Recent Warming and Inter-Annual Variability in the Shelf/Slope System in the Middle Atlantic Bight

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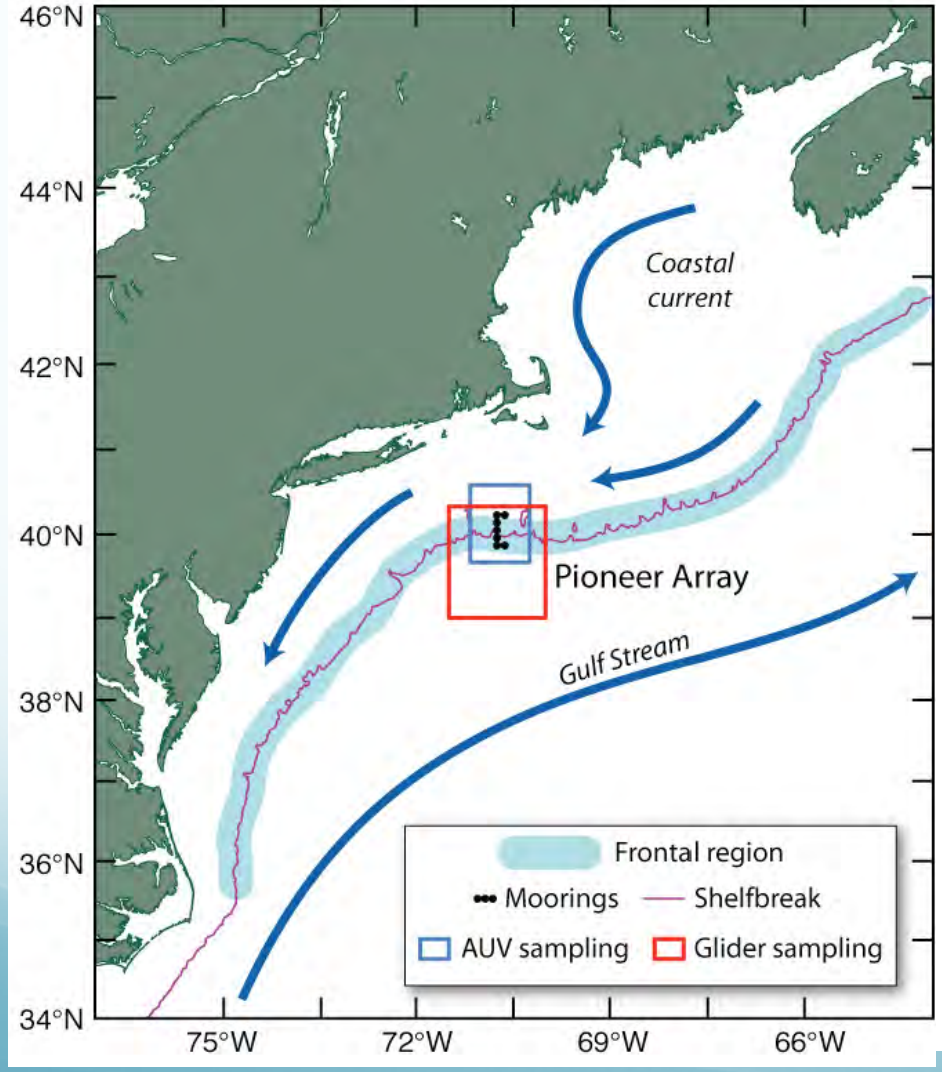
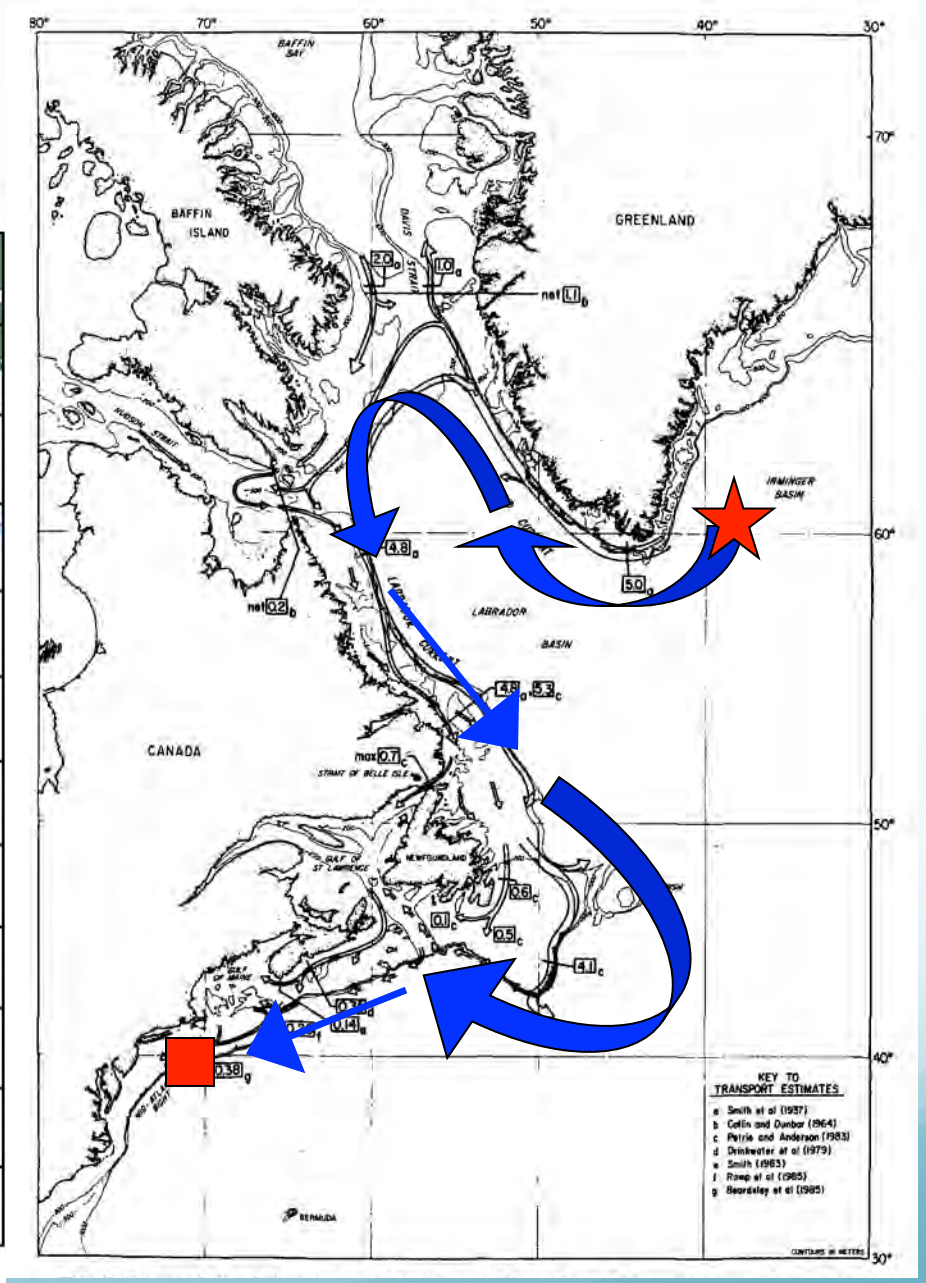
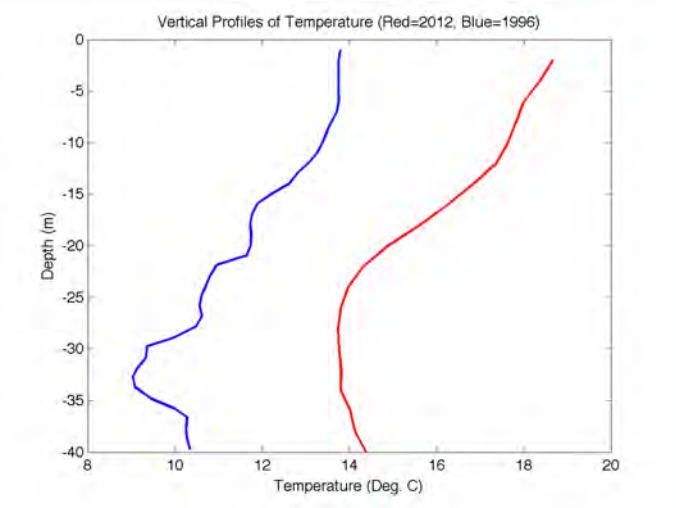
WHOI
OOI Coastal Observatories Workshop

