ENSO: Recent Evolution, Current Status and Predictions

Update prepared by:
Climate Prediction Center / NCEP
5 March 2018

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Recent Evolution and Current Conditions

Oceanic Niño Index (ONI)

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ENSO Alert System Status: La Niña Advisory

La Niña conditions are present.*

Equatorial sea surface temperatures (SSTs) are below average across the central and eastern Pacific Ocean.

A transition from La Niña to ENSO-neutral is most likely during the Northern Hemisphere spring (~55% chance of ENSO-neutral during the March-May season).*

* 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.

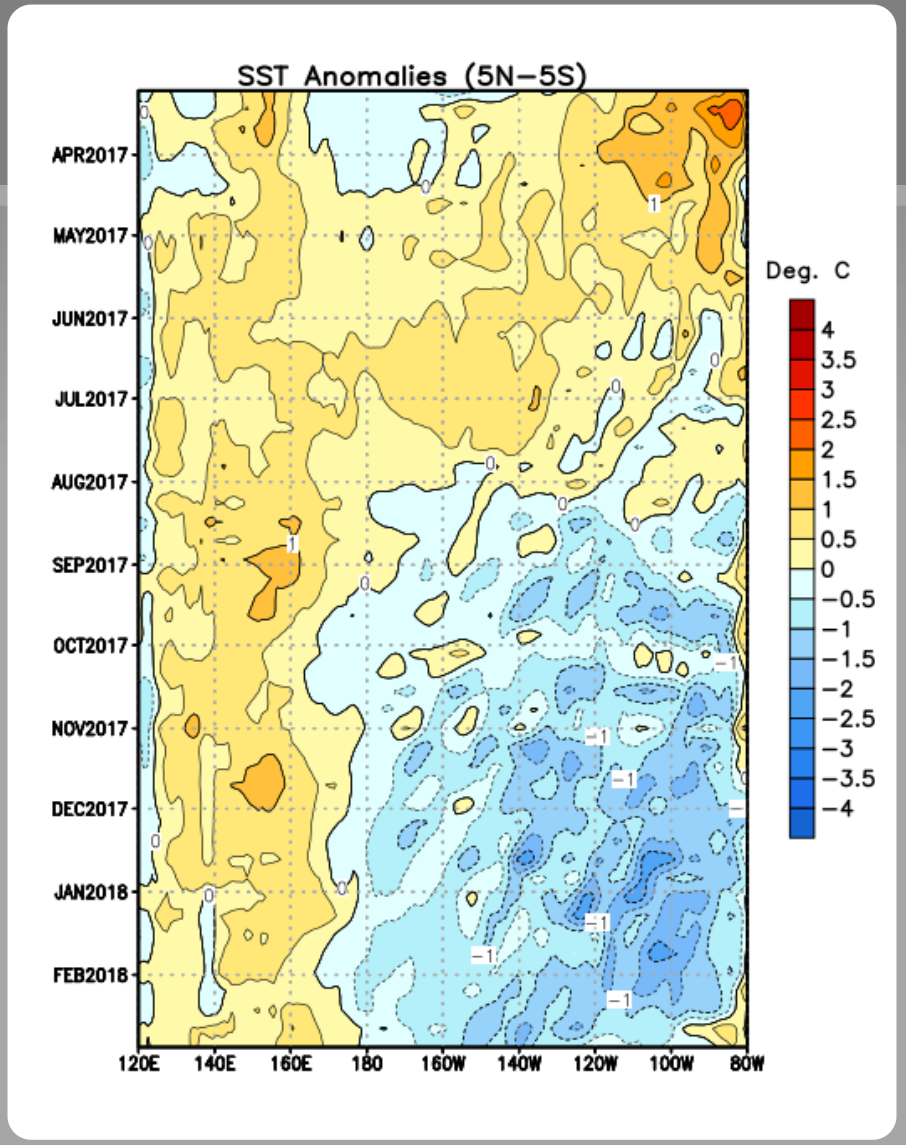
Recent Evolution of Equatorial Pacific SST Departures (°C)

From mid April to July 2017, near-to-above average SSTs spanned most of the equatorial Pacific.

During August 2017, above-average SSTs dissipated east of the date line.

Since September 2017, negative SST anomalies have generally persisted in the east-central equatorial Pacific.

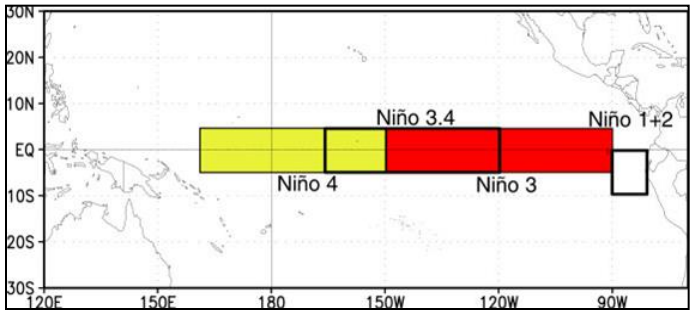
Recently, SSTs have returned to near average in the far eastern Pacific.

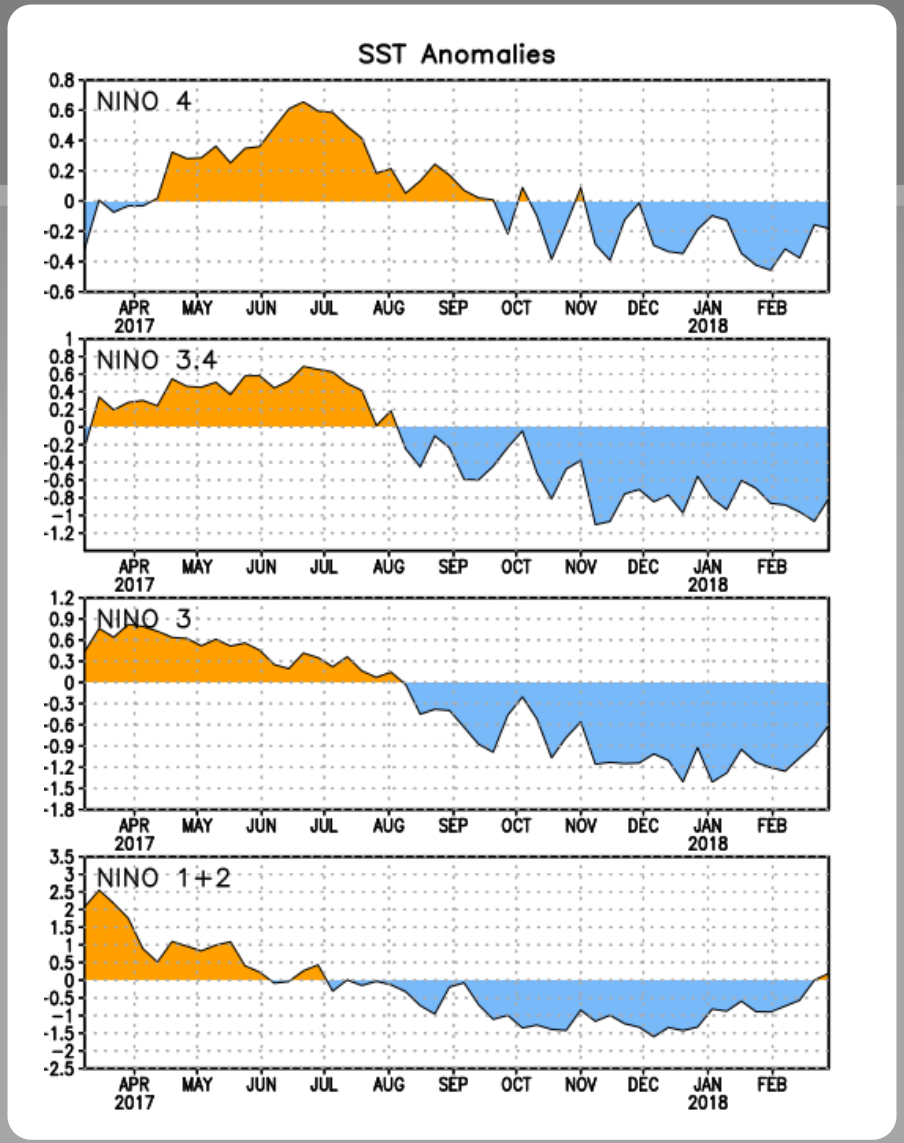


Niño Region SST Departures (ºC) Recent Evolution

The latest weekly SST departures are:

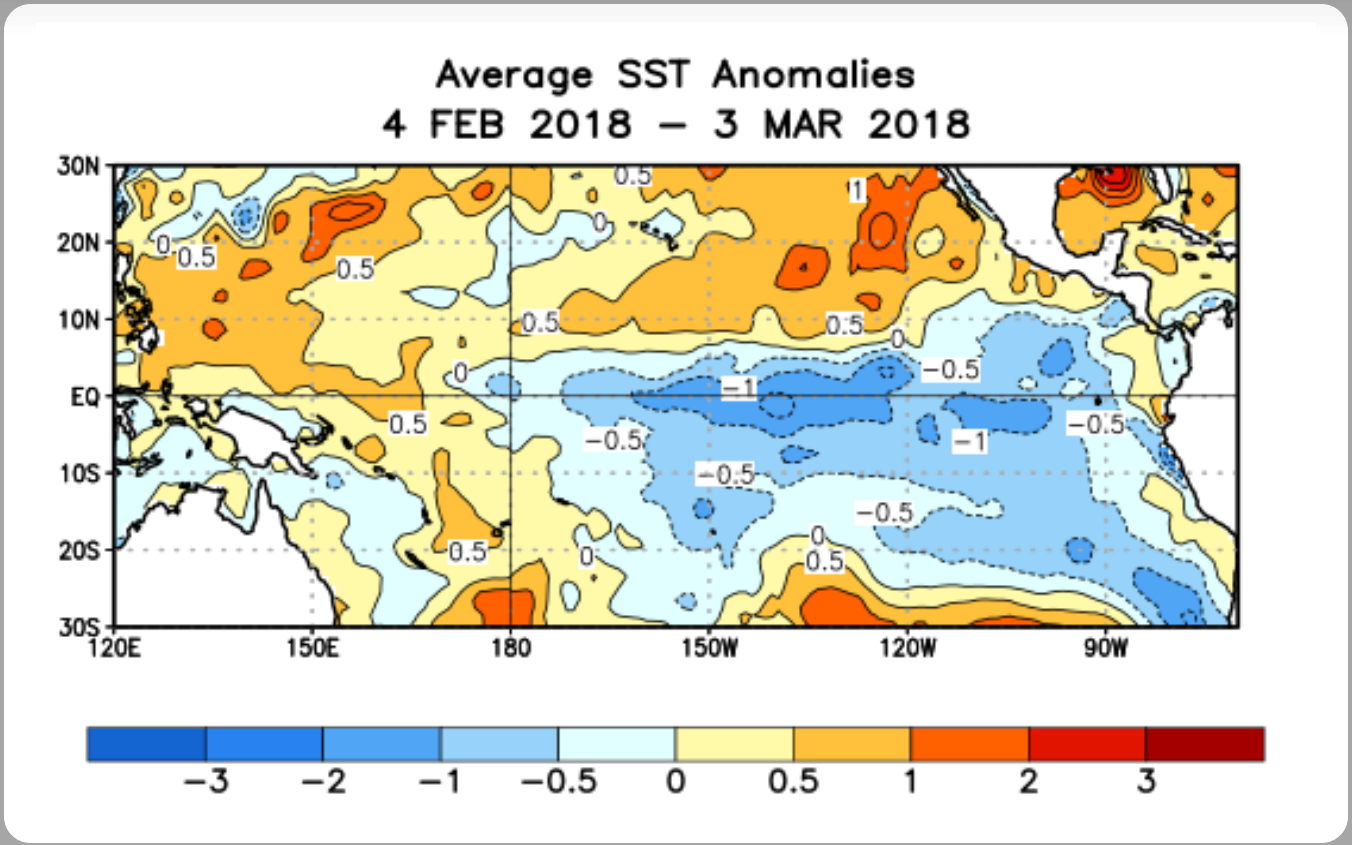
Niño 4	-0.2ºC
Niño 3.4	-0.8ºC
Niño 3	-0.6ºC
Niño 1+2	0.2ºC





