ENSO: Recent Evolution, Current Status and Predictions

Update prepared by:
Climate Prediction Center / NCEP
29 April 2019

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Recent Evolution and Current Conditions

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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.

A weak El Niño is likely to continue through the Northern Hemisphere summer 2019 (65% chance) and possibly fall (50-55% chance).

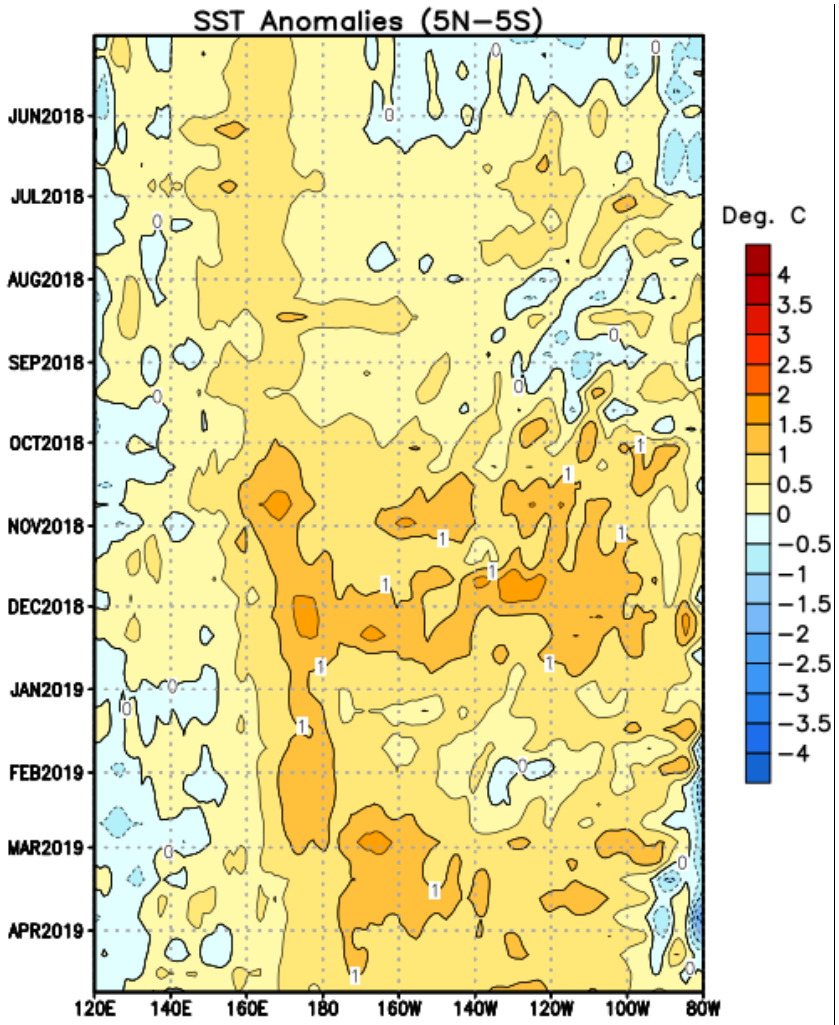
*** Note: These statements are updated once a month (2nd Thursday of each month) in association with the ENSO Diagnostics Discussion, which can be found by clicking here.**

Recent Evolution of Equatorial Pacific SST Departures (°C)

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.

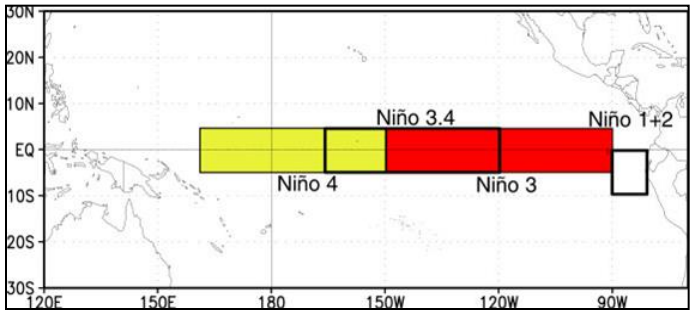
Over the last month, positive SST anomalies have persisted across much of the Pacific.

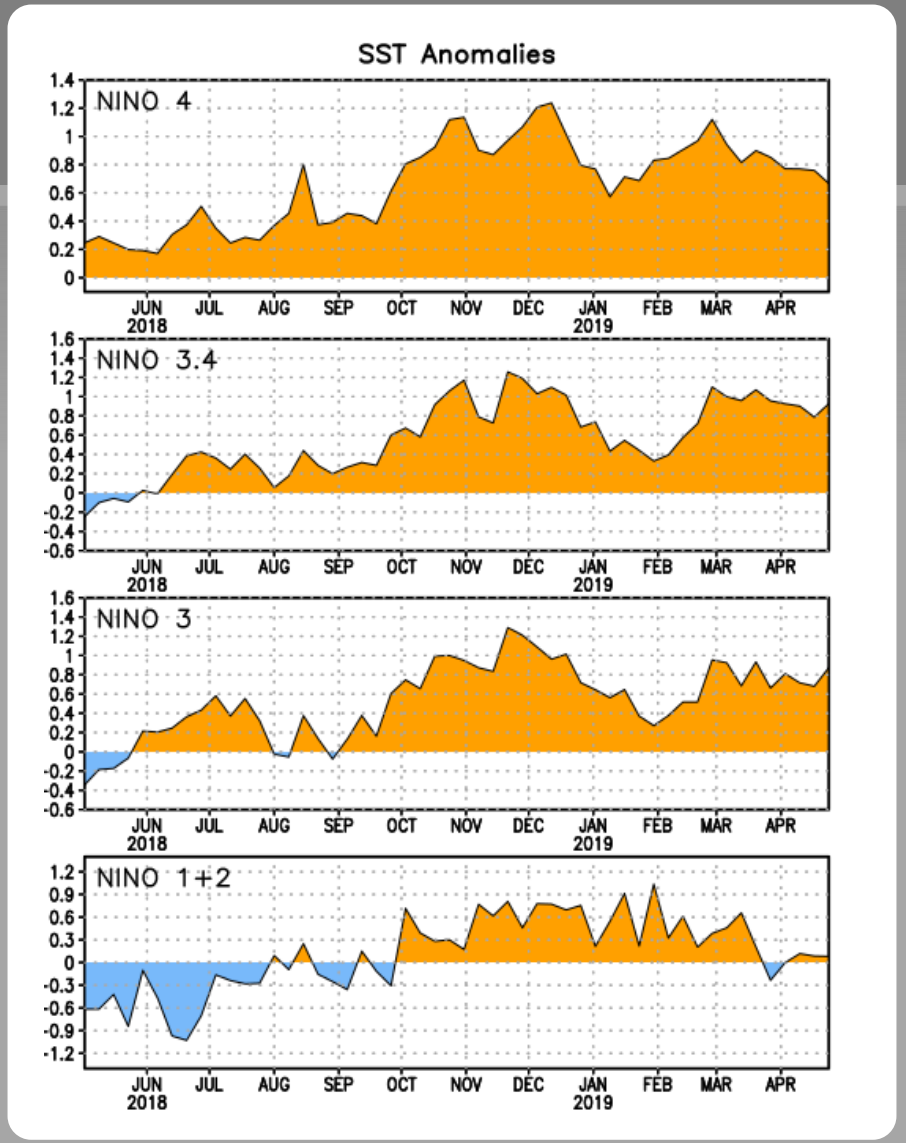


Niño Region SST Departures (ºC) Recent Evolution

The latest weekly SST departures are:

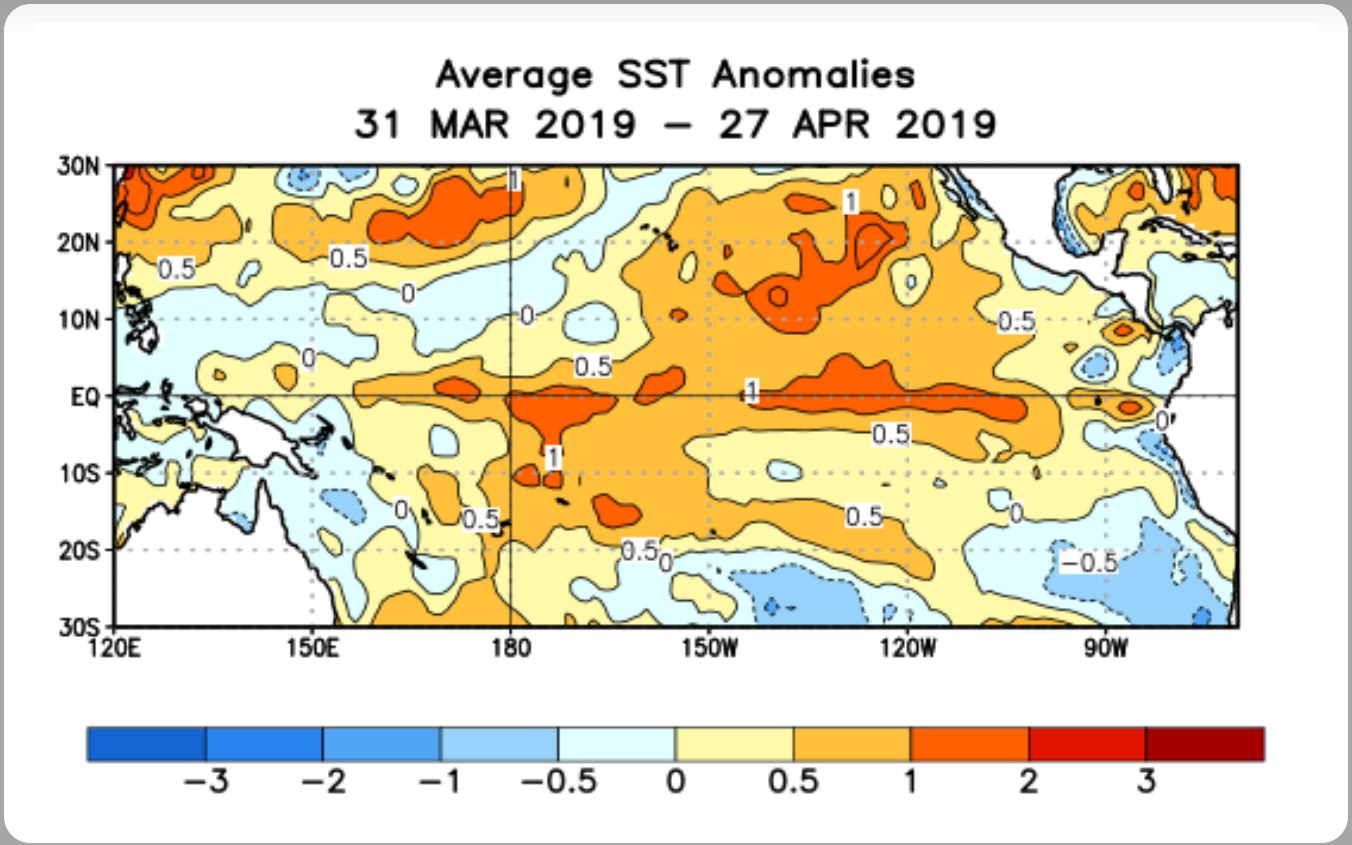
Niño 4	0.7ºC
Niño 3.4	0.9ºC
Niño 3	0.9ºC
Niño 1+2	0.1ºC





