

NOAA IOOS Program Office Regional Status Assessment for the Mid-Atlantic Coastal Ocean Observing Regional Association (MACOORA)

April 30, 2008
Rutgers University

Carolyn Thoroughgood

Scott Glenn

Andrew Voros

Bill Boicourt

Jeff Yapalater

Bob Tudor

Larry Atkinson (remote)

Ed Kelly

Dave Chapman

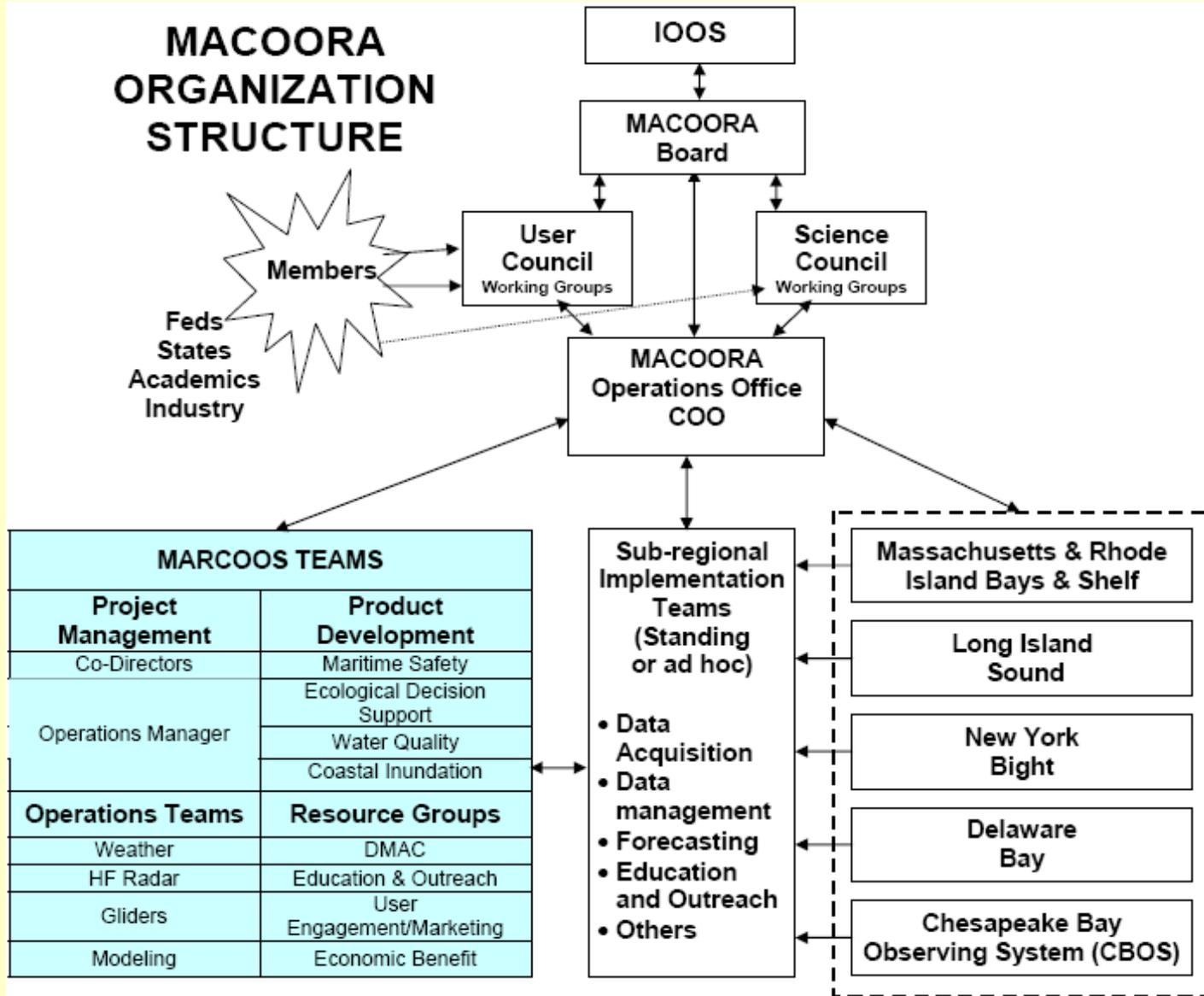


MACOORA Structure and Governance

- MACOORA leadership
 - Carolyn Thoroughgood, Board Chair
 - Ed Kelly, Board Vice Chair
 - Larry Atkinson, Board Secretary
 - Jay Titlow, Board Treasurer
 - Dave Chapman, Executive Director
- Board sets policy; Executive Director carries out MACOORA's goal and policies
- Organizational structure - 501(c)(3) incorporated Dec 2005; By-Laws; Business Plan



MACOORA ORGANIZATION STRUCTURE



MACOORA Structure and Governance

- Board membership
 - 12 to 15 Directors
 - All five sub-regions select a Director; seven At-Large Directors elected by MACOORA Membership; up to three additional Directors selected by Board
 - Industry, NGO, and Academic representation
 - Maritime, Water Quality, Energy, Fishing
 - Board meets in person 2X per year, by teleconference as needed, focusing on policy, goals, and guidance



MACOORA Board of Directors

At-Large

Larry Atkinson (2008)
MACOORA Board Secretary
Old Dominion University

William C. Boicourt (2008)
University of Maryland

Scott M. Glenn (2008)
Rutgers University

Edward Kelly (2009)
MACOORA Board Vice Chair
Maritime Association of the Port of New York and
New Jersey

Carolyn Thoroughgood (2008)
MACOORA Board Chair
University of Delaware

Jay Titlow (2010)
MACOORA Board Treasurer
Weatherflow Inc.

Andrew Voros (2009)
NY/NJ Clean Ocean And Shore Trust

Board Appointed

Michael Bruno (2010)
Stevens Institute of Technology

Wayne Wittman (2010)
Public Service Electric and Gas Company (PSE&G)

Jeffrey Yapalater (2010)
Freeport Tuna Club

Sub-Regional

Massachusetts and Rhode Island Bays and Shelf
Wendell Brown (2010)
University of Massachusetts Dartmouth

Long Island Sound
Jim O'Donnell (2009)
University of Connecticut

New York Bight
Lucy Ambrosino (2010)
Port Authority of NY/NJ

Delaware Bay
Bob Tudor (2010)
Delaware River Basin Commission

Chesapeake Bay
Fredrika Moser (2009)
Maryland Sea Grant College



Stakeholder Engagement

- **Key stakeholder groups or individuals**
 - Maritime Safety
 - USCG, NOAA HAZMAT, NOAA NWS Surf Zone Forecasters
 - Ecological Decision Support
 - Fisheries Groups-Commercial, Recreational, Management
 - Water Quality
 - EPA, State Environmental Agencies, County Health Agents, & Municipal Governments
- **Types and frequency of engagement (workshops, regular mtgs, etc.)**
 - Annual Meeting (October)
 - User needs workshops
 - Sub-regional meetings



Stakeholder Engagement

- Key issues of importance to regional stakeholders, and how the RA addresses them?
 - Inundation
 - Maritime Safety
 - Ecological Decision Support
 - Water Quality



Stakeholder Engagement

- Quantifiable, tangible expressions of support from stakeholders
 - Specific examples that demonstrate benefit of the RA to the region
- Other stakeholders?



