



# Insights from the CFRF/WHOI Shelf Research Fleet and the June Salinity Intrusion Cruise

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**Aubrey Ellertson, Susan Inglis, and Dave Bethoney, CFRF**

# Outline



Introductions



Shelf Research Fleet Update



Salinity Intrusion project



New ideas on changing conditions



Future Directions and Funding



Discussion & Closing Remarks

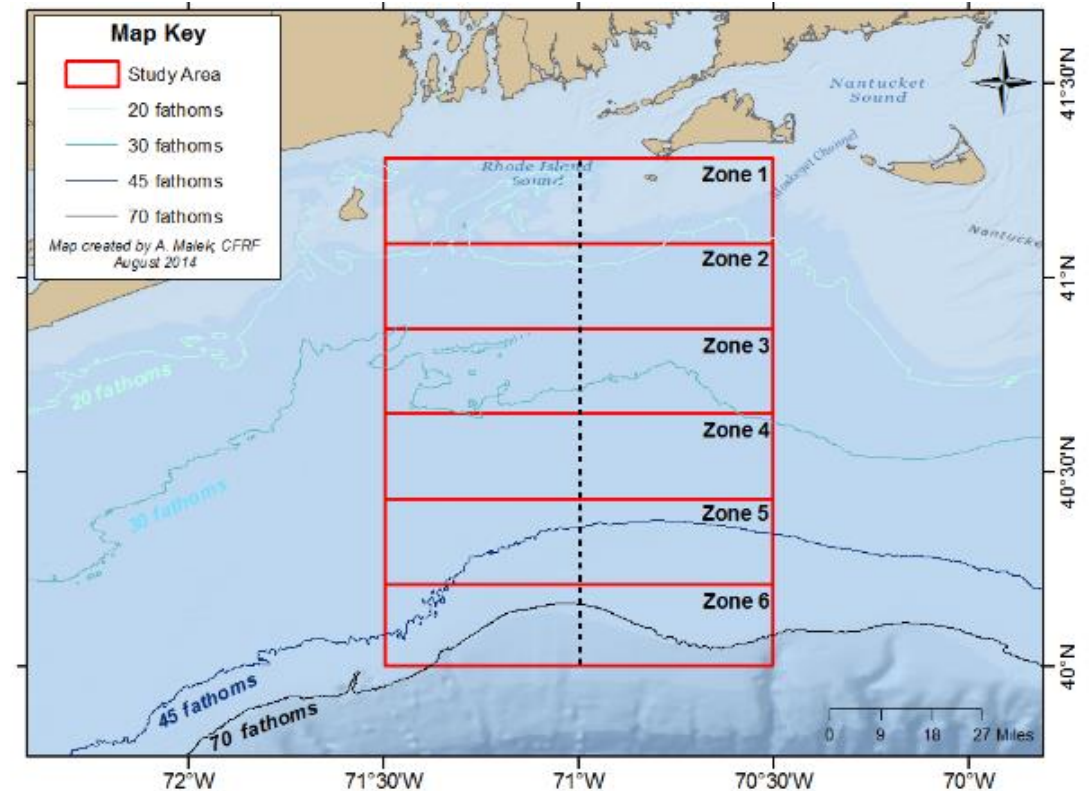
# Introductions

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- Name
- Affiliation
- If in the fishing community please say: where you fish out of, and for what species, gear type

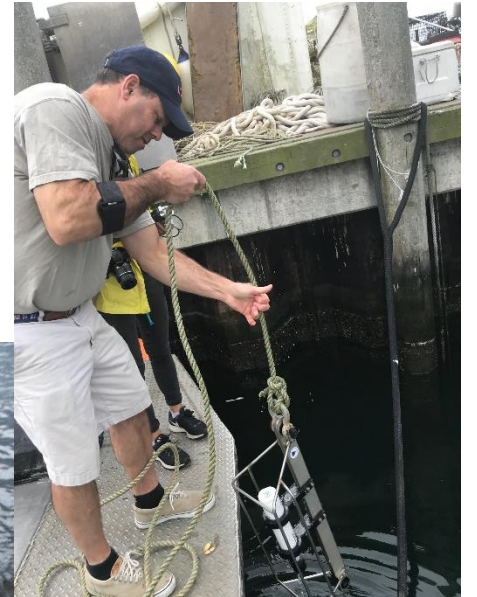
# CFRF/WHOI Shelf Research Fleet

- Project Goals:
  - study the oceanographic conditions across the continental shelf off the coast of RI
- Fishing vessels collect temperature, salinity, depth from six designated study zones
- Each F/V samples 2 stations every other week
- Currently funded through September 2021



# Huge thank you to our fleet participants!

Brooke C, Erica Knight, Excalibur, Finast Kind II, Harvest Moon, Mister G





# Progress to Date

"Where'd the fish go? Where are they?" Well, it's pretty much explained right there and it all has to do with the warm bottom temperatures, the salinity. The fish know that they can't spawn in that area."

Rob Walz

Collected 721 profiles as of Aug 23, 2021

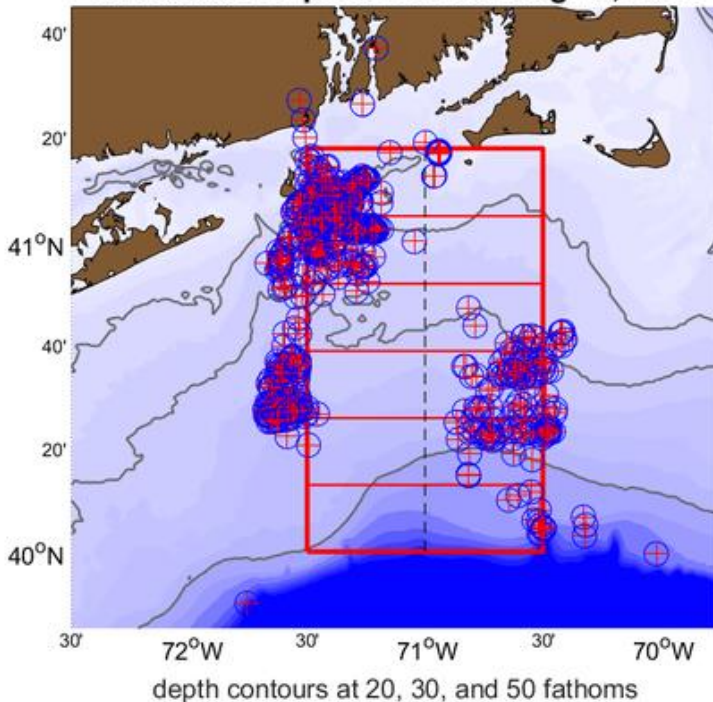
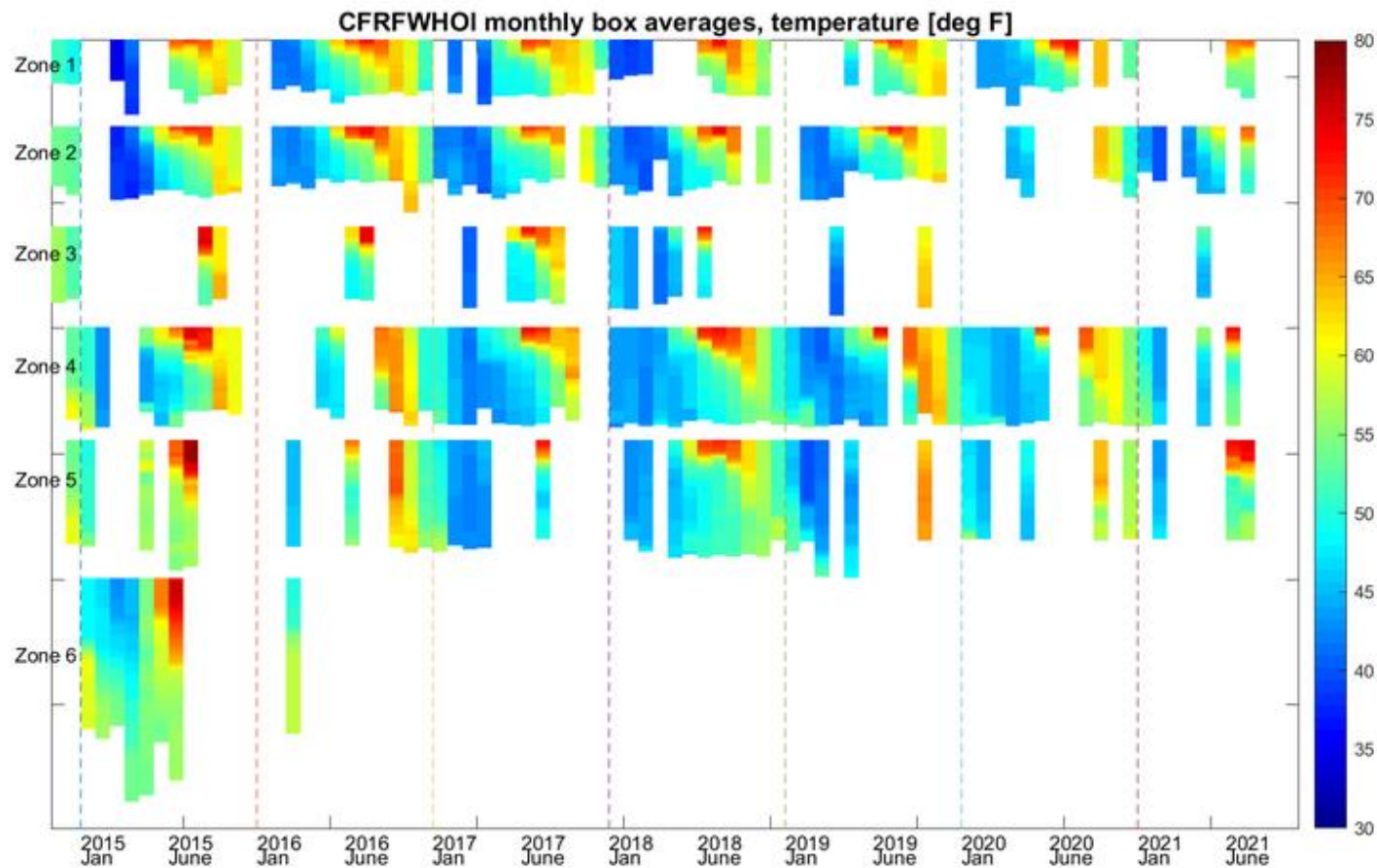


Photo credit: © Woods Hole Oceanographic Institution: Daniel Cojanu, Under Current Productions

# Temperature Data by Month and Zone



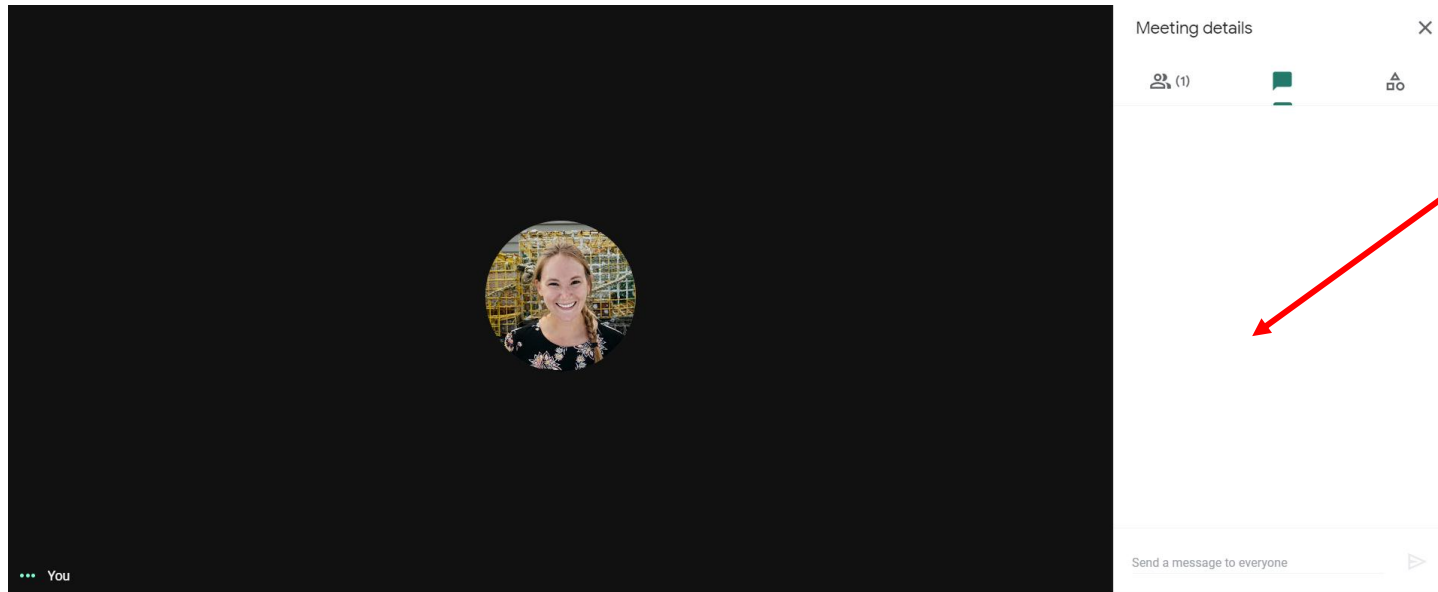




# Glen Gawarkiewicz, Physical Oceanographer, WHOI



# Housekeeping for Google Meets



- You can enter questions in chat box. This will be seen by everyone

How to turn mic on  
When someone is presenting,  
please keep yourself muted  
(red), and then unmute to speak.

