Oceanographic Conditions from Shelf Research Fleet

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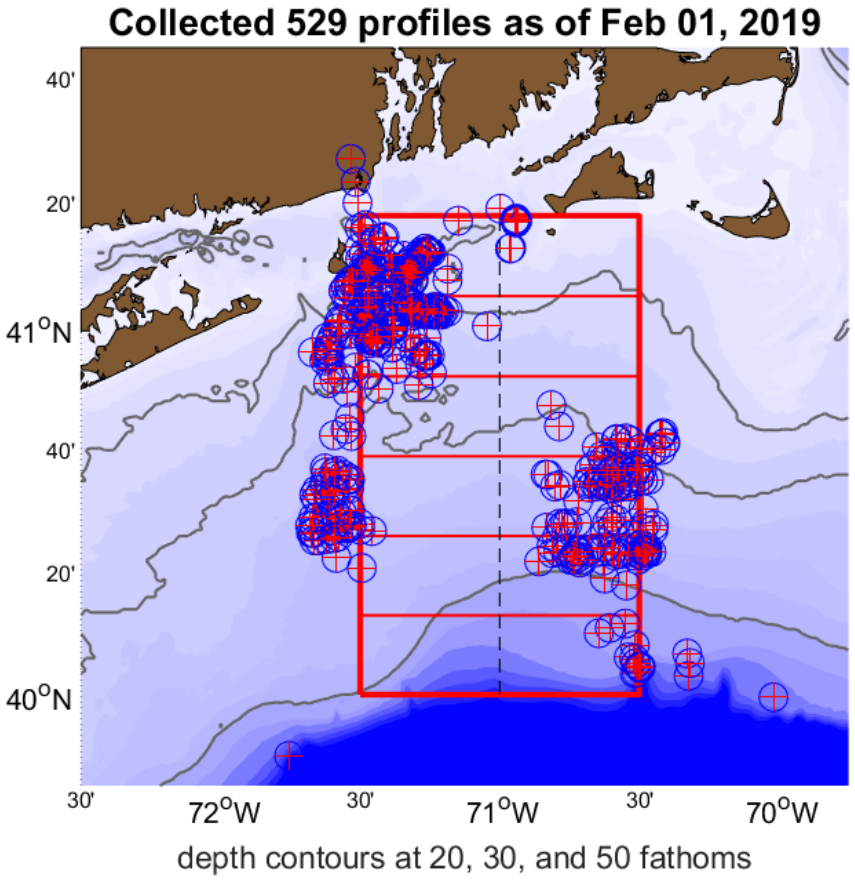
February 4, 2019

Progress so far- Nov. 2014 to present



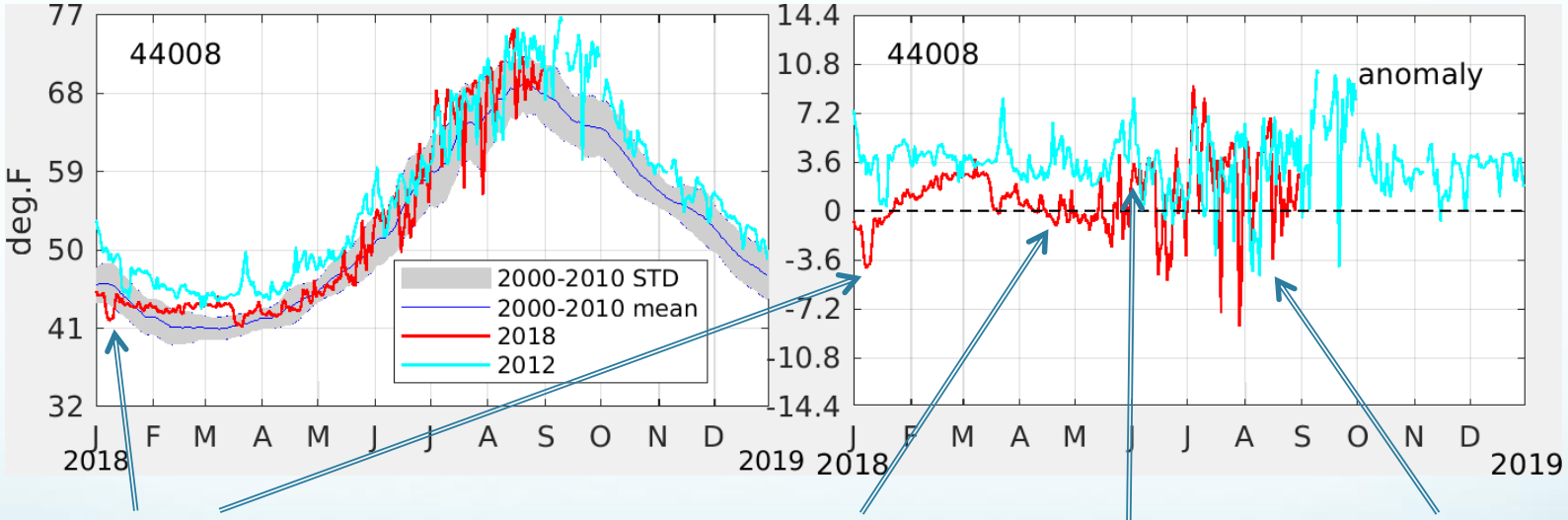
529 Profiles as of Today

Participating vessels
F/V Brooke C.- Point Judith
F/V Captain Robert- Point Judith
F/V Cailyn Grace- Sakonnet Pt.
F/V Erica Knight- Point Judith
F/V Excalibur- Newport
F/V Harvest Moon- Point Judith
F/V Mister G Point- Judith
F/V Virginia Marise- Point Judith

MANY THANKS FOR THE DATA COLLECTION!!!!!!!!!!!!!!!!!

CTDs in action

2018 Review-NDBC 44008 Nantucket Shoals



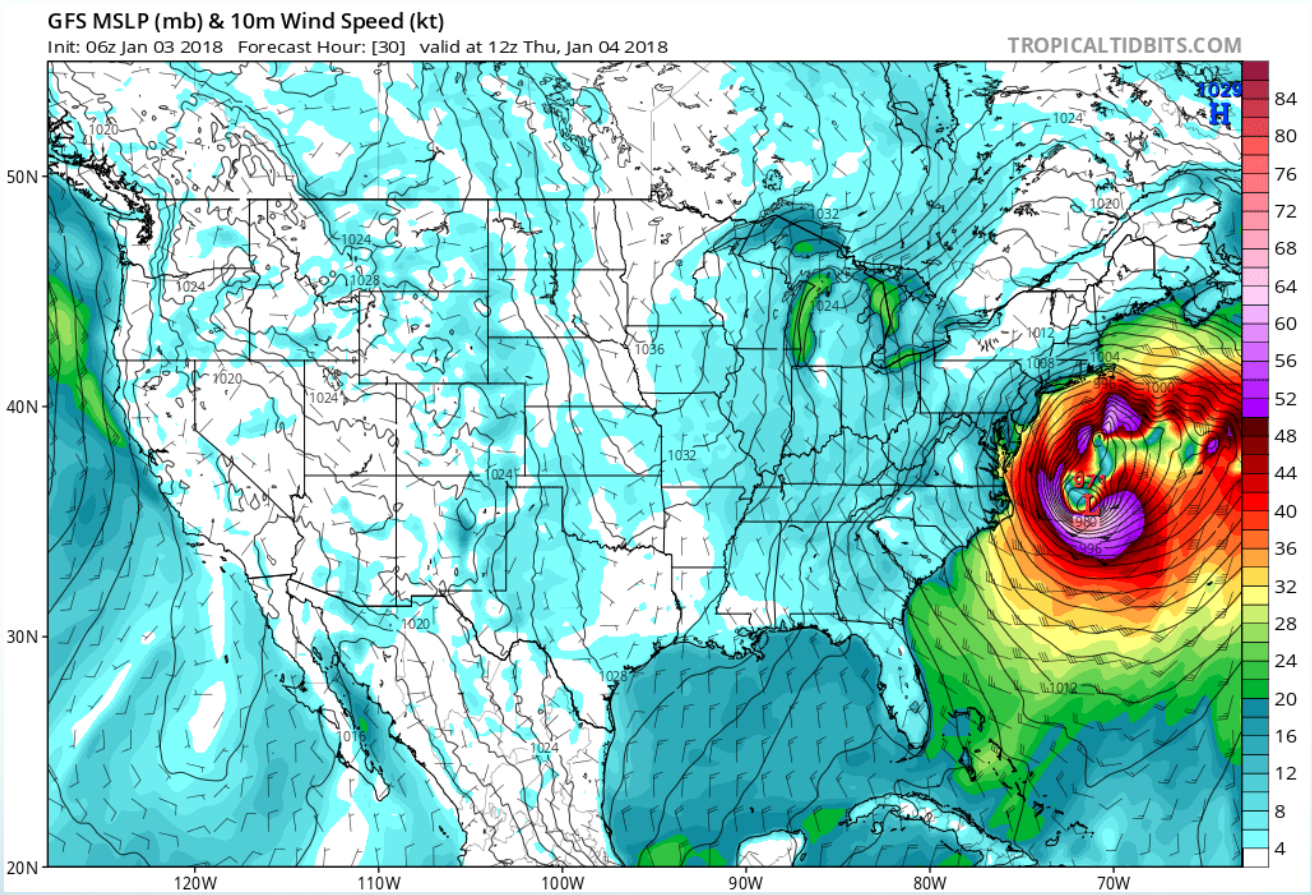
Big Storm- Jan. 4

Normal Temp.
Mid-March to
Late May

Warm Temperatures
May-June Ring Influence?

