

# ENSO: Recent Evolution, Current Status and Predictions



Update prepared by:  
Climate Prediction Center / NCEP  
4 April 2022

# Outline

Summary

Recent Evolution and Current Conditions

Oceanic Niño Index (ONI)

Pacific SST Outlook

U.S. Seasonal Precipitation and Temperature Outlooks

Summary

# Summary

ENSO Alert System Status: **La Niña Advisory**

La Niña is present.\*

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

The tropical Pacific atmosphere is consistent with La Niña.

La Niña is favored to continue into the Northern Hemisphere summer (53% chance during June-August 2022), with a 40-50% chance of La Niña or ENSO-neutral thereafter.\*

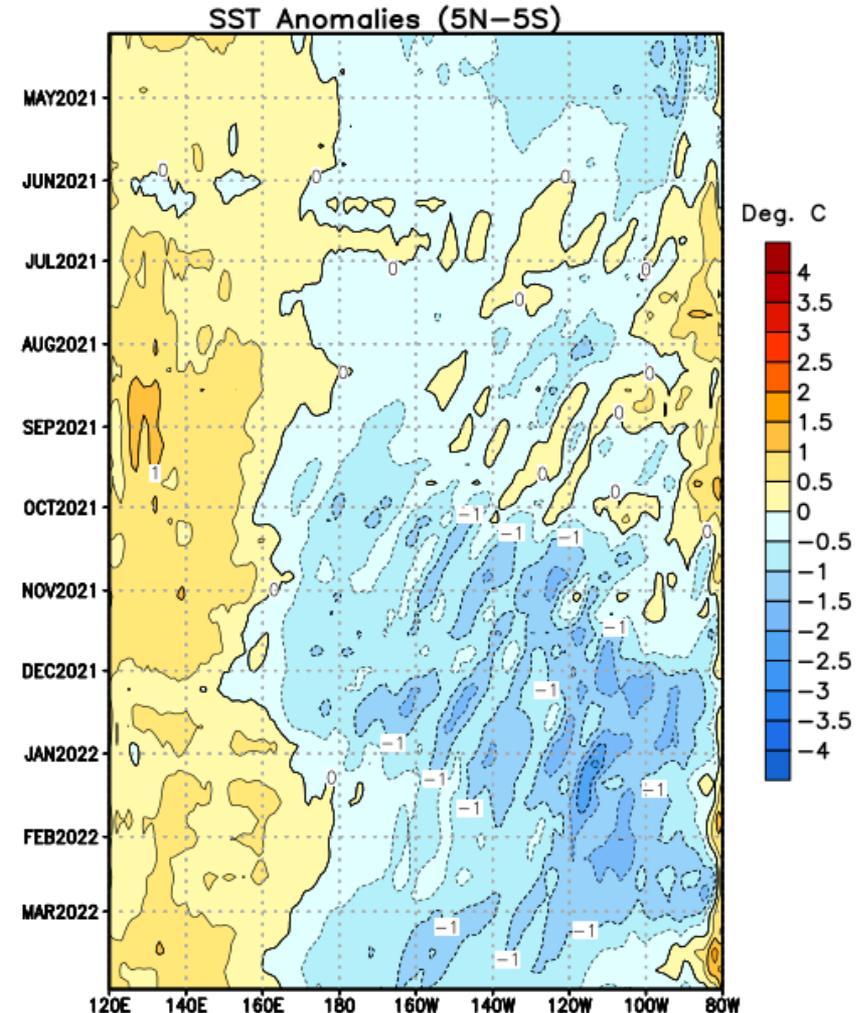
\* Note: These statements are updated once a month (2<sup>nd</sup> Thursday of each month) in association with the ENSO Diagnostics Discussion, which can be found by clicking [here](#).

# Recent Evolution of Equatorial Pacific SST Departures (°C)

From March to July 2021, equatorial SSTs gradually returned to average over most of the Pacific Ocean.

During January 2022, below-average equatorial SSTs weakened across the Pacific Ocean.

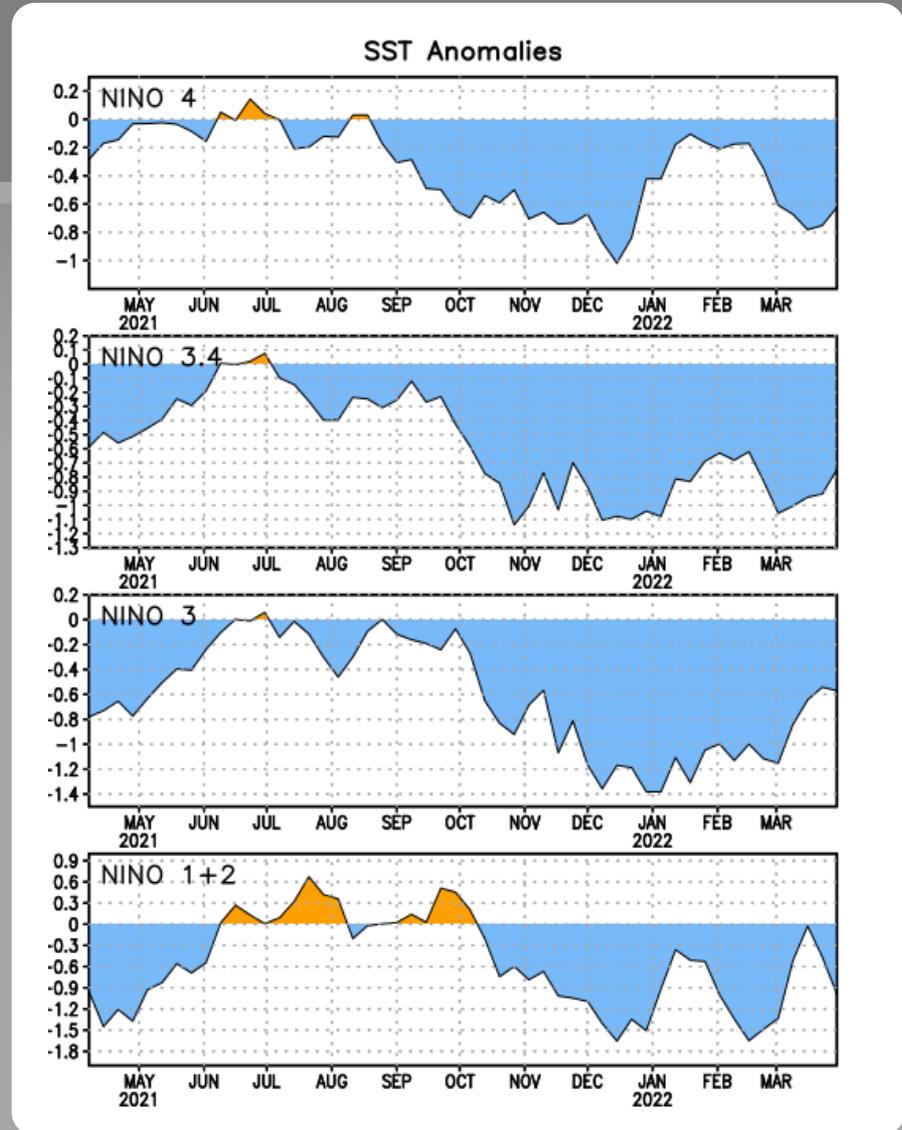
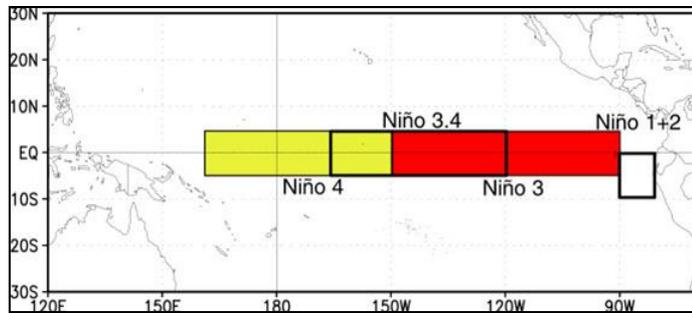
In the last week, below-average SSTs persisted across the equatorial Pacific Ocean.



# Niño Region SST Departures (°C) Recent Evolution

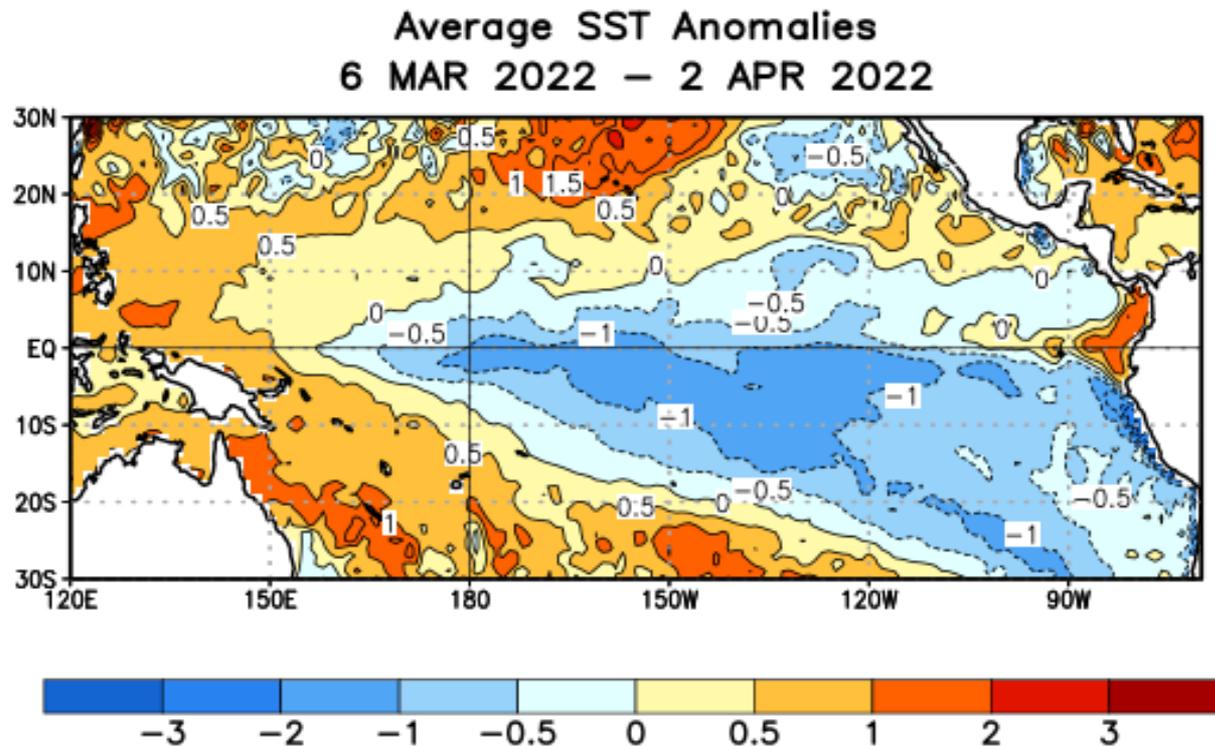
The latest weekly SST departures are:

