ENSO: Recent Evolution, Current Status and Predictions

Update prepared by:
Climate Prediction Center / NCEP
3 September 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 near-to-above average across most of the Pacific Ocean.

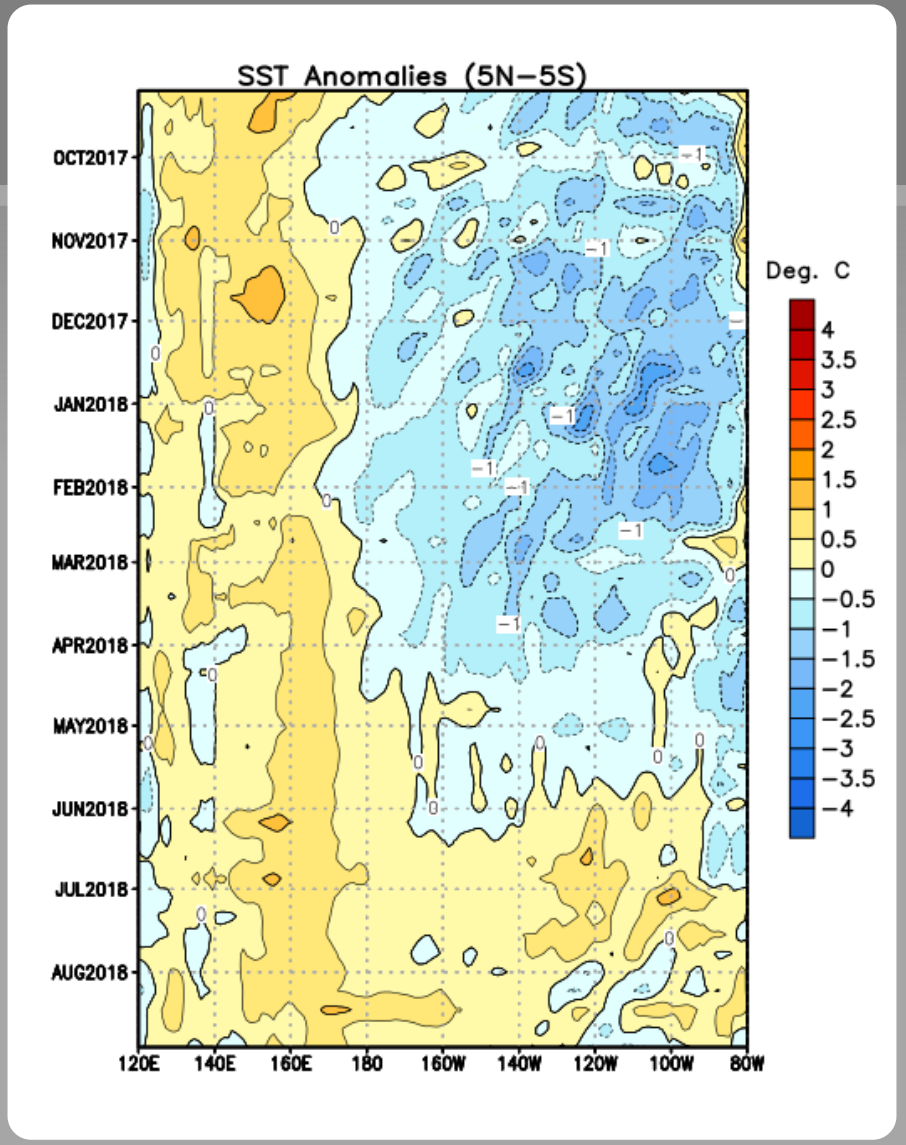
There is ~60% chance of El Niño in the Northern Hemisphere fall 2018 (September-November), increasing to ~70% during winter 2018-19.

*** 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)

From September 2017 to late March 2018, below-average SSTs persisted across the central and eastern Pacific Ocean.

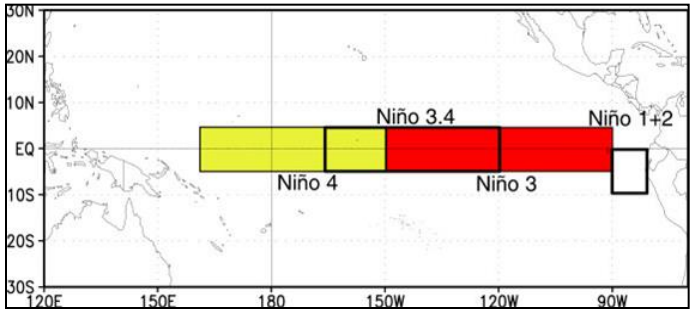
Since early June, near-to-above average SSTs have been present across most of the Pacific Ocean.

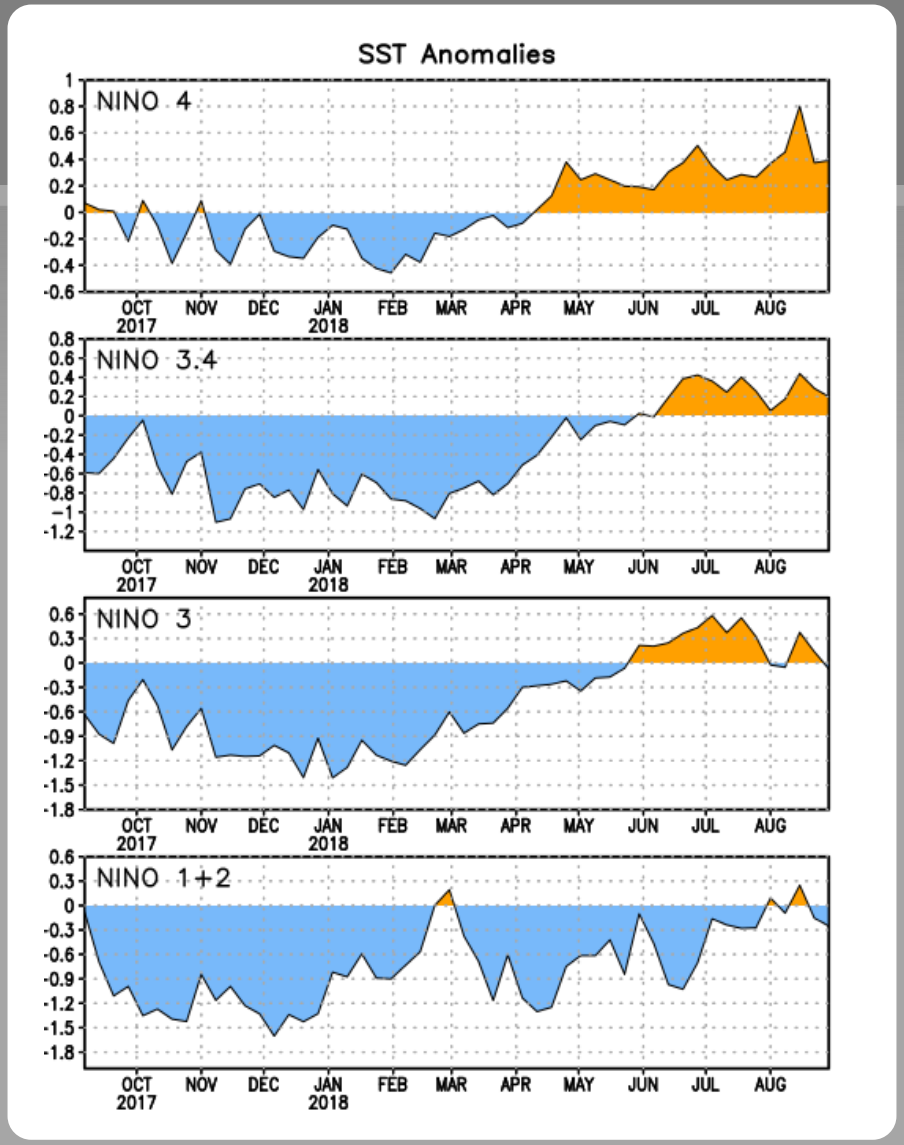


Niño Region SST Departures (ºC) Recent Evolution

The latest weekly SST departures are:

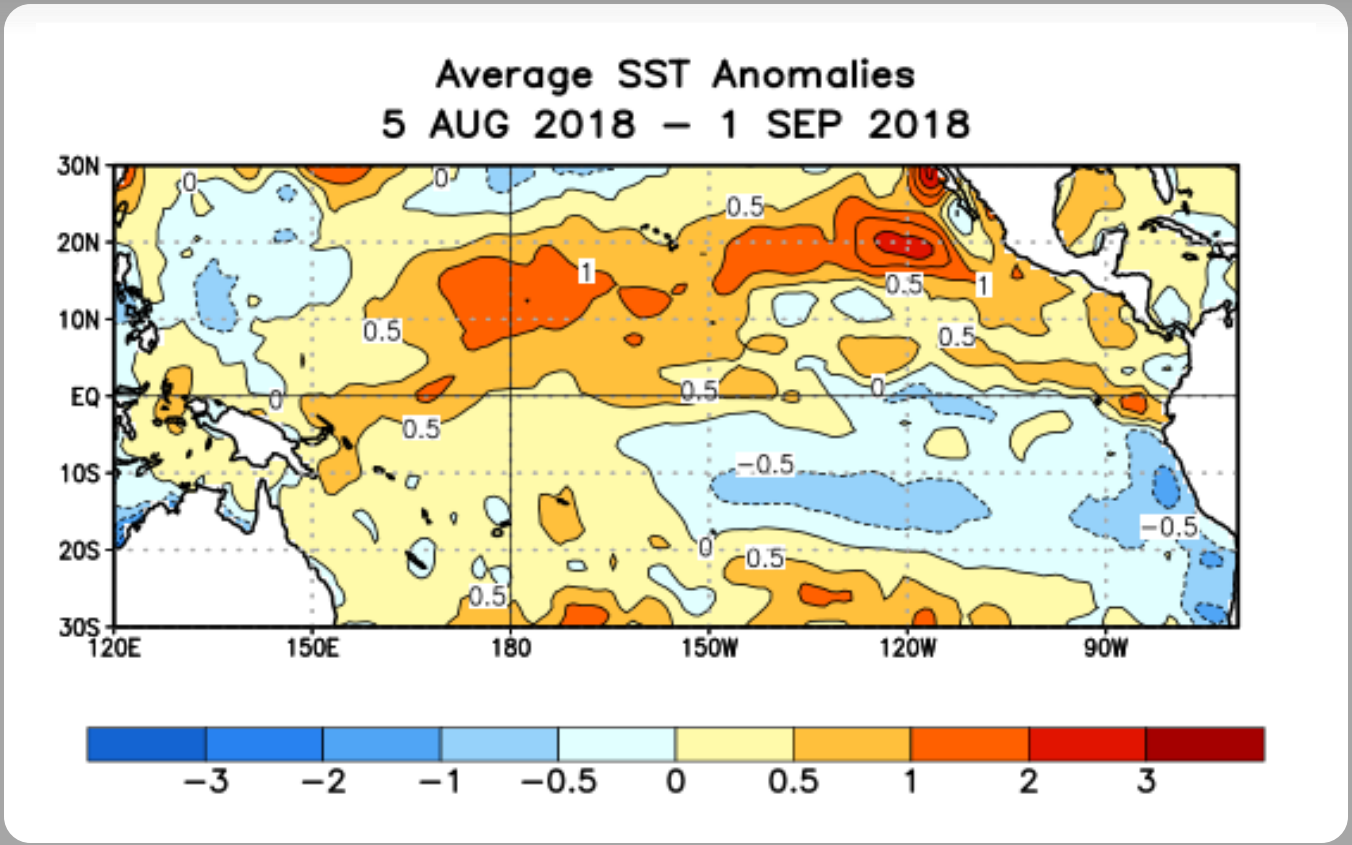
Niño 4	0.4ºC
Niño 3.4	0.2ºC
Niño 3	-0.1ºC
Niño 1+2	-0.3ºC