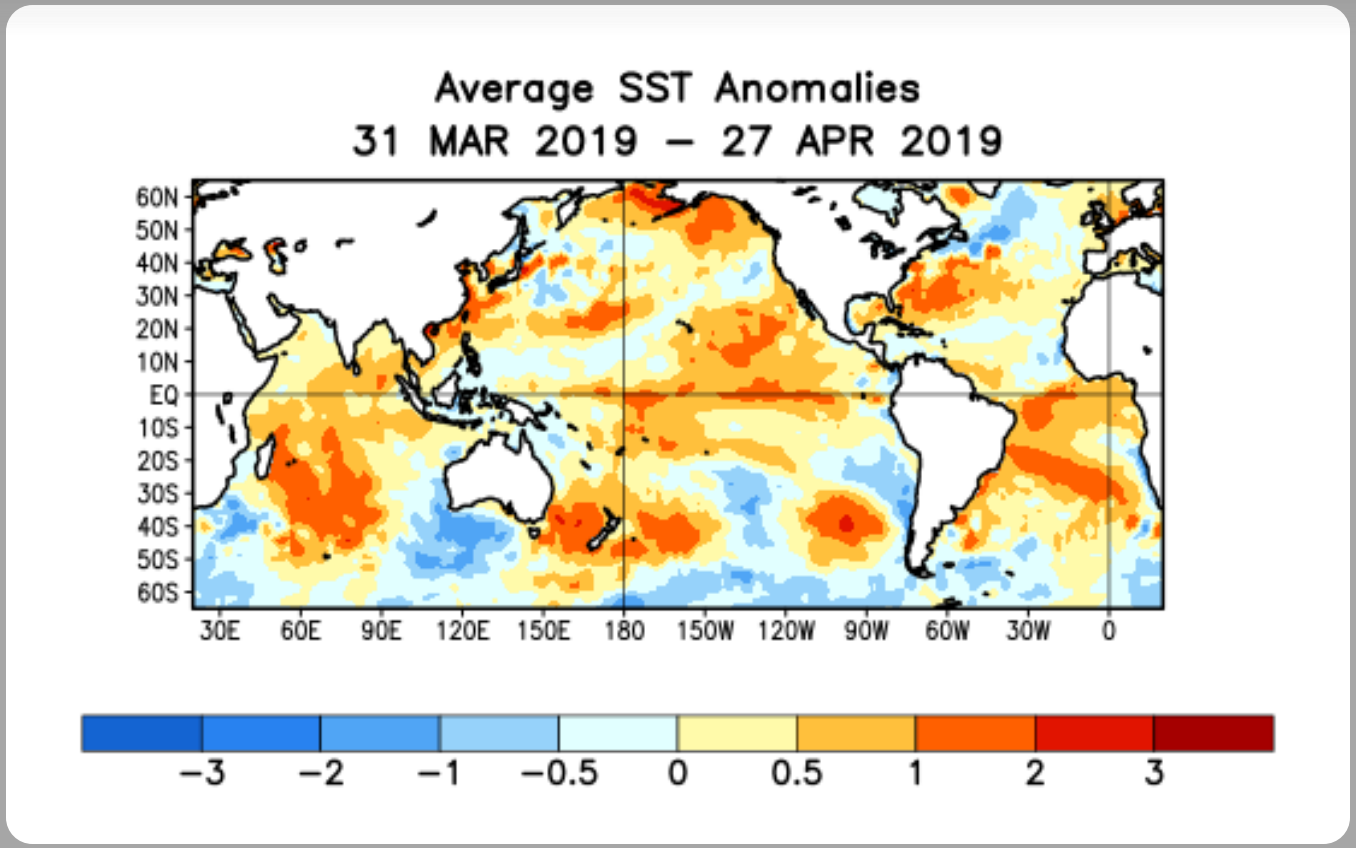
SST Departures (°C) in the Tropical Pacific During the Last Four Weeks

During the last four weeks, equatorial SSTs were above average in the central and east-central Pacific Ocean. SSTs were below average around Indonesia and in parts of the far eastern Pacific.



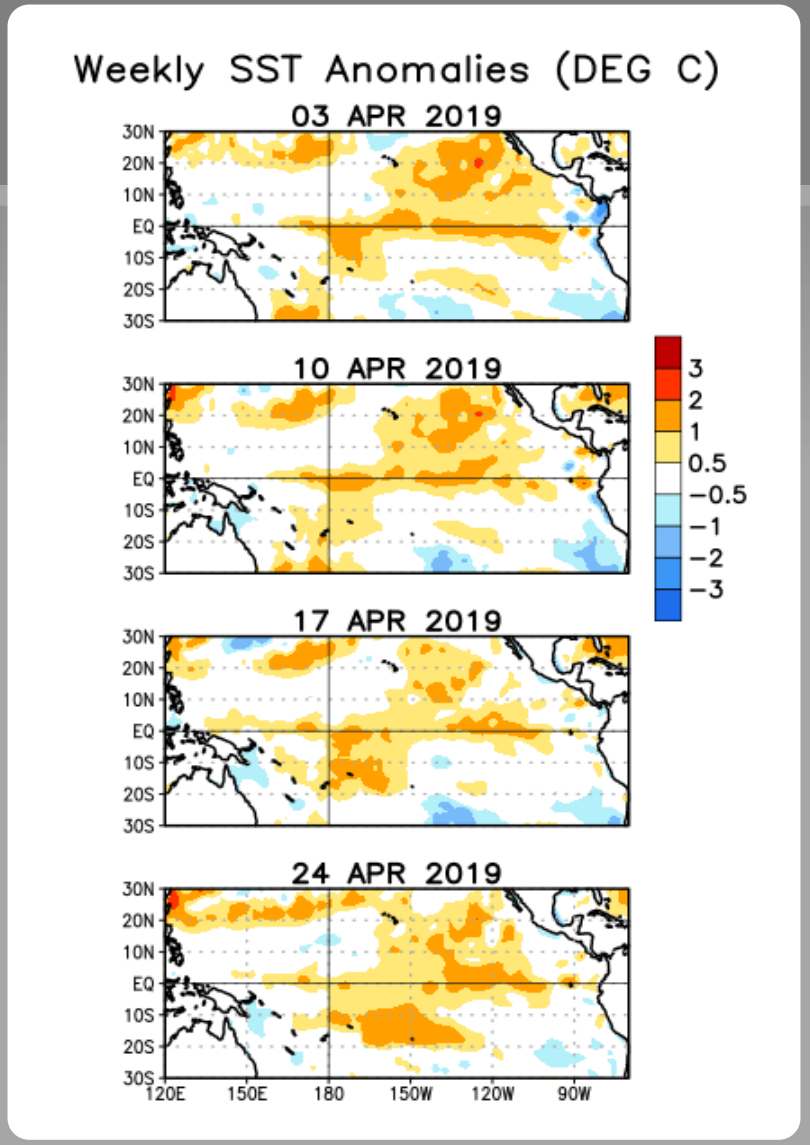
Global SST Departures (°C) During the Last Four Weeks

During the last four weeks, equatorial SSTs were above average across the central and eastern Pacific Ocean, Atlantic Ocean, and Indian Ocean. SSTs were below average near Indonesia and in parts of the far eastern Pacific.



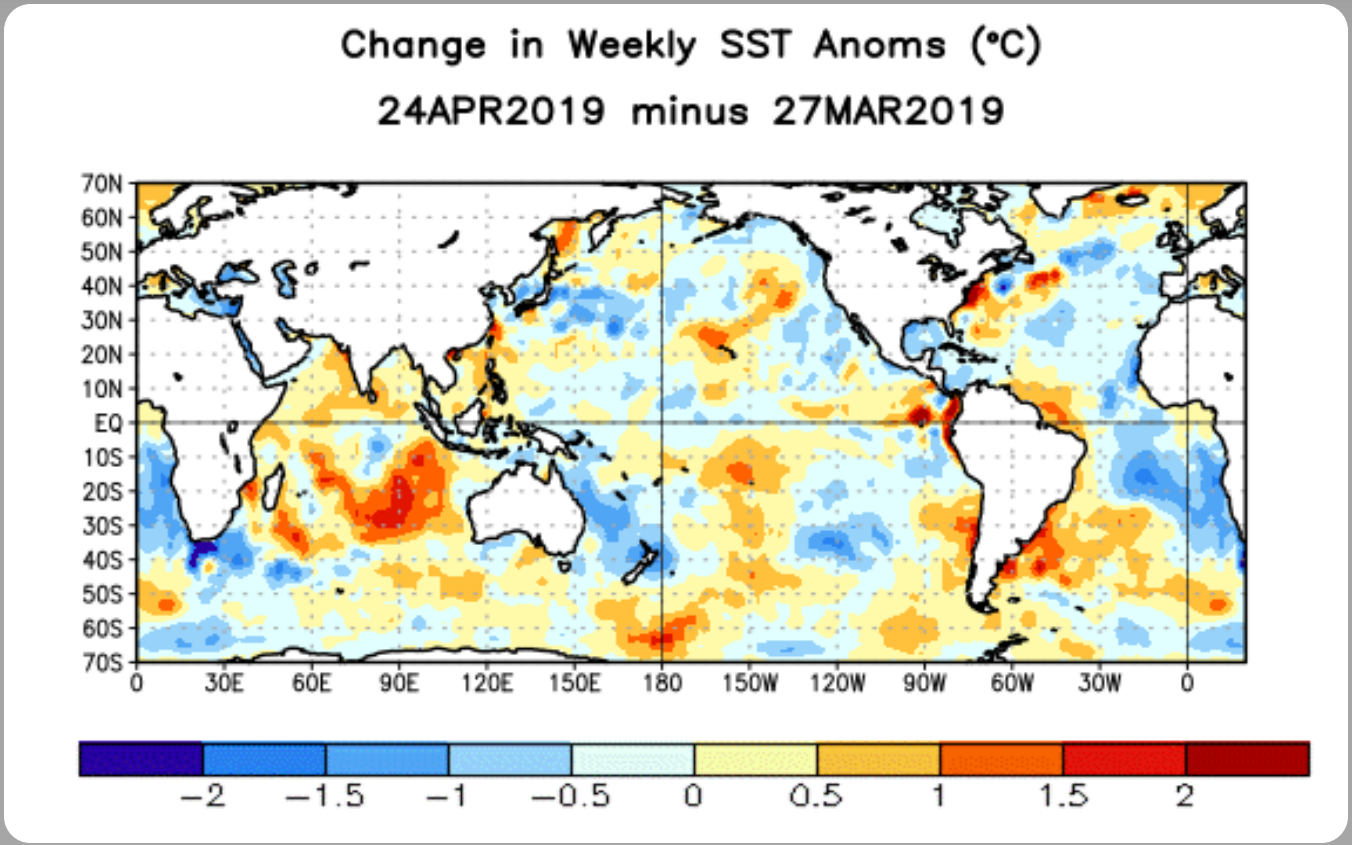
Weekly SST Departures during the Last Four Weeks

During the last four weeks, above-average SSTs have persisted across the east-central equatorial Pacific Ocean.



