

**U.S. Integrated Ocean
Observing System (IOOS):**
Monitoring to Protect Human Health

by

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Office of Research and Development
National Health & Environmental Effects
Research Laboratory

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Coastal Zone '05 Conference



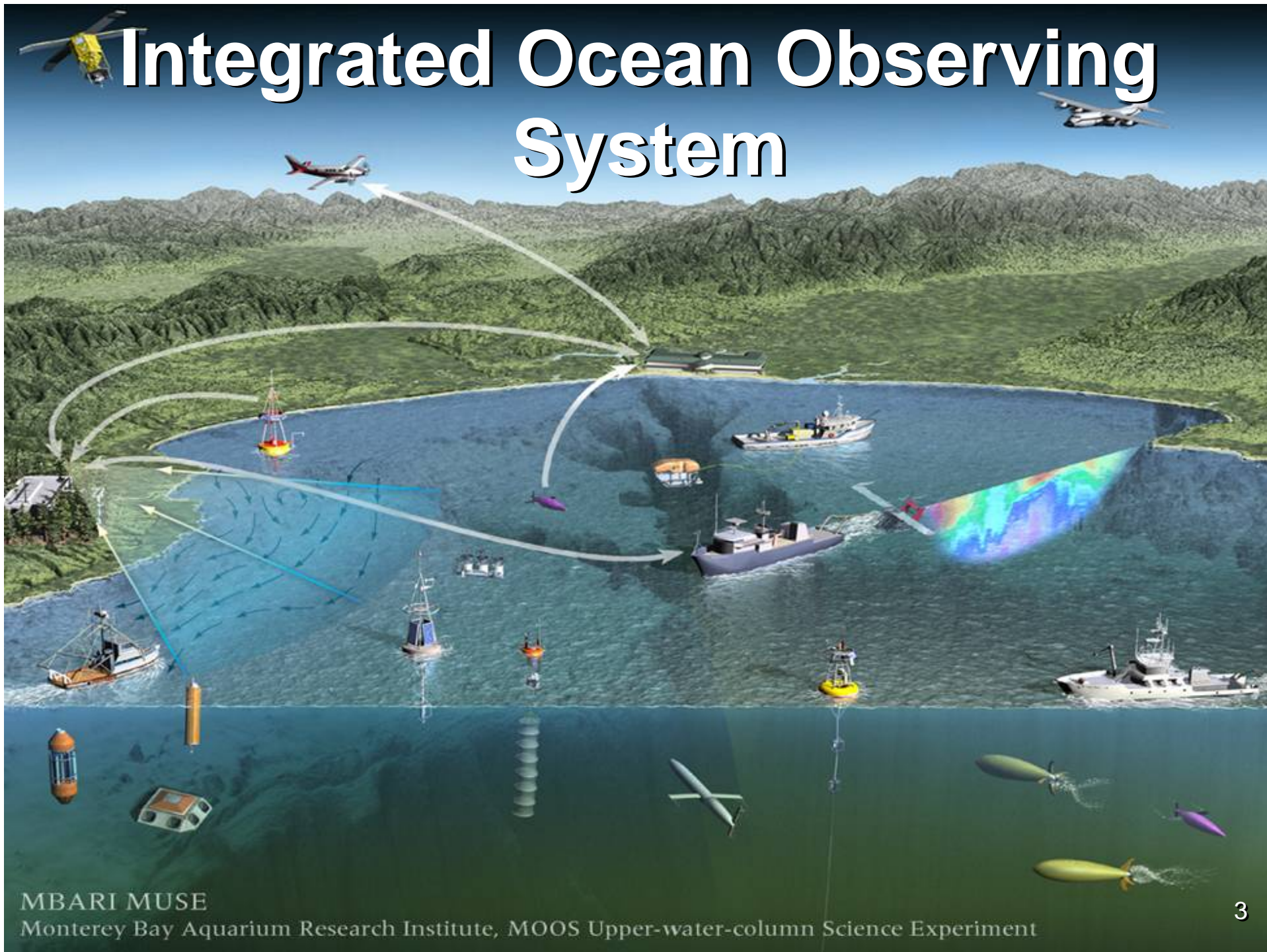
RESEARCH &
DEVELOPMENT

*Building a
scientific
foundation
for sound
environmental
decisions*

U.S. IOOS & Human Health Monitoring

- ▶ IOOS Description
- ▶ Seven IOOS Societal Goals
- ▶ Why IOOS is being developed
- ▶ Collaboration with other Agencies
- ▶ IOOS Architecture
- ▶ Human Health Monitoring (Examples)
 - *Microbial Pathogens*
 - *Harmful Algal Blooms (HABs)*
- ▶ Future Human Health Activities

Integrated Ocean Observing System



MBARI MUSE
Monterey Bay Aquarium Research Institute, MOOS Upper-water-column Science Experiment

