ENSO: Recent Evolution, Current Status and Predictions

Update prepared by:
Climate Prediction Center / NCEP
1 December 2014

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ENSO Alert System Status: El Niño Watch

ENSO-neutral conditions continue.*

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

There is a 58% chance of El Niño during the Northern Hemisphere winter, which is favored to last into the Northern Hemisphere spring 2015.*

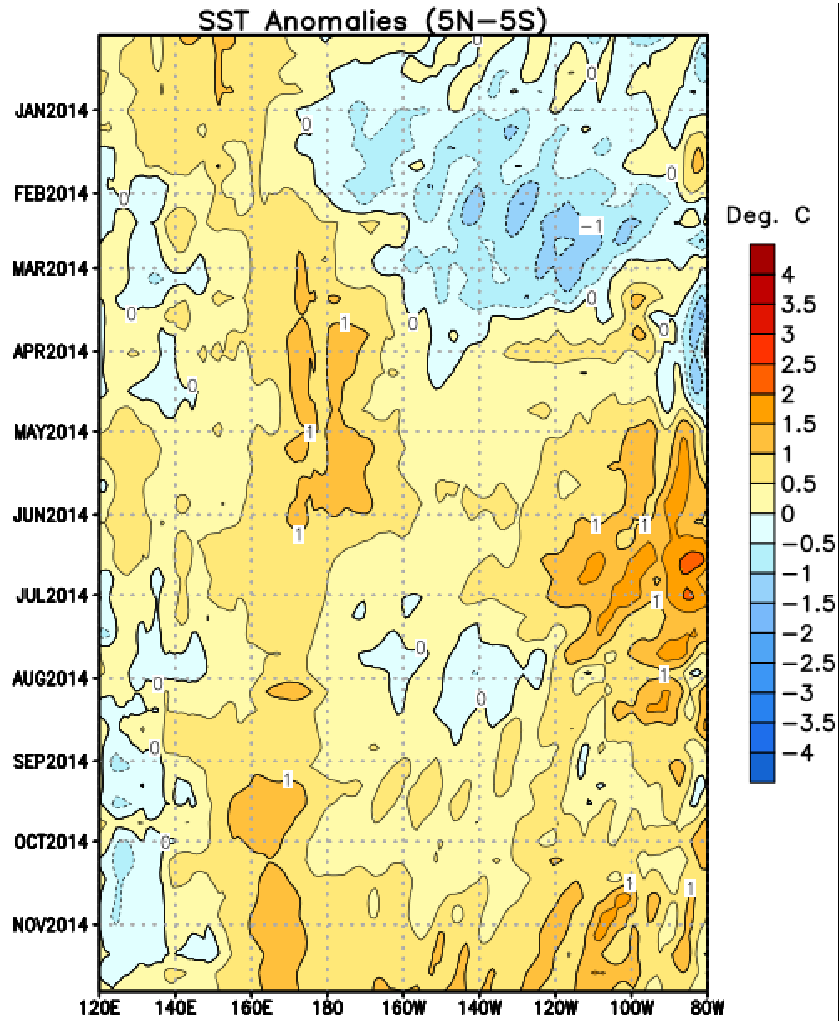
* Note: These statements are updated once a month in association with the ENSO Diagnostics Discussion, which can be found by clicking here.

Recent Evolution of Equatorial Pacific SST Departures (°C)

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.

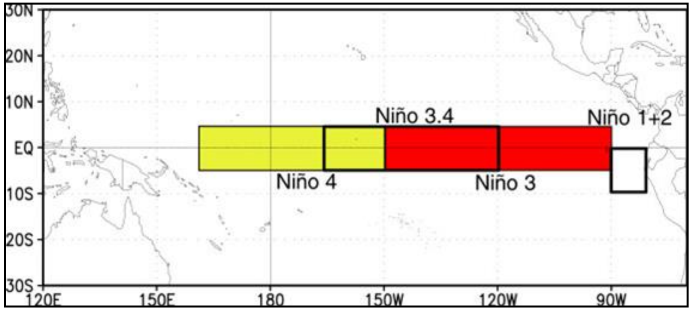
Recently, positive SST anomalies cover the equatorial Pacific.

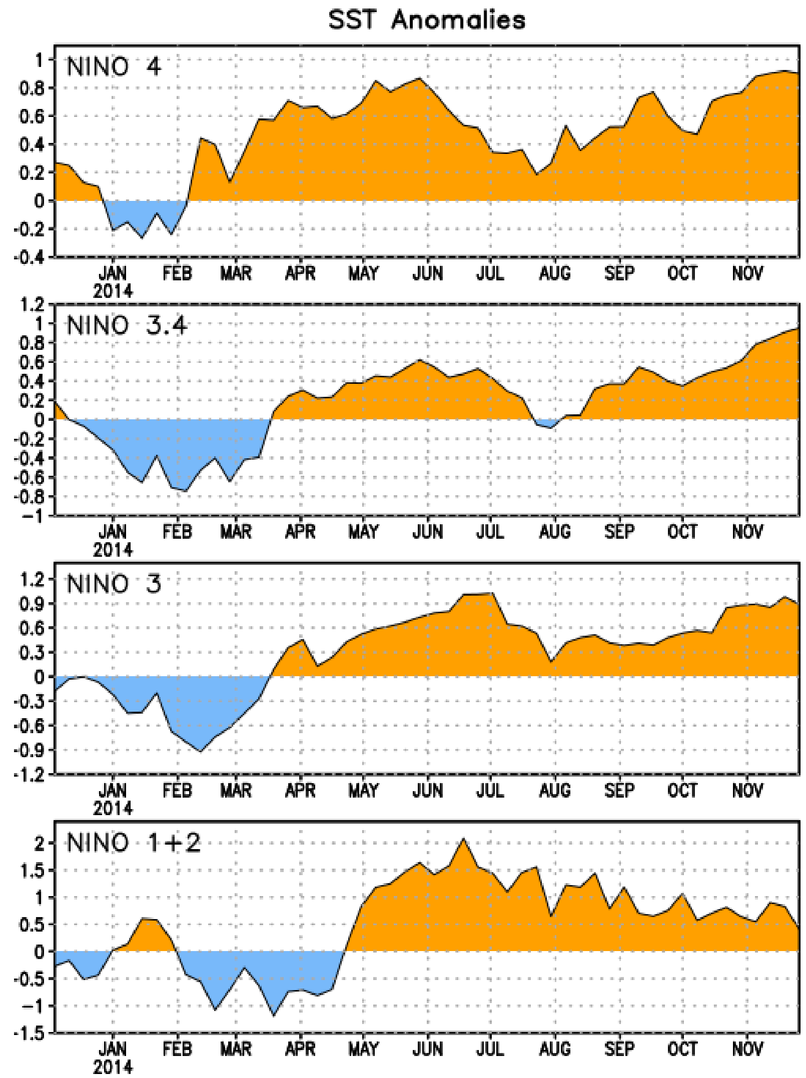


Niño Region SST Departures (°C) Recent Evolution

The latest weekly SST departures are:

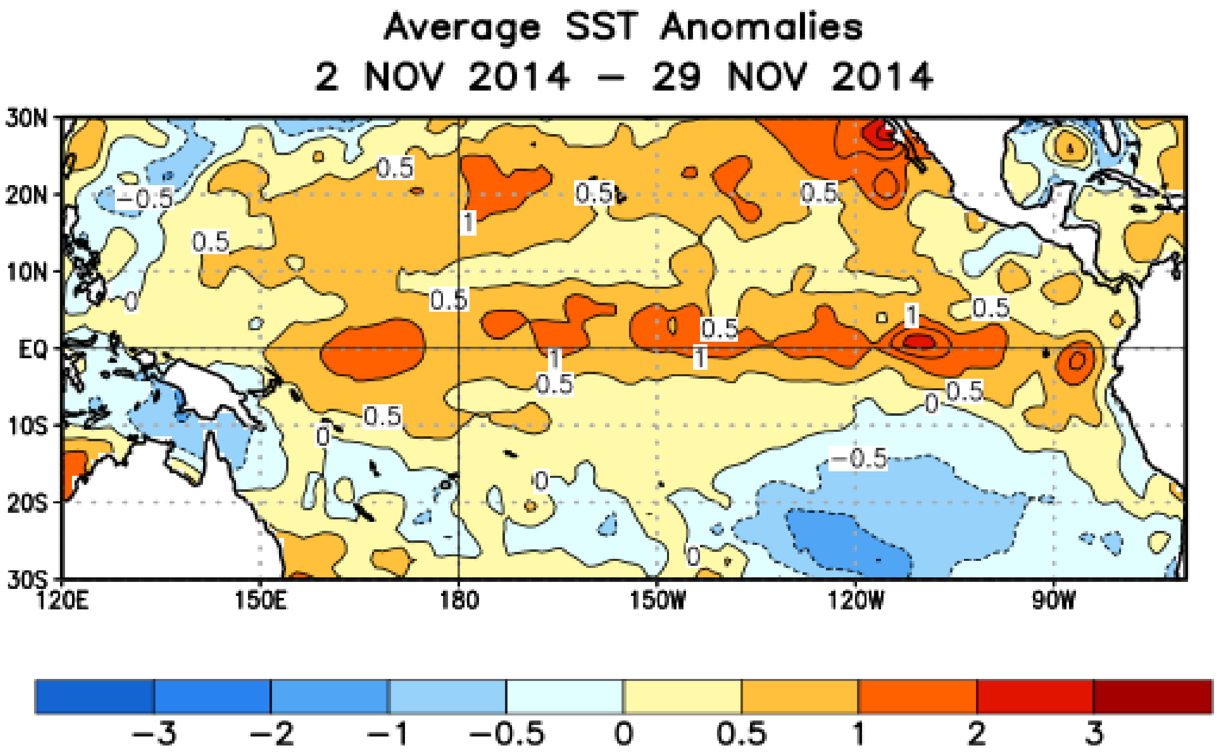
Niño 4	0.9°C
Niño 3.4	1.0°C
Niño 3	0.9°C
Niño 1+2	0.4°C