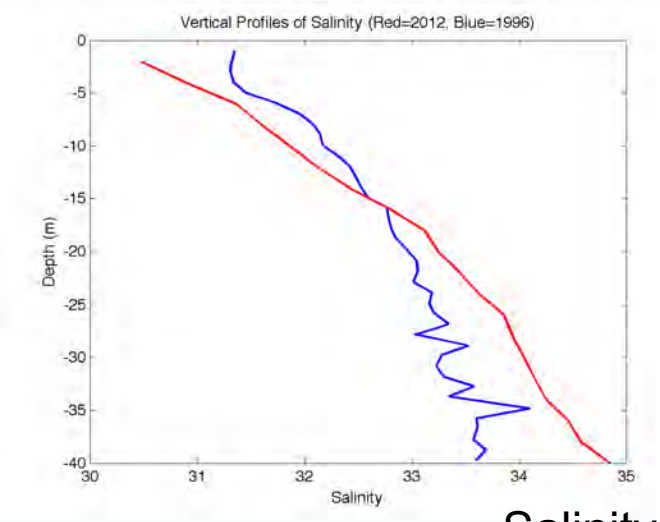
High-latitude climate connection between global and coastal





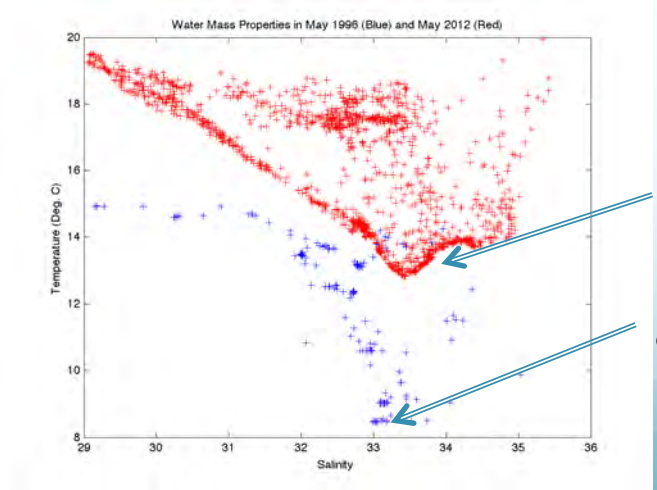
Comparing May 2012 to May 1996- north of Cape Hatteras





