, and an underwater robot known as OTIS for research on sturgeon.

A large dramatic phytoplankton bloom occurred 2 summers ago in the Mid-Atlantic Bight. These are natural events and phytoplankton form the base of the marine food web. The “bloom” of phytoplankton is almost as large as the state of New Jersey and is easily visible in satellite imagery. These events are driven by ocean circulation patterns and this bloom off southern New Jersey does not appear to be related to outflow from the Hudson river. Measuring DO and impact on fish and most especially shell fish that can not move.

Gulf of Mexico – Gliders outfitted with Brev Buster help in the operational GOMEX HAB bulletin.

Hurricane Irene in Mid-Atlantic – Glider was able to pick up the mixing and POST processing showed that with the right SST initial conditions that intensity forecast could be improved.

DWH: Sentinels to evaluate cross-shelf transport of hydrocarbons; 41,000 casts.

Arctic Research to understand the flow of oil.
Goals of Gliderpalooza included to:

1. Provide a unique data set to modelers
2. Provide a standardized dataset over ecological scales and information on fish/mammal migrations
3. Provide a 3-D snapshot of the MAB cold pool
4. Provide an extensive distributed network through the peak period of fall storms, demonstrating "surge" capacity
5. Demonstration of a national glider network
6. Proof of data flow through IOOS to NDBC via DMAC
7. Engage undergraduates in ocean observing efforts.

Summary:
On 5 December the last Navy glider was picked up, officially ending Gliderpalooza 2013. With over 15 partners, the gliders provided over 25,000 profiles. Thanks are due to MARACOOS partner Rutgers University for having the idea, leading the implementation, coordination and operational control; to our Canadian partners in the Ocean Tracking Network who made this not only an interagency event but an international event and set up the first marine animal east coast “picket line”; to the National Data Buoy center for their 24x7 data distribution and quality control to the Global Telecommunication System; to the IOOS Program Office and MARACOOS for setting up an IOOS Glider Data Assembly Center in time for the event and ensuring all the data was captured for future studies; and finally to every one of the glider operators for their participation. (Z-Gram 12/2013)
Mission/Vision

- This is the first draft of a National Glider Network Plan. It was developed after the workshop was held at Scripps Institute last August. A steering team and several workshop participants contributed to authoring this document.
- Workshop participants included representatives from several agencies and Regional associations.

- It also serves as the third national plan that IOOS has put together and hopefully we are starting to develop a standard format to these plans.

- It advocates maintaining sustained glider lines around the coastal US to take advantage of profiling gliders and improve subsurface monitoring and implementing a Data Assembly Center to serve glider data, using standardized glider data formats

- Education role of plan

- The plan is being reviewed by IOOS Regional Associations and IOOC.
Examples of Regional IOOS Use of Gliders:

**PacIOOS A’a Wave Glider:** "A’a" is a wave glider mission from Liquid Robotics, Inc. to the Papahānaumokuākea Marine National Monument (Northwestern Hawaiian Islands). During its entire journey, this unmanned ocean robot transmits measurements of wave height, direction, and period every thirty minutes. It also measures ocean currents every hour. After departing the leeward side of Big Island on October 23, A’a headed north. On November 8-12, the glider began circling the waters surrounding the Monument and eventually started its way back home.

**GCOOS:** TAMU-GERG Deploys a Second Glider in the Western Gulf of Mexico. In early October, Texas A&M University Department of Oceanography (TAMU) and the Geochemical and Environmental Research Group (GERG) deployed a second Teledyne Webb Research Slocum G2-200m glider in the southwestern Gulf of Mexico. This is TAMU-GERG's second glider mission and the first multi-week mission. The glider will fly along the shelf in waters 500 - 1000 meters deep collecting salinity, temperature, dissolved oxygen, fluorescence, and color dissolved organic matter (CDOM) data. The mission started on 2 October 2013 about 80 nautical miles southwest of Corpus Christi Bay, Texas. The mission will last approximately three weeks with the glider being recovered near the Flower Garden Banks. GCOOS has developed a glider viewer for the TAMU-GERG mission. To follow the glider's progress and observe the data collected, please visit [http://gcoos.org/products/maps/GERG/glider201310/](http://gcoos.org/products/maps/GERG/glider201310/).

**GCOOS** - Highlighting Glider Research in the Gulf of Mexico. GCOOS has started a multi-part feature focusing on the new Slocum gliders at Texas A&M University.

**MARACOOS: Underwater robot seeks out endangered sturgeons:** Through the generosity of a private donor, but leveraging the US IOOS-MARACOOS infrastructure, an acoustic telemetry glider (OTIS) was developed and is flying on a 3-month mission searching for endangered Atlantic sturgeon

**MARACOOS deploys Challenger glider** - On Friday 11 January, Challenger was deployed off of Cape Town, South Africa by a team consisting of Dave Aragon, JP, Ashley, Sinekhaya (Sea Technology Services) with Pieter Truter driving the boat while Tina Haskins, Rutgers, ran the computer on shore. Challenger deployed just 10 miles from shore out of Cape Town where the water just about reaches 100m depth. Challenger joins Silbo who is battling unfavorable currents to the North. Keep up with the 2 gliders as they make their way westward across the Atlantic to Brazil.
FY2013 Accomplishments

Governance and Management
Data Management and Communications
Observations

Modeling and Analysis
Research and Development
Education and Outreach
National and Regional Model Advances

Nationally:
- IOOS Coastal & Ocean Modeling Testbed progressed in year 2
- Visit testbed.sura.org for more information

Regionally:
- NANOOS – announced new seasonal forecast capability
- PacIOOS – developed 2 new high res wave models for Samoa

**PacIOOS: 2 new high resolution regional wave models for the Samoa region:** Two wave models have been included in the PacIOOS Voyager application, an interactive map interface for visualizing and downloading oceanographic observations, forecasts, and other geospatial data and information. They are NOAA WaveWatch III (NWW3), at approximately 5-km or 0.05-degree resolution for the Samoan Islands region surrounding both Samoa and American Samoa, and Simulating WAves Nearshore (SWAN), at approximately 500-m resolution for Tutuila Island in American Samoa. Each of these new datasets come from Dr. Kwok Fai Cheung of the Department of Ocean and Resources Engineering (ORE) in the School of Ocean and Earth Science and Technology (SOEST) at the University of Hawai‘i at Mānoa. These models complement our existing global and regional NWW3 forecasts (Hawaiian Islands, Mariana Islands) as well as our SWAN collection in Hawai‘i and Guam.

**New PacIOOS Models:** PacIOOS is serving a high resolution regional atmospheric model for the Samoan Islands region, including the islands in both American Samoa and Samoa. This Weather Research and Forecasting (WRF) model provides 7-day forecasts of surface air temperature, wind, rain, humidity, and air pressure that are updated hourly. Model runs are produced by Dr. Yi-Leng Chen of the Department of Meteorology in the School of Ocean and Earth Science and Technology (SOEST) at the University of Hawai‘i at Mānoa (UHM). Dr. Brian Powell, SOEST at UHM is producing Regional Ocean Modeling System (ROMS) models that provide 7-day, daily average forecasts of water temperature, currents, salinity, and sea surface height at various depths for Guam and the Commonwealth of the Northern Mariana Islands (CNMI).
PacIOOS supports NOS’ Office of Response and Restoration (OR&R): OR&R, NOAA’s authority on spill response, participated in a town hall conference call with Senator Schatz, HI, to help answer questions of where the molasses water that comes out of Keehi Lagoon flows. OR&R’s Ruth Yender provided the presentation, which was well received as she emphasized because it drove home the point that everyone is in tune with all the available data out there, both from NOAA and non-Federal partners such as PacIOOS. The Office of Response and Restoration's Emergency Response Division has been working with the Hawaii Department of Health's Hazard Evaluation and Emergency Response Office and state and federal partners to assess the large underwater plume of molasses and reduce risks to marine life in the area. Data from PacIOOS included UH ROMS and HF Radar as it contributes to the models.

