

# Evaluation of the NOAA Operational Forecast System in Delaware Bay



Dr. Hugh Roarty

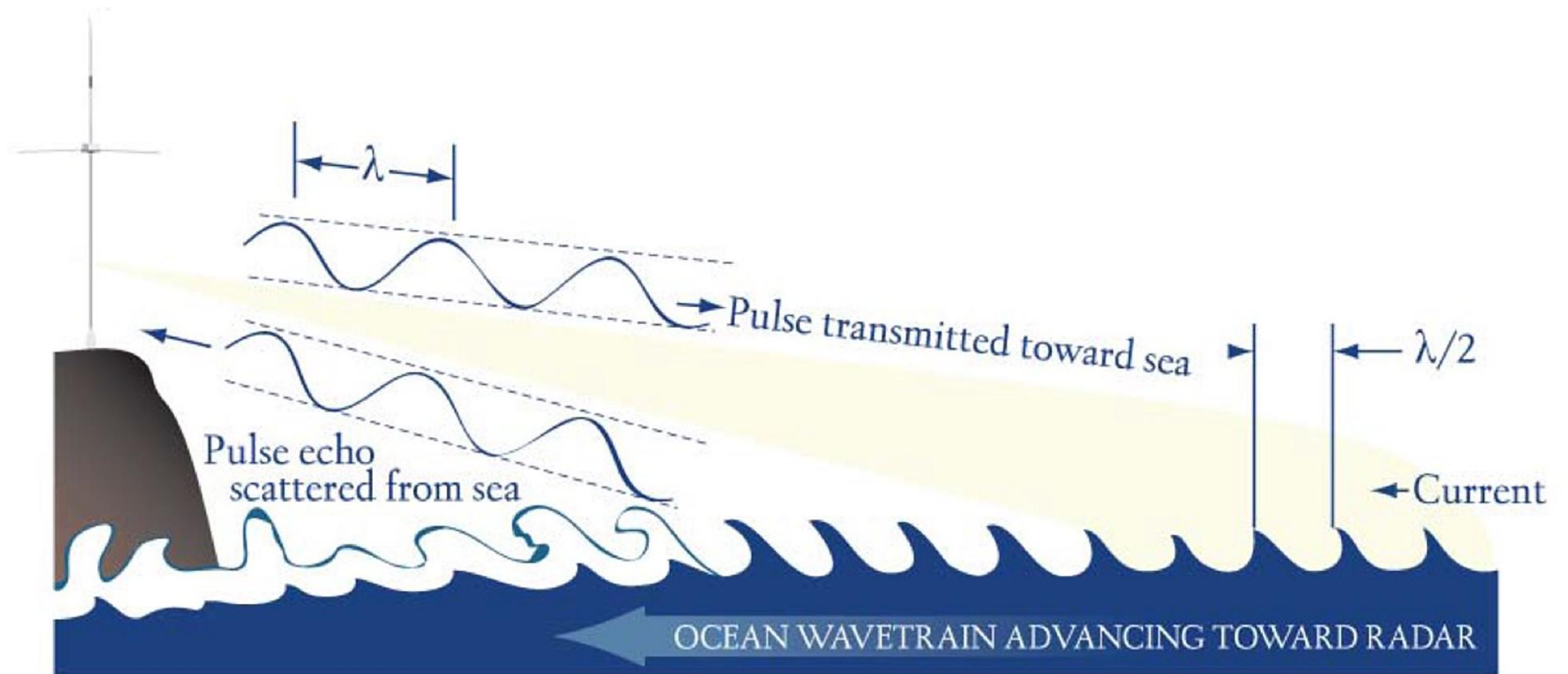


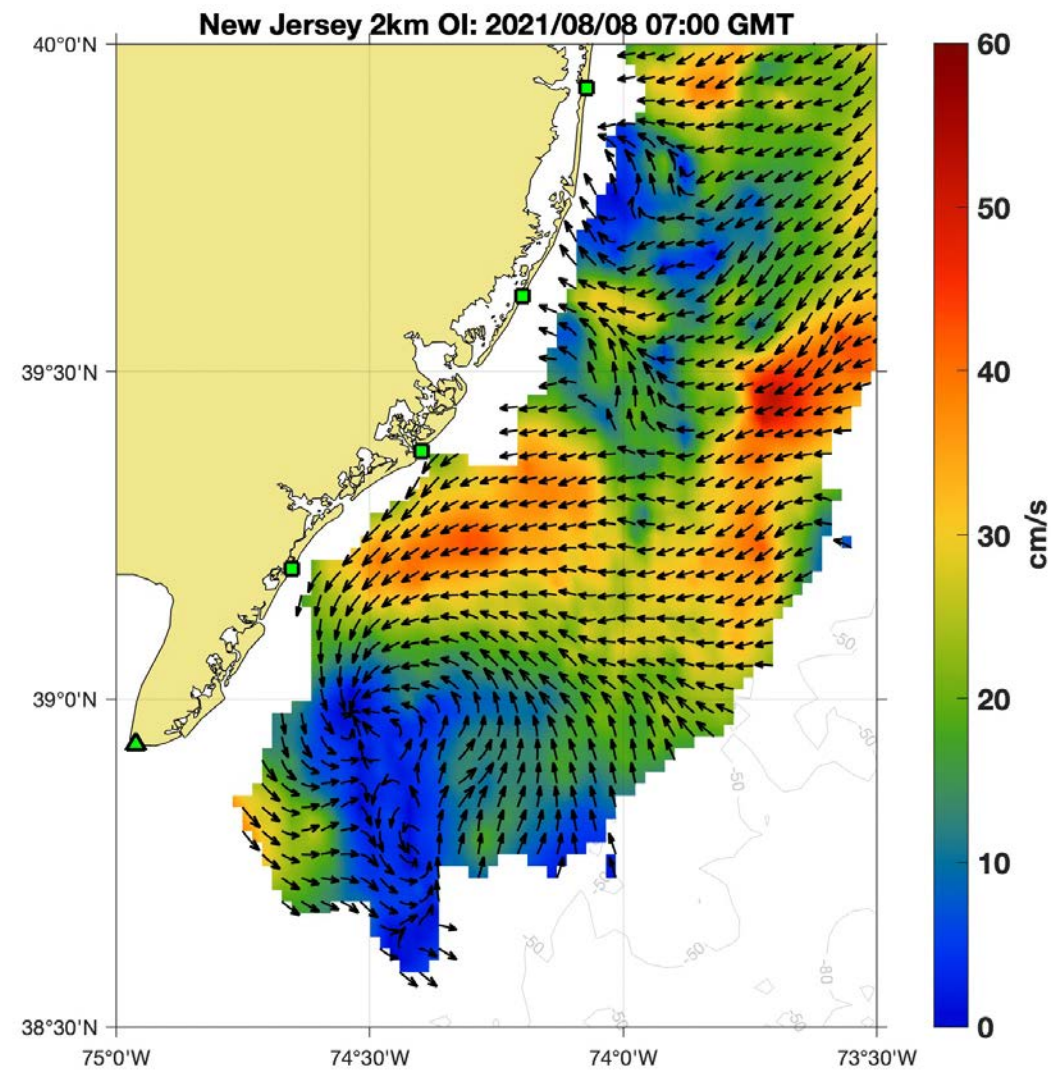
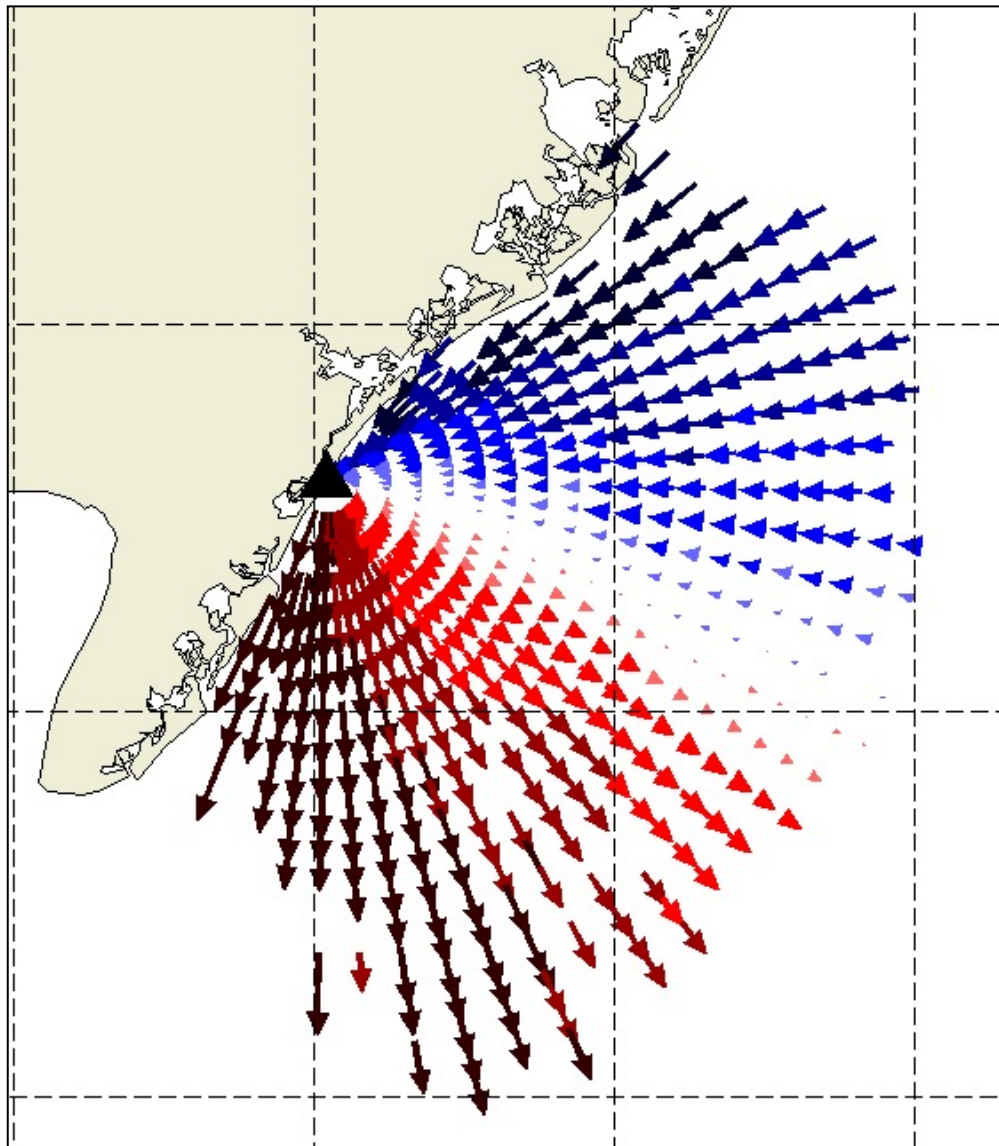
# Outline

