

ENSO: Recent Evolution, Current Status and Predictions



Update prepared by:
Climate Prediction Center / NCEP
1 May 2017

Outline

Summary

Recent Evolution and Current Conditions

Oceanic Niño Index (ONI)

Pacific SST Outlook

U.S. Seasonal Precipitation and Temperature Outlooks

Summary

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ENSO Alert System Status: Not Active

ENSO-neutral conditions are present.*

Equatorial sea surface temperatures (SSTs) are near-average across the central Pacific. They are above-average in the eastern Pacific Ocean.

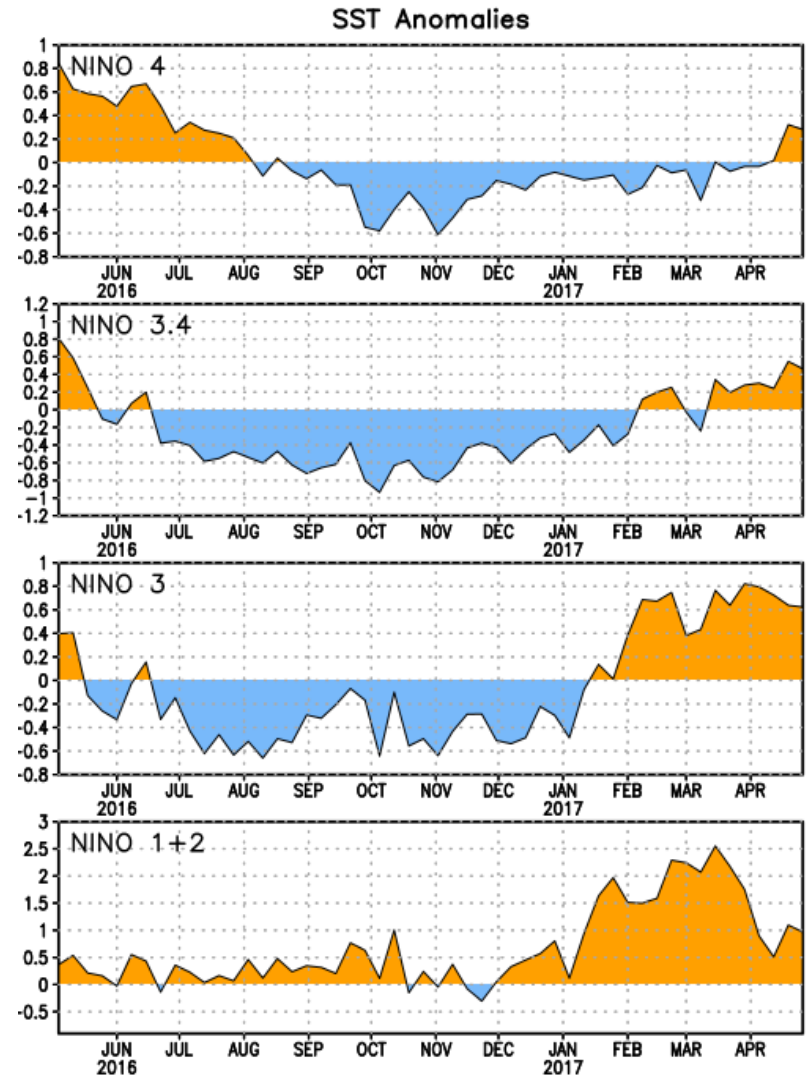
ENSO-neutral conditions are favored to continue through at least the Northern Hemisphere spring 2017, with increasing chances for El Niño development by late summer and fall.*

* 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](#).

Niño Region SST Departures (°C) Recent Evolution

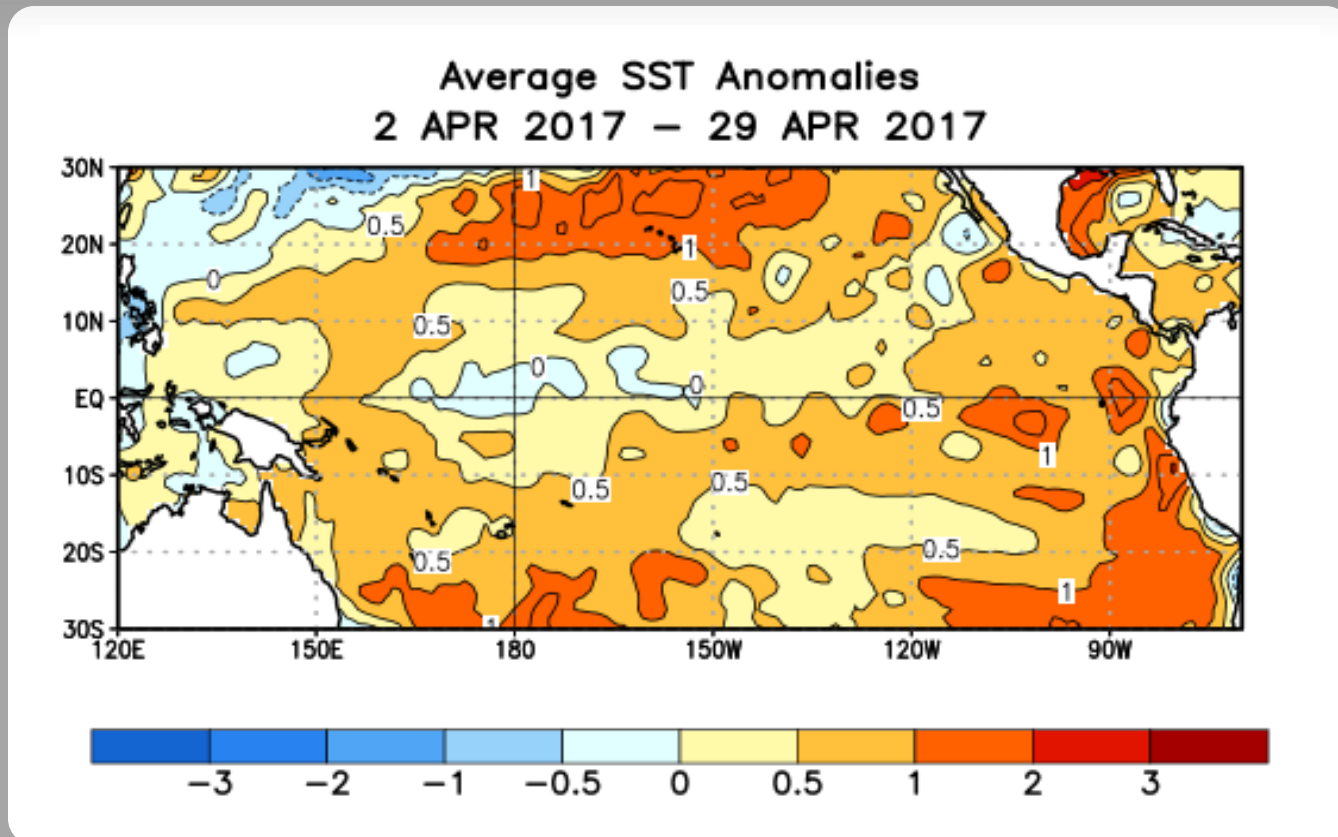
The latest weekly SST departures are:

Niño 4	0.3°C
Niño 3.4	0.5°C
Niño 3	0.6°C
Niño 1+2	1.0°C



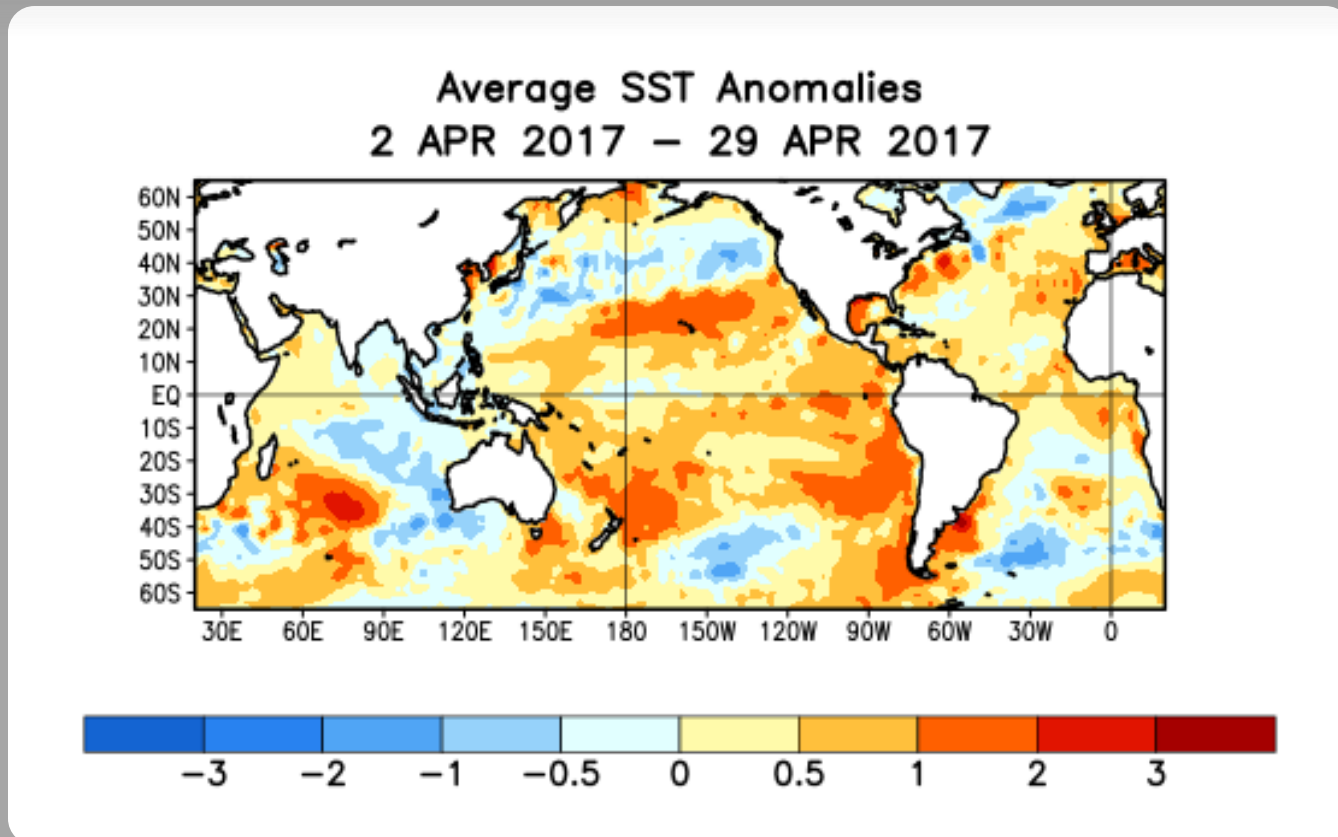
SST Departures (°C) in the Tropical Pacific During the Last Four Weeks

