



The OOI and the IOOS—Can They Be Differentiated? An NSF Perspective.

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In addition to providing financial support for much of the oceanographic research conducted at universities and research institutions in the U.S., the National Science Foundation (NSF) supports much of the infrastructure and facilities for the conduct of ocean science. It is an ongoing process to assess whether the facilities and support mechanisms that NSF provides to the community are optimal for conducting oceanographic research, and if not, to make the changes that are required. Building upon research community input and with the endorsement of two National Research Council reports, (NRC 2000, 2003) it has been demonstrated that in order to meet data collection requirements for modern ocean science research, new types of infrastructure are needed that are capable of providing long-term, high-resolution observations of critical environmental parameters on appropriate time and space scales. Consequently, the Division of Ocean Sciences (OCE) has been working to secure funds to construct an ocean observatory network. Funds for the Ocean Observatories Initiative (OOI) are being sought through NSF's Major Research Equipment and Facilities Construction (MREFC) account. OOI infrastructure will provide the oceanographic research and education communities with new modes of access to the ocean. The OOI has three primary elements: 1) a regional cabled network consisting of interconnected sites on the seafloor spanning several geological and oceanographic features and processes (most likely to be initiated in the northeast Pacific Ocean), 2) relocatable deep-sea buoys that could also be deployed in harsh environments such as the Southern Ocean, and 3) new construction or enhancements to existing systems leading to an expanded network of coastal observatories.

Just as the U.S. academic research fleet is accessible to all investigators, the OOI will begin building an openly accessible network of ocean observatories to facilitate the collection of long time-series data sets needed to understand the dynamics of biological, chemical, geological and physical processes. The primary infrastructure for all components of the OOI include both dedicated fiber-optic cables to shore and moorings capable of two-way communications with a shore station. Moorings are envisioned to be both

freestanding, as for the global array of buoys, and they will also be attached to fiber optic cables to provide the capability for water column investigations. Seafloor junction boxes connected to this primary infrastructure will support individual instruments or instrument clusters at varying distances from cables as well as the moorings. These junction boxes include undersea connectors that provide not only the power and two-way communication needed to support seafloor instrumentation, but also the capability to exchange instrumentation in situ when necessary for conducting new experiments or for repairing existing instruments.

In the NSF Fiscal Year 2004 President's Budget Request to Congress, the OOI MREFC request was listed as a priority new start for FY 2006. Because funds acquired through the MREFC account can only be used for specific activities related to the construction and implementation phase of the initiative, it is important to acknowledge the other necessary and varied ocean observatory activities that OCE currently funds and will fund in the future. These include research and operations support, maintenance, and mobile observational capabilities, such as floats, gliders, and drifters. The overarching ocean observatory science activity that includes the OOI construction phase has been named ORION (Ocean Research Interactive Observatories Networks, Figure 1).

The research-driven ORION (with its infrastructure construction OOI component) is part of a broader national and international effort to establish long-term ocean observatories, for basic research and education, as well as for operational oceanographic needs. The most fundamental relationship between the OOI and operational ocean/Earth observing systems at the national level is with the proposed U.S. Integrated Ocean Observing System (IOOS)—an operational observing system that is being planned for the National Ocean Partnership Program (NOPP) by Ocean.US (see D. Martin, this issue). The purpose of the IOOS is to provide data of societal interest to "customers," ranging from fishermen and shippers, to coastal zone managers, to surfers. Data to be collected are aimed at supplementing current knowledge. In contrast, the NSF's OOI is focused on developing new knowledge and new technologies that will advance our understanding of

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the oceans. By addressing the ocean research community's needs for time-series measurements of ocean processes, the OOI will provide some initial infrastructure needed to advance knowledge and understanding of the ocean/atmosphere/earth system, as well as the technical capabilities for monitoring that system.

In a recently released National Research Council Report (NRC, 2003) a key finding states "The OOI will greatly improve the ability of operational ocean observing systems such as the Integrated and Sustained Ocean Observing System IOOS and the Global Ocean Observing System (GOOS) to observe and, predict ocean phenomena."

"The research based OOI is an important complement to the proposed IOOS. IOOS is an operational system driven by the needs of potential users, and designed to improve the safety and efficiency of marine shipping, mitigate effects of natural hazards, reduce public health risks, improve weather and climate predictions, protect and restore a healthy coastal environment and enable sustainable use of marine resources. The OOI, in contrast, is driven by basic research questions and its principal products will be improved understanding of the oceans and new and improved technologies. The

OOI will thus provide the key enabling research for IOOS, including fundamental advances in observatory platforms and, through the research of investigators using the OOI, basic understanding and in sensor technology that will enable IOOS to meet its longer term operational goals. The IOOS is important for the OOI because it will provide a larger framework of observations and background data necessary for interpreting the process oriented experiments that are the centerpiece of basic research."

The hypothesis driven basic research that will be conducted at ORION observatories and the development of operational oceanography through the IOOS program are, in fact, critically interdependent and synergistic, with each program supplying ingredients essential to the other, and with academic researchers playing pivotal roles in both. The outcomes of research and technology development, that are an integral part of ORION, will provide essential support for the IOOS. For example, the cabled and moored buoy systems of

ORION will function as test beds and incubator sites for the development of new technologies (sensors, power sources, data telemetry) as well as advanced modeling capabilities (data assimilation, nowcasting, forecasting) essential to the evolution of the sustained IOOS. Once fully implemented, ORION and IOOS will have areas of overlap where common infrastructure may serve both the research and operational communities. 

References

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