

highlights
2019-2020



IMOS Integrated **Marine Observing** System

Enabling research that delivers benefits across Australian society, its environment, and its economy.

Director's Overview

In our 14th year of operation the Integrated Marine Observing System (IMOS), and our community, have weathered some significant changes. However, we have collectively continued to strive for excellence in the delivery, use and uptake of the IMOS program and this document celebrates the highlights and our achievements.



As IMOS grows and evolves we continue to move from strength to strength as our operations, data streams and outputs mature and increase in their relevance. Active monitoring of the use and users of our data outline the breadth of our community, the applicability and value of the observations we produce and reflect the strength of our partnerships. Our collaborative approach, high data quality and commitment to making our observations accessible underpin our outstanding national and international reputation.

Despite the disruptive events of the 2019-2020 year, which included extensive bushfires and the start of the global corona virus pandemic, the IMOS community rallied to continue to deliver ocean observations which are critical to numerous elements of Australian life and wellbeing. IMOS observations support weather and climate modelling and forecasting, help inform ocean conditions relative to maritime operations by industry and Defence, define dynamics related to food security and biodiversity conservation and facilitate scientific research into these areas and more.

IMOS strives for continual improvement through exploring the potential of new technologies to improve our observing capability and test new ways to deliver data for use by researchers, industry, managers, policy makers and the general public. As we enter the United Nations Decade of Ocean Science and look toward 2030, IMOS will continue to deliver ocean observations for the benefit of Australia and our regional neighbours who share our oceans.

I would like to take this opportunity to thank all of our partners, collaborators and supporters for helping make IMOS successful. I hope you enjoy seeing some of the highlights of 2019-2020 and look forward to what we can collectively achieve in 2020-2021.

Michelle Heupel
IMOS Director

For more information on IMOS Highlights for 2019-2020 please visit bit.ly/IMOSHighlights19-20.

Observing the Impact of IMOS

As a research infrastructure IMOS delivers high quality marine and climate data to Australia's scientists, students, industries and other stakeholders for their use in research and operational activities. IMOS data is taken up and used thousands of times, creating impact and benefits at local, national and global scales. IMOS measures impact in two ways: through our **societal benefit** and through our more proximate **research infrastructure impact**.

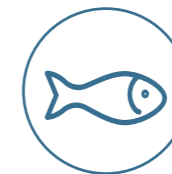
IMOS Societal Benefit

Australia has an expansive marine estate, which influences many aspects of our social, cultural and economic lives, and the environment in which we live. The importance of our marine estate is reflected in the range of areas where it intersects with areas of societal benefit. IMOS has identified five areas of societal benefit where our observations and data can produce value for Australia.



Coastal populations

Infrastructure • Industry • Populations
• Tourism • Human health



Food security

Fishing • Aquaculture
• Recreational fishing • Agriculture



Energy security

Oil and gas industry
• Renewable energy: terrestrial and ocean



Marine sovereignty, safety & security

Ports and shipping • Indigenous Australians and sea country • Border security and defence
• Search and rescue • Regional security and aid



Biodiversity conservation & management

Threatened species • Monitoring & assessment • Environmental obligations
• Biosecurity • Marine Protected Areas

Research Infrastructure Impact



Scientific

Be a national and world-leading research infrastructure and an enabling facility to support science excellence.



Technology and Innovation

Provide high quality scientific data and associated services, to underpin and enable innovation.



Training and Education

Promote educational outreach and knowledge transfer to support the next generation of marine and climate scientists.



Economic and Community

Support regional, national and international communities, industries and clusters of scientific excellence.



Social

Promote and support social responsibility within and beyond Australia's marine observing system.

IMOS Highlights 2019-2020

A new global ocean wind speed and direction database from the IMOS Surface Waves sub-Facility is available on the AODN Portal. The dataset can be applied to studying the impacts of extreme wind speeds, the effect of climate change on weather conditions, ship routing, feasibility studies for offshore wind projects, and assisting with the design of coastal and offshore structures.



IMOS was one of the only ocean observing systems in the world to maintain coastal radar observations and data delivery during COVID-19 shutdown periods. The IMOS ocean radar systems map surface currents and provide a valuable tool to monitor coastal currents for use in research and operational oceanography.



A decade of IMOS ocean glider data has revealed a unique water transport process along Australia's continental shelf, called Dense Shelf Water Transport. The slow-moving process provides an effective mechanism for the transport of water, heat, salt, phytoplankton, nutrients and pollutants from shallow coastal regions into the deep ocean.



Satellite tracking of marine predators in the Southern Ocean has revealed key ecological areas that are experiencing disproportionate pressure from human activities. The tracking data, including marine predators tracked by IMOS, provides strong evidence for the ecological importance of existing and proposed Southern Ocean marine protected areas.



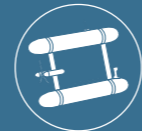
The AODN and National Mooring Network Facilities have created several new user-friendly time series products. The data products, which aggregate long time series data from each site, ensure the wealth of IMOS coastal mooring data from over 60 sites is more accessible to scientists, students and other stakeholders for use in their research.



Systematic and sustained observing



Internationally peer-reviewed planning



13 Facilities and observing platforms



Open access data



In 2020 IMOS deployed ocean gliders to provide critical water temperature data to help researchers and managers monitor marine heatwaves on the Great Barrier Reef (GBR) and the northwest shelf. In February IMOS mobilised our glider fleet in regions at greatest risk of coral bleaching on the GBR, providing unique sub-surface water temperature data, including operating in cloudy conditions when satellites can no longer observe ocean temperatures.



Measuring the colour of the oceans provides information about suspended particles in the water column (such as marine algae) and is crucial for understanding marine ecosystems, their productivity and response to environmental change. IMOS in-situ ocean colour data are being used in an international project to develop and validate a new tool to improve satellite ocean colour data in coastal areas.



IMOS marine microbial data were used to investigate the genetic diversity of marine viral communities in the East Australian Current system for the first time. This data is crucial for understanding the significant impact that viruses have on marine productivity and how they alter the flux of nutrients in marine microbial food-webs.



IMOS deployed the first two Biogeochemical Argo floats from the Marine National Facility RV Investigator in October 2019. The floats were deployed into the East Australian Current and are carrying sensors to measure temperature, salinity, dissolved oxygen, pH, dissolved nitrate, chlorophyll fluorescence and optical backscatter. These data streams will help define variability in the oceans' biological carbon pump, uptake of anthropogenic CO₂ by the ocean, deoxygenation and acidification, support validation of satellite observations and can be applied to marine resource management.



IMOS launched the State and Trends of Australia's Oceans in early 2020. The report provides a baseline for contributions to marine assessments now and into the future. The time series' in the report provide scientifically robust information on the state and trends of 27 ecosystem indicators for Australia's vast and valuable marine estate.

The Australian Ocean Data Network Portal now includes 253 dataset collections that can be discovered, accessed, sub-setted and downloaded. Thousands of users access these openly available datasets. Data users range from researchers in the world's leading universities and government agencies, students learning data science and about the marine environment, to commercial and recreational fishers seeking information about their local waterways.

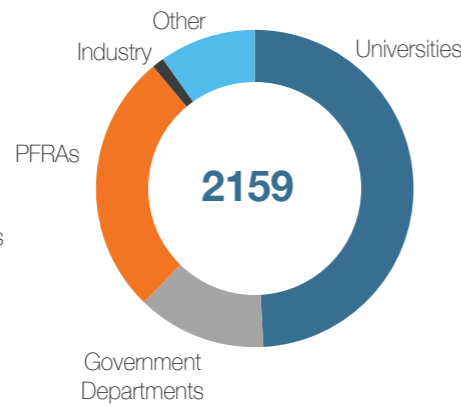
Use and Users of IMOS Data

The core uptake and use of IMOS data is measured in terms of numbers of research projects, postgraduate students, publications, products conference presentations, training and education. These uses are fully listed in the IMOS Impact Database. For more detailed information of IMOS performance indicators please visit bit.ly/IMOSHighlights19-20.

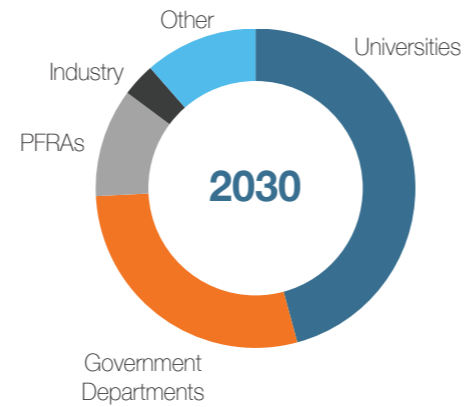
Uptake and Use



Australian Users*



International Users*



* These users are identified from publications, reports (grey literature) and other outputs. These numbers do not include the broader user base of IMOS data, including those who use IMOS OceanCurrent, THREDDS and other products.

Financial Summary

A summary of the IMOS finance for the 2019–20 financial year:

FINANCIAL OVERVIEW

	2019-20	2018-19
Capital	4,909,950	4,021,104
Personnel	12,207,382	10,651,215
Other	3,918,151	3,797,722

Expenditure relating to NCRIS funds

Cash Co-investments	5,739,321	2,694,845
In-kind Co-investments	29,796,739	24,298,252
Total – Resources utilised	56,571,543	45,463,138

Full-time equivalent staff numbers

	FTE 2019-20	FTE 2018-19
NCRIS funded	95.01	86.84
Co-investment funded	35.74	29.43
Total FTE staff	130.75	116.27



New Technology Proving

IMOS invests in New Technology Proving capabilities to pilot new technologies and methods to improve our efficiency, fill gaps, and enhance our existing observations.

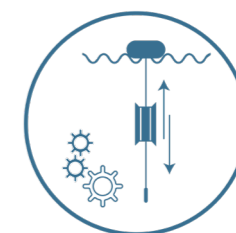
The first three successfully funded projects are exploring new research and data opportunities related to: low cost wave buoy technology, a wind speed and direction database and profiling moorings.



Low Cost Wave Buoy Technology



Wind Speed Direction Extension



Profiling Mooring Evaluation

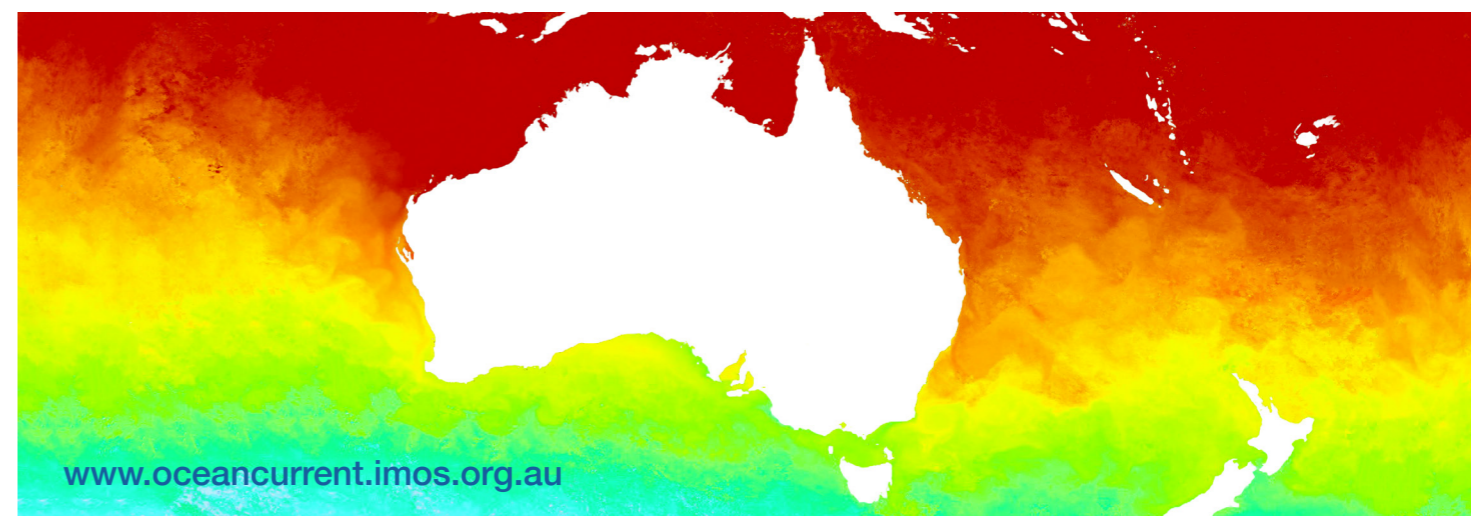


IMOS OceanCurrent

The IMOS OceanCurrent website provides ready access to graphics of Australia's ocean conditions, including sea surface temperature, sea level anomaly and ocean colour, overlaid with sea level contours and surface current velocities.

IMOS OceanCurrent sources data from many of the IMOS Facilities including Satellite Remote Sensing, Deep Water Moorings, National Mooring Network, Ocean Radars, Animal Tracking, Ocean Gliders and Argo Floats.

The daily IMOS OceanCurrent maps are highly valued by the IMOS science community and a broader stakeholder base to support research and marine operations.





Australia's Integrated Marine Observing System (IMOS) is enabled by the National Collaborative Research Infrastructure Strategy (NCRIS). It is operated by a consortium of institutions as an unincorporated joint venture, with the University of Tasmania as Lead Agent. www.imos.org.au

PRINCIPAL PARTICIPANTS



(Lead Agent)



SIMS is a partnership involving four universities.

ASSOCIATE PARTICIPANTS



IMOS acknowledges the Traditional Custodians and Elders of the land and sea on which we work and observe and recognise their unique connection to land and sea. We pay our respects to Aboriginal and Torres Strait Islander peoples past, present and future.

Partners

CO-INVESTORS AND OPERATIONAL PARTNERS • Antarctic Climate and Ecosystems Cooperative Research Centre • Austral Fisheries • Australian Longline • BHP Billiton • Department of Defence • Department of Environment and Science, Qld • Department of Jobs, Tourism, Science and Innovation, WA • Department of Planning, Industry and Environment, NSW • Department of State Growth, Tas • Director National Parks • Environmental Protection Authority, Victoria • Flinders University • James Cook University • Macquarie University • Marine National Facility • Monash University • Oceanographic Field Services Pty Ltd • Office of Environment and Heritage, NSW • Quadrant Energy • Rio Tinto • Sydney Water Corporation • University of Melbourne • University of New South Wales • University of Queensland • University of Sydney • University of Technology Sydney • Woodside Energy **INTERNATIONAL COLLABORATORS** • European Space Agency • First Institute of Oceanography • French Polar Institute • Hokkaido University • National Aeronautics and Space Administration • National Centre for Scientific Research • National Institute of Water and Atmospheric Research • National Oceanic and Atmospheric Administration • National Science Foundation • Ocean Tracking Network • Scripps Institution of Oceanography • Sealord • Southern Ocean Observing System • TOSCA Dumont d Urville expedition • University of Stockholm • Woods Hole Oceanographic Institution **RESEARCH PARTNERSHIPS** • Bioplatforms Australia • BlueLINK Ocean Forecasting • eReefs • Fisheries Research and Development Corporation • Great Barrier Reef Marine Park Authority • National Environmental Science Programme Earth Systems and Climate Change Hub • National Environmental Science Programme Marine Biodiversity Hub • National Research Providers' Network (Fishing & Aquaculture) • Reef 2050 Integrated Monitoring and Reporting Program • Western Australian Marine Science Institution • Various ARC-funded Projects