A Sustained, Integrated Ocean Observing System for the Gulf of Mexico (GCOOS): Infrastructure for Decision-making

GCOOS Regional Association
Board of Directors
and
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IOOS Surface Current Mapping Plan

Five Year Build-out
• Cover US Coast in lower 48 with long-range HFR
• Approximately 4 nested higher resolution systems per RA (GoM has more than 4 important ports)
National HF Server and Architecture Project

- Integrated National Network for “Radials”
- Scalable and distributed data management system
  - Data Storage
  - Data Access
  - Data Delivery
- Enhancements include:
  - Compute “Totals”
  - Objectively Interpolated “Totals”
- Single source of surface currents for
  - Coast Guard Search and Rescue
  - NOAA ER&R
  - Mariners
  - …

HFRNet

NDBC HF Radar Network Page

Scripps National HF Radar Network Page
GCOOS HFR Objective

A high priority for the GCOOS-RA is to develop the capacity to monitor ocean surface currents over the U.S. continental shelf of the Gulf of Mexico. This objective will be accomplished in part by deploying long-distance radar systems along the U.S. Gulf Coast with continuous, overlapping coverage in order to retrieve 2-D surface current fields.
Present System

- Scripps: 2 on offshore production platforms
- USM: 3, 5MHz CODAR
- USF: 2, 5 MHz CODAR & 2, 12.6 MHz WERA
- Mote/Rutgers: 1, 5 MHz CODAR
- UM: 3 16 MHz WERA & 1 12.6 MHz WERA
5 Year Phased Build-Out Plan
Long-Range HFR

• YR1: 3 stations southeastern LA & 3 stations northeastern TX coast
• YR2: 3 stations southwest LA coast and 3 stations TX Coastal Bend
• YR3: 3 stations Florida Big Bend, 1 Cape San Blas; 2 Florida Keys
• YR4: 3 stations FL Big Bend, 3 Florida Keys
• YR5: 1 station FL Keys; 4 TX coast; 1 Everglades outflow

TAMU will be acquiring and deploying 6 HFR stations on the TX coast centered about Galveston.
Challenges in GoM

- Entire eastern seaboard has area of 17,540 km$^2$ with elevation < 1.5 m NAVD88. Gulf Coast has 40,093 km$^2$ < 1.5 m above NAVD88 (Titus and Richman, 2001)
- Large fraction of coastline dominated by low lying barrier islands, marshes, deltas and lagoons without infrastructure in place

Images courtesy of NASA, Nature Conservancy and NERACOOS.
Challenges in GoM


- Hurricane evacuation orders in coastal parishes of Louisiana begin 72 hrs before projected landfall.
The Gulf of Mexico Master Mapping Plan (GMMMP) identifies requirements for bathymetry and topography, and planned mapping activities in the near-term. However, requirements will change with the next disaster or coastal issue, and the planned activities will transition from a planned state to production of data. In the original proposal for the creation of the GMMMP, GCOOS was identified as the eventual owner of the plan, with the responsibility to update requirements and planned activities on an annual basis, or as the need arises.

The two main components of the GMMMP, requirements and planned mapping activities, should be updated on a regular schedule, and continuously through automated means. A requirements workshop will be held each GCOOS funding cycle to re-evaluate priorities in the document. An interactive website will allow input of new requirements throughout the funding cycle to keep the document current. Planned mapping activities will be communicated in a separate yearly workshop, and maintained online as a collaborative mapping tool. As planned activities identified by the GMMMP are completed, the GCOOS will ensure new datasets are added to existing online data warehouses.

Staff will be required for workshop organization and facilitation, data entry, and project tracking of planned mapping activities.

Capital costs: $425K; Annual O&M: $28.5K

3.9 Enhanced Water Level Network

In February 2011, the Conrad Blucher Institute for Surveying and Science (CBI) at Texas A&M University-Corpus Christi, through a partnership with the NOAA’s Center for Operational Oceanographic Products and Services (CO-OPS) completed the installation of two (2) Sentinel of the Coast water level stations in Texas that have become part of the Texas Coastal Ocean Observation Network (TCOON). The Sentinels, installed at Texas Point and the Galveston Entrance Channel North Jetty, were funded by the US Army Corps of Engineers due to the destruction of monitoring stations by Hurricane Ike in 2008. Four more Sentinel stations have now been funded through The US Fish and Wildlife Service Coastal Improvement and Assessment Program and administered by the Texas General Land Office. These Sentinels will be placed at Port Isabel, Port Aransas, Port O'Connor, and Freeport, Texas.

Knowledge of water levels at appropriate spatial and temporal scales is crucial for daily operations, long-term planning, and management of coastal ecosystems. Needs for accurate water level measurements include the following activities: navigation in ports and waterways; most recreational and coastal activities; dredging and coastal engineering; determining tidal datums for hydrographic and shoreline surveys, littoral boundaries and property delineation; creation and improvement of hydrodynamic, tidal, storm surge and other models; and assessing the relative importance of local subsidence and sea level rise.

The key parameter to be measured or modeled is water level; supplemental parameters are wind speed, wind direction, salinity, water currents, sea temperature and land motion. All technologies meeting a given precision and accuracy standard are acceptable for water level measurements.

Water levels around the Gulf are measured and modeled by federal, state and local entities.

NOAA Sentinel Stations

- Hurricane Hardened
- Order $500k installed
- Limited number but TX recently announced plans to install a set off its coast
- Limited to single antenna for HFR
Long-Range System Costs

- ~34-38 long-range sites needed to cover entire coast (depending upon how much FL-Straits to include)
- 12 long range sites operational
- Capital investment is estimated at ~$212-$250/site
- ~$45k/site O&M including QA/QC
- $?/site evacuation for Tropical Cyclones
Summary

- GCOOS Build-Out Plan has been focused on covering the entire coastline with overlapping long-range HFR
- Plans are also being made for developing high frequency subnets at critical locations such as heavily utilized ports.