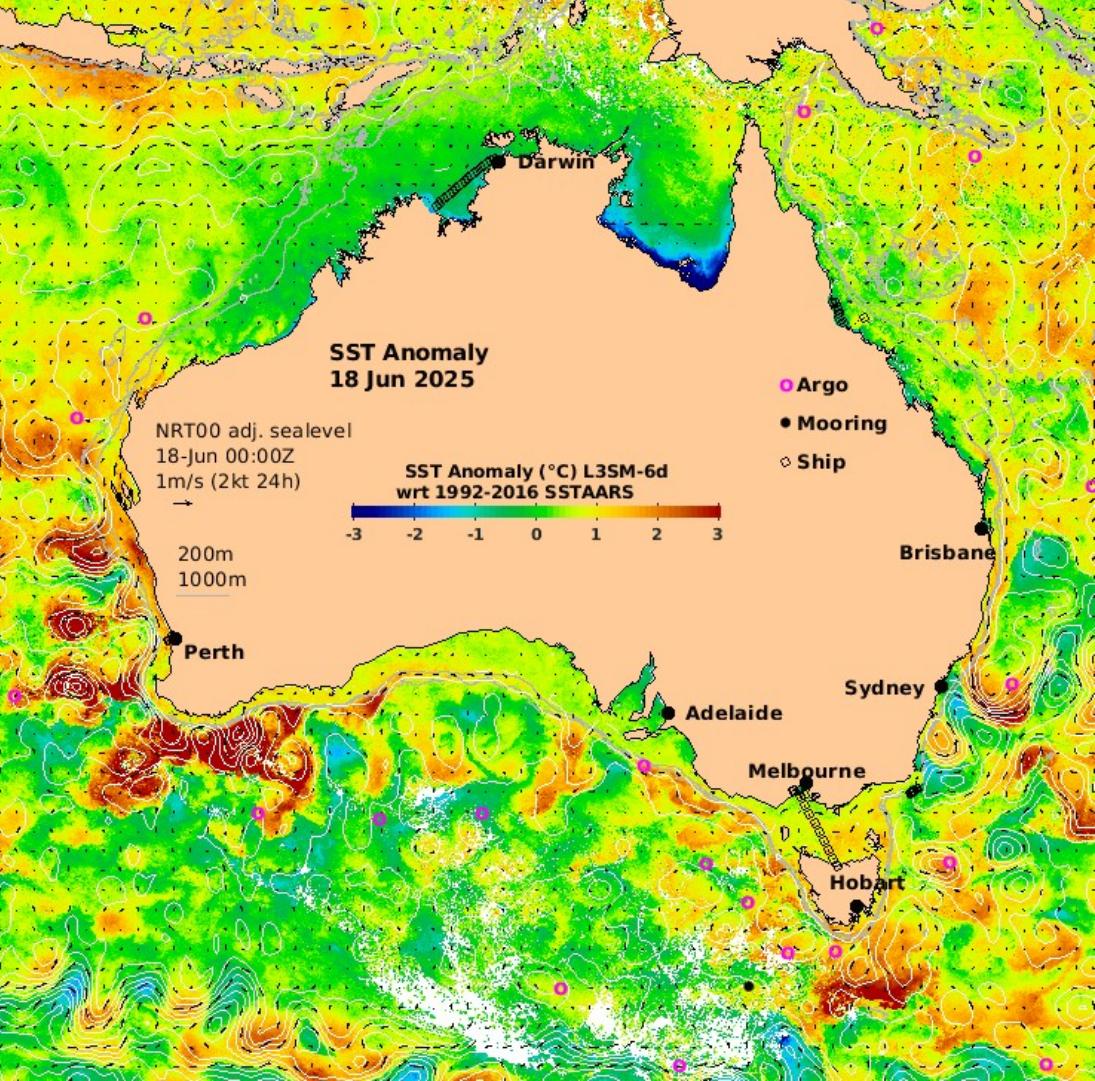




IMOS-OceanCurrent: Up-to-date ocean information around Australia

Gabriela Semolini Pilo
David Griffin
Roger Scott
Edward King

Australia's National Science Agency



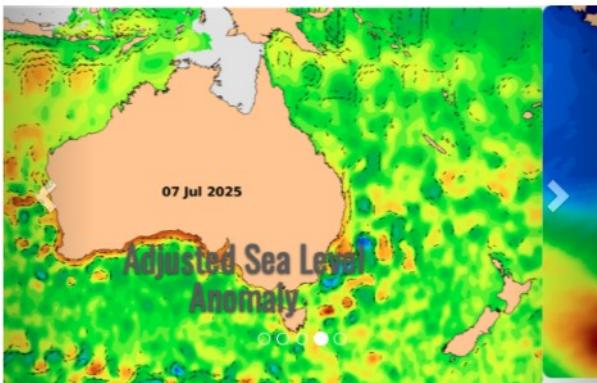


IMOS-OceanCurrent

IMOS OceanCurrent
Surface Currents and Temperature
Up to date ocean information around Australia.

Maps ▾ In-water ▾ News Guided Tour

IMOS AODN Portal

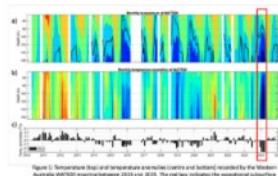


OceanCurrent News

Cryptic upwelling off Western Australia

Ming Feng, Toan Bui, Chari Pattiaratchi

31 May, 2025



Earlier this year, the National Mooring Network team has successfully retrieved the data from the instruments in the mooring array off Western Australia (WA). An exceptional subsurface cooling event...

TC Alfred's imprint in the deep ocean

Gabriela S. Pilo

31 March, 2025



A quick integrated view of ocean data around Australia

What data is available

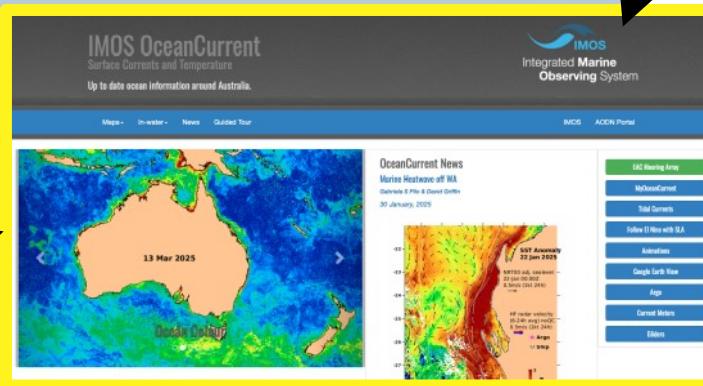
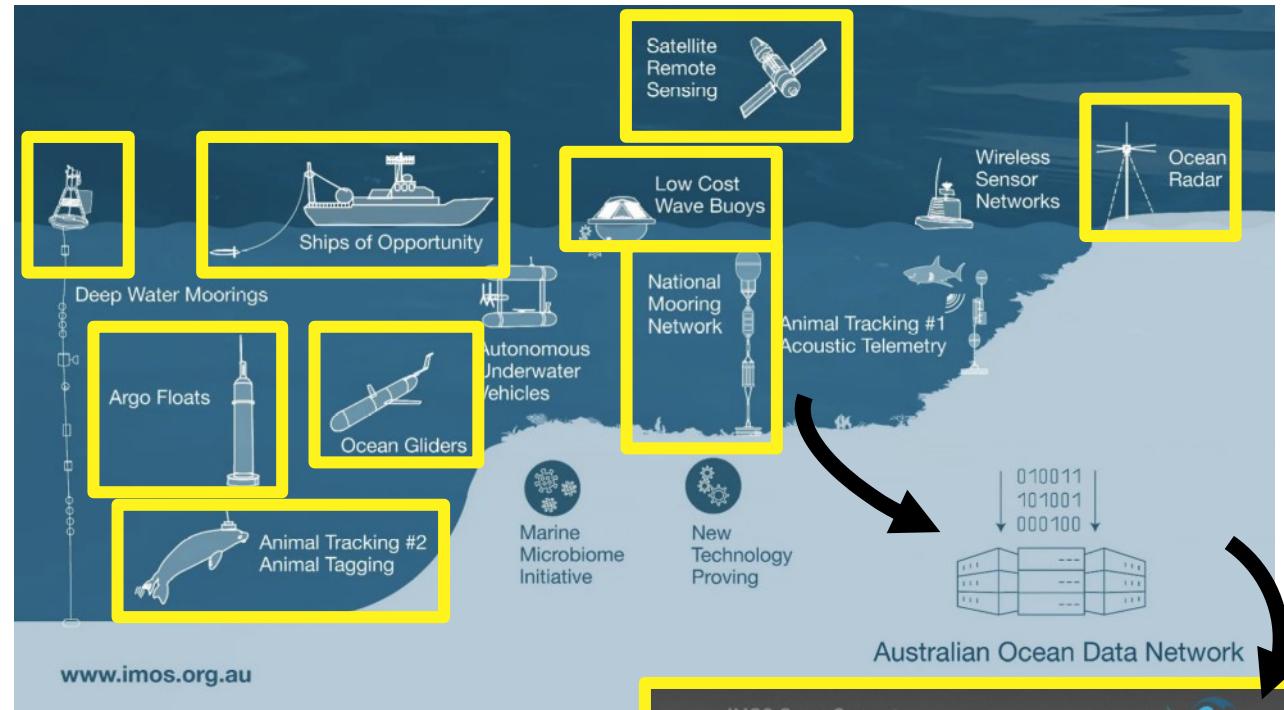
What data types are available

Quick look into case studies

Ready-made figures for copying and pasting (free to use)

- EAC Mooring Array
- MyOceanCurrent
- Tidal Currents
- Follow El Nino with SLA
- Animations
- Google Earth View
- Argo
- Current Meters
- Gliders

Lots of ocean information around Australia

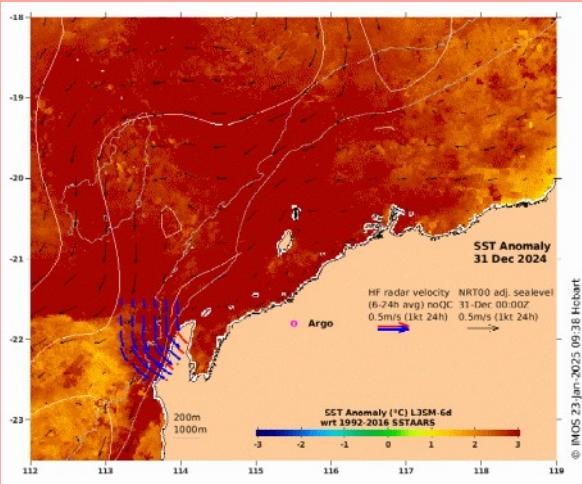


Tide gauge data

Wave buoy data

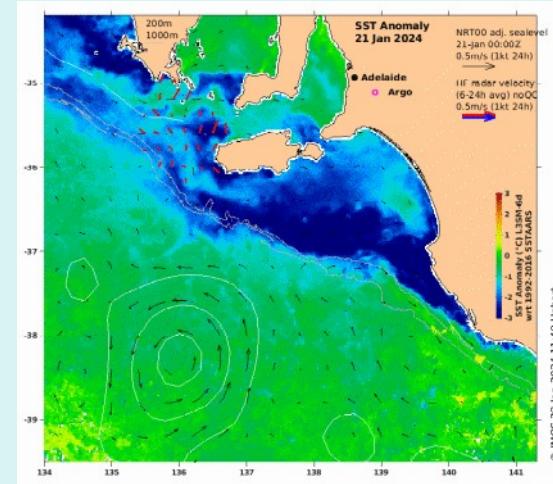
Ocean conditions off WA during the 24/25 summer

- Did we measure it?
- How hot was it?
- Was it different from previous summers?
- Was it too hot for too long?
- Did the heat penetrate below the surface?



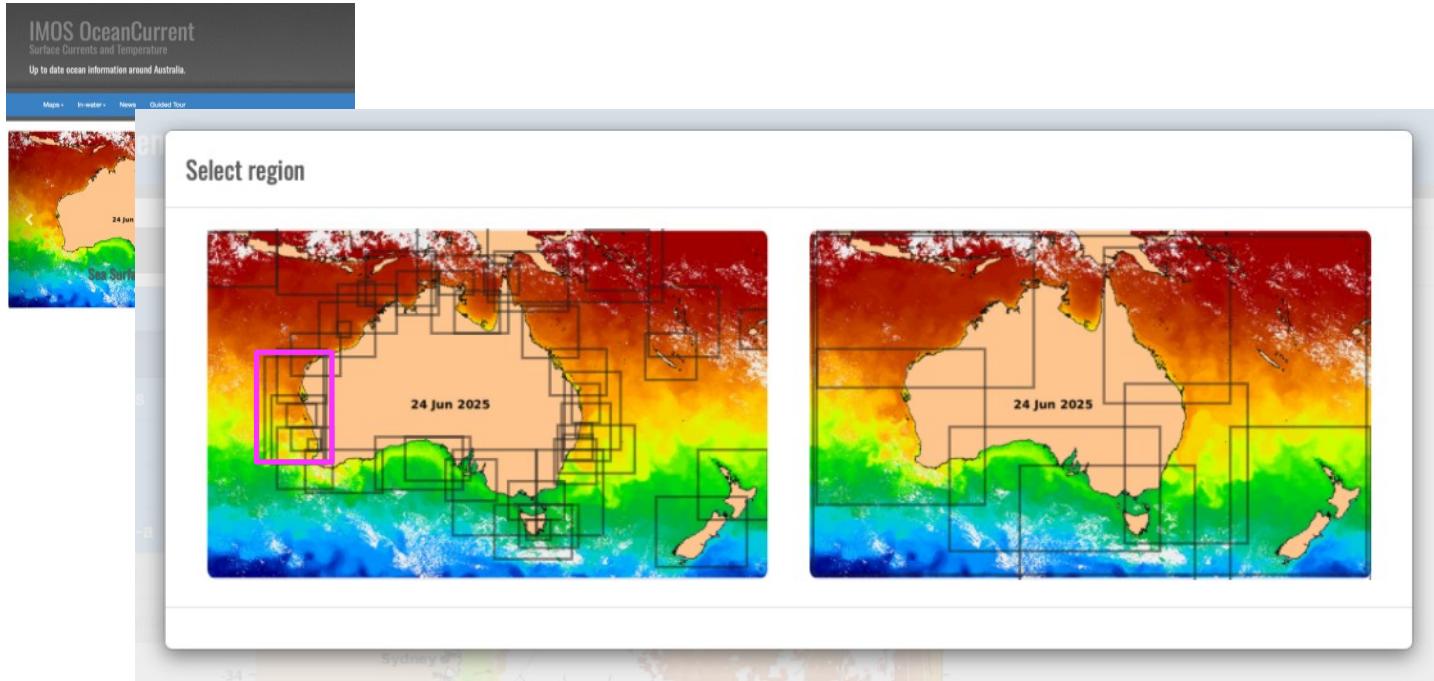
Ocean circulation near Kangaroo Island

- What do the currents usually look like off SA?
- How cold does it get at the surface?
- How strong is the upwelling this year?
- What datasets are available?