Niño 4	-0.6°C
Niño 3.4	-0.7°C
Niño 3	-0.6°C
Niño 1+2	-1.0°C



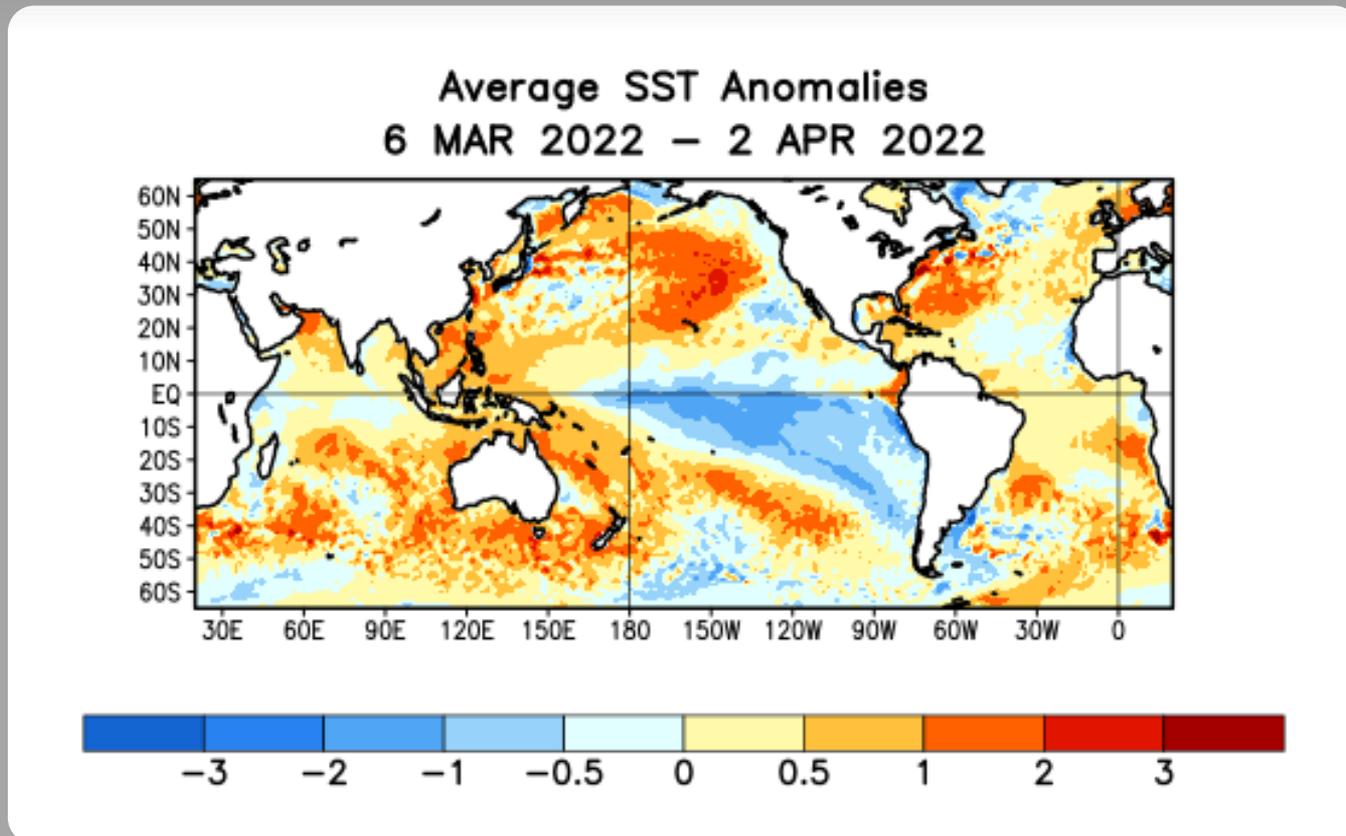
# SST Departures (°C) in the Tropical Pacific During the Last Four Weeks

In the last four weeks, equatorial SSTs were below average across the east-central and central Pacific Ocean and were above average in the western Pacific Ocean and near South America.



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

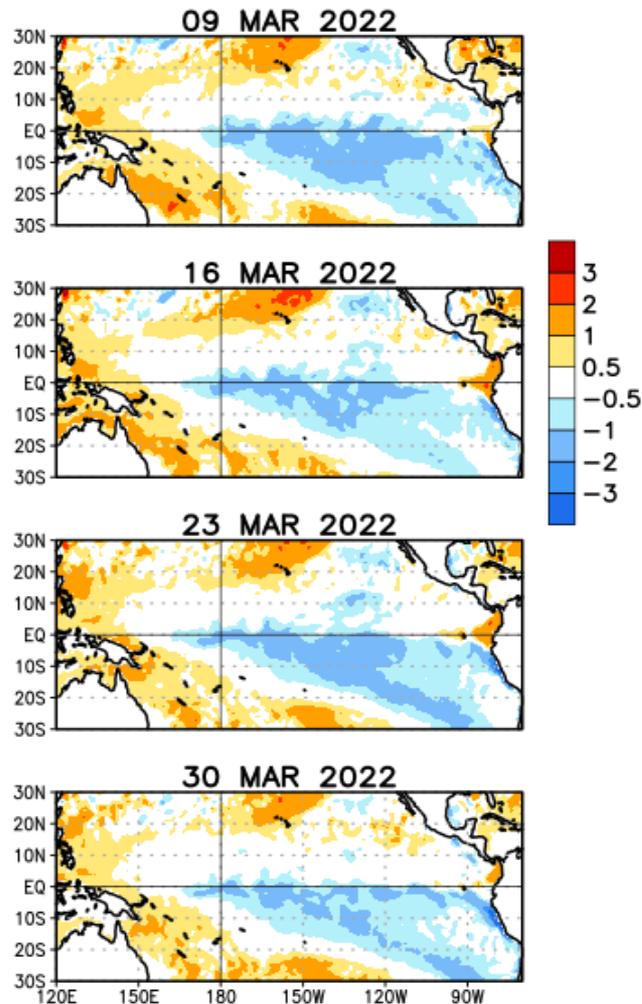
During the last four weeks, equatorial SSTs were below average across the east-central and central Pacific Ocean and the western Indian Ocean. Equatorial SSTs were above average in the western Pacific Ocean and near South America.



# Weekly SST Departures during the Last Four Weeks

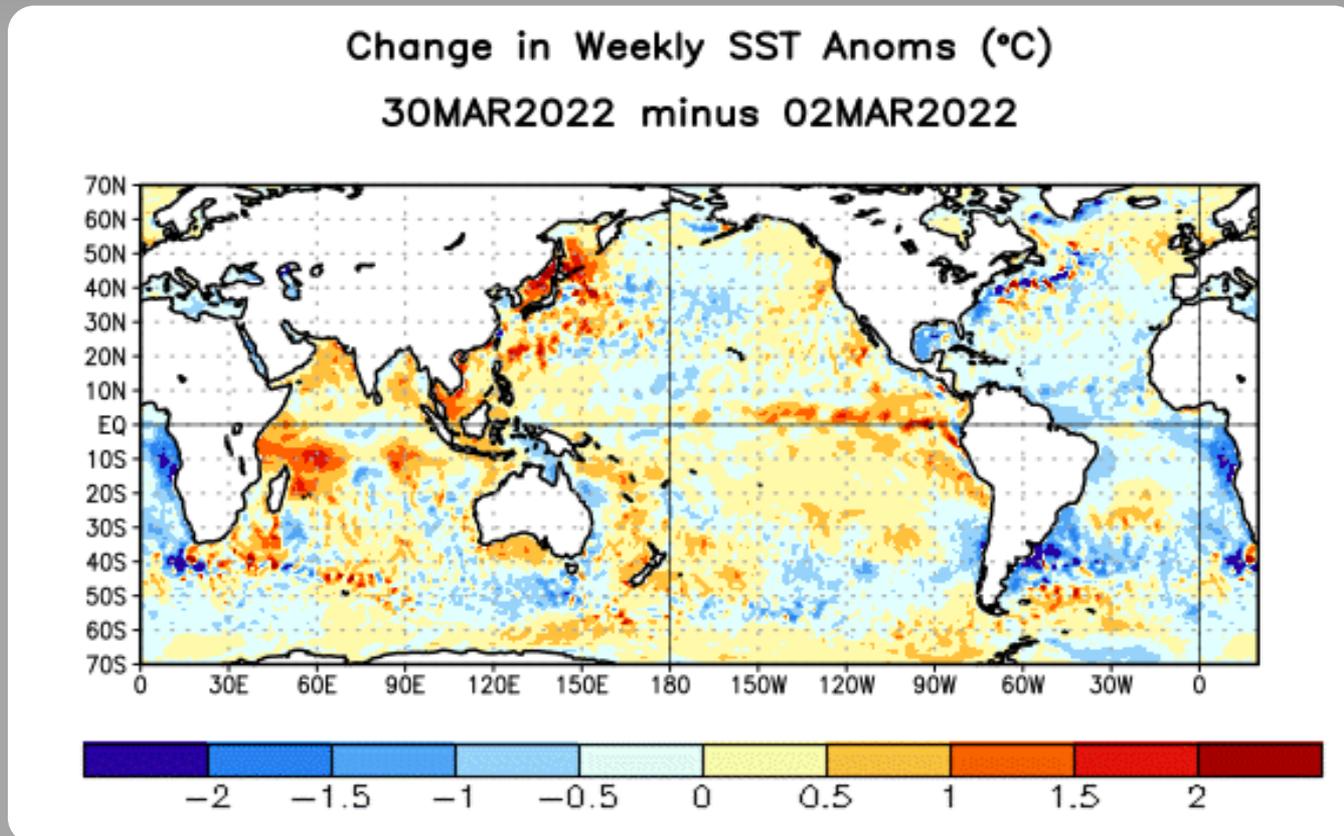
During the last 4 weeks, negative SST anomalies have persisted in the central and east-central Pacific Ocean.

