



ENSO Wrap-Up

Current state of the Pacific and Indian Ocean

Recent warming of Pacific Ocean could be early indication of El Niño

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Recent warming of the tropical Pacific Ocean has primed the Pacific for El Niño. However, history has shown El Niño does not always develop from the ocean trends currently observed.

International climate models monitored by the Bureau indicate the central tropical Pacific Ocean is likely to continue to warm, with all models predicting El Niño thresholds will be reached or exceeded by mid-year. However, the accuracy of model outlooks at this time of year, the traditional El Niño–Southern Oscillation (ENSO) transition period, is lower than for outlooks made at other times of the year. Hence, some caution should be exercised when using model outlooks to predict the likelihood of El Niño.

The Bureau's ENSO Tracker remains at El Niño WATCH status. This means that when current observations and model outlooks are considered together, there is about a 50% chance of El Niño developing in the coming months, which is twice the normal likelihood.

El Niño is often associated with below-average winter and spring rainfall over eastern Australia and above-average daytime temperatures over the southern half of Australia. However, in the shorter-term, much of Australia is likely to have a wetter-than-average April to June. See the latest [climate outlook](#).

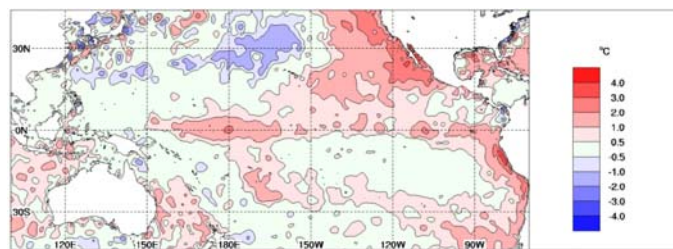
Next update expected on 14 April 2015 |

Weekly sea surface temperatures

The past two weeks have seen significant increases in sea surface temperature (SST) anomalies across the eastern half of the tropical Pacific, especially near and along the coast of South America. SSTs for the NINO3 region, in the eastern Pacific, have increased by the largest amount for any two-week period since at least July 2001 (when the Bureau's weekly monitoring dataset commenced).

The SST anomaly map for the week ending 29 March shows warm anomalies extending across nearly all of the equatorial Pacific Ocean, from about 150°E to the South American coast. Small areas of cool anomalies remain in the Coral and Bismarck seas; to the north of Papua New Guinea (PNG) and between PNG and Queensland's east coast.

Warm anomalies remain across a large part of the northeast of the Pacific Basin, across waters between Australia's east to southeast and New Zealand, and to Australia's west and northwest, extending across most of the Indian Ocean. The warm anomalies in the eastern Indian Ocean are forecast to contribute to above-average rainfall during April to June (see the latest [climate outlook](#)).



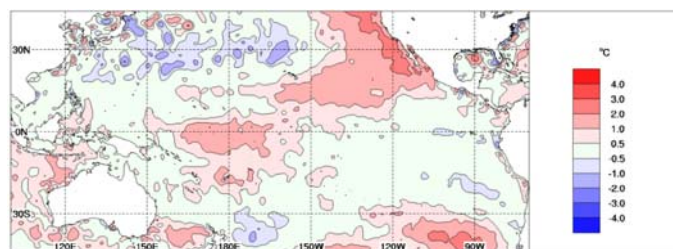
Index	Previous	Current	Temperature change (2 weeks)
NINO3	-0.1	+0.7	0.8 °C warmer
NINO3.4	+0.3	+0.7	0.4 °C warmer
NINO4	+0.9	+1.0	0.1 °C warmer

Baseline period 1961–1990.

Monthly sea surface temperatures

The SST anomaly map for February shows warmer than average waters over large areas of the Pacific. These areas include the tropical Pacific west of about 160°W, much of the northeast of the Pacific Basin, and the Tasman Sea. Warmer waters also persist across large parts of the Indian Ocean.

Compared to January, positive anomalies had decreased slightly in the eastern equatorial Pacific and increased slightly in the western equatorial Pacific.



