



## CARICOOS OCEAN ACIDIFICATION MONITORING PROGRAM

Sustained monitoring of near-reef carbonate chemistry at the Atlantic Ocean Acidification NCRMP Class III Station, La Parguera, Puerto Rico

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**Performance Period: Dec 1, 2019 – May 31, 2020**

### **LONG-TERM GOALS**

A principal CARICOOS mission is to understand and predict changes in our ocean and coasts and inform decision-makers in the US Caribbean region. Ocean acidification (OA) represents one such change unfolding in direct response to increasing atmospheric carbon dioxide (CO<sub>2</sub>) concentrations. This project aims at improving our understanding of how OA impacts the coral reef ecosystem and the biogeochemical processes controlling the near-reef and nearshore carbonate dynamics. This is achieved using high-temporal resolution chemical monitoring, which aids NOAA's Coral Reef Monitoring Program efforts to establish baselines and track changes in both carbonate chemistry and associated ecological impacts of OA. Furthermore, this effort supports NOAA's progress towards achieving a holistic understanding of the Earth system, identified as a core objective of NOAA's Science and Technology Enterprise.

### **MILESTONES / OBJECTIVES**

1. Provide information about the existing and foreseeable carbon chemistry conditions to help mitigate the causes and effects of OA and support adaptation to ecosystem changes.
2. Continue the bimonthly (formerly bi-weekly) discrete sampling for carbonate chemistry at selected sites along the offshore to nearshore gradient in La Parguera Marine Reserve (LPMR). Data is used for validating automated collection by the MapCO<sub>2</sub> buoy and assessing the role of nearshore ecosystems in the local carbonate chemistry.
3. Provide operational maintenance to the MapCO<sub>2</sub> buoy and support data management and product dissemination.
4. Quality assurance, synthesis, and reporting of acquired data.
5. Provide yearly maintenance of the MapCO<sub>2</sub> buoy.

### **WORK COMPLETED**

- The field cruises and laboratory analyses are currently on hold due to the COVID-19 pandemic. We completed 3 cruises to collect surface water samples and CTD profiles throughout La Parguera. A total of 9 pH samples were analyzed at the CARICOOS laboratory (UPRM), while 15 samples are pending for analysis. Also, 44 TA samples are pending for



analysis. Another 32 DIC samples were analyzed at UNH. The University shut down on March 16, 2020 until further notice, and all research efforts, including laboratory and field tasks, are currently paused.

- García-Troche and Luis Rodríguez replaced the CTD on the MapCO<sub>2</sub> buoy on February 25, 2020
- The TA titrator and muffle furnace replacement parts arrived in late February and early March, respectively. Due to the COVID-19 pandemic and University shut down on March 16<sup>th</sup>, we did not get a chance to restart the TA analyses and refurbish the muffle furnace.
- On April 2, 2020 we provided Dharma Rodríguez (Statistics Institute of Puerto Rico) with in-situ pH data from La Parguera for 2016-2017. The data set included the Offshore, MapCO<sub>2</sub>, and Enrique Seagrass stations. The Institute will use the data to comply with the United Nations Sustainable Development Goals, objective 14.

## **MAJOR OUTCOMES**

- The manuscript entitled “Carbonate chemistry seasonality in a tropical mangrove lagoon in La Parguera, Puerto Rico” was accepted for review by the journal *Plos ONE*. This research describes how The Bioluminescent Bay was unable to consistently buffer declines in pH over five years, contrary to what other research has found in other mangrove sites over diurnal time scales.
- Julio Morell, Joe Salisbury, and Melissa Melendez participated in the PI’s NOAA’s OAP meeting that aimed to share OAP funded research results and engage the community in developing OAP’s strategic research plans for the *NOAA Ocean and Great Lakes Research Plan 2020-2029*. Meléndez presented a lightning talk about the seasonal variation in carbonate chemistry at La Parguera in the NOAA OAP Community Meeting and Mini-Symposium. Univ. of Miami, RSMAS Campus, Jan 7-9, 2020.

