



Forum for Operational
Oceanography

FOO 2019

Meeting Report

15-16 October, Melbourne

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Pullman Albert Park Hotel, Melbourne

Overview

The third meeting of an Australian Forum for Operational Oceanography (FOO) was held in Melbourne from 15-16 October 2019. Its purpose was to review progress of FOO since the first event in 2015, to explore opportunities for operational oceanography to drive the development of Australian marine industries, and to assess risks to Australian marine industries and the role of operational oceanography to help manage them.

More broadly, the Forum continually aims to:

- foster more collaboration between the pillars of the Forum (Figure 1);
- to align itself with Australian government policies which impact the science and maritime sectors;
- to communicate and emphasise the importance of operational oceanography to sustain and enhance the social, economic, and environmental benefits of Australia's marine estate.

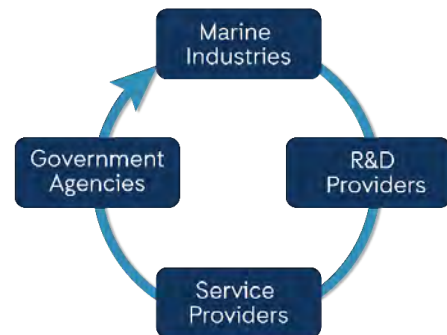


Figure 1: FOO Pillars

The meeting was attended by ~100 participants. These participants came from 38 organisations i.e. 4 marine industries, 15 service providers, 9 government agencies, and 10 R&D providers. Attendance was down from ~120 participants at previous events, likely reflective of the move of the Forum from Western Australia to Victoria.

Presentations and discussions were organised around four themes. The two major themes were 'opportunities for operational oceanography' and 'assessment of risks and the role of operational oceanography'. These were bracketed by an opening theme centred upon the intersessional activities of the FOO working groups and an update from the FOO Secretariat, and a final thematic session on 'looking ahead'. Presentations are available on the FOO website – www.foo.org.au.

An update on the Australian Forum for Operational Oceanography since 2017

The FOO concept continues to endure since its first meeting in 2015. Since 2017, the priority areas within operational oceanography continue to focus on surface currents and surface waves, forecasting, data products, and data accessibility and stewardship. There

was agreement that FOO should continue to run biennial events with resources now secure to support FOO 2021 and 2023.

In looking to the future of FOO, the outgoing Steering Committee Co-Chair, Dr Jan Flynn, encouraged the next generation of FOO advocates to build a diverse community of purpose that can help address the challenges facing marine industries through operational oceanography.

Steering Committee: The Steering Committee of the Australian Forum for Operational Oceanography has stayed true to the vision of FOO as a unique collaboration, with representatives from each pillar of the community (Figure 2). It was reported that Steering Committee revitalisation would be required in the next intersessional period, due to the number of outgoing members.

It was reported that cash investment had been secured from Bureau of Meteorology and CSIRO, along with the Integrated Marine Observing System (IMOS), to assist the IMOS Office to continue to run the FOO Secretariat. The FOO Steering Committee thanks those organisations for their ongoing support.

The Steering Committee reported that in the period since FOO 2017 a new website had been created that facilitated communication via updates and occasional news items. The membership mailing list has continued to grow (+120 since 2017) and will be continually refreshed to ensure the FOO message is communicated effectively.

