The East Coast Integrated Ocean Observing System

IOOS® INTEGRATED OCEAN OBSERVING SYSTEM

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U.S. Integrated Ocean Observing System

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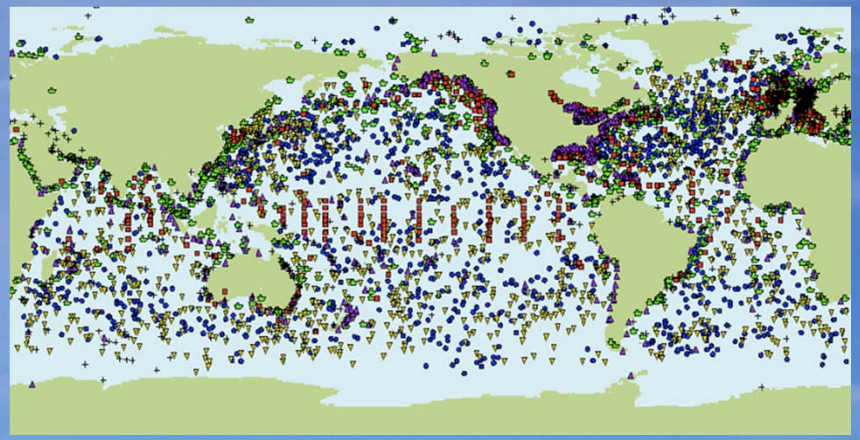
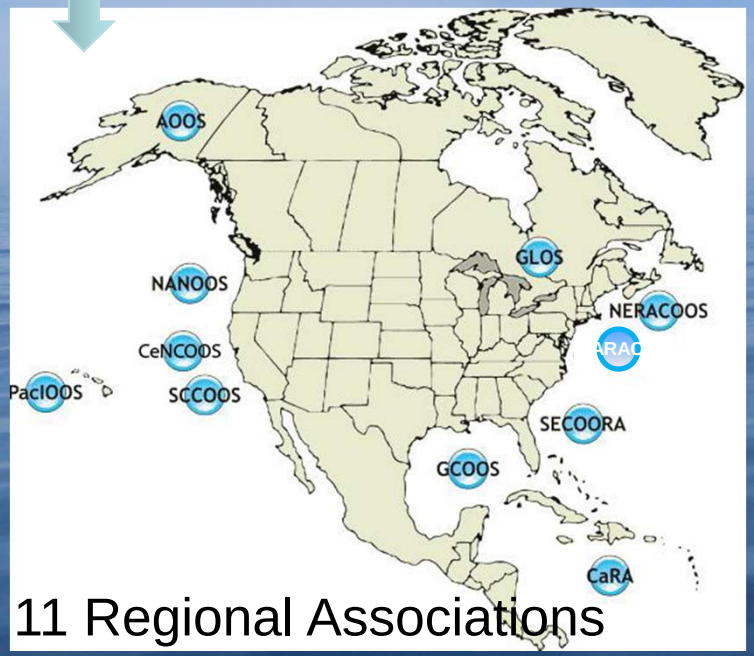
Global Component



Global Ocean Observing System

National Component

Regional Component



11 Regional Associations

17 U.S. Federal Agencies

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SECOORA
Southeast Coastal Ocean Observing Regional Association

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IOOS Regions Mission

- The federal mission of Regional Associations is to gather "required System observation data, supporting and integrating all aspects of coastal and ocean observing and information programs within a region and that reflects the needs of" stakeholders and users (ICOOS Act, 2009).
- *"Deliver ocean information to users"*

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NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE
IOOS
INTEGRATED OCEAN OBSERVING SYSTEM
NERACOOS
NFRA
Bedford Institute of Oceanography
www.bio-iob.gc.ca
asa
science. services. solutions.
CINAR
Seacoast Science Center
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
United States Coast Guard
U.S. Department of Homeland Security
UNIVERSITY OF CONNECTICUT 1881
UNIVERSITY OF Rhode Island
UNIVERSITY of NEW HAMPSHIRE
BOSTON UNIVERSITY
THE UNIVERSITY OF MAINE
usm
UNIVERSITY OF SOUTHERN MAINE
NESEC
NORTHEAST STATES EMERGENCY CONSORTIUM
OPeNDAP
US Army Corps of Engineers.
CZM
ASA
UMASS
DALHOUSIE UNIVERSITY
Inspiring Minds
DEEPWATERWIND
USGS
science for a changing world
NORTHEAST REGIONAL OCEAN COUNCIL
Sea Grant
Rhode Island
Sikorsky
Durand & Anastas Environmental Strategies
JMS
NAVAL ARCHITECTS
SALVAGE ENGINEERS
WOODS HOLE OCEANOGRAPHIC INSTITUTION
1930
COASTAL OCEAN Observing Center
ATLANTIC OFFSHORE LOBSTERMEN'S ASSOCIATION
54 Chatham Drive Bedford, New Hampshire 03110
phone: 603-206-5468 fax: 603-666-5601
FARSOUNDER, INC
GoMOOS
Massachusetts Ocean Partnership
Great Bay National Estuarine Research Reserve
BIGELOW LABORATORY FOR OCEAN SCIENCES
Cooke AQUACULTURE
CONNECTICUT DEPARTMENT ENVIRONMENTAL PROTECTION
MAINE PORT AUTHORITY
ORPC
Ocean Renewable Power Company
Narragansett Bay Research Reserve
Based on Prudence Island
TELEDYNE TECHNOLOGIES INCORPORATED
Gulf of Maine Council on the Marine Environment
Wells National Estuarine Research Reserve
at Laudholm Farm
Gulf of Maine Research Institute
NEW HAMPSHIRE DEPARTMENT OF Environmental Services
MAINE DMR MARINE RESOURCES
CENSUS OF MARINE LIFE
Commonwealth of Massachusetts DIVISION of MARINE FISHERIES
WAQUOIT BAY
... to preserve, protect, develop, and restore coastal resources for all Rhode Islanders
RHODE ISLAND COASTAL RESOURCES MANAGEMENT COUNCIL
NeCODP
Northeast Coastal and Ocean Data Partnership
Building a Region-Wide Information System from the Bottom Up

NERACOOS - FY2011 Funded Partners

- University of Maine —operations and maintenance of the Gulf of Maine buoy array (formerly GoMOOS), and to support operations of a coastal radar system that measure currents and supports search and rescue.
- Gulf of Maine Research Institute—data management, website and data product development.
- University of New Hampshire—buoy in Great Bay, a wave buoy off New Hampshire, and ocean acidification buoy and shore station.
- University of Massachusetts at Dartmouth and WHOI—sophisticated forecast system that predicts ocean conditions.
- University of Rhode Island—development and testing of sensors to measure ocean nutrients and to support sharing of data from Narragansett Bay.
- University of Connecticut—buoys in Long Island Sound specifically designed to better understand water quality in the area.
- Bedford Institute of Oceanography, Nova Scotia— a wave forecast system and monitoring and detection of harmful algal blooms.

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OBSERVATIONS

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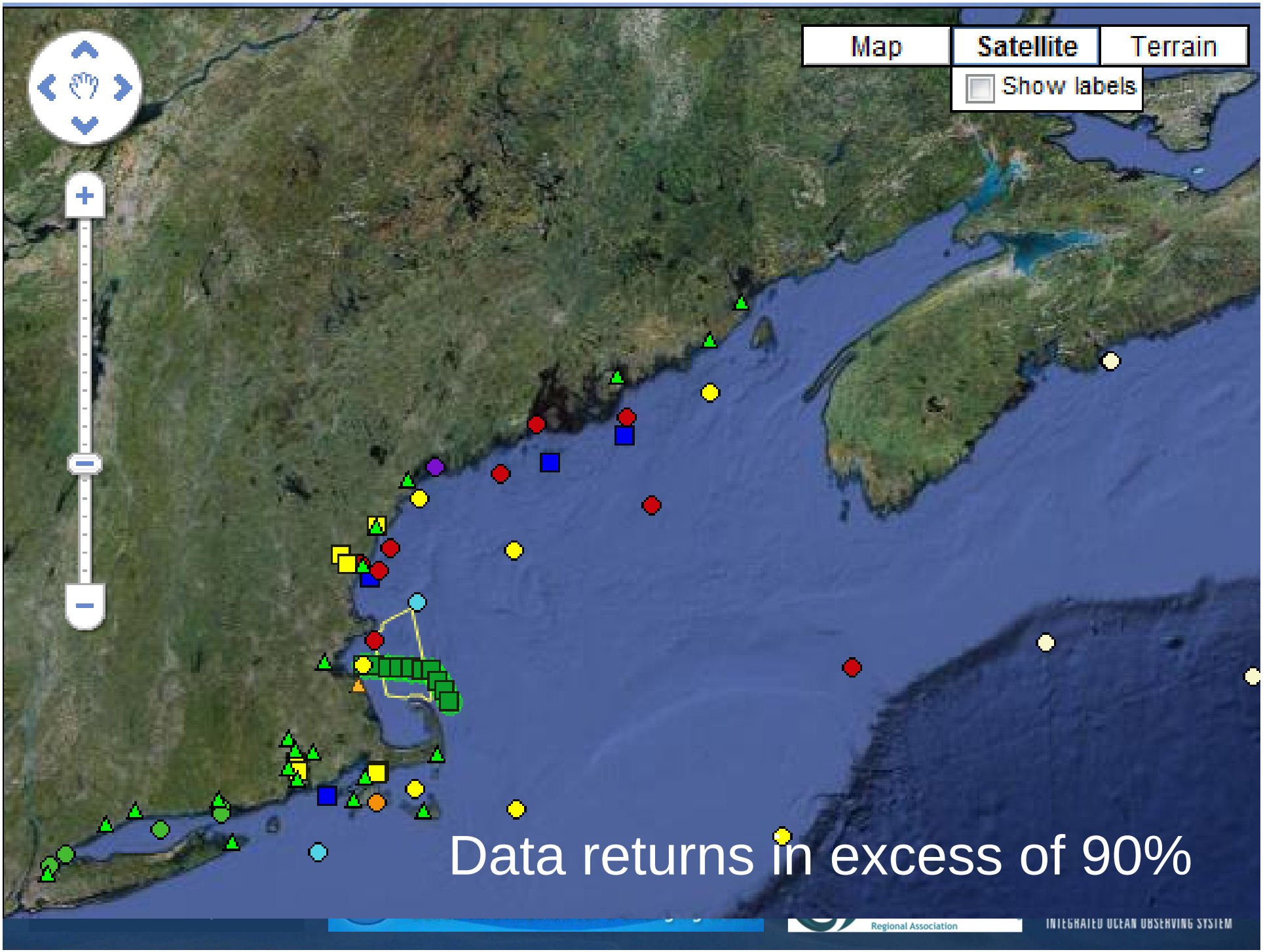
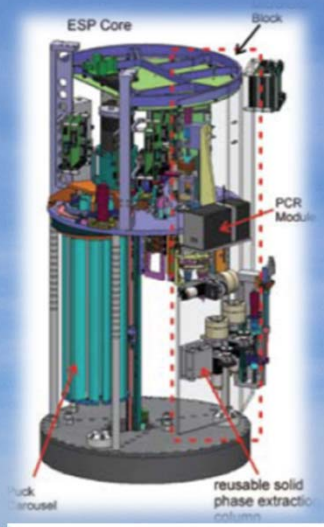
Multipurpose Buoys



Data returns in excess of 90%

Visibility Sensors in the Gulf of Maine

Ocean and Coastal Ecosystem Health



Harmful Algal Blooms - WHOI led effort uses observations to understand historical and current conditions, forecast HABs, and pioneering real-time HAB observations.

"… having uninterrupted access to these NERACOOS mooring time series is critically important to our Alexandrium forecasts." - Don Anderson, WHOI.