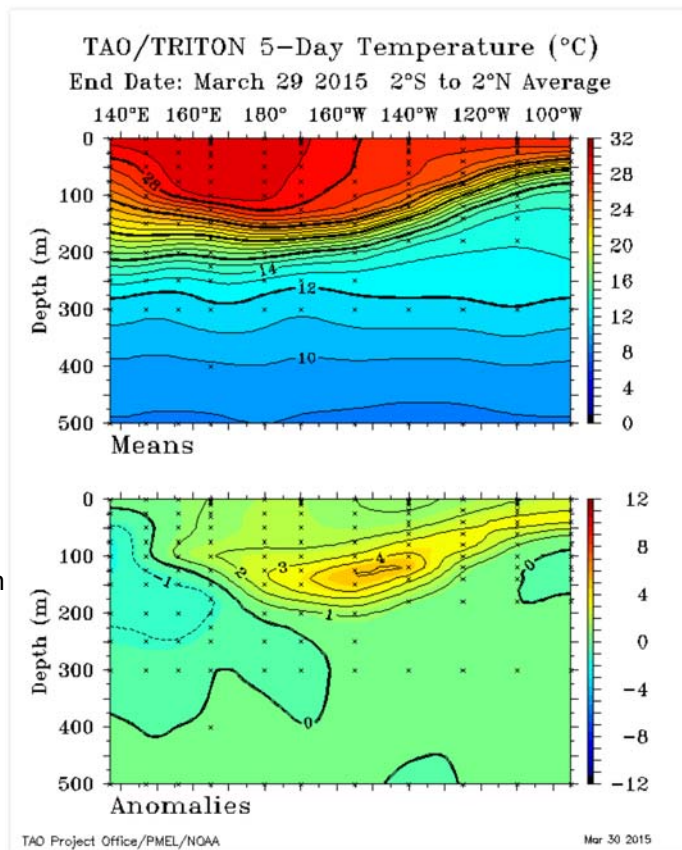
Index	January	February	Temperature change
NINO3	+0.3	+0.2	0.1 °C cooler
NINO3.4	+0.5	+0.5	no change
NINO4	+0.9	+1.0	0.1 °C warmer

Baseline period 1961–1990.

5-day sub-surface temperatures

The sub-surface temperature map for the 5 days ending 30 March shows a large volume of warmer-than-average water is present below the surface of the central equatorial Pacific. When compared with two weeks ago, the sub-surface has warmed in both the central and eastern equatorial Pacific. This pool of warmer-than-average water has progressed eastward over recent weeks (this is known as a downwelling Kelvin wave) with warm anomalies present in the central Pacific between 100 m and 200 m depth, rising to the top 100 m in the eastern Pacific. Warm anomalies in the central Pacific exceeded +4 °C.

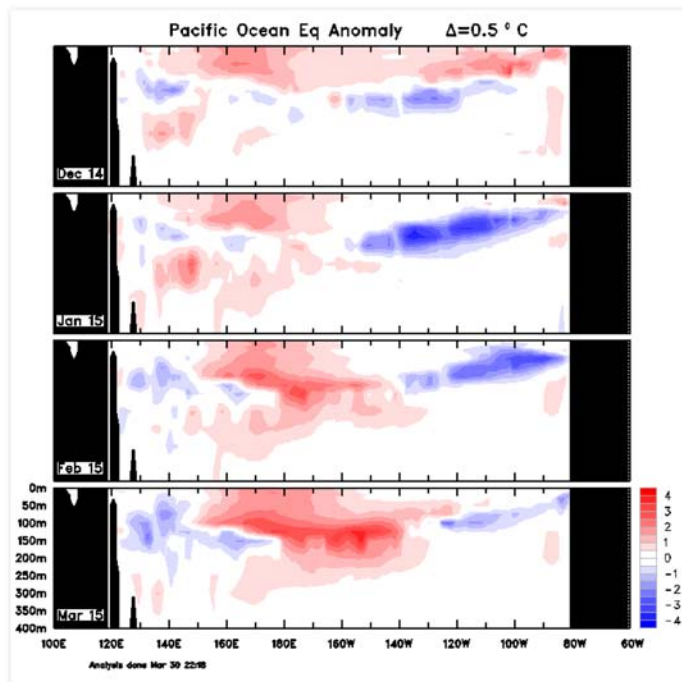
In the top 100 m of the equatorial Pacific temperatures were near average, except in the far east where warm anomalies have begun to shoal. Significant increases in surface temperature anomalies in the eastern Pacific in recent weeks have resulted as warm anomalies below the surface of the tropical Pacific have been slowly risen towards the surface of the ocean.



