ENSO: Recent Evolution, Current Status and Predictions

Update prepared by:
Climate Prediction Center / NCEP
2 September 2014

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ENSO Alert System Status: El Niño Watch

ENSO-neutral conditions continue.*

Positive equatorial sea surface temperature (SST) anomalies continue in the eastern Pacific Ocean and just west of the Date Line.

Chance of El Niño has decreased to about 65% during the Northern Hemisphere fall and early winter.*

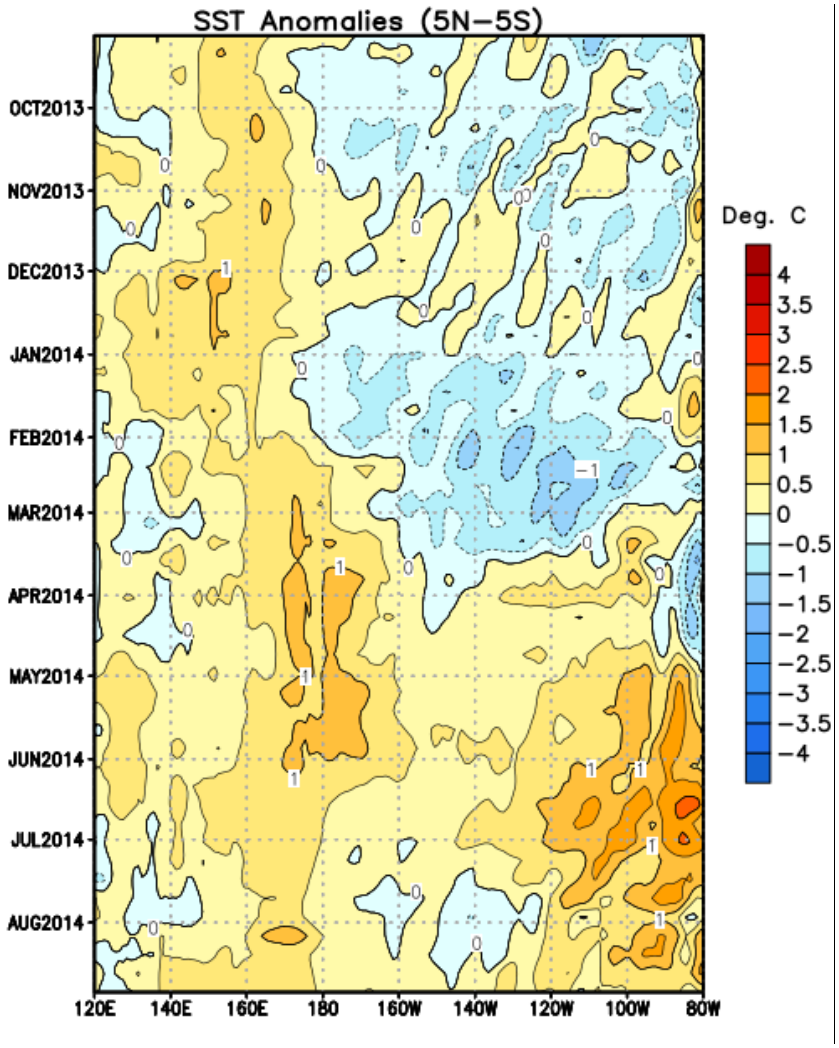
* Note: These statements are updated once a month in association with the ENSO Diagnostics Discussion, which can be found by clicking here.

Recent Evolution of Equatorial Pacific SST Departures (ºC)

From January- February 2014, SSTs were mostly below average across the eastern equatorial Pacific.

From March-June 2014, above-average SSTs (departures >0.5°C) were evident near the Date Line and in the eastern Pacific.

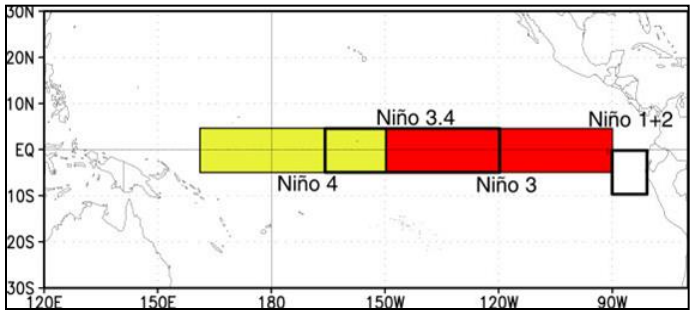
Recently, SSTs have increased in the east-central Pacific, while remaining above-average in the western and eastern Pacific.

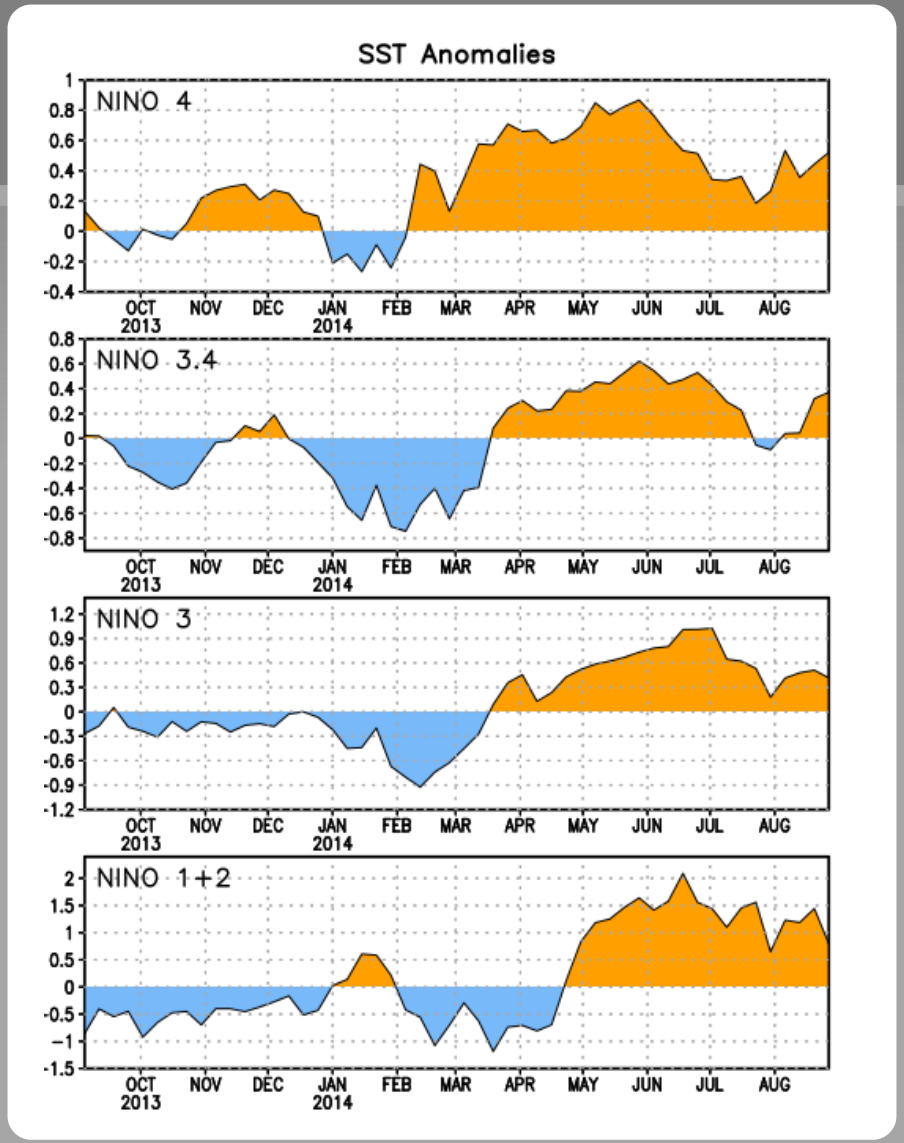


Niño Region SST Departures (ºC) Recent Evolution

The latest weekly SST departures are:

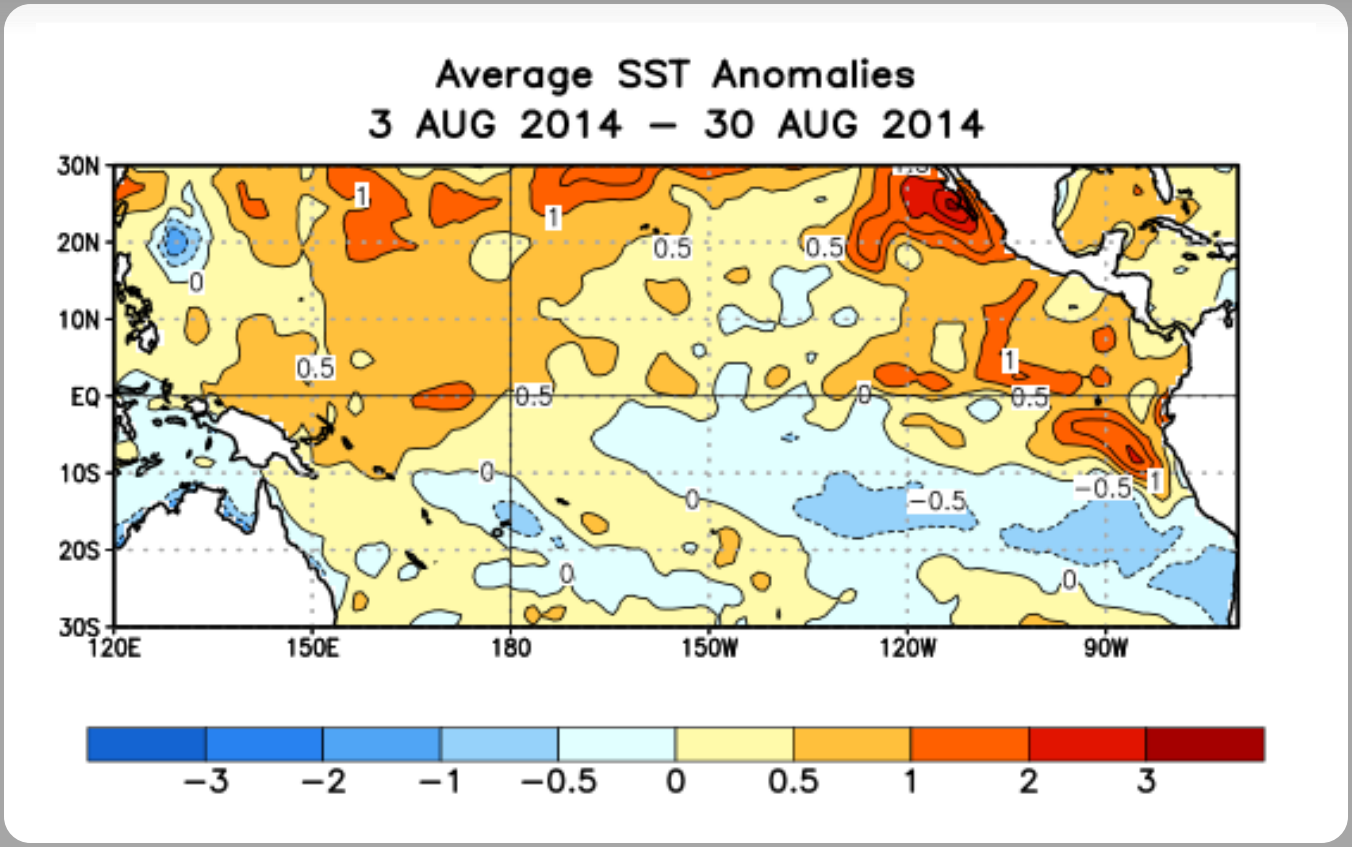
Niño 4	0.5ºC
Niño 3.4	0.4ºC
Niño 3	0.4ºC
Niño 1+2	0.8ºC





