

ENSO: Recent Evolution, Current Status and Predictions



Update prepared by:
Climate Prediction Center / NCEP
2 July 2018

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: El Niño Watch

ENSO-neutral conditions are present.*

Equatorial sea surface temperatures (SSTs) are near-to-above average across the east-central Pacific Ocean.

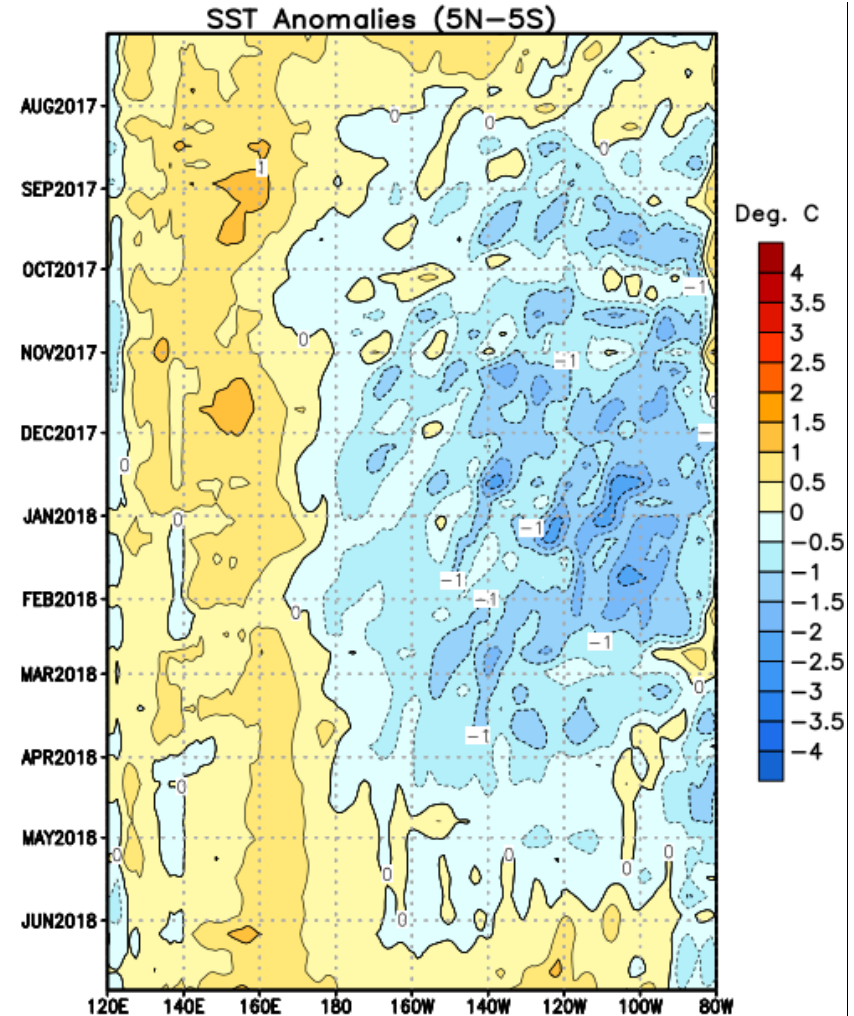
ENSO-neutral is favored through Northern Hemisphere summer 2018, with the chance for El Niño increasing to 50% during fall, and ~65% during winter 2018-19.

* 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](#).

Recent Evolution of Equatorial Pacific SST Departures (°C)

Below-average SSTs across the central and eastern Pacific persisted from September 2017 to late March 2018.

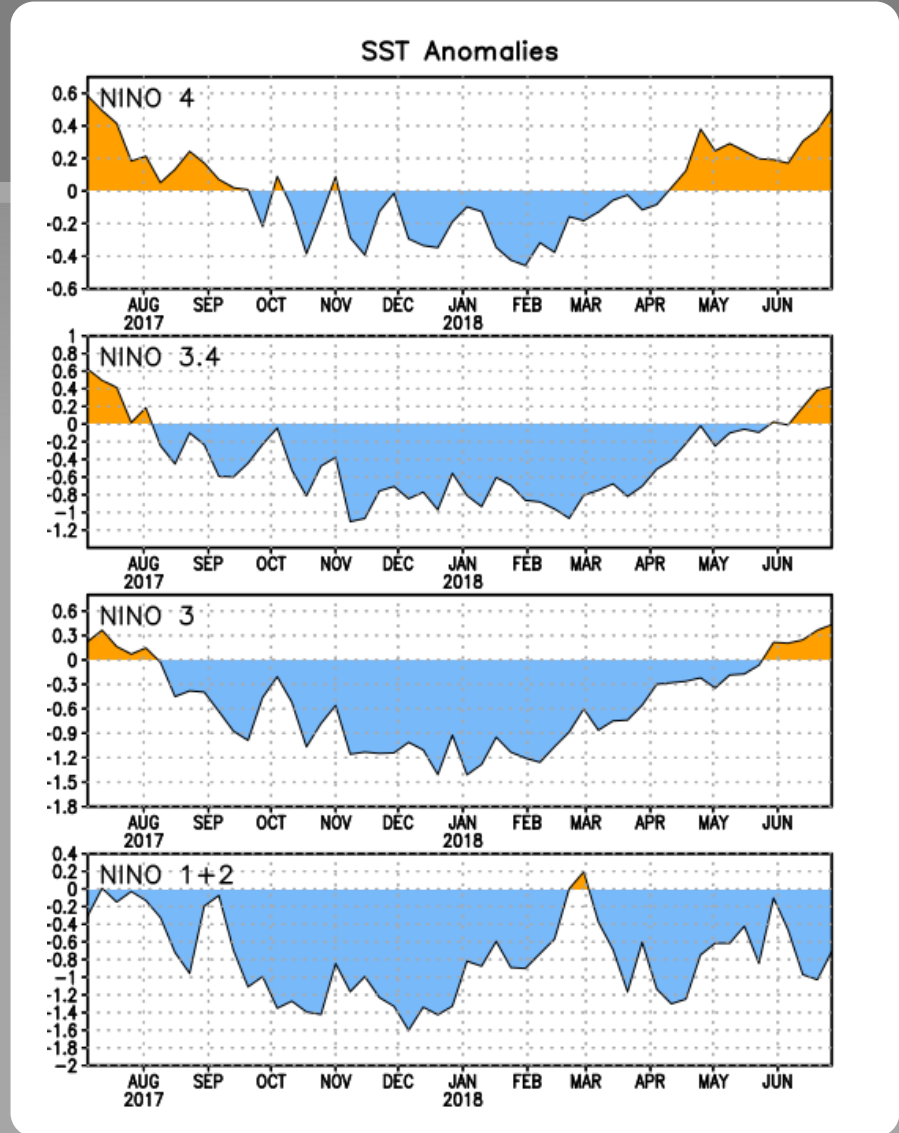
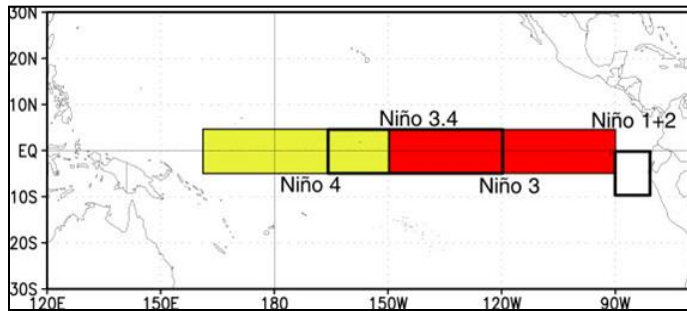
Since early June, near-to-above-average SSTs have emerged across most of the Pacific Ocean. SSTs remain below average in the far eastern Pacific Ocean.



Niño Region SST Departures (°C) Recent Evolution

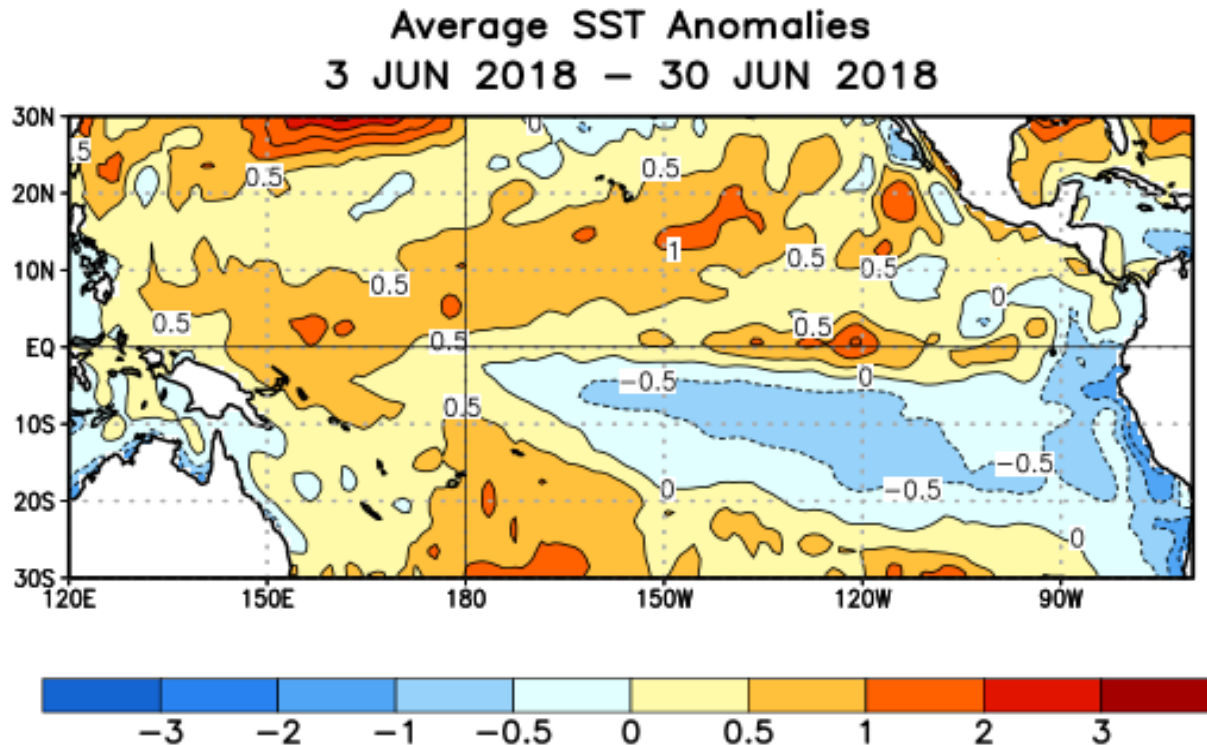
The latest weekly SST departures are:

Niño 4	0.5°C
Niño 3.4	0.4°C
Niño 3	0.4°C
Niño 1+2	-0.7°C



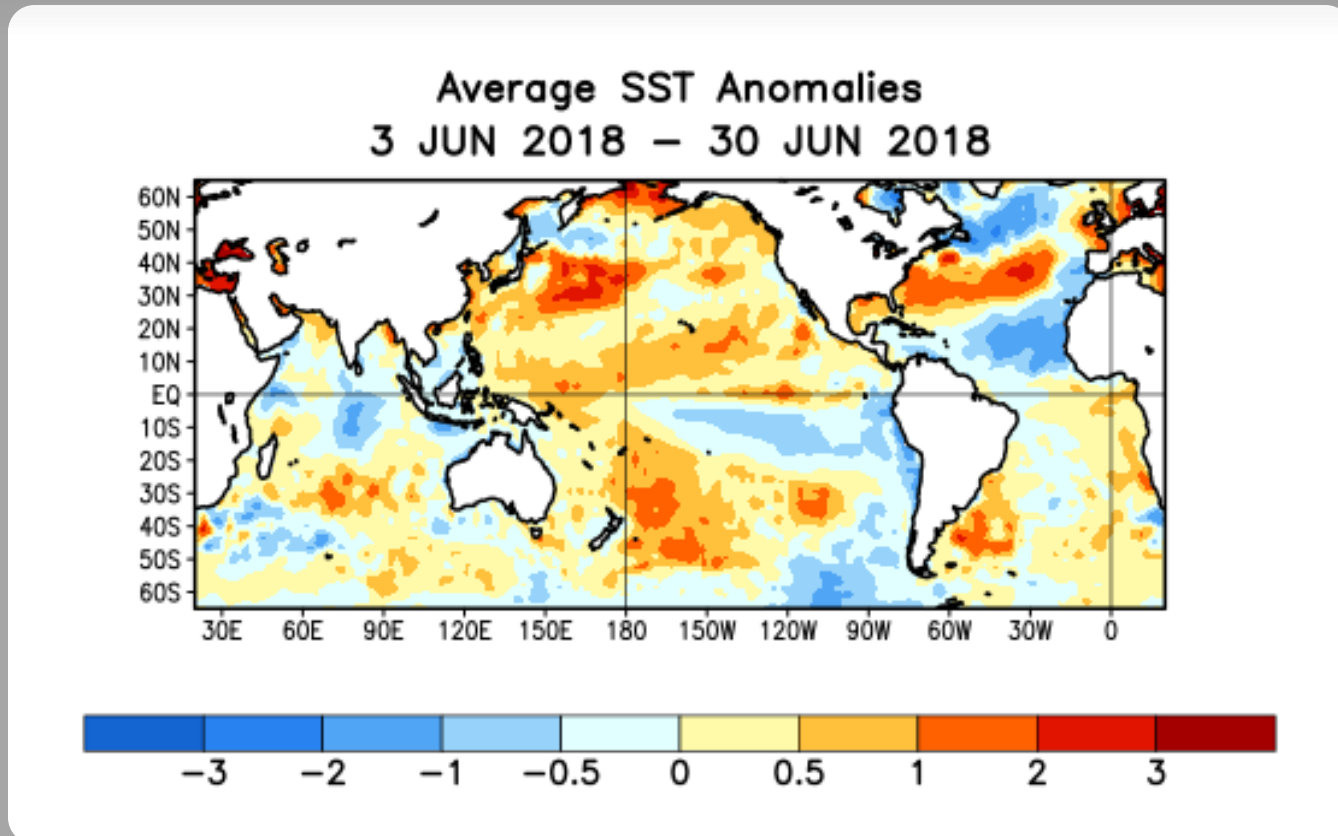
SST Departures (°C) in the Tropical Pacific During the Last Four Weeks

During the last four weeks, equatorial SSTs were near-to-above average across most of the Pacific Ocean. SSTs were below average along the South American coast.



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

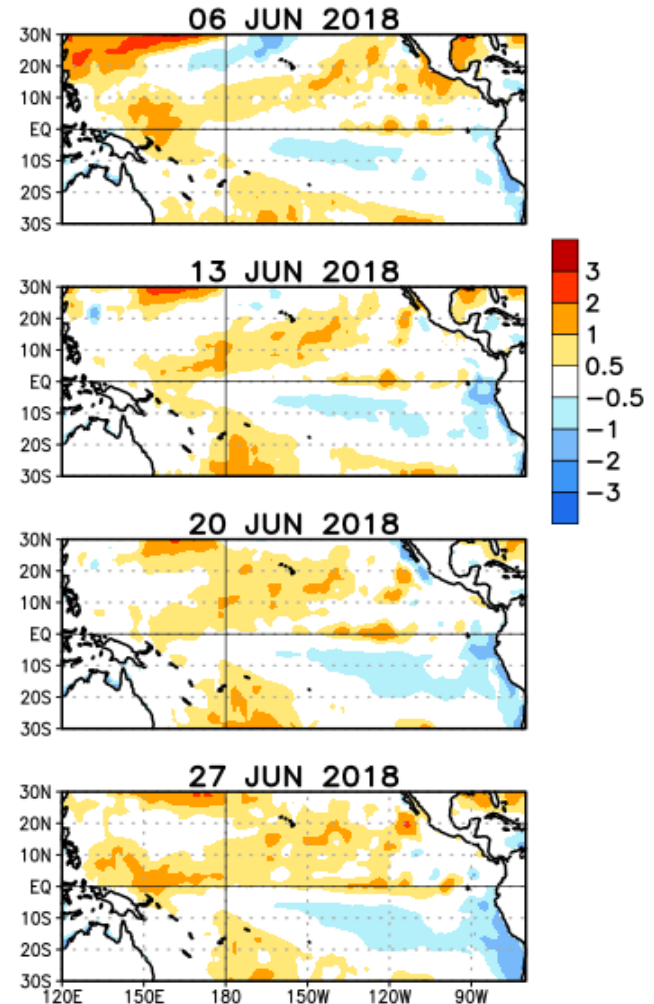
During the last four weeks, equatorial SSTs were above average in parts of the east-central Pacific, western Pacific, and eastern Atlantic Oceans. SSTs were below average in the far eastern Pacific and Indian Oceans.



Weekly SST Departures during the Last Four Weeks

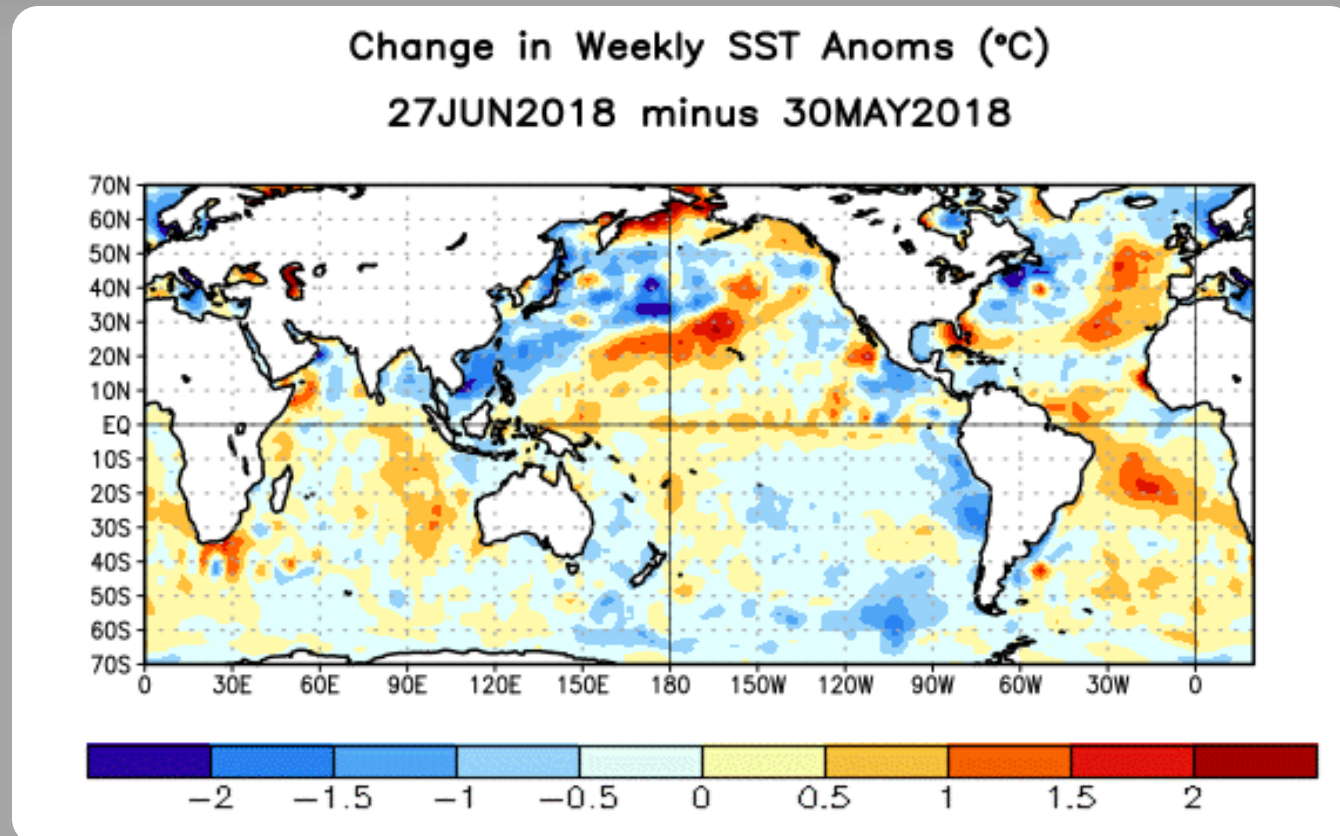
During the last four weeks, above average SSTs have strengthened around the central and east-central equatorial Pacific Ocean. Negative anomalies have persisted near South America.