## **RELATED PROJECTS**

- Impact of Sargasso Inundation on Coastal Ecosystems. **PI:** Julio Morell
- JBNERR 2019-20: *An Assessment of Spatial Variability in Jobos Bay waters using surface mapping*. **PI:** Julio Morell **Co-PI:** Erick García-Troche
- NOAA Ocean Acidification Program, Education Minigrants - 2019 – 2020: *Tracking Ocean Acidification in Puerto Rico: A Video Journey* (PI: Lisamarie Carrubba; Co-PI: Melissa Meléndez, Ernesto Otero; \$10,000)

## **WORK PLAN FOR UPCOMING PERFORMANCE PERIOD (June 1– November 30, 2020)**

- The yearly MapCO<sub>2</sub> buoy refurbishment is scheduled for September 2020.
- The SAMI pH sensor on the MapCO<sub>2</sub> is currently offline and will be replaced when The University allows for fieldwork to resume.



- Continue the collaborative effort with UNH to maintain and enhance OA observational capabilities (i.e., provide analytical support for DIC determinations).
- Continue with the CARICOOS-JBNERR surface mapping effort at Jobos Bay.
- Continue collaborating in data management and product dissemination. Work in progress includes the further improvement of the CARICOOS data portal to provide a seasonal estimate of calcification, production/respiration.
- Continue participation of the Global Ocean Acidification (OA) Observing Network and the OAP Pier2Peer program.

## **PUBLICATIONS & PRODUCTS**

### **PUBLICATIONS**

**García-Troche, E.M., Morell, J.M., Meléndez, M., Salisbury, J.** Carbonate chemistry seasonality in a tropical mangrove lagoon in La Parguera, Puerto Rico. *Plos ONE*, resubmit with revisions.

**Meléndez, M., Salisbury, J.,** Gledhill, D., Langdon, C., **Morell, J.M.,** Manzello, D., Musielewicz, S., Rodriguez-Abudo, S., and Sutton, A. Seasonal variations of carbonate chemistry at two western Atlantic coral reefs, *Journal of Geophysical Research: Oceans*, resubmit with revisions.

**Meléndez, M., García-Troche, E.M.; Morell, J.M.; Salisbury, J.E.** 2019. Dissolved inorganic carbon, total alkalinity, pH, nutrients, and other variables collected from discrete profile observations in the southwest coast of Puerto Rico from 2009-01-16 to 2019-03-07 (NCEI Accession 0188506). *NOAA National Centers for Environmental Information*. Dataset. <https://accession.nodc.noaa.gov/0188506>

### **TALKS**

**García-Troche, E.M., Morell, J.M.,** Dieppa, A., Muñóz, M. An assessment of spatial variability in Jobos Bay waters using surface mapping. Third JBNERR Science and Research Symposium, Ponce, Puerto Rico, December 14, 2019.

**Meléndez, M.** Seasonal variations of carbonate chemistry and reef metabolism at two western Atlantic coral reefs. Lightning Talk. NOAA Ocean Acidification Program Community Meeting and Mini-Symposium. OAP PIs and NOAA partners meeting. Univ. of Miami, RSMAS Campus, Jan 7-9, 2020

**Salisbury, J.** Ocean acidification on the east coast. OAP PIs and NOAA partners meeting. Univ. of Miami, RSMAS Campus, Jan 7-9, 2020

**Salisbury, J.** Submarine, overland and aerial assault: a tutorial on acidification and carbonate system variability in oceanic and coastal waters. Ocean Sciences Meeting 2020. San Diego, CA. Feb 16-21, 2020

### **POSTERS**

Sutton et al. Constraining change and variability of surface ocean CO<sub>2</sub>: A global network of autonomous time series. OceanObs19, Honolulu, Hawaii, Sept 16-20, 2019.