The Integrated Ocean Observing System



- ▶ **Multi-Institutional Partnership**
- ▶ **Sustained**
- ▶ **User-Driven**
- ▶ **End-to-End**
- ▶ **Multi-Disciplinary**
- ▶ **Multi-Scale**

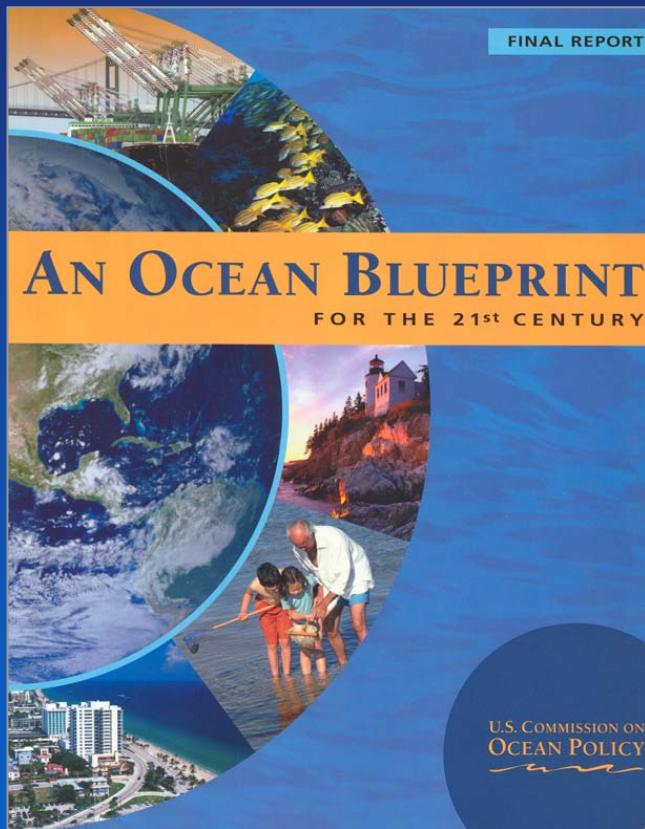
**By making more effective use of
& enhance existing assets**

Seven IOOS Societal Goals

- ▶ Predict climate change and effects
- ▶ Mitigate natural hazards
- ▶ Improve marine operations
- ▶ Improve national security
- ▶ ***Reduce public health risks***
- ▶ Protect ecosystems
- ▶ Sustain marine resources



Commission on Ocean Policy



- ▶ **Implement an Integrated Ocean Observing System (IOOS)**
- ▶ **Implement Ecosystem–Based Management**
- ▶ **Strengthen Regional Approach**

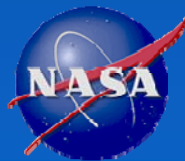
U.S. Ocean Action Plan

"The United States is playing a lead role in bringing the international community together to develop an integrated, comprehensive, and sustained earth observing system of systems that includes a substantial ocean component, known as the Global Ocean Observing System (GOOS).