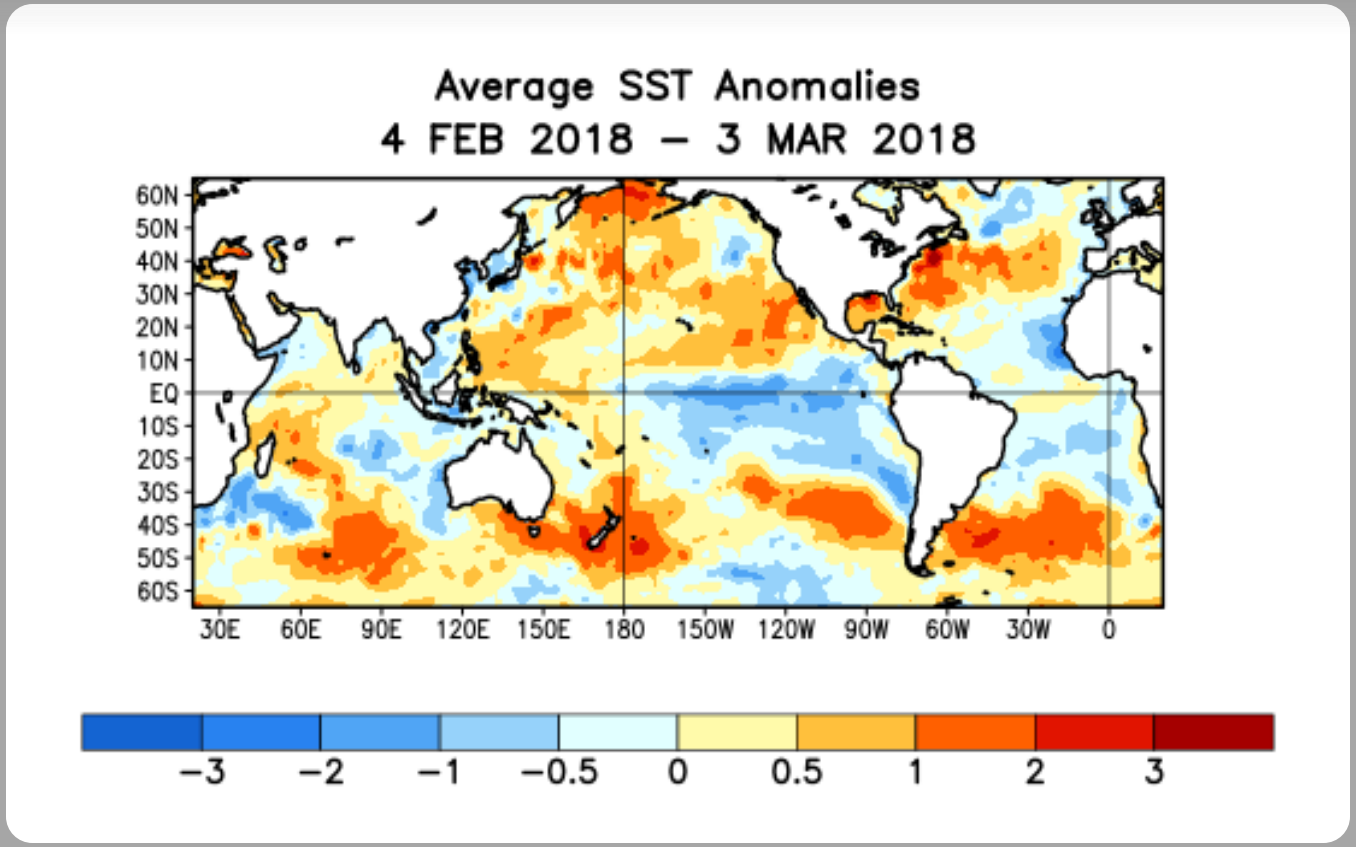
SST Departures (ºC) in the Tropical Pacific During the Last Four Weeks

During the last four weeks, equatorial SSTs were below average across most of the central and eastern Pacific Ocean, and above average in parts of the western Pacific.



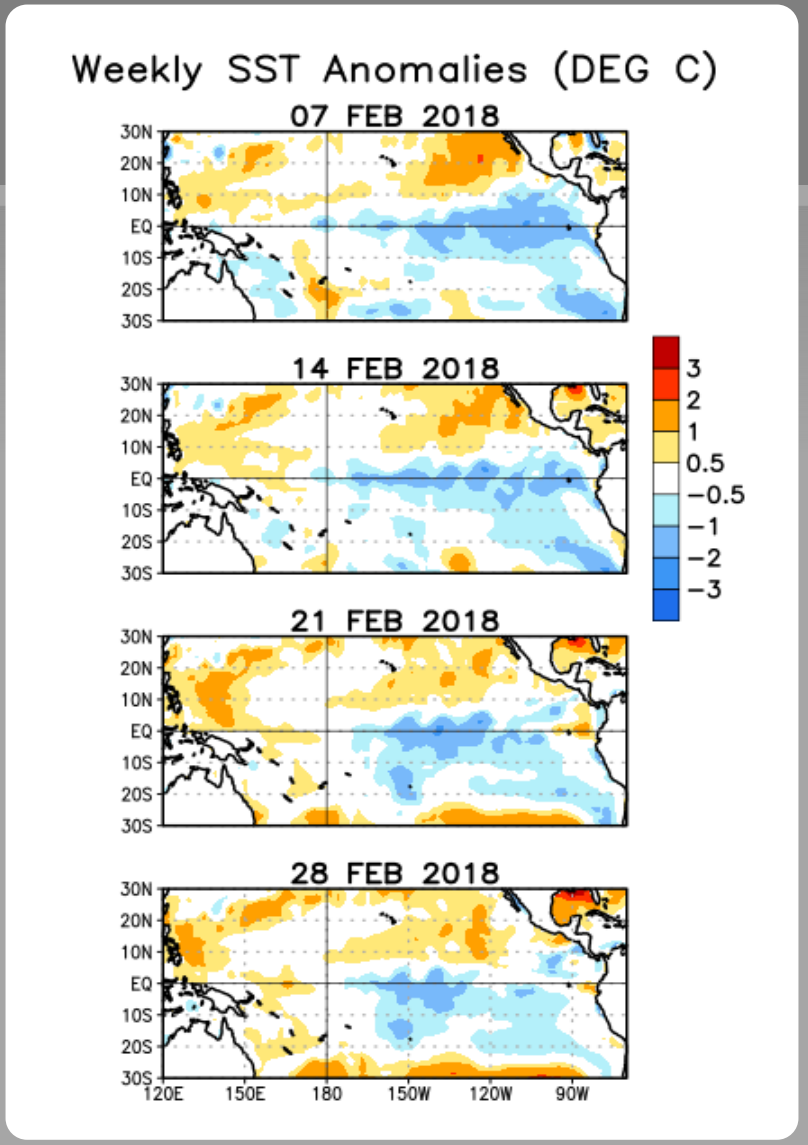
Global SST Departures (°C) During the Last Four Weeks

During the last four weeks, equatorial SSTs were above average in parts of the western Pacific. SSTs were below average across most of the central and eastern Pacific Ocean.



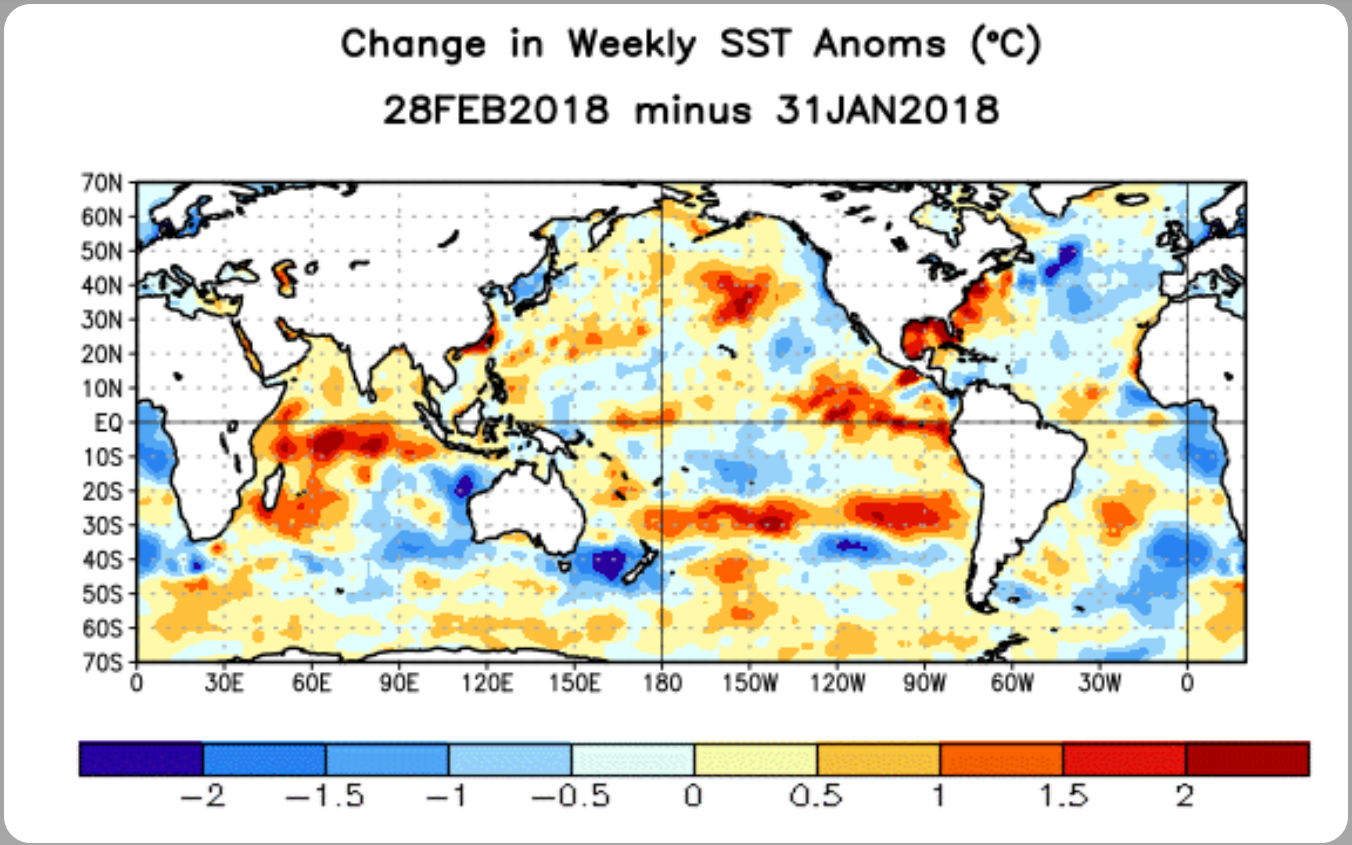
Weekly SST Departures during the Last Four Weeks

During the last four weeks, below-average SSTs persisted across the east-central Pacific Ocean, while negative anomalies dissipated near the Date Line and in the far eastern Pacific.