### Weekly SST Anomalies (DEG C)



# Change in Weekly SST Departures over the Last Four Weeks

During the last four weeks, positive changes in equatorial SST anomalies were observed in the eastern Pacific.



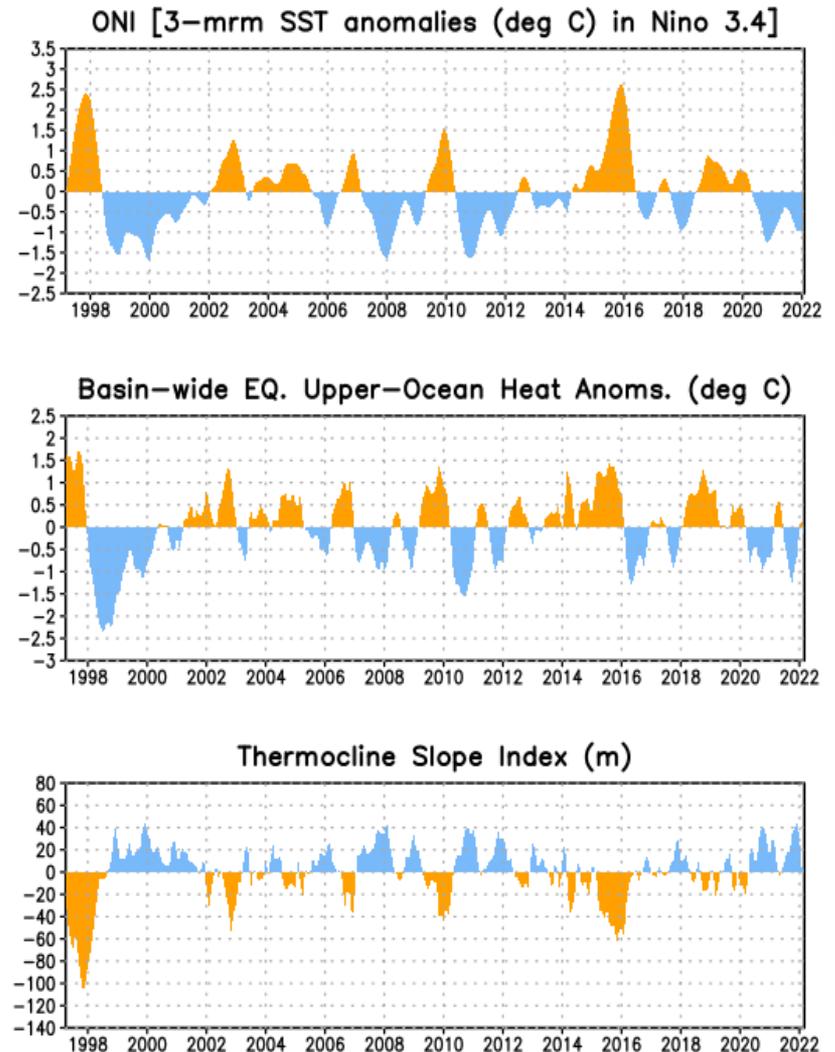
# Upper-Ocean Conditions in the Equatorial Pacific

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.

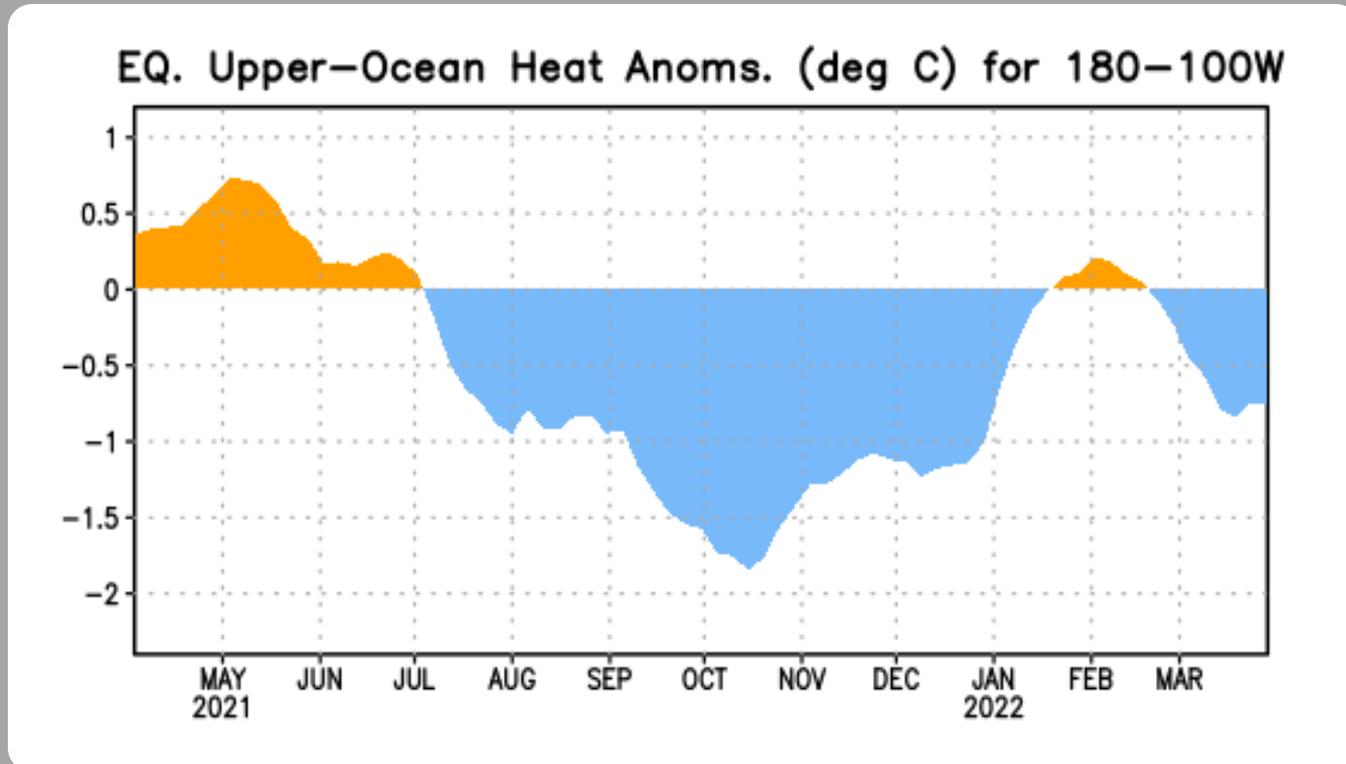
Recent values of the upper-ocean heat anomalies (below average) and thermocline slope index (above average) reflect La Niña.

*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).*



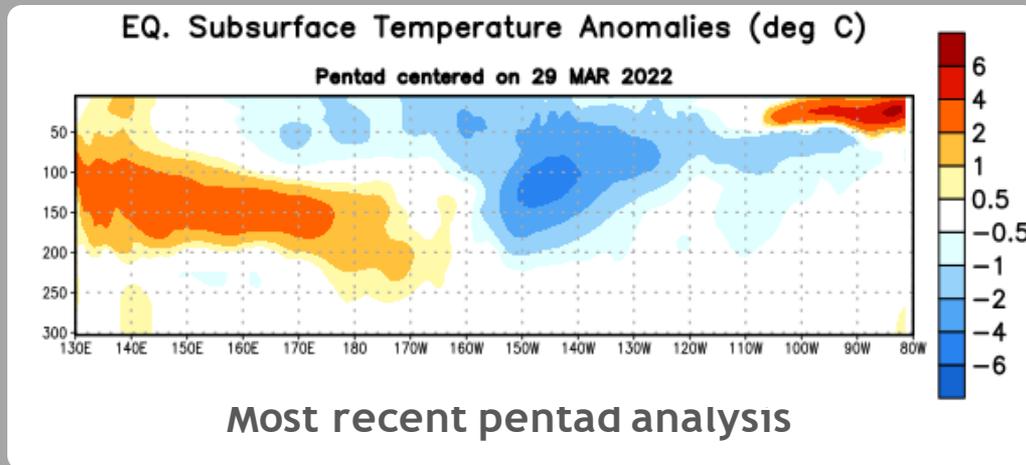
# Central and Eastern Pacific Upper-Ocean (0-300 m) Weekly Average Temperature Anomalies

From mid-March to early July 2021, subsurface temperature was above average. Negative temperature anomalies returned in July 2021 and persisted through mid-January 2022. Since February, subsurface temperatures have decreased and are negative.