Improving Water Quality -

Hypoxia monitoring and modeling in Long Island Sound for NY and CT waste load allocations. Informing NH DES nutrient criteria effort to protect eelgrass habitat in Great Bay, NH. Nutrient sensor testing in Narragansett Bay. HAB and nutrient monitoring in Canada

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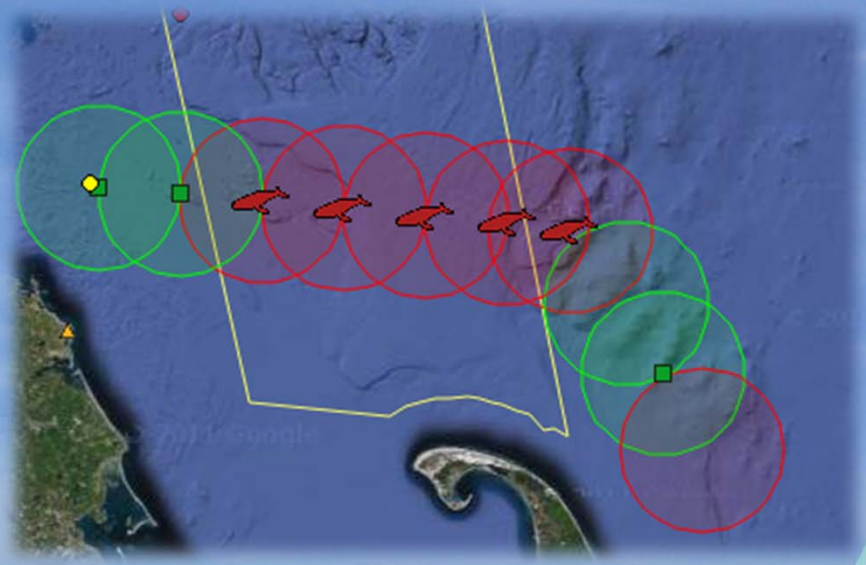
Ocean and Coastal Ecosystem Health



Right Whale Detection –

Cornell University buoys in the Boston shipping channel provide near real-time detection of endangered whales.

Acoustic Telemetry -

Receivers on all Gulf of Maine array buoys since 2005. ~10,000 detections of 63 acoustic tags from 11 different projects. Species include: Atlantic salmon, Atlantic sturgeon, alewives, striped bass, winter flounder, and spiny dog fish

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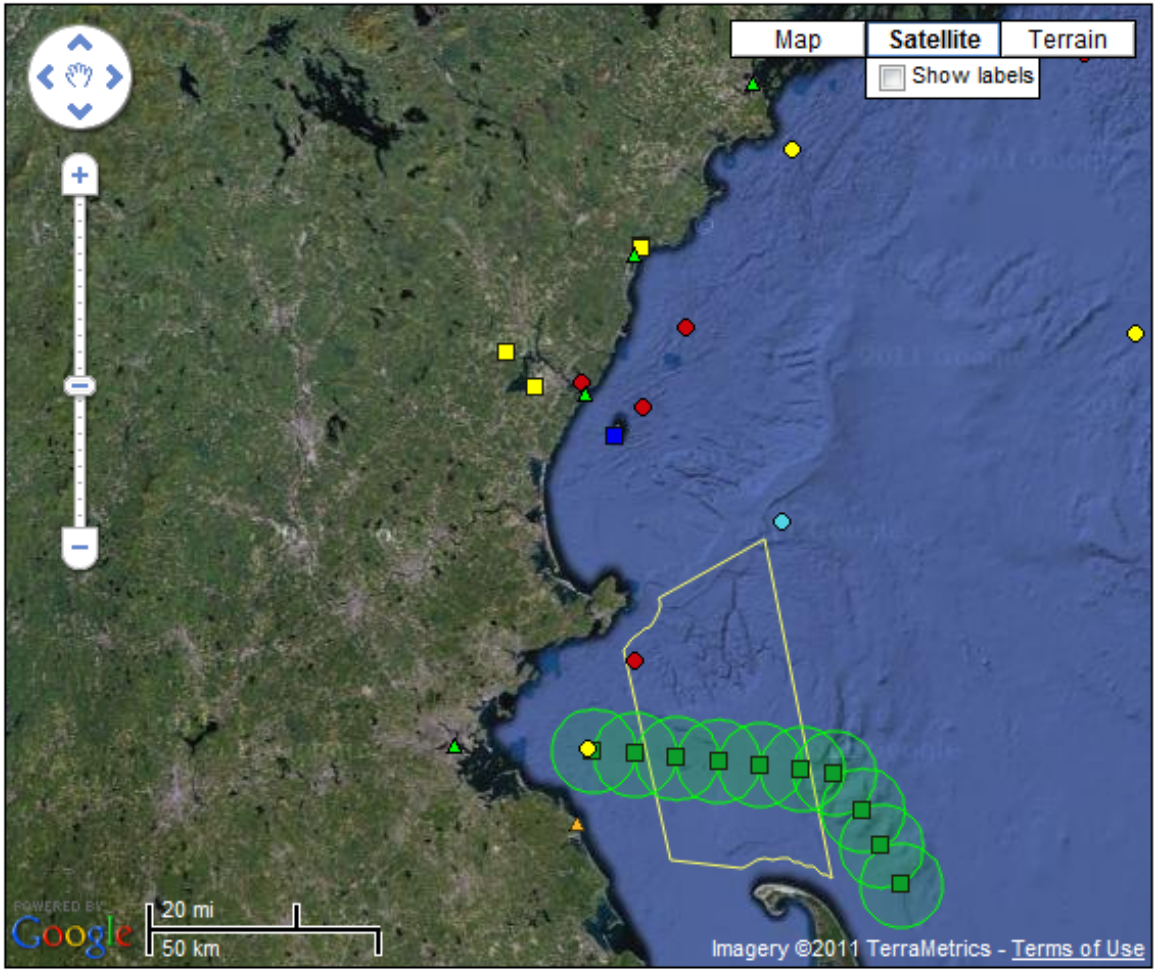
CO_2 and Ocean Acidification



View full screen map.

Zoom to: - select -

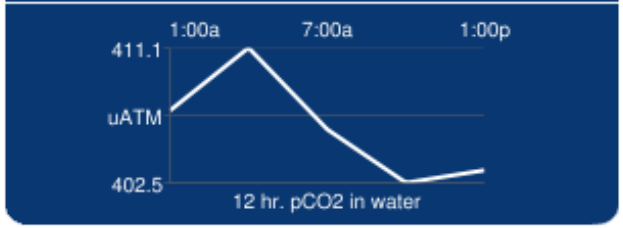
NERACOOS Gulf of Maine

Appledore Island CO2

Lat: 43.02 **Lon:** -70.54

Latest Observation: 11/29 7:51 AM EST

Variable	Value
Wind speed	3 knots (3 mph, 5 kph)
Wind direction	NNW (333°)
Wind gust	4 knots (5 mph, 8 kph)
Air temp	51 ° F (10.3 ° C)
Air pressure	NA
Water temp	49 ° F (9.5 ° C)
Salinity	30.69 psu
Dissolved Oxygen	4.04 ml/l
Turbidity	0.231 ntu
Chlorophyll	0.54mg chl/m3
CO_2 pressure in air	398.780 µATM
CO_2 pressure in water	403.300 µATM



Owned/Operated by:

University of New Hampshire

Dr. Doug Vandemark COOA

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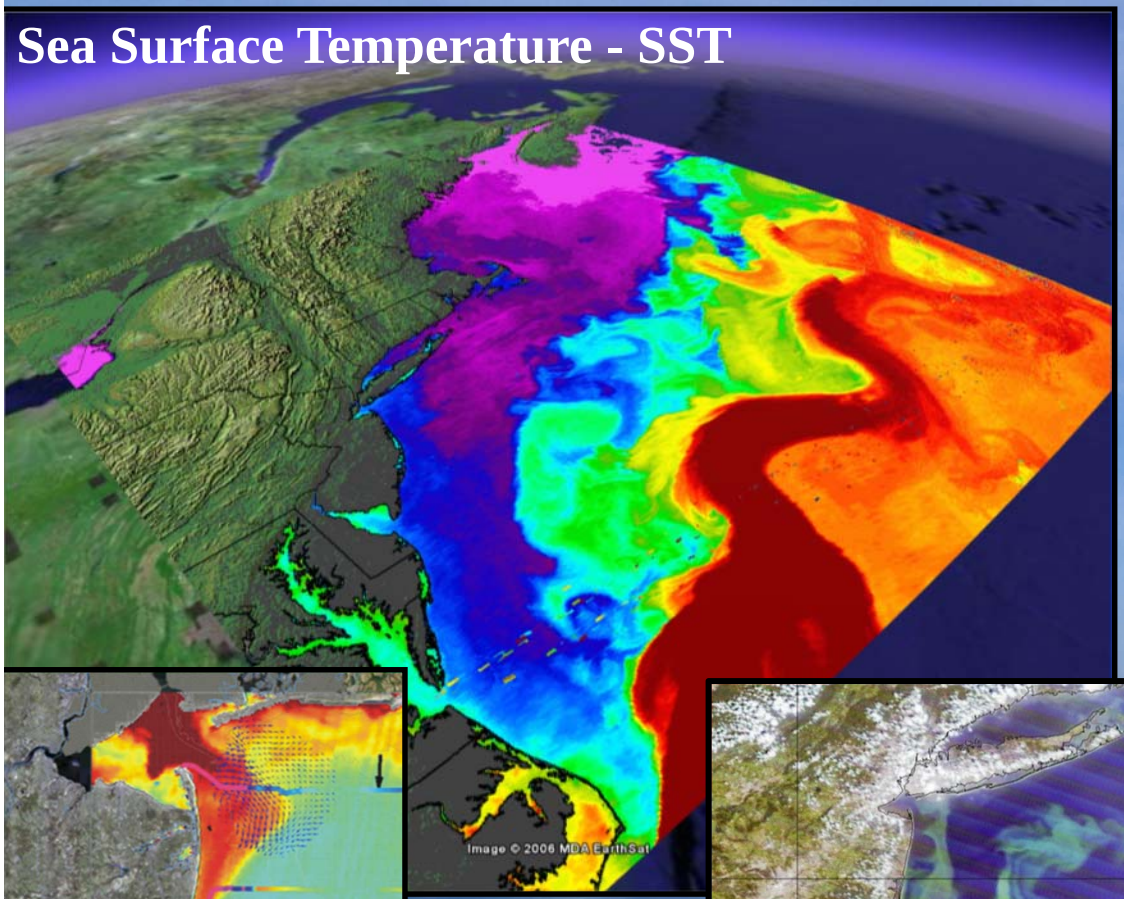
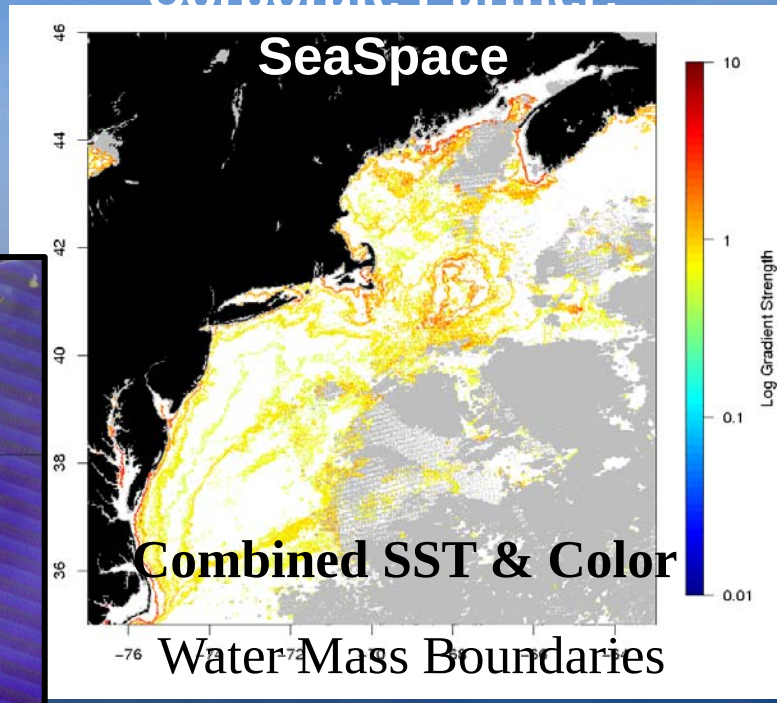
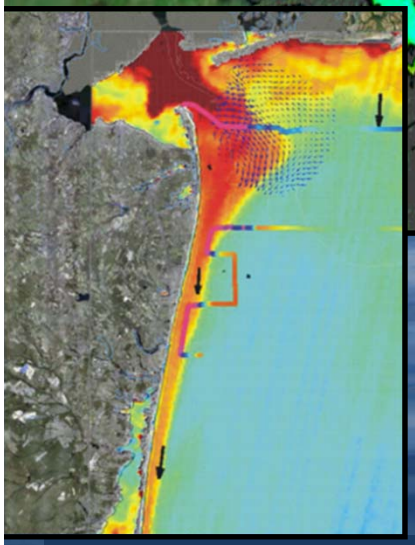
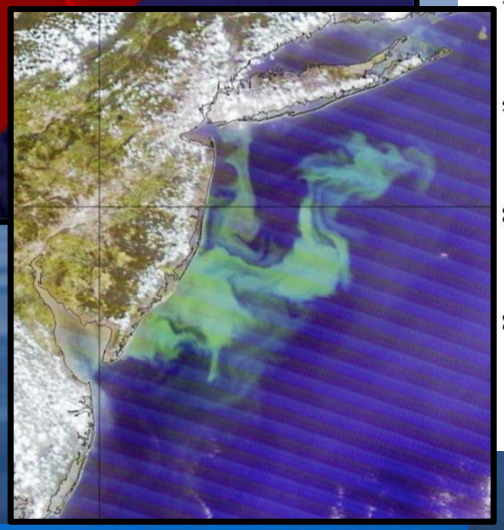
MARACOOS - International Constellation of Satellites – Since 1992



