

# Gulf of Mexico Coastal Ocean Observing System (GCOOS) and Coastal Inundation

Ann E. Jochens

*GCOOS Regional Coordinator  
Texas A&M University  
College Station, Texas*

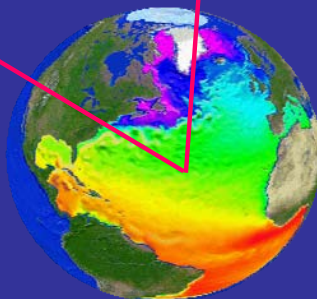
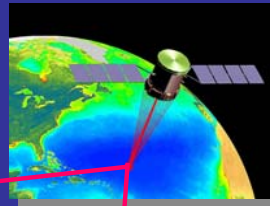
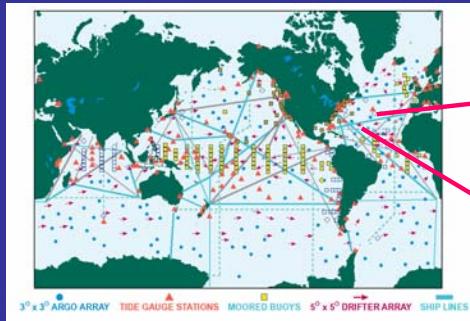
Gulf of Mexico Alliance  
Resilience Working Group Meeting  
Corpus Christi, Texas  
12 December 2007

# Topics

1. U.S. Integrated Ocean Observing System (IOOS)
2. Gulf of Mexico Coastal Ocean Observing System (GCOOS) and its Regional Association (RA)
3. Stakeholder Priorities
4. 2007 Storm Surge and Inundation Workshop Results

# **U.S. Integrated Ocean Observing System (IOOS)**

# The Global Ocean Observing System GOOS



- **Two Interdependent Modules**
  - Global Ocean
  - Coastal
- **Global Module**
  - Planning began in late 1980's
  - Implementation plan completed in late 1990's
  - Implementation underway
- **Coastal Module**
  - Planning began in late 1990's
  - Implementation strategy approved in 2004

[www.ioc-goos.org/](http://www.ioc-goos.org/)

# 1998 – Congress Called for Integrated Ocean Observing System (IOOS)

Routinely Provide Data/Info Required for  
Rapid Detection & Timely Prediction of State Changes

- Improve the safety & efficiency of marine operations
- Improve national/homeland security
- Improve forecasts of natural hazards and mitigate their effects more effectively
- Improve predictions of climate change & their effects
- Minimize public health risks
- Protect & restore healthy marine & estuarine ecosystems more effectively
- Sustain living marine resources

