



# IMOS SRS Surface Waves Sub-facility

Marites Canto | 12<sup>th</sup> March 2026

[Climate Intelligence](#) | [Environment RU](#) | [CSIRO](#)

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IMOS acknowledges the Traditional Custodians and Elders of the land and sea on which we work and observe, and recognise them as Australia's first marine scientists and carers of sea Country. We pay our respects to Aboriginal and Torres Strait Islander peoples past and present.

Offshore operations



Public recreation and safety



Coastal hazards & planning

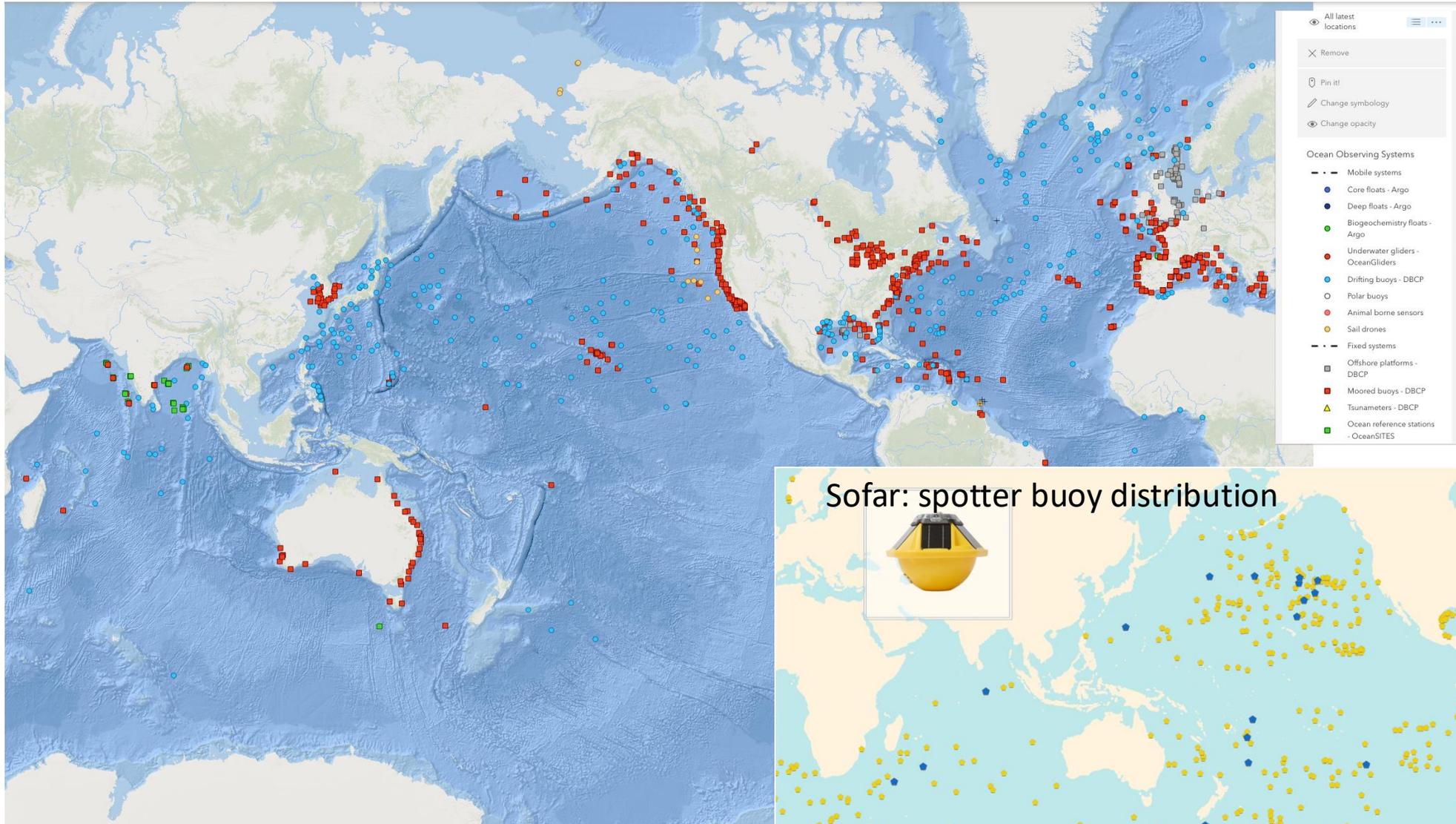


Wind and wave resource assessment

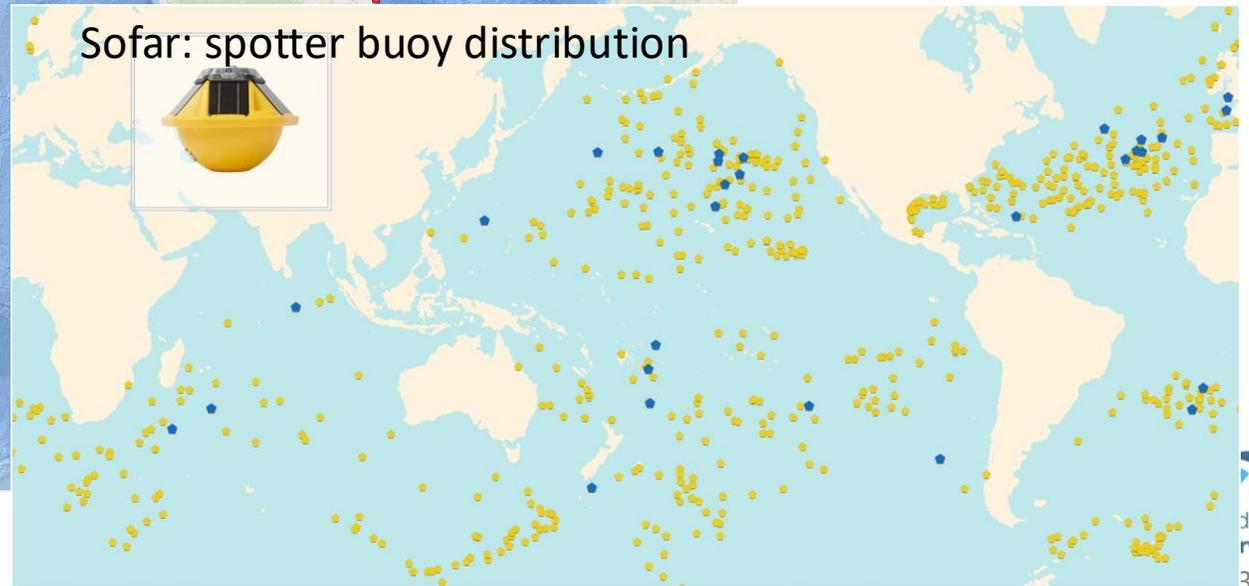
Accurate wave / wind forecasts are crucial for decision-making in marine industries, Navy operations and tactical awareness, and environmental applications

