

Linking IOOS & NWQMN: Applications of New Estuarine & Coastal Observing Technologies

THE STATE UNIVERSITY OF NEW JERSEY
RUTGERS



**Fred Grassle, Scott Glenn, Oscar Schofield,
Robert Chant, and Josh Kohut *at Rutgers University***



Research

<http://marine.rutgers.edu/cool>

Operations Center

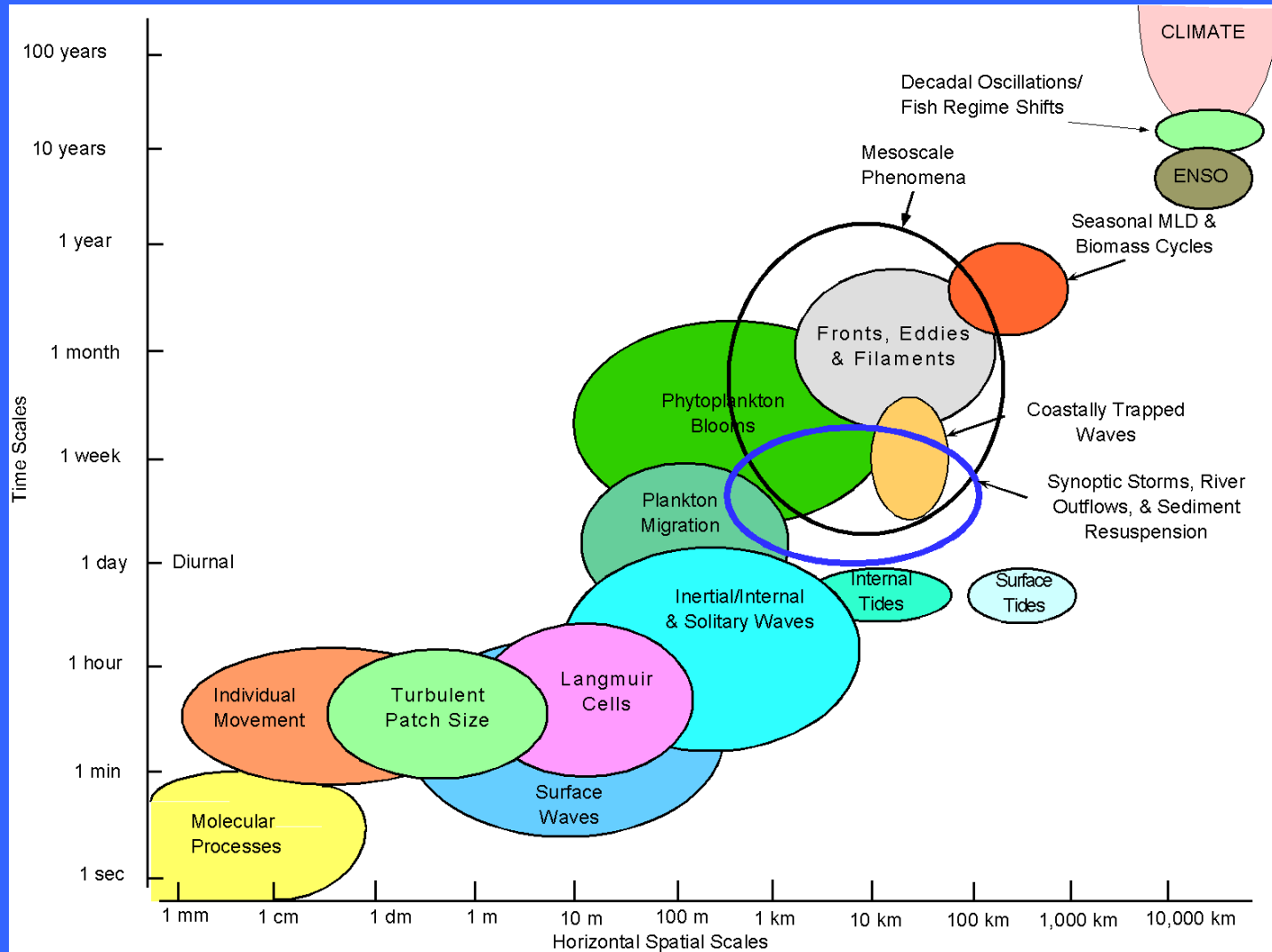
<http://www.thecoolroom.org>

K-12 Education

<http://coolclassroom.org>



Processes Operate of Time and Space



What is the frequency of events?

- Resuspension events
- Waste discharge, sewage discharge (pipe breakage, treatment plant failure,)
- Spills (oil, chemicals, etc.)
- North Atlantic climate Oscillation (NAO), etc.
- Hurricanes and coastal inundation
- Earthquakes
- Estuary: suspended sediment discharge

Monitoring designs

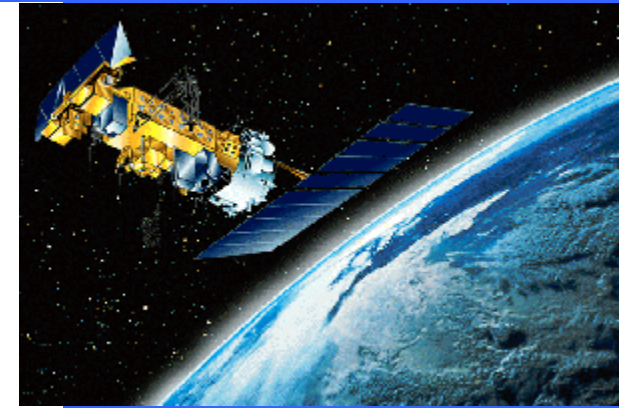
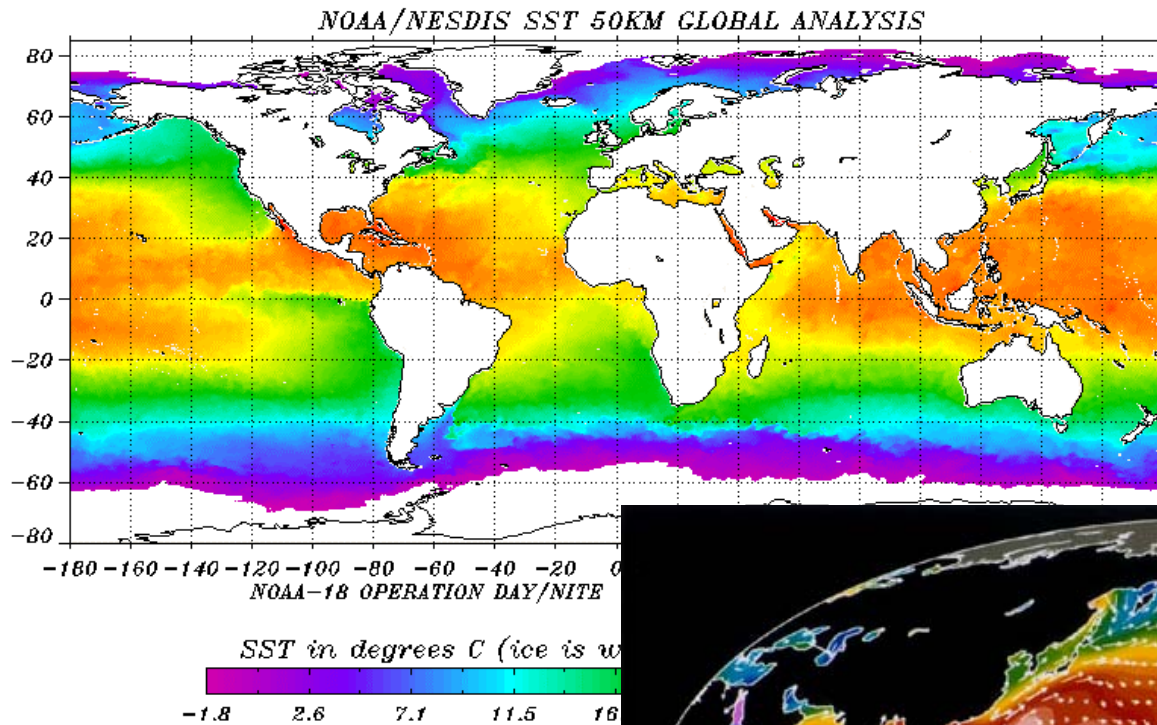
Benthos

- Gridded
- Remap/emap
- Habitat maps and nested sampling

Water column

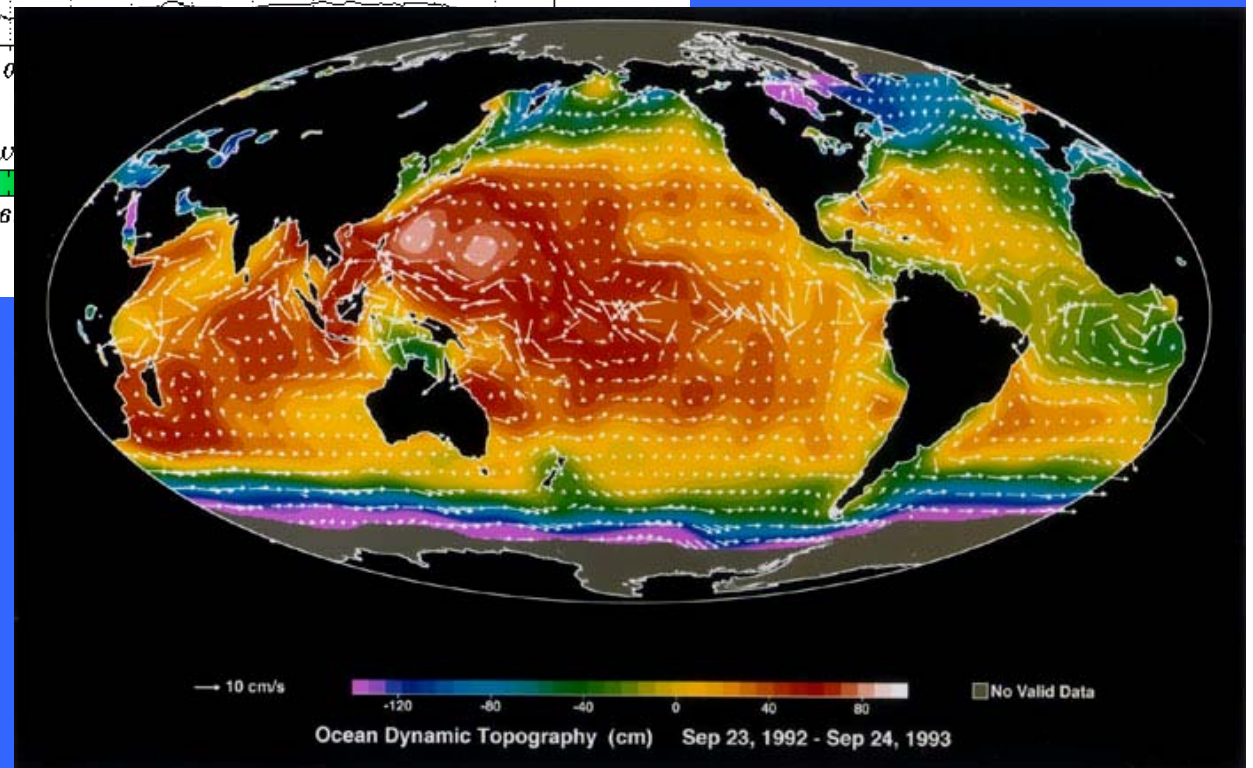
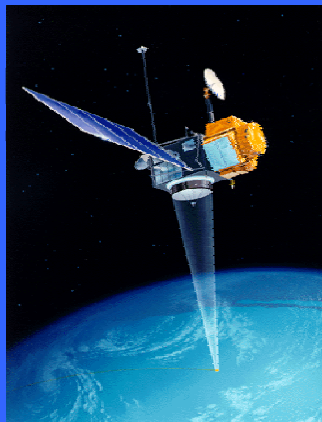
- Adaptive sampling

A Global View from Space: Imagers and Altimeters



Passive Imagers for SST & Ocean Color

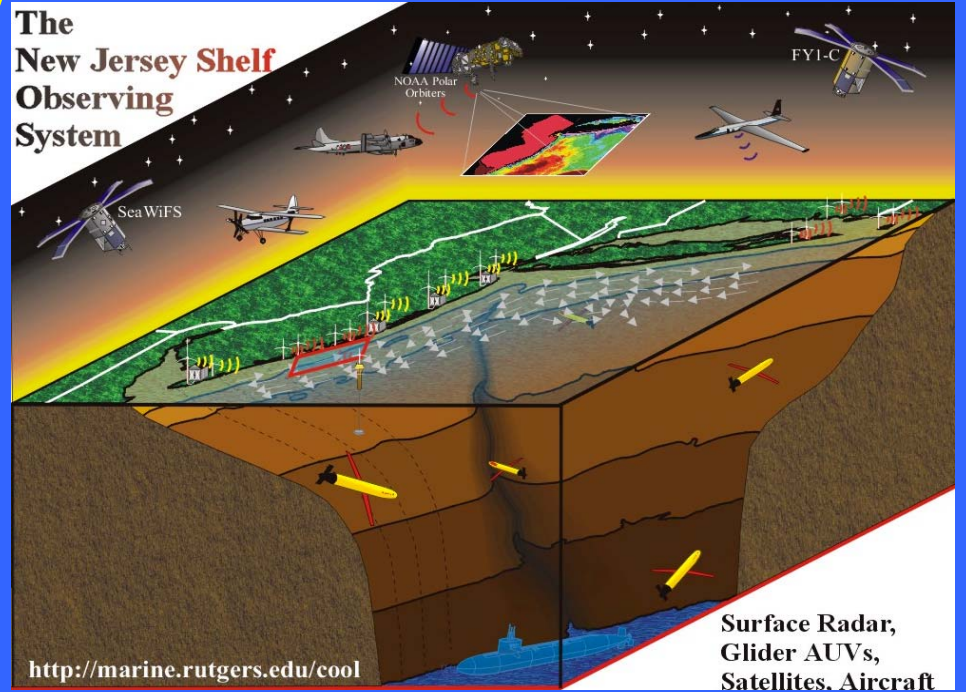
Active Radars for Altimetry



Rutgers Coastal Observatory

Provide a Long-term Shelf-Wide Context for High Resolution Nested Process Studies

The New Jersey Shelf Observing System



<http://marine.rutgers.edu/cool>

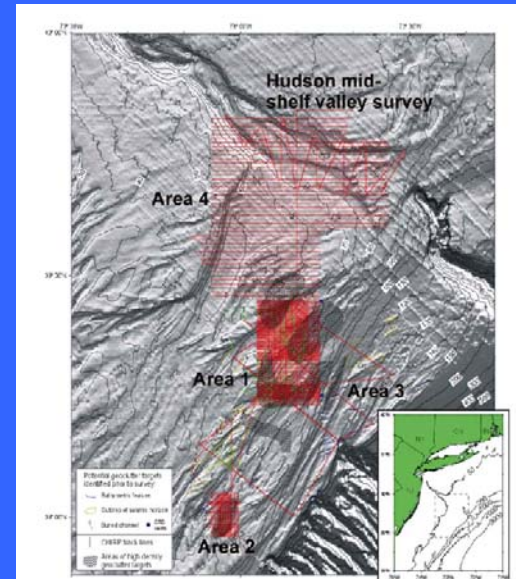
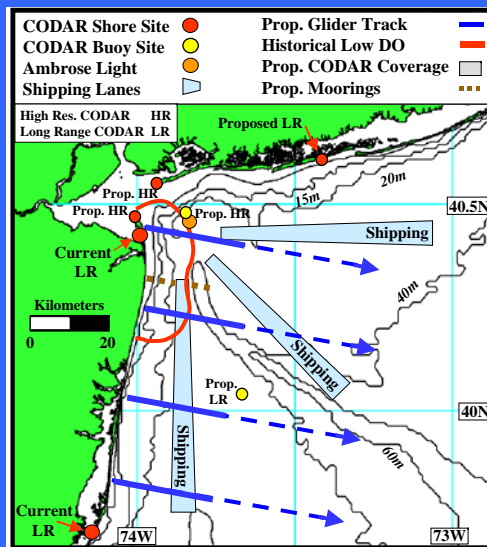
Surface Radar, Glider AUVs, Satellites, Aircraft



LEO

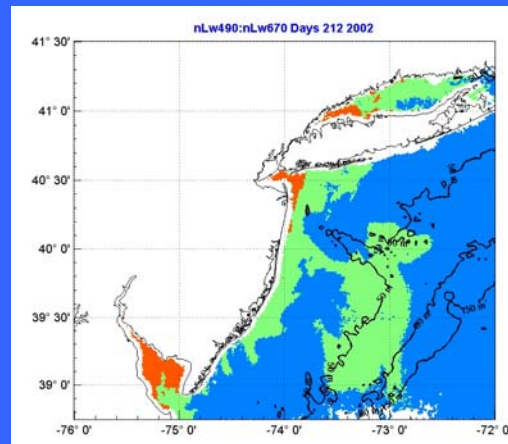
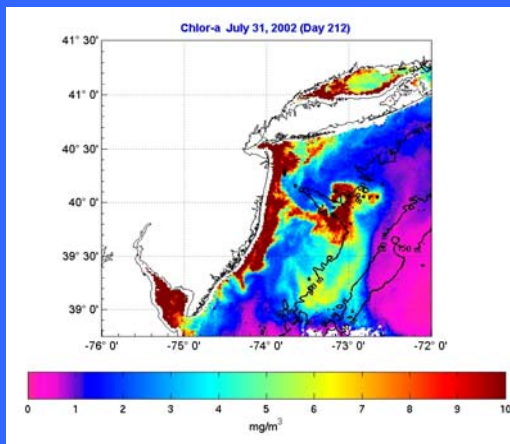
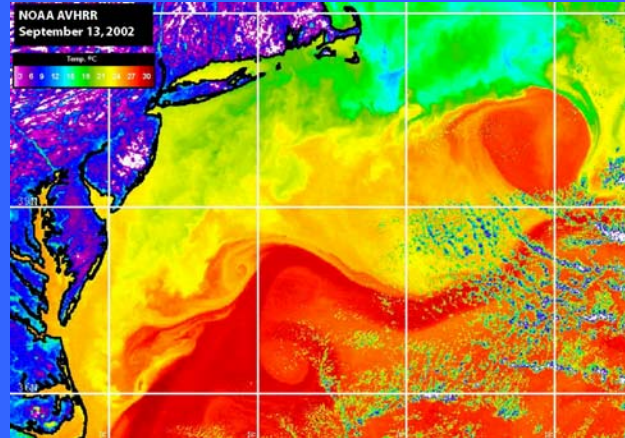
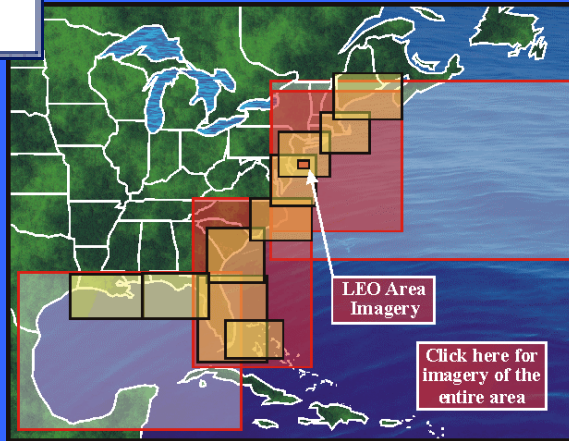
LaTTE