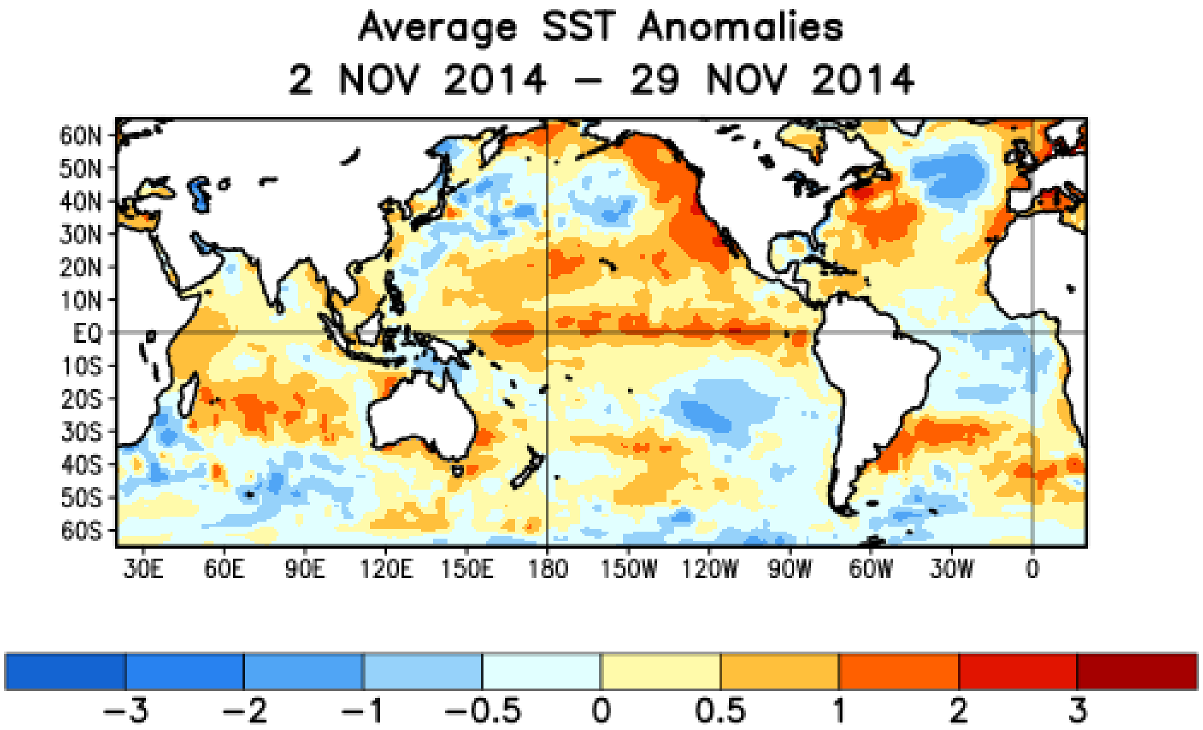
SST Departures (oC) in the Tropical Pacific During the Last Four Weeks

During the last four weeks, equatorial SSTs were above average across the Pacific.



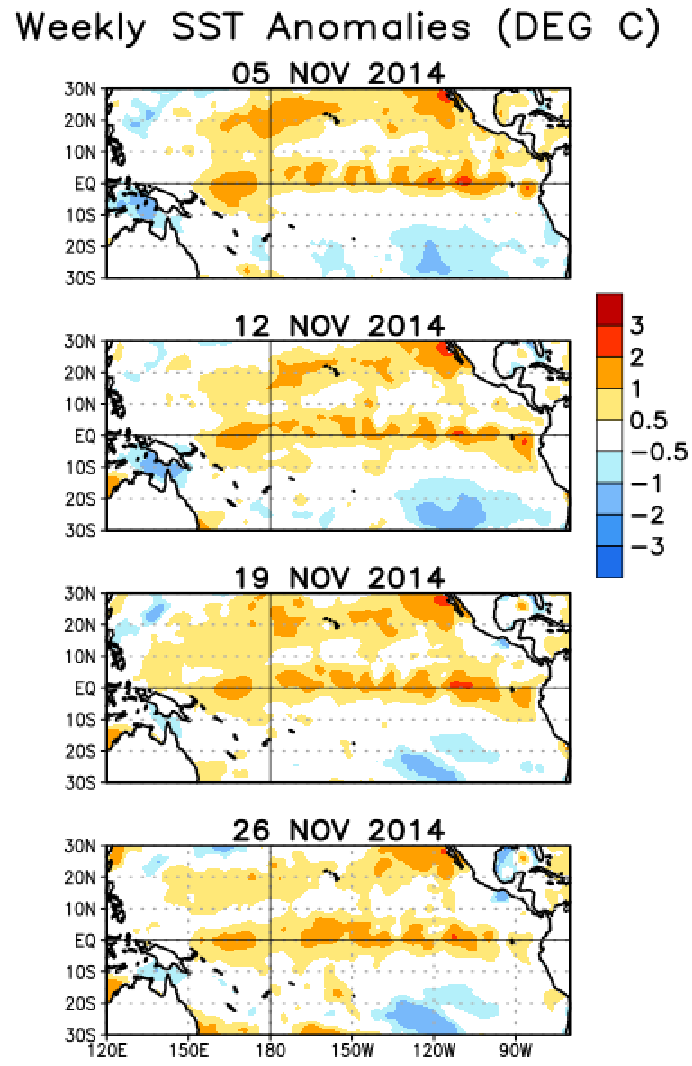
Global SST Departures (ºC) During the Last Four Weeks

During the last four weeks, equatorial SSTs were above-average across the Pacific and western Indian Ocean, and below-average north of Australia (the Maritime Continent) and in the eastern Atlantic Ocean.



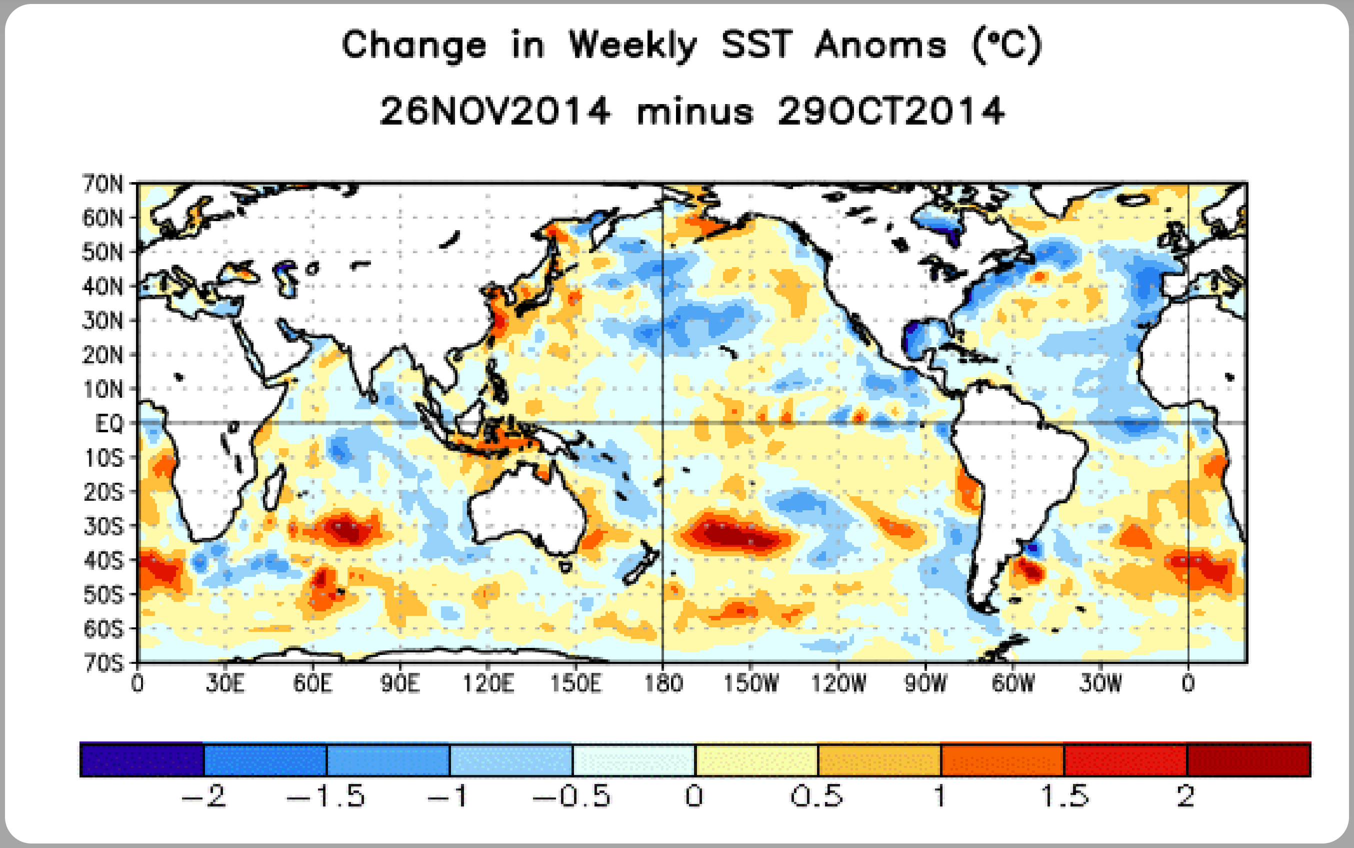
Weekly SST Departures during the Last Four Weeks

During the last four weeks, positive SST anomalies persisted in the equatorial Pacific.