These rely on accurate modelling as well as on **an observing system (in situ, satellite etc.)** able to support predictive modelling (refine initial conditions, improve, and verify forecasts) as well as for near real time and climate monitoring.

# Global in-situ wave buoy network is quite sparse... and largely coastal...

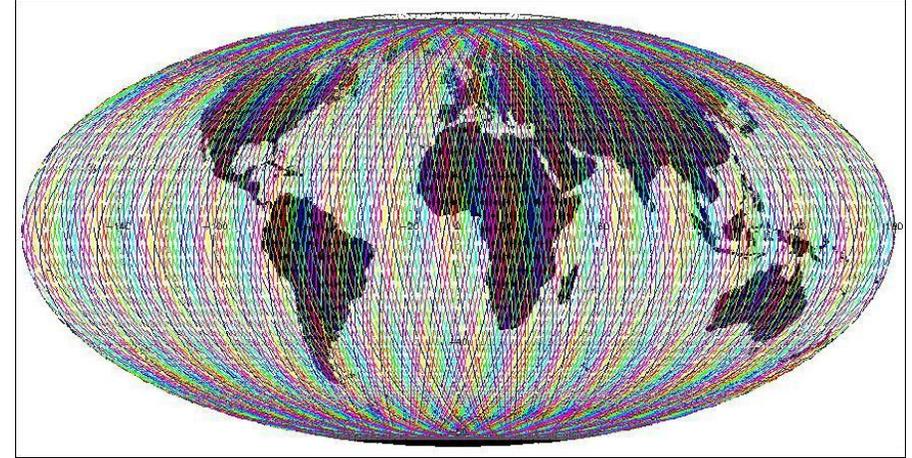


Sofar: spotter buoy distribution



## AIM

- Provide calibrated and accessible satellite ocean waves and wind data to support ongoing and emerging marine research and industry needs in Australia



13-day repeat orbit CFOSat

- Cost effective maintenance, enhancement of global met-ocean data: raw datasets (Altimeter, SAR, and Scatterometer) are all available in public domain, and the unique underlying data processing techniques are mature. No kit is physically deployed.

# Achievements

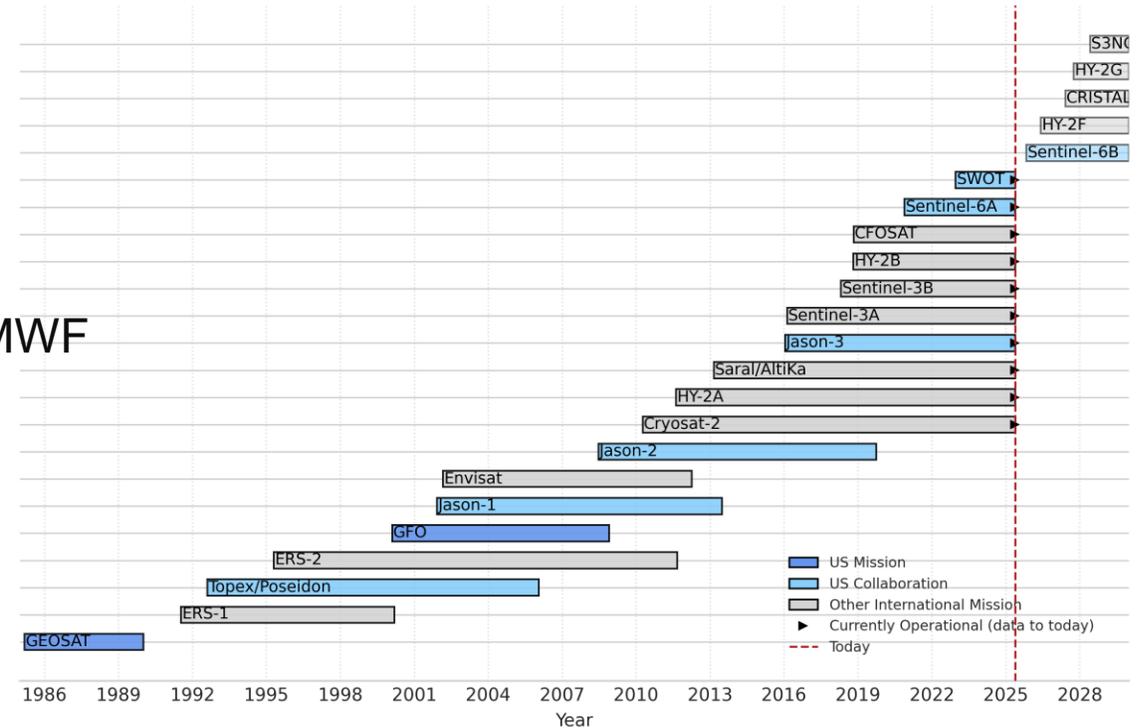
- Broad marine user need for wave/wind measurements highlighted in NMSP (2015-2025) and FOO (~2015) resulting in IMOS investment:
  - SRS surface waves sub-facility
  - Wave buoy facility (BoM led)
  - New tech pilot satellite surface winds bid (2020-2021), now part of sustained observing
  - New tech pilot low-cost wave buoy bid, now IMOS Coastal Wave Buoy facility (UWA-led)
  - ARDC Catching Oz Waves which enhanced the AODN wave archive (AODN-led)
- FOO SWWG (lead through the RS facility and active now for ~decade) playing an anchoring role in high industry/service provider engagement, seeding new directions, and cross-sector connections
- IMOS *OceanCurrent* wave tool integrates wave information at national scale
- AODN has previously reported high demand and uptake of these data
  - Some of these archives have been cited in virtually every other international research article in ocean waves domain in the last few years



