

# ENSO: Recent Evolution, Current Status and Predictions



Update prepared by:  
Climate Prediction Center / NCEP  
30 June 2014

# 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 Watch

ENSO-neutral conditions continue.\*

Sea surface temperatures (SST) are above-average across the equatorial Pacific Ocean.

Tropical rainfall is slightly enhanced over Indonesia and near the International Date Line.

Chance of El Niño is 70% during the Northern Hemisphere summer and reaches 80% during the fall and winter.\*

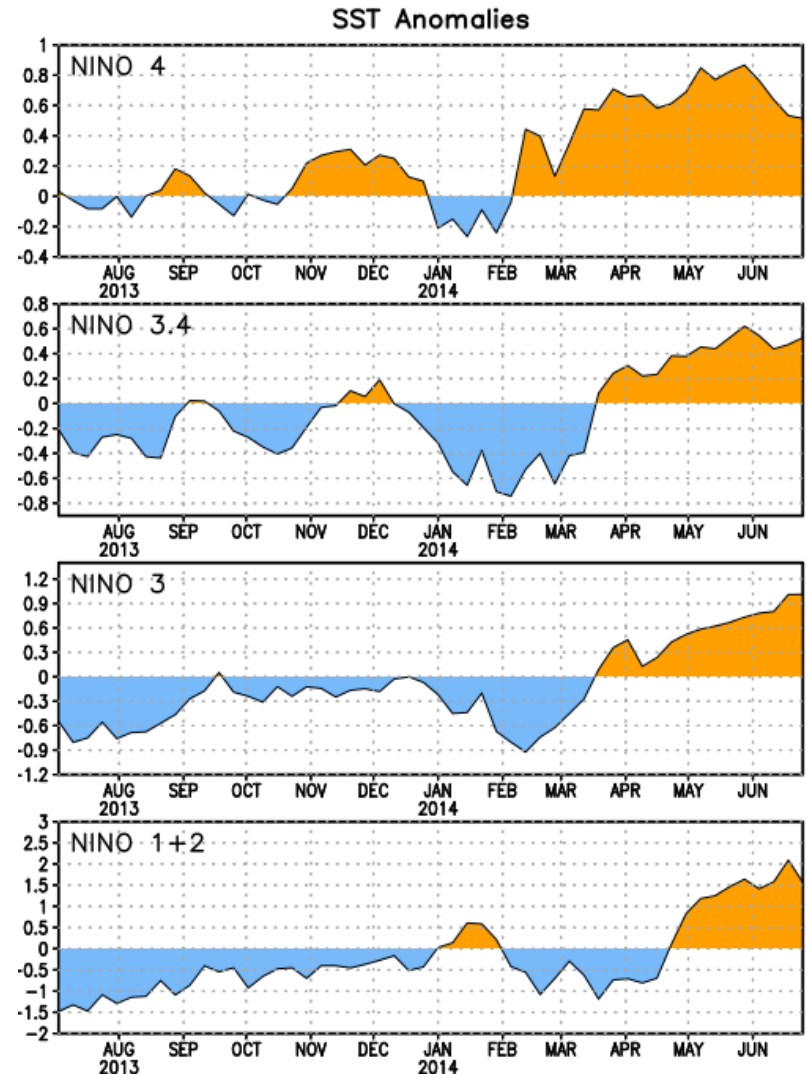
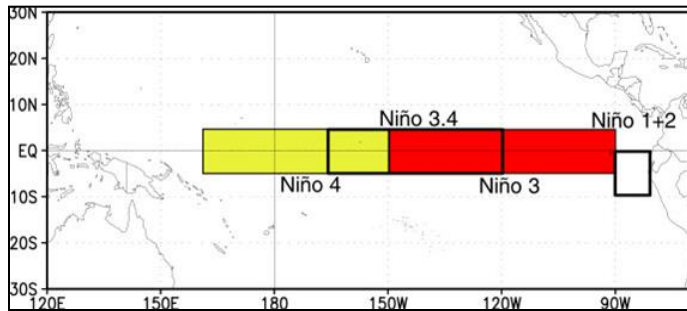
\* Note: These statements are updated once a month in association with the ENSO Diagnostics Discussion, which can be found by clicking [here](#).



# Niño Region SST Departures (°C) Recent Evolution

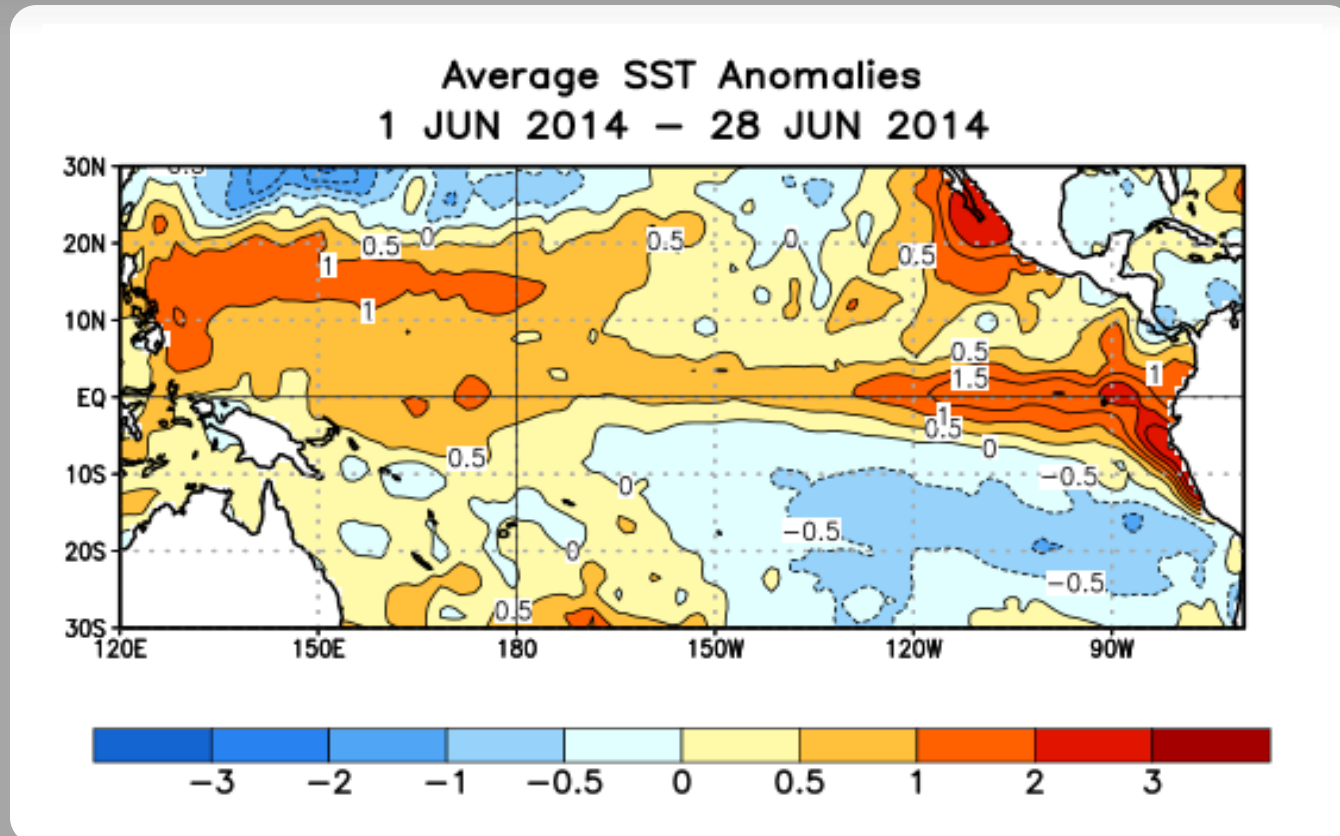
The latest weekly SST departures are:

Niño 4	0.5°C
Niño 3.4	0.5°C
Niño 3	1.0°C
Niño 1+2	1.6°C



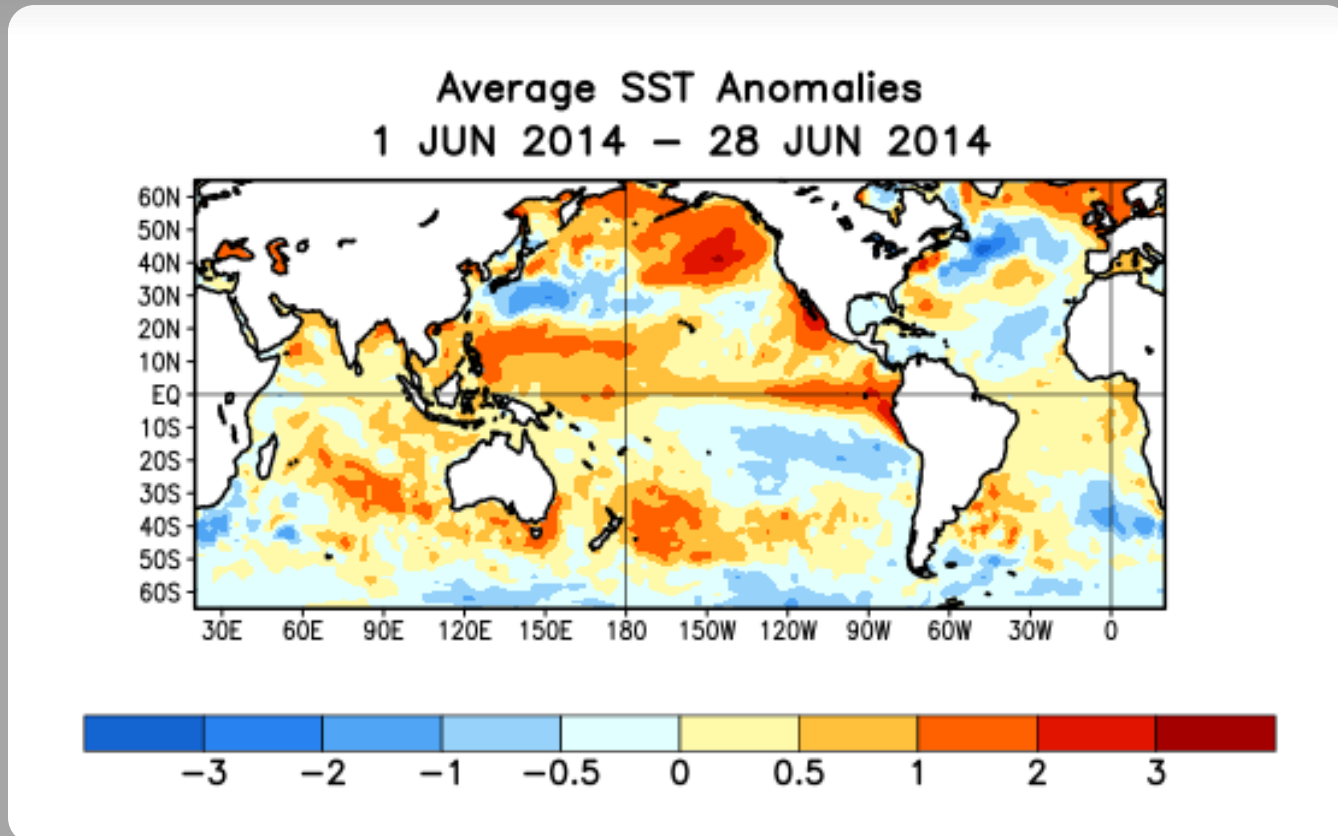
# SST Departures ( $^{\circ}\text{C}$ ) in the Tropical Pacific During the Last Four Weeks

During the last four weeks, equatorial SSTs were above average across the Pacific Ocean, especially near the Date Line and in the eastern Pacific.