1 System, 7 Societal Goals

# U.S. IOOS

## Two Interdependent Components Multi – Scale Hierarchy of Observations

Global Ocean  
Climate Component  
GOOS/GCOS

Coastal Ocean  
Component

GLs

NE

MAB

SE

Go  
Mex

Caribbean

National  
Backbone

Regional  
Observing  
Systems

GoA

NW

H  
Isl

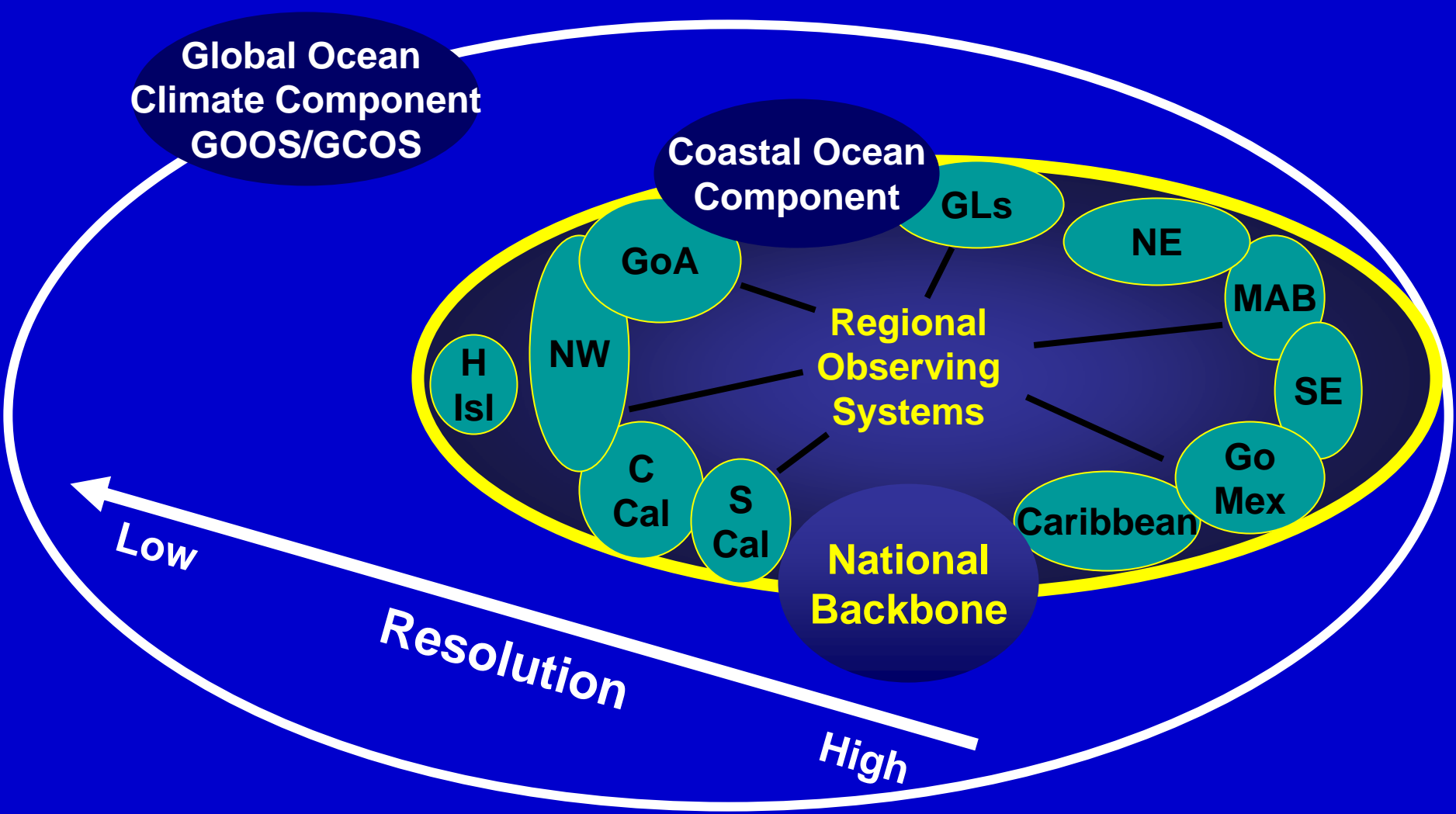
C  
Cal

S  
Cal

Low

Resolution

High



# Coastal Component

## Regional COOSs

- Operated by Regional Associations
- Involve private & public sectors
- Inform Federal Agencies of user needs
- Enhance the backbone based on user needs
- Incorporate Sub-regional systems

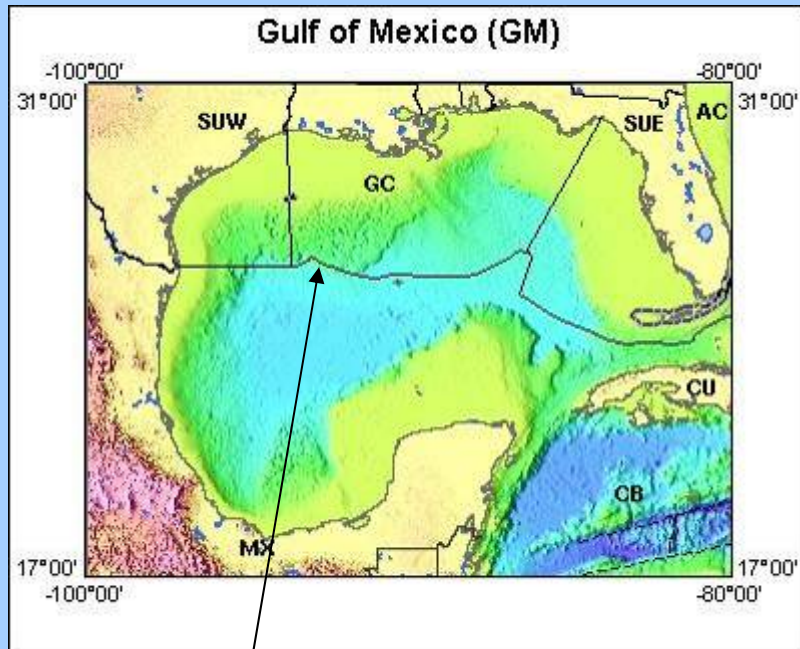
## National Backbone

- Operated by Federal Agencies
- EEZ & Great Lakes
- Core variables required by regions & Federal Agencies
- Networks of sentinel & reference stations
- Standards/Protocols



