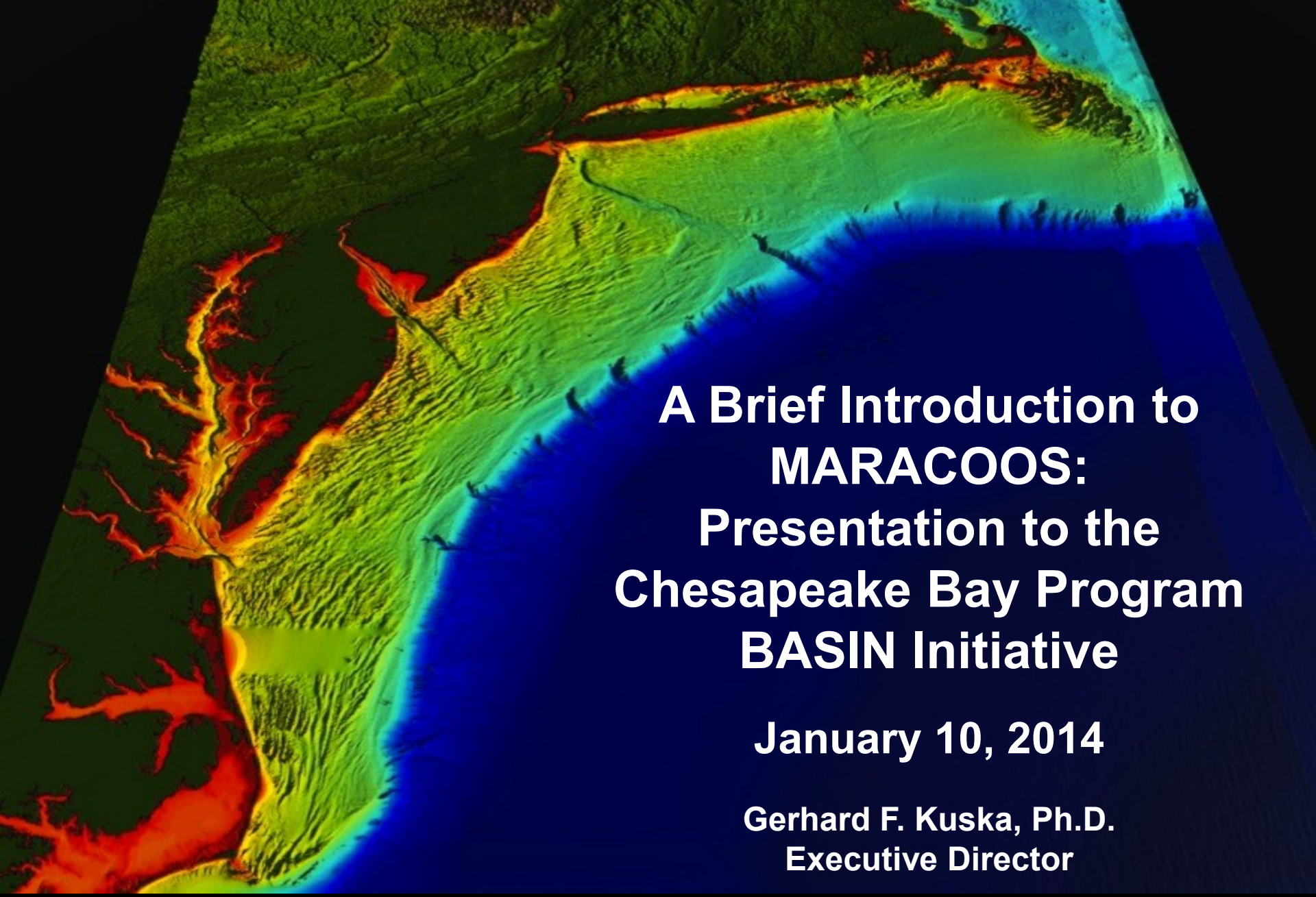


A Brief Introduction to MARACOOS: Presentation to the Chesapeake Bay Program BASIN Initiative

January 10, 2014

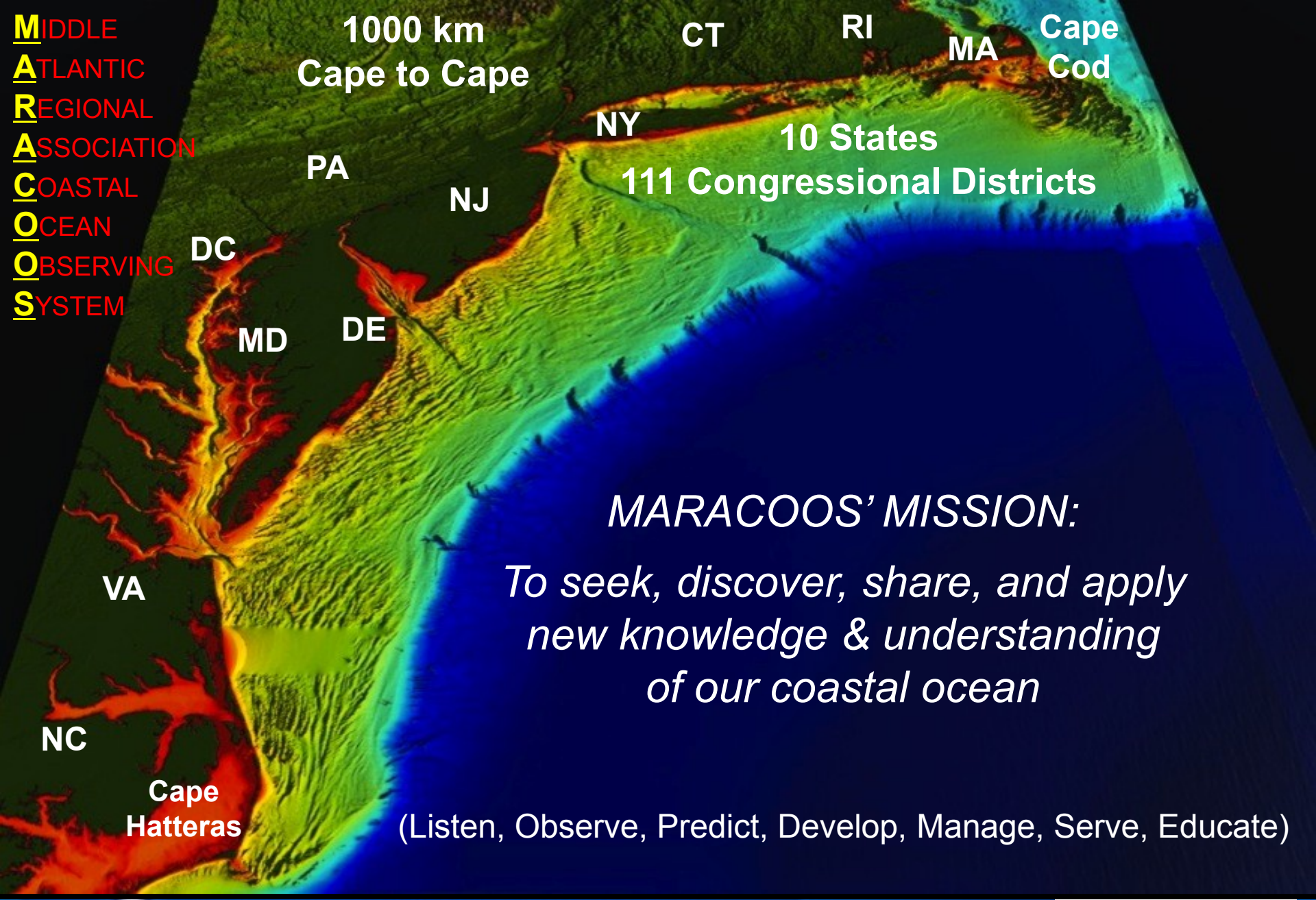
Gerhard F. Kuska, Ph.D.
Executive Director

MARACOOS
Ocean Information for a Changing World

5 Questions/Areas for Today:

1. Objectives of the Network
2. Operational Model
3. Business Model and Funding
4. Governance and Oversight
5. Successes and Challenges

