marinematters

IMOS

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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**

Satellite data gets a brighten up

University of Tasmania researchers have re-analysed long-term satellite ocean colour observations for the Southern Ocean which are supported and hosted by Australia's Integrated Marine Observing System (IMOS), bringing new insights into the ocean at high latitudes and significantly improving the sophistication of remote sensing technology.

Measuring changes in microscopic plant life in the ocean provides a critical indicator of the productivity of the ocean – its capacity to support fish and plant life. The best measure is chlorophyll, the key to photosynthesis in all plant life.

To achieve accurate chlorophyll measurements over vast and sometimes challenging areas, satellite remote sensing of chlorophyll concentrations is widely recognised as the most effective way to measure changes in phytoplankton levels.

The ocean's changing colour signifies changes in the quantities of phytoplankton, and by indicating how chlorophyll concentrations change over large areas year-to-year, satellite ocean colour data can be used to improve our understanding of the ecology and biogeochemistry of the ocean and the impact of climate change over time.

However, at high latitudes (closer to the poles) the algorithms that underlie the most-used satellite products start to become inaccurate.

The satellites are also on a wider angle to the earth and must 'see' though a deeper wedge of atmosphere. As well, in these areas, seasonally low light and other environmental factors influence the way that phytoplankton package chlorophyll within their cells. The unique conditions of some of these regions, like the Southern Ocean in particular, challenge the technology.

While allowances and corrections for these factors are made, they have not generally been sufficient, and the ocean colour products generated by satellite remote sensors have significantly underestimated how much chlorophyll is present.

The team's new algorithms correct the significantly underestimated chlorophyll levels at high altitudes, making data more reliable and useful in ecosystem modeling.

Researchers recently have assessed and improved the algorithms of the three main ocean colour products (see Satellite Ocean Sensor box on page 2) and have developed a way to compensate for these factors, to generate a more accurate reading of chlorophyll than previously possible.

University of Tasmania researcher Robert Johnson from the Institute of Marine and Antarctic Studies used long-term observations from the Southern Ocean to develop a processing method that has higher sensitivity and can detect a wider range of chlorophyll.

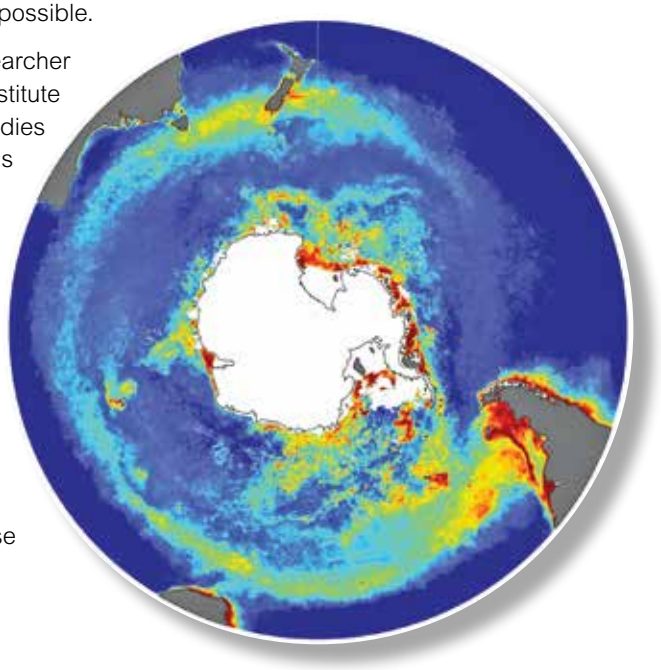
"We can now see how chlorophyll changes with the seasons and over longer time periods far more accurately, because our new algorithms give us a higher level sensitivity in these regions."

The team's new algorithms correct the significantly underestimated chlorophyll levels at high altitudes, making data more reliable and useful in ecosystem modeling.

"Ocean colour remote sensing is our most effective tool for understanding ocean ecology and biochemistry in difficult to access locations like the Southern Ocean," he says.

"High latitude oceans are of particular interest because they are the most remote and difficult to sample, but are also potentially the most sensitive to climate change."

Continued on Page 2



A summertime snapshot of phytoplankton chlorophyll blooms in the Southern Ocean and Antarctica, NASA MODISA data modified as per Johnson et al 2013. Photo by Robert Johnson.

director's corner

Welcome to Marine Matters. I'm pleased to advise that as part of the 2013-14 Budget, the Australian Government announced additional funding for the renewal of the National Collaborative Research Infrastructure Strategy (NCRIS). The renewed NCRIS will provide $185.9 million from 2013-14 to 2014-15 to secure Australian researchers' access to current major research facilities and the supporting infrastructure and networks necessary to undertake world-class research. And that includes IMOS!

