ENSO: Recent Evolution, Current Status and Predictions

Update prepared by:
Climate Prediction Center / NCEP
28 August 2017

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Summary

Recent Evolution and Current Conditions

Oceanic Niño Index (ONI)

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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-below average across the central and eastern Pacific Ocean.

ENSO-Neutral is favored (~85% chance during Jul-Sep, decreasing to ~55% during Dec-Feb) through the Northern Hemisphere winter 2017-18.*

* 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)

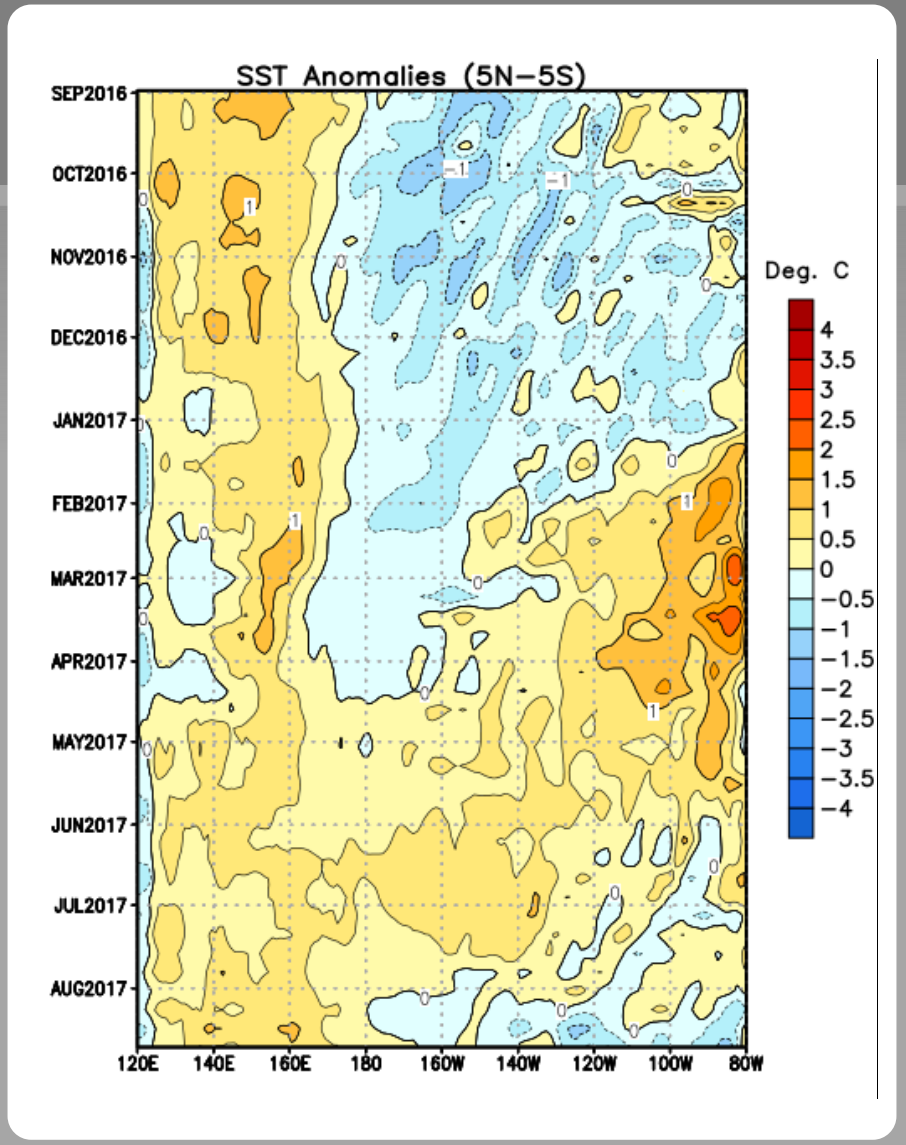
Below average SSTs were observed over most of the central and eastern Pacific Ocean through January 2017.

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

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

In the last month, above-average temperatures have dissipated across the central and eastern Pacific.

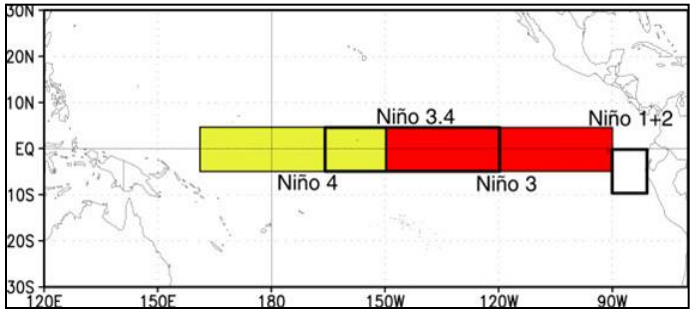
In the last week, SSTs were near-to-below average over the eastern Pacific.

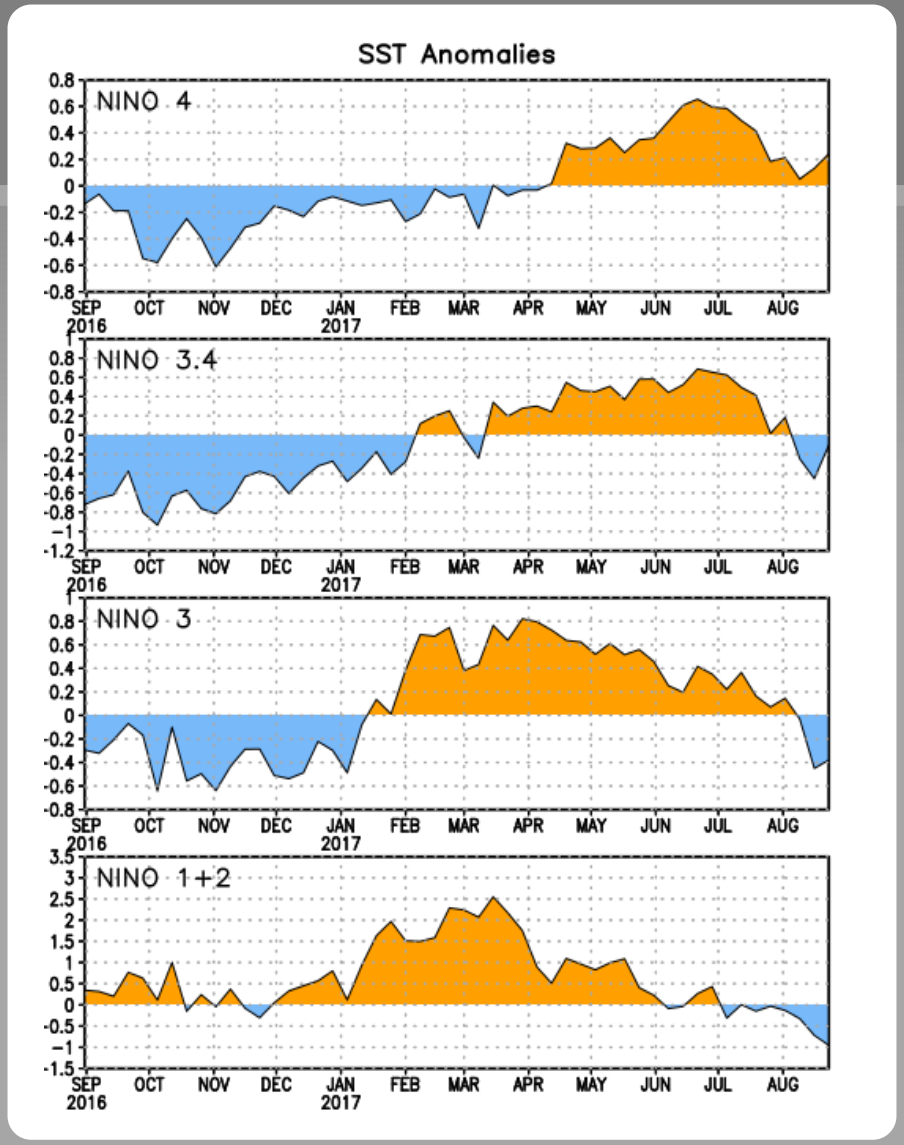


Niño Region SST Departures (ºC) Recent Evolution

The latest weekly SST departures are:

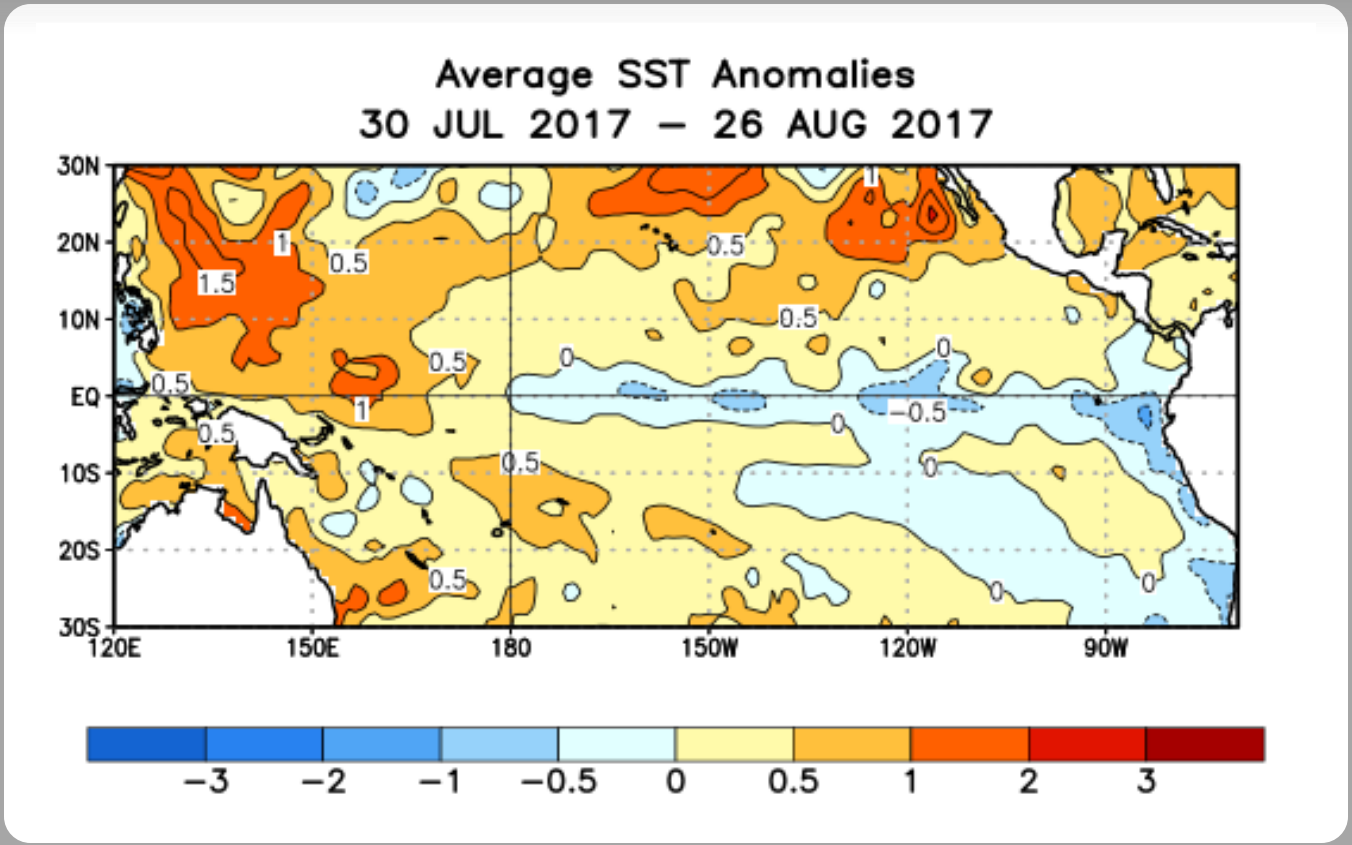
Niño 4	0.2ºC
Niño 3.4	-0.1ºC
Niño 3	-0.4ºC
Niño 1+2	-1.0ºC





