

ENSO: Recent Evolution, Current Status and Predictions



Update prepared by:
Climate Prediction Center / NCEP
2 February 2015

Outline

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Recent Evolution and Current Conditions

Oceanic Niño Index (ONI)

Pacific SST Outlook

U.S. Seasonal Precipitation and Temperature Outlooks

Summary

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ENSO Alert System Status: El Niño Watch

ENSO-neutral conditions continue.*

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

There is an approximately 50-60% chance of El Niño conditions during the next two months, with ENSO-neutral favored thereafter.*

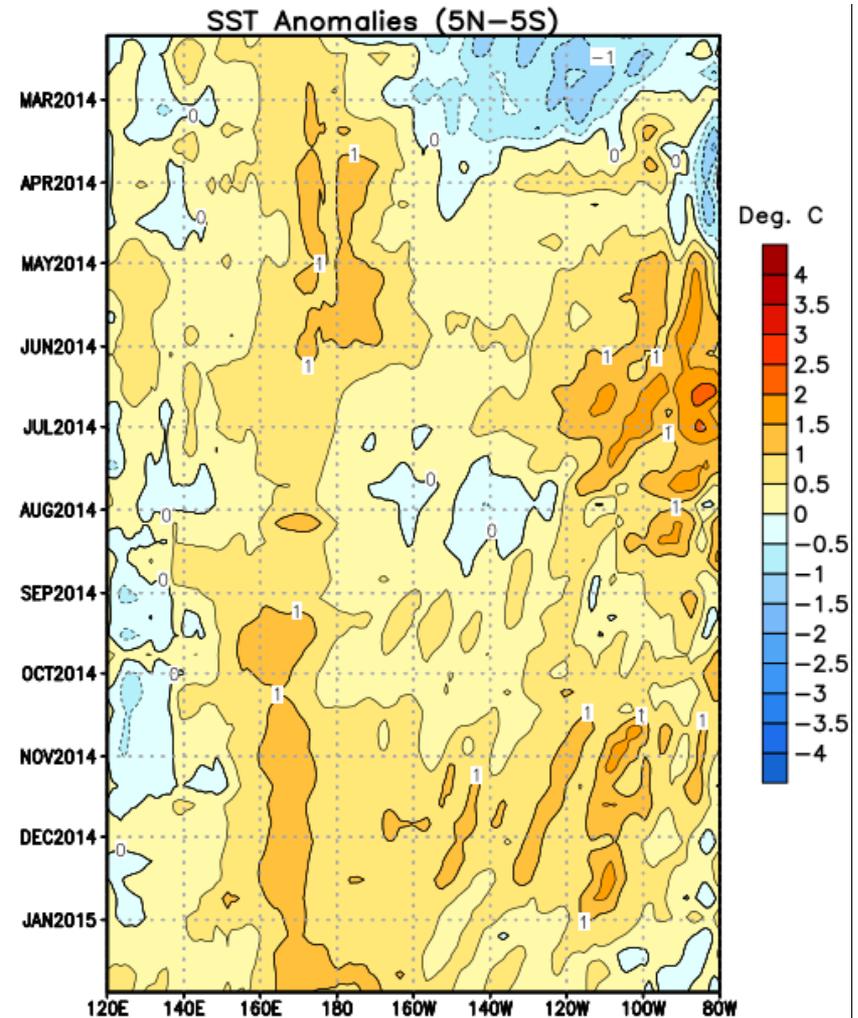
* Note: These statements are updated once a month in association with the ENSO Diagnostics Discussion, which can be found by clicking [here](#).

Recent Evolution of Equatorial Pacific SST Departures ($^{\circ}\text{C}$)

From March-June 2014, above-average SSTs (departures $>0.5^{\circ}\text{C}$) were evident near the Date Line and in the eastern Pacific.

Since September 2014, positive SST anomalies covered most of the equatorial Pacific.

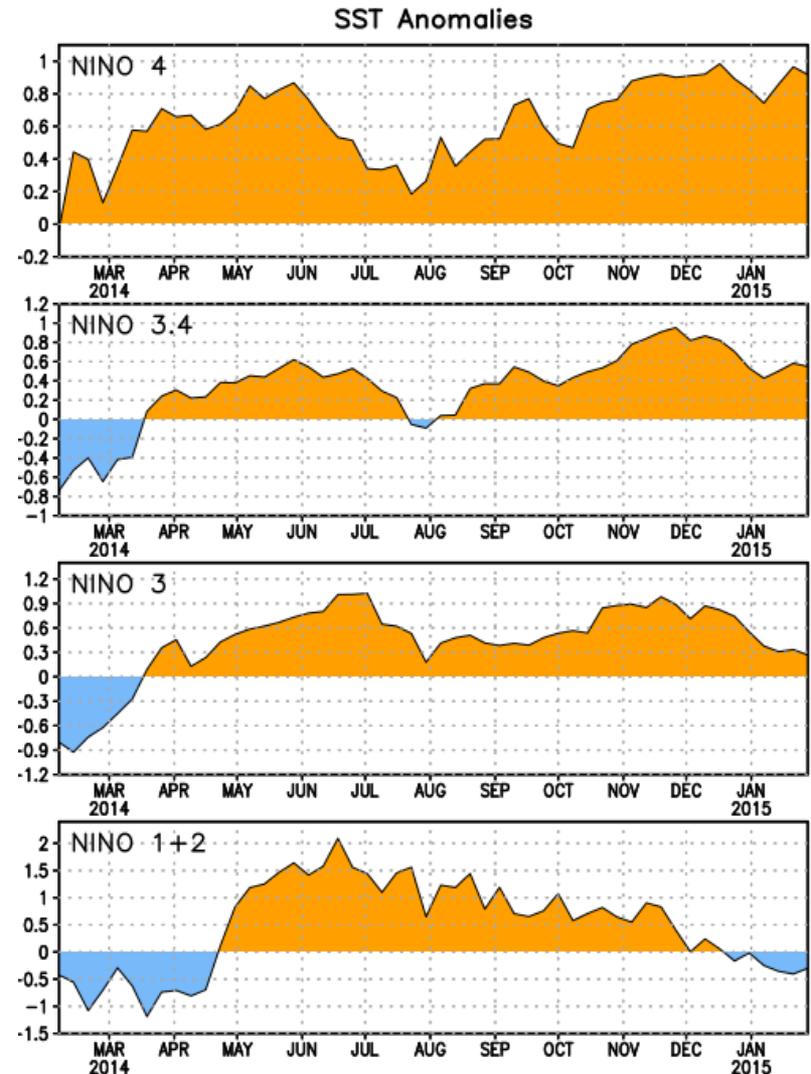
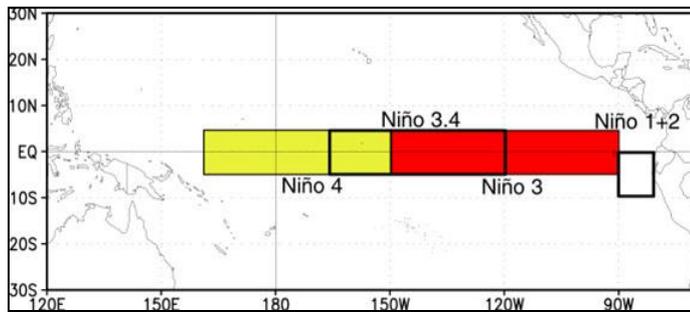
Recently, positive SST anomalies have persisted across most of the equatorial Pacific. In the far eastern Pacific, SSTs were near-average during January 2015.



Niño Region SST Departures (°C) Recent Evolution

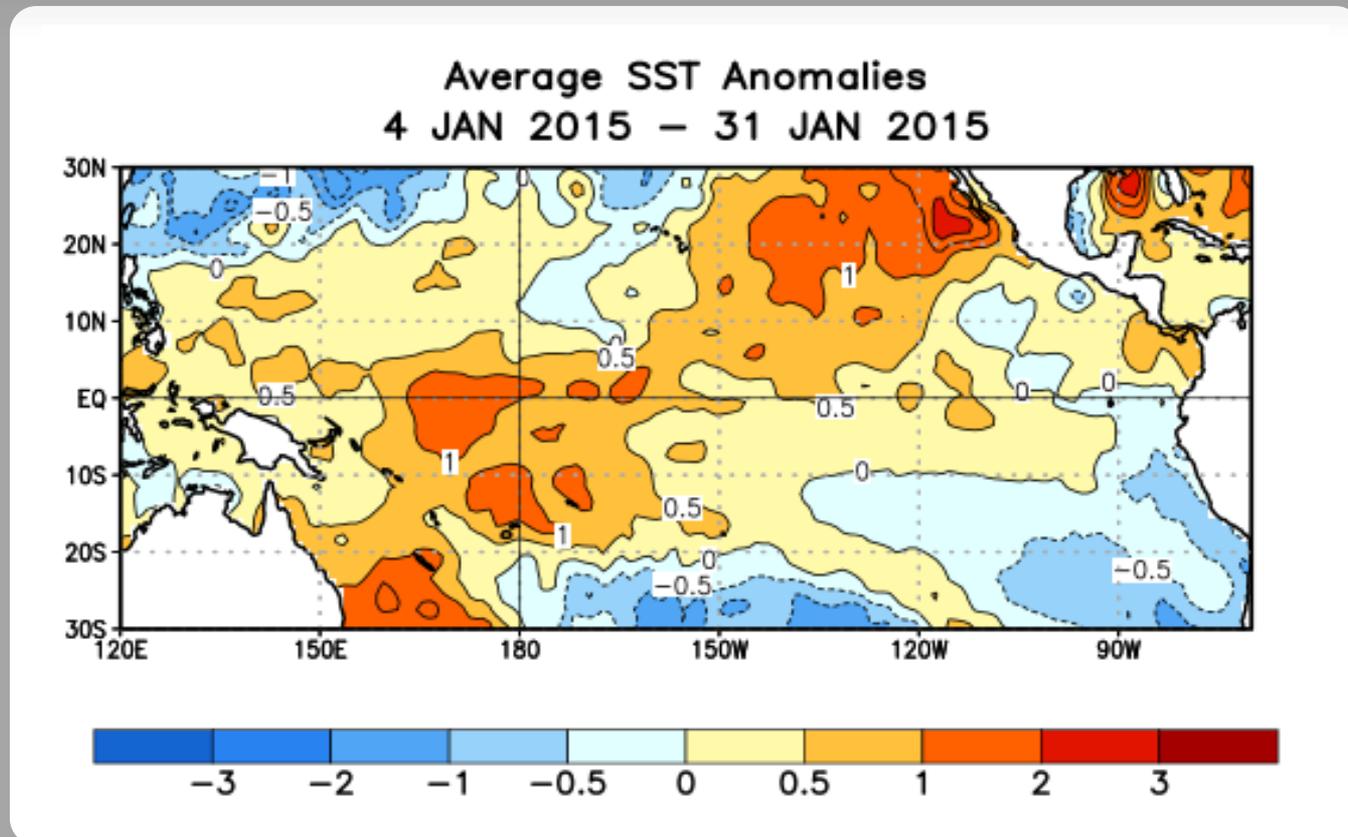
The latest weekly SST departures are:

Niño 4	0.9°C
Niño 3.4	0.5°C
Niño 3	0.3°C
Niño 1+2	-0.3°C



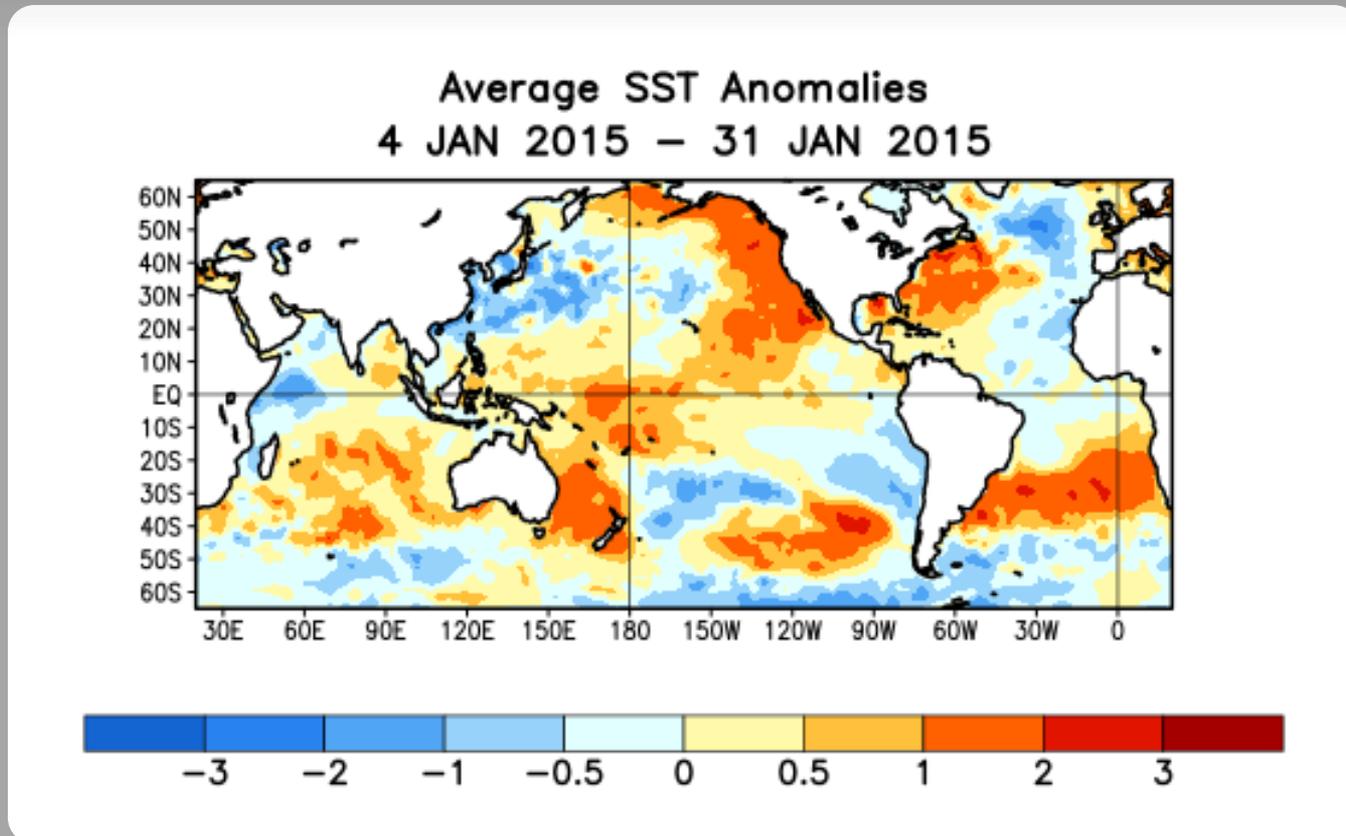
SST Departures ($^{\circ}\text{C}$) in the Tropical Pacific During the Last Four Weeks

During the last four weeks, equatorial SSTs were above average across most of the Pacific, except near the coast of South America.



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

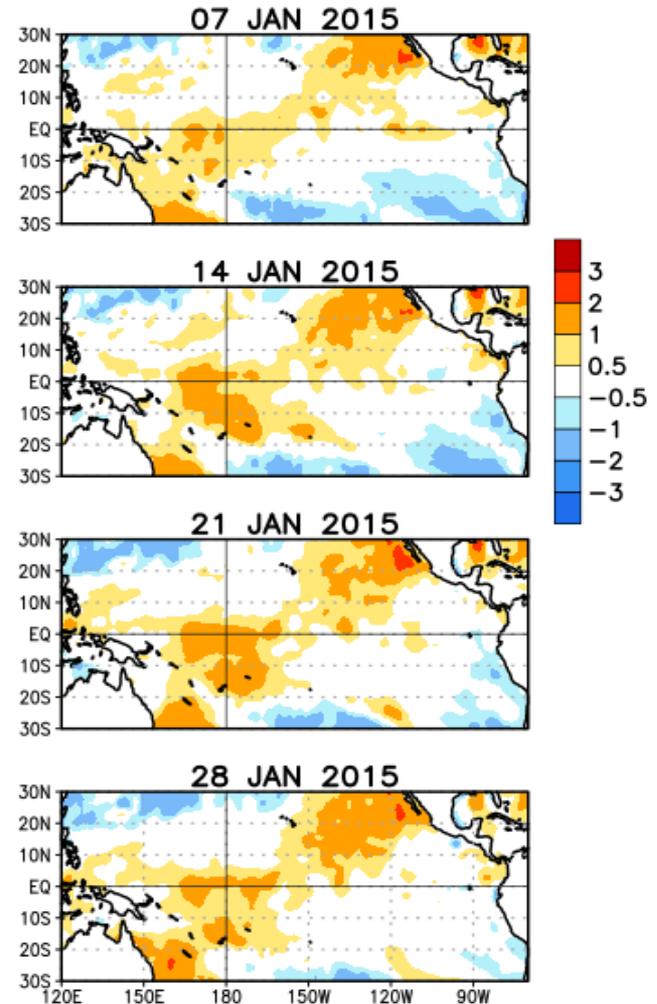
During the last four weeks, equatorial SSTs were above average across most of the Pacific and below average in the western Indian Ocean.



Weekly SST Departures during the Last Four Weeks

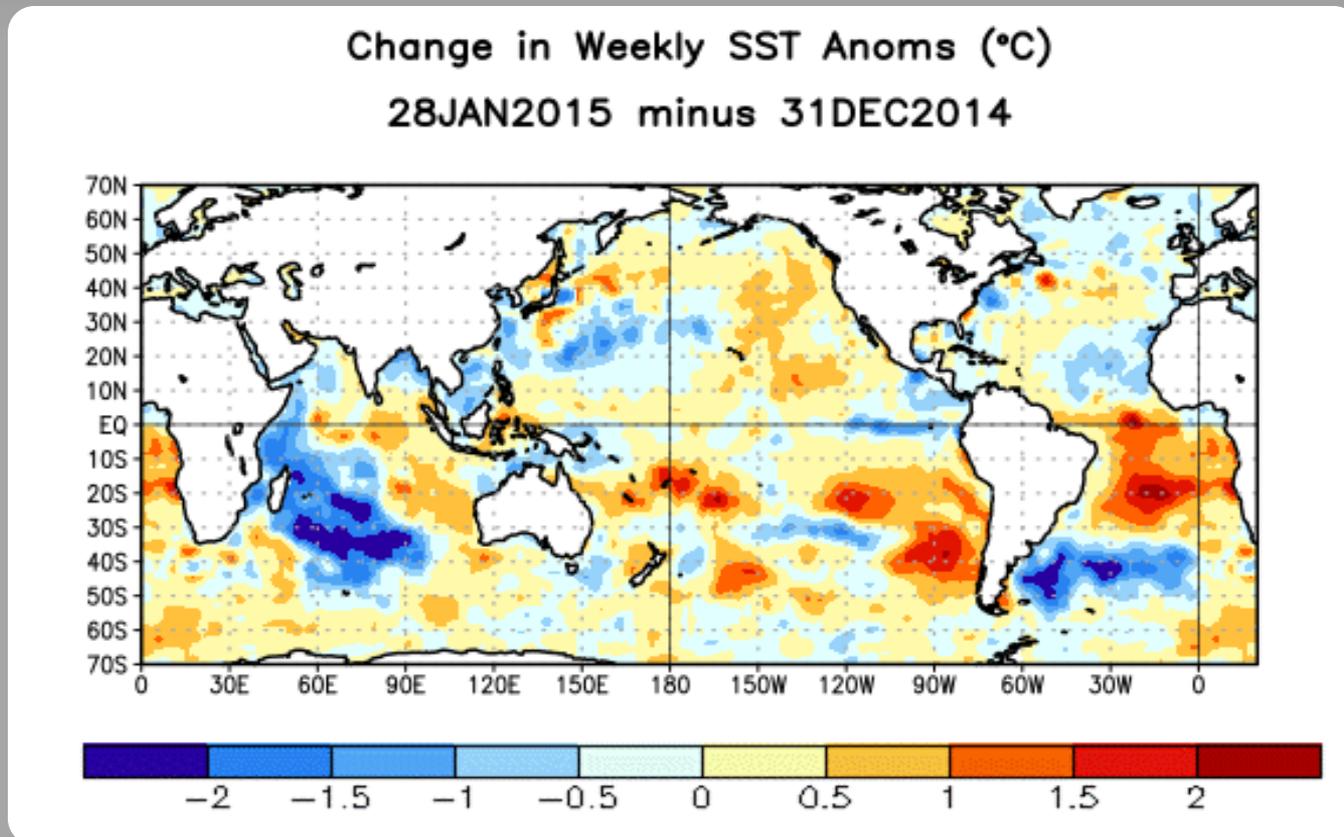
During the last four weeks, equatorial SSTs were above or near average across most of the Pacific.

