

## Tasmanian IMOS launched by Senator Carol Brown and Ms Rebecca White MP

Senator for Tasmania Carol Brown with Dr Peter Thompson, TasIMOS Node Leader, next to an ocean glider.

(Photo: Bryony Bennett, CSIRO)



A new IMOS Tasmanian science node was launched in Hobart on the 14th of December. Around 50 people attended the launch, speeches were provided by Senator for Tasmania Carol Brown (representing Senator Kim Carr, Minister for Innovation, Industry, Science and Research), Ms Rebecca White Parliamentary Secretary for Small Business, and the node leader Dr Peter Thompson.

Afterwards the guests viewed a display of observing tools including a mooring float, an acoustic receiver, an Argo float and a glider, as well as an interactive data display.

The Tasmanian Integrated Marine Observing System (TasIMOS) was formed during 2010, and will take an integrated, whole-of-system approach to sustained observing and monitoring of the ocean around Tasmania. It will explicitly link oceanography and biogeochemistry with shelf and upper slope seabed ecology,

food chain dynamics and the movement of key species. Data streams will be amplified through direct incorporation into oceanographic, biogeochemical and ecosystem models.

TasIMOS activities will be supported by \$2.5M of new funding from the Education Investment Fund. The Node is co-led by CSIRO and the University of Tasmania through the Institute of Marine and Antarctic Studies (IMAS), in collaboration with the Australian Antarctic Division.

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### The key IMOS infrastructure in the TasIMOS Node

- The Maria Island National Reference Station
- Slocum Glider in Storm Bay
- Sea Glider transecting the East Australian Current Extension off the East Coast
- Satellite altimetry calibration moorings
- Acoustic curtains off the East Coast for detecting tagged marine animals
- Monitoring at a number of benthic reference sites using the Autonomous Underwater Vehicle

## director's corner

Tim Moltmann



Welcome to the final Marine Matters for 2010. It's been an enormously productive year for the IMOS community, and before anything else I'd like to thank everyone involved in making IMOS such a success.

We have finalised almost all of the planned NCRIS deployments and made good progress on the first phase of EIF-funded deployments. Availability of data via the Ocean Portal is building impressively by the month, and a lot of effort is now going into ensuring that IMOS data streams are being taken up and used to do great science, and to meet other needs where possible.

In order to facilitate effective uptake and use, it will be important for the functionality of our information infrastructure to be improved over time. Roger Proctor, Director of eMII, has recently circulated an eMII forward plan to IMOS Facility and Node Leaders for comment. This document lays out eMII development priorities, and we will be aiming to achieve community consensus on the plan in early 2011.

We've also been paying attention to the status of data availability from IMOS

Facilities. Overall this is pretty good, but there are inevitably some teething issues still to be resolved. Sustaining long time-series of quality-controlled data streams across the breadth of the IMOS portfolio will be very challenging, and as IMOS moves out of the ramp-up phase and into a more mature mode of operation, we need to begin 'hardening' the observing system and ensuring that our techniques and processes are becoming robust.

The Southern Australian Node (SAIMOS), Bluewater and Climate Node, and new Tasmanian Node all held launches during 2010, aimed at raising the profile of IMOS. We plan to continue these activities in 2011. We've also produced the inaugural IMOS Annual Highlights Document, intended as a 'report card' to our large and diverse stakeholder base. If you haven't received a copy and would like one (or more!), please contact Marian McGowen.

In preparation for building the case to keep IMOS going beyond mid-2013, all Node Science and Implementation Plans have recently had international peer reviews. These reviews will be taken into account as we evolve towards a National-level Science Plan and redevelop the current IMOS Five Year Strategy into a longer-term (Decadal) Strategy, all of which will happen in early 2011.

I would like to take this opportunity to note a few changes in the IMOS governance structure, and to register our thanks to outgoing colleagues and welcome some new ones:

- Professor Paddy Nixon has joined the Advisory Board in his role as UTAS Pro Vice Chancellor Research.

Paddy has a BSc, MA and PhD in Computer Science, and was most-recently the Science Foundation Ireland Research Professor in Distributed Systems. We thank Professor Allan Canty for his wise counsel while on the Board as Acting UTAS PVCR.

- Professor Iain Suthers (UNSW) has stepped down from NSW-IMOS Node Leadership. Iain has been a driving force in NSW-IMOS from 'day one', and has made a major contribution to IMOS as a whole. We owe him a great deal. Iain assures me he'll be staying engaged, and will continue to be a champion for IMOS. Welcome to Dr Martina Doblin (UTS) who joins the NSW-IMOS Node Leadership Team. Martina is a Senior Research Fellow at the C3-Plant Functional Biology and Climate Change Cluster.
- Dr Nick D'Adamo has stepped down from WAIMOS Node Leadership, though remains on the Advisory Board where he'll continue to provide invaluable regional and global context for IMOS through his role with the Intergovernmental Oceanographic Commission (IOC). Welcome to Dr Jamie Oliver (AIMS) who joins the WAIMOS Node Leadership Team. Jamie is Leader of AIMS' Exploring Marine Biodiversity research program based in Perth.

Best wishes to you and your families for the Christmas/New Year season, from all at the IMOS Office.

A handwritten signature in black ink, appearing to read 'T. Moltmann', with a long horizontal flourish extending to the right.