Case Study #1: A quick look into the ocean conditions off WA during the 24/25 summer



Select region



29 Jun 2025



SST



Permalink

Snapshot SST

Four hour SST

6-Day SST & Centiles

Climatology

SST Anom vs Time

Snapshot Chlorophyll-a

Adj. Sea Level Anom.

Non-Tidal Sea Level Anom.

Data sources

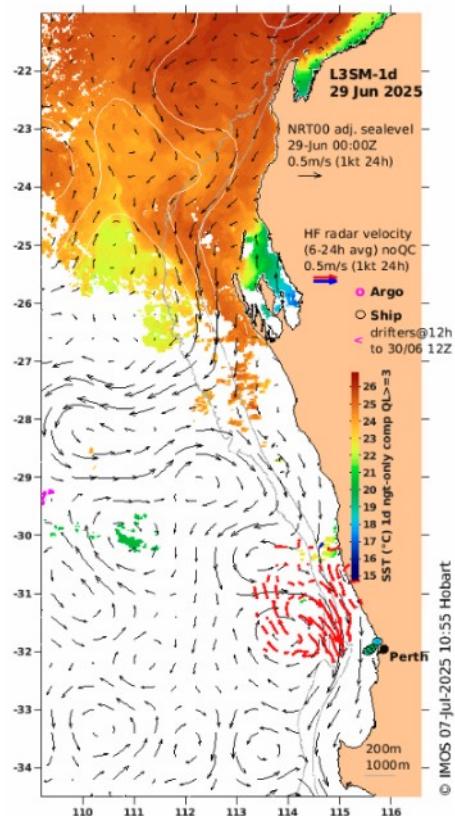
SST L3S-6d ngt
(1992-2017)SST L3SM-6d ngt
(2018-now)

GSLA

SSTAARS

Legend

- Argo
- Glider
- Radar
- > Drifter
- Ship

Click for more
information

Case Study #1: A quick look into
the ocean conditions off WA
during the 24/25 summer

Case Study #1: A quick look into the ocean conditions off WA during the 24/25 summer

Select region

Snapshot SST

Four hour SST

6-Day SST & Centiles

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Snapshot Chlorophyll-a

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Non-Tidal Sea Level Anom.

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(1992-2017)SST L3SM-6d ngt
(2018-now)

GSLA

SSTAARS

Legend

- Argo
- ♦ Glider
- Radar
- > Drifter
- Ship

Click for more information



29 Jun 2025

Jun 2025



Permalink

Su Mo Tu We Th Fr Sa

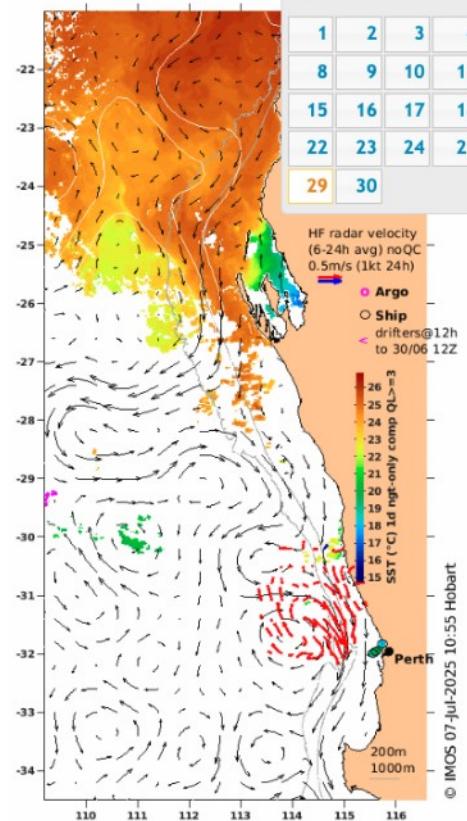
1 2 3 4 5 6 7

8 9 10 11 12 13 14

15 16 17 18 19 20 21

22 23 24 25 26 27 28

29 30



Case Study #1: A quick look into the ocean conditions off WA during the 24/25 summer

Select region

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6-Day SST & Centiles

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Snapshot Chlorophyll-a

Adj. Sea Level Anom.

Non-Tidal Sea Level Anom.

Data sources

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(1992-2017)SST L3SM-6d ngt
(2018-now)

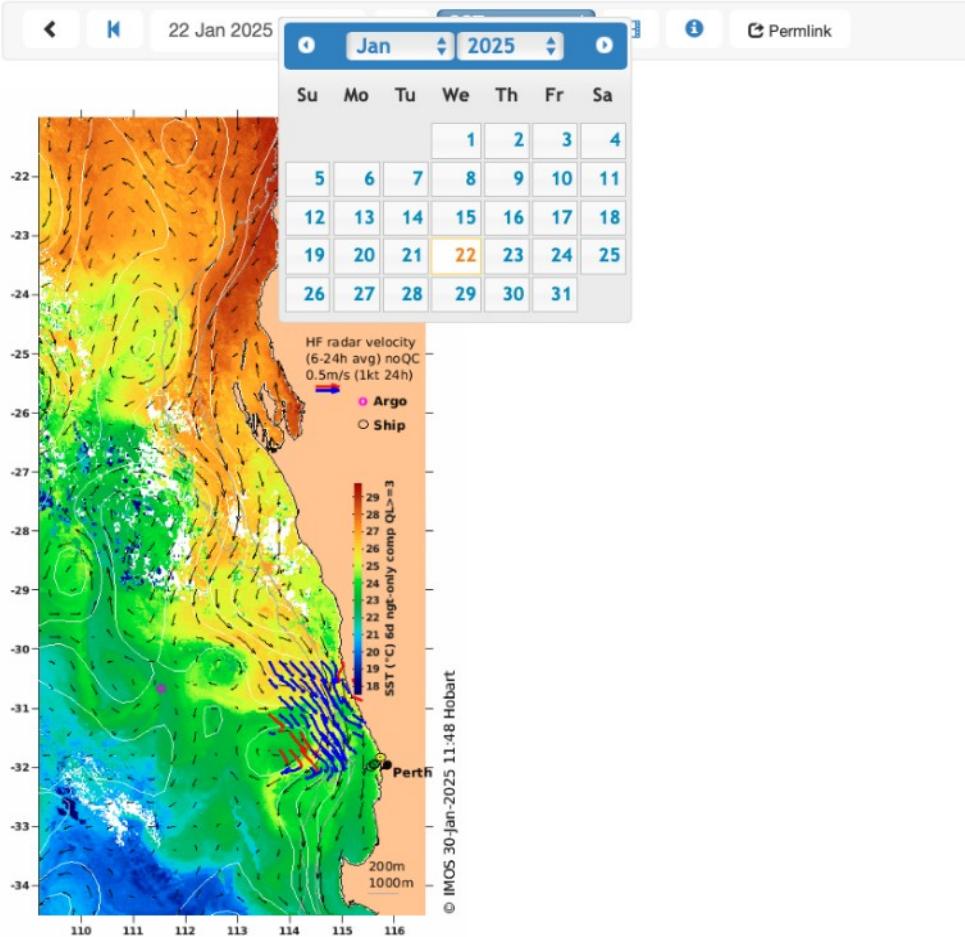
GSLA

SSTAARS

Legend

- Argo
- ◆ Glider
- Radar
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- Ship

Click for more



Select region

Snapshot SST

Four hour SST

6-Day SST & Centiles

Climatology

SST Anom vs Time

Snapshot Chlorophyll-a

Adj. Sea Level Anom.

Non-Tidal Sea Level Anom.

Data sources

SST L3S-6d ngt
(1992-2017)SST L3SM-6d ngt
(2018-now)

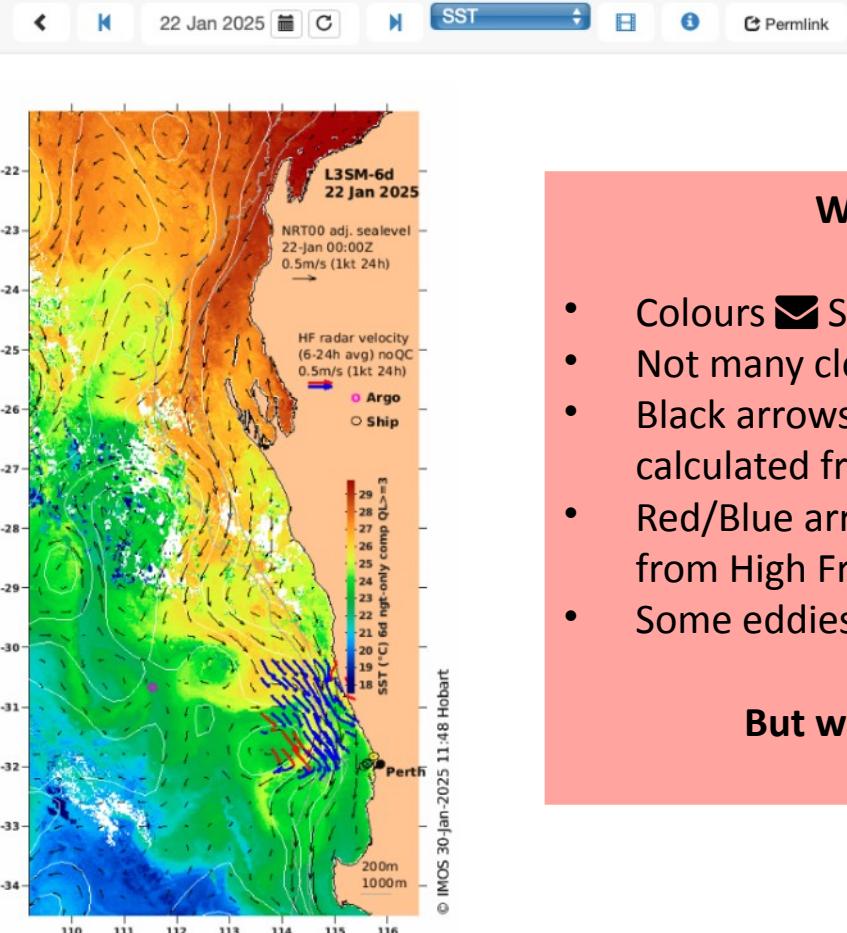
GSLA

SSTAARS

Legend

- Argo
- ◆ Glider
- Radar
- > Drifter
- Ship

Click for more



Case Study #1: A quick look into the ocean conditions off WA during the 24/25 summer

What are we seeing?

- Colours ↗ SST
- Not many clouds
- Black arrows ↗ geostrophic currents calculated from satellite data
- Red/Blue arrows ↗ total surface velocity from High Frequency land-based radar
- Some eddies offshore

But was this SST anomalous?

Want to download and analyse this data?
Tutorial this afternoon!

Case Study #1: A quick look into
the ocean conditions off WA
during the 24/25 summer

- Select ...
- Hour SST
- 6-Day SST & Centiles
- Climatology
- SST Anom vs Time
- Snapshot Chlorophyll-a
- Adj. Sea Level Anom.
- Non-Tidal Sea Level Anom.

