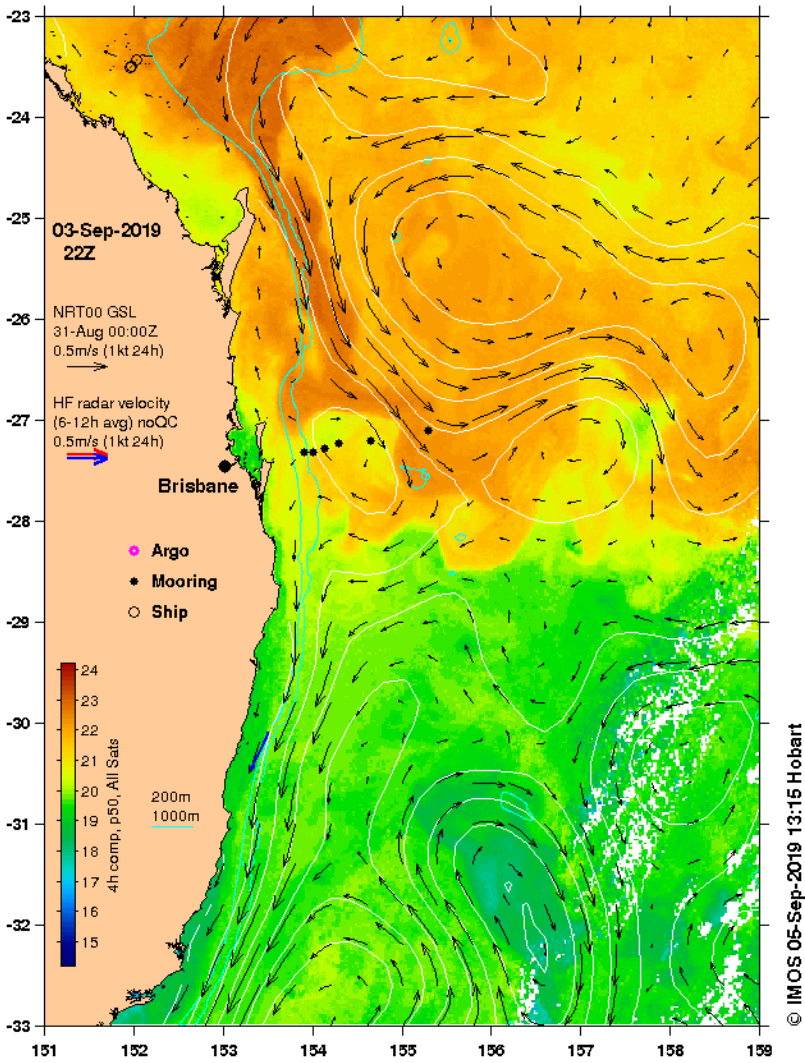
IMOS OceanCurrent

New Opportunities in Satellite SST

Madeleine Cahill | 15 October 2019



OceanCurrent

Putting IMOS data in context

Satellite observations provide context

- High-resolution images improve the interpretation of events
- Ocean Colour: Chlorophyll-a
  - high resolution
  - still problematic, particularly in coastal regions
- Altimetry: geostrophic velocity
  - ~40km x ~6day
- SST: skin temperature
  - cloud always an issue for AVHRR
  - recent advances

Reliant on Bureau of Meteorology & NOAA

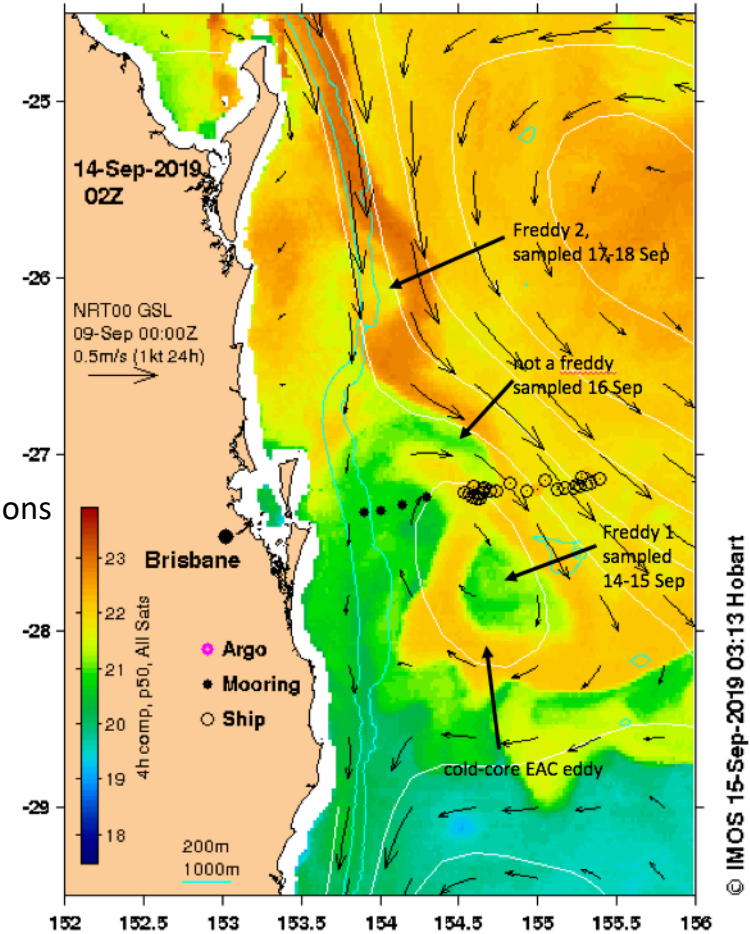


Figure 1. Four-Hour SST at 02:00 14 September 2019 showing two frontal eddies, one of which has entered the small cold-core eddy off Brisbane, just southeast of the EAC array (black dots). RV Investigator locations indicated with open circles.

