



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

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

### 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 latest improvements of Sargassum tracking method at OCEANS 2020 virtual meeting	Oct 31, 2020	Complete
2	Evaluate the NOAA Maximum Chlorophyll Index product in comparison to the USF AFAI product for estimating Sargassum around Puerto Rico and the Virgin Islands	Dec 31, 2020	Complete
3	Develop a validation method of the Sargassum Tracker for beaching events	Feb 15, 2021	Complete
4	Evaluate if the CARICOOS FVCOM surface current product outperforms the AMSEAS model product for beaching events and/or coastal circulation.	Mar 15, 2021	On Schedule, will be delivered during no cost extension
5	Attend CARICOOS General Assembly	Apr 2021	TBD

### WORK COMPLETED

Made several improvements to the [Sargassum Tracker](#).

- Now utilizing the MCI satellite product to color the drifters
- Adjusted the range of colormap to -0.05 to 0.1 MCI



# CARICOOS

CARIBBEAN COASTAL OCEAN OBSERVING SYSTEM

- Adjusted and high levels of MCI to indicate Sargassum
- Drifters now retain MCI concentration after they stop drifting

colormap to low, medium

We are now downloading FVCOM model runs from CARICOOS. We have April 23, 2021 to June 15, 2021 at Rutgers.

Held phone conference with William Hernandez to discuss research overlap. He has a Sea Grant project focused on utilizing high resolution sensors (10-30 m, Landsat, Sentinel-2) to quantify the Sargassum impact. In addition to identifying the hotspot areas where they have seen accumulation over the past years, but also engaging with partners to collect water quality information in those areas as well.

Generated AFAI vs MCI daily composites from April 28, 2020 to October 22, 2021 to perform qualitative comparison of products.

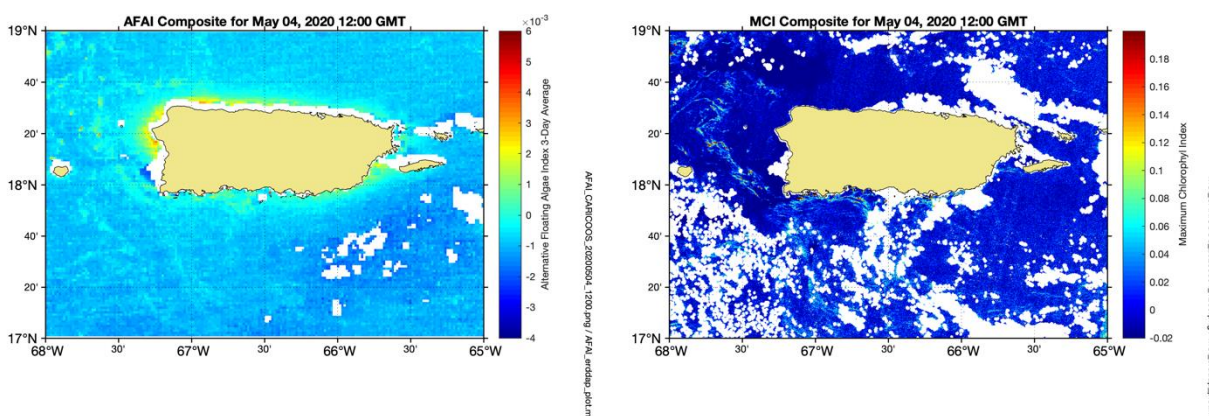


Figure 1: Comparison of AFAI (left) and MCI (right) satellite products for May 4, 2020.

Developed interface to access historical drifter trajectories. The archive is available [here](#).

Generated animation of weekly NOAA Sargassum Inundation Reports (SIR) from July 2019 to October 2020 for the Lesser Antilles Region. The animation demonstrates the waves of Sargassum that passed Puerto Rico in July 2019, June 2020 and April 2021. See Figure 2.