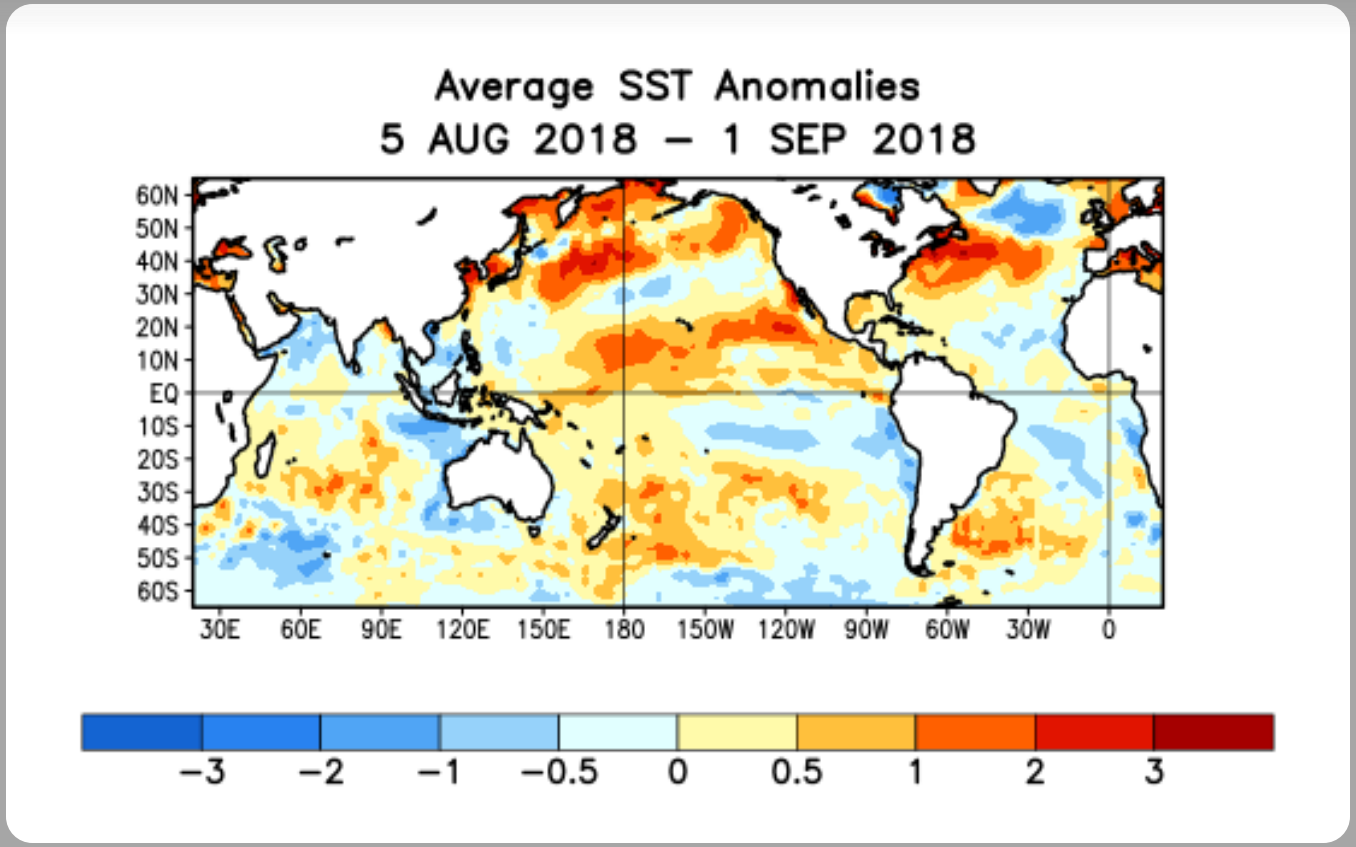
SST Departures (ºC) in the Tropical Pacific During the Last Four Weeks

During the last four weeks, equatorial SSTs were mostly near average across the east-central Pacific, while remaining above average in the central and western Pacific.



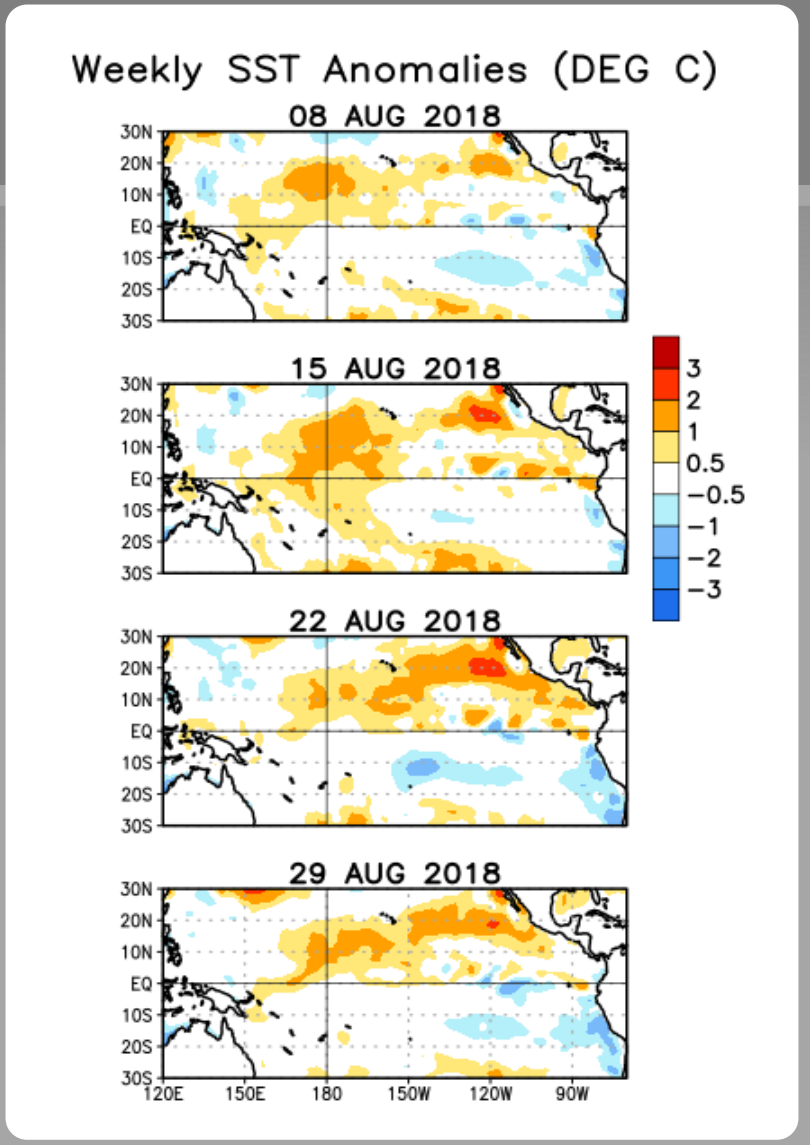
Global SST Departures (°C) During the Last Four Weeks

During the last four weeks, equatorial SSTs were above average in the central and western Pacific Ocean. SSTs were below average near Indonesia.



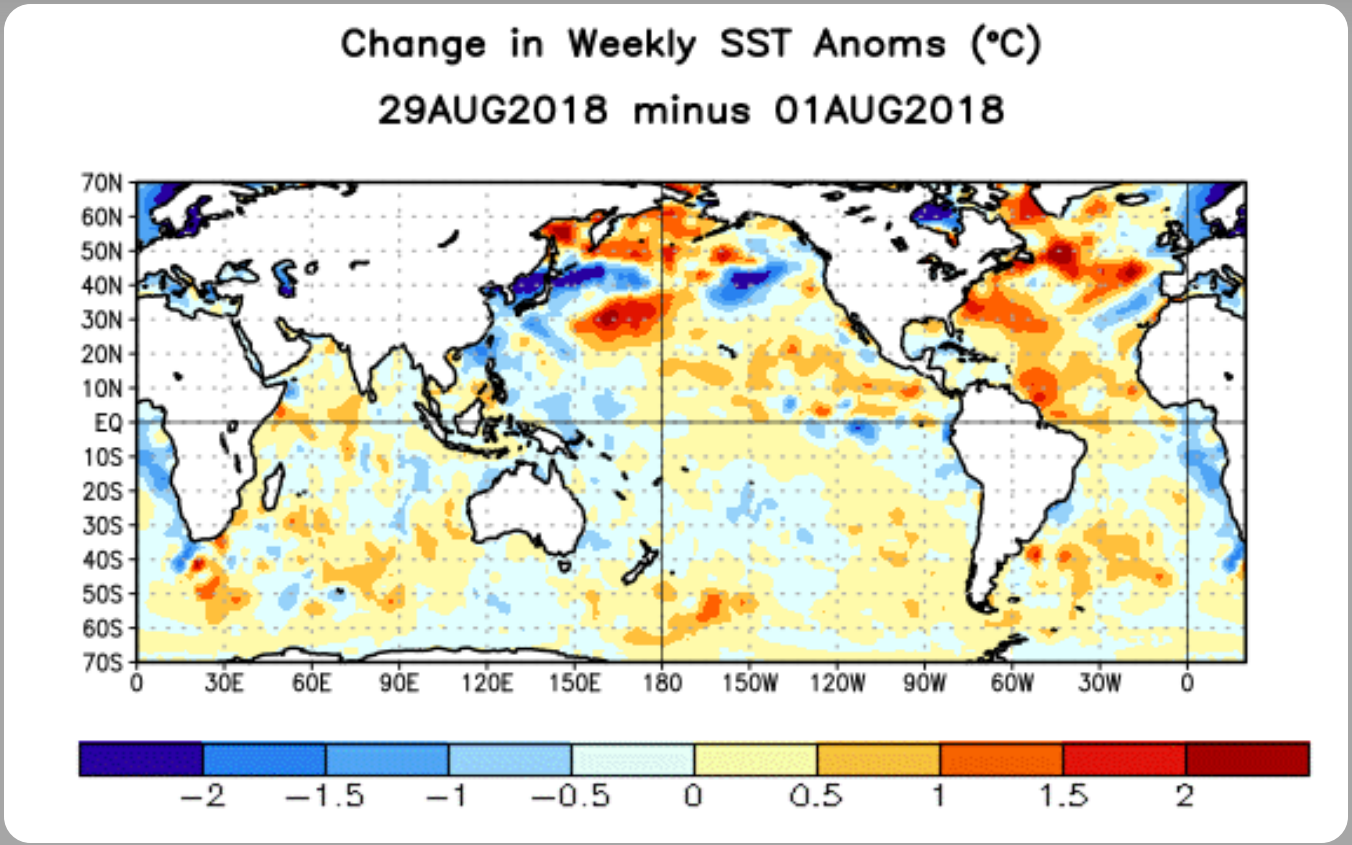
Weekly SST Departures during the Last Four Weeks

During the last four weeks, above-average SSTs near the Date Line have dominated, while near-average SSTs generally persisted in the east-central and eastern Pacific.