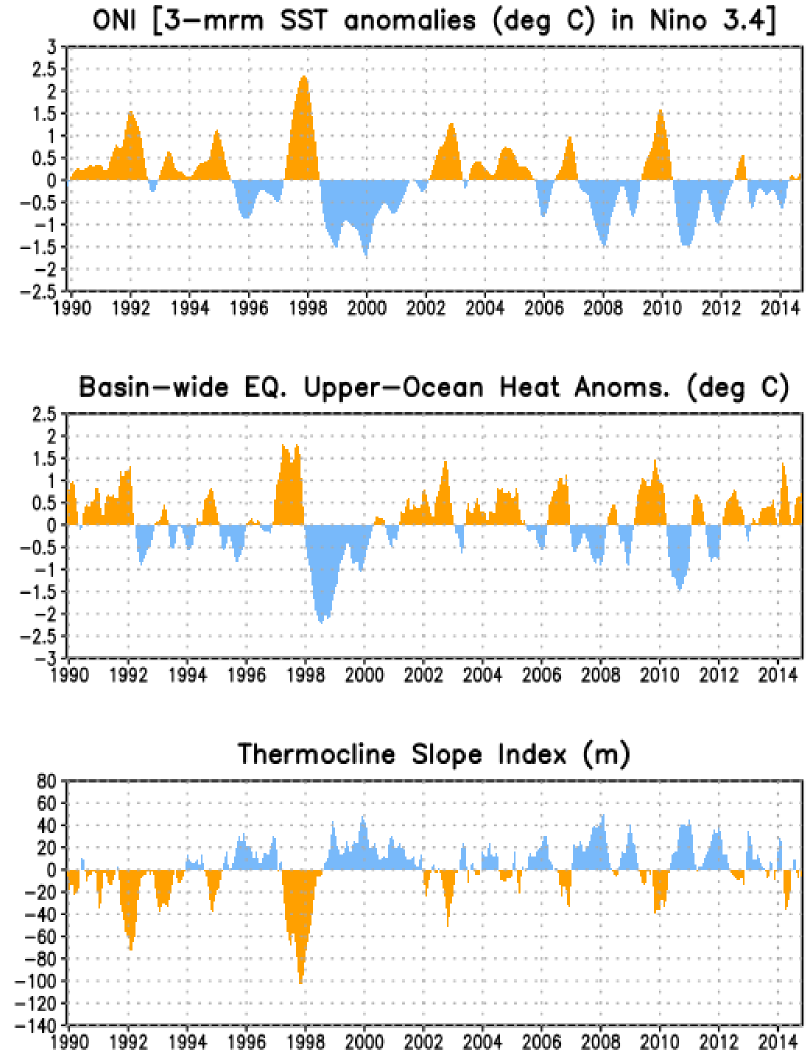


Change in Weekly SST Departures over the Last Four Weeks

During the last four weeks, changes in equatorial SST anomalies were small across most of 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.

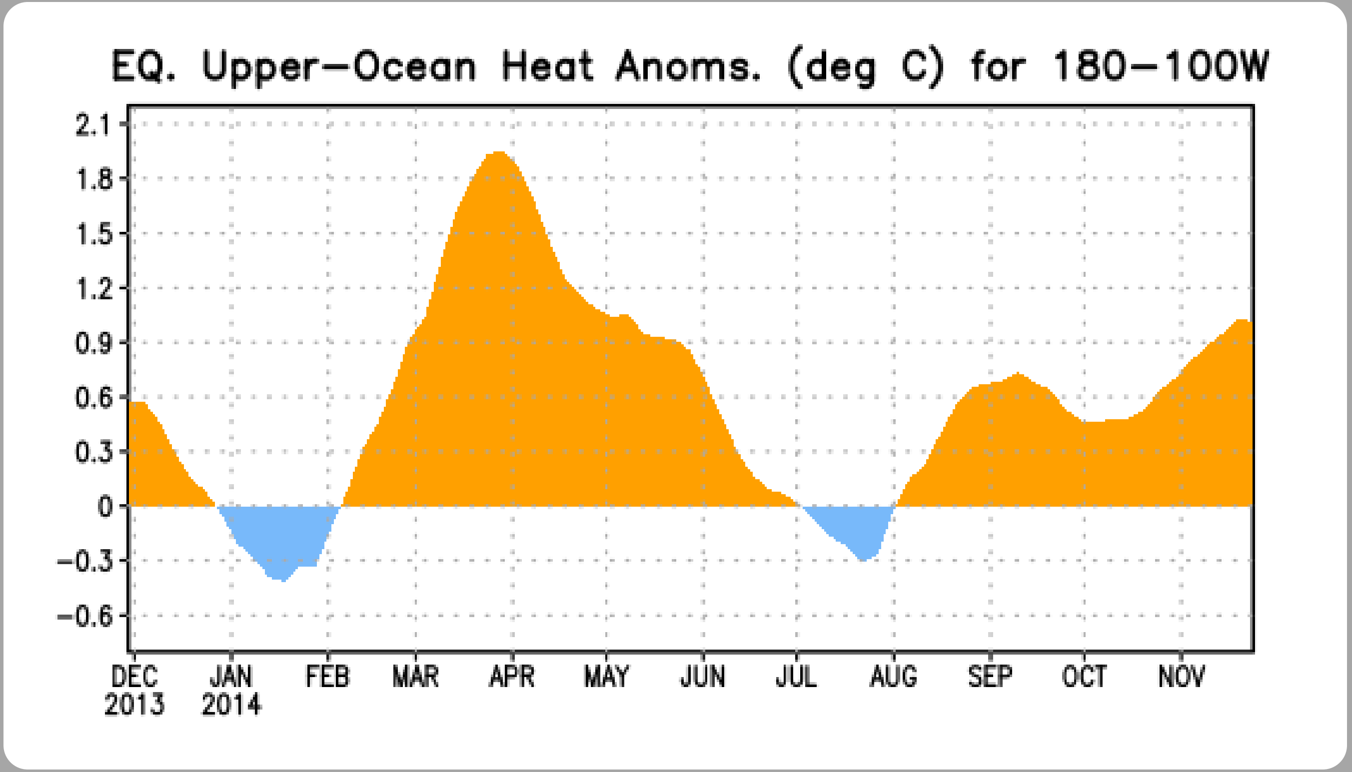
The slope of the oceanic thermocline is least (greatest) during warm (cold) episodes.

Recent values of the upper-ocean heat anomalies (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 20ºC isotherm between the western Pacific (160ºE-150ºW) and the eastern Pacific (90º-140ºW).

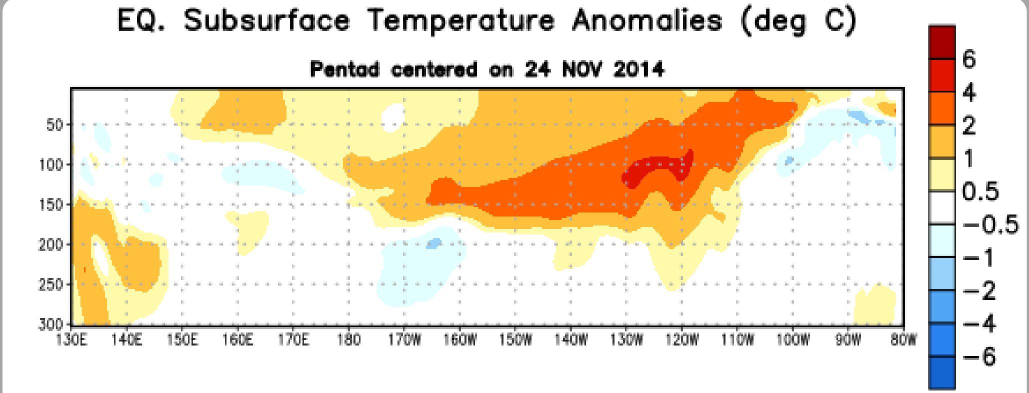
Central and Eastern Pacific Upper-Ocean (0-300 m) Weekly Average Temperature Anomalies

Subsurface temperature anomalies strongly increased during January - March 2014. During April-July 2014, the positive anomalies decreased to near zero. Temperature anomalies increased between late July and late August, were relatively unchanged during September-October, and increased during November.

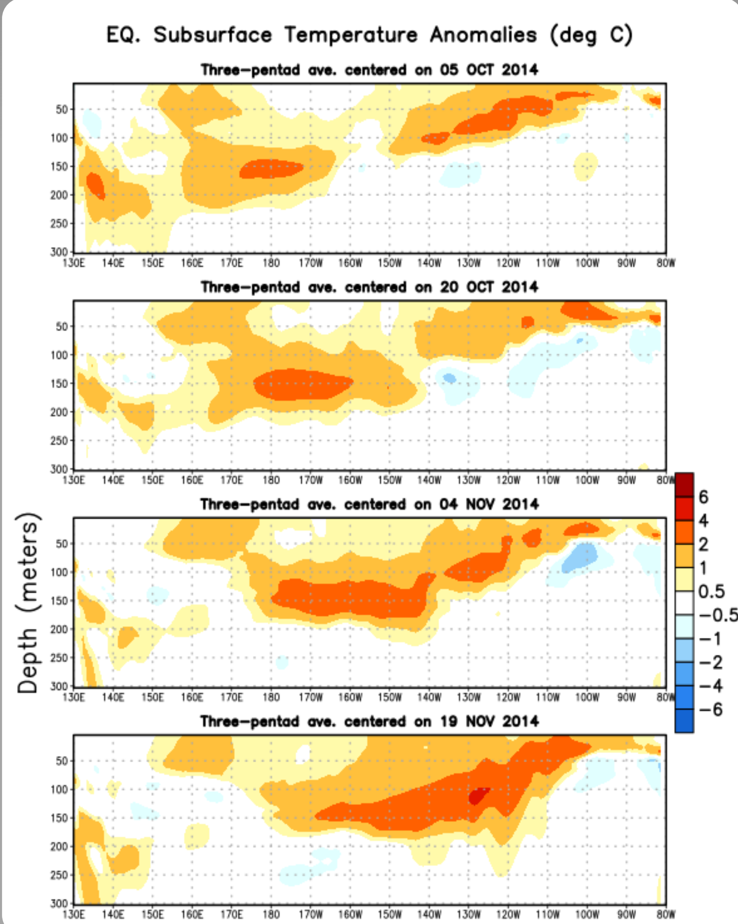


Sub-Surface Temperature Departures in the Equatorial Pacific

Since mid September, positive subsurface temperature anomalies have stretched across most of the equatorial Pacific.



