marinematters

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Integrated **Marine Observing** System

IMOS News

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

Clive McMahon, Sydney Institute of Marine Science.

Elephant seal data highlighted in the new Nature journal 'Scientific Data'

IMOS data has contributed to a database of hydrographic profiles from tagged elephant seals in the Southern Indian Ocean.

Our understanding of Southern Ocean currents is limited by a lack of data, particularly in seasons and locations that are hard for ships to access. By affixing sensors to wild seals, the researchers have built a large database of temperature and salinity profiles, extending our knowledge of this key component of our planet's oceans.

The instrumentation of southern elephant seals with satellite-linked conductivity, temperature,and depth (CTD) tags has offered unique temporal and spatial coverage of the Southern Indian Ocean since 2004. This includes extensive data from the Antarctic continental slope and shelf regions during the winter months, which is outside the conventional areas of Argo autonomous floats and ship-based studies. This landmark dataset of around 75,000 temperature and salinity profiles from 20–140 °E, concentrated on the sector between the Kerguelen Islands and Prydz Bay, continues to grow through the coordinated efforts of French and Australian marine research teams.

Study co-author and Antarctic Climate and Ecosystems Cooperative Research Centre oceanographer Guy Williams says the seal data was "invaluable".

"This is a big step forward; they are taking observations where none exist and where none may ever have existed," he said. "This is an open data project, so it feeds the world's climate models; scientists rely on this data and the seals (fill) a gap."

To read the full paper visit http://www.nature.com/articles/sdata201428.

About the new Nature journal Scientific Data

The Nature Publishing Group launched their new journal Scientific Data earlier this year. The journal is an open-access, peer-reviewed publication for descriptions of scientifically valuable datasets. The primary article-type, the Data Descriptor, is designed to make data more discoverable, interpretable and reusable. http://www.nature.com/sdata

director's corner

Welcome to Marine Matters. As IMOS progresses through its ninth year of operation, the importance of partnering for impact is increasingly on show in the articles featured in this edition.

Back in 2009 and 2010, IMOS science and implementation plans were put through international peer review. We received a lot of great feedback and advice through this process, but the clearest and most consistent message was the need to partner more strongly with the coastal and ocean modelling communities. Since that time, IMOS has put in place a number of strategies to achieve this. The article on the second Australian Coastal and Oceans Modelling and Observations (ACOMO) workshop at the Academy of Science demonstrates just how far we have come.

As an *in situ* marine observing system, effective partnership with the research vessel fleet is vital for IMOS. We are all extremely excited about the commissioning of RV *Investigator* as the Marine National Facility's bluewater research vessel. *Investigator* will enable IMOS to recommence globally significant observing programs in the Southern Ocean and the East Australian Current. And as the 'flagship' of the IMOS Ship of Opportunity program, it will be collecting a wide variety of underway measurements every time it goes to sea – all available for discovery, access and use through the Ocean Portal.

The article on the Great Australian Bight Research Program shows how with IMOS in place, research and industry partnerships can be conceived and implemented at a much greater scale that ever before. Building on a systematic and sustained national marine observing system is much more effective and efficient that the traditional approach of starting from scratch, program by program, region by region.

International partnerships are also featured. There is an article on a *Nature Scientific Data* publication about an international collaboration that has built a Southern Indian Ocean database of hydrographic profiles obtained with instrumented elephant seals. It is also pleasing to report that at its most recent meeting in Paris, the Intergovernmental Oceanographic Commission (IOC) of UNESCO formally recognised IMOS as a Regional Alliance of the Global Ocean Observing System (GOOS). Australia obtains huge benefits from freely available ocean observations funded by other nations – satellite remote sensing data and tropical moored buoy data to name but two examples. It is great to see that our national efforts through IMOS, although quite modest at the global scale, are valued and appreciated by the international community.

On behalf of the IMOS Office and Advisory Board, I'd like to wish you and your families all the best for the festive season. IMOS thrives on the strength of its partners and the interest of its stakeholders, and your ongoing support is greatly appreciated.

Tim Moltmann

2013/14 Annual Highlights document published

The document covers the eighth year of IMOS operation, with a focus on the benefits of sustained observing across this time frame. IMOS is now mature enough to be contributing to the evidence base used in preparing periodic assessments of ocean state at national and global scales.

Using observations and data that simply did not exist before IMOS, new discoveries continue to accrue at a rapid rate. This is particularly true at finer scales where global effects translate into local issues of interest, as highlighted under the themes of continental shelf and coastal processes, and ecosystem responses.

Most fundamentally, some of the 2013-14 Annual Highlights give a real sense of how significant IMOS has become to the future of collaborative marine and climate science in Australia. IMOS is a complex system, and it takes the combined efforts of hundreds of people in multiple institutions around the nation to make it work on a daily basis.

Building on a reliable flow of new observations and data, science uptake and use continues to expand, through a large number of research projects and programs addressing priorities across a range of government, industry and societal needs. This provides hard evidence that IMOS is relevant and having impact in areas which are of significance to Australia as a 'marine nation'. The highlights for 2013-14 give us confidence that relevance and impact will further increase in coming years.

The Annual Highlights document is available from the IMOS website **http://imos.org.au/highlights.html**.

IMOS welcomes new Advisory Board members

The IMOS Advisory Board provides strategic guidance to the University of Tasmania, as the host and operator of the IMOS office, and monitors the overall strategic direction, management and performance of IMOS in accordance with the Funding Agreements. Recently the IMOS Advisory Board has seen a number of changes, and we would like to welcome the new members. The new IMOS Advisory Board membership is:

Dr Ian Poiner – Independent Chair

Professor Lee Astheimer – Deputy Vice-Chancellor (Research), Deakin University

Commodore Brett Brace – Royal Australian Navy, Hydrographer of Australia

Mr John Gunn – CEO Australian Institute of Marine Science

Mr Barry Hanstrum – Deputy Director Observations & Infrastructure, Bureau of Meteorology

Dr Ken Lee – Director ofCSIRO's Oceans and Atmosphere Flagship

Professor Pauline Mooney – Executive Director, South Australian Research & Development Institute

Professor Paddy Nixon – Deputy Vice-Chancellor (Research), University of Tasmania

Professor Robyn Owens – Deputy Vice-Chancellor (Research), University of Western Australia

Professor Peter Steinberg – Director and Chief Executive Officer, Sydney Institute of Marine Science

Mr Tim Moltmann – IMOS Director

Our thanks go to the following outgoing Board members, all of whom served with distinction – Professor Rob Lewis, Professor Jason Middleton, Dr Nick D'Adamo, Dr Peter Rogers, Dr Bruce Mapstone, and Commander Robyn Phillips.