Monthly sub-surface temperatures

The four-month sequence of sub-surface temperature anomalies (to 30 March) shows cool anomalies decreased during March in the sub-surface of the eastern equatorial Pacific, compared to last month, while warm anomalies have increased in the western and central equatorial Pacific sub-surface. Weakening of cool anomalies in the east and strengthening of warm anomalies in the central to western Pacific is a pattern which had been observed over the months since January 2015.

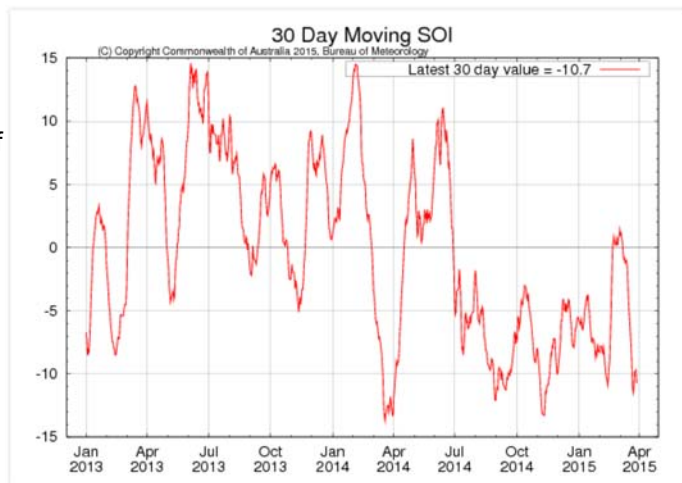
For March, warm anomalies were present in the top 200 m of the equatorial Pacific sub-surface between about 150°E and 130°W. Anomalies in small parts of this region reached more than +3 °C. A small area of weak cool anomalies remains between 50 m and 150 m, east of about 130°W.



Southern Oscillation Index

The Southern Oscillation Index (SOI) has decreased further over the past two weeks, falling to values which can be indicative of El Niño if sustained. The latest 30-day SOI value to 29 March is -10.7 . The passage of tropical weather systems near Darwin or Tahiti during the 30-day window will contribute to fluctuation of SOI values. Fluctuation of the SOI associated with tropical systems is common during the first quarter of the year. It remains to be seen whether this fall in the SOI is a result of transient tropical weather systems, or a more sustained shift towards El Niño-like conditions.

Sustained positive values of the SOI above $+8$ may indicate La Niña, while sustained negative values below -8 may indicate El Niño. Values of between about $+8$ and -8 generally indicate neutral conditions.

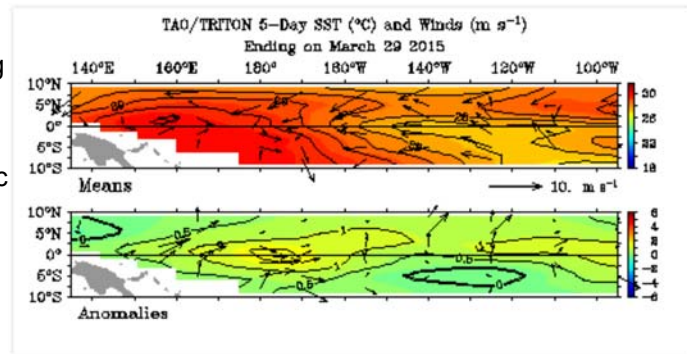


Trade winds

Trade winds were weaker than average over the western half of the tropical Pacific for the 5 days ending 29 March (see map). A persistent reversal of wind direction (i.e. from southeasterlies to westerlies) has been observed in parts of the western equatorial Pacific for about seven weeks now. Trade winds in the eastern half of the tropical Pacific were near average.

