ENSO: Recent Evolution, Current Status and Predictions

Update prepared by:
Climate Prediction Center / NCEP
5 June 2017

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Recent Evolution and Current Conditions

Oceanic Niño Index (ONI)

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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.

ENSO-neutral and El Niño are nearly equally favored during the Northern Hemisphere summer and fall 2017.*

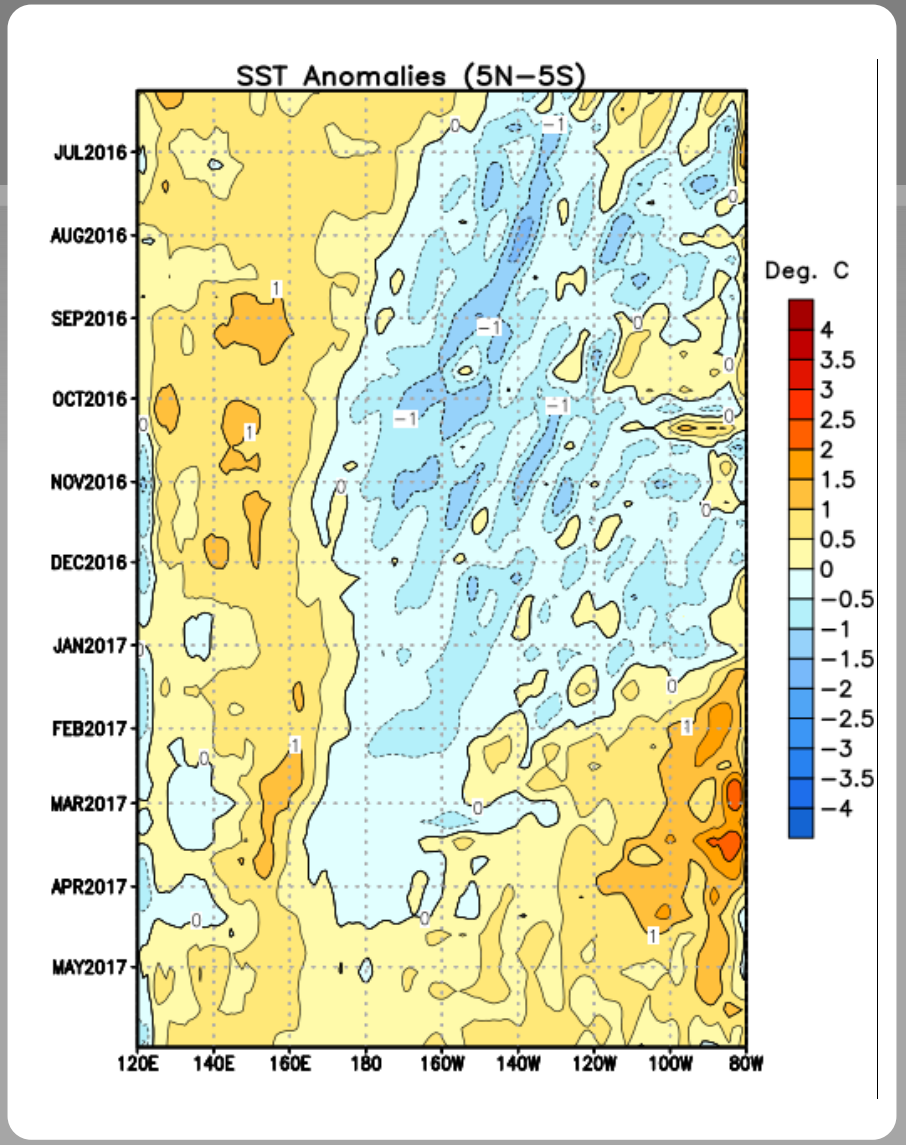
*** Note: These statements are updated once a month (2nd Thursday of each month) in association with the ENSO Diagnostics Discussion, which can be found by clicking here.**

Recent Evolution of Equatorial Pacific SST Departures (°C)

From July through December 2016, below average SSTs were observed over most of the central and eastern Pacific Ocean.

During January and February 2017, above-average SSTs expanded within the eastern Pacific Ocean.

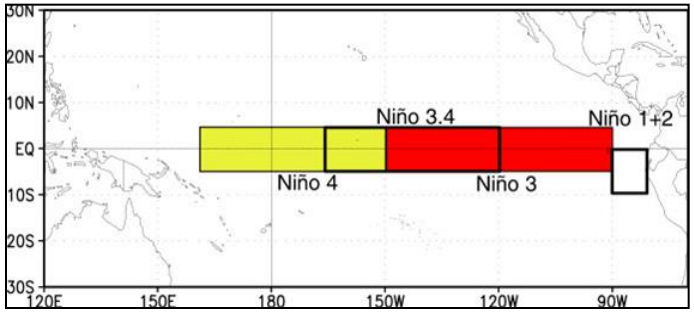
Since mid April 2017, near-to-above average SSTs expanded across the equatorial Pacific.

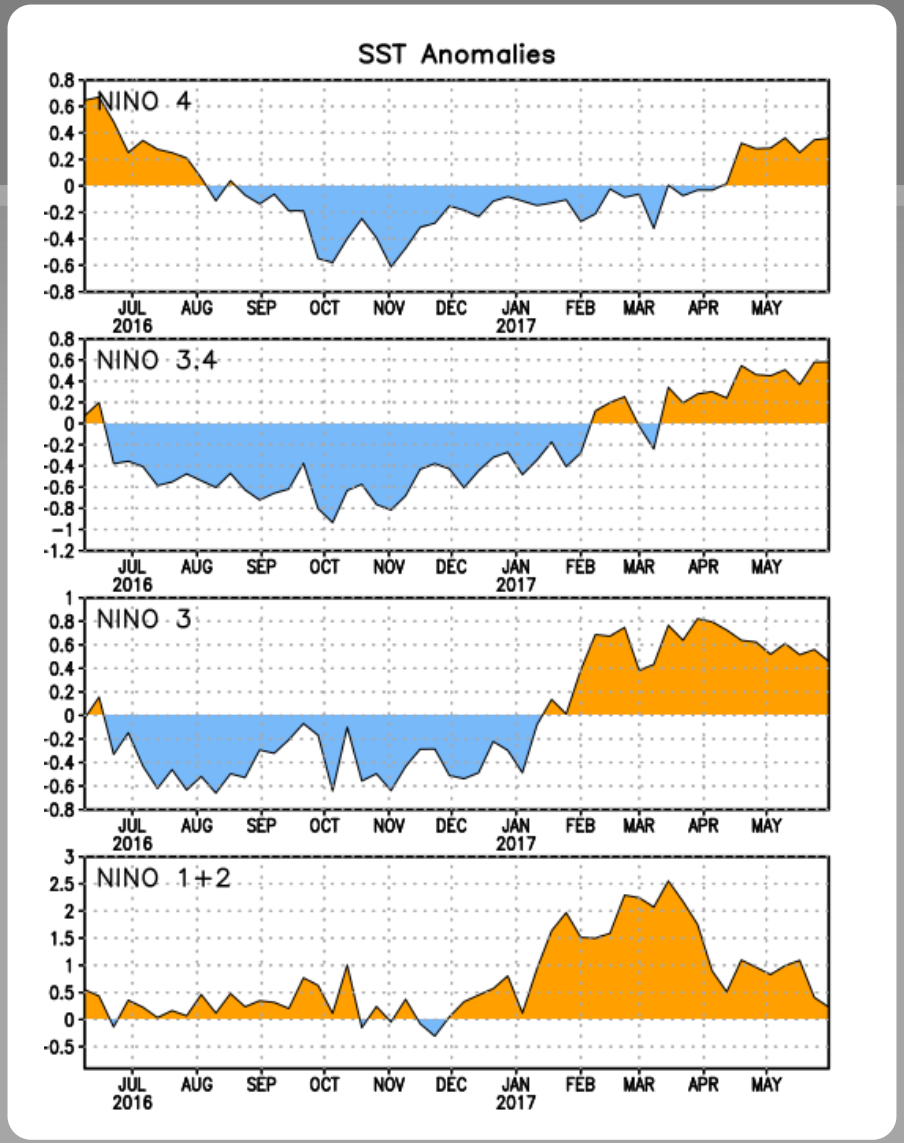


Niño Region SST Departures (ºC) Recent Evolution

The latest weekly SST departures are:

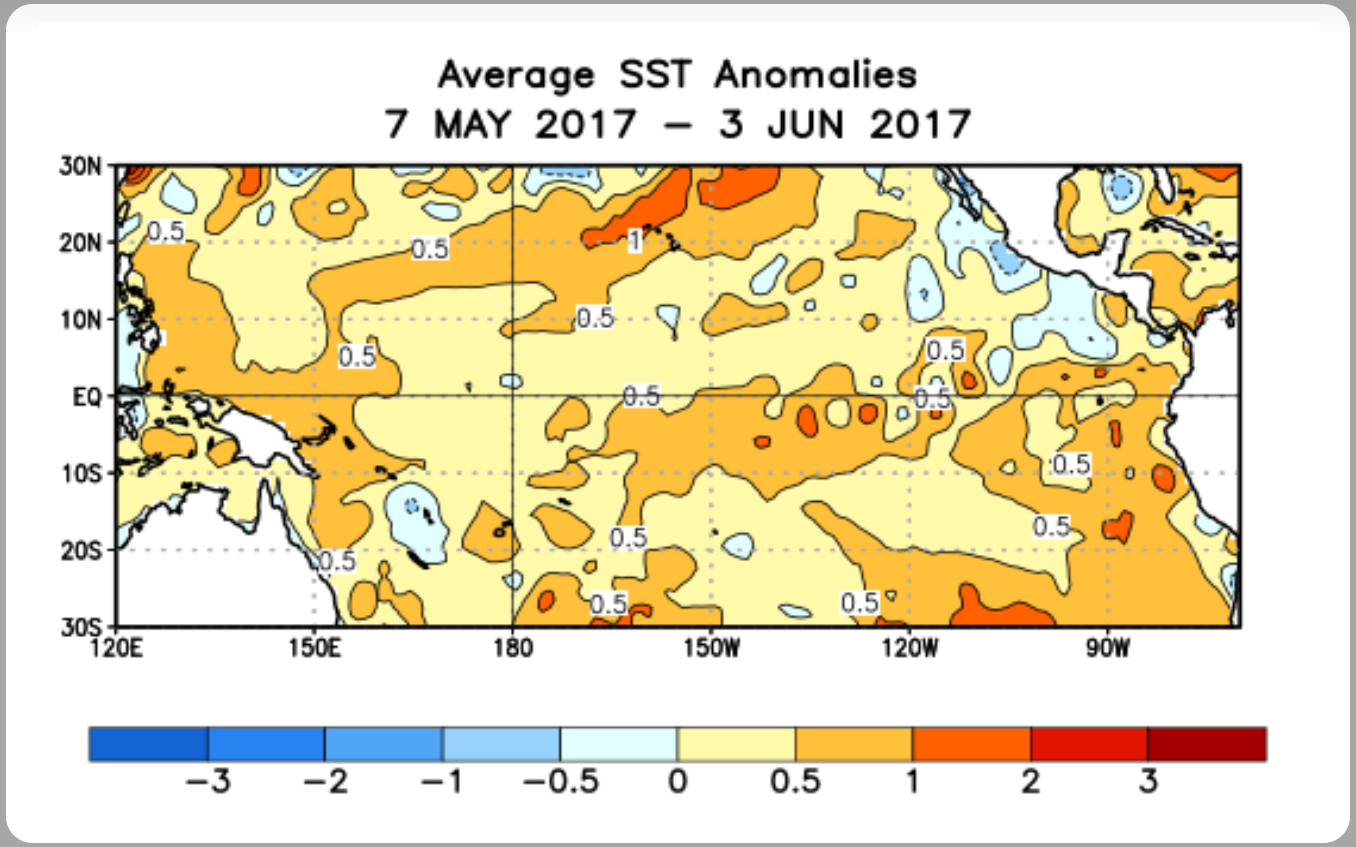
Niño 4	0.4ºC
Niño 3.4	0.6ºC
Niño 3	0.5ºC
Niño 1+2	0.2ºC