During the last four weeks, equatorial SSTs were near-average across the central Pacific Ocean, and above-average across the eastern Pacific.



Global SST Departures (°C) During the Last Four Weeks

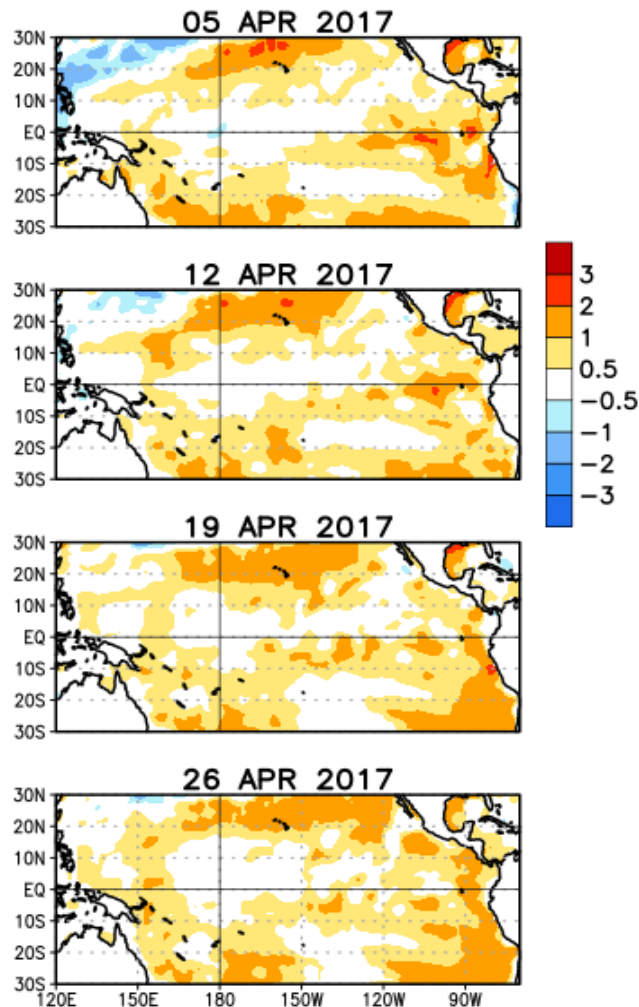
During the last four weeks, equatorial SSTs were above average in the eastern Pacific and Atlantic and near-average in the Indian and central Pacific Oceans.



Weekly SST Departures during the Last Four Weeks

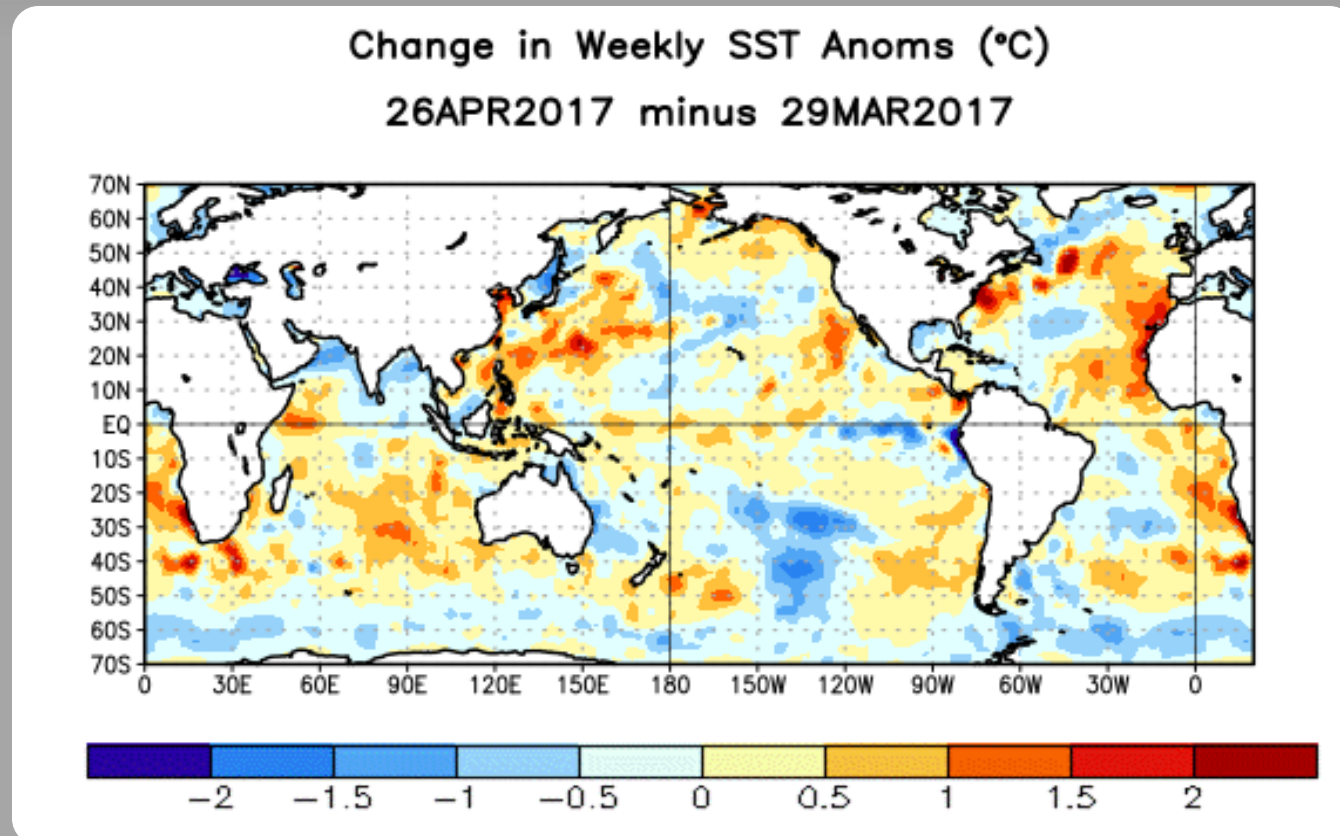
During the last four weeks, near-average SSTs continued in the central Pacific, while above-average SSTs persisted across the eastern Pacific.

Weekly SST Anomalies (DEG C)



Change in Weekly SST Departures over the Last Four Weeks

During the last four weeks, negative changes in equatorial SST anomalies were evident in the eastern Pacific, while positive changes were observed over the western to central Pacific.



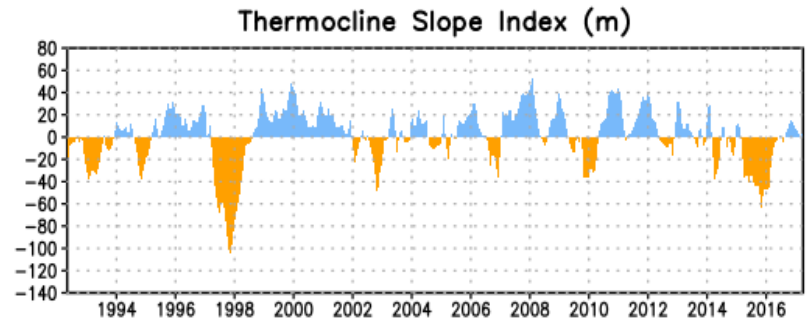
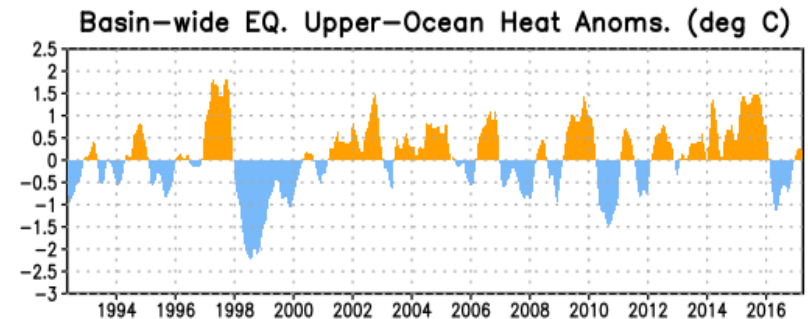
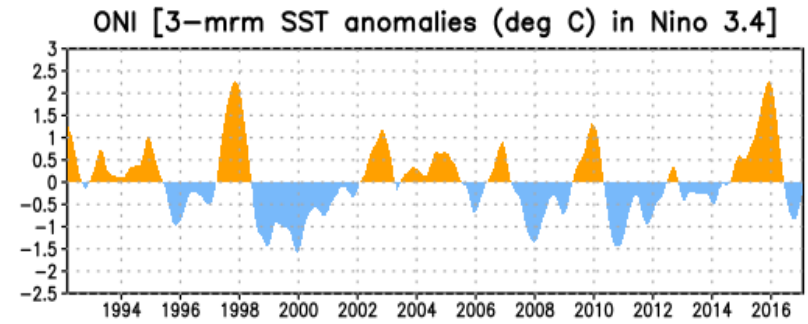
Upper-Ocean Conditions in the Equatorial Pacific

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.

