SURFACE CURRENT WORKING GROUP

Surface Current – Working Group

At the inaugural FOO meeting in July 2015, a number of priority areas emerged that would benefit from further dialogue to ensure effective, ongoing communications and cooperation.

Working groups were formed for the two highest priorities

One being the surface current Working Group which first convened in Feb 2016

Has regularly convened around every two months since then

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Membership

The group participants have consisted of attendees from the FOO 2015 meeting that had a particular interest in this area.

Initially determined to keep the group a manageable size and consisting of a mixture of data providers, specialists and end users.

'Current' Members

- AIMS
- AMSA
- Bureau of Met
- CSIRO
- DHI
- Metocean
- RPS
- QLD Government - Dept of Environment and Science
- Woodside
- UTAS/IMOS
- UWA

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What is a ‘surface current’??

No standard definition – a ‘surface current’ can mean different things for different people.

Modellers: layer thickness of 10cm through to 10m.
Observationalists: measured velocities at depths from 1cm through to 15m

US has a standard 1m layer – developed through time and user requirements

Important for Search and Rescue as well as pollution and other user perspectives, in which case it needs to be a Lagrangian velocity. (Ocean model and current meters do Eulerian velocity, drifters measure Lagrangian velocity.

The difference is the Stokes Drift, which has a totally different time-history and vertical profile).

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Recommendation and position statement

Depth Averaging

Near-surface shear can be significant so the FOO recommends that the term ‘surface’ be phased out in preference for a terminology that is more explicit about vertical averaging.

1m vertical averaging is the layer most applicable to SAR so when developing future models the recommendation is that an estimate of the 1m average is provided (in addition to the native grid).

Currently Australia’s operational model has a surface layer 5m thick so the un-modelled shear needs to be added – either by the provider or the user (but not both!). For trajectory modelling, an estimate of the Stokes Drift needs to be added (perhaps via an empirical ‘windage’ term) to the Eulerian velocity.

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Recommendation and position statement

Time Averaging

Modelled and observed velocities are always an average over a period of time.
3h in the case of Australia's OceanMAPS system

However operational users typically require an estimate at shorter intervals than that so the effect of

- Tide
- Inertial oscillations and
- Atmospherically-forced motions are represented.

FOO recommends that operational forecasts be available at hourly intervals with tides included

