ENSO Cycle: Recent Evolution, Current Status and Predictions

Update prepared by
Climate Prediction Center / NCEP
9 January 2012

Outline

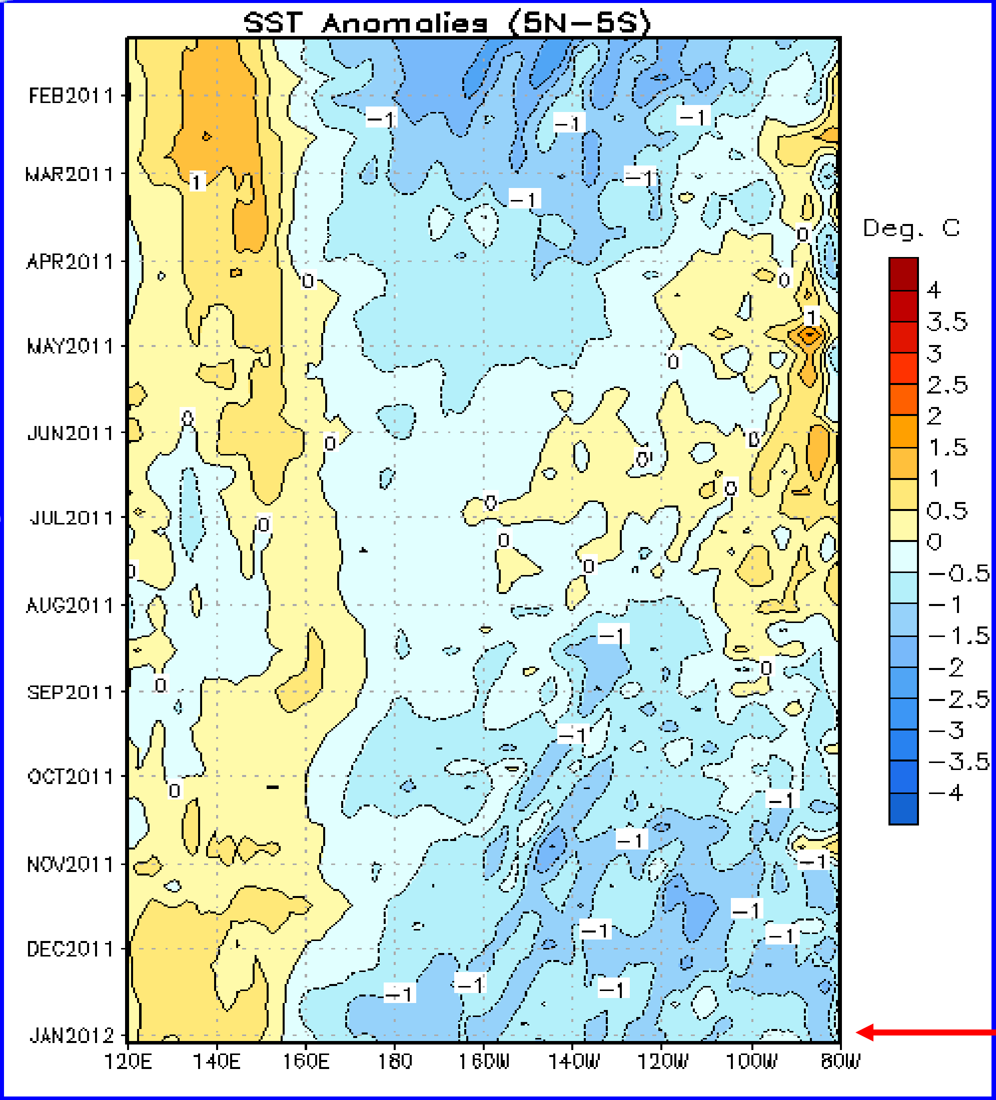
- Overview
- Recent Evolution and Current Conditions
- Oceanic Niño Index (ONI) – "Revised December 2008"
- Pacific SST Outlook
- U.S. Seasonal Precipitation and Temperature Outlooks
- Summary
- La Niña Composites

Summary

- La Niña conditions are present across the equatorial Pacific.*
- Sea surface temperatures (SST) were at least 0.5°C below average across much of the central and eastern equatorial Pacific Ocean.
- Atmospheric circulation anomalies are consistent with La Niña.
- La Niña is expected to continue into the Northern Hemisphere spring 2012.*

* Note: These statements are updated once a month in association with the ENSO Diagnostics Discussion:
http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory

Recent Evolution of Equatorial Pacific SST Departures (ºC)



Time

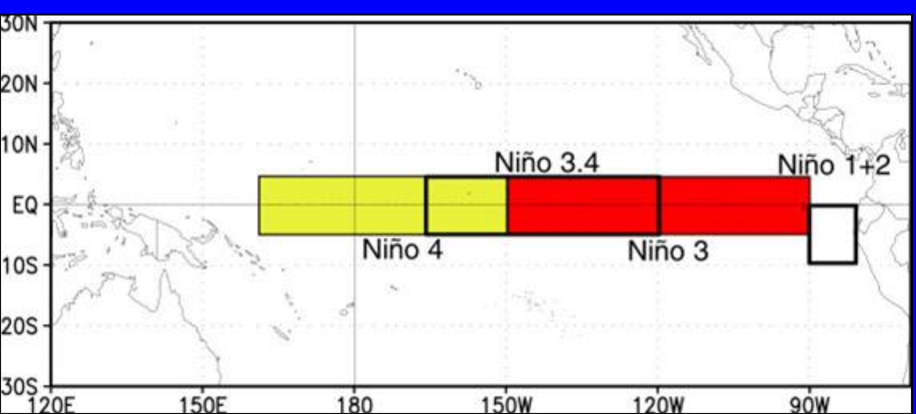
Longitude

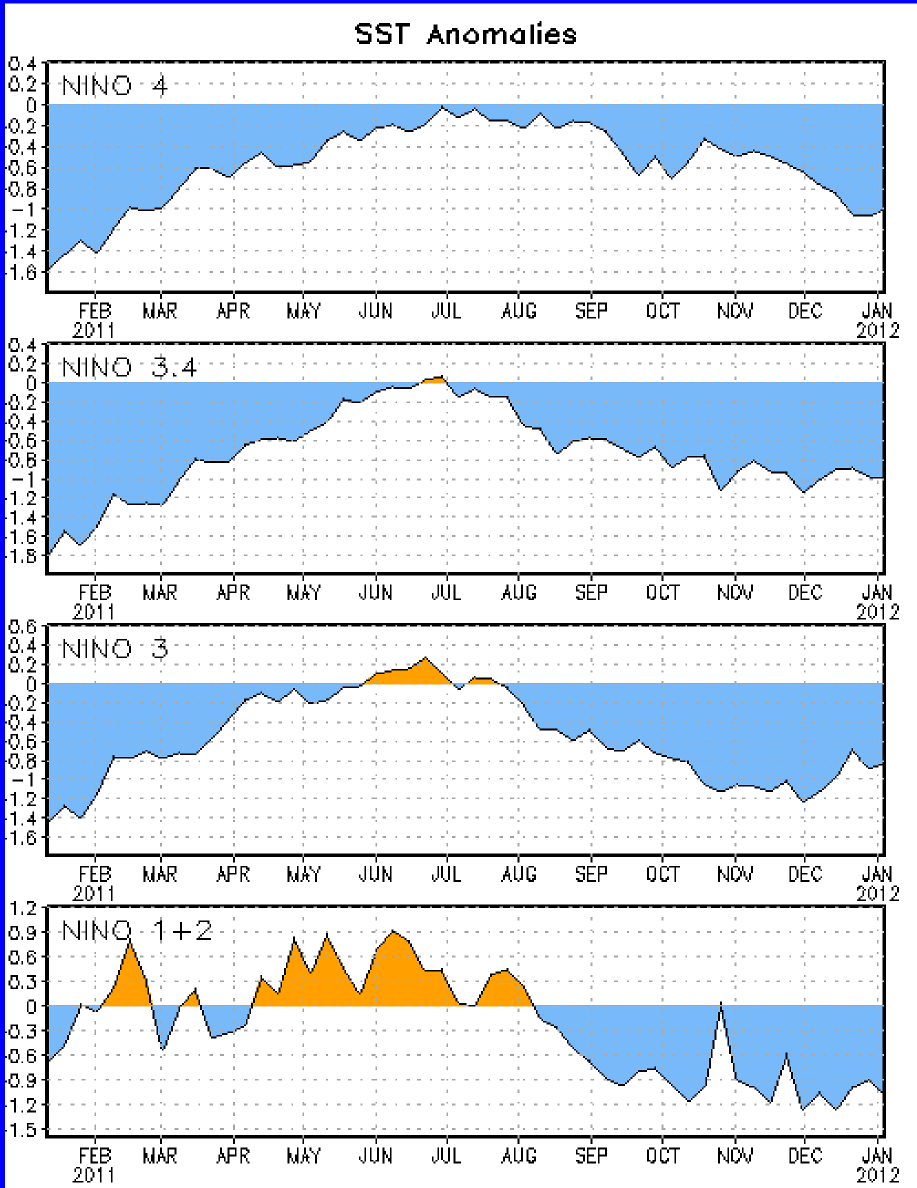
Over the past month, below-average SSTs have persisted across much of the equatorial Pacific.

Niño Region SST Departures (ºC) Recent Evolution

The latest weekly SST departures are:

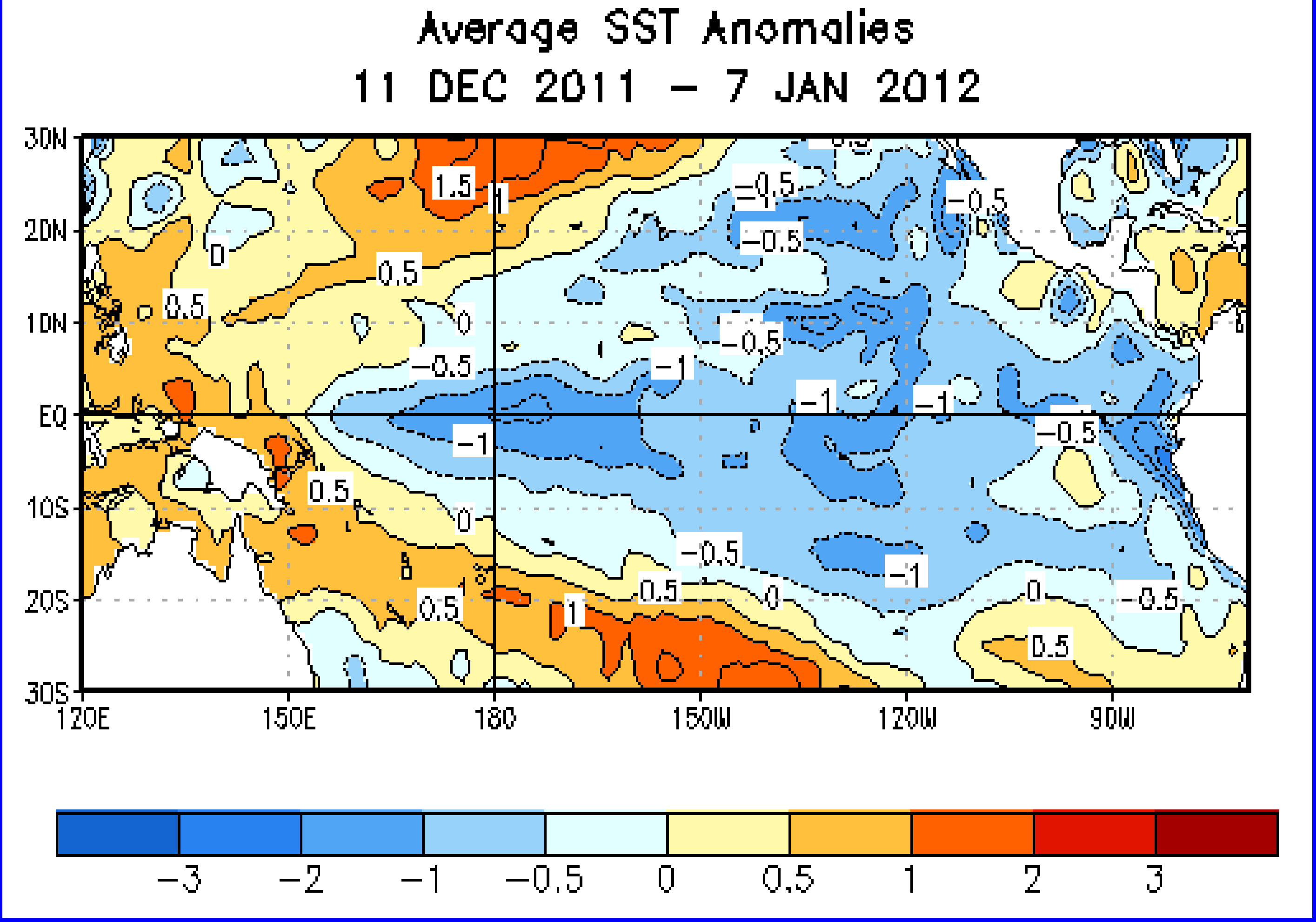
Niño 4	-1.0ºC
Niño 3.4	-1.0ºC
Niño 3	-0.8ºC
Niño 1+2	-1.1ºC