Change in Weekly SST Departures over the Last Four Weeks

During the last four weeks, positive changes in SST anomalies were evident in parts of the eastern Pacific, while negative changes were evident near the Date Line.



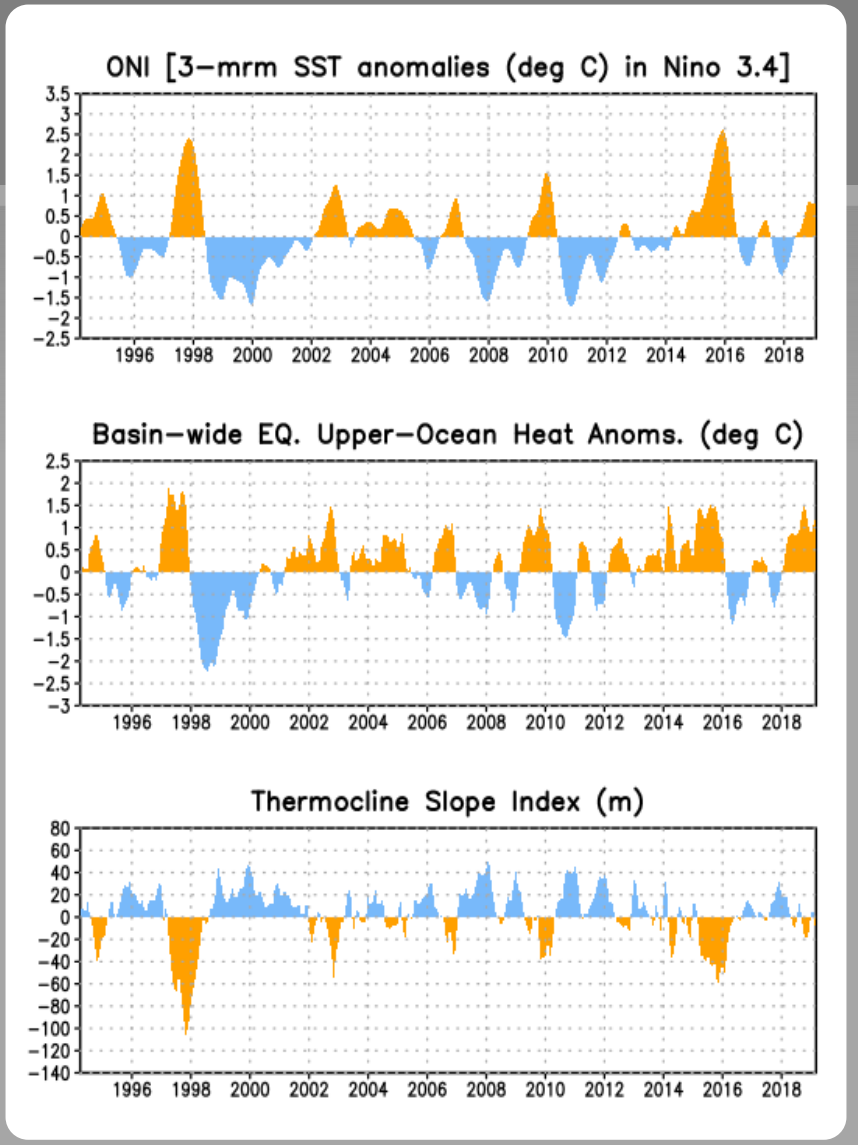
Upper-Ocean Conditions in the Equatorial Pacific

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.

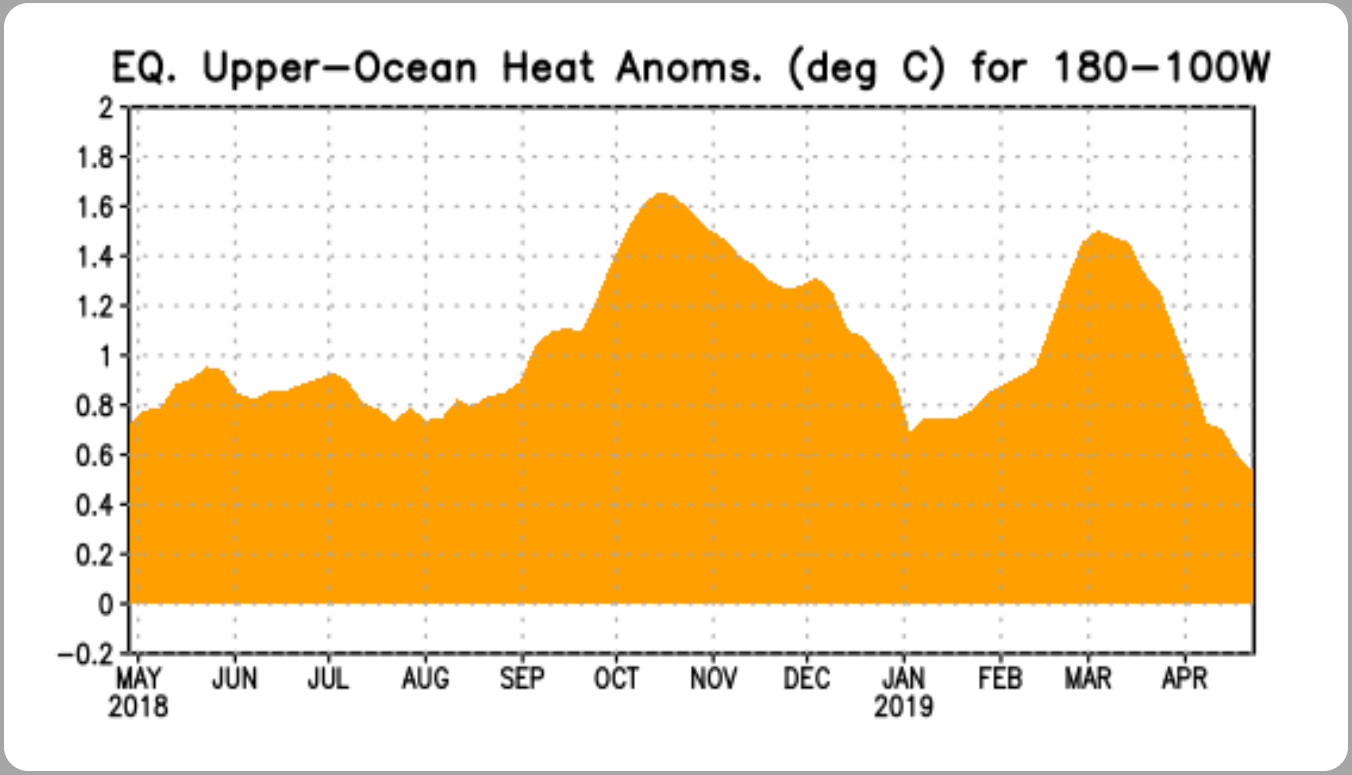
Recent values of the upper-ocean heat anomalies (above average) and thermocline slope index (below average) reflect El Niño.

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).



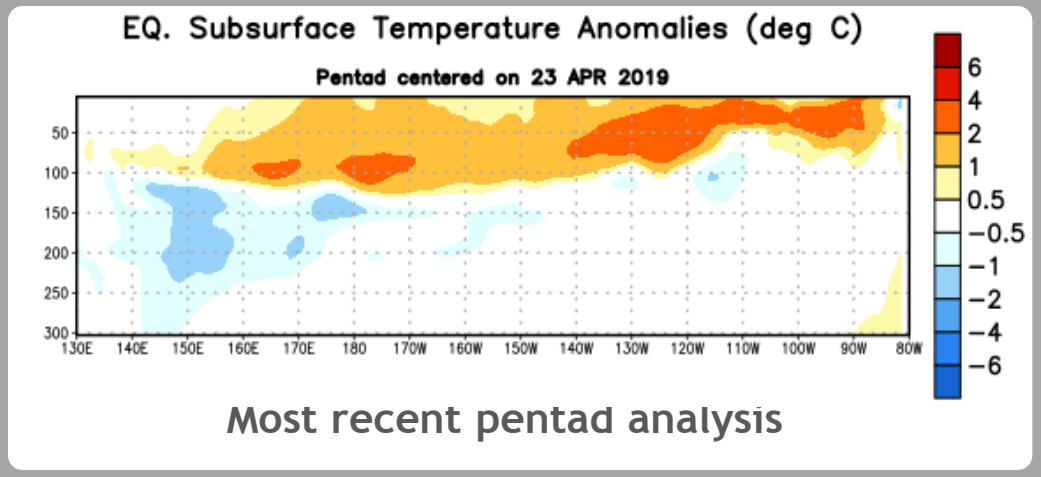
Central and Eastern Pacific Upper-Ocean (0-300 m) Weekly Average Temperature Anomalies

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.