Most recent pentad analysis



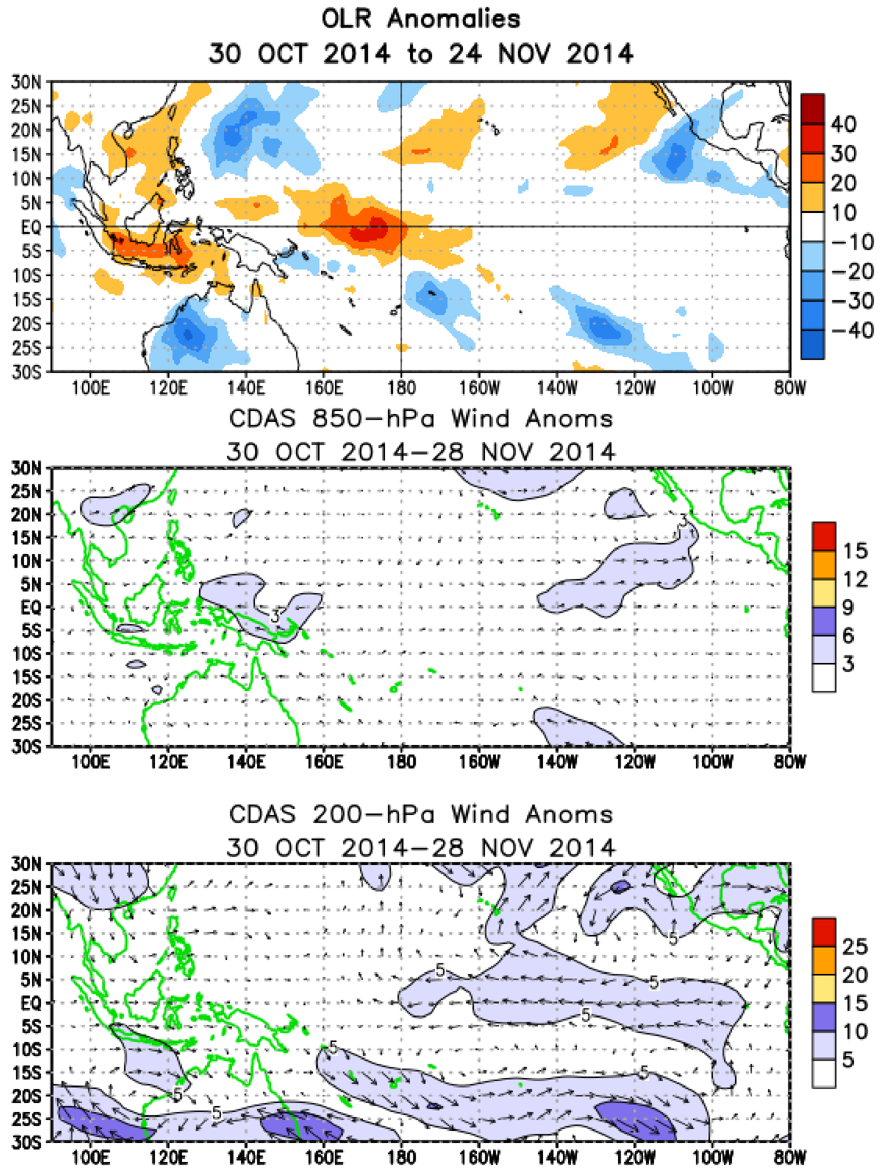
Recently, positive subsurface anomalies in the central Pacific are expanding eastward and strengthening.

Tropical OLR and Wind Anomalies During the Last 30 Days

Positive OLR anomalies (suppressed convection and precipitation, red shading) were evident over Indonesia and near the Date Line. Negative OLR anomalies (enhanced convection and precipitation, blue shading) were apparent east of the Philippines.

Low-level (850-hPa) winds were near-average across most of the equatorial Pacific. Weak westerly wind anomalies were observed near 140°W-120°W and weak easterly wind anomalies were evident in the far western Pacific.

Anomalous upper-level (200-hPa) easterly winds were evident across much of the central and eastern equatorial 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:

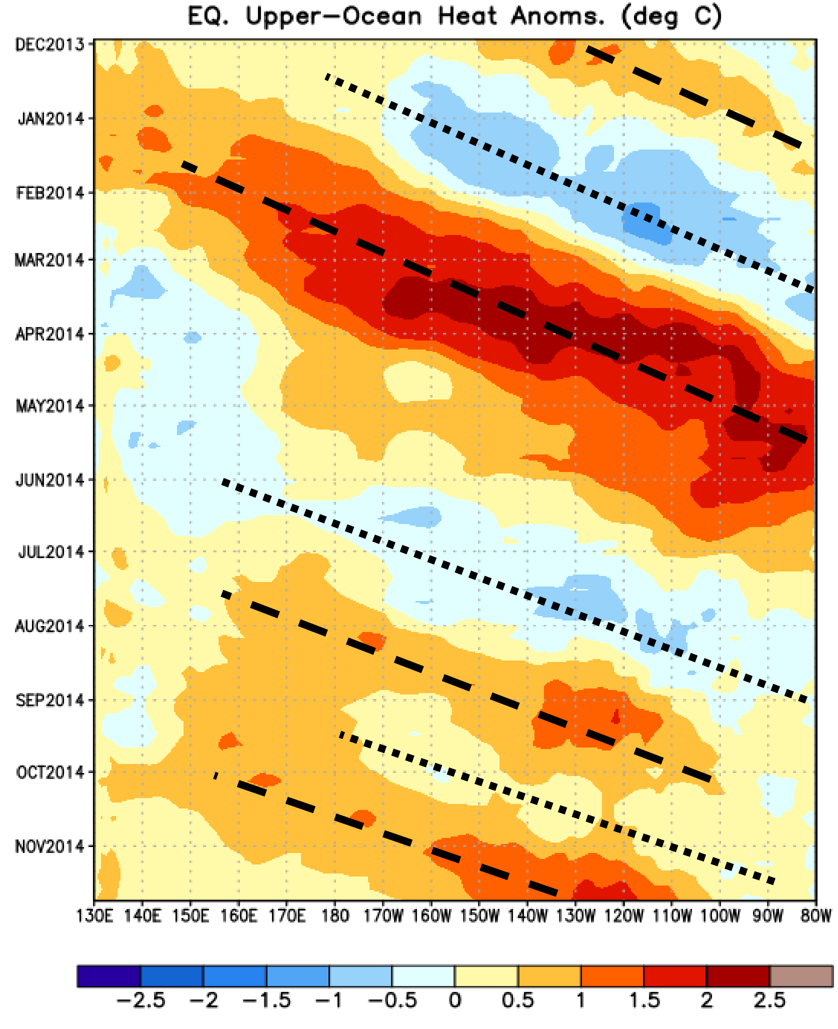
Significant weakening of the low-level easterly winds usually initiates an eastward-propagating oceanic Kelvin wave.

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 the upwelling phase of the Kelvin wave.

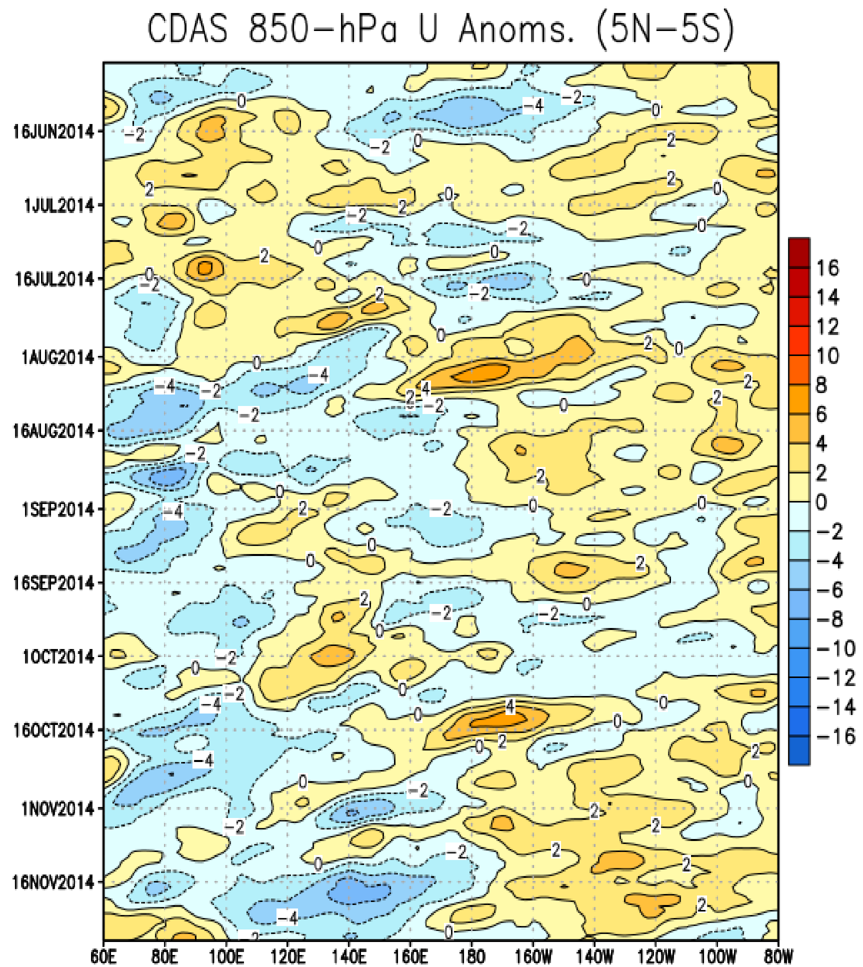
Since early October, positive subsurface temperature anomalies have expanded eastward and strengthened.