SW06

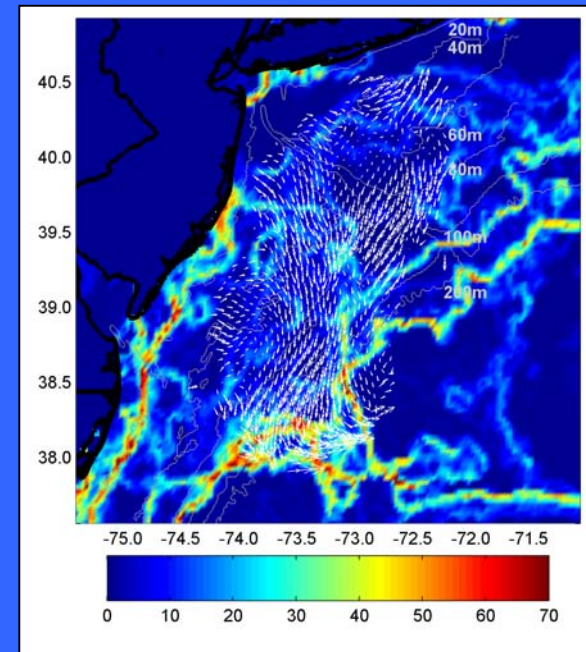




New Enabling Technologies – Coastal Satellites

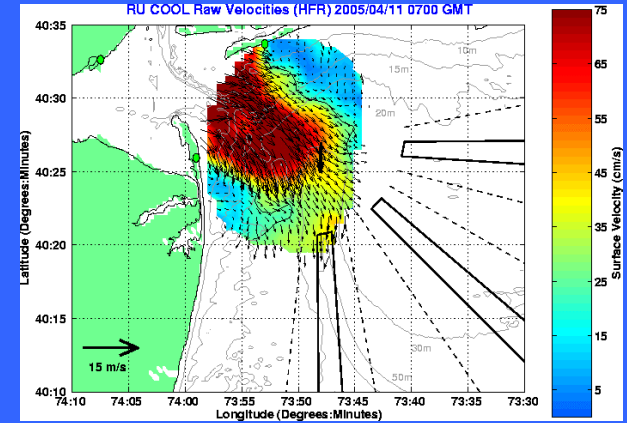
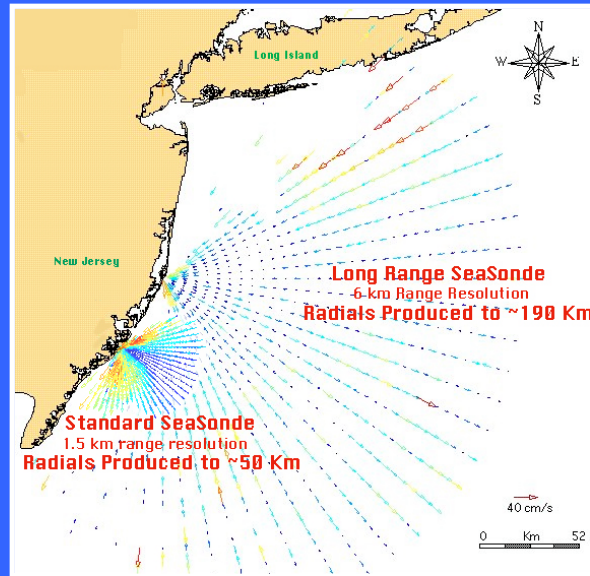


Water mass classification
(Blooms vs Rivers)



Objective Gradient and
Frontal Boundaries

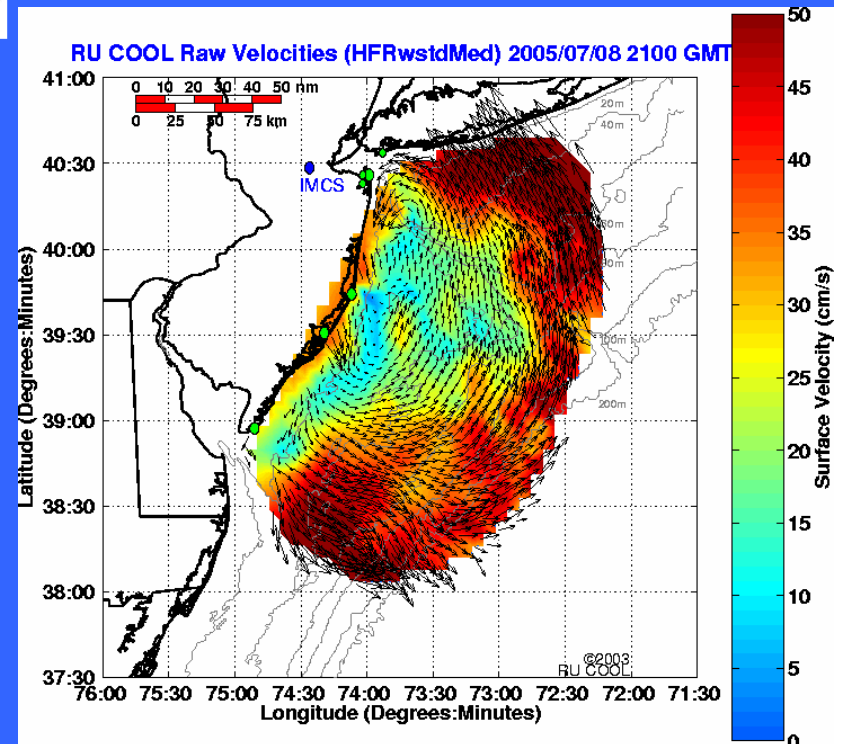
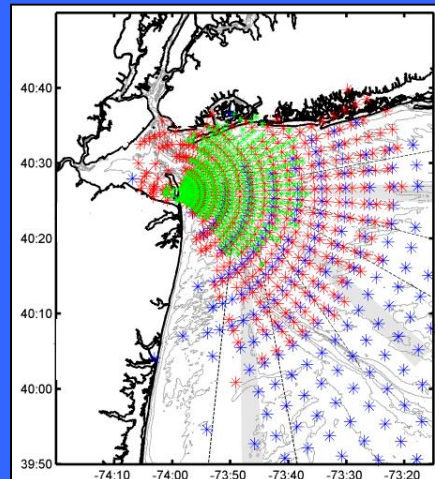
New Enabling Technologies – CODAR HF Radar

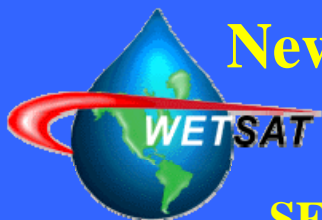


Hudson Plume – April, 2005 Summer Storm – July, 2005



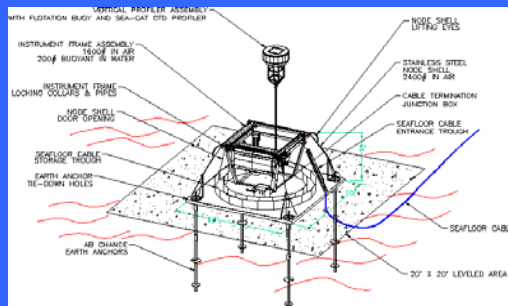
Each Radar Measures
Radial Component
of the Surface Current





New Enabling Technologies - Seafloor Cabled Observatories

SEAFLOOR CABLES: LEO-15



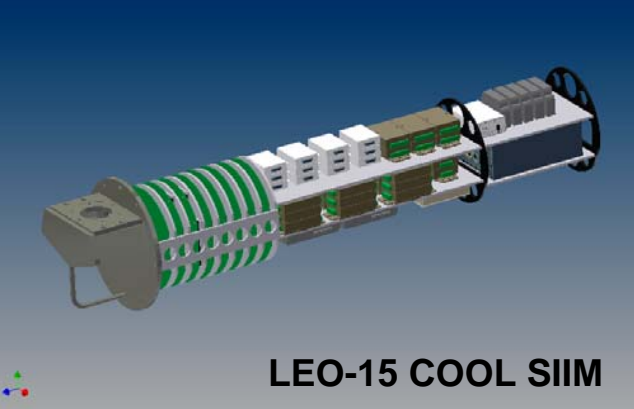
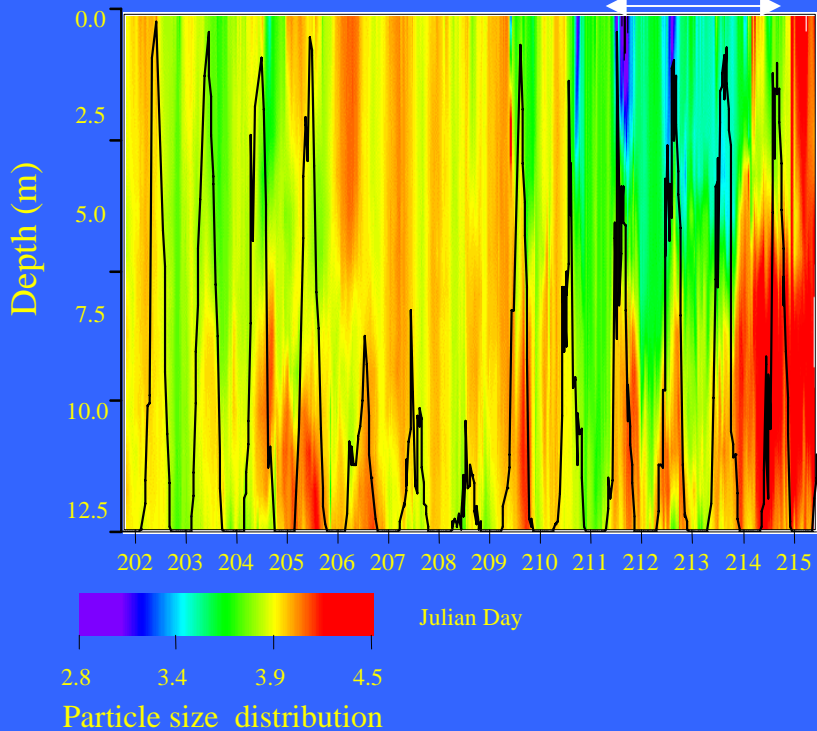
Evolving instrument deployment packages



Evolving profilers (still need work!)

SUSTAINED PRESENCE TO CAPTURE "EVENTS"

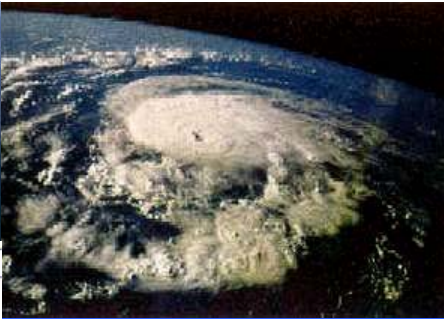
Hudson River



LEO-15 COOL SIIM

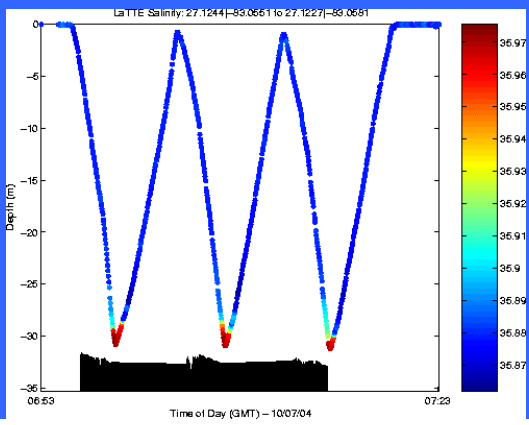
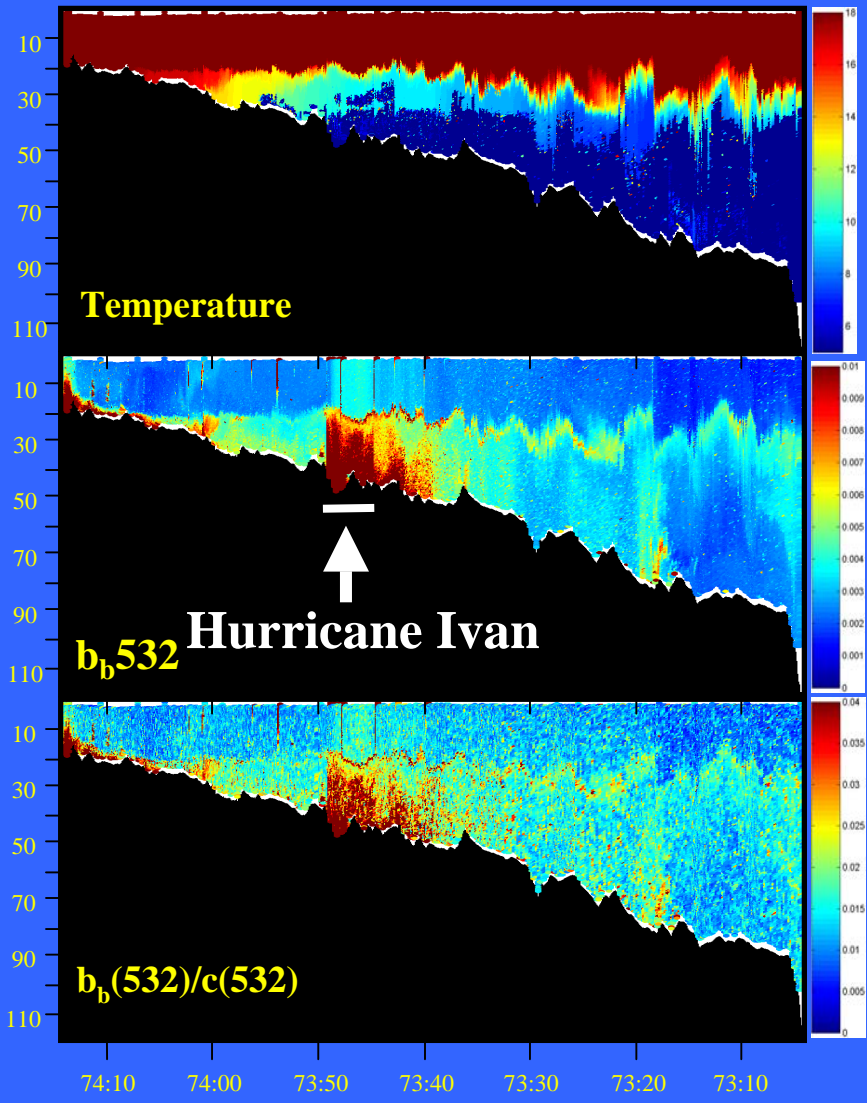
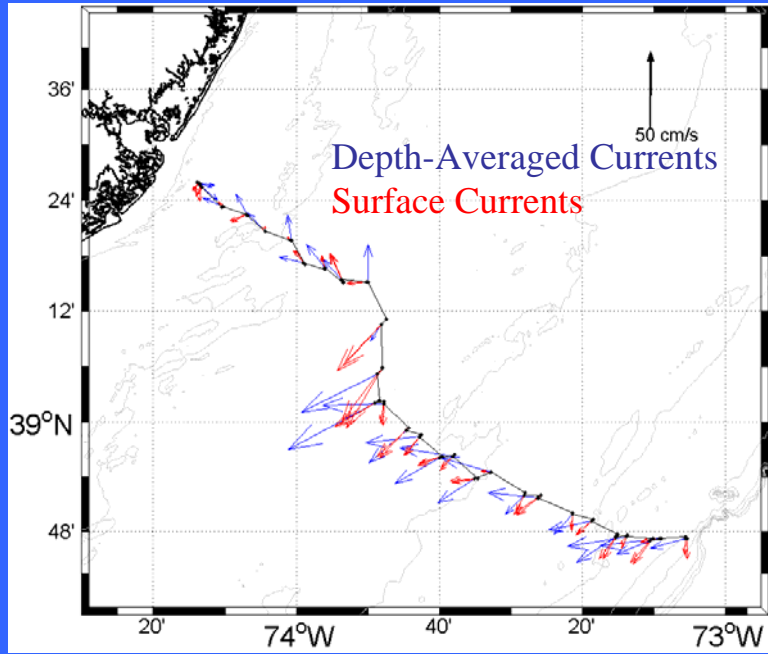


WEBB RESEARCH CORPORATION



New Enabling Technologies: GLIDER IN THE STORM

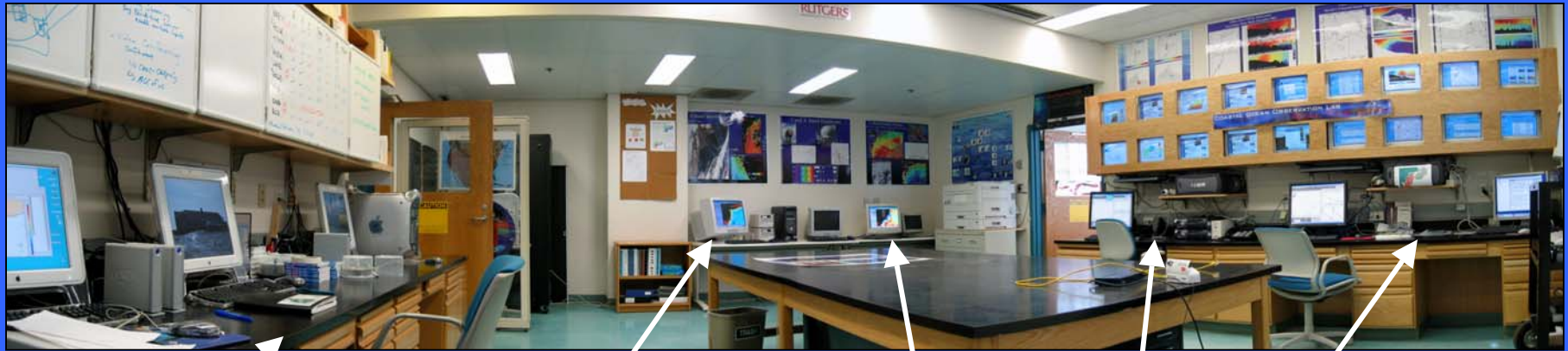
16-Sep-2004 15:00:53 - 23-Sep-2004 11:57:27



A defining characteristic is the remote interactivity

Coastal Ocean Observation Lab

Center for Advanced and Sustained Technologies (CAST)



