NERP

Torres Strait / GBR environmental conditions report:

Recent status and predictions

November 2014

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Outline

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

Overview

- Despite an overall increase in SST anomalies, ENSO neutral conditions continued in the Pacific during November due to a lack of clear atmospheric circulation response to the anomalously warm ocean.

- OceanMAPS shows an intensified and persistent East Australia Current adjacent to the GBR with the EAC core hugging the shelf edge as it flowed poleward during November.

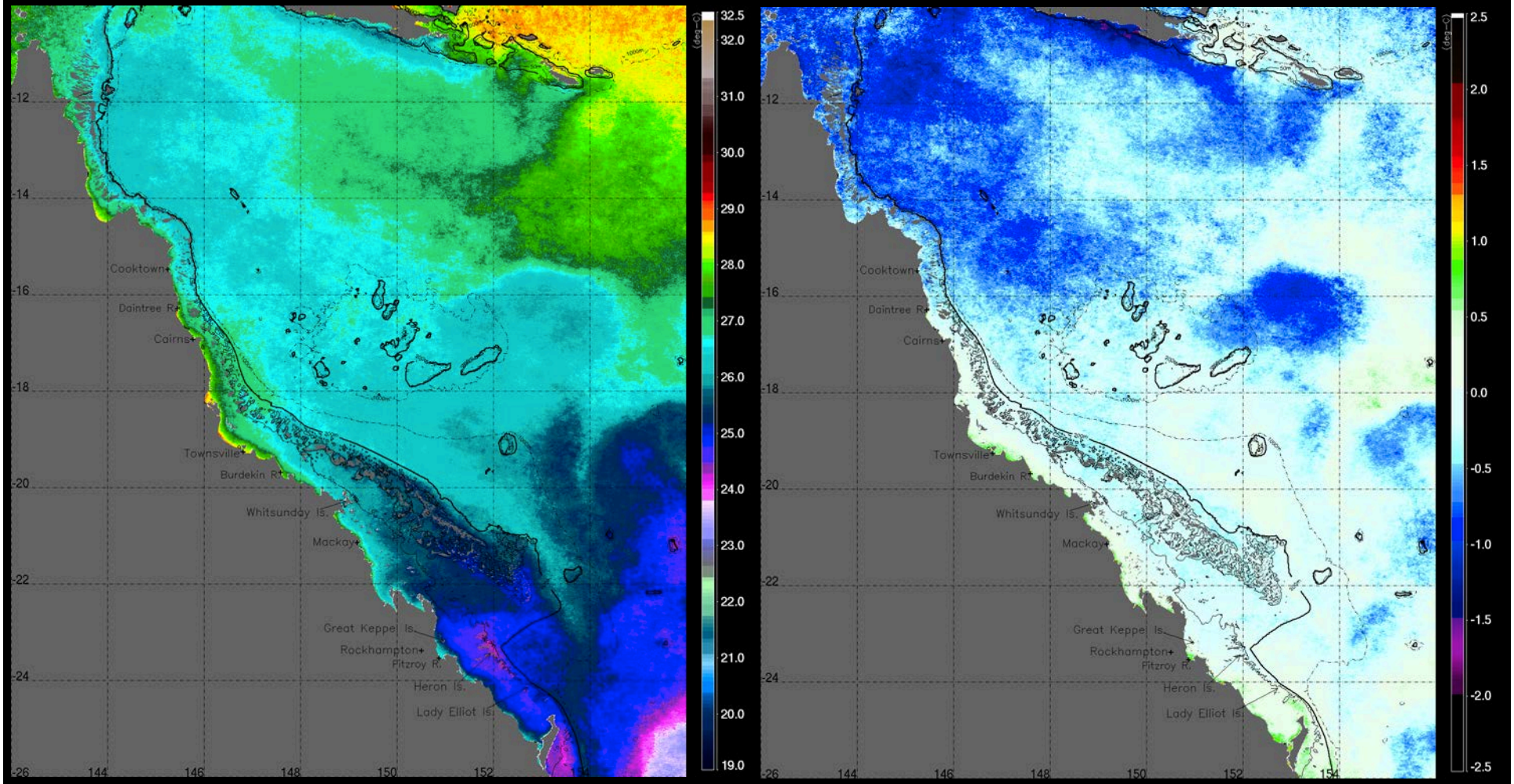
- Negative SST conditions persisted during November along the far northern GBR and Torres Strait regions while neutral to weak negative SST anomalies presented in the central to southern GBR.

- *In situ* temperature fluctuations for November remained below the long-term mean for most stations except for Myrmidon Reef and Heron Island sites which both experienced temperatures well above the long-term mean.

- NOAA Coral Reef Watch indicates overall increased potential thermal stress levels for the Torres Strait and GBR regions as we head into summer. NOAA CFS-based (60%) model predicts higher stress levels indicating an “Alert Level2” potential stress for GBR and “Alert Level1” for Torres Strait.