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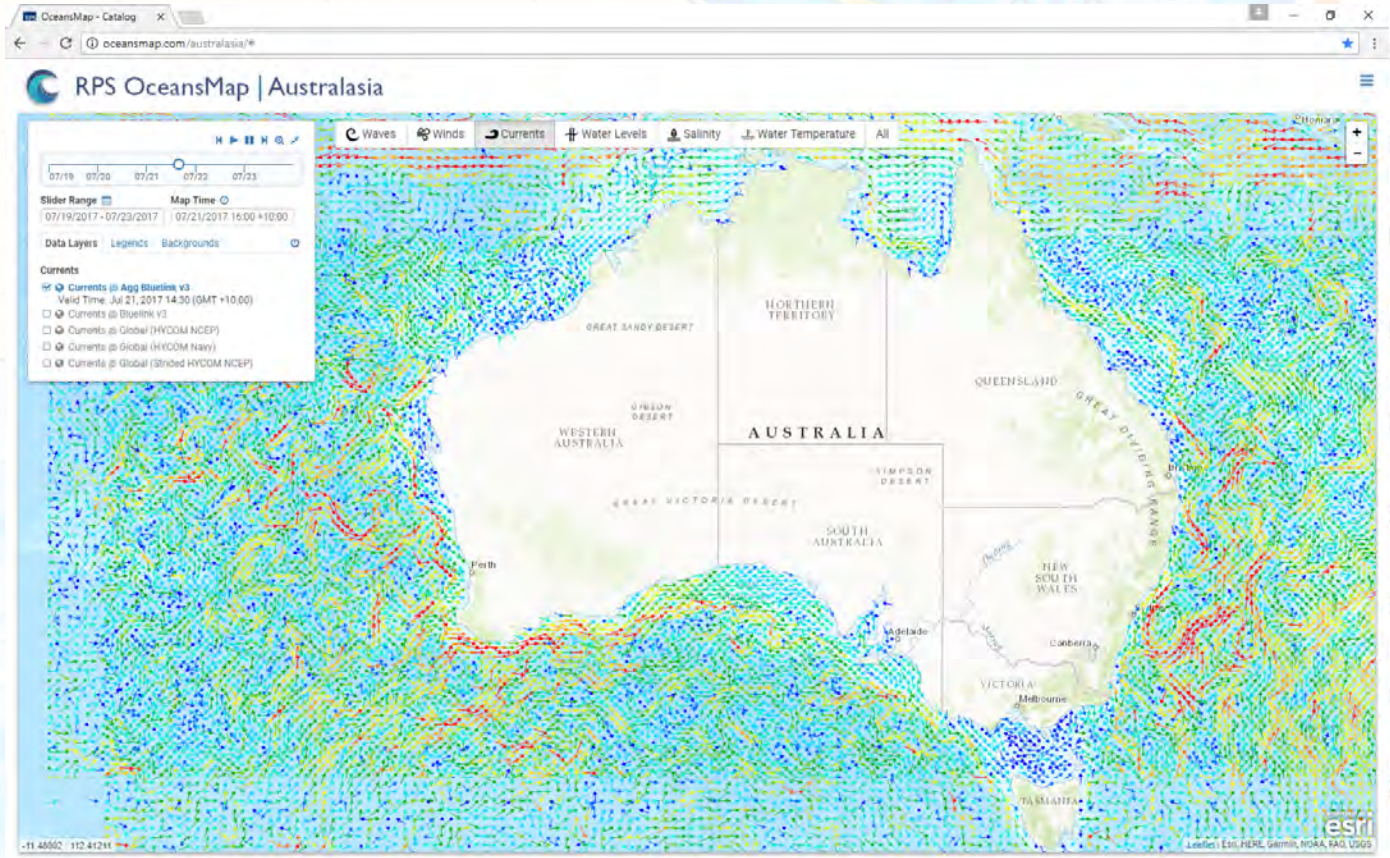
Operational Use of Surface Current Forecasts

Surface current forecasts are used for a wide range of operational uses including:

- Oil and chemical spill forecasting
- Maritime search and rescue
- Predicting the path of lost drifting objects
- Oil and Gas industry daily operations
- Optimal ship routing
- Sailing and recreational boating
- Backtracking to determine incident locations
- Ports and Harbour Actions



Online portal for viewing metocean forecast model data

HF Radar

Australian Coastal Radar Network (ACORN)

Australian Ocean Radar Facility at University of WA – primarily measures met-ocean parameters from an array of High-Frequency Radar (HFR) systems
Phased-array (WERA) HFR systems & commercial direction finding (SeaSonde)

Rottnest Shelf and Turquoise Coast (WA), Coffs Harbour and Newcastle (NSW) and South Australian Gulf

Configured primarily to sample ocean currents out to approximately 200km

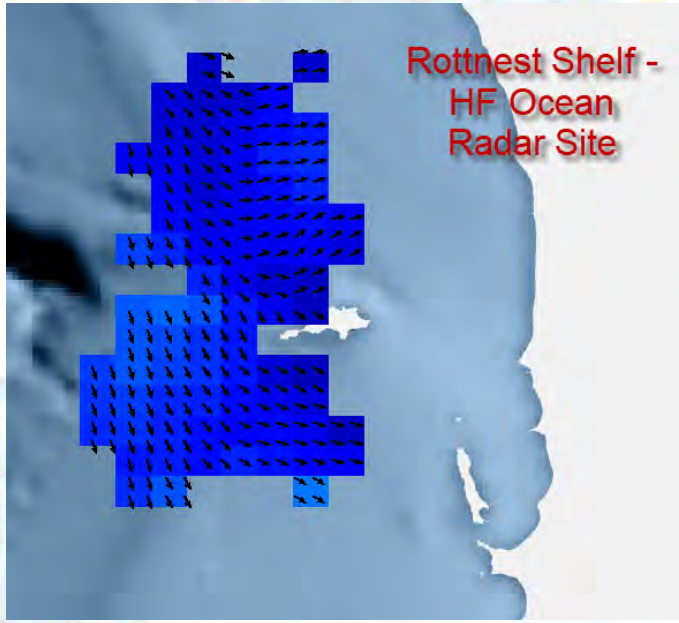
HF Radar observations include Stokes Drift