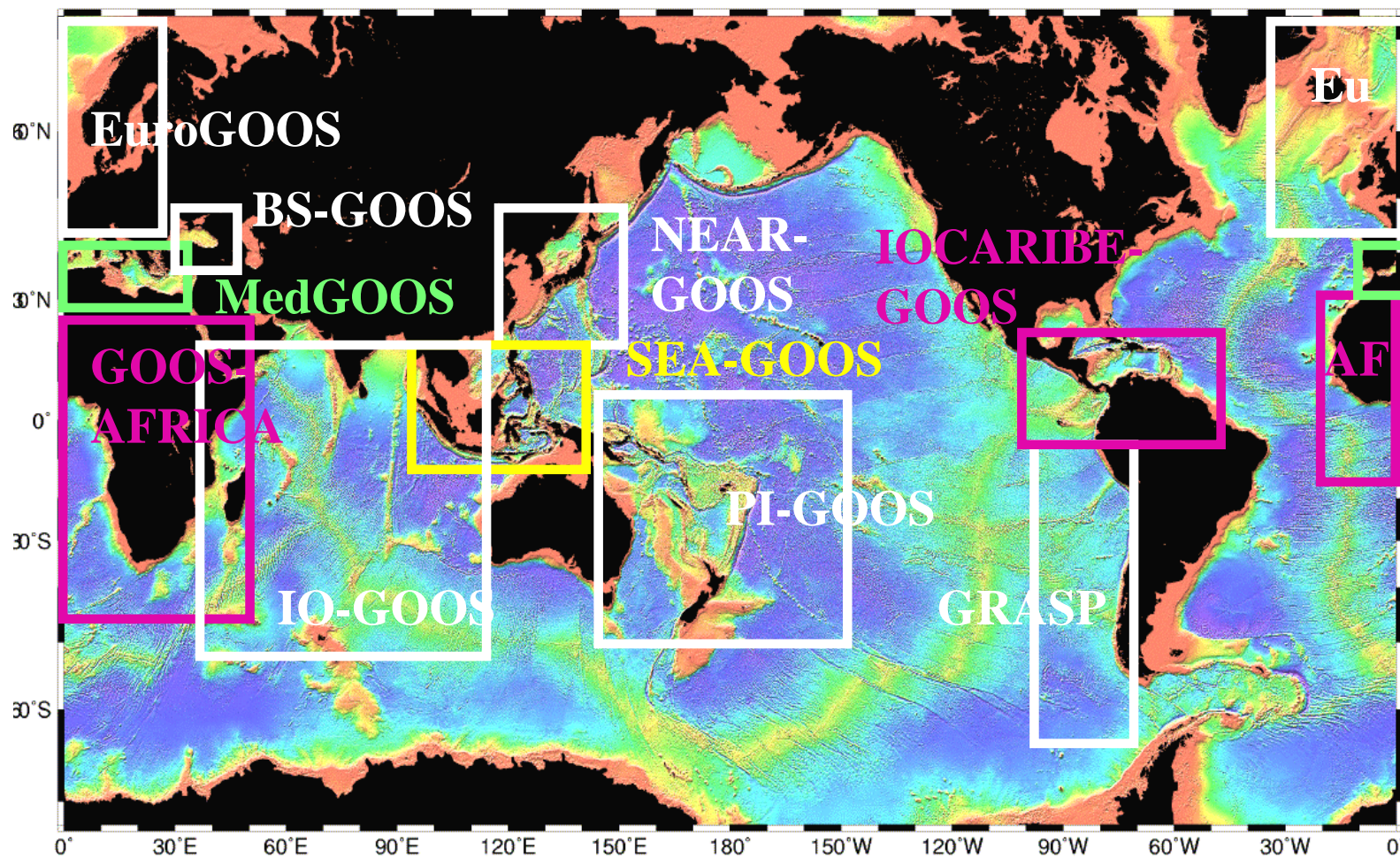
The U.S. Integrated Ocean Observing System will be a major element of GOOS."

- from the President's U.S. Ocean Action Plan, December 2004

Ocean.US
EXCOM:



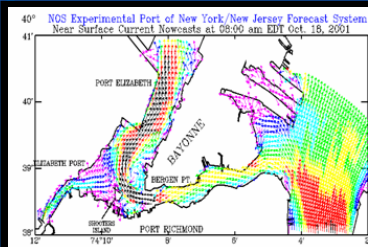
GOOS REGIONS



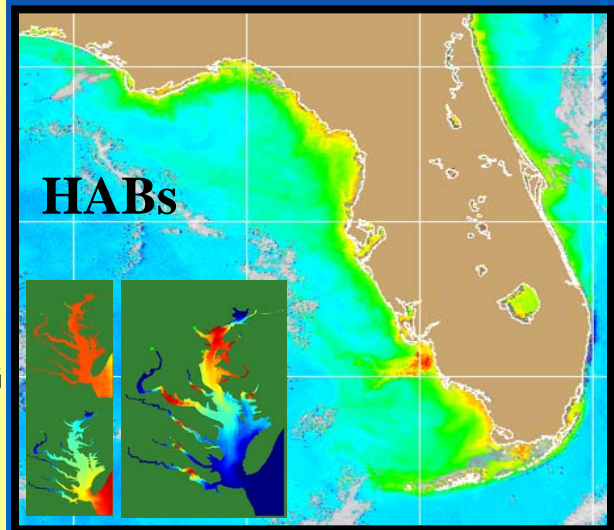
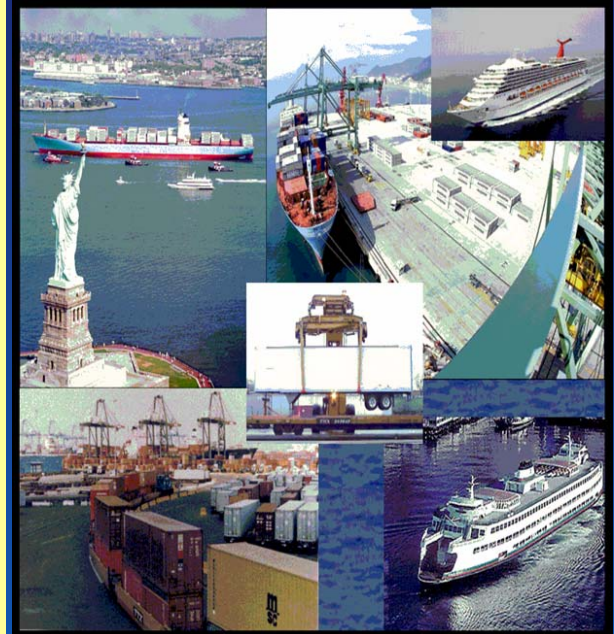
Walter H. F. Smith and David T. Sandwell, Seafloor Topography Version 4.0, SIO, September 26, 1996