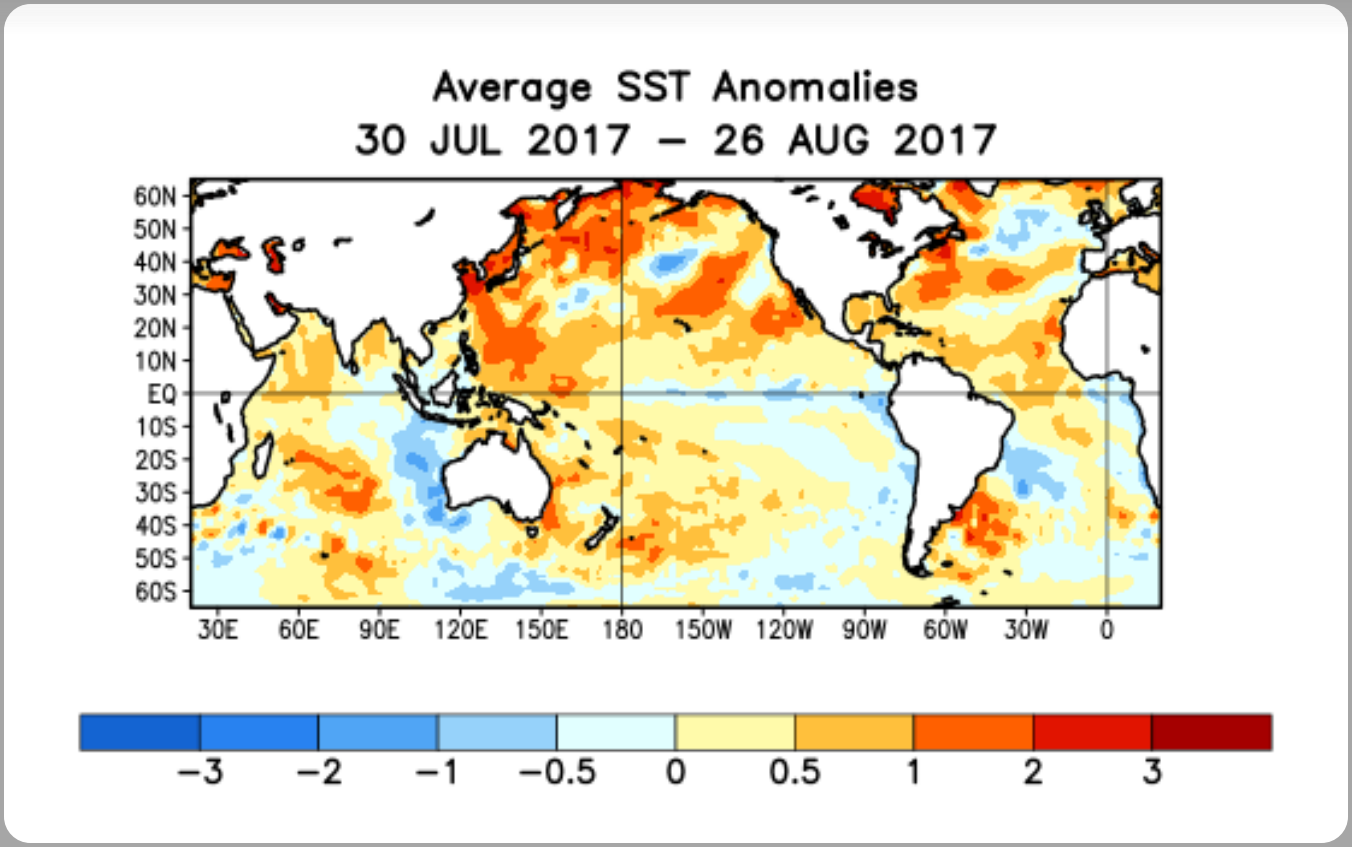
SST Departures (ºC) in the Tropical Pacific During the Last Four Weeks

During the last four weeks, equatorial SSTs were near-to-below average across the central and eastern Pacific Ocean.



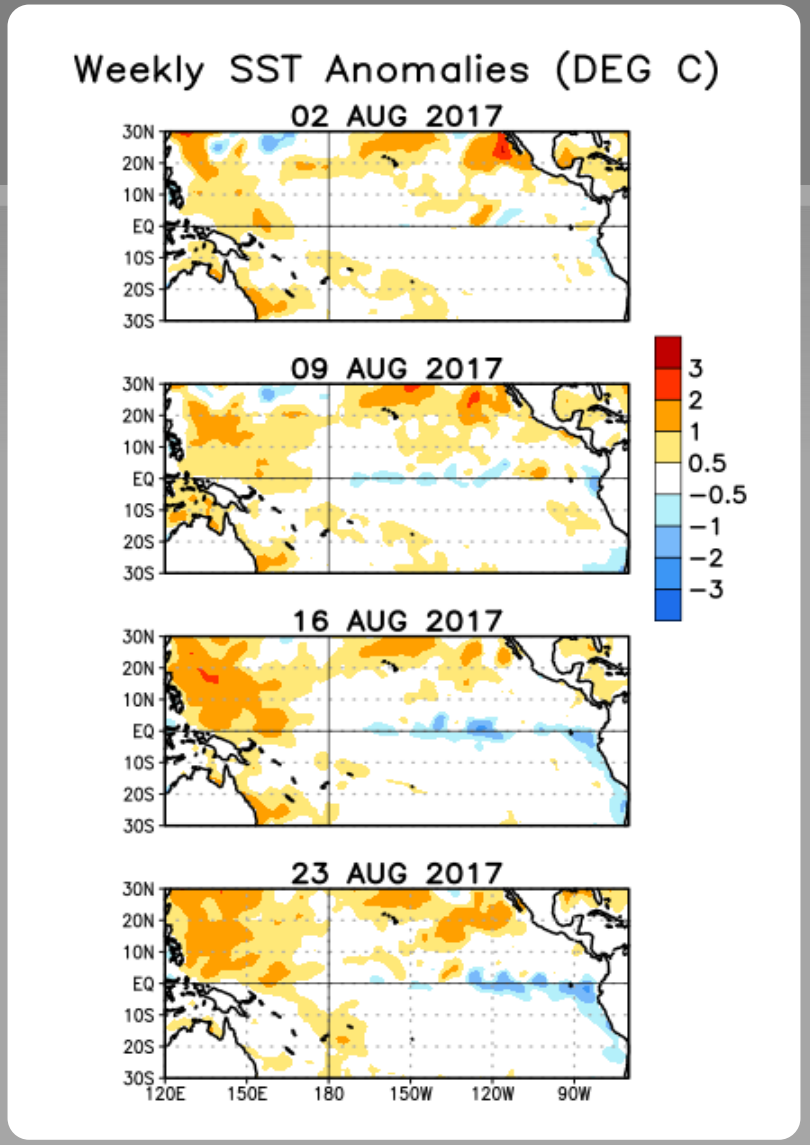
Global SST Departures (°C) During the Last Four Weeks

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



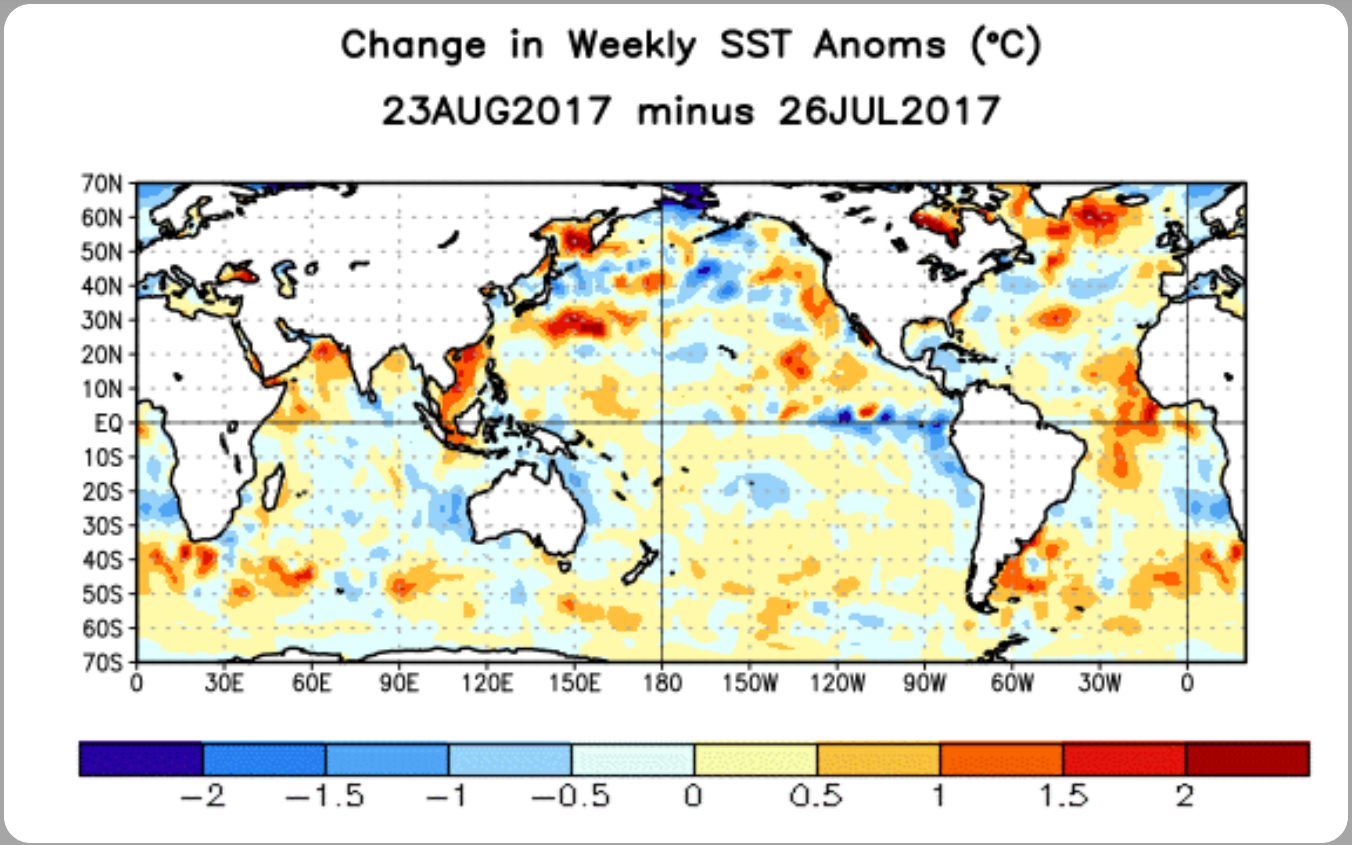
Weekly SST Departures during the Last Four Weeks

During the last four weeks, below-average SSTs have emerged across portions of the central and eastern Pacific Ocean.



