ENSO: Recent Evolution, Current Status and Predictions

Update prepared by:
Climate Prediction Center / NCEP
4 May 2015

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Recent Evolution and Current Conditions

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ENSO Alert System Status: El Niño Advisory

El Niño conditions are present.*

Positive equatorial sea surface temperature (SST) anomalies continue across most of the Pacific Ocean.

There is an approximately 70% chance that El Niño conditions will continue through Northern Hemisphere summer 2015, and a greater than 60% chance it will last 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.

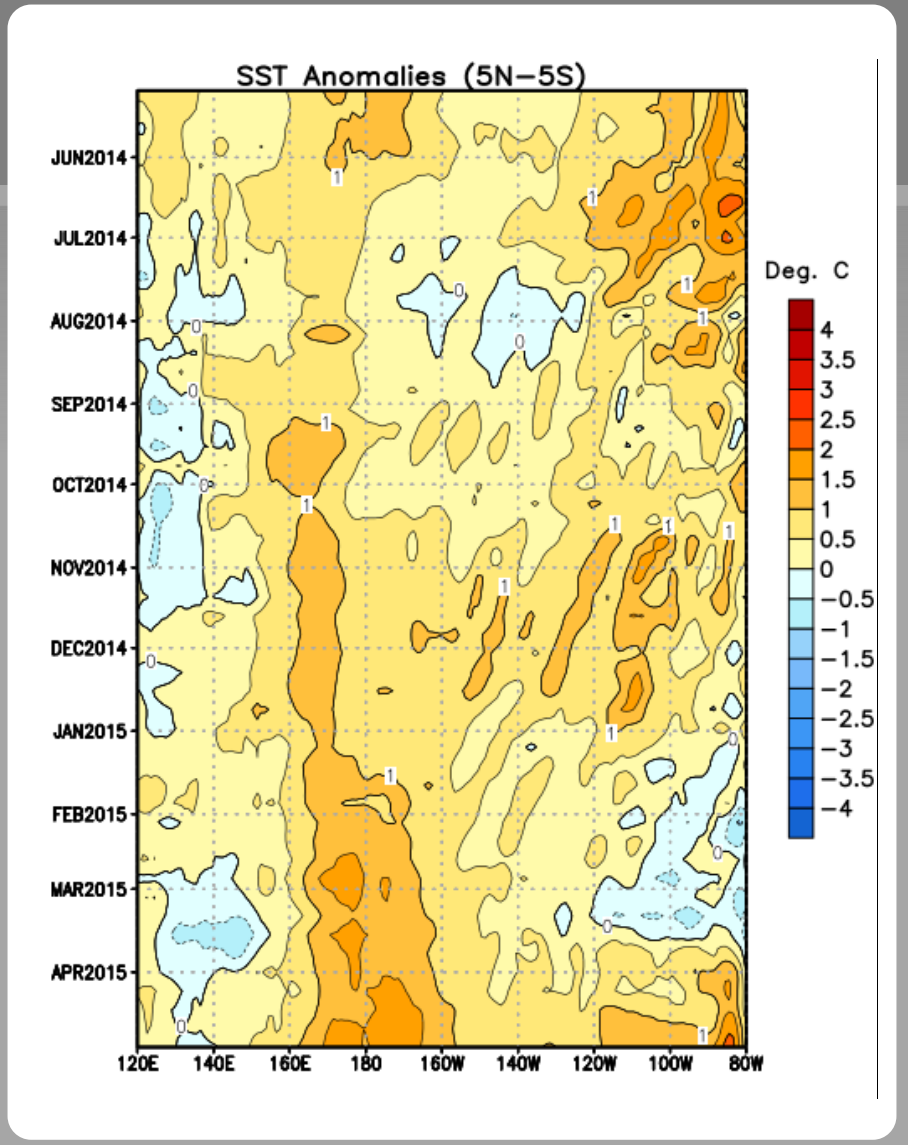
Recent Evolution of Equatorial Pacific SST Departures (°C)

During September-December 2014, positive SST anomalies covered most of the equatorial Pacific.

During January-mid March 2015, near-to-below average SSTs were observed in the eastern Pacific.

Positive SST anomalies have persisted across the western and central Pacific.

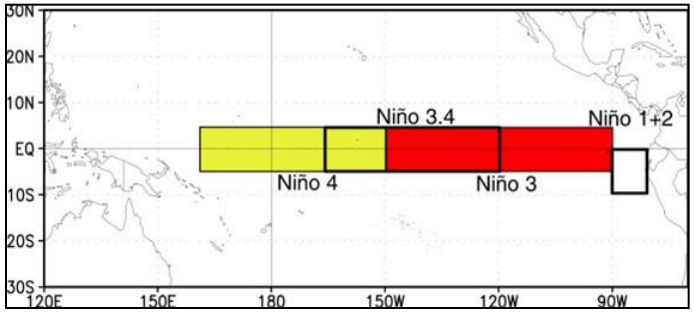
Recently, positive SST anomalies have strengthened across the Pacific.

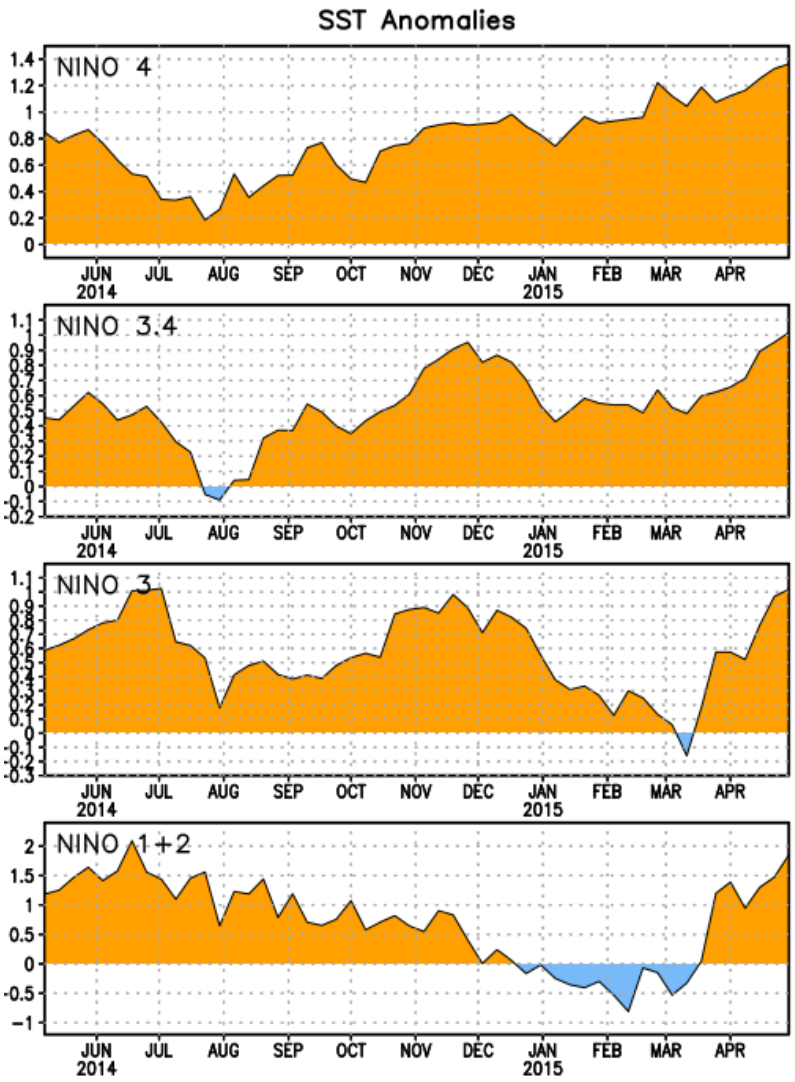


Niño Region SST Departures (ºC) Recent Evolution

The latest weekly SST departures are:

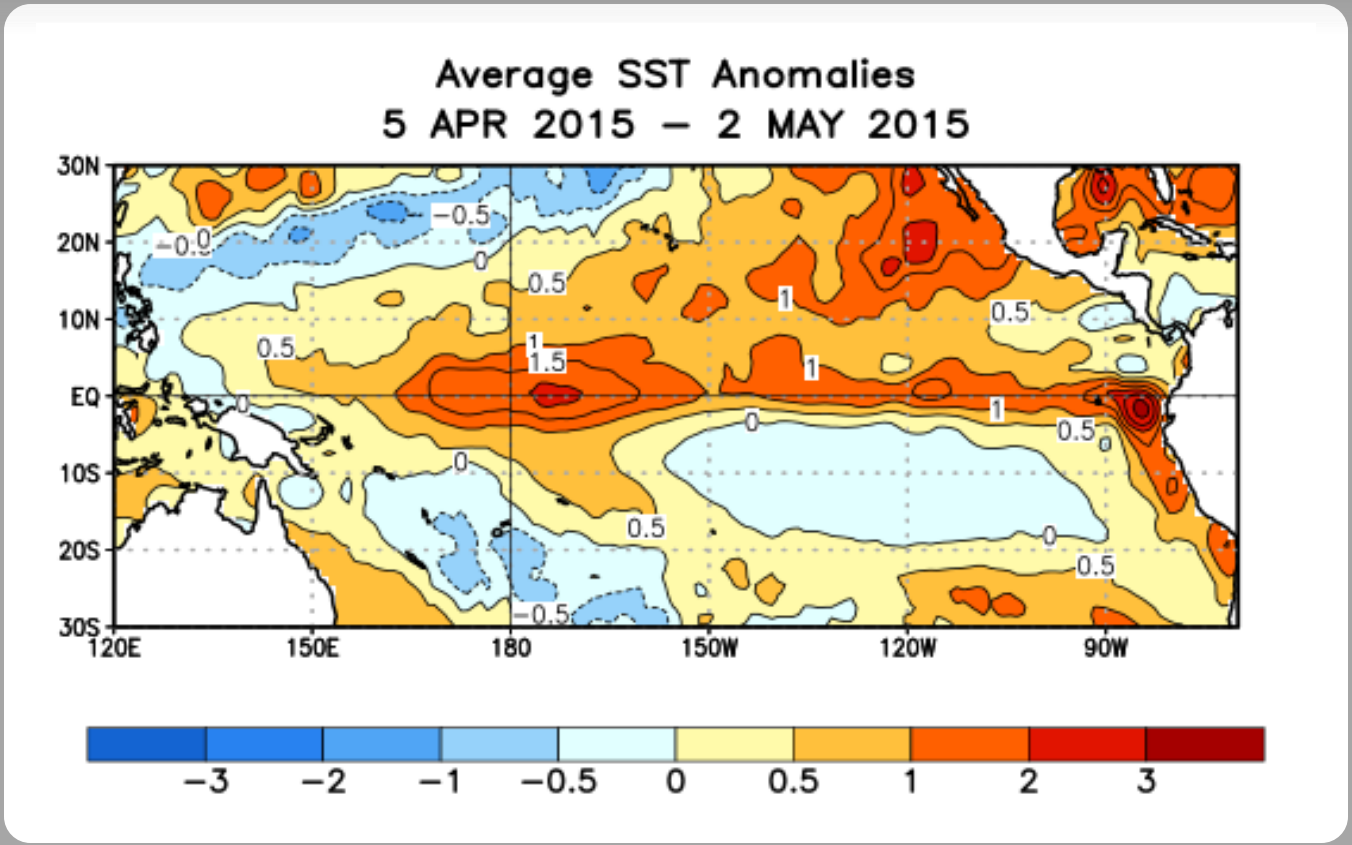
Niño 4	1.4ºC
Niño 3.4	1.0ºC
Niño 3	1.0ºC
Niño 1+2	1.9ºC