**Gulf of Mexico Coastal Ocean  
Observing System  
and its Regional Association**

# Gulf of Mexico Coastal Ocean Observing System (GCOOS)



GCOOS is the Gulf of Mexico component for the U.S. contribution to the coastal module of the Global Ocean Observing System (GOOS)

U.S. Exclusive  
Economic Zone

Source: USGS

<http://walrus.wr.usgs.gov/infobank/gazette/html/regions/gm.html>

# Two Guiding Concepts

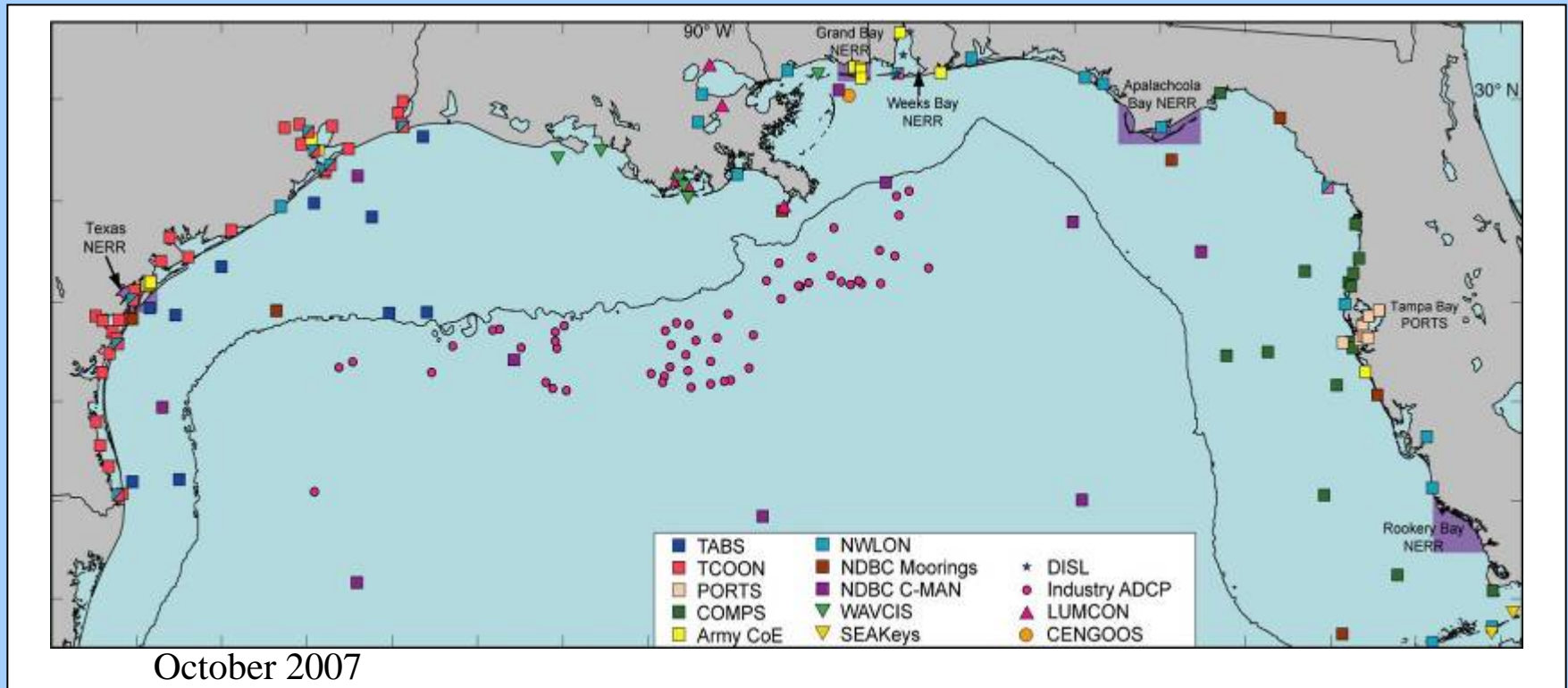
- The Gulf of Mexico Coastal Ocean Observing System is considered to be a "System of Systems" comprised of many sub-systems that may be supported by different entities for a variety of different reasons.
- The observations of these various sub-systems will be more useful to GCOOS goals if integrated to produce products needed by other stakeholders.