Copyright 1996, Walter H. F. Smith and David T. Sandwell

IOOS Potential Benefits



- **SAFE NAVIGATION**
 - avoid groundings
 - avoid collisions
- **NATURAL HAZARDS**
 - coastal protection
 - storm surge forecasts
- **SEARCH & RESCUE**
- **EFFICIENT NAVIGATION**
 - improved port throughput
- **SAFETY AT SEA warnings**
 - high winds/waves
 - rip currents
- **ENVIRONMENTAL PROTECTION**
 - hazardous spill response
- **ECOLOGICAL FORECASTING**
 - harmful algal blooms forecasting



Coastal Phenomena of Interest

Globally Ubiquitous, Local Expressions of Large Scale Changes



Climate, Marine Ops, Natural Hazards

- ▶ Surface currents, Waves
- ▶ Sea level, Temperature, Salinity
- ▶ Coastal flooding & erosion

Public Health Risk

- ▶ Seafood contamination
- ▶ Direct exposure to pathogens & toxins

Ecosystem Health & LMRs

- ▶ Loss of habitat, Biodiversity
- ▶ Nutrient pollution, Anoxia
- ▶ HABs, Invasive species
- ▶ Mass mortalities
- ▶ Chemical contamination
- ▶ Declines in living resources
- ▶ Aquaculture production

A dramatic photograph of a massive wave crashing over a concrete pier structure. The wave is white and turbulent, with a large plume of water and spray rising into the sky. The sky is a deep blue with some white clouds. The pier is made of concrete and has several rectangular blocks or pillars. The overall scene is one of intense natural power.

