

IOOS and Maritime Operations in the Gulf of Mexico

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. For example, IOOS information on surface currents can help marine transportation in the oil and gas sector, and can be used to track the movement of oil spills. 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 (see Table 1 for a few examples). 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. IOOS will focus initially on a series of high priorities.

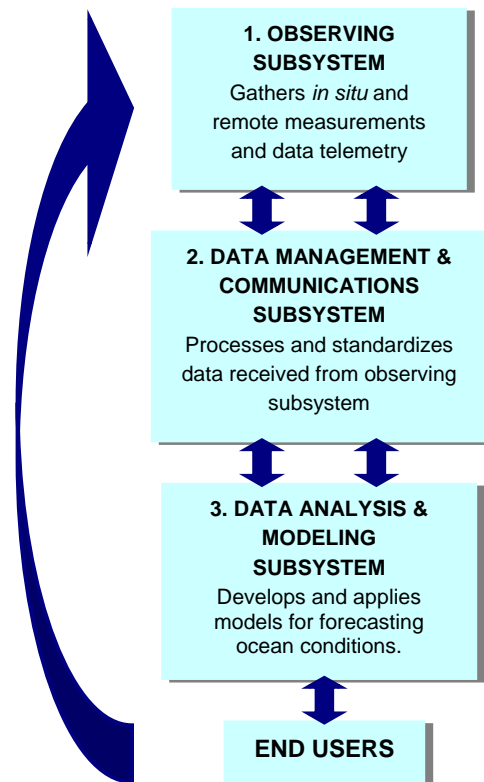


Table 1. Examples of already-existing data collection systems useful for Maritime Operations in the Gulf of Mexico

Existing Data Source	Measurements Collected by Data Source	Representative Outcomes
National Data Buoy Center (NDBC)	Wave height and period, temperature, pressure, winds, currents	Provides marine observations for weather forecasting
Physical Oceanographic Real-Time System (PORTS)	Real-time water level, currents, temperature, winds, pressure, salinity	More efficient and safe vessel passage
Texas Automated Buoy System (TABS)	Currents, wind speed, wind direction	Weather forecasting and data for ship routing
TOPEX/Poseidon	Ocean surface topography, circulation, wave height, wind speeds, water mass transport, altimetry	Better understanding of global climate change, especially major events (e.g., El Niño)

How can IOOS Help Ensure Safe and Efficient Maritime Operations in the Gulf of Mexico?

Safe and efficient maritime operations are fundamental to the Gulf of Mexico States Accord (GoMSA) goals for growth in trade, tourism, and associated transportation corridors. The Gulf of Mexico region, with a population of over 60 million, drives approximately \$6 trillion in trade and \$2 trillion in gross state product¹. Maritime operations in the Gulf of Mexico include such wide-ranging activities as energy exploration, production, and transportation; recreation and tourism; fisheries, aquaculture, and agriculture; and the transportation of goods.

By making available an integrated network of real-time data and by applying these data to models and other forecasting tools, IOOS can help the planners and operators of Gulf maritime activities exploit all available ocean-related information to reliably monitor present and predict future conditions. IOOS can be instrumental for **ship routing, severe weather planning, oil spill and other contingency preparation and response, transportation pathway optimization, tourism planning, and fisheries industry efficiency**. For example, as evident in the Hurricane Katrina aftermath, severe weather

¹ Gulf of Mexico States Partnership, Rebuilding the Gulf of Mexico Border Region: The Gulf of Mexico Trade Corridor Transportation Study, 2006, http://www.stpt.usf.edu/brownbag/port_files/GOMSP_report.doc.

poses monumental danger to valuable coastal and offshore infrastructure. IOOS can enable regional-scale assessments of oceanographic conditions as well as nearshore and offshore bathymetry and onshore topography to assist with **long-range risk management and infrastructure planning**. Additionally, IOOS's ability to strengthen the reliability of weather nowcasts and forecasts can provide more advanced warning of severe weather, allowing, if necessary, **timely evacuations and vessel reroutings** or, if no danger is posed, preventing costs associated with unnecessary shut-downs. In this way, IOOS data and modeling resources can not only save human life and increase the efficiency of infrastructure planning, but can also **increase productivity** by reducing unnecessary spending.

IOOS developers are committed to making IOOS a user-driven system, by listening to the needs of key stakeholders, incorporating those needs into future products, and using these recommendations to guide future funding and development of IOOS. In November 2005, a Gulf of Mexico-centric workshop asked participants to prioritize the various data products that would be of most use to the oil and gas sector. Table 2 lists only a handful of the products identified at the workshop that can improve operations, reduce risk, and maintain competitiveness for both oil and gas and other maritime-based activities, including ship routing and tourism planning. Many of the measurements needed to develop the products (as shown in the center column) are already available through any number of data collection systems, (Table 1). However, IOOS's initial responsibility will be to centralize the data and integrate them into a useful forecasting product.

Table 2. Sample maritime operations product needs

Product Need	Measurements Needed to Develop Product	Needed Scale/Range of Product
Hurricane severity forecasts	Upper-level circulation, boundary layer, ocean mixed-layer temperature, offshore Doppler radar	Accuracy of 20% central pressure index at 5 days out
Surface current forecasts	Wind, high frequency radar, density profiles, sea surface temperatures, river inflow, air-sea flux, bathymetry, front locations, tomography	0-15 day nowcasting/forecasting 10 km. horizontal for deepwater 1 km. horizontal for shelf waters
Deepwater current forecasts	Density profiles, sea surface height and temperature, air-sea flux, acoustic Doppler current profiler, Caribbean current inflow (for Gulf of Mexico)	0-30 day nowcasting/forecasting 10 km. horizontal accuracy 50 m vertical accuracy

The safety and efficiency of maritime operations in the Gulf of Mexico depend on reliable environmental data to improve productivity and optimize operational efficiency, prevent damage to equipment and personnel, and limit negative environmental impacts. IOOS supports these needs by helping the maritime operations community in

- Determining the best possible route for tankers and other vessels in regards to weather conditions, the oceanographic environment, and existing vessel traffic
- Planning onshore and offshore infrastructure according to the risks posed by severe weather, historic hurricane trajectories, and current and eddy forecasting
- Improving storm track and hurricane landfall forecasts, which could prevent unnecessary evacuations, prevent shut-down time, and save millions of dollars
- Enhancing short-term fog and precipitation forecasts to prevent accidents and help with scheduling.
- Improving the accuracy of high-resolution coastal topography (being made available by recent surveys and NOAA's archive center), which will enhance preparedness and inundation modeling to protect coastal infrastructure.

What Can GoMSA and Other Maritime Operations 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: Maritime operators 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.

Data Sharing: Maritime operators should share data (e.g., weather information from vessel-based instruments or observations from offshore platforms) with federal, state, and local agencies. For instance, many oil platform operators already participate in sharing Acoustic Doppler Current Profiler data in coordination with the NDBC and the TABS. These types of common data reporting and exchange protocols are key to helping IOOS achieve interoperability of data with broad utility without sacrificing protection of proprietary information.