Hang up call

Turn video on and off

Raise hand

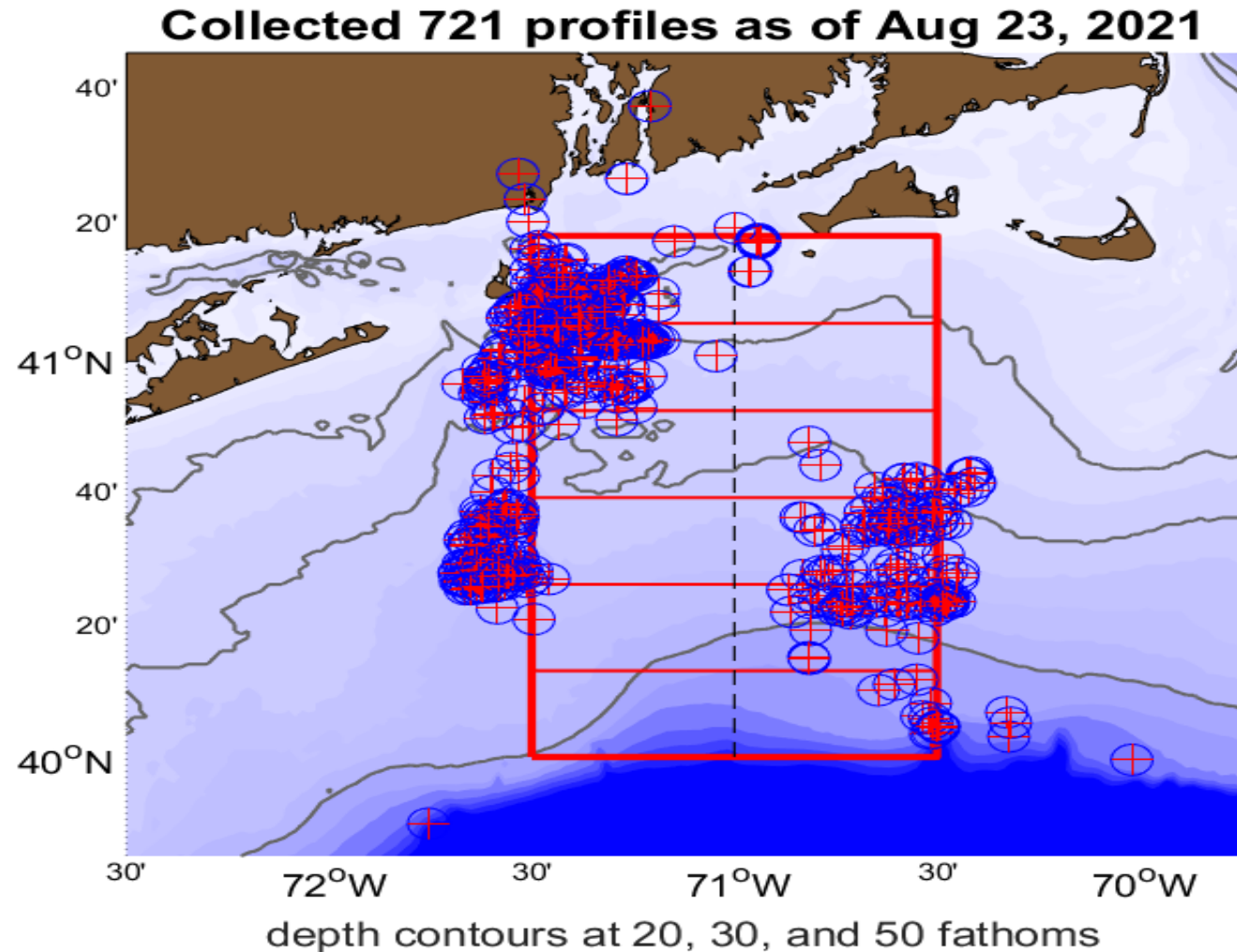
# Profiles to Date

721 Profiles as of August 23, 2021

Sampling through time periods when Academic ships were not operating

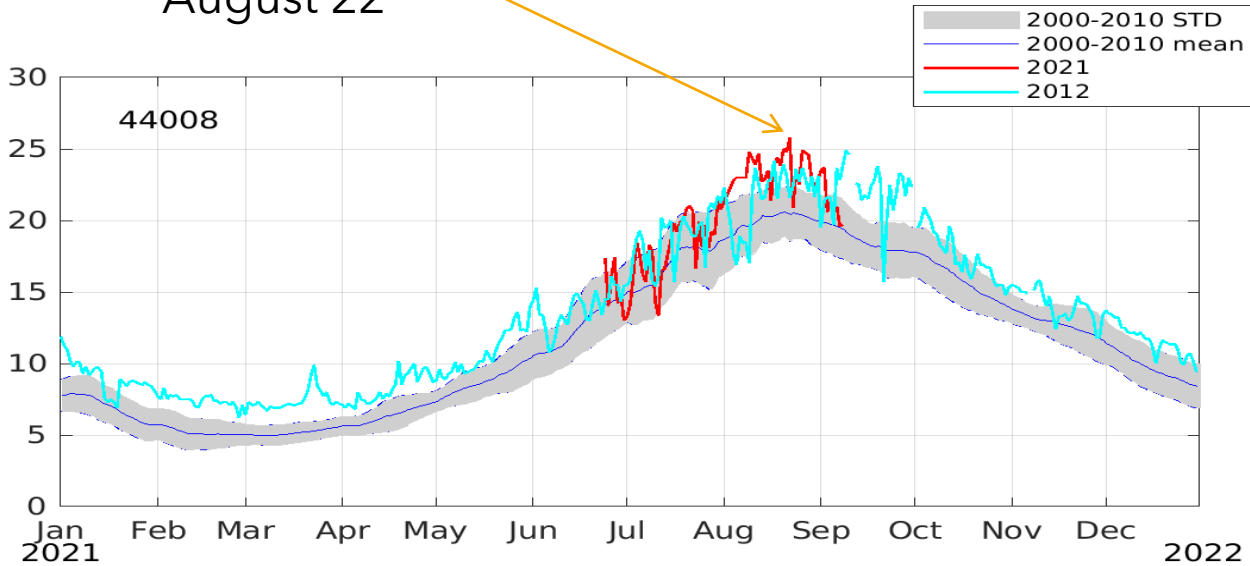
Data shared with Office of Naval Research for April-June to assist in large experiment for Task Force Ocean

Used data in runup to passage of Hurricane Henri to assess subsurface temperatures