Change in Weekly SST Departures over the Last Four Weeks

During the last four weeks, positive changes in equatorial SST anomalies were observed near the Date Line and in the eastern Pacific Ocean.



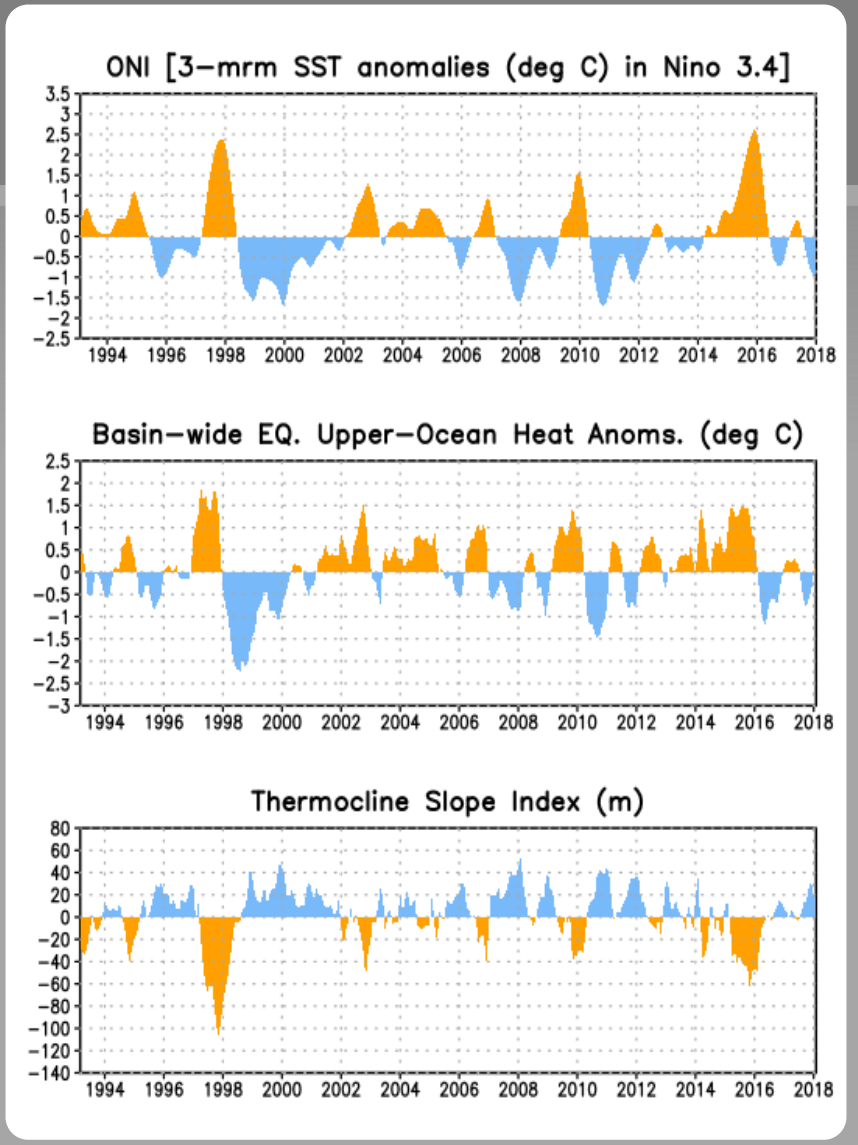
Upper-Ocean Conditions in the Equatorial Pacific

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.

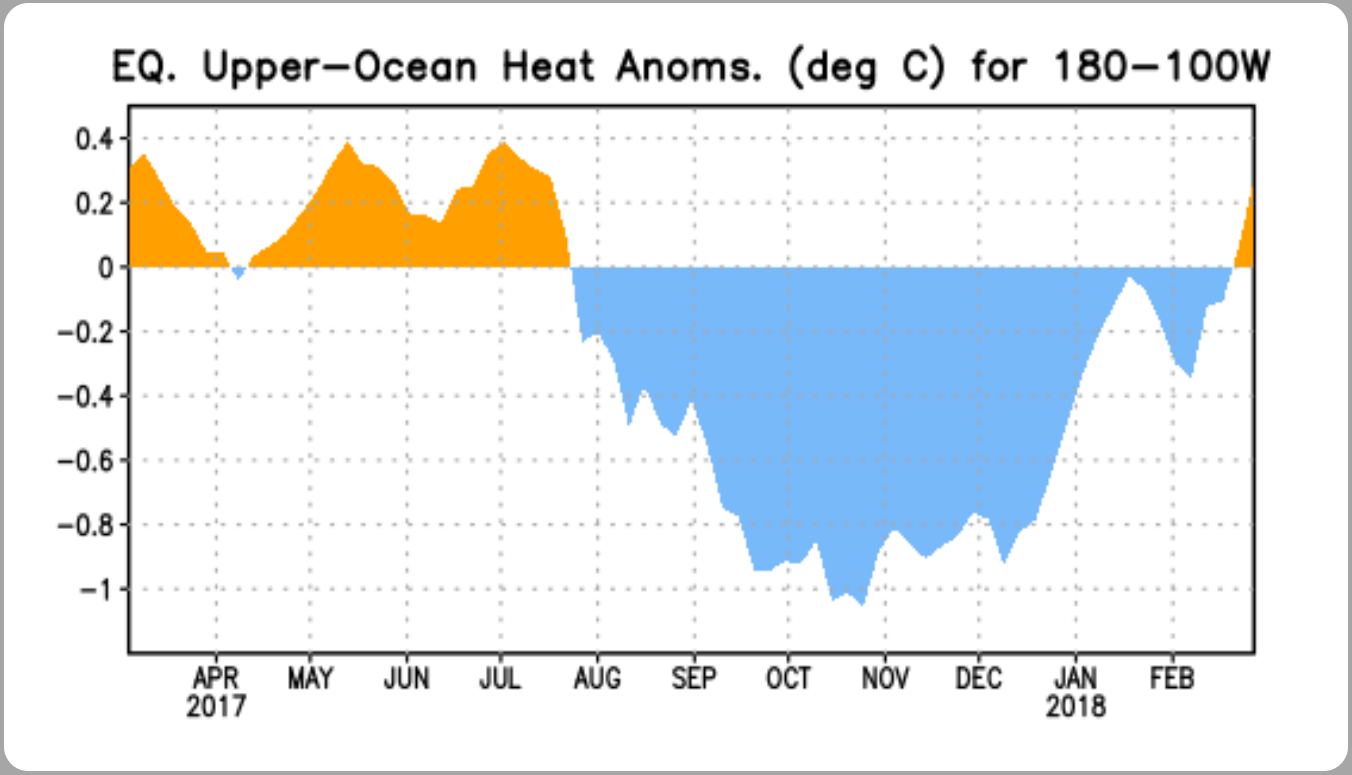
Recent values of the upper-ocean heat anomalies (below average) and thermocline slope index (above average) reflect La Niña conditions.

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).



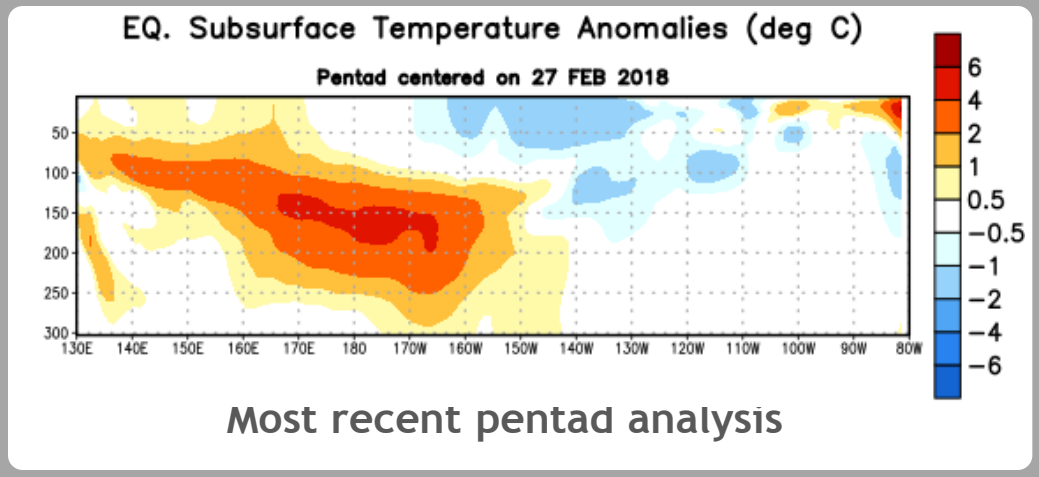
Central and Eastern Pacific Upper-Ocean (0-300 m) Weekly Average Temperature Anomalies

Positive subsurface temperature anomalies with large fluctuations in amplitude were present from mid-January through mid-July 2017. Negative anomalies lasted from August 2017 to February 2018. Temperatures became slightly positive near the end of February 2018.



