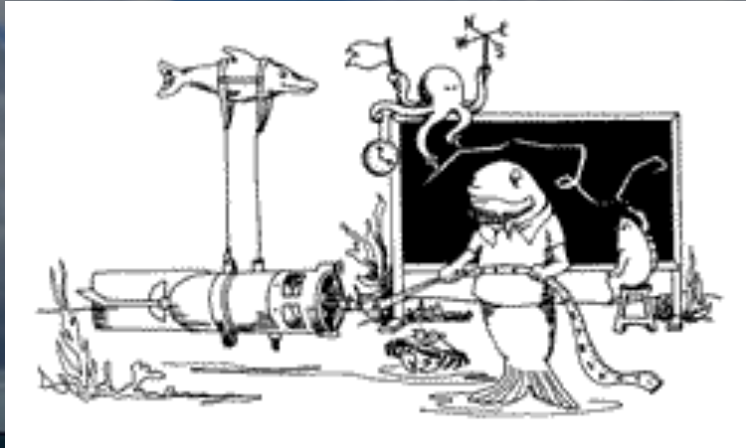


Determining the Origin and Fate of Oceanic eDNA



*Dr. Hugh Roarty
Mr. Brendan Henley
Mr. Tim Stolarz
Dr. Jason Adolf
Dr. Josh Kohut*



CWTM 2024
March 18-20, North Carolina



OUTLINE

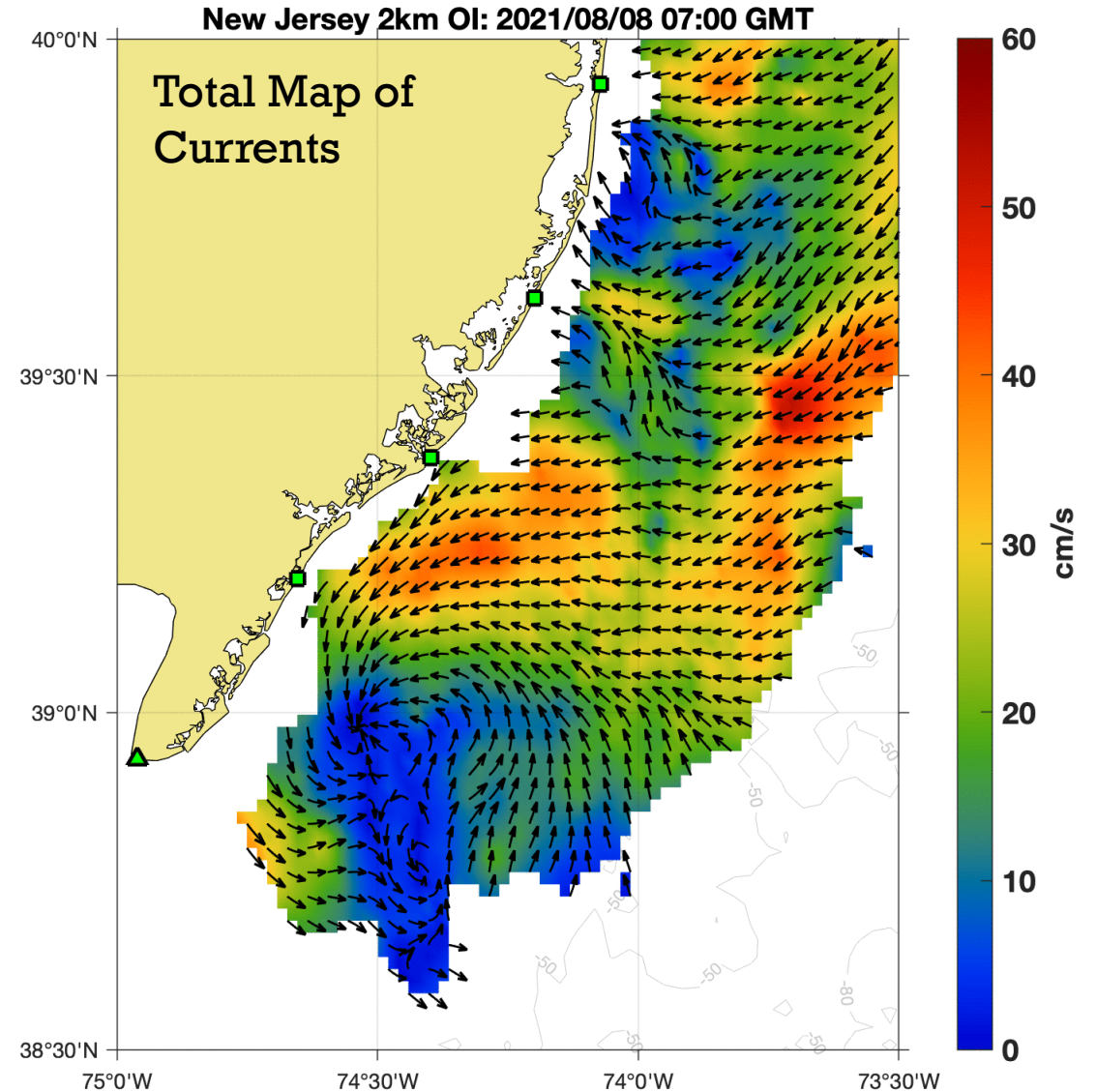
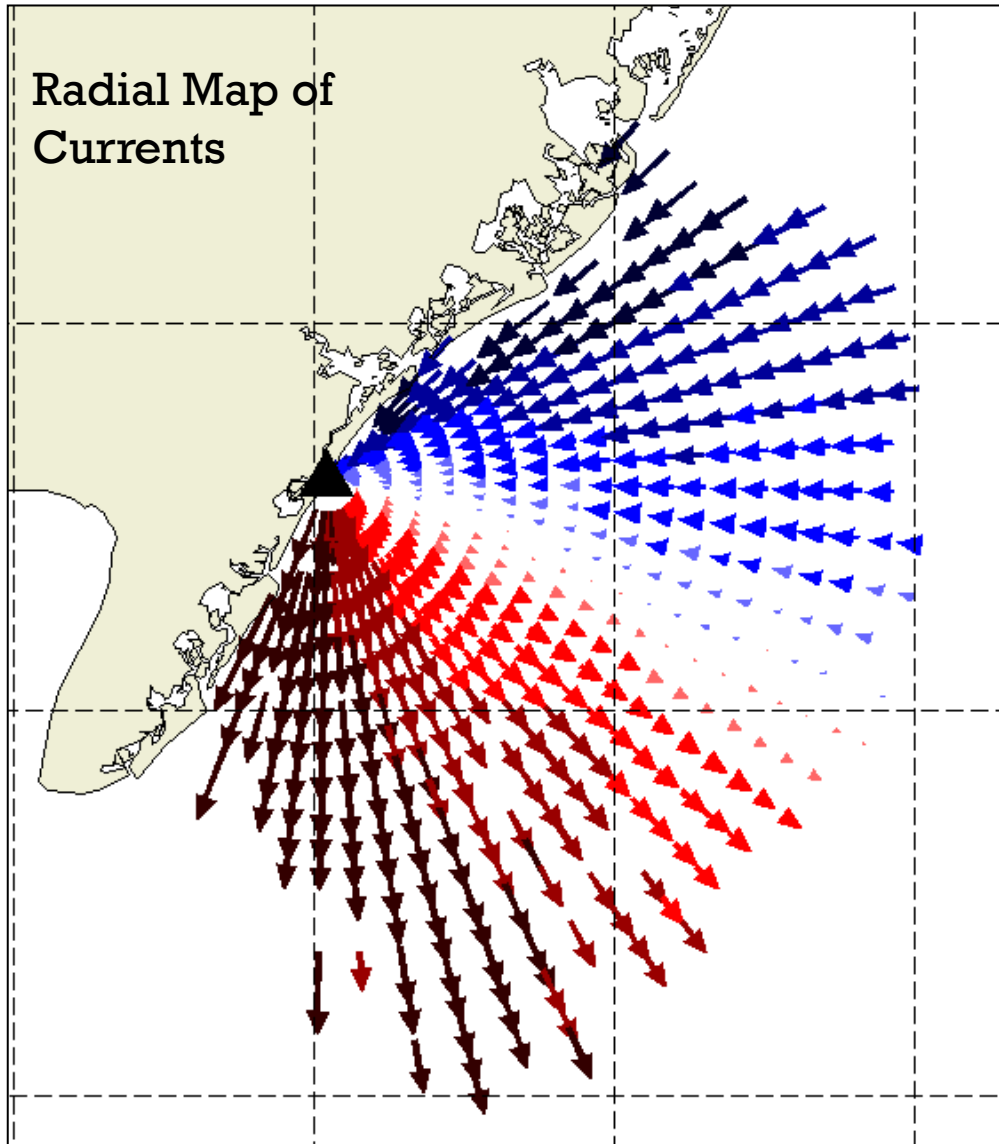
- Introduction to HF radar
- Forward Trajectories of Particles
- Reverse Trajectories of Particles
- Conclusion