Bursts of westerly winds over the equatorial Pacific can induce warming of the ocean below by driving downwelling Kelvin waves, which travel eastward as a 'pulse' of warmer-than-average water and warm the surface and sub-surface of the ocean.

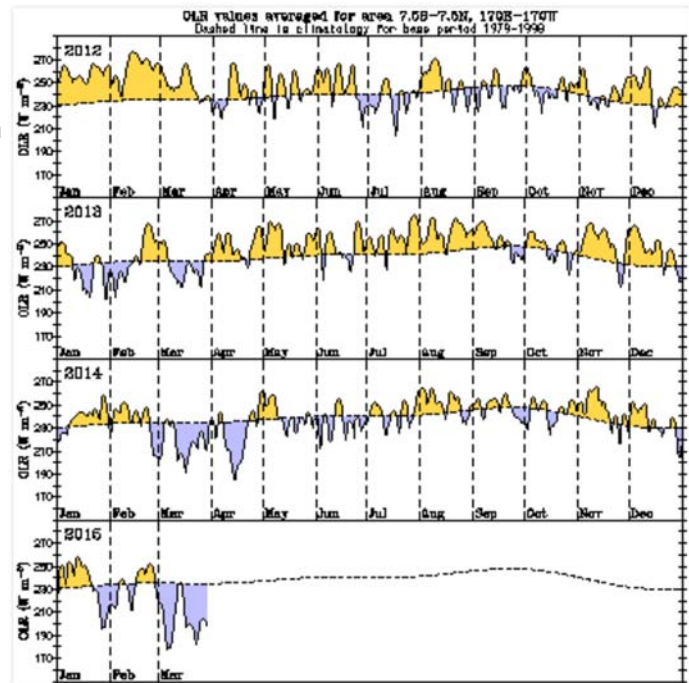
During La Niña there is a sustained strengthening of the trade winds across much of the tropical Pacific, while during El Niño there is a sustained weakening of the trade winds.



Cloudiness near the Date Line

Cloudiness near the Date Line has been above average for most of March.

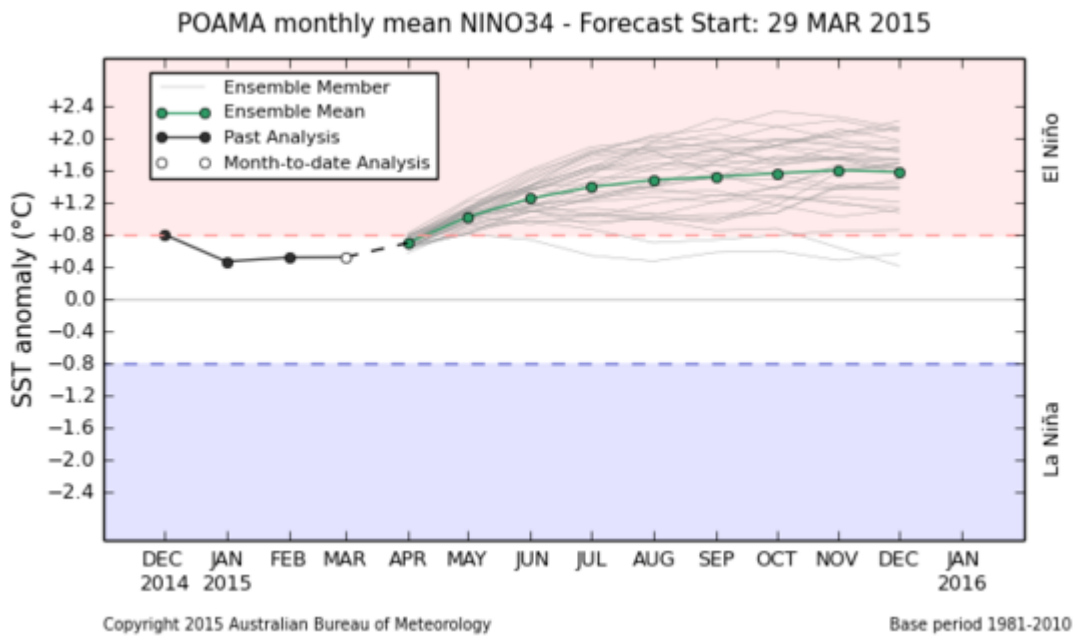
Cloudiness along the equator, near the Date Line, is an important indicator of ENSO conditions, as it typically increases (negative OLR anomalies) near and to the east of the Date Line during El Niño and decreases (positive OLR anomalies) during La Niña.



