

# ENSO: Recent Evolution, Current Status and Predictions



Update prepared by:  
Climate Prediction Center / NCEP  
3 June 2019

# Outline

Summary

Recent Evolution and Current Conditions

Oceanic Niño Index (ONI)

Pacific SST Outlook

U.S. Seasonal Precipitation and Temperature Outlooks

Summary

# Summary

## ENSO Alert System Status: El Niño Advisory

El Niño is present.\*

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

The pattern of anomalous convection and winds are consistent with El Niño.

El Niño is likely to continue through the Northern Hemisphere summer 2019 (70% chance) and fall (55-60% chance).\*

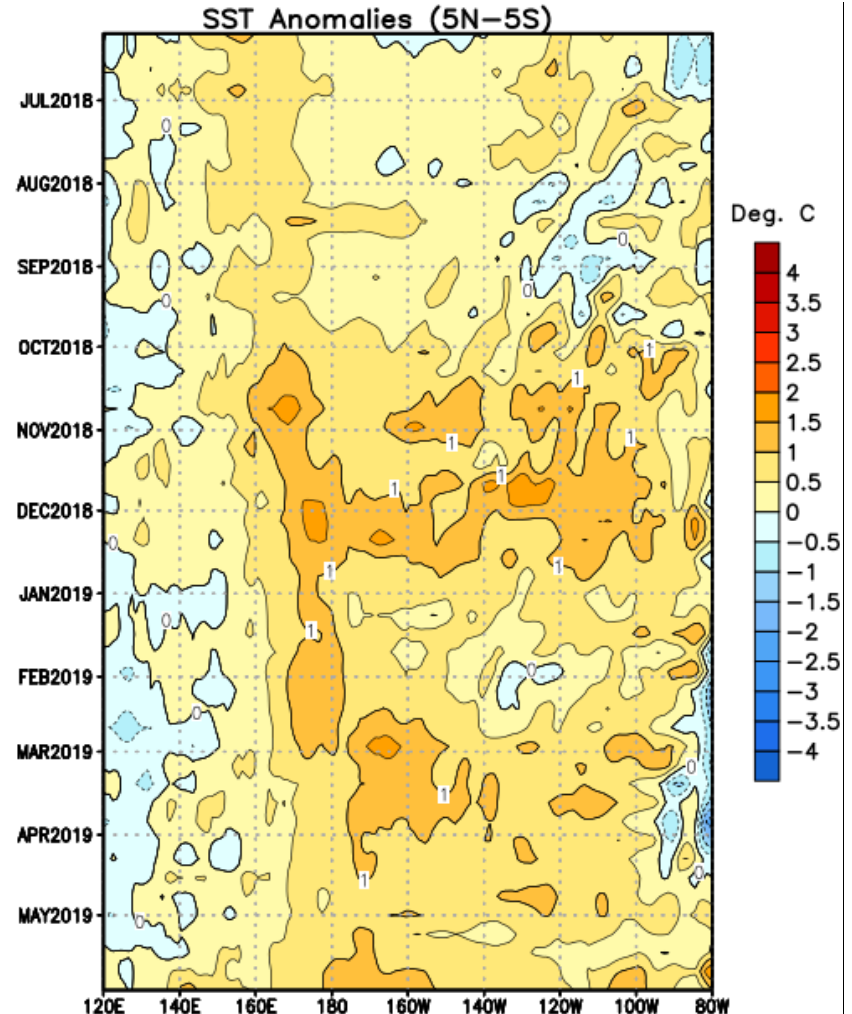
\* Note: These statements are updated once a month (2<sup>nd</sup> Thursday of each month) in association with the ENSO Diagnostics Discussion, which can be found by clicking [here](#).

# Recent Evolution of Equatorial Pacific SST Departures (°C)

Since early June 2018, 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.

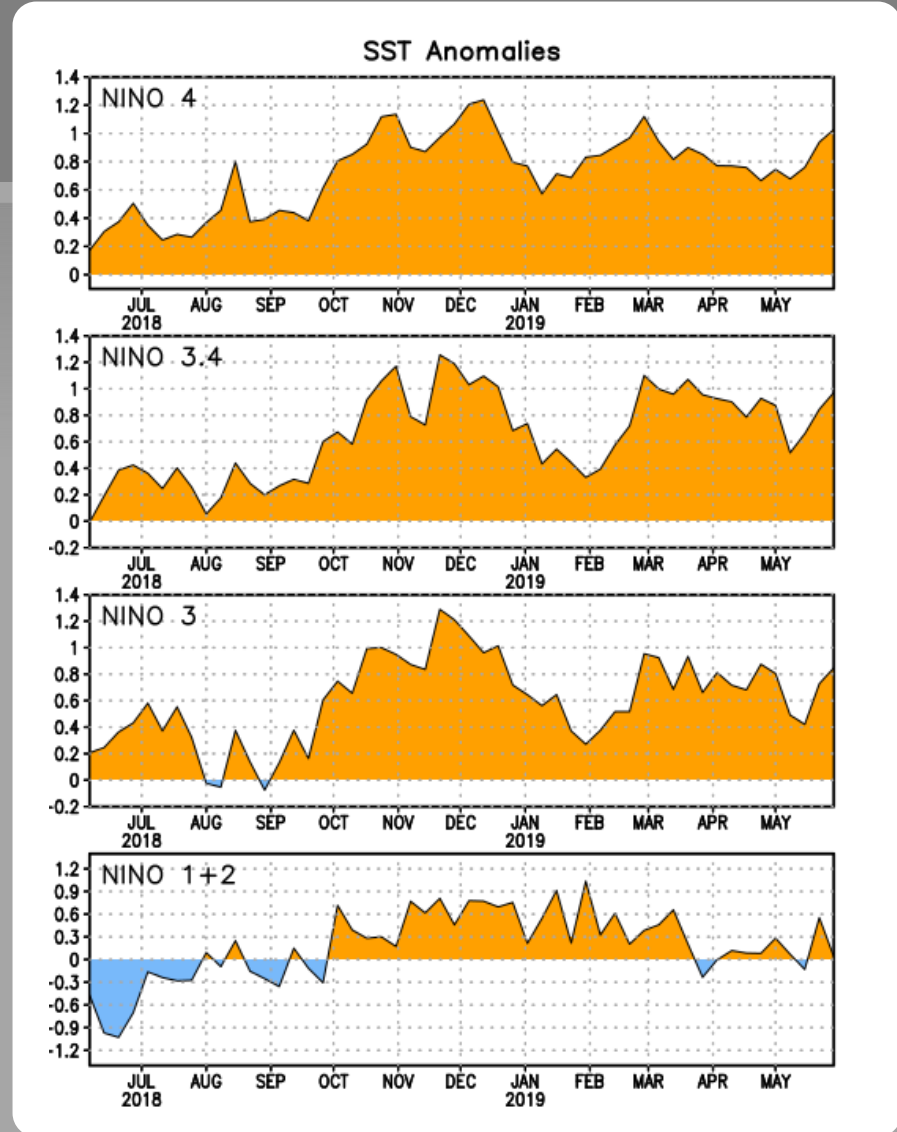
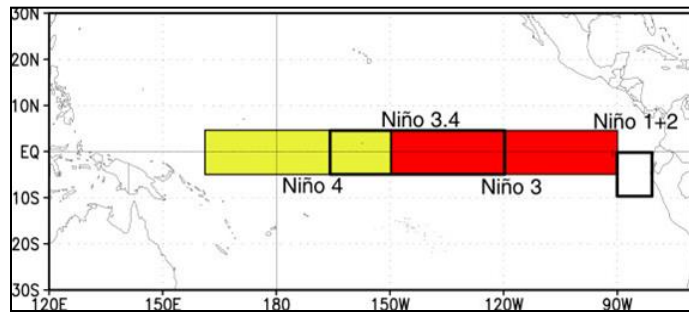
In the last several weeks, positive SST anomalies strengthened across most of the equatorial Pacific Ocean.



# Niño Region SST Departures (°C) Recent Evolution

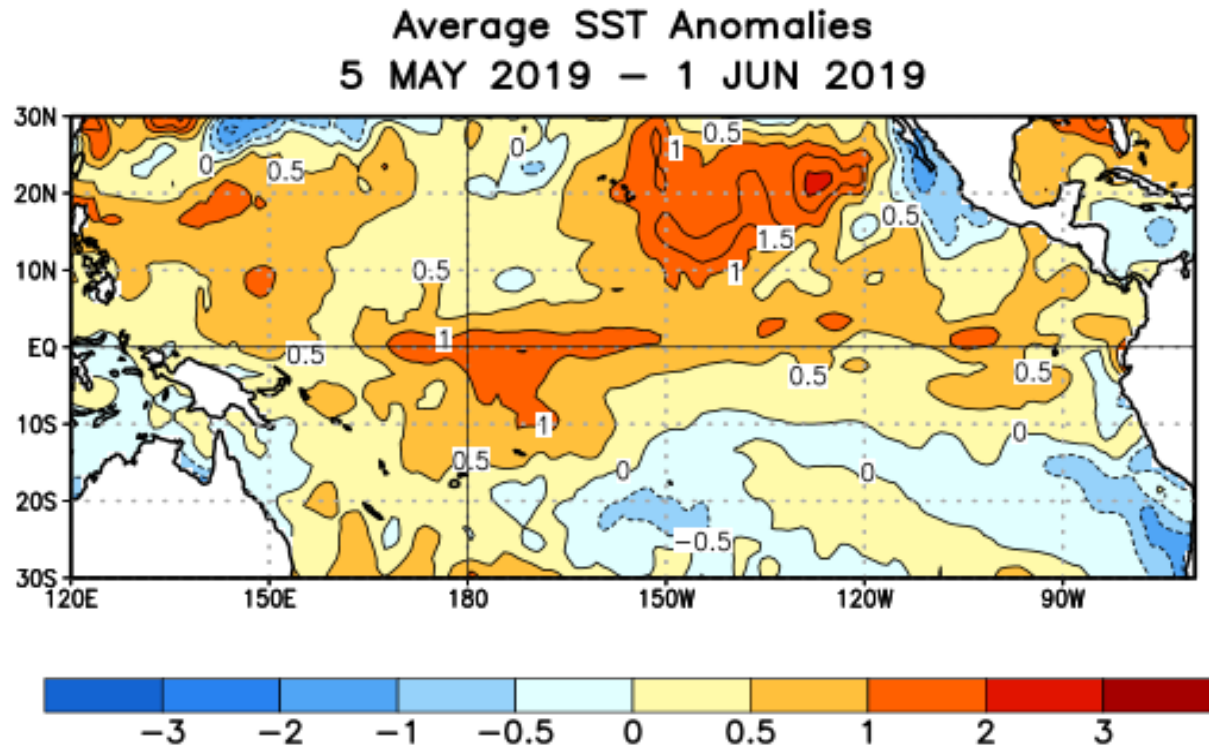
The latest weekly SST departures are:

