

## Advancing Coastal Intelligence in the US Caribbean: Surface Currents

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**Performance Period: December 1, 2018 – May 31, 2019**

### LONG-TERM GOALS

Rutgers University Center for Ocean Observing Leadership (RUCOOL) is a global leader in High-Frequency radar (HFR) network implementation and management. Through this proposal, RUCOOL looks to assist CariCOOS in the expansion and operation of their HFR network. The US Coast Guard has identified the ocean surface current data from the five existing HFR stations as an important resource for their search and rescue activities. The real-time surface current information improves the decision-making capabilities during critical lifesaving search and rescue missions.

The HFR network is part of the observational sensor subsystem for CariCOOS. The other subsystem for CariCOOS is a modeling and forecast component. The subsystem is comprised of wave, storm surge, wind and ocean circulation models. The ocean circulation model is based upon the Regional Ocean Modeling System (ROMS). The goal of this proposal is to compare the surface current measurements of the HF radar network with the output of the circulation model and test the capability of the other models to assimilate the measured ocean surface current data.

### MILESTONES / OBJECTIVES

No.	Deliverable	Delivery Date	Status
1	Deliver paper on Sargassum tracking method at OCEANS 2018 meeting in Charleston, SC	October 25, 2018	Complete
2	Make the Sargassum tracker real time	December 20, 2018	Revised to July 1, 2019
3	Hold midterm project meeting in Puerto Rico	November 15, 2018	Revised to August 1, 2019
4	Work with CARICOOS partners to test delivery of Sargassum warning	March 15, 2019	Revised to August 20, 2019
5	Attend CARICOOS General Assembly	April 2019	Complete



## WORK COMPLETED

1. We applied for a no cost extension to complete the work this summer. That was approved and we anticipate making the Sargassum tracker available this summer.
2. A new webpage was developed to chronicle the project [here](#). The old webpage that has the previous analysis from Year 1 and 2 is still available [here](#).
3. Hugh Roarty and Joe Anarumo attended the CARICOOS General Assembly and presented a poster on using the HFR measurements to validate the AMSEAS model. They also inspected the radar station at Playa Punta Tuna (MABO) to see how the station fared after Hurricane Maria and get a first-hand look at the Sargassum problem in the region
4. The HFR network performed well during this progress period. The radial data availability over the progress period is provided in Figure 1. The latest monthly coverage maps for each station are shown in Figure 2. The coverage for the five stations look good with two exceptions.
  - a. As noted in the previous progress report, the one troubling aspect of this plot is the radial vector count for the CDDO station. There is a daily drop in coverage due to an outside interference problem. The problem has been identified as a nearby light. Colin Evans is working with the property owner to remedy the situation.
  - b. The uneven spatial coverage at PYFC for the measured radials should also be addressed soon.
5. The totals vector maps are typically created on a 2 km and 6 km grid. The monthly average vector plots from the 6 km grid are shown in Figure 3.
6. We spent most of the spring evaluating the AMSEAS model (Figure 4) for use in the Sargassum tracker. We created daily mean maps of AMSEAS and compared them against daily mean maps of the HFR surface currents. The model agreed with the HFR data at least 50% of the time from December 1, 2018 to March 31, 2019. Therefore, we are ready to use the AMSEAS model to simulate surface drift and use it as predictor of Sargassum landings on shore.
7. We have identified five locations within CARICOOS where we will generate daily predictions of surface drift to help manage the Sargassum problem. One location was chosen from each region in the ¡Pa' la Playa! App. The locations are:
  - a. La Concha (North)
  - b. El Turque (South)
  - c. Combate (West)
  - d. El Cocal, Yabucoa (East)
  - e. Hull Bay, St. Thomas (Virgin Islands)