Weekly SST Anomalies (DEG C)



Change in Weekly SST Departures over the Last Four Weeks

During the last four weeks, positive changes were observed across most of the equatorial Pacific, except for the negative changes evident near South America.



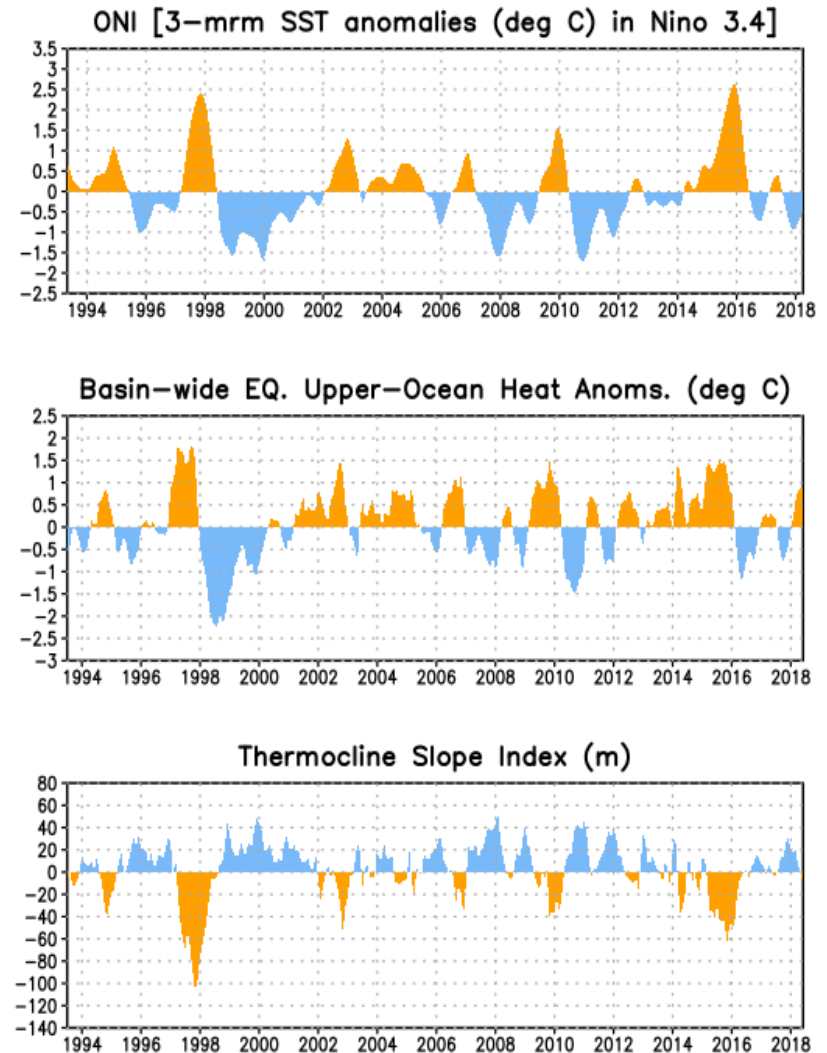
Upper-Ocean Conditions in the Equatorial Pacific

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.

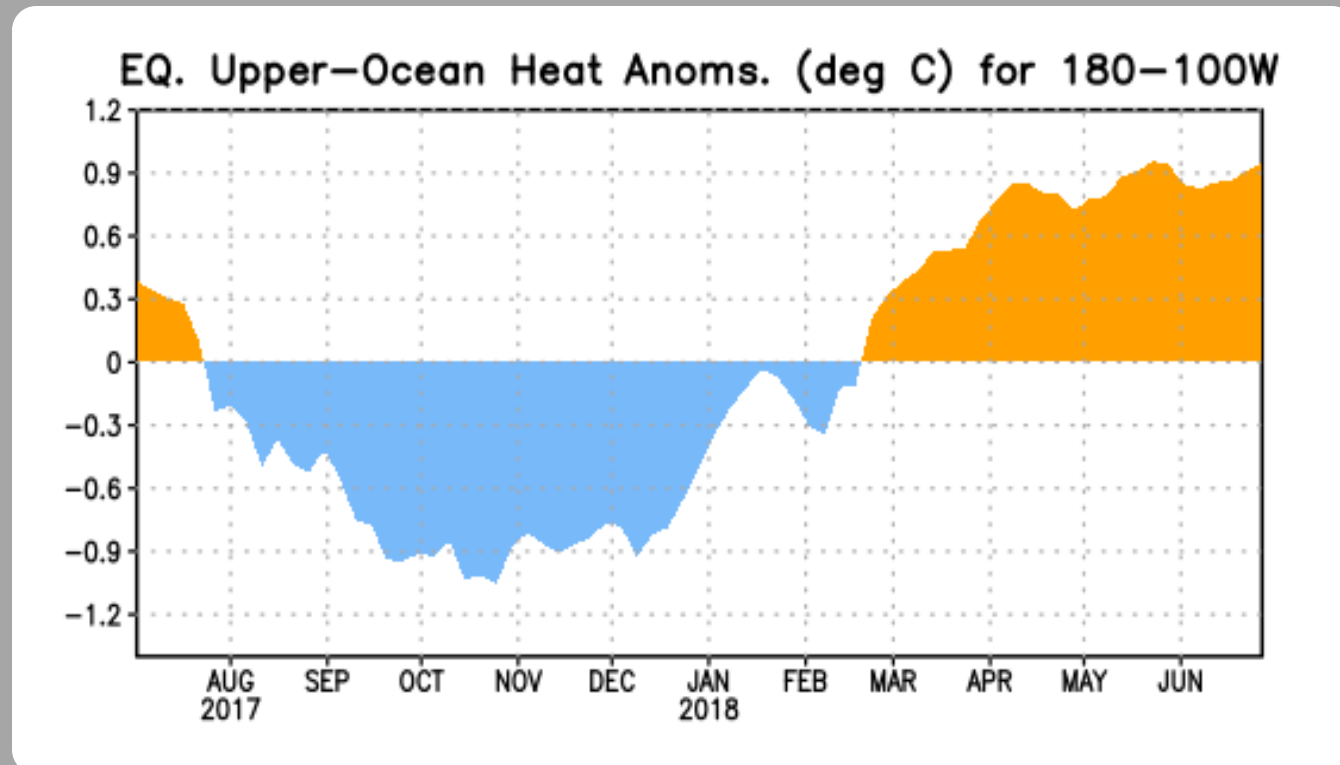
Recent values of the upper-ocean heat anomalies (above average) and thermocline slope index (near average) reflect ENSO-neutral conditions.

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).



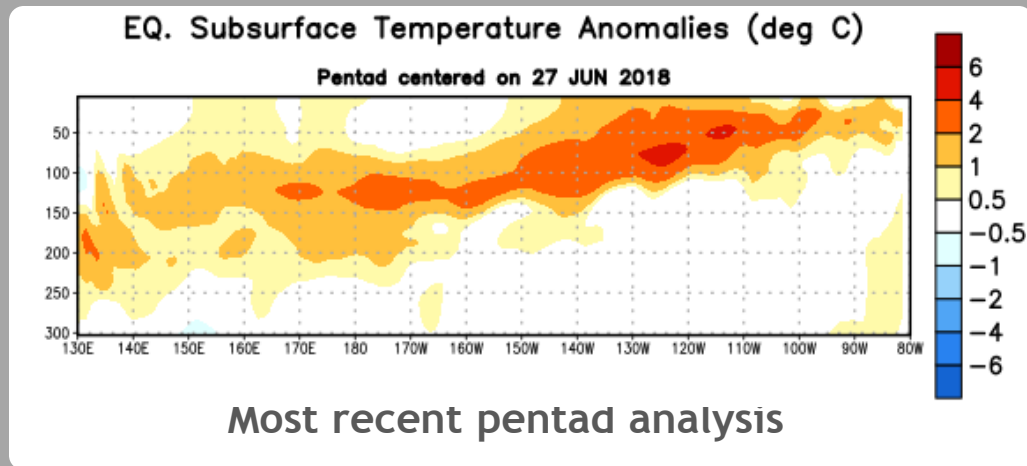
Central and Eastern Pacific Upper-Ocean (0-300 m) Weekly Average Temperature Anomalies

Negative subsurface temperature anomalies lasted from August 2017 to February 2018. Since the end of February, temperature anomalies have increased and remained positive.