Niño 4	1.0°C
Niño 3.4	1.0°C
Niño 3	0.8°C
Niño 1+2	0.0°C



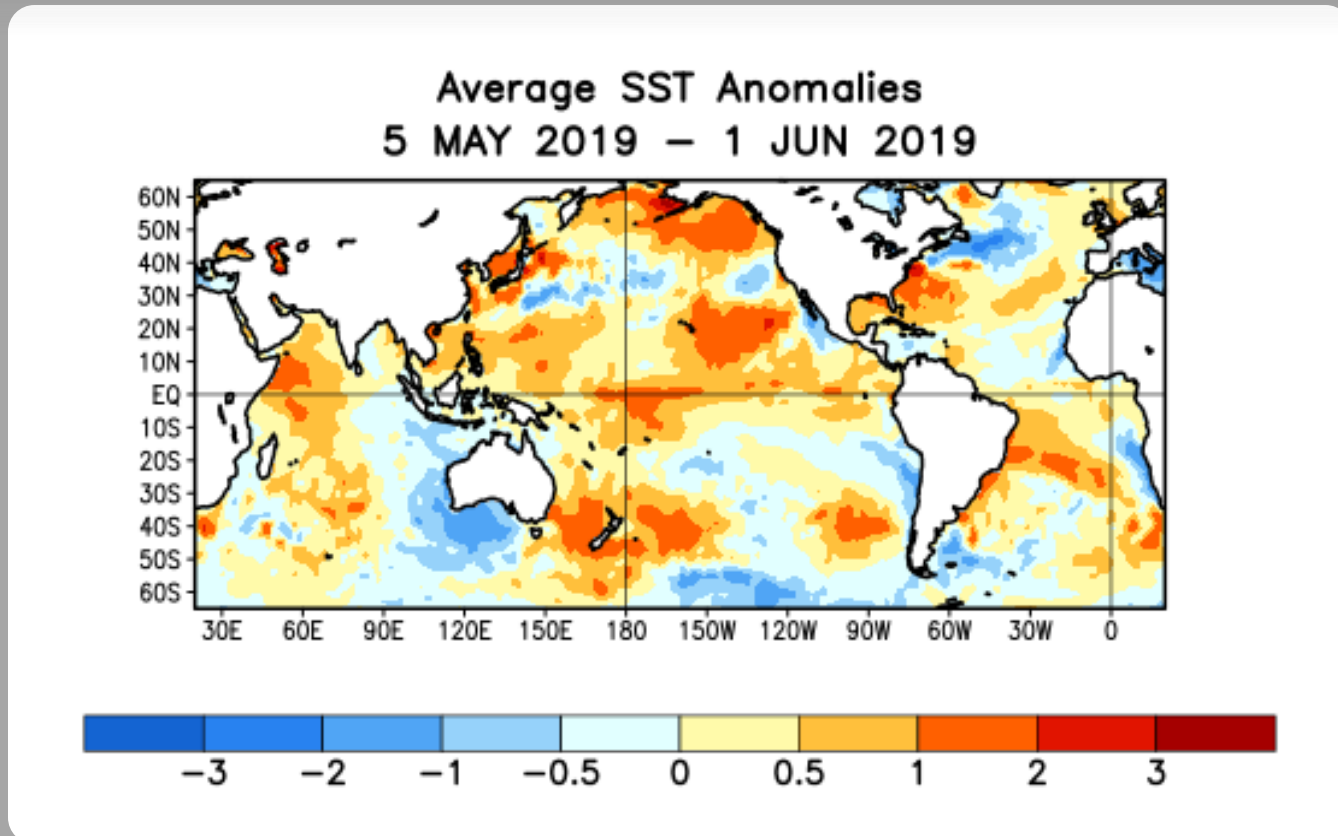
# SST Departures (°C) in the Tropical Pacific During the Last Four Weeks

During the last four weeks, equatorial SSTs were above average across most of the Pacific Ocean, with the largest departures between 170°E and 150°W. SSTs were near-to-below average around Indonesia.



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

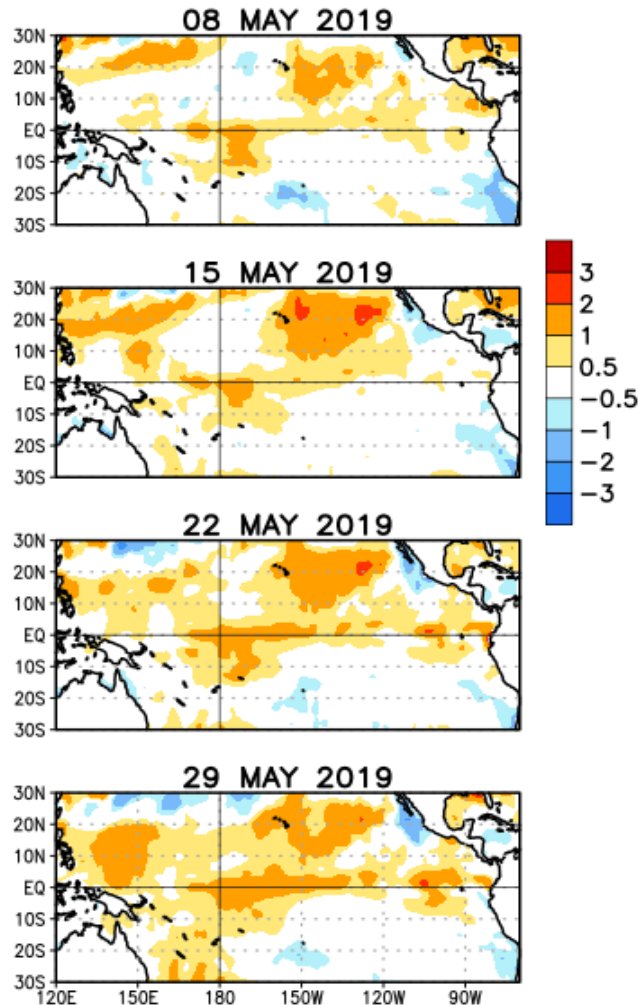
During the last four weeks, equatorial SSTs were above average across most of the Pacific Ocean and western Indian Ocean. SSTs were near-to-below average near Indonesia and the eastern Indian Ocean.



# Weekly SST Departures during the Last Four Weeks

During the last four weeks, above-average equatorial SSTs have persisted near the Date Line, while recently strengthening in the eastern Pacific.

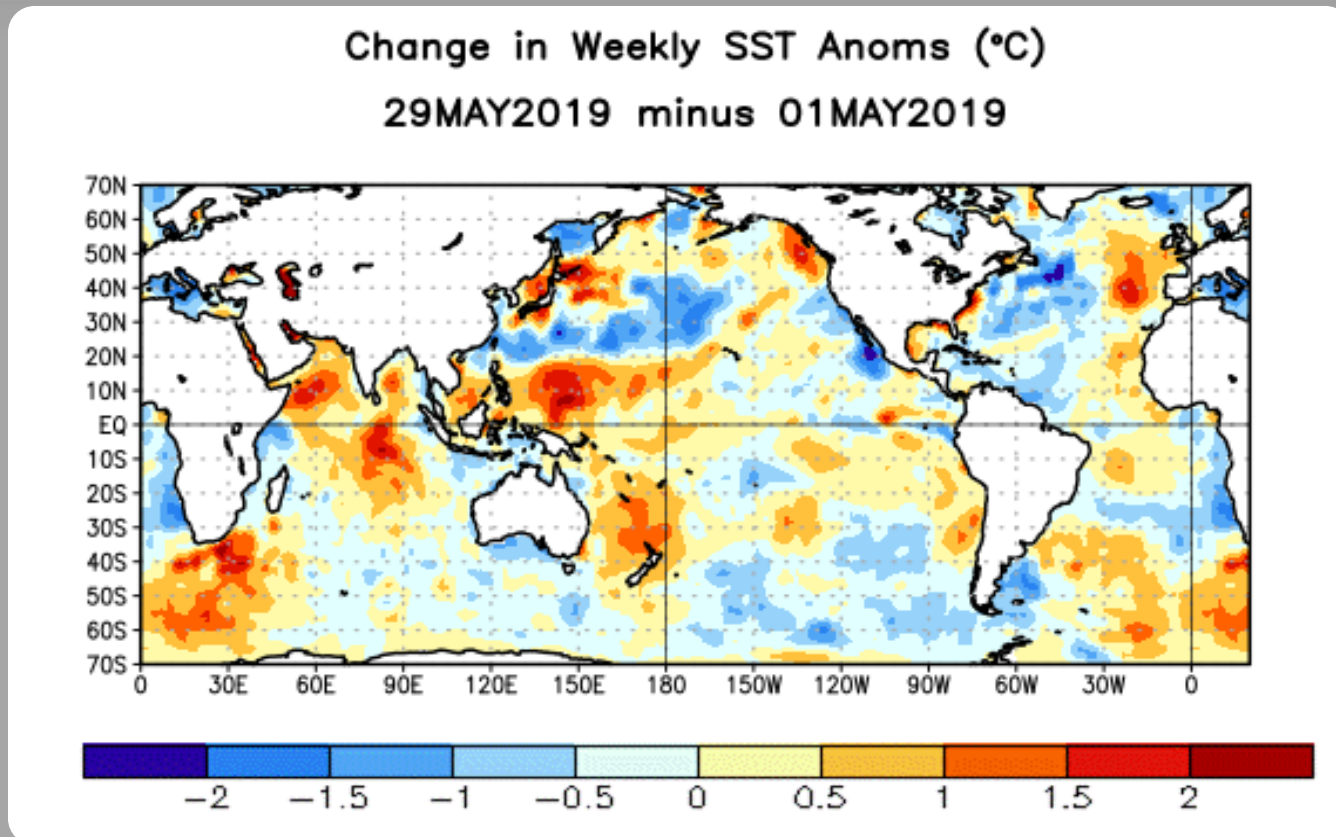
### Weekly SST Anomalies (DEG C)





# Change in Weekly SST Departures over the Last Four Weeks

During the last four weeks, weak, local changes in SST anomalies were evident across the equatorial Pacific.