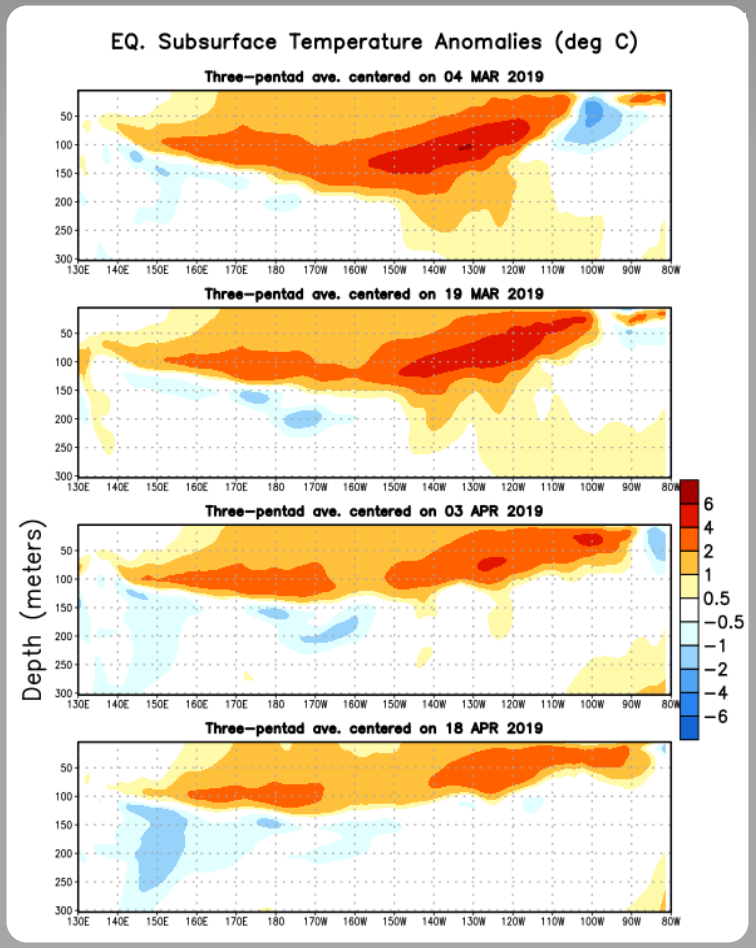
Sub-Surface Temperature Departures in the Equatorial Pacific

In the last two months, positive subsurface temperature anomalies have persisted across most of the equatorial Pacific Ocean.



Most recent pentad analysis

Negative subsurface temperature anomalies have nearly disappeared from the far eastern Pacific (85°W-80°W), while emerging at depth near and west of the Date Line.

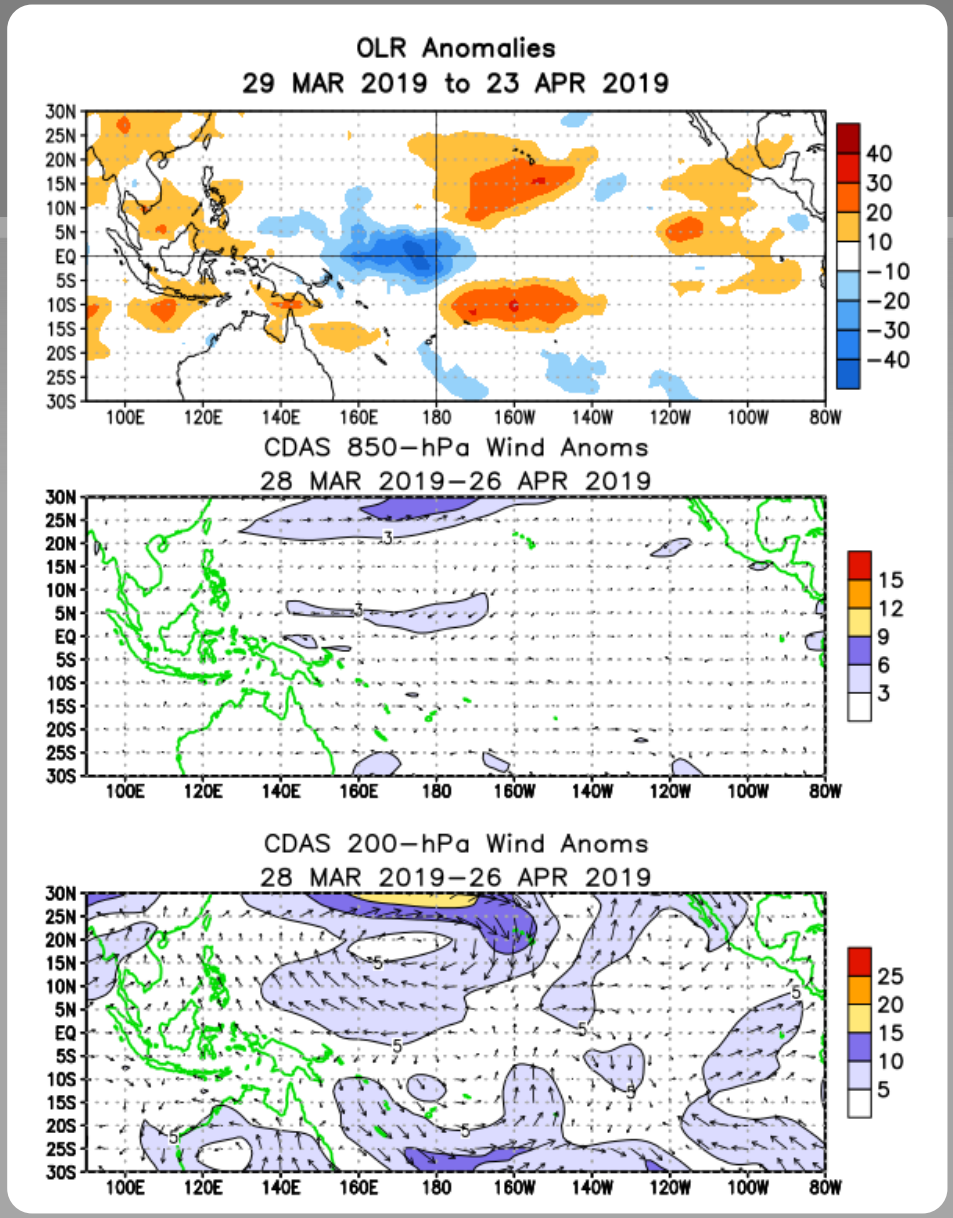


Tropical OLR and Wind Anomalies During the Last 30 Days

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 western equatorial Pacific.

Anomalous low-level (850-hPa) easterly winds were evident just north of the equator near the Date Line.

Upper-level (200-hPa) easterly wind anomalies were present across the central and western equatorial Pacific, while westerly wind anomalies were observed over the eastern 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:

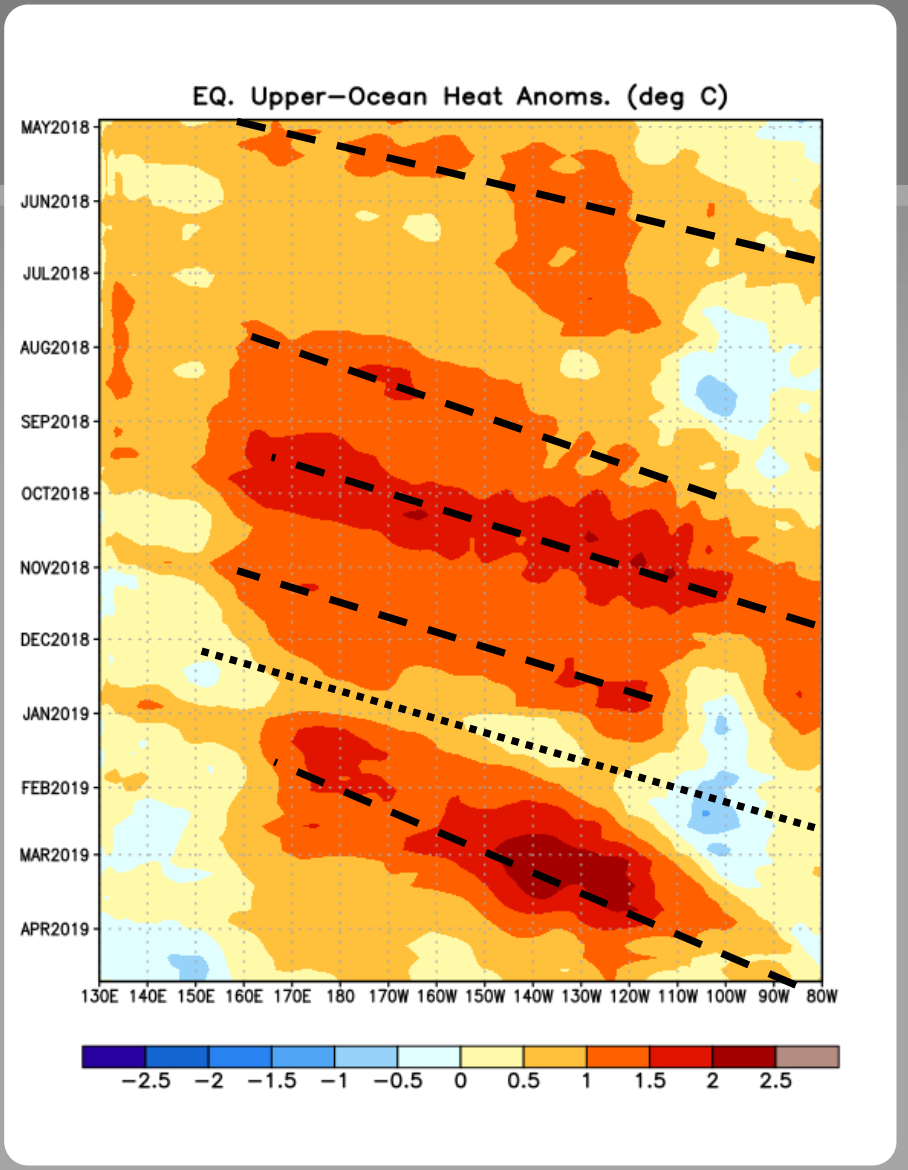
Significant weakening of the low-level easterly winds usually initiates an eastward-propagating oceanic Kelvin wave.

Weekly Heat Content Evolution in the Equatorial Pacific

Equatorial oceanic Kelvin wave activity has been especially prominent since August 2018.

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

During January-March 2019, another downwelling Kelvin wave led to an eastward progression of large positive subsurface temperature anomalies.



