ENSO: Recent Evolution, Current Status and Predictions

Update prepared by:
Climate Prediction Center / NCEP
11 May 2020

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Recent Evolution and Current Conditions

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Summary

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ENSO Alert System Status: Not Active

ENSO-neutral conditions are present.*

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

The tropical atmospheric circulation is consistent with ENSO-neutral.

ENSO-neutral is favored for the Northern Hemisphere summer 2020 (~60% chance), remaining the most likely outcome through autumn.*

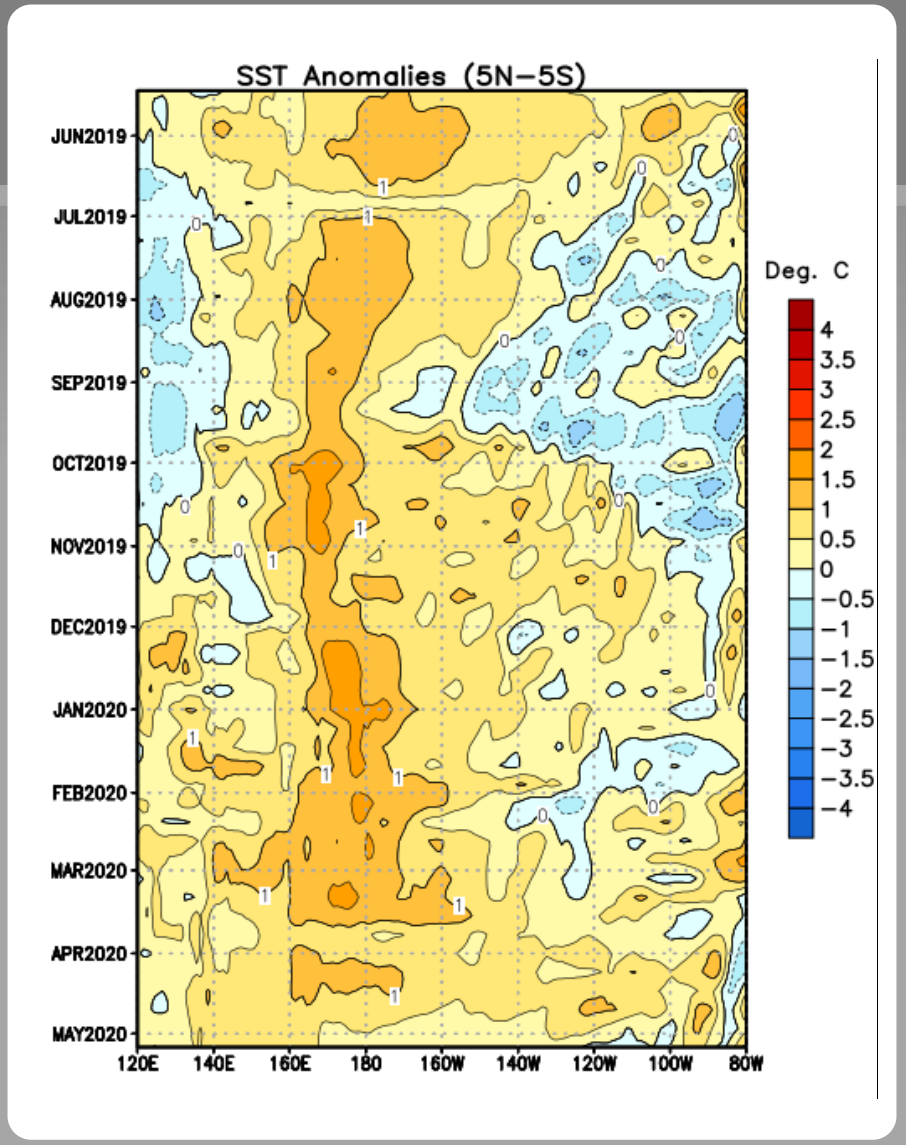
*** Note: These statements are updated once a month (2nd Thursday of each month) in association with the ENSO Diagnostics Discussion, which can be found by clicking here.**

Recent Evolution of Equatorial Pacific SST Departures (°C)

From July-September 2019, below-average SSTs expanded westward into the east-central Pacific.

Beginning in mid-September 2019, above-average SSTs expanded from the Date Line into the eastern Pacific Ocean.

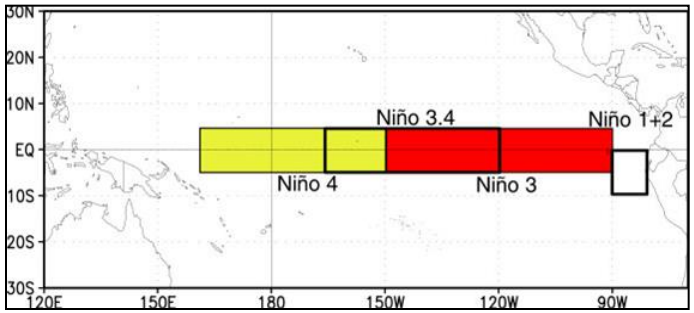
In mid-April 2020, above-average SSTs weakened across the equatorial Pacific Ocean.

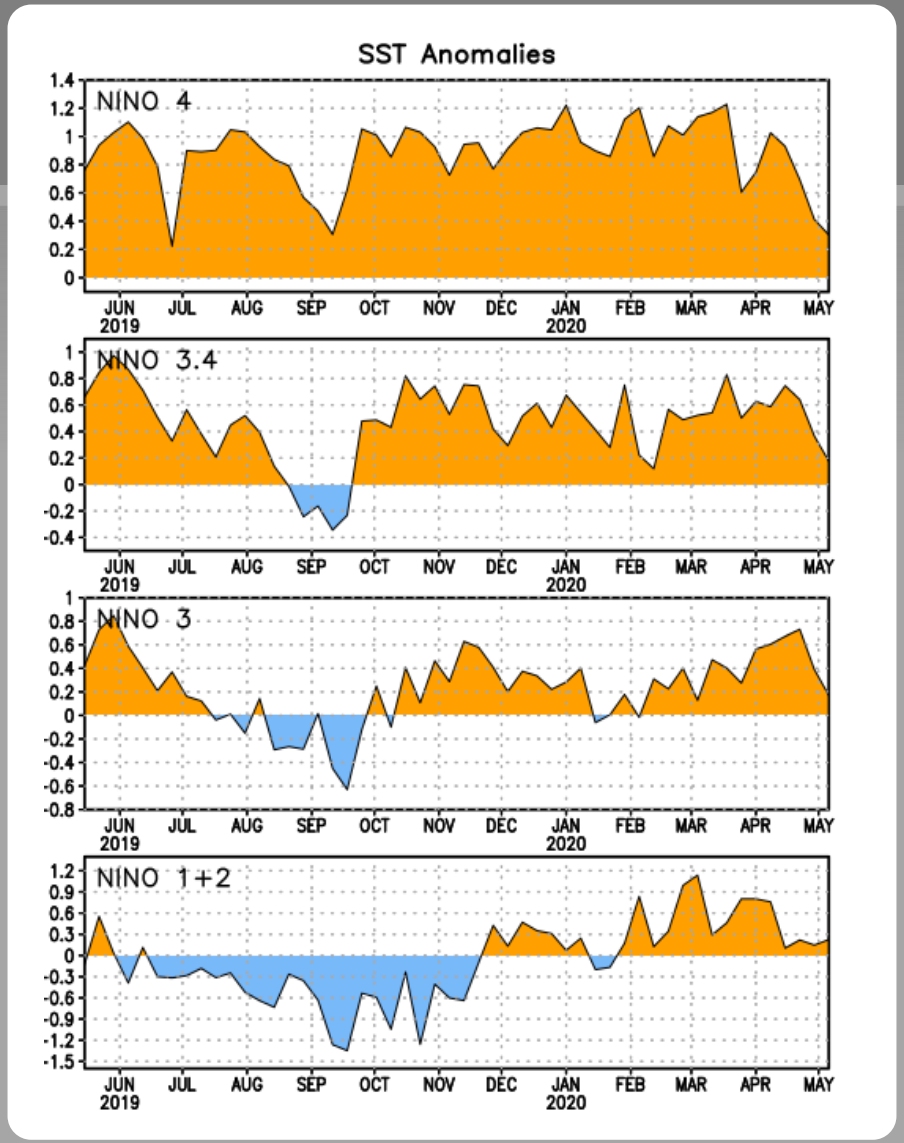


Niño Region SST Departures (ºC) Recent Evolution

The latest weekly SST departures are:

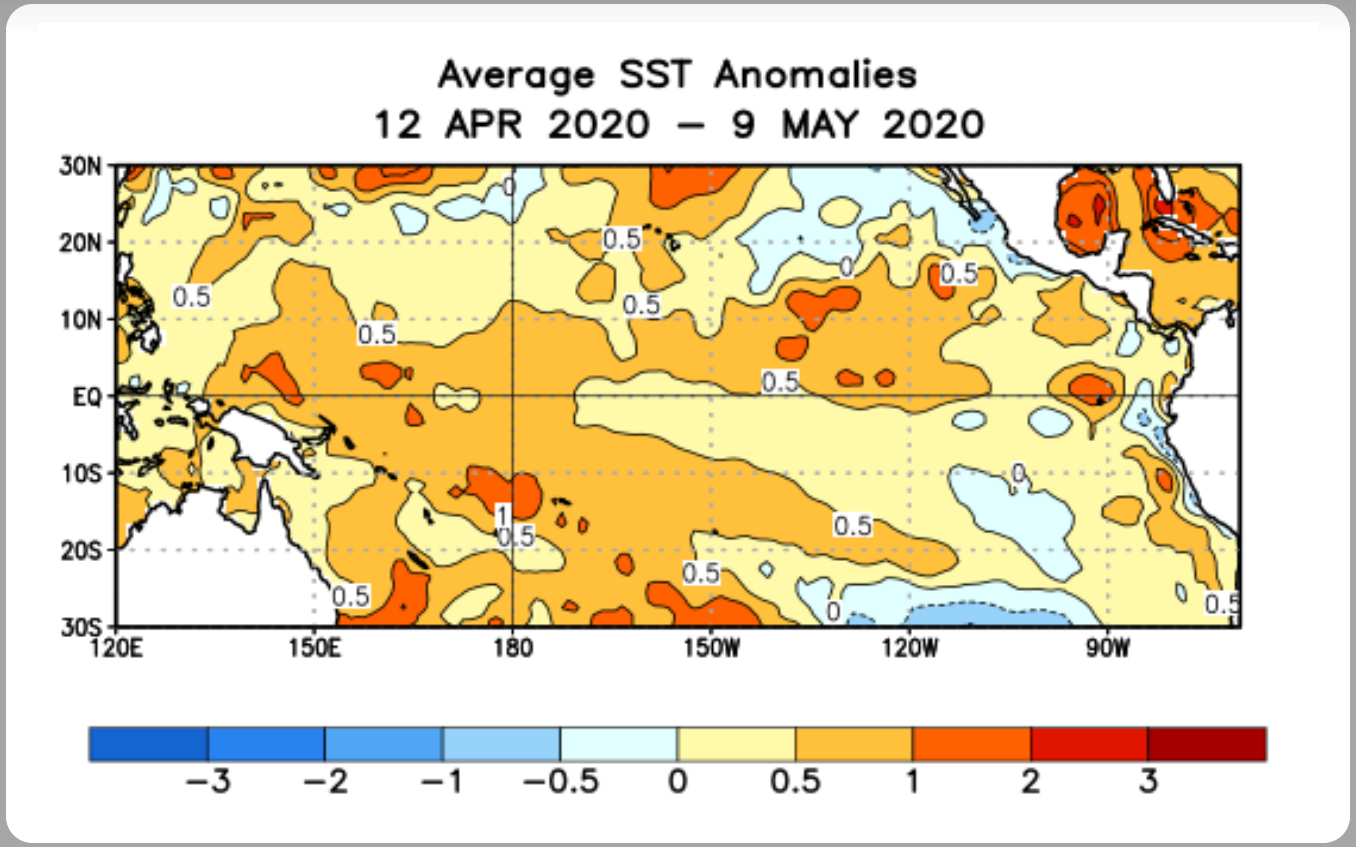
Niño 4	0.3ºC
Niño 3.4	0.2ºC
Niño 3	0.2ºC
Niño 1+2	0.2ºC