# 1. SRS Surface Waves – Altimeter record

UoM lead (1985 – present; Ribal & Young, 2019)

- Altimeter Hs and Wspd (U10),
- **+ mean wave period** on all operational missions
- Global, ~40-year, multi-mission (17 altimeters)
- Calibrated against global buoy dataset NDBC, ECMWF
- Cross-validated amongst altimeter missions
- 1 x 1 deg tiled netCDF files
- 6-monthly updated
- TBA: SWOT + future planned missions



IMOS - SRS Surface Waves Sub-Facility - altimeter wave/wind

Select >>



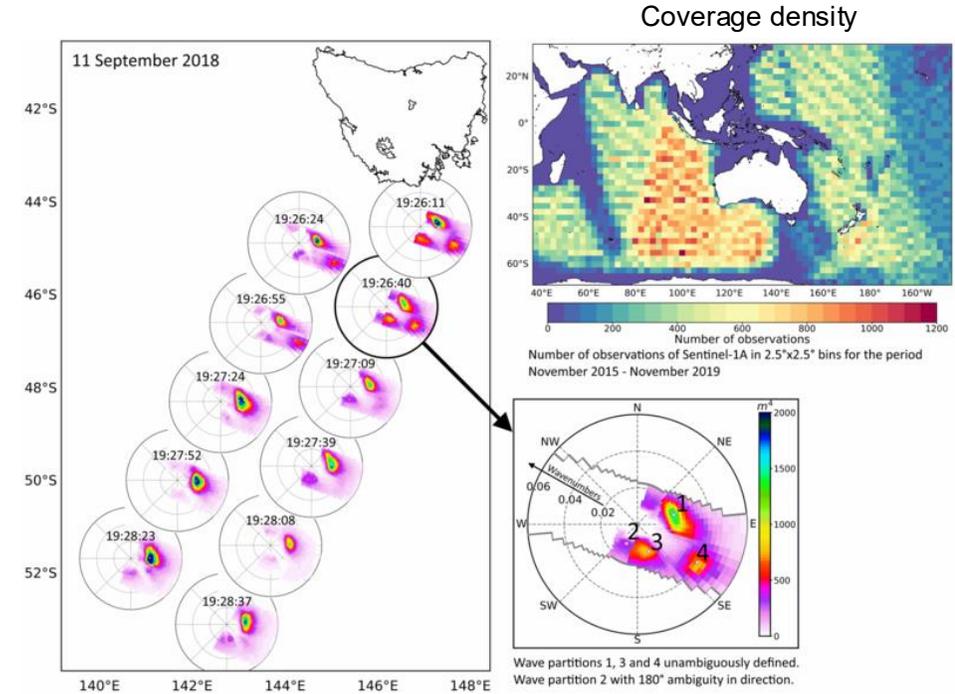
Wave - Wind [more >](#)  
 1985 - 2024  
 Integrated Marine Observing System (IMOS) - Department of Infrastructure Engineering, The University of Melbourne  
 Satellite



## 2. SRS Surface Waves – SAR record

[CSIRO lead](#) (Khan et al, 2020)

- Sentinel-1 A/B platforms\*
- Covers an Australasian region of interest
- Spans Jul 2015 – present (DM and NRT)
- Along-track ~daily NetCDF files
- DM 6-monthly updated (Dec 2023)
- NRT up to date feeds into OceanCurrent
- TBA: CFOSAT directional wave spectra, Sentinel-1 C/D, SWOT, Envisat...



A descending pass south of Tasmania

IMOS - SRS Surface Waves Sub-Facility - SAR wave - Delayed mode data [Select >>](#)

  Wave [more >](#)  
 2015 - 2024   
 Integrated Marine Observing System (IMOS) - CSIRO Oceans and Atmosphere - Hobart  
 Satellite 