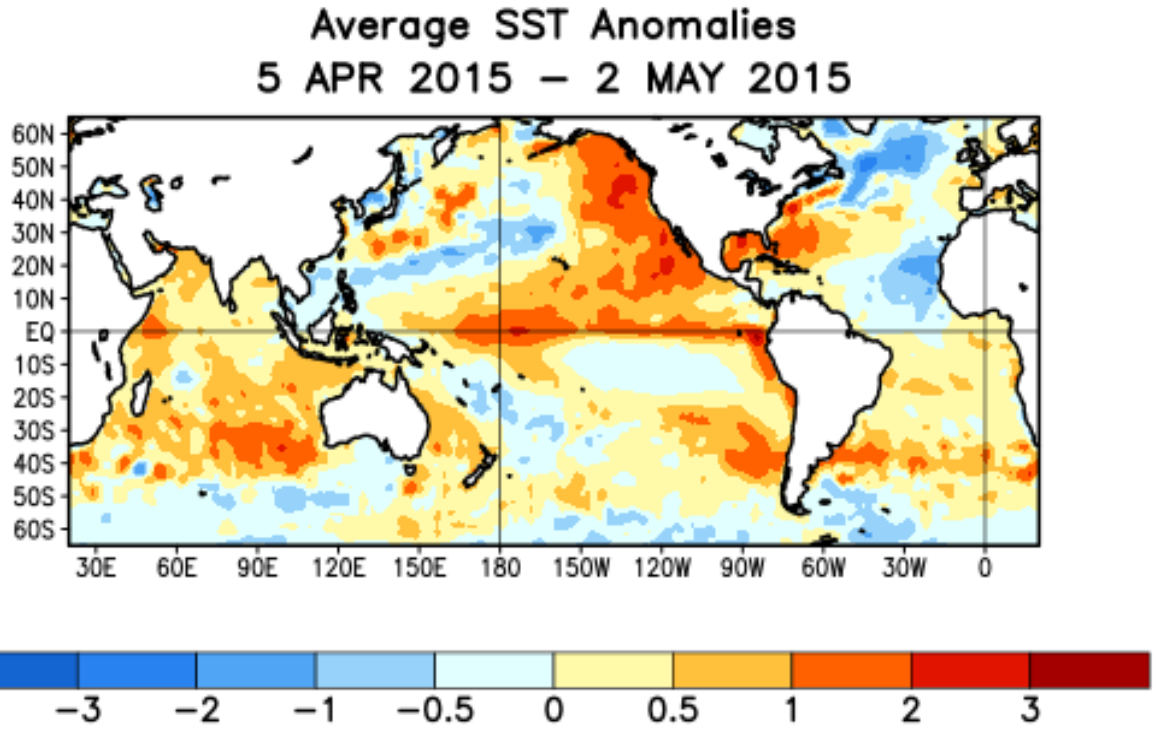
SST Departures (ºC) in the Tropical Pacific During the Last Four Weeks

During the last four weeks, equatorial SSTs were above average across most of the Pacific, with the largest anomalies present near the Date Line and off the coast of S. America.



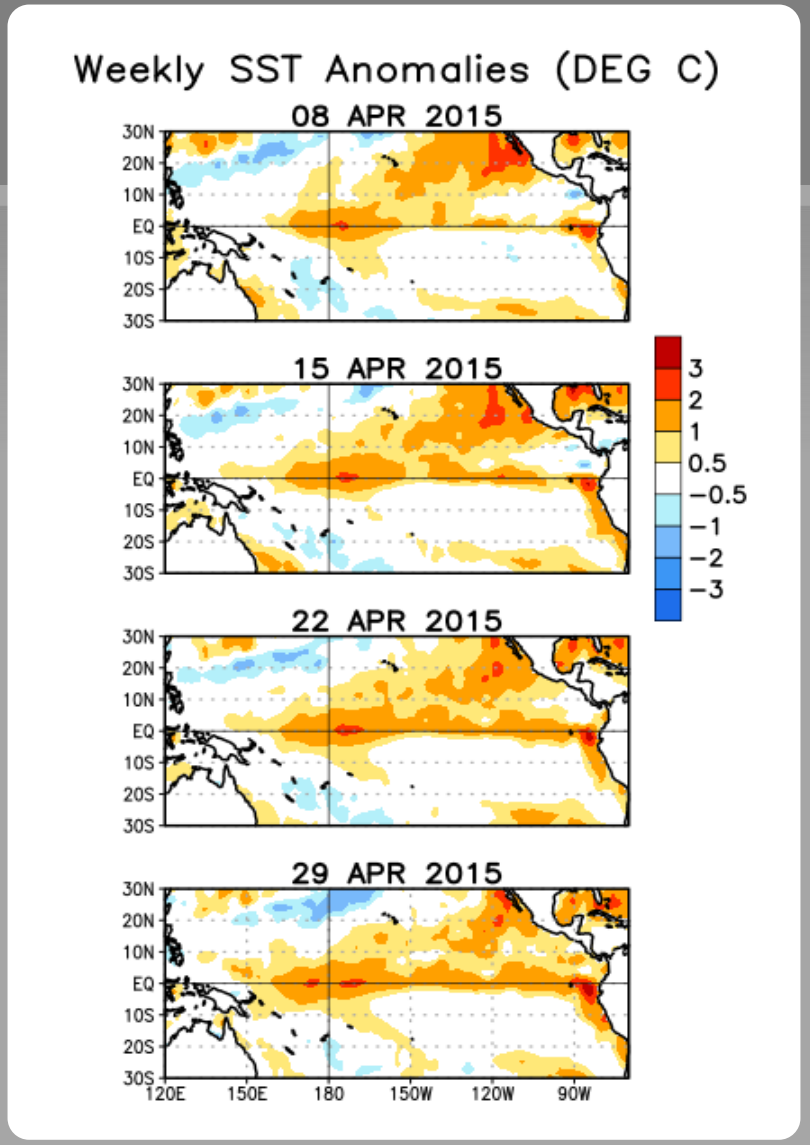
Global SST Departures (°C) During the Last Four Weeks

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



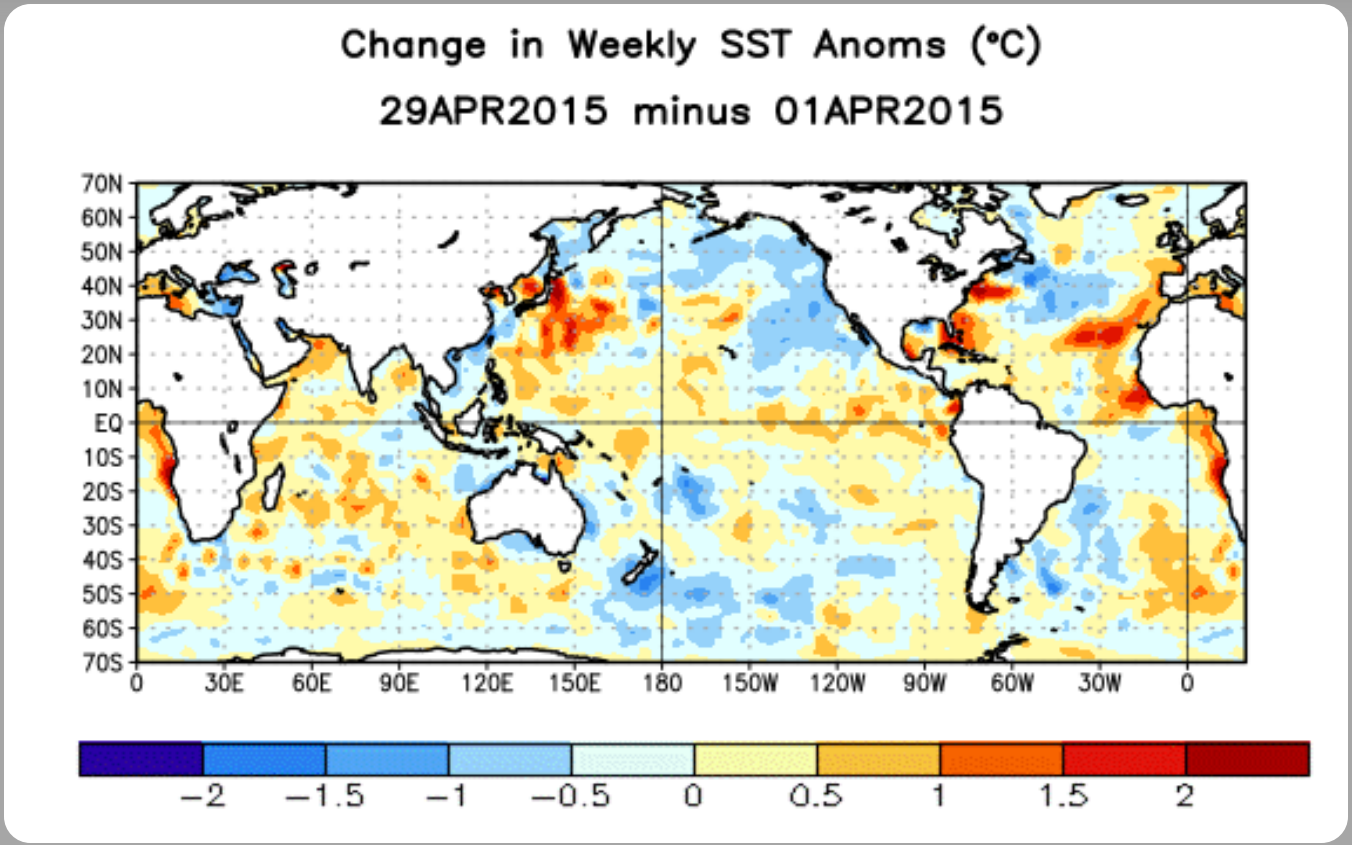
Weekly SST Departures during the Last Four Weeks

During the last four weeks, positive equatorial SST anomalies strengthened across the Pacific.



