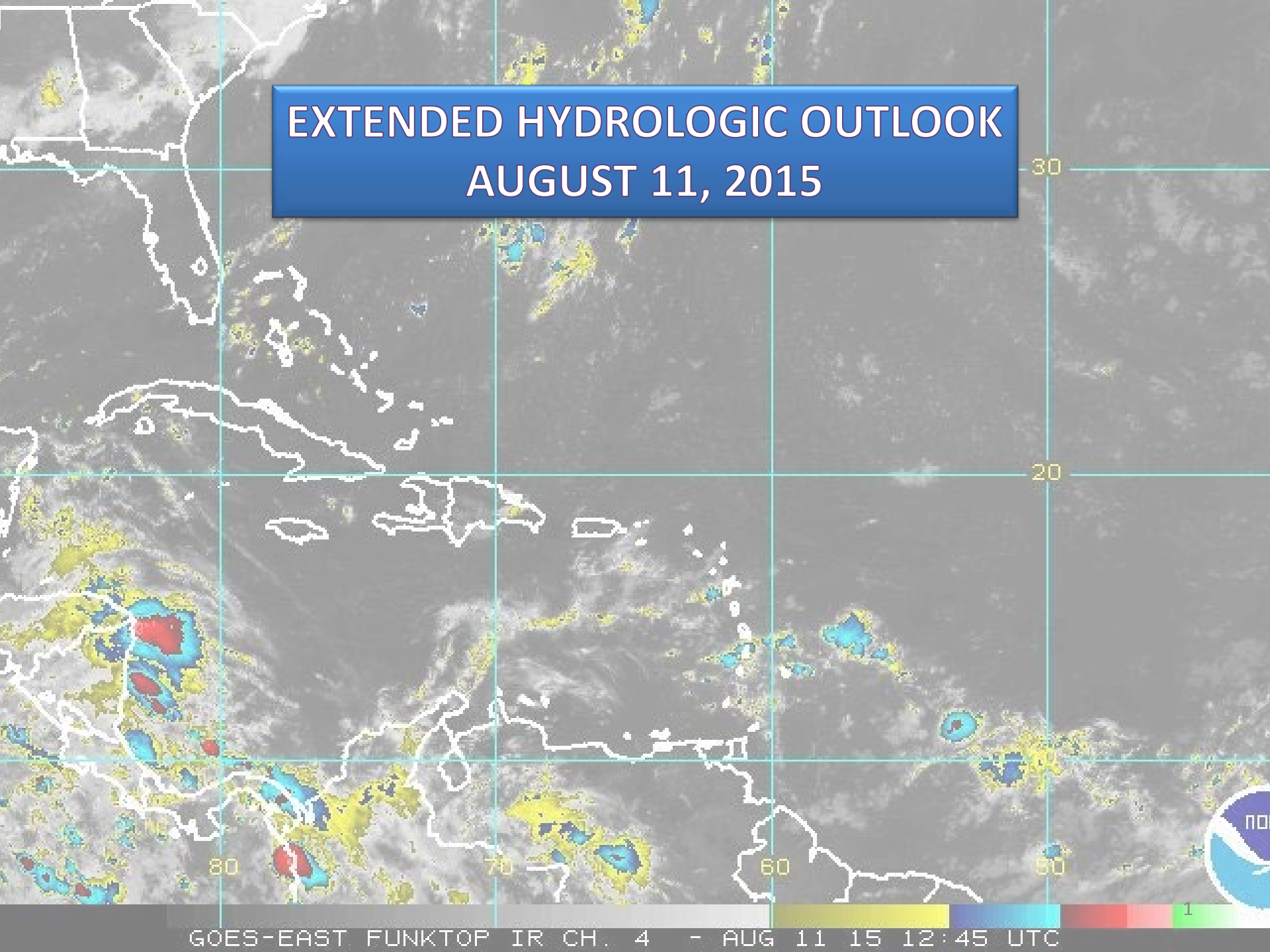
EXTENDED HYDROLOGIC OUTLOOK
AUGUST 11, 2015



Summary

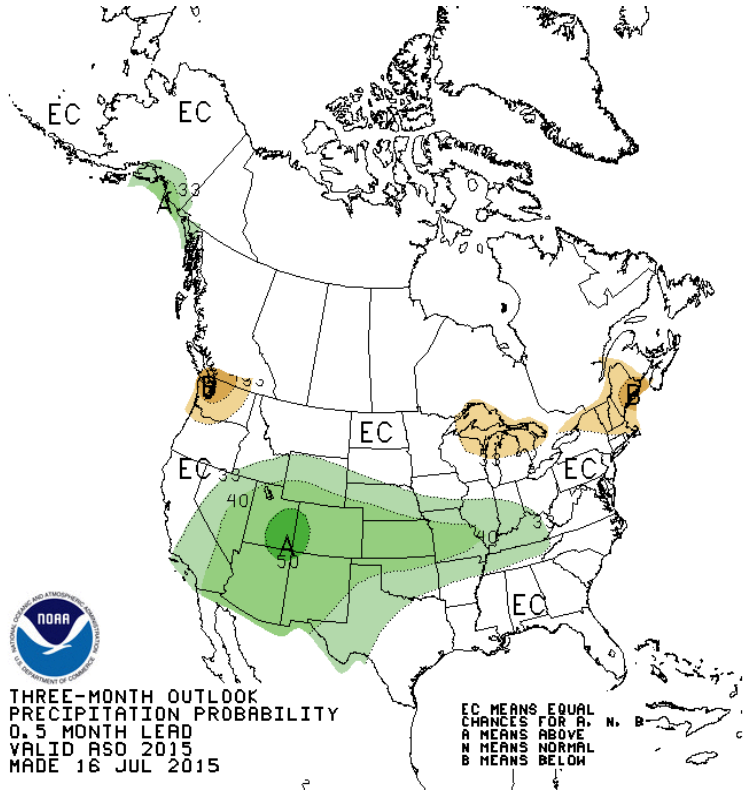
- The Climate Prediction Center (CPC) is forecasting equal chances of above-normal, normal and below-normal rainfall for August through October.
- El Niño conditions continue to strengthen. A moderate to strong El Niño is likely to persist into early 2016. The latter half of the wet season will tend towards normal rainfall probabilities. There are increased chances of above normal rainfall for the 2015-2016 dry season.
- The wet season should tend to have less tropical activity that will affect Florida. NOAA CPC issued 90% likelihood of below normal hurricane activity due to stronger vertical wind shear, enhanced sinking motion, increased atmospheric stability.
- The Atlantic Multidecadal Oscillation (AMO) is likely entering the cold (negative) phase, which creates the potential for drier conditions in south Florida. AMO cold (negative) also decreases tropical activity in the Atlantic.
- The current switch from the negative phase to a strong positive phase of the Pacific Decadal Oscillation increases the potential for above normal rainfall in the winter and a greater number of El Niño events for multi-year periods.

U. S. Seasonal Outlooks

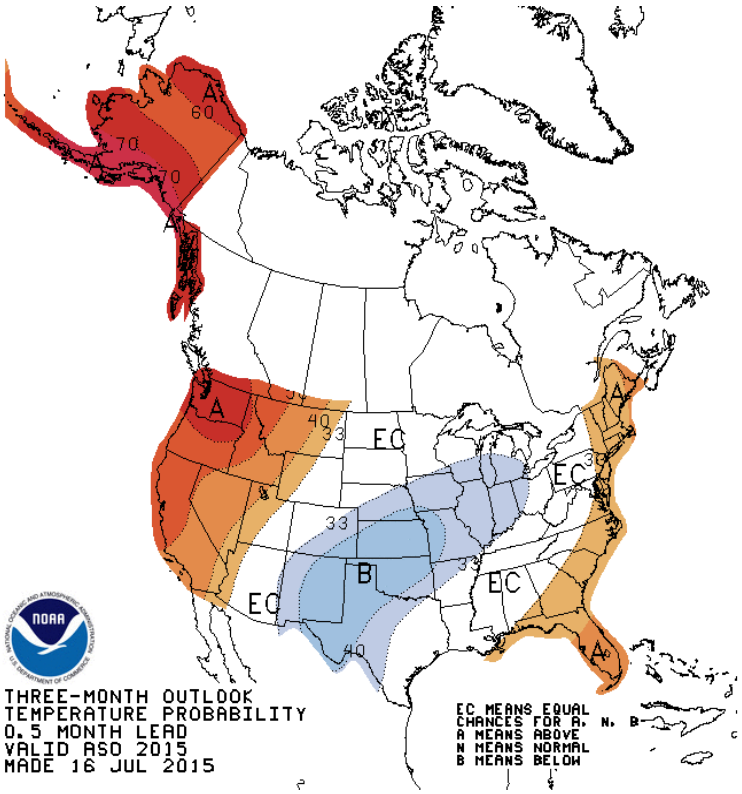
August – October 2015

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

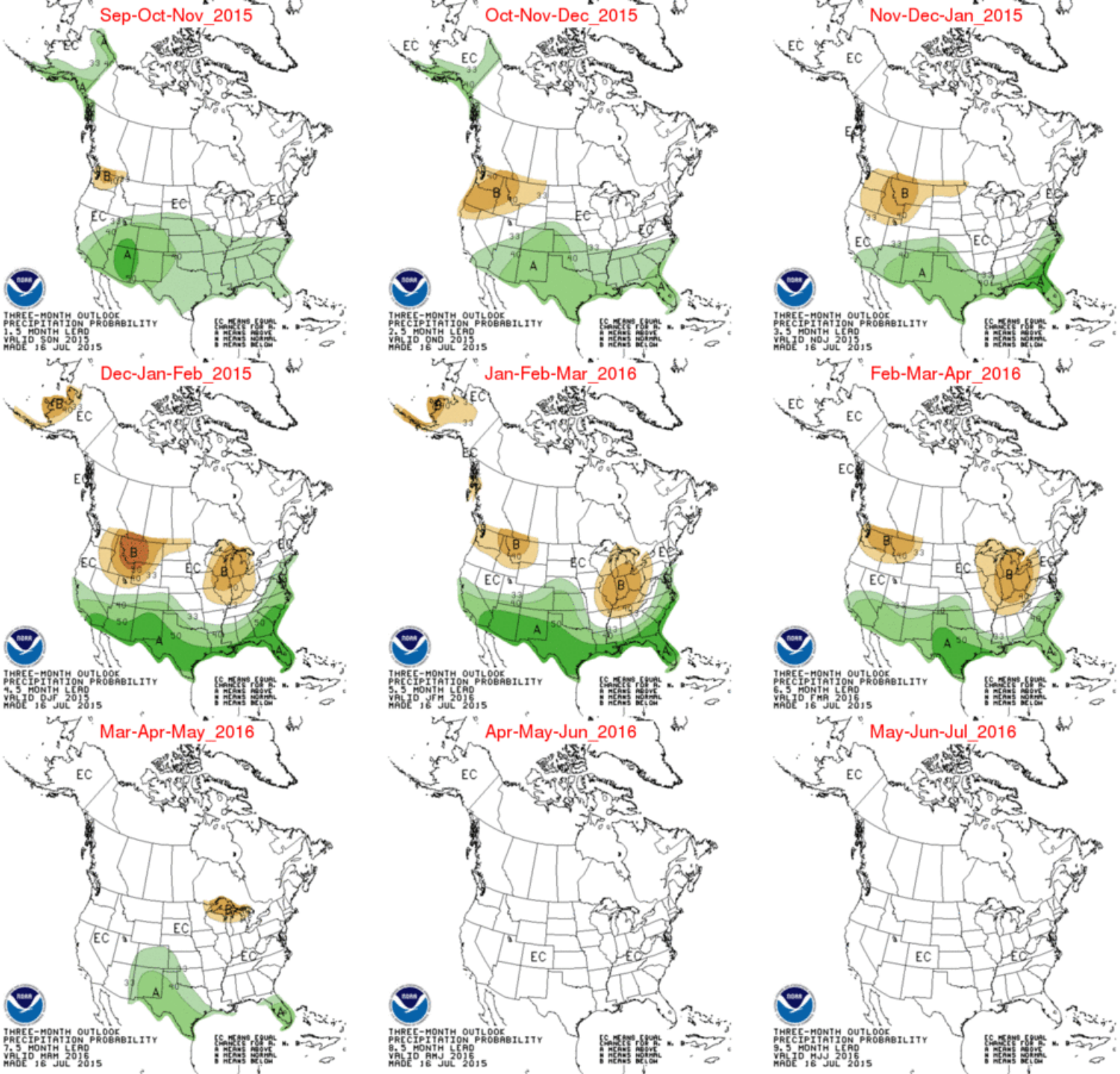
Precipitation



Temperature

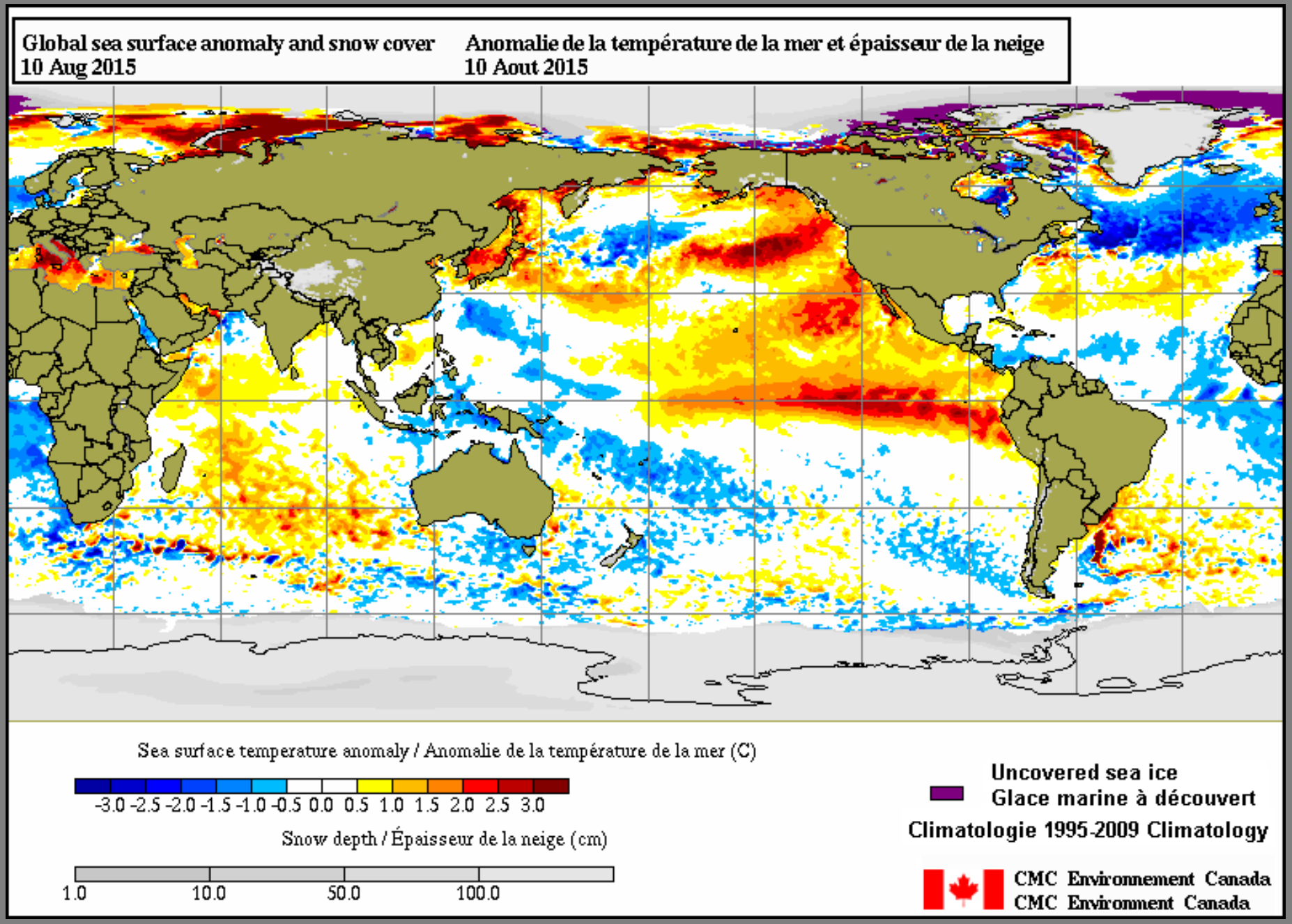


Prepared by: Climate Prediction Center / NCEP



Prepared by: Climate Prediction Center / NCEP

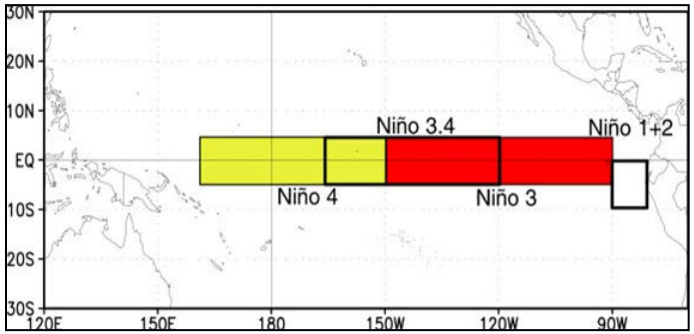
Current Global Sea Surface Temperature Anomalies