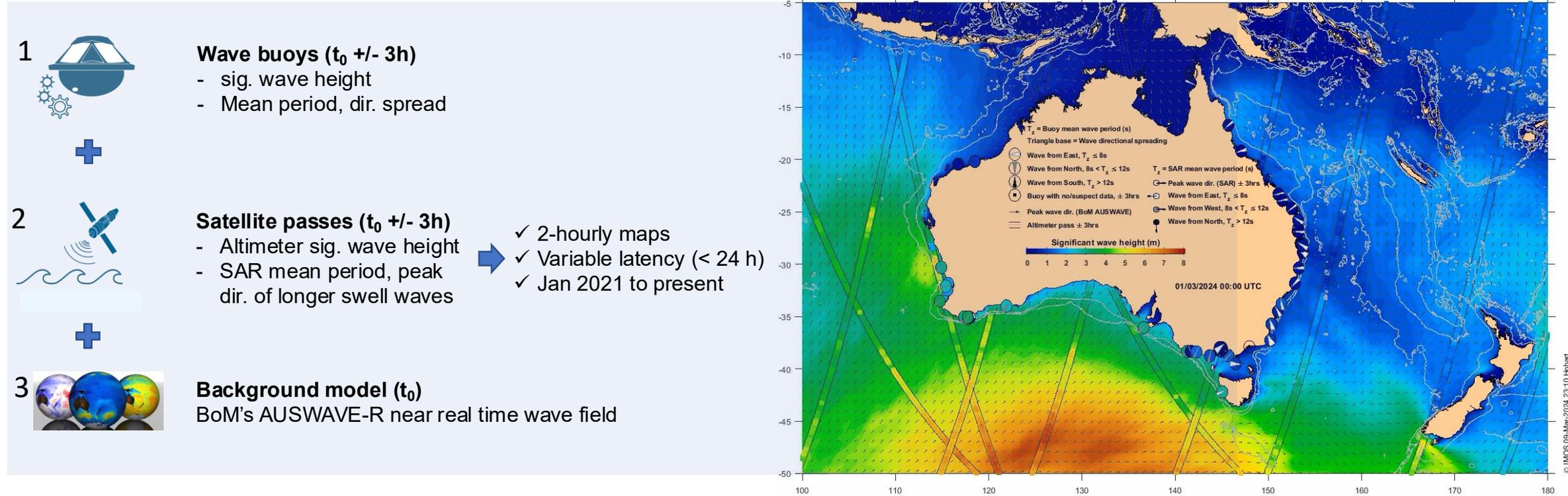
IMOS - SRS Surface Waves Sub-Facility - SAR wave - Near real-time data [Select >>](#)

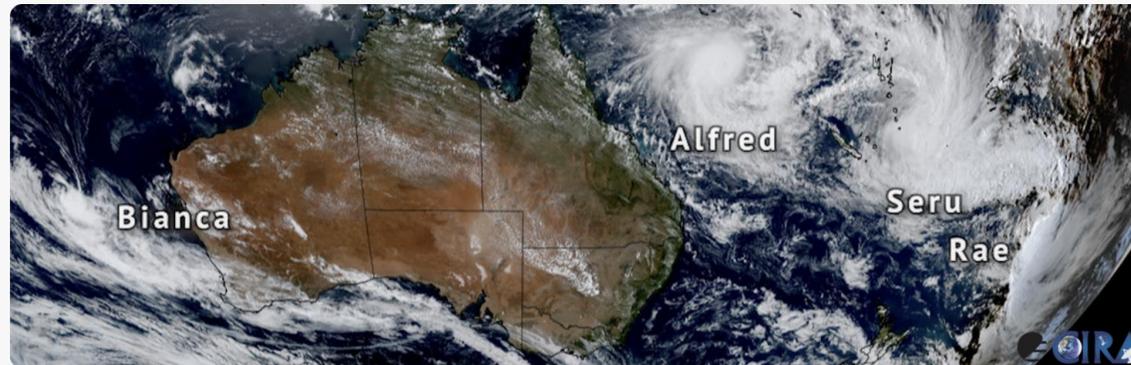
  Wave [more >](#)  
 2019 - 2024   
 Integrated Marine Observing System (IMOS) - CSIRO Oceans and Atmosphere - Hobart  
 Satellite 

# 3. IMOS OceanCurrent Surface Waves

CSIRO lead (Khan et al, 2020)

[oceancurrent.imos.org.au](http://oceancurrent.imos.org.au)



