



## ENSO Wrap-Up

### Current state of the Pacific and Indian Ocean

## Indian Ocean Dipole over and out for 2015

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The positive Indian Ocean Dipole (IOD)—which reinforced El Niño impacts since late August—has broken down over the past fortnight. This rapid decay is common at the start of the monsoon season. The IOD has little influence on Australian climate between December and April.

More broadly, Indian Ocean temperatures have remained warmer than average through 2015; the October sea surface temperature (SST) anomaly for the Indian Ocean was the highest positive anomaly for any month on record. The warm Indian Ocean appears to have offset some of the drying influence from El Niño during the winter months.

A strong El Niño persists in the tropical Pacific Ocean. The event is comparable to the record events of 1997–98 and 1982–83. International climate models suggest that El Niño SSTs are approaching their peak, and will decrease in the first quarter of 2016. With such warm SSTs, models suggest the tropical Pacific is unlikely to return to neutral until at least autumn 2016, although impacts on Australian climate are likely to decline prior to this.

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.

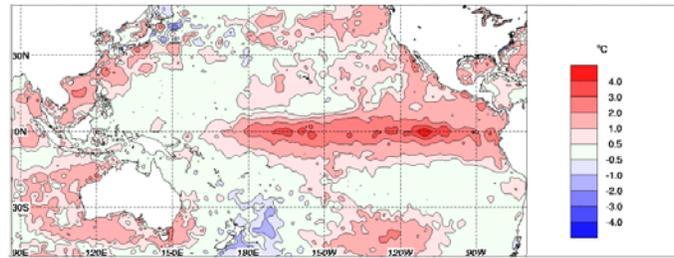
Next update expected on 8 December 2015 |

## Weekly sea surface temperatures

Compared to two weeks ago, warm sea surface temperature (SST) anomalies have increased in parts of the eastern equatorial Pacific and decreased across the northeast of the basin and over the western equatorial Pacific (west of the Date Line). Cool anomalies have dissipated across the Indonesian archipelago and waters to Australia's north.

Anomalies for the week ending 22 November exceeded +2 °C across nearly the entire 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, extending from the South American coastline to about 160°E.

Warm anomalies also remain across much of the Pacific Ocean in the northern hemisphere east of the Date Line. Warm anomalies persist in areas wrapping from Australia's southeast, around the Bight, to Australia's northwest, and are also present across most of the Indian Ocean.



Index	Previous	Current	Temperature change (2 weeks)
NINO3	+2.3	+2.5	0.2 °C warmer
NINO3.4	+2.4	+2.5	0.1 °C warmer
NINO4	+1.7	+1.7	no change

Baseline period 1961–1990.

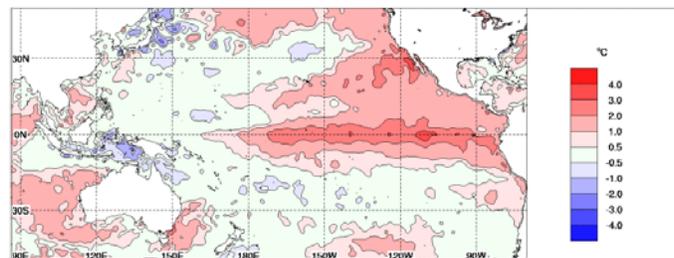
## Monthly sea surface temperatures

The SST anomaly map for October 2015 shows warm SST anomalies extended across the equatorial Pacific from the South American coastline to about 165°E and also across much of the east and far north of the basin in the northern hemisphere.

Compared to September, warm anomalies have increased along the equator and to Australia's southeast and west, but have decreased north of the equator in the central Pacific. Cool anomalies have increased across the Indonesian archipelago and waters to Australia's north. Moderate to strong warm anomalies persist across much of the Indian Ocean.

All of NINO3, NINO3.4 and NINO4 continued to warm, reaching anomalies of +2.3 °C, +2.4 °C, and +1.7 °C respectively for October 2015. The NINO4 region has been unusually warm, with each month since February the warmest since records began in 1981.

NINO3.4 still remains behind the peak monthly anomaly value reached during either 1982 or 1997 (+2.8 °C and +2.7 °C respectively). *Note:* peak values are typically recorded late in the year.



Index	September	October	Temperature change
NINO3	+2.2	+2.3	0.1 °C warmer
NINO3.4	+2.0	+2.2	0.2 °C warmer
NINO4	+1.1	+1.3	0.2 °C warmer

Baseline period 1961–1990.