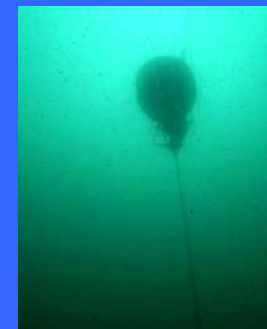
CODAR Network



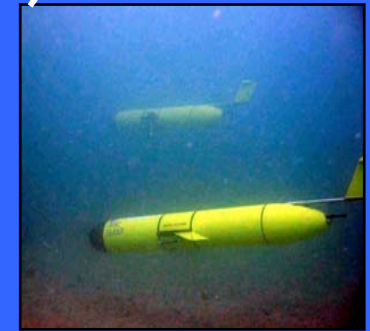
L-Band



X-Band



Cable



Glider Fleet

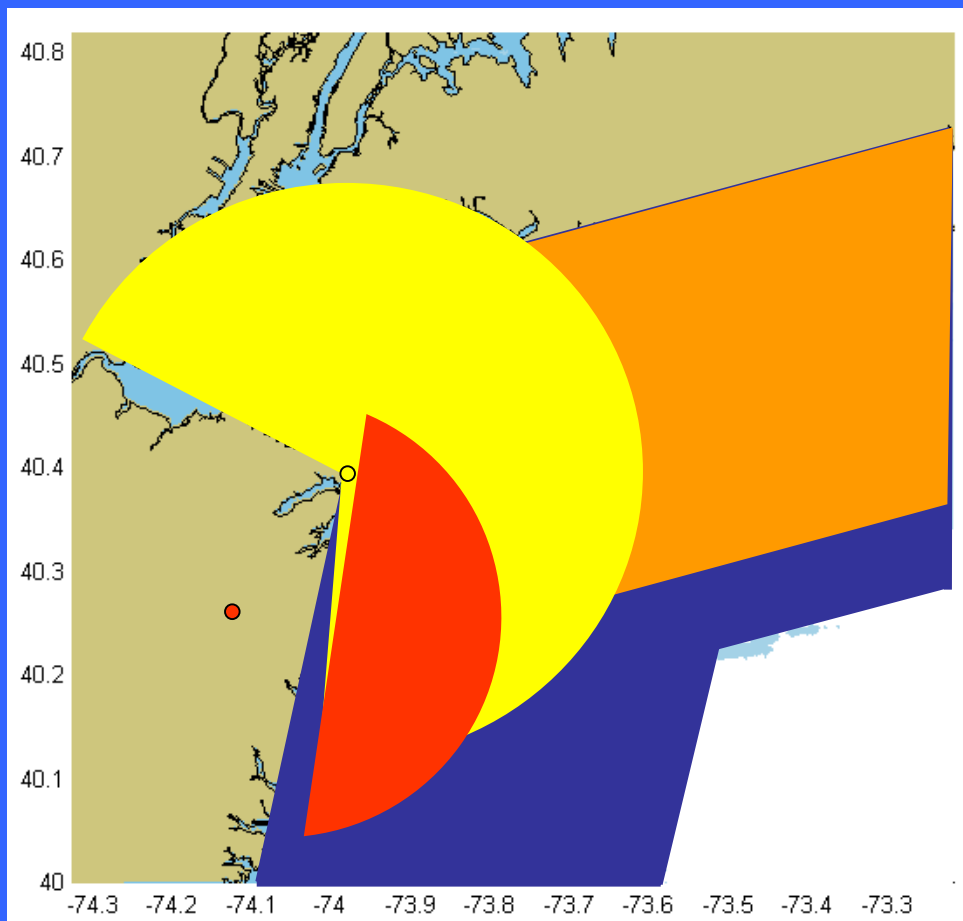


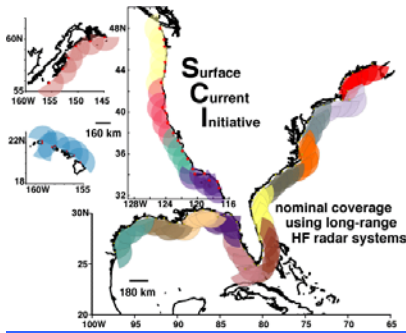


Ship-to-Shore Communications Guide Shipboard Sampling



- **AirNet Communications Wireless Broadband** (~1.5 Mbps, coverage 7 miles offshore from Sandy Hook)
- **Verizon National Access** (~100 kbps, coverage up to 20+ miles off Long Island, less for New Jersey)
- **Freewave Radio Modems** (~80 kbps, coverage for a 18 mile radius centered at Sea Bright Fire Department)
- **Verizon Quick2Net** (14.4 kbps, coverage up to 20+ miles off both New Jersey and Long Island)
- **Iridium Satellite** (2,400 bps, global coverage, data and voice)





Evolving National HF Radar Network

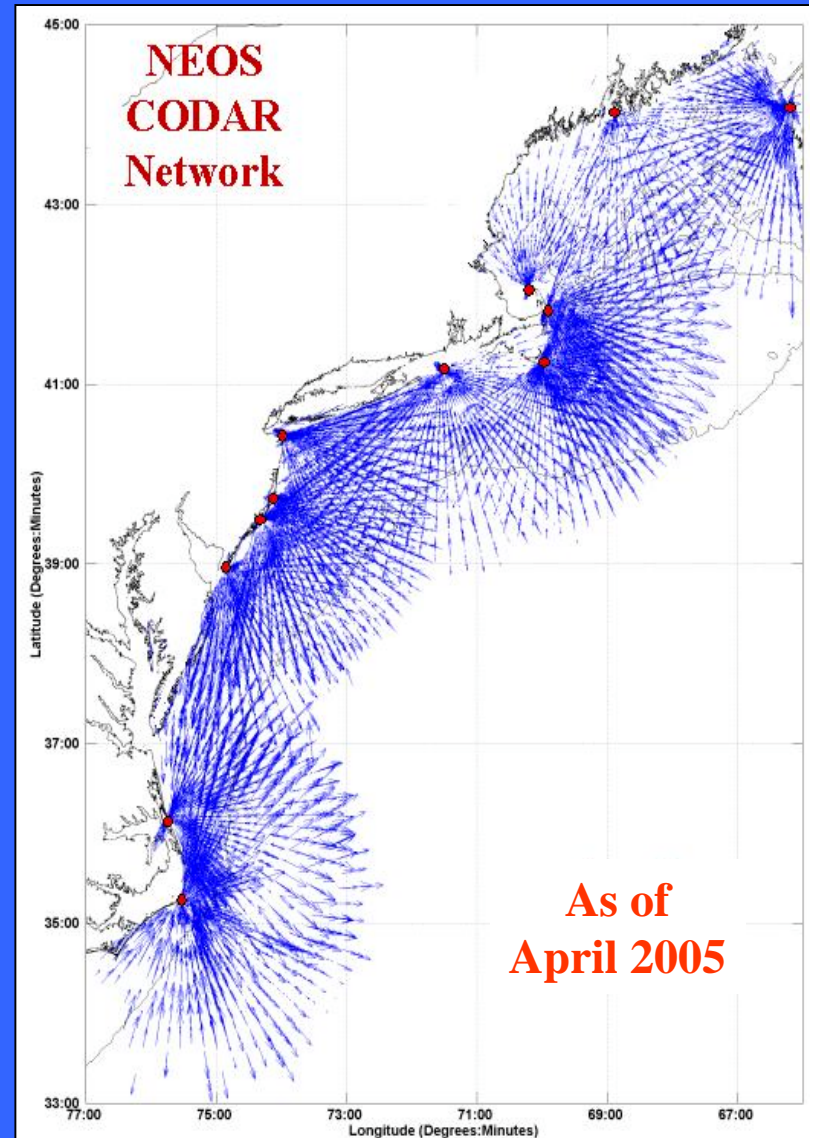
HF Radar Data Management System
Multiple Nodes to a Central Hub



From Eric Terrill, SIO

20 Radars Operating, 5 Funded

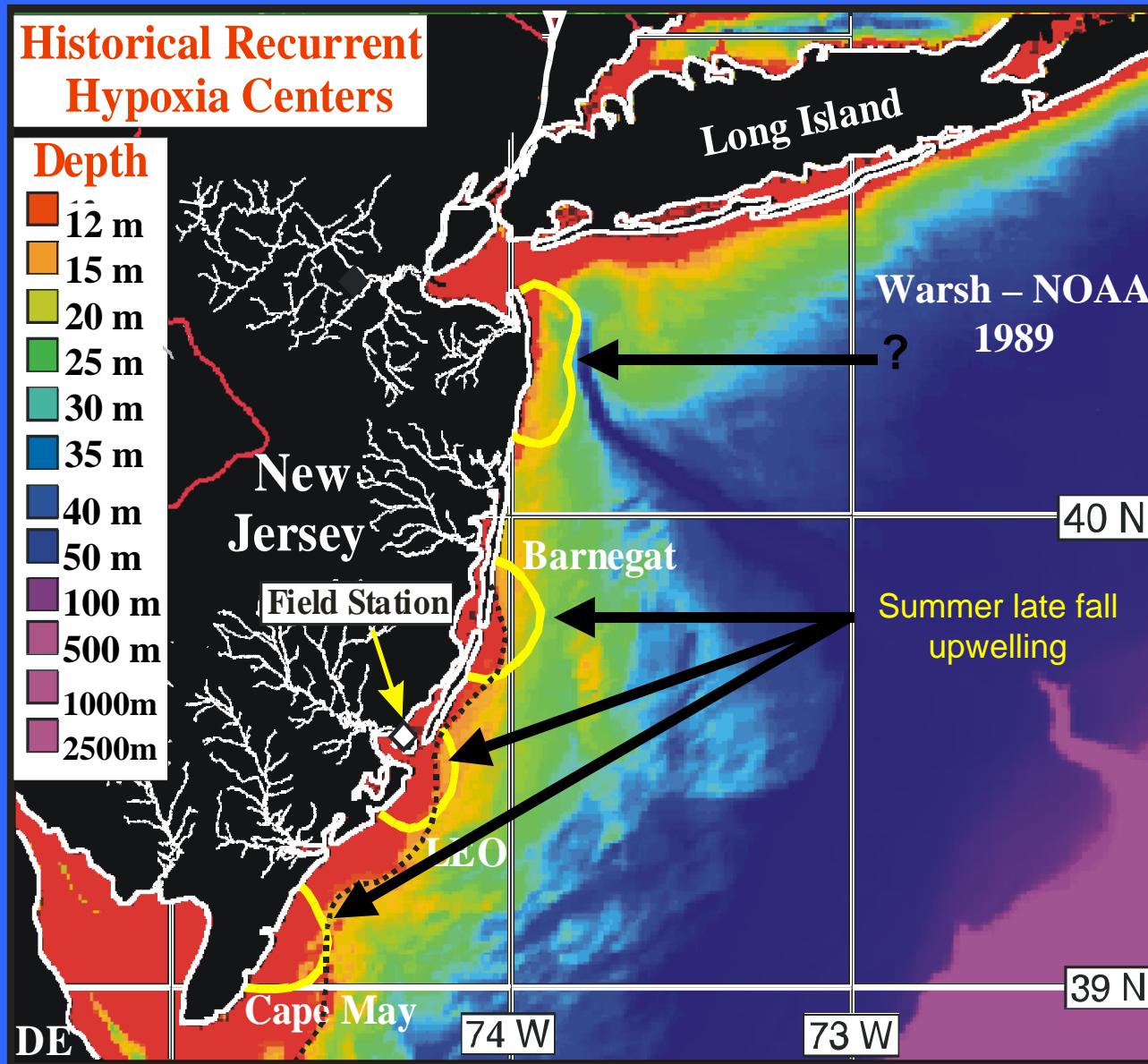
10 Radars
Operating,
20 Funded



COCMP
HF RADAR COVERAGE



Hypoxia/Anoxia & Bottom Bathymetry

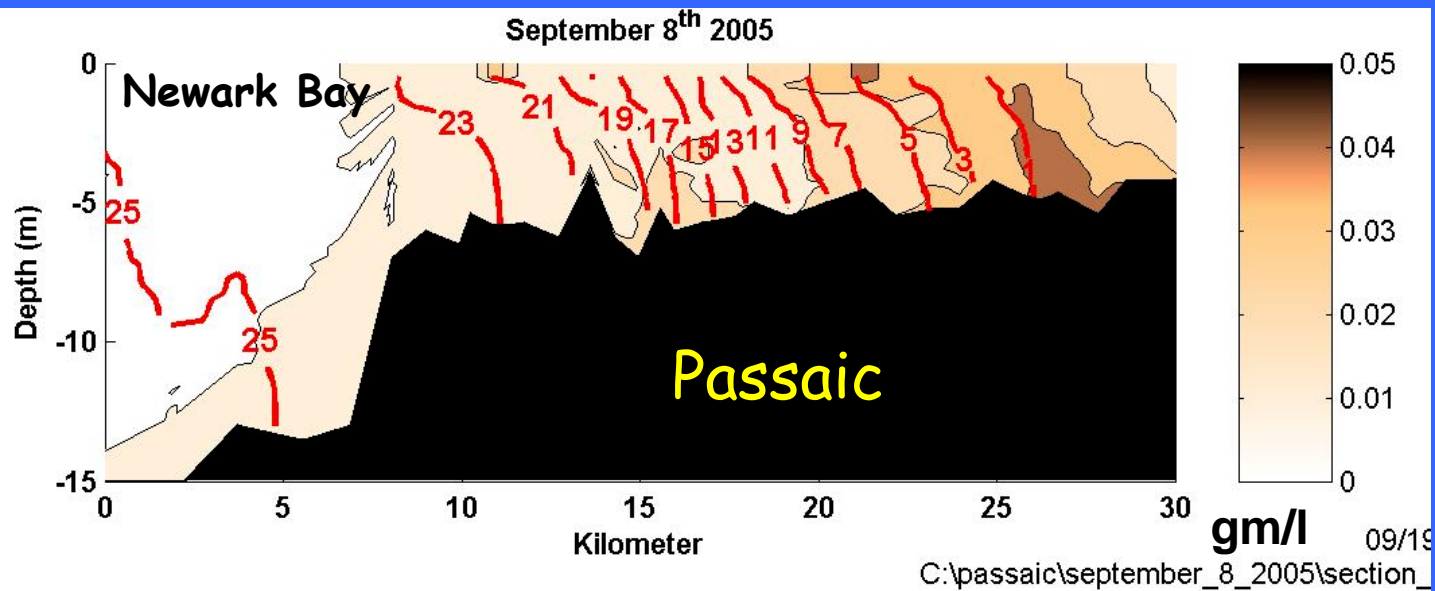


RGB Aqua 05/04/06 18:30 GMT

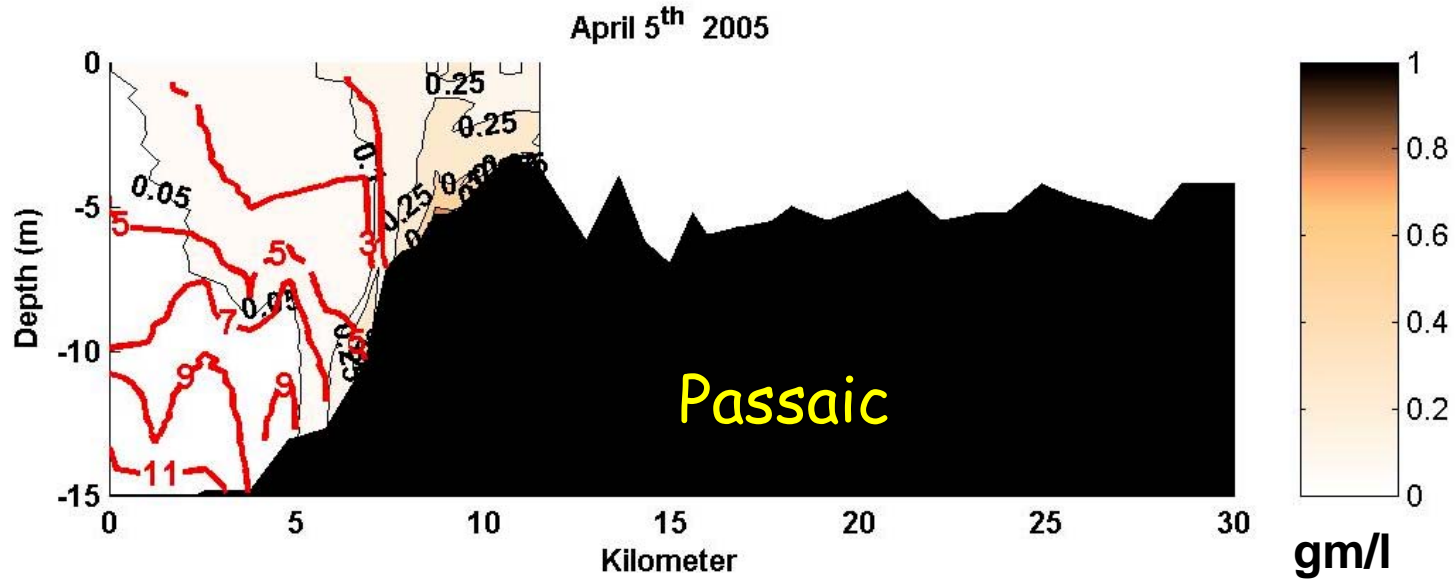


A satellite image from the Terra satellite showing a coastline. The land on the left is a mosaic of brown, green, and white, representing vegetation, urban areas, and clouds. The ocean on the right is a deep blue. A white box in the upper right corner contains the text "TERRA RGB" and "April 5th 2005".