Stakeholder Engagement

- *MARCOOS observational data and models might enhance the predictions by the USCG's Search And Rescue Optimal Planning System (SAROPS) - USCG*
- *[MARCOOS] has the potential to provide significantly more accurate and detailed analyses and forecasts of [winds and currents]. – NWS*
- *Your proposal to provide statistical regional surface current forecasts would be particularly supportive of our climate research as well as of our mission to promote sustainable fisheries. – NMFS*
- *The maritime security element of [MARCOOS] will be beneficial to Connecticut from the standpoint of search and rescue and especially oil spill response. – CT DEP*



Stakeholder Engagement

- *We are very interested in the inundation modeling and management tools that your [MARCOOS] will support. - MD EMA*
- *A [MARCOOS] forecasting model based on an understanding of the hydrodynamics of bacteria in the environment will reduce the present time-lag in the assessment of human health risks. – MC(NJ) DofH*
- *We are very excited at the prospect of having access to 3-D mapping of surface and subsurface ocean temperatures in the Mid-Atlantic, and for the enhanced marine safety that [MARCOOS] addresses. – Rec. Fishing Assoc.*
- *[MARCOOS] information helps the fleet target the proper areas, reduces search time, reduces fuel costs and increases efficiency. It also helps us target the proper species of fish. – Atlantic Frost Seafood*



Stakeholder Engagement Example

- Right whales avoidance issue addressed at CBOS user forum
- Discussion led by Maritime Association with talks by VA Port Authority, NMFS and Navy.
- Outcome is more action by NMFS with maritime community.



David Cottingham, NOAA/NMFS
Heather Mantz, VA Port Authority
David White, VA Maritime Assoc
Donald Schrerardus,
Deputy Asst. Sec. of the Navy
for the Environment



Stakeholder Engagement – Recreational Fishing

The **Recreational Fishing Community (RFC)** needs and wants more information for safer and more productive ocean trips. Some of this data exists but is not easily available to the user. We need to find ways to make research easier to find, use, and incorporate into the lives of fishing stakeholders.

Information needs include:

- localized real time weather
- real-time sea conditions
- sub-surface temps
- enhanced sea temp data
- offshore VHF broadcasts
- coordination between Governmental and institutional entities for comprehensive sharing of observing resources

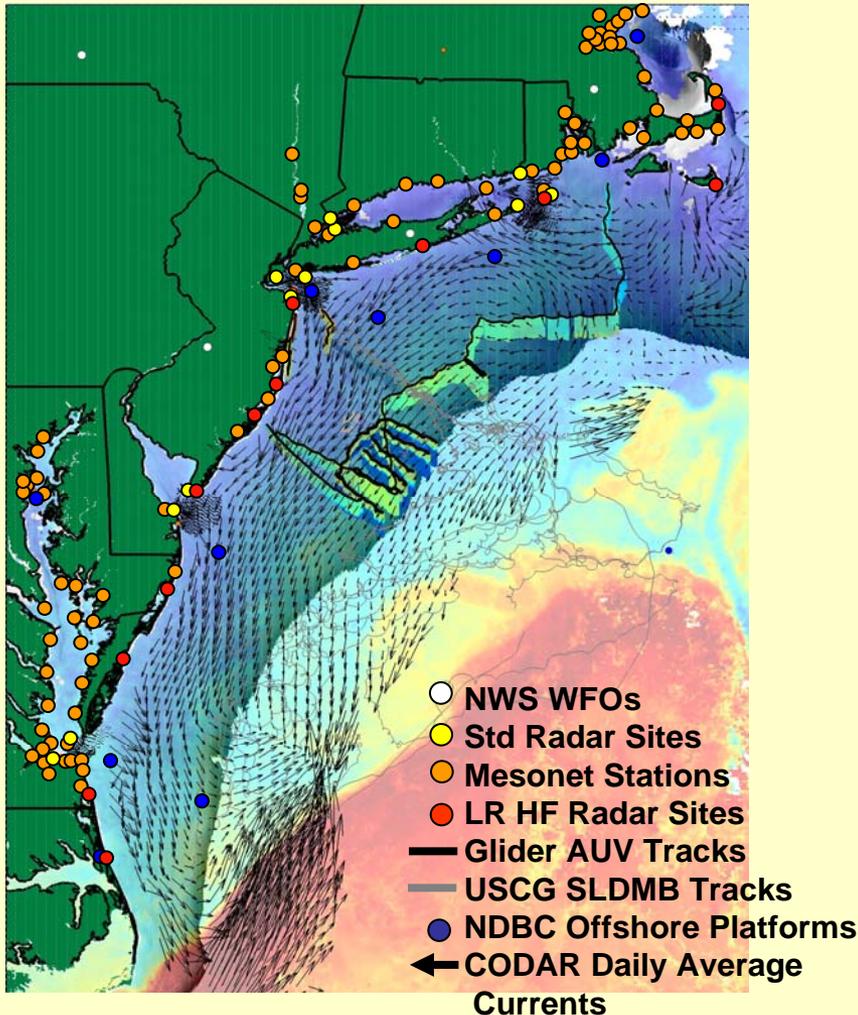


Current Activities and Funding

- A summary of key activities in the region that are related to or support IOOS, including those not funded by NOAA IOOS
- Interaction/joint work with other federal agencies
- How can NOAA IOOS best support you in engaging other Federal agencies?