- Introduction to
  - HF radar
  - NOAA PORTS
  - Delaware Bay Operational Forecast System (DBOFS)
  - US Coast Guard Ports and Waterways Safety Assessment
- Overview of HF radar measurements in Delaware Bay
- Two week evaluation of the NOAA Operational Forecast Model in Delaware Bay using the HFR measurements

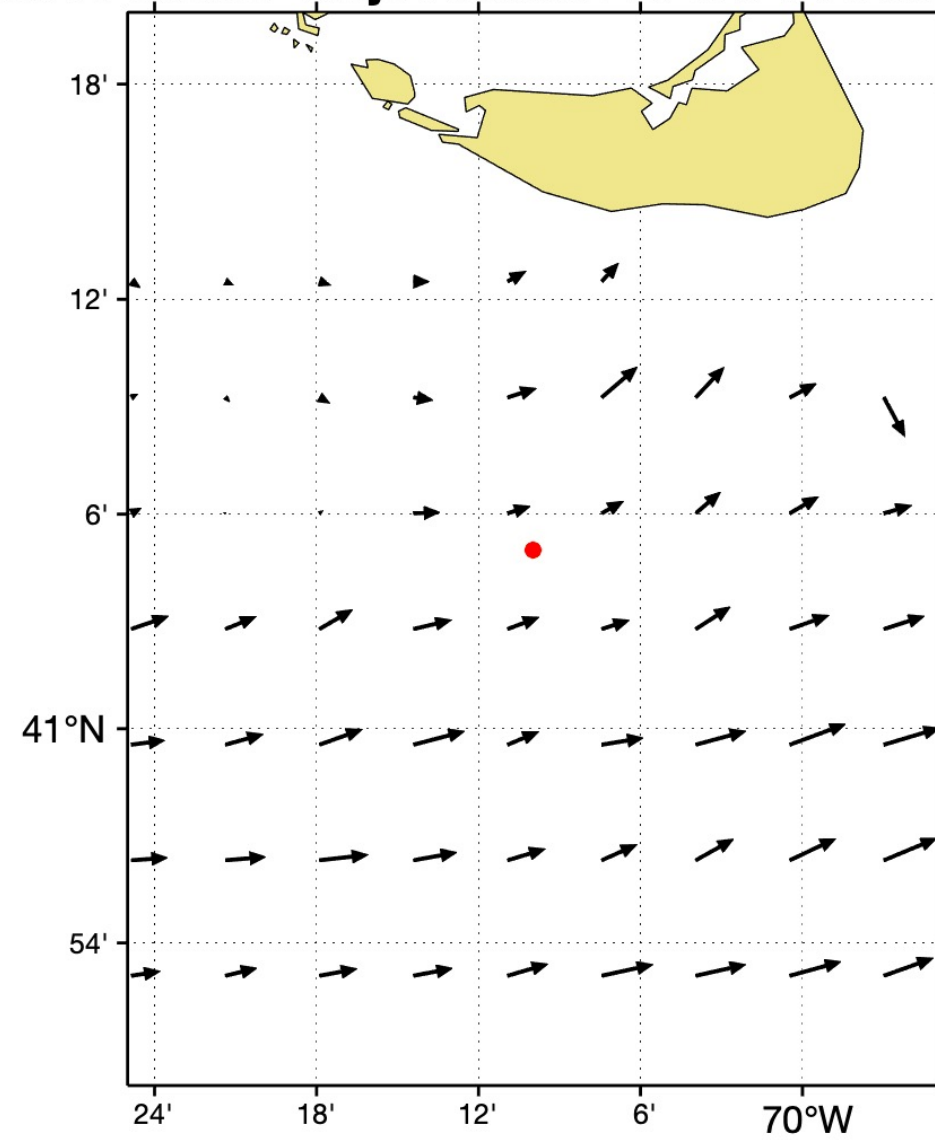


# Introduction to HF Radar



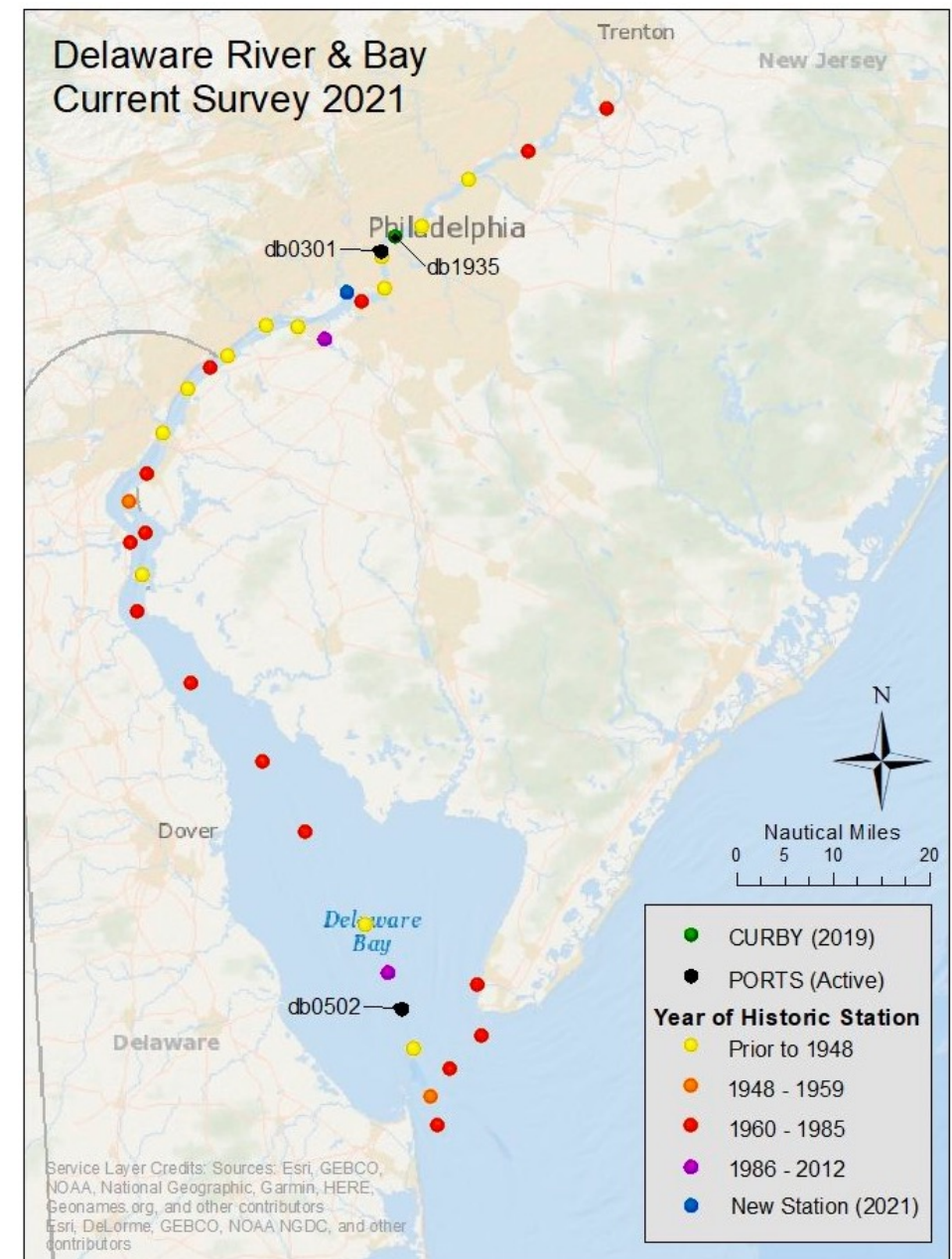


