

IMOS News

> For more news from all the IMOS Facilities check the IMOS website imos.org.au/news.html

IMOS launched by the Hon Duncan Kerr SC MP

On June 29th IMOS launched the public access to all of its data-holdings through the IMOS Ocean Portal, an innovative system that provides ocean data freely via the internet. Over 100 guests attended the launch at CSIRO Marine and Atmospheric Research (CMAR) in Hobart. Proceedings were started by the outgoing Director, Gary Meyers, followed by speeches from Dr Steve Rintoul (Acting Chief of CMAR), Dr Trevor Powell (Chair of the IMOS Advisory Board), Professor Jo Laybourn-Parry (Pro Vice-Chancellor (Research), University of Tasmania) and the Hon Duncan Kerr SC MP, who then launched the IMOS Ocean Portal.

Professor Gary Meyers said, "Researchers, the public and business-sectors will be able to "see" the oceans around Australia better than ever before. It is a basic tenet of IMOS to provide free, open and timely access to all of our data streams. This is a new way to support research, and it is consistent with the Principles of the Australian Government's programs to develop research infrastructure."

"This is a great scientific advance for Australia," Professor Meyers said. "We're beginning to have the long term time series we need to understand climate change and its impacts on the



Professor Gary Meyers, the Hon Duncan Kerr SC MP and Tim Moltmann at the recent IMOS launch.

marine environment. We know the major boundary currents are changing, but we don't know what the impact on living marine resources will be." The IMOS records are currently focused on the major boundary and ocean currents and the offshore environments along the 30,000 km Australian coast.

The launch of the IMOS Ocean Portal is an enormous step forward for researchers and policy-makers accessing knowledge of the oceans around Australia. IMOS will continue to bring together the Australian marine research community on a national scale, to work towards common goals.



Guests trying out the IMOS Ocean Portal.

Australian Government announces \$52 million extension to IMOS in the May Budget

The Super Science Marine and Climate Initiative was announced in the Federal Budget in May 2009. IMOS was awarded an additional \$52M for the period July 2009 to June 2013 to enhance and extend the observing system, with an emphasis on the Southern Ocean and northern Australian waters. The funding was provided with a requirement to develop an interim plan by 30 June 2009 to invest the first

\$8M (during 2009/10), and to develop a final plan covering the full \$52M plus co-investment by 28 February 2010.

The new funding is through the Education Investment Fund (EIF), and the University of Tasmania has been contracted to enhance and extend IMOS through the creation and development of additional infrastructure. The new EIF funding provides an opportunity for existing and prospective partners to co-

invest in the enhancement and extension of IMOS to further their own interests within a national strategic approach, and discussions with these partners will be informed by any implications of the change of funding source (from NCRIS to EIF). The additional funding does not alter the core business of IMOS which is to create and develop research infrastructure in the form of systematic, repeated data collection over many

years, delivered openly and in a timely manner to national and international marine research communities.

To keep informed of the developments for the IMOS EIF process please visit the following page on the IMOS website imos.org.au/eif.html

The Draft IMOS Five Year Strategy 2009-13, IMOS EIF Facility Project Plan and Node Science & Implementation Plan templates for 2010-13 are available from this webpage now.

IMOS presence at the recent AMSA conference

IMOS held a full day symposium at Australian Marine Sciences Association (AMSA) Annual Conference at Adelaide in early July. The audience of up to 80 heard talks from the new IMOS Director, Tim Moltmann, all of the five Science Nodes, four of the IMOS Facilities, an international program with links to IMOS – the Sustained Indian Ocean Biogeochemical and Ecosystem Research (SIBER) – and six science talks either using IMOS data or related data. Particular highlights included Roger Proctor's eMII talk describing the IMOS Ocean Portal, the discussion about the new EIF funding for IMOS, and the use of IMOS data in student projects (see the student profile about Julie Wood on page 7, for an example). We look forward to many more science talks at next year's conference!

IMOS Factsheets available on the IMOS website

Our Development Officer, Katy Hill, has produced a wonderful set of IMOS Facility Factsheets. Each Factsheet outlines for each facility: Instrumentation, Data, Applications of the data, Focus and Priorities.