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 in the eastern Pacific.



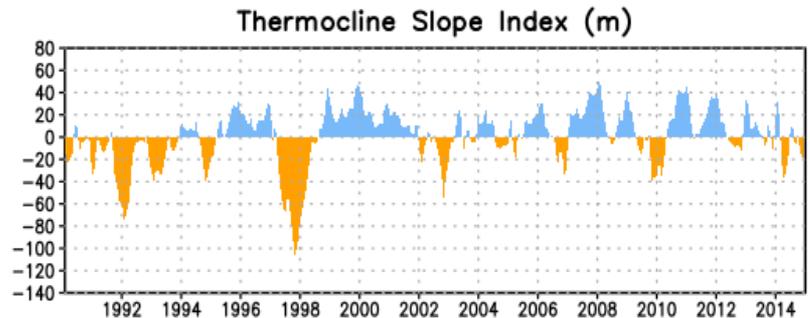
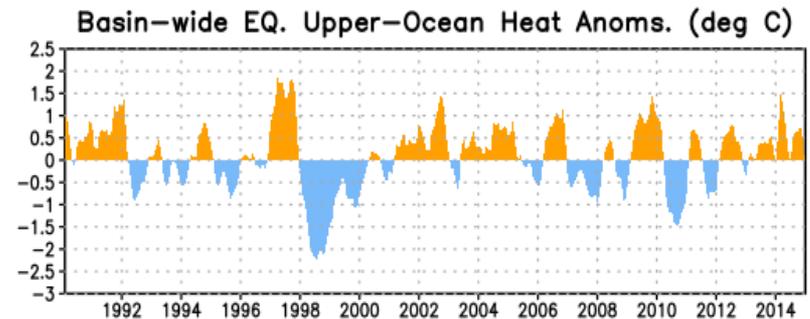
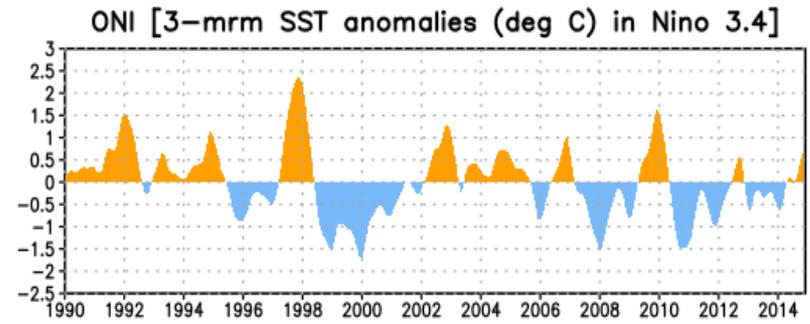
Upper-Ocean Conditions in the Equatorial Pacific

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.

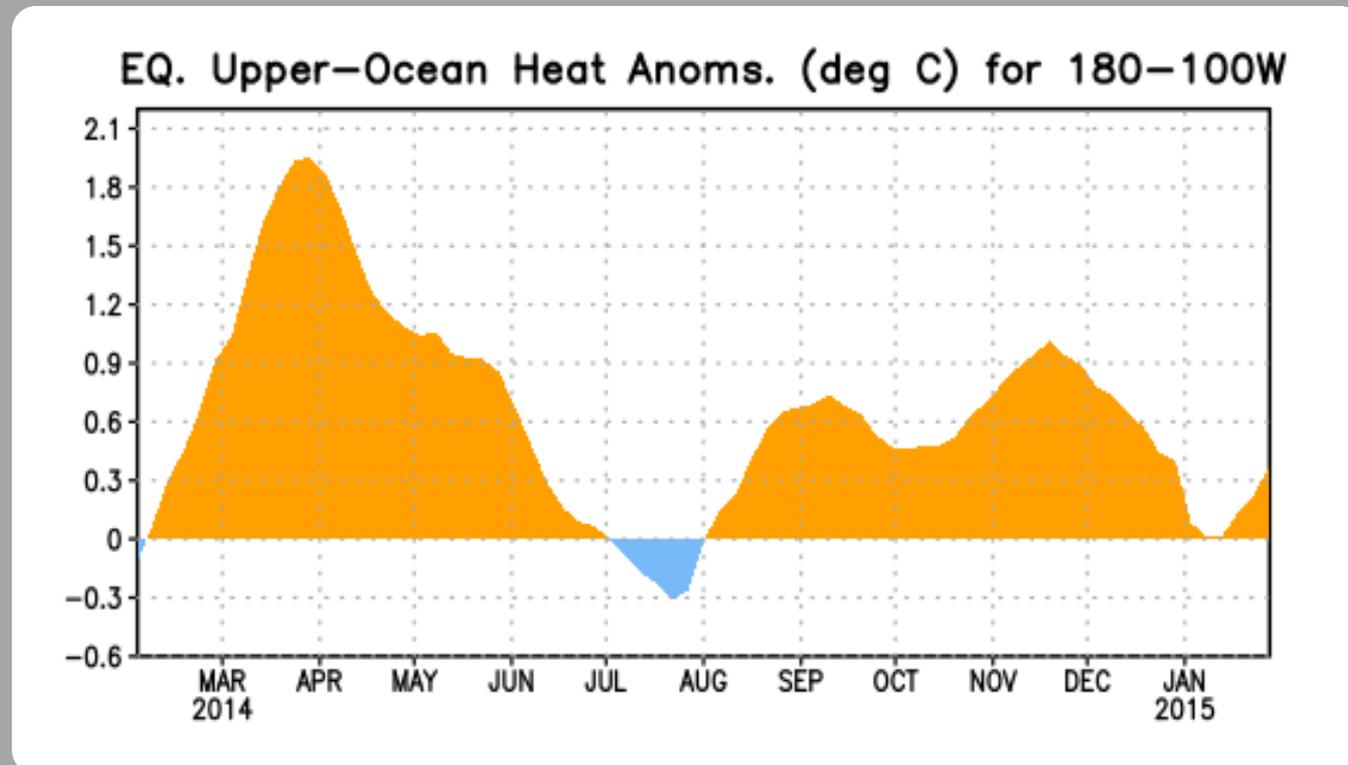
Recent values of the upper-ocean heat anomalies (slightly positive) and thermocline slope index (near zero) reflect a tendency toward El Niño conditions.

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).



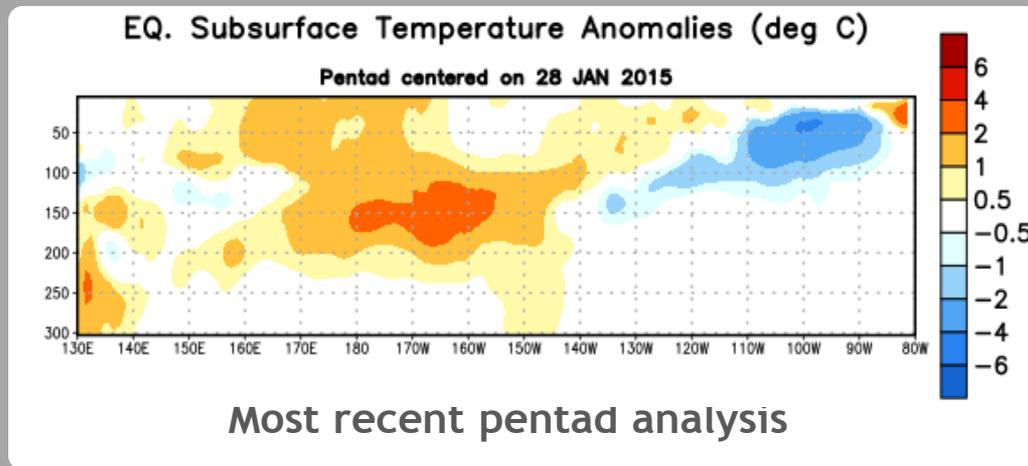
Central and Eastern Pacific Upper-Ocean (0-300 m) Weekly Average Temperature Anomalies

Subsurface temperature anomalies increased from late July to late August, were relatively unchanged from September to mid-October, and increased from mid-October to mid-November before become near average. Recently, temperatures have become slightly above average.

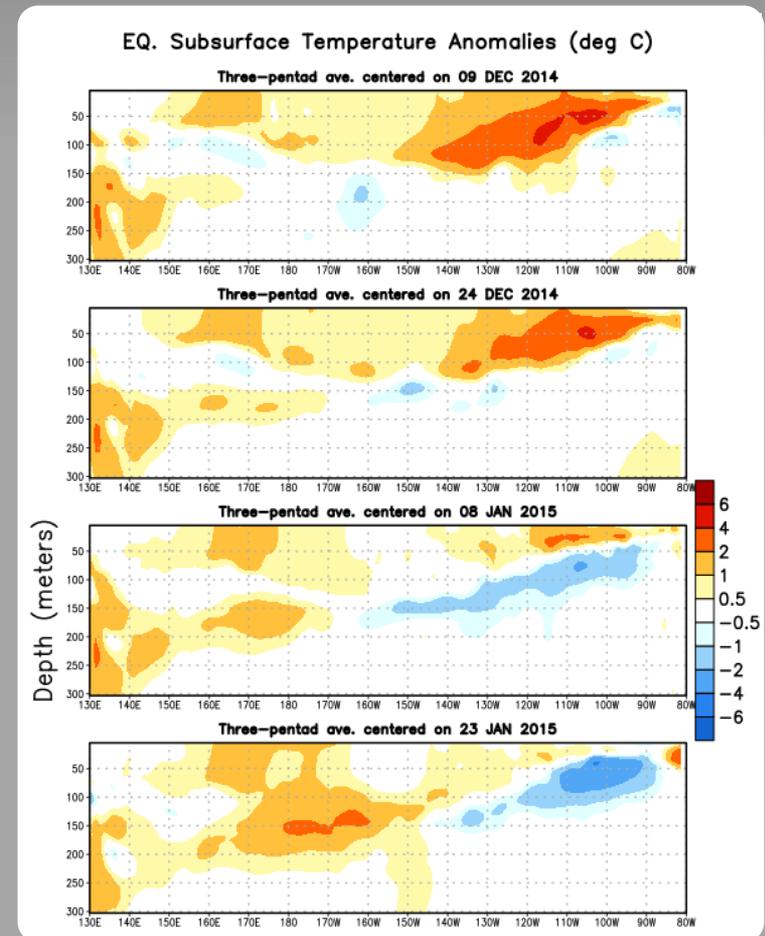


Sub-Surface Temperature Departures in the Equatorial Pacific

During January, negative subsurface temperature anomalies expanded in the eastern Pacific.



