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’ MISSION:
To seek, discover, share, and apply new knowledge & understanding of our coastal ocean
(Listen, Observe, Predict, Develop, Manage, Serve, Educate)
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

- Ocean Circulation
- Tropical Storms
- Climate Change
- Critical Habitat
- Population
- Ports

MARACOOS
Ocean Information for a Changing World
REGIONAL THEMES

1) Maritime Safety and Resiliency

2) Water Quality

3) Ecosystem Decision Support (Fisheries)

4) Coastal Inundation

5) Energy – Offshore Wind
Measured Start / Expanding Future

• Focus on specific region-wide issues
  – Initially: Maritime, Fisheries
  – Recently more: Inundation, Water Quality

• 10-year Build Out Plan

• Increasing focus in Estuaries
OPERATIONAL MODEL
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!

Ecosystem Decision Support
Ocean Observation
Marine Safety
Offshore Wind Energy
Water Quality
Coastal Inundation

From Observation to Prediction and End Use
From Observations To Predictions

1. Regional Management
   1) Defines regional themes
   2) Designs, constructs & operates a Regional Coastal Ocean Observing System
   3) Engages stakeholders

2. Observing Subsystem
   - Met Stations
   - Satellites
   - HF-RADAR
   - Drifters
   - Gliders

3. Data Management
   - Thredds
   - QA/QC
   - Asset Map
   - Assimilation
   - Adaptive Sampling

4. Modeling & Analysis
   - Nested Weather Forecasts
     - NOAA-WRF
     - Weatherflow RAMS
     - RU-WRF
     - SUNY
   - Nested Ocean Forecast Models
     - UConn STPS
     - RU ROMS
     - Stevens NYHOPS
     - UMass HOPS
   - Weather Forecast Ensemble
   - Validation
   - Enhancements 2011

5. Education & Outreach
   - Visualization
     - WWW
     - Google Maps
     - Google Earth
     - MAYA 3-D

User Defined Regional Themes
- Maritime Safety
- Ecosystem Mgmt
- Water Quality
- Inundation
- Energy

MACOORA 2004 - Present
MARCOOS 2007-Present
Leveraged Regional Weather Forecasts
Enhancements 2011

MARACOOS
Ocean Information for a Changing World
Real-Time Satellite Ground Stations in the Northeast U.S. Since 1992

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

- Rutgers
- Johns Hopkins
- U. Maine
- City College of N.Y.
- U. Delaware

MARACOOS
Ocean Information for a Changing World
High Frequency Radar – Since 1996

Nested Grids of Hourly Surface Current Maps ^

Combined CODAR & Satellite Products >

Corporate Partner:
CODAR Ocean Sensors

Satellite Ocean Color

Satellite SST

Subsurface Glider Data

Corporate Partner: Teledyne Webb Research

MARACOOS
Ocean Information for a Changing World
The Mid-Atlantic Regional Coastal Ocean Modeling System
Established 2007

1) STPS
U. Connecticut

2) NYHOPS
Stevens Institute of Technology

3) ROMS
Rutgers University

4) HOPS
U. Massachusetts, Dartmouth
Composite Data & Forecast Products

Remote Sensing + Gliders = 3-D Nowcasts

3-D Nowcasts + Nested Models = 4-D Forecasts
MARACOOS Asset Map

- Regional Data
- Federal Data
- In-Situ
- Gliders
- Satellite
- Radar
- Models
- IOOS Standards
### Leveraging Data & Products

<table>
<thead>
<tr>
<th>Regional Priority Themes</th>
<th>Regional Observation &amp; Modeling Capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weather Mesonet</td>
</tr>
<tr>
<td><strong>Theme 1. Maritime Safety</strong></td>
<td>Operational Input to USCG SAROPS</td>
</tr>
<tr>
<td><strong>Theme 2. Ecological Decision Support</strong></td>
<td>Weather forecast ensemble validation</td>
</tr>
<tr>
<td><strong>Theme 3. Water Quality</strong></td>
<td>Winds for transport, river plumes, &amp; upwelling</td>
</tr>
<tr>
<td><strong>Theme 4. Coastal Inundation</strong></td>
<td>Weather forecast ensemble validation</td>
</tr>
<tr>
<td><strong>Theme 5. Offshore Energy</strong></td>
<td>Historical analysis &amp; wind model validation</td>
</tr>
</tbody>
</table>
BUSINESS MODEL AND FUNDING
Typical Funding Distribution

- ONR: 23.80%
- NSF: 21.79%
- NASA: 10.61%
- NOAA: 14.21%
- Industry: 5.91%
- NOPP: 5.72%
- EPA: 0.39%
- USDA: 0.37%
- DHS: 16.66%
- Foundations: 2.14%
- DOA: 3.36%
- Foreign Governments: 3.80%
- State Governments: 0.79%

1997 - 2008 Total Grants $76,717,845
MARACOOS 2013 Leveraged Funding

Total: $15.37 million
GOVERNANCE AND OVERSIGHT
U.S. Integrated Ocean Observing System

Global Ocean Observing System

International Component

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
SUCCESES 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

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.
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...”

A Look Back: NHC Forecasts for Hurricane Sandy
(and at how forecasts have improved through the years)

This advanced notice provides valuable lead time for emergency management, government, you and your families to plan & prepare!
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

From Forecast

To Impact

Bridging the Gap
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

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 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