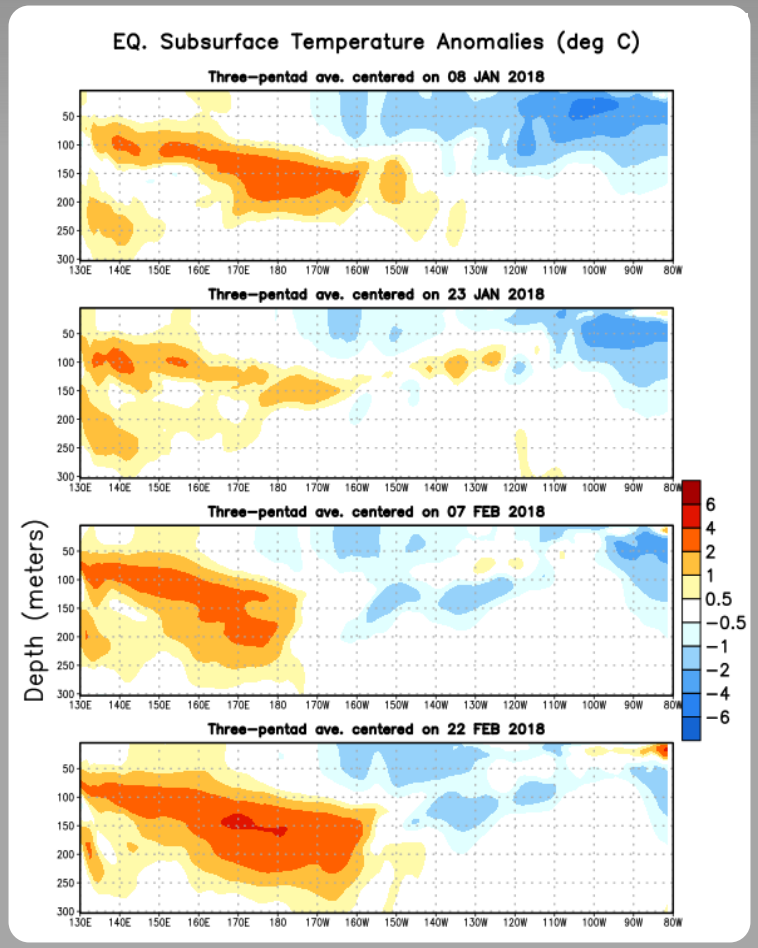
Sub-Surface Temperature Departures in the Equatorial Pacific

In the last two months, negative subsurface temperature anomalies have weakened across the eastern Pacific Ocean.



Most recent pentad analysis

Recently, prominent positive temperature anomalies at depth have shifted eastward to ~140°W. Negative anomalies persist closer to the surface between 170°W and 110°W.

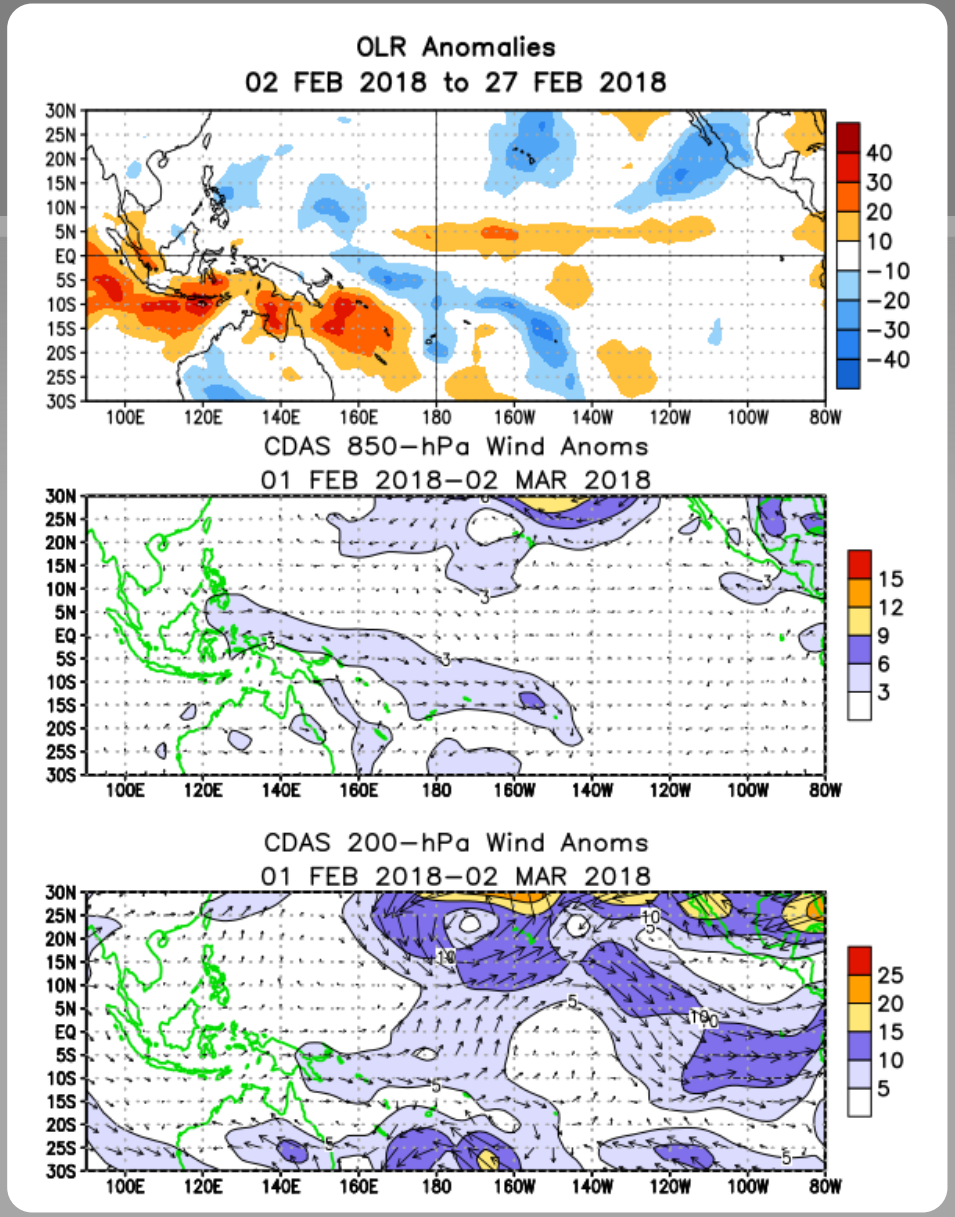


Tropical OLR and Wind Anomalies During the Last 30 Days

Weak, negative OLR anomalies (enhanced convection and precipitation) were evident just east of Papua New Guinea. Positive OLR anomalies (reduced convection and precipitation) were present over Indonesia and just north of Australia.

Low-level (850-hPa) winds were anomalous westerly over the western tropical Pacific Ocean.

Upper-level (200-hPa) winds were anomalous westerly over the eastern tropical Pacific Ocean and anomalously cross equatorial over the 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

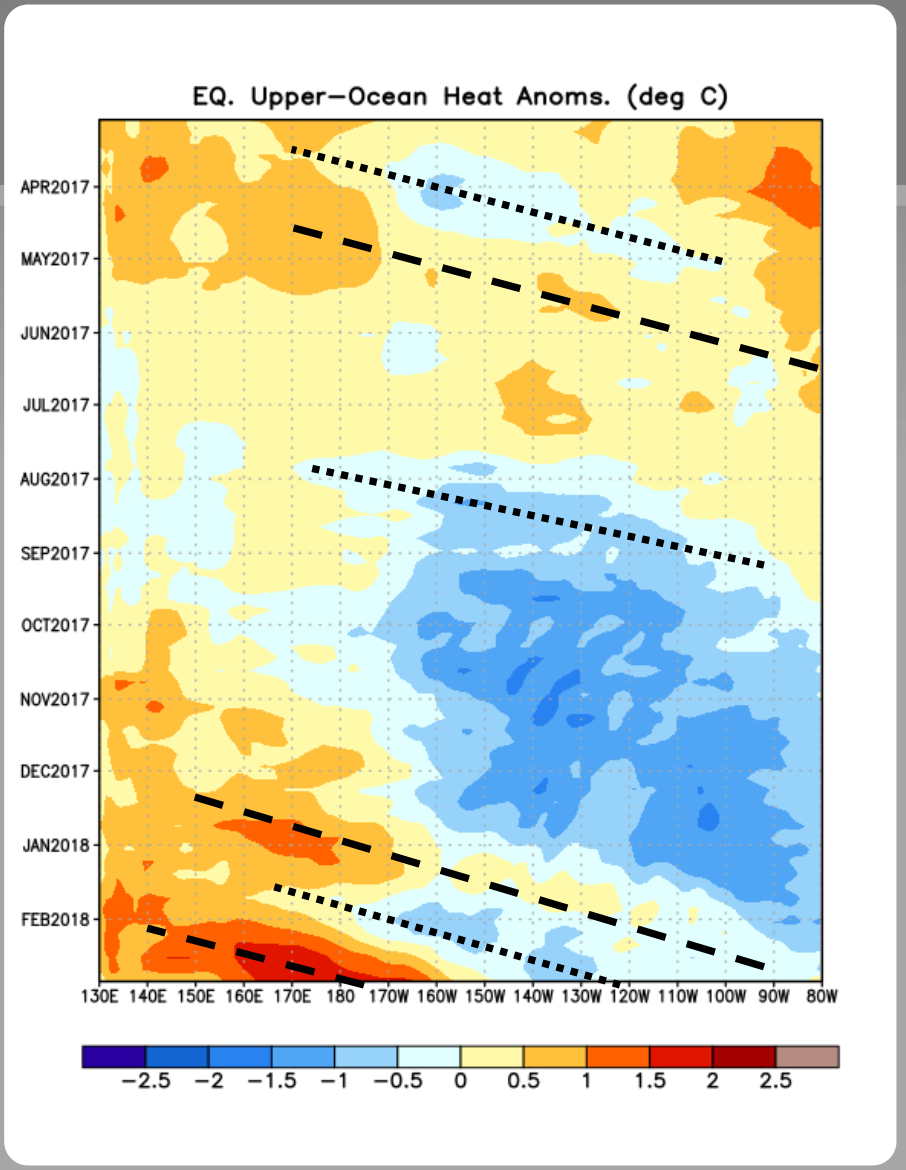
From August 2017- early January 2018, negative subsurface anomalies persisted in the central and eastern Pacific Ocean.

From December 2017- February 2018, a downwelling Kelvin wave contributed to the eastward shift of above-average subsurface temperatures.

From mid January 2018 to present, an upwelling Kelvin wave resulted in below-average subsurface temperatures in the central and east-central Pacific.