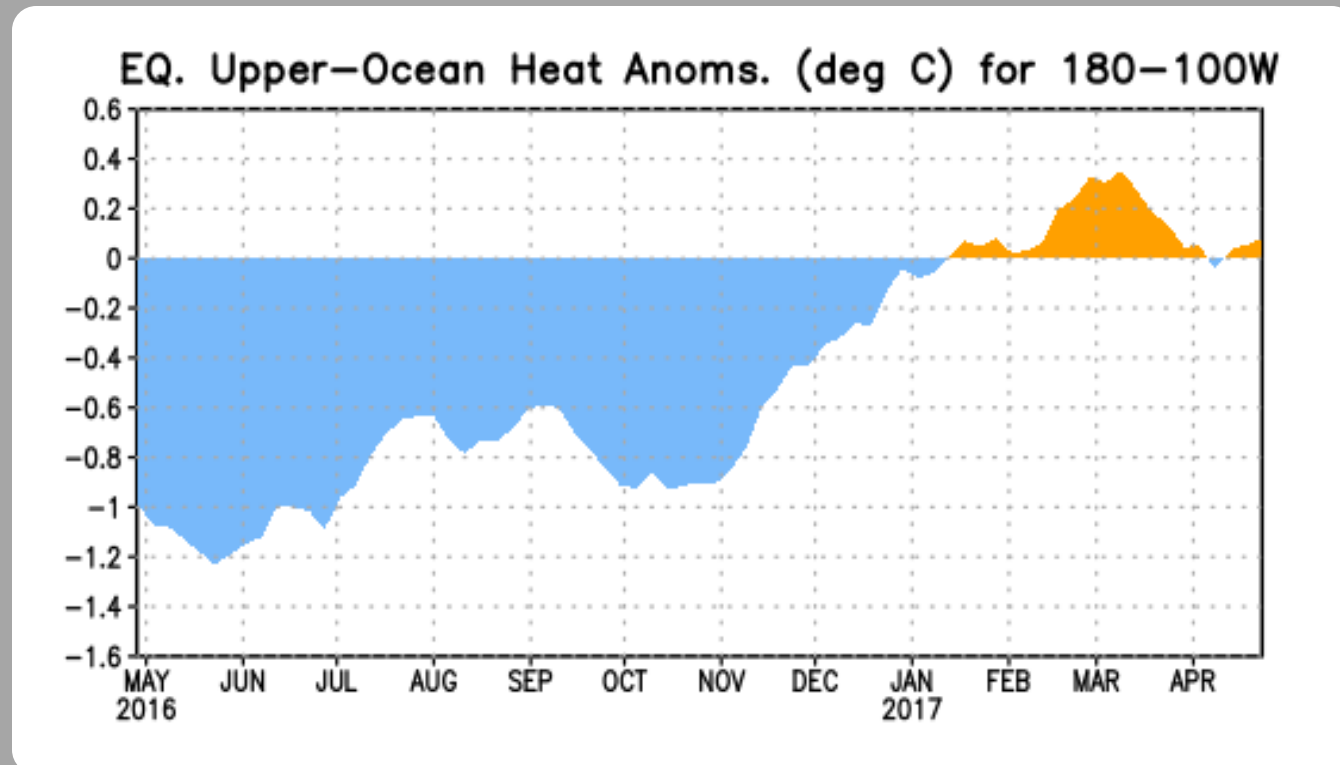
Recent values of the upper-ocean heat anomalies (near average) and thermocline slope index (near average) reflect ENSO-neutral conditions.

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).



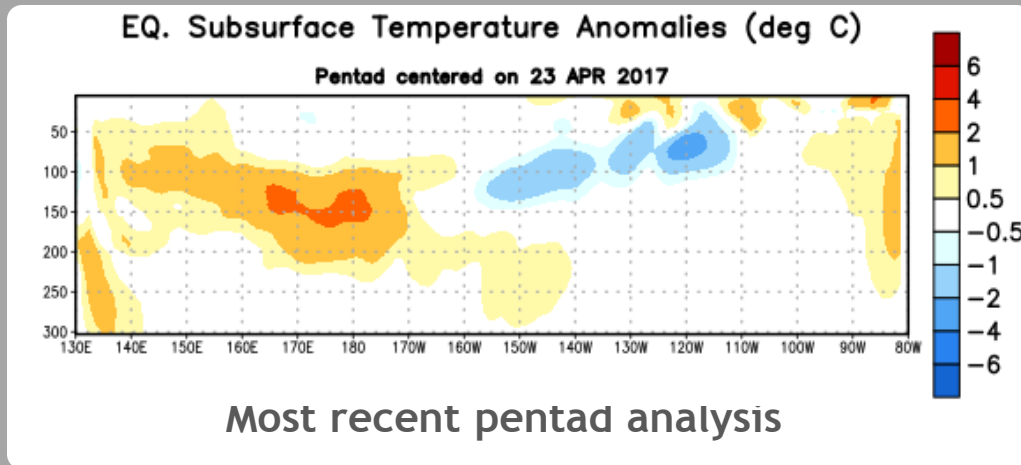
Central and Eastern Pacific Upper-Ocean (0-300 m) Weekly Average Temperature Anomalies

Negative subsurface temperature anomalies were present through December 2016. Positive anomalies were present from mid-January through March 2017. Recently the anomalies have been near zero.

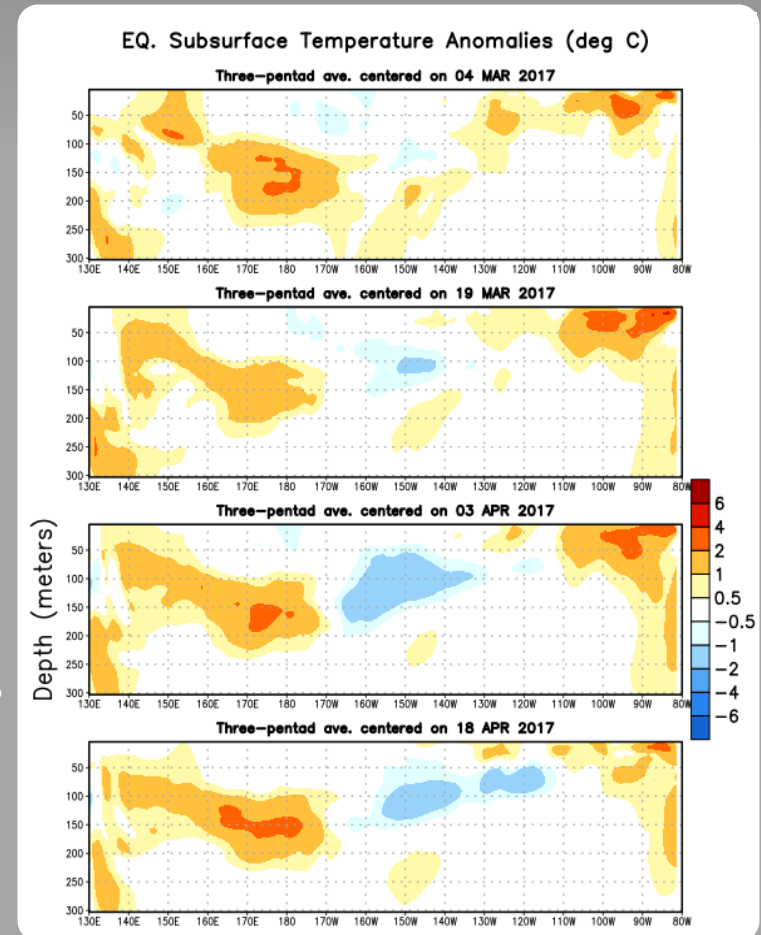


Sub-Surface Temperature Departures in the Equatorial Pacific

During the last two months, positive subsurface temperature anomalies have persisted in the western and eastern Pacific Ocean.



Recently, negative subsurface temperature anomalies persisted in the central equatorial Pacific Ocean, while positive anomalies weakened in the eastern Pacific.