Salinity

Temperature
Red 2012
Blue 1996



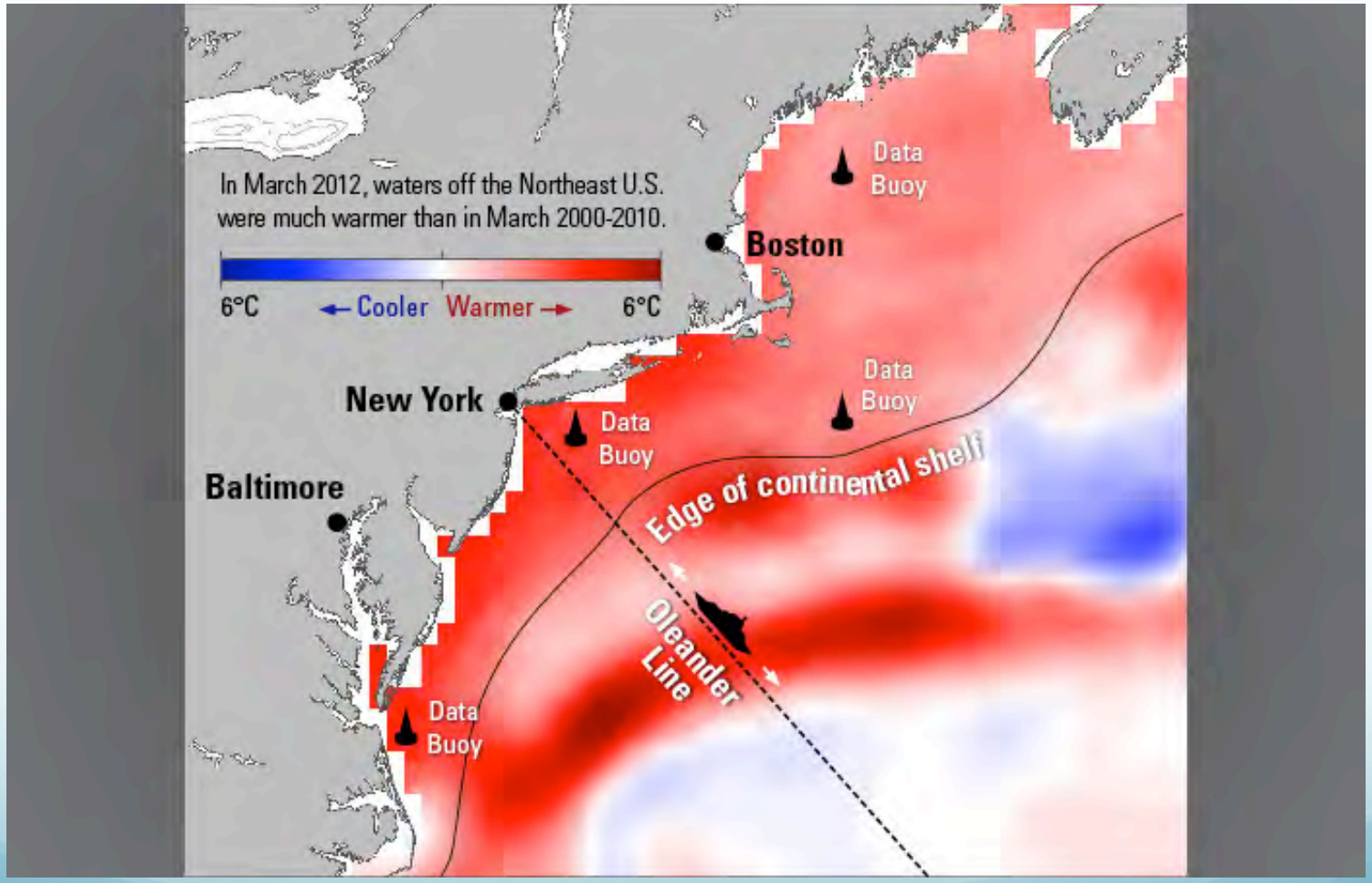
12.9 Deg C

8.2 Deg C

T/S Diagram

Temperature Difference
4.7 Deg C !!!