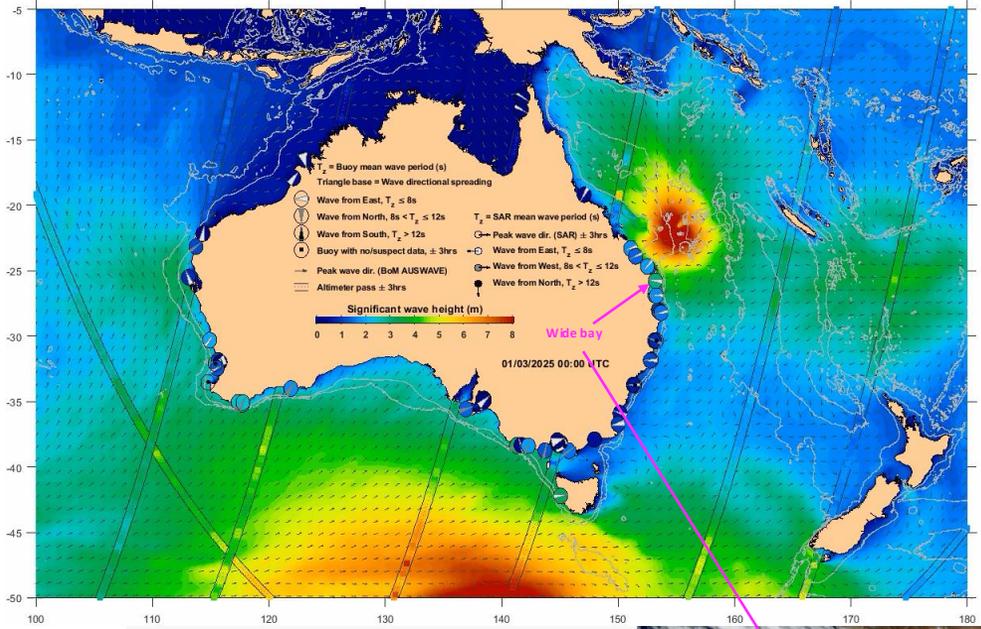


## IMOS OceanCurrent wave tool monitors high waves from TC Alfred

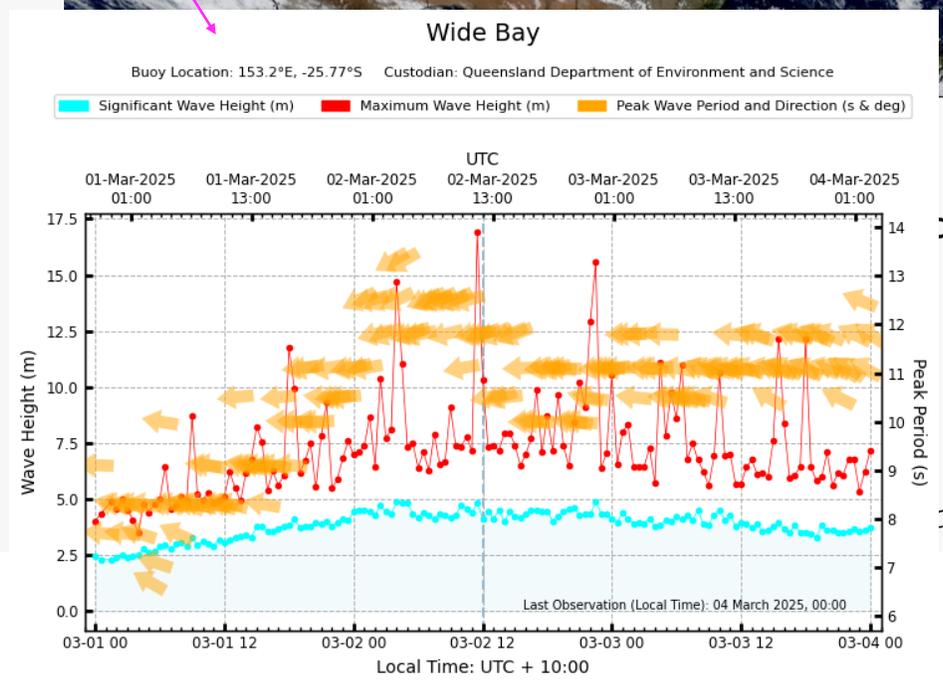
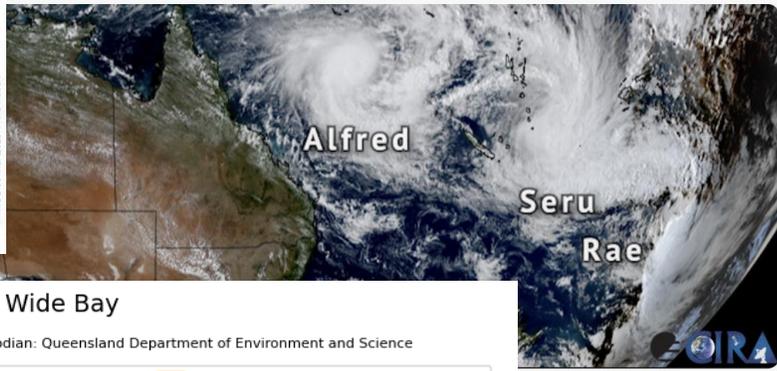
Mar 7, 2025

*Written by Salman Khan, Marites Canto, Mark Hemer, and Hamish Ramsay (CSIRO, Environment)*

# TC Alfred waves



I'm looking for...



waves from

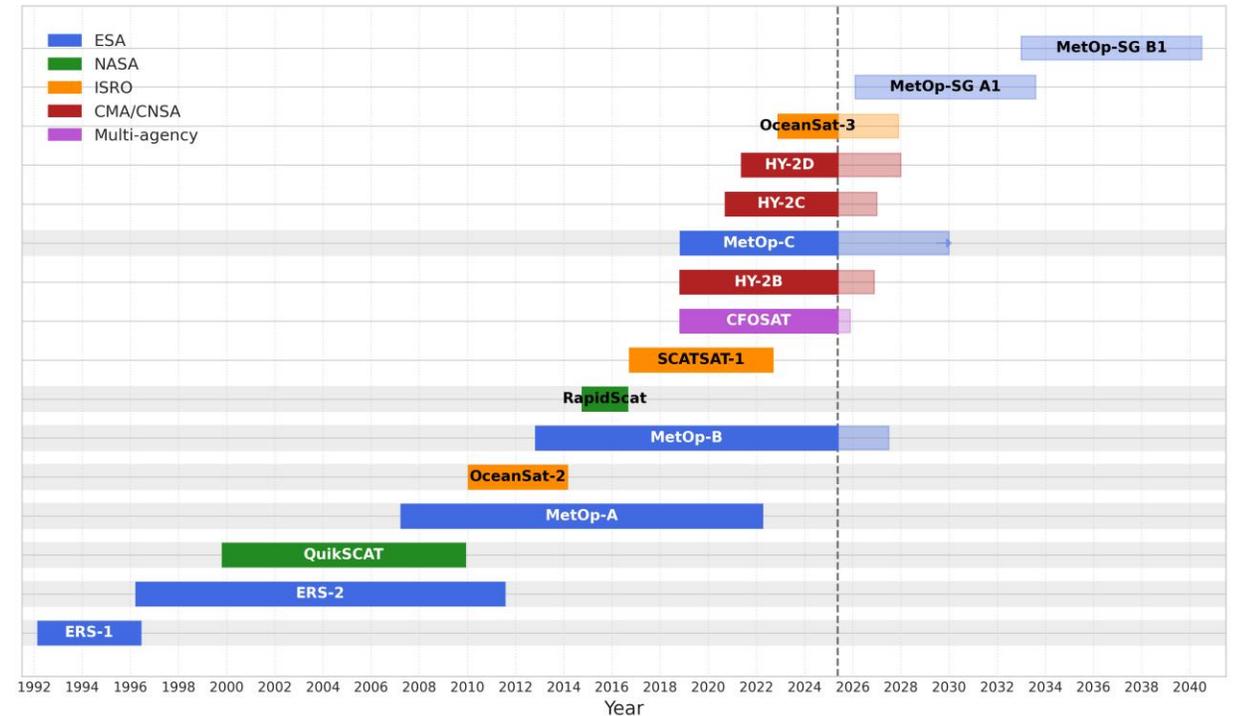
CSIRO, Environment)