Recently, positive subsurface anomalies near the International Date Line have strengthened and shifted eastward.

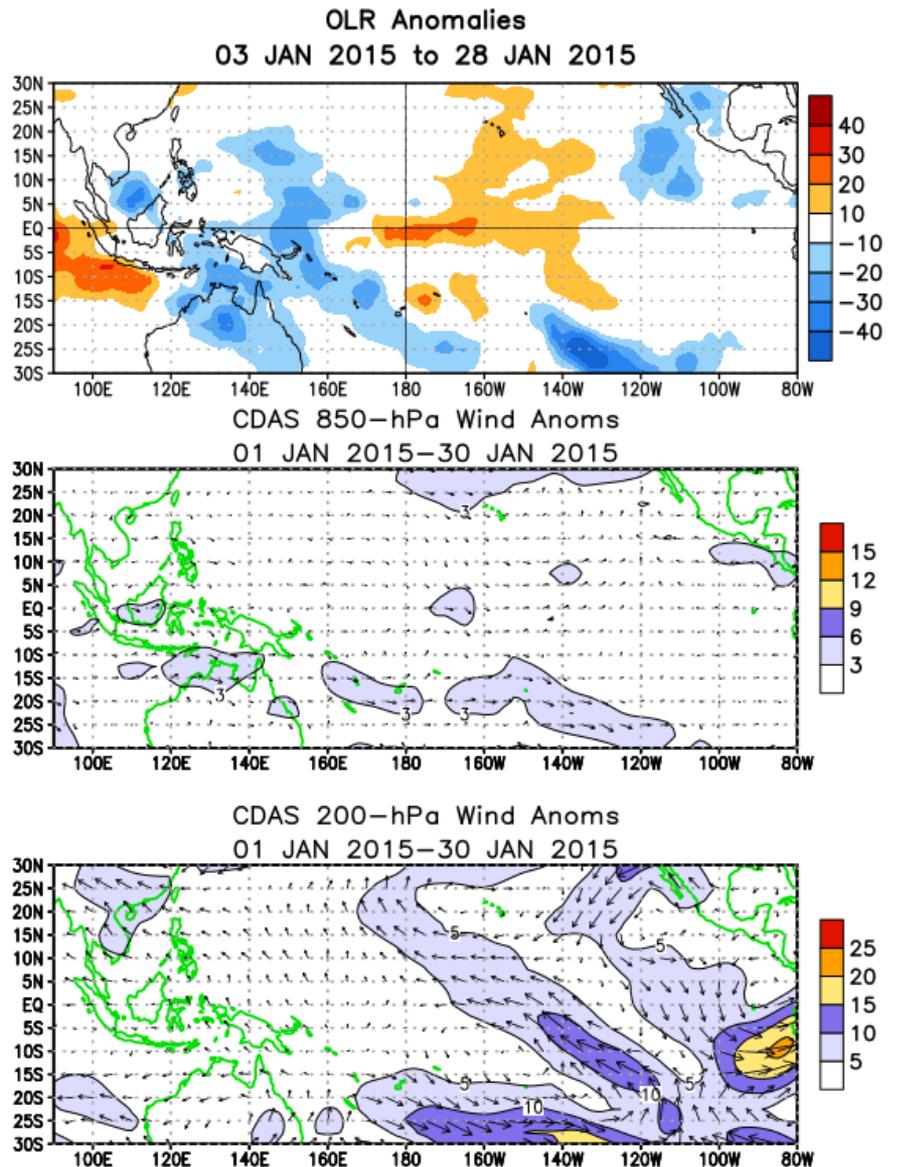


Tropical OLR and Wind Anomalies During the Last 30 Days

Positive OLR anomalies (suppressed convection and precipitation, red shading) were apparent near the Date Line. Negative OLR anomalies (enhanced convection and precipitation) were evident over northern Australia and the western Pacific.

Weak low-level (850-hPa) westerly winds were apparent in a small region east of the Date Line.

Anomalous upper-level (200-hPa) easterly winds were evident across the east-central equatorial Pacific, while northerly cross equatorial flow was apparent over the eastern 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.

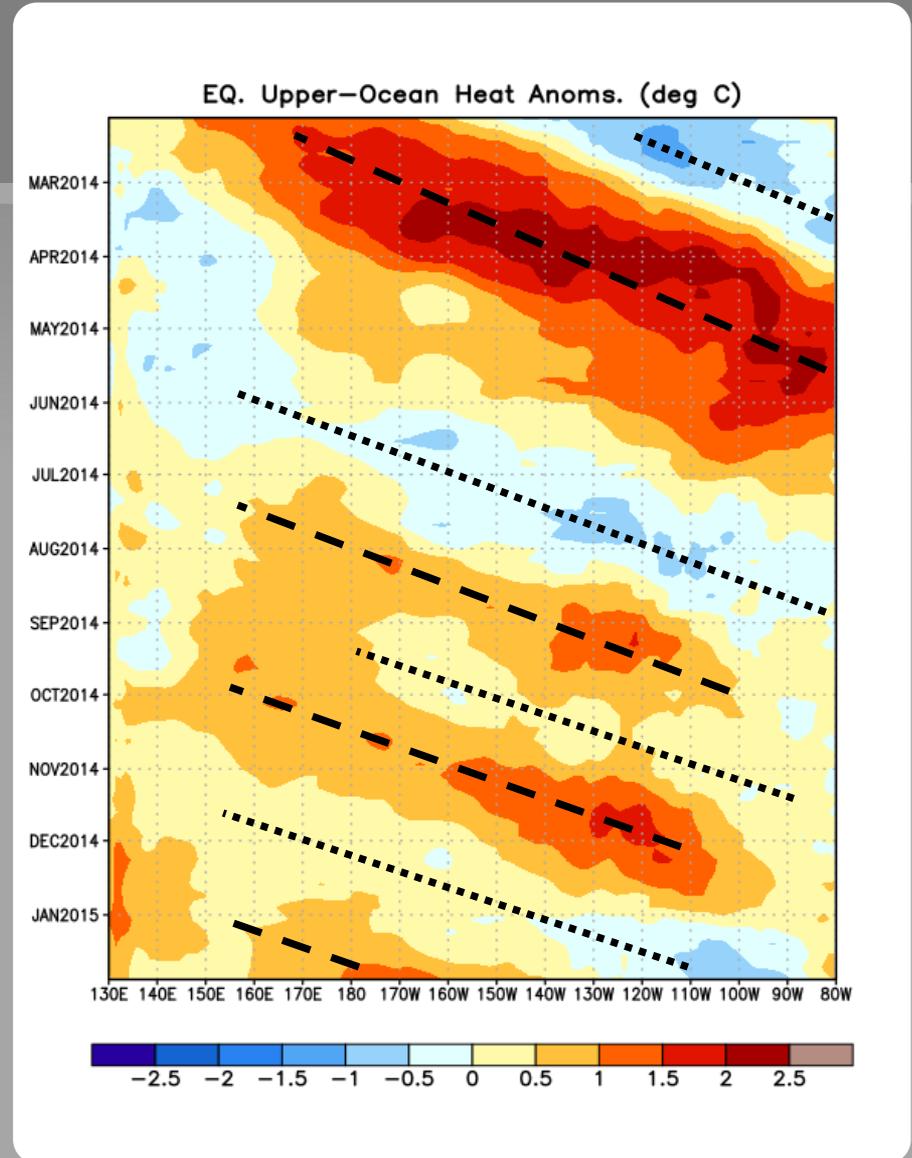
The upwelling phase of a Kelvin wave went through during May-July.

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

Since November, the upwelling phase of a Kelvin wave has shifted eastward.

Since January 2015, another downwelling phase of a Kelvin wave pushed eastward.

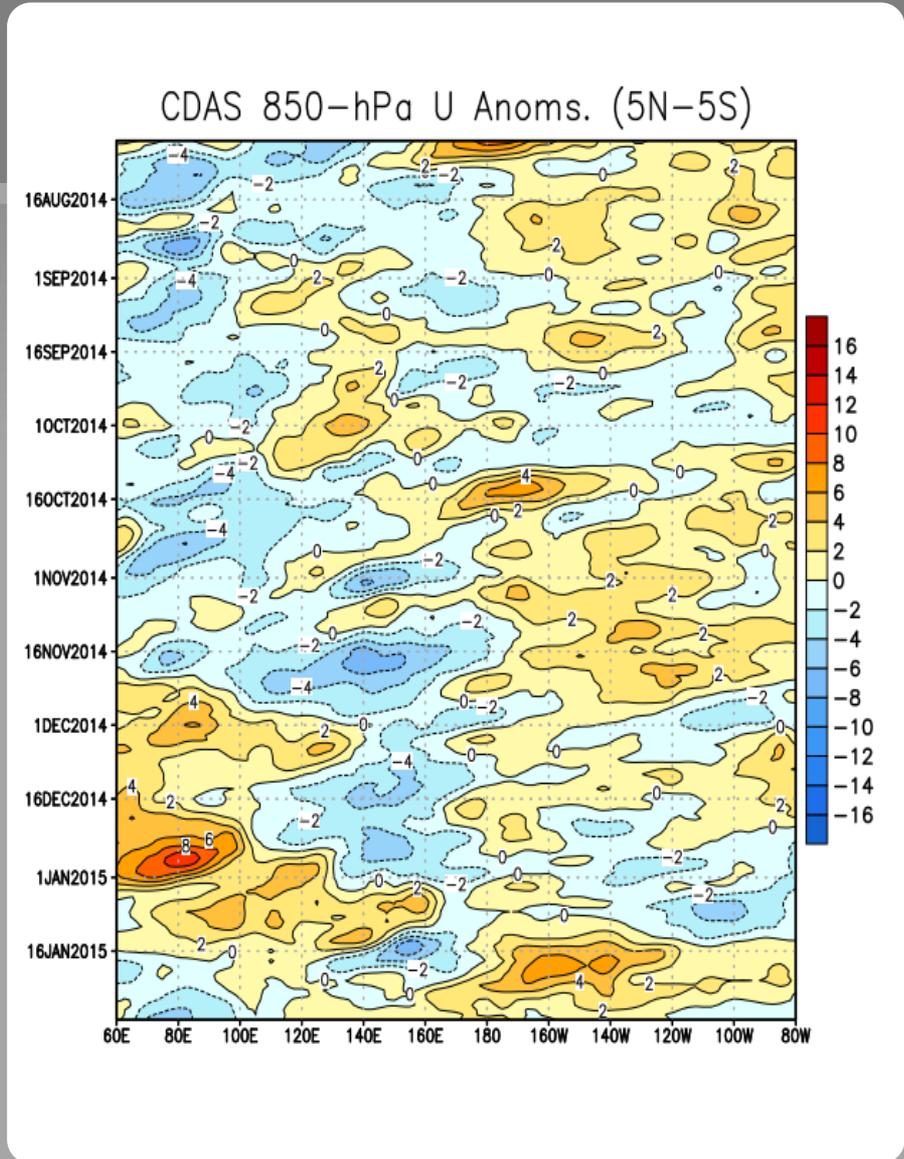
Oceanic Kelvin waves have alternating warm and cold phases. The warm phase is indicated by dashed lines. Down-welling and warming occur in the leading portion of a Kelvin wave, and up-welling and cooling occur in the trailing portion.