Wrap up of ACOMO 2014

The second IMOS Australian Coastal and Oceans Modelling and Observations Workshop (ACOMO 2014) was held on the 7th and 8th October 2014, at the Shine Dome, Australian Academy of Sciences, Canberra. The meeting brought together over 80 participants from several organisations, including international representation and private industry, and was attended by Australia's Chief Scientist Professor Ian Chubb who closed the first day's session.

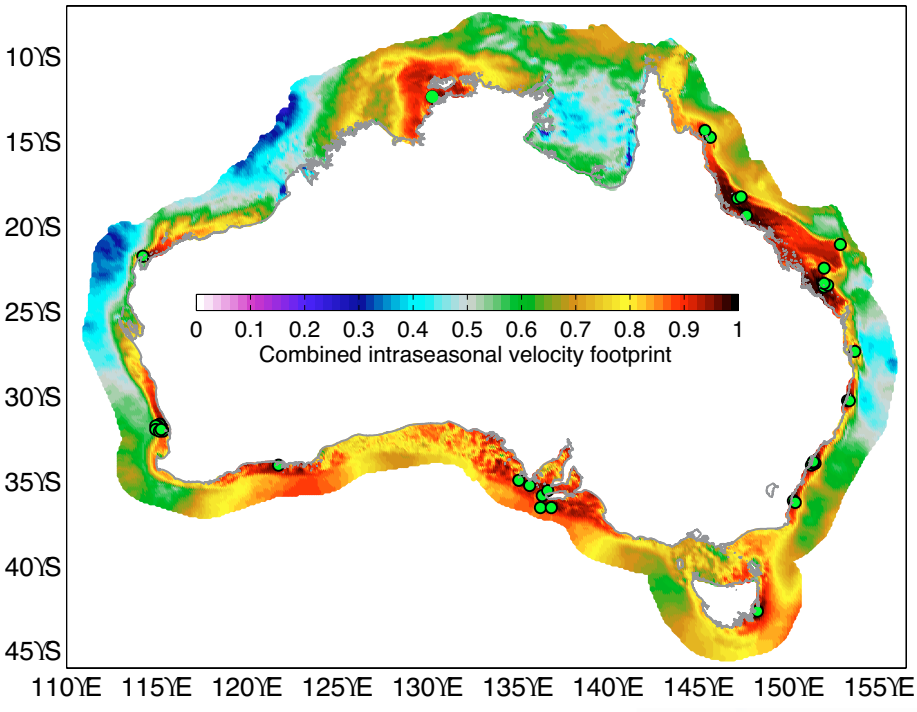
The purpose of the workshop was to keep encouraging and supporting the co-evolution and engagement between Australia's Integrated Marine Observing System and our national coastal and ocean modelling capability. It also provided an opportunity to update the community of the activities and developments accomplished in the two years since the inaugural 2012 ACOMO workshop.

The ACOMO 2014 workshop devoted a whole session on biogeochemistry and introduced a talk on ecosystem modelling. Another important topic included this year was the shelf reanalysis session, which outlined the exciting plan to undertake a whole of Australia shelf reanalysis project; The Australian National Shelf Reanalysis (ANSR) project. This project first piqued interest at the IMOS National Planning meeting in Hobart in February this year, and ACOMO 2014 provided the right forum to consult a wider community to further the planning process. The Bluelink Reanalysis (BRAN) is an open ocean product not designed for the continental shelf, and with a step change in availability of shelf observations through IMOS and related developments in regional ocean modelling capability within Australia, we have an unprecedented opportunity to provide new national products that will be of significant interest for marine industry planning and development, emergency response, maritime defence, and environmental management.

The remaining two sessions included in the workshop were: developments in coastal modelling and observations; and modelling toolkits. The coastal modelling session had presentations that covered the shelf all the way to harbours and gulfs. The modelling toolkit session included important information on the Marine Virtual laboratory (MARVL) and the Climate and Weather Science Laboratory.

Based on the level of attendance, the quality of talks and discussion, and feedback from attendees, the workshop was very successful. Progress made from ACOMO 2012 was palpable, and there is strong support for ACOMO 2016. There was much more biogeochemistry at the recent meeting and we will endeavor to stretch towards more ecosystem modelling at the 2016 event.

The workshop report can be found at **http://imos.org.au/acomo2014.html**.



Map of the "footprint" (showing correlation) of the IMOS moorings (green dots) for surface currents around Australia. A correlation of one implies perfect coverage, and a correlation of zero implies no coverage. This map demonstrates the coverage of IMOS observations for the new Australian National Shelf Reanalysis (ANSR) project. Adapted from Oke, P. R., P. Sakov, 2012: Assessing the footprint of a regional ocean observing system. *Journal of Marine Systems*, 105-108, 30-51, doi:10.1016/j.jmarsys.2012.05.009.

IMOS recognised as a GOOS Regional Alliance

The Intergovernmental Oceanographic Commission (IOC) of UNESCO formally recognised IMOS as a Regional Alliance of the Global Ocean Observing System (GOOS) in July this year.

At their 47th session the IOC Executive Council reviewed the recommendation of the GOOS Steering Committee to recognise the Australian Integrated Marine Observing System (IMOS) as a GOOS Regional Alliance. The Executive Council acknowledged the accomplishments of the Australian IMOS, welcomed the intention of IMOS to serve regional needs in addition to national programmes and recognised IMOS as a GOOS Regional Alliance.