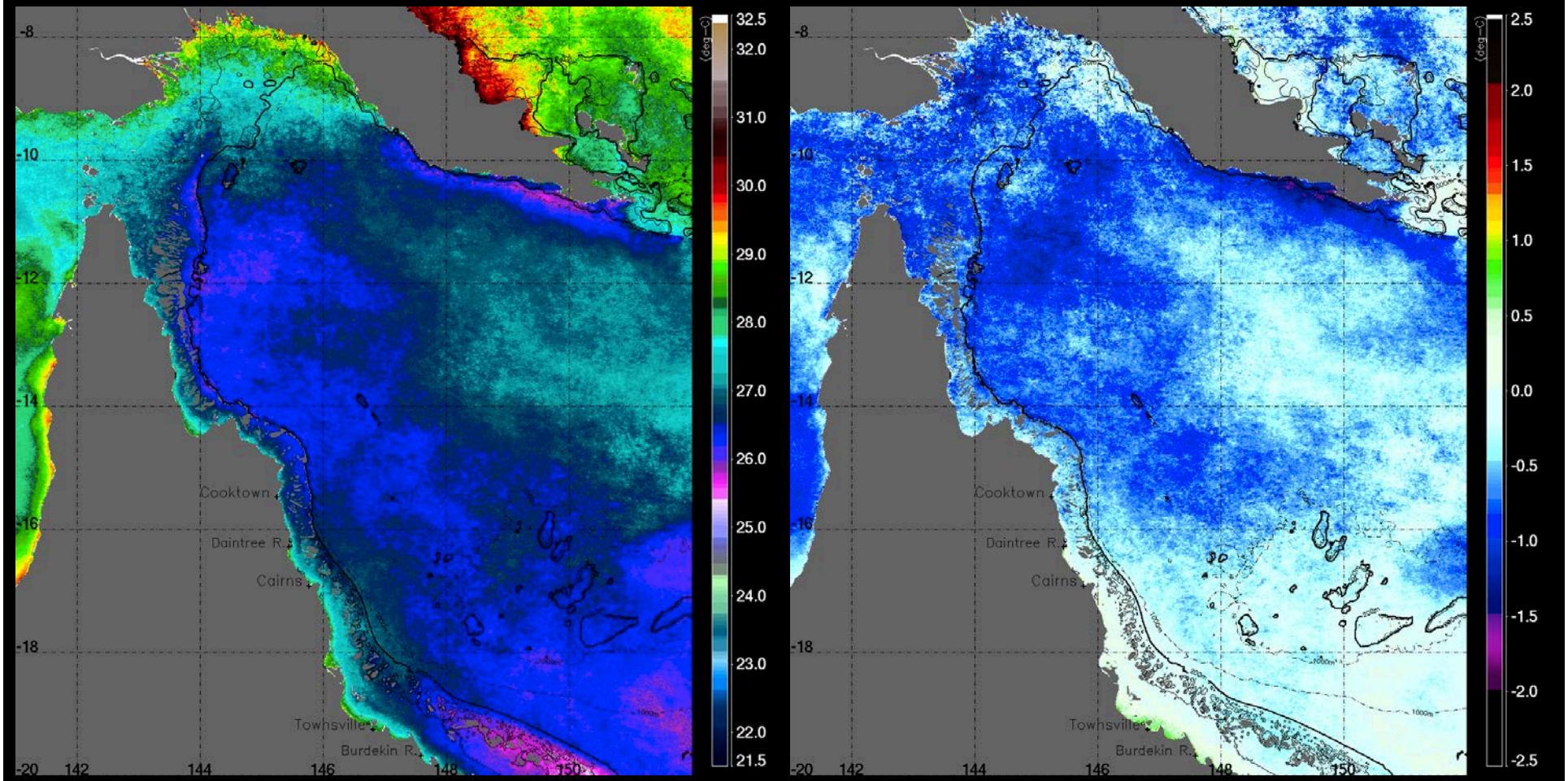
- POAMA forecast indicates increasing positive SST anomalies with increasing probabilities of SST anomalies exceeding 0.6°C for the upcoming months from January to May 2015

MODIS sea surface temperature (day+night) November 2014



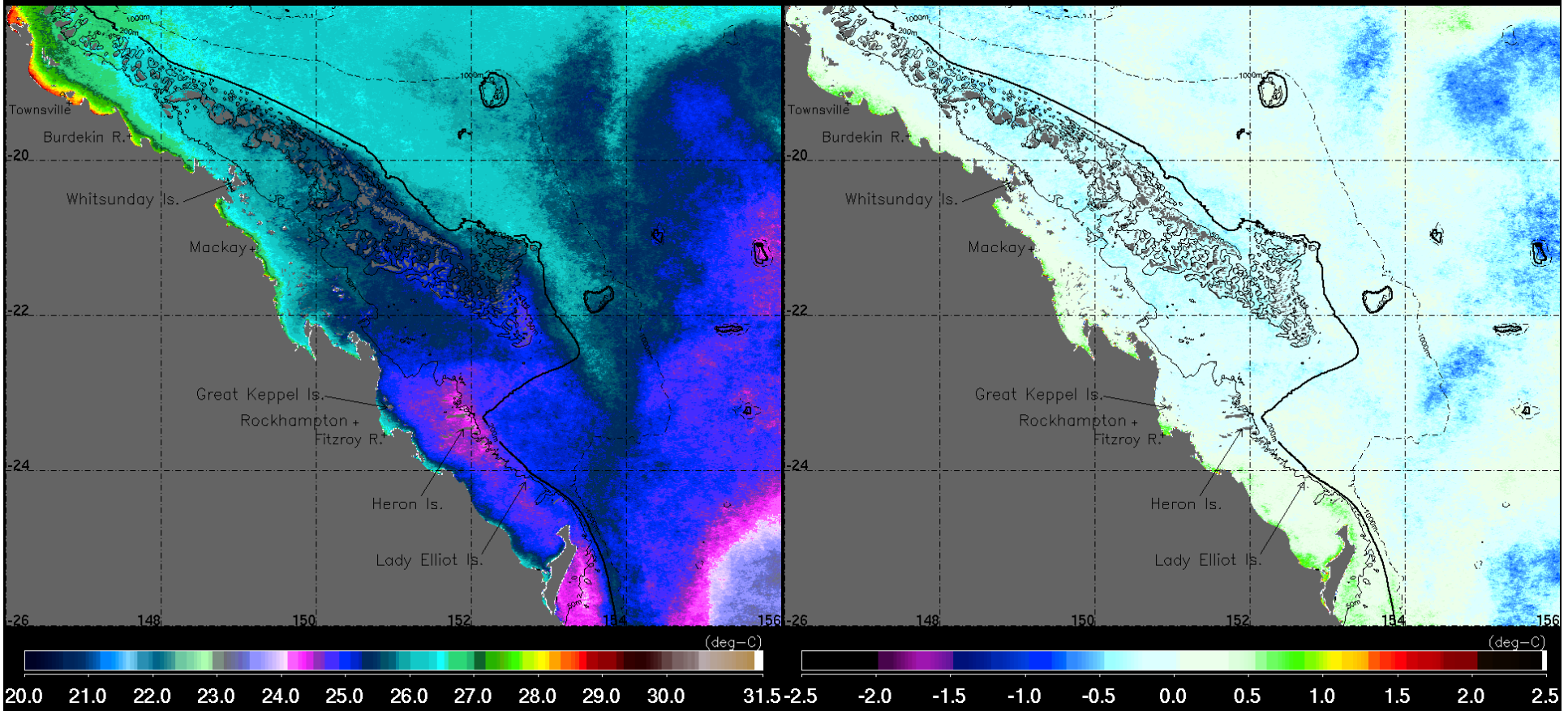
- Seasonal increase in temperatures on the GBR, especially inshore along the length of the GBR
- Neutral to weak negative SST anomalies except for the far northern GBR and Torres Strait regions showing strong negative SST anomalies, also apparent in areas of the Coral Sea
- Weak positive SST anomalies close inshore from Townsville to Fraser Island