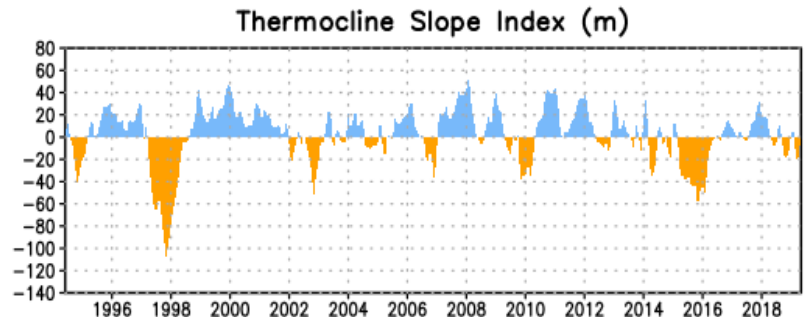
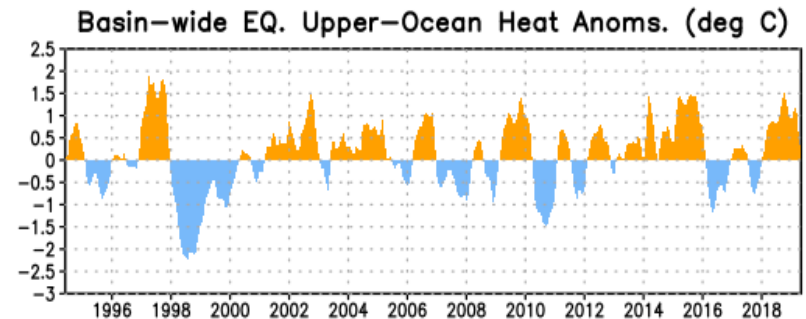
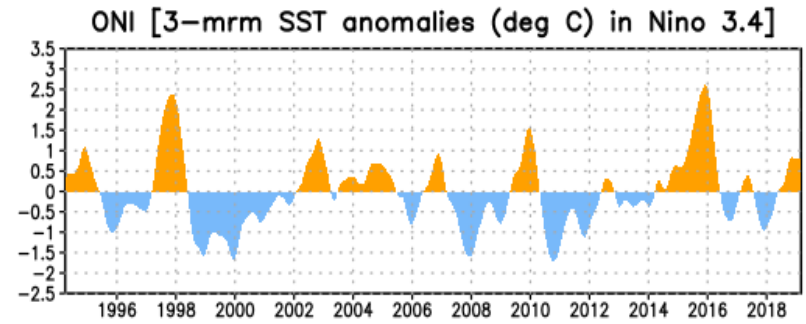
# Upper-Ocean Conditions in the Equatorial Pacific

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.

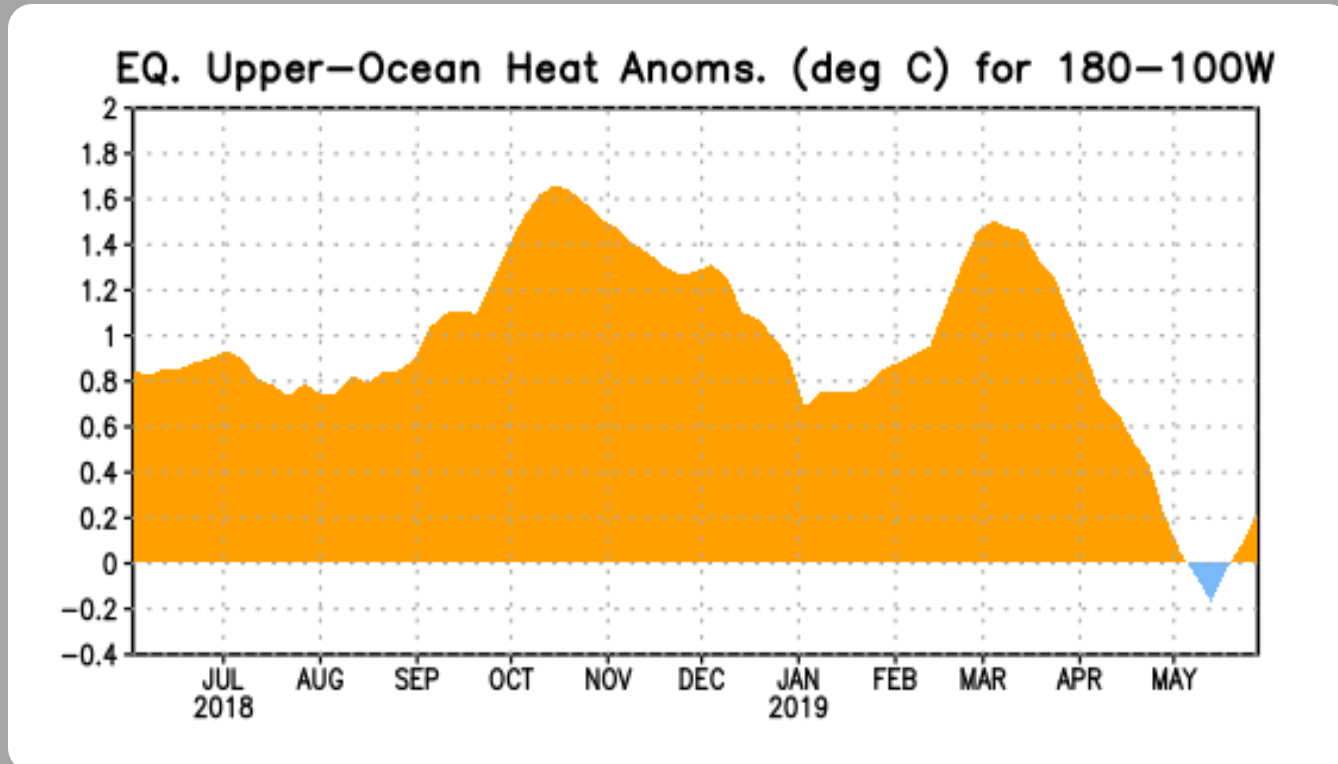
Recent values of the upper-ocean heat anomalies (above average) and thermocline slope index (below average) reflect El Niño.

*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).*



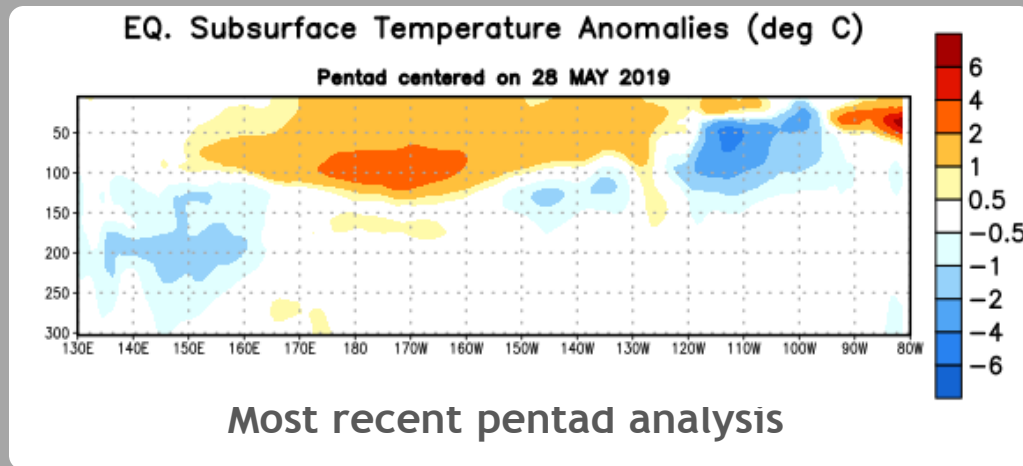
# Central and Eastern Pacific Upper-Ocean (0-300 m) Weekly Average Temperature Anomalies

Positive subsurface temperature anomalies have been present for more than a year, with a peak in October and a minimum in early January 2019. Positive anomalies increased in January and February, and have decreased since March. Since late April, temperatures have been near average.

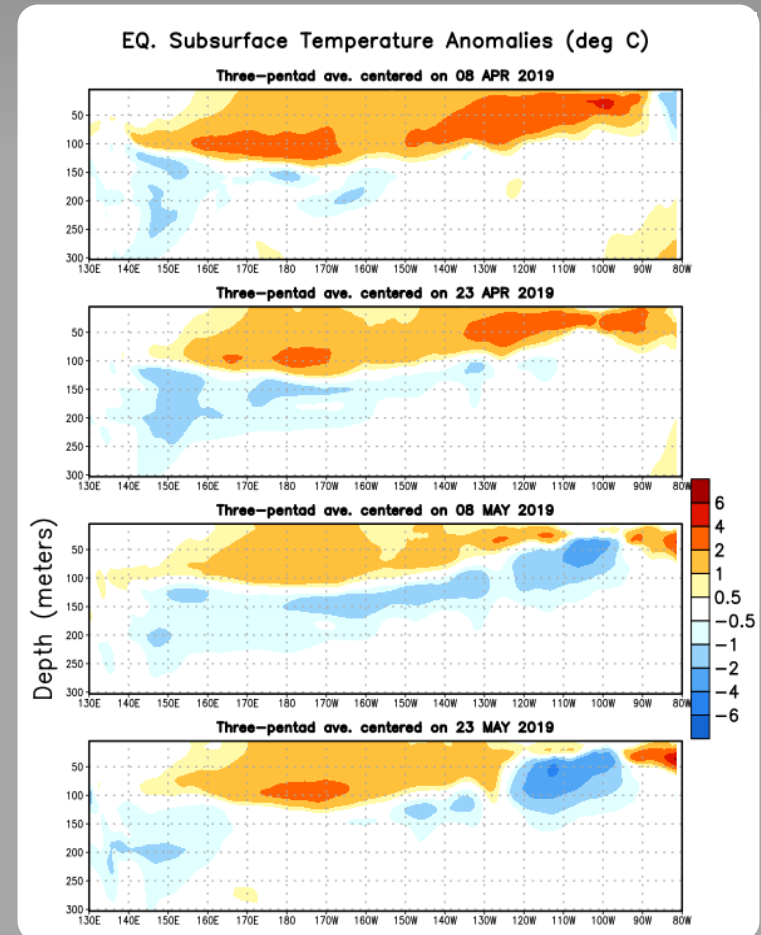


# Sub-Surface Temperature Departures in the Equatorial Pacific

In the last two months, positive subsurface temperature anomalies have weakened, but still reside near the surface across most of the Pacific.



