# ENSO: Recent Evolution, Current Status and Predictions


Update prepared by:
Climate Prediction Center / NCEP
1 June 2015

# 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: 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 90% chance that El Niño conditions will continue through Northern Hemisphere summer 2015, and a greater than 80% chance it will last through 2015.***

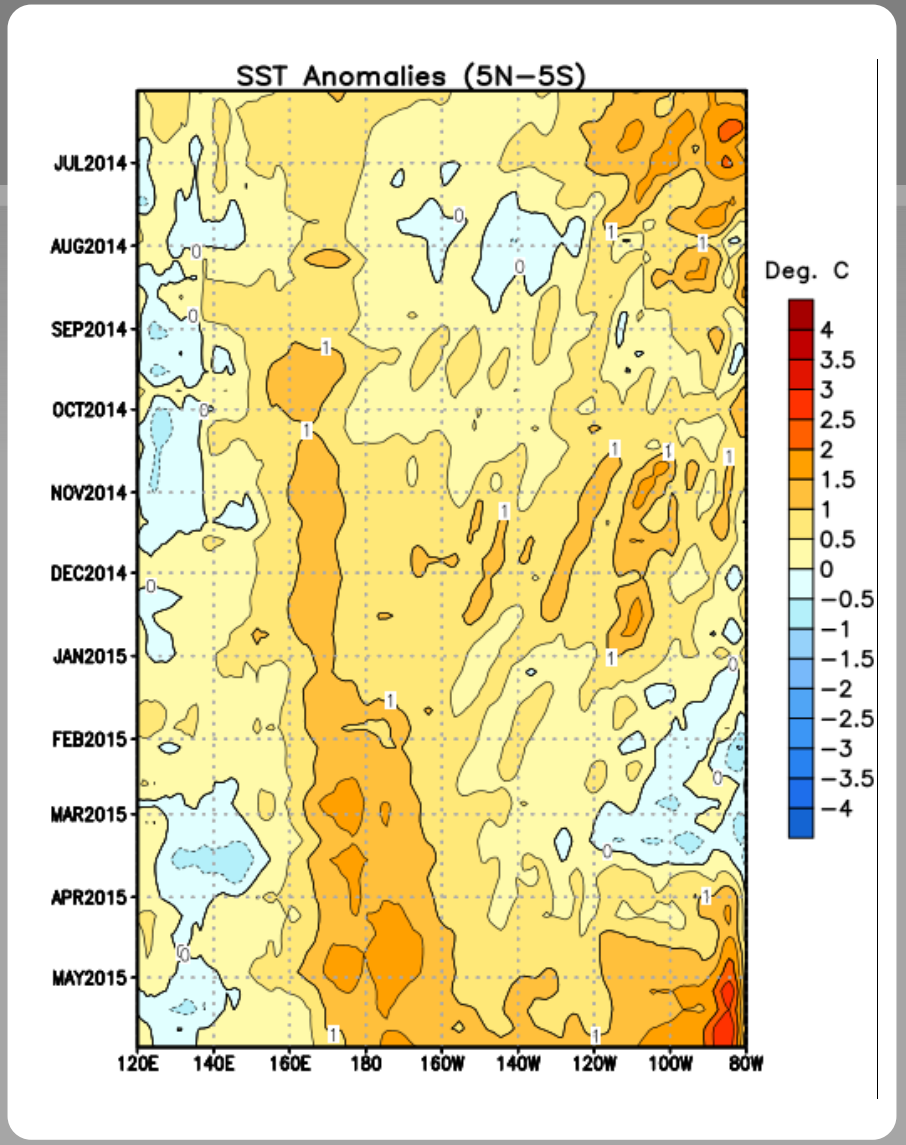
* Note: These statements are updated once a month (2nd Thursday of each month) in association with the ENSO Diagnostics Discussion, which can be found by clicking here.

# Recent Evolution of Equatorial Pacific SST Departures (ºC)

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

During January through mid-March 2015, near-to-below average SSTs were observed in the eastern Pacific, and positive SST anomalies persisted across the western and central Pacific.

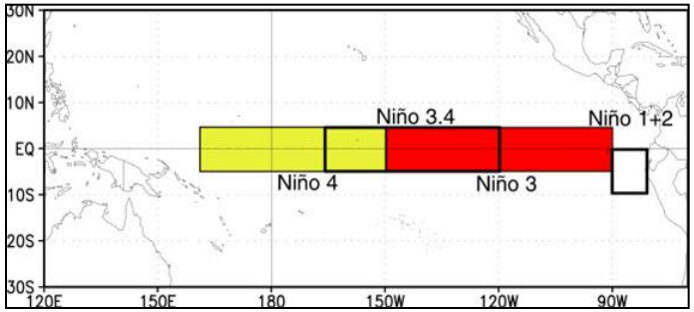
During the last month, positive SST anomalies strengthened across the eastern Pacific.

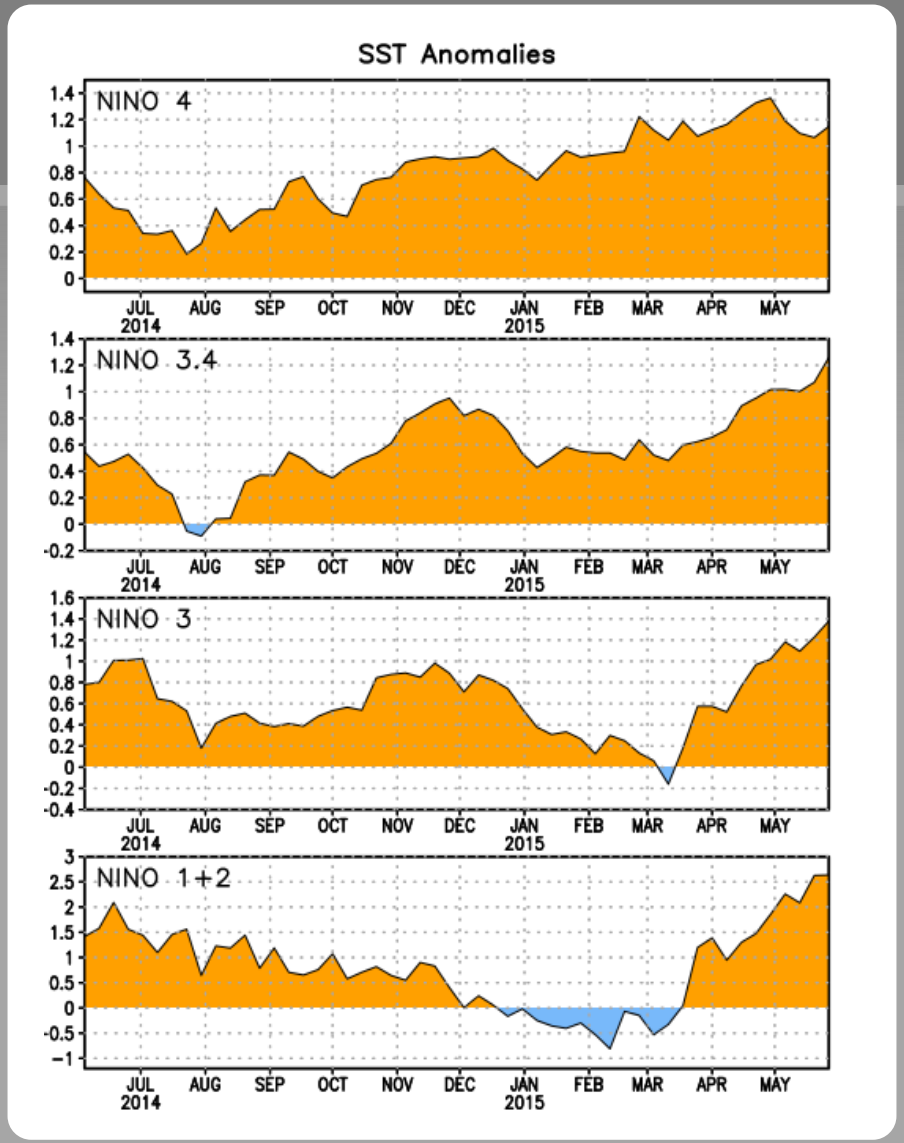


# Niño Region SST Departures (ºC) Recent Evolution

The latest weekly SST departures are:

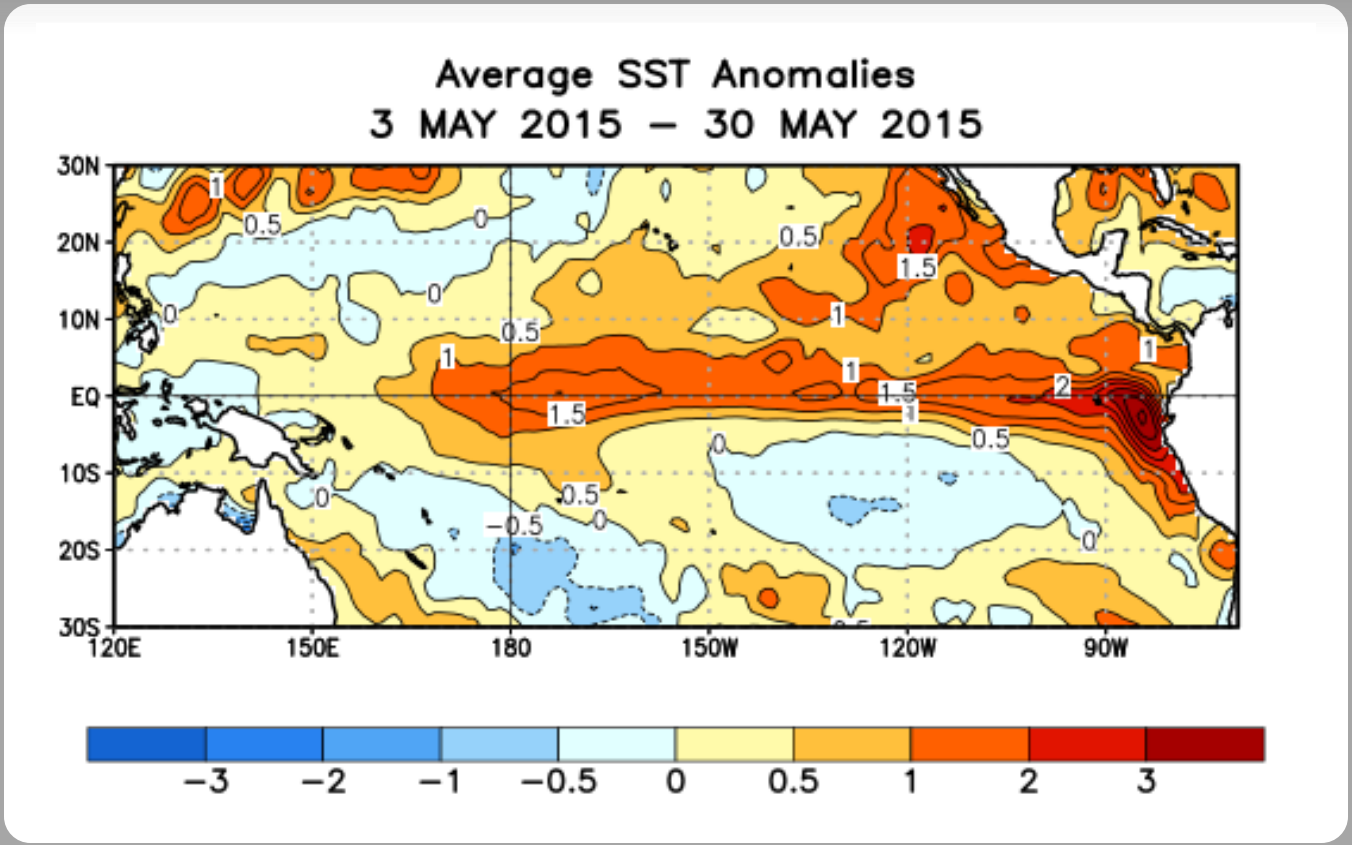
| | |
|---|---|
| Niño 4 | 1.1ºC |
| Niño 3.4 | 1.3ºC |
| Niño 3 | 1.4ºC |
| Niño 1+2 | 2.6ºC |