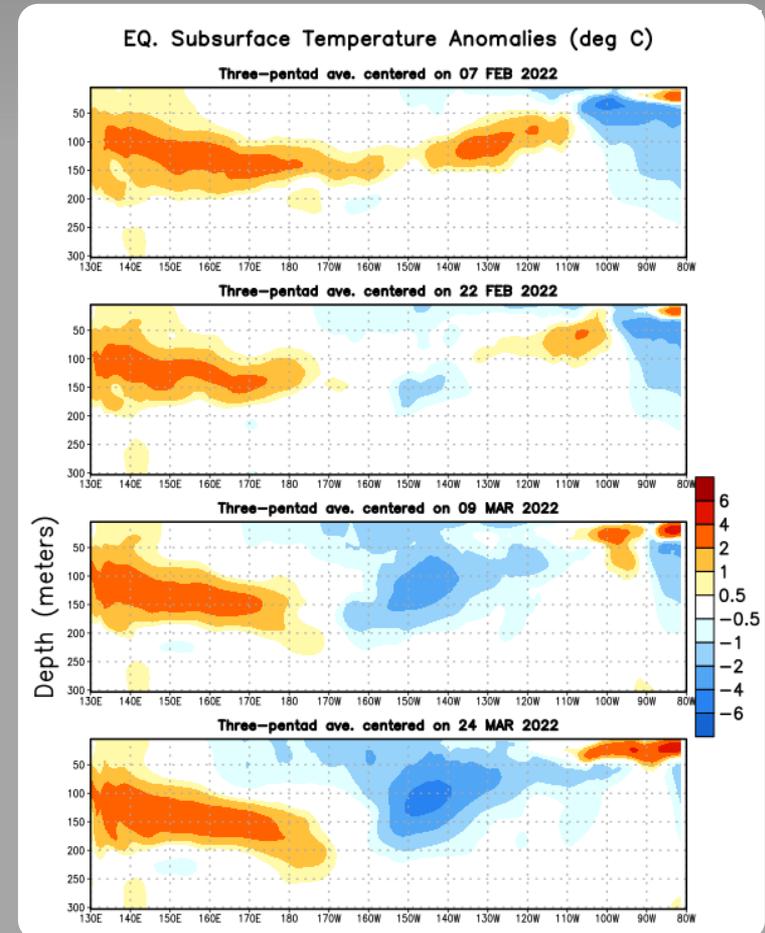


# Sub-Surface Temperature Departures in the Equatorial Pacific

During the last two months, positive and negative temperature subsurface anomalies shifted eastward across the equatorial Pacific Ocean.



Beginning in late February, negative subsurface temperature anomalies developed and strengthened in the central Pacific, while expanding across a shallow layer near the surface. Positive anomalies are now restricted to the western Pacific, mostly at depth, and near the surface in the eastern Pacific Ocean.

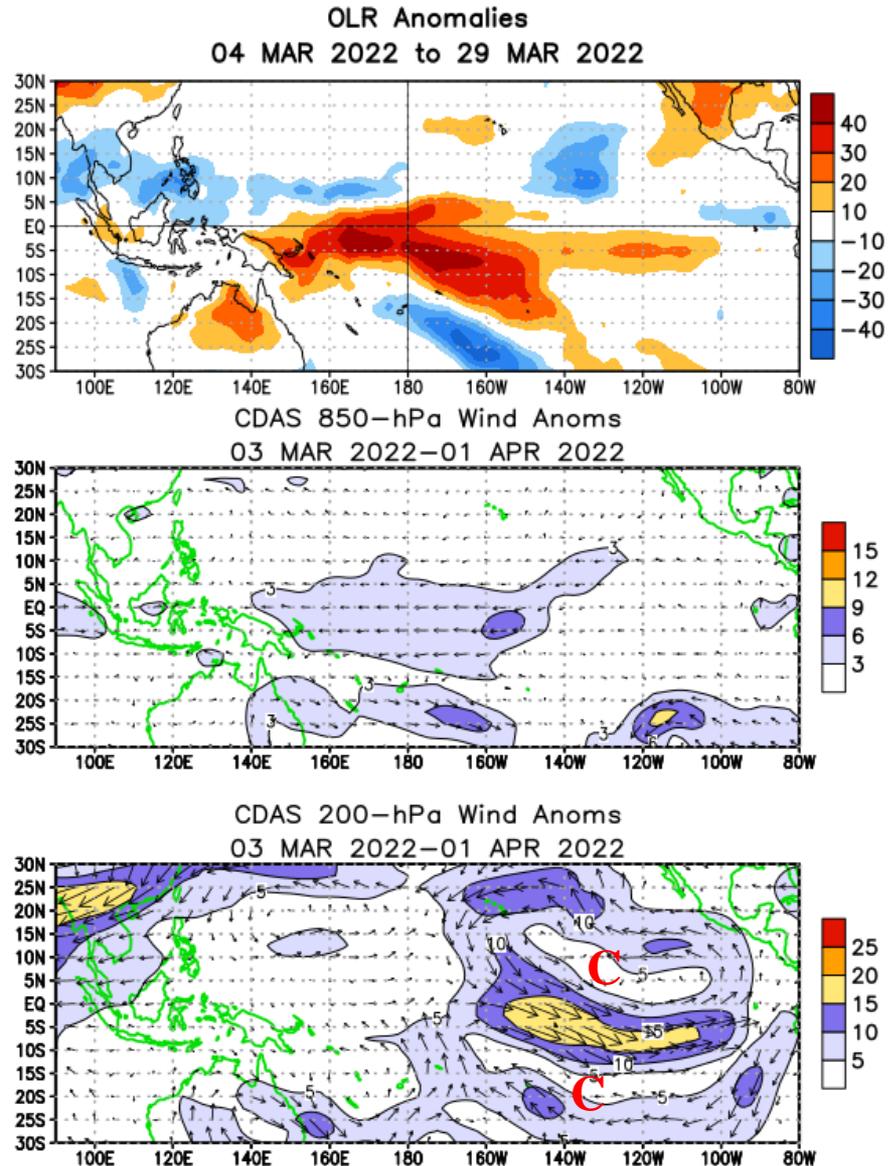


# Tropical OLR and Wind Anomalies During the Last 30 Days

Positive OLR anomalies (suppressed convection and precipitation) were located over the central and western Pacific Ocean. Negative OLR anomalies (enhanced convection and precipitation) were observed over the Philippines, parts of Indonesia, and over Southeast Asia.

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

Upper-level (200-hPa) westerly wind anomalies and an anomalous cyclonic couplet were observed over the east-central tropical 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.

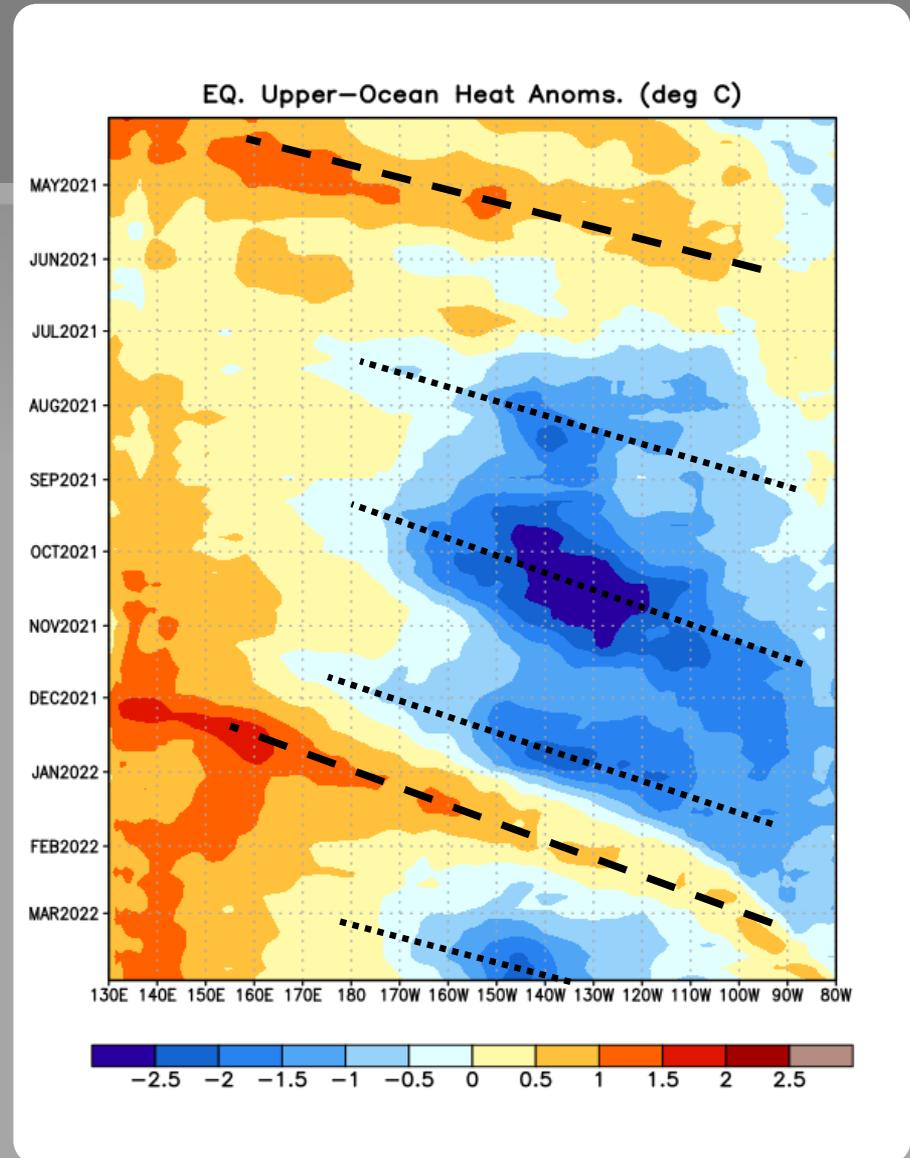
# Weekly Heat Content Evolution in the Equatorial Pacific

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

During March through May 2021, positive anomalies shifted eastward in association with two downwelling Kelvin waves. In July 2021, September 2021, and November 2021 negative subsurface temperature anomalies shifted eastward associated with three upwelling Kelvin waves. From mid-December 2021 through February 2022, a downwelling Kelvin wave shifted eastward.

In early February 2022, an upwelling Kelvin wave emerged.