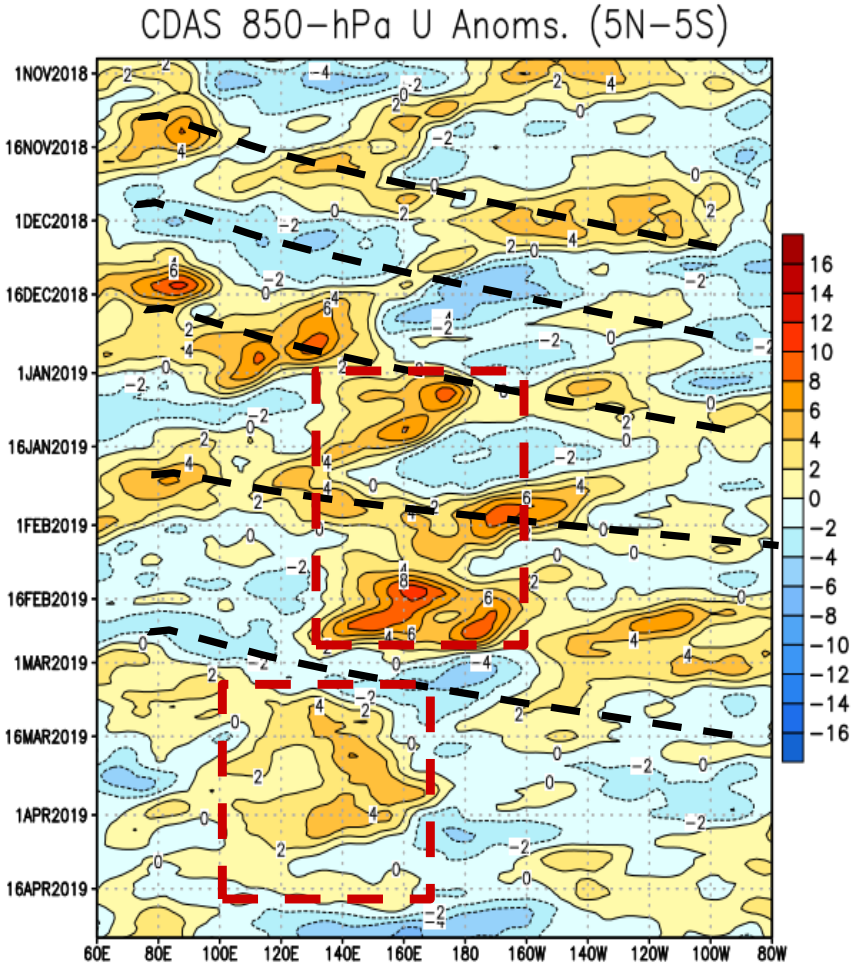
Equatorial oceanic Kelvin waves have alternating warm and cold phases. The warm phase is indicated by dashed lines. Down-welling and warming occur in the leading portion of a Kelvin wave, and up-welling and cooling occur in the trailing portion.

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

At times, the Madden Julian Oscillation (MJO) 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 past week, easterly wind anomalies were observed over most of the equatorial Pacific Ocean.

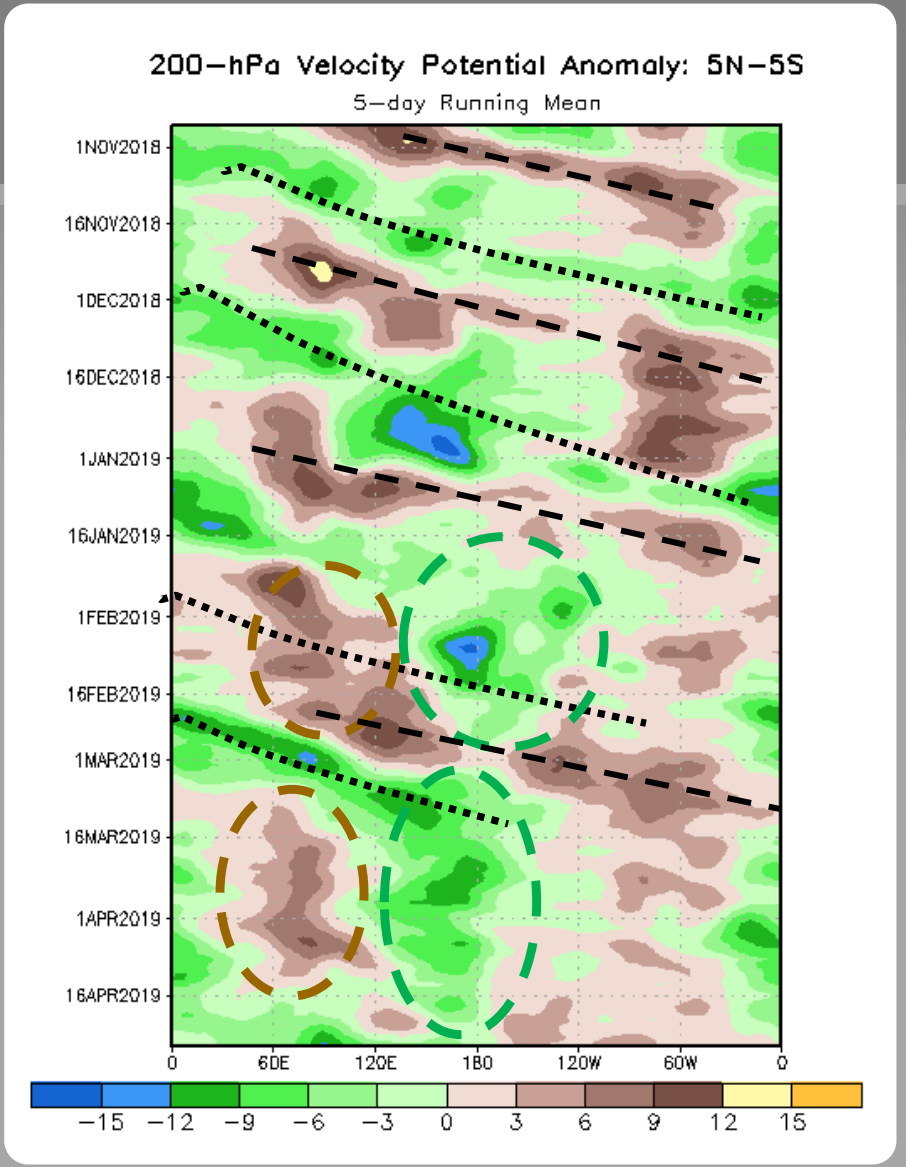


Westerly Wind Anomalies (orange/red shading)
Easterly Wind Anomalies (blue shading)

Upper-level (200-hPa) Velocity Potential Anomalies

From October through mid-March, eastward propagation was evident in the anomalies.

Since early March 2019, anomalous upper-level divergence (green shading) has persisted near the Date Line and western Pacific.



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

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

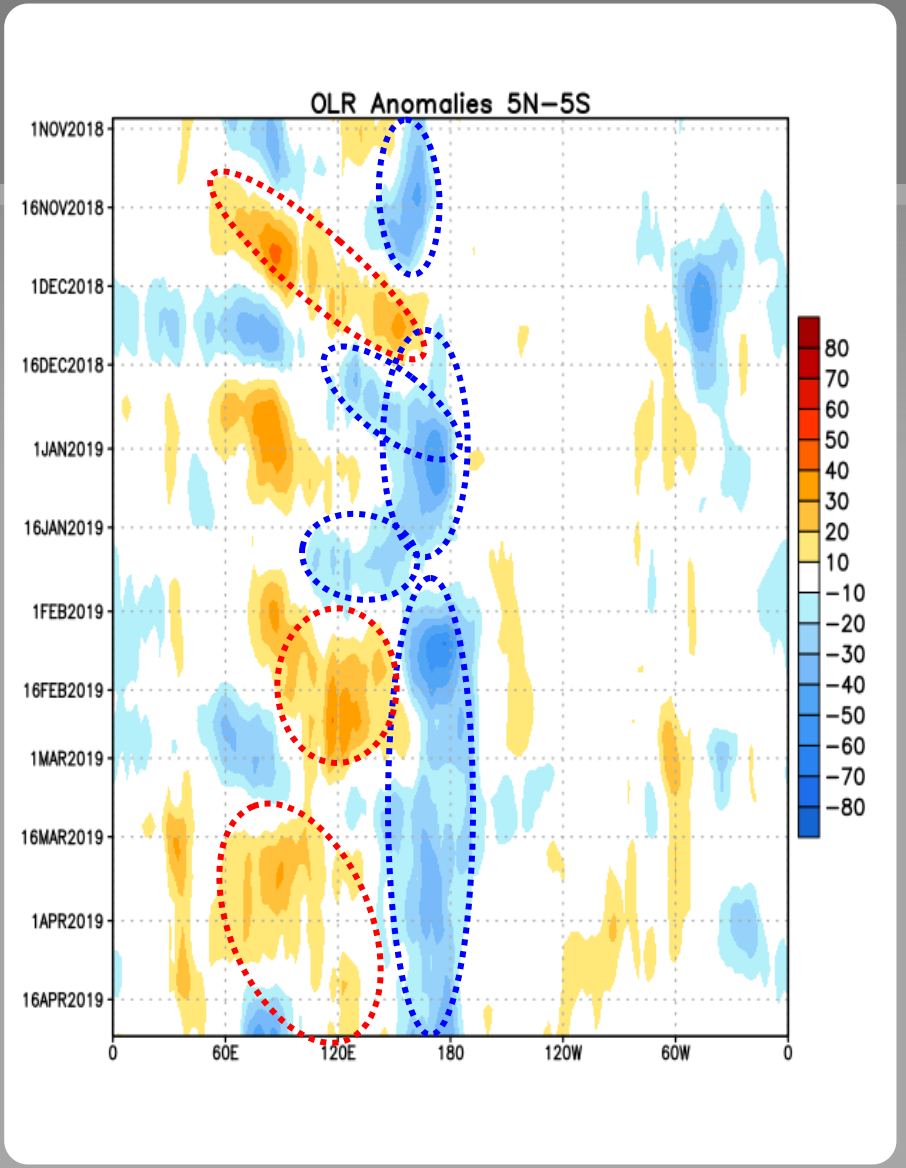
Outgoing Longwave Radiation (OLR) Anomalies

From mid-October to late November 2018 and again between mid-December to mid January 2019, negative OLR anomalies persisted over the western Pacific.

During February 2019, positive OLR anomalies were over Indonesia, while negative OLR anomalies were near the Date Line.

More recently, negative OLR anomalies have persisted near the Date Line, while positive OLR anomalies were generally present over the Indian Ocean and/or 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°C.