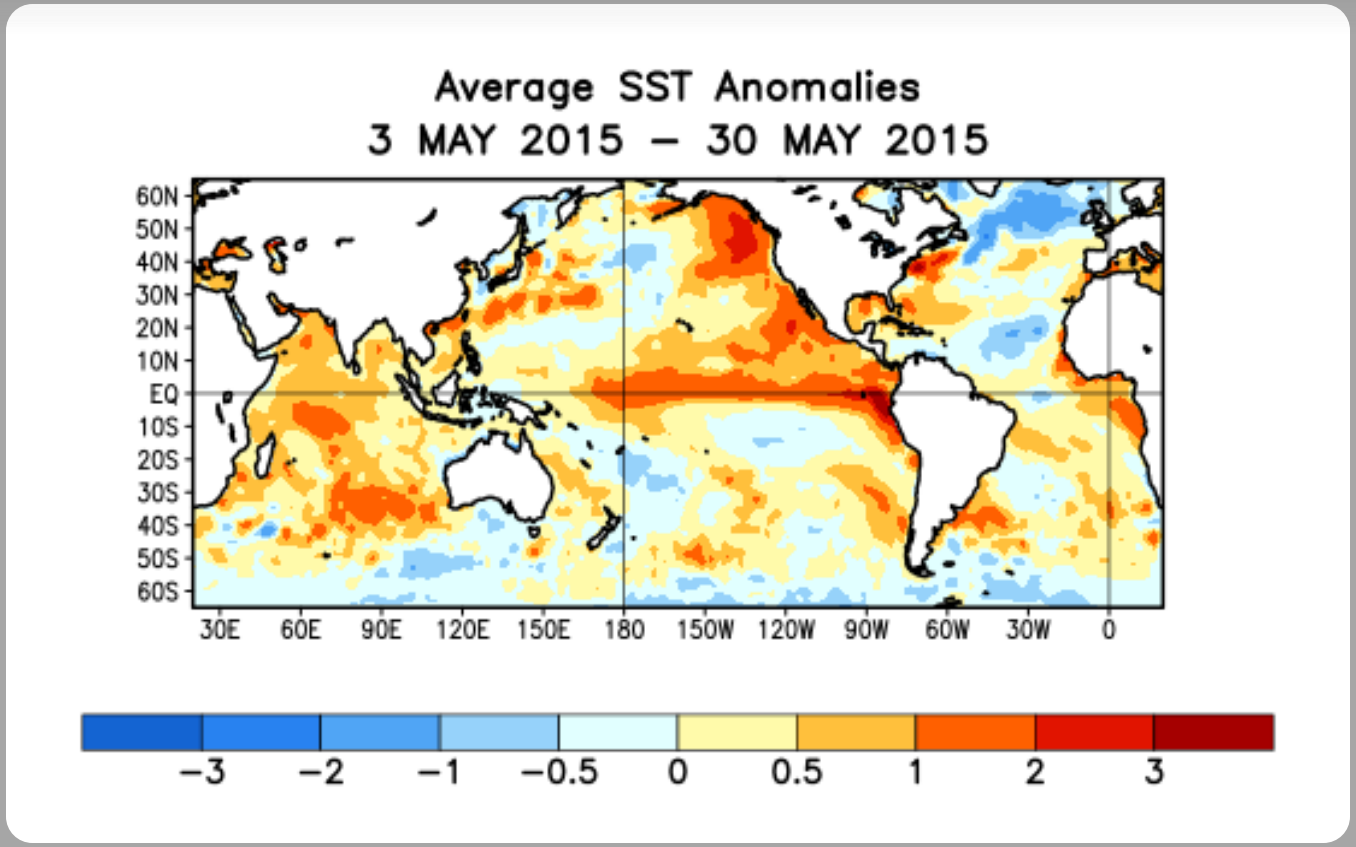
# SST Departures (ºC) in the Tropical Pacific During the Last Four Weeks

During the last four weeks, equatorial SSTs were above average across the central and eastern Pacific, with the largest anomalies off the coast of S. America.



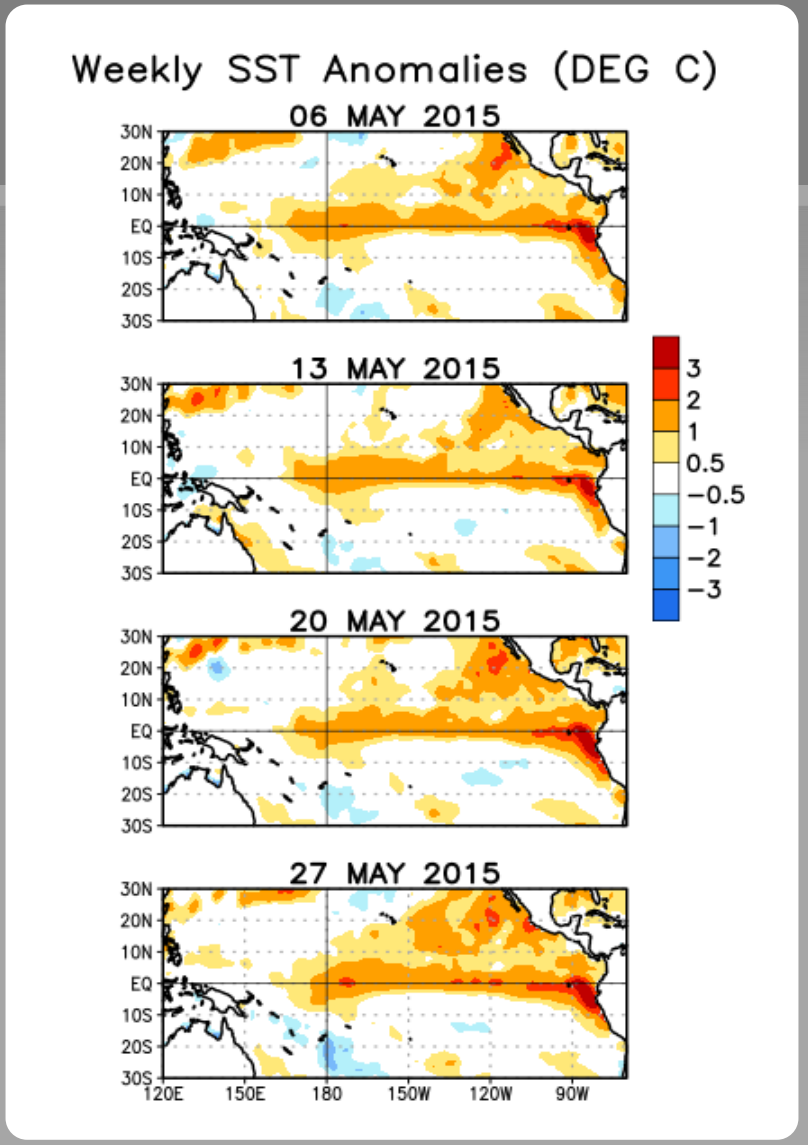
# Global SST Departures (°C) During the Last Four Weeks

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



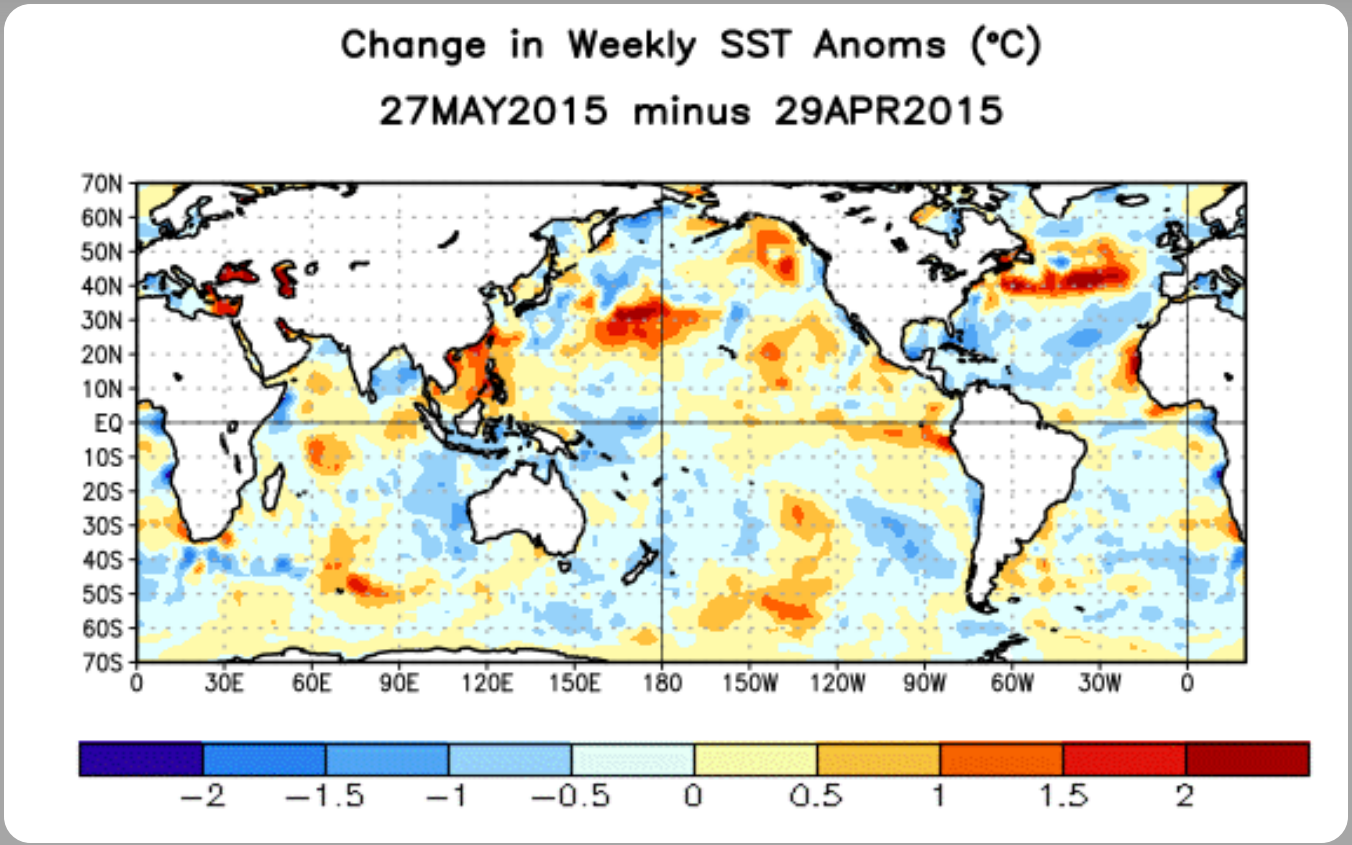
# Weekly SST Departures during the Last Four Weeks