To download the factsheets see imos.org.au/factsheets.html

The Australian Continuous Plankton Recorder survey (AusCPR) has successfully deployed a plankton recorder behind the commercial vessel ANL Windarra from Brisbane to Melbourne 27-29 June, collecting the first monthly samples for phytoplankton and zooplankton species identification along the East Australia Current.



Data User Workshops

eMII has hosted two data user workshops recently, in Hobart (30 June) and in Adelaide (10 July). Participants at the workshops included post-graduate students, established researchers, data managers and state department officials. The day was split into two parts: a morning session of introductory talks about the science behind IMOS, the data management approach and a 'walk-through' of the IMOS Ocean Portal, exploring all aspects of its ability to discover, access, download and visualise data; and an afternoon 'hands-on' session where the group were taken through a basic 'How do I?' tutorial, followed by some

examples of data discovery posed by eMII. Both sessions prompted lively discussion, mixed with a bit of fun. Feedback indicates that the workshops have been a successful learning experience, for both the group and for eMII!

Many suggestions for additions and improvements to the Ocean Portal capability were made during the hands-on sessions, ideas which will be seriously considered by the portal development group. Feedback from users is seen as an important input to the portal development.

For upcoming workshops please check the eMII Facility Feature article on page 5.



Participants at the Hobart workshop.

The Facility for Automated Intelligent Monitoring of Marine Systems has successfully deployed the world's first large-scale coral reef sensor network which has been measuring a range of parameters for the last eight months.



The National Reference Station Mooring off Maria Island has been delivering real time data since April, using a newly designed and developed telemetry surface buoy deployed within close proximity to the existing in-situ sensors.



The Australian Acoustic Tagging and Monitoring System and Fisheries Western Australia recently deployed the first International Ocean Tracking Network (OTN) array in the world. This line runs from Fremantle to Rottnest Island and extends seaward to 200 metre isobath.



During May the Australian Coastal Ocean Radar Network installed both types of high frequency radars in Western Australia- the phased array beam-forming technology (WERA); and the direction-finding technology (SeaSonde). These radars should be fully operational by the end of the year.



The Australian National Facility for Ocean Gliders has successfully completed repeat deployments off New South Wales, Tasmania, South Australia and Western Australia. The data obtained from these glider missions are providing a unique view of the oceanic variability around Australia.



Argo Australia surpassed its goal of deploying over 50 floats during the year with 69 deployments. There are now 225 active Australian Argo floats exceeding their target of an 180 float array by June 2009.



director's corner

Tim Moltmann



At the outset, I'd like to say how delighted I am to be the new IMOS Director. I've been involved in research management in Australia for more than 10 years, and during that time have participated in many debates about the need for observations and the value of modelling.

When I joined CSIRO's Division of Marine Research in the late 1990's, there was much discussion about modelling taking over, and how difficult it had become to fund observing programs and sustain them. Over the next decade

of my career, I found it very exciting to be part of an era in which ocean observing came back into vogue, driven largely by technological innovation and global collaboration. And a bit of perspiration... Roll forward to 2009 and Australia now has an Integrated Marine Observing System, which is about to get bigger and better!

The additional \$52M for IMOS announced in the Federal Budget on 12th May is wonderful news (see page 1). My top priority in the coming months will be to work with you all to ensure that we make the most of this opportunity. I will be looking to build on the strengths created in getting IMOS to this point, and to be very targeted about enhancing and extending into new areas, to address significant gaps and take up exciting developments.

My other major priority will be ensuring that IMOS data streams are being used to do great science. The recent launch of the Ocean Portal means that we are now well and truly open for business

(see feature article below). There were encouraging signs in some of the talks given at the recent AMSA annual conference in Adelaide, but much, much more will rapidly become possible as the data flows in. All of us at IMOS/eMII are keen to do whatever we can to facilitate widespread use of IMOS data streams within the Australian marine and climate research community. Let us know if you are striking any impediments. And don't forget to tell us about your successes.

In closing, I would like to publicly express my gratitude to Gary Meyers for a fantastic job as the inaugural IMOS Director. Gary is a founding father of ocean observing in Australia, and the IMOS role provided a fitting crescendo to an outstanding career. His wisdom, patience and persistence have put us on a very sound footing for the future, and we all owe him a great debt. Thanks Gary.