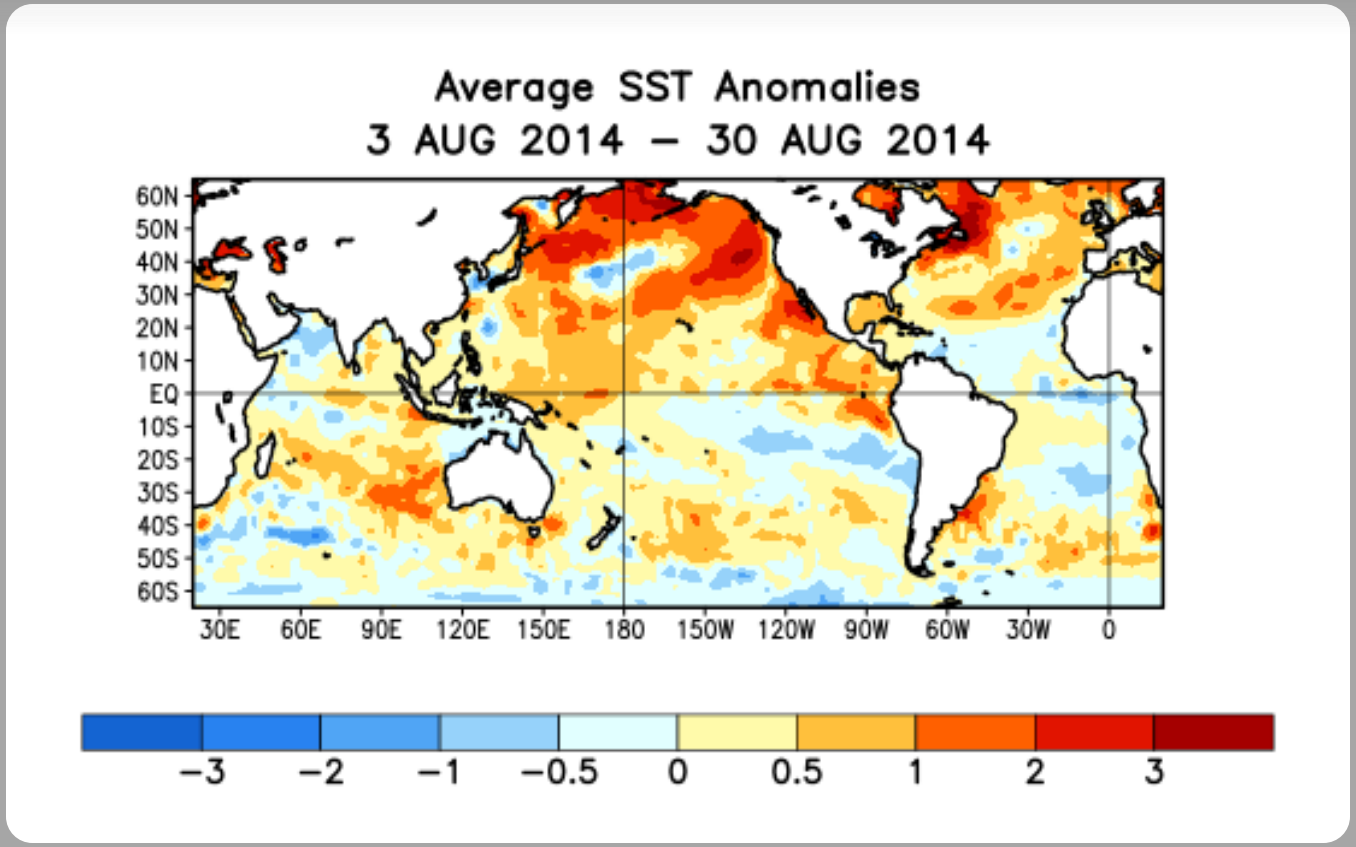
SST Departures (ºC) in the Tropical Pacific During the Last Four Weeks

During the last four weeks, equatorial SSTs were above average west of the Date Line and in the eastern Pacific Ocean, and were near average in the east-central Pacific.



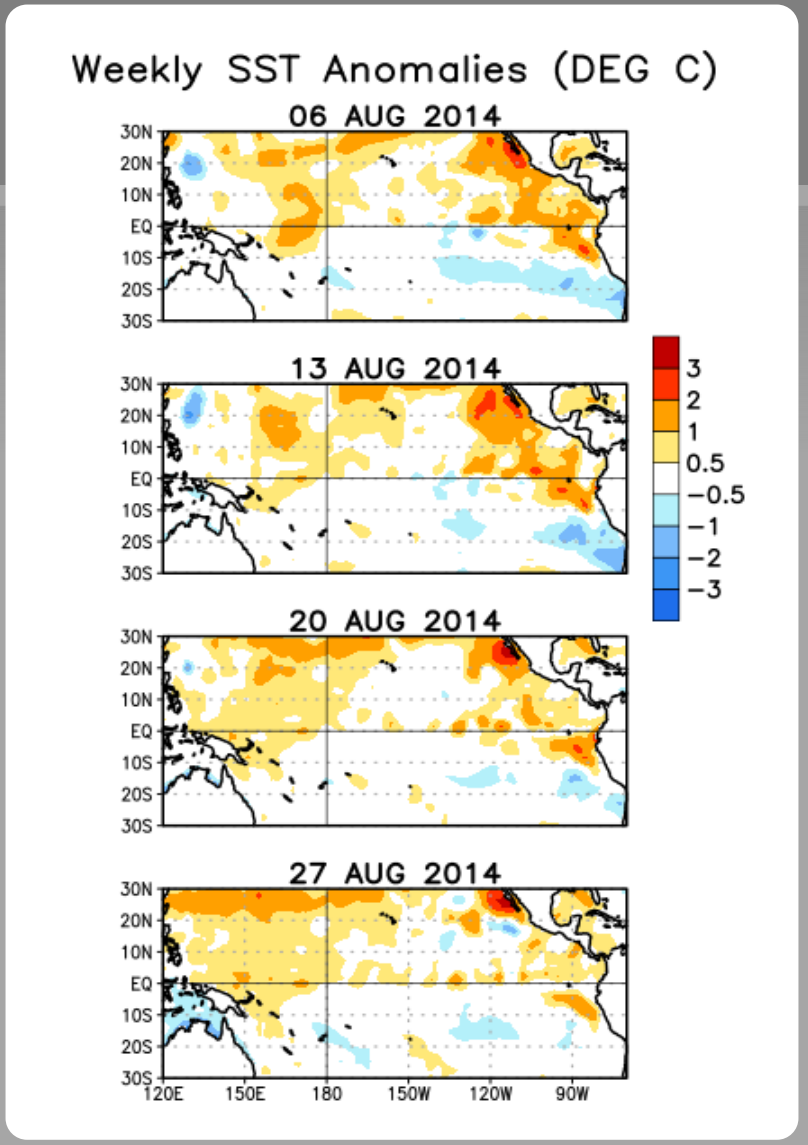
Global SST Departures (°C) During the Last Four Weeks

During the last four weeks, equatorial SSTs were above-average across the eastern Pacific and west of the International Date Line, and below-average across the Atlantic and western Indian Ocean.



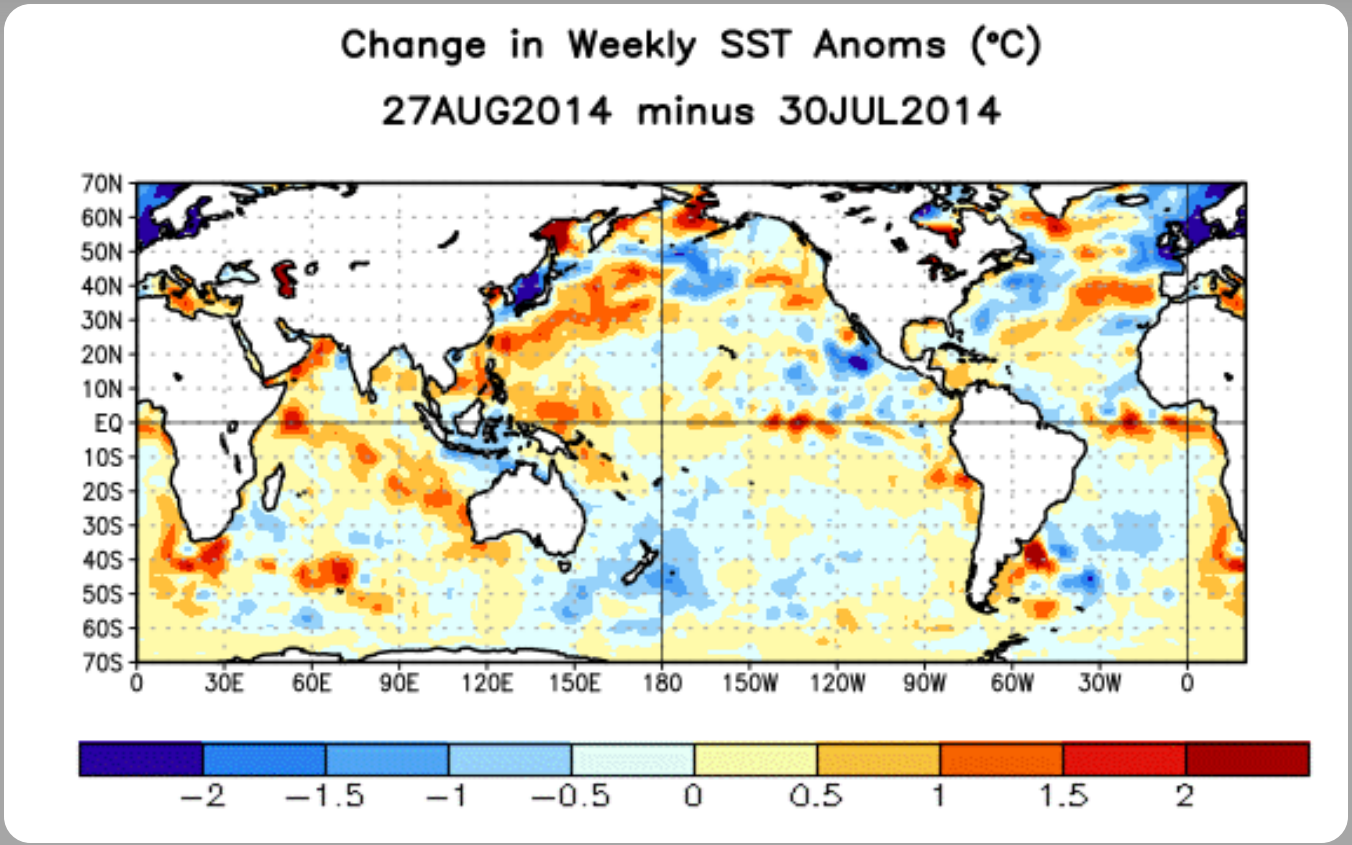
Weekly SST Departures during the Last Four Weeks

During the last four weeks, positive SST anomalies persisted west of the Date Line and redeveloped across portions of the east-central equatorial Pacific.