Satellite SST Availability

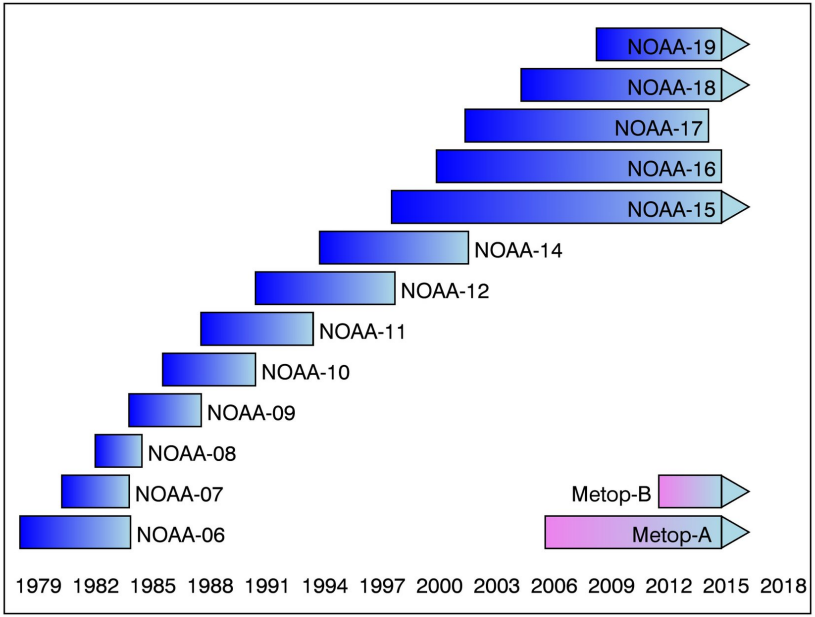
- AVHRR NOAA ends with NOAA-19
- NOAA-18/19 now at end of life

- VIIRS is NOAA's new technology launched 2012, available 2018
- NOAA-20 is also VIIRS technology launched Nov 2017, not yet available

- Metop-A&B AVHRR technology launched by Eumetsat not yet available

- Himawari-8 launched 2015, available mid-2017

NB Here, available effectively means sufficiently accurate SST for inclusion with AVHRR



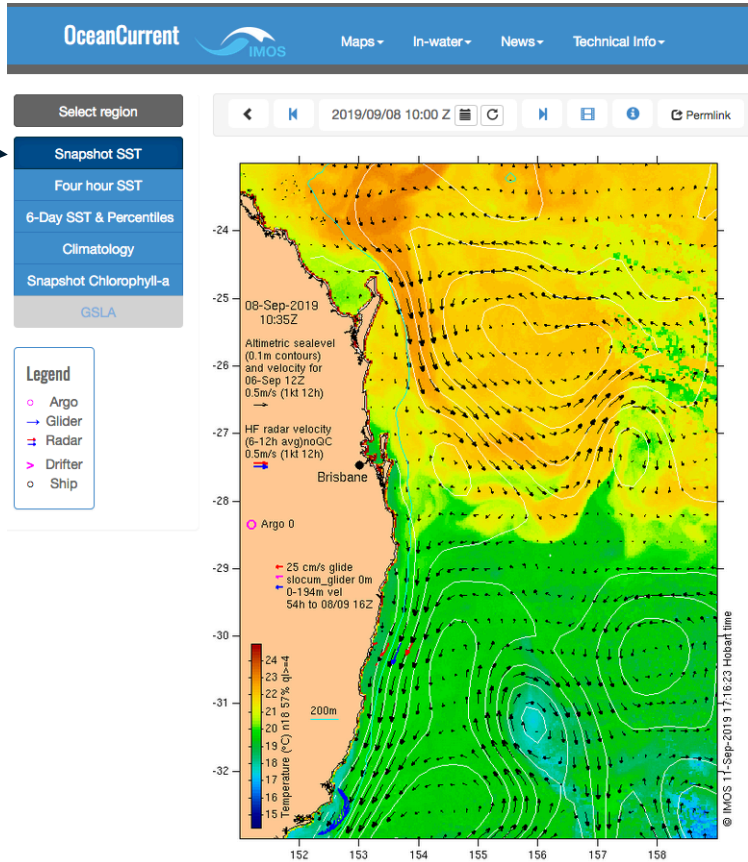
Schematic courtesy of DLR – Earth Observation Centre

CSIRO

SST Products

Legacy Product - Snapshot SST

- 1km resolution
- images back to the 1990s!