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



- Seasonal warming in the Torres Strait and far northern GBR clearly apparent
- However, SST anomalies remained negative along the far northern GBR and Torres Strait regions during November

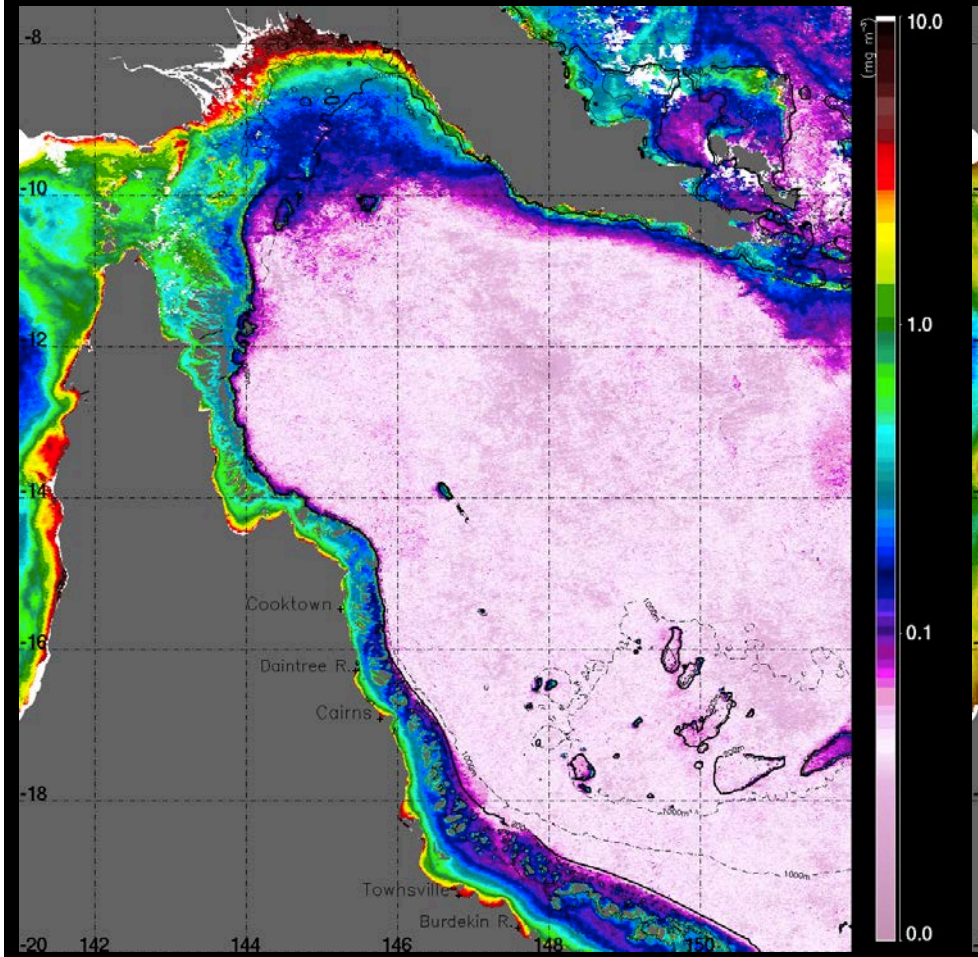
Southern GBR
MODIS sea surface temperature (day+night)
November 2014



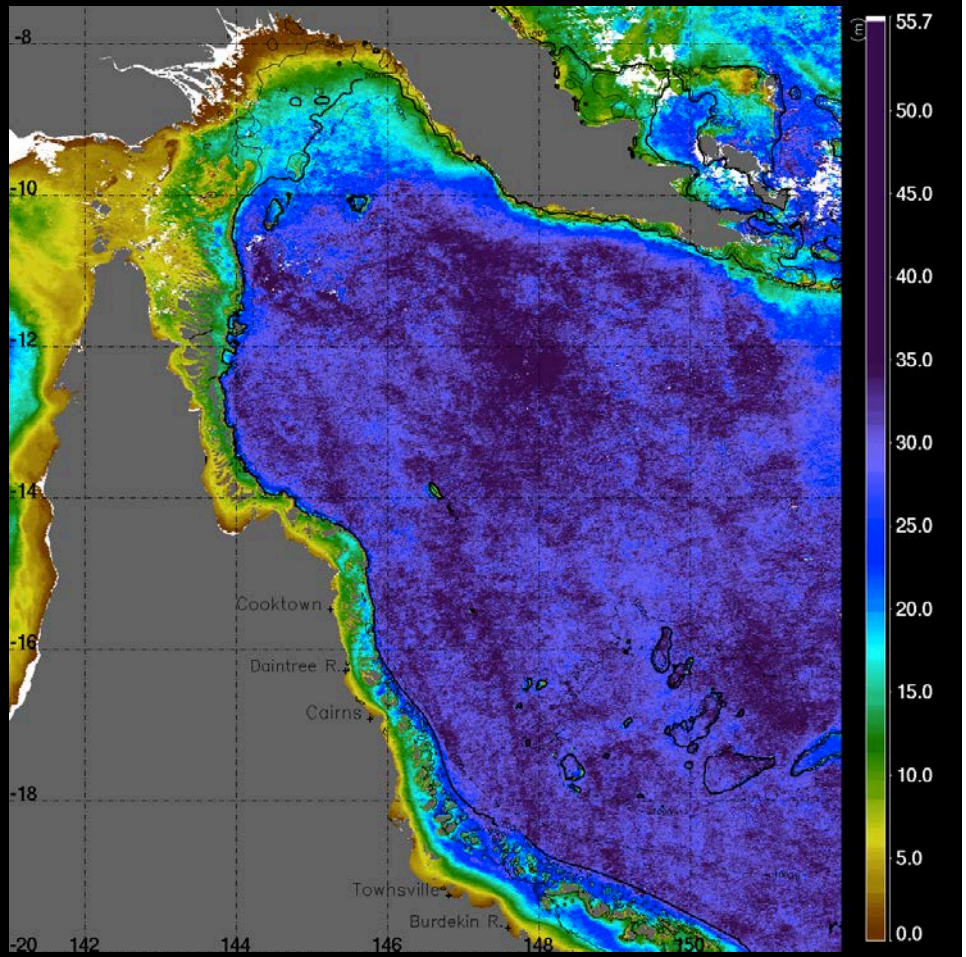
- Increased temperatures in central-southern GBR, especially on inshore reefs
- Neutral to weak negative SST anomalies on mid- to outer shelf with weak positive SST anomalies developed on inshore reefs of the central to southern GBR