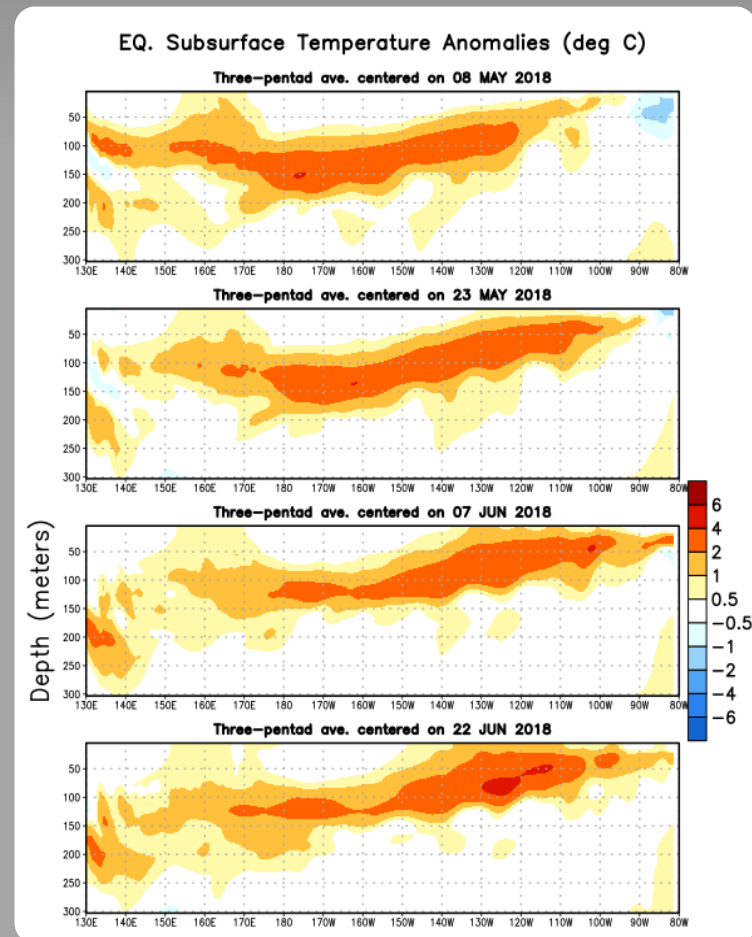


Sub-Surface Temperature Departures in the Equatorial Pacific

In the last two months, positive subsurface temperature anomalies have strengthened and expanded into the far eastern Pacific Ocean.



Positive temperature anomalies extend to the surface in the eastern Pacific Ocean.

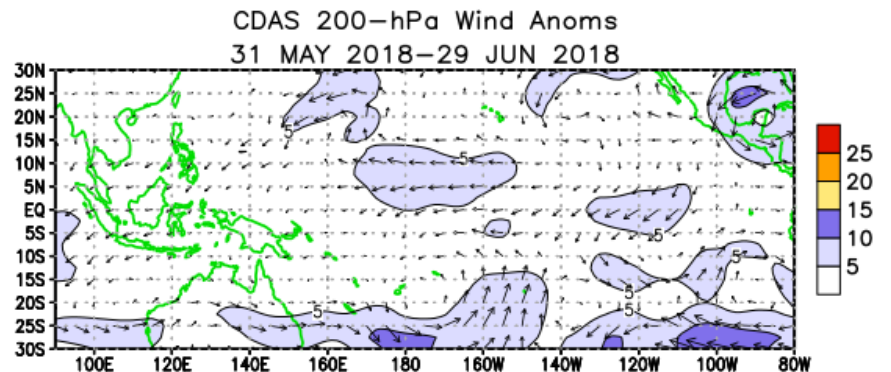
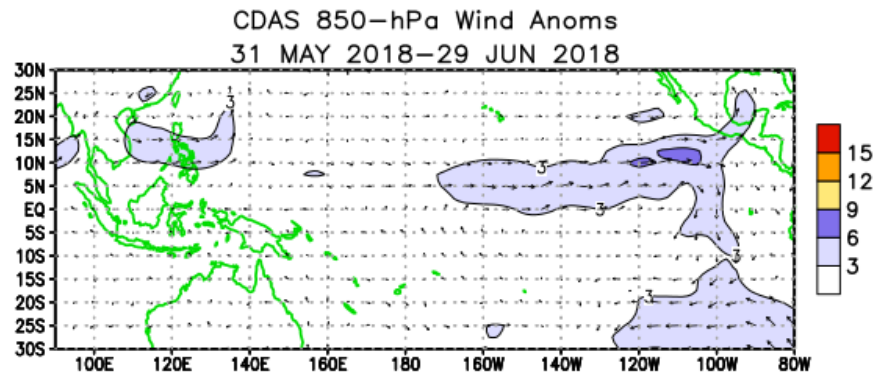
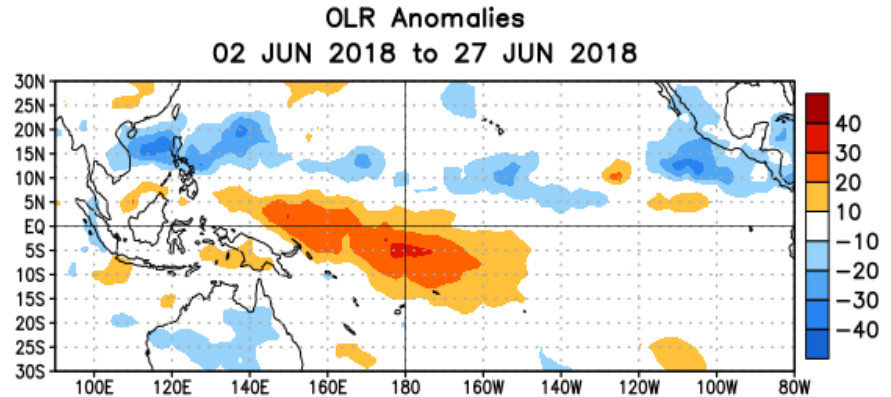


Tropical OLR and Wind Anomalies During the Last 30 Days

Positive OLR anomalies (reduced convection and precipitation) were evident over the western Pacific Ocean and Date Line.

Anomalous low-level (850-hPa) westerly winds were evident over the eastern tropical Pacific Ocean, mostly north of the equator.

Anomalous upper-level (200-hPa) winds were easterly near the Date Line and over the east-central equatorial Pacific Ocean



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.

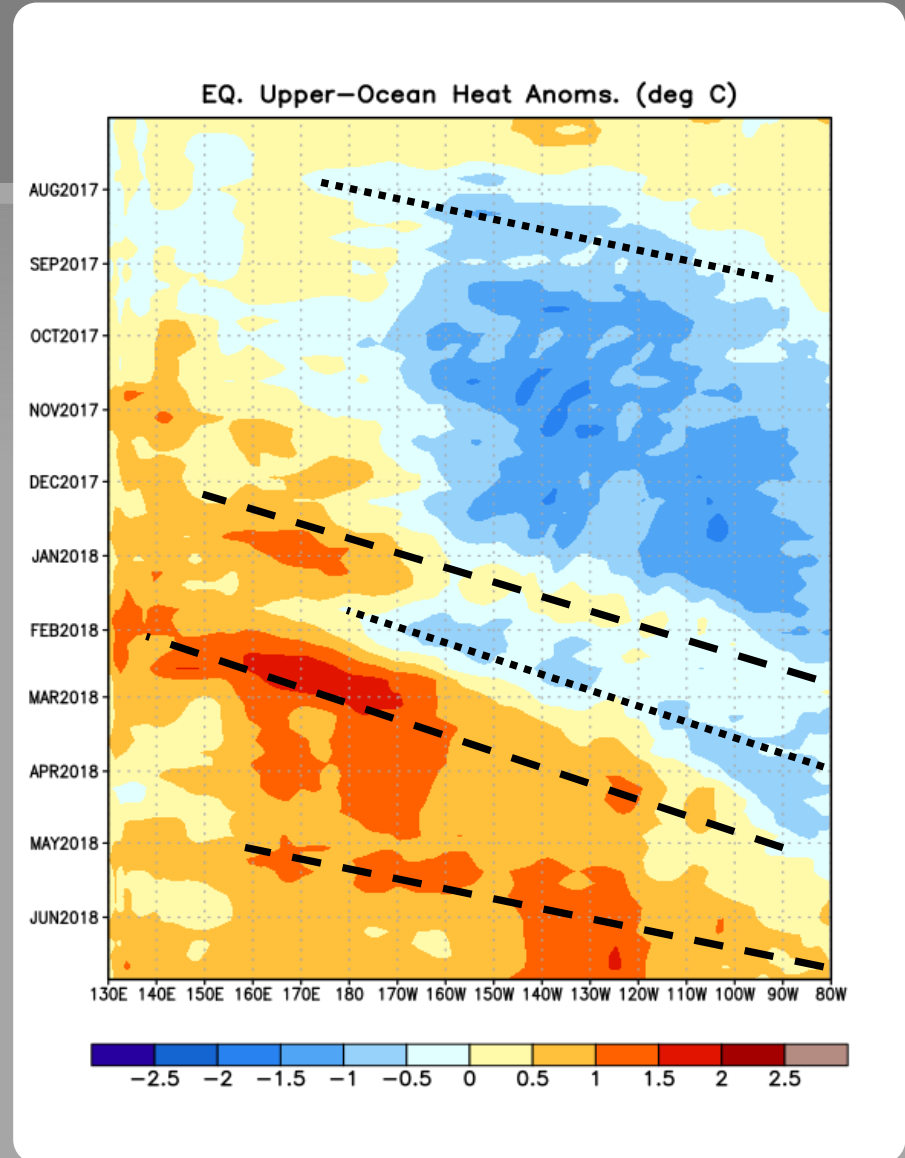
Weekly Heat Content Evolution in the Equatorial Pacific

From August 2017- early January 2018, negative subsurface temperature anomalies persisted in the central and eastern Pacific Ocean.