OBJECTIVES OF THE NETWORK



MARACOOS

Ocean Information for a Changing World

Societal Goals
of the U.S. Integrated Ocean Observing System

(1) Climate change and weather

(2) Maritime operations

(3) Natural hazards

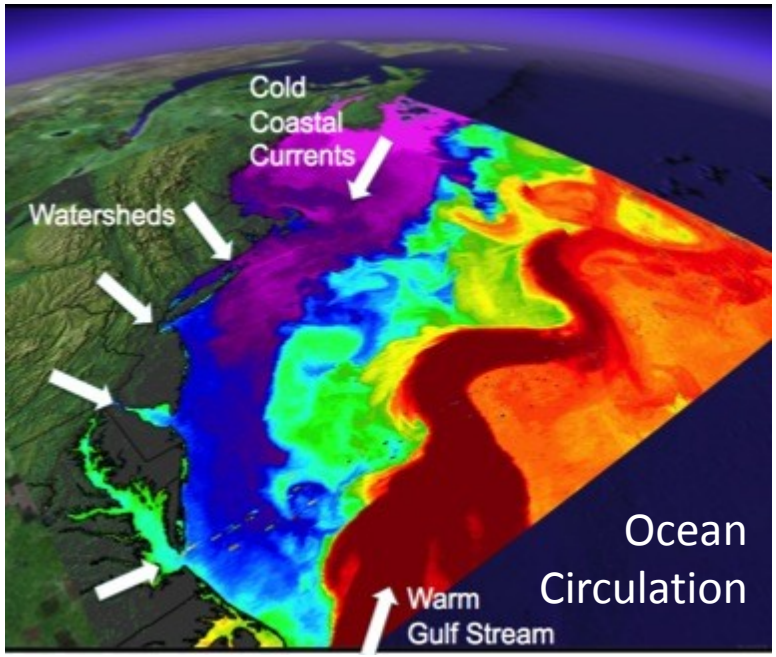
(4) National and homeland security

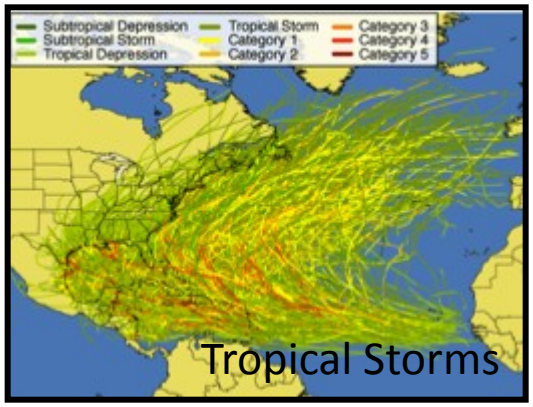
(5) Public health

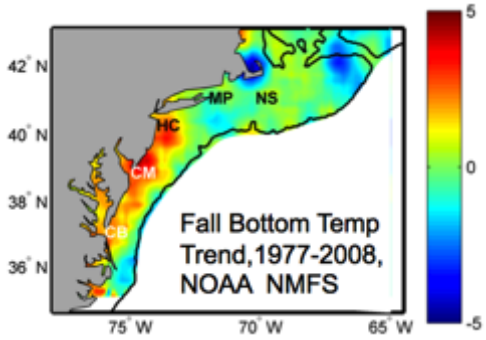
(6) Coastal Ecosystems

(7) Ocean and coastal resources

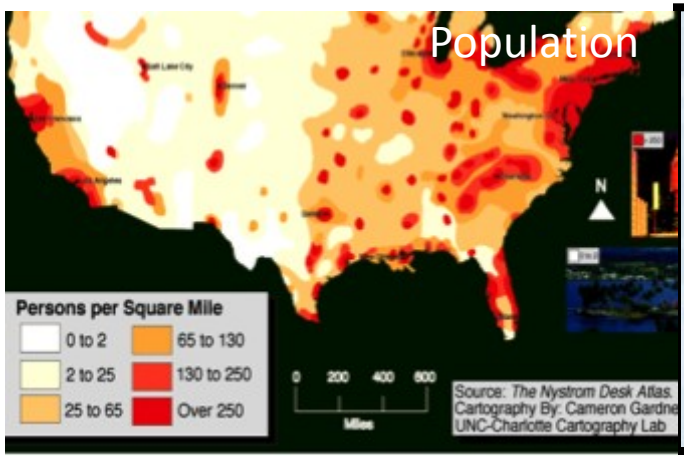
MID-ATLANTIC REGIONAL DRIVERS





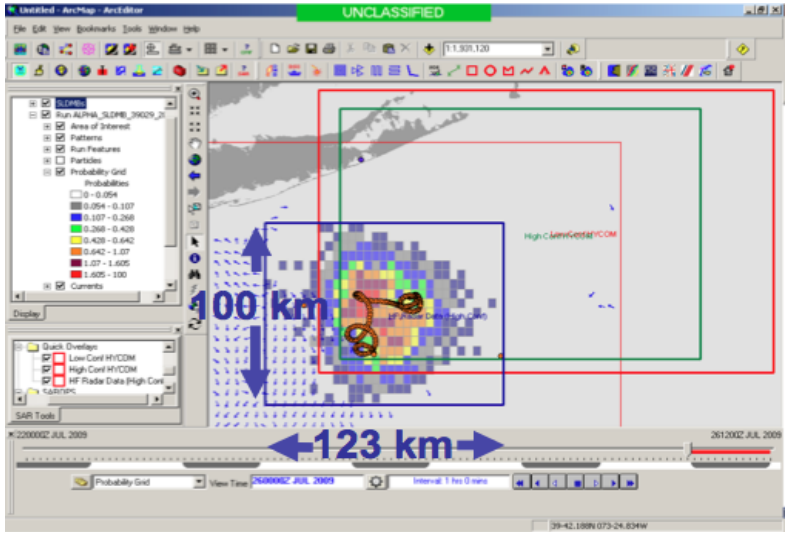


Climate Change



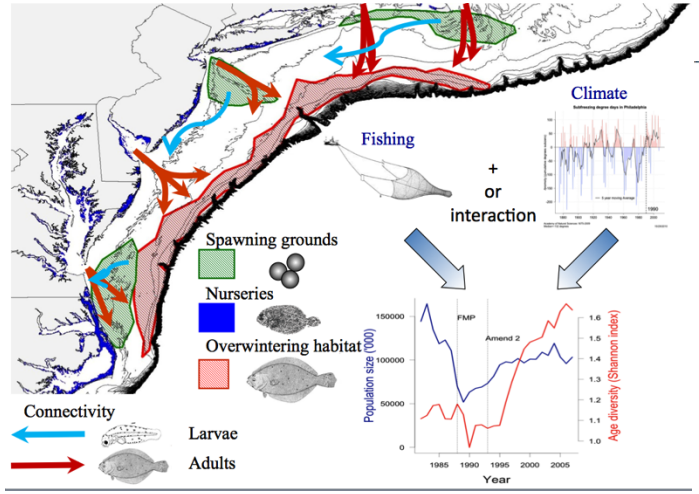
REGIONAL THEMES

1) Maritime Safety and Resiliency

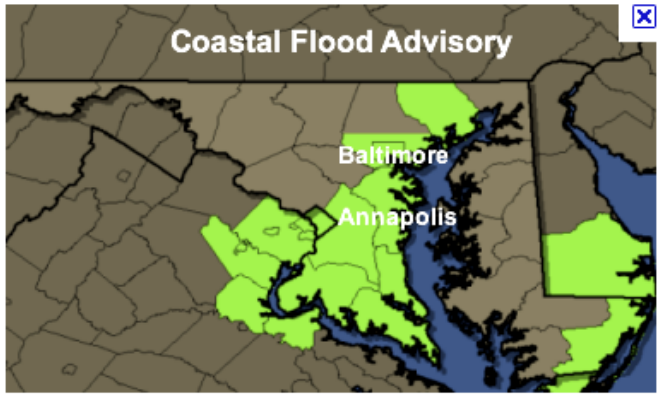


2) Water Quality

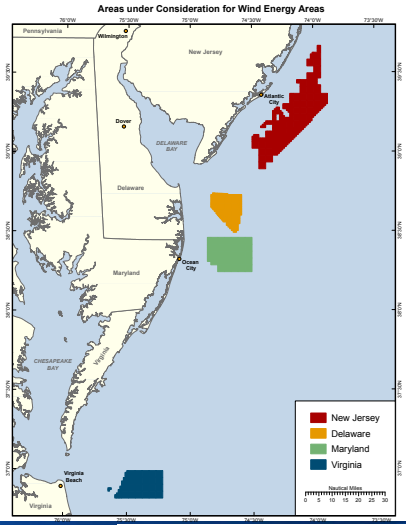
3) Ecosystem Decision Support (Fisheries)



4) Coastal Inundation



5) Energy – Offshore Wind



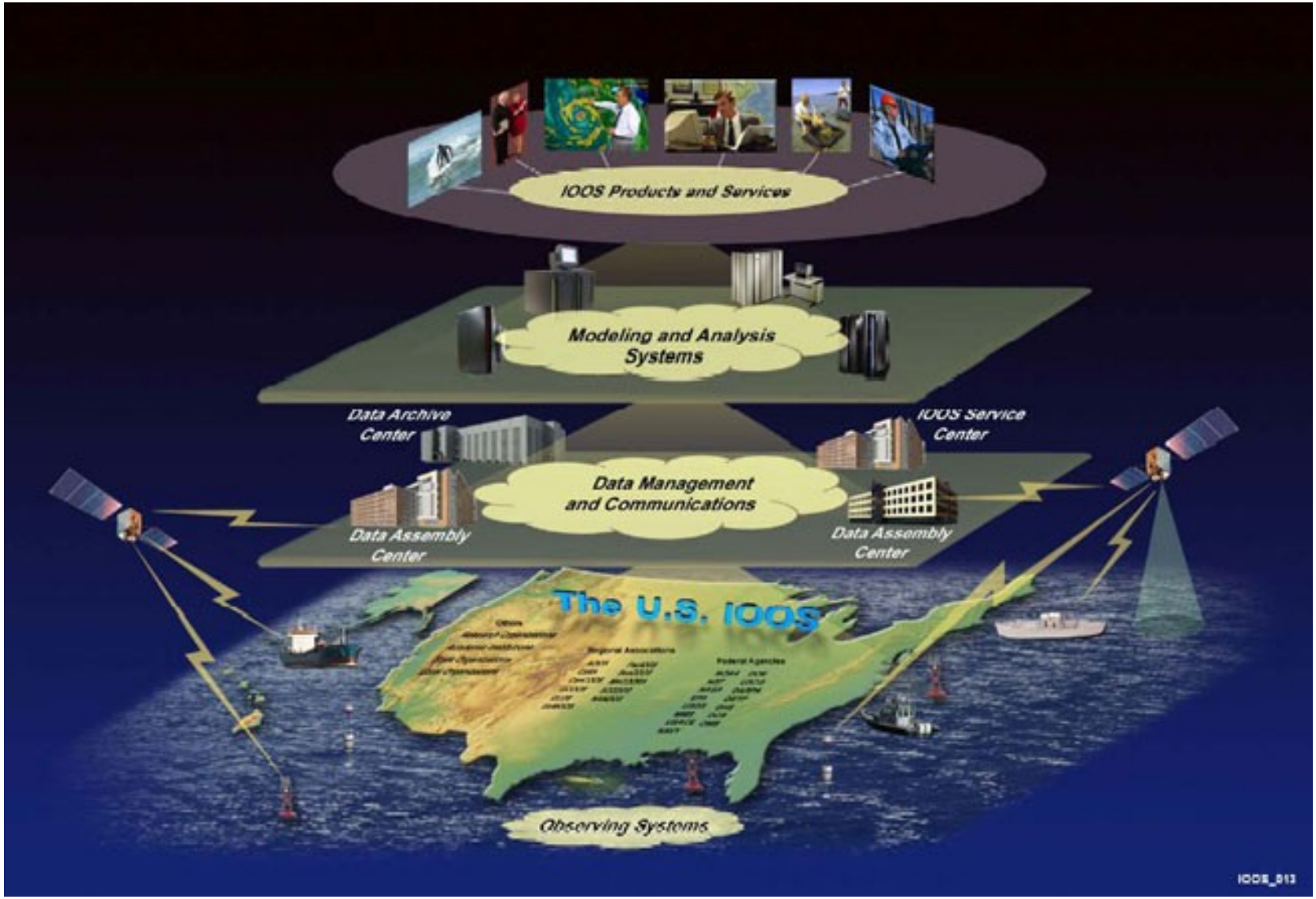
MARACOOS
Ocean Information for a Changing World

Measured Start / Expanding Future

- Focus on specific region-wide issues
  - Initially: Maritime, Fisheries
  - Recently more: Inundation, Water Quality
- 10-year Build Out Plan

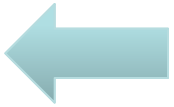
  (online at: http://www.ioosassociation.org/sites/nfra/files/documents/ioos_documents/regional/MARACOOS_BOP_2011.zip)
- Increasing focus in Estuaries

OPERATIONAL MODEL


IOOS Products and Services
Modeling and Analysis Systems
Data Archive Center
IOOS Service Center
Data Management and Communications
Data Assembly Center
Data Assembly Center
The U.S. IOOS
Observing Systems

How can we successfully execute R2O?

1. Research  Operations/Application

2. Research  ? Operations/Application

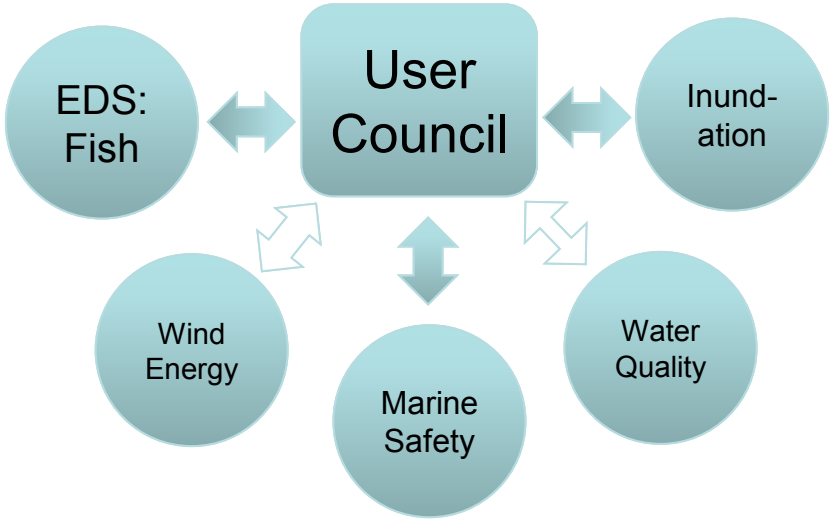
3. Research  Operations/Application

Product Development Infrastructure






- User/Stakeholder Infrastructure
  - User Council
  - Product Groups



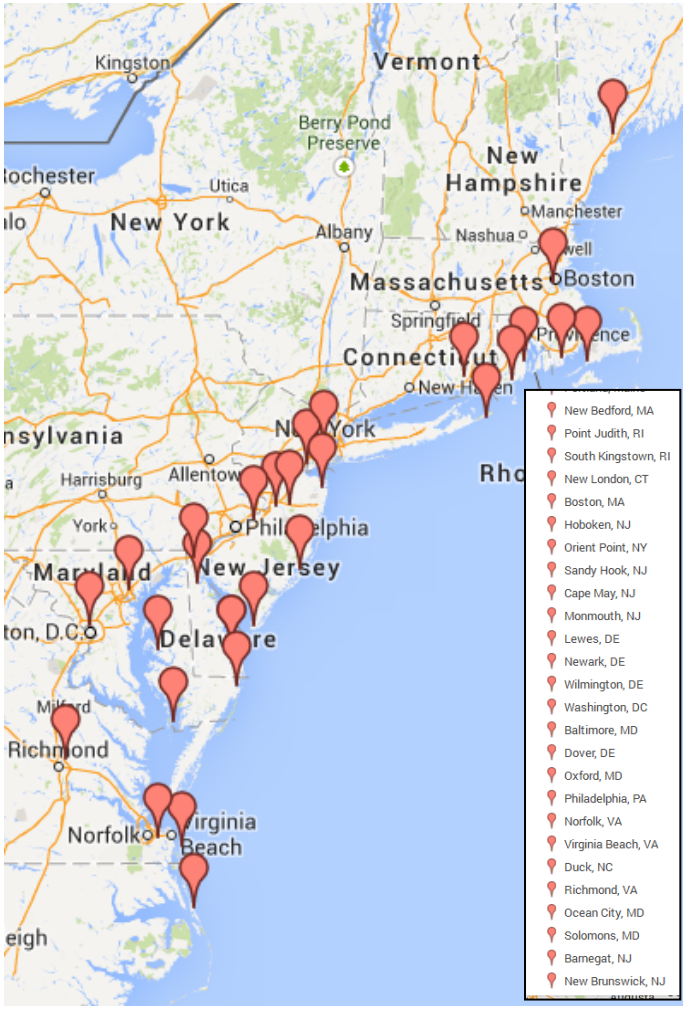
- Stakeholder Liaison Service

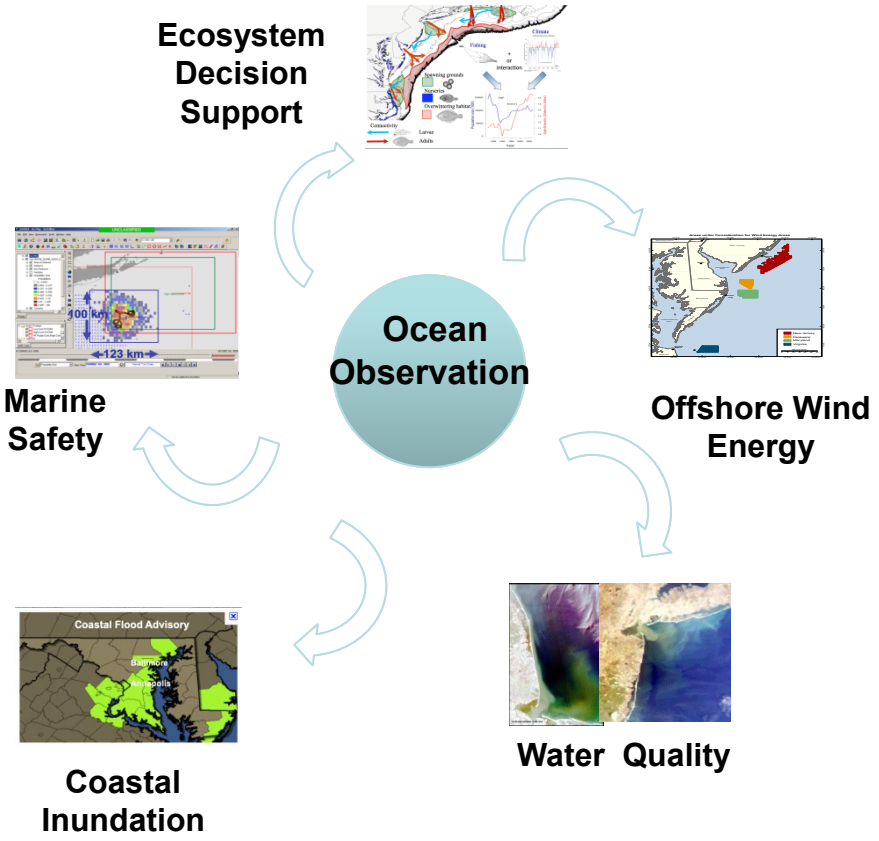
(Geographic and Theme-focused, and leveraged through partnerships)

