ENSO: Recent Evolution, Current Status and Predictions

Update prepared by:
Climate Prediction Center / NCEP
15 October 2018
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Recent Evolution and Current Conditions
Oceanic Niño Index (ONI)
Pacific SST Outlook
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Summary
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ENSO Alert System Status: El Niño Watch

ENSO-neutral conditions are present.*

Equatorial sea surface temperatures (SSTs) are above average across most of the Pacific Ocean.

El Niño is favored to form in the next couple of months and continue through the Northern Hemisphere winter 2018-19 (70-75% 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 September 2017 to late March 2018, below-average SSTs persisted across the central and eastern Pacific Ocean.

Since early June, near-to-above average SSTs have been present across most of the Pacific Ocean.

Recently, positive SST anomalies strengthened across the central and eastern equatorial Pacific.
Niño Region SST Departures (°C) Recent Evolution

The latest weekly SST departures are:

- Niño 4  0.9°C
- Niño 3.4  0.6°C
- Niño 3  0.7°C
- Niño 1+2  0.4°C
During the last four weeks, equatorial SSTs were above average over most of the Pacific Ocean. Above-average SSTs were also observed north of the equator in the eastern Pacific, while below-average SSTs were present south of the equator.
Global SST Departures (°C) During the Last Four Weeks

During the last four weeks, equatorial SSTs were above average across most of the Pacific Ocean and the central Atlantic Ocean. SSTs were below average near Indonesia and the eastern Indian Ocean.
Weekly SST Departures during the Last Four Weeks

During the last four weeks, above-average SSTs have persisted near the Date Line and expanded into the eastern Pacific.
Change in Weekly SST Departures over the Last Four Weeks

During the last four weeks, positive changes were observed over most of the central to 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 (above average) and thermocline slope index (near average) reflect ENSO-neutral conditions.

*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).*
Central and Eastern Pacific Upper-Ocean (0-300 m)
Weekly Average Temperature Anomalies

Negative subsurface temperature anomalies lasted from August 2017 to February 2018. Since the end of February, temperature anomalies have increased and remained positive. During September and October, positive anomalies increased again.
In the last two months, positive subsurface temperature anomalies have strengthened and expanded into the eastern Pacific Ocean.

The recent evolution is associated with a downwelling equatorial oceanic Kelvin wave, and with a continued evolution toward El Niño.
Positive OLR anomalies (suppressed convection and precipitation) were evident over Indonesia and near the Date Line.

Anomalous low-level (850-hPa) cross-equatorial winds were evident over the eastern Pacific Ocean, while westerly anomalies were apparent over the far western Pacific and in the east-central Pacific.

Anomalous upper-level (200-hPa) easterly winds were observed over the east-central Pacific.
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.
From December 2017- May 2018, successive Kelvin waves contributed to the eastward shift of positive and negative subsurface temperature anomalies.

From early April 2018 to early July, positive subsurface temperature anomalies persisted across most of the equatorial Pacific.

During July-August 2018, positive subsurface temperature anomalies weakened in the eastern Pacific.

Since early August 2018, positive subsurface anomalies have increased, partly due to a downwelling Kelvin wave.

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) contributed to the eastward propagation of low-level wind anomalies.

Since mid-July, westerly wind anomalies have become more prevalent over the equatorial Pacific Ocean.

Since mid-September, strong westerly wind anomalies have been present east of the Date Line.
Upper-level (200-hPa) Velocity Potential Anomalies

Through June 2018, anomalous upper-level convergence (brown shading) persisted over the central Pacific.

Since early July 2018, anomalous upper-level convergence has mostly persisted over the Indian Ocean, while anomalous upper-level divergence (green shading) has mostly persisted over the central and east-central Pacific.

Recently, an eastward propagating pattern of anomalous upper-level convergence has moved over the 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

Through June 2018 and from mid-July to mid-August, positive OLR anomalies persisted over the central Pacific Ocean. Recently, positive OLR anomalies have persisted from Indonesia to the Date Line.

Drier-than-average Conditions (orange/red shading)
Wetter-than-average Conditions (blue shading)
Oceanic Niño Index (ONI)

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.
NOAA Operational Definitions for El Niño and La Niña

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 (July - September 2018) is +0.1°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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El Niño is favored to form in the next couple of months and continue through the Northern Hemisphere winter 2018-19 (70-75% chance).
The majority of models predict El Niño to develop during September-November 2018.
The CFS.v2 ensemble mean (black dashed line) favors El Niño forming soon and continuing through Northern Hemisphere spring 2019.
Atmospheric anomalies over the North Pacific and North America During the Last 60 Days

Since late August 2018, anomalous ridging (and above-average temperatures) were evident over the eastern U.S., while anomalous troughing (and below-average temperatures) were present over the northwestern U.S.
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U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 13 October 2018
End Date: 13 October 2018
The seasonal outlooks combine the effects of long-term trends, soil moisture, and, when appropriate, ENSO.
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