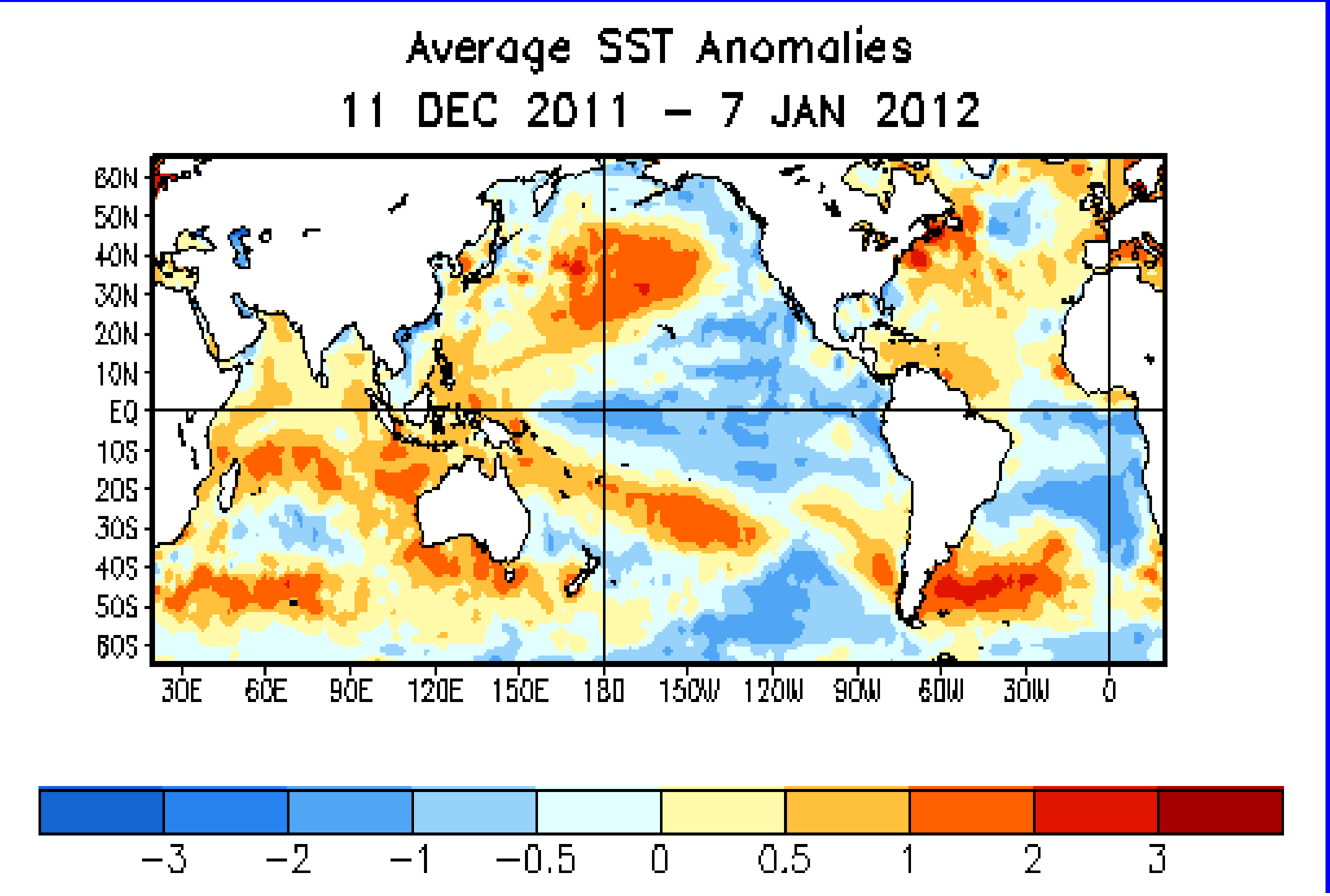


SST Departures (ºC) in the Tropical Pacific During the Last 4 Weeks

During the last 4-weeks, equatorial SSTs were more than 0.5°C below average east of 155°E and more than 1°C below average in several regions between 165°E and the South American coast.

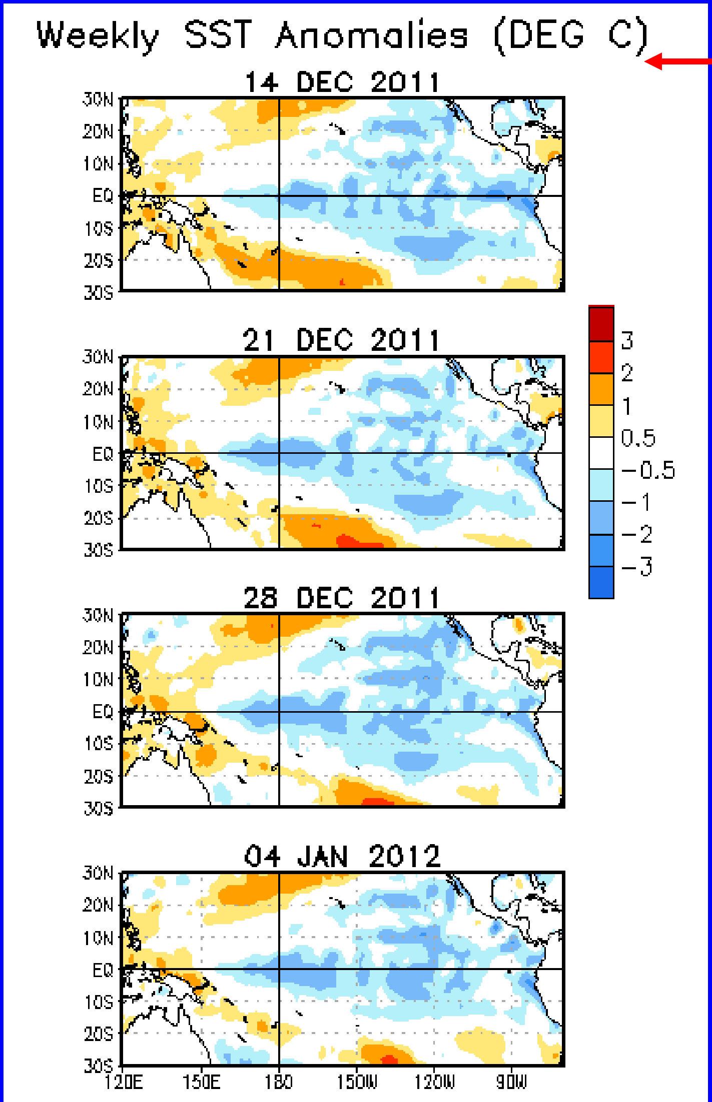


Global SST Departures (ºC)



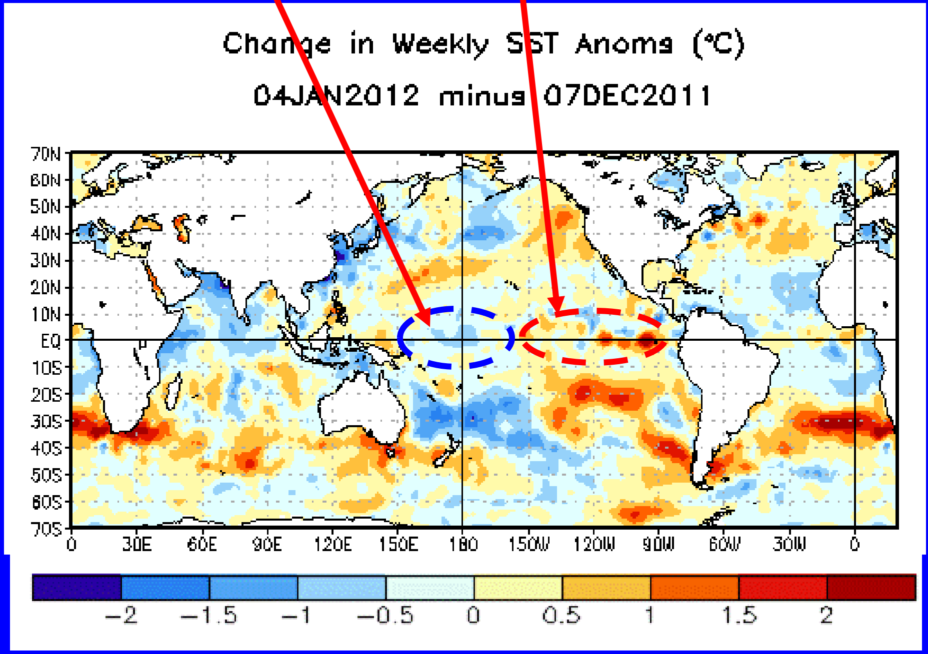
During the last four weeks, equatorial SSTs were below average across much of the Pacific and Atlantic Oceans, and above average across the Indian Ocean. A horseshoe pattern of above-average SSTs extended from the Maritime Continent into the middle latitudes of the Pacific Ocean.

Weekly SST Departures (ºC) for the Last Four Weeks



- During the last four weeks, equatorial SSTs were below average across most of the Pacific.

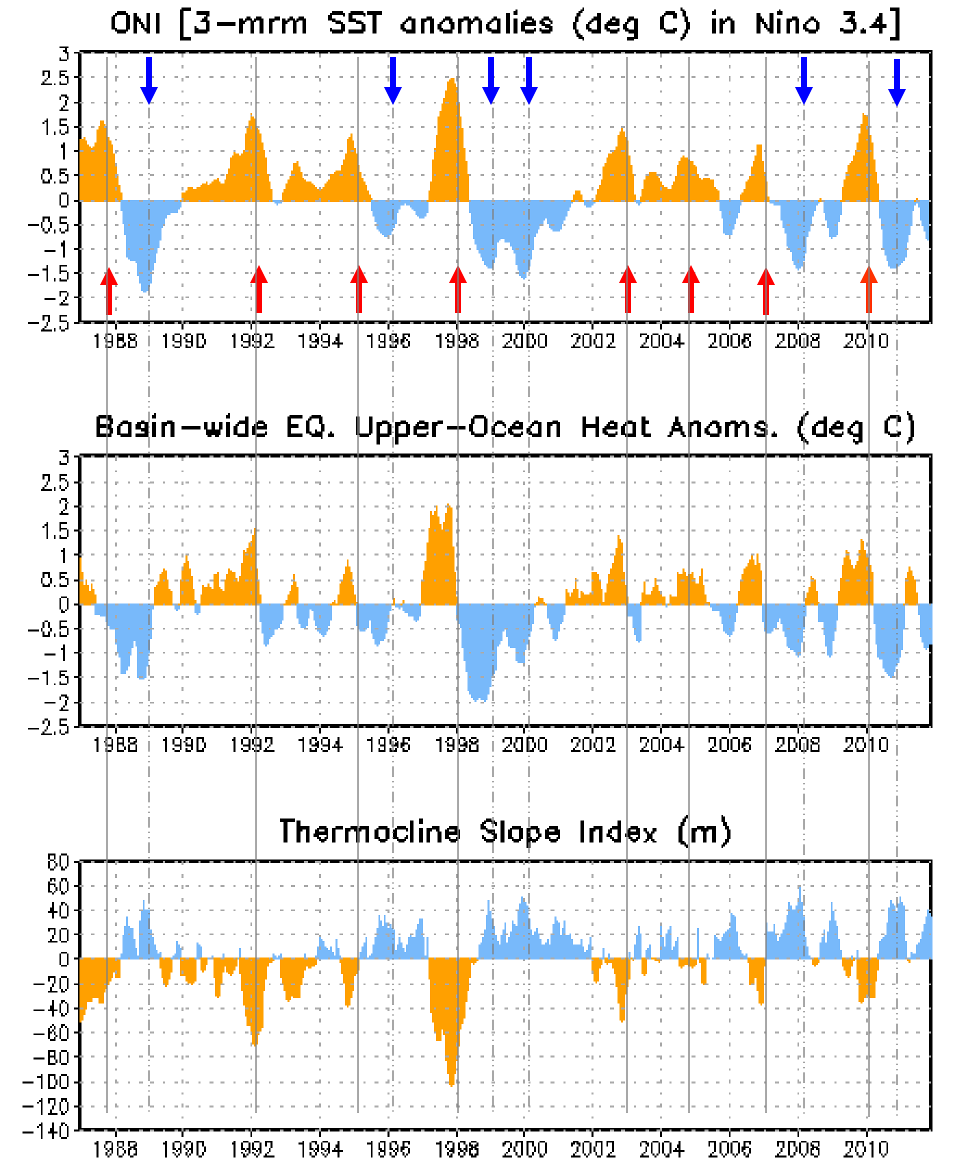
- During the last 30 days, the negative SST anomalies weakened slightly in the eastern Pacific Ocean, and strengthened near the Date Line.



Upper-Ocean Conditions in the Eq. Pacific

Cold Episodes ↓

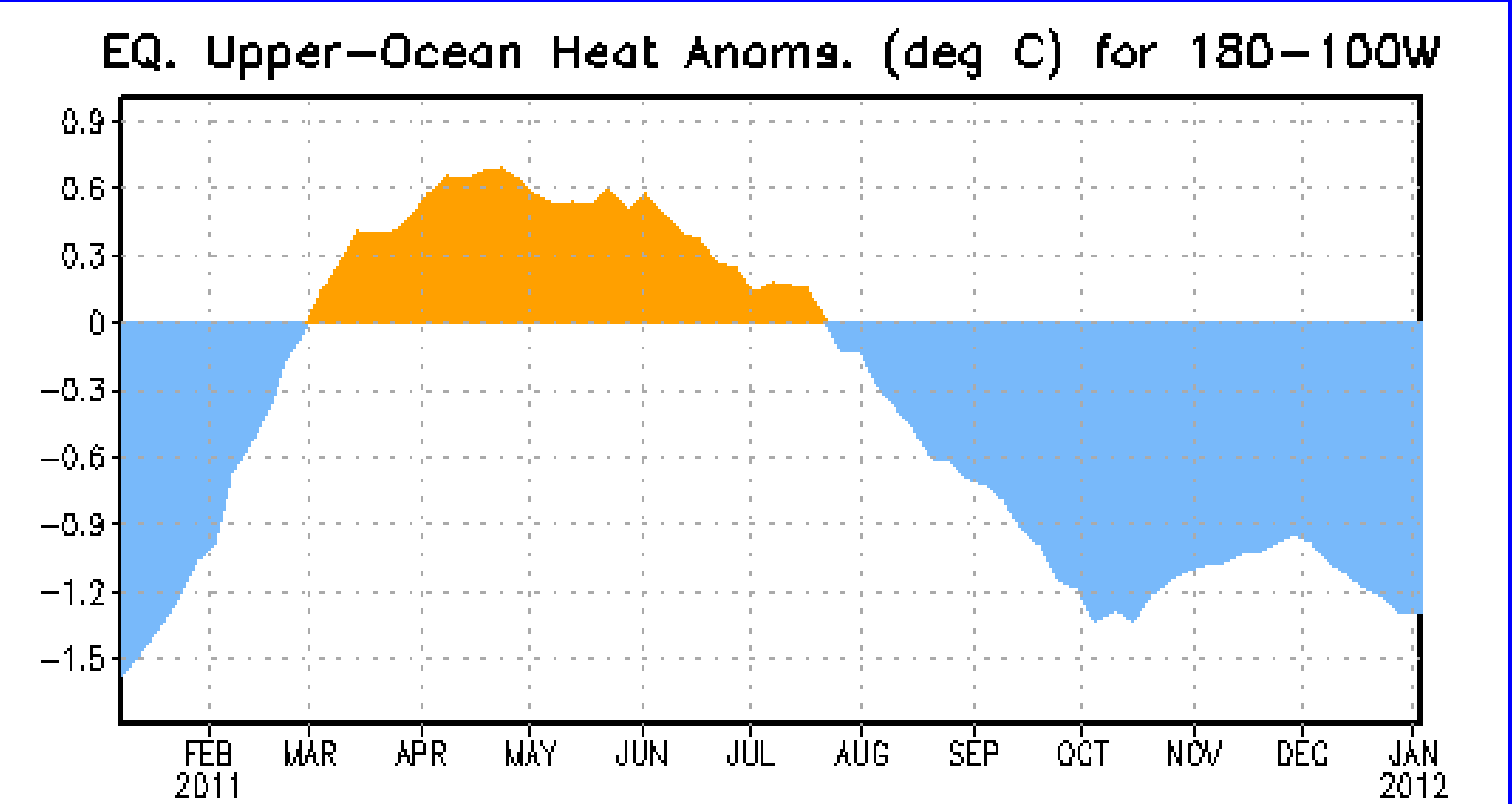
Warm Episodes ↑



- **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 (negative) and a positive thermocline slope index reflect La Niña 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).