Corporate Partner:







Ocean Color

<River Plumes

Ocean Blooms>

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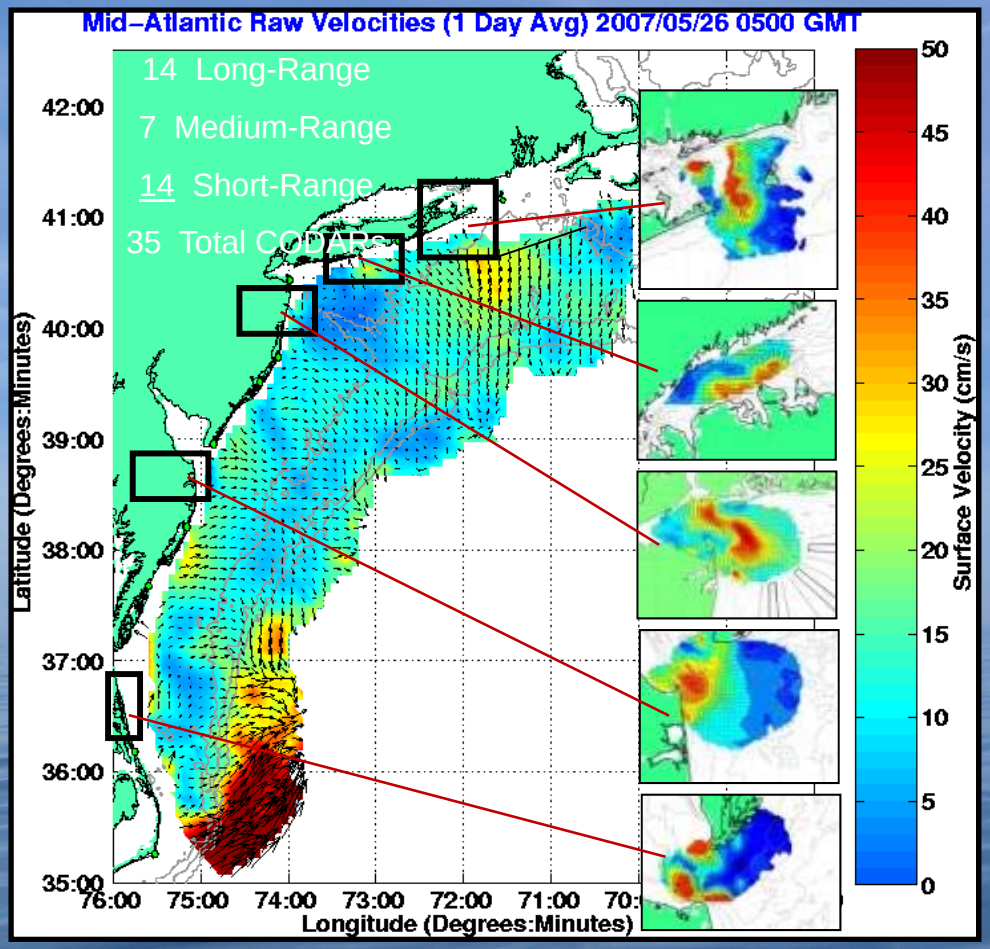
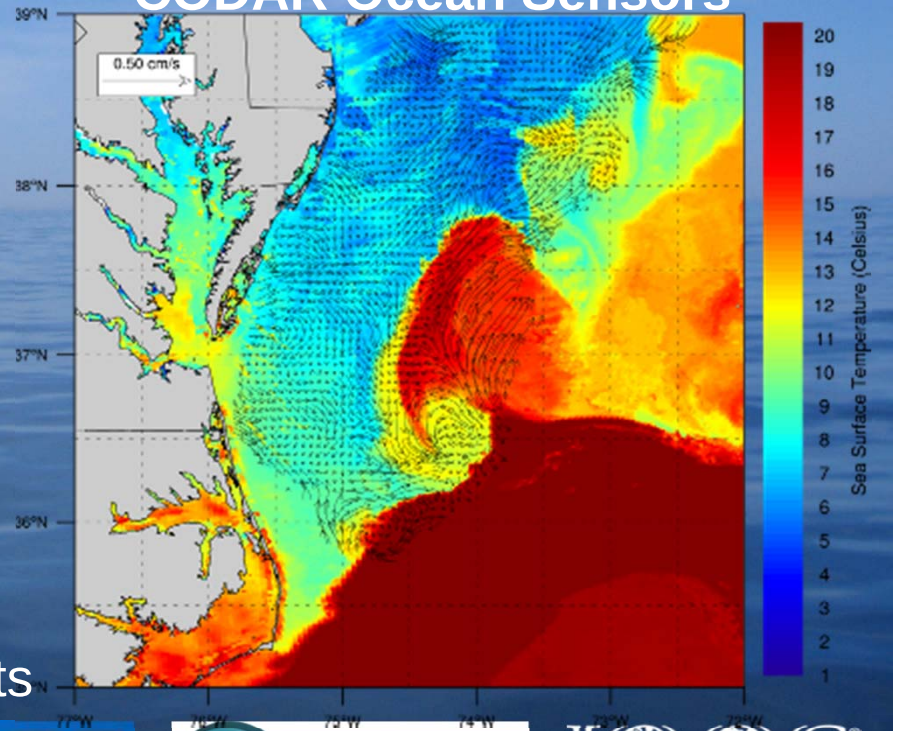
High Frequency Radar – Since 1996



Corporate Partner: CODAR Ocean Sensors



Nested Grids of Hourly Surface Current Maps

Combined CODAR & Satellite Products

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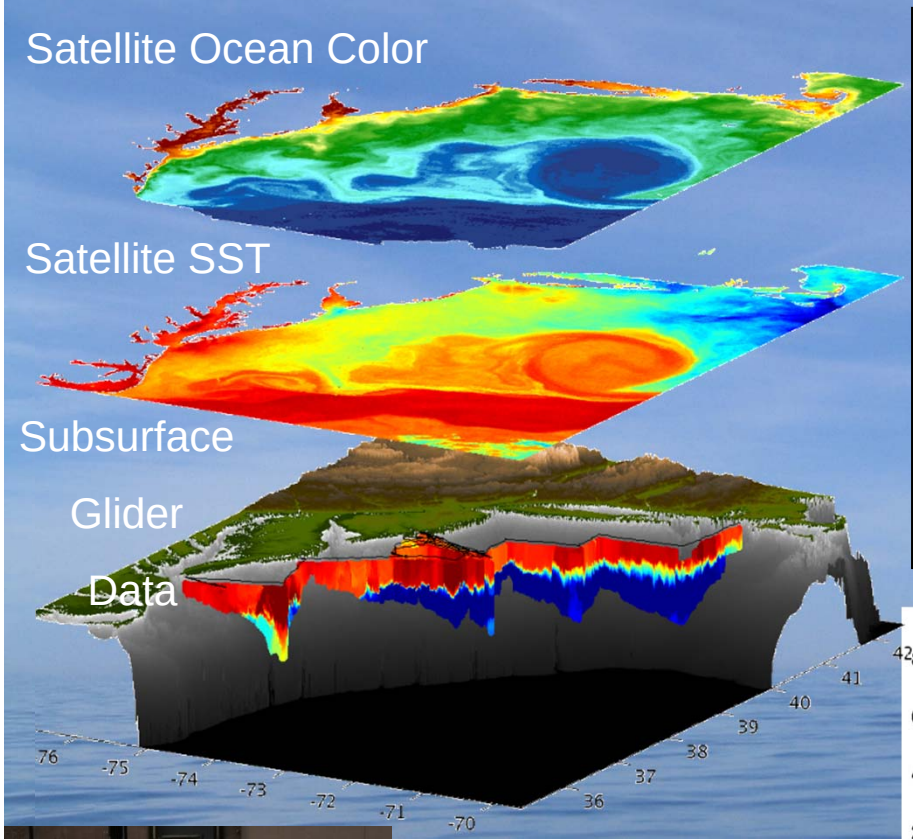
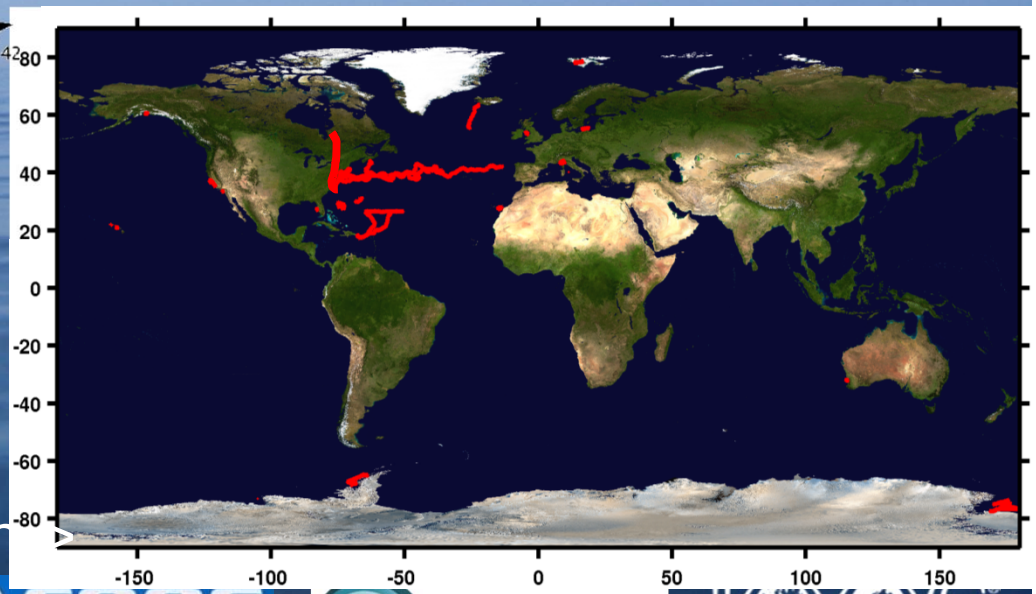
MARACOOS - Autonomous Underwater Gliders – Since 1998