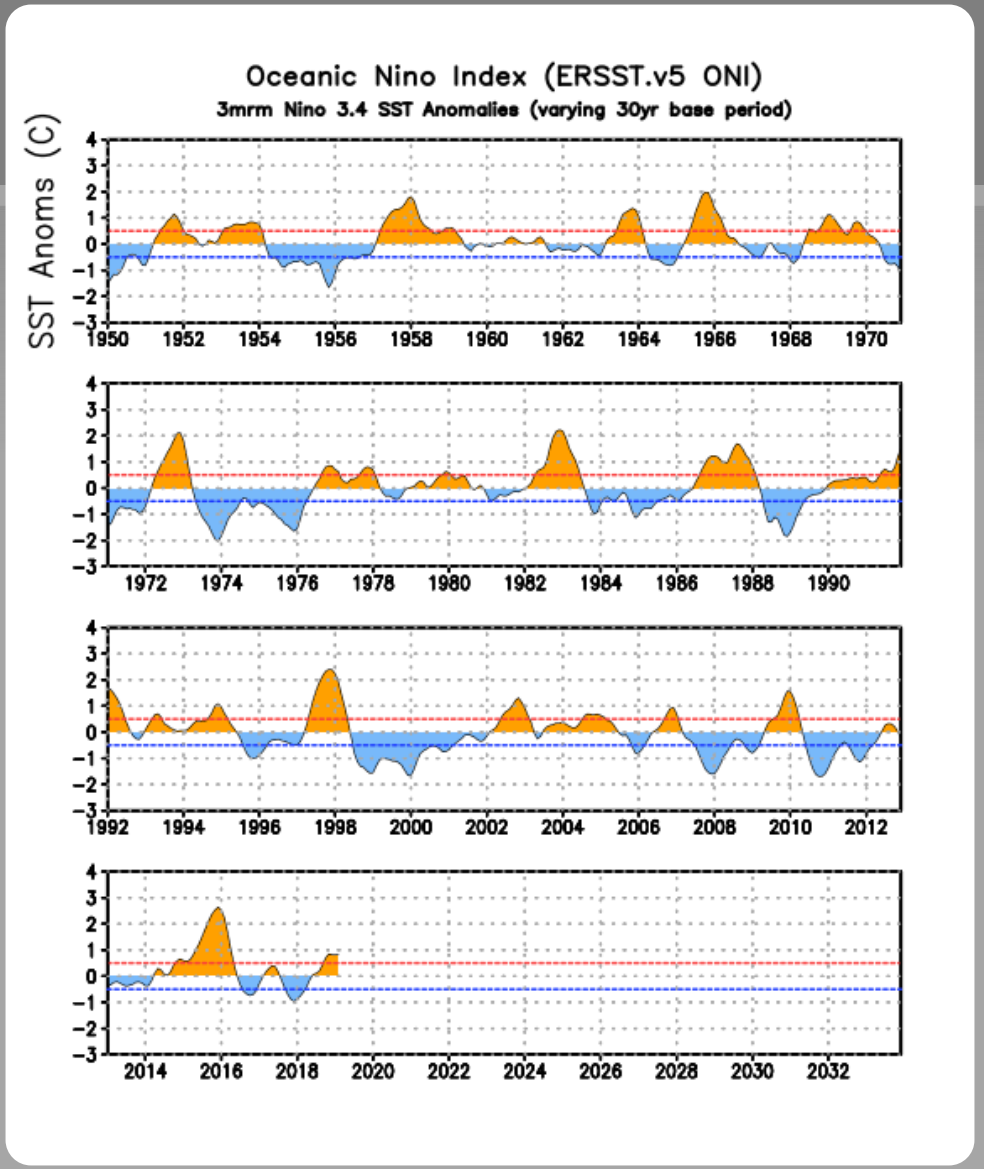
La Niña: characterized by a negative ONI less than or equal to -0.5°C.

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 (January - March 2019) is +0.8°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.

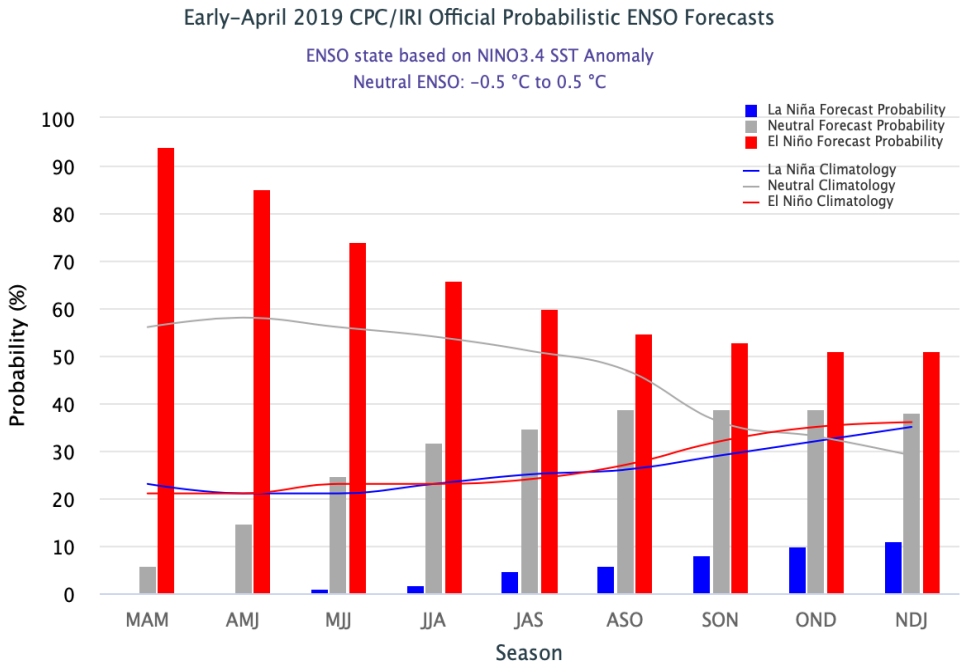
The ONI is one measure of the El Niño-Southern Oscillation, and other indices can confirm whether features consistent with a coupled ocean-atmosphere phenomenon accompanied these periods. The complete table going back to DJF 1950 can be found here.

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
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	0.1	0.2	0.4	0.7	0.9	0.8
2019	0.8	0.8										

CPC/IRI Probabilistic ENSO Outlook

Updated: 11 April 2019

El Niño conditions are favored to continue through fall 2019 with diminishing chances (~50% in October-November-December).



IRI/CPC Pacific Niño 3.4 SST Model Outlook

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

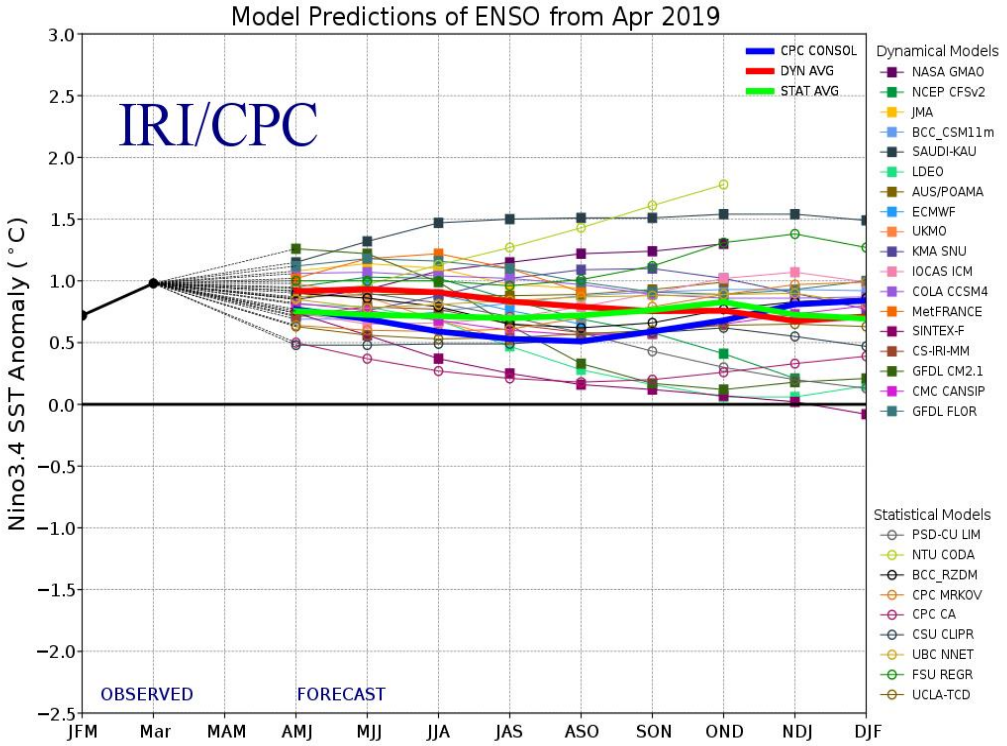
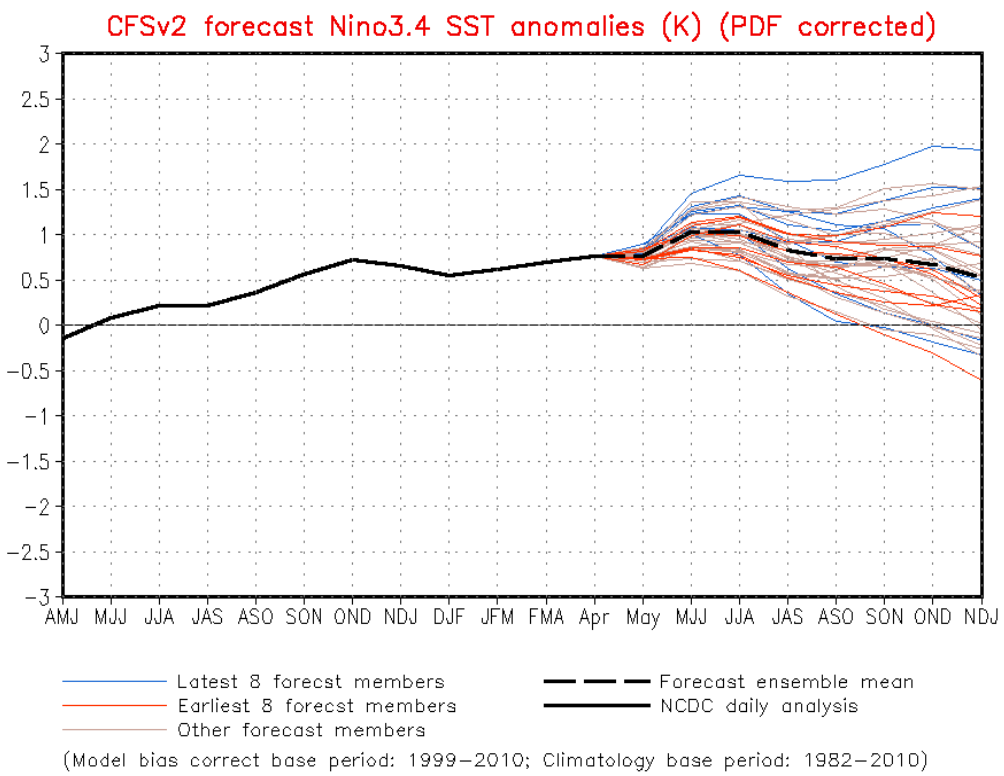


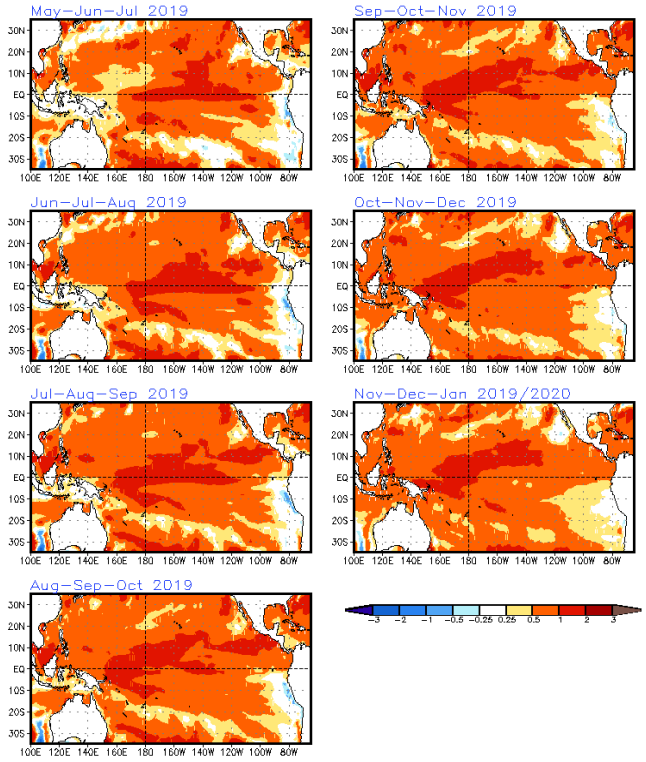
Figure provided by the International Research Institute (IRI) for Climate and Society (updated 19 April 2019).