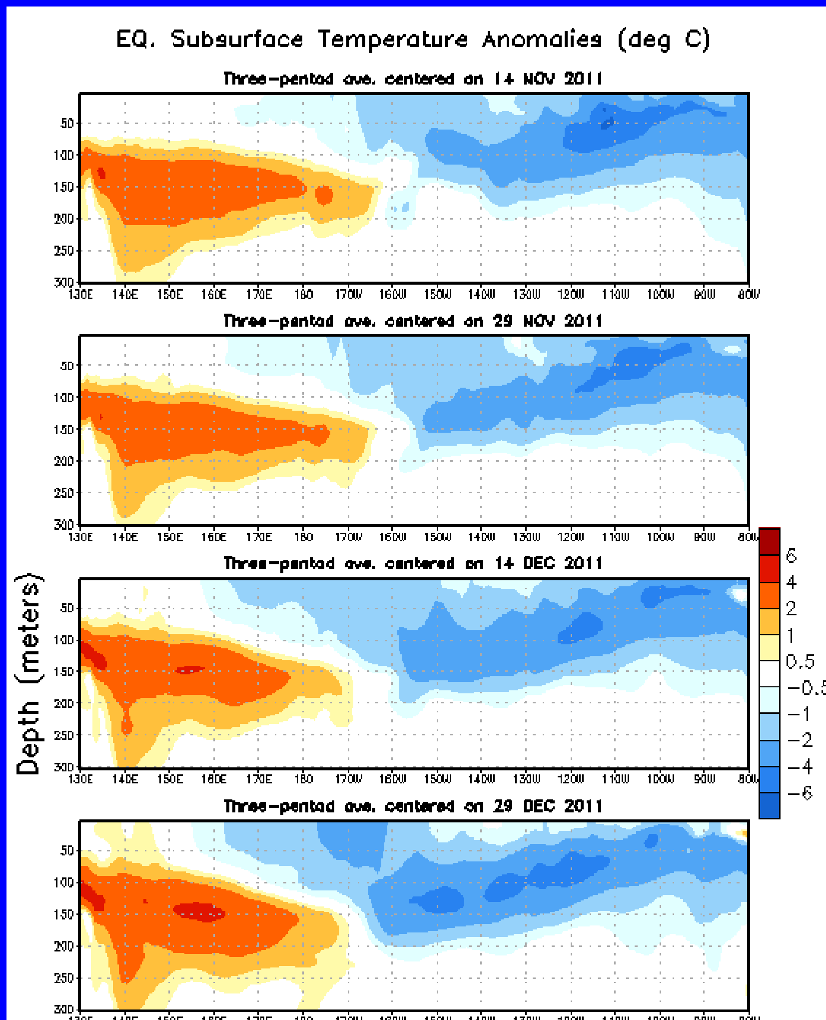
Weekly Central & Eastern Pacific Upper-Ocean (0-300 m) Average Temperature Anomalies



Positive subsurface anomalies were evident from March-July 2011. Negative anomalies developed in late July 2011 and strengthened through early October 2011. After weakening slightly during late October and November 2011, negative anomalies strengthened again in December 2011.

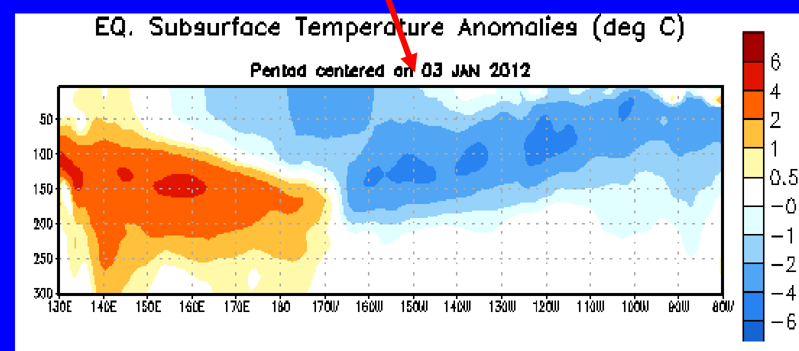
Sub-Surface Temperature Departures (ºC) in the Equatorial Pacific

Time



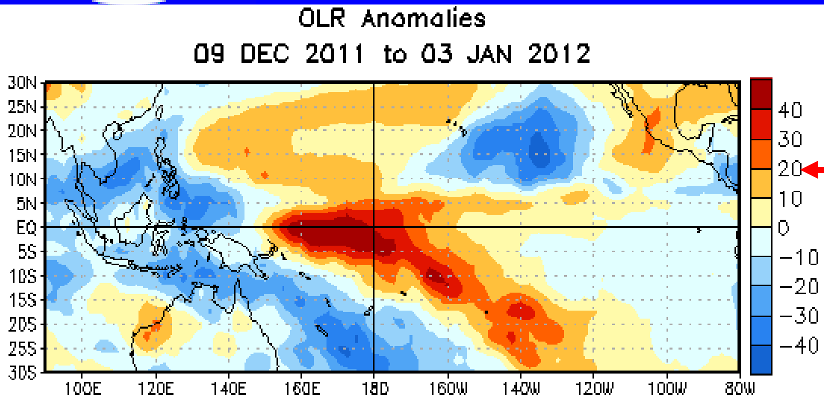
Longitude

- During November 2011, negative subsurface temperature anomalies (100-300m) weakened slightly in the eastern half of the Pacific.
- During December and the recent period, the negative anomalies have strengthened across the eastern half of the Pacific.

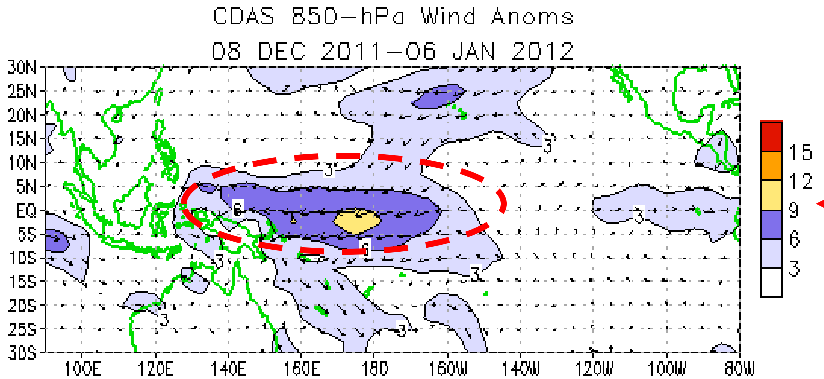


Most recent pentad analysis

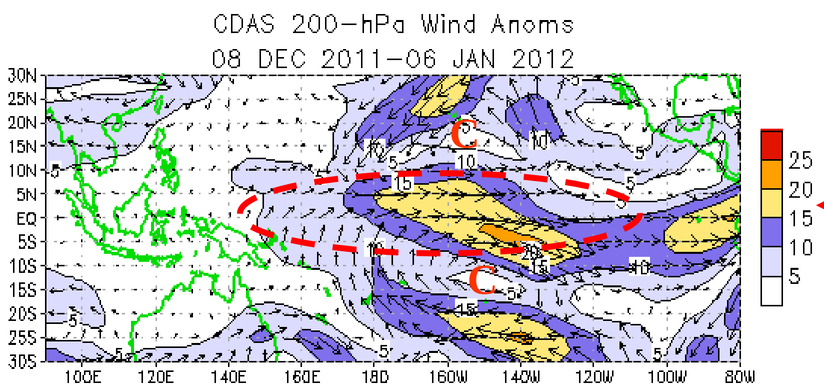
Tropical OLR and Wind Anomalies During the Last 30 Days



Negative OLR anomalies (enhanced convection and precipitation, blue shading) were observed over portions of northern Australia, the Philippines, and Indonesia. Positive OLR anomalies (suppressed convection and precipitation, red shading) were located over the western and central tropical Pacific.



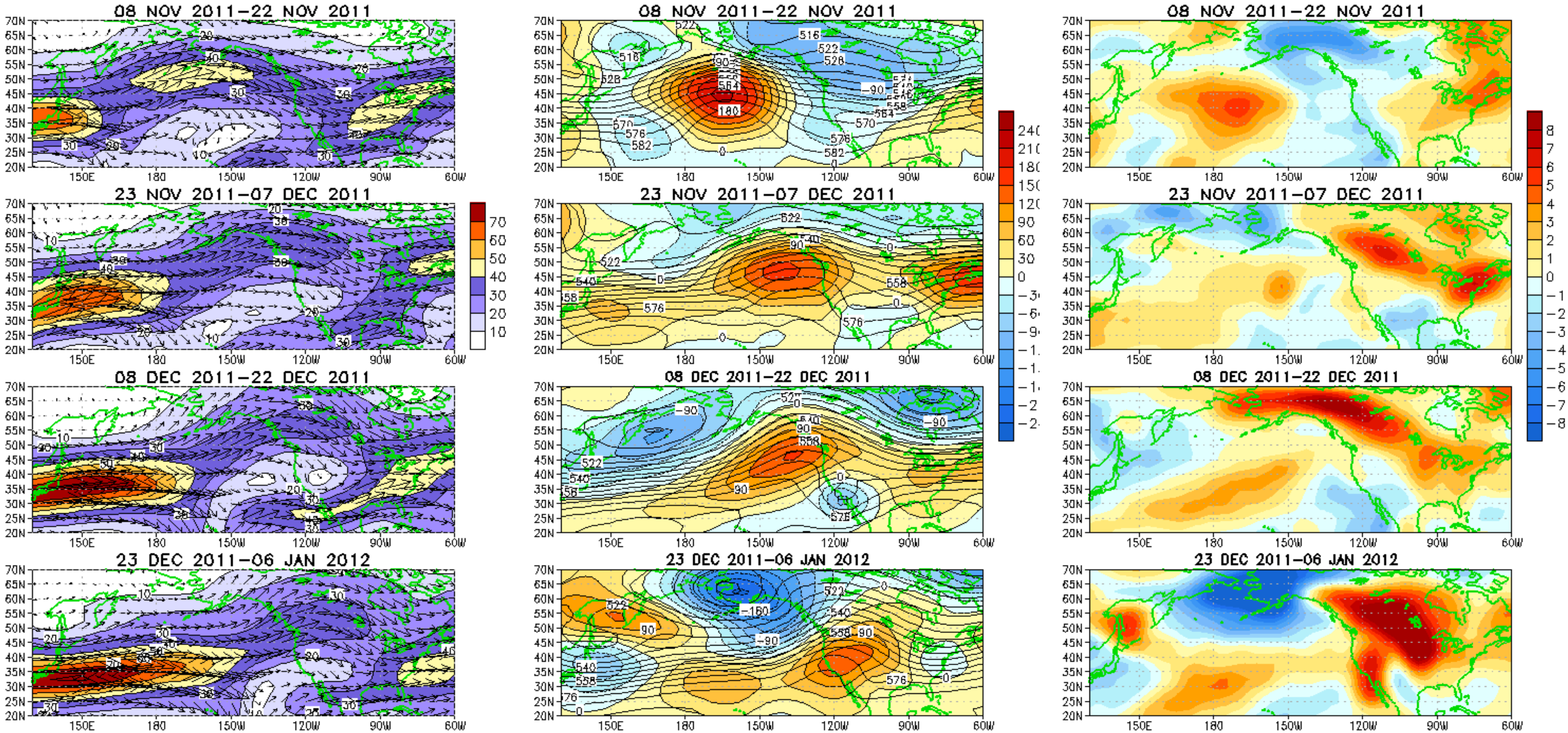
Low-level (850-hPa) easterly anomalies were observed over the central and western tropical Pacific.



Upper-level (200-hPa) westerly anomalies were observed over much of the tropical Pacific. Cyclonic circulation anomalies were present in the subtropics of both hemispheres

Atmospheric Circulation over the North Pacific & North America During the Last 60 Days

200-hPa Wind | **500-hPa Height & Anoms.** | **925-hPa Temp. Anoms. (°C)**

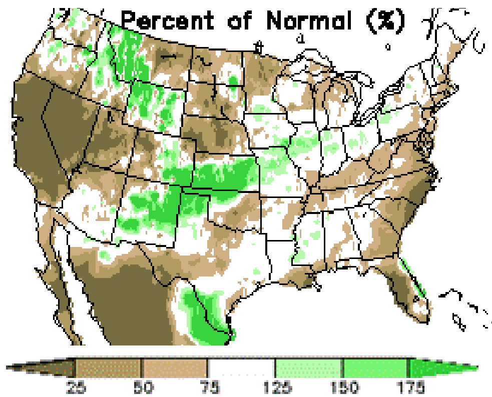


During November and December, the circulation over the North Pacific and North America showed considerable variability in association with significant evolution of the East Asian jet stream. Early in the period, that jet stream was retracted to west of the date line, and the downstream ridge and trough locations were shifted approximately 40° west of normal to the central North Pacific and western North America. Later in the period, the east Asian jet extended well east of the date line, and the downstream ridge and trough axes were in a more normal position. Throughout the period, above-average heights and temperatures were observed over the eastern U.S.