Tim Moltmann



High resolution seafloor images captured by the AUV in Tasmania.

## Tasmanian IMOS launched by Senator Carol Brown and Ms Rebecca White MP

From page 1



Dr Peter Thompson with Ms Rebecca White MP at the TasIMOS launch. (Photo: Bryony Bennett, CSIRO)



Dr David Smith, CSIRO Wealth from Oceans Flagship, Dr Peter Thompson, Dr Kerrie Swadling, TasIMOS Deputy Node Leader, IMAS and Mr Tim Moltmann, IMOS Director at the TasIMOS launch. (Photo: Bryony Bennett, CSIRO)

## Capability building visit to the United States for Phil de Boer, CSIRO moorings technician

Mr Phil de Boer, the mechanical technician for the National Reference Station sub-facility, received a CSIRO early career grant in 2009/10 and used the funds to travel to National Oceanic and Atmospheric Administration (NOAA) and Woods Hole Oceanographic Institute (WHOI) in the United States in March to learn more about mooring engineering and deployment.

Phil's trip included a Buoy workshop at NOAA, a visit to the Monterey Bay Aquarium Research Institute, working with the various mooring engineering and servicing groups at WHOI, and assisting with a mooring deployment with the group at NOAA/ Pacific Marine Environmental Laboratory.

Phil got the opportunity to work alongside engineers and technicians at WHOI and NOAA who are at the forefront of mooring design and innovation. The teams fit out mooring buoys and instruments, plan logistics and mobility for mooring deployment, recovery and servicing.

"WHOI were very happy for me to work alongside their team, and be a part of



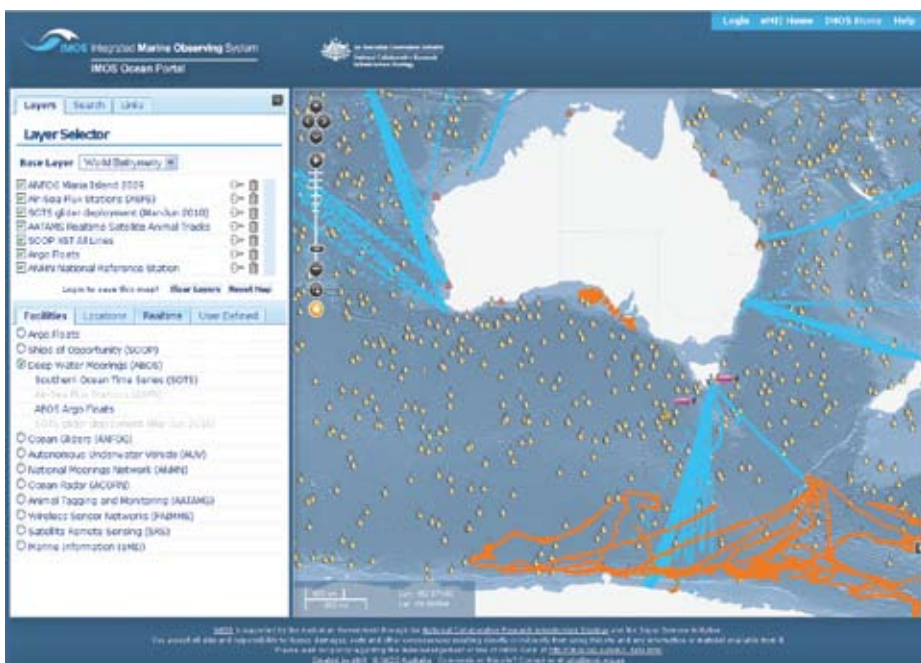
my learning and technical exchange" Phil said.

The knowledge and expertise Phil gained during his time overseas will be put to good use as the network of IMOS National Reference Stations are

Phil de Boer learning about work practices with glass floats in the United States.

expanded with a new site near Brisbane, and strengthened with the addition of new sensors.

## Bluewater and Climate node launched at the Australia-New Zealand Climate Forum



The IMOS Bluewater and Climate science node launched the new EIF funded open ocean observations at the Australia-New Zealand Climate Forum in Hobart in October. The Bluewater and Climate node brings together ocean and climate scientists from research institutions across the nation, including the University of Tasmania, CSIRO, Australian Antarctic Division, Bureau of Meteorology, Australian Institute of Marine Science, Sydney Institute of Marine Science, and University of Western Australia.

What is happening in the open ocean is vitally important to all Australians

Left: The open ocean data streams available through the IMOS Ocean Portal.

## Coral Sea ocean glider completes longest mission yet for IMOS

The longest unmanned, remotely-controlled voyage yet undertaken in Australian waters was completed in late October. The IMOS Seaglider spent 149 days exploring the secrets of the Coral Sea, before being recovered by Australian Institute of Marine Science (AIMS) researchers near Jewell Reef, north-east of Lizard Island.

During its five months travelling the Seaglider made 768 dives to depths of up to a kilometre and travelled 2,977 kilometres. The voyage was managed

*The data gathered during this project will help to better understand the El Niño and La Niña cycles that drive weather patterns in eastern Australia.*

and controlled from the opposite side of the continent by staff working at the Australian National Facility for Ocean Gliders based at the University of Western Australia. While at sea it measured a host of key ocean variables such as temperature, salinity, plankton productivity, water turbidity and dissolved oxygen. This new Seaglider route is part of the Education Investment Fund (EIF) enhancement to IMOS.