Change in Weekly SST Departures over the Last Four Weeks

During the last four weeks, an increase in SST anomalies occurred across the equatorial Pacific.



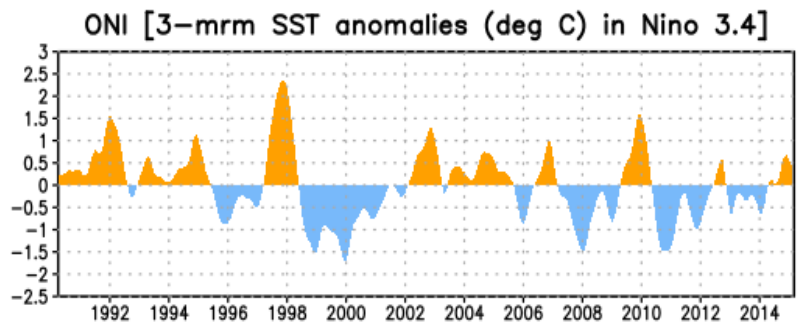
Upper-Ocean Conditions in the Equatorial Pacific

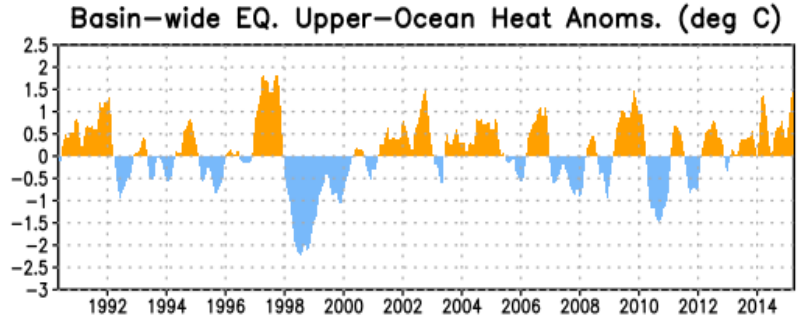
The basin-wide equatorial upper ocean (0-300 m) heat content is greatest prior to and during the early stages of a Pacific warm (El Niño) episode (compare top 2 panels), and least prior to and during the early stages of a cold (La Niña) episode.

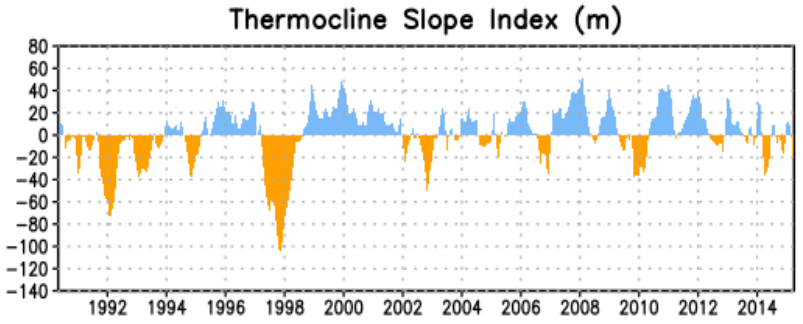
The slope of the oceanic thermocline is least (greatest) during warm (cold) episodes.

Recent values of the upper-ocean heat anomalies (positive) and thermocline slope index (negative) reflect El Niño 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).

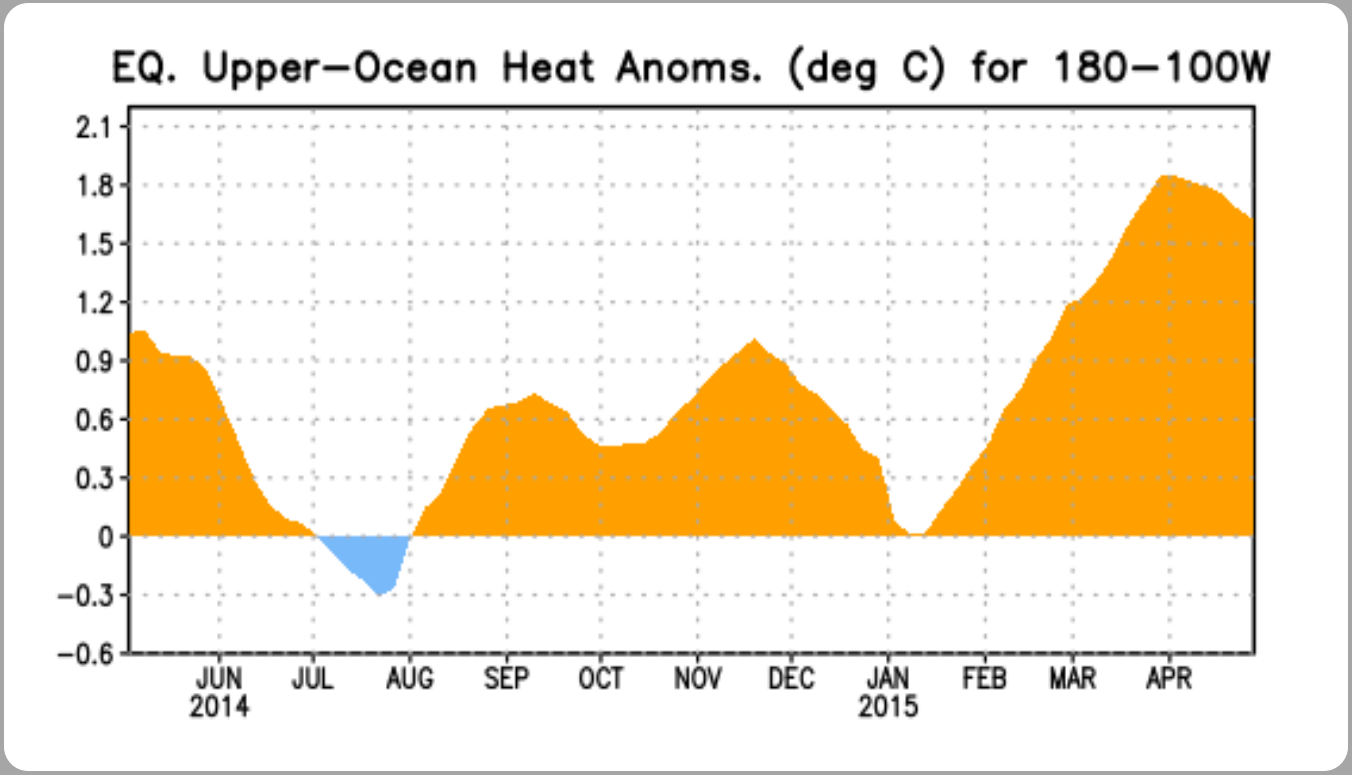






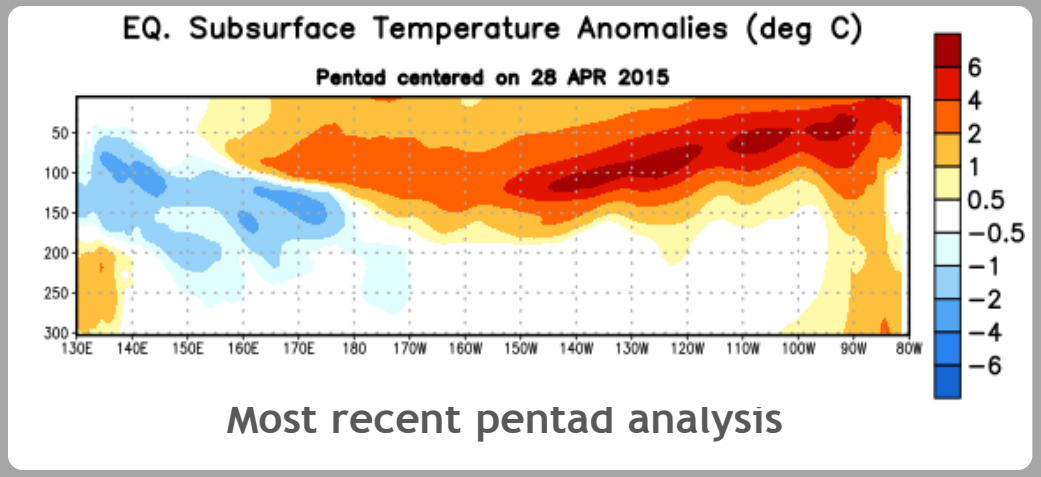
Central and Eastern Pacific Upper-Ocean (0-300 m) Weekly Average Temperature Anomalies

Subsurface temperature anomalies increased from mid-October to mid-November 2014 before decreasing to near zero in early January 2015. From January to March, temperatures anomalies grew significantly. During April, the strongly positive anomalies decreased slightly.



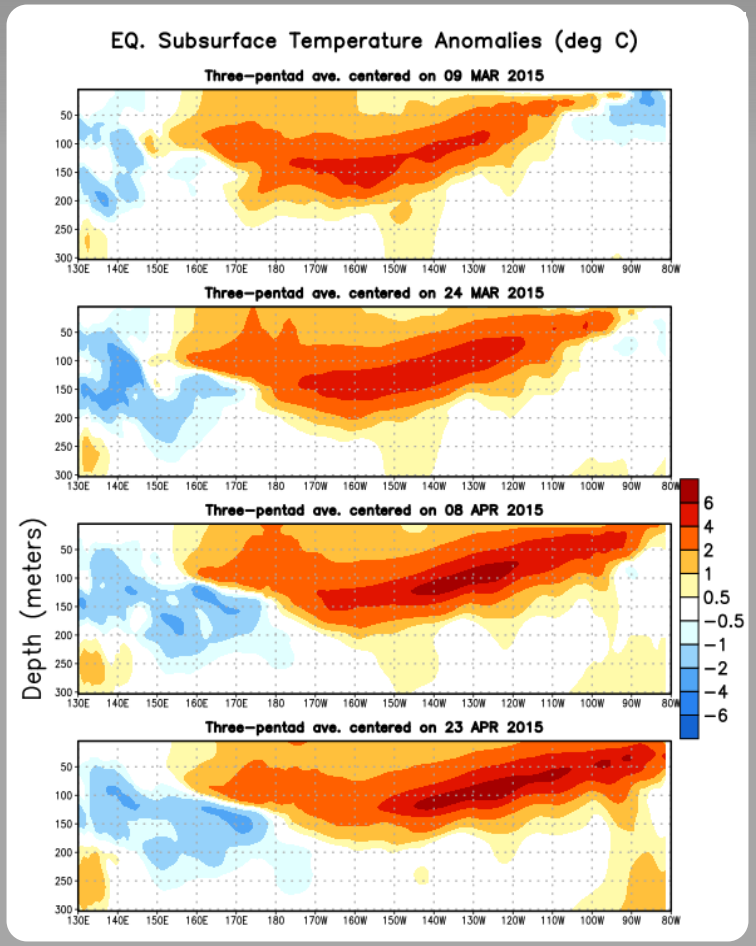
Sub-Surface Temperature Departures in the Equatorial Pacific

During the last two months, positive subsurface temperature anomalies increased at depth in the eastern Pacific.