## MARA Particle Trajectories: 2020/04/18 00:00 GMT

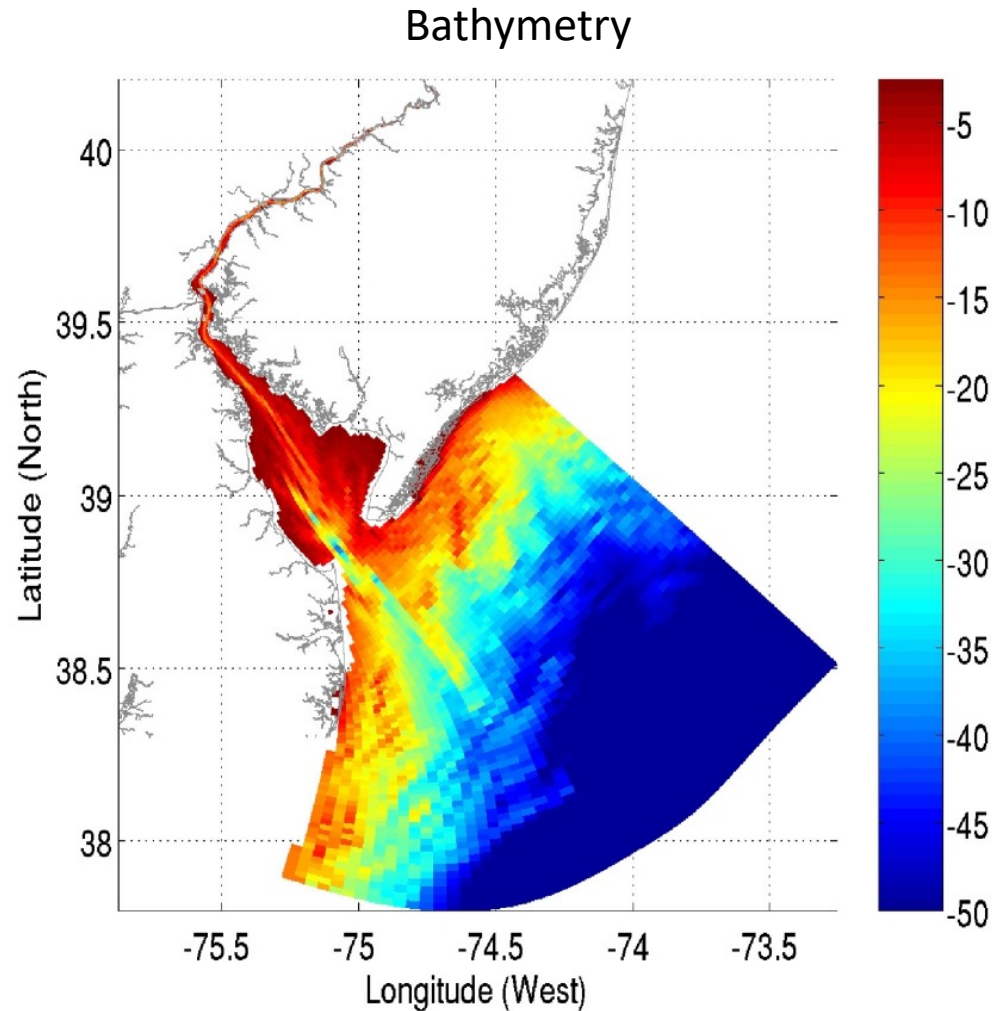




# NOAA PORTS

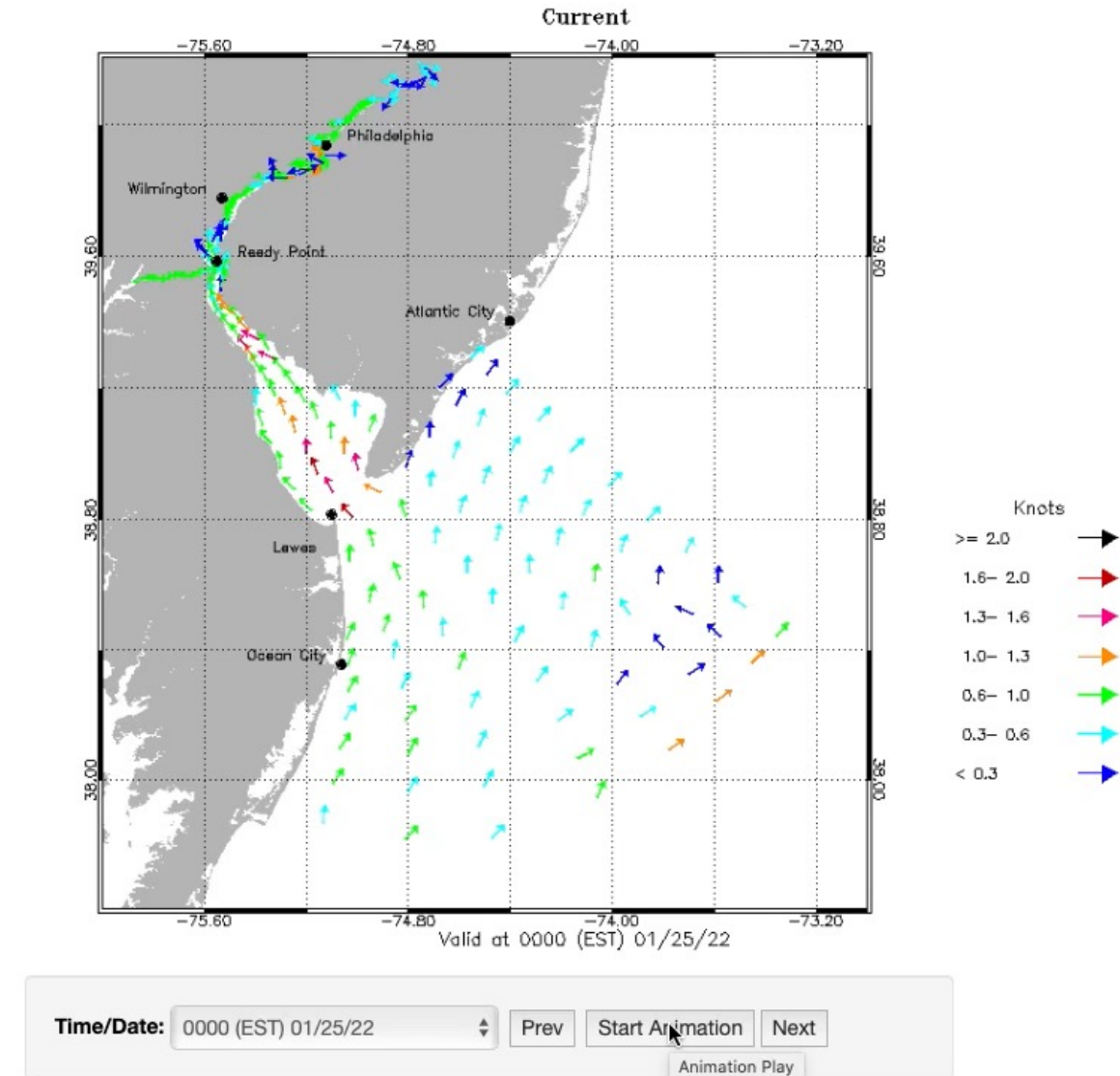


# Delaware Bay Operational Forecast System



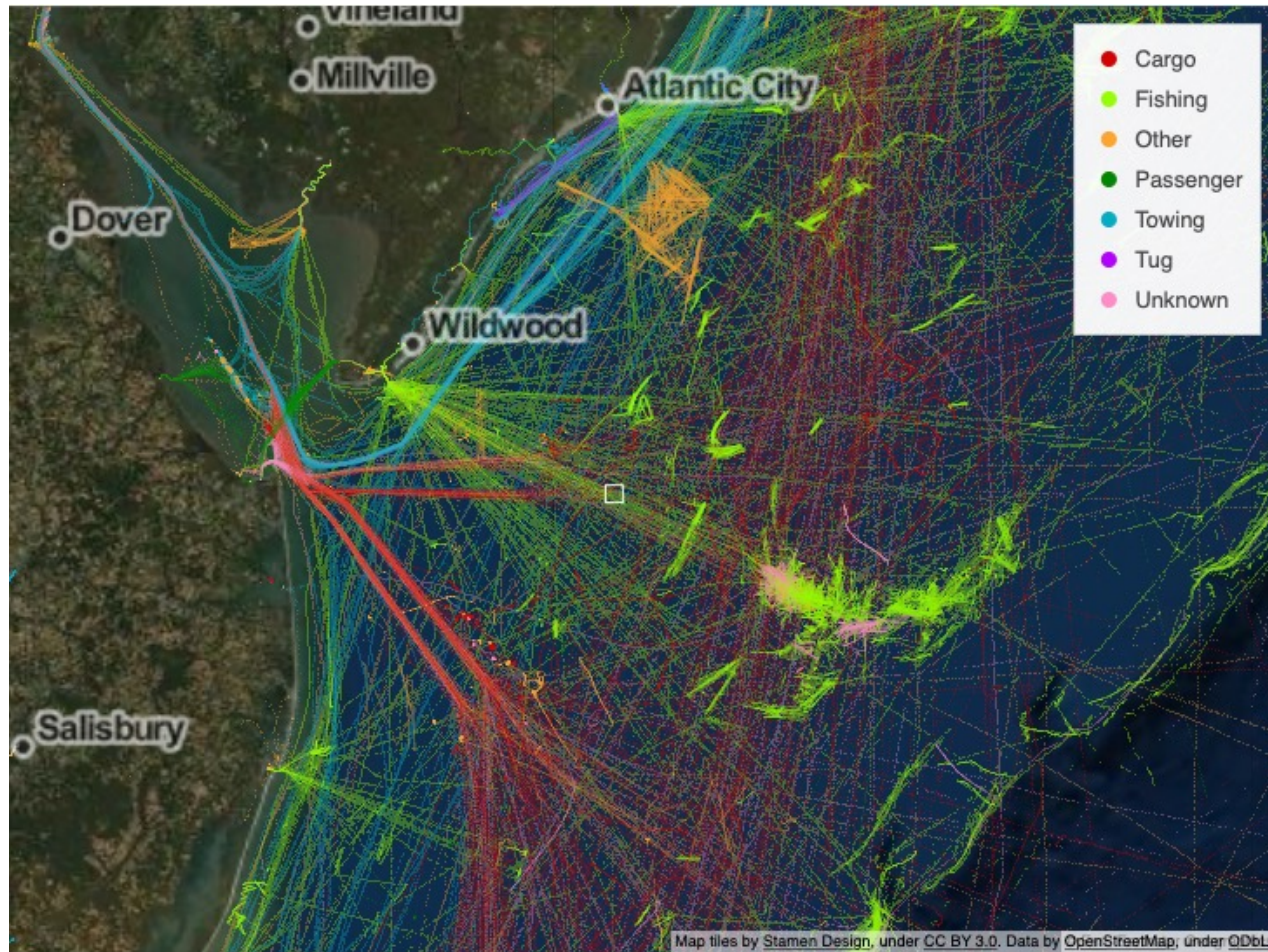
## Delaware Bay OFS Currents Nowcast

All model nowcast and forecast information is based on a hydrodynamic model and should be considered as computer-generated nowcast and forecast guidance.