High Frequency Radar

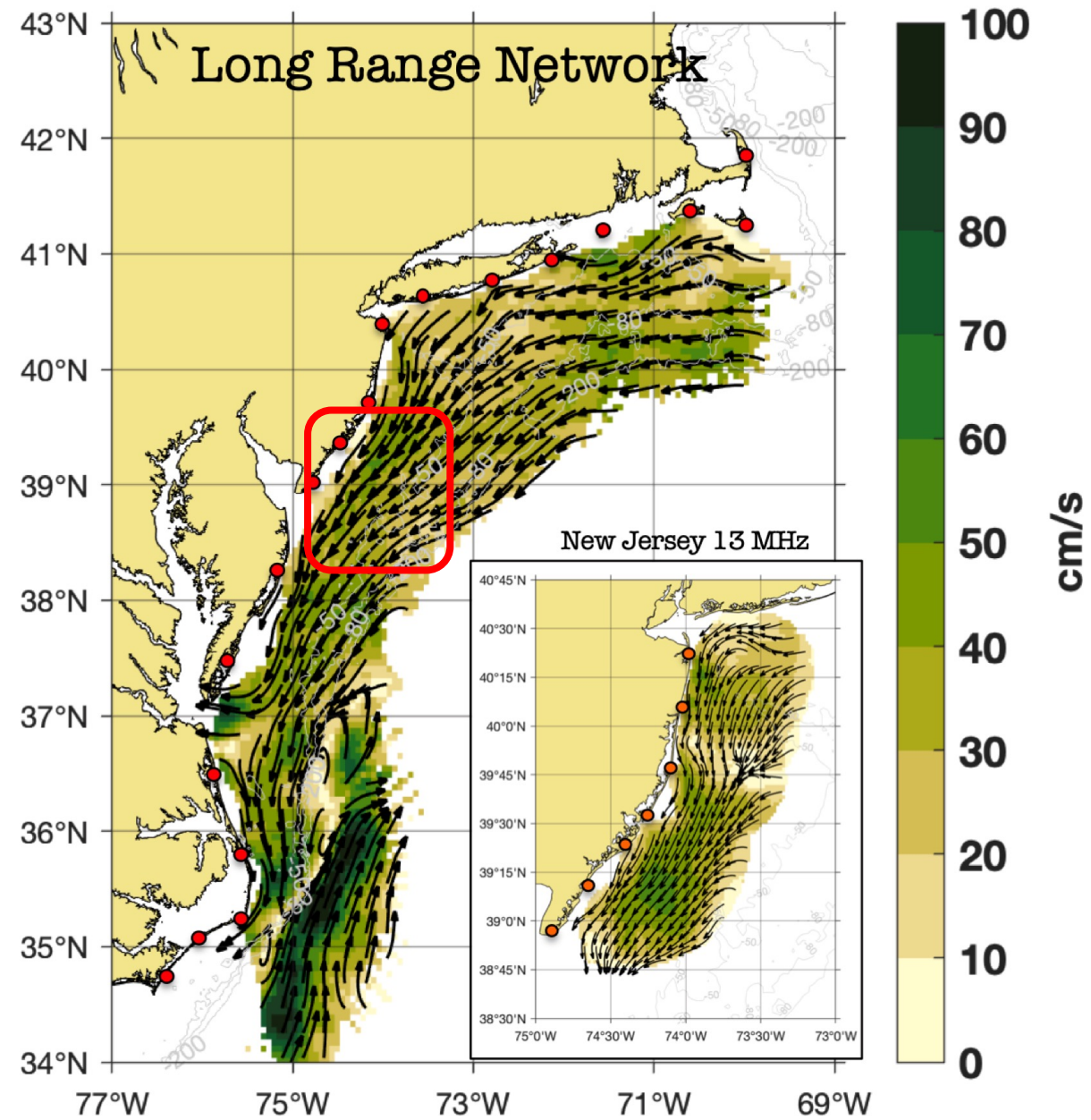
CODAR Tx/RX ANTENNA
LEWES BEACH, DE USA



Surface Currents from SeaSonde HF Radar



Study Area



Forward Trajectory of Particles

rowg/hfrprogs



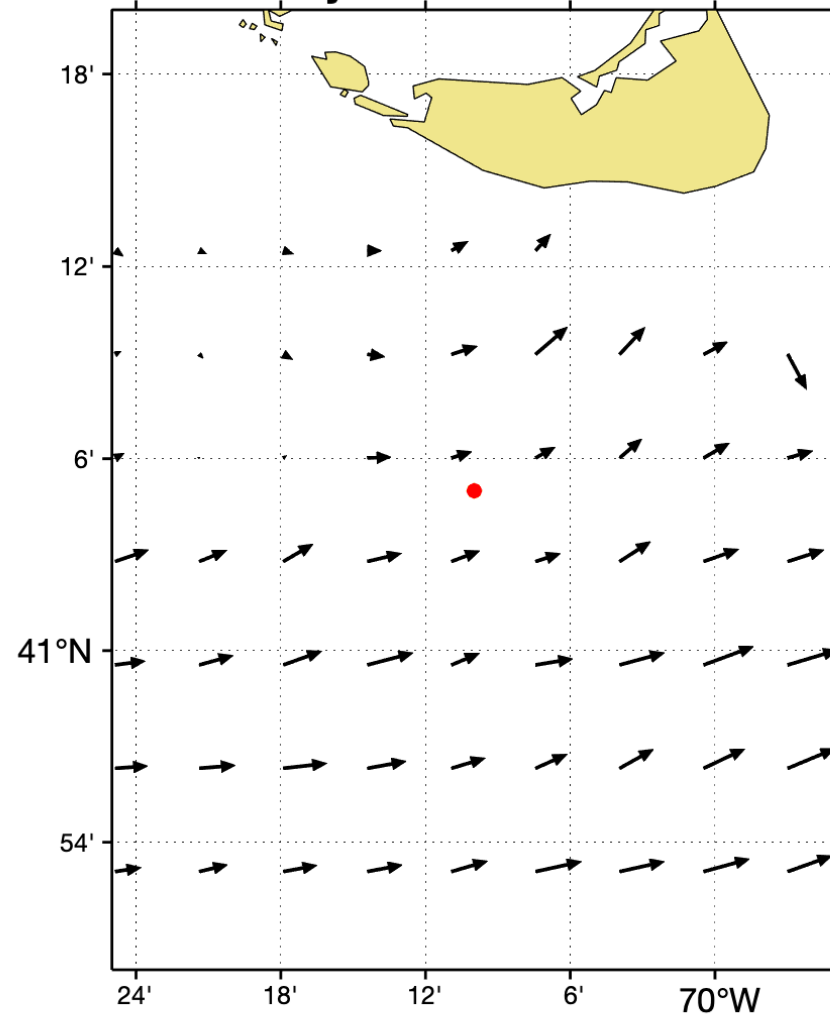
Programs for analysis and visualization of oceanographic HF radar data

2 Contributors 1 Issue 16 Stars 8 Forks

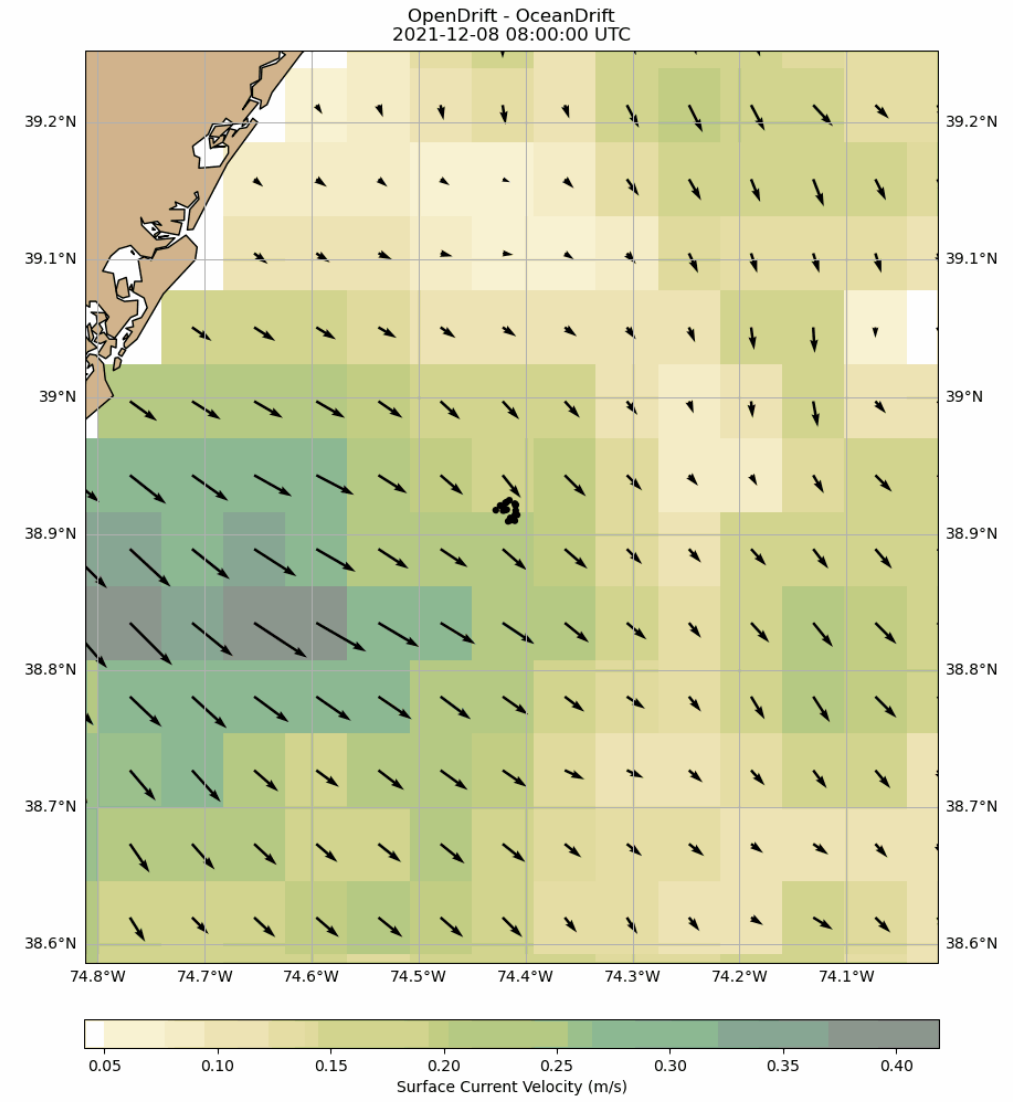
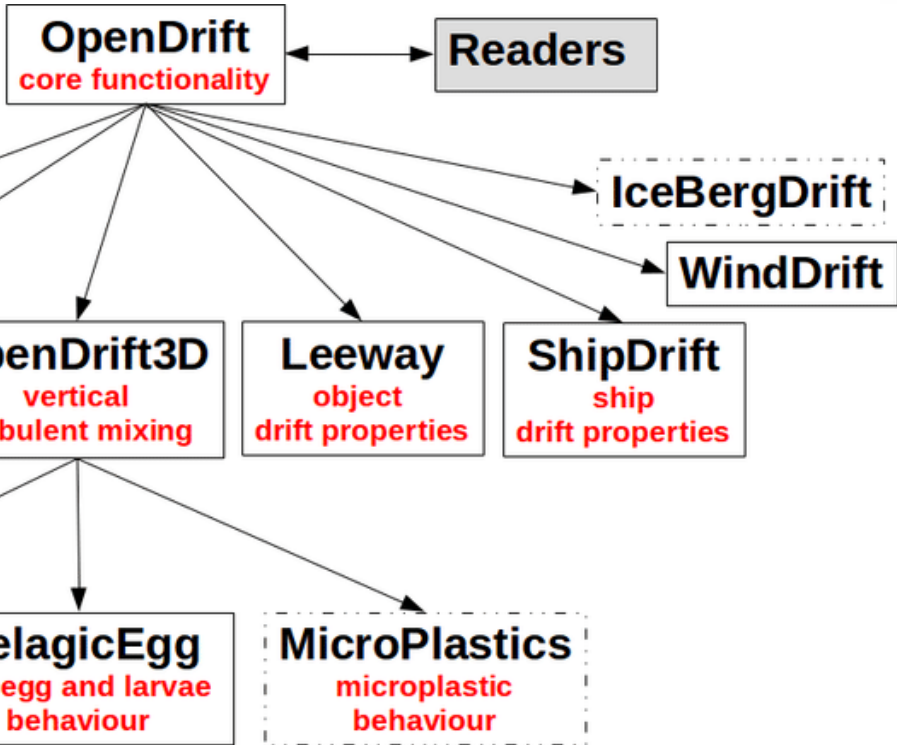


