

NERP

Torres Strait / GBR environmental conditions report: Recent status and predictions

June – July 2014

By Marites Magno-Canto
work supervised by Dr. Scarla Weeks
Contact: m.canto@uq.edu.au

UQ-GPEM Biophysical Oceanography Group

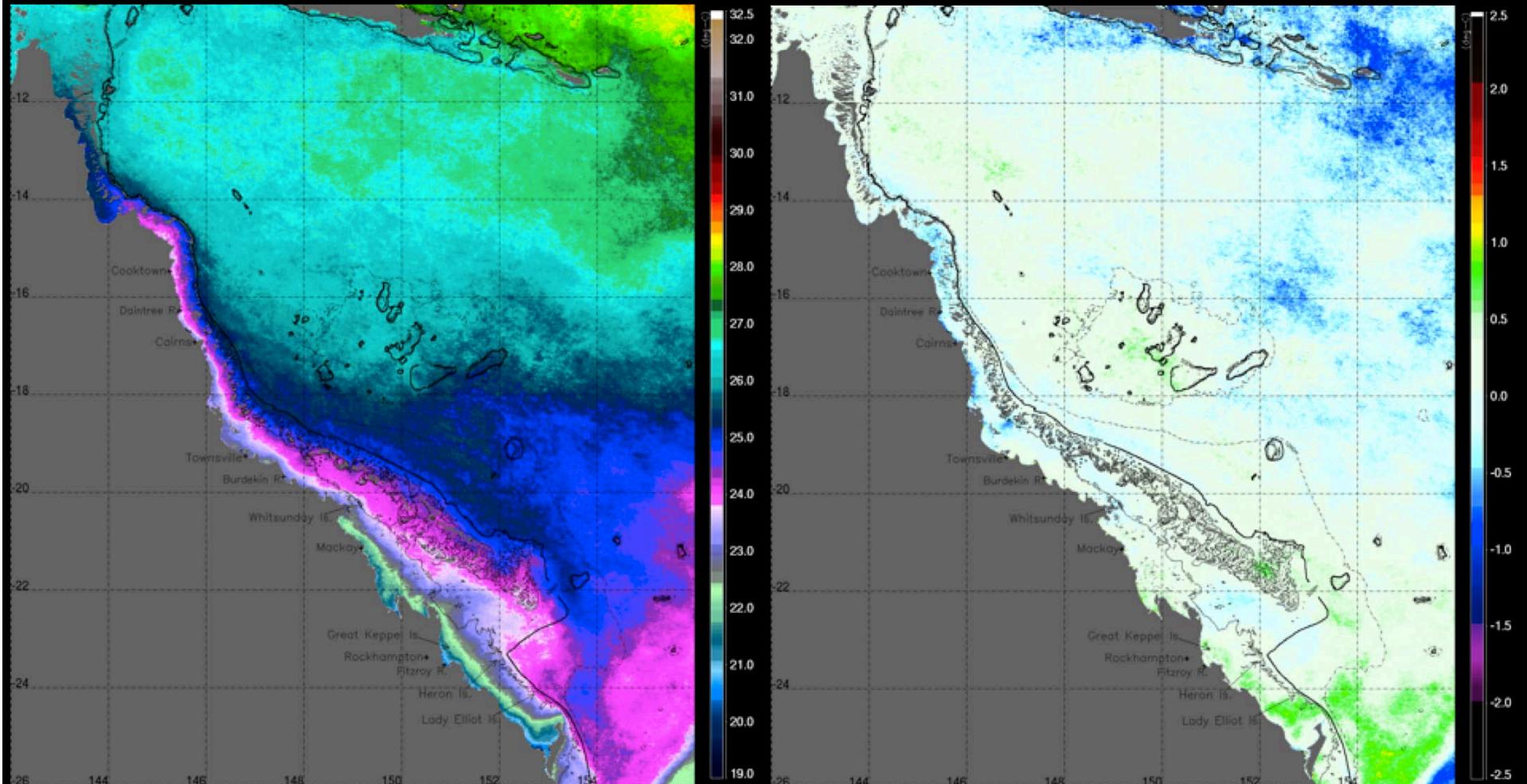
Outline

- Overview
- Recent SST and in situ Temperature evolution
- Monthly means and anomalies of MODIS Chlorophyll-a concentrations and 10% Photic Depth
- GBR SST forecast (POAMA)
- Coral Bleaching Outlook (NOAA:CRW)
- Surface conditions in the tropical Pacific
- ENSO evolution and predictions

Overview

- ENSO neutral conditions continue despite the tropical Pacific Ocean having been primed for El Niño over the past months.
- Eastward propagating Kelvin Wave that persisted for several months dissipated considerably through June and July.
- OceanMAPS shows strong westward flow of the South Equatorial Current feeding the Papua New Guinea Gyre, with weak East Australia Current flow adjacent to the GBR
- POAMA forecasts warmer conditions along the southernmost areas of the GBR for August and September with decreased probability of SST anomalies exceeding 0.6° compared to June
- Mostly close to average conditions along the length of the GBR and Torres Strait regions but intensified positive SST anomalies in the southern GBR and core EAC apparent in MODIS data
- *In situ* data show sea water temperature fluctuations close to the long-term mean for most stations except for Heron Island which showed considerable oscillations through June and July

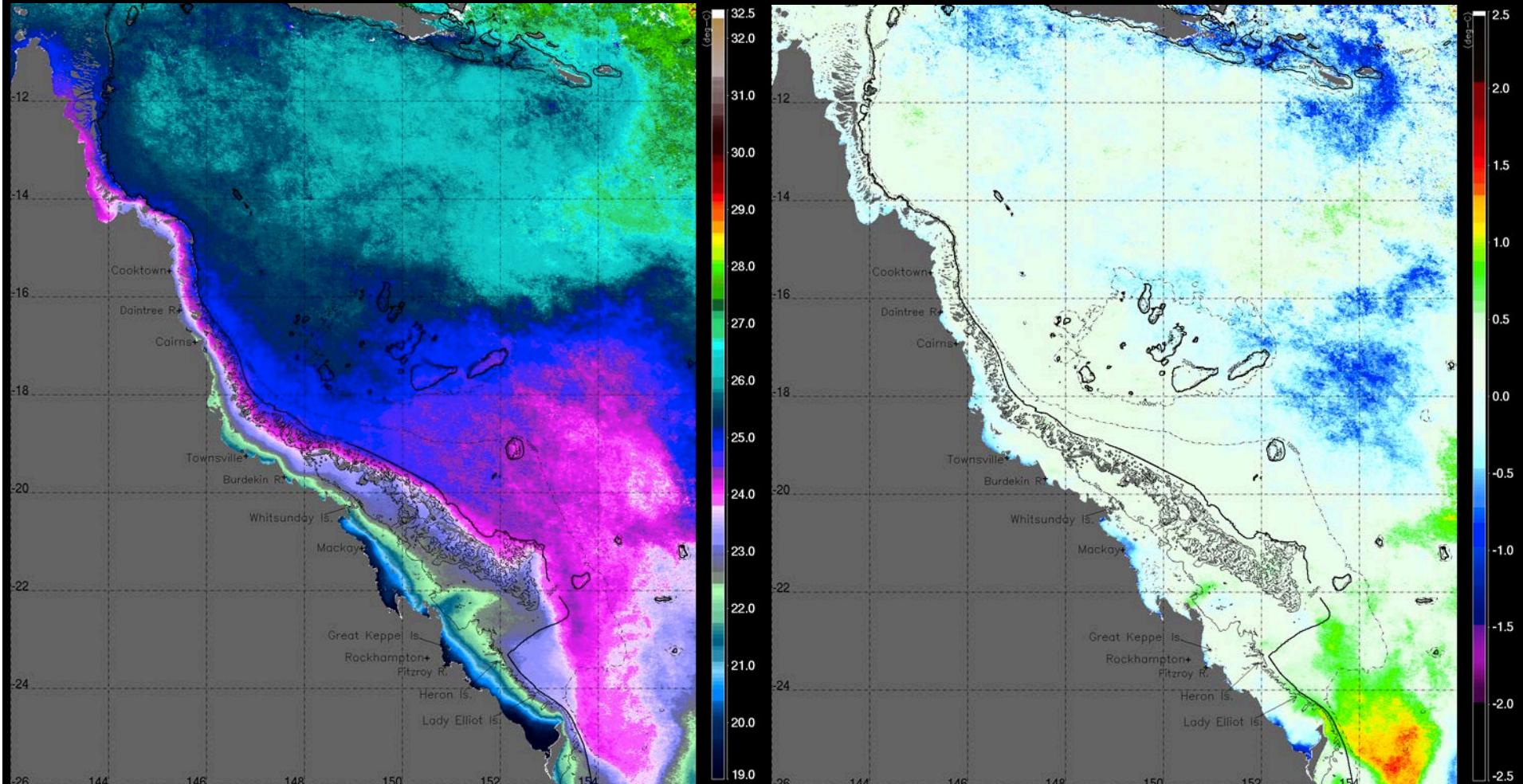
MODIS sea surface temperature (day+night) June 2014