# GCOOS-RA Mission

- Build sustained ocean observing system
- Encompass a broad community of stakeholders
- Share data, models, and products
- Link resources
- Integrate to build the U.S. IOOS
- Build sustained financial support

**Memorandum of Agreement (MoA): Governance structure for the GCOOS Regional Association**

# Integration of Existing Sub-systems

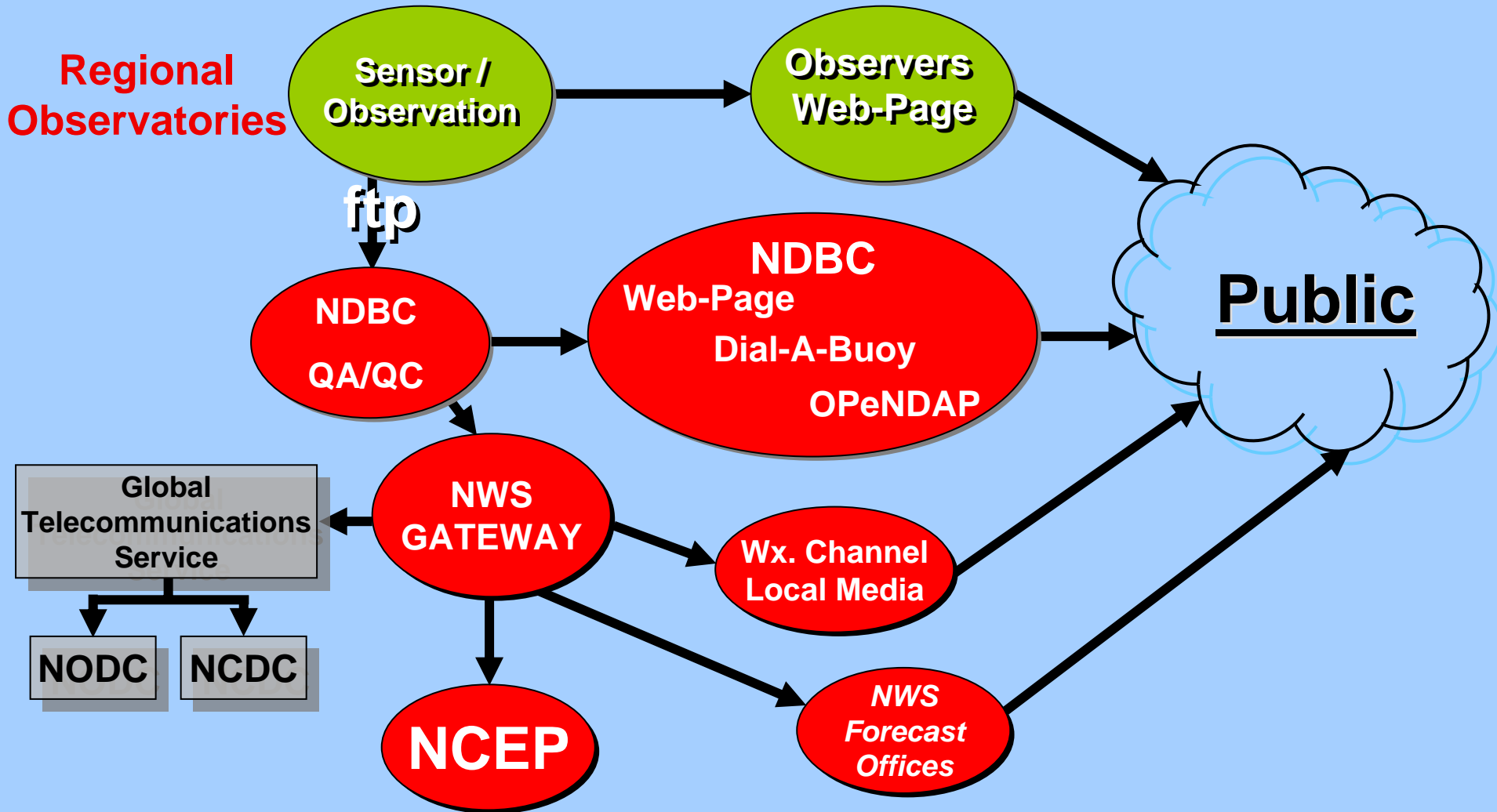


Goal: Bringing new extant real-time data sets to the NOAA National Data Buoy Center (NDBC) for quality control and open distribution.