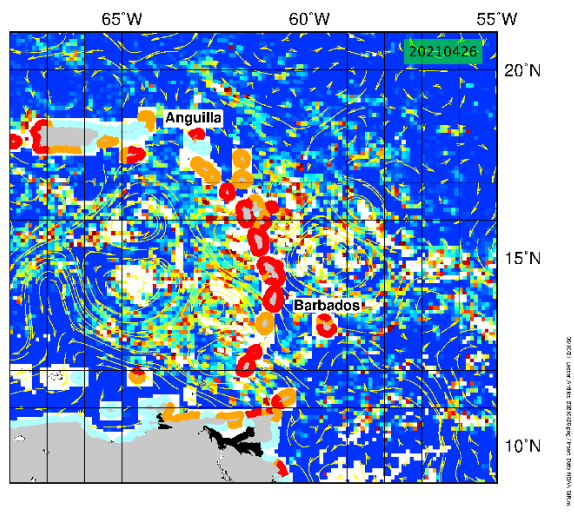


Figure 2: NOAA Sargassum Inundation Report (SIR) for April 26, 2021 for Lesser Antilles.

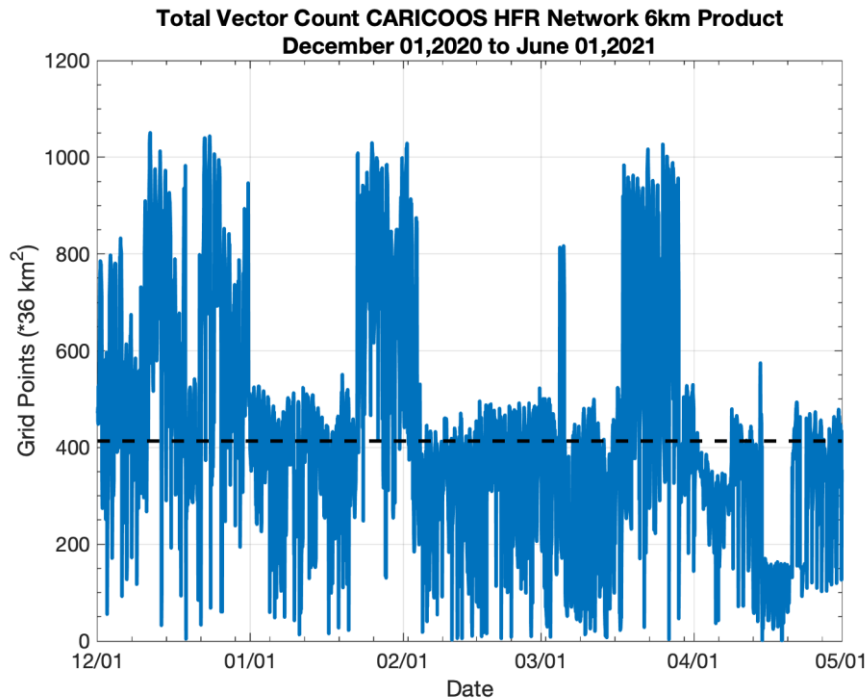


Figure 3: Time series of 6 km total vector coverage. The dashed black line represents the mean coverage for the progress period which equates to approximately 14,900 km<sup>2</sup>.

## **MAJOR OUTCOMES**

We concluded that the MCI product outperforms the AFAI product in estimating Sargassum concentrations around Puerto Rico and the Virgin Islands.

Data from the [Sargassum Monitoring Project](#) which documents beaching events have been utilized to validate the ocean currents from the AMSEAS model and organic material concentration from the satellite products. See Figure 4.