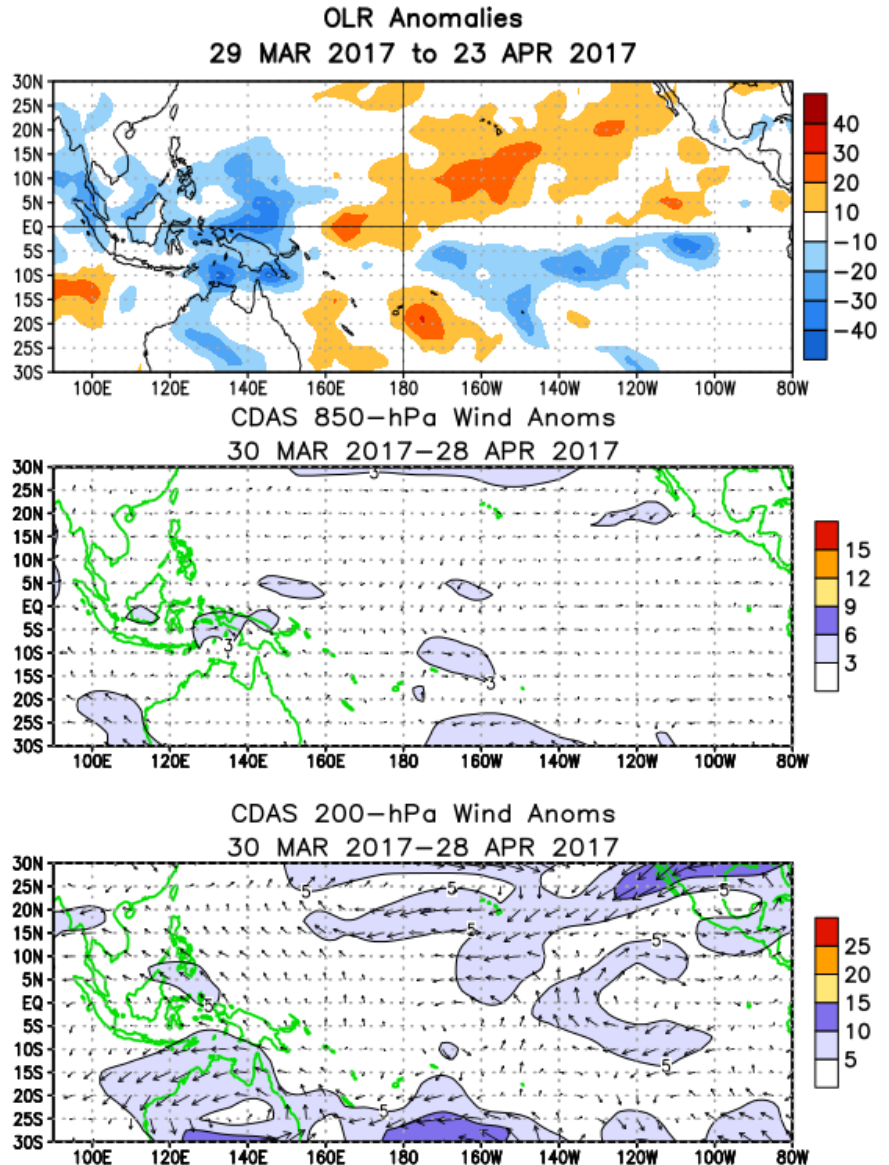


Tropical OLR and Wind Anomalies During the Last 30 Days

Negative OLR anomalies (enhanced convection and precipitation) were evident over Malaysia and Papua New Guinea. Positive OLR anomalies (suppressed convection and precipitation) were observed around the International Date Line and north of the equator in the central Pacific.

Low-level (850-hPa) winds were near average over most of the equatorial Pacific.

Cross-equatorial upper-level (200-hPa) anomalous winds were evident across the east-central tropical 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.

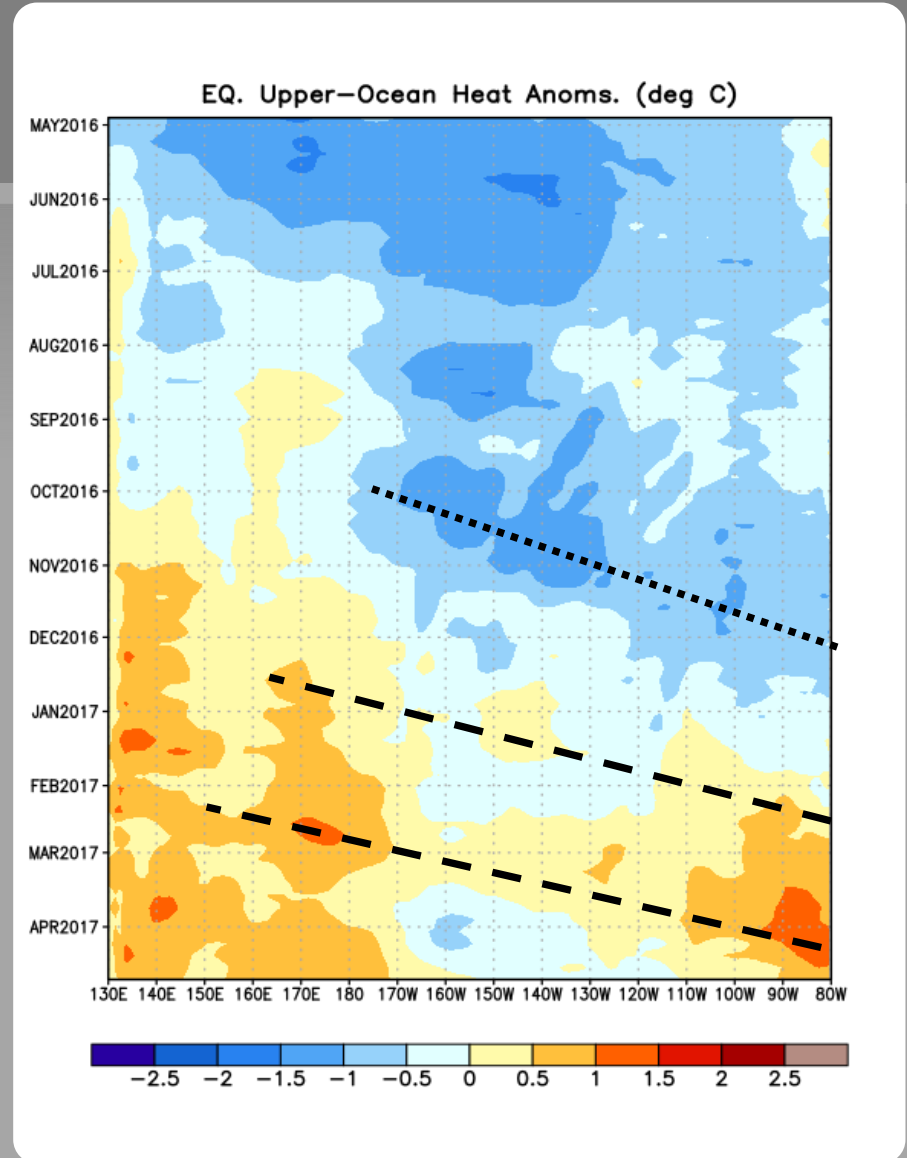
Weekly Heat Content Evolution in the Equatorial Pacific

With the passage of an upwelling equatorial oceanic Kelvin wave in March 2016, below-average subsurface temperatures extended across much of the equatorial Pacific.

Since February 2017, positive subsurface temperature anomalies have persisted in the western and eastern Pacific Ocean.

Since mid March 2017, negative subsurface temperature anomalies have persisted in the central to east-central 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.



Low-level (850-hPa) Zonal (east-west) Wind Anomalies (m s^{-1})

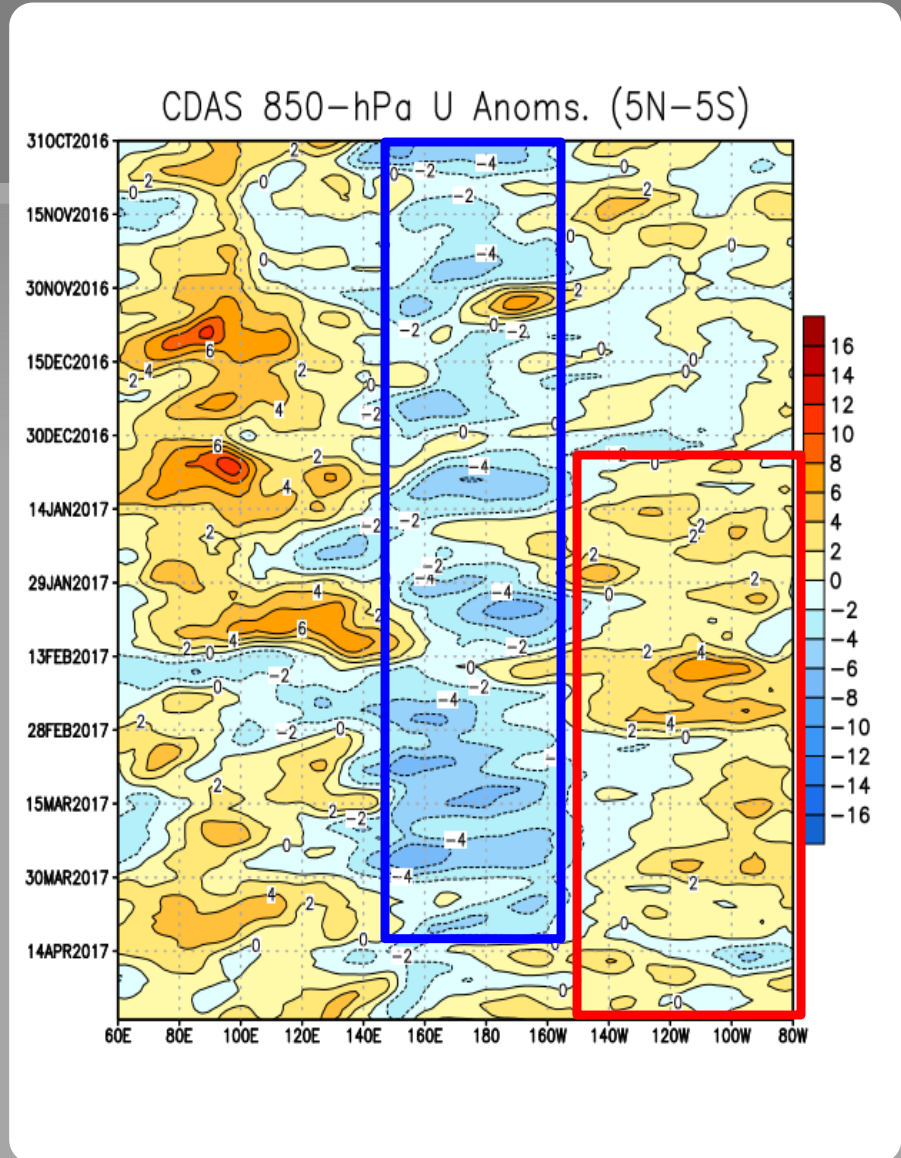
Since mid September 2016, low-level easterly wind anomalies generally persisted over the central and western equatorial Pacific.