Peter Dexter, Head of Australian delegation, thanked the Council and explained that, "the IMOS was established several years ago now, with largely Federal Government funding, to provide a multi-disciplinary, multi-institutional approach to enhancing the observation and understanding of the oceans for societal benefit, not just within the Australian EEZ, but extending to large open ocean areas in the Indian, Southern and south-west Pacific Oceans. It has been remarkably successful in its short lifetime to date, with all the data collected under IMOS being freely and openly available through the dedicated IMOS web portal."

The **Global Ocean Observing System** (GOOS) is a permanent global collaborative system for observations, modelling and analysis of marine and ocean variables to support operational ocean services worldwide. GOOS provides accurate descriptions of the present state of the oceans, including living resources; continuous forecasts of the future conditions of the sea for as far ahead as possible, and the basis for climate change assessments and scenarios. GOOS is sponsored by the Intergovernmental Oceanographic Commission (IOC), United Nations Environmental Programme (UNEP), World Meteorological Organization (WMO) and International Council for Science (ICSU), and is the ocean component of Global Earth Observing System of Systems (GEOSS). GOOS is implemented by Member States through their government agencies, navies and oceanographic research institutions working together in a range of global thematic panels and observing networks and regional alliances.

The Global Ocean Observing System (GOOS) Regional Alliances (GRAs) identify, enable, and develop sustained GOOS ocean monitoring and services to meet regional and national priorities, aligning the global goals of GOOS with the need for services and products satisfying local requirements. As an integral part of GOOS, the GRAs are tasked with adhering to the GOOS Principles (1998) of shared ocean observations, data policy, best practices and capacity development in their implementation of regional and national ocean observation systems.

IMOS Director Tim Moltmann says "We are very pleased about this decision, as it provides further evidence of the high value placed on the Australian Government's investment in IMOS by the international marine science community."

Deep ocean meets outer space at NCRIS showcase

IMOS and Astronomy Australia Limited (AAL) were among the capabilities on show at the NCRIS Showcase held in Parliament House on 30 September.

IMOS was showing off our IMOS Ocean Portal and a range of marine observing technologies, including Argo autonomous profiling floats. AAL featured a number of projects including the Australian Square Kilometre Array Pathfinder (ASKAP) which is a new radio telescope currently being commissioned at the Murchison Radio-astronomy Observatory in Western Australia. It is part of the international Square Kilometre Array project, which is building the world's largest and most sensitive radio telescope.

Tim Moltmann (IMOS Director) and Yeshe Fenner (AAL Executive Officer) conducted a symbolic exchange of Argo and ASKAP models.

Image: Professor Brian Schmidt

Looking up and looking down – Argo meets ASKAP at NCRIS showcase.

IMOS to redeploy important ocean observation equipment from the new research vessel RV *Investigator*

Australia's new Marine National Facility (MNF), the RV *Investigator*, is set to give ocean science a boost as it begins a series of voyages to deploy equipment crucial in measuring ocean currents, air-sea exchange, temperature, carbon and other indicators of ocean-climate interaction. IMOS will deploy sophisticated monitoring equipment in the ocean using the new national vessel.

'The *Investigator* is a highly advanced research vessel with a broad range of scientific equipment and IMOS is very excited to be one of the first to take advantage of it to carry out vital research.' Says IMOS Director, Tim Moltmann.

In March next year IMOS will redeploy deep-water moorings for climate and carbon cycle studies southwest of Tasmania. This Southern Ocean Time Series program facilitates investigation into issues of ocean physics and chemistry, climate change, carbon cycling and biogeochemical controls on marine productivity.

At the same time, IMOS will redeploy equipment to measure real-time meteorological and oceanographic conditions at the sea surface. Known as the Southern Ocean Flux Station, this mooring is located in sub-Antarctic waters 580km southwest of Tasmania. The station will provide data on air-sea heat and moisture changes, which, when combined with meteorological data, are essential for climate change research.

Later next year, *Investigator* will redeploy IMOS moorings to measure the full depth transport of the East Australian Current (EAC). This major boundary current influences climate, weather and biological productivity all along the heavily populated eastern seaboard.

'All of these programs were interrupted when RV *Southern Surveyor* came out of commission in late 2013, so there is much excitement about the science recommencing."

'The RV *Investigator* is also the flagship vessel in the IMOS Ships of Opportunity Program. Every time it goes to sea, regardless of the purpose of a voyage, it will collect wide range of underway observations for use by the IMOS community,' added Mr Moltmann.

Southern Ocean Flux Station prior to deployment.

Australia's new Marine National Facility (MNF), the RV *Investigator*.

Image: Tim Moltmann

Smart science supporting sustainable development of the Great Australian Bight

Written by Heather Riddell

A major research program on the marine ecosystems of the Great Australian Bight (GAB) was a "great example of the expanding use and value of the national Integrated Marine Observing System to Australian science and industry," according to IMOS director, Tim Moltmann.

Mr Moltmann was among leading marine and socio-economic scientists from around Australia who gathered at SARDI Aquatic Sciences near Adelaide on November 5 and 6 to review progress on one of the largest and most exciting whole-of-ecosystem studies to be undertaken in Australia – the Great Australian Bight Research Program.

Mr Moltmann said that significant data collections generated through IMOS and the Southern Australian Integrated Observing System (SAIMOS) would be used by many of the 100 GAB researchers to help understand the ocean's changing environment and its effect on marine organisms and animals.

More than 50 researchers from BP, CSIRO, SARDI, the University of Adelaide and Flinders University, met to share their research plans and early findings across the program's seven themes of oceanography, pelagic ecosystems, benthic biodiversity, apex predators, socio-economic analysis, petroleum geology and geochemistry, and integration and modelling.

The four-year $20 million program will improve understanding of the environmental, economic and social values of the Great Australian Bight.