PacIOOS provides 7.5 day wave prediction models: The new forecasts provide 7.5 days of predicted wave height, period and direction—updated twice per day.


High Resolution Atmospheric Models Now Available for Guam and CNMI: PacIOOS now runs two new high resolution regional atmosphere models for the Mariana Islands region (CNMI at approximately 12-km resolution and Guam at approximately 3-km resolution). These Weather Research and Forecasting (WRF) mesoscale numerical weather prediction models provide hourly, 7-day forecasts of surface air temperature, wind, rain, humidity, and air pressure.

NANOOS announces new seasonal forecast capability: NANOOS announced its collaboration with JISAO's Seasonal Coastal Ocean Prediction of the Ecosystem (J-SCOPE). J-SCOPE is a seasonal forecast system for the Washington and Oregon coasts. J-SCOPE forecasts SST, chlorophyll, hypoxia, sardine habitat, and regional climate indices 6-9 months into the future. J-SCOPE is a partnership between NOAA’s Northwest Fisheries Science Center, JISAO and NANOOS; and is funded by NOAA's Fisheries And The Environment (FATE) program. Kudos to the NOAA FATE project team including: Samantha Siedlecki, JISAO; Isaac Kaplan, NOAA NWFSC; Nick Bond, JISAO; Al Hermann, JISAO; Troy Tanner and Jan Newton (NANOOS); and several collaborators at NOAA NWFSC, UW Coastal Modeling Group, and NOAA PMEL. For more information, please go to the following link: http://www.nanoos.org/products/j-scope/
Upgrades to CeNCOOS COAMPS Atmospheric Model: The Naval Research Laboratory has developed a new configuration for its CeNCOOS COAMPS atmospheric model domain. The entire California coast is now contained within the 4 km, high resolution, innermost grid. Forty-eight hour forecast fields are available [here](#) as well as on the GODAE server, which also hosts archived model data.

CariCOOS - High-Resolution Nearshore Wave Model reaches one year of continuous operations: The CariCOOS High-Resolution Nearshore Wave Model launched in October 2012 attained a 99.3% availability level during its first year of operation. This high-resolution operational wave model includes "nested grids" at a spatial resolution ranging from 1.1 km to 60 meters that allow visualization of nearshore wave details in selected sub-regions. An evaluation of model performance using their buoy network has shown a significant improvement over other models used in the Region. The CariCOOS model is forced by WW3 spectral data at the boundaries and the wind forcing is based on NWS NDFD data; the best wind model currently available. CariCOOS has also developed very high resolution model domains for San Juan Bay and the coastal beach town of Rincon.

MARACOOS Partner shows Hoboken, NJ flooding from Sandy: Dr. Alan Blumberg, Stevens Institute of Technology has produced an eye opening inundation animation for Hoboken's flooding when Sandy came through. Calculations of flooding are from sECOM their latest version of Princeton Ocean Model. [http://vimeo.com/70902259](http://vimeo.com/70902259)

CeNCOOS in Action: New ROMS Surface Current Trajectory Product: A new forward particle trajectory animation product made available online for use.
Yearly mean SSTA (°C, relative to 1981–2010 average) from ERSST (bar) and HadISST (blue line) for 1950–2012 (bar) and OISST for 1982–2012 (black line) averaged over the global ocean (State of the Climate 2012)

These analyses are based on satellite data plus in-situ data (supported by NOAA/OAR’s Climate Program Office)
Global average ocean heat content anomaly 0-700m continues to be warm, but has not risen much in the last five years (even though the atmosphere continues to warm) - where is the excess heat going?

Time series of annual average global integrals of in situ estimates of upper (0–700 m) Ocean Heat Content Anomaly (OHCA) for 1993–2012 with standard errors of the mean. There are different estimates (different colored lines) depending on bias corrections of the observational data.

These curves are based on data (e.g. XBT and Argo) supported by NOAA/OAR’s Climate Program Office. This product is also supported by NOAA/OAR’s Climate Program Office.

- The CSIRO/ACE CRC estimate (smoothed by a 3-year running mean) and its uncertainties are up-dated following Domingues et al. (2008).
- The PMEL/JPL/JIMAR estimate is a weighted integral (Lyman and Johnson 2008) using data and instrument bias corrections described in the text with uncertainty estimate methodology following Lyman et al. (2010).
- The NODC estimate (http://www.nodc.noaa.gov/OC5/indprod.html) follows Levitus et al. (2012). Uncertainties are estimated solely from the variance of quarterly estimates of OHCA.
- The Hadley estimate is computed from gridded monthly temperature anomalies (relative to 1950–2012) calculated from EN3 v2a data following Palmer et al. (2007). An updated version of the instrument bias corrections of Gouretski and Reseghetti (2010; V. Gouretski, personal communication) was applied. Uncertainty estimates follow Palmer and Brohan (2011).
- For comparison, all estimates have been individually offset (vertically on the plot), first to their individual 2004–12 means (the best sampled time period), and then to their collective 1993–2012 mean (the record length).
FIG. 3.27. (a) The 2012 annual mean SSH anomaly from the 1993–2012 baseline compared with the 2012 sea level anomaly computed from tide gauges (dots). Altimeter data from NASA and NOAA. The Global Sea Level Observing System (observations plus international coordination) is supported by NOAA/OAR’s Climate Program Office.

Annually-averaged sea level during 2012 reflects the La Niña pattern that dominated the tropical Pacific and Indian Oceans at the start of the year (Fig. 3.27a). The Pacific decadal oscillation (PDO) index was consistently negative throughout 2012, as it has been since mid-2010. The 2012 sea level field is characteristic of a negative PDO phase with low sea level anomalies along the eastern boundary that extend westward across the basin, particularly at low latitudes (Merrifield et al. 2012; Zhang and Church 2012). At midlatitudes in the North Pacific, high sea levels occurred associated with anomalous wind forcing in the Aleutian Low region. Over the Southern Ocean, a broad region of negative sea levels persisted west of the southern tip of South America. Annual sea levels were generally high in the tropical Indian Ocean. Sea level in the Atlantic Ocean was high north of the Gulf Stream extension and low south of this region.
FY2013 Accomplishments

- Governance and Management
- Data Management and Communications
- Observations
- Modeling and Analysis
- Research and Development
- Education and Outreach
Deep Argo floats will allow full-depth profiles (initially of T and S) to 6000m (reminder that Argo profiles only to 2000m).

Southwest Pacific was selected because we can locate a large area of nearly constant depth for the array and because the signals are very stable allowing for evaluation of the precision of the instruments over time.