IMOS has been allocated a further $18.4M from the renewed NCRIS which is in addition to the $7.2M already allocated under CRIS. Together with monies carried over from 2012-13, we now have a level of funding that will enable us to operate the program at something close to full strength over the next two years. This is a wonderful outcome given the overall fiscal climate. Our sincere thanks go to staff in the Innovation Department's Research Funding and Infrastructure Branch who worked tirelessly to articulate the benefits of continued investment in NCRIS. And thanks to all in the IMOS community for doing such a great job. The Australian Government has been compelled to invest because we're delivering high quality research infrastructure and using it to do great science. Let's keep it coming.

This edition includes stories on improved ocean colour products for the Southern Ocean, and new resources for plankton researchers, highlighting the benefits of building and hosting long term datasets and integrating data from multiple sites and sampling platforms. It also has a theme of rising to the challenges of working in the marine environment, with stories about reoccupation of the Lucinda Jetty Coastal Observatory after Cyclone Yasi, and recovering a valuable ocean glider from a chartered fishing vessel in rough conditions.

Finally, there's a small item on recent changes in leadership of IMOS Nodes that I'd like to emphasise: Chari Pattiaratchi (WAIMOS), John Middleton (SAOMOS) and Moninya Roughan (NSW IMOS) are all stepping down as Node Leaders. It's great to see some new people stepping up and getting more involved, and Chari, John and Moninya will all continue to be a part of IMOS through the gilder and mooring Facilities. However it's important to recognise the fantastic contribution they've made. Collectively, they have been a big part of the leadership as IMOS has grown from a great idea to a powerful national collaboration, and we couldn't have done it without them.

Tim Moltmann

Satellite data gets a brighten up *Continued from Page 1*

In some areas like the Southern Ocean, Robert Johnson says, conditions are entirely different to other areas and have different optical and biological properties, and these also need to be accommodated in the algorithms.

"Because the Southern Ocean also has distinctive properties, developing regional algorithms should also improve our ability to detect the response of phytoplankton to climate change, which is a long-term goal of NASA's ocean colour project."

These re-processed Southern Ocean datasets are supported and hosted by Australia's Integrated Marine Observing System where they are available for download and use.

www.imos.org.au/sensingoceans.html

Satellite Ocean Sensor

Satellite images used in ocean research rely on colour as an indicator, and are produced from data remotely sensed a great distance away. Accounting for interference from the atmosphere and the water is an important part of creating accurate images. It is also important to allow for different aquatic environments, which all have their particular properties depending on the season and the time of day.

SeaWiFS Sea-viewing Wide Field-of-view Sensor: examine oceanic factors that affect global change and to assess the oceans' role in the global carbon cycle, as well as other biogeochemical cycles, through a comprehensive research program.

MODIS-Aqua MODerate-resolution Imaging Spectroradiometer: a key instrument on aboard the ocean-observing satellite hosted by NASA.

GlobColour Long time series ocean colour data merged from three other satellite data sources.

Left: Claire Davis and Ryan Crossing from CSIRO attach a Niskin bottle for sampling at the Ningaloo NRS. Image courtesy Tim Lynch, CSIRO.

New National Reference Station biogeochemical database

Marine scientists now have a new tool to assess changes in marine ecosystems, with a new collation of biogeochemical data now available from Australia's Integrated Marine Observing System (IMOS).

The IMOS National Reference Stations are a network of water sampling sites and moorings at nine locations around Australia, collecting information about the physical, chemical and biological properties of coastal and ocean waters (see box at right).

The data collected over the past decade from a suite of monitoring stations around the Australian coastline, will be valuable for scientists interpreting seawater changes and likely impacts on marine life.

Until recently, the water samples used for biogeochemical analysis collected from the reference stations have been uploaded to the central IMOS data portal individually after analysis and at centralised labs by multiple analysts. The sampling field log sheets, containing important sampling metadata (dates, times, locations), have also been uploaded separately to the IMOS web portal by the various sampling teams.

According to IMOS project manager Claire Davies, from CSIRO, past separation of the data and metadata streams meant analysis across samples has required time-consuming manual manipulation to combine individual data to create usable time-series datasets.

"We have created a database that aggregates all the plankton data, and we can now expand this so that all of the biogeochemical data is combined into a single complete biogeochemical database," Claire explains.

"We have also developed an easy-to-use data entry and search interface, so that laboratory analysts and field samplers can enter their data directly and all the data will be available and searchable to via the data entry interface," she said.

"The real value of this system is in the integration of all the data sets, so that access is via a single repository."

According to Claire the advantages are –

- The delivery of data to eMII is streamlined with automatic, daily update of the webserver making the data immediately available. This removes the need of individual analysts to upload several Excel worksheets manually.
- Each group has been doing separate quality control checks according to their data. These will now be standardized across the full data set and will be fully documented.
- All sampling data are now linked to their metadata.
- Analysis across the data is now easily achievable; sample data can be queried across time frames, across stations and across taxa.
- Manual errors and time to manipulate Excel data sheets to match across samples have been removed.
- The data are stored and backed up via the CSIRO data centre.