IOOS Architecture

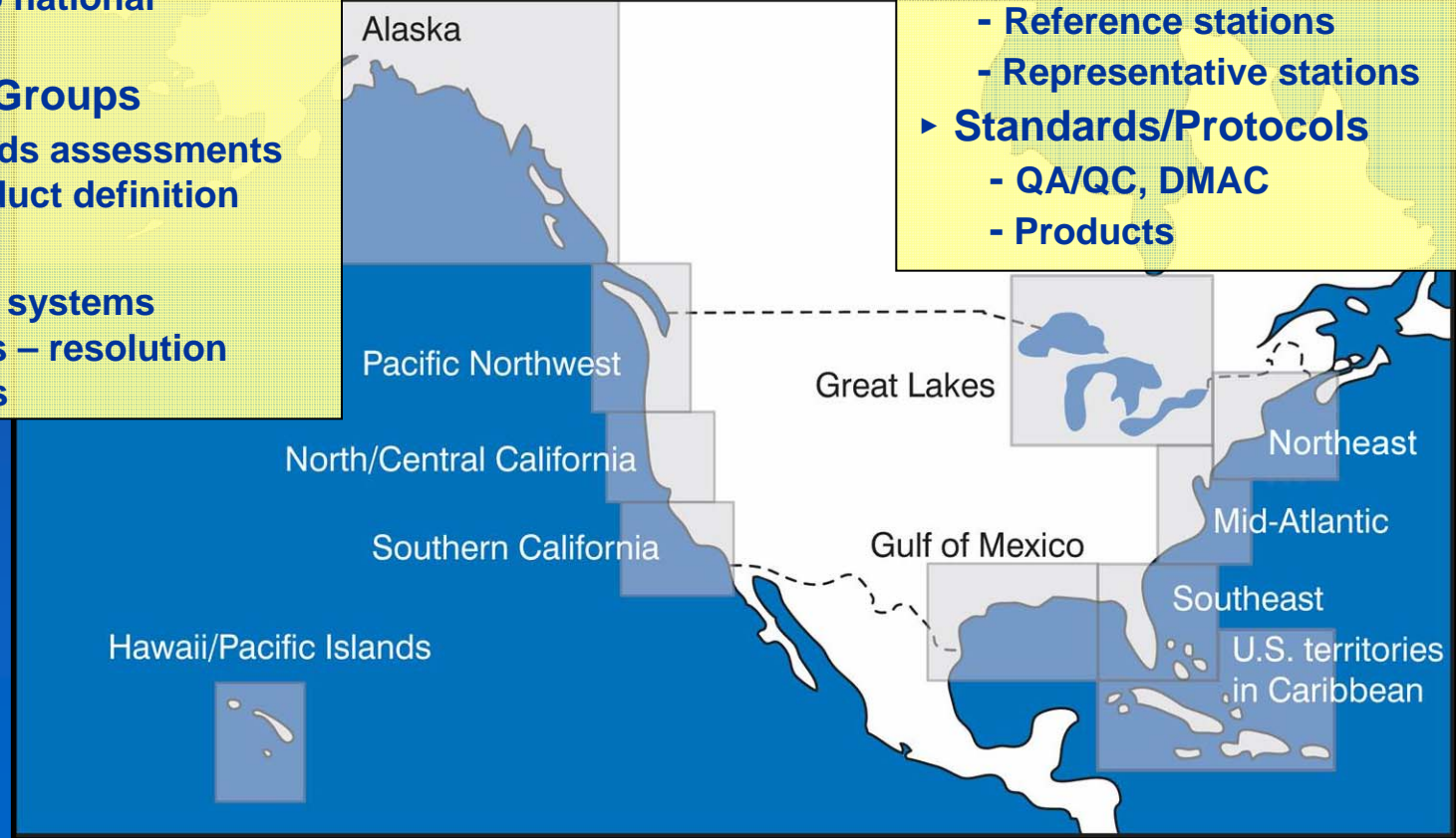
Coastal Component

Regional Systems

- ▶ **11 Regional Associations**
 - Develop
 - Operate
 - Contribute to national backbone
- ▶ **Involve User Groups**
 - Conduct needs assessments
 - Tailored product definition
- ▶ **Incorporate**
 - Sub regional systems
 - Observations – resolution and variables

National Backbone

- ▶ **Operated by**
 - NOPP Agencies & partners
- ▶ **EEZ & Great Lakes**
- ▶ **Core variables**
 - Required by regions
- ▶ **Networks**
 - Sentinel stations
 - Reference stations
 - Representative stations
- ▶ **Standards/Protocols**
 - QA/QC, DMAC
 - Products



National Backbone

Core Variables

▶ Physical

- Sea surface winds
- Sea surface waves
- Sea surface currents
- Sea level
- Stream flows
- Temperature, Salinity
- High Res Bathymetry
- Ice distribution