Massive Swings
July-August

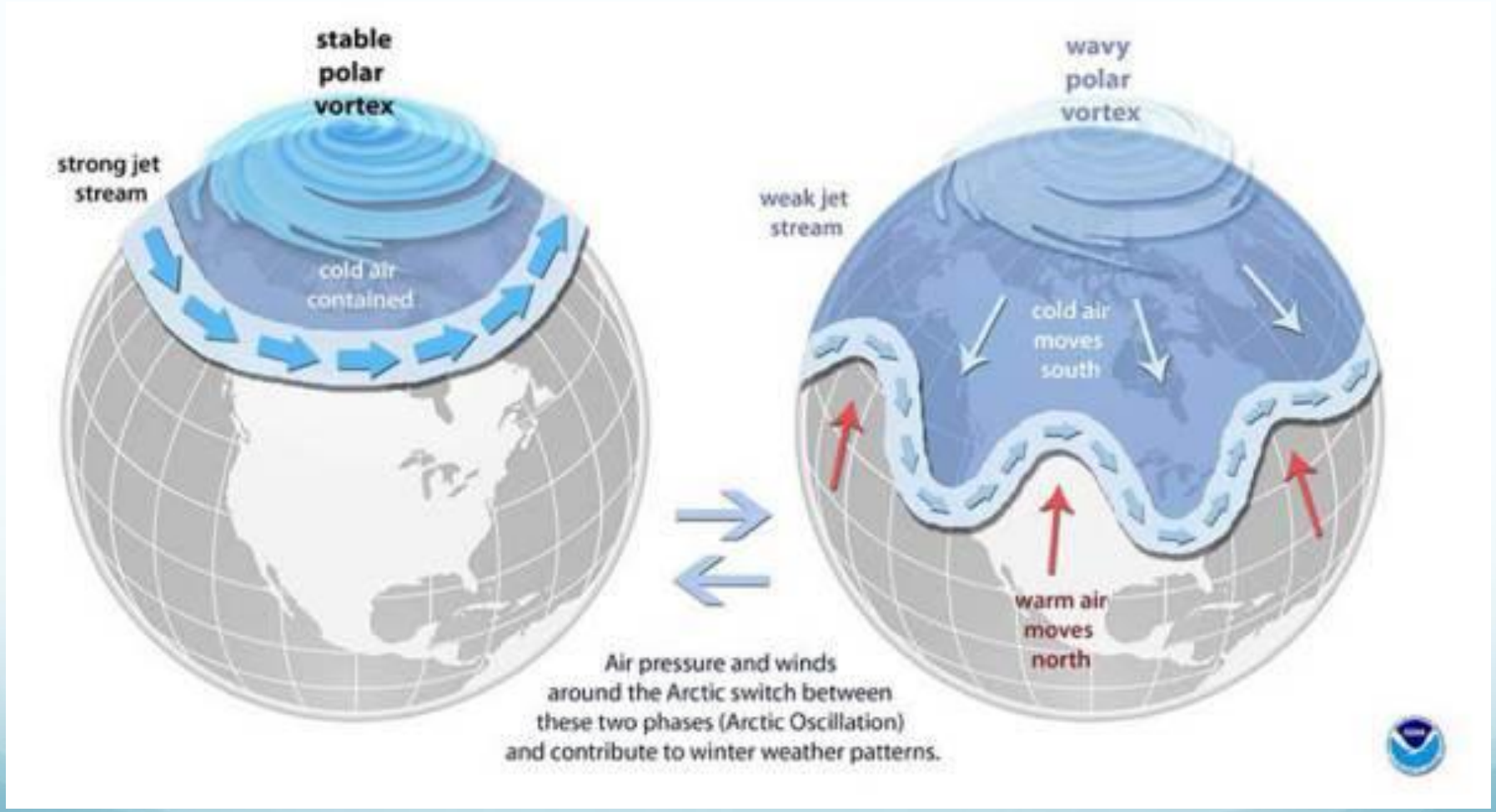
January 4 Bomb Storm



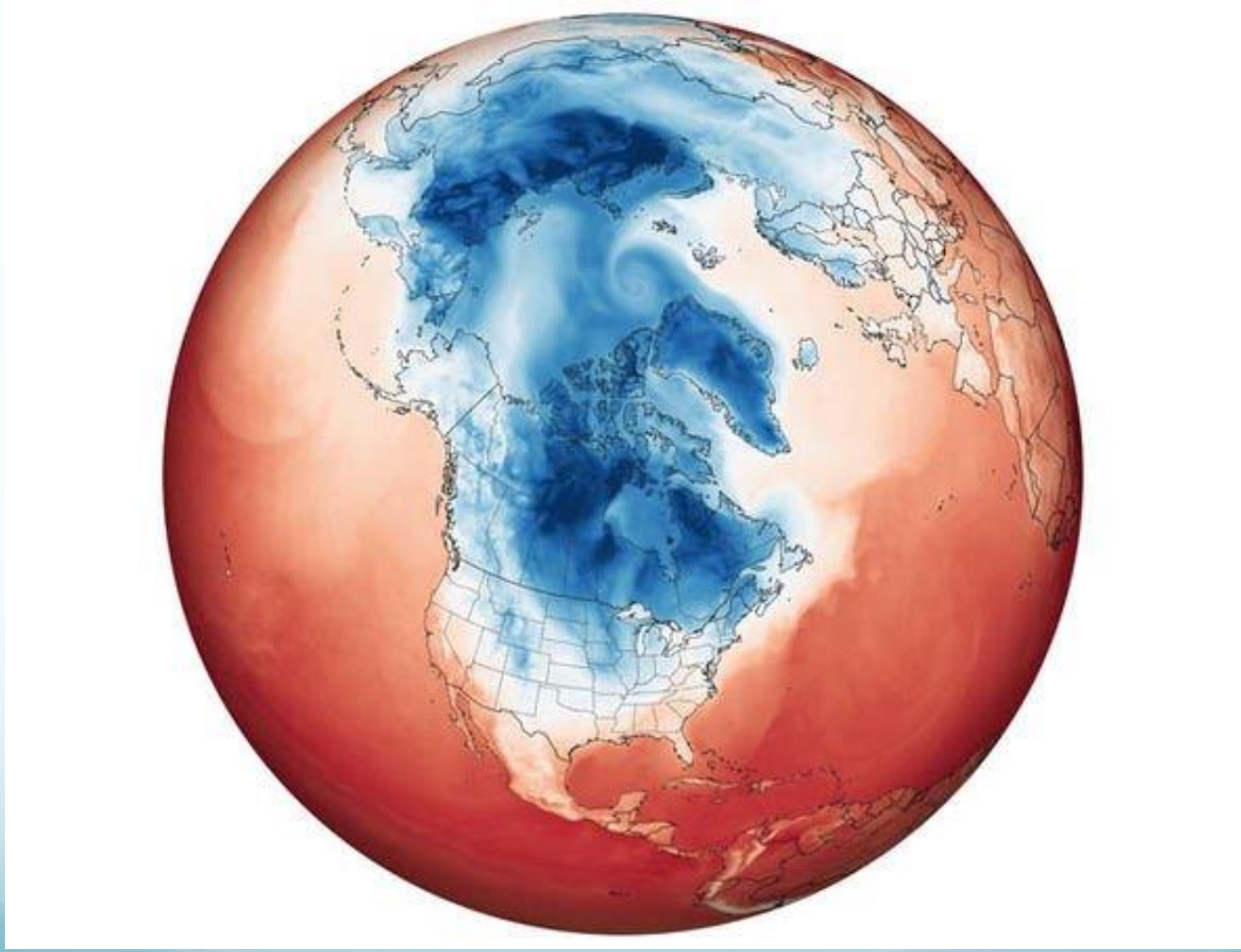
64 knots at 30 feet above sea surface- minimum pressure 950 mb