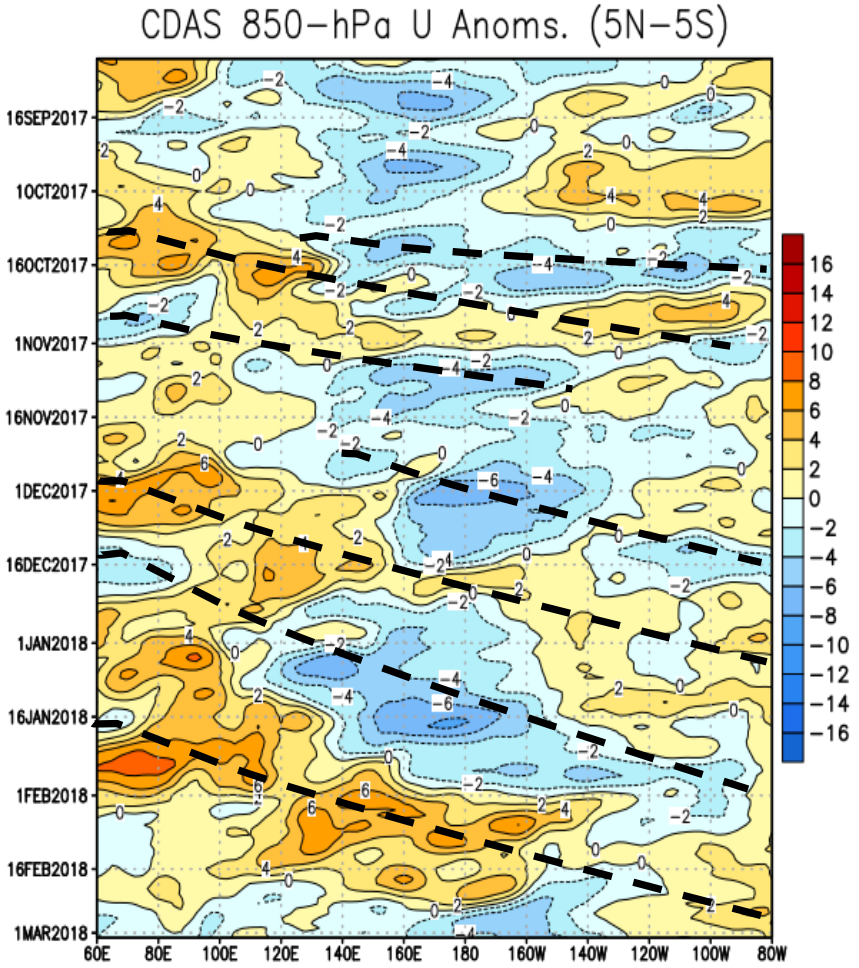
Since early February 2018, another downwelling Kelvin wave has led to positive subsurface anomalies near the Date Line.

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})

Since mid-October 2017, the Madden Julian Oscillation (MJO) disrupted the pattern, contributing to the eastward propagation of low-level wind anomalies.

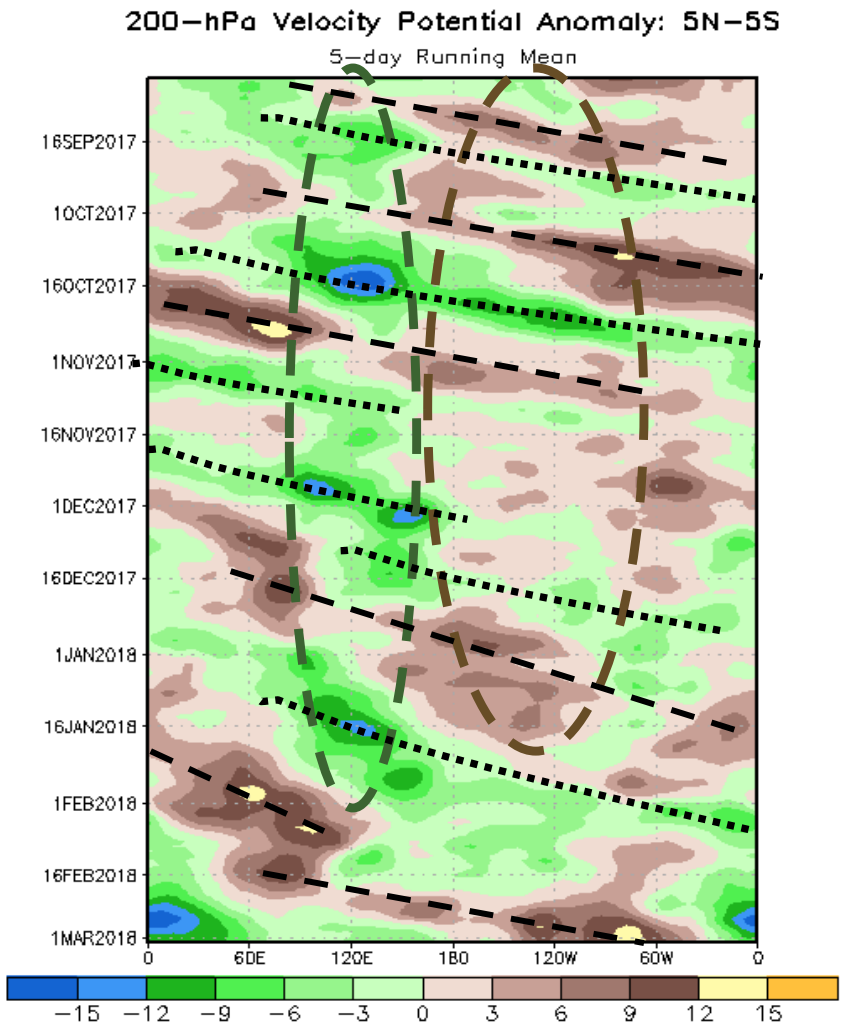


Westerly Wind Anomalies (orange/red shading)
Easterly Wind Anomalies (blue shading)

Upper-level (200-hPa) Velocity Potential Anomalies

Until January 2018, anomalous upper-level divergence (green shading) generally persisted near Indonesia, while anomalous convergence (brown shading) persisted near the Date Line.

Eastward propagation of regions of upper-level divergence (green shading) and convergence (brown shading) has been evident from mid-July 2017 to the present.



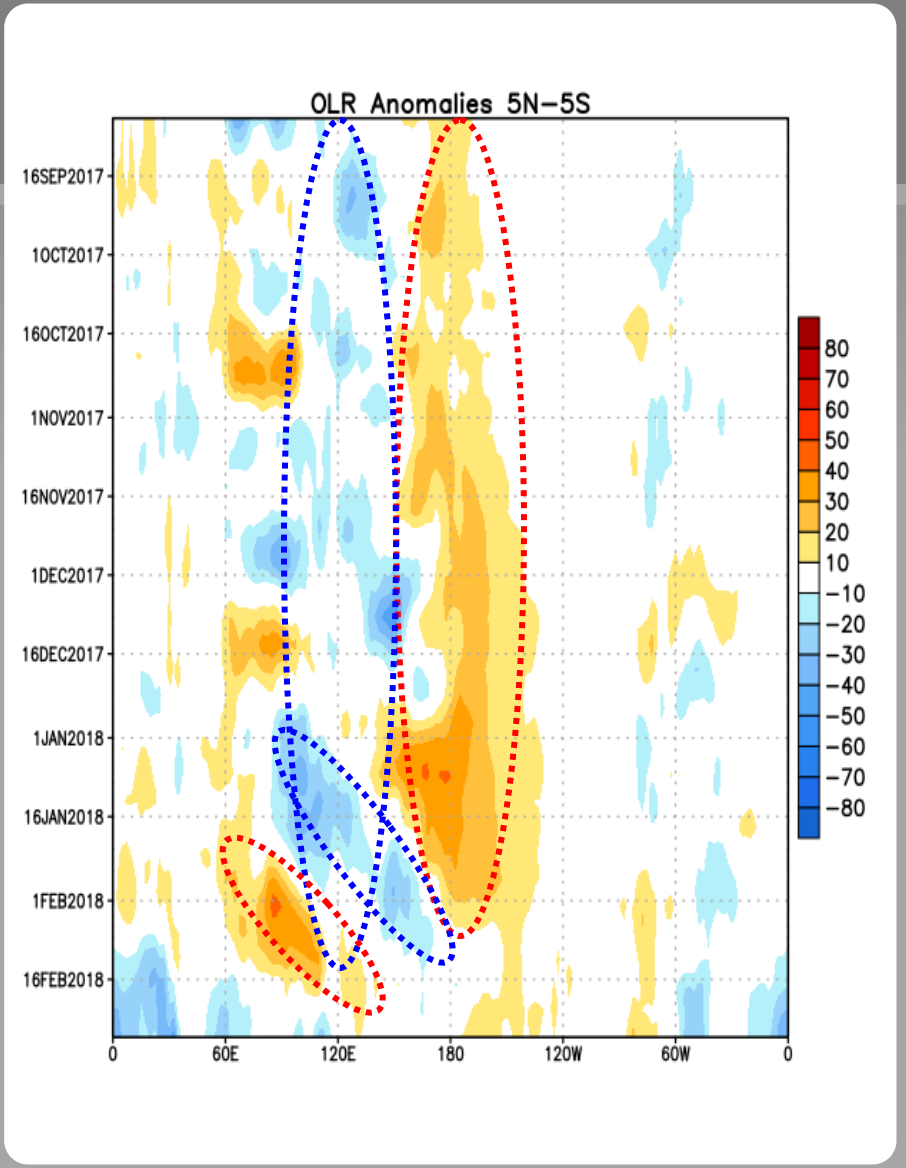
Unfavorable for precipitation (brown shading)
Favorable for precipitation (green shading)

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

Outgoing Longwave Radiation (OLR) Anomalies

Until late January 2018, positive OLR anomalies persisted over the central Pacific Ocean. At the same time, negative OLR anomalies were more intermittent near the Maritime Continent.

Recently, OLR anomalies have been weak across Indonesia and the equatorial 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°C.