Since January 2017, westerly wind anomalies were generally observed over the eastern Pacific Ocean.

Recently, weak low-level westerly anomalies have expanded to the Date Line.

Westerly Wind Anomalies (orange/red shading)

Easterly Wind Anomalies (blue shading)



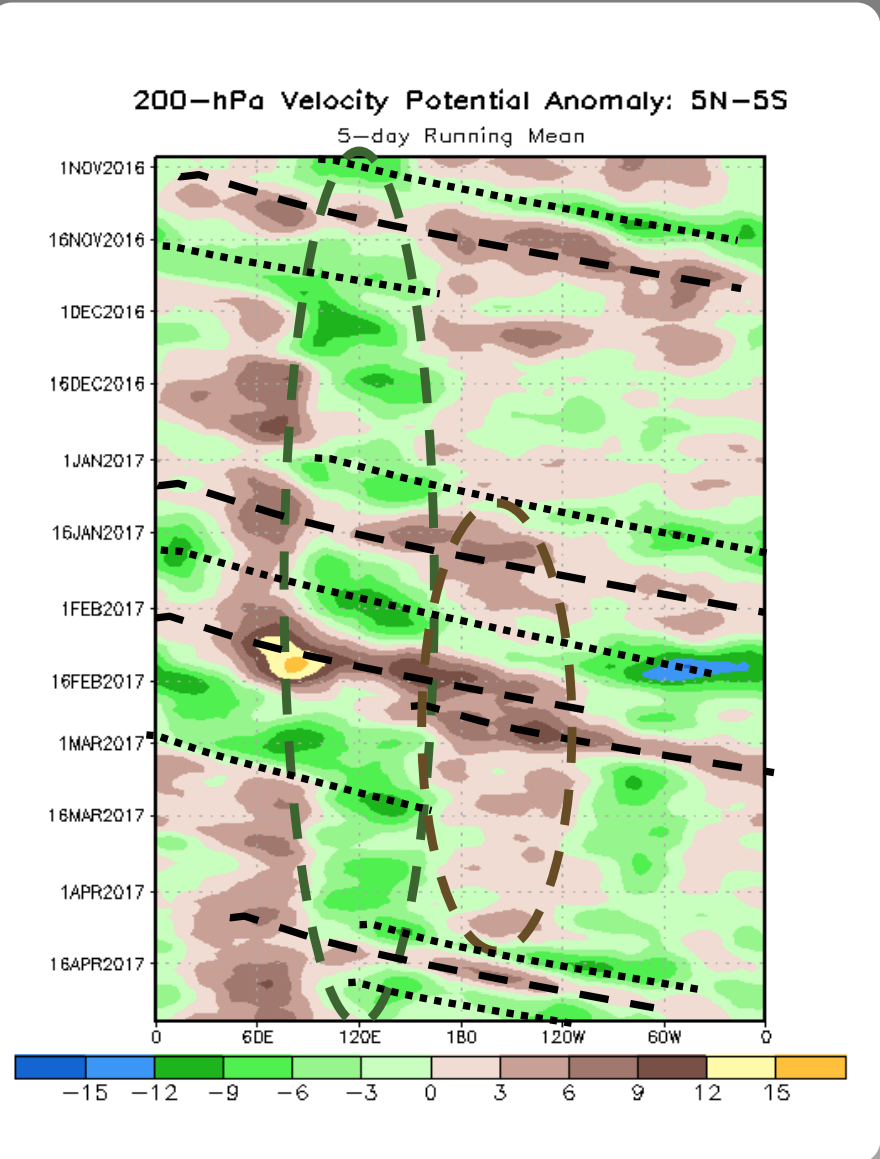
Upper-level (200-hPa) Velocity Potential Anomalies

Eastward propagation of regions of upper-level divergence (green shading) and convergence (brown shading) are particularly evident during November 2016, January-February 2017, and since early April 2017.

Since September 2016, anomalous upper-level divergence has generally persisted near Indonesia.

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

Note: Eastward propagation is not necessarily indicative of the Madden-Julian Oscillation (MJO).

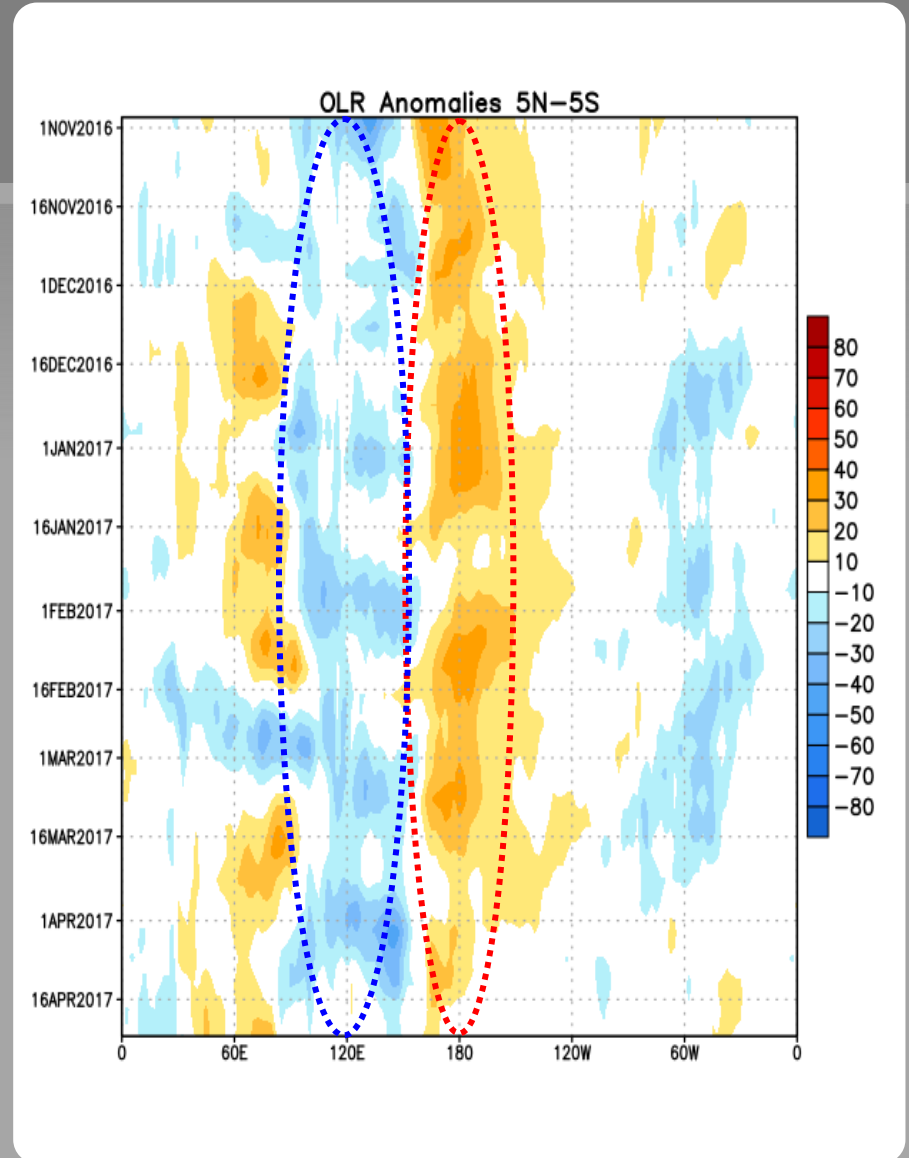


Outgoing Longwave Radiation (OLR) Anomalies

Since early August 2016, positive OLR anomalies have persisted near the International Date Line.

Since early September 2016, negative OLR anomalies have generally persisted near the Maritime Continent/far western Pacific Ocean.

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.v4). The SST reconstruction methodology is described in Huang et al., 2015, J. Climate, vol. 28, 911-930.)

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 $+0.5^{\circ}\text{C}$.