# CARICOOS

CARIBBEAN COASTAL OCEAN OBSERVING SYSTEM

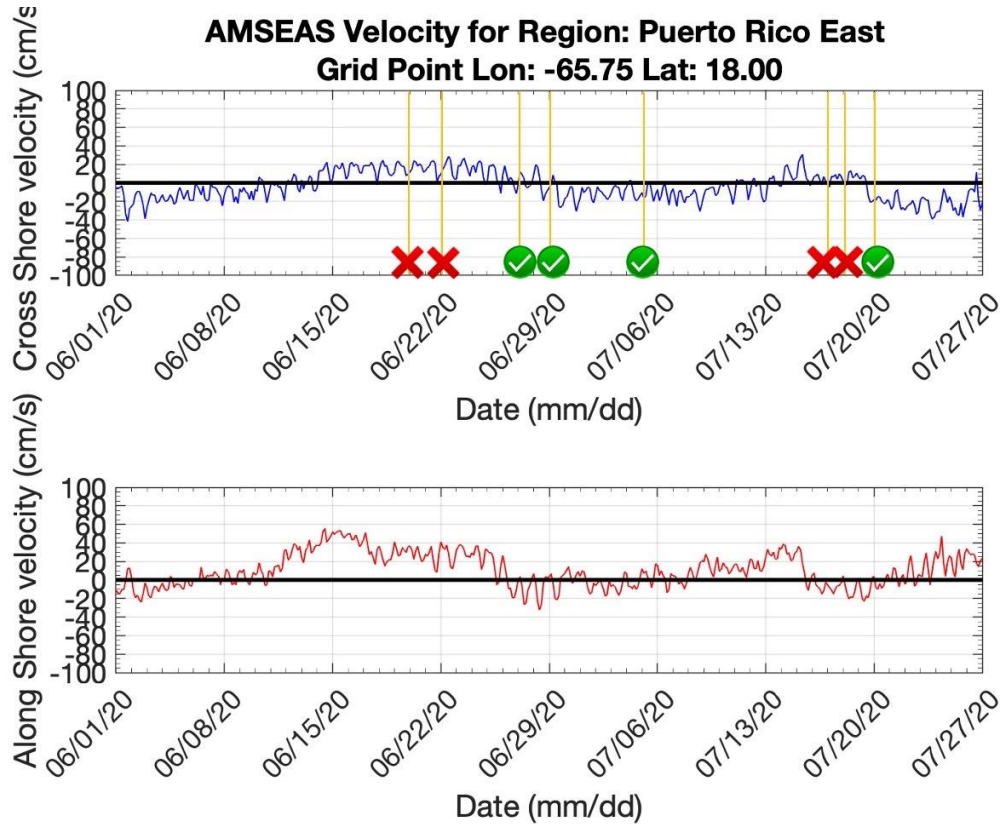


Figure 4: Time series plot of cross shore (top) and alongshore (bottom) velocity from the AMSEAS model along the east coast of Puerto Rico. The yellow horizontal lines in the top plot represent Sargassum beaching events as recorded by the Sargassum Monitoring Project. The red arrows mark events where the cross-shore velocity was offshore which would suggest the model could not explain the beaching event while the green circles mark periods when the cross-shore velocity was onshore indicating the model could explain the beaching event.

We documented a Sargassum beaching event for Vieques on May 20, 2021. We generated AFAI and MCI maps and the MCI provided greater detail of the Sargassum concentrations. We also generated 24-hour surface trajectories for May 18 and 19 using the CARICOOS FVCOM model output. Both days showed a transport towards the north around Vieques which would agree with the beaching event (Figure 5).