Phased arrays also allow wave and wind data to be collected

Real time and delayed mode products, such as radial velocity and surface current maps

Quality Control procedures – to improve the observation quality

Data available - https://portal.aodn.org.au



Future – look at supporting validation of data by deployment of AMSA SLDMBs – Newcastle site identified as priority

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IMOS Drifter Proposal

Not enough surface current observations for real time information or validation of model forecasts

Proposal developed July 2018 by members of SCWG to establish base infrastructure and coordinate efforts to enhance drifter observations for;
Surface current, surface temperatures and atmospheric pressure

Potential benefits to research, management, response and maritime industry stakeholders

Two target regions were identified with around 75 drifter buoys total proposed per annum;
Gulf of Carpentaria and the Arafura Sea to the north & the Coral Sea to the NE of Australia

Coral Sea drifters could traverse the entire eastern coast on the EAC. Support radar validation and significantly enhance observations all the way to the Tasman Sea.

The Gulf of Carpentaria and Arafura Sea have few observations . The seasonal circulation of the Gulf of Carpentaria remains poorly understood and the high prevalence of ghost nets are of concern to the environment.

Deployment of buoys would be through partner agencies

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IMOS Drifter Proposal

This proposal had the option to focus on either one or both geographical regions, and is also scalable to less or more drifter deployments.

Add additional drifter deployments by researchers, industry (e.g. WA & Shell Prelude) and other organisations such as AMSA (SLDMBs). Upload data for accessibility via the AODN and develop atlas of surface currents for model validations.

Although the proposal was ultimately unsuccessful in obtaining backing there were merits in developing the proposal;

Lessons Learnt –

- Experience in developing government funding proposals (first for some in the group)
- Work more closely with the funding organisation in the early proposal stage
- Clarified the priorities with regards to enhancing surface current forecasting
- Realistic scale of program and associated funds
- Better use of partner agencies and co-contribution – value of networking

- Consideration of other avenues for funding? Industry and Government partnerships - perhaps

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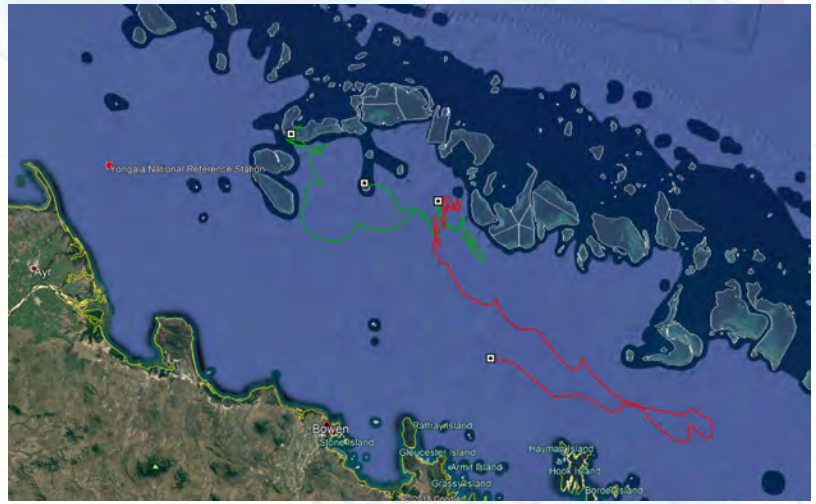
AIMS – AMSA deployment of SLDMBs



In Nov 2018 the Australian Maritime Safety Authority (AMSA) the Australian Institute of Marine Science (AIMS) worked together to track coral spawn slicks in the GBR.