- Enhanced Cross-Regional focus

Stakeholder Liaison Travels: 2012-2013

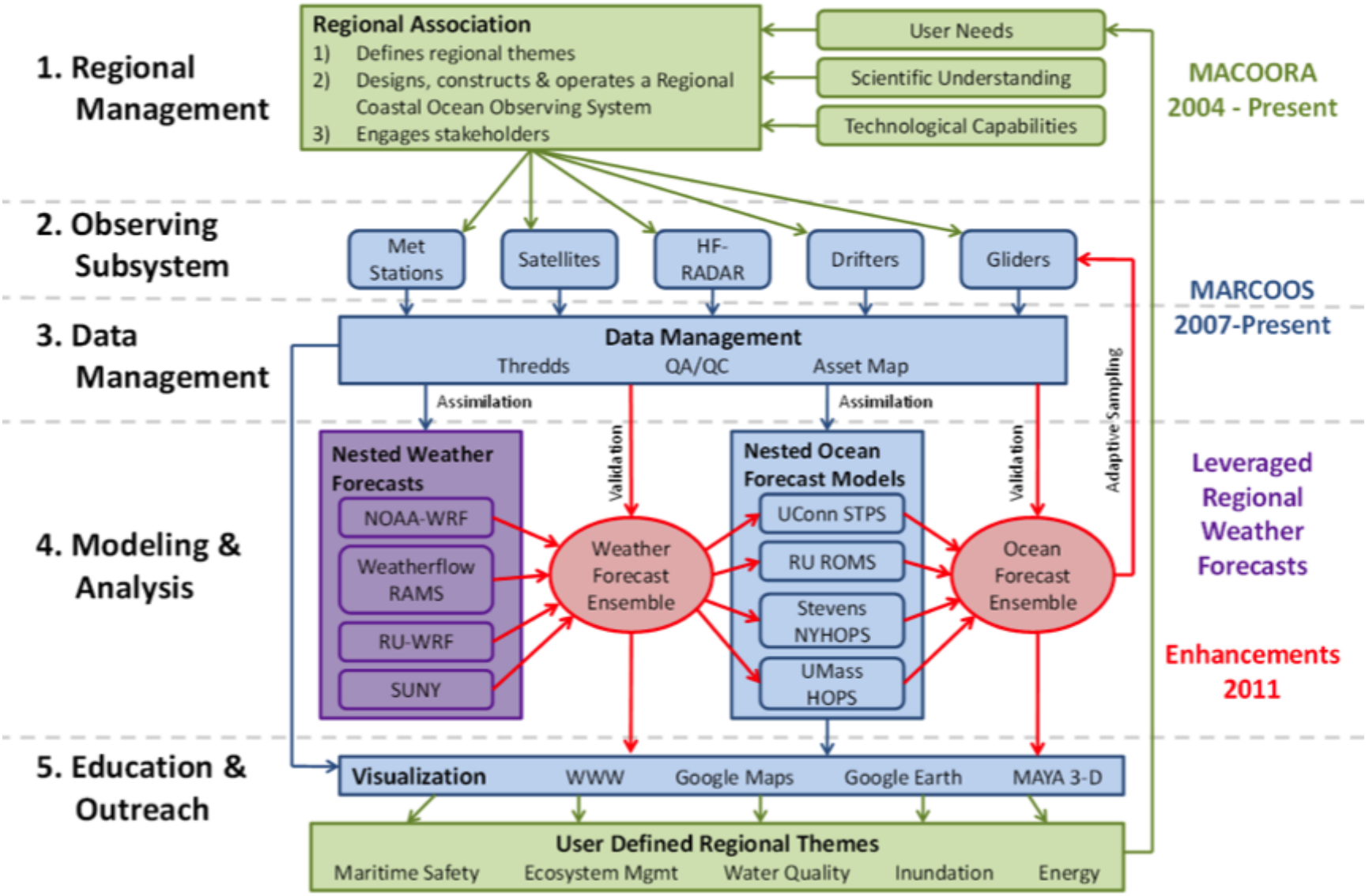
29 Cities, 12 months!





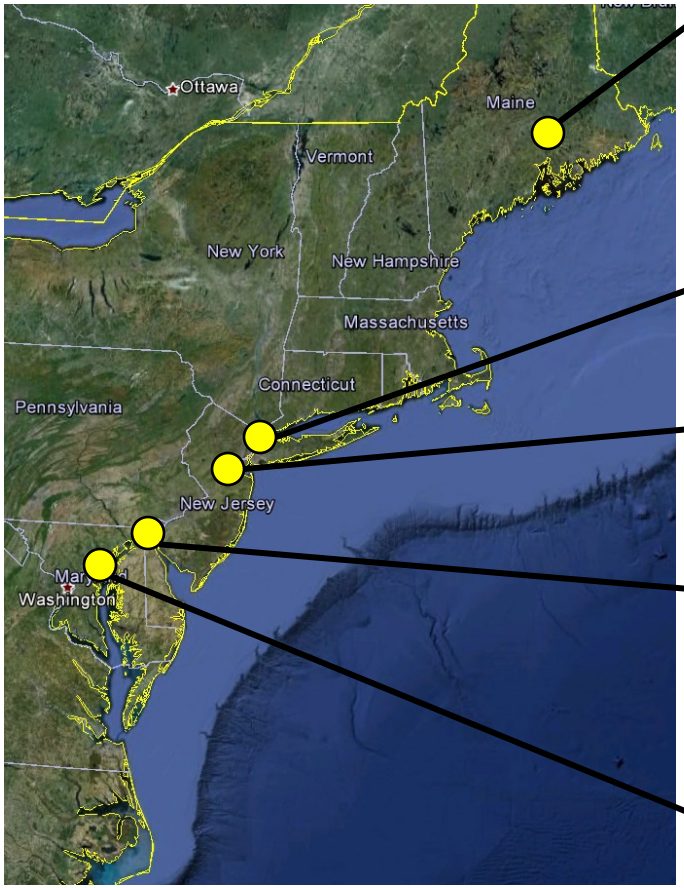
From Observation to Prediction and *End Use*

From Observations To Predictions



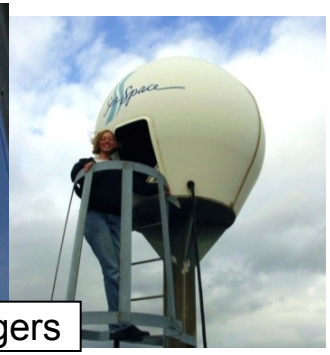
Real-Time Satellite Ground Stations in the Northeast U.S. Since 1992

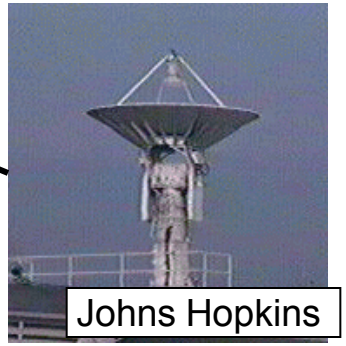
Satellites: NPP, Terra, Aqua, NOAA Polar Orbiters, Metop & GOES

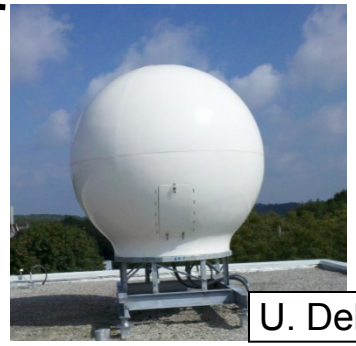



U. Maine


City College of N.Y.



Rutgers

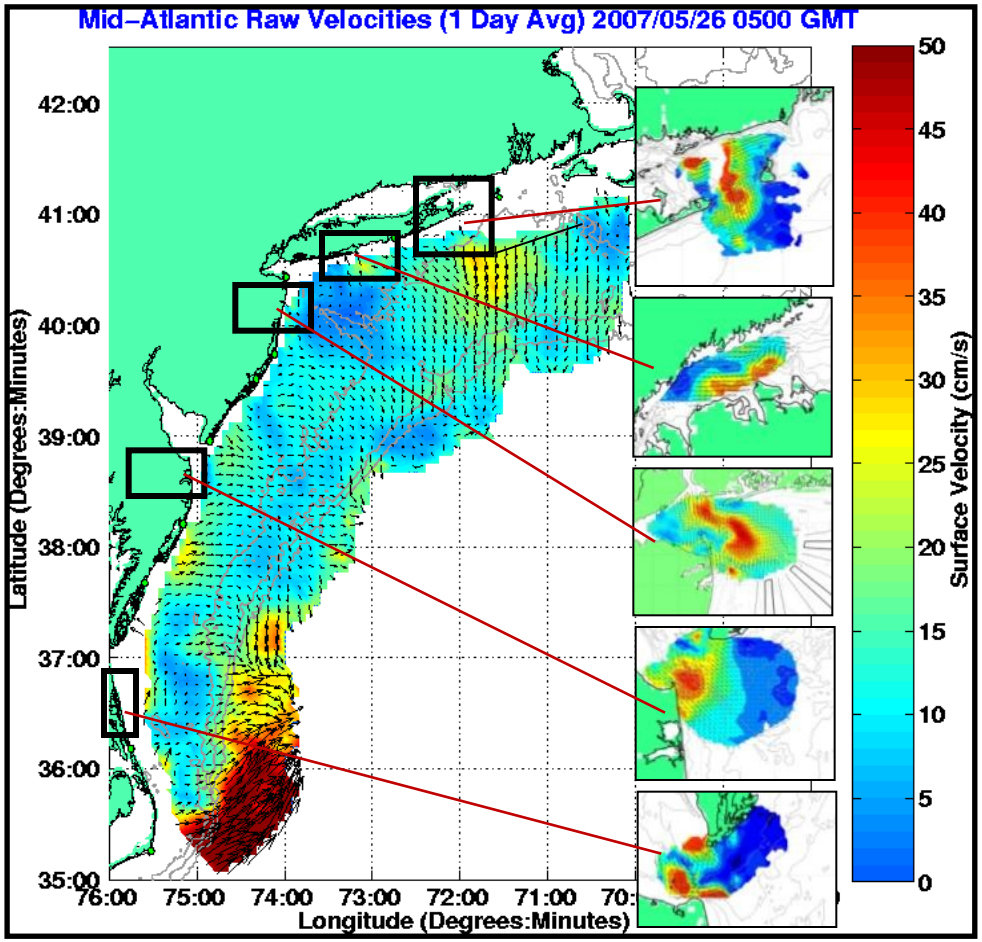

Johns Hopkins



U. Delaware

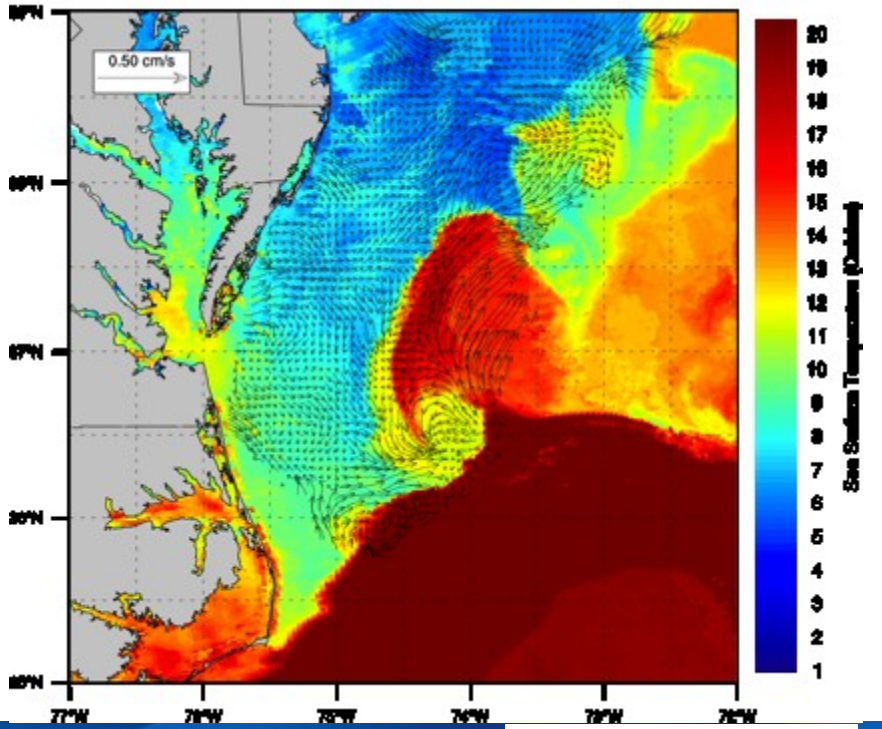
MARACOOS
Ocean Information for a Changing World