Leader of the AIMS team that will be analysing and interpreting the data obtained by the Seaglider, Craig Steinberg, said the Coral Sea is one of the most sparsely sampled marine environments. 'There has been a huge data and knowledge gap there,' Mr Steinberg said. 'Our ship operations only get us there to do profiles once or twice every year,

whereas the Seaglider is continuously logging away. In comparison to the cost of sending a ship to do an equivalent survey it really is very economical. This one voyage by this Seaglider has produced more data than all of Australia's past research surveys put together in this remote marine region.'



(Photo: Australian Institute of Marine Science)

and their understanding of local and regional climate. It drives our climate and weather extremes, is the workplace for offshore industries and maritime defence activities and contains a diversity of marine life that currently is barely described. There is a need to observe this part of the earth system to understand how it's changing, and what the impacts might be on current and future generations of Australians.

Carrying out research in harsh, remote regions of the planet is extremely challenging, and technology plays an increasingly important role. The new \$22M open ocean observing array will include: ice-capable Argo floats, marine mammals equipped with satellite tags, Seagliders and deepwater moorings.

The Bluewater and Climate node continues to collaborate with northern hemisphere partners, including the United States, France, the United Kingdom, and Korea. IMOS is also helping to foster a new era of cooperation between scientific disciplines that have not traditionally worked together through the node.

CSIRO oceanographer and leader of the IMOS Bluewater and Climate node, Dr Susan Wijffels, said "This is a unique approach to monitoring the linkage between the physical properties of oceans, such as temperature and salinity, and how they influence the marine ecosystem."

The data gathered during this project will help to better understand the El Niño and La Niña cycles that drive weather patterns in eastern Australia. The El Niño phenomenon is associated with drought conditions in eastern Australia while the La Niña phase that we are now experiencing is characterised by warmer Coral Sea waters leading to predictions of a wetter summer and increased tropical cyclone activity.

Of particular interest to the AIMS researchers is the existence of an immense layer of plant plankton that is found at a depth of 50 to 150 metres in the Coral Sea. One of the predictions of climate change is that this layer, which is an important food source, could become thinner if ocean temperatures continue to increase, with significant consequences for the productivity of the Coral Sea. The glider was able to undertake detailed mapping of this plankton layer and IMOS will sustain these measurements to determine any trends.

## Satellite altimetry calibration moorings deployment a success

The CSIRO Coastal Moorings Team recently deployed a pair of moorings in Bass Strait (13 October) and Storm Bay (19 October) in support of the satellite altimetry calibration and validation sub-facility.

The moorings will enable the determination of a precise sea surface height record that is used to calibrate and validate observations of sea level made from satellite altimeters – notably from the principle US/French mission known as the Ocean Surface Topography Mission (OSTM), or Jason-2.

Key positions in Bass Strait and Storm Bay, both in Tasmania, have been selected that sit directly under the same

satellite ground track. The satellite altimeter descends over Bass Strait and continues onto Storm Bay – this enables the calibration and validation process to be undertaken in two regions with very

*The calibration data stream generated from the two sites will provide a unique contribution to the international OSTM/Jason-2 mission team...*

different wave climate, yet with almost no difference in orbit related errors associated with the spacecraft.

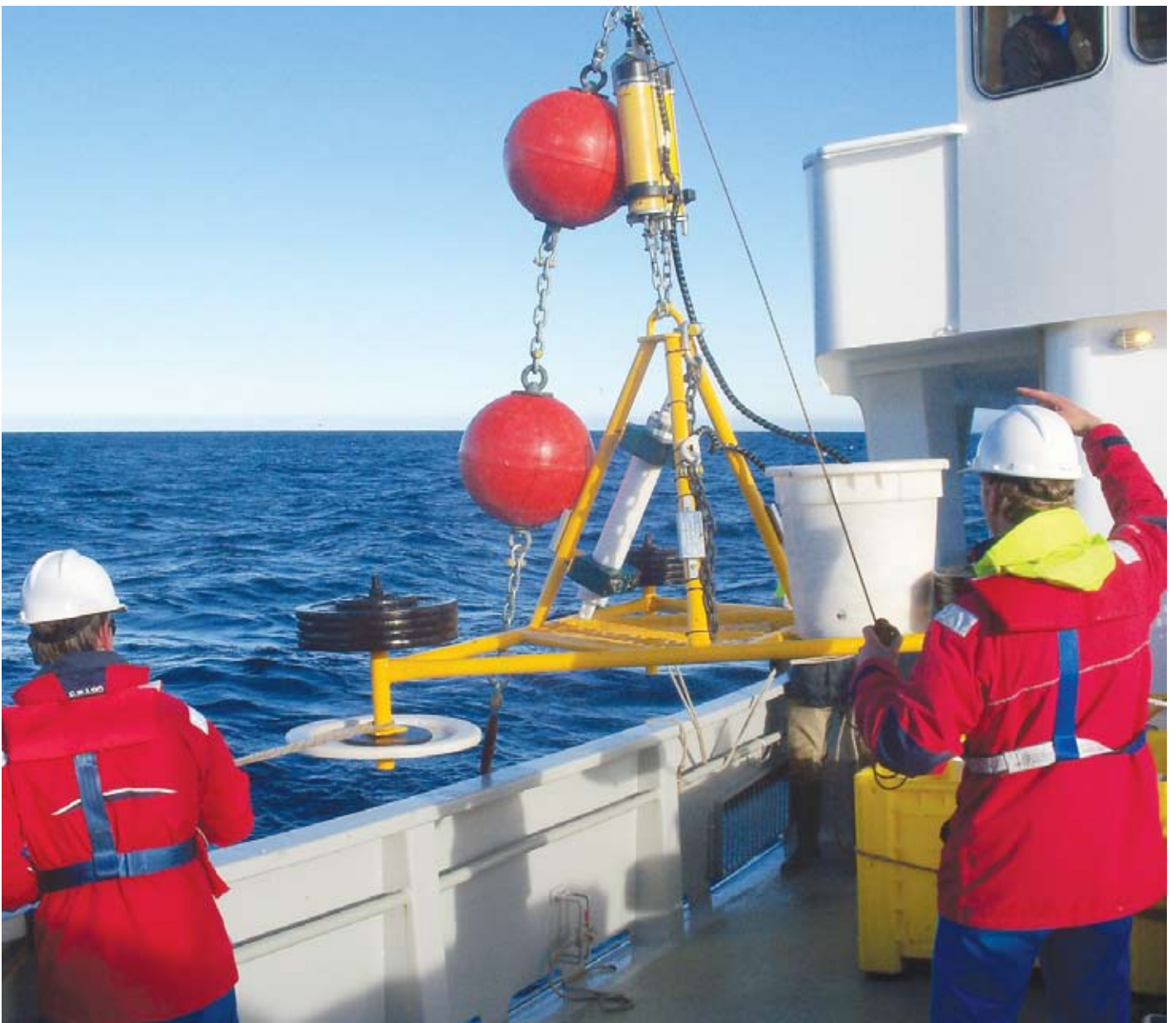
The calibration data stream generated from the two sites will provide a unique contribution to the international OSTM/Jason-2 mission team, with the Australian