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

Issued: 29 April 2019

The CFS.v2 ensemble mean (black dashed line) predicts El Niño to persist through the Northern Hemisphere fall 2019.

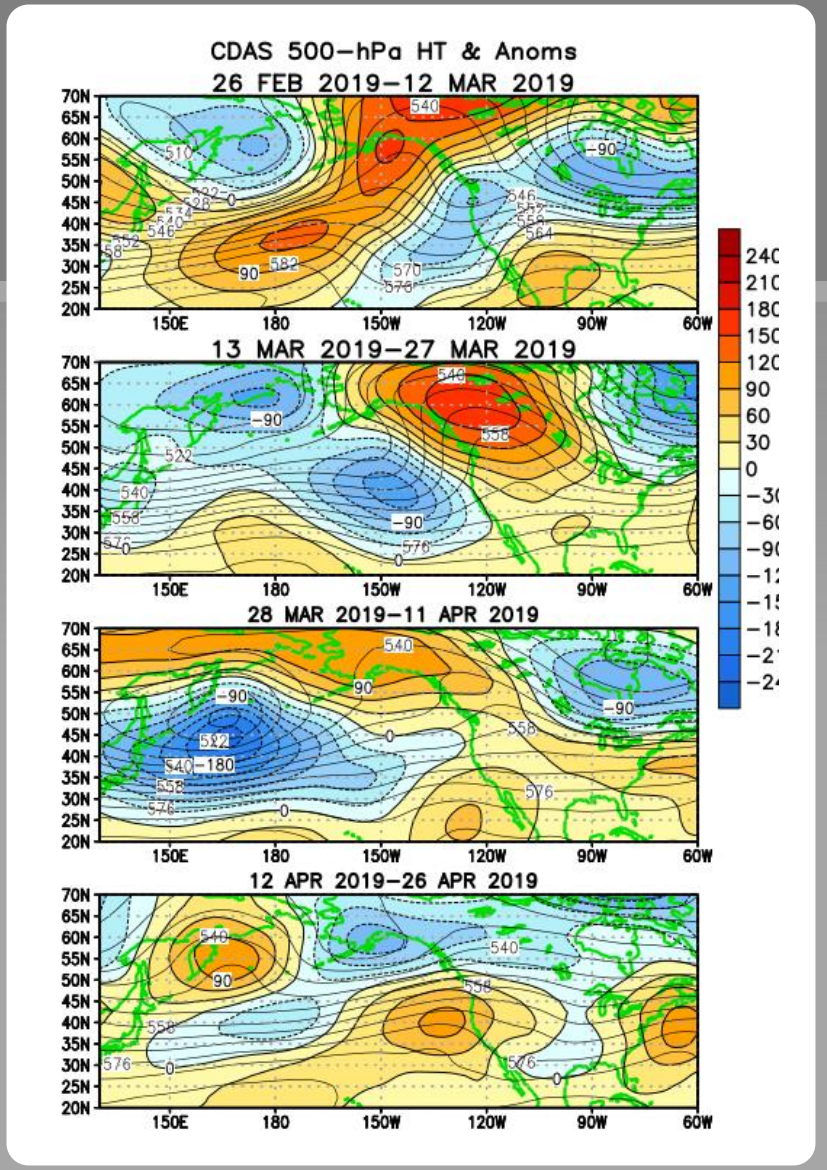




Atmospheric anomalies over the North Pacific and North America During the Last 60 Days

From late February to late March, an anomalous ridge was present over western Canada, and a downstream anomalous trough was present over eastern Canada. These conditions contributed to well above-average temperatures in Alaska, and to below-average temperatures across much of Canada and parts of the U.S.

Since late March, anomalous ridging and above-average temperatures have prevailed over most of the contiguous U.S.



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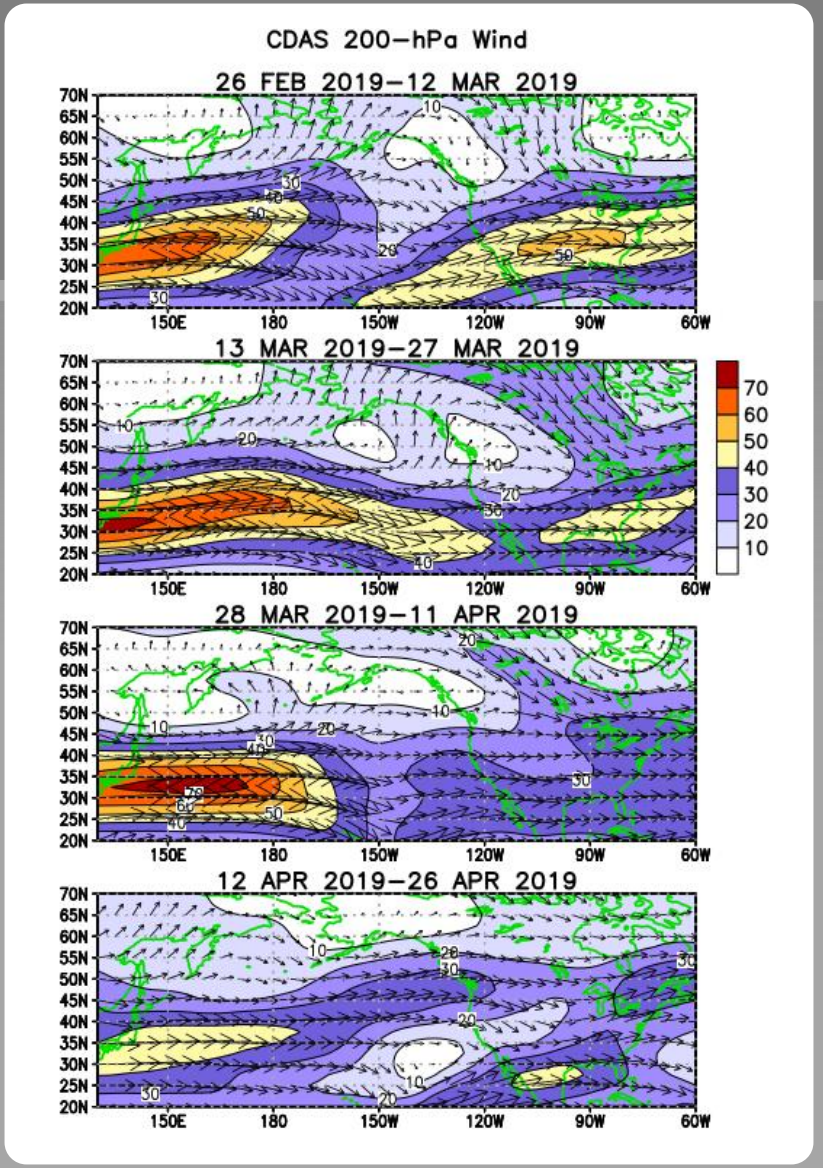

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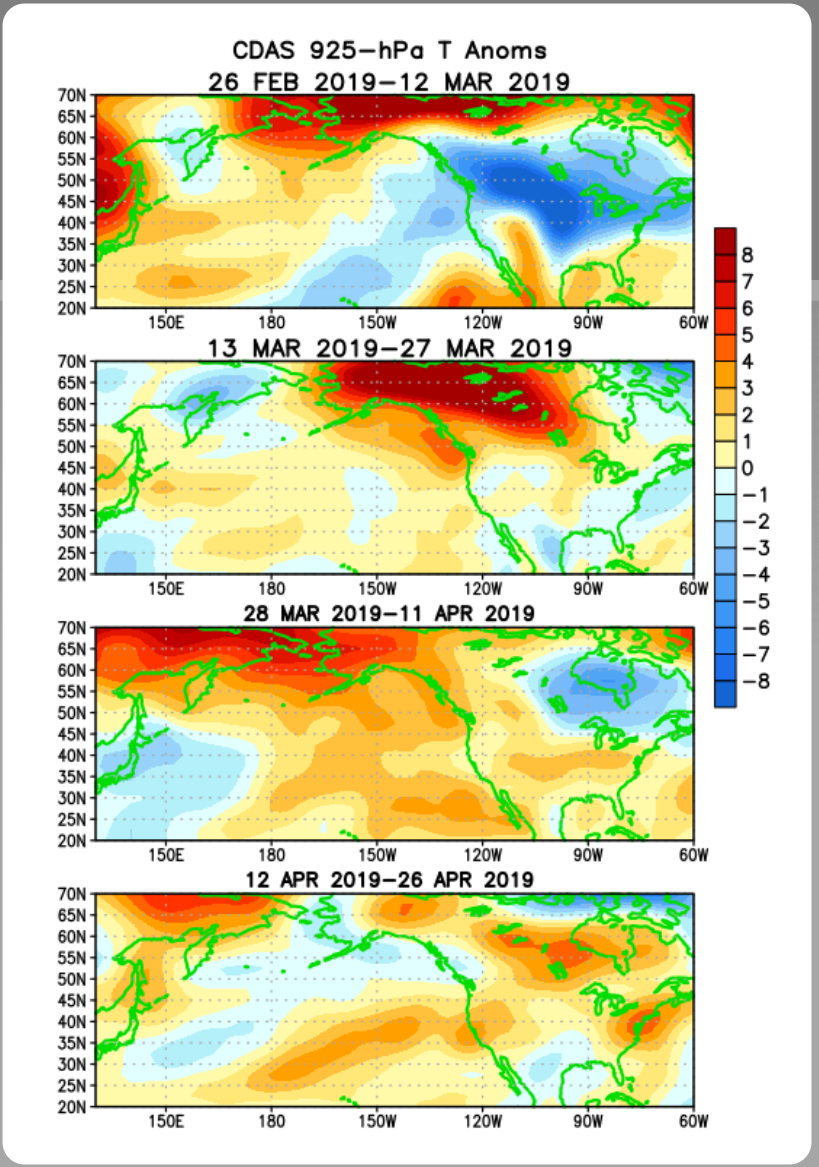
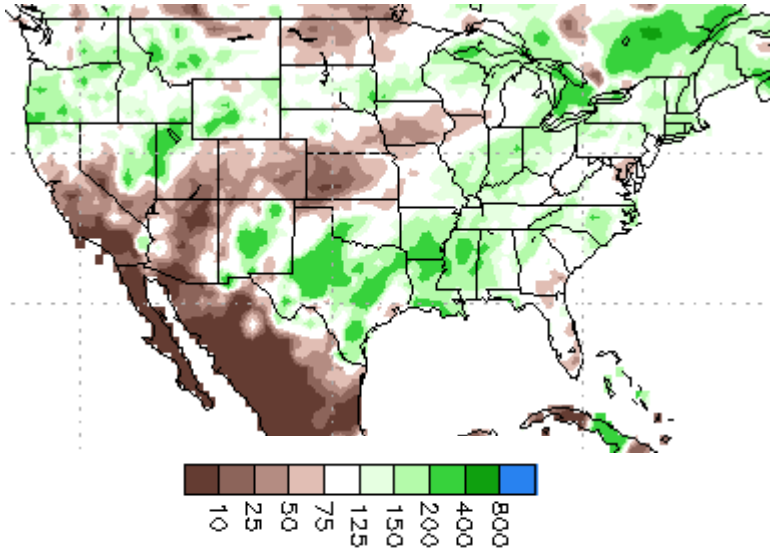