Community toolbox used to process and manage HFR surface current data

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

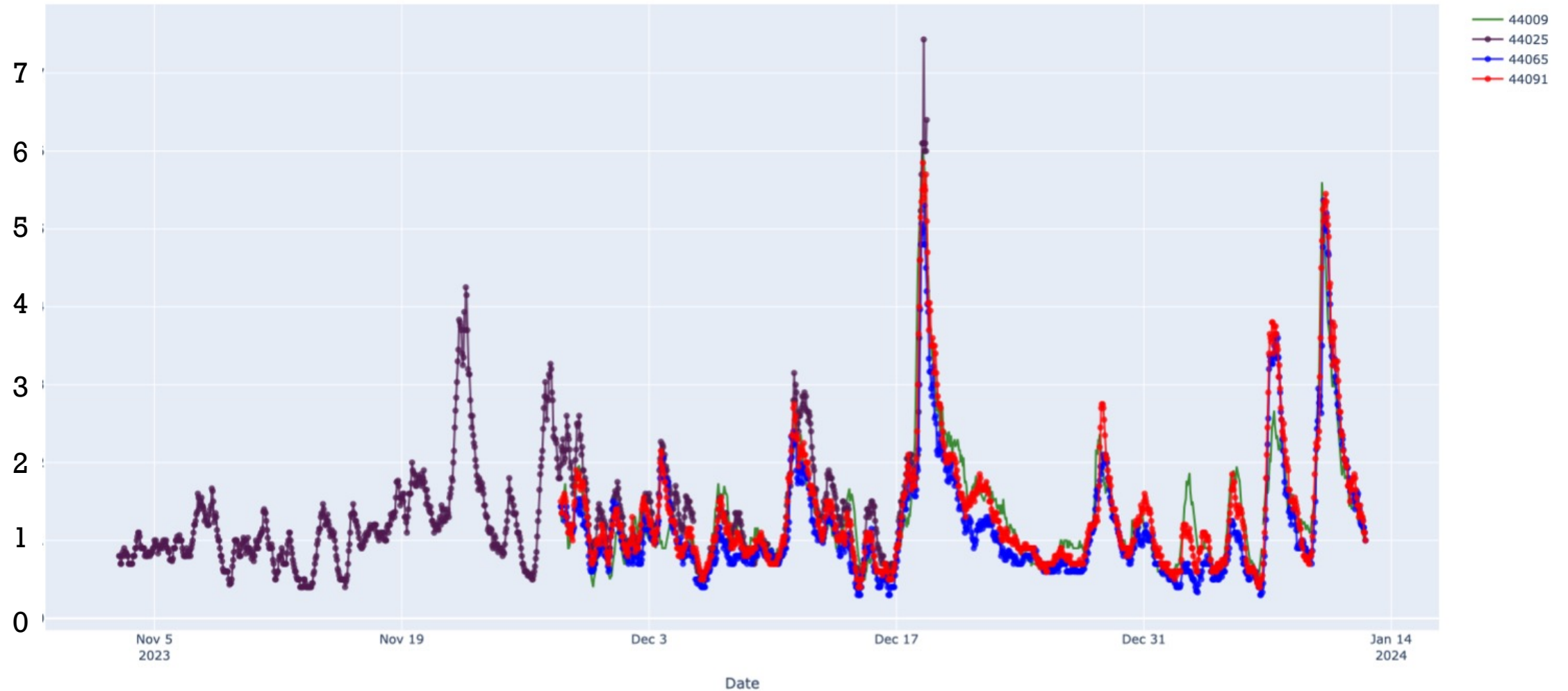


04/21/20 trajectories_from_5.m



Nor'easter December 2023

Wave Height (m) from NDBC Buoys



Nor'easter December 2023



NDBC Buoy 44025 Broke Free on December 18

Station 44025 (LLNR 830) - LONG ISLAND - 30 NM South of Islip, NY

Owned and maintained by National Data Buoy Center
3-meter foam buoy
SCOOP payload
40.251 N 73.164 W (40°15'3" N 73°9'52" W)

Site elevation: sea level
Air temp height: 3.7 m above site elevation
Anemometer height: 4.1 m above site elevation
Barometer elevation: 2.7 m above mean sea level
Sea temp depth: 1.5 m below water line
Water depth: 36.3 m
Watch circle radius: 83 yards

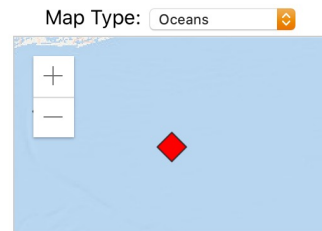
The buoy from station 44025 has gone adrift as of 1300z, 12/18/23. To view the latest position from the buoy, click [here](#).

Right whales are active off NY from November to April. Speed restrictions of 10 knots apply to vessels 65 feet or greater in specific areas along the mid-Atlantic coast. To learn more about right whales and rules protecting them, go to: <http://www.nmfs.noaa.gov/pr/shipstrike>

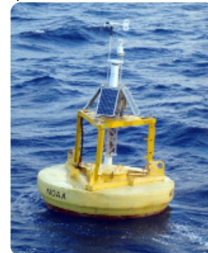
[Latest NWS Marine Forecast 1](#) and [Latest NWS Marine Forecast 2](#)

[Important Notice to Mariners](#)

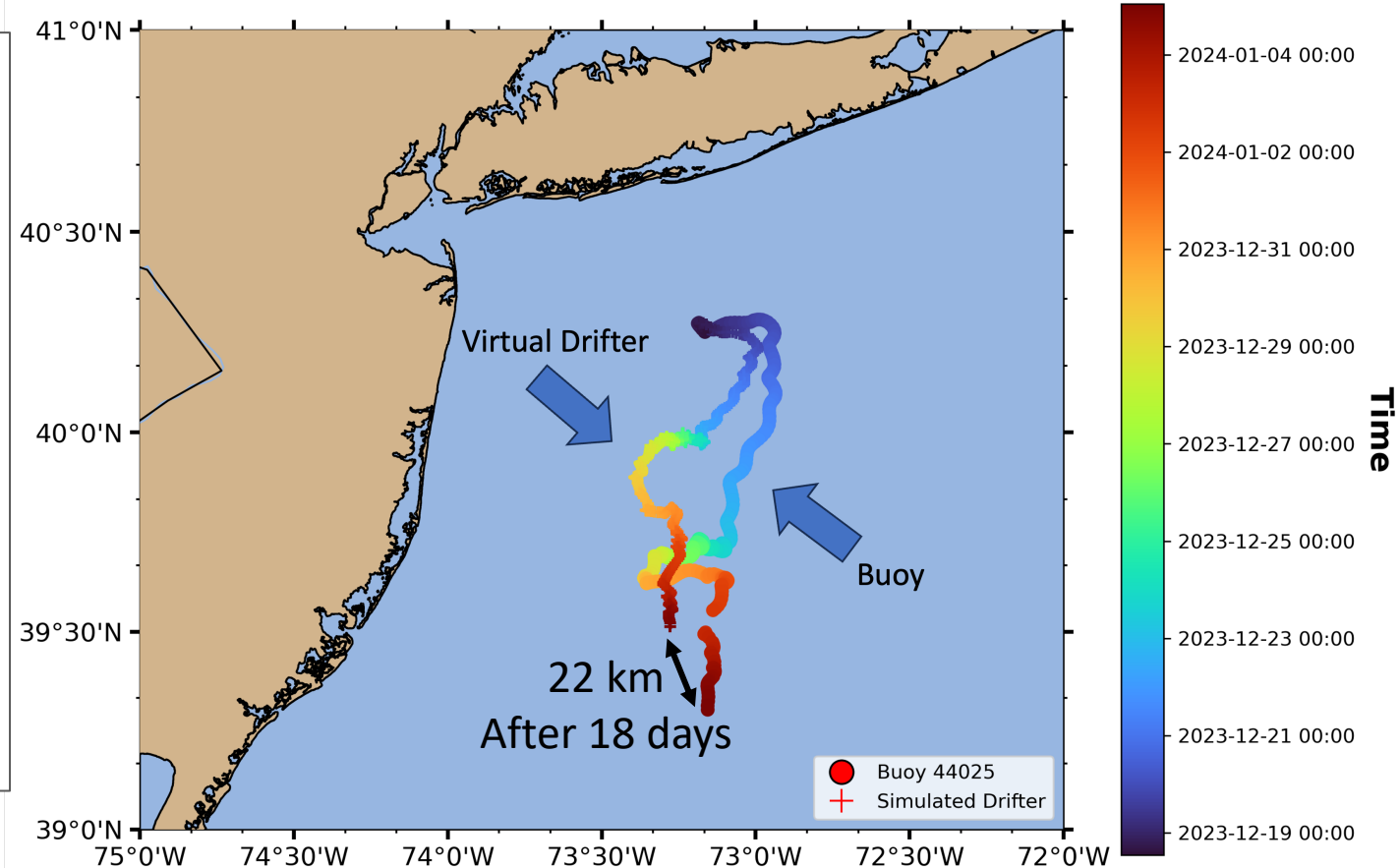
[Meteorological Observations from Nearby Stations and Ships](#)



Esri, GEBCO, Garmi... Powered by Esri



NDBC Buoy 44025 Drift vs Simulated Drifter 2023 December 18th 13:00 - 2024 January 5th 01:00



