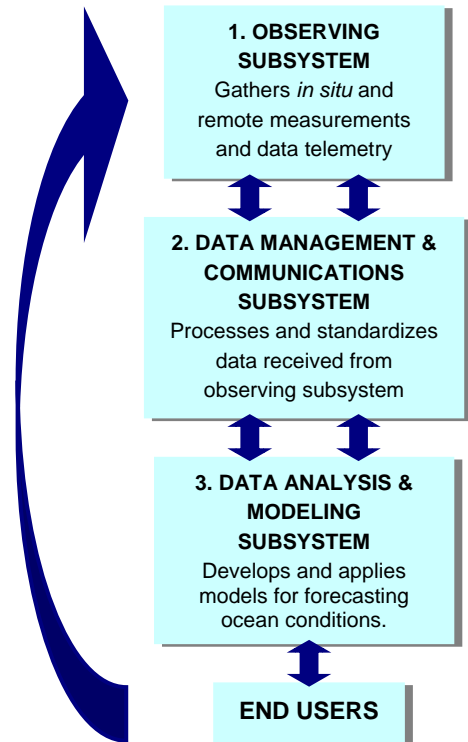


IOOS and United States Coast Guard Vessel Management Operations

What does IOOS do?

IOOS (Integrated Ocean Observing System) is a **multidisciplinary** system designed to provide ocean and coastal data in the formats, rates, and scales required for decision-making, based initially on the **integration** of existing private, federal, state, and local systems. Consisting of three major subsystems (see figure at right), IOOS will constantly evolve according to user needs.

Currently, numerous ocean and weather data collection systems are maintained by scores of federal, state, and non-governmental agencies and organizations. IOOS is gathering these useful but disparate and isolated data sources into integrated systems, giving users ready access to all ocean-related data gathered by all possible sources. In addition, IOOS will allow any compilation of data specified by the user to be manipulated using myriad existing forecasting models, thereby turning raw numbers into actionable information relevant to the user's specific concerns. Finally, IOOS is seeking new research and enhancements to add to its already-extensive catalog of products. In this way, IOOS becomes a flexible, adaptable system capable of keeping up with new developments while maintaining the reliable delivery of data, analyses, and forecasting results.

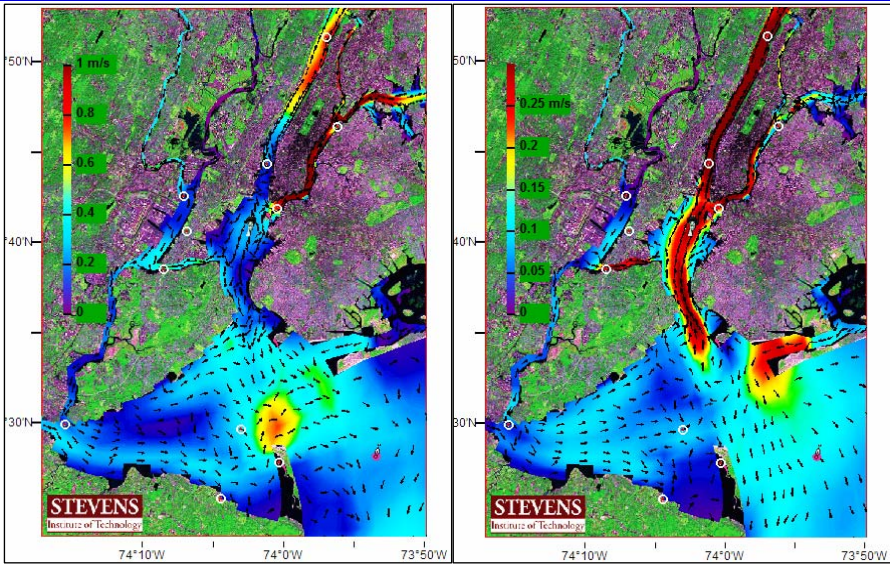


How Can IOOS Help Improve Vessel Management?

The ports and harbors of the United States can have strong currents that can vary by depth. The navigational activities of many large, deep-draft vessels that frequent U.S. waterways can be compromised by these currents, particularly those close to the keel (which, for some vessels, may not be far from the ocean floor). Additionally, shipping companies and other vessel owners have an economic incentive to maximize the possible size and draft of their vessels. According to NOAA¹, **one more foot of draft can mean between \$36,000 and \$288,000 more in revenue per ship**, and these figures increase every year. The larger the vessel, the more critical it is to understand the physical conditions of the port or harbor and to have access to real-time data and modeling capabilities.

