NCEP Coastal Ocean Simulations

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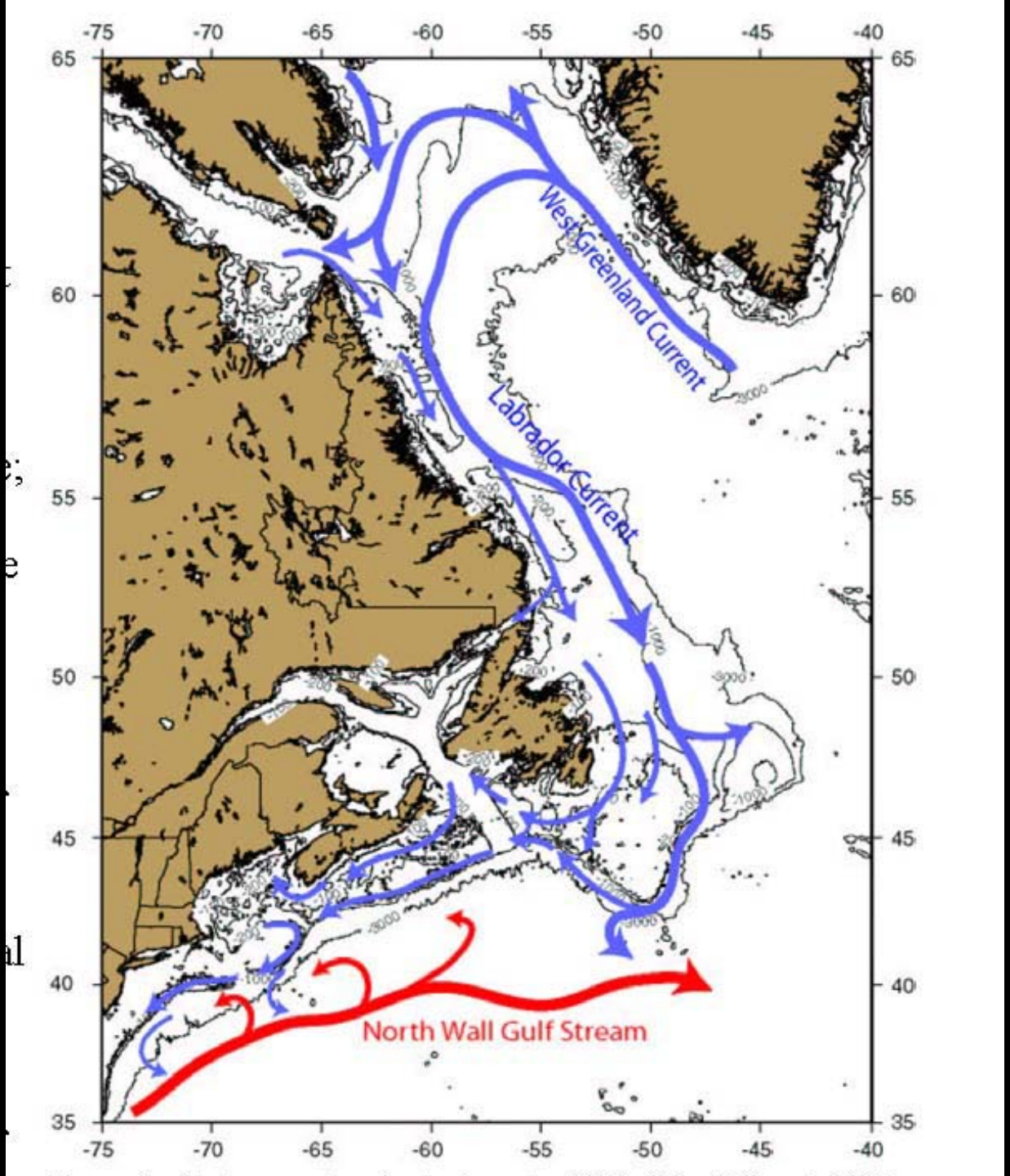
Primary Objective