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



# Change in Weekly SST Departures over the Last Four Weeks

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



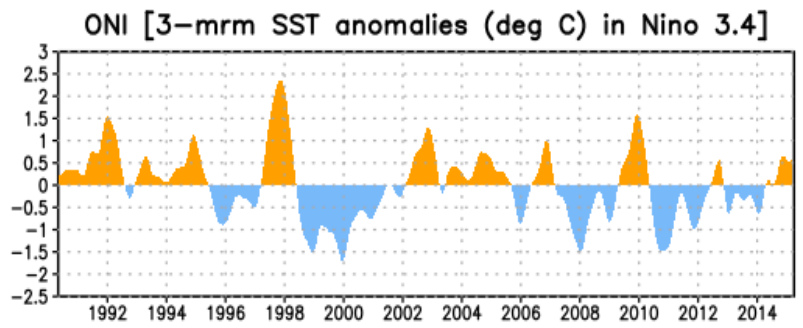
# Upper-Ocean Conditions in the Equatorial Pacific

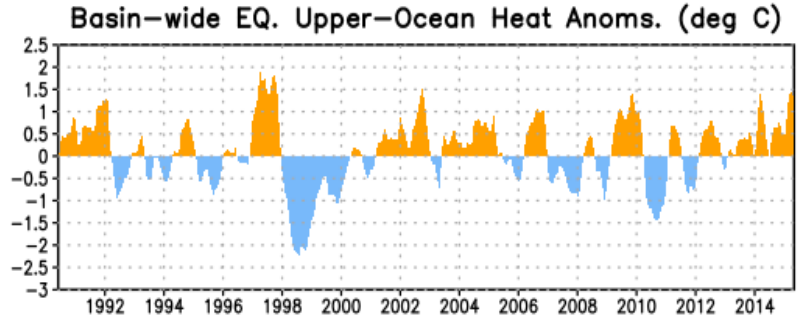
The basin-wide equatorial upper ocean (0-300 m) heat content is greatest prior to and during the early stages of a Pacific warm (El Niño) episode (compare top 2 panels), and least prior to and during the early stages of a cold (La Niña) episode.

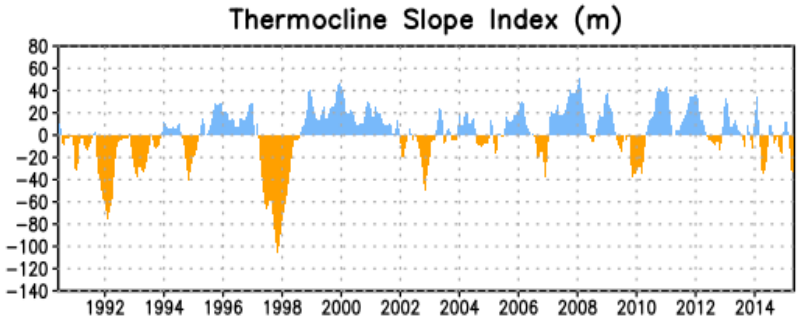
The slope of the oceanic thermocline is least (greatest) during warm (cold) episodes.

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

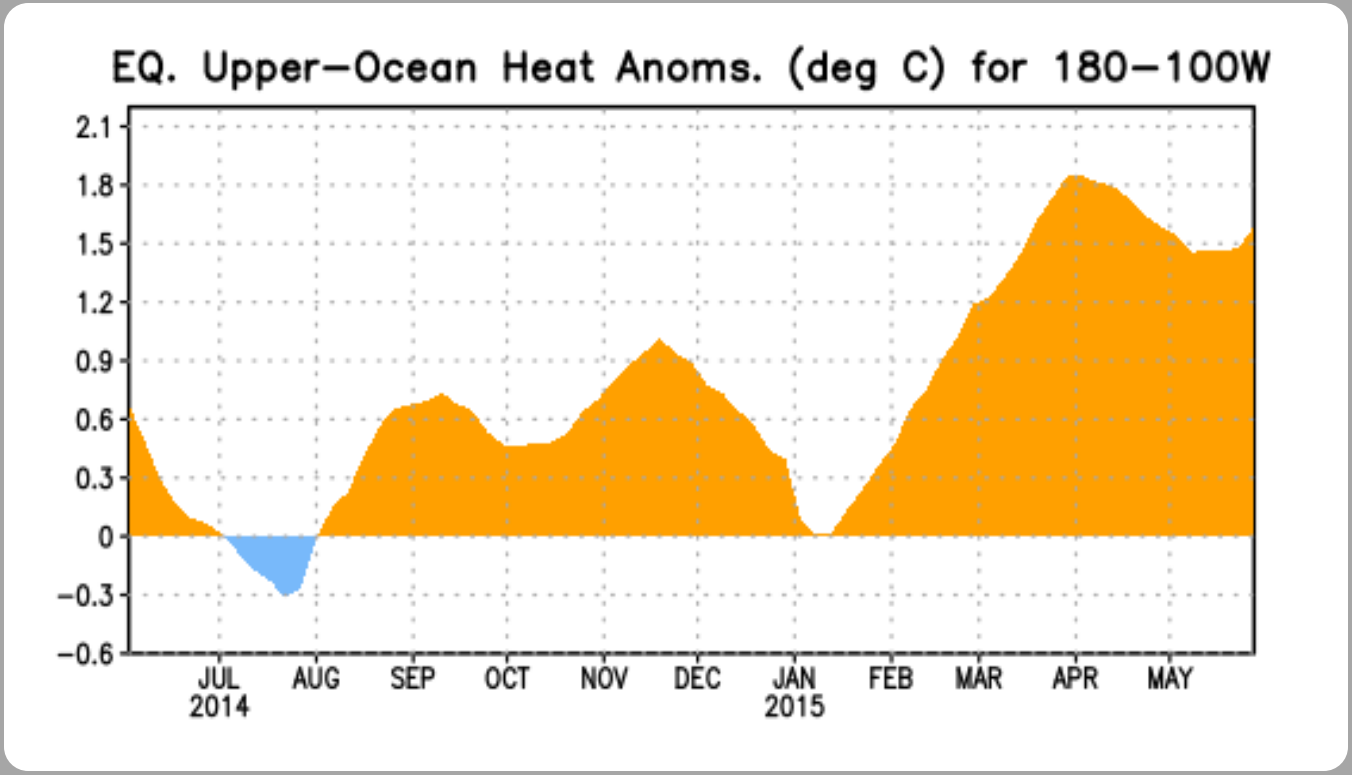


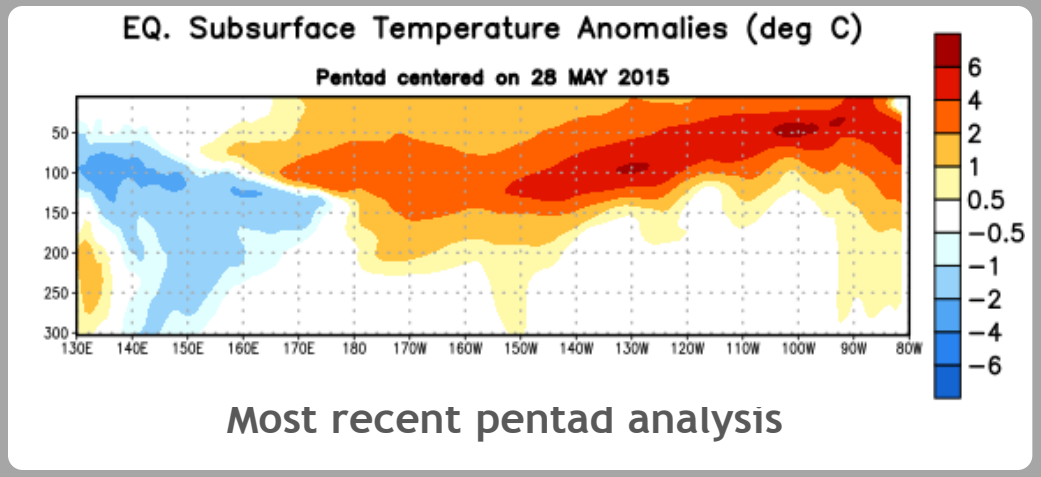
# Central and Eastern Pacific Upper-Ocean (0-300 m) Weekly Average Temperature Anomalies

Subsurface temperature anomalies increased from mid-October to mid-November 2014 before decreasing to near zero in early January 2015. Temperature anomalies grew from January to March, and decreased during April. During May, the positive anomalies have persisted.