< Glider Fleet

With Global Reach >



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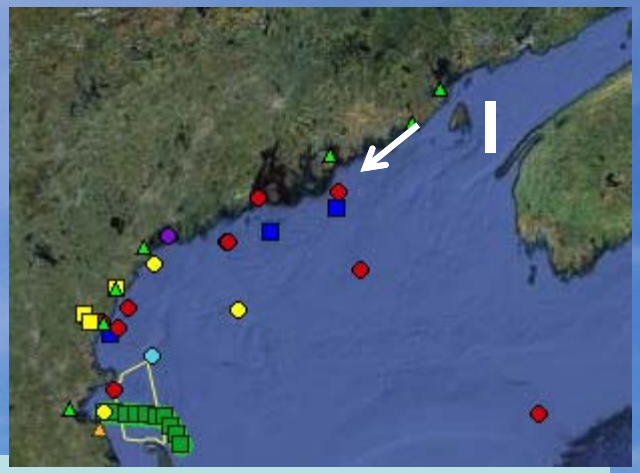
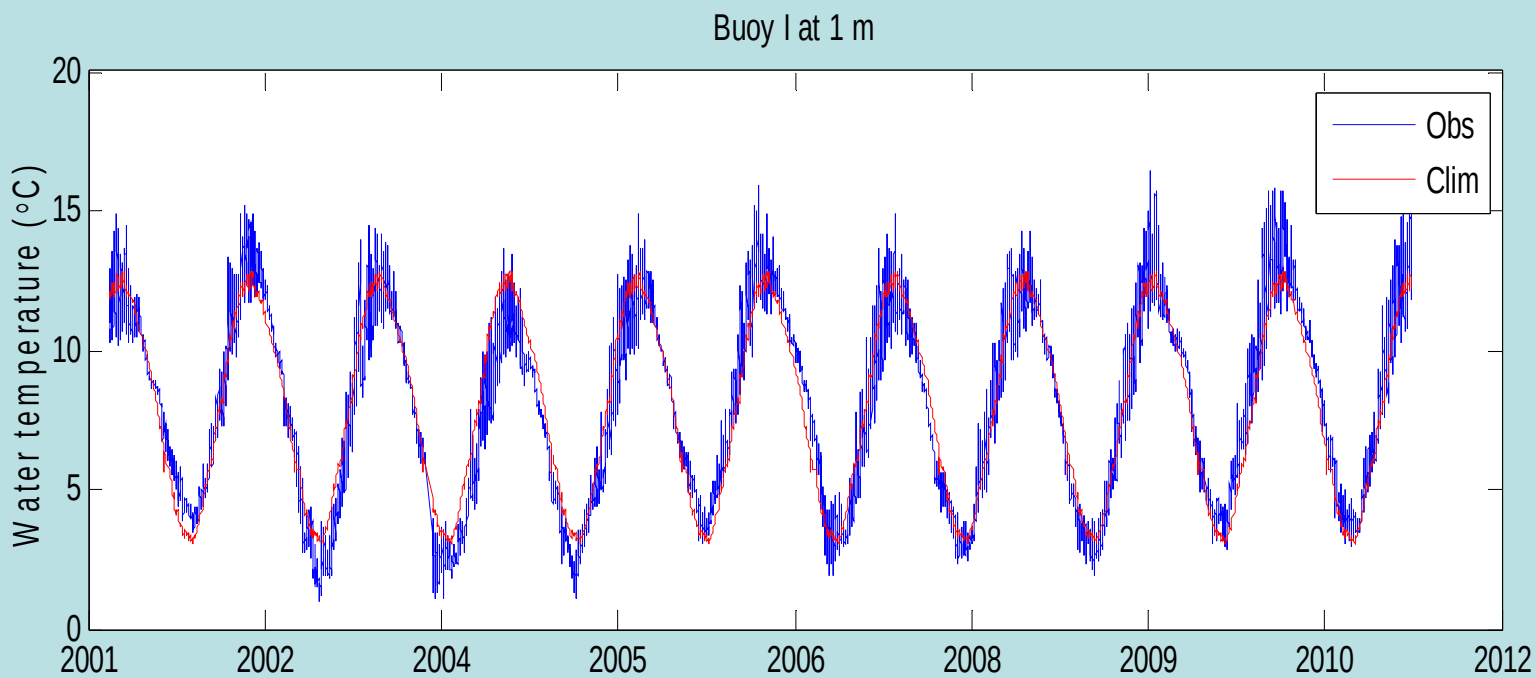
Climate Variability and Change

Over 10 Years of NERACOOS Buoys





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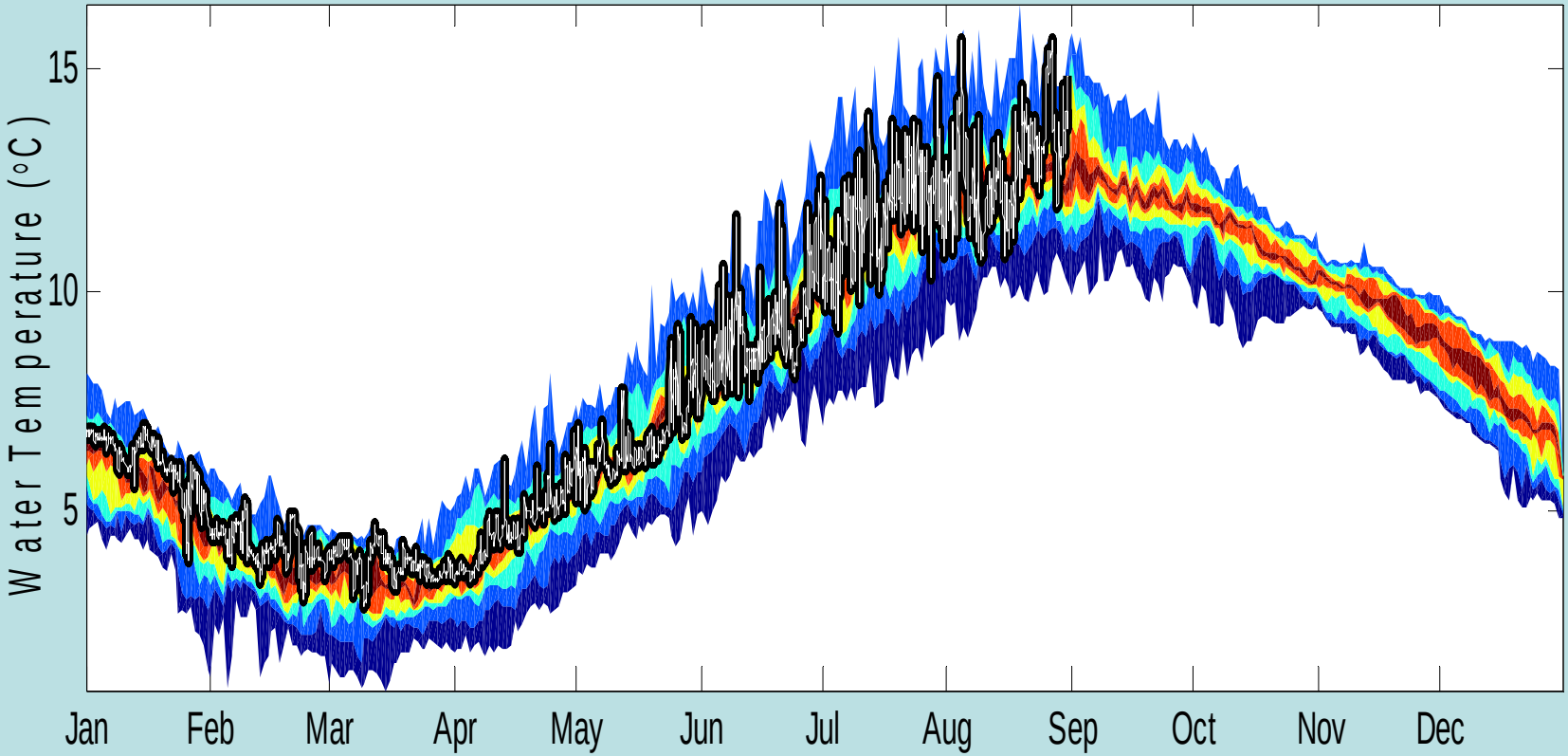
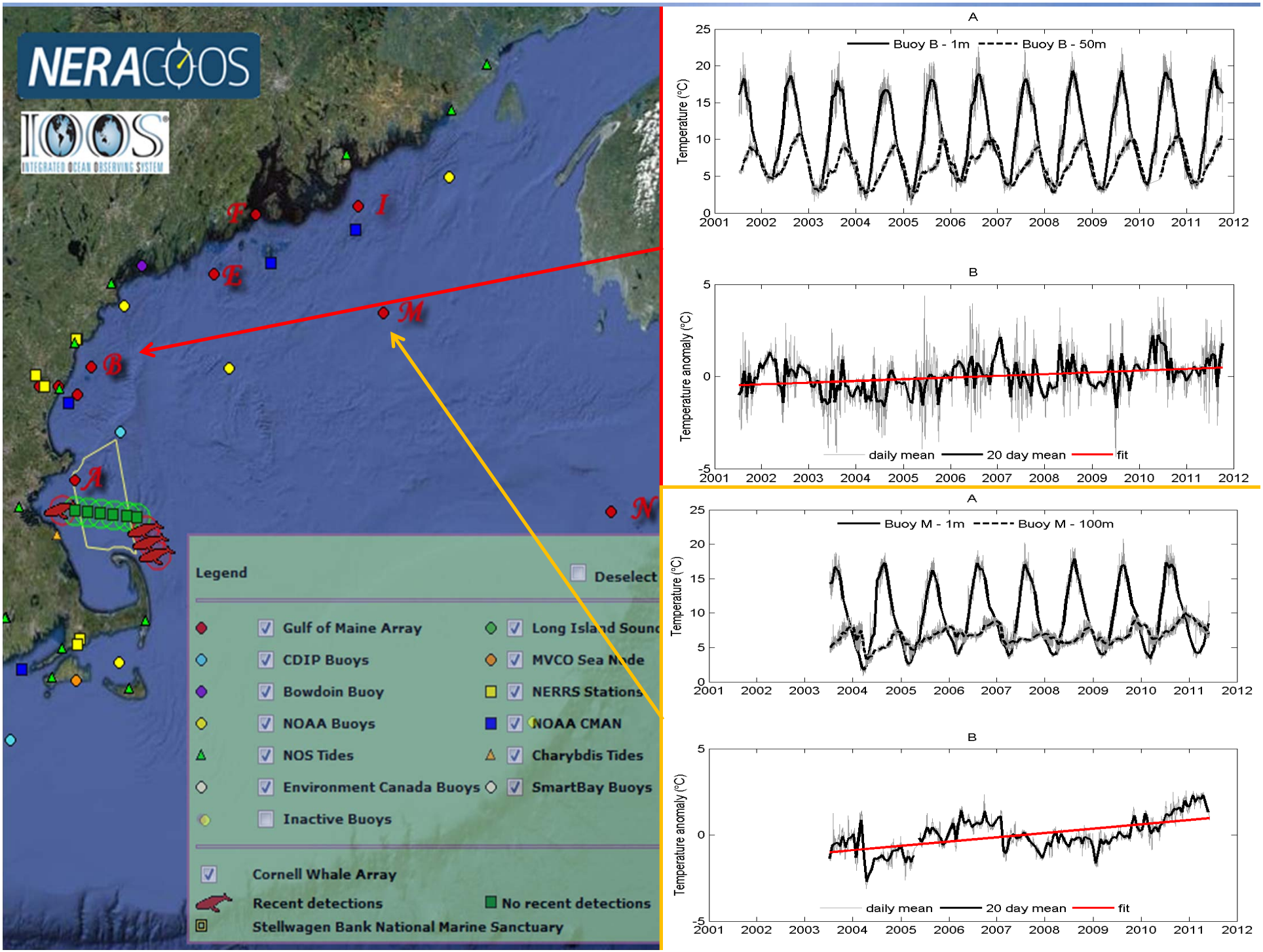
Climatologies