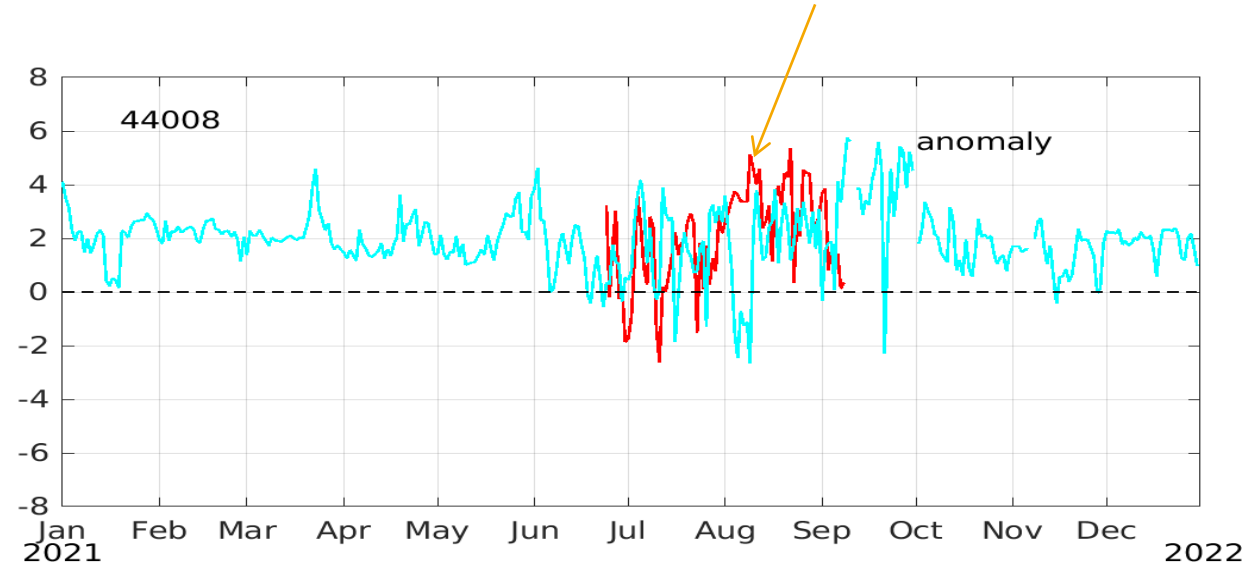


# NDBC Buoy 44008 Nantucket Shoals

79 Deg. F  
August 22



9 Deg. F warmer  
than 2000-2010 Ave.

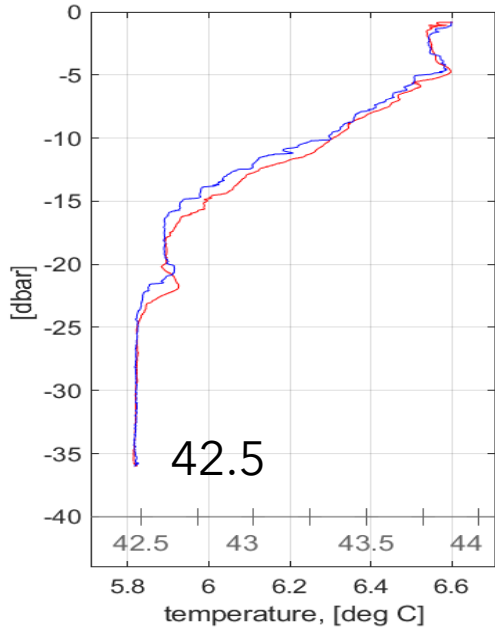


**Warmer** than 2012 in August

# Zone 2 (Near Block Island)

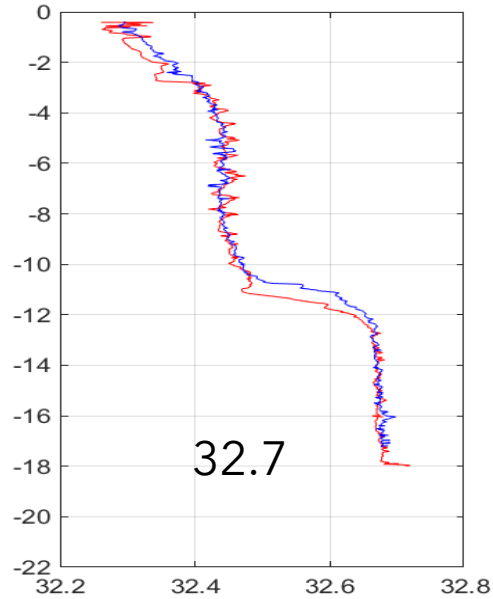
Temperature

44



Salinity

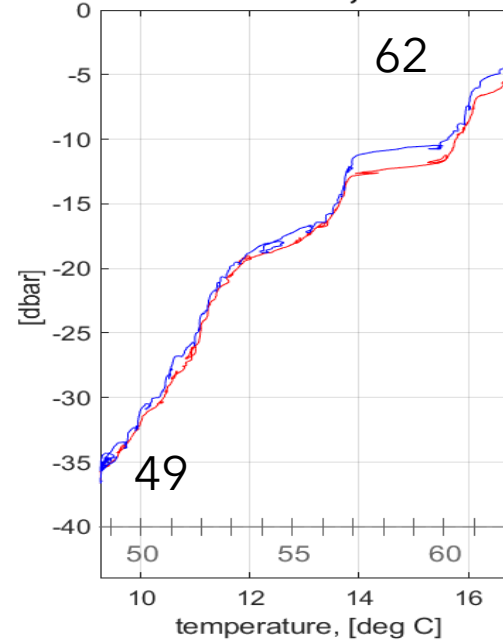
32.3



May 15

Temperature

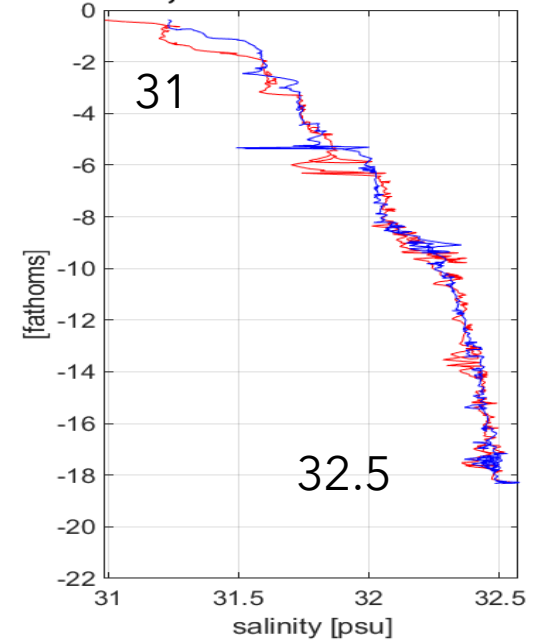
62



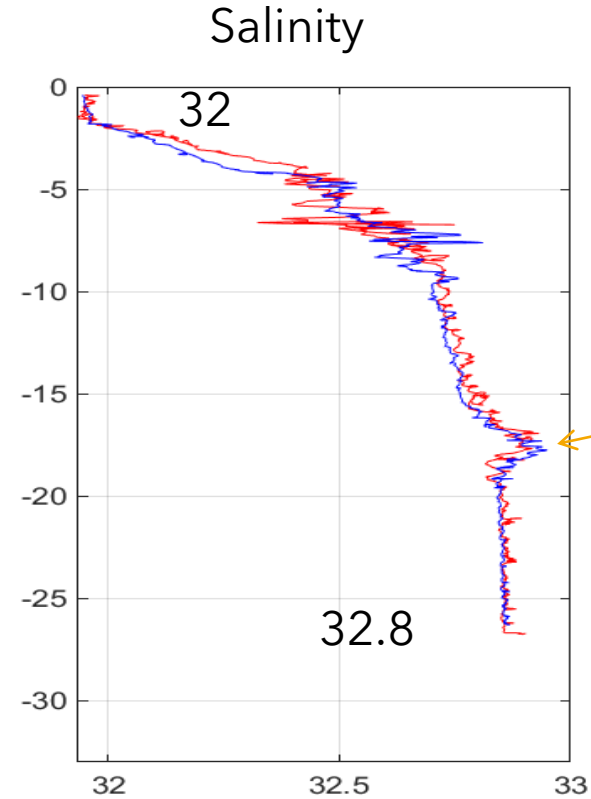
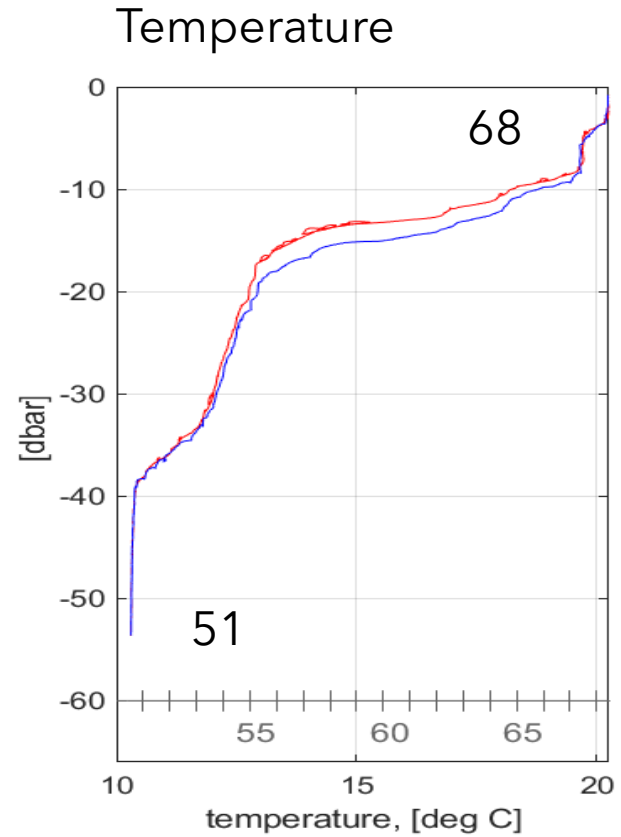
June 15

Salinity

31



# Zone 2 (Near Block Island)



August 8

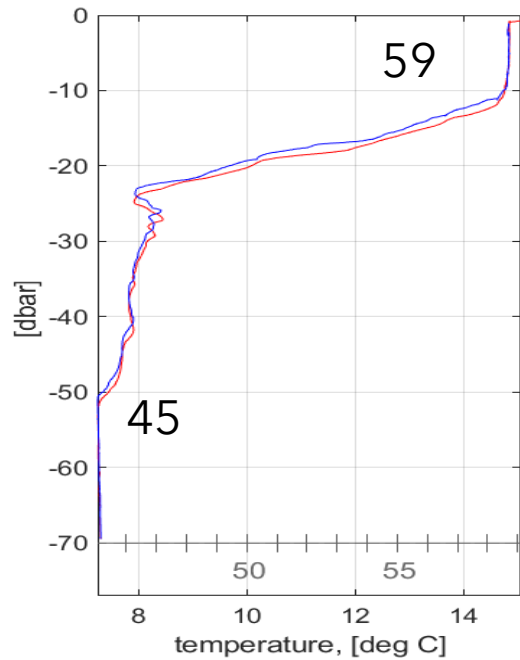
# Zone 4 (Outer Shelf)

Temperature

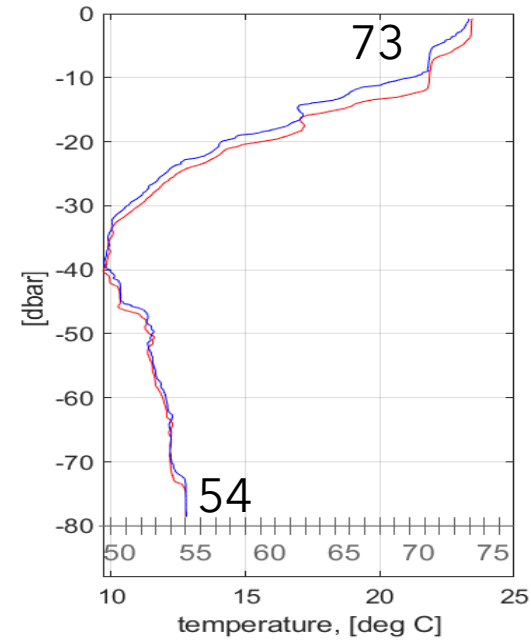
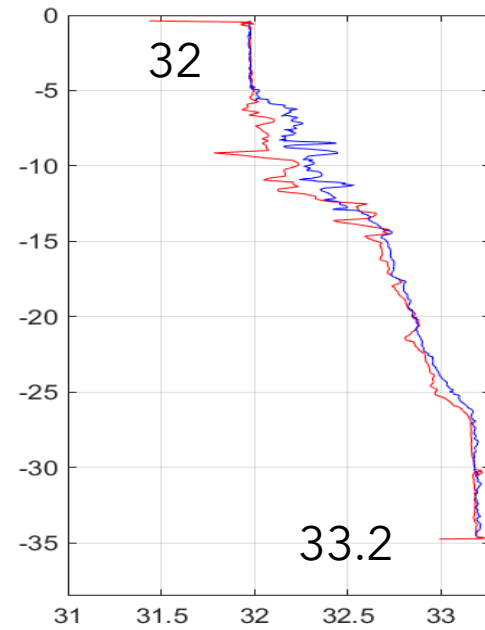
Salinity

