



ENSO Wrap-Up

Current state of the Pacific and Indian Ocean

2015 El Niño near its peak

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The strong 2015 El Niño event is near its peak. While sea surface temperatures remain close to record-high values, some El Niño indicators are now showing signs of easing. However, the current El Niño is likely to persist well into 2016.

El Niño indicators, notably sea surface and sub-surface temperatures, westerly wind anomalies in the central Pacific, and cloudiness near the Date Line, remain well above El Niño thresholds. The Southern Oscillation Index (SOI) has eased back into neutral values, though this may be short-lived: the SOI tends to be more variable during the northern Australian wet season (October–April). Model outlooks and the strength of the current event suggest El Niño thresholds may continue to be exceeded well into the southern hemisphere autumn.

The 2015–16 El Niño is strong, and likely to rank in the top three events of the past 50 years. Presently, several key indicators fall short of their 1997–98 and 1982–83 values, both in the ocean (e.g. sub-surface temperatures, which have peaked around +8 °C this year, compared to +12 °C in 1997–98), and atmosphere (e.g. SOI, for which monthly values peaked around –20, while 1982–83 had several months at –30).

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. However, on average an El Niño summer brings below-average rainfall across northern Queensland, and a slight drying influence across the southeast of Australia. Conversely, inland Western Australia often sees above-average rainfall at this time of year during El Niño.

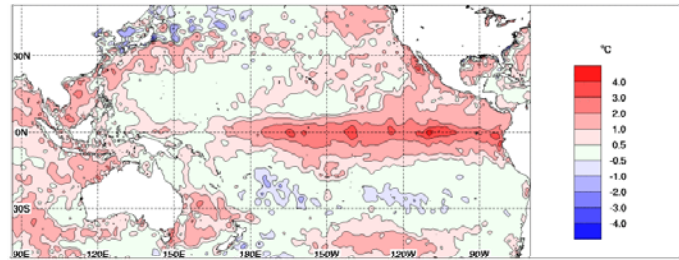
The Indian Ocean Dipole has little influence on Australian climate between December and April. However, Indian Ocean sea surface temperatures remain very much warmer than average across the majority of the basin. This basin-wide warmth may provide extra moisture for rain systems across Australia.

Next update expected on 22 December 2015 |

Weekly sea surface temperatures

Compared to two weeks ago, each of the central and eastern Pacific NINO indices have cooled, reflecting a decrease in warm sea surface temperature (SST) anomalies across most of the equatorial Pacific. However, warm anomalies have increased to the west of 160°E and across the Maritime Continent.

Anomalies for the week ending 6 December exceeded +2 °C across the entire equatorial Pacific east of 170°W (just east of the Date Line), with some areas exceeding +3 °C. Warm anomalies are present along most of the equatorial Pacific, across the northeast of the Pacific Basin, across the Tasman Sea, around the western edge of the Pacific Basin from north of Australia to south of Japan. Similarly, warm anomalies extend across most of the Indian Ocean.



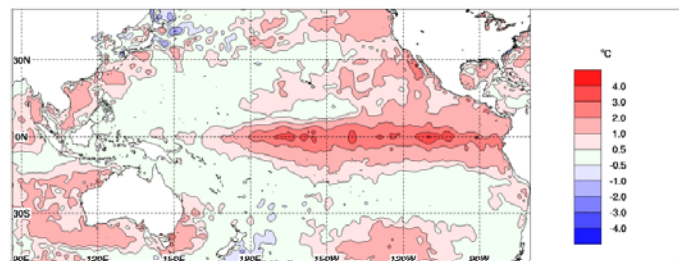
Index	Previous	Current	Temperature change (2 weeks)
NINO3	+2.5	+2.4	0.1 °C cooler
NINO3.4	+2.5	+2.4	0.1 °C cooler
NINO4	+1.7	+1.6	0.1 °C cooler

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.