Negative subsurface temperature anomalies have strengthened and are strongest just below the surface around 120°-100°W

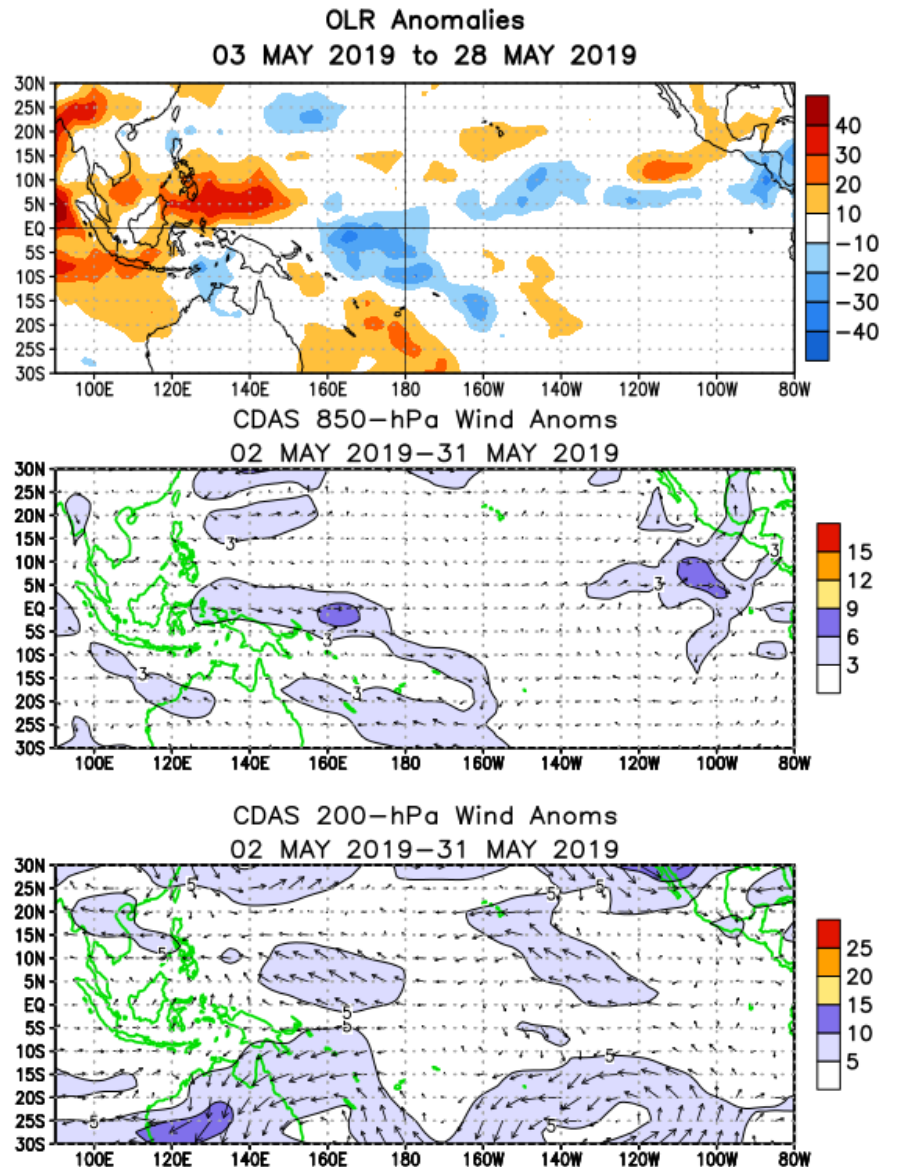


# Tropical OLR and Wind Anomalies During the Last 30 Days

Positive OLR anomalies (suppressed convection and precipitation) were evident around the Philippines, Malaysia, and Indonesia. Negative OLR anomalies (enhanced convection and precipitation) were present over the Date Line and west-central equatorial Pacific.

Low-level (850-hPa) westerly wind anomalies were evident in the western equatorial Pacific Ocean.

Upper-level (200-hPa) easterly wind anomalies were present across the western and east-central 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.

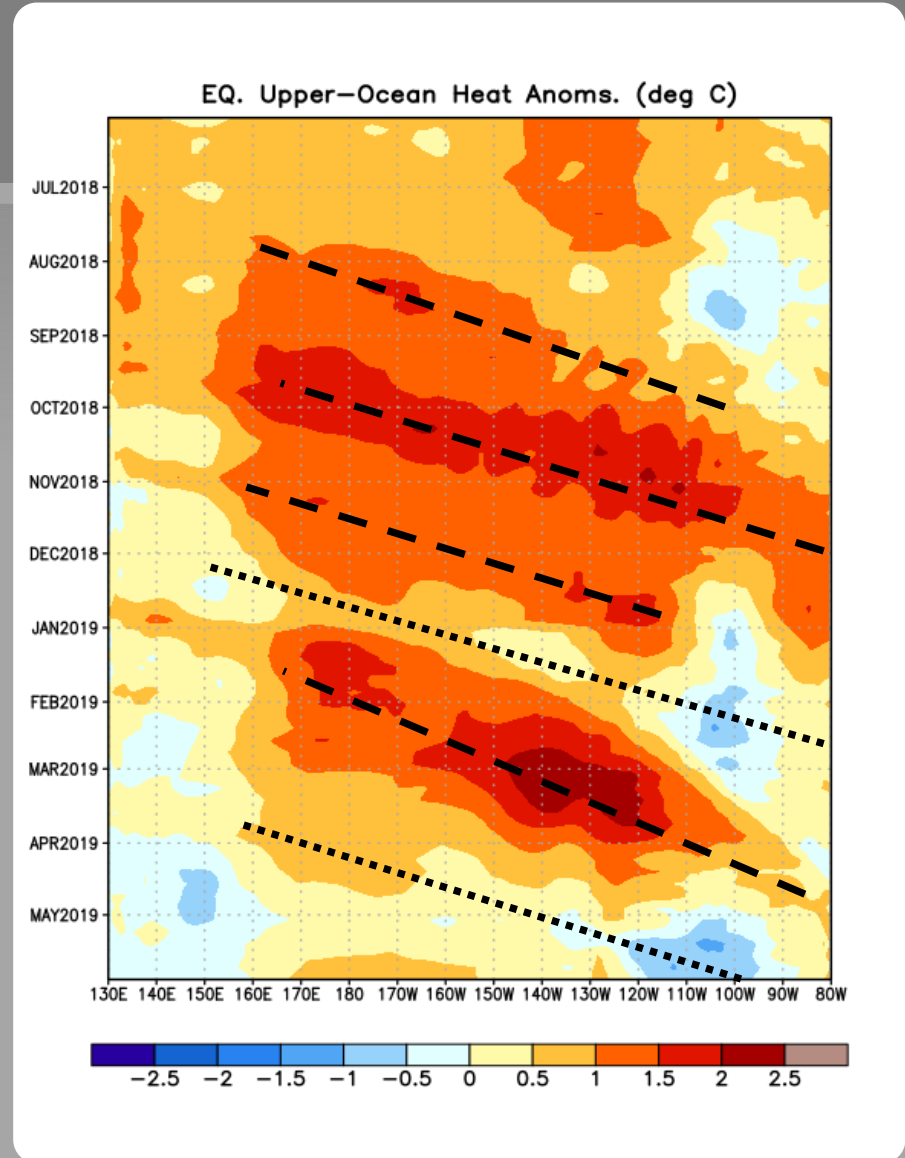
# Weekly Heat Content Evolution in the Equatorial Pacific

In early August, October, November 2018 and in January-March 2019, positive subsurface temperature anomalies increased, partly due to downwelling Kelvin waves.

In the last month or so, an upwelling Kelvin wave contributed to the reduction of positive subsurface anomalies and emergence of negative anomalies around 120°-100°W.

In the last couple of weeks, positive subsurface anomalies have strengthened near the Date Line.

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 up-welling and cooling occur in the trailing portion.