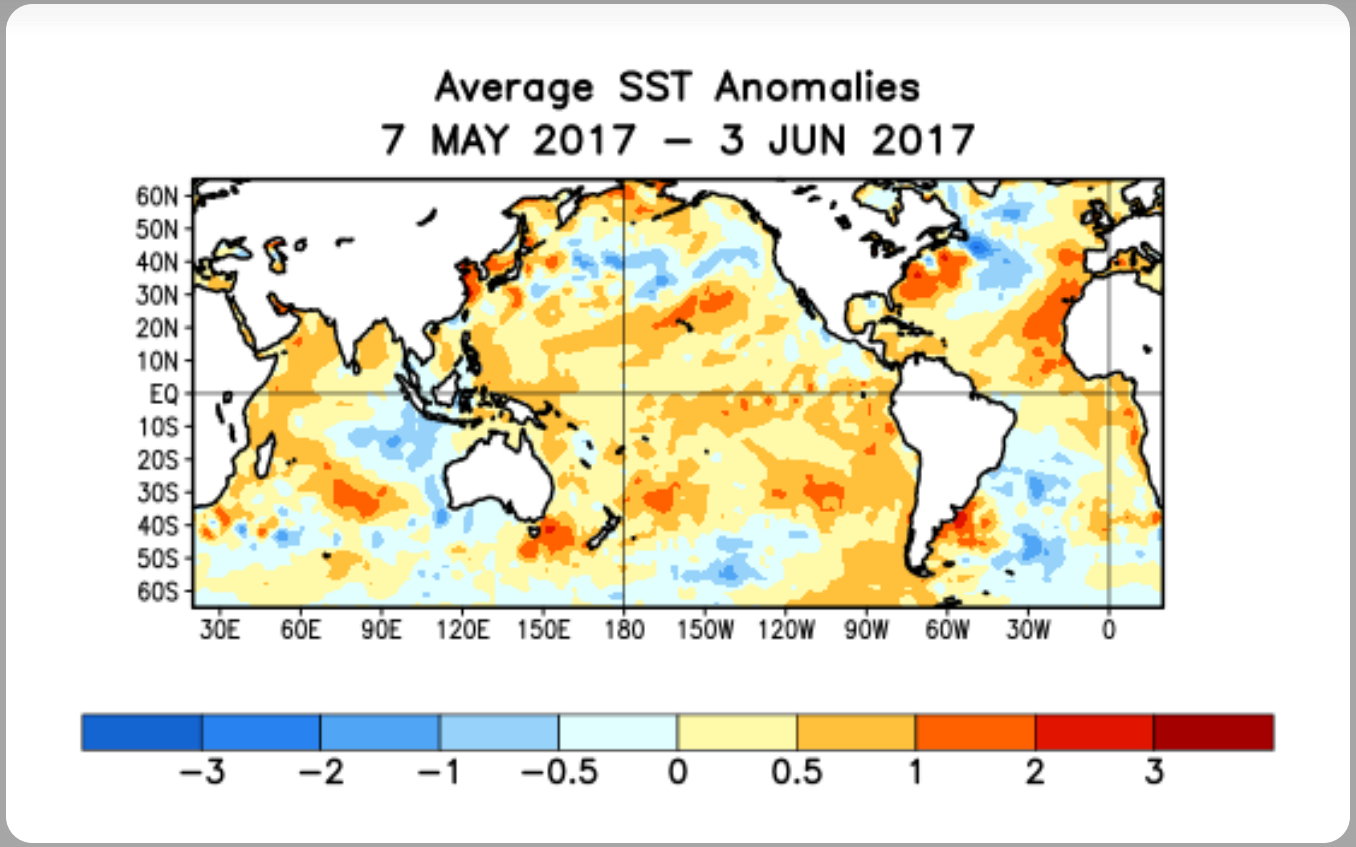
SST Departures (ºC) in the Tropical Pacific During the Last Four Weeks

During the last four weeks, equatorial SSTs were near-average near the International Date Line, and above-average across the far western Pacific and portions of the eastern Pacific.



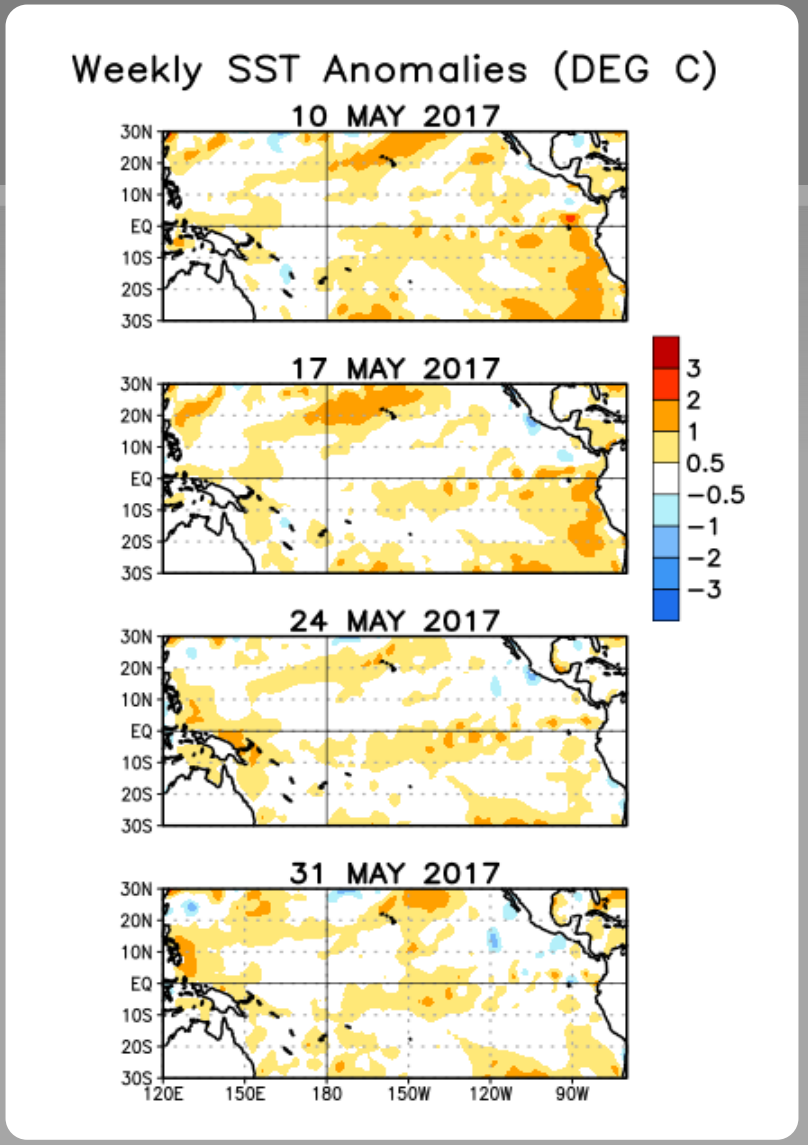
Global SST Departures (°C) During the Last Four Weeks

During the last four weeks, equatorial SSTs were below average in the eastern Indian Ocean, and above average in the eastern Atlantic, western Indian, and the eastern and western Pacific Oceans.



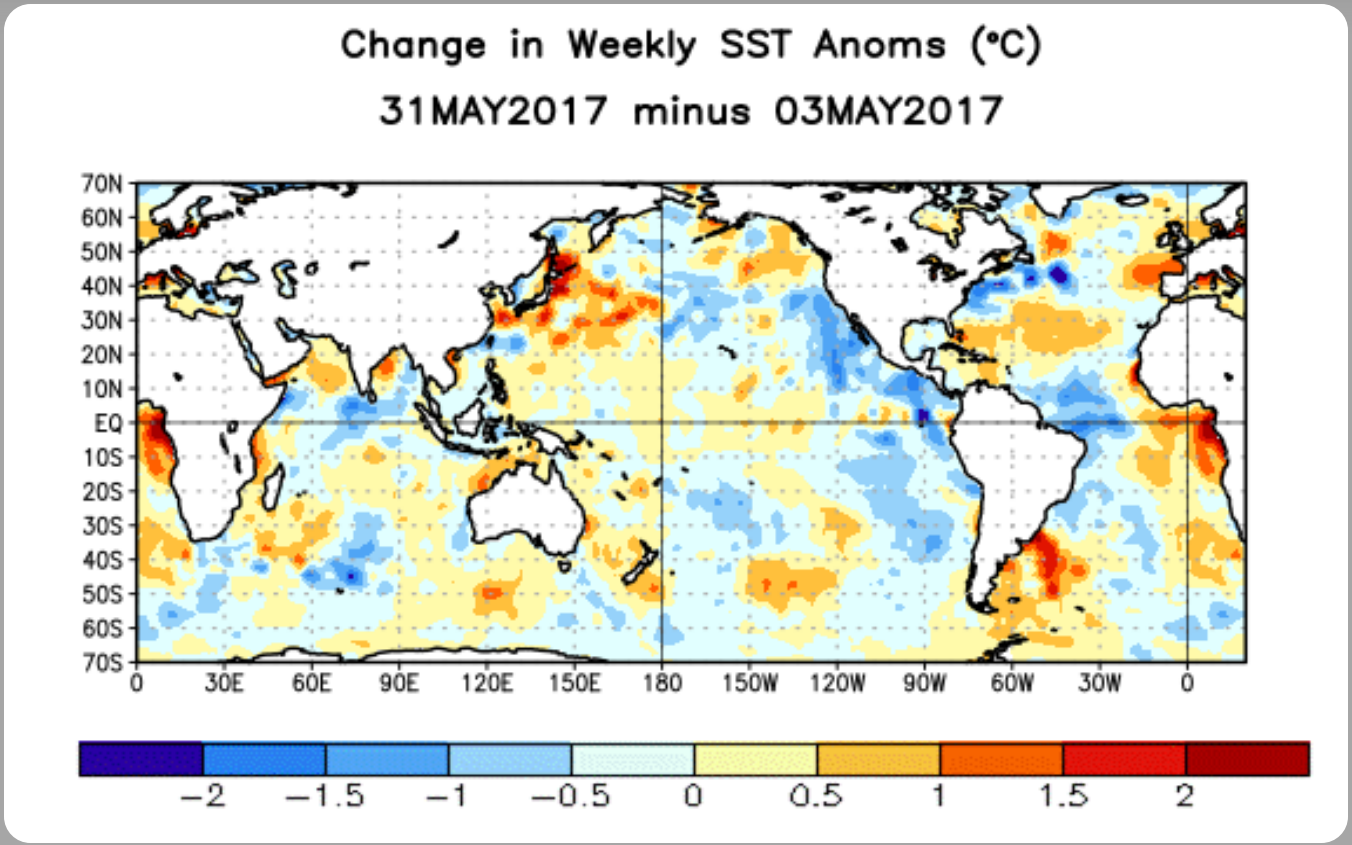
Weekly SST Departures during the Last Four Weeks

During the last four weeks, near-average SSTs continued in the central Pacific, while above-average SSTs weakened across the eastern Pacific.