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

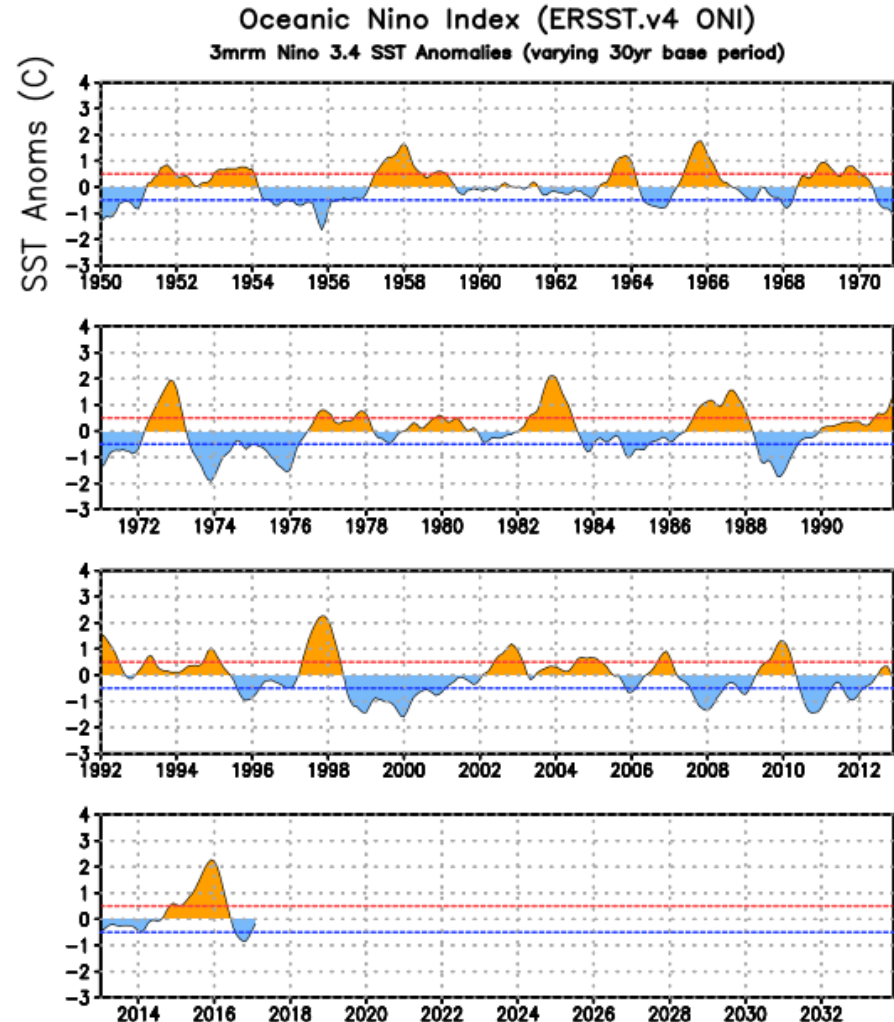
By historical standards, to be classified as a full-fledged El Niño or La Niña episode, these thresholds must be exceeded for a period of at least 5 consecutive overlapping 3-month seasons.

CPC considers El Niño or La Niña conditions to occur when the monthly Niño3.4 OISST departures meet or exceed $\pm 0.5^{\circ}\text{C}$ 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 (January - March 2017) is -0.2°C .

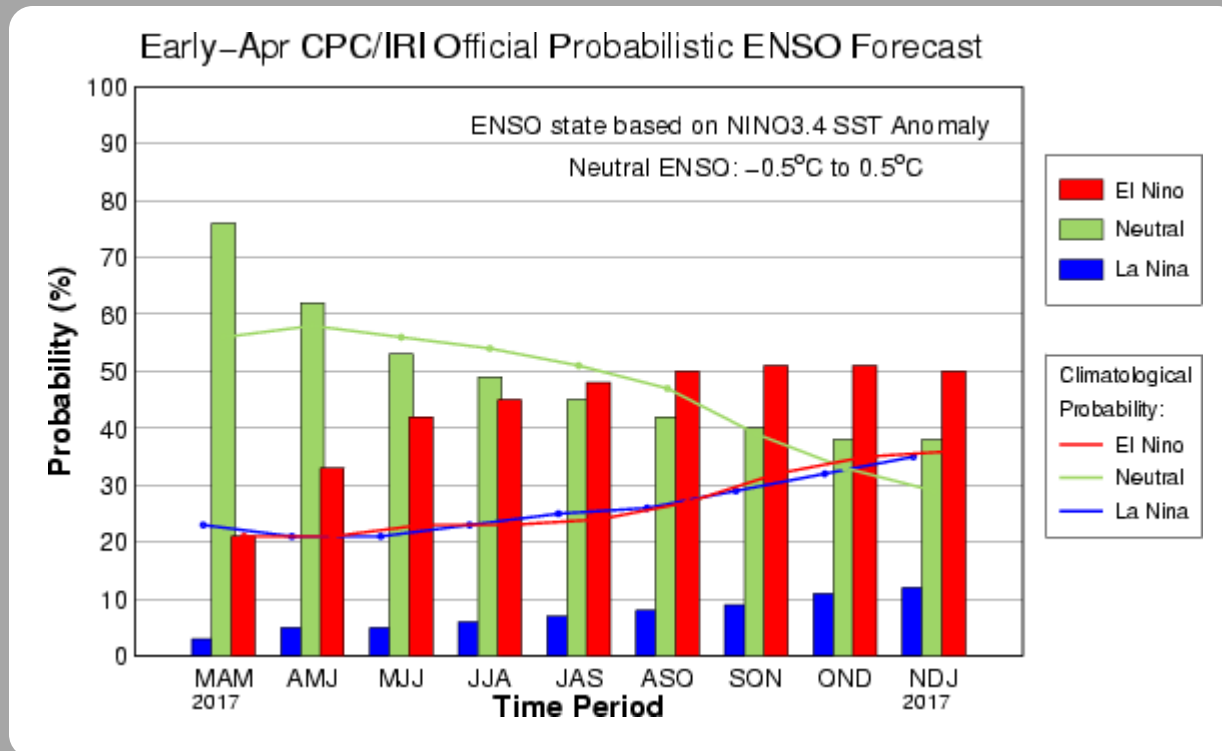
El Niño ↑
Neutral
La Niña ↓



CPC/IRI Probabilistic ENSO Outlook

Updated: 13 April 2017

ENSO-neutral is favored through mid-2017, with a slight tilt toward El Niño (~50%) during the late summer through fall 2017.



IRI/CPC Pacific Niño

3.4 SST Model Outlook

Most models favor El Niño by the late Northern Hemisphere summer 2017, with the dynamical models favoring onset during the summer of 2017.

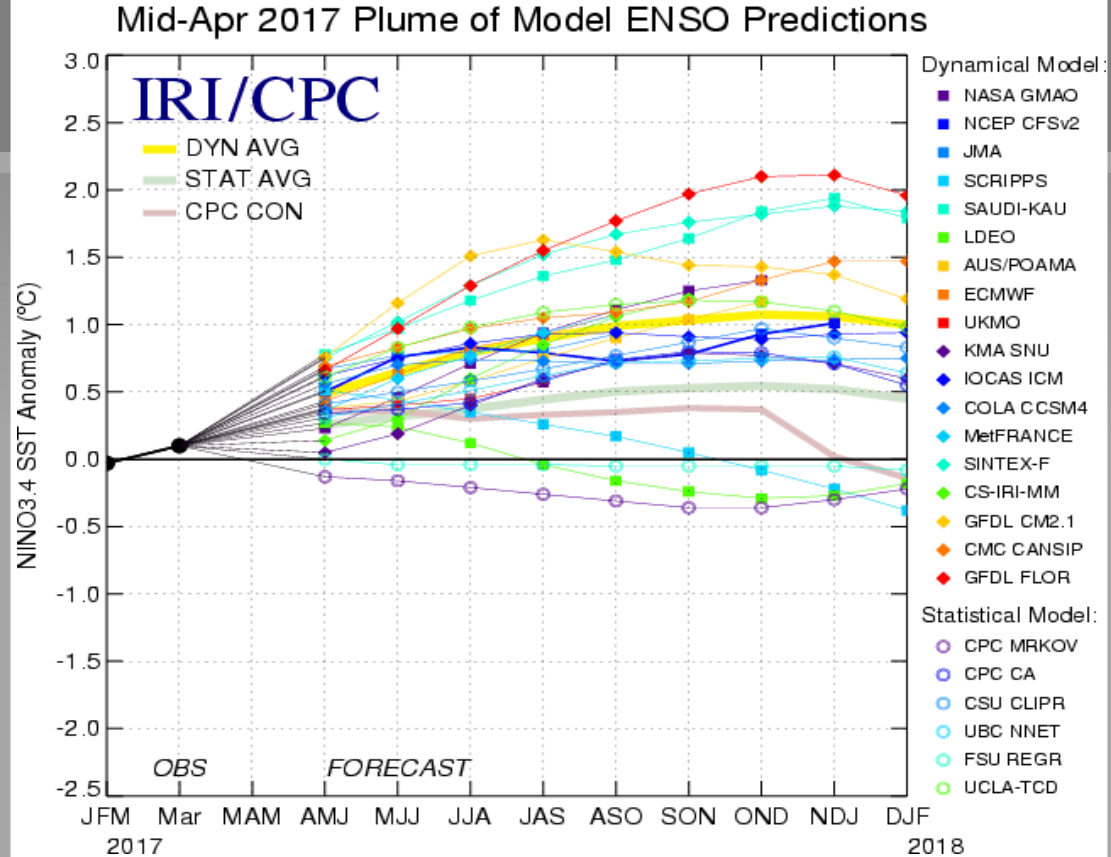


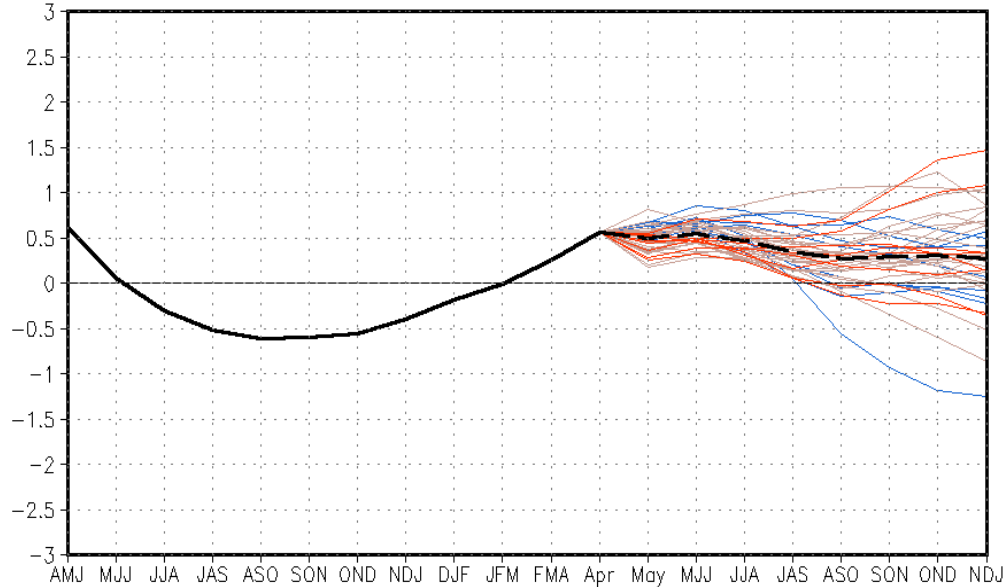
Figure provided by the International Research Institute (IRI) for Climate and Society (updated 18 April 2017).