Full notes from slide bullets originally provided by David Legler (edited for space on the slide):
- 1\textsuperscript{st} prototype Deep SOLO (developed at Scripps Institution) deployment of the coast of California 24 Jan 2013
- 2\textsuperscript{nd} prototype float completed; 2\textsuperscript{nd} deployment will be > 5000 m, planned for Jan-Feb 2014.
- Deep APEX (developed by Teledyne-Webb) has been operated to 6000 m off Hawaii and Puerto Rico. The two instruments are quite similar in shape and configuration.
- Deployment of a “full depth“ (~6000 m) pilot array comprised of both instrument types, cycling at 10-day intervals scheduled for June 2014 in the Southwest Pacific. Array will be recovered after one year for calibration and evaluation.
Members of the Ocean Observatories Initiative (OOI) team continue to make progress on a number of fronts including test activities leading up to upcoming deployments of infrastructure equipment and development of tools that will ultimately allow the user community to connect with the OOI.

The OOI Education and Public Engagement component passed an Initial Operating Capability (IOC) Review for Release 3 of the EPE tools. The EPE will develop five online tools: 1) educational visualization tools, 2) an ontology-linked concept mapping tool, 3) a lab lesson builder, 4) an educational resource database, and 5) an integrated web interface. Follow the OOI Website for updates on these tools and more information about the EPE component.

The OOI EPE team, led by Rutgers, is building a suite of software interfaces and web-based tools that will allow educators to bring the ocean into learning environments. Collectively, these tools will provide easy access for the development and use of educationally appropriate scientific data visualizations. These tools will facilitate broader access to OOI data for undergraduate educators and free choice learners by translating OOI science themes into educational materials.

Earlier this fall the members of the OOI team participated in some key outreach events on both the East and West Coasts to spread the news about the OOI. The OOI participated as part of a larger Consortium for Ocean Leadership presence at the OCEANS 2013 MTS/IEEE conference in San Diego, CA, and also at a National Science Foundation STEM Science and Education Fair in Dulles, VA.

The OOI Team participates in a number of public science & education events each year. Please visit the Events Section of the OOI Website to see past events and continue to visit our OOI Website for information on upcoming happenings. Click here for more information on the OOI Education and Public Engagement. Please continue to visit the OOI Website for updates and other program news and events.
IOOS Announces new Marine Sensor Innovation Project: There are 3 components to the program:

1 - Sensor Evaluation: This function was awarded to the Alliance for Coastal Technologies who were awarded $1M in FY13.

2 - U.S.IOOS Coastal Ocean Modeling Testbed (COMT): In September 2013, the Southeastern University Research Association (SURA) successfully competed for a two year award with the ability to extend the award to five years. For the two years the total dollar amount is $3.2M. Year one dollars are $1M. Projects include: Hypoxia: Estuarine and Gulf of Mexico, Inundation in island regions, West Coast Modeling Project and Cyber Infrastructure.

3 - Marine Sensor and advanced observing technology transition: 2 projects were selected for funding in FY13:
   - Transitioning new ocean acidification sensor technology to support shellfish industry monitoring and develop the technical workforce’s capacity to work with these sensors. $574,000 to fund projects in AOOS, NANOOS, CeNCOOS, SCCOOS and PacIOOS to develop ocean acidification sensor technology to support West Coast and Alaska shellfish industry monitoring needs, improve measurements of the state of ocean acidification in the Pacific Islands, and develop workforce capacity to work with ocean acidification sensors.
   - Transitioning the Environmental Sample Processor (ESP) for harmful algal bloom monitoring – 340,000 through Northeast IOOS Regional Association in support of Woods Hole Oceanograhic Institute and McLane Industries efforts to transition cutting-edge observing platforms monitoring the emergence of harmful algal blooms and improve harmful algal bloom forecasts in the Gulf of Maine.
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<th>FY2013 Accomplishments</th>
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Governance and Management
Data Management and Communications
Observations
Modeling and Analysis
Research and Development

Education and Outreach
Education and Outreach

Highlights include:

- NERACOOS sponsors Drifter for Global Learning Charter School
- GCOOS *Eco Hero* game wins award
- IOOS HF Radar included at Exploratorium

***IOOS HF Radar and support to Exploratorium***: With Pier 15 as the backdrop, the Exploratorium now includes an HF Radar set up by CeNCOOS member San Francisco State University. The team at the Exploratorium is working on visualizations that will stream the data in real-time to the visitors. CeNCOOS board member Mary Miller told me she is very excited about bringing ocean observations to life for the public. Her goal is to connect San Francisco Bay to the global ocean and explain the importance of the bay and ocean on our daily lives.

***Three IOOS videos***: OA – significant PR for NOAA and NOS; HAB and Search and Rescue. IOOS OA video reached roughly 40,000 people between our social media roll-out and the NOS podcast sharing. NOS says it is one of their most successful podcasts of all time!

***Podcast on animal tagging/telemetry***

***Educating the next generation of scientists*** is a strong tenet for the U.S. IOOS community. For example IOOS’ Caribbean Coastal Ocean Observing System (CariCOOS) has teamed up with NOAA’s Puerto Rico’s Weather Camp to introduce coastal weather and ocean observing tools. The purpose of the camp is to broaden and increase exposure of high school students to academic programs, career opportunities, techniques, and research in atmospheric sciences, meteorology and oceanography. In 2012, the U.S. Virgin Island Marine Action Group sponsored the first student from USVI. On average there are 15 students per class and more than 45% of the previous attendees stayed in the meteorology or oceanography fields.
**GCOOS Eco Hero Game Wins Gulf Guardian Award:** Eco Hero is an interactive, conservation game to understand the environmental value of the Gulf of Mexico and to “bridge the gap” between research conducted within the Gulf and the relevance of scientists’ findings to our everyday lives. The game was funded by a NOAA grant to the GCOOS-RA, which was subcontracted to the Institute for Marine Mammal Studies-Center for Marine Education and Research (IMMS-CMER), MS. Game exhibits were developed for five informal learning centers throughout the Gulf of Mexico, including four Coastal Ecosystem Learning Centers (the Florida Aquarium, Dauphin Island Estuarium, AL, Audubon Aquarium of the Americas, LA, and Texas State Aquarium), and the IMMS-CMER. Additional exhibits were subsequently leveraged for other facilities, and a portable version of the game was created for public outreach events. The intellectual content of the Eco Hero game reflects the collective expertise of the 23-member GCOOS Education and Outreach Council, representatives from each of the informal learning centers, and several subject matter experts. The company MindClay Creative, Inc., partnered with IMMS-CMER and the GCOOS-RA to render the game characters and help translate the science in a fun, engaging way. The importance of the sharing of expertise that went into the creation of the Eco Hero game was recognized through award to the GCOOS-RA and IMMS-CMER of the prestigious U.S. Environmental Protection Agency Gulf of Mexico Program’s Gulf Guardian Award in the Civic/Nonprofit category that recognizes “the businesses, community groups, individuals, and agencies that are taking positive steps to keep the Gulf healthy, beautiful, and productive.” The success of the Eco Hero game exemplifies innovative solutions that develop when we pool resources and look for creative ways to positively impact our quality of life and economic well-being. The award reinforces the value of having a stakeholder-driven GCOOS-RA to leverage multi-institutional, interdisciplinary experts to address shared challenges facing the communities and ecosystems of the Gulf of Mexico.