Change in Weekly SST Departures over the Last Four Weeks

During the last four weeks, changes in SST anomalies were negative in the eastern Pacific Ocean.



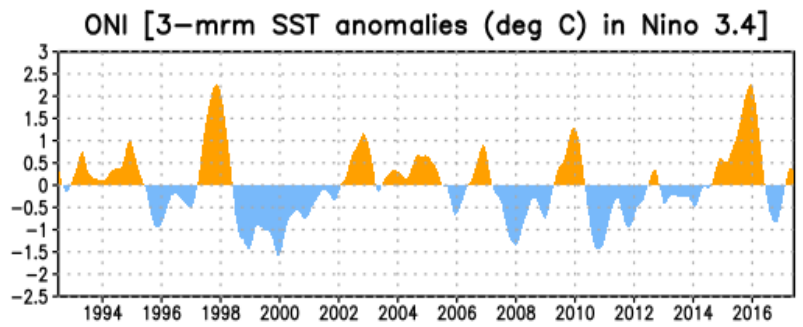
Upper-Ocean Conditions in the Equatorial Pacific

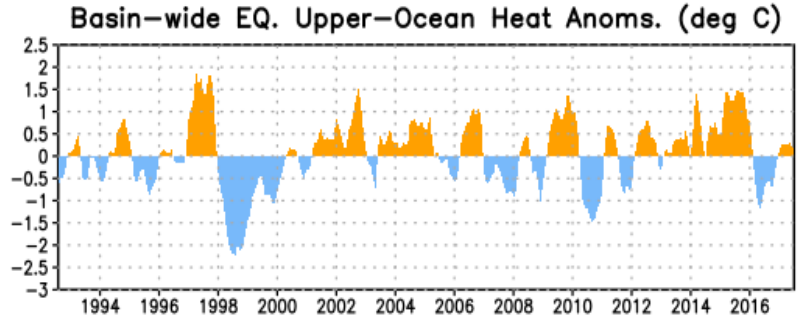
The basin-wide equatorial upper ocean (0-300 m) heat content is greatest prior to and during the early stages of a Pacific warm (El Niño) episode (compare top 2 panels), and least prior to and during the early stages of a cold (La Niña) episode.

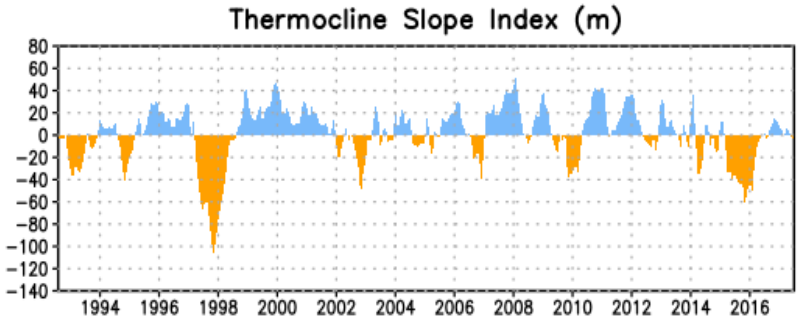
The slope of the oceanic thermocline is least (greatest) during warm (cold) episodes.

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

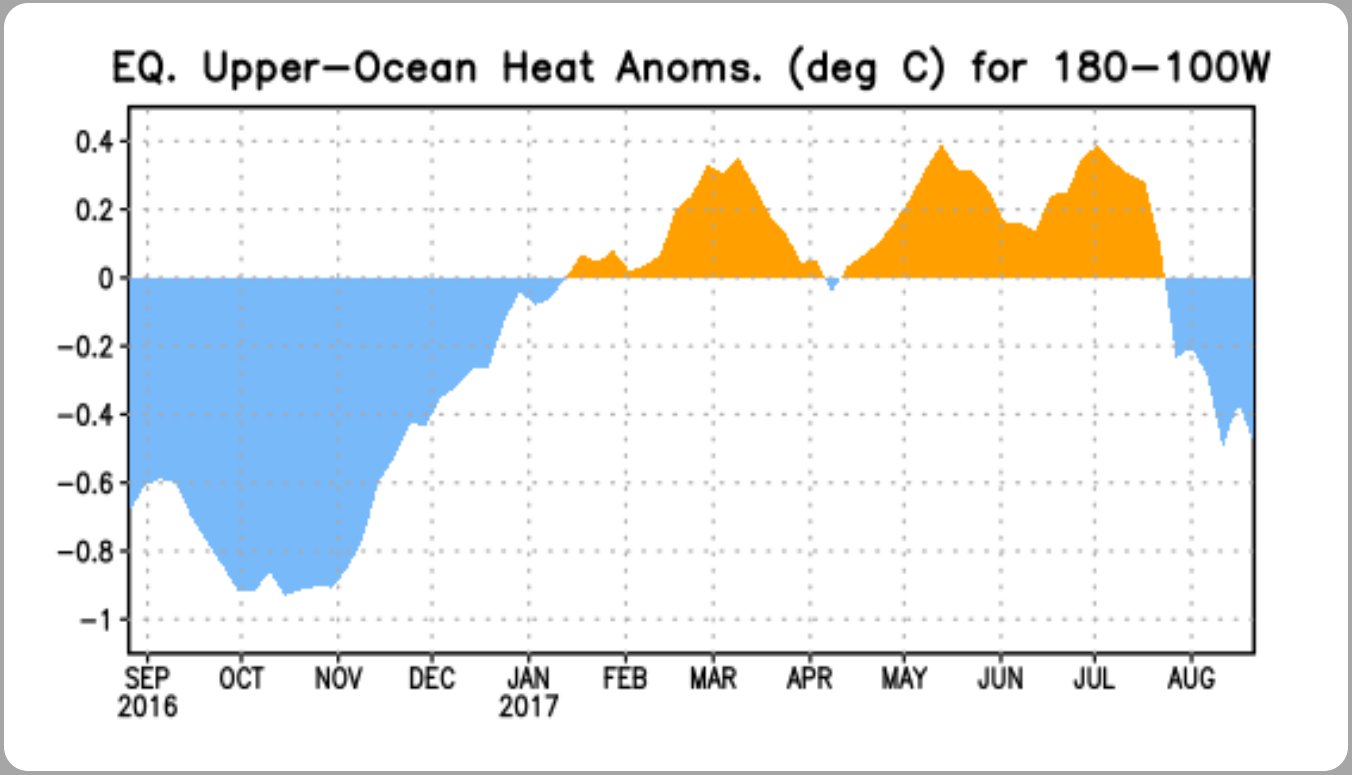






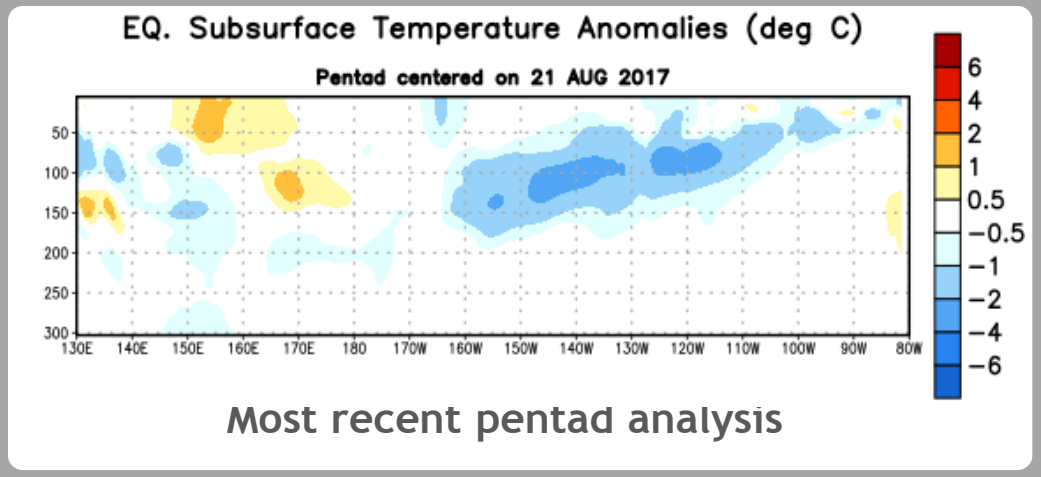
Central and Eastern Pacific Upper-Ocean (0-300 m) Weekly Average Temperature Anomalies

Negative subsurface temperature anomalies were present through December 2016. Positive anomalies were present from mid-January through March 2017 before weakening to near zero. Starting in mid-April and mid-June, positive anomalies strengthened before tapering off again. Since mid-July, anomalies have been negative.