Temperature

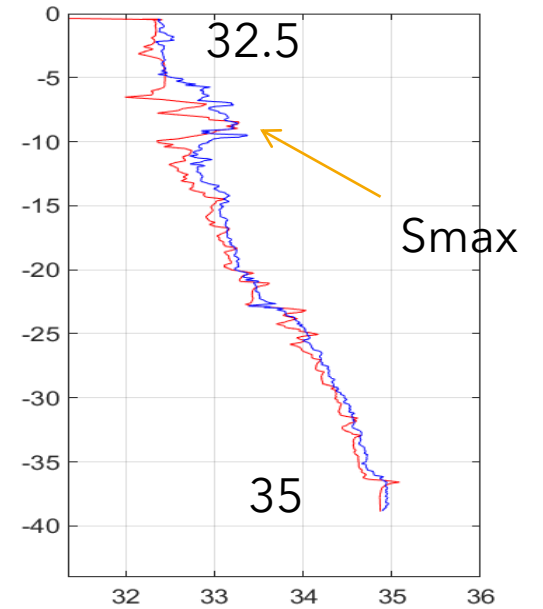
Salinity



May 26

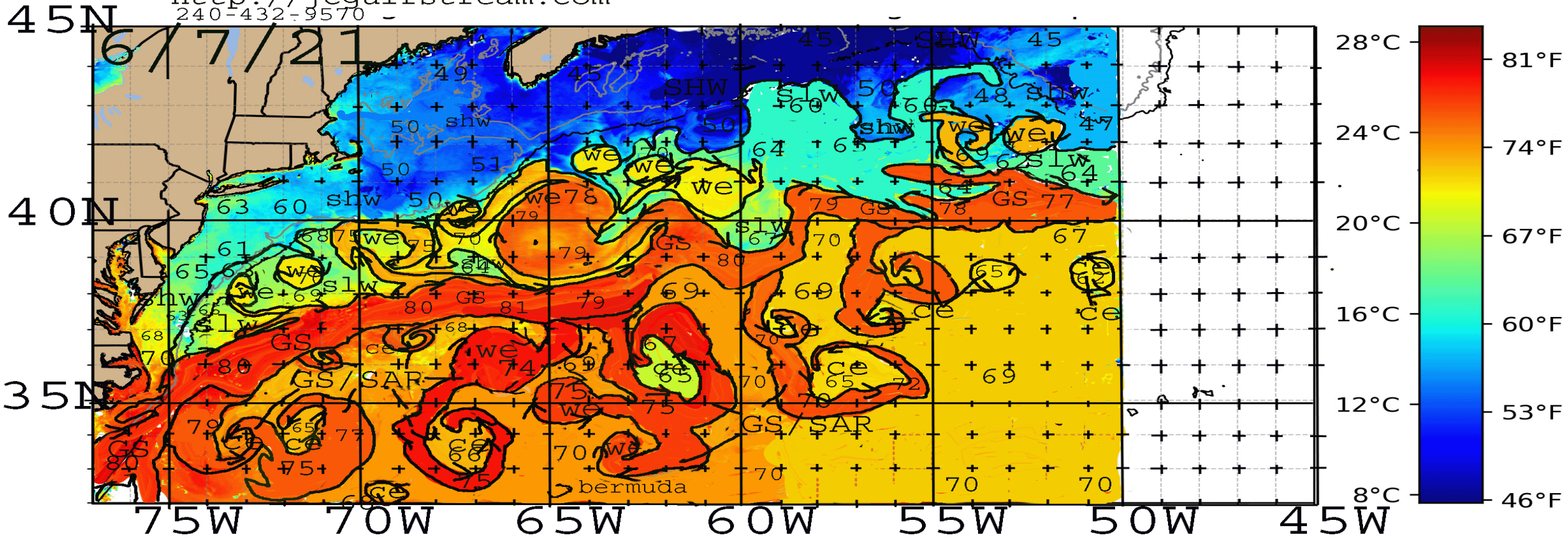


July 27



# Rings!!! (from Avijit and Adrienne)

<http://jcgulfstream.com>  
240-432-9570



Early June



# SIRATES- Salinity Intrusions, Rings, AUVs, Turbulence, and Squid

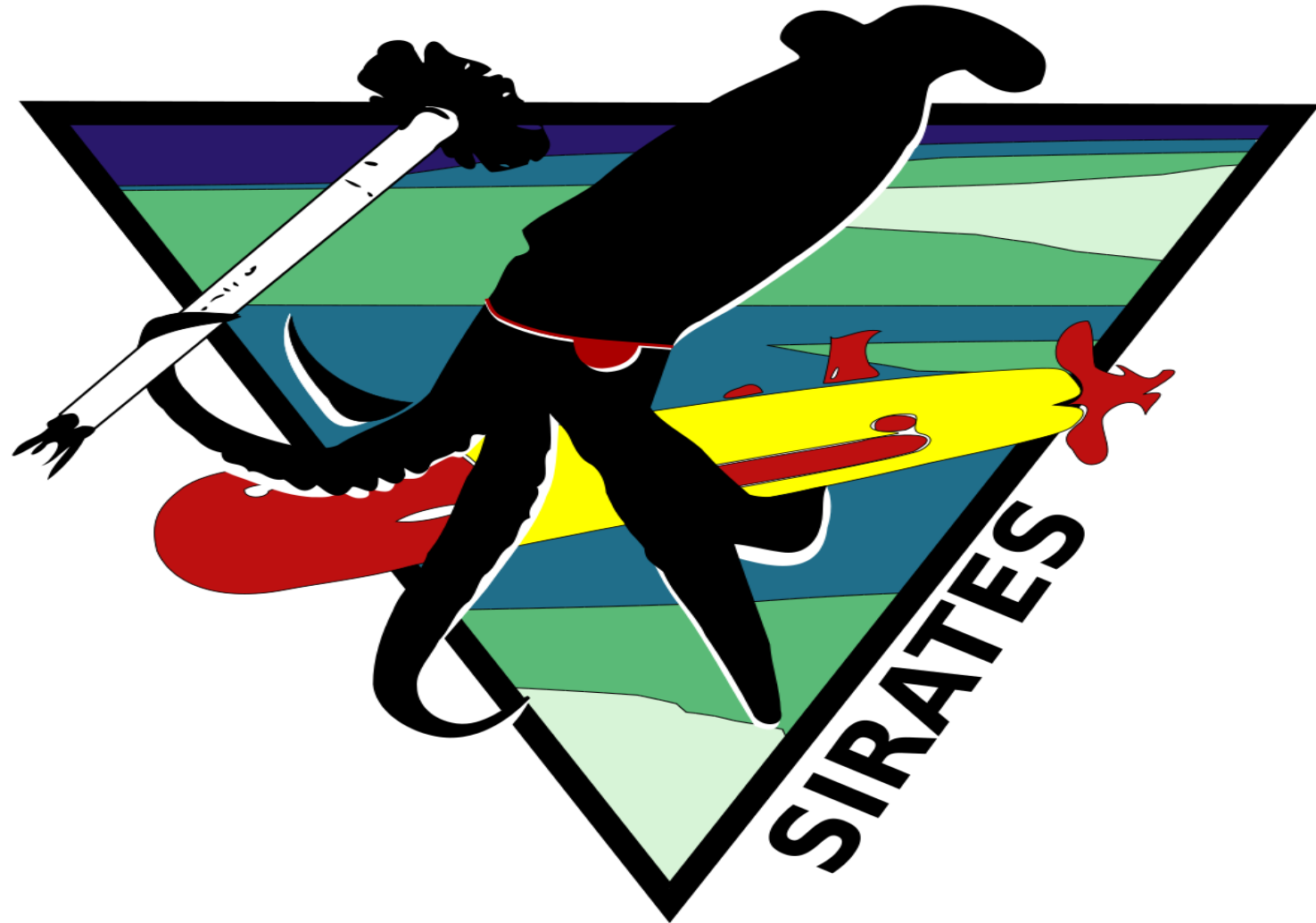
Map Intrusion with multiple AUVs, Shipboard CTD, and turbulence Profiler

Determine linkage of intrusions to presence of Warm Core Rings

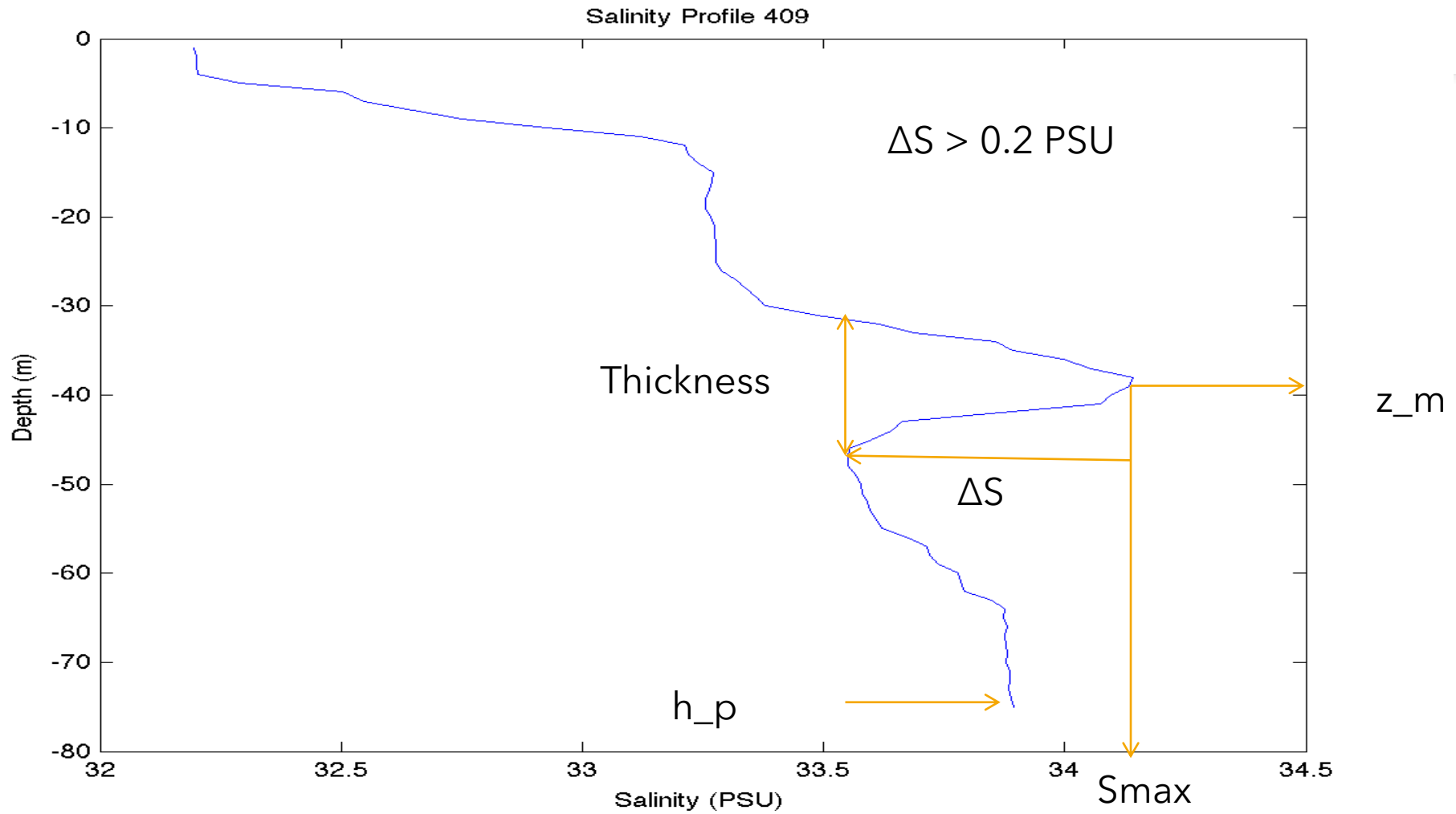
Measure mixing rates of an Intrusion

Determine if there is any connection to onshore pulses of squid

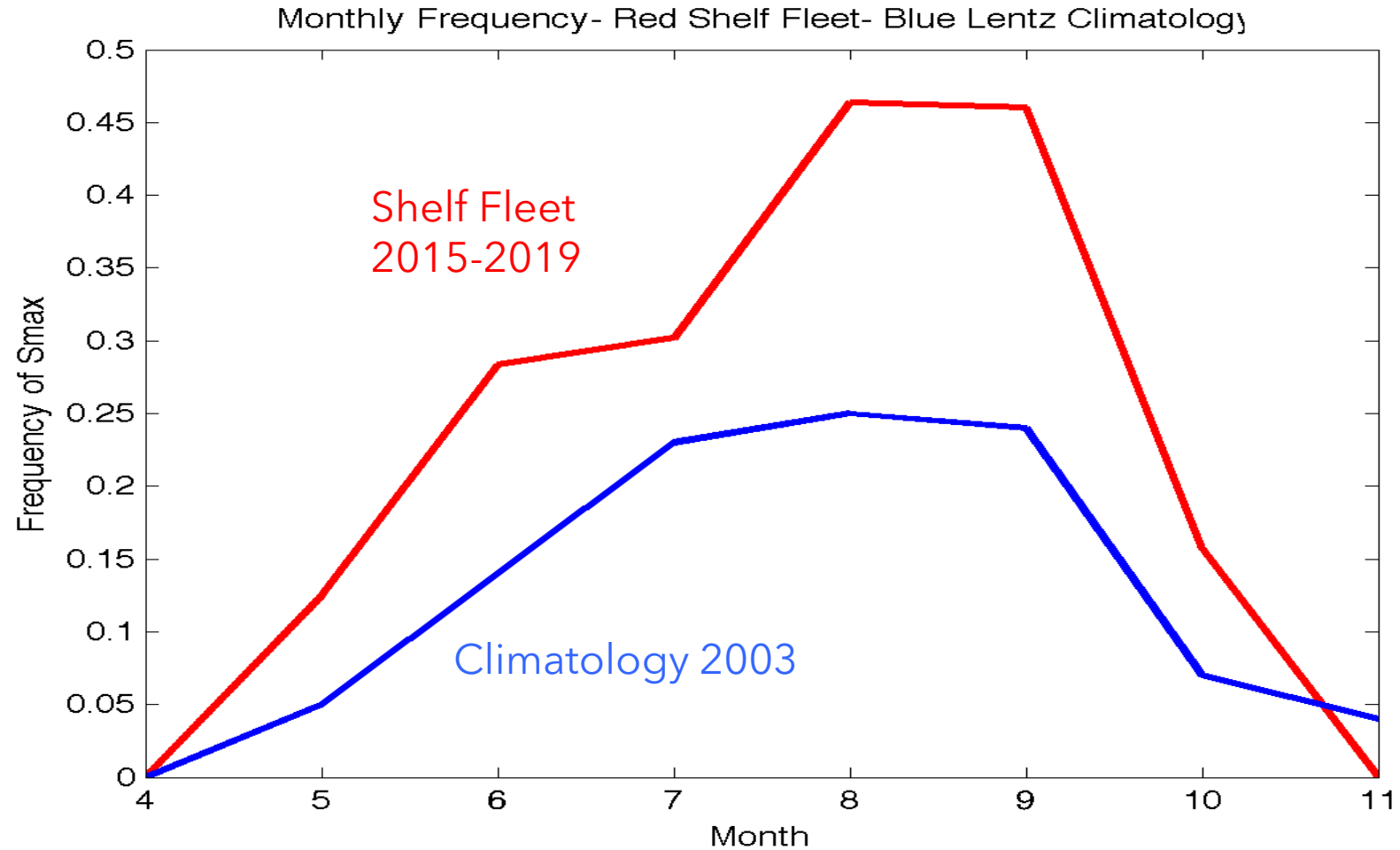
Two cruises- June 17-July 2 and September 16-23 2021