▶ Multidisciplinary

- Optical properties
- Bottom character/Benthic habitats

▶ Chemical

- Dissolved inorganic nutrient
- Contaminants
- Dissolved oxygen

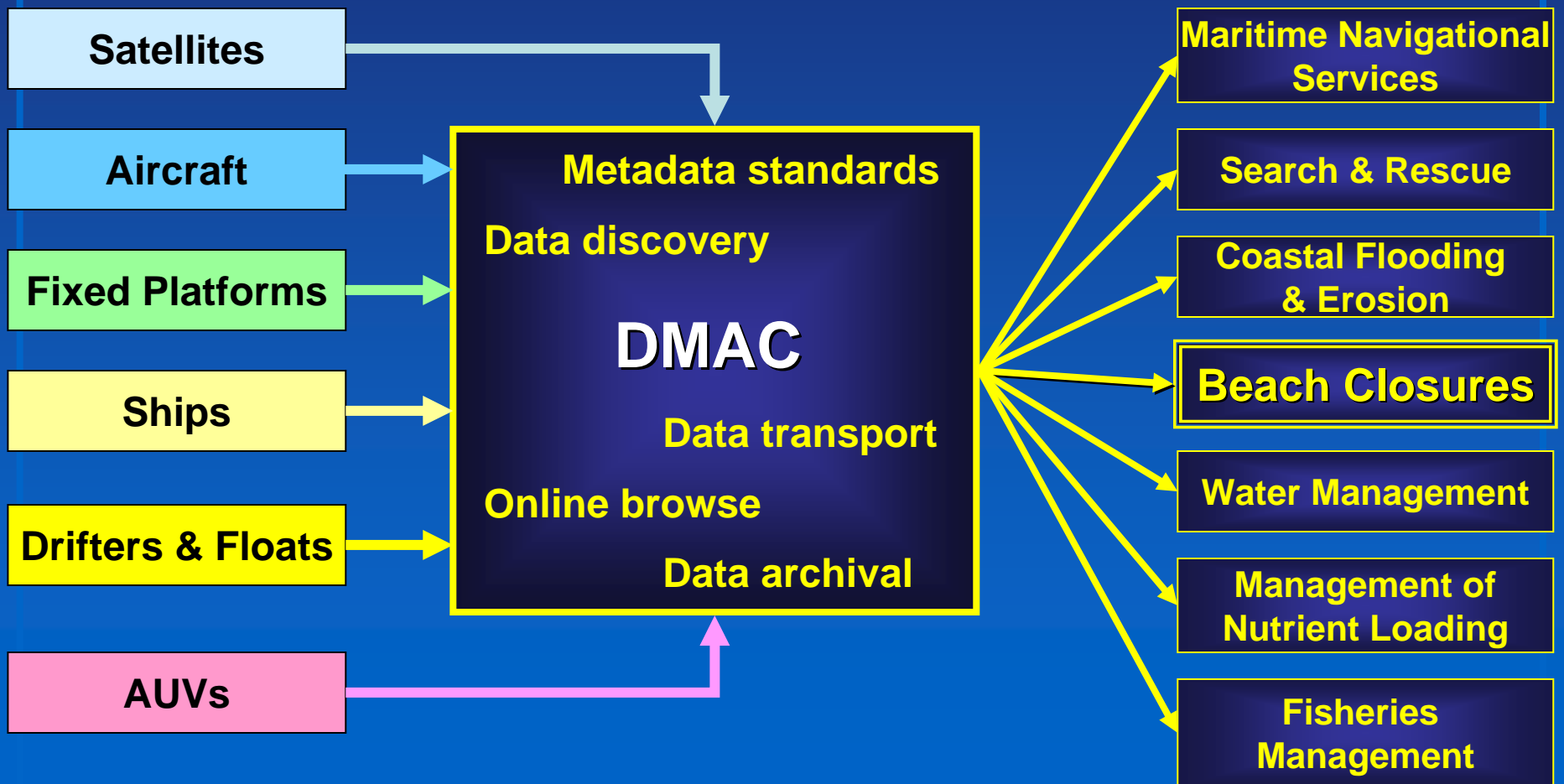
▶ Biological

- Fish species, abundance
- Zooplankton species, abundance
- Phytoplankton species, biomass (ocean color)
- Pathogens

Sustained, Integrated, End-to-End System

Rapid Access to Diverse Data from Many Sources

Observations → Data Telemetry → Data Management & Communications → Modeling & Analysis → Data & Information Applications



EPA BEACH Monitoring Programs

- ▶ **Grants: \$42 Million since FY-2001**
- ▶ **National List of Beaches (ca. 6000)**
- ▶ **Monitoring Accomplishments:**
 - Risk-Based, “Tiered” Monitoring
 - Improved State Programs
- ▶ **Public Notification Programs Improving**





National List of Beaches

March 2004

U.S. Environmental Protection Agency
Office of Water
1200 Pennsylvania Avenue, NW
Washington DC 20460

EPA-823-R-04-004

States and Territories in the National List of Beaches





BEACON - Beach Advisory and Closing On-line Notification

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Find Your Beach



BEACON is EPA's application to make state beach advisory and closing data available to the public.

Type a Beach Name:

or

Click on a green state on the map or select a state in the list below.

Legend
Has Data
No
Yes

Alabama
American Samoa
California
Connecticut
Delaware
Florida
Georgia
Guam
Hawaii
Illinois
Indiana
Iowa
Louisiana
Maine
Maryland
Massachusetts

GO

BEACON is best viewed using Internet Explorer 5.0 or higher at 800 X 600 screen resolution or greater.

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Louisiana Counties with Beach Data

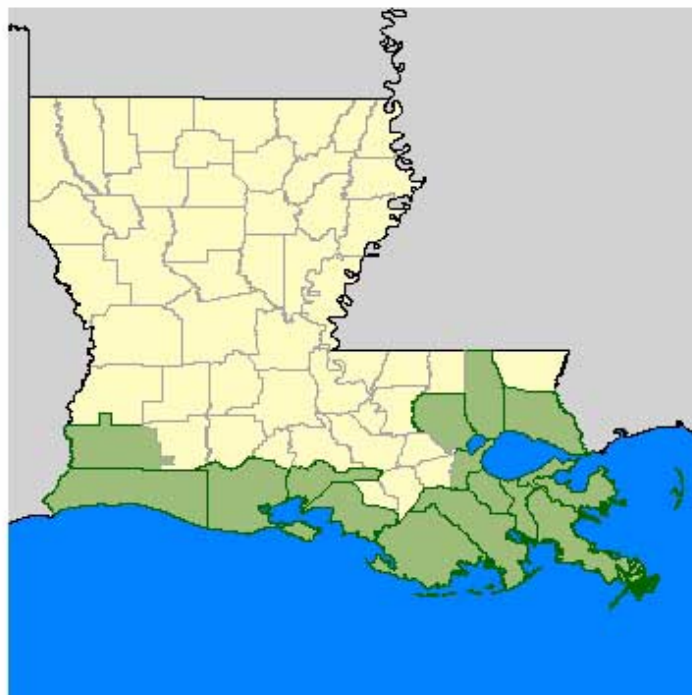


[Beach Watch Home](#)

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[State Contacts](#)

● Click on a green county in the map or select a county from the list and press the "GO" button.