Pressure dropped by 59 mb in 24 hours- bomb is > 24 mb in 24 hours

Polar Vortex

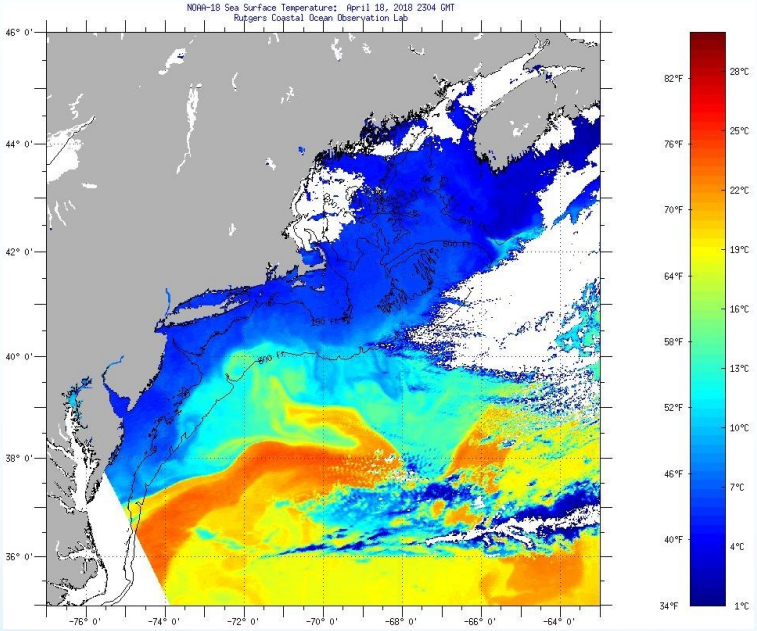


Polar Vortex January 2019

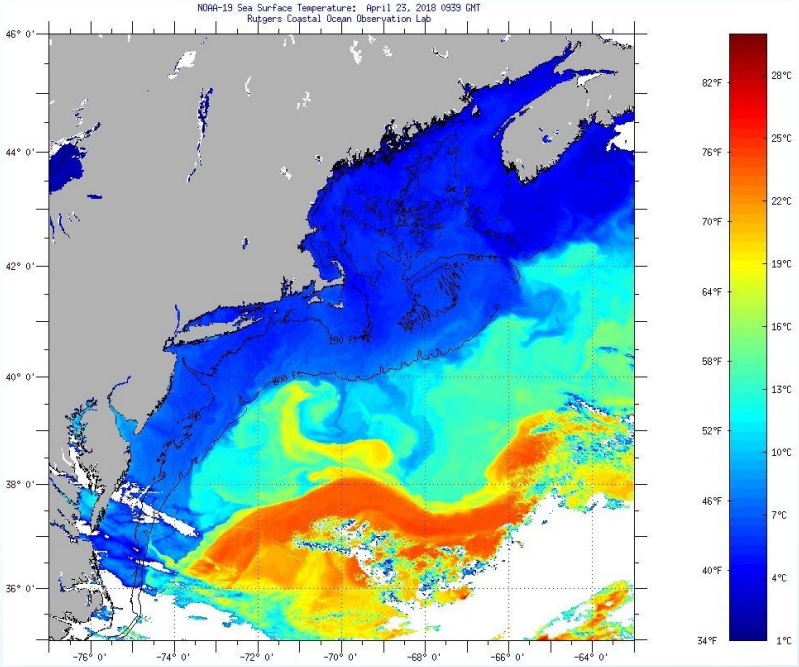


Polar Vortex
Breaks up
Into three
Pockets
Allowing
Southward
Shift of
Cold air

Sea Surface Temperature

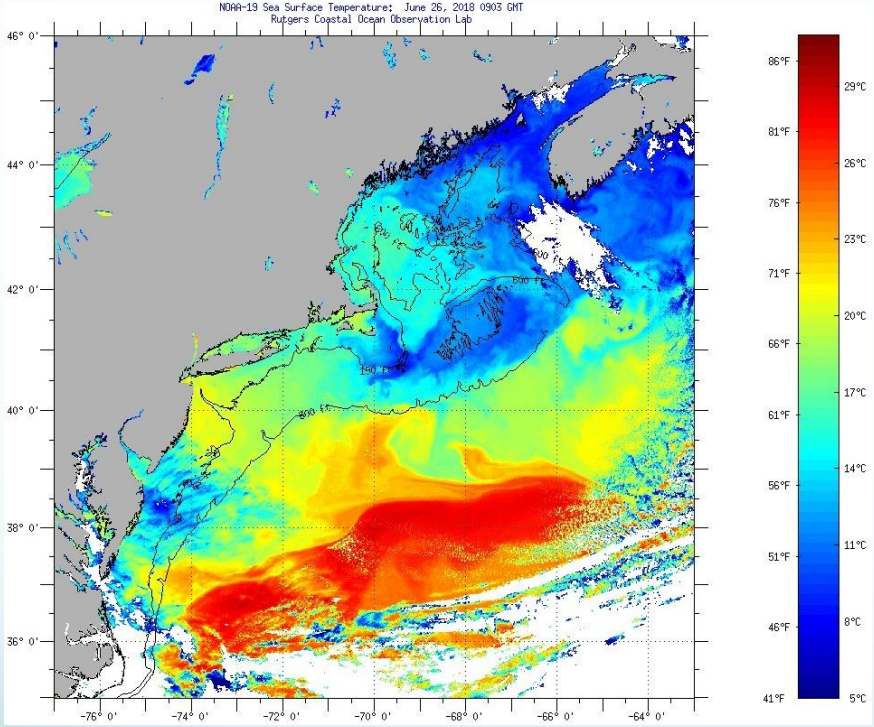


April 18, 2018

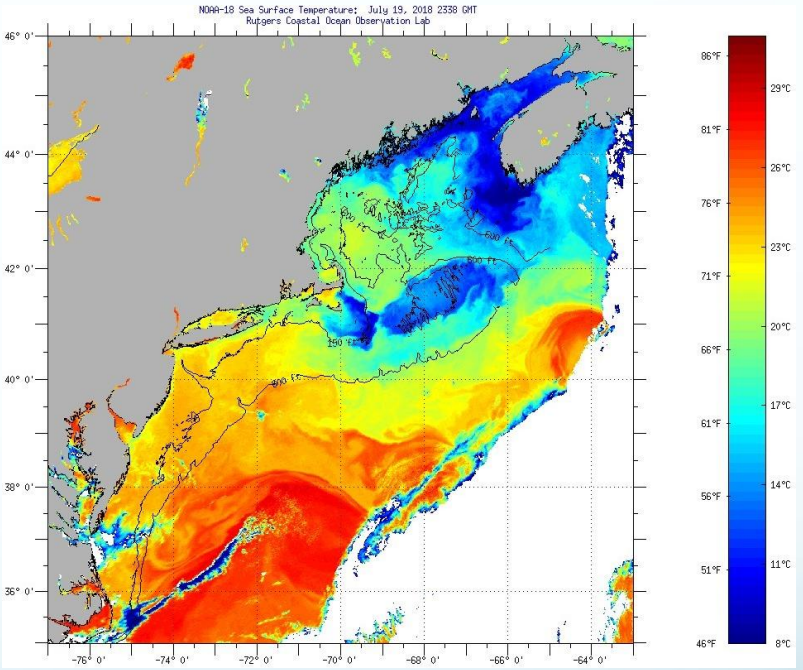


April 23, 2018

Sea Surface Temperature

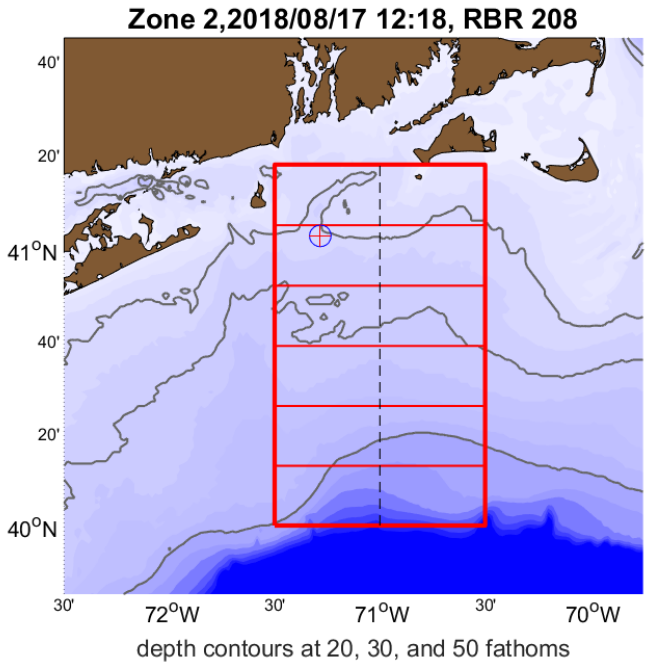


June 26, 2018



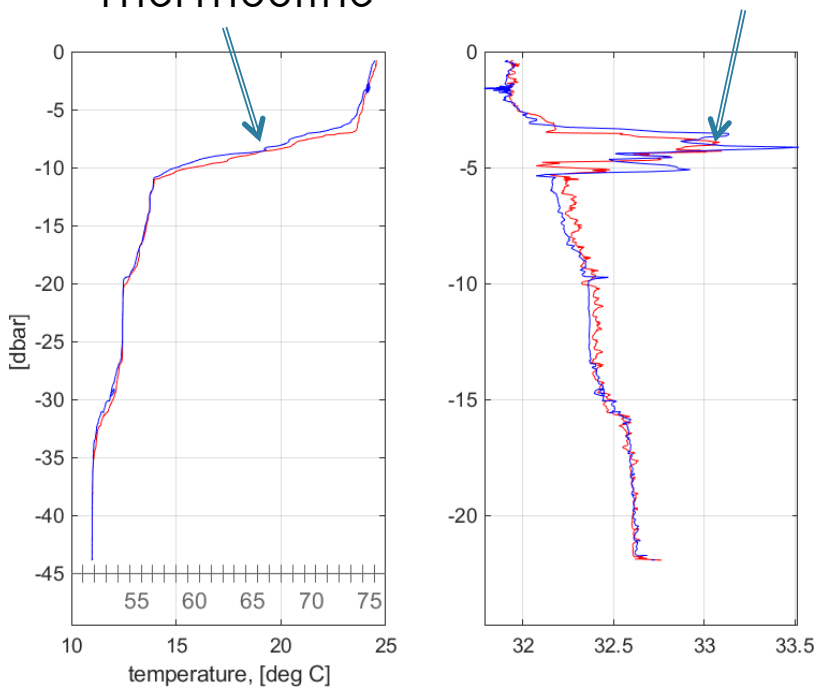
July 19, 2018

Mid-Depth Salty Intrusions July-August



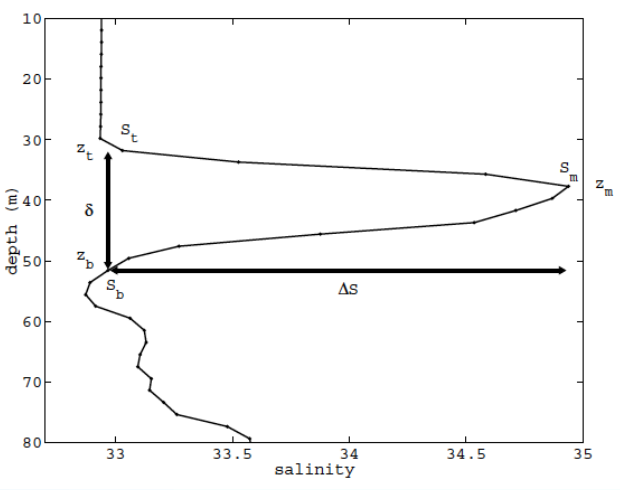
Thermocline

Salty Intrusion



August 17, 2018

Salinity Maximum Intrusions