The National Reference Stations are part of the IMOS Australian National Moorings Network, coordinated nationally and distributed between several sub-facilities.

www.imos.org.au/anmn.html

Australia's National Reference Stations

The National Reference Stations provide baseline information needed to understand how large-scale, long-term change and variability in the global oceans are affecting the ecosystems of Australia's coastal seas.

Such long-term observations (over 10 yrs) are particularly sparse in the Southern Hemisphere, so in an effort to address a paucity of sustained observations, Australia's Integrated Marine Observing System (IMOS) supported by a network of institutional partners, has developed a network of nine National Reference Stations (NRS). This coordinated network of sites is unique for a coastal monitoring system deployed at a continental scale.

The goal is to develop a time series of the physical and biogeochemical properties of Australia's coastal seas over several decades, to inform research into ocean change, climate variability, ocean circulation and ecosystem responses.

The expanded biogeochemical sampling program has, for the first time, allowed for consistent continental-scale sampling of the diversity of coastal zooplankton and phytoplankton.

Before IMOS, existing reference stations were simple waypoints where regular boat-based water samples were taken. Moored instrumentation at these sites and expansion of the biogeochemical sampling has significantly improved the quality and quantity of data that can be collected and used to inform management.

All NRS data is freely and publically available via the IMOS OceanPortal.

What zooplankton is that?

Australian Marine Zooplankton: a taxonomic guide and atlas

Zooplankton are a fascinating, diverse and abundant group of animals living in water bodies throughout the world. It encompasses all the major invertebrate phyla, as well as bony fish as larvae.

Because they are the principal diet of most larger ocean animals, including commercially important fish, studying zooplankton is essential for a complete understanding of how marine ecosystems function. Zooplankton also drive our cars and ensure our lights remain on; oil and natural gas deposits are formed from dead zooplankton that have been subjected to extreme heat and pressure over millions of years.

Historically, Australia has had little zooplankton time series data, compared with the other countries, including many developing nations, which have zooplankton times series spanning more than 15 years in 30 countries.

The longest ongoing times series in Australia is two years and given its diversity of marine habitats and the economic and social importance of fishing, Australia is impoverished in its long-term zooplankton datasets.

The IMOS Australian Continuous Plankton Recording (AusCPR) and National Reference Station projects have helped to change this, by providing data from all around Australia.

The AusCPR survey measures plankton communities as a guide to the health of Australia's oceans. It is part of the IMOS Ships of Opportunity facility, and is jointly operated by CSIRO and the Australian Antarctic Division. There are nine National Reference Stations and there are physical, chemical and biological information collected monthly, augmented by detailed environmental data from moorings.

What started out as a quality control initiative to improve the zooplankton data streams within IMOS, has culminated in an easy-to-use guide of zooplankton identification for novices, including students and those from the aquaculture industry, and experts alike.

Project leaders, Kerrie Swadling from IMAS and Anthony Richardson from CSIRO, say that identifying zooplankton can be a challenging task, because traditional keys have usually been designed for users with a high level of expertise.

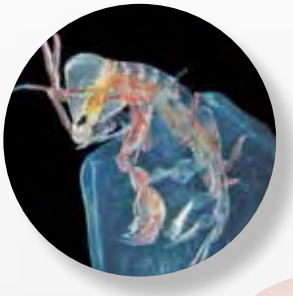
"This online guide allows even beginners to identify a specimen to the major group and species level via an image-based key," Kerrie says "and it also caters for more experienced practitioners who might want to go directly to detailed taxonomic sheets."

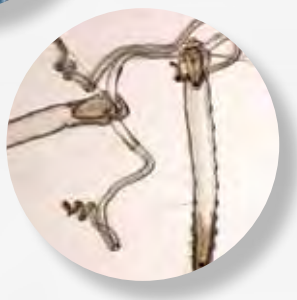
There are two options for accessing information: for those new to zooplankton identification, images help to home in on a particular group and where possible a particular species; for those with more zooplankton experience, species-level taxonomic sheets describe diagnostic characteristics.

Both options provide access to downloadable species-level taxonomic sheets that not only have taxonomic information, but also include excellent photographs, diagrams, distribution maps, information on ecology and key references.