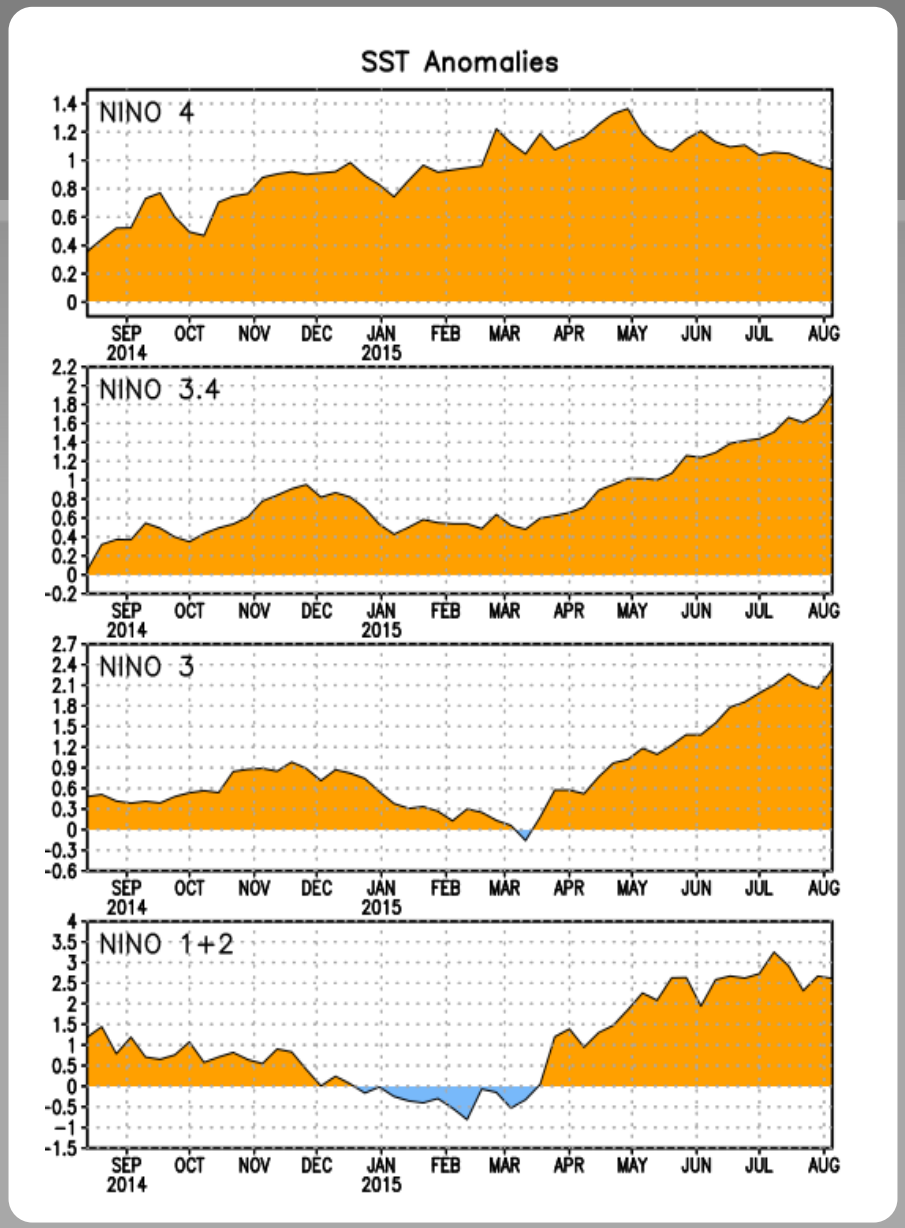


Niño Region SST Departures (ºC) Recent Evolution

The latest weekly SST departures are:

Niño 4	0.9ºC
Niño 3.4	1.9ºC
Niño 3	2.3ºC
Niño 1+2	2.6ºC





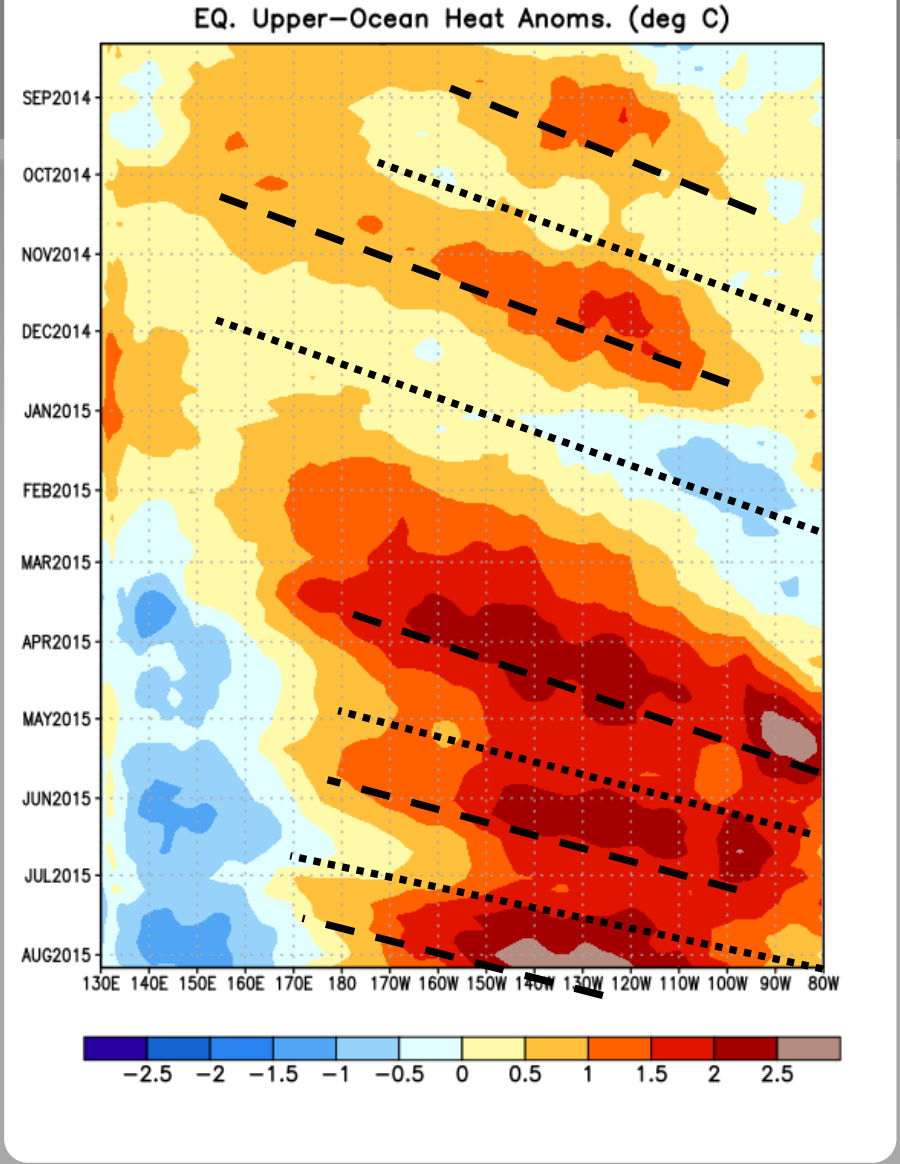
Prepared by: Climate Prediction Center / NCEP

Weekly Heat Content Evolution in the Equatorial Pacific

During November - January, the upwelling phase of a Kelvin wave shifted eastward. This was followed by the downwelling phase of a Kelvin wave in March-April.

From mid-May to late June, another Kelvin wave crossed the Pacific.

Since early July, the downwelling phase of a third Kelvin wave during 2015 is evident.

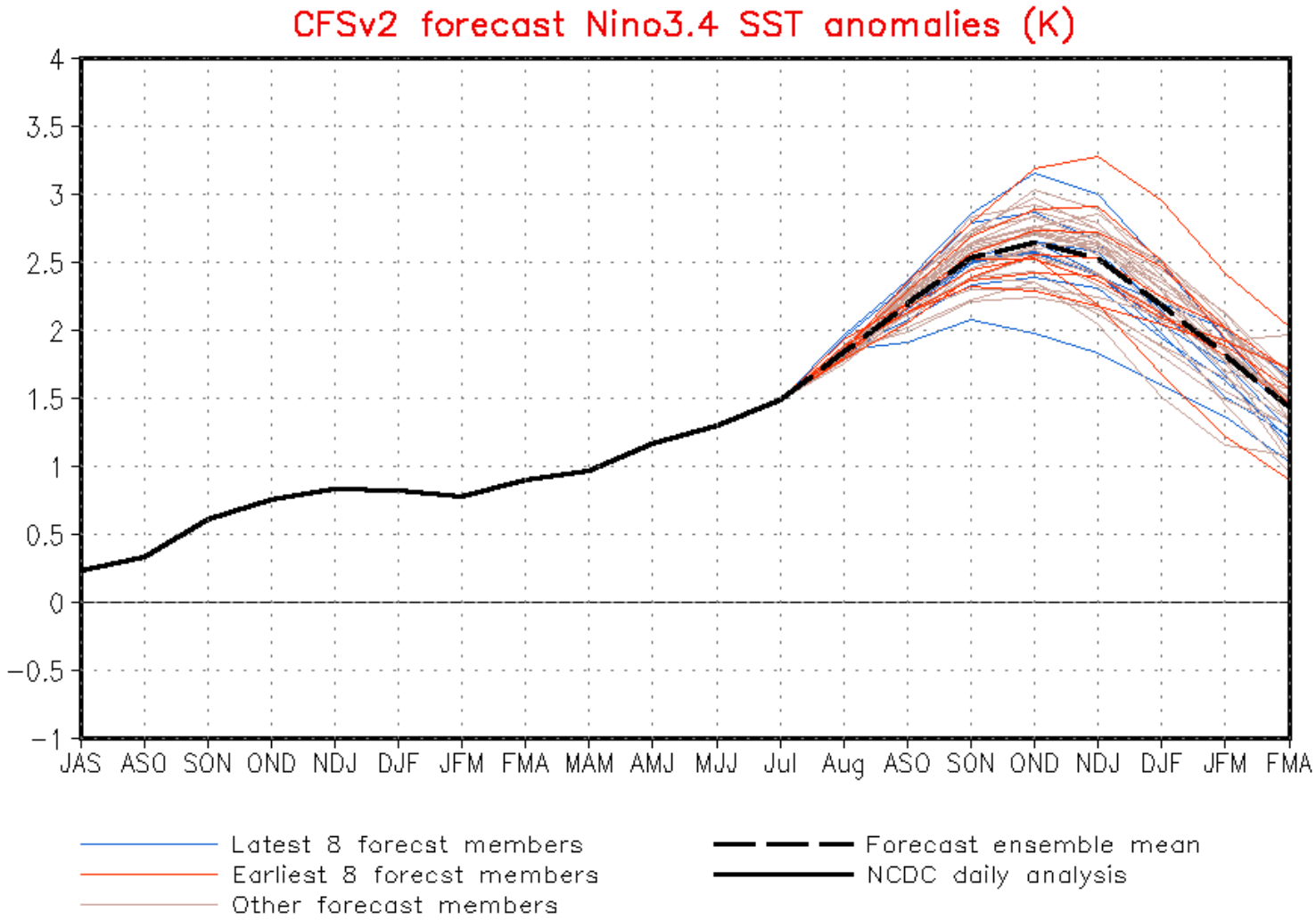


Oceanic Kelvin waves have alternating warm and cold phases. The warm phase is indicated by dashed lines. Down-welling and warming occur in the leading portion of a Kelvin wave, and up-welling and cooling occur in the trailing portion.

Prepared by: Climate Prediction Center / NCEP

NWS/NCEP/CPC

Last update: Mon Aug 10 2015
Initial conditions: 31Jul2015–9Aug2015



CPC/IRI Pacific Niño 3.4 SST Model Outlook

Almost all of the models indicate Niño 3.4 SST anomalies will remain greater than or equal to +0.5ºC through spring 2016.

All multi-model averages suggest that Niño 3.4 will be above +1.5ºC (a "strong" El Niño) during late 2015 into early 2016.

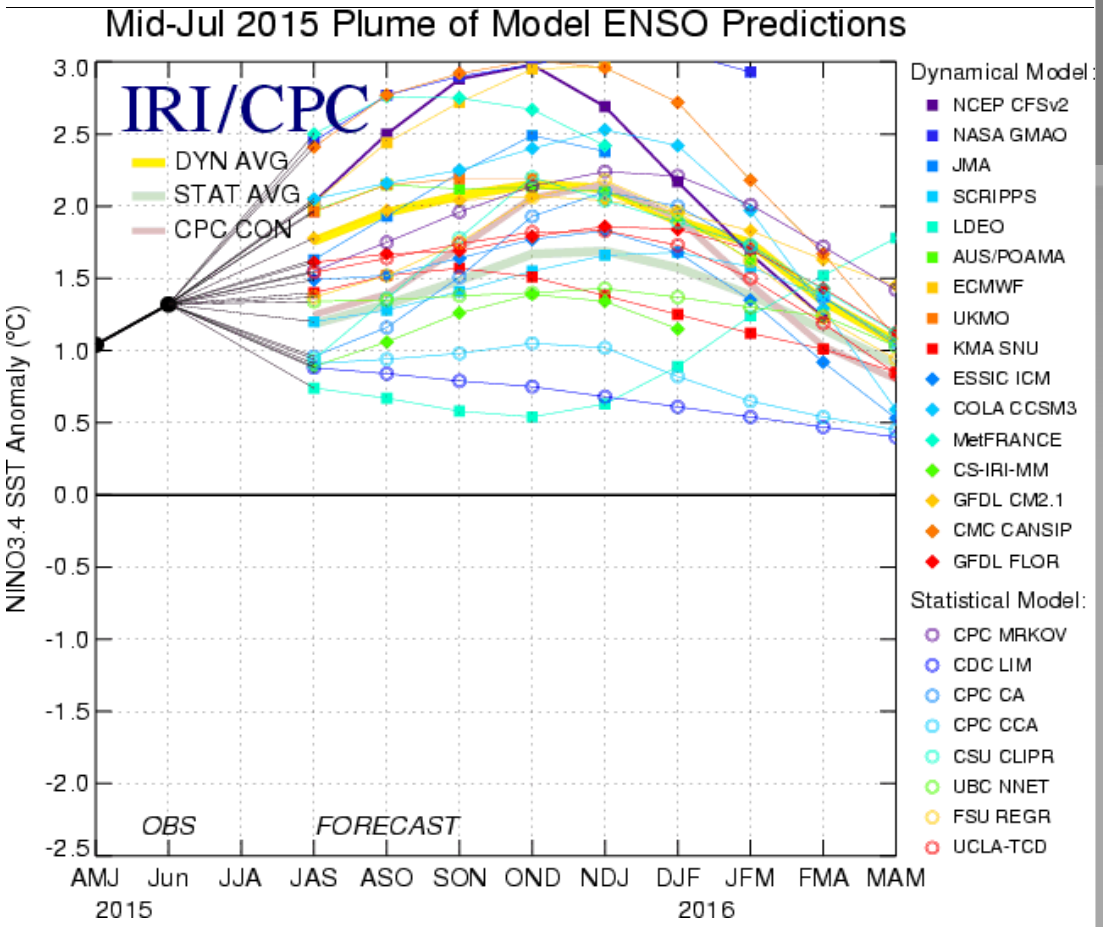
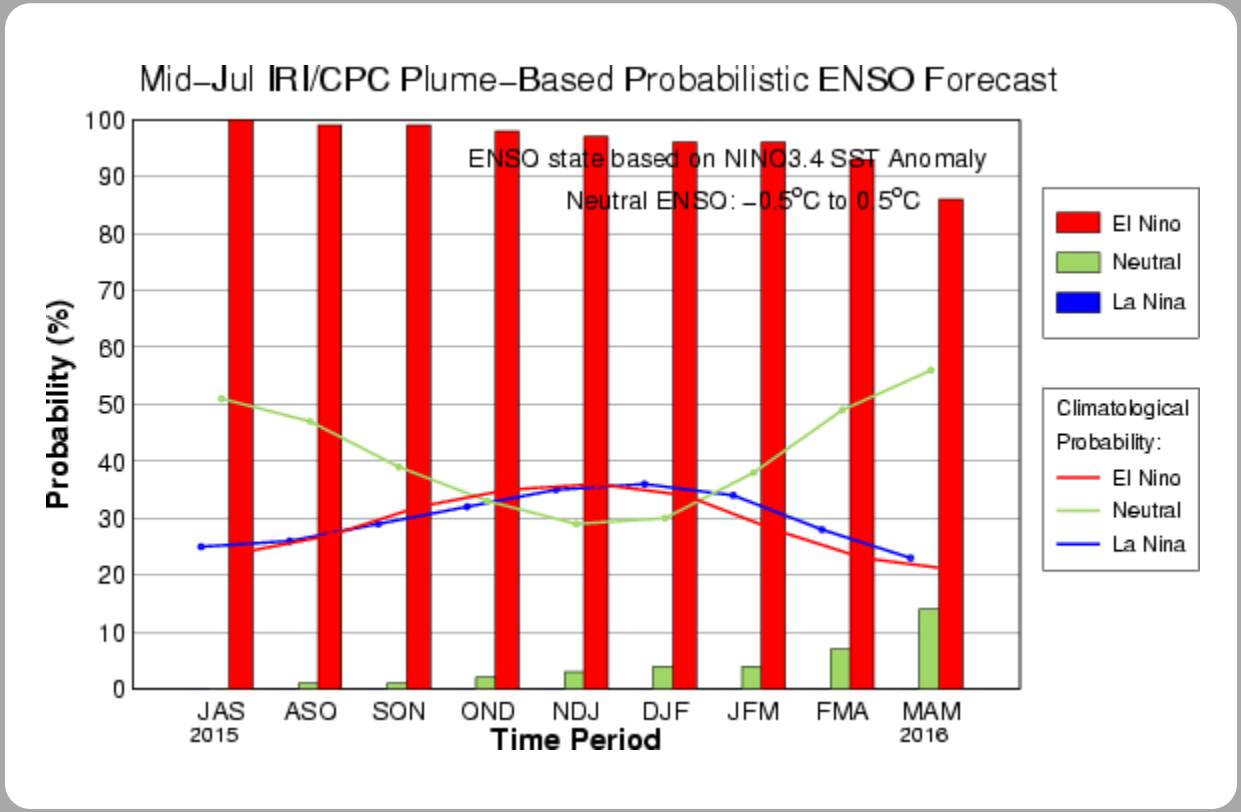


Figure provided by the International Research Institute (IRI) for Climate and Society (updated 14 July 2015).