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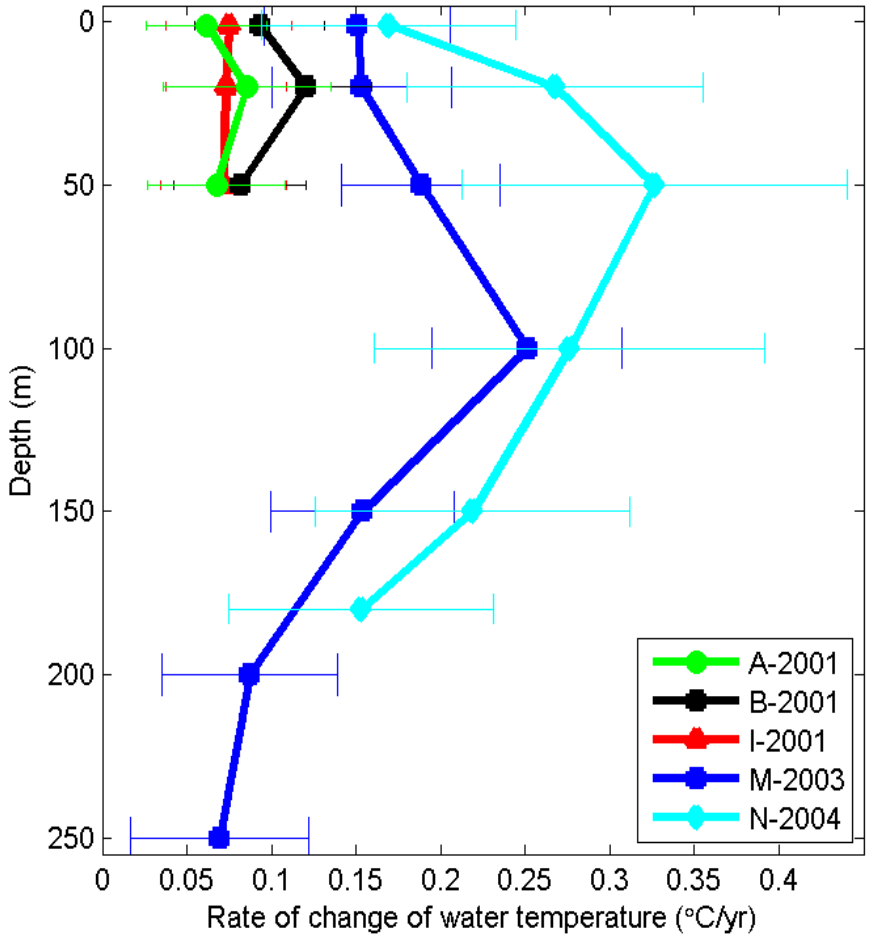
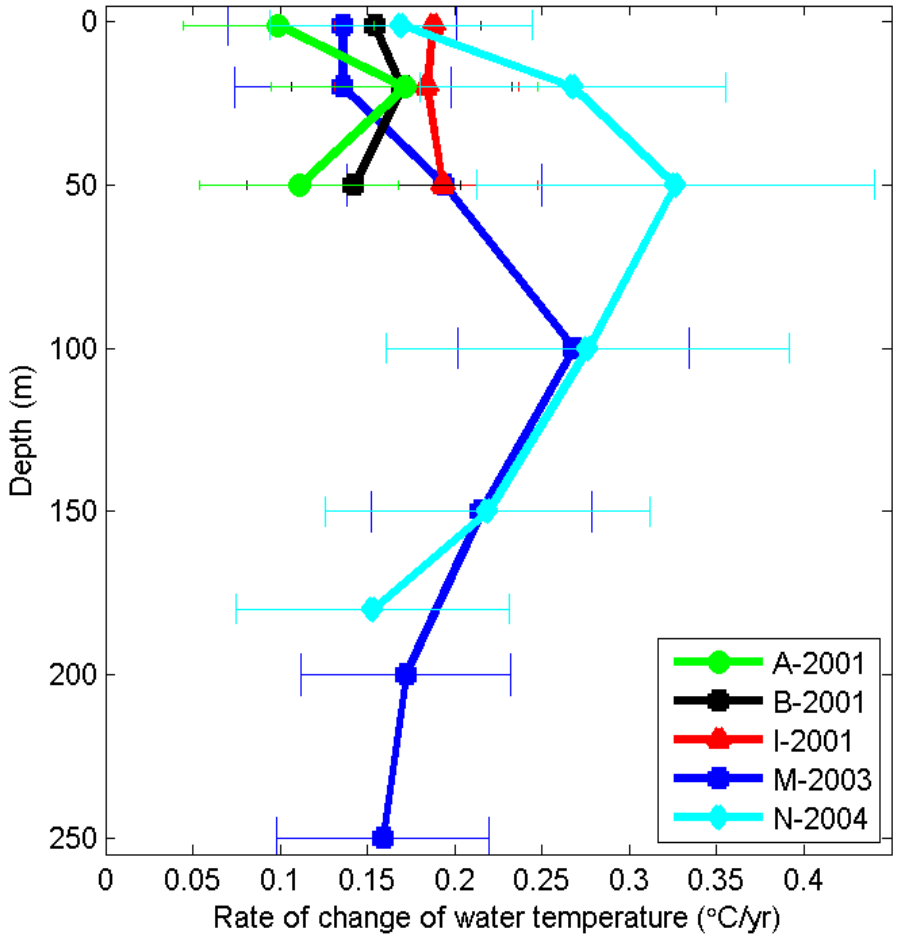
F
I
E
M
B
A
N
Legend
Deselect
Gulf of Maine Array
CDIP Buoys
Bowdoin Buoy
NOAA Buoys
NOS Tides
Environment Canada Buoys
Inactive Buoys
Long Island Sound
MVCO Sea Node
NERRS Stations
NOAA CMAN
Charybdis Tides
SmartBay Buoys
Cornell Whale Array
Recent detections
No recent detections
Stellwagen Bank National Marine Sanctuary
A
Buoy B - 1m
Buoy B - 50m
Temperature (°C)
B
Temperature anomaly (°C)
daily mean
20 day mean
fit
A
Buoy M - 1m
Buoy M - 100m
Temperature (°C)
B
Temperature anomaly (°C)
daily mean
20 day mean
fit
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012



All Data



Since 2004

NERACOOS

Compared to historical trends (Sherman & Lentz, 2010)

SHEARMAN AND LENTZ

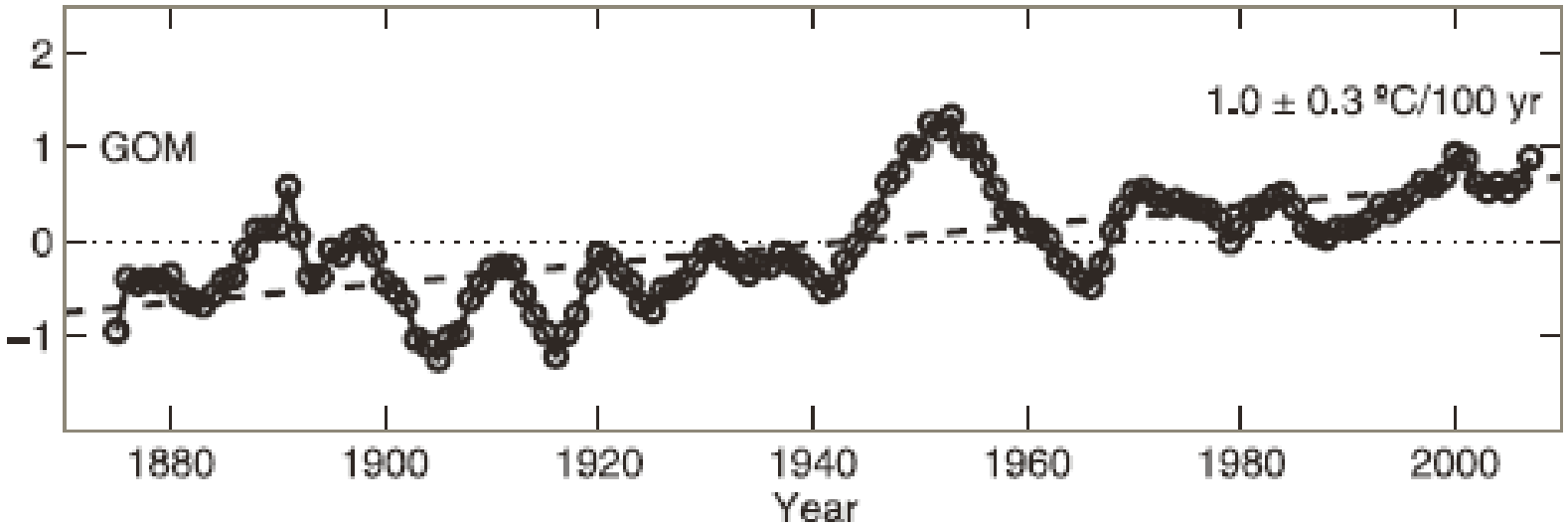


FIG. 8. Composite average SST anomalies (black) for GOM, MAB, SAB, and FL, smoothed with a 5-yr running mean, plus regional surface air temperature anomalies (gray) for the northeast United States, southeast United States, and Labrador. Best linear fits are plotted (thick dashed lines), and trends with 95% confidence intervals are noted.

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MODELS
FORECASTS AND HINDCASTS