Torres Strait / far northern GBR
November 2014

MODIS chlorophyll-*a* concentration



MODIS 10% photic depth

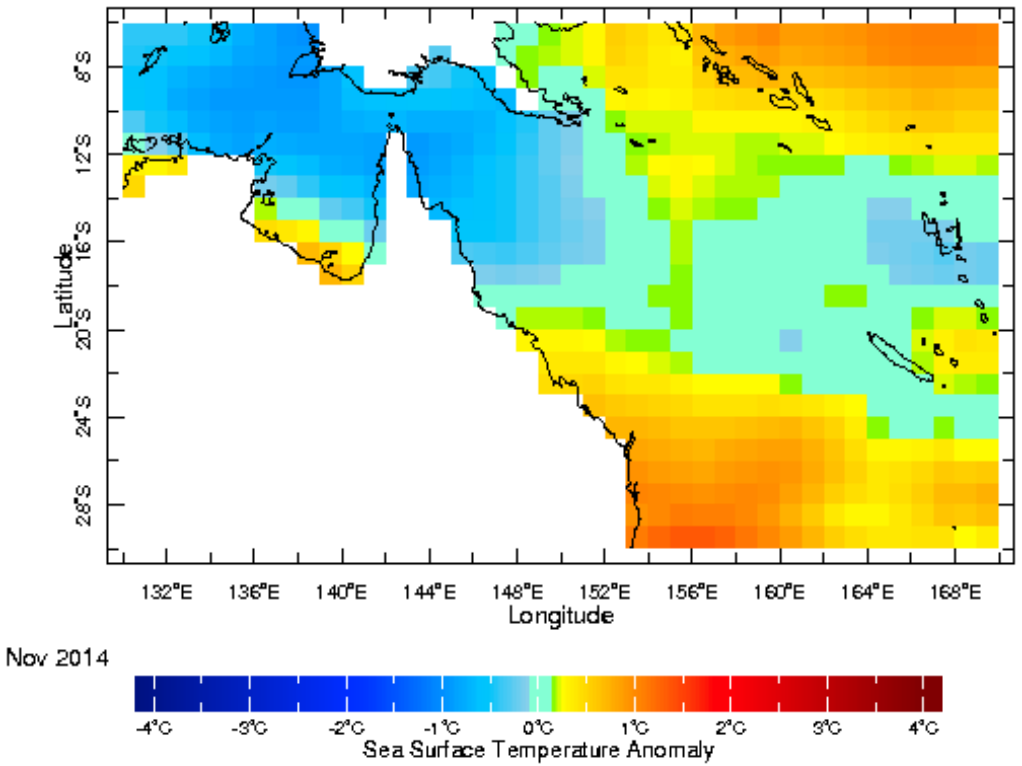


- Average chlorophyll concentrations and photic depths in the far northern GBR and Torres Strait regions during November, with more oligotrophic conditions (lower chlorophyll / increased photic depth) in the Coral Sea
- Stronger oceanic intrusions onto the shelf through the Myrmidon / Palm Passages and through the outer reefs, compared to October

Sea Surface Temperature Anomaly

from NOAA NCEP EMC CMB GLOBAL Reyn_SmithOIv2

November 2014

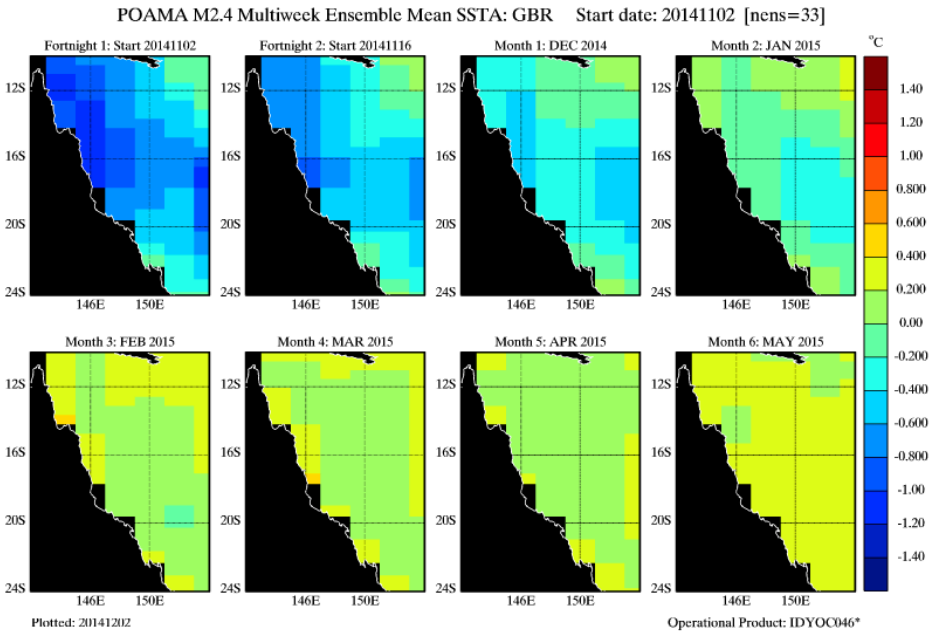


- The lower resolution Reynolds SST anomaly data indicate negative SST anomalies along the northern GBR and Torres Strait regions in agreement with MODIS data, with positive SST anomalies intensifying poleward from the central GBR

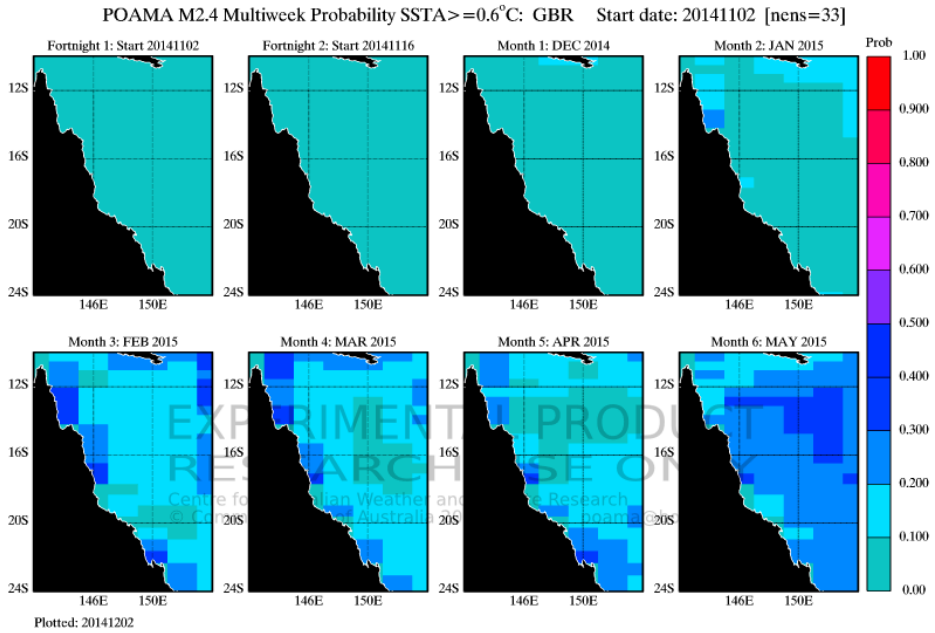
http://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCEP/.EMC/.CMB/.GLOBAL/.Reyn_SmithOIv2/