U.S. Temperature and Precipitation Departures During the Last 30 and 90 Days

Last 30 Days

30-day (ending 8 Jan 2012) % of average precipitation

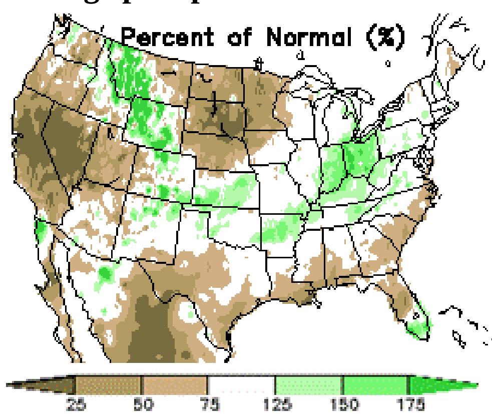


30-day (ending 7 Jan 2012) temperature departures (degree C)

There are technical difficulties with the temperature plots

Last 90 Days

90-day (ending 8 Jan 2012) % of average precipitation



90-day (ending 7 Jan 2012) temperature departures (degree C)

There are technical difficulties with the temperature plots

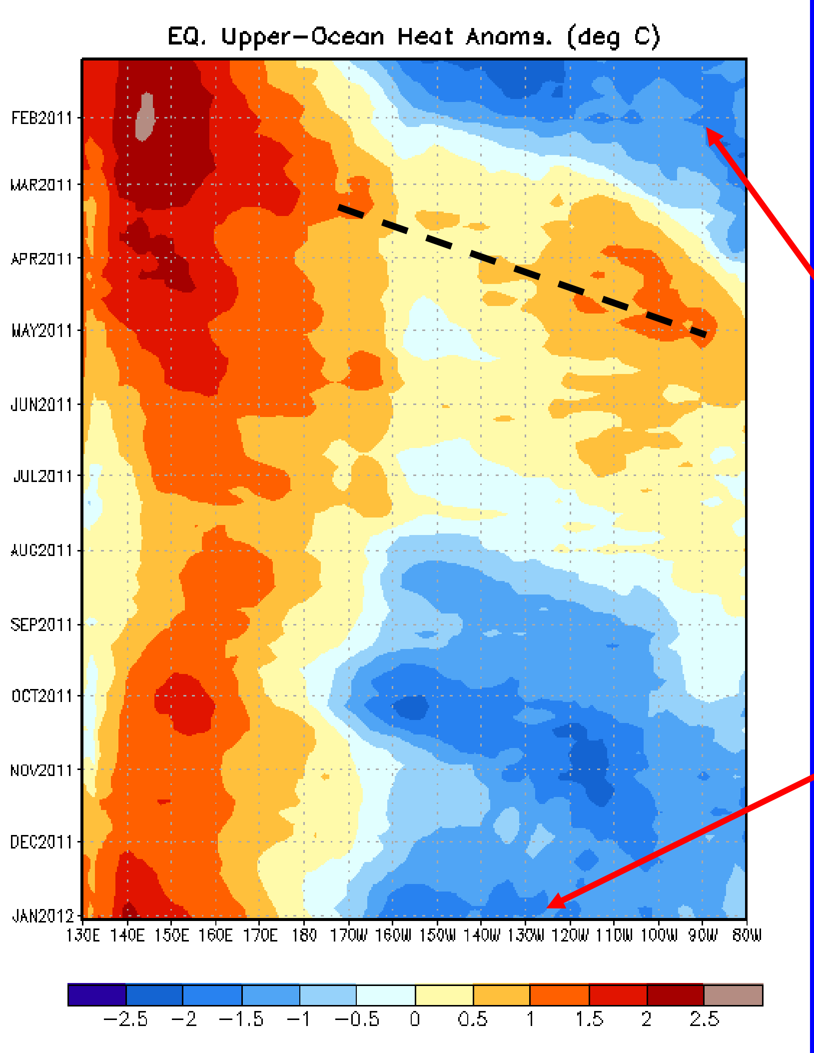
Intraseasonal Variability

- 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

Time



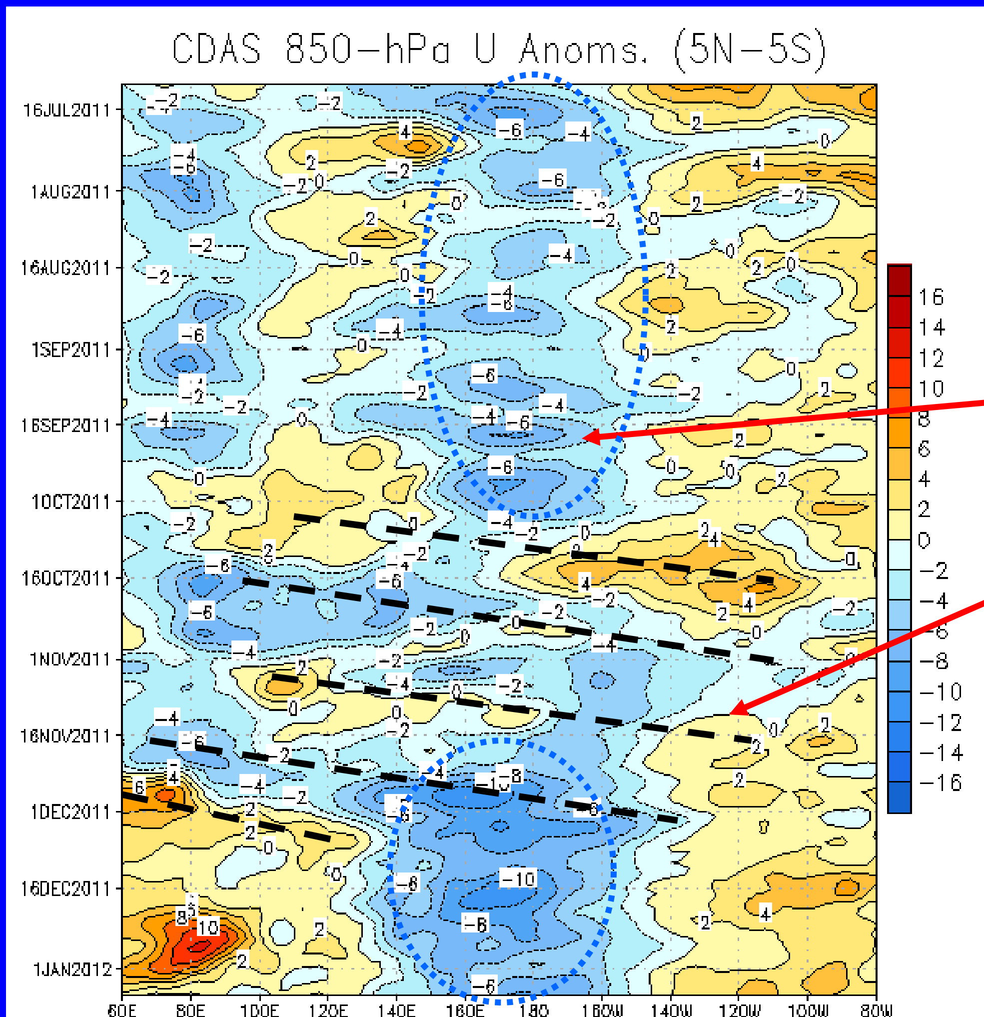
Longitude

- **From May 2010- January 2011, negative heat content anomalies extended across the equatorial Pacific in association with La Niña.**
- **From February-June 2011, the heat content was above-average, especially across the western Pacific.**
- **Since late July 2011, negative heat content anomalies have persisted in the eastern half of the equatorial Pacific.**
- **Recently, below-average heat content has 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})

Time



Longitude

Westerly wind anomalies (orange/red shading).

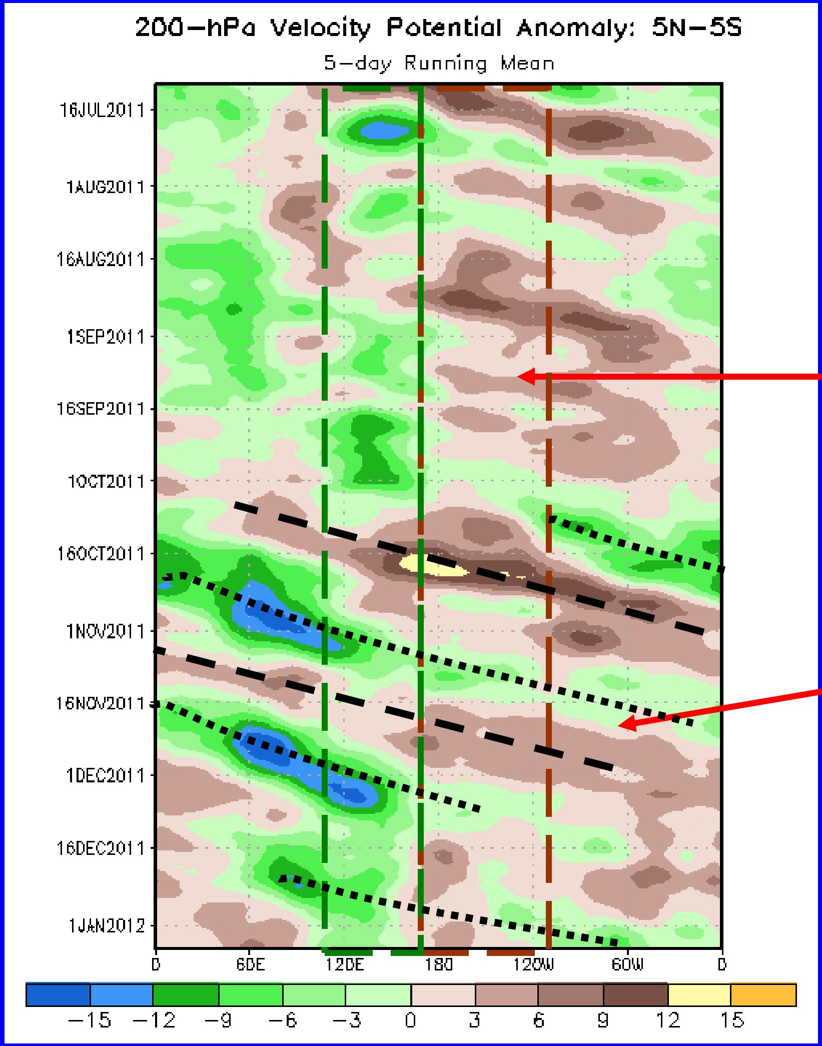
Easterly wind anomalies (blue shading).

Between March 2010-September 2011, low-level easterly wind anomalies have persisted over the western and central equatorial Pacific.

During October- mid December 2011, the MJO contributed to an eastward shift of the low-level wind anomalies.

Since the beginning of December 2011, low-level easterly wind anomalies have remained over the western and central equatorial Pacific.

200-hPa Velocity Potential Anomalies (5ºN-5ºS)



Time

Longitude

Positive anomalies (brown shading) indicate unfavorable conditions for precipitation.

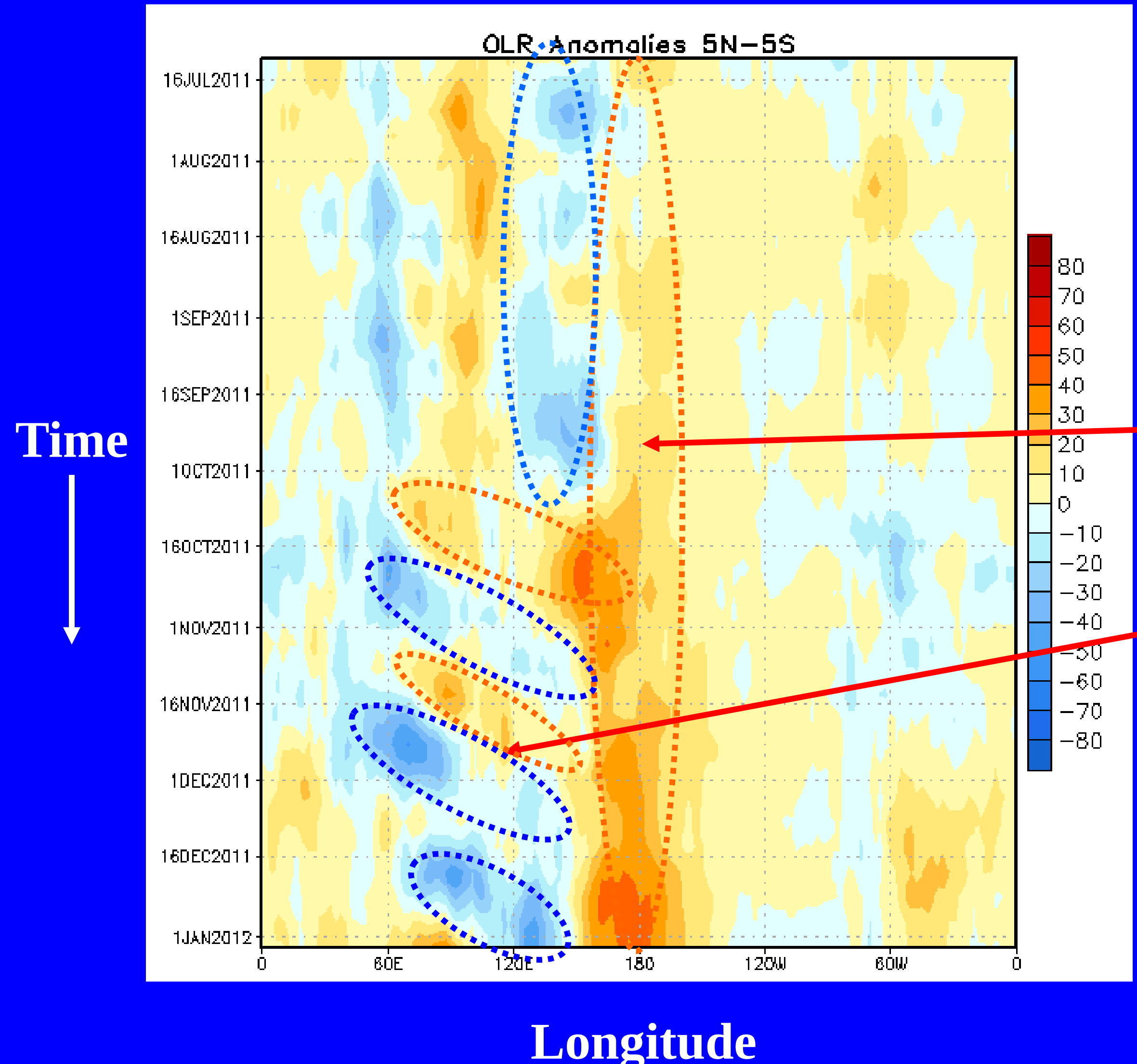
Negative anomalies (green shading) indicate favorable conditions for precipitation.

Since May 2010, persistent upper-level convergence anomalies (brown) were evident over the central Pacific, while anomalous upper-level divergence (green) generally prevailed over the Maritime Continent.

During October - mid December 2011, the MJO was active.

There are hints that the MJO is continuing but is less coherent at the present time.

Outgoing Longwave Radiation (OLR) Anomalies



Drier-than-average conditions (orange/red shading)

Wetter-than-average conditions (blue shading)

Since April 2010, negative OLR anomalies have been observed near the Maritime Continent and positive OLR anomalies have prevailed over the western and central Pacific.

