



## CARICOOS HF Radar Network

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


Performance Period: December 1, 2020 – May 31, 2021

### LONG-TERM GOALS

Maintain optimal surface current products through calibrations and data quality control and expand the HF Radar network to meet stakeholder interests, specifically in maritime safety.

### MILESTONES / OBJECTIVES

The following table includes the milestones/tasks as included in the FY20 scope of work and their current status.

Milestone/Task	Status (%)	Delivery Date	Status	Notes
Operate the CARICOOS HFR network	 100	Continuous	Completed	
Test 13 MHz radar in Isla de Cabras	 100	January 2021	Completed	
Install new HF Radar in St. Thomas	 50	May 2021	Delayed	Property lease signed; permits completed; concrete slabs can now be built for antennas & enclosure installation.
Install new HF Radar in Isla de Cabras	 25	May 2021	Delayed	Letter of agreement signed and delivered to Juan at Club de Pesca; Juan knows a contractor that will quote us for concrete slabs and cable trench.
Test 13 MHz radar at Fajardo lighthouse	 100	March 2021	Completed	
Meet with Brian Zelenke and Freedom Technologies to discuss HF Radar frequency transitions	 100	April 2021	Completed	

### WORK COMPLETED

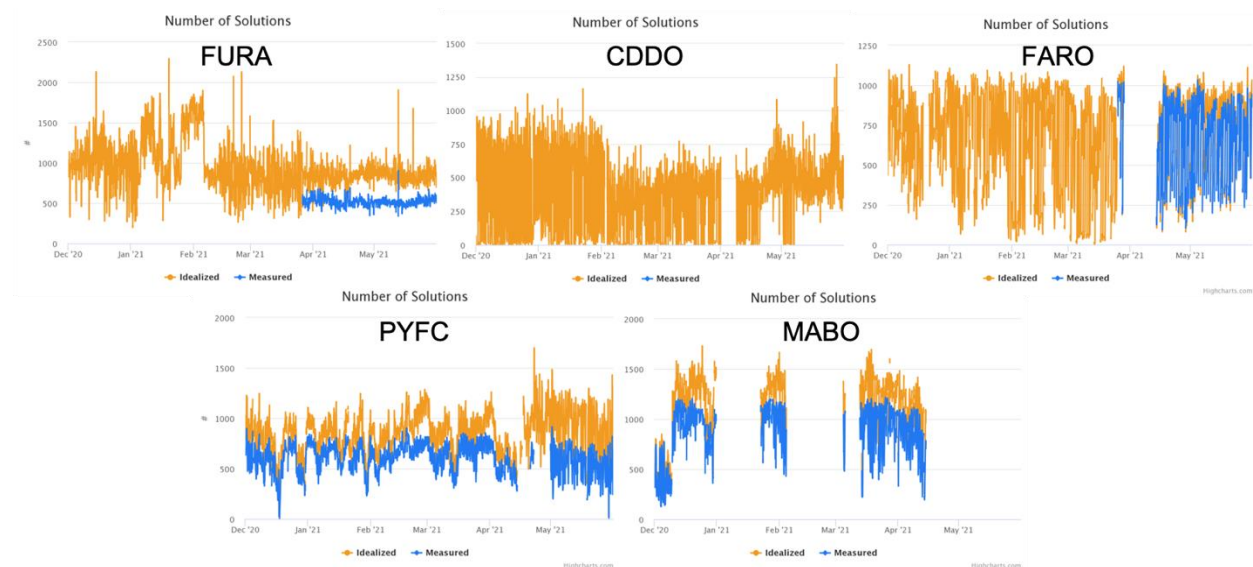
- CARICOOS successfully performed an off-grid test of a new mid-range HF Radar at an anticipated location in Isla de Cabras San Juan as part of the 5-year network expansion
- A similar off-grid test was successfully completed at the lighthouse in Fajardo.
- The diurnal light source interference issue at the CDDO HF Radar site has been minimized; the marina director replaced it with a low power solar light