Reverse Trajectories of Particles

New Jersey Offshore Wind Lease Areas

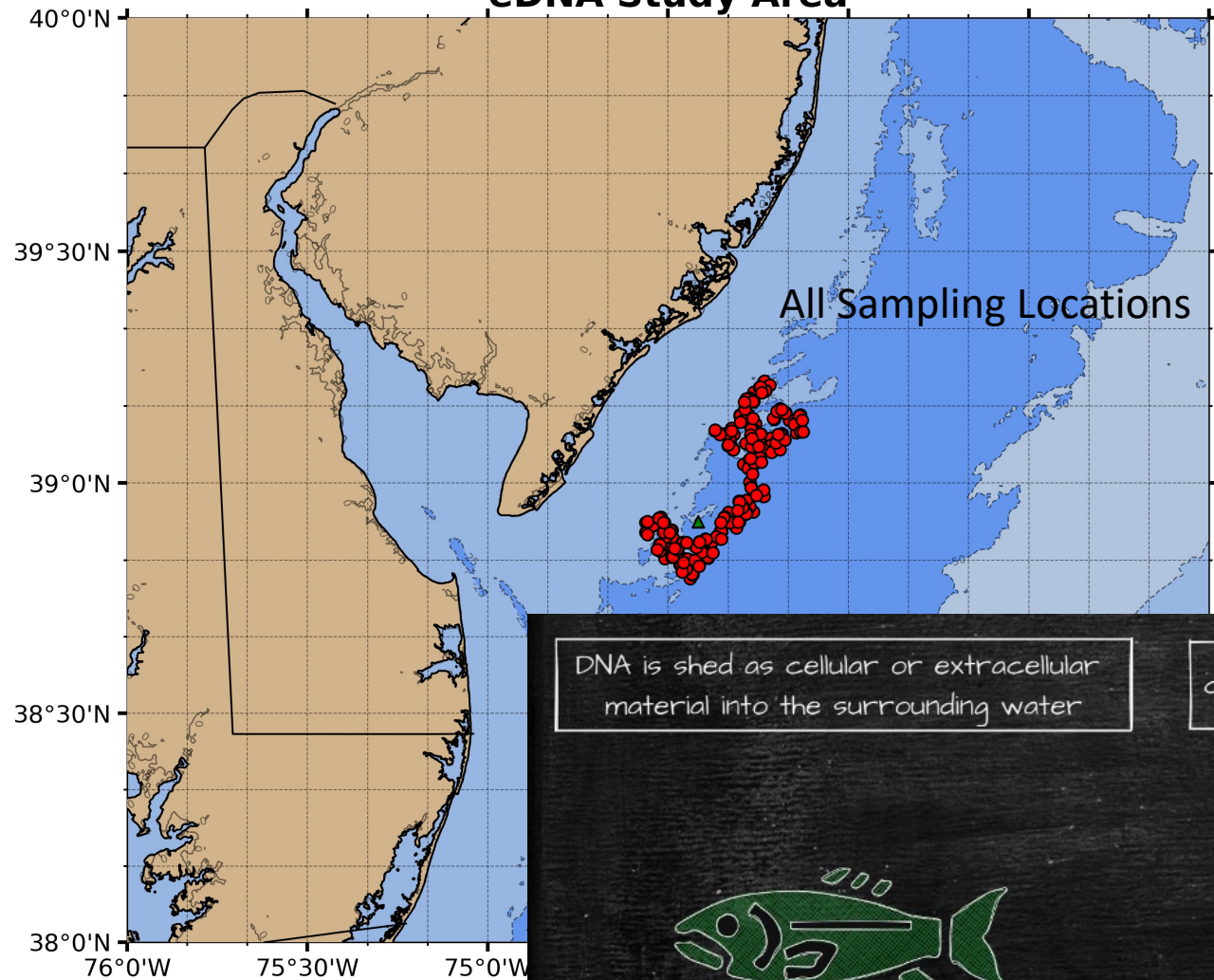


State	OSW Goal (MW)	Target Date
Massachusetts	5,600	2027
Rhode Island	430	2025
Connecticut	2,000	2030
New York	9,000	2035
New Jersey	11,000	2040
Maryland	8,500	2035
Virginia	5,200	2034
North Carolina	8,000	2040
TOTAL	49,730	