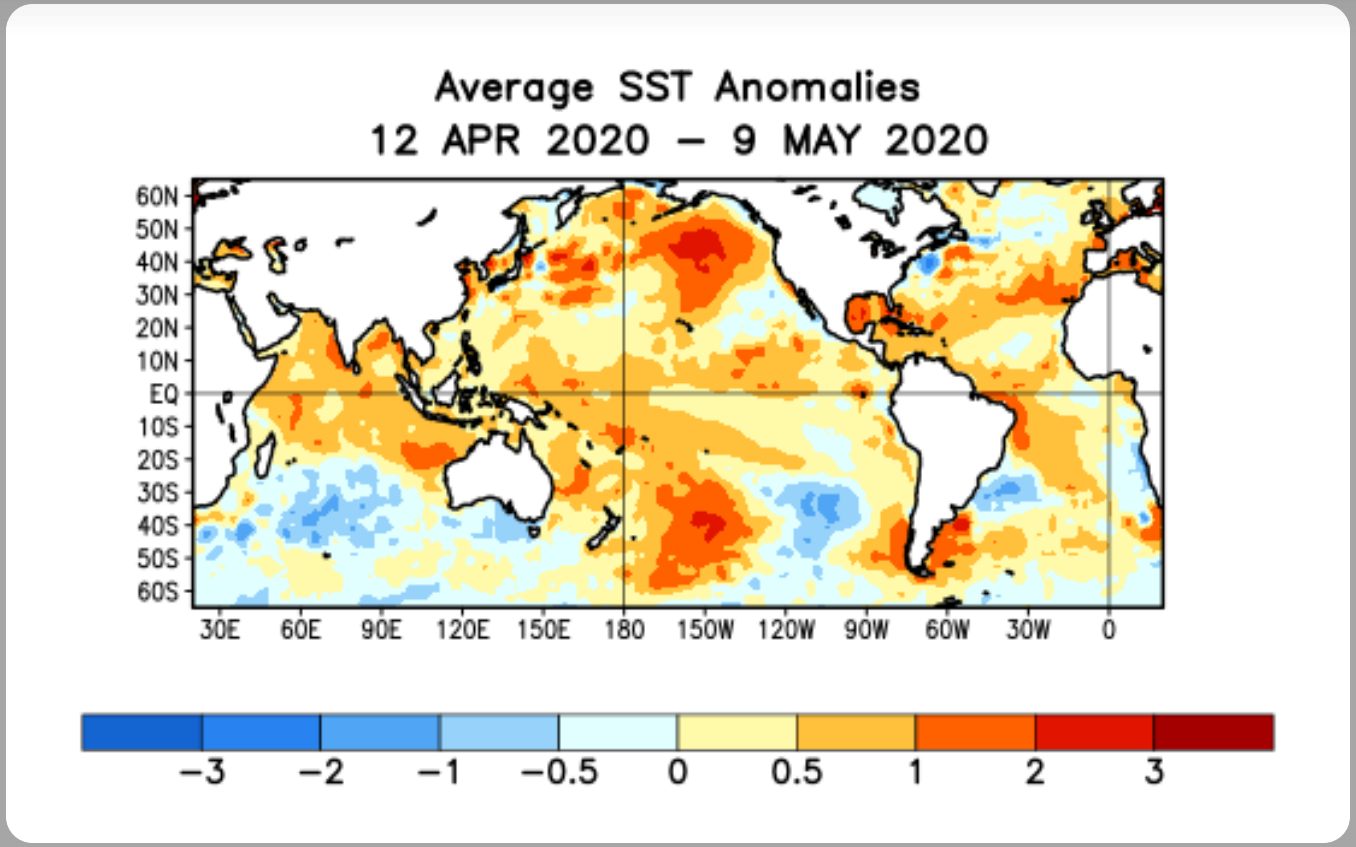
SST Departures (ºC) in the Tropical Pacific During the Last Four Weeks

During the last four weeks, equatorial SSTs were above average across most of the Pacific Ocean, except in small regions of the eastern Pacific.



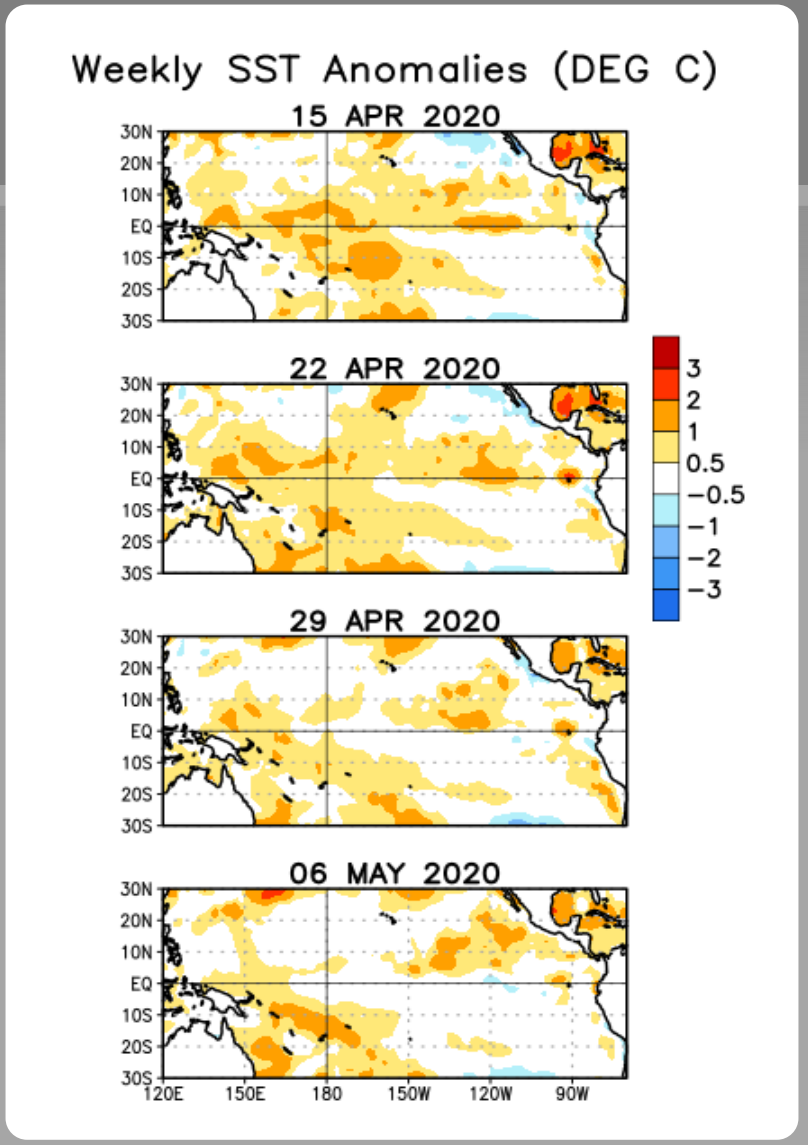
Global SST Departures (°C) During the Last Four Weeks

During the last four weeks, equatorial SSTs were above average across most of the Pacific Ocean, the western and eastern Atlantic Ocean, and the Indian Ocean.



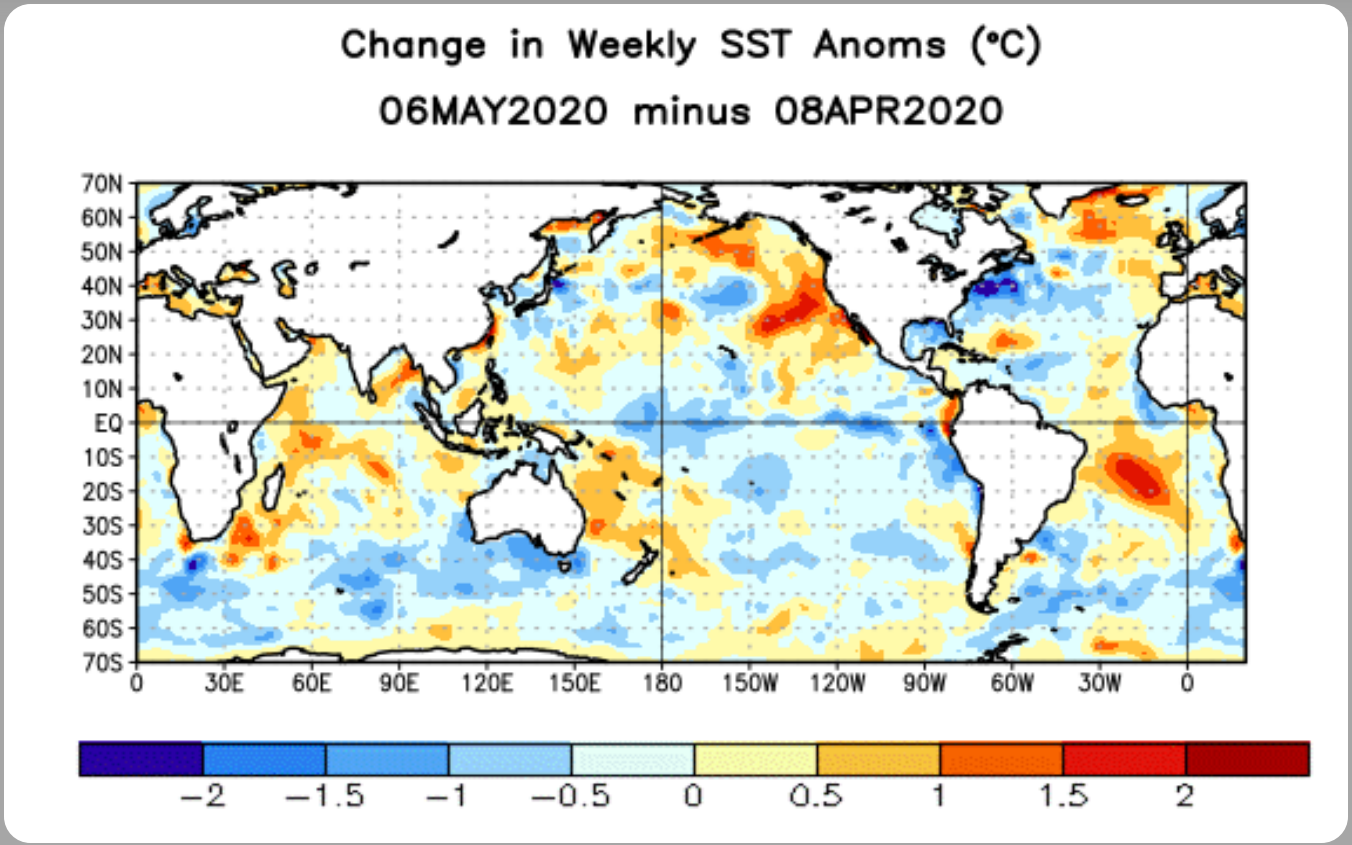
Weekly SST Departures during the Last Four Weeks

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



Change in Weekly SST Departures over the Last Four Weeks

During the last four weeks, the changes in equatorial SST anomalies were negative across most of the Pacific Ocean.