The Ocean Warming of 2012



Courtesy Ke Chen WHOI

Temperature Anomalies- NDBC Buoys in Gulf of Maine and Middle Atlantic Bight

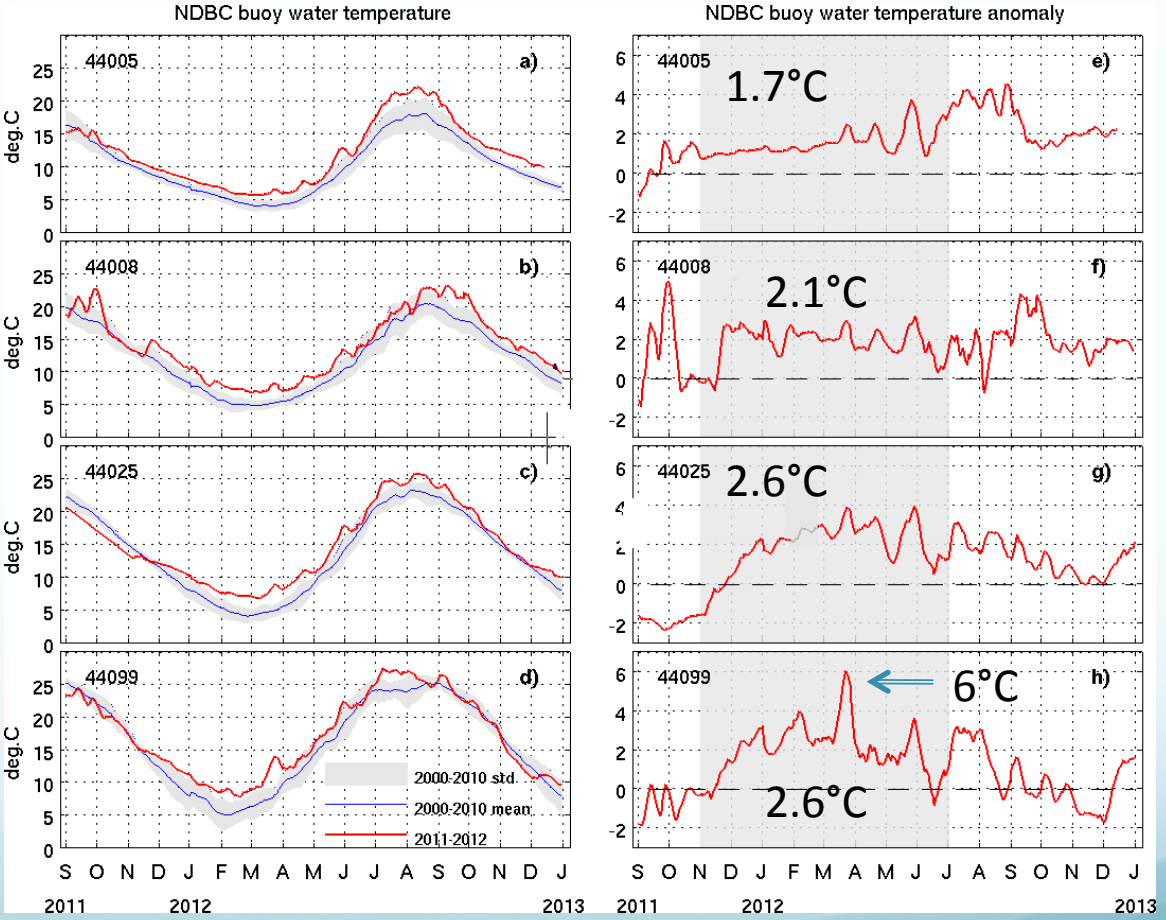
Relative to 2000-2010 mean

Gulf of Maine

Nantucket Shoals

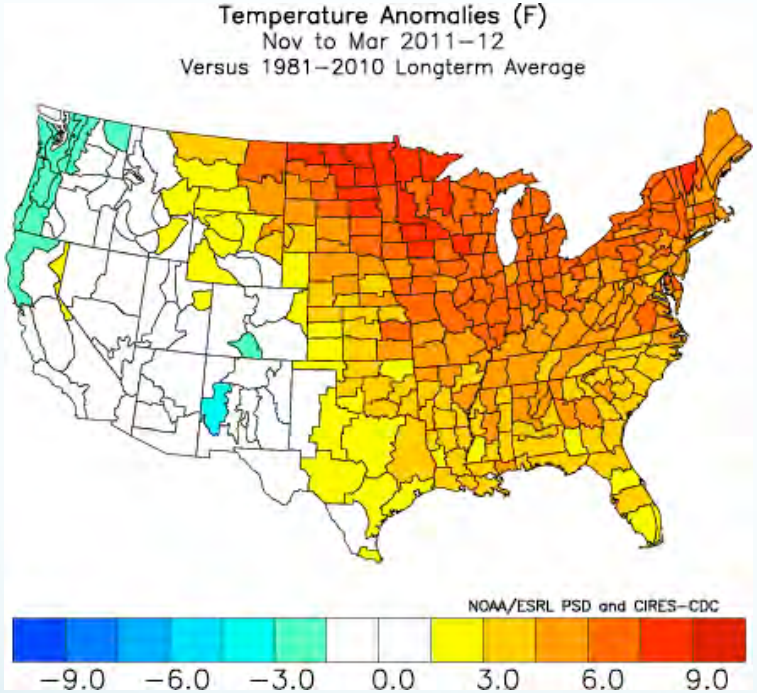
Long Island

Chesapeake Bay Mouth

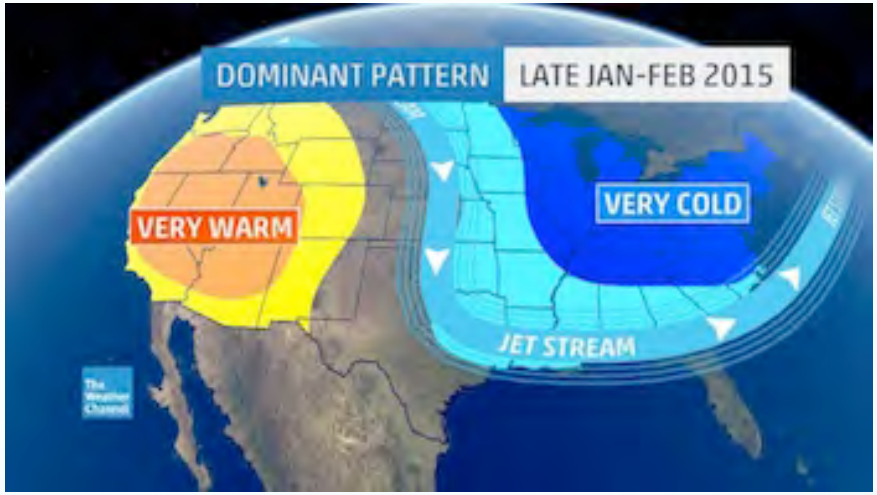


Chen et al. (2014)

What is going on with the atmosphere?