Note:

- Mostly close to average conditions along the length of GBR throughout the month of June
- Weak positive SST anomalies in the southernmost region, both inshore in Curtis Channel and offshore in the core EAC

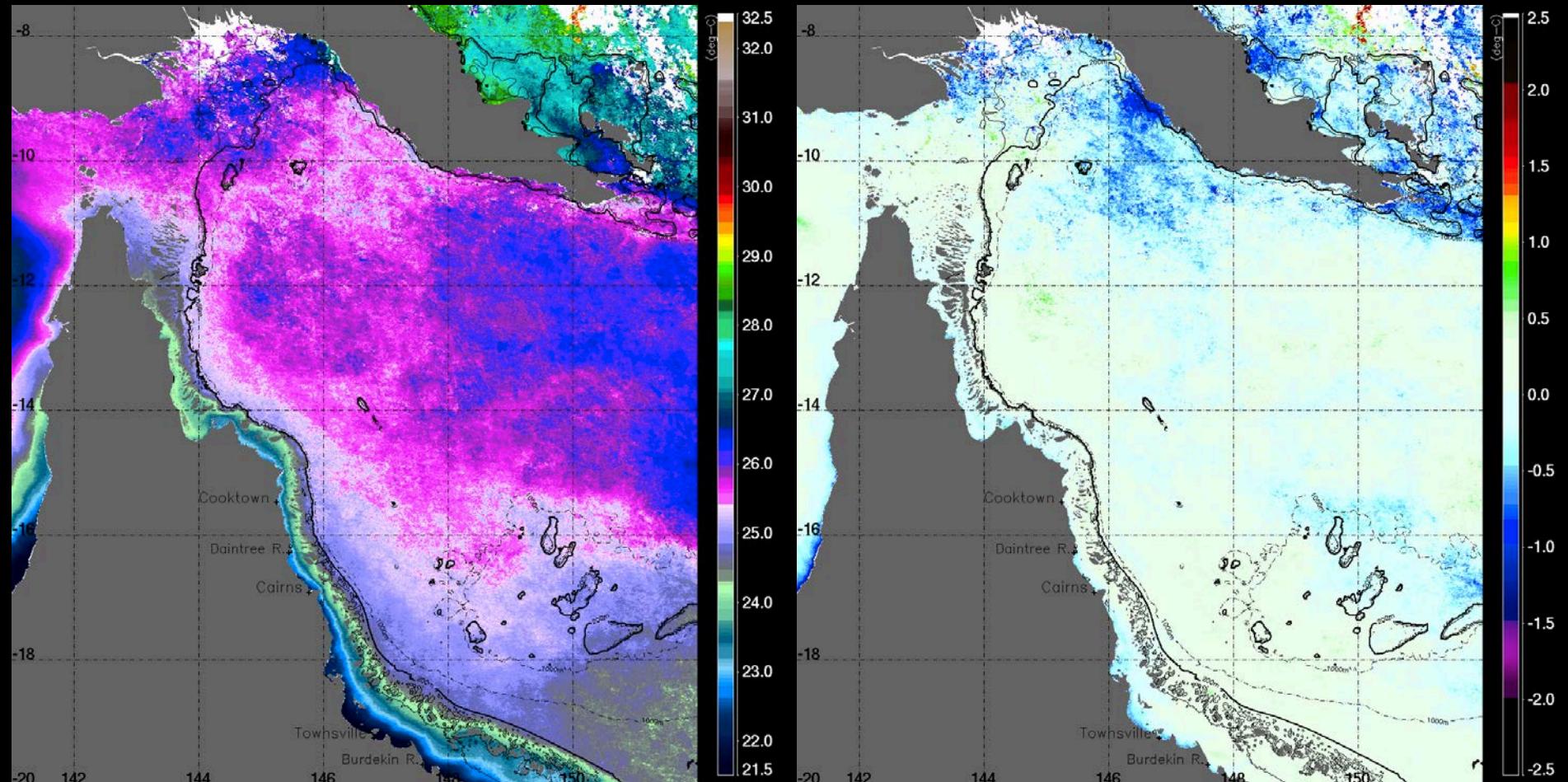
MODIS sea surface temperature (day+night) July 2014



Note:

- As waters cooled further through July, close to average conditions continued along the length of the GBR except for the Capricorn Bunker reefs where –
- Positive SST anomalies intensified around the Capricorn Eddy region compared to June, especially in the core EAC offshore of Fraser Is.

Torres Strait / far northern GBR MODIS sea surface temperature (day+night) July 2014



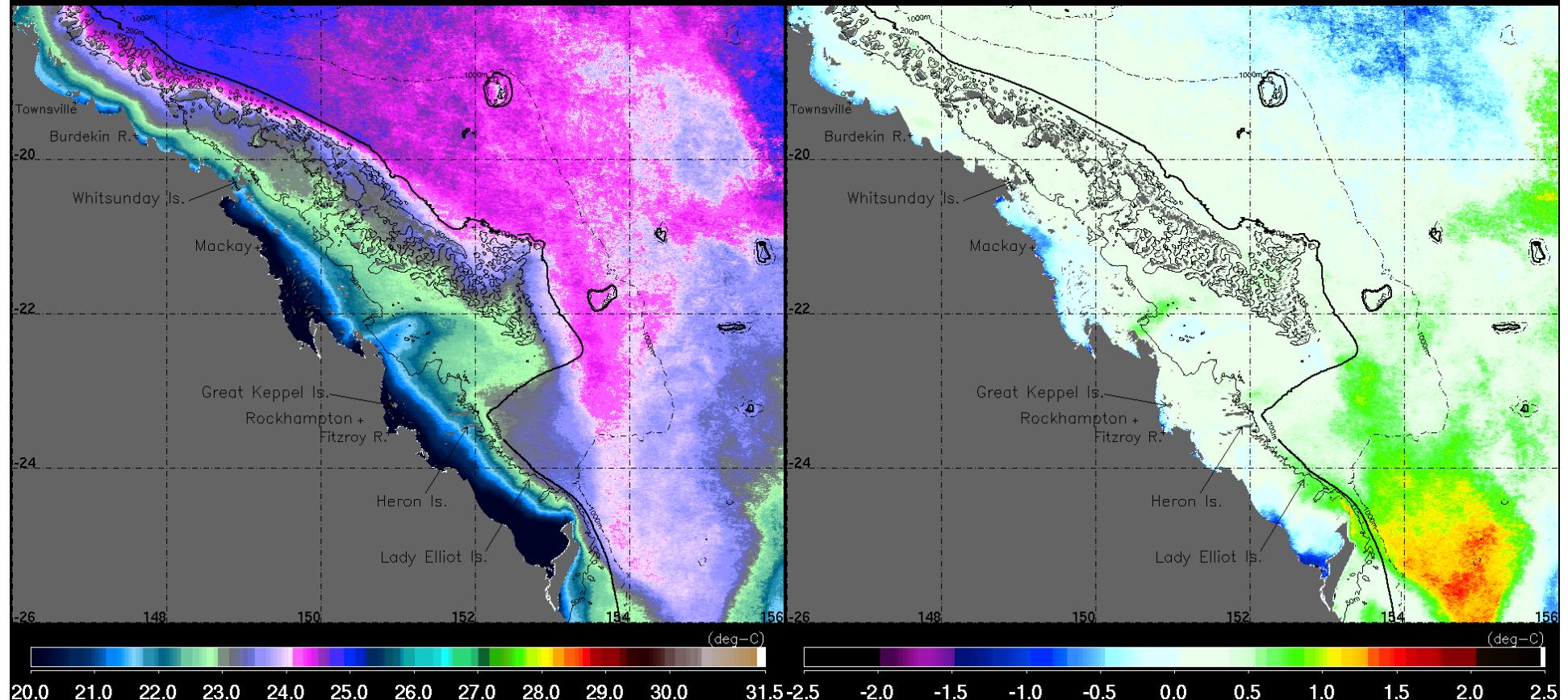
Note:

- Average SST conditions throughout the N-GBR and Torres Strait continued from June through July as waters cooled further while -
- Negative anomalies persisted in eastern PNG waters

Southern GBR

MODIS sea surface temperature (day+night)

July 2014

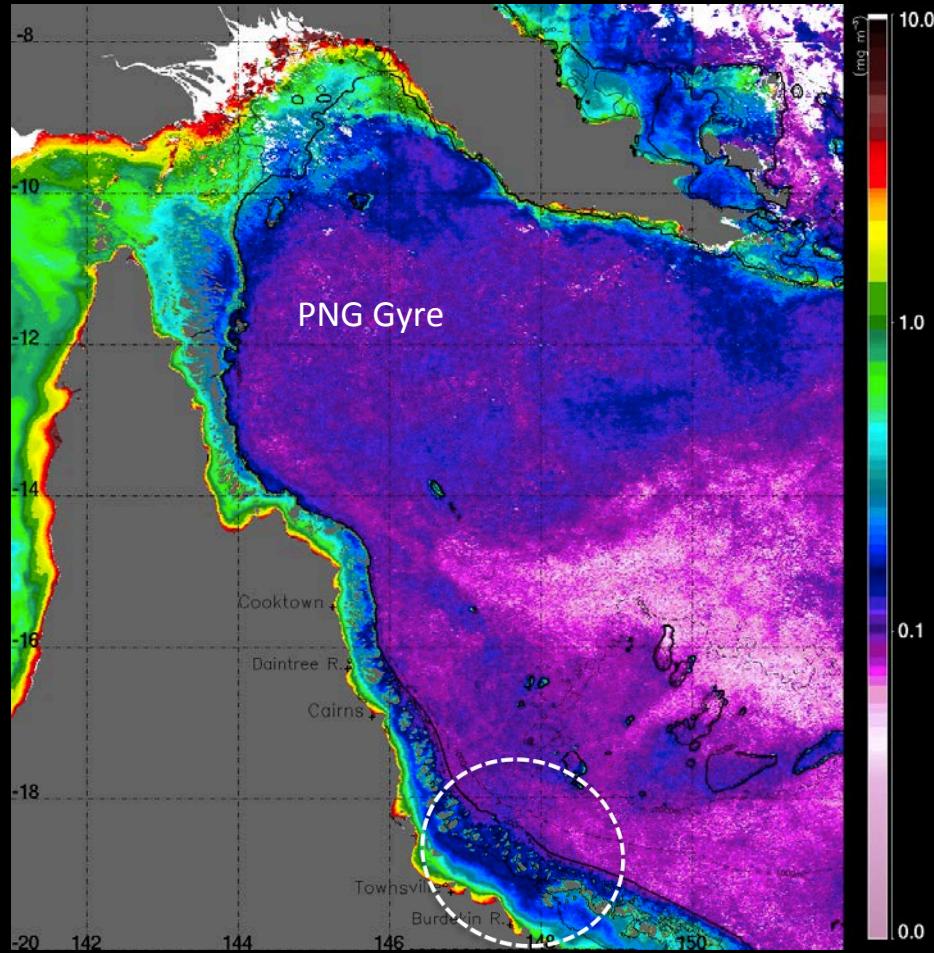


Note:

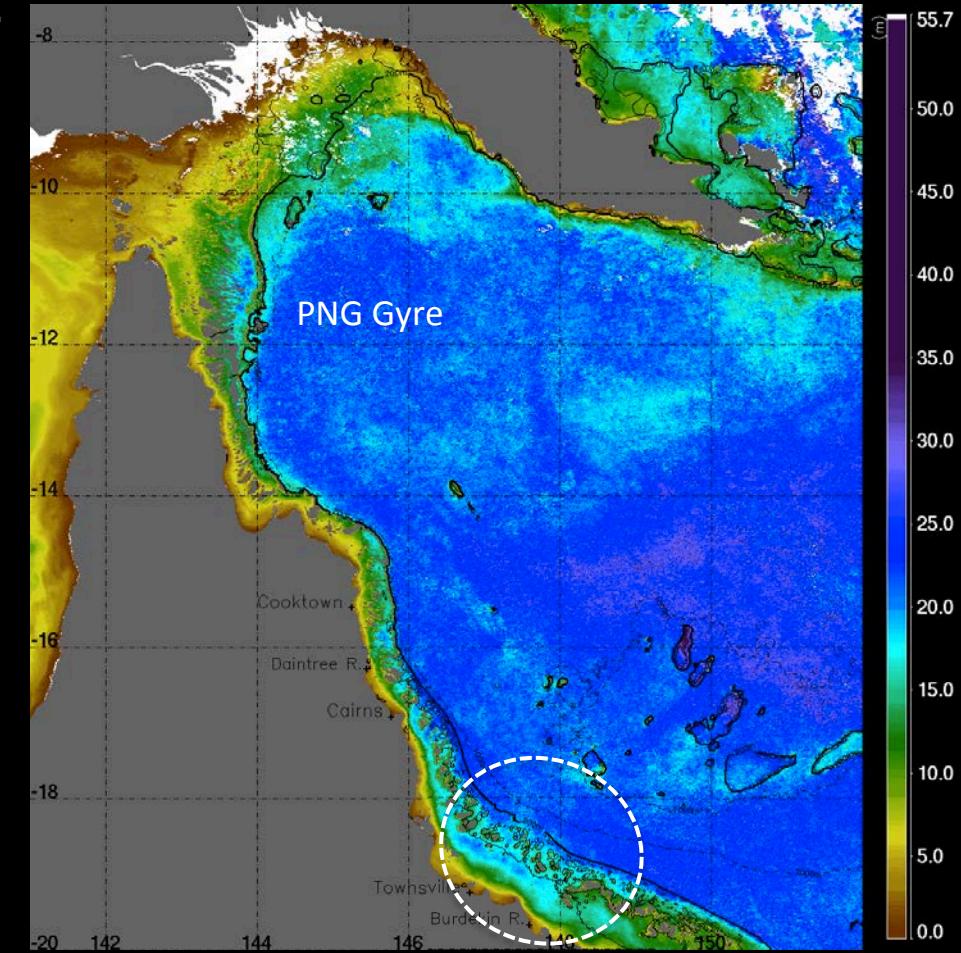
- In the S-GBR, primarily close to average conditions continued from June through July except for –
- A positive SST anomaly patch off Cape Clinton related to strong offshore flow (east to southeastward)
- Intensified positive SST anomalies in the southern Capricorn Bunker reefs - related to Capricorn Eddy dynamics, and in the core EAC offshore of Fraser Is.