Change in Weekly SST Departures over the Last Four Weeks

During the last four weeks, small regions of positive and negative changes were observed in the east-central and eastern equatorial Pacific.



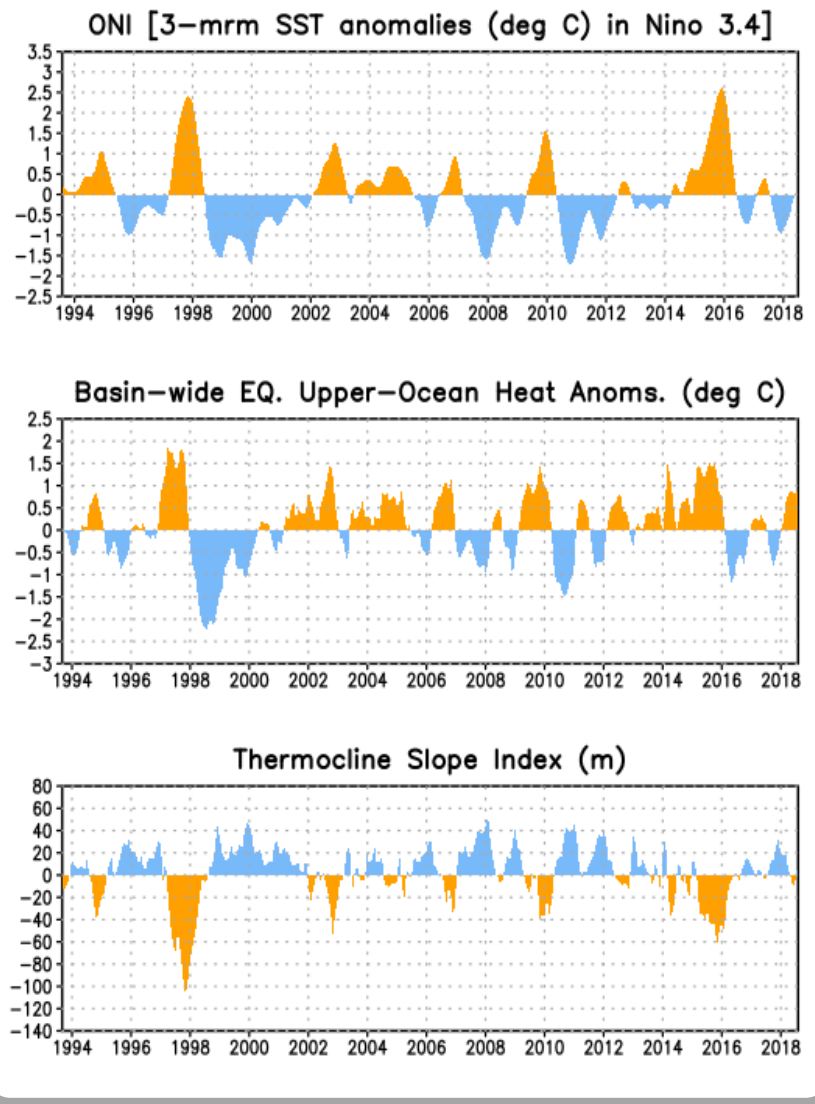
Upper-Ocean Conditions in the Equatorial Pacific

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.

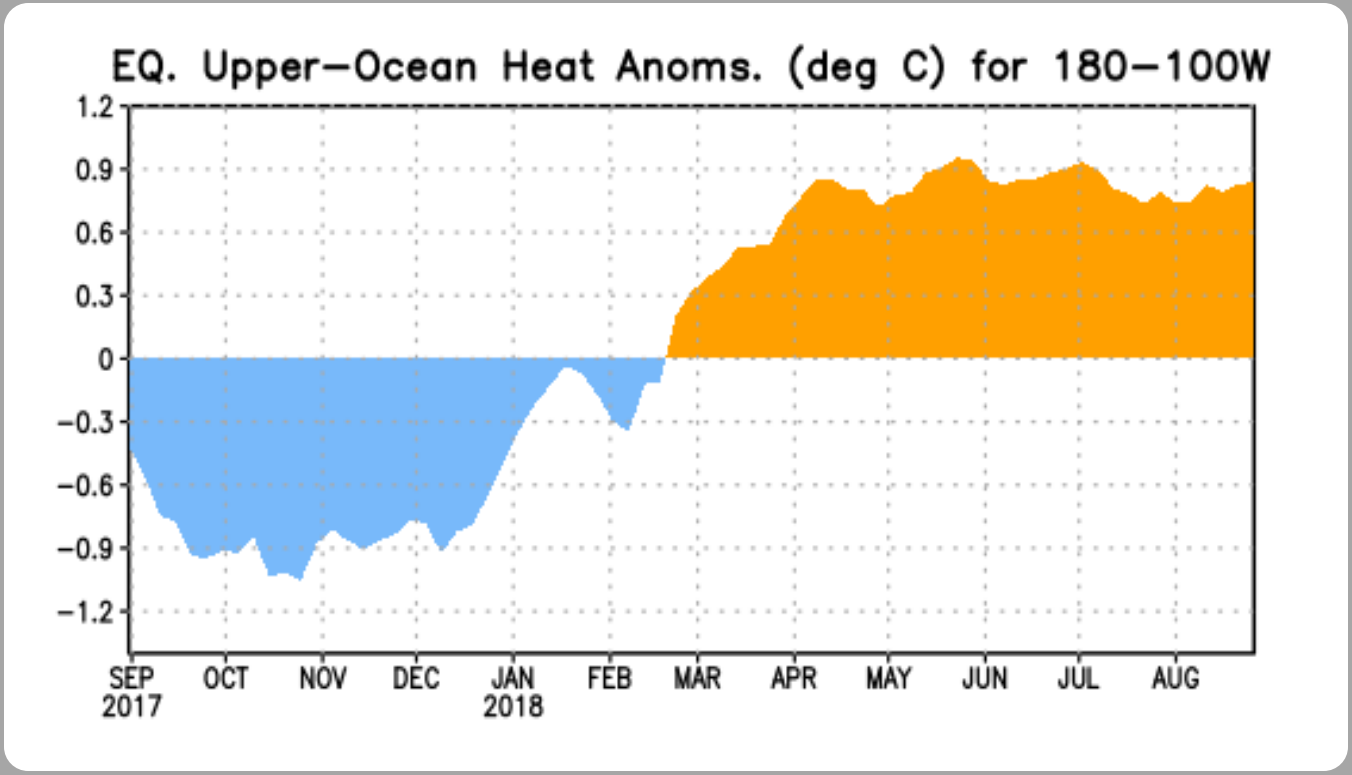
Recent values of the upper-ocean heat anomalies (above average) and thermocline slope index (near average) reflect ENSO-neutral conditions.

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).



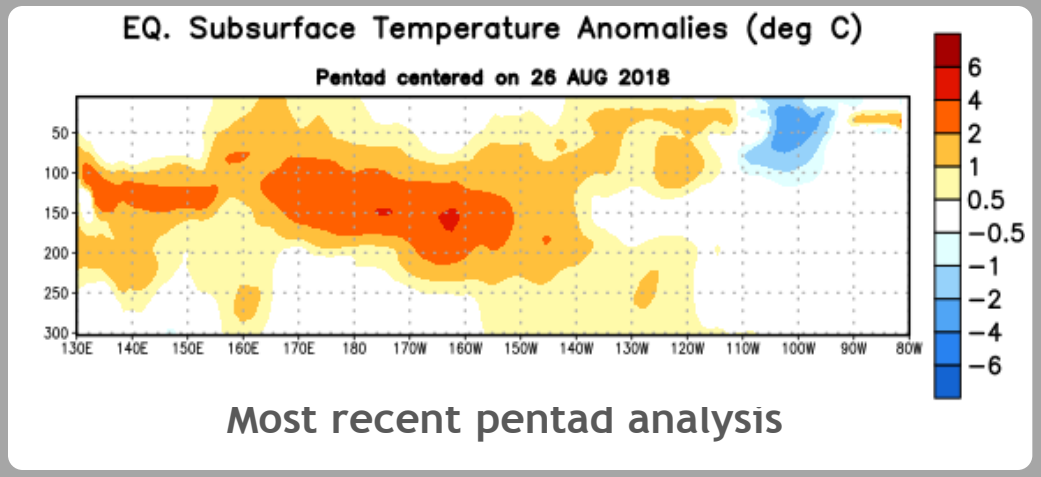
Central and Eastern Pacific Upper-Ocean (0-300 m) Weekly Average Temperature Anomalies

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



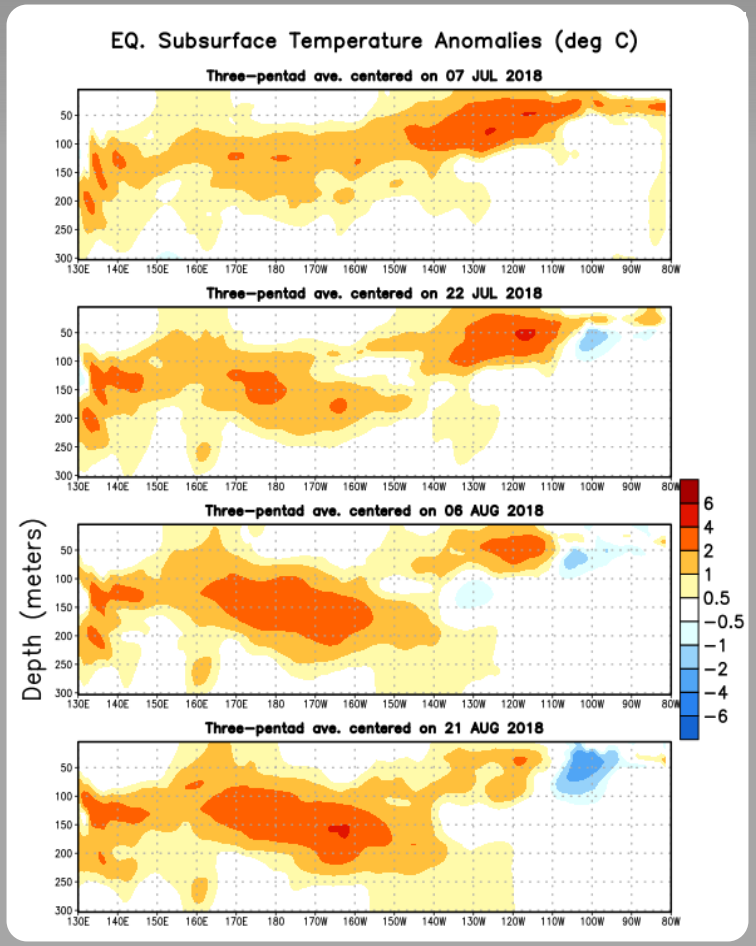
Sub-Surface Temperature Departures in the Equatorial Pacific

In the last two months, positive subsurface temperature anomalies have increased in the central Pacific.