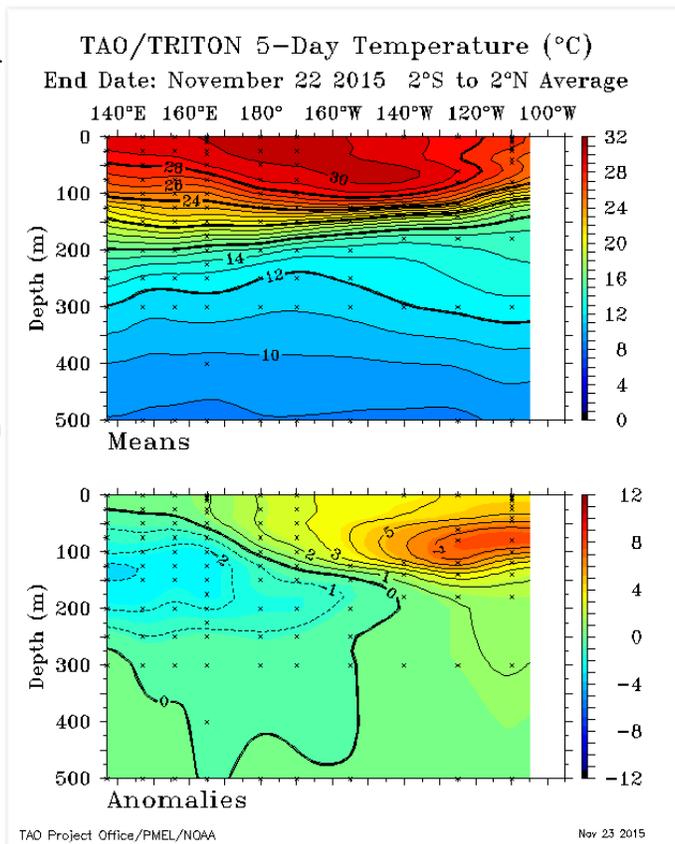
## 5-day sub-surface temperatures

The sub-surface temperature map for the 5 days ending 22 November shows temperatures were warmer than average in the top 150 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. Compared to two weeks ago, warm anomalies around 150 m depth have strengthened. An area around 75 m depth is more than 7 °C warmer than average.

Cool anomalies in the western equatorial Pacific remain similar to two weeks ago. Anomalies across much of the western equatorial Pacific sub-surface are more than 2 °C cooler than average.

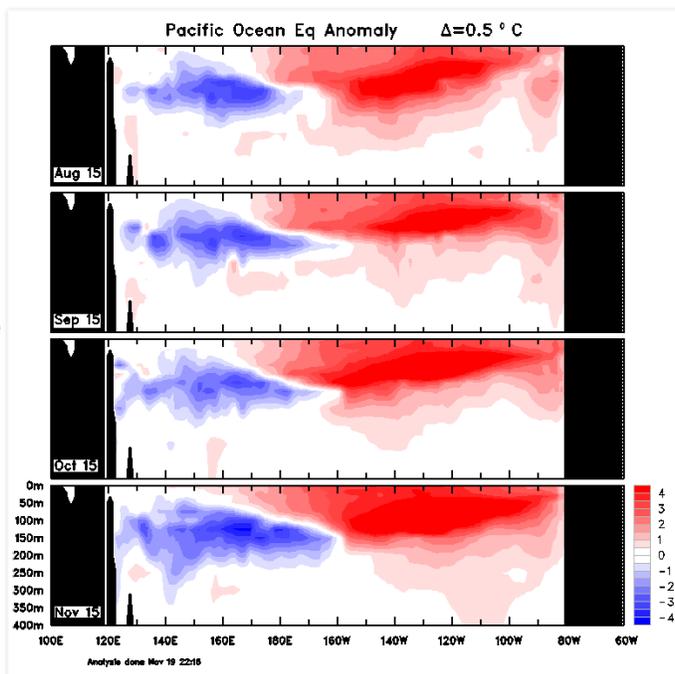
The pattern of warm anomalies in the eastern sub-surface and cool anomalies in the west is consistent with a well-established El Niño.

In the mean 5-day values (upper panel), the thermocline remains almost flat. The thermocline sits around the 20 °C region, and is considered mid-point between the warmer surface waters, and cooler subsurface waters. An almost flat thermocline is typical of strong El Niño events.