Change in Weekly SST Departures over the Last Four Weeks

During the last four weeks, changes in equatorial SST anomalies were positive in the western Pacific and portions of the east-central Pacific and negative in some regions of the eastern Pacific.



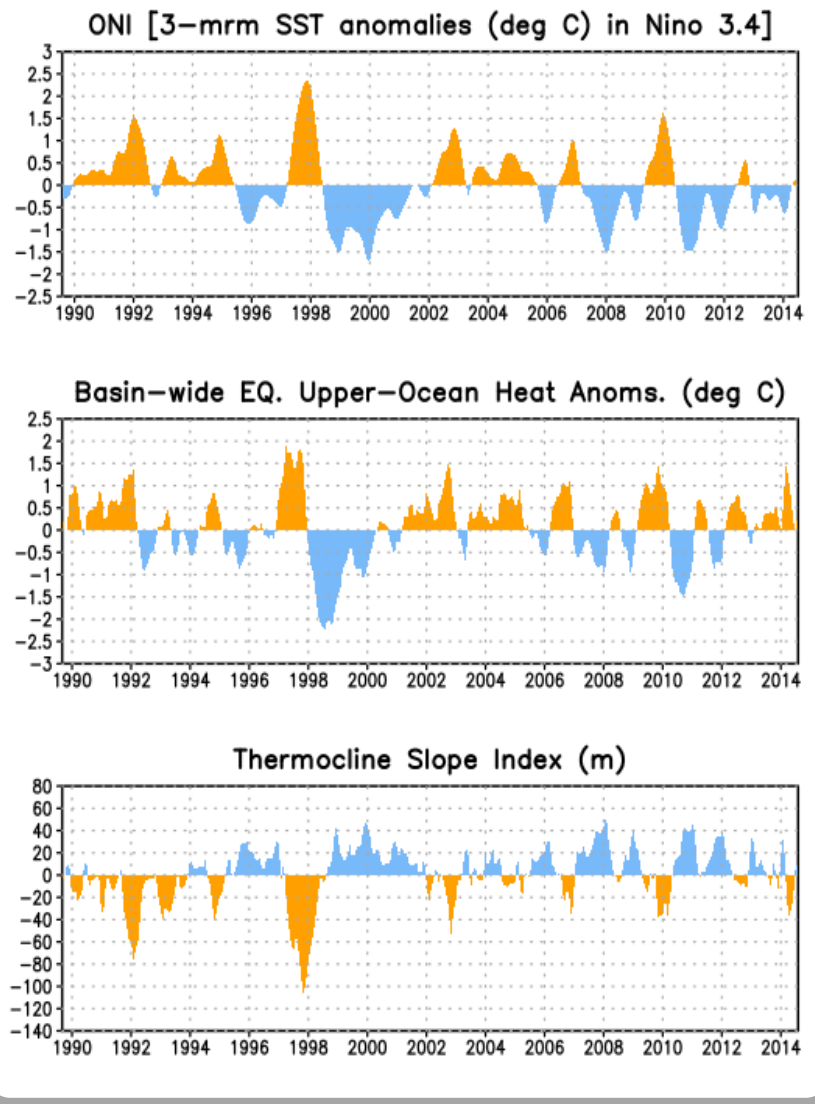
Upper-Ocean Conditions in the Equatorial Pacific

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.

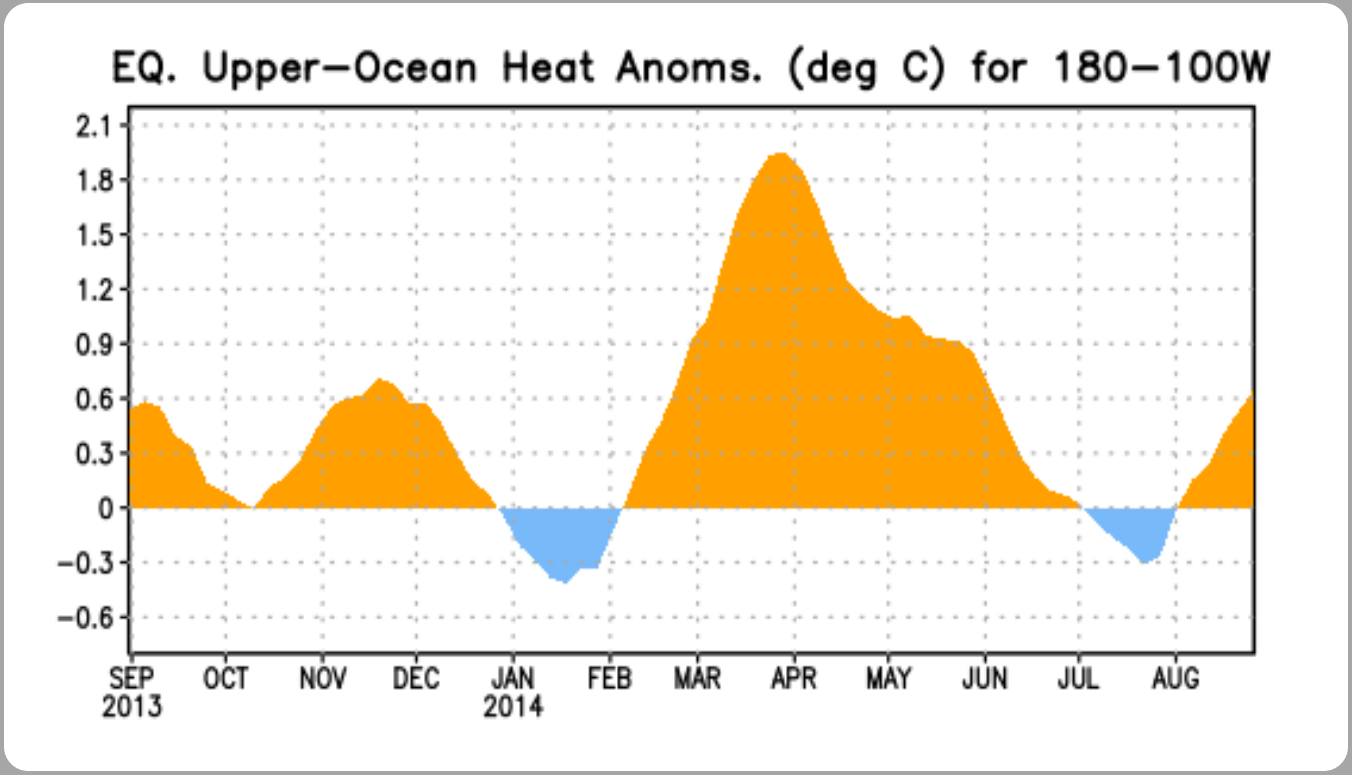
Recent values of the upper-ocean heat anomalies (near zero) and thermocline slope index (near zero) reflect ENSO-neutral conditions.

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).



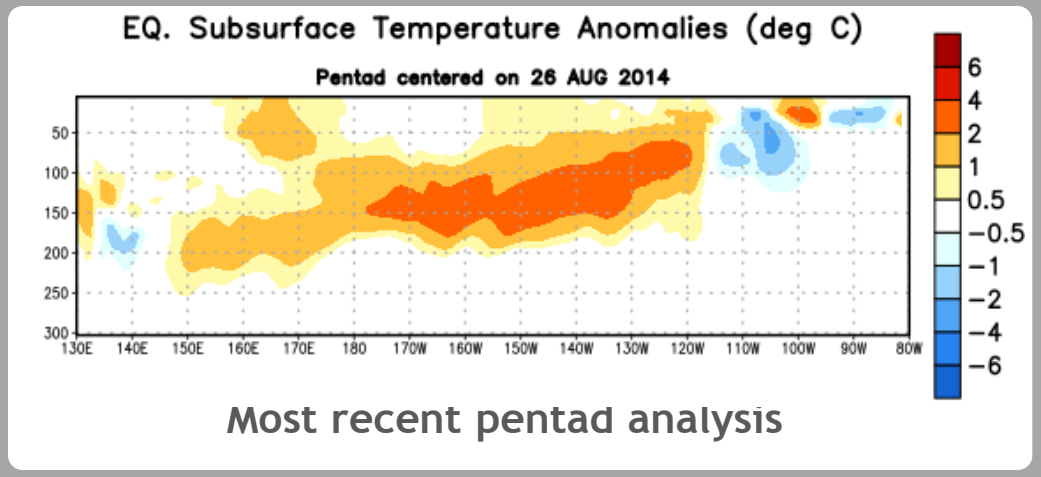
Central and Eastern Pacific Upper-Ocean (0-300 m) Weekly Average Temperature Anomalies

Subsurface temperature anomalies strongly increased during January - March 2014. During April-July 2014, the positive anomalies decreased to near average values. Since late July, temperature anomalies have increased.



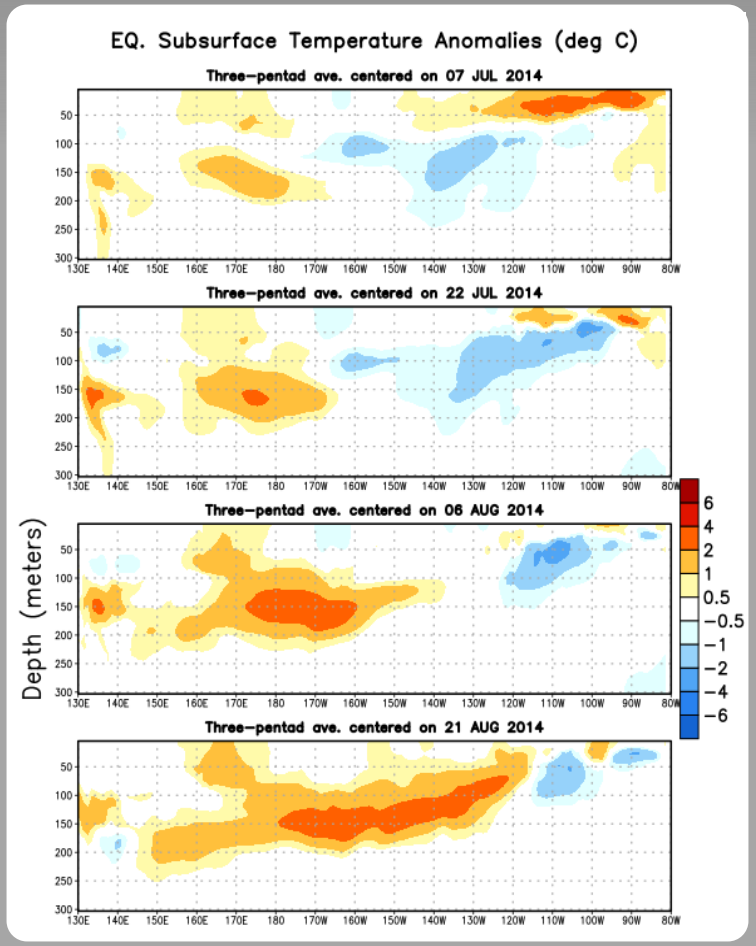
Sub-Surface Temperature Departures in the Equatorial Pacific

Another downwelling Kelvin wave emerged in mid August 2014 as reflected by the eastward shift of positive temperature anomalies.