Most recent pentad analysis

Recently, negative subsurface temperature anomalies were near the surface in the eastern Pacific.

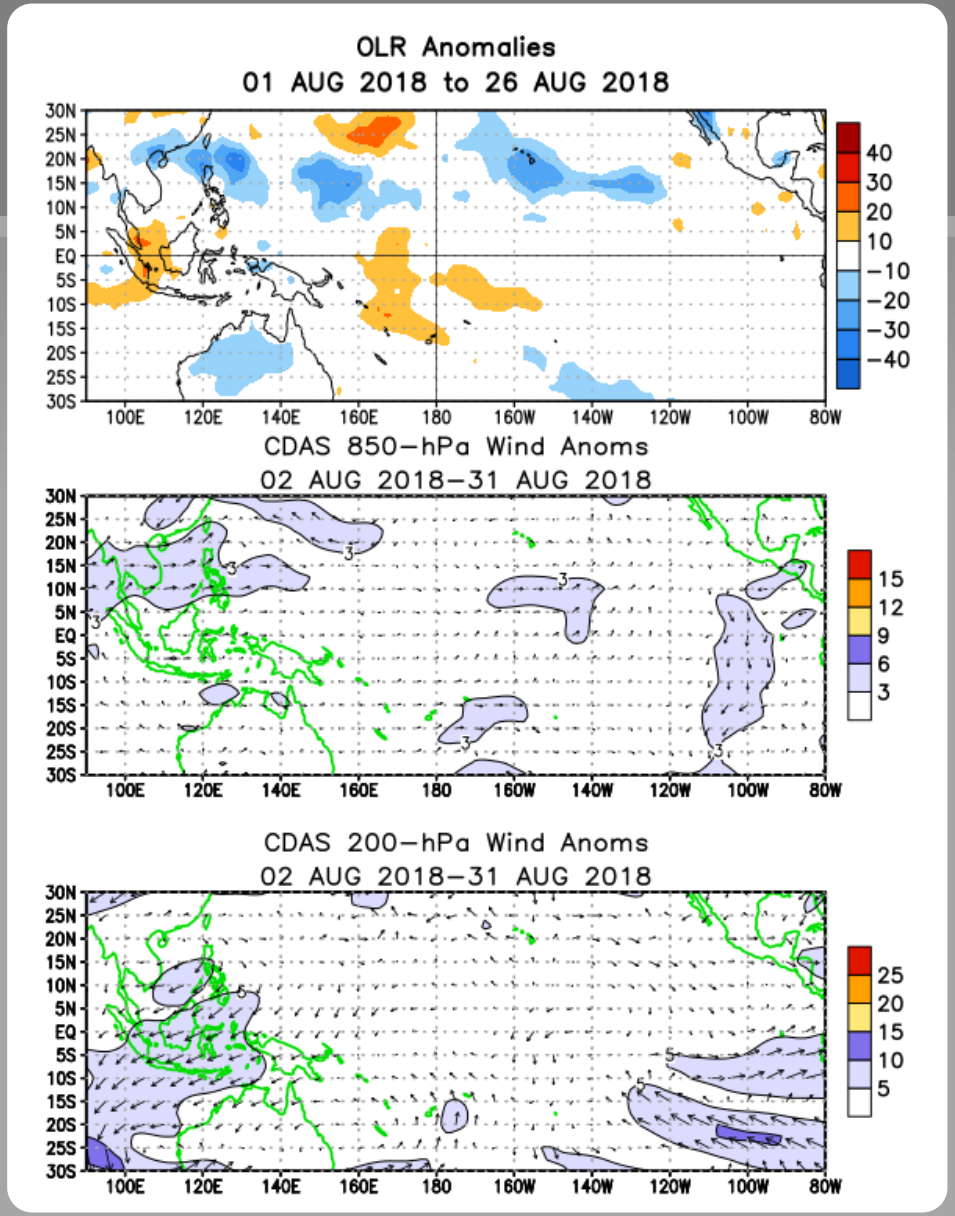


Tropical OLR and Wind Anomalies During the Last 30 Days

Weak, positive OLR anomalies (reduced convection and precipitation) were evident over the western Pacific and western Indonesia.

Anomalous low-level (850-hPa) cross-equatorial winds were evident over the eastern Pacific Ocean, and westerly wind anomalies were observed over a small region of the east-central Pacific.

Upper-level (200-hPa) westerly winds were mostly near average across the 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.

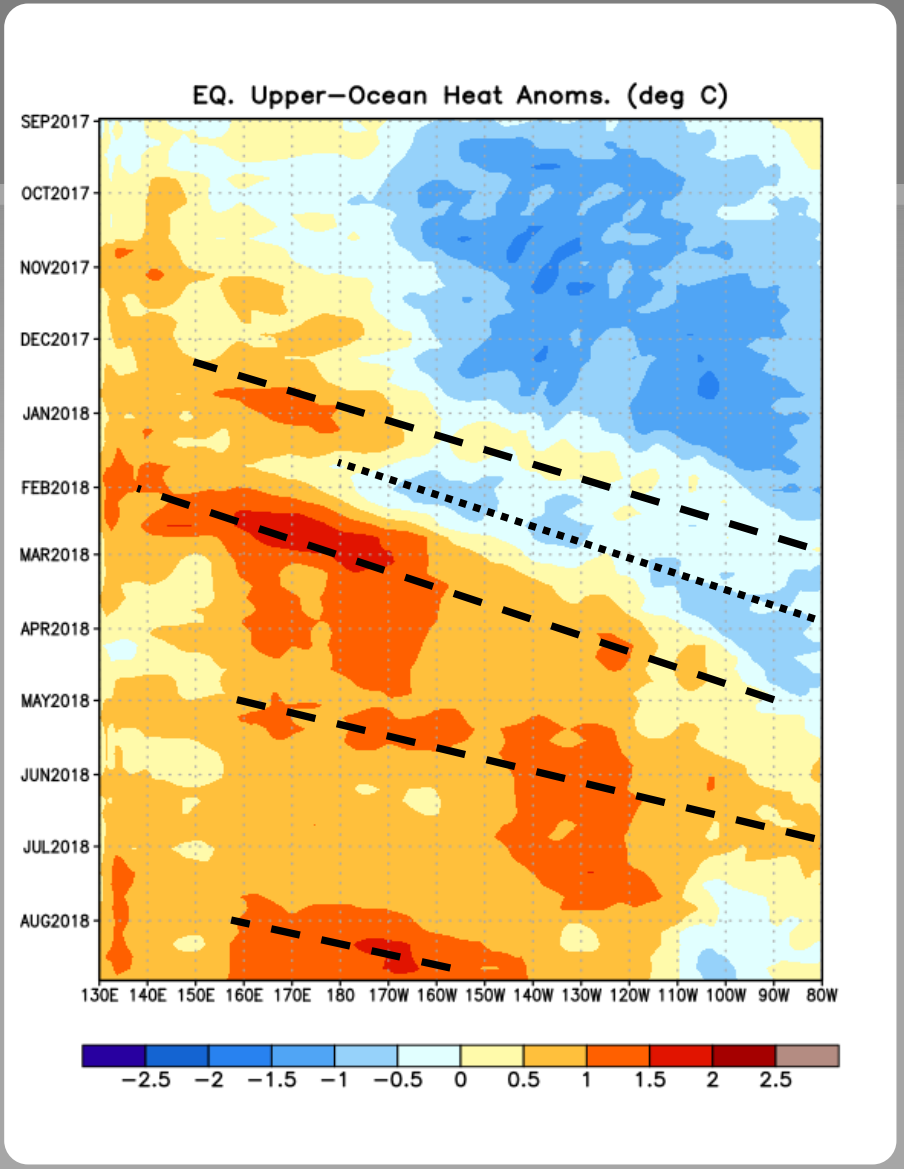
Weekly Heat Content Evolution in the Equatorial Pacific

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, with the largest anomalies from mid-May to mid-July 2018 occurring between ~150°-110°W.

Since early July 2018, positive subsurface temperature anomalies weakened in the far eastern Pacific.

Since early August 2018, a downwelling Kelvin wave has shifted eastward.

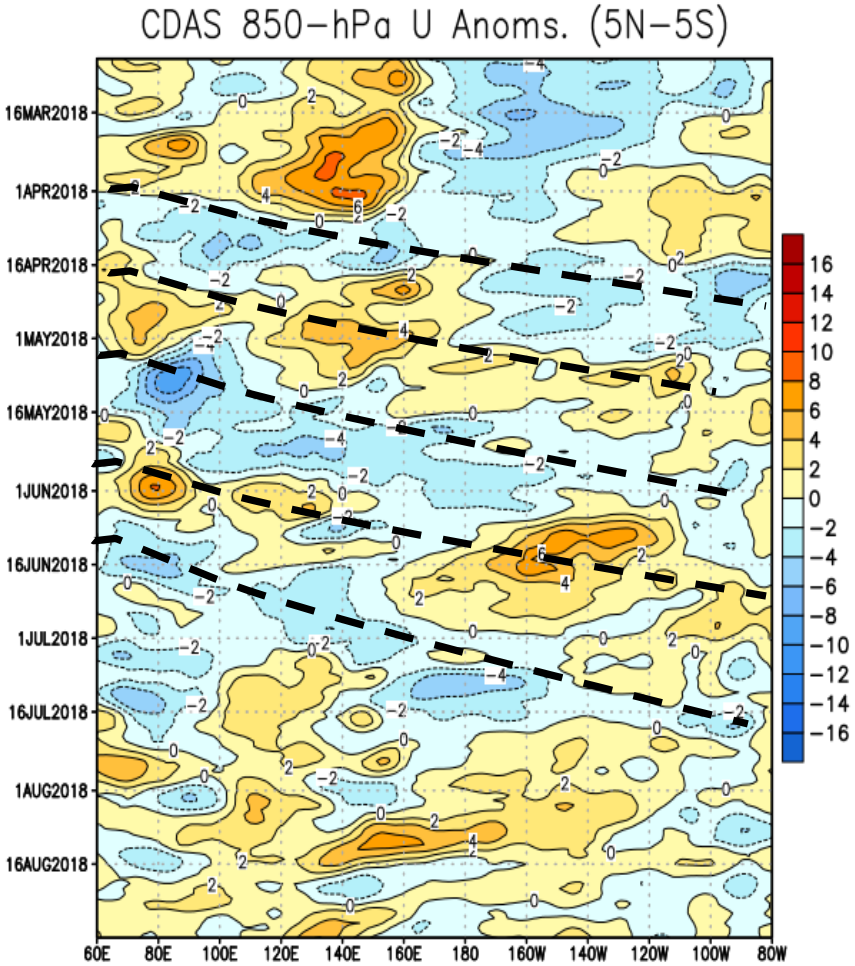


Equatorial oceanic Kelvin waves have alternating warm and cold phases. The warm phase is indicated by dashed lines. Down-welling and warming occur in the leading portion of a Kelvin wave, and up-welling and cooling occur in the trailing portion.