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

Since mid January 2015, westerly wind anomalies were prevalent near and east of the Date Line.

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



Upper-level (200-hPa) Velocity Potential Anomalies

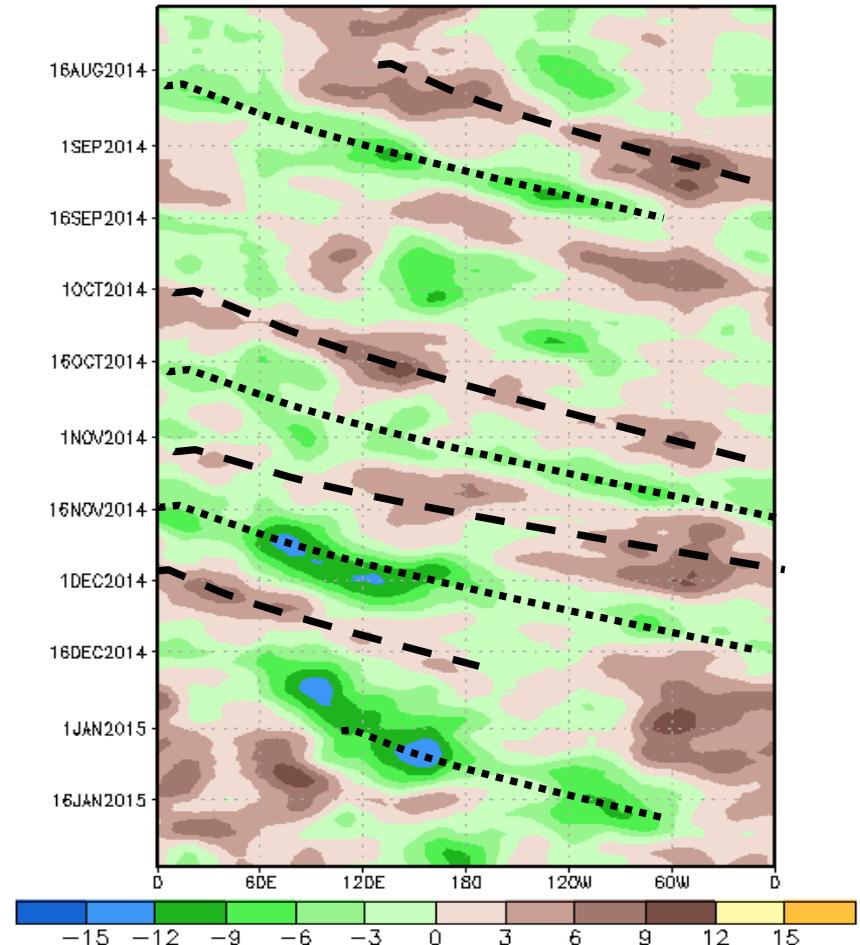
During mid-August to mid-September and October-mid December, eastward propagating velocity potential anomalies were observed.

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

Since mid January, anomalous upper-level divergence was observed near the Date Line.

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

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

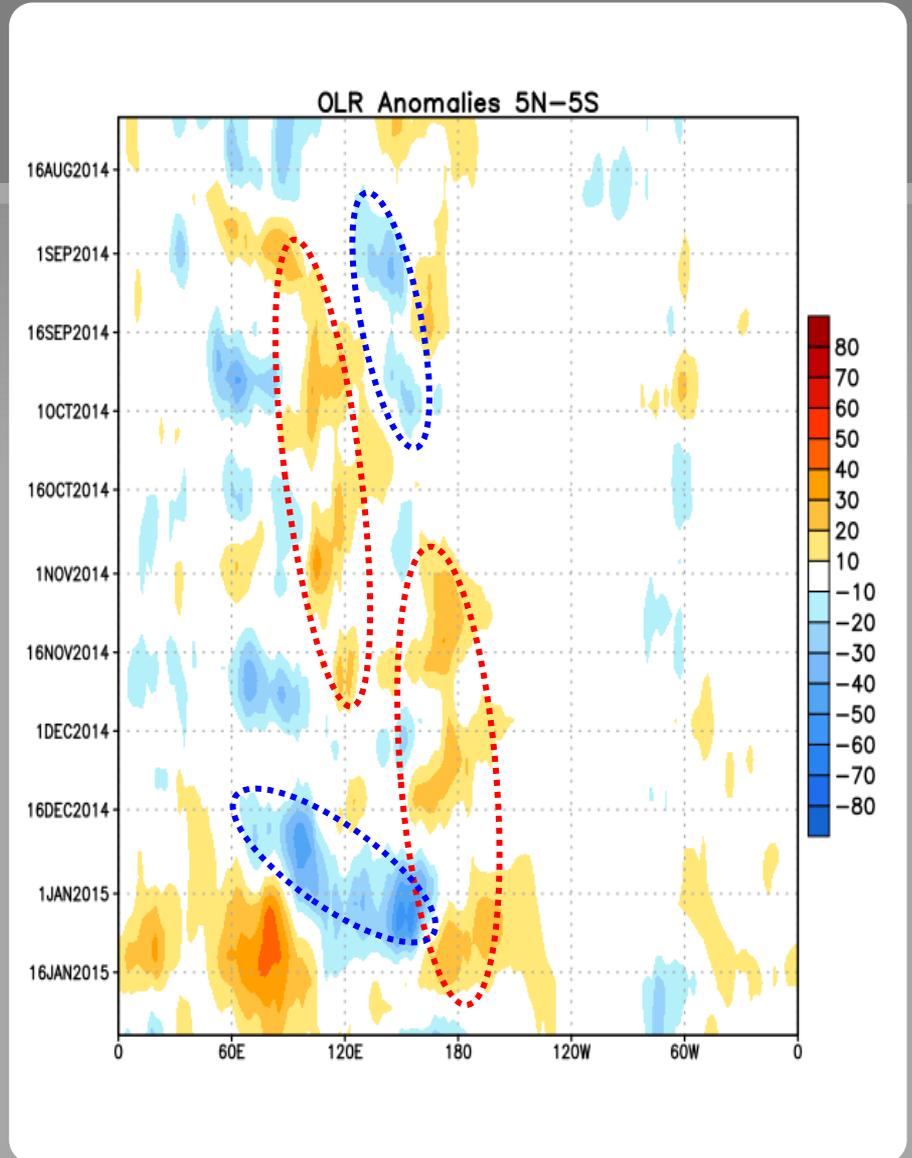


Outgoing Longwave Radiation (OLR) Anomalies

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

More recently, near-to-below average OLR was apparent 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 $+0.5^{\circ}\text{C}$.

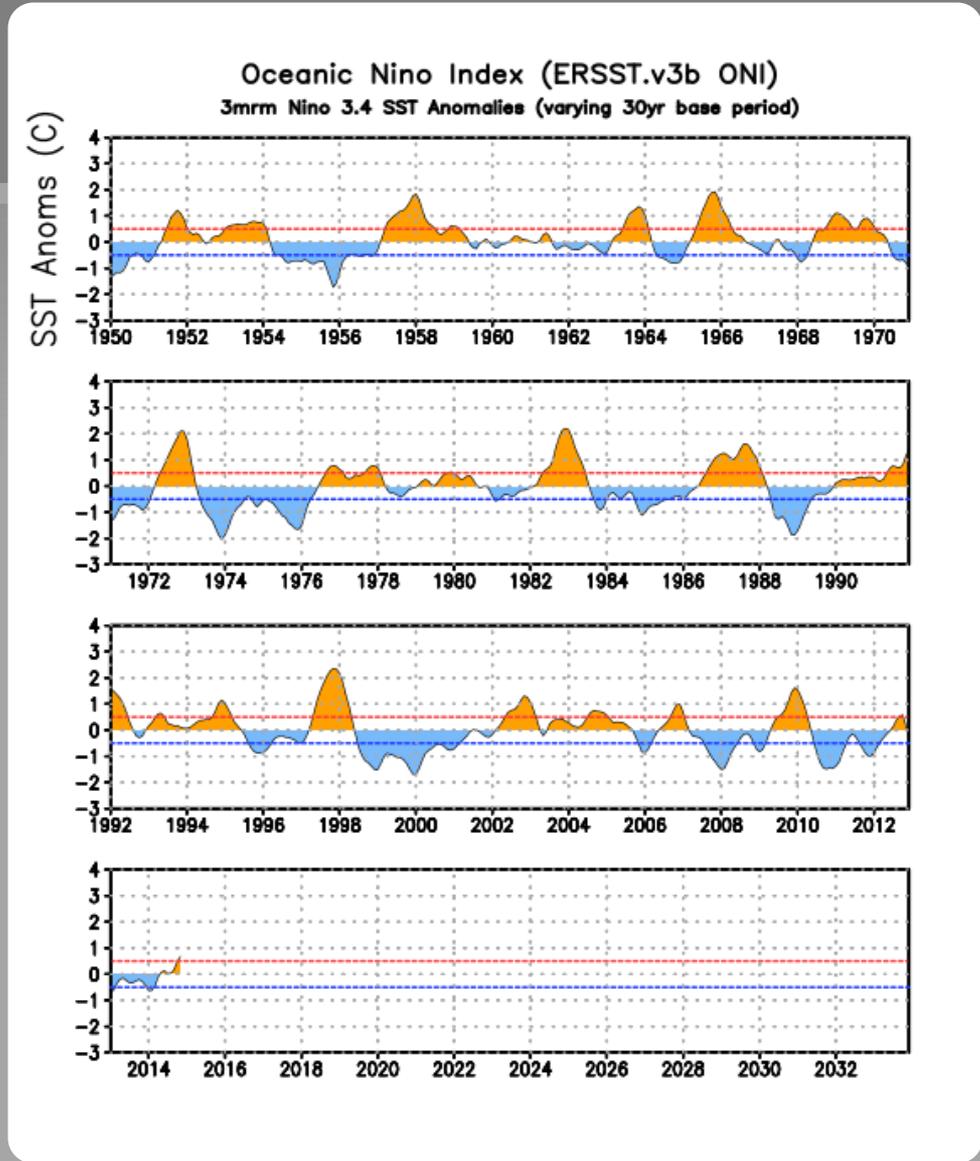
La Niña: characterized by a negative ONI less than or equal to -0.5°C .

