



CARICOOS

Enhancing Coastal Intelligence in the US Caribbean Archipelago: The Caribbean Coastal Ocean Observing System

PROGRAM PERFORMANCE REPORT

Reporting Period: 12/01/2018 – 05/31/2019

Project title: Enhancing coastal intelligence in the US Caribbean archipelago:
The Caribbean Coastal Ocean Observing System

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I. PERFORMANCE PROGRESS REPORT

This report informs on progress towards milestones proposed for the third year of the Enhancing Coastal Intelligence in the US Caribbean Archipelago: CARICOOS Cooperative Agreement. During this past program year CARICOOS was able to continue its agenda of enhancing its services to our stakeholders while continuing moving toward the system's recovery from hurricane impacts.

Among other outstanding achievements, efforts in collaboration with NOAA-AOML for the deployment of gliders for hurricane forecasting were significantly impacted by the deployment of 10 Slocum gliders loaned by the US Navy in the region. The improvement of the "Pa' La Playa" beach app and the development of the CARICOOS Boat App represent major steps towards making information accessible to large sectors of our clientele. While a beta version of the boat app will be released to testers from the boating community in July 2019. The beach app was improved to include wind time series, Sargasso sightings, jelly fish risks, beach facilities and activities, among others. The PR Tourism Company and OPAS, the PR NGO that manages the Blue Flag program, have endorsed this app. In addition, both data-to-text/icon products are accessible to English speaking users/tourists visiting the islands, as well as the USVI stakeholders.

Besides the above, CARICOOS has devoted energy and resources to the maintenance and often enhancement of its various subsystems. While some observational assets are still pending to be repaired/replaced, the majority of the system's data streams are operational. The modeling subsystem has implemented an advanced weather model (WRF-ARW) and a high-resolution hydrodynamic model (FVCOM) for nearshore areas and harbors which are currently pending validation. The implementation of FVCOM for nearshore and harbors where understanding and forecasting hydrodynamics is required in support of emergency response or resource management was initiated for the La Parguera domain (SW Puerto Rico) due to the ecological importance of the area and existing observational infrastructure. Although not operational at this time, significant progress has been achieved and major limitations identified. An operational version along with a set of lessons learned is expected for December 2019. In addition, significant progress was achieved with the development of forecasts for massive Sargasso arrivals, our initial response to the latter emergent issue. Successful partner projects supported which showed marked progress include fish larvae dispersal studies in support of marine reserve management and diverse efforts on coastal barrier restoration.

The DMAC subsystem continues to meet system requirements and strengthen CARICOOS server assets and web products. Outreach and Education efforts continue to be in demand by agencies, institutions and private organizations seeking understanding of oceanographic and meteorological processes and the appropriate utilization of CARICOOS sea-state pertinent data and forecast products. CARICOOS Inc. continued to successfully support governance related activities and provide logistic and administrative support to the whole CARICOOS effort.

1. Progress and Accomplishments

The following table takes into consideration milestone delivery dates indicated on the rescoped workplan for FY18 submitted in October 2018.

MILESTONE / TASK	Q1	Q2	Q3	Q4	ORIGINAL COMPLETION DATE	STATUS / NOTE
SUPPORT SAFE AND EFFICIENT MARITIME OPERATIONS						
Continued dissemination of sea state data and products (winds, waves, currents) in real time					Continuous	Completed (May 2019)
Continuously maintain, validate and improve wave, wind, and hydrodynamic modeling for ports in the region to facilitate decision-making by the maritime sector					Continuous	Completed (May 2019)
Develop a mobile app to provide data and forecasts to small craft boaters and fishers (OTT CARICOOS)					May 2019	Delayed (Beta version will be released to testers in July 2019)
Modeling and product development in support of the CARICOOS Boating App					May 2019	Completed (May 2019)
Continue operation of the Yabucoa Port Metocean observation and prediction system					Continuous	Completed (May 2019)
Install a Nortek AOS real time current meter and a meteoration at Crown Bay, St. Thomas, USVI in support of cruise ship operations in Crown Bay and other mariners in the West Gregerie Channel					May 2019	Completed (April 2019)
MINIMIZING IMPACTS FROM COASTAL HAZARDS						
Maintain and enhance the operational CARICOOS - Sea Grant Nearshore Breaker Model					Continuous	Completed (May 2019)
Continue to support Surfrider's BWTF efforts to monitor beach water pathogens in the northwest of Puerto Rico					Continuous	Completed (May 2019)
Maintenance and further development of the CARICOOS Beach App					May 2019	Completed (May 2019)
Issue an English version of the CARICOOS Beach App for English speaking tourists and USVI stakeholders					May 2019	Completed (May 2019)
Further development of beach pathogen nowcasts using Doppler weather radar-based precipitation estimates					May 2019	On-Track (Development on track for 3 sites, implementation to take place by Dec 2019)
Maintenance and further development of CARICOOS Beach Water Quality products					Continuous	On-Track (CARICOOS Beach Grade developed and maintained)
Include USVI beach water quality data as part of CARICOOS data products					May 2019	Delayed
Install a remotely-sensed video system to monitor coastal zone changes, provide information for beachgoer safety, storm damage safety and beach water quality					April 2019	On-Track (Video system will be installed by December 2019)
COASTAL RESOURCES: MONITORING AND MANAGEMENT						