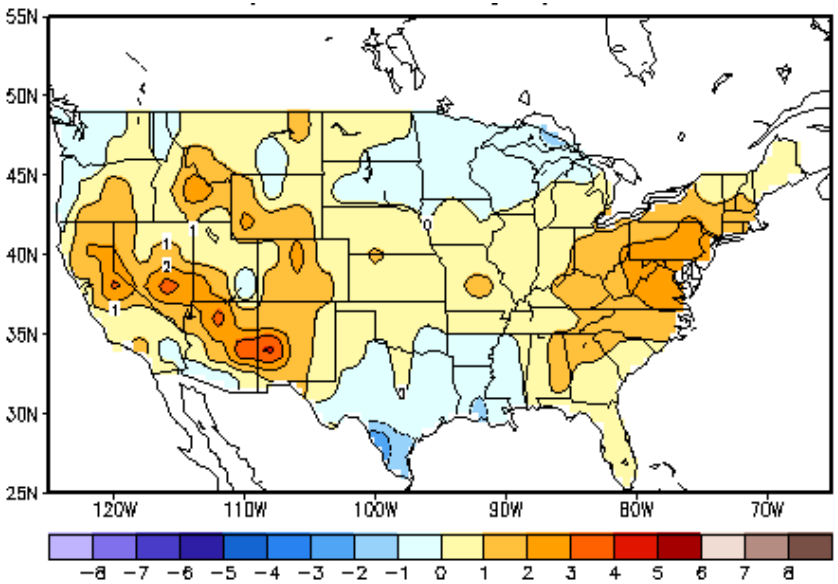
U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 27 April 2019

Percent of Average Precipitation



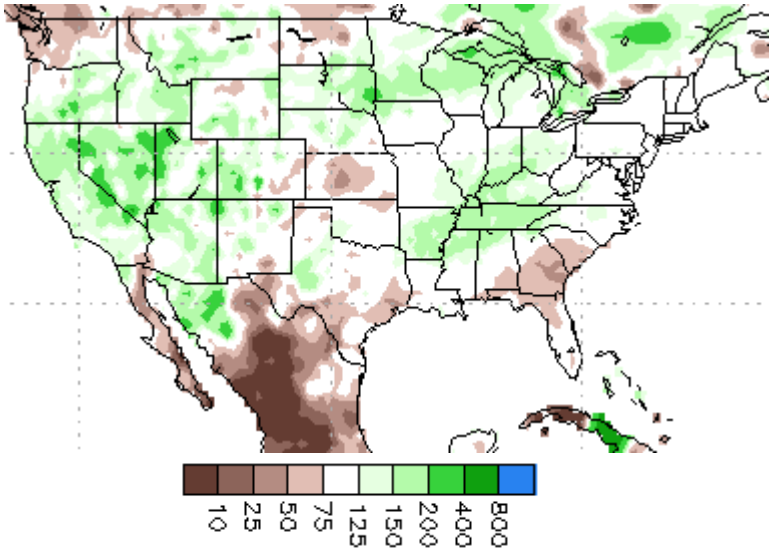
Temperature Departures (degree C)



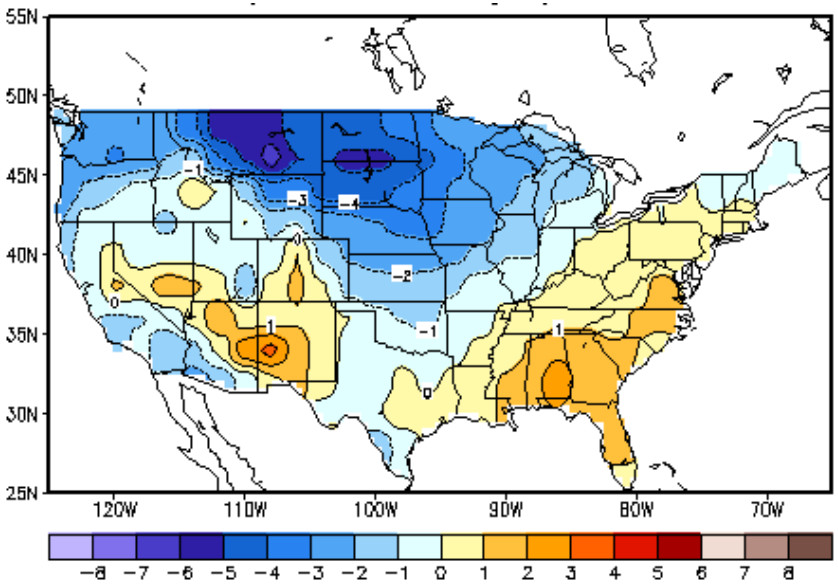
U.S. Temperature and Precipitation Departures During the Last 90 Days

End Date: 27 April 2019

Percent of Average Precipitation



Temperature Departures (degree C)

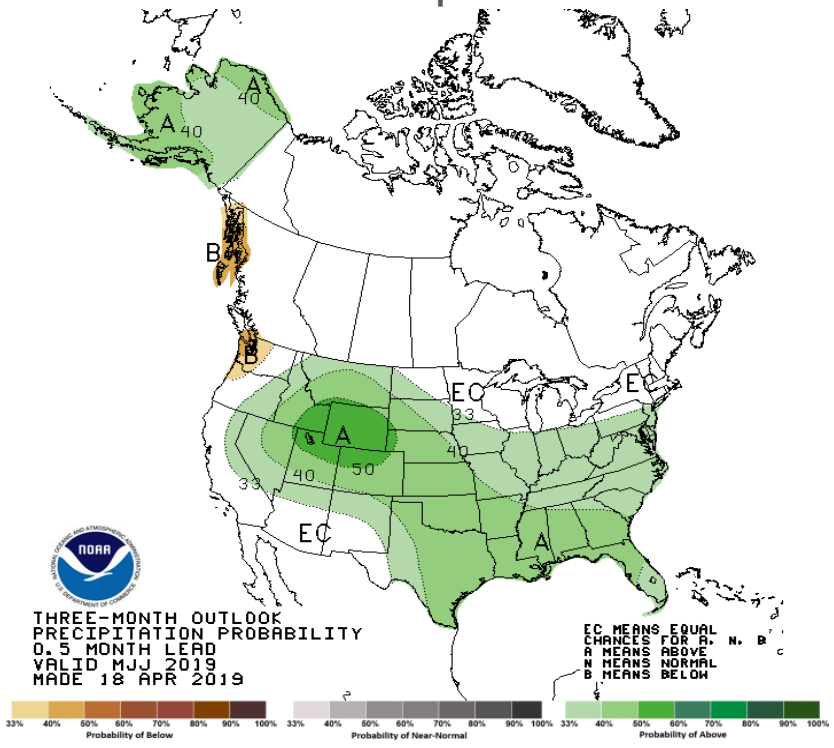


U. S. Seasonal Outlooks

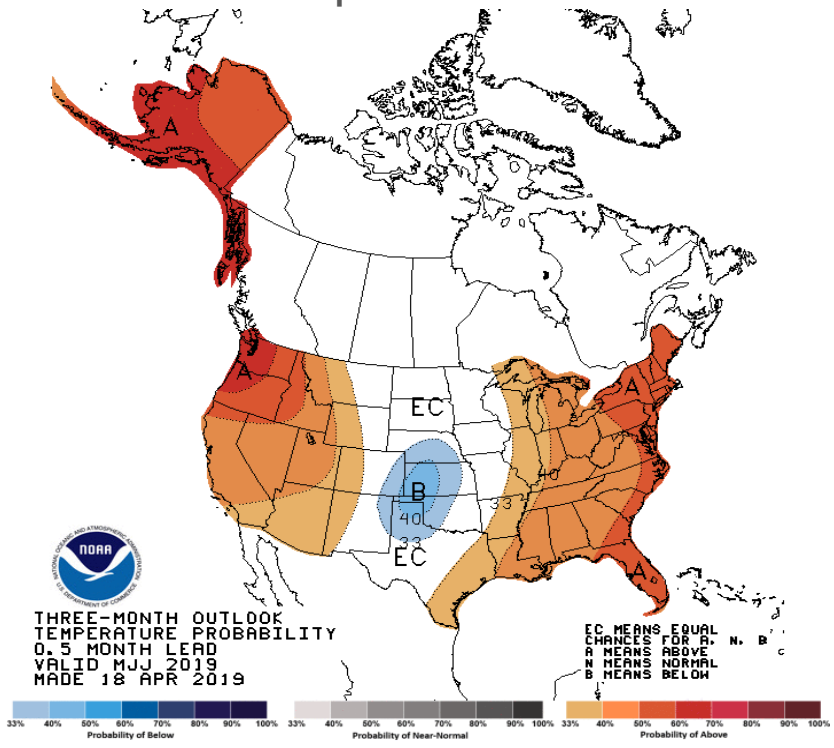
May-July 2019

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

Precipitation



Temperature



Summary

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

A weak El Niño is likely to continue through the Northern Hemisphere summer 2019 (65% chance) and possibly fall (50-55% chance).

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