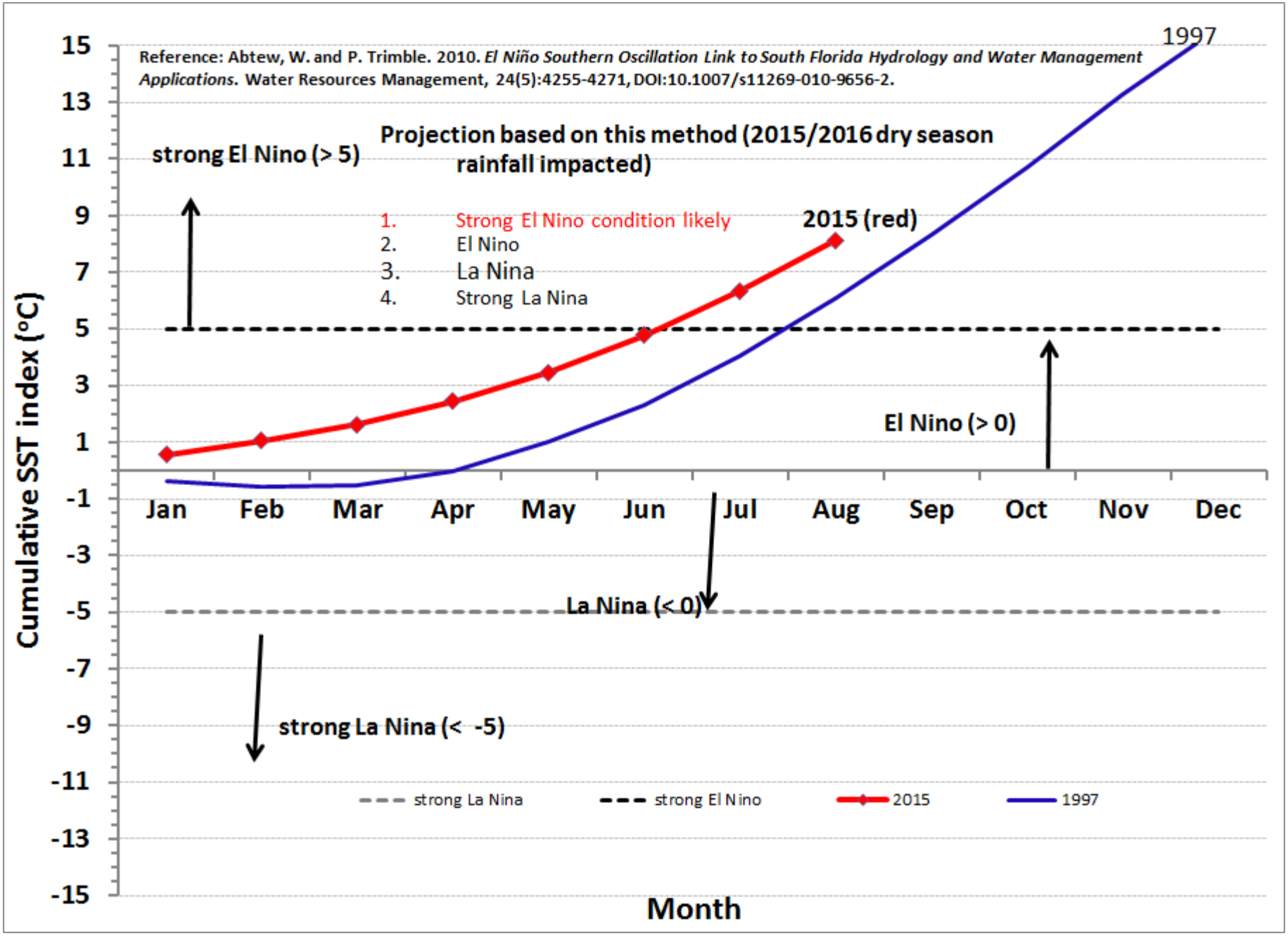
CPC/IRI Probabilistic ENSO Outlook

Updated: 16 July 2015

The chance of El Niño is at least 80% into early spring 2016.



Prepared by: Climate Prediction Center / IRI


Reference: Abtew, W. and P. Trimble. 2010. *El Niño Southern Oscillation Link to South Florida Hydrology and Water Management Applications*. Water Resources Management, 24(5):4255-4271, DOI:10.1007/s11269-010-9656-2.
Projection based on this method (2015/2016 dry season rainfall impacted)
1. Strong El Nino condition likely
2. El Nino
3. La Nina
4. Strong La Nina
2015 (red)
1997
strong El Nino (> 5)
El Nino (> 0)
La Nina (< 0)
strong La Nina (< -5)
strong La Nina
strong El Nino
2015
1997
Cumulative SST index (°C)
15
13
11
9
7
5
3
1
-1
-3
-5
-7
-9
-11
-13
-15
Jan
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Nov
Dec
Month

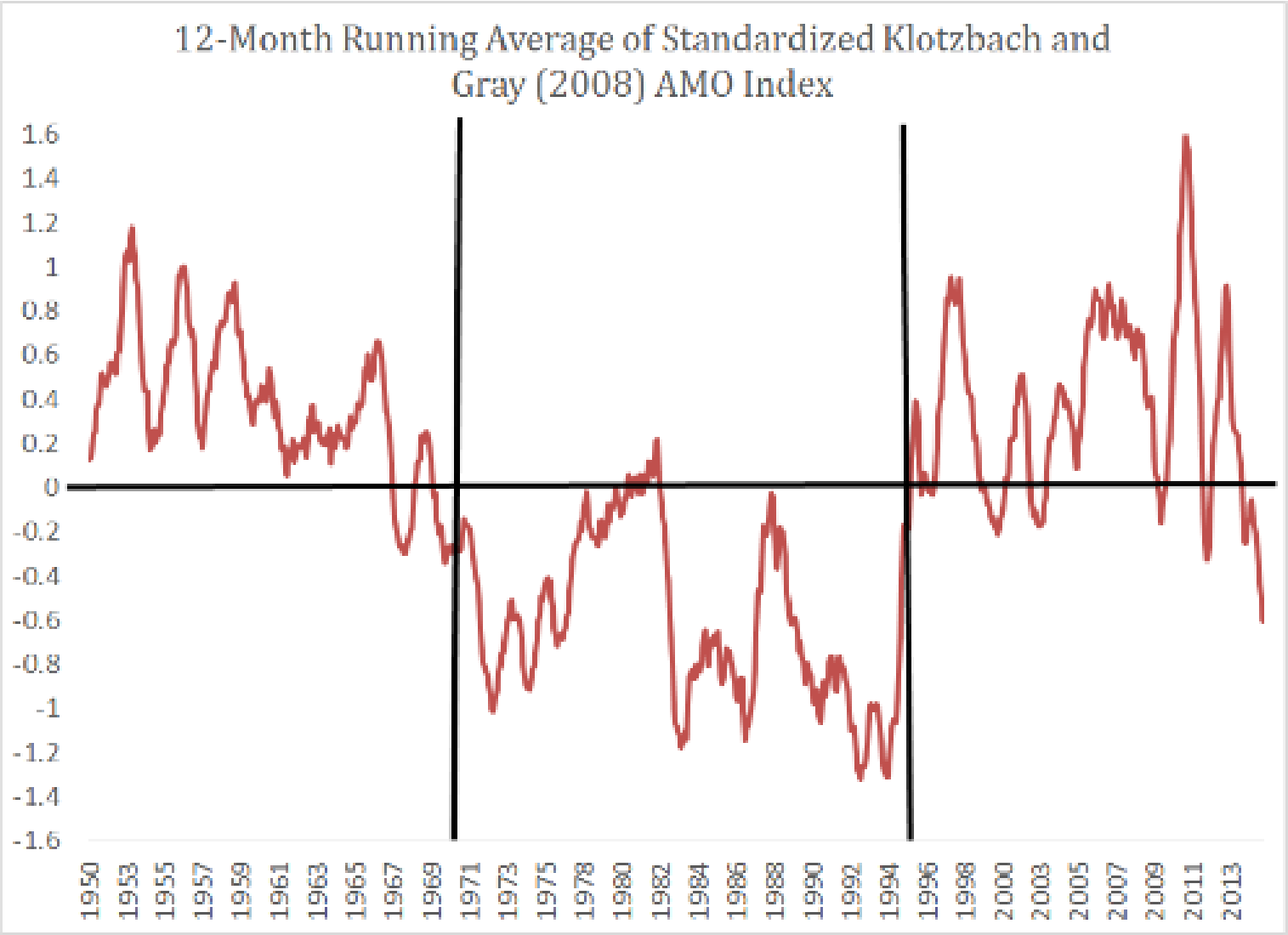


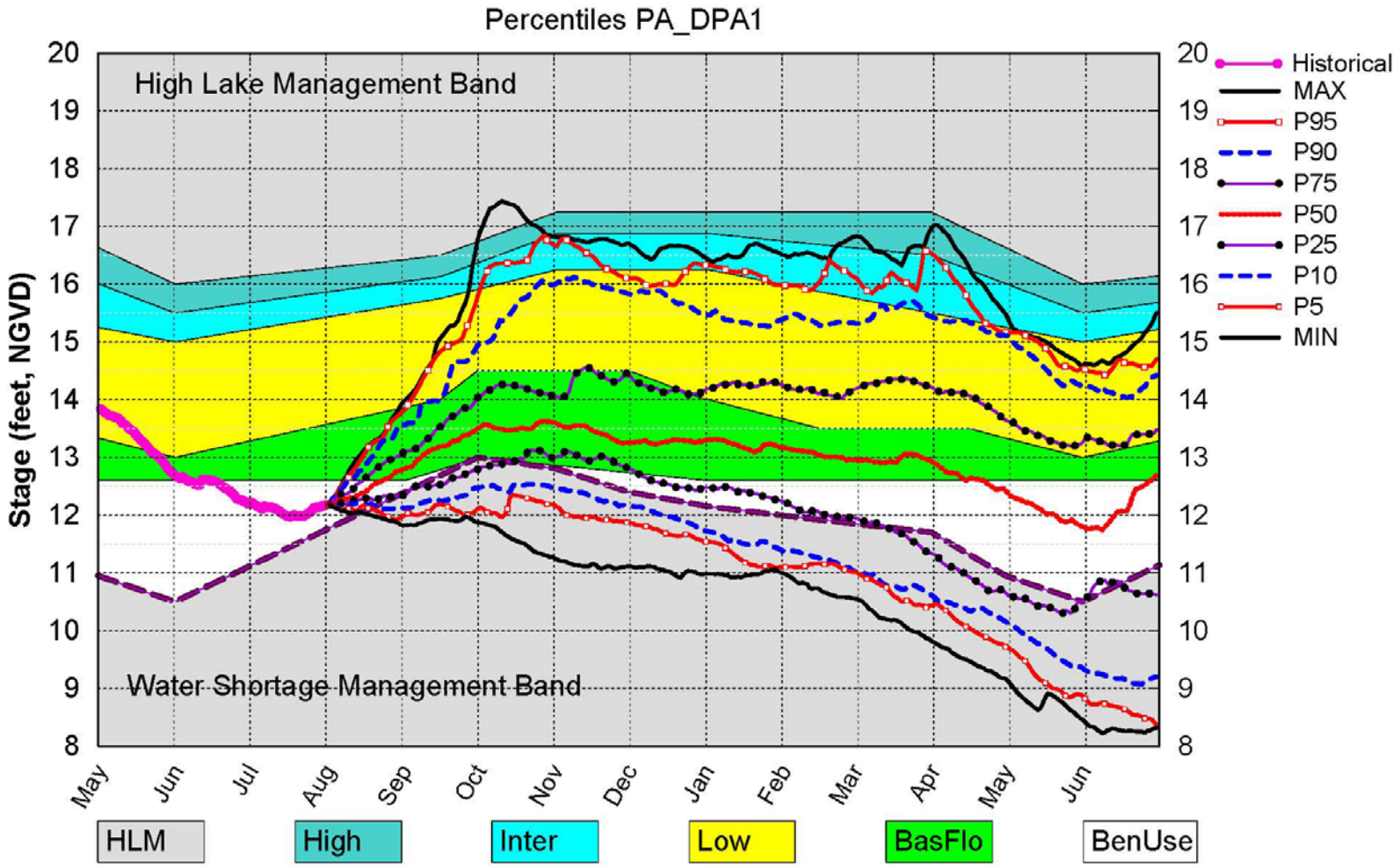
Figure 17: 12-month running average values of our standardized index of the AMO/THC. Current 12-month running average values are at their lowest since 1994.

Multidecadal Variability in North Atlantic Tropical Cyclone Activity

PHILIP J. KLOTZBACH AND WILLIAM M. GRAY

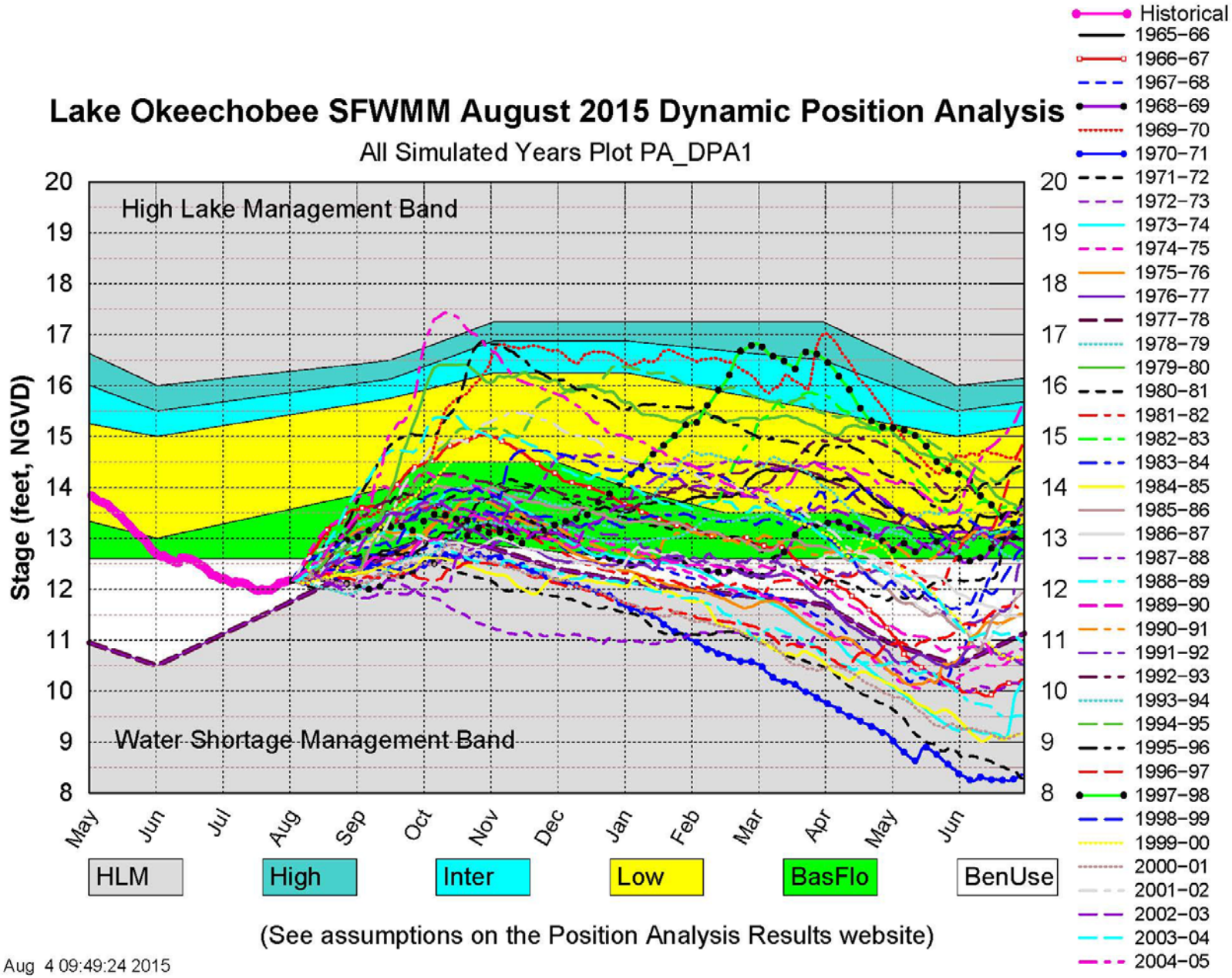
Department of Atmospheric Science, Colorado State University, Fort Collins, Colorado