In welcoming participants, Dr Rod Lukatelich, from BP, said all partners shared a common goal to better understand the GAB ecosystem to ensure informed and sustainable management of the region.

GAB Research Program Director, Dr Steve Lapidge, said a focus of the symposium was to ensure researchers from the program's seven themes were collaborating effectively and understood each other's research needs to ensure that the large program remains fully integrated.

"We have more than 100 researchers from several major institutions involved in this program and much of the success of each group's work depends on the knowledge being gathered by the Program's other research themes. At the end of the program, all the outcomes must be integrated into computer models of the entire Great Australian Bight ecosystem, so it is really important that we operate cohesively."

The Great Australian Bight Research Program is a collaboration between BP, CSIRO, the South Australian Research and Development Institute (SARDI), the University of Adelaide, and Flinders University.

Great Australian Bight Research Program researchers from SARDI, CSIRO, BP, University of Adelaide and Flinders University met at SARDI Aquatic Sciences last week.

Image: SARDI

IMOS data proves invaluable for understanding the EAC

IMOS observations are providing significant new insights into the variable nature of the East Australian Current (EAC). The EAC, off eastern Australia, is the complex and highly energetic western boundary current system of the South Pacific subtropical gyre.

The EAC is the dominant mechanism for the redistribution of heat between ocean and atmosphere in the Australian region. Changes in the dynamics and strength of the EAC due to large-scale forcing changes may potentially result in significant regional climate and marine ecosystem changes in the Australian region.

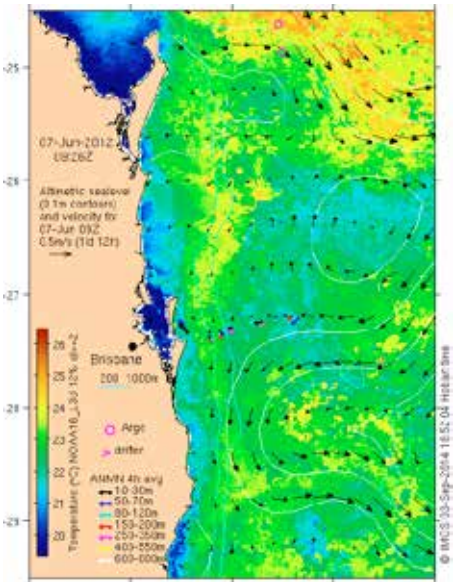
From April 2012 to September 2013, IMOS deployed seven full-depth ocean moorings off Brisbane, along a 200 km line from the continental shelf to the deep abyssal ocean. The moorings were lined with sensors recording temperature, salinity, nutrients and velocity of the current. The largest of the EAC moorings was located at a depth of nearly five kilometres below the surface. This was the first successful in-situ monitoring of the full depth transport of the EAC.

Analysis of the data from this deployment by Dr Bernadette Sloyan's team at CSIRO shows that the EAC during this 18-month period had a mean southward transport of 25.3 Sv (1 sverdrup = 10^6 m^3 s^{-1}) and southward heat flux of 1.6 PW (1 petawatt = 10^{15} W). The IMOS mooring data also show that the location of the EAC is highly variable, the EAC can be found at any location along the mooring line and that it can move position rapidly.

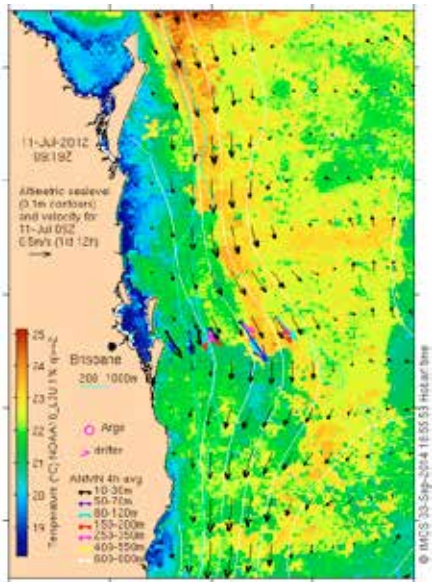
Data from this mooring deployment, released earlier this year, are proving to be rich with interesting features.

IMOS *OceanCurrent* observed a month-long anomaly in June-July 2012 where the EAC was not flowing along the continental slope, as noted in a news item posted by Dr David Griffin (CSIRO). This event was monitored in real-time by satellite observations of low sea level, low surface temperatures and high chlorophyll, which all show that the flow of the EAC was displaced offshore by a cyclonic eddy. What the EAC mooring data reveal is that on 7 June the flow velocity off Brisbane suddenly dropped from normal values to near-zero, where it stayed until 11 July. During that period of near-zero flow along the 2000m isobath, the flow farther offshore at the other instrument moorings swung from shoreward on 21 June to northward on 2 July then to seaward on 4 July before turning south on 11 July and accelerating to speeds in excess of 1m/s by 15 July. The satellite data show that this sequence of events can be explained by the movement of the cyclonic eddy that in early June was centered more than 100km NE of the array but then moved west and subsequently south, passing through the array in early July then continuing along the continental slope.