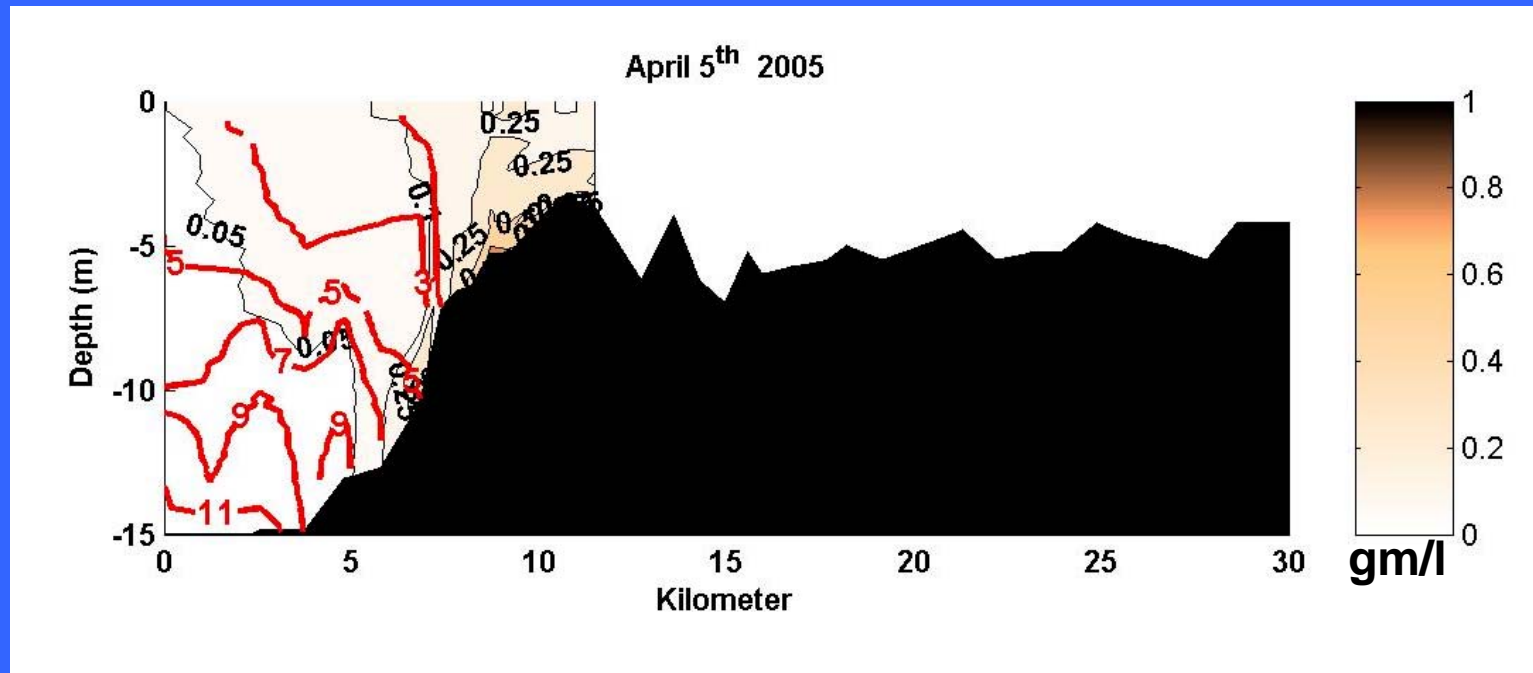
TERRA RGB
April 5th 2005



Low Flow



High Flow



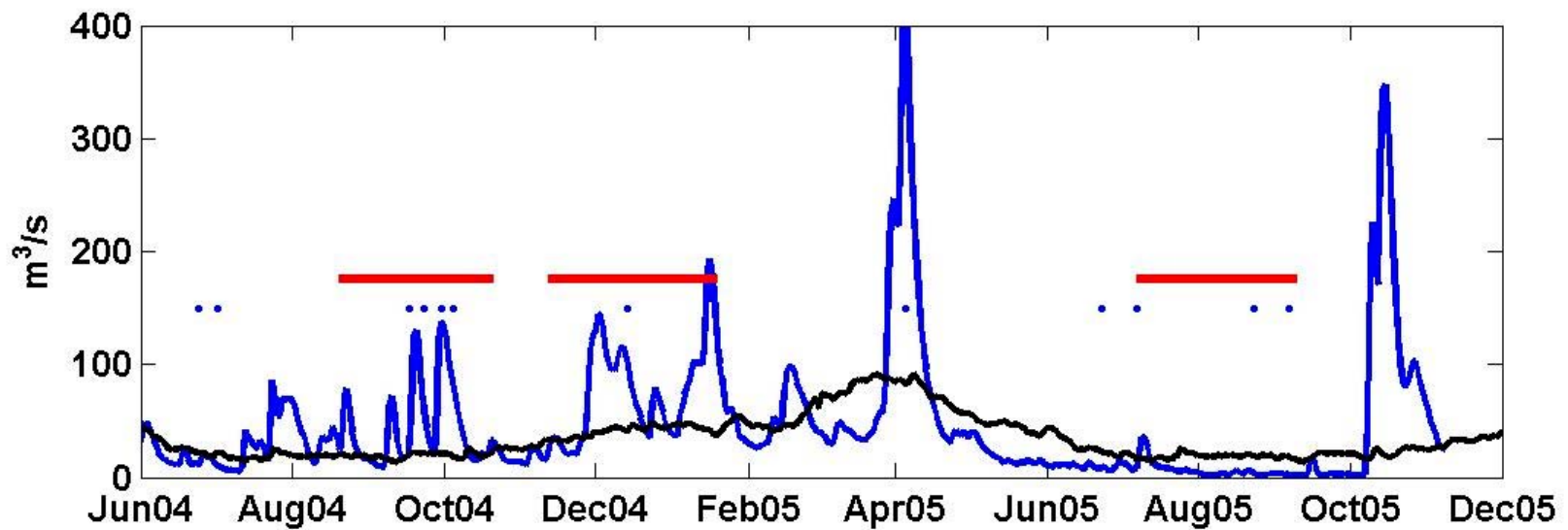
TSS Transport $\sim Q * TSS = 100 \text{ kg/s} \sim 10,000 \text{ MT/day}$

$Q = 400 \text{ m}^3/\text{s}$ $TSS \sim 250 \text{ gm/m}^3$

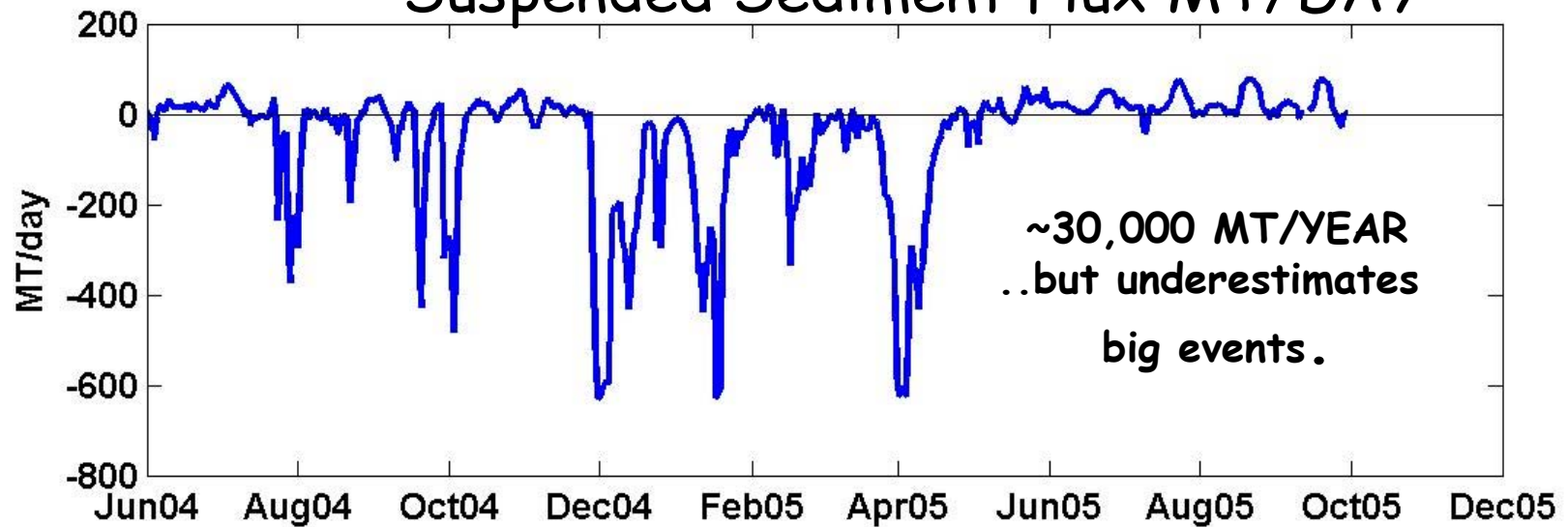
Q & $TSS \sim 10$ times above "normal"

- Transport 100 times above normal
- Export even relatively higher

If TCDD concentration .5 ppb event would transport 5 gms/day into Newark Bay



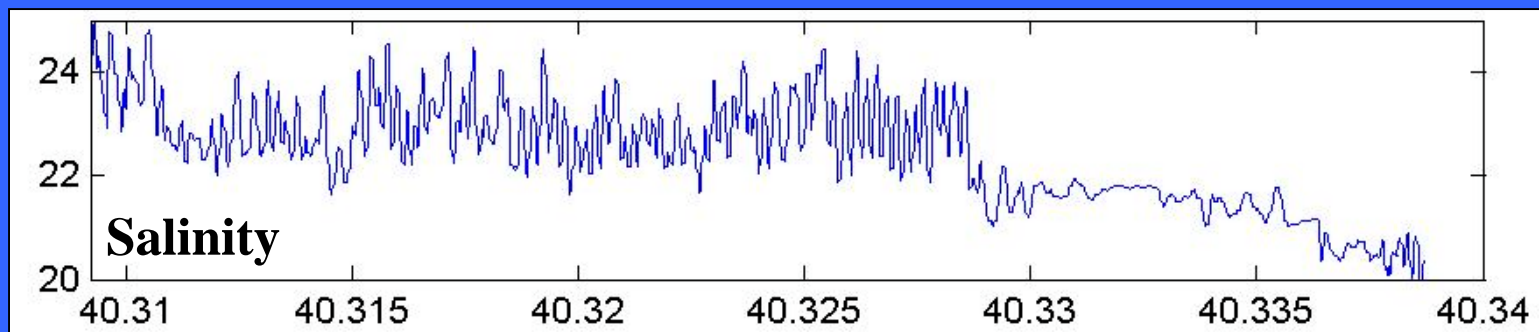
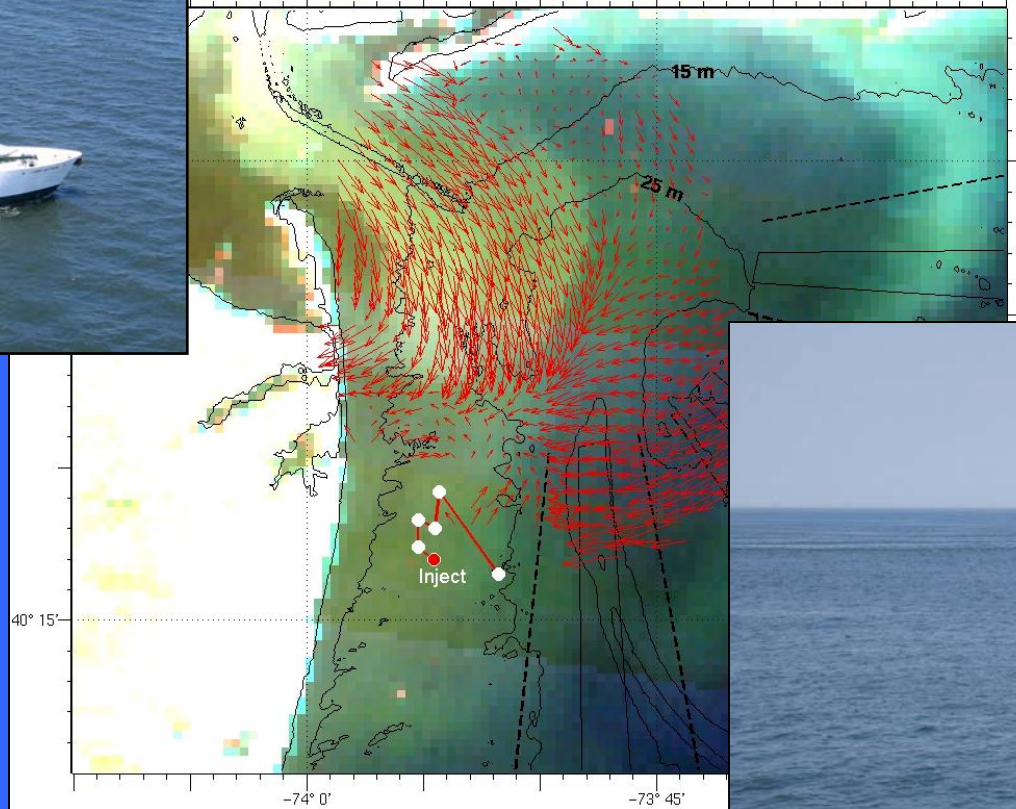
Suspended Sediment Flux MT/DAY



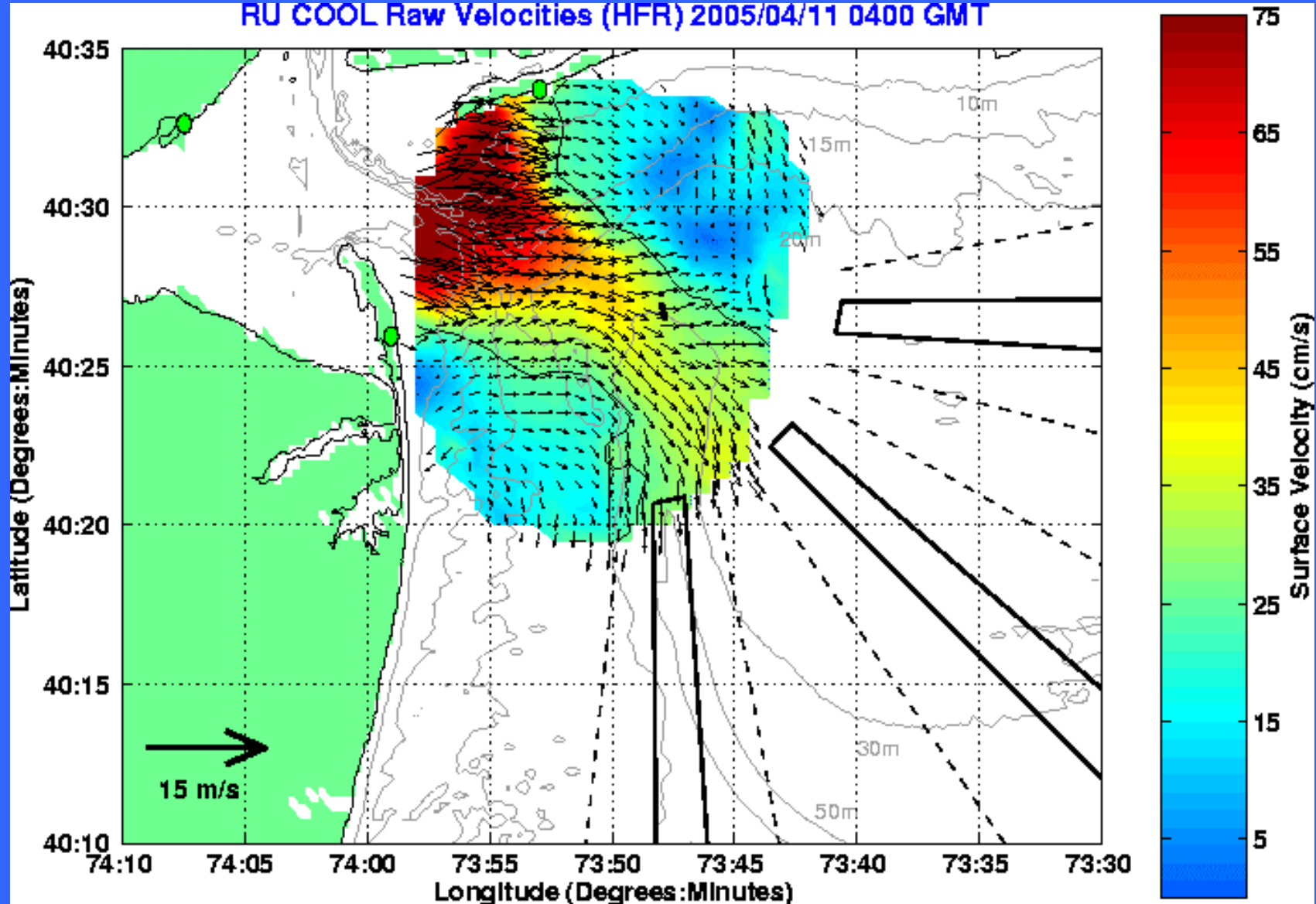
The buoyant pulse front looks like a tidal bore as it flows past the R/V Cape Hatteras (2005)