From December 2017- May 2018, successive Kelvin waves contributed to the eastward shift of positive and negative subsurface temperature anomalies.

Since early April 2018, positive subsurface temperature anomalies have persisted across most of the equatorial Pacific, with the largest anomalies occurring between 140°-120°W.

Equatorial oceanic Kelvin waves have alternating warm and cold phases. The warm phase is indicated by dashed lines. Down-welling 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 (m s^{-1})

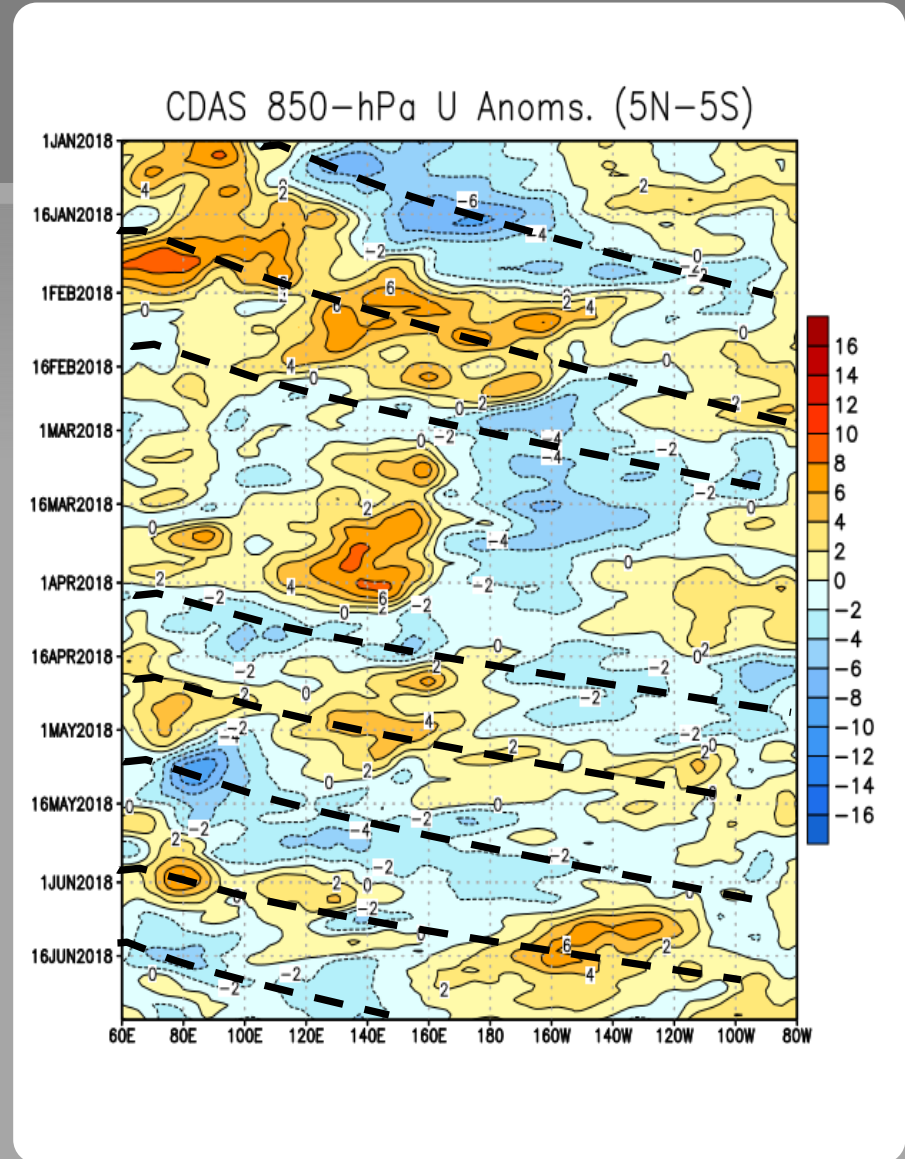
Through mid-January 2018, easterly wind anomalies prevailed across the central equatorial Pacific.

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

During the last couple of weeks, westerly wind anomalies have persisted in the eastern Pacific.

Westerly Wind Anomalies (orange/red shading)

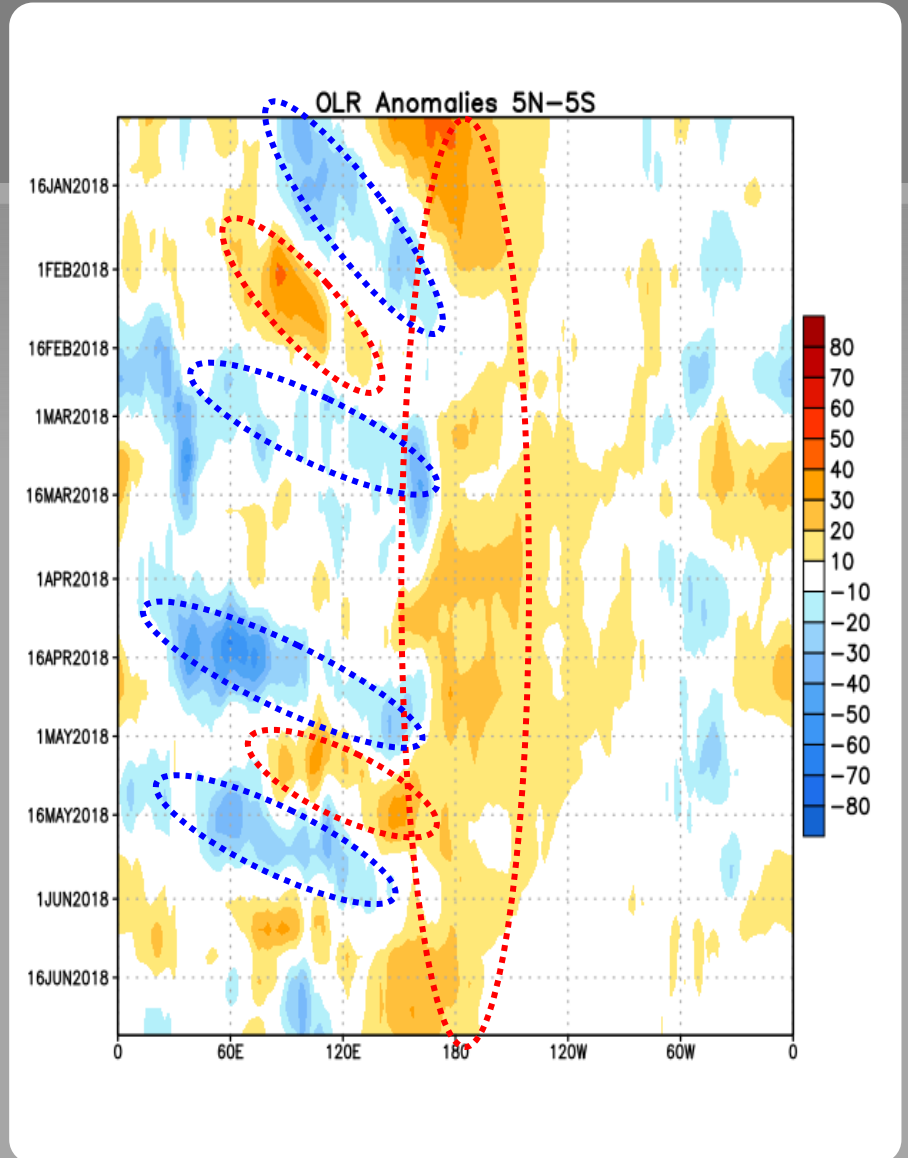
Easterly Wind Anomalies (blue shading)



Outgoing Longwave Radiation (OLR) Anomalies

During the period, positive OLR anomalies persisted over the central 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.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°C .

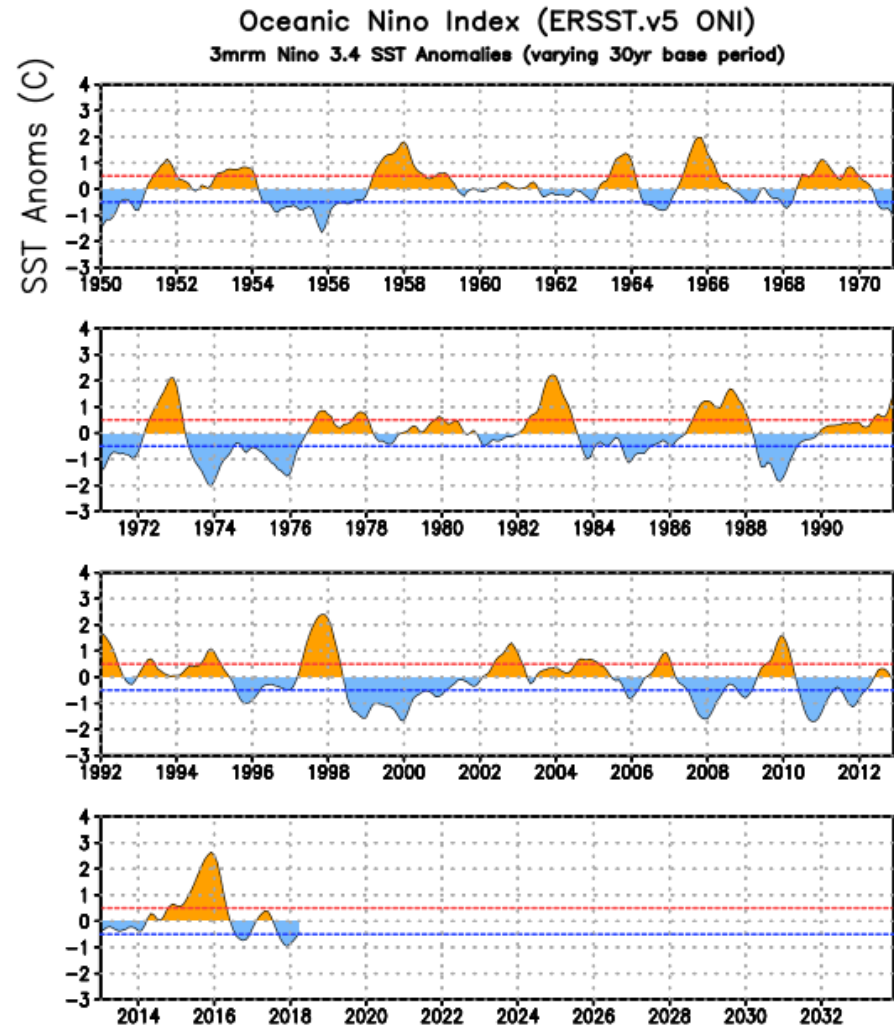
By historical standards, to be classified as a full-fledged El Niño or La Niña episode, these thresholds must be exceeded for a period of at least 5 consecutive overlapping 3-month seasons.