# Salinity Profile with Smax

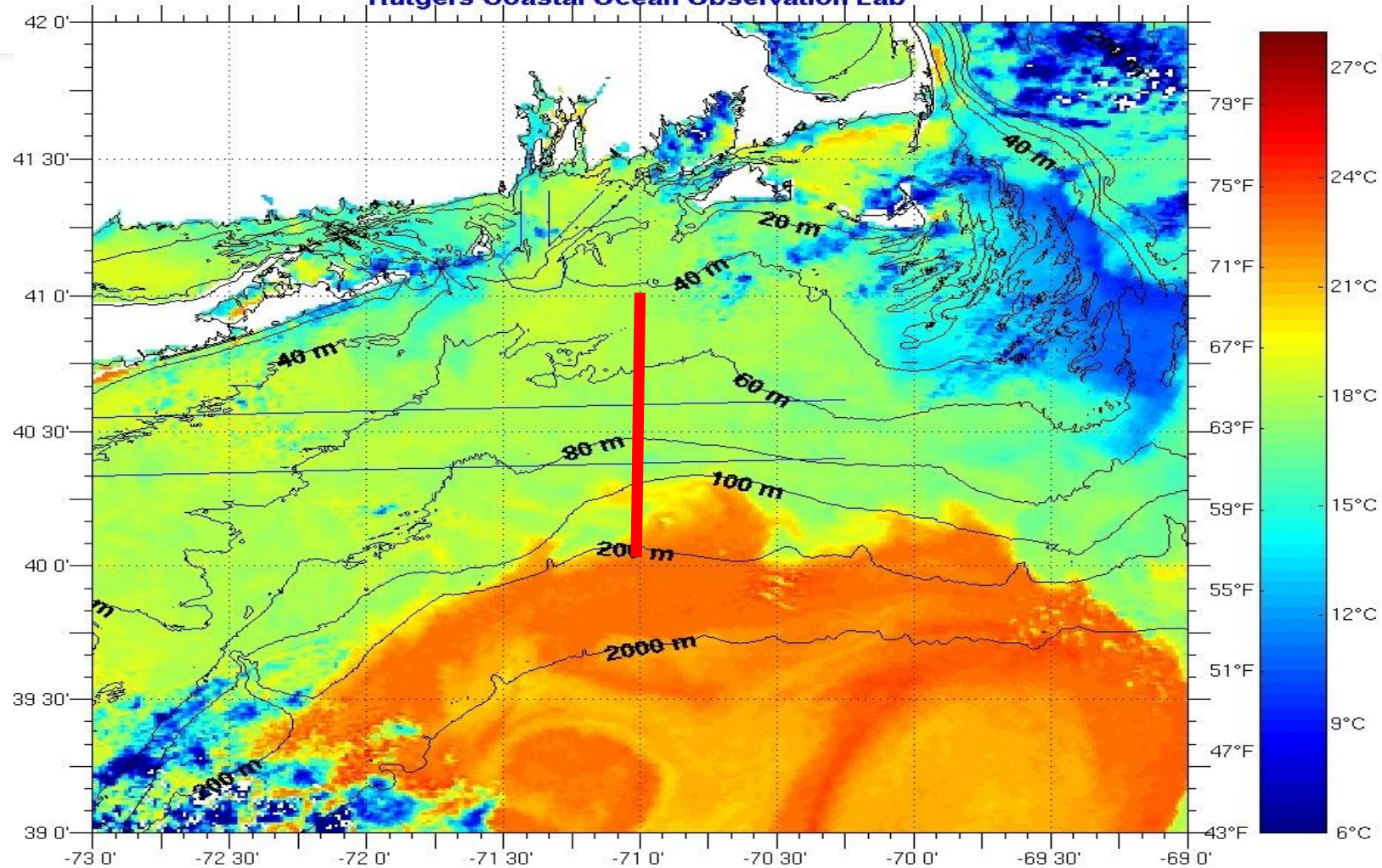


# Frequency of Smax by Month of Year



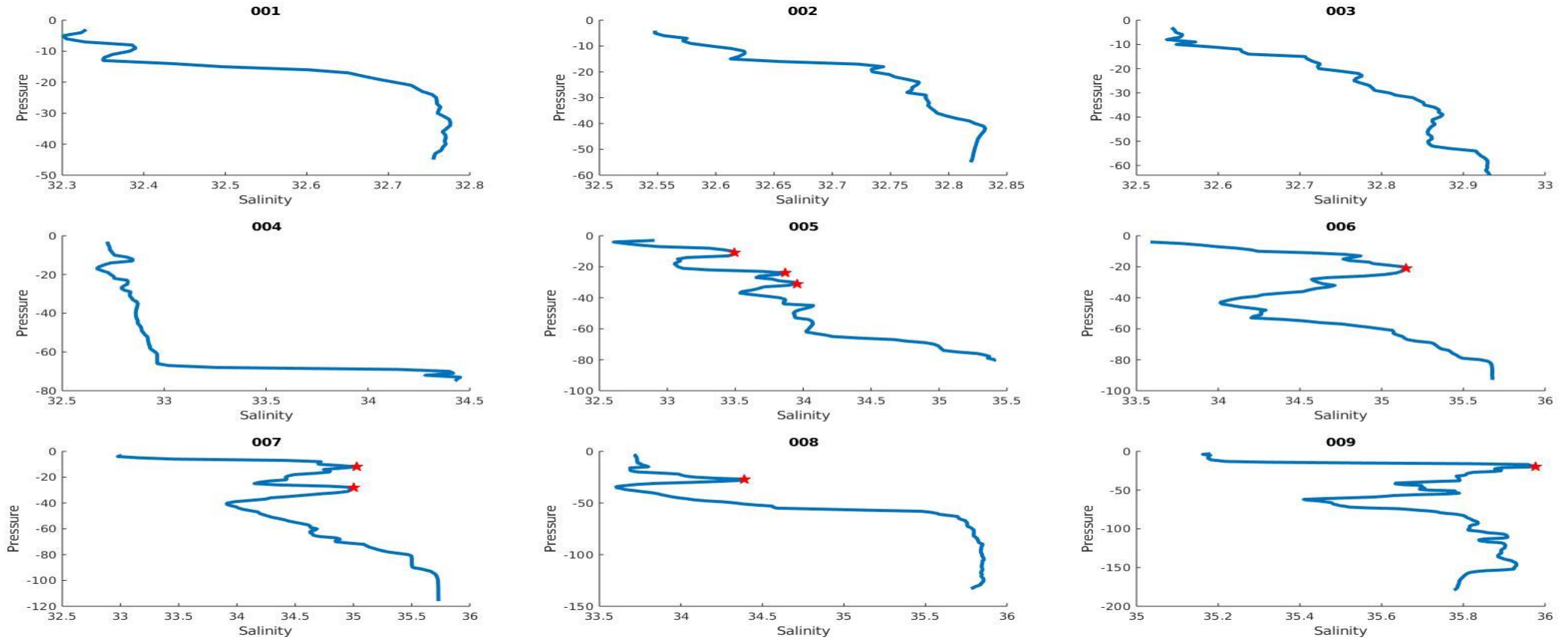
# Finding an Smax

NOAA-18 Sea Surface Temperature June 17, 2021 0223 GMT  
Rutgers Coastal Ocean Observation Lab

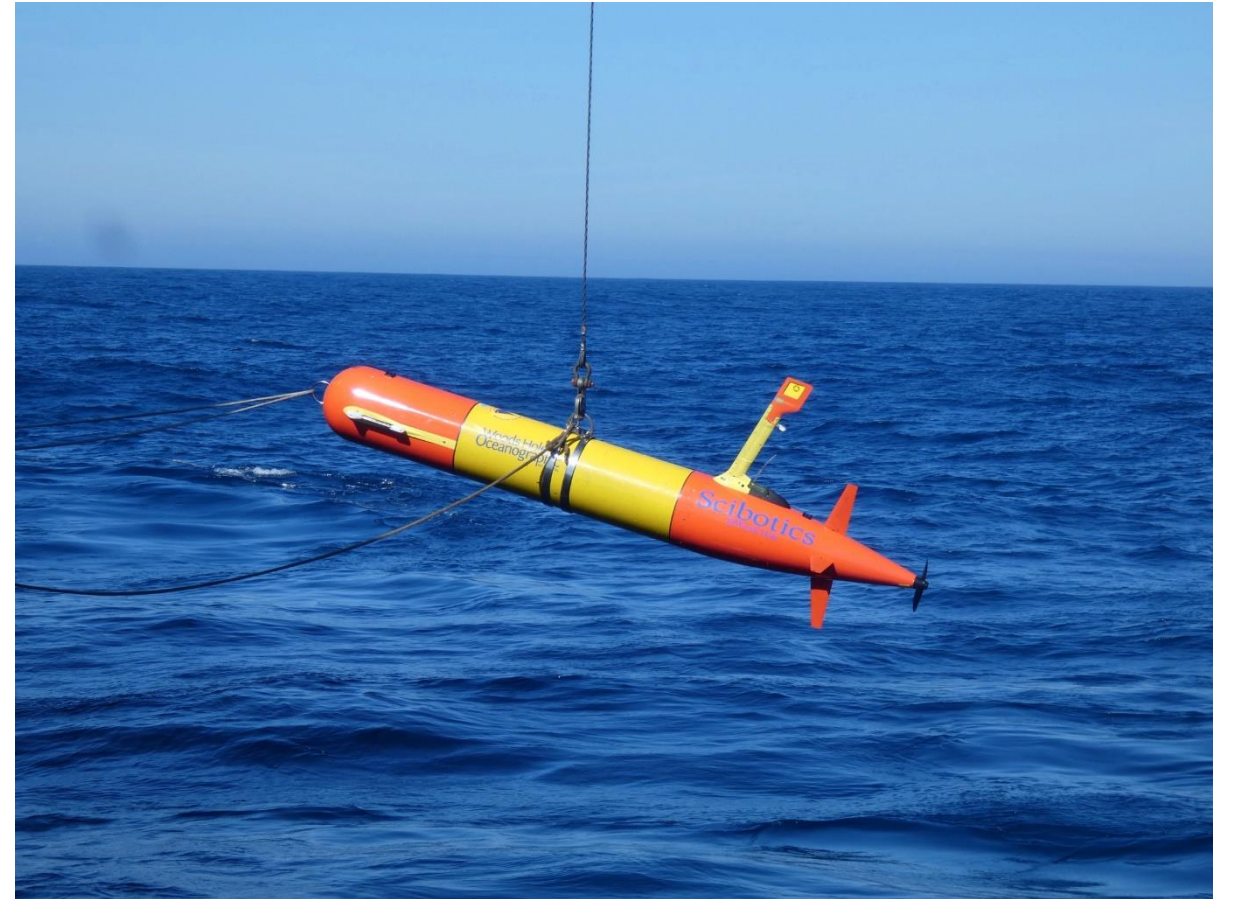
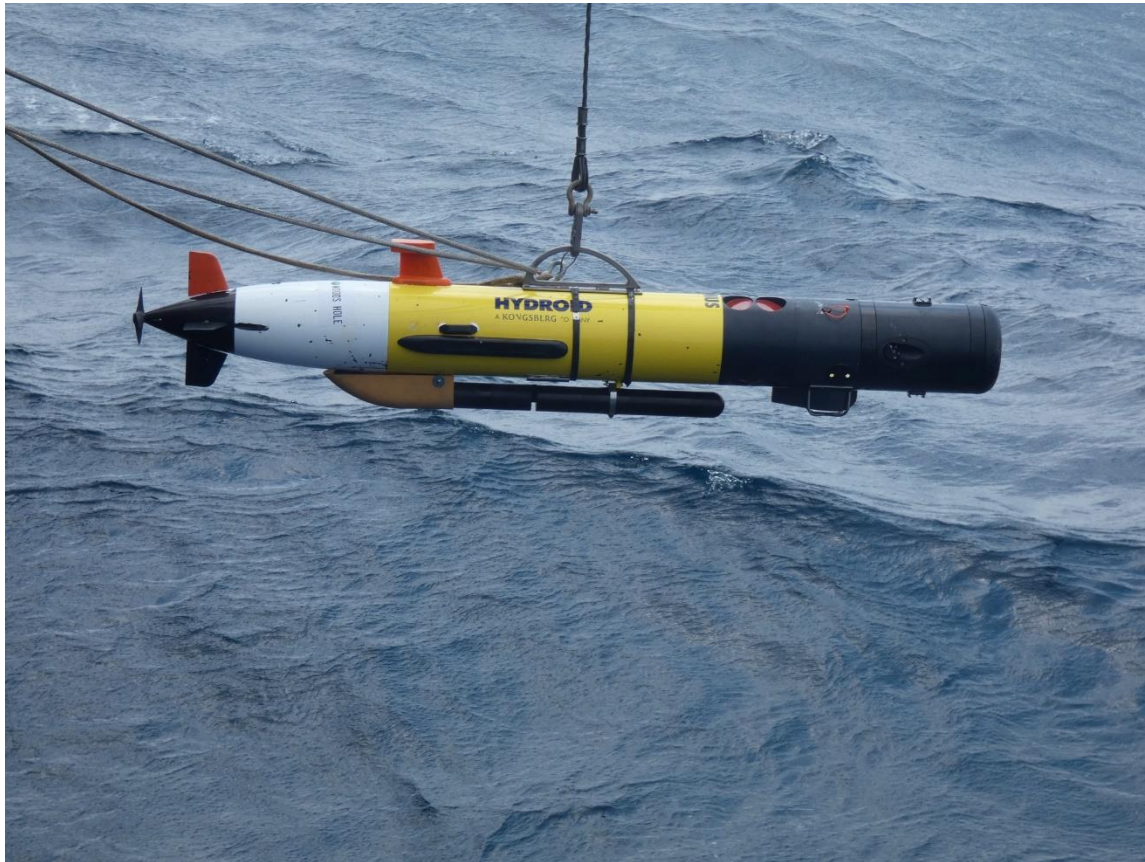


