

New insights into the role of oceans on climate, ecosystems and seafood

Unlocking the knowledge beneath our seas will divulge critical information to help manage our valuable fisheries and shape our responses to climate change.

The Southern Australian Integrated Marine Observing System (SAIMOS) is a \$9.4m program providing the latest technologies and infrastructure to collect new information on ocean circulation and planktonic ecosystems.

SAIMOS equipment is being deployed off the coasts of southern Australia and western Victoria by a team of world class scientists from the South Australian Research and Development Institute (SARDI) and Flinders University who form the Oceanography program based at SARDI Aquatic Sciences, West Beach.

The team is also disseminating the information, much of which will be available to the public in near real time via the internet. This will assist shipping, search and rescue, fire fighting and ecotourism operations as well as providing intelligence on marine biota and pollution dispersion. Data is being interpreted through a hydrodynamic/biogeochemical modelling capability that has been developed by the Oceanography team.

SAIMOS infrastructure comprises shelf moorings, ship-based surveys, ocean gliders, autonomous underwater vehicles, underwater acoustic 'curtains' monitoring fish movements, HF Ocean RADAR, and even Australian sea lions.

The benefits

Little is known about ocean current systems, their affect on climate and the valuable fisheries and marine environments they support.

Oceanographic research provides practical solutions regarding:

- aquaculture management
- the spread of pathogens and pollutants within the gulfs and on the shelf
- the impacts of desalination plants, sewage outfalls and coastal structures
- the dispersion, settlement and recruitment of larval species such as prawns and lobster
- the connectivity of marine regions and selection of Marine Protected Areas
- the nature of the circulation of nutrients and heat and the ecosystems that underpin our fisheries and aquatic life.



- the nature and stresses of currents and waves on sea-floor habitats, such as sea-grasses, and changes to coastal morphology as driven by beach-sand transport
- long-term changes to marine environments that may result from climate variability and climate change
- Marine pollution containment

Technologies

SAIMOS observing equipment has been deployed in the region of Kangaroo Island and Eyre Peninsula where significant upwelling of nutrients occurs. These nutrients provide food for the phyto/zooplankton ecosystems that underpin the highly productive fisheries and marine life of the region and gulfs. In collaboration with Victorian agencies and IMOS, an additional component of SAIMOS will be established on the Bonney Coast.

High quality oceanographic data from these sources is revealing information from our ocean's depths that will significantly contribute to the healthy development of our fisheries and aquaculture industries.

SAIMOS is collecting data through:

An array of mooring stations, continuously monitoring the physical and biological properties of waters off the Continental shelf.

The deployment of underwater vehicles, including ocean gliders, that provide real time data on temperature, salinity, ocean currents, turbidity, and the presence of phytoplankton.

Australian sea lions fitted with conductivity-temperature and depth loggers and GPS trackers have provided thousands of water column profiles in areas that are ecological 'hot spots' in terms of productivity and biodiversity

A state-of-the-art HF Ocean RADAR system on the Eyre and Yorke Peninsulas and an additional system on the Bonney Coast in south-eastern SA. Data from these systems will provide users of the marine environment with valuable real time information on the web, detailing ocean currents, waves and winds.

In particular the RADAR system will benefit:

- Marine industries and ecotourism operators who will be able to plot cruise plans to surf ocean currents saving time, money and greenhouse gas emissions.
- Sea search and rescue operations
- Weather prediction during severe bushfire events
- Marine pollution management

Current projects

Understanding the biophysical implications of climate change: The SAIMOS data streams have been used to validate a hydrodynamic model of the ocean circulation systems for the S.A. region. This model can be used to run scenario studies to assess possible changes that may occur under climate change.

Carrying Capacity of Spencer Gulf: SAIMOS data streams are being used in a major study by SARDI providing advice on the placement and sustainable growth of new aquaculture zones in Spencer Gulf.

The information will help scientists identify the total capacity for aquaculture growth that Spencer Gulf can support, the best locations for aquaculture farms, as well as acceptable feed and stock rates.

The research involves measurement and modelling of currents on the shelf and within Spencer Gulf to establish the effects of ocean currents on flushing and the biological response of its ecosystem to aquaculture.



Sustainability of the rock lobster resource in the south-eastern Australia in a changing environment: Together with colleagues from Victoria and Tasmania, SARDI scientists are investigating SAIMOS data streams that have revealed the existence of two extreme upwelling events that occurred in 2008 and 2010. Such events bring cold, nutrient rich water to the surface that can beneficially support our marine life and fisheries. Such events may be related to climate change and may also have an adverse impact on some species such as Lobster and prawns. The SAIMOS program is expected to provide some answers.

SAIMOS Partners

SAIMOS forms part of the national Integrated Marine Observing System (IMOS) funded by the Commonwealth Government's National Collaborative Research Infrastructure Scheme and Education Investment Fund. With cash and in-kind support from universities and state agencies, the total value of IMOS is around \$180M. Our collaborative partners include many universities and Commonwealth and state agencies who provide the over-arching science plan that under-pins IMOS and facility support to each of the nodes.

SAIMOS is one of the largest of the five coastal nodes in Australia with infrastructure covering South Australia and western Victoria. Investment in the project over seven years (2006 to 2013) currently exceeds \$9.4m with Commonwealth and State government funding, as well as in-kind support from SARDI Aquatic Sciences, Flinders University and the Victorian Marine and Freshwater Fisheries Research Institute.

The SAIMOS team

The SAIMOS 'seed' grew with the South Australian Government initiative, Marine Innovation SA (MISA) appointment of Australian oceanographer, Associate Professor John Middleton in 2006. Professor Middleton and colleagues saw the need and the opportunity through IMOS to provide a world-class oceanographic capability to SA marine science providing timely information to support and enhance our fisheries and aquaculture industries.

The SAIMOS program now comprises 12 highly skilled researchers with expertise in hydrodynamic modelling, biological ecosystems, shelf and coastal ocean circulation systems, field data collection and tidal modelling and sediment transport. The program is based at SARDI Aquatic Sciences at West Beach and at the Flinders University School of Biological Sciences.

The team includes senior biological oceanographer, Professor Laurent Seuront, and Drs Charles James, John Luick, Sophie Leterme, Mark Doubell, Louise Renfrey, Professor John Bye, Leyeing Wu, Shaun Byrnes, Carlos Teixeira, James Patterson and Virginie Van Dongen-Vogels.

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