Model outlooks

All of the eight surveyed international [climate models](#) favour warming of central Pacific Ocean SSTs over the coming months. All surveyed models indicate that NINO3.4 will reach El Niño threshold levels by mid-year, with further warming by August. All models suggest that SSTs will remain above threshold levels for a sustained period.

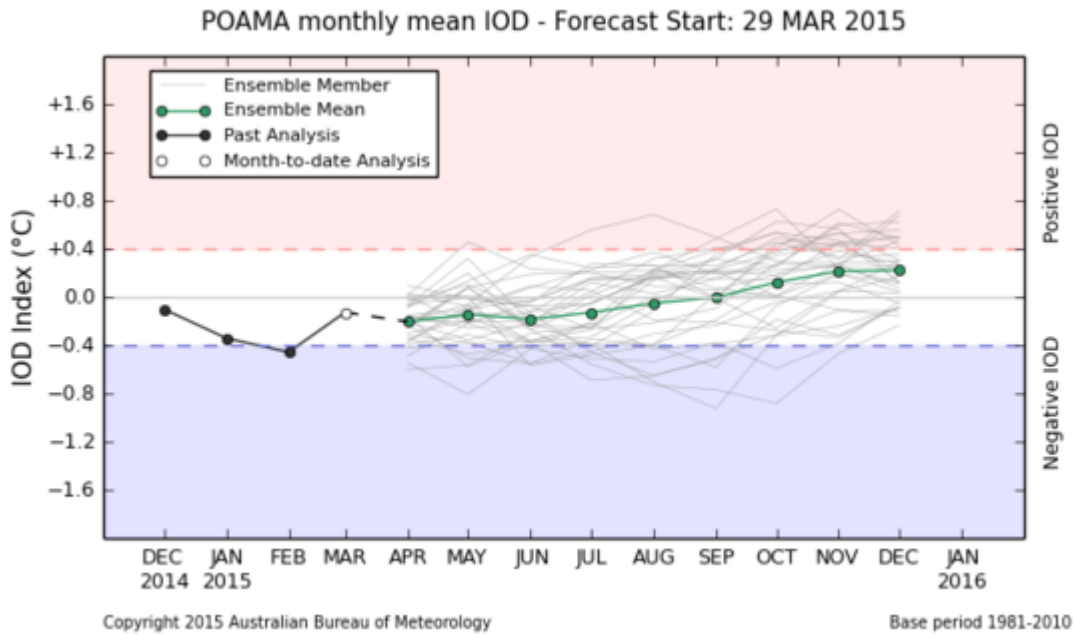
Model outlooks spanning February to May (the traditional ENSO transition period) have lower confidence than forecasts made at other times of year. Some models currently show some spread in their outlooks for tropical Pacific Ocean temperatures, indicating that while further warming is indeed very likely, there remains some ambiguity about the amount of warming expected.



Indian Ocean Dipole

The latest weekly value of the Indian Ocean Dipole (IOD) index to 29 March is 0.0 °C. Climate models surveyed in the [model outlooks](#) favour a continuation of a neutral phase of the IOD until at least mid-year. Positive IOD events are more likely to occur in conjunction with El Niño events, therefore climatologists will closely monitor the Indian Ocean for any early signs of a developing event.

The IOD typically has little influence on Australian climate from December to April. During this time of year, establishment of negative or positive IOD patterns is largely inhibited by the development and position of the monsoon trough in the southern hemisphere.



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