Tim Moltmann

Facility Feature Article #7

Written by Marian McGowen

electronic Marine Information Infrastructure (eMII)

– creating a data delivery system for the Australian Integrated Marine Observing System

Facility Leader: Dr Roger Proctor

This key Facility in IMOS does not deploy any observing equipment in the ocean; instead the electronic Marine Information Infrastructure (eMII) is responsible for hosting, managing, distributing and archiving data from the 10 IMOS Facilities located around Australia. eMII is providing the tools to enable researchers to access and use all of the IMOS data, so supporting Australia's marine science researchers and other marine data users.

The eMII Facility is based at the University of Tasmania's Hobart campus. Roger Proctor, the eMII Director, brings with him a wealth of experience from his previous research position at the Proudman Oceanographic Laboratory (POL) in the United Kingdom. His role at POL included the continuation of the POL Coastal Observatory in the Irish Sea,



eMII team at the University of Tasmania.

a real-time observing and modelling system started in 2001. 'IMOS presents a challenge of scale far in excess of any European observing system,' Roger says.

Roger heads up a team of 12 people in eMII, whose roles vary from project management and administration, to programming and software design. eMII has the task of coordinating the handling of all IMOS data and the organisation of its storage. eMII is closely associated with each of the IMOS Facilities, and helps them develop specialised protocols for data management and data quality control.

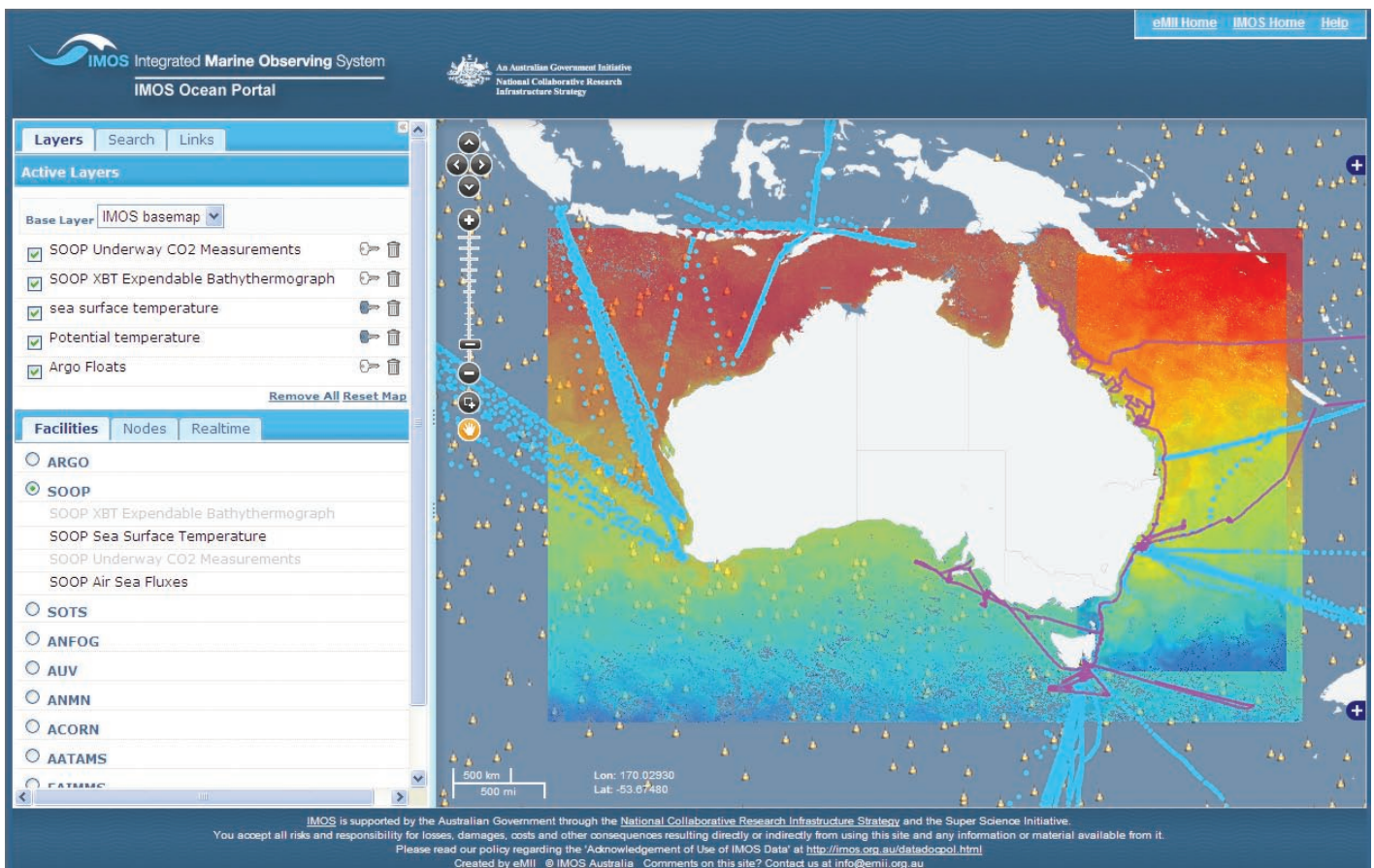
As the IMOS project has evolved from setting up the observing infrastructure around the country to collecting streams of data, IMOS needed a public face for discovery and exploration. The eMII team has been busy creating and developing the IMOS Ocean Portal (www.imos.org.au), which was launched on June 29th by the Honourable Duncan Kerr MP SC, as the gateway to data from all the IMOS Facilities around Australia.