**NERACOOS Sponsors Drifter for Global Learning Charter School Students:** Students from the Global Learning Charter Public School (GLCPS) in New Bedford, Massachusetts, deployed an ocean drifter this month thanks to NERACOOS. The GLCPS class spent their first semester studying sea surface currents, tides, and waves. This semester they are learning about marine biology and ecosystems. The drifter data will be used to make connections between the physical and biological components of the ocean. Assembling, deploying, and tracking the drifter will prove how the GLCPS capitalizes on the exceptional resources of our region and tie these resources to their curriculum and instruction. The workshop was hosted by NERACOOS, the Massachusetts Marine Educators, and the Northeast Fisheries Science Center. The GLCPS students will be following their drifters on [www.neracoos.org/drifters/globalcharter](http://www.neracoos.org/drifters/globalcharter) every day in their classrooms. To learn more about the drifter program, and to see the other schools who built and deployed drifters this year, visit visit [http://neracoos.org/drifters](http://neracoos.org/drifters) and [http://www.nefsc.noaa.gov/drifter/](http://www.nefsc.noaa.gov/drifter/). NERACOOS will be co-sponsoring another workshop in September with the [Gulf of Maine Marine Educators](http://www.nefsc.noaa.gov/drifter/).
CariCOOS builds regional ocean observing skills training: For the past 5 years, CariCOOS had provided students with relevant opportunities to develop regional knowledge in the US Caribbean. Graduate and undergraduate students, mostly from Engineering, Marine Sciences, Physics and Math disciplines, have participated in summer internships and graduate research projects under the mentorship of various program investigators. During this "hands-on" training, students have had the opportunity to work on diverse topics within an interdisciplinary and collaborative environment. Research topics explored by CariCOOS students include storm surge (Juan Gonzalez and Ernesto Rodriguez), nearshore wave modeling (Carlos Anselmi), ocean acidification (Melissa Melendez), waves hydrodynamics (Andre Amador), coastal morphodynamics (Patricia Chardon), ocean circulation modeling (Edgardo Garcia), rip current numerical modeling (Estefania Quinones), ROMS ocean current simulations (Edward Rivera) and analysis of surface currents using high frequency radars (Luis Pomales). CariCOOS students have proven to be highly competitive. Some are currently employed at the National Weather Service Forecast Office in San Juan, Puerto Rico, while others are in private industry. Several are pursuing doctoral degrees in well recognized institutions such as Notre Dame University, Scripps Institution of Oceanography at the University of California San Diego, the University of Delaware, and Stevens Institute of Technology.

SCCOOS, CeNCOOS and NANOOS jointly hosting a one-year fellowship with the West Coast Governors Alliance (WCGA) Regional Data Framework (RDF). This West Coast Oceanographic Data Integration Fellowship is located at the SCCOOS program office at Scripps Institution of Oceanography in La Jolla, CA. It focuses on the identification of priority regional management questions and information needs to be informed by West Coast oceanographic data products and the development and distribution of those products.

PacIOOS Celebrates Earth Day and World Oceans Day: PacIOOS was excited to celebrate Earth Day this year with a number of partners. At the Mauka to Makai Environmental Expo at the Waikiki Aquarium (sponsored by the City and County of Honolulu's Department of Environmental Services and the State of Hawaii's Department of Health Clean Water Branch) and the Moloka'i Earth Day event sponsored by The Nature Conservancy (TNC), PacIOOS offered hands-on water quality activities for children and their families. During the Marine Advanced Technology Education (MATE) Remotely Operated Vehicle (ROV) competition, PacIOOS offered real-world insight into the theme of the competition: ocean observing. For World Oceans Day, PacIOOS joined the efforts of the Friends of Kewalos in their annual basin park clean up to teach participants about water quality and how to measure it. At the Waikiki Aquarium, PacIOOS was a main attraction with four different exhibits: Shark Tagging; Ocean Forecasting; Water Quality; and PacIOOS Voyager.
US-IOOS-NERACOOS: Science Center Event Engages Public on Ocean Acidification and IOOS®: On World Ocean Day, June 8, the Northeast region of the U.S. Integrated Ocean Observing System (IOOS) hosted a public event at the Sea Coast Science Center in Rye, New Hampshire, to highlight ocean acidification. Hands-on activities helped teach children about the importance of a healthy ocean, while adults watched a short film on ocean acidification featuring third-generation ocean explorer Fabien Cousteau.

First Ever IOOS Photo Press Release: Working closely with NANOOS and NOAA public affairs, we released the first-ever IOOS photo press release, highlighting the Earth Day cruise to redeploy IOOS-NANOOS buoy with OA sensors. Teachers "make a splash" on Earth Week
IOOS has been featured in various publications this year including Sea Technology Magazine, Signal Magazine, NOAA Press Releases, Marine Scientist, Marine Technology, and completed the 2013 Report to Congress.

The Gliderpalooza press release was picked up by over 15 (awaiting exact number from Jennie) media outlets, including the New York Times, Discovery Channel, Fox News, and NPR.

Video on ocean acidification: [http://www.ioos.noaa.gov/ocean_acidification/welcome.html](http://www.ioos.noaa.gov/ocean_acidification/welcome.html)
**Products and Services**

**SCCOOS: The Cardiff Beach Erosion and Inundation Project:** As part of the SCCOOS Coastal Hazards, this program is developing a field-validated, site-specific model for use in providing real-time warnings of wave- and tide-induced inundation. After a reliable model is developed, inundation warnings will be disseminated to users via the Internet and/or automated phone calls. The objective is to understand the physics at work, and to help answer relevant management questions. Model predictions are expected to improve with additional observations and feedback on the accuracy of the inundation warnings from end-users. Potential impacts of beach nourishments (or a lack of beach nourishments) include effects on lobster and other biota, surfing, cliffs, tourism, Hwy 101, and the Amtrak rails. SCCOOS and Sea Grant specifically support outreach on local beach management issues. Ongoing monitoring includes building a database of sand level changes and waves at local beaches.

**Yukon River Salmon Fishery Forecast:** Joint NOAA's National Marine Fisheries Service, Alaska Fisheries Science Center in partner with US IOOS-AOOS and National Weather Service Alaska. The project uses NWS and other sources of meteorological and oceanographic information to do a three-week ahead forecast of fishery performance. The weather-driven environmental cues that shape the fish behavior have concluded before the migration starts, so the forecast is of the timing of the migration, not the weather. At present we have 52 years of biological response measurements and a good working hypothesis of how the physics interacts with the biology to determine the migratory timing (phenology) on which the fishing regulations are based. Although we use statistical models, we do so because we lack the numerical modeling support that would allow us to develop and parametrize the primitive equations describing the evolution of the migration as functions of the rates of change in salinity at key locations in the migratory pathway, and because the statistical relationships are very strong and easily produced.
**GLOS: New beach safety information - Great Lakes beach app adds hazard alerts:** As swimming season begins in the Great Lakes, the Great Lakes Commission has released new tools to ensure people’s time spent at the beach, hitting the waves and cruising the waters is safe and fun. To help protect swimmers from dangerous currents, the Great Lakes myBeachCast smartphone application (app) now features beach hazard statements issued by the National Oceanic and Atmospheric Administration (NOAA). To download myBeachCast, go to beachcast.glin.net. Funded by the Great Lakes Restoration Initiative, the Great Lakes Commission, in partnership with the Great Lakes states, LimnoTech and the GLOS, has developed myBeachCast to provide convenient, public access to swim advisories and other environmental conditions information for more than 1,800 beaches in the Great Lakes region.