From October - December, variability in OLR anomalies (focused mostly over the Indian Ocean and Maritime Continent) was associated with the MJO.

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°C.

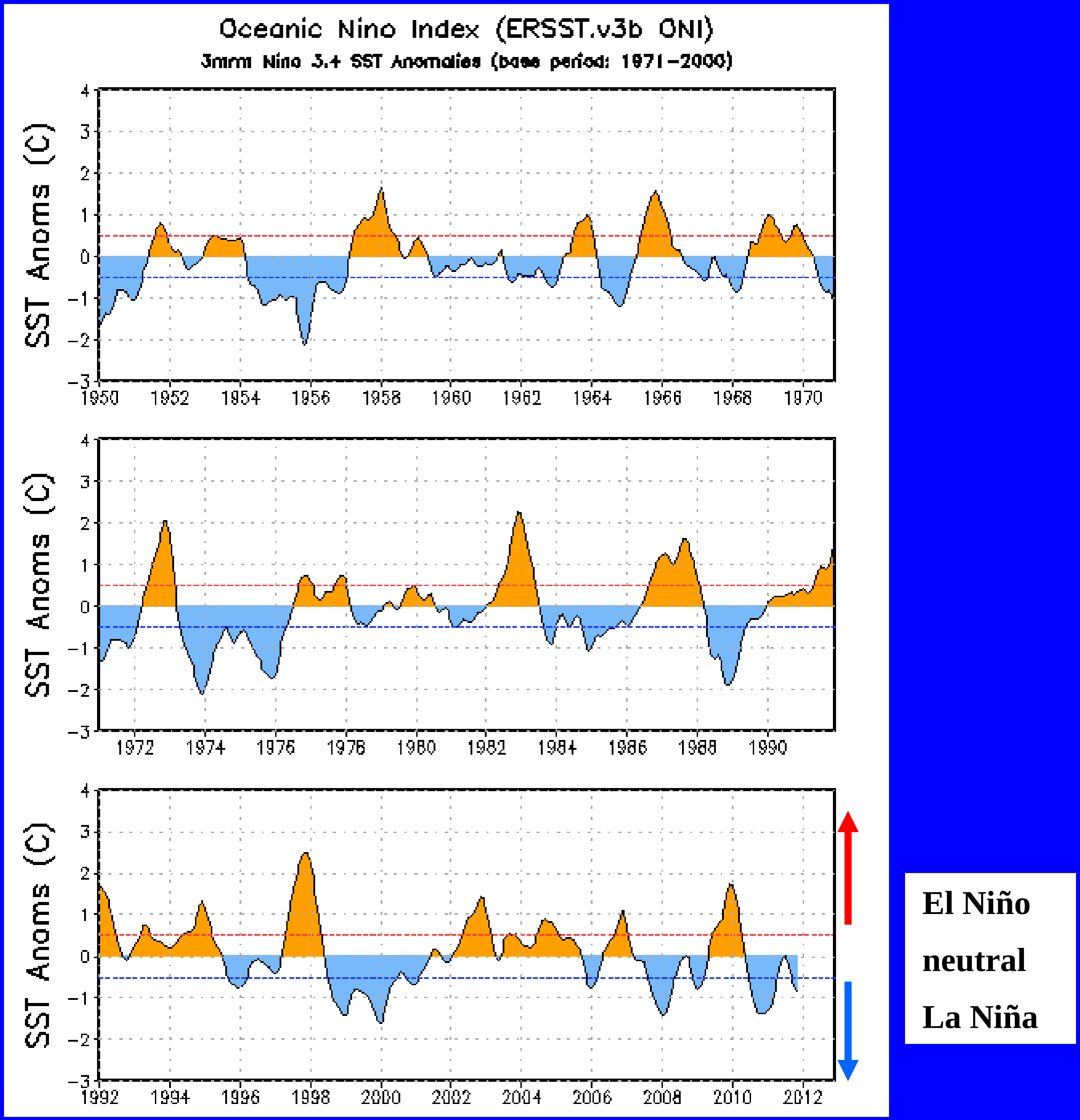
La Niña: characterized by a *negative* ONI less than or equal to −0.5°C.

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 (ºC): Evolution since 1950

The most recent ONI value (October – December 2011) is -0.8ºC.



Historical El Niño and La Niña Episodes

Based on the ONI computed using ERSST.v3b

NOTE:

After updating the ocean analysis to ERSST.v3b, a new La Niña episode was classified (ASO 1962-DJF 1962/63) and two previous La Niña episodes were combined into one single episode (AMJ 1973- MAM 1976).

El Niño	Highest ONI Value
JAS 1951 - NDJ 1951/52	0.8
MAM 1957 – MJJ 1958	1.7
JJA 1963 – DJF 1963/64	1.0
MJJ 1965 – MAM 1966	1.6
OND 1968 – MJJ 1969	1.0
ASO 1969 – DJF 1969/70	0.8
AMJ 1972 – FMA 1973	2.1
ASO 1976 – JFM 1977	0.8
ASO 1977 - DJF 1977/78	0.8
AMJ 1982 – MJJ 1983	2.3
JAS 1986 – JFM 1988	1.6
AMJ 1991 – JJA 1992	1.8
AMJ 1994 – FMA 1995	1.3
AMJ 1997 – AMJ 1998	2.5
AMJ 2002 – FMA 2003	1.5
MJJ 2004 – JFM 2005	0.9
JAS 2006 - DJF 2006/07	1.1
MJJ 2009 – MAM 2010	1.8

La Nina	Lowest ONI Value
ASO 1949 – FMA 1951	-1.7
MAM 1954 – DJF 1956/57	-2.1
ASO 1962 – DJF 1962/63	-0.8
MAM 1964 – DJF 1964/65	-1.1
NDJ 1967/68 – MAM 1968	-0.9
JJA 1970 – DJF 1971/72	-1.3
AMJ 1973 – MAM 1976	-2.0
SON 1984 – ASO 1985	-1.0
AMJ 1988 – AMJ 1989	-1.9
ASO 1995 – FMA 1996	-0.7
JJA 1998 – MJJ 2000	-1.6
SON 2000 – JFM 2001	-0.7
ASO 2007 – AMJ 2008	-1.4
JJA 2010 – MAM 2011	-1.4

NOAA

Historical Pacific warm (red) and cold (blue) episodes based on a threshold of +/- 0.5 ºC 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)], calculated with respect to the 1971-2000 base period. 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.

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
1950	-1.7	-1.5	-1.3	-1.4	-1.3	-1.1	-0.8	-0.8	-0.8	-0.9	-0.9	-1.0
1951	-1.0	-0.9	-0.6	-0.3	-0.2	0.2	0.4	0.7	0.7	0.8	0.7	0.6
1952	0.3	0.1	0.1	0.2	0.1	-0.1	-0.3	-0.3	-0.2	-0.2	-0.1	0.0
1953	0.2	0.4	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4
1954	0.5	0.3	-0.1	-0.5	-0.7	-0.7	-0.8	-1.0	-1.2	-1.1	-1.1	-1.1
1955	-1.0	-0.9	-0.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.4	-1.8	-2.0	-1.9
1956	-1.3	-0.9	-0.7	-0.6	-0.6	-0.6	-0.7	-0.8	-0.8	-0.9	-0.9	-0.8
1957	-0.5	-0.1	0.3	0.6	0.7	0.9	0.9	0.9	0.9	1.0	1.2	1.5
1958	1.7	1.5	1.2	0.8	0.6	0.5	0.3	0.1	0.0	0.0	0.2	0.4
1959	0.4	0.5	0.4	0.2	0.0	-0.2	-0.4	-0.5	-0.4	-0.3	-0.2	-0.2
1960	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.1	0.0	-0.1	-0.2	-0.2	-0.2
1961	-0.2	-0.2	-0.2	-0.1	0.1	0.2	0.0	-0.3	-0.6	-0.6	-0.5	-0.4
1962	-0.4	-0.4	-0.4	-0.5	-0.4	-0.4	-0.3	-0.3	-0.5	-0.6	-0.7	-0.7
1963	-0.6	-0.3	0.0	0.1	0.1	0.3	0.6	0.8	0.9	0.9	1.0	1.0
1964	0.8	0.4	-0.1	-0.5	-0.8	-0.8	-0.9	-1.0	-1.1	-1.2	-1.2	-1.0
1965	-0.8	-0.4	-0.2	0.0	0.3	0.6	1.0	1.2	1.4	1.5	1.6	1.5
1966	1.2	1.0	0.8	0.5	0.2	0.2	0.2	0.0	-0.2	-0.2	-0.3	-0.3
1967	-0.4	-0.4	-0.6	-0.5	-0.3	0.0	0.0	-0.2	-0.4	-0.5	-0.4	-0.5
1968	-0.7	-0.9	-0.8	-0.7	-0.3	0.0	0.3	0.4	0.3	0.4	0.7	0.9
1969	1.0	1.0	0.9	0.7	0.6	0.5	0.4	0.4	0.6	0.7	0.8	0.7
1970	0.5	0.3	0.2	0.1	0.0	-0.3	-0.6	-0.8	-0.9	-0.8	-0.9	-1.1
1971	-1.3	-1.3	-1.1	-0.9	-0.8	-0.8	-0.8	-0.8	-0.8	-0.9	-1.0	-0.9
1972	-0.7	-0.4	0.0	0.2	0.5	0.8	1.0	1.3	1.5	1.8	2.0	2.1
1973	1.8	1.2	0.5	-0.1	-0.6	-0.9	-1.1	-1.3	-1.4	-1.7	-2.0	-2.1
1974	-1.9	-1.7	-1.3	-1.1	-0.9	-0.8	-0.6	-0.5	-0.5	-0.7	-0.9	-0.7
1975	-0.6	-0.6	-0.7	-0.8	-0.9	-1.1	-1.2	-1.3	-1.5	-1.6	-1.7	-1.7

Historical Pacific warm (red) and cold (blue) episodes based on a threshold of +/- 0.5 ^{o}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)], calculated with respect to the 1971-2000 base period. 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.

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
1976	**-1.6**	**-1.2**	**-0.8**	**-0.6**	**-0.5**	-0.2	0.1	0.3	**0.5**	**0.7**	**0.8**	**0.7**
1977	**0.6**	**0.5**	0.2	0.2	0.2	0.4	0.4	0.4	**0.5**	**0.6**	**0.7**	**0.7**
1978	**0.7**	0.4	0.0	-0.3	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3	-0.2	-0.1
1979	-0.1	0.0	0.1	0.1	0.1	-0.1	0.0	0.1	0.3	0.4	0.5	0.5
1980	0.5	0.3	0.2	0.2	0.3	0.3	0.2	0.0	-0.1	-0.1	0.0	-0.1
1981	-0.3	-0.5	-0.5	-0.4	-0.3	-0.3	-0.4	-0.4	-0.3	-0.2	-0.1	-0.1
1982	0.0	0.1	0.1	0.3	**0.6**	**0.7**	**0.7**	**1.0**	**1.5**	**1.9**	**2.2**	**2.3**
1983	**2.3**	**2.0**	**1.5**	**1.2**	**1.0**	**0.6**	0.2	-0.2	-0.6	-0.8	-0.9	-0.7
1984	-0.4	-0.2	-0.2	-0.3	-0.5	-0.4	-0.3	-0.2	-0.3	**-0.6**	**-0.9**	**-1.1**
1985	**-0.9**	**-0.8**	**-0.7**	**-0.7**	**-0.7**	**-0.6**	**-0.5**	**-0.5**	**-0.5**	-0.4	-0.3	-0.4
1986	-0.5	-0.4	-0.2	-0.2	-0.1	0.0	0.3	**0.5**	**0.7**	**0.9**	**1.1**	**1.2**
1987	**1.2**	**1.3**	**1.2**	**1.1**	**1.0**	**1.2**	**1.4**	**1.6**	**1.6**	**1.5**	**1.3**	**1.1**
1988	**0.7**	**0.5**	0.1	-0.2	**-0.7**	**-1.2**	**-1.3**	**-1.2**	**-1.3**	**-1.6**	**-1.9**	**-1.9**
1989	**-1.7**	**-1.5**	**-1.1**	**-0.8**	**-0.6**	-0.4	-0.3	-0.3	-0.3	-0.3	-0.2	-0.1
1990	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.4
1991	0.4	0.3	0.3	0.4	**0.6**	**0.8**	**1.0**	**0.9**	**0.9**	**1.0**	**1.4**	**1.6**
1992	**1.8**	**1.6**	**1.5**	**1.4**	**1.2**	**0.8**	**0.5**	0.2	0.0	-0.1	0.0	0.2
1993	0.3	0.4	0.6	0.7	0.8	0.7	0.4	0.4	0.4	0.4	0.3	0.2
1994	0.2	0.2	0.3	0.4	**0.5**	**0.5**	**0.6**	**0.6**	**0.7**	**0.9**	**1.2**	**1.3**
1995	**1.2**	**0.9**	**0.7**	0.4	0.3	0.2	0.0	-0.2	**-0.5**	**-0.6**	**-0.7**	**-0.7**
1996	**-0.7**	**-0.7**	**-0.5**	-0.3	-0.1	-0.1	0.0	-0.1	-0.1	-0.2	-0.3	-0.4
1997	-0.4	-0.3	0.0	0.4	**0.8**	**1.3**	**1.7**	**2.0**	**2.2**	**2.4**	**2.5**	**2.5**
1998	**2.3**	**1.9**	**1.5**	**1.0**	**0.5**	0.0	**-0.5**	**-0.8**	**-1.0**	**-1.1**	**-1.3**	**-1.4**
1999	**-1.4**	**-1.2**	**-0.9**	**-0.8**	**-0.8**	**-0.8**	**-0.9**	**-0.9**	**-1.0**	**-1.1**	**-1.3**	**-1.6**
2000	**-1.6**	**-1.4**	**-1.0**	**-0.8**	**-0.6**	**-0.5**	-0.4	-0.4	-0.4	**-0.5**	**-0.6**	**-0.7**
2001	**-0.6**	**-0.5**	-0.4	-0.2	-0.1	0.1	0.2	0.2	0.1	0.0	-0.1	-0.1

Historical Pacific warm (red) and cold (blue) episodes based on a threshold of +/- 0.5 ºC 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)], calculated with respect to the 1971-2000 base period. 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.

