ENSO: Recent Evolution, Current Status and Predictions

Update prepared by:
Climate Prediction Center / NCEP
19 August 2019
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Recent Evolution and Current Conditions
Oceanic Niño Index (ONI)
Pacific SST Outlook
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Summary
ENSO Alert System Status: Final El Niño Advisory

ENSO-neutral conditions are present.*

Equatorial sea surface temperatures (SSTs) are above average across the western and central Pacific Ocean and are below average in the eastern Pacific. The pattern of anomalous convection and winds are generally consistent with ENSO-neutral.

ENSO-neutral is most likely to continue through Northern Hemisphere winter 2019-20 (50-55% chance).*

* Note: These statements are updated once a month (2nd Thursday of each month) in association with the ENSO Diagnostics Discussion, which can be found by clicking here.
From early June 2018 through May 2019, near-to-above average SSTs have been present across most of the Pacific Ocean.

During February 2019, positive SST anomalies strengthened across most of the equatorial Pacific.

Over the last month, SSTs have become near-to-below average in the eastern Pacific, while remaining above average in the western and central Pacific.
Niño Region SST Departures (°C) Recent Evolution

The latest weekly SST departures are:

Niño 4  0.8°C  
Niño 3.4  0.1°C  
Niño 3  -0.3°C  
Niño 1+2  -0.7°C
During the last four weeks, equatorial SSTs were above average across the central Pacific Ocean, with the largest departures between 170°E and 170°W. Below-average SSTs were evident in the eastern Pacific.
During the last four weeks, equatorial SSTs were above average across the western and central Pacific Ocean and also the far eastern Atlantic. SSTs were below average near Indonesia and in the eastern Pacific.
Weekly SST Departures during the Last Four Weeks

During the last four weeks, SSTs were below average in the eastern equatorial Pacific, and remained above average around the Date Line.
During the last four weeks, SST anomalies decreased in the eastern equatorial Pacific.
Upper-Ocean Conditions in the Equatorial Pacific

The basin-wide equatorial upper ocean (0-300 m) heat content is greatest prior to and during the early stages of a Pacific warm (El Niño) episode (compare top 2 panels), and least prior to and during the early stages of a cold (La Niña) episode.

The slope of the oceanic thermocline is least (greatest) during warm (cold) episodes.

Recent values of the upper-ocean heat anomalies (near average) and thermocline slope index (near average) reflect ENSO-neutral.

The monthly thermocline slope index represents the difference in anomalous depth of the 20°C isotherm between the western Pacific (160°E-150°W) and the eastern Pacific (90°-140°W).
Positive subsurface temperature anomalies have been present through most of the period. Anomalies decreased to near zero in late April before returning to positive in late May. During June and July, anomalies were slightly positive at times. More recently, subsurface temperatures were near average.
In the last two months, positive subsurface temperature anomalies have weakened across the Pacific, but remain in the central Pacific.

Most recent pentad analysis

Negative subsurface temperature anomalies have persisted at depth in the central and western Pacific and reside closer to the surface in the eastern Pacific.
Positive OLR anomalies (suppressed convection and precipitation) were evident around western Indonesia.

Low-level (850-hPa) cross-equatorial wind anomalies were evident in the eastern tropical Pacific Ocean.

A small region of upper-level (200-hPa) westerly wind anomalies were present over the eastern equatorial Pacific.
Intraseasonal Variability

Intraseasonal variability in the atmosphere (wind and pressure), which is often related to the Madden-Julian Oscillation (MJO), can significantly impact surface and subsurface conditions across the Pacific Ocean.

Related to this activity:

Significant weakening of the low-level easterly winds usually initiates an eastward-propagating oceanic Kelvin wave.
In October, November 2018, and in January-March 2019, positive subsurface temperature anomalies increased, partly due to downwelling Kelvin waves.

During May 2019, an upwelling Kelvin wave contributed to the reduction of positive subsurface anomalies and emergence of negative anomalies around 110°-90°W.

During May and July, downwelling Kelvin waves helped to increase the positive subsurface temperature anomalies across the central and east-central Pacific. However, negative anomalies remained over the eastern Pacific.

Equatorial oceanic Kelvin waves have alternating warm and cold phases. The warm phase is indicated by dashed lines. Downwelling and warming occur in the leading portion of a Kelvin wave, and upwelling and cooling occur in the trailing portion.
At times, the Madden Julian Oscillation (MJO) has contributed to the eastward propagation of low-level wind anomalies.