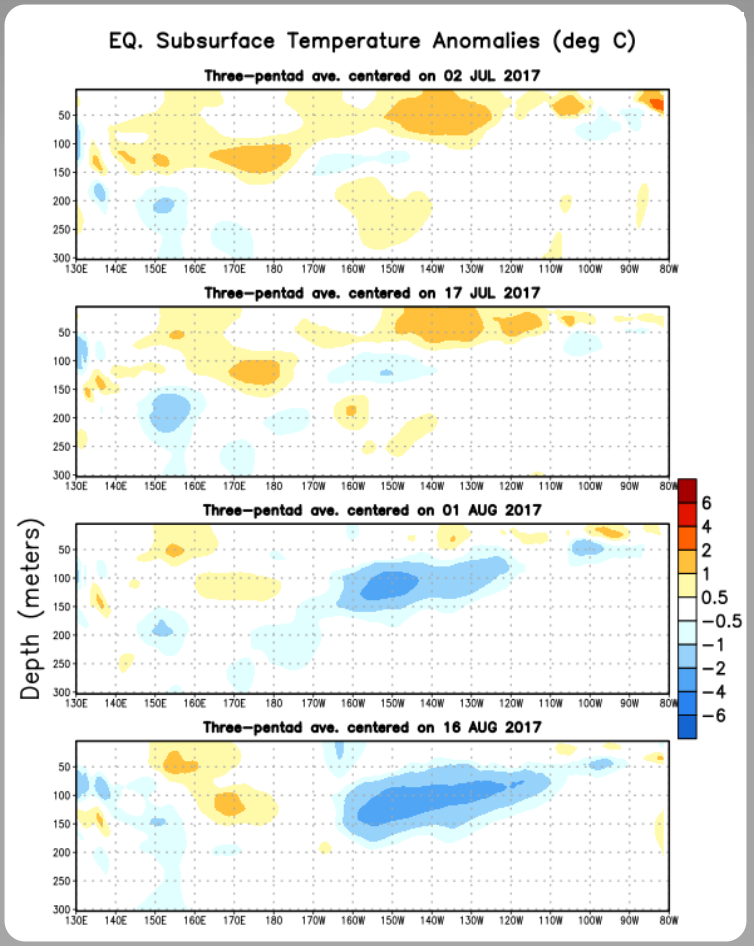
Sub-Surface Temperature Departures in the Equatorial Pacific

In the last two months, subsurface positive temperature anomalies have been replaced by negative temperature anomalies across the Pacific.



Most recent pentad analysis

Since late July, negative subsurface anomalies strengthened at depth, with the strongest anomalies between 160°W-110°W.

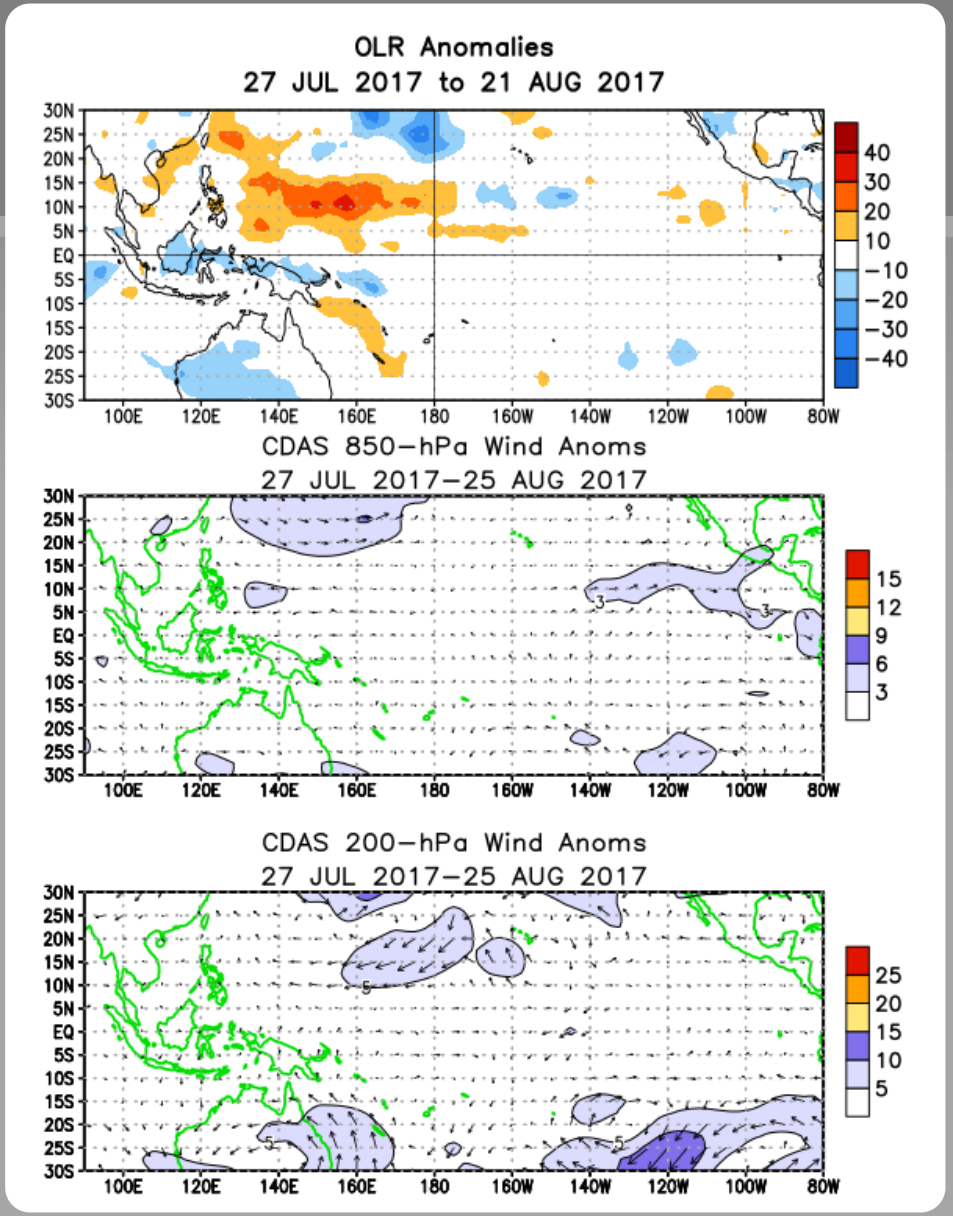


Tropical OLR and Wind Anomalies During the Last 30 Days

Weak, negative OLR anomalies (enhanced convection and precipitation) were evident over eastern Indonesia and near Papua New Guinea.

Low-level (850-hPa) winds were anomalous westerly in a small region of the eastern Pacific.

Upper-level (200-hPa) winds were near average across most of the 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.

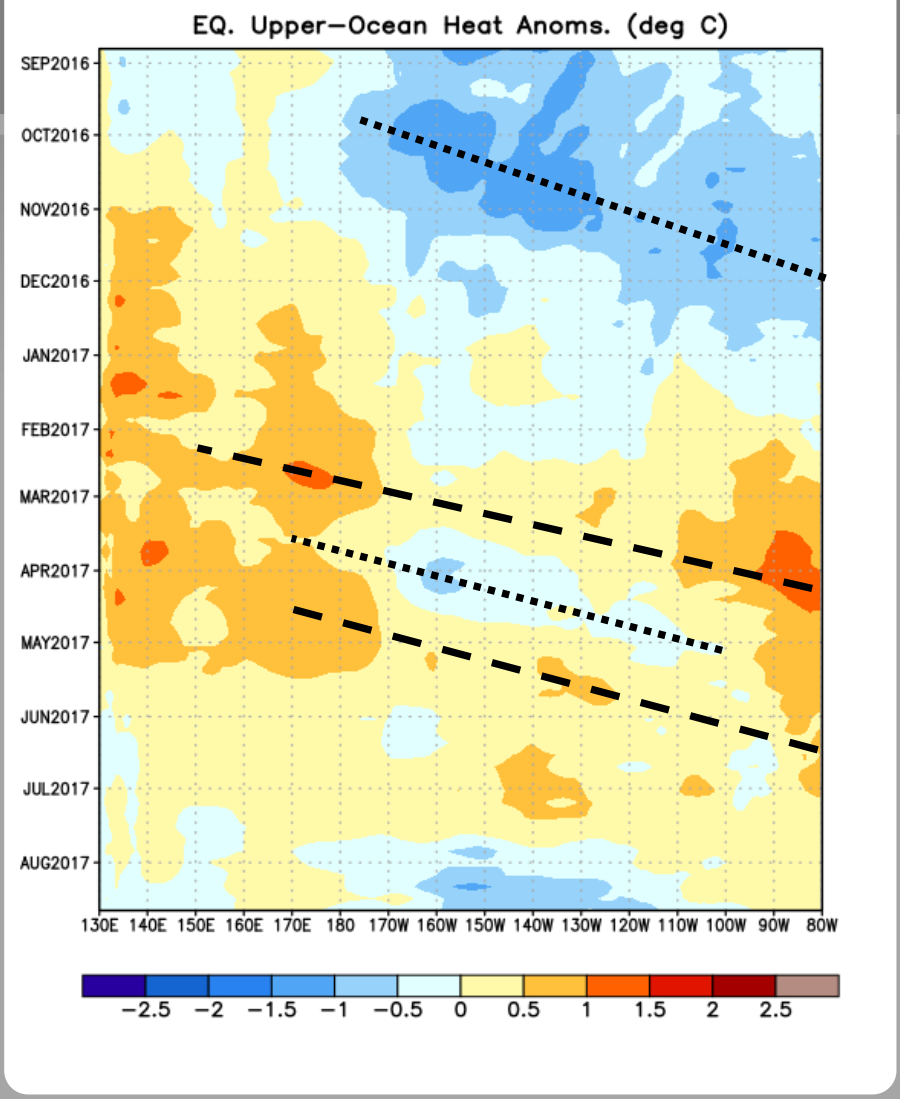
Related to this activity:

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 February 2017 through May 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.

Recently, subsurface temperature anomalies are near-to- below average across the central and east-central equatorial Pacific.

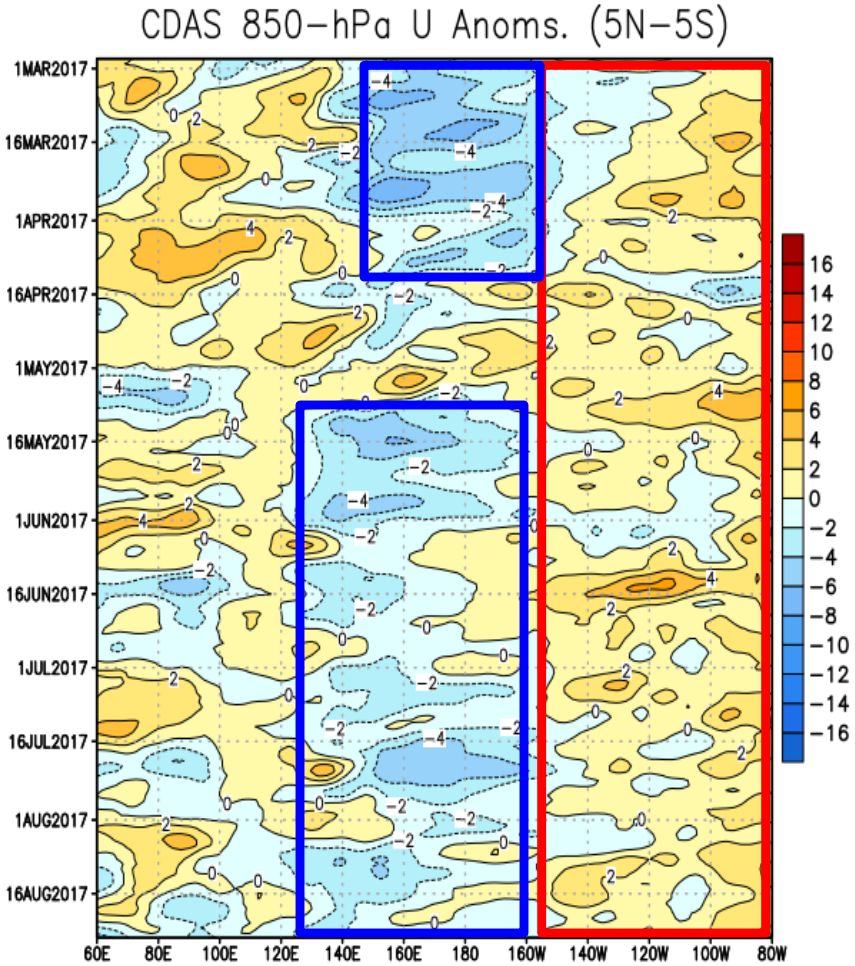


Equatorial oceanic Kelvin waves have alternating warm and cold phases. The warm phase is indicated by dashed lines. Down-welling and warming occur in the leading portion of a Kelvin wave, and up-welling and cooling occur in the trailing portion.