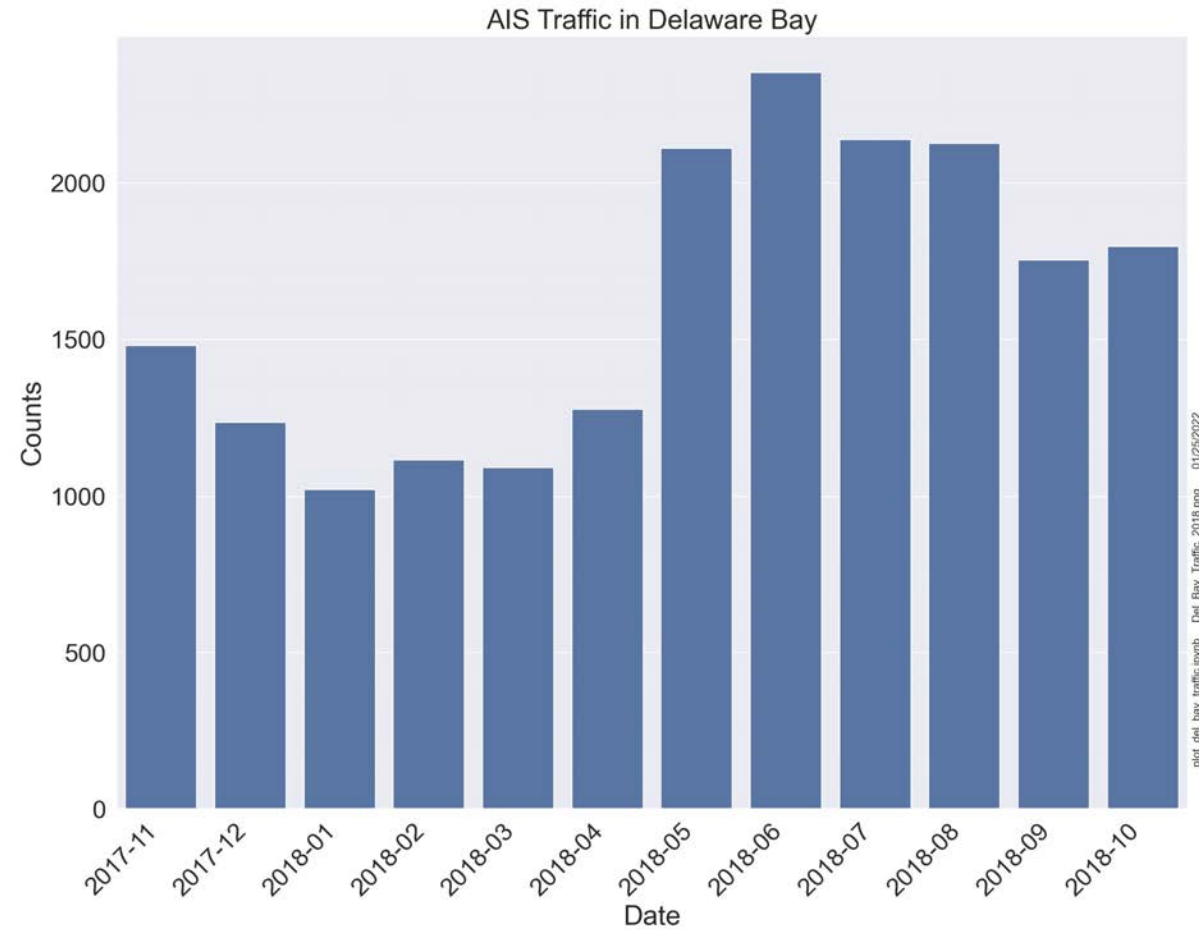




# Delaware Bay Traffic



[https://examples.pyviz.org/ship\\_traffic/ship\\_traffic.html](https://examples.pyviz.org/ship_traffic/ship_traffic.html)





# Ports and Waterways Safety Assessment

## Ports and Waterways Safety Assessment

### Workshop Report

### Delaware River



United States Coast Guard  
Marine Transportation Systems Directorate



Providing Navigation Safety Information  
for America's Waterways Users

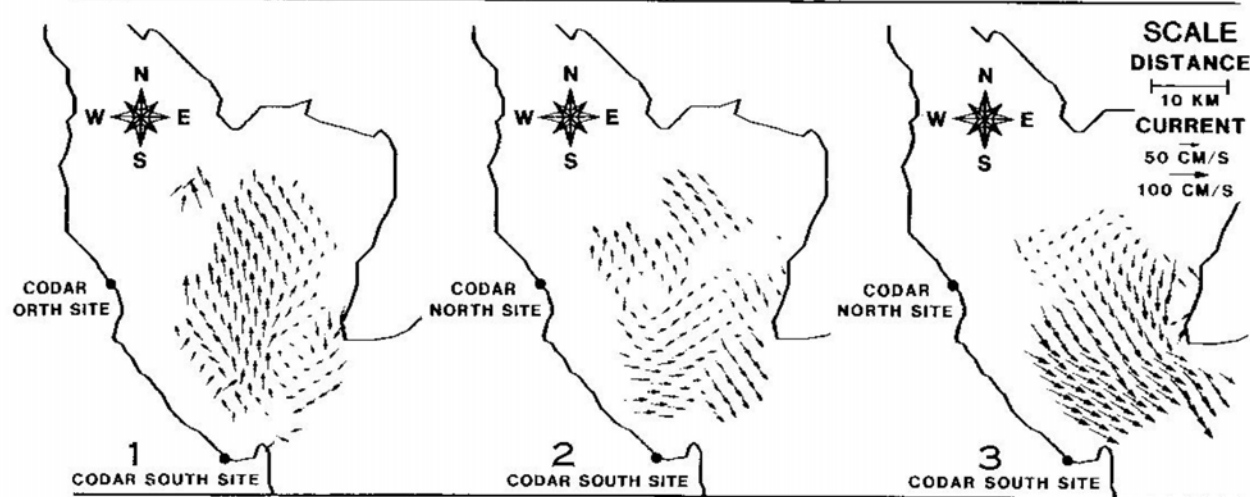
## Waterway Risk Model

Vessel Conditions	Traffic Conditions	Navigational Conditions	Waterway Conditions	Immediate Consequences	Subsequent Consequences
Deep Draft Vessel Quality	Volume of Commercial Traffic	Winds	Visibility Impediments	Personnel Injuries	Health and Safety
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	Environmental
Commercial Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic

# HFR in Delaware Bay 1984

## Mapping Surface Currents with CODAR

*This Emerging Technology—with Its Growing List of Applications—Uses HF Radar for Accurate, Real-Time, Remote Sensing.*

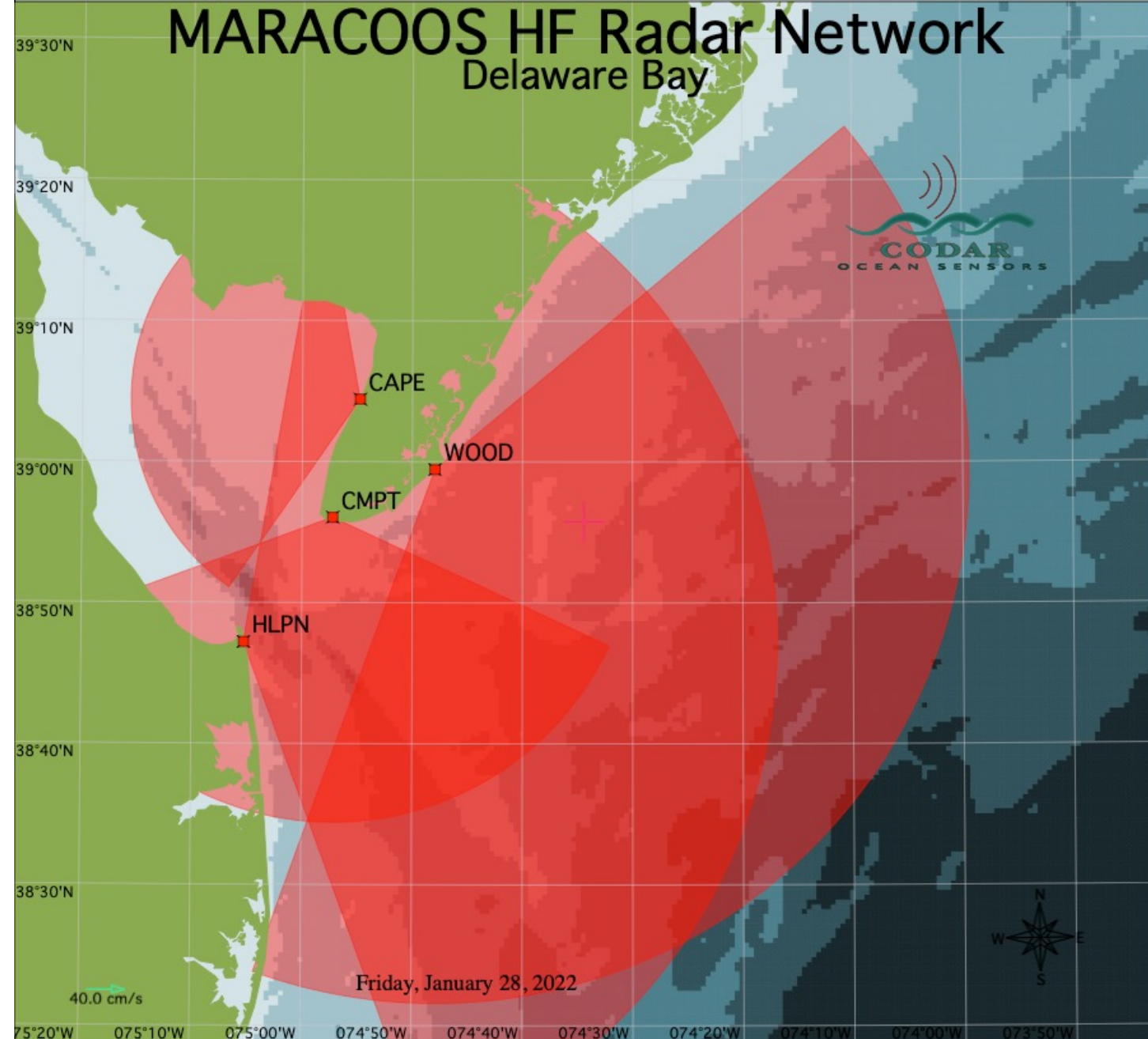


CODAR maps of Delaware Bay circulation at (1) 1226 hours EST, (2) 1352 hours, and (3) 1522 hours. Only vectors with uncertainties less than 10 centimeters/second were plotted.