**GLOS/GLERL Weather Buoy to Aid Forecasters in West Michigan:** The buoy has been relocated halfway between two of the busiest boating and beach communities on the Great Lakes, the Grand Haven and Holland areas. The buoy is the first of its kind in the Great Lakes to be outfitted with a webcam that is capable of transmitting high resolution images and video clips over the internet on a regular basis. Images from the webcam will be used by NOAA weather forecasters to verify current conditions and to estimate visibility on the water.

**AOOS: Wave Buoy Assists Mariners in Region Known for Extreme Weather and Strong Currents:** On July 15th, a wave and weather buoy was deployed in the Bering Strait approximately 35 miles west of King Island. The buoy streams real-time information on waves, wind, air surface temperature, and sea surface temperature on an hourly basis, and can be accessed through the AOOS real-time sensor map. The goal of the buoy is to assist village residents, National Weather Service forecasters, the U.S. Coast Guard, commercial and recreational ships, and anyone else transiting the region which is known for extreme weather and strong currents.

**SECOORA – New Water Quality Stations:** Florida Atlantic University (FAU), Harbor Branch Oceanographic Institute (HBOI) has installed two real-time water quality monitoring stations in the Indian River Lagoon to support the long term multi-disciplinary ecosystem based approach to monitoring of the lagoon. HBOI will acquire and deliver high-accuracy and high-resolution physical, chemical and biological data in near real-time (e.g. air-temperature, wind speed and direction, relative humidity, salinity, chlorophyll, nitrates, phosphates, water temperature, turbidity). Work is underway to publish and provide access to the data via FAU and SECOORA websites.
Ocean Acidification in the Northeast: NERACOOS and NOAA’s Ocean Acidification Program have launched the Northeast Coastal Acidification Network (NE-CAN) representing a nexus of scientists, federal and state agency representatives, resource managers, and affected industry partners dedicated towards coordinating and guiding regional observing, research, and modeling endeavors. The purpose is to better identify critical vulnerabilities, particularly with respect to regionally important and economically significant marine resources. If you are interested in participating in or want to find out more please visit www.neracoos.org/necan. There you can join the NE-CAN list-serve to keep up to date with ocean acidification activities in the region. The first webinar was held November 12, and by signing up for the list-serve you will get information on future seminars.

SCCOOS in Action: Detected Red Waters From La Jolla to Carlsbad, California in October: SCCOOS harmful algal bloom monitoring program not only provides data, but also is a resource for news, weekly updates, and programmatic information. SCCOOS works alongside CeNCOOS, to monitor for HABs at 8 piers along the California coastline.

GCOOS Member Blucher Institute Receives $2 Million for Coastal Safety Monitoring: The Conrad Blucher Institute for Surveying and Science (CBI) at Texas A&M University-Corpus Christi and GCOOS member, was awarded a $2 million grant from the Texas General Land Office (TGLO) to install four “Sentinels of the Coast” data collection stations by mid 2015.

Robotic Sensing System Provides Real-Time Information on Harmful Algae And Pathogens: Now available on NANOOS’s data portal: NOAA’s Northwest Fisheries Science Center has partnered with NANOOS to provide live data on harmful algae and pathogens at shellfish growing areas. Data are obtained using an advanced robotic sampling and analysis unit called an Environmental Sample Processor (ESP). Bravo Zulu to: Stephanie Moore, NOAA NWFSC lead PI of the project; John Stein, NOAA NWFSC Director & NANOOS governing council member; and Emilio Mayorga & Troy Tanner, NANOOS DMAC, and Brent Roman, the MBARI software engineer, who collectively worked the electrons to make this data serving partnership happen! The wet end of this project is another collaboration of many; Steph worked with Taylor Shellfish, MBARI, UBC, WA DOH, COS, and others at the NWFSC, as shown on the NVS credits tab.

MARACOOS launches fishing-specific interface: MARACOOS provides real-time data based on measurements made with a wide variety of in-water gear, satellites and weather stations; four daily models; and data management. A fishing-specific interface is available at mymaracoos.org. Streaming and downloadable information includes: Chesapeake Bay buoy system acoustic data, water levels, water column temperatures from sea surface to ocean bottom, salinity and chlorophyll levels, wave heights and directions, wind and current speeds, marine frontal movement, water quality, and by-catch data.
SECOORA Supports Coast and Ocean Portal for the Governors' South Atlantic Alliance: The Governors' South Atlantic Alliance (GSAA) launched the beta version of the GSAA Coast and Ocean Portal, available at www.gsaaportal.org. The Portal was developed by a diverse team of experts led by SECOORA. It is an online toolkit and resource center that consolidates access to state, regional, and federal datasets into one location.

CeNCOOS in Action: Shore Station Webpage Beta Release – A new shore station webpage has been released as a beta version. The site provides access to data from all CeNCOOS-supported shore stations. Each of the eleven station pages has a latest conditions display of recent data as well as detailed station information and data download access. AIS ship tracking upgraded to include the recommended tracks through the Monterey Bay National Marine Sanctuary for vessels carrying hazardous cargo in bulk and for vessels over 300 gross tons. The Transportation Separation Schemes (TSS) for the San Francisco and Los Angeles areas have also been added as a map layer.

NERACOOS and NROC (the Northeast Regional Ocean Council) are breaking ground again with the Northeast Sentinel Monitoring Project for Climate Change. The project kicked off with enthusiasm as over 45 regional experts attended the all day workshop on June 27th at the Seacoast Science Center in Rye, NH. Modeled after the Long Island Sound Study these dedicated scientists will be identifying and designing a plan to observe key climate change indicators from Long Island Sound to Nova Scotia over the next year.

NERACOOS - Renewable Ocean Energy Spinning up in New England - NERACOOS information is playing a key role in the development and testing of ocean based renewable energy projects in the Northeast. With a twelve year archive of hourly data, reliable streams of real-time observations and regional forecasts of ocean conditions, many stakeholders in this growing industry are using NERACOOS information to support their renewable ocean energy projects. A recent and exciting example is the launch of the first North American based offshore wind turbine by the University of Maine’s Advanced Structures and Composites Center and their partners.

GCOOS Launches Invasive Species Tool: Working with GCOOS-RA member Dr. Jorge Brenner from The Nature Conservancy, and incorporating information from the U.S. Geological Survey (USGS), the National Oceanic and Atmospheric Administration (NOAA), and other regional institutions, GCOOS Geographic Information Systems specialist Dr. Shinichi Kobara has created an interactive map that allows users to track the spread of lionfish (Pterois volitans, Linnaeus, 1758), in the Gulf of Mexico, Caribbean Sea, and western Atlantic Ocean.