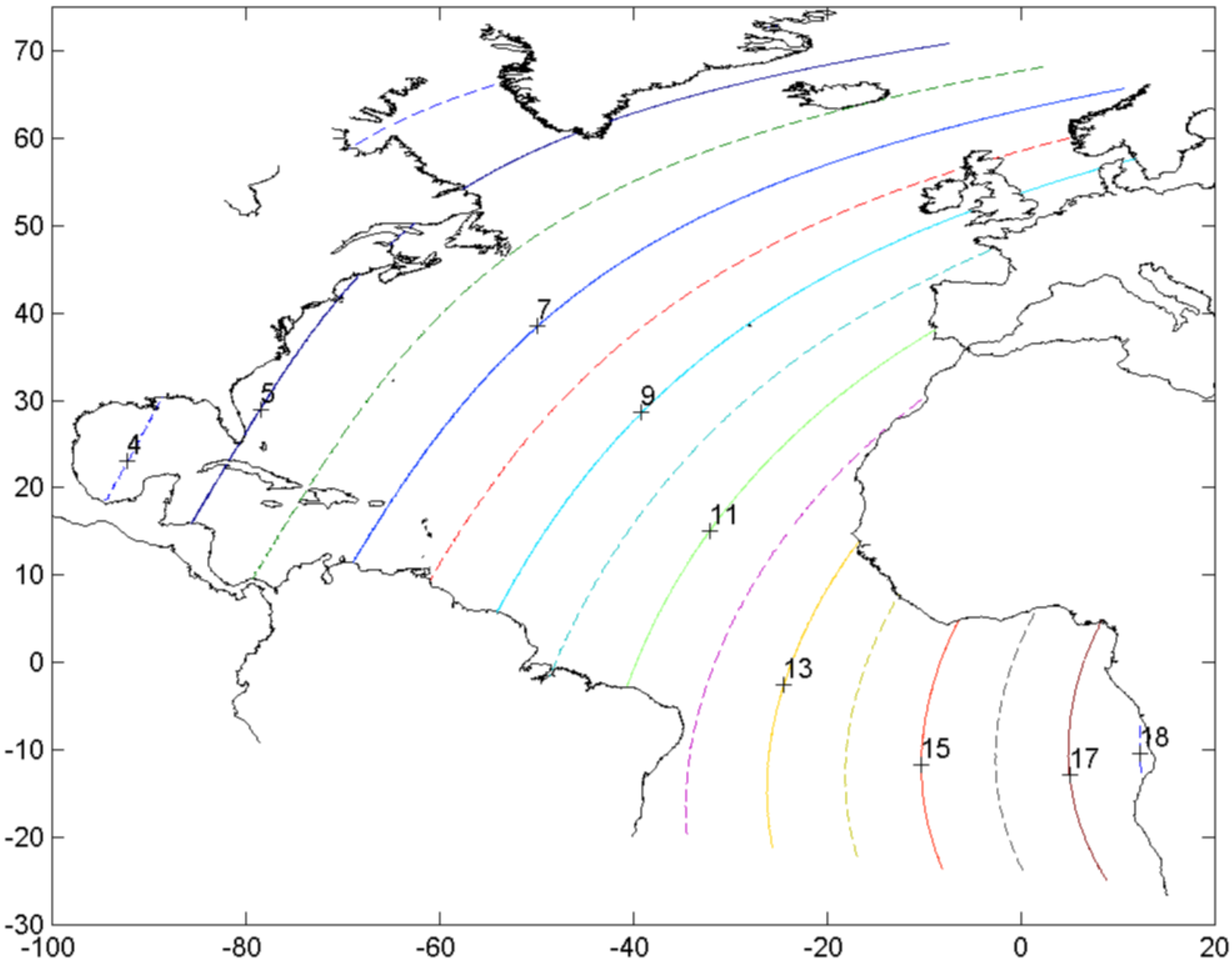
Improve the coastal ocean forecasts

Circulation elements and water masses should have approximately the observed properties of interest.

What do we need ?

- Model skill
- A good initialization
- Data assimilation


-75
-70
-65
-60
-55
-50
-45
-40
65
60
55
50
45
40
35
West Greenland Current
Labrador Current
North Wall Gulf Stream


NCEP Atlantic: Grid Size (km)
70
60
50
40
30
20
10
0
-10
-20
-30
-100
-80
-60
-40
-20
0
20
4
5
7
9
11
13
15
17
18

Objective

- To improve monthly coastal oceans climatology

Motivation

- The present coastal ocean climatology is not adequate

- Required for the initialization in the coastal oceans

Approach: Create Initial Climatology

- Use existing ocean climatology such as GDEM, Levitus, Yashayaev or Hydrobase that covers entire Atlantic Basin
- Develop metrics for evaluating the strengths/weaknesses of different climatologies
- Develop procedures for quality control
- Create initial climatology

Approach: Meld Climatology using historical data

- Obtain historical data from various sources for different regions
- Modify climatology using optimal interpolation
- Conduct extensive quality check
- Evaluate regional water masses