SST Outlook: NCEP CFS.v2 Forecast (PDF corrected)

Issued: 1 May 2017

The CFS.v2 ensemble mean (black dashed line) favors borderline El Niño to develop in the near term and weaken through 2017.

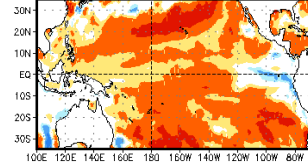
CFSv2 forecast Nino3.4 SST anomalies (K) (PDF corrected)



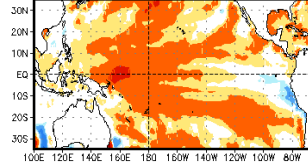
— Latest 8 forecast members
— Earliest 8 forecast members
— Other forecast members
- - - Forecast ensemble mean
— NCDG daily analysis

(Model bias correct base period: 1999–2010; Climatology base period: 1982–2010)

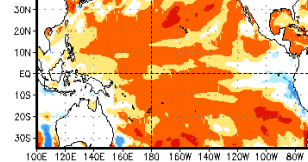
May–Jun–Jul 2017



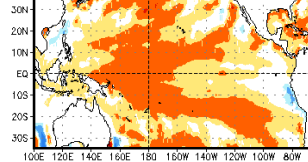
Sep–Oct–Nov 2017



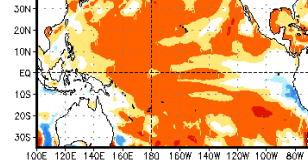
Jun–Jul–Aug 2017



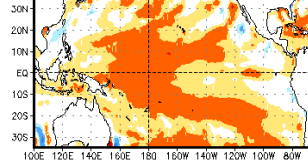
Oct–Nov–Dec 2017



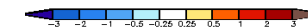
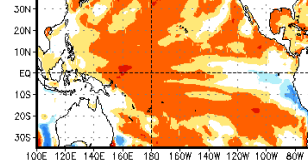
Jul–Aug–Sep 2017



Nov–Dec–Jan 2017/2018

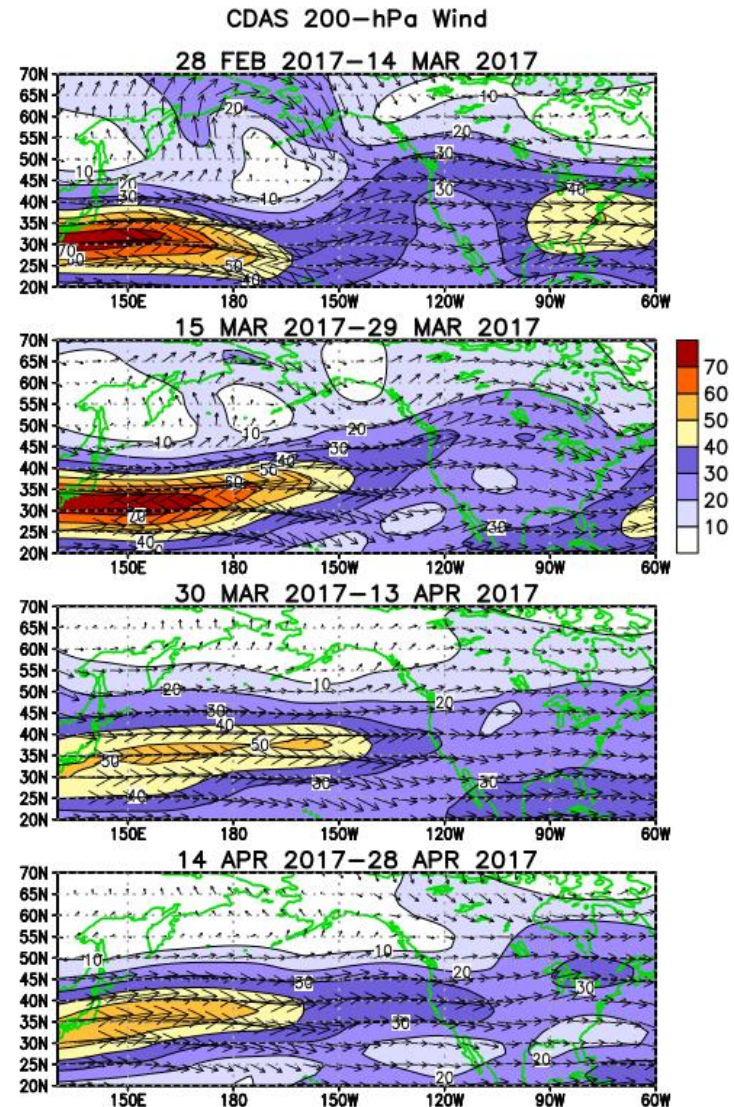


Aug–Sep–Oct 2017



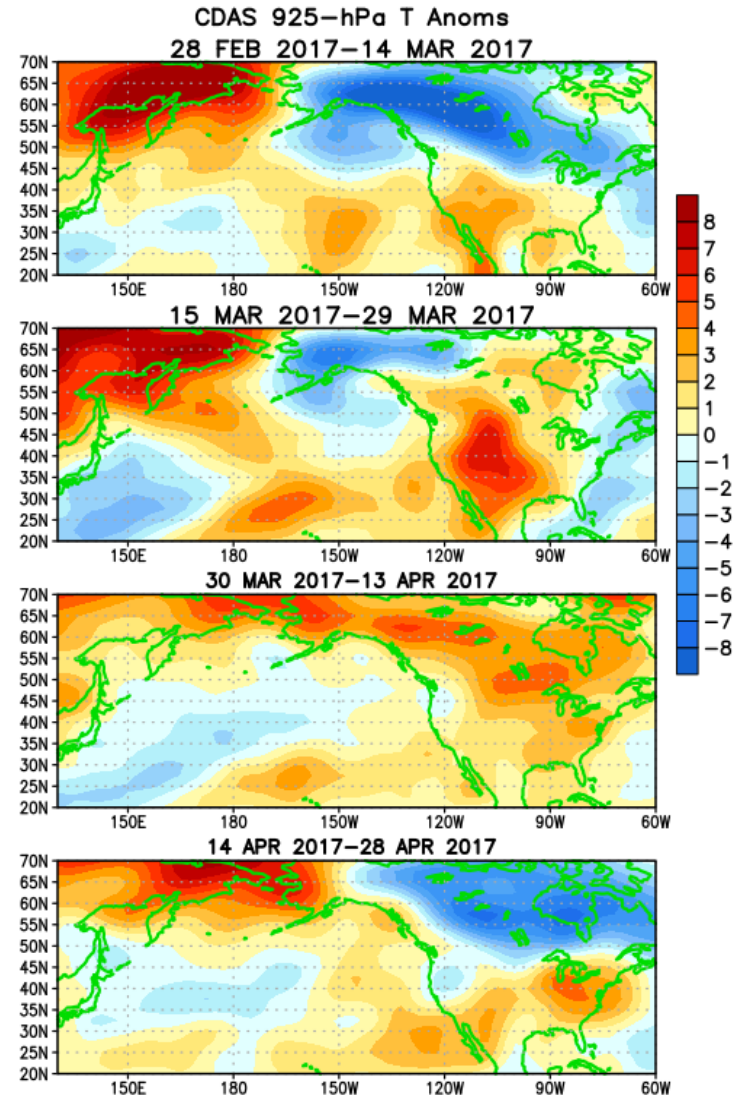
Atmospheric anomalies over the North Pacific and North America During the Last 60 Days

Since late February 2017, above-average heights and temperatures have prevailed over the southern United States, while heights and temperatures have varied over the North Pacific Ocean and the western U.S.