Change in Weekly SST Departures over the Last Four Weeks

During the last four weeks, negative changes in equatorial SST anomalies were evident in regions of the far eastern Pacific.



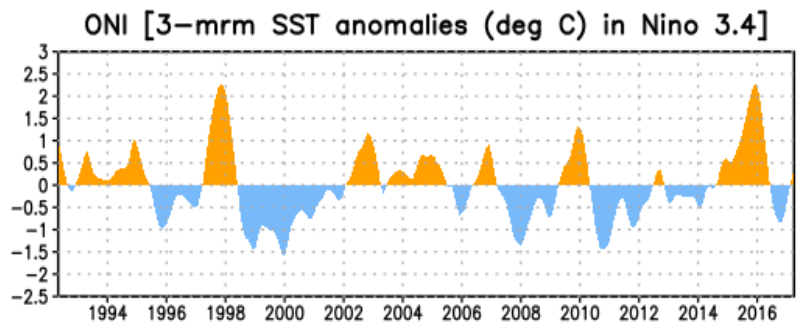
Upper-Ocean Conditions in the Equatorial Pacific

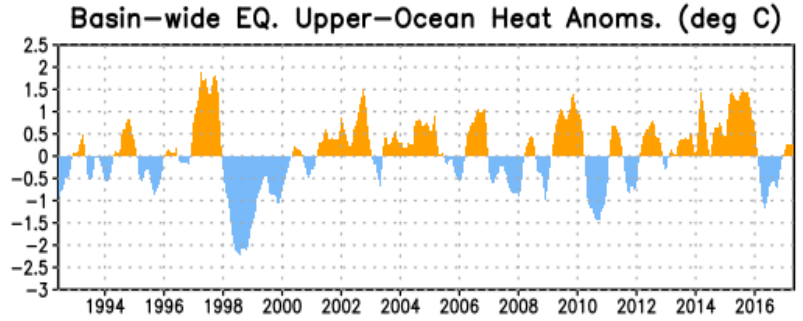
The basin-wide equatorial upper ocean (0-300 m) heat content is greatest prior to and during the early stages of a Pacific warm (El Niño) episode (compare top 2 panels), and least prior to and during the early stages of a cold (La Niña) episode.

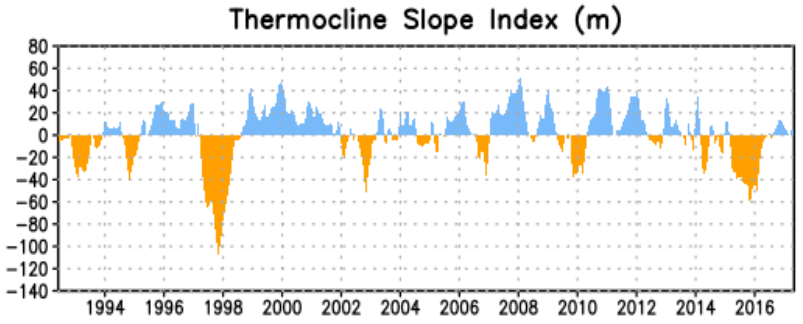
The slope of the oceanic thermocline is least (greatest) during warm (cold) episodes.

Recent values of the upper-ocean heat anomalies (near 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).

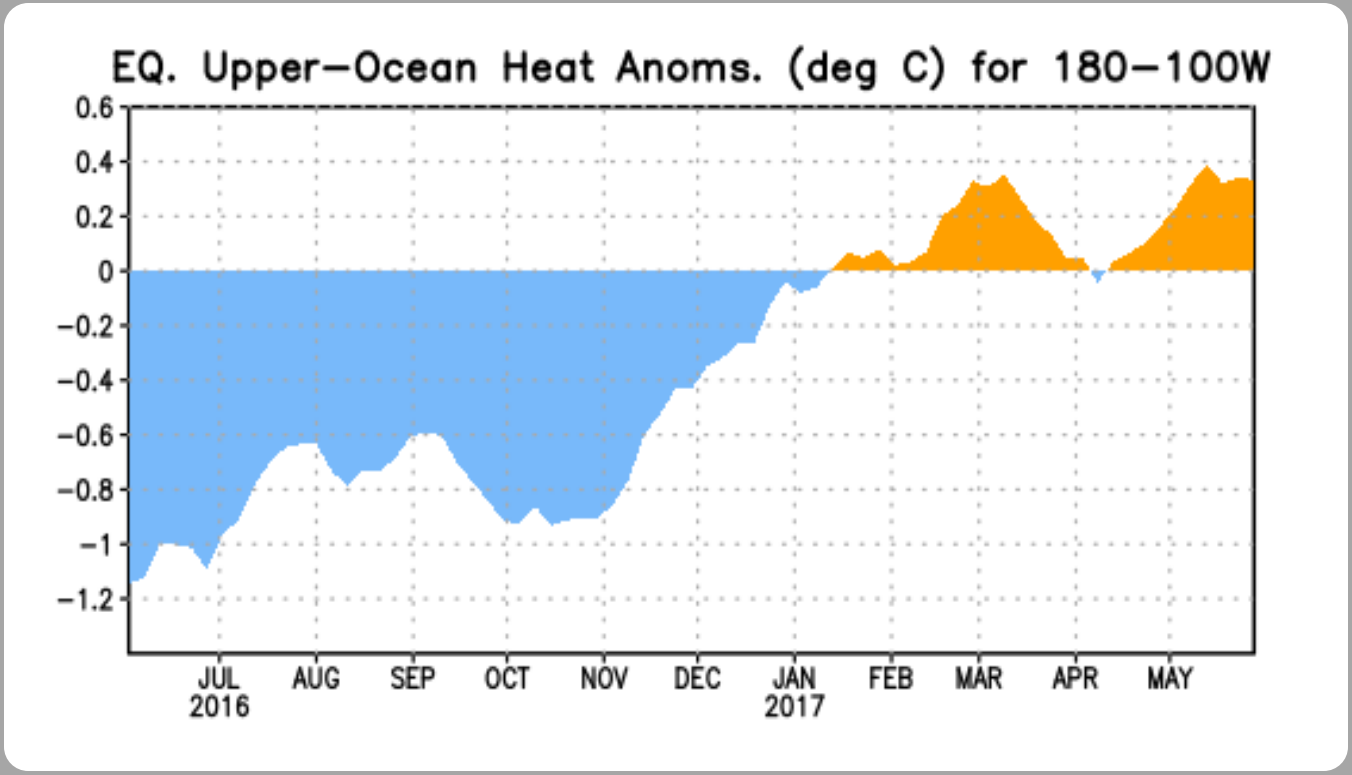






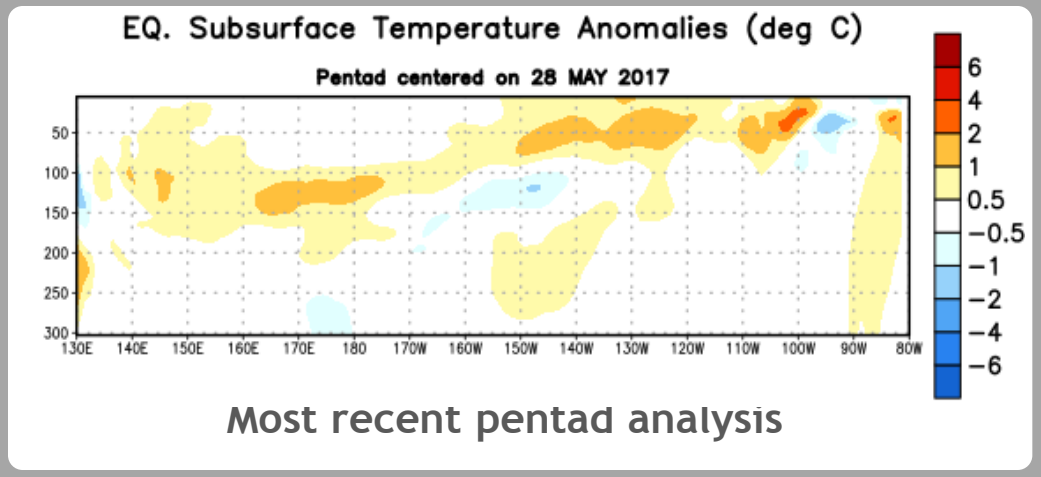
Central and Eastern Pacific Upper-Ocean (0-300 m) Weekly Average Temperature Anomalies

Negative subsurface temperature anomalies were present through December 2016. Positive anomalies were present from mid-January through March 2017 before weakening to near zero. From mid-April to mid-May, positive anomalies strengthened. Recently, positive anomalies have persisted.



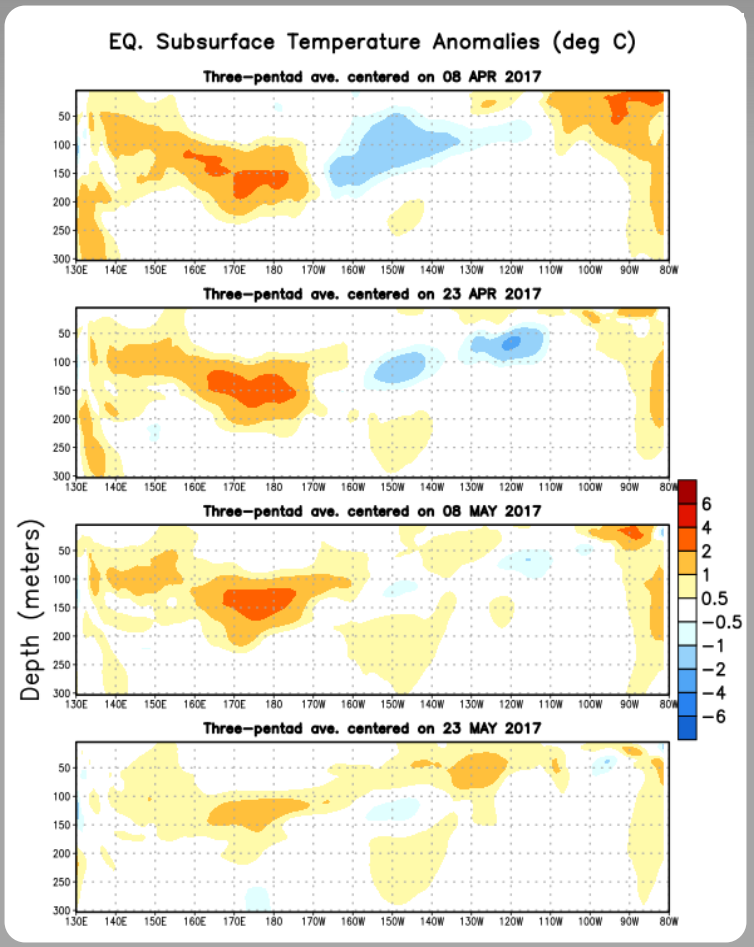
Sub-Surface Temperature Departures in the Equatorial Pacific

During the last two months, positive subsurface temperature anomalies have shifted from the western to the central Pacific.