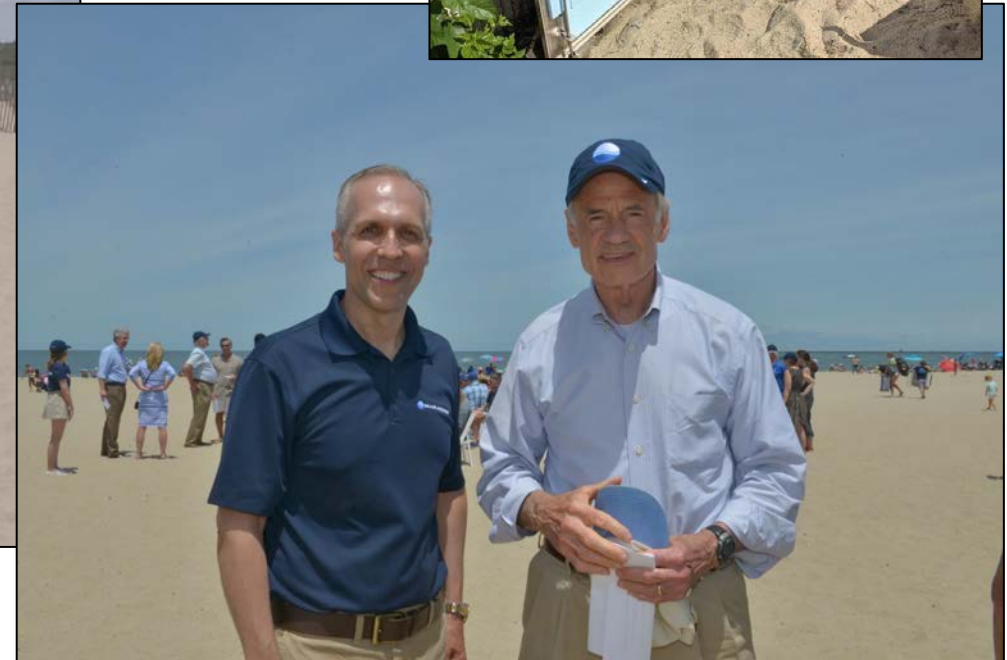
With an area resolution of about 5 kilometers selected for these maps, there is evidence of a weak gyre that forms at the mouth of the bay at slack current tide. This gyre then propagates some distance up the bay (seen in subsequent maps) at the phase velocity determined by the water depth in this area; these features tend to disintegrate due to varying depth over their spatial expanse. Although most such features repeat themselves with semi-diurnal regularity in calm conditions, CODAR shows that stiff winds cause significant departures from the norm, a factor that any successful model must include.