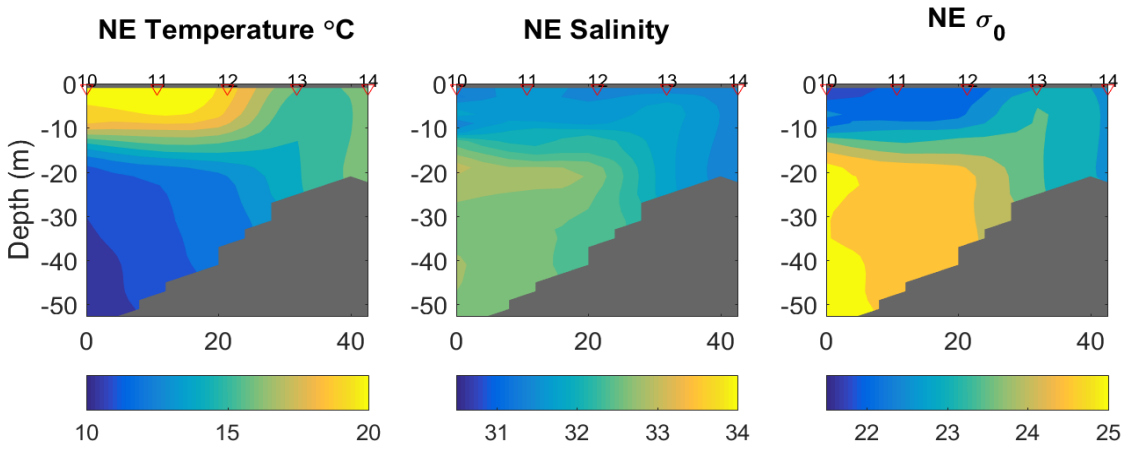


Lentz 2003

Usually occur May-September
Usually at depths of 15-20 fathoms
2018- 3 to 7 fathoms much more shallow

In August 2018, reached about 10 NM south of Martha's Vineyard with max salinity greater than 35.5 PSU

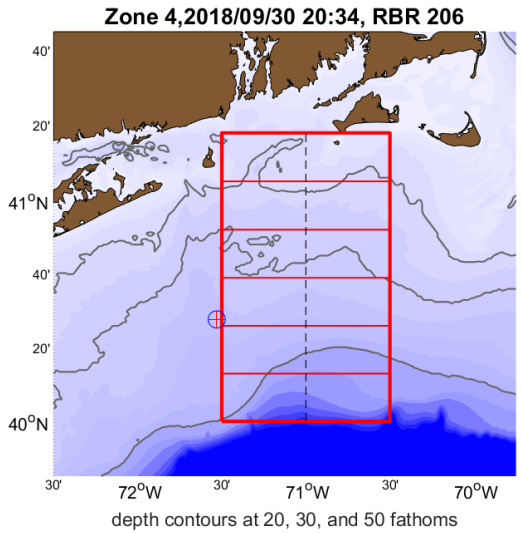
Near Nantucket
August 2017
Extends to Nantucket Shoals
15 fathoms

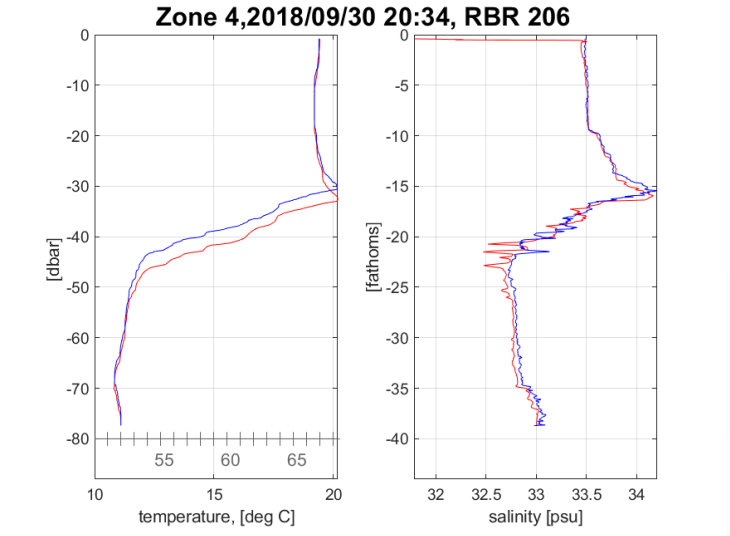


Questions about Salinity Maximum Intrusions

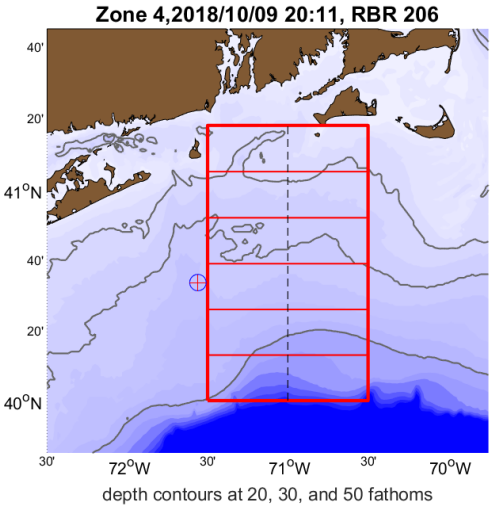
- Are they occurring more frequently than in the past?
- Are they the result of warm core rings impinging against the shelfbreak?
- Are they occurring at much more shallow depths?
- Do they promote onshore motions of species such as long-finned squid (Loligo)?

