



# Ocean Observing IOOS

INTEGRATED OCEAN OBSERVING SYSTEM

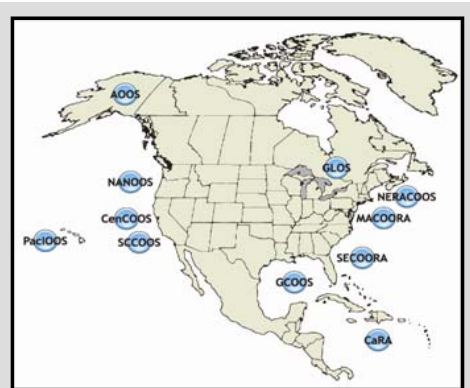
## Piecing Together The Puzzle

Three sub-systems turn raw data into usable information:

•**Observations:** Observations are continuously collected in the water, on land, in the air, and from space. Tools include buoys, ships, satellites, underwater robots and high-frequency radar stations.

•**Data Management & Communications:** This is the actual integration of the data. The U.S. IOOS will make data compatible and accessible, without further translation, thus saving users time and money. The NOAA IOOS Data Integration Framework (DIF) is spear-heading this effort by developing and adopting common data standards, such as whether temperature is collected in Celsius or Fahrenheit, as well as protocols for how data is exchanged.

•**Modeling & Analysis:** Users will turn the integrated data into forecasts and models that do things like improve predictions of severe weather and natural hazards, enhance pollution and oil spill tracking models, and create a more complete picture of our oceans and coasts. These forecasts and models will arm decision-makers with information they need to improve safety, grow the economy, and protect the environment.



There are 11 regions that make up the U.S. IOOS

## For More Information:

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National Federation for Regional Associations (NFRA)  
[www.usnfra.org](http://www.usnfra.org)  
(207) 725-8143

## Organization

- Global Component
  - IOOS is the U.S. contribution to the Global Ocean Observing System, or “GOOS”.
  - GOOS is the ocean component of an even larger system, the Global Earth Observation System of Systems (GEOSS), which includes atmospheric data.
- Coastal Component: National and Regional
  - IOOS is a partnership of 17 federal agencies and 11 regions.
  - The 11 regions meet unique regional needs for marine information and enhance the federal government’s ability to observe U.S. waters.
  - The Alliance for Coastal Technologies (ACT) provides IOOS with information required for the deployment of reliable and cost-effective networks.



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## What is IOOS?

The Integrated Ocean Observing System (IOOS) is a vital tool for tracking, predicting, managing and adapting to changes in our ocean and coastal environments. NOAA is proud to lead a national effort, in partnership with other federal agencies and 11 regions, to link marine data in an easy-to-use, standard format that will provide users with a composite picture of our nation’s waters in an accurate and timely manner.

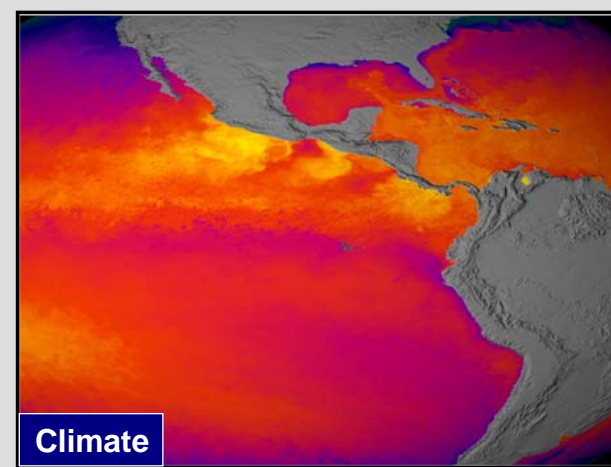
That ‘bigger picture’ view is important because observing is the foundation of understanding. With increased understanding of our oceans comes an increased ability to improve *safety*, grow our *economy* and protect our *environment*.



Continuously collected data is turned into useful information for decision makers.

## Climate Change: Better Adaption & Response through Better Understanding

Ocean and coastal observations represent a clear connection to the health and safety of those living near the coast.



This is a **false color chart**, a model that uses color to depict differing water temperatures. Global warming is causing water temperatures to increase, thus melting glaciers and causing sea level rise. Integrating our marine data will improve understanding and predictions of what is happening so that the nation will better understand how to adapt and respond.

Marine data and information are used to:

- Predict El Nino events, sea level rise and climate change. Integrating data will improve scientific ability to make these predictions earlier and with greater accuracy.
- Complement existing data and observations on wind speed, barometric pressure and other atmospheric measurements to predict the path and severity of approaching weather.
- Monitor and predict marine conditions and issue small craft advisories.

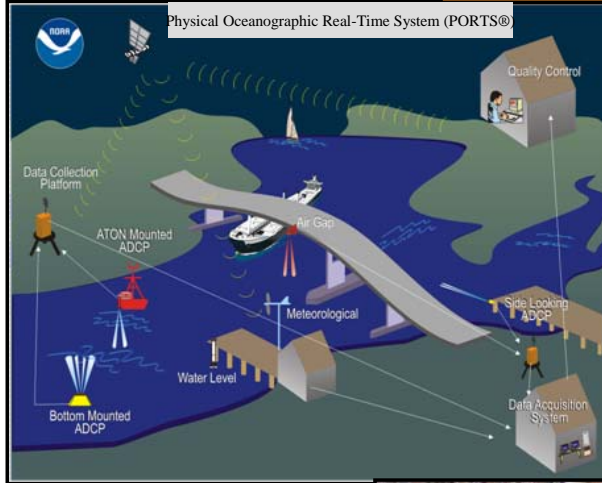
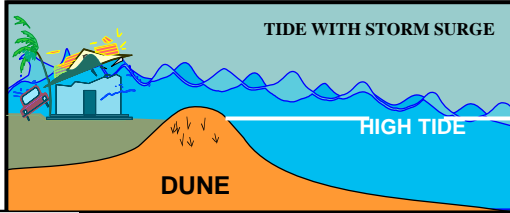


**STORM SURGE PLUS WAVES**

### Sea Level Rise & Flooding

Global warming is melting glaciers and causing long term sea level rise and flooding along our coasts. IOOS is working to capture and combine a wide variety of observations in similar formats and make the data available from one place. This new capability will allow scientists to create more sophisticated flooding assessments – making it possible to combine effects of not only sea level rise on flooding, but the effects of rain, urban runoff, coastal development and storm strength, among other factors.