Winter 2011-2012 Temperature Anomalies compared to 1981-2010

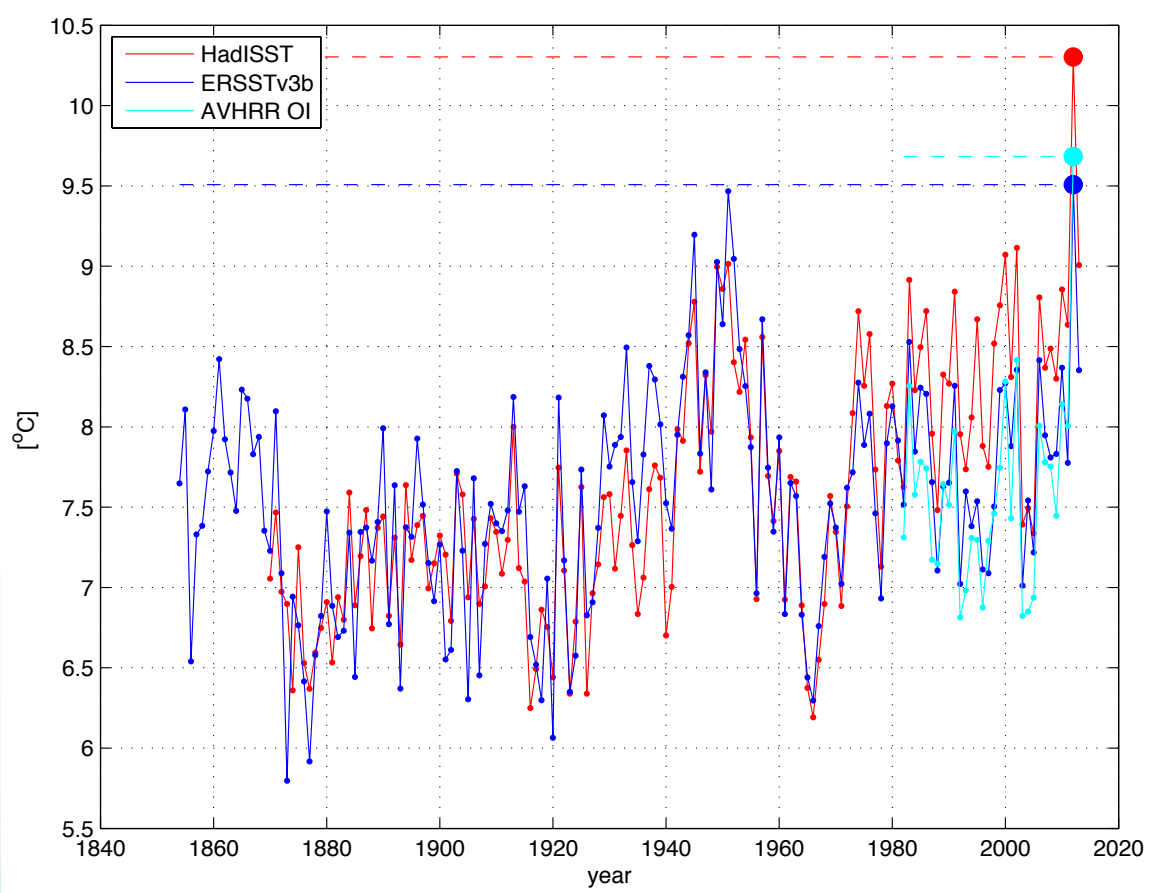


Dominant Weather Pattern for Winter 2014-2015

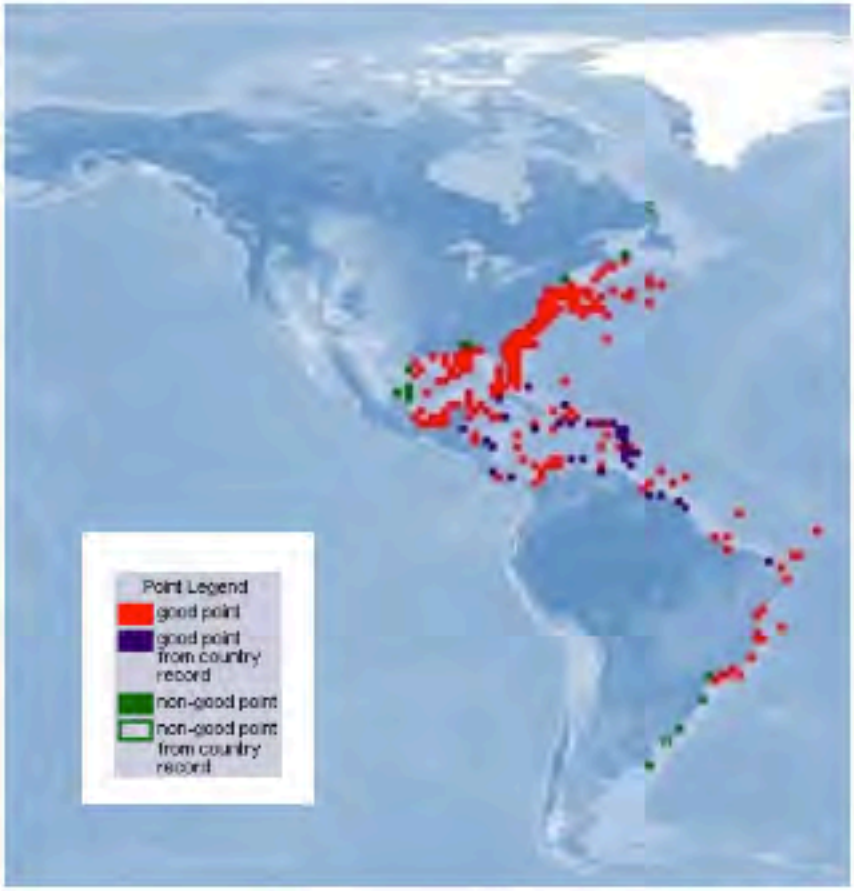
Jet Stream Ridge- Eastern US

Jet Stream Trough- Eastern US

The Ocean Warming of 2012- A historical context



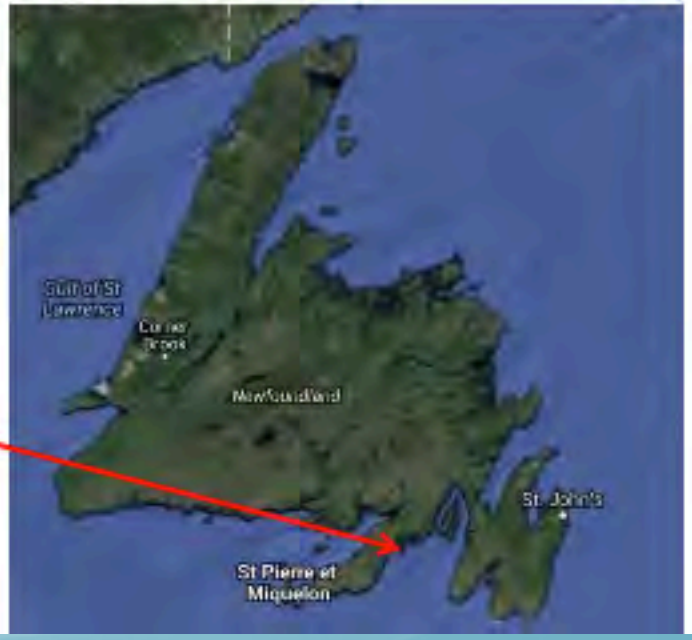
Spatial mean SST in the Middle Atlantic Bight and Gulf of Maine from Hadley Center (red), NOAA Extended Reconstructed SST Version 3b (blue), and NOAA Optimally Interpolated SST (Cyan). From Chen et al. (2015)