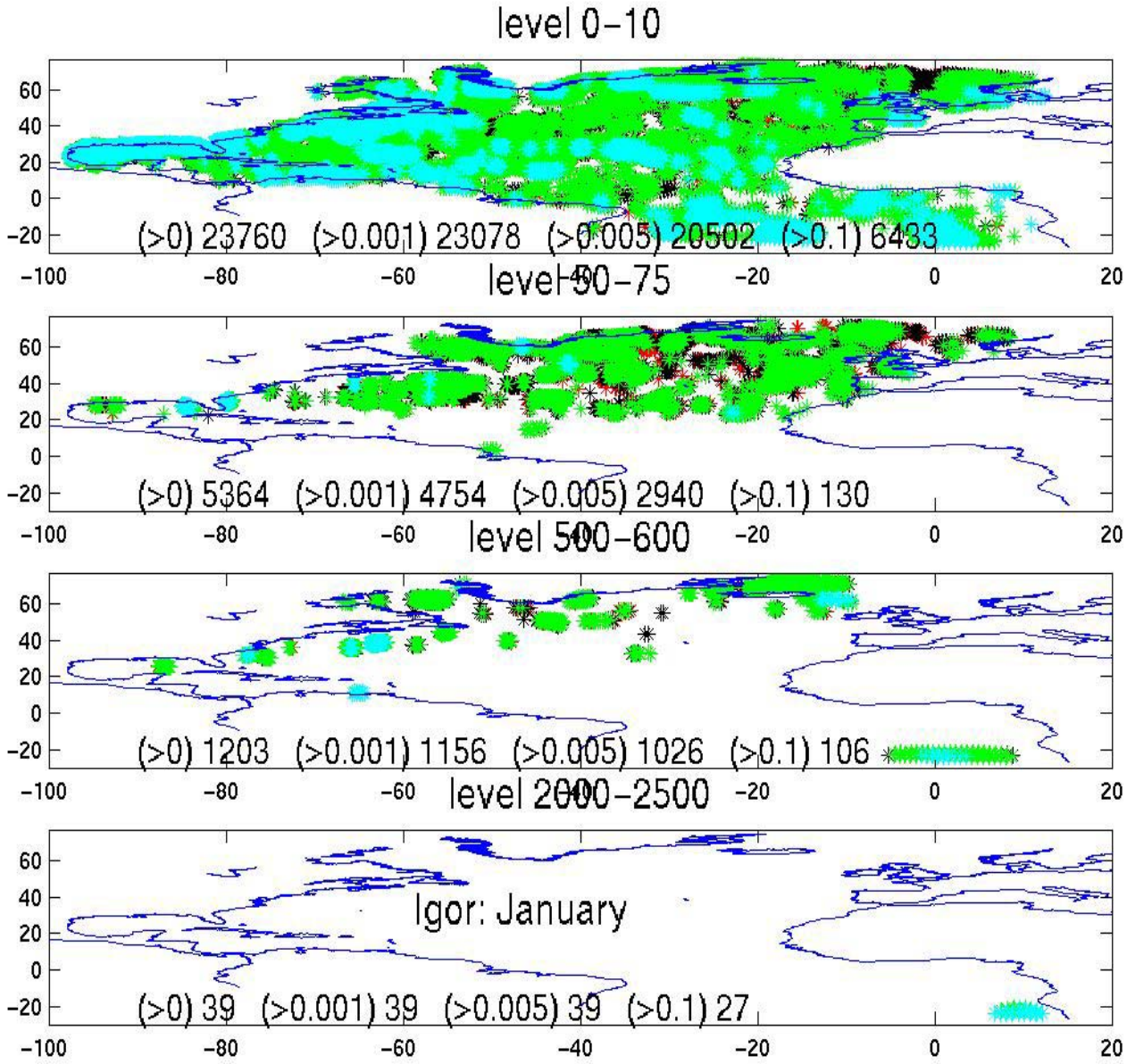
Data Collected

- Bedford Institute
- Brian Blanton
- Maureen Taylor
- Rich Garvine
- Ruoying Ye
- Steve Lentz

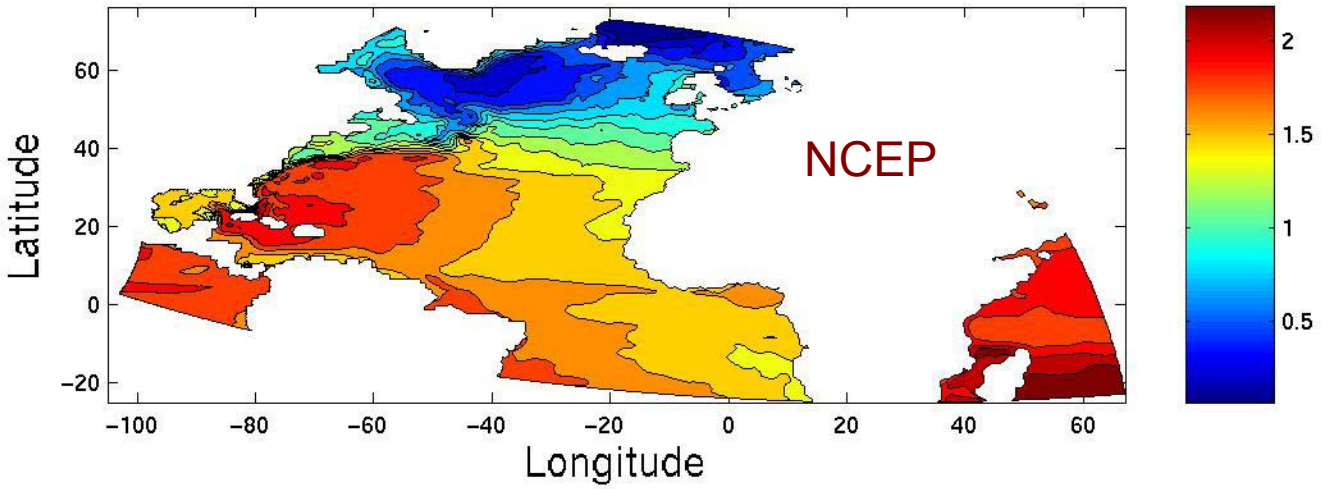
- Northern Atlantic
- SAB
- MAB
- NJ/Delaware
- West Florida, GoM
- MAB

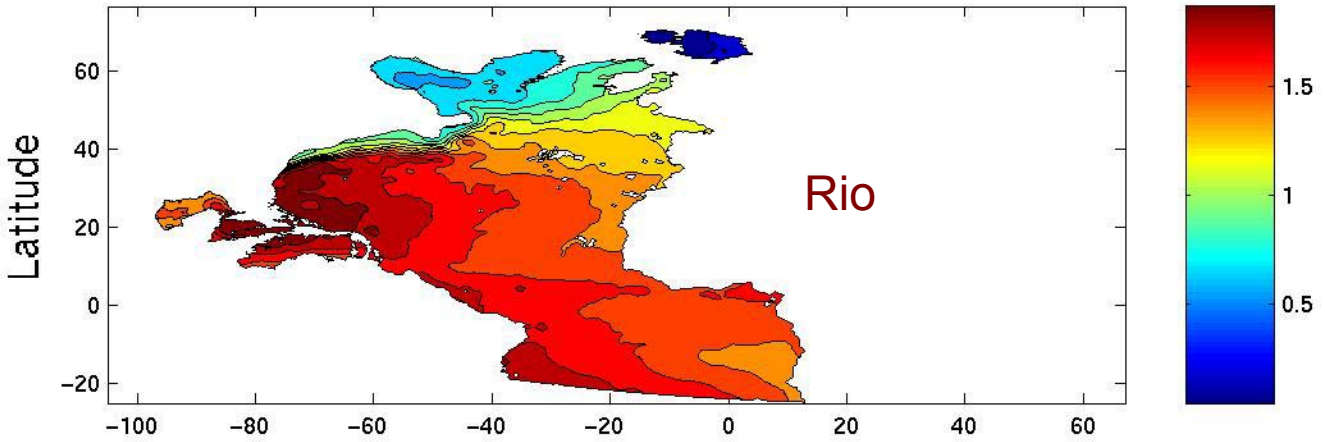
- Stability of water column
- **Circulation elements and water masses have observed properties of interest**
- T-S diagrams
- Mean dynamic height