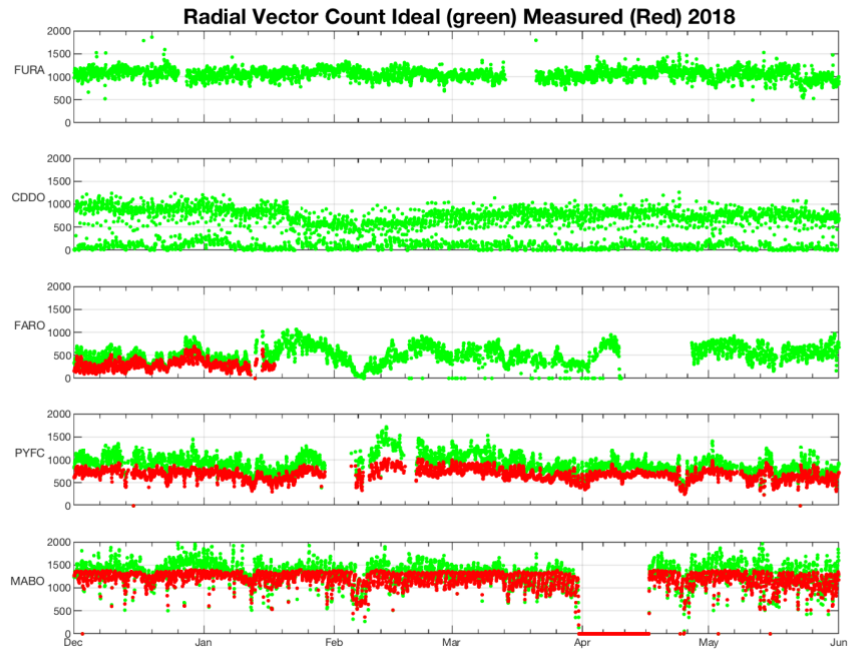
The locations are shown in Figure 5. An example of the East Region surface drift is shown in Figure 6 where a 24-hour simulation indicated that the surface drift was towards the northwest, so the likelihood of Sargassum landing on shore during this time period was low.

## MAJOR OUTCOMES



# CARICOOS

CARIBBEAN COASTAL OCEAN OBSERVING SYSTEM



06/04/19

Radial\_Vector\_Count\_01\_PR\_Meas\_2018.png / plotRadialVecsFromDB\_PR)v2.m

Figure 1: Ideal (green) and measured (red) radial data availability of the 5 HF radar stations in Puerto Rico on the Rutgers servers for December 1, 2018 to June 1, 2019.

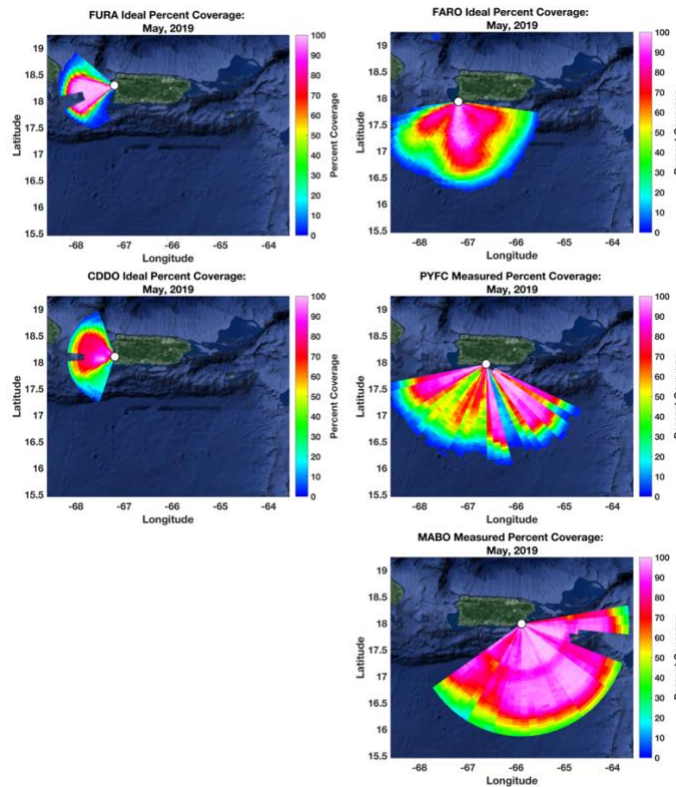


Figure 2: Radial coverage maps for FURA and CDDO (left) and FARO, PYFC and MABO (right) for May 2019.