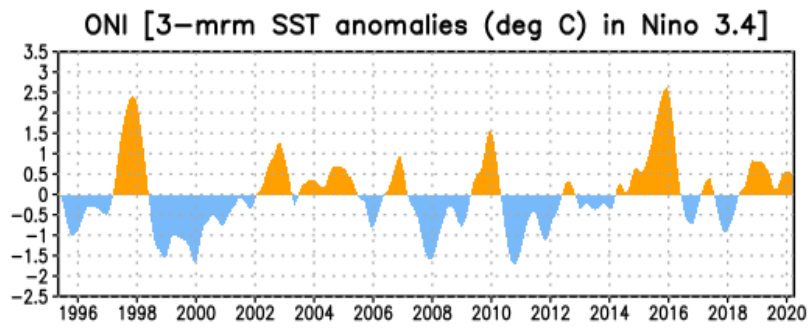
Upper-Ocean Conditions in the Equatorial Pacific

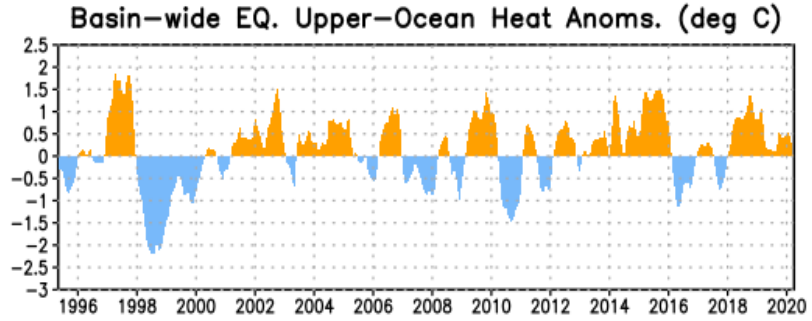
The basin-wide equatorial upper ocean (0-300 m) heat content is greatest prior to and during the early stages of a Pacific warm (El Niño) episode (compare top 2 panels), and least prior to and during the early stages of a cold (La Niña) episode.

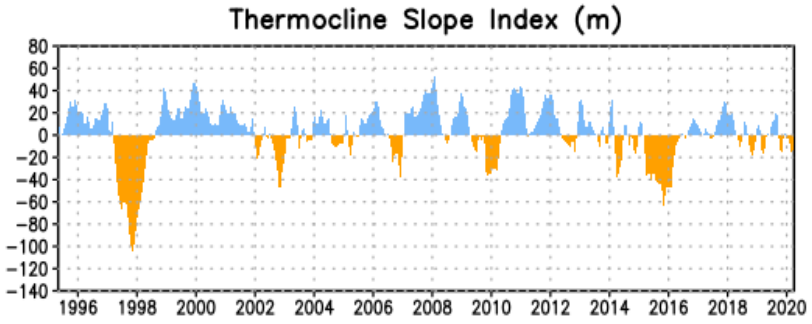
The slope of the oceanic thermocline is least (greatest) during warm (cold) episodes.

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

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).

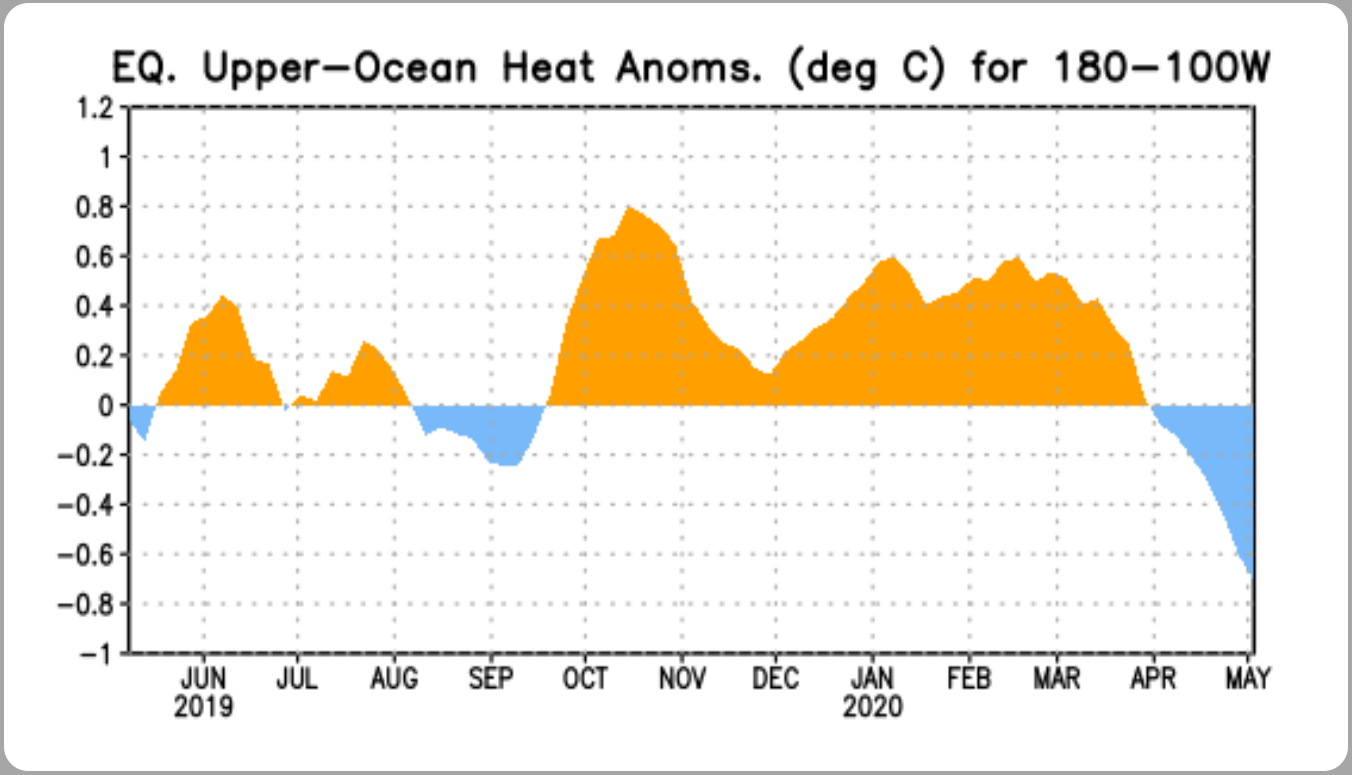






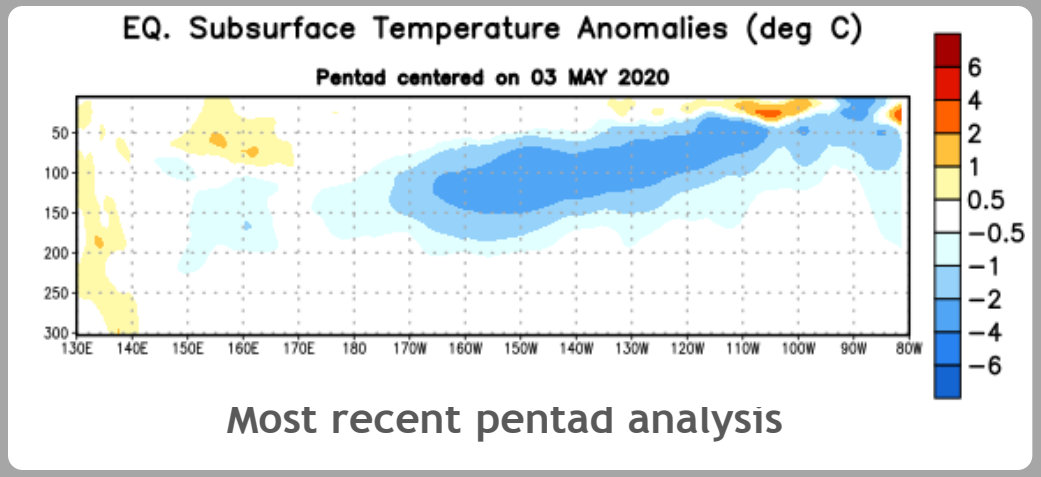
Central and Eastern Pacific Upper-Ocean (0-300 m) Weekly Average Temperature Anomalies

Subsurface temperature anomalies peaked during October 2019 and during January-February 2020. In March, positive anomalies weakened and returned to zero. During April, negative anomalies strengthened.