Most recent pentad analysis

Recently, positive anomalies have weakened near the Date Line and strengthened near the surface in the east-central Pacific.

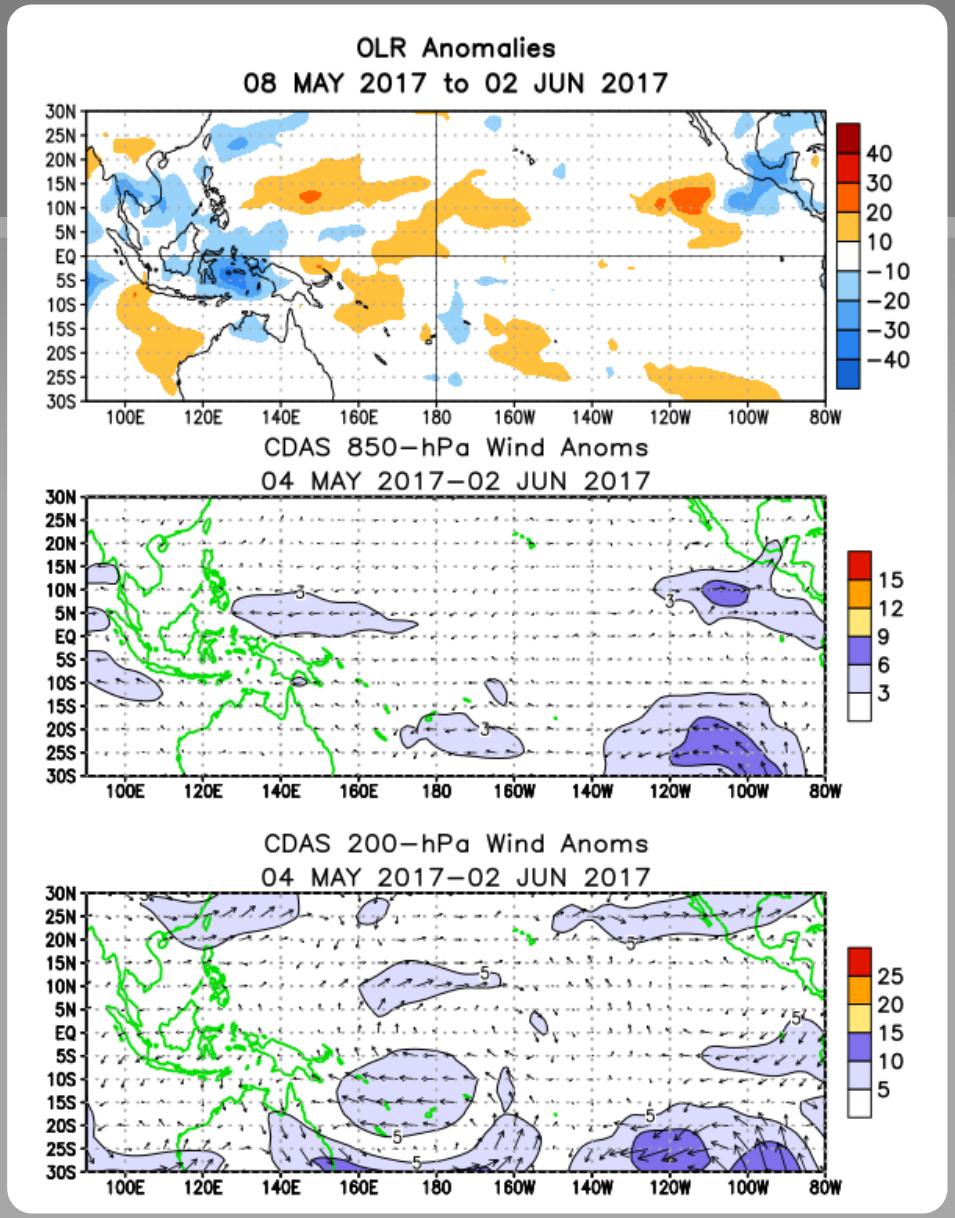


Tropical OLR and Wind Anomalies During the Last 30 Days

Negative OLR anomalies (enhanced convection and precipitation) were evident across portions of Indonesia. Positive OLR anomalies (suppressed convection and precipitation) were observed near the International Date Line.

Low-level (850-hPa) winds were anomalously westerly over the far eastern equatorial Pacific and were anomalous easterly over the western Pacific.

Upper-level (200-hPa) easterly wind anomalies were evident 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:

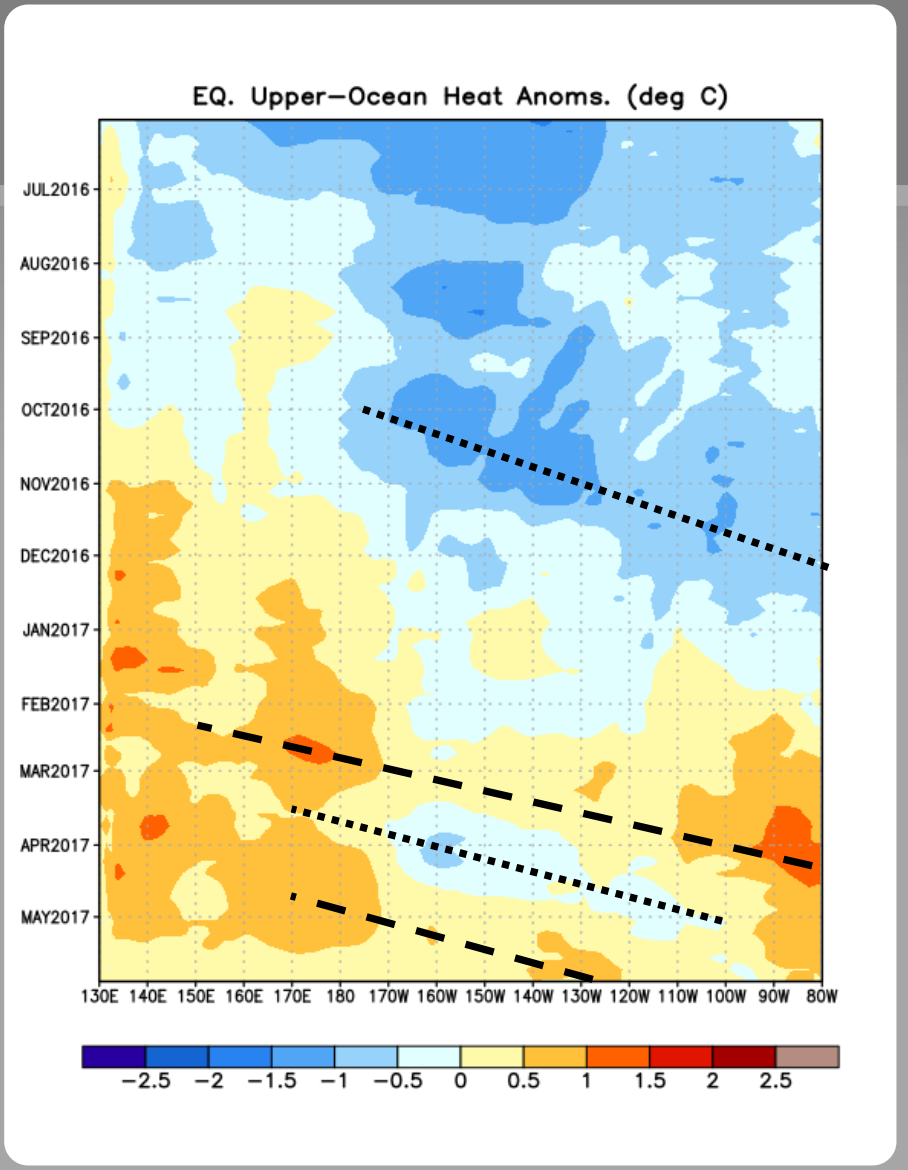
Significant weakening of the low-level easterly winds usually initiates an eastward-propagating oceanic Kelvin wave.

Weekly Heat Content Evolution in the Equatorial Pacific

From March 2016 through December 2016, below-average subsurface temperatures extended across most of the equatorial Pacific.

From February 2017 through April 2017, positive subsurface temperature anomalies persisted in the western and eastern Pacific Ocean, with oceanic Kelvin waves resulting in anomalous temperature variability in the central Pacific.

Since early May 2017, positive subsurface temperature anomalies shifted eastward into the central and east-central Pacific.



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.

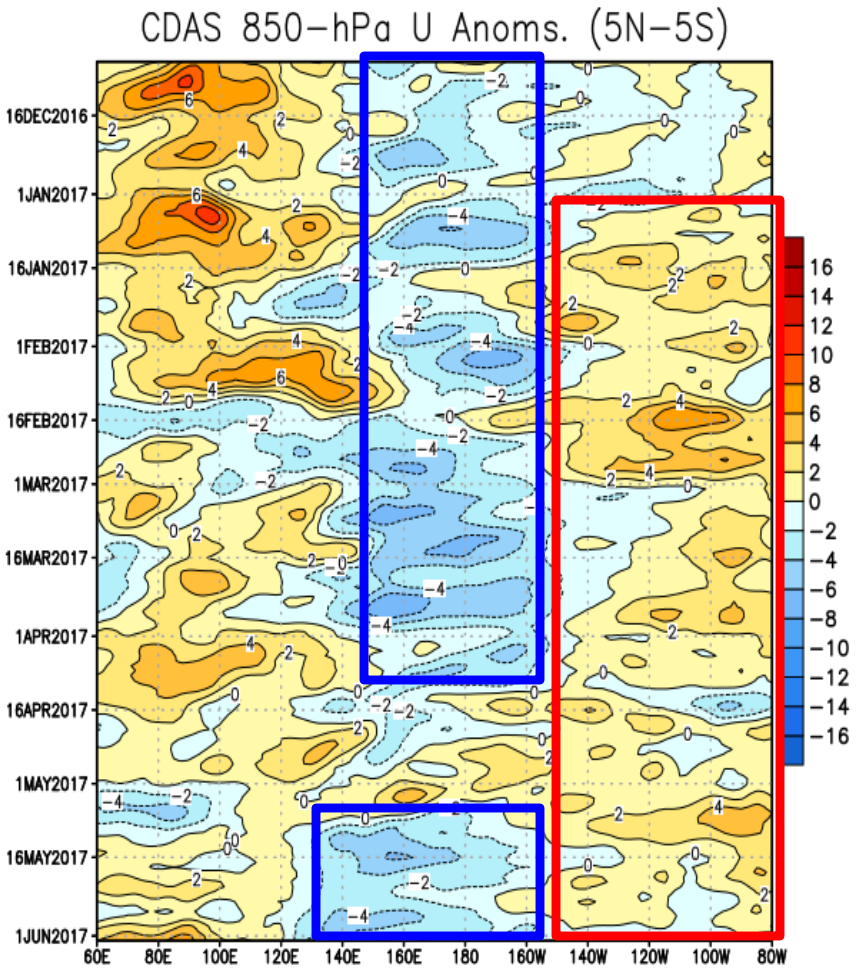
Low-level (850-hPa) Zonal (east-west) Wind Anomalies (m s^{-1})

From mid September 2016 to mid April 2017, low-level easterly wind anomalies generally persisted over the central and western equatorial Pacific.