contribution the sole facility of its kind in the Southern Hemisphere.

The moorings in Bass Strait and Storm Bay, which include a Water Quality

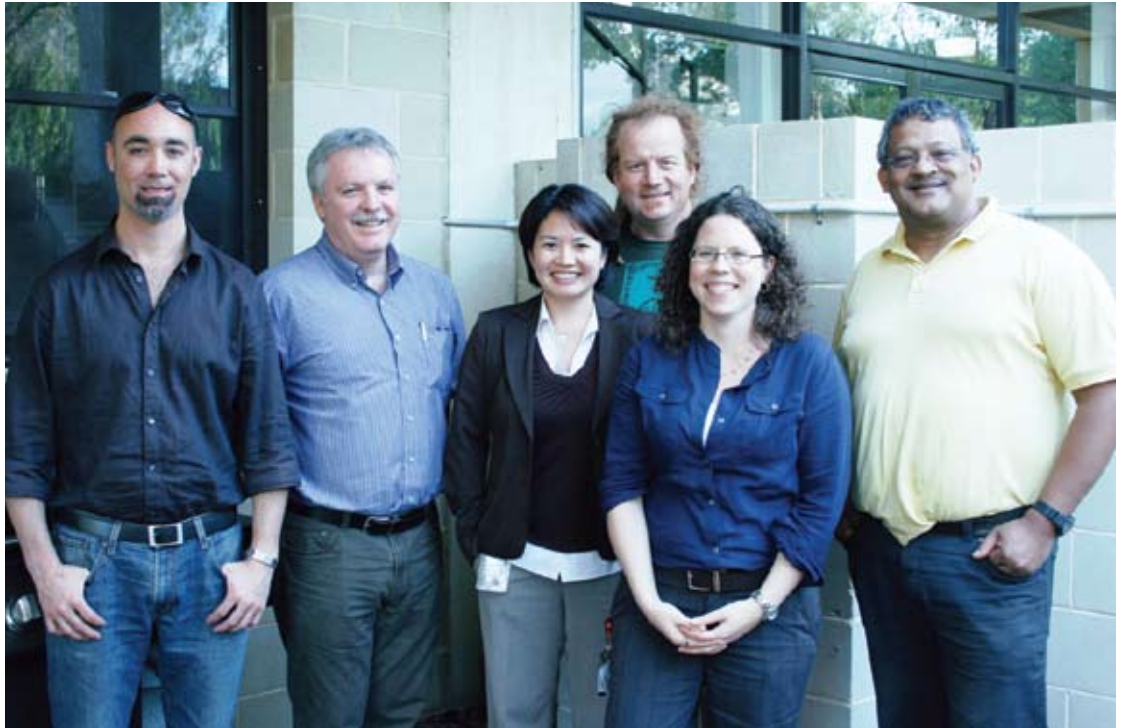
Monitor (WQM) instrument in support of Tasmanian IMOS node activities, will be visited on a 6-month cycle over the 3 year period of Education Investment Fund investment in this sub-facility.

**Bass Strait mooring being deployed.**  
(Photo: Darren Moore)



## Dr Ian Walsh, of WET Labs, visits the University of Western Australia

Dr Ian Walsh, Senior Oceanographer and Vice President of Sales and Marketing at WET Labs, visited the School of Environmental Systems Engineering and the Oceans Institute at the University of Western Australia in November. WET Labs are manufacturers of underwater sensors (<http://www.wetlabs.com>). IMOS uses WET Labs Water Quality Monitors (WQMs) on many of our shelf/slope and reference station moorings to measure temperature, depth, salinity, dissolved oxygen, chlorophyll fluorescence and turbidity.