Blue runner (*Caranx crysos*) point records from fishbase.org.

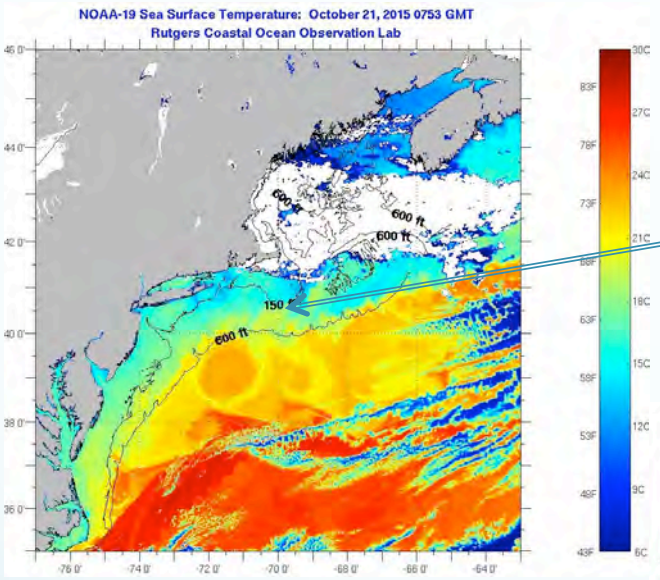
Note no valid records from Newfoundland.

Rushoon, NL

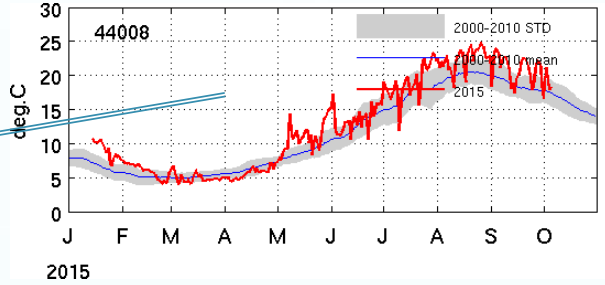


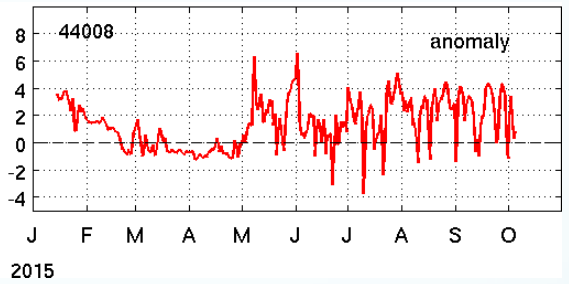
Slide provided by Jon Fisher, Marine Institute, Memorial University of Newfoundland

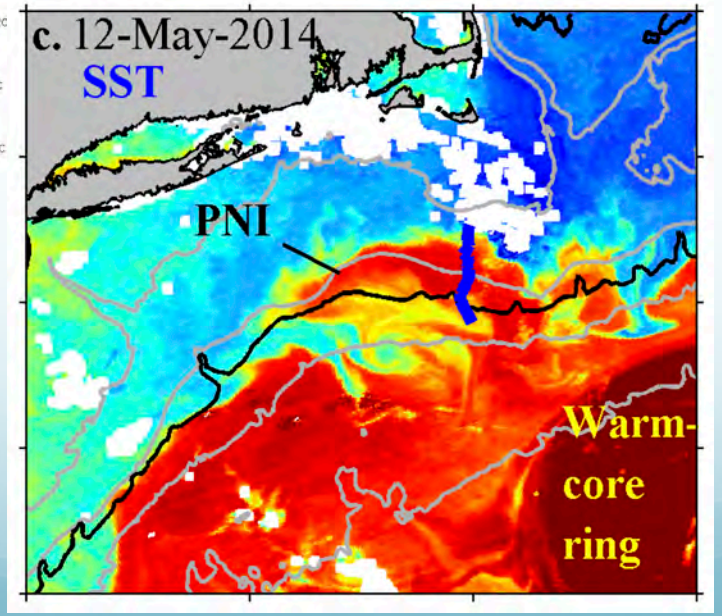
Warm Core Ring interactions with the continental shelf 2014 and 2015



