Advancing Coastal Intelligence in the US Caribbean: Surface

PI Hugh Roarty
71 Dudley Rd. New Brunswick, NJ 08901
hroarty@marine.rutgers.edu
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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	Color code the virtual drifters based upon the AFAI concentration from the USF satellite product.	January 30, 2020	Complete
2	Develop a validation page that shows the comparison between the HFR surface trajectories and the ocean model trajectories.	February 28, 2020	Complete
3	Hold midterm project meeting in Puerto Rico	February 15, 2020	Delayed
4	Evaluate the RTOFS model for surface trajectory skill. If the FVCOM model output is available, evaluate that as well.	May 15, 2020	Delayed
5	Attend CARICOOS General Assembly	April 2020	Delayed

WORK COMPLETED

- Corresponded and met with Benjamin Jelen. He is working with municipalities for permission to gather the tons of Sargassum biomass after they have cleared beaches. He is interested in the Sargassum monitoring and prediction being done. Base on our discussions we added a Northeast quadrant (Figure 1) to the Sargassum tracker. https://marine.rutgers.edu/~hroarty/caricoos/animations/

- We made several improvements to the Sargassum Tracker

    o Modified code to expand the bounds for current extraction. Previously the code was using the plotting bounds. This gives drifters opportunity to keep moving.

    o A land mask is now applied to the matrix of drifters so that drifters that are located on land are not shown in the animation.

    o Added legend to AFAI colorbar

    o We wrote a function to read in the AFAI data and color code the drifters based on AFAI concentration.

- Received an FVCOM dataset in Matlab .mat format from Miguel Canals on January 29, 2020. We created a Matlab function to read in the FVCOM dataset so it can be integrated into the Sargassum tracker code. We generated 24 hour trajectories for January 18, 19 and 20 , 2019 and compared the FVCOM trajectories to the AMSEAS and HFR trajectories.

- We have developed the code to generate trajectories for the FVCOM surface currents that are posted online in .nc format (Figure 2). We plan on making this code operational in the next progress period.

- Developed a quantitative comparison between the HFR and AMSEAS trajectories (Figure 3). The Matlab code runs once a day at 08:00 local. The time in the code is set to go back two days and run the trajectories forward for 24 hours. The reason for going back two days is to allow any intermittent communications to be resolved so the HFR data can make it back to the central data assembly center. The trajectories are started at 06:00 GMT to give the HFR trajectories the greatest chance of advecting as the coverage for that product varies with time of day and HF noise environment. The data exists from March 5, 2020 to present. The imagery and data files are available here: https://marine.rutgers.edu/~hroarty/caricoos/Drifter_Simulations/

- We informed NOAA twice of problems with the AMSEAS model, once on April 22 and the other instance was May 20. This prevented the AMSEAS animations from running.

- We corresponded with Joaquin Trinanes from NOAA in February 2020. We discussed the Weekly Sargassum report. It utilizes the weekly density report from USF to estimate the presence of Sargassum. They are hoping to make the report available in a GIS shape file, but the images in the pdf and on the site are what is currently available. The coastal coverage is not optimal. They have a 300 m product that they would like to introduce but the amount of data is large and they don't have the resources to accommodate such a large data set.

- The HFR network performed well during this progress period. The radial data availability over the progress period is provided in Figure 4 and the total vector availability is given in Figure 5. The total vector drop in late December is atributed to PYFC being down and the drop in early May is linked to MABO being down.
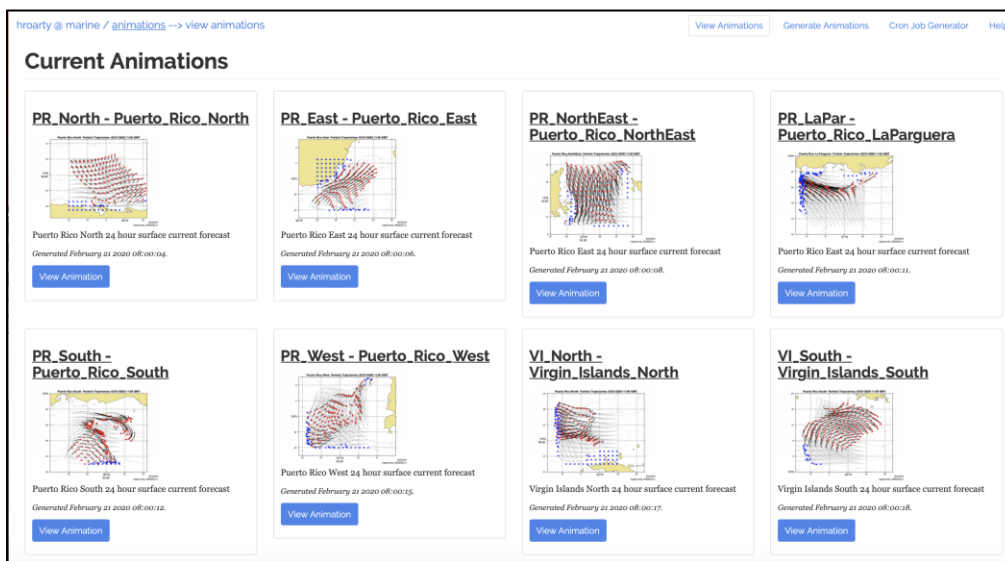
MAJOR OUTCOMES