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

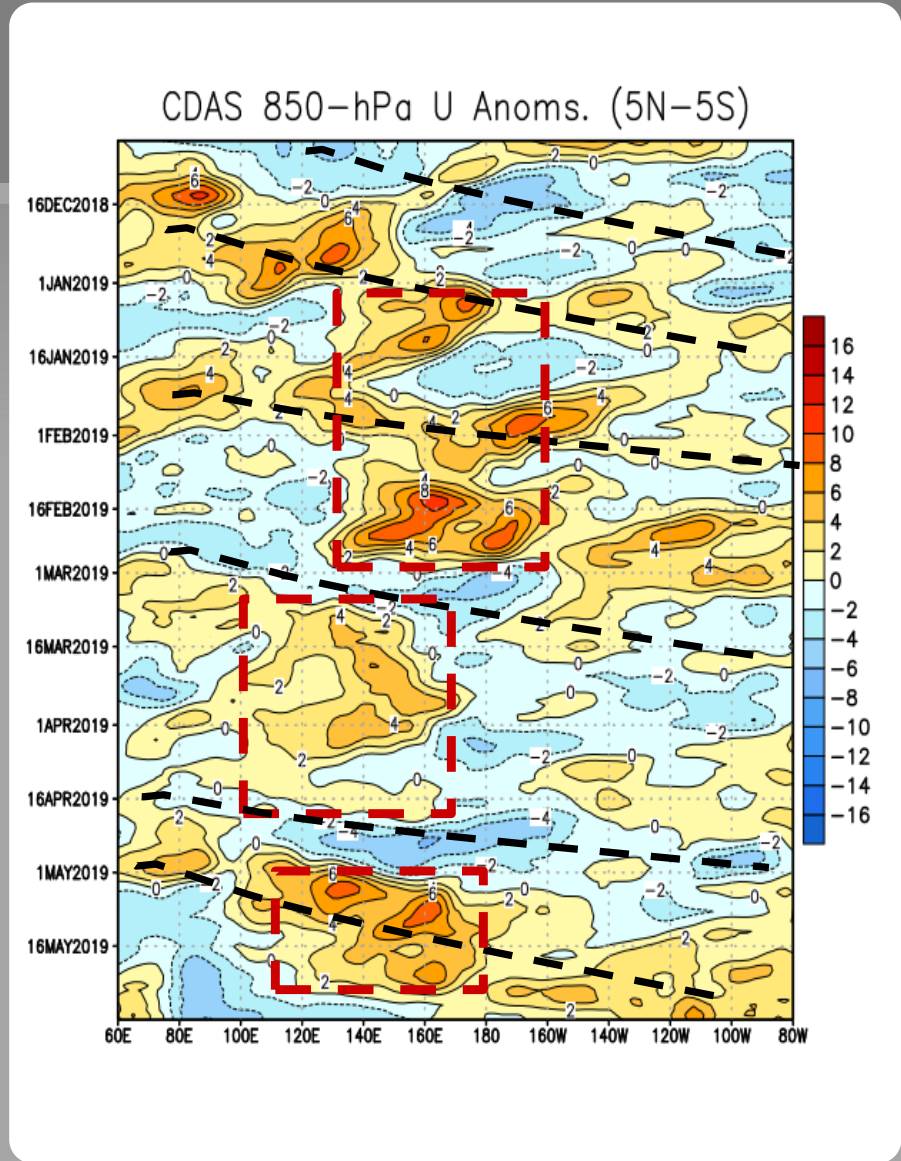
At times, the Madden Julian Oscillation (MJO) has contributed to the eastward propagation of low-level wind anomalies.

During January-February 2019, westerly wind anomalies generally persisted over the west-central equatorial Pacific Ocean.

In the last week, westerly wind anomalies were observed over the eastern equatorial Pacific Ocean, while easterly wind anomalies were evident over the western Pacific.

Westerly Wind Anomalies (orange/red shading)

Easterly Wind Anomalies (blue shading)





# Upper-level (200-hPa) Velocity Potential Anomalies

From October through mid-March and since April 2019, eastward propagation were evident in the anomalies.

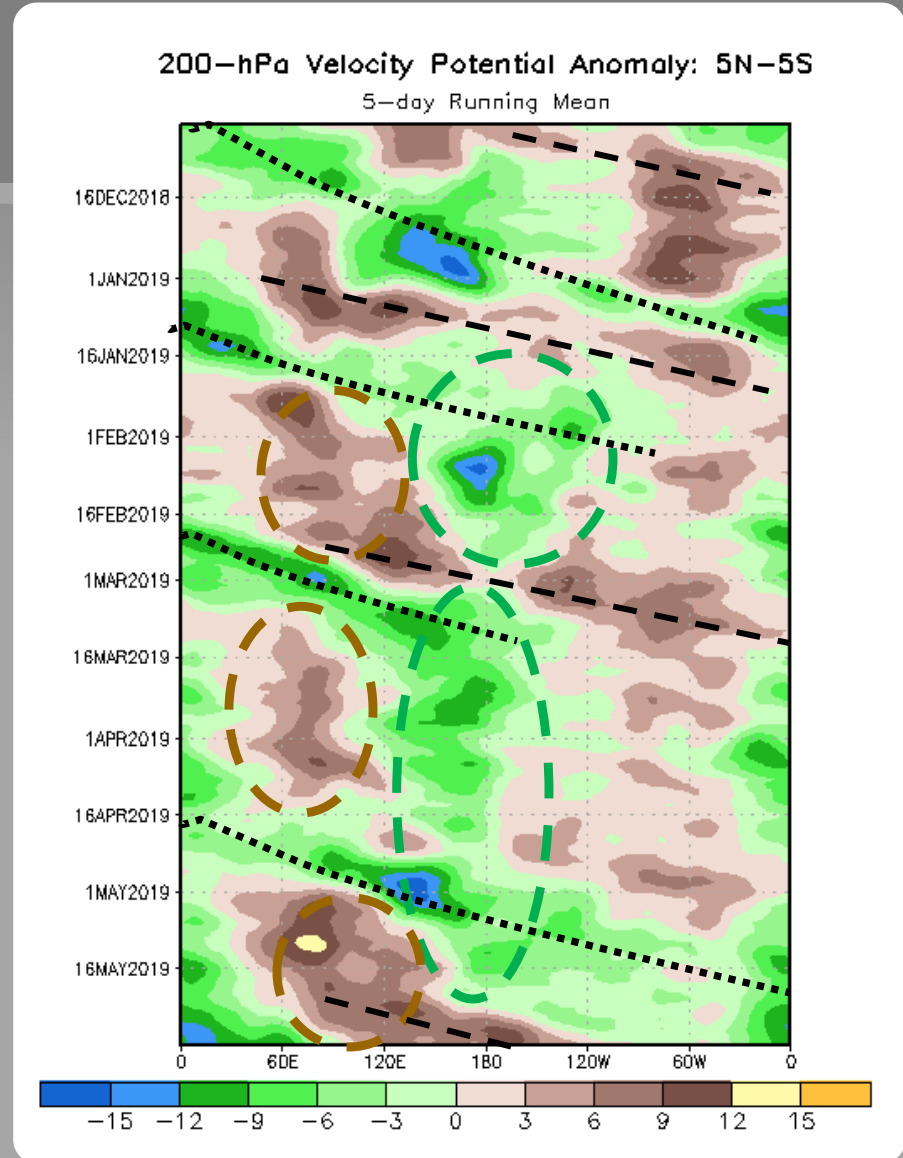
From early March to mid May 2019, anomalous upper-level divergence (green shading) persisted near the Date Line.

Since early May 2019, anomalous upper-level convergence (brown shading) has persisted near Indonesia. Recently these anomalies have expanded into 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).

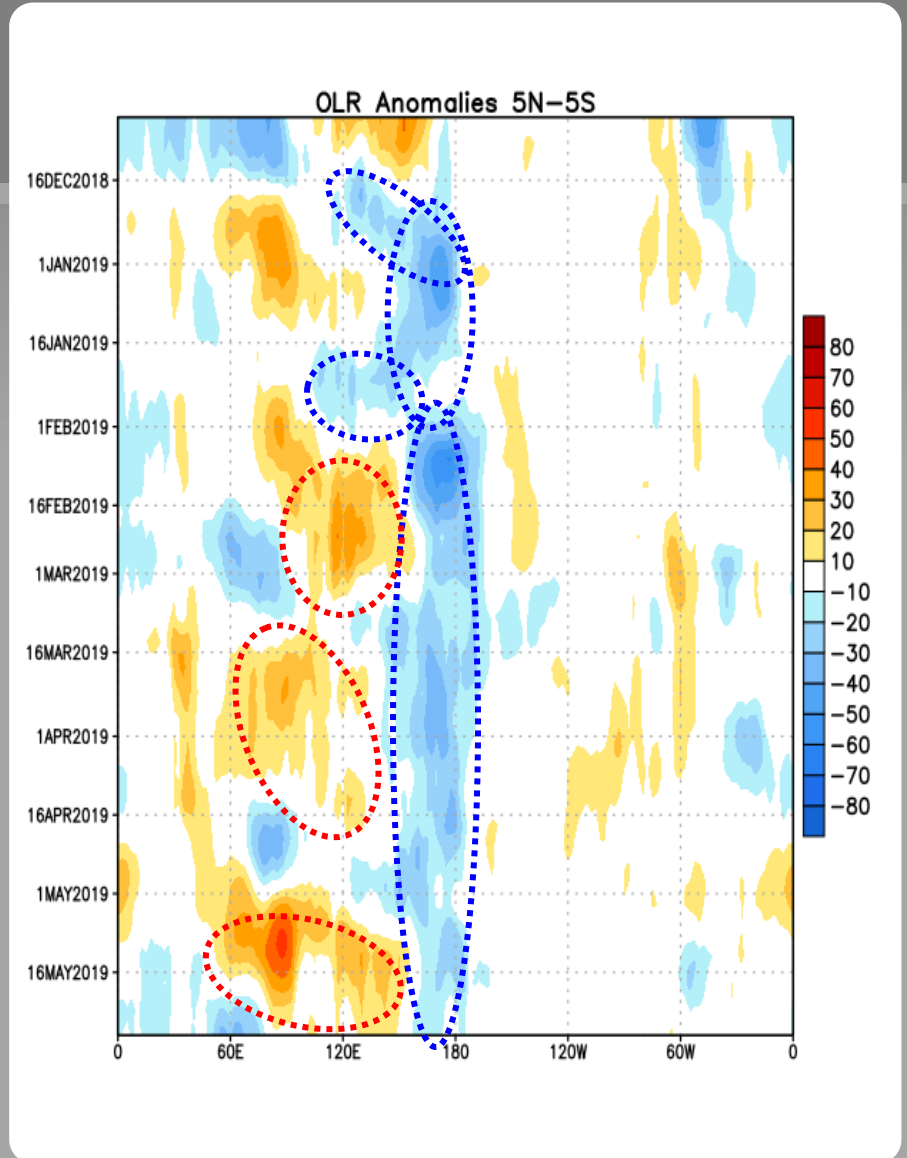


# Outgoing Longwave Radiation (OLR) Anomalies

Since mid-December 2018, negative OLR anomalies have largely persisted near the Date Line.

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

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

La Niña: characterized by a negative ONI less than or equal to  $-0.5^{\circ}\text{C}$ .