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2002	-0.1	0.1	0.2	0.4	**0.7**	**0.8**	**0.9**	**1.0**	**1.1**	**1.3**	**1.5**	**1.4**
2003	**1.2**	**0.9**	**0.5**	0.1	-0.1	0.1	0.4	0.5	0.6	0.5	0.6	0.4
2004	0.4	0.3	0.2	0.2	0.3	**0.5**	**0.7**	**0.8**	**0.9**	**0.8**	**0.8**	**0.8**
2005	**0.7**	**0.5**	0.4	0.4	0.4	0.4	0.4	0.3	0.2	-0.1	-0.4	-0.7
2006	-0.7	-0.6	-0.4	-0.1	0.1	0.2	0.3	**0.5**	**0.6**	**0.9**	**1.1**	**1.1**
2007	**0.8**	0.4	0.1	-0.1	-0.1	-0.1	-0.1	-0.4	**-0.7**	**-1.0**	**-1.1**	**-1.3**
2008	**-1.4**	**-1.4**	**-1.1**	**-0.8**	**-0.6**	-0.4	-0.1	0.0	0.0	0.0	-0.3	-0.6
2009	-0.8	-0.7	-0.5	-0.1	0.2	**0.6**	**0.7**	**0.8**	**0.9**	**1.2**	**1.5**	**1.8**
2010	**1.7**	**1.5**	**1.2**	**0.8**	0.3	-0.2	**-0.6**	**-1.0**	**-1.3**	**-1.4**	**-1.4**	**-1.4**
2011	**-1.3**	**-1.2**	**-0.9**	**-0.6**	-0.2	0.0	0.0	-0.2	-0.4	**-0.7**	**-0.8**	
2012												
2013												
2014												
2015												
2016												
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												
2026												
2027												

Pacific Niño 3.4 SST Outlook

- The majority of models predict the continuation of La Niña (Niño-3.4 SST anomalies less than -0.5°C) at least through the Northern Hemisphere spring (March-April-May).

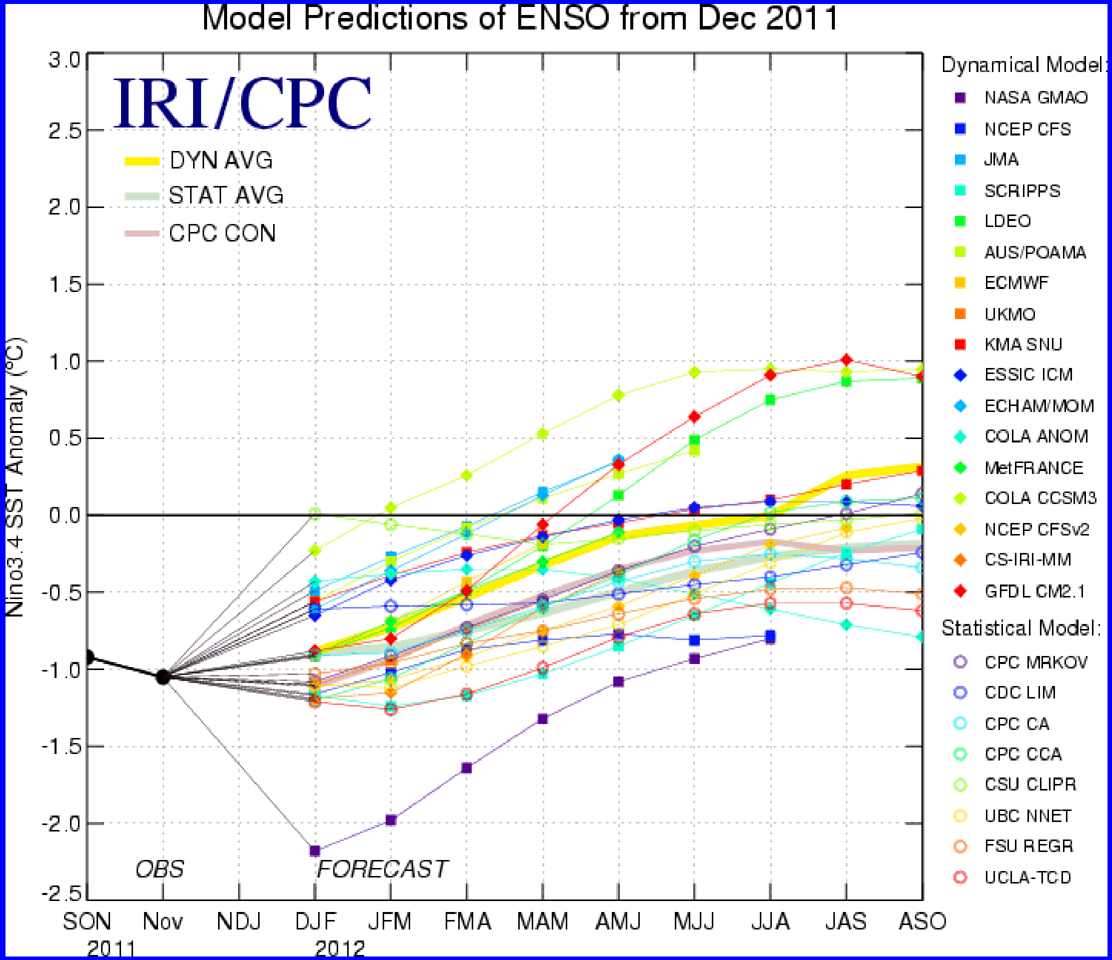
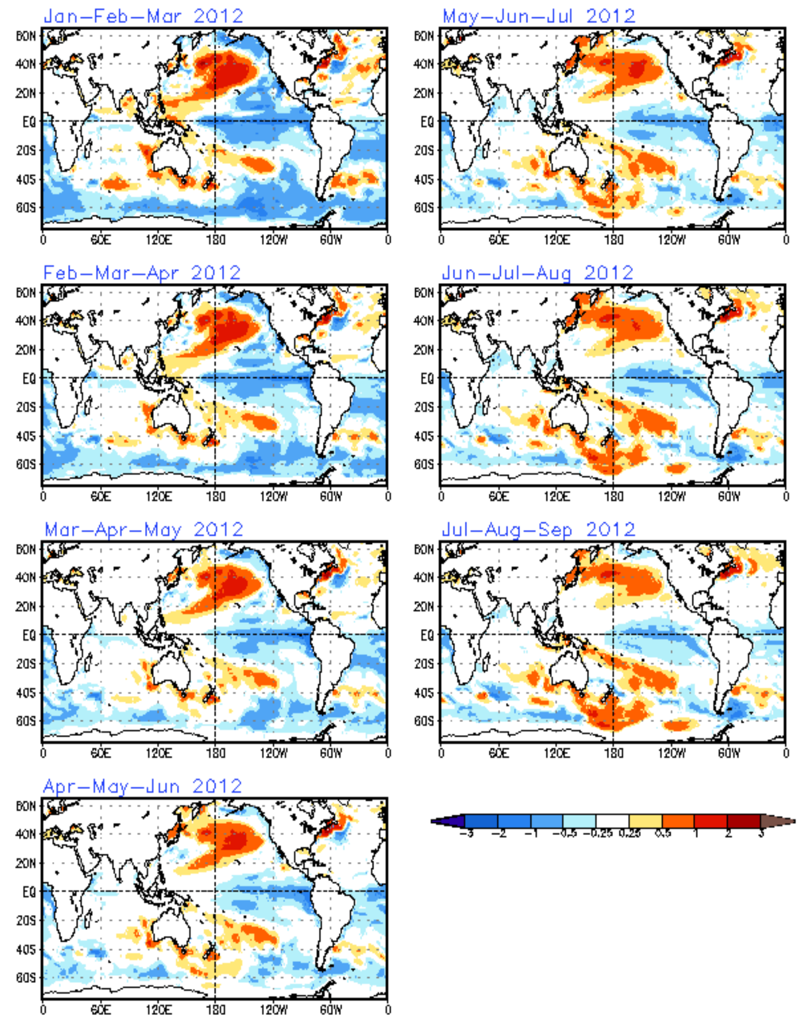
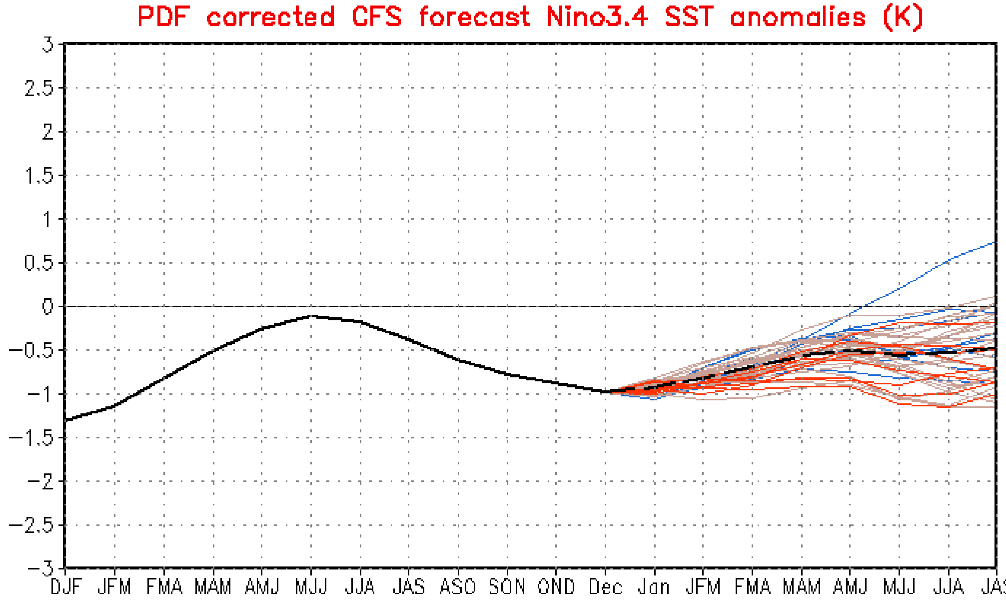


Figure provided by the International Research Institute (IRI) for Climate and Society (updated 13 December 2011).

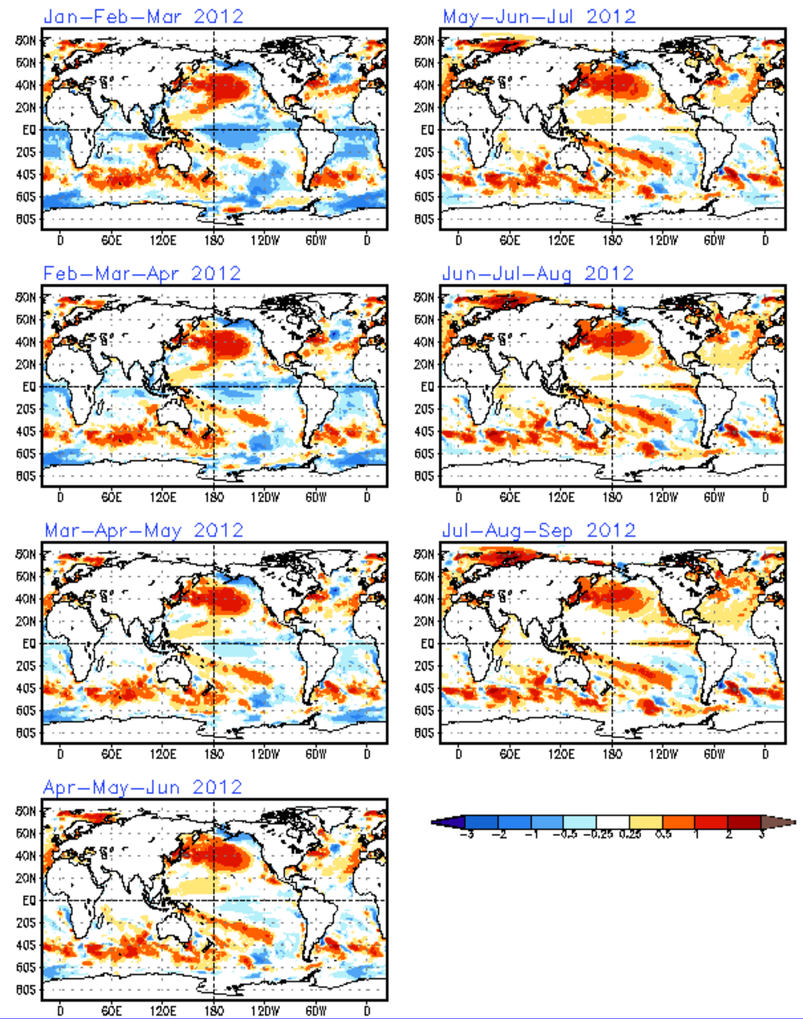
SST Outlook: NCEP CFS.v1 Forecast
Issued 9 January 2012



The CFS.v1 ensemble mean (black dashed line) predicts La Niña conditions to continue through the Northern Hemisphere spring 2012.

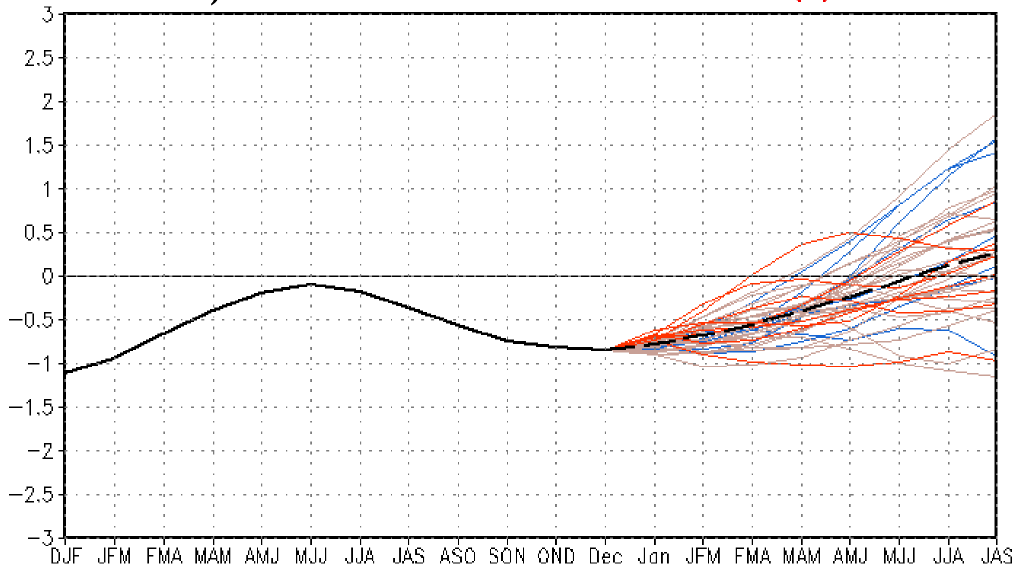


SST Outlook: NCEP CFS.v2 Forecast Issued 9 January 2012



The CFS.v2 ensemble mean (black dashed line) predicts La Niña conditions to continue into the Northern Hemisphere spring 2012.

