Meeting the needs of marine research in both open oceans and coastal oceans around Australia

The Australian Integrated Marine Observing System

Figure 1: The IMOS data facilities and their regional node implementation.

In recent years Australia has commenced the establishment of marine research-infrastructure in Australia to systematically service Australia's significant requirements and responsibilities for one of the largest marine jurisdictions of any nation on earth. At over 14 million km^2 Australia's Exclusive Economic Zone (EEZ) is nearly twice the surface area of the Australian continent. It extends from the tropics to high latitudes in Antarctic waters and much of it is unexplored.

The surrounding Pacific and Indian Oceans strongly affect the continental climate-system at all time scales, from seasons to decades. The major ocean currents on its eastern, western, northern and southern boundaries, best known of these being the East Australian Current and the Leeuwin Current, affect regional climatic conditions and help sustain the marine ecosystems. There is evidence that these currents are changing on decadal time scales and have already impacted marine ecosystems, but the data is sparse and neither the currents nor ecosystems have been monitored in a systematic way. Research on marine climate impacts is an open book in Australia, and the pages are nearly blank, because long term data has been missing.

The Integrated Marine Observing System (IMOS) was established as part of the Australian Government's National Collaborative Research Infrastructure Strategy (NCRIS) with $A50M and more than equal co-investments from universities and government agencies. It is a nationally managed and distributed set of equipment established and maintained at sea, providing streams of in situ oceanographic data and information services that collectively will contribute to meeting the needs of marine research in both open oceans and coastal oceans around Australia. Combined with satellite data, it provides essential in situ data to understand and model the role of the oceans in climate change, and data to initialize seasonal climate prediction models. If sustained in the long term, it will permit identification and management of climate change in the coastal marine environment. It will provide an observational nexus to better understand and predict the fundamental connections between coastal biological processes and regional/oceanic phenomena that influence biodiversity. While IMOS was originally designed to support research, the data streams are also useful for many societal, environmental and economic applications, such as management of marine natural resources and their associated ecosystems, support and management of coastal and offshore industries, safety at sea, marine tourism and defense.

The IMOS strategic research-goal is to assemble and provide free, open and timely access to streams of data that support research on:

- The role of the oceans in the climate system, and
- The impact of major boundary currents on continental shelf environments, ecosystems and biodiversity.

Given the extent and challenge of addressing the broad range of marine issues in the Australian EEZ, IMOS is considered only the beginning of the observing system that Australia needs. The cost of an adequate observing system will be high due to the great length of coastline and the relatively small population and economy. Never the less, staged enhancements are being planned. The return from investing in ocean observations around Australia was estimated through an economic analysis undertaken in 2006 by the Australian Academy of Technological Sciences and Engineering and the Western Australian Global Ocean Observing System Inc. That study, based on only a limited set of benefiting industries, concluded that the cost:benefit to the Australian economy of investing in ocean observations was better than 1:20.

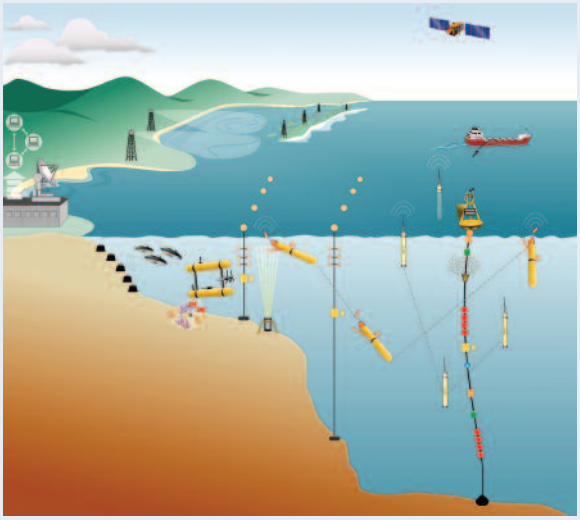

Figure 2: A regional observing system using all of the IMOS facilities.

Governance of IMOS is controlled by an advisory board with an independent chair. The board members are appointed for outstanding abilities to guide the program and are senior leaders able to take a broad, national perspective on IMOS development. The IMOS Office established at the University of Tasmania coordinates and manages all of the investments as a national system.

The scientific rationale for IMOS is set by five regional Nodes covering the Great Barrier Reef, New South Wales (southeastern Australia), Southern Australia, Western Australia and the Bluewater and Climate Node (Figure 1). Each Node has 50 to 100 members. The Node Leaders and the director of the IMOS Office are members of the IMOS Steering Committee. Nine national facilities under direction of the IMOS Office make the observations specified by the Nodes using different components of infrastructure and instruments; for example, there are separate facilities for Argo floats, ships of opportunity, coastal radar, etc. The observing facilities include three for ***bluewater and climate observations*** (Argo Australia, Enhanced Measurements from Ships of Opportunity and Southern Ocean Time Series), three facilities for ***coastal currents and water properties*** (Moorings, Ocean Gliders and HF Radar) and three for ***coastal ecosystems*** (Acoustic Tagging and Tracking, Autonomous Underwater Vehicle and a biophysical sensor network on the Great Barrier Reef). The operators of the facilities are the major players in marine research in Australia. A satellite remote sensing facility assembles data for the region and the electronic Marine Information Infrastructure (eMII) will provide access to all IMOS data, enhanced data products, and web services in a searchable and interoperable framework. Recognizing the importance of access to data in eResearch, the Director of eMII also is a member of the IMOS Steering Committee. The value from this infrastructure investment lies in the nationally coordinated deployment of a wide range of equipment aimed at deriving critical data sets within a region that serves multiple applications.

For more information:
www.imos.org.au