Data sources

SST L3S-6d ngt
(1992-2017)

SST L3SM-6d ngt
(2018-now)

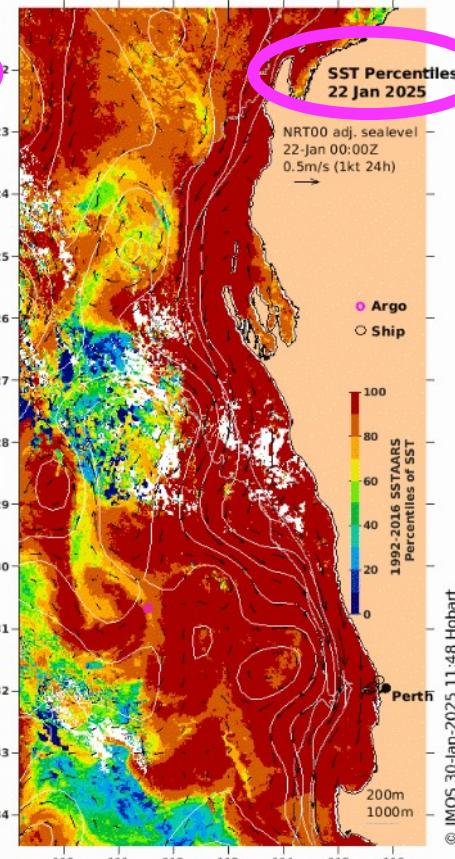
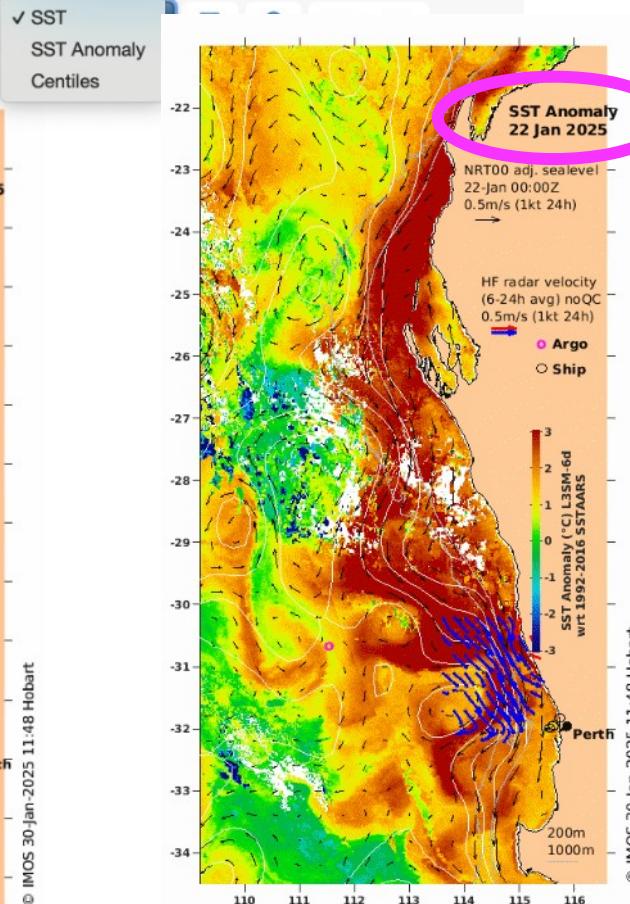
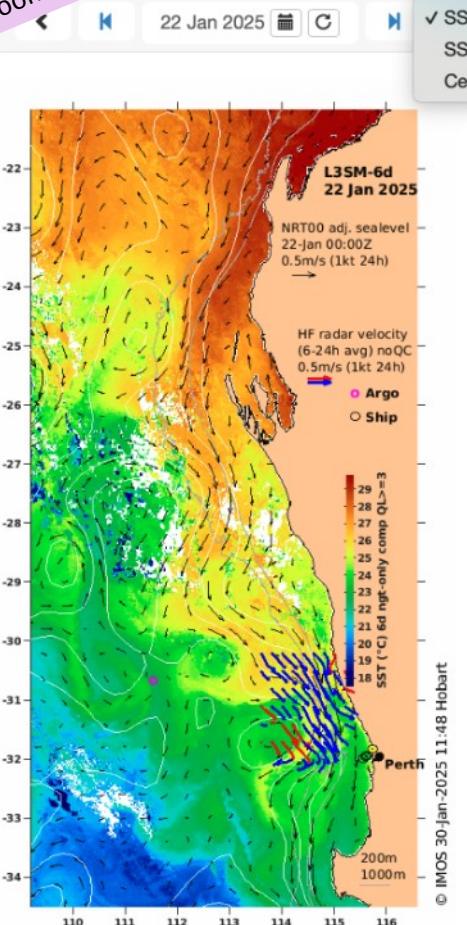
GSLA

SSTAARS

Legend

- Argo
- ◆ Glider
- Radar
- > Drifter
- Ship

Click for more



Select region

- Snapshot SST
 - Four hour SST
 - Day SST & Centiles
 - Climatology
 - ST Anom vs Time
 - Snapshot Chlorophyll-a
 - Sj. Sea Level Anom.
 - Tidal Sea Level Anom.

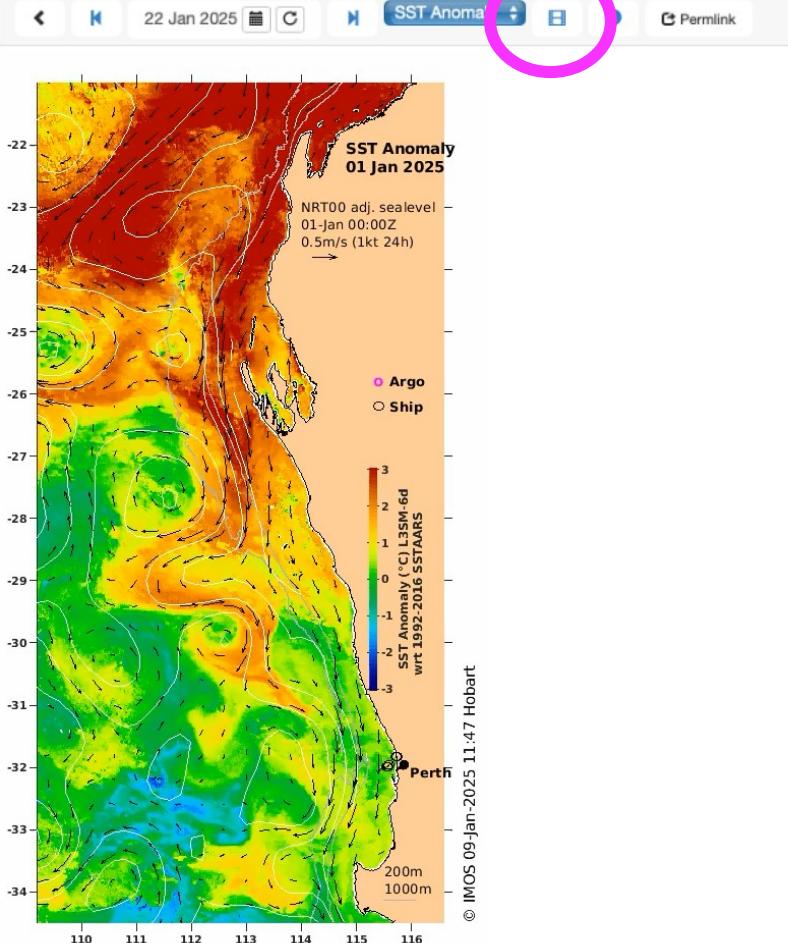
Data sources

- SST L3S-6d ngt
(1992-2017)
SST L3SM-6d ngt
(2018-now)
GSLA
SSTAARS

Legend

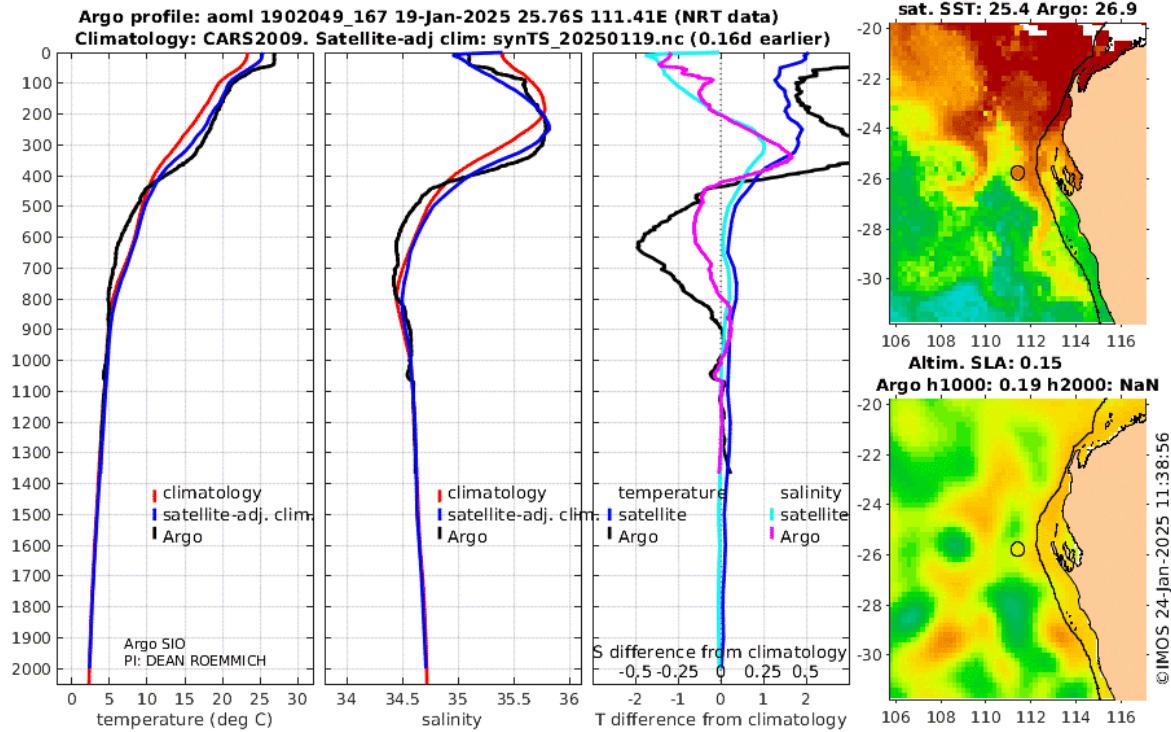
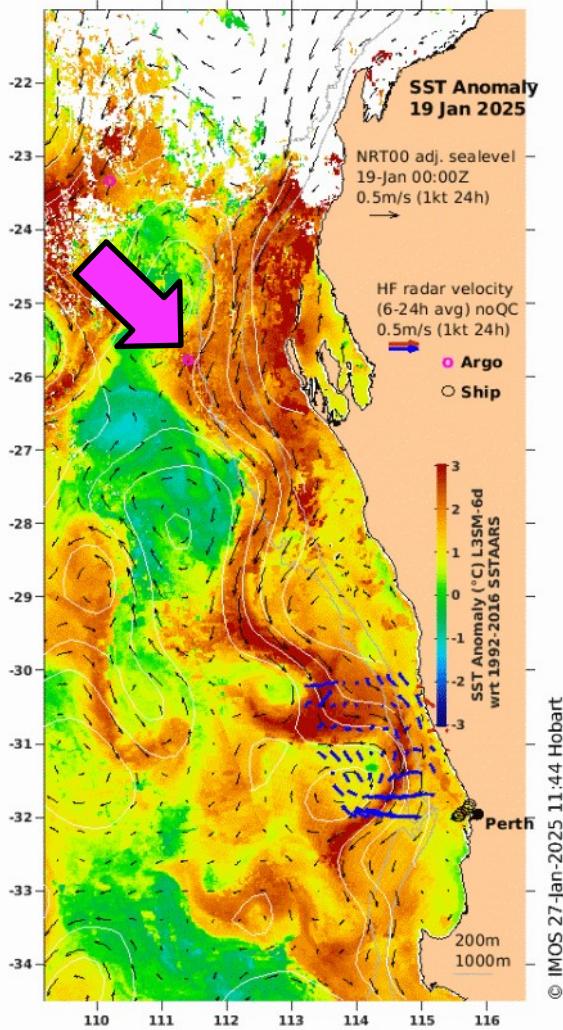
- Argo
 - ◆ Glider
 - Radar
 - > Drifter
 - Ship

[Click for more
information](#)

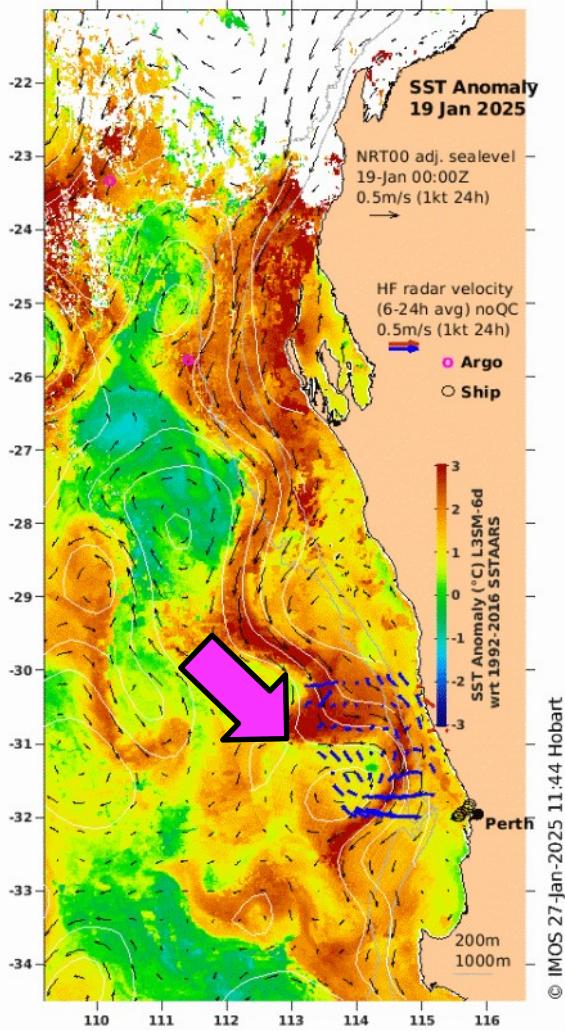


Case Study #1: A quick look into the ocean conditions off WA during the 24/25 summer

Case Study #1: A quick look into
the ocean conditions off WA
during the 24/25 summer



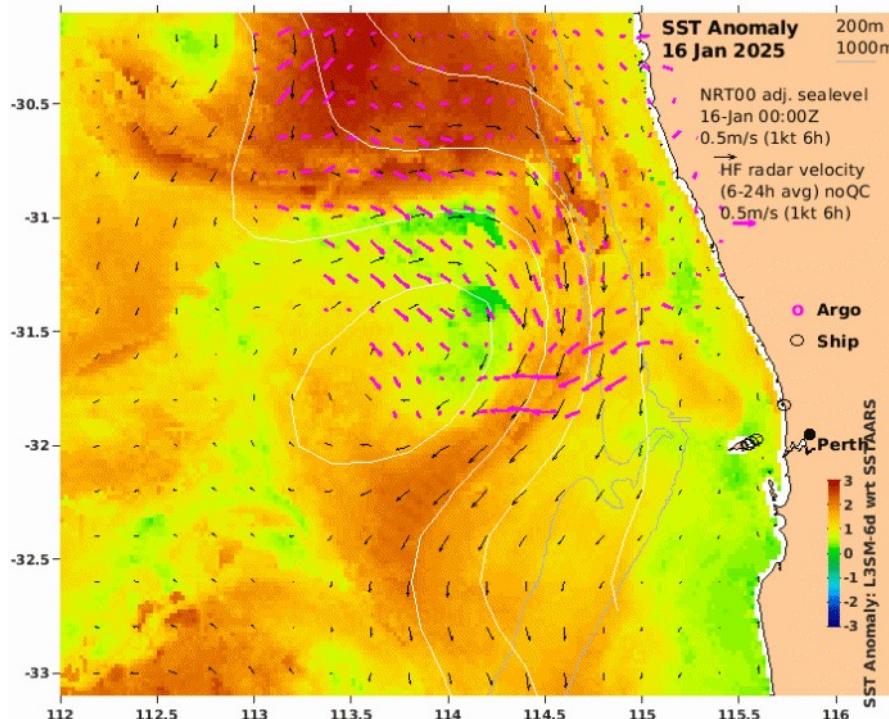
Case Study #1: A quick look into the ocean conditions off WA during the 24/25 summer