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



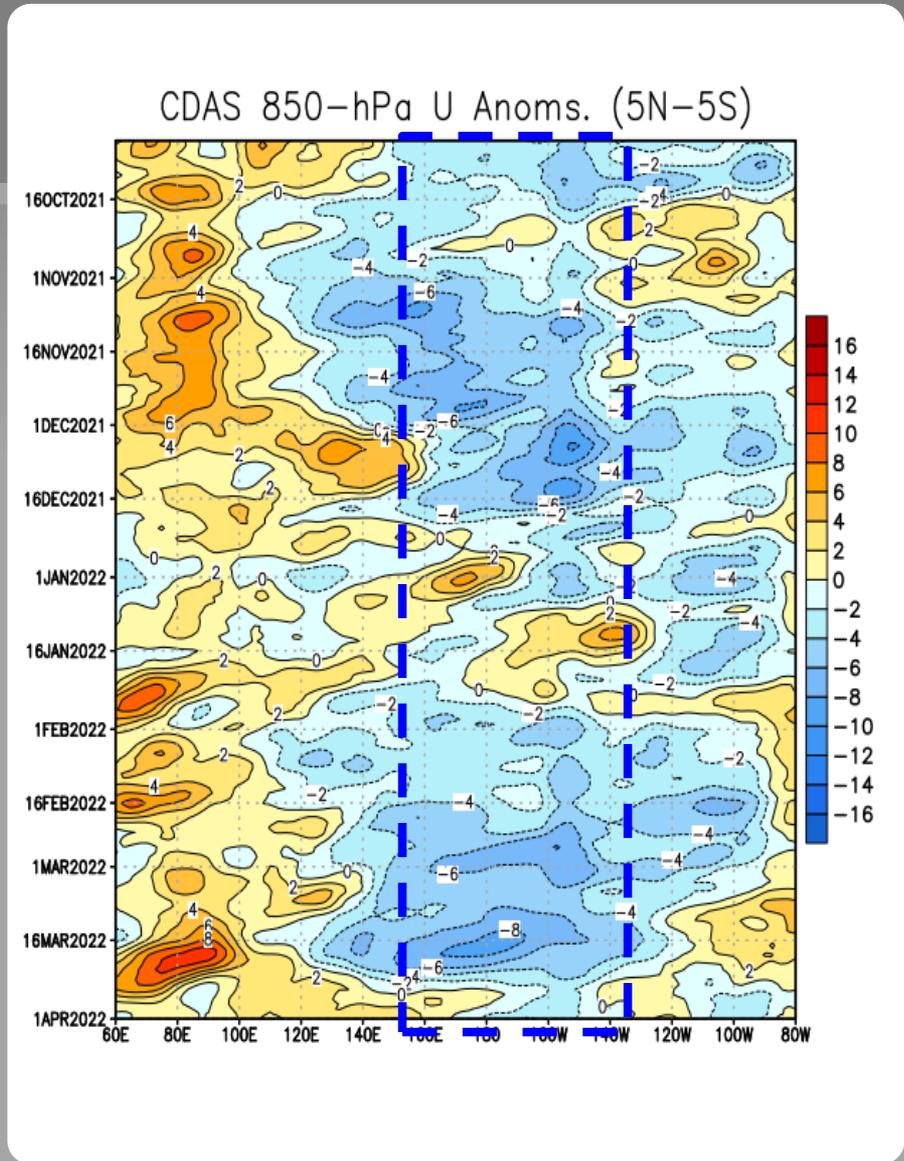
# Low-level (850-hPa) Zonal (east-west) Wind Anomalies ( $\text{m s}^{-1}$ )

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

Since the beginning of the period, easterly wind anomalies have generally dominated over the central and east-central Pacific, except for breaks during late October 2021, late December-to-January 2022, and late March 2022.

Westerly Wind Anomalies (orange/red shading)

Easterly Wind Anomalies (blue shading)

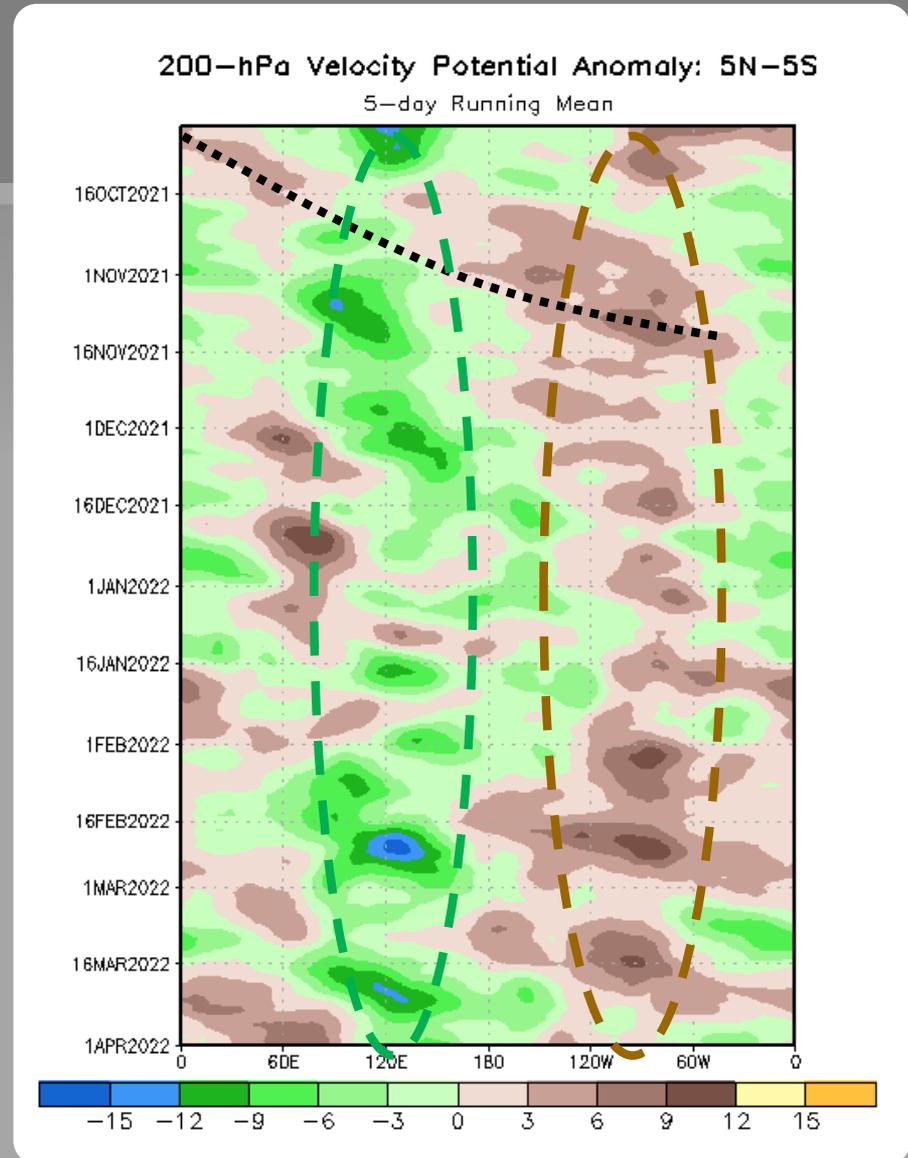


# Upper-level (200-hPa) Velocity Potential Anomalies

During most of the period, anomalous divergence (green shading) generally remained over Indonesia or the western Pacific, while anomalous convergence (brown shading) persisted over the eastern Pacific Ocean.

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

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

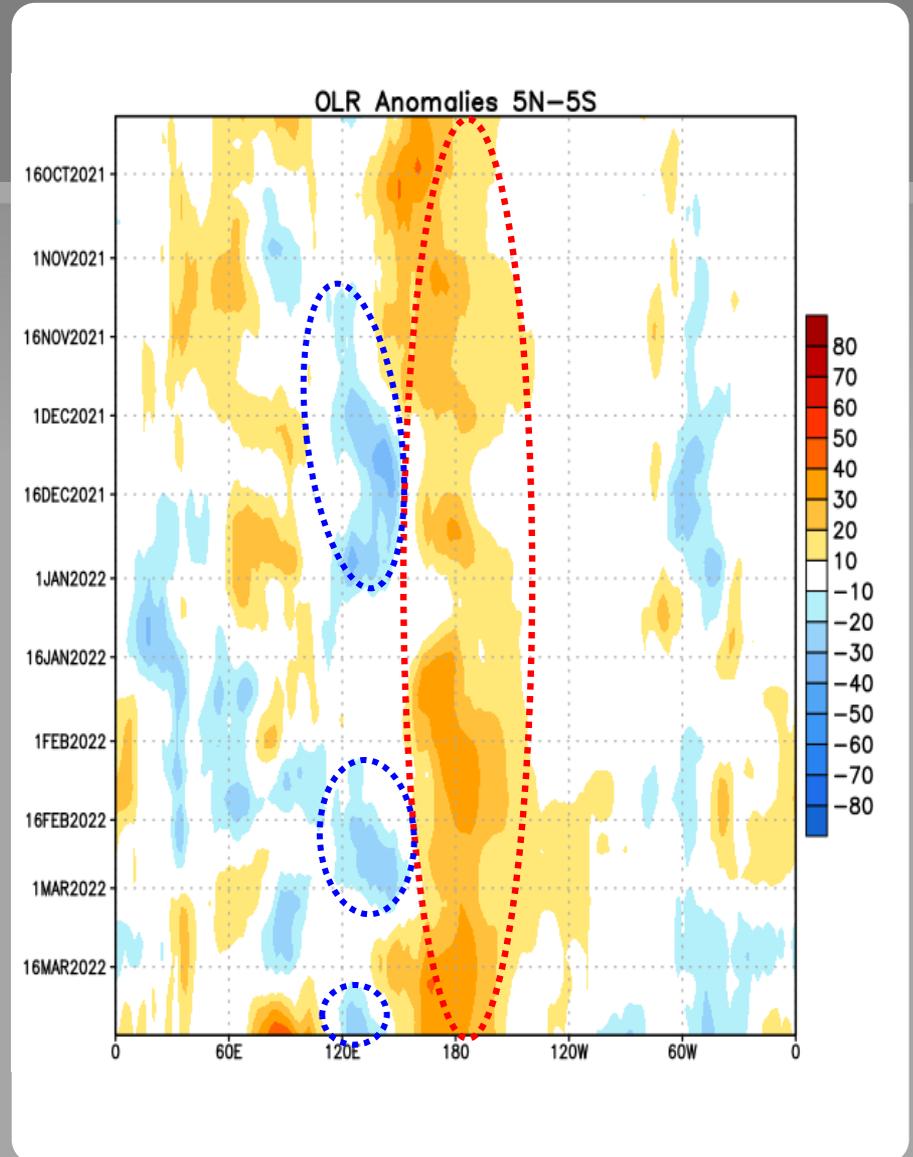


# Outgoing Longwave Radiation (OLR) Anomalies

Since late July 2021, positive OLR anomalies were evident over the western and/or central Pacific Ocean.