# NDBC MODEM Kit

(Meteorological and Oceanographic Data Exchange Module)



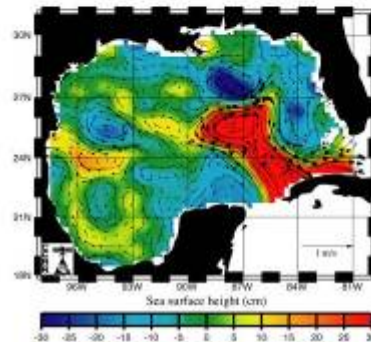
# Satellite Products

Satellite products are available from the USF Institute for Marine Remote Sensing, Colorado Center for Astrodynamics Research, Johns Hopkins University, LSU Earth Scan Laboratory, and Naval Research Laboratory. Below are some examples of products available.

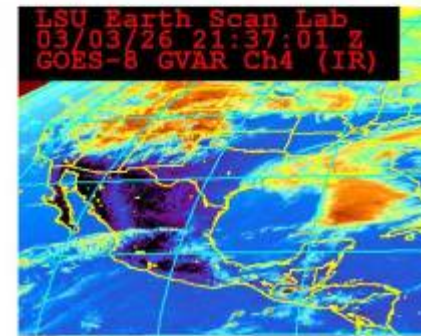
IMaRS  
MODIS image  
3/23/2003



CCAR  
TOPEX/ERS-2 Analysis  
3/23/2003



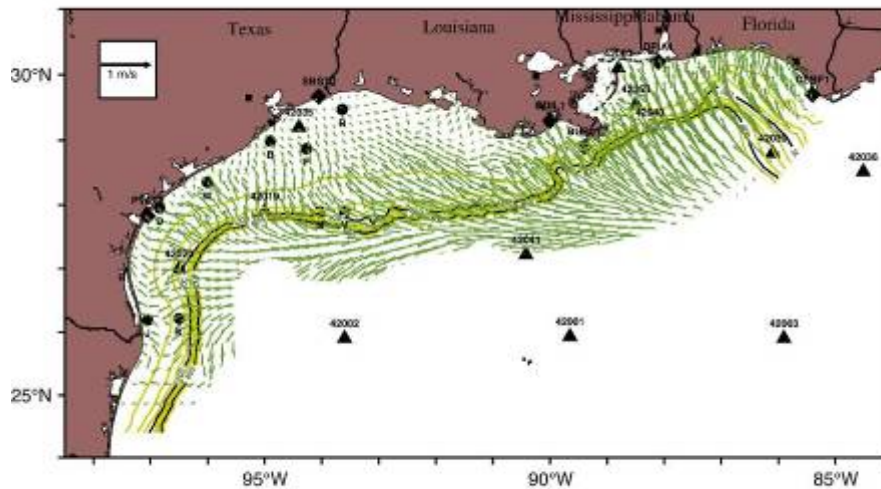
Color Thermal  
Imagery LSU  
Earth Scan Lab



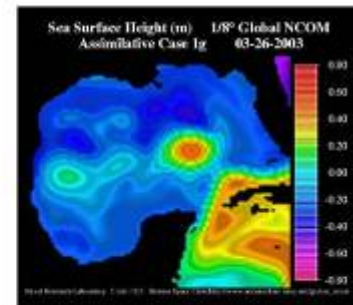
# Model Products

Sustained Model Products Available include those from:

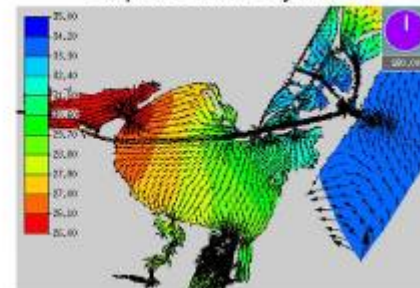
- USF Nowcast and Forecast System for Eastern Gulf of Mexico
- TGLO/TAMU Surface Current Forecast for Northwestern Gulf of Mexico
- Naval Research Laboratory
- Naval Oceanographic Office
- Texas Water Development Board
- COAPS Winds and SSH simulations



Forecast current vector field (at 2m depth) from POM (barotropic 3D) using forecast wind for 0100 (UTC) March 27, 2003. Locations of NDBC (triangle) and TABS (circle) stations indicated.