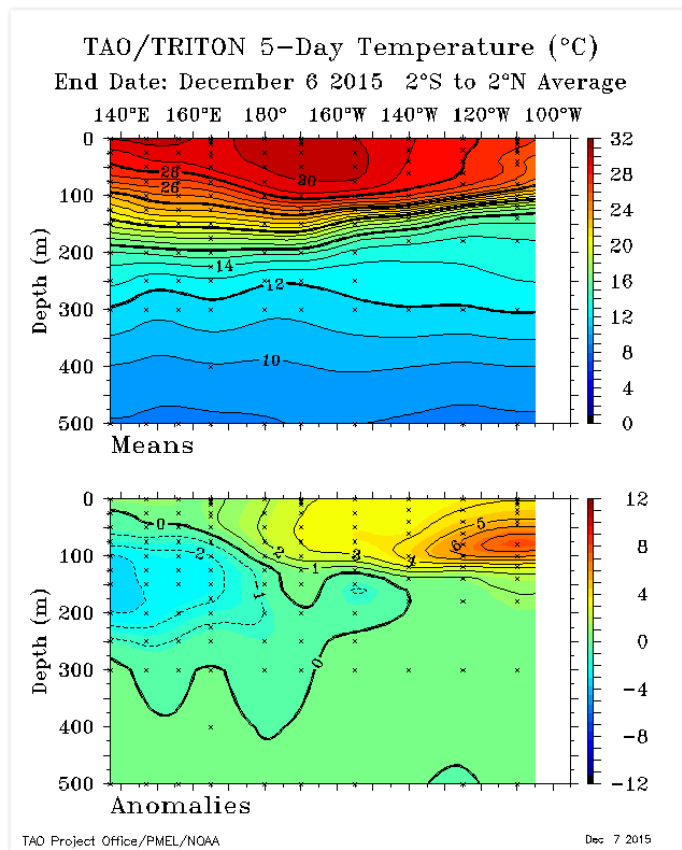
5-day sub-surface temperatures

The sub-surface temperature map for the 5 days ending 6 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 compared to two weeks ago. An area around 75 m depth is more than 7 °C warmer than average. At the comparable time in 1997, values in a similar region were in excess of +11 °C.

Cool anomalies in the western equatorial Pacific have strengthened 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.

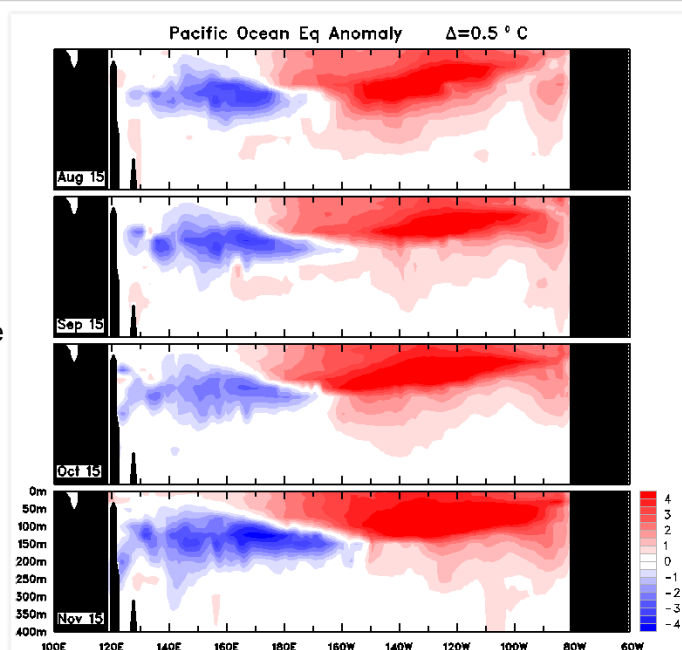
The pattern of warm anomalies in the eastern sub-surface and cool anomalies in the west is consistent with a well-established strong El Niño.

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 November) shows a generally consistent pattern of anomalies throughout the past four months. In November, warm anomalies have been present in the top 200 m of the equatorial Pacific sub-surface, extending between about 160°E and the South American coastline. Monthly anomalies across large areas of the eastern half of the equatorial Pacific reached more than +4 °C. Cool anomalies persist in the sub-surface of the western equatorial Pacific, and have strengthened compared to last month.

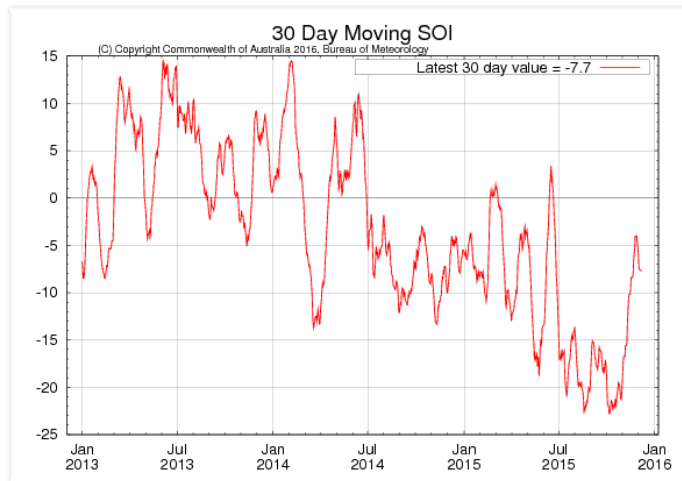


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Southern Oscillation Index

During the past two weeks the Southern Oscillation Index (SOI) rose further into neutral territory before again dipping past the threshold value. The 30-day SOI value to 6 December was -7.7 . 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 -15.4 .