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})

Recently, winds have become closer to average over the equatorial Pacific.

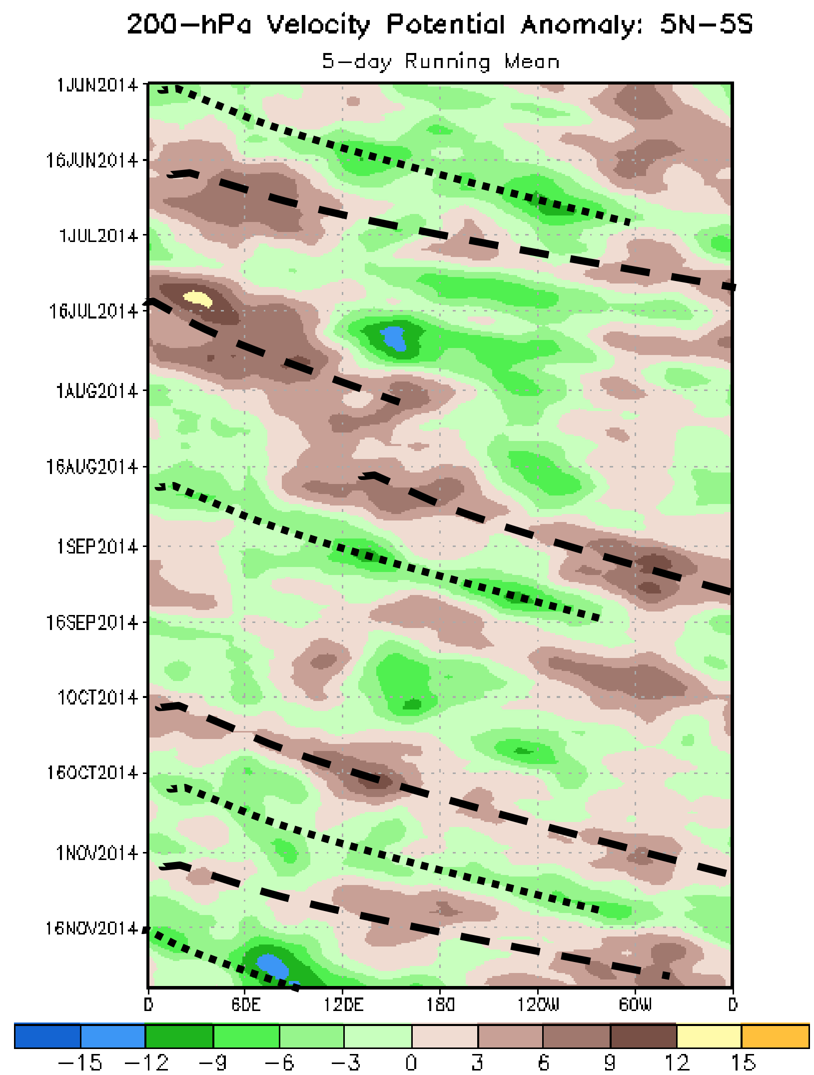


Westerly Wind Anomalies (orange/red shading)
Easterly Wind Anomalies (blue shading)

Upper-level (200-hPa) Velocity Potential Anomalies

During June-July 2014, and mid August- mid September, eastward propagating velocity potential anomalies were observed.

Recently, the Madden Julian Oscillation (MJO) emerged and can be observed in the eastward propagation of anomalies.



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

Outgoing Longwave Radiation (OLR) Anomalies

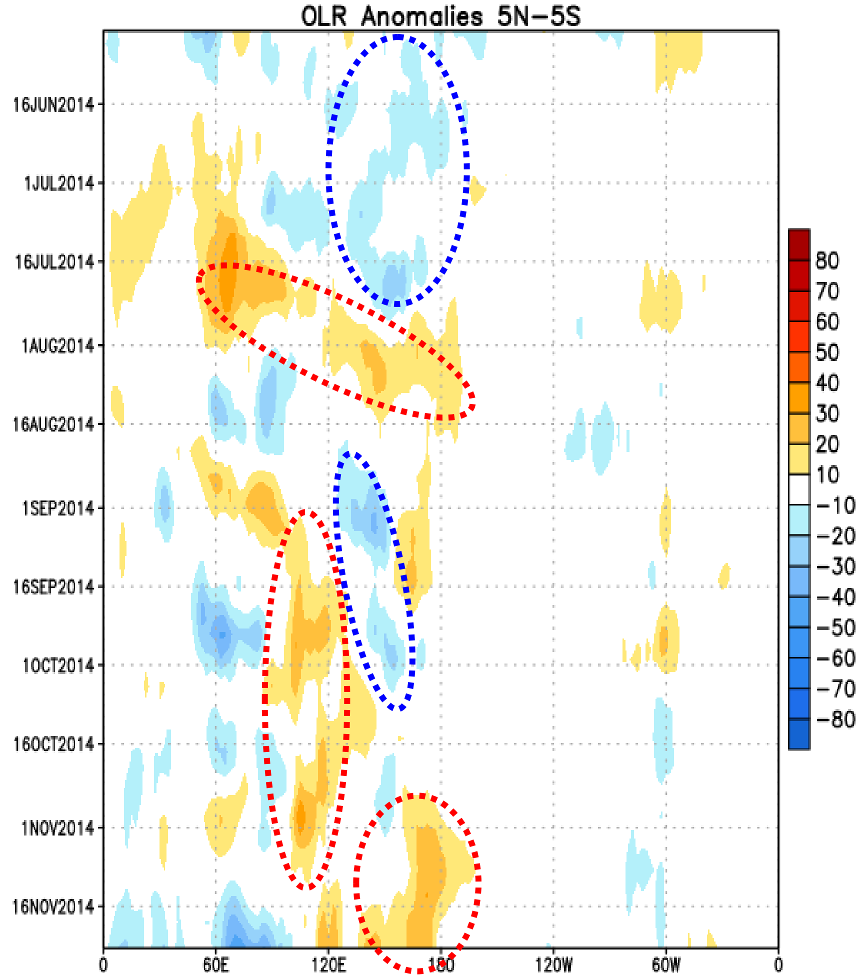
From May through early July, weak negative anomalies persisted over the western equatorial Pacific

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

During September and October, positive anomalies persisted over Indonesia.

During November, positive anomalies have been observed near the Date Line and western 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 +0.5ºC.

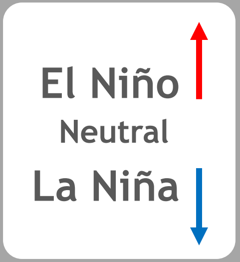
La Niña: characterized by a negative ONI less than or equal to -0.5ºC.

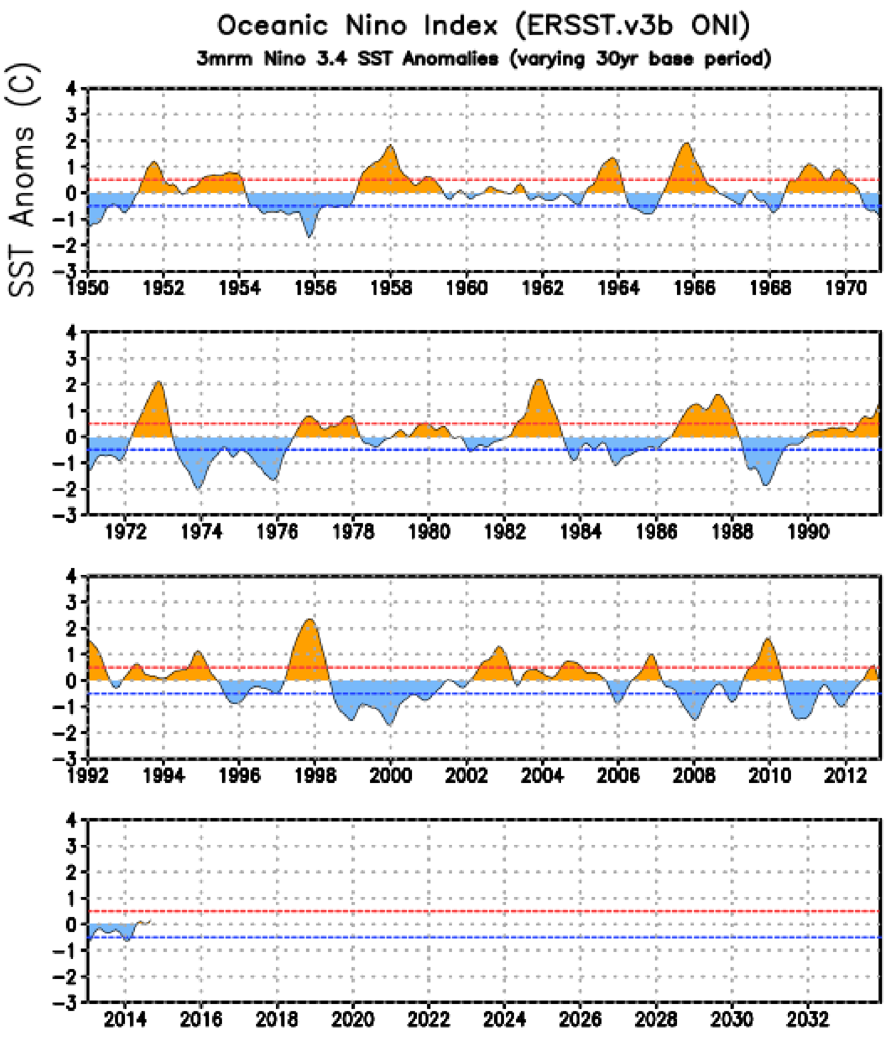
By historical standards, to be classified as a full-fledged El Niño or La Niña episode, these thresholds must be exceeded for a period of at least 5 consecutive overlapping 3-month seasons.