IMOS will deliver a true paradigm shift in Australia's marine research effort by creating an enhanced, nationally integrated capacity to collect marine data, draw it together and make it accessible in a timely and usable fashion.

eMII has developed a set of principles that guides its development and implementation. Data needs to be easily discoverable and accessible, and all IMOS data is freely available. Rather than a central repository of the data, data is distributed on 'cloud' computing resources around the country with support from the Australian Research Collaboration Service (ARCS). In the future IMOS data will be archived within the Australian Ocean Data Network (AODN), a data storage and discovery network involving leading Australian marine research facilities. The importance of adhering to national and international standards is key to the success of the interoperability of IMOS data. It will allow the data streams to be integrated within IMOS and also with other national and international sources of the data streams.

The eMII Facility, similar to the other IMOS Facilities, does build infrastructure, the IMOS Ocean Portal being only one example. The Portal allows you to search for data that is held in the Metadata Entry and Search Tool (MEST). The MEST is the backend catalogue to the Portal, and contains metadata records harvested from all IMOS data hosts. An important eMII deliverable is the creation of adequate metadata to maximize the discovery and understanding of the data. Metadata describes data in a consistent, descriptive way, and all IMOS metadata conforms to international standards.

Roger Proctor explains the difference between metadata and data with a soup can analogy, "A can of soup has a label on it, the label contains information about the manufacturer, the use-by-date, contact details and the nutritional



The IMOS Ocean Portal. IMOS data from all around Australia is delivered direct to your computer through this interactive map based interface (www.imos.org.au).

breakdown. If the label was missing, the can of soup becomes less valuable; as you wouldn't know if it was safe to eat or even what it is!" In a similar manner the metadata describes: how IMOS data was collected, the rationale for its collection, who to contact about it, the sensor used, sensor calibration information, the list continues. The IMOS data would be of little use without the metadata, and thus the importance of creating and documenting the metadata.

The initial strategy of eMII has been to focus on defining specific data streams, and then developing end-to-end protocols, standards and systems to join the related observing systems into a unified data storage and access framework. IMOS data utilises the ARCS Data Fabric, a simple production service allowing researchers, research groups, research organizations and research communities to store their data. A distributed network of OPeNDAP / THREDDS servers around Australia forms the primary data storage. OPeNDAP (Open-source Project for a Network Data Access Protocol) is a software framework that simplifies all aspects of scientific data networking, allowing easy access to data. Existing, familiar data analysis and visualisation applications can be transformed into OPeNDAP clients. The THREDDS (Thematic Realtime Environmental Distributed Data Services) project is developing middleware to bridge the gap between data providers and data

users. The goal is to simplify the discovery and use of scientific data and to allow scientific publications and educational materials to reference scientific data.