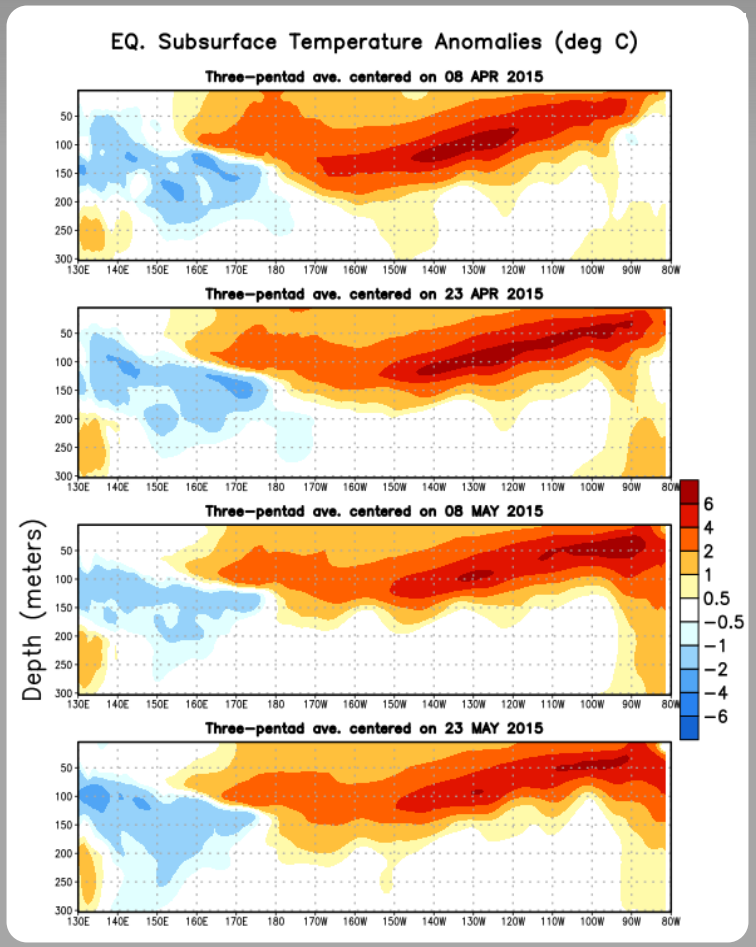
# Sub-Surface Temperature Departures in the Equatorial Pacific

During the last two months, positive subsurface temperature anomalies were observed across most of the equatorial Pacific




Most recent pentad analysis

Negative anomalies at depth have persisted in the western Pacific.

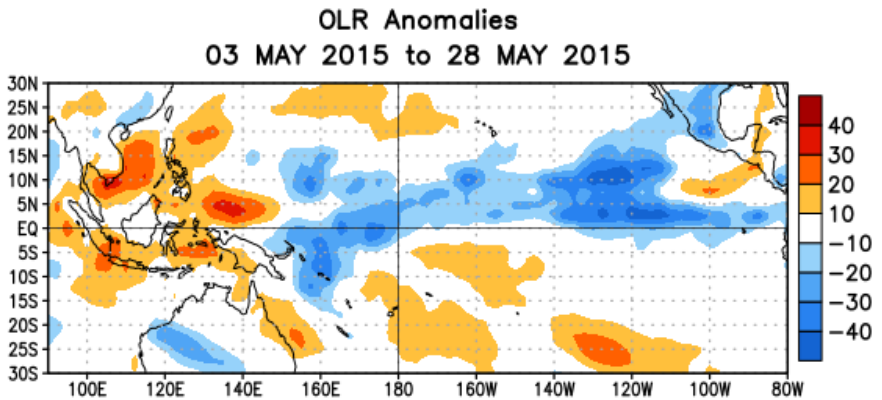


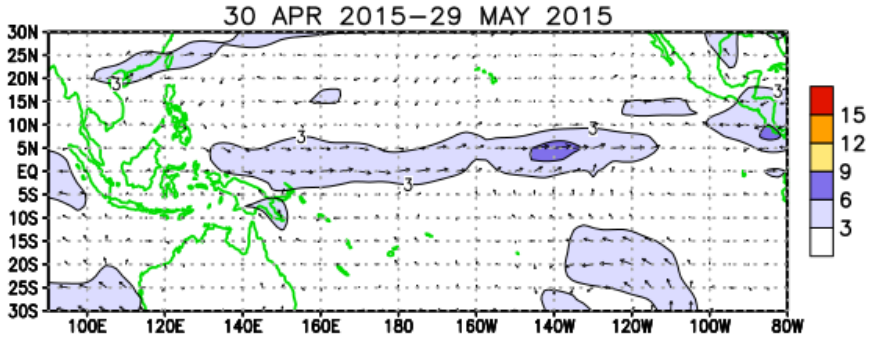
# Tropical OLR and Wind Anomalies During the Last 30 Days

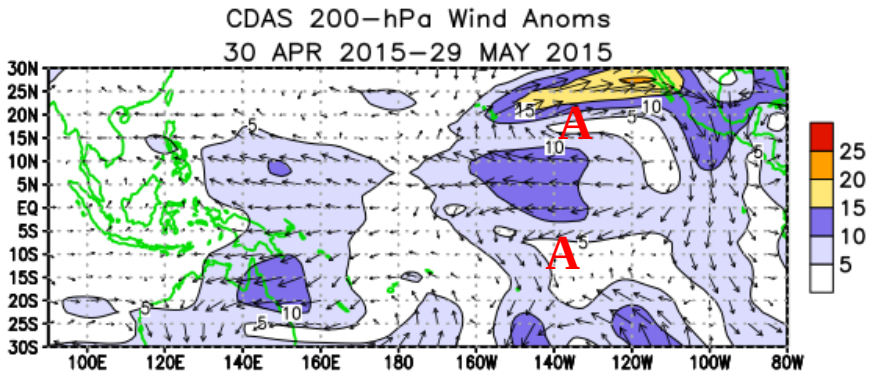
Negative OLR anomalies (enhanced convection and precipitation) were evident near the Date Line and across the central and eastern tropical Pacific. Positive OLR anomalies (suppressed convection and precipitation) were located near Indonesia, Philippines, and Papua New Guinea.

Anomalous low-level (850-hPa) westerly winds were located across most of the equatorial Pacific.

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

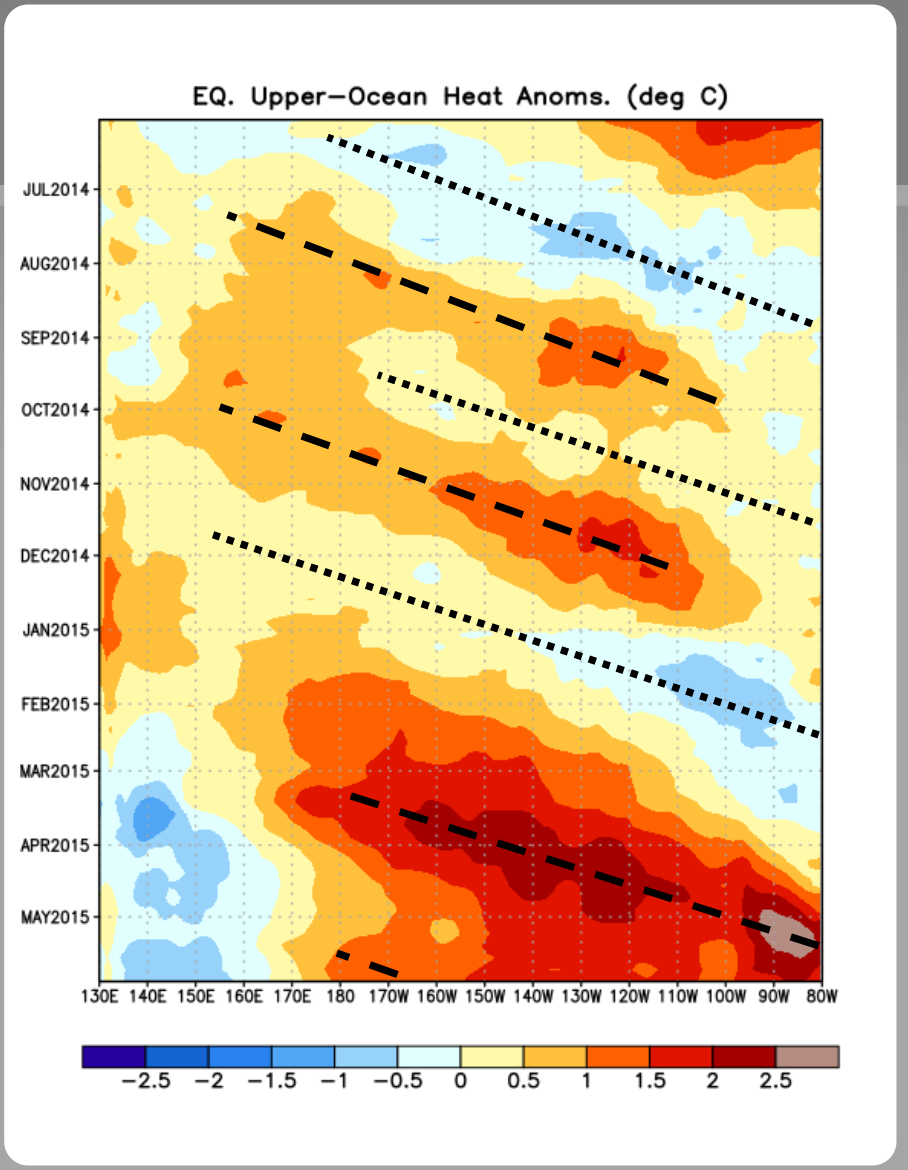
# Weekly Heat Content Evolution in the Equatorial Pacific

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.

During January through April, another downwelling phase of a Kelvin wave pushed eastward.

Over the last month, positive subsurface anomalies have persisted in the eastern Pacific.

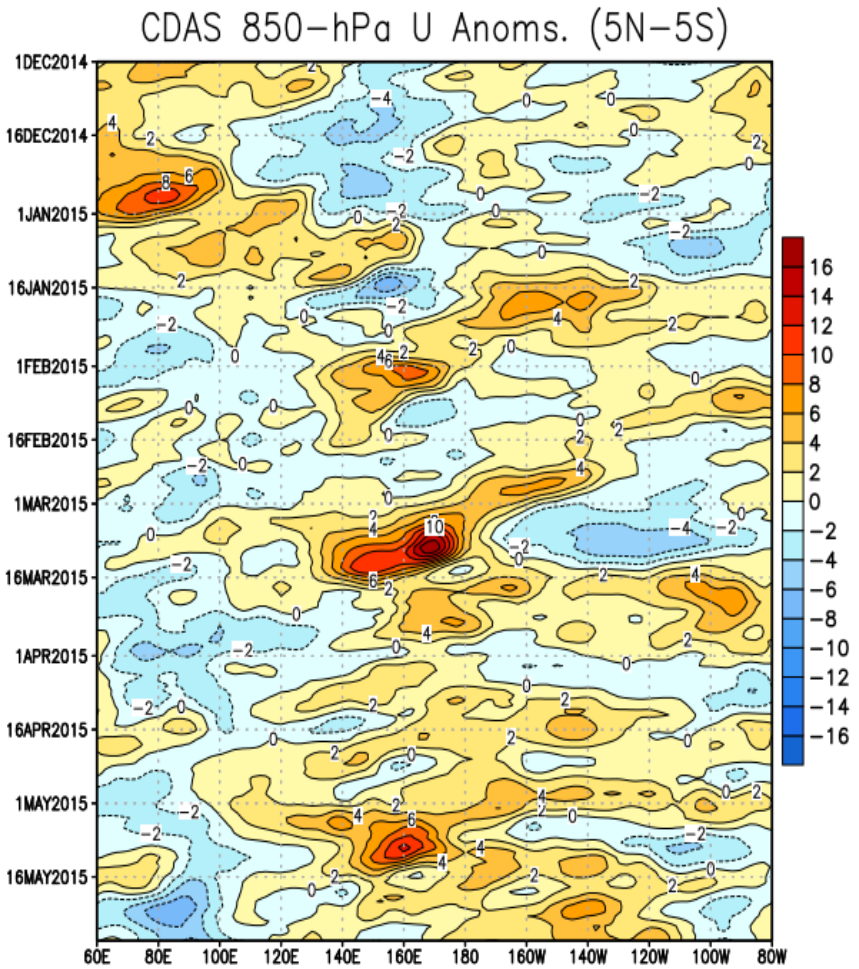



Oceanic Kelvin waves have alternating warm and cold phases. The warm phase is indicated by dashed lines. Down-welling and warming occur in the leading portion of a Kelvin wave, and up-welling and cooling occur in the trailing portion.