Since January 2017, westerly wind anomalies were generally observed over the eastern Pacific Ocean.

During mid-to-late April 2017, low-level westerly anomalies expanded to the western and central Pacific.

Since mid May, easterly wind anomalies returned to the west-central Pacific, while westerly anomalies persisted in the eastern Pacific.

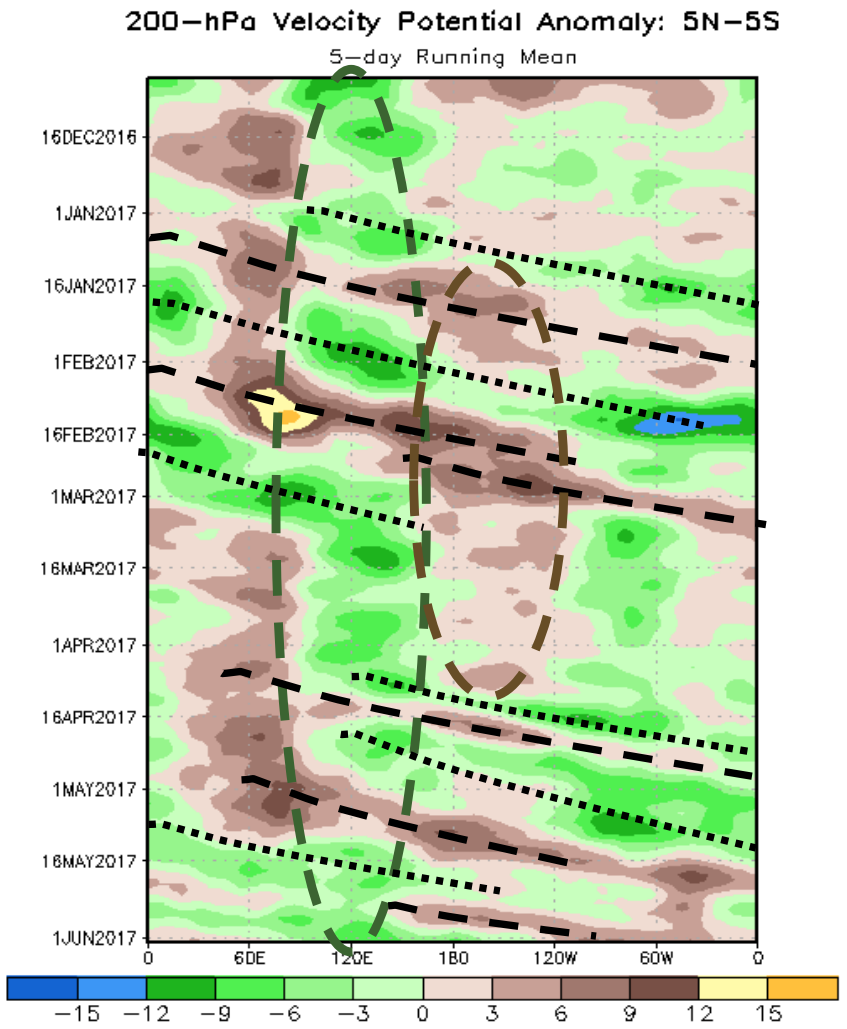


Westerly Wind Anomalies (orange/red shading)
Easterly Wind Anomalies (blue shading)

Upper-level (200-hPa) Velocity Potential Anomalies

From September 2016 to present, anomalous upper-level divergence (green shading) generally persisted near Indonesia.

Eastward propagation of regions of upper-level divergence (green shading) and convergence (brown shading) is particularly evident during November 2016, January-February 2017, and since early April 2017.



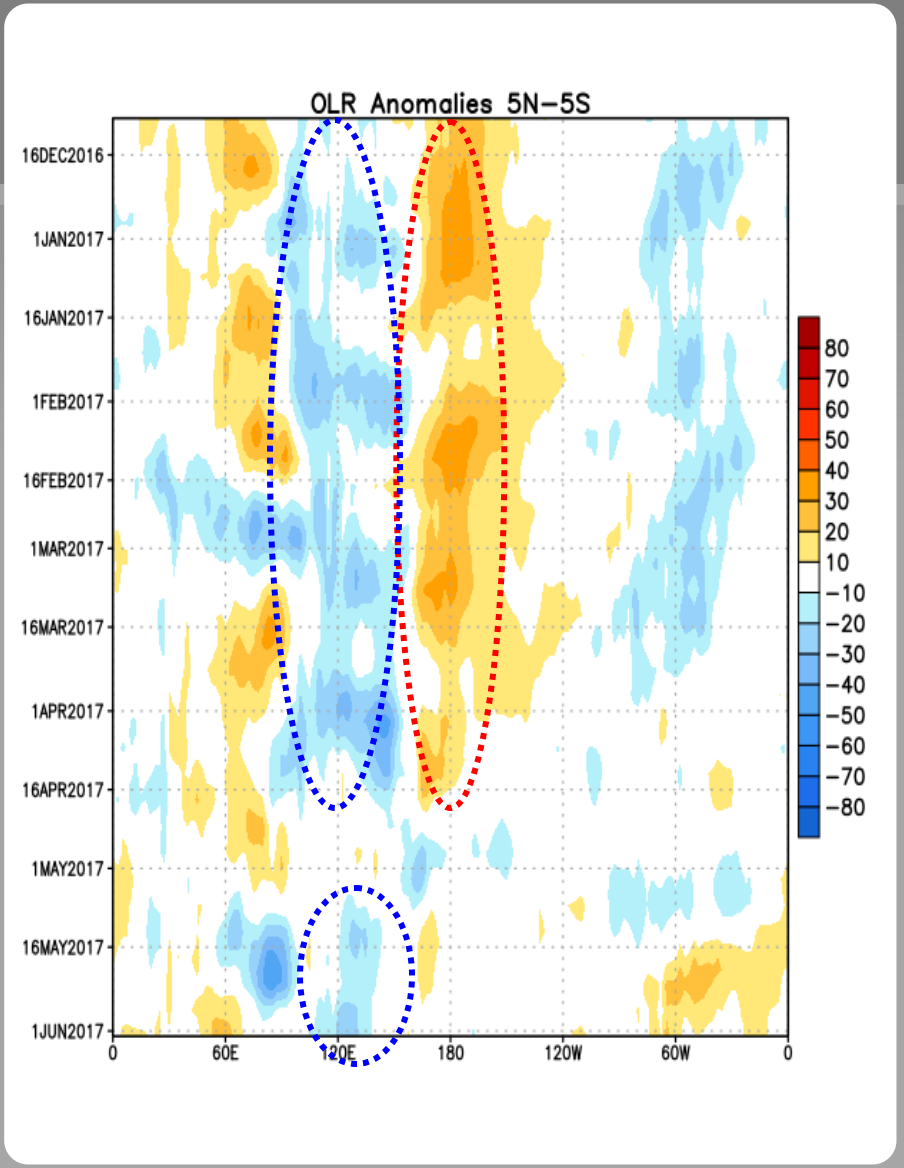
Unfavorable for precipitation (brown shading)
Favorable for precipitation (green shading)

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

Outgoing Longwave Radiation (OLR) Anomalies

From early September 2016 to mid April 2017, positive OLR anomalies persisted near the International Date Line, with negative OLR anomalies persisting near the Maritime Continent/far western Pacific Ocean.

In the past couple of weeks, OLR anomalies were negative over 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.v4). The SST reconstruction methodology is described in Huang et al., 2015, J. Climate, vol. 28, 911-930.)

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.

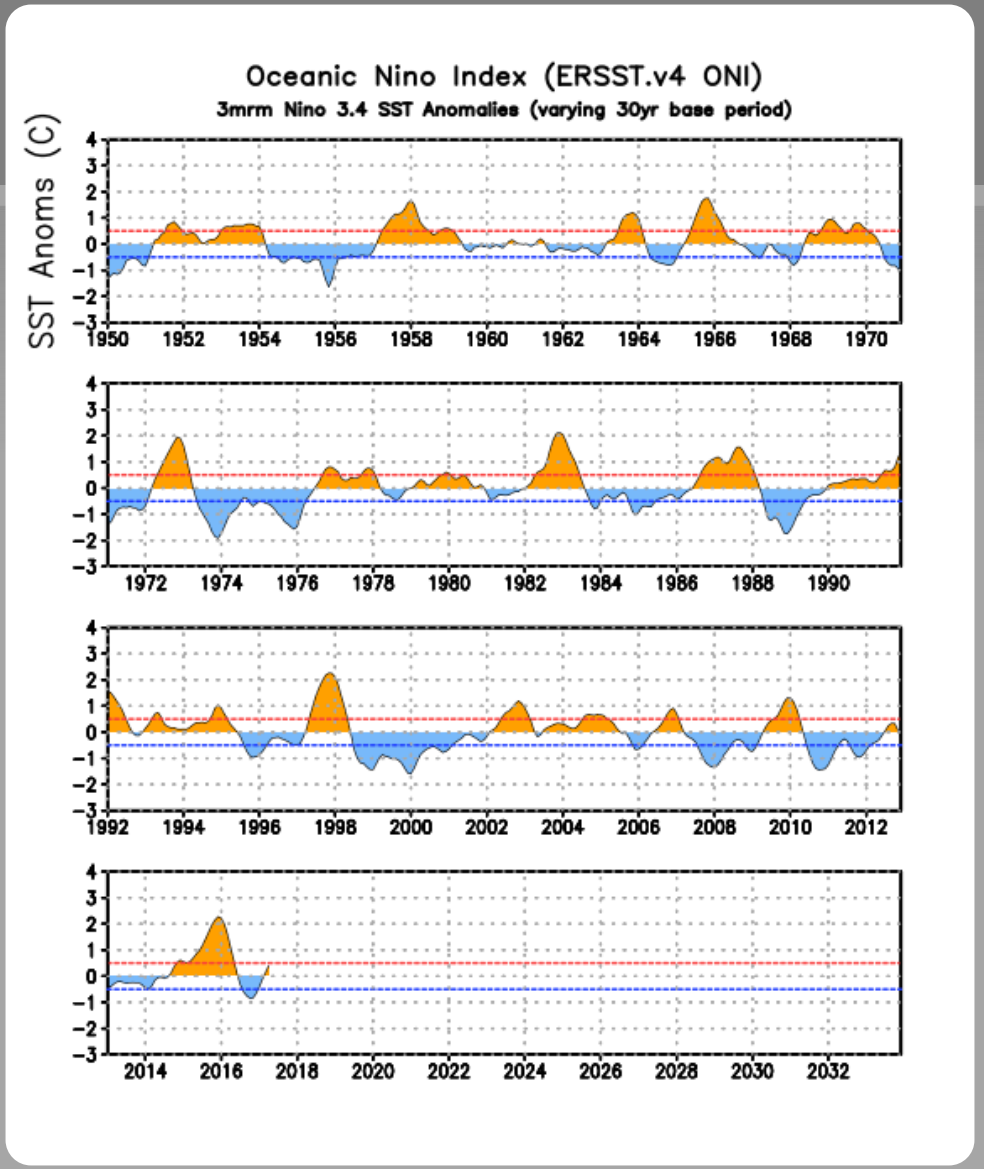
La Niña: characterized by a negative ONI less than or equal to -0.5°C.