During his visit Ian gave a seminar on “Observations on the Deepwater Horizon oil spill in the Gulf of Mexico and Ocean Observing Systems”. He provided an overview of the response by the oceanographic community which included conductivity, temperature and depth (CTD) profiling from research vessels to map the extent of the deep oil plume using transmissometers, coloured dissolved organic matter (CDOM) fluorometers and dissolved oxygen sensors. At the same time, a fleet of ocean gliders were deployed across the Gulf and the newest oceanographic

Bryan Murphy (IMBROS), Ian Walsh (WET Labs) and the Australian National Facility for Ocean Gliders team – Mun Woo, Dennis Stanley, Christine Hanson and Chari Pattiaratchi.

technologies began reporting data immediately to the web.

Ian concluded that despite the technological hurdles that were surmounted, the truth was the oceanographic community in the United States was not prepared to react as effectively as it could have been. A glaring lack is an accessible and comprehensive oceanographic monitoring system that would provide

the framework to respond with both technological and human resources.

Ian said “The Australian Integrated Marine Observing System is from my perspective one of the leading efforts to create such a system. Where IMOS is going is still very much the frontier and the lessons learned will have enormous value around the world and for many years to come.”

### Obituary: Duncan Mercer

The IMOS Autonomous Underwater Vehicle (AUV) Facility has recently lost one of its senior technical officers. Dr Duncan Mercer played an instrumental role in operating the AUV on numerous deployments around Australia and liaised closely with personnel at the eMarine Information Infrastructure facility to work out efficient ways to transfer and access the large volumes of visual data collected by the vehicle.

Duncan was passionate about many things including doing things the right way, climbing, diving and whiskey. He passed away quite suddenly at the young age of 39 and will be missed by all those who knew him.



## Using gliders as observing tools: Charles Eriksen's presentation at the CAWCR workshop

IMOS supported Professor Charles Eriksen from the School of Oceanography at the University of Washington (where Seagliders were developed) to present a seminar at the recent Centre for Australian Weather and Climate Research (CAWCR) workshop in Hobart. The workshop had up to 100 participants from national, state and university research groups around Australia and focused on ocean forecasting and the role of oceans in climate.

In his keynote talk Charles discussed the use of gliders in ocean observing in North America, and it provided an excellent chance to compare the use of gliders in Australia by IMOS. He also

highlighted the exciting development of the new Seaglider called Deepglider which is capable of making dives to nearly 6000m and can be deployed on missions as long as 18 months and over a 10,000 km range. Whilst in Australia Charles also visited the University of New South Wales to meet with groups who use the IMOS glider data.

Charles' visit was a great chance for knowledge exchange between his group and technicians and scientists in Australia, and the collaboration between the University of Washington and IMOS will continue in the future as we continue to use ocean gliders in our observing system.

## IMOS Technical Director, Simon Allen, honoured at the Marine Technology Society awards

IMOS would like to congratulate Simon on being recognised by the US-based Marine Technology Society (MTS) as the winner of their 2010 Compass International Award.

This award is presented each year to an individual, company or organization for outstanding contributions to the advancement of marine science and technology, and is open to those from any country or territory outside the United States.

Simon received his award in September at the MTS Awards Lunch during OCEANS'10 MTS/IEEE Seattle.

## Australian Continuous Plankton Recorder Survey publish their 1st newsletter

The Australian Continuous Plankton Recorder Survey (AusCPR) newsletter has been created to give people more information about the survey, what we do, what we have found so far and our plans for the future. It summarises the highlights of the first 2 years of the survey and hopefully will encourage people to use our data which is freely

available through IMOS. Included are project updates from Brisbane, Hobart and Perth, as well as data summaries, towing and shipping information, species lists, recent events and a health and safety feature on the importance of microscope ergonomics (a good article to pass on to colleagues that spend long hours at the microscope).

The newsletter will be issued every 6 months. If you wish to be added to the AusCPR Survey Friends and Supporters List to receive newsletters and research updates please email Anita.Slotwinski@csiro.au. The newsletter is available for download at <http://imos.org.au/auscprnewsletters.html>.

## IMOS publishes the first Annual Highlights document

The IMOS office has recently published the first IMOS Annual Highlights document, covering the 2009-10 year. The 16 page colour brochure includes:

- a brief description of 'how IMOS works',
- sections on each of the five major research themes the observing system is designed to address,
- annual highlights by theme,
- performance indicators,
- a financial summary, and
- acknowledgement of our Operators and Co-Investors.

To download an electronic copy please visit the IMOS website (<http://imos.org.au/highlights.html>), or if you would prefer to receive a paper copy please email [imos@imos.org.au](mailto:imos@imos.org.au).





## Introducing the new Bio-Acoustic Ships of Opportunity sub-facility

Bio-Acoustic Ships of Opportunity sub-facility (BASOOP) is a new addition to the IMOS program that started in July 2010. BASOOP is focusing on the acoustic sensing of mid-trophic level organisms (meso-zooplanktonic and micronekton communities ~2 to 20 cm in length including small fish, crustaceans, squids and gelatinous) across the oceans basins.