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 (March - May 2018) is -0.4°C .

El Niño ↑
Neutral
La Niña ↓



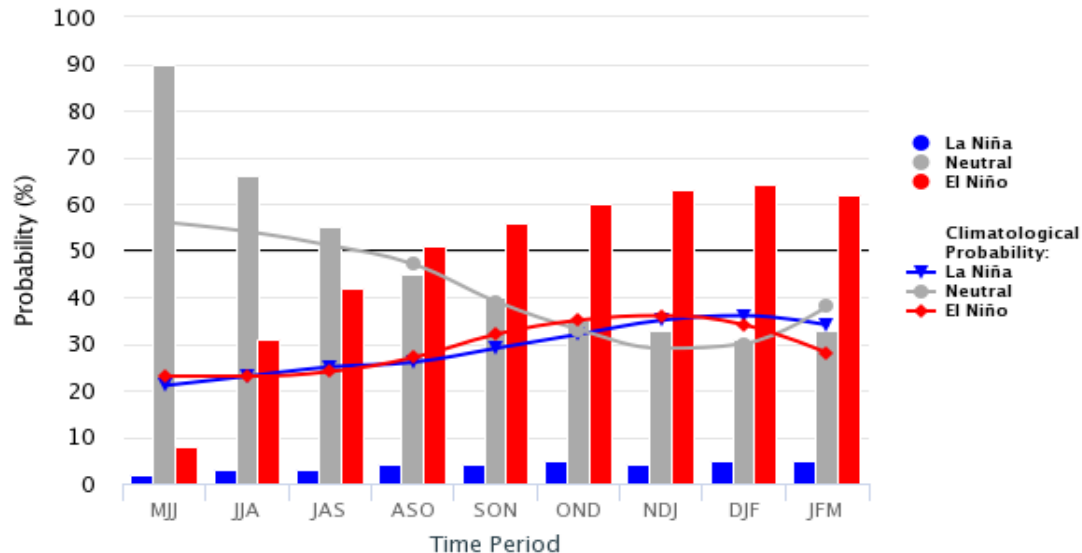
CPC/IRI Probabilistic ENSO Outlook

Updated: 14 June 2018

ENSO-neutral is favored through July-September 2018, with El Niño favored thereafter. Chances for El Niño are near 65% during Northern Hemisphere winter 2018-19.

Early-Jun CPC/IRI Official Probabilistic ENSO Forecasts

ENSO state based on NINO3.4 SST Anomaly
Neutral ENSO: $-0.5\text{ }^{\circ}\text{C}$ to $0.5\text{ }^{\circ}\text{C}$



IRI/CPC Pacific Niño 3.4 SST Model Outlook

The majority of models predict ENSO-neutral through summer 2018, with El Niño favored by August-October 2018.

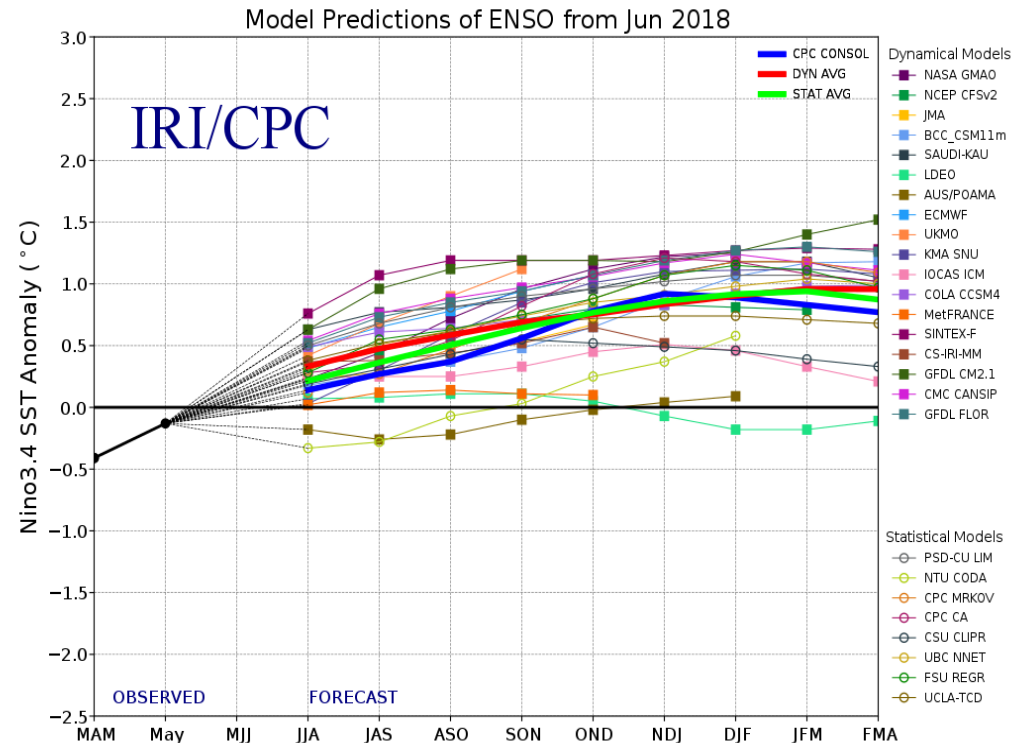


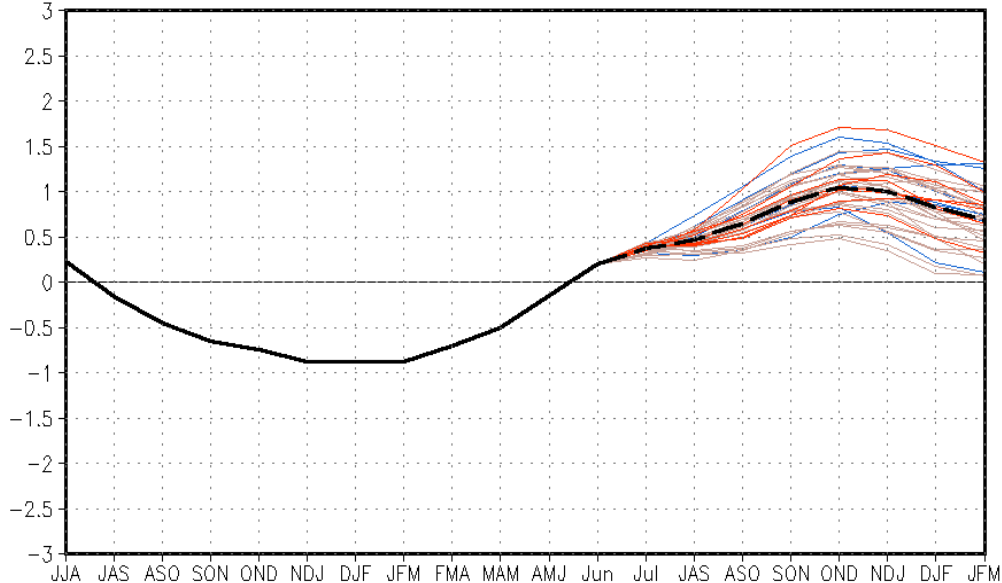
Figure provided by the International Research Institute (IRI) for Climate and Society (updated 19 June 2018).

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

Issued: 1 July 2018

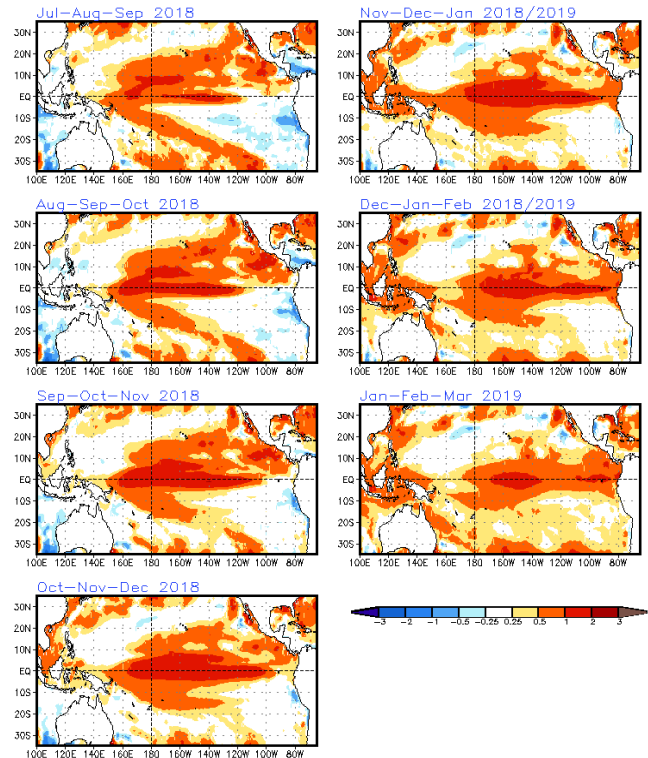
The CFS.v2 ensemble mean (black dashed line) favors El Niño forming during the August-October season and continuing through winter 2018-19.