The Atlas is an ongoing work in progress, and will be continually updated, building on feedback from other scientists. Whether you are a beginner or an expert in zooplankton ecology, the website has something for you. Take a look – http://www.imas.utas.edu.au/zooplankton/home – you will be amazed at the stunning images and diversity of lifeforms in the zooplankton!

www.imas.utas.edu.au/zooplankton





Images courtesy Anita Slotwinski, CSIRO.

news from the nodes

There have been a number of recent changes in leadership of IMOS Nodes:

- WAIMOS: Gary Kendrick (UWA) replaces Chari Pattiaratchi as Node Leader and Ming Feng (CSIRO) replaces Jamie Oliver as Deputy.
- NSW IMOS: Martina Doblin (UTS) steps up as Node Leader with Moninya Roughan stepping down. Robin Robertson (UNSW/ADFA) and Tim Ingleton (NSW OEH) join us as Co-Deputy Leaders.
- SAIMOS: Simon Goldsworthy (SARDI/Flinders) replaces John Middleton as Node Leader.
- IMOS Office: Jess Tyler has joined IMOS as Communications Manager, replacing Frances Hutchinson.

Sincere thanks go to Chari, Jamie, Moninya and John for their strong contributions to the leadership of IMOS over a number of years. Fortunately, all of them are staying involved in others roles.

These changes reflect both a natural evolution within IMOS, which is entering its eighth year of operation, and a reflection of the Advisory Board's desire to see greater separation between Node Leadership and Facility Leadership/Operator Representation. It is pleasing to see a number of new people being willing to take on leadership roles and share the load across our national collaboration.

AATAMS National Workshop 2013

13-15 November 2013, Brisbane and Stradbroke Island

We have great pleasure in inviting you to attend the 4th AATAMS acoustic telemetry workshop at the University of Queensland and Stradbroke Island research station 2013.

The Australian Acoustic Tagging and Monitoring System (AATAMS) together with major sponsor Vemco is once again hosting an acoustic telemetry workshop that will bring together a wide range of acoustic telemetry users from across Universities, government organizations and industry from Australia and abroad.

This workshop will incorporate the Vecmo acoustic telemetry roadshow as well as a key-note address from the director of the Ocean Tracking Network (OTN) Fred Whoriskey from Dalhousie University CA and of course a wide variety of acoustic telemetry talks from around the nation.

The workshop will include hands-on teleosts and elasmobranches tagging surgery, presentations by the Australian community, Vemco staff tuition and open discussions on acoustic telemetry related topics and data visualization products as well as how to use the AATAMS national data base and much more.

Vemco will introduce their newest products and discuss current limitations and potential improvements of this technology.

If you are interested in attending this event please fill in the registration form and send them to the AATAMS team by the due date outlined on the forms.

If you are interested in sponsoring this evert as a major or minor sponsor please contact the AATAMS team before the 1st of September 2013.

aatams@sims.org.au

Queensland: Lucinda Jetty back on line

The Lucinda Jetty Coastal Observatory has recently come back online after a lengthy outage following cyclone Yasi in 2011.

The IMOS gear had been safely stowed before the event, but the jetty wasn't so lucky, needing a significant overhaul by site operators Queensland Sugar Limited.

With that completed (August 2012), the IMOS facility is now up and ready to begin satellite remote sensing, acquiring both above-water measurements of water radiance and in-water measurements of optical properties.

The data it collects will help to identify inaccuracies in remotely sensed satellite ocean colour products that are caused by the optical complexity in coastal waters and the overlying atmosphere.

Located nearly 6 km out in an ideal location at the junction of a river, a channel, lagoon and coast, the Lucinda Jetty Observatory is in the right place to provide data on a variety of habitats.

Validating and improving the accuracy of remotely sensed observations will increase reliability and precision in applications such as water quality monitoring.

IMOS project leader Vittorio Brando, from CSIRO, coordinated the deployment in partnership with QSL and the successful installation was completed by barge in late mid April 2013, with the instrumentation now operational, despite some frustrating delays.

"We knew that we needed very specific weather and tide conditions," he says "so the project was planned well in advance and with the major variable being wind."

"Limited opportunities were available to re-install the instrumentation, as the right combination of high tide, low wind and calm water didn't present often."

"We have a close relationship with QSL and we are extremely appreciative of their efforts in assisting us to complete the project."

The IMOS Lucinda Jetty Coastal Observatory will become the pre-eminent source of measurements for the validation of coastal-ocean colour radiometric products applied to biogeochemistry and climate studies in Australia.

Validating and improving the accuracy of remotely sensed observations will increase reliability and precision in applications such as water quality monitoring.

The Lucinda Jetty Coastal Observatory with CSIRO technicians working on the final touches, with Hitchenbrook island as the backdrop. Image courtesy CSIRO.

Out on a limb

The Lucinda Jetty Coastal Observatory is located on the end of the 5.8 km long Lucinda Jetty in the coastal waters of the Great Barrier Reef World Heritage Area close to the Herbert River Estuary and the Hinchinbrook Channel. The bulk sugar terminal is operated by Queensland Sugar Limited. The facility is so long the construction actually follows the curvature of the earth. Through QSL's generous support, the Jetty is an ideal location for IMOS to sample a broad range conditions.