Stability of Water column


level 0-10
(>0) 23760 (>0.001) 23078 (>0.005) 20502 (>0.1) 6433
level 50-75
(>0) 5364 (>0.001) 4754 (>0.005) 2940 (>0.1) 130
level 500-600
(>0) 1203 (>0.001) 1156 (>0.005) 1026 (>0.1) 106
level 2000-2500
Igor: January
(>0) 39 (>0.001) 39 (>0.005) 39 (>0.1) 27
60
40
20
0
-20
-100
-80
-60
-40
-20
0
20

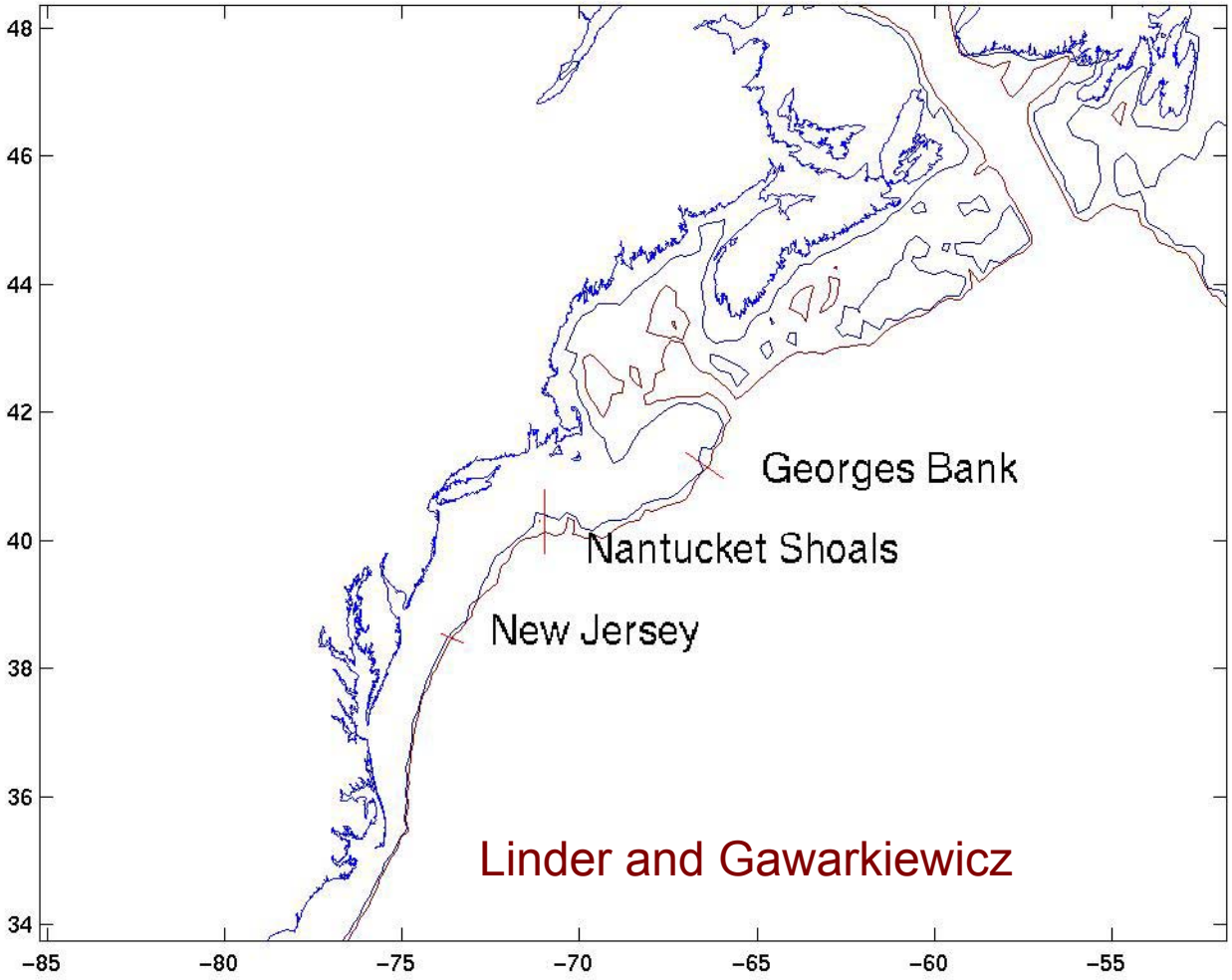
Mean Dynamic Height





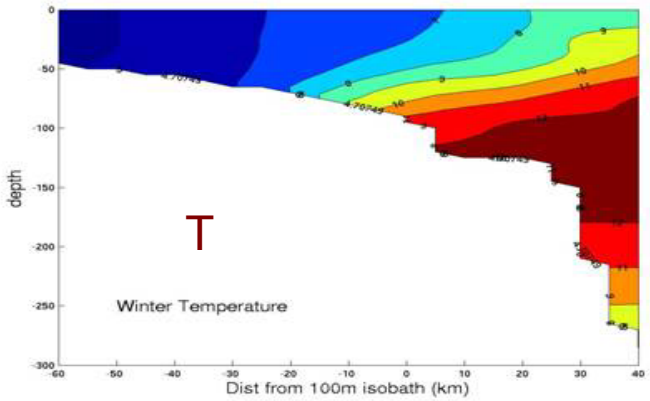
Rio, M.-H. and F. Hernandez, 2003: A Mean Dynamic Topography computed over the world ocean from altimetry, in-situ measurements and a geoid model. Submitted to JGR.