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 $\pm 0.5^{\circ}\text{C}$ 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 (October - December 2014) is 0.7°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

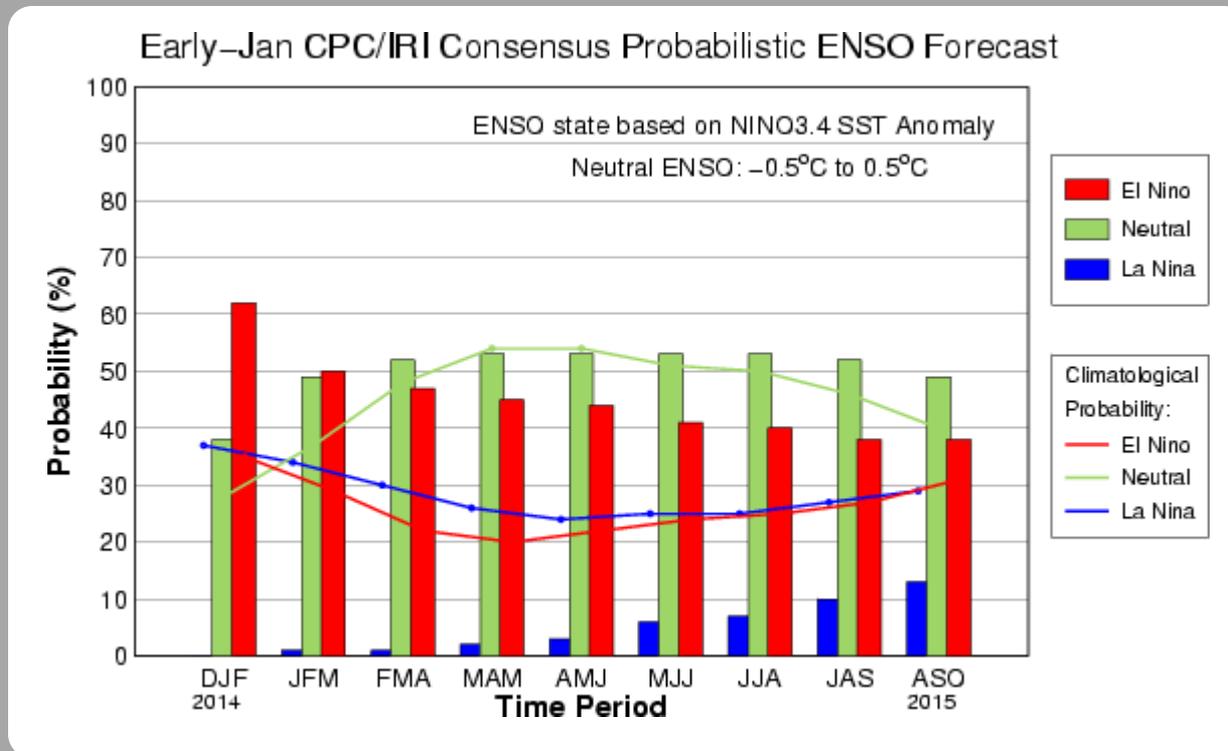
Recent Pacific warm (red) and cold (blue) episodes based on a threshold of +/- 0.5 °C for the Oceanic Niño Index (ONI) [3 month running mean of ERSST.v3b SST anomalies in the Niño 3.4 region (5N-5S, 120-170W)]. For historical purposes El Niño and La Niña episodes are defined when the threshold is met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

CPC/IRI Probabilistic ENSO Outlook

Updated: 8 January 2015

The chance of El Niño is approximately 50-60% during the next couple of months and decreases into spring/summer 2015.



IRI/CPC Pacific Niño 3.4 SST Model Outlook

Most models predict Niño 3.4 SST anomalies greater than or equal to +0.5C to persist through the Northern Hemisphere Spring 2015.

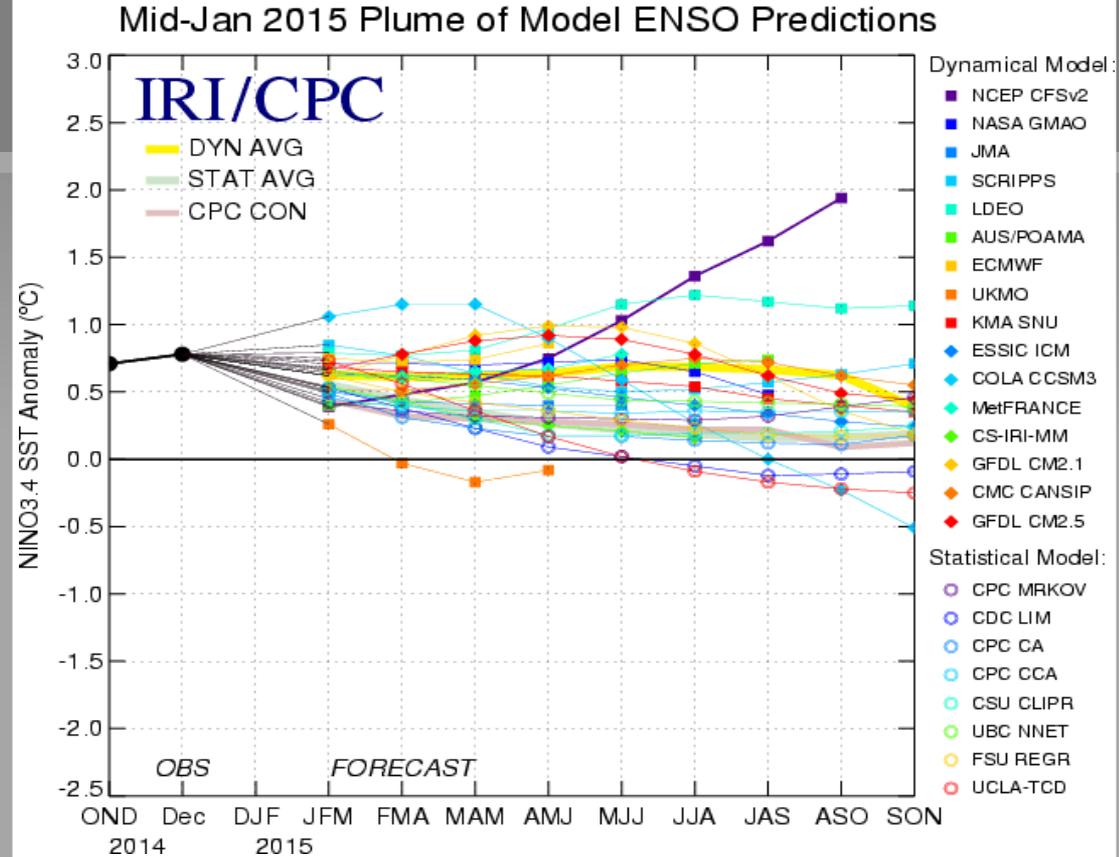
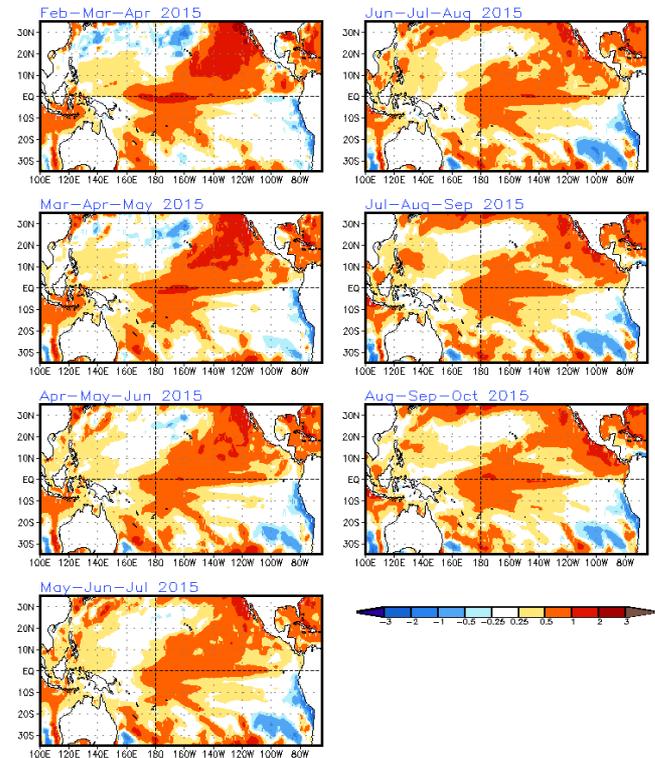
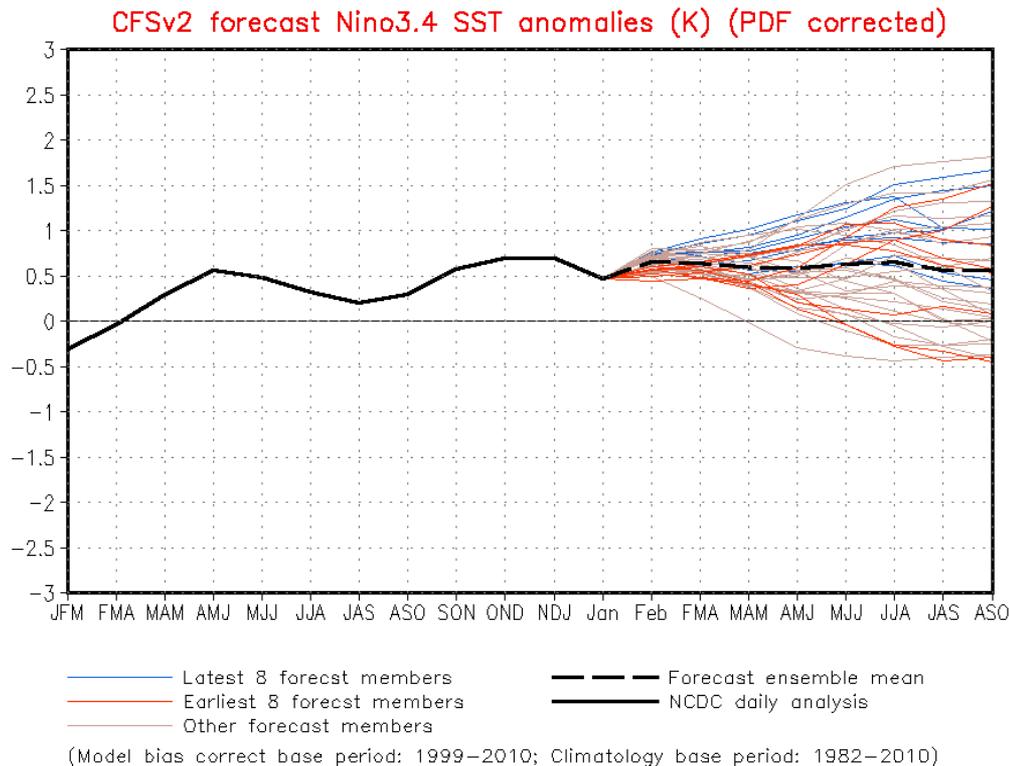


