



ENSO Wrap-Up

Current state of the Pacific and Indian Ocean

El Niño remains strong, but some cooling now observed at depth

Issued on 22 December 2015 | Product Code IDCKGEWW00

El Niño remains near its peak, with the tropical Pacific Ocean and overlying atmosphere consistent with a strong event. Models suggest the event will start to decline in 2016, but a return to ENSO-neutral is not likely until at least autumn.

Sea surface temperatures and cloud patterns near the Date Line remain well in excess of El Niño thresholds. The Southern Oscillation Index (SOI) has returned to El Niño levels following a brief period of neutral values. Below-surface ocean temperatures in the eastern tropical Pacific remain significantly warmer than average, but clearly some cooling has occurred in the past fortnight. Changes in the sub-surface are an important indicator, as the sub-surface plays a significant role in maintaining the strength and longevity of El Niño events.

El Niño's influence on Australian rainfall is variable at this time of year, with both wetter and drier summers observed in past events depending on how quickly the event breaks down. Both daytime and overnight temperatures tend to be warmer than average during an El Niño summer. For more information, see the official rainfall and temperature [outlook](#).

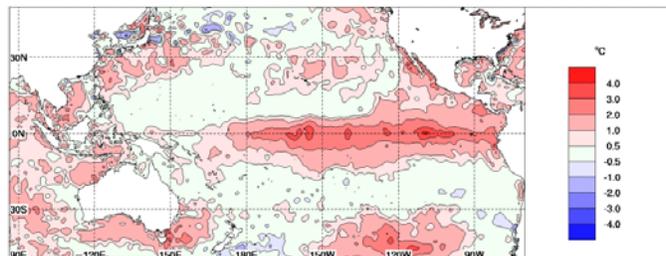
The Indian Ocean Dipole has little influence on Australian climate between December and April. However, Indian Ocean sea surface temperatures remain very much warmer than average across the majority of the basin. This basin-wide warmth may provide extra moisture for rain systems across Australia.

Next update expected on 5 January 2016 |

Weekly sea surface temperatures

Sea surface temperatures across the tropical Pacific remain generally similar to two weeks ago. Away from the equator, warm anomalies have increased in areas around southern Australia and across the Great Australian Bight, and have decreased in parts of the northeast of the basin adjacent to the North American coastline.

Anomalies for the week ending 20 December exceeded +2 °C across the equatorial Pacific east of the Date Line, with some areas exceeding +3 °C. Warm anomalies are present along most of the equator in the Pacific, across much of the northeast of the Pacific Basin, across the Tasman Sea, around the western edge of the Pacific Basin from north of Australia to around Japan. Similarly, warm anomalies extend across most of the Indian Ocean.



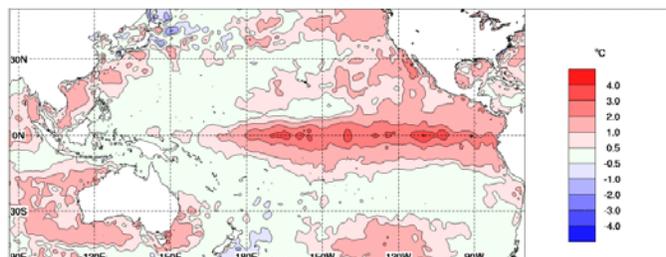
Index	Previous	Current	Temperature change (2 weeks)
NINO3	+2.4	+2.4	no change
NINO3.4	+2.4	+2.3	0.1 °C cooler
NINO4	+1.6	+1.6	no change

Baseline period 1961–1990.

Monthly sea surface temperatures

The SST anomaly map for November 2015 shows warm SST anomalies extended across nearly the entire equatorial Pacific. Warm anomalies were also present across much of the eastern half of the Pacific Basin in the northern hemisphere.

Compared to October, warm anomalies increased along most of the equator, but decreased markedly over the northeast of the Basin. Cool anomalies have dissipated across the Indonesian archipelago and waters to Australia's north. Moderate to strong warm anomalies persisted across much of the Indian Ocean, and surround most of Australia with the exception of the Coral Sea.