HF Radar data

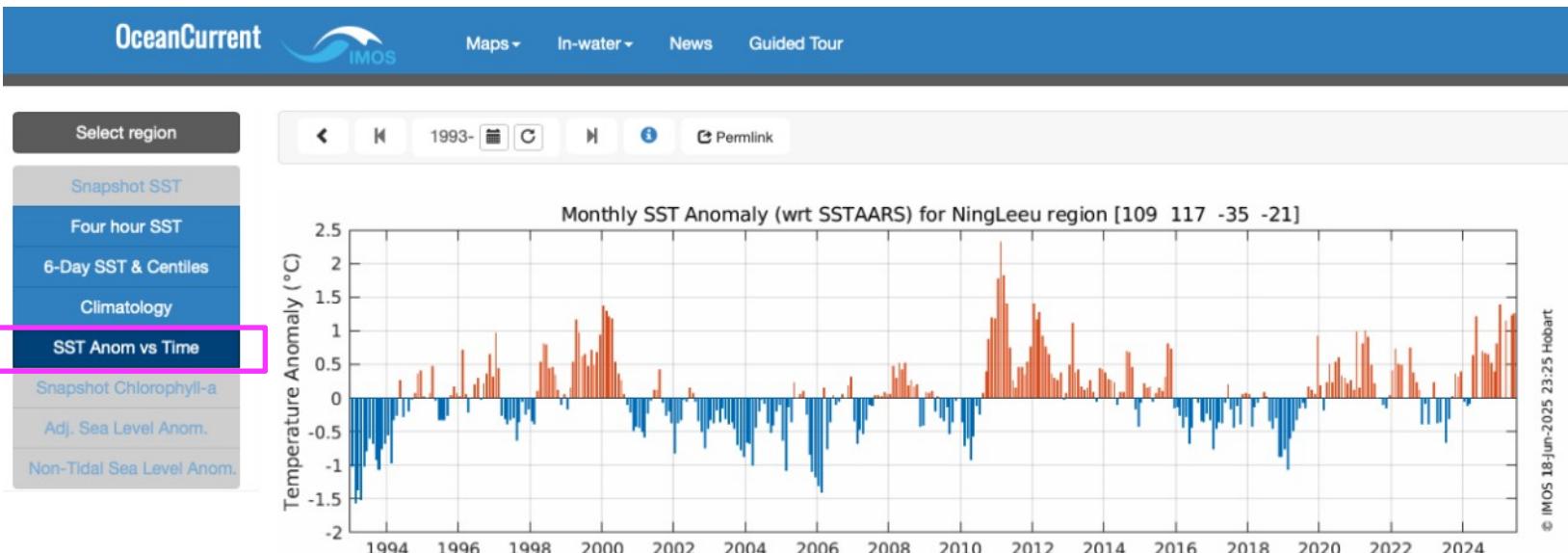
Surface Geostrophic velocity from map of adjusted sea level

SST filaments



Q: Is the ocean off the west coast getting hotter?

Case Study #1: A quick look into the ocean conditions off WA during the 24/25 summer



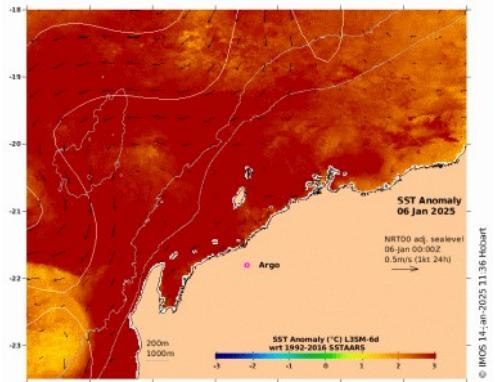
Q: Is the ocean off the west coast getting hotter?

Case Study #1: A quick look into the ocean conditions off WA during the 24/25 summer

OceanCurrent

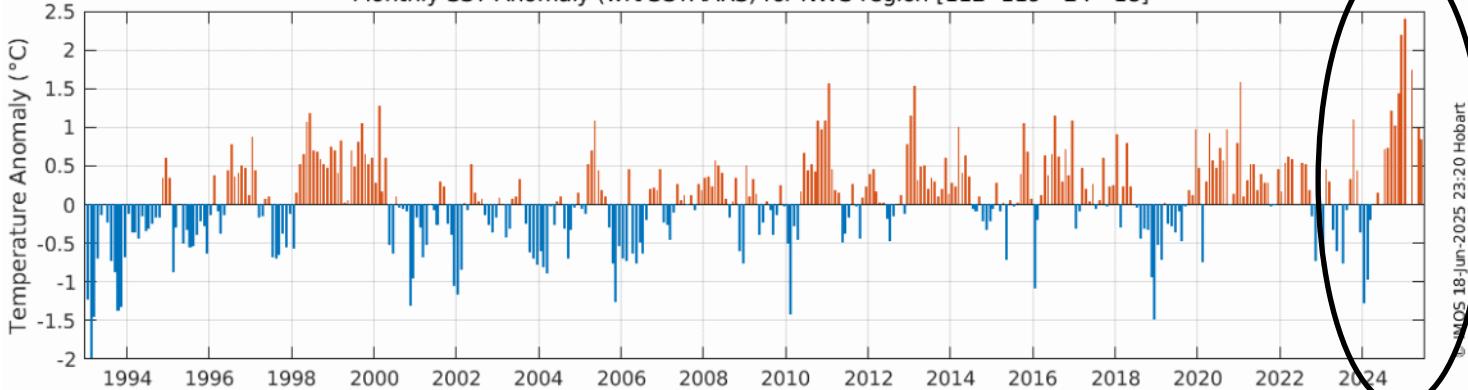
- Maps ▾
- In-water ▾
- News
- Guided Tour

- Select region
- Snapshot SST
- Four hour SST
- 6-Day SST & Centiles
- Climatology
- SST Anom vs Time**
- Snapshot Chlorophyll-a
- Adj. Sea Level Anom.
- Non-Tidal Sea Level Anom.



Q: What about Marine Heatwave metrics and Degree Heating Days? Both available at the AODN Portal!
Tutorial this afternoon!

Monthly SST Anomaly (wrt SSTAARS) for NWS region [112 119 -24 -18]



Q: Did we have any gliders in the water?

Case Study #1: A quick look into the ocean conditions off WA during the 24/25 summer

IMOS OceanCurrent

Surface Currents and Temperature

Up to date ocean information around Australia.

Maps In-water News Guided Tour

- Argo
- Current Meters
- Gilders**
- SealCTD
- Tidal Currents
- EAC Mooring Array

06 Jul 2025

Surface Waves

OceanCurrent Maps In-water News Guided Tour

Gliders

[Explanations, revision history, issues, highlights].

Our latest check for new IMOS Glider Facility data at the IMOS data server was at 07-Jul-2025 14:23:20 Hobart time. FFI: [UWA glider page] [Event-based sampling program]

Sea Glider index

Sea Glider index

Slocum Glider index

Slocum Glider index

(example) mission data

Deployments sorted by 1) deployment date, 2) mission name, 3) distance alongshore to Darwin, or 4) Event-based sampling

N	dates	lat	lon	days	km	T-S	details	anim	glider	proc	mission name
402	"S 2025	"E		10025	223723	T-S	4 12 30	4 12 30	vers	(AODN thredds)	
15	2025				240	T-S	4 12 30	4 12 30	SL227	5.	PortLincoln20250529_nrt
402	29 May - 16 Jun 2025	35.41	136.59	19	443	T-S	4 12 30	4 12 30	SL287	5.	Portland20250522_nrt
400	15 May - 18 May 2025	31.74	115.36	3	78	T-S	4 12 30	4 12 30	SL812	5.	TwoRocks20250515_nrt
399	06 May - 02 Jun 2025	32.69	152.28	26	462	T-S	4 12 30	4 12 30	SL248	5.01	Forster20250507
398	01 May - 18 May 2025	40.22	146.64	18	451	T-S	4 12 30	4 12 30	SL212	5.01	BassStrait20250501

Q: Did we have any gliders in the water?

Case Study #1: A quick look into the ocean conditions off WA during the 24/25 summer

OceanCurrent



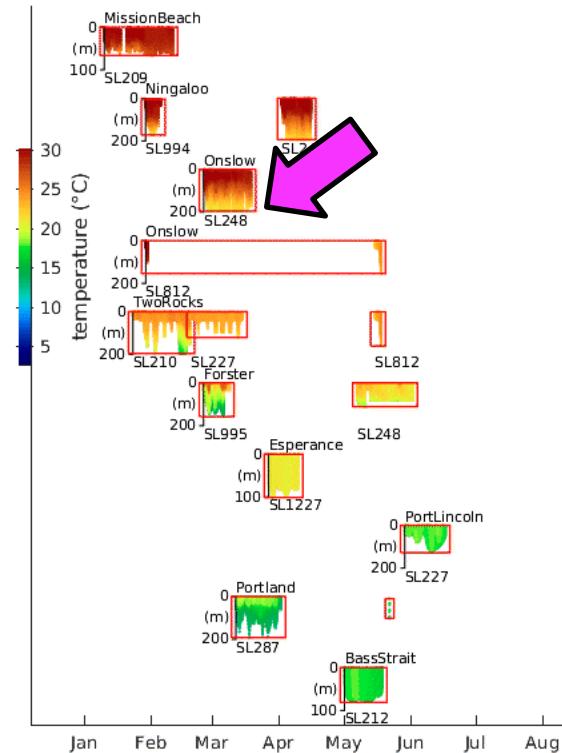
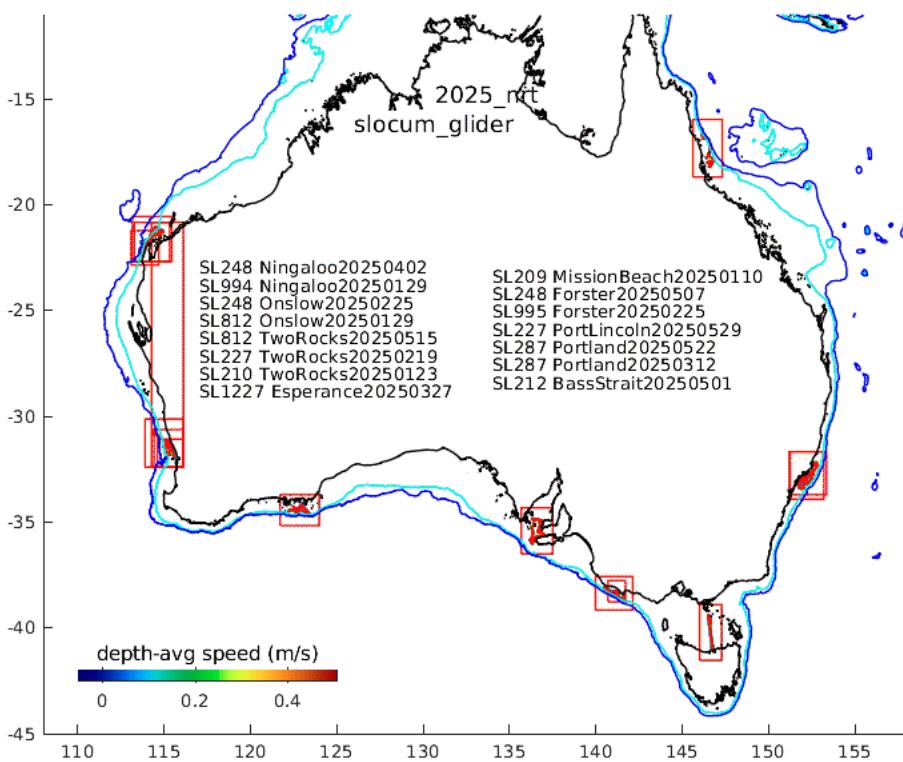
Maps ▾