Most recent pentad analysis

Positive subsurface anomalies are evident across most of the Pacific, except for a region of negative anomalies in the eastern Pacific.

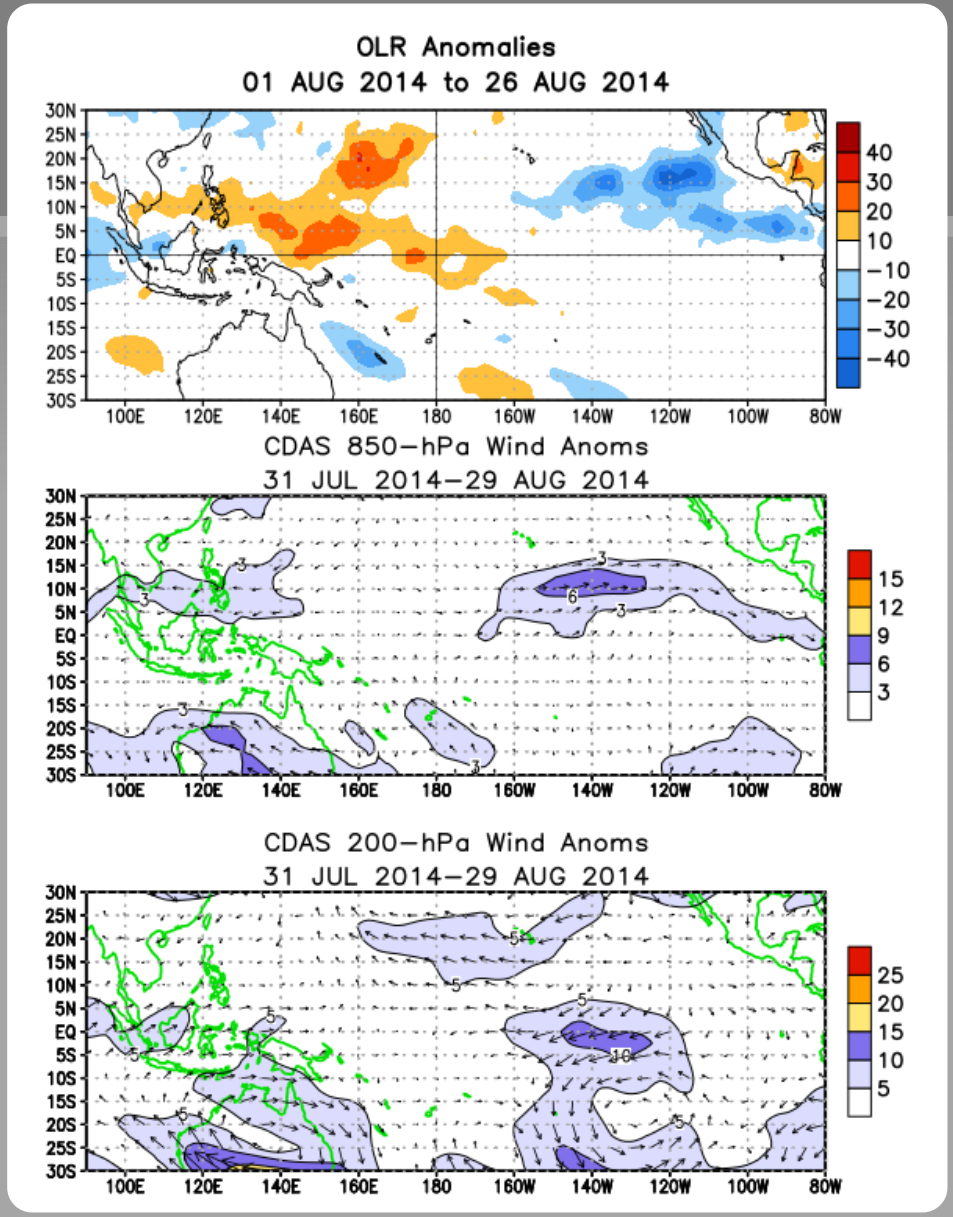


Tropical OLR and Wind Anomalies During the Last 30 Days

Positive OLR anomalies (suppressed convection and precipitation, red shading) were evident over the Date Line and western Pacific, mostly north of the equator.

Low-level (850-hPa) winds were near-average across most of the equatorial Pacific. Anomalous westerlies were present mostly north of the equator, across the eastern half of the Pacific.

Easterly upper-level (200-hPa) wind anomalies were observed over the east-central 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:

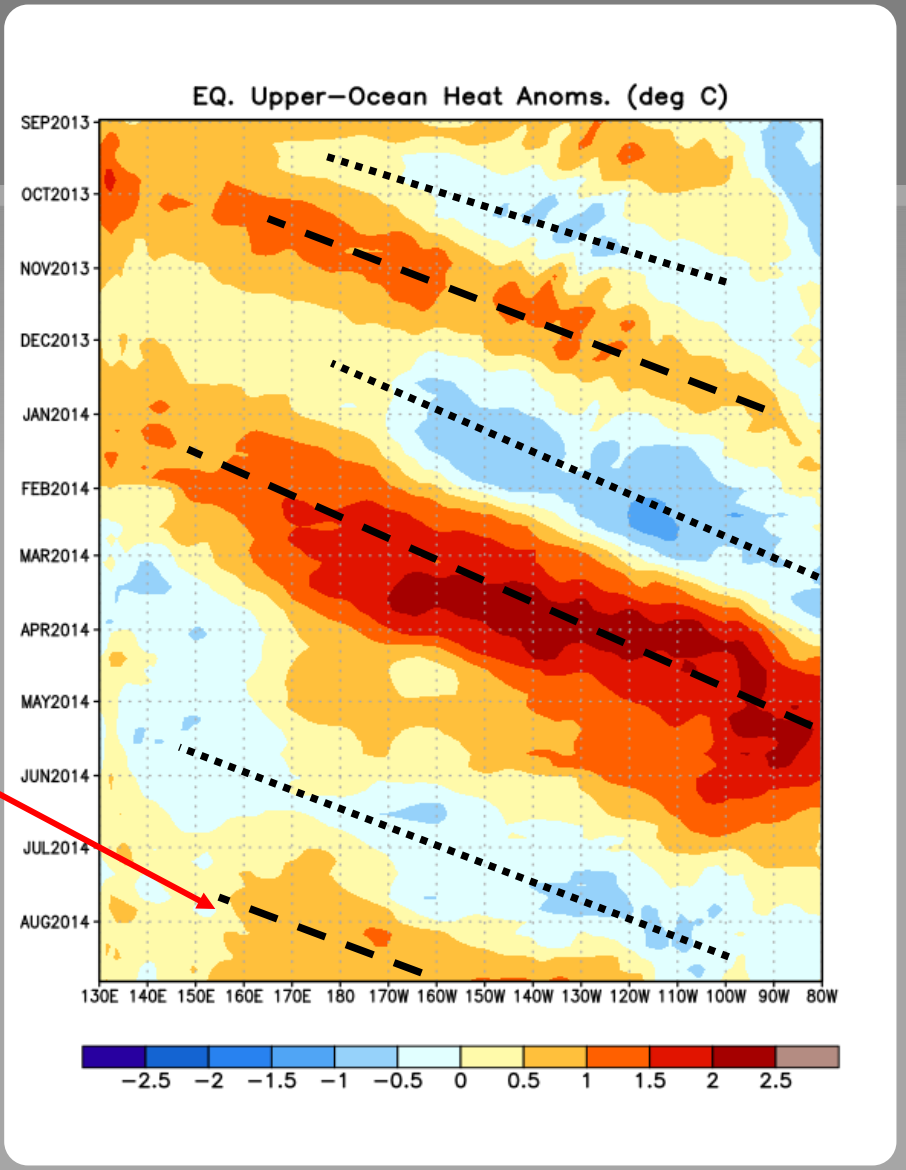
Significant weakening of the low-level easterly winds usually initiates an eastward-propagating oceanic Kelvin wave.

Weekly Heat Content Evolution in the Equatorial Pacific

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

During May-July, positive temperature anomalies progressively disappeared from the equatorial Pacific in response to an upwelling Kelvin wave.

In late July and August, a downwelling Kelvin wave moved into the east-central equatorial Pacific.

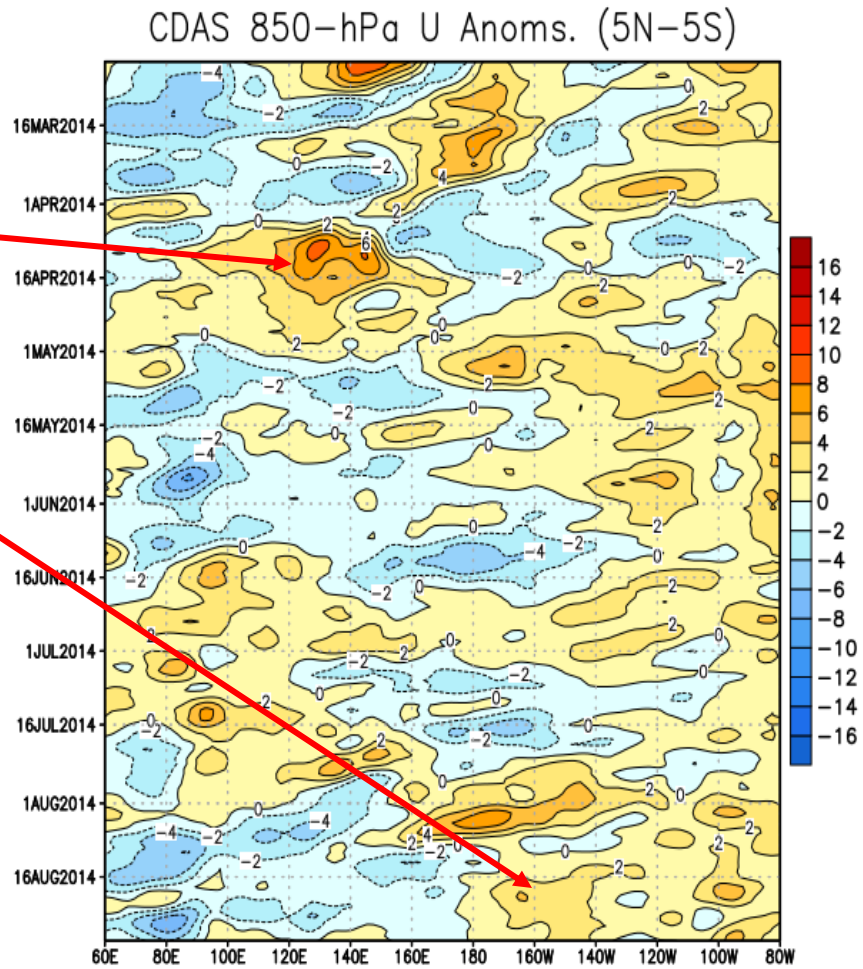


Oceanic Kelvin waves have alternating warm and cold phases. The warm phase is indicated by dashed lines. Down-welling and warming occur in the leading portion of a Kelvin wave, and up-welling and cooling occur in the trailing portion.