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

During early March and early May, westerly wind bursts were observed between 140°E and 180°.

Recently, westerly anomalies have dominated across the equatorial Pacific.

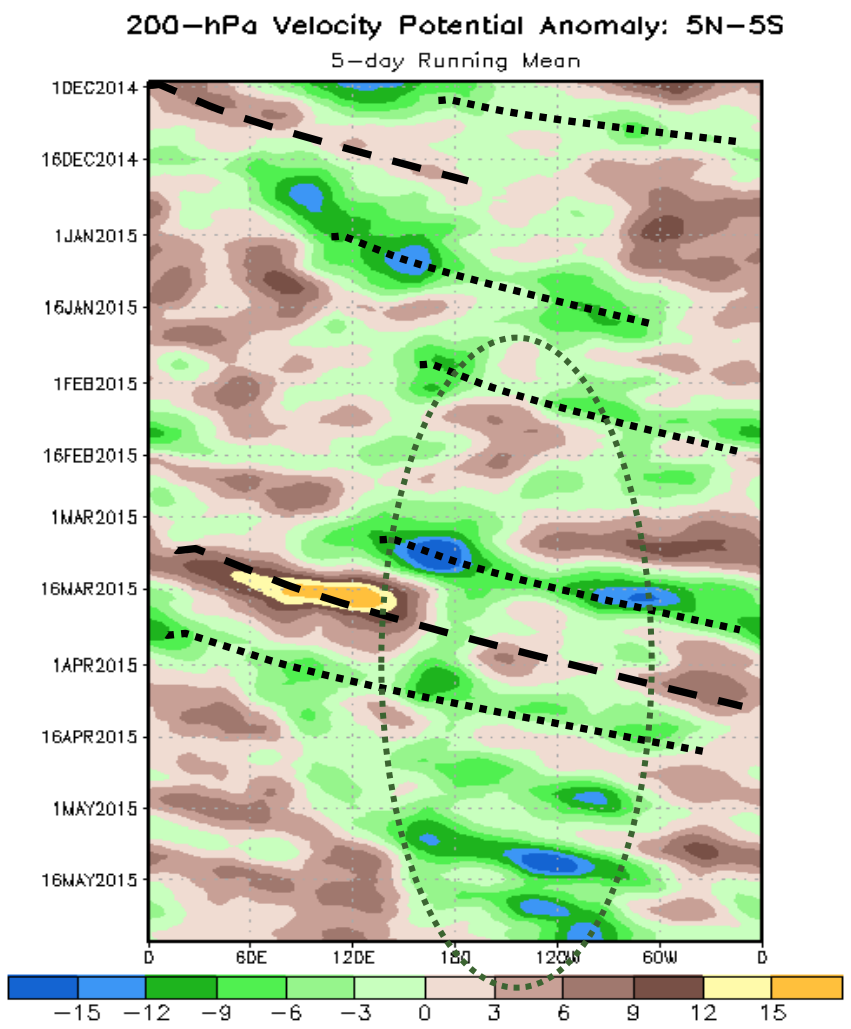



Westerly Wind Anomalies (orange/red shading)
Easterly Wind Anomalies (blue shading)

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

During March 2015, the Madden-Julian Oscillation (MJO) was associated with eastward propagating velocity potential anomalies.

Since mid-January 2015, negative anomalies and anomalous upper-level divergence (green shading) have prevailed near the Date Line and/or eastern Pacific.




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

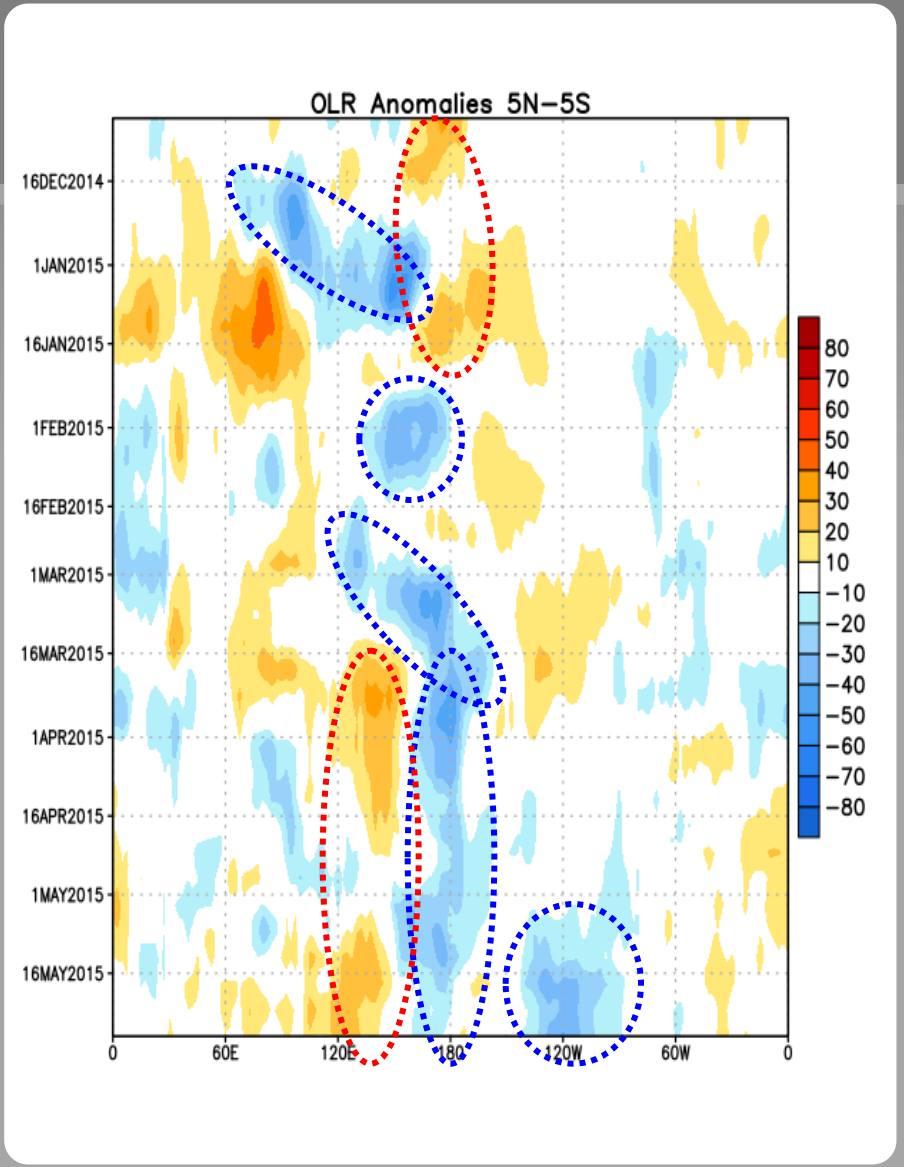
# Outgoing Longwave Radiation (OLR) Anomalies

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, where they have persisted.

Since mid March, positive OLR anomalies have remained mostly stationary near Indonesia.

Since early May, negative OLR anomalies have persisted in the eastern Pacific.




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.

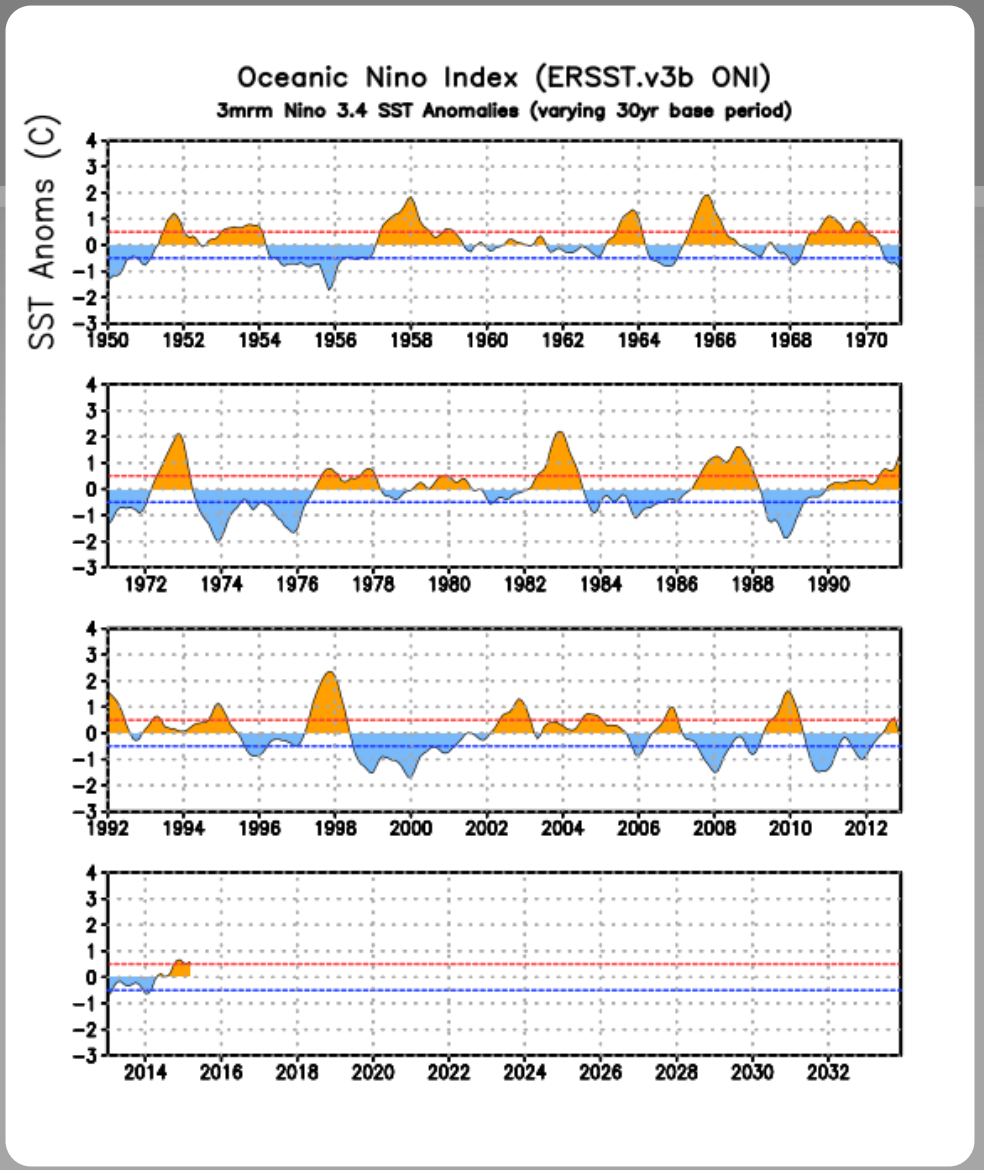
La Niña: characterized by a negative ONI less than or equal to -0.5°C.