Most recent pentad analysis

Recently, negative anomalies in the eastern Pacific have dissipated, while they have increased at depth in the western Pacific.

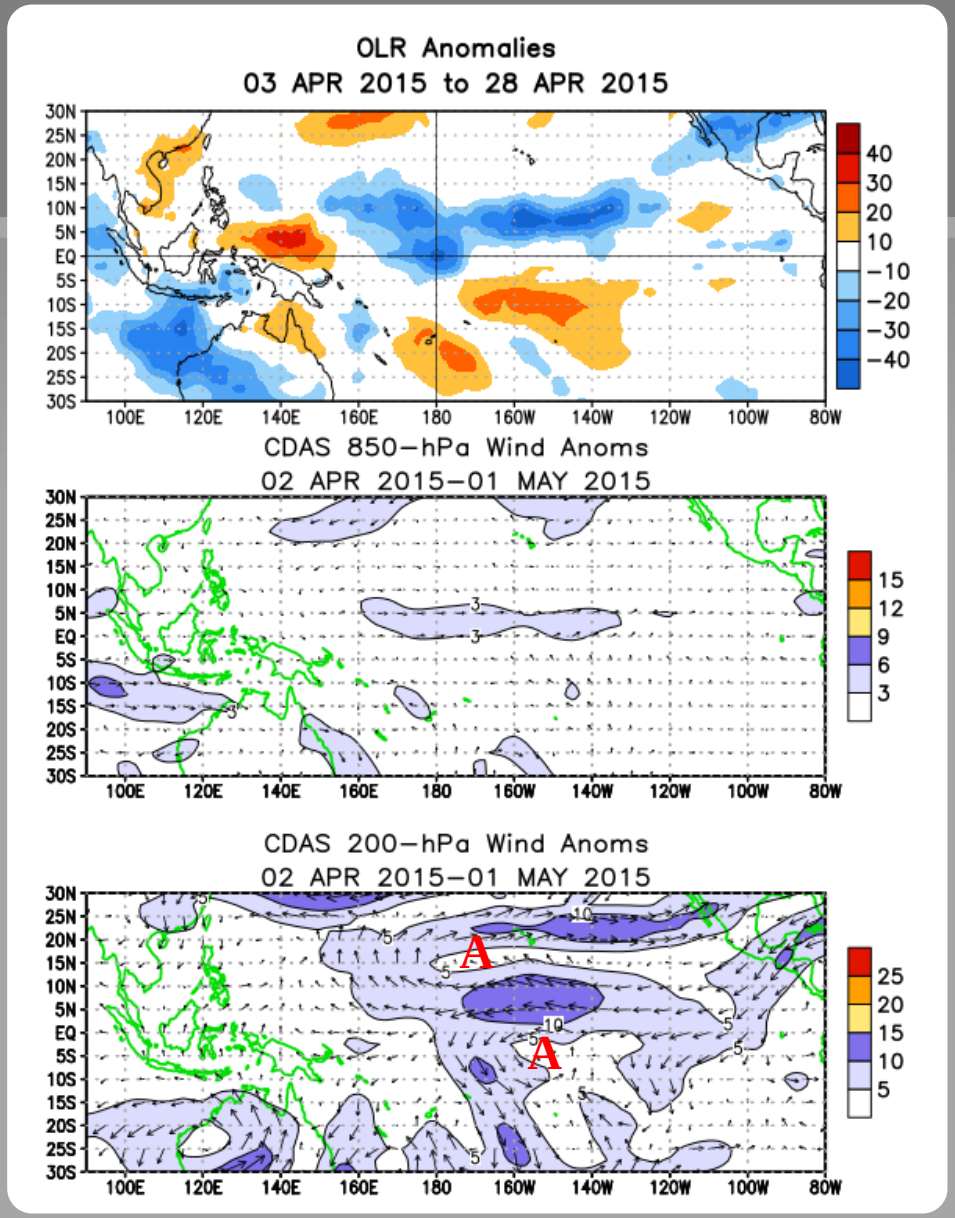


Tropical OLR and Wind Anomalies During the Last 30 Days

Negative OLR anomalies (enhanced convection and precipitation) were evident near the Date Line. Positive OLR anomalies (suppressed convection and precipitation) were located over the far western Pacific.

Weak, anomalous low-level (850-hPa) westerly winds were located in the central and east-central Pacific.

Anomalous upper-level (200-hPa) easterlies were observed over the central and east-central Pacific. An anomalous anti-cyclonic couplet straddled the equator over the central 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.

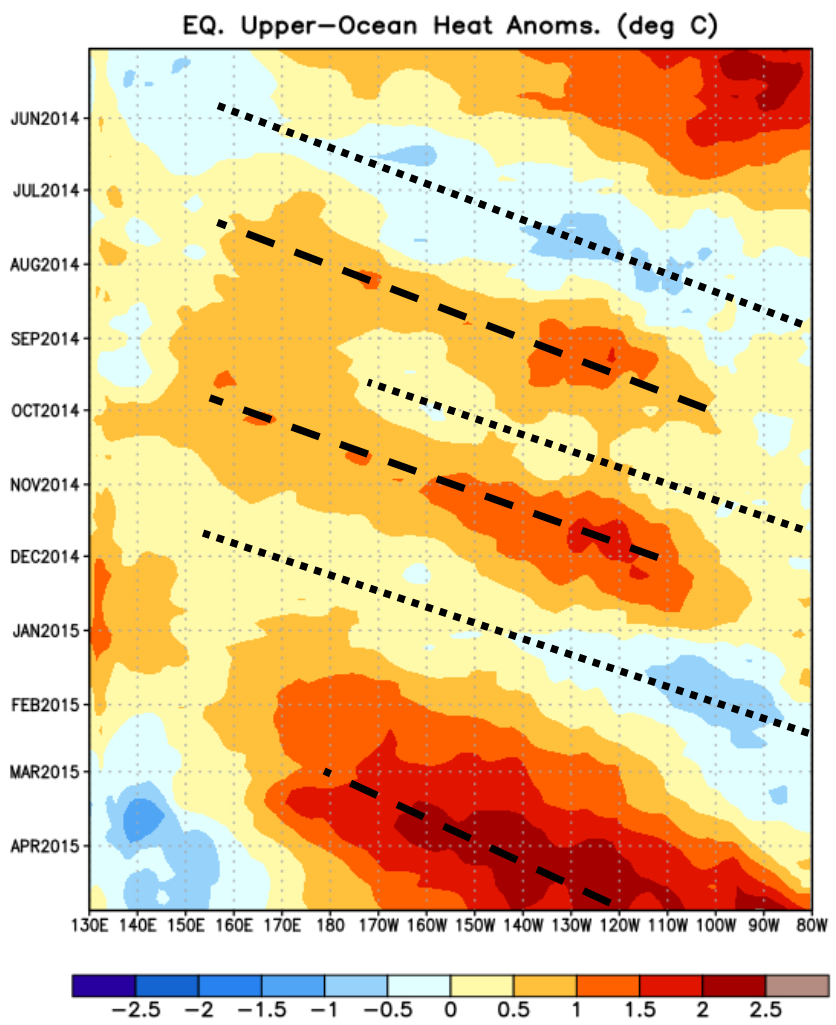
Weekly Heat Content Evolution in the Equatorial Pacific

The upwelling phase of a Kelvin wave went through during May-July.

During October-November, positive subsurface temperature anomalies increased and shifted eastward in association with the downwelling phase of a Kelvin wave.

During November - January, the upwelling phase of a Kelvin wave shifted eastward.

Since January, another downwelling phase of a Kelvin wave has pushed eastward.

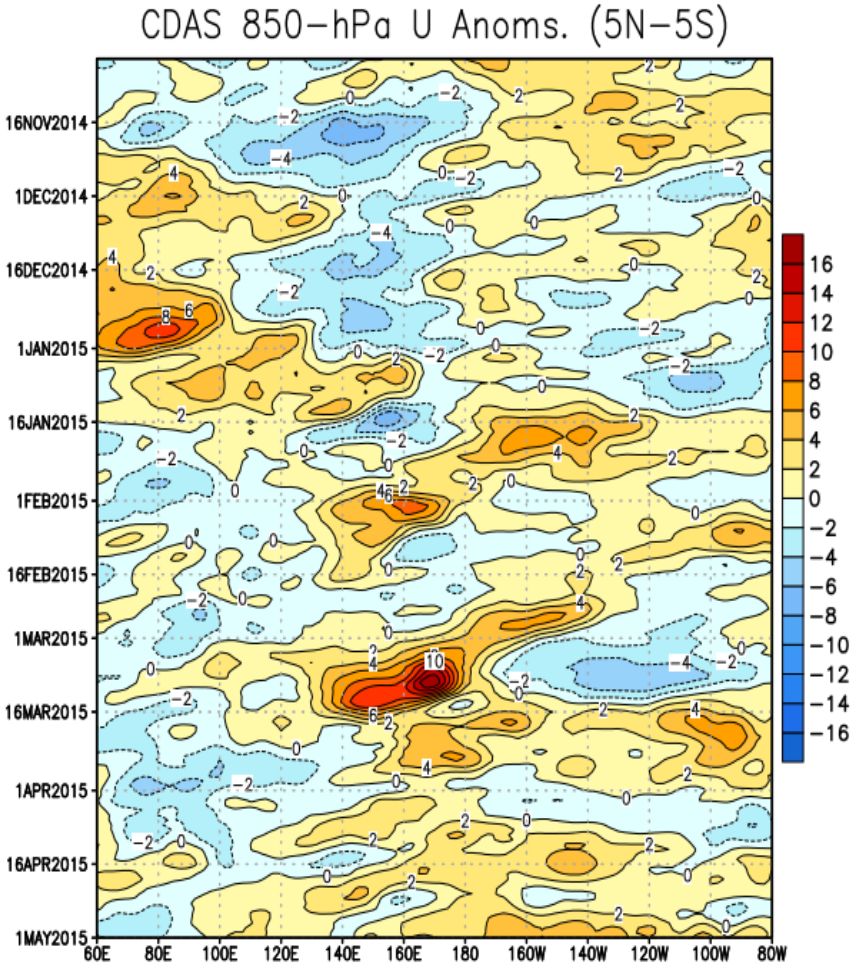


Oceanic Kelvin waves have alternating warm and cold phases. The warm phase is indicated by dashed lines. Down-welling and warming occur in the leading portion of a Kelvin wave, and up-welling and cooling occur in the trailing portion.

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

During early March, a strong westerly wind burst was observed between 140°E and 180°.

Recently, anomalous westerly winds were present over most of the equatorial Pacific.