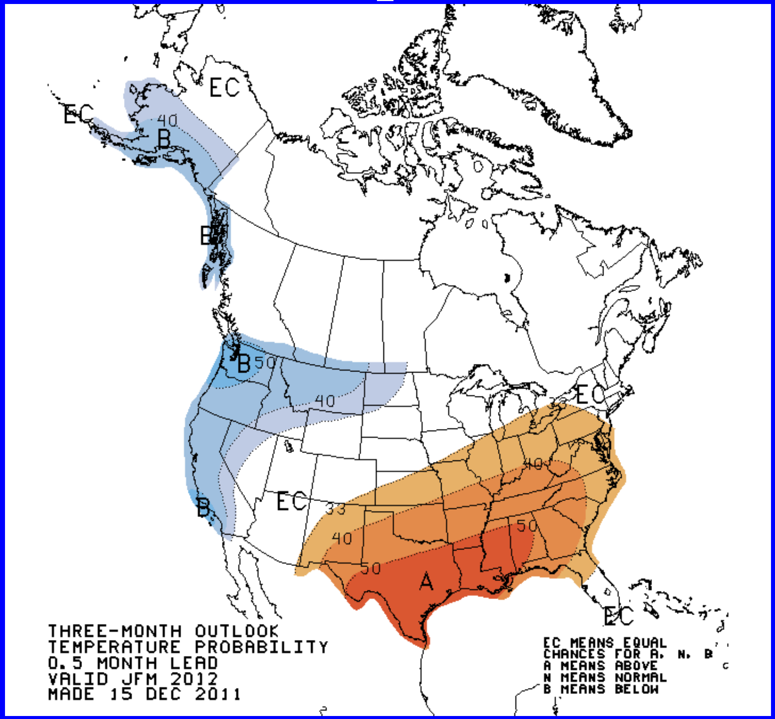
(not PDF corrected) CFSv2 forecast Nino3.4 SST anomalies (K)



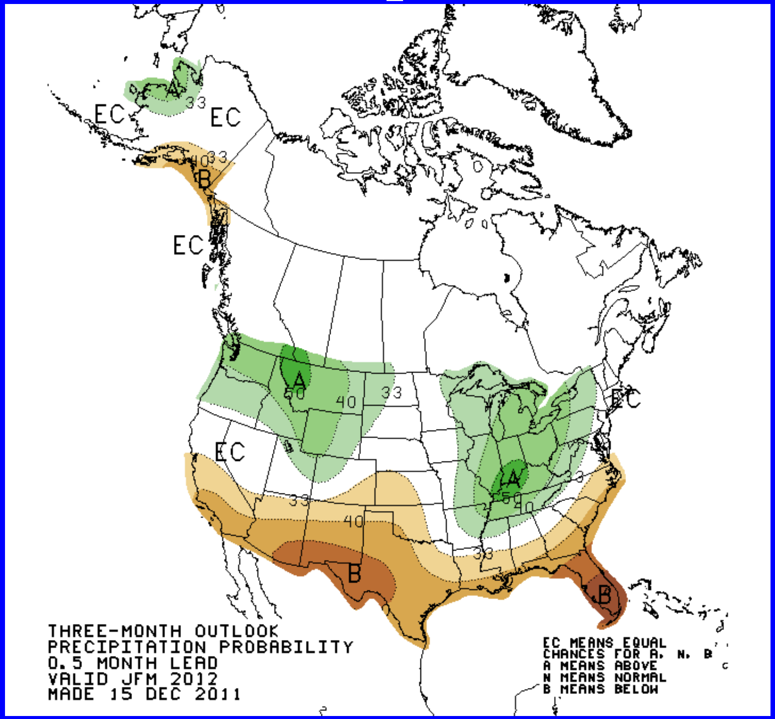
CFS.v2 is now operational. More information on version 2 is available at http://cfs.ncep.noaa.gov/cfsv2/docs.html

U. S. Seasonal Outlooks
January – March 2012

Temperature



Precipitation



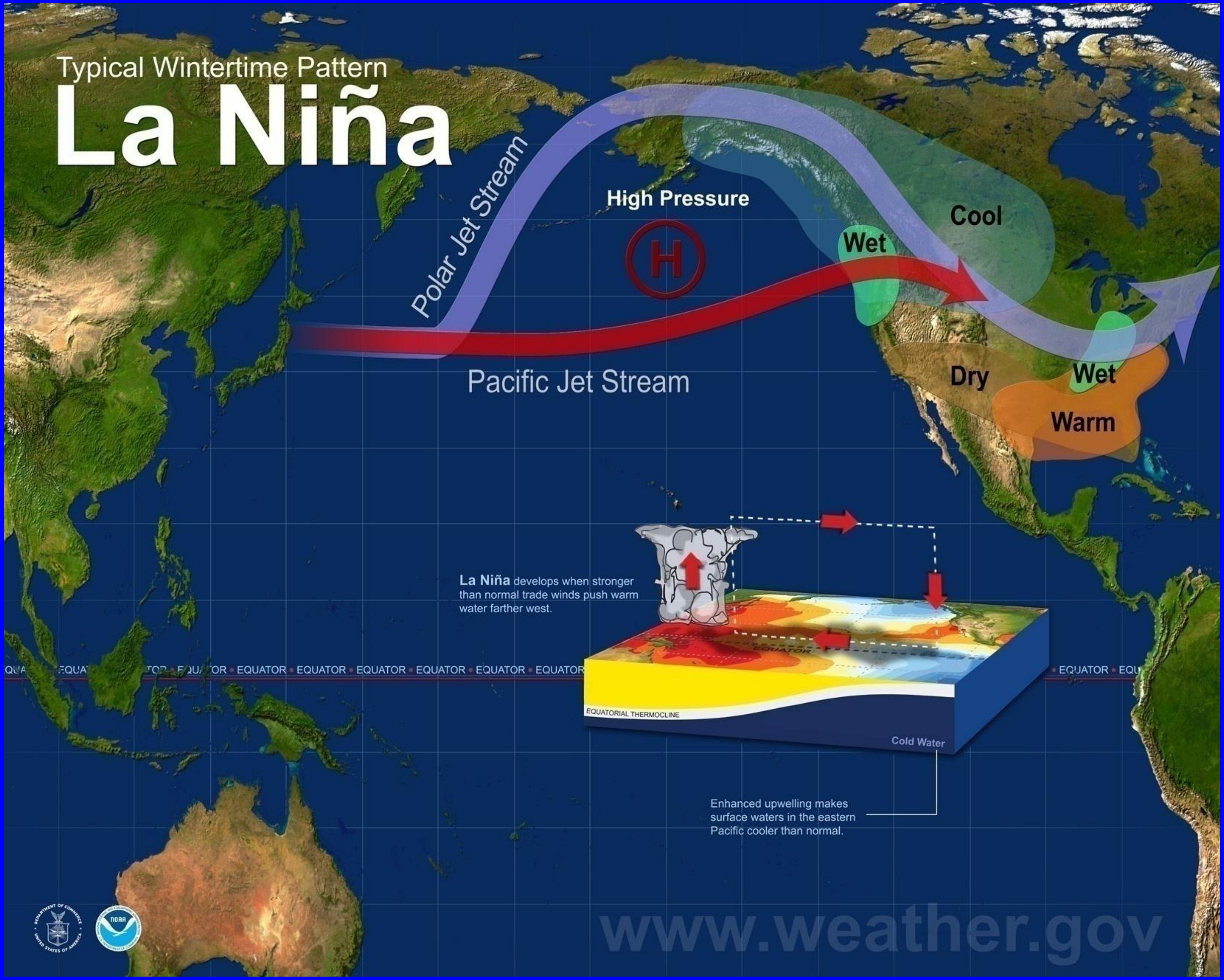
The seasonal outlooks combine the effects of long-term trends, soil moisture, and, when appropriate, ENSO.

Summary

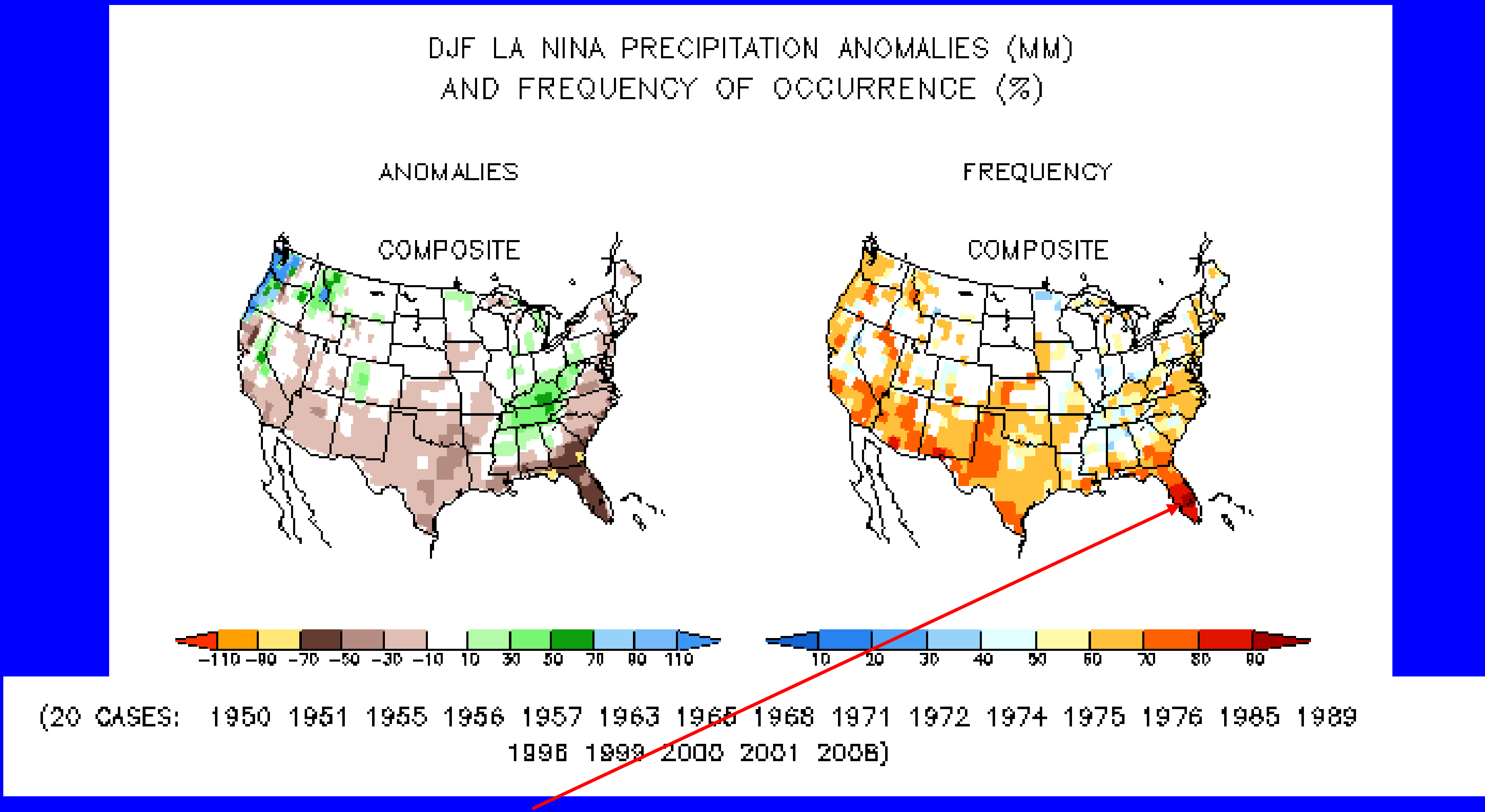
- La Niña conditions are present across the equatorial Pacific.*
- Sea surface temperatures (SST) were at least 0.5°C below average across much of the central and eastern equatorial Pacific Ocean.
- Atmospheric circulation anomalies are consistent with La Niña.
- La Niña is expected to continue into the Northern Hemisphere spring 2012.*

* Note: These statements are updated once a month in association with the ENSO Diagnostics Discussion:
http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory

Typical US Temperature, Precipitation and Jet Stream Patterns during La Niña Winters

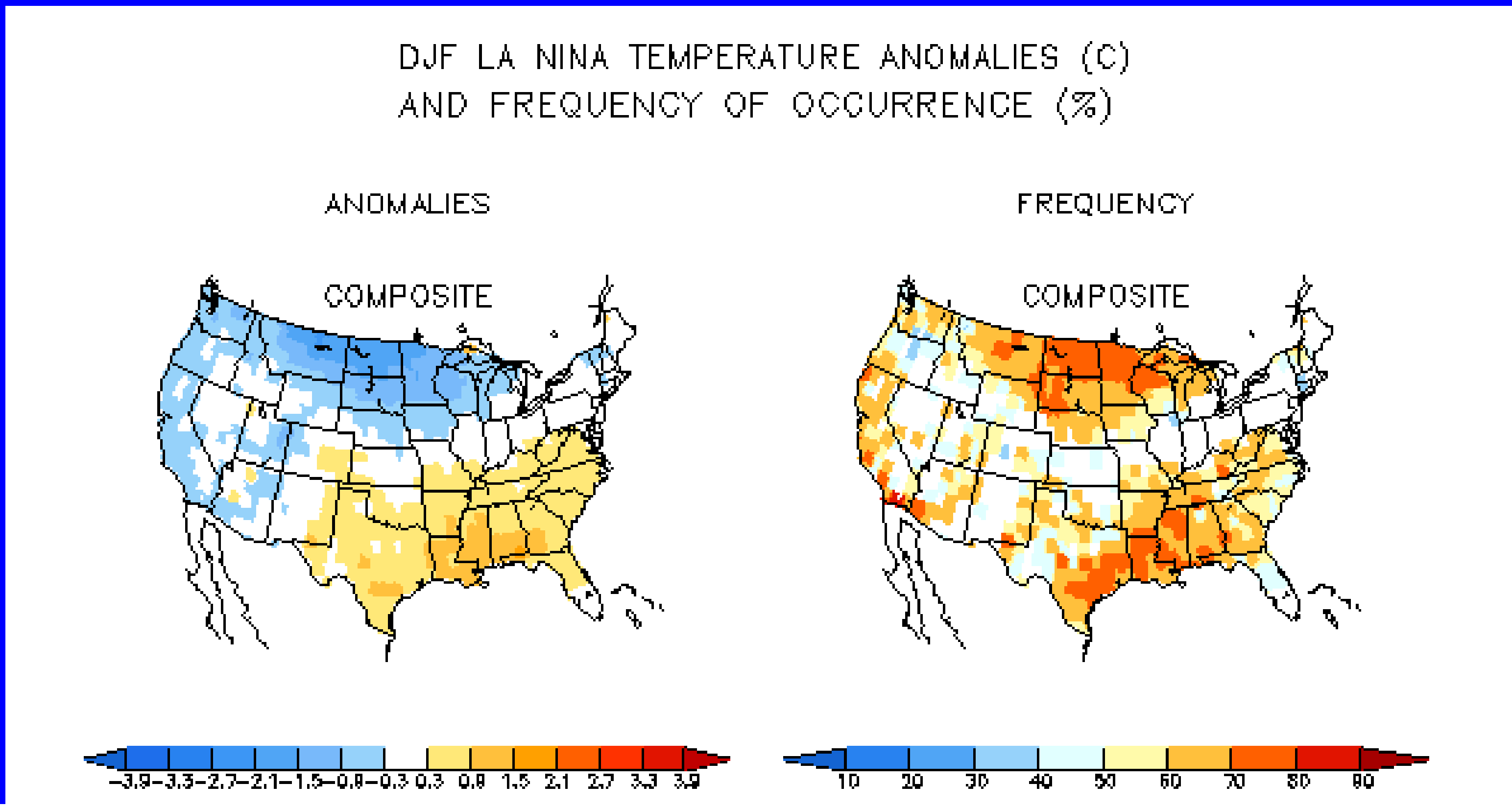


U.S. Precipitation Departures (mm) and Frequency of Occurrence (%) for La Niña during Dec.-Feb.