MACOORA's Regional Coastal Ocean Observing System (RCOOS)



- Mid-Atlantic Regional Coastal Ocean Observing System (MARCOOS)
- October 1, 2007 Start
- Year 1: Request: \$2.0 M
Awarded: \$1.7 M
- Year 2: Request: \$3.5 M
Awarded: \$1.7 M
- Year 3: Request: \$3.5 M
- <http://www.marcoos.us>



MARCOOS – 30 PI's, 20 Institutions, 2 Regional Themes, 2 Support Themes

Investigator	Affiliation	Investigator	Affiliation
A. Allen	U.S. Coast Guard	L. Atkinson	Old Dominion University
A. F. Blumberg	Stevens Institute of Technology	W. Boicourt	University of Maryland
W. Brown	University of Massachusetts	M. Bruno	Stevens Institute of Technology
D. Chapman	University of Delaware	A. Cope	NOAA Mount Holly WFO
A. Gangopadhyay	University of Massachusetts	T. Herrington	Stevens Institute of Technology
D. Holloway	OPeNDAP	E. Howlett	Applied Science Associates
D. King	University of Maryland	J. Kohut	Rutgers University
B. Lipphardt	University of Delaware	A. MacDonald	Monmouth University
J. McDonnell	Rutgers University	J. Moisan	NASA Wallops
J. O'Donnell	University of Connecticut	M. Oliver	Rutgers University
O. Schofield	Rutgers University	H. Seim	University of North Carolina
J. Titlow	WeatherFlow Inc.	D. Ullman	University of Rhode Island
J. Wilkin	Rutgers University	R. Wilson	SUNY, Stony Brook
W. Wittman	Public Service Electric & Gas	M. Yarosh	CIT
A. Voros	NY/NJ COAST	S. Glenn	Rutgers University

- Regional Theme 1 – Maritime Safety – Search And Rescue
- Regional Theme 2 – Ecological Decision Support – Fisheries
- Regional Support for Water Quality
- Regional Support for Coastal Inundation



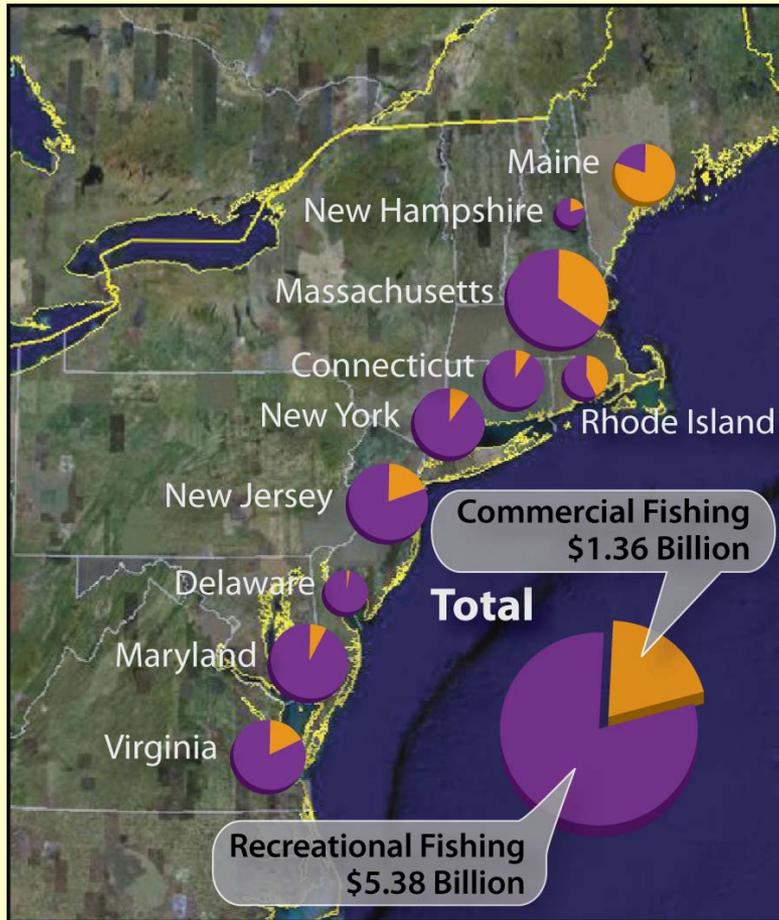
MARCOOS – 10 Major Tasks

- Improved weather data and forecasts
- HF Radar Network Operations
- HF Radar QA/QC & Products
- Autonomous Glider Operations
- Satellite Data Acquisition
- Statistical Short Term Prediction System
- Ensemble of Dynamical Forecasts
- DMAC
- Education and Outreach
- Economic Impact

6 Month Progress Report Submitted
All Tasks on Track.



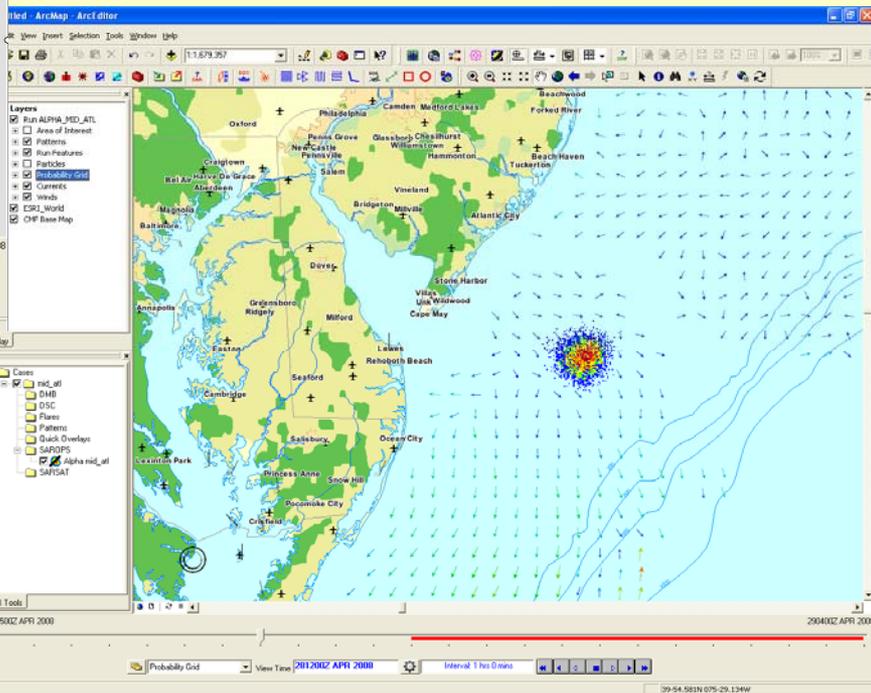
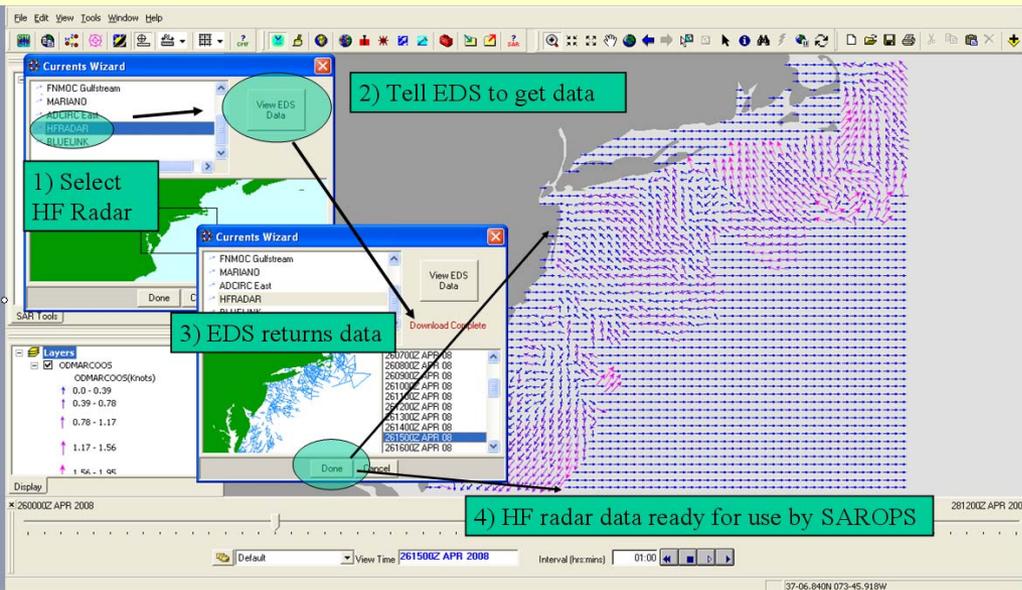
MARCOOS – Economic Impact