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.

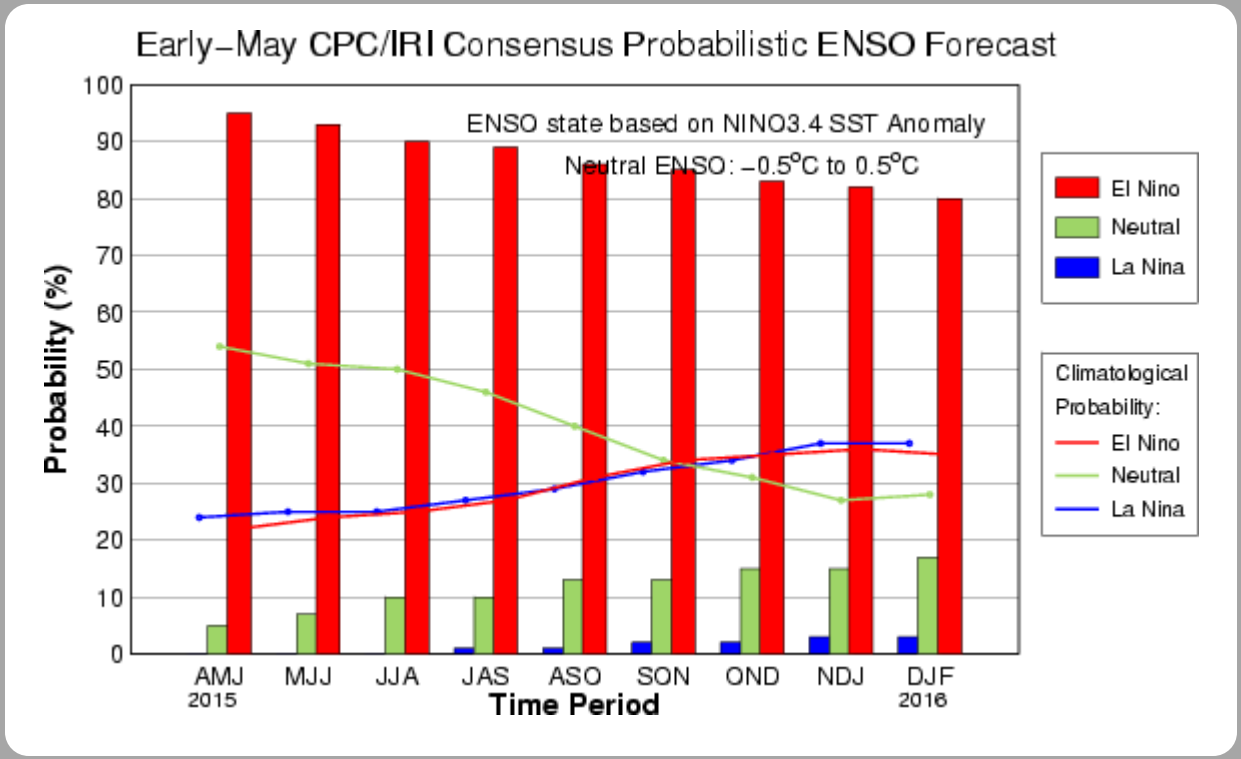
The ONI is one measure of the El Niño-Southern Oscillation, and other indices can confirm whether features consistent with a coupled ocean-atmosphere phenomenon accompanied these periods. The complete table going back to DJF 1950 can be found here.

| 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: 14 May 2015

The chance of El Niño is approximately 80-90% through 2015.



# IRI/CPC Pacific Niño 3.4 SST Model Outlook

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

However, there is a large amount of spread in the potential strength of El Niño.

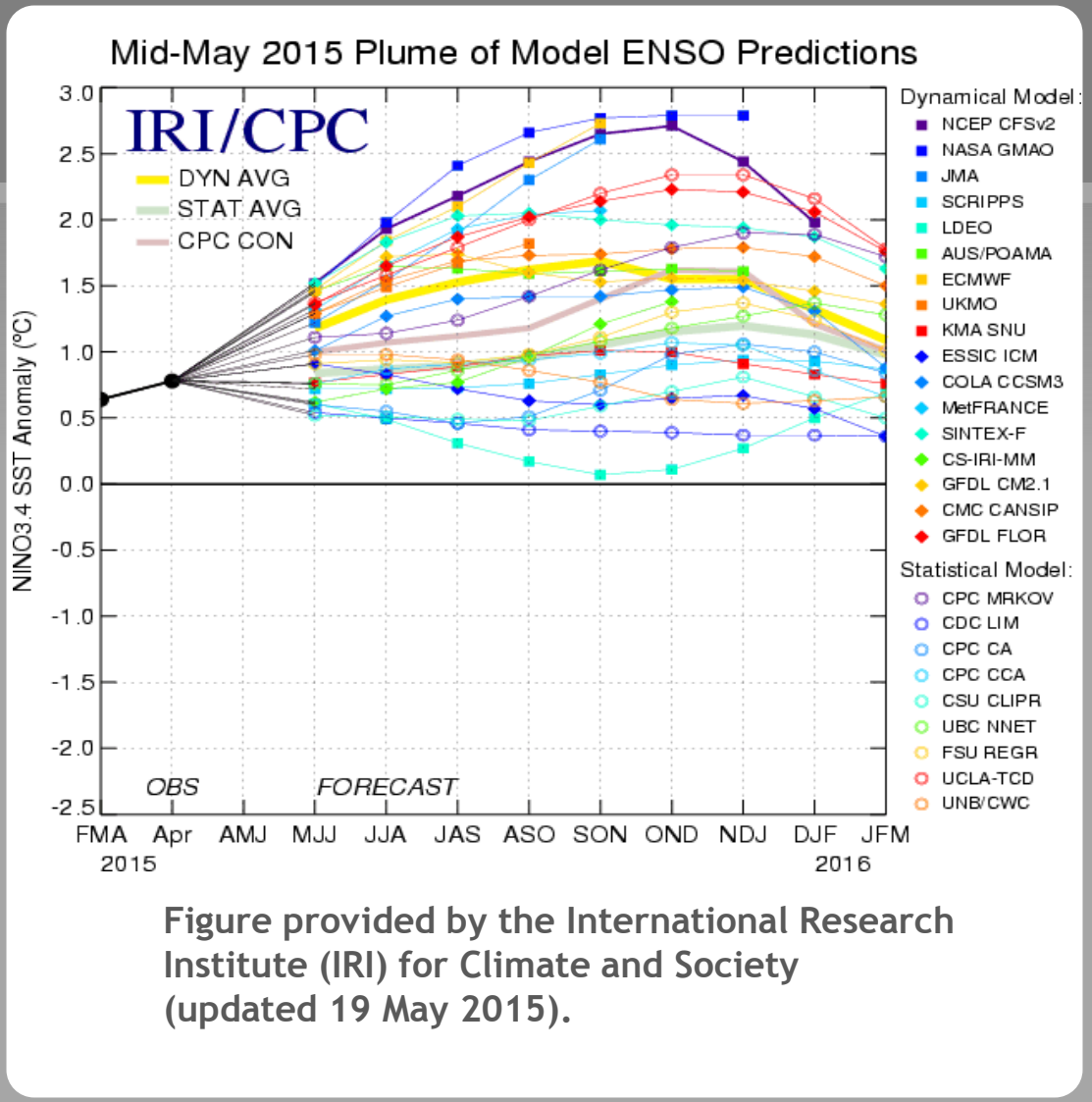
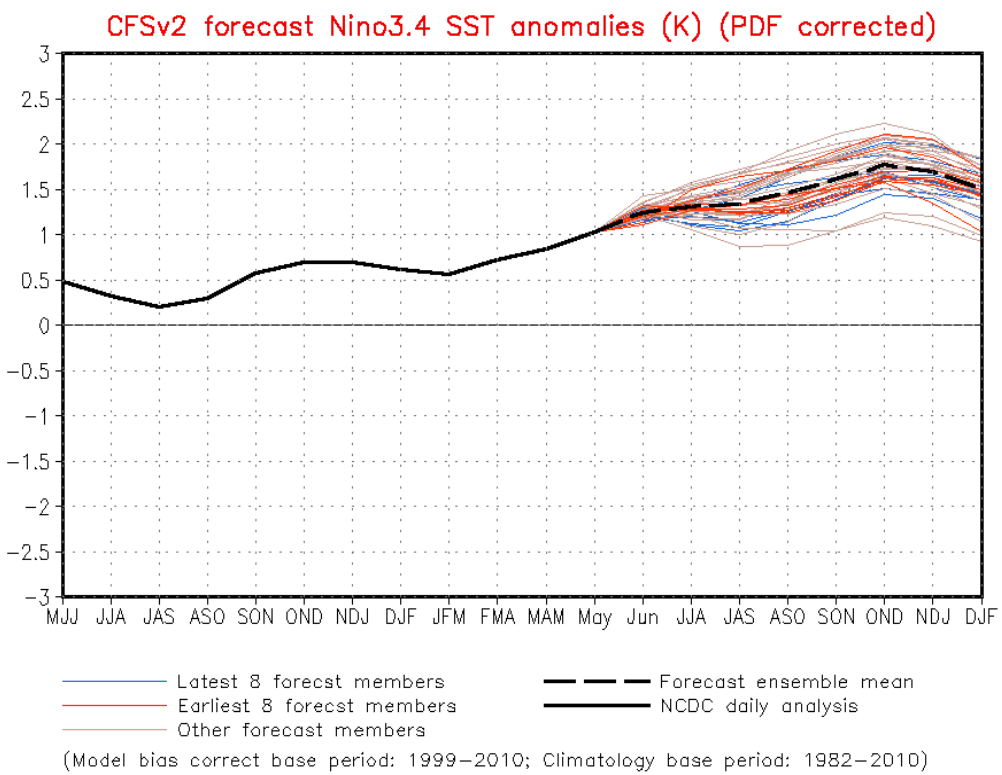