It is envisaged that shelf and ocean-basin scale methods of characterising mid-trophic level organisms will provide valuable inputs to ecosystem-based fisheries management, marine planning and monitoring impacts of climate change and variability.

These mid-trophic level organisms regulate the primary production involved in biogeochemical cycles (e.g. CO<sub>2</sub> fixation) and are forage for top predators (e.g. tunas, seals, birds). Despite the enormous pelagic realm these organisms occupy and their pivotal role in the functioning of ecosystems linking biogeochemistry to the distribution and abundance of predators they remain one of the least known components of the ecosystem.

Much of the BASOOP work to date has focused on formalising the data collection, processing and posting with appropriate metadata to the eMarine Information Infrastructure facility.

At present, nine vessels are participating in the BASOOP program. Six are commercial fishing vessels that have agreed to record 38 kHz acoustic

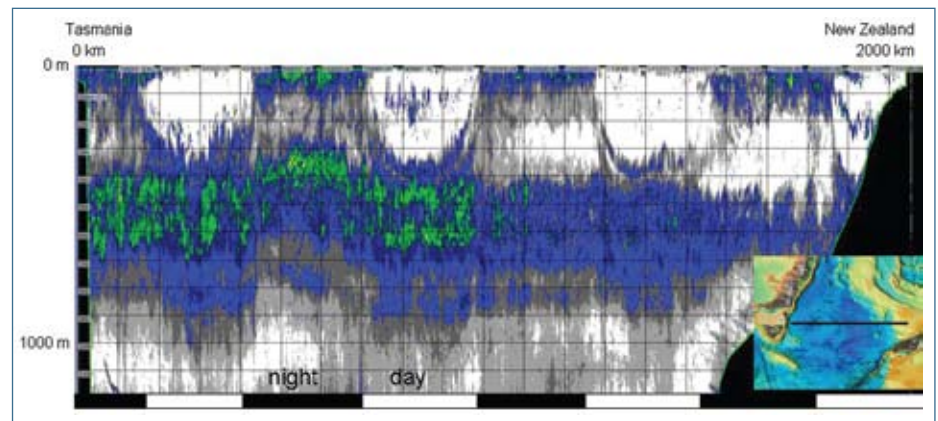
*At present, nine vessels are participating in the BASOOP program.*

data during transits to and from fishing grounds. The remaining three are scientific research vessels collecting underway acoustic data during transits and science operations covering frequencies from 12 kHz, 38 kHz, 120 kHz and 200 kHz.

The figure (below) shows data collected from one of the calibrated fishing

vessels, FV *Rehua*, over a four day period in August 2010 across the Tasman Sea. For this transit the IMOS continuous plankton recorder was also logging

data enabling co-located sampling of this dynamic region, predicted to be a climate change hot spot. The acoustic data shows a cross section of the ocean to 1200 m revealing the strength and variability of the deep scattering layer dominated by small fish, crustaceans, squid and gelatinous organisms and their diurnal migration to the shallower waters at night.



Basin-scale acoustic backscatter (Sv data at 38 kHz) obtained by FV *Rehua* from Australia to New Zealand in August 2010. Vertical grid lines indicate 100 km distance, horizontal grid lines indicate 100 m depth intervals down to a maximum depth of 1200 m. Screen gain set to -78 dB.

## The IMOS ocean glider facility has released its newest data visualisation software, GLIDERSCOPE

At the WAMSI (Western Australian Marine Science Institute) Public Symposium held on 3 Nov 2010, the Australian National Facility for Ocean Gliders (ANFOG) announced its release of GLIDERSCOPE v2.0, a software package designed to allow scientists and students to immediately extract, view and analyse glider data, without having to go through the laborious computer programming tasks usually required for handling scientific data.

During the symposium, Dr Christine Hanson and the software's developer, Dr Mun Woo, demonstrated the use of GLIDERSCOPE in their study of Seaglider deployments off Western Australia in the Perth Canyon; in an offshore eddy off Kalbarri; and across the Leeuwin Current off Ningaloo.

GLIDERSCOPE v2.0 can be freely downloaded from: [http://imos.org.au/anfog\\_data.html](http://imos.org.au/anfog_data.html)