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

Low-level easterly wind anomalies generally persisted over the central and western equatorial Pacific from mid September 2016 to mid April 2017 and again since May 2017.

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

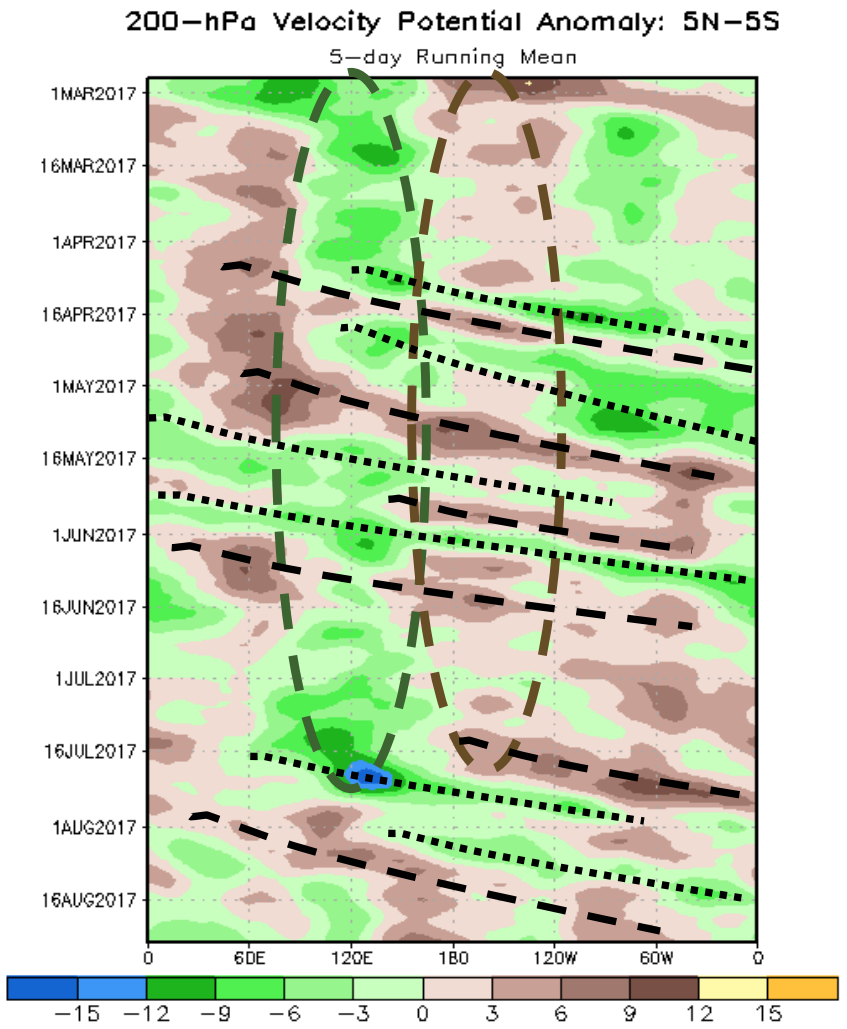


Westerly Wind Anomalies (orange/red shading)
Easterly Wind Anomalies (blue shading)

Upper-level (200-hPa) Velocity Potential Anomalies

At least from January to late July 2017, 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) is particularly evident during January-February 2017, April-May 2017, and July-August 2017.



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

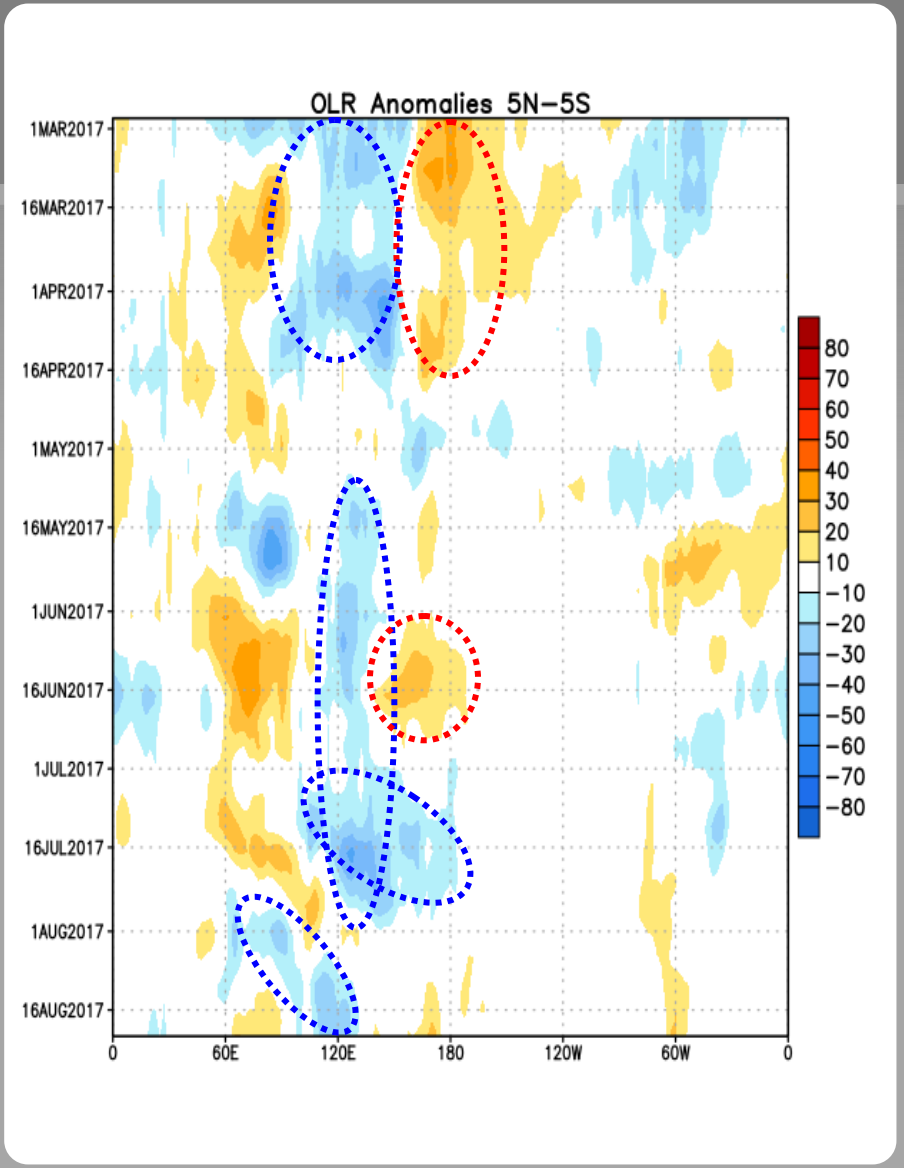
Note: Eastward propagation is not necessarily indicative of the Madden-Julian Oscillation (MJO).

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.

From mid-May to late July 2017, OLR anomalies were negative near Indonesia.

Recently, negative OLR anomalies have returned to 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.

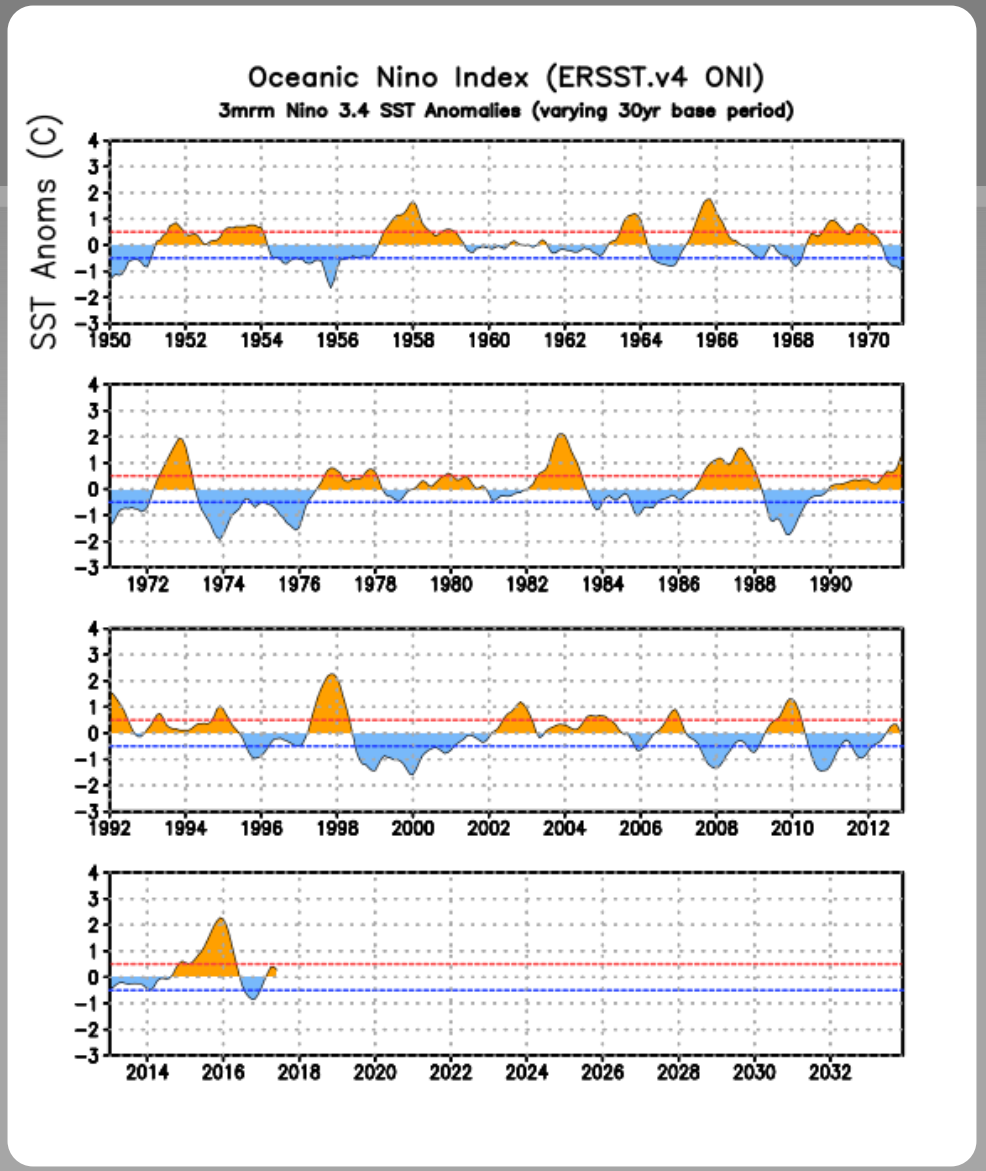
La Niña: characterized by a negative ONI less than or equal to -0.5°C.