# 4. IMOS SRS Surface Wind – Scatterometer record

UoM lead (Ribal & Young, 2020)

- Global wind speed ( $U_{10}$ ) and direction at 12.5 - 25 km resolution over 30 years, 8 missions
- Calibrated against NDBC buoys
- Validated at cross-over points between Scatterometer at a range of geographic locations
- 6-monthly updated (Mar 2024)



## IMOS - SRS Surface Waves Sub-Facility - scatterometer wind

Select >>



- ⚙ Wind
- 📅 1992 - 2024
- 🏛 Integrated Marine Observing System (IMOS) - Department of Infrastructure Engineering, The University of Melbourne
- 📡 Satellite

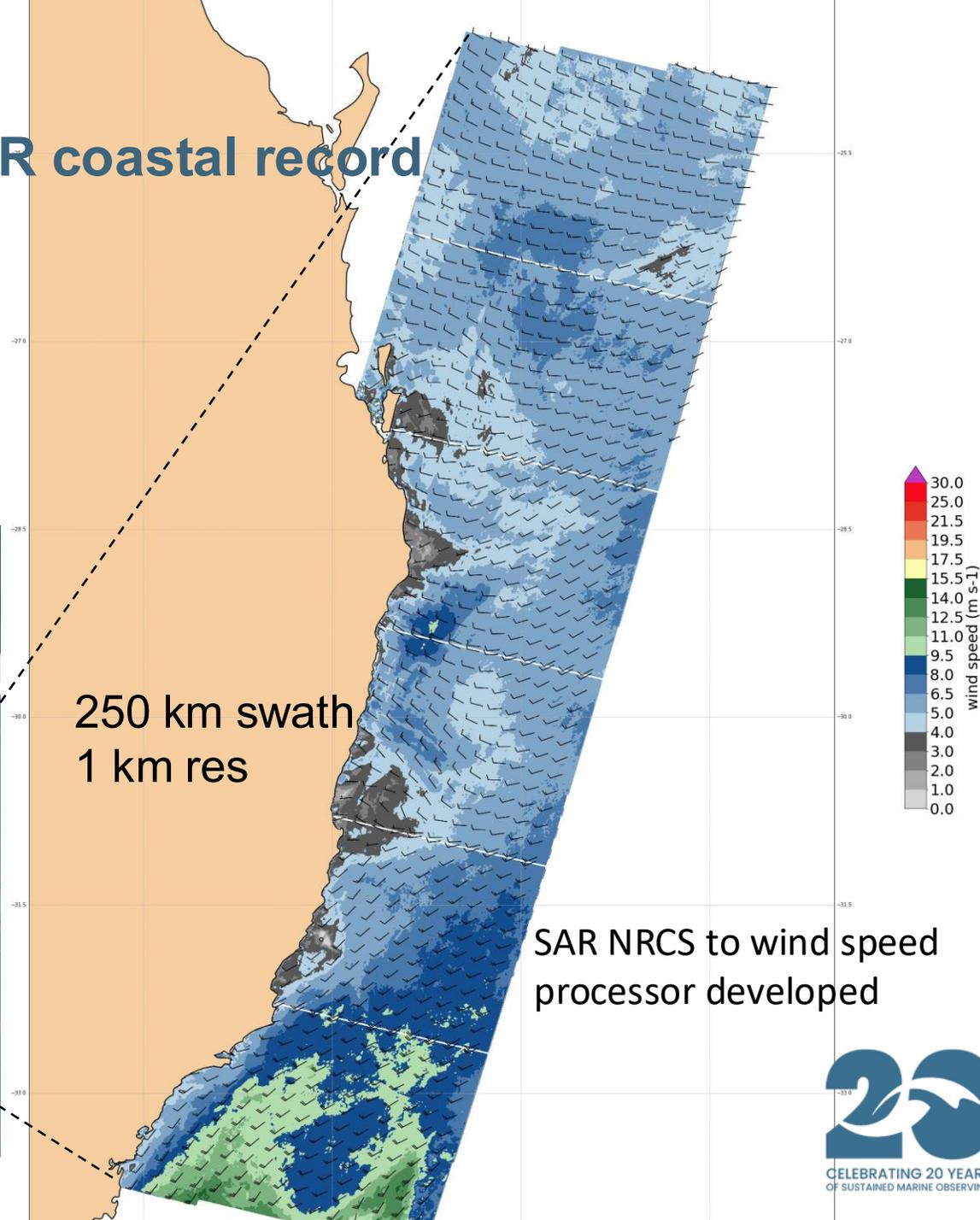
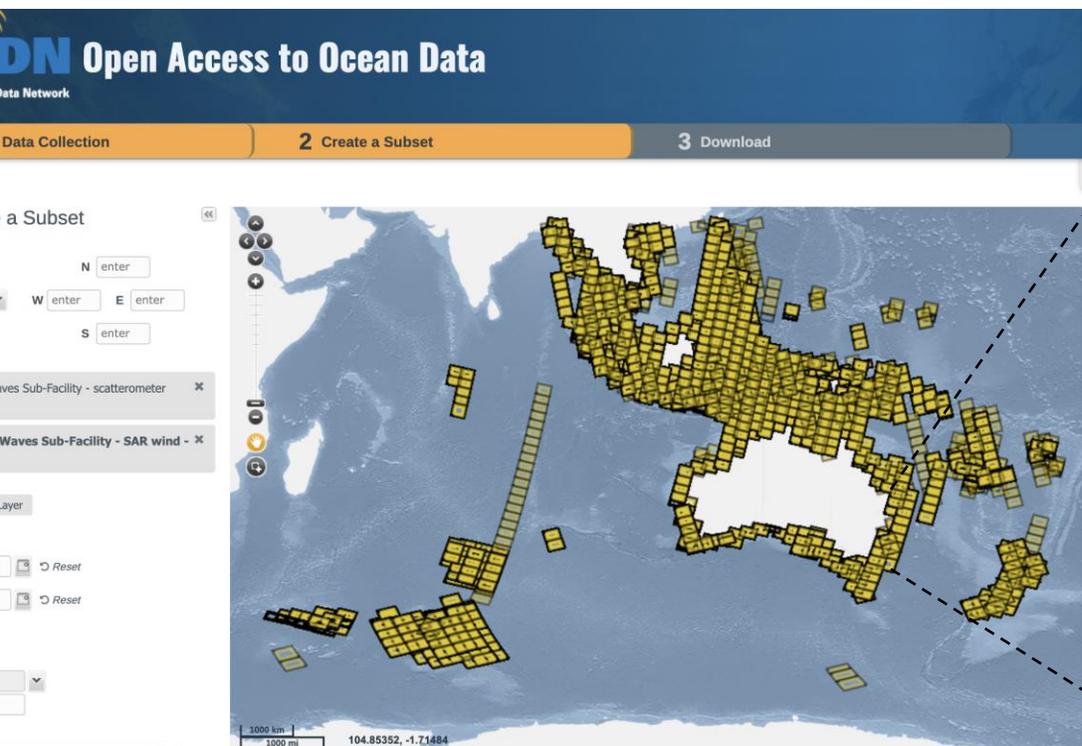
[more](#)