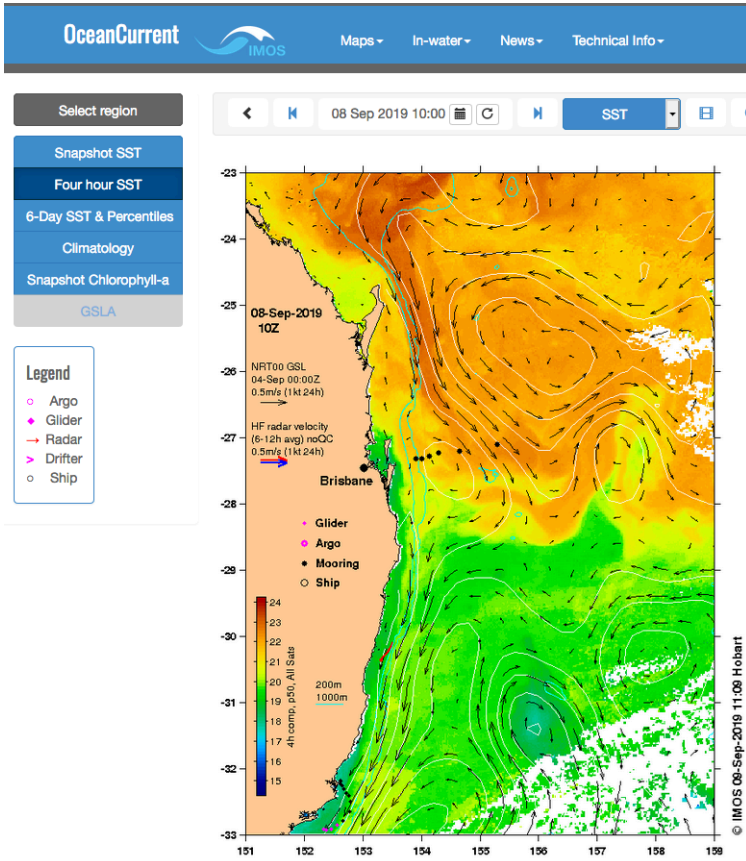
SST Products

Legacy Product - Snapshot SST

- 1km resolution
- images back to the 1990s!

Four-Hour SST

- Based on Himarwari-8 (10min images)
- 2km resolution, since 2017



SST Products

Legacy Product - Snapshot SST

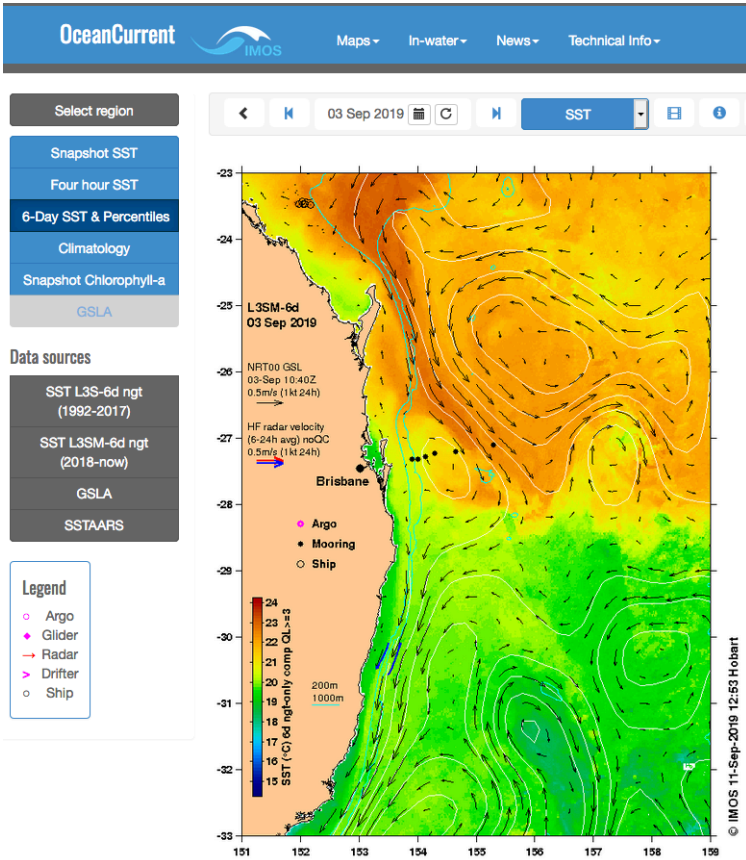
- 1km resolution
- images back to the 1990s!

Four-Hour SST

- Based on Himarwari-8
- 2km resolution, since 2017

6-day SST and Percentiles

- 2km resolution
- AVHRR & VIIRS
- daily files of night-only SST
- based on 26year reanalysis by Helen Beggs at BoM



CSIRO

SST Products

Legacy Product - Snapshot SST

- 1km resolution
- images back to the 1990s!