- Year 1 Focus: Value of MARCOOS Output in Fisheries
- Document and evaluate historical fishery science/management uses and current user needs for MARCOOS work products.
- Develop strategies to match user needs with value-added MARCOOS products
- Prepare articles, papers, and presentations that convey research results and provide recommendations for maximizing fishery values of MARCOOS

MARCOOS – Search And Rescue

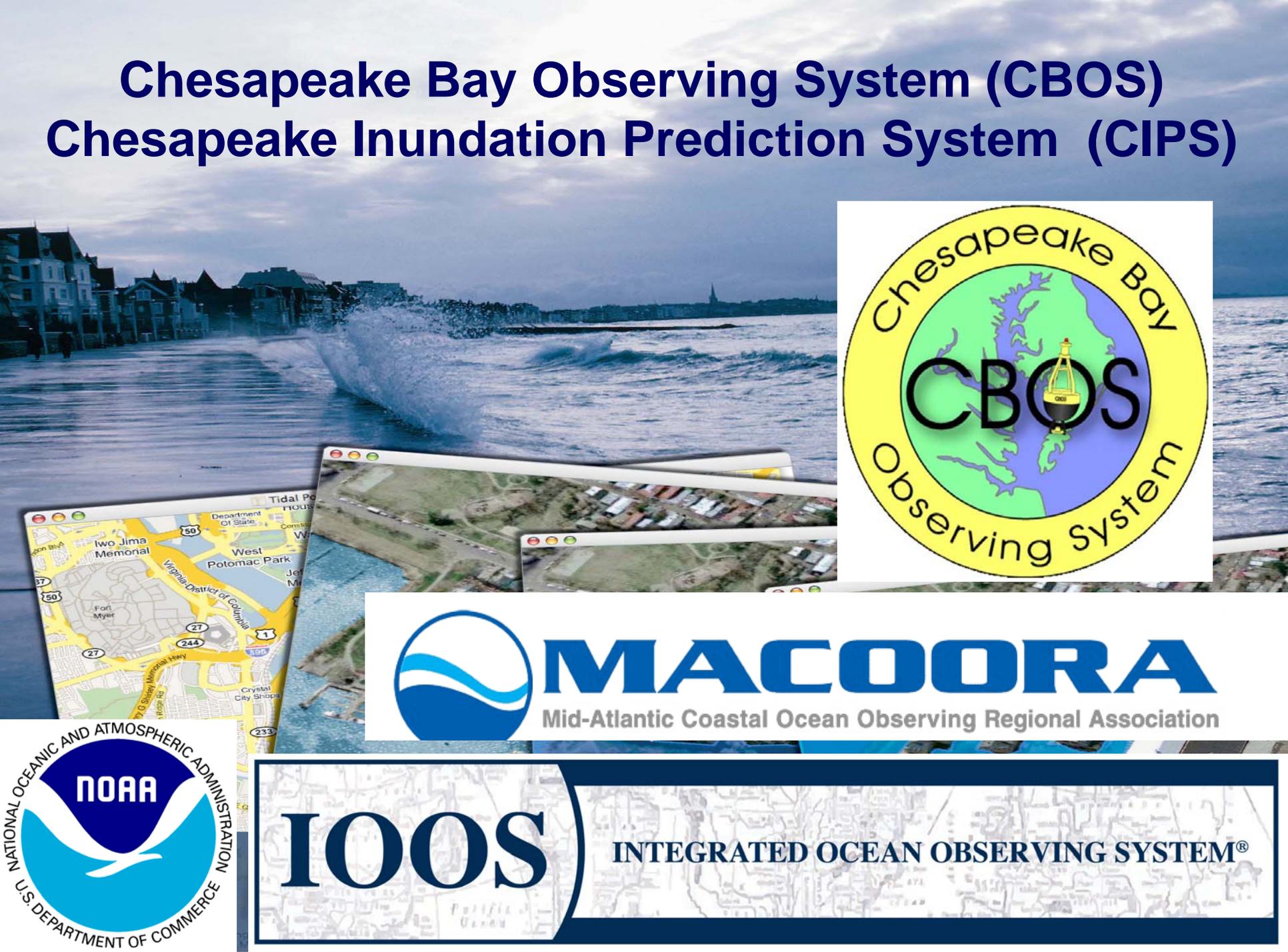
MAB HF Radar surface currents and Weatherflow winds used in a SAROPS test case.



Selecting HF Radar data in SAROPS

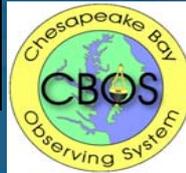


Chesapeake Bay Observing System (CBOS) Chesapeake Inundation Prediction System (CIPS)



The Cast

- **Elizabeth Smith**, CBOS Executive Director, ODU
- **Peter Ahnert**, NOAA National Weather Service MARFC
- **John Billet**, NOAA National Weather Service, Wakefield, VA
- **Bill Boicourt**, UMCES
- **Dennis King**, UMCES
- **Mike Koterba**, USGS
- **James Lee**, NOAA, National Weather Service, Sterling, VA
- **Ming Li**, UMCES
- **David Manning**, NOAA National Weather Service, Sterling, VA
- **Mark Penn**, City of Alexandria, Alexandria, VA
- **Kevin Sellner**, CRC
- **Tony Siebers**, NOAA National Weather Service, Wakefield, VA
- **Wade Smith**, Noblis, Inc.
- **Barry Stamey**, Noblis, Inc.
- **Gary Szatkowski**, NOAA National Weather Service, Mt. Holly, NJ
- **Jay Titlow**, Weatherflow, Inc.
- **Harry Wang**, VIMS
- **Doug Wilson**, NOAA Chesapeake Bay Office