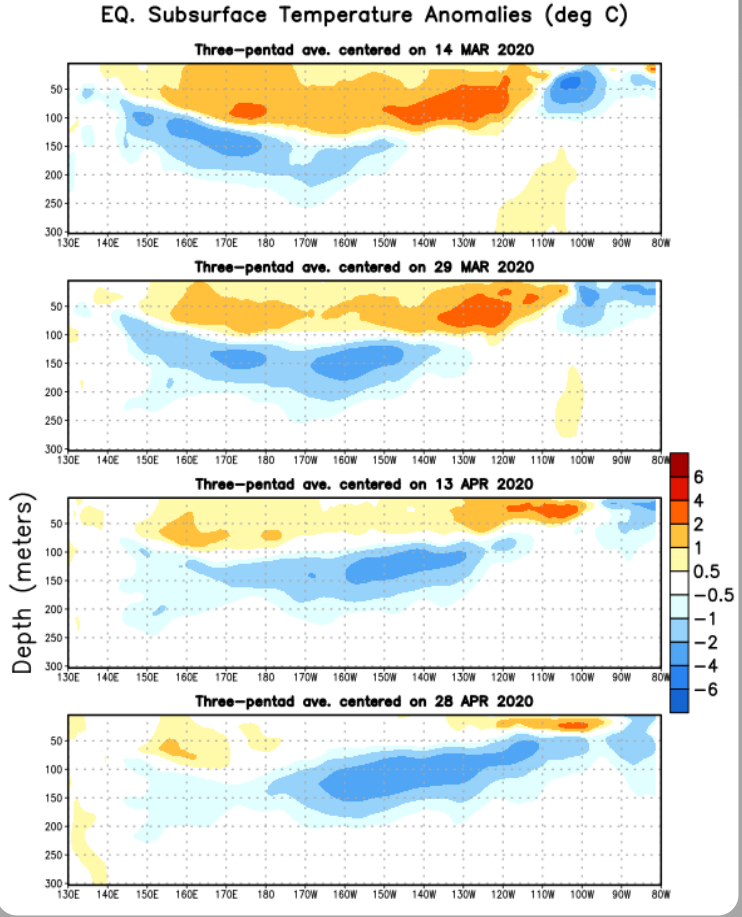
Sub-Surface Temperature Departures in the Equatorial Pacific

In the last two months, negative subsurface temperature anomalies, have shifted from the western to eastern Pacific Ocean.



Most recent pentad analysis

Positive subsurface temperature anomalies are weakening near the surface, while the negative anomalies are strengthening in the central and eastern Pacific Ocean.

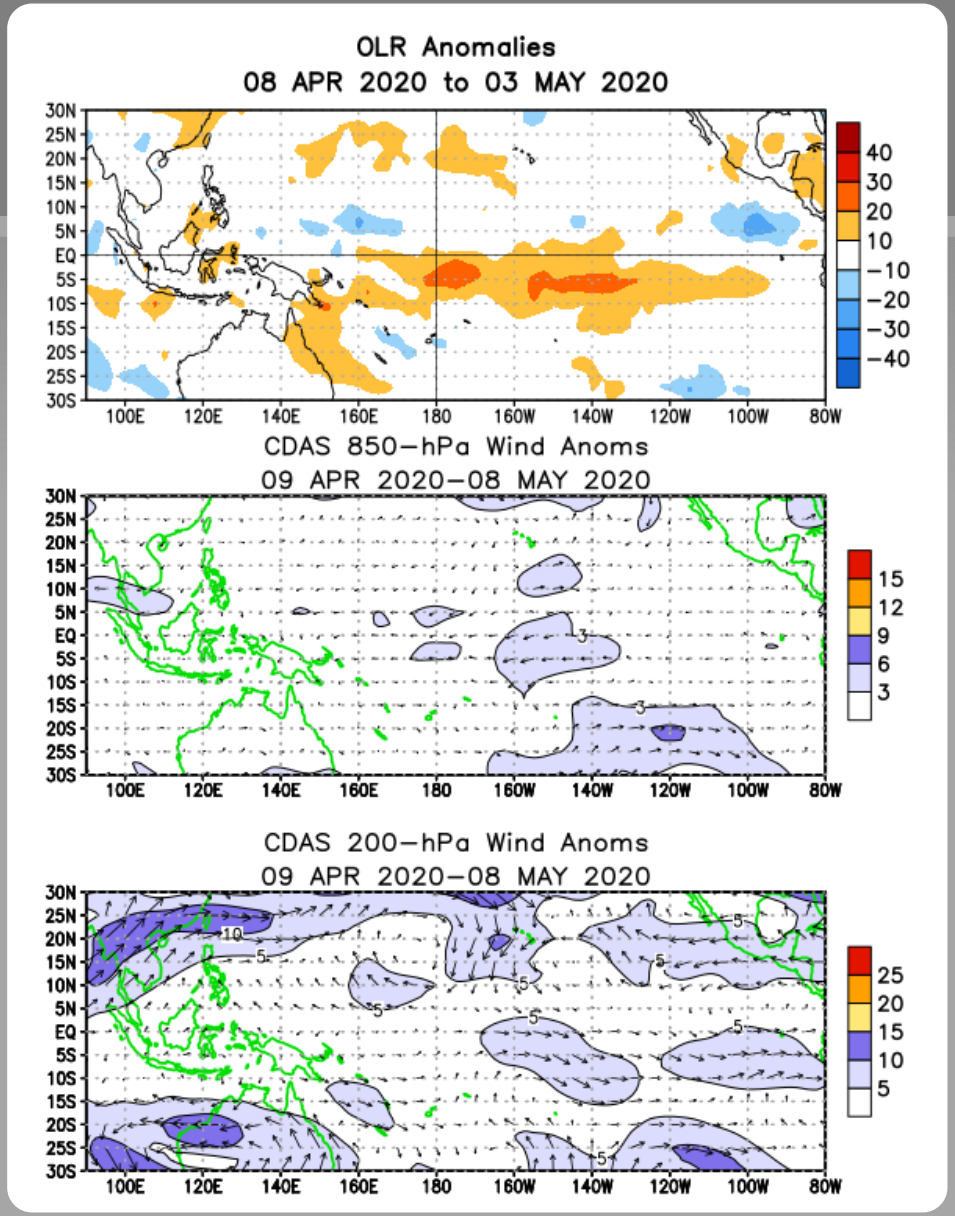


Tropical OLR and Wind Anomalies During the Last 30 Days

Positive OLR anomalies (suppressed convection and precipitation) were evident near the Date Line.

Low-level (850-hPa) wind anomalies were easterly over the central and east-central equatorial Pacific Ocean.

Upper-level (200-hPa) wind anomalies were westerly over the central and eastern 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:

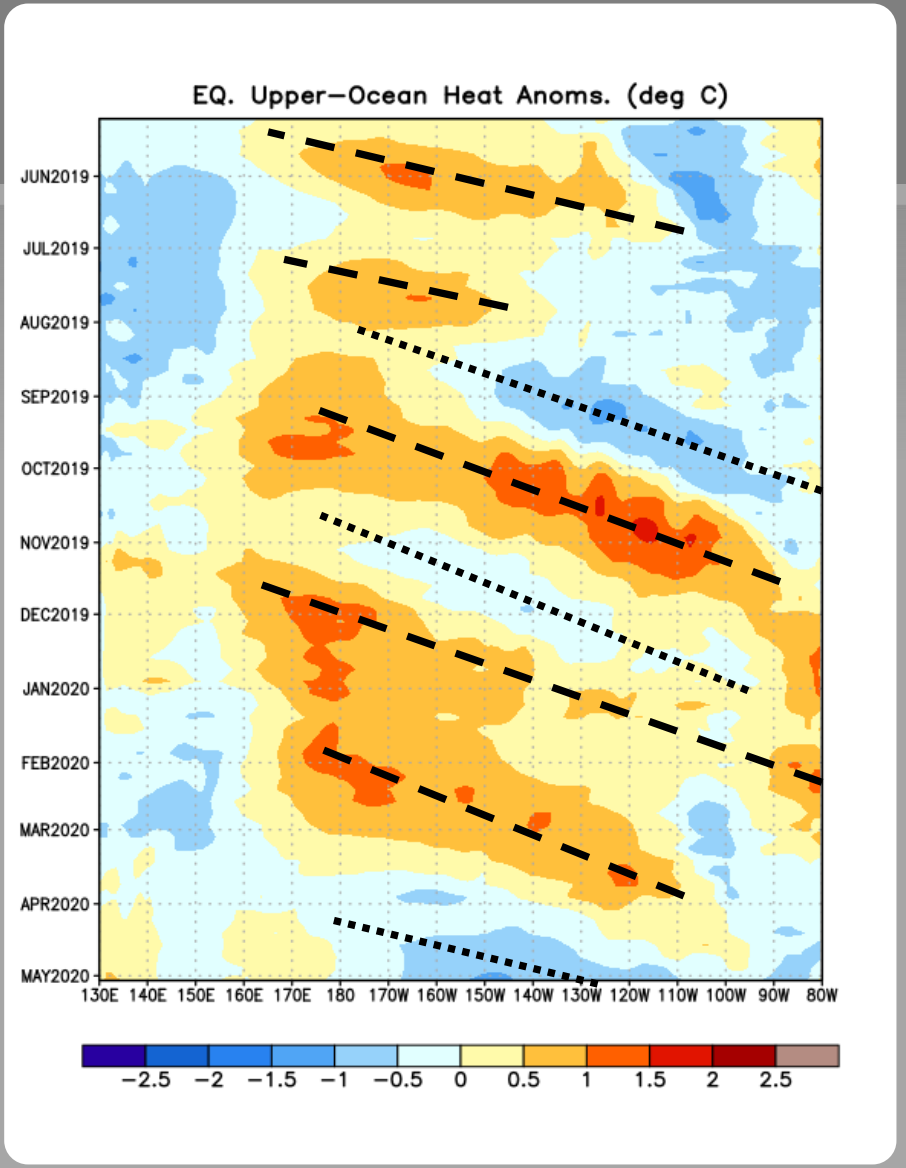
Significant weakening of the low-level easterly winds usually initiates an eastward-propagating oceanic Kelvin wave.

Weekly Heat Content Evolution in the Equatorial Pacific

Significant equatorial oceanic Kelvin wave activity (dashed and dotted lines) has been present throughout the period shown.

During December 2019 and January 2020, a downwelling Kelvin wave (dashed line) resulted in above-average subsurface temperatures across the central and east-central equatorial Pacific.

Since late March 2020, negative subsurface temperature anomalies have expanded eastward in association with an upwelling Kelvin wave.



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.