# 5. IMOS SRS Surface Wind – SAR coastal record

CSIRO lead; UoM collaboration (Khan et al, 2023)

- Sentinel-1 A/B
- Australasian region
- 2017 to present
- Calibrated and validated against Scatterometer and Altimeter winds
- 6-monthly updated (Dec 2023)

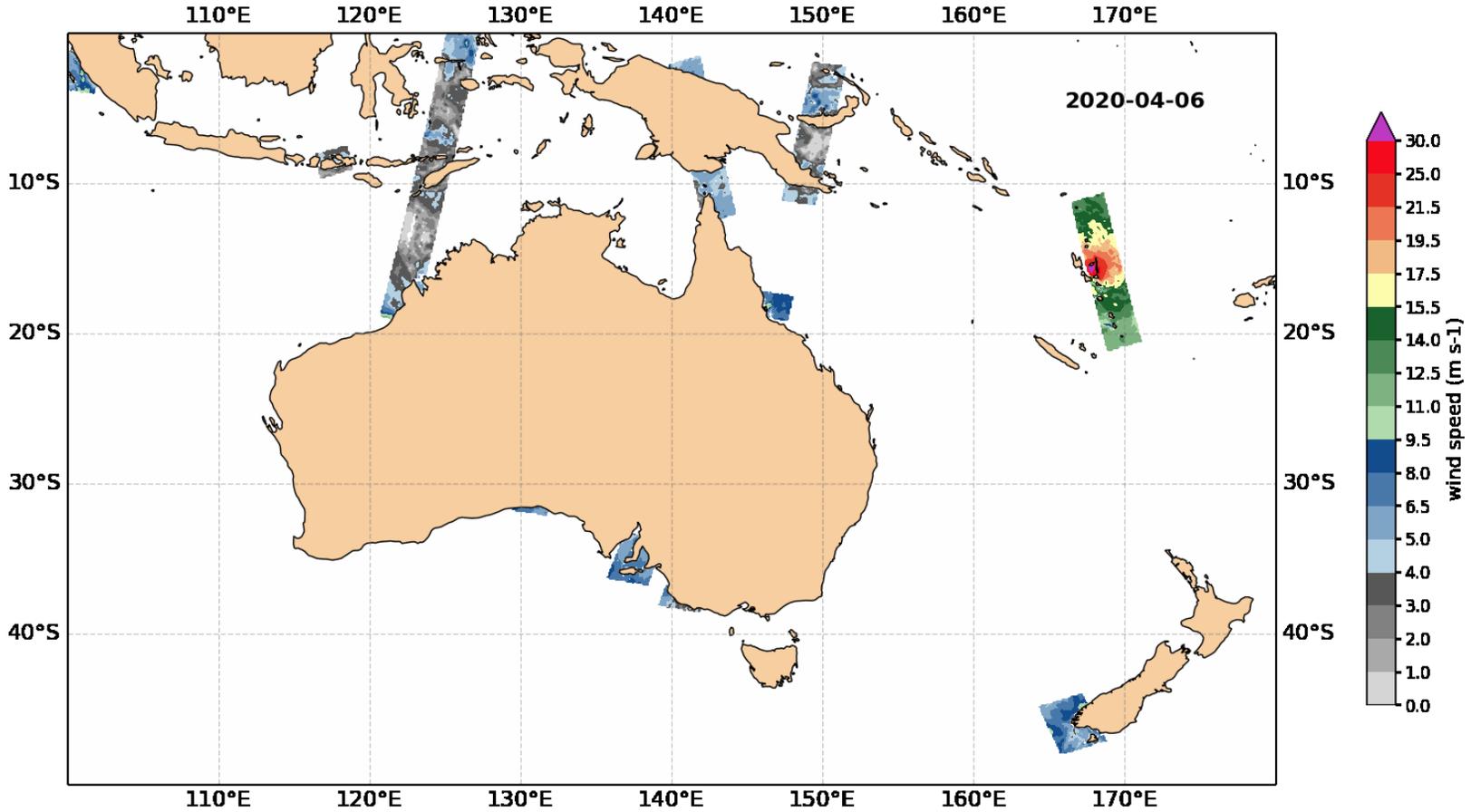


250 km swath  
1 km res

SAR NRCS to wind speed  
processor developed



# Gridded products: e.g., L3 daily SAR winds at 0.01°



Collection now online



Scan me

[thredds.aodn.org.au/thredds/catalog/IMOS/SRS/Surface-Waves/SAR\\_Wind/DELAYED/GRIDDED/catalog.html](https://thredds.aodn.org.au/thredds/catalog/IMOS/SRS/Surface-Waves/SAR_Wind/DELAYED/GRIDDED/catalog.html)