GCOOS Drift Cards Dropped In Gulf Can Reveal Ocean Current Data Coming soon to a beach near you: a “drift card” washing up on Gulf of Mexico shores that is part of a research project at Texas A&M University to study ocean currents.
AOOS produced 2013 Chinook Salmon Run Forecast.

Great Lakes Boaters’ Forecast Tool: GLOS launched their expanded Boaters’ Forecast tool that now covers the entire Great Lakes - http://data.glos.us/boaters/. The tool provides information on water currents and depth to help boaters plan a safe and enjoyable boating day. The easy-to-use, web-based format was customized to address information needs specific to Great Lakes boaters, including information on marina and boat launch locations. GLOS worked in partnership with New York Sea Grant, NOAA’s Great Lakes Environmental Research Laboratory (GLERL) and the Cooperative Institute for Limnology and Ecosystem Research (CILER) to develop the tool.

IOOS RA MARACOOS Data providing safer navigation: NOAA is using data from a new current meter in New York harbor, operated by one of its academic partners, New Jersey’s Stevens Institute of Technology, to provide enhanced real-time information to mariners travelling through the nation’s second busiest port. The Stevens current meter measures the direction, speed, and volume of ocean currents in the harbor’s navigation channels, north of the Narrows between Brooklyn and Staten Island. Its data will be used in NOAA’s Physical Oceanographic Real-Time System (PORTS®) system.

Industry Arctic Data Now Publicly Available Through AOOS Research Workspace: Signed in August of 2011, a data-sharing agreement between NOAA and three oil companies (Shell, ConocoPhillips, and StatOil) laid the groundwork for AOOS to provide public access to a wealth of oceanographic and environmental data collected between 2008 and 2011 in the Chukchi Sea. The agreement calls for sharing three major data sets in the lease sale areas including: real-time weather and ocean observations, environmental information and sea ice and sea floor mapping data.

NERACOOS supports Bay Pilot: David Gelinas, Penobscot Bay Pilot, gave us a glimpse of what he faces in his job and sent along his appreciation for how NERACOOS contributes to safe, efficient port operations in Penobscot Bay. David needed to pilot a tanker at Monhegan Island coming up from Boston. While the seas at the pilot boarding area were only 4' when the ship left Boston, the NERACOOS wave prediction page showed them to be 8-11' by the time the ship would have been at the boarding area. Dave confirmed that the seas would be too rough and cancelled the job for that day well in advance of the vessel's arrival. The seas eventually reached nearly 20' later that night. Dave set up boarding for 1500 the next day, when the prediction showed a more modest 8' sea with a much longer period between waves. He reported that it was still a challenging boarding, but the ability to so accurately predict the seas and establish a schedule greatly contributed to the safety of the job, as well as provided the shipper with a firm idea of when his ship would come into port.
Underwater Ocean Observing Robots Sniff Out Signs of Toxic Algae: Two autonomous robotic environmental sample processors capable of detecting an algae toxin were deployed off California in March as part of a new ocean-observing network. These underwater laboratories transmit data to shore from a sensor designed by a researcher from the National Centers for Coastal Ocean Science. The sensors detect the presence of domoic acid, an early sign of a particular species of toxic algae. Researchers are integrating these robots into an array of sensors measuring the physics, chemistry, and biology of the ocean to investigate the complex interactions favorable for blooms of this algae species in order to develop more accurate forecast models and to establish an early warning system.

AOOS in Action: Annex #2 to the NOAA – Industry Data Sharing Agreement signed. This annex provides access to $75 million worth of environmental studies collected by ConocoPhillips, Shell and Statoil in the Chukchi Sea between 2008 and 2011. AOOS will become the public access for the data.

New Wave Buoy Pages on PacIOOS Website: Users can now easily access the latest real-time data (for the past 24 hours) from PacIOOS' eleven directional wave buoys across the Pacific in table or graph formats.
NASA and NOAA, Multi-sensor Improved Sea Surface Temperature (MISST) for (IOOS).

Objectives of this joint funded project are to (1) improve and continue generation of satellite SST data and SST analyses in the IOOS DMAC and CF compliant Group for High Resolution Sea Surface Temperature (GHRSST) Data Specification GDS format; (2) distribute and archive these data; and (3) use this improved SST data in applications, many specifically targeted for the IOOS. 22 projects with 28 scientists from industry, academia and government completed this year. A few highlights include:

• Established accessibility via the Southwest Fisheries Science Center's ERDDAP server.

• NAVOCEANO is providing operational L2P GDS 2.0 VIIRS SST, preparing to transition to GDS 2.0 for N-18, N-19, METOP-A GAC, and N-19 LAC, and ready to ingest GDS 2.0 L2P data.

• Implementation and operational production of version 4.0 of the Multi-scale Ultra-high Resolution (MUR) Sea Surface Temperature Data Set.

• All MISST data are operationally archived and made available through IOOS DMAC-compliant services by NODC, which has also enabled LAS access to gridded MISST data.

• The capability for direct assimilation of satellite sea surface temperature (SST) radiances has been implemented in the three-dimensional variational Navy Coupled Ocean Data Assimilation system (NCODA 3DVAR).

• An adjoint-based procedure to determine the impact of assimilation of observations on reducing ocean model forecast error has been integrated into the Navy’s global HYCOM ocean analysis/forecast system.

• A heat budget model for ocean warming over coral reefs of the Florida reef tract has been developed using MISST, reanalysis, and a Coastal Relief Model for reef bathymetry; the model matches annual cycles and extremes of in situ reef temperature at a variety of long-term coral reef monitoring sites.
EPA: After receiving zero funds in 2013 to support the long-standing EPA “BEACHES Monitoring and Notification Program” this program is funded in the FY-2014 omnibus Budget Bill. Funding would allow this program to continue to be a major contributing Human Health related program, providing important information to the U.S. Integrated Ocean Observing System. The program focuses on 5 areas to of improve public health and environmental protection for beach goers and provides the public with info about the quality of beach water: strengthening beach standards and testing; providing faster laboratory test methods; predicting pollution; investing in health and methods research; informing the public. (see http://water.epa.gov/type/oceb/beaches/beaches_index.cfm)

Smithsonian and NOAA/NGS: NGS established a tide station at the Smithsonian’s Marine Station at Fort Pierce, FL to help the Smithsonian Institution better understand sea level change impacts and coastal and marine habitat responses. The collaboration allowed the Smithsonian Institution to develop a pan-Caribbean sea level change impact-monitoring network, based in a large part on the sentinel site program established by NOAA’s National Estuarine Research Reserve System.

US Navy meeting on passive acoustics monitoring (PAM): IOOS Program Office reps discussed with the US Navy’s Robin Fitch standards for passive acoustics monitoring and collaboration opportunities. Robin is Director of Marine Resources and At Sea Policy in the office of the Deputy Assistant Secretary of the Navy for the Environment which is responsible for environmental compliance. She is interested in working with IOOS on standards for the acquisition and quality control of PAM data and on possibly adding unclassified PAM instruments to the emerging IOOS Registry.
Contributions from Across NOAA

Center for Operational Oceanography Products & Services (CO-OPS)

- installed a new tide station at Panama City Beach, Florida (Russell's Pier).
- Installed New Water Level Gauge in San Francisco PORTS®, at the Martinez-Amorco Pier.