Atmospheric anomalies over the North Pacific and North America During the Last 60 Days

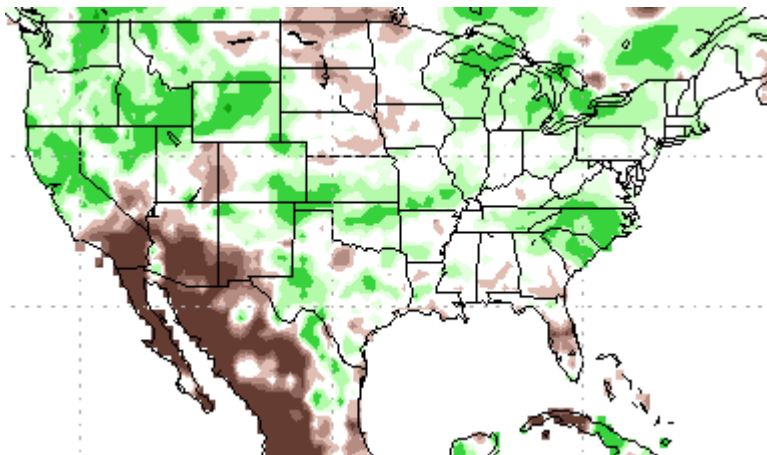
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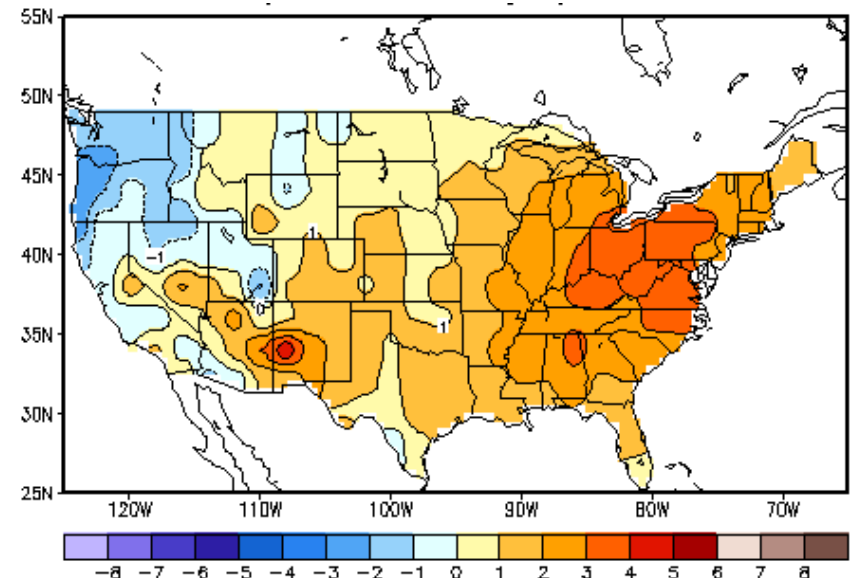
U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 29 April 2017

Percent of Average Precipitation



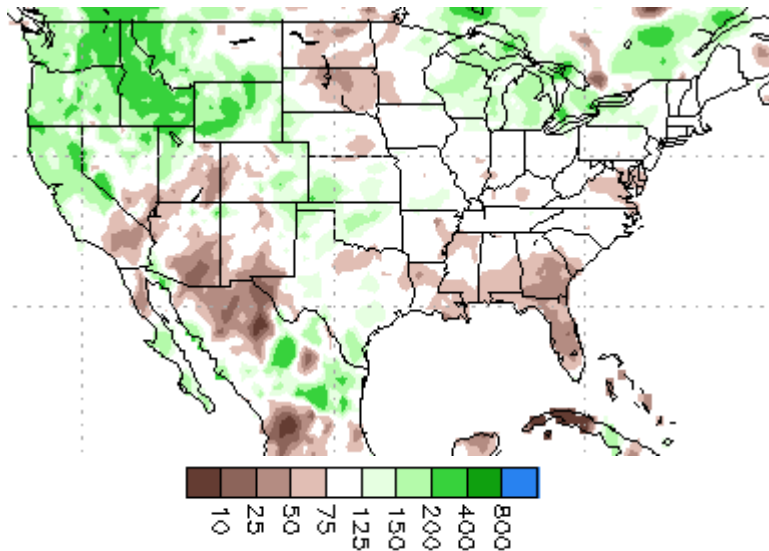
Temperature Departures (degree C)



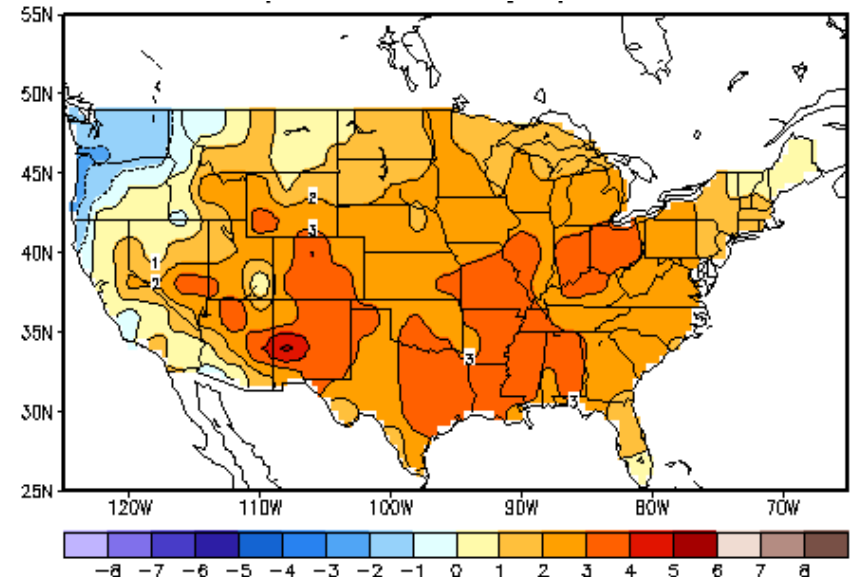
U.S. Temperature and Precipitation Departures During the Last 90 Days

End Date: 29 April 2017

Percent of Average Precipitation



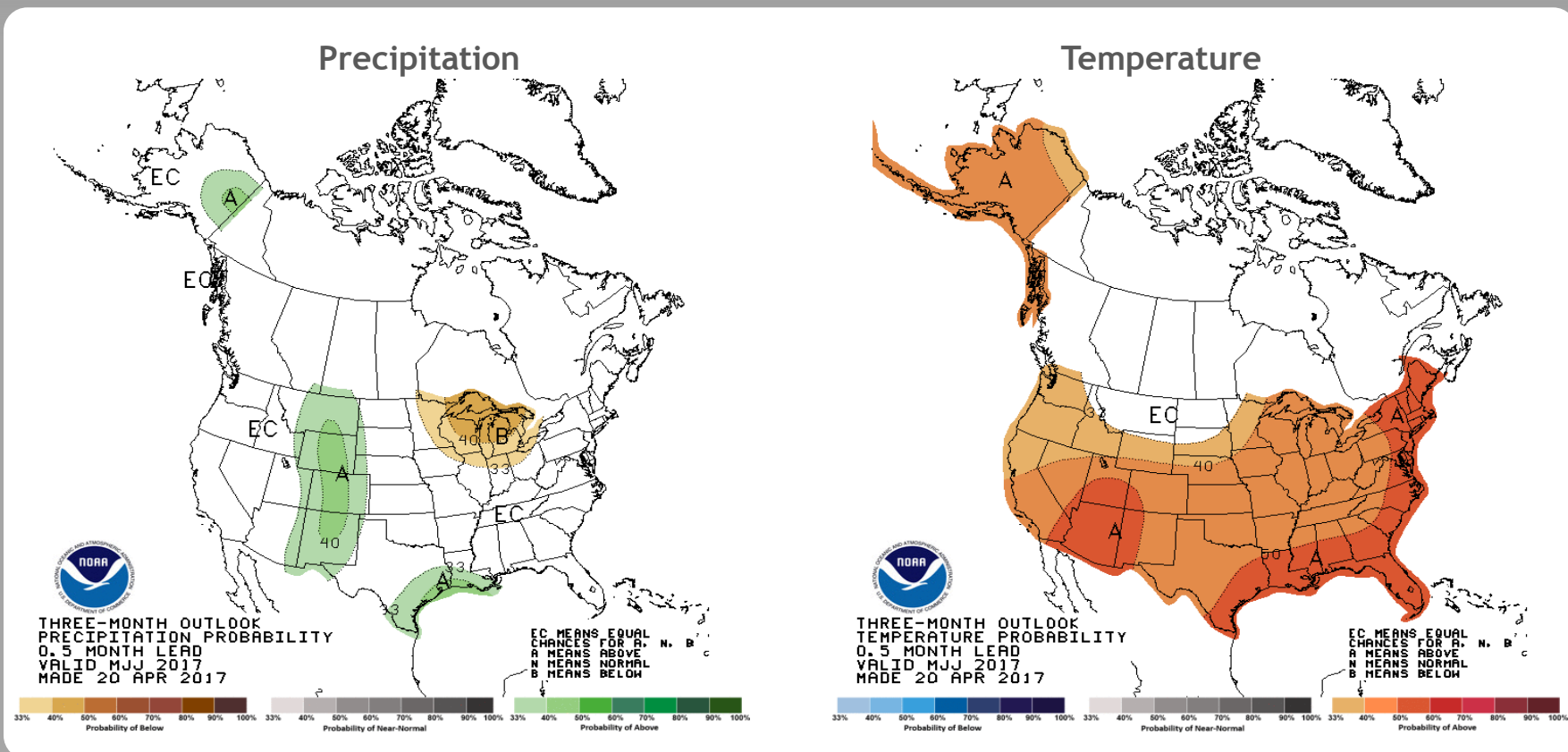
Temperature Departures (degree C)



U. S. Seasonal Outlooks

May - July 2017

The seasonal outlooks combine the effects of long-term trends, soil moisture, and, when appropriate, ENSO.



Summary

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ENSO-neutral conditions are present.*

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ENSO-neutral conditions are favored to continue through at least the Northern Hemisphere spring 2017, with increasing chances for El Niño development by late summer and fall.*

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