COOL Terra MODIS RGB: April 18, 2005 1538 GMT With Second Dye Track

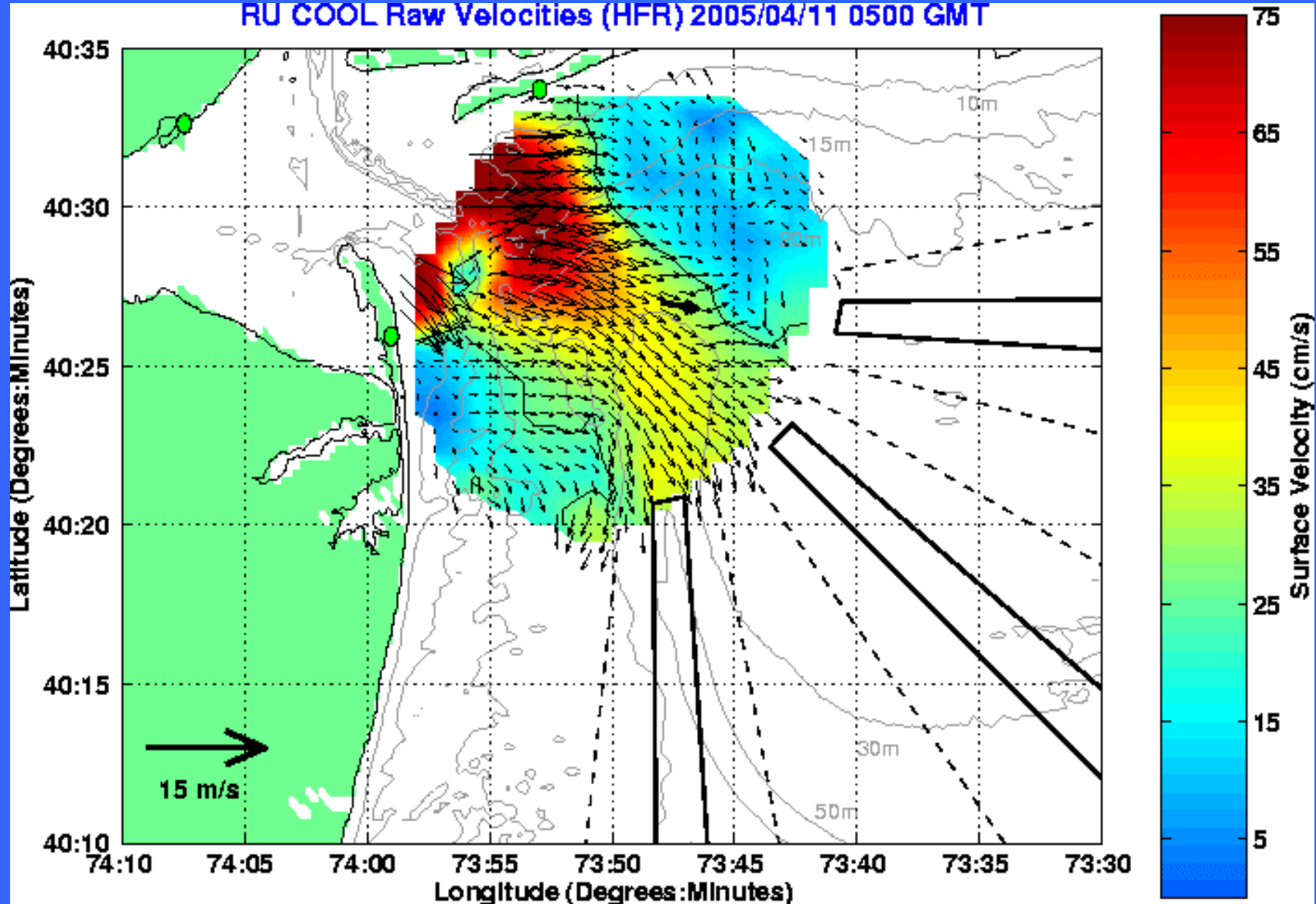


RU COOL Raw Velocities (HFR) 2005/04/11 0400 GMT



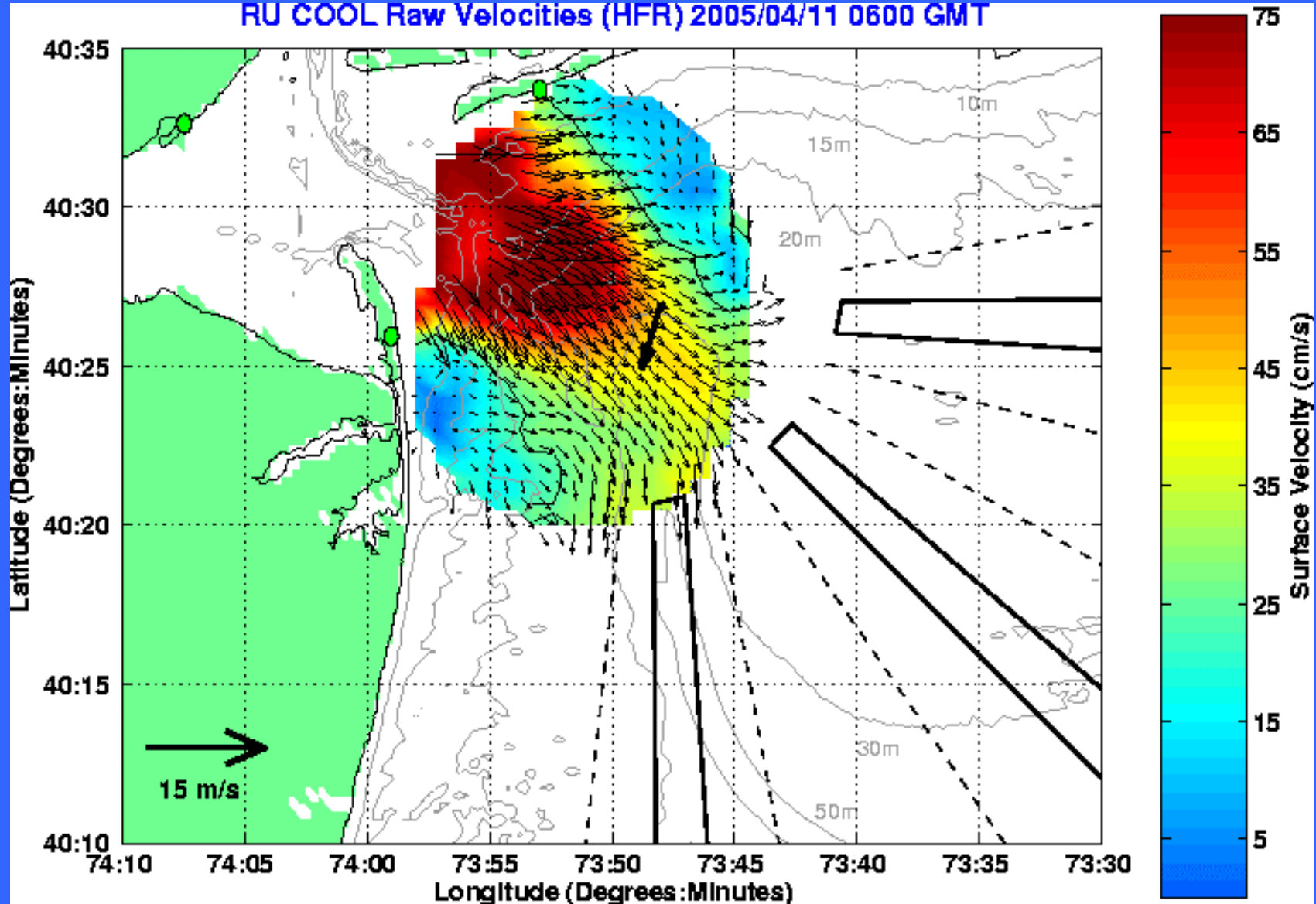
Wind data from NOAA NDBC station at Ambrose Light

RU COOL Raw Velocities (HFR) 2005/04/11 0500 GMT



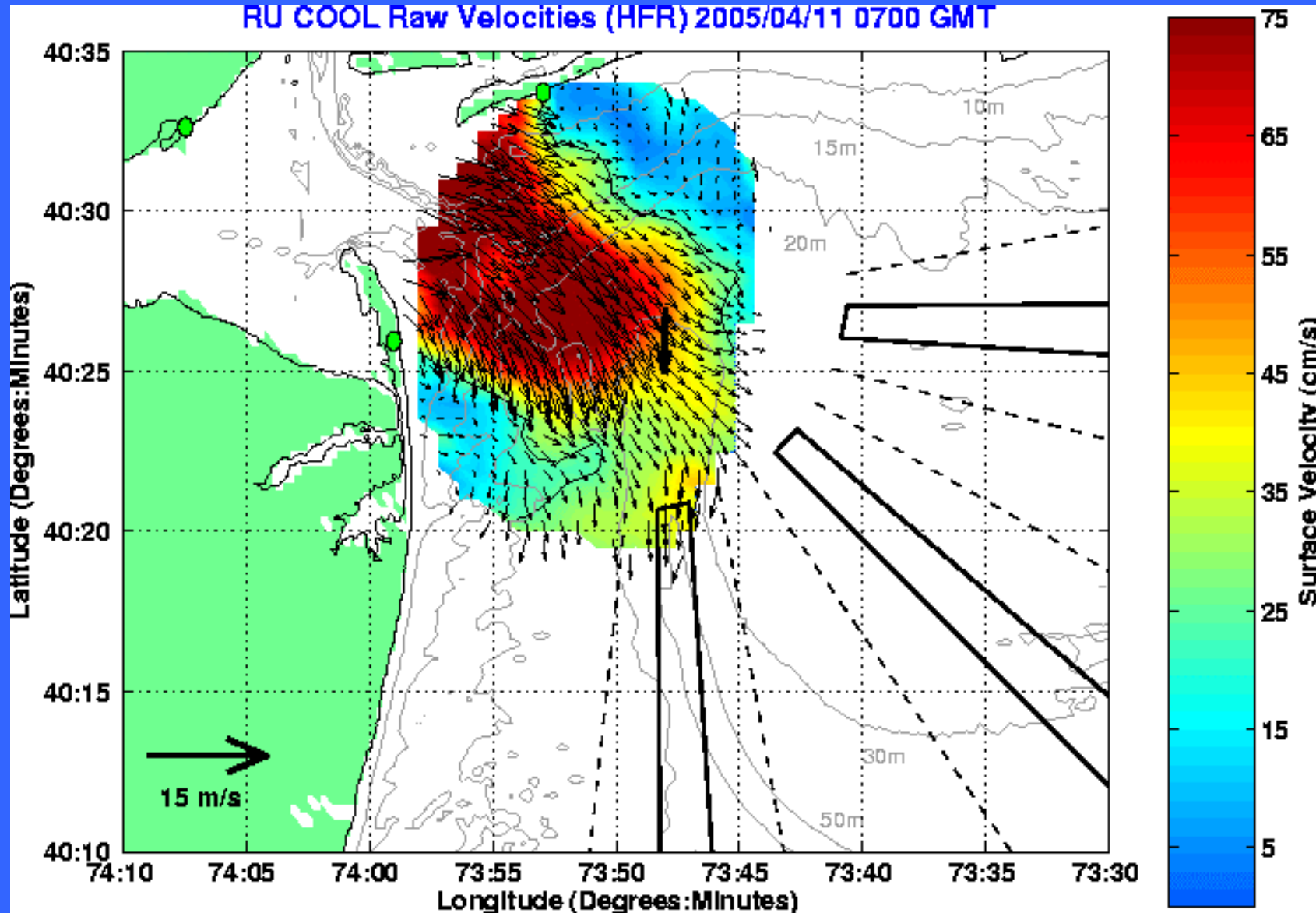
Wind data from NOAA NDBC station at Ambrose Light

RU COOL Raw Velocities (HFR) 2005/04/11 0600 GMT



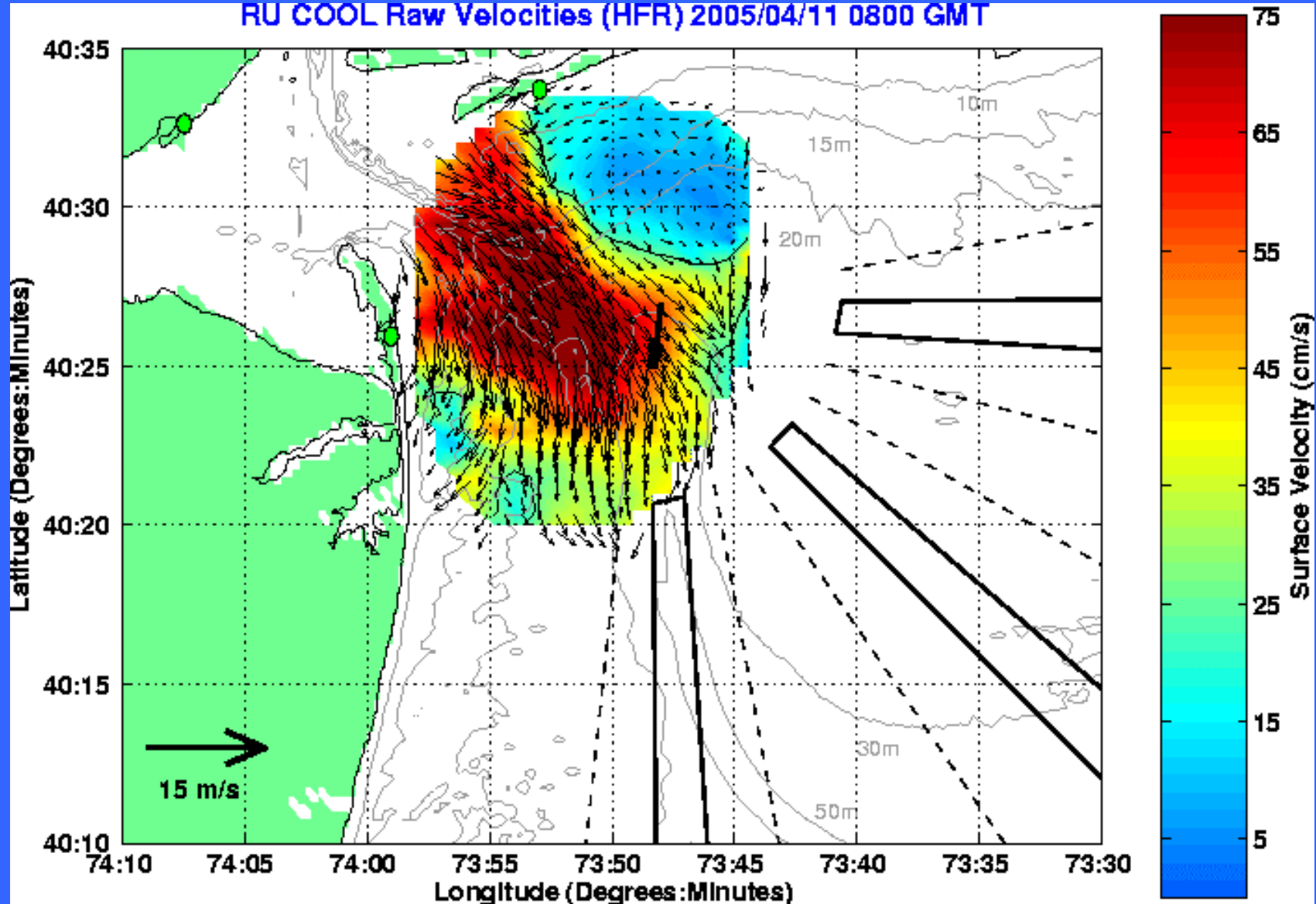
Wind data from NOAA NDBC station at Ambrose Light

RU COOL Raw Velocities (HFR) 2005/04/11 0700 GMT



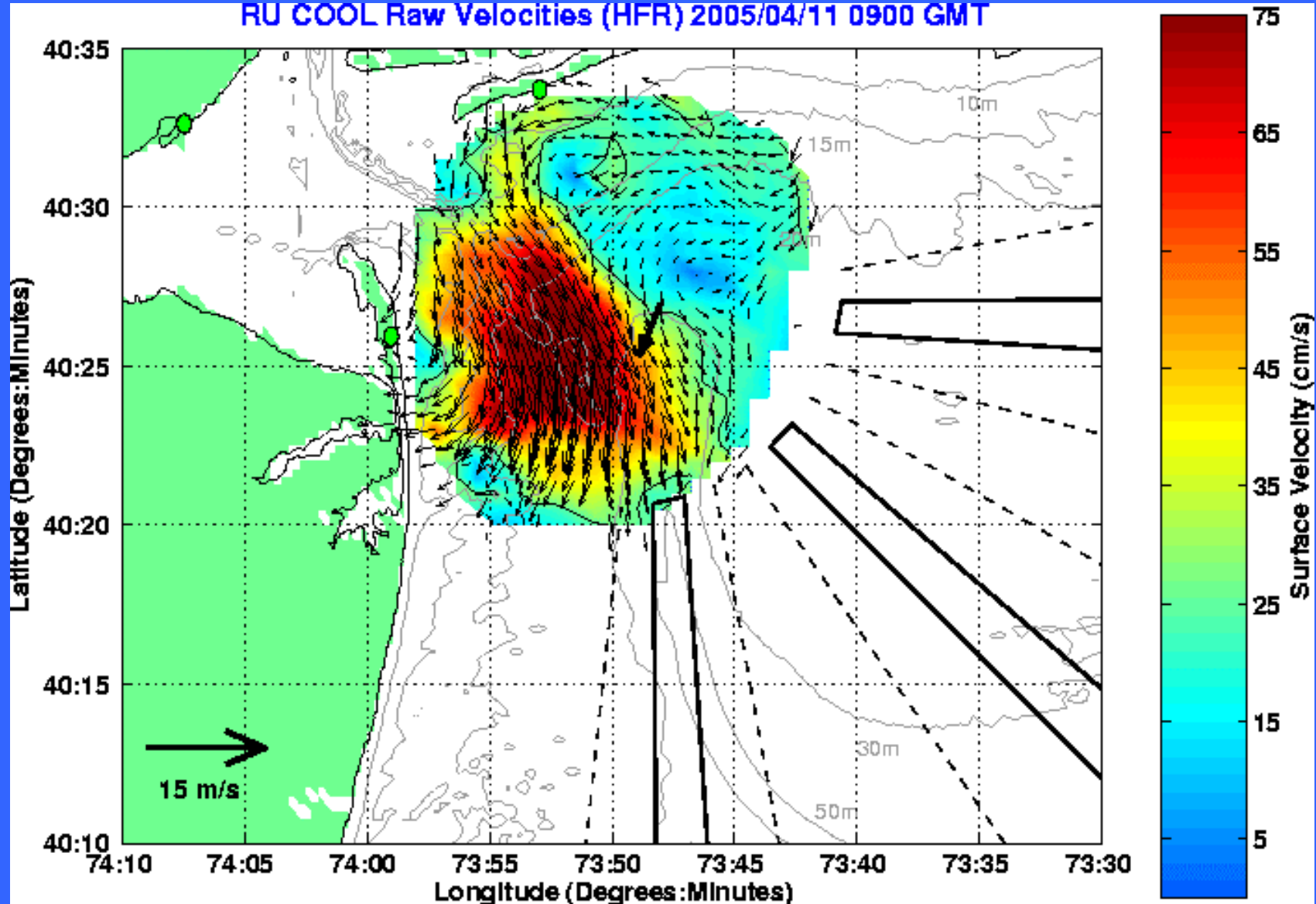
Wind data from NOAA NDBC station at Ambrose Light

RU COOL Raw Velocities (HFR) 2005/04/11 0800 GMT



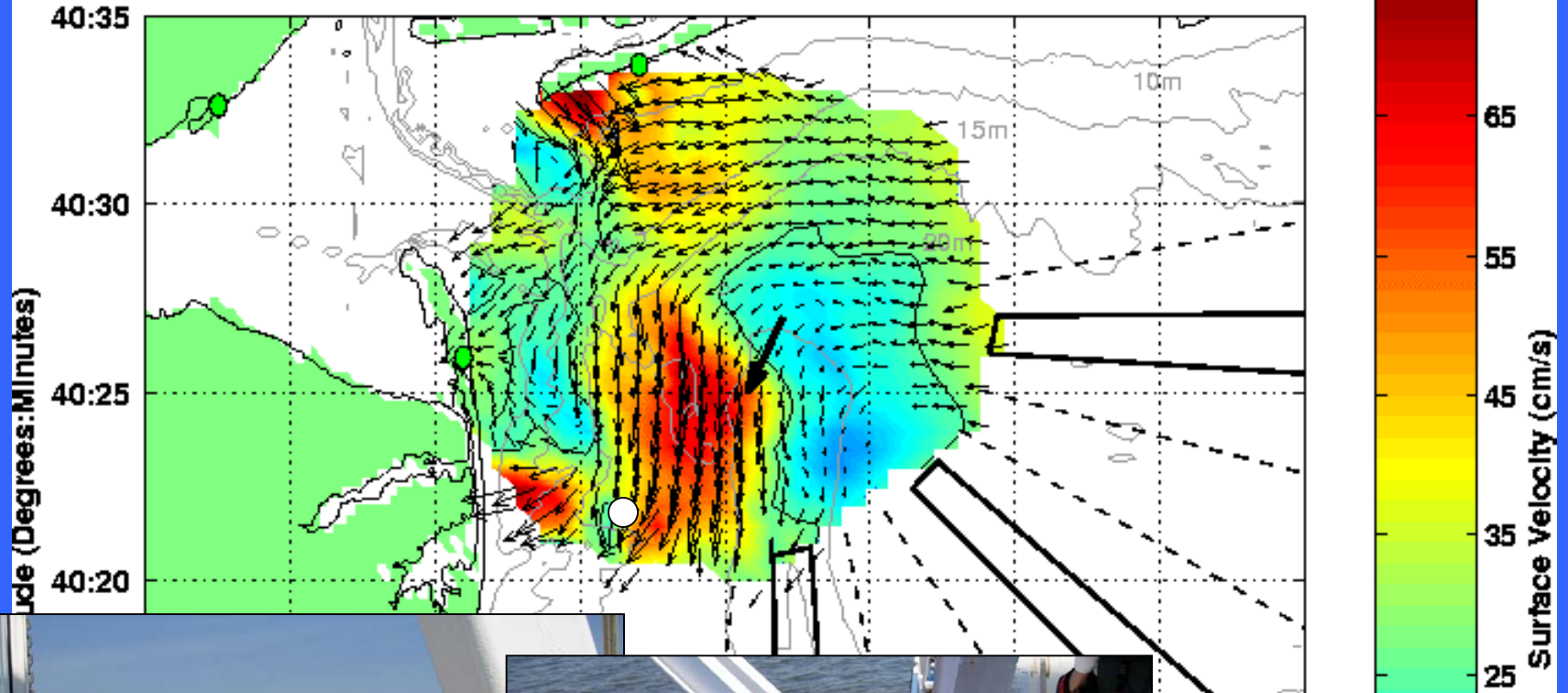
Wind data from NOAA NDBC station at Ambrose Light