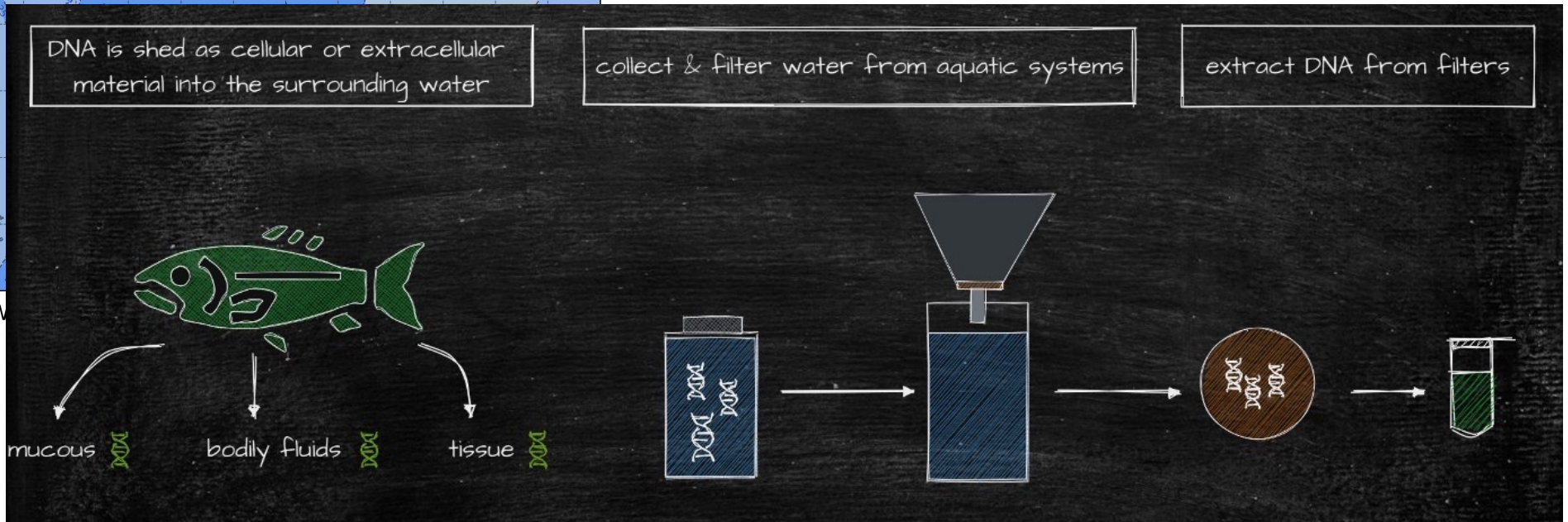
Federal Goal: 30,000 MW by 2030

Assuming 10 MW turbines ~5,000 turbines

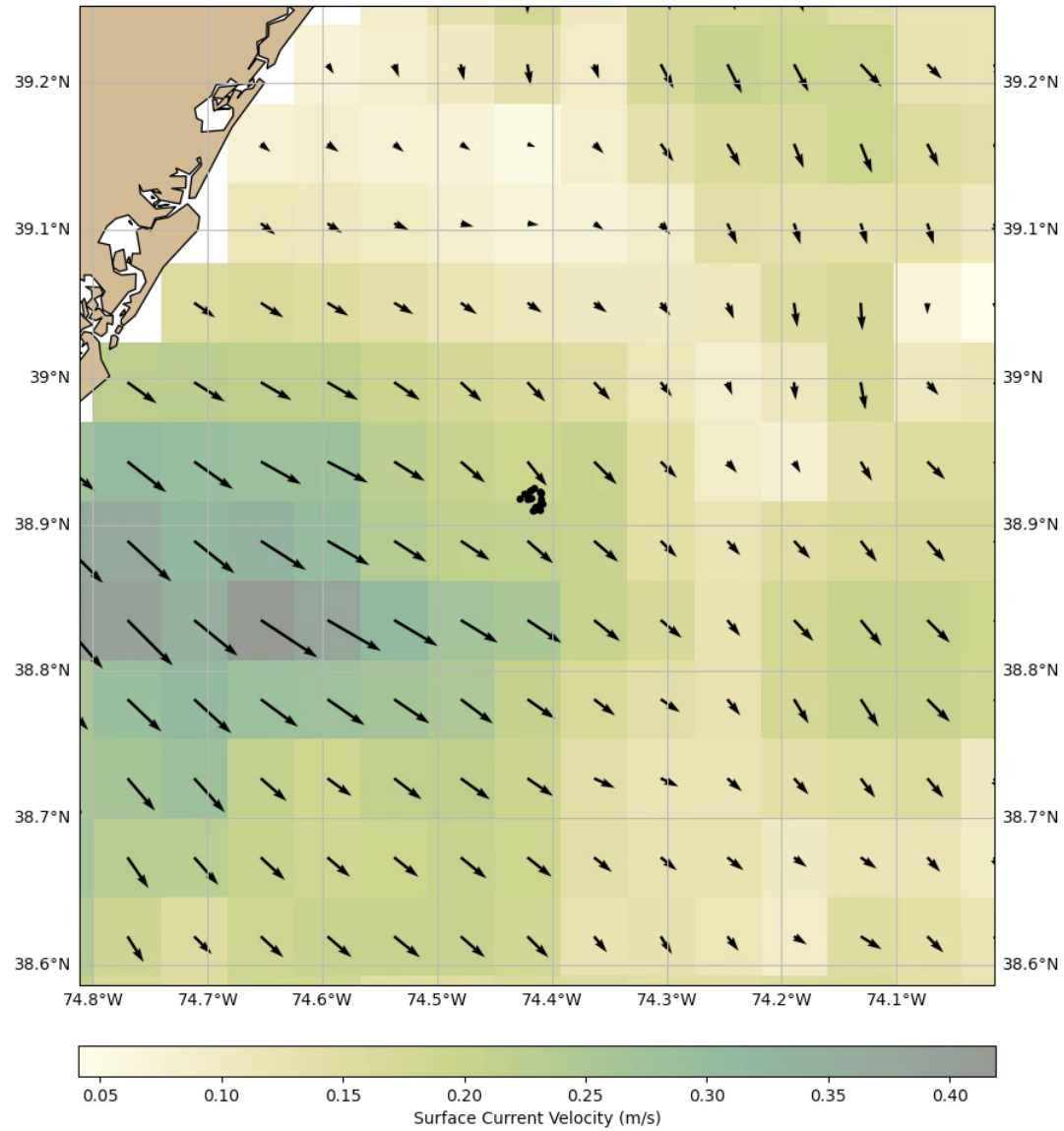
eDNA Study Area



Environmental DNA



OpenDrift - OceanDrift
2021-12-08 08:00:00 UTC

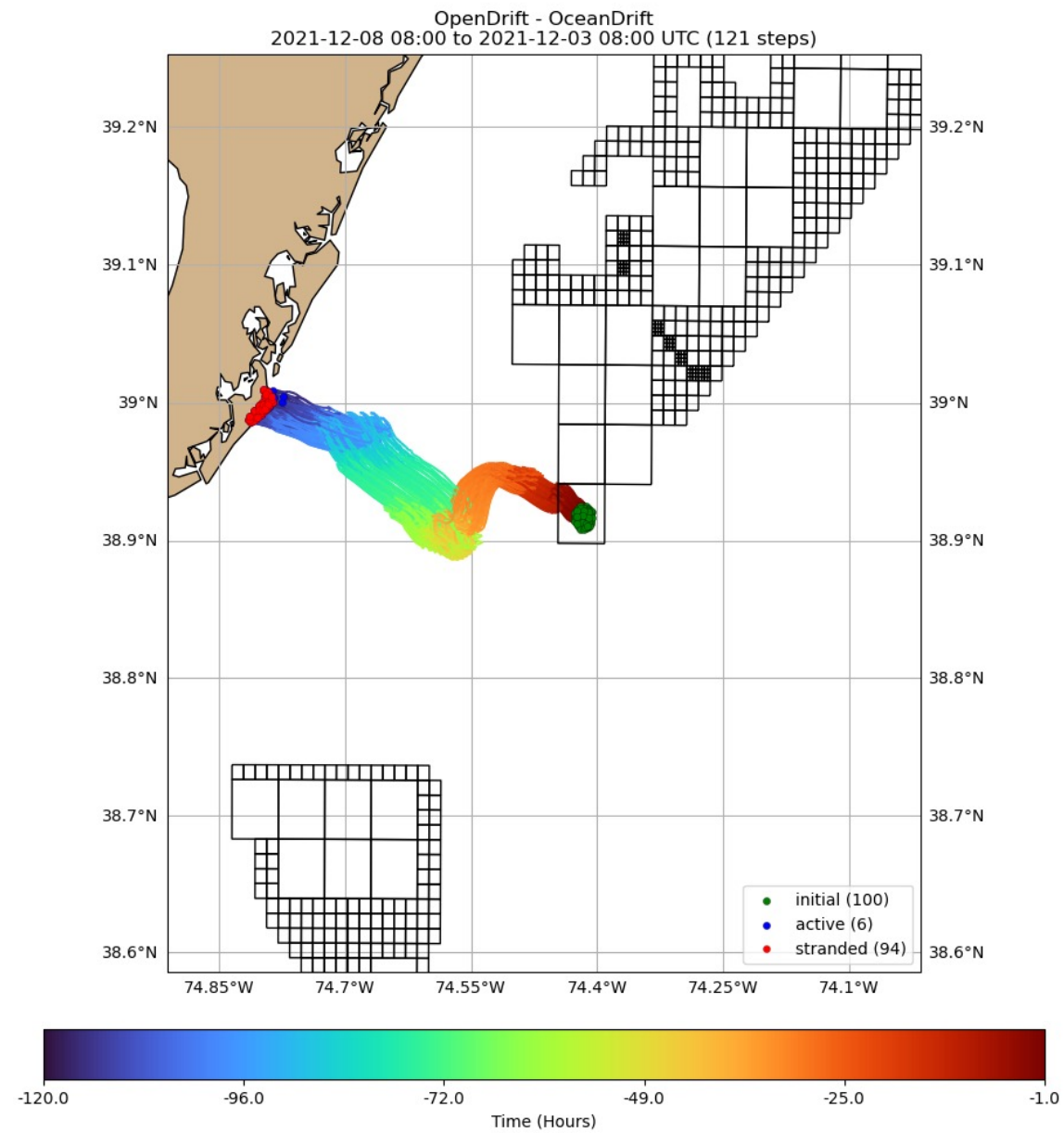


Reverse Drift



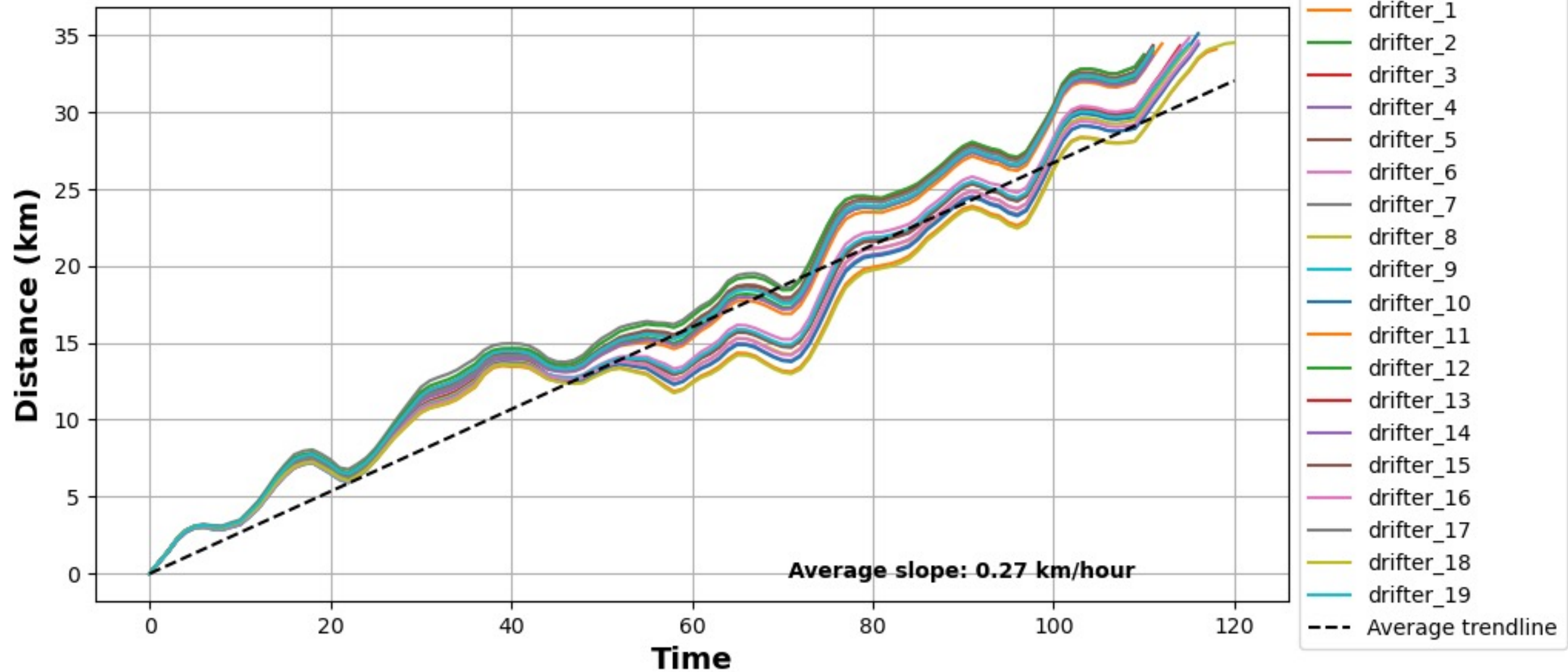
Mummichog

Reverse Drift



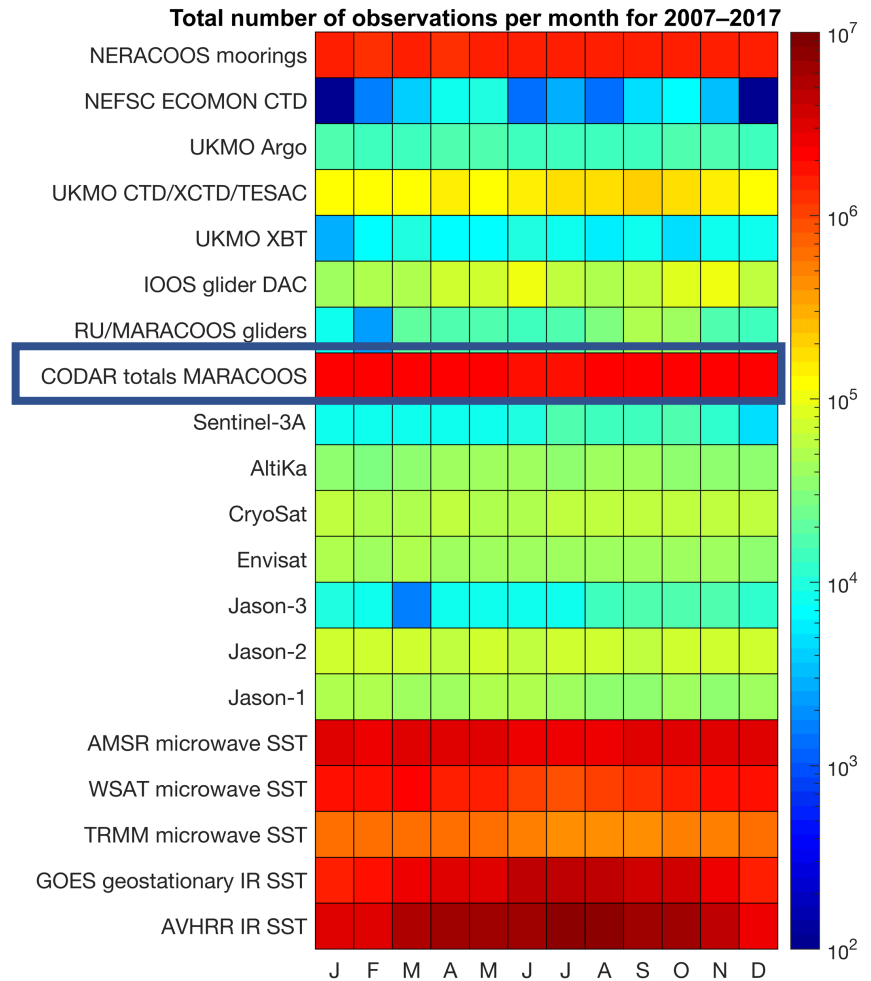
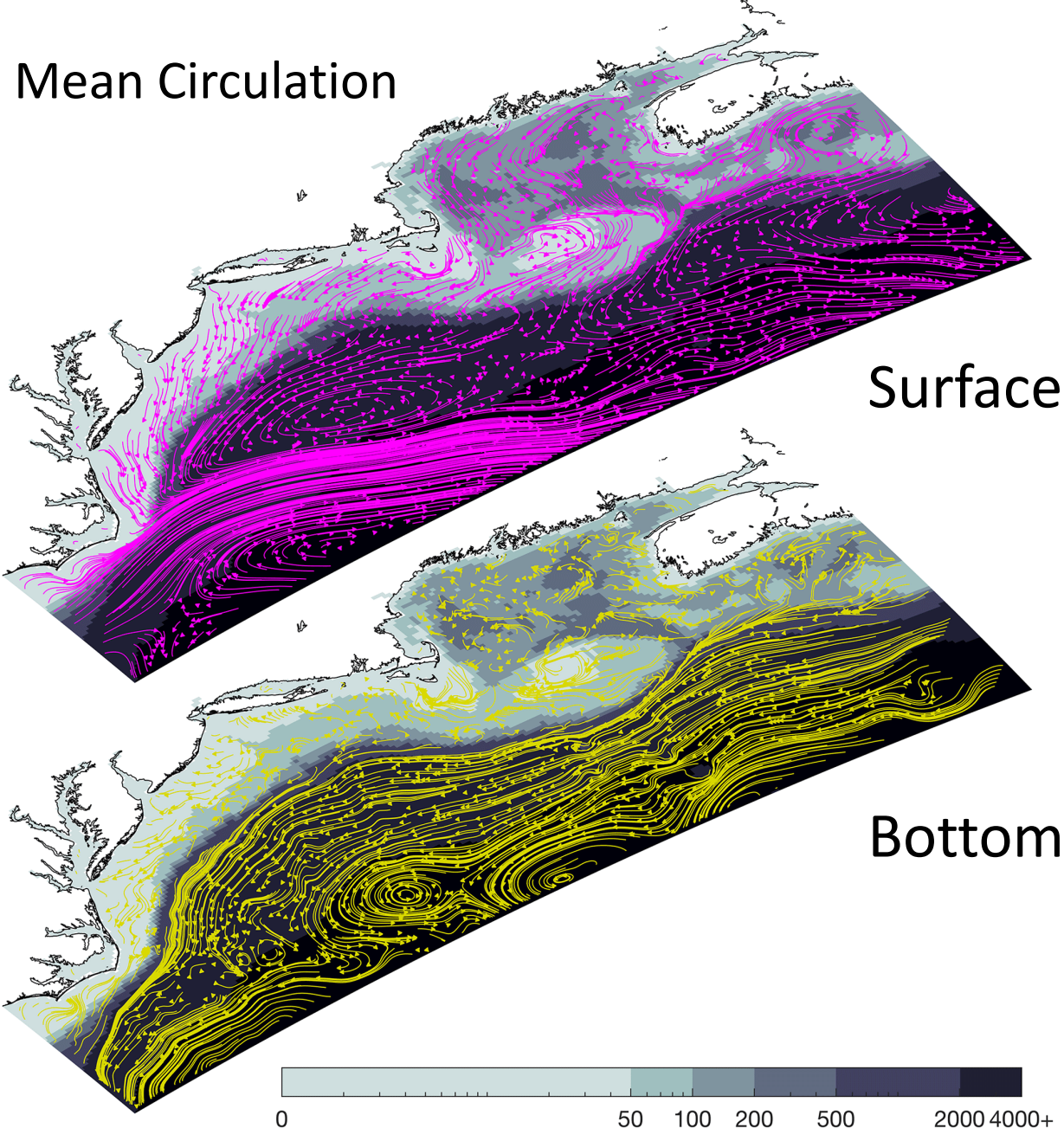
Distance from Origin for Each Drifter