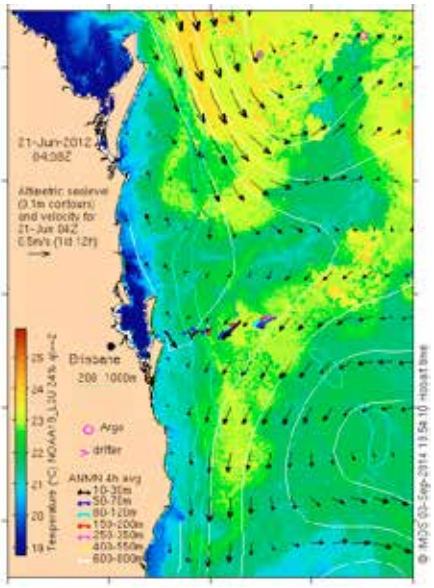
7 June



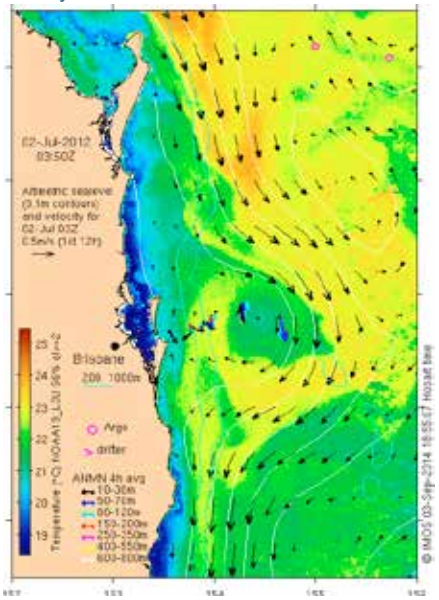
11 July



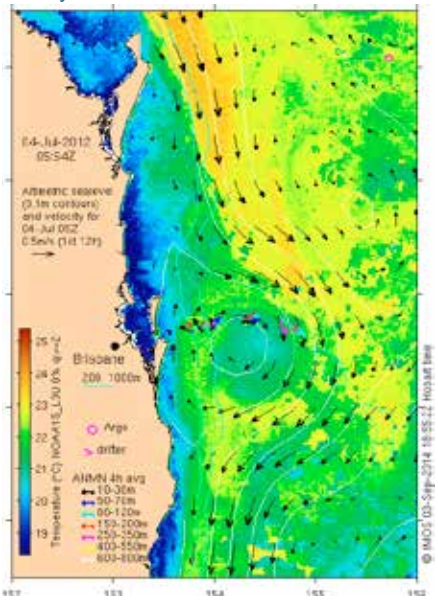
21 June



2 July



4 July



IMOS *OceanCurrent*

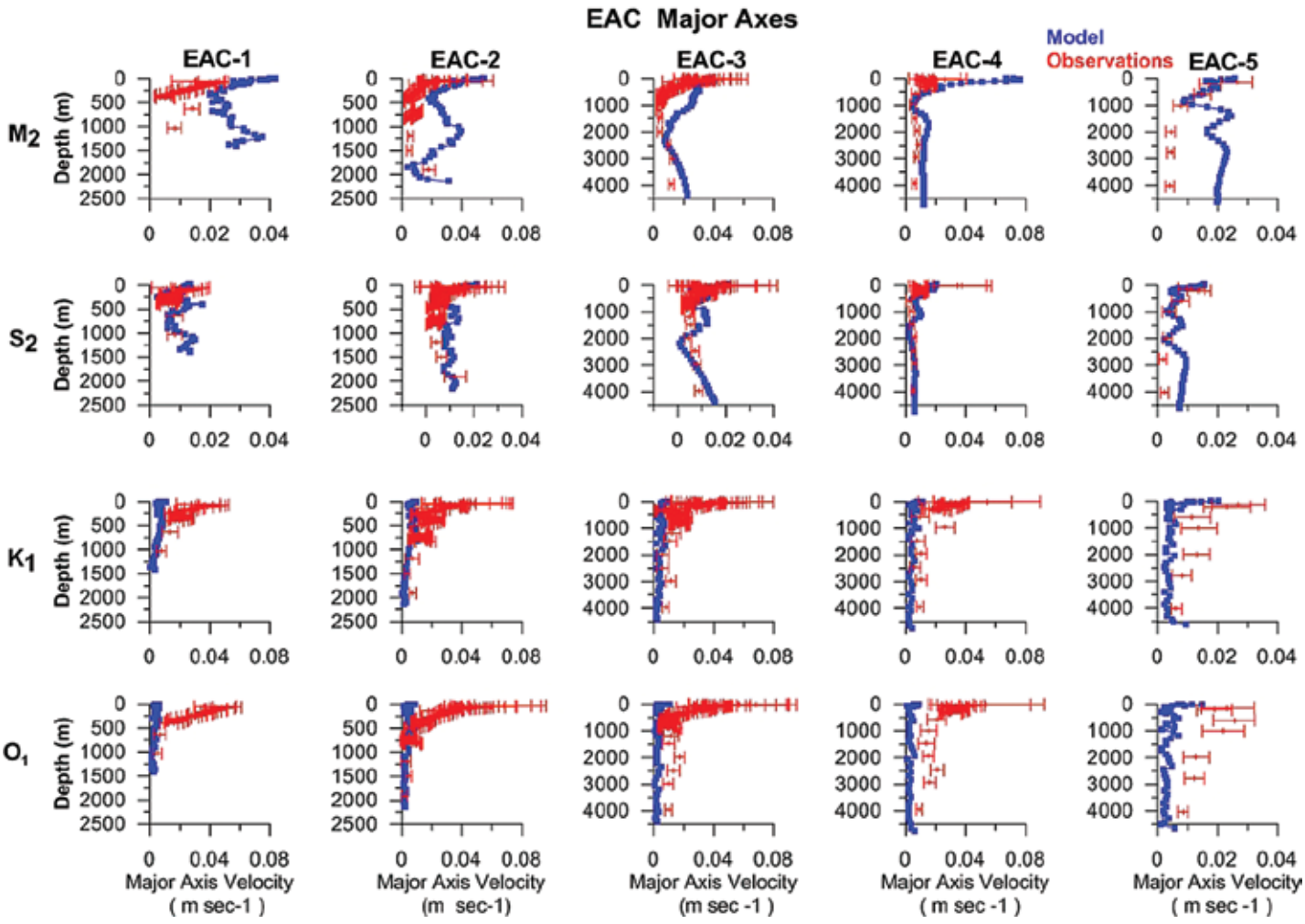
Continued from page 8 ...

Dr Robin Robertson, Senior Lecturer in Oceanography at the University of New South Wales, Canberra has used the data for validating ocean models. To improve forecasting in coastal waters, high-resolution coastal simulations are being implemented with the Regional Ocean Modelling System (ROMS). Vertical mixing is of key interest in these simulations due to their influences on cross-shelf transports, dense water flows, nutrient replenishment, formation of tidal fronts, and other processes. Much of the vertical mixing is attributed to internal waves and tides.