The IMOS data streams can be categorised in four ways:

- gridded data from satellites and HF radar systems;
- time series data from moorings, Argo floats, gliders, sensor networks and ships of opportunity;
- image data from Autonomous Underwater Vehicles;
- biological data from continuous plankton recorders and acoustic tagging.

The first two provide real-time and delayed-mode data sets whereas the latter are delayed-mode delivery only. For a summary of the types of data streams that are available from each Facility see the table below.

Although the IMOS project is well underway, there is still more equipment to deploy and data to serve. In the future, eMII will develop a set of data products combining data across observations on regional and national scales, as well as tools that facilitate the integration and analysis of data. IMOS, through eMII, is leading the paradigm shift in data access, making data available to researchers and the community at no cost in easily discoverable and accessible forms.

eMII are hosting Data User Workshops around the country

eMII have already run workshops in Hobart and Adelaide. The Data User Workshops aim to increase the awareness and use of the high quality IMOS data, facilitate communication among professional roles within the marine sciences and enable participants to examine practical examples of the data.

The workshops introduce researchers to the IMOS project and its present status, and demonstrate how the data is accessible, discoverable and down-loadable through a set of tutorial activities.

Hands-on sessions also give the participants a chance to work with a number of data tools, worked examples, and interact with the workshop leaders to discuss how their own research could benefit from the tools, data and services provided.

Upcoming workshops will be in:

- Perth 28th October 2009
- Sydney 9th November 2009
- Brisbane Early 2010

For more information about the upcoming data workshops: imos.org.au/data_user_workshops.html

Or email info@emii.org.au

	Sea Temperature				Salinity	Dissolved Oxygen	Radiation flux	Meteorology	Dissolved CO ₂	Fluorescence	Turbidity	Optical Observations				Current	Biogeochemical	Biological	Bathymetry	Stereo imagery
	Skin Temp	Surface temp	Sub surface temp	Vertical temp profile								Coloured Dissolved Organic Matter	Chlorophyll a	Clarity						
Argo Australia				●	●	●								●						
Ships of Opportunity	●	●	●	●	●	●	●	●	●	●	●		●			●	●			
Southern Ocean Timeseries				●	●		●	●	●	●	●					●	●			
Ocean Gliders		●	●	●	●	●				●	●	●	●	●						
Auto. Underwater Vehicle			●		●					●	●	●		●			●	●		
National Moorings Network		●	●	●	●	●	●	●		●	●			●		●	●			
Coastal Ocean Radar Network														●						
Acoustic Tagging of Fish																	●			
Barrier Reef Sensor Network			●					●												
Satellite Remote Sensing	●												●							

A summary of the range of datastreams available through IMOS and the Facilities which deliver them.

CERF Marine Biodiversity Hub

Written by Professor Nic Bax, Director

The CERF Marine Biodiversity Hub is funded through the Commonwealth Environment Research Facilities Program (CERF), administered through the Australian Government's Department of the Environment, Water, Heritage and the Arts (DEWHA).

CERF supports research that has a strong public good focus and that can demonstrate a strong public good outcome. It is designed to build critical mass in areas of Australia's research strengths. It also encourages the development of world-class research facilities by supporting proposals that draw on multiple disciplines, professional partnerships and prior research efforts. It aims to deliver outcomes of significant national benefit.

The University of Tasmania, CSIRO, Geoscience Australia, Australian Institute of Marine Science and Museum Victoria received \$6 million to create a CERF Hub for the Prediction and Management of Australia's Marine Biodiversity. The 5 partners are contributing \$12.4 million of their own funds to this initiative. The University of Tasmania hosts the Hub.