High Frequency Radar – Since 1996



Nested Grids of Hourly Surface Current Maps ^

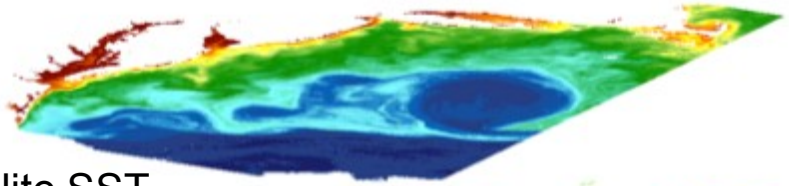
Corporate Partner:
CODAR Ocean Sensors



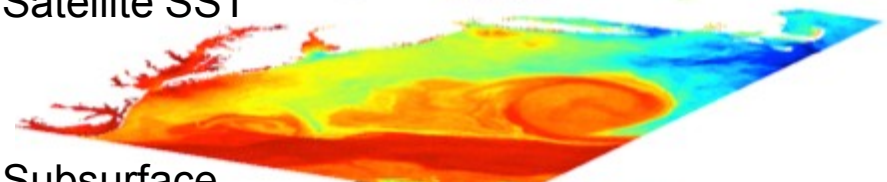
Combined CODAR & Satellite Products >

Autonomous Underwater Gliders – Since 1998

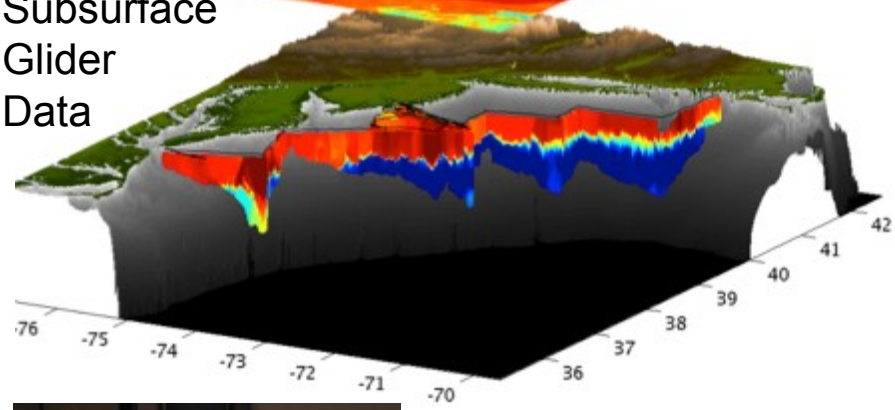
Satellite Ocean Color



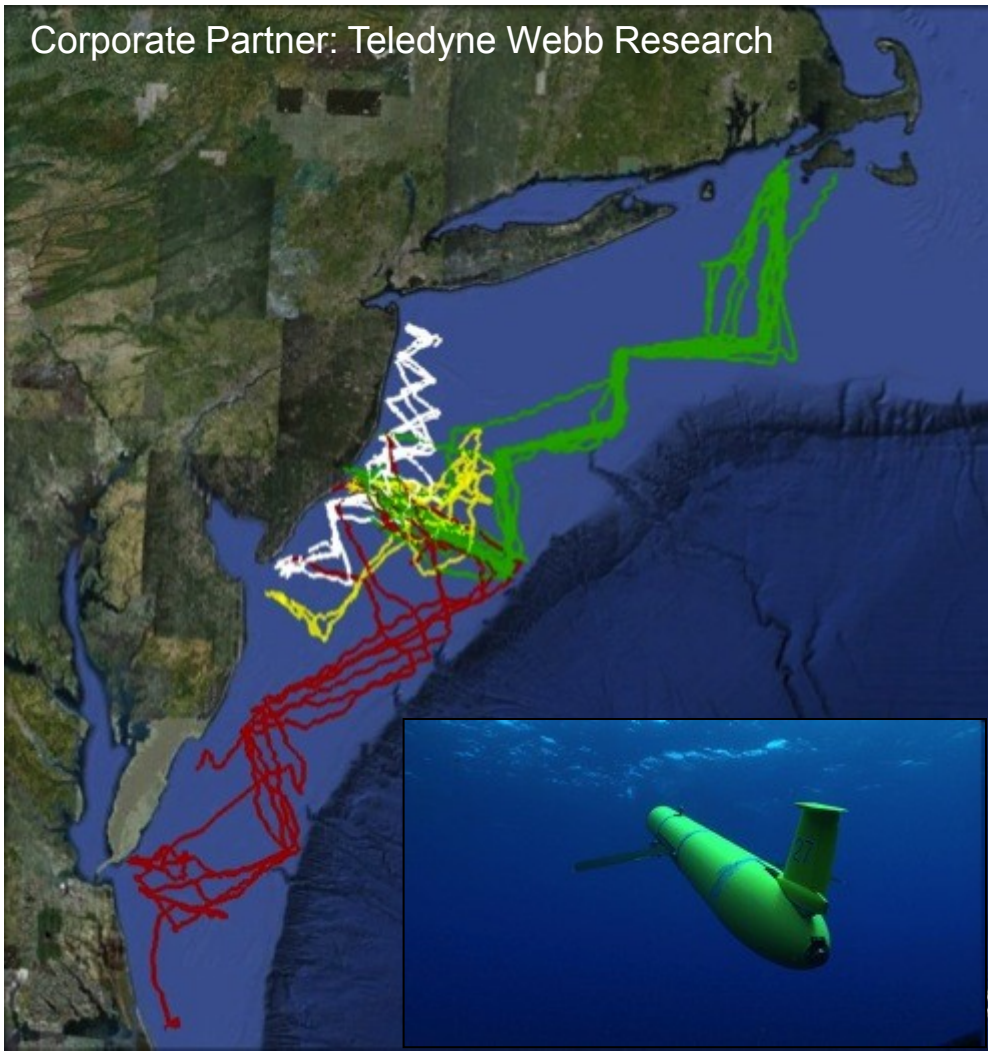
Satellite SST



Subsurface Glider Data

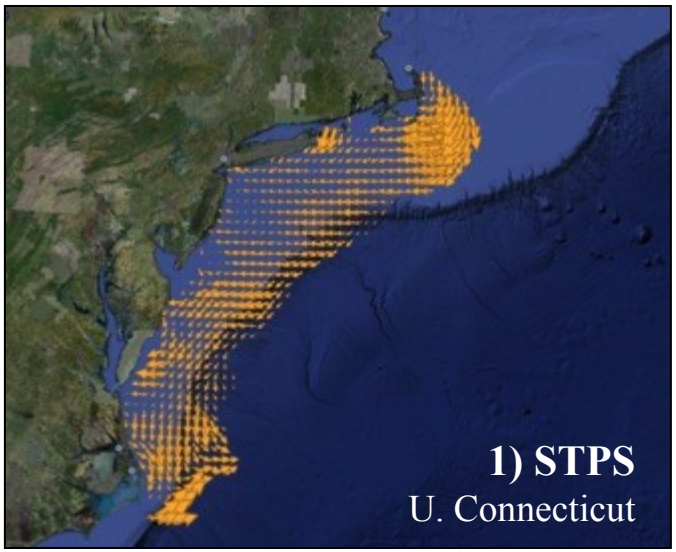


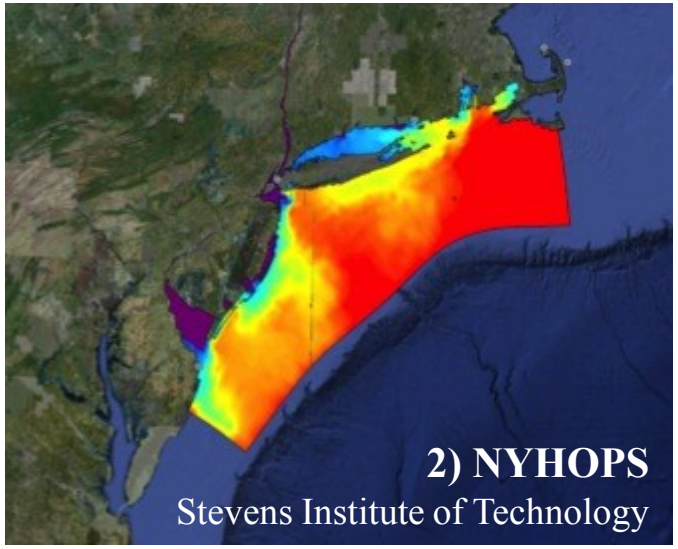
Corporate Partner: Teledyne Webb Research

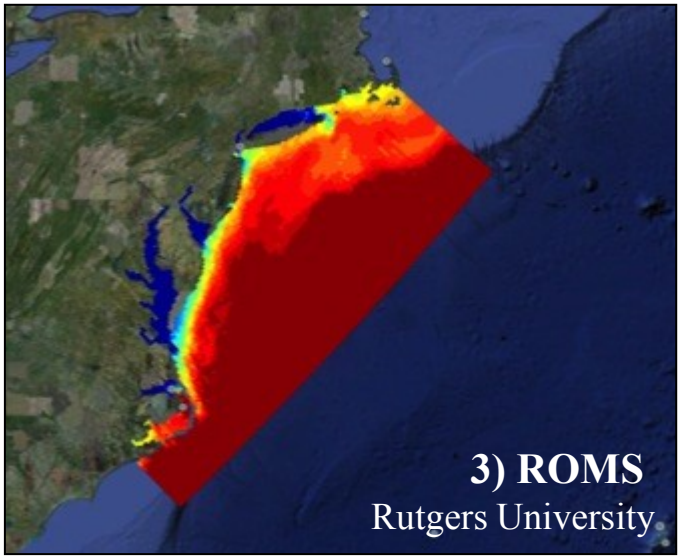


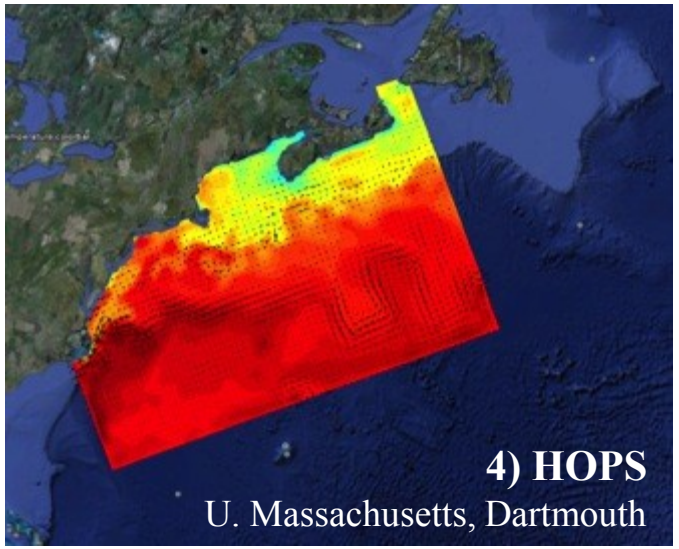
The Mid-Atlantic Regional Coastal Ocean Modeling System

Established 2007

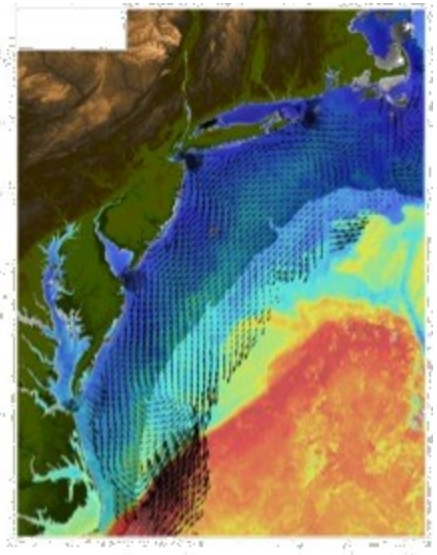








Composite Data & Forecast Products



Remote Sensing

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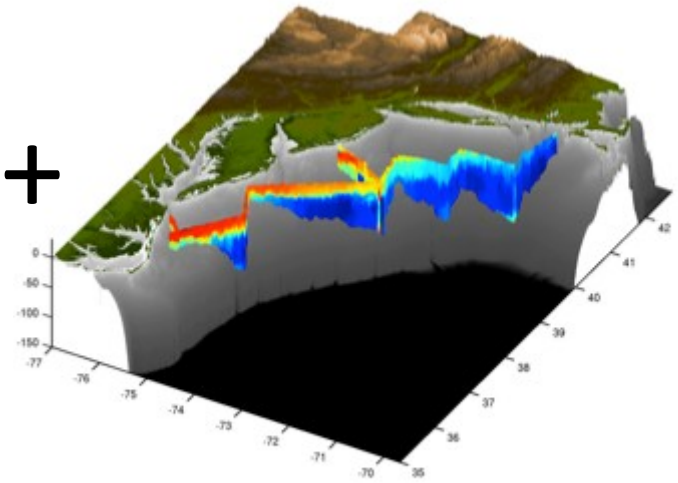