Index	October	November	Temperature change
NINO3	+2.3	+2.4	0.1 °C warmer
NINO3.4	+2.2	+2.4	0.2 °C warmer
NINO4	+1.3	+1.7	0.4 °C warmer

Baseline period 1961–1990.

In November, NINO3, NINO3.4 and NINO4 have reached their highest monthly anomalies for the event so far during November. Values in the Bureau dataset reached +2.4 °C, +2.4 °C, and +1.7 °C respectively, still short of the peak monthly anomaly value reached during either 1982 or 1997 (+2.8 °C and +2.7 °C respectively). However these historical values are from a non-Bureau dataset, and may not be directly comparable.

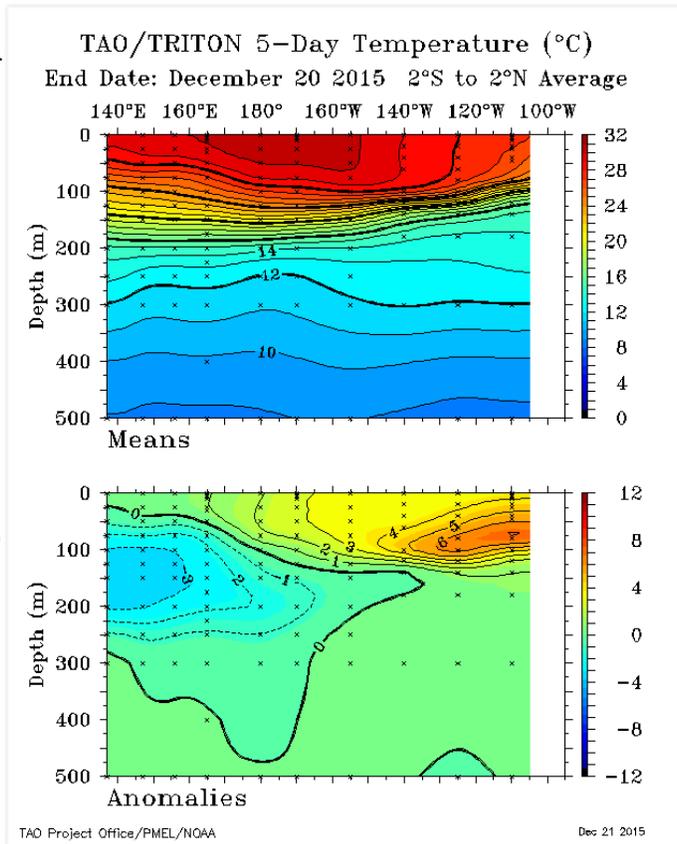
5-day sub-surface temperatures

The sub-surface temperature map for the 5 days ending 20 December shows temperatures were warmer than average in the top 125 m of the eastern half of the equatorial Pacific and cooler than average below the surface of the ocean in the western half. Water in the eastern Pacific sub-surface remains much warmer than average, but has cooled slightly compared to two weeks ago. An area around 75 m depth remains more than 6 °C warmer than average.

Cool anomalies in the western equatorial Pacific have continued to strengthen compared to two weeks ago. An area in the far western equatorial Pacific sub-surface between 100 and 200 m depth are more than 3 °C cooler than average, and has extended out to around 160°E.

The pattern of warm anomalies in the eastern sub-surface and cool anomalies in the west is consistent with a well-established strong El Niño. However the eastward extension of the cooler than average anomalies can be a precursor to the breakdown of the warm anomalies in the east.

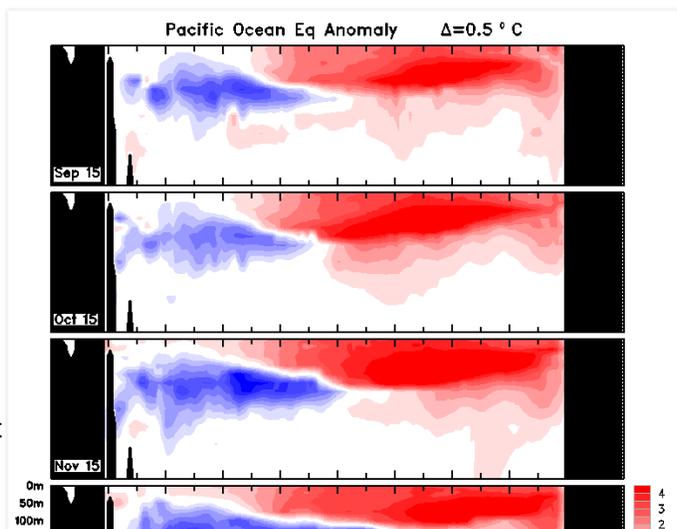
In the mean 5-day values (upper panel), the thermocline has lifted slightly in the east in recent weeks (see animation link). This tilting of the thermocline in the east is associated with the contraction of warm anomalies in the eastern sub-surface to above 125 m depth, and may indicate the El Niño is starting to decline. An almost flat thermocline tends to only occur during strong El Niño events.