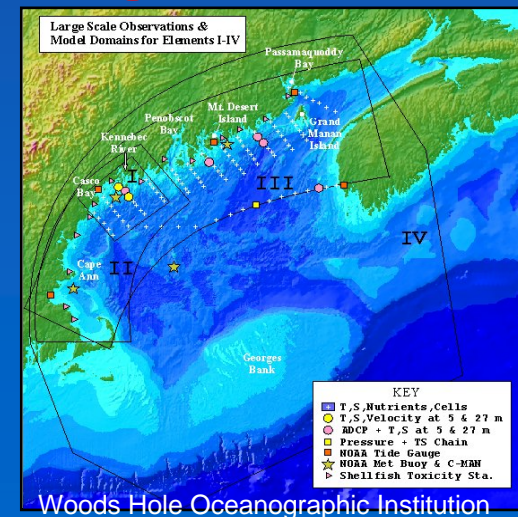
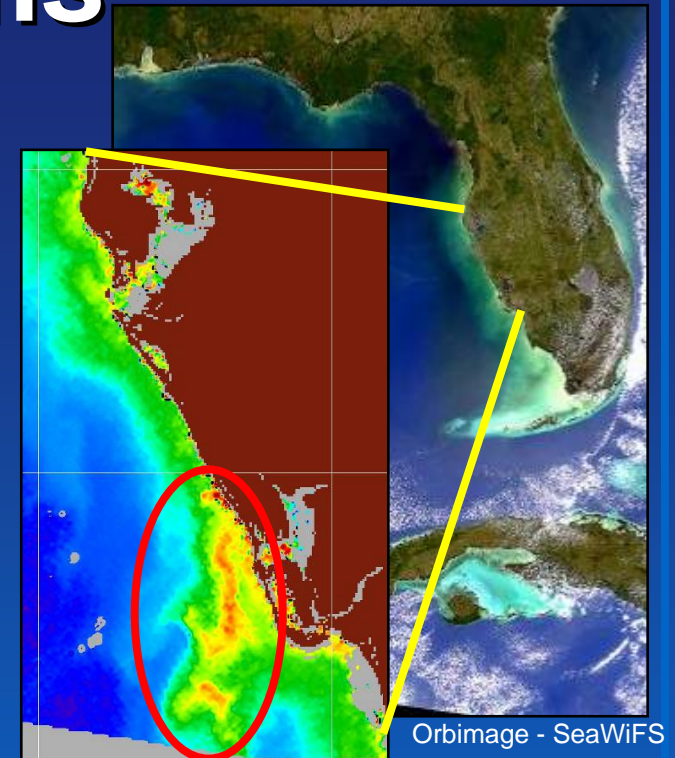


- Calcasieu
- Cameron
- Iberia
- Jefferson
- Lafourche
- Livingston
- Orleans
- Plaquemines
- St. Bernard
- St. Charles
- St. John The Baptist
- St. Mary
- St. Tammany
- Tangipahoa
- Terrebonne
- Vermilion

GO

Harmful Algal Blooms *Integration*

- **Successful predictions require integrating:**
 - Knowledge of oceanographic processes and species ecology (*Stumpf et al. 2003*)
 - Ocean color derived from chlorophyll from SeaWiFS
 - C-MAN buoy winds
 - Field measurements
 - Satellite predicted winds
 - Meteorological information
- **Involves Federal, state, and local coordination**



Harmful Algal Bloom Bulletins

Page 1

Gulf of Mexico Harmful Algal Bloom Bulletin
21 September 2004
National Ocean Service/NCCOS and CSC
NESDBS/CoastWatch and NDEBC
Last bulletin: September 17, 2004

Analysis
HAB Forecast:

No harmful algal blooms have been found along Florida's coast. Recent tropical storms have caused sediment resuspension and non-harmful blooms, which may cause discolored water.

Analysis:

Samples taken last week from southwest Florida near Sarasota, Fort Meyers, and Naples showed no *Karenia brevis*. Imagery shows elevated chlorophyll along much of Florida's west coast: concentrations over 4 micrograms per liter off Cape San Blas and Cedar Key; over 5 micrograms per liter near Clearwater, Sarasota, Naples, and over 7 micrograms per liter Everglades City.

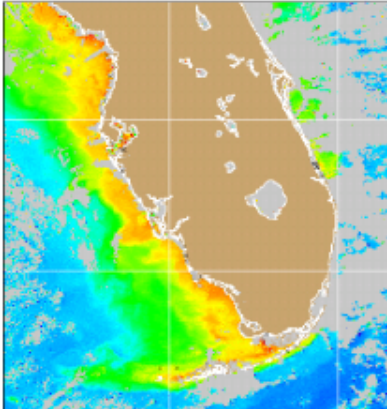
Winds have favored upwelling in southwest Florida for several days and are forecasted to continue for the rest of the week and through the weekend. These conditions are conducive to HAB formation, so this area should be monitored. Sampling here is recommended. Conditions in the panhandle don't favor HAB formation.

Broder, Stoltz

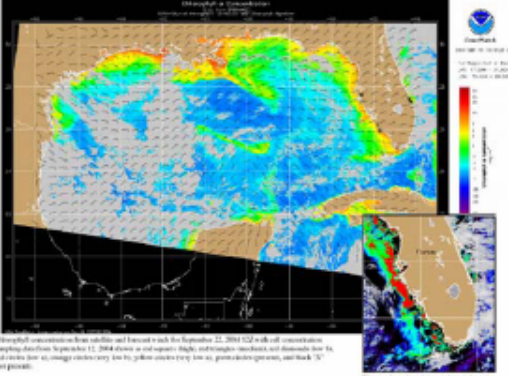
Please note the following restrictions on all SeaWiFS imagery derived from CoastWatch.