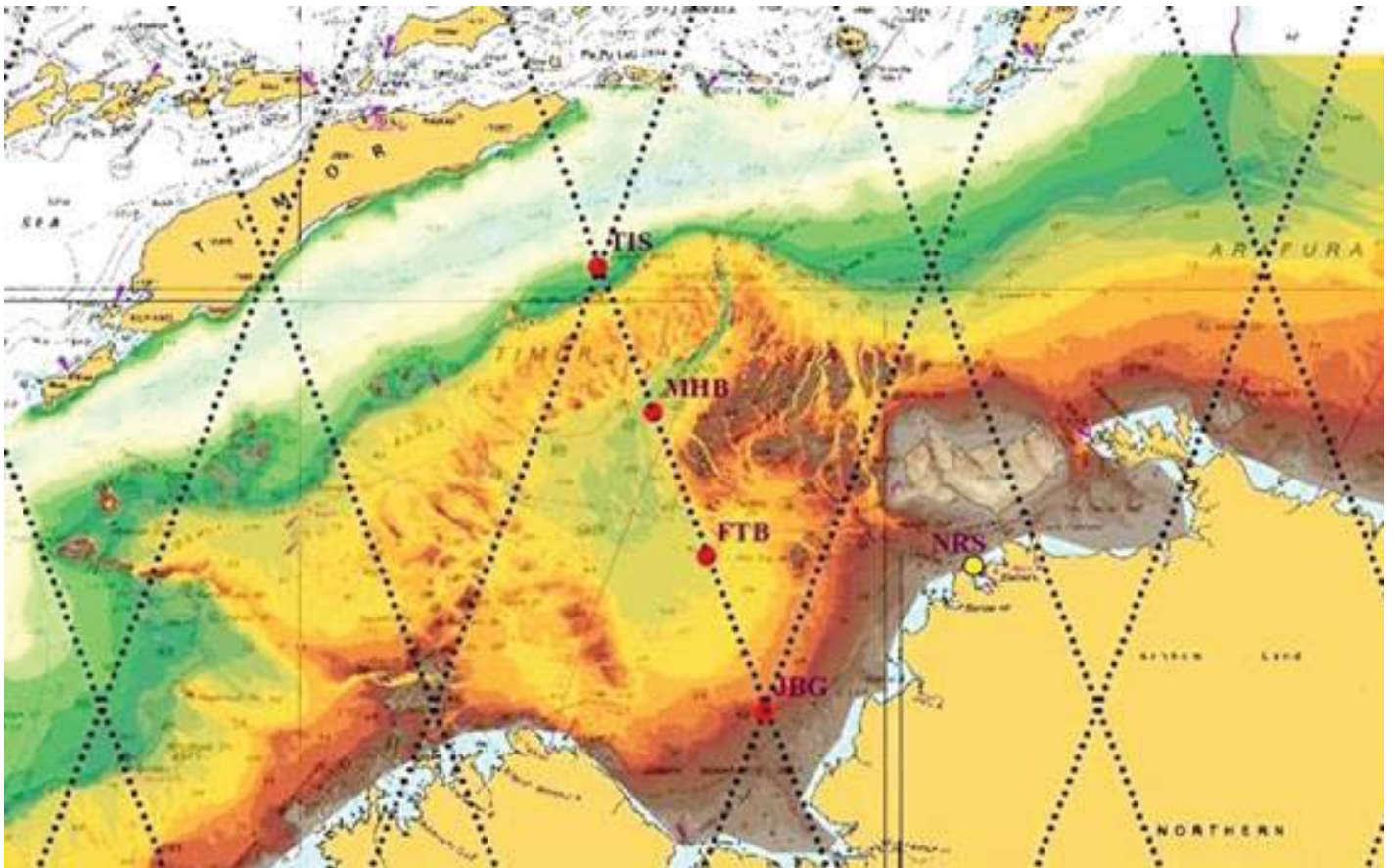
### 4th Annual Progress Report submitted to the Department of Innovation, Industry, Science and Research

The IMOS office submitted the 2009/10 Annual Progress Report to the Department of Innovation, Industry, Science and Research on the 24th September. We would like to thank all the Facility and Node leaders for their assistance in writing the report. We would also like to thank the Advisory Board for providing feedback on the report.

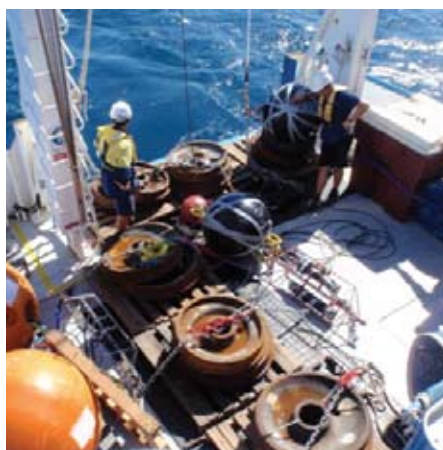
## EIF funded moorings deployed in northern Australia

The Indonesian Throughflow Shelf Transect Moorings (the array is comprised of four moorings extending from the Timor Trough to Joseph Bonaparte Gulf) were deployed in June by the National Mooring Network Facility from the AIMS Research Vessel *Solander*. This was an important first step in the enhanced monitoring of northern Australian waters with the additional funds IMOS received from the Education Investment Fund (EIF). These shelf moorings will complement planned Deep Water Moorings that will be deployed in the Timor Passage and Ombai Strait to monitor inter-basin Indian-Pacific Ocean exchange. The Darwin National Reference Station was also upgraded to provide real time data for currents and water quality.

Below: Location of the Indonesian Throughflow Shelf Transect Mooring and Darwin National Reference Station. (TIS= Timor South, MHB= Margaret Harries Banks, FTP= Flat Top Bank, JBG= Joseph Bonaparte Gulf, NRS= Darwin National Reference Station)



The AIMS Research Vessel *Solander*.



Assembling the mooring components on deck.



Deploying the moorings.

# IMOS Postgraduate Student Profile

Students using IMOS data for their postgraduate research

## Carlos Teixeira

South Australia Research and Development Institute,  
SARDI Aquatic Sciences

University of New South Wales,  
School of Mathematics and Statistics

Carlos is a Brazilian oceanographer, he finished a masters in Physical Oceanography, before moving to Australia to start a PhD at UNSW. He worked under the supervision of Associate Professor John Middleton at SARDI Aquatic Sciences.