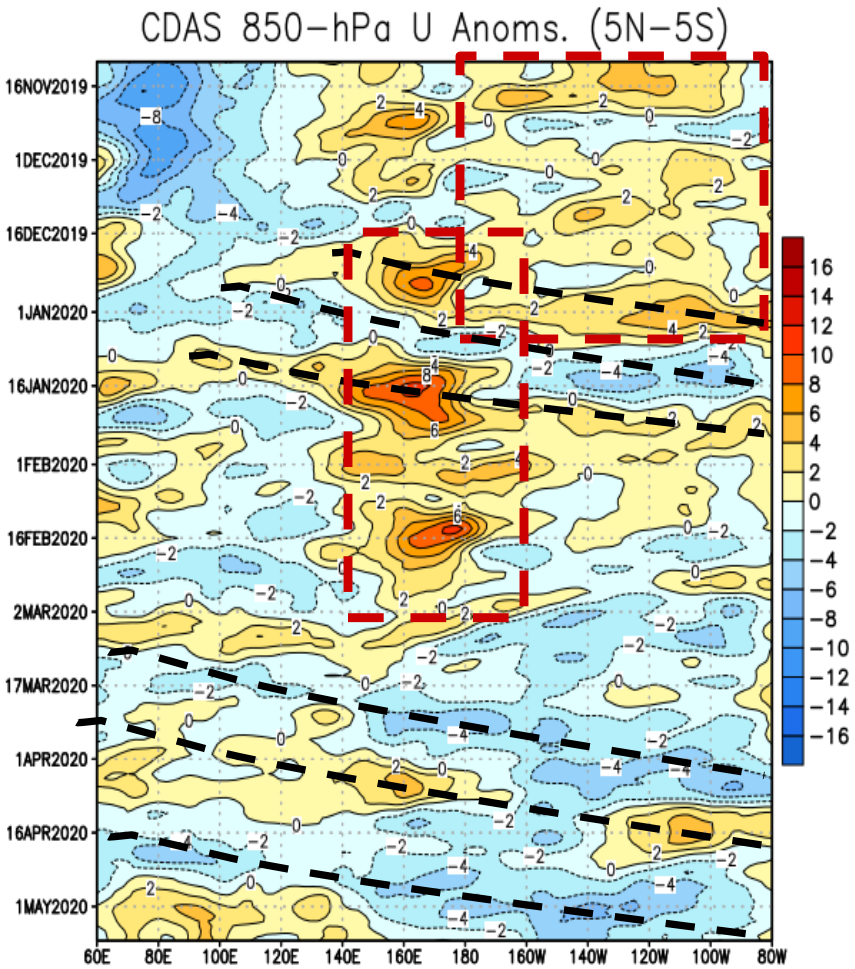
Low-level (850-hPa) Zonal (east-west) Wind Anomalies (m s^{-1})

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

From early September to early January, low-level westerly wind anomalies generally persisted east of the Date Line.

From mid-December 2019 through February 2020, westerly wind anomalies persisted near the Date Line.

In the last week, easterly wind anomalies have persisted over the central and eastern equatorial Pacific.



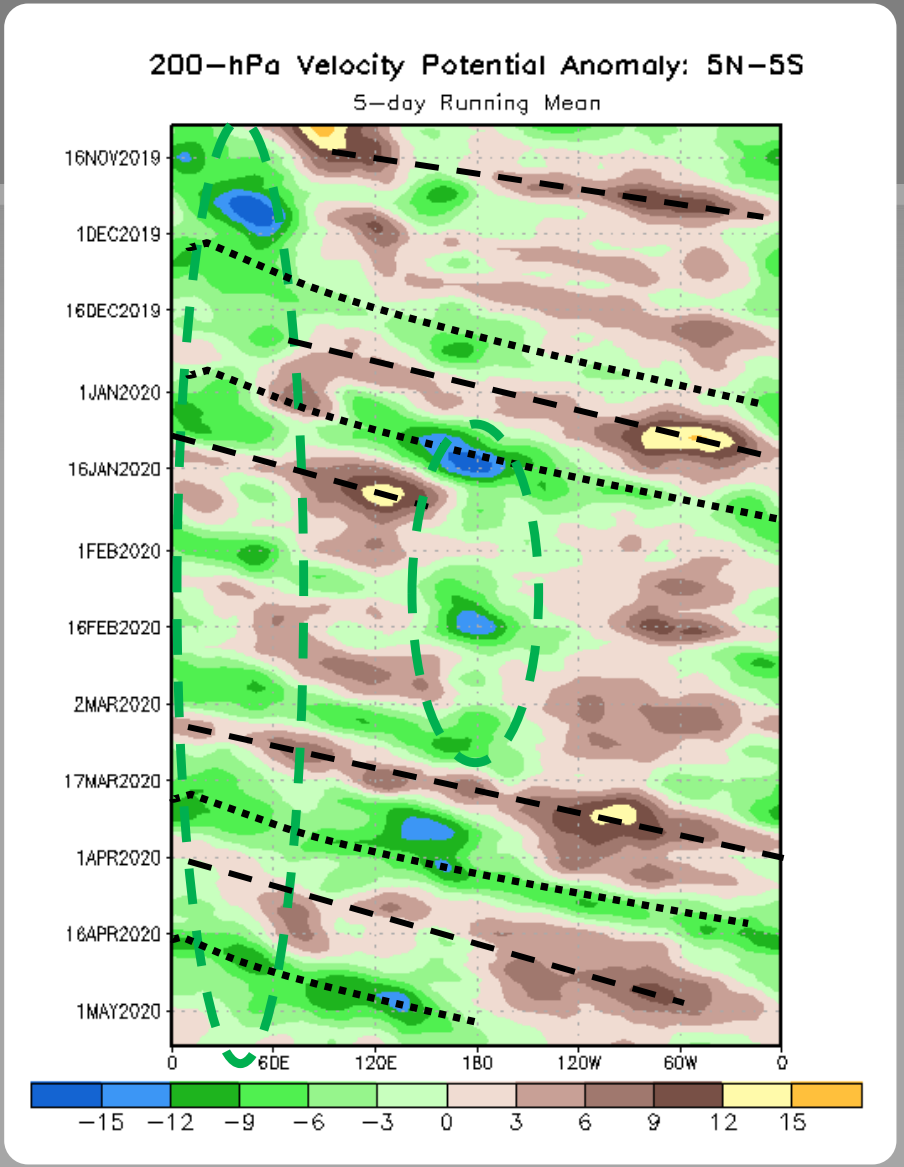
Westerly Wind Anomalies (orange/red shading)
Easterly Wind Anomalies (blue shading)

Upper-level (200-hPa) Velocity Potential Anomalies

Eastward propagation of anomalies has, at times, been evident.

Since mid-September 2019, anomalous divergence (green shading) has generally persisted over Africa and the western Indian Ocean.

From early January to early March 2020, anomalous divergence persisted over the Date Line.



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

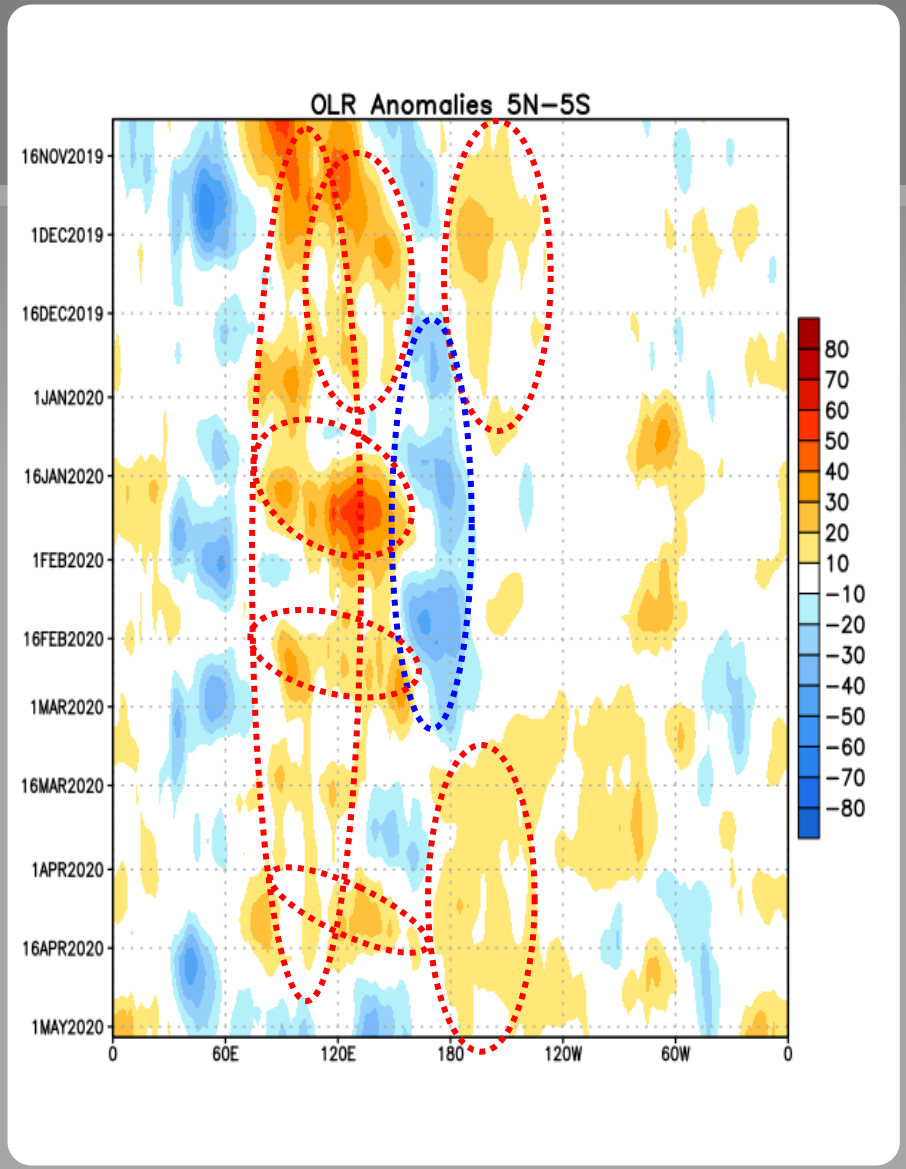
From mid-November through December 2019, positive OLR anomalies were evident near and just east of the Date Line.

From mid-December through February 2019, negative OLR anomalies were observed near and west of the Date Line.

From July 2019 through mid-April 2020, positive OLR anomalies persisted over Indonesia.

Since mid-March, positive OLR anomalies were observed at the Date Line.

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.