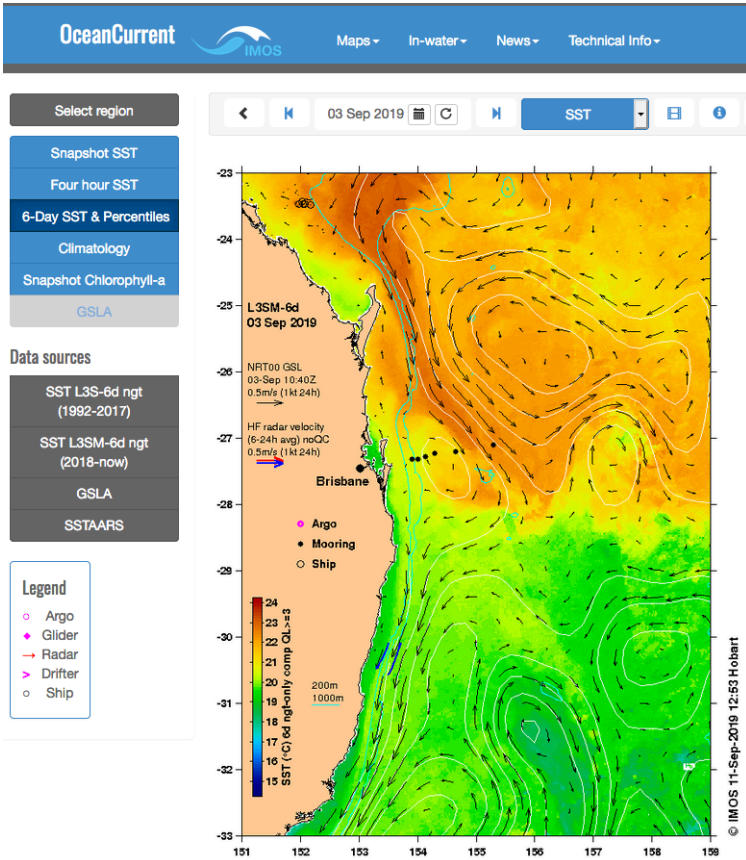
Four-Hour SST

- Based on Himarwari-8
- 2km resolution, since 2017

6-day SST and Percentiles

- 2km resolution
- daily files of night-only SST

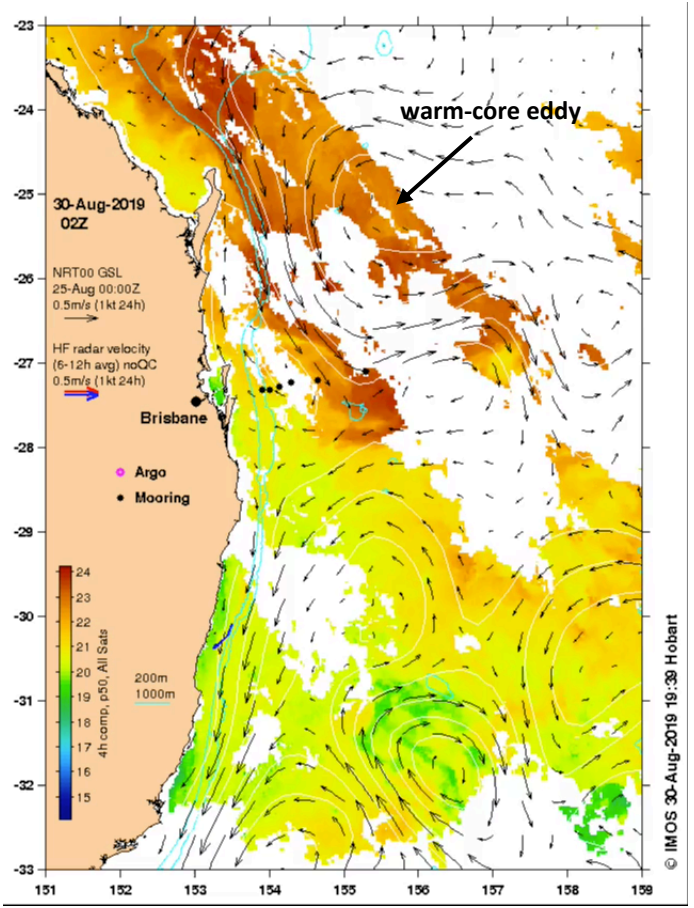
- Navigation with calendar
- Information button
- Movies!



CSIRO

A few days of Four-Hour SST
September 2019

- the EAC usually flows southward along the shelf-break for another 500km
- this time, much of the warm tropical water is being taken eastward by a huge warm-core eddy
- diurnal heating evident

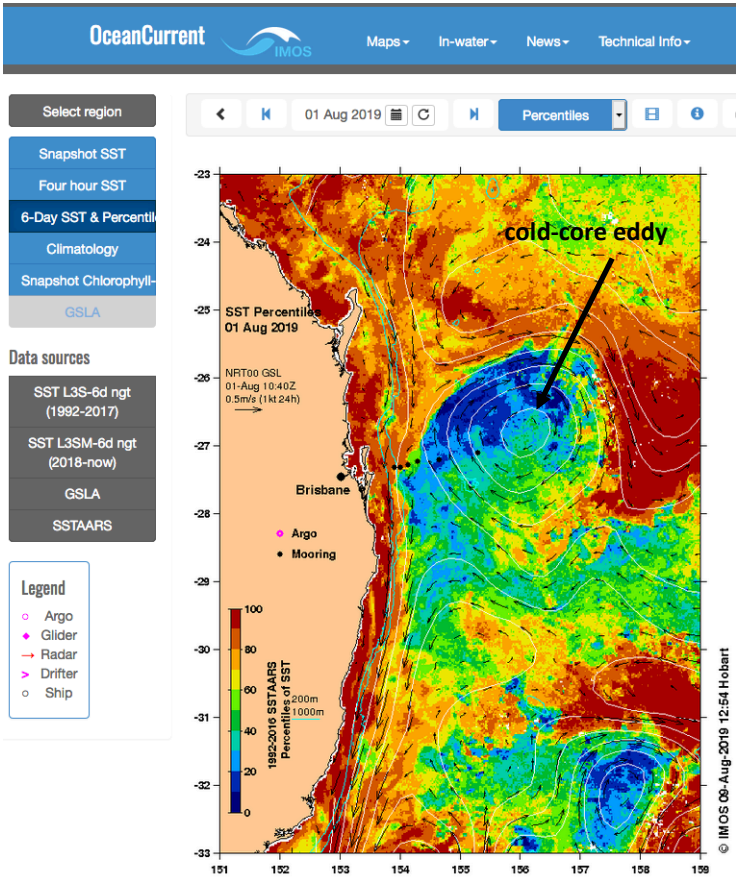


SST Percentiles – 1 August

In August:

substantial EAC flow south of Brisbane

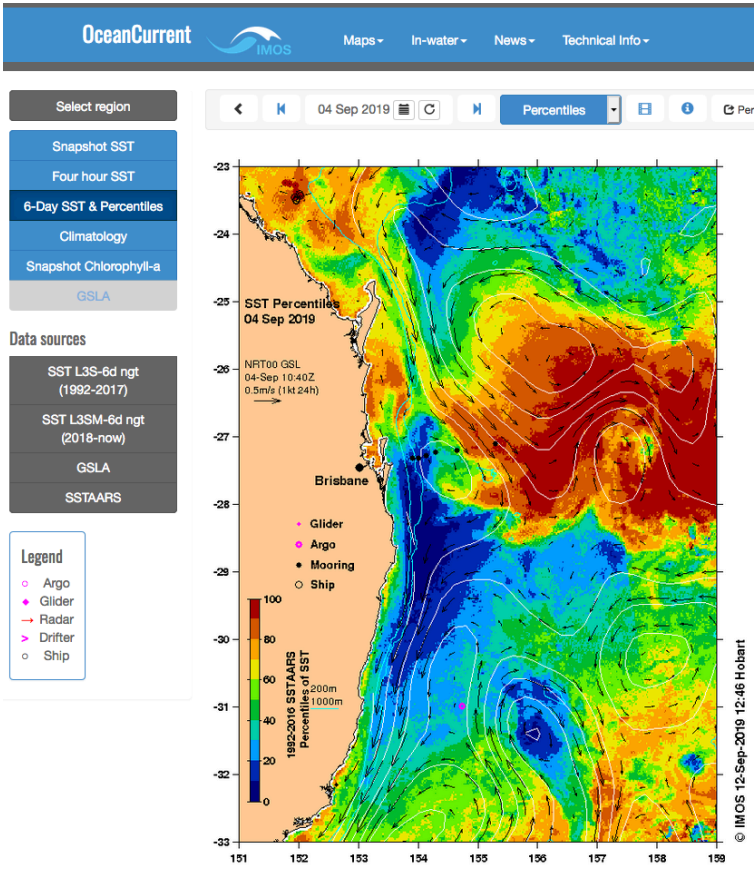
A cold-core eddy had developed shunting EAC water offshore



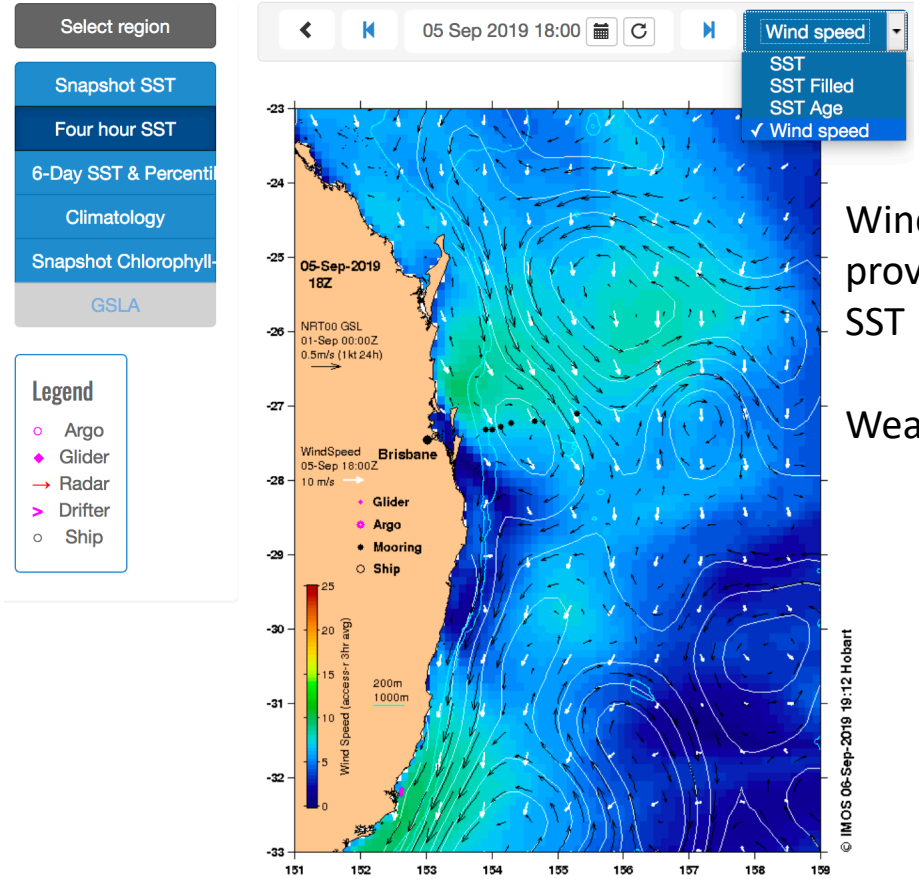
SST Percentiles – 4 September

By September:

water south of Brisbane had become much colder than usual for that time of year



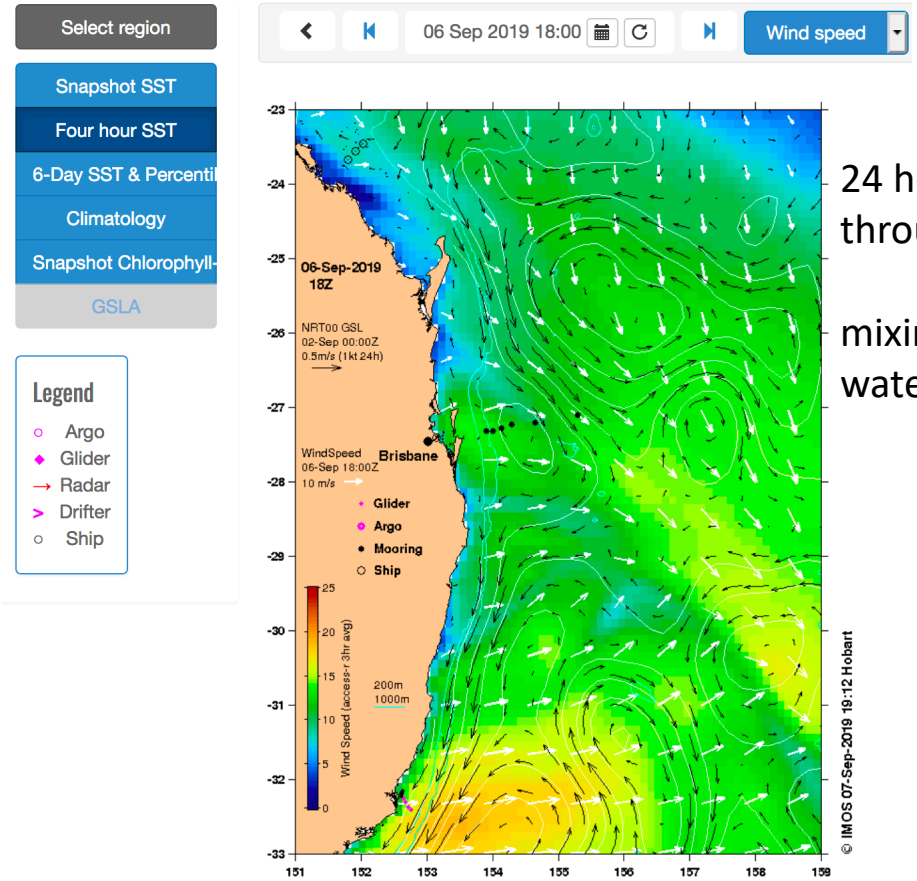
BoM ACCESS Winds (3hr avg)



Wind speed and direction are provided to help interpret the SST

Weak winds at 5 Sep 18:00

ACCESS Winds (3hr avg)

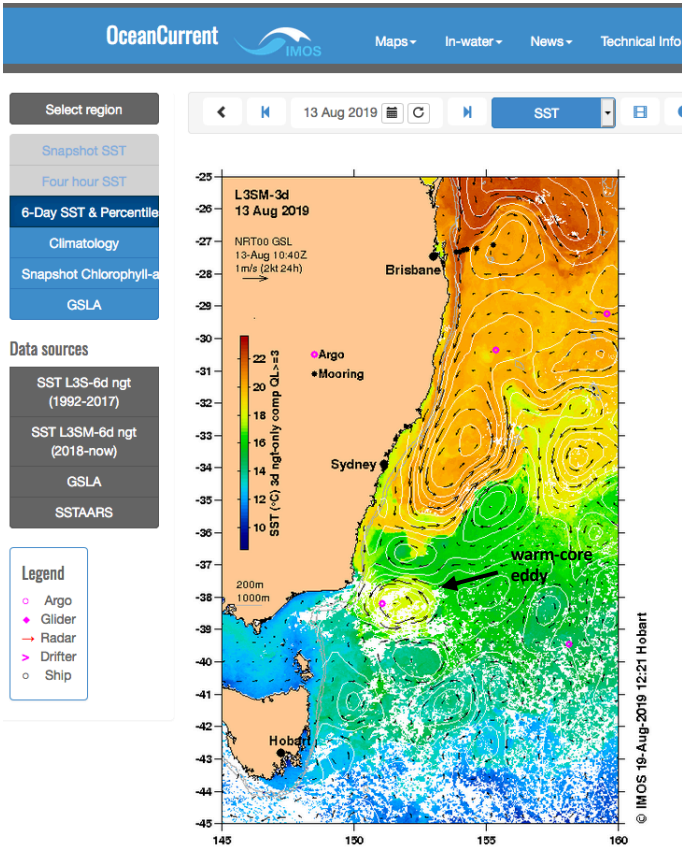


24 hours later a front passes through traveling northeastward

mixing in the shallow surface waters, cooling the SST

Looking below the surface

- EAC warm-core eddies increasingly traveling much further south
- An Argo float sampled one of these eddies in August
- click on the float to see the profile

