Leveraging the Gulf of Mexico Coastal Ocean Observing System (GCOOS) Build-out Plan (BOP) with Louisiana’s System Wide Assessment and Monitoring Program (SWAMP)
Synergies for the Good of Louisiana

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Overview

• Quick intro. to GCOOS
• LA SWAMP needs
• Key opportunities to enhance efficiency and effectiveness of LA SWAMP
  – Access to monitoring and observations – existing data
  – Data management standards
  – QA/QC standards
  – Modeling resources
  – Support for existing and needed monitoring assets
• Summary
GCOOS Spatial Scope

- U.S. coastal zone to seaward extent of EEZ
Long-term Plan Includes 19 Elements to Meet Common Stakeholder Priorities, with Cost Estimates

Bold indicates common areas of interest with LA CPRA

- Surface currents and waves network
- Fixed mooring network
- Autonomous meteorological measurement network
- Glider and AUV network
- Satellite observations and products
- Aircraft observations
- Bathymetry and topography mapping network
- Water level network
- Enhanced PORTS® network
- Outreach and Education
- Harmful Algal Bloom Integrated Observing System
- Ecosystem monitoring
- Water quality and beach quality monitoring
- Hypoxia monitoring
- Monitoring of river discharge
- Physical modeling
- Ecosystem modeling
- Data management and communications system
- Research – input into new technology development
What does LA SWAMP Need\textsuperscript{1,2}?

- Access to monitoring data (for planning, progress, models)
  - Continuous and/or long-term
  - Archived
- Solid data management, QA/QC
- Modeling
- Support for existing monitoring assets
- More assets to fill monitoring gaps

GCOOS and SWAMP Variables

GCOOS data providers monitor SWAMP variables in real-time (RT) or near real-time (NRT), from >1650 sensors, including:

- **Weather and Climate**
  - Wind, precipitation, air pressure, air temperature, relative humidity

- **Water Quality**
  - Chlorophyll, turbidity, nutrients, salinity, dissolved oxygen, water temperature

- **Hydrology**
  - Waves, water levels, currents
Access to Continuous Monitoring & Observations

GCOOS Data Portal

• Can search by data source or by observation
• Tools and open source web services provided for modelers and other data users

http://data.gcoos.org
Archived Data Available from GCOOS Portal and More

• At GCOOS – http://data.gcoos.org/waf.php (Web Accessible Folders, by source or observation)

• At NOAA NDBC – http://www.ndbc.noaa.gov/

• At DataOne (v. soon) – https://cn.dataone.org/onemercury/

• Soon, long-term archiving at NOAA National Center for Environmental Information (NCEI)
Other Data Access Through GCOOS (not continuous, but long-term)

CAGES LA Fisheries Data on ERDDAP server

SWAMP Biotic Integrity Variables

LA Nutrients and Hypoxia Data Portal (GOMA $)

SWAMP Water Quality Variables


http://nutrients.gcoos.org/
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Resources for Data Management

• U.S. Integrated Ocean Observing System (IOOS) Data Management and Communications Standards
  – Community-based standards for Open Data sharing, metadata, Service Oriented Architecture, and data access services
    • https://ioos.noaa.gov/data/contribute-data/
  – developed over the last 15 years for real-time and near-real-time coastal and ocean data
  – Used by GCOOS and all regions

• GCOOS Data Management Expertise
Real-time Quality Control Manuals

These manuals are living documents that reflect the state-of-the-art QC testing procedures for real-time in-situ current observations.

- Real-Time Quality Control of Dissolved Nutrients Observations
- Real-Time Quality Control of Wind Data
- Real-Time Quality Control of Water Level Data
- Real-Time Quality Control of In-Situ Surface Wave Data
- Real-Time Quality Control of Ocean Optics Data
- Real-Time Quality Control of In-Situ Temperature and Salinity Data
- Real-Time Quality Control of Dissolved Oxygen Observations in Coastal Oceans
- Real-Time Quality Control of In-Situ Current Observations
- Manual for Oceanographic Data Quality Control Flags

The Manual for the Use of Real-Time Oceanographic Data Quality Control Flags provides information to operators of ocean observing systems about the purpose and protocols of marking or flagging data, so that subsequent use of the data can be properly controlled by both users and automated processes. It also provides an excellent reference for various schemes currently in use.

http://www.ioos.noaa.gov/qartod/welcome.html
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Modeling Resources