**NOAA’s CO-OPS Launches Managed Hosting Service:** CO-OPS began providing a managed hosting service for the NOAA Chesapeake Bay Office’s (NCBO) Chesapeake Bay Interpretive Buoy System (CBIBS) application and servers. The CBIBS system ingests data from ten Chesapeake Bay buoys and provides information via a website that is publicly accessible. CO-OPS is providing hosting services and administrative support for the operating system, while NCBO maintains and operates the functional application and buoys.

**NOAA’s CO-OPS and AOOS integration of Partner CT Sensor at Cordova NWLON Station:** The Center for Operational Oceanographic Products and Services (CO-OPS) integrated CT sensor at the Prince William Sound Science Center (PWSSC) who received funding via the Alaska Ocean Observing System Regional Association to look at the influence of freshwater runoff on oil spill modeling. Conductivity data from the PWSSC sensor is now being recorded and transmitted real-time via the NWLON station system and is being ingested and disseminated via CO-OPS main database.

**CO-OPS / NDBC Partnership:** Met QC Software Released: The Met QC project (CRR-88) was implemented in production on Oct 30 as part of an enhanced data exchange partnership with NDBC. This allows NDBC to:
- switch the retrieval method of CO-OPS data from FTP services to the more reliable method of the IOOS-SOS web services;
- provides CO-OPS with monthly files of quality-controlled data plus flags, and climate summaries; and,
- sends the quality-controlled data to NODC for archival.

This project enables CO-OPS to automatically ingest the quality-controlled time series data and flags and climate summary statistics into new database tables. Over 5.8 million records can be inserted in about 2 min or an average of ~ 0.02ms/record! Prior rate was 10ms/record.

CO-OPS now has the ability to conduct internal assessments using reliable meteorological data sets. These data can be used for long-term climate assessments, validation of hydrodynamic model performance, and will provide a basis for future eco-forecasting development efforts. Climate summaries provide monthly, annual, and cumulative statistics (mean, max, and min) for the period of record that NDBC has retrieved.

**NDBC goes after buoy vandalism:** NDBC has installed cameras on 7 TAO buoys and 1 buoy in the Gulf of Mexico. Bravo Zulu to NDBC for the real-time detection and monitoring of the TAO vandalism. The camera was used to detect and monitor the Venezuelan fishing vessel Cayude as she attached a line to the TAO buoy and started to tug. From there the US Coast Guard was able to warn the vessel, NOAA OCG Enforcement engaged the international fisheries community, and NWS International Affairs and the U.S. State Department engaged the Venezuelan government. This is generating high-level positive attention in a number of areas. Not only have the cameras on the TAOs and in the Gulf shown fishing vessels, but NDBC personnel were also able to monitor the sea state and sky from 8N-110W as TS Alvin passed to the north of the mooring in the Pacific.
Office of Response & Restoration. **NANOOS and ERMA Partnership:** The NANOOS "situational awareness" map layers are now final and available on the ERMA Pacific NW platform: [https://www.era.unh.edu/northwest/erma.html](https://www.era.unh.edu/northwest/erma.html)

NOAA Benthic Habitat Layers for Northwestern Hawaiian Islands Now in PacIOOS Voyager: The maps cover the Northwestern Hawaiian Islands (NWHI), which contains the Papahānaumokuākea Marine National Monument. These maps include French Frigate Shoals, Kure Atoll, Laysan Island, Lisianski Island, Maro Reef, Midway Islands, Necker Island, Nihoa Island, as well as Pearl and Hermes Atoll. NOAA's National Centers for Coastal Ocean Science (NCCOS) produced these maps to support coral reef research and management. For more information on this layer, please see the [Voyager News Page](https://www.era.unh.edu/northwest/erma.html).

**Animal Tagging in the Mid-Atlantic:** A project funded through 2014 by the NOAA's Chesapeake Bay Office will maintain an acoustic array around the Chesapeake Bay to study Navy impacts to sturgeon. This effort uses the Chesapeake Bay Interactive Buoy System (CBIBS) to transmit the information about the sturgeon location back in real-time. The data management infrastructure, the Mid-Atlantic Animal Tracking Observing System (MATOS), is being developed by ASA.

**NOS – National Geodetic Survey (NGS) Evaluates LiDAR Sensors Operating in the Coastal Zone:** As part of its ongoing investigation of new airborne remote sensing technologies for NGS' Coastal Mapping Program and to support other Integrated Ocean and Coastal Mapping (IOCM) applications, NGS has been conducting a multi-wavelength Light Detection and Ranging (LiDAR) evaluation project aboard the NOAA King Air aircraft beginning the week of June 17, with three different airborne LiDAR systems being tested. This is the first time these three different wavelength LiDARs have been flown simultaneously, and the project is being done in conjunction with complimentary field support from the U.S. Army Corps of Engineers and the U.S. Geological Survey.

**National Geodetic Survey Completes Vertical Datum for Main Island of Puerto Rico:** NGS has completed 18 leveling adjustments that make up the mainland adjustment for the Puerto Rico vertical network. These adjusted projects define the vertical datum of Puerto Rico, PRVD02. The Puerto Rico islands were connected to each island's tidal benchmark provided by National Ocean Service's CO-OPS to define PRVD02. The islands of the territory of Puerto Rico have had a mixed patchwork series of geodetic control over the last century and a lack of a comprehensive vertical datum. These new elevations establish accurate and reliable heights consistent for the main island of Puerto Rico, where the majority of the population resides.

**IOOS - NOAA Fisheries Collaboration in Data Management:** IOOS Program Office met with the new NOAA Fisheries EDM IA Mark Brady to brief him on the recent implementation of IOOS Biological Data Project in SECOORA and GCOOS and how the IOOS efforts could help with NMFS new architecture design for NOAA fisheries data.
The IOOS Regional Associations not only built capacity in observations, data management, modeling, and education/outreach, but also developed new tools across these disciplines. For example:

- **ACT** developed test protocols for pH sensor validation and verification.
- **AOOS** built a new oil spill response tool for Cook Inlet, to better manage spill responses; AOOS also created Arctic region webpages which help stakeholders access information such as the Arctic sea ice atlas, glider missions in the Chukchi, HF Radar deployments, ocean acidification monitoring, and where to access other Arctic resources.
- **AOOS/NOAA** collaborated on Salmon Run Timing Prediction project, a joint research project between NOAA's Auke Bay Lab and Alaska Department of Fish & Game (ADFG). The project has shown a strong correlation over the past 51 years between certain oceanographic conditions and salmon run timing. The team predicted the timing of the salmon runs in the last two seasons to within three days of the actual timing before the start of each run.
- **CaRiCOOS** developed a ship tracker, which plots near-real-time positions of ships at sea using the Automatic Identification System (AIS).
- **CeNCOOS** developed an app, Currents on the Bay, which improves safety through real-time and predicted information on surface currents within the San Francisco Bay.
- **GLOS** supported monitoring activities that provide oxygen levels, water temperature, and wave heights to the Cleveland Division of Water, which allowed for water system shut downs to avoid taking in low quality raw water or adjust treatment appropriately. GLOS also developed new web tool displays, providing information to recreational boaters on the St. Lawrence River, such as nowcasts and 12-hour forecasts of water currents and depth, river condition alerts, details about boat launching locations, and information to aid trip planning.
- **MARACOOS** developed a Rip Current app which helps protect swimmers from coastal rip tides. Rip currents account for 80% of all water rescues and causes over 100 drownings each year in the United States. The app, developed by the Stevens Institute of Technology, helps lifeguards identify and catalog rip current occurrences.
- **NANOOS** developed the Pacific Northwest Tsunami Evacuation Zones online portal and smartphone app, an at-a-glance view of tsunami hazard zones along the coasts of Oregon and Washington.
- **NERACOOS** developed the Scituate Inundation Forecast System, a new system for forecasting coastal hazards such as Nor'easters, hurricanes and other coastal storms, and provides more detailed coastal forecasts in warning of coastal flooding, and to facilitate evacuation and other emergency measures.
- **PacIOOS** developed a high water level forecasting tool which provides advanced notice of the potential for high sea levels.
- **SECOORA** developed a predictive beach water quality model which was used by the South Carolina Dept of Health and Environmental Control to made a decision to cease support of its rain gauge system that was costly and time consuming to maintain.
New beach safety information - Great Lakes beach app adds hazard alerts: [http://www.glc.org/announce/13/05beach.html](http://www.glc.org/announce/13/05beach.html) As swimming season begins in the Great Lakes, the Great Lakes Commission has released new tools to ensure people’s time spent at the beach, hitting the waves and cruising the waters is safe and fun. To help protect swimmers from dangerous currents, the Great Lakes *myBeachCast* smartphone application (app) now features beach hazard statements issued by the National Oceanic and Atmospheric Administration (NOAA).

**NOAA’s Storm QuickLook product Enhanced:** Storm tide relative to Mean Higher High Water (MHHW) and Mean Sea Level (MSL) can now be viewed at [http://tidesandcurrents.noaa.gov/quicklook.shtml](http://tidesandcurrents.noaa.gov/quicklook.shtml). A line denoting MHHW is also now displayed on the water level time series plots for reference. At many locations, water levels above MHHW indicate that flooding inundation may be occurring.

**Multi-Use Technology Promotes Strategic CRS/IOOS Partnership:** From surface current patterns to tsunami wave warnings to surface vessel detection and tracking, High Frequency Radar (HF radar) is maturing as a versatile multi-use technology serving diverse stakeholders. The National Center for Secure and Resilient Maritime Commerce, CSR, is leveraging this multi-use capability by forging strategic partnerships with regional partners of the national Integrated Ocean Observing System (IOOS). CSR focuses on a layered vessel surveillance system for port security, where HF radar bridges the over-the-horizon gap between satellite surveillance and near-shore passive acoustic detection and tracking. Eleven coastal observing systems and regional associations, together with participating federal agencies constitute the national coastal component of U.S. IOOS; a network that provides coastal ocean data and data products to stakeholders in commerce, government, education, tourism, research and law enforcement. IOOS supports a national HF radar surface current network that provides data to assist diverse stakeholders including the U.S. Coast Guard for search and rescue and oil spill tracking, fishery scientists for larval dispersion studies and fishermen for targeted fishing efforts among others. Research support by CSR partners from the Mid-Atlantic Regional Association Coastal Ocean Observing System (MARACOOS) enhances the center’s HF Radar near-shore and harbor surveillance capabilities for New York Harbor and approaches. In the eastern Caribbean, IOOS affiliate CSR partners at the Caribbean Coastal Ocean Observing System (CariCOOS) host joint CSR/CariCOOS operations of the HF radar Mona Passage array.
These groups recently demonstrated the feasibility of vessel detection and tracking from the remote Mona Island environment in a multi-agency experiment involving U.S. Coast Guard and the Puerto Rico Department of Natural Resources and the Environment. IOOS affiliates benefit from this partnership by service to their stakeholders while providing to CSR the access to computational facilities, field bases, and administrative and personnel support. Such strategic partnerships based on mutual need and complementary capabilities strengthen and extend individual capabilities. CSR is pleased to contribute to and be part of the national IOOS effort. Credit: The National Center for Secure and Resilient Maritime Commerce, CSR newsletter posted at: http://www.stevens.edu/csr/news/single_news.php?news_events_id=3951
FY2014 Priorities
As we near the end of the first quarter of FY2014, we are already well underway on our FY14 priorities. The text boxes show high-level lists of **U.S. IOOS priorities for the year**.

NOTE: Slide is animated to cycle through priorities.

The original slide view shows the three overlapping circles representing elements of US IOOS: National; Regional; building DMAC.

In the next three slide views, only one box/arrow appears at a time associating priorities with the elements of US IOOS.
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## Areas of Collaborations in 2014

- Engagement with IOOS Advisory Committee
- National Ocean Policy Implementation Plan
- Advance implementation of DMAC
- Implement actions to address Summit recommendations

**Purpose:** Invite discussion on these elements.
Glossary of Acronyms (1 of 3)

- AOOS Alaska Ocean Observing System
- BIO TT Biological Integration and Observation Task Team
- CalCOFI California Cooperative Oceanic Fisheries Investigations
- CaRICOOS Caribbean Coastal Ocean Observing System
- CeNCOOS Central and Northern California Ocean Observing System
- COD Climate Observation Division
- COMT Coastal and Ocean Modeling Testbed
- CO-OPS Center for Operational Oceanographic Products and Services
- DAC Data Assembly Center
- DMAC Data Management and Communications
- DMAC-ST Data Management and Communications Steering Team
- EPA Environmental Protection Agency
- ERDDAP Environmental Research Division's Data Access Program
- GCOOS Gulf of Mexico Coastal Ocean Observing System
- GEO Group on Earth Observations
- GLOS Great Lakes Observing System
- GOOS Global Ocean Observing System
- GTS Global Telecommunications System

- JCOMM Joint Technical Commission for Oceanographic and Marine Meteorology
- MARACOOS Mid-Atlantic Regional Coastal Ocean Observing System
- MISST Multi-sensor Improved Sea Surface Temperature
- NANOOS Northwest Association of Networked Coastal Ocean Observing Systems
- NASA National Aeronautics and Space Administration
- NDBC National Data Buoy Center
- NERACOOS North Eastern Regional Association of Coastal Ocean Observing Systems
- NGO Nongovernmental Organizations
- NGS National Geodetic Survey
- NOAA National Oceanic and Atmospheric Administration
- NPO Non-Profit Organization
- NSF National Science Foundation
- OAP Ocean Acidification Program
- OAR Oceans and Atmospheric Research
- OOI Ocean Observatories Initiative
- OR&R Office of Response and Restoration
• OSMC  Observing System Monitoring Center
• PacIOOS  Pacific Islands Ocean Observing System
• PIRATA  Prediction and Research Moored Array in the Atlantic
• QARTOD  Quality Assurance for Real-Time Oceanographic Data
• RAMA  Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction
• RICE  Regional Information Coordination Entity
• SCCOOS  Southern California Coastal Ocean Observing System
• SECOORA  Southeast Coastal Ocean Observing Regional Association
• SOS  Sensor Observation Service
• SURA  Southeastern Universities Research Association
• USCG  United States Coast Guard
## Glossary of Acronyms (2 of 3)

<table>
<thead>
<tr>
<th>Acronym</th>
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<td>HFR</td>
<td>High Frequency Radar</td>
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