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 (March - May 2017) is 0.4°C.



Historical El Niño and La Niña Episodes Based on the ONI computed using ERSST.v4

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.v4 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.

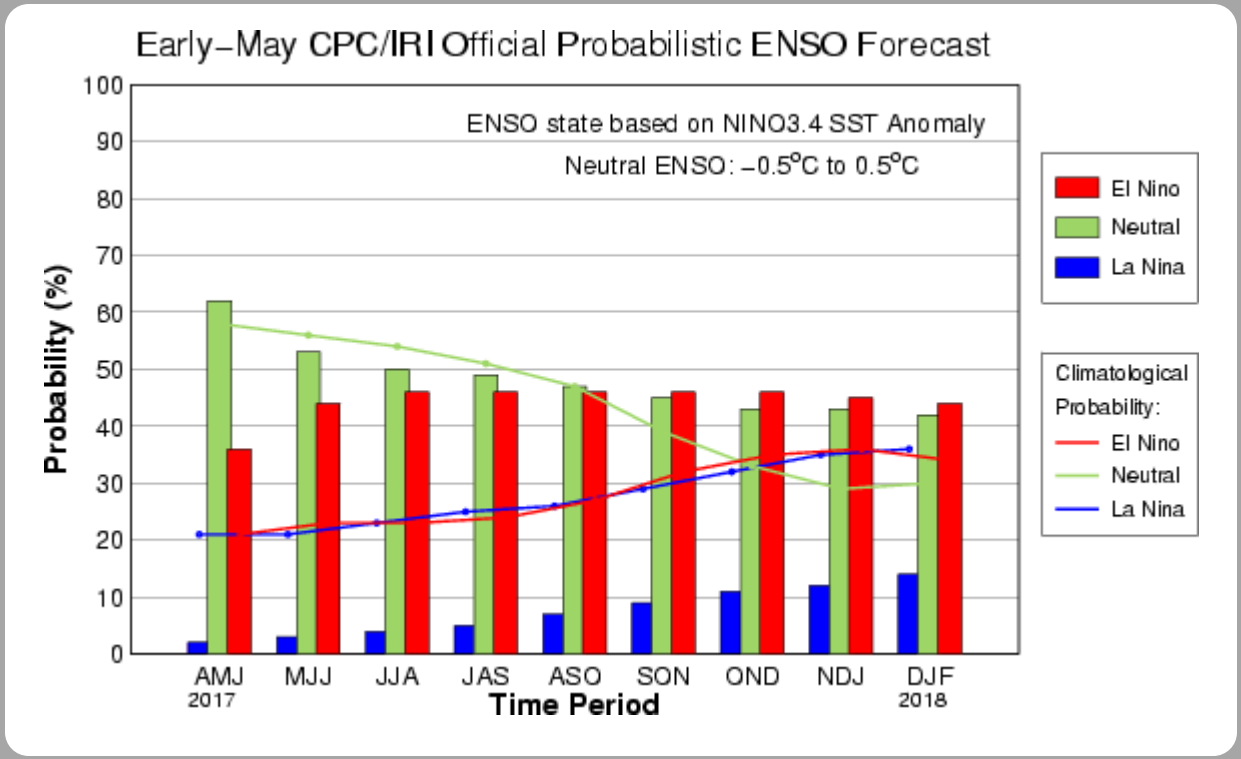
The ONI is one measure of the El Niño-Southern Oscillation, and other indices can confirm whether features consistent with a coupled ocean-atmosphere phenomenon accompanied these periods. The complete table going back to DJF 1950 can be found here.

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2005	0.7	0.6	0.5	0.5	0.3	0.2	0.0	-0.1	0.0	-0.2	-0.5	-0.7
2006	-0.7	-0.6	-0.4	-0.2	0.0	0.0	0.1	0.3	0.5	0.7	0.9	0.9
2007	0.7	0.4	0.1	-0.1	-0.2	-0.3	-0.4	-0.6	-0.9	-1.1	-1.3	-1.3
2008	-1.4	-1.3	-1.1	-0.9	-0.7	-0.5	-0.4	-0.3	-0.3	-0.4	-0.6	-0.7
2009	-0.7	-0.6	-0.4	-0.1	0.2	0.4	0.5	0.5	0.6	0.9	1.1	1.3
2010	1.3	1.2	0.9	0.5	0.0	-0.4	-0.9	-1.2	-1.4	-1.5	-1.4	-1.4
2011	-1.3	-1.0	-0.7	-0.5	-0.4	-0.3	-0.3	-0.6	-0.8	-0.9	-1.0	-0.9
2012	-0.7	-0.5	-0.4	-0.4	-0.3	-0.1	0.1	0.3	0.3	0.3	0.1	-0.2
2013	-0.4	-0.4	-0.3	-0.2	-0.2	-0.2	-0.3	-0.3	-0.2	-0.3	-0.3	-0.3
2014	-0.5	-0.5	-0.4	-0.2	-0.1	0.0	-0.1	0.0	0.1	0.4	0.5	0.6
2015	0.6	0.5	0.6	0.7	0.8	1.0	1.2	1.4	1.7	2.0	2.2	2.3
2016	2.2	2.0	1.6	1.1	0.6	0.1	-0.3	-0.6	-0.8	-0.8	-0.8	-0.7
2017	-0.4	-0.1	0.2	0.4								

CPC/IRI Probabilistic ENSO Outlook

Updated: 11 May 2017

ENSO-neutral is favored through spring 2017, with nearly equal chances (~45%) of El Niño and ENSO-neutral through the remainder of 2017.



IRI/CPC Pacific Niño 3.4 SST Model Outlook

Many models favor at least a weak El Niño by the Northern Hemisphere summer 2017, continuing through winter 2017-18.

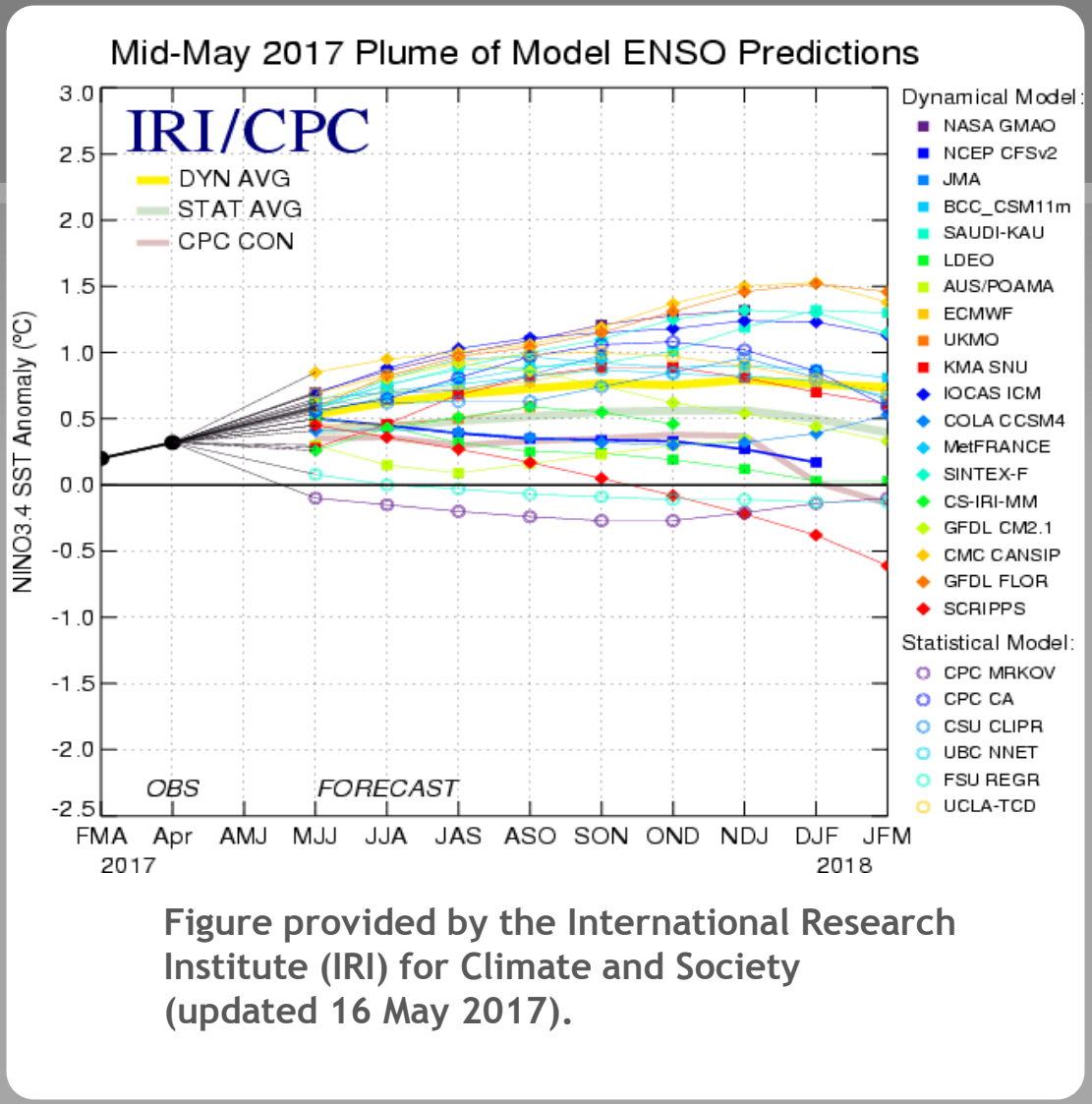
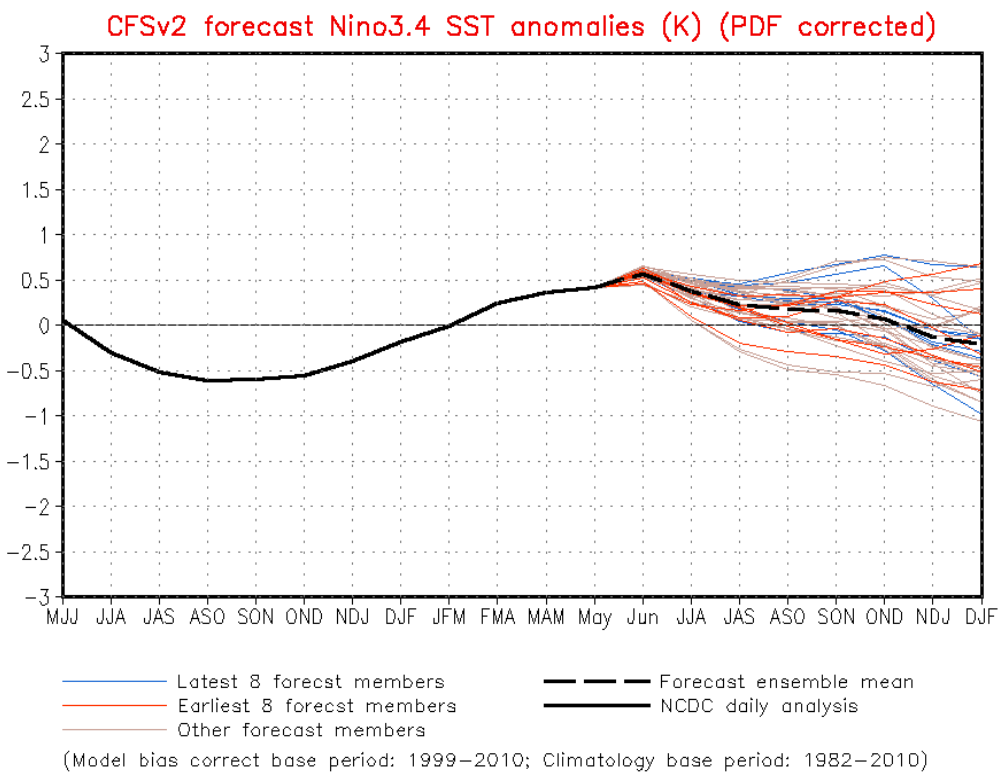