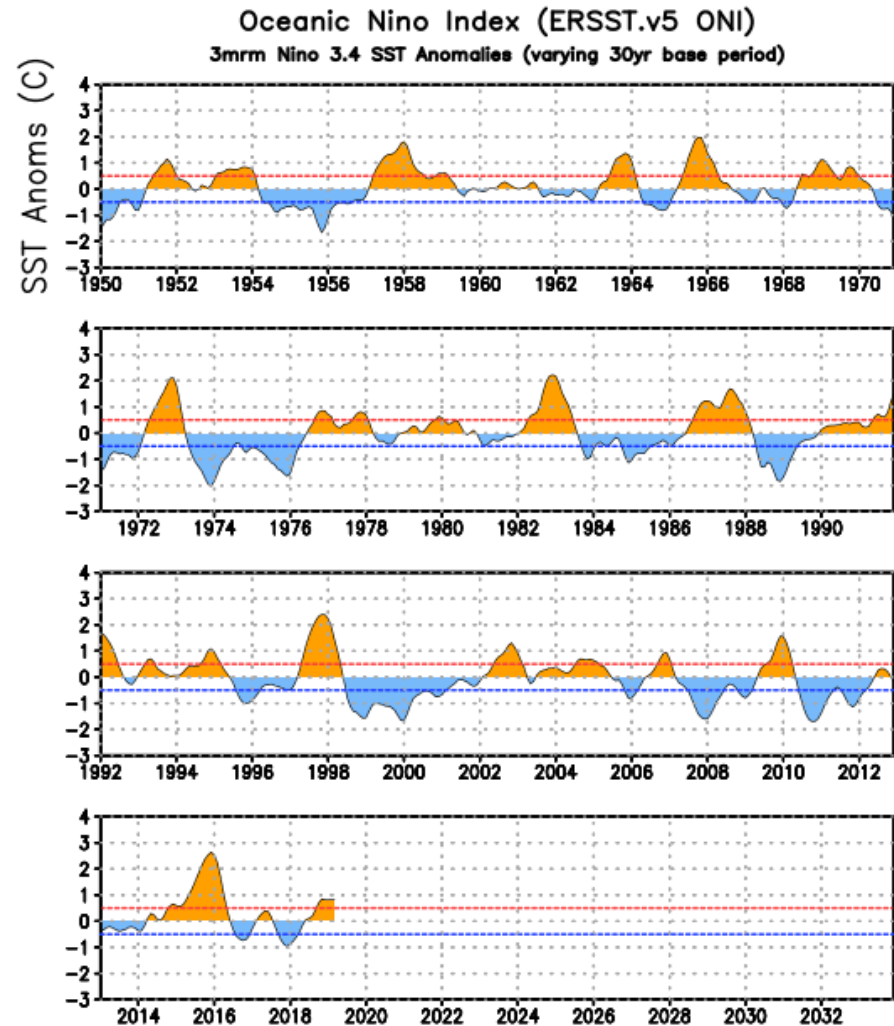
By historical standards, to be classified as a full-fledged El Niño or La Niña episode, these thresholds must be exceeded for a period of at least 5 consecutive overlapping 3-month seasons.

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 (February - April 2019) is +0.8°C.

El Niño ↑  
Neutral  
La Niña ↓

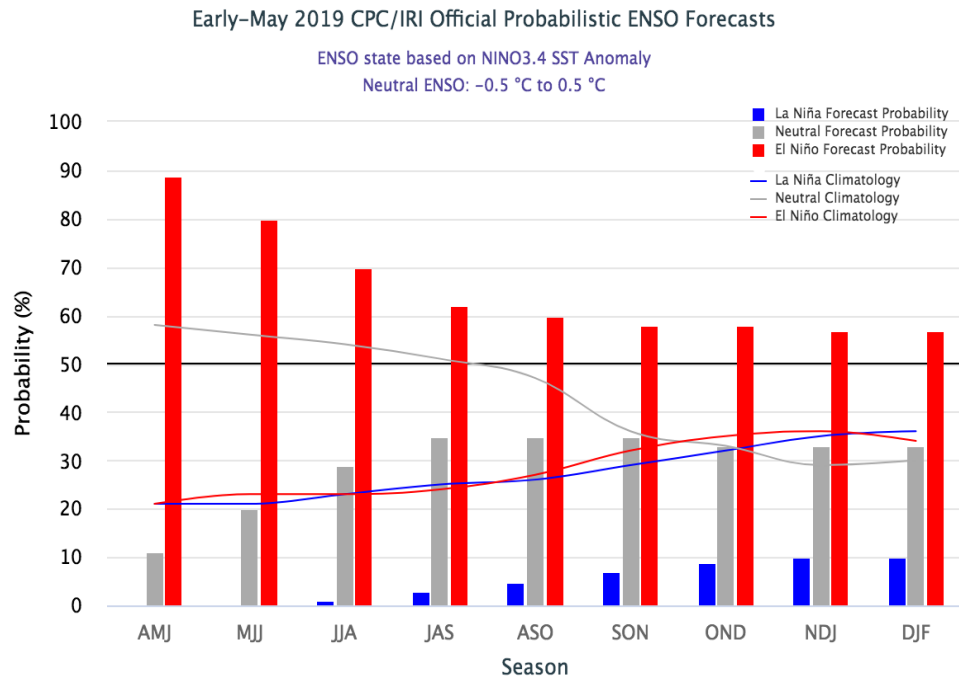




# CPC/IRI Probabilistic ENSO Outlook

Updated: 9 May 2019

El Niño conditions are favored to continue through winter 2019-20 with diminishing chances.



# IRI/CPC Pacific Niño

## 3.4 SST Model Outlook

The majority of models predict a weak El Niño to continue into the Northern Hemisphere winter 2019-20.

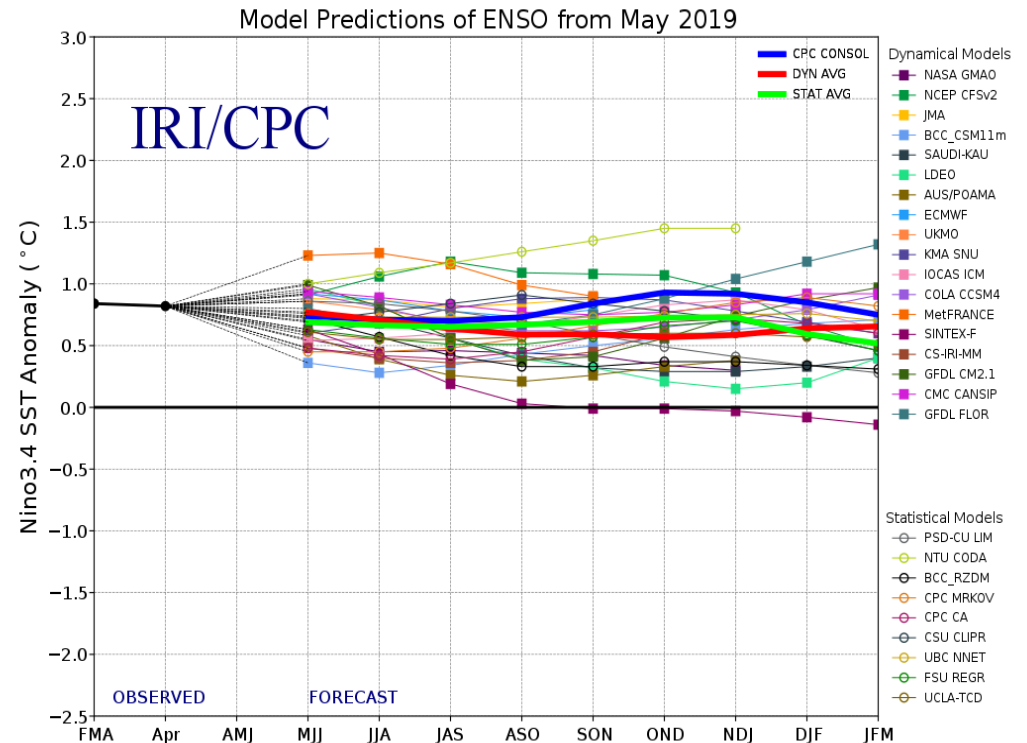


Figure provided by the International Research Institute (IRI) for Climate and Society (updated 20 May 2019).

