

## Progress Report

# Advancing the Caribbean Coastal Ocean Observing System

Reporting Period: 12/01/2013 - 5/31/2014

Project title: Advancing the Caribbean Coastal Ocean Observing System

Award number: NA11NOS0120035

Recipient Institution: University of Puerto Rico at Mayaguez

Principal Investigator: Julio M Morell, julio.morell@upr.edu

Address: University of Puerto Rico at Mayaguez

Department of Marine Sciences

Magueyes Island, La Parguera, Lajas Puerto Rico

Postal address: PO Box 3446 Lajas, PR 00667-3446

Phone number: 787-899-2048 ext 255; 787-450-0139 (cel)

Fax: 787-899-2564

Program Officer: Regina Evans, 301-427-2422, [regina.evans@noaa.gov](mailto:regina.evans@noaa.gov)

Program Office: NOS Integrated Ocean Observations Systems (IOOS)

Award Period: 06/01/2011 - 05/31/2016

Project Web Site: <http://www.caricoos.org>

## Table of Contents

1.	Introduction .....	3
2.	Progress and Accomplishments .....	4
2.1.	Observational Subsystem .....	4
2.2.	Modeling Subsystem.....	6
2.3.	DMAC, Products & Computational Subsystems .....	8
2.4.	Outreach and Education Subsystem .....	10
2.5.	IOOS, CaRA and IOOS Association .....	12
2.6.	Contractual.....	13
2.7.	Subawards .....	14
2.8.	Partner projects.....	14
3.	Scope of Work for FY14 .....	15
3.1.	Observing subsystem: .....	15
3.2.	Data management and dissemination subsystem: .....	15
3.3.	Modeling subsystem: .....	16
3.4.	Outreach and Education (O&E) subsystem: .....	16
4.	Leadership Personnel and Organizational Structure .....	17
5.	Budget .....	17
5.1.	Personnel .....	17
5.2.	Subawards .....	17
6.	Issues .....	18

## **1. Introduction**

CariCOOS has strived to meet prioritized stakeholder needs for coastal information with an efficient design, which consists of minimizing observing assets while developing complementary modeling tools. This initial system proved effective in providing wind, wave and current data products as well as simulations supporting forecasting these for the Atlantic and Caribbean insular shelves. A hurricane driven storm surge modeling effort directed towards issuing inundation maps for the region is fully developed and operational dissemination of the remotely sensed water quality products provides valuable information to fishermen, managers and researchers. This project provides for completion and operation of the initial CariCOOS phase and supporting the development of observing, modeling and skill assessment assets and tools required for the shoreward extension of the CariCOOS product domains. Said extension proposed to provide informational support to specific shore-dependent activities/sectors such as port and harbor operations (navigation safety and rapid response), facilitating recreational activities while minimizing hazards and coastal resource management including remediation, mitigation and adaptation to coastal hazards.

During the reporting period, CariCOOS has continued delivering real time data on coastal weather from its buoy system and Mesonet and Windnet coastal weather stations. Numerical modeling efforts have focused on continued improvements to existing CariCOOS wave (SWAN) and wind (WRF) models. Outstanding achievements reported herein include the development of a beach breaker height predictive model in support of NWS rip current forecasting, new storm inundation maps for USVI, formalized collaboration with the PR Emergency Management Agency, and progress of our circulation modeling efforts, among others.

In addition to progress in the technical areas outlined above, this project continues to support the Caribbean Regional Association (CaRA) in its mission including continued stakeholder engagement and representation, outreach efforts and forging key alliances with public and private partners, as well as with RICE certification requirements as set forth in the Ocean Observing Act.

## 2. Progress and Accomplishments

Progress toward proposed ***tasks*** and ***milestones*** (in *italics*).

### 2.1. Observational Subsystem

#### 2.1.1. ***Operate, maintain and enhance the CariCOOS buoy network***

- CariCOOS buoys A, B, C and E maintained operational status and underwent routine annual maintenance.
- During December 2013 the Rincon wave buoy (D) showed signs of incorrect wave spectra. To ensure data quality the data flow was interrupted. After tests including mooring replacement, the buoy was retired from station and sent to Datawell Inc. for inspection. A new replacement buoy was immediately ordered and was deployed by CariCOOS personnel on June 20, 2014. Assistance with data transmission was provided to CariCOOS by SCCOOS and CDIP. The original buoy has been sent to Datawell for repair and will be kept as a backup and for short term validation deployments.