Figure 1: Screen grab of the Sargassum Tracker available at this link. The Northeast region was added this progress period based on the conversations with Ben Jalen.
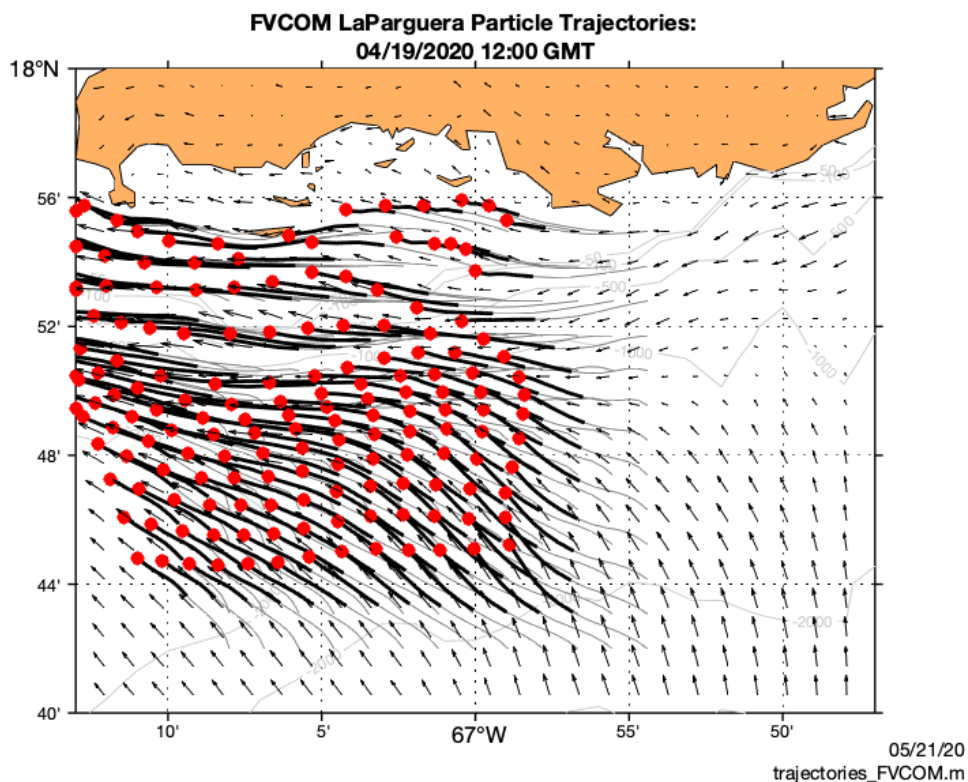