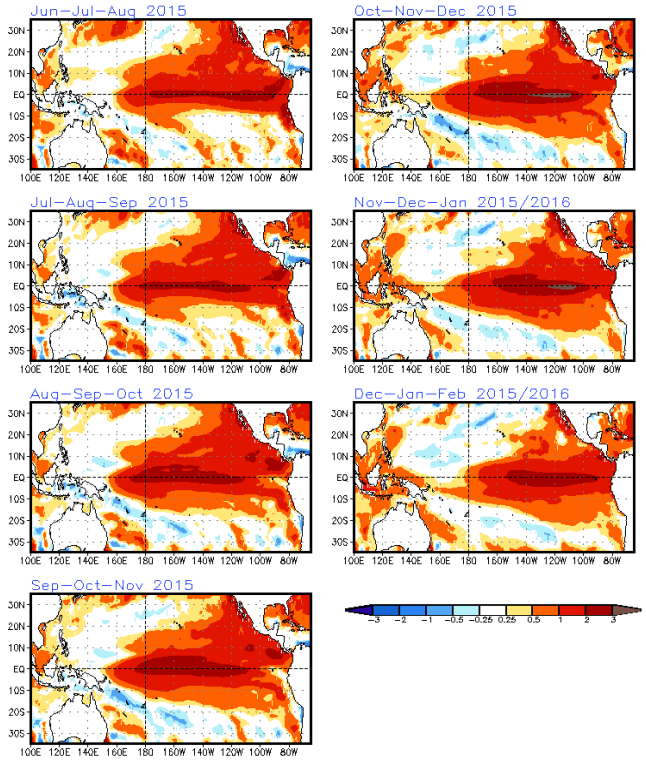

Figure provided by the International Research Institute (IRI) for Climate and Society (updated 19 May 2015).

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

**Issued: 1 June 2015**

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

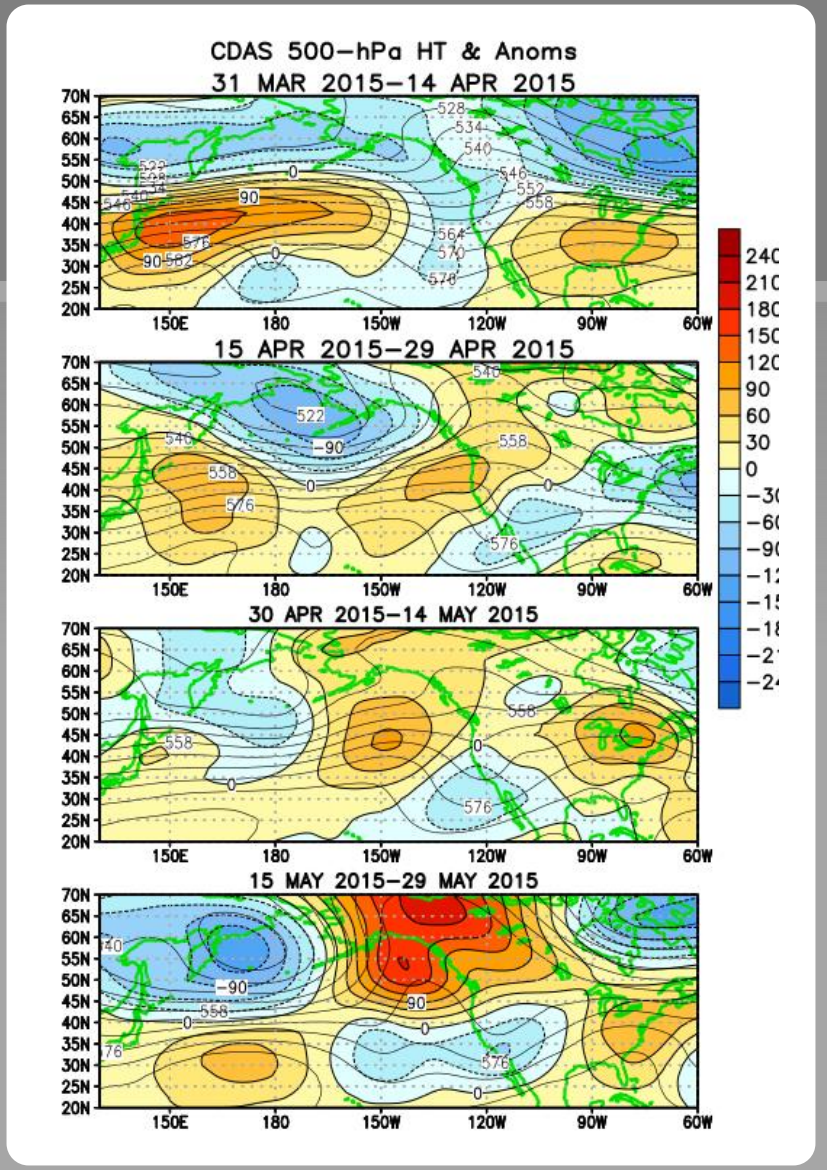


# Atmospheric anomalies over the North Pacific and North America During the Last 60 Days

From late March – May 2015, above average heights and temperatures have generally prevailed over eastern North America.

Since early May, below-average heights and temperatures have persisted over western North America.



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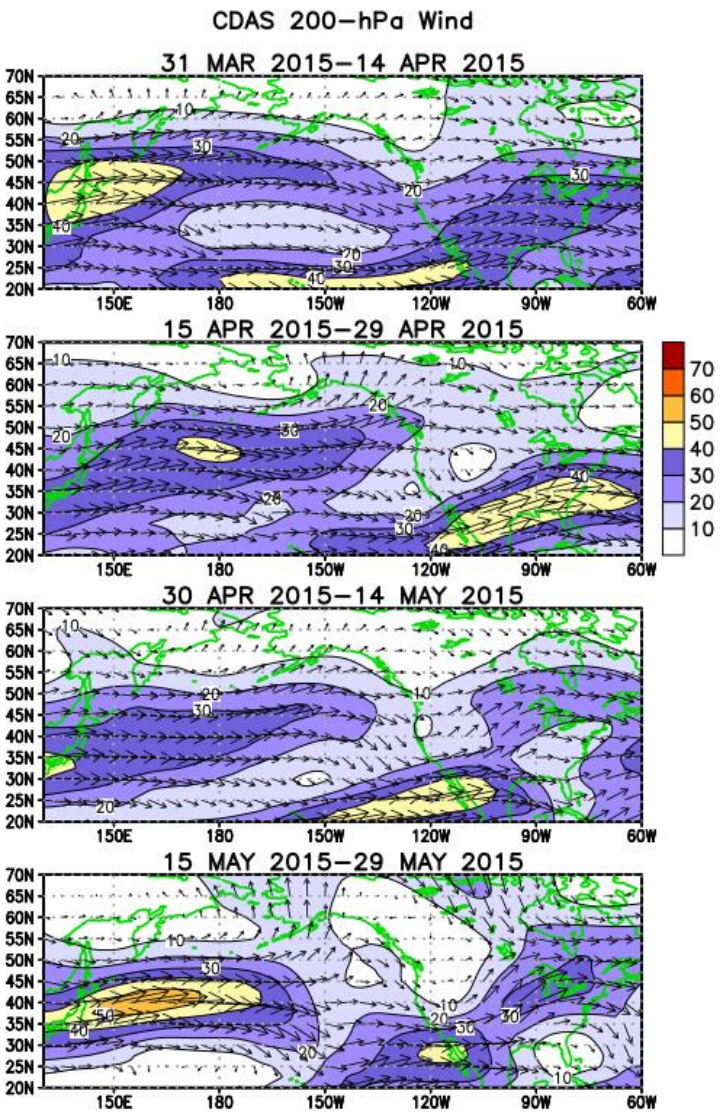

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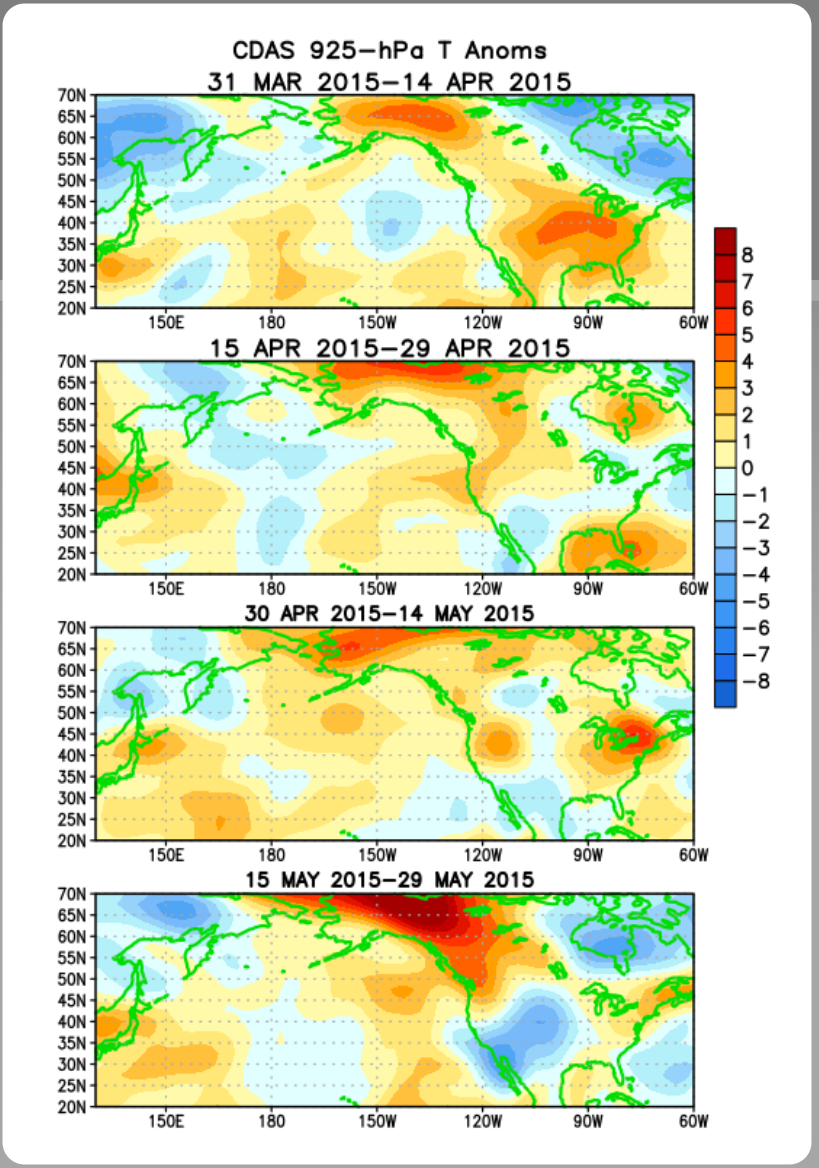
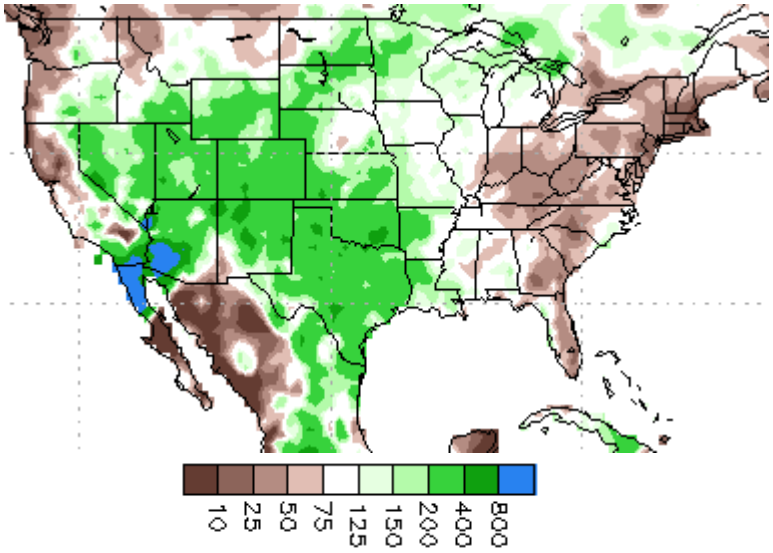