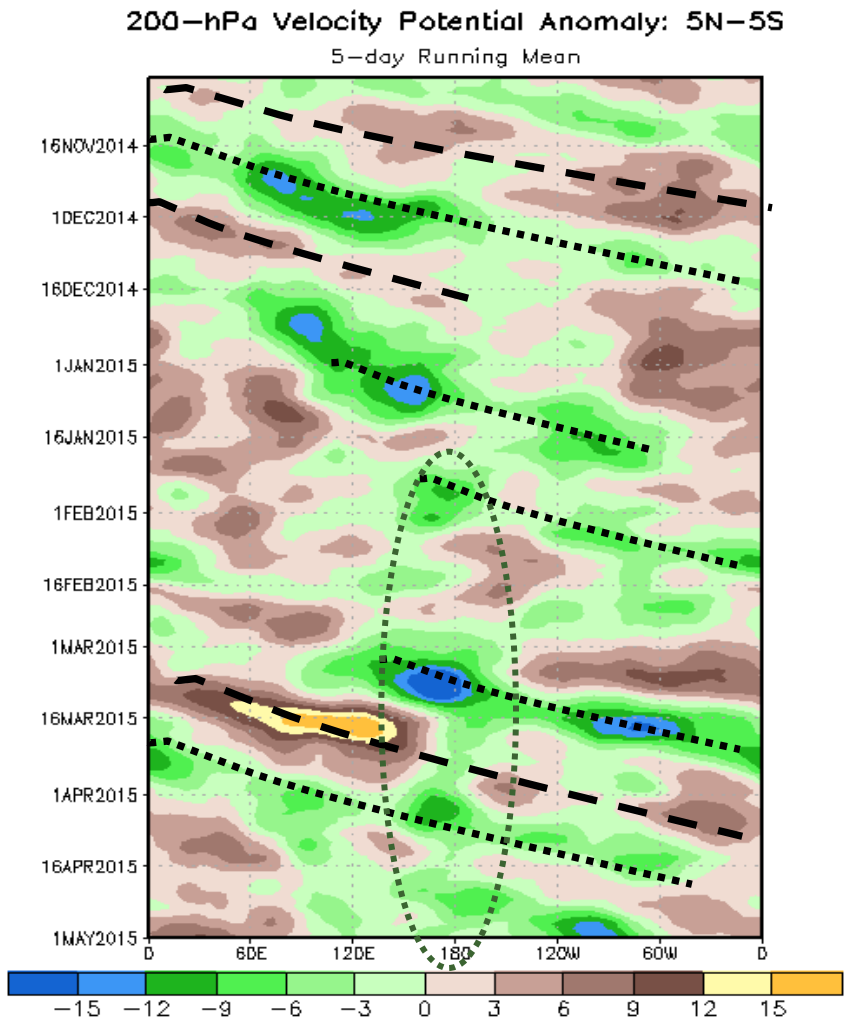
Westerly Wind Anomalies (orange/red shading)
Easterly Wind Anomalies (blue shading)

Upper-level (200-hPa) Velocity Potential Anomalies

During November through mid-December, the Madden-Julian Oscillation (MJO) emerged.

During March 2015, an MJO was associated with eastward propagating velocity potential anomalies.

Since mid-January 2015, anomalous upper-level divergence has prevailed near the Date Line.



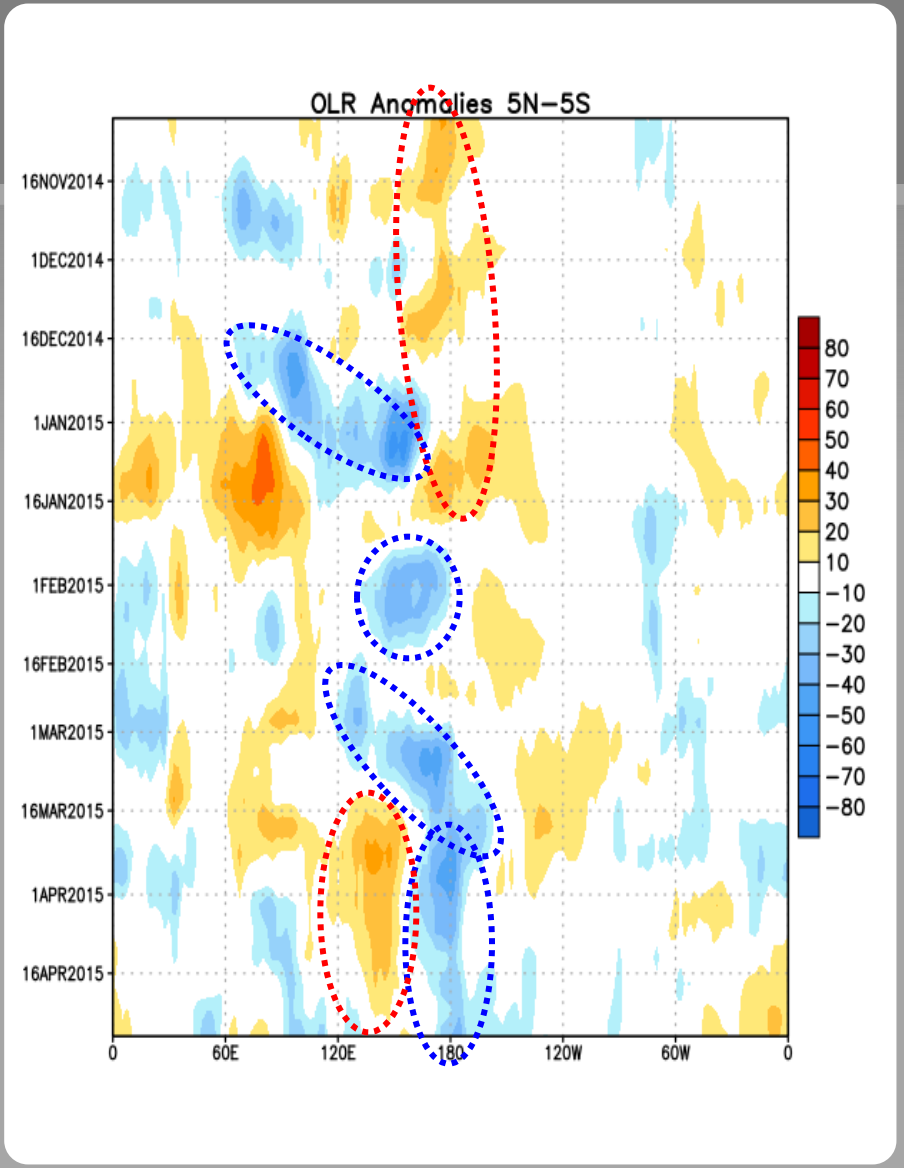
Unfavorable for precipitation (brown shading)
Favorable for precipitation (green shading)

Outgoing Longwave Radiation (OLR) Anomalies

During November- mid January, positive OLR anomalies were observed near the Date Line.

During early March, negative OLR anomalies shifted from Indonesia to the Date Line.

Since mid March, positive anomalies have been evident near Indonesia, while negative anomalies have persisted near 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.v3b). The SST reconstruction methodology is described in Smith et al., 2008, J. Climate, vol. 21, 2283-2296.)

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.

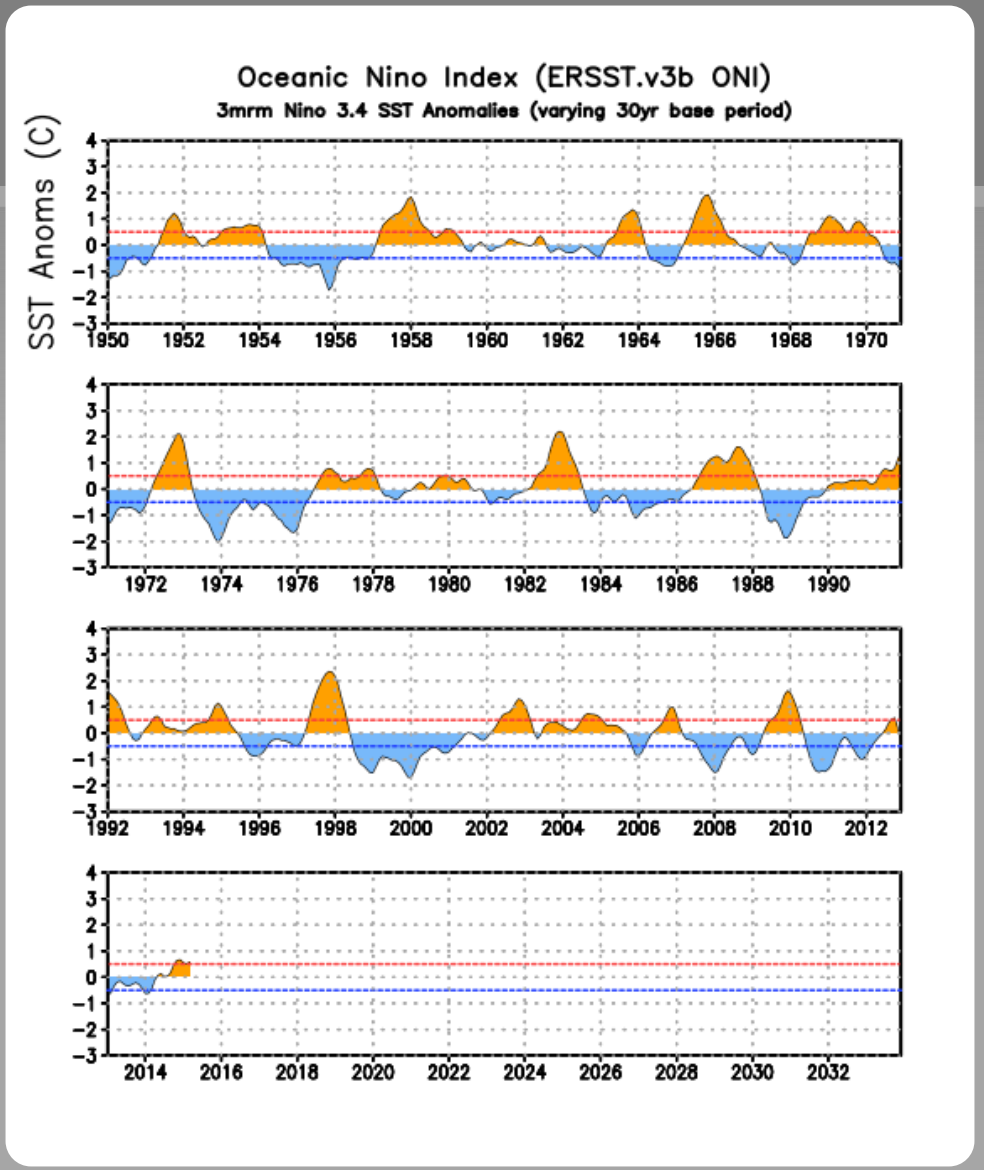
La Niña: characterized by a negative ONI less than or equal to -0.5°C.