#### 2.1.2. ***Continued collaboration with NOAA's Ocean Acidification program***

- Bi-weekly sampling at the MAPCO2 site and at the offshore reference site continued uninterrupted. All sample analysis for pH and Total Alkalinity were completed. Data continues to be shared through NOAA's OA program.
- The MapCO2 buoy was successfully retrieved, refurbished and redeployed on December 2013. On May 2014 the buoy was retrieved due to an apparent loss of buoyancy possibly related to vessel impact. A replacement buoy has been shipped by NOAA-PMEL and scheduled for deployment on mid-June.
- MapCO2 buoy data is now electronically downloaded and published in the CariCOOS webpage. Data from the Mauna Loa atmospheric CO2 time series is now included as a reference for MapCO2 data thus providing a global perspective to the stakeholders and a validation tool.
- Two CariCOOS interns have been trained in basic oceanographic techniques and pH and total alkalinity analyses.
- Funding has been secured from the NOAA Ocean Acidification Program for the continuation of this effort including support to Dr. J. Salisbury's U. of New Hampshire group, who will provide sample analysis, data management and operational coordination of buoy operations.

### **2.1.3. Continued development and publication of remote sensing water quality products**

- Daily remotely sensed imagery products (Chlorophyll a and Kd<sub>490</sub>) from MODIS Terra, MODIS Aqua and VIIRS sensor/platforms for the CariCOOS region and Eastern Caribbean continues to be published in our web interface.
- Vicarious calibration of MERIS Total Suspended Matter (TSM) has been finalized. Historical data products depicting the data are available at: <http://www.caricoos.org/drupal/node/228>.
- Data from the above work has provided documentation of historical (2005 to 2009) occurrence and severity of suspended sediment loading in the nearshore CariCOOS region. A white paper summarizing the findings is being currently developed.

### **2.1.4. Collaboration with Fundación Surfrider Rincón (FSR) in the Blue Water Task Force (BWTF) water testing program**

- CariCOOS continued to support FSR with logistics and delivered materials and supplies to the Surfrider Foundation to support their voluntary-driven, fecal contamination testing program in Puerto Rico.

### **2.1.5. Operation/enhancement of HF Radar system in the Mona Passage (collaboration with DHS-CSR)**

- In collaboration with the DHS-CSR project, a new telemetry system was installed at CDDO and FURA HFR sites in order to reduce HFR system downtime
- Purchase of a new HFR unit has been completed and delivery from CODAR is expected in July / August 2014.
- The optimal location for the emplacement of this third unit is still being evaluated; it will either replace the loaner unit (belonging to TAMU) at FURA, or installed at a third site to augment HFR coverage. The final decision depends on the continued funding of the DHS-CSR project.
- In order to evaluate the operation of HFR in extreme environments, Rutgers University and UPRM-CariCOOS conducted their second HFR experiment in the Mona Passage as part of the DHS CSR project. The team installed and tested a 13 MHz HFR unit from the cliffs of Mona Island and aboard the M/V Mariangie.

### **2.1.6. Operate, maintain and enhance CariCOOS WindNET & Mesonet**

- A new CariCOOS land-based WindNET station was successfully installed in Magueyes Island, La Parguera in Lajas, Puerto Rico.
- All CariCOOS/WxFLOW stations (13 total) continue in operation.
- Efforts are underway to push CariCOOS/WxFlow Mesonet data to WMO GTS; this task is expected to be completed by the end of July 2014.
- Conversations are underway with the Municipality of Culebra, PR to install a new CariCOOS/WxFlow weather station at the Isla Culebrita Lighthouse. CariCOOS/WxFlow are awaiting for final approval from the City Mayor in order to proceed with installation.