SST anomaly forecast (POAMA-2): Nov 2014 – Mar 2015

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)



News: SST anomaly forecast for GBR has been updated to show both multi-week and monthly forecasts

- POAMA forecasts indicate increasing positive SST anomalies with increasing probabilities (0 to 40%) of SST anomalies exceeding 0.6°C from January to May 2015

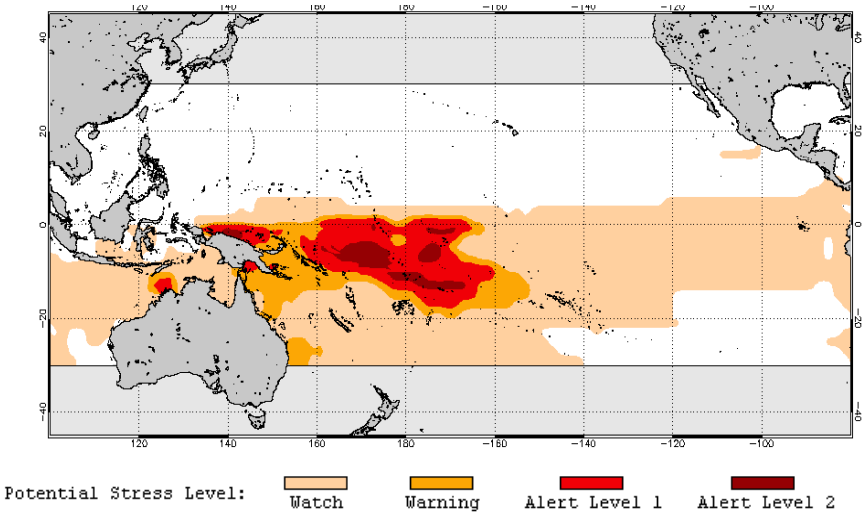
NOAA Coral Reef Watch

Seasonal coral bleaching thermal stress outlook

December 2014 to March 2015

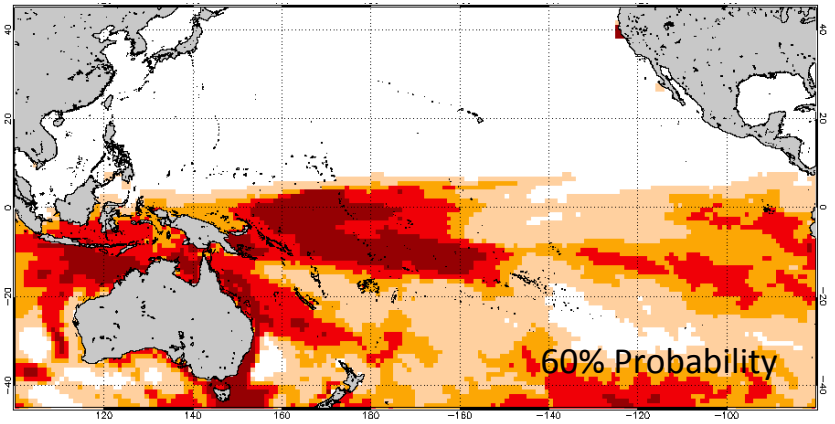
LIM-based

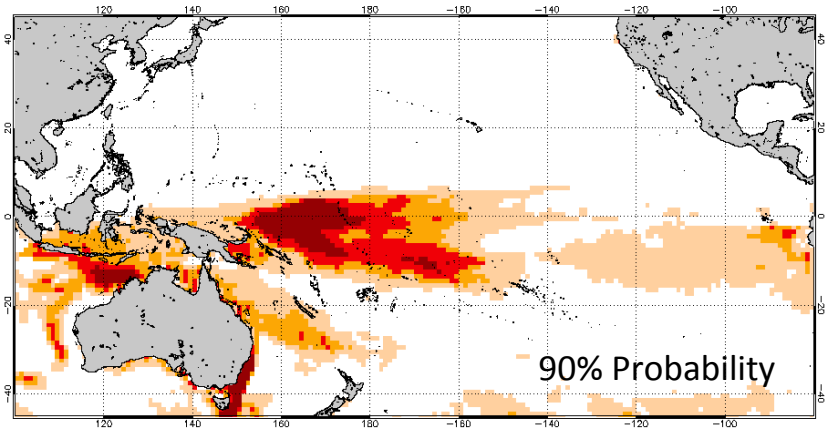
Version 2, experimental, weekly 2x2 degree spatial resolution



CFS-based

Version 2, experimental, weekly 1x1 degree spatial resolution





Note:

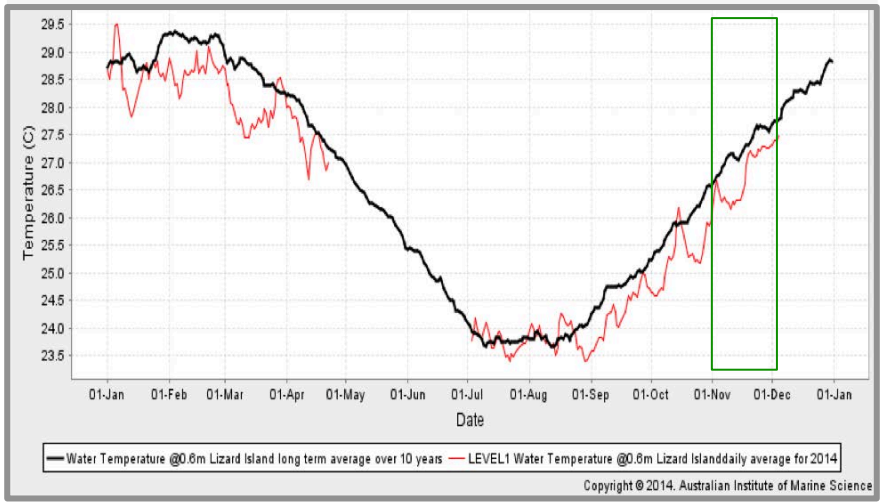
- LIM-based Coral Reef Watch outputs continue to suggest further increased stress levels from mostly "Warning" to "Alert Level1" in some areas along the length of the GBR and PNG, including the Torres Strait, as we head into summer.