# CARICOOS

CARIBBEAN COASTAL OCEAN OBSERVING SYSTEM

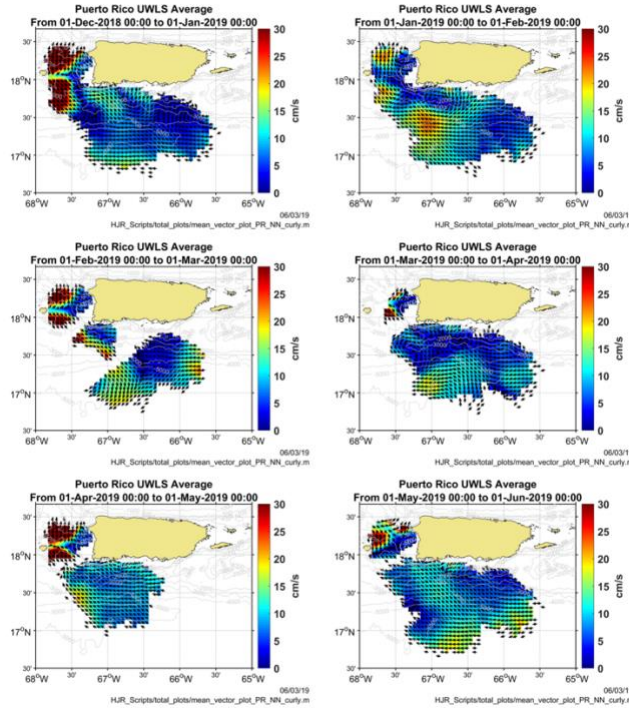


Figure 3: Monthly mean surface current measurements on the 6 km grid from December 2018 (top left) to May 2019 (bottom right). The color bar indicates speed from 0-30 cm/s and the arrows on the map indicate direction the current is towards. Each map requires 50% temporal coverage in order to plot a vector

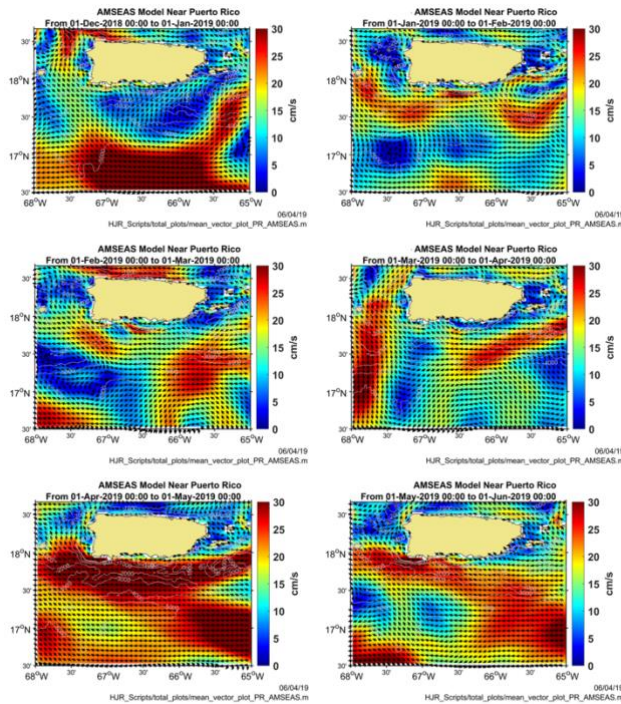


Figure 4: Monthly mean surface current measurements from AMSEAS model from December 2018 (top left) to May 2019 (bottom right). The color bar indicates speed from 0-30 cm/s and the arrows on the map indicate direction the current is towards.