In-water ▾

News

Guided Tour

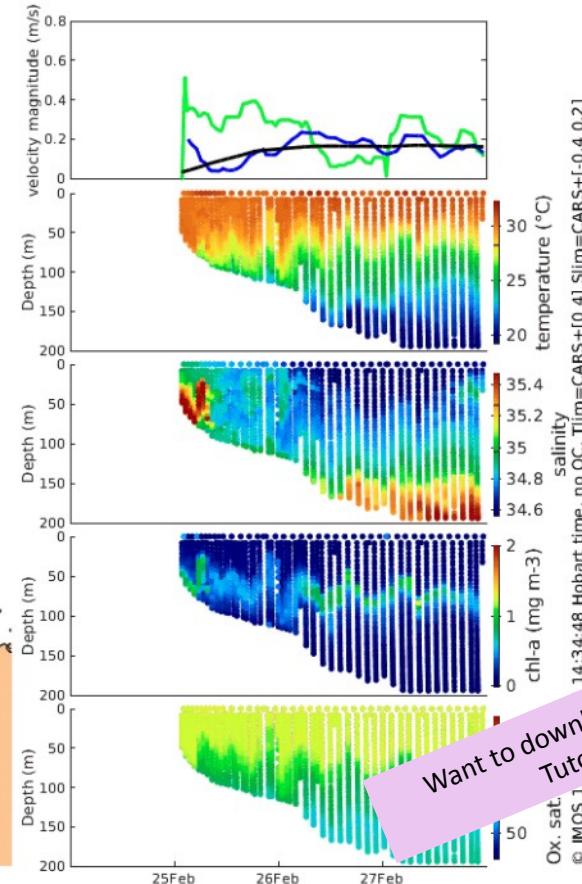
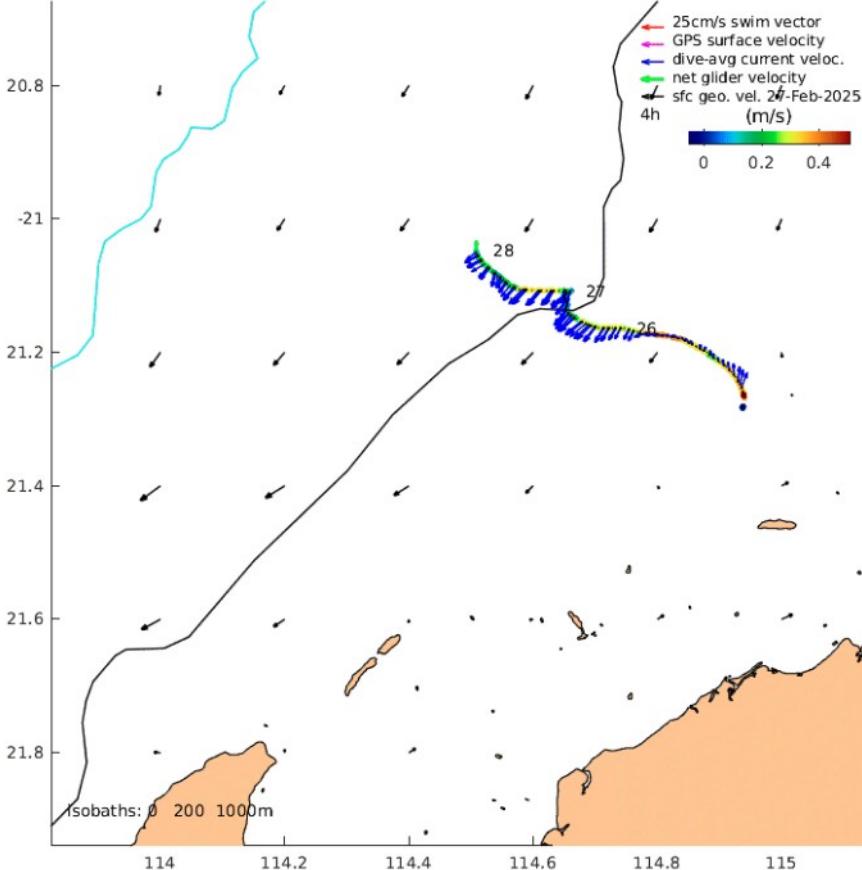
[Gliders] [sg] [sl] [temp] [tempa] [psal] [psala] [flu2] [doxy] [30d] [12d] [04d] [PREV]





[PREV][NEXT][DATE INDEX]

SL248 Onslow20250225 25-Feb 01Z to 27-Feb 23Z.
Dist. over ground: 58km. Dist. swum: 63km. Mission DOG: 58km. Swum: 63km



Want to download and analyse this data?
Tutorial this afternoon!

Case Study #1: A quick look into the ocean conditions off WA during the 24/25 summer

IMOS OceanCurrent

Surface Currents and Temperature

Up to date ocean information around Australia.

Maps ▾ In-water ▾ News Guided Tour

Marine Heatwave off WA

Gabriela S Pilo & David Griffin

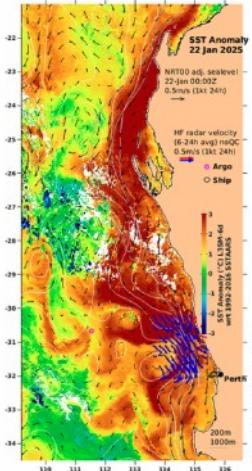


Figure 1

30 January, 2025

The ocean off Western Australia is extremely hot right now (Figure 1). The monthly sea surface temperature (SST) off Australia's northwest was up to 2.5°C above the long-term mean over the past few months (Figure 2). That is 1°C above the previous summers maxima (Figure 2c). The event has been characterised as a Marine Heatwave (MHW), evolving from category 1 (moderate) to 3 (severe) since September.

The high temperatures started in September, off Australia's NW. By November (Figure 3a), the SST exceeded 2°C above the seasonal mean (i.e., the average temperature for that time of the year, at that location). In that region, by December, the temperature was 3°C over the seasonal mean at the sea surface (Figure 3b), and 26°C waters were observed down to 100 metres by a glider off Onslow. An intense Leeuwin Current, accompanied by strong winds from tropical cyclone Sean, carried that hot water southward along the WA shelf break (Figure 3b, c).

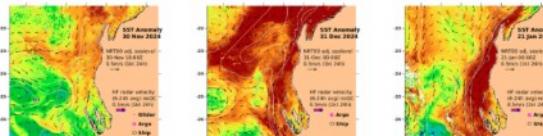
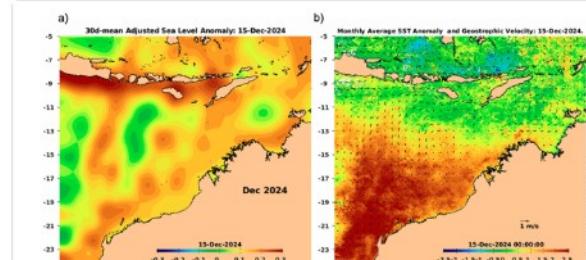
Ocean temperatures within the Leeuwin current were up to 3°C above the seasonal mean (Figure 3c) near the surface. These anomalously high temperatures extended from the surface to 400 m off Shark Bay (25oS) and to 800 m off Jurien (30°S), as shown by Argo floats sampling the Leeuwin Current and its eddies. Outside of the Leeuwin current, however, sub-surface temperatures are still within the climatological mean.

On the shelf, the IMOS Gilder and Event-based facilities have deployed three gliders to monitor this MHW. One glider is currently off Perth doing a routine on-off shelf transect, and two other were deployed off Onslow, one doing on-off shelf transects, and the other sampling southward along the Ningaloo Coast to be collected in Shark Bay.

This year's MHW has a different onset and timing than the 2011 WA MHW, which had devastating effects in kelp, seagrass, and coral reef ecosystems. However, it has already impacted local marine life due to thermal stress, including 30,000 dead fish washing ashore off the Pilbara Coast. The extent of coral bleaching and further impacts are still being assessed.

Possible causes for the current MHW off WA include a combination of local and remote air-sea interactions, anomalously weak winds in the NW shelf, and a strong Leeuwin Current bringing the anomalous heat southward.

The SST in some regions off WA were exceeding the range we had set in our maps. We have now changed the range of the colourbar in some of our regions off WA for better visualization.



Case Study #1: A quick look into the ocean conditions off WA during the 24/25 summer
Want to learn more?

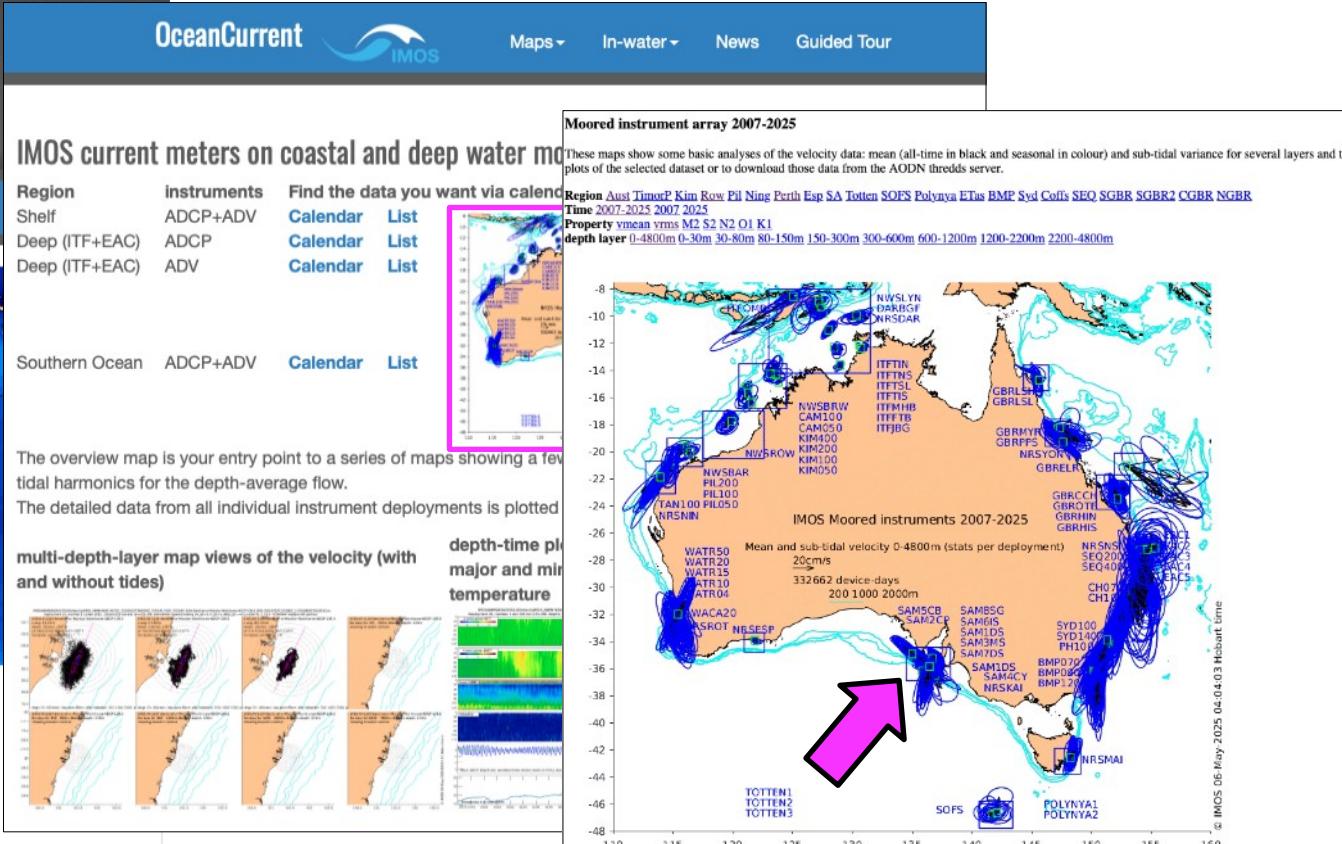
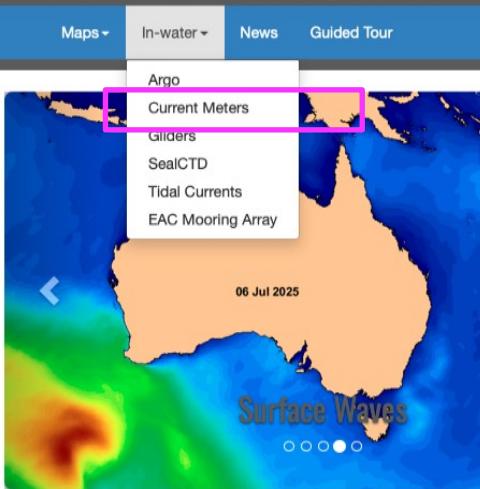


Case Study #2: How's the ocean circulation near Kangaroo Island?

IMOS OceanCurrent

Surface Currents and Temperature

Up to date ocean information around Australia.



Moored instrument array 2007-2025

These maps show some basic analyses of the velocity data (mean in black and seasonal in colour) and sub-tidal variance for several locations. You can download and analyse this data in the AODN thredds server.