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

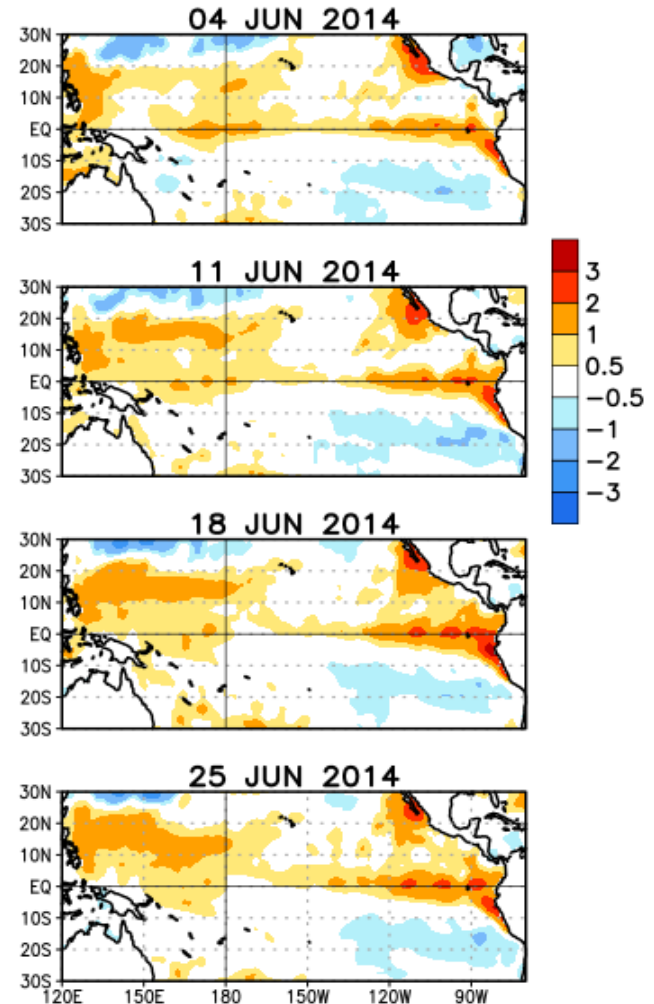
During the last four weeks, above-average equatorial SSTs were observed across the Pacific, near Indonesia, and in the eastern Atlantic Ocean.



# Weekly SST Departures during the Last Four Weeks

During the last four weeks, the SST anomalies persisted in the eastern Pacific, while weakening near the International Date Line.

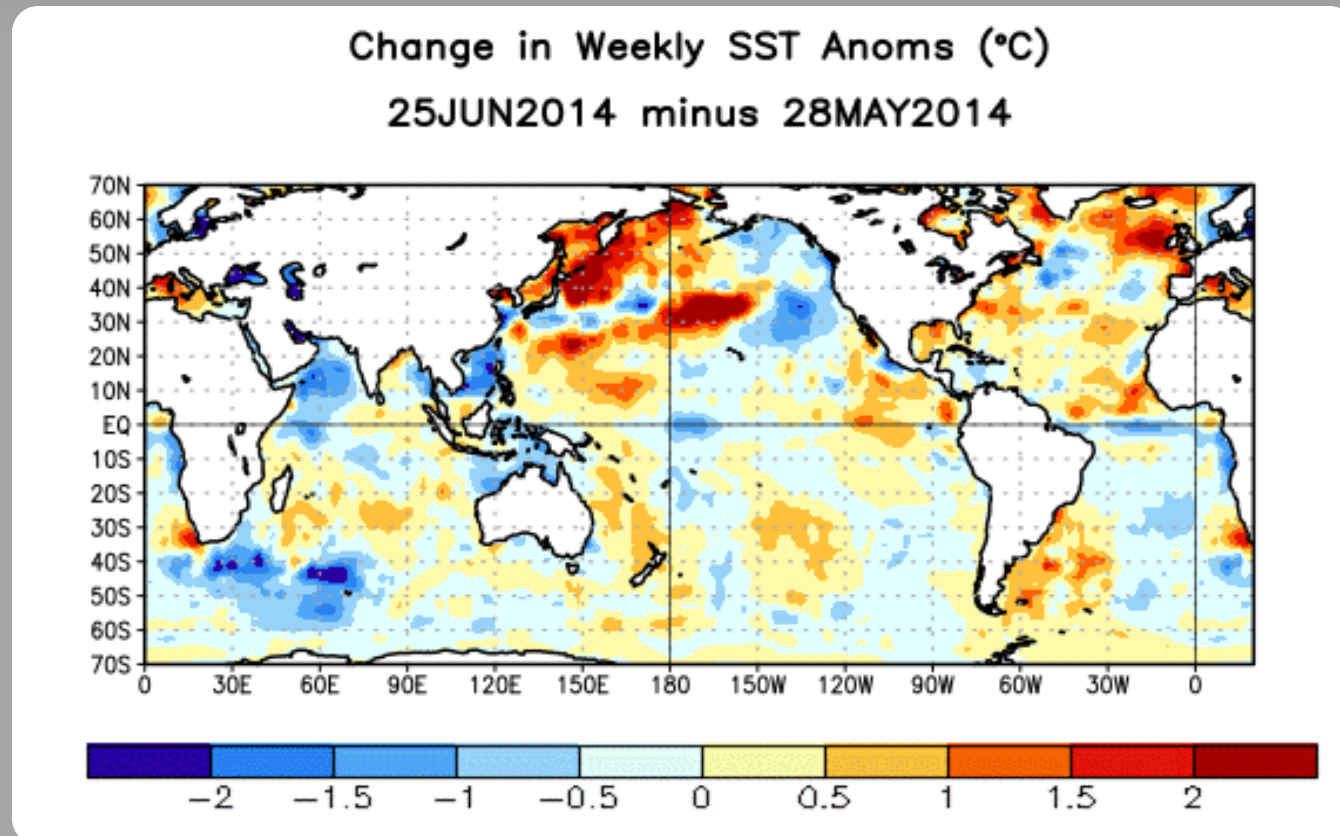
## Weekly SST Anomalies (DEG C)





# Change in Weekly SST Departures over the Last Four Weeks

During the last four weeks, changes in equatorial SST anomalies were negative near the International Date Line and positive in the eastern Pacific.



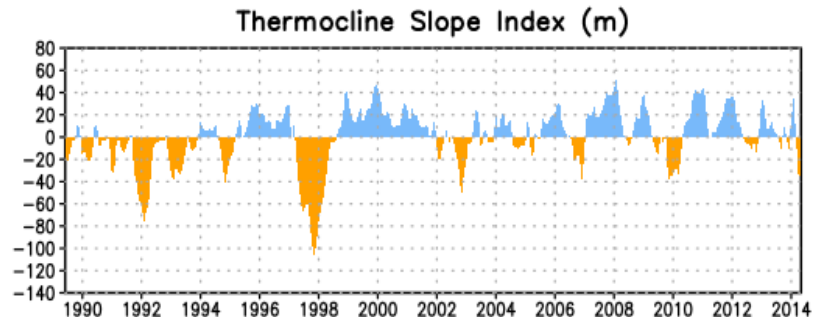
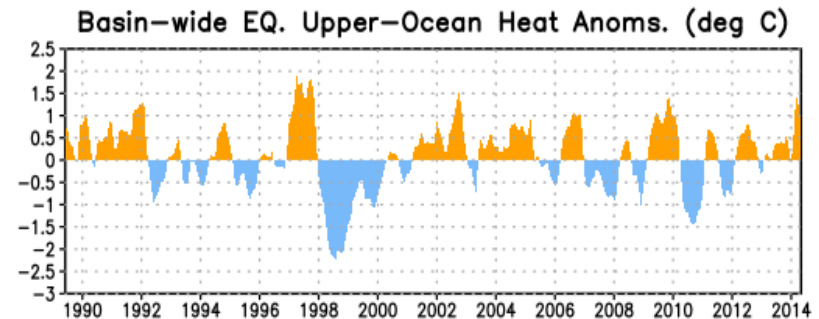
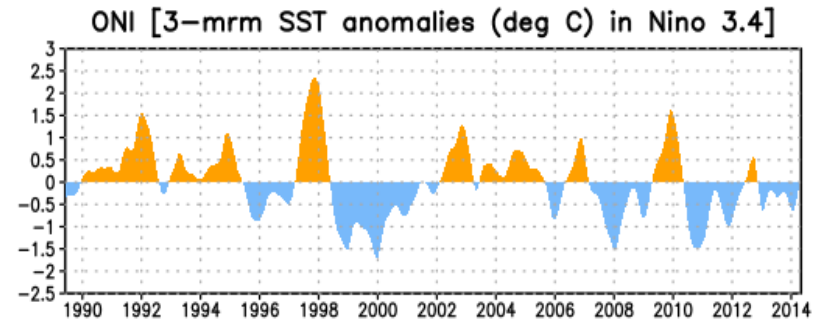
# Upper-Ocean Conditions in the Equatorial Pacific

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.