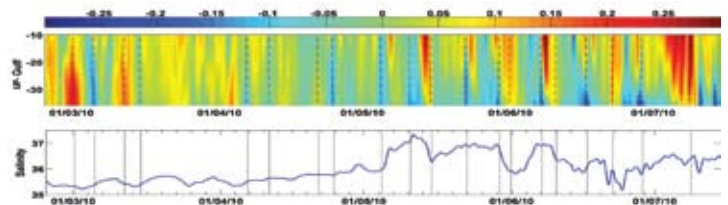
His PhD project focused on understanding the importance of winds, fresh water and net heat fluxes and tides to the circulation within Spencer Gulf, South Australia, and to the gulf-shelf exchange. While most of the investigation was done through numerical experiments using the Regional Ocean Model System (ROMS), the data from a Southern Australian IMOS (SAIMOS) mooring was used to validate the model results.

The Acoustic Doppler Current Profiler (ADCP) and Conductivity Temperature Depth (CTD) data from a mooring at the entrance to the gulf was fundamental to confirm that the gulf-shelf exchange is blocked during summer time and modulated by the spring-neap tidal cycle. The numerical experiments also showed that a series of eddies are created inside the Spencer Gulf and propagate to the shelf carrying very salty water. Again, SAIMOS data was essential to confirm the existence of these eddies.

In line with their Mediterranean cousins, Carlos and John suggest the eddies here be named Speddies.

Carlos and the oceanography team from SARDI hope that the data from the SAIMOS National Reference Station and a deep mooring located at the shelf break will help to identify how the eddies and the outflow from the gulf are transported on the shelf.

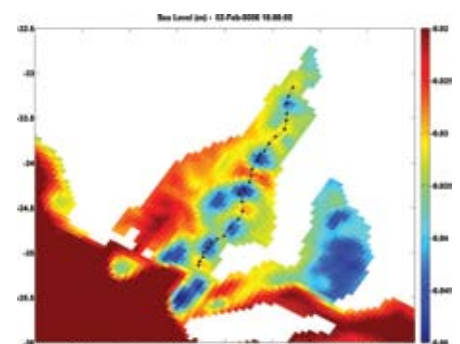
**Project:** Ocean Dynamics of Spencer Gulf: a numerical study



Top: Carlos Teixeira with one of the ADCP deployed at the region.

Above right: Preliminary results from an ADCP and a bottom mounted CTD at the entrance to Spencer Gulf.

Right: Sea Level simulated results showing the eddies within Spencer gulf and the exchange with the shelf.



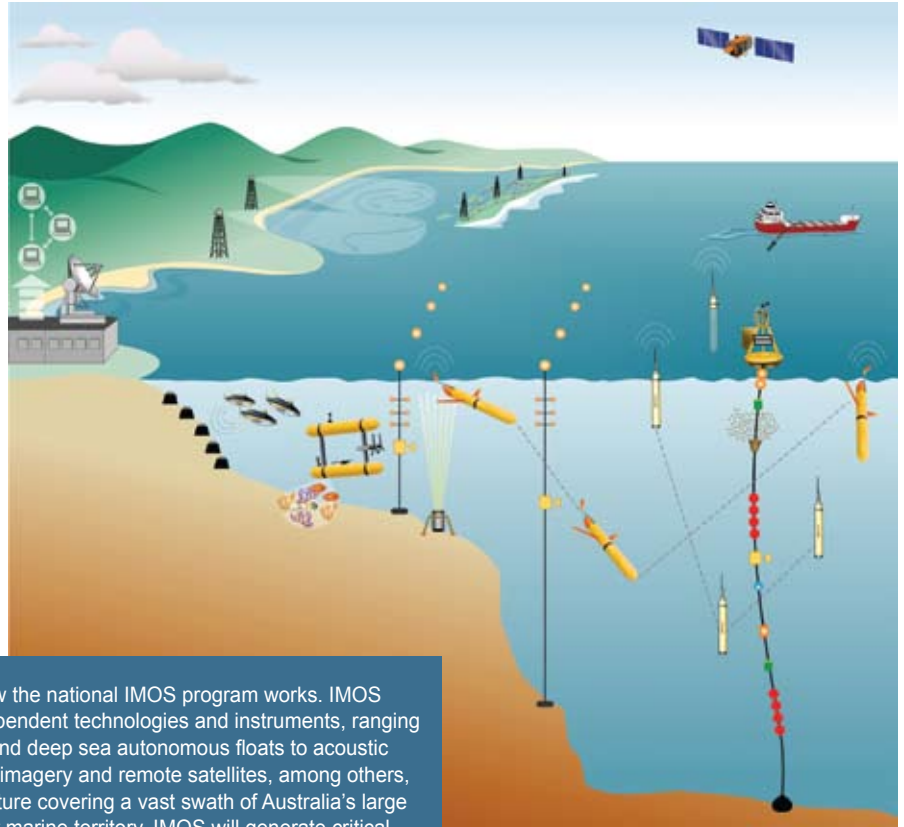


Diagram illustrating how the national IMOS program works. IMOS integrates several independent technologies and instruments, ranging from moored sensors and deep sea autonomous floats to acoustic tracking devices, radar imagery and remote satellites, among others, into research infrastructure covering 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.

For more information about IMOS please visit the website [www.imos.org.au](http://www.imos.org.au)

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Australian Government  
Department of Innovation  
Industry, Science and Research



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