Gliders

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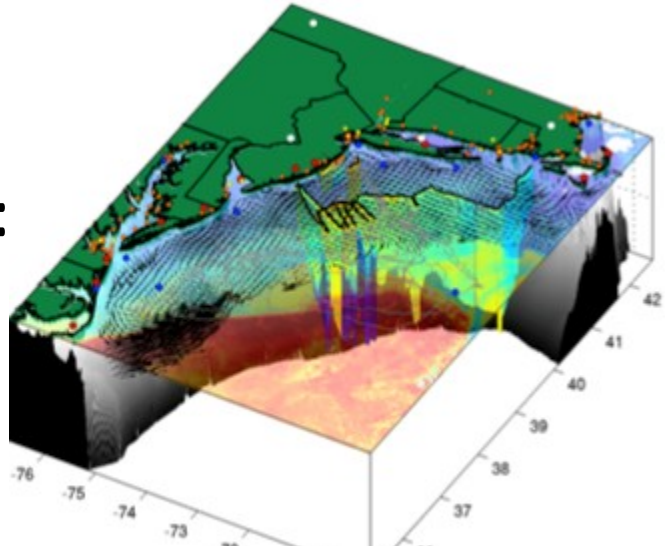
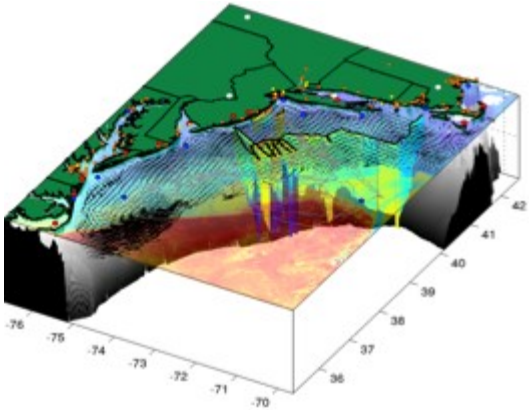
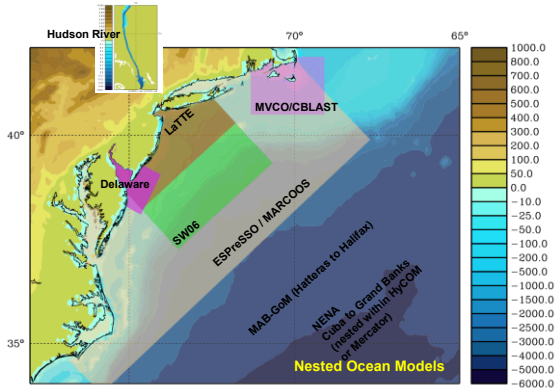


3-D Nowcasts



3-D Nowcasts

+



Nested Models

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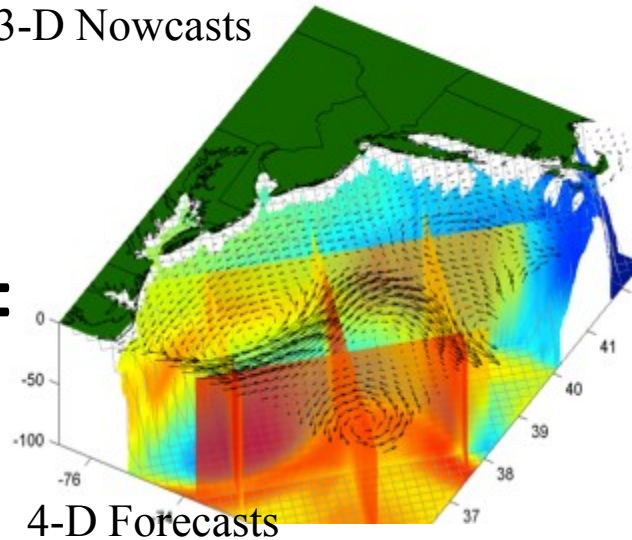
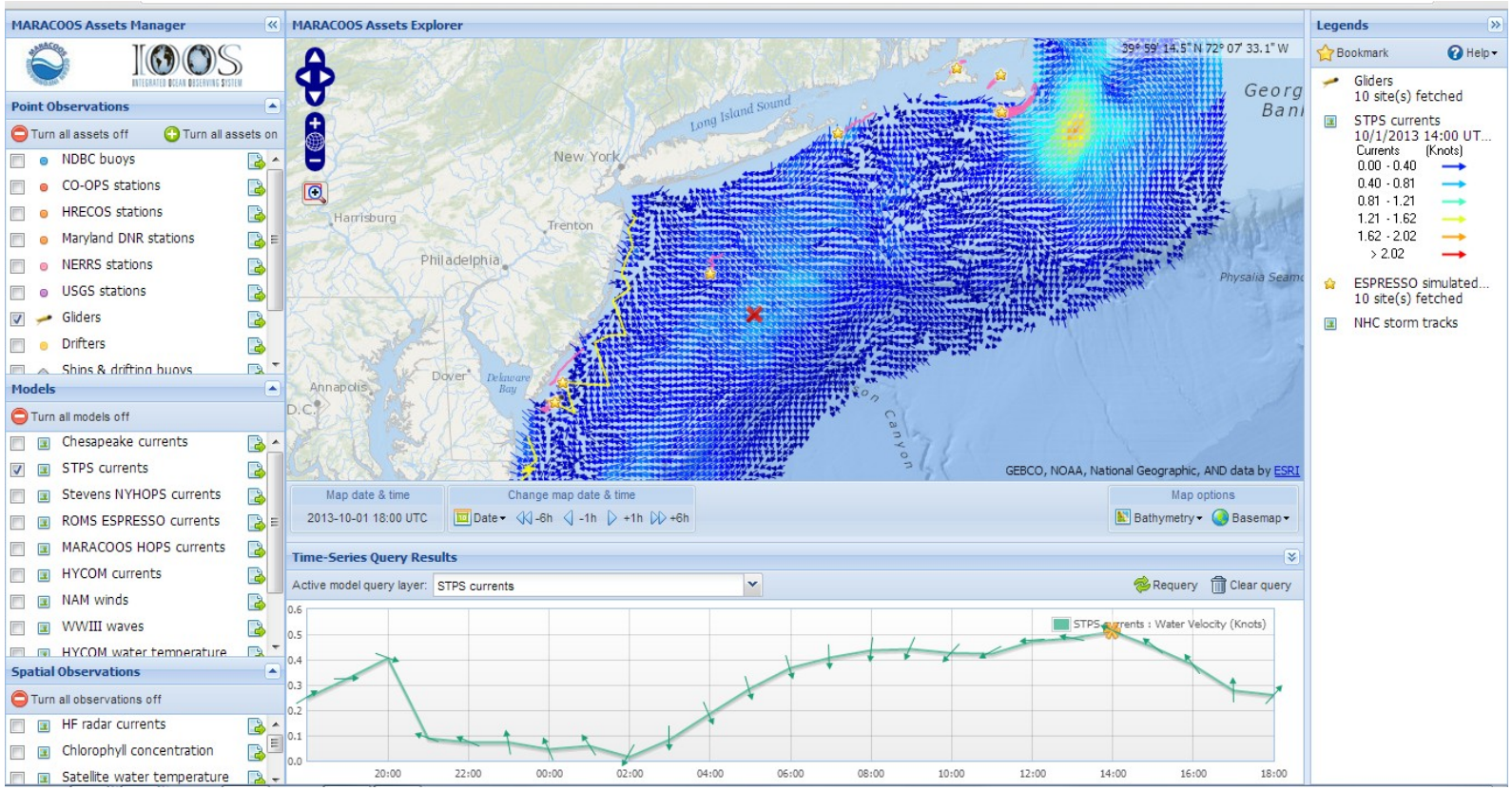


4-D Forecasts

MARACOOS Asset Map

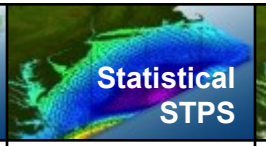
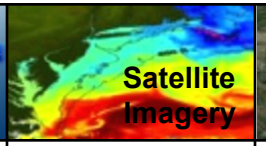
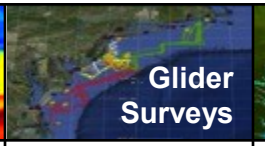
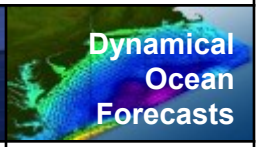