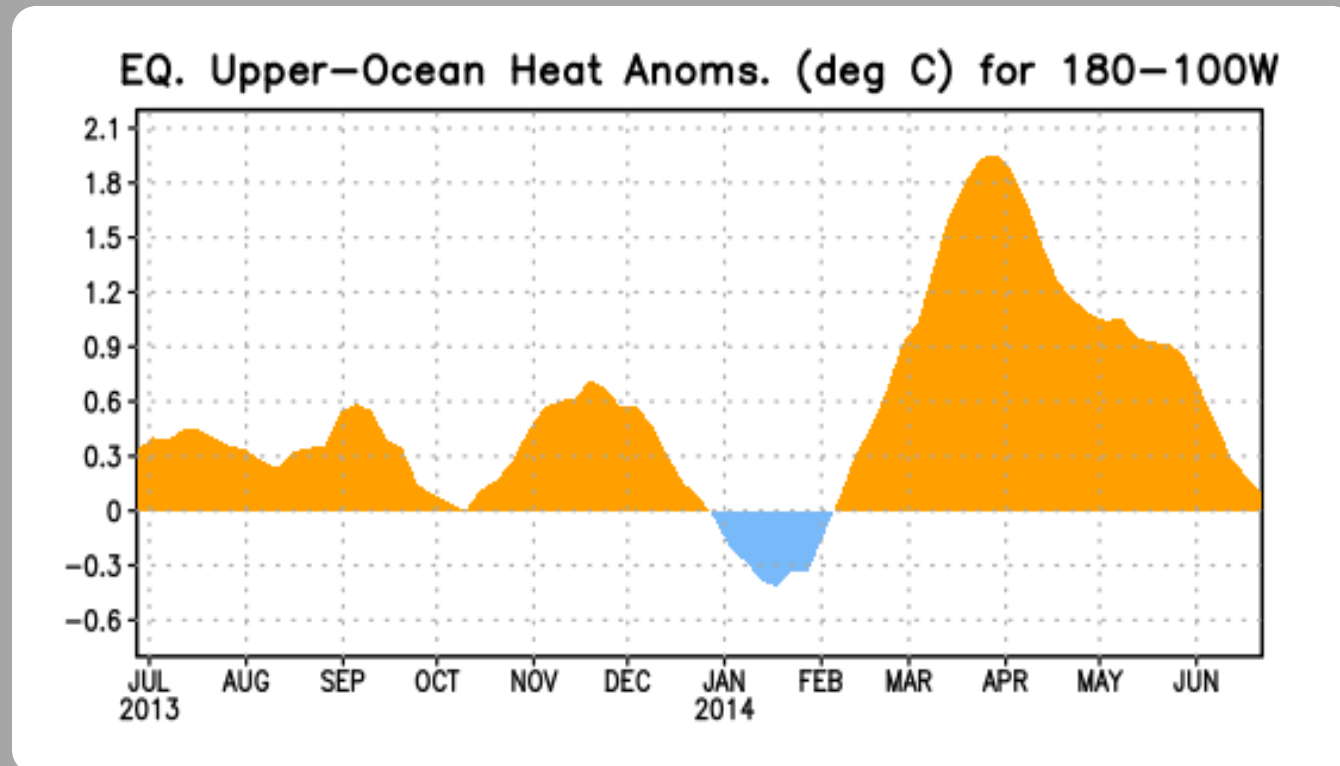
Recent values of the upper-ocean heat anomalies (positive) and thermocline slope index (negative) reflect a progression toward El Niño.

*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).*

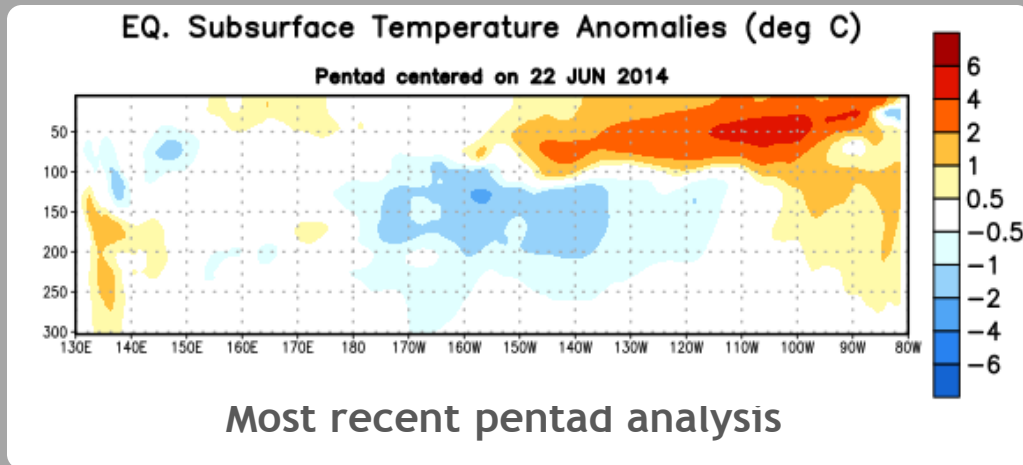


# Weekly Central & Eastern Pacific Upper-Ocean (0-300 m) Average Temperature Anomalies

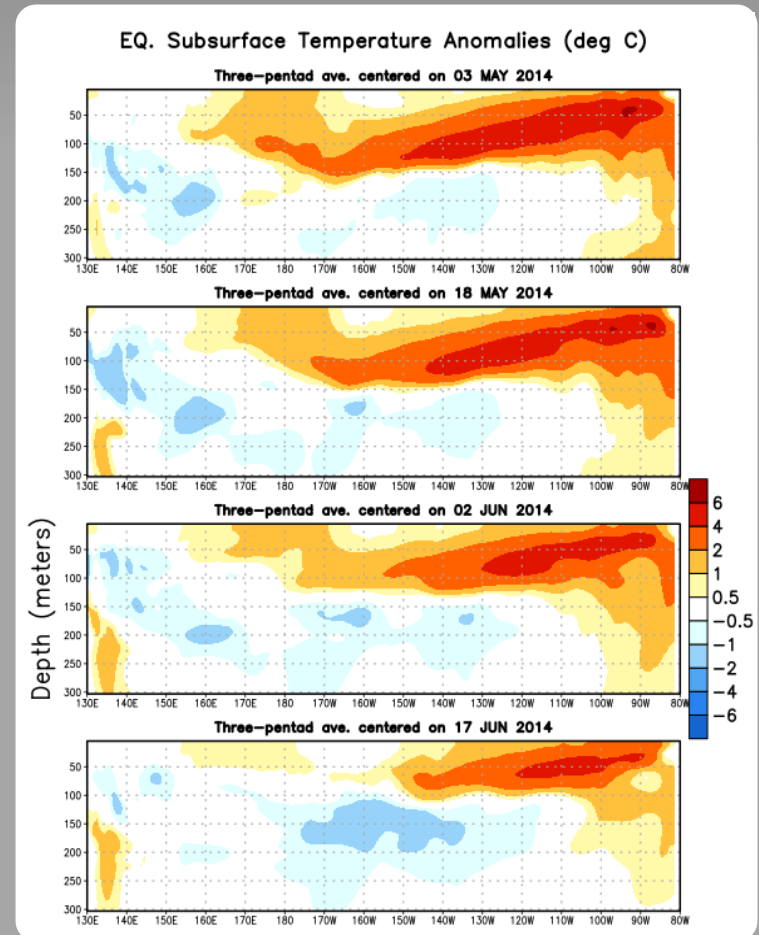
Subsurface temperature anomalies increased during June, August, and in October 2013. From January - March 2014, temperature anomalies strongly increased. Since April 2014, the positive anomalies have weakened and are now near zero.



# Sub-Surface Temperature Departures in the Equatorial Pacific



Positive subsurface anomalies are evident near the surface (<100m) across most of the Pacific basin, while negative anomalies have strengthened in the central and east-central Pacific at depth.

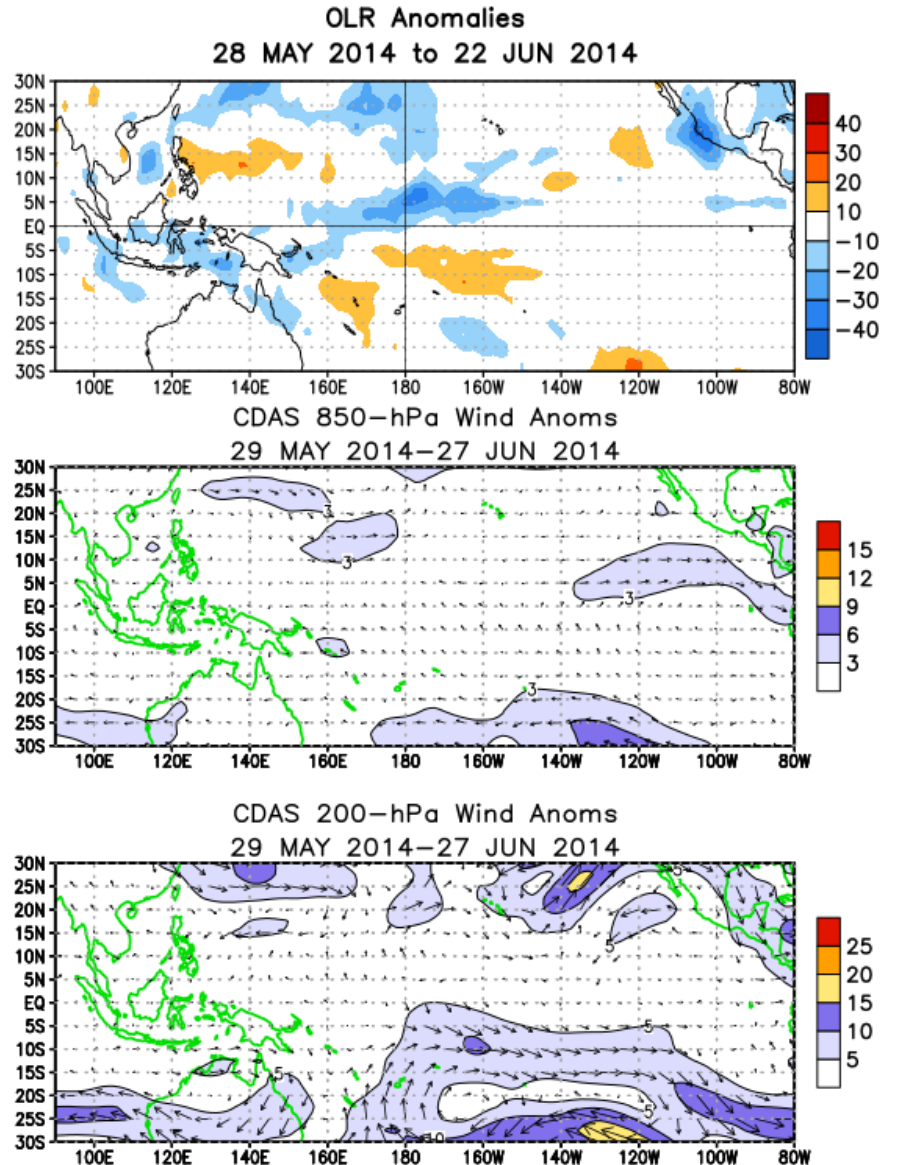


# Tropical OLR and Wind Anomalies During the Last 30 Days

Weak negative OLR anomalies (enhanced convection and precipitation, blue shading) were observed over Indonesia and near the International Date Line, north of the equator.