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

A westerly wind burst occurred in early April 2014.

Recently, westerly wind anomalies have persisted across the eastern Pacific.

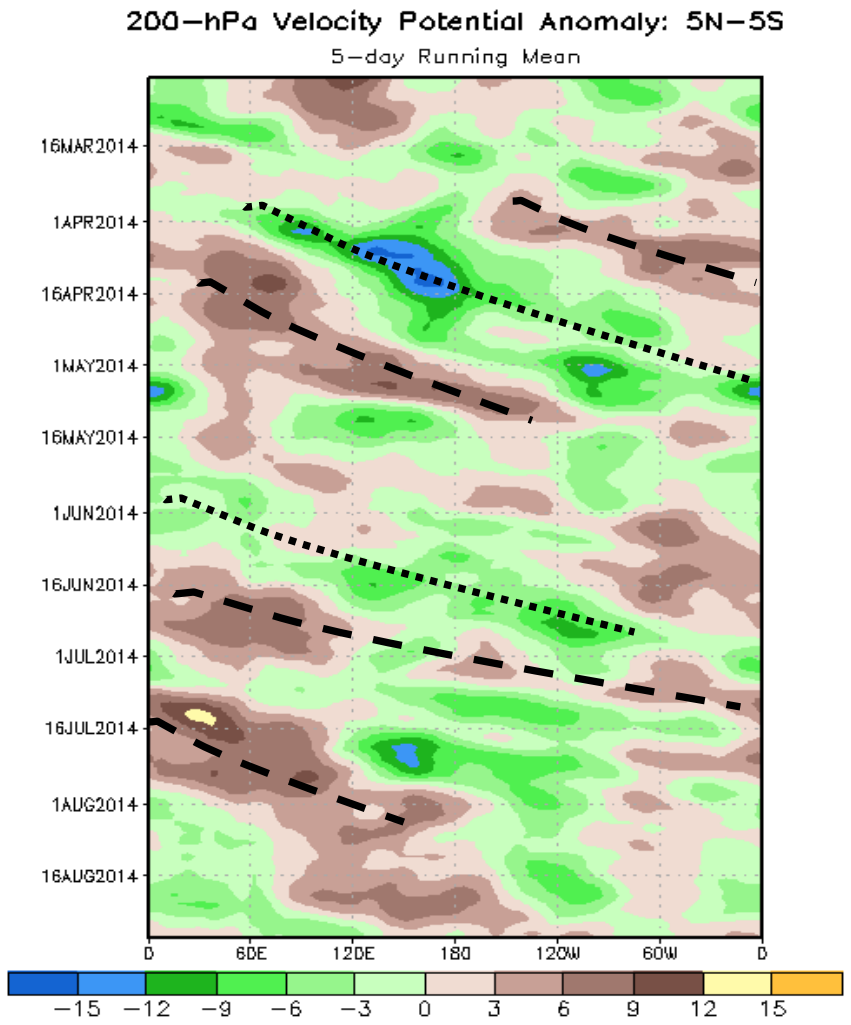


Westerly Wind Anomalies (orange/red shading)
Easterly Wind Anomalies (blue shading)

Upper-level (200-hPa) Velocity Potential Anomalies

During April-May 2014 and during June-July 2014, eastward propagating velocity potential anomalies were observed.

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



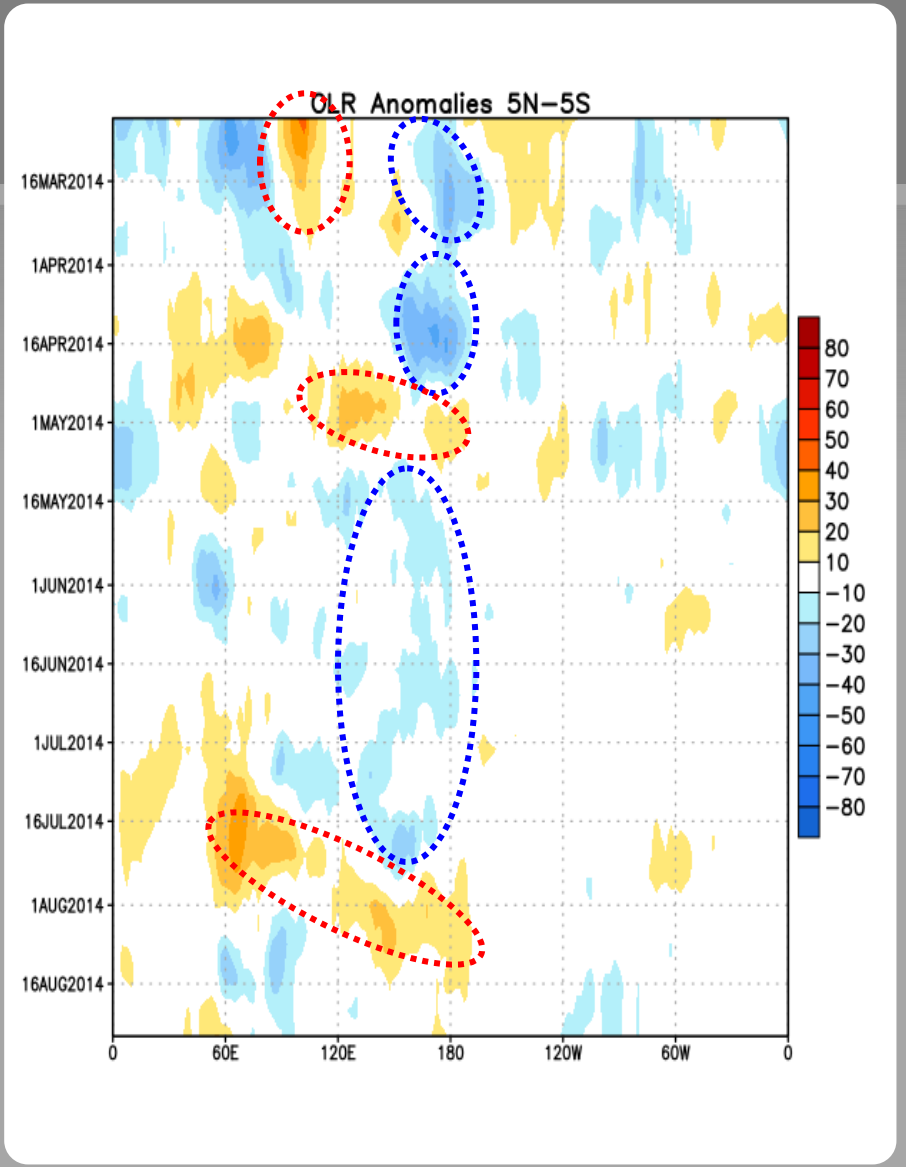
Outgoing Longwave Radiation (OLR) Anomalies

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.

From May through early July, weak negative anomalies persisted over the western equatorial Pacific

During late July-early August 2014, positive OLR anomalies shifted eastward from the Indian Ocean, across Indonesia to 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.)

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 +0.5ºC.

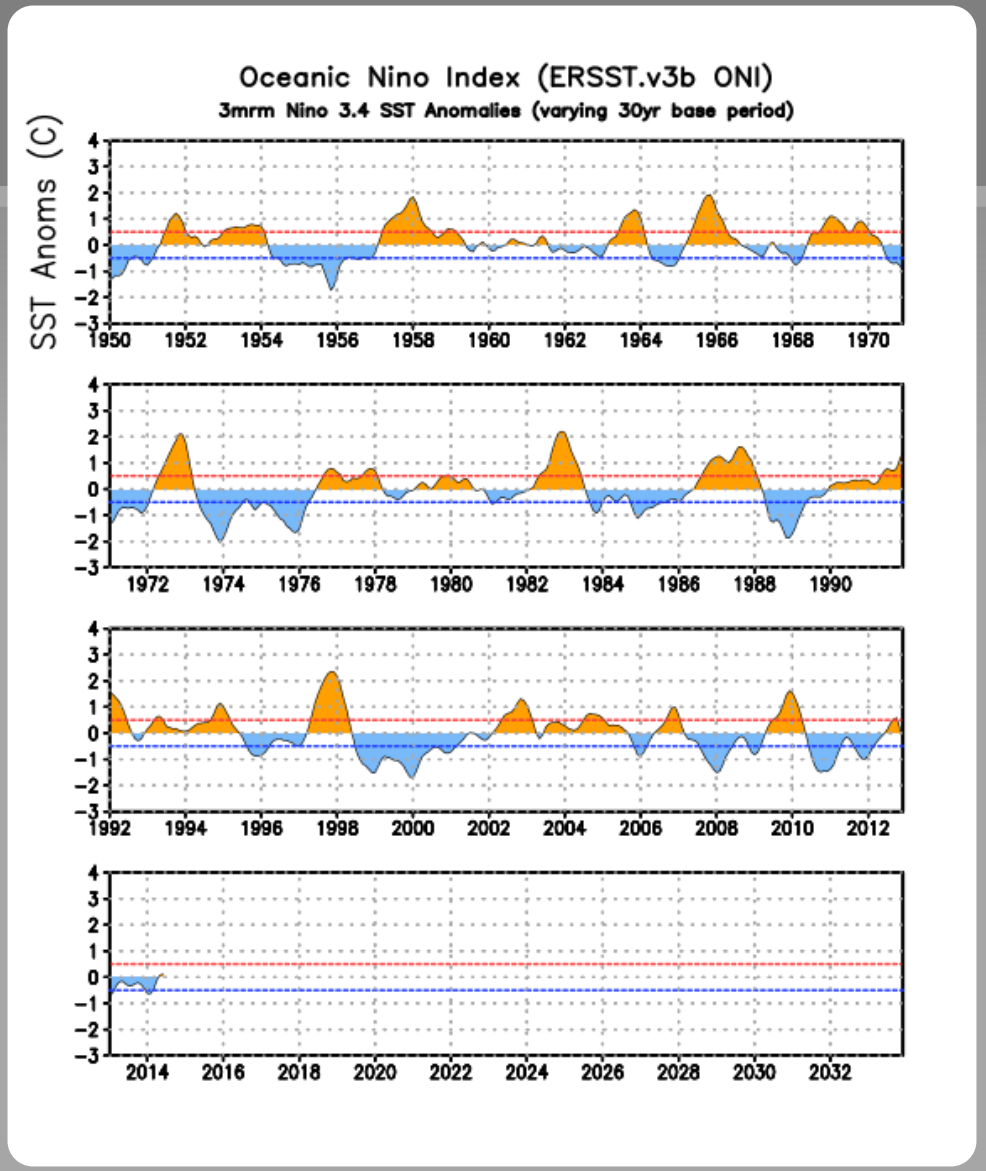
La Niña: characterized by a negative ONI less than or equal to -0.5ºC.