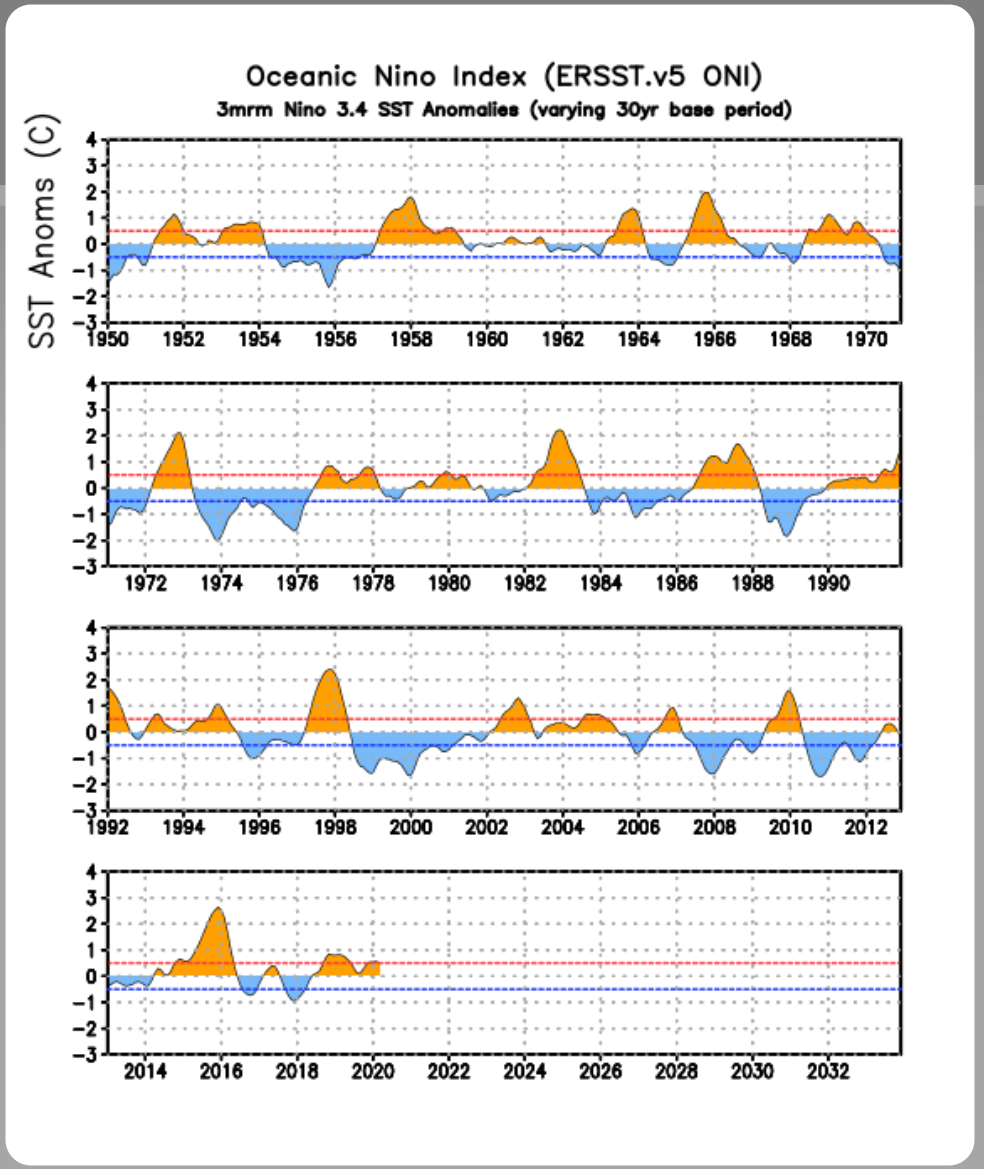
La Niña: characterized by a negative ONI less than or equal to -0.5°C.

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 (February - April 2020) is +0.5°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.

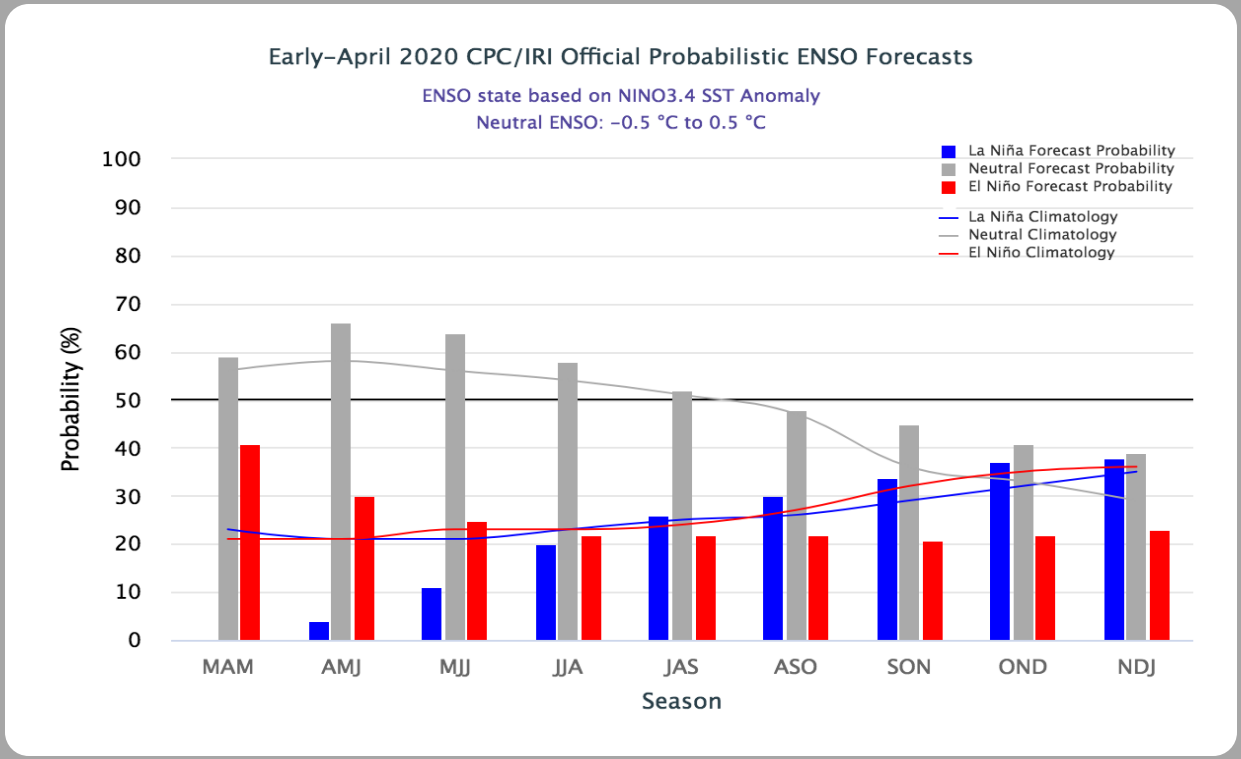
The ONI is one measure of the El Niño-Southern Oscillation, and other indices can confirm whether features consistent with a coupled ocean-atmosphere phenomenon accompanied these periods. The complete table going back to DJF 1950 can be found here.

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
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	0.8	0.8	0.6	0.5	0.3	0.1	0.1	0.3	0.5	0.5
2020	0.5	0.6	0.5									

CPC/IRI Probabilistic ENSO Outlook

Updated: 9 April 2020

ENSO-neutral is most likely to continue through the Northern Hemisphere fall 2020.



IRI/CPC Pacific Niño 3.4 SST Model Outlook

A majority of models favor ENSO-neutral through the Northern Hemisphere summer and fall 2020.

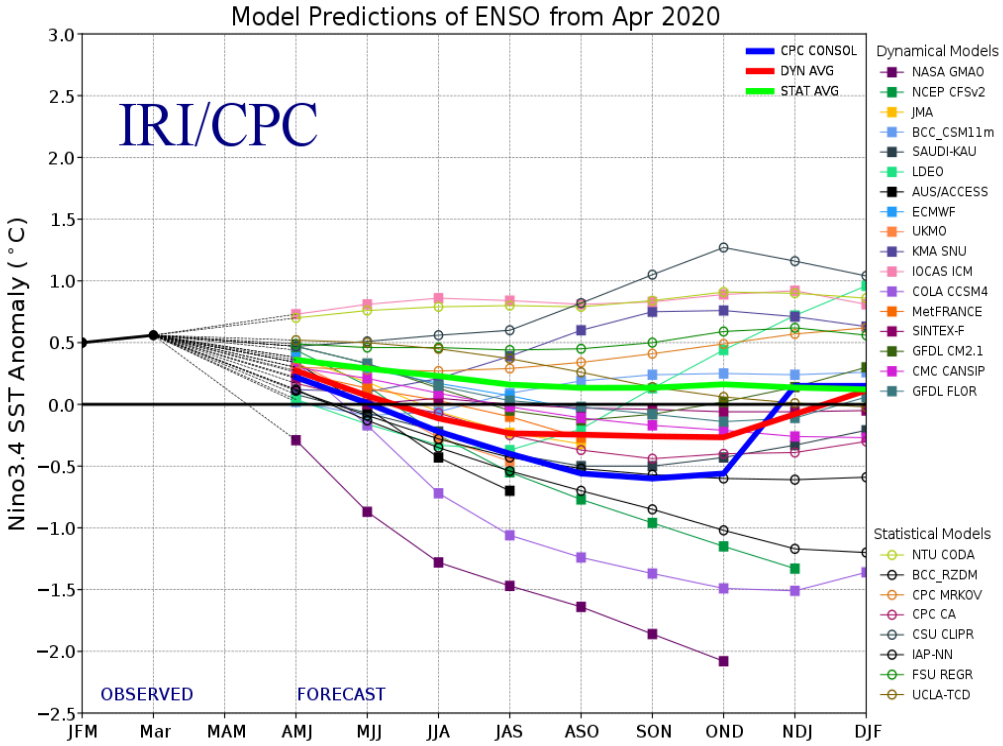
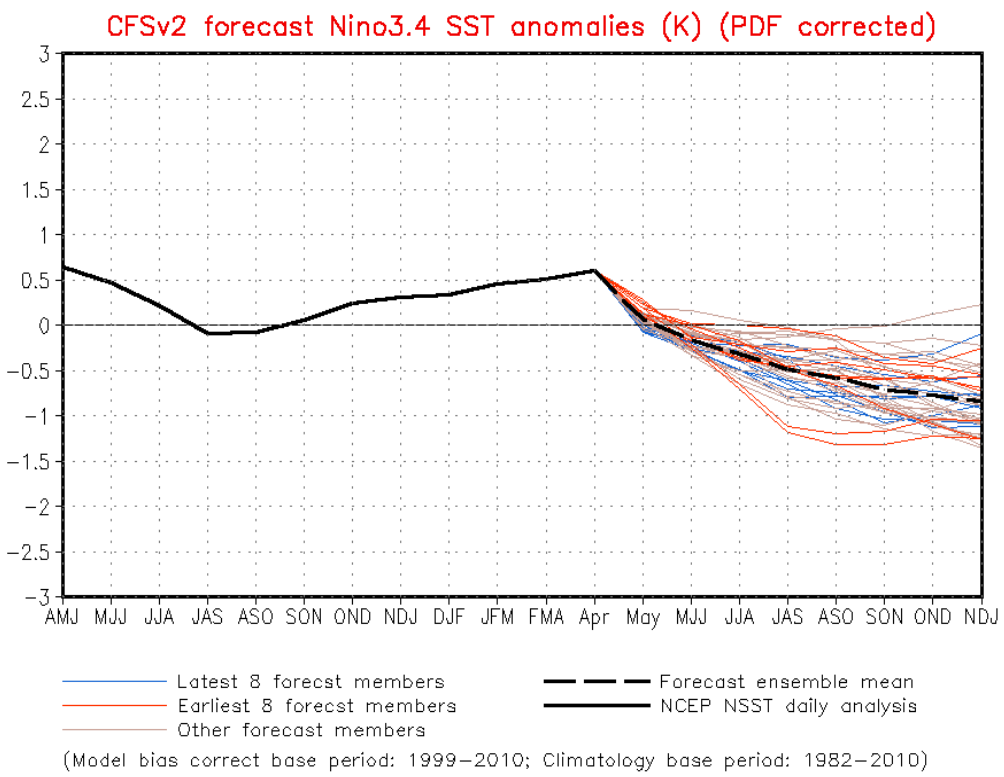