- The CFS-based (60%) prediction shows an even higher thermal stress level with "Alert Level2" along the length of the GBR and "Alert Level1" thermal stress for Torres Strait. However, lower "Warning" stress levels are suggested for the GBR based on 90% CFS predictions.

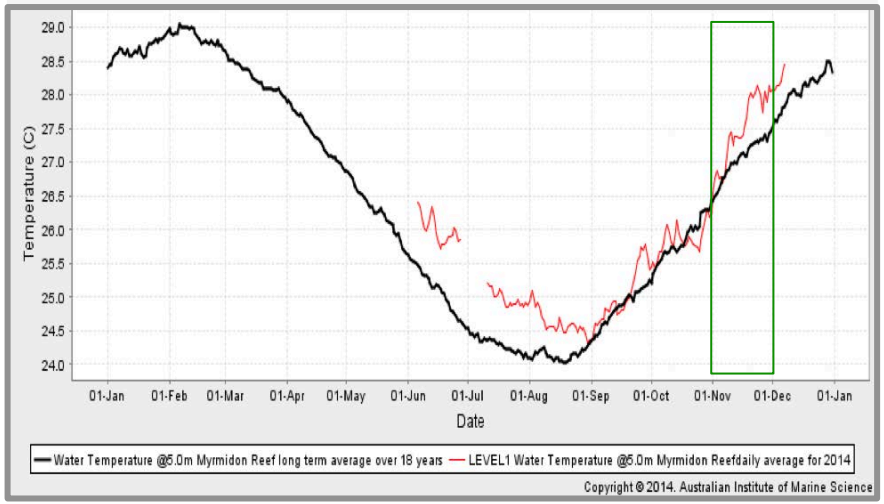
These outlooks are based on SST predictions from: CRW's experimental statistical Linear Inverse Model (LIM-based – left panel) and the NCEP Climate Forecast System (CFS-based – right panel) systems

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

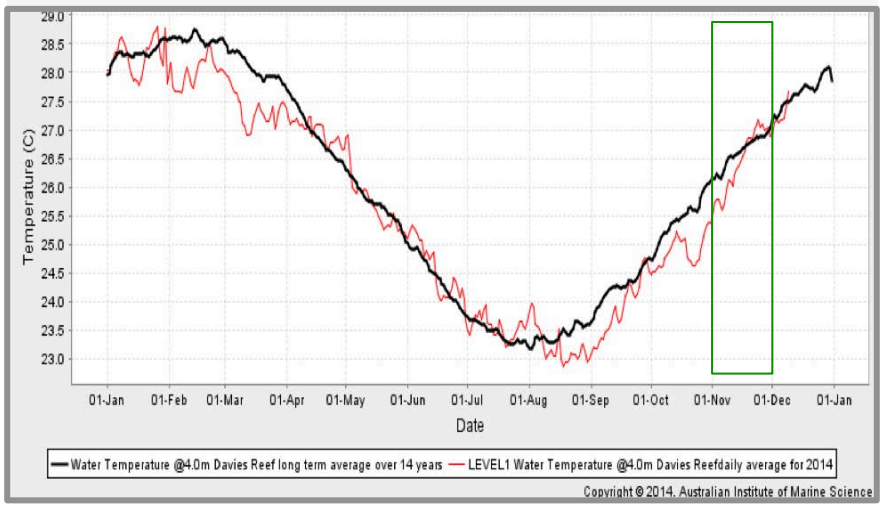
Water temperature @0.6m Lizard Island Sensor Float 3Trend against longterm average



Water temperature @5.0m Myrmidon Reef Platform trend against longterm average



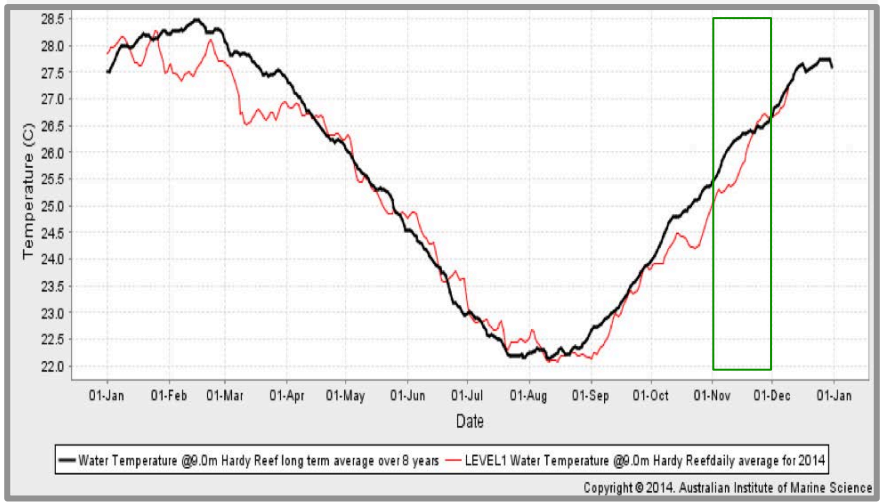
Water temperature @4.0m Davies Reef Platform trend against longterm average



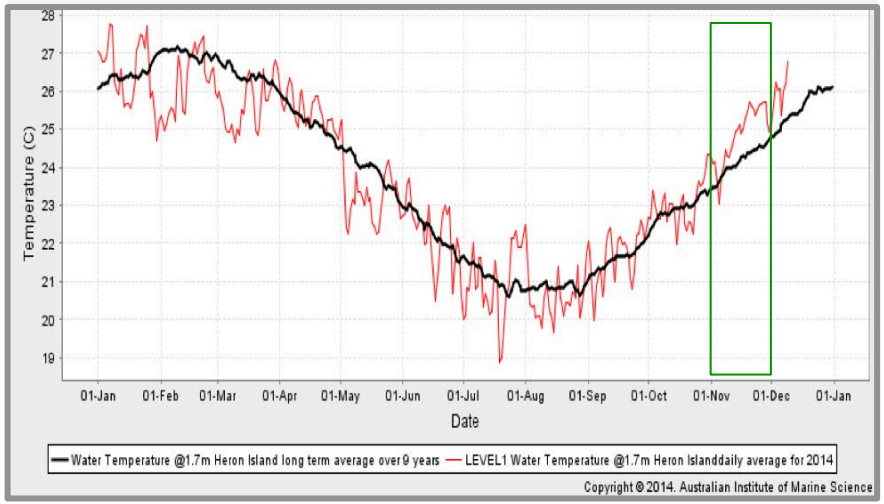
- Below average temperature conditions continued for Lizard Island and Davies Reef during November, while Myrmidon Reef weather station sensor showed temperatures well above the long term mean.
- The latter is likely related to enhanced warm oceanic water intrusions onto the shelf through the Myrmidon and Palm Passages as seen in MODIS SST data.