# HFR Present Day 2021

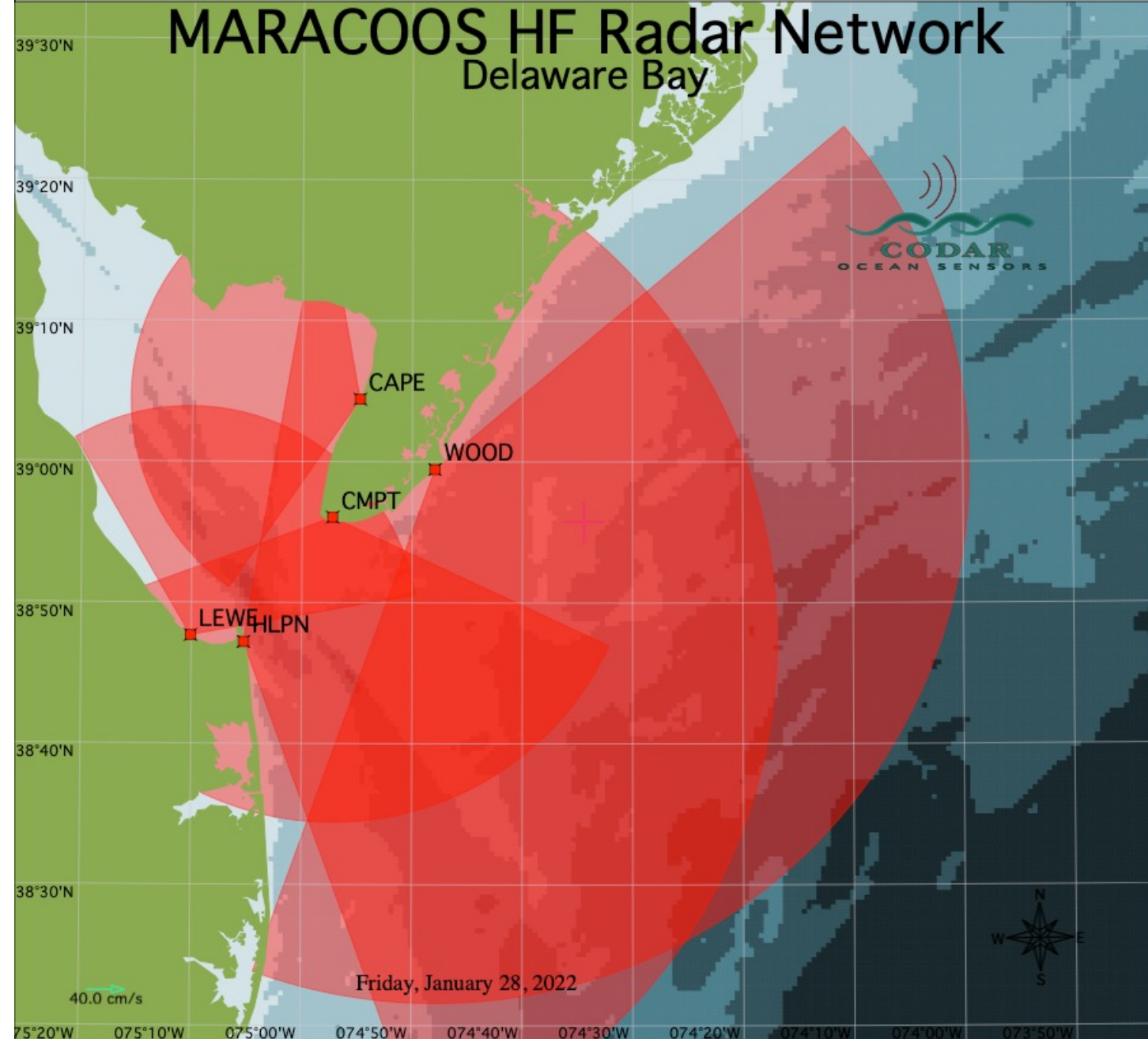


# Lewes HFR Installation





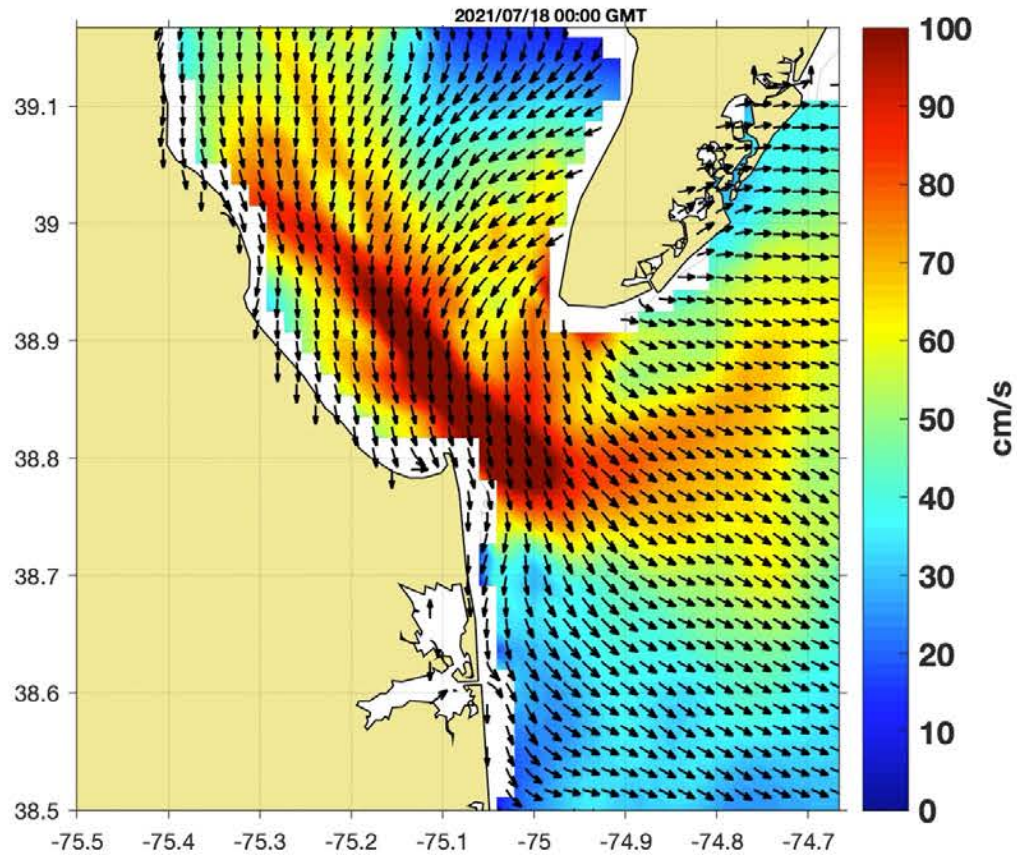
# HFR Present Day 2021



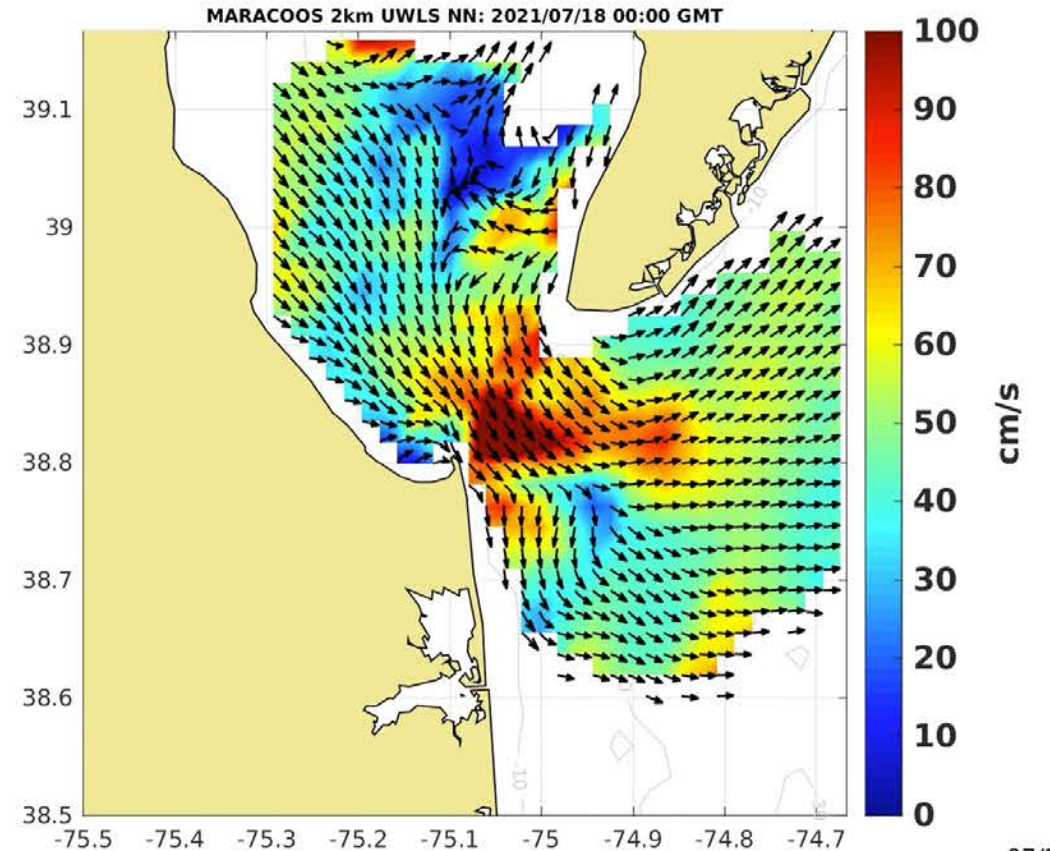
# DBOFS

# VS

# HFR



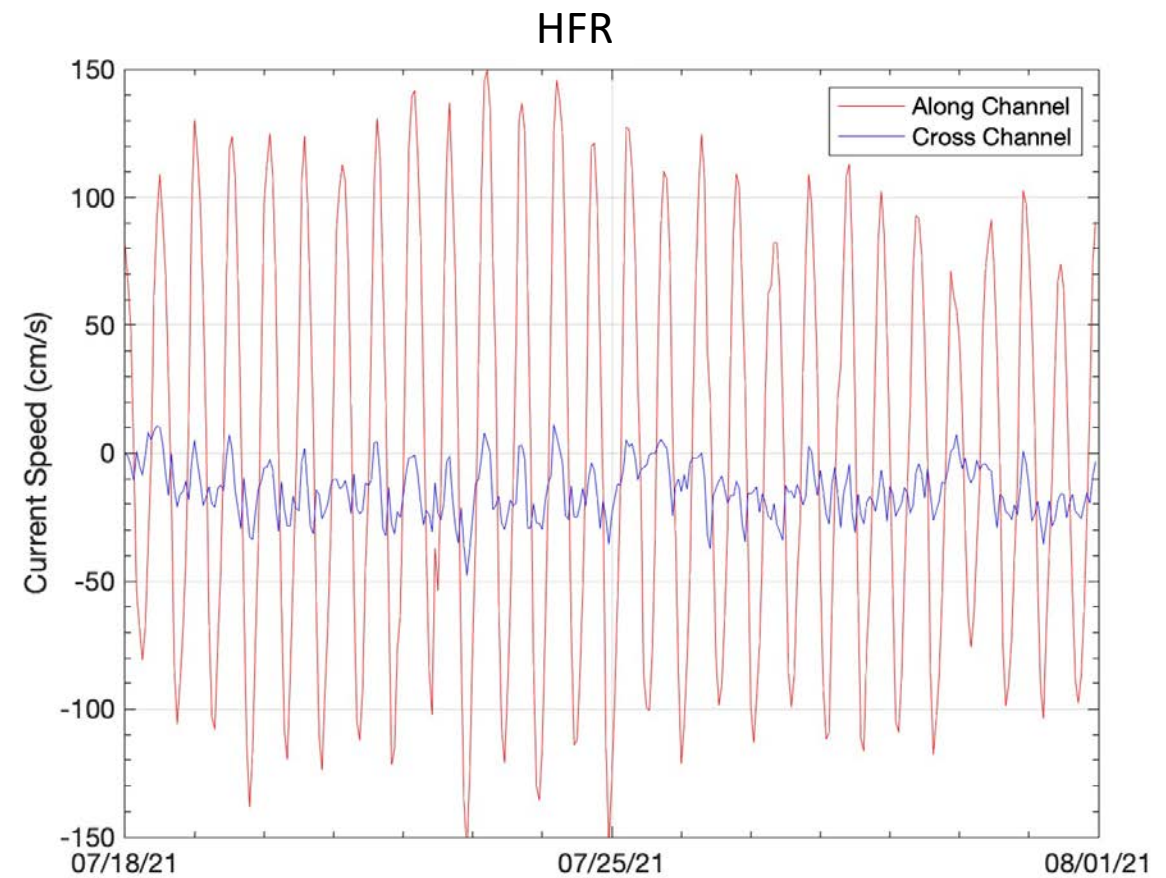
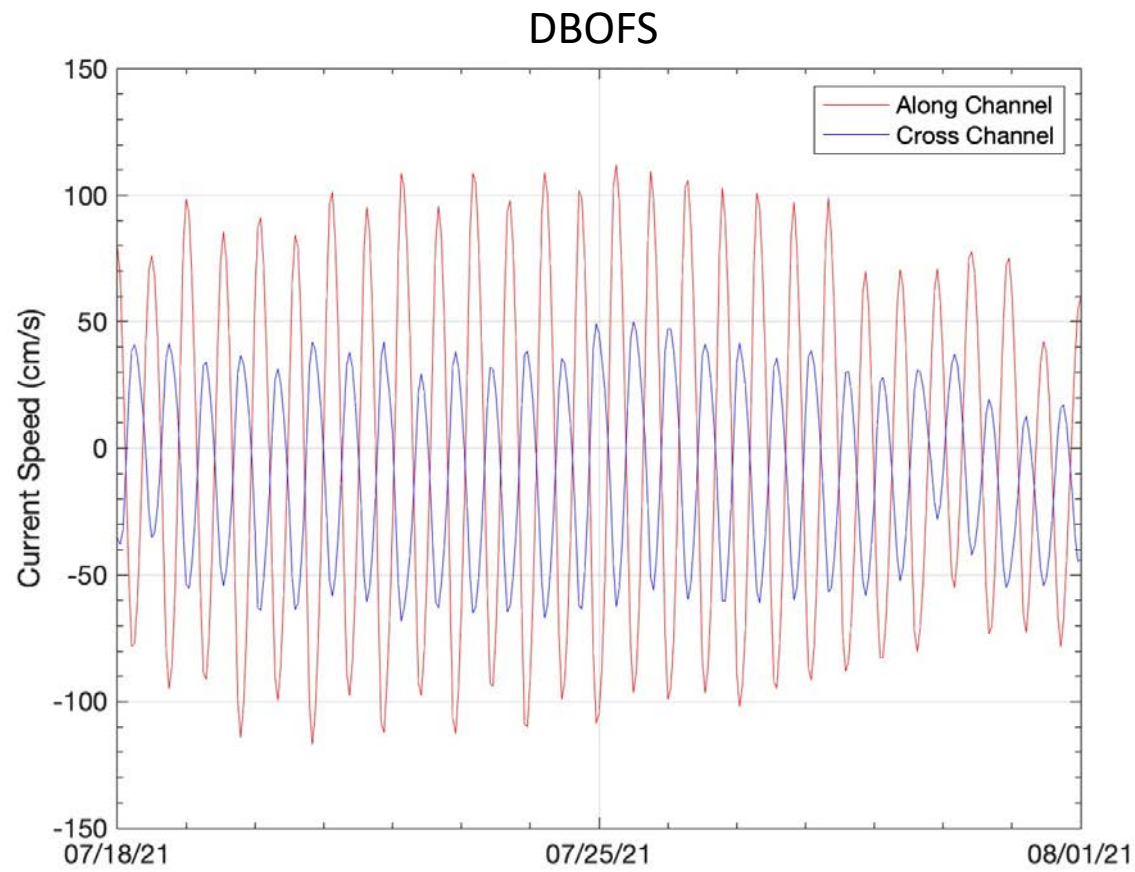
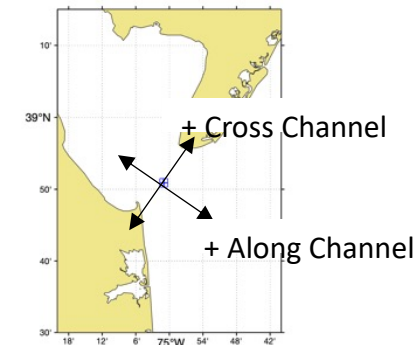
09/16/21 vector\_plot\_hourly\_RPS\_EDS\_curly\_v2\_DelBay.m