Anomalous low-level (850-hPa) westerly winds were observed across the eastern tropical Pacific, mostly north of the equator.

Upper-level winds were near -average (200-hPa).



# 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

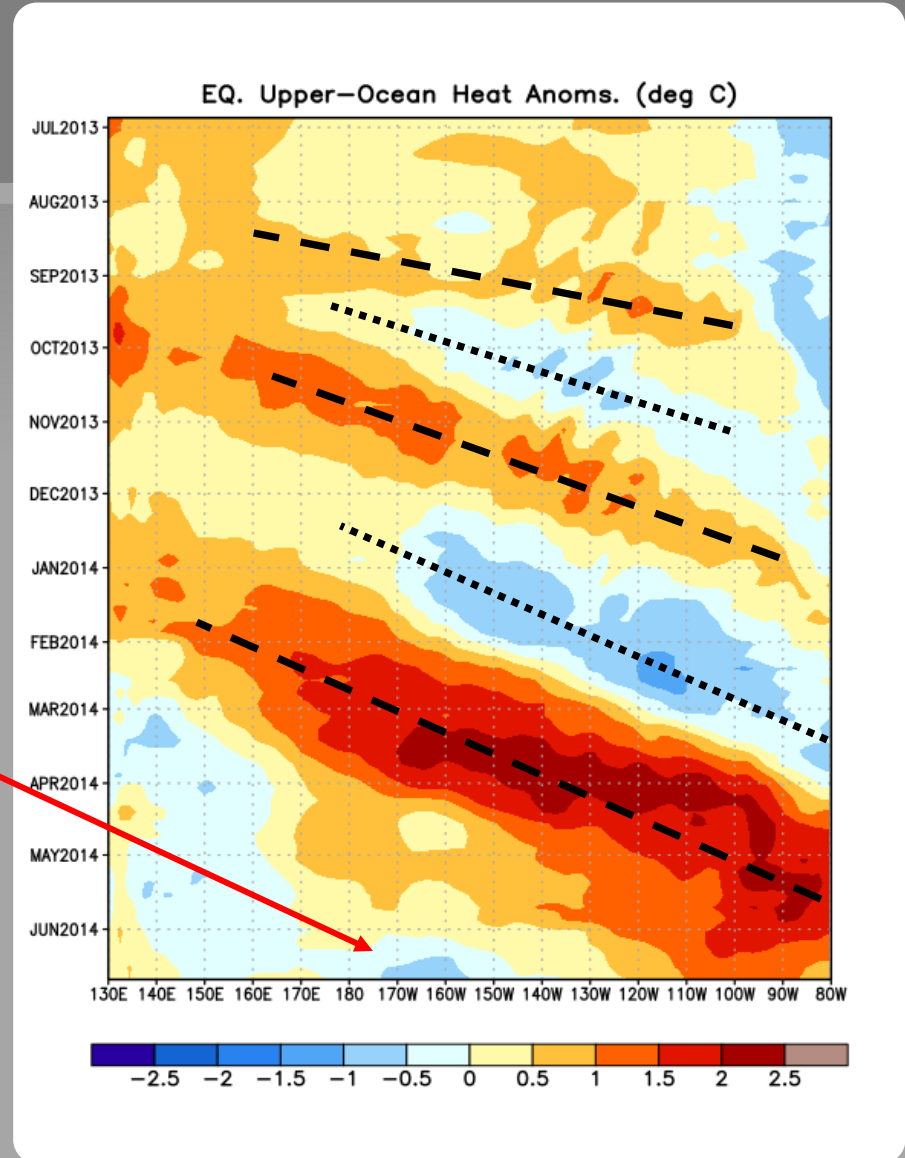
Enhanced oceanic Kelvin wave activity has been observed since early August 2013.

During January - April 2014, the downwelling phase of a strong Kelvin wave crossed the Pacific.

Since April, the positive anomalies have progressively weakened across most of the Pacific.

Since June, weak negative anomalies have become evident across the western half of the 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 ( $\text{m s}^{-1}$ )

During the last halves of January and February 2014, strong westerly wind bursts occurred over the western equatorial Pacific.

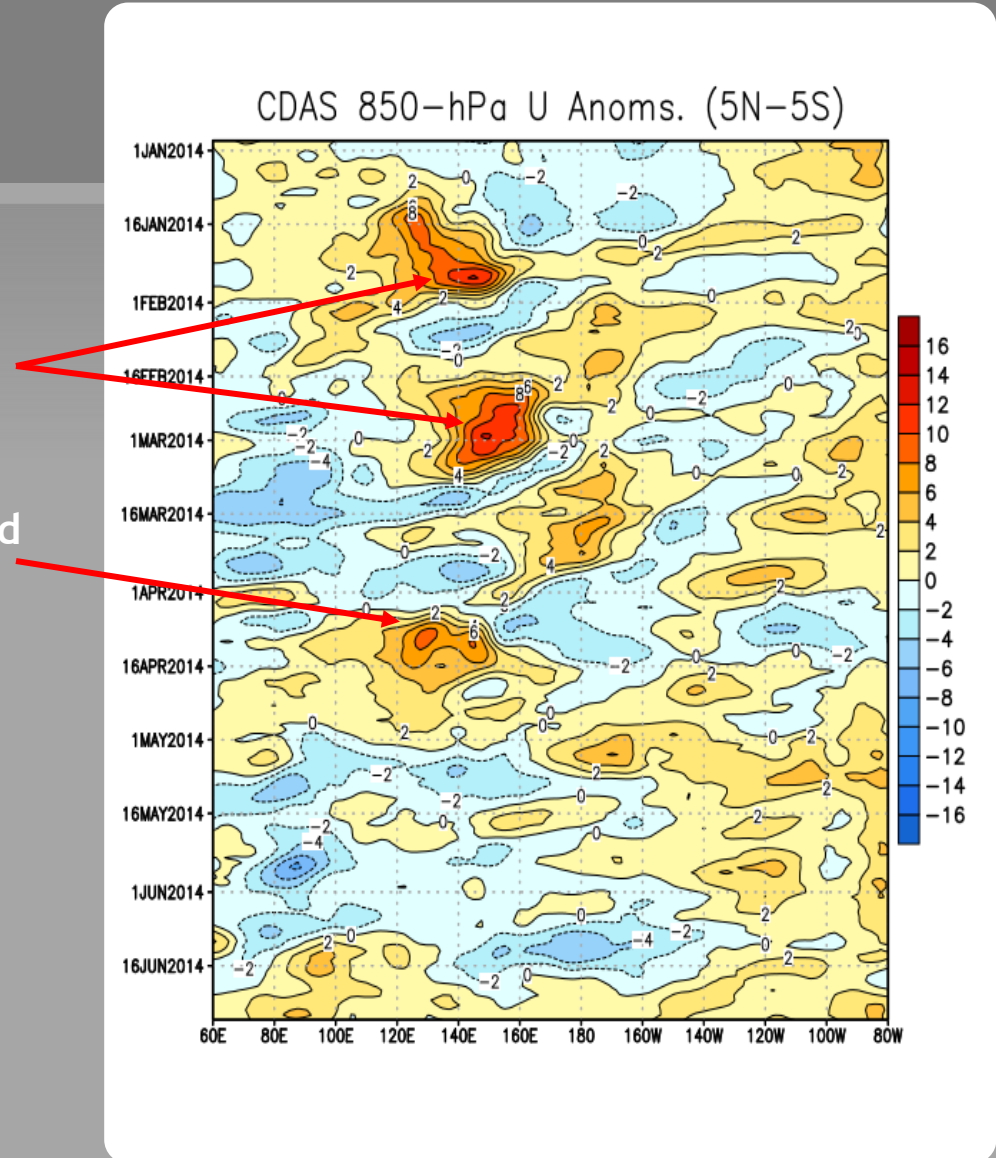
A weaker westerly wind burst occurred in early April 2014.

Since May, low-level westerly wind anomalies have persisted across the eastern equatorial Pacific.

In the last week, weak low-level westerly wind anomalies have been evident across the Pacific.