## **2.2. Modeling Subsystem**

### **2.2.1. Implement CariCOOS coastal circulation modeling program at regional and nearshore scales**

- The ROMS regional model domain at 1 km spatial resolution, nested within the Navy's regional AMSEAS-NCOM, is running operationally and its output is available from our THREDDS/OPeNDAP (TDS) servers. The current version is still not considered final but graphical products and model output are being made available to the public for evaluation and testing. This effort is led by Dr. Stefano Leonardi's group, currently at the University of Texas in Dallas, and CariCOOS personnel at UPRM.
- The San Juan and St. Thomas nested high-resolution domains are currently delayed due to challenges associated with two-way nesting within ROMS. Modeling efforts during year 4 are aimed at resolving these issues.
- The southwest PR high resolution domain is operational in offline nesting mode and undergoing validation and testing. The model runs at a 265 m spatial resolution, and a validation experiment involving two ADCP deployments is planned for July 2014.
- All regional and high resolution ROMS grids are currently run on CariCOOS HPC servers

### **2.2.2. Continue operation and enhancement of CariCOOS Nearshore Wave Model (CNWM)**

- The CariCOOS Nearshore Wave Model has continued operational status without any issues.
- Two new grids at 120 meter resolution were added in the northeast and southeast regions of Puerto Rico as required for the beach hazard effort, as shown in Figure 1.
- An additional 30 nearshore virtual buoys were added to the CNWM to support the CariCOOS / Seagrass / NWS surfzone hazard efforts (see Section 2.3.2 of this report).

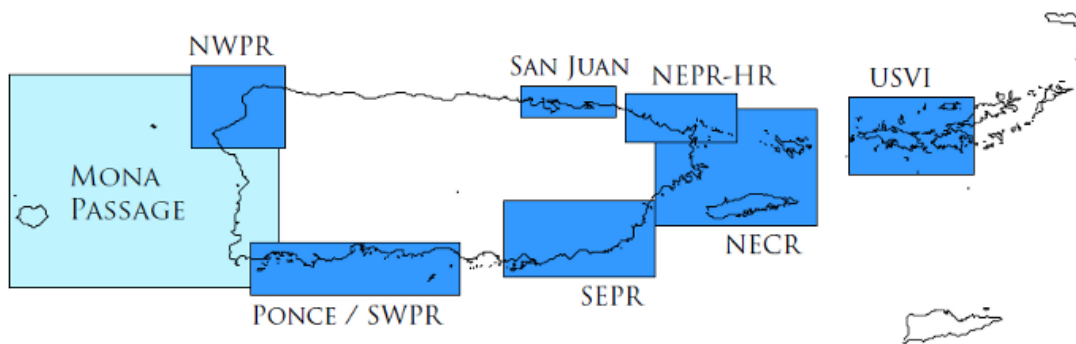


Figure 1. High-resolution grids of the CariCOOS Nearshore Wave Model. Two new grids at 120 meters resolution (SEPR & NEPR) were added during Spring 2014.

### **2.2.3. Finalize and publish updated Storm Surge Atlas for the CariCOOS region**

- The USVI Storm Surge Atlas was recently completed as available at [http://www.caricoos.org/drupal/usvi\\_storm\\_surge](http://www.caricoos.org/drupal/usvi_storm_surge).
- Development of the Storm Surge Atlas for Puerto Rico is well underway and expected to become available by the end of August when it will be formally delivered to the Puerto Rico State Emergency and Disaster Management Agency as agreed on their MOU with CariCOOS.

#### **2.2.4. Operation and development of the CariCOOS Coastal Weather model (WRF)**

- Since March 2014 the implementation of the 1km High-Resolution WRF is currently operational (<http://www.caricoos.org/drupal/node/241>) and run daily to generate 72 hr. forecasts. Using a new server, starting in summer 2014 the model will be run twice a day for cycles 00z and 12z and will be used to provide wind forcing for the CariCOOS SWAN and ROMS models.
- Real-time WRF model validation products will be completed during summer 2014 by a CariCOOS Intern under the guidance of Co-PI Aponte. This effort, aligned with NWS-SJ/CariCOOS MOU purposes, will provide for the operational deployment of said implementation for official forecasting.