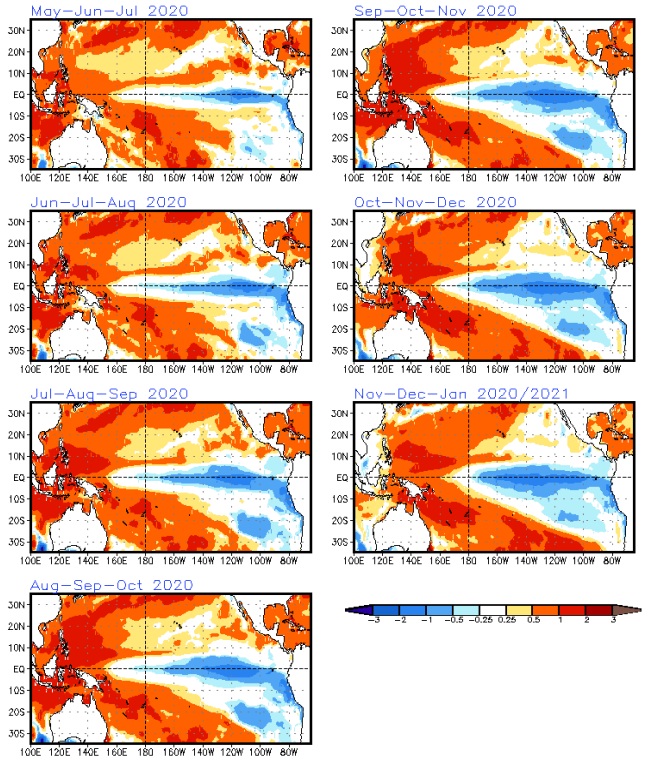
Figure provided by the International Research Institute (IRI) for Climate and Society (updated 19 April 2020).

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

Issued: 11 May 2020

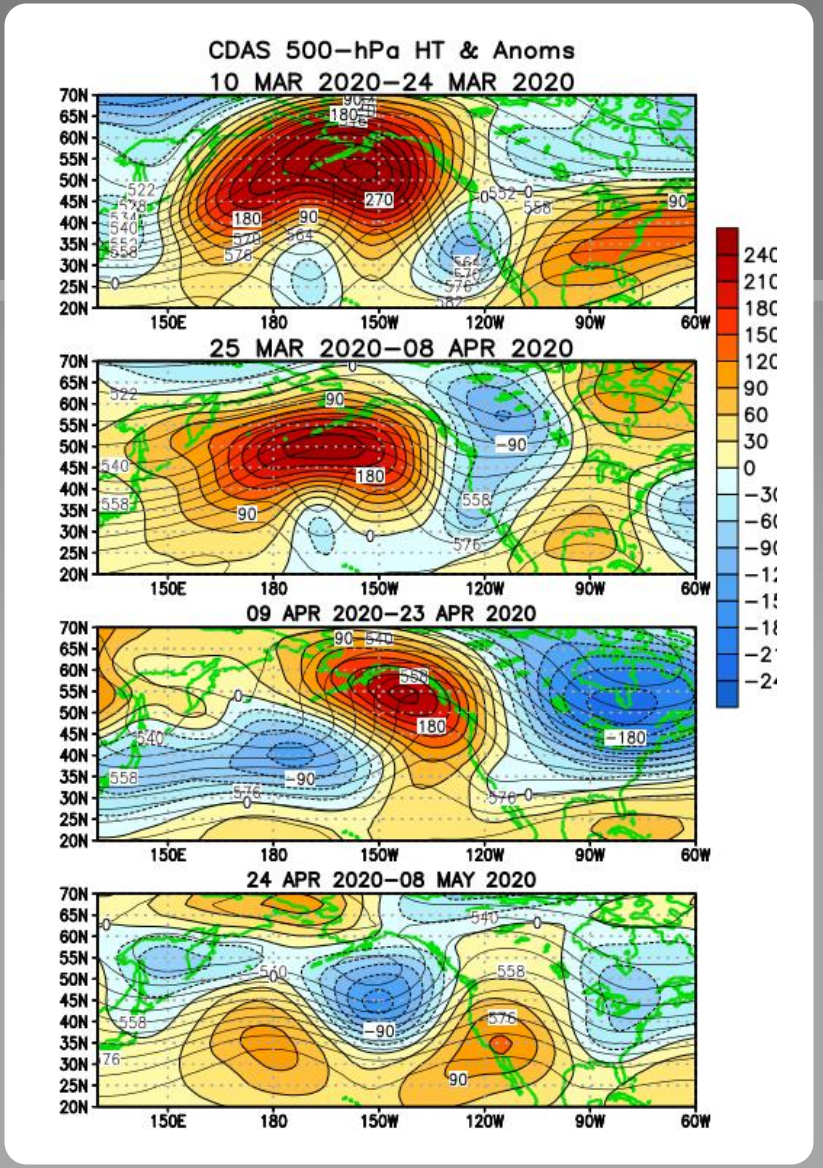
The CFS.v2 ensemble mean (black dashed line) predicts ENSO-neutral to continue into summer 2020, with chances favoring La Niña thereafter.





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

During April, heights and temperatures switched from mostly below average to above average over the western United States. The reverse was the case over the eastern United States where heights and temperatures went from above average to below average.



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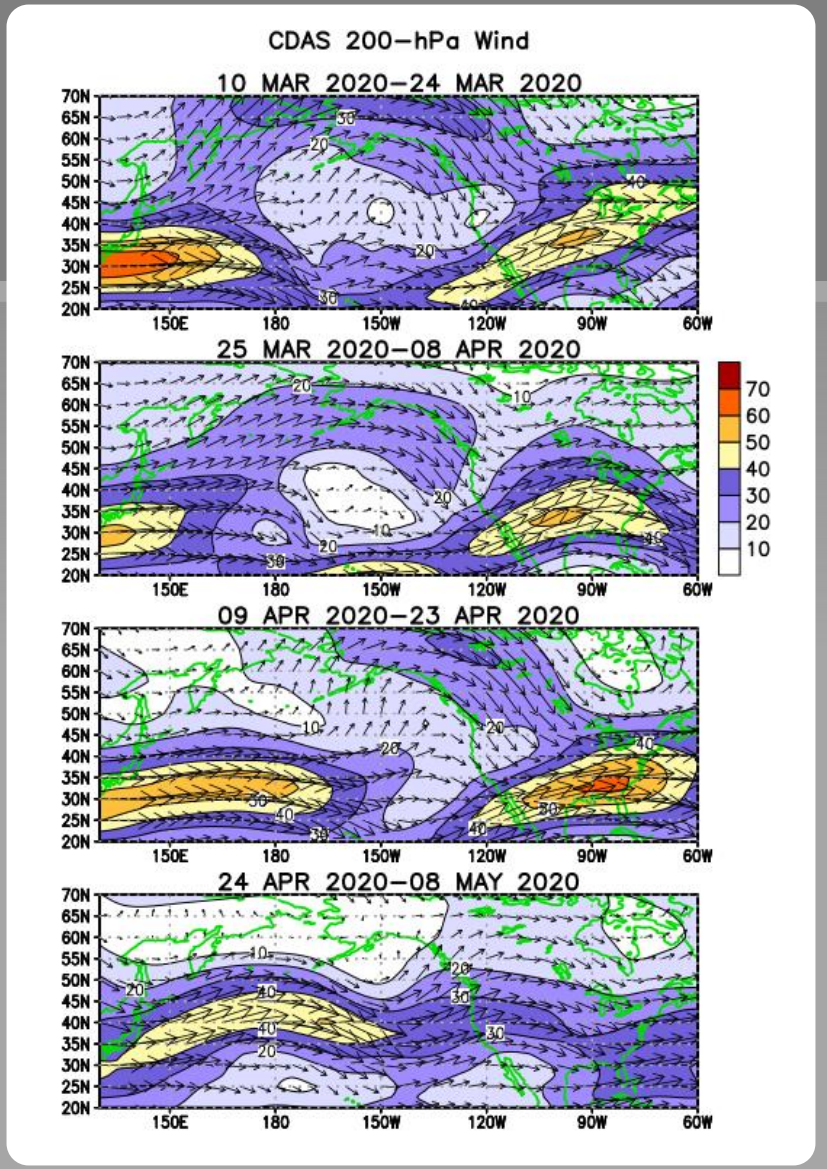

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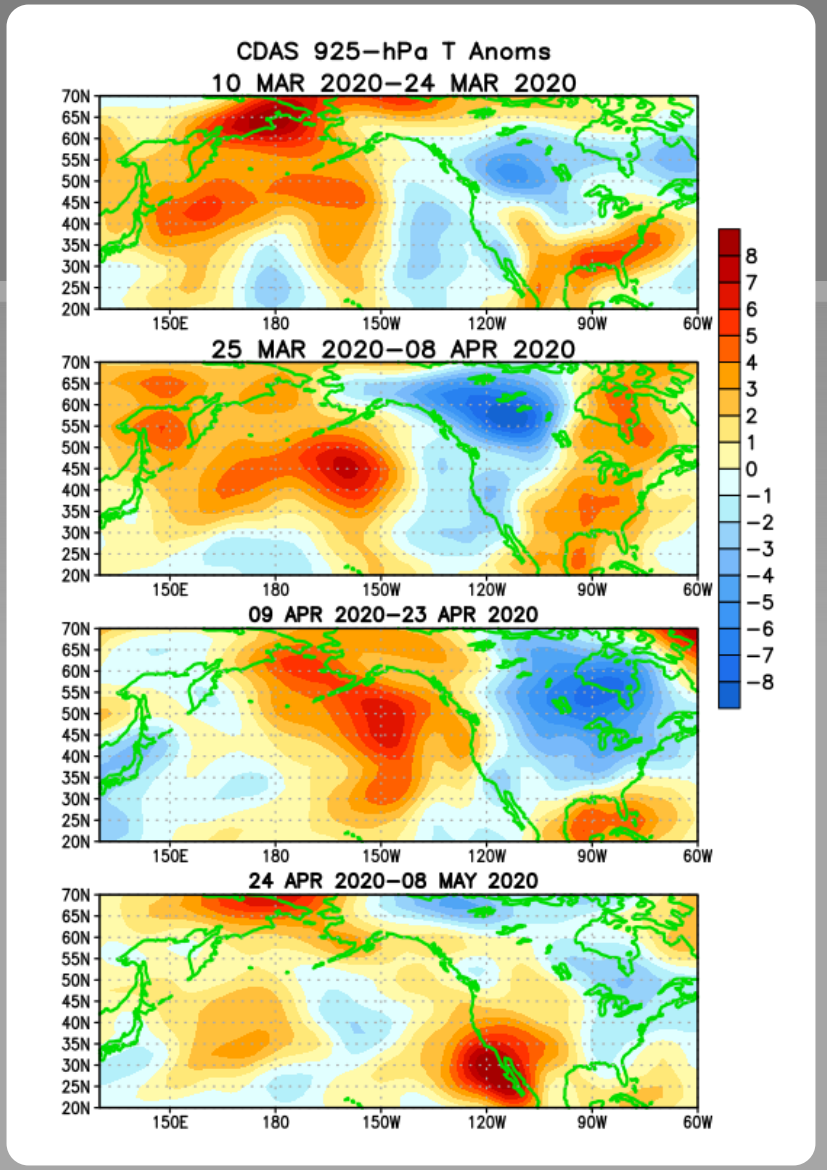
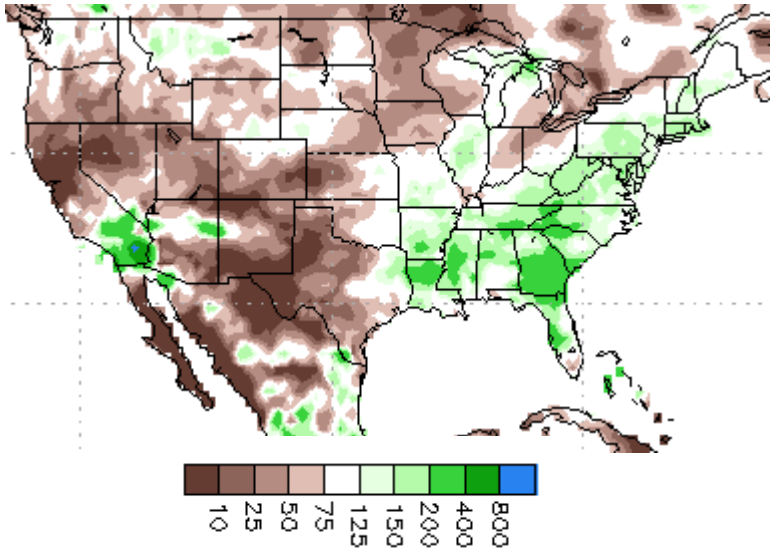