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



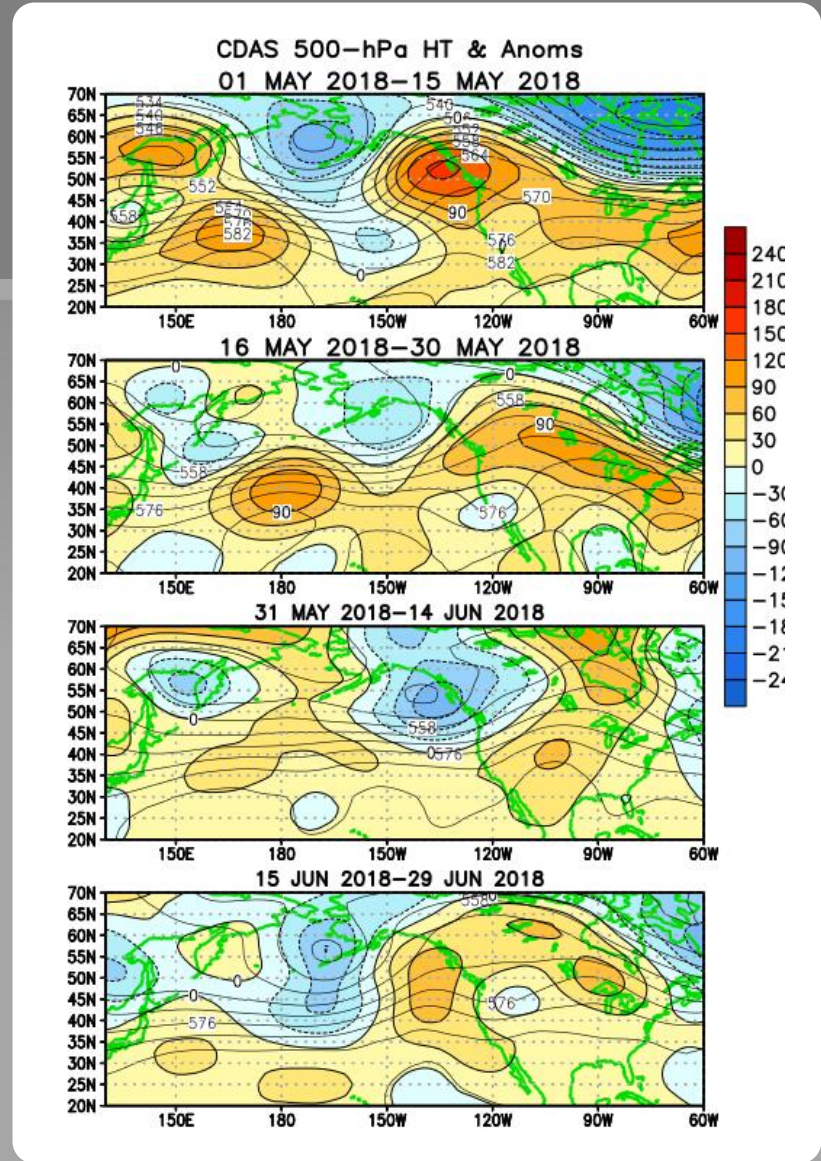
— Latest 8 forecast members
— Earliest 8 forecast members
— Other forecast members
- - - Forecast ensemble mean
— NCDc daily analysis

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



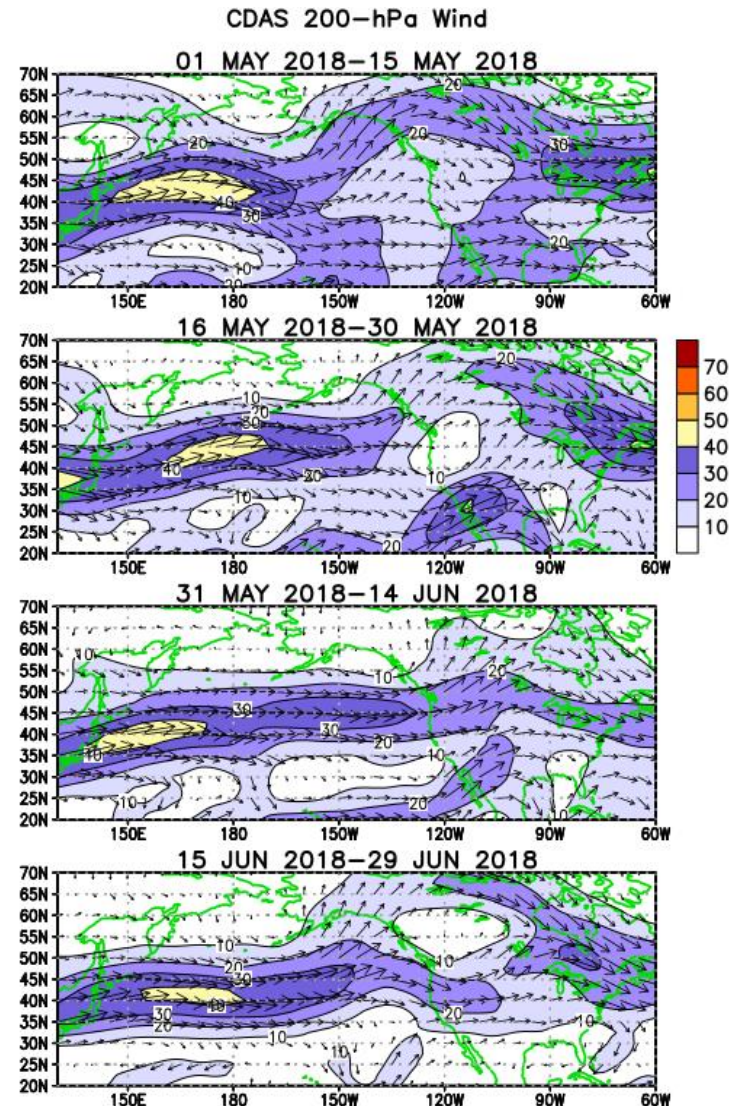
Atmospheric anomalies over the North Pacific and North America During the Last 60 Days

Since early May 2018, anomalous ridging (and above-average temperatures) have prevailed over most of the contiguous United States.



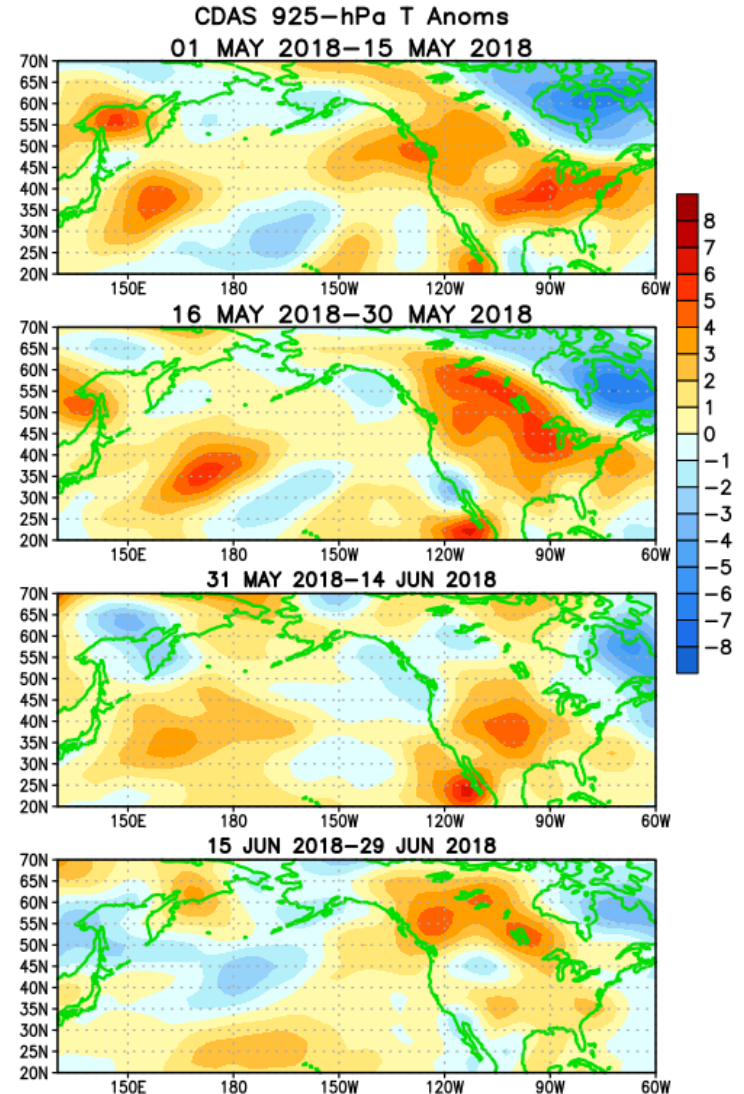
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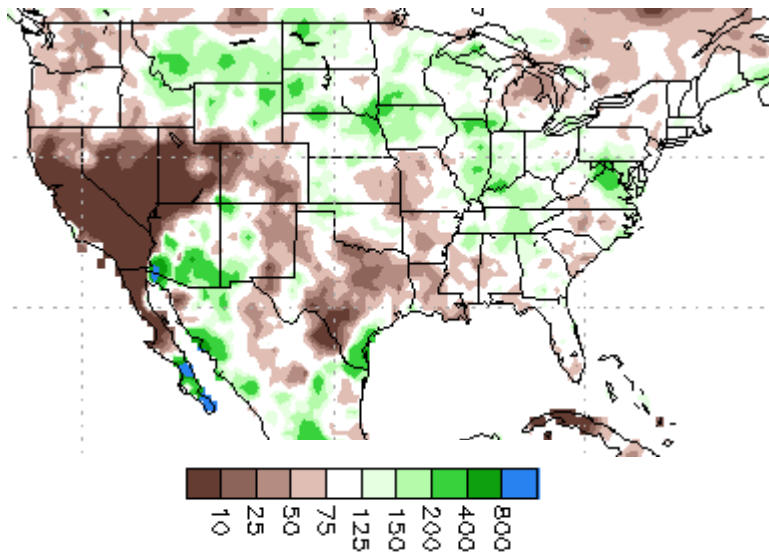
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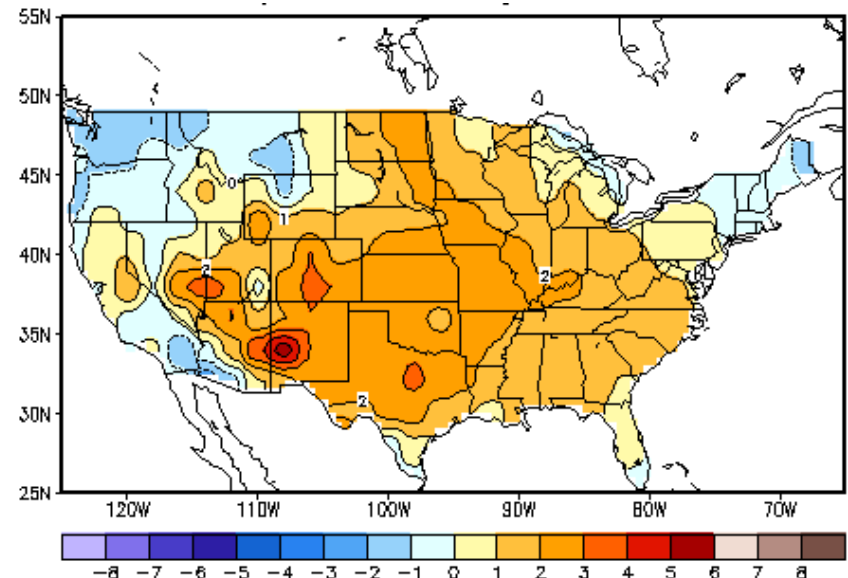
U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 30 June 2018