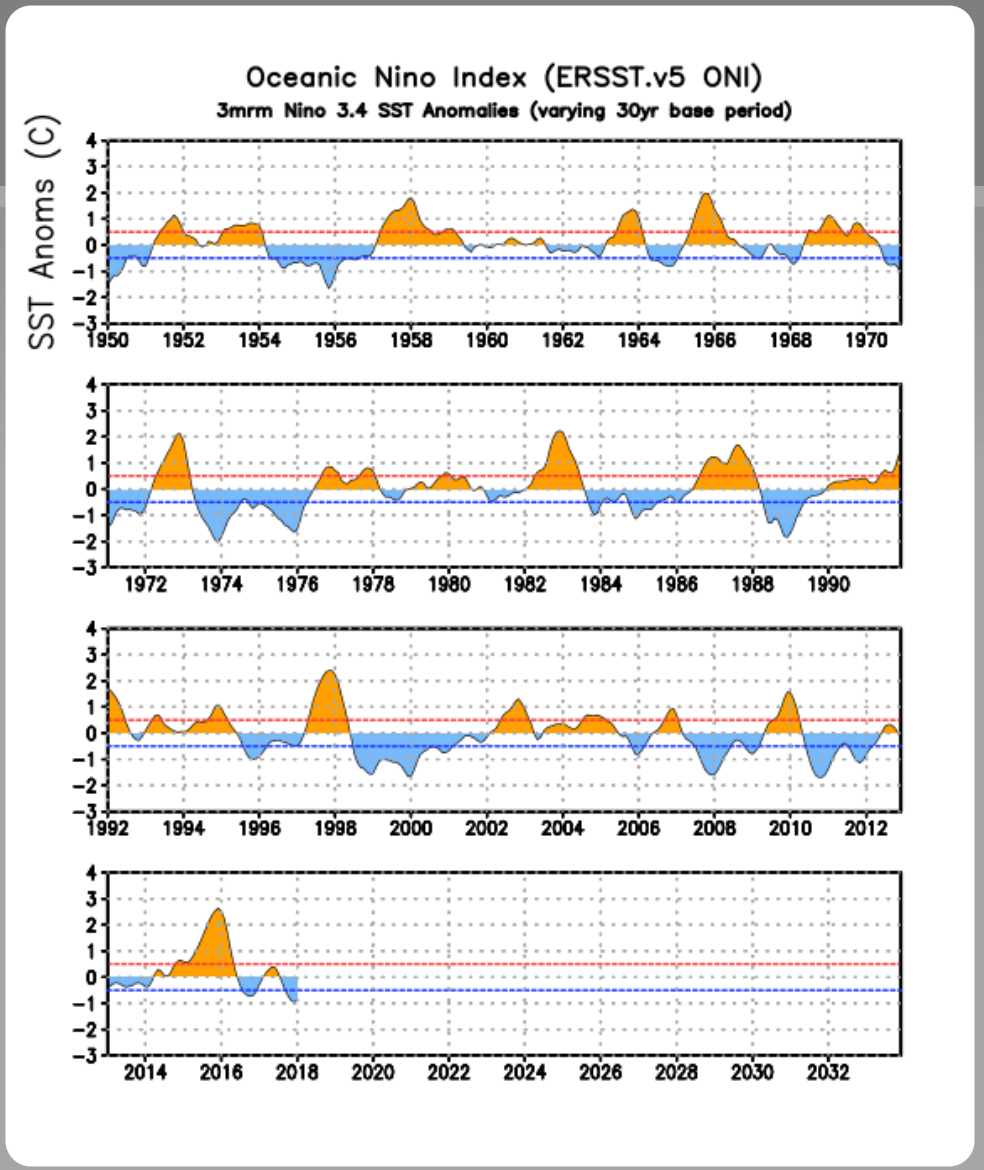
La Niña: characterized by a negative ONI less than or equal to -0.5°C.

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 (December 2017- February 2018) is -0.9°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.

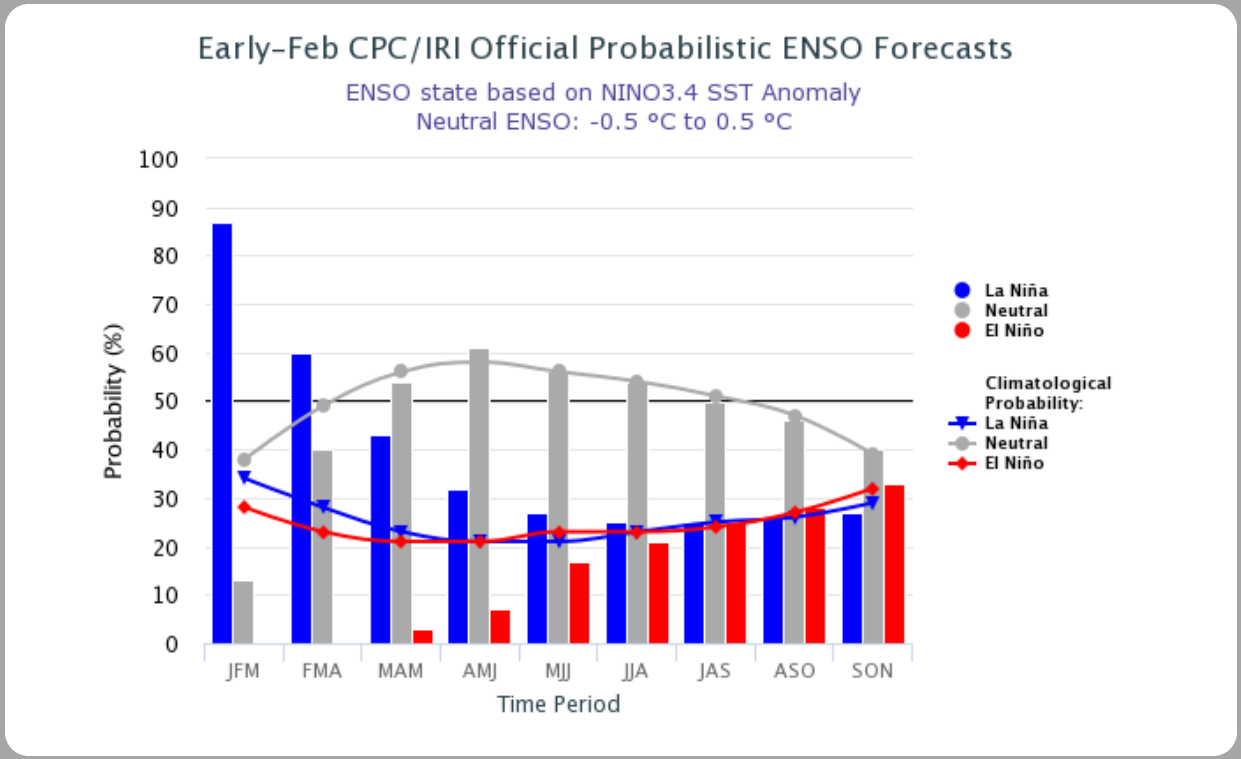
The ONI is one measure of the El Niño-Southern Oscillation, and other indices can confirm whether features consistent with a coupled ocean-atmosphere phenomenon accompanied these periods. The complete table going back to DJF 1950 can be found here.

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											

CPC/IRI Probabilistic ENSO Outlook

Updated: 8 February 2018

A transition from La Niña to ENSO-neutral is expected during the Northern Hemisphere spring (~55% chance of ENSO-neutral during March-May). Thereafter, ENSO-neutral conditions are favored through fall 2018.



IRI/CPC Pacific Niño 3.4 SST Model Outlook

The majority of models predict La Niña to persist into Northern Hemisphere spring 2018, with a return to ENSO-neutral by summer 2018.

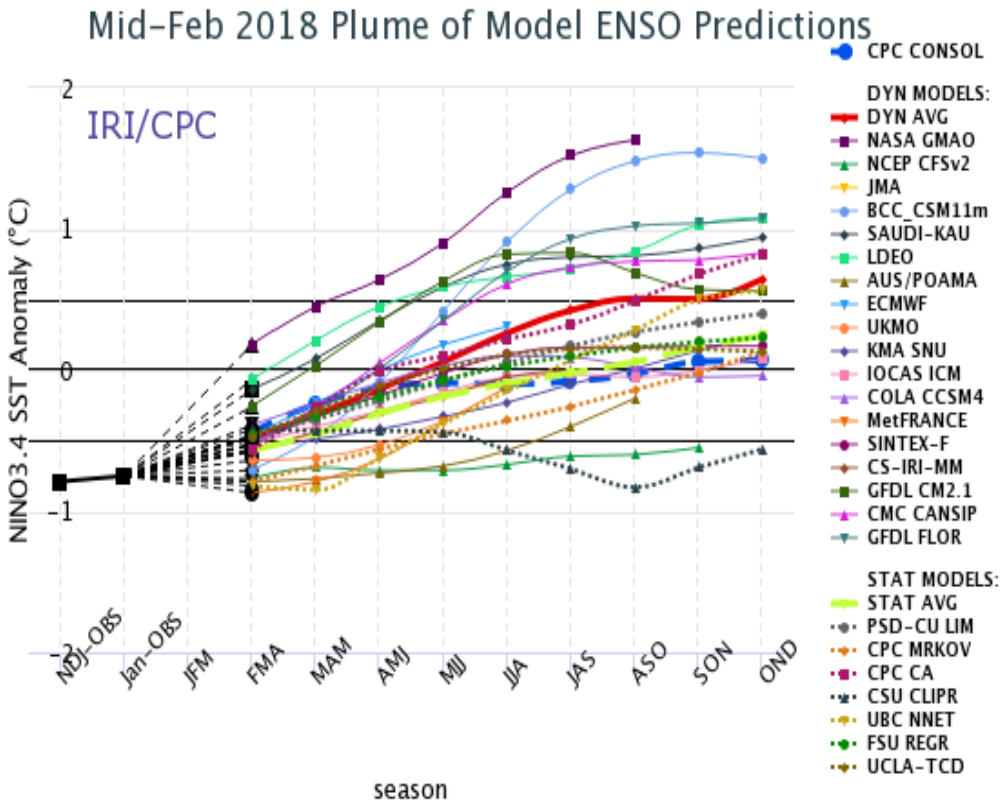
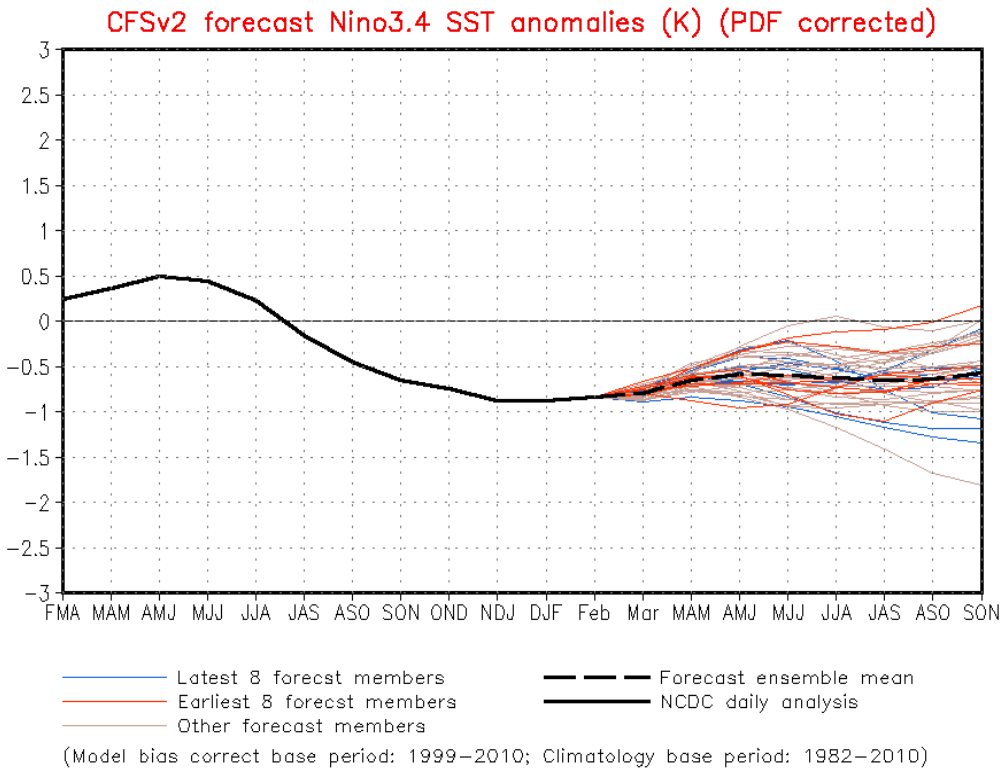