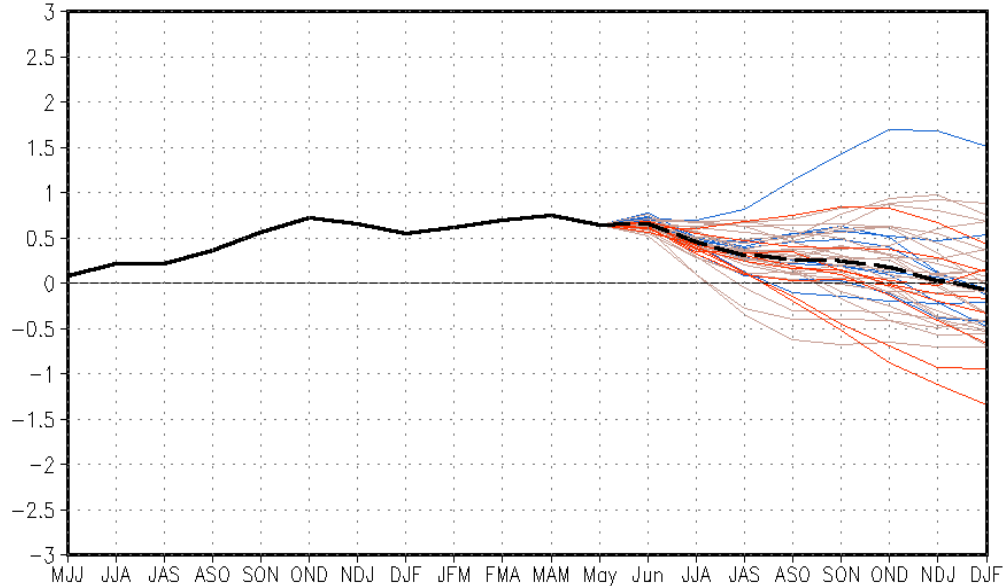


# SST Outlook: NCEP CFS.v2 Forecast (PDF corrected)

Issued: 3 June 2019

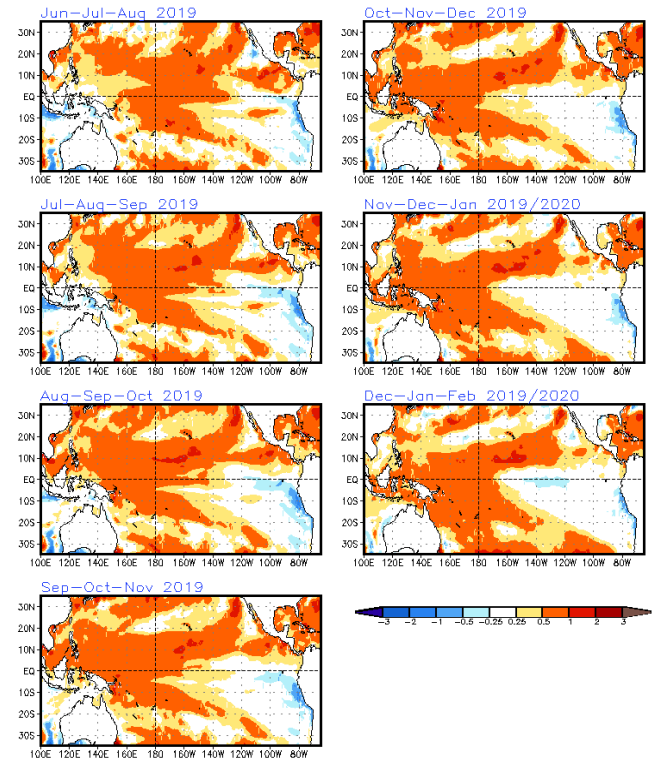
The CFS.v2 ensemble mean (black dashed line) predicts El Niño to persist into the Northern Hemisphere summer 2019, returning to Neutral thereafter.

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



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

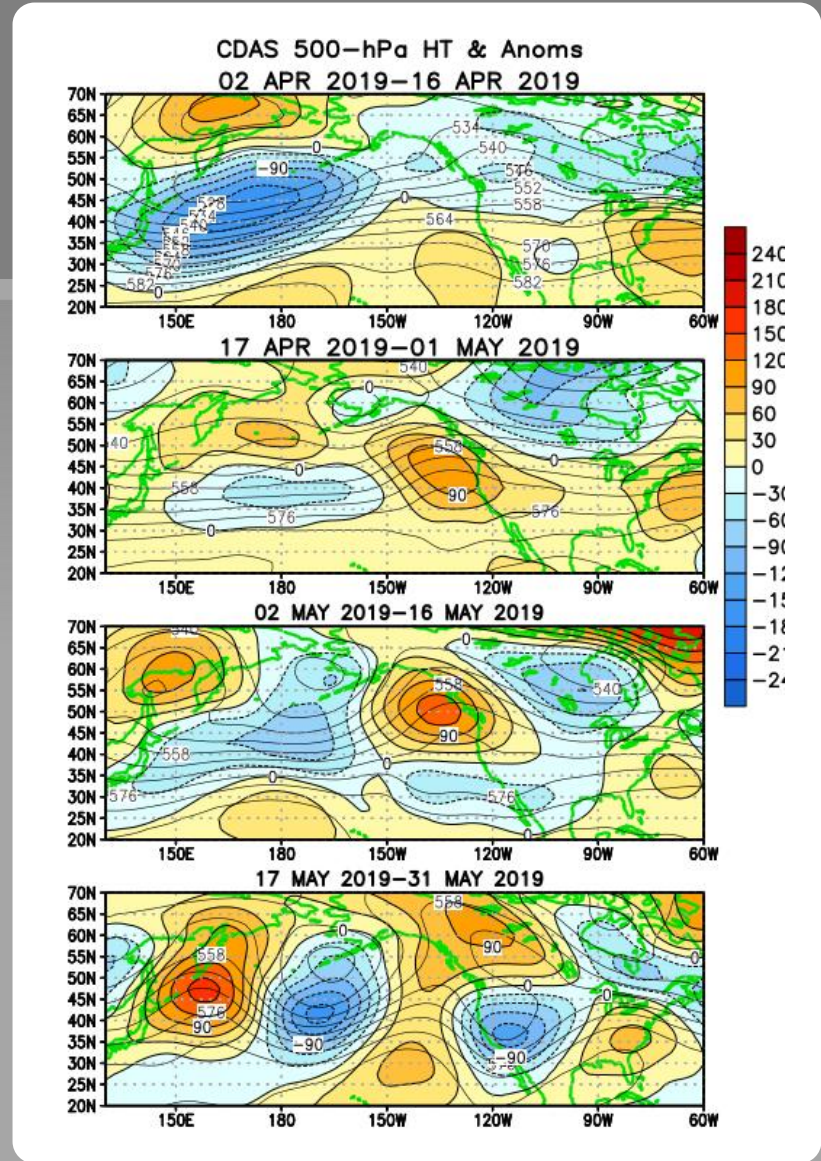
(Model bias correct base period: 1999–2010; Climatology base period: 1982–2010)



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

From April to mid May, an anomalous ridge persisted over the western and eastern U.S., associated with above-average temperatures.

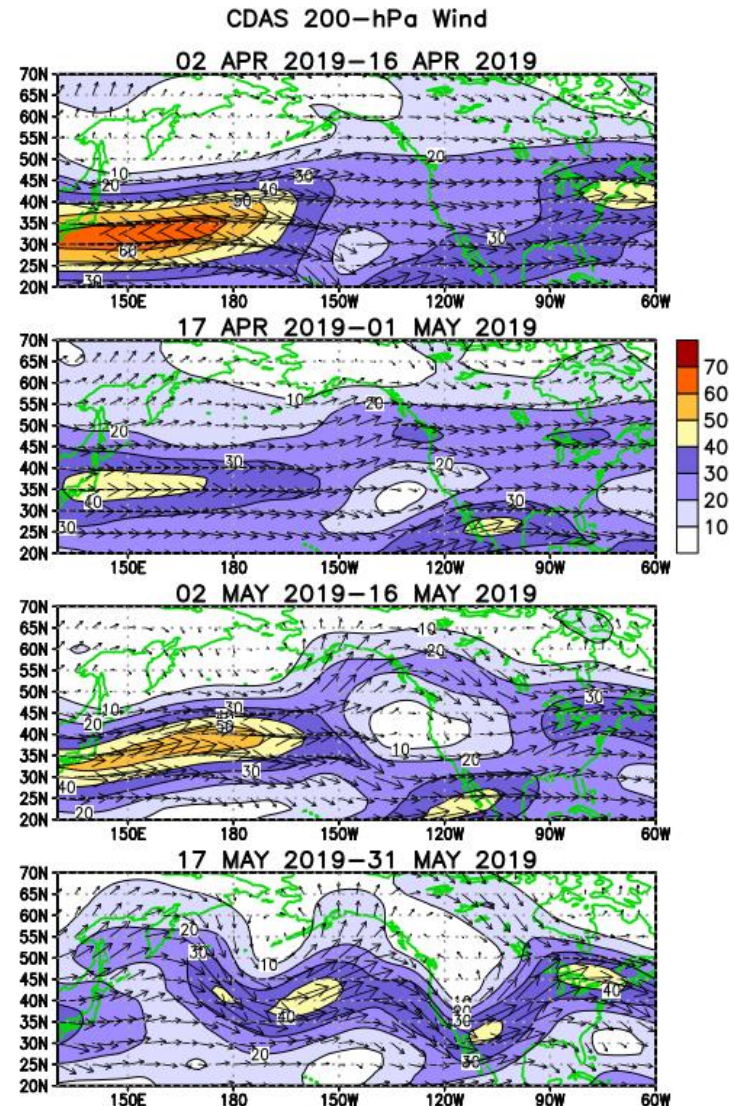
Since mid May, anomalous troughing and negative temperature anomalies expanded into the central and southwestern U.S., while above-average temperatures have persisted over the eastern U.S.