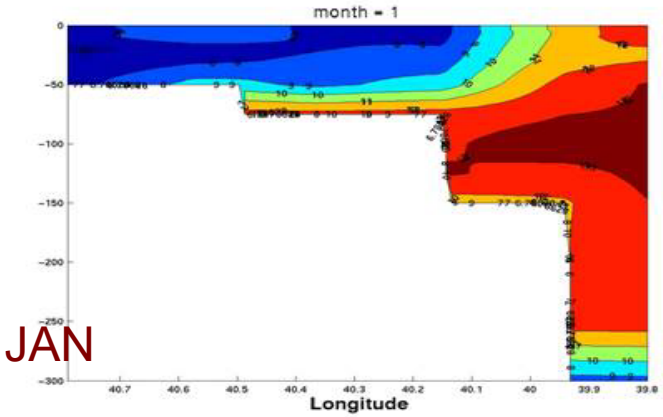
Circulation and Water Masses

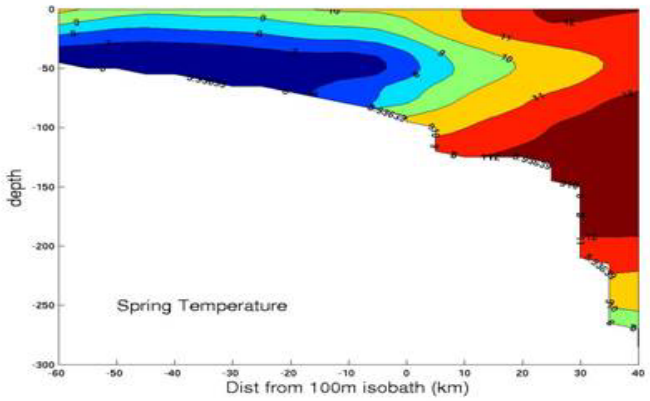


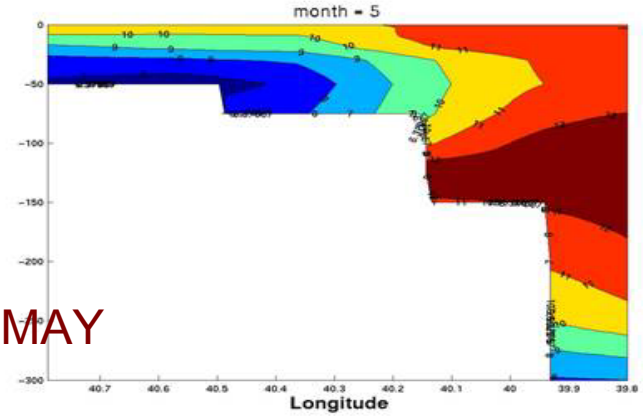
•A Climatology of the shelfbreak front in the Middle Atlantic Bight, 1998.

•Data from Curry's HydroBase (1996)- NODC data from 1900s to 1990.


depth
T
Winter Temperature
Dist from 100m isobath (km)


month = 1
JAN
Longitude


depth
Spring Temperature
Dist from 100m isobath (km)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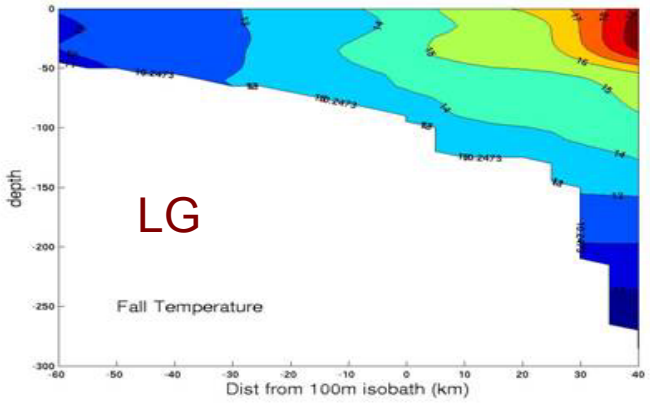
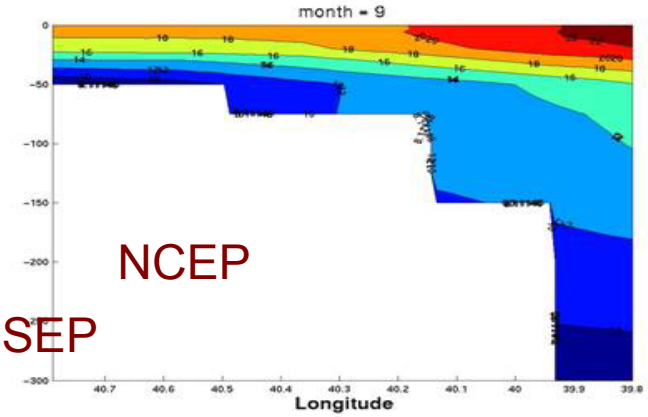
MAY
Longitude