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 2015) is 0.6°C.



Historical El Niño and La Niña Episodes Based on the ONI computed using ERSST.v3b

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.v3b 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.

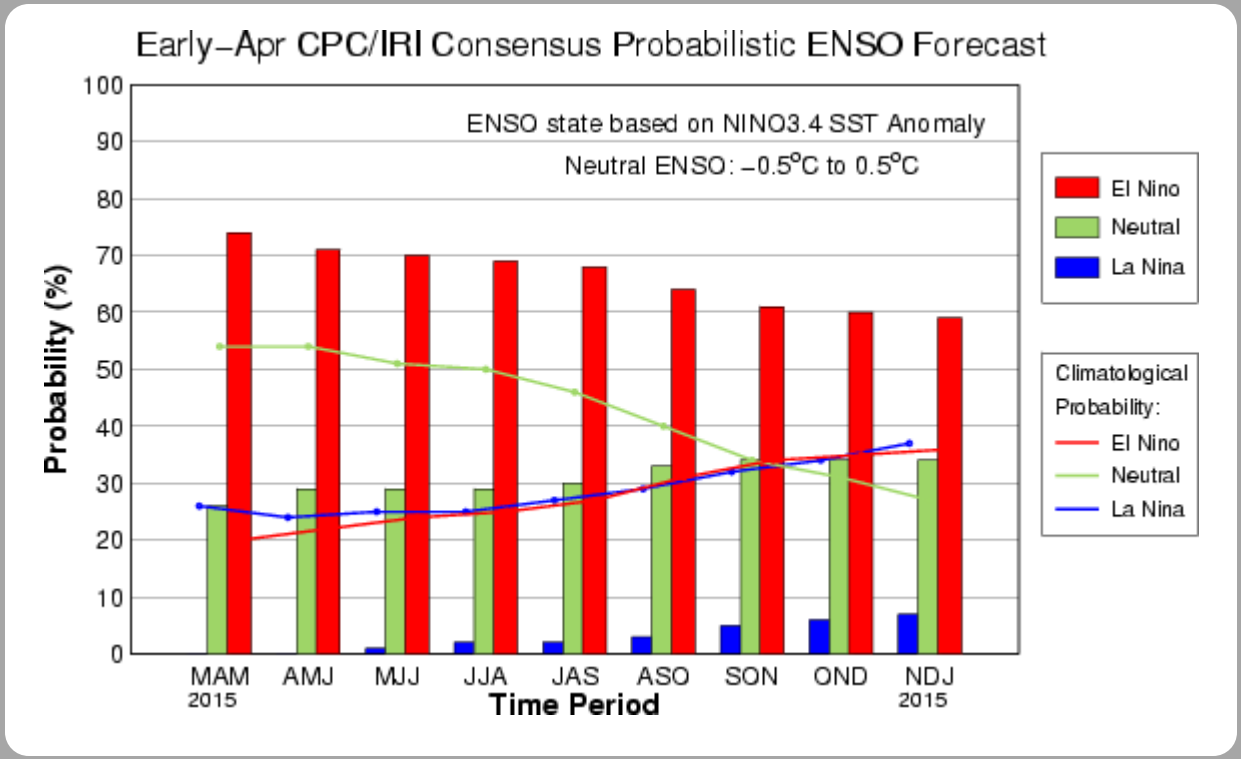
The ONI is one measure of the El Niño-Southern Oscillation, and other indices can confirm whether features consistent with a coupled ocean-atmosphere phenomenon accompanied these periods. The complete table going back to DJF 1950 can be found here.

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2003	1.1	0.8	0.4	0.0	-0.2	-0.1	0.2	0.4	0.4	0.4	0.4	0.3
2004	0.3	0.2	0.1	0.1	0.2	0.3	0.5	0.7	0.8	0.7	0.7	0.7
2005	0.6	0.4	0.3	0.3	0.3	0.3	0.2	0.1	0.0	-0.2	-0.5	-0.8
2006	-0.9	-0.7	-0.5	-0.3	0.0	0.1	0.2	0.3	0.5	0.8	1.0	1.0
2007	0.7	0.3	-0.1	-0.2	-0.3	-0.3	-0.4	-0.6	-0.8	-1.1	-1.2	-1.4
2008	-1.5	-1.5	-1.2	-0.9	-0.7	-0.5	-0.3	-0.2	-0.1	-0.2	-0.5	-0.7
2009	-0.8	-0.7	-0.5	-0.2	0.2	0.4	0.5	0.6	0.8	1.1	1.4	1.6
2010	1.6	1.3	1.0	0.6	0.1	-0.4	-0.9	-1.2	-1.4	-1.5	-1.5	-1.5
2011	-1.4	-1.2	-0.9	-0.6	-0.3	-0.2	-0.2	-0.4	-0.6	-0.8	-1.0	-1.0
2012	-0.9	-0.6	-0.5	-0.3	-0.2	0.0	0.1	0.4	0.5	0.6	0.2	-0.3
2013	-0.6	-0.6	-0.4	-0.2	-0.2	-0.3	-0.3	-0.3	-0.3	-0.2	-0.3	-0.4
2014	-0.6	-0.6	-0.5	-0.1	0.1	0.1	0.0	0.0	0.2	0.5	0.7	0.7
2015	0.6	0.5	0.6									

CPC/IRI Probabilistic ENSO Outlook

Updated: 9 April 2015

The chance of El Niño is approximately 60-70% through 2015.



IRI/CPC Pacific Niño 3.4 SST Model Outlook

The majority of the models indicate Niño 3.4 SST anomalies will remain greater than or equal to +0.5C through the end of 2015.

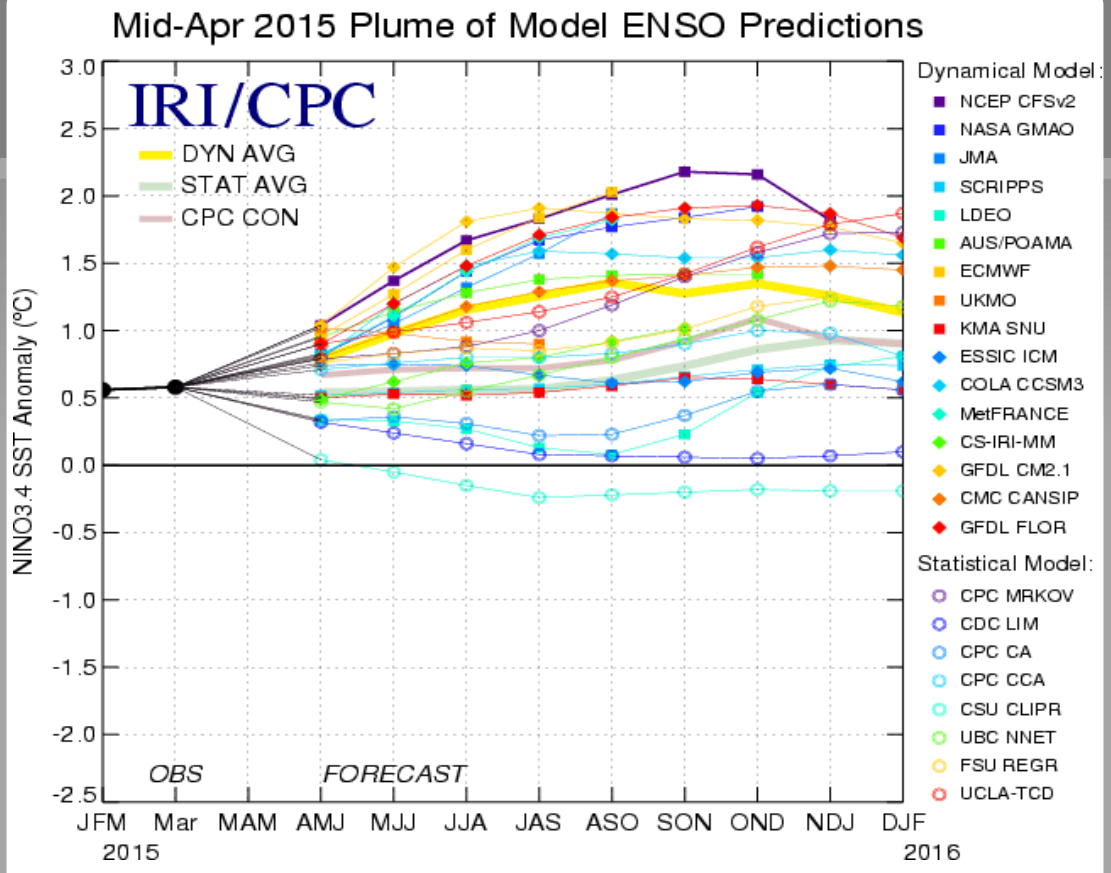
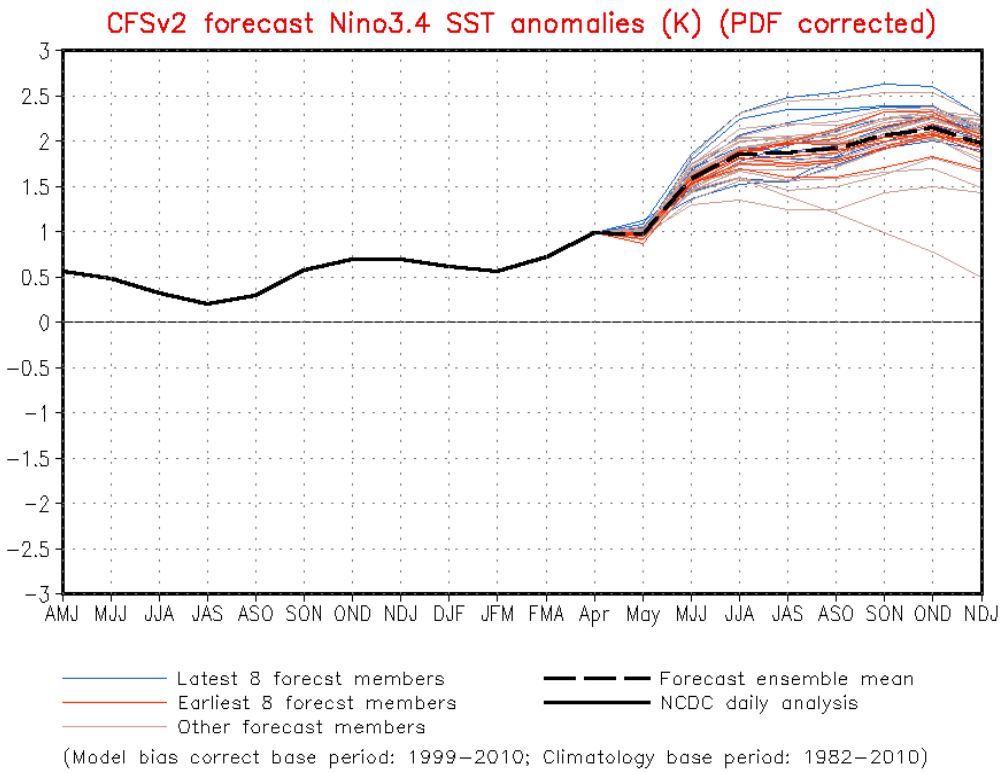