The Cairns-based AMSA Challenger jet aircraft was used to deploy self-locating datum marker buoys (SLDMBs) (zero leeway buoys) with real-time satellite tracking technology, into the sea near Darley Reef off Townsville and Hope Reef off Bowen, to help track the movement of coral spawn slicks.

Primarily used for Search and Rescue also a great environmental tool.
Information shared with CSIRO and can assist in validating ocean models

Buoys were at end of shelf life for SAR purposes and deployed on a training flight so no additional costs occurred

A example of collaboration and something that we wish to support in future.

Some good media coverage to raise awareness

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Information accessibility – Current Catalogue/Atlas

Queensland government's Dept of Science and Environment is moving towards 5th generation buoys and will have surface currents information. They would like to make these data visible through AODN. There is data North of Weipa with 2 buoys.

Historical current data is available, however it is in various formats – group members (AIMS/QLD Govt/CSIRO) contributing on creating a current Atlas that will hopefully end in the AODN

Data formats appear to be an issue as each organisation has their own standards – perhaps a additional priority?

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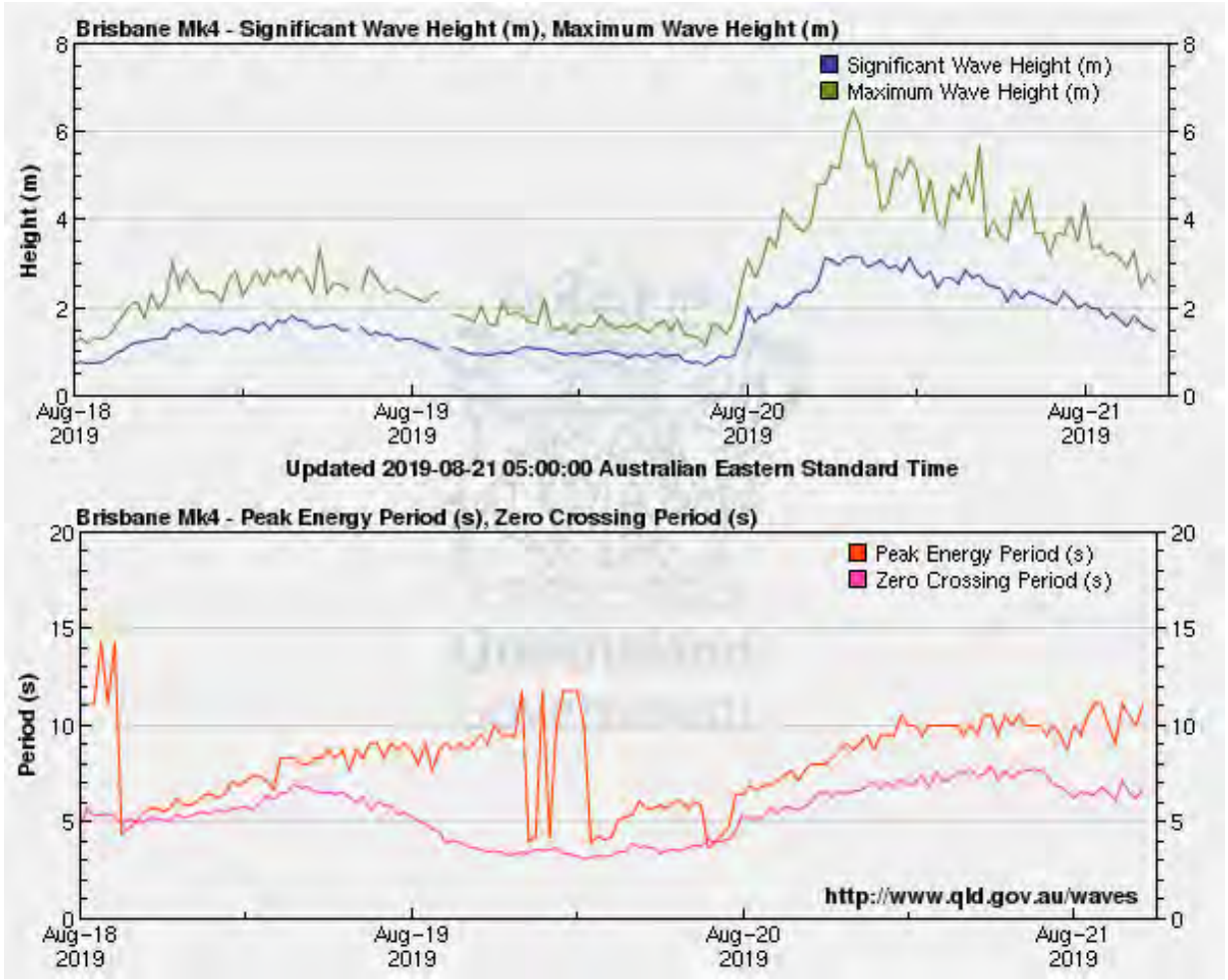
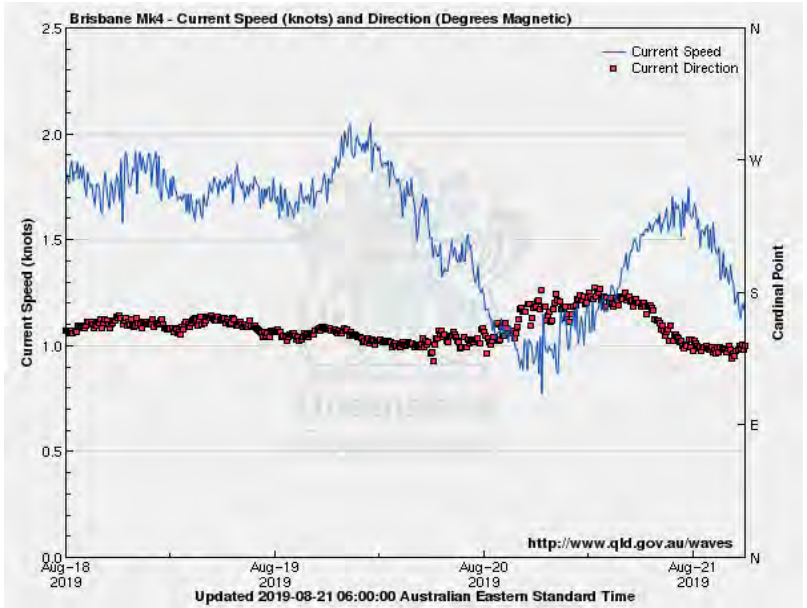
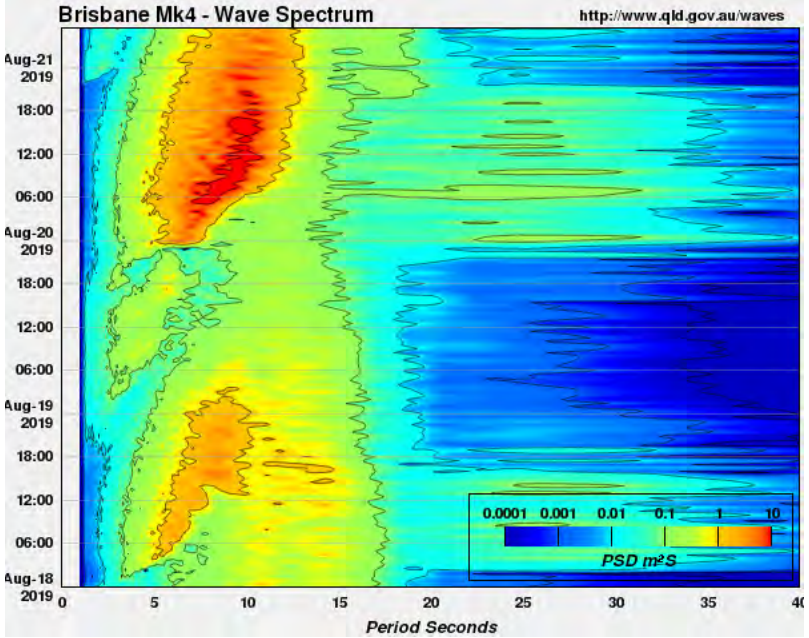
Wave & Current Buoys : NT & Coral Sea