Different offices within NOAA and within the regions are combining their talent and expertise with those of academic, private and government partners to monitor and tackle varying environmental factors that impact the location and extent of flooding. Scientists can also use combined data to improve ground elevation measurements and enhance precision of map locations of both natural and man-made coastal features.

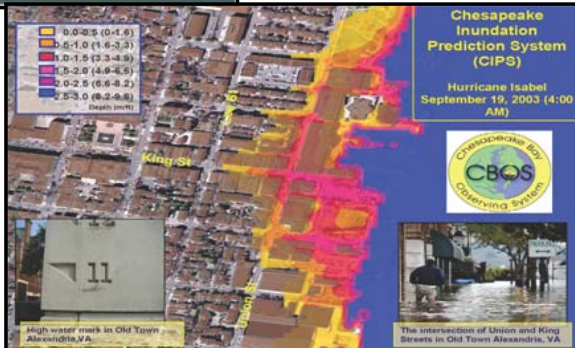


### Marine Safety & Economy

Climate changes increase coastal storms, which increase the challenges of safe navigation in and out of major ports. The Southern California Coastal Ocean Observing System provides data to one of NOAA's Physical Oceanographic Real-Time Systems (PORTS®). PORTS® supplies real-time data on water levels, currents, salinity, wind and bridge clearance to reduce the risk of vessel groundings and inform mariners of when the heaviest ships can safely pass through narrow channels. This increases the amount of cargo moving through a port, translating to millions of dollars in goods being more efficiently distributed.

### Chesapeake Bay Flood Prediction

The Chesapeake Bay Inundation Prediction System is under development to improve the accuracy, reliability and capability of severe weather flooding forecasts by modeling and visualizing expected on-land storm-surge along the Chesapeake Bay and its tributaries. IOOS partners with the Chesapeake Bay Observing System of the Mid-Atlantic Coastal Ocean Observing Regional Association have developed an initial prototype.



### Harmful Algal Blooms

Harmful algal blooms are outbreaks of toxic algae that kill our fish, contaminate our seafood and pollute our waters. They can also make people sick and lead to beach closures. NOAA has established a cross-program effort to develop a forecasting system for such events. The system provides information on the location, extent and possible movement of a harmful algal bloom. Bulletins are already generated in the eastern Gulf of Mexico to inform managers, mariners and other interested parties of these events. However, harmful algal blooms vary regionally and the regions are developing tools to address their own unique issues. For example, the Gulf of Maine Ocean Observing System is testing a similar warning system.

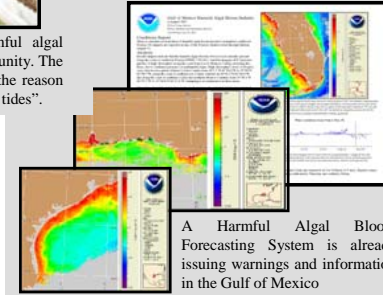


Harmful Algal Blooms kill fish, contaminate seafood and pollute our waters

The above image shows a harmful algal bloom approaching a coastal community. The deep color the blooms produce is the reason these events are also known as "red tides".

### Science at Work

In November 2007, a mystery substance coated the wings of birds in Monterey Bay and caused three massive bird strandings there.



A Harmful Algal Bloom Forecasting System is already issuing warnings and information in the Gulf of Mexico

Right now, scientists manually compile and convert various ocean and coastal data into the formats needed for each forecast. IOOS is working with partners to integrate this data so it is compatible and easily available from one place. This will make work more efficient for scientists, so they can spend less time managing data and more time improving models and forecasts.

Though the *Cosco Busan* oil spill happened around the same time, investigators ruled out the possibility that the coating was petroleum-based. The Central and Northern California Ocean Observing System is now leading a team of science experts trying to prove that the mystery coating that stranded the birds is the result of a red tide byproduct. If researchers note a strong link, it will be the first finding of its kind. The same team has also led research to improve the understanding of the source of red tides in Monterey Bay and the marine conditions that seem to support red tides.

### Integrated Ecosystem Assessments

Diverse data are critical to understanding the health of a marine ecosystem and what factors influence that ecosystem. Integrating data is expected to improve scientific ability to develop ecosystem forecasts, assess ecosystem health and trends, and assess causes of those trends. IOOS and its partners are working to make data from multiple sources easily accessible in standard formats so the data work together, without further translation. The initial focus is on a pilot project in the California Current Regional Ecosystem. This effort will later be extended for use within other regions across the Nation.

Climate change is impacting the Bering Sea ecosystem and fisheries in ways we are still working to decipher. The Alaska Ocean Observing System integrates data for the Bering Sea Integrated Ecosystem Research Program and contributes to ecosystem assessments.



An Integrated Ecosystem Assessment is an important element of a critical NOAA objective – to take an ecosystem approach to management to protect, restore & manage the use of coastal, ocean and Great Lakes resources.