## Monthly sub-surface temperatures

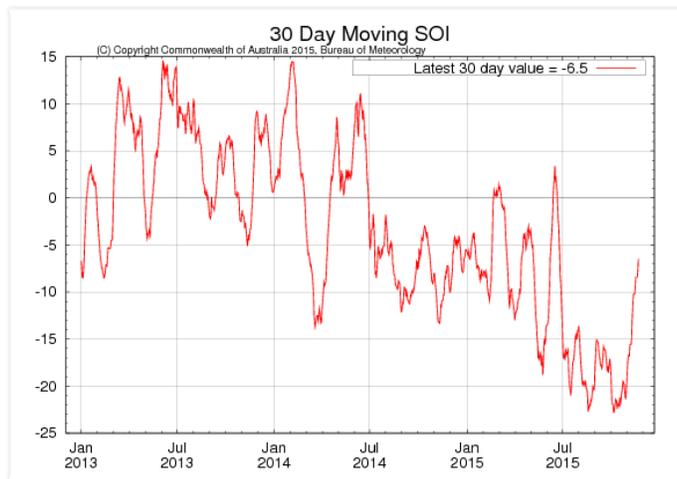
The four-month sequence of sub-surface temperature anomalies (to November) shows a generally consistent pattern of anomalies throughout the past four months. In November, warm anomalies have been present in the top 200 m of the equatorial Pacific sub-surface, extending between about 160°E and the South 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.



## Southern Oscillation Index

During the past two weeks the Southern Oscillation Index (SOI) has risen sharply, crossing into neutral territory for the first time since late June. The 30-day SOI value to 22 November was  $-6.5$ , and is expected to rise further in coming days, however the 90-day value remains typical of El Niño, with a value of  $-15.1$ . During Australia's northern wet season (October–April), the SOI is more erratic, and should be used cautiously.

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.

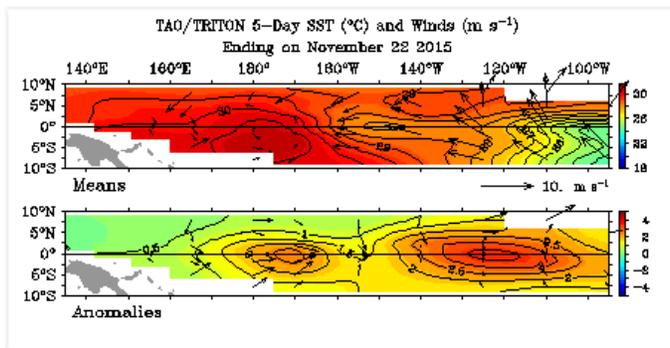


## Trade winds

Trade winds for the 5 days ending 22 November show weak westerly anomalies across the western to central equatorial Pacific. The area of westerly anomalies has increased slightly 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.

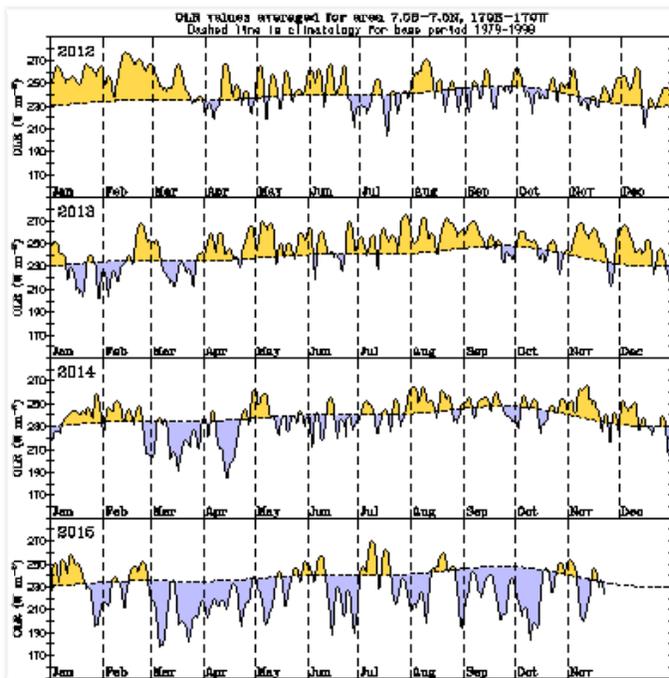
During La Niña events, there is a sustained strengthening of the trade winds across much of the tropical Pacific, while during El Niño events there is a sustained weakening of the trade winds.



### Cloudiness near the Date Line

Cloudiness near the Date Line has fluctuated around the long-term average during the past two weeks, following a period of above-average values earlier during November. 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.