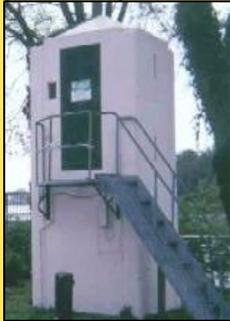
MOTIVATION: NOAA Storm Surge User Needs Assessment [Jan 2006] MACOORA Inundation Workshop [Nov 2006] Principal Findings:

- **Modeling Improvement**: Wave set-up, **rainfall/river outflows**, **increase vertical precision (+/- 1 ft)**, **uniform national grid**, **expand to inland bays**, **expand extratropical forecasts**, **additional sensors to baseline and validate**, probabilistic data runs for forecast uncertainty
- **Decision-Support Tools**: Integrate data from several models, **extend forecast to 48 hours before landfall**, **resolve issues on vertical datums**, **display surge as GIS/aerial photo/satellite image**, need info on social and economic impacts, deliver on street-level detail.
- **Communication**: **NWS Forecast Offices communicate effectively**, **users are unaware of services**, need increased agency collaboration, **graphs and text are less effective**, land use and coastal development need this, **emergency/evacuation needs this**
- **Outreach/Training**: **Need visualization tools**, need impact information, educate policy makers about forecast uncertainties, need localized training, increase outreach to planners

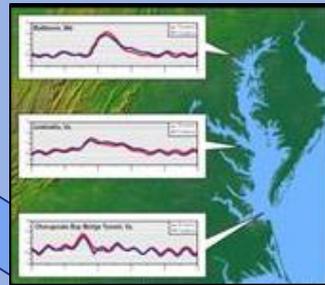
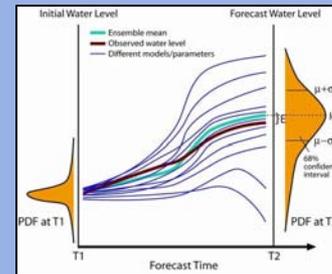
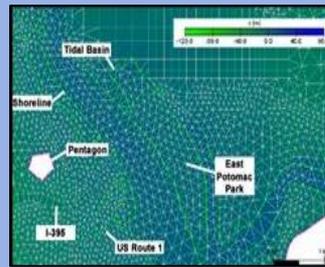




OBSERVATIONS



VISUALIZATION



VALUATION



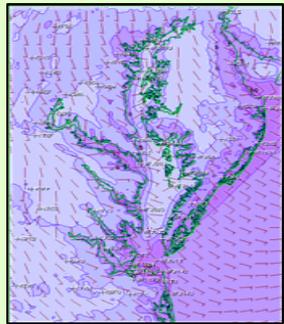
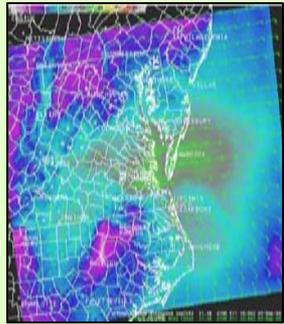
VALIDATION



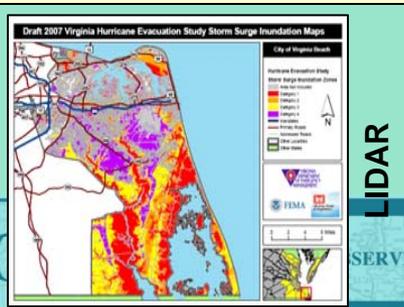
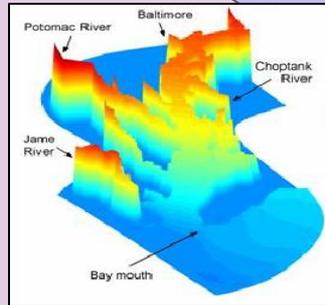
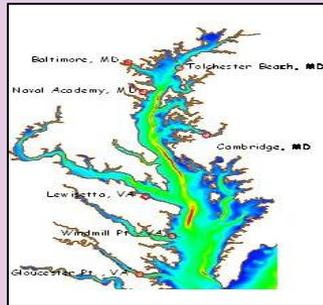
FORECAST



ATMOSPHERIC MODELING



HYDRODYNAMIC MODELING



LIDAR

CIPS Storyboard 2007-2010

OUTREACH

Emergency Management

Structural Mitigation

Tsunami Planning?

Natural Resources

Environmental Quality

Sea Level Rise



MID-ATLANTIC COASTAL OCEAN OBSERVING REGIONAL ASSOCIATION

Ensemble Approach

- 4 Atmospheric Models—larger-scale models providing context for 2 high-res models: WRF and RAMS
- 2 Hydrodynamic Models—ELCIRC, ROMS
- 6 BC's
- $2 \times 6 = 12$ Atmospheric Forecast Runs \times 2 Storm Surge Models = 24 = Ensemble
- First: Hindcast Cases for Selected Sites
 - Alexandria, VA
 - Talbot/Dorchester County, MD
 - Norfolk, VA
- Selected Storms:
 - Hurricane Isabel
 - Tropical Storm Ernesto
 - Northeaster, November 2006



Immediate Focus

- Common grid output from both hydrodynamic models to begin visualization process,
- Availability of LIDAR data in all areas
- Visualization of the wind fields? How and how often and spatial resolution,
- Determining the product for the EMs, elected officials, and citizens, e.g. WebEOC, EMMA
- Integration into existing communication and decision making systems



Current Activities – New York Bight: Maritime Safety

Funding Agencies



Partners and Collaborators



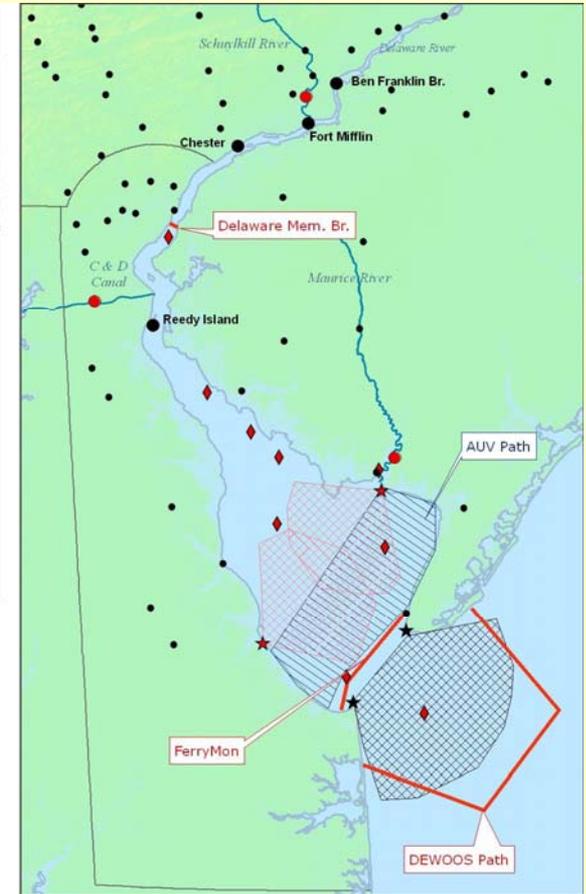
Current Activities – Delaware Bay

NWQMN Pilot Study

- Riverine, estuarine and coastal
- Resource management components:
 - Watersheds
 - Estuaries
 - Coastal/Ocean
 - Beaches
 - Wetlands
 - Groundwater
 - Atmosphere
- Partners/leveraging