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 (May - July 2017) is 0.3°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.

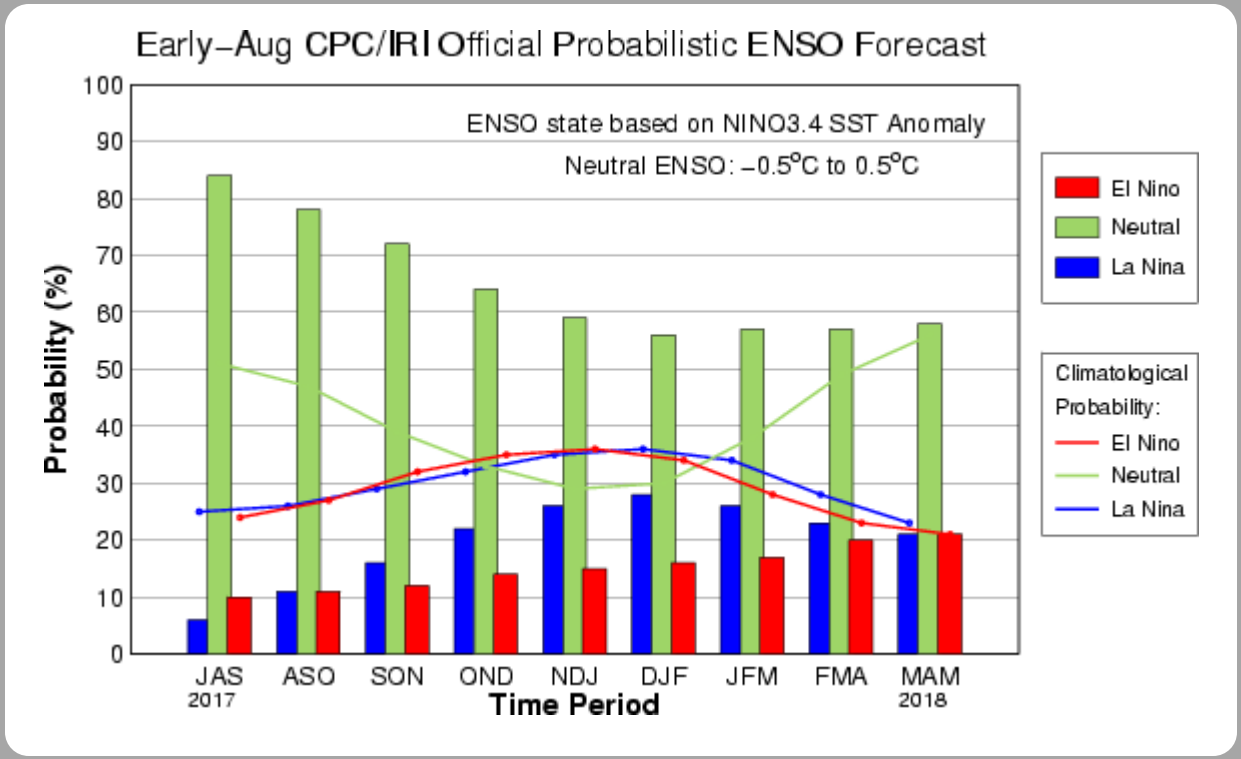
The ONI is one measure of the El Niño-Southern Oscillation, and other indices can confirm whether features consistent with a coupled ocean-atmosphere phenomenon accompanied these periods. The complete table going back to DJF 1950 can be found here.

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	0.4	0.3						

CPC/IRI Probabilistic ENSO Outlook

Updated: 10 August 2017

ENSO-Neutral is favored (~85% chance during Jul-Sep, decreasing to ~55% during Dec-Feb) through the Northern Hemisphere winter 2017-18.



IRI/CPC Pacific Niño 3.4 SST Model Outlook

Most models and the multi-model averages predict ENSO-Neutral through the remainder of the year and into early 2018.

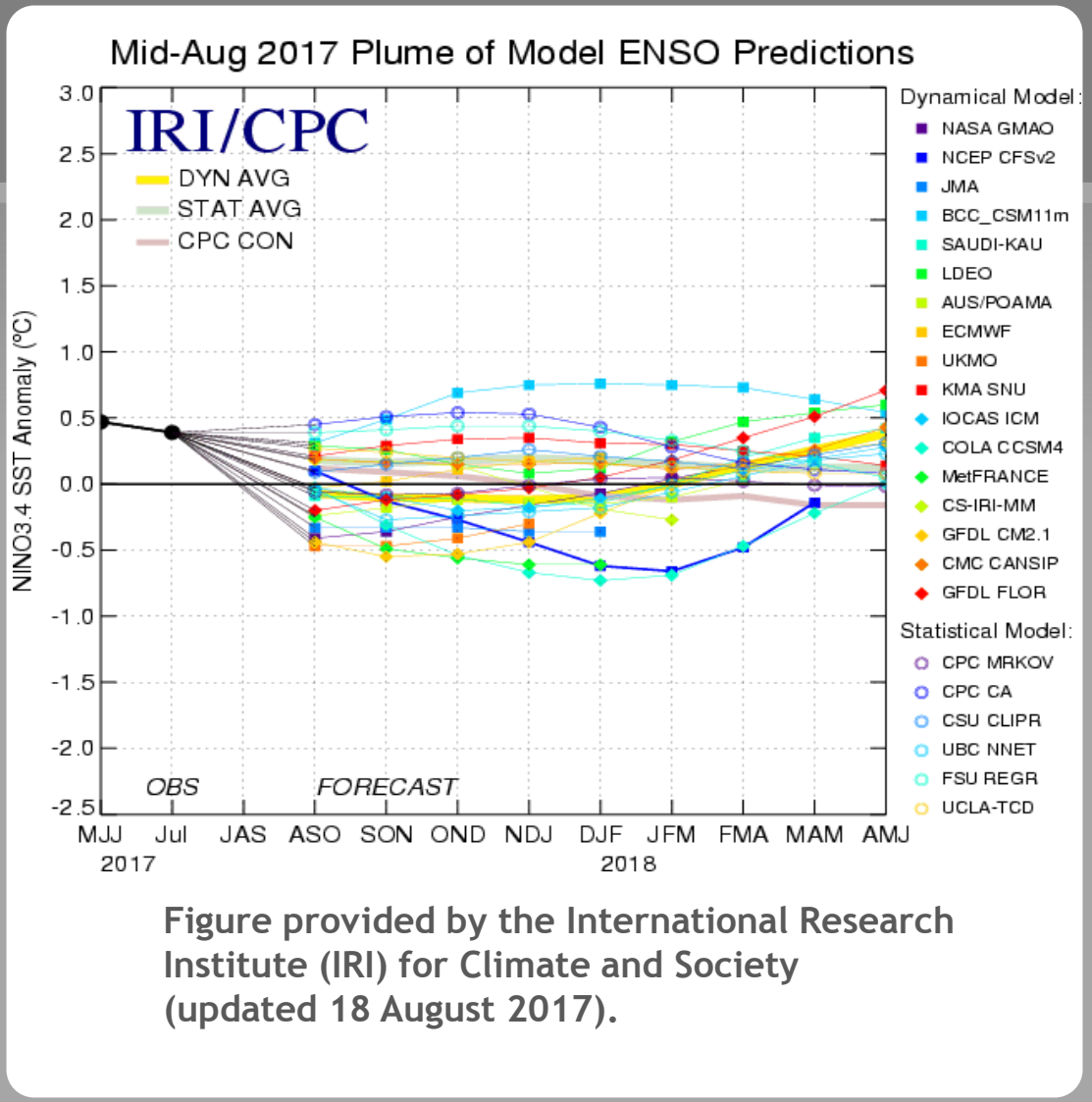
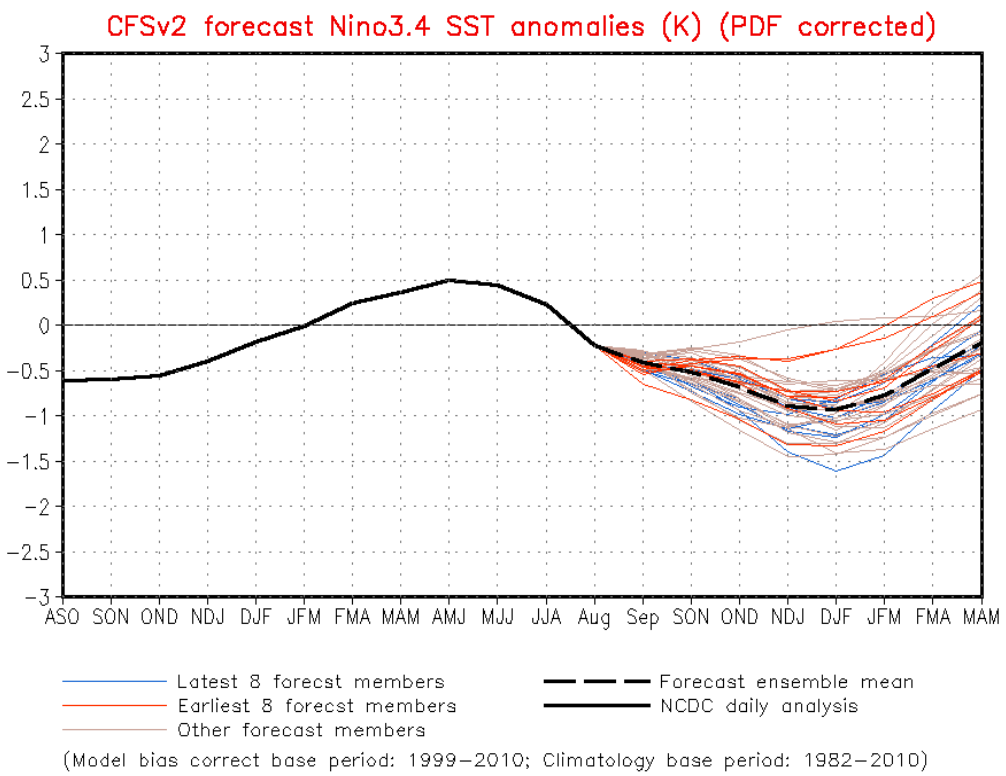