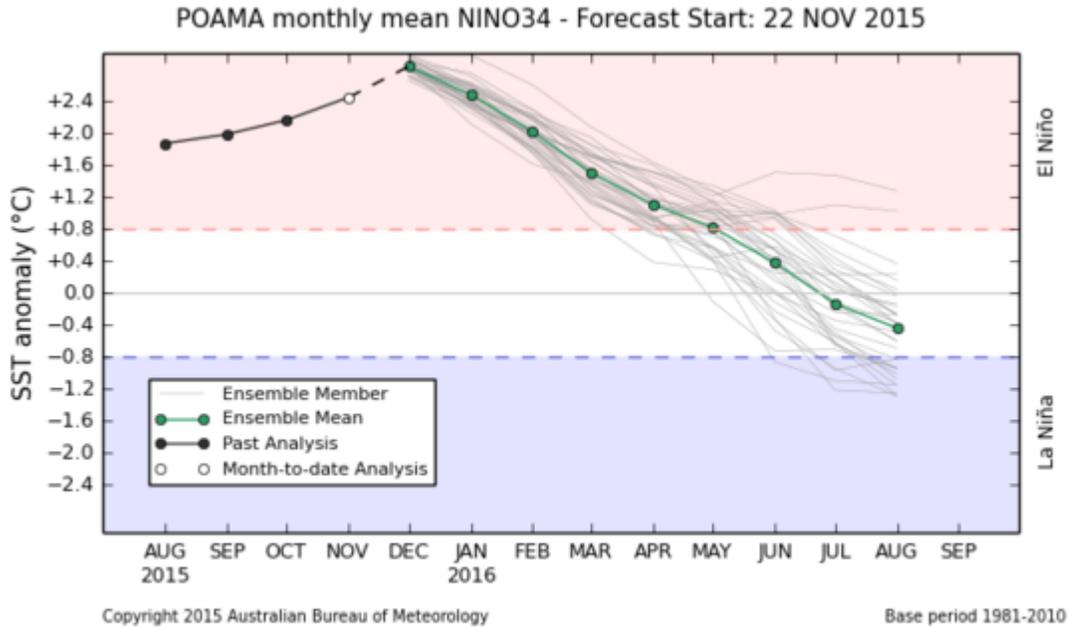


### Model outlooks

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.

All models indicate a steady decline in central Pacific SST values in the first quarter of 2016.

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.

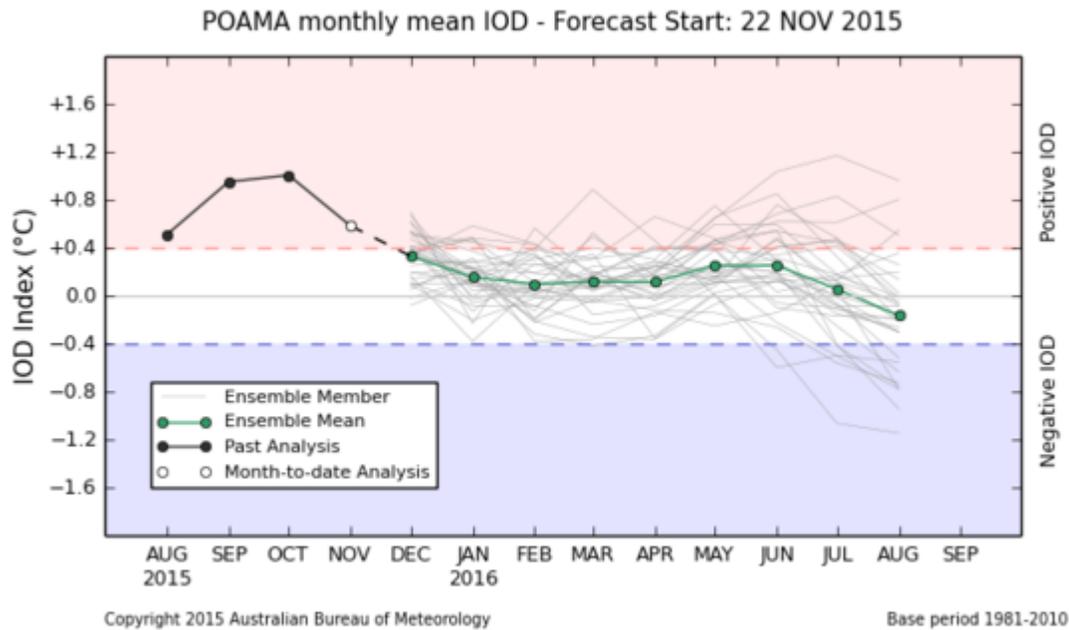


## Indian Ocean Dipole

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 22 November was +0.13 °C.

Sea surface temperatures (SSTs) in the Indian Ocean are warmer than average over much of the basin. Warm anomalies have increased across the Indonesian archipelago and to Australia's north compared to two weeks ago.

All but one surveyed international [climate model](#) indicates that neutral values are expected over the summer.



See also: [IOD forecasts](#)

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