Red Bar  
Initial CTD  
Line

# Salinity Profiles First Cross-Shelf Transect



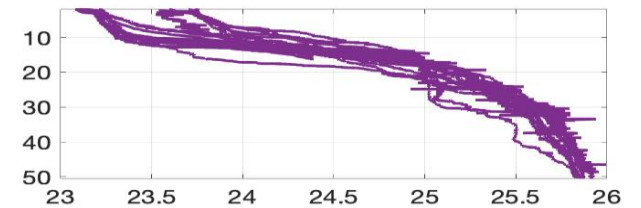
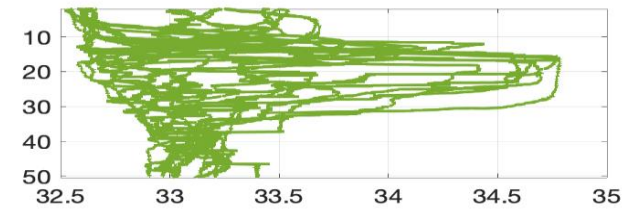
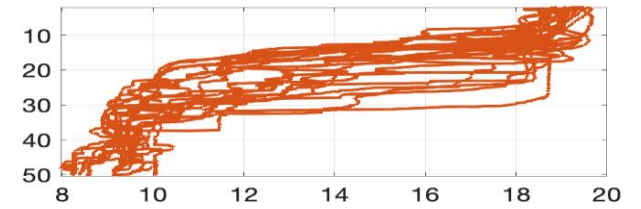
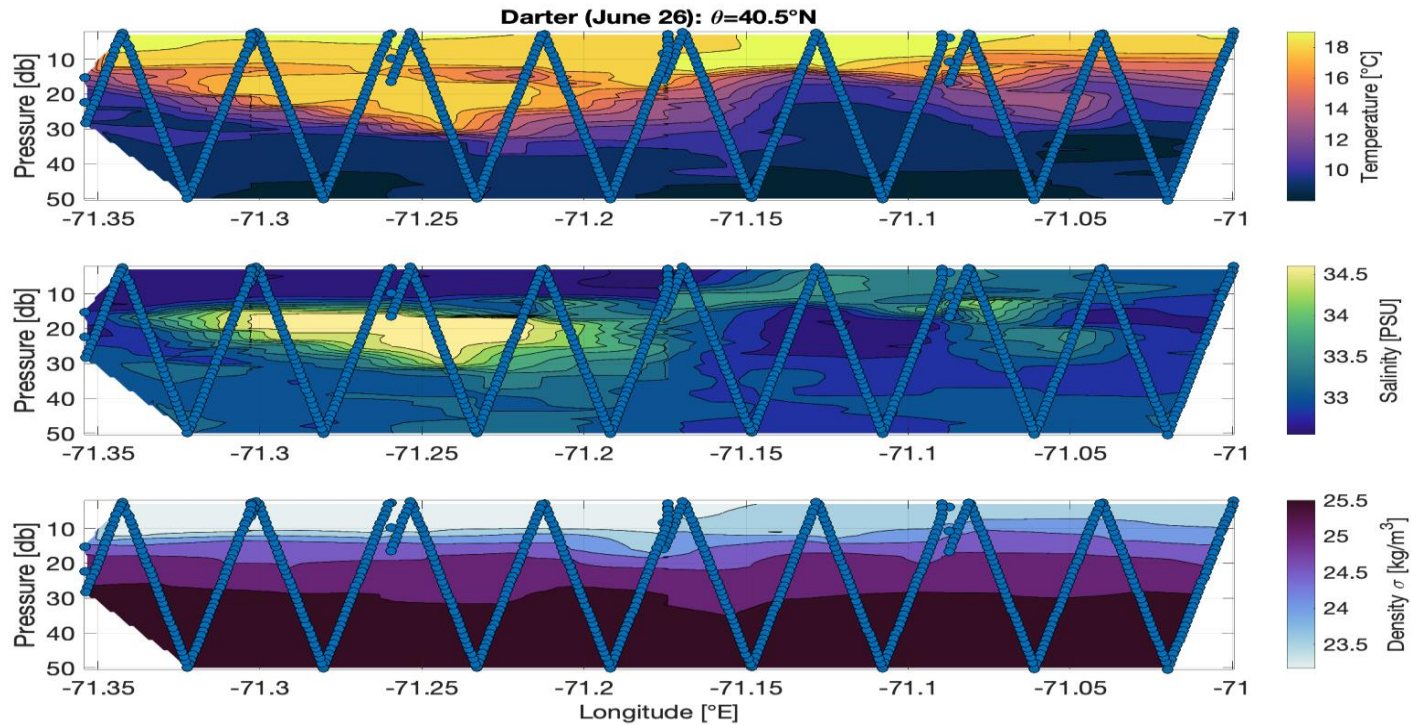
# AUVs- REMUS 100 and Long Range AUV