Temperature Anomalies- Nantucket Shoals NDBC-2015

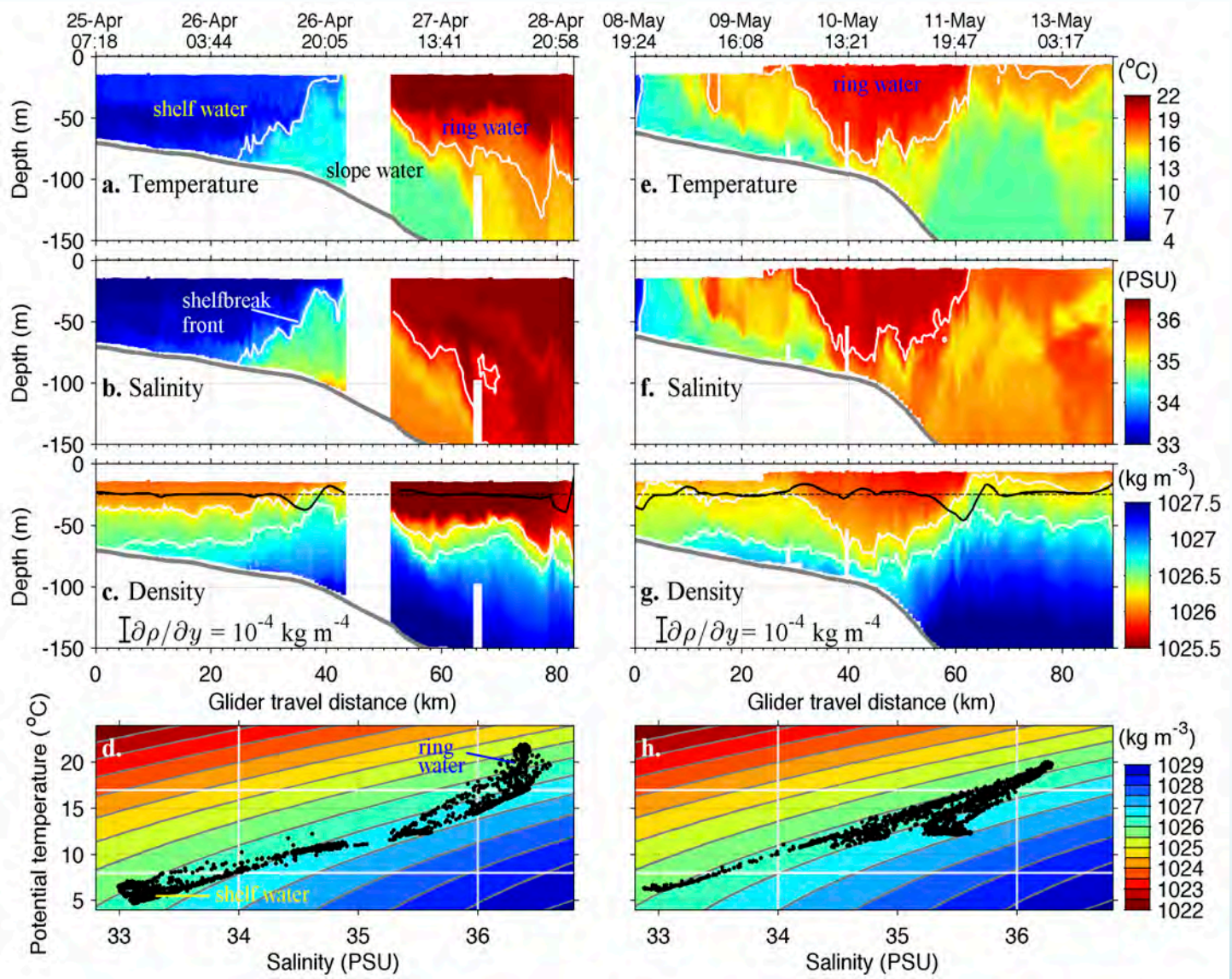






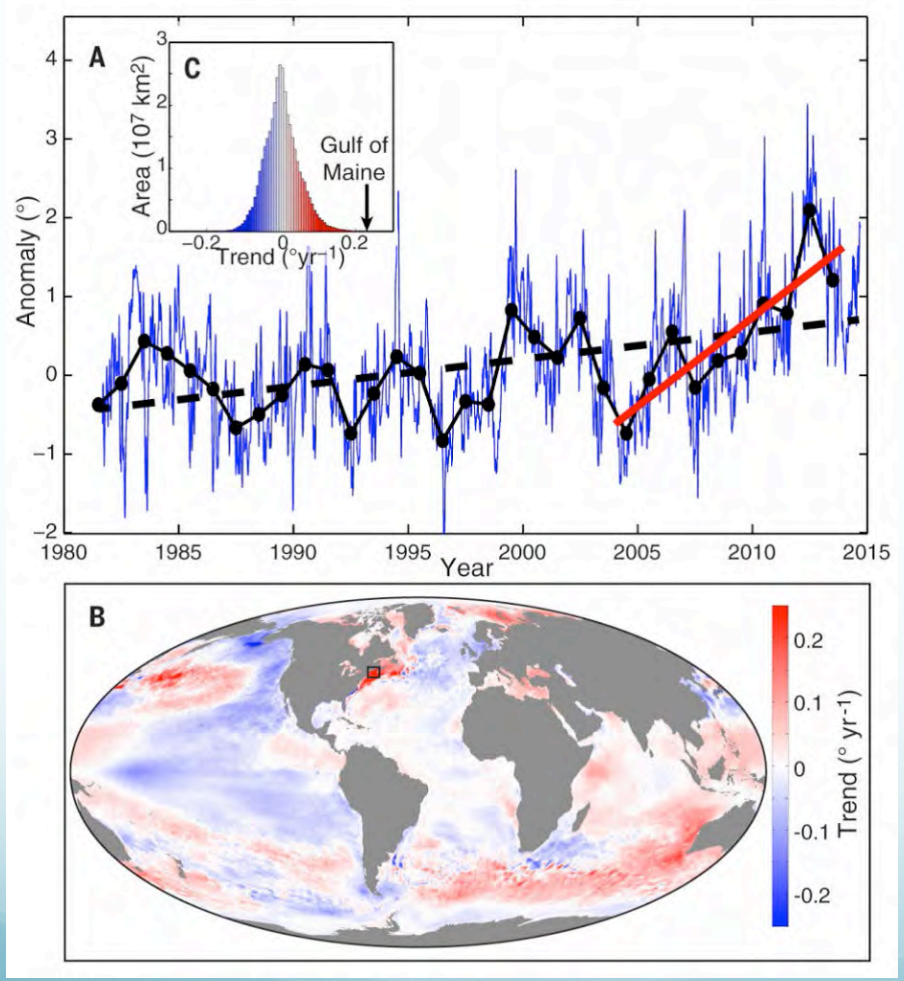
2-4 Deg C anomalies relative to 2000-2010 mean (11 Deg. F)