- Regional Data
- Federal Data

- In-Situ
- Gliders
- Satellite
- Radar
- Models

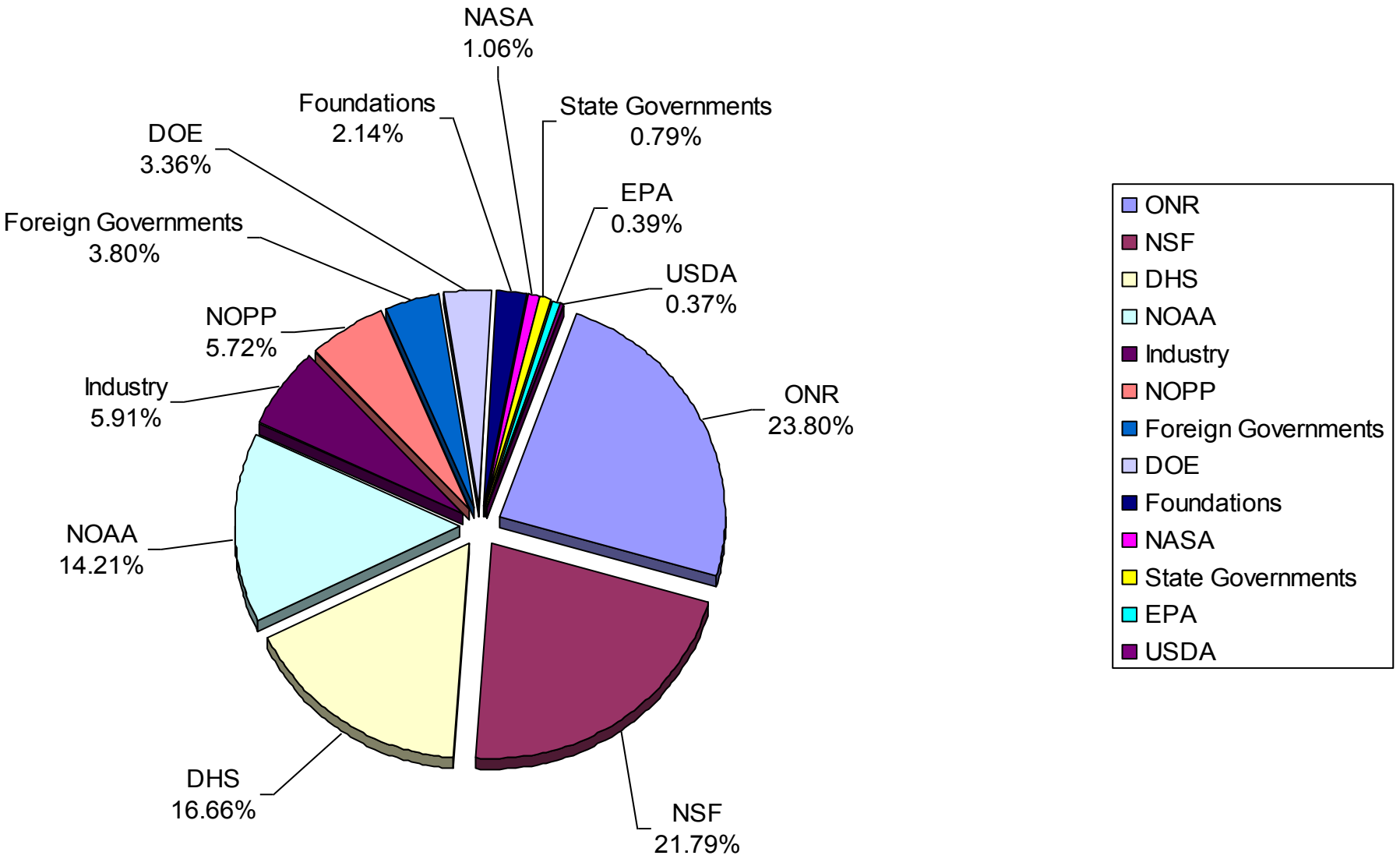
- IOOS Standards

Leveraging Data & Products

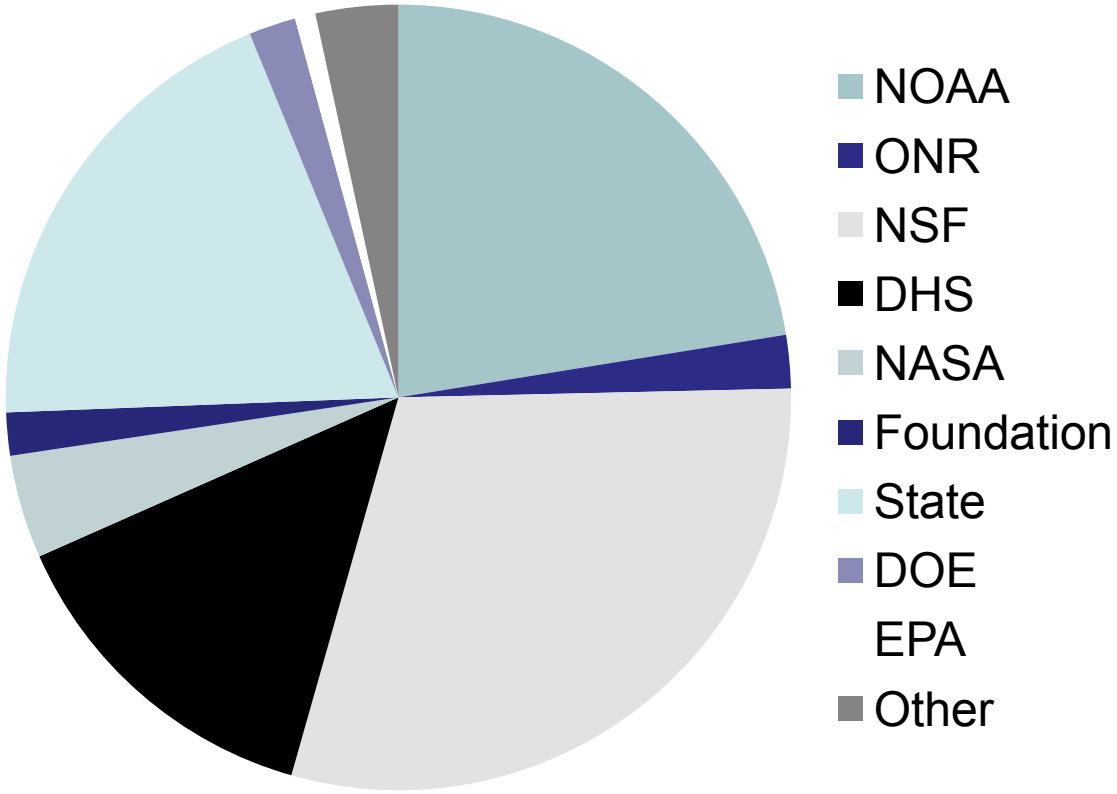
Regional Priority Themes	Regional Observation & Modeling Capabilities					
	 Weather Mesonet	 HF Radar Network	 Statistical STPS	 Satellite Imagery	 Glider Surveys	 Dynamical Ocean Forecasts
Theme 1. Maritime Safety	Operational Input to USCG SAROPS	Operational input to USCG SAROPS	Operational input to USCG SAROPS	SST for survivability planning	Assimilation dataset for forecast models	Surface currents for SAROPS
Theme 2. Ecological Decision Support	Weather forecast ensemble validation	Circulation and divergence maps for habitat		SST & Color for habitat	Subsurface T & S for habitat	3-D fields of T, S, circulation for habitat
Theme 3. Water Quality	Winds for transport, river plumes, & upwelling	Surface currents for flotables, bacteria, spill response	Surface currents for flotables, bacteria, spill response	Ocean color for river plumes	Nearshore dissolved oxygen surveys	Surface currents for floatables, bacteria, spill response
Theme 4. Coastal Inundation	Weather forecast ensemble validation	Current forecast model validation		SSTs assimilation into forecast models	Assimilation dataset for forecast models	Nested forecast ensembles
Theme 5. Offshore Energy	Historical analysis & wind model validation	Historical current analysis & wind model validation		Historical analysis surface fronts & plumes for siting	Historical analysis of subsurface fronts & plumes	Coupled ocean-atmosphere models for resource estimates

BUSINESS MODEL AND FUNDING

Typical Funding Distribution



MARACOOS 2013 Leveraged Funding



Total: $15.37 million

GOVERNANCE AND OVERSIGHT

U.S. Integrated Ocean Observing System

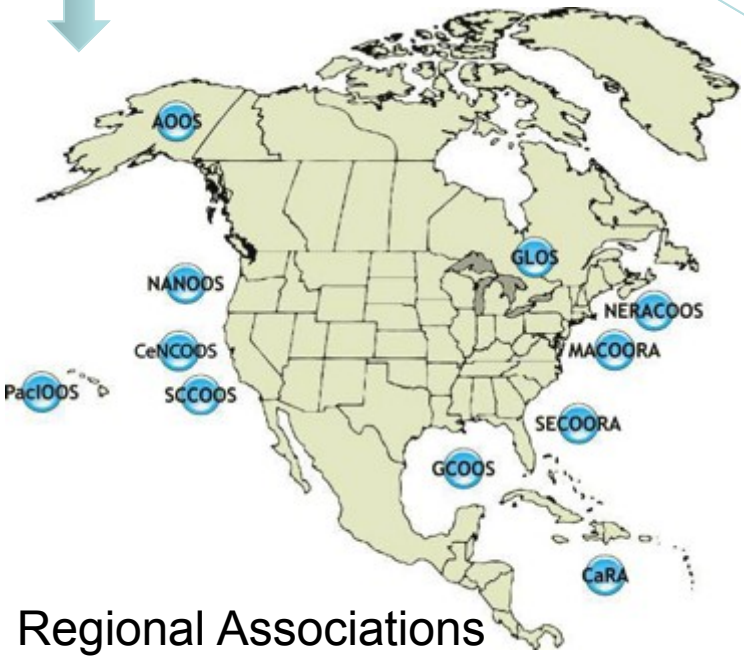
IOOS
INTEGRATED OCEAN OBSERVING SYSTEM

International Component

Global Ocean Observing System

Regional Component

National Component



11 Regional Associations

18 U.S. Federal Agencies

MARACOOS Board of Directors

Carolyn Thoroughgood
Delaware Bay
Board Chair

Edward Kelly

Board Vice Chair

Larry Atkinson

Board Secretary

Doug Wilson
Chesapeake Bay

Andrew McGovern
Long Island Sound

Genevieve Boehm-Clifton
New York Bight

Wendell Brown
Massachusetts/R.I. Bays

William Boicourt

Scott Glenn
MD - Observatory

Hank Lobe

Joseph R. Vietri

Raymond Toll

Jay Odell

Michael Bruno

Paul Cooper

User Council

- **Bruce Bailey** (AWS Truepower) Offshore Energy User Group
- **Bob Connell** (DHHS/PHS/FDA) Water Quality User Group
- **Greg DiDomenico** (Garden State Seafood Association) Fisheries-EDS User Group
- **Avijit Gangopadhyay** (UMASS-Dartmouth)
- **Chris Heyer** (YSI Inc.)
- **Andrew McGovern** (Sandy Hook Pilots) Maritime Safety User Group
- **Joe Sienkiewicz** (NOAA/NCEP/Ocean Prediction Center) Inundation User Group
- **Nancy Vorona** (Center for Innovative Technology)
- **Doug Wilson** (MARACOOS Board)

MARACOOS Management Team

Gerhard Kuska
Executive Director

Mike Crowley
Technical Director

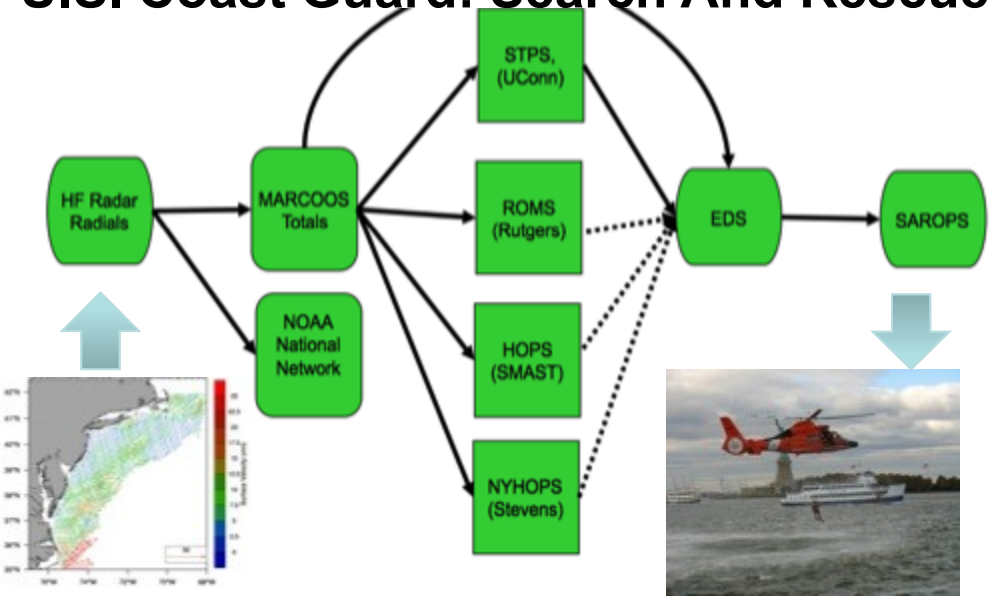
Peter Moore
Stakeholder Liaison

→ Plus part-time admin support and part-time interns

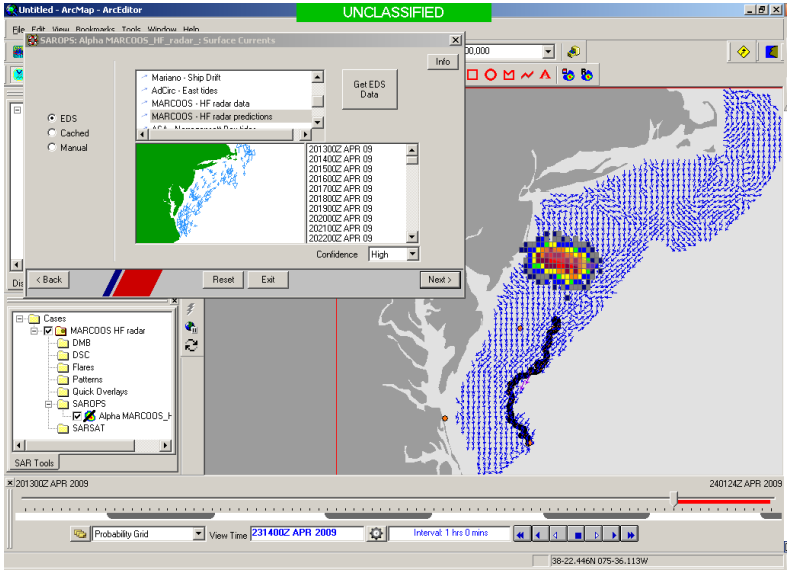
→ Leverage support externally for stakeholder outreach, government relations, and communications

SUCCESSES AND CHALLENGES

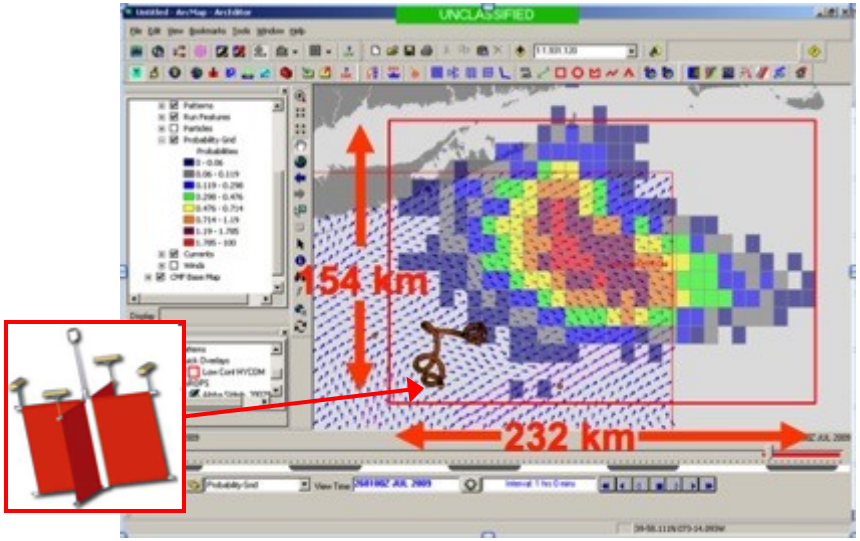
U.S. Coast Guard: Search And Rescue Optimal Planning System *SAROPS*