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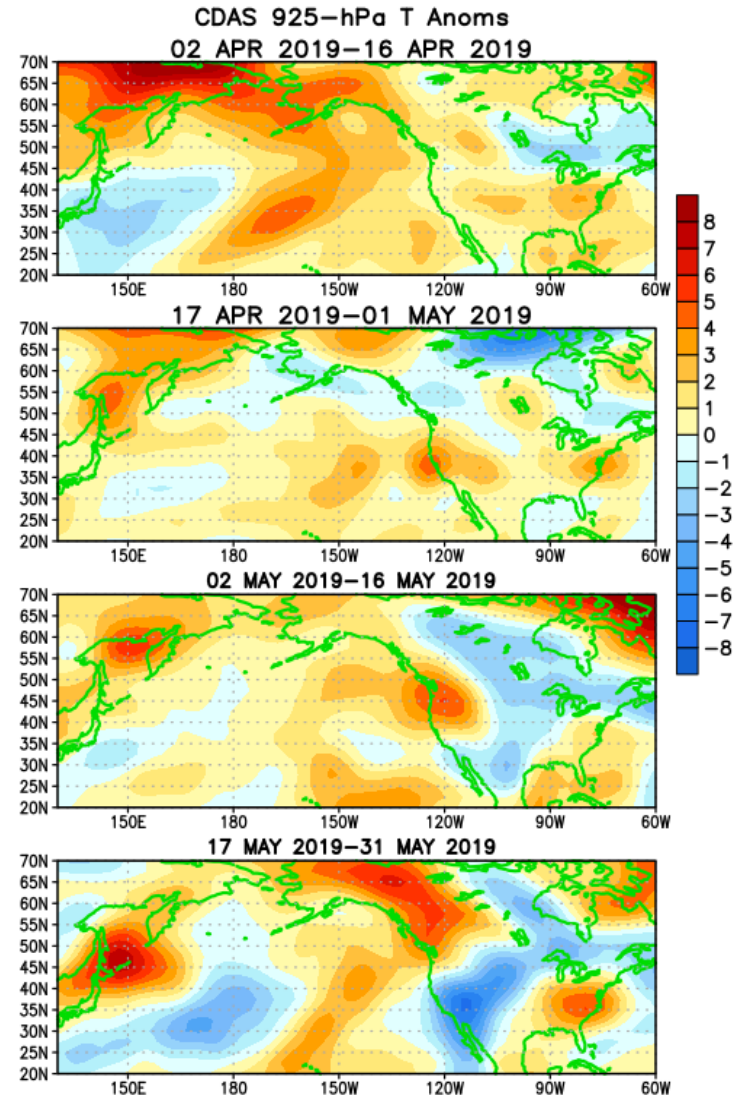
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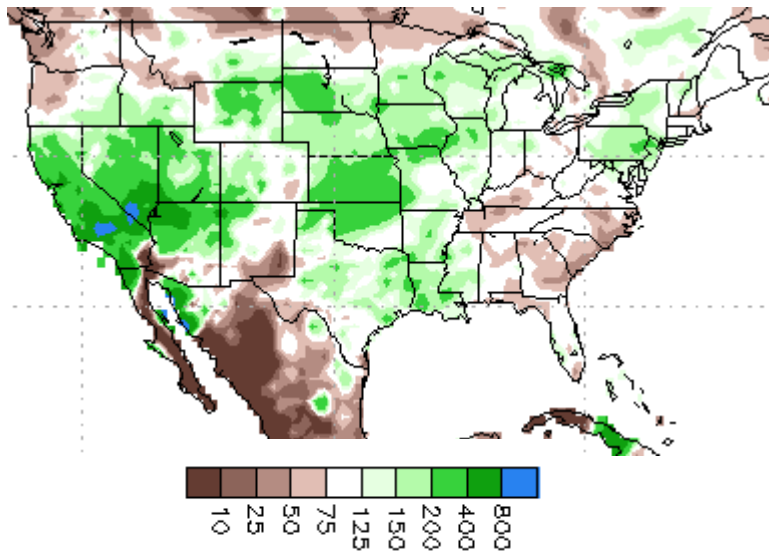
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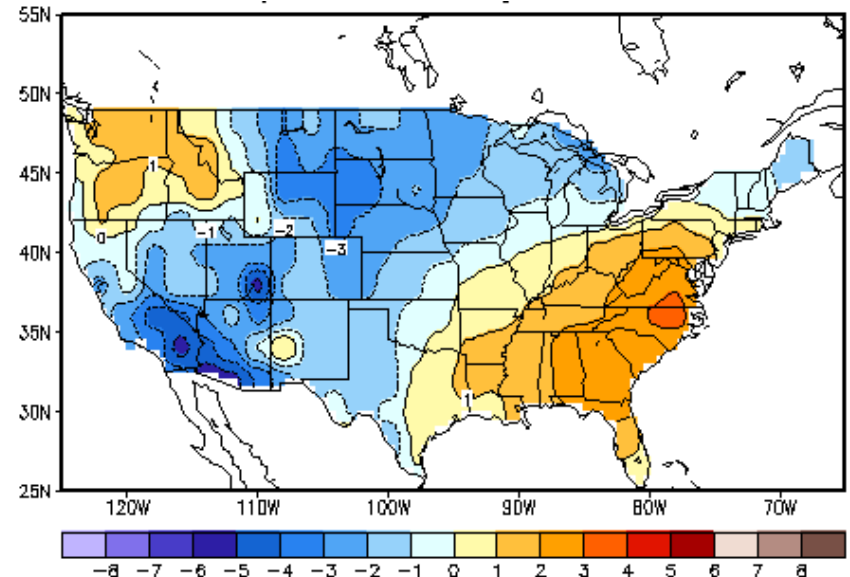
# U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 1 June 2019

### Percent of Average Precipitation



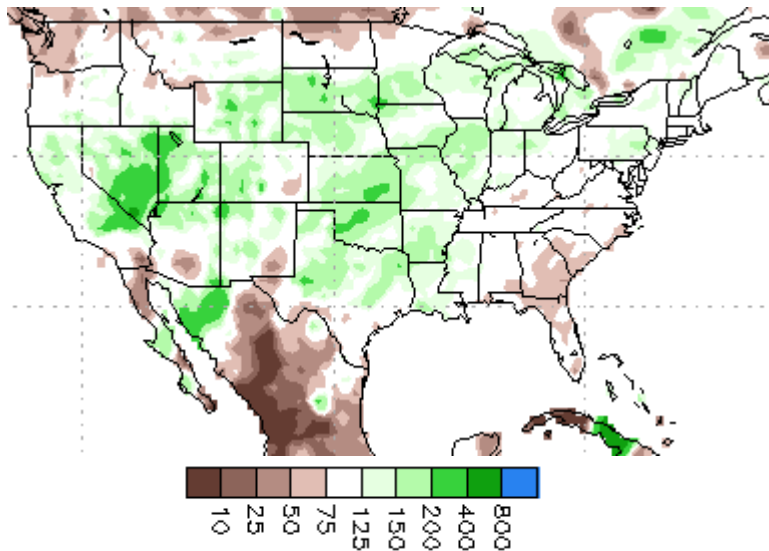
### Temperature Departures (degree C)



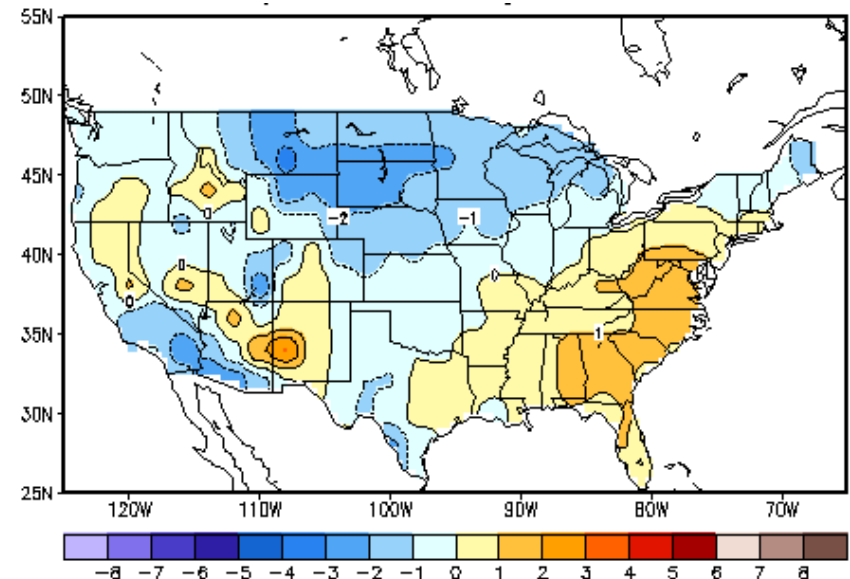
# U.S. Temperature and Precipitation Departures During the Last 90 Days

End Date: 1 June 2019

Percent of Average Precipitation



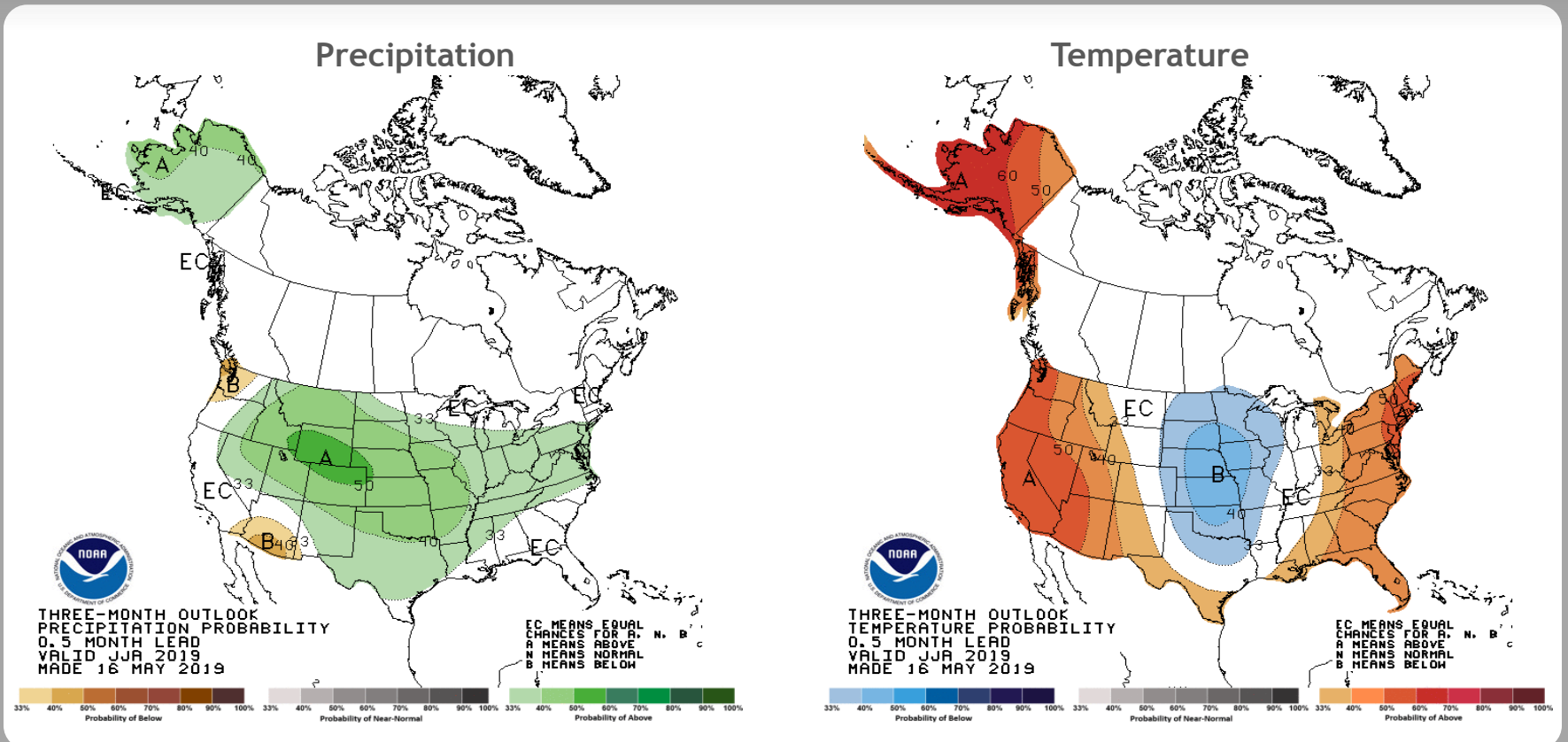
Temperature Departures (degree C)



# U. S. Seasonal Outlooks

## June-August 2019

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



# Summary

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