INTEGRATION OF ENVIRONMENTAL INFORMATION SYSTEMS

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*2008 South Carolina Water Resources Conference, October 14-15, 2008*
A major challenge of the “information age”-- to share and integrate environmental information from multiple sources.

*What is required -- Interoperability*

- increases utility of distributed databases
- creates efficiencies in data generation and use
- makes it possible to apply a broader spectrum of environmental information to any given problem.

But
- difficult and time consuming
- must deal with differences in measurements, data, and data management.

Coastal ocean observing systems have addressed interoperability--examples is the Southeast Atlantic Coastal Ocean Observing System (SEACOOS).
SEACOOS was initiated in 2002 with ONR funding to develop a coastal ocean information system for FL, GA, SC and NC.

**Goal:**
To increase the quantity and quality of environmental information from the coastal ocean of the SE U.S. and facilitate its use in a range of societal, scientific, and educational applications.
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<tr>
<th>Founding Members</th>
<th>Affiliates</th>
<th>Pending Affiliates</th>
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<td>University of North Carolina</td>
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<td>Field Research Facility/USACE</td>
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<td>CLION/DOD</td>
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<td>Jacksonville WFO/NWS/NOAA</td>
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<td>NCDDC/NOAA</td>
<td>NAMOC/USN</td>
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<td>NDBC/NOAA</td>
<td>Florida Spaceport</td>
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The National Backbone of NOS NWLON and NDBC CMAN & Buoys

SEACOOS Partner Additions of in-situ Buoys/Towers/Coastal
Observing the Coastal Ocean with a variety of tools
Three major bottlenecks preventing prediction or timely response to critical events:

- Access and integrated use of distributed, heterogeneous data
- Insufficient density of appropriate data observations
- Insufficient predictive model development

*Access to the data is the primary limitation*
Principles of SEACOOS Information Management

• Retain observation systems and associated databases at primary sources -- no attempt to centralize
• Build upon existing resources and practices as much as possible –
  – support participant autonomy
  – conserve resources
  – promote rapid progress
• Establish “open access” policy
  – data freely accessible in a timely manner
  – IM developments could be readily adopted by others
Relationship between data sources, the different ways in which data can be processed or utilized, and types of information products available to users.
Interoperability requires:

• Common vocabulary – “data dictionary”
• Mechanisms for data transport
• Metadata – MetaDoor
• Dissemination tools – Map-based tools
• Documentation and information sharing – SEACOOS Cookbook
Schematic diagram representing data flow in the Xenia Relational Database, illustrating the multiple data formats and data products accommodated.
Two basic types of map presentations

- Report-based maps
- Interactive maps
Report Based:
Visualization of real time data

Accessing data from multiple sources
Aggregating data for visualization platforms
Interactive Maps: Screenshot showing remote sensing images of SST combined with in-situ SST, winds, and water levels
Carolinas Coast

Built on the strengths in data aggregation and IT development by coastal ocean observing programs in the region through:

Aggregation of near real-time observations from in-situ platforms, models, and remote sensing

Application of technologies developed by SEACOOS, Caro-COOPS, and CORMP

Integration with NOAA NWS observations and products

Leveraging of outreach activities within the NWS and the coastal ocean observing programs
Some examples from Hurricane Ernesto, 9/1/06
SEACOOS is transitioning to become a major component of the Southeast Coastal Ocean Observing Regional Association – SECOORA
SECOORA Maps/WMS (OGC Web Mapping Service) via MapServer - animations via javascript

DODS/OPeNDAP access to basic tables (organization, platform, sensor, multi_obs)
SECOORA interactive maps via javascript (OpenLayers http://openlayers.org )
Latest data products

KML (Keyhole Markup Language) which is the XML format used to visualize data in Google Earth and potentially other 3D Globes such as NASA WorldWind and ESRI ArcExplorer
Lessons learned

• Data managers and programmers are likely to form highly productive, networked, problem-solving communities.
• Information Management should be recognized as a core function and be supported accordingly.
• Standards must be identified -- requires committed effort and consensus.
• Appropriate redundancy and back-up must be established.
• Both real-time data and historical databases should be accommodated.
Information management is not only essential for IOOS system data...

It can also provide access to additional monitoring systems and databases that can be integrated for development of broader applications.

One example: new center for Integrated Information Systems (collaborative with Raytheon)
Underlying Conceptual Design

Users

Common Services
- Workflow
- Security
- Registry
- Communications

Adapter (Portlet)

Adapter (Data/Application Access)

Asset

Service Infrastructure

GEOSS Enterprise
Proof of principle was demonstrated on a limited scale:
Acknowledgements

• SEACOOS PIs:
  • H. Seim and F. Werner / Marine Sciences / UNC-CH
  • J. Nelson / Skidaway Institute of Oceanography
  • L. Spence / SC Sea Grant Program
  • M. Fletcher / Univ. South Carolina
  • C. Mooers / Univ. Miami
  • R. Weisberg / Univ. South Florida

Information Management:
• USC: Payne Seal, Hanna Habashi, Monisha Kanoth
• UNC-CH: Chris Calloway, Jesse Cleary, Sara Haines
• USF: Jeff Donovan, Vembu Subramanian
• U Miami: Ed Kearns, Liz Williams
• SkIO: Trent Moore
• Charlton Galvarino

SEA-COOS was sponsored by the Office of Naval Research under Award No. N00014-02-1-0972