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.

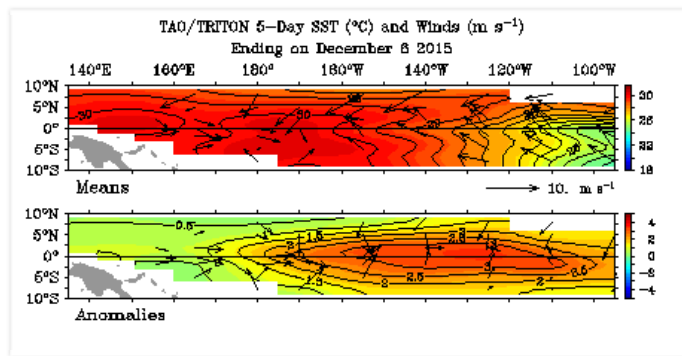


Trade winds

Trade winds for the 5 days ending 6 December show westerly wind anomalies across the western half of the equatorial Pacific, and an area of westerly winds (i.e. a reversal) to the west of the Date Line. The spatial extent and strength of westerly anomalies has increased 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.

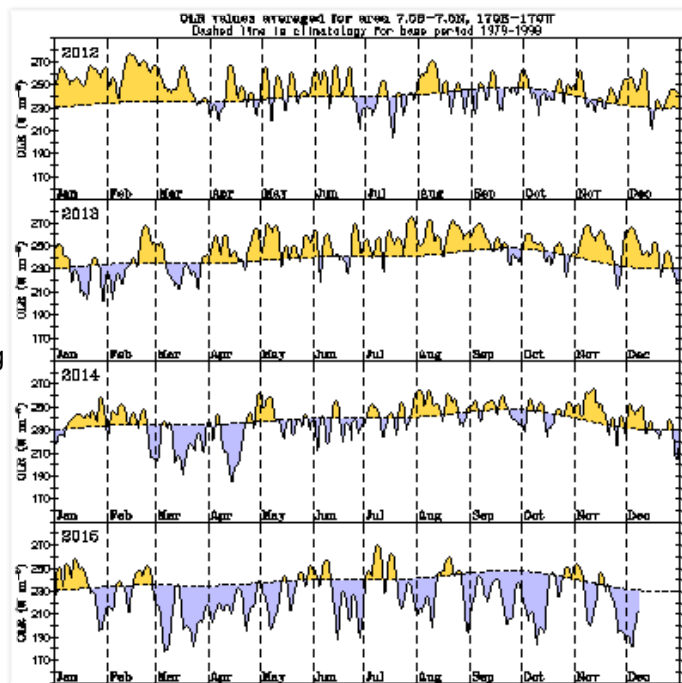
During La Niña events, there is a sustained strengthening of the trade winds across much of the tropical Pacific, while during El Niño events there is a sustained weakening of the trade winds.



Cloudiness near the Date Line

Cloudiness near the Date Line has been above the long-term average during the past two weeks. Cloudiness near the Date Line has generally been above average since March.