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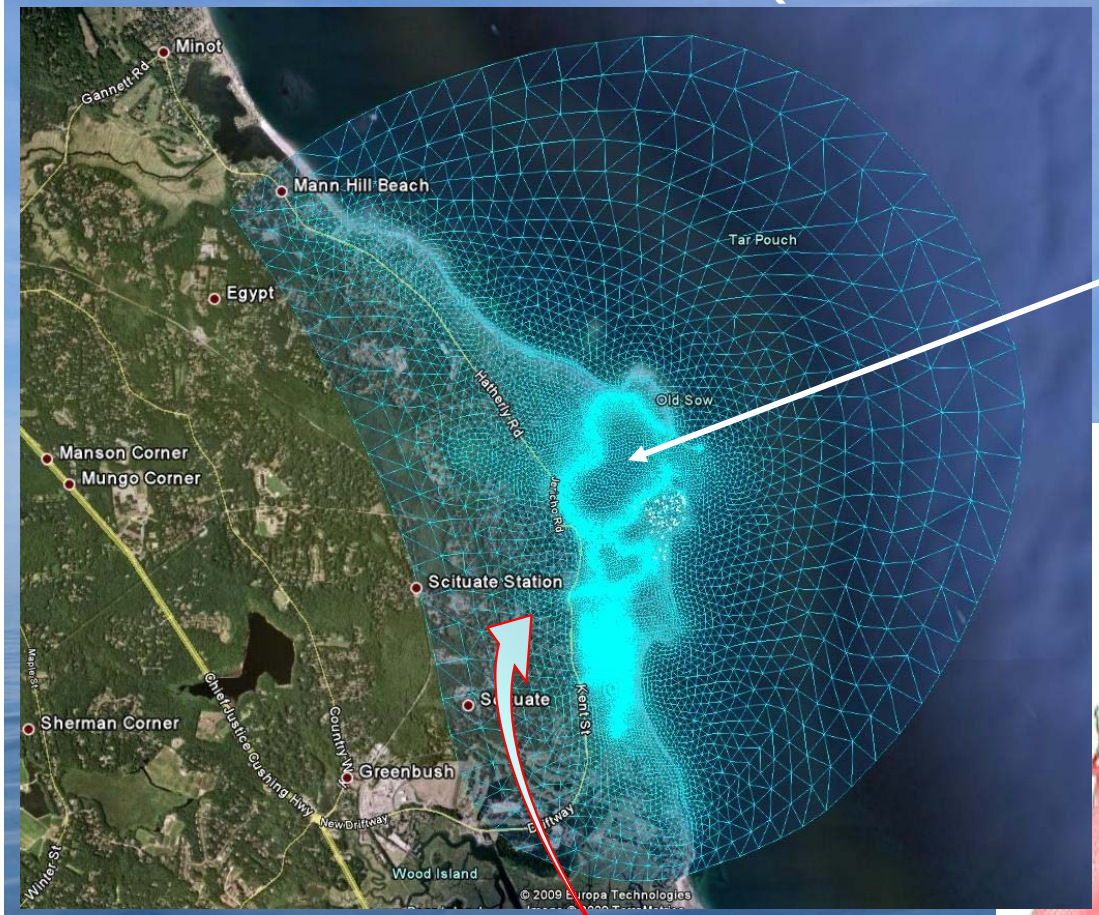
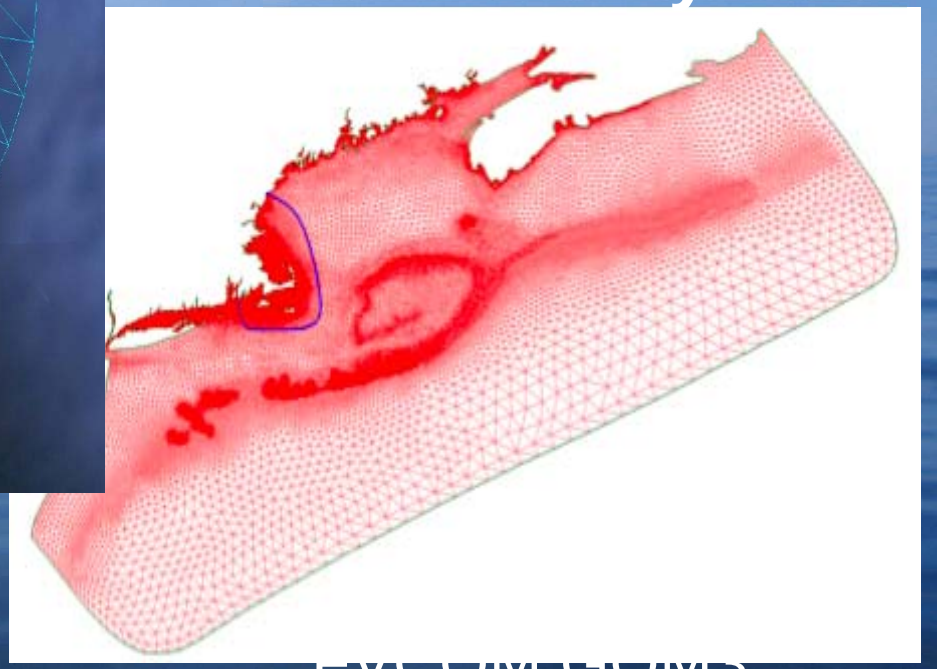
Northeast Coastal Ocean Forecast System (NECOFS)



Scituate Harbor

Inundation

Forecast System



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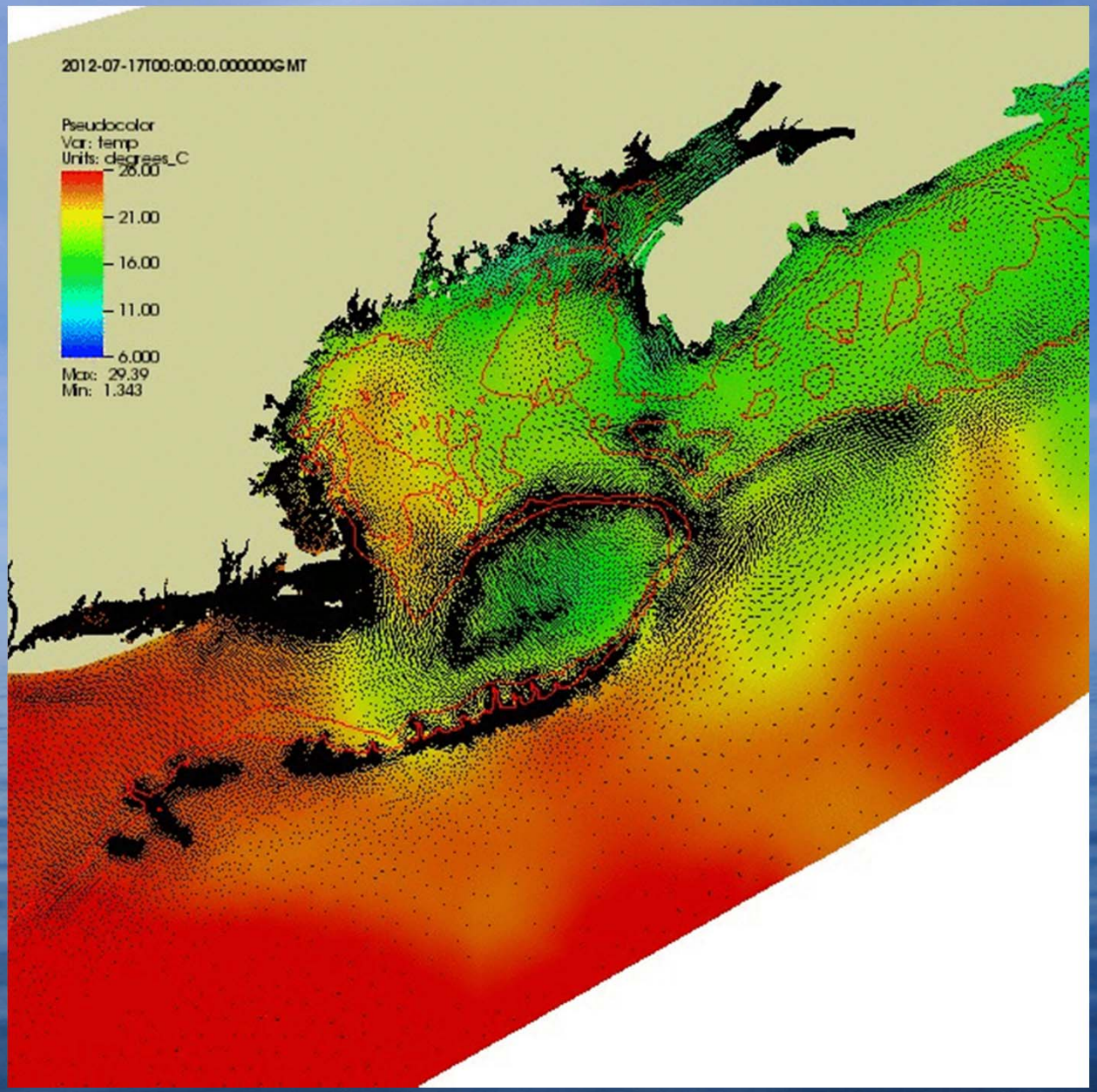
30 Year Hindcast – 3 Day Forecast

similar at MARACOOS and SECOORA



SEAPLAN

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DATA MANAGEMENT AND COMMUNICATIONS (DMAC)

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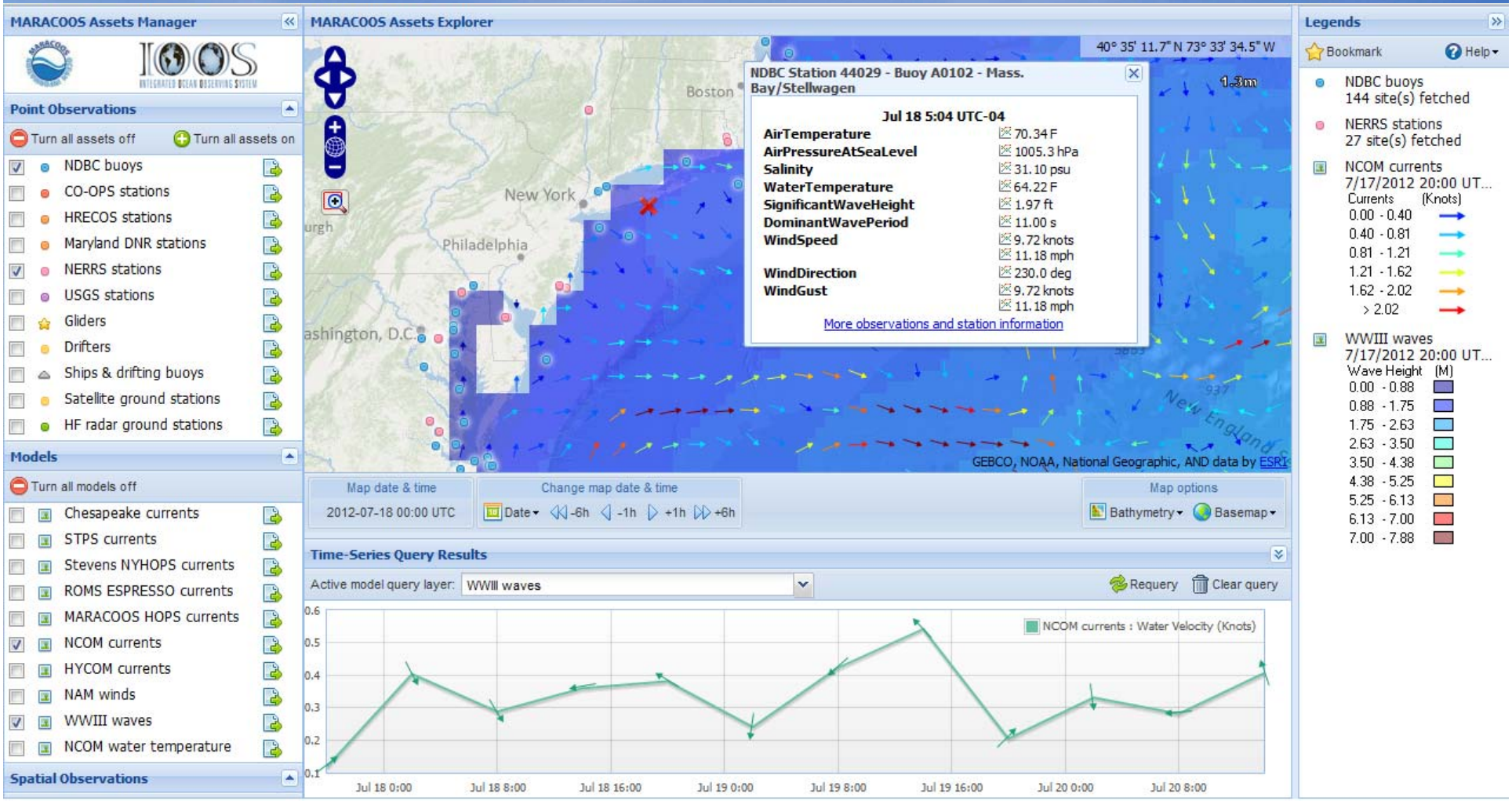
DMAC – brings it all together and to you