Lake Okeechobee SFWMM August 2015 Dynamic Position Analysis



(See assumptions on the Position Analysis Results website)

Tue Aug 4 09:46:46 2015



(See assumptions on the Position Analysis Results website)

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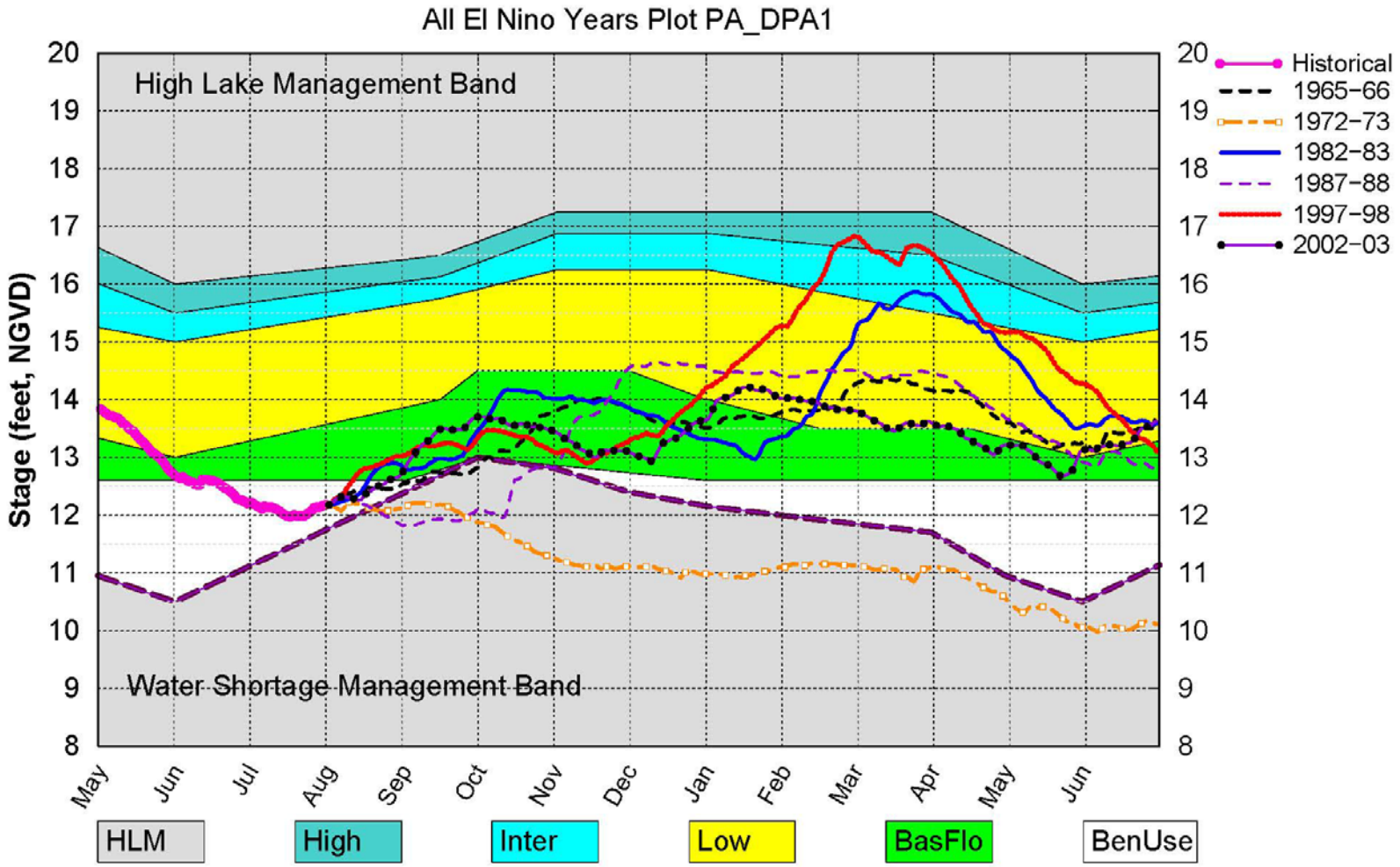
Lake Okeechobee SFWMM August 2015 Dynamic Position Analysis



(See assumptions on the Position Analysis Results website)

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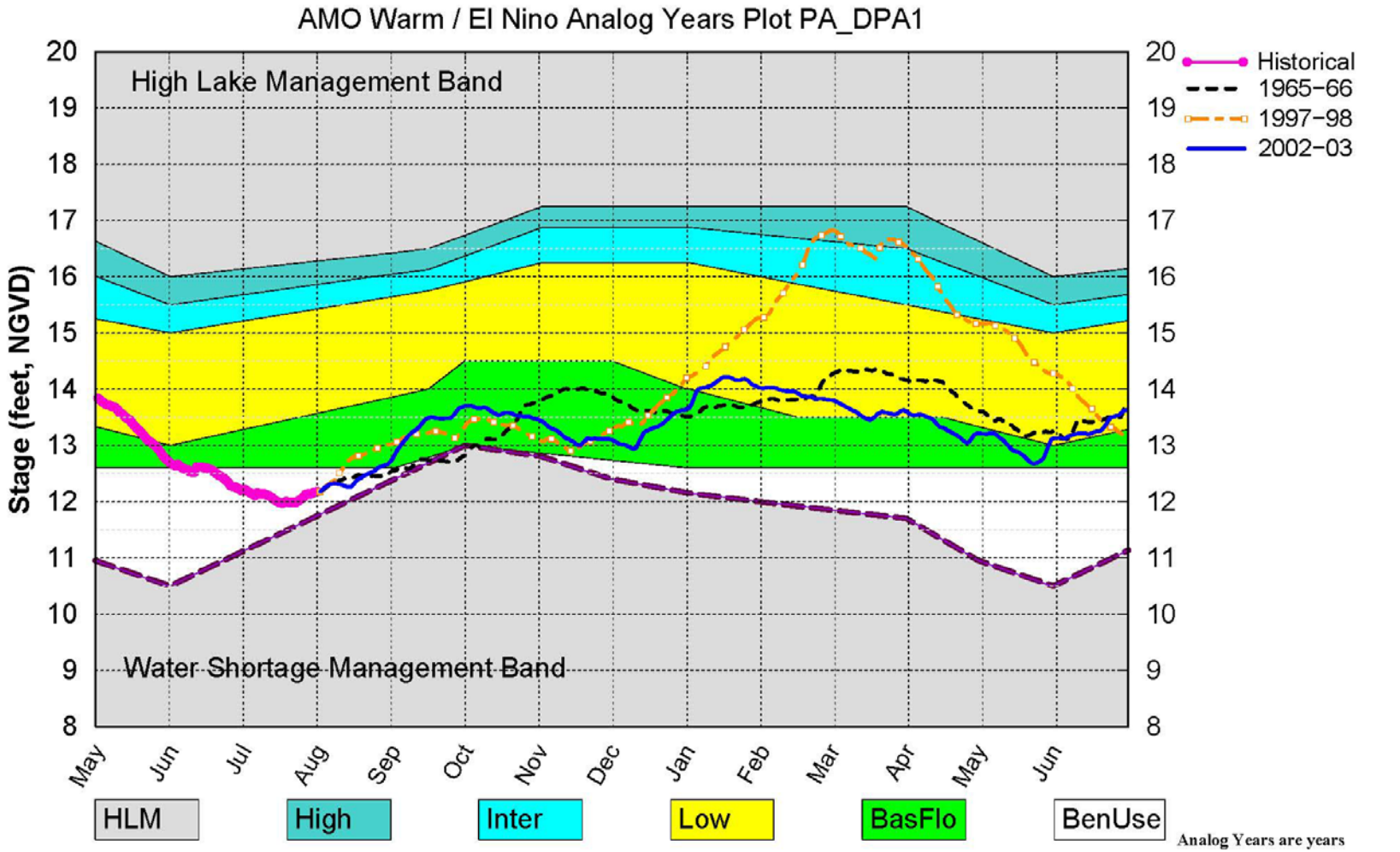
Lake Okeechobee SFWMM August 2015 Dynamic Position Analysis



(See assumptions on the Position Analysis Results website)

Analog Years are years with similar climatological conditions to the current year.

Tue Aug 4 09:47:20 2015

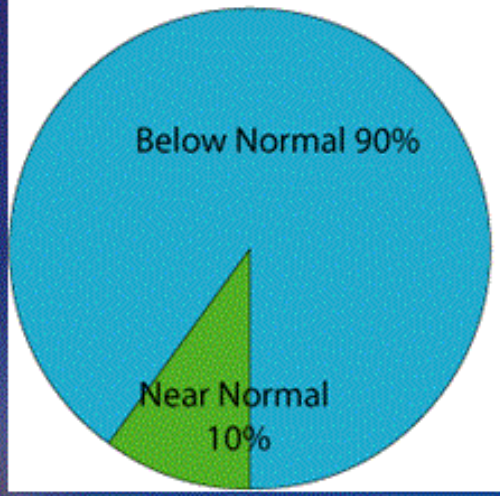
Early Tropical Season Outlook

NOAA's Updated 2015 Atlantic Hurricane Season Outlook

NOAA's Updated 2015 Atlantic Hurricane Season Outlook

90% Chance of Below-Normal Season

Probability of Season Type

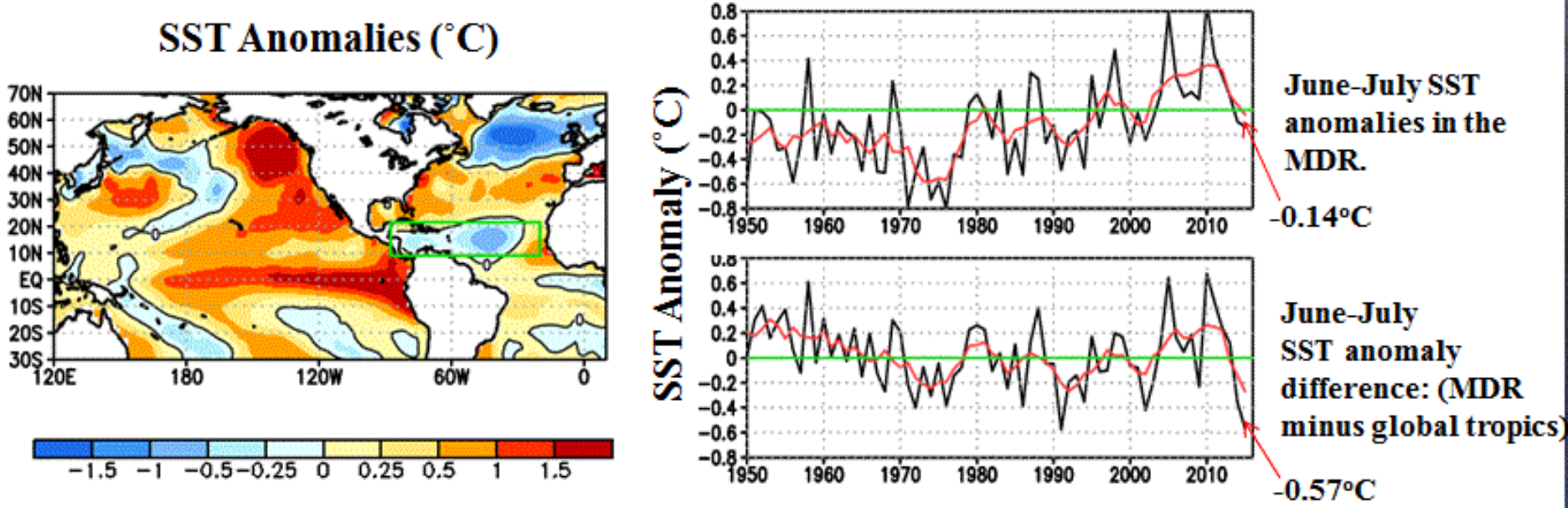


Predicted Activity

70% Probability For Each Range		Season Averages (1981-2010)
Named Storms	**6-10**	**12**
Hurricanes	**1-4**	**6**
Major Hurricanes	**0-1**	**3**

http://www.cpc.ncep.noaa.gov/products/outlooks/hurricane.shtml

June-July 2015: Atlantic SST Anomalies



Caption: (Left) June-July 2015 SST anomalies (˚C) with green box denoting the MDR. (Right) June-July area-averaged SST anomalies since 1950: (Top) in the MDR, and (Bottom) difference between MDR and the global tropics (20˚N-20˚S). Anomalies are departures from the 1981-2010 ERSST.V3b monthly means.

Tropical Atlantic SSTs were below average during June-July 2015. Area-averaged SST anomalies in the MDR were -0.17˚C during this period, which is much cooler (0.57˚C cooler) than the remainder of the global tropics.

http://www.cpc.ncep.noaa.gov/products/outlooks/hurricane.shtml

Backup Slides

ENSO Impacts on U.S. regional Hurricane Activity

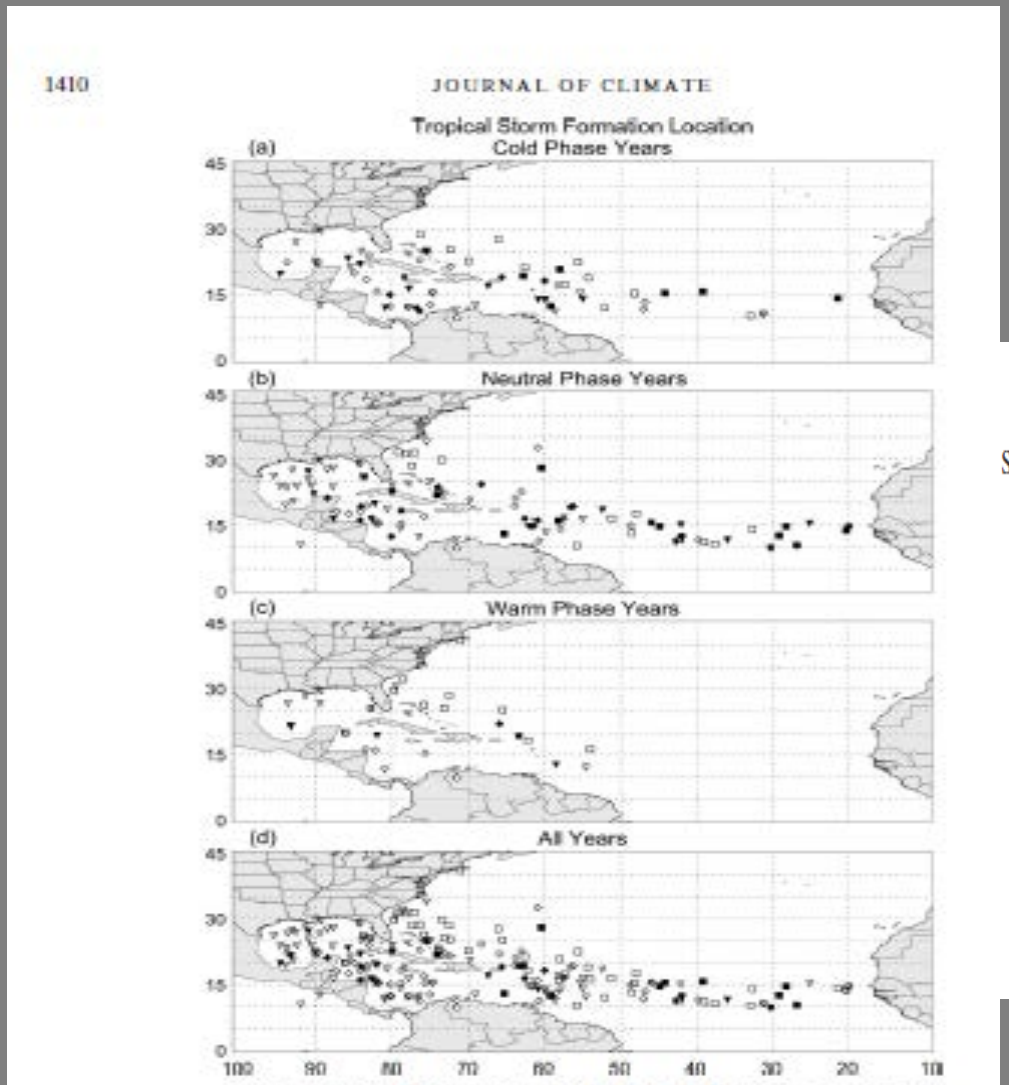


FIG. 5. Location at which hurricanes making landfall in the United States are first designated as a tropical storm (or stronger) within the HURDAT for ENSO (a) cold, (b) neutral, and (c) warm phases and (d) all years combined. Landfall location is separated into East Coast (square), Florida (diamond), and Gulf Coast (inverted triangle). Open symbols are hurricanes that made landfall as a category-1 or -2 storm, and closed symbols are hurricanes that made landfall as a category-3, -4, or -5 storm. Note that storms may move across land as a tropical storm and make landfall in a different region as a hurricane.