## Puerto Rico/Virgin Islands Study Areas

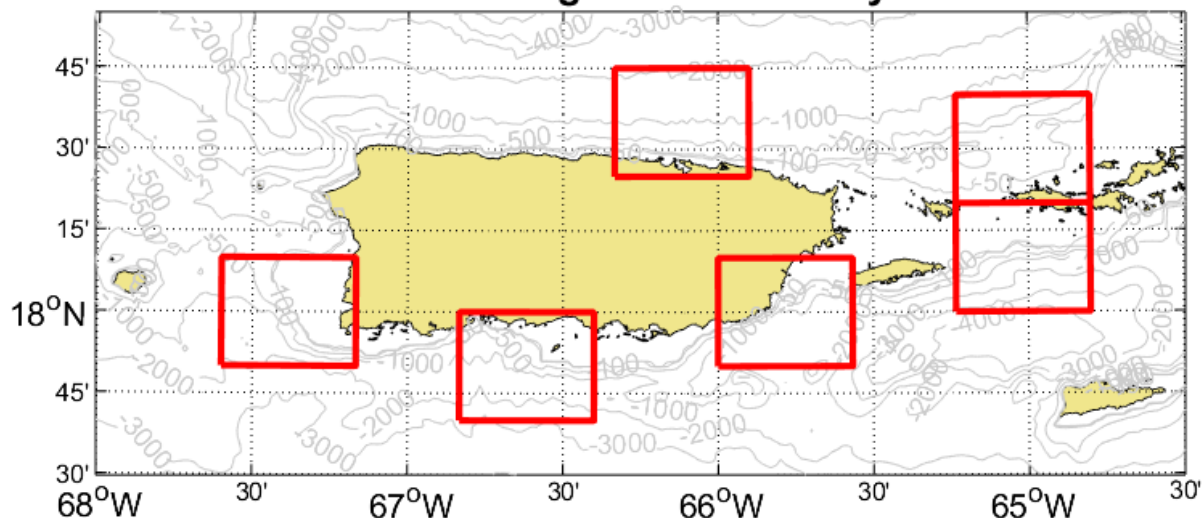


Figure 5: Map of Puerto Rico and Virgin Islands showing the locations (red boxes) where drifter simulations will be made available.

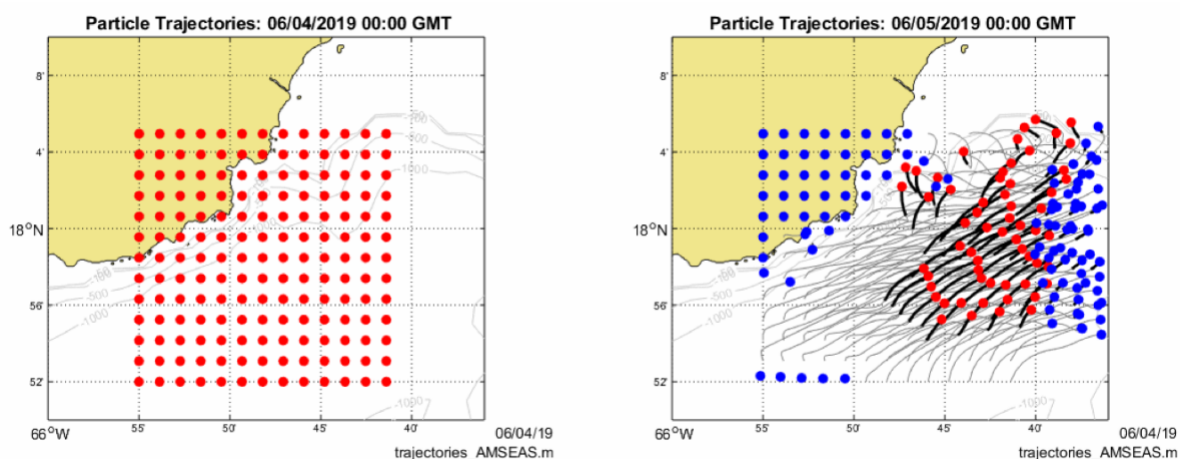


Figure 6: Surface drifter simulations off the southeast corner of Puerto Rico starting on June 4, 2019 00:00 UTC (left) and ending 24 hours later on June 5, 2019 00:00 UTC (right). If the particle left the surface current domain it turned from red to blue.

### RELATED PROJECTS

None

### PUBLICATIONS & PRODUCTS

1. Anarumo, J.A. and Roarty, H. (2019) "Evaluating AMSEAS Model Using HF Radar Data" CARICOOS General Assembly, San Juan Puerto Rico May 24, 2019