Continue R&D for implementing a Sargasso monitoring and tracking system					May 2019	Completed (May 2019)
Support a preliminary study of using fish aggregating devices (FADS) to collect information about the pelagic fish movements in the Mona Passage					May 2019	Delayed – funding not secured by PR-DNER
Develop a marine biodiversity observing network (MBON) using historical data to understand the human impact on marine systems in the US Caribbean continental shelf					October 2019	On-Track
Research cruises in La Parguera to compare near-reef carbonate chemistry versus oceanic conditions					October 2019	Completed (May 2019)
MONITORING UPPER OCEAN PROPERTIES AND CLIMATE VARIABILITY						
Operate La Parguera MAP CO ₂ buoy and provide data dissemination					Continuous	Completed (May 2019)
Deployment, emergency rescues, retrieval and shipping of 10 USN Gliders					November 2018	Completed (October 2018)
Deployment, retrieval and refurbishment of NOAA-AOML Gliders					November 2018	Completed (November 2018)
Secure and equip a facility to operate as a GLIDER maintenance, storage and ops center					May 2019	On-Track
OBSERVING SUBSYSTEM						
Operate the CARICOOS data buoy network					Continuous	Completed (May 2019)
Operate the CARICOOS HF radar network (HFR)					Continuous	Completed (May 2019)
Operate the CARICOOS MESONET and WINDNET					Continuous	Completed (May 2019)
Quarterly inspections of CARICOOS Rincón wave buoy					Continuous	Completed (May 2019)
Yearly maintenance of the CARICOOS-U Maine data buoys					April 2019	Delayed (Yearly maintenance will be performed in August 2019)
Yearly maintenance of the CARICOOS Rincón wave buoy					May 2019	Delayed (Yearly maintenance performed in June 2019)
Yearly maintenance of the La Parguera MAP CO ₂ buoy					February 2019	Completed (May 2019)
Operation and maintenance of CARICOOS MESONET					Continuous	Completed (May 2019)
Attend the HF Radar operators and engineers meeting (ROWG)					October 2018	Completed (October 2018)
Servicing visit to fix the issue with the external sensors installed on St. John buoy					October 2018	Completed (December 2018)
Install a new data buoy to replace the UVI owned buoy in St. Thomas destroyed by Hurricane Irma					May 2019	Delayed (Pending the final allotment of hurricane supplemental funding.)

						Buoy should be installed before May 2020)
Install HFR antenna in St. Thomas					March 2019	On-Track (Waiting for lease agreement. HFR system should be installed before December 2019)
Repair and replace the HFR equipment damaged by Hurricane María					February 2019	Delayed (Pending the final allotment of hurricane supplemental funding)
Repair six meteorological stations damaged by Hurricanes Irma and María (WeatherFlow)					September 2018	Completed (August 2018)
Seaglider refurbishment and piloting training sessions at AOML/UPRM facilities					September 2018	Completed (September 2018)
Beach pathogen monitoring					May 2019	Completed (May 2019)
Seasonal carbonate chemistry sampling					May 2019	Completed (May 2019)
MODELING & ANALYSIS SUBSYSTEM						
Operate and maintain CARICOOS Nearshore Wave Model					Continuous	Completed (May 2019)
Operate and maintain CARICOOS WRF Model (1 km & 2 km resolution)					Continuous	Completed (May 2019)
Migrate the CARICOOS Nearshore Wave Model and CARICOOS WRF Model to Amazon EC2 HPC instance					March 2019	Completed (May 2019)
Improve the CARICOOS WRF model to provide other parameters to stakeholders					March 2019	Completed (May 2019)
Maintenance, validation and improvement of CARICOOS FVCOM circulation model					Continuous	Completed (May 2019)
Implement CARICOOS FVCOM to understand the hydrodynamics in La Parguera Marine Reserve (NOAA sponsored Ocean Acidification studies)					April 2019	On-Track
Further development of CARICOOS-ROMS (assimilation)					May 2019	On-Track
DMAC SUBSYSTEM						
Add ROMS and FVCOM model output to CARICOOS ERDDAP as these models become operational					As required	On-Track (Testing and validating models with observations)
Assist modelers in the migration of WRF, SWAN, FVCOM and ROMS to our HPC server at AWS.					May 2019	On-Track
Attend IOOS DMAC meeting					As required	Completed (May 2019)
Develop a data portal to provide real-time acidification data collected by La Parguera MAP CO ² buoy and derived ecosystem metabolic rates					February 2019	On-Track

