ENSO: Recent Evolution, Current Status and Predictions

Update prepared by:
Climate Prediction Center / NCEP
11 February 2019
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Recent Evolution and Current Conditions
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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.

Convection and winds are mostly near average over the tropical Pacific.

El Niño is expected to form and continue through the Northern Hemisphere spring 2019 (~65% 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.
Since early June 2018, near-to-above average SSTs have been present across most of the Pacific Ocean.

Since mid-December 2018, positive SST anomalies have weakened across most of the equatorial Pacific.
Niño Region SST Departures (°C) Recent Evolution

The latest weekly SST departures are:

- Niño 4 0.8°C
- Niño 3.4 0.4°C
- Niño 3 0.4°C
- Niño 1+2 0.3°C
During the last four weeks, equatorial SSTs were above average across most of the Pacific Ocean.
During the last four weeks, equatorial SSTs were above average across most of the Pacific Ocean and central Atlantic Ocean. Equatorial SSTs were below average in the western Indian Ocean.
During the last four weeks, above-average SSTs weakened in the east-central equatorial Pacific Ocean.
Change in Weekly SST Departures over the Last Four Weeks

During the last four weeks, negative changes were observed in the east-central equatorial Pacific Ocean, while positive changes were evident around and just east of the Date Line.
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 (below average) reflect borderline El Niño 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).
Positive subsurface temperature anomalies have been present since the end of February 2018, with a peak in October and a minimum in early January 2019. Positive anomalies have increased since January 2019.
In the last two months, positive subsurface temperature anomalies have persisted across most of the equatorial Pacific Ocean.

Since mid-December 2018, negative subsurface temperature anomalies have persisted between 80-120°W.
Positive OLR anomalies (suppressed convection and precipitation) were evident over the eastern Indian Ocean. Negative OLR anomalies (enhanced convection and precipitation) extended from the Date Line to the far western Pacific.

Anomalous low-level (850-hPa) westerly winds were evident over the western Pacific.

Anomalous upper-level (200-hPa) westerly winds were observed over the eastern 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.
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.

From mid-July to early October, westerly wind anomalies prevailed over the eastern Pacific.

Since mid-October, wind anomalies have propagated eastward, with westerly wind anomalies more prevalent over most of the central and western Pacific.
Upper-level (200-hPa) Velocity Potential Anomalies

From July through September 2018, anomalous upper-level convergence (brown shading) mostly persisted over the Indian Ocean, while anomalous upper-level divergence (green shading) mostly persisted over the central and east-central Pacific.

Since October 2018, eastward propagation has been evident in the anomalies. More recently, anomalous upper-level divergence persisted near the Date Line.

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

Note: Eastward propagation is not necessarily indicative of the Madden-Julian Oscillation (MJO).
From mid-July to mid-August, positive OLR anomalies persisted over the central Pacific Ocean.

From mid-October to late November 2018 and again between mid-December to mid January 2019, negative OLR anomalies persisted over the western Pacific.

Since late January 2019, negative OLR anomalies have persisted around 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 Reconstruced 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 (November 2018 - January 2019) is +0.8°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 ºC 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 overlapping 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 expected to form and continue through the Northern Hemisphere spring 2019 (~65% chance).
The majority of models predict the Niño-3.4 index to slowly weaken into the Northern Hemisphere summer 2019.
The CFS.v2 ensemble mean (black dashed line) predicts El Niño through the Northern Hemisphere summer 2019.
Atmospheric anomalies over the North Pacific and North America During the Last 60 Days

From mid December to early January, anomalous ridging (and above-average temperatures) were evident over the central/eastern U.S.

Since late January, the pattern has changed with anomalous troughing (and below-average temperatures) apparent over the northern tier of the U.S., while anomalous ridging (and above-average temperatures) evident over the western U.S.
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U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 9 February 2019
U.S. Temperature and Precipitation Departures During the Last 90 Days

End Date: 9 February 2019
The seasonal outlooks combine the effects of long-term trends, soil moisture, and, when appropriate, ENSO.
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The patterns of convection and winds are mostly near average over the tropical Pacific.

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