Tidal changes are the net result of multiple influences that act over varying periods. These influences are called tidal constituents. Robin simulated the internal tides of the different tidal constituents for a region off Eastern Australia using ROMS and climatological data, and compared them to IMOS observations from five of the EAC moorings. She found that the model (blue in the figure below) agreed reasonably well with the observations (red), particularly for the semidiurnal constituents (M_2 and S_2) (upper two rows in the figure below). The model overestimated tidal velocities below 1000 m. Agreement was generally better for the diurnal constituents (K_1 and O_1) (lower two rows in the figure below) below 500 m.

These 'world first' EAC transport observations can now be used to address several major sources of model error; ocean processes that are not included in the model; the difference between the climatological data used in the model and the observational data; the model resolution; and finally the variability of the EAC itself are not included in the model.

We will continue to watch with interest as the data obtained from the IMOS EAC mooring array is used by numerous researchers, both in Australia and overseas, to increase our understanding of the complexities of this globally significant western boundary current.



Comparison between model results (blue) and observations (red) for the major axes of the tidal ellipses for the four major tidal constituents (M_2, S_2, K_1, and O_1) at the 5 EAC moorings. Image: Robin Robertson.

SAIMOS: Watershed cruise for SAIMOS

Written by Heather Riddell

The Southern Australian Integrated Marine Observing System (SAIMOS) team has reached a major milestone with the successful completion of their 50th research cruise.

Cruise leader, Paul Malthouse, says the expedition covered more than 500 nautical miles in four days collecting detailed oceanographic data in the shelf waters of the eastern Great Australian Bight. The data adds to the invaluable knowledge bank which the SAIMOS program has been building since it began in 2008.

The $9.4 million program, which is part of the national Integrated Marine Observing System (IMOS), was established by the South Australian Research and Development Institute (SARDI) and Flinders University.

The program has deployed a range of cutting edge infrastructure off the coasts of Southern Australia to gather information on the role of the Southern Ocean on our climate, ecosystems and seafood production. The technologies being used include sub-surface ocean gliders, shelf moorings, ship-based surveys, High Frequency RADAR arrays and animal borne instruments.

"We started in 2008 with no capability, and have now developed significant field capability in Southern Australia," said SAIMOS program leader, Associate Professor John Middleton. "We are also the only State-based institution that has mounted this length of self-run cruises, and we are very proud of this milestone.

"Fifty cruises represents a huge amount of physical and biological oceanographic data that are now being used for scientific studies that weren't even envisioned when the program started.

"For example, it has enabled the development of a hydrodynamic model that is now supporting the sustainable expansion of finfish aquaculture in Spencer Gulf.

"It will also provide critical baseline information to help in the formulation of the new $20m Great Australian Bight Research Program which is building a greater understanding of the GAB ecosystems. Ongoing SAIMOS data will underpin crucial components of the Program by helping researchers understand how ocean circulation, currents and waves impact ecosystems and food webs."

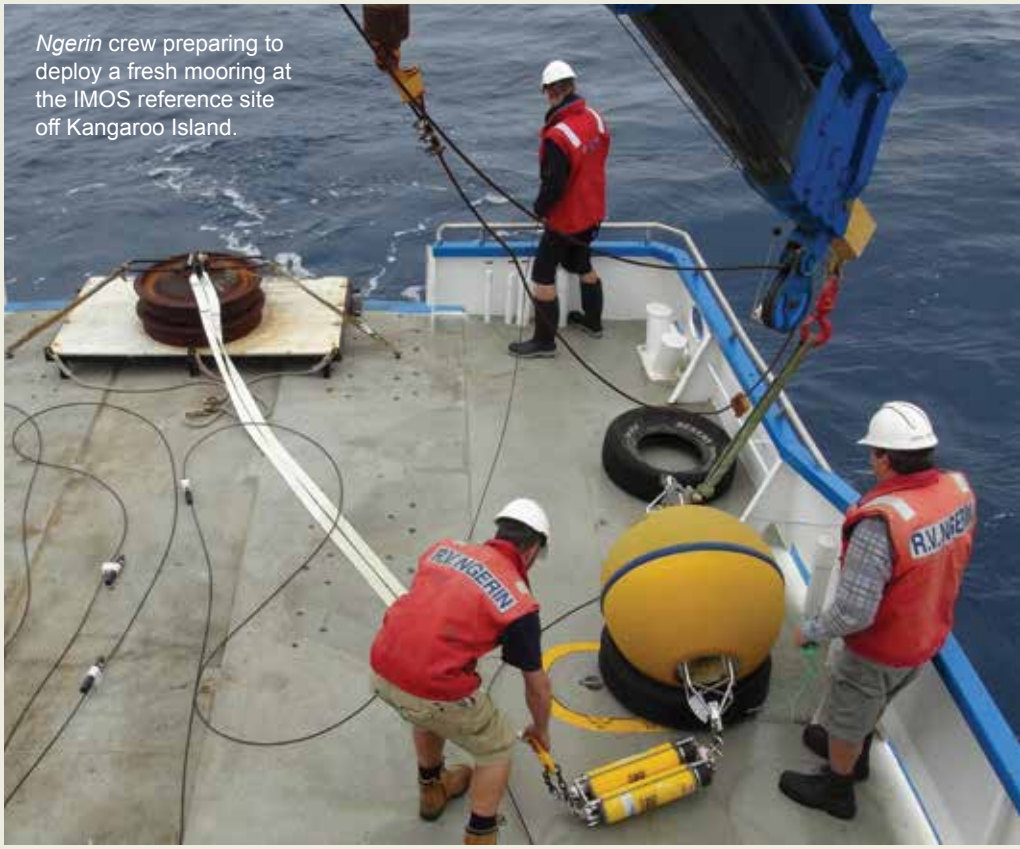
Mr Malthouse said the cruise was one of six conducted each year.