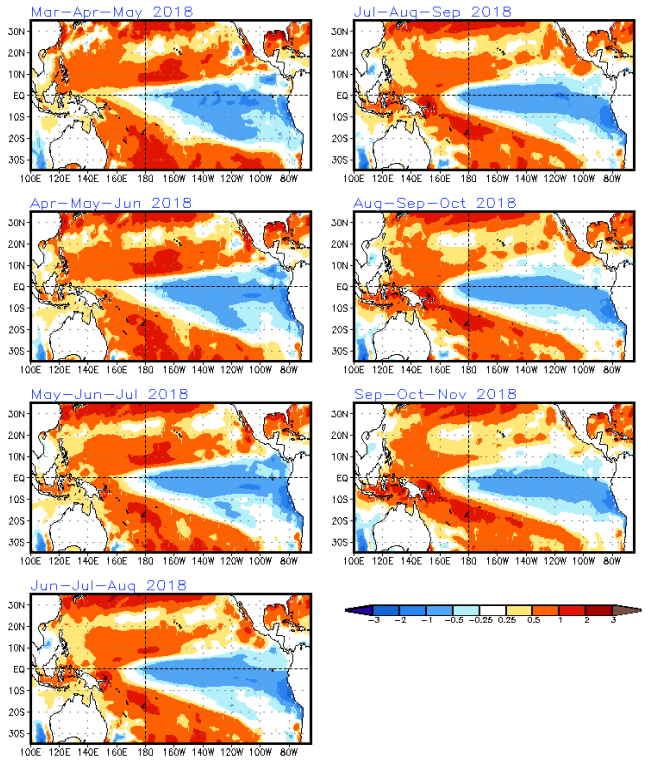
Figure provided by the International Research Institute (IRI) for Climate and Society (updated 19 February 2018).

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

Issued: 4 March 2018

The CFS.v2 ensemble mean (black dashed line) favors borderline ENSO-neutral or La Niña conditions through the Northern Hemisphere summer 2018.



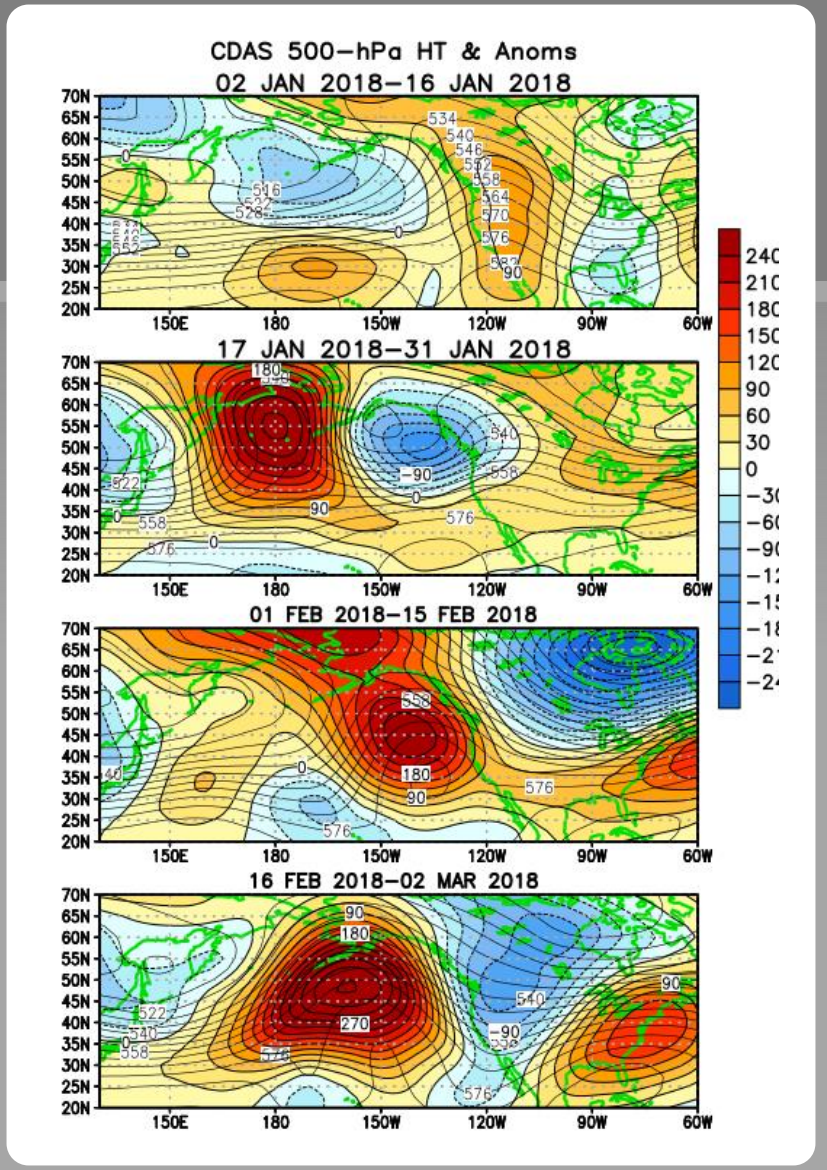


Atmospheric anomalies over the North Pacific and North America During the Last 60 Days

Since early January 2018, large fluctuations in the eastward extent and strength of the East Asian jet stream have contributed to periods of strong anomalous ridging over the high latitudes of the North Pacific and western North America.

These conditions have been associated with periods of well below-average heights and temperatures downstream.

Above-average temperatures have generally prevailed over the southwestern U.S.



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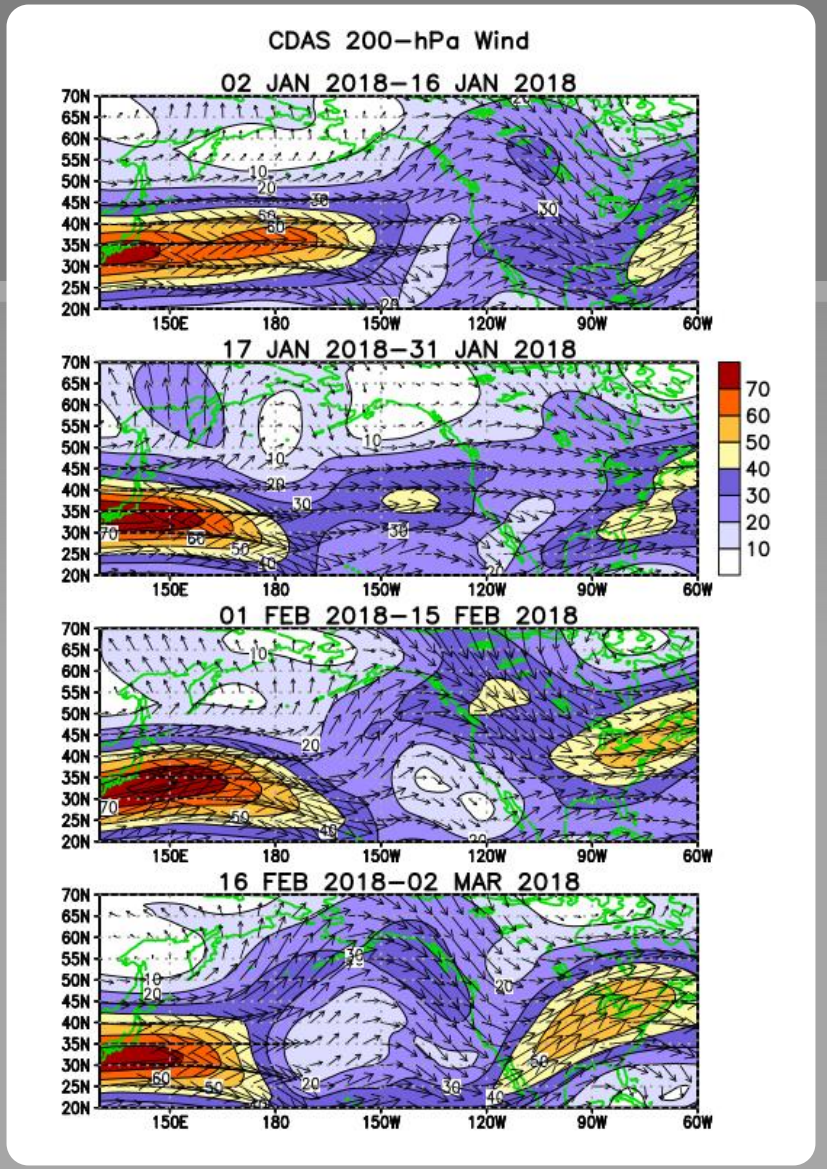

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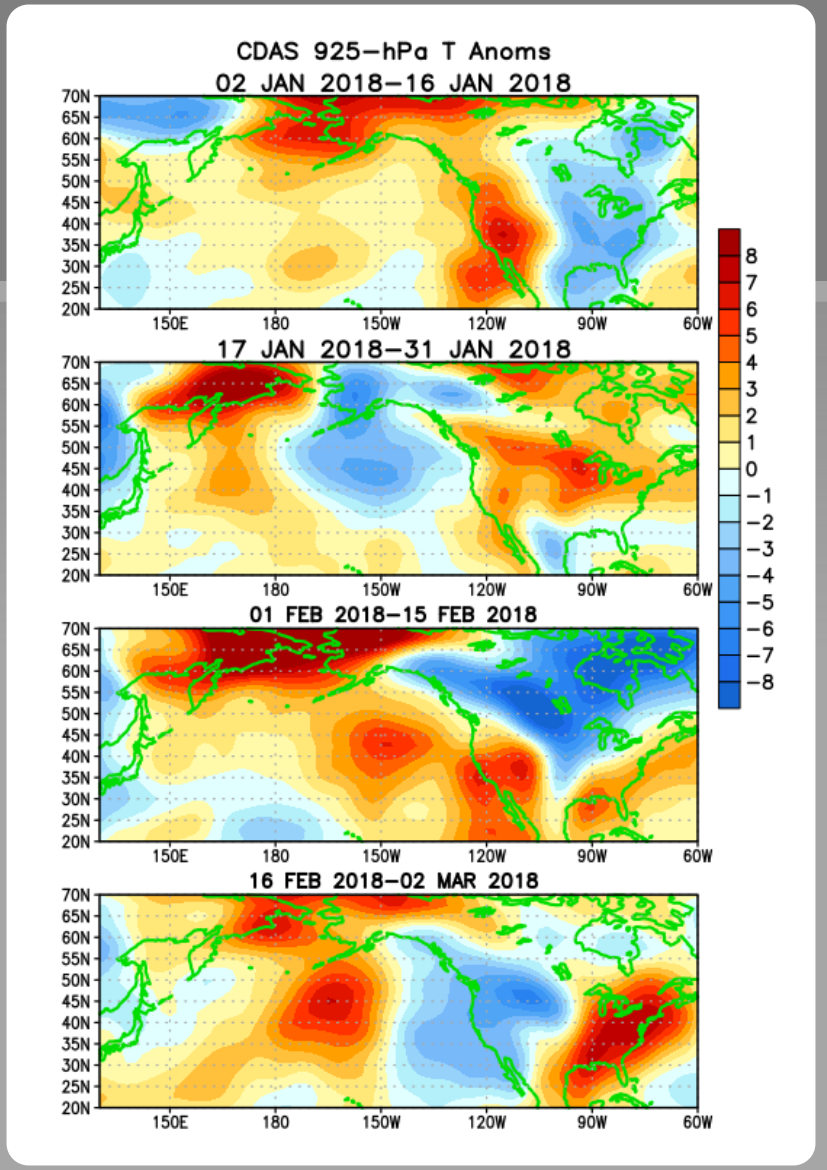
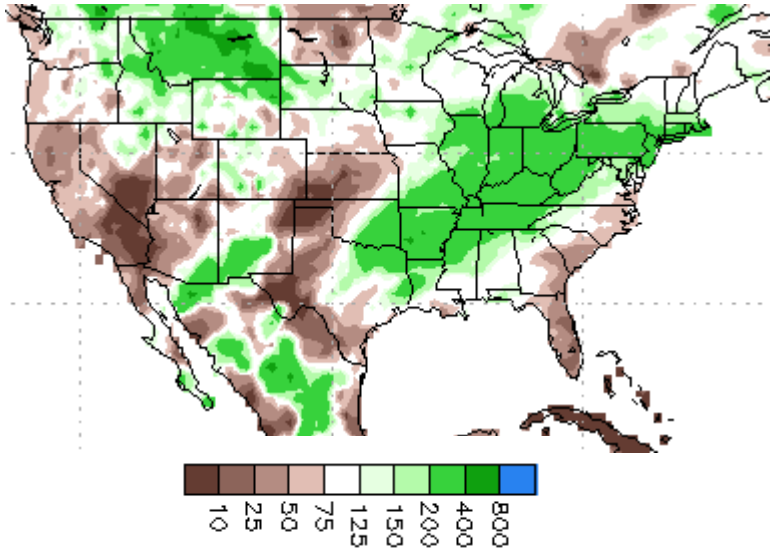