Westerly Wind Anomalies (orange/red shading)

Easterly Wind Anomalies (blue shading)



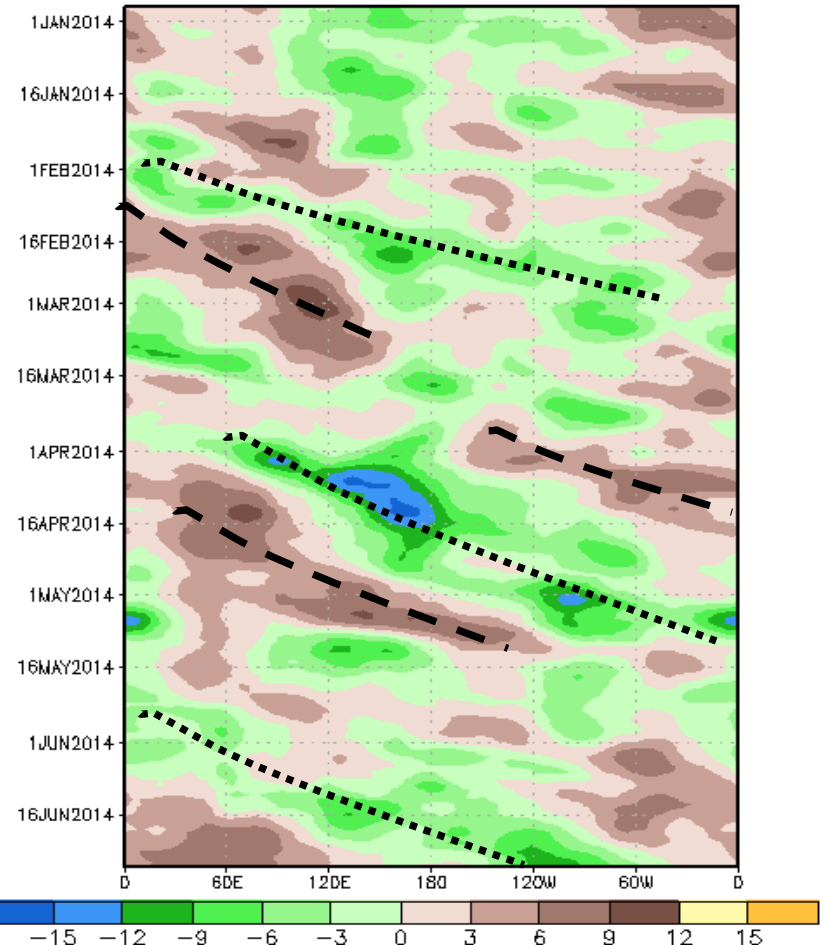


# Upper-level (200-hPa) Velocity Potential Anomalies

During late February 2014, April-May, and more recently, eastward propagating velocity potential anomalies have been observed.

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

200-hPa Velocity Potential Anomaly: 5N-5S  
5-day Running Mean



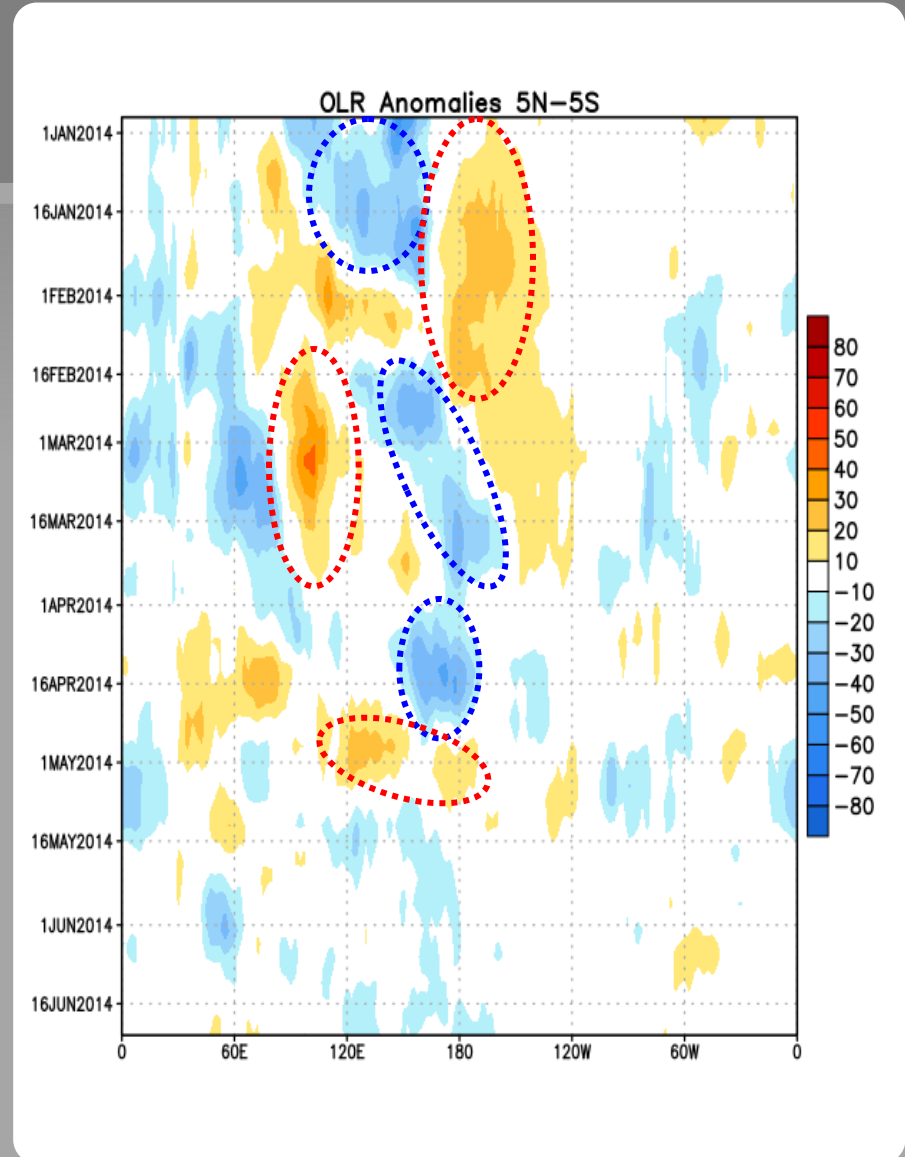
# Outgoing Longwave Radiation (OLR) Anomalies

Until January/February 2014, below-average OLR was generally evident over the western Pacific and above-average OLR persisted near the Date Line.

During February and March 2014, above-average OLR persisted near western Indonesia, while below-average OLR was observed over the western or central equatorial Pacific.

Recently, OLR has been mostly near average across the 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.)

Used to place current events into a historical perspective

NOAA's operational definitions of El Niño and La Niña are keyed to the ONI index.

# NOAA Operational Definitions for El Niño and La Niña

El Niño: characterized by a positive ONI greater than or equal to  $+0.5^{\circ}\text{C}$ .

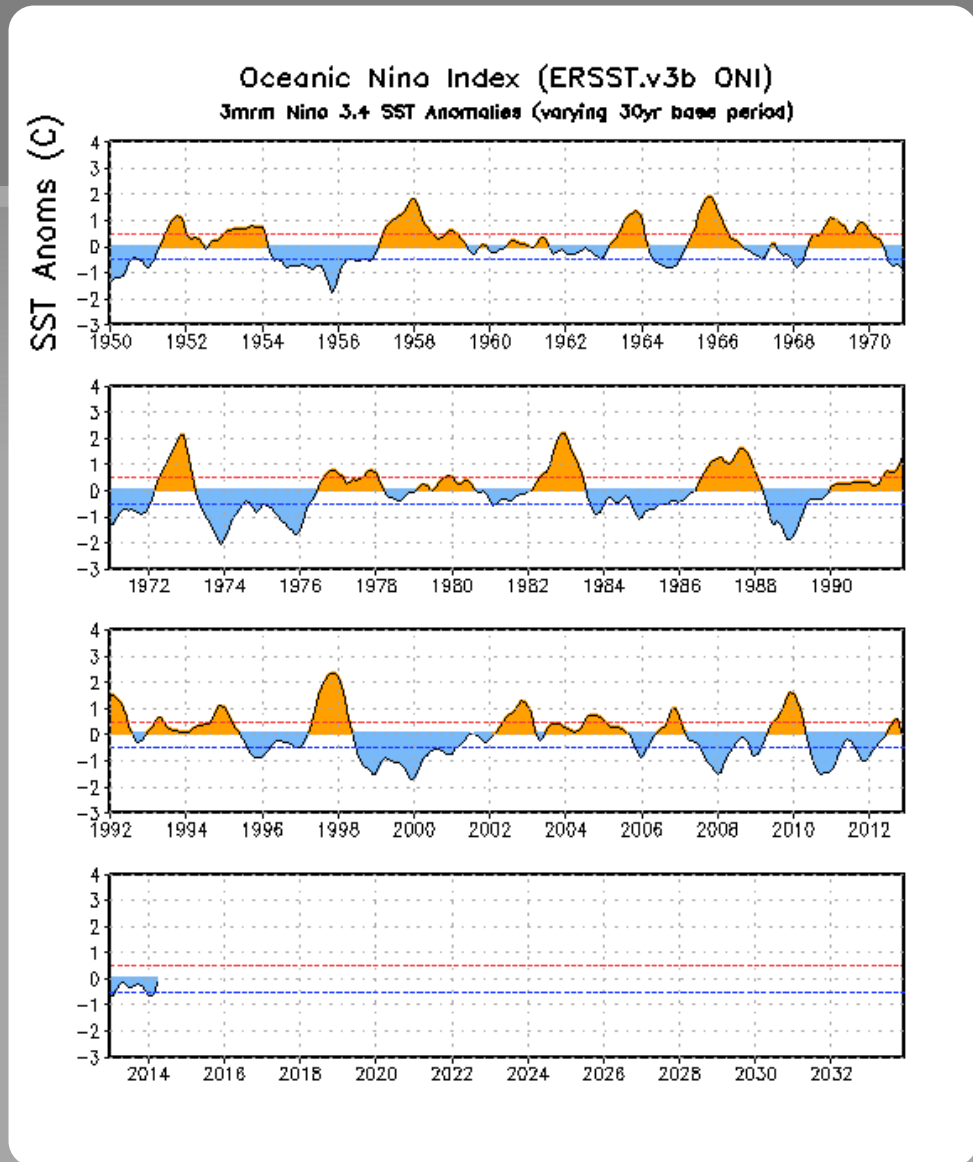
La Niña: characterized by a negative ONI less than or equal to  $-0.5^{\circ}\text{C}$ .

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 (March - May 2014) is  $-0.2^{\circ}\text{C}$ .



