

Forum for Operational Oceanography

Meeting Report

25-27 July, 2017 Esplanade Hotel, Fremantle WA

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The second meeting of an Australian Forum for Operational Oceanography (FOO) was held in Fremantle from 25-27 July 2017. Its purpose was to review progress of FOO since the first event in 2015, to assess present capabilities, engagement and needs, to explore uses and users of operational oceanography, and to focus on the 'hot topic' of marine extremes.

More broadly, the Forum aimed to foster more collaboration between the pillars of the Forum (Figure 1), to align itself within the Australian National Innovation and Science Agenda, and to emphasise the importance of operational oceanography to sustain and enhance the social, economic, and environmental benefits of Australia's marine estate.





The meeting was attended by 120 participants, with 11 representatives from marine industries, 31 from

service providers, 34 from government agencies, and 44 from R&D providers. These participants came from 47 organisations i.e. 9 marine industries, 18 service providers, 9 government agencies, and 11 R&D providers. So while industry looked underrepresented at participant level, the mix at organisational level was well balanced.

Presentations and discussions were organised around four themes and a final session on 'looking ahead'. Two of the themes ('review of progress' and 'users and uses') were based on invited talks to ensure a broad representation of interests from the FOO community. The other two themes ('assessing capabilities' and 'marine extremes') were based on submitted abstracts to showcase the most recent science, innovation, and knowledge. (n.b. presentations are available on the FOO website – www.foo.org.au)

An update on the Australian Forum for Operational Oceanography since 2015

It was noted that at the inaugural 2015 meeting, participants wished the FOO concept to endure. The priority areas within operational oceanography that emerged from the first meeting included: surface currents, surface waves, thermal structures, consensus forecasting, data products, and data stewardship.

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). The Steering Committee reported that in the period since FOO 2015 a

website had been created that facilitated communication via updates and occasional news items.



Figure 2: FOO Steering Committee

The Forum recognised that the National Innovation and Science Agenda, along with its constituent elements like the National Infrastructure Roadmap, provided an opportunity and incentive to strengthen marine industry-research collaboration, while also being an important context within which to drive FOO's priorities.

The importance of operational oceanography on a global level was reiterated from FOO 2015, and included the emphasis on ocean observing, information, services and products that helped decision-makers and industry in sustainably growing Australian blue economy. It was noted that the AIMS Index of Marine Industry recently valued Australia's blue economy at \$74 billion per annum, and that with marine industries being more deeply engaged as champions of the blue economy, operational oceanography will grow in social, economic, and political importance.

It was noted that the FOO email list had grown significantly over two years and that participation numbers at the 2015 and 2017 events had remained level. Attendance by industry had not increased, though the calibre of industry representation has remained high. (N.B. Strategies for strengthening industry engagement were discussed at various stages throughout the meeting.) In outlining the progress of the FOO it was noted that two working groups had been established to address two of the Priority Areas: the FOO Surface Currents Working Group and the FOO Surface Waves Working Group.

Craig Longmuir (AMSA) reported on behalf of the Surface Currents Working Group. The group informed FOO that: they had been meeting approximately every six weeks since 2016; their progress in areas such the creation of a position statement on depth and time, ad hoc verification, and new technologies was continuing in an organic manner. The Working Group noted that they wished to derive more tangible benefits and outputs from their work, and wished for more involvement from actual and potential end-users. They also thanked Ana Lara-

Lopez (IMOS Office) for supporting the group. FOO participants encouraged the Surface Currents Working Group to continue building on these efforts, and to continue and/or build upon communication with end users.

Mark Hemer (CSIRO) presented on behalf of the Surface Waves Working Group. The group reported that they had convened four times since FOO 2015. The discussions had centred around identifying existing public domain and commercially owned wave data and their availability, whether they were suitable for the FOO community, and where future investment could be placed. The Working Group noted that they could do a collaborative priority setting exercise to identify user needs and priorities, while also engaging more with industry partners to ensure wave data was utilised effectively and efficiently. This exercise will involve the FOO community being surveyed via email, with all participants being encouraged to take part. FOO participants thanked Mark Hemer of CSIRO for volunteering to lead the group with ongoing support from the IMOS Office (Emma Sommerville).