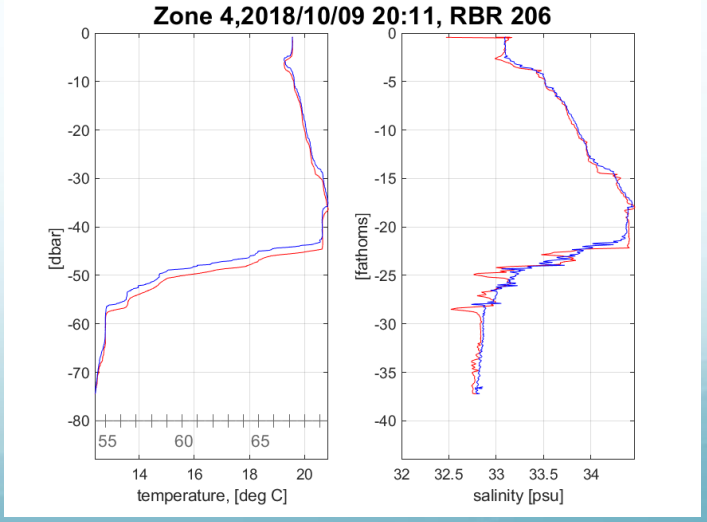
Salinity Maximim Intrusions in September/October