Journal of Climate

ENSO's Impact on Regional U.S. Hurricane Activity

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(Manuscript received 5 December 2005, in final form 19 June 2006)

ABSTRACT

Regional variations in North Atlantic hurricane landfall frequency along the U.S. coastline are examined in relation to the phase of El Niño–Southern Oscillation (ENSO). ENSO warm (cold) phases are known to reduce (increase) hurricane activity in the North Atlantic basin as a whole. Using best-track data from the U.S. National Hurricane Center, regional analysis reveals that ENSO cold-phase landfall frequencies are only slightly larger than neutral-phase landfall frequencies along the Florida and Gulf coasts. However, for the East Coast, from Georgia to Maine, a significant decrease in landfall frequency occurs during the neutral ENSO phase as compared to the cold phase. Along the East Coast, two or more major (category 3 or above) hurricanes never made landfall in the observational record (1900–2004) during a single hurricane season classified as an ENSO neutral or warm phase.

Total Number of Hurricanes
El Niño is listed here as “Warm”

Total Number of Major Hurricanes
El Niño is listed here as “Warm”

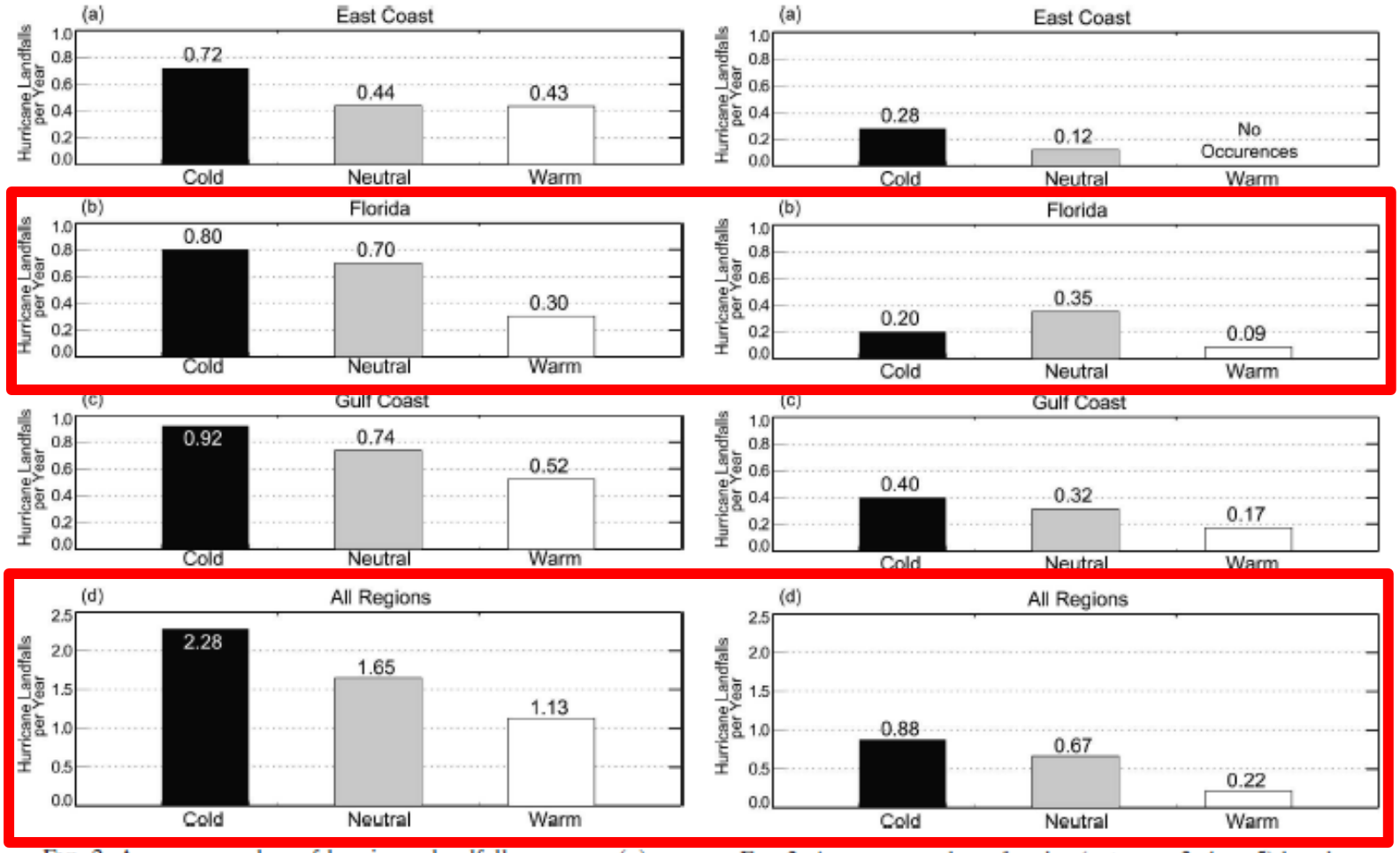
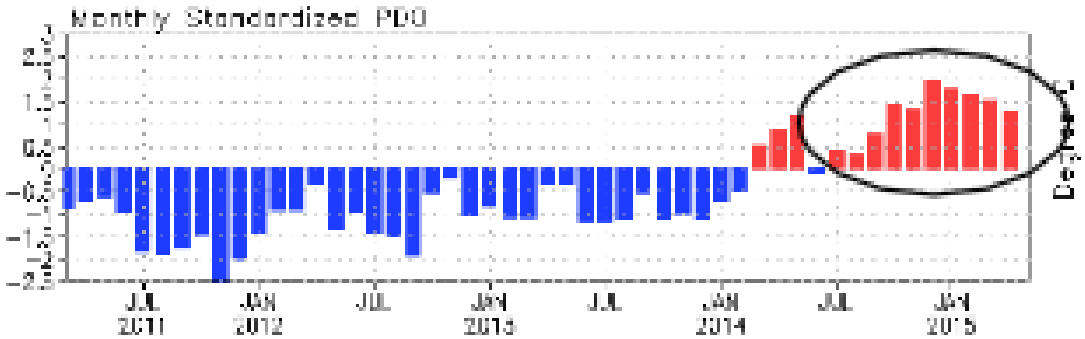
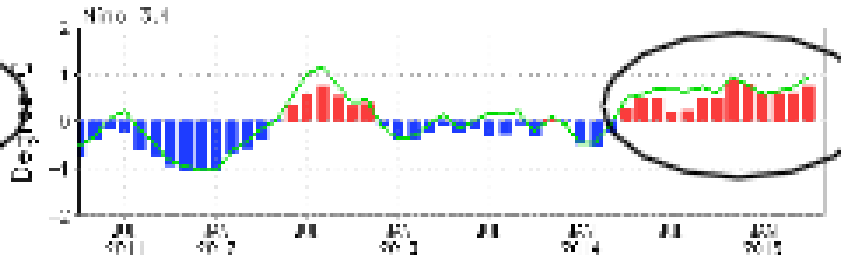


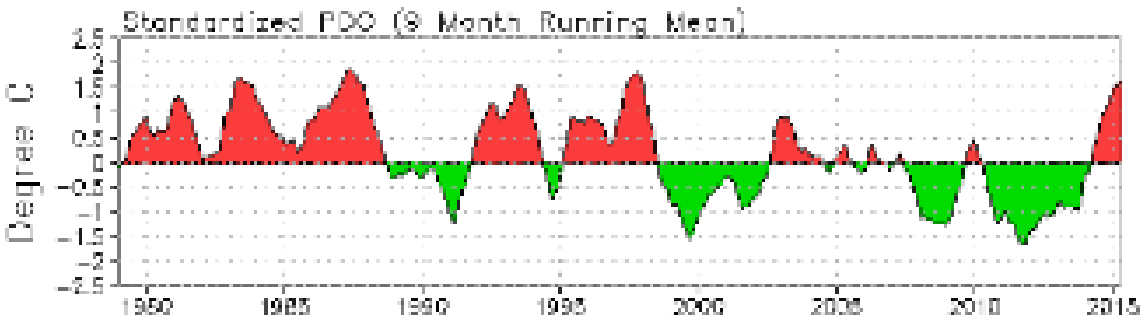
FIG. 2. Average number of hurricane landfalls per year (a) on the East Coast (except Florida), (b) in Florida, (c) along the Gulf Coast (except Florida), and (d) along the entire U.S. coastline from 1900 to 2004 during years classified as cold, neutral, or warm ENSO phases. As an example of how to interpret these averages, approximately one (0.92) landfall occurs per ENSO cold phase vs one landfall for every two ENSO warm phases (0.52) along the Gulf Coast.

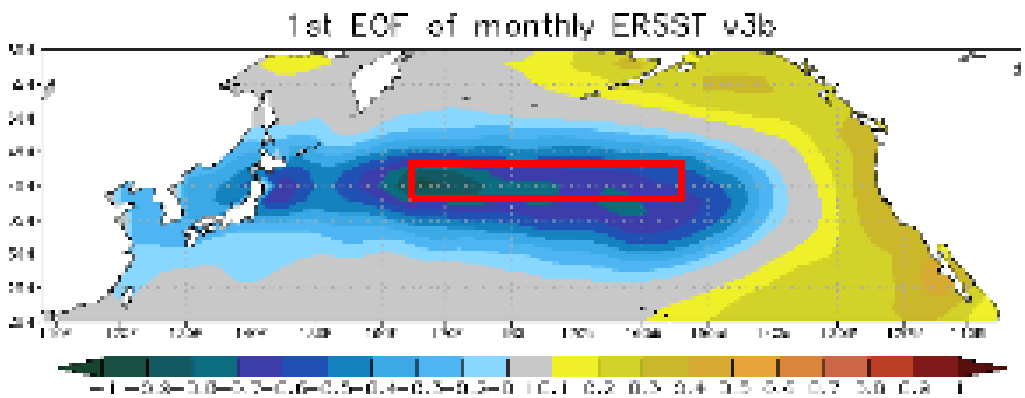
FIG. 3. Average number of major (category 3, 4, or 5) hurricane landfalls per year (a) on the East Coast (except Florida), (b) in Florida, (c) along the Gulf Coast (except Florida), and (d) along the entire U.S. coastline from 1900 to 2004 during years classified as cold, neutral, or warm ENSO phases. Within the 1900–2004 period, there were no occurrences of major hurricane landfalls along the East Coast during ENSO warm phases.

Pacific Decadal Oscillation









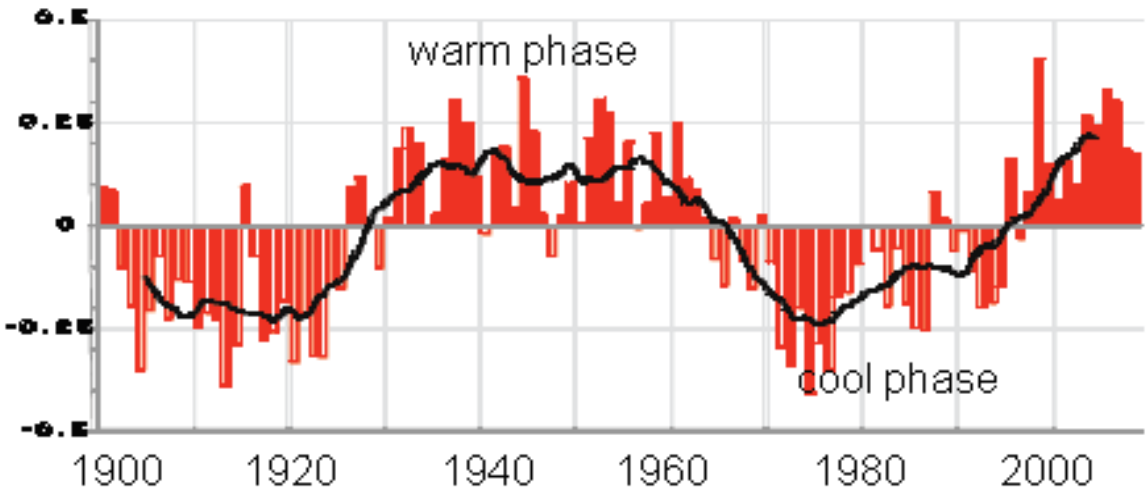
- The positive phase of PDO index has persisted 10 months since Jul 2014 with PDO index =1.3 in Apr 2015.

- Statistically, ENSO leads PDO by 3-4 months, may through atmospheric bridge.

- Pacific Decadal Oscillation is defined as the 1st EOF of monthly ERSST v3b in the North Pacific for the period 1900-1993. PDO index is the standardized projection of the monthly SST anomalies onto the 1st EOF pattern.

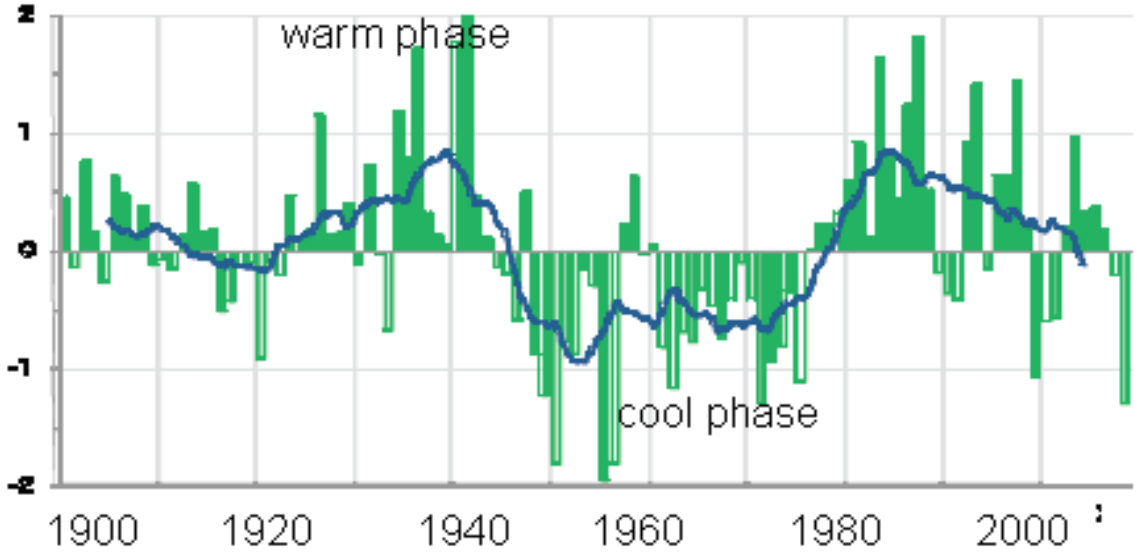
- The PDO index differs slightly from that of JISAO, which uses a blend of UKMET and OIv1 and OIv2 SST.