• GCOOS-RA Modeling Task Team - http://gcoos.org/?page_id=3759
• Ecosystem modeling workshop and white paper
  – real-time data needs for ecosystem models (bio, chem, phys)
• Model forecast products on GCOOS site* - http://gcoos.org/products/index.php/model-forecasts/
• Nutrient Decision-Support Tool
• Inventory of circulation models in GoM, including coastal
  – E.g., Northern Gulf Operational Forecast System (NGOFS), Regional Ocean Model System (ROMS)
• Viewer for multiple GoM hydrodynamic models*

*will discuss in more detail
Model Forecast Products, GCOOS website

Multiple Hydrodynamic Models w/ Obs Deep-C Viewer Expansion

Funded by GOMRI & Climatology and Simulation of Eddies Joint Industry Project
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Support for Existing Monitoring Assets

• Wave-Current-Surge Information System (WAVCIS) – Data system interoperability for RT obs.
• LUMCON – same
• LSU Earth Scan Laboratory – high spatial resolution products from Landsat-8, VIIRS, and MODIS satellite sensors integrated with surface currents from RT obs and models (SST, SS, Chl a, CDOM, true color, land/water interface, vegetation). User interface for N. GoM coastal zone and continental shelf/slope.
• Colorado Center for Astrodynamics Research (CCAR) – GoM Sea Surface Height products from CCAR NRT altimeter
What does LA SWAMP Need$^{1,2}$?

• Access to monitoring data (for planning, progress, models)
  – Continuous and/or long-term
  – Archived

• Solid data management, QA/QC

• Modeling

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Requests for Additional Assets: Surface Currents and Waves (High Frequency Radar)

• Advocating for a Gulf coast-wide network of HFR – white paper from Gulf experts, http://gcoos.tamu.edu/?p=8229

• State proposals - Submitted RESTORE proposals for HFR to all Gulf States, exc. TX

• Federal Appropriations - FY2017 Commerce, Justice, Science, and Related Agencies Appropriations
  – Passed Senate and House Appropriations Committees as of 5/24
US IOOS FY 17 High Frequency Radar Request

$3.1 million to install 12 high frequency radar systems

- Safeguarding the Arctic Marine Highway: 2 remote radars needed
- Protecting Lives and Public Health in the Pacific Northwest: 3 radars needed
- Cleaning up the Great Lakes: 3 radars needed
- Saving Lives off Florida’s Coast: 2 radars needed
- Saving Millions in the Gulf of Mexico: 3 radars needed
US IOOS FY 17 High Frequency Radar Request

Saving Millions in the Gulf of Mexico

3 radars needed
Requests for Additional Assets: Enhanced Water Levels/Land Elevations

• More stations to fill gaps in National Water Level Observation Network (8 more stations in LA); hurricane-hardened
• Adding precision Continuously Operating Reference System (CORS) GPS stations near water level sites (3D pos., accurate subsidence rates)
• All part of the Gulf Coast Spatial Reference System Network (LSU LSRC is a partner) - long-term monitoring of the relative sea-level and subsidence change along the northern Gulf of Mexico coast
  – LA CORS sites 2015
    • Port Sulphur
    • Port Fourchon
    • Cypremort Point
Summary:

GCOOS-RA Can Help With SWAMP

• Monitoring data – 24/7 access to data portal
  – RT and NRT observations
  – Archived at GCOOS, NOAA NDBC, and DataOne Portal; soon to be archived long-term at NOAA NCEI

• Other data products – estuarine fish data, nutrient and hypoxia data

• Data management standards, expertise, and QA/QC standards
  – All data is QA/Qced and managed/shared according to community-developed open source standards and protocols (developed by experts over 15 years)

• Modeling expertise, products for modelers, white paper on ecosystem modeling

• Funding for existing LA observations referenced in SWAMP
  – Wave-Current-Surge Information System (WAVCIS) – RT obs
  – LUMCON – RT obs
  – LSU Earth Scan Laboratory integrated satellite products
  – CCAR Sea Surface Height product

• Requests for additional monitoring assets to fill gaps in LA
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Questions?

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Links:
GCOOS Long-term Plan -
http://gcoos.tamu.edu/BuildOut/BuildOutPlan-V2-1.pdf

QA/QC Manuals -
http://www.ioos.noaa.gov/qartod/welcome.html

Thank you!
Acronyms

- EEZ = Exclusive Economic Zone
- CDOM = Colored Dissolved Organic Matter
- LSRC = Louisiana Spatial Reference Center
- LUMCON = Louisiana Universities Marine Consortium
- MODIS = Moderate Resolution Imaging Spectroradiometer
- QA/QC = Quality Assurance/Quality Control
- QARTOD = Quality Assurance for Real-Time Oceanographic Data
- SOS = Sensor Observation Service
- SS = Suspended Sediment
- SST = Sea Surface Temperature
- VIIRS = Visible Infrared Imaging Radiometer Suite