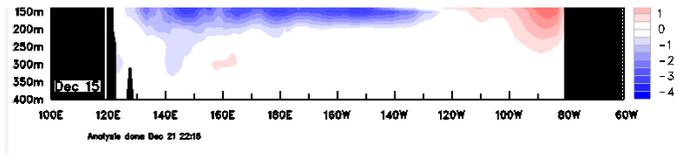
Monthly sub-surface temperatures

The four-month sequence of sub-surface temperature anomalies (to December) shows a decrease in warm sub-surface anomalies and an eastward expansion of cool sub-surface anomalies compared to November.

During December, warm anomalies have been present in the top 150 m of the equatorial Pacific sub-surface, extending between about 160°E and the South American coastline. Monthly anomalies reached more than +4 °C across large areas of the eastern equatorial Pacific east of 135°W. Cool anomalies for December to date covered much of the western and central Pacific at around 150 m depth, underlying warm anomalies in the



central region.

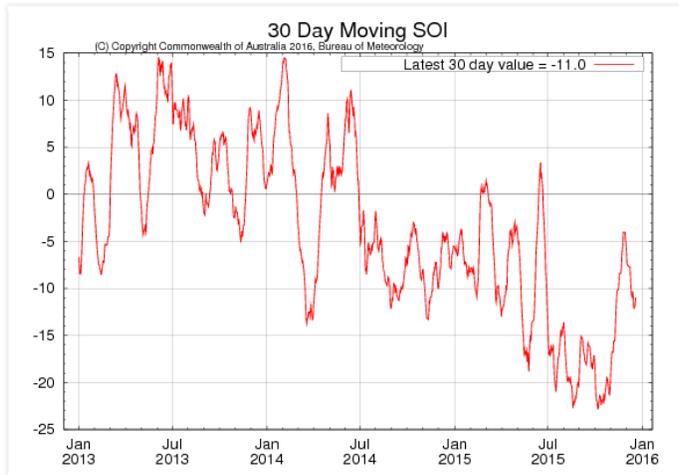


Southern Oscillation Index

The Southern Oscillation Index (SOI) has dropped over the past two weeks. The 30-day SOI value to 20 December was -11.0.

Fluctuations of the SOI during Australia's northern wet season (October–April) are not unusual as the passage of tropical systems affects atmospheric pressure. During this period, the SOI should be used cautiously; 90-day values may provide a more reliable guidance. The current 90-day SOI is -13.0.

Sustained positive values of the SOI above +7 typically indicate La Niña, while sustained negative values below -7 typically indicate El Niño. Values of between about +7 and -7 generally indicate neutral conditions.

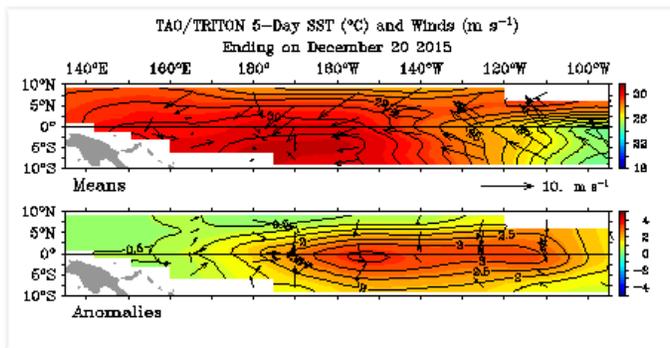


Trade winds

Trade winds for the 5 days ending 20 December show westerly wind anomalies across the western equatorial Pacific. The spatial extent and strength of westerly anomalies has decreased compared to two weeks ago.