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 (August – October 2014) is 0.2ºC.





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

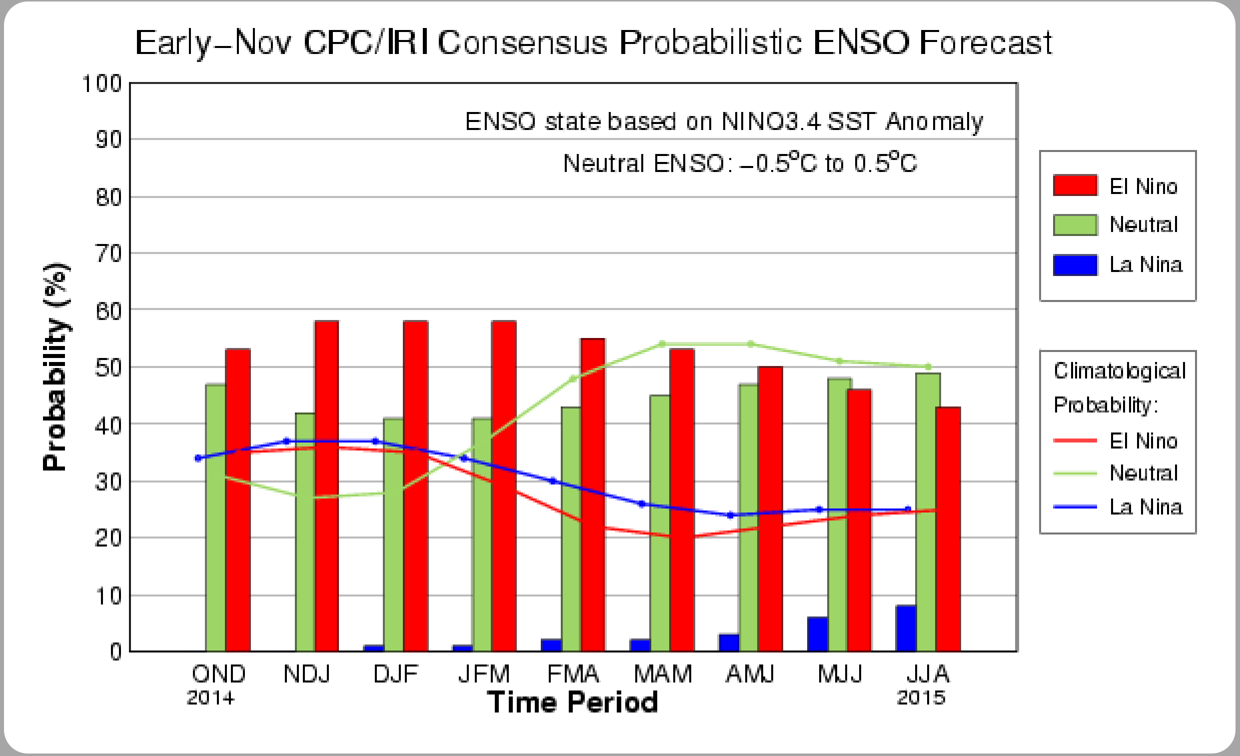
Recent Pacific warm (red) and cold (blue) episodes based on a threshold of +/- 0.5 °C for the Oceanic Nino Index (ONI) [3 month running mean of ERSST.v3b SST anomalies in the Nino 3.4 region (5N-5S, 120-170W)]. For historical purposes El Niño and La Niña episodes are defined when the threshold is met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

CPC/IRI Probabilistic ENSO Outlook

Updated: 6 November 2014

The chance of El Niño is 58% during the Northern Hemisphere winter and decreases into spring/summer 2015.



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 November 2014 - January 2015 and to persist through Northern Hemisphere spring 2015.

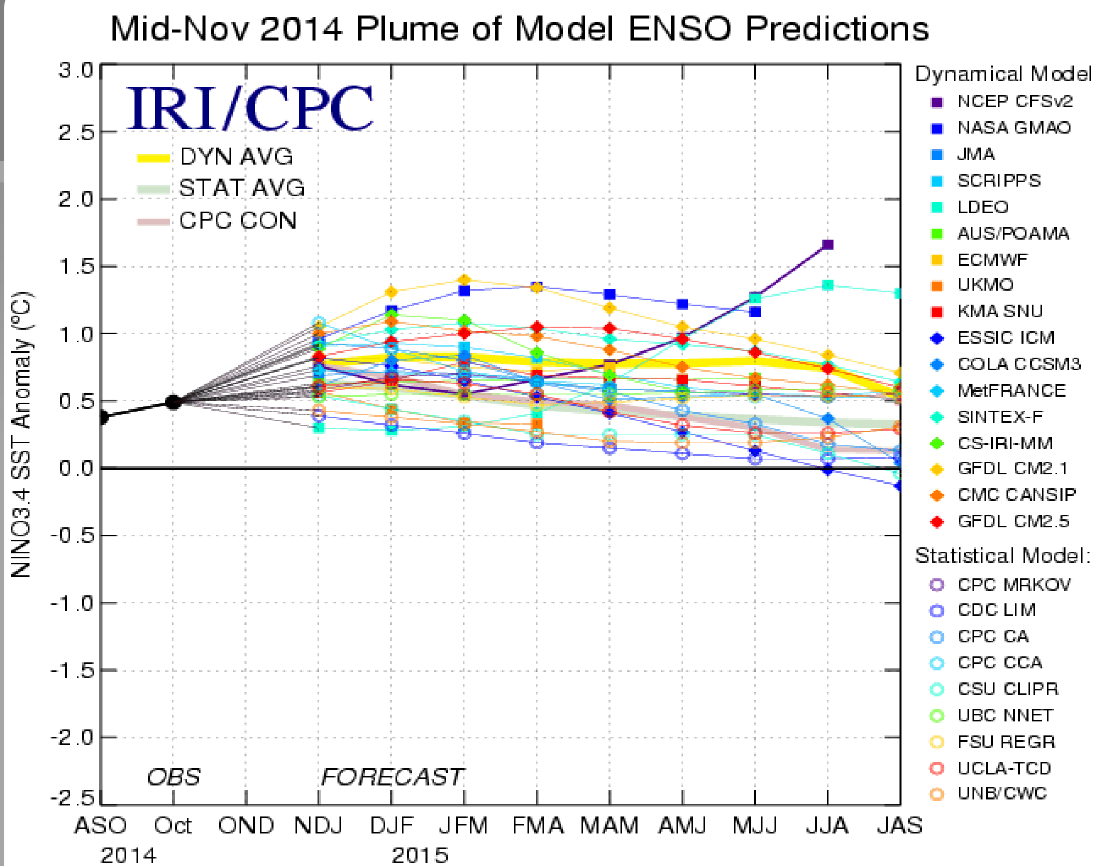
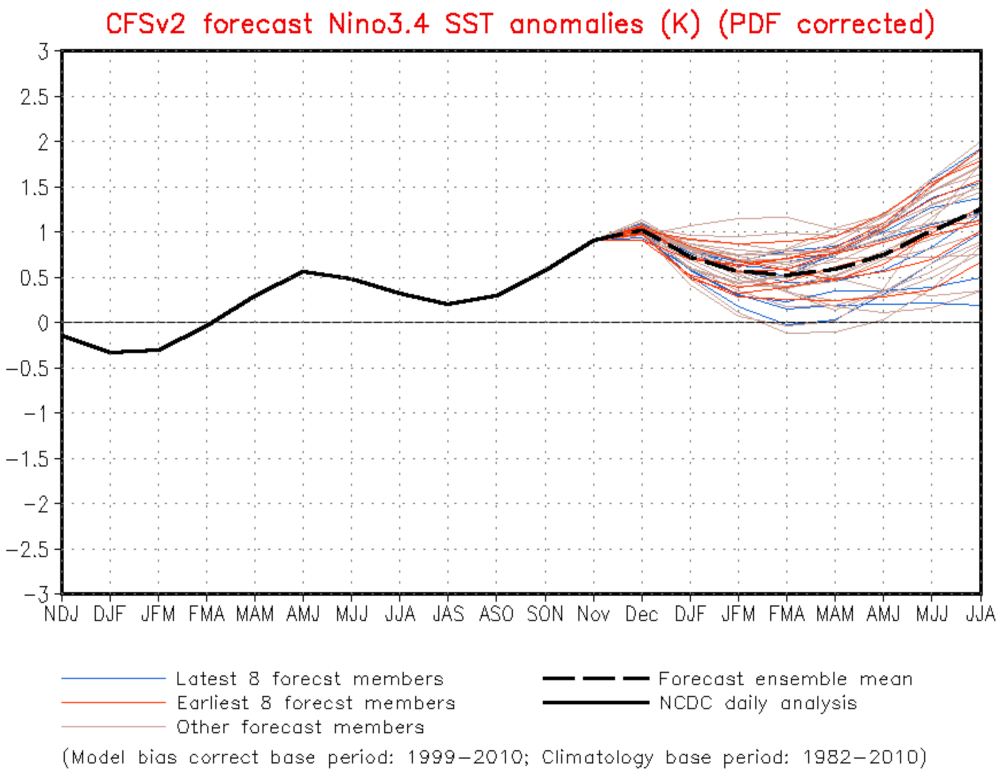


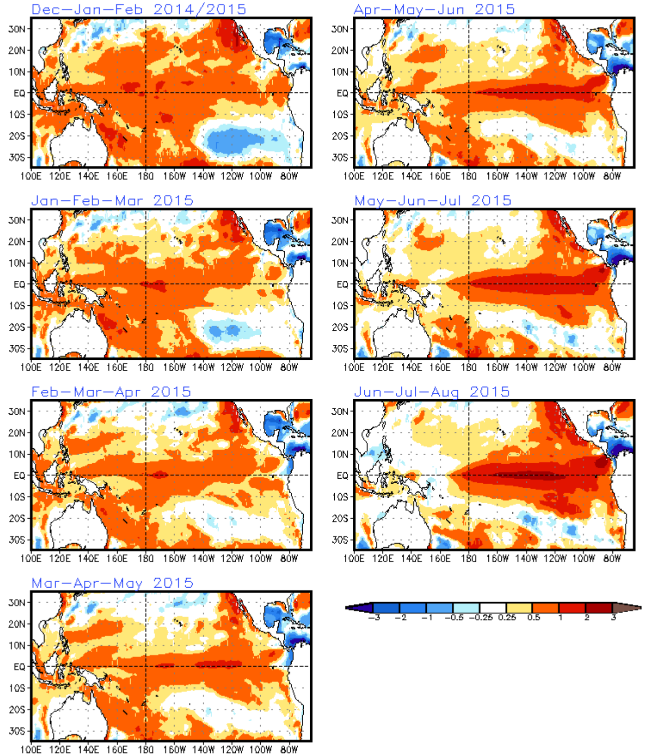
Figure provided by the International Research Institute (IRI) for Climate and Society (updated 18 November 2014).