Percent of Average Precipitation



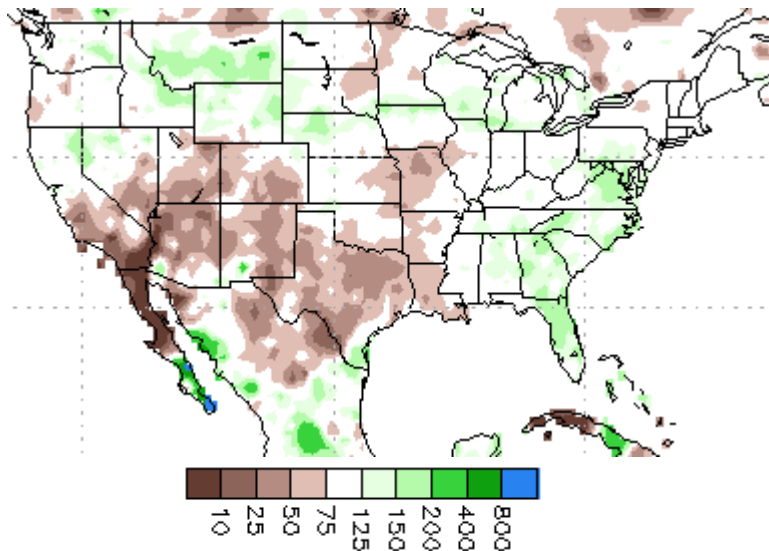
Temperature Departures (degree C)



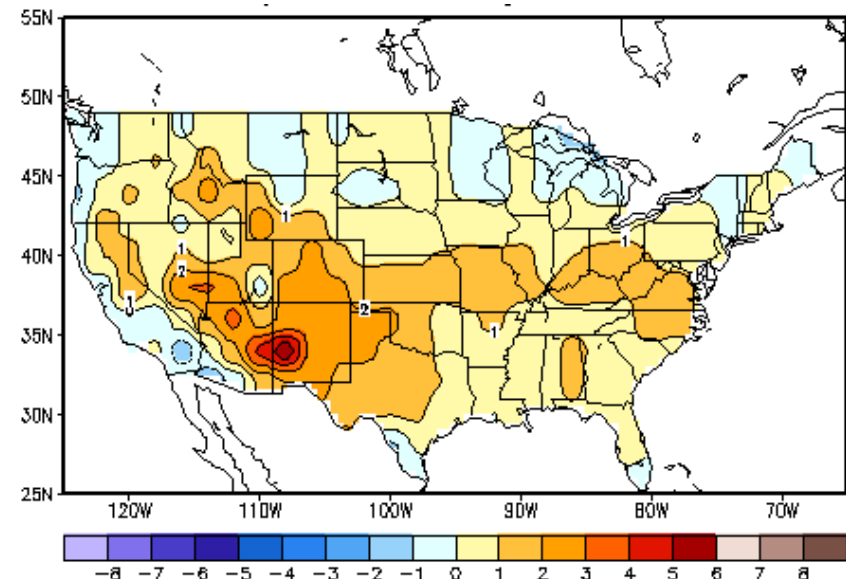
U.S. Temperature and Precipitation Departures During the Last 90 Days

End Date: 30 June 2018

Percent of Average Precipitation



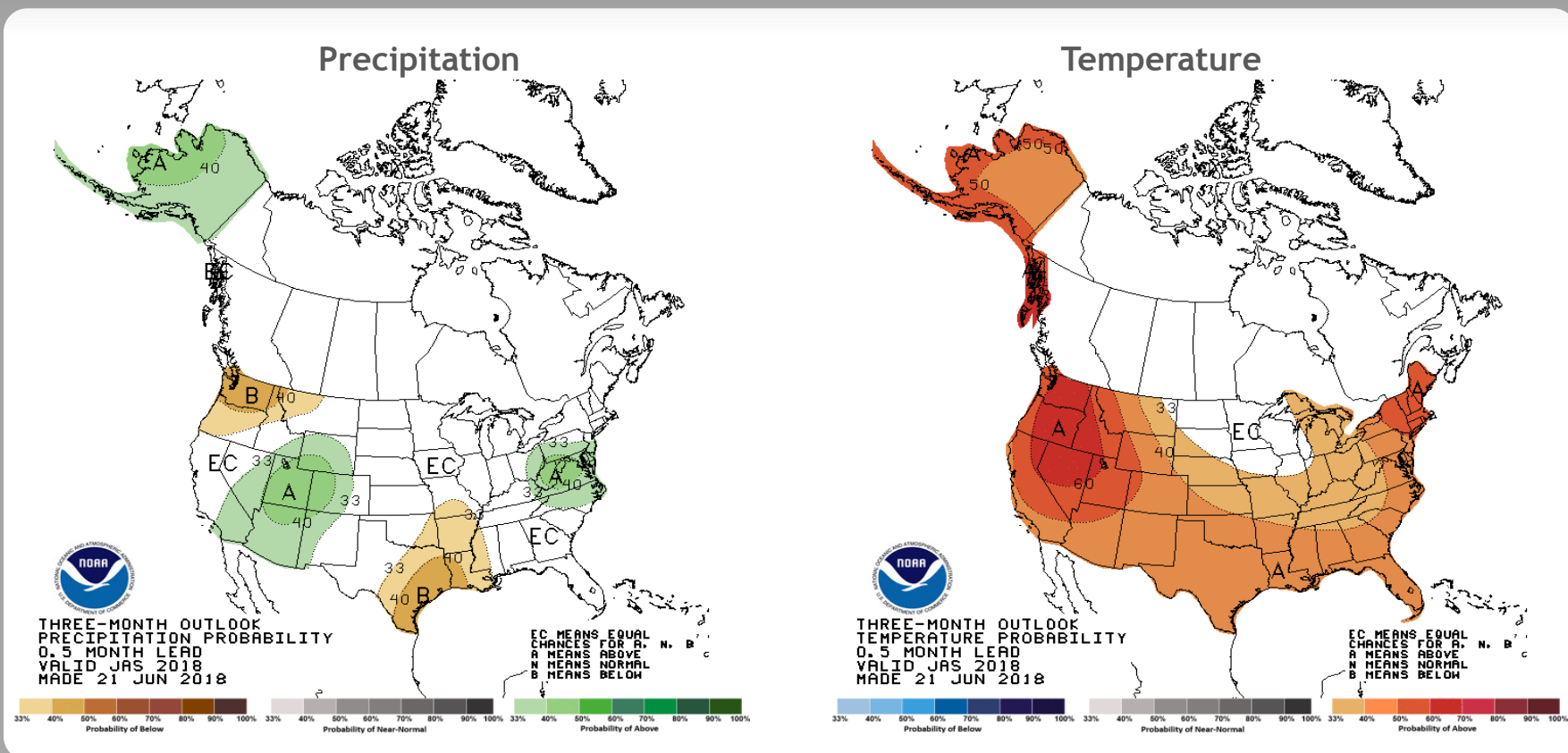
Temperature Departures (degree C)



U. S. Seasonal Outlooks

July - September 2018

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



Summary

ENSO Alert System Status: El Niño Watch

ENSO-neutral conditions are present.*

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ENSO-neutral is favored through Northern Hemisphere summer 2018, with the chance for El Niño increasing to 50% during fall, and ~65% during winter 2018-19.

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