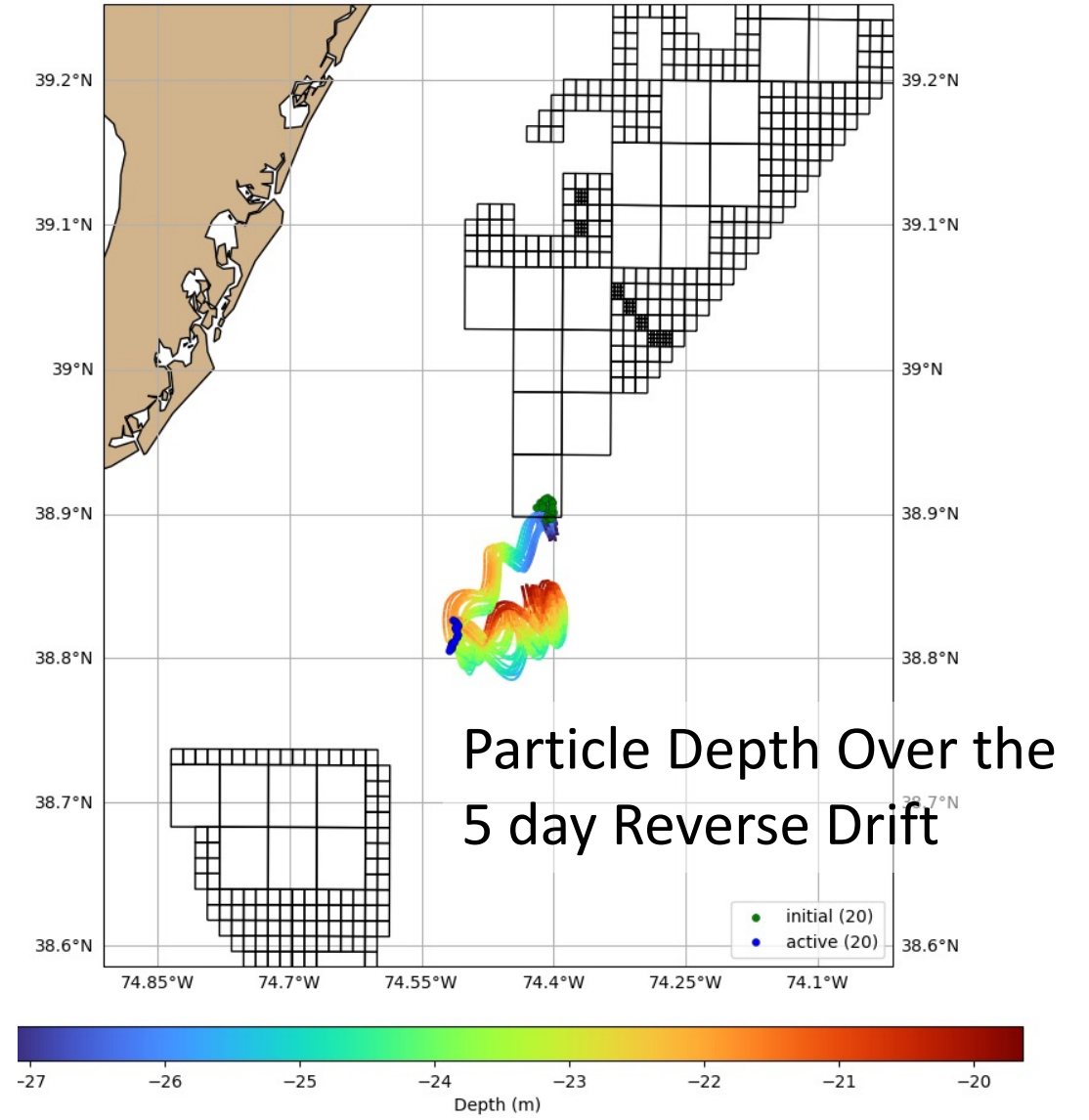
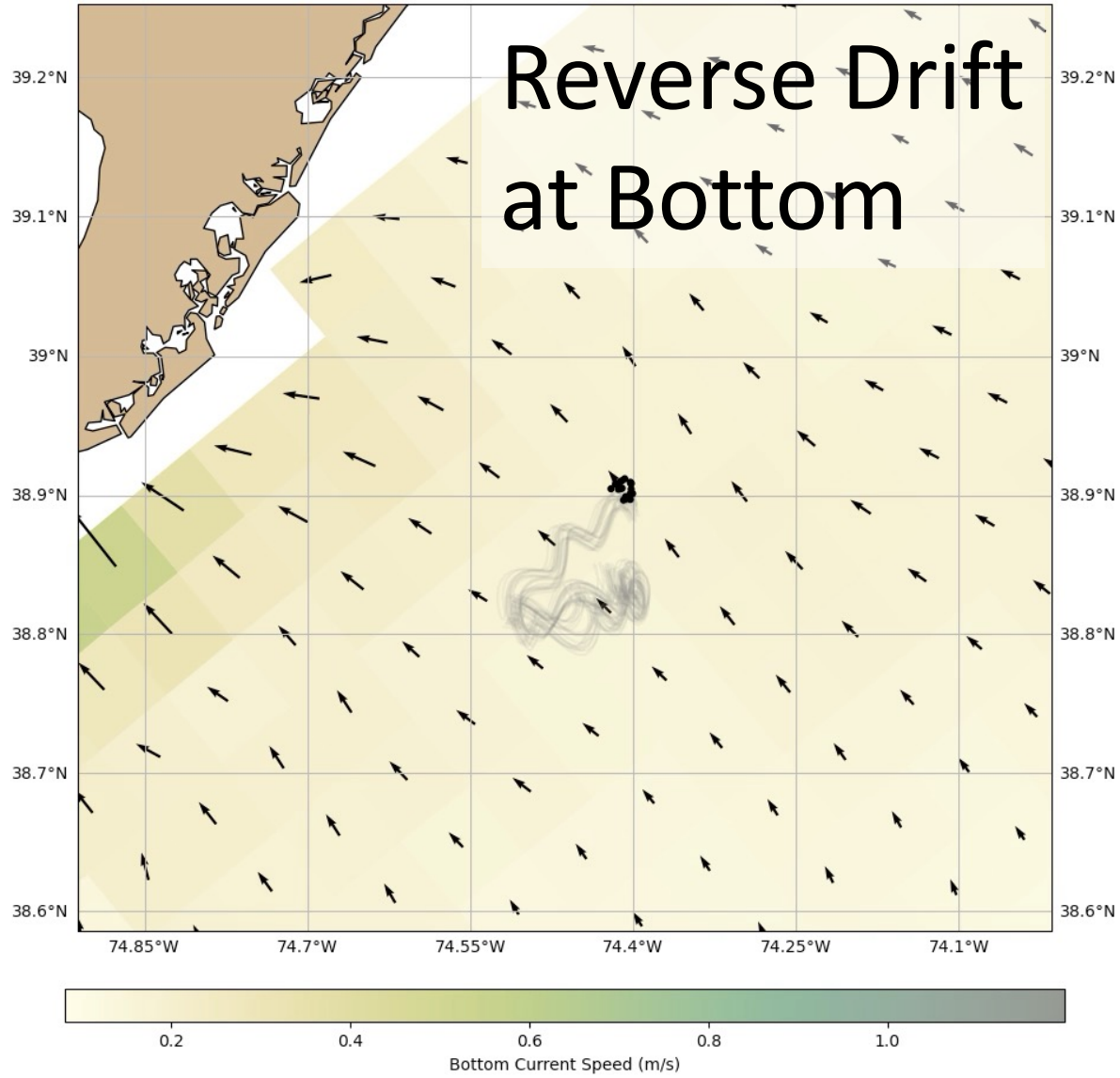
2021-12-08 08:00:00 to 2021-12-03 08:00:00