# Vertical Microstructure Profiler (Turbulence)



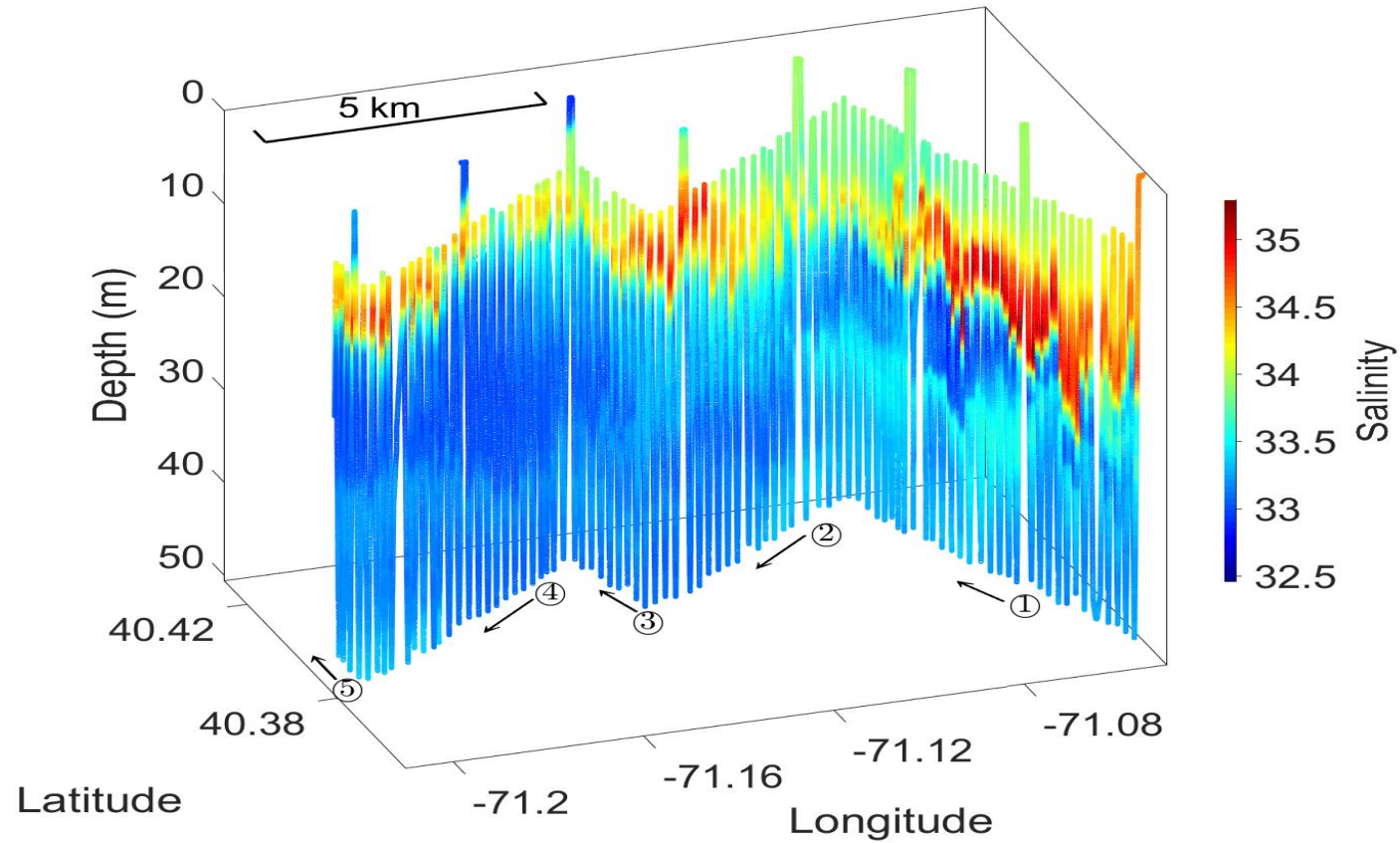
# REMUS Mapping- June 26



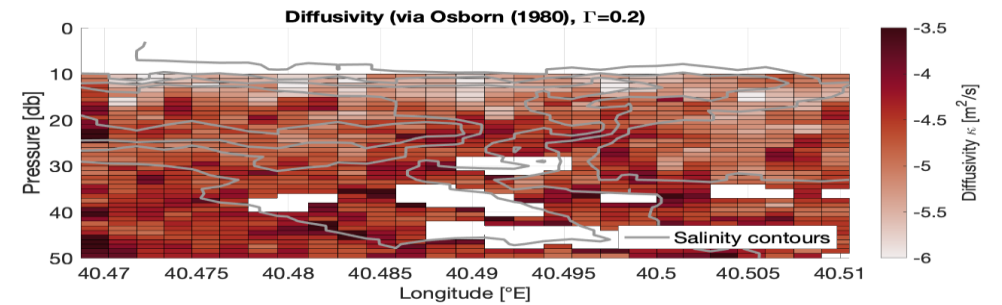
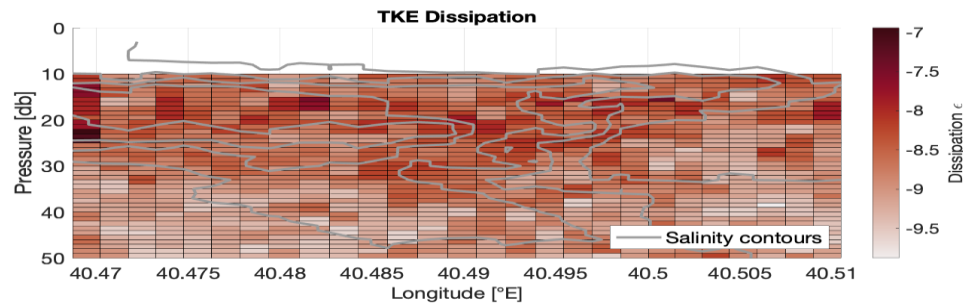
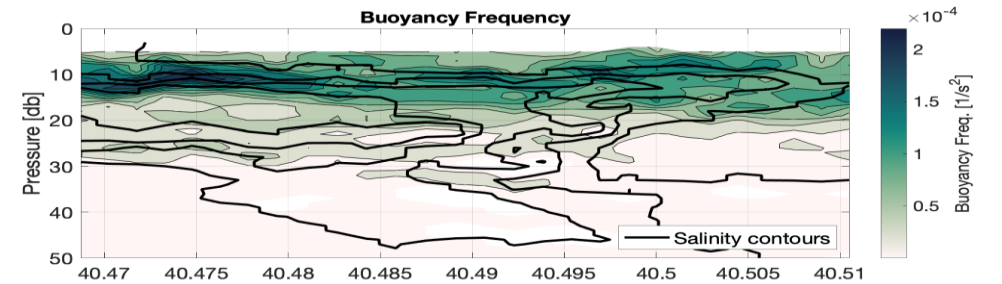
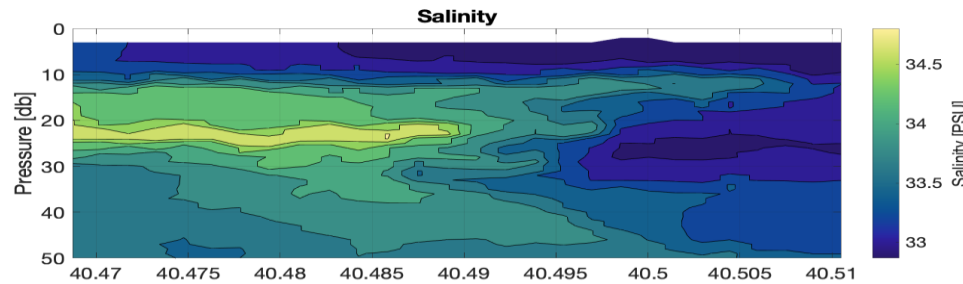
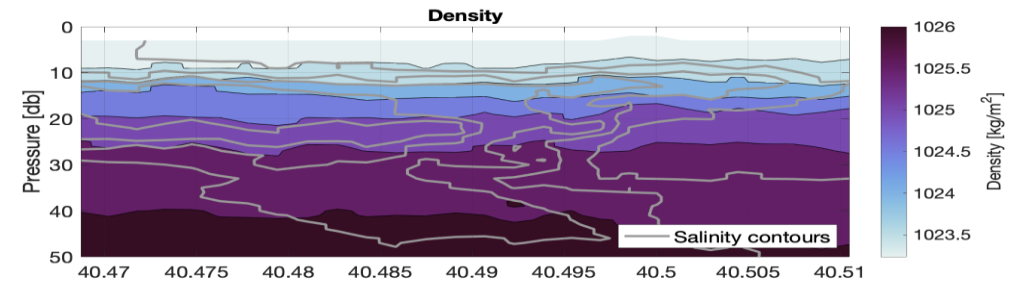
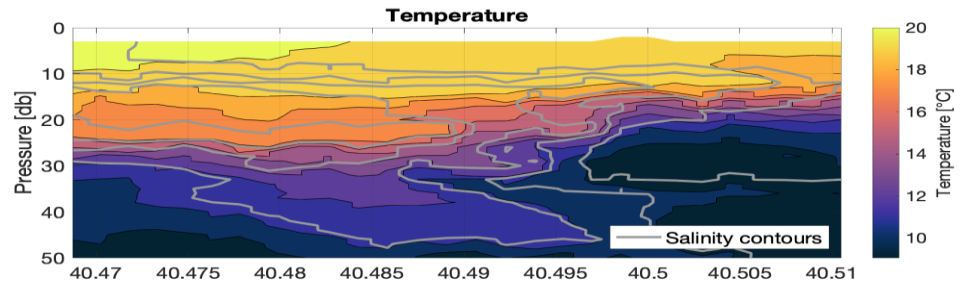


# LRAUV Frontal Tracking

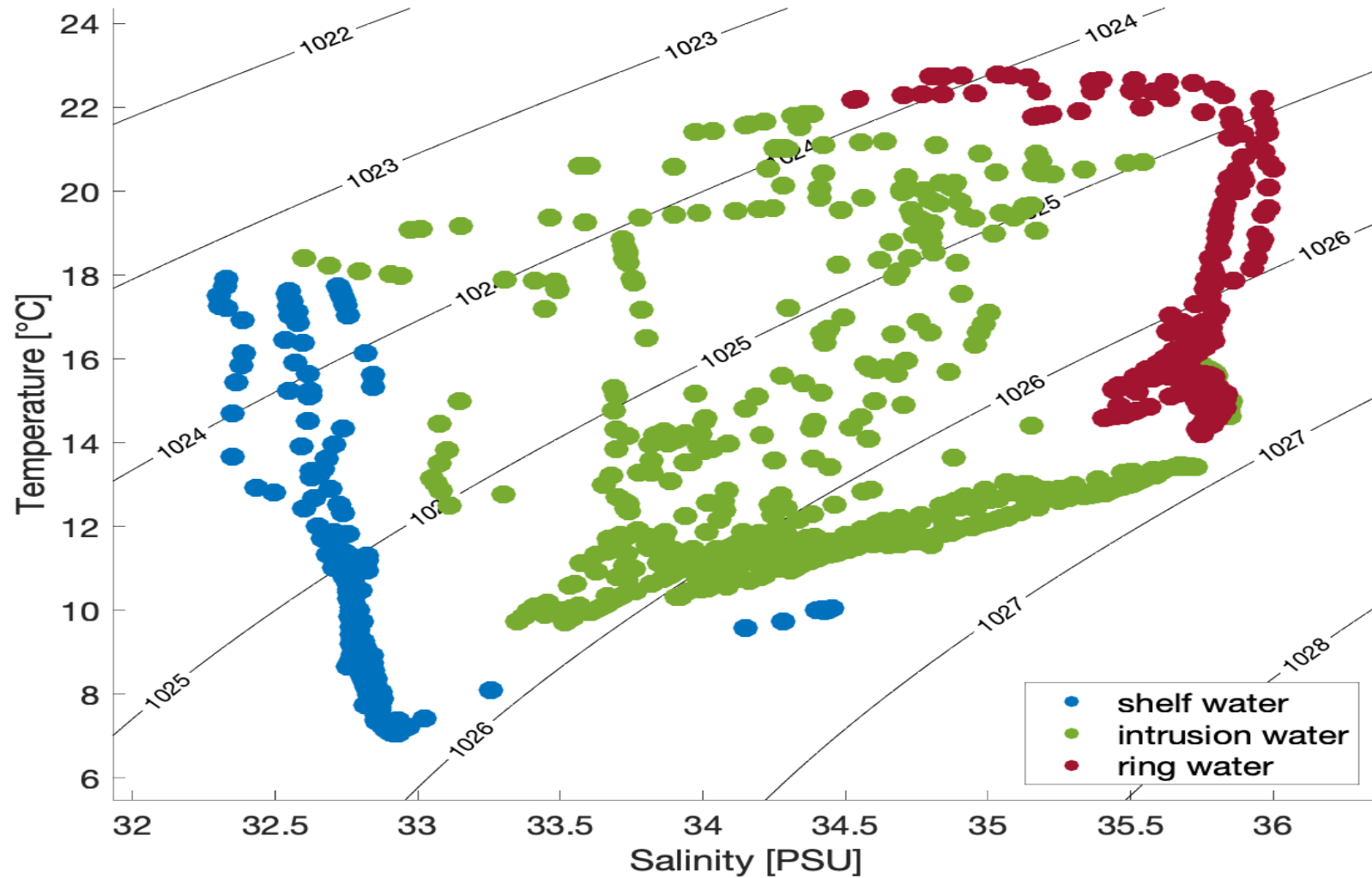
From 25-Jun-2021 17:48 to 26-Jun-2021 01:48 UTC



# VMP- Mixing

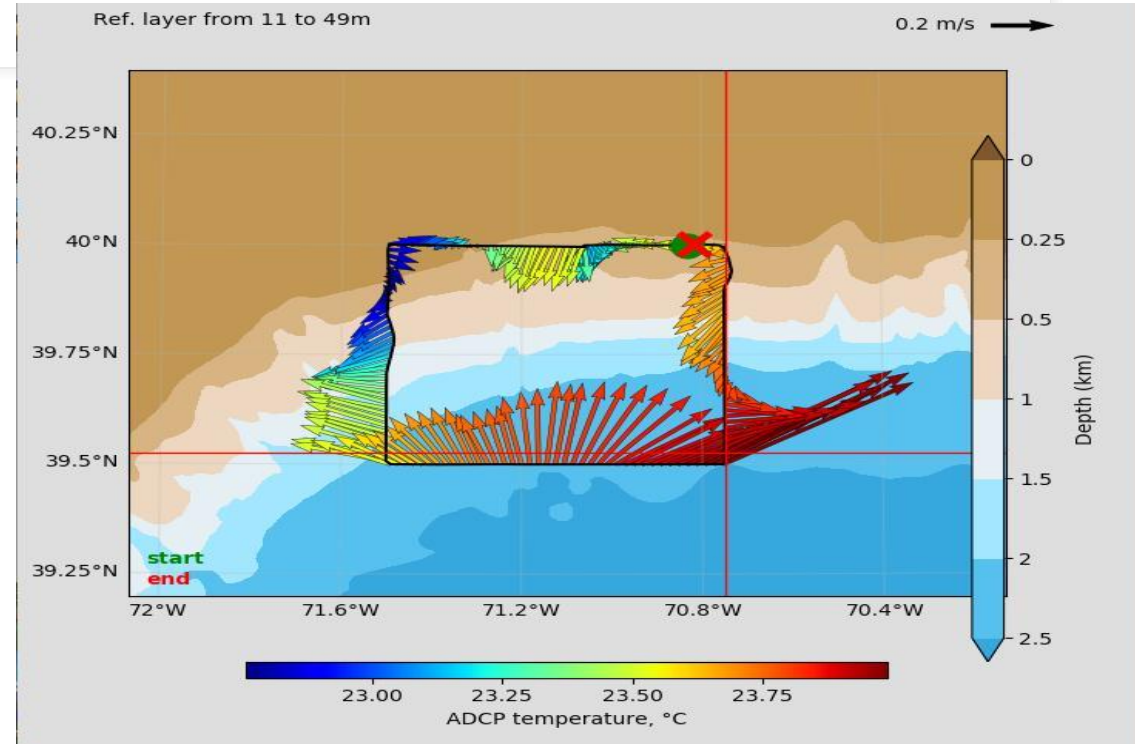
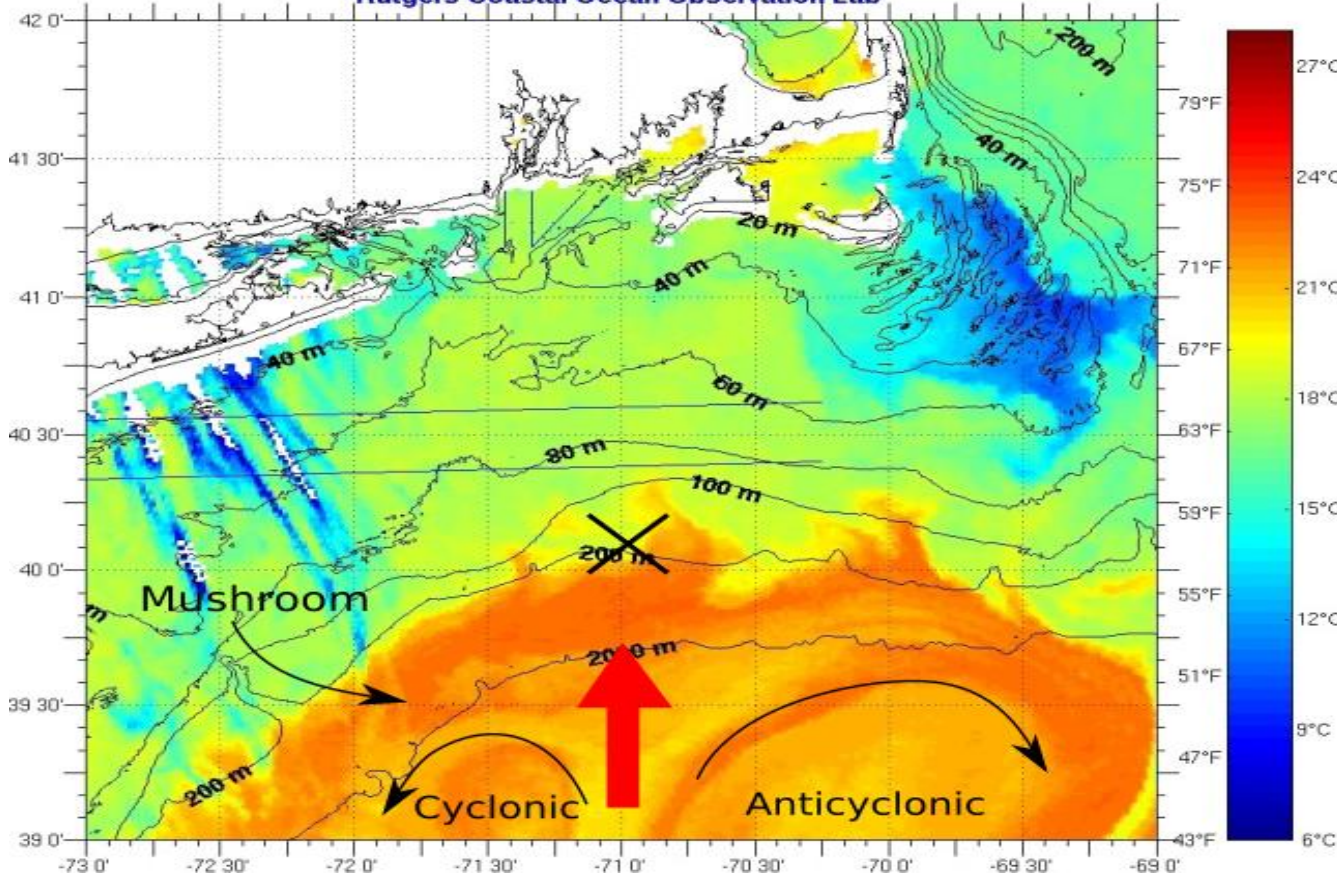