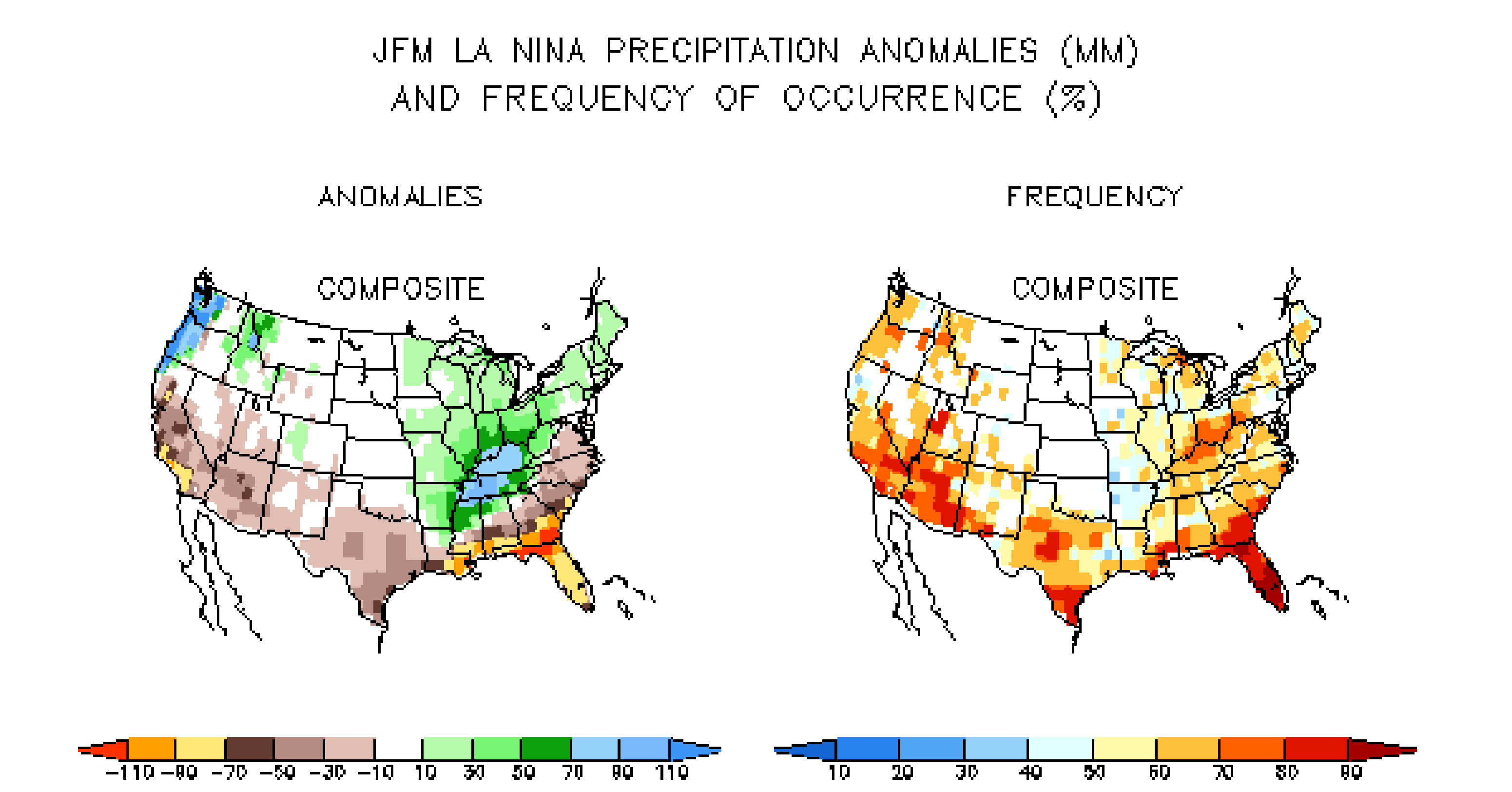
FREQUENCY (right panel) indicates the percentage of La Niña years that the indicated departure (left panel) occurred. For example, below-average seasonal precipitation over Florida occurred in 70%-90+% of the La Niña years.

U.S. Temperature Departures (°C) and Frequency of Occurrence (%) for La Niña during Dec.-Feb.



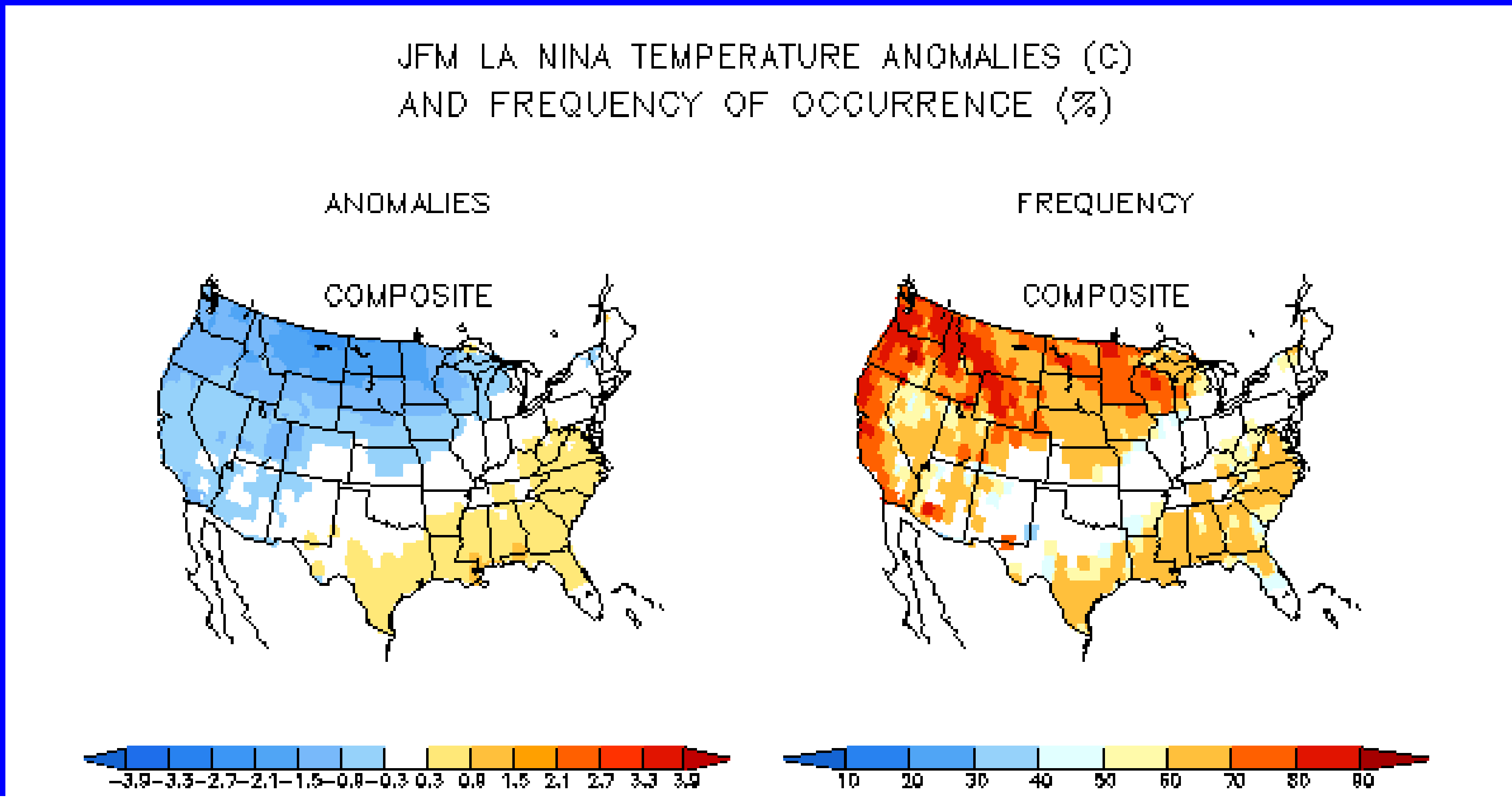
(20 CASES: 1950 1951 1955 1956 1957 1963 1965 1968 1971 1972 1974 1975 1976 1985 1989 1996 1999 2000 2001 2006)

U.S. Precipitation Departures (mm) and Frequency of Occurrence (%) for La Niña during Jan.-Mar.



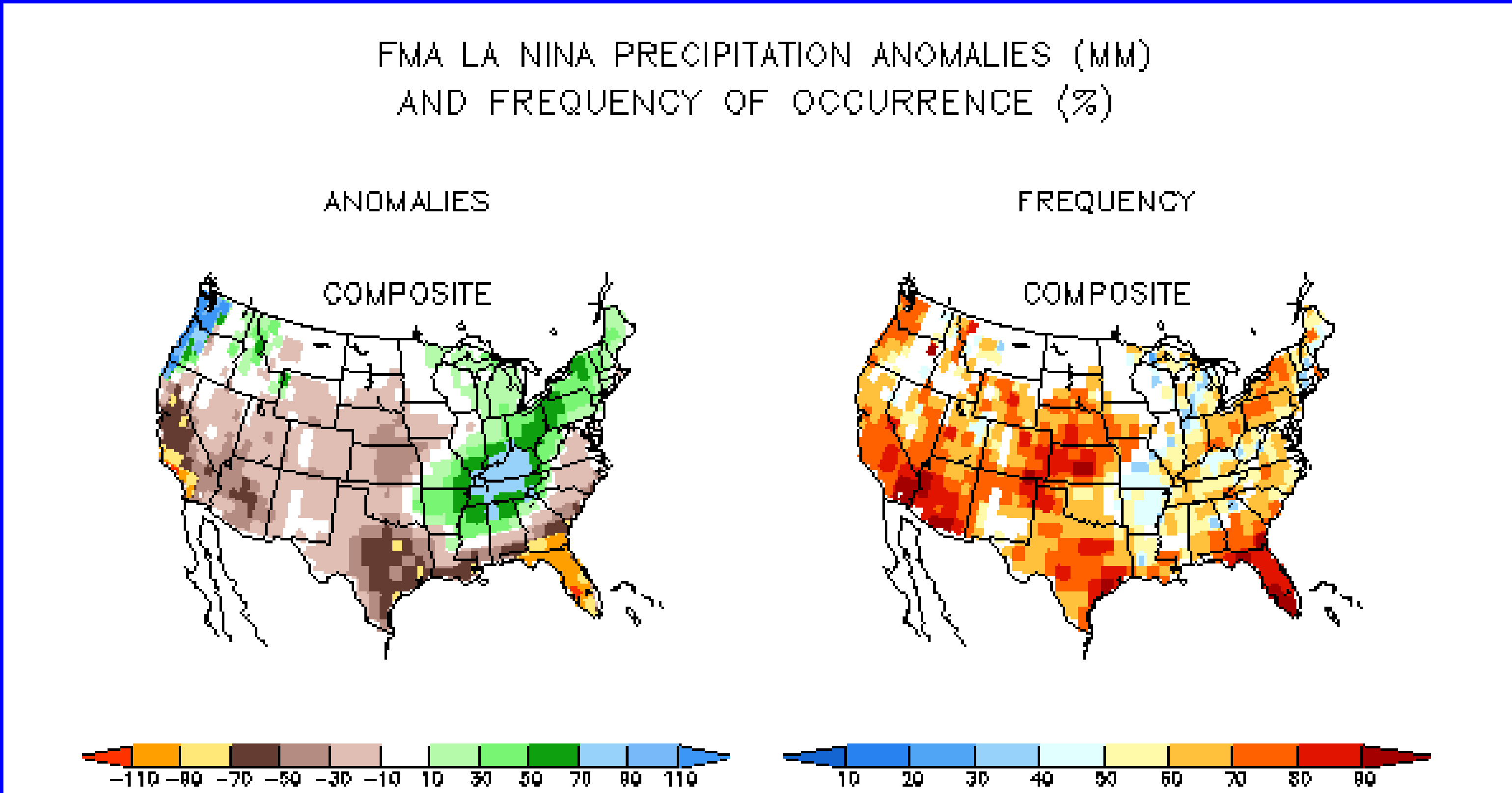
(16 CASES: 1950 1951 1955 1956 1968 1971 1974 1975 1976 1985 1989 1996 1999 2000 2001 2008)

U.S. Temperature Departures (°C) and Frequency of Occurrence (%) for La Niña during Jan.-Mar.



(16 CASES: 1950 1951 1955 1956 1968 1971 1974 1975 1976 1985 1989 1996 1999 2000 2001 2008)

U.S. Precipitation Departures (mm) and Frequency of Occurrence (%) for La Niña during Feb.-Apr.



(15 CASES: 1950 1951 1955 1956 1968 1971 1974 1975 1976 1985 1989 1996 1999 2000 2008)

U.S. Temperature Departures (°C) and Frequency of Occurrence (%) for La Niña during Feb.-Apr.