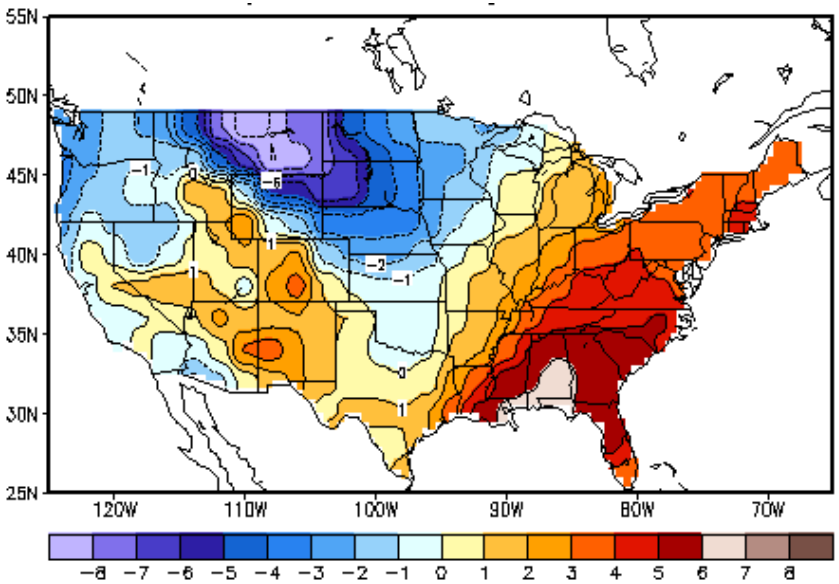
U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 3 March 2018

Percent of Average Precipitation



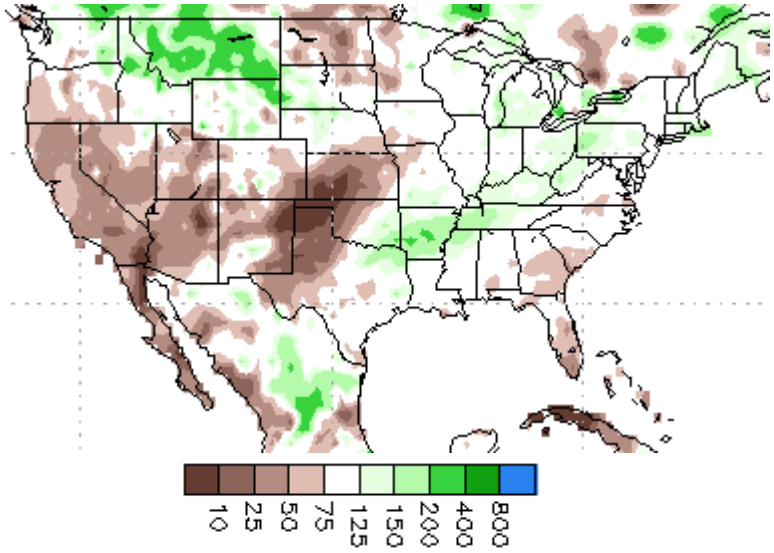
Temperature Departures (degree C)



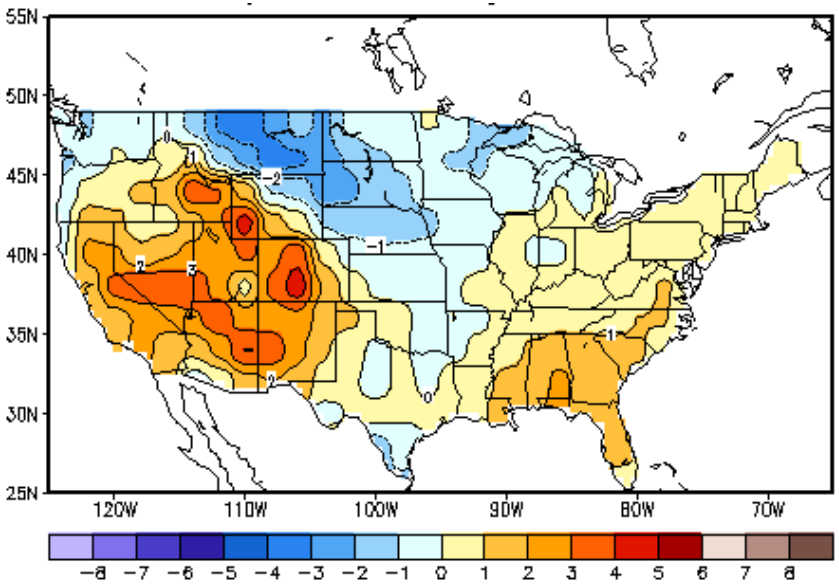
U.S. Temperature and Precipitation Departures During the Last 90 Days

End Date: 3 March 2018

Percent of Average Precipitation



Temperature Departures (degree C)

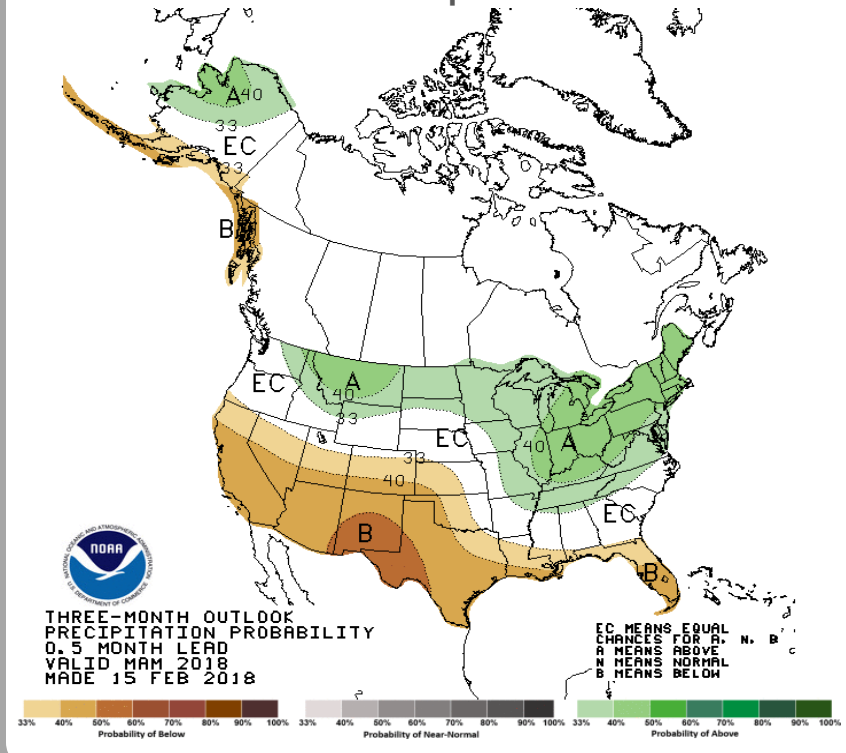


U. S. Seasonal Outlooks

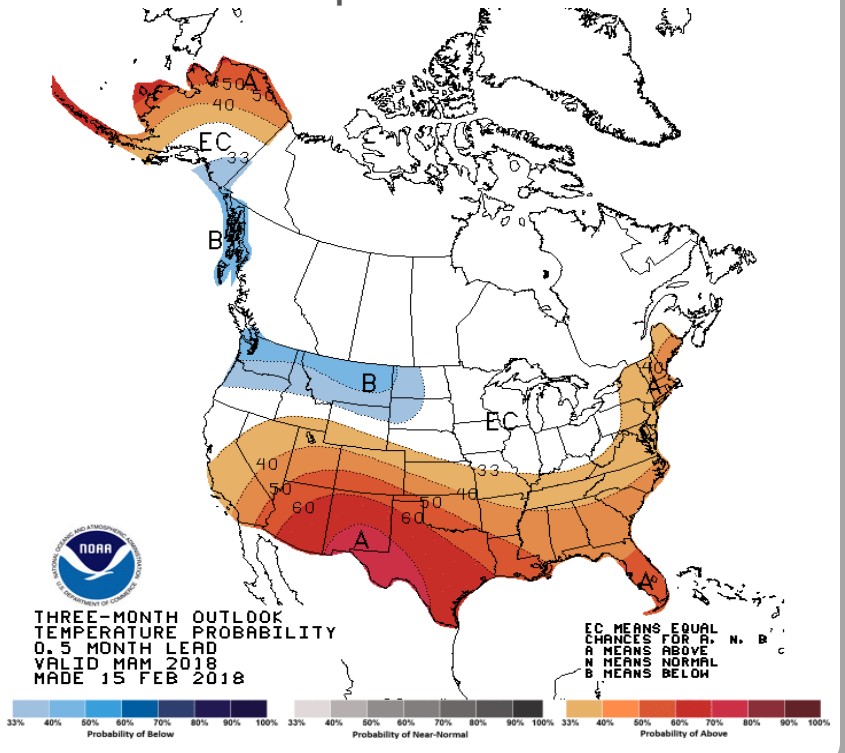
March - May 2018

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

Precipitation



Temperature



Summary

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