"On this cruise we retrieved the IMOS Reference Station mooring located about 15 km off the west coast of Kangaroo Island. The mooring has been collecting continuous data on water currents, temperature, pressure and salinity at a depth of 100 metres since it was deployed there in May 2014.

"Another crucial component of this mooring is an instrument at 40 metres depth that has been collecting information on fluorescence, temperature, salinity, irradiance (available light), turbidity and dissolved oxygen at depths where the water column mixes nutrients from the lower layers into the surface mixed layer. This zone is where biological activity is usually at its highest."

"From programs like SAIMOS we can create long term data sets of ecologically important physical, chemical and biological parameters," added Mr Malthouse.

"The system we are creating is right up there with international best practice, and the information it provides will benefit the public and scientific communities by providing vital information to our decision makers into the future. That will in turn provide better management of our 'Blue Economy' here in South Australia and nationally.



Ngerin crew preparing to deploy a fresh mooring at the IMOS reference site off Kangaroo Island.

Image: SARDI

NSW-IMOS: Workshop of science using data from the Port Hacking National Reference Station

The NSW Node ran a workshop at Sydney Institute of Marine Science (SIMS) in early August focused on science being undertaken using the Port Hacking National Reference Station and related sampling programs. The quality and diversity of presentations was very impressive, ranging from 'maths to microbes'. The workshop provided a very good demonstration of how reliable, functional marine research infrastructure can be used creatively by the science community to study a wide variety of important topics. The crucial role of the NSW Office of Environment and Heritage (OEH) as an operational partner was clearly evident, and IMOS is looking to strengthen this relationship by providing some support to enable OEH's state-of-the-art RV *Bombora* to be used as the platform for Port Hacking sampling on an ongoing basis.

focus on facilities

Facility 4: Ocean Gliders

Gliderscope Version 5 Released

A new version of the Ocean Glider Facility's data-visualising software is now available for download.

The software, called Gliderscope, has received an update following recent data-processing improvements, which have resulted in the move to the latest NetCDF-4 format and the incorporation of additional scientific data. This latest update of Gliderscope is able to manage the new as well as old formats of ocean glider data.

Additionally, users will now be able to extract data and export it as text or NetCDF files, using its user-friendly interactive graphical interface.

Gliderscope v5 is available for Windows and Macintosh platforms. Additionally, a Matlab App version of the software has also been introduced for for the first time.

Free downloads of Gliderscope v5 are available from: http://imos.org.au/anfog_data.html

Facility 6: Australian National Mooring Network (ANMN)

Hobart hosts another successful QC summit

Written by Carlie Devine

For those not familiar with our QC summit the aim is for scientific, technical and operational staff – that is those actively involved in collecting and quality controlling the data – to get together to discuss the issues, swap methods and network to produce better data.

The summit in November played host to speakers from various platforms across Australia, including CSIRO, the Australian Institute of Marine Science (AIMS), the University of Tasmania, the University of NSW, the South Australian Research and Development Institute (SARDI) and the Environment Protection Authority Victoria (EPA).

This was our fourth QC summit and our discussions were wide ranging. A formal report will be published on the IMOS website but some first impressions were the good progress made with developing QC procedures. In particular the ADCP and profiling CTD working groups have rapidly maturing processes. The influence of written and published methods was also obvious with Morello et al 2014 becoming the conceptual bed rock of not only the ANMN QC but also more widely within IMOS. This sort of consolidation of methods and approaches could provide a way forward for the program to achieve better QC.

We had a huge turnout this year with over 40 attendees over the three day round-table event. With twenty presentations and workshops, it provided a unique opportunity for roll up your sleeves, hands on collaboration with presentations on ADCP operations in the south-west W.A sub facility, a Bio-optics workshop and profiling CTDs, a toolbox training session for the people doing the processing of the Matlab Toolbox, an AIMS deployment database presentation and a capital replacement gear workshop.

A summaries and conclusions document by Dr Tim Lynch will be forthcoming, in the meantime you can access this year's presentations via the IMOS website http://imos.org.au/qcsummit2014.html

Image: Carlie Devine, CSIRO

IMOS Plankton Team teaches zooplankton identification

Written by Mark Tonks

On the 16th October, Julian Uribe and Mark Tonks from the IMOS Plankton Team provided a 1-day zooplankton identification workshop to staff from the Sydney Water Corporation and the Sydney Institute of Marine Science (SIMS). The workshop was held at Sydney Water, West Ryde NSW.

This opportunity arose because Sydney Water Monitoring Services were looking to further develop their identification of zooplankton in the marine pelagic environment. Traditionally, Sydney Water has monitored the composition of benthic marine and freshwater biota in relation to water quality. In doing so, they have been able to successfully develop a significant list of bio-indicator species for these environments.

The purpose of the Workshop was to provide attendees with the ability to identify free-living zooplankton to at least the taxonomic level of Order. We also provided information about how to go about identification to family and species level. It was an interactive workshop that included theory followed by practical microscopy sessions using preserved zooplankton samples collected from IMOS National Reference Stations. A considerable part of the Workshop focused on identifying micro-crustaceans (particularly copepods) and gelatinous plankton such as jellyfish, arrow worms, pelagic tunicates and the barrelled shaped doliolids and salps.

The feedback provided by the attendees was very positive. Participants felt that their identification of marine pelagic zooplankton improved substantially and has therefore enabled them to provide a more holistic service to stakeholders. Sydney Water has indicated a desire to continue developing their marine zooplankton taxonomic capability. Discussions are under way for the IMOS Plankton lab in Brisbane to host Sydney Water marine analysts for several days in 2015. During this visit it is intended that they experience pelagic zooplankton sampling and identification techniques associated with the IMOS National Reference Stations. The fostering of plankton taxonomic skills by IMOS – needed for provision of plankton time series – has enabled these skills to be passed onto a wider community.