Torres Strait / far northern GBR July 2014

MODIS chlorophyll-*a* concentration



MODIS 10% photic depth



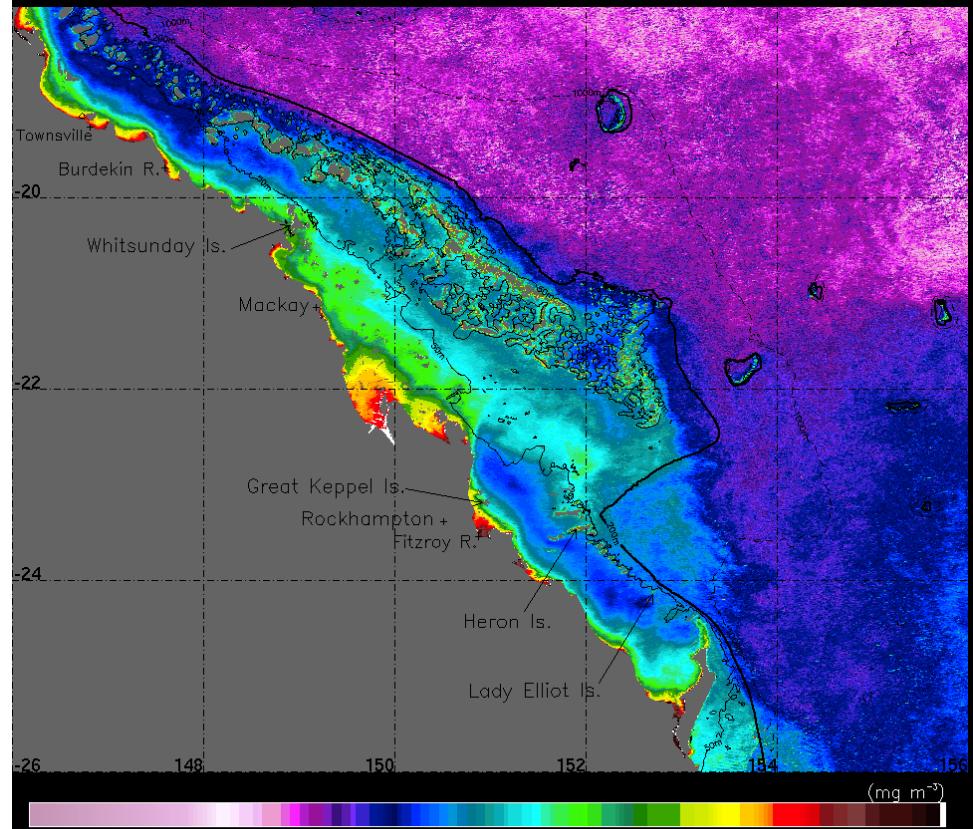
Note:

- Surface manifestation of the PNG Gyre remained apparent in both chlorophyll-*a* and photic depth monthly mean images through June & July as lower chlorophyll / deeper photic depth oceanic waters
- Oceanic intrusions (dashed circle) apparent through the Myrmidon and Palm Passages, extending shoreward from June to July

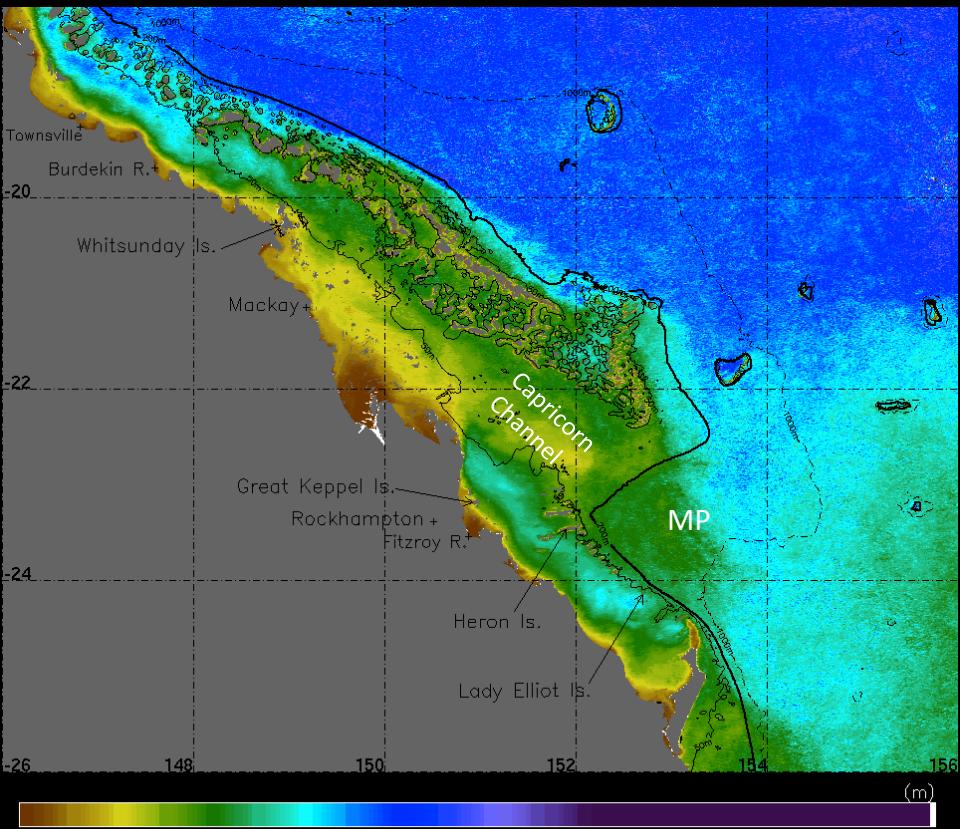
Southern GBR

July 2014

MODIS chlorophyll- α concentration



MODIS 10% photic depth



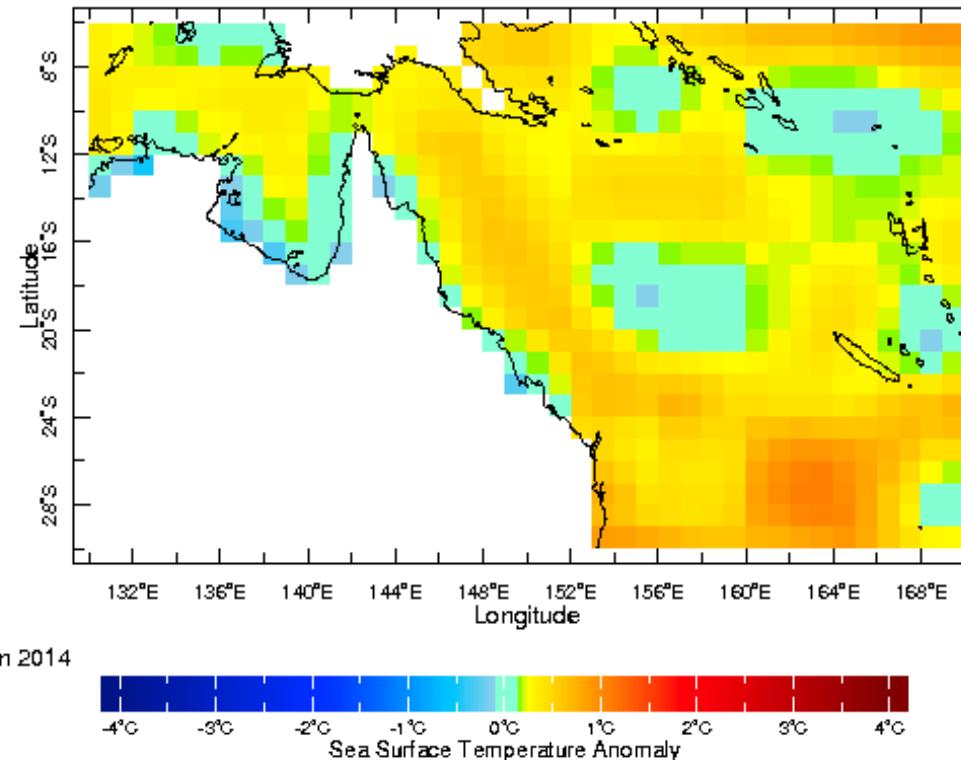
Note:

- Strong south-eastward surface flow extending from Cape Clinton, along the Capricorn Channel and beyond the shelf edge to the Marion Plateau (MP) - clearly evident in the higher chlorophyll / low photic depth signals
- Inshore of the Capricorn Bunker group, lower chlorophyll / higher photic depth waters in Curtis Channel likely related to north-westward flow in this region