Time series of multidecadal climate regimes



Atlantic Multidecadal Oscillation (AMO)

In warm phase since 1995

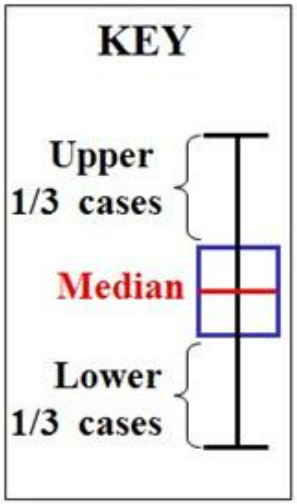


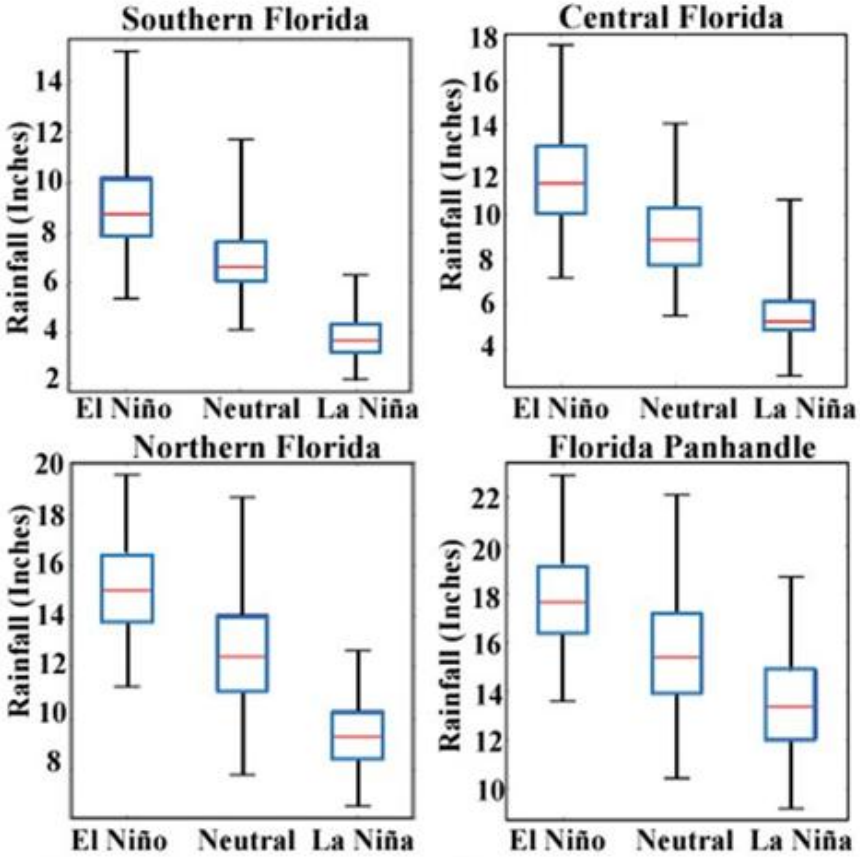
Pacific Decadal Oscillation (PDO)

Just entering cool phase

Figure Courtesy: M. Jelinek

Florida Winter Rainfall (Inches)





Throughout Florida, El Niño, Neutral, and La Niña wintertime rainfall differ dramatically

Atlantic Multidecadal Warm and Cold Phases

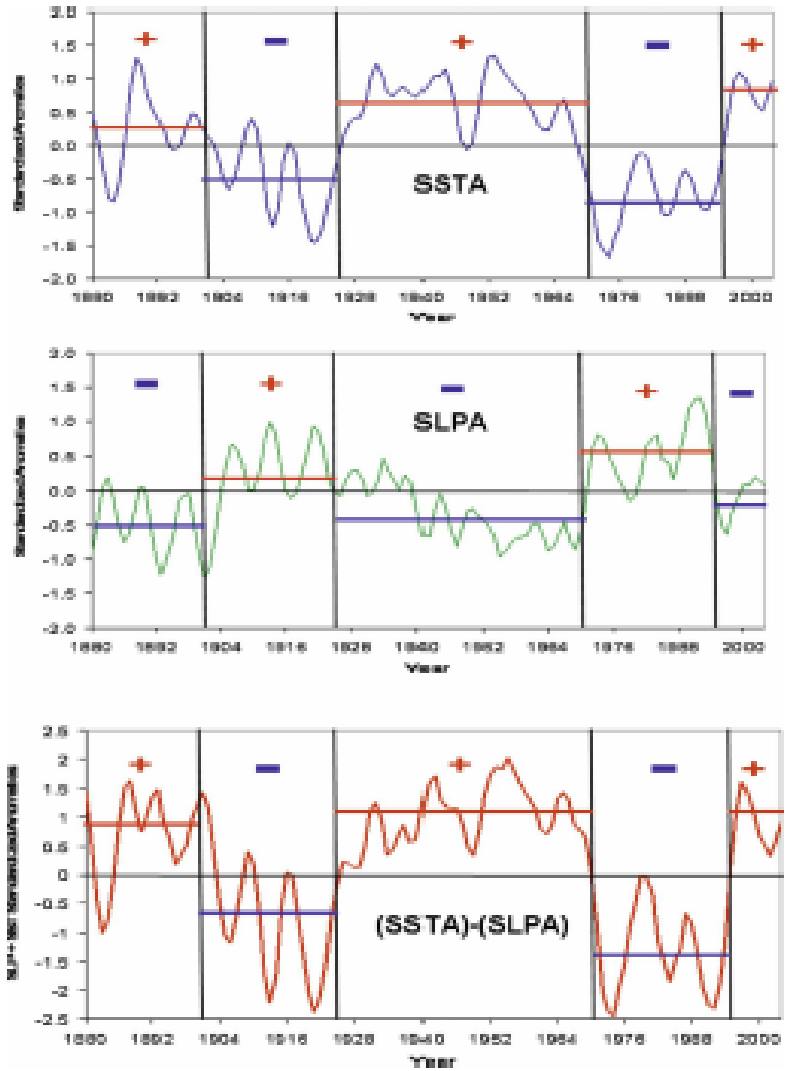


FIG. 1. Standardized values of (top) North Atlantic SSTA for the area from 50°–60°N and from 50°–10°W, (middle) North Atlantic SLPA for the area from 0°–30°N and from 70°–10°W, and (bottom) the combination of these two parameters (SSTA − SLPA) taken to be the strength of the AMO from 1880 to 2004. Horizontal lines indicate average values for the multidecadal period, while (+) and (−) symbols indicate that positive or negative values of the particular index predominated during that period. A 1-2-3-2-1 filter has been applied to the data.

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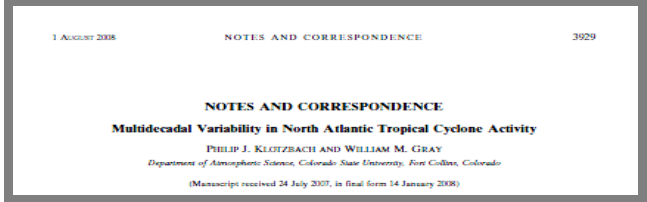

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NOTES AND CORRESPONDENCE

Multidecadal Variability in North Atlantic Tropical Cyclone Activity

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Department of Atmospheric Science, Colorado State University, Fort Collins, Colorado

(Manuscript received 24 July 2007, in final form 14 January 2008)

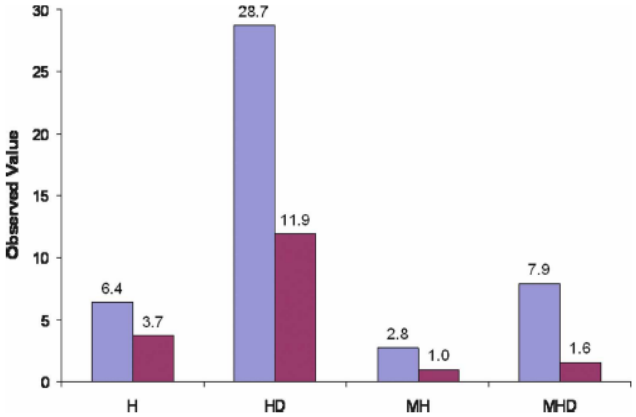
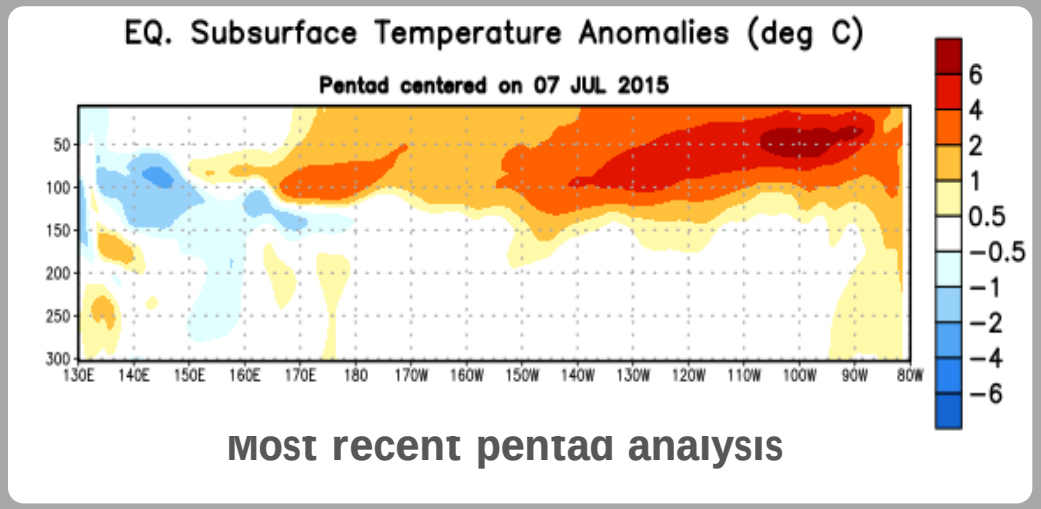


FIG. 2. Annually averaged Atlantic basin H, HD, MH, and MHD for the top 20 AMO years (blue bar) and the bottom 20 AMO years (red bar).

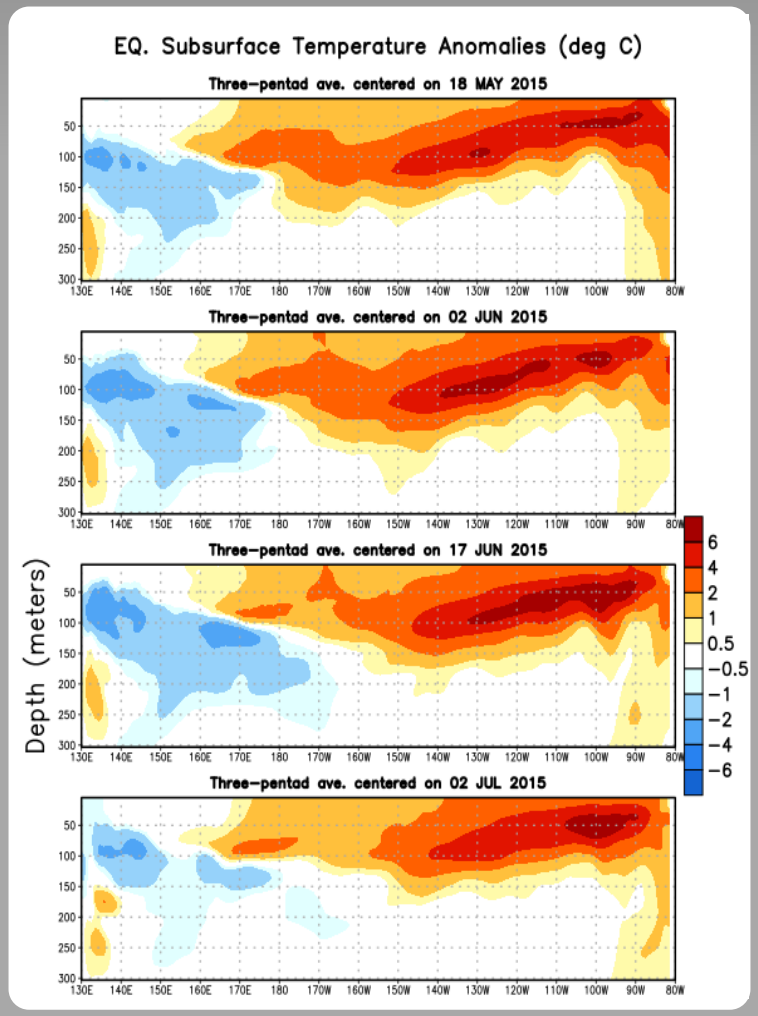
Sub-Surface Temperature Departures in the Equatorial Pacific

During the last two months, positive subsurface temperature anomalies were observed across most of the equatorial Pacific

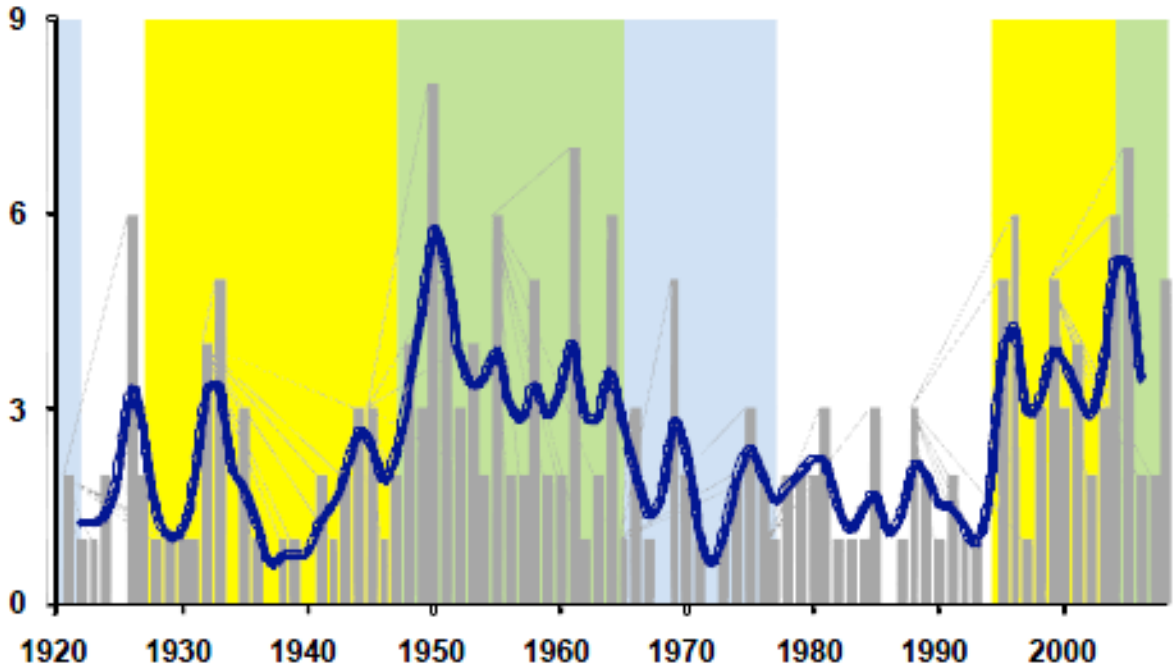


Most recent pentad analysis

Negative anomalies at depth have weakened in the western Pacific.