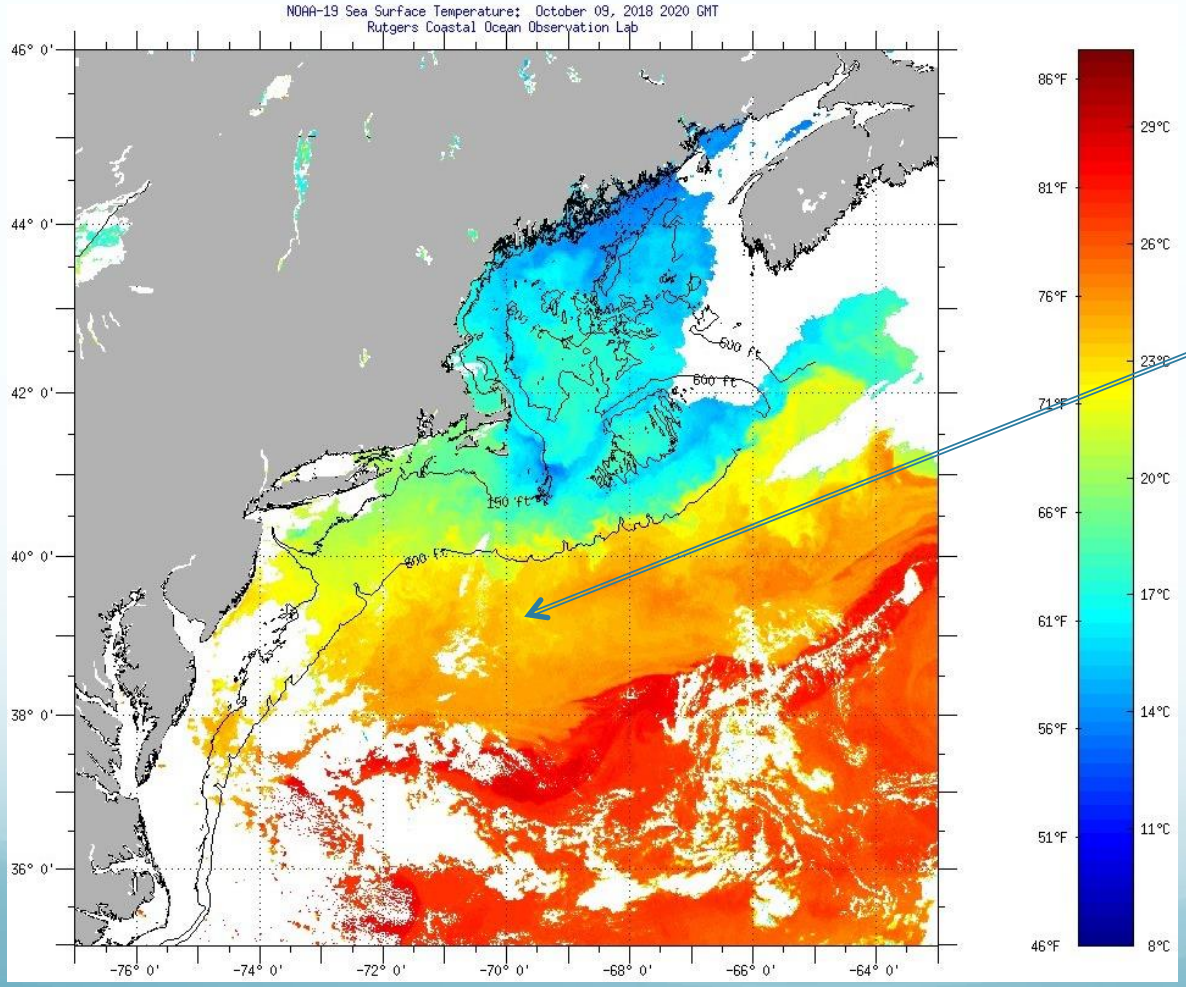
Sept. 30 2018





October 9 2018

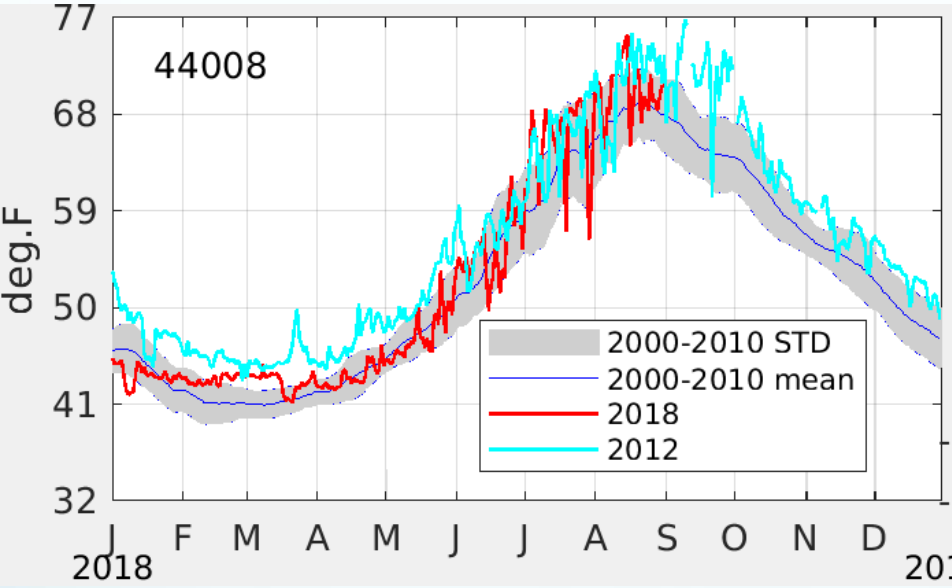
Sea Surface Temperature October 9, 2018

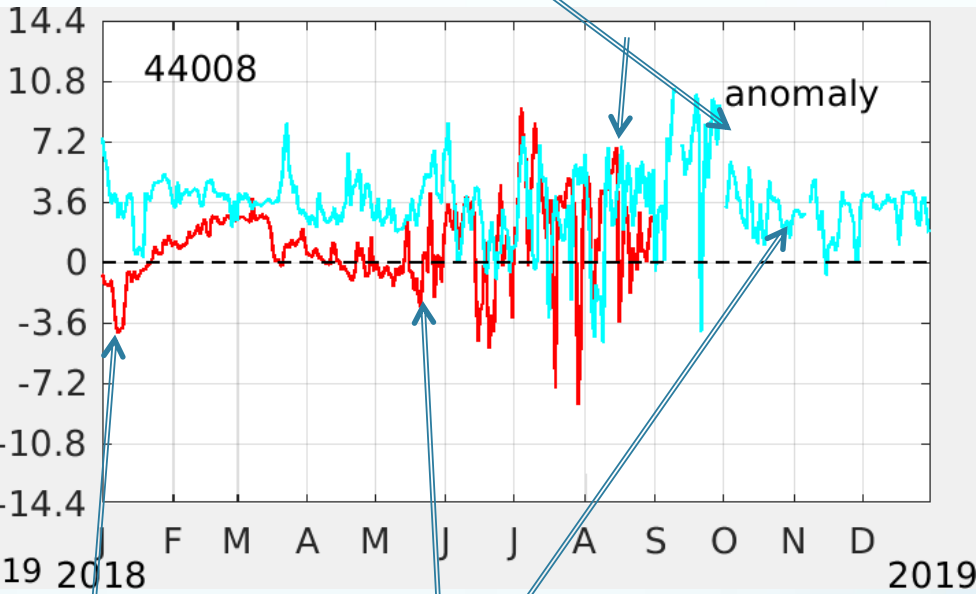


Slope water
VERY WARM
72-74 Deg. F

2018 In Summary

Salnity Max Intrusions
July-Early October

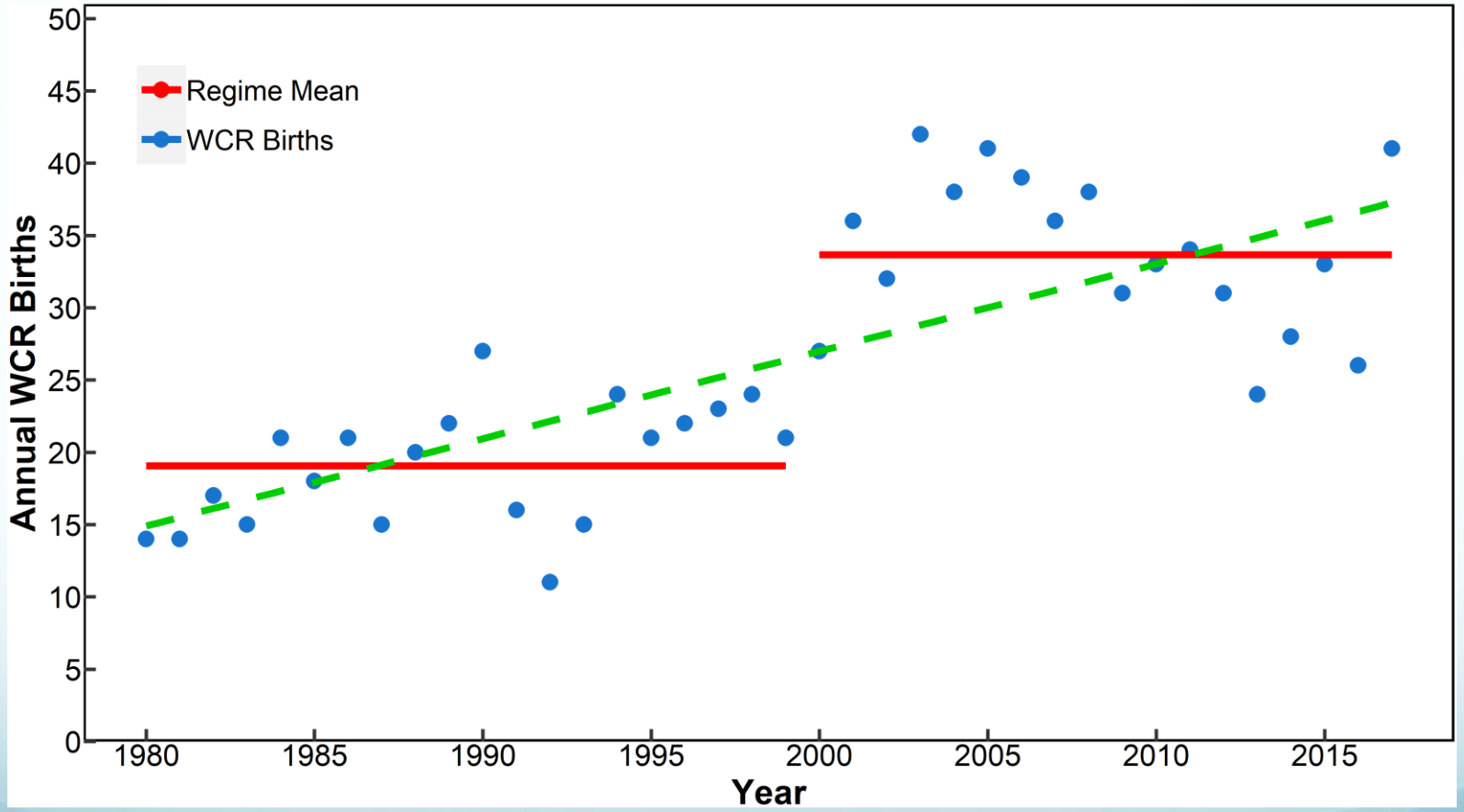




Storm
Jan. 4

Ring Influence
Late May-Mid October

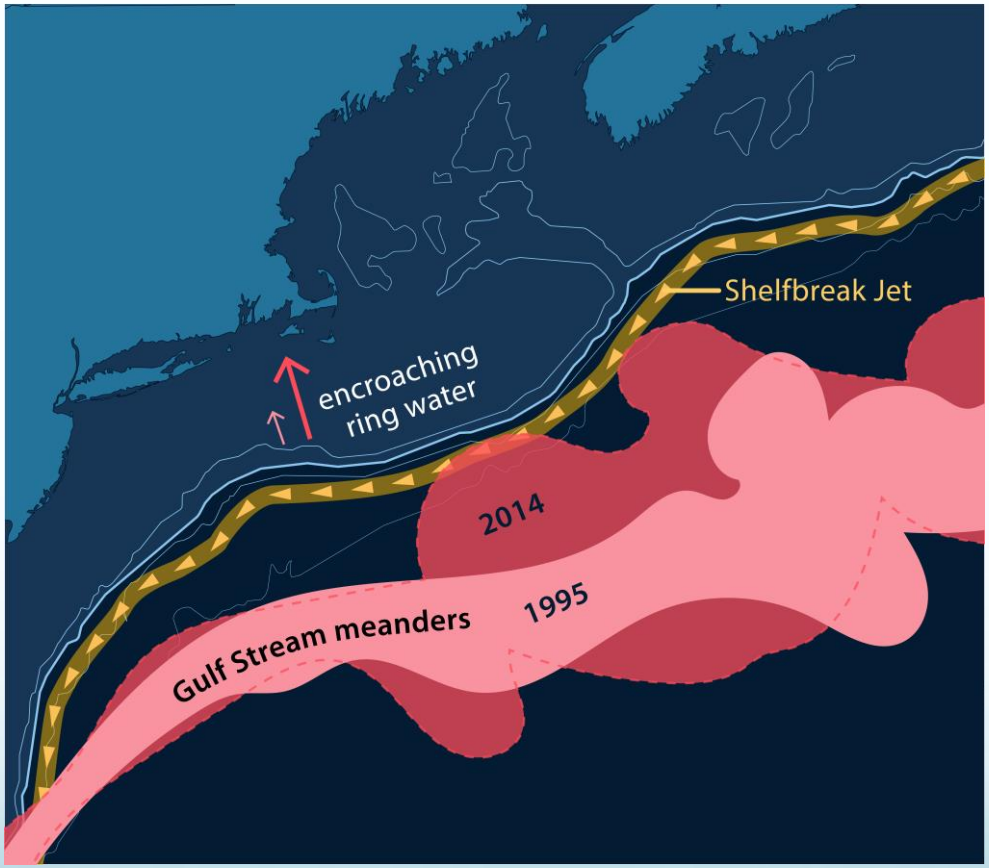