Trade winds have been consistently weaker than average, and on occasion reversed in direction (i.e. westerly rather than easterly), since the start of 2015.

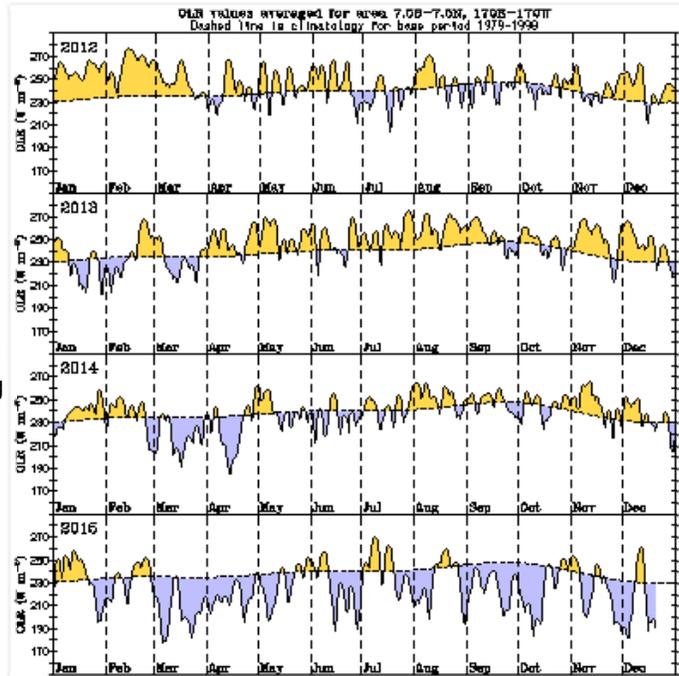
During La Niña events, there is a sustained strengthening of the trade winds across much of the tropical Pacific, while during El Niño events there is a sustained weakening of the trade winds.



Cloudiness near the Date Line

Cloudiness near the Date Line has been above the long-term average during most of December, with a brief fluctuation into below average values. Cloudiness near the Date Line has generally been above average since March.

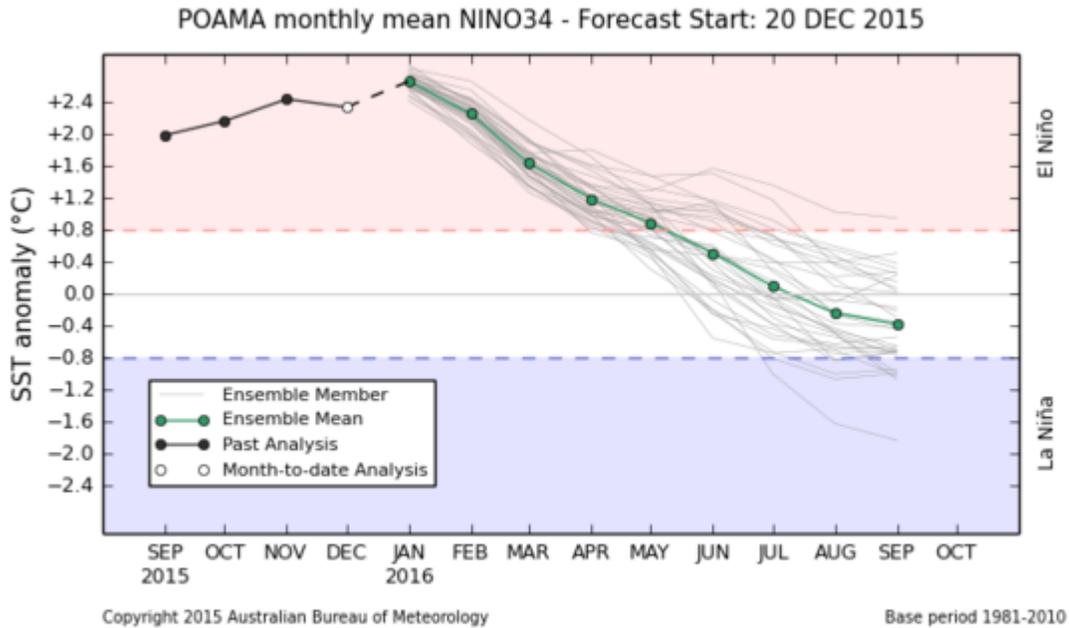
Cloudiness along the equator, near the Date Line, is an important indicator of the El Niño–Southern Oscillation (ENSO), as it typically increases (negative OLR anomalies) near and to the east of the Date Line during El Niño and decreases (positive OLR anomalies) during La Niña.