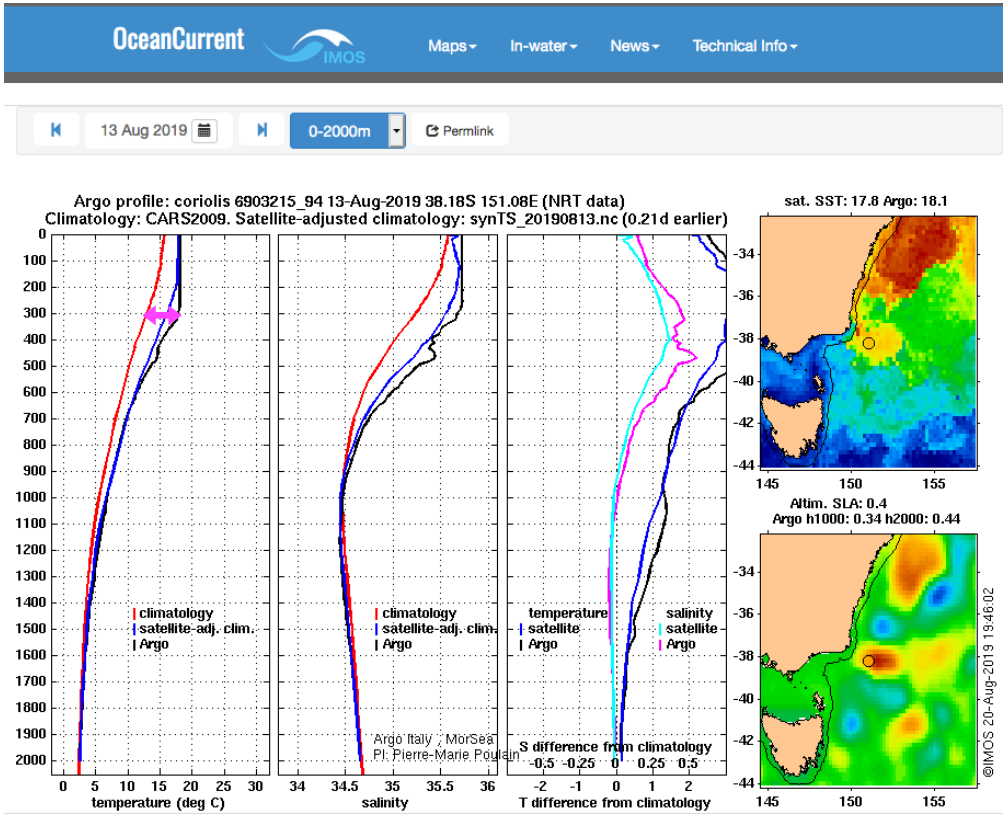


Argo profiles: Temperature, Salinity, Anomalies

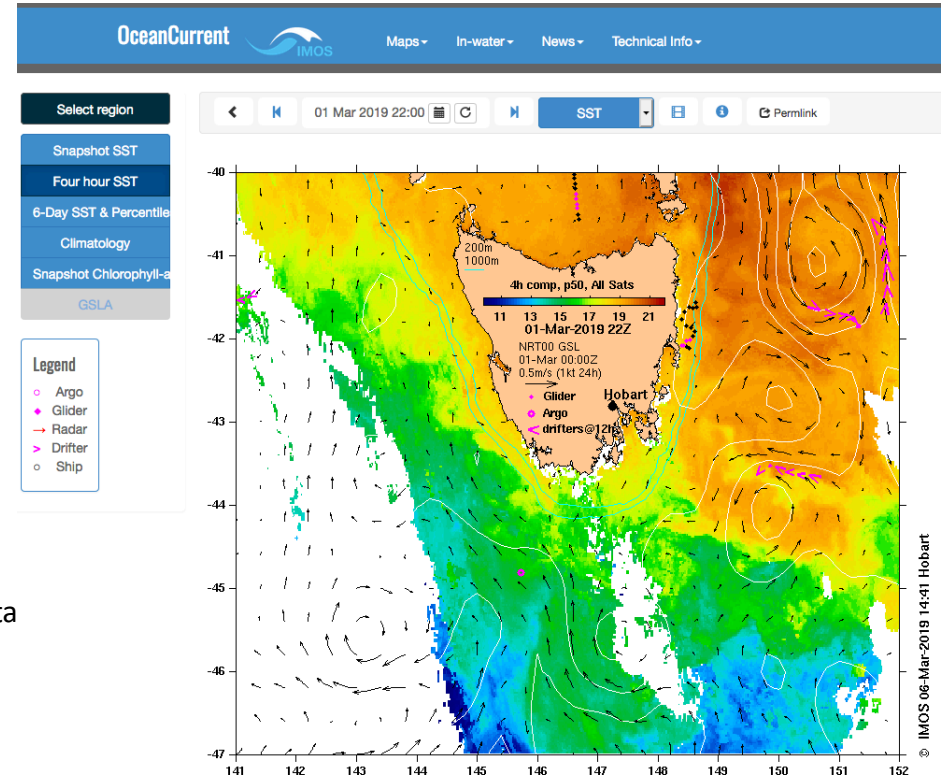
The profiles are plotted along with the climatological mean (red)

The eddy is 1-5°C warmer than in the mean for over 1km of depth

We can also see that the anomaly in both temperature and salinity is larger at 300m than at the surface