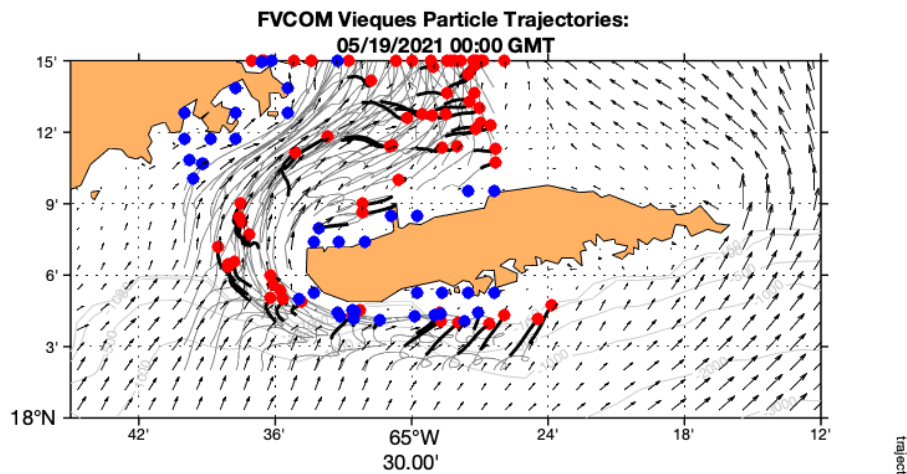


Figure 5: Surface trajectories from FVCOM data for May 18, 2021



# CARICOOS

CARIBBEAN COASTAL OCEAN OBSERVING SYSTEM

The HFR network was utilized to identify an anticyclonic eddy that was offshore of the southern coast of Puerto Rico in May 2021. This coincided with a significant Sargassum beaching event in the same area.

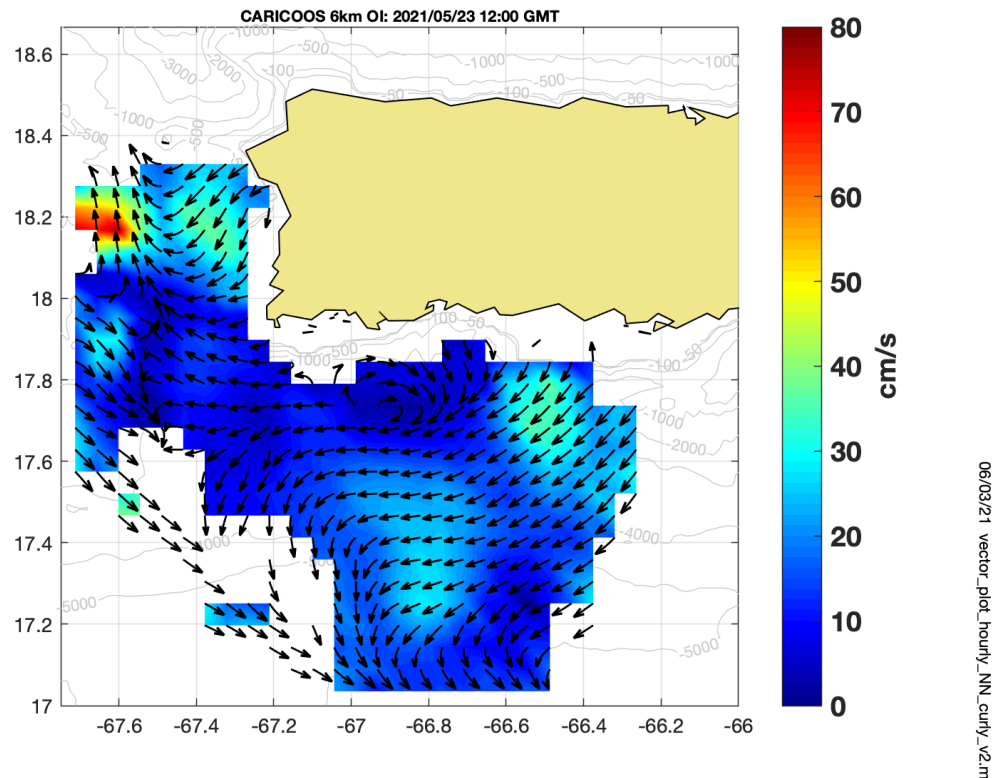


Figure 6: HFR surface currents on May 23, 2021 12:00 UTC. Note the anticyclonic eddy south of La Parguera.

## RELATED PROJECTS

The work being conducted here is closely aligned with the HFR surface current work being conducted within MARACOOS.

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

We plan to generate surface trajectories using the FVCOM data we are receiving from CARICOOS.

## REFERENCES

none

## PUBLICATIONS & PRODUCTS

none