IMOS OceanCurrent

Surface Currents and Temperature

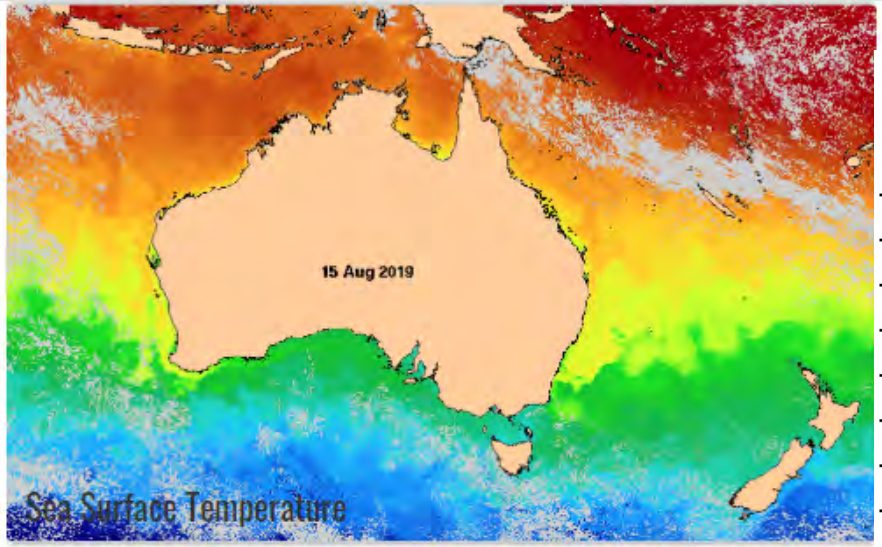
Up to date ocean information around Australia.