### **2.3. DMAC, Products & Computational Subsystems**

#### **2.3.1. Maintain existing data and data product availability and distribution**

- All existing data streams have been maintained
- Completely redundancy of the CariCOOS observations map webpage has been achieved by duplicating the observations database architecture at CariCOOS's facilities in Mayaguez

#### **2.3.2. Construct and distribute new data products**

- A CariCOOS Coastal Weather application for Android has been developed. This App allows an integrated view of ocean conditions in the US Caribbean and provides real time buoy (waves, wind and currents) and Mesonet wind station data.
- After evaluation of an initial test version, the CariCOOS Asset Explorer is currently under development by contractors Dr. Doug Wilson and Applied Science Associates
- A new product, the CariCOOS – Sea Grant Nearshore Breaker Model is now operational at [http://www.caricoos.org/drupal/nearshore\\_breaker](http://www.caricoos.org/drupal/nearshore_breaker). NWS San Juan has required this product for use in their rip current and surfzone forecasts.



■ LOW to MODERATE BREAKERS (< 4FT) ■ MODERATE to HIGH BREAKERS (4-8 FT) ■ HIGH to VERY LARGE BREAKERS (>8FT)

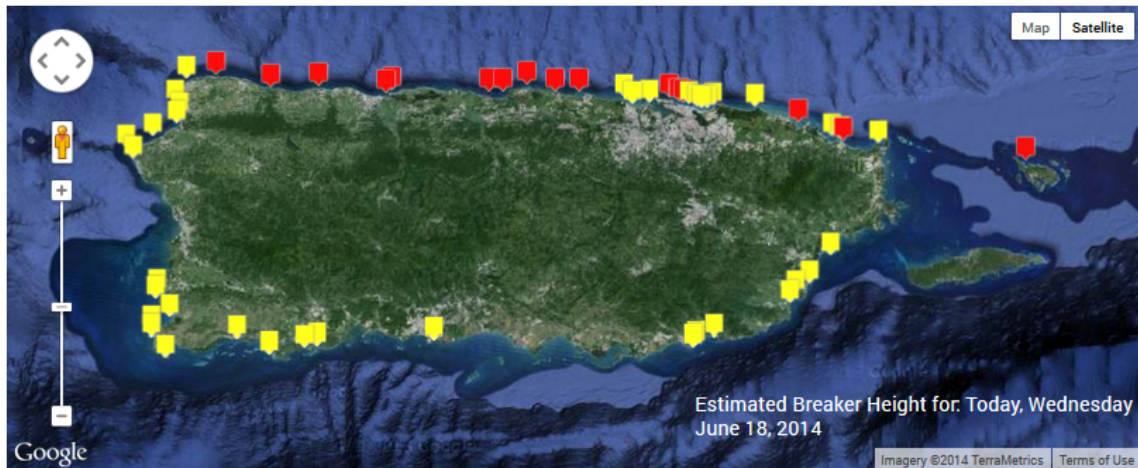


Figure 2. The CariCOOS – Sea Grant Nearshore Breaker Model is now operational at [http://www.caricoos.org/drupal/nearshore\\_breaker](http://www.caricoos.org/drupal/nearshore_breaker).

### ***2.3.3. Continue operation and development of DMAC subsystem in compliance with IOOS requirements.***

- All national IOOS SOS-compliance deadlines for 2014 have been met, some highlights are as follows:
  - ncSOS compliance has been achieved for CariCOOS buoy and for Mesonet meteo station data
  - CariCOOS buoy holdings in our TDS were made ncSOS compliant in collaboration with Eric Bridger of NERACCOOS.
  - CariCOOS TDS ncSOS-compliant buoy data has been aggregated
  - ncSOS compliance of Mesonet-WeatherFlow data has been achieved
  - Near-real-time Mesonet-WeatherFlow data now available via TDS, and updated every 15 minutes
  - Rincon Waverider buoy data is now linked to our TDS
  - SWAN model output aggregation now available in our TDS
  - Merged PR-VI 1s NGDC DEM available in NetCDF format through our TDS
  - CariCOOS WRF 1 km is now available in our TDS

#### **2.3.4. Operate, maintain and enhance CariCOOS computational resources**

- A new server for SWAN and WRF was installed during Fall 2013 and during Spring 2014 it was configured to run both WRF and SWAN in operational mode.
- A proposal titled “*CC\*IIE Networking Infrastructure: SciNet: A Science DMZ for Science and Engineering Research at UPRM*” was submitted to NSF. Associate Director Canals participated as Co-PI in the proposal in collaboration with UPRM’s Electrical and Computer Engineering Department, with the goals of enhancing network bandwidth at UPRM, including CariCOOS facilities in Mayaguez, PR. As of June 2014 this proposal has been recommended for funding by NSF. If ultimately funded, this project will greatly enhance CariCOOS DMAC capabilities.