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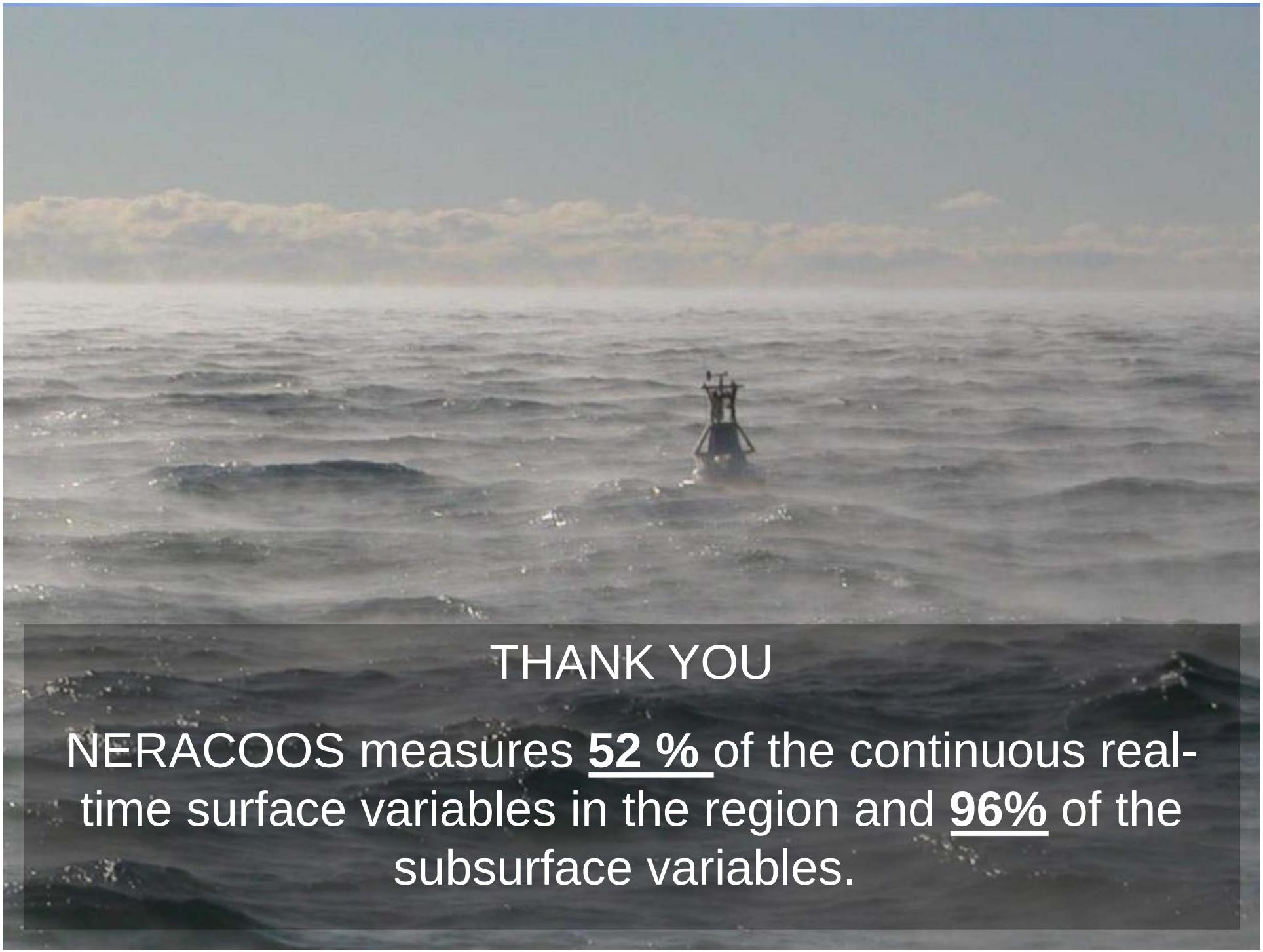

THANK YOU

NERACOOS measures **52 %** of the continuous real-time surface variables in the region and **96%** of the subsurface variables.

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Weather Conditions – National Weather Service Weather Forecast Offices marine desks "*routinely integrate NERACOOS data into our forecasts and warning operations on an hourly basis*". Coastal Inundation tools and forecasts. Forecasting ship icing potential.

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE GRAY ME
209 PM EDT SUN JUN 21 2009

*THE **NERACOOS** COASTAL FLOOD NOMOGRAM WOULD SUGGEST SPLASH-OVER AND MINOR FLOODING OF LOW LYING PROPERTIES AND ESTUARIES NEAR THE SHORELINE TONIGHT. THIS WOULD MOSTLY BE CONFINED TO EAST AND NORTHEAST BEACHES FROM ABOUT PORTLAND AND POINTS SOUTH ALONG THE COAST.*

THEREFORE...WE WILL BE ISSUING COASTAL FLOOD WARNINGS FROM PORTLAND SOUTH TONIGHT. COASTAL FLOOD ADVISORIES FOR NUISSANCE TYPE MORE MINOR PROBLEMS WILL BE ISSUED FOR THE MIDCOAST.

DORA
tal Ocean Observing
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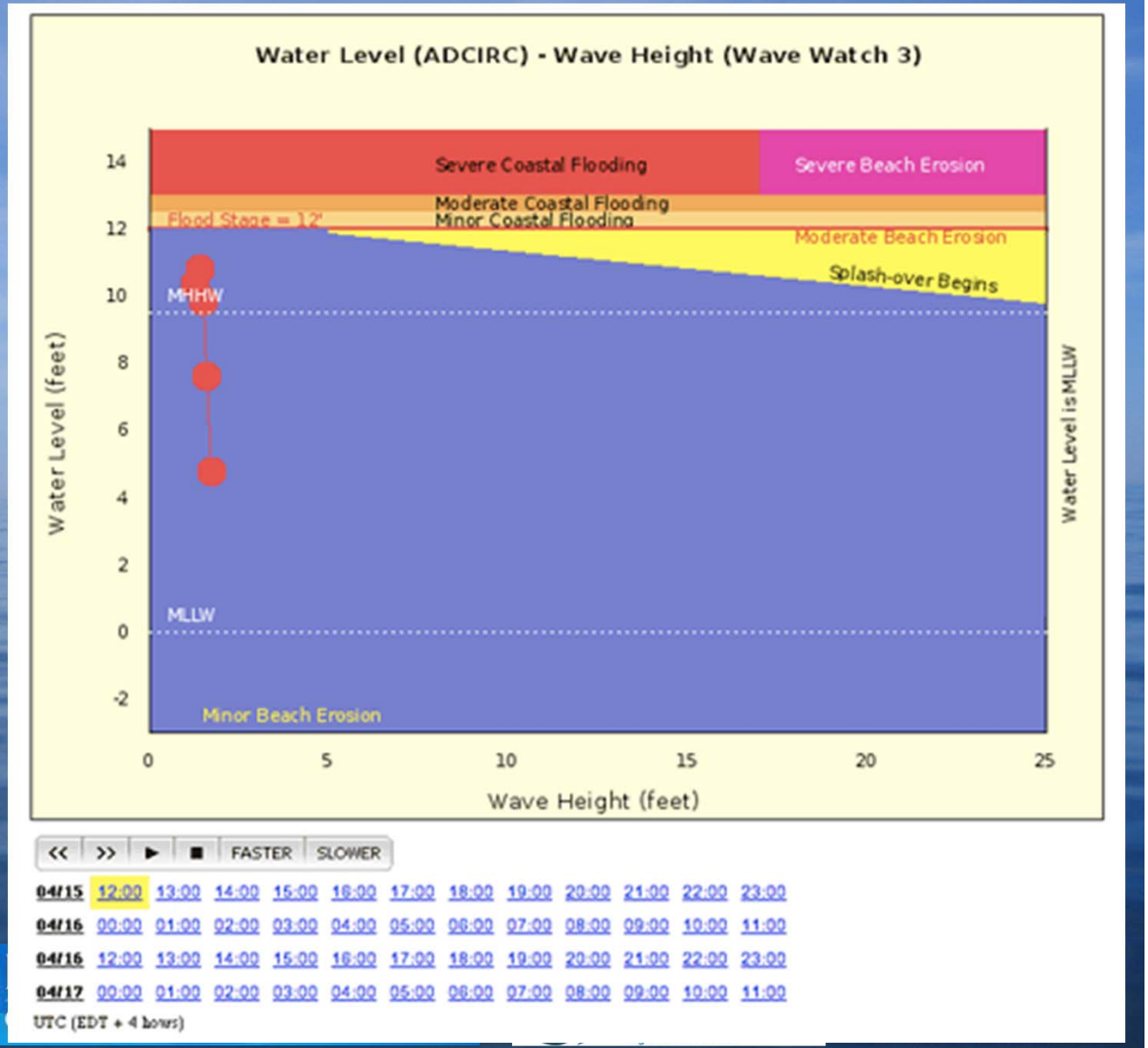
Coastal Flooding and Erosion Forecast

Patriot's Day Nor'easter April 15-17, 2007



Near Street Level Inundation Forecasts

©2010 Google

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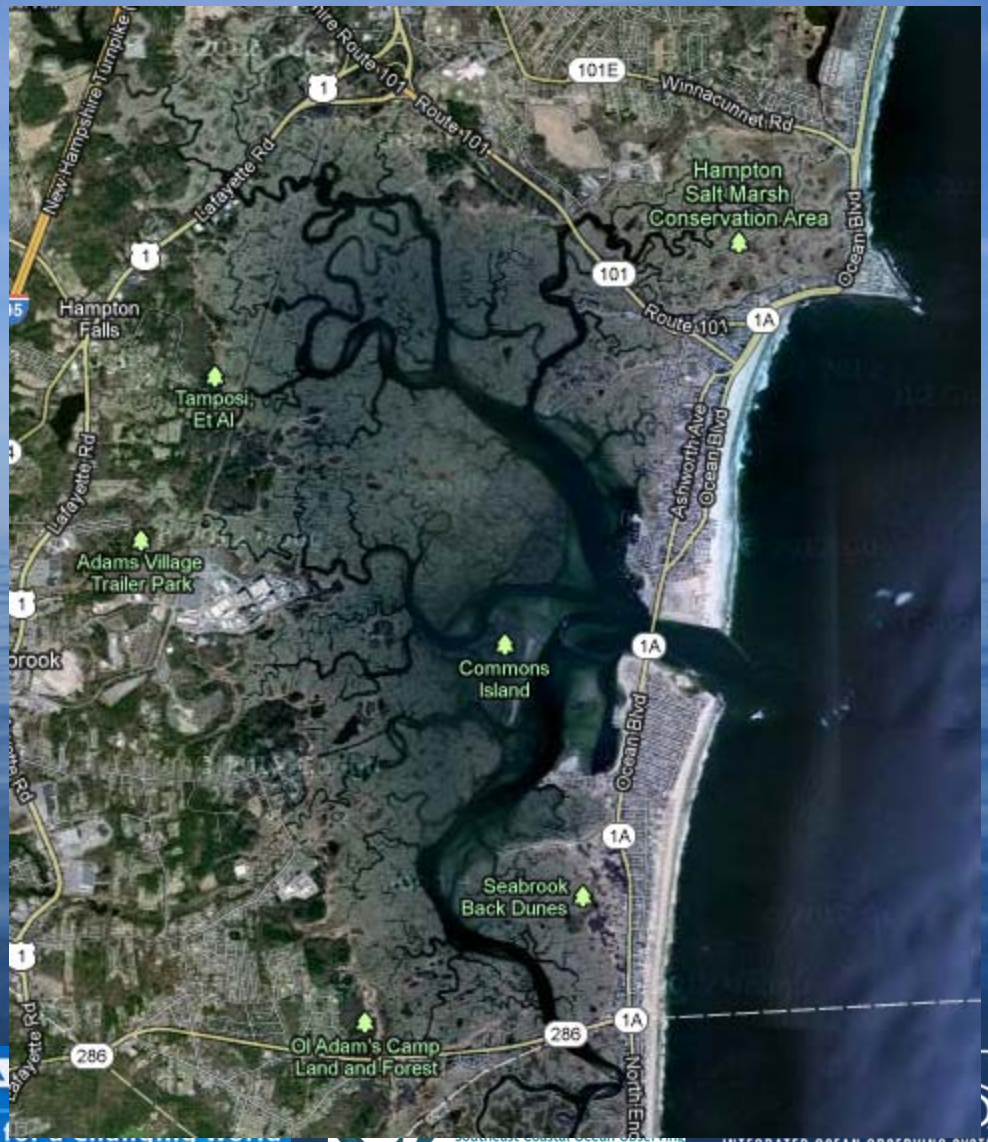
Hampton / Seabrook next

- Tide gage being installed this summer – funds from Seabrook power station and PREP
- Modeling from NERACOOS