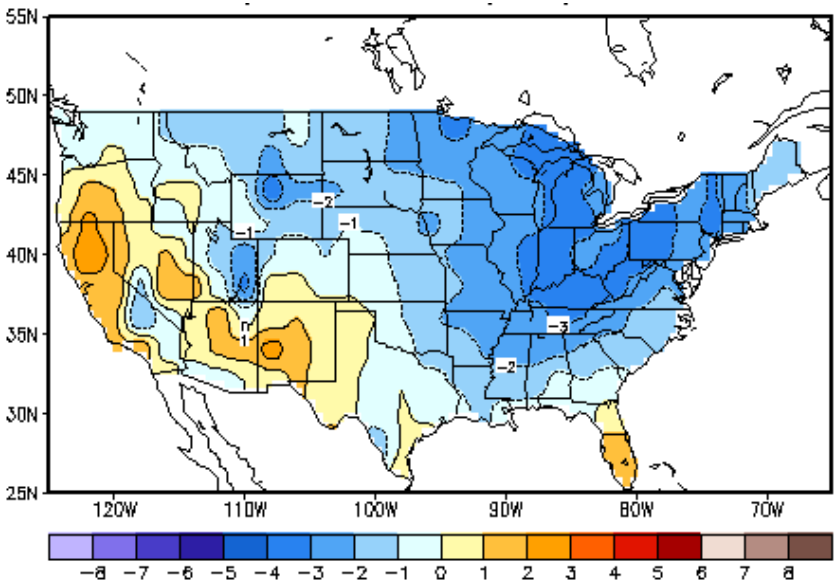
U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 9 May 2020

Percent of Average Precipitation



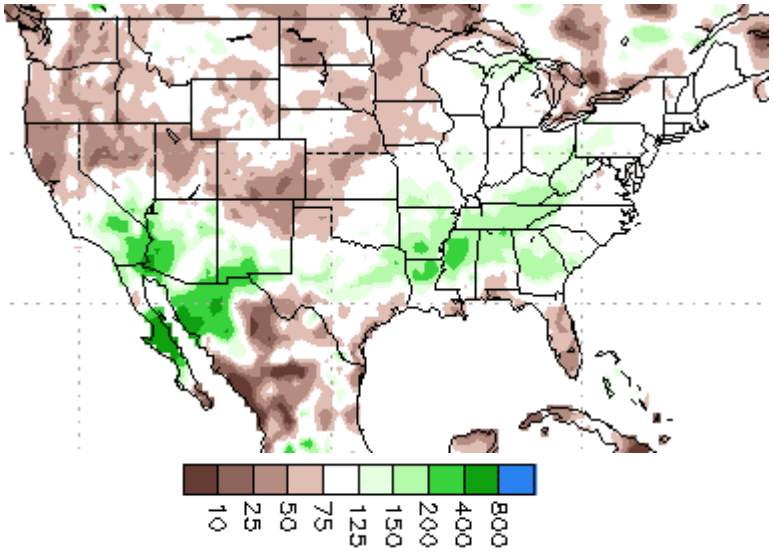
Temperature Departures (degree C)



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

End Date: 9 May 2020

Percent of Average Precipitation



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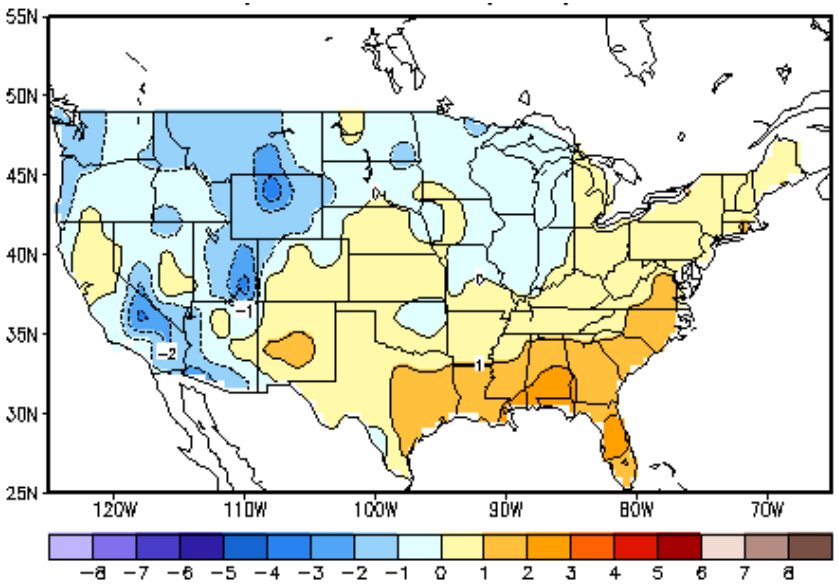
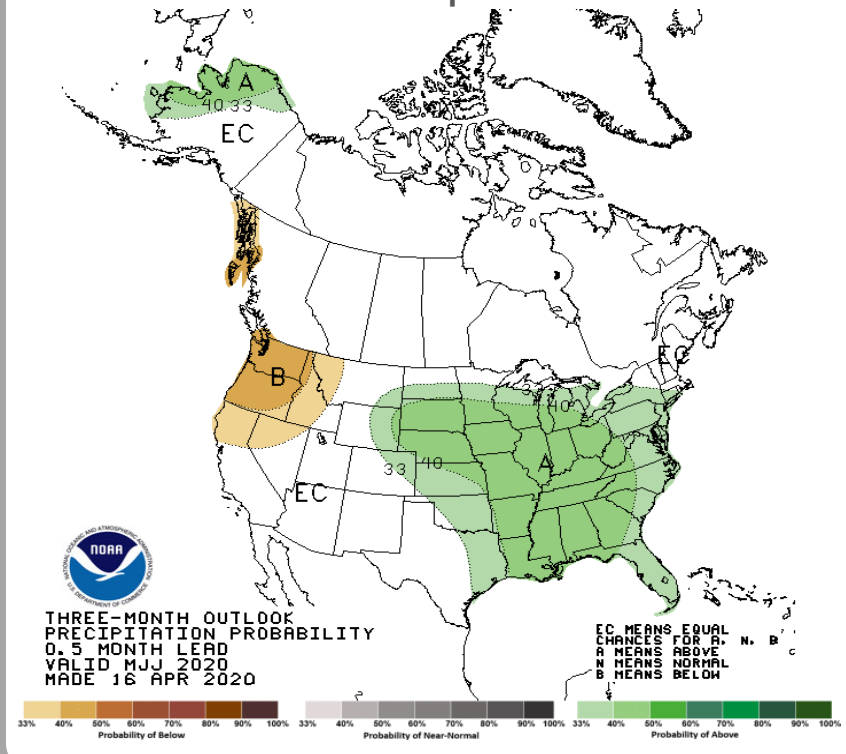


U. S. Seasonal Outlooks

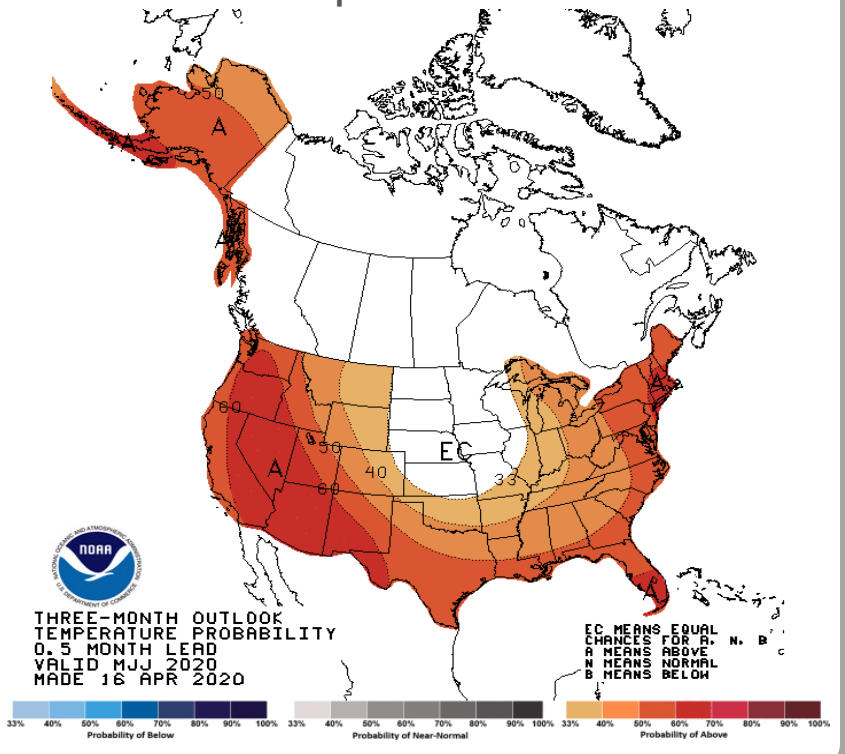
May-July 2020

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

Precipitation



Temperature



Summary

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The tropical atmospheric circulation is consistent with ENSO-neutral.

ENSO-neutral is favored for the Northern Hemisphere summer 2020 (~60% chance), remaining the most likely outcome through autumn.*

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