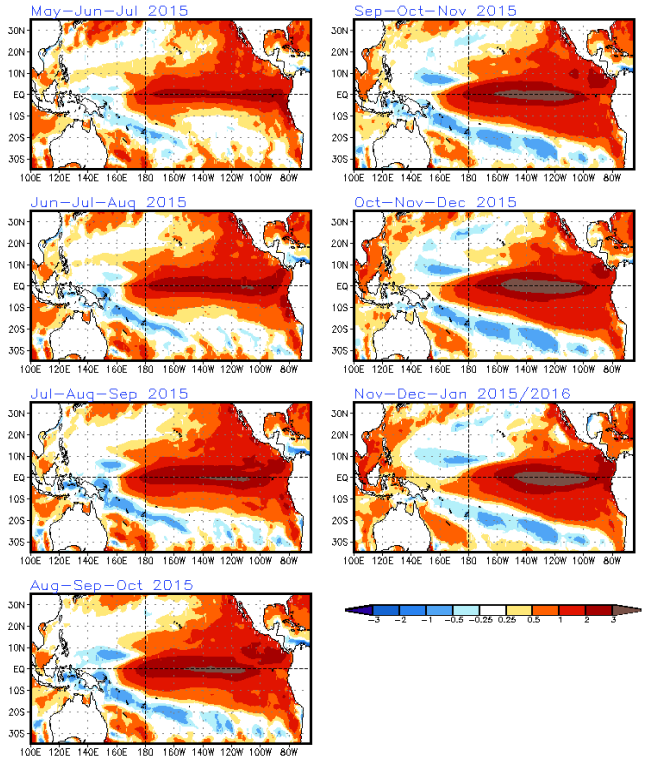
Figure provided by the International Research Institute (IRI) for Climate and Society (updated 14 April 2015).

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

Issued: 4 May 2015

The CFS.v2 ensemble mean (black dashed line) predicts El Niño through NDJ 2015-16.

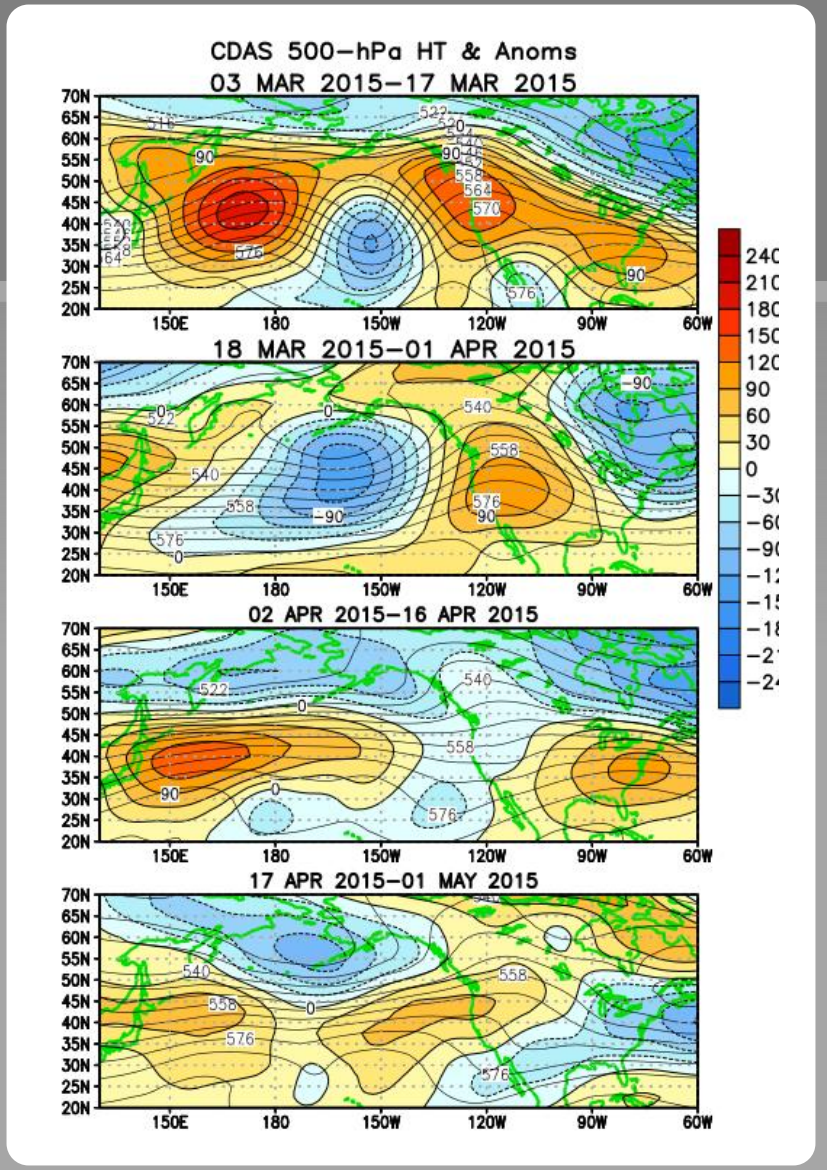




Atmospheric anomalies over the North Pacific and North America During the Last 60 Days

From March-April 2015, above average heights and temperatures have prevailed over western North America.

Over eastern North America, the anomalous pattern has been more variable.



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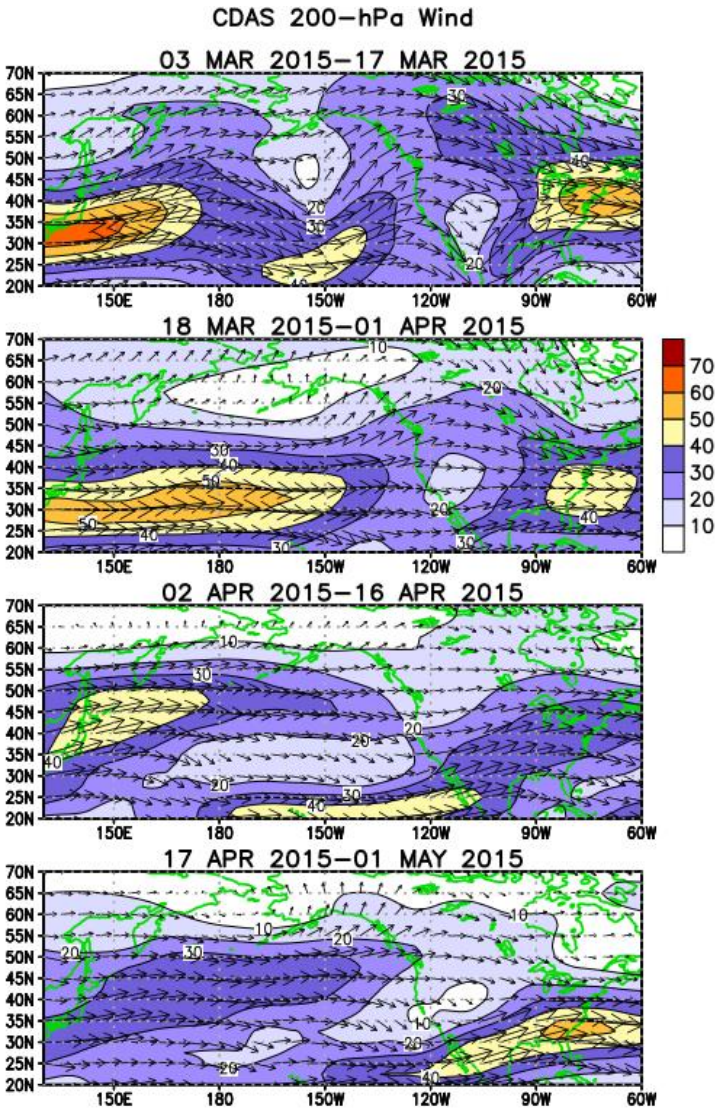

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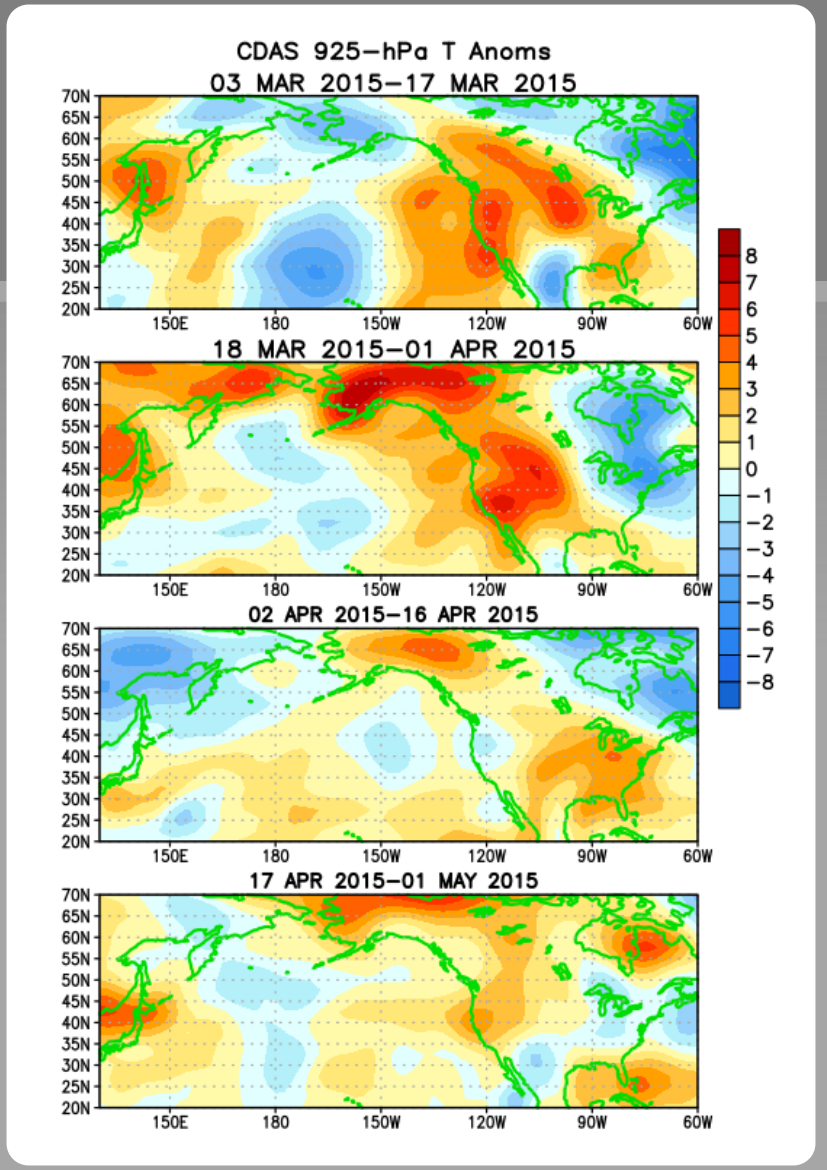
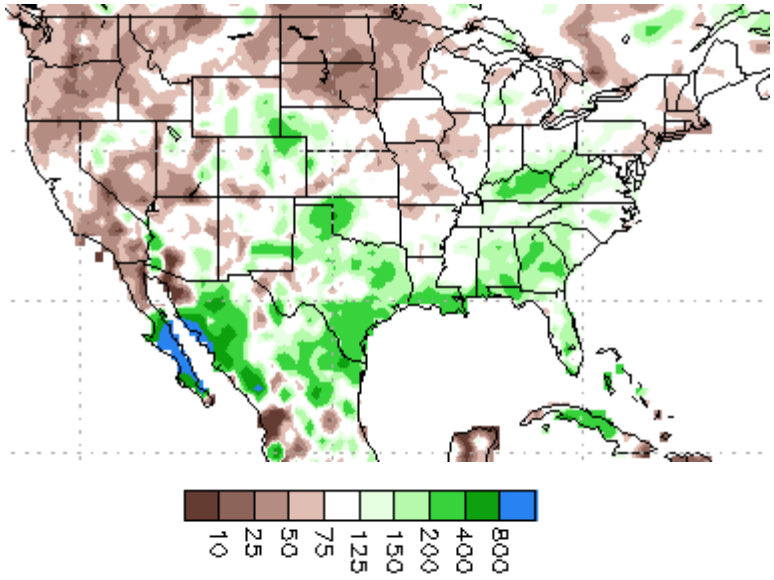