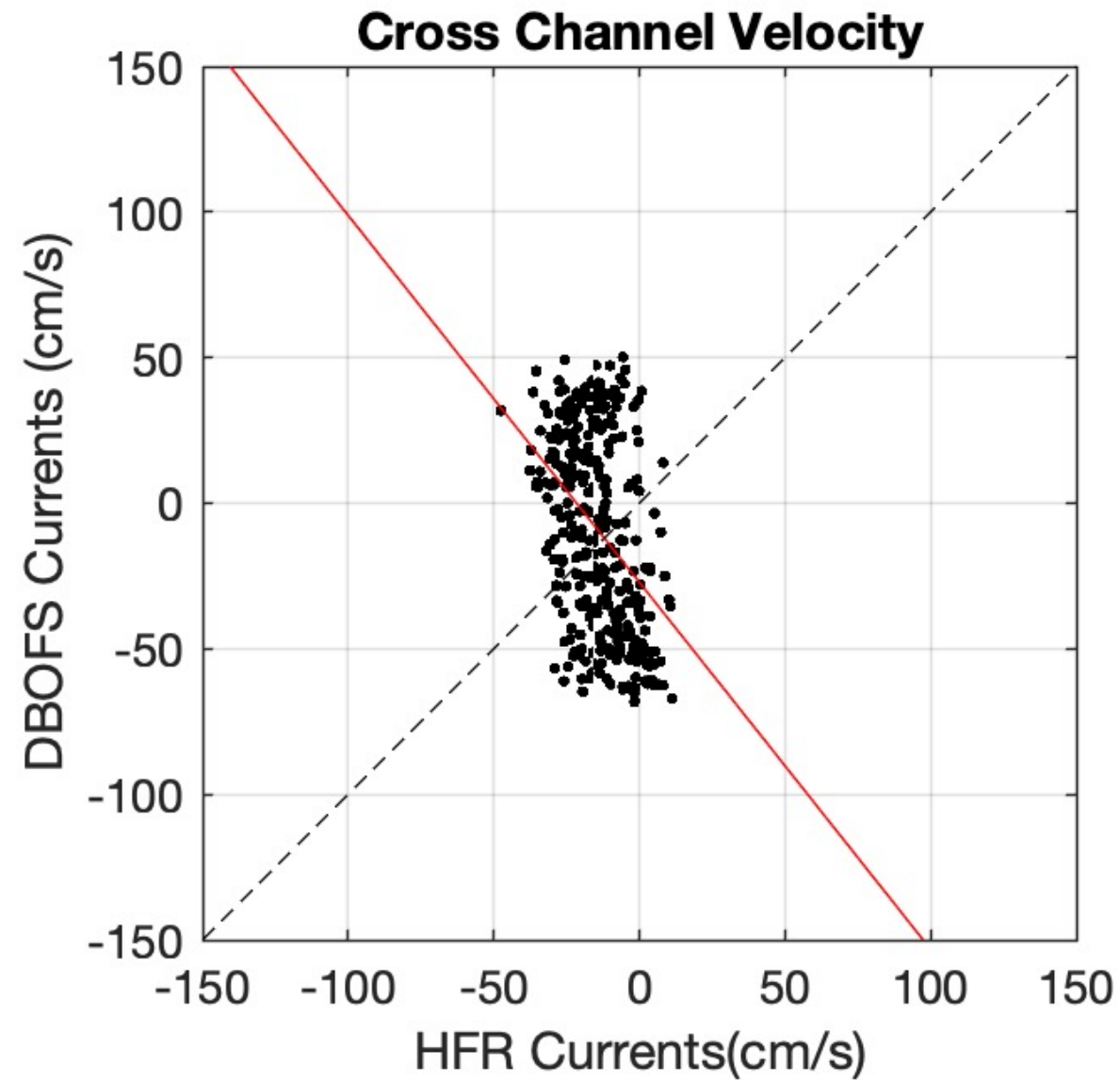
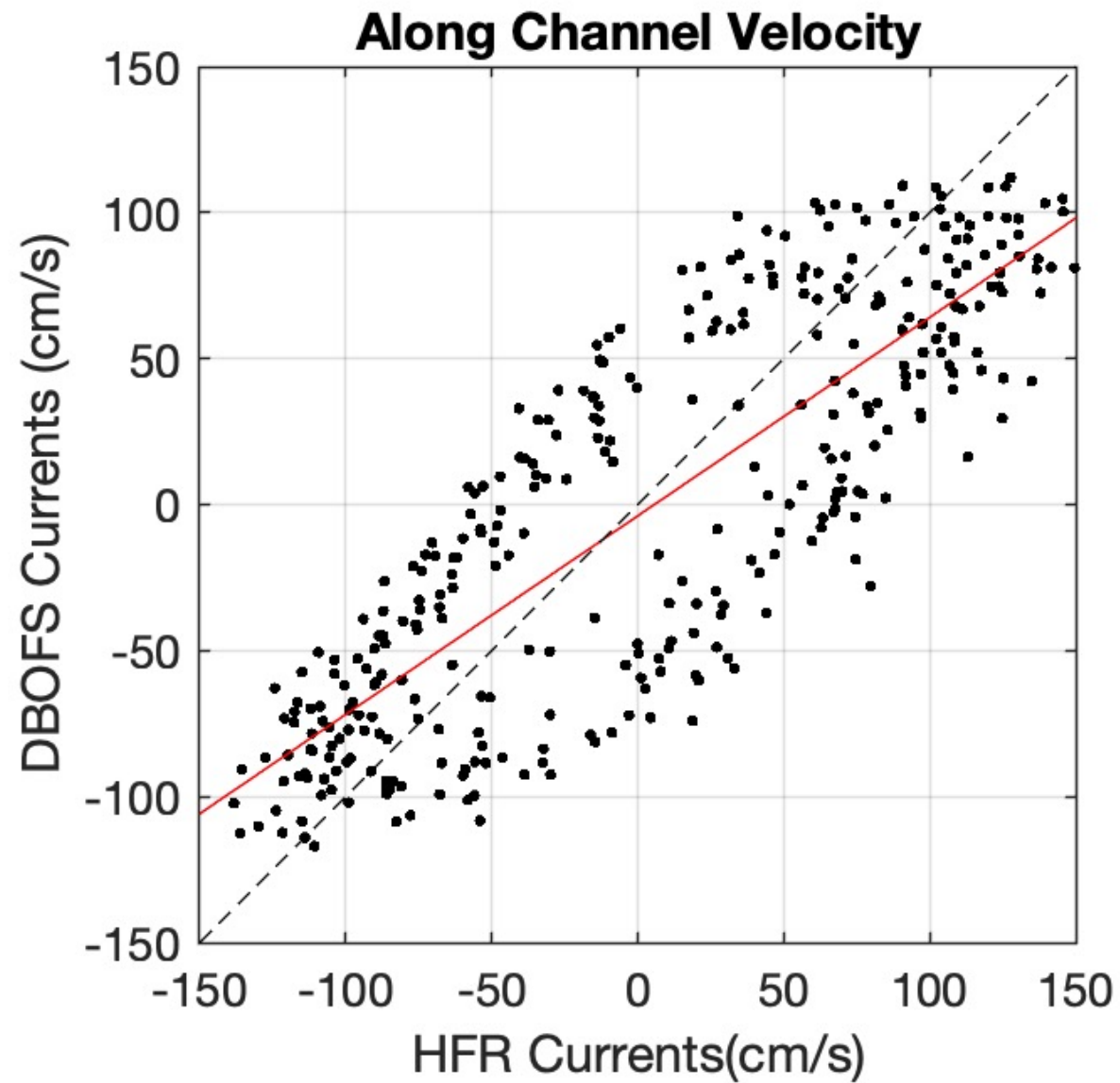