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

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 western and east-central equatorial Pacific Ocean.



Westerly Wind Anomalies (orange/red shading)
Easterly Wind Anomalies (blue shading)

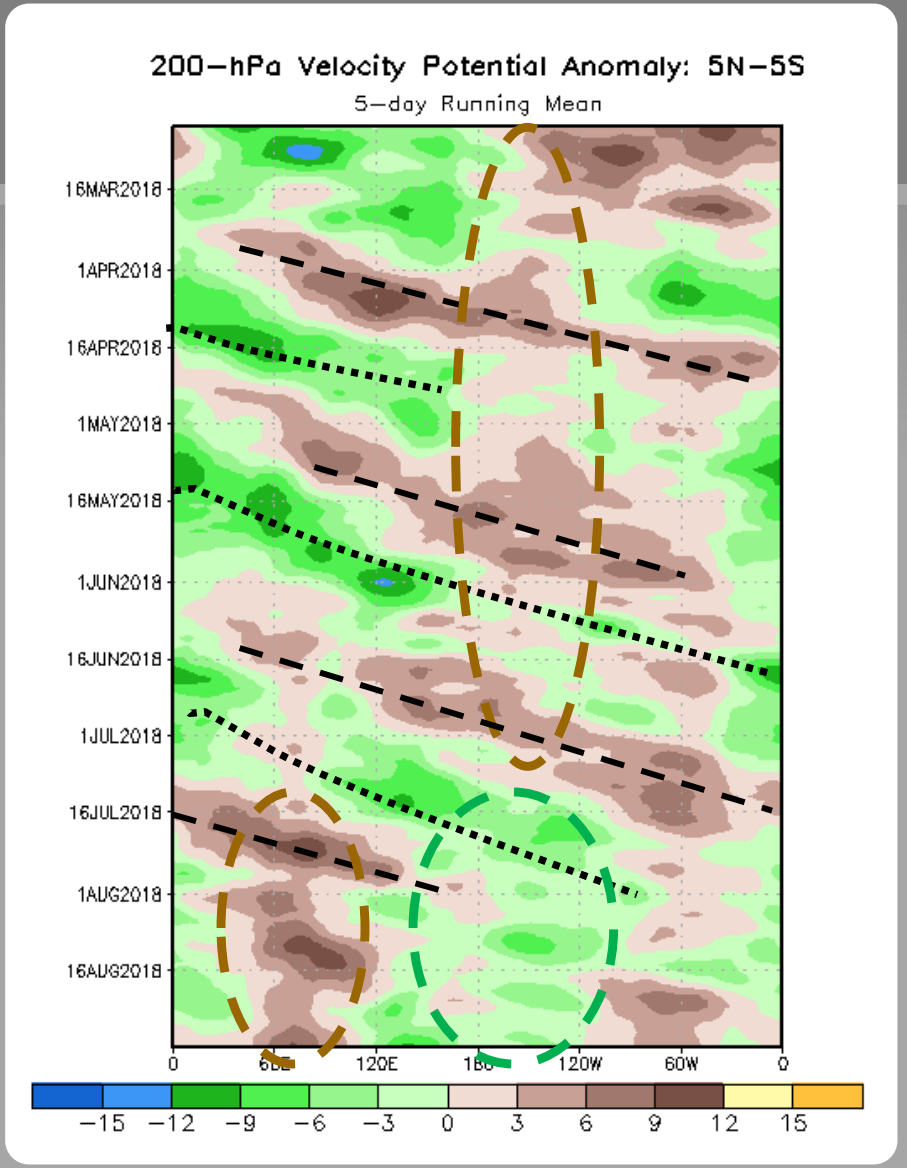
Upper-level (200-hPa) Velocity Potential Anomalies

From mid February through June 2018, anomalous upper-level convergence (brown shading) persisted over the central Pacific.

Eastward propagation of regions of upper-level divergence (green shading) and convergence (brown shading) has been evident.

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

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

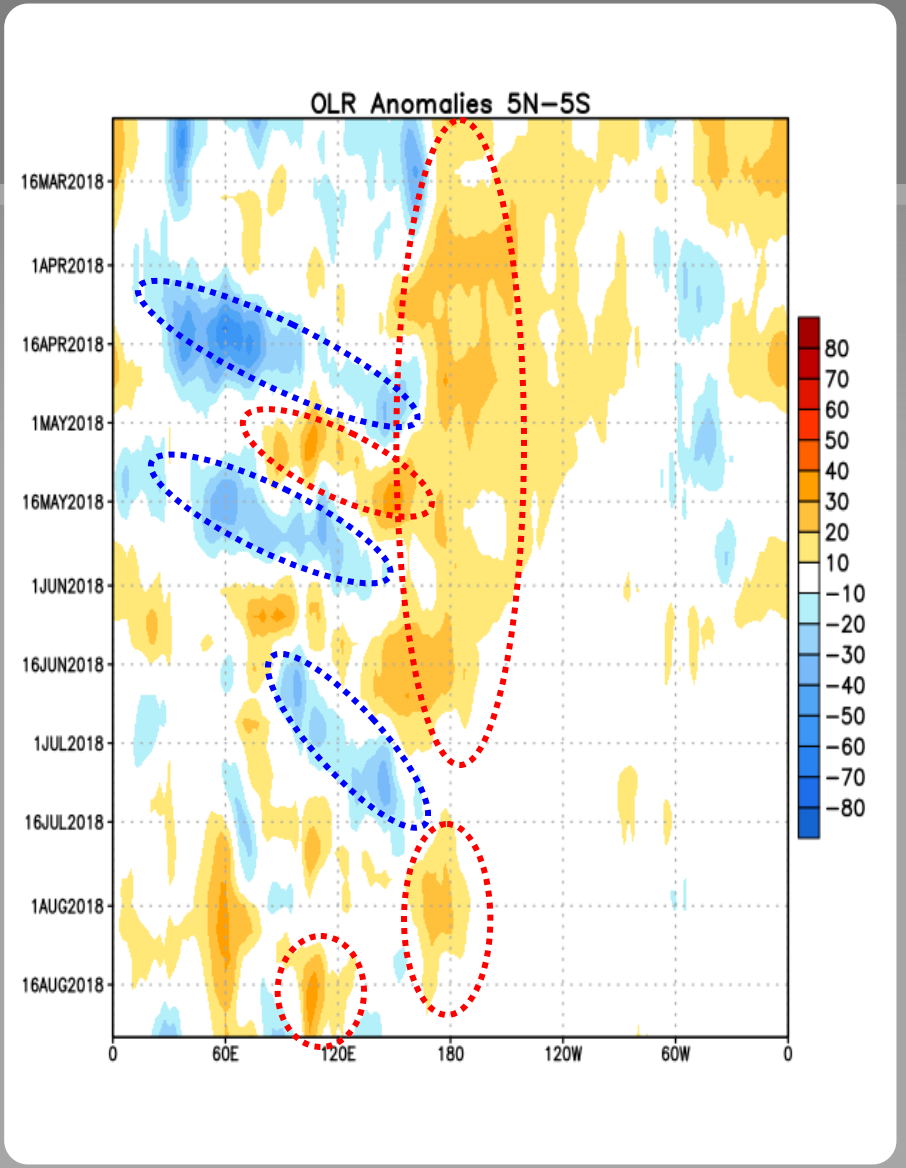


Note: Eastward propagation is not necessarily indicative of the Madden-Julian Oscillation (MJO).

Outgoing Longwave Radiation (OLR) Anomalies

Up to June 2018 and from mid-July to mid-August, positive OLR anomalies persisted over the central Pacific Ocean.

Recently, positive OLR anomalies have emerged near Indonesia (~120°E).



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.

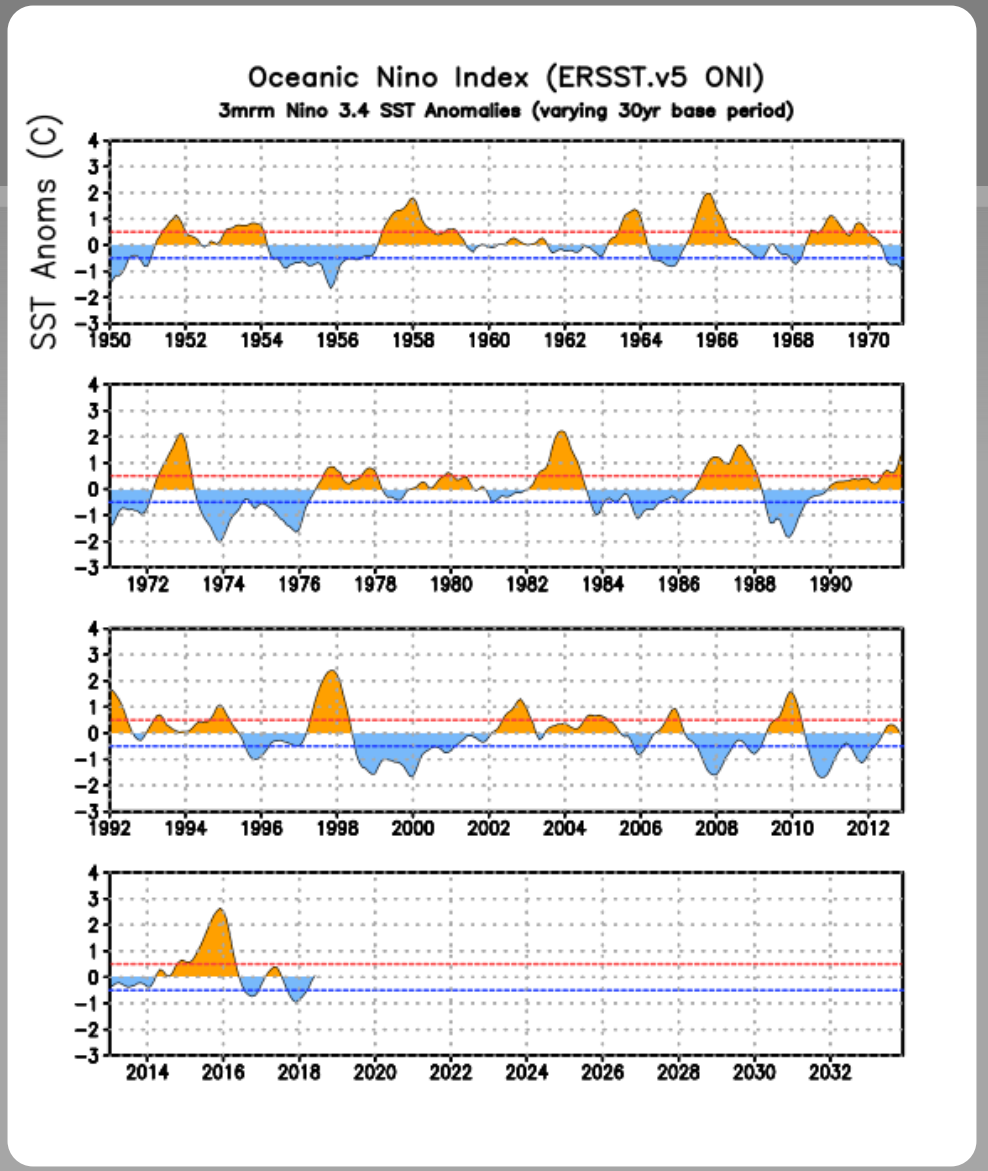
La Niña: characterized by a negative ONI less than or equal to -0.5°C.