Texas Water Development Board  
Corpus Christi Bay Model



# Further integration of sub-systems

- Bring new (including non-physical) real-time data sets to the NOAA National Data Buoy Center (NDBC) for quality control and open distribution.
- Encourage communication among sub-systems through our Observing Systems Committee.
- Develop standards and protocols for use by all sub-systems through our Data Management and Communication Committee.

# Stakeholder Priorities

# Stakeholder Priorities Are Key

- We are working to:
  - identify observations and products needed by users
  - estimate economic benefits of these needs
  - prioritize these needs
  - plan and initiate pilot projects to enable these needs to be met
- Mechanisms used:
  - Workshops & Meetings with Stakeholders
  - Task Team on Public Health
  - Development of Observing System Plan
  - Development of a Business Plan

# GCOOS Workshops:

## Identification of Potential User Requirements

### Goal of Focused Sector Workshops:

The primary objective is to identify prioritized measurements and products of value to the sector. This is important to build the GCOOS user base, identify and implement needed observing system elements, provide rationale and priorities for developing GCOOS, and build advocacy.

# GCOOS Workshops

1. Integrated Data Systems for Oceanography, 31 October-2 November 2000, Stennis Space Center, MS
2. NVOOS Workshop for Managers of Coastal Observing Systems, 14-15 January 2003, Stennis Space Center, MS
3. Exploration of Private Sector Interests in IOOS: Focus on GOM and Southeast U.S. 2-4 March 2004, Houston, TX
4. **Harmful Algal Blooms: GCOOS Role in Detection, Monitoring, and Prediction 13-15 April, 2004, St Petersburg, FL**
5. Next Steps in the Gulf of Mexico; Needed Underpinning Research 7-8 July 2004, College Station, TX
6. Formation of a GCOOS Education and Outreach Council, 29-30 November 2004, Biloxi, MS
7. Initial GCOOS Stakeholder Meeting: Development of a Governance Structure, 24-25 January 2005, New Orleans, LA
8. **GCOOS and the Private Sector: Oil and Gas and Related Industry, 2-4 November 2005, Houston, TX**
9. **GCOOS-SECOORA-NOAA CSC Storm Surge and Inundation Workshop, 24-26 January 2007, New Orleans, LA**
10. **Harmful Algal Bloom Observing System Plan for the Gulf of Mexico Workshop, 14-16 November 2007, New Orleans, LA (GCOOS & GOMA)**

# Future Focused Stakeholder Workshops and Other Stakeholder Interactions

- **Maritime transportation workshop**—including tanker traffic, container ships, cruise ships, shipping agents, port authorities, pilots, LNG carriers, intercoastal waterway traffic, and commercial transportation of people
- **Recreational boating workshop**—including marina operators, power squadrons, yacht clubs, marina operators, and retailers.
- **Urban planners/developers workshop**
- **Fisheries (commercial, recreational, and regulatory)**—Seeking assistance from the Gulf of Mexico Fishery Management Council, Gulf States Marine Fisheries Commission, and NOAA Southeast Fisheries Research Center, and state fishery agencies
- **Standing GCOOS Task Team on Public Health**—Building on national workshops for priorities for tracking human pathogens
- **Collaborations/Interactions with Gulf of Mexico Alliance**

# 2007 Storm Surge and Inundation Workshop Results

GCOOS-SECOORA-NOAA CSC  
Storm Surge and Inundation Workshop  
24-26 January 2007  
New Orleans, LA

Workshop Objectives:

- To identify, with priorities, measurements and products needed to better predict and mitigate effects of storm surge and inundation in the southeastern U.S. and Gulf of Mexico.
- To suggest a few high priority pilot projects that might be undertaken soon to advance the development of the higher priority measurements and products.
- To provide estimates of annual economic benefits of the identified measurements and products as feasible.