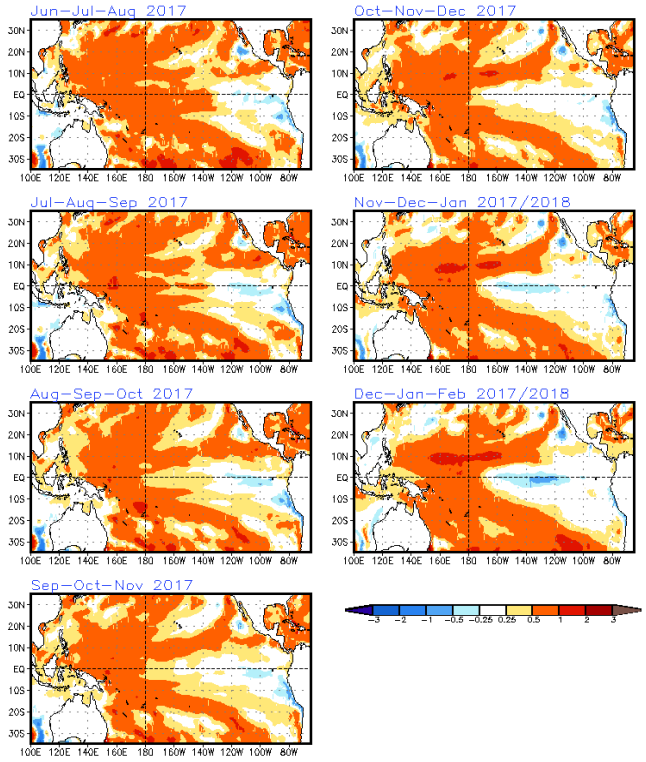
Figure provided by the International Research Institute (IRI) for Climate and Society (updated 16 May 2017).

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

Issued: 5 June 2017

The CFS.v2 ensemble mean (black dashed line) favors ENSO-neutral to continue through 2017.

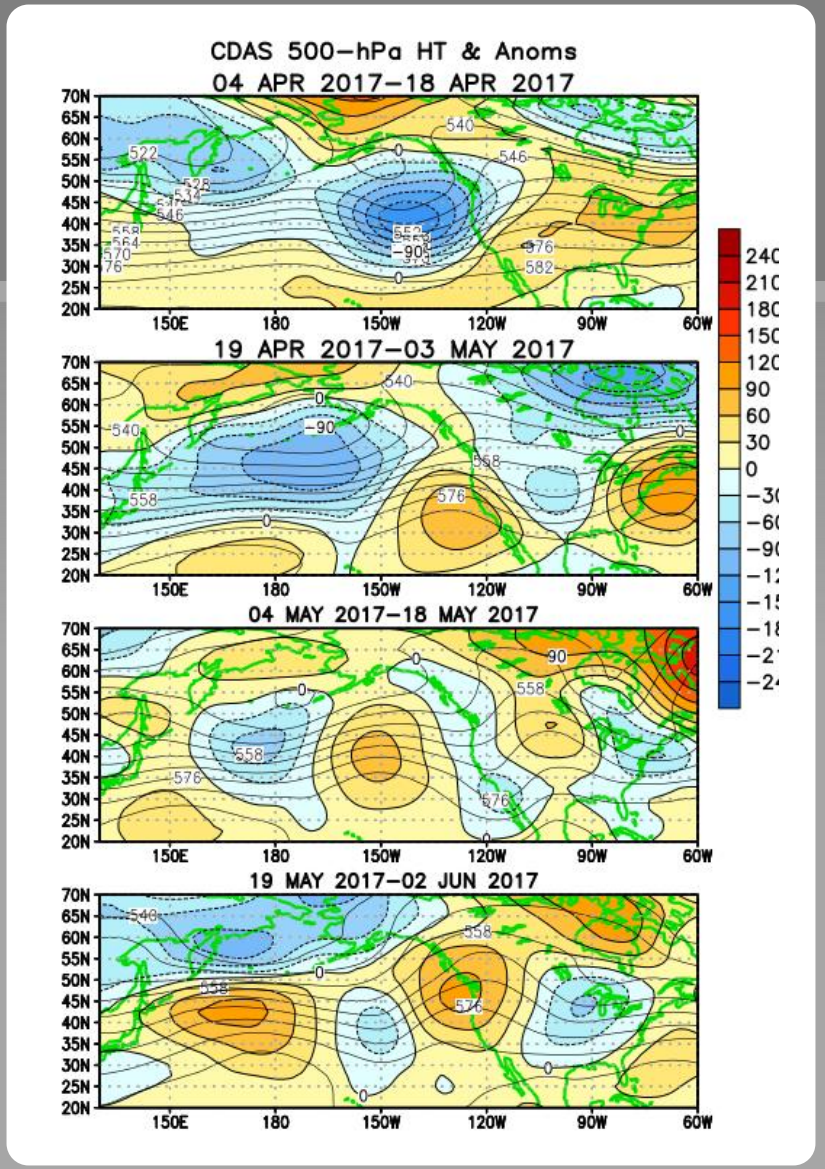




Atmospheric anomalies over the North Pacific and North America During the Last 60 Days

The pattern of temperature, winds, and heights have been variable over the last 60 days.

More recently, an anomalous trough and negative temperature anomalies have been evident over the central U.S.



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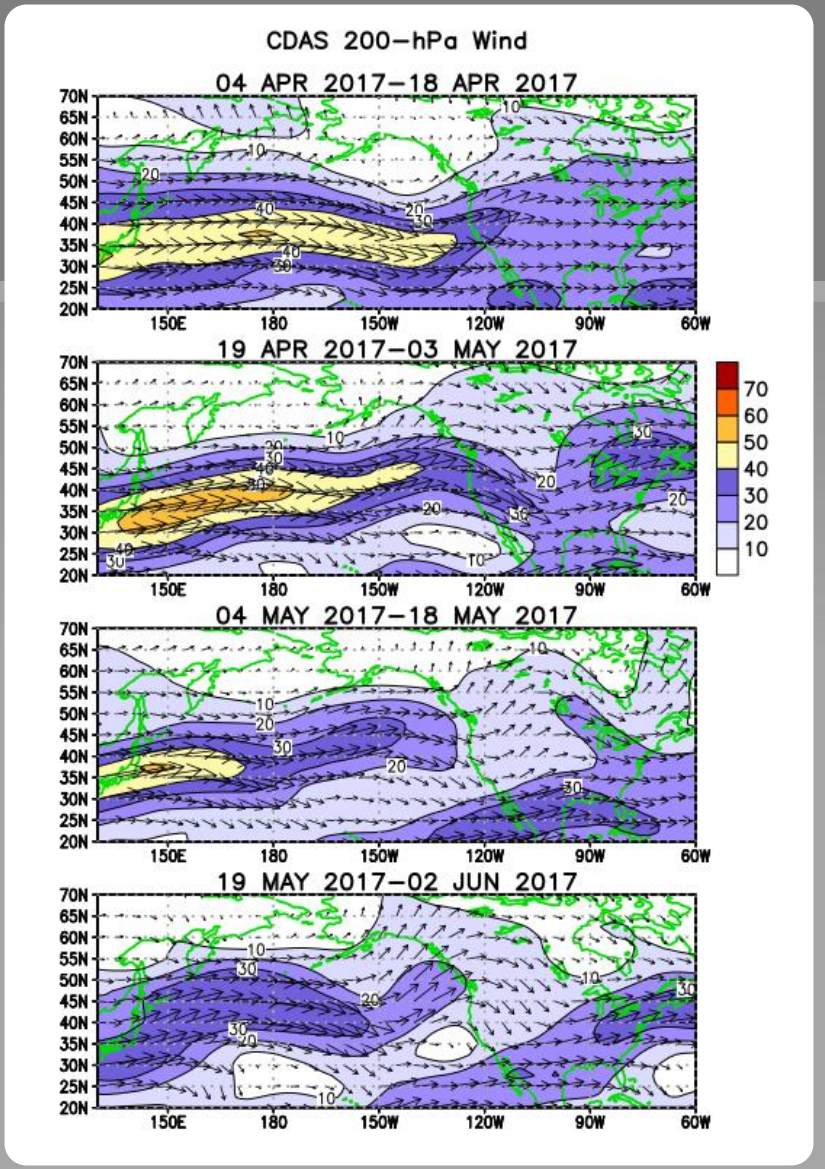