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 2014) is 0.1°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.

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

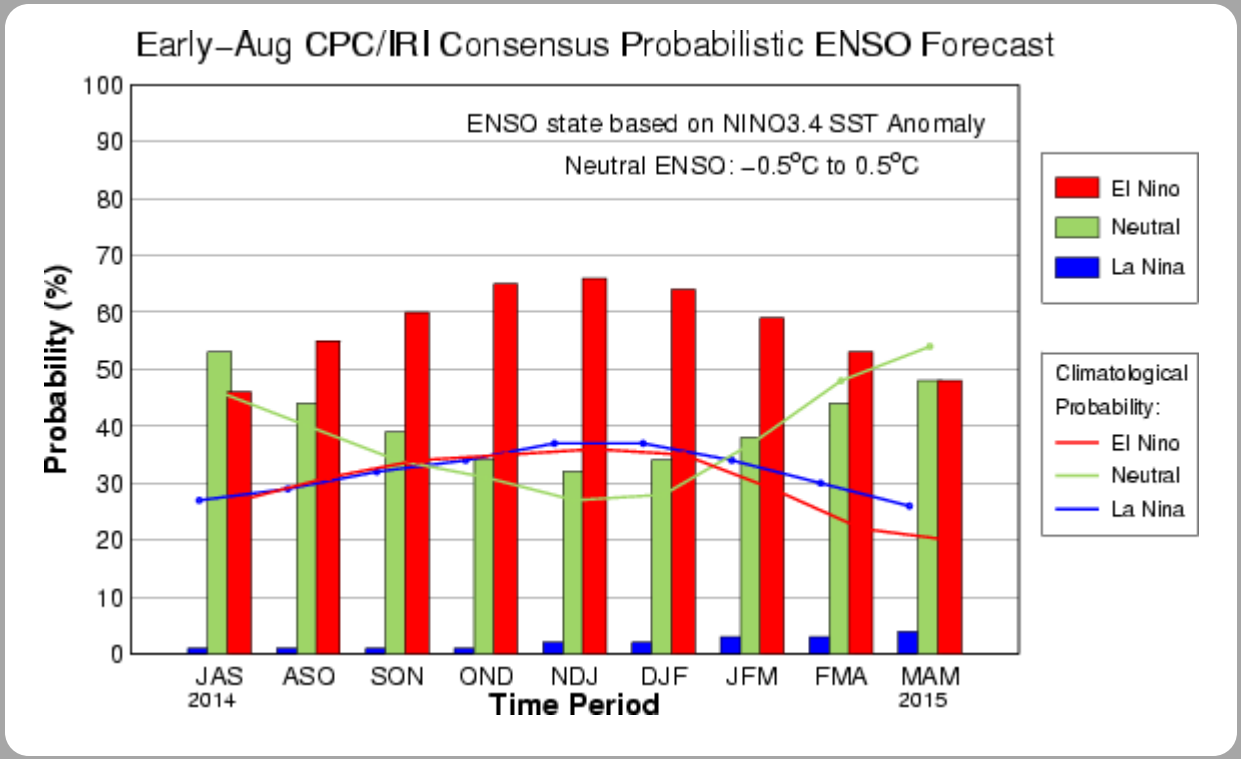
Recent Pacific warm (red) and cold (blue) episodes based on a threshold of +/- 0.5 °C for the Oceanic Nino Index (ONI) [3 month running mean of ERSST.v3b SST anomalies in the Nino 3.4 region (5N-5S, 120-170W)]. For historical purposes El Niño and La Niña episodes are defined when the threshold is met for a minimum of 5 consecutive over-lapping seasons. 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
2002	-0.2	0.0	0.1	0.3	0.5	0.7	0.8	0.8	0.9	1.2	1.3	1.3
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						

CPC/IRI Probabilistic ENSO Outlook

Updated: 7 August 2014

The chance of El Niño is about 65% during the Northern Hemisphere fall and early winter.



IRI/CPC Pacific Niño 3.4 SST Model Outlook

Most models favor El Niño (greater than or equal to +0.5°C) to develop during October-December 2014 and persist through Northern Hemisphere winter 2014-15.

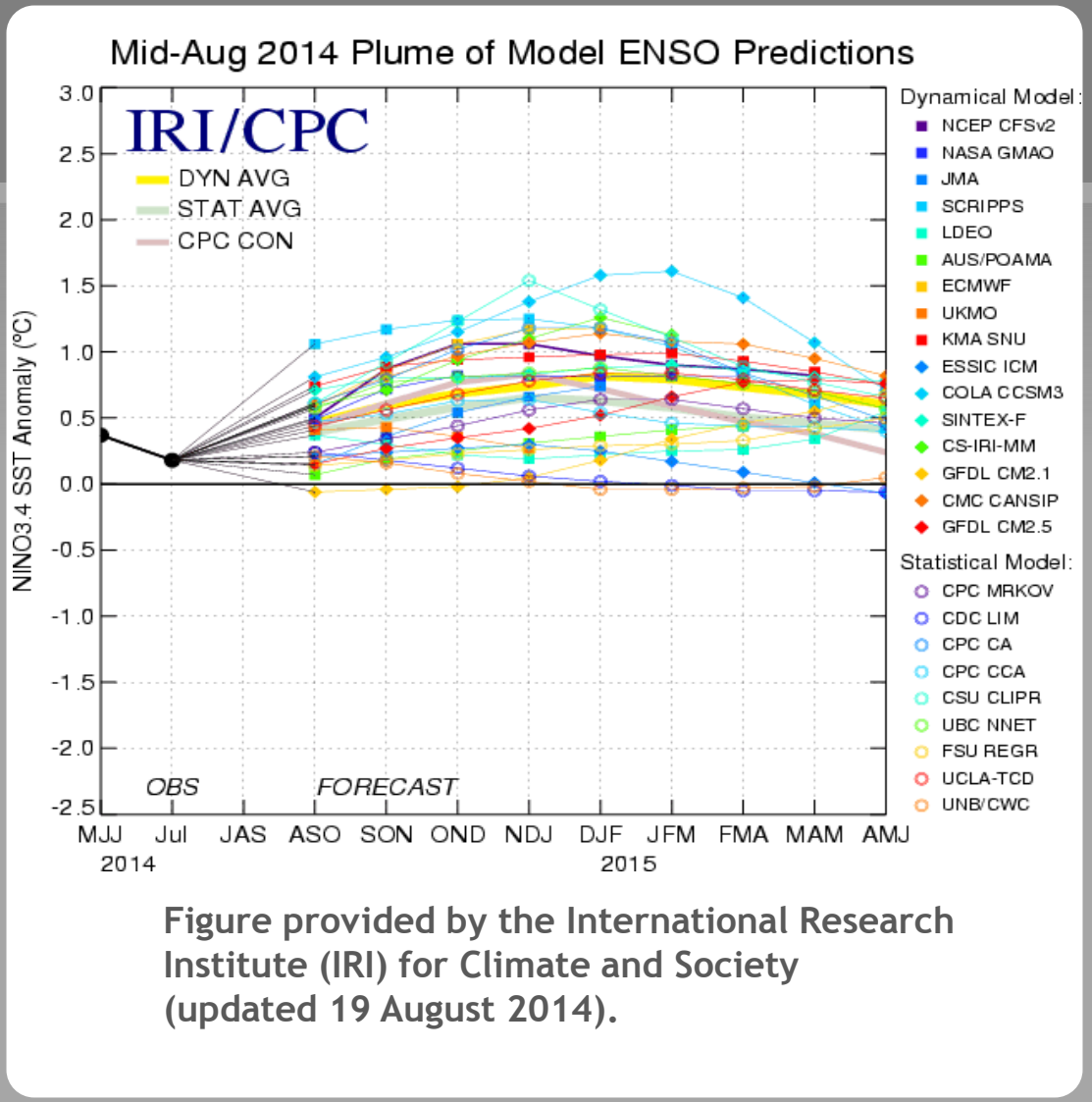
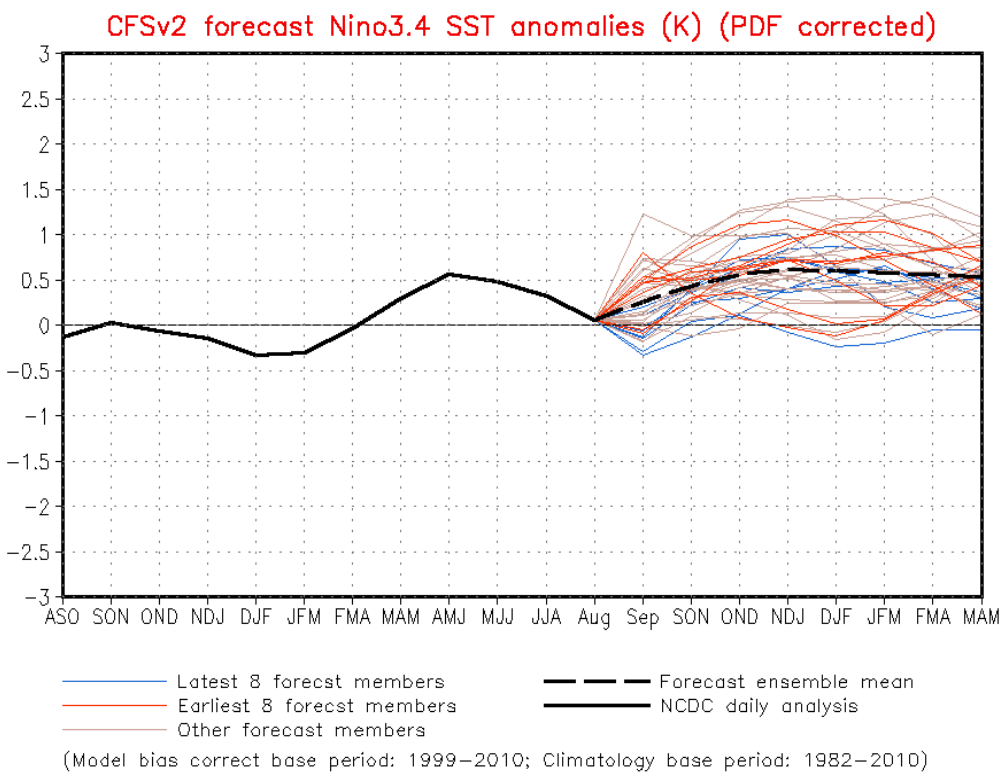