RU COOL Raw Velocities (HFR) 2005/04/11 0900 GMT

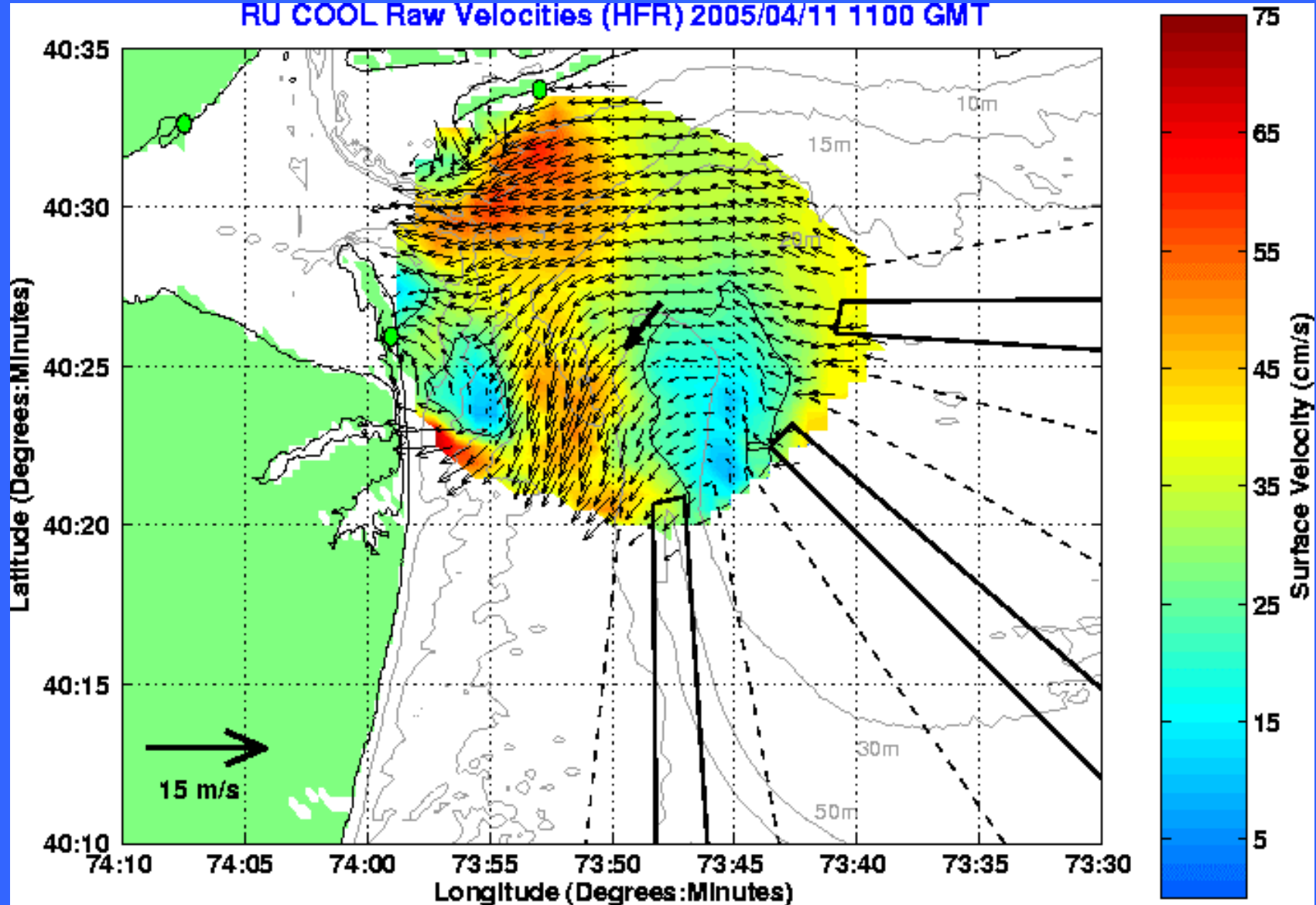


Wind data from NOAA NDBC station at Ambrose Light

RU COOL Raw Velocities (HFR) 2005/04/11 1000 GMT

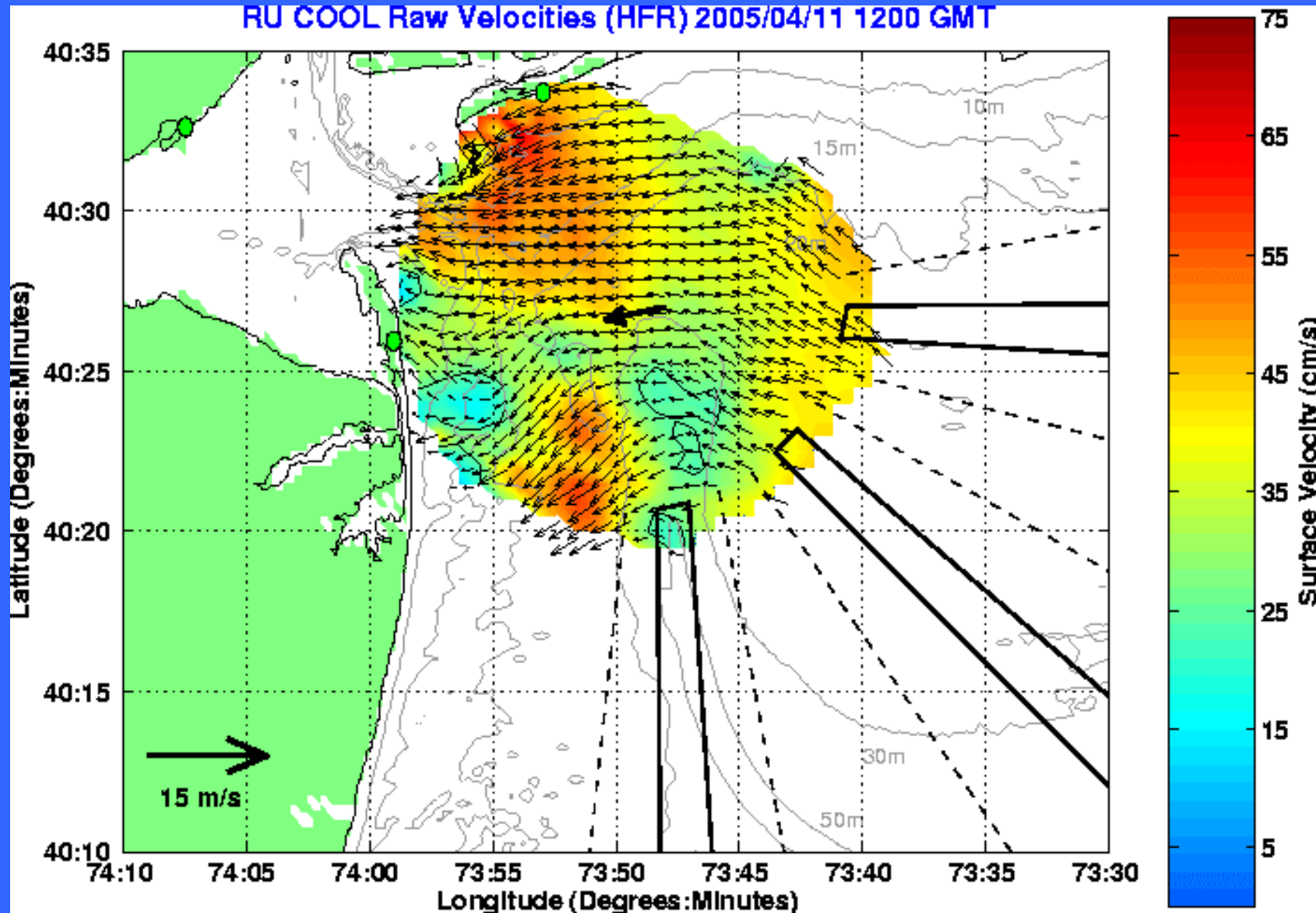


RU COOL Raw Velocities (HFR) 2005/04/11 1100 GMT



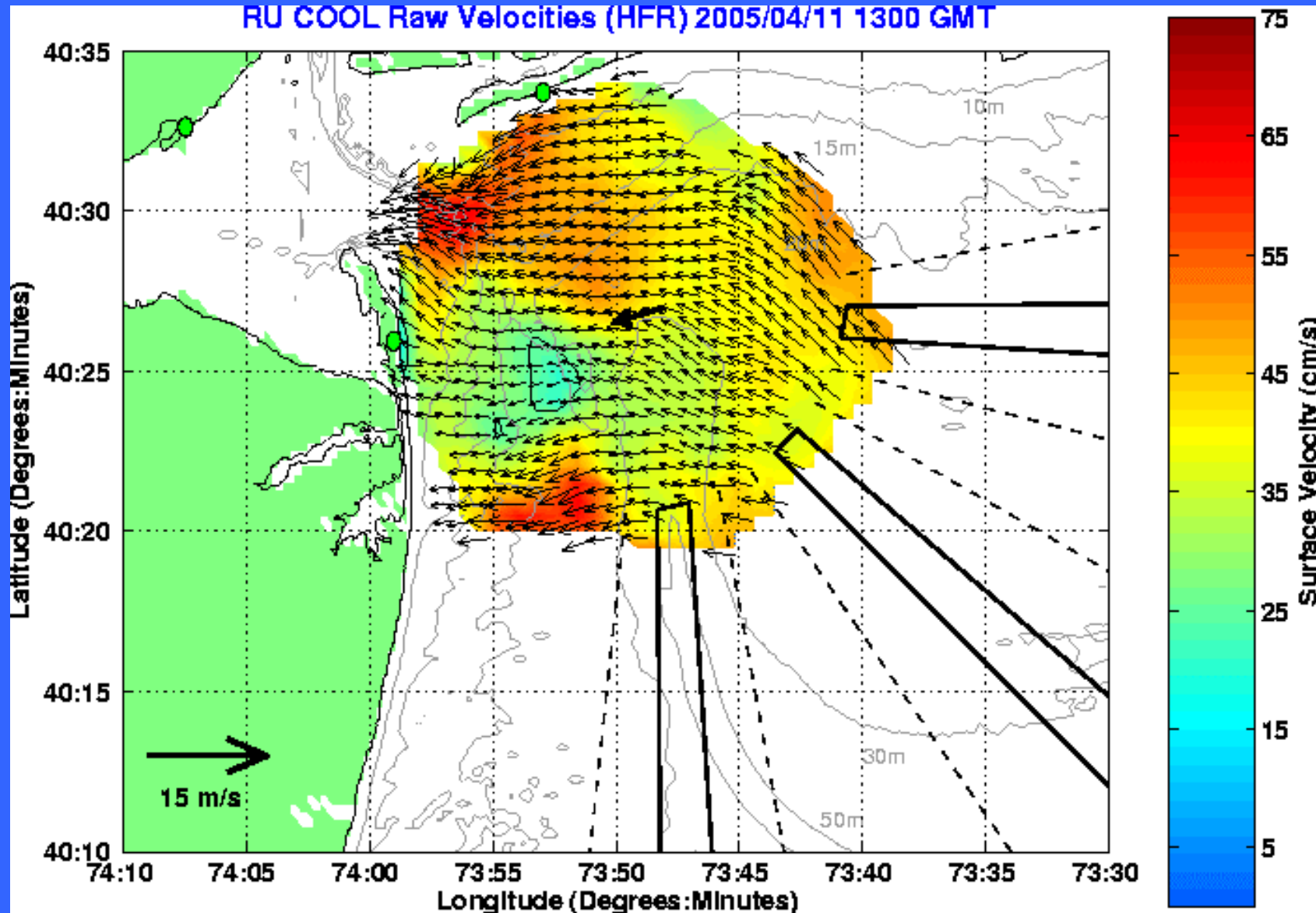
Wind data from NOAA NDBC station at Ambrose Light

RU COOL Raw Velocities (HFR) 2005/04/11 1200 GMT



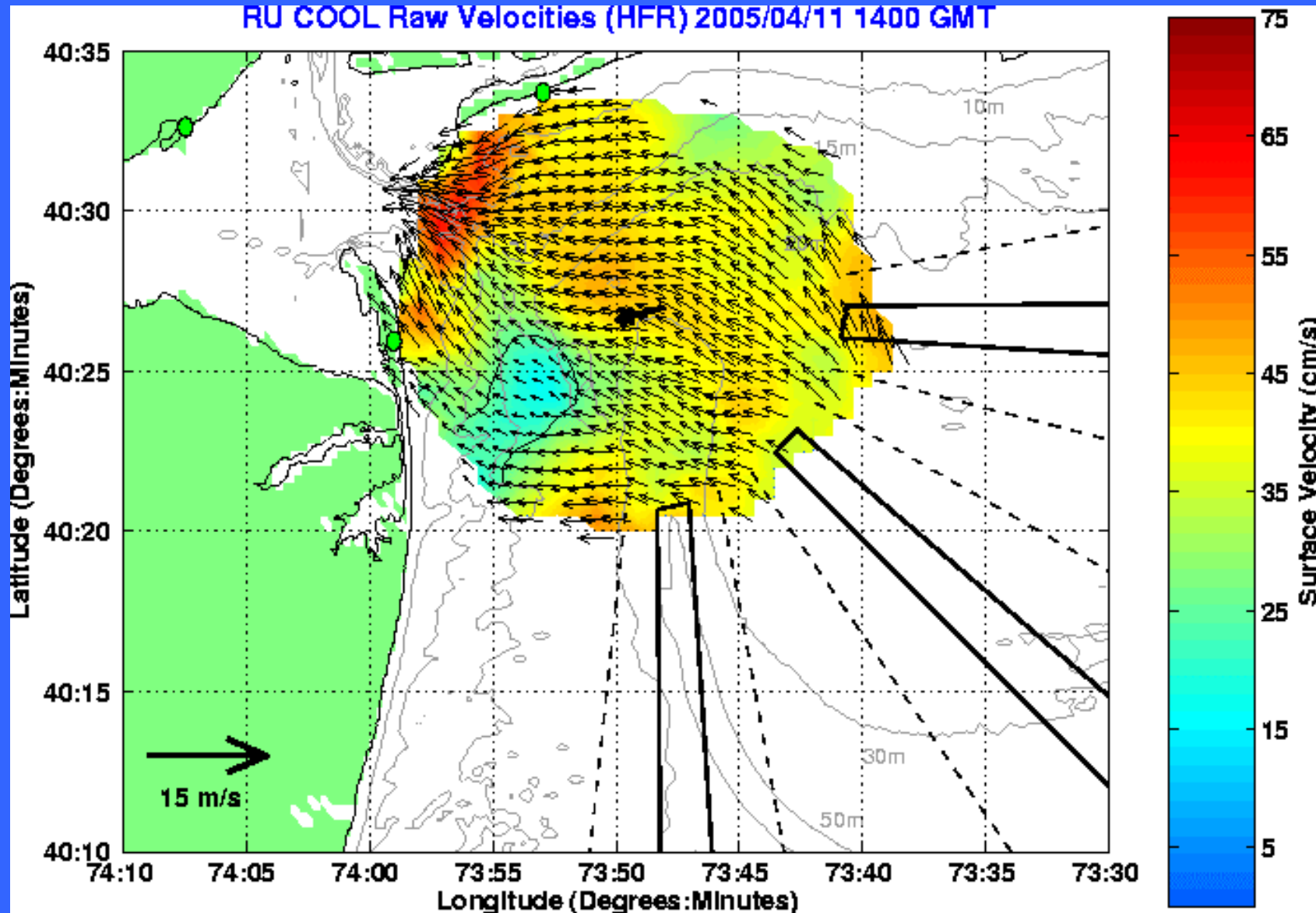
Wind data from NOAA NDBC station at Ambrose Light

RU COOL Raw Velocities (HFR) 2005/04/11 1300 GMT



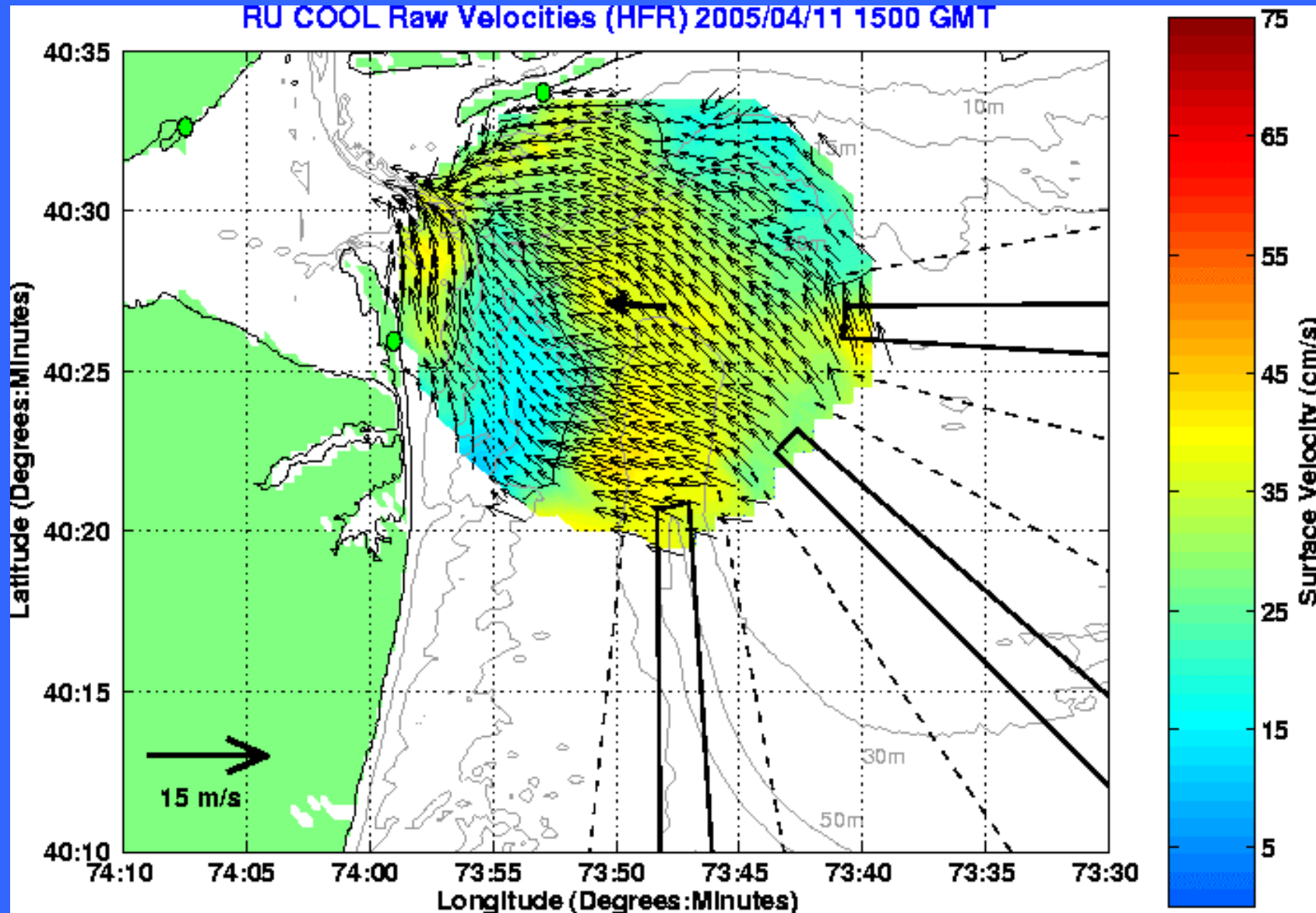
Wind data from NOAA NDBC station at Ambrose Light