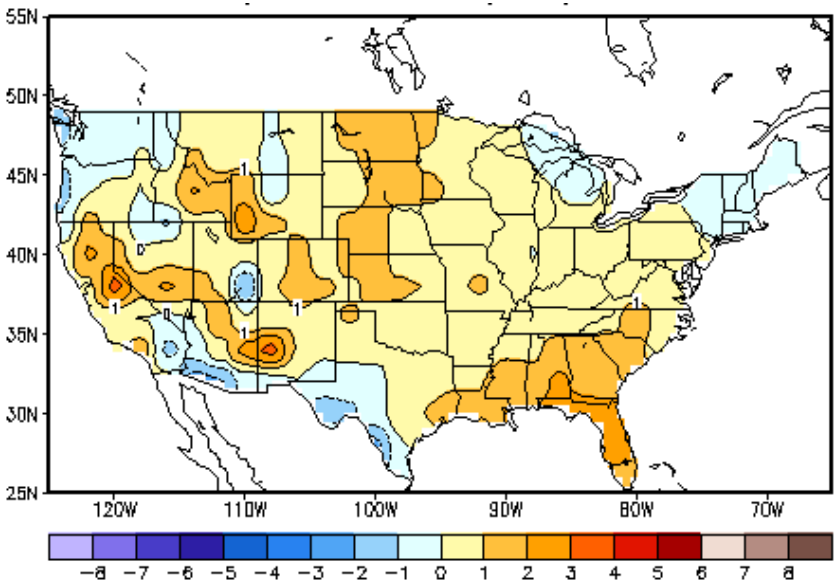
U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 2 May 2015

Percent of Average Precipitation



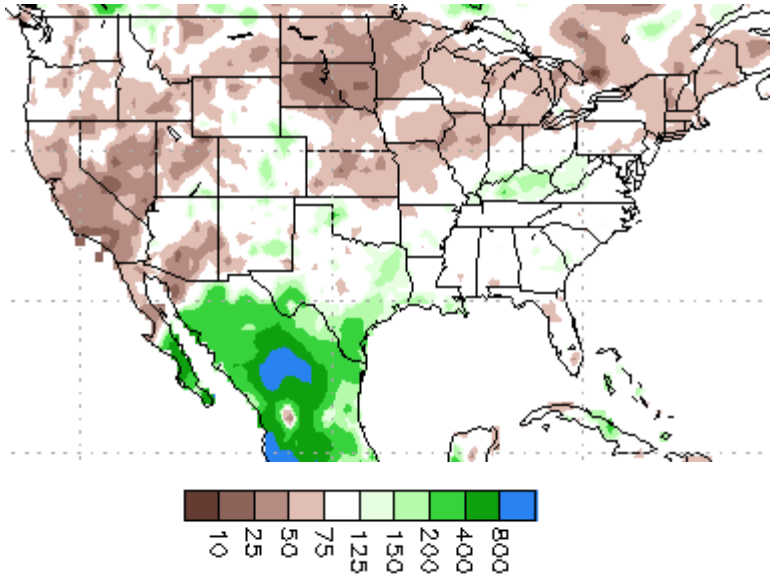
Temperature Departures (degree C)



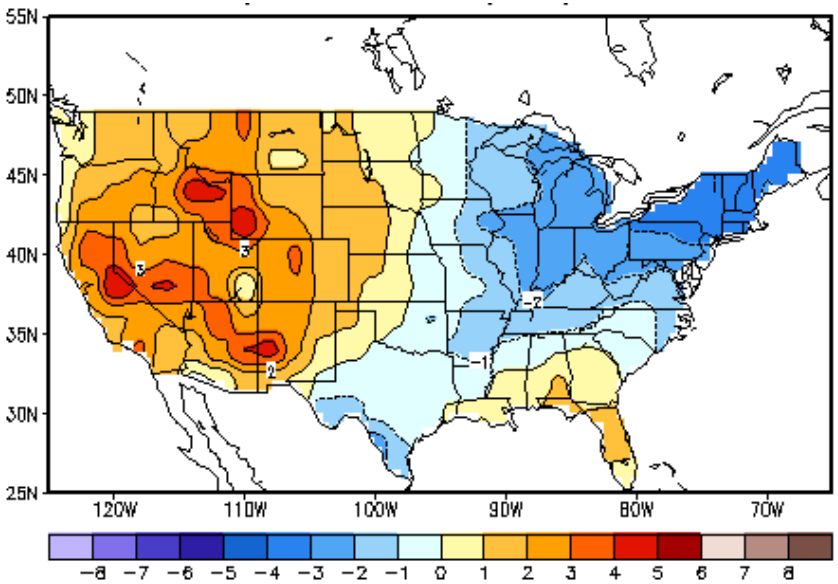
U.S. Temperature and Precipitation Departures During the Last 90 Days

End Date: 2 May 2015

Percent of Average Precipitation



Temperature Departures (degree C)

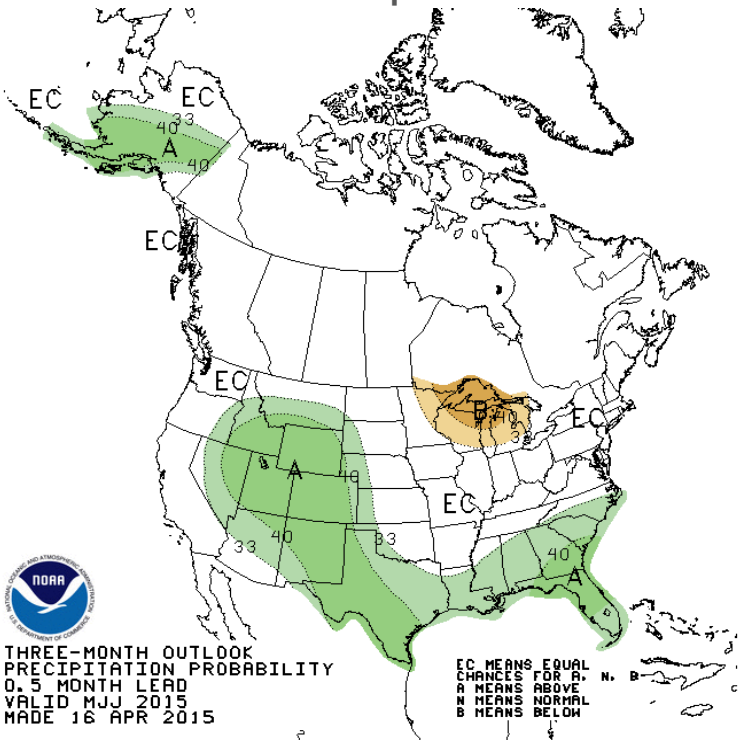


U. S. Seasonal Outlooks

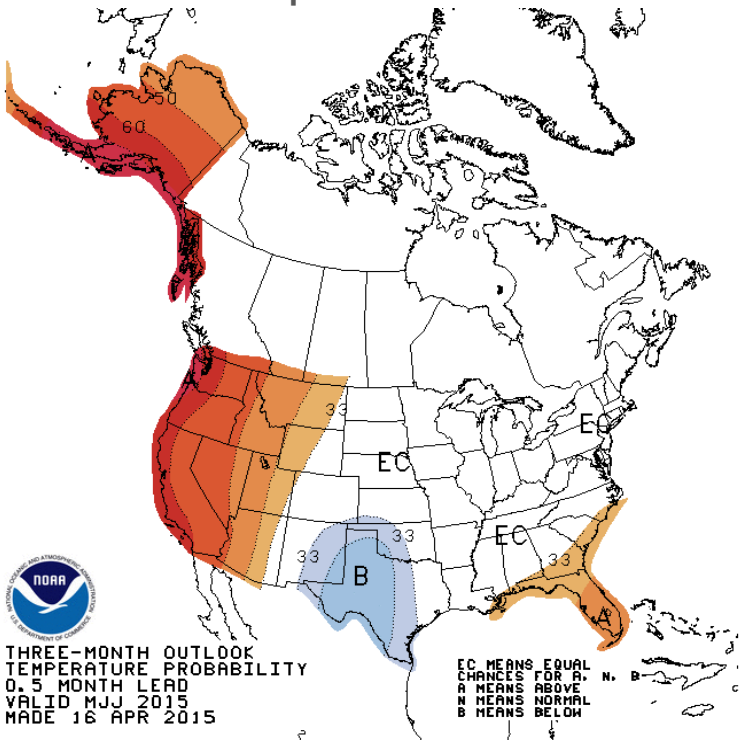
May - July 2015

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

Precipitation



Temperature



Summary

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There is an approximately 70% chance that El Niño conditions will continue through Northern Hemisphere summer 2015, and a greater than 60% chance it will last through autumn.*

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