Sea Surface Temperature Anomaly

from NOAA NCEP EMC CMB GLOBAL Reyn_SmithOlv2

June 2014

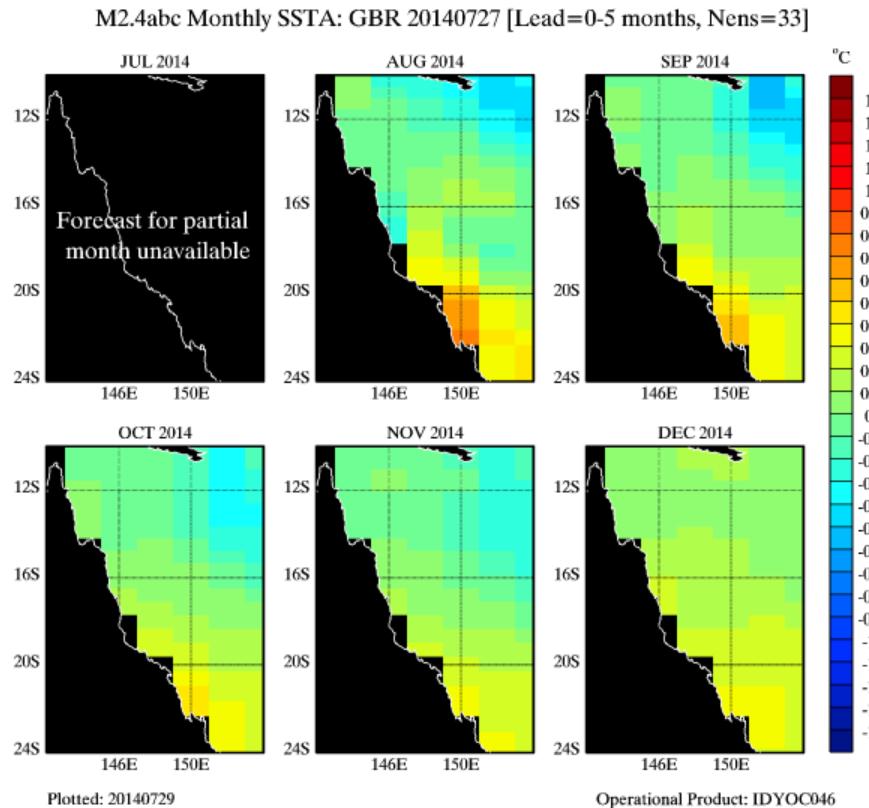


Note:

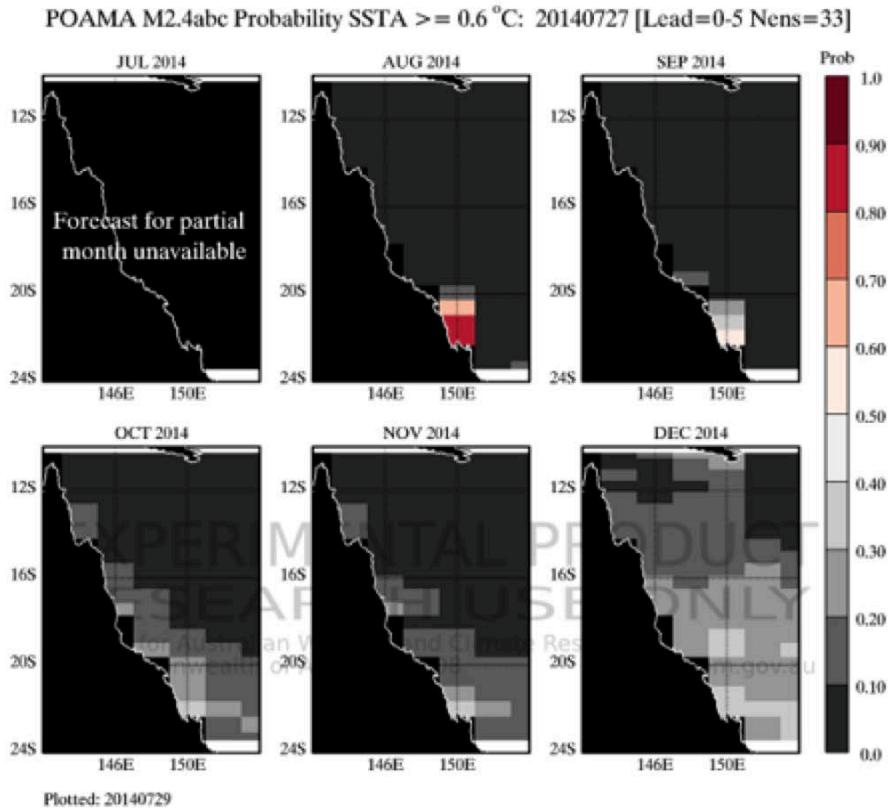
- NOAA NCEP data depicted neutral to low positive anomaly conditions along the length of the GBR for June (July data not yet available)

SST anomaly forecast (POAMA-2): August – December 2014

POAMA SST anomaly forecast for the next 6 months (operational)



Probabilities of SST anomalies greater than 0.6°C for the next 6 months (Experimental)



Note:

- POAMA forecast show warmer conditions along the southernmost areas of the GBR for August and September with decreased probability of SST anomalies exceeding 0.6°C in the region compared to June.

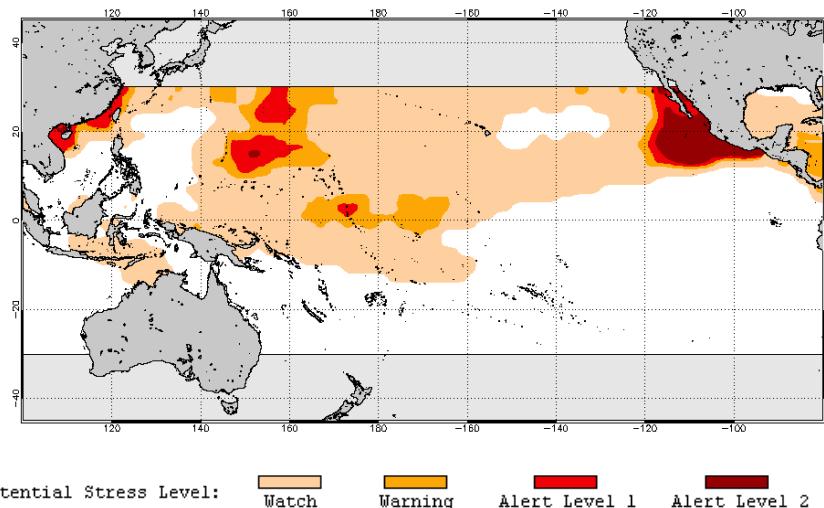
NOAA Coral Reef Watch

Seasonal coral bleaching thermal stress outlook

August to November 2014

LIM-based

Version 2, experimental, weekly 2x2 degree spatial resolution



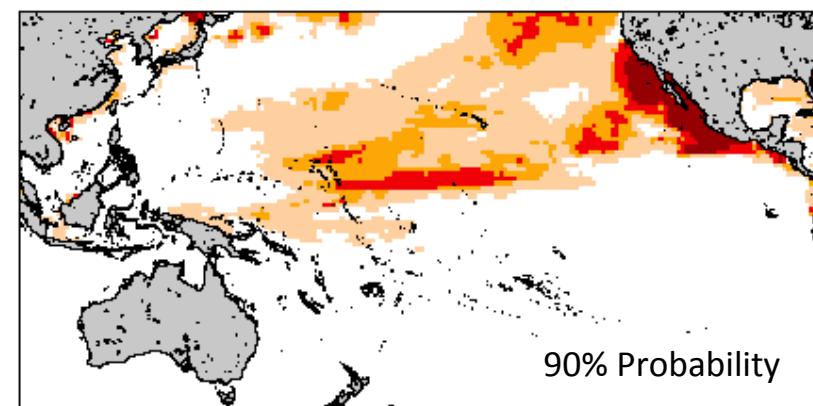
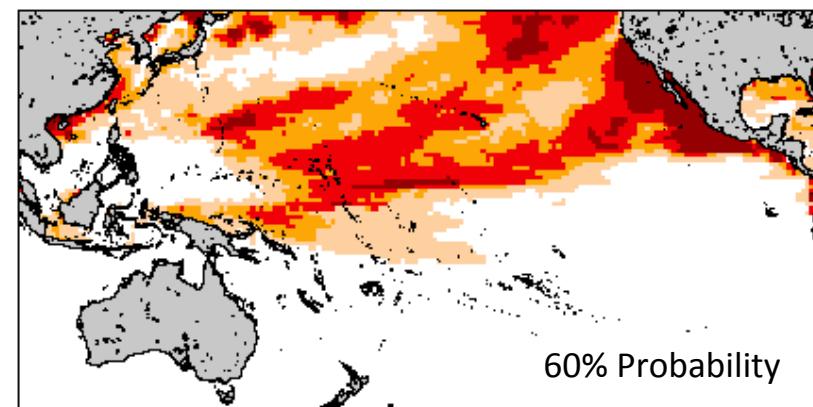
Note:

- Outputs from Coral Reef Watch continue to depict no potential stress levels for the upcoming months over the GBR and Torres Strait areas.