GCOOS-SECOORA-NOAA CSC  
Storm Surge and Inundation Workshop  
24-26 January 2007  
New Orleans, LA

Workshop Structure:

1. Pre-storm preparedness—preparing for resiliency
2. Emergency response
3. Recovery and rebuilding—improve resiliency

Workshop Participants:

49 attendees representing state emergency managers, flood plain managers, USGS, NWS, NHC, NSSL, CSC, FEMA, weather and flood plain consultants, and researchers

Workshop Minutes:

[http://ocean.tamu.edu/GCOOS/Office/meetings/2007\\_Jan/minutes.htm](http://ocean.tamu.edu/GCOOS/Office/meetings/2007_Jan/minutes.htm)

# Workshop priorities (1)

1. Accurate bathymetry and topography with consistent vertical control between various data sets
2. Data on sea level, winds, waves, etc. for use in forecast models, nowcast analyses, and forensic reports. Hardened data collection and communications.
3. Improved forecasts of inundation. Ensemble forecasts are needed. These should include heights of surge, tides, wave set up, precipitation, and river flow, as well as waves.
4. Improved inundation maps for hazard mitigation planning. This requires updated probabilistic methods, improved models, use of forensic data, and improved, easy access to archived data.

# Workshop Priorities (2)

5. Inreach communication among emergency managers, community planners and others to develop and present consistent messages, to build expertise, and to develop a sense of "community".
6. A clearing house for pre- and post-storm information. This might have both a public access and an access only for operational users. It should include both pre-storm data (e.g., areal photos and post-storm information) for use by teams during rescue and adjustors.
7. Forensic engineering studies to assess wind and flood inundation damage.

# Workshop Priorities (3)

Others, unranked:

- Augmented Safir-Simpson scale for hurricanes with additional information.
- Improved public outreach
- A clear process for moving storm surge models from research to operational status

## **Recommended Pilot Projects (1)**

- (1) Benefit-cost analysis to determine value of having current 24-hour-quality forecast at 48 hr. Use data from various past events (Floyd, Rita, Georges, Katrina)
- (2) Compile/develop standardized methods to measure surge elevations. Include gauges, other sensors, HWMs. Utilize best practices that are out there.

## Recommended Pilot Projects (2)

- (3) Work with EM community to develop sample inundation forecast products for decision-making at various time steps (96/72/48/24 hr). Products should give easily digestible info, and not overwhelm individual with too many separate maps for each step.
- (4) Develop prototype of surge event clearinghouse. Needs assessment to get components/players. Must include min. standards/QC for data (avoid “landfill” syndrome). Can include key staff/ capabilities wanted for EOC (e.g., Science Coord., GIS expertise)

## **Recommended Pilot Projects (3)**

- (5) Conduct sensitivity runs of storm surge models to help determine required horizontal and vertical resolutions of bathymetry.

# Efforts Underway

- Efforts to improve hurricane intensity forecasting
  - Letters of support for NWS research projects
  - Offer to help deploy instrumentation on platforms to fill data gaps
  - Project to assemble, test, and deploy self-sufficient meteorological instrumentation on platforms

# Future Efforts

- Identify efforts by other groups that are working toward similar goals and collaborate
- Pursue funding opportunities for high priority areas, in collaboration with others as feasible
- Conduct additional workshop that engages additional emergency managers and others
- Identify small working groups to prepare prospectus for high priority areas

# GCOOS Summary

Developing lasting connections between system elements

Establishing mechanisms for increased and improved sharing of data, model output, and products

Establishing mechanisms for obtaining regional priorities of all stakeholders

Pursuing funding opportunities from multiple sources to deploy and sustain high priority measurements

Building partnerships to achieve common goals

# GCOOS Office Contact Information

**Worth D. Nowlin, Jr.**  
Project Principal Investigator  
wnowlin@tamu.edu  
(979) 845-3900

**Ann E. Jochens**  
Regional Coordinator  
ajochens@tamu.edu  
(979) 845-6714

**Matthew K. Howard**  
DMAC Coordinator  
mhoward@tamu.edu  
(979) 862-4169

**Susan R. Martin**  
Research Associate and Webmistress  
srmartin@tamu.edu  
(979) 845-3900

Website: **<http://www.gcoos.org>**

Mailing address : Department of Oceanography  
3146 TAMU  
College Station, TX 77843-3146

Fax number: (979) 847-8879