# Larger Context



# Larger Context 2

NOAA-18 Sea Surface Temperature June 18, 2021 1433 GMT  
Rutgers Coastal Ocean Observation Lab



# Jigging for Squid



## New Ideas

### Marine Heatwave 2016 (Perez et al. 2021)

- Two separate Marine Heatwaves in 2016- January-March and September-October
- Winter strongest over slope and caused by large Gulf Stream meanders south of Nova Scotia
- Fall caused by anomalous northern Jet Stream position affecting heat loss from ocean

## New Ideas

### Bottom Intrusion in January 2017 (Chen et al., 2021, submitted)

- Computer model successfully reproduces warm saline bottom intrusion in January 2017
- Two necessary conditions for formation- steady winds from the west for several days AND shallow cyclonic eddy next to Shelfbreak Front
- Bottom Intrusion is steered by bathymetry and points towards Block Island/Cox's Ledge

# New Ideas

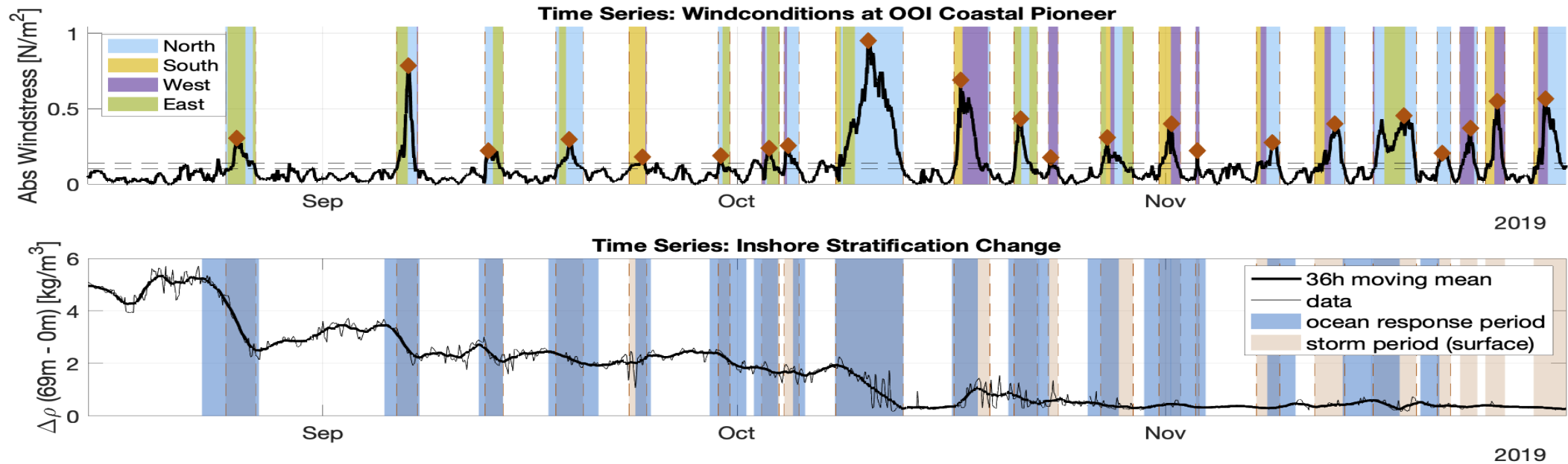
## Slope Productivity (Oliver et al. 2021)

- Survey in April 2019 showed diatom hot spot over upper continental slope
- Associated with cyclonic eddy near Warm Core Ring
- Presence of Gulf Stream water over slope increases upwelling over slope through more eddies
- Need only upwelling of 30 feet to get high nitrate waters into euphotic zone over slope
- Slope water productivity may have increased by 50% in past several years due to increased Gulf Stream influences



# New Ideas

## Storms and Ocean Stratification (Lobert et al. 2021, in prep.)

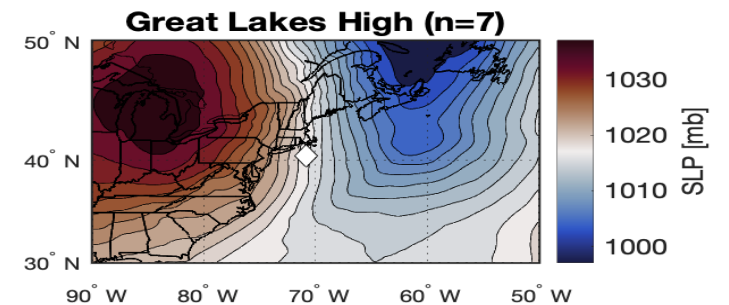
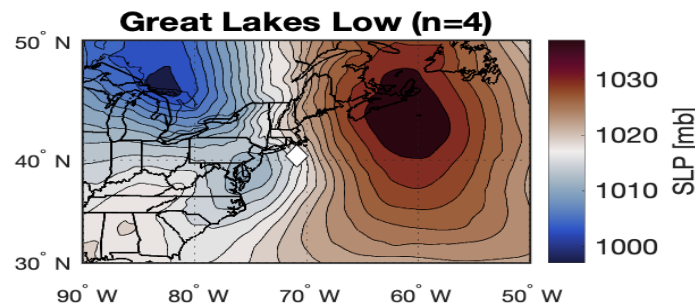
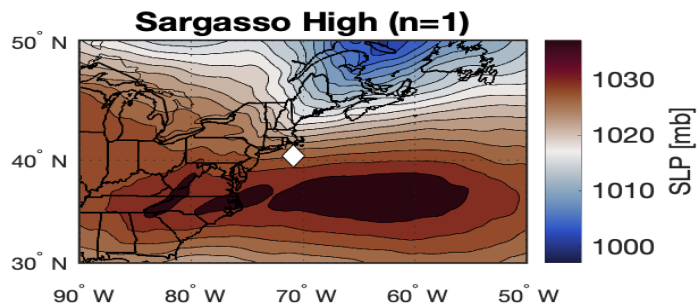
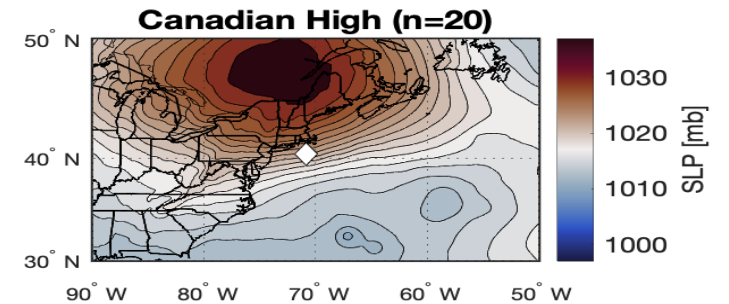
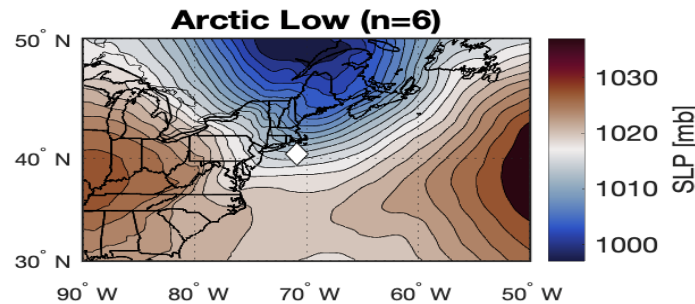
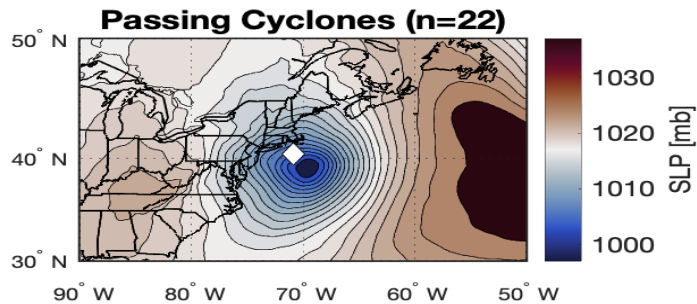


Storms and changes in ocean stratification from the Pioneer Array  
Data is from 2019

# Weather Systems Changing Stratification

## Storms

Extended winds from east



# Future Directions

- Obtain funding for Shelf Fleet!!!!
- Pioneer Array moving to Cape Hatteras region, ends in New England in October 2022
- Analysis of year to year differences in seasonal transitions and stratification from Shelf Fleet data 2015-2020
- Develop Ocean Acidification sensors and tools for addition to Shelf Fleet (with Aleck Wang WHOI)

# Thank you for joining us!

For Shelf Research Fleet data access and visualization please visit:

<http://science.whoi.edu/users/seasoar/cfrfwho/>

[Introduction](#)

[Sections](#)

[2014/15](#)  
[2016](#)  
[2017](#)  
[2018](#)  
[2019](#)  
[2020](#)

[Monthly](#)

[Averages:](#)

[Overview](#)  
[Temp. \(deg. E\)](#)  
[Temp. \(deg. C\)](#)  
[Salinity](#)  
[Density](#)

[Individual profiles](#)

[Data Access](#)

[related info](#)



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## CFRF - WHOI Shelf Research Fleet