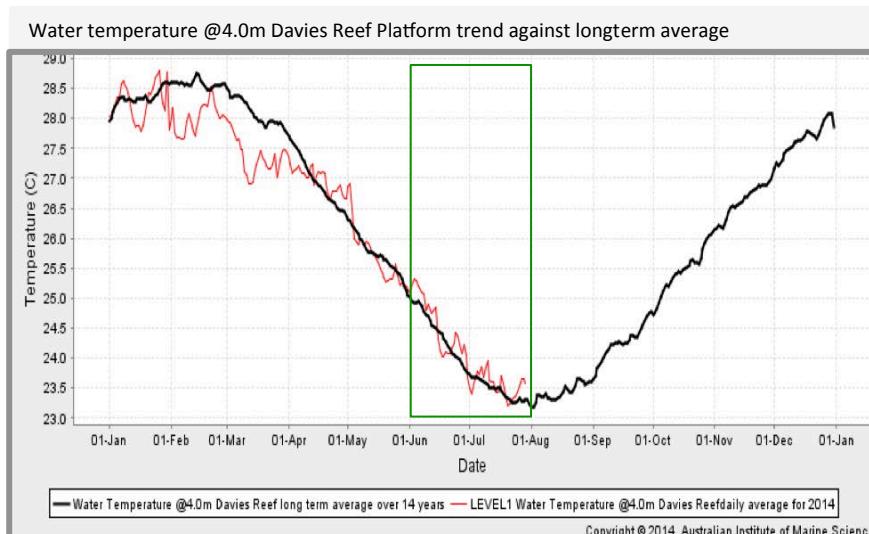
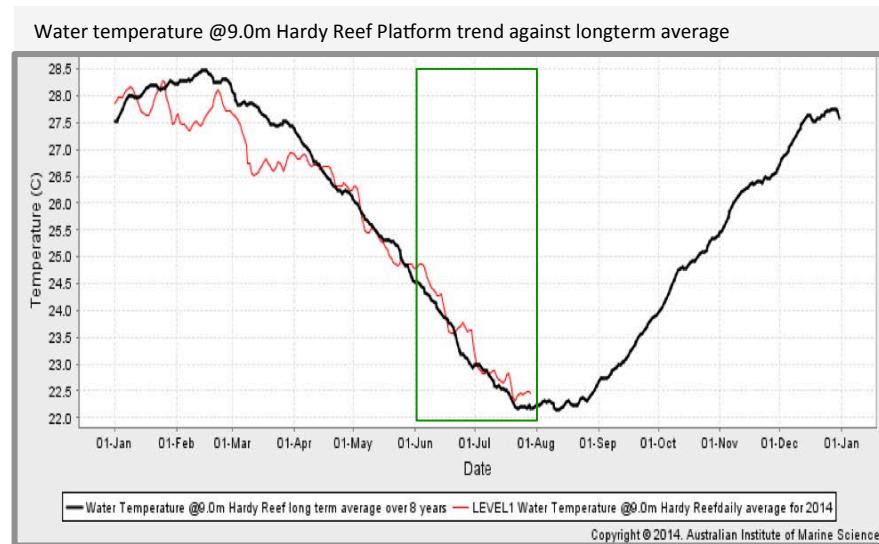
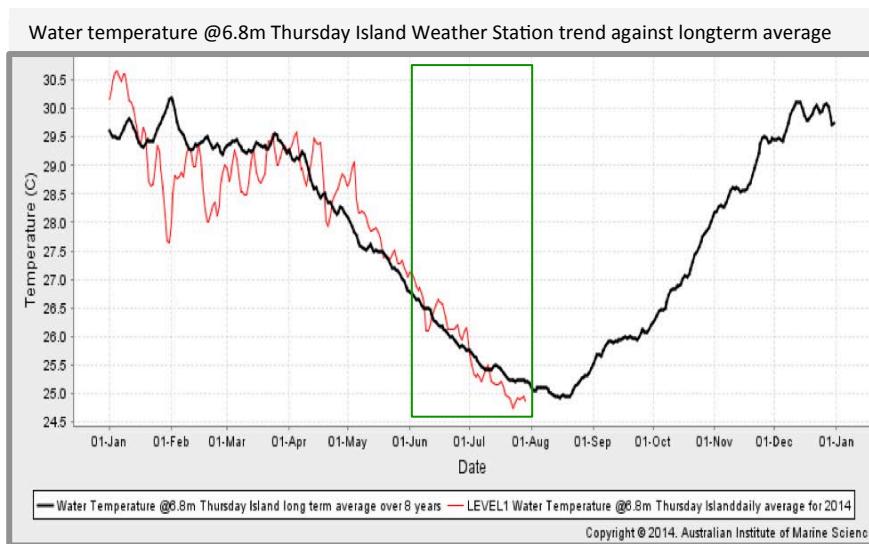
(These outlooks are based on SST predictions from: CRW's experimental statistical Linear Inverse Model (LIM-based – left panel) and the NCEP Climate Forecast System (CFS-based – right panel) systems)

CFS-based

Version 2, experimental, weekly 1x1 degree spatial resolution

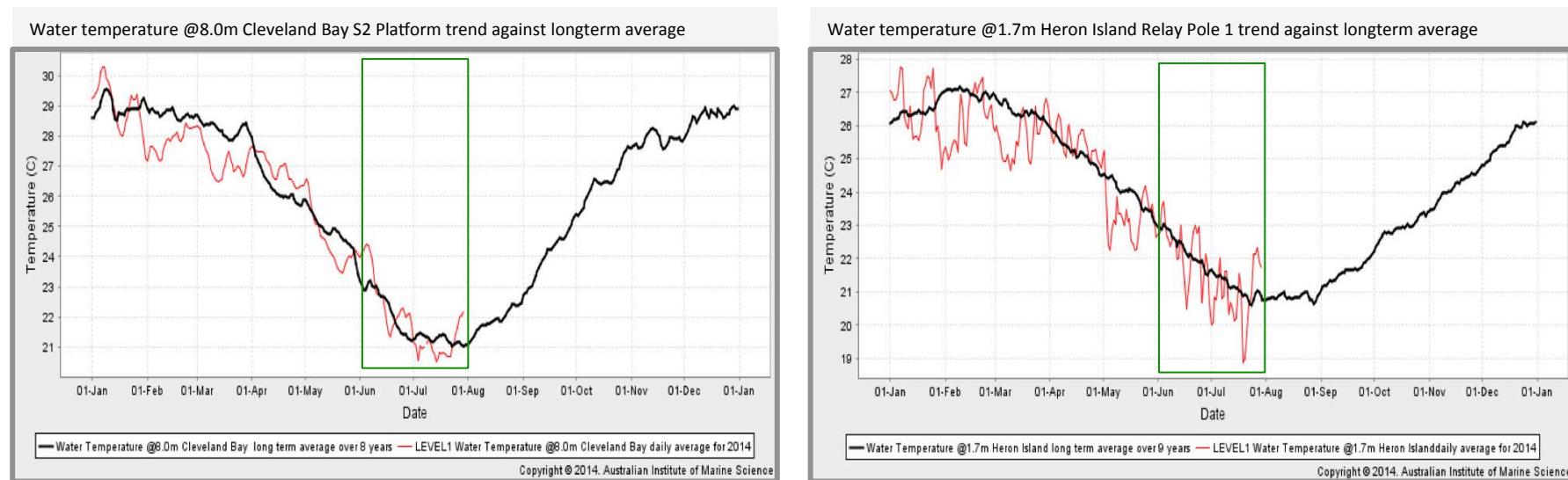


Water temperatures from IMOS Sensor Network (FAIMMS) (AIMS operated)



- Thursday Island recorded temperatures below the long-term average for July
- Data from the AIMS weather stations @ Hardy and Davies Reefs show *in situ* sea water temperatures fluctuations very close to the long-term mean

Water temperatures from IMOS Sensor Network (FAIMMS) (AIMS operated)