#### **2.4. Outreach and Education Subsystem**

##### **2.4.1. Continue the CariCOOS summer intern program**

- After a formal application and evaluation process, two UPRM undergraduate physics students, Alexandra Ramos and Jaynise Perez, were selected as the 2014 CariCOOS summer interns. They will spend the summer working side-by-side with CariCOOS investigators Dr’s. Jorge Capella and Luis Aponte in areas related to the CariCOOS mission.

##### **2.4.2. Issue a media toolkit for press to help expand and enhance CariCOOS abilities to educate stakeholders through media**

- Currently in development.

##### **2.4.3. Present the CariCOOS traveling exhibit at different venues**

- CariCOOS exhibits were presented at the CariCOOS-Sea Grant teacher’s workshop, and at the Marine Sciences Department Open house (April 26, 2014).

##### **2.4.4. Produce and disseminate educational television and radio spots informing the general audience about CariCOOS products and services**

- TV producer, Maria Falcón, submitted a proposal to CariCOOS for the development of four informative videos (in Spanish with English captions) focusing on the applications and benefits users can acquire when using CariCOOS data. The main themes in this suite of videos are commercial

fishing, port operations, beach hazards and National Weather Service. The final product is in the last editing stage.

- Roberto Cortes, TV meteorologist from Telemundo TV, received recognition for his support of CariCOOS at the General Assembly held last March in the San Juan Yacht Club.

#### ***2.4.5. “In-Service” teacher training for K-12 educators from school districts of PR and USVI***

- CariCOOS, UPRM Sea Grant and the recently created Center for Education on Environmental Climate Change (CENECCA) joined to sponsor an “in-service” teacher’s immersive workshop from April 25 to 27, 2014. A total of 19 teachers from private and public schools participated in this activity, which aimed to educate them about the interrelationship between coastal ecosystems and climate.

#### ***2.4.6. Strengthen the CariCOOS-USCG Auxiliary collaboration***

- Training for USCG Auxiliary instructors has been scheduled for June. The training will review recently developed products and recommend appropriate delivery to students in the USCG Auxiliary boating and seamanship courses.

#### ***2.4.7. Expand and enhance CariCOOS abilities to educate stakeholders through media***

- Several CariCOOS-related articles have been published in local newspapers as well as regional boating magazines.

#### ***2.4.8. Other education and outreach activities:***

- Diverse exhibits and a comprehensive poster session (20 posters, [http://cara.uprm.edu/?q=2014\\_posters](http://cara.uprm.edu/?q=2014_posters)) were presented at the CaRA General Assembly (March 13, 2014) to showcase the most relevant CariCOOS observing assets, services, products and collaborations.
- CariCOOS participated in the South Coast Harbor Safety & Security Council quarterly meetings held in February and May 2014.
- CariCOOS is providing scientific support to Oceánica, the first long term exhibit of the Eco-Exploratorio science museum project, which is opening this summer at Plazas las Americas, the largest shopping mall in the Caribbean.

## **2.5. IOOS, CaRA and IOOS Association**

### ***2.5.1. Participate in IOOS activities, meetings and teleconferences***

- Dr. Jorge Corredor, CaRA's Council Chairperson, attended the IOOS 2014 Spring Meeting at the US IOOS Program Office Conference Room, Silver Spring, MD
- CaRA/CariCOOS representative(s) have attended all IOOS monthly calls.

### ***2.5.2. Participate in IOOS Association meetings and teleconferences***

- Dr. Jorge Corredor attended the IOOS Association 2014 Spring Meeting

### ***2.5.3. Development and execution of a CaRA/CariCOOS certification plan***

- Marichal, Juarbe & Hernandez Inc., attorneys at law, have been retained and will provide guidance to CaRA and UPRM on feasibility of and possible approaches towards meeting certification criteria

### ***2.5.4. Support CaRA activities and provide legal and administrative support***

- The project has continued providing logistic, financial and legal support to CaRA activities

### ***2.5.5. Convene Council Meetings***

- The CariCOOS Council Meeting was conducted on March 12, 2014. Prof. Morell informed the Council about the status and goals of CariCOOS. The Council was also informed about consultations regarding CaRA becoming a 501(c)(3) organization.