It was further noted that through regular communication with Working Groups, the Steering Committee may be able to assist in bringing new initiatives to fruition.

Assessing Present Capabilities and Needs

In assessing the current capability and needs of the FOO community, participants were informed of:

- advancements in satellite measured wave data,
- improvements in the performance operational wave models,
- collaborative approaches to swell affected operations,
- port decision-making with operational oceanographic forecasting,
- the steps being taken towards an operational now-cast/forecast ocean prediction systems
- near real-time atmosphere-ocean two-way nested systems
- complex near-bed sedimentary dynamics in seasonably stratified waters and visibility for subsea engineering
- challenges and advances in predicting waves in the nearshore
- emergence of data-drive technologies for operational oceanographic applications, and
- maximising impacts and value from marine observations

In light of these presentations, FOO participants examined developments in operational wave modelling, noting significant gaps in the publicly available wave buoy network and impediments to improved forecasting, including the need for better shallow water bathymetry. However the existence of significant industry held wave data in locations complementing the public network was noted as providing an opportunity. This theme of enabling greater access to industry data with a goal of improving publicly available products and services needed by industry recurred

throughout the meeting. The case for a regional North-West Shelf swell monitoring and prediction system was also discussed. Developments in regional, ocean modelling capability since FOO 2015 (including eMarine SA, UWA coastal oceanography, and others) were also noted.

The case for a regional North-West Shelf swell monitoring and prediction network was considered to have merit and warrant further consideration. More broadly, there was support for a shelf/coastal modelling, forecasting and analysis working group. This need has already been identified by the National Marine Science Committee and it would make sense to have one national working group. Interest from the FOO community presents an exciting opportunity to ensure that both cutting edge science and operational requirements are considered. There is a near term opportunity for additional funding into this area through further development of the Marine Virtual Laboratory (MARVL).

A number of industry representatives expressed an interest in discussing data access to facilitate such efforts, and in doing so encouraged interested participants to communicate with them regarding that access. Further, there was general emphasis on the importance of greater articulation and communication of the value of ocean observations and the services that they underpin.

Users and Uses of Operational Oceanography

In evaluating the use and uses of operational oceanography in Australia, FOO 2017 was informed of:

- The development of decision support tools for offshore and nearshore marine operations by the oil and gas industry
- The challenges facing the fisheries industry in a changing ocean
- The National Energy Resources Australia technology and science activities
- The Prelude Floating Liquefied Natural Gas Facility and the needs for operational oceanography
- AMSA's application of metocean models and awareness to support strategic and operational decision-making
- Marine and Ocean Services at the Bureau of Meteorology and the importance of partnerships in strengthening the value chain
- The possibilities of harmful algal bloom forecasting
- Spatial management of fisheries in a changing ocean using operation oceanography
- SEA 2400 and the next generation hydrographic capability for Australia, and
- An introduction to Pilbara Ports Authority's Metocean Networks

Participants thanked the presenters and noted the particular usefulness of having such a broad range of users and uses discussed in a single forum.

Offshore industry concerns included tropical cyclones, squalls, persistent strong winds, excessive rainfall (visibility), swells (large and small), eddies, and shelf currents. Many of these were also issues for ports and shipping. While the fishing and aquaculture industries face additional challenges such as species range shifts, ocean acidification and harmful algal blooms, common requirements for operational oceanography again emerged.

Participants discussed the impacts of end-user engagement with operational oceanography products in the context of the new BOM strategy and structure. It was also noted that engagement with industry will be enhanced in the future by the Defence HydroScheme Industry Partnership Program (HIPP), and also with funding opportunities soon to become available through the NERA Collaboration Project Fund.

Participants were impressed by the multi-layer risk estimation and related regional modelling being undertaken for AMSA, and the significant observational and data capabilities of Pilbara Ports Authority. Many participants stated interest in continued dialogue and engagement with these and other initiatives, highlighting the benefit of FOO as a unique forum for exposing existing capabilities to a broader community.

Australia's dependence on overseas-derived satellite data, and future access to these data resources, was highlighted as a potential emerging issue, though some noted the reciprocal and valuable nature of Australia's *in situ* infrastructure.