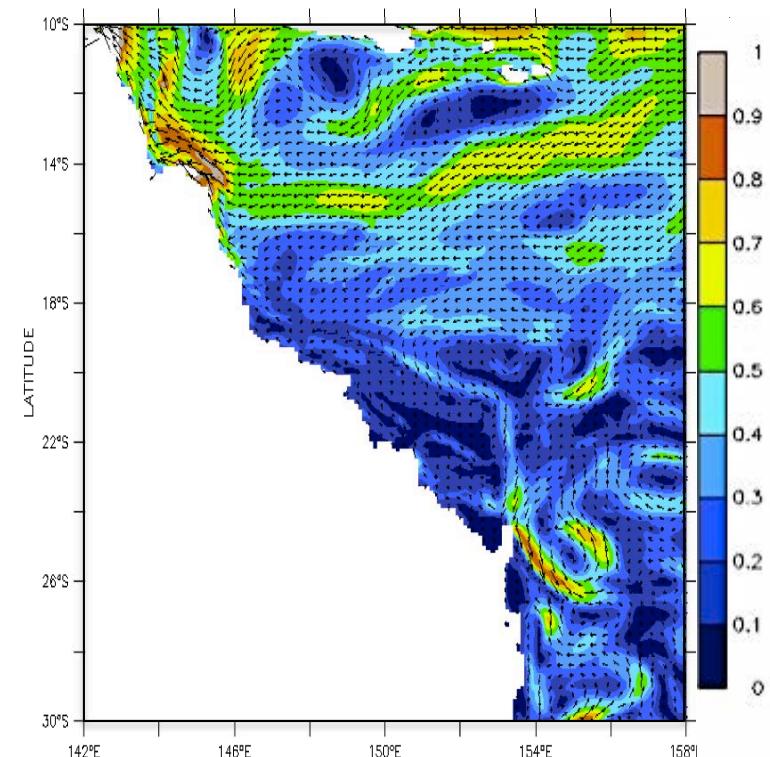
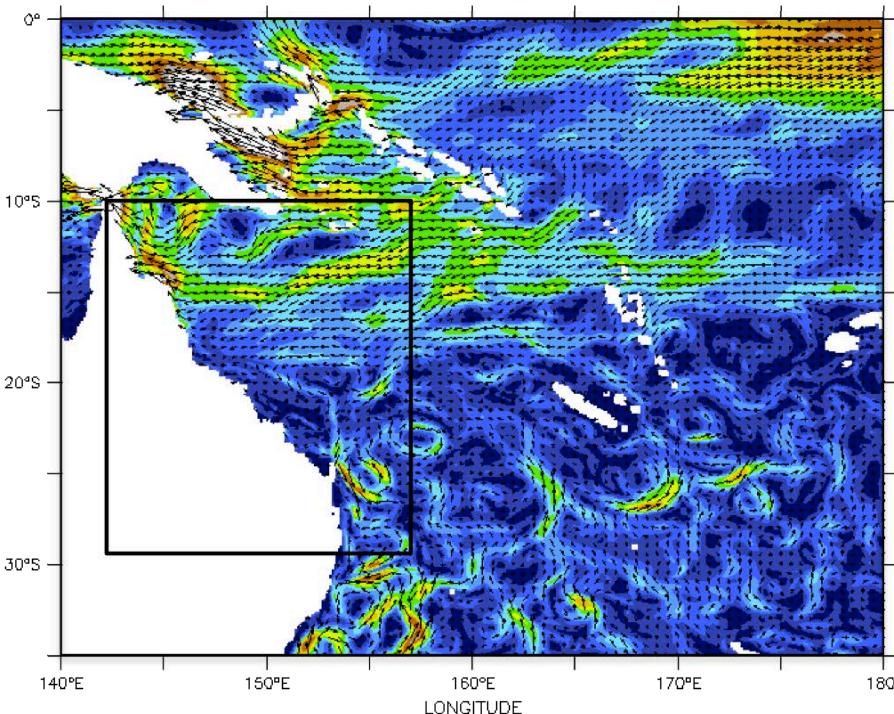
Note:

- AIMS weather station data at Heron Is. show considerable fluctuations of *in situ* sea water temperature relative to the long term mean for June and July

OceanMAPS 15m Depth-Average Currents

July 2014

OceanMAPS Ocean Modeling, Analysis and Prediction System was developed at CSIRO Marine and Atmospheric Research and the Bureau of Meteorology and it is part of the **Bluelink** project.



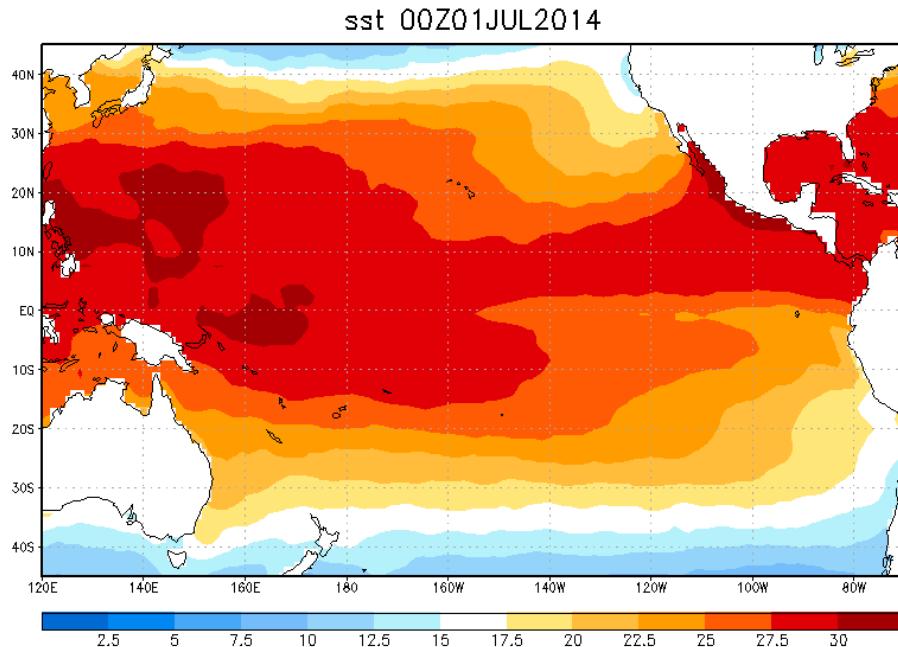
Behind Real Time analysis 15 m Depth-Averaged Currents (m/s)

Note:

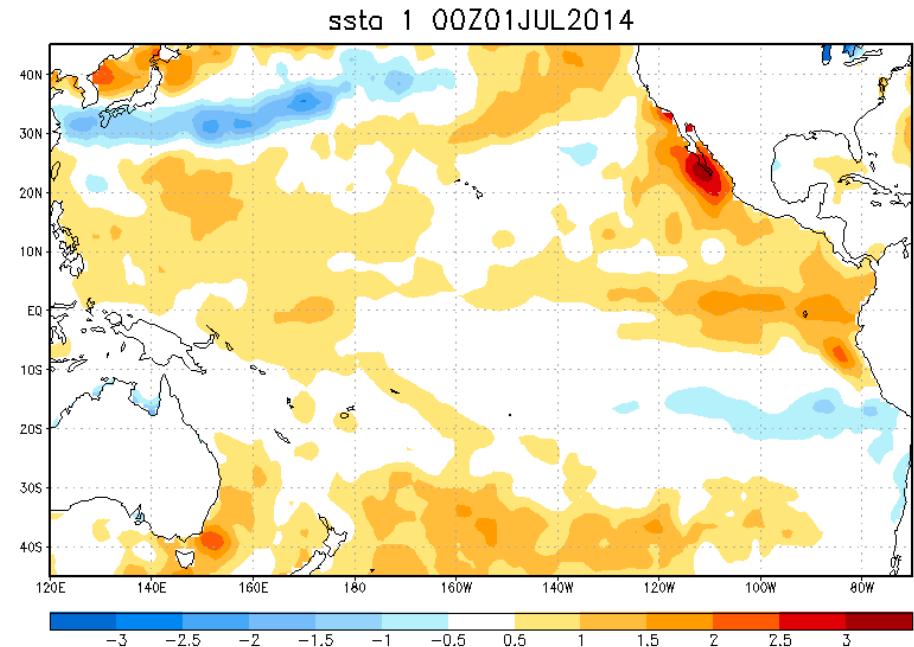
- Strong westward flow of the South Equatorial Current (SEC) towards the N-GBR (centered $\sim 15^{\circ}\text{S}$) feeding the North Queensland (Hiri) Current and ultimately the gyre in the Gulf of Papua New Guinea
- Weak EAC flow adjacent to the GBR, also related to seasonally prevailing south-easterly winds
- Intense anticyclonic eddy off Fraser Island resulting in positive SST anomalies in that region, as seen in MODIS data