Easier use with models, scalable, user friendly



## Cross Capability / Facility Connection

Close integration with Australian coastal wave buoy network (AODN wave archive and real time feed, IMOS Wave Buoy and Coastal Wave Buoy facilities) through IMOS *OceanCurrent facility* and cross-facility data comparison

Utilisation and verification against Southern Ocean Flux Station (SOFS) wave data

Value derived from comparisons with emerging drifting spotter wave buoys (overseas and emerging Australian)

Leveraging FOO SWWG leadership as an umbrella to better connect diverse wave expertise across Australia (especially with industry perspectives)

Joint facility resurrection of the Aus/NZ Wind-Wave Symposium 2025 aligned with FOO

## Key overseas partnerships

International relationships critical to ensuring continued access to free and open satellite data

Locally supported satellite calibration and validation is highly valued overseas

Privileged early access to information from new satellite technologies and latest products

Relationship with Europe is increasingly important, especially in the face of growing US uncertainty:

ESA (incl. sea-state Climate Change Initiative project), Copernicus program, CNES (SWOT, CFOSat intl. science team), EUMETSAT, ECMWF, Ifremer, National Oceanography Center, etc.

## Users and impact

- **Offshore renewable industry** needs detailed mapping, long-term resource assessment, and cal/val of regional wind/wave models. (e.g., *Energise Renewables Pty Ltd.*; *Renewable Energy Systems Ltd.*)
- **Offshore oil and gas industry** needs quality predictions of wind and wave fields for operation, design of structures, and cal/val of forecasting models
- **Wind/wave climate and forecasts:** increased understanding beneficial for offshore industry operations, fisheries, ship navigation, coastal and harbour management (e.g., Dalrymple port birthing operations).
- **Wave model skill improvement:** wind forcing a major source of errors, cal/val and tuning of models



# Users and impact

## Large-scale sector programs:

- Australian Climate Service (ACS) – coastal hazards and risk information
- Bluelink Partnership - Navy's interest in nearshore wind, wave, currents observations for littoral awareness and prediction
- NESP 2 Climate Systems Hub – Oceans and Coasts research theme – drivers of coastal variability and change (wind, waves, SLR etc.)
- BoM's operational wave model verification and development

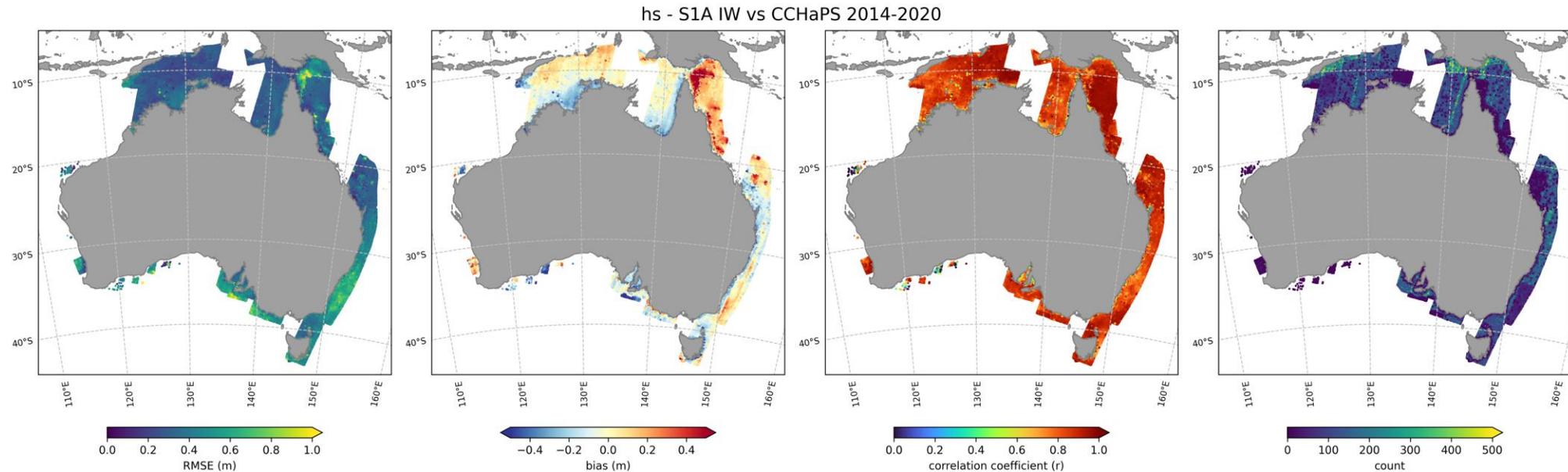


## Future Priorities

- New tech/missions (CFOSAT, SWOT, NG-Scatterometers, -SARs, -Altimeters)
- More accurate data over extremes, like Tropical Cyclones
- More usable data closer to the coast

# Future Priorities: Exploring ESA Sea State 18-year data set (2002-2020) capitalising on numerous data holdings for this period

- Significant wave height from satellite altimeters that include all the ESA missions, and Topex/Jason series
- Status: evaluation / comparison of the product against CCHaPS (and AODN wave buoy) Hs data



## Coupled Coastal Hazard Prediction System (CCHaPS) Hindcast for Australia

Commonwealth Scientific and Industrial Research Organisation

Hernaman, Vanessa ; Hoeke, Ron ; Hally, Bryan ; Trenham, Claire ; Seers, Blake ; Leighton, Ben ; Meucci, Alberto ; Echevarria, Emilio



# Thank you