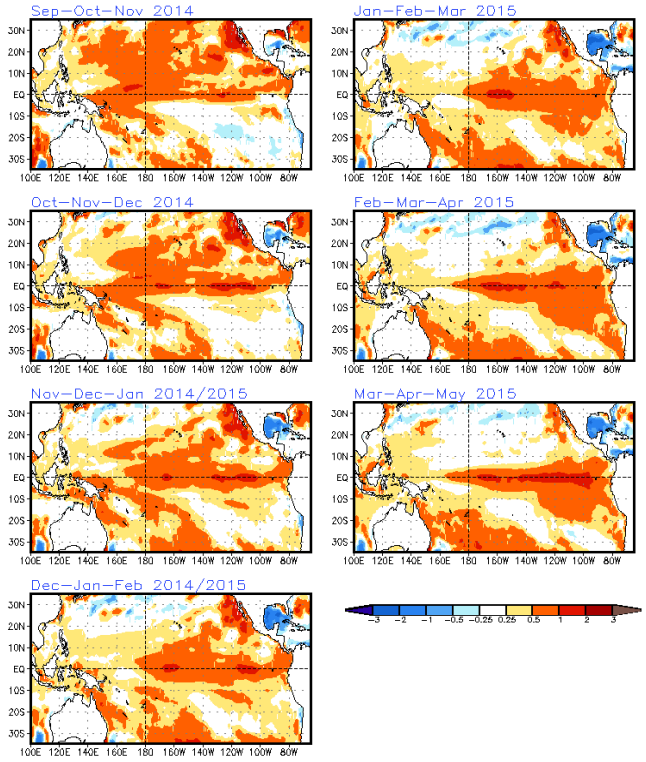
Figure provided by the International Research Institute (IRI) for Climate and Society (updated 19 August 2014).

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

Issued: 2 September 2014

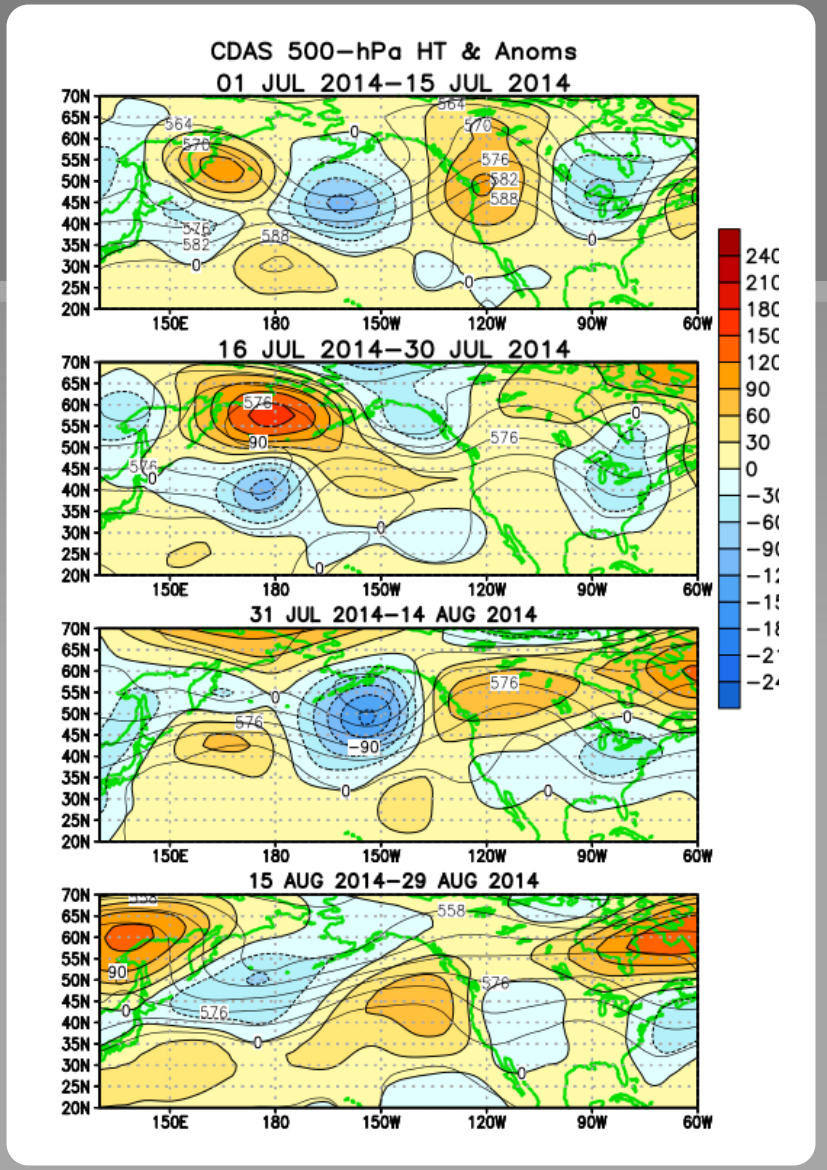
The CFS.v2 ensemble mean (black dashed line) predicts El Niño starting around September-November 2014 and lasting through early 2015.





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

Since early July, an anomalous trough over the central and eastern U.S. contributed to below-average temperatures in the region.



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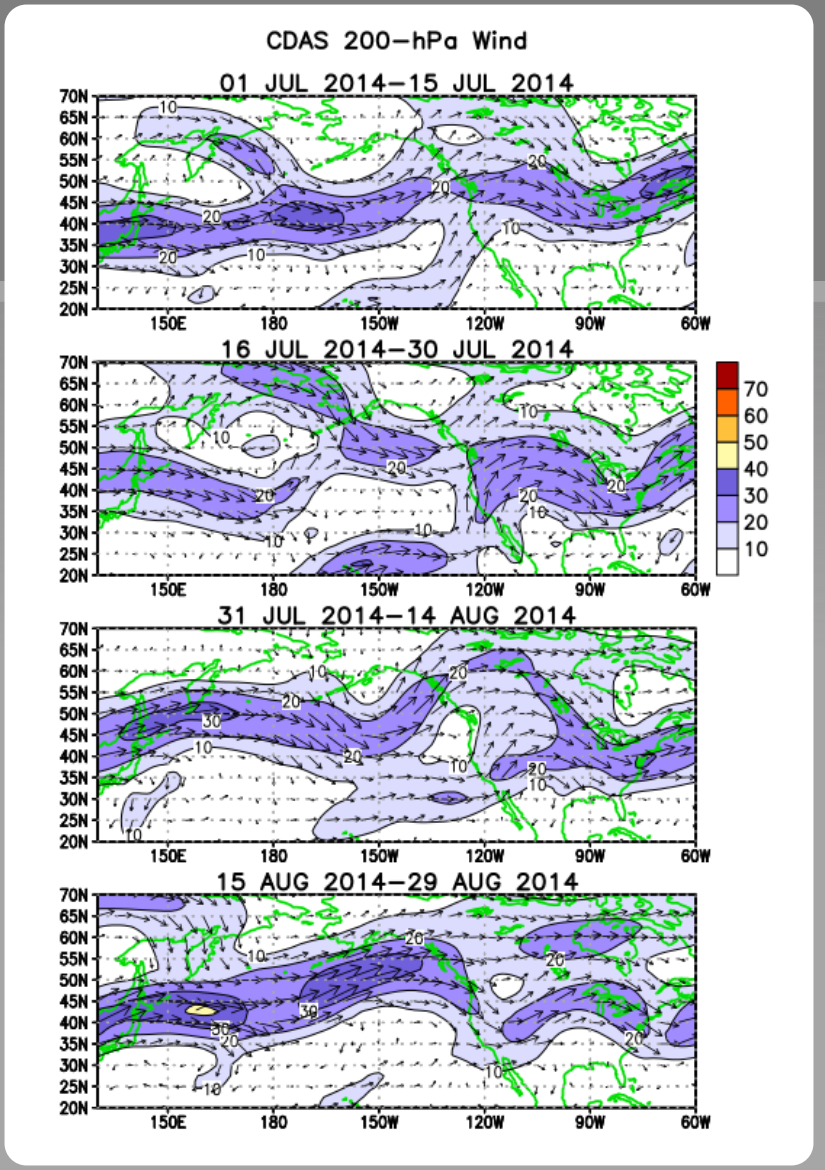