New South Wales: retrieval of seaglider 130 nm off Jervis Bay

A crew with 'The Right Stuff' braved night and sea to save a very important glider from being lost at sea, thanks to local fisherman at Jervis Bay.

IMOS Seaglider 516 seemed to be on track for an orderly recovery somewhere close to Jervis Bay recently: its ability to glide across a strong ocean current was being used to the full to get it out of a warm core eddy off southern NSW.

Suddenly, however, the battery voltage dropped faster than expected, making glides to depth in a chosen direction impossible. Disabled, the glider drifted at the surface with the current, being pushed back towards the centre of the eddy by strong winds that also made recovery impossible.

Faced with the very real possibility that the glider would follow a nearby satellite-tracked surface drifter off into the Tasman, NSW-IMOS elected to charter a fishing vessel and make an overnight trip out to the glider as soon as conditions were suitable.

The strategy paid off and the glider was retrieved early in the morning, 130 nm from shore.

Here's what David Griffin had to say about the dedicated team:

"Zooming out on a boat at short notice (and staying up all night sending info off into the silent ether) is the sort of dedication that is really uplifting to see."

"Losing that glider would have been a real body blow to the whole program, so I thank Neptune we have people like you with The Right Stuff."

The errant glider is now safely back in captivity and will be reunited with the cradle and crate at the UNSW oceanography lab.

Image courtesy Amandine Schaeffer.

Hide and seek game for ocean heat

A significant but elusive chunk of the Earth's energy budget missing for some time in our climate models might have been found, thanks in part to the first decade of deep ocean data gathering by the IMOS Argo Australia program.

Operated by CSIRO, the Argo Australia program is part of an international venture that has operated more than 3500 high-tech floats throughout the world's oceans over the past decade, providing detailed data on a scale not seen before and at new depths in the ocean.

Until now, researchers have struggled to explain why the warming trend which has been most notable since the 1970s appeared to taper off after 2004 in some studies. This was at odds with observations that the Earth was continuing to trap more energy than it released back to space and according to scientists the usual heat-sink culprit, the near surface ocean, wasn't responsible.

Data for this surface layer of the ocean, to around 700m, was not showing enough warming to balance the amount coming in. This mis-match became known as 'missing heat' and its whereabouts has been hotly discussed.

Armed with the unprecedented coverage Argo provides for deeper waters between 700 m to 2000 m, scientists have recently been able to re-do their calculations, discovering that the missing heat is not missing at all, but has rather been absorbed by this deeper layer.

The data also revealed that large natural events like El Niño contribute to temporary periods of cooling of the surface waters – which may have explained the tapering off in the overall energy budget at around 2004. How these cycles reorganize the ocean's heat uptake is still being explored.

The recent discovery has pointed to the likely importance of deep ocean 'layers' in setting rates of global warming, providing climate scientists with a better understanding of the ocean-earth-atmosphere system.

Combined, the findings point to an important interplay between the deep and surface waters and the atmosphere.

According to Argo Australia program leader Susan Wijffels from CSIRO, the findings demonstrate the value of the new observing technology and the power of long-term data sets to be a game-changer for climate science.

"Argo's global reach and its consistent measurement of the ocean down to 2000m allows us to explore the different processes that drive the stop and start nature of the significant rise in upper ocean heat content that we have seen over the past 50 years. Until recently the role of the deep ocean in this picture has been invisible to us."

IMOS Postgraduate **Student Profile**

Students working with IMOS for their postgraduate research

Robert Johnson

University of Tasmania

Data is provided by the Australian Antarctic Division and was collected on several Antarctic field campaigns.

Robert's work looks at the microscopic life that lives in the sea – the phytoplankton. His specialty and experience is in bio-optics, phytoplankton physiology and pigments, and bridging the gap between small-scale phytoplankton and broad-scale oceanography.