Negative OLR anomalies were evident over Indonesia from early November 2021 through early January 2022, and during February to early March 2022.

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.

Note: a different SST dataset is used for weekly SST monitoring (slides #4-9) and is using OISSTv2.1 (Huang et al., 2021).

# 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  $-0.5^{\circ}\text{C}$ .

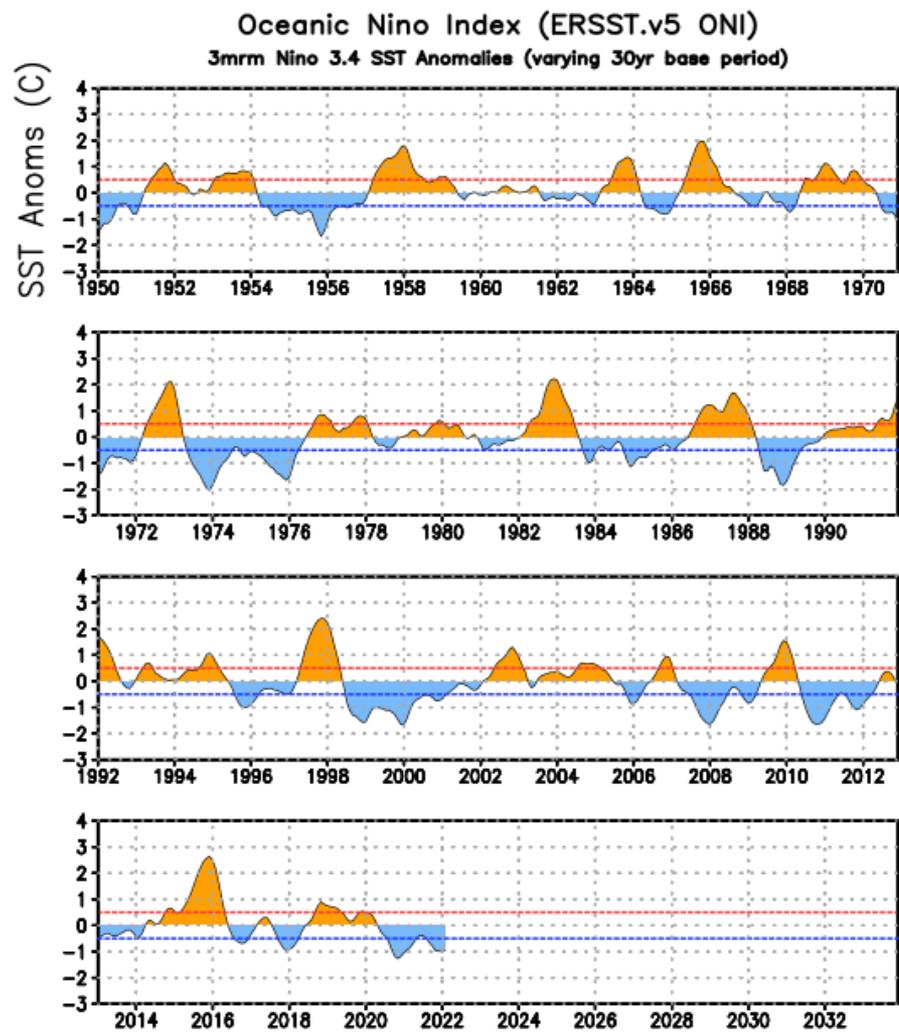
By historical standards, to be classified as a full-fledged El Niño or La Niña episode, these thresholds must be exceeded for a period of at least 5 consecutive overlapping 3-month seasons.

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 (January - March 2022) is  $-0.9^{\circ}\text{C}$ .

El Niño ↑  
Neutral  
La Niña ↓

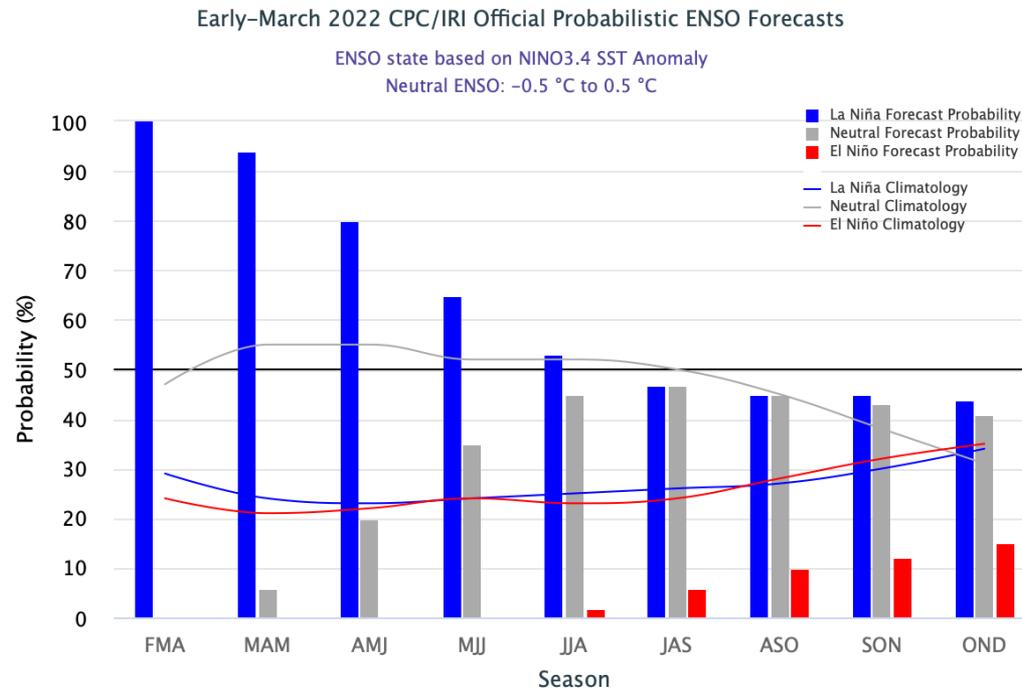




# CPC/IRI Probabilistic ENSO Outlook

Updated: 10 March 2022

La Niña is favored to continue into the Northern Hemisphere summer (53% chance during June-August 2022), with a 40-50% chance of La Niña or ENSO-neutral thereafter.



# IRI/CPC Pacific Niño

## 3.4 SST Model Outlook

A majority of models indicate La Niña is expected to continue and then transition to ENSO-neutral during the Northern Hemisphere summer 2022.