Increase in Warm Core Rings Since 2000



1977-1999 Average of 19 per year

2000-2017 Average of 34 per year

Gulf Stream Meanders 1995 versus 2014



Shelf Fleet- 4 Years of Data Collection- Temperature

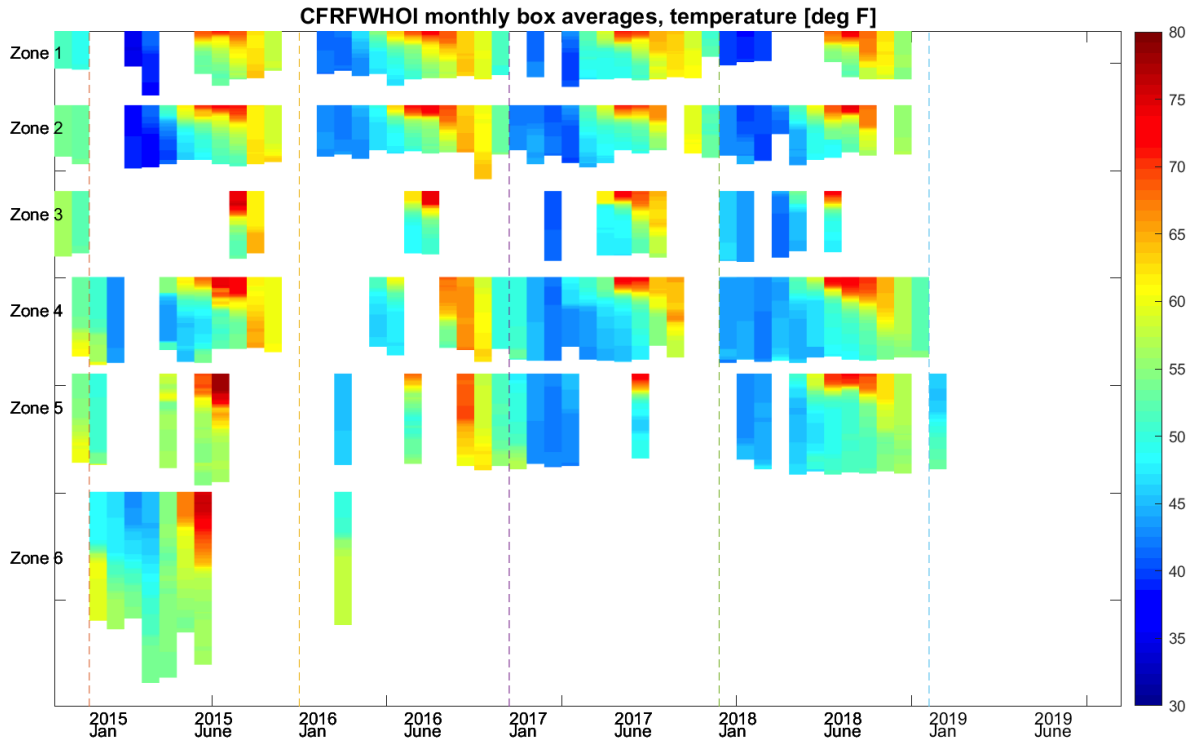


Figure- Frank Bahr

Shelf Fleet 4 Years of Data Collection- Salinity

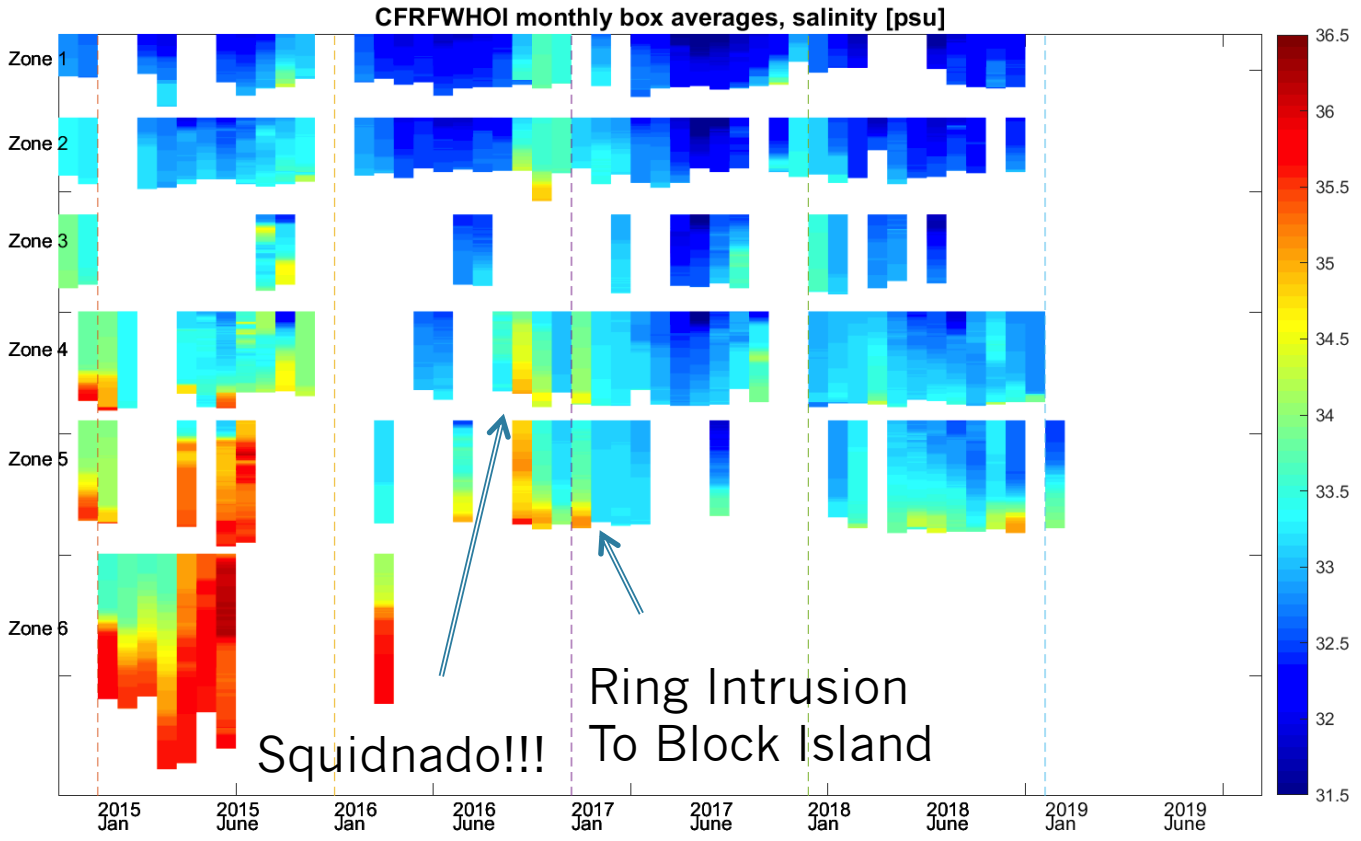
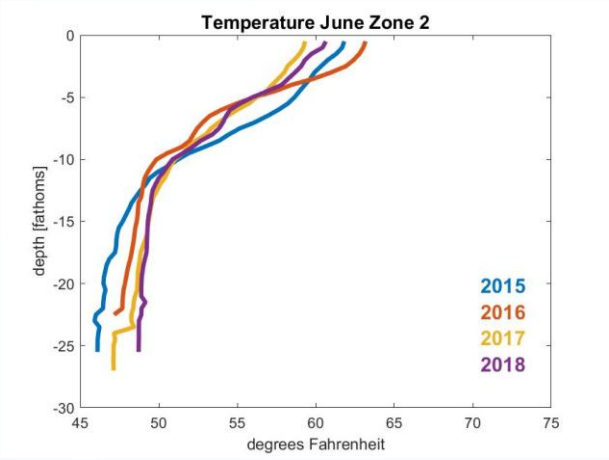
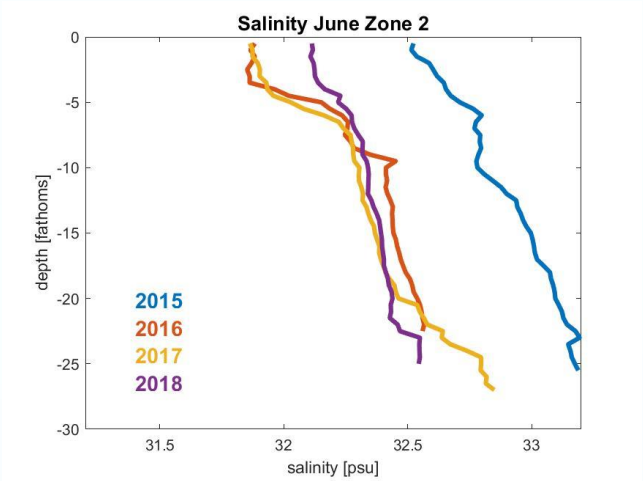