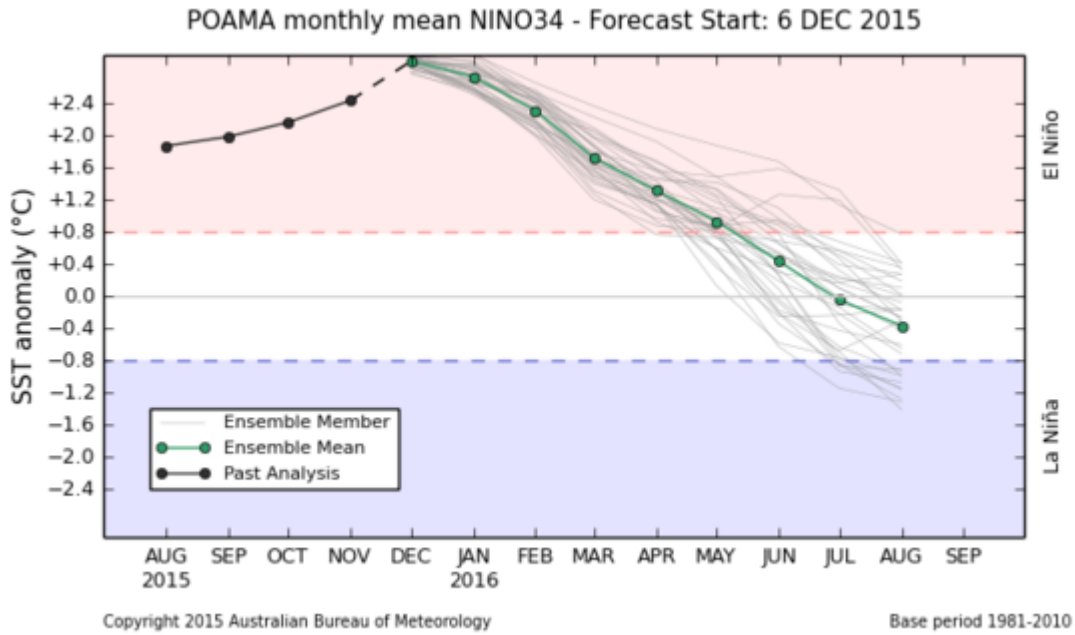
Cloudiness along the equator, near the Date Line, is an important indicator of the El Niño–Southern Oscillation (ENSO), as it typically increases (negative OLR anomalies) near and to the east of the Date Line during El Niño and decreases (positive OLR anomalies) during La Niña.



Model outlooks

All of the eight international [climate models](#) surveyed by the Bureau indicate that the peak values of this event in the central Pacific Ocean are likely to be reached by the end of 2015, with a steady decline in central Pacific SST values from December onwards.

All surveyed models indicate that NINO3.4 will remain above El Niño thresholds through the first quarter of 2016, with 5 of the 8 models indicating a return to neutral values by the middle of the austral autumn.

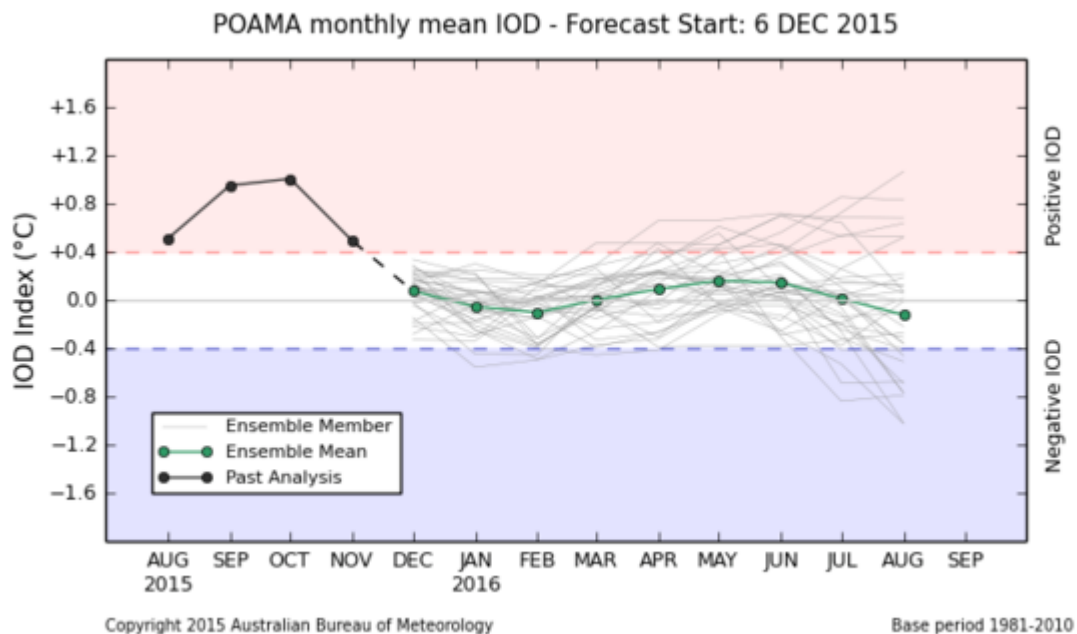


Indian Ocean Dipole

The positive Indian Ocean Dipole (IOD) event has ended, with the positive IOD pattern replaced by broad positive anomalies across the tropical Indian Ocean region. The weekly index value to 6 December was $+0.18\text{ }^{\circ}\text{C}$.

Sea surface temperatures (SSTs) in the Indian Ocean were warmest on record for November (and third largest anomaly on record for any month), with warmer than average water over most of the 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](#)

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