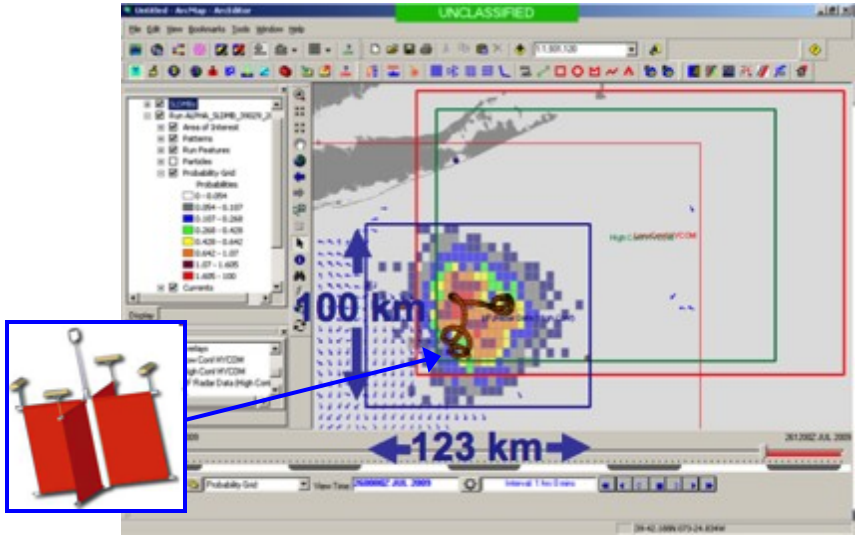
Mid-Atlantic Operational Data Flow to SAROPS



SAROPS User Interface



SAROPS 96-Hour Search Area: **HYCOM = 36,000 km²**



SAROPS 96-Hour Search Area: **HF Radar = 12,000 km²**

Ecological Decision Support – Fisheries

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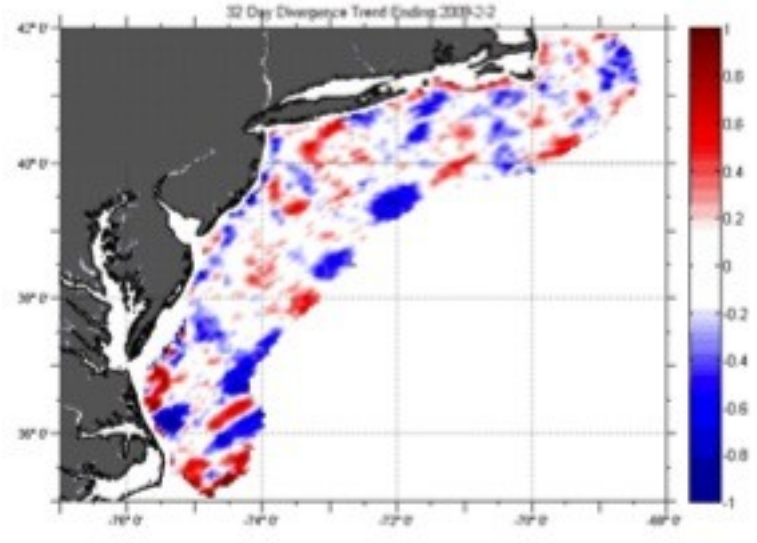
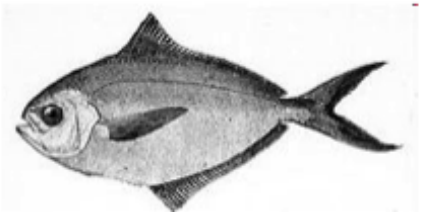


Long fin squid

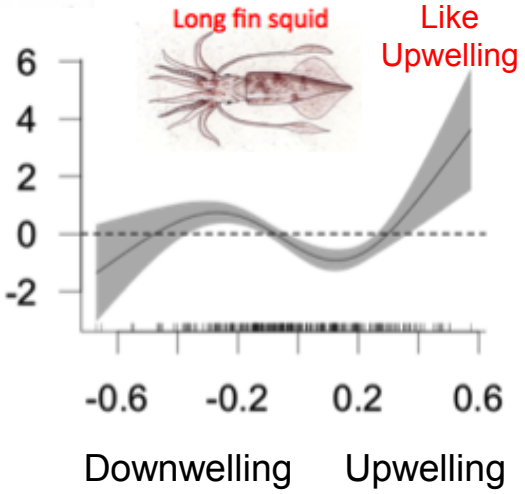
Butterfish

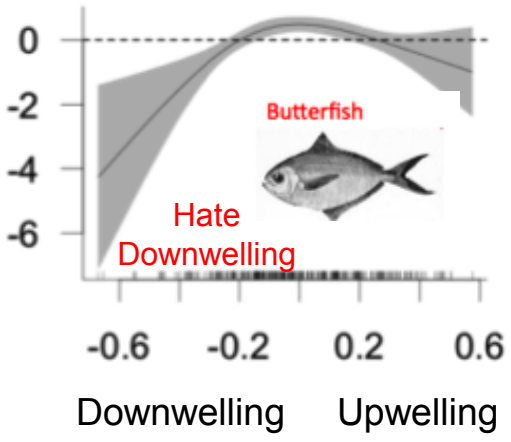


Our Approach:

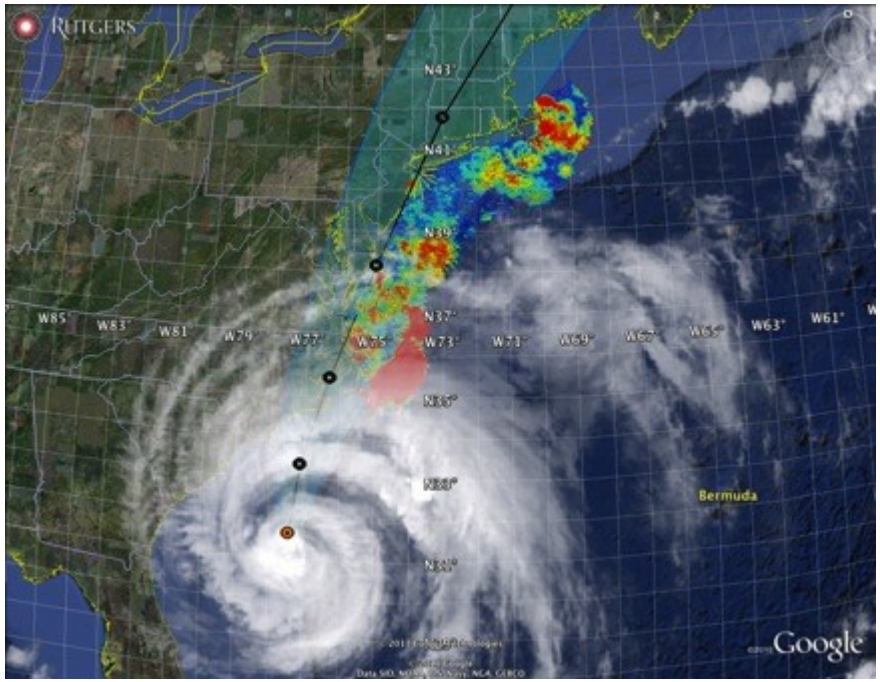
Develop statistical models using bottom trawl surveys and MARACOOS 3-D data to predict species distribution based on observed or forecasted MARACOOS 3-D fields.