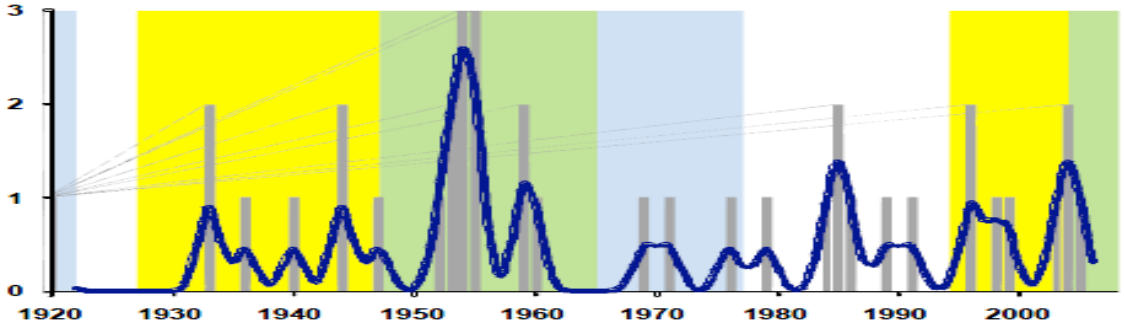
NATL Major Hurricanes



Strong increase in warm AMO, cool PDO

Figure Courtesy: M. Jelinek

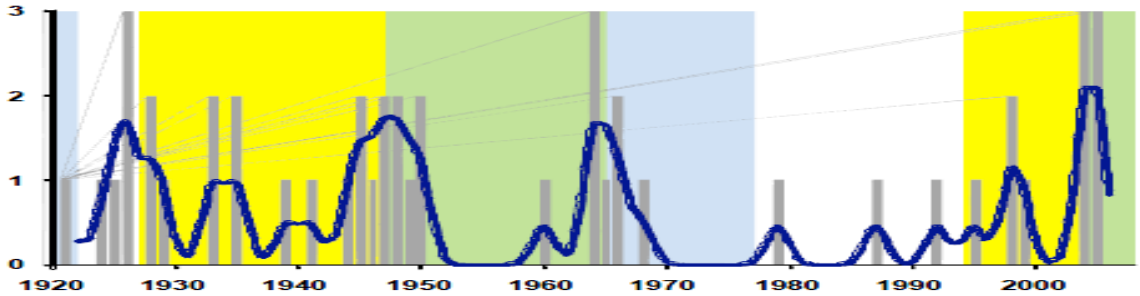
ATL coast landfalling hurricanes



More landfalls in warm AMO, cool PDO

Figure Courtesy: M. Jelinek

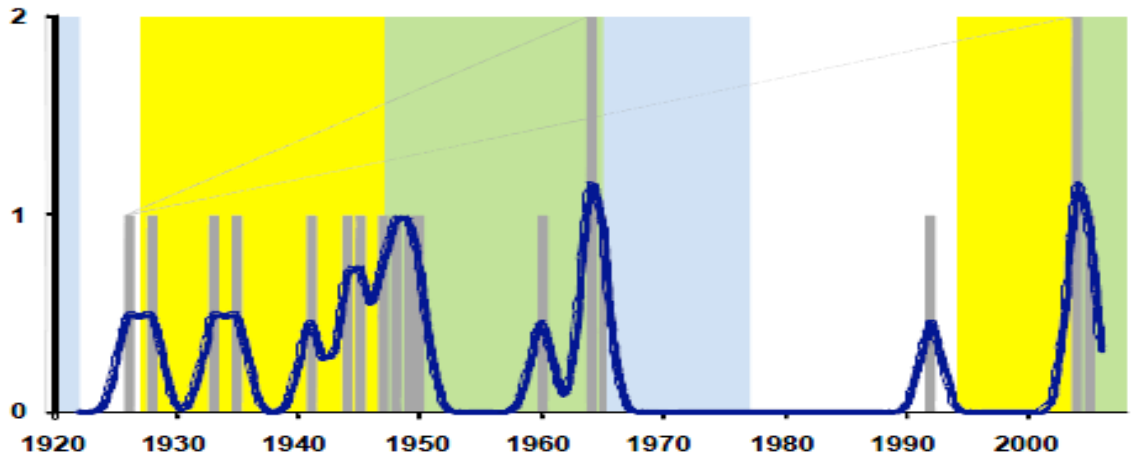
FL Landfalling Hurricanes



More landfalls in warm AMO

Figure Courtesy: M. Jelinek

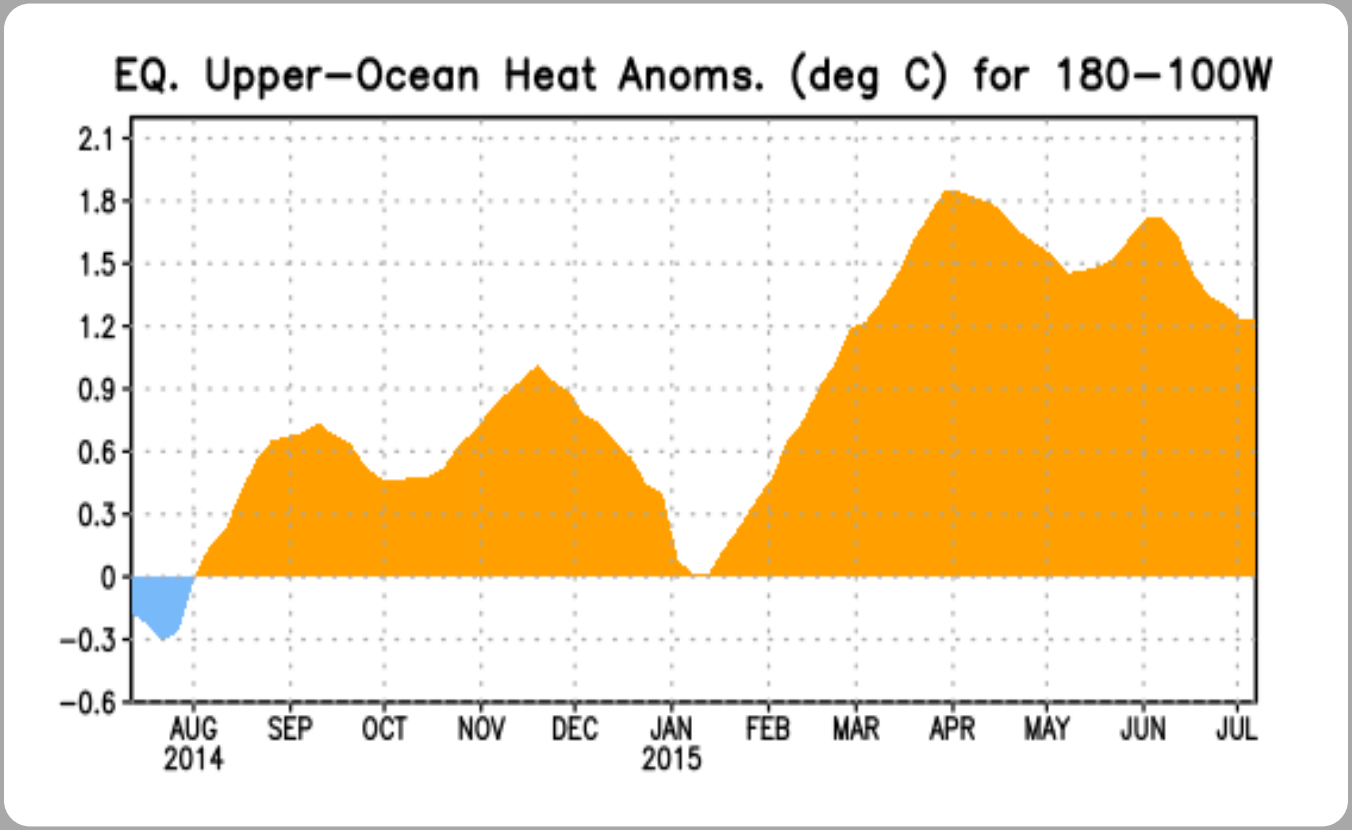
FL Landfalling Major Hurricanes

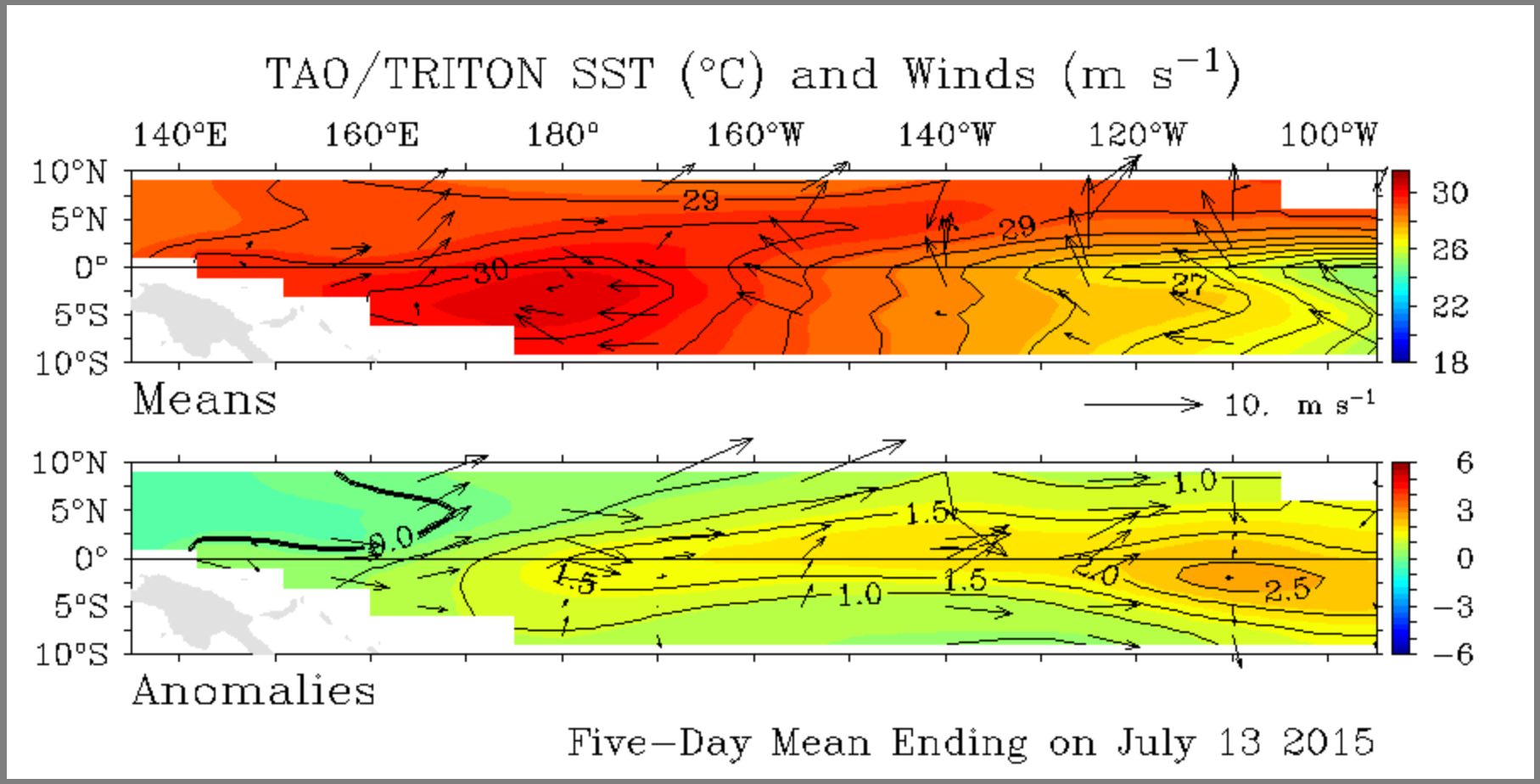


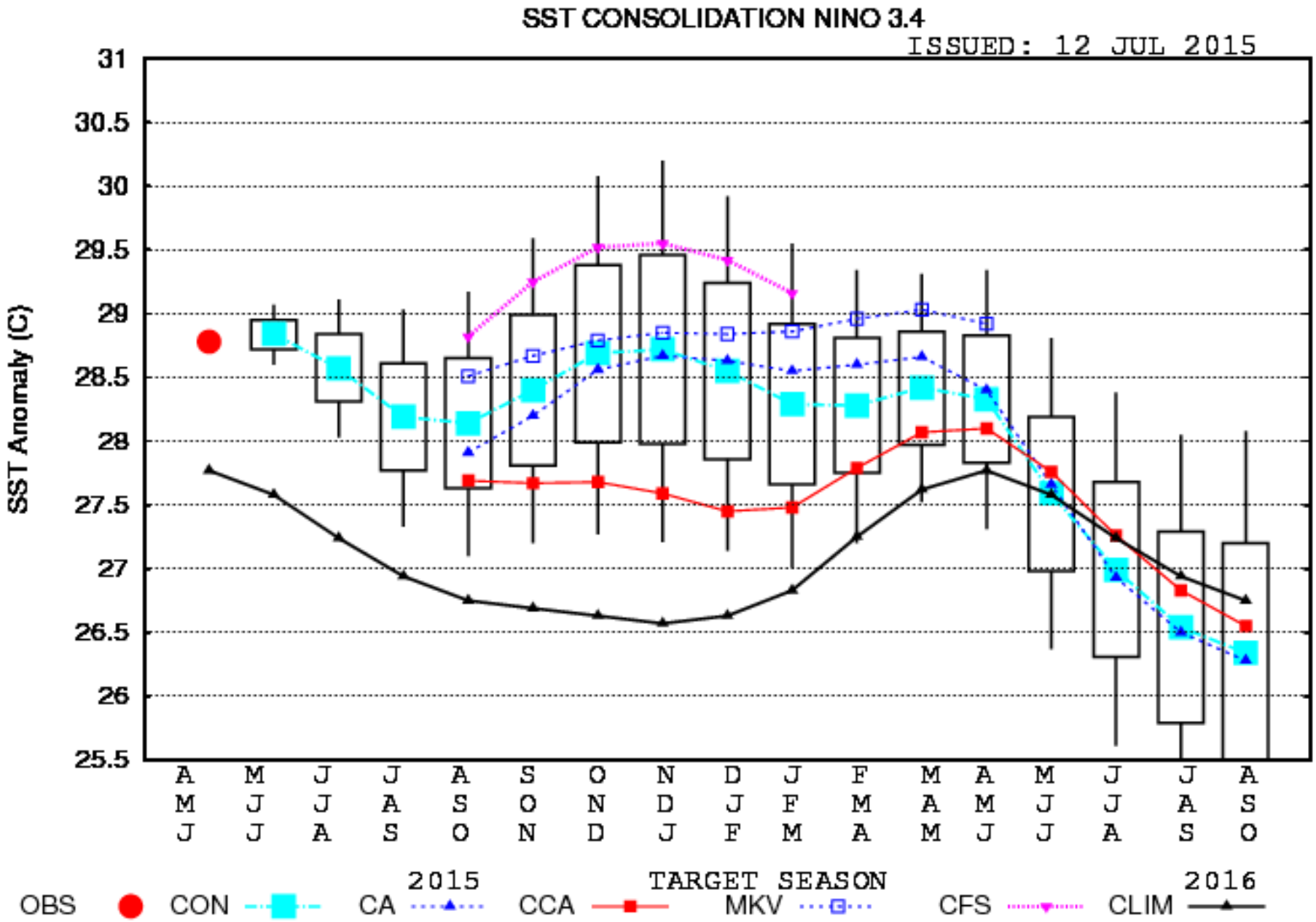
More major landfalls in warm AMO

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

Subsurface temperature anomalies increased from mid-October to mid-November 2014 before decreasing to near zero in early January 2015. Temperature anomalies grew from January to March, decreased during April, and increased during May. During June, anomalies decreased.




TAO/TRITON SST (°C) and Winds (m s^{-1})
140°E
160°E
180°
160°W
140°W
120°W
100°W
10°N
5°N
0°
5°S
10°S
29
30
29
27
30
26
22
18
Means
10. m s^{-1}
0.0
1.5
1.5
1.0
1.5
1.0
2.0
2.5
6
3
0
−3
−6
Anomalies
Five−Day Mean Ending on July 13 2015


SST CONSOLIDATION NINO 3.4
ISSUED: 12 JUL 2015
SST Anomaly (C)
31
30.5
30
29.5
29
28.5
28
27.5
27
26.5
26
25.5
A M J
M J J
J J A
J A S
A S O
S O N
O N D
N D J
D J F
J F M
F M A
M A M
A M J
M J J
J J A
J A S
A S O
2015
TARGET SEASON
2016
OBS
CON
CA
CCA
MKV
CFS
CLIM

Historical El Niño and La Niña Episodes Based on the ONI computed using ERSST.v4

Recent Pacific warm (red) and cold (blue) periods based on a threshold of +/- 0.5 °C for the Oceanic Nino Index (ONI) [3 month running mean of ERSST.v4 SST anomalies in the Nino 3.4 region (5N-5S, 120-170W)]. For historical purposes, periods of below and above normal SSTs are colored in blue and red when the threshold is met for a minimum of 5 consecutive over-lapping seasons.

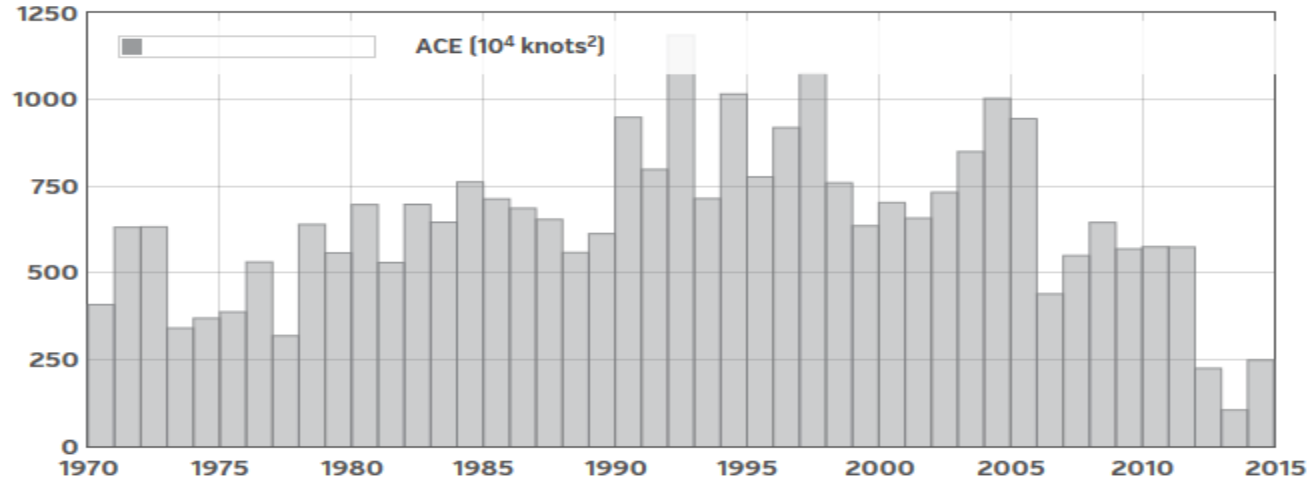
The ONI is one measure of the El Niño-Southern Oscillation, and other indices can confirm whether features consistent with a coupled ocean-atmosphere phenomenon accompanied these periods. The complete table going back to DJF 1950 can be found here.