depth
LG
Fall Temperature
Dist from 100m isobath (km)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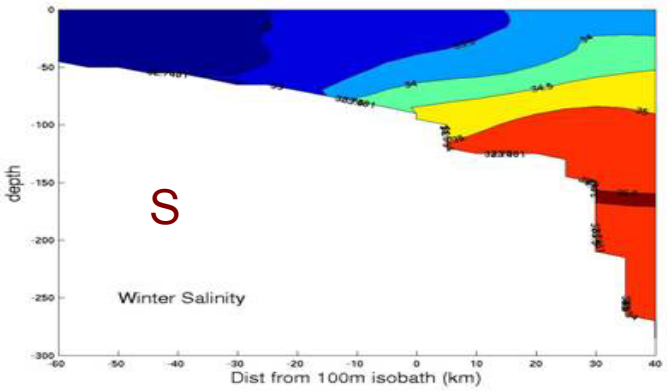
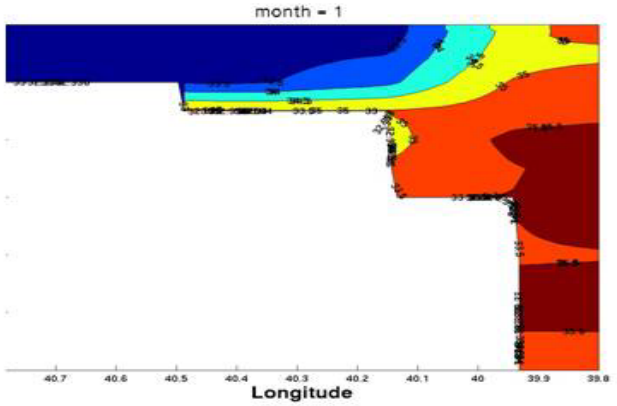
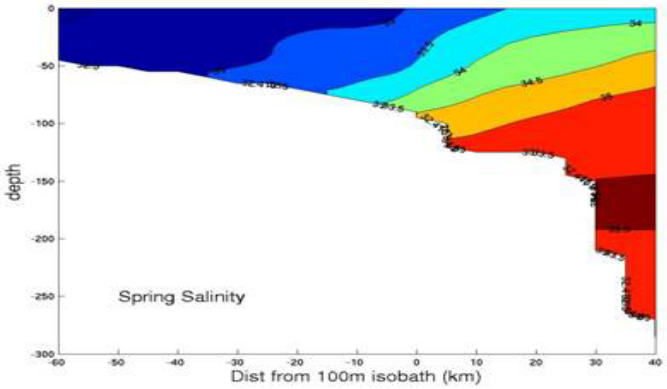
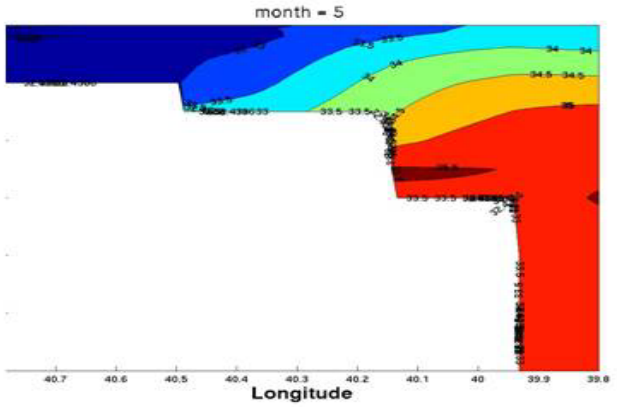
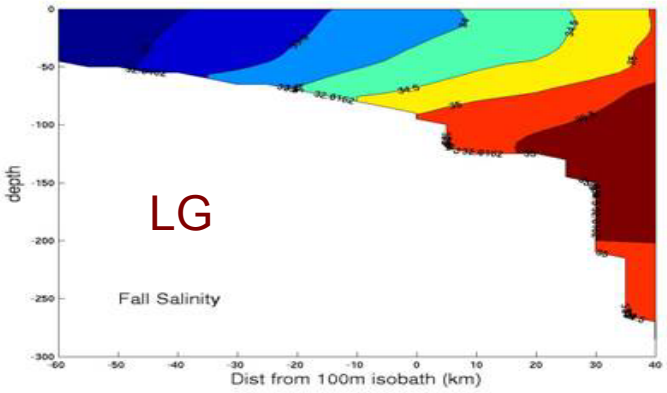
NCEP
SEP
Longitude

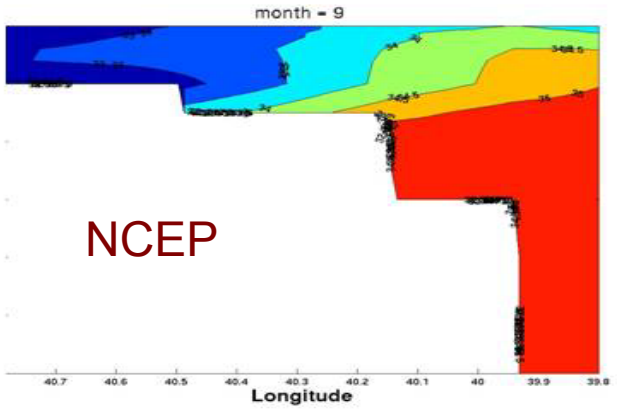

S
Winter Salinity
depth
Dist from 100m isobath (km)


month = 1
Longitude


Spring Salinity
depth
Dist from 100m isobath (km)