						Being developed. Should be available by December 2019)
Compliance with IOOS DMAC metadata, file and data discovery standards and checks					Continuous	Completed (May 2019)
Continue CARICOOS DMAC and Regional DAC efforts as detailed in the RICE DMS Plan					Continuous	Completed (May 2019)
Continue operating DMAC and computational infrastructure					Continuous	Completed (May 2019)
Fully populate CARICOOS ERDDAP with operational models (SWAN, WRF, ROMS/FVCOM)					May 2019	On-Track (ROMS and FVCOM are still pending)
Historic data archival					Continuous	Completed (May 2019)
Identify suitable regional biological datasets and proceed with processing into OBIS. Supported by Supplemental Funding when available.					May 2019	On-track (May 2019)
Maintain and enhance new CARICOOS website					Continuous	Completed (May 2019)
Maintain the HPC infrastructure					Continuous	Completed (May 2019)
Maintenance of CARICOOS in Spanish					As required	Completed (May 2019)
RICE DMAC Review					Early 2019	Pending
Technical transfer to in-house IT, improvement and debugging of our web page					Continuous	Completed (May 2019)
EDUCATION & OUTREACH SUBSYSTEM						
Continue O&E formal and informal activities focused on enhancing awareness and appropriate utilization of CARICOOS products and services					May 2019	Completed (May 2019)
Develop and deliver products training workshops					May 2019	Completed (May 2019)
Continued assessment of stakeholder/user needs					Continuous	Completed (May 2019)
Assess user need pertaining to the development of the CARICOOS Boat App and provide support as requested					May 2019	Completed (May 2019)
Host training workshops for teachers to facilitate interpretation of data and products and obtain essential feedback.					May 2019	Completed (May 2019)
Host the CARICOOS summer internship program					August 2018	Completed (August 2018)
Continue to procure an active presence in pertinent forums, such as Harbor Safety & Security Committees, PR Climate Change Council, UPR Sea Grant Advisory Board, JBNERR's Research Advisory Board. Continue working meetings with key governmental agencies including US Coast Guard, WFO-San Juan, PR CZM among others.					Continuous	Completed (May 2019)

Consult stakeholders via direct communication and interaction at CARICOOS General Assembly meeting and at sector focused meeting					May 2019	Completed (May 2019)
Expand the CARICOOS kiosk network					Continuous	Completed (May 2019)
Continue to issue CARICOOS communications via quarterly newsletters, social media, and CARICOOS School (O&E webpage)					Continuous	Completed (May 2019)
Stakeholder engagement throughout the region					Continuous	Completed (May 2019)
Conduct Board of Directors meetings					March 2019	Completed (January 2019)
Support CARICOOS Inc. governance, data management/dissemination and operations.					Continuous	Completed (May 2019)
Host annual CARICOOS General Assembly					May 2019	Completed (May 2019)

2. Scope of Work

The scope of work in the subsequent fiscal year will include all pending and delayed deliverables detailed in the table above. Significant progress has been made on the “On-Track” deliverables. ROMS and FVCOM models need further fine-tuning in order to decrease input and model prediction uncertainties. Fulfilling these deliverables will allow the complete migration of CARICOOS numerical models to the HPC server at Amazon Web Service (AWS).

Beach water quality data from over 30 beaches in the US Virgin Islands is still pending the formal response of CARICOOS OCOVI and USVI’s DPNR office. This data will be included in CARICOOS Beach Water Quality data products. Puerto Rico’s DNER was unable to secure funding for deployment of fish aggregating devices (FADS) off the south and west coast of PR to collect information about the pelagic fish movements in the Mona Passage. Therefore, using the FADS as platforms for hydrophones will be not possible.

Remotely sensed video system and data portal to provide real-time acidification data are in the stage of development and testing.

Further activities toward full recovery of the observing capabilities from hurricane damage are now underway after the reception of supplemental funding. The funding will allow the replacement of St. Thomas buoy, sensors aboard data buoys, and electronic components of two HF radar stations.

During the next fiscal year, CARICOOS proposes to continue operating all subsystems while responding to emergent needs and supporting collaborative efforts towards CARICOOS mission. Issuance of a detailed scope of work for project year 4 will follow formal communication of fiscal resources available.

3. Leadership Personnel and Organizational Structure

No changes to CARICOOS leadership personnel and organizational structure.

4. Budget Analysis

Funds allotted for the 2018-2019 year totaled \$2,033,136. From that, expenditures and encumbrance total \$1,619,615 and \$331,609 respectively. Funds drawdown to date total \$1,314,334.

II. ENVIRONMENTAL COMPLIANCE

No activities outside those considered in the final U.S. IOOS PROGRAMMATIC ENVIRONMENTAL ASSESSMENT and found as posing no significant impact (FONSI 6/29/2016) were undertaken in the period here reported.