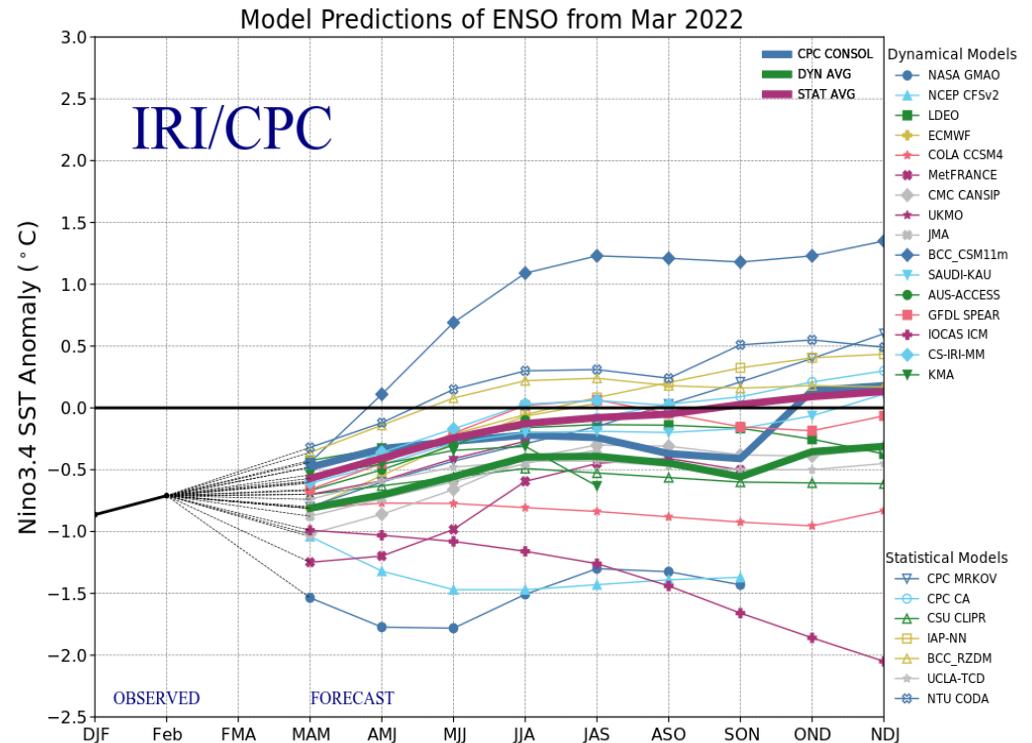
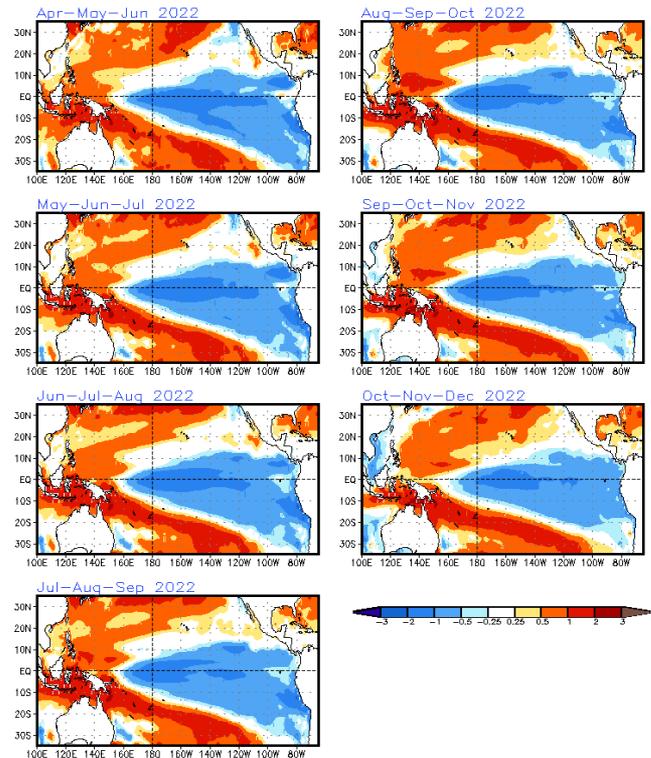
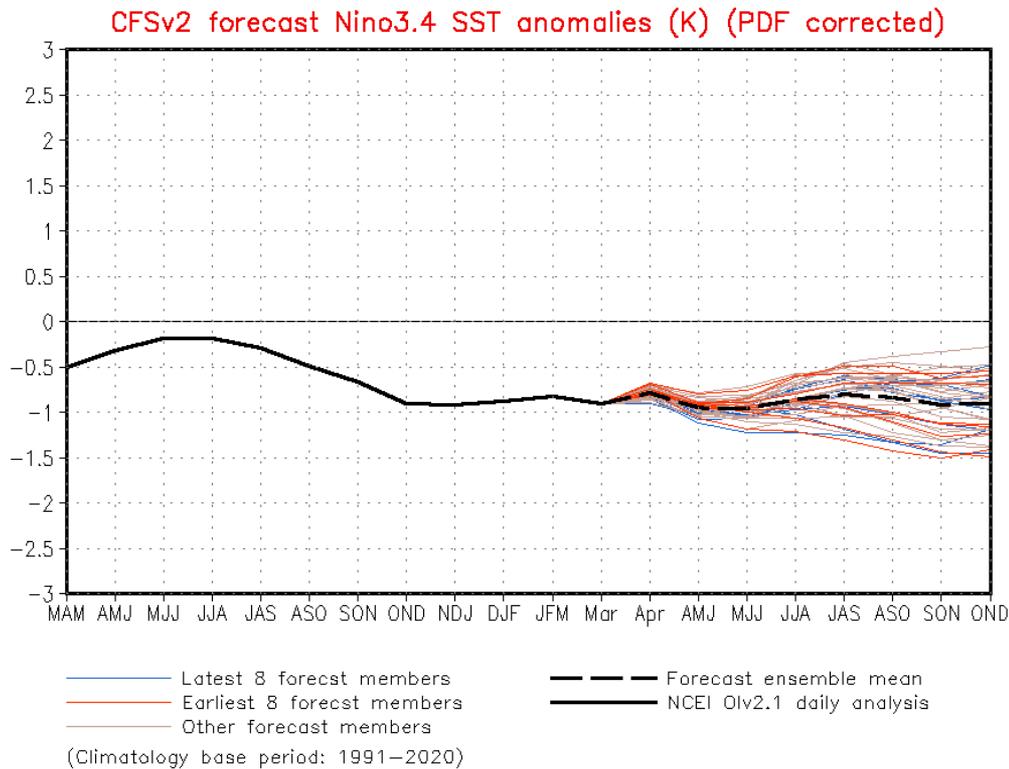


Figure provided by the International Research Institute (IRI) for Climate and Society (updated 18 March 2022).

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

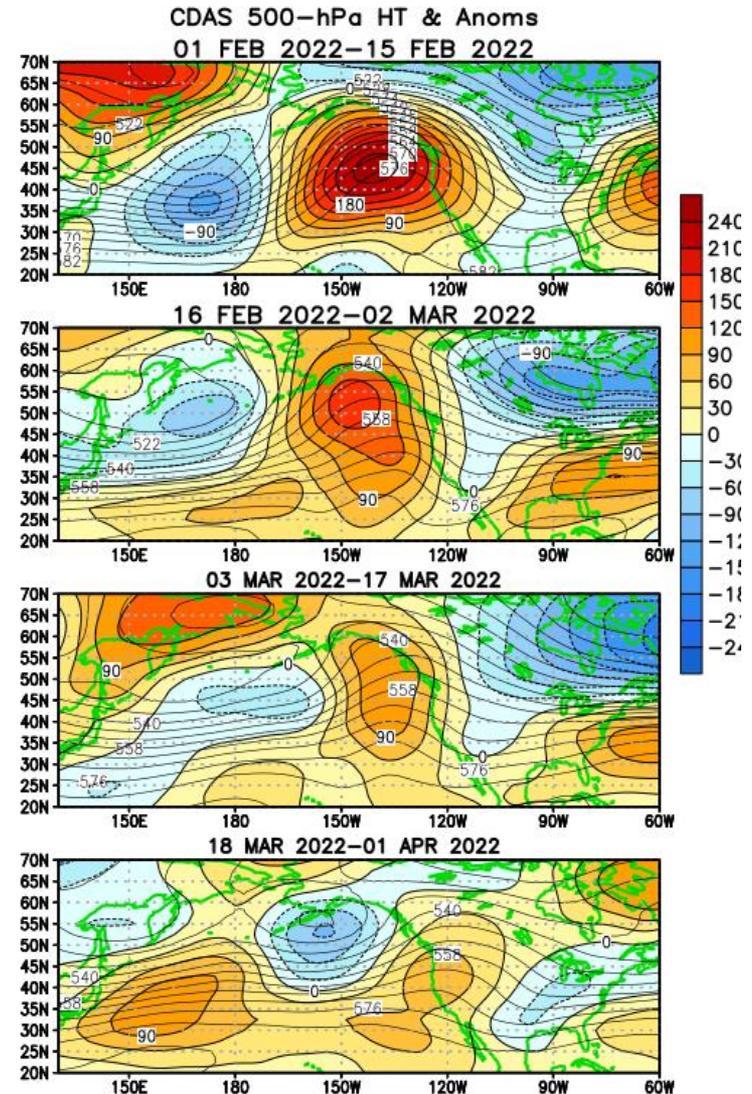
Issued: 4 April 2022

The CFS.v2 ensemble mean (black dashed line) predicts La Niña to continue through the end of the year.



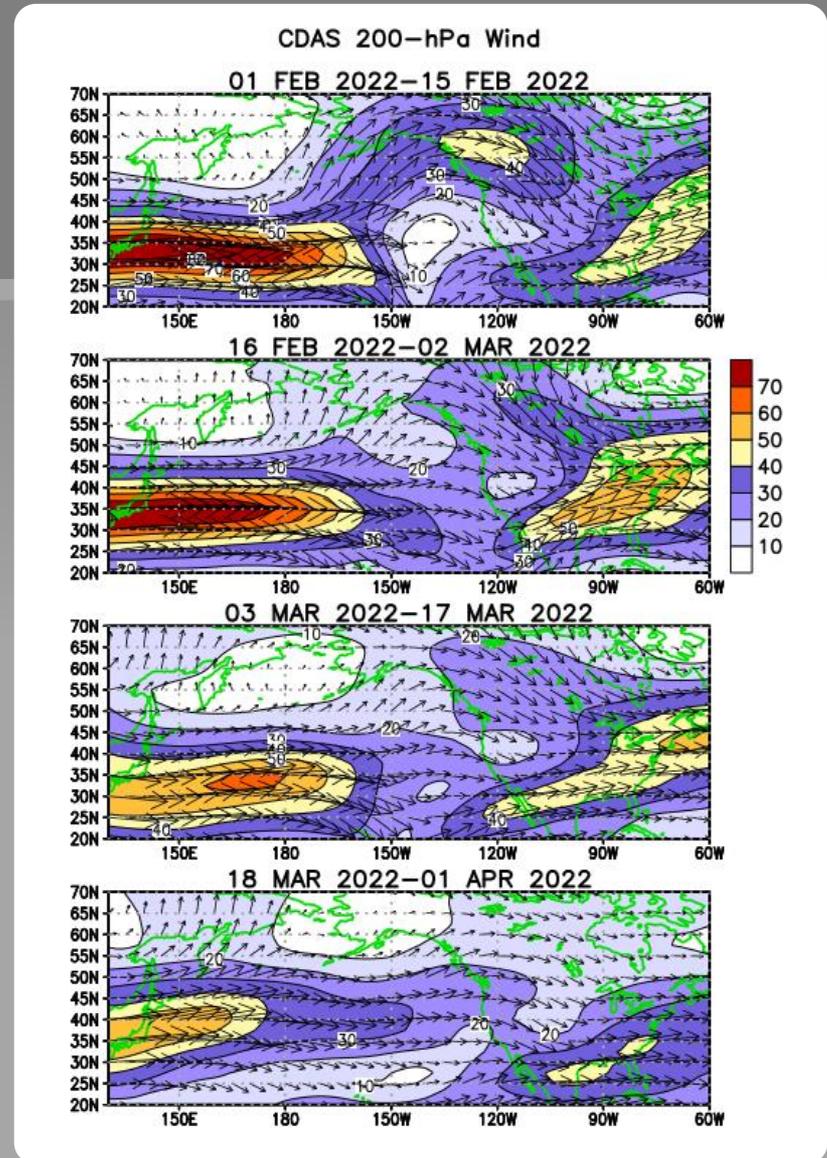
# Atmospheric anomalies over the North Pacific and North America During the Last 60 Days

From early February through mid-March, the teleconnection pattern resembled La Niña and is characterized by height anomalies: 1) ridging over the central and eastern North Pacific, 2) a downstream trough centered over Canada, and 3) ridging over the southeastern U.S. This pattern is conducive to below-average temperature over the northern tier of the U.S. and above-average temperature over the southeastern and eastern U.S.