### ***2.5.6. Convene yearly General Assembly***

- The Caribbean Regional Association for Coastal Ocean Observing CaRA held its sixth General Assembly on March 13, 2014 at the Club Náutico de San Juan. Over 100 Stakeholders representing diverse sectors attended the event aimed at informing all interested parties about the status, advances and new initiatives of the Caribbean Coastal Ocean Observing System (CariCOOS).

## **2.6. Contractual**

- Contractual responsibilities agreed with WeatherFlow Inc. (WF) for the operation of the CariCOOS/WF MESONET and providing related data management have been properly addressed. The remaining task, deployment of an additional station in Culebrita Island, awaits for authorization from the Municipality of Culebra, who manages the structure were the station will be installed.
- The initial phase of incorporating data from NDBC and CariCOOS assets and numerical model output in to the web interface “Caribbean Assets Explorer” has been satisfactorily finalized by Caribbean Wind LLC .
- Field technical services contracted with J. Sabater, and R. Castro and D. Carrero include benthic surveys as well as buoy and instrument deployments and maintenance. E. Figueroa has provided photo-documentation of activities.
- Dr. Jorge Capella has effectively coordinated the implementation of DMAC system for CariCOOS. He is also active in the validation of ocean modelling products.
- Professor Roy Watlington has served as an effective liaison with UVI and the USVI community. He also is an active participant in IOOS Association activities.
- Legal services have been provided by Torres y García for CaRA legal counsel and Marichal, Juarbe & Hernandez Inc. for certification and governance consultations.
- Special Appointments (employees) active during the reporting period include
  - Carlos Ortiz (field tech, diving operations)
  - Belitza Brocco (GIS and water quality)
  - José Rodriguez (cyber systems/computational resources)
  - Adolfo Gonzalez (web master)
  - Valentine Hensley (laboratory technician)
  - Yasmin Detrés (E&O Director)
  - Vanessa Gutierrez (Administrative Assistant)

## **2.7. Subawards**

- U. Virgin Islands, Paul Jobsis (PI): The limited progress shown by UVI responds to delays in formalizing the subaward. UVI requested and has been granted a no cost extension to 12/31/2014. No invoicing has been submitted to UPRM.
- U. Texas, Dallas, S. Leonardi (PI): Dr. Leonardi's group has demonstrated satisfactory progress in the implementation of CariCOOS-ROMS ocean modelling program.
- U Maine Physical Oceanography Group, N. Pettigrew (PI): UMPHOG has complied with all requirements detailed in the SA in support of CariCOOS buoy operation and maintenance program.

## **2.8. Partner projects**

- IOOS Coastal and Ocean Modeling Testbed for Puerto Rico and the Virgin Islands (<http://testbed.sura.org/node/522>): CariCOOS is directly participating in this COMT project by carrying out numerical simulations and data analysis of selected hurricane and tropical storm case studies.
- Sustained and Targeted Ocean Observations for Improving Atlantic Tropical Cyclone Intensity and Hurricane Seasonal Forecasts.: This project, sponsored by IOOS and led by Dr. G. Goni-NOAA AOML, will provide real time data of upper water column structure along two glider (SEAGLIDER) lines off the north and south coast of the Northern Caribbean arc. The derived data is expected to provide for improved performance of hurricane intensity forecasting models. CariCOOS personnel participated in the initial project meeting held in AOML facilities where they provided a perspective on upper ocean water densities and currents expected to be encountered by the gliders and participated in a training exercise on glider deployment and recovery. The initial deployments have been scheduled for the 16<sup>th</sup> of July 2014 aboard UPRM's R/V Sultana
- DHS Center of Excellence in Secure and Resilient Maritime Commerce: As mentioned earlier, an HFR experiment was conducted in Mona Island in collaboration with CariCOOS. A no-cost extension was approved and a new 5-year proposal for the continuation as Center partners has been submitted in collaboration with Rutgers University.

### **3. Scope of Work for FY14**

The scope of work for FY14 is outlined below, with bullets representing specific milestones for each major project task or CariCOOS subsystem.