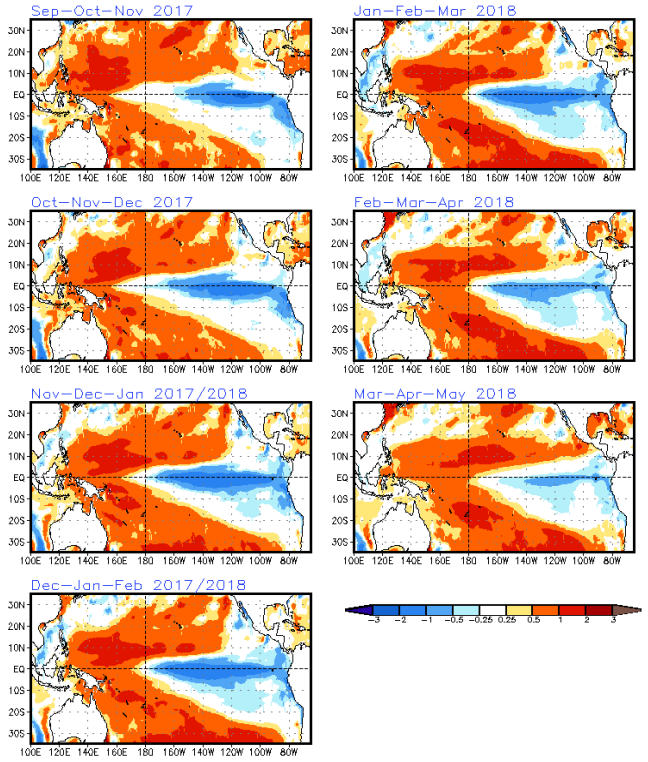
Figure provided by the International Research Institute (IRI) for Climate and Society (updated 18 August 2017).

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

Issued: 27 August 2017

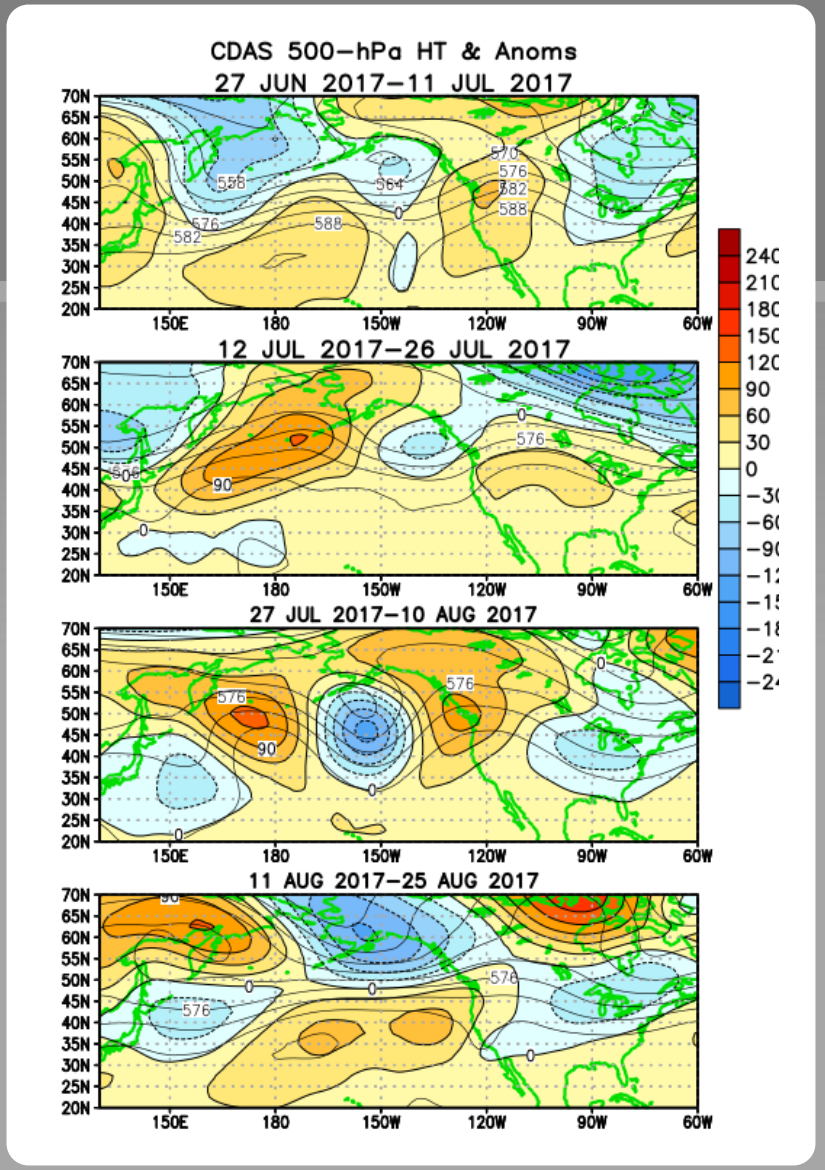
The CFS.v2 ensemble mean (black dashed line) favors La Niña during the 2017-18 Northern Hemisphere winter.





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

Since late June 2017, an anomalous trough (and below-average temperatures) was more common over parts of central/eastern N. America. Over the western contiguous U.S., an anomalous ridge (and above-average temperatures) generally prevailed.



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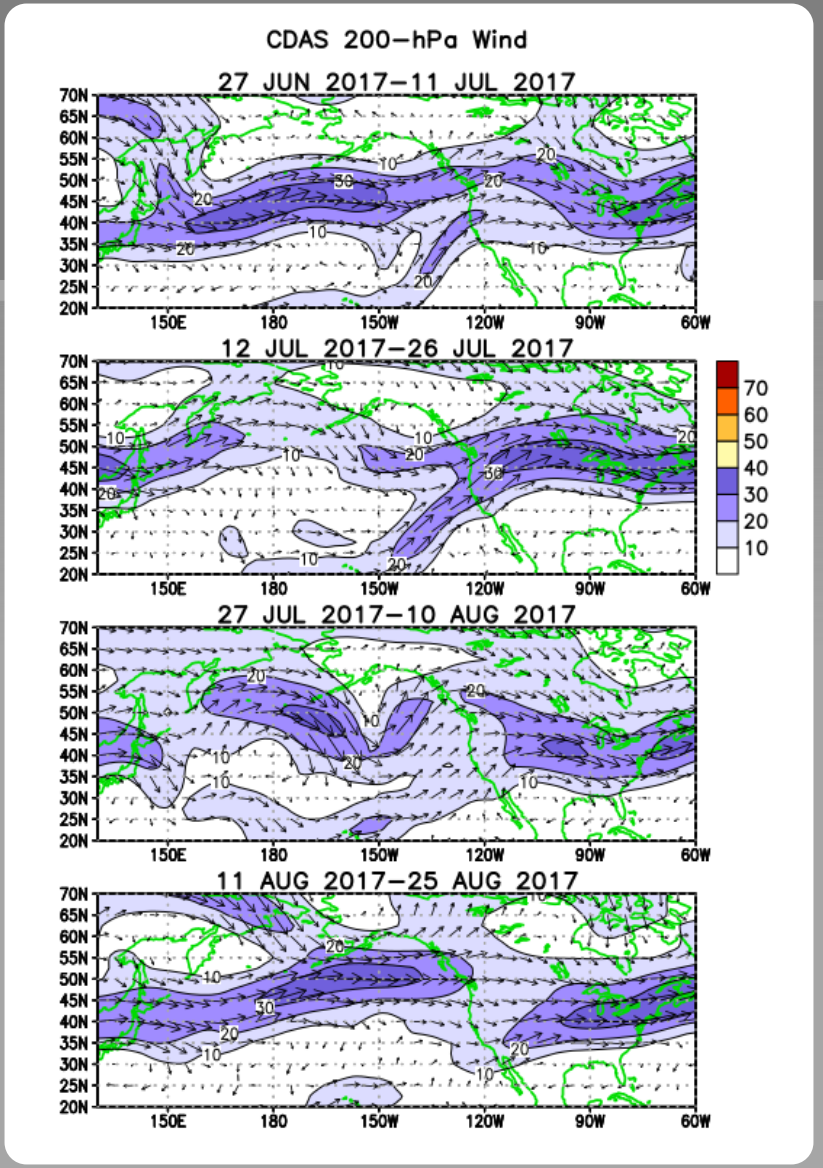

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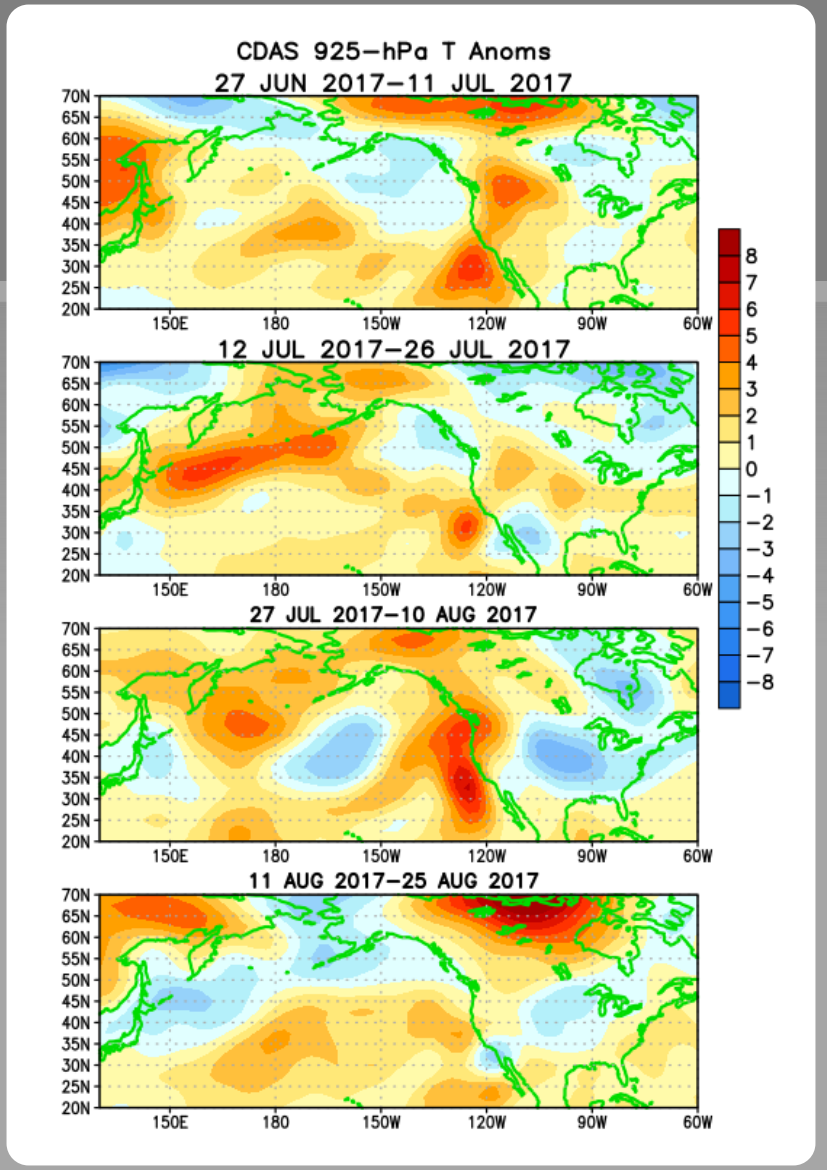
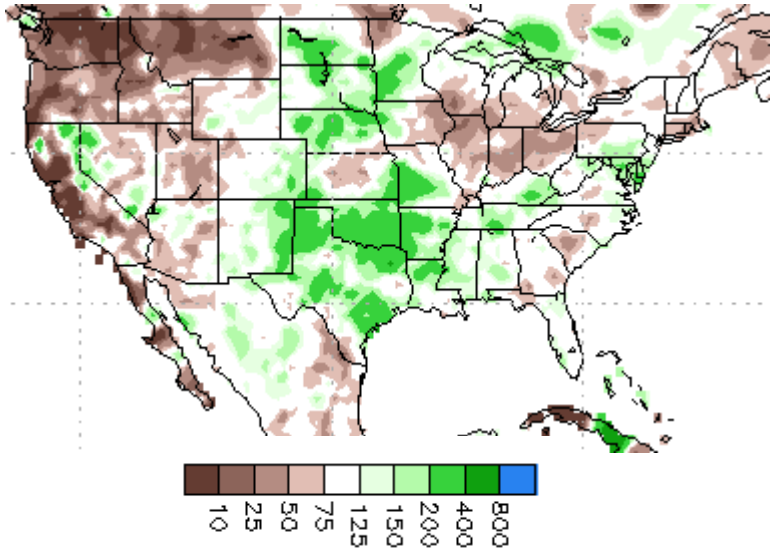