Region [Aust](#) [Timor](#) [P](#) [Kim](#) [R](#) [C](#) [T](#) [A](#) [Ten](#) [SOFS](#) [Polynya](#) [ETas](#) [BMP](#) [Syd](#) [Coffs](#) [SEQ](#) [SGBR](#) [SGBR2](#) [CGBR](#) [NGBR](#)

Time [2007-2025](#) [2007-2015](#)

Property [vm](#) [vms](#)

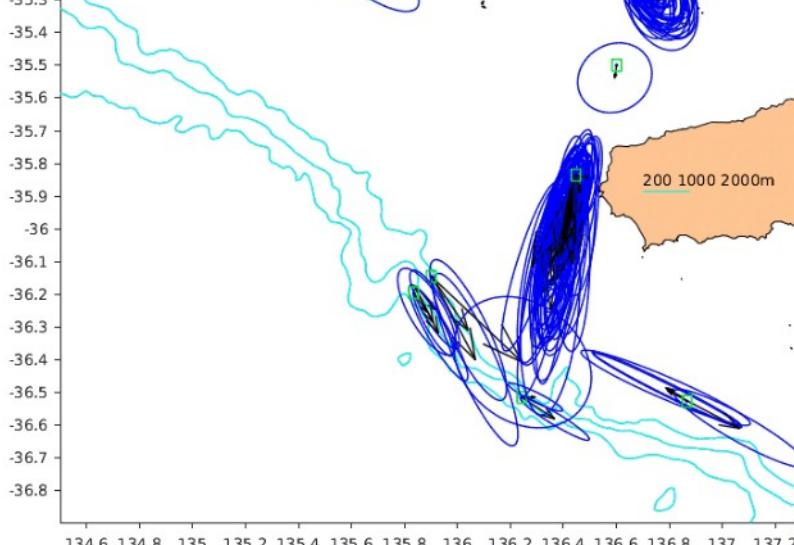
depth [0-150m](#) [150-300m](#) [300-600m](#) [600-1200m](#) [1200-2200m](#) [2200-4800m](#)

IMOS Moored instruments 2007-2025 Mean and sub-tidal velocity 0-4800m (stats per depth)

20cm/s →
17984 device-days

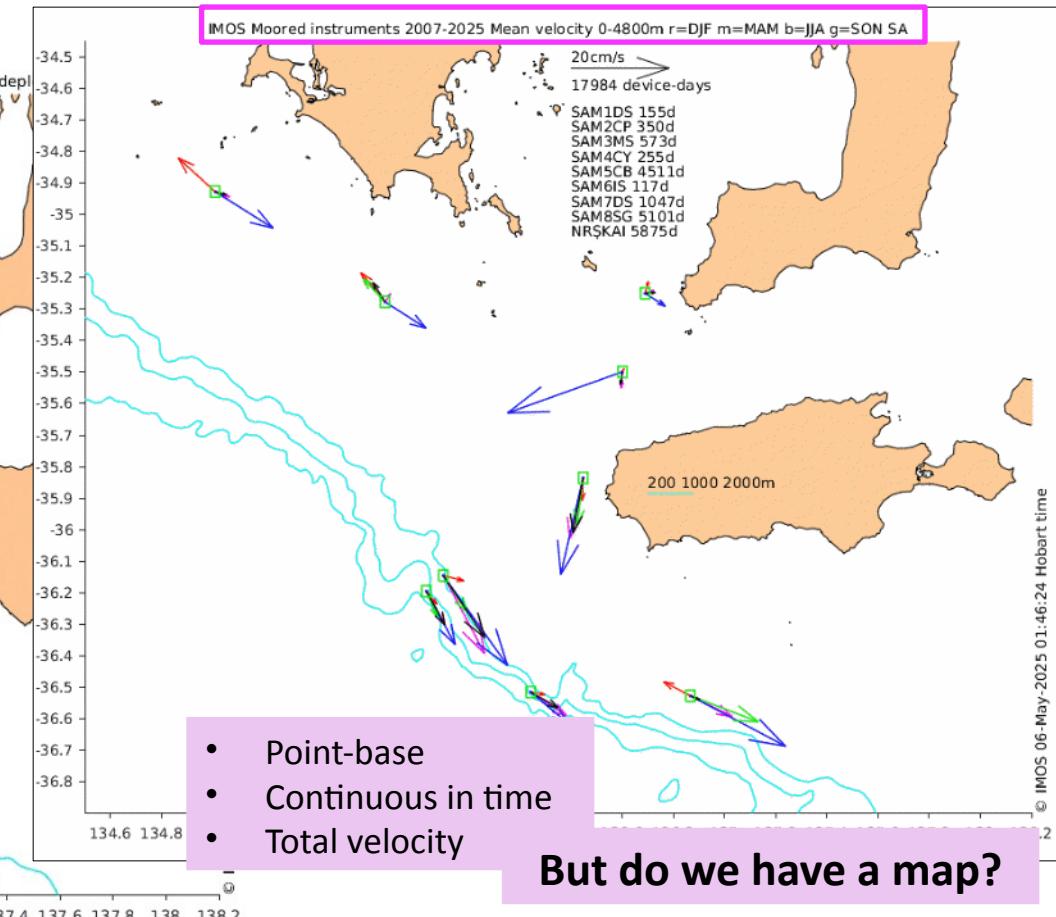
SAM1DS 155d
SAM2CP 350d
SAM3MS 573d
SAM4CY 255d
SAM5CB 4511d
SAM6IS 117d
SAM7DS 1047d
SAM8SG 5101d
NR\$KAI 5875d

200 1000 2000m

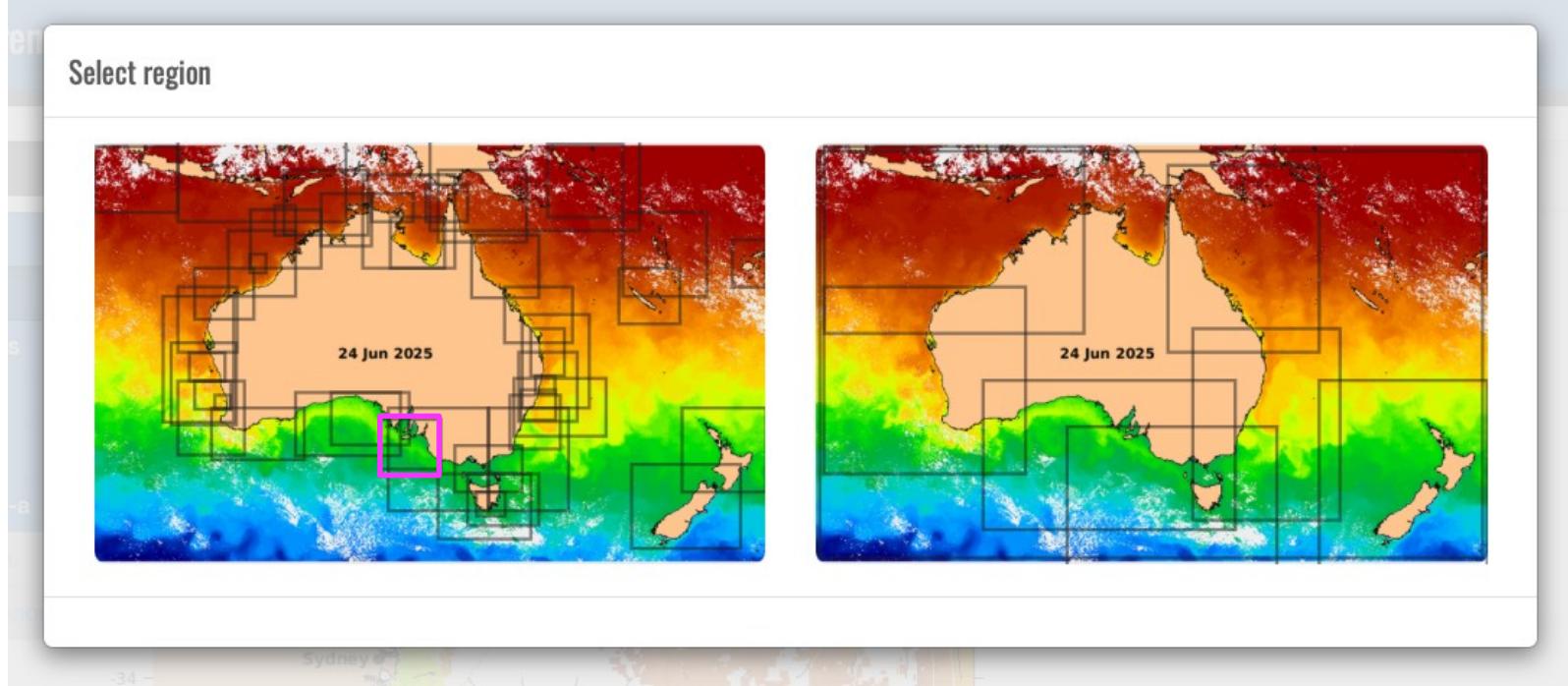


Want to download and analyse this data?
Tutorial this afternoon!

Case Study #2: How's the ocean circulation near Kangaroo Island?



But do we have a map?



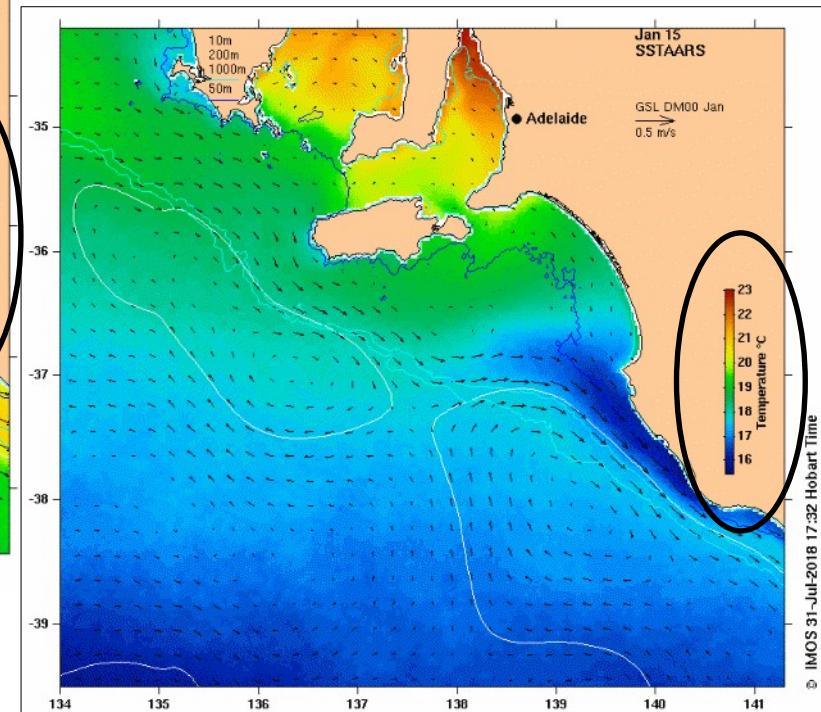
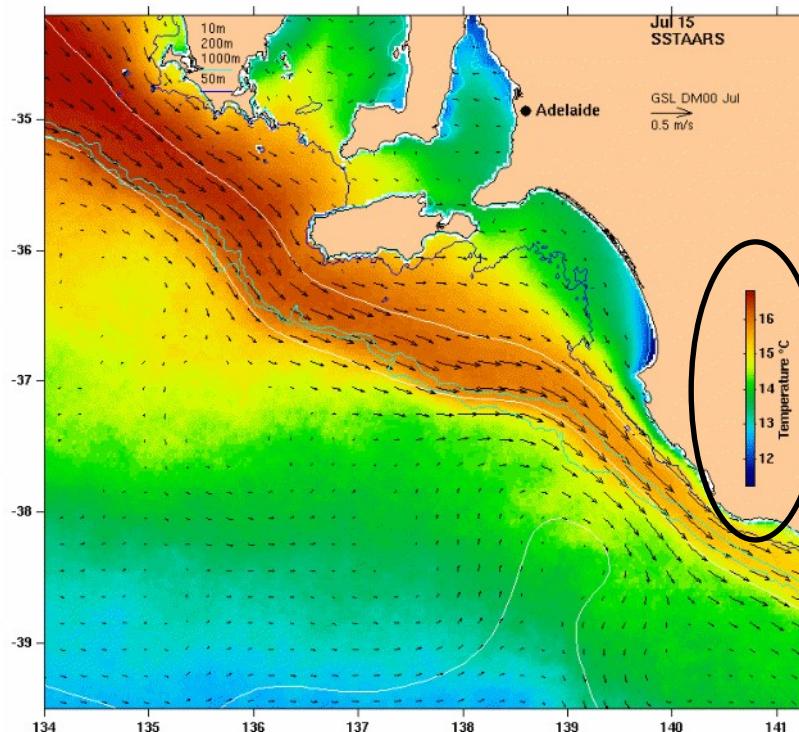
Select region

- Snapshot SST
- Four hour SST
- 6-Day SST & Centiles
- Climatology
- SST Anom vs Time
- Snapshot Chlorophyll-a
- Adj. Sea Level Anom.
- Non-Tidal Sea Level Anom.

Data sources

SSTAARS

◀ Jul ⏷ C ▶ i Permalink



Do we have in-situ biological observations?
Yes!

Go to the Biological Ocean Observer (BOO) website

Select region

24/01/22 05:00 Z
C

Chi-A



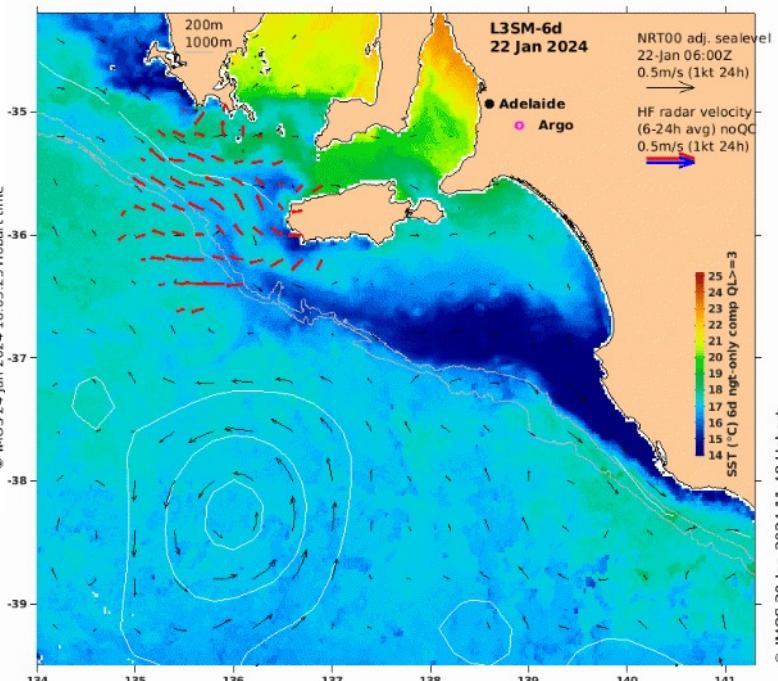
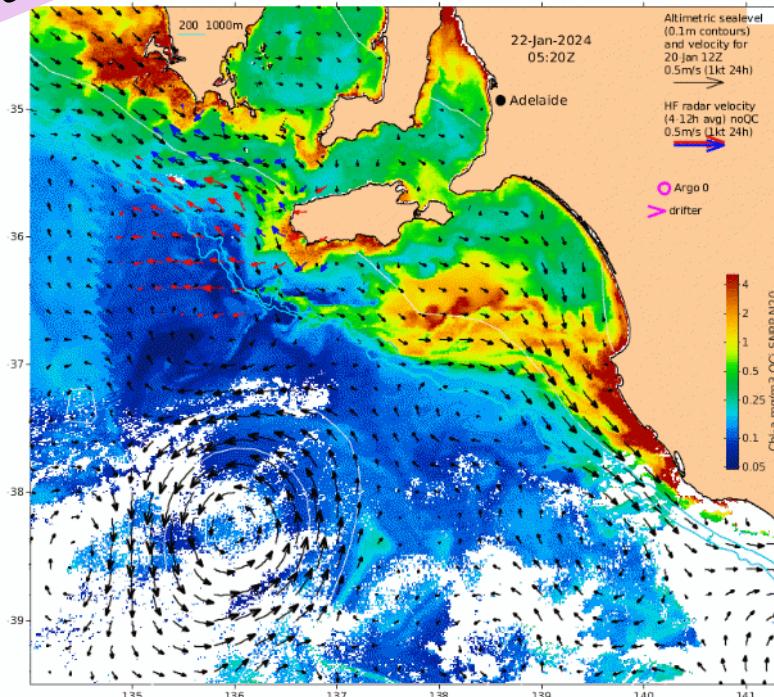
Permalink

- [Climatology](#)
- [SST Anom vs Time](#)
- [Snapshot Chlorophyll-a](#)
- [Adj. Sea Level Anom.](#)
- [Non-Tidal Sea Level Anom.](#)

Legend

- Argo
- Glider
- Radar
- Drifter
- Ship

Click for more information



Case Study #2: How's the ocean circulation near Kangaroo Island?