- An antenna calibration was performed at FURA in late March
- An antenna calibration was performed at FARO in late March
- New antenna calibrations were performed at PYFC in April and May
- Developed provisional 5-year HF Radar expansion plan to meet stakeholder interests
- Maintained network operation, despite power failures at FARO and MABO sites
- Contacted HFRnet to switch radial pattern type to measured for contribution into National Network surface current maps
- RMA 2272 (failed 5 V supply on transmitter 2017504 front panel board) from CODAR Ocean Sensors was repaired, delivered, and reinstalled

## **MAJOR OUTCOMES**

During this progress period, the HF Radar network performed best in December 2020. However due to the MABO site downtime resulting from power availability issues, data coverage in the southeast was limited during the January, February, and May 2021 months. [Figure 1](#) shows the monthly radial solution availability for the CARICOOS region computed by the National Network held at Scripps University in San Diego, California.



*Figure 1. Number of radial solutions for each CARICOOS HF Radar site for Dec 2020 - May 2021.*

Averaged surface currents, or totals, are provided in [Figure 2](#) to show distinct features in the monthly mean flows. Only total solutions that met a minimum 40% monthly availability threshold per grid point were used in the calculations. Furthermore, as part of the National Network quality control requirement, vectors with a geometric dilution of precision (GDOP) greater than 1.25 were omitted [1]. A spatial distribution of the GDOP values are shown in [Figure 3](#).



# CARICOOS

CARIBBEAN COASTAL OCEAN OBSERVING SYSTEM

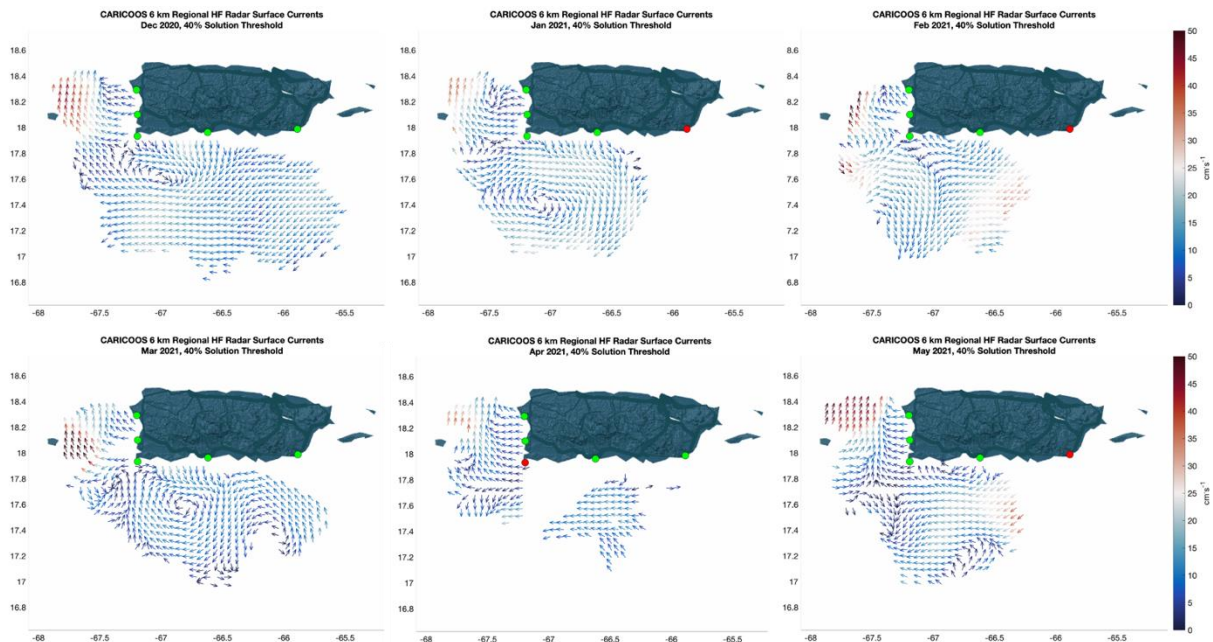


Figure 2. Monthly averaged surface currents fit to a 6 km grid. Sites that did not meet the 40% data availability requirement are shown in red.