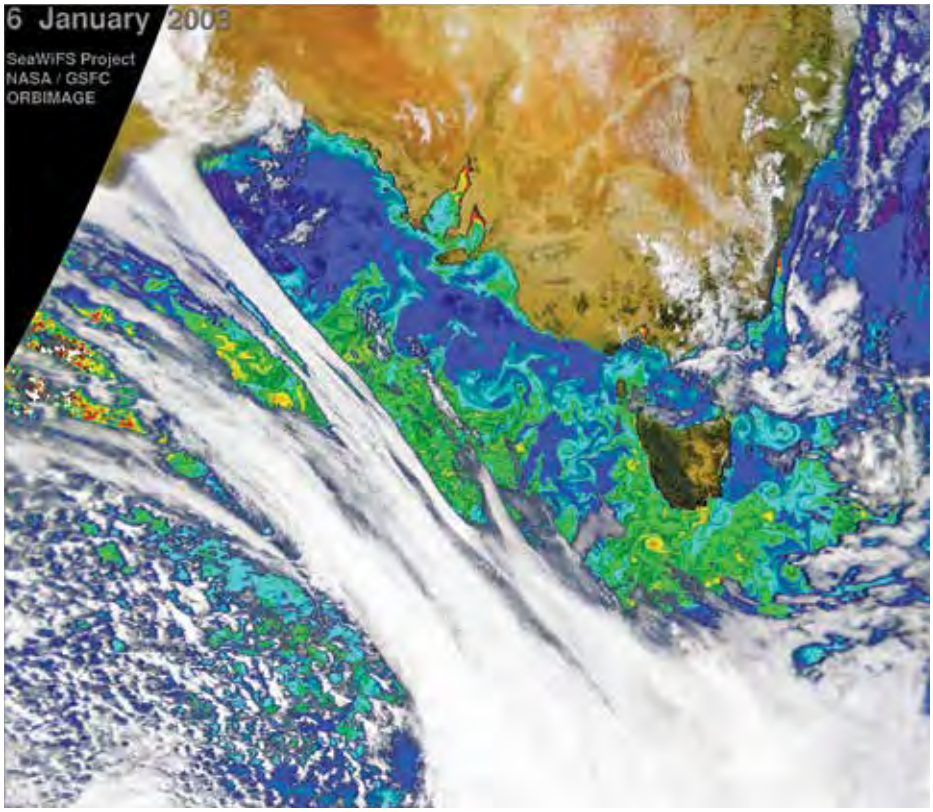
The central focus of his work is using and assimilating a long term, that is >10 years and continuing, biological and oceanographic dataset to describe the distribution, abundance, health and productivity of Phytoplankton in the Southern Ocean south of Australia.

His most recent work describes the development of three regional satellite chlorophyll algorithms, using two NASA satellites and one European satellite, each specifically tuned for the Southern Ocean.

Through this work we are gaining unique insights that have never before been possible into how and why the Southern Ocean is biologically and optically different. Through his PhD he has developed robust and highly accurate methods to capture this uniqueness at the synoptic scale.

Robert's work looks at the microscopic life that lives in the sea – the phytoplankton.

Project: *Effects of climate change on phytoplankton primary production and chemotaxonomy in Southern Ocean and Antarctic ecosystems*



Top right: UTAS PhD student Robert Johnson in an Antarctic 'selfie'.

Bottom right: A view from space of the large phytoplankton blooms possible in the waters around Tasmania. Image courtesy NASA GSFC Ocean Colour Image Gallery.

Catalyst celebrates *Southern Surveyor*

If you're a physicist, you want a particle collider. If you're an astronomer, you probably like very large telescopes. And if you're a marine scientist in Australia, you need at least one of these – an ocean-going research ship.

That's how the story about the illustrious career of the RV Southern Surveyor began on ABC's 'Catalyst' airing on 1 August 2013.

Mark Horstman from Catalyst, and his film crew went onboard RV *Southern Surveyor* to film the departure of the ship on an IMOS moorings voyage led by CSIRO's Tom Trull.

The show included contributions of video and photos from around the country, from past and present users of the Marine National Facility, and the story was a broad look at the people who've used the ship, places it has gone and the science been undertaken since the ship came into service, first for CSIRO and then the Marine National Facility.

It was an excellent showcase of how IMOS carries out its work and how many people contribute to bringing about successful voyages.

"IMOS and the Marine National Facility are two essential components of Australia's marine research infrastructure that work in tandem," said IMOS Director Tim Moltman.

"Surveyor has been the flagship of our Ship of Opportunity fleet, and we simply couldn't have implemented our Deepwater Moorings program without her. She's been a great workhorse, but the day has come and we're all very excited about the prospect of seeing *RV Investigator* sail into Hobart."

The retrospective story has been a great collaborative effort across a wide range of institutions and organisations, which has been wonderful to see.

www.abc.net.au/catalyst/stories/3816267.htm

Launch of CSIRO Biosecurity Flagship

CSIRO has created a Biosecurity Flagship, to bring scale and connectivity to help Australia prepare for and prevent the spread and impacts of pests and diseases. IMOS was involved in organising a workshop in Tasmania on marine biosecurity, and showcased its leading edge observing platforms and sensors.

IMOS was well represented, with talks by IMOS Director Tim Moltmann and Scott Bainbridge (AIMS) and attendance by Stefan Williams (SIMS/USyd) and Roger Proctor (UTAS).

Tim Moltmann welcomed the new organisation, saying "it's great to see consideration being given to marine biosecurity. Too often, it is out of sight, out of mind."

Image courtesy CSIRO.

CSIRO's major biosecurity effort

Historically, Australia's strong quarantine measures and geographic isolation have protected us from some of the most serious impacts posed by exotic pests and diseases circulating around the world. But, the movement of plants, animals and people across the globe and a changing climate are placing pressure on Australia's future ability to protect itself from these exotic pest and disease threats.

To address these challenges, last month CSIRO launched the Biosecurity Flagship, to bring scale and connectivity to help Australia prepare for and prevent the spread and impacts of pests and diseases.

According to Gary Fit, Biosecurity Flagship Director, the new Flagship brings a national perspective and focus on the science needed to tackle the major biosecurity challenges that are facing Australia.

www.csiro.au/biosecurityflagship

$37M SeaSim opens in Townsville

An aquarium that mimics conditions in the open ocean, providing ideal conditions to study the long-term effects of ocean warming, water acidification and dredging, among other changes, has been welcomed by Australian scientists.

Minister for Innovation, Industry, Science and Research Senator Kim Carr and Senator for Queensland Jan McLucas opened the National Sea Simulator (SeaSim), at the Australian Institute of Marine Science (AIMS) in Townsville in 2 August 2013.

The $37 million experimental sea simulator will enable Australian scientists to recreate ocean conditions and study how both human activities and natural events will affect our marine environment in the future.

SeaSim research will focus on topics including climate change, coral bleaching, pest management, sediment and pollution, and seawater technologies.

The Rudd Labor Government provided more than $27 million for SeaSim through the Education Investment Fund, with AIMS also investing close to $10 million in Commonwealth funding to the project.

www.aims.gov.au/seasim

Image: John de Rooy Photography © AIMS.

AMSA highlight for Andrew Boomer

At the AMSA Jubilee conference in July this year, the 2013 AMSA Technical Awardee prize went to Andrew Boomer, Operations Manager of the IMOS Australian Animal Tracking and Monitoring System (see box at right), recognizing his outstanding achievements in the field of technical support to marine science in Australia.

Andrew's role as Operations Manager is overseeing the System's network of 1275+ acoustic receiver stations at 14 locations around Australia. It encompasses deployments, servicing, retrieval and maintenance of the network and provides data to 2000 registered receivers, 120 users, 60 research projects and 40 student projects. Recently, the database recorded its 28 millionth hit.

His work involves a high level of technical competence, working under hostile conditions and needing very high levels of safety – diving in shark infested murky waters, grappling moorings at 3 am in 55 Kn winds, to punishing 14-hour days in frigid Tasmanian waters.

"Not only does Andrew perform an outstanding job in maintaining the network, he devotes many hours advising researchers – from senior academics to government scientists to early career students."

Over and above this, reads the citation, Andrew has voluntarily spent hundreds of hours ensuring that projects worked efficiently and successfully.

Andrew was first appointed in 2008 and since then has made "an outstanding technical contribution to marine science in Australia, in the field, at the desktop and around the meeting room," says the citation.

"It is Andrew's unique ability to innovate and deliver 'in-water' solutions and the engage a large community of science collaborators and to see the data collection through, to availability/uptake/use that makes his achievement truly outstanding.

National Science Week Explore the Seafloor a runaway success

AS part of National Science Week 2013 IMOS and the ABC partnered up in a citizen science project aimed at identifying kelp and sea urchins in images of the seafloor.

This job is normally done by research assistants and is time-consuming and laborious. In Explore the Seafloor on the ABC's website, the crowd-sourcing approach to reduce this workload and asked regular folk to get involved and help the scientists with their research work.

And it worked, with 6400 people signing up to catalogue 130,000 images.

According to IMOS project coordinator Stefan Williams, while he is working through the data to assess its quality, he said it "… should present a nice complement to some of the analysis that has already been done by our partners."

Scientists from research centres and universities around Australia have collaborated to develop Explore the Seafloor with ABC Science, creating an informative website where citizens can register, learn to identify what's in the photos and submit their observations to the research group. The institutions that have collaborated include University of Sydney, University of New South Wales, University of Tasmania, University of Western Australia, James Cook University, AIMS and CSIRO.

www.exploretheseafloor.net.au

The Australian Animal Tagging and Monitoring System

The Australian Animal Tagging and Monitoring System (AATAMS) is one of ten facilities of the Integrated Marine Observing System (IMOS). AATAMS represents the higher biological monitoring of the marine environment for the IMOS program.

- Form a national network and increase collaboration between tracking researchers.
- Invest in over 500 permanent, strategically located receivers (VR2Ws and VR3s) to maximise national benefit and form a continental array with existing infrastructure.
- Lead the Southern Hemisphere section of an internationally coordinated Marine Animal Tracking program: Ocean Tracking Network (OTN).
- Act as a central repository for data from collaborating institutes and researchers around the Nation.
- To assess climate change in the Southern Oceans.

AATAMS is set up to collect data over a long period of time. This sustained approach will enable researchers to assess the effects of climate change, ocean acidification and other physical changes that affect animals within the marine environment.

Currently AATAMS monitors the coastal and oceanic movements of marine animals from the Australian mainland to the sub-Antarctic islands and as far south as the Antarctic continent.

A large range of fish, sharks and mammals are collecting a wide range of data including behavioural and physical data such as the depth, temperature, salinity and movement effort of individual marine animals.

This data is freely available via the IMOS Ocean Portal and can be combined with data from the other IMOS facilities.

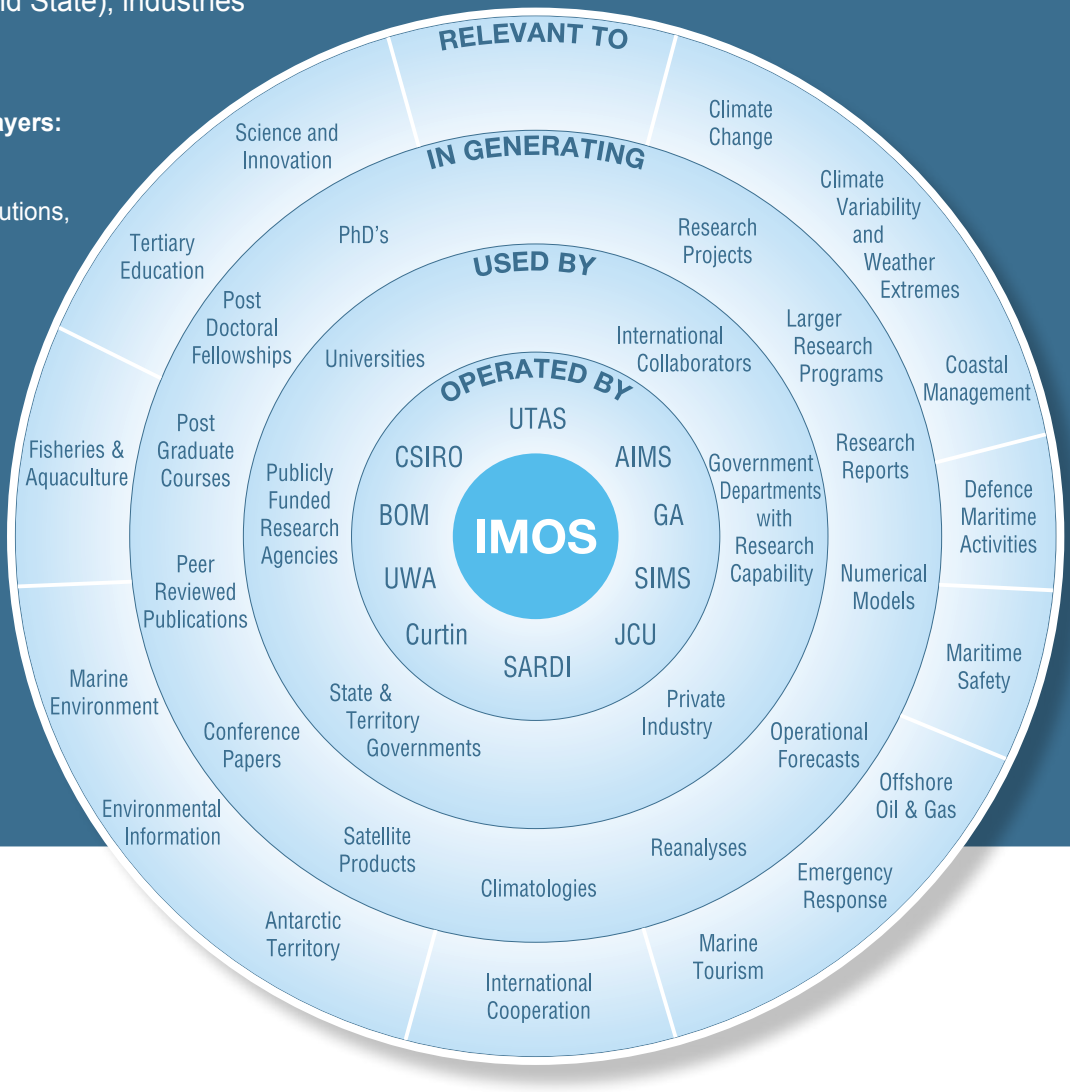
www.imos.org.au/aatams.html

IMOS has brought the Australian marine research community together on a national scale, to work towards common goals. This collaboration is providing important benefits to Australia, through world-class research and support for a strong marine industry sector. (IMOS annual plan)

IMOS has developed a 'circle diagram' to capture the complexity of engagement for IMOS as a broadly based research infrastructure program delivering to a national community, undertaking research of relevance across government portfolios (Federal and State), industries and communities.

The diagram has five layers:

1. IMOS at the core,
2. the ten 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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