Workshop participants. Credit: Adrienne Gatt, Sydney Water.

Facility 7: Ocean Radar

Ocean radar on the move

The University of Western Australia (UWA) became the operating institution for the IMOS Ocean Radar Facility (Australian Coastal Ocean Radar Network- ACORN) from 1 October 2014.

Professor Lucy Wyatt, the current ACORN Facility Leader at James Cook University (JCU), is returning to the UK. This has precipitated a change in arrangements. UWA is an experienced operating institution, having run the IMOS Ocean Glider Facility since 2006-7, and will now also operate the HF Radar Facility. UWA is in the process of recruiting a new Facility Leader in Perth, and assembling a team of technical and support staff.

"We're very sorry to see Lucy leave Australia" says IMOS Director, Tim Moltmann. "She's done a fantastic job over the last few years and we hope to maintain active collaboration with her when she returns to the University of Sheffield."

"We'd also like to express our thanks to the technical and support staff at JCU. Arnstein Prytz and Dan Atwater have been with ACORN from the beginning, and their efforts have been instrumental in establishing an Ocean Radar Facility in Australia. Robyn Nickalls has provided sterling support to the team for many years. We wish them all the best for the future."

Paul Lethaby (ACORN Technical Officer) is already based at UWA and will continue working with the Facility. Dan Atwater will continue to work with ACORN until the end of 2014 during which time he will help to train and pass on his expertise to the new team. Andrew Middleditch has just started as the new Data Officer and Jim Pettigrew will be joining the team in early December. Andrew comes with WERA and signal processing expertise and has worked with Lucy over many years. Jim has worked for many years with SeaSondes in California.

The ACORN team have worked hard to ensure that all six ocean radar sites continued to operate during the transition period, though any faults and breakdowns may take a little longer to resolve until the new arrangements are fully bedded down. Enquiries should be sent to acorn-ecm@uwa.edu.au

Professor Lucy Wyatt

ACORN launched at UWA

Written by Agi Gedeon

On November 21st the University of Western Australia welcomed the ACORN Facility with a launch and workshop event.

A broad cross-section of around 50 people attended, including scientists, and a number of government and industry users. Winthrop Professor Charitha Pattiaratchi kicked off the morning with an introduction to IMOS and its international links, and presented a few examples to highlight the value of sustained ocean observations and the sometimes serendipitous discoveries that the IMOS data have enabled.

Professor Lucy Wyatt summarised the history of ACORN and its roots in the work of Mal Heron at JCU. Lucy then presented some examples of applications of HF radar both internationally and in Australia and of potential future deployments.

The UWA Deputy Vice-Chancellor of Research, Professor Robyn Owens, a recently appointed IMOS board member, then officially launched ACORN on behalf of UWA. After morning tea there were a number of presentations on the scientific applications of radar data.

Topics covered included the applications of radar data on coastal waters, the effects of wind forcing on surface currents, eddy formation and critical latitude, global phased array systems and trajectory modelling for emergency response.

The final presentation from Murray Burling of RPS APASA on the use of the radar data for Search and Rescue and dealing with accidental spills generated quite a lot of interest. This is an important example of the development and uptake of IMOS data into the operational sphere.

Image: Yasha Hetzel

Andrew Middleditch (Data Officer), Chari Pattiaratchi, Dan Atwater (ACORN TO), Lucy Wyatt, Robyn Owens (UWA DVCR), Paul Lethaby (Technical Officer).

Facility 11: eMarine Information Infrastructure (eMII)

Do you ever wonder about what types of data you can download from the IMOS Ocean Portal?

Better, easier and simpler! We're very excited to show you the new "faceted search" function of the IMOS Ocean Portal. Grouping similar types of measurements together means that finding and downloading data is now easier than ever.

We're proud to announce a significant and exciting enhancement to the IMOS 1-2-3 Portal.

You can now navigate your way through available IMOS datasets using comprehensive menus of parameters, organisations and collection platforms to narrow your search. We've used faceted menus to group our free, online data collections into related, intuitive classifications that make it easy for you to pinpoint the data you are looking for, and to quickly see other related datasets that might interest you.

Visit **http://imos.aodn.org.au/** for free and open online access to Australian marine data.

IMOS Postgraduate **Student Profile**

Students working with IMOS for their postgraduate research

Jamie McWilliam | **Project:** *Shallow water soundscapes*

Jamie preparing to deploy acoustic recorders at Lizard Island, on the Great Barrier Reef.

Centre for Marine Science and Technology, Curtin University

The aim of Jamie McWilliam's PhD research is to investigate the ecological importance of soundscapes in coastal marine ecosystems and establish their relevance for marine monitoring and management initiatives.

Marine soundscapes have recently acquired a significant amount of research interest and are now listed as a high research priority by several international committees, including the European Commission.

It has been frequently suggested that local soundscapes play a key role in the life processes of several marine organisms, including fish. Yet, there has been limited work developing and applying appropriate monitoring techniques to comprehensively investigate any relationship between a marine soundscape and fish communities at appropriate spatial and temporal scales.

Data for this work will be collected using an integrated survey system consisting of autonomous acoustic recorders, underwater video and sonar. Primary field work will be carried out at Wireless Sensor Network at Lizard Island on the Great Barrier Reef, and at sites along Western Australia.

Field data and previously collected long-term acoustic datasets will be linked with site-specific IMOS datasets and analysed to investigate potential environmental drivers of marine soundscapes and fish choruses.

The IMOS 'circle diagram' which is designed to be read from inside to out, illustrates how the system is operated by selected institutions but available for use by the entire community through open data access, generating a wide range of outputs that are relevant across portfolios and sectors.

The diagram has five layers:

1. IMOS at the core,
2. the eight operating institutions,
3. the broader research community,
4. various pathways for uptake and use of IMOS data and products, and
5. portfolios of relevance and impact.

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

IMOS is a national collaborative research infrastructure, supported by Australian Government. It is led by University of Tasmania in partnership with the Australian marine and climate science community.

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