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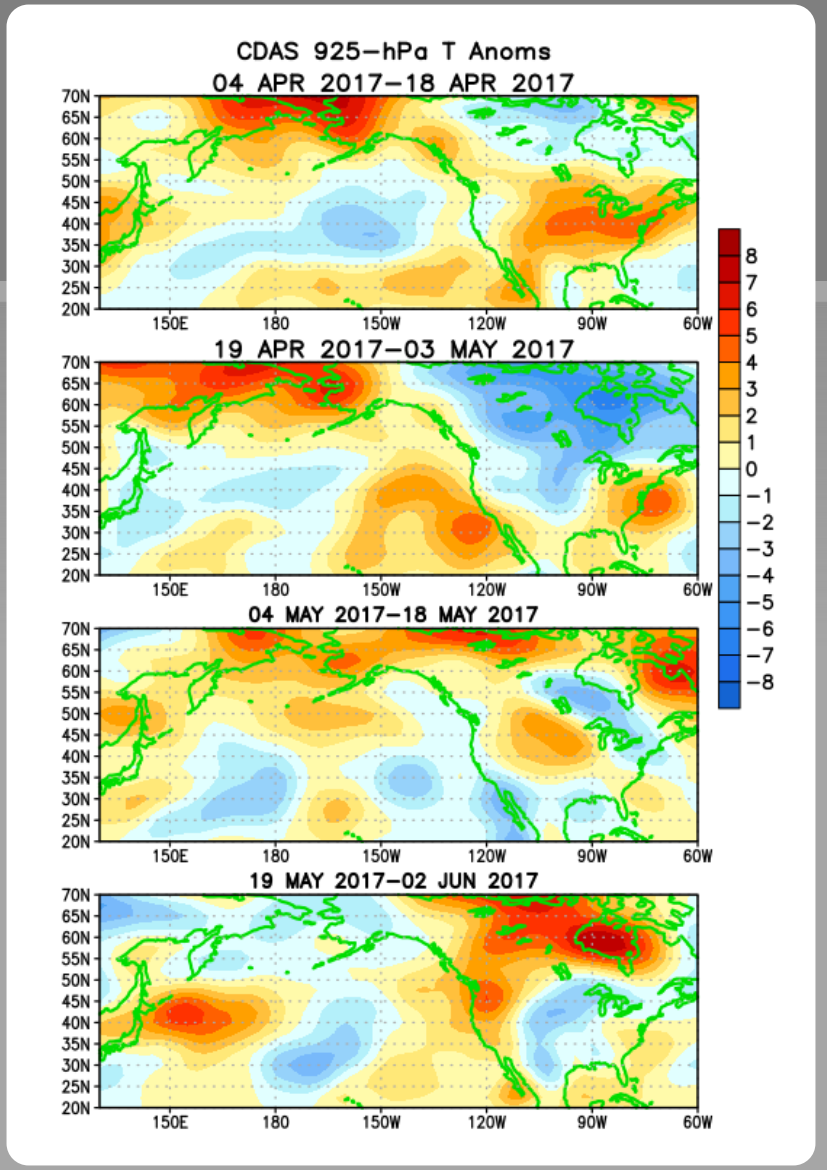
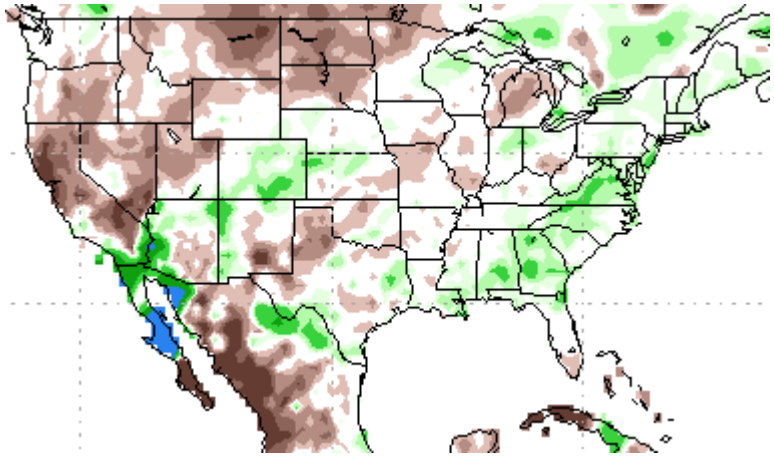


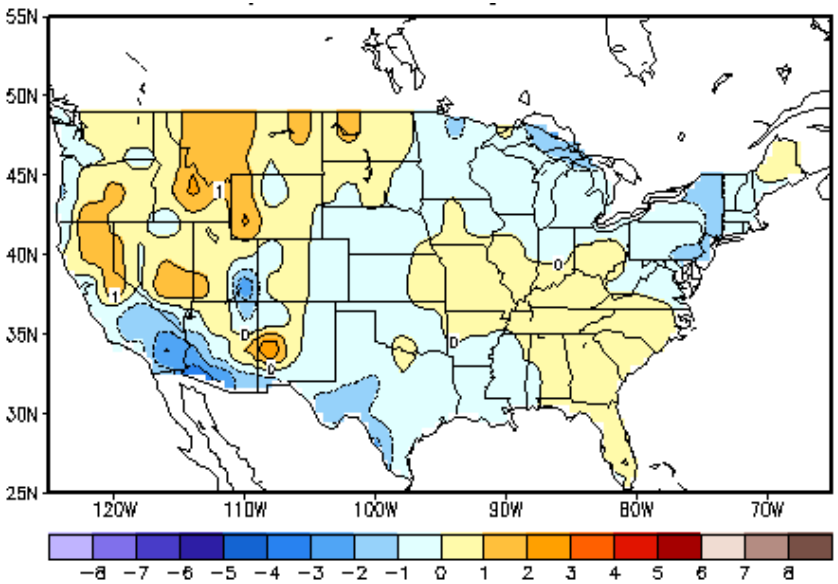
U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 3 June 2017

Percent of Average Precipitation



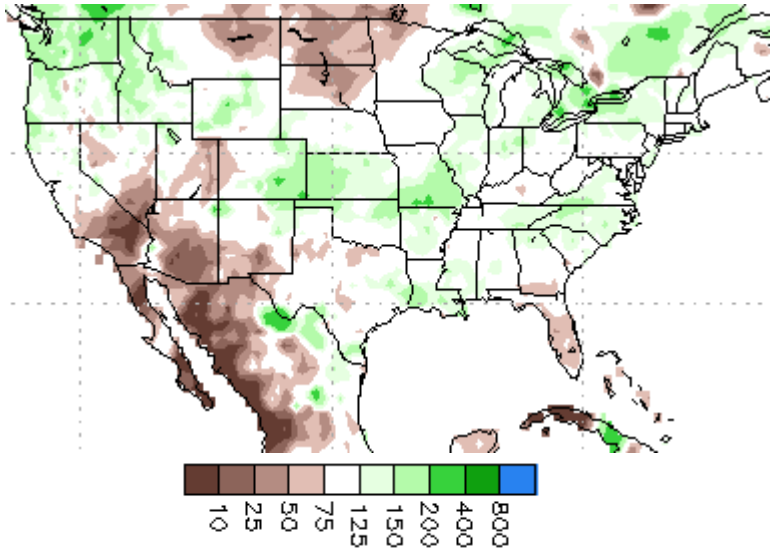
Temperature Departures (degree C)



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

End Date: 3 June 2017

Percent of Average Precipitation



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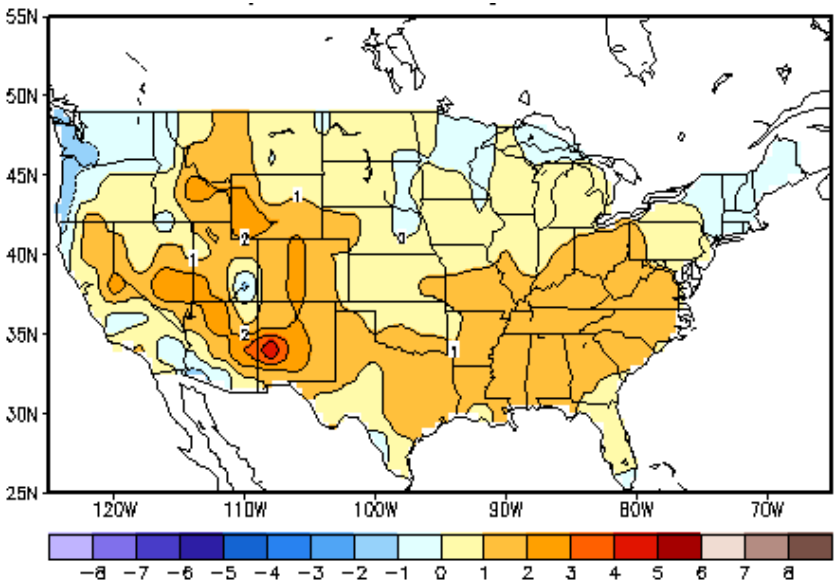
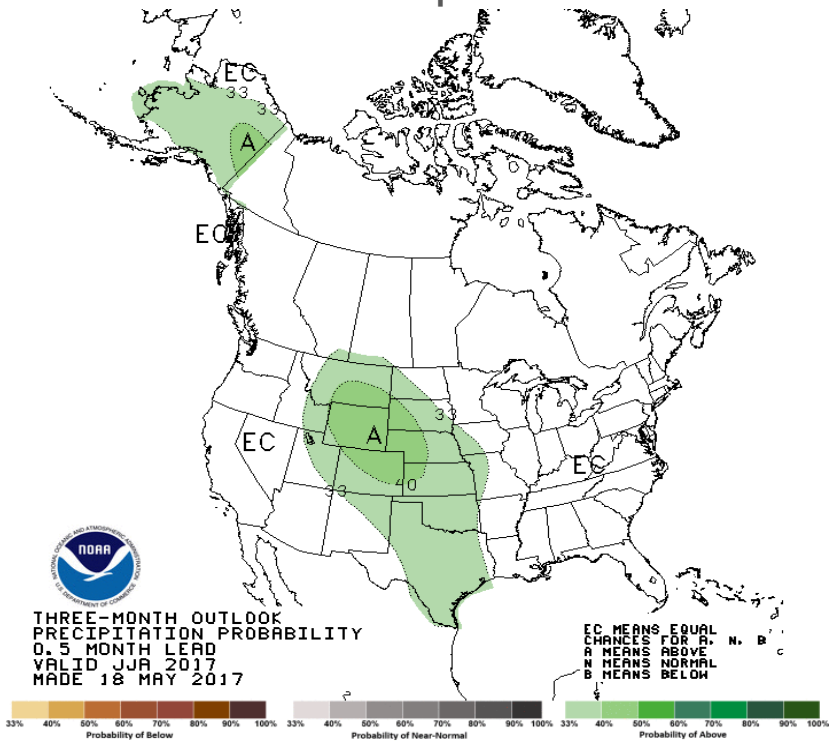


U. S. Seasonal Outlooks

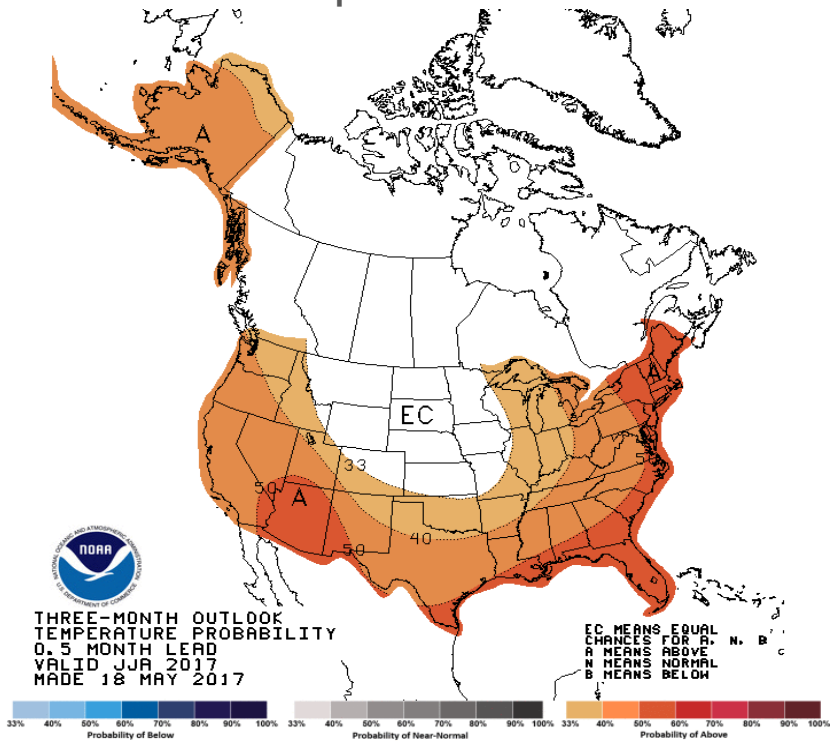
June - August 2017

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

Precipitation



Temperature



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