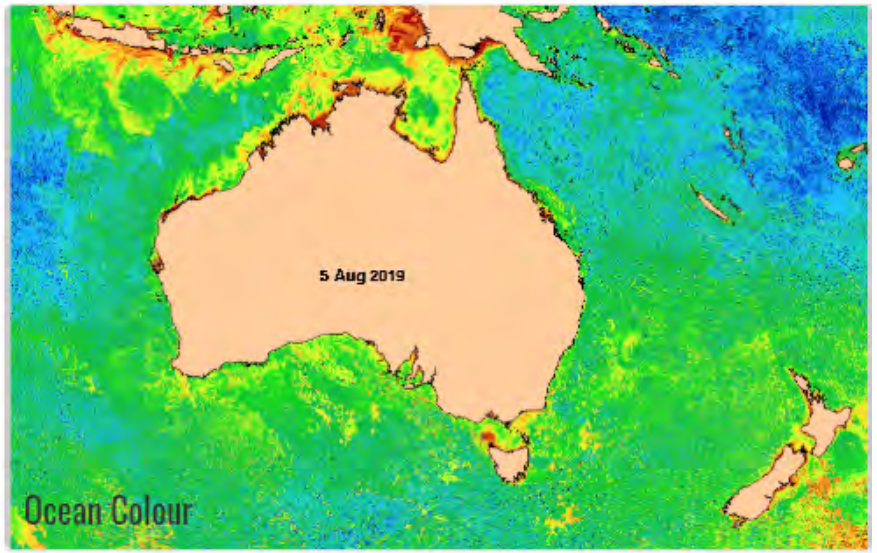
Maps | In-water | News | Technical Info

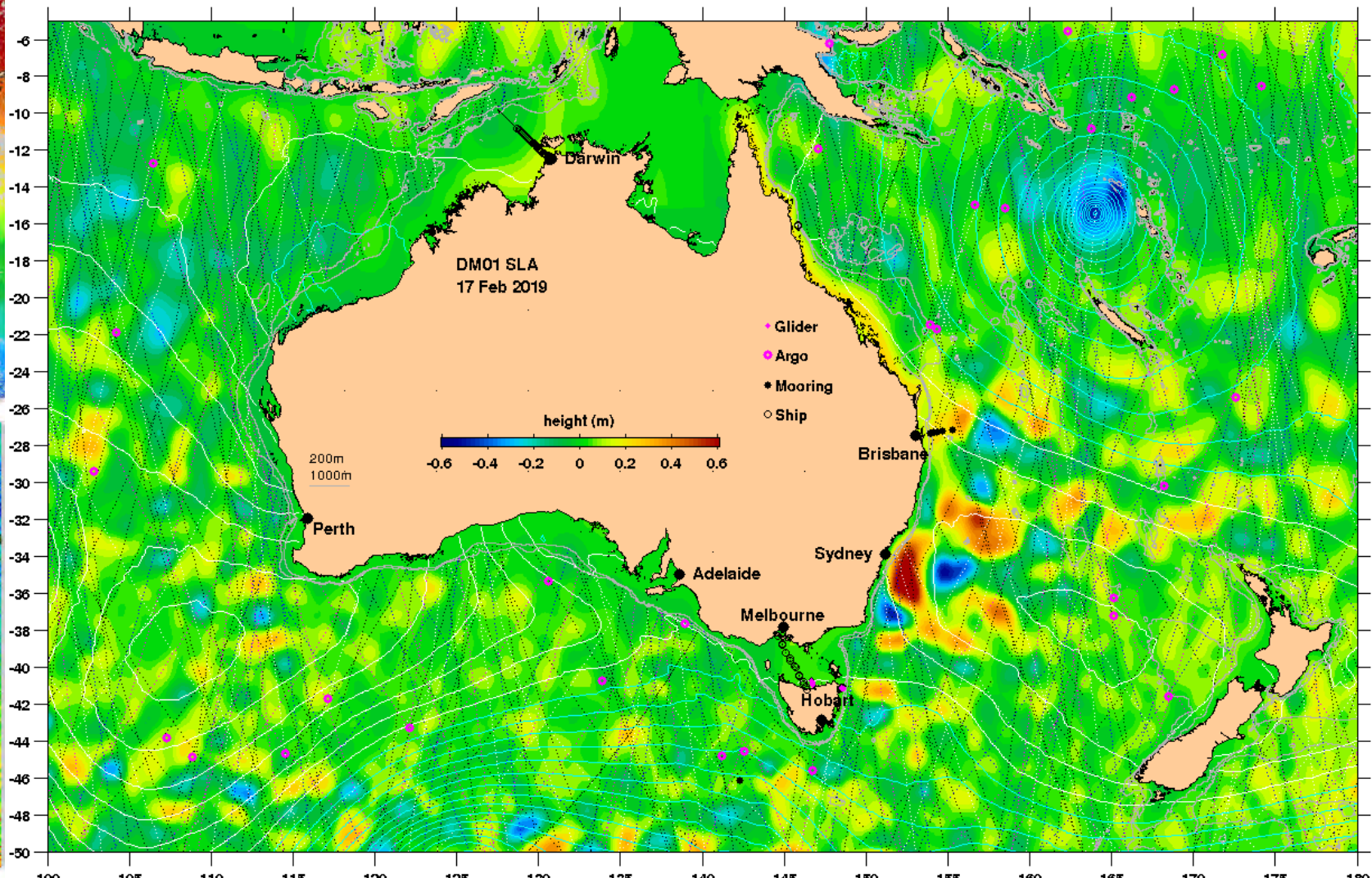
Tropical Cyclone Oma: a lasting ocean impac

Before threatening south-eastern Queensland back in February, Tropical Cyclone Oma spent a week causing great damage to Vanuatu and New Caledonia, even sinking a bulk carrier with a US$50 million clean-up bill.