#### **3.1. Observing subsystem:**

- Operate and maintain the CariCOOS 5 data buoy network including UVI's buoy.
- Operate and maintain the CariCOOS Rincón Wave Buoy
- Operate and maintain WeatherFlow MESONET and CariCOOS WindNet
- Operate and Maintain HF Radar Mona Passage surface current monitoring system
- Operational deployment of new HF system
- Operate and maintain MAP CO<sub>2</sub> buoy and continue discreet sampling program under NOAA's Ocean Acidification program
- Continued dissemination of remotely sensed water quality products for the region
- Development of observational techniques for inshore water quality monitoring
- Assess the technical feasibility of implementing a beach pathogen forecasting program
- Operational deployment of 2 SEAGLIDER AUVs for upper water column heat monitoring as part of the IOOS NOAA-AOML project entitled Sustained and Targeted Ocean Observations for Improving Atlantic Tropical Cyclone Intensity and Hurricane Seasonal Forecasts
- Continued engagement of the private enterprises as potential sponsors of observing assets required for their marine operations

#### **3.2. Data management and dissemination subsystem:**

- Continued development of CariCOOS DMAC subsystem while meeting IOOS requirements
- Operate and maintain CariCOOS data streams, data products and dissemination interfaces
- Operate, maintain and upgrade computational infrastructure
- Develop new specific data products in response to stakeholder needs

- Renovation of CariCOOS and CaRA's web pages

### **3.3. Modeling subsystem:**

- Maintain currently operational high resolution (HR) WRF (weather) and SWAN (wave) model implementations
- Implementation of very high resolution (VHR) WRF and SWAN model at critical harbors and beaches
- Operational deployment and enhancement of CariCOOS - Sea Grant Nearshore Breaker Model
- Continue the development and validation of regional high-resolution (HR) CariCOOS-ROMS hydrodynamic model and assessment of potential data assimilation schemes
- Initiate the implementation of a unstructured hydrodynamic model (FVCOM) for nearshore waters
- Continue development of very high-resolution (VHR) ROMS implementations for critical coastal areas including major ports
- Finalization of Storm Surge Inundation (SSI) Map Catalog for all hurricane categories
- Construct and disseminate SSI maps and provide training to pertinent agencies
- Conduct and experimental numerical assessment of the potential role of channelized urban rivers as conduits of storm surge to high-density population areas in Puerto Rico
- Continued participation in IOOS Coastal and Ocean Modeling Testbed for Puerto Rico and the Virgin Islands

### **3.4. Outreach and Education (O&E) subsystem:**

- Continue O&E formal and informal activities focused on enhancing awareness and appropriate utilization of CariCOOS products and services
- Continued assessment of stakeholder/user needs
- Continue and enhance communication and consultation between CariCOOS, CaRA, regional programs, IOOS and IOOS Association
- Provide support to CaRA membership and council and provide logistical and administrative support as required for accomplishment of their mission and meeting requirements for certification as a regional information coordination entity (RICE) as defined under the ICOOS Act.



#### **4. Leadership Personnel and Organizational Structure**

Dr. Jorge Corredor accepted an appointment as Interim Director of the Department of Marine Sciences-UPRM and therefore requested to be relieved from his duties as CariCOOS Associate Director. These have been assumed by the Executive Director J. Morell and Associate Director, M. Canals with the assistance of Y. Detrés, Coordinator for Outreach and Education.

#### **5. Budget**

Required modifications to the proposed budget are detailed below:

##### **5.1. Personnel**

- No changes in personnel during the reporting period

##### **5.2. Subawards**

- U. Maine: P.I. N. Pettigrew confirmed expenditure of all allotted funds. Pettigrew's team has, as before, satisfactorily accomplished all proposed tasks. A detailed progress report has been submitted. The transfer of corresponding funds to U. Maine has yet to be completed
- U. of Texas: P.I. S. Leonardi informed all assigned funding has been expended. Progress towards operational implementation of CariCOOS-ROMS has met expectations as evidence in the detailed progress report submitted. The transfer of corresponding funds to U. of Texas has yet to be completed
- U. of the Virgin Islands: P.I. P. Jobsis reports expenditures totaling \$41,000 or 34% of the assigned funds. As discussed above, U.V.I requested a no-cost extension until December 2014.

## 6. Issues

No issues worth reporting for this performance period.