Background

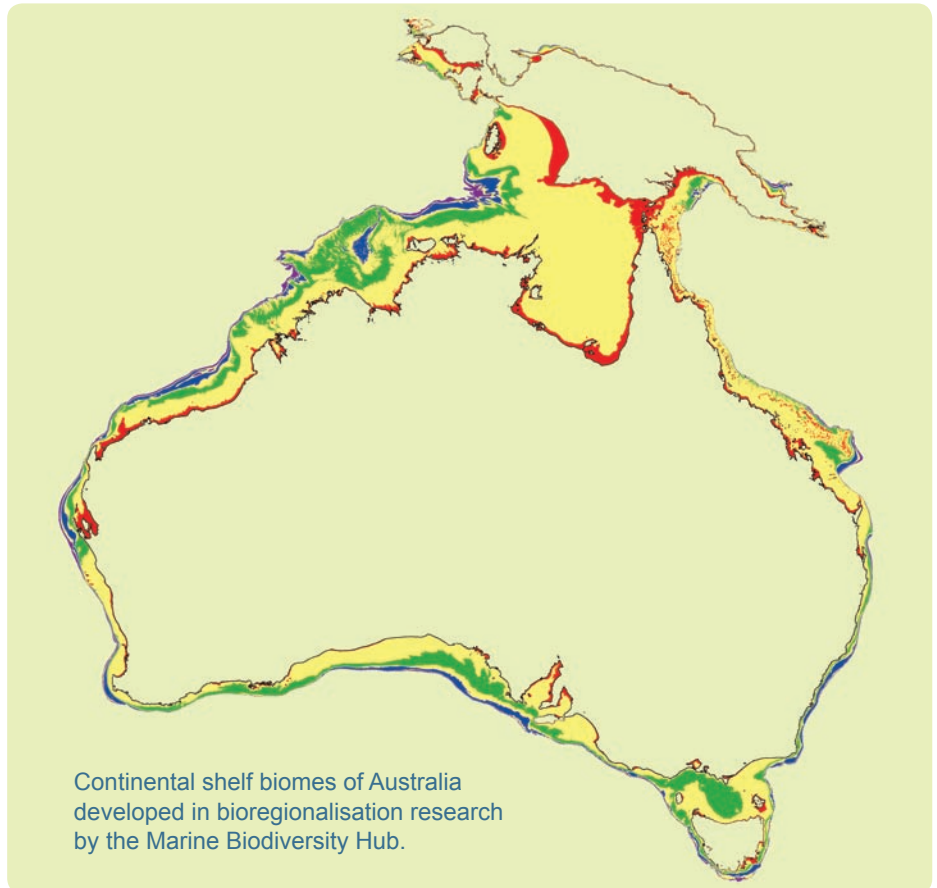
Australia will have a National Representative System of Marine Protected Areas (NRSMPA) by 2012. The NRSMPA will be a major step towards conserving Australia's marine biodiversity, but is unlikely to be sufficient by itself. The CERF Marine Biodiversity Hub is developing the knowledge to manage off-reserve biodiversity. Together, the NRSMPA and off-reserve management provide the best option for long-term protection and sustainable use of our marine biodiversity.

Research Focus

The Hub addresses two primary questions:

1. How can we predict the distribution of marine biodiversity?
2. How can we use this improved capability to conserve and manage marine biodiversity in a multiple-use environment?

Our strategic focus is 3-5 years, ie. supporting the NRSMPA once it is established, however many of the tools and analyses we are developing



are being immediately taken up by Commonwealth and State marine planners to assist in MPA planning.

Products

- **Bioregionalisation** – the Marine Biodiversity Hub has updated Australia's bioregions with an increased number of fish species, for use in marine planning.
- **New National Datasets Being Used to Predict Patterns in Biodiversity** – the Marine Biodiversity Hub will develop biologically informed analysis of the physical data around Australia at a fine scale.
- **High resolution near-shelf surveys used to develop new surrogates** – coincident physical and biological data at very fine spatial scales are being collected to develop new physical surrogates of marine biodiversity.

This includes using the IMOS Autonomous Underwater Vehicle.

- **Connectivity** – Genomic methods are being used to determine the connectivity of marine species, and then these will be compared to the connectivity predicted from oceanographic models to assist in the design and management of marine reserve networks.
- **Off-reserve management methods** – market-based instruments are being investigated as options for off-reserve management to support the goals of NRSMPA.

For more information:

Please download the Fact Sheet 'Ensuring a future for life in Australia's oceans' from the Marine Biodiversity Hub website www.marinehub.org

IMOS Postgraduate Student Profile

Students using IMOS data for their postgraduate research

Julie Wood

The University of New South Wales

Project: I will be using a long term oceanographic dataset, gathered by Sydney Water and new IMOS moorings to examine trends in temperature stratification and coastal shelf processes off Sydney.