Figure provided by the International Research Institute (IRI) for Climate and Society (updated 15 January 2015).

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

Issued: 26 January 2015

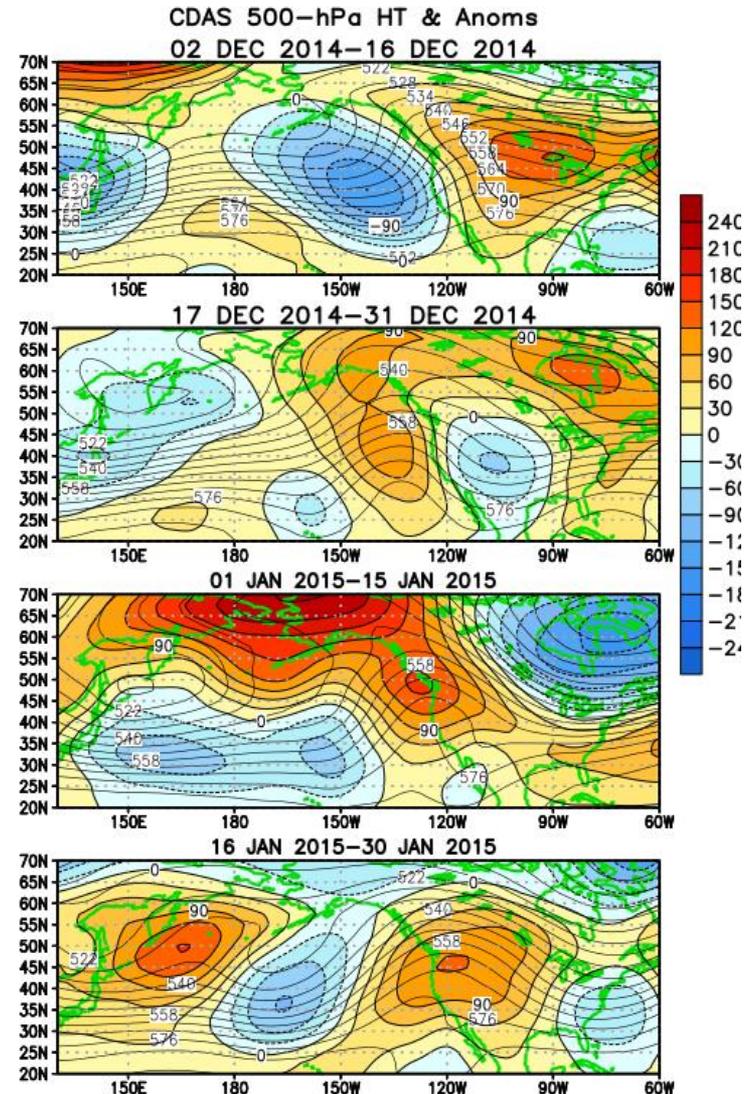
The CFS.v2 ensemble mean (black dashed line) predicts Niño 3.4 SST anomalies to be near or greater than +0.5C through mid-2015.



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

Overall, the anomalous circulation and temperature pattern has been highly variable since the beginning of December 2014.

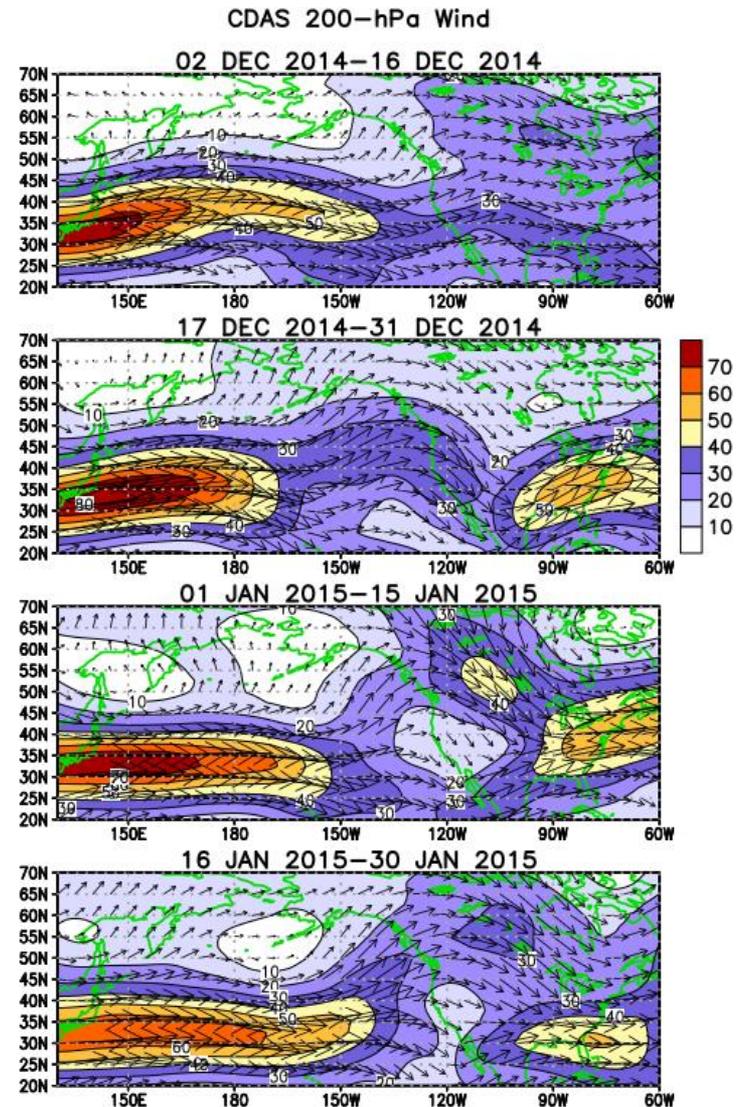
Since mid January 2015, above average heights and temperatures have prevailed over much of North America.