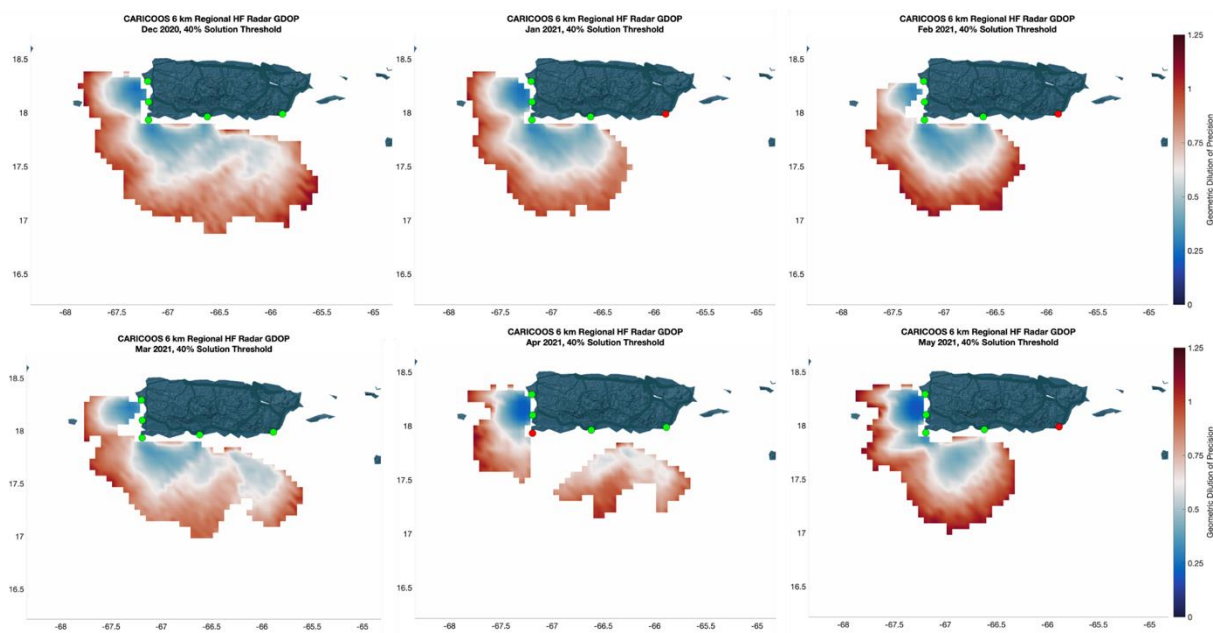


Figure 3. HF Radar Network GDOP magnitudes.

A significant contribution to the recent 5-year proposal submitted to the NOAA IOOS office centered around the CARICOOS HF Radar network expansion to the north coast where the U.S. Coast Guard has requested data availability for the sea lanes between the San Juan Bay and St. Thomas. Two locations in Isla de Cabras and Fajardo, PR were selected as optimal locations for data coverage. Data was collected from two separate days of testing to confirm the



HF Radar coverage and performance to validate if the selected locations would meet stakeholder needs. Figure 4 shows the radial overlay from each site.