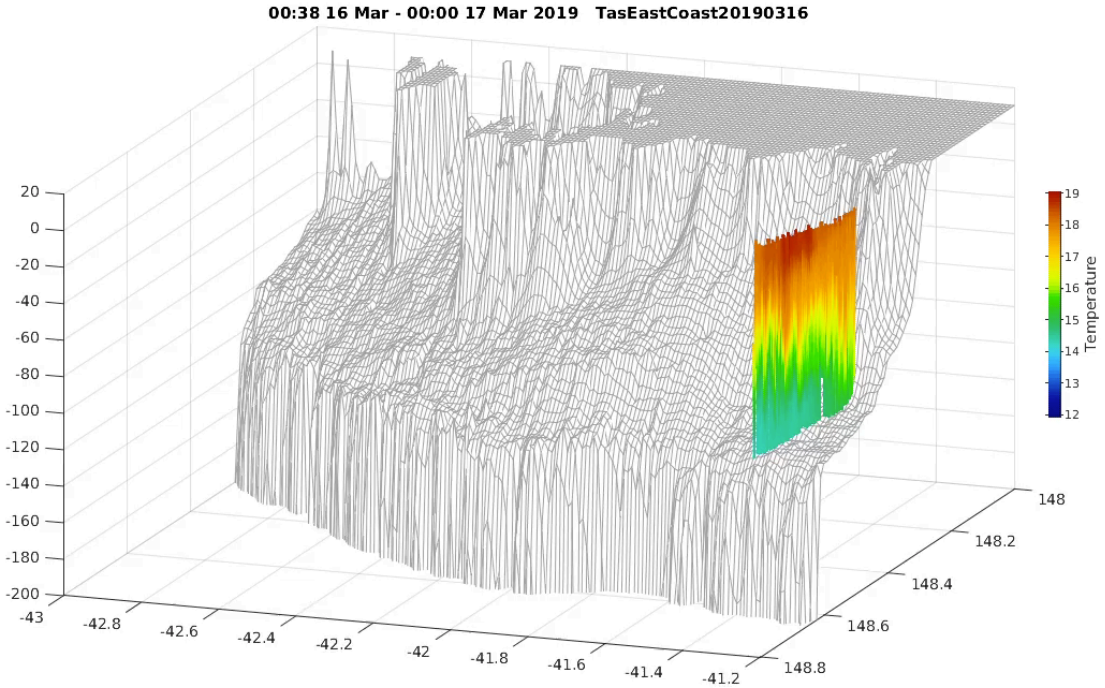
Glider observations are plotted near-real time



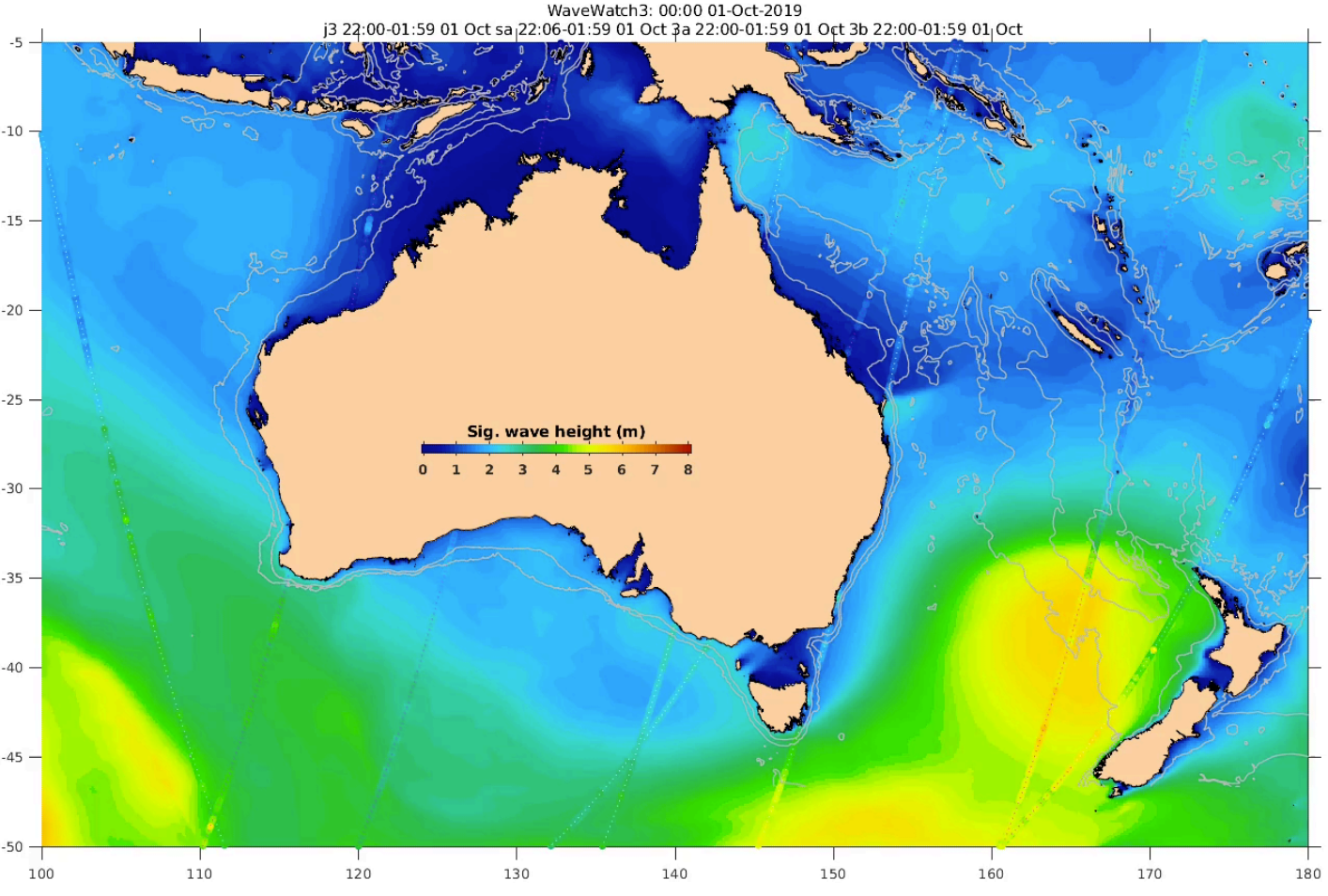
click on the pink dots to see the data

Glider temperature transects off Tasmania's East Coast

Event-based sampling targeting Marine Heatwaves



Future Development: Waves (Mark Hemer & Ian Young)



Thank you

Oceans & Atmosphere
Madeleine Cahill
Physical oceanographer

+61438 253 692
madeleine.cahill@csiro.au