One of the most valuable data sources for marine transportation safety is NOAA's National Ocean Service's **Physical Oceanographic Real-Time System (PORTS®)**. By measuring and disseminating observations and predictions of water levels, currents, salinity, and meteorological parameters (e.g., winds, atmospheric pressure, air and water temperatures), PORTS® is able to promote safe and efficient navigation of U.S. waters. Accessible to users in a variety of user-friendly formats, PORTS® provides the types of data that **can prevent maritime accidents such as collisions and groundings, as well as the potential results of these accidents, such as oil spills**. PORTS® is currently operating in 13 U.S. locations. Establishing such a system in all harbors and ports of the nation would not only benefit the port-related USCG missions, but is critical to the goals of IOOS. IOOS will combine data available from PORTS® with Electronic Navigational Charts, shoreline mapping data, water level and current information, satellite-based positioning services like GPS, and other operating and planned initiatives (e.g., NYHOPS) to provide the critical information needed by the USCG and other responsible entities to maintain waterway navigation and prevent ecologically and economically devastating accidents. Currently, NOAA is working to integrate the PORTS network with the **USCG's Automatic Identification System (AIS)**, which is capable of sending detailed vessel-related information from vessels equipped with a special programmable VHF transmitter to shore-based vessel traffic centers. The AIS broadcasts such information as speed, position, heading, and rate of turn every 2 to 10 seconds while underway; every 6 minutes, information such as cargo type, draft, vessel name, and vessel dimensions is broadcast.

¹ NOAA. 1999. Commercial Shipping: Using NOAA Tools for Safe Navigation. <http://nauticalcharts.noaa.gov/psn/commercl.htm>



NYHOPS Observations of Surface Currents (left) and Bottom Currents (right) in the NY/NJ Harbor Estuary on April 21, 2007 at 11:00am.

Source: <http://hudson.dl.stevens-tech.edu/NYHOPS>

The Stevens Institute of Technology's Center for Maritime Systems (CMS) designed, installed, and now operates an observing and forecasting system for the Ports of New Jersey and New York with potential applications nationwide and definitive benefits for IOOS. The **New York Harbor Observing and Prediction System (NYHOPS)** collects and provides ocean and weather condition data similar to PORTS® capabilities, but extends the coverage beyond the immediate port to **cover other heavily-trafficked areas** used by cruise ships, fishing vessels, and ferries.

Additionally, NYHOPS utilizes port-specific characteristics to determine how, for example, the sheltering effect of Manhattan Island may affect wind conditions in the Hudson River or the influence of piers and seawalls on waves

and currents. By tailoring NYHOPS to the region, the CMS team created a **customizable observing system** that is effective and provides usable, reliable information to the stakeholders in the area, including the USCG (see example maps above). The NYHOPS network includes a collection of shore-based, moored, and vessel-mounted sensors and a CODAR HF radar system. Observations from NYHOPS provide **large spatial coverage on a 10-minute time scale and are enhanced by a three-dimensional circulation/wave modeling system** derived from the Princeton Ocean Model. In addition, NYHOPS provides ocean condition forecasts for up to 48 hours ahead and employs a high-volume information distribution system and web-based access.

IOOS has the ability to provide the types of data and forecasting results available from NYHOPS and combine them with information available from other systems (e.g., PORTS®, CODAR) to present clear, accurate, and highly applicable information to the entities that need it. The USCG, with its port safety and incident response responsibilities, can benefit in numerous ways from the information provided by IOOS and its components. Efficiency can increase, accidents can be prevented, potential accident precursors can be remedied, and response time and effectiveness in responding to accidents (e.g., oil spills) can be enhanced. But the USCG will not only have access to an existing customizable suite of data and modeling products: **IOOS is a constantly evolving network** that places its users at the forefront of access to new technologies and breakthrough modeling methodologies. By concentrating the research power behind institutes, universities, agencies, and private entities into one accessible system, IOOS will reflect and integrate new developments in the field of ocean observing.

What Can USCG and Other Vessel Management Stakeholders Do?

The value added from the integrating and sustaining power of IOOS will only be realized with regional association **participation** and **data sharing**.

Participation: Stakeholders should get involved with an IOOS Regional Association (RA) (www.ocean.us/regional_associations). RAs are critical for engaging private and public user groups to identify regional data and information needs. Additionally, RAs can be high-value entry points for a user to get involved with specific IOOS pilot projects (many of which are happening right now) through which users help improve and refine IOOS. Pilot projects and RAs can facilitate data sharing, the cornerstone of IOOS, between previously unconnected parties. Even by sharing small amounts of data, users can reap significant benefits through invaluable forecasting results.

Data Sharing: Stakeholders should share data (e.g., weather information from vessel-based instruments or observations from offshore platforms) with federal, state, and local agencies.