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 (May - July 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.

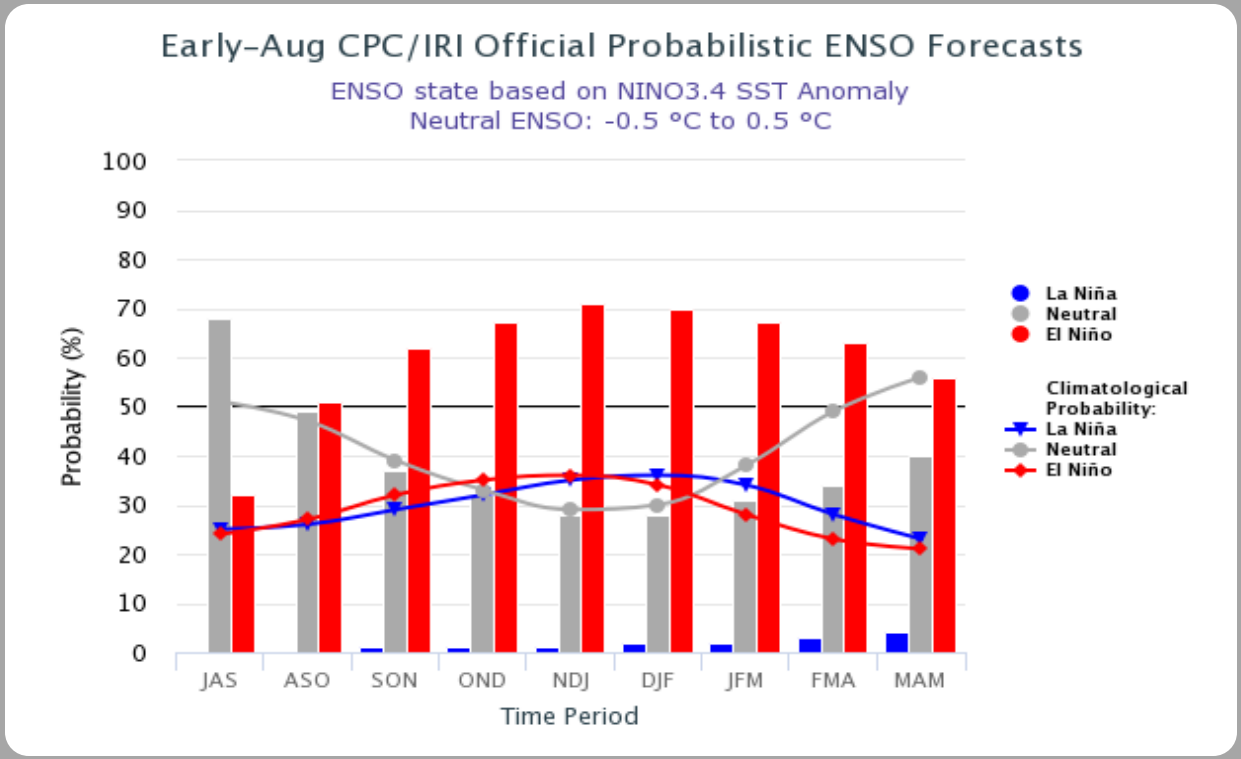
The ONI is one measure of the El Niño-Southern Oscillation, and other indices can confirm whether features consistent with a coupled ocean-atmosphere phenomenon accompanied these periods. The complete table going back to DJF 1950 can be found here.

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2006	-0.8	-0.7	-0.5	-0.3	0.0	0.0	0.1	0.3	0.5	0.7	0.9	0.9
2007	0.7	0.3	0.0	-0.2	-0.3	-0.4	-0.5	-0.8	-1.1	-1.4	-1.5	-1.6
2008	-1.6	-1.4	-1.2	-0.9	-0.8	-0.5	-0.4	-0.3	-0.3	-0.4	-0.6	-0.7
2009	-0.8	-0.7	-0.5	-0.2	0.1	0.4	0.5	0.5	0.7	1.0	1.3	1.6
2010	1.5	1.3	0.9	0.4	-0.1	-0.6	-1.0	-1.4	-1.6	-1.7	-1.7	-1.6
2011	-1.4	-1.1	-0.8	-0.6	-0.5	-0.4	-0.5	-0.7	-0.9	-1.1	-1.1	-1.0
2012	-0.8	-0.6	-0.5	-0.4	-0.2	0.1	0.3	0.3	0.3	0.2	0.0	-0.2
2013	-0.4	-0.3	-0.2	-0.2	-0.3	-0.3	-0.4	-0.4	-0.3	-0.2	-0.2	-0.3
2014	-0.4	-0.4	-0.2	0.1	0.3	0.2	0.1	0.0	0.2	0.4	0.6	0.7
2015	0.6	0.6	0.6	0.8	1.0	1.2	1.5	1.8	2.1	2.4	2.5	2.6
2016	2.5	2.2	1.7	1.0	0.5	0.0	-0.3	-0.6	-0.7	-0.7	-0.7	-0.6
2017	-0.3	-0.1	0.1	0.3	0.4	0.4	0.2	-0.1	-0.4	-0.7	-0.9	-1.0
2018	-0.9	-0.8	-0.6	-0.4	-0.1	0.1						

CPC/IRI Probabilistic ENSO Outlook

Updated: 9 August 2018

ENSO-neutral is favored through July-September 2018, with El Niño favored thereafter. Chances for El Niño are near 70% during Northern Hemisphere winter 2018-19.



IRI/CPC Pacific Niño 3.4 SST Model Outlook

The majority of models predict El Niño to develop by September-November 2018.

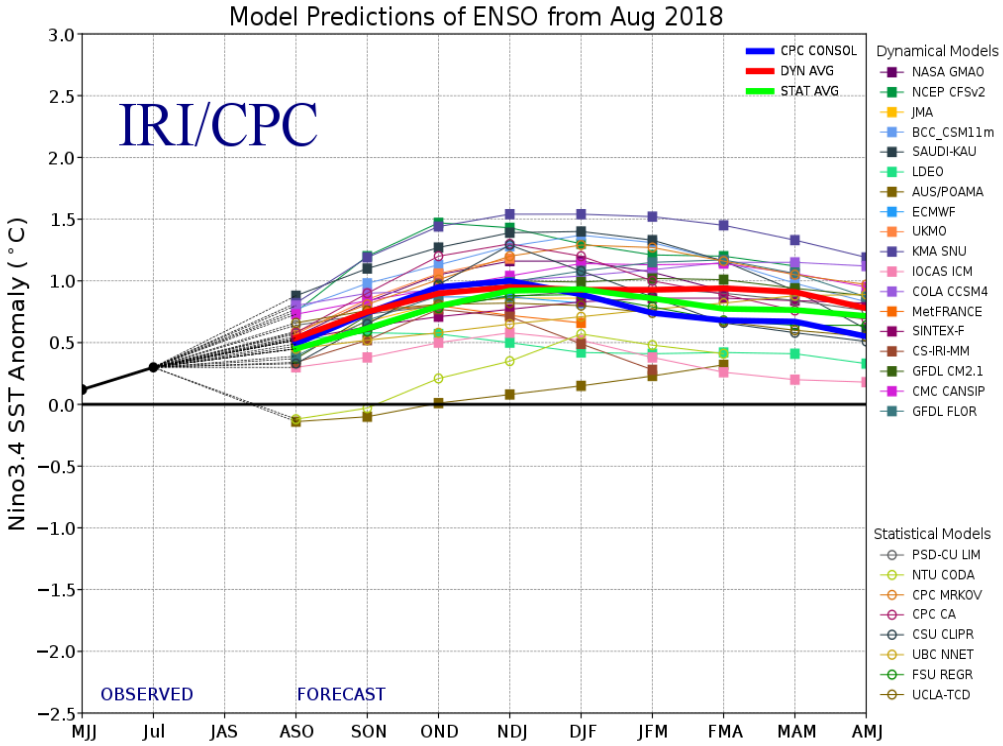
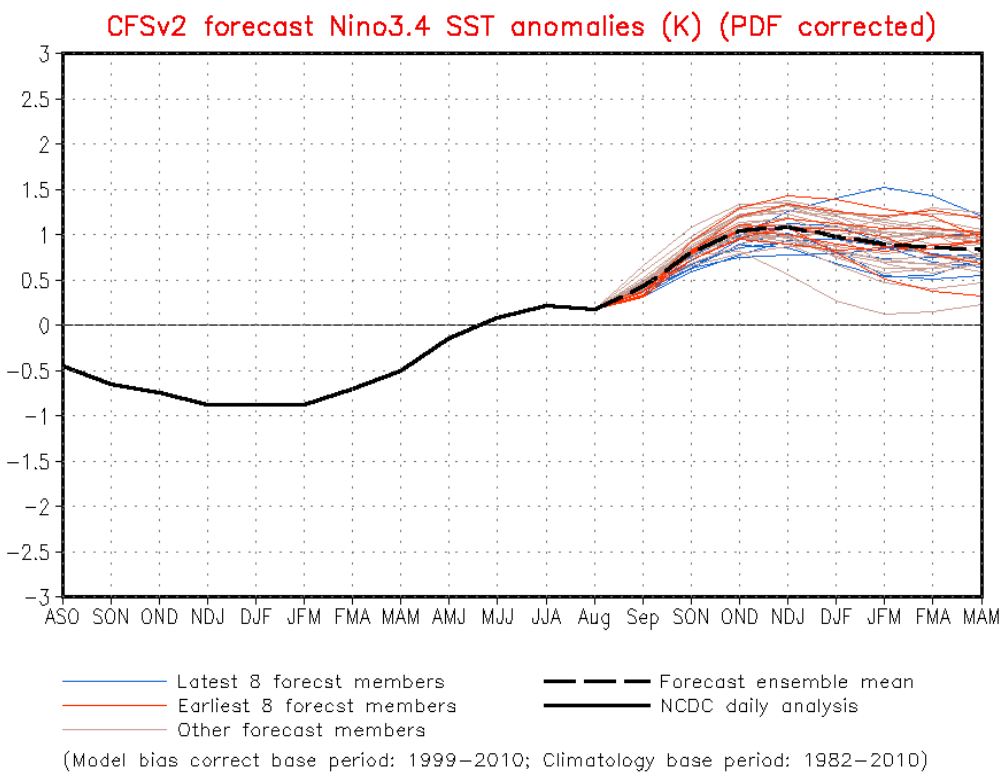