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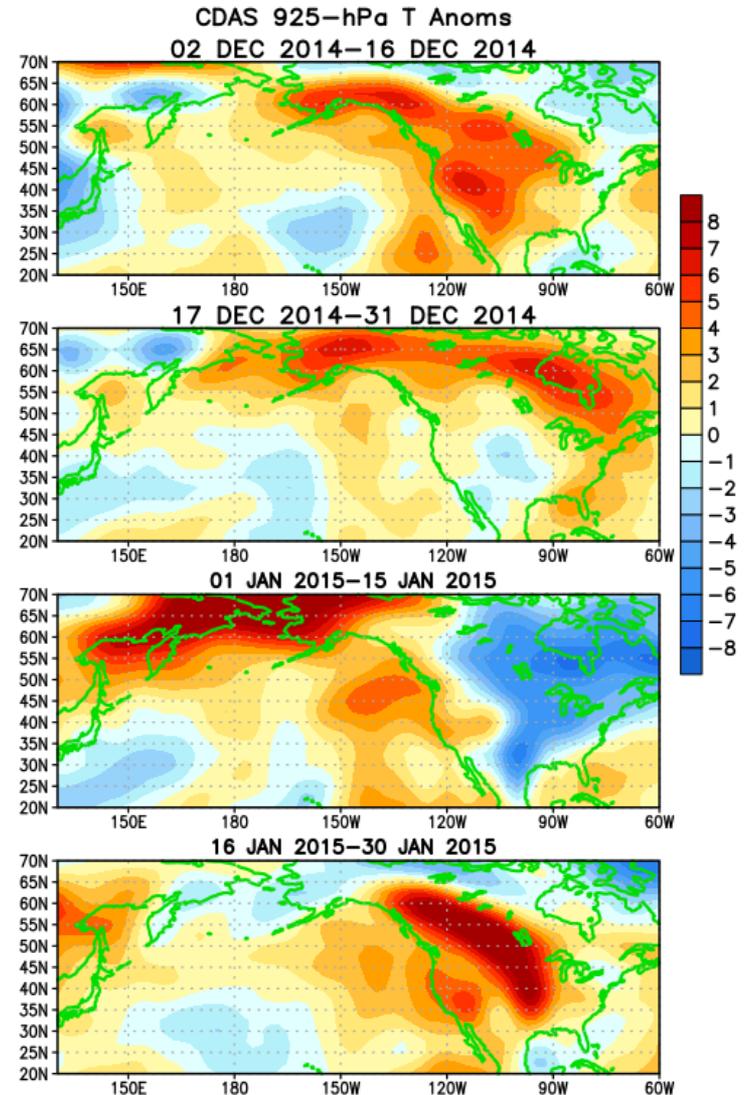
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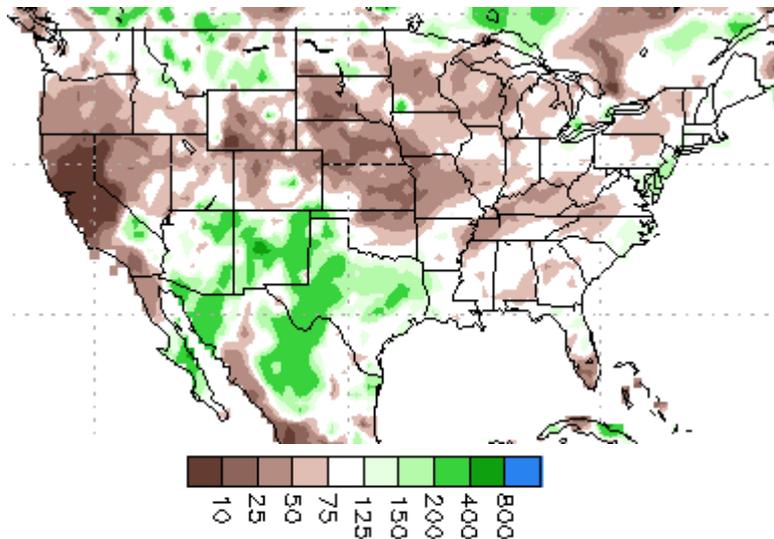
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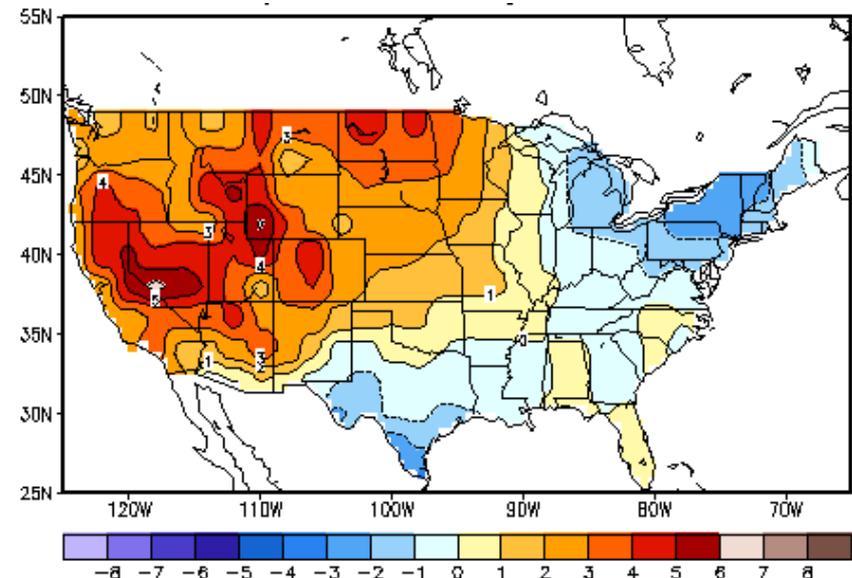
U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 31 January 2015

Percent of Average Precipitation



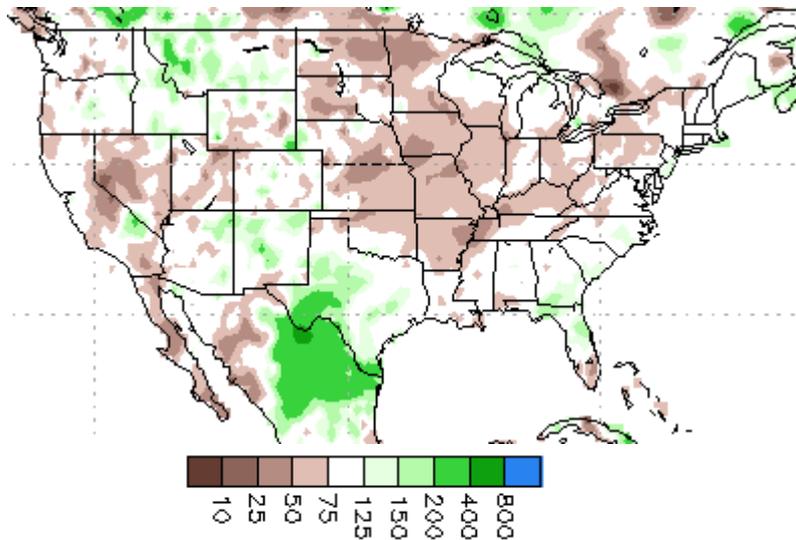
Temperature Departures (degree C)



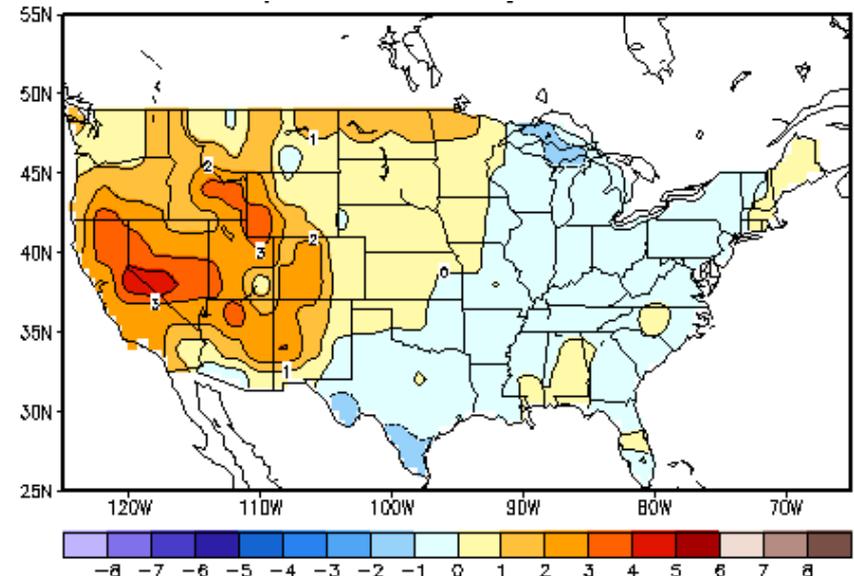
U.S. Temperature and Precipitation Departures During the Last 90 Days

End Date: 31 January 2015

Percent of Average Precipitation



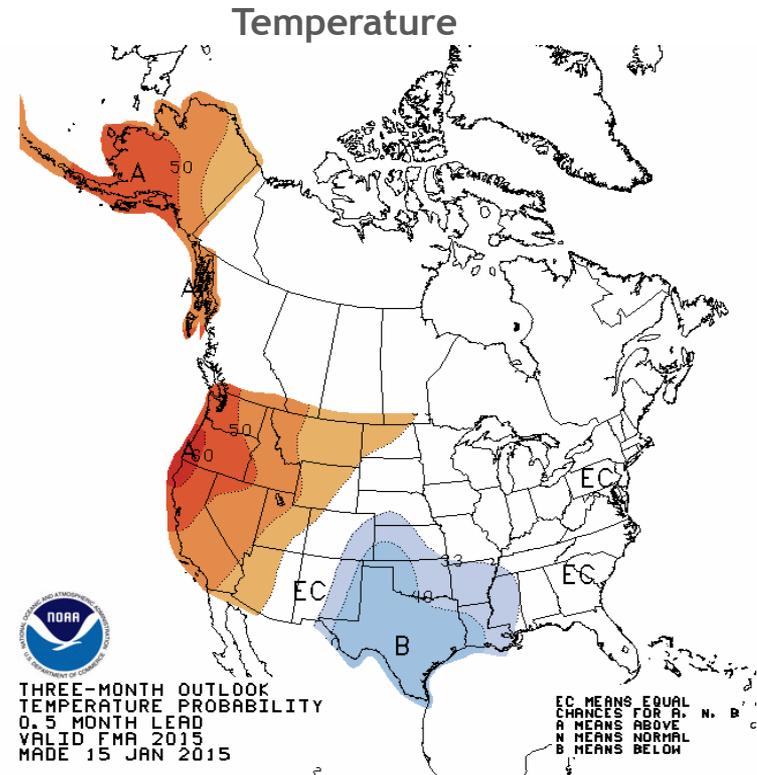
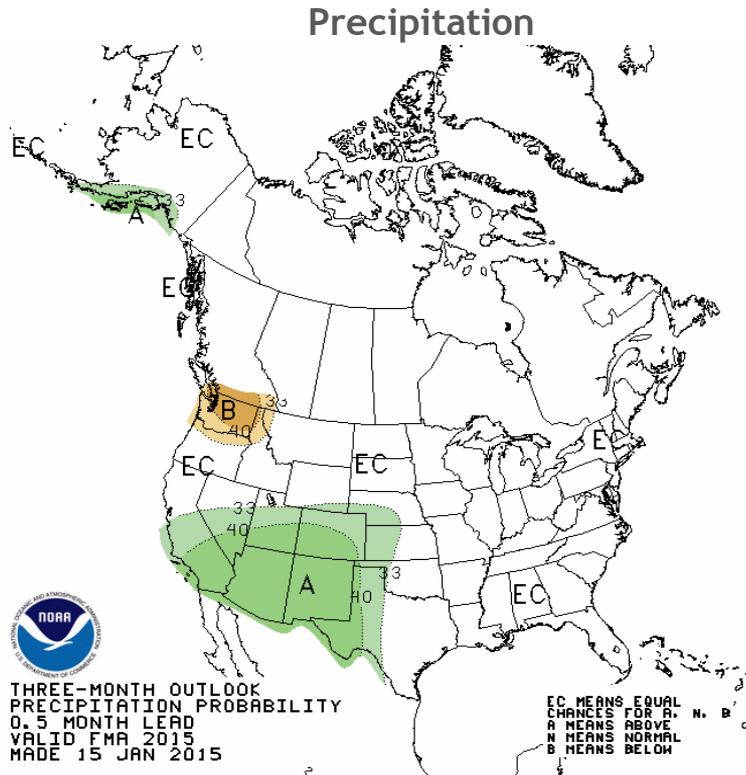
Temperature Departures (degree C)



U. S. Seasonal Outlooks

February - April 2015

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



Summary

ENSO Alert System Status: El Niño Watch

ENSO-neutral conditions continue.*

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

There is an approximately 50-60% chance of El Niño conditions during the next two months, with ENSO-neutral favored thereafter.*

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