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

Issued: 1 December 2014

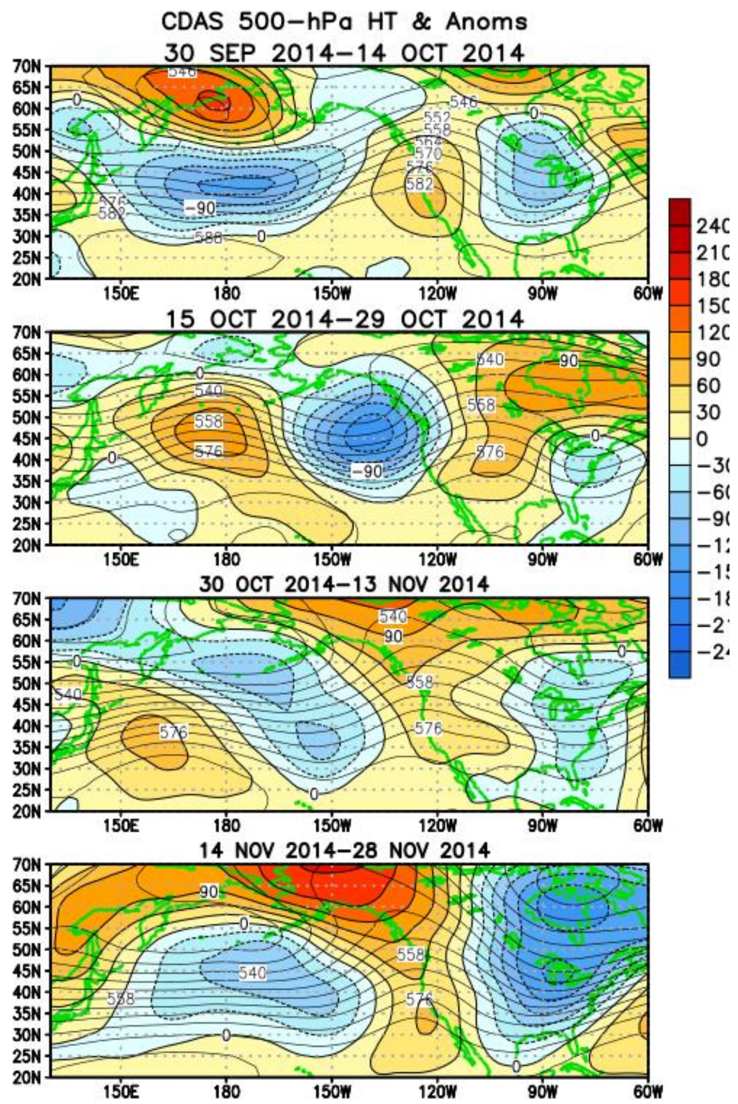
The CFS.v2 ensemble mean (black dashed line) predicts El Niño into mid 2015.





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

During late September- late November, the pattern generally featured an anomalous ridge over western N. America and an anomalous trough over eastern N. America. This pattern led to above-average temperatures in the West, and below average temperatures in the East.



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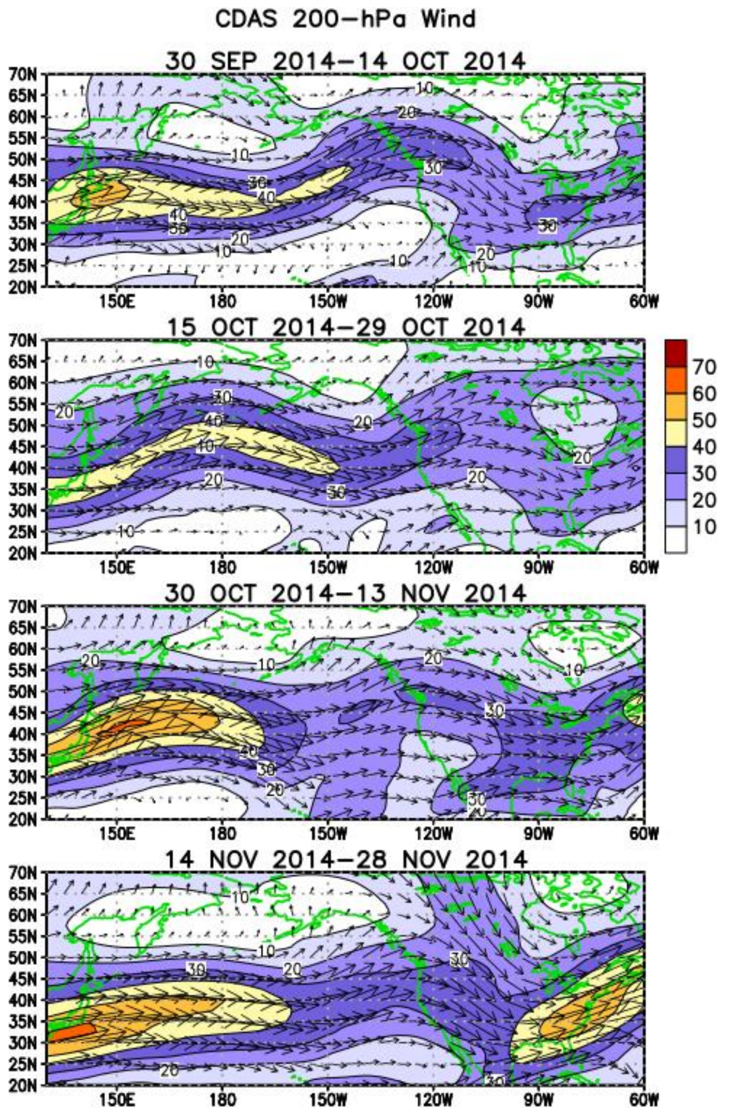

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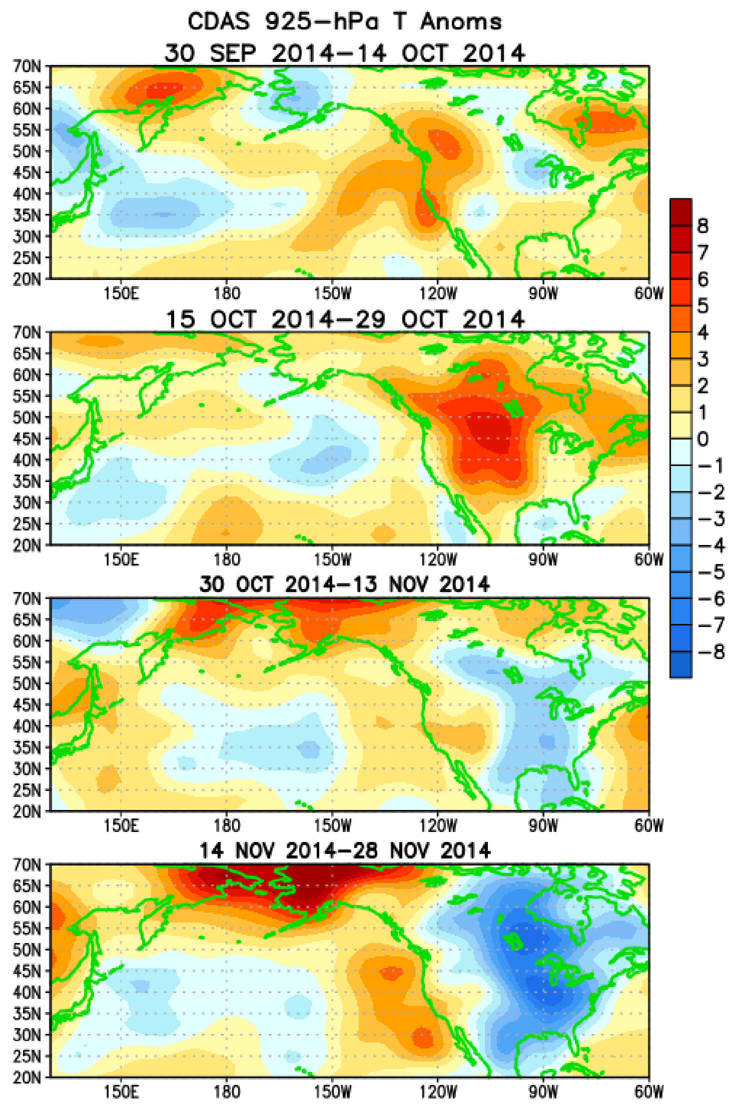
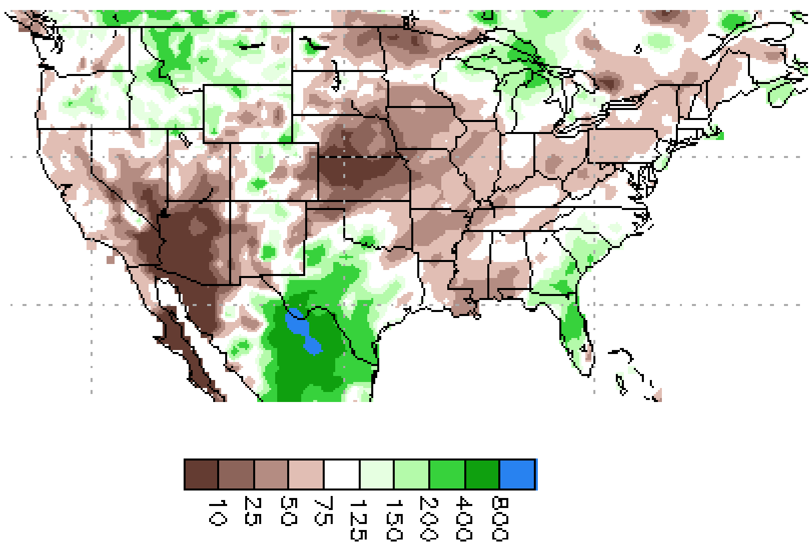