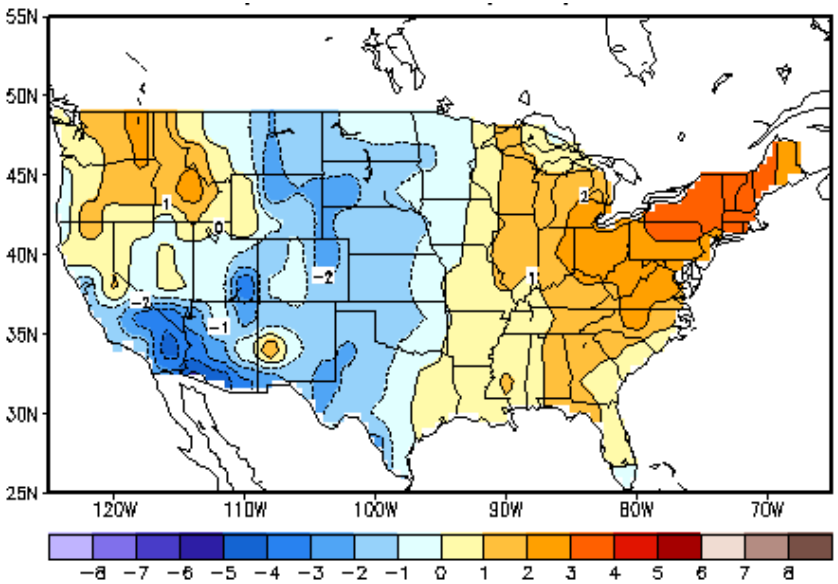
# U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 30 May 2015

Percent of Average Precipitation



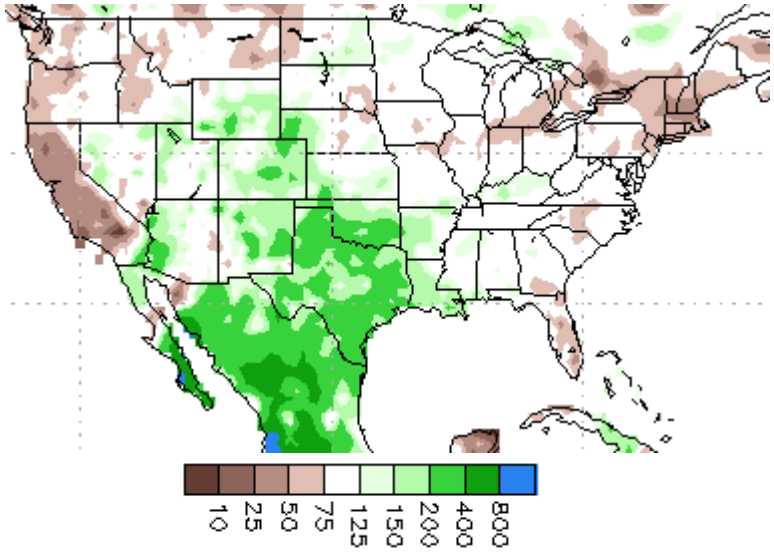

Temperature Departures (degree C)



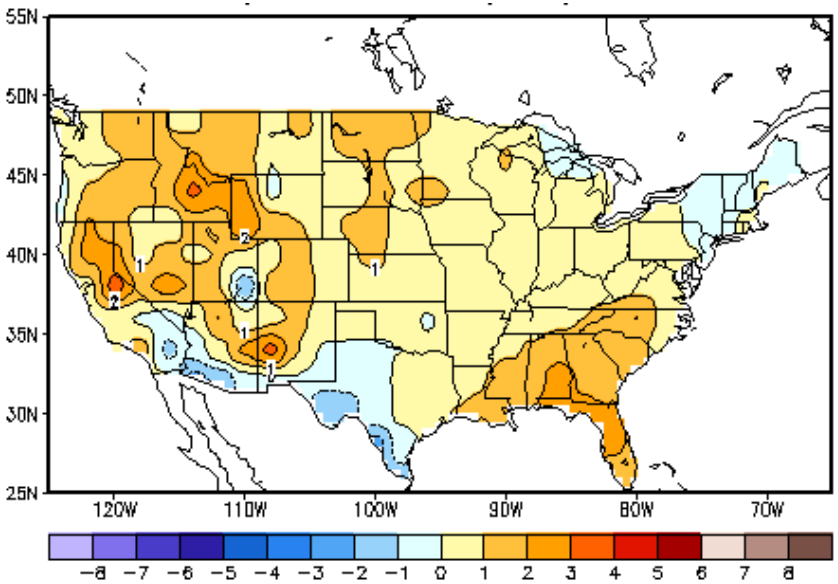
# U.S. Temperature and Precipitation Departures During the Last 90 Days

End Date: 30 May 2015

Percent of Average Precipitation




Temperature Departures (degree C)

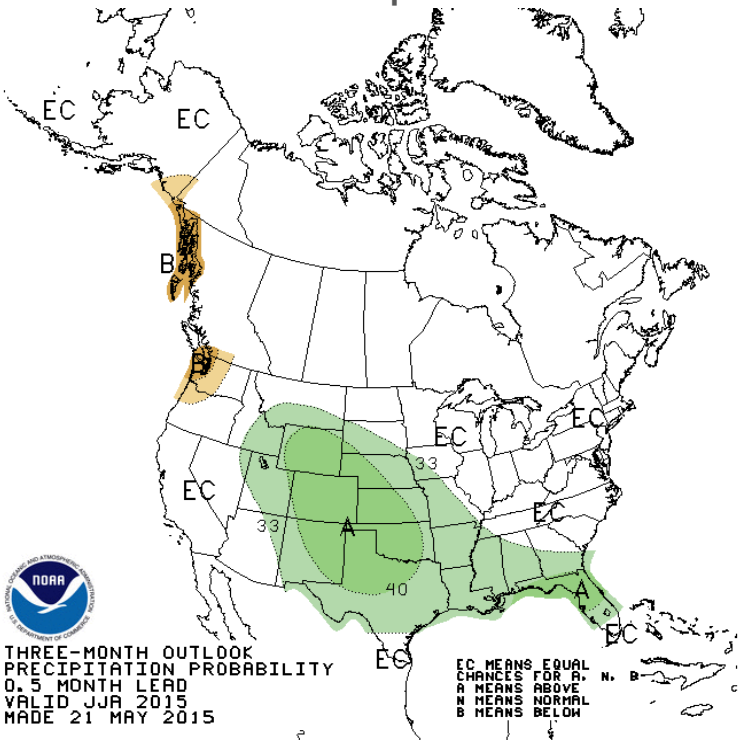


# U. S. Seasonal Outlooks

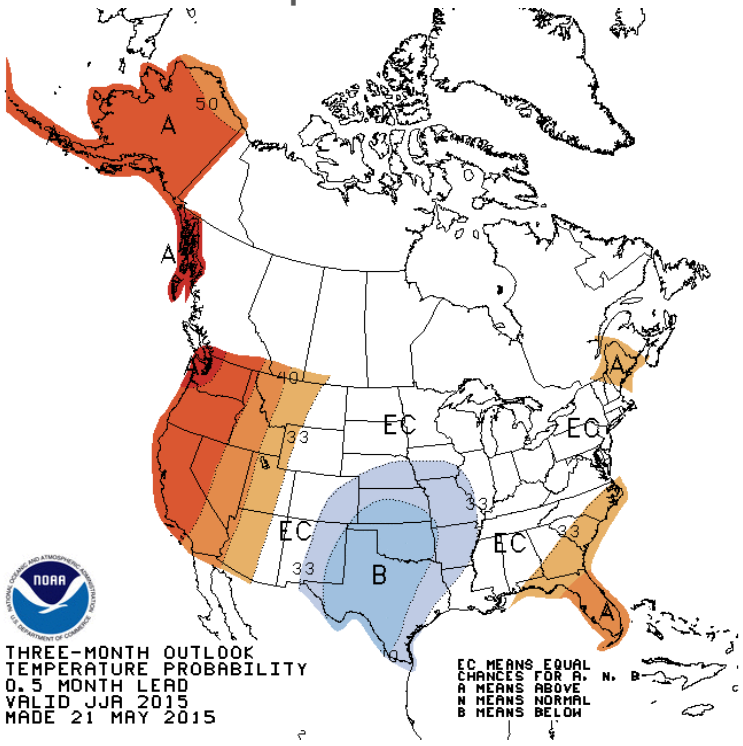
## June - August 2015

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

### Precipitation




### Temperature



# Summary

**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 90% chance that El Niño conditions will continue through Northern Hemisphere summer 2015, and a greater than 80% chance it will last through 2015.***

* 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.