Figure- Frank Bahr

June July 2015-2018 Zone2

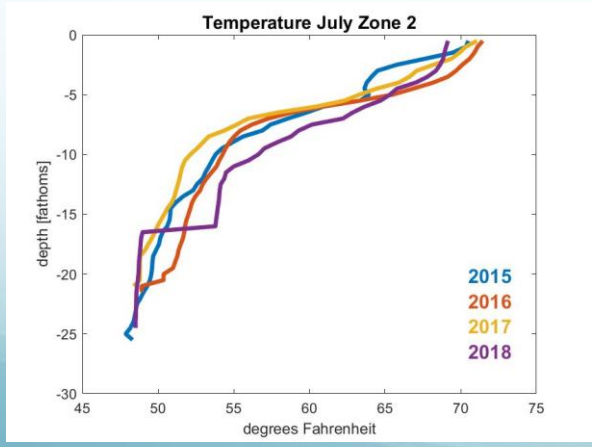


June Temperature

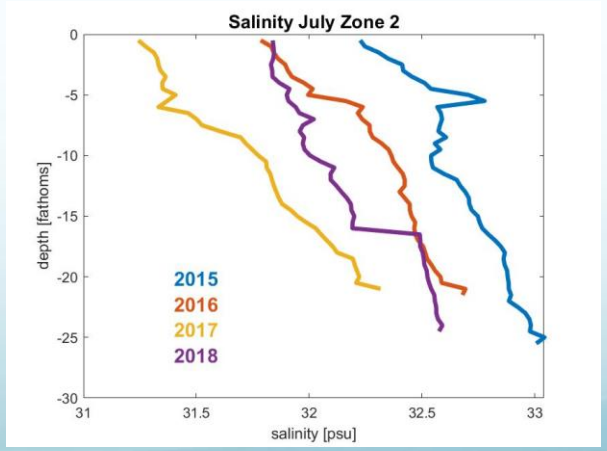


June Salinity

2016
Slightly
Warmer
At surface



July Temperature



July Salinity

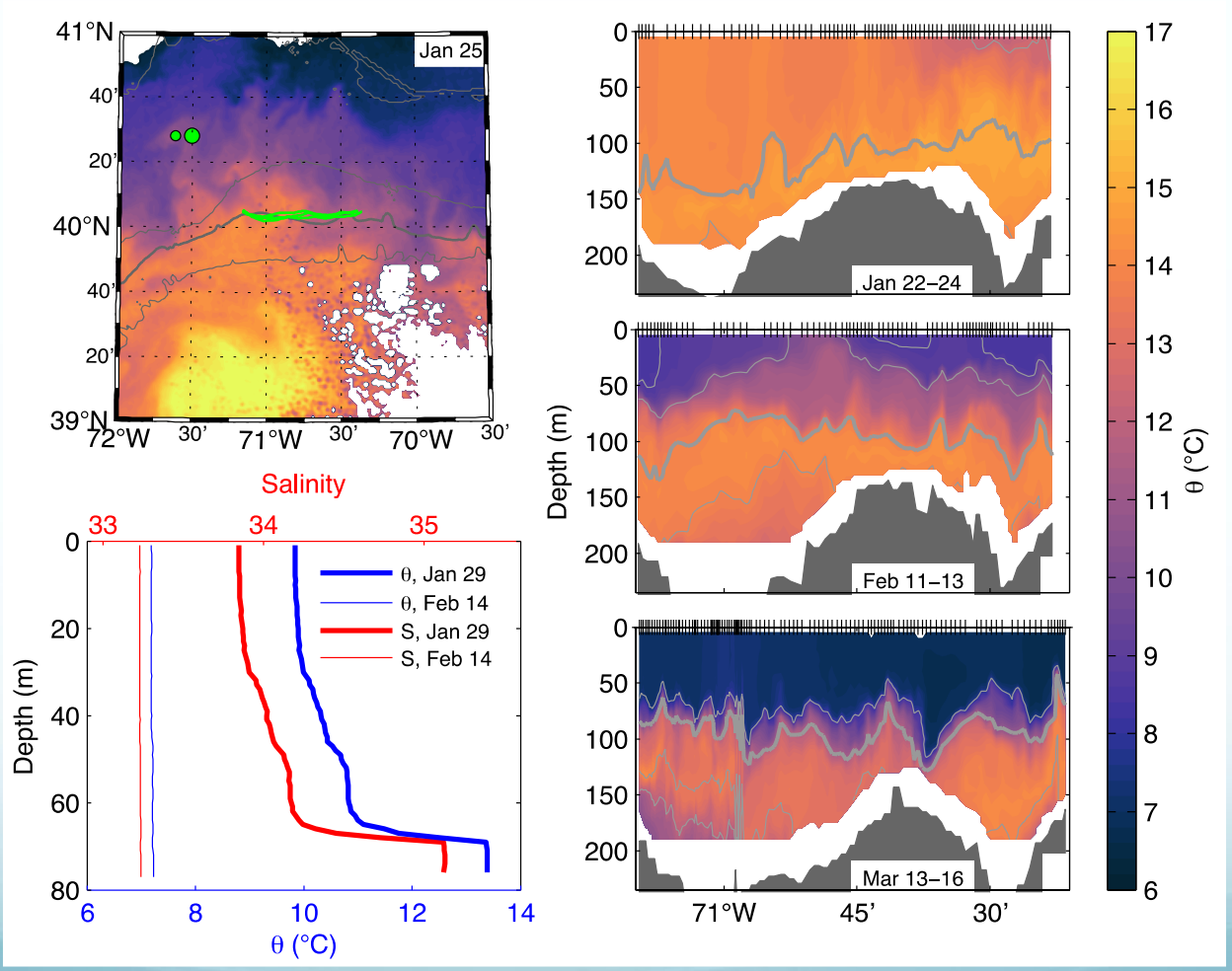
2016 Similar
To 2018 in
Salinity
Much less
Than 2015
More than
2017

For Squidnado/2016

- No clear oceanographic pattern as a causal factor
- 2015 had much saltier continental shelf and 2017 was much more fresh
- Surface temperature warmest of the four years in June but not significantly larger
- Need to look closely at Pioneer Array data to see if there are larger signals for June/July 2016 for consideration

These should be Squid

Major Ring Intrusion 2017



Future Analysis Tasks

- Look closely at individual profiles in different years to examine July 2016 and Jan/Feb 2017 more closely
- Climatology of Salinity Maximum Intrusions
- Warming after Jan. 4 2018 storm- ring influence?
- Examine October year to year variations- October 2016 was highest salinity in Pioneer Array data to date

Papers Out

- Oceanography Magazine- Combines Shelf Fleet data with Pioneer Array data to describe Extreme Shelfbreak Exchange Events- Out March 2018
- “Partnering with Fishing Fleets to Monitor Ocean Conditions”- Annual Review of Marine Science, OUT LAST WEEK

Funding Update

- Proposal in to van Beuren Foundation Jan. 15 to extend Shelf Fleet two more years. Will hear in May if it is funded
- Pending Proposal to National Science Foundation to study Salinity Maximum Intrusions in 2020 and 2021- Will hear soon (hopefully)
- Will submit proposal to National Science Foundation this week to use computer models to study Extreme Shelfbreak Exchange Events. Will hear in July.
- Bahr and Gawarkiewicz funded by WHOI to do analysis of Shelf Research Fleet data this year

The Big One- NSF Coastlines and People Initiative

- NSF wants large proposals for research hubs to study how coastline communities are being affected by a changing ocean
- Science and community connections not well defined
- Likely RFP in early 2020, for 20-50 Million over 5-10 years
- Propose to examine adaptation to ocean warming by studying lobster and Jonah crab
- Combine Shelf Research Fleet and Lobster/Jonah Crab Fleet efforts
- Other partners may include SMAST (Umass-Dartmouth), Buzzards Bay Coalition, Massachusetts Division of Marine Fisheries, Rhode Island Division of Environmental Management, University of Rhode Island (resource economics)
- Scope may include more general effects of ocean warming including sea level rise and impact of storms and storm surge