Divergence index

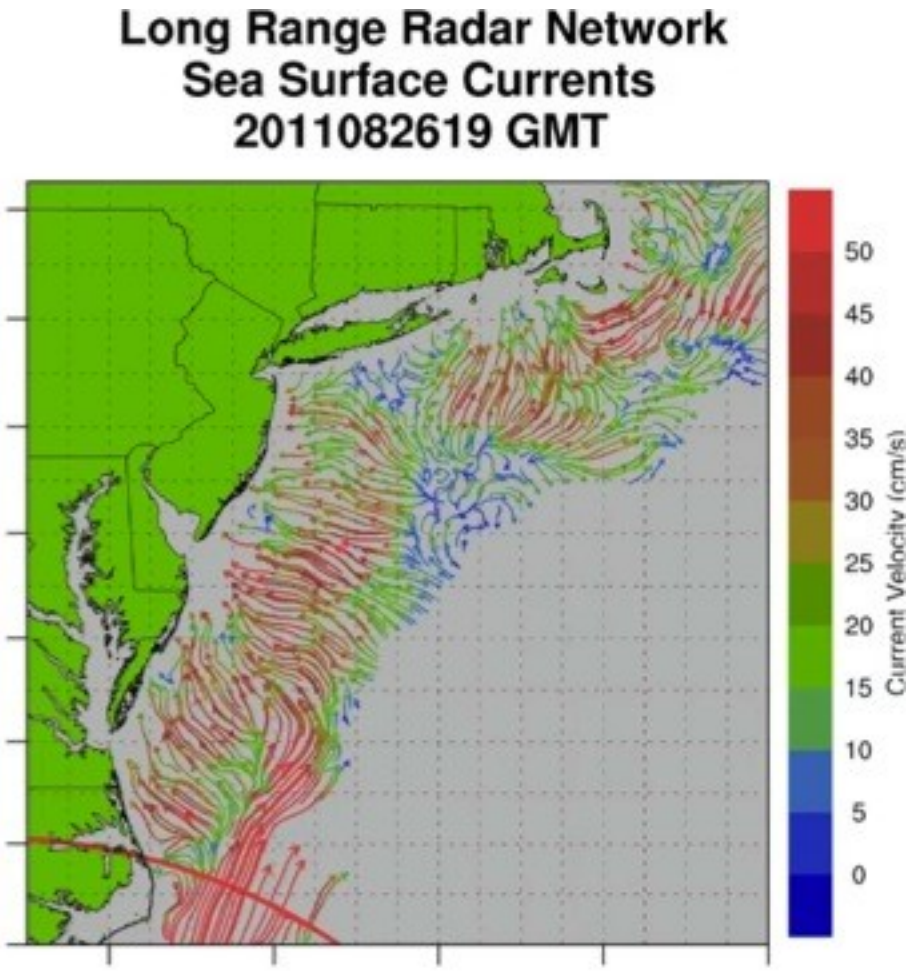




Maritime Safety – Tracking Hurricane Irene

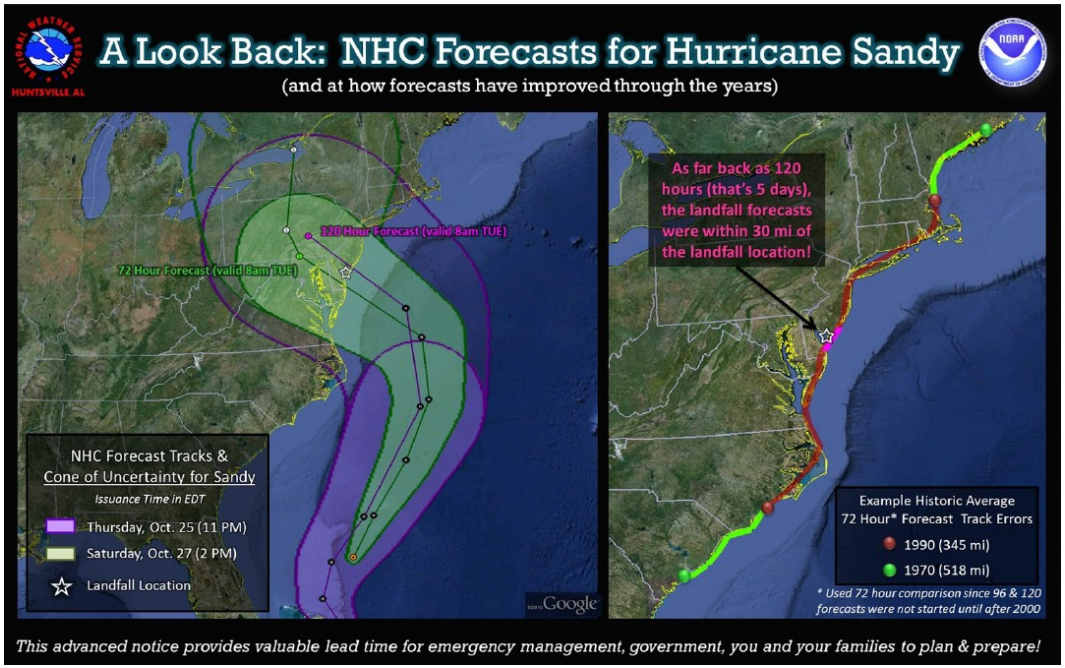


Hurricane Irene Approaches the MARACOOS HF Radar Network



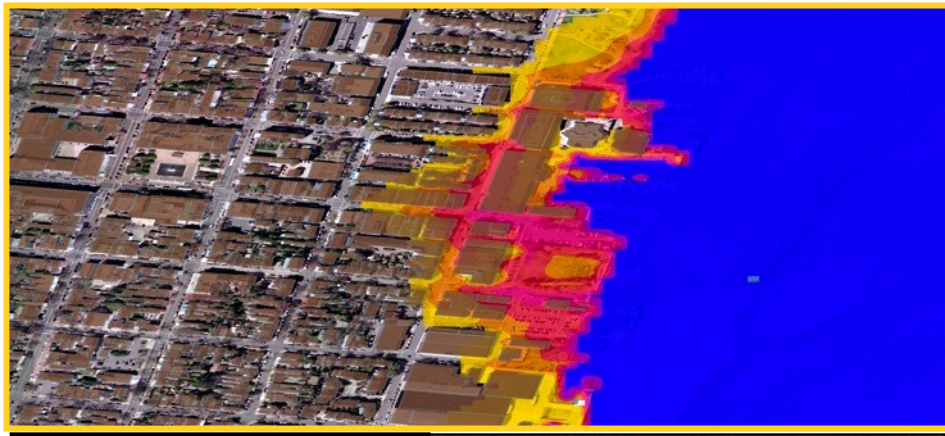
Reduced Impacts from Sandy

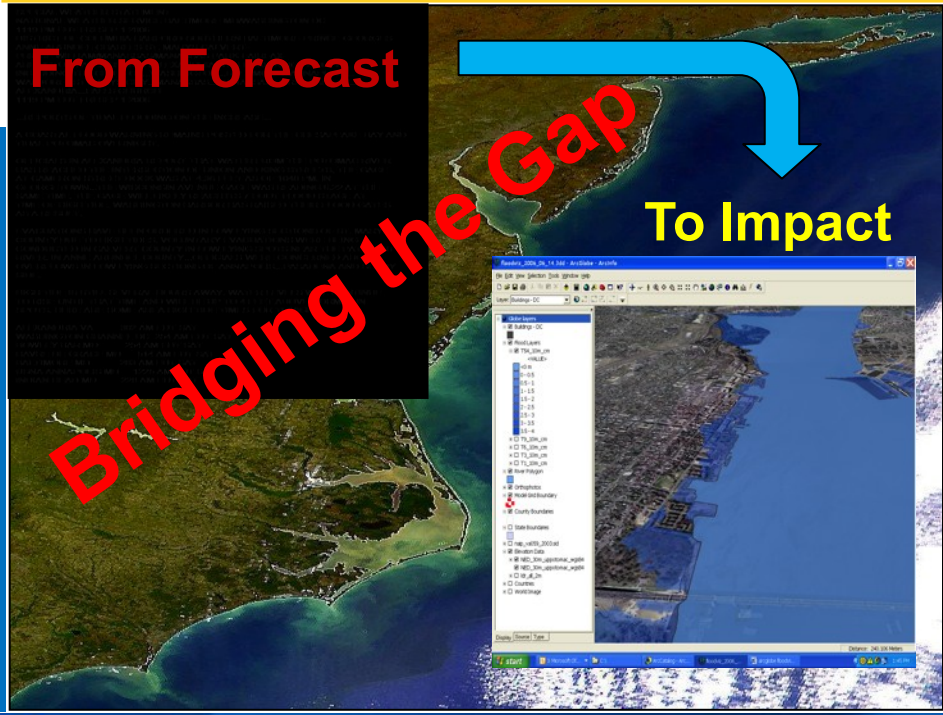
- Navy: "…80 ships sortied, saving $500M…"
- Shipping: "…Christmas 2012 was saved…)
- Hoboken: IOOS high resolution surge forecasts saved lives & property
- Oil and Gas: "…relied exclusively on US IOOS products and services…"



Coastal Inundation

Chesapeake Inundation Prediction System (CIPS) Partners



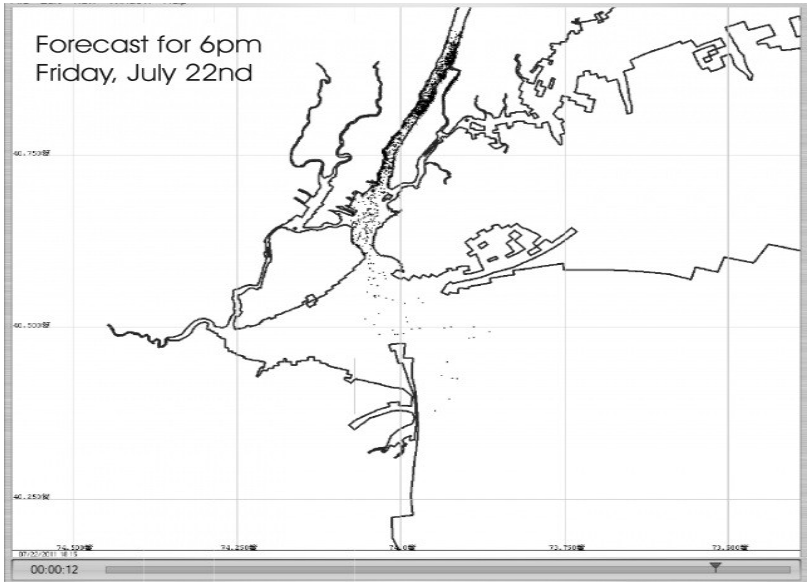


MATURING TECHNOLOGY

- Regional scale atmospheric wind forecast model
- Very high-resolution hydrodynamic models with land flooding
- Very high-resolution land elevation data (LIDAR)
- Emerging GIS and visualization capabilities for integrated, high-resolution pictures and products

Water Quality

Data and Modeling to respond to 120+ million gallons of sewage released into the Hudson River following North River Wastewater Treatment Plant fire in NYC, July 2011



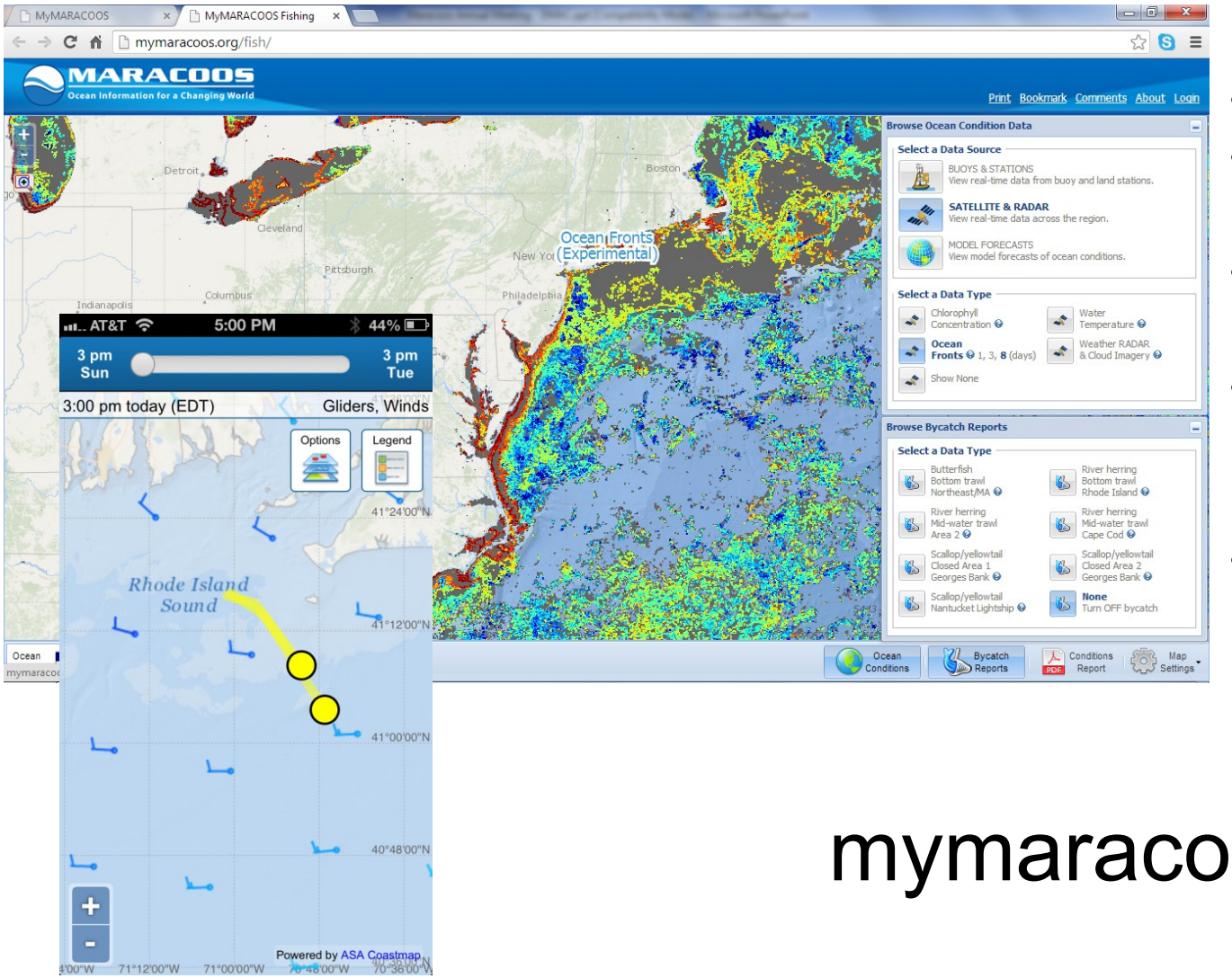
CBIBS: MARACOOS partners with NOAA to enhance utility of CBIBS

Chesapeake Bay
INTERPRETIVE BUOY SYSTEM

MARACOOS partners will

- Integrate CBIBS data into MARACOOS data management system, including IOOS DMAC standards and services and QARTOD QA/QC procedures.
- Integrate CBIBS data feeds into NOAA PORTS system.
- Support CBIBS planning, operations, and maintenance activities.
- Expand CBIBS system
- Support Research and Development applications (e.g., Nutrient Monitoring, Ocean Acidification)

MyMARACOOS Fishing



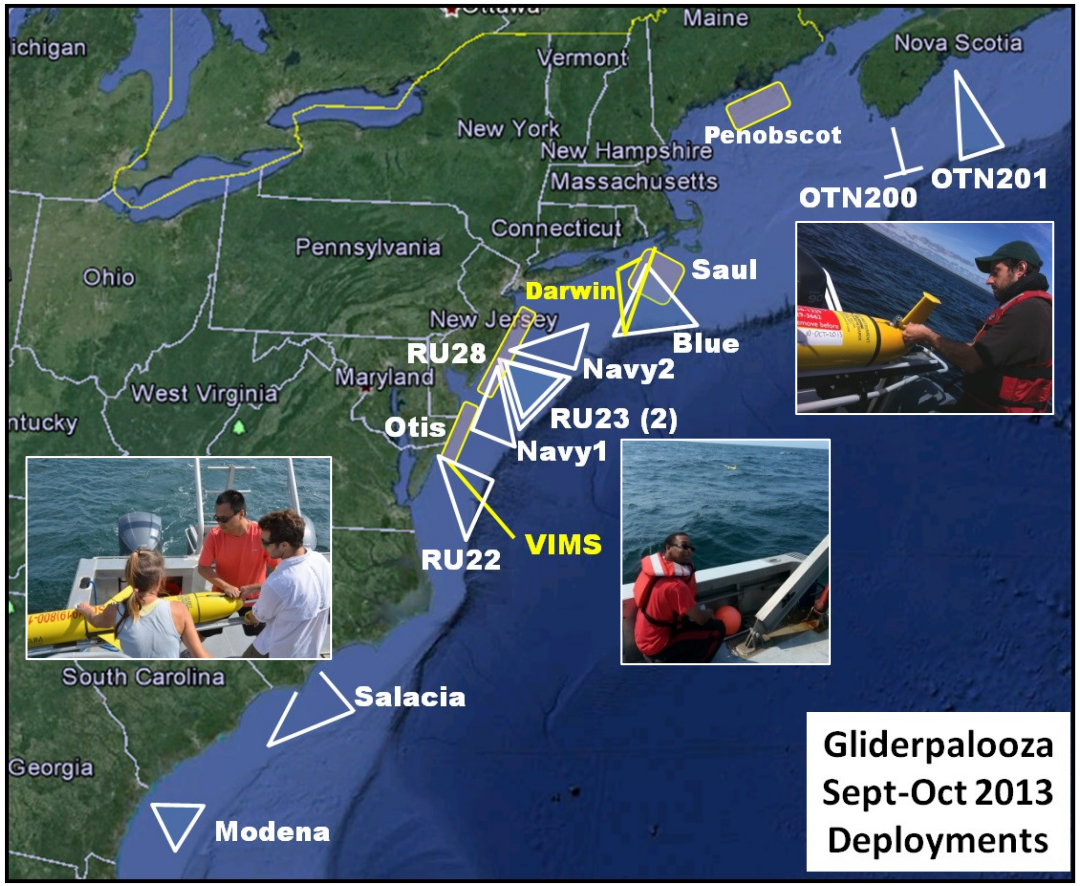
- Web Site
- Mobile Site

- Extensive outreach activities
- Customized to meet user needs

- IOOS Standards

mymaracoos.org

Gliderpalooza 2013: So much more than gliders



1. Provide a unique data set to modelers
2. Provide standardized dataset a over ecological scales and information on fish/mammal migrations
3. Provide a 3-D snapshot of the MAB cold pool
4. Provide an extensive distributed network through the peak period of fall storms, demonstrating "surge" capacity
5. Demonstration of a national glider network
6. Proof of data flow through IOOS to NDBC via DMAC
7. Engage undergraduates in ocean observing efforts.

Some successes, but…

Big challenges lie ahead:

1. Growing needs of the stakeholders
2. Expectation to continue to build out the system (10-year BOP)
3. Fiscal future? (in & out of government)
4. Pressure to demonstrate value
5. Misperceptions of MARACOOS / IOOS

THANK YOU

www.maracoos.org

MARACOOS

Ocean Information for a Changing World