- Proposed Automatic Monitoring Site
- Existing USGS Stream Gage
- Existing Automatic Monitoring Site
- ★ Existing HF Radar
- ★ Proposed HF Radar
- ♦ Proposed Bouy Sites
- Existing MARCOOS Glider
- Proposed DWOOS Glider
- Existing HF Radar Area
- Proposed HF Radar Area
- Proposed AUV Glider



Current Activities – MARIBS

- MIT Sea Grant project investigates transient tidal eddy motion east of Cape Cod and into the Great South Channel
- Combines MARCOOS CODAR-derived surface current maps, shipboard/AUV water property & velocity measurements with ocean modeling
- Surface drifter measurements and UCONN-developed STPS are used to assess regional CODAR measurement uncertainty
- Future investigations will focus on how this eddy phenomena affects regional scallop fisheries recruitment



Current Activities and Funding

Key activities in the region that are related to or support IOOS,
including those not funded by NOAA IOOS

- NOAA PORTS - Maritime safety
- NDBC - Buoys
- NWS – Marine forecasts; Coastal inundation watches and warnings
- NMFS - Fisheries
- NERRS - Stream gages
- Sea Grant – Research, education, and outreach
- MMS - offshore wind power activities
- CG - SAROPS application



Current Activities and Funding

key activities in the region that are related to or support IOOS,
including those not funded by NOAA IOOS

- Martha's Vineyard Coastal Observatory
- Ocean Observation Laboratory (OCEANOL)
- Long Island Sound Coastal Observatory (LISICOS)
- Monitoring Your Sound (MYSOUND)
- Marine Sciences Research Center (MSRC)
- New York Harbor Observing & Prediction System (NYHOPS)
- New Jersey Coastal Monitoring Network (CMN)
- Stevens Storm Surge Warning System (SSWS)



Current Activities and Funding

key activities in the region that are related to or support IOOS,
including those not funded by NOAA IOOS

- Rutgers University Coastal Ocean Observation Lab (COOL)
- Delaware Bay Observing System (DBOS)
- Chesapeake Bay Observing System (CBOS)
- Virginia Estuarine & Coastal Observing System
- Center for Coastal Physical Oceanography (CCPO)
- WeatherFlow, Inc.



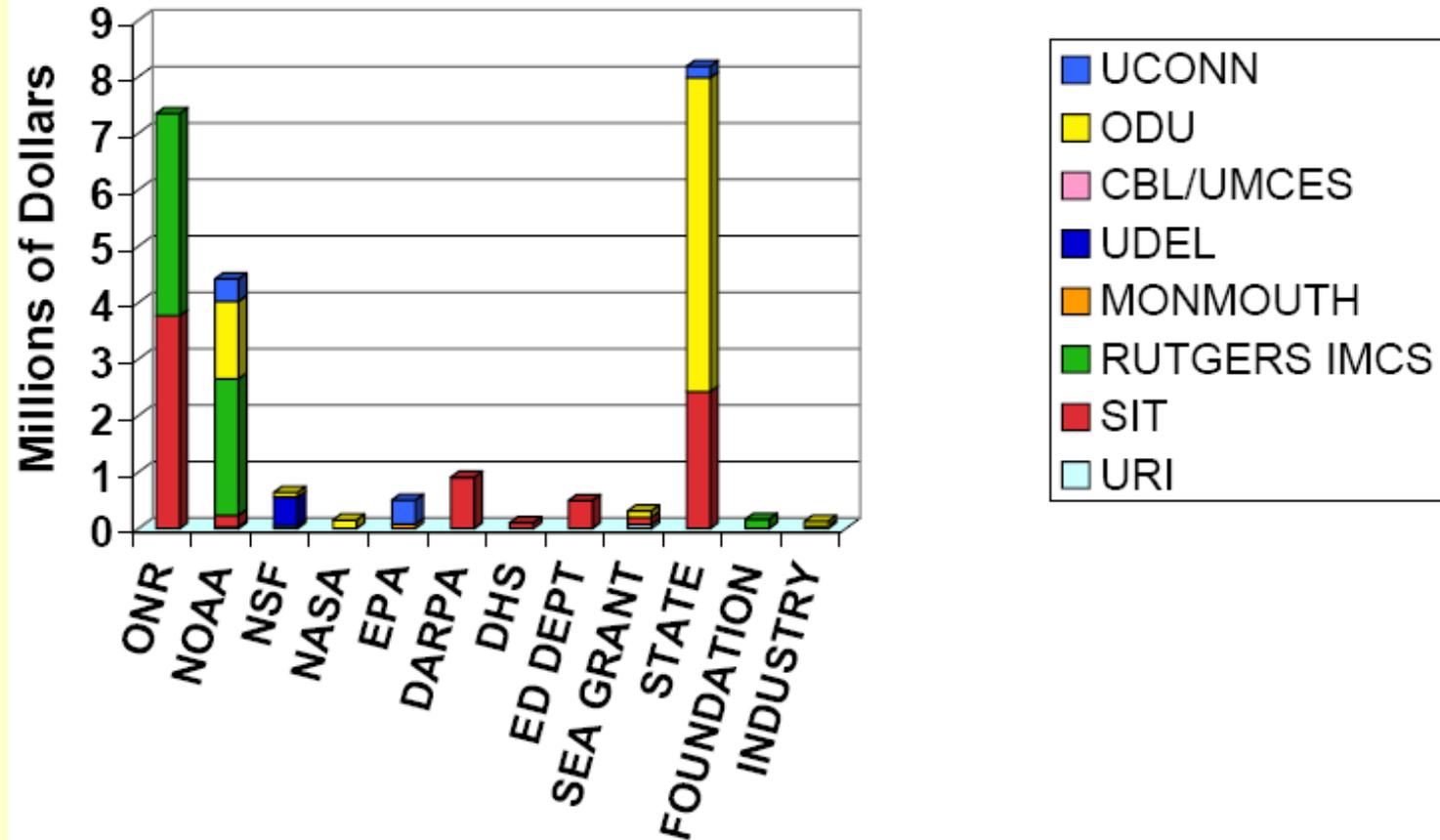
Current Activities and Funding

- Sources of funding
 - NOAA IOOS and other NOAA funds
 - Other Federal
 - Non-Federal
- RA plans/efforts to match IOOS dollars with funding from other sources
 - What sources, and in what areas of work?
 - How can the NOAA Program Office help?