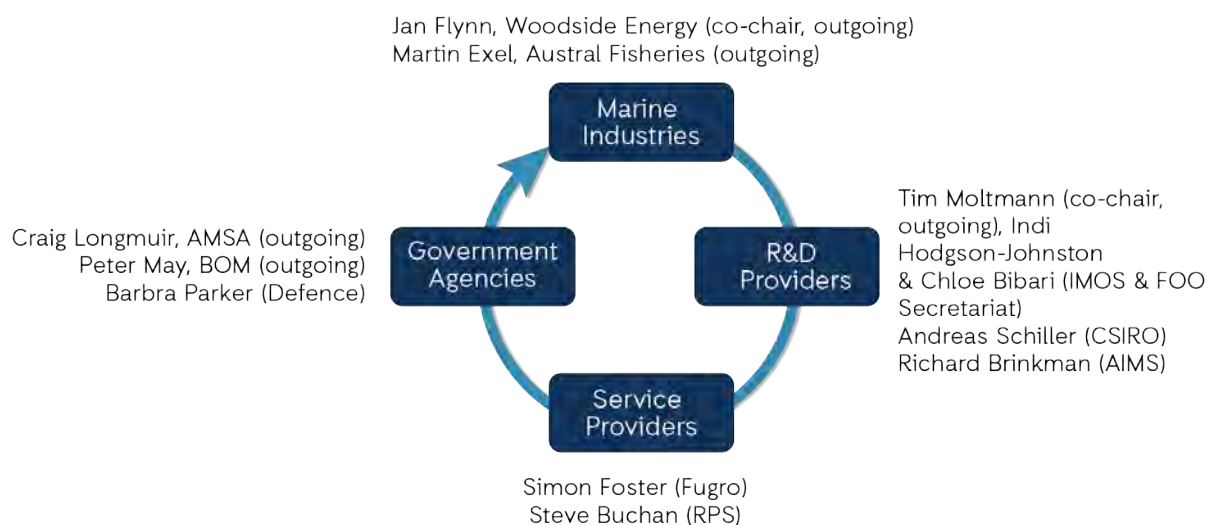


Figure 2: Steering Committee

It was recalled that FOO acted to benefit the safety and efficiency of Australia’s marine industries, which contributed \$68.1 billion to the Australian economy in 2016-17.¹ FOO aims to align itself with government policies and agendas, such as the National Innovation and Science Agenda. FOO noted that with the significant government funding, and industry investment in the Blue Economy Cooperative Research Centre, that interest in Australia’s

¹ AIMS Index of Marine Industry (2018) <https://www.aims.gov.au/aims-index-of-marine-industry>

marine industry sector is growing. This emphasises that operational oceanography has an important role to play in the future strategy and policies of Australia's blue economy.

Surface Waves Working Group: Dr Mark Hemer (CSIRO) and Dr Diana Greenslade (BOM) gave the community an update on the intersessional activities of the Surface Waves Working Group. This group has representatives from all pillars, and it was noted that more engagement from industry, service providers and Defence would be beneficial.

Achievements of the group included:

- Attracting investment from IMOS into wave-buoys, satellite remote sensing wave capabilities, and a new technology proving facility based in Western Australia;
- Engagement with the Victorian Department for Environment, Land, Water and Planning Coastal Monitoring Program.
- the publication of their priorities for waves research in Australia in the *Bulletin of the American Meteorological Society* (2019) (doi: 10.1175/BAMS-D-18-0262.1);
- the publication of the optimisation of the Australian wave observation network in the *Journal of Southern Hemisphere Earth Systems Science* (2018)

The group remains committed to defining and prioritising elements of wave research in Australia, and activities in the next year include standardisation of Australian wave data archive practices.

Surface Currents Working Group: Craig Longmuir (Australian Marine Safety Authority - AMSA) updated the community on the intersessional activities of the Surface Currents Working Group. Membership is from all pillars except industry. Much focus has been on defining what a 'surface current' is in the context of operational oceanography, noting its definitional importance to modellers. The group is developing proposals involving drifters, which in part will help rectify areas of sparse surface current observations. It was noted that information accessibility will be a priority in the national standardisation of surface current data, and that the Queensland Government was looking to make their 5th generation drifter buoy data available through the Australian Ocean Data Network. In the future, the group would like to focus on:

- Continuing collaboration and information sharing;
- Ensuring the right people and institutions are engaged with the Working Group;
- Prioritising research and operational directions for Australian surface currents.

Data Sharing Working Group: It was agreed at FOO 2017 that a working group in data sharing would be established. This group held meetings in 2017 and 2018, however it is currently in abeyance due to faltering attendance at meetings and a lack of engagement. At FOO 2019, it was discussed that there remained a need for an increased push for data sharing, and that a different strategy to approach this important issue should be pursued.

Opportunities for Operational Oceanography

In evaluating the opportunities for operational oceanography in Australia, FOO 2019 was informed of:

- How the United Kingdom forms partnerships for ocean prediction capability;

- Development of innovative oceanography products through the National Energy Resources Australia (NERA) to benefit industry;
- The development of a comprehensive Southern Ocean wave climate analysis, ongoing innovation in wave forecasting models, the possibility of observations from new autonomous technologies, and the use of machine learning to improve wave forecasting;
- Opportunities and challenges for the new NASA/CNES Surface Water Ocean Topography (SWOT) missions;
- Development of new SST products through IMOS OceanCurrent;
- Product development from service providers, including those to increase fuel efficiencies during ocean transits;
- Opportunities possible through more precise positioning in the maritime sector;
- The future need for operational oceanography in the development of the new Blue Economy CRC;
- Ongoing evaluation of machine learning frameworks to forecast storm surges;
- Data sharing needs on the NW Shelf; and
- Feasibility and needs for future tidal energy capability.

Participants thanked the presenters and noted the exciting opportunities being developed by the broad FOO community.

The importance of developing institutional partnerships between the FOO pillars and aligning efforts with broadscale policy directions were highlighted. This engagement was particularly emphasised in the keynote by John Siddorn of the United Kingdom Met Service, where the National Partnership for Ocean Prediction facilitates integration of models, observations and scientific understanding occurs across various agencies.

The many developments across wave and storm surge forecasting, machine learning, models, and products will provide many benefits to the maritime sector, including increasing safety and efficiency, while also delivering broad societal benefits in coastal communities. Data sharing and standards in this area, and more broadly, were emphasised throughout the session. Product development was also considered, with end-user engagement during the creation of products being a critical component.

Innovation in the development of new ocean resource industries such as offshore aquaculture and tidal energy, were discussed. The need for operational oceanography to assist in the development of these industries were discussed in the context of the new Blue Economy CRC.

Risk Management for Marine Industries

Participants engaged in discussions on the risks to Australian marine industries and the role of operational oceanography in helping to manage those risks, including:

- Applications and opportunities of oceanography and meteorology to improve design and operation of offshore and onshore structures;
- Management needs to address risk to the blue economy;
- Projects designing models for tropical cyclone wind and waves for NW Australia;

- Bayesian statistical methods and computing integrating with physical models to predict solitons to provide industrial tools for decision-making under uncertainty;
- Improving short-term wave forecasting algorithms;
- The use of ocean models for safety and mission success from a Navy perspective;
- The use of predictive tools to locate containers lost at sea and which pose dangers to maritime traffic;
- Developments from the New Zealand Ocean Operational Forecast System;
- Updates on Bluelink ocean forecasting operations;
- Seasonal forecasting to manage the impacts of extreme ocean temperatures on Australian marine industries;
- Product development to support the future management of the Great Barrier Reef, including safety for shipping within the Park;
- Products to verify sea states for the efficiency and safety of port operations.

Risks to marine industries include extreme weather, extreme ocean temperatures, and increasing uncertainty in forecasting driven by climate change and variability. Participants discussed the importance of forums such as FOO to bring together all pillars to 'brainstorm' solutions that alleviate risk across many dimensions.

It was recognised that industries less proximate to traditional marine industries, such as tourism on the Great Barrier Reef, can also benefit from operational oceanography.

Looking Ahead

FOO 2019 confirmed that the Forum has a clear, ongoing role to play in Australia's blue economy. Participants noted that it is unique amongst the many conferences and workshops they could potentially attend. Inclusion of R&D Providers, Government Agencies, Service Providers and Marine Industries (the four pillars of the Forum) is what makes it distinctive. There is no other event in Australia that can put this group of people into the same room at the same time. The networking at FOO 2019 was a highlight, as it has been in previous years.

With ongoing sponsorship from the Integrated Marine Observing System (IMOS) now being matched by the Bureau of Meteorology and CSIRO, FOO 2019 was conducted in the knowledge that there will be a FOO 2021 and a FOO 2023. This is significant as it means the Australian FOO community can begin to think longer-term. The enhanced level of sponsorship also means that FOO will have a level of funded secretariat support going forward, albeit modest for now (estimated at 0.2 FTE per annum).

The model of biennial conferences underpinned by intersessional, priority-focused, Working Groups is considered to provide a sound basis for the Forum. FOO 2019 also highlighted the potential of the Forum to catalyse new dialogues and initiatives. It is as much if not more an enabler as it is a delivery mechanism.

Relocation of FOO 2019 to Melbourne, after the first two events were held in Perth, provided two important pieces of information. Firstly, that the Forum is viable as a national endeavour. With a high-quality program delivered to 100 participants over two days in Melbourne, we now know this can work on the east coast. Secondly, it tells us that location

matters. Western Australia is globally significant in terms of the offshore oil & gas and ports & shipping industries. Participation at FOO 2019 was ~17% lower than in previous years, most significantly in the marine industries pillar. It is suggested that we think of Perth as 'home base' for FOO, with perhaps every third event run elsewhere.

Surface Waves and Surface Currents were again hot topics at FOO 2019, indicating that they remain priority areas. Several talks addressed developments since FOO 2017 as well as future directions. Support for the Surface Waves and Surface Currents Working Groups will continue.

In some cases, there are clear pathways for recommendations of FOO Working Groups to be considered. For example, those relating to infrastructure and data can be considered through IMOS processes, and several examples were discussed. Increased IMOS investment in Surface Waves can be directly attributed as a success of the Forum. Increased industry investment in the IMOS Ocean Radar network to measure Surface Currents has also been assisted by FOO.

In other cases, the pathways for Working Group recommendations to be considered are less clear, for example in the areas of modelling and forecasting. It was suggested that the FOO Steering Committee could become more active in helping to facilitate responses to recommendations from Working Groups.

Data sharing was again a major topic of discussion at FOO 2019. A third Working Group in Data Sharing was spawned after FOO 2017 but failed to establish and sustain itself as the others have done. A number of threads emerged through further discussion at FOO 2019 that provide the basis for a multi-faceted approach to this complex but fundamentally important issue. It is important to note that these threads may intersect and overlap:

- Industry members need to establish the business case for enhanced data sharing in the Australian region, particularly the North West Shelf. The metocean committee of the International Association of Oil and Gas Producers (IOGP) provides a mechanism to discuss this further.
- It was suggested that focusing on a reanalysis product for the North West Shelf could be a very useful and constructive first step.
- The Surface Waves and Surface Currents Working Groups could be asked to identify and work on data sharing opportunities as a way to bring focus to this general issue.
- Focus on data standards and formats may also be very helpful in some areas, particularly where multiple FOO pillars are collecting the same types of data but in different ways that do not enable discovery, access, use and reuse for broader benefit.

A theme that emerged in the wrap-up session was use of the Forum as a place for industry to share problems, particularly with the R&D sector. There was good discussion about possible mechanisms by which to engage the broader FOO community in addressing industry priorities. Candidate problem areas raised were:

- Sea state verification for management of port dredging operations.
- Issues with current forecasting on the North West Shelf related to lack of information about density.

The keynotes and invited talks also identified a number of new partnership opportunities:

- The UK National Partnership for Ocean Prediction provides a model that may have relevance in Australia as we look to accelerate the impact of operational oceanography on improving the safety and efficiency of marine industries.
- National Energy Resources Australia (NERA) has been facilitating some projects in the operational oceanography domain and FOO 2019 could provide a basis for new ideas.
- The Blue Economy Cooperative Research Centre (CRC) has just been funded as a large, long-term, research/industry partnership that will have clear need for operational oceanography if it is to realise its goals.
- The Defence Department's Meteorology and Oceanography (METOC) section is keen to enhance collaboration with the FOO community.

Forum Outcomes

In summary, the outcomes of FOO 2019 will be progressed by the Steering Committee (with secretariat support), Working Groups, and other mechanisms as appropriate, with an eye to the next biennial conference in Perth, October 2021.

Appreciation

Thanks goes out to all the participants from across the four pillars of the Australian Operational Oceanography Community, the speakers from across various organisations, and the Steering Committee for their leadership.

Sincere thanks go to the Department of Education (Integrated Marine Observing System), CSIRO, and the Bureau of Meteorology for their sponsorship of FOO 2019.

Further thanks go to Conference Designs, and in particular Tara and Ben, for their invaluable support in running the FOO 2019 event.



foo.org.au