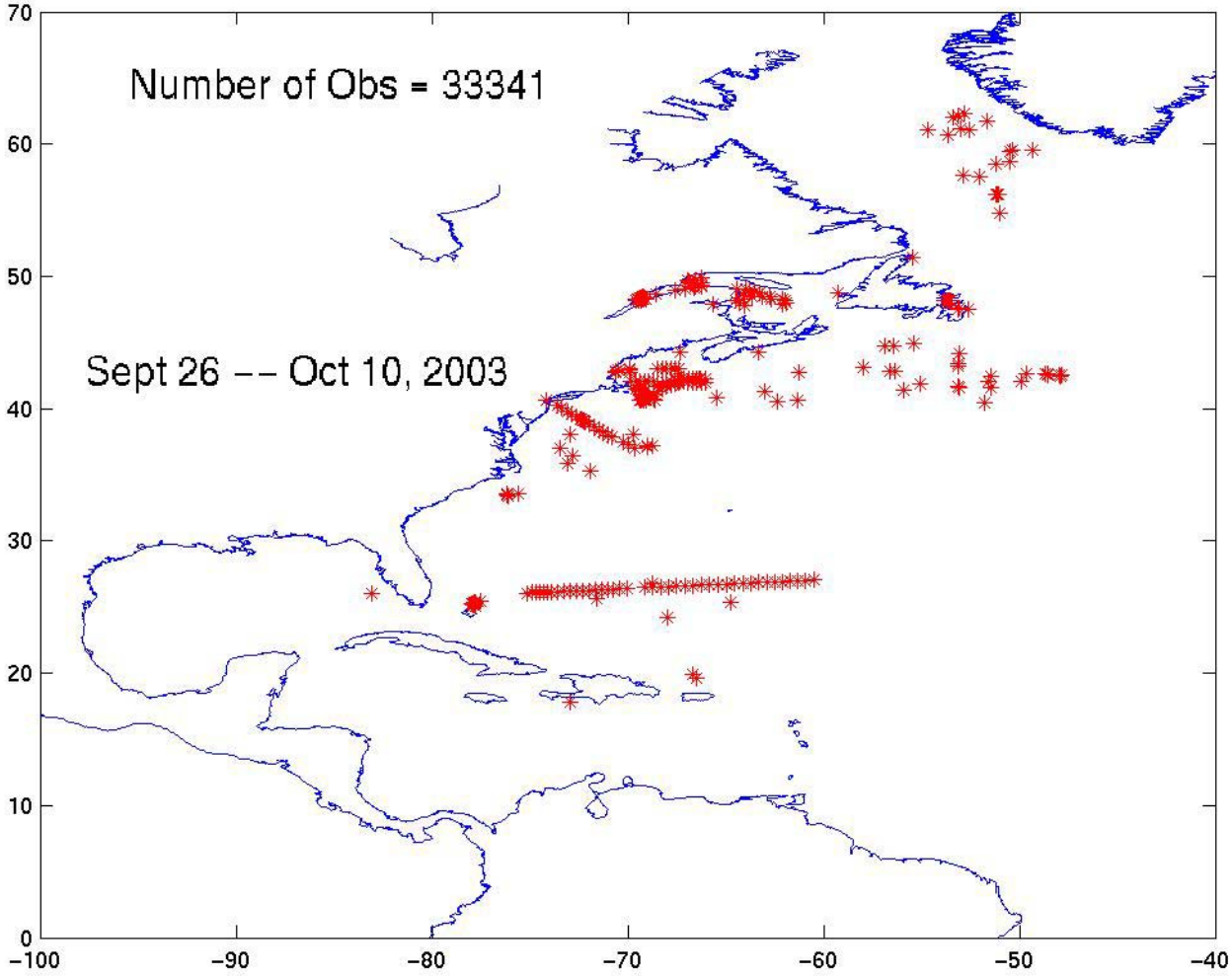

month = 5
Longitude

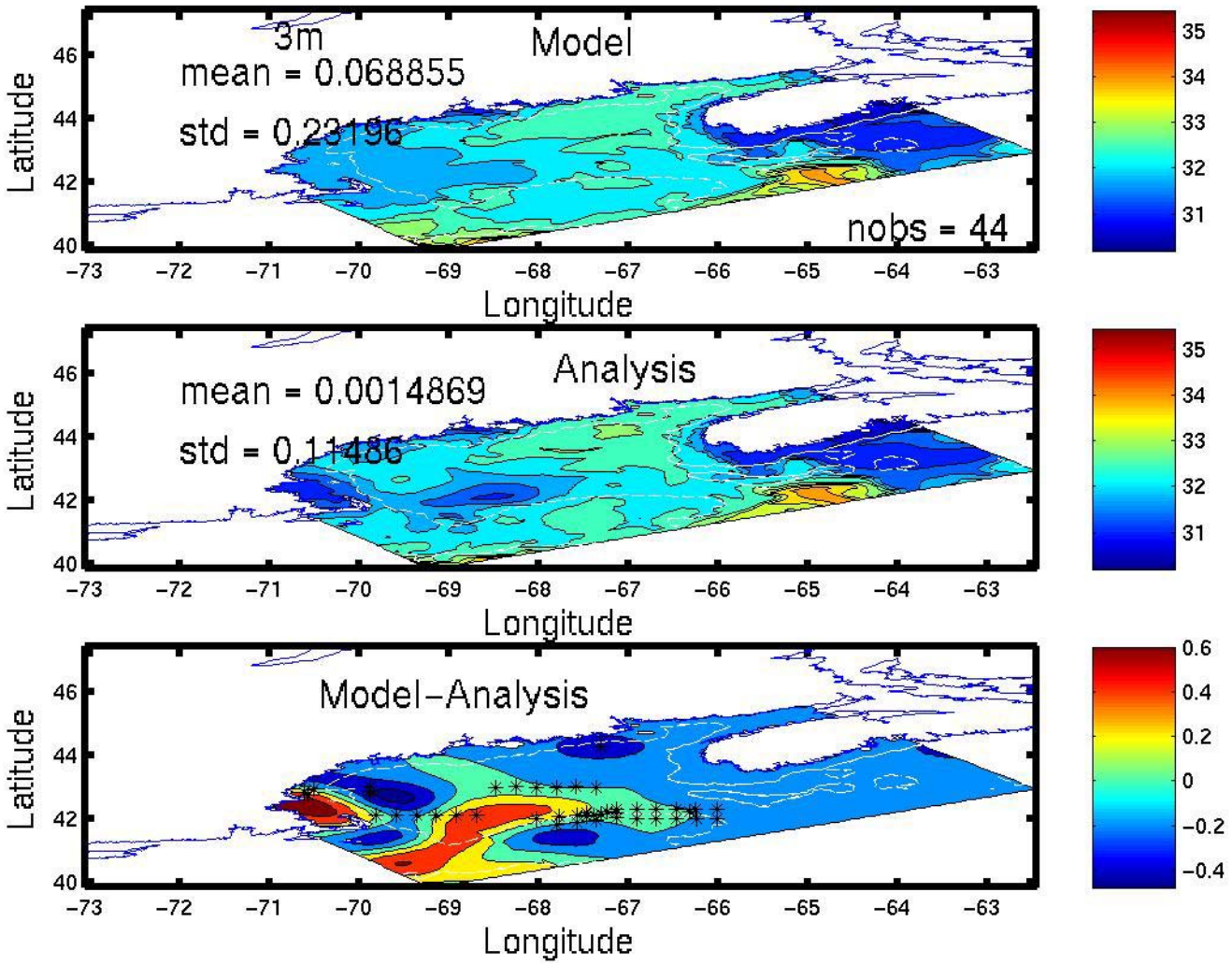

LG
Fall Salinity
depth
Dist from 100m isobath (km)