During the period, westerly wind anomalies have periodically emerged over the western or central equatorial Pacific Ocean.

In the last week, low-level wind anomalies were westerly over the central and eastern Pacific Ocean.
Upper-level (200-hPa) Velocity Potential Anomalies

Eastward propagation of anomalies has, at times, been evident throughout the period.

From early March to mid May 2019, anomalous upper-level divergence (green shading) persisted near the Date Line.

Since early-mid June 2019, anomalous upper-level convergence (brown shading) has persisted in the far eastern Pacific and S. America, while anomalous divergence has remained over the east-central Pacific.

Unfavorable for precipitation (brown shading)
Favorable for precipitation (green shading)

Note: Eastward propagation is not necessarily indicative of the Madden-Julian Oscillation (MJO).
Outgoing Longwave Radiation (OLR) Anomalies

From mid-December 2018 to mid-June 2019, negative OLR anomalies largely persisted near the Date Line.

Since early February 2019, positive OLR anomalies have, at times, been evident over Indonesia.

In the last week, convection was suppressed near western Indonesia.

Drier-than-average Conditions (orange/red shading)
Wetter-than-average Conditions (blue shading)
The ONI is based on SST departures from average in the Niño 3.4 region, and is a principal measure for monitoring, assessing, and predicting ENSO.

Defined as the three-month running-mean SST departures in the Niño 3.4 region. Departures are based on a set of improved homogeneous historical SST analyses (Extended Reconstructed SST - ERSST.v5). The SST reconstruction methodology is described in Huang et al., 2017, J. Climate, vol. 30, 8179-8205.)

It is one index that helps to place current events into a historical perspective.
El Niño: characterized by a positive ONI greater than or equal to +0.5°C.

La Niña: characterized by a negative ONI less than or equal to -0.5°C.

By historical standards, to be classified as a full-fledged El Niño or La Niña episode, these thresholds must be exceeded for a period of at least 5 consecutive overlapping 3-month seasons.

CPC considers El Niño or La Niña conditions to occur when the monthly Niño3.4 OISST departures meet or exceed +/- 0.5°C along with consistent atmospheric features. These anomalies must also be forecasted to persist for 3 consecutive months.
ONI (°C): Evolution since 1950

The most recent ONI value (May - July 2019) is +0.5°C.
Historical El Niño and La Niña Episodes Based on the ONI computed using ERSST.v5

Recent Pacific warm (red) and cold (blue) periods based on a threshold of +/- 0.5 °C for the Oceanic Nino Index (ONI) [3 month running mean of ERSST.v5 SST anomalies in the Nino 3.4 region (5N-5S, 120-170W)]. For historical purposes, periods of below and above normal SSTs are colored in blue and red when the threshold is met for a minimum of 5 consecutive over-lapping seasons.

The ONI is one measure of the El Niño-Southern Oscillation, and other indices can confirm whether features consistent with a coupled ocean-atmosphere phenomenon accompanied these periods. The complete table going back to DJF 1950 can be found [here](#).

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ENSO-neutral is most likely to continue through the Northern Hemisphere winter 2019-20.
The average of the dynamical models (thick red line) predicts ENSO-neutral through Northern Hemisphere winter 2019-20.

The average of the statistical models (thick green line) predicts a weak El Niño to continue into the Northern Hemisphere winter 2019-20.

Figure provided by the International Research Institute (IRI) for Climate and Society (updated 19 August 2019).
The CFS.v2 ensemble mean (black dashed line) predicts ENSO-neutral to continue through winter 2019-20.
Atmospheric anomalies over the North Pacific and North America During the Last 60 Days

During late June through mid July, below-average heights and temperatures were most evident over the western contiguous U.S, while above average heights and temperatures were evident over the eastern U.S.

From late July to early August, the pattern was mostly near average across the U.S. with some anomalous troughing (and slightly below-average temperatures) over the Pacific Northwest and southeastern U.S.

Since early August, below-average heights and temperatures have been evident over parts of the central and eastern U.S.
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U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 17 August 2019
U.S. Temperature and Precipitation Departures During the Last 90 Days

End Date: 17 August 2019
The seasonal outlooks combine the effects of long-term trends, soil moisture, and, when appropriate, ENSO.
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