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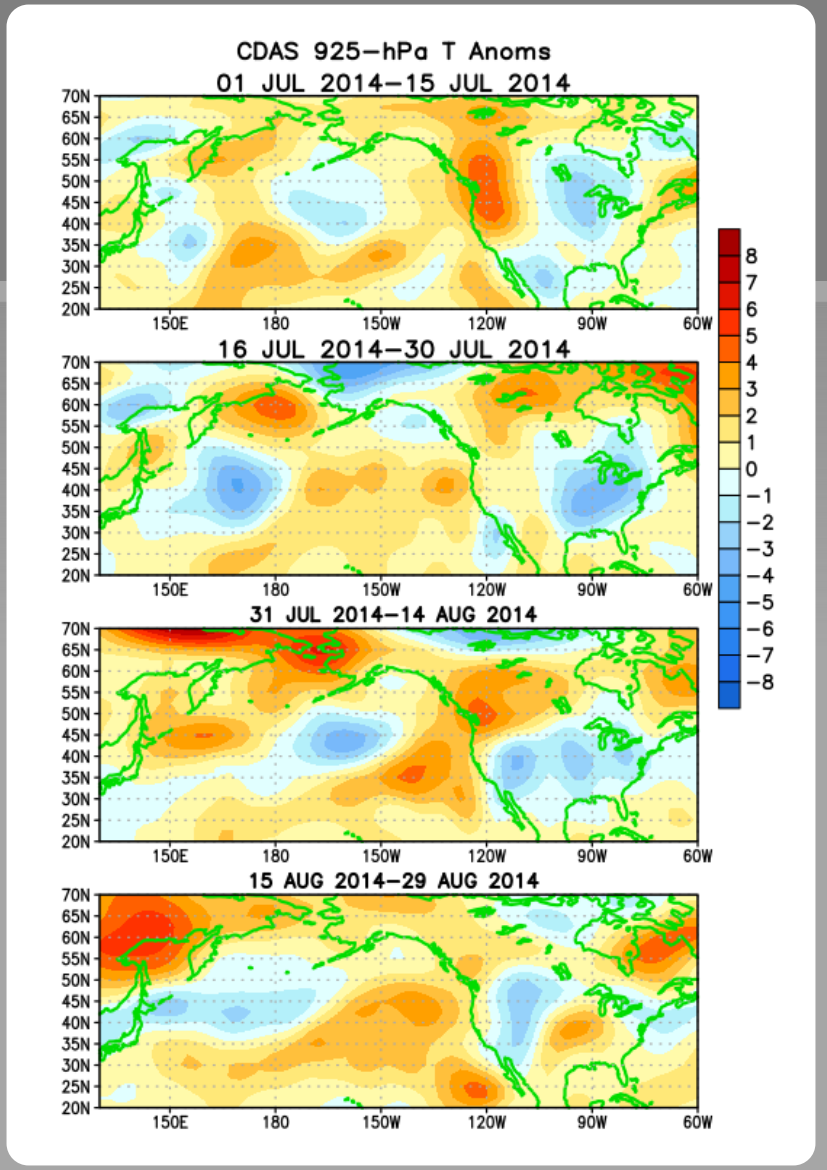
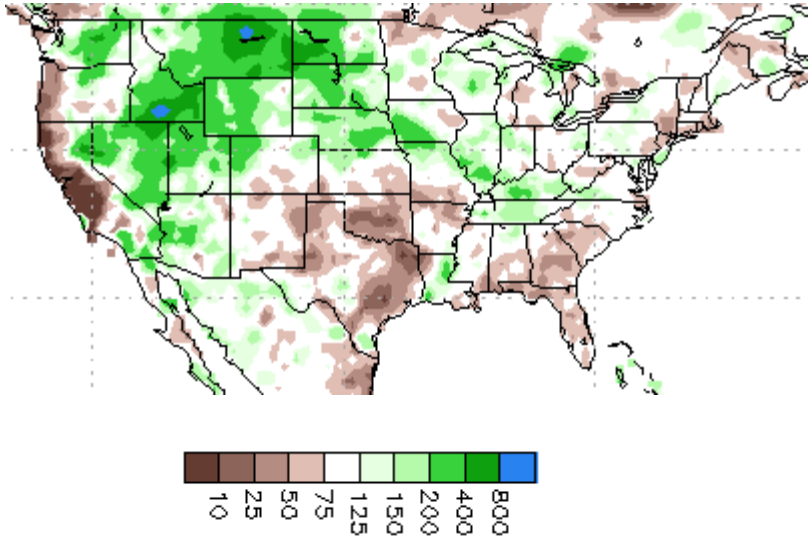


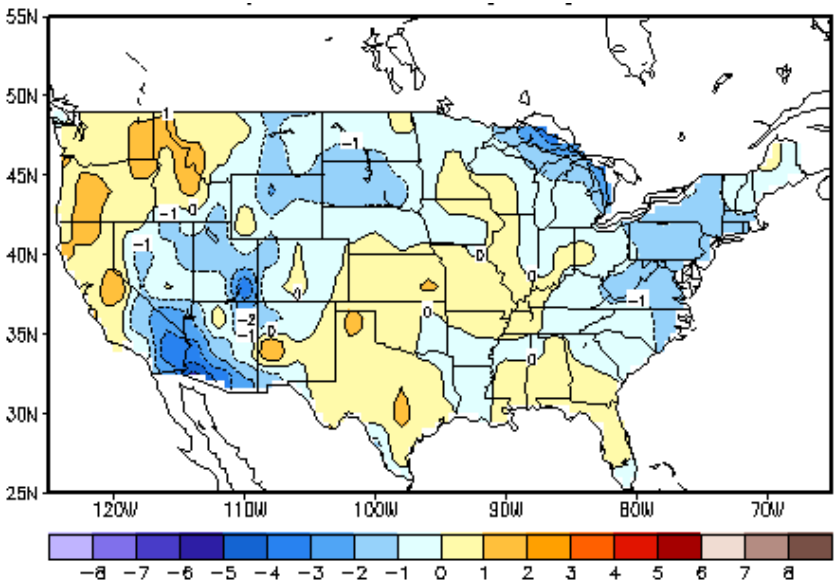
U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 31 August 2014

Percent of Average Precipitation



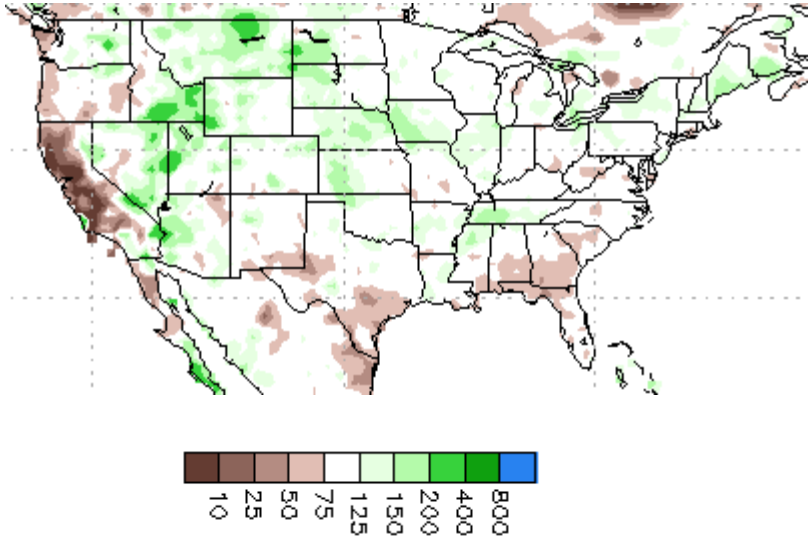
Temperature Departures (degree C)



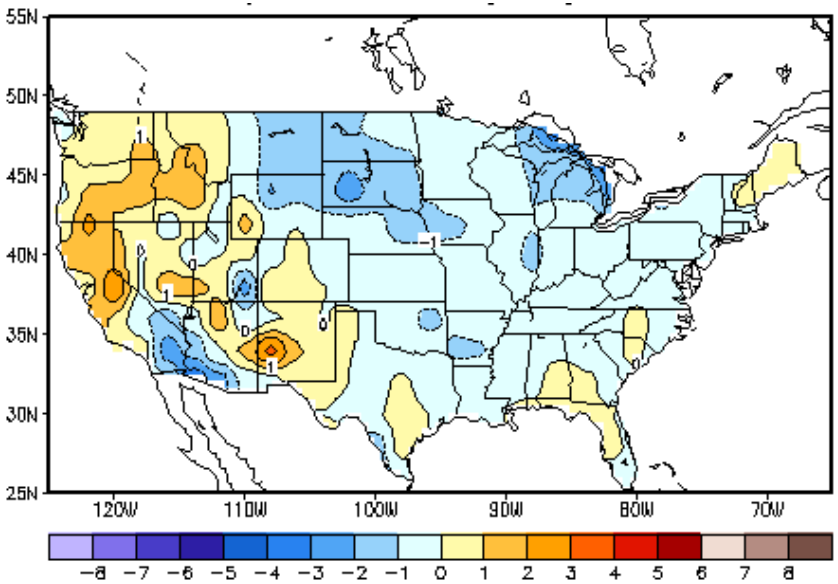
U.S. Temperature and Precipitation Departures During the Last 90 Days

End Date: 31 August 2014

Percent of Average Precipitation



Temperature Departures (degree C)

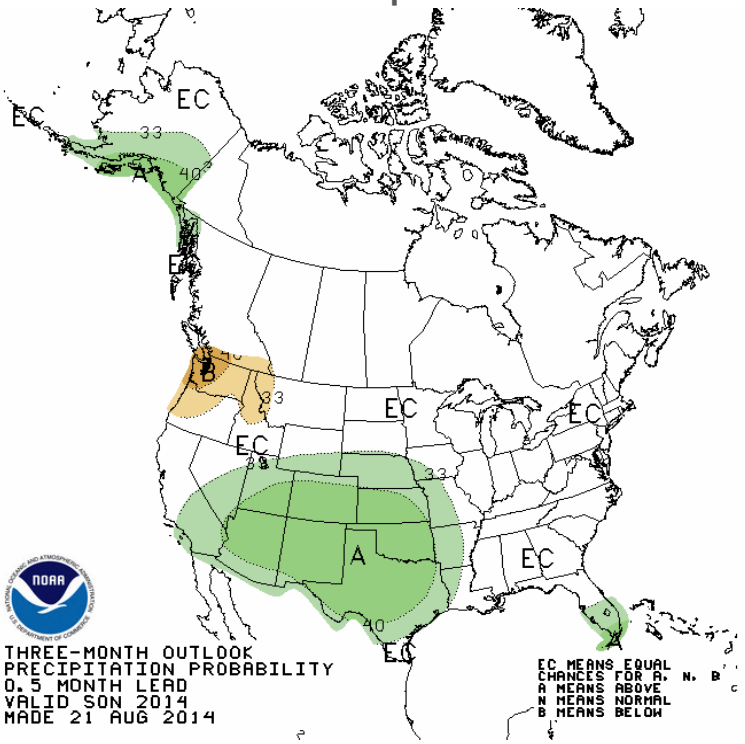


U. S. Seasonal Outlooks

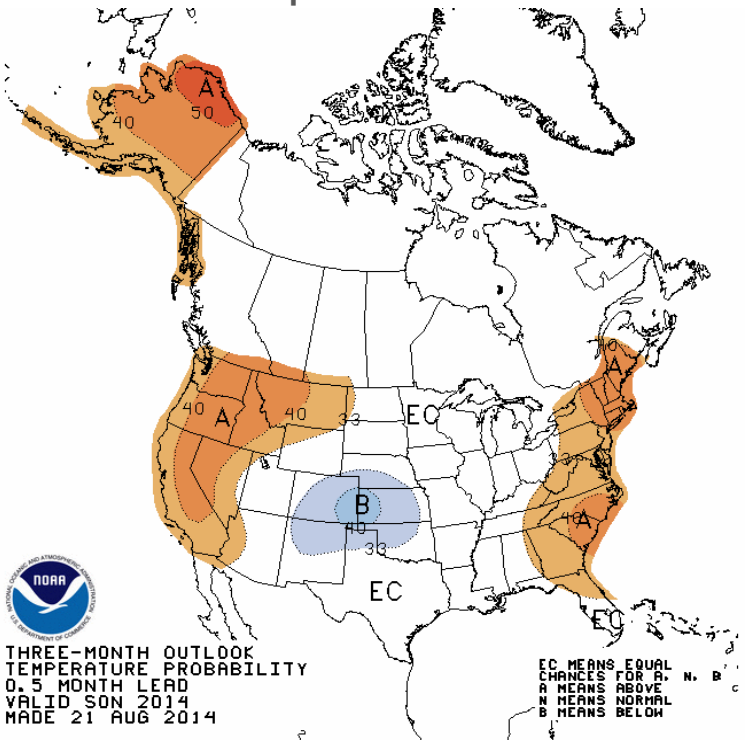
September - November 2014

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

Precipitation



Temperature



Summary

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