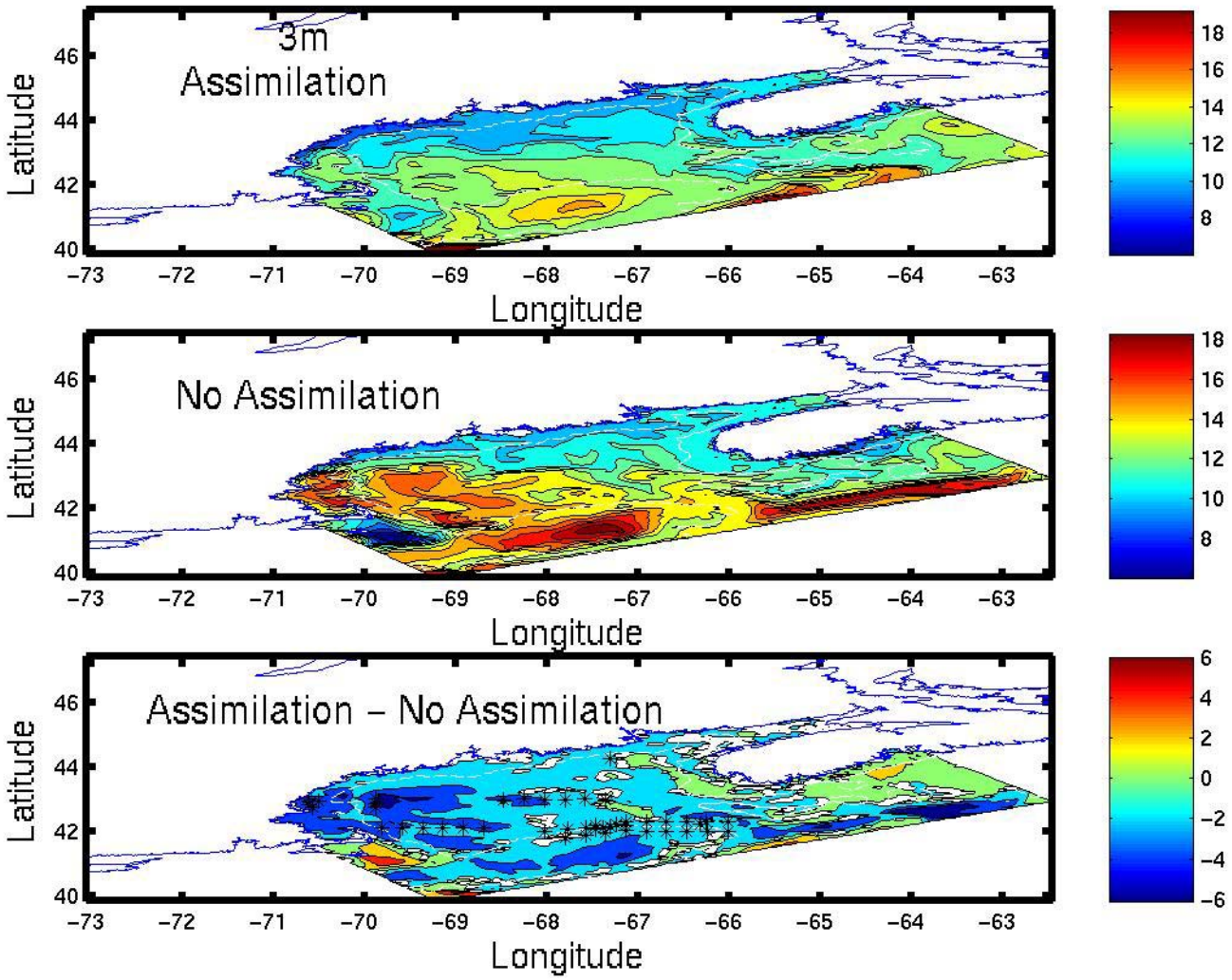

month = 9
NCEP
Longitude

Assimilation

- **Cold start is prepared from the NCEP climatology for mid-september 2003**
- **Model is integrated by assimilating in situ data for Oct 3, 2003.**
- **In-situ data was collected for the period Sept 26- Oct 10.**


Number of Obs = 33341
Sept 26 -- Oct 10, 2003
70
60
50
40
30
20
10
0
−100
−90
−80
−70
−60
−50
−40


3m
Model
mean = 0.068855
std = 0.23196
nobs = 44
Analysis
mean = 0.0014869
std = 0.11486
Model−Analysis
Latitude
Longitude
46
44
42
40
−73
−72
−71
−70
−69
−68
−67
−66
−65
−64
−63
35
34
33
32
31
0.6
0.4
0.2
0
−0.2
−0.4


3m
Assimilation
No Assimilation
Assimilation – No Assimilation
Latitude
Longitude
46
44
42
40
−73
−72
−71
−70
−69
−68
−67
−66
−65
−64
−63
18
16
14
12
10
8
6
4
2
0
−2
−4
−6

Conclusions

- A new climatology was created at NCEP that has better coverage in the coastal ocean
- There is a need for observations, sustained and adapted to events of interest and error estimation.
- Continuous interaction with ocean data and modelling community