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2003	0.9	0.6	0.4	0.0	-0.2	-0.1	0.1	0.2	0.3	0.4	0.4	0.4
2004	0.3	0.2	0.1	0.1	0.2	0.3	0.5	0.7	0.7	0.7	0.7	0.7
2005	0.6	0.6	0.5	0.5	0.4	0.2	0.1	0.0	0.0	-0.1	-0.4	-0.7
2006	-0.7	-0.6	-0.4	-0.2	0.0	0.1	0.2	0.3	0.5	0.8	0.9	1.0
2007	0.7	0.3	0.0	-0.1	-0.2	-0.2	-0.3	-0.6	-0.8	-1.1	-1.2	-1.3
2008	-1.4	-1.3	-1.1	-0.9	-0.7	-0.5	-0.3	-0.2	-0.2	-0.3	-0.5	-0.7
2009	-0.8	-0.7	-0.4	-0.1	0.2	0.4	0.5	0.6	0.7	1.0	1.2	1.3
2010	1.3	1.1	0.8	0.5	0.0	-0.4	-0.8	-1.1	-1.3	-1.4	-1.3	-1.4
2011	-1.3	-1.1	-0.8	-0.6	-0.3	-0.2	-0.3	-0.5	-0.7	-0.9	-0.9	-0.8
2012	-0.7	-0.6	-0.5	-0.4	-0.3	-0.1	0.1	0.3	0.4	0.4	0.2	-0.2
2013	-0.4	-0.5	-0.3	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.3
2014	-0.5	-0.6	-0.4	-0.2	0.0	0.0	0.0	0.0	0.2	0.4	0.6	0.6
2015	0.5	0.4	0.5	0.7	0.9							

Accumulated Cyclone Energy (ACE)

Atlantic | East Pacific | West Pacific | Indian Ocean | Southern Hemisphere | **Global**

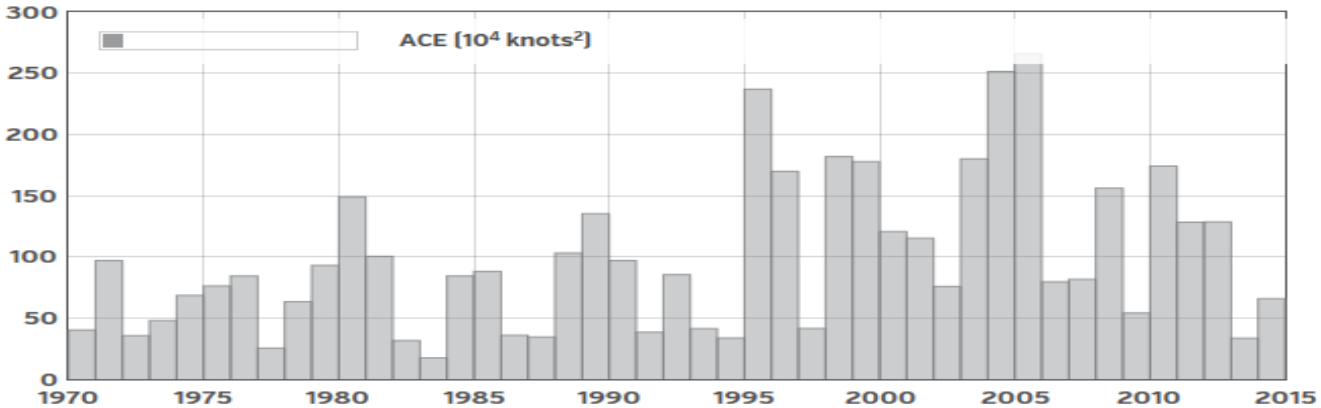
Updated: February 13, 2015



Accumulated Cyclone Energy (ACE)

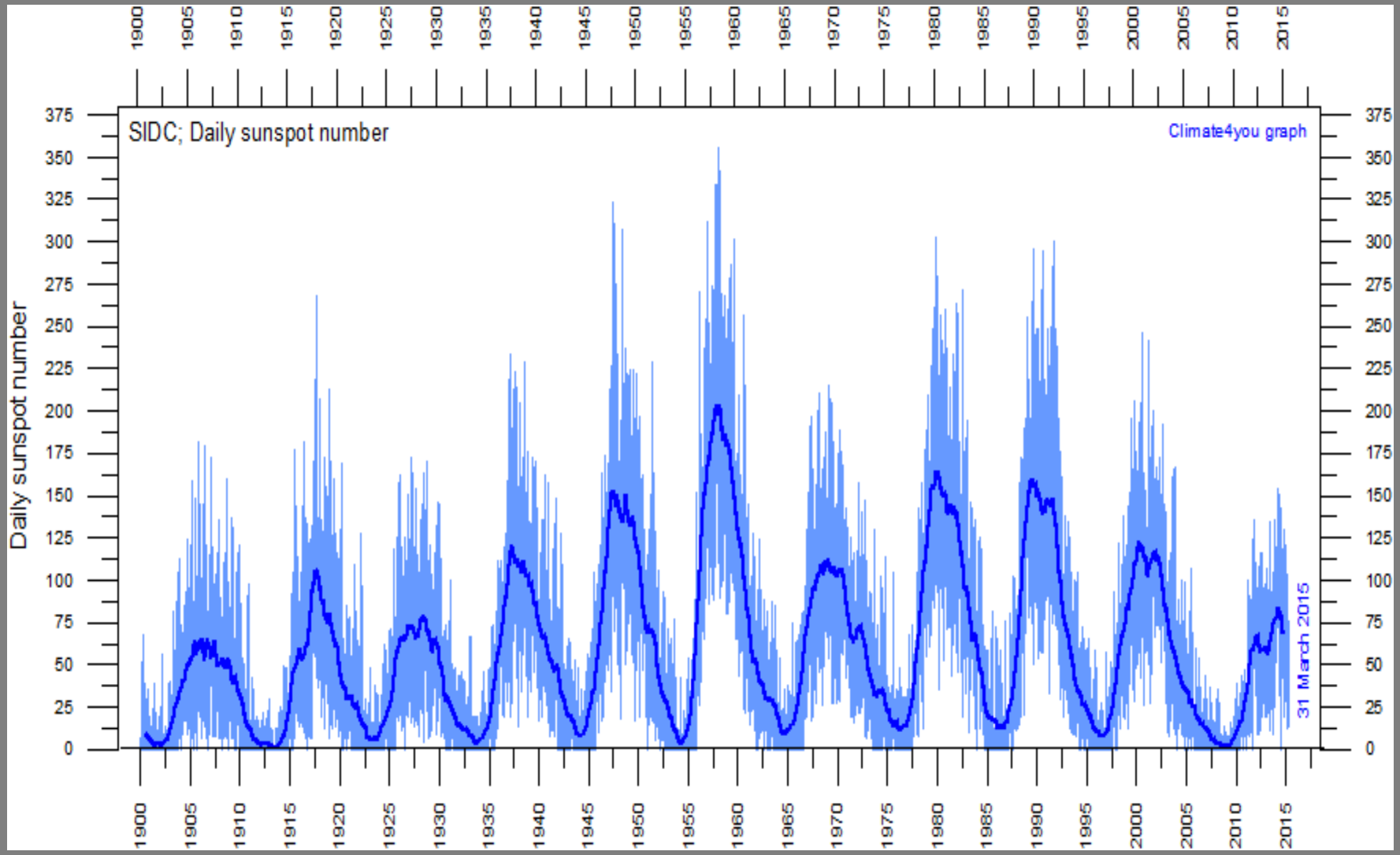
Atlantic | East Pacific | West Pacific | Indian Ocean | Southern Hemisphere

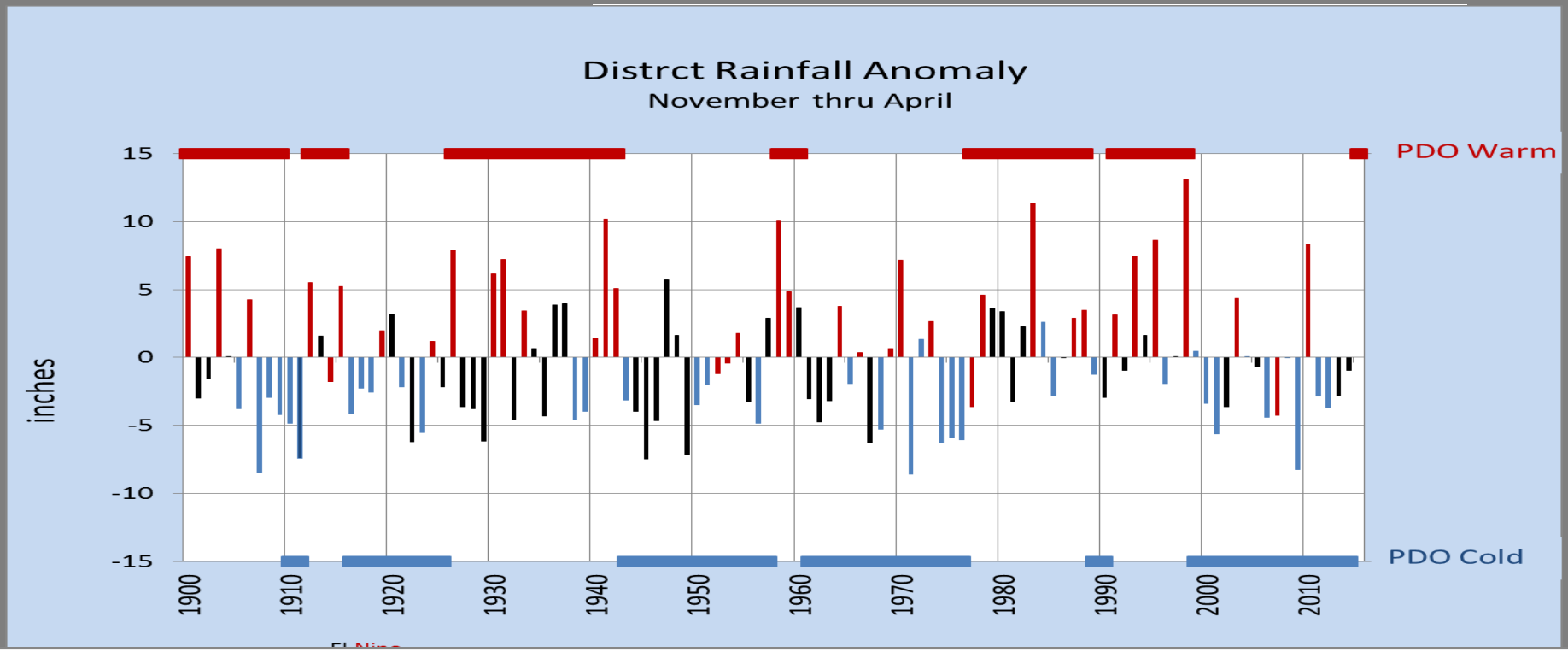
Updated: February 13, 2015

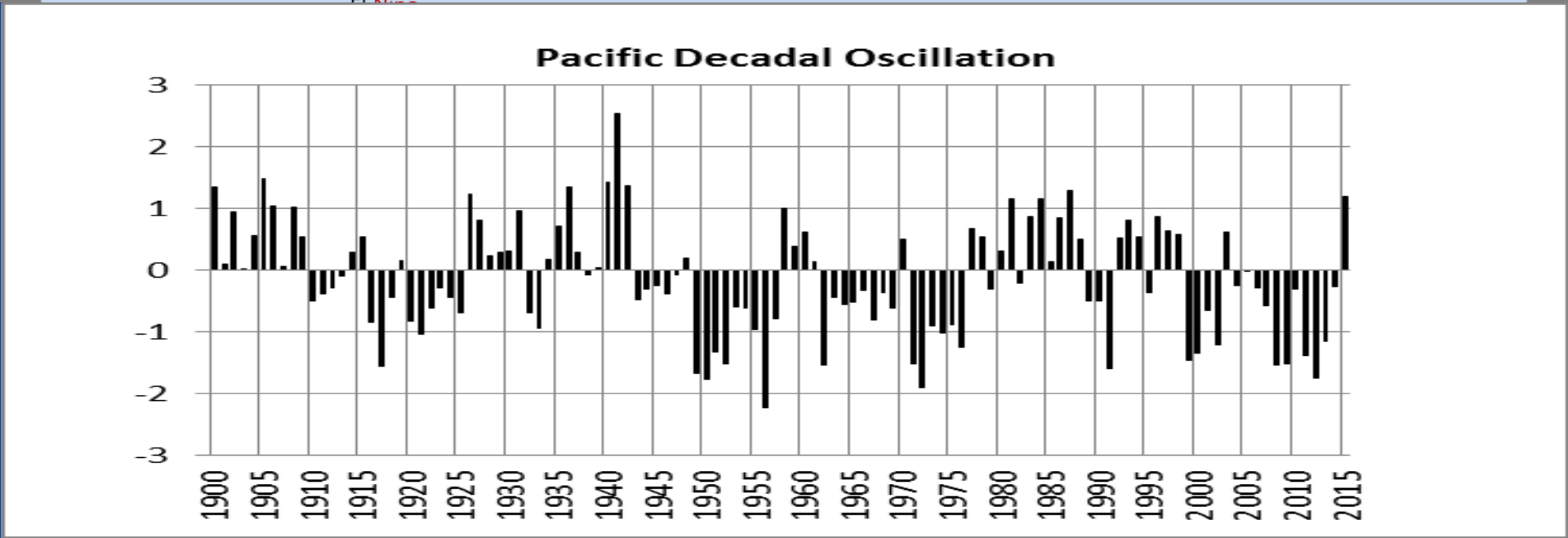


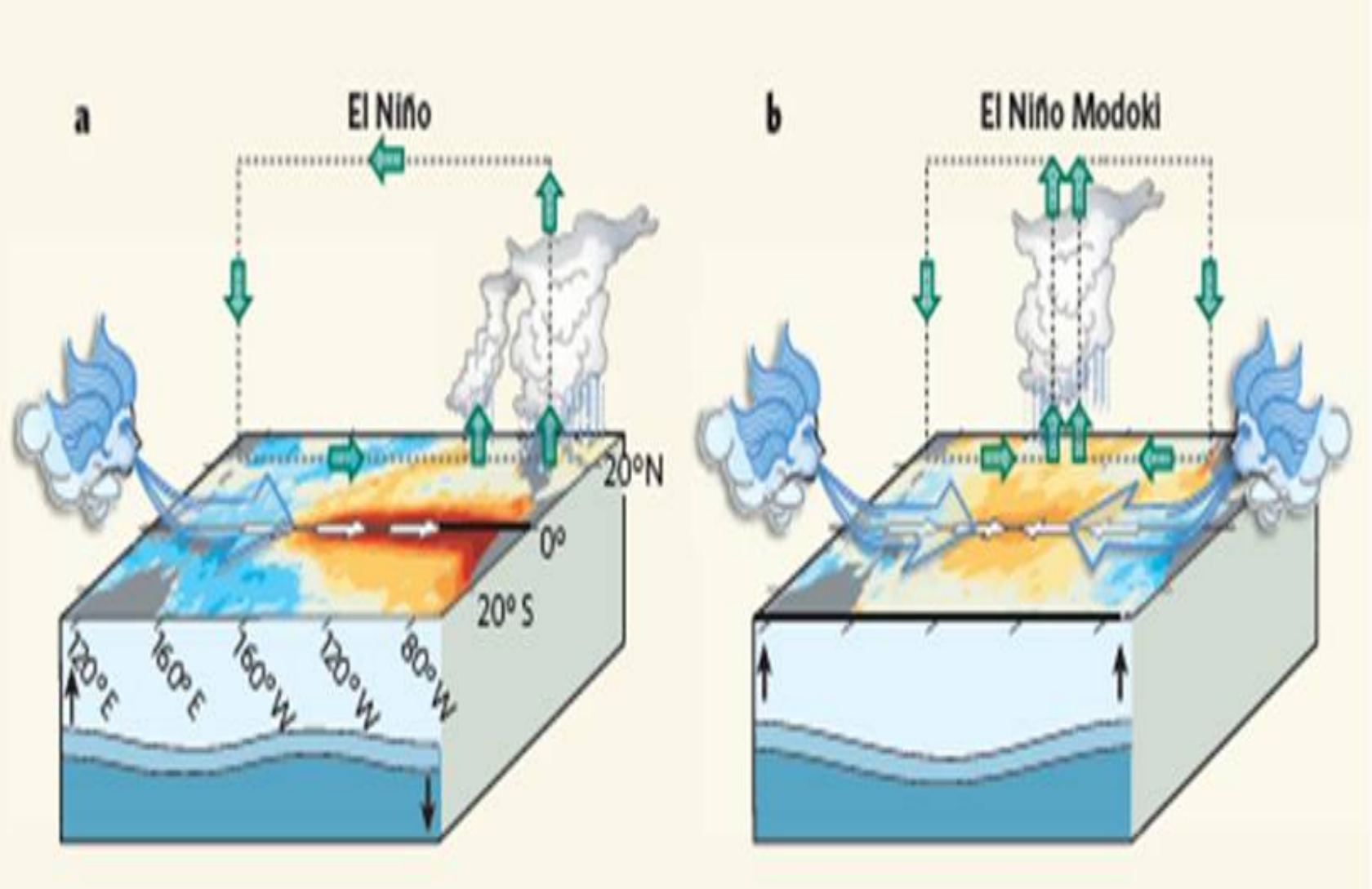
Average year: 110
2015 year-to-date: 0