NOAA optimum interpolation sea surface temperature

OI SST July 2014



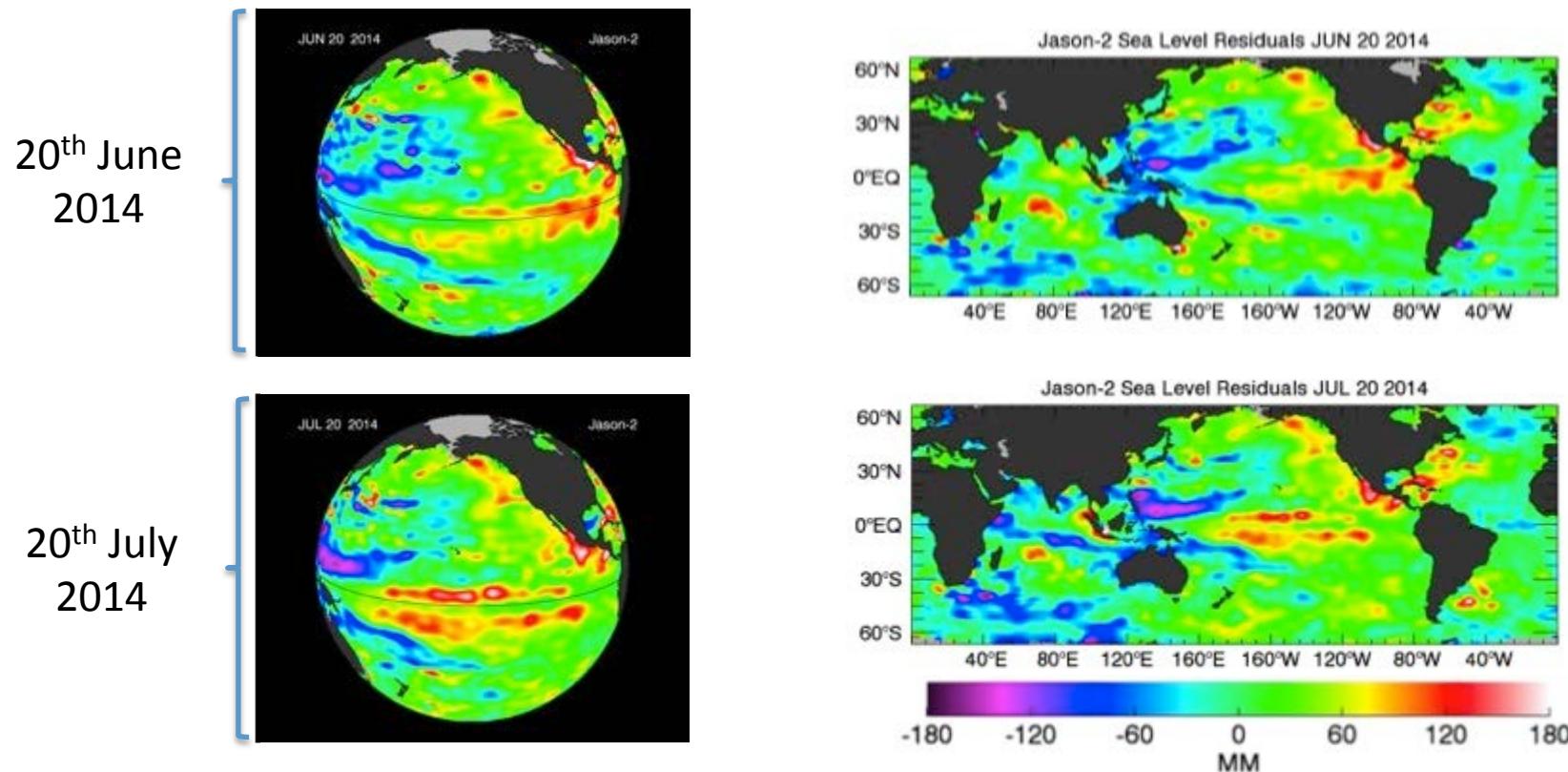
OI SST anomaly July 2014



Note:

- Although some cooling has taken place in the central and eastern tropical Pacific Ocean, positive SST anomalies are still apparent in the eastern equatorial Pacific

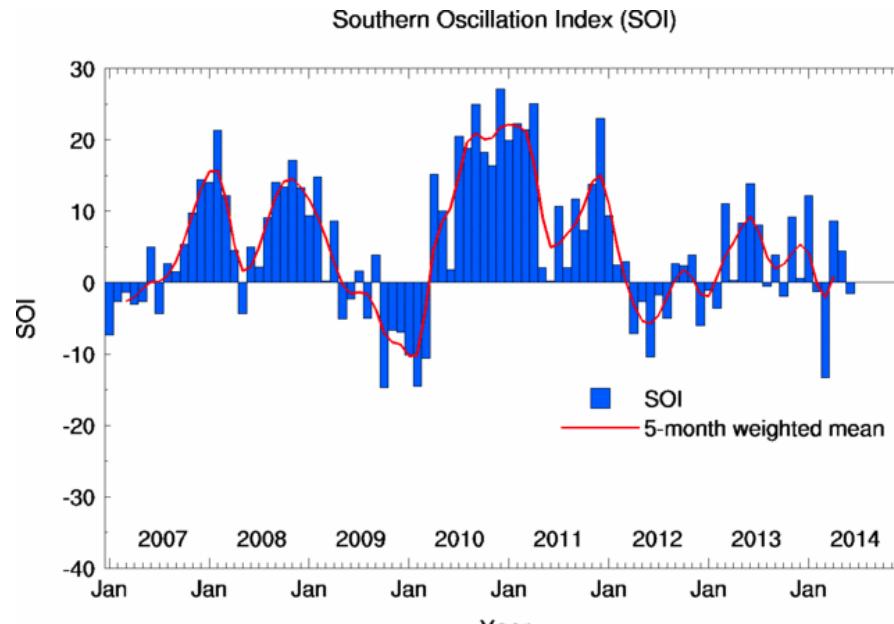
Sea surface height anomalies from Ocean Surface topography: Jason-2 (NASA/French)



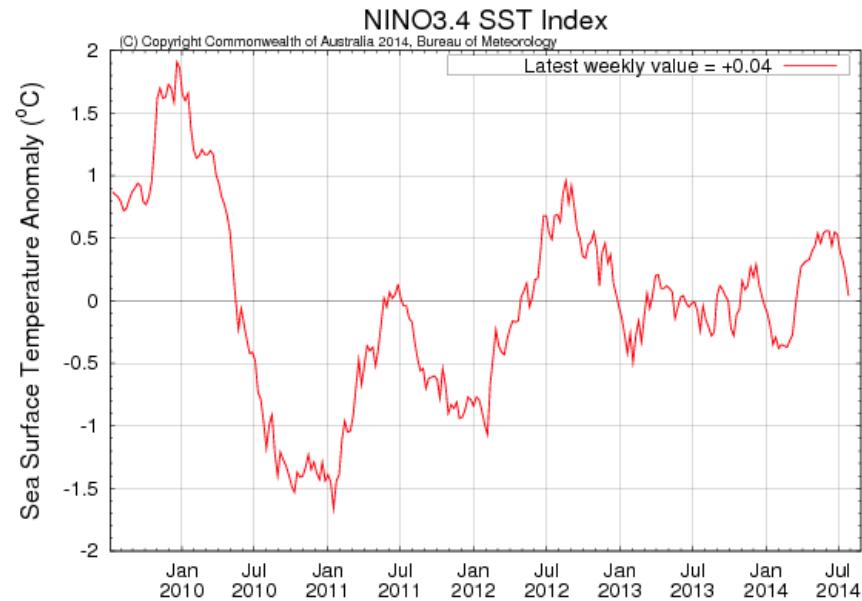
Note:

- Sea-level data shows the eastward propagating Kelvin Wave that persisted for several months has dissipated considerably over the last two months (June and July)

ENSO Index



Negative SOI = El Niño



Positive Nino 3.4 index= El Niño

Note:

- ENSO neutral conditions continue, while the El Niño 3.4 SST index shows a decrease in the SST anomaly data to below 0.5°C in July
- Although the tropical Pacific Ocean has been primed for El Niño over the past months and warmer-than-average waters persist in parts of the tropical Pacific, the atmosphere has failed to respond accordingly
- The majority of climate models still indicate El Niño onset (70%) by August and continuing into early 2105 at weak-to-moderate strength, while BoM indicates ~50% chance of El Niño developing in 2014