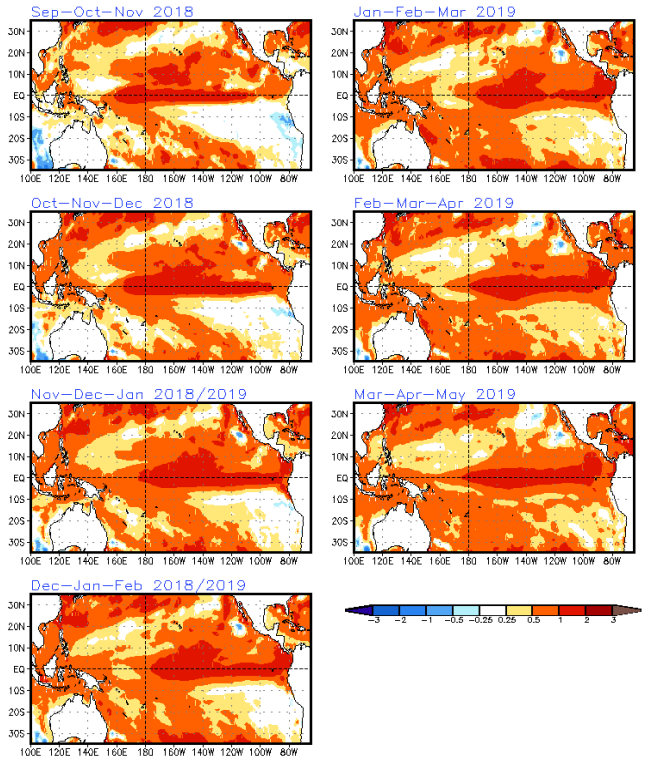
Figure provided by the International Research Institute (IRI) for Climate and Society (updated 20 August 2018).

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

Issued: 2 September 2018

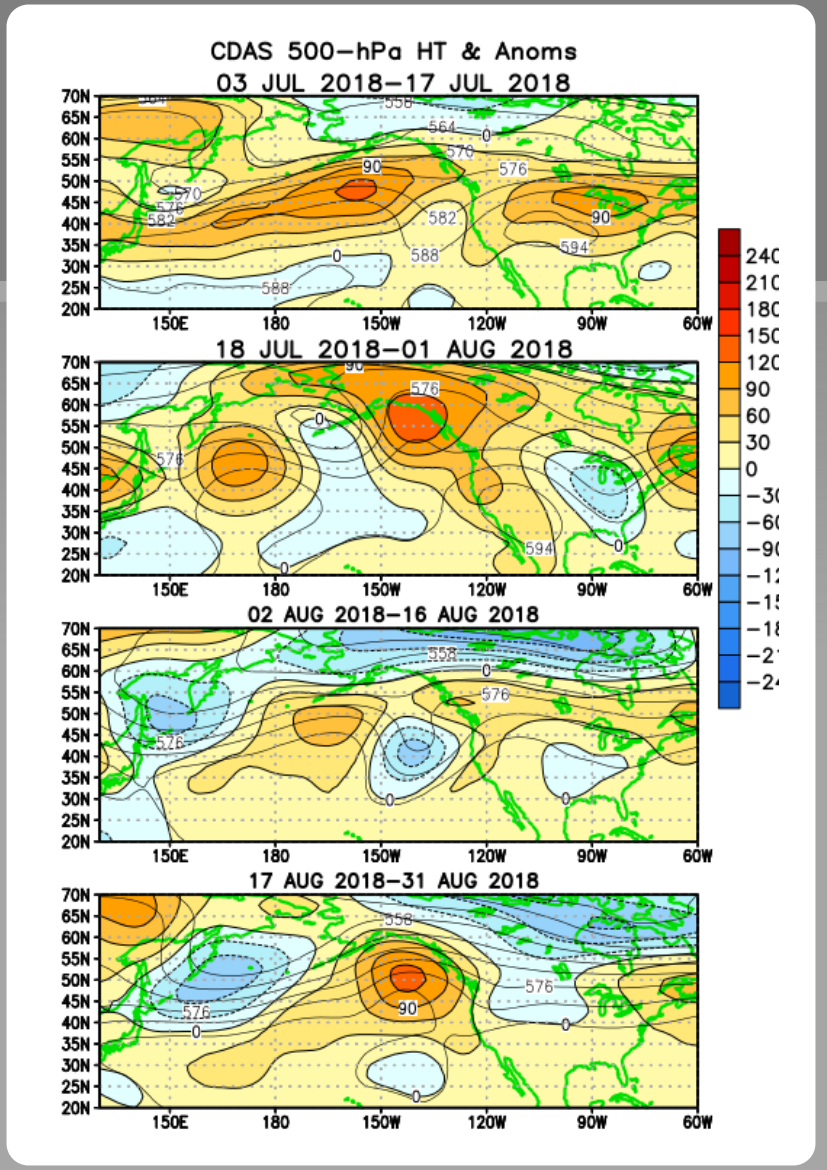
The CFS.v2 ensemble mean (black dashed line) favors El Niño forming in the next few months and continuing through winter 2018-19.





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

Since early July 2018, anomalous ridging (and above-average temperatures) has prevailed over the western U.S. Since mid-July, anomalous troughing (and below-average temperatures) were evident over the central or eastern U.S.



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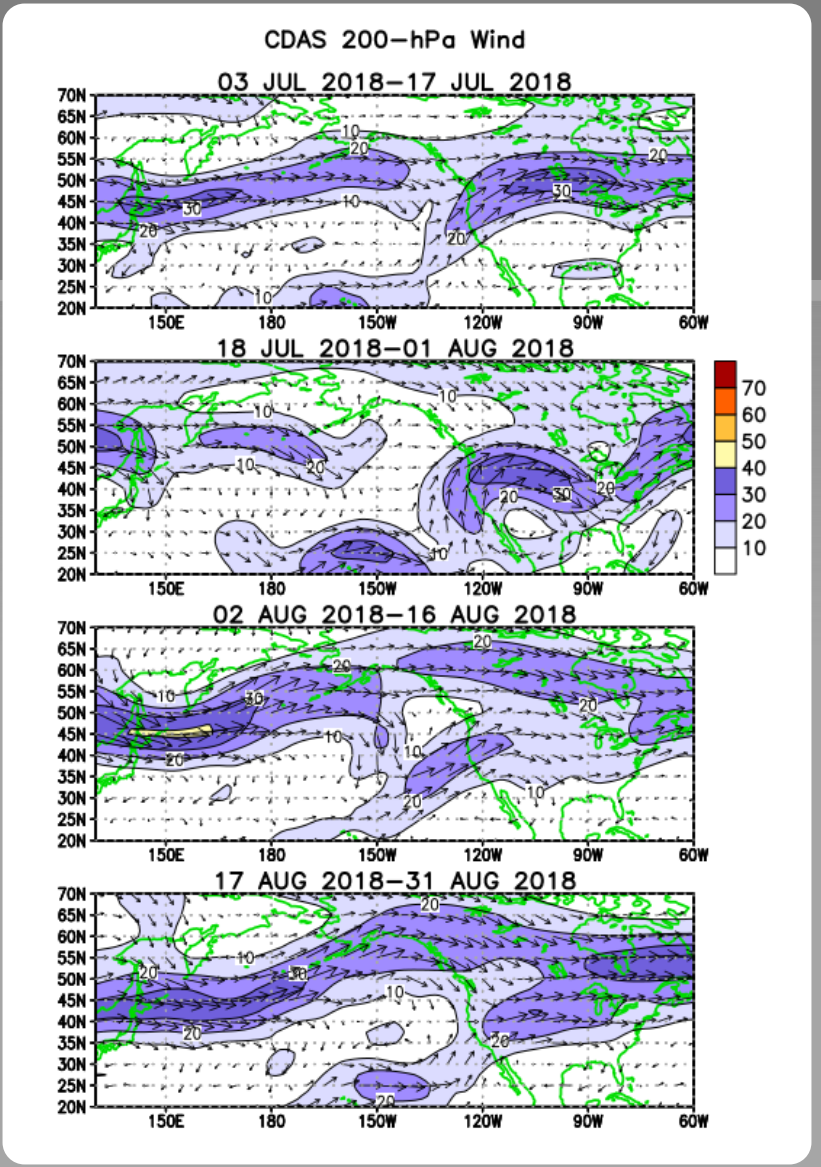

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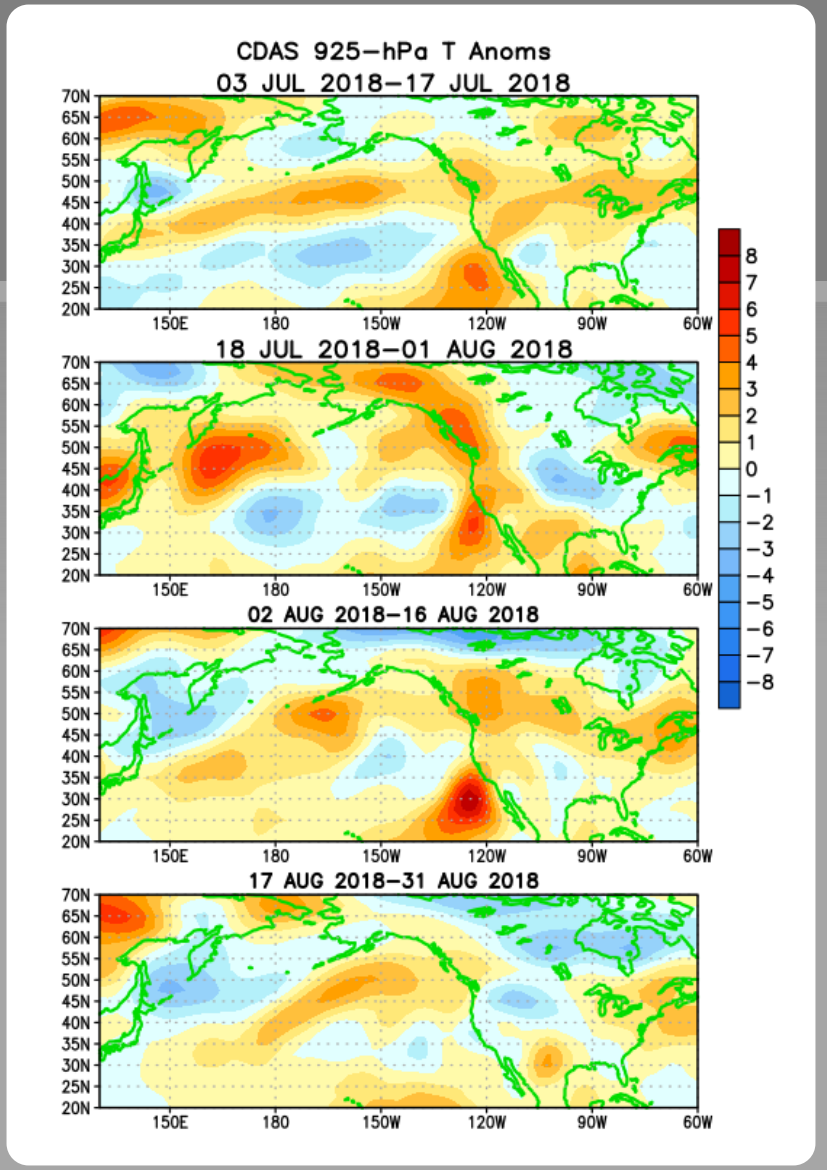
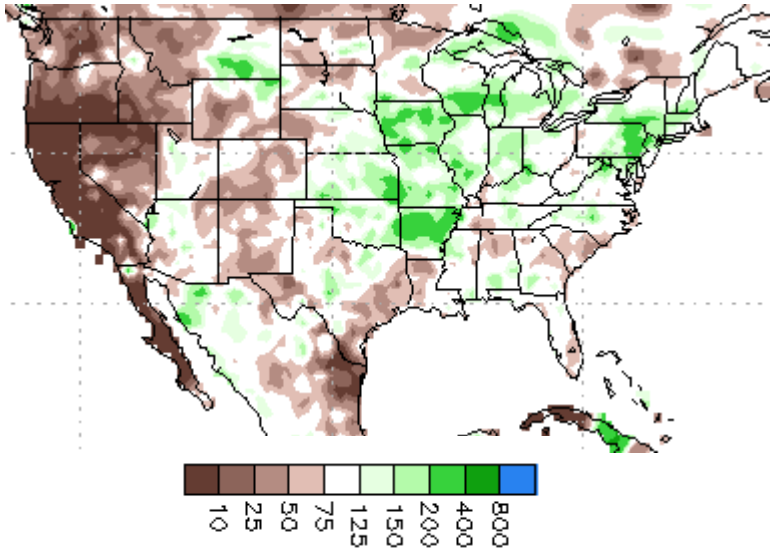