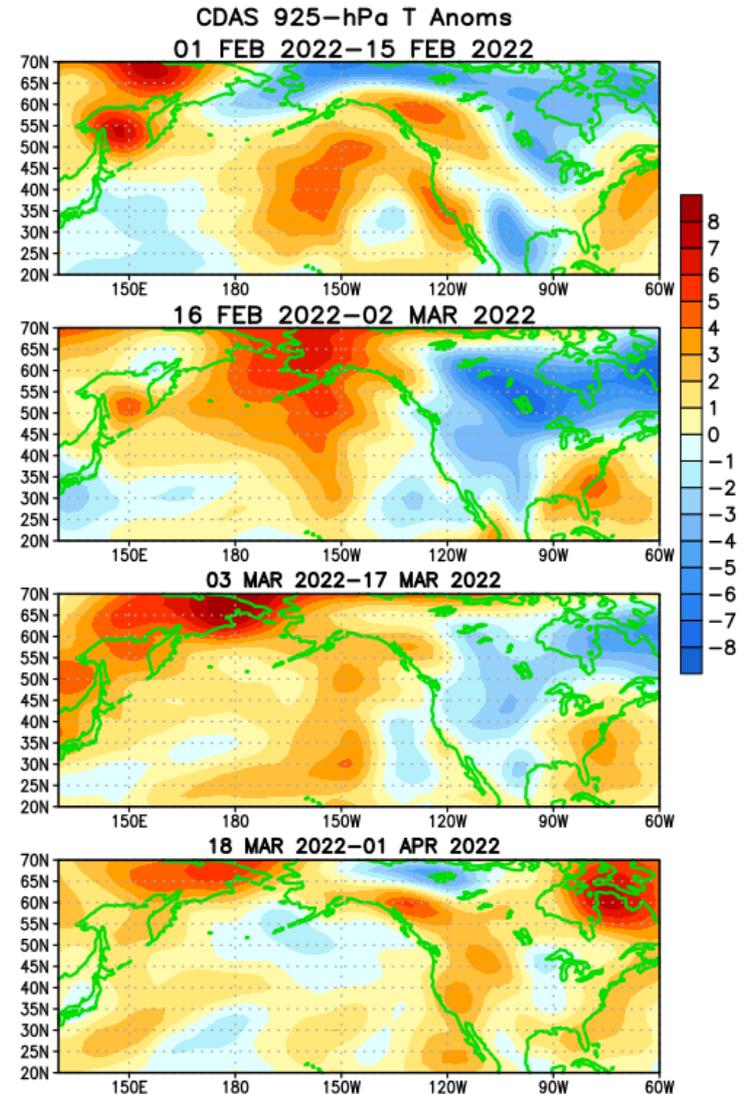
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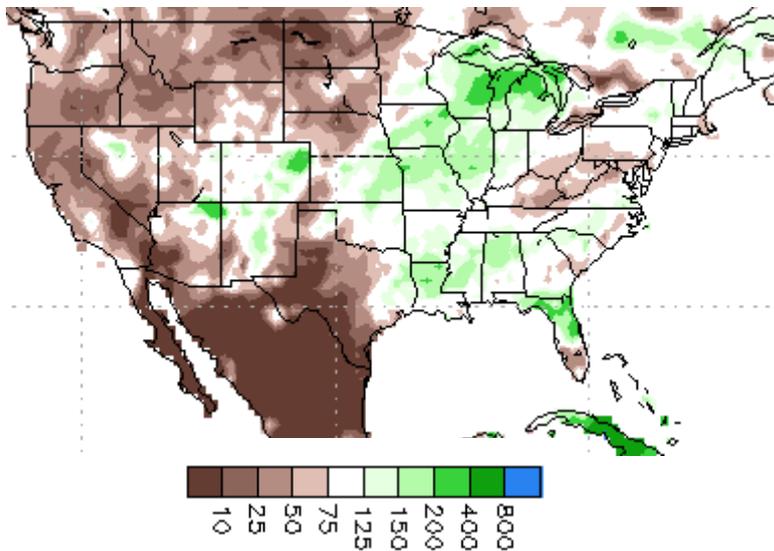
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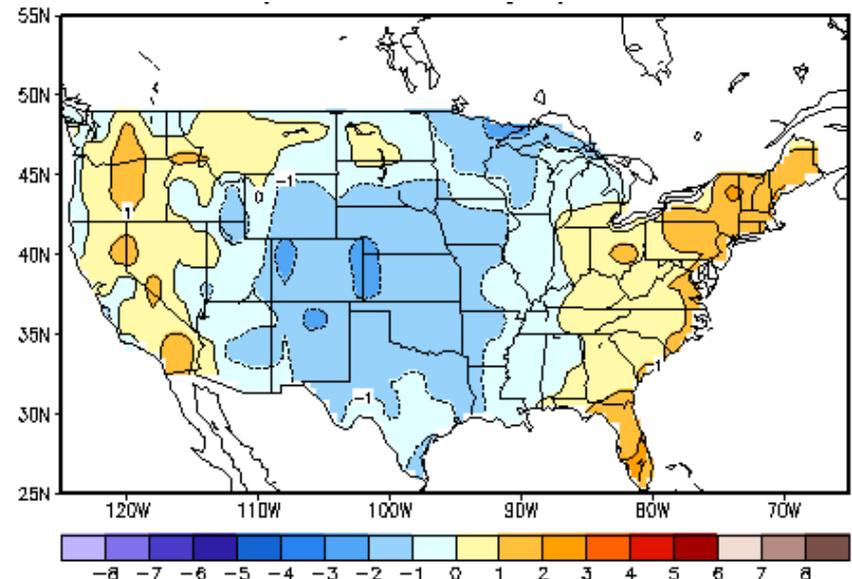
# U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 2 April 2022

### Percent of Average Precipitation



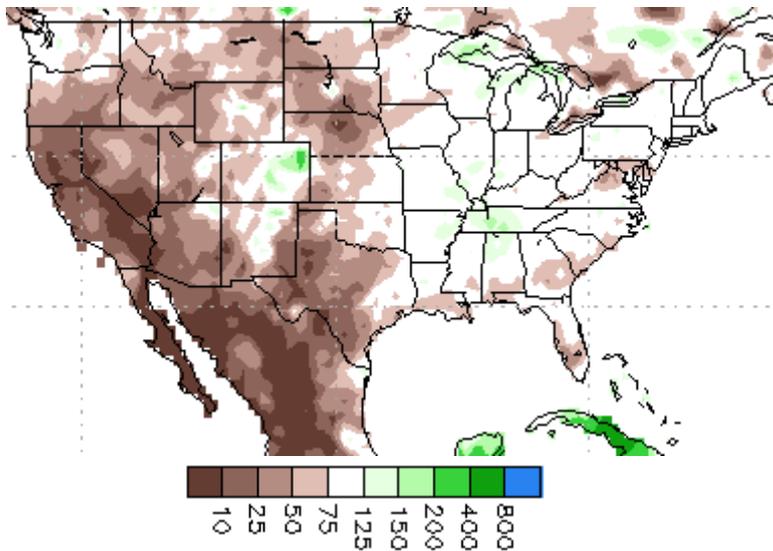
### Temperature Departures (degree C)



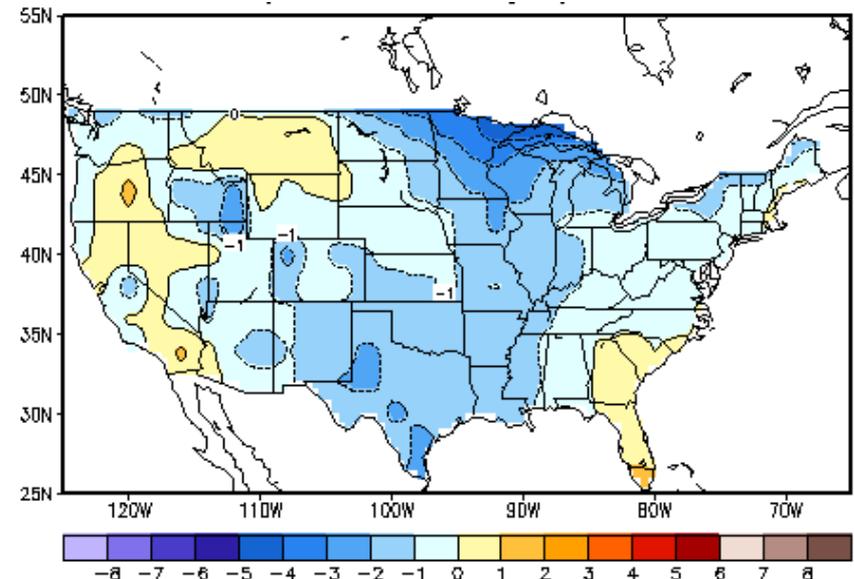
# U.S. Temperature and Precipitation Departures During the Last 90 Days

End Date: 2 April 2022

### Percent of Average Precipitation



### Temperature Departures (degree C)





# Summary

ENSO Alert System Status: **La Niña Advisory**

La Niña is present.\*

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

The tropical Pacific atmosphere is consistent with La Niña.

La Niña is favored to continue into the Northern Hemisphere summer (53% chance during June-August 2022), with a 40-50% chance of La Niña or ENSO-neutral thereafter.\*

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