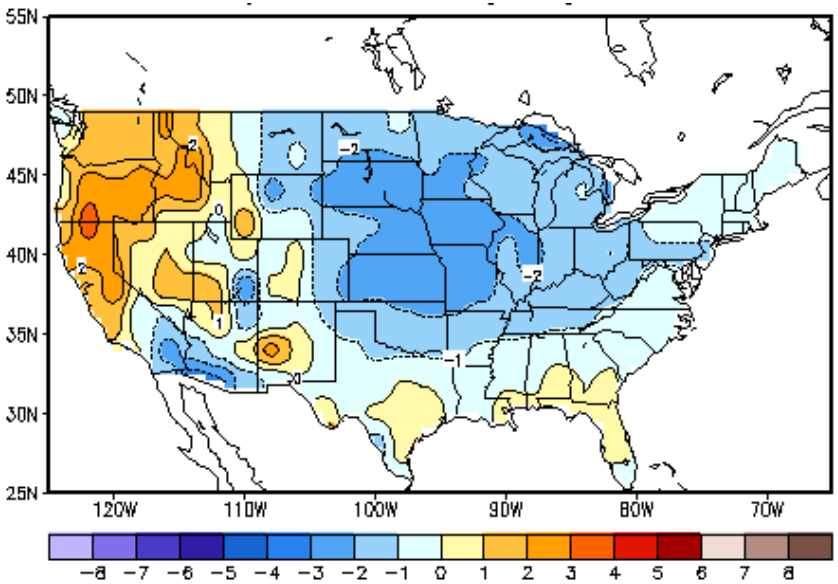
U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 26 August 2017

Percent of Average Precipitation



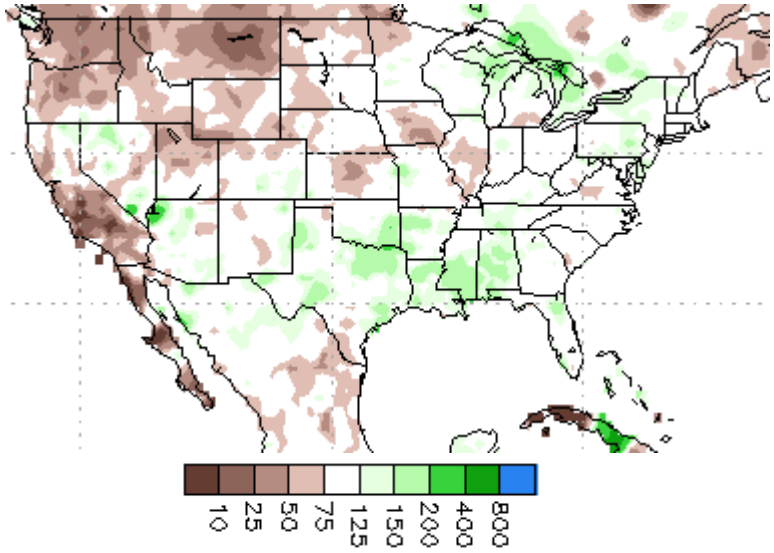
Temperature Departures (degree C)



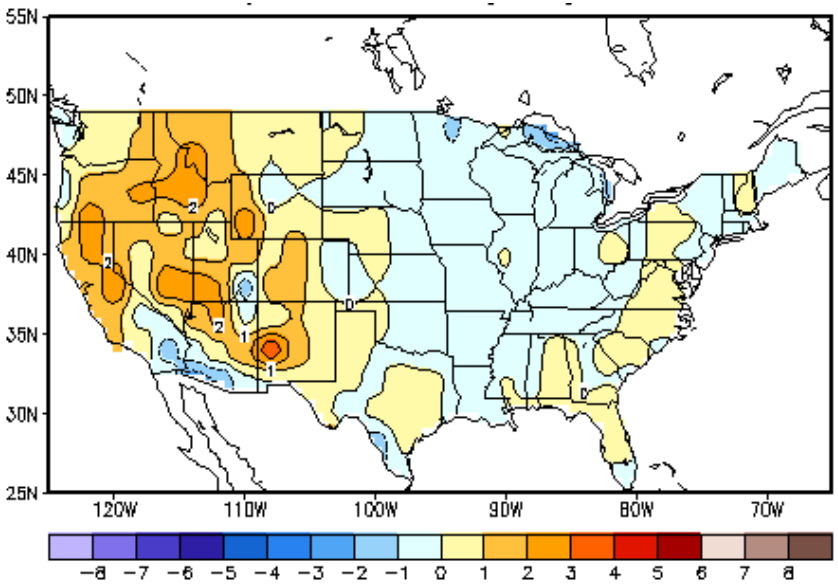
U.S. Temperature and Precipitation Departures During the Last 90 Days

End Date: 26 August 2017

Percent of Average Precipitation



Temperature Departures (degree C)

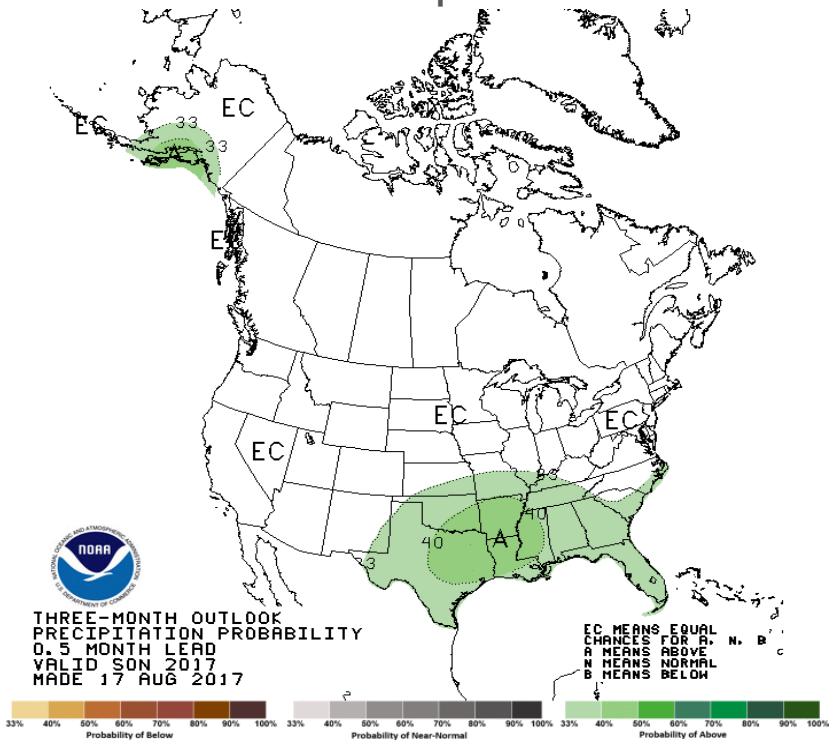


U. S. Seasonal Outlooks

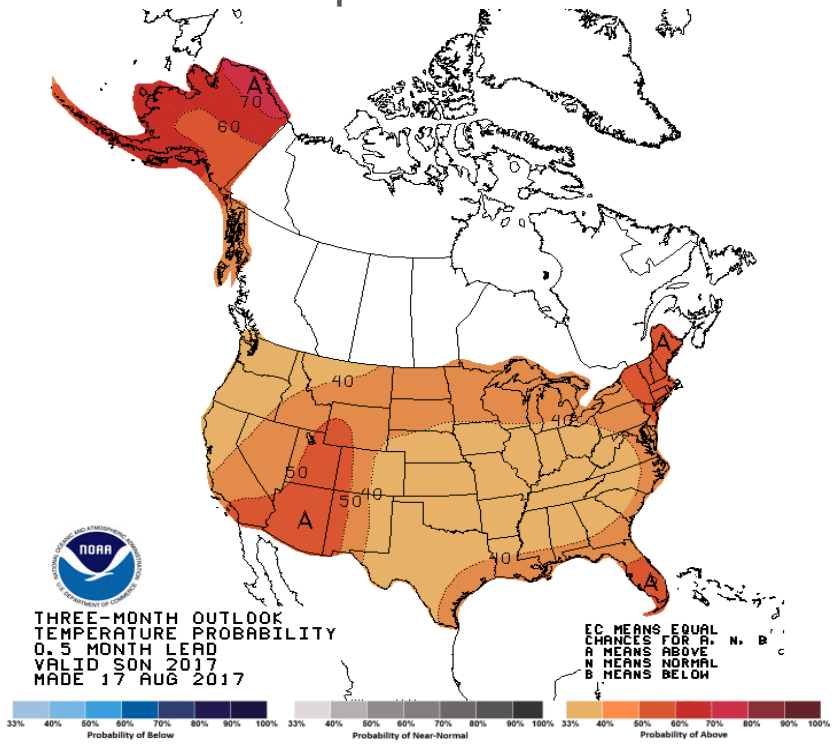
September - November 2017

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

Precipitation



Temperature



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