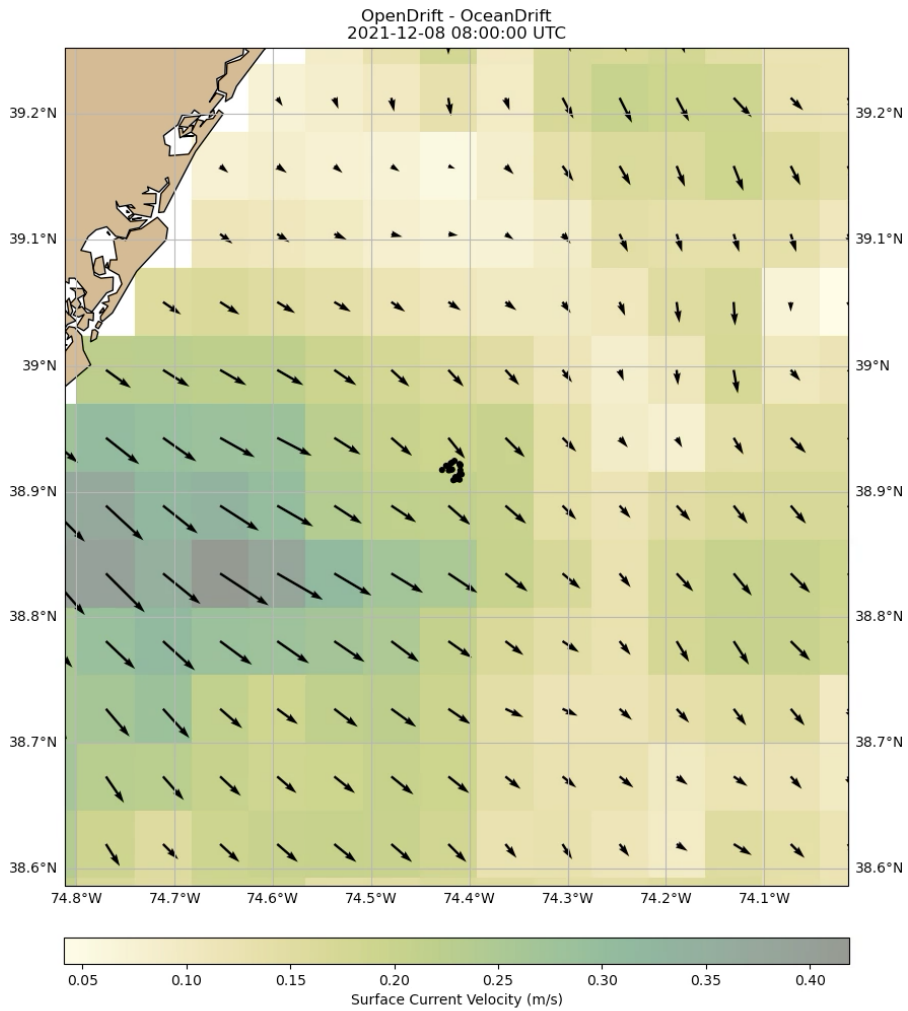
Mean Circulation

Doppio – a ROMS (v3.6)-based circulation model for the Mid-Atlantic Bight and Gulf of Maine:

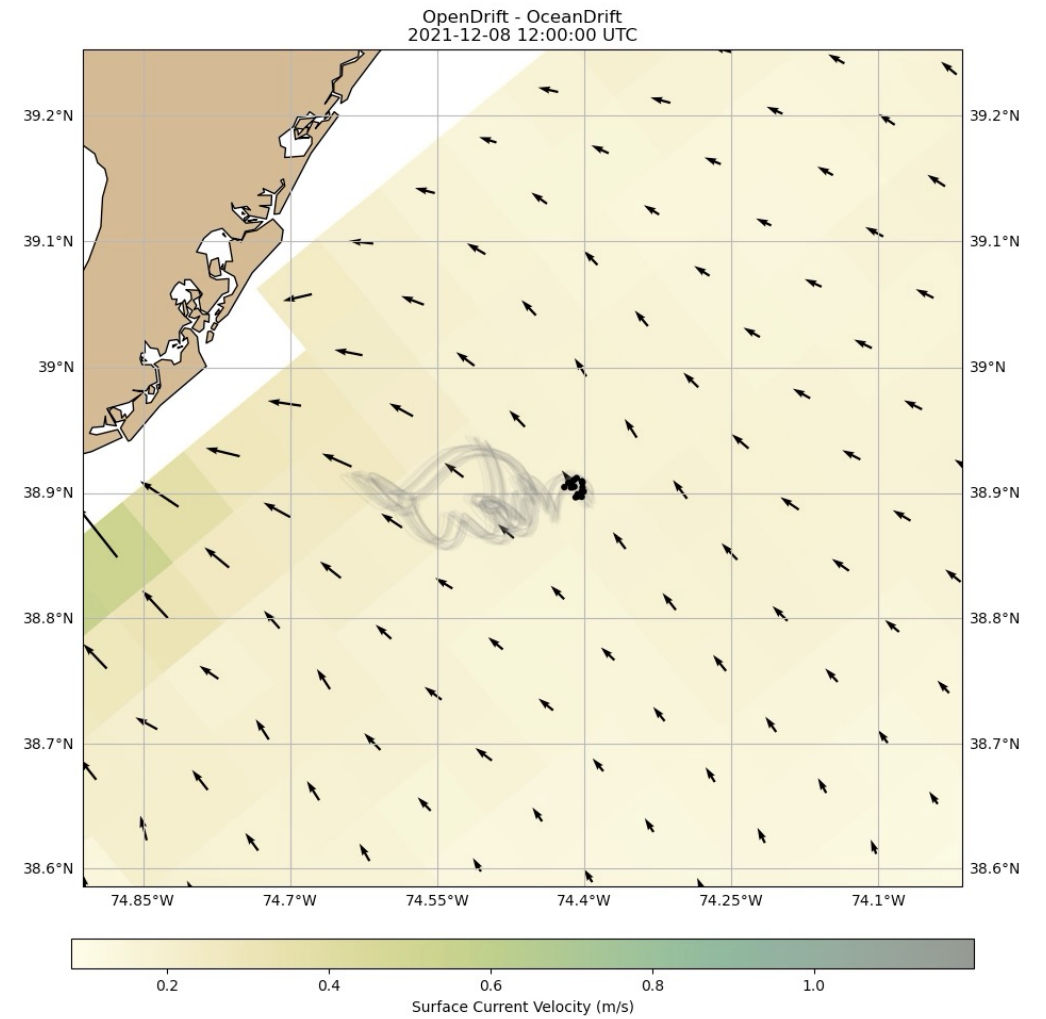




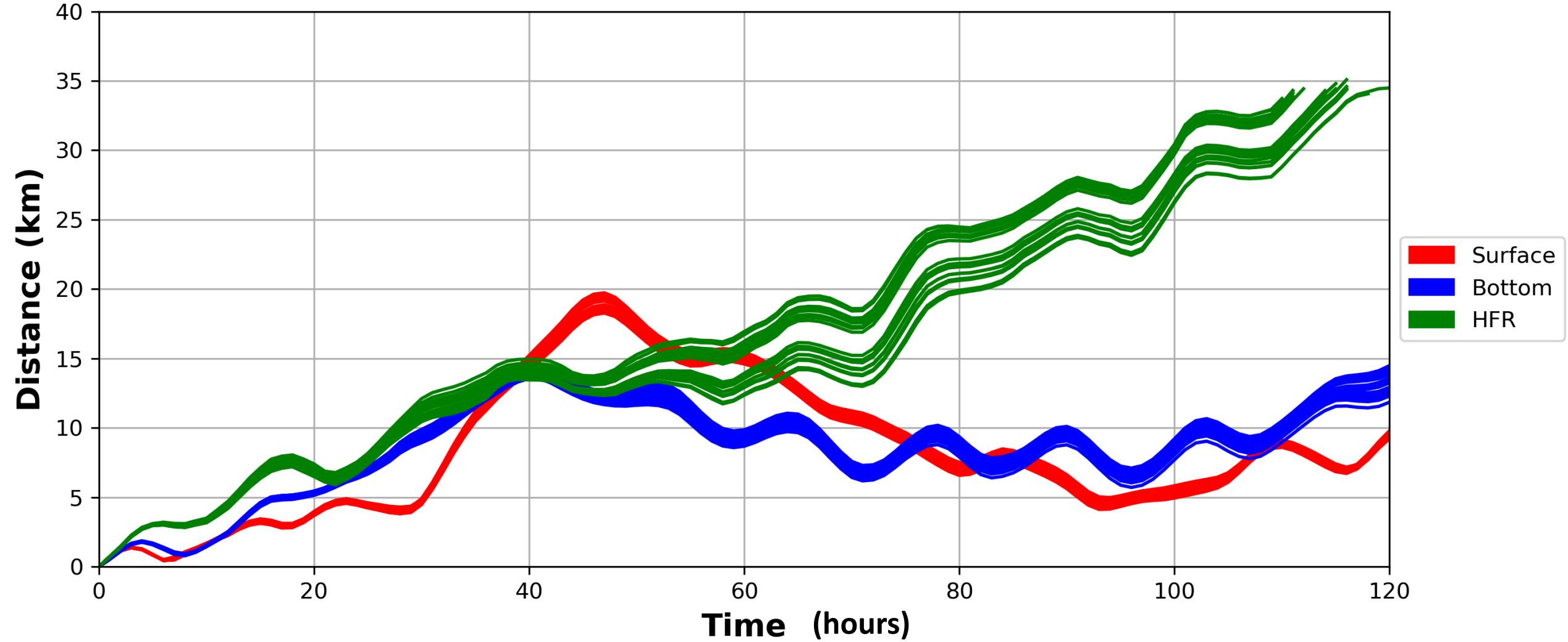
HFR Surface Currents



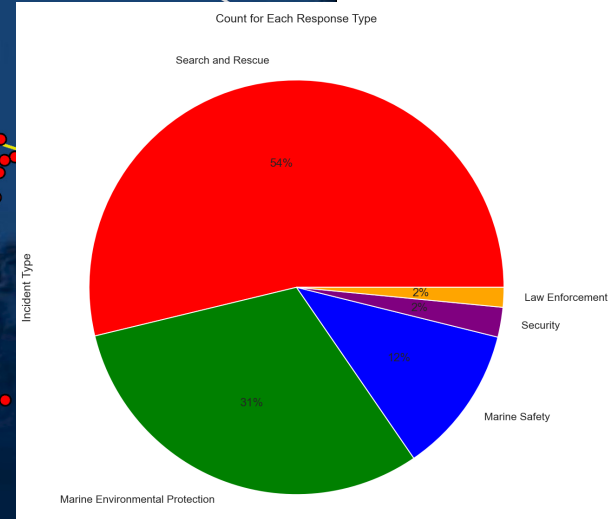
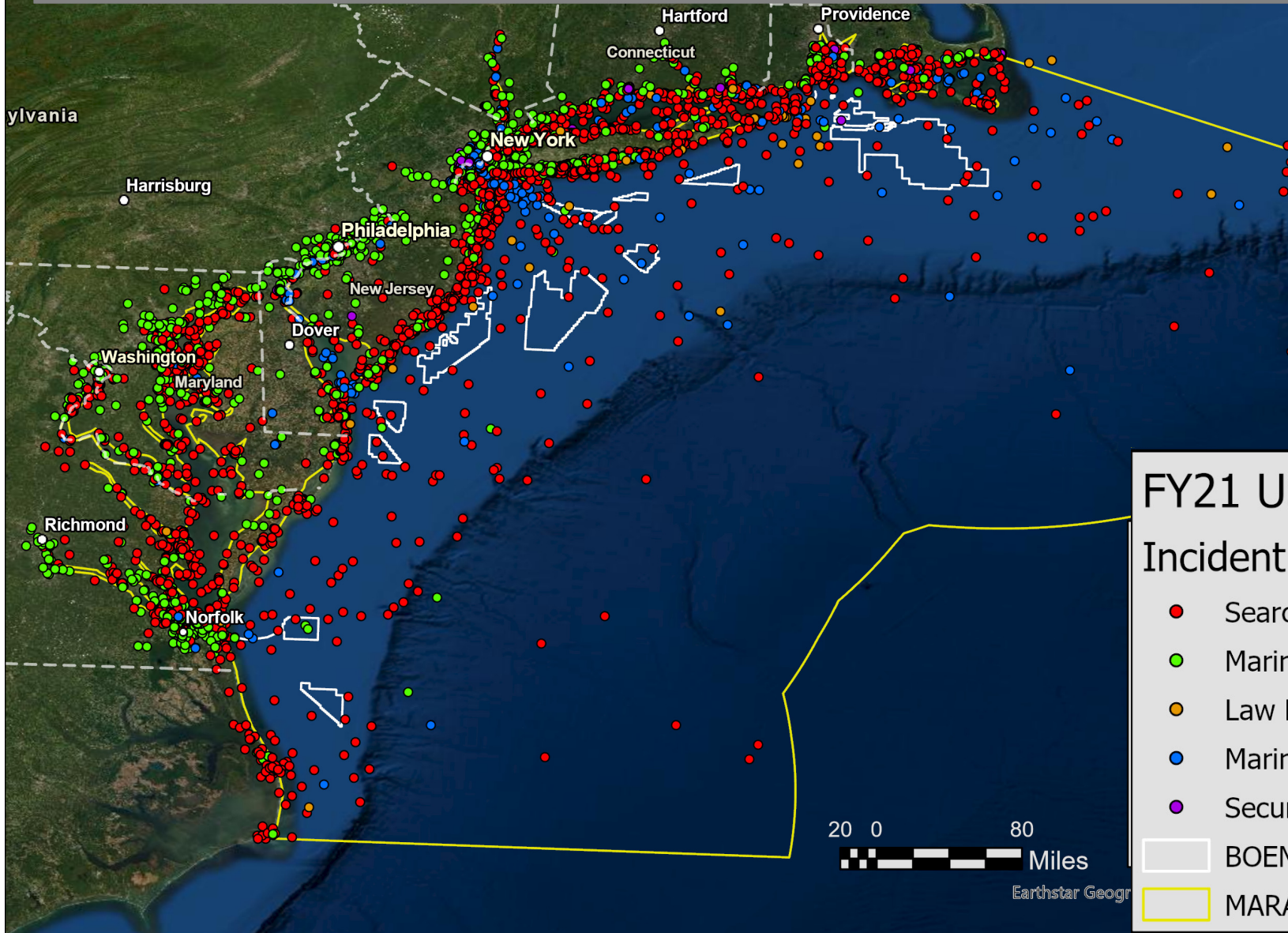
DOPPIO Surface Currents



Surface + Bottom DOPPIO, and HFR Distance from Origin for Each Drifter 2021-12-08 08:00:00 to 2021-12-03 08:00:00



USCG FY21 MISLE Cases within 10 miles of MARACOOS Area



FY21 USCG MISLE Cases

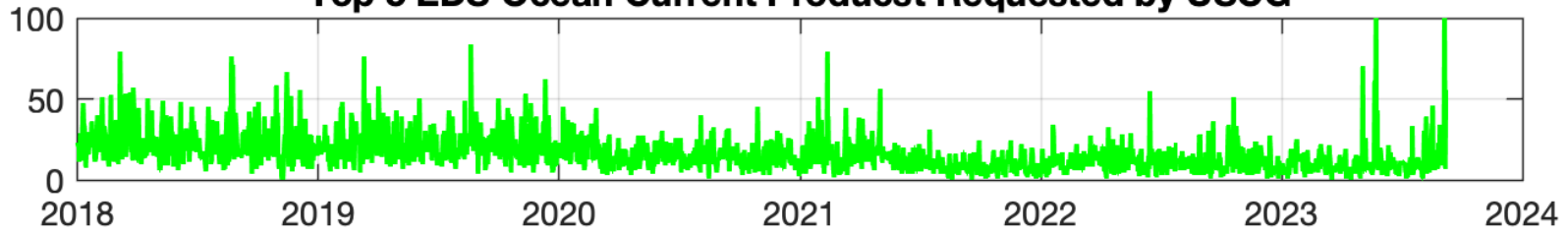
Incident Type

- Search and Rescue
 - Marine Environmental Protection
 - Law Enforcement
 - Marine Safety
 - Security
- BOEM Wind Energy Areas
 - MARACOOS Boundary

Top 5 EDS Ocean Current Product Requested by USCG

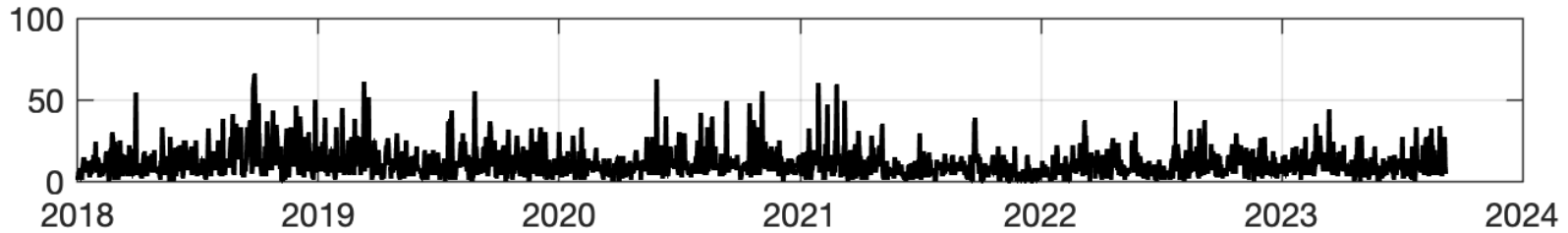
Average Daily Requests

ADCIRC



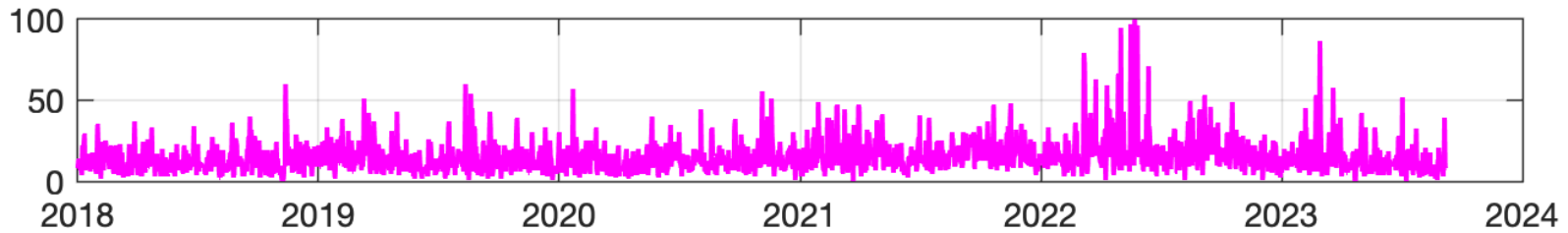
16

HYCOM Navy



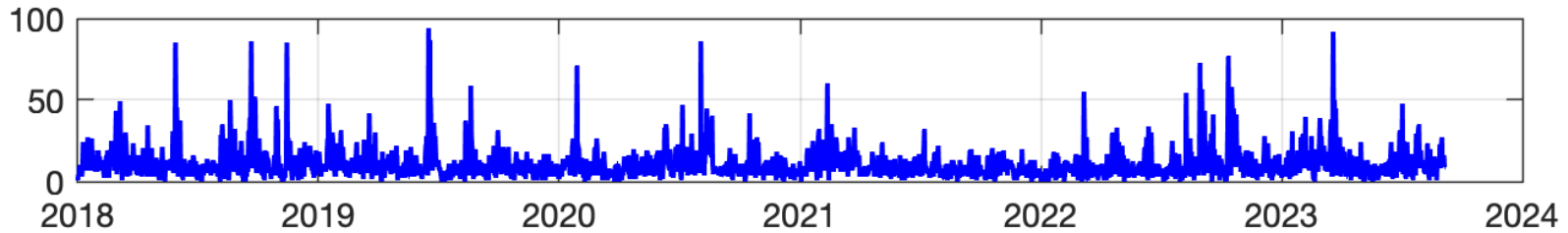
10

HYCOM NCEP



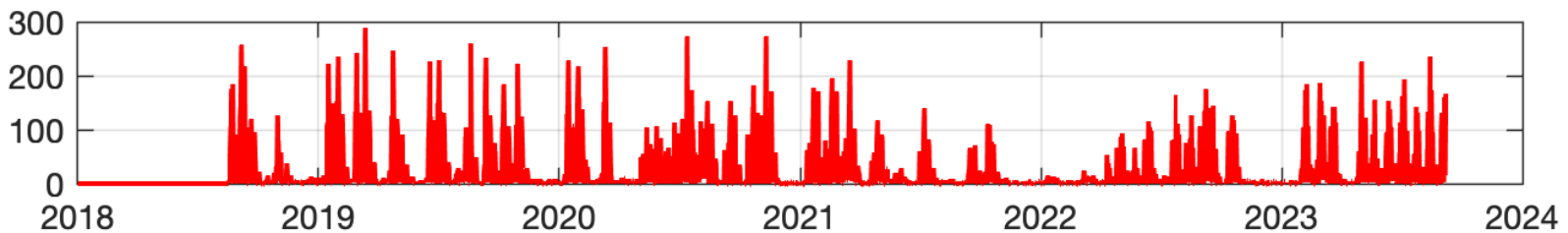
14

HFR STPS



11

DOPPIO

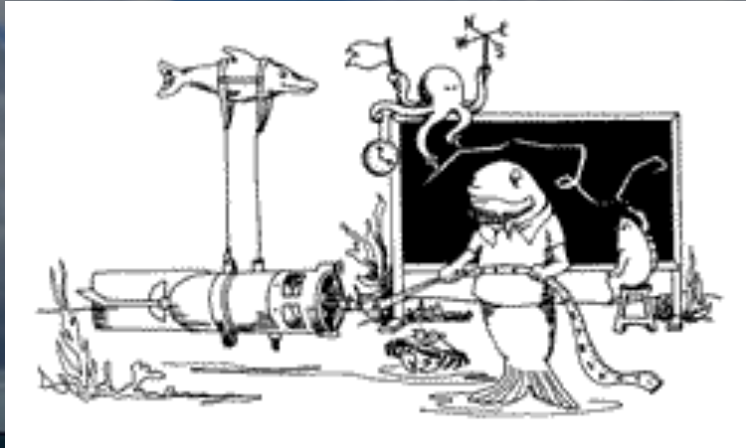


26

Conclusions

- Provided introduction to HF radar
- Described the network in the Mid Atlantic and how its used for particle tracking
- Now we are expanding the use to estimate the source water of eDNA samples

Determining the Origin and Fate of Oceanic eDNA



Thanks



CWTM 2024
March 18-20, North Carolina