Model outlooks

About half of the eight international [climate models](#) surveyed by the Bureau indicate that the current El Niño may maintain central Pacific Ocean SSTs at similar levels to present into the new year. Conversely, two models indicate that peak values are likely to have already occurred.

All models agree that a steady decline in central Pacific SST values is likely to occur from early 2016. Six of the eight models indicate a return to neutral values by the middle of the austral autumn, with the remaining two returning to neutral values during the first half of winter.

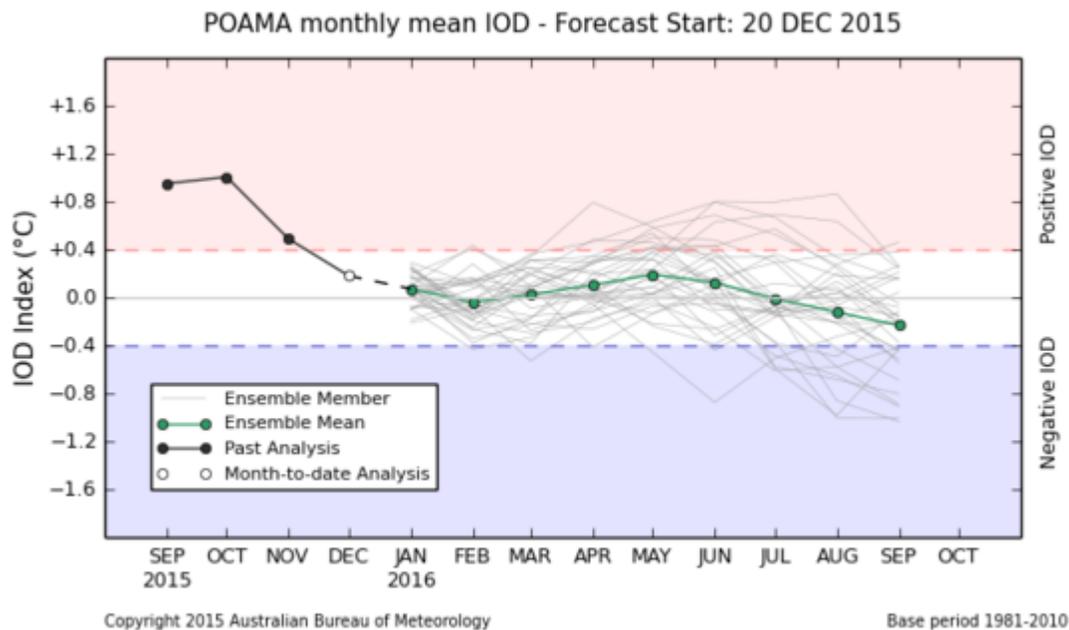


Indian Ocean Dipole

The Indian Ocean Dipole (IOD) is neutral. The index value to 20 December was $+0.15$ °C.

Sea surface temperatures (SSTs) remain significantly warmer than average across most of the Indian Ocean basin.

The influence of the IOD on Australian climate is weak during the months December to May as the monsoon trough shifts south over the tropical Indian Ocean. However, widespread record-warm sea surface temperatures in the Indian Ocean are likely to influence Australian climate during the summer months. These warm waters act as a source of moisture, and may provide extra moisture for rainfall systems developing over Australia.



See also: [IOD forecasts](#)

This page was created at **14:53 on Tuesday 22 December 2015 (AEDT)**

© [Copyright](#) Commonwealth of Australia 2015, Bureau of Meteorology (ABN 92 637 533 532) | [Disclaimer](#) | [Privacy](#) | [Accessibility](#)