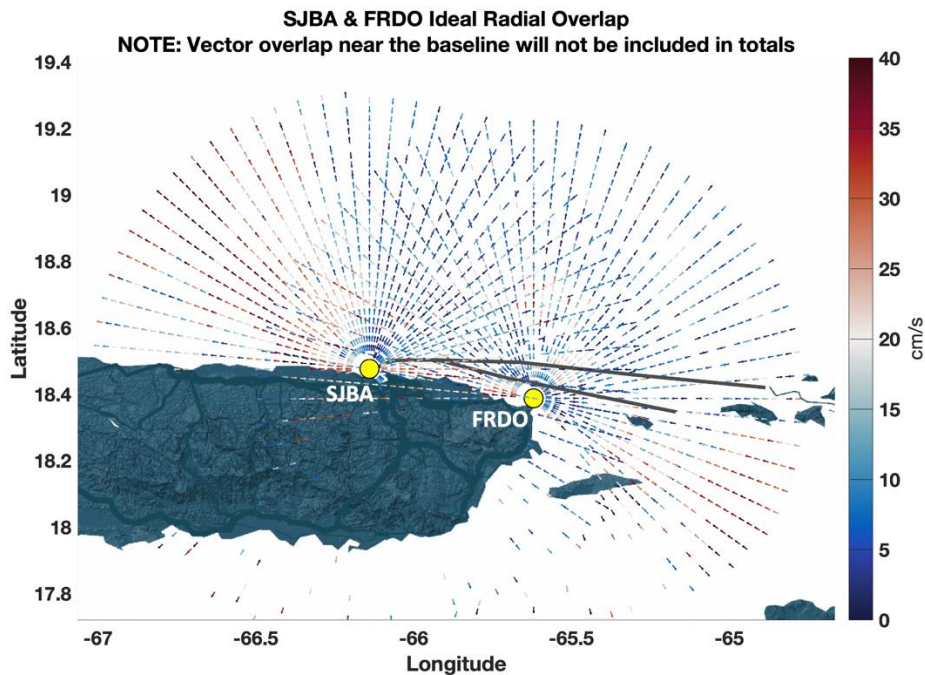


Figure 4. Radial overlay for Isla de Cabras (SJBA) and Fajardo lighthouse (FRDO) from 13 MHz HF Radar off-grid testing. The two black line segments indicate the sea lanes.

## **RELATED PROJECTS**

Data from the CARICOOS HF Radar network is being used for validation in the *Sargassum* inundation forecasting project, which is utilizing AMSEAS and FVCOM regional models.

## **WORK PLAN FOR UPCOMING PERFORMANCE PERIOD (June 1, 2021 – November 30, 2021)**

- Power restoration at MABO site
- Rotate receive antenna and perform calibration at MABO site
- Reinstall original PYFC receive antenna when new parts are delivered from CODAR Ocean Sensors
- Troubleshoot receiver restart issues at FARO site
- Install new HF Radar site at the fishing club in Isla de Cabras in the San Juan Bay
- Install new HF Radar site on Water Island in St. Thomas
- Hold several technical discussions with CODAR Ocean Sensors regarding off-grid power module specifications and SeaSonde low power (LP) operations
- Attend and present at MTS OCEANS conference



# CARICOOS

CARIBBEAN COASTAL OCEAN OBSERVING SYSTEM

- Develop code to automatically compare HF Radar radial data to buoy currents and regional models (RTOFS & FVCOM) as part of quality control
- Develop automated wave parameter comparison code comparing north HF Radar sites with new Arecibo directional wave buoy
- Perform antenna pattern calibration at CDDO

## **REFERENCES**

1. HFRNet (N.D.), "HF-Radar Network Near-Real Time Ocean Surface Current Mapping"  
[https://cordc.ucsd.edu/projects/mapping/documents/HFRNet\\_QC-RTVproc.pdf](https://cordc.ucsd.edu/projects/mapping/documents/HFRNet_QC-RTVproc.pdf)

## **PUBLICATIONS & PRODUCTS**

Abstract submitted to MTS OCEANS San Diego held September 2021. Title of abstract: "A Bird's-Eye View of the CARICOOS HF Radar Network Expansion and *Sargassum* Dispersal Asset"