A Bonney Bloom

Gabriela S. Pilo, Larissa Patrício-Valerio, and Edward King

2 February, 2024

Late last year we took note of the persistent upwelling along the Bonney Coast. Indeed, the ocean conditions led to a phytoplankton bloom

IMOS Satellite Remote Sensing facility (Figure 2).

The high resolution of ocean colour imagery provided by the MODIS sensor onboard the Aqua satellite allows us to see a trio of beautiful structures in the rotating filaments in the ocean colour image, but also provide vertical exchanges of properties between the surface and the subsurface, as can be seen in the rotating filaments in the ocean colour image, but also provide vertical exchanges of properties between the surface and the subsurface.

Each eddy in the trio is roughly 18 km in diameter, so we cannot see their signature in our surface geostrophic velocity maps (black arrows), but we can see them in the SST maps (color contours). The SST anomalies are positive, indicating upwelling, and the SST values are lower than normal, indicating cool waters. This is consistent with what we've seen over the past week.

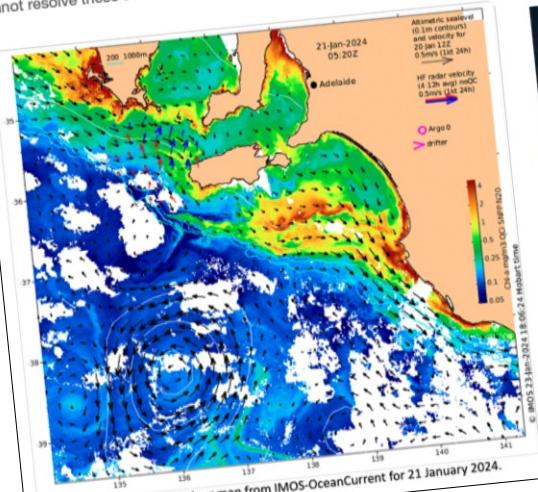


Figure 1: Ocean Colour map from IMOS-OceanCurrent for 21 January 2024.

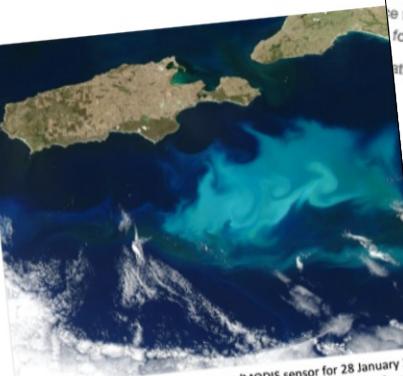


Figure 2: True color image from the Aqua/MODIS sensor for 28 January 2023. Kangaroo Island (South Australia); credit: IMOS Satellite Remote Sensing facility.

An early Bonney upwelling

Hugo Bastos de Oliveira and Jessica Benthuysen
11 December, 2023

Intense south-easterly storms have recently hit South Australia's coast, causing strong upwelling events along the Bonney coast.

The Bonney upwellings are usually providing a favourable environment for phytoplankton blooms, but this year they are occurring earlier than usual.

Events, with cold, nutrient-rich bottom waters rising to the surface, allowing phytoplankton to grow. We've described the Bonney upwelling at IMOS-

start in 2020, and when it was observed by an ocean glider in 2016.

that it is so strong so early in the season. Bonney upwelling events

after is not yet stratified.

events, last between 5 and 10 days. This year, the first upwelling event

we've seen over the past week is likely the lowest

time is seen in our maps of SST centiles, where the SST of the

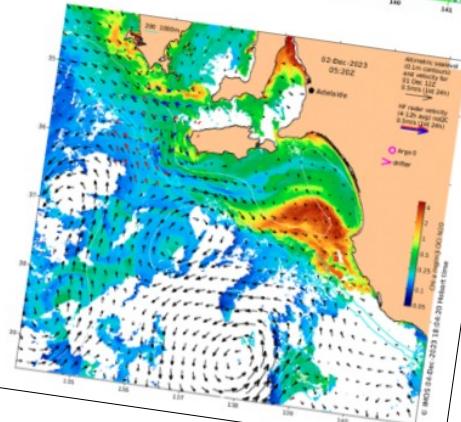
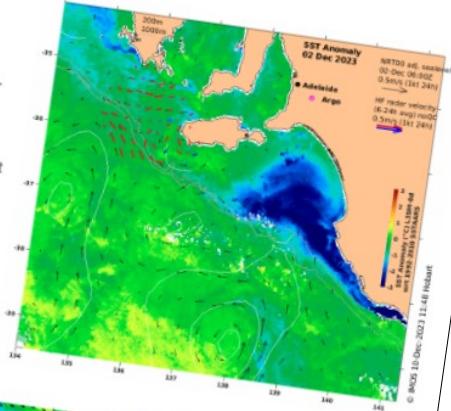
record (1993–2016). The spatial extent of this event was also large

until March next year. It's likely that the positive ENSO and the

the intensity of the events yet to come. In addition, the

following events, leading to stronger temperature anomalies,

satellite imagery we'll see as a result.



- Want to learn more?
- Guided Tour
 - News items

IMOS OceanCurrent

Surface Currents and Temperature

Up to date ocean information around Australia.

Maps

In-water

News

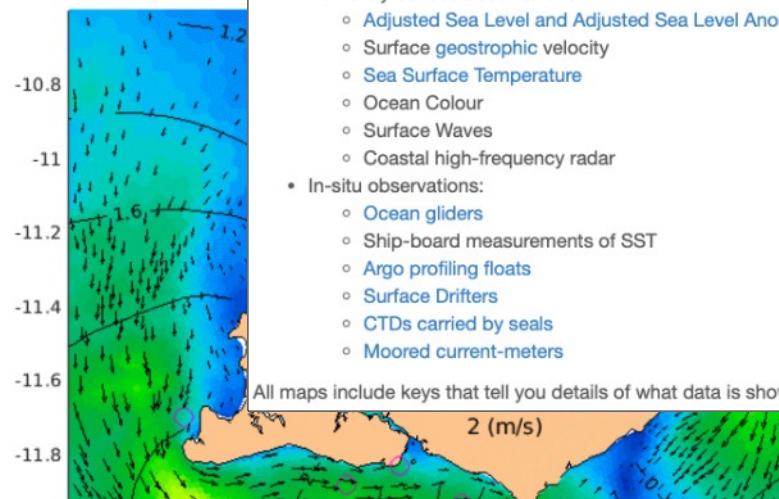
Guided Tour

When is slack tide?

David Griffin

2 September, 2023

Slack tide is when the tidal current turns from flooding to ebbing, or vice versa. If you need to conduct an operation during the period of weakest tidal current, this is when to do it. But published predictions of slack tide timings are very few, and there is no universal rule of thumb relating the timing of slack tide to the timing of high or low tide. For the case of a narrow strait leading into a large bay, slack tide in the strait occurs close to the times of high and low tide within the bay. In many places, however, it is far less clear, and slack tide occurs at different times in nearby places. In Clarence Strait (between Darwin and Melville Island), for example, slack tide is half way between high and low tide at Darwin. Stepping through [our maps of tidal current speed](#) is one way to find the approximate time of slack tide at an arbitrary location. We are working on a way to estimate slack tide more precisely at any location, but in the mean time,



IMOS-OceanCurrent maps: What's shown?

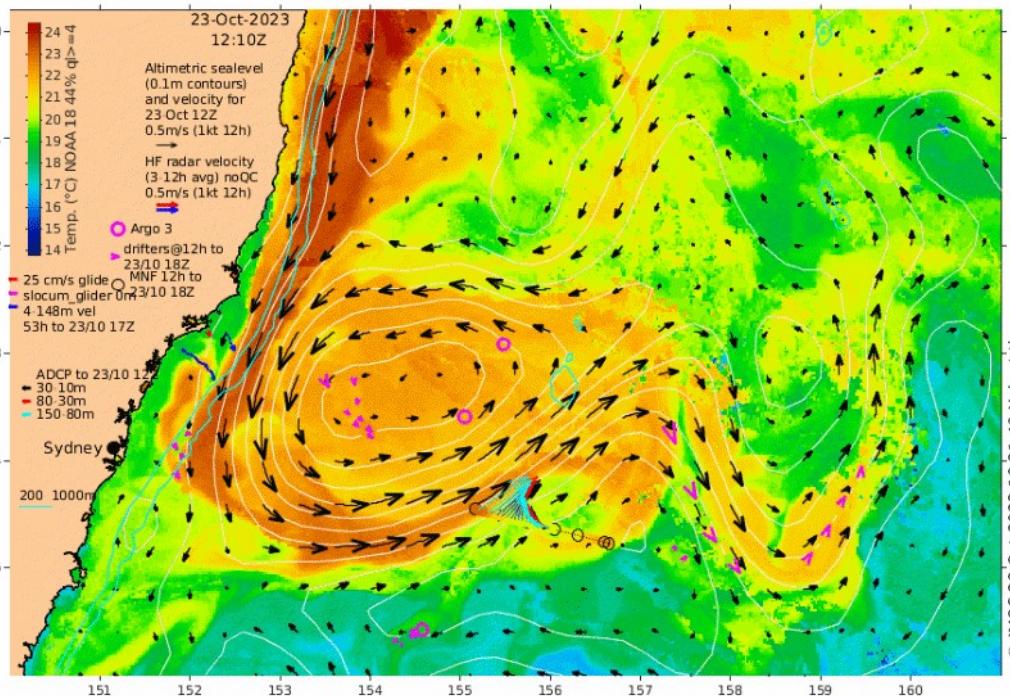
The IMOS OceanCurrent maps are divided into three categories, according to their spatial scale: [local regions](#), [state regions](#), and the [whole country](#). Combinations of satellite-derived datasets and in-situ datasets, in ways appropriate to the scale of the map. The datasets included are:

- Remotely-sensed observations:
 - Adjusted Sea Level and Adjusted Sea Level Anomaly
 - Surface geostrophic velocity
 - Sea Surface Temperature
 - Ocean Colour
 - Surface Waves
 - Coastal high-frequency radar
- In-situ observations:
 - Ocean gliders
 - Ship-board measurements of SST
 - Argo profiling floats
 - Surface Drifters
 - CTDs carried by seals
 - Moored current-meters

All maps include keys that tell you details of what data is shown. Here we explain how to interpret those keys, using the three spatial scales.



Thank you! Questions?



Satellite Sea Surface Temperature (IMOS-Satellite Remote Sensing)

Surface geostrophic currents from gridded satellite altimetry (IMOS-OceanCurrent)

Surface Drifters (NOAA's Global Drifter Program)

RV Investigator location & in-situ temp (MNF)

Argo floats (IMOS-Argo, IMOS-BGC Argo, IMOS-Deep Argo)

Glider (IMOS-Ocean Gliders)

Shipboard ADCP data (MNF)



Gabriela.semolinipilo@csiro.au
<http://oceancurrent.imos.org.au>





OceanCurrent

How to find the data used to make the figure?