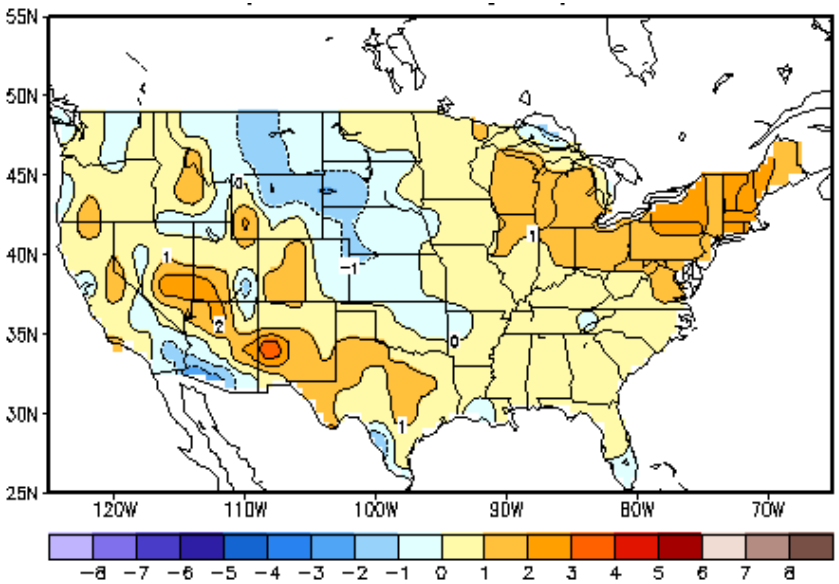
U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 1 September 2018

Percent of Average Precipitation



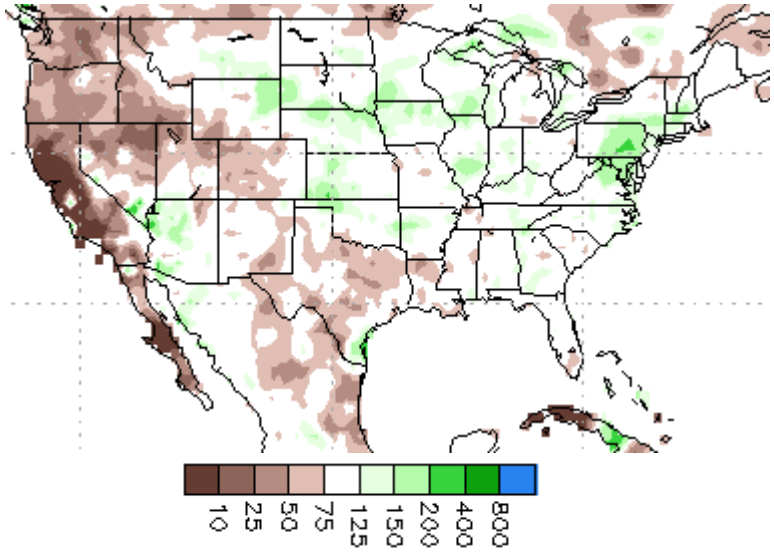
Temperature Departures (degree C)



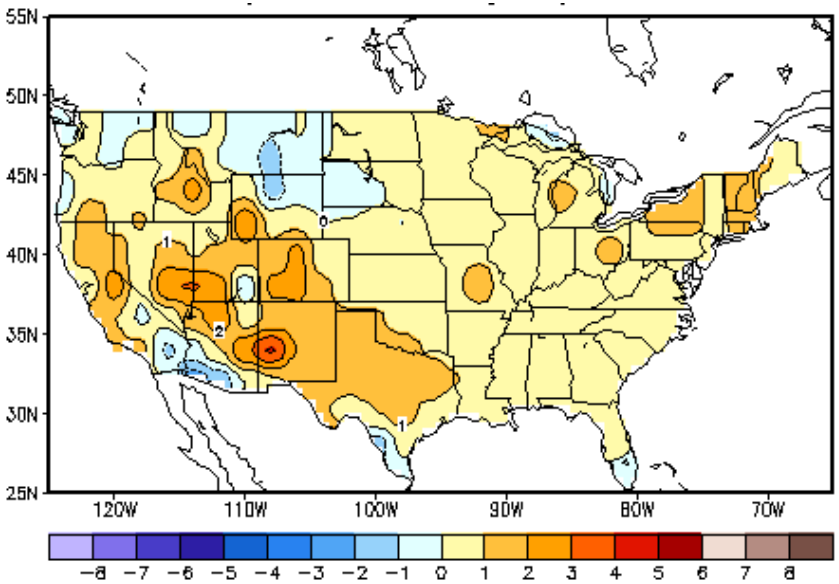
U.S. Temperature and Precipitation Departures During the Last 90 Days

End Date: 1 September 2018

Percent of Average Precipitation



Temperature Departures (degree C)

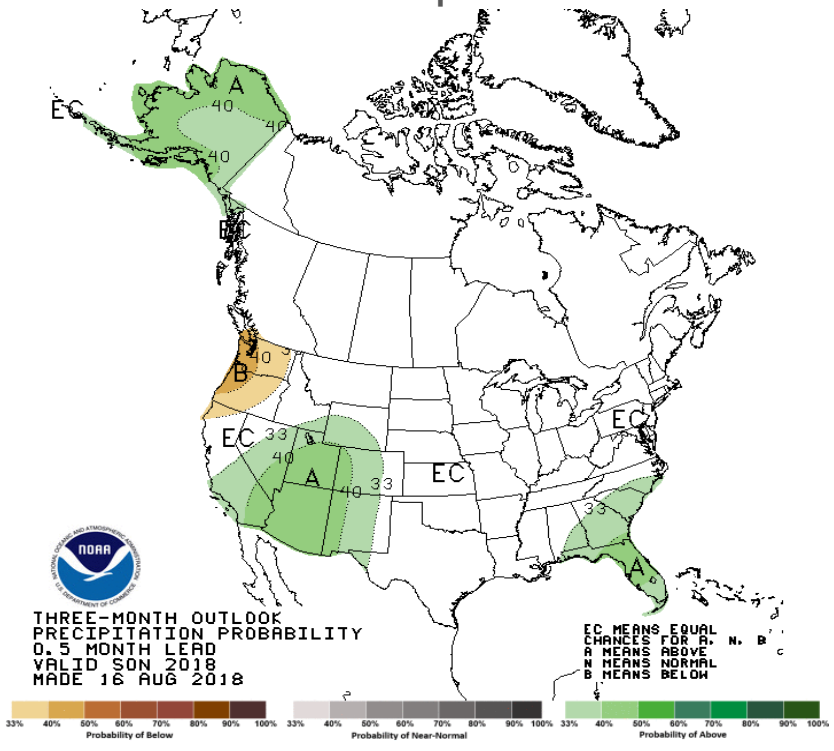


U. S. Seasonal Outlooks

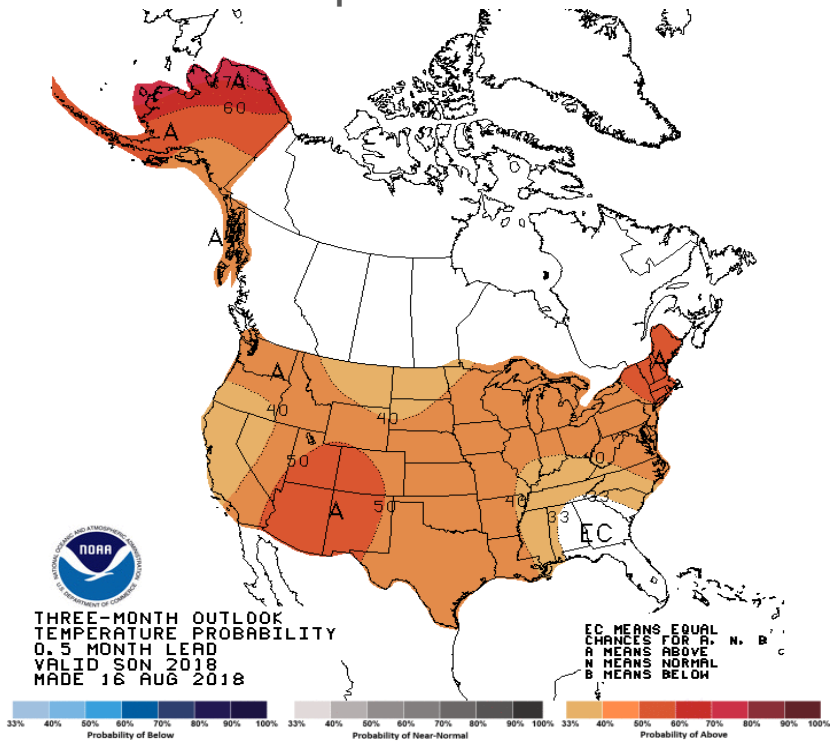
September - November 2018

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

Precipitation



Temperature



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There is ~60% chance of El Niño in the Northern Hemisphere fall 2018 (September-November), increasing to ~70% during winter 2018-19.

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