1. These data are restricted to civil marine applications only; i.e. federal, state, and local government use/distribution is permitted.
2. Distribution for military, or commercial purposes is NOT permitted.
3. There are restrictions on Internet/Web/public posting of these data.
4. Image products may be published in newspapers. Any other publishing arrangements must receive Orbimage approval via the CoastWatch Program.

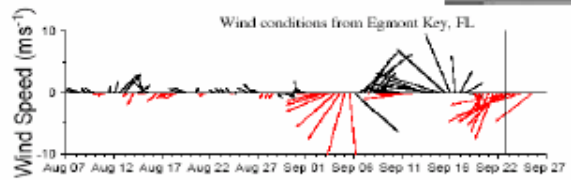
Page 2



Chlorophyll concentration from satellite with possible HAB areas shown as red squares (low a), red circles (low b), orange circles (very low b), yellow (present), and black "X" (not present).



Chlorophyll concentration from satellite and forecast for September 22, 2004 (22Z) with all concentration sampling locations September 22, 2004 shown as red squares (low a), red circles (low b), orange circles (very low b), yellow (present), and black "X" (not present).



Wind conditions from Egmont Key, FL

Wind speed and direction are averaged over 12 hours from measurements made on buoys. Length of line indicates speed; angle indicates direction. Red indicates that the wind direction favors upwelling near the coast. Values to the left of the dotted vertical line are measured values; values to the right are forecasts.

Southwest Florida: Winds have been northeasterly for the past few days, and are forecasted to shift to easterly then northeasterly over the next couple of days. The NWS Marine Forecast calls for easterly winds until Thursday, then northeasterly winds over the weekend. Florida Panhandle: Winds have been northeasterly for the past few days, and are forecasted to become easterly for the next couple of days.

Sent as PDF



Harmful Algal Bloom Forecasting System


Harmful Algal Bloom Forecasting System - Netscape

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http://www.csc.noaa.gov/crs/habf/index.html

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 **Harmful Algal Bloom Forecasting System**
Information on HAB detection and forecasting in the Gulf of Mexico

Overview

Advance warning of harmful algal blooms (HABs) increases the options for managing these events. The HAB Forecasting System provided by NOAA supplies information on the location, extent, and potential for development or movement of *Karenia brevis* blooms in the Gulf of Mexico.

The forecasting system relies on satellite imagery, field observations, and buoy data to provide the large spatial scale and high frequency of observations required to assess bloom location and movements. Conditions are posted to this Web page twice a week during the HAB season. Additional analysis is included in the HAB Bulletin that is provided to state and local resource managers in the region.

This an ongoing project that depends on the dedication, energy, and feedback of individuals from partner agencies and numerous other organizations working on this issue in the Gulf of Mexico.

Conditions Report

There is presently no red tide in Florida.

HAB Bulletin **Public notice**

The HAB Bulletin alerts subscribers to developing blooms and changes in the location and extent of existing blooms.

The HAB Bulletin is sent twice a week via e-mail to registered users with natural resource management responsibilities. Forty-eight hours after the bulletin has been issued, it is posted to the Harmful Algal Bloom Bulletin Archive for general access. If you have management responsibility and would like to be added to the mailing list, contact hab@csc.noaa.gov.

- HAB Bulletin Archive
- Case Study

Contact Information

E-mail comments or questions to hab@csc.noaa.gov

Contributors

- Florida Fish and Wildlife Research Institute
- Mote Marine Laboratory
- NOAA Center for Coastal Monitoring and Assessment
- NOAA Center for Operational Oceanographic Products and Services
- NOAA Coastal Services Center
- NOAA CoastWatch
- NOAA National Weather Service

Available Mapping Systems

Interactive tools are available that provide historical and near real-time data of environmental conditions that may affect the initiation and movement of these blooms.

- Near Real Time Data

USDOC | NOAA | NOS
NOAA Coastal Services Center

<http://www.csc.noaa.gov/crs/habf>

Privacy policy
E-mail comments to ccz@csc.noaa.gov
Updated on September 30, 2004





RESEARCH &
DEVELOPMENT

*Building a
scientific
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Future IOOS Human Health Activities

- ▶ EPA International Cyanobacteria HABs Symposium (September, 2005)
- ▶ IOOS Human Health Workshop: Microbial Pathogens and HABs (January, 2006)
- ▶ IOOS Regional Associations Develop or Improve Existing Monitoring Programs; and
- ▶ Development of new Indicators, Sensors; and Monitoring Designs

Take Home Messages

IOOS ...

- ▶ **Requires** a sustained involvement to develop, maintain, and ensure the highest quality for the system
- ▶ **Tribes, States, and Federal Agencies** should remain actively involved during the development & implementation of the IOOS.