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

Water temperature @9.0m Hardy Reef Platform trend against longterm average



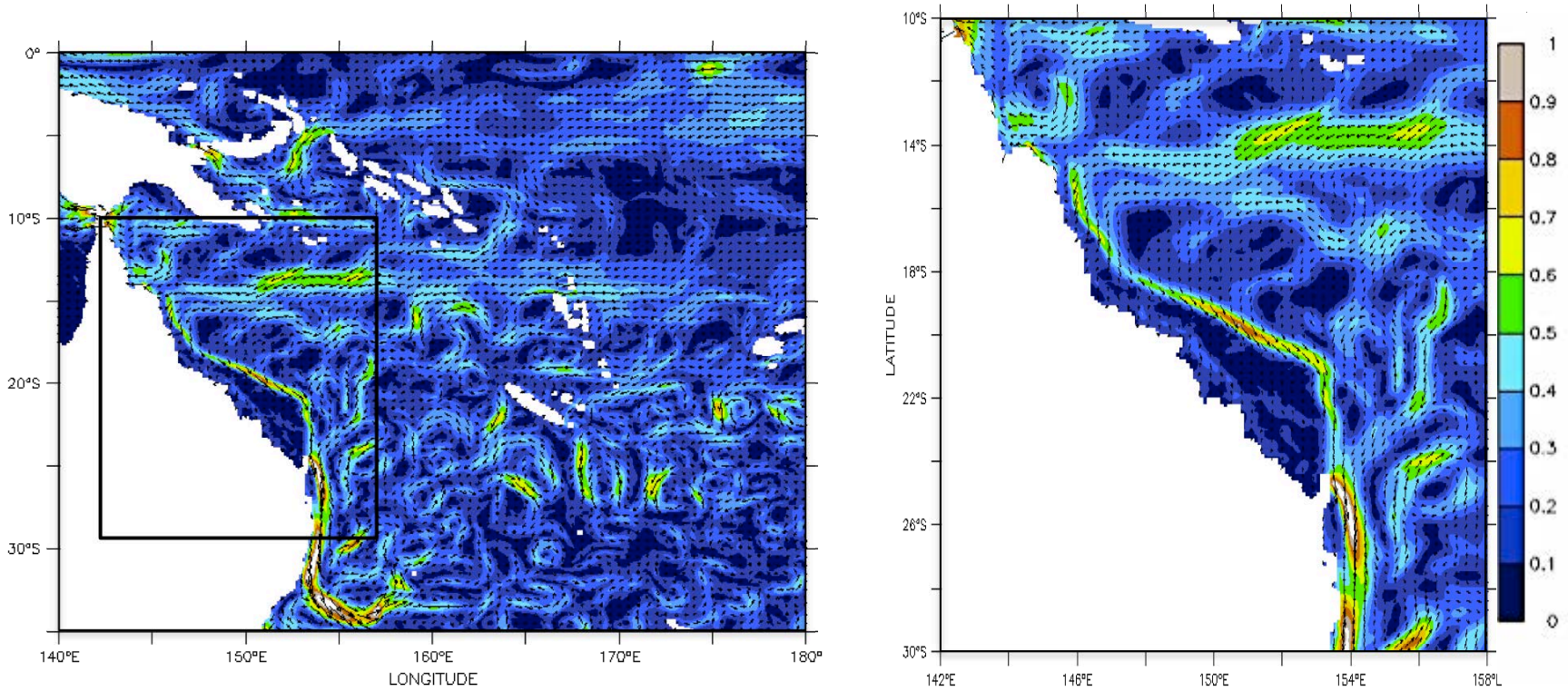
Water temperature @1.7m Heron Island Relay Pole 1 trend against longterm average



- Similar to October, Hardy Reef continued to show *in situ* sea water temperature below the longterm average during most of November.
- On other hand, Heron Island *in situ* data indicates temperatures well above the longterm mean.

OceanMAPS 15m Depth-Average Currents
November 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.

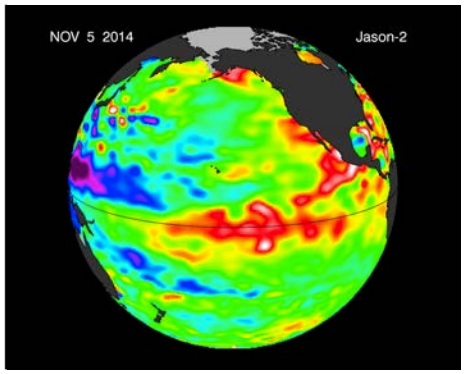


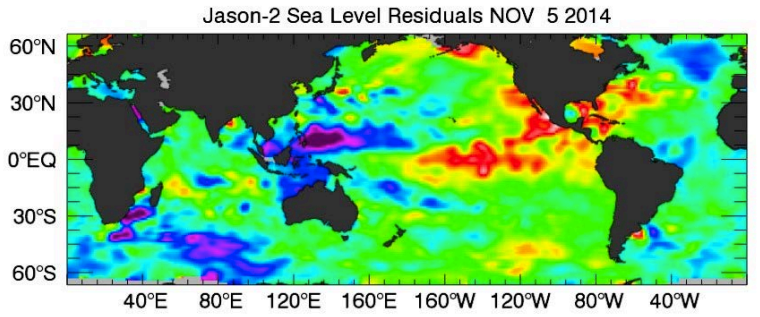
Behind Real Time analysis 15 m Depth-Averaged Currents (m/s)

- Weakened South Equatorial Current (SEC) inflow as it approached the northern GBR
- Intensified and persistent East Australia Current (EAC) flow visible as a clear southward-flowing band along the GBR shelf, further strengthening off Fraser Island as the core of the EAC hugged the shelf-edge