Figure 2: Surface trajectories generated from the FVCOM surface current data provided by Miguel Canals research group.
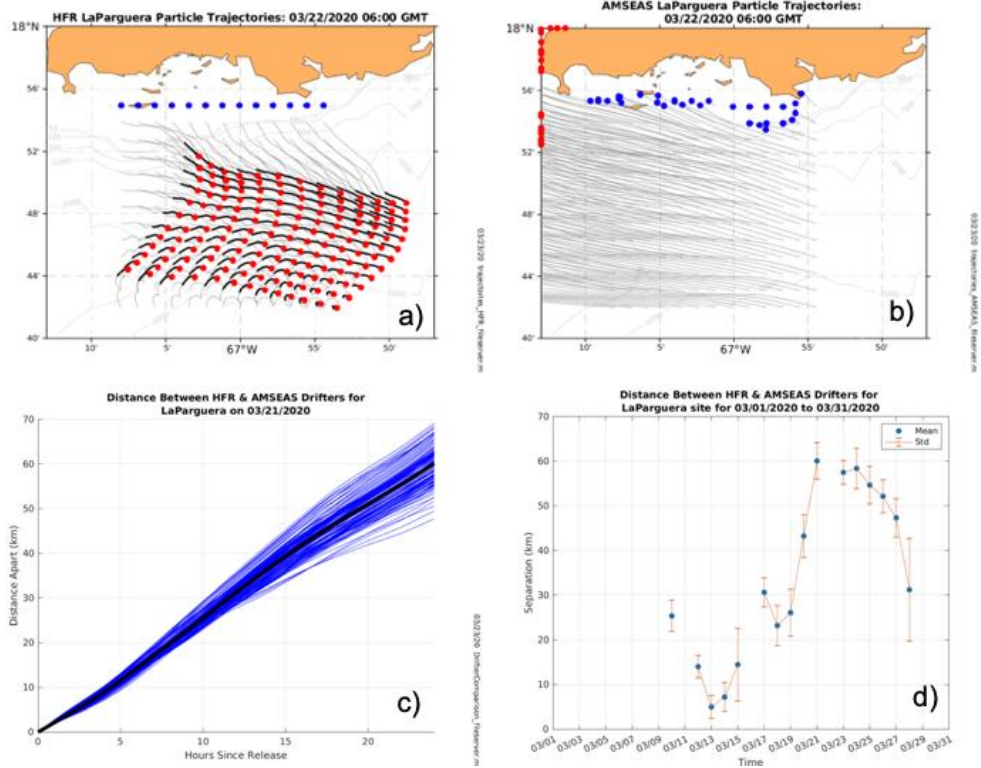
Figure 3: Summary picture of the AMSEAS model validation tool. a) 24-hour surface trajectories from the HFR network b) 24-hour surface trajectories from the AMSEAS model c) separation between the HFR and AMSEAS drifters (blue lines) and average (black line) over 24 hours d) the mean (blue dot) and standard deviation (error bars) separation for March 2020 for the La Parguera region.
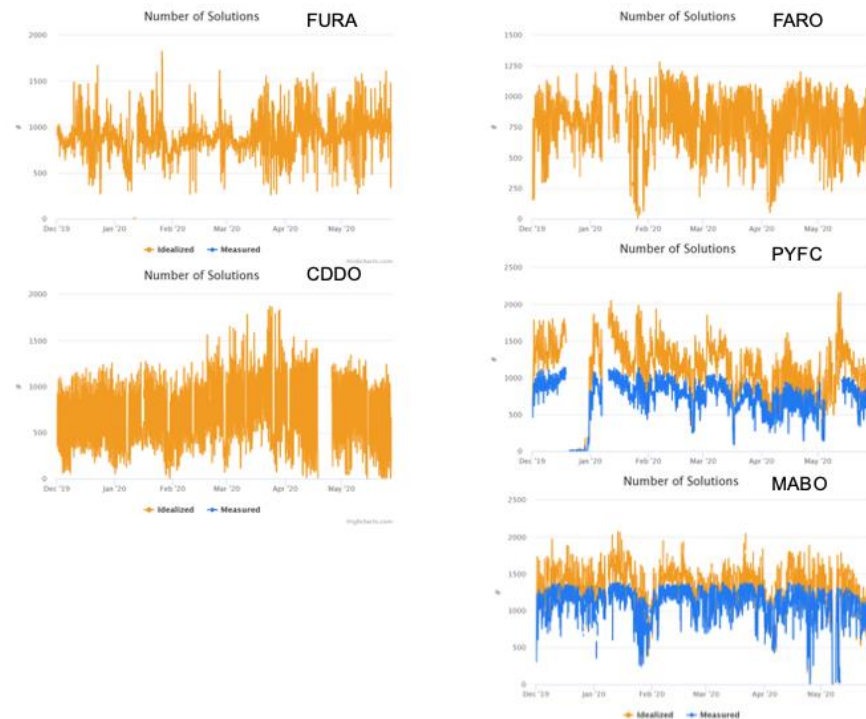

Figure 4: Ideal (orange) and measured (blue) radial data availability of the 5 HF radar stations in Puerto Rico on the National Network servers for December 1, 2019 to May 27, 2020.
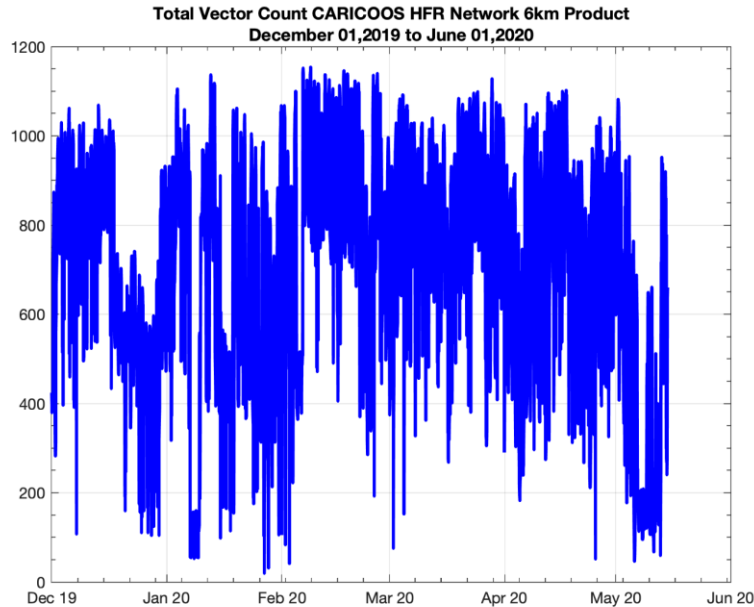
Figure 5: Time series of 6 km total vector coverage.

RELATED PROJECTS

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

CHANGES/PROBLEMS

Due to the COVID-19 pandemic, we were unable to travel to Puerto Rico for the General Assembly and the midterm project meeting. Because of this, we requested a no cost extension to continue the work till after the pandemic has subsided and we are able to travel again. We have spent 35% of the budget so far, so this leaves us in a good situation to contune the work in the summer and fall with a majority of the budget still remaining.

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

[Briefly describe your work plan for FY20 (**if applicable**), taking into account the progress described in this report]

PUBLICATIONS & PRODUCTS

Abstract submitted to the MTS OCEANS Biloxi meeting "Integration of Additional Products into the Sargassum Seaweed Tracker"

REFERENCES

None