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

## El Niño

### Highest ONI Value

JJA 1951 - DJF 1951/52	1.2
DJF 1952/53 - JFM 1954	0.8
MAM 1957 - JJA 1958	1.8
OND 1958 - FMA 1959	0.6
MJJ 1963 - JFM 1964	1.4
AMJ 1965 - MAM 1966	1.9
JAS 1968 - DJF 1969/70	1.1
AMJ 1972 - FMA 1973	2.1
ASO 1976 - JFM 1977	0.8
ASO 1977 - JFM 1978	0.8
AMJ 1982 - MJJ 1983	2.2
JAS 1986 - JFM 1988	1.6
AMJ 1991 - MJJ 1992	1.6
ASO 1994 - FMA 1995	1.2
AMJ 1997 - MAM 1998	2.4
AMJ 2002 - JFM 2003	1.3
JJA 2004 - DJF 2004/05	0.7
ASO 2006 - DJF 2006/07	1.0
JJA 2009 - MAM 2010	1.6

## La Niña

### Lowest ONI Value

ASO 1949 - JAS 1950	-1.4
SON 1950 - JFM 1951	-0.8
AMJ 1954 - NDJ 1956/57	-1.7
AMJ 1964 - DJF 1964/65	-0.8
JJA 1970 - DJF 1971/72	-1.3
AMJ 1973 - JJA 1974	-2.0
SON 1974 - MAM 1976	-1.7
ASO 1983 - DJF 1983/84	-0.9
SON 1984 - ASO 1985	-1.1
AMJ 1988 - AMJ 1989	-1.9
ASO 1995 - FMA 1996	-0.9
JJA 1998 - FMA 2001	-1.7
OND 2005 - FMA 2006	-0.9
JAS 2007 - MJJ 2008	-1.5
OND 2008 - FMA 2009	-0.8
JJA 2010 - MAM 2011	-1.5
ASO 2011 - FMA 2012	-1.0

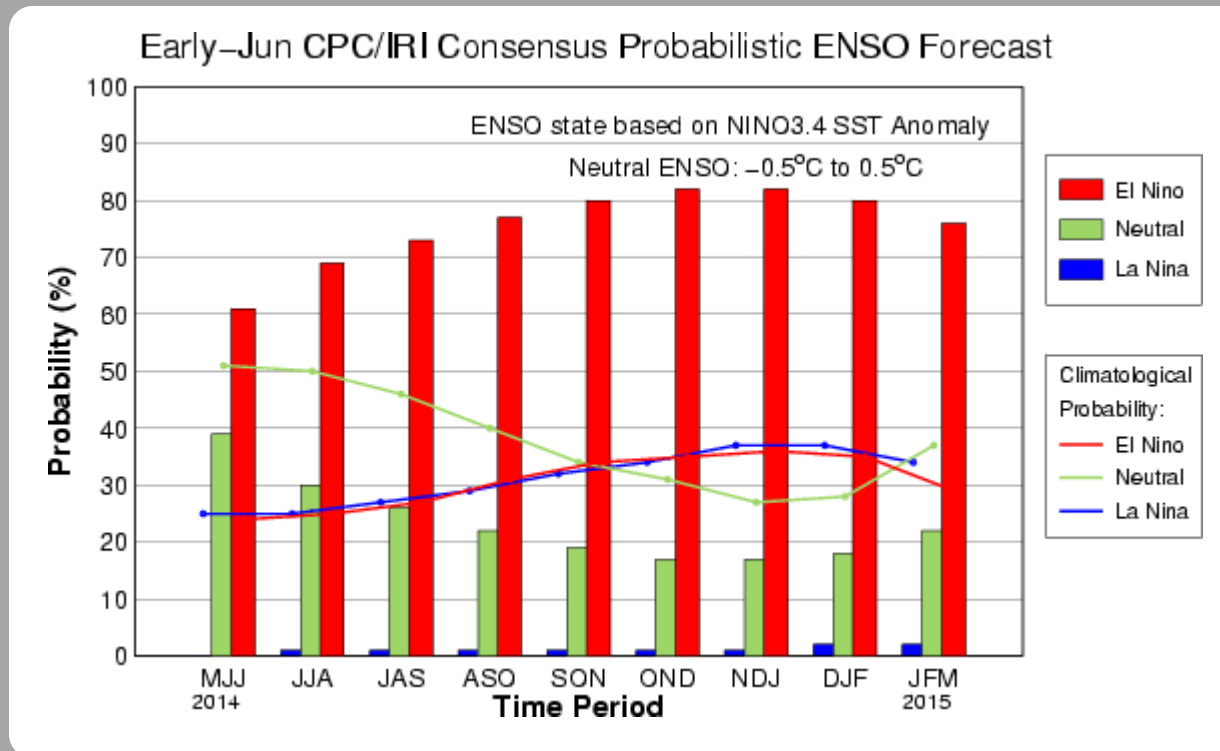
NOTE (Mar. 2012): The historical values of the ONI have slightly changed due to an update in the climatology. Please click [here](#) for more details on the methodology.



# CPC/IRI Probabilistic ENSO Outlook

Updated: 5 June 2014

The chance of El Niño is 70% during the Northern Hemisphere summer and reaches 80% during the fall and winter.





# IRI/CPC Pacific Niño

## 3.4 SST Model Outlook

Most models favor El Niño (greater or equal to +0.5°C) to develop in the next several months and persist through Northern Hemisphere winter 2014-15.

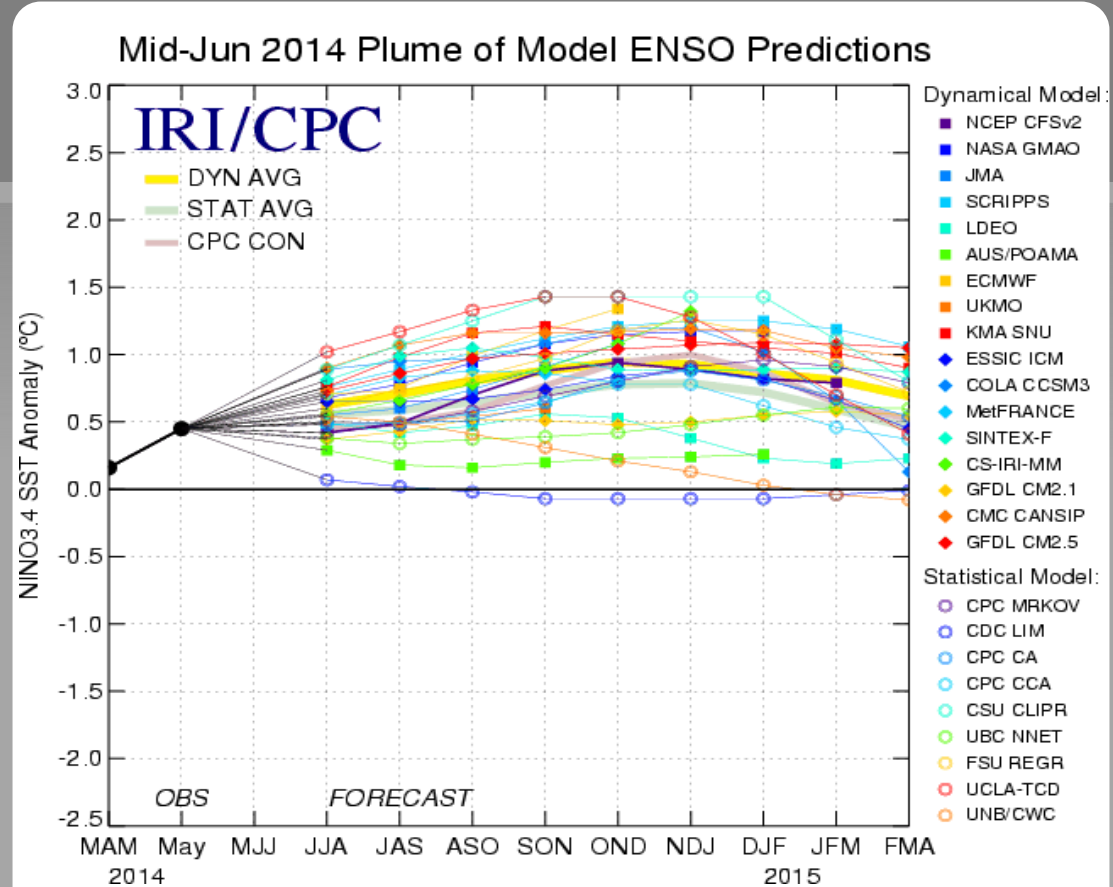
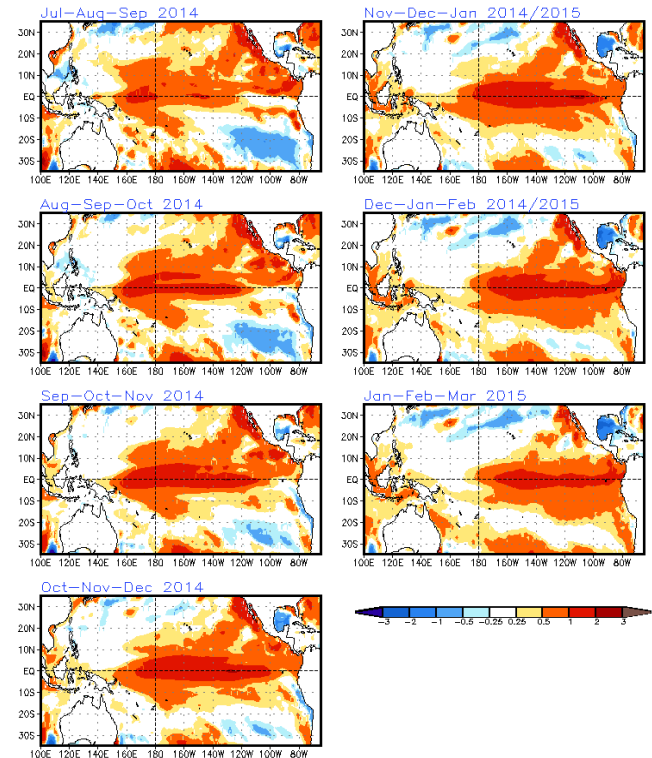
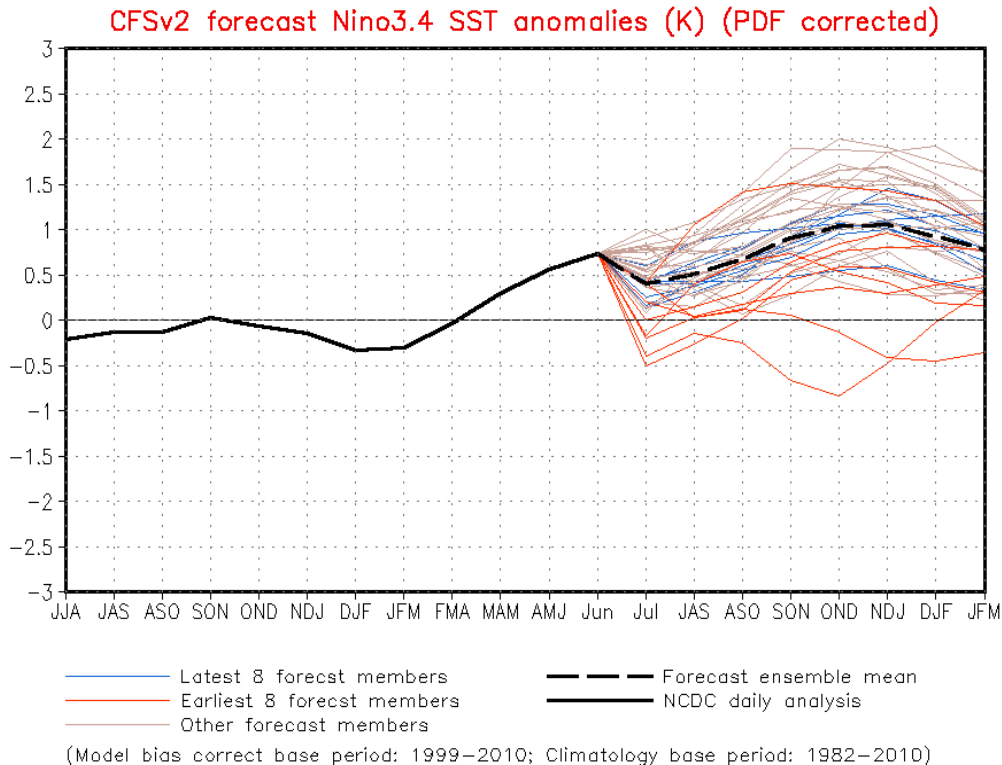