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Regional Association

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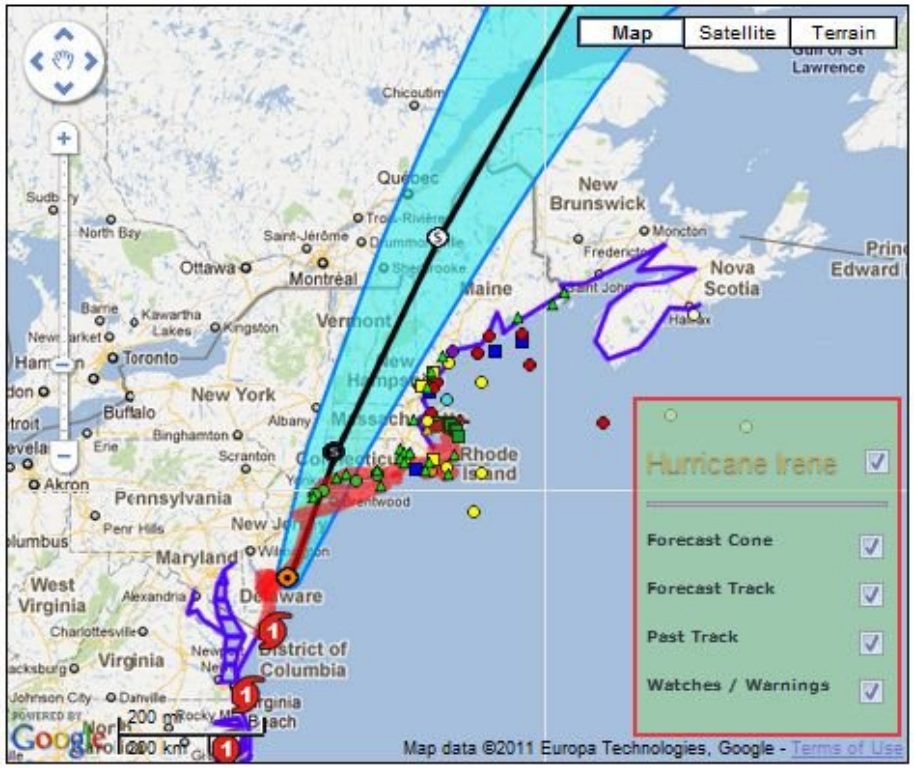
Hurricane Irene



View full screen map.

Hurricane Irene is forecast to impact the Northeast during the weekend of August 27-28th. The latest forecast track, cone of impact and past track from the National Hurricane Center can be toggled on and off using this legend. The legend can also be moved by clicking and dragging to a different location in your browser window.

Legend

- Current Center Location
- Forecast Center Locations:
  - Tropical Cyclone
    - Sustained wind > 110 mph
    - Sustained wind > 73 mph
    - Sustained wind 39 - 73 mph
    - Sustained wind < 39 mph
  - Post-Tropical Cyclone
    - Sustained wind > 73 mph
    - Sustained wind 39 - 73 mph
    - Sustained wind < 39 mph
- Watches / Warnings:
  - Hurricane Warning
  - Hurricane Watch
  - Tropical Storm Warning
  - Tropical Storm Watch
- Cone of Uncertainty:
  - Potential Day 1-3 Track Area
  - Potential Day 4-5 Track Area

Zoom to: - select -

NOAA 44008 - Nantucket

Lat: 40.5 **Lon:** -69.43

Latest Observation: 08/28 7:00 AM EDT

Variable	Value
Wind speed	31 knots (35 mph, 57 kph)
Wind direction	SE (130°)
Wind gust	36 knots (42 mph, 68 kph)
Wave height	19.4 ft (5.9 m)
Wave period	16.0 sec
Air temp	77 ° F (25.2 ° C)
Air pressure	1000.00 mb
Water temp	70 ° F (21.3 ° C)

Owned/Operated by:

National Data Buoy Center

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Legend Deselect all

- Gulf of Maine Array
- Long Island Sound Array
- CDIP Buoys
- MVCO Sea Node
- Bowdoin Buoy
- NERRS Stations
- NOAA Buoys
- NOAA CMAN
- NOS Tides
- Charybdis Tides
- Environment Canada Buoys
- SmartBay Buoys
- Inactive Buoys

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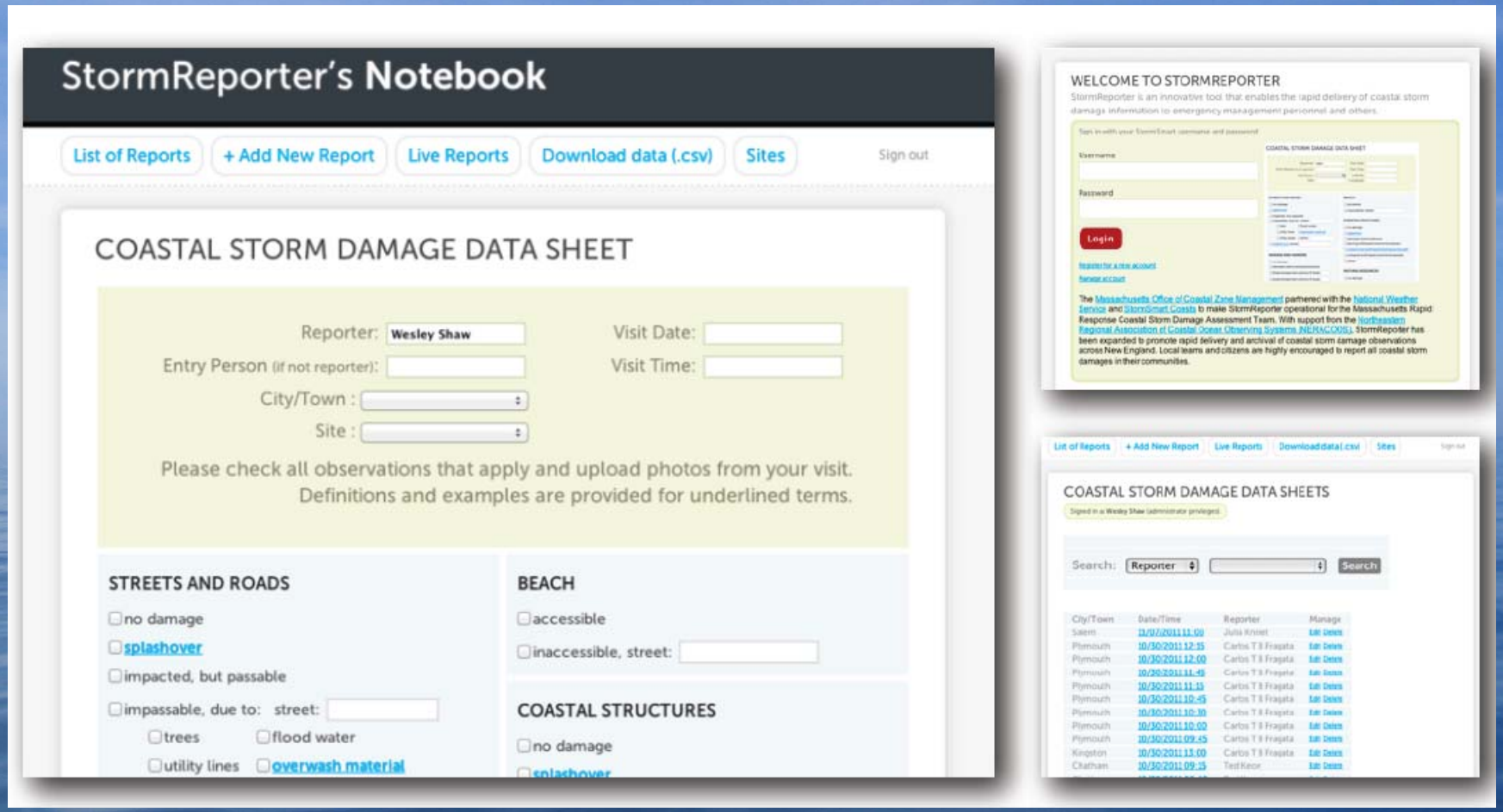
MARACOOS Ocean Information for a Changing World

SECOORA Southeast Coastal Ocean Observing Regional Association

IOOS INTEGRATED OCEAN OBSERVING SYSTEM

Storm Reporter



Developed by Blue Urchin for NROC, NOAA and IOOS

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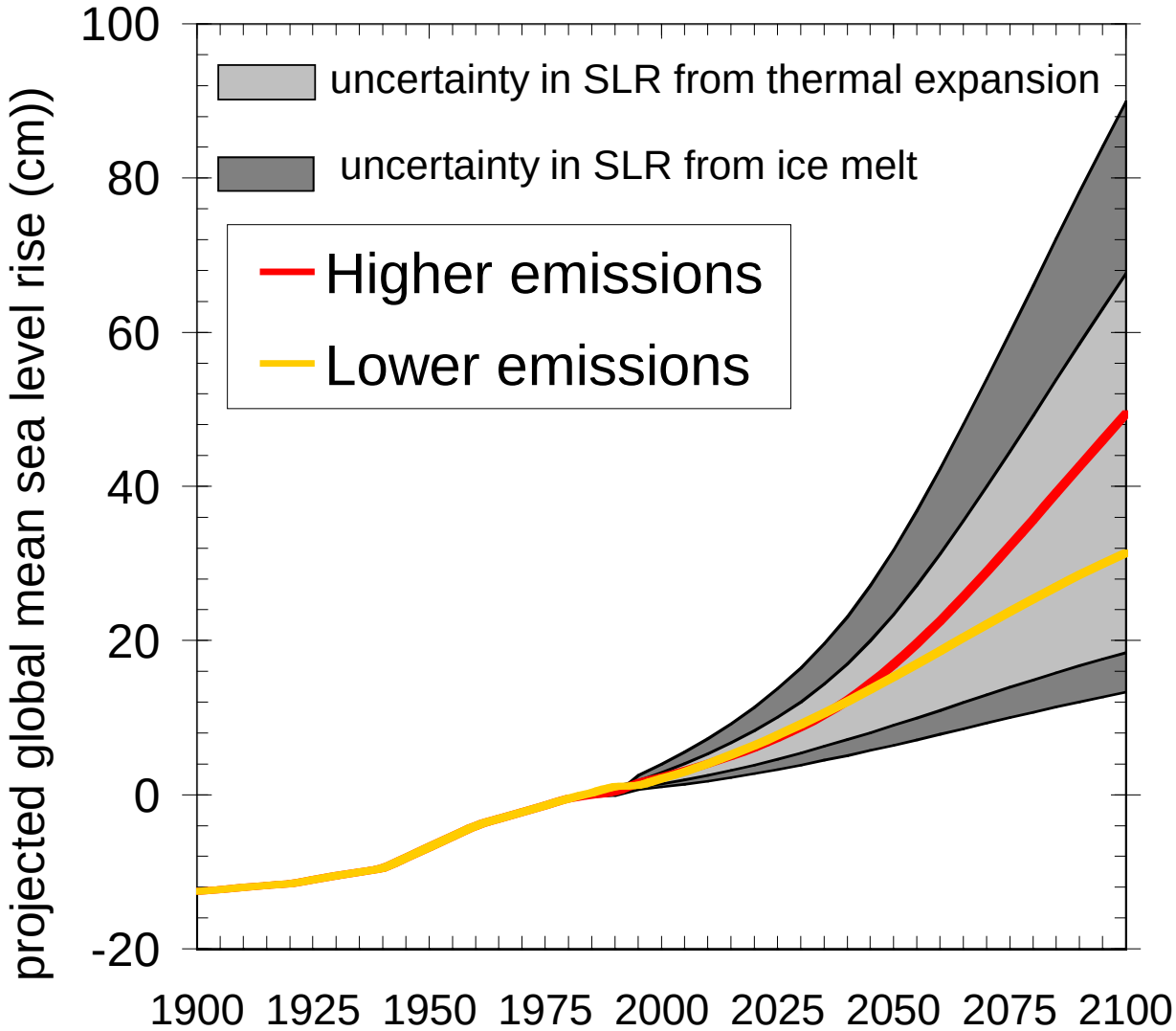
Sea-Level Rise



Associated Press

Higher: 8-33 inches

Lower: 4-21 inches

These estimates do not include the potential for additional increases due to more rapid melting of major polar ice sheets.

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