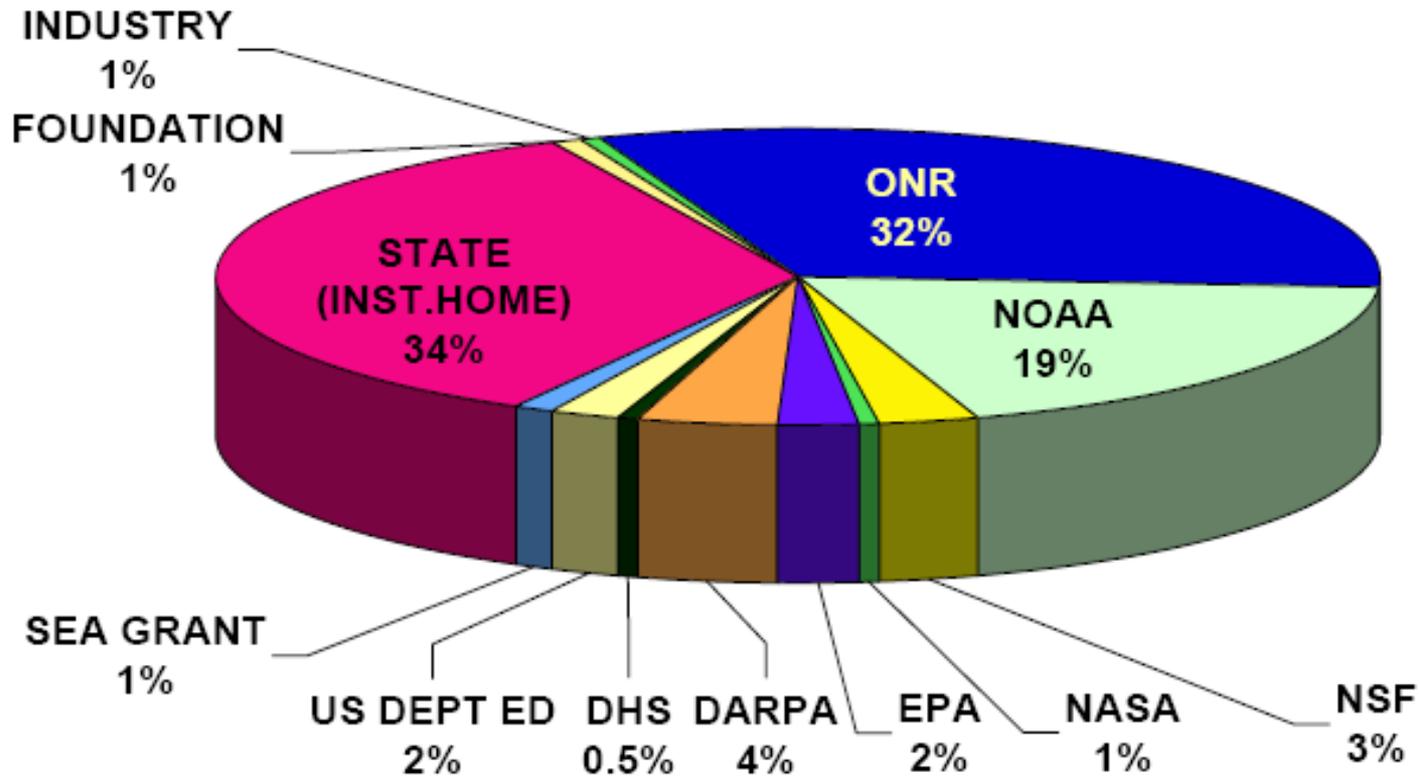
Current Activities and Funding

MID-ATLANTIC OCEAN OBSERVING
FUNDING SOURCES



Current Activities and Funding

MID-ATLANTIC OCEAN OBSERVING FUNDING SOURCES



RA Coordination: Cooperative Agreements

- As we reach the end of the first set of RA coordination grants, provide a summary of overall progress
 - Milestones and status
 - Updates to the RA progress reports
 - Any new information?
 - How are you doing?



RA Coordination: Cooperative Agreements

- **Milestones and status**
 - Approved By-Laws
 - Elected Board of Directors
 - Incorporated Dec 2005 as 501(c)(3)
 - Obtained tax-free status
 - Held 3rd Annual Meeting Oct 2007
 - Approved Business Plan
 - Submitted Concept of Operations document



RA Coordination: Cooperative Agreements

- **Updates to the RA progress reports**
 - Sponsored CBOS Sub-regional User's Forum (December 2007, Norfolk) OCEAN OBSERVATIONS TO IMPROVE DECISION- MAKING
 - Marine Weather Forecasting, Storm-tide and Inundation in Chesapeake Bay
 - Ocean Observing and Safer, More Efficient Maritime Operations: Northern Right Whale Ship Strikes
 - Observing Systems for Education, Recreation and Water Quality Monitoring



RA Coordination: Cooperative Agreements

- **Updates to the RA progress reports**
 - Water Quality Monitoring: Managers' Needs Assessment Workshop for Estuarine, Coastal, and Ocean Observations (Philadelphia, March 2008)
 - User Needs and Requirements
 - Public Health
 - Hypoxia/Algal Blooms
 - Habitat Loss and Freshwater Requirements
 - Needs versus Current Capabilities (Gap Analysis)
 - Filling the Gaps: Identifying opportunities and solutions



RA Coordination: Cooperative Agreements

- Updates to the RA progress reports
 - Convened MARCOOS PI Meeting (Fall River, March 2008)
 - Initial six month progress assessment



RA Coordination: Cooperative Agreements

- **Updates to the RA progress reports**
 - Continuing to survey Coastal Ocean Observing Assets in The Mid-Atlantic Region



RA Coordination: Cooperative Agreements

- **What will change with the new RA grant in FY08?**
- Strengthen MACOORA organizational structure
 - Establish formal User Council
 - Establish formal Science Council
 - Establish formal Education and Outreach Council
 - Organize Sub-region implementation group
- Retain workshops (stakeholder engagement) in year 1, but without travel support for attendees



RA Coordination: Cooperative Agreements

- **What will change with the new RA grant in FY08?**
 - Migrate to more outreach in years 2 and 3, focusing on interactions among MACOORA's broad and diverse user community
 - Coordinate the demonstration and assessment of products emanating from the observing system
 - Consider Memorandums of Agreement with ocean observation providers to strengthen connection with MACOORA observation network
 - Revamp website



RA Coordination: Cooperative Agreements

- **New directions, partners, etc.?**
 - Address energy theme (in addition to maritime safety, ecological decision-making, coastal inundation, and water quality)
 - Seek large corporate collaboration(s)