OceanCurrent News







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Tropical Cyclone Oma: a lasting ocean impact

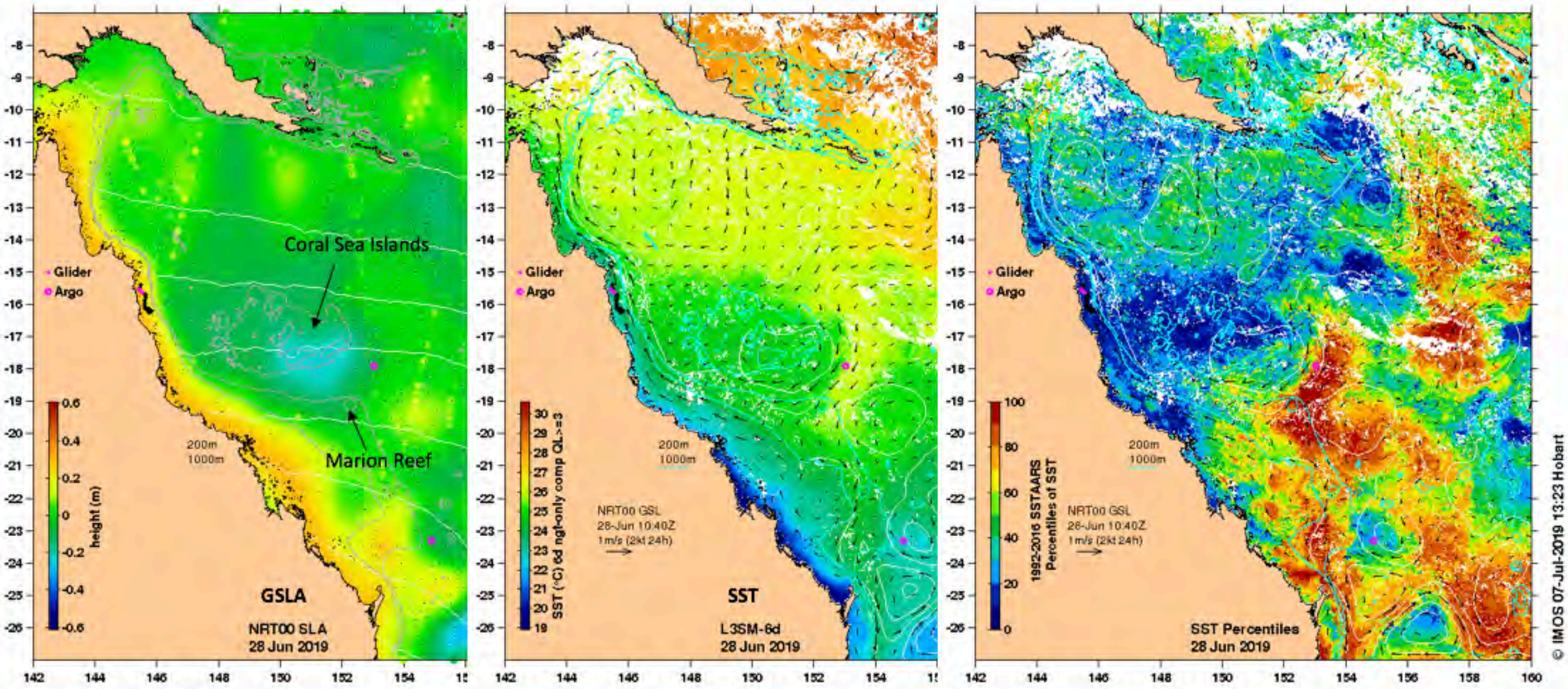

Figure 2. GSLA, SST and SST Percentiles (l-r) for 28 Jun 2019. The cold-core eddy can be seen in the GSLA (left) at 151E 18S encountering the Coral Sea Islands. Warm water is advected south along the eastern flank of the eddy (middle) and (right) high SST percentiles are associated with the advected water.

Where to?

Continue Collaboration?

Continue information sharing?

Future opportunities – funding possibilities?

Make-up of Group – right mix of interested people?

Size of group – contract/stabilise/expand?

Frequency of meetings – continue to meet every 8 weeks or so?

Priorities and how do we progress these ? Enhanced observations? Data formats? Assimilation or validation of data versus forecasts

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Questions?