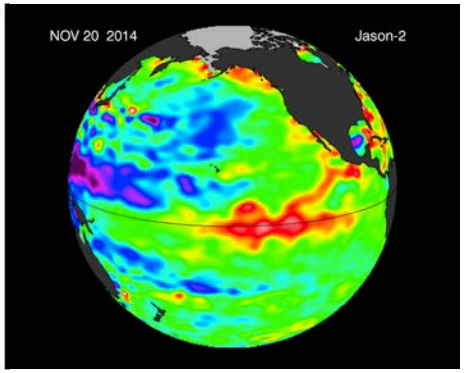
Sea surface height anomalies from Ocean Surface topography: Jason-2 (NASA/French)

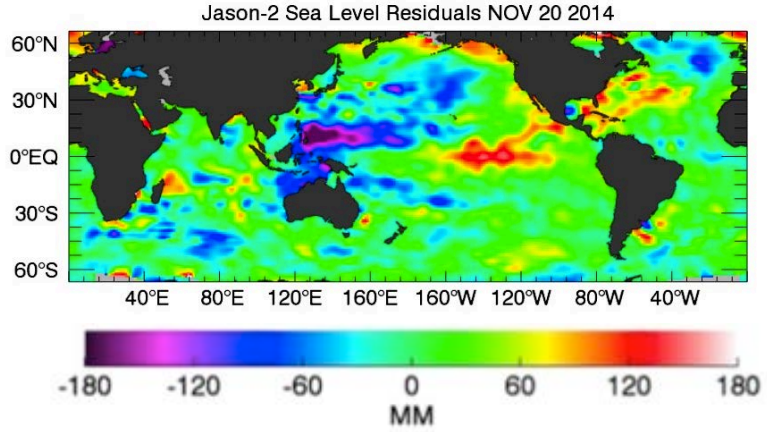
5th Nov 2014





20th Nov 2014

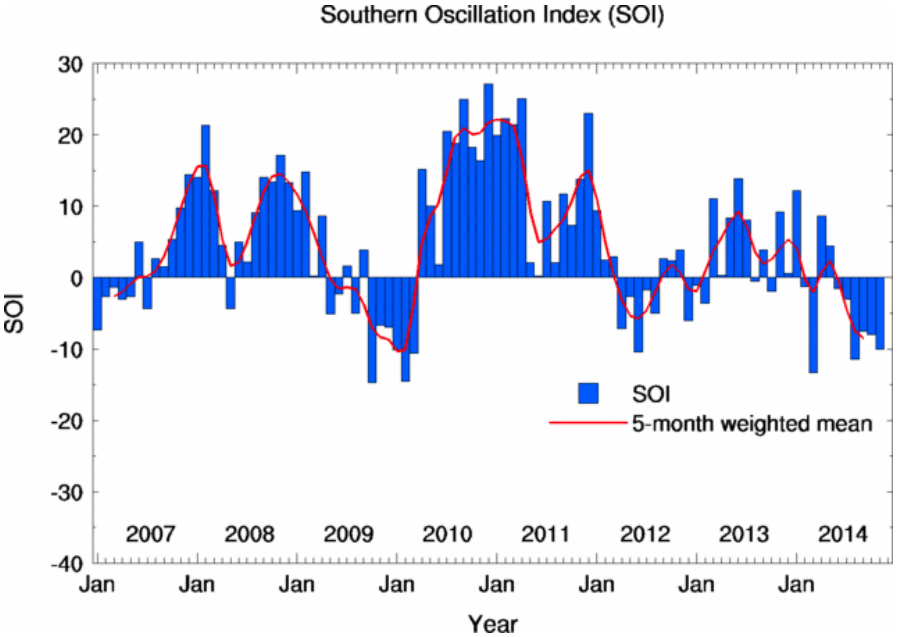




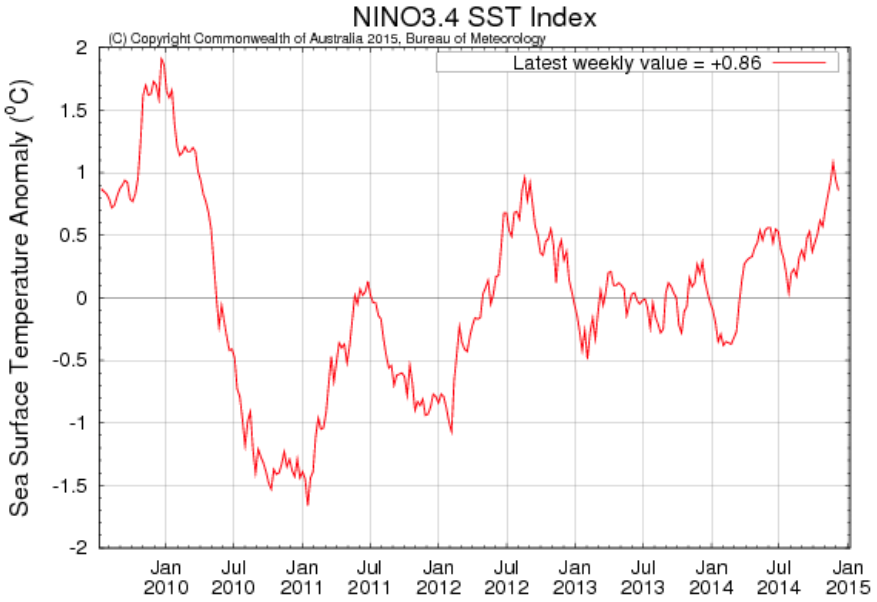
- Sea-level data shows a new eastward-propagating Kelvin Wave formed during late October to early November, with associated increase in subsurface temperatures in the central to eastern equatorial Pacific

http://sealevel.jpl.nasa.gov/science/elninopdo/latestdata/

ENSO Index



Negative SOI = El Niño



Positive Nino 3.4 index= El Niño

- The SOI continues to show sustained negative values while the Niño3.4 index shows overall warming reached +1.0 during November.
- Across the central and eastern equatorial Pacific, SST anomalies increased during November but the overall atmospheric circulation (including patterns of wind and rainfall anomalies) has yet to show a clear coupling to the anomalously warm ocean waters.
- Hence, the combined atmospheric and oceanic conditions remains indicative of **ENSO neutral conditions**.
- Models continue to predict **~65% chance that El Niño conditions** will occur during the austral summer and continue into austral autumn 2015.

SOI: http://www.bom.gov.au/climate/current/soi2.shtml ; ONI: http://134.178.63.141/climate/enso/indices.shtml