RU COOL Raw Velocities (HFR) 2005/04/11 1400 GMT



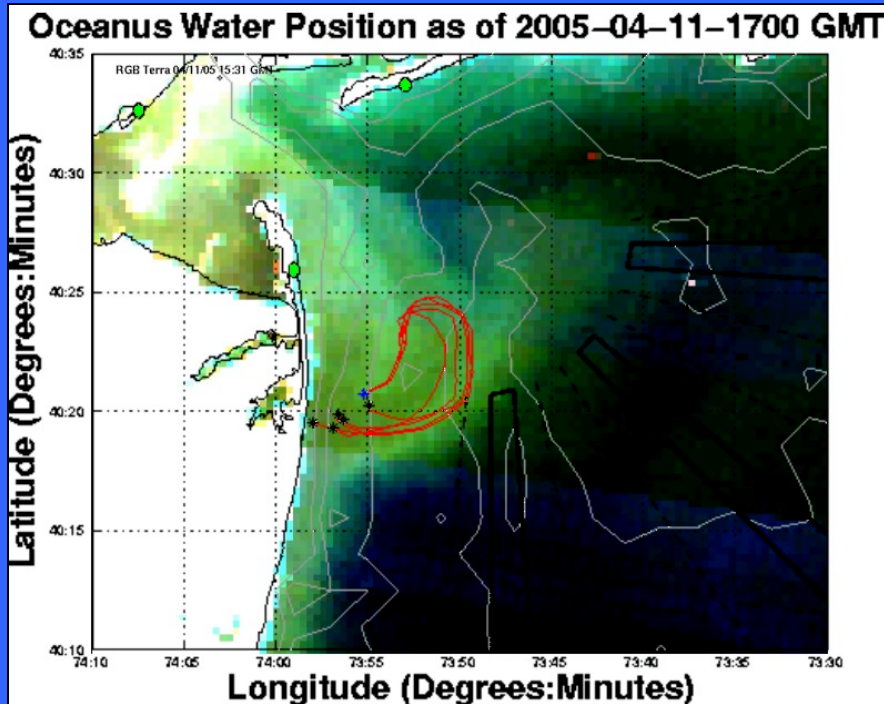
Wind data from NOAA NDBC station at Ambrose Light

RU COOL Raw Velocities (HFR) 2005/04/11 1500 GMT



Wind data from NOAA NDBC station at Ambrose Light

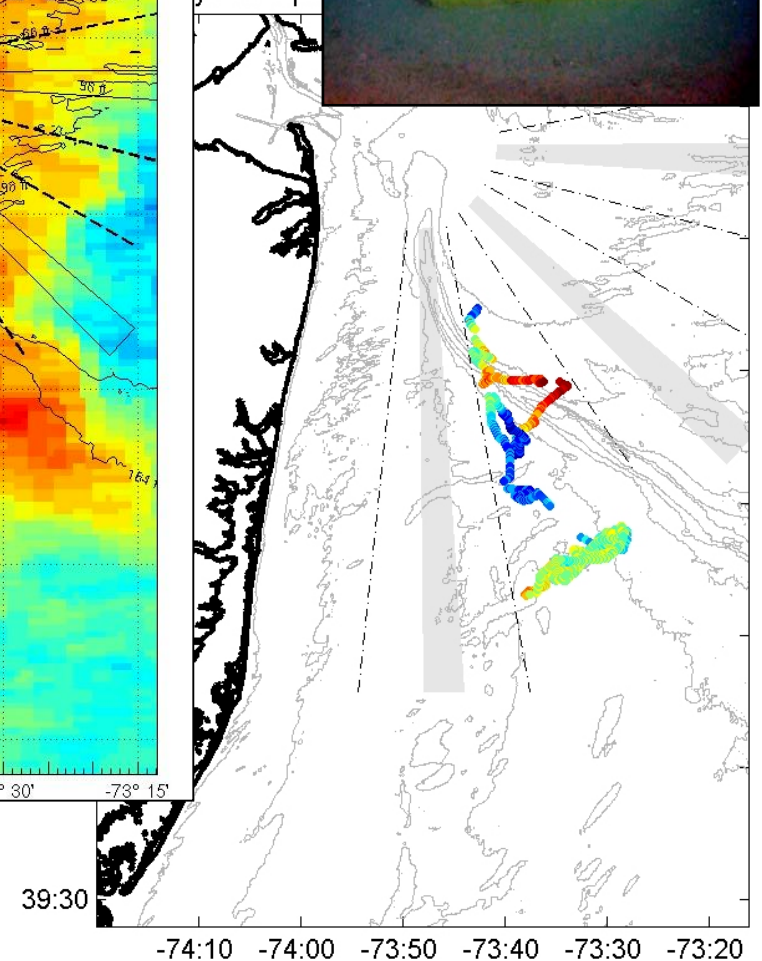
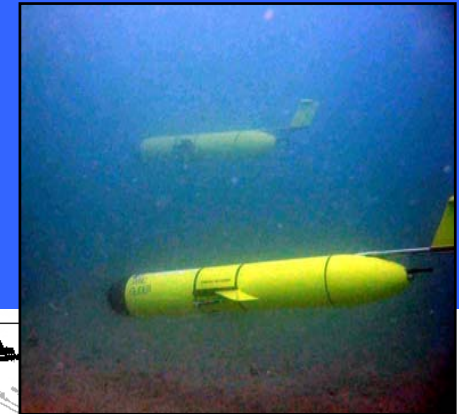
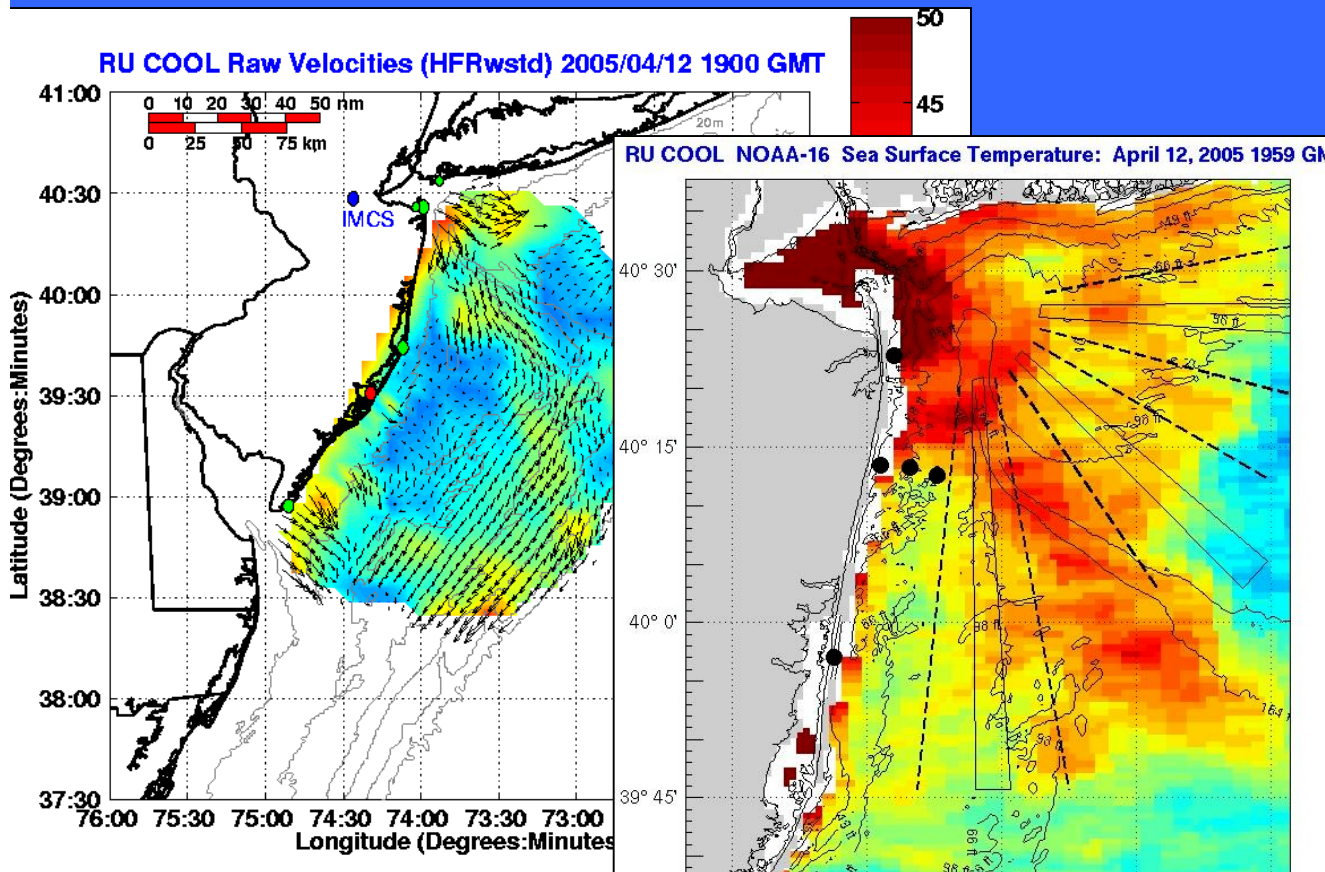
The Nearshore Recirculation: A Potential Incubator (known to locals as the Frazer eddy)



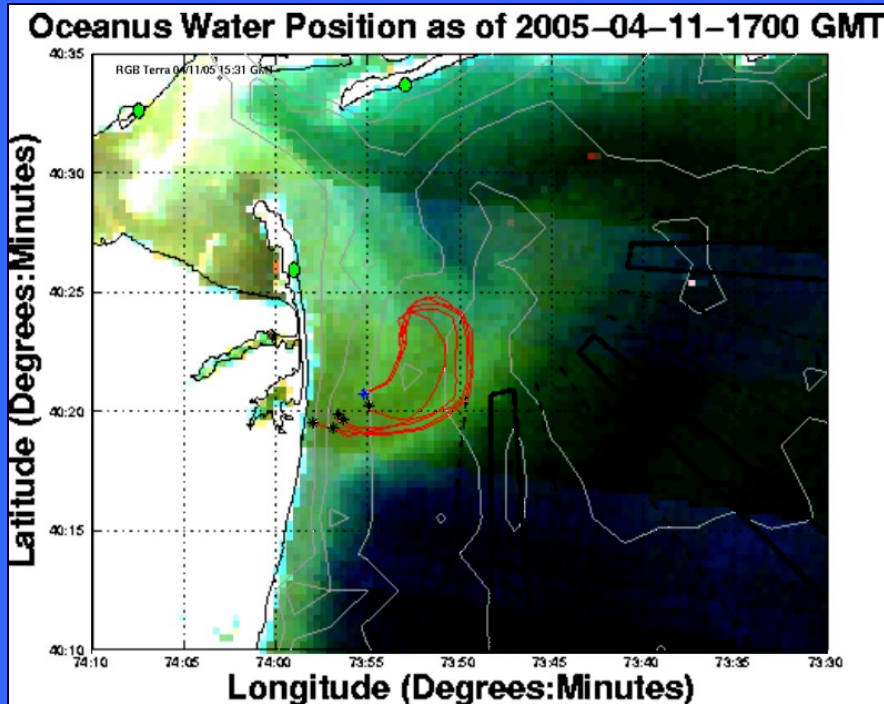
A Biological Incubator
Abundant Nutrients
Large Phytoplankton
Plunging DO



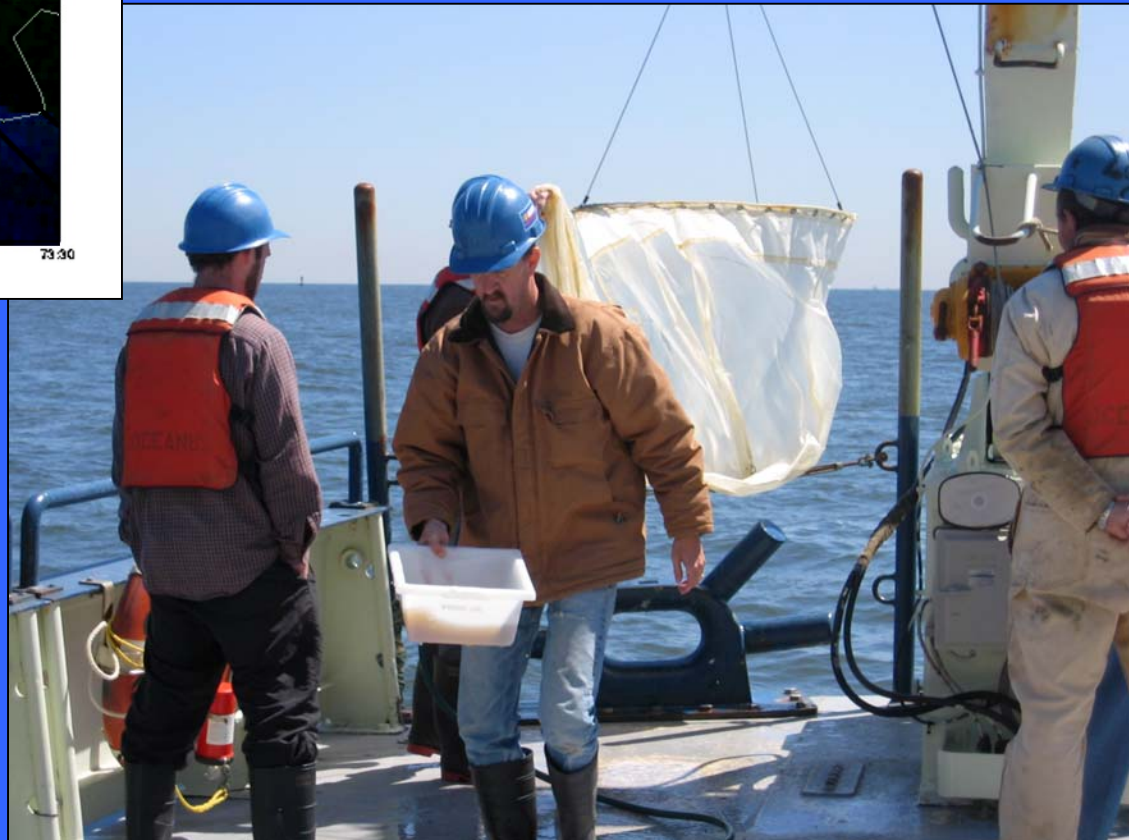
Freshwater Plume Moves Out Across the Shelf: Hudson Shelf Valley



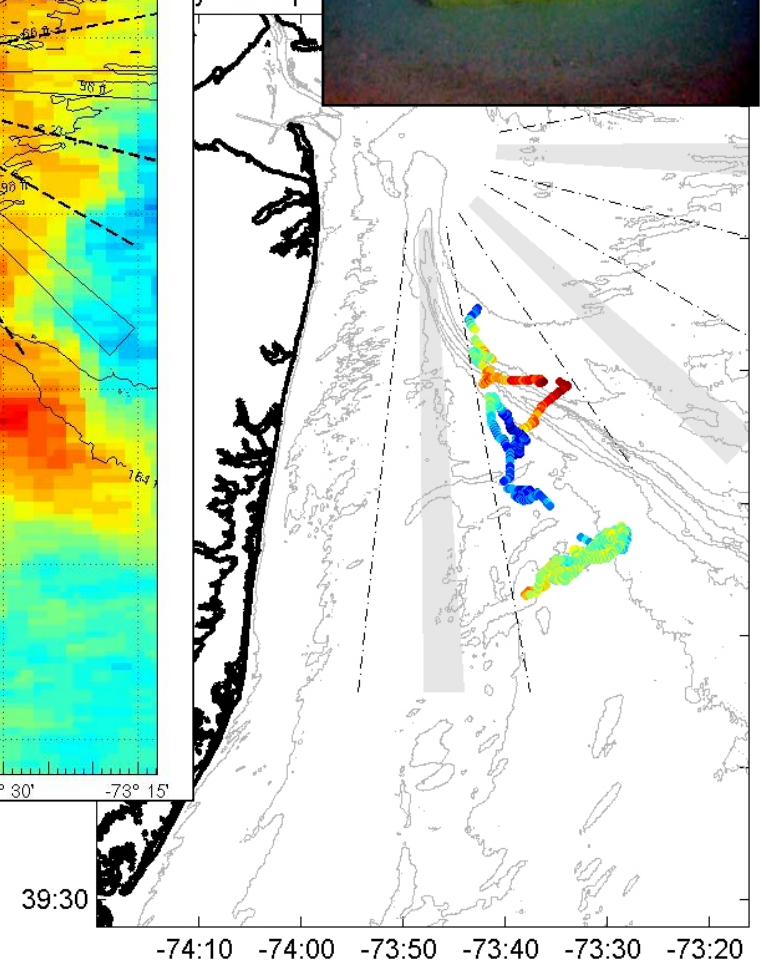
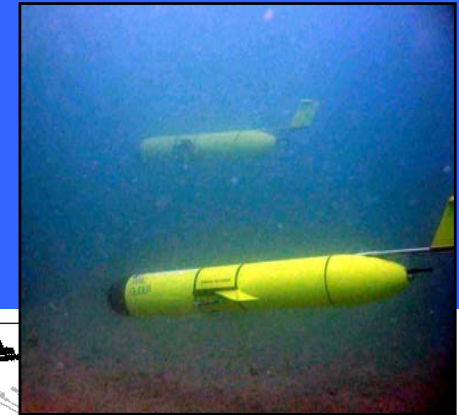
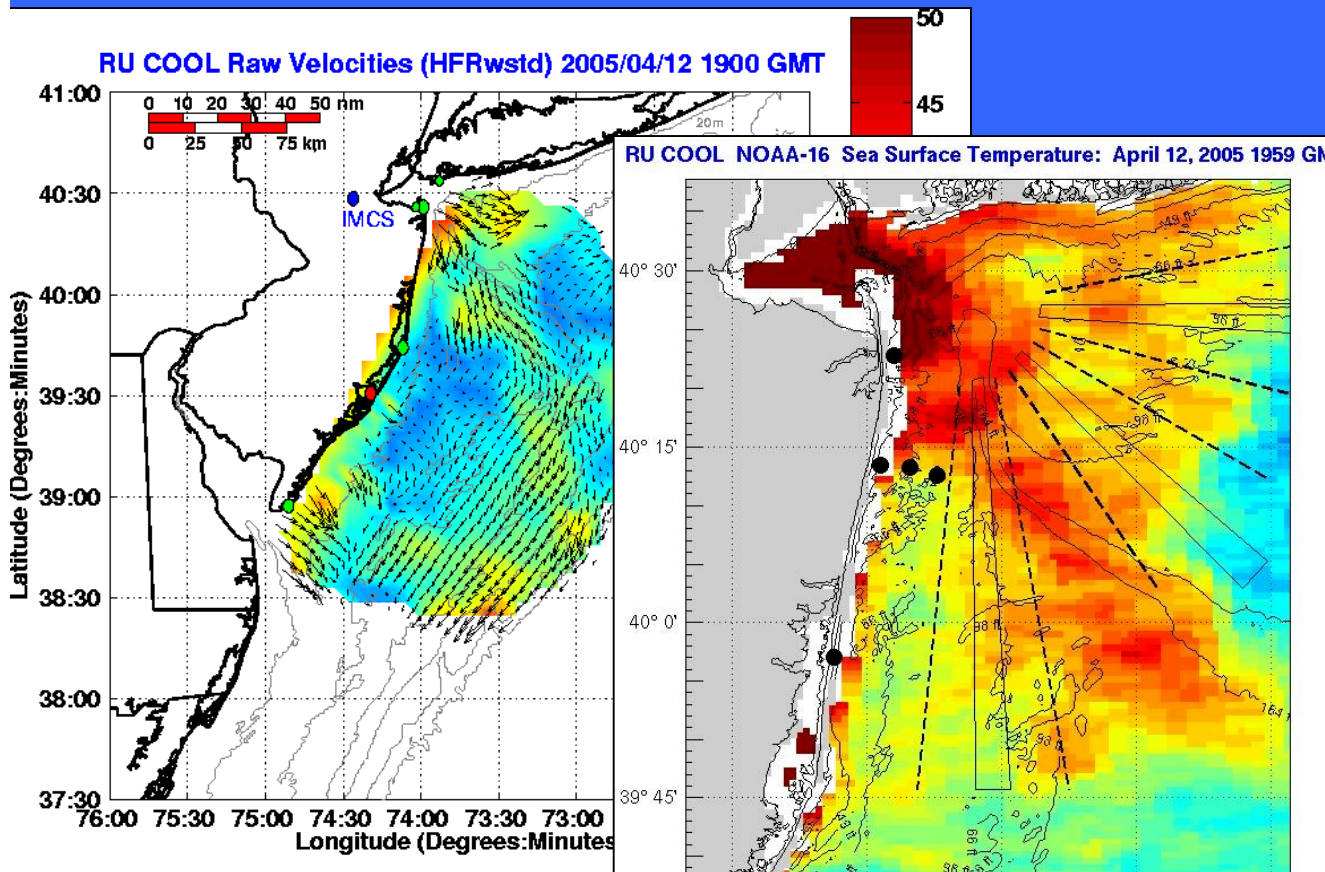
The Nearshore Recirculation: A Potential Incubator (known to locals as the Frazer eddy)