Figure provided by the International Research Institute (IRI) for Climate and Society (updated 17 June 2014).

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

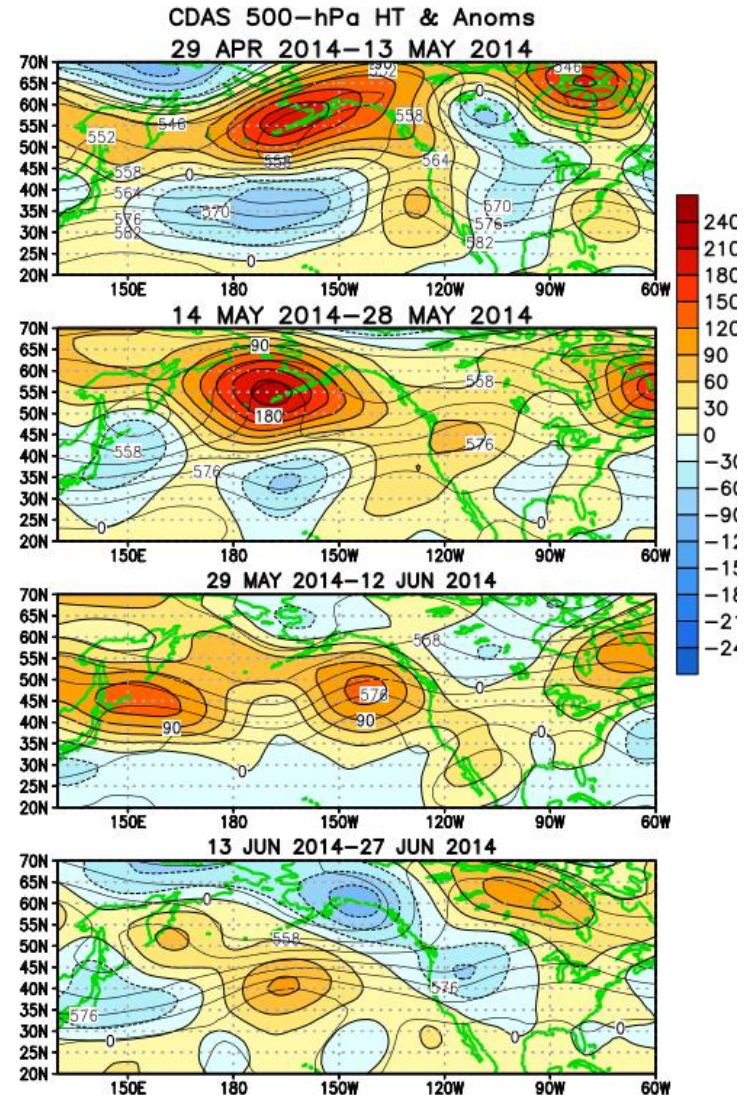
Issued: 30 June 2014

The CFS.v2 ensemble mean (black dashed line) predicts El Niño starting in next several months and lasting through early 2015.



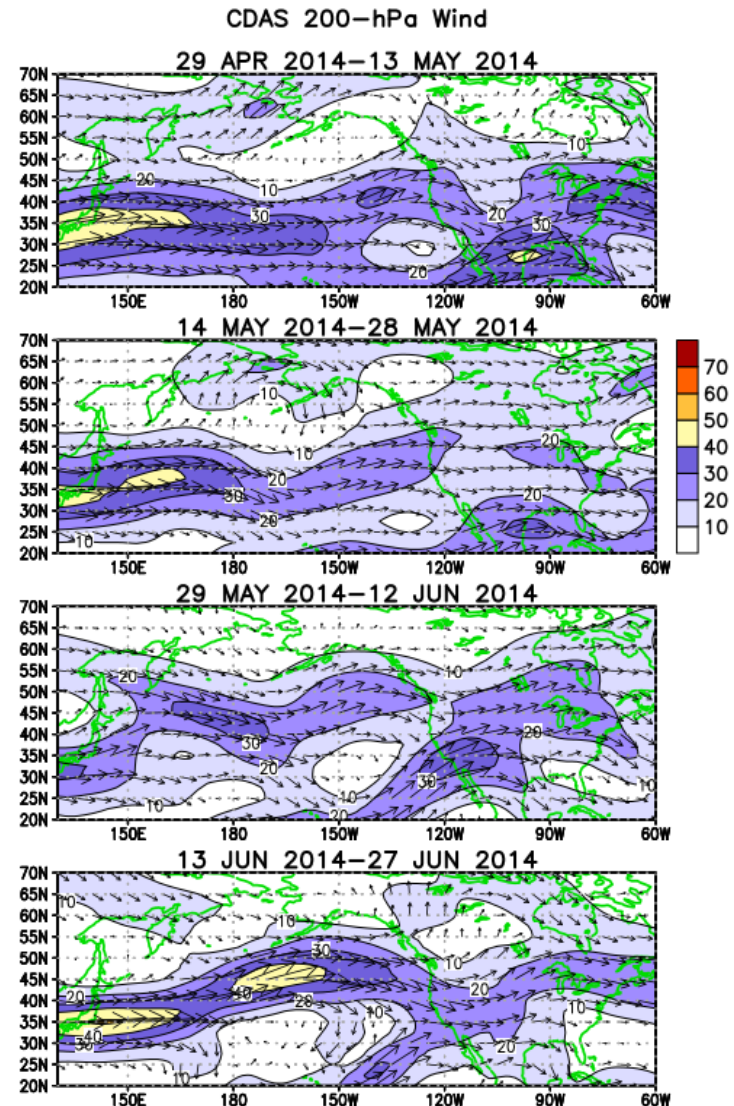
# Atmospheric anomalies over the North Pacific & North America During the Last 60 Days

During late April through mid-June, an anomalous ridge and above-average temperatures affected western N. America. Over central and eastern N. America, the pattern has been more variable leading to periods of below, near, or above average temperatures.