07/19/21  
vector\_plot\_hourly\_NN\_curly\_v2.m



# Time series – July 18-Aug 1, 2021





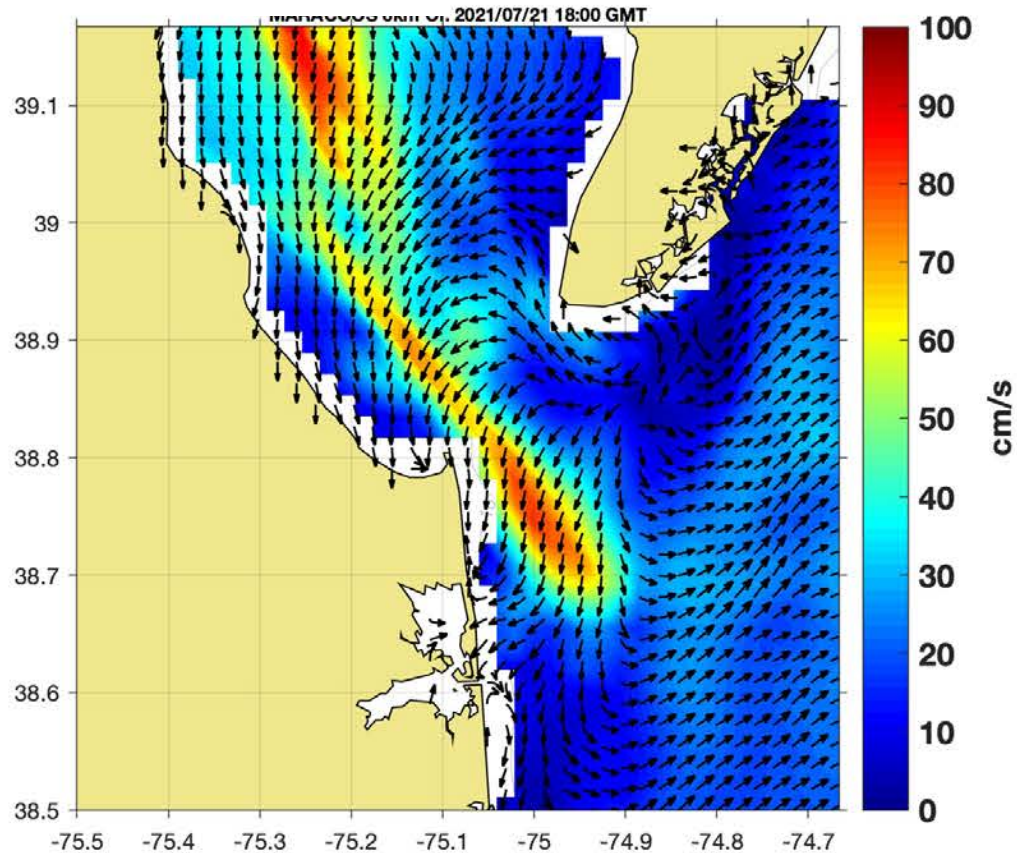


# Spatial comparison

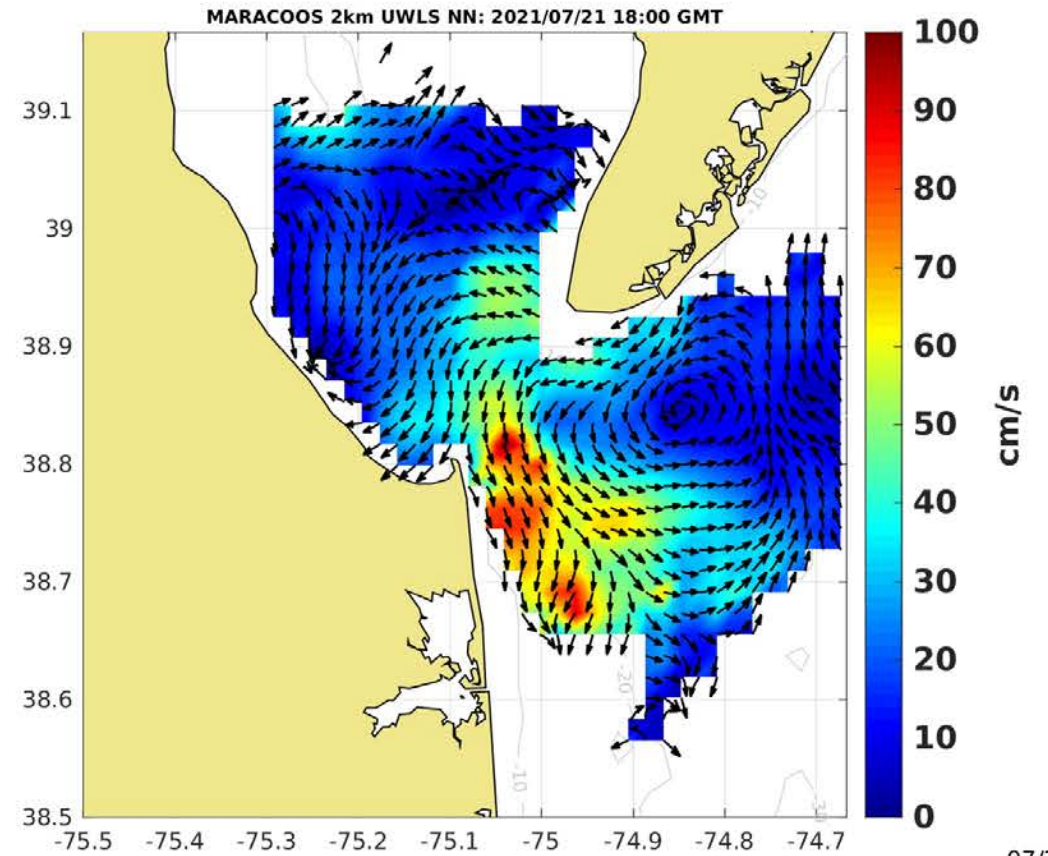
## DBOFS

## VS

## HFR

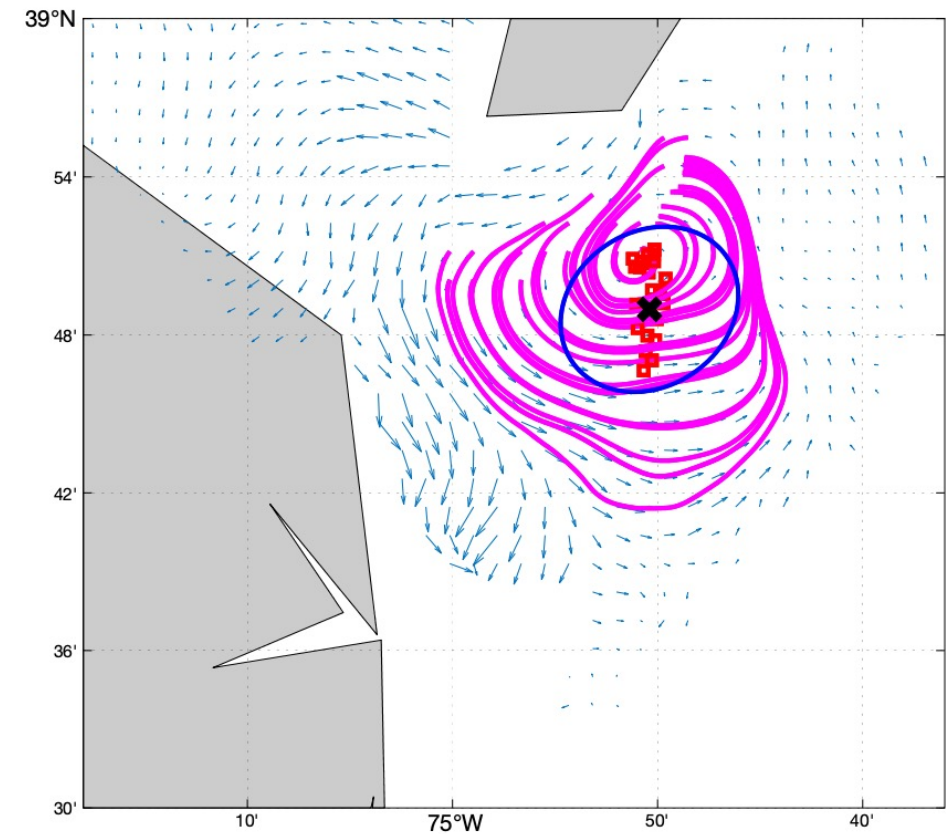
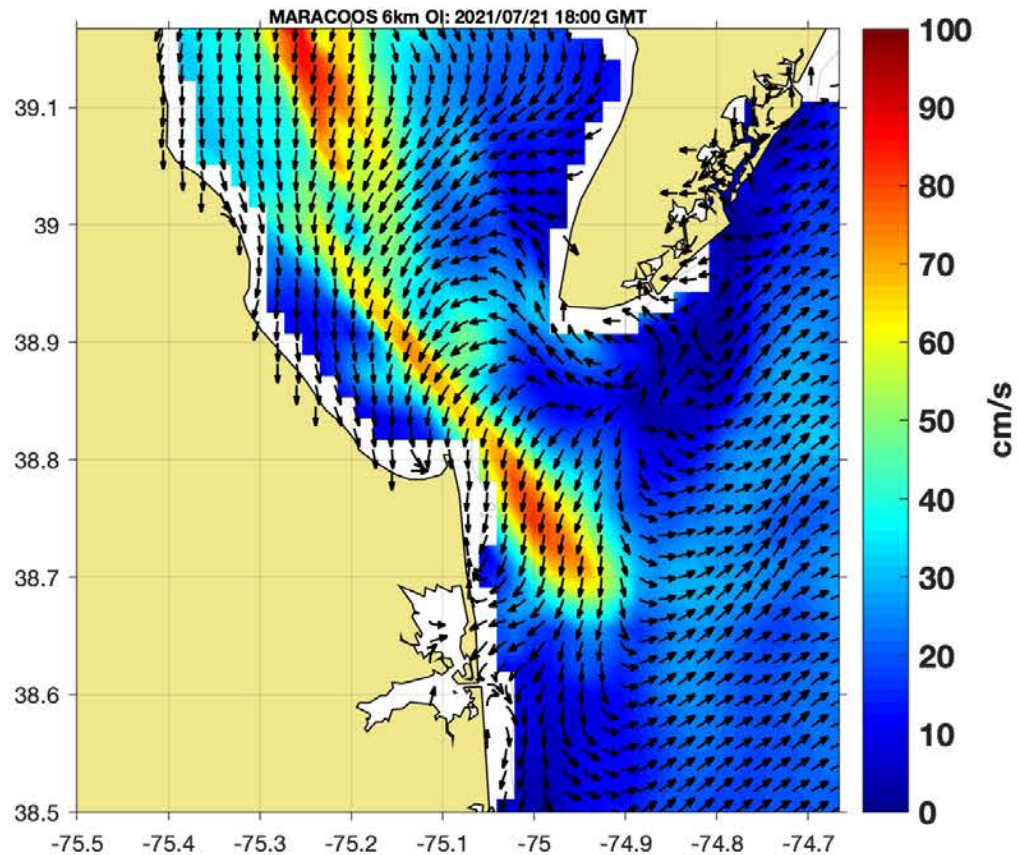


09/16/21 vector\_plot\_hourly\_RPS\_EDS\_curly\_v2\_Del\_Bay.m



07/22/21  
vector\_plot\_hourly\_NN\_curly\_v2.m

# Spatial comparison





# Conclusions

- HFR measurements and model forecasted currents are available in Delaware Bay for use by the maritime community
- The model is underestimating the currents in the along channel direction and show no skill in the cross channel
- The HFR measurements are capturing cyclonic eddies on a daily basis that are not seen in the model

# Evaluation of the NOAA Operational Forecast System in Delaware



## Thank You!