Catalog <https://thredds.aodn.org.au/thredds/catalog/IMOS/SRS/SST/ghrsst/L3S-6d/ngt/catalog.html>

Dataset

Size



ngt

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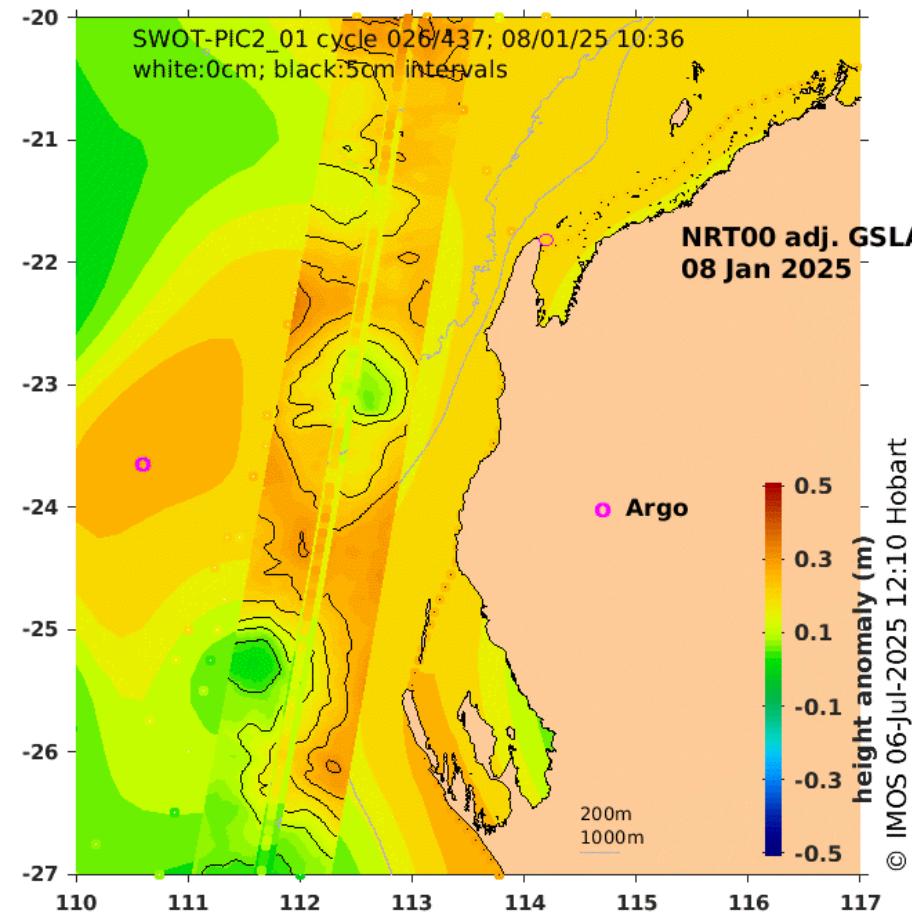
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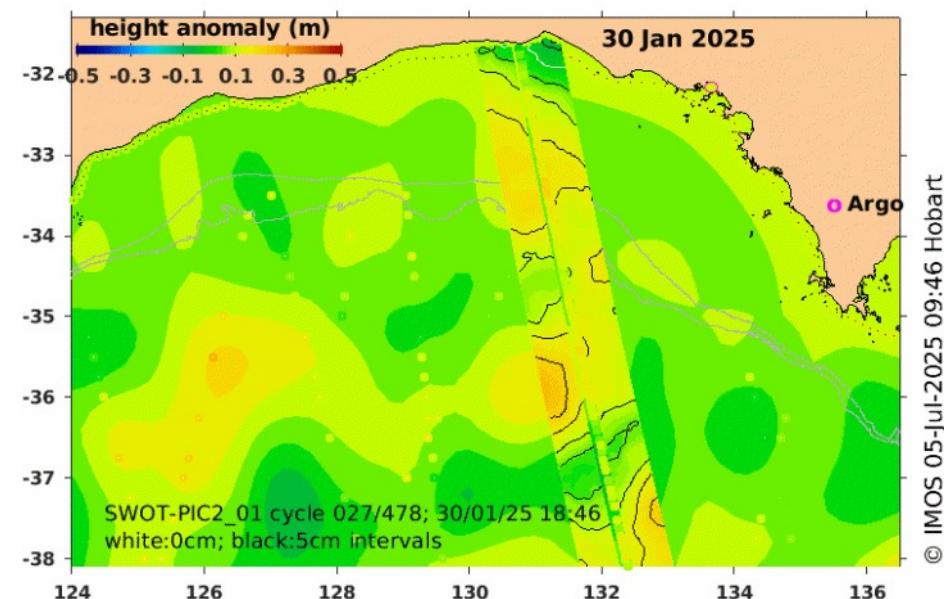
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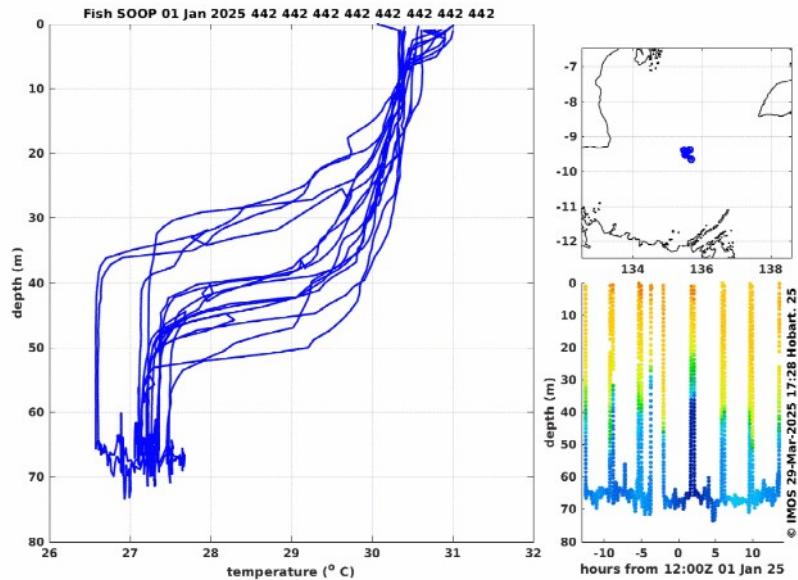
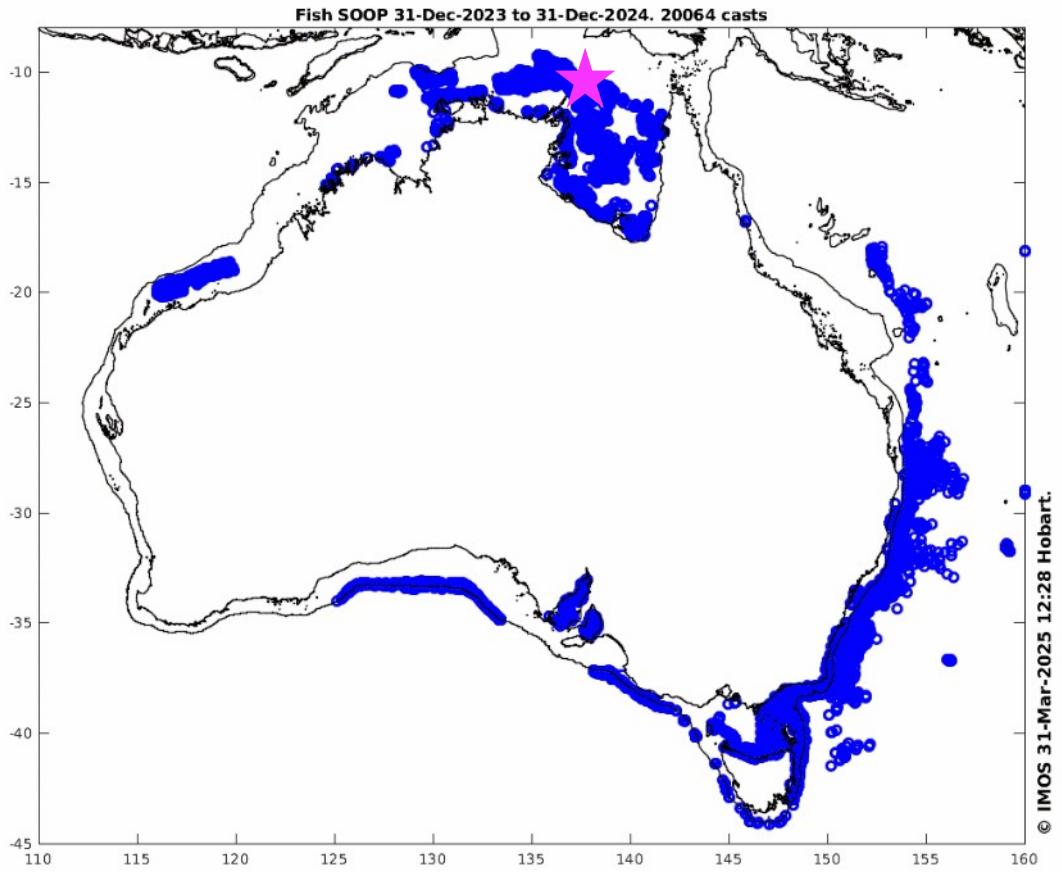


New product with SWOT data to
go live this month!





Sneak peek - FishSOOP data





Bespoke SST maps - MyOceanCurrent

IMOS OceanCurrent
Surface Currents and Temperature

Up to date ocean information around Australia

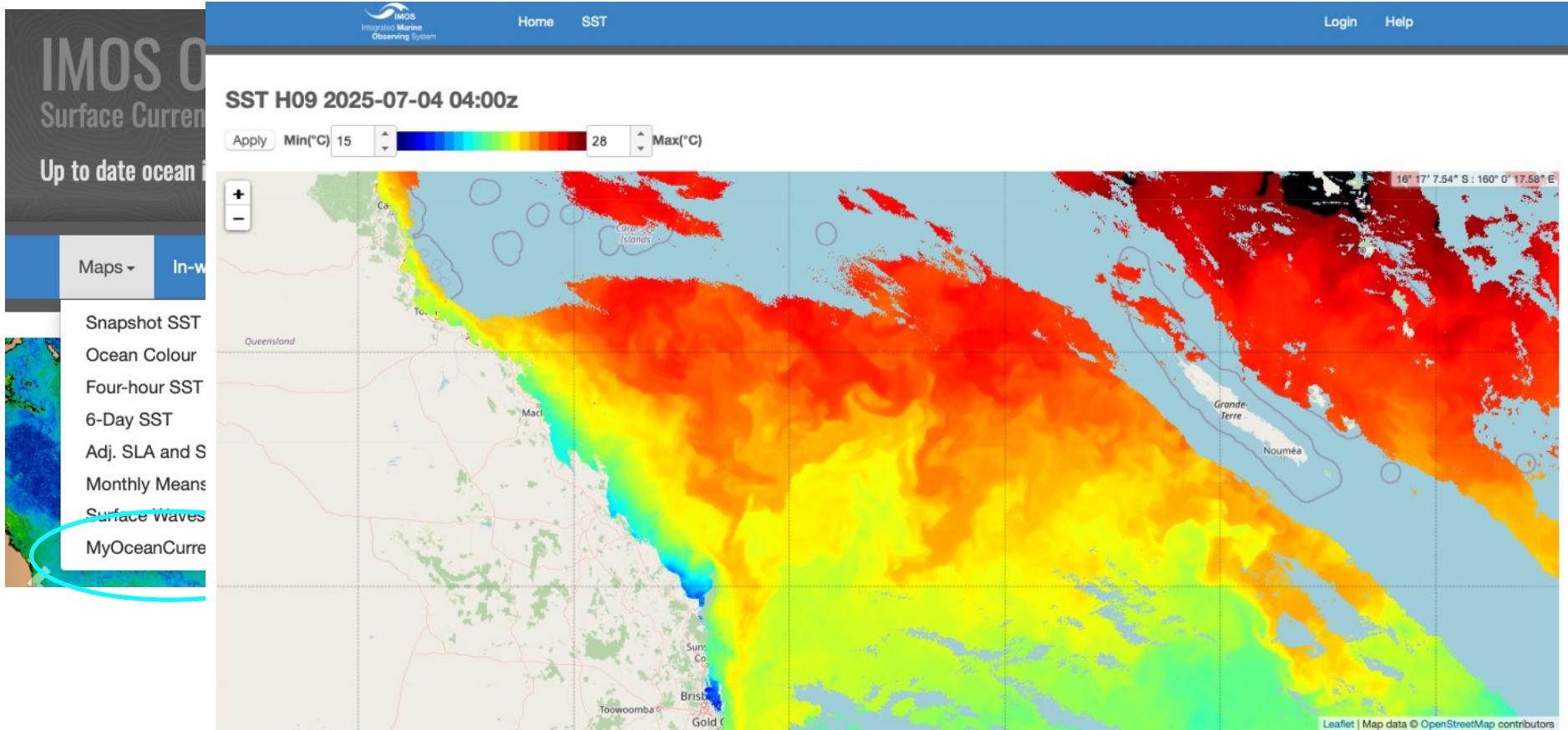
Maps In-water News Guided Tours

NRT SST Satellites: H09 modisA modisT viirsV

Snapshot SST
Ocean Colour
Four-hour SST
6-Day SST
Adj. SLA and SST maps
Monthly Means
Surface Waves
MyOceanCurrent



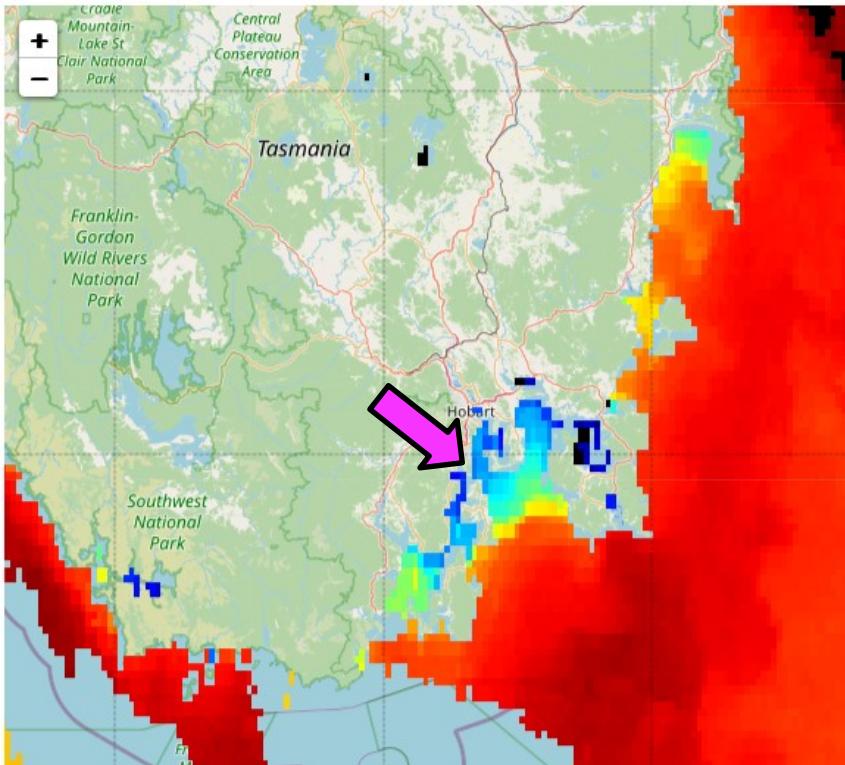
Bespoke SST maps - MyOceanCurrent





Bespoke SST maps - MyOceanCurrent

SST H09 2025-07-03 20:00z



6am, 4th July 2025
~10degC at the top 50 cm