Pinocchio's Nose Intrusion- 2014 Zhang and Gawarkiewicz (2015)



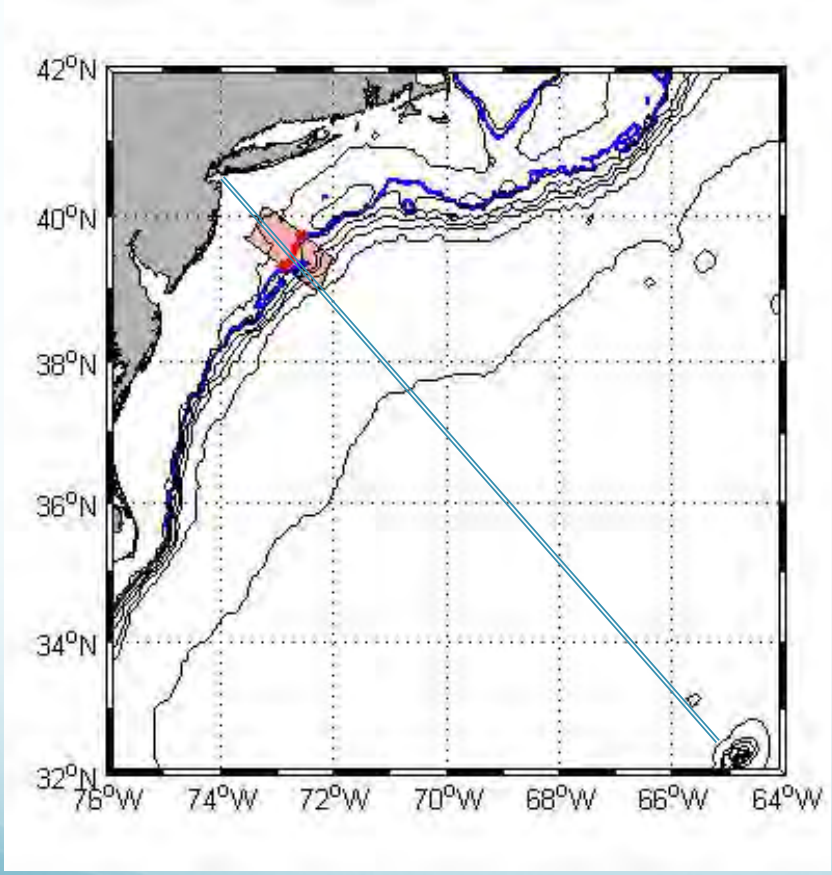
OOI Glider showing the initial limb of ring water (left panels) and the feature trapped along the shelfbreak (right panels)
Zhang and Gawarkiewicz (2015)

Gulf of Maine- Top 1 % of SST warming in the World Oceans

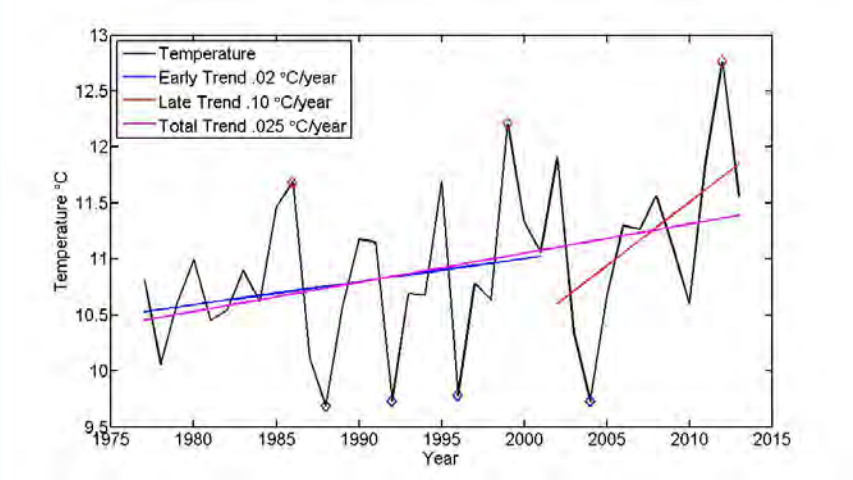


Pershing et al. 2015

Warming Trend- Annual Shelf Temperatures from MV Oleander New Jersey shelf



MV Oleander
Ocean measurements since 1977



Warming Trend is 5 times faster
In 2003-2013 than 1977-2013

Warming Trend is 15 times faster
In 2003-2013 than 1880-2004

From Forsyth et al. 2015