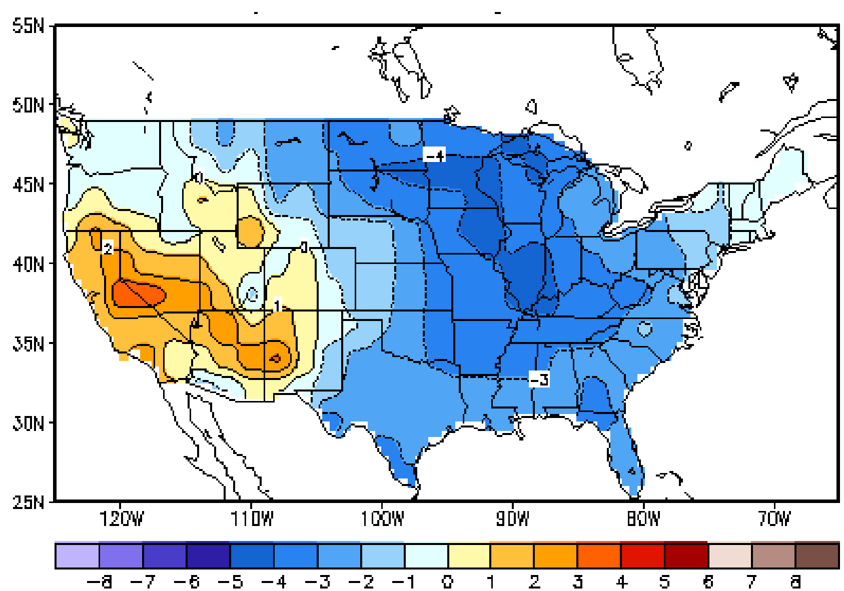
U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 29 November 2014

Percent of Average Precipitation



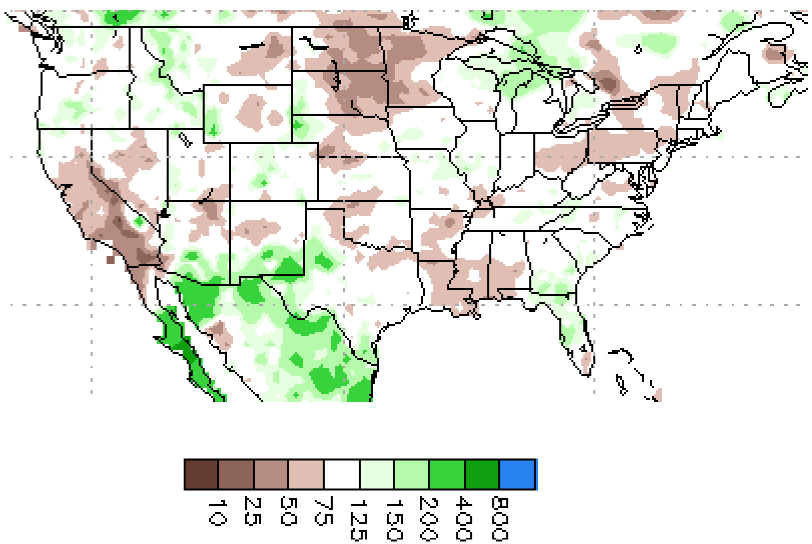
Temperature Departures (degree C)



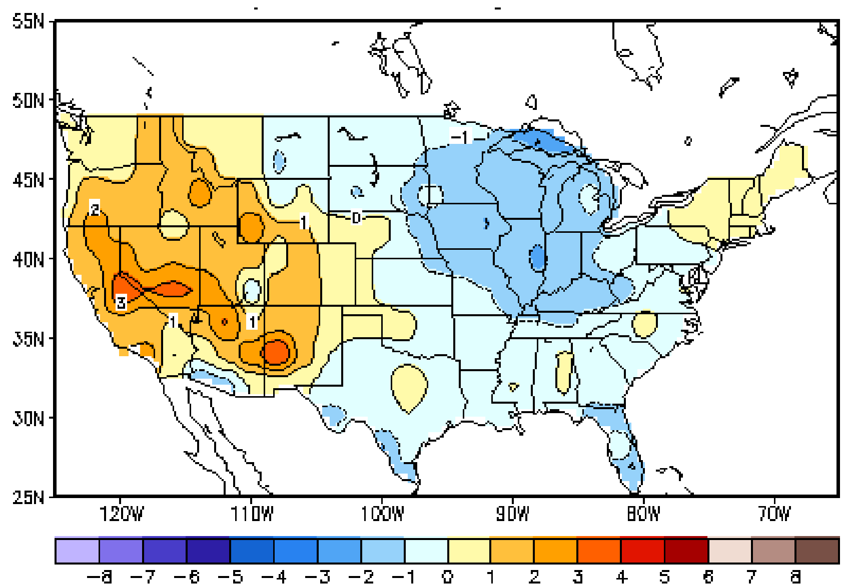
U.S. Temperature and Precipitation Departures During the Last 90 Days

End Date: 29 November 2014

Percent of Average Precipitation



Temperature Departures (degree C)

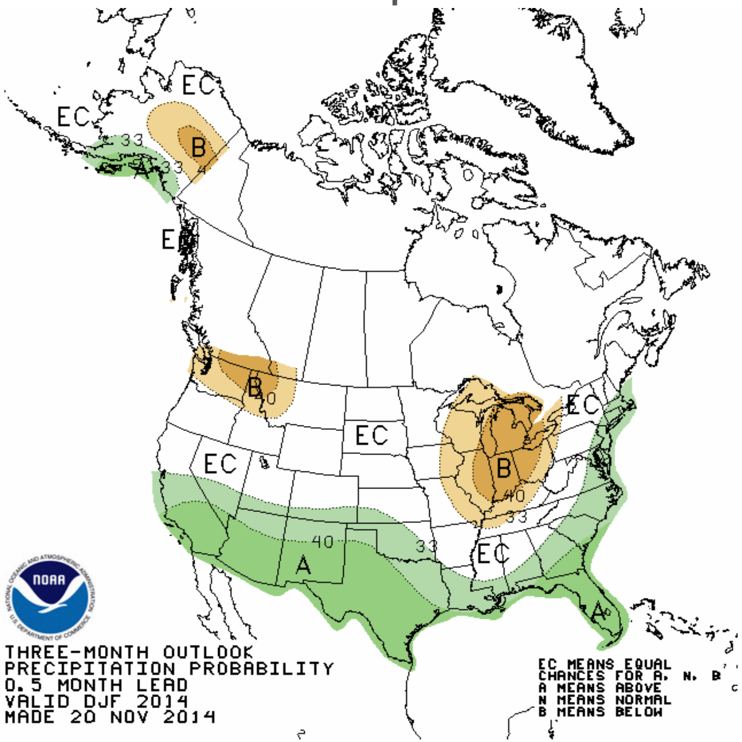


U. S. Seasonal Outlooks

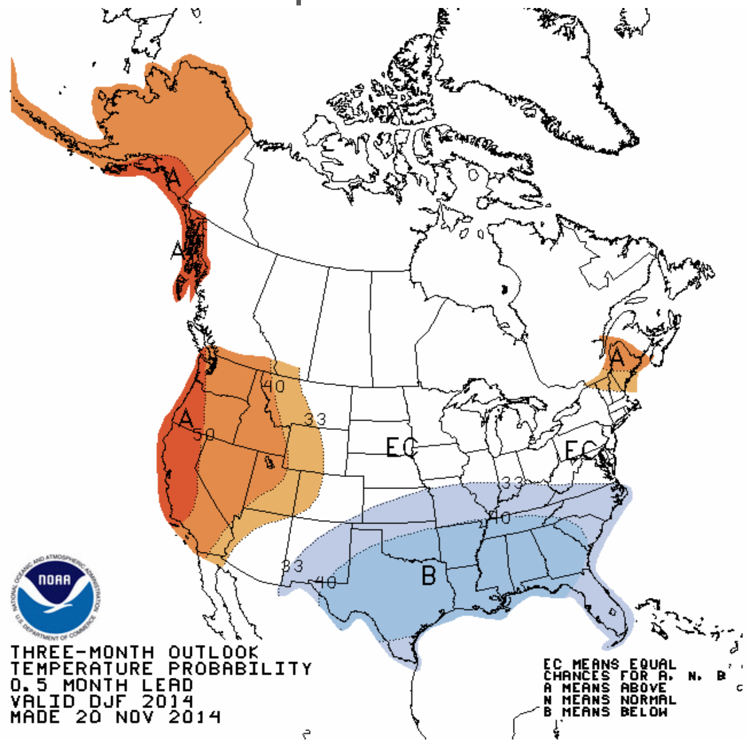
December 2014 - February 2015

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 a 58% chance of El Niño during the Northern Hemisphere winter, which is favored to last into the Northern Hemisphere spring 2015.*

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