A Biological Incubator
Abundant Nutrients
Large Phytoplankton
Plunging DO

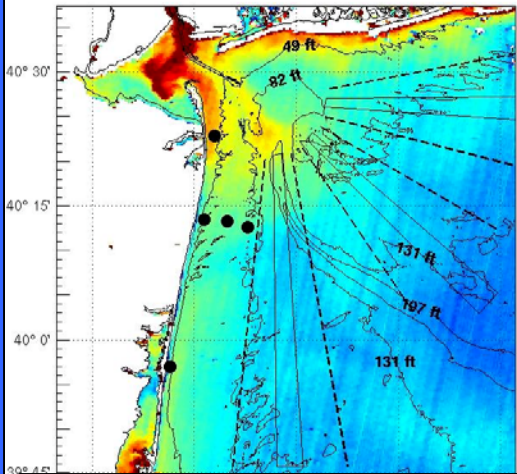


Freshwater Plume Moves Out Across the Shelf: Hudson Shelf Valley

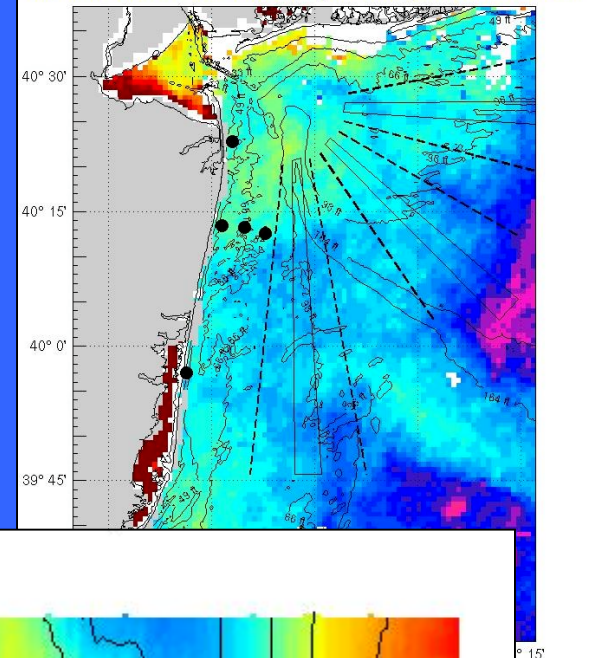


Freshwater Plume Moves Out Across the Shelf: Water Mass Boundaries (Oliver et al., 2004)

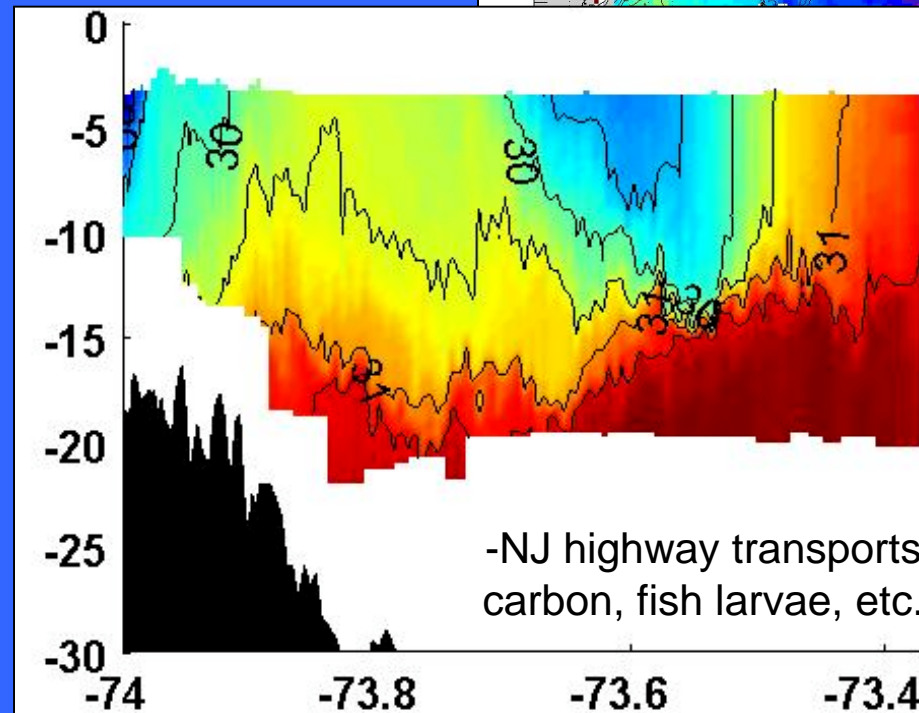
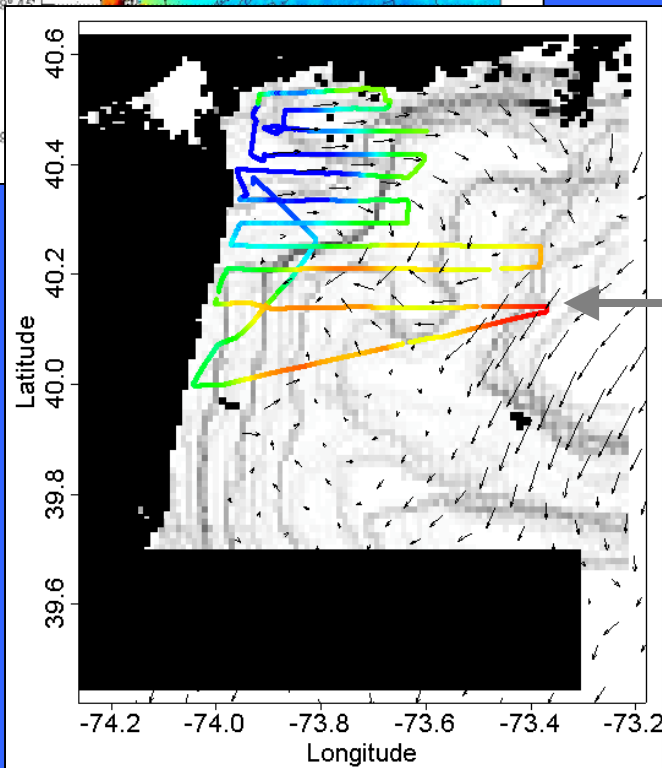
RU COOL Oceansat Chlorophyll: April 13, 2005 1713 GMT



RU COOL NOAA-17 Sea Surface Temperature: April 13, 2005 1546 GMT



April 13, 2005



-NJ highway transports
carbon, fish larvae, etc.

International Programs

- Global Ocean Observing System
- Census of Marine Life
- Ocean Biogeographic Information System

EXPLORE DATA ON LOCATIONS OF MARINE ANIMALS AND PLANTS

Obtain data tables, maps and predict distributions using environmental information

9.3 million records of 55,000 species from 108 databases

SEARCH BY NAME

"Great white shark" or "Carcharodon" or "Carcharodon carcharias"

Search >>

[Advanced Search](#) including date, depth, dataset [Browse by taxonomic groups](#)


SEARCH BY GEOGRAPHY


Search latitude: 40 - 40.5 N
longitude: 74 - 73.5 W

0.5° search area

Search >>



Name Search 

Search 

[Advanced Search](#)

[Browse by taxonomic groups](#)

[Would you like to give us any feedback on OBIS? Click here to take our survey.](#)

RESULTS

How to [cite OBIS data](#)

Sort by: Scientific name Common name Higher taxon Number of global records

Search criteria included:
" latitude 40.0 N - 40.5 N, longitude 74.0 W -
73.5 W "

Results 1 - 10 (of 218)

Balaenoptera (unspecified)

a whale, 1101 global records

Balaenoptera acutorostrata "Minke whale"

a whale, name verified, 6771 global records

Balaenoptera physalus "fin whale"

a whale, name verified, 51054 global records

Tursiops truncatus "bottle-nosed dolphin"

a dolphin/small toothed whale, name verified, 12702 global records

Phoca vitulina "harbor seal"

a seal/sea lion/walrus, name verified, 1319 global records

Calonectris diomedea "cory's shearwater"

a bird, name verified, 2218 global records

Larus (unspecified)

a bird, 6302 global records

Larus argentatus "herring gull"

a bird, name verified, 27698 global records

Larus atricilla "laughing gull"

a bird, name verified, 2340 global records

Larus delawarensis "ring-billed gull"

a bird, name verified, 372 global records

Result page: [1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) [Next](#)

Name Search

Search >>

[Advanced Search](#)

[Browse by taxonomic groups](#)

[Would you like to give us any feedback on OBIS? Click here to take our survey.](#)

RESULTS

[How to cite OBIS data](#)

Sort by: Scientific name Common name Higher taxon Number of global records

Search criteria included:
" latitude 40.0 N - 40.5 N, longitude 74.0 W -
73.5 W "

Results 31 - 40(of 218)

Caretta caretta "loggerhead"
a turtle, name verified, 18313 global records

Chelonia mydas "common green sea turtle"
a turtle, name verified, 859 global records

Dermochelys coriacea "leatherback"
a turtle, name verified, 524 global records

Alosa aestivalis "Blueback shad"
a fish, name verified, 1009 global records

Alosa mediocris "Hickory shad"
a fish, name verified, 19 global records

Alosa pseudoharengus "Alewife"
a fish, name verified, 5903 global records

Alosa sapidissima "American shad"
a fish, name verified, 1438 global records

Ammodytes dubius "Northern sand lance"
a fish, name verified, 3535 global records

Brevoortia(unspecified)
a fish, 755 global records

Caranx hippos "Crevalle jack"
a fish, name verified, 1021 global records

Result page: [Previous](#) [4](#) [5](#) [6](#) [7](#) [8](#) [9](#) [10](#) [Next](#)

Name Search

Search >>

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RESULTS

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Sort by: Scientific name Common name Higher taxon Number of global records

Search criteria included:
" latitude 40.0 N - 40.5 N, longitude 74.0 W -
73.5 W "

Results 71 - 80(of 218)

Prionotus carolinus "Northern searobin"
a fish, name verified, 3545 global records

Prionotus evolans "Striped searobin"
a fish, name verified, 320 global records

Scomber scombrus "Atlantic mackerel"
a fish, name verified, 5119 global records

Scophthalmus aquosus "Windowpane"
a fish, name verified, 5413 global records

Sphoeroides maculatus "Northern puffer"
a fish, name verified, 177 global records

Squalus acanthias "Blue dog"
a fish, name verified, 23033 global records


Stenotomus chrysops "Scup"
a fish, name verified, 1087 global records


Tautoglabrus adspersus "Blue perch"
a fish, name verified, 2241 global records

Urophycis chuss "Ling"
a fish, name verified, 10956 global records

Urophycis regia "Spotted codling"
a fish, name verified, 2450 global records

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Name Search 

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Sort by: Scientific name Common name Higher taxon Number of global records

Search criteria included:
" latitude 40.0 N - 40.5 N, longitude 74.0 W -
73.5 W "

Results 91 - 100(of 218)

[Homarus americanus](#) "American lobster"
a decapod, name verified, 5745 global records

[Ampelisca\(unspecified\)](#)
an amphipod, 690 global records

[Ampelisca abdita](#)
an amphipod, name verified, 561 global records

[Ampelisca vadorum](#)
an amphipod, name verified, 270 global records

[Ampelisca verrilli](#)
an amphipod, name verified, 190 global records

[Corophium tuberculatum](#)
an amphipod, name verified, 115 global records

[Gammarus mucronatus](#)
an amphipod, name verified, 24 global records

[Cubaris plasticus](#)
an isopod, name verified, 2047 global records

[Cyathura polita](#)
an isopod, name verified, 482 global records

[Acartia spp.](#)
a copepod, 49993 global records

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Sort by: Scientific name Common name Higher taxon Number of global records

Search criteria included:
" latitude 40.0 N - 40.5 N, longitude 74.0 W -
73.5 W "

Results 111 - 120(of 218)

Pseudocalanus elongatus

a copepod, name verified, 32014 global records

Rhincalanus nasutus

a copepod, name verified, 1634 global records

Temora longicornis

a copepod, name verified, 40438 global records

Temora turbinata

a copepod, name verified, 926 global records

Evadne spp.

a branchiopod, 15235 global records

Podon spp.

a branchiopod, 9832 global records

Brania(unspecified)

a polychaete, 32 global records

Brania(unspecified)

a polychaete, 32 global records

Eteone heteropoda

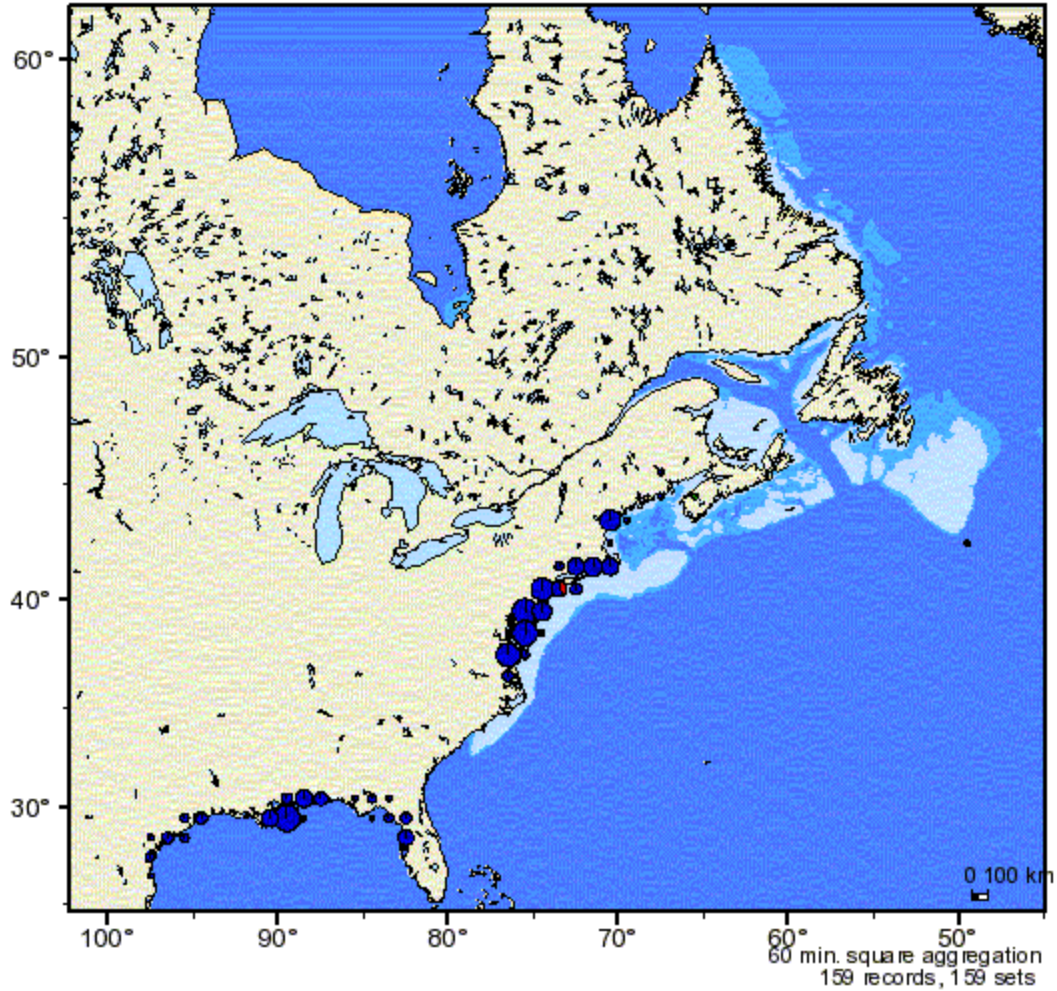
a polychaete, name verified, 172 global records

Glycera americana

a polychaete, name verified, 547 global records

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OBIS Data



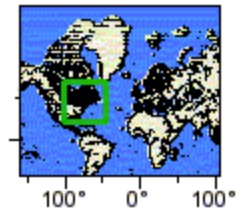
Total N records
• 1
• 3
• 5
• 10

Max. = 1.0
Total = 159.0

Res Name:



Total



100 m
200 m



Wed Apr 19 15:43:16 2006
rev. 9: 2005/03/01

Data retrieval : 9.2 sec.
ACON time: 2.4 sec.

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"Great white shark" or "Carcharodon" or "Carcharodon carcharias"

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SEARCH BY GEOGRAPHY

Search latitude: 40.5 - 41 N
longitude: 74.5 - 74 W

0.5° search area

Search >>



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Sort by: Scientific name Common name Higher taxon Number of global records

Search criteria included:
" latitude 40.5 N - 41.0 N, longitude 74.5 W -
74.0 W "

Results 1 - 10(of 165)

Larus argentatus "herring gull"

a bird, name verified, 27698 global records

Larus delawarensis "ring-billed gull"

a bird, name verified, 372 global records

Larus marinus "great black-backed gull"

a bird, name verified, 19536 global records

Larus philadelphia "bonaparte's gull"

a bird, name verified, 7372 global records

Phalacrocorax auritus "double-crested cormorant"

a bird, name verified, 8174 global records

Phalacrocorax phalacrocorax auritus

a bird, 8153 global records

Aluterus schoepfii "Orange filefish"

a fish, name verified, 834 global records

Menidia menidia "Atlantic silverside"

a fish, name verified, 415 global records

Menidia menidia menidia

a fish, 3 global records

Peprilus paru "American harvestfish"

a fish, name verified, 64 global records

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