RA Future Development

- RA views on function and performance metrics
 - How can we best measure outputs and outcomes?
 - Need guiding set of goals we all understand
 - HF Radar national network
 - National Water Quality Monitoring Network
 - Coordination of modeling efforts - how to knit together
 - For CODAR, report percentage of “up” time



RA Future Development

- Objectives of the RA and plans for the near-term FY08-12
 - Establish formal User Council
 - Establish formal Science Council
 - Establish formal Education and Outreach Council
 - Organize Sub-region implementation group
 - Plan Sub-regional stakeholder meetings
 - Plan Regional strategy meeting
 - Plan Promotional activity



RA Future Development

Summary of top five priorities for development of RCOOS capabilities with cost estimates

1. Enhance MACOORA: \$3M/yr
 - Data Management (\$1 M)
 - Education & Outreach (\$1 M)
 - Economic Impact studies (\$1M)
2. Build out current MARCOOS (Maritime Safety and Ecological Decision-making) at original budget: \$3.5M/yr
3. Enhance MARCOOS to address additional regional priorities (Coastal Inundation and Water Quality): \$3.5M/yr



RA Future Development

Summary of top five priorities for development of RCOOS capabilities with cost estimates

4. Enhance MARCOOS to sustain sub-regional components of regional network: \$2M per sub-region = \$10M/yr
5. Enhance "National Backbone": \$3M/yr

Providing operational funding for:

- PORTS within region (\$1M - 5 @ \$200K)
- NDBC (New Buoys – Hudson Canyon; Ambrose, Chesapeake)(\$1 M)
- Weather Research & Forecasting Models (WRF) @ WFO's (5 x \$200 K = \$1M)



RA Views on Regional and National IOOS

- RA needs with regard to the integration of regional and national planning efforts
 - MACOORA is very supportive of national planning for an integrated, distributed ocean observation system
- RA expectations for development of the “national backbone” of observations
 - In situ, remote sensing, and data management and communications (DMAC) capabilities
 - Coordination of “national backbone” activities with regional and sub-regional ocean observing activities



RA Views on Regional and National IOOS

RA expectations for development of the “national backbone” of observations

- PORTS operational funding
 - Narragansett Bay
 - New Haven
 - New York – New Jersey
 - Delaware River and Bay
 - Chesapeake Bay
- NDBC (New Buoys – Hudson Canyon; Ambrose, Chesapeake)
- WRF @ WFO's



Sub-regions connect to state and local organizations

For example CBOS interacts closely with state agencies, NGO's, and the large Bay programs (EPA) at a granularity that cannot be achieved regionally



Cross-regional Coordination

- Discuss existing and potential coordination with other IOOS RAs
 - On regional efforts/issues?
 - On a national scale?



Cross-regional Coordination

With NERACOOS:

“As neighbors to the south, your observing system (MARCOOS) and regional association (MACOORA) are of particular importance to NERACOOS. Comprehensive observing systems in the Northeast and the Middle Atlantic will clearly complement each other and benefit both regions.”

John Trowbridge, NERACOOS



Cross-regional Coordination

With SECOORA:

“It is heartening to see that both the Mid Atlantic and the South East Atlantic are implementing Regional Coastal Ocean Observing Systems to support the regional user themes of Search and Rescue and Fisheries Management. The match between these independently generated themes reinforces their significance and indicates that they are of general interest across regions. This provides us a great opportunity to leverage experience across regions for the greater good of IOOS... We look forward to sharing lessons learned with MARCOOS as we both sustain our existing regional products and develop new products to serve our regional, local, and national needs.”

Harvey Seim and Rick DeVoe, SECOORA



Best Practices and Lessons Learned

- Describe problems encountered to date and their resolutions
 - **LIMITED FUNDING** (MARCOOS funding a major plus)
 - Integrating sub-regions into MACOORA (energize sub-regional steering committees that meet quarterly with MACOORA ED)
 - Outreach (focus on specific activity, e.g., educating Congressional staff, promoting neat new OO product)
 - State agency people in MACOORA's 9-state region have limited travel capability to attend regional meetings (try to rotate meetings geographically)



Best Practices and Lessons Learned

- What are some “good ideas” or best practices that you can share with other RAs?
 - Focused needs assessment workshops (inundation, water quality)
 - Work with NWS’s Weather Forecast Offices
 - Administrative Services Agreement with PI institution
 - Collaborative relationships (e.g., data management with ASA)



Parting Thoughts

- What support or information do you need from NOAA that you are not currently receiving?
 - Z-grams very helpful and appreciated.
 - MACOORA enjoys excellent relationship with NWS WFO's
 - As you are well aware, we (and the entire IOOS Program) need more funding, with a reasonable expectation of its continuity, in order to achieve full and reliable operation



Parting Thoughts

- Is there input you would like to give to us, but don't have a venue?
 - We are concerned about the lack of integration of ocean observing activities, not only within NOAA, but between NOAA and other Federal agencies as well.
 - What can be done to engage the other 13 of the 14 Federal agencies *involved* in ocean observing?



Parting Thoughts

- Is there input you would like to give to us, but don't have a venue?
 - We (collectively) are missing an opportunity to do more with less if we don't resolve to all pull together.
 - What is (and will be) the role of Ocean.US?



Parting Thoughts

- Is there input you would like to give to us, but don't have a venue?
 - How can the National Sea Grant Office be encouraged to support their stated objective of developing an outreach network for ocean observations (See *Implementing NOAA's Mandate to Engage Coastal Users: Opportunities for National Sea Grant Outreach Growth, ORESU-Q-03-002*)?
 - Dave Chapman briefed National Sea Grant Office (Jamie Krauk and Sami Grimes) last April at the Mid-Atlantic Sea Grant Extension Meeting in Chincoteague, Virginia on this point.



Parting Thoughts

- How can NOAA IOOS best receive regular updates or information from the RAs?
 - RA and partner achievements, news items, expressions of stakeholder support, engagement of new stakeholders
 - How can NOAA IOOS best understand (and articulate) how RAs support the national system?
 - How can we help to support your
- Other parting thoughts?



Parting Thoughts

- How can NOAA IOOS best receive regular updates or information from the RAs?
- Borrow from USDA 'Best Practices' with annual joint planning session (NOAA IOOS and RA's) to get regional voices by tapping resources of each RA's leadership and be more attuned to the needs of the nation
 - Plan theme for coming year; develop standardization for data collection
 - Use the Plan to engage ocean sector businesses (as USDA engages agribusiness)



Parting Thoughts

- How can NOAA IOOS best receive regular updates or information from the RAs?
 - Perhaps we could establish communication links from each region and NFRA to a media/promotion person in the NOAA IOOS office
- Other parting thoughts?