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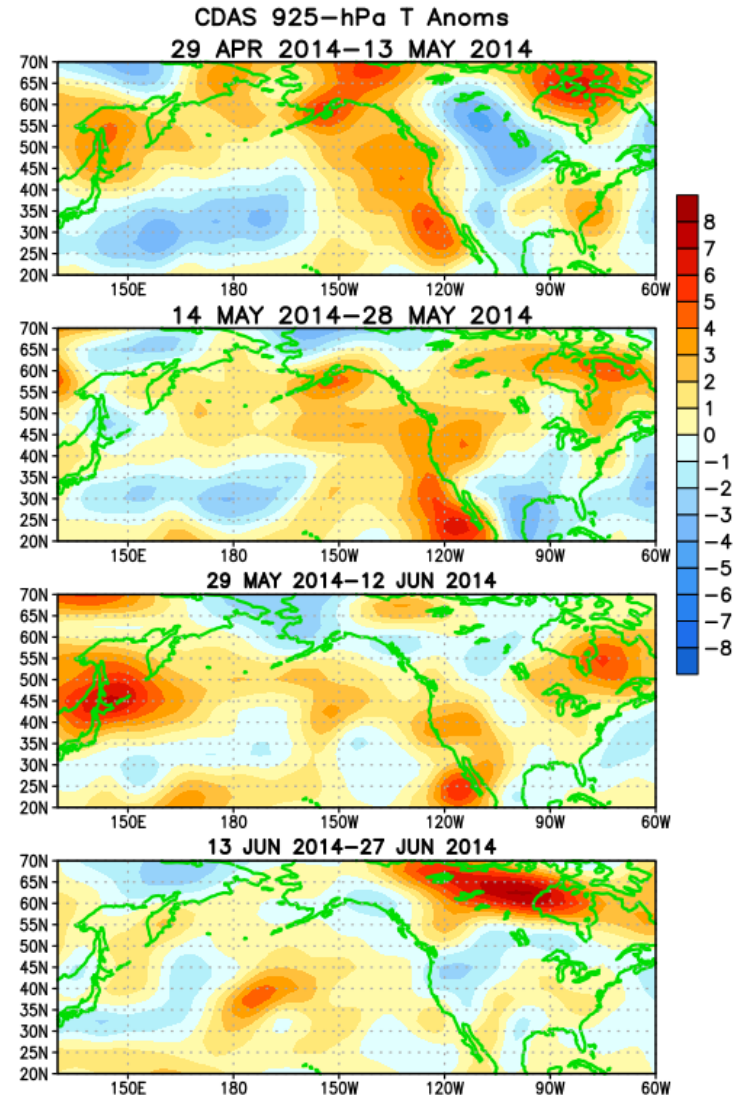
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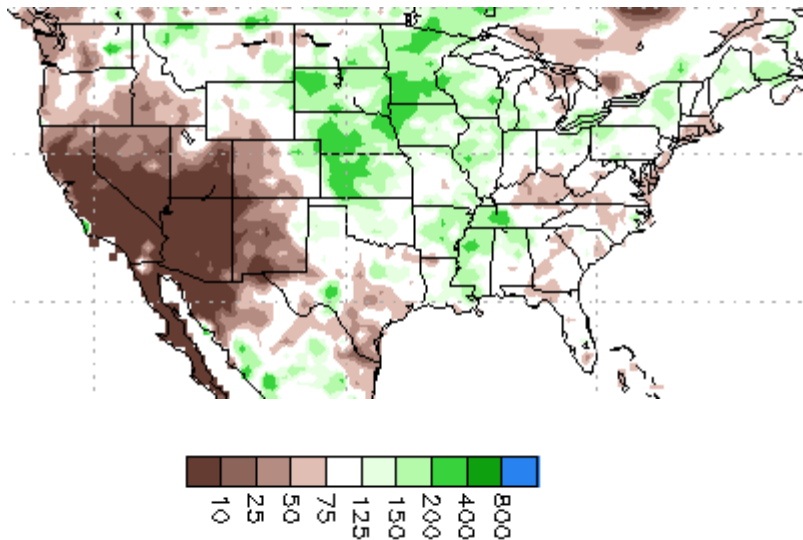
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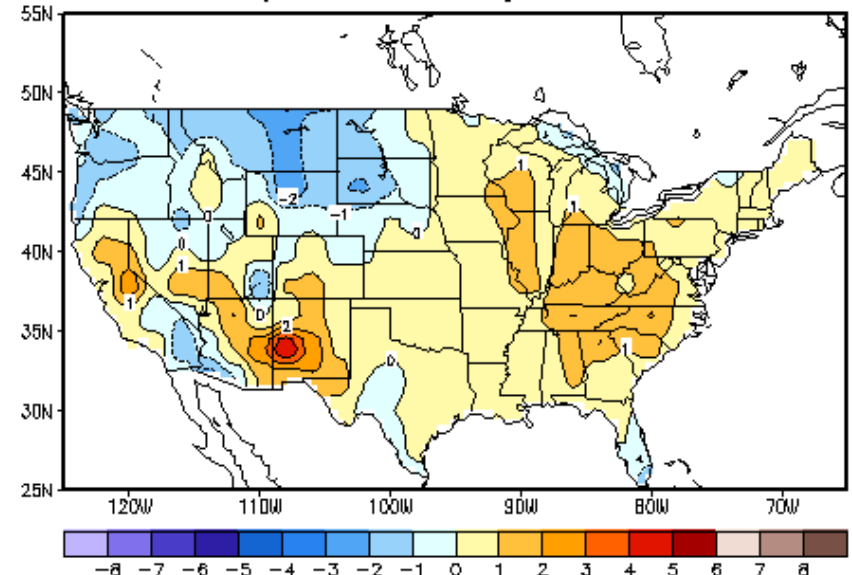
# U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 28 June 2014

### Percent of Average Precipitation



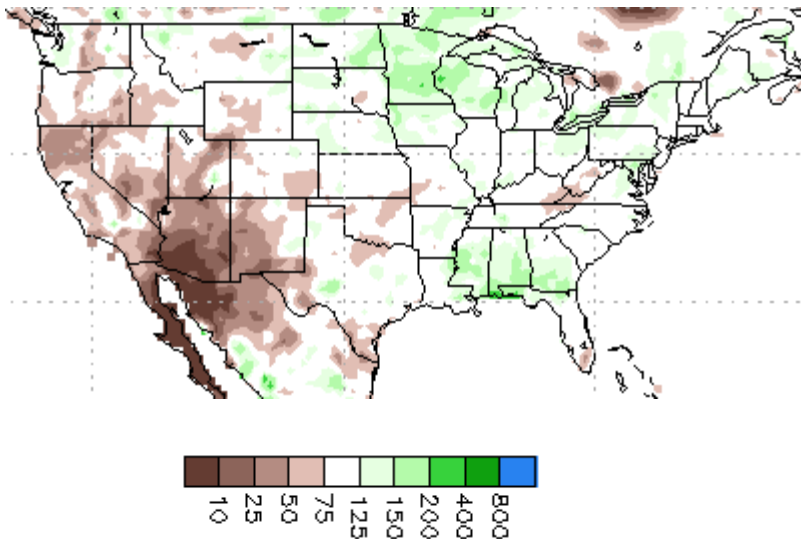
### Temperature Departures (degree C)



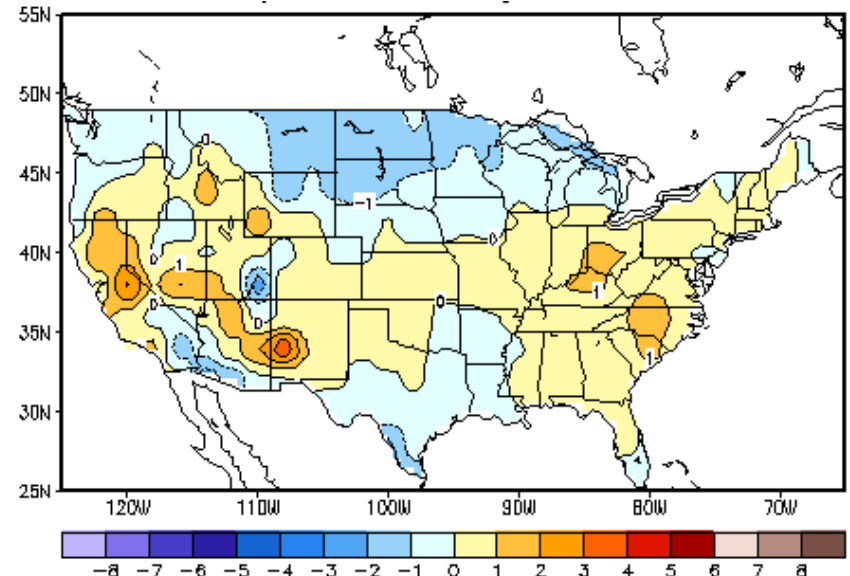
# U.S. Temperature and Precipitation Departures During the Last 90 Days

End Date: 28 June 2014

### Percent of Average Precipitation



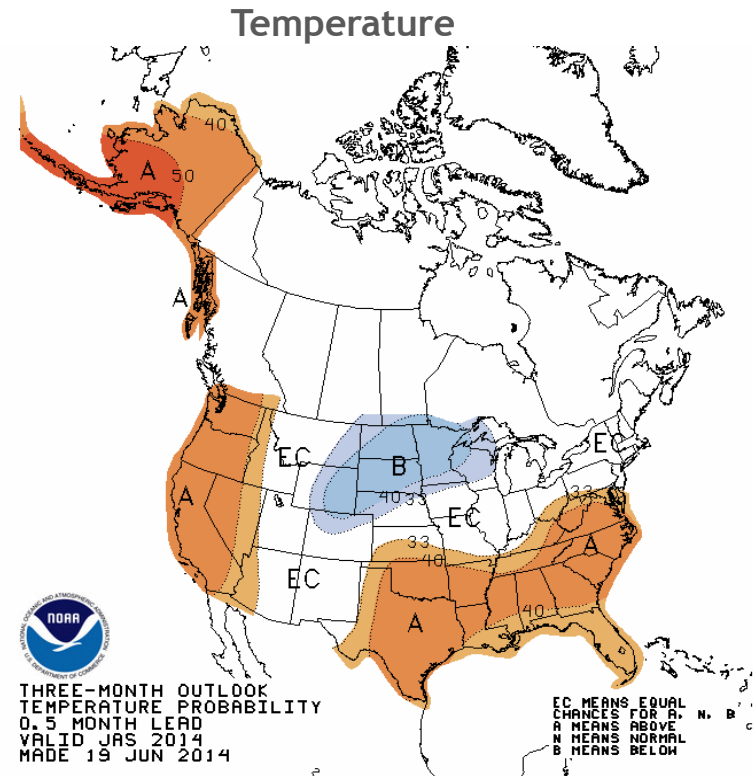
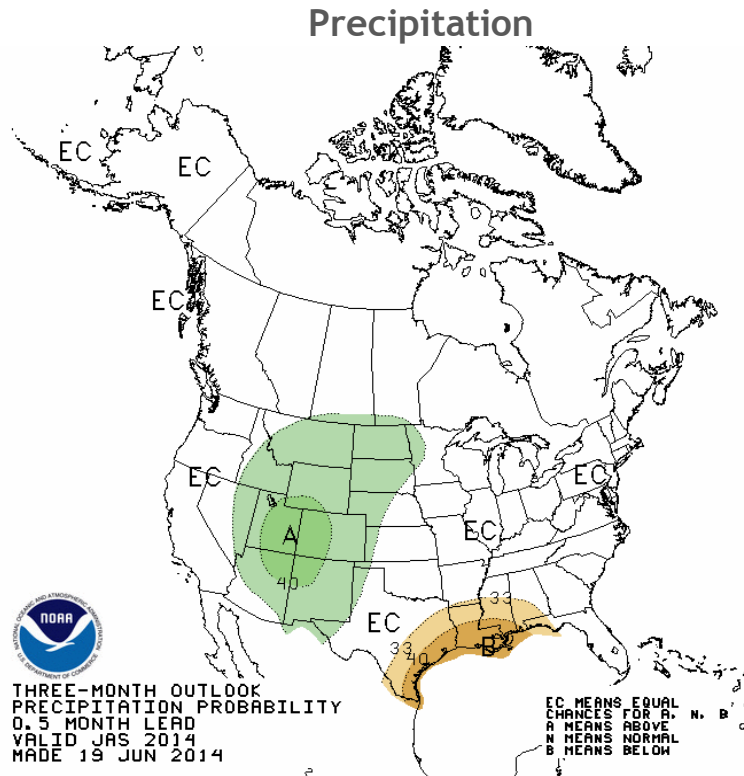
### Temperature Departures (degree C)



# U. S. Seasonal Outlooks

July - September 2014

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





# Summary

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ENSO-neutral conditions continue.\*

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Tropical rainfall is slightly enhanced over Indonesia and near the International Date Line.

Chance of El Niño is 70% during the Northern Hemisphere summer and reaches 80% during the fall and winter.\*

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