Since November 1990, a marine observation station has been measuring oceanographic parameters three kilometres off the coast of Bondi. The system was set up by Sydney Water to satisfy the requirements of the environmental protection licence conditions for the deep water ocean outfalls from three key sewerage treatment plants servicing Sydney's residents. Apart from this licence requirement, the dataset is highly valuable for investigating long term trends in parameters and oceanographic features at this location. Sydney Water is now partnering with IMOS by providing the previous 18 years of data and ongoing data at this location.

While working at Sydney Water, I considered undertaking study in oceanography. When the idea of using Sydney Water's oceanography data for a project related to Sydney Water's operations was suggested, the opportunity was too good to miss.

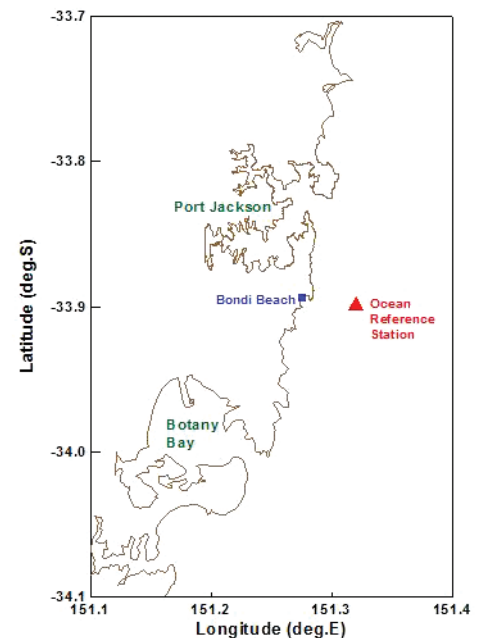


Julie Wood at the Sydney Institute of Marine Science at Chowder Bay.

My research will focus on two questions:

The first is to determine if there have been any changes over the long term water temperature data series at this location. I would like to determine the implications that any trends (should they continue) may have on the movement and dilution of the discharges from the deep water ocean outfalls.

The data set also lends itself well to investigating coastal processes in the Sydney region. I am investigating coastal shelf processes which lead to conditions indicative of upwelling in the Sydney region. The introduction by IMOS of two further moorings in an array at this location further enhances the already existing data set to assist with this purpose.



Study location for Julie's project.

For more information about
IMOS please visit the website
www.imos.org.au

General enquiries:

Integrated Marine Observing
System (IMOS)
University of Tasmania
Private Bag 110
Hobart, TAS, 7001
+61 (03) 6226 7505 T
+61 (03) 6226 2107 F
imos@imos.org.au

Director

Mr Tim Moltmann
Tim.Moltmann@imos.org.au

Executive Officer

Mrs Jo Neilson
Jo.Neilson@imos.org.au

Project Officer

Dr. Marian McGowen
Marian.McGowen@utas.edu.au

Development Officer

Ms Katy Hill
Katy.Hill@imos.org.au

Office Assistant

Ms Virginia Bowen
Virginia.Bowen@utas.edu.au

Technical Director

Mr Simon Allen
Simon.Allen@imos.org.au

Facility Leaders:

Argo Australia
Dr Susan Wijffels
susan.wijffels@csiro.au

**Enhanced Measurements from
Ships of Opportunity (SOOP)**

Mr Ken Ridgway
Ken.Ridgway@csiro.au

**Southern Ocean Automated Time
Series Observations (SOTS)**

Dr Eric Schulz
E.Schulz@bom.gov.au
Dr Tom Trull
Tom.Trull@utas.edu.au

**Australian National Facility for
Ocean Gliders (ANFOG)**

Prof Charitha Pattiaratchi
chari.pattiaratchi@uwa.edu.au

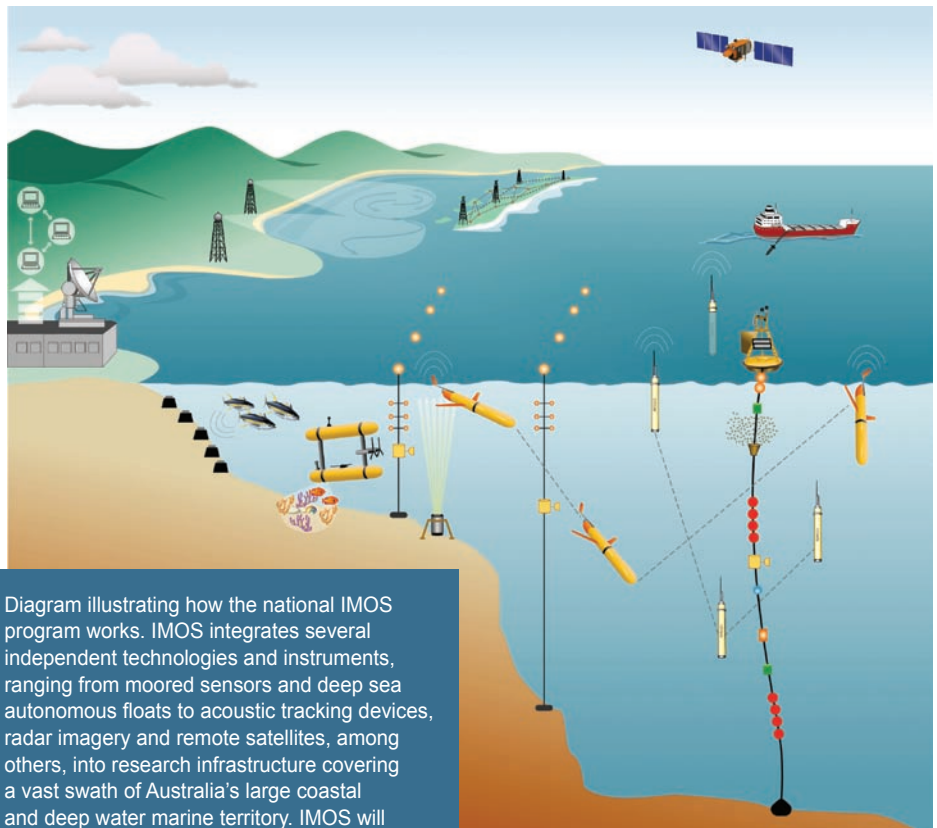


Diagram illustrating how the national IMOS program works. IMOS integrates several independent technologies and instruments, ranging from moored sensors and deep sea autonomous floats to acoustic tracking devices, radar imagery and remote satellites, among others, into research infrastructure covering a vast swath of Australia's large coastal and deep water marine territory. IMOS will generate critical data needed to support a diverse range of marine research projects.

**Autonomous Underwater
Vehicle Facility (AUV)**
Dr Stefan Williams
stefanw@acfr.usyd.edu.au

Australian National Mooring Network
Dr Tim Lynch
Tim.Lynch@csiro.au

**Australian Coastal Ocean
Radar Network (ACORN)**
Prof Mal Heron
mal.heron@jcu.edu.au

**Australian Acoustic Tagging and
Monitoring System (AATAMS)**
Dr Rob Harcourt
rharcour@gse.mq.edu.au

**Facility for Automated Intelligent
Monitoring of Marine Systems (FAIMMS)**
Mr Scott Bainbridge
s.bainbridge@aims.gov.au

eMarine Information Infrastructure (eMII)
Dr Roger Proctor
Roger.Proctor@utas.edu.au

Satellite Remote Sensing (SRS)
Dr Peter Turner
Peter.Turner@csiro.au

Node Leaders:

Blue water and climate
Mr Ken Ridgway
Ken.Ridgway@csiro.au

**Great Barrier Reef Ocean
Observing System (GBROOS)**
Dr Peter Doherty
p.doherty@aims.gov.au

New South Wales IMOS (NSW-IMOS)
Prof Iain Suthers
i.suthers@unsw.edu.au

Southern Australia IMOS (SAIMOS)
Dr Laurent Seuront
Laurent.Seuront@flinders.edu.au

Western Australia IMOS (WAIMOS)
Prof Charitha Pattiaratchi
chari.pattiaratchi@uwa.edu.au



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This issue of marine matters has been compiled by Dr Marian McGowen.