Data licensing and the role of IMOS in brokering data access and use was also raised, with the emphasis on overcoming legal hurdles in industry joint ventures being identified as an issue in data access. These issues were identified as being surmountable, and it was agreed that there would be further discussion on facilitating greater access to data in a way that is sensitive to commercial ventures.

The concept of 'test beds' were raised, particularly in the context of building modelling capability.

Gender diversity was raised, with it being noted that 20% of the FOO participants were women. Gender equity and balance is a priority under the National Innovation and Science Agenda. Participants were encouraged to pursue greater equity in the observational oceanography space.

Marine Extremes

Participants heard operational oceanography responses and activities in regards to:

- The 2016-2017 Mass Coral Bleaching events on the Great Barrier Reef
- Sub-surface intensification of marine heatwaves off south-eastern Australia
- Deriving extreme metocean criteria for the Browse Basin
- Estimates of extreme water levels around Australia

- Severe Tropical Cyclone Debbie and the sea surface response
- Marine heatwaves in northern Australia and new observations to improve predictions
- Improved tropical cyclone predictions for northwest Australia

In thanking the speakers for their presentations, participants emphasised the importance of operational oceanography in informing responses to extreme events. The potential for new ocean observing technologies (air-sea fluxes, waves) was highlighted, with interest from all pillars of the FOO community in pursuing solutions in the operational oceanography space.

There was also the potential for industry to support deployment of equipment in the northwest, with R&D organisations encouraged to keep an open dialogue with industry for increased partnerships and engagement.

Looking Ahead

In looking forward, presenters informed FOO 2017 of issues such as offshore carbon capture and storage projects, industry pathways to innovation, commercialisation and R&D engagement, and the broader National Innovation and Science Agenda and the possibilities for the blue economy.

It was stressed by industry that there is overseas domination in developing ocean technologies and this was contributing to a 'brain drain' of operational oceanographic technical expertise and innovation to other countries.

Some participants noted that the dialogue from the Australian space science community was one that could be replicated on some level by the operational oceanographic community. Participants heard that the positive discourse of astronomy could be a way in which to leverage political, industry and community support for ocean science. It was noted this is exactly what the National Marine Science Committee is trying to do, and that combining with the efforts of FOO would be a powerful package. Participants were encouraged to 'think bigger' and to emphasise the benefits of what we already know about the ocean, and the opportunities presented by new knowledge we are about to obtain.

Forum Outcomes

First and foremost, participants overwhelmingly agreed that FOO 2017 was a successful event and that the Forum should continue. There was ongoing support for biennial events in broadly the same format, with some constructive suggestions for improvement. Location of the next event on the east coast should be considered.

FOO 2015 was an experiment and the community has been feeling its way over the last two years. FOO 2017 confirmed that there is a clear need for the Forum. By addressing an important gap in our national innovation system with direct relevance to Australia's large and growing blue economy, FOO has a defined role to play and should move forward with confidence.

Continuation and expansion of working groups was strongly supported as a way to advance FOO's agenda. However needs and priorities identified by working groups will have to translate

into new products and services if FOO is to realise its potential. The combined resources of FOO participants and the funding opportunities presented through initiatives such as the National Innovation and Science Agenda provide pathways to achieve this.

Interest was expressed in somewhere between four and six working groups. The Surface Currents and Surface Waves groups will continue (with enhancements outlined above). A new group in Data Sharing will be established, with Roger Proctor (IMOS/AODN) as point of contact. A new group on Shelf/Coastal Modelling, Forecasting and Analysis will also be established, with Peter May (BOM) as point of contact. It should be noted that the National Marine Science Committee is already active in this area and the opportunity is to enhance this effort through engagement with FOO. Two other potential working groups were suggested, and will scoped for further input and discussion. One in Ensemble Prediction (Jeff Kepert, BOM) and one in Model Verification (Gary Brassington, BOM and David Griffin, CSIRO).

In closing it was noted that FOO has no dedicated staff, and that to date it has relied on the time and effort of Steering Committee members, with heavy reliance on the IMOS Office. Exploring options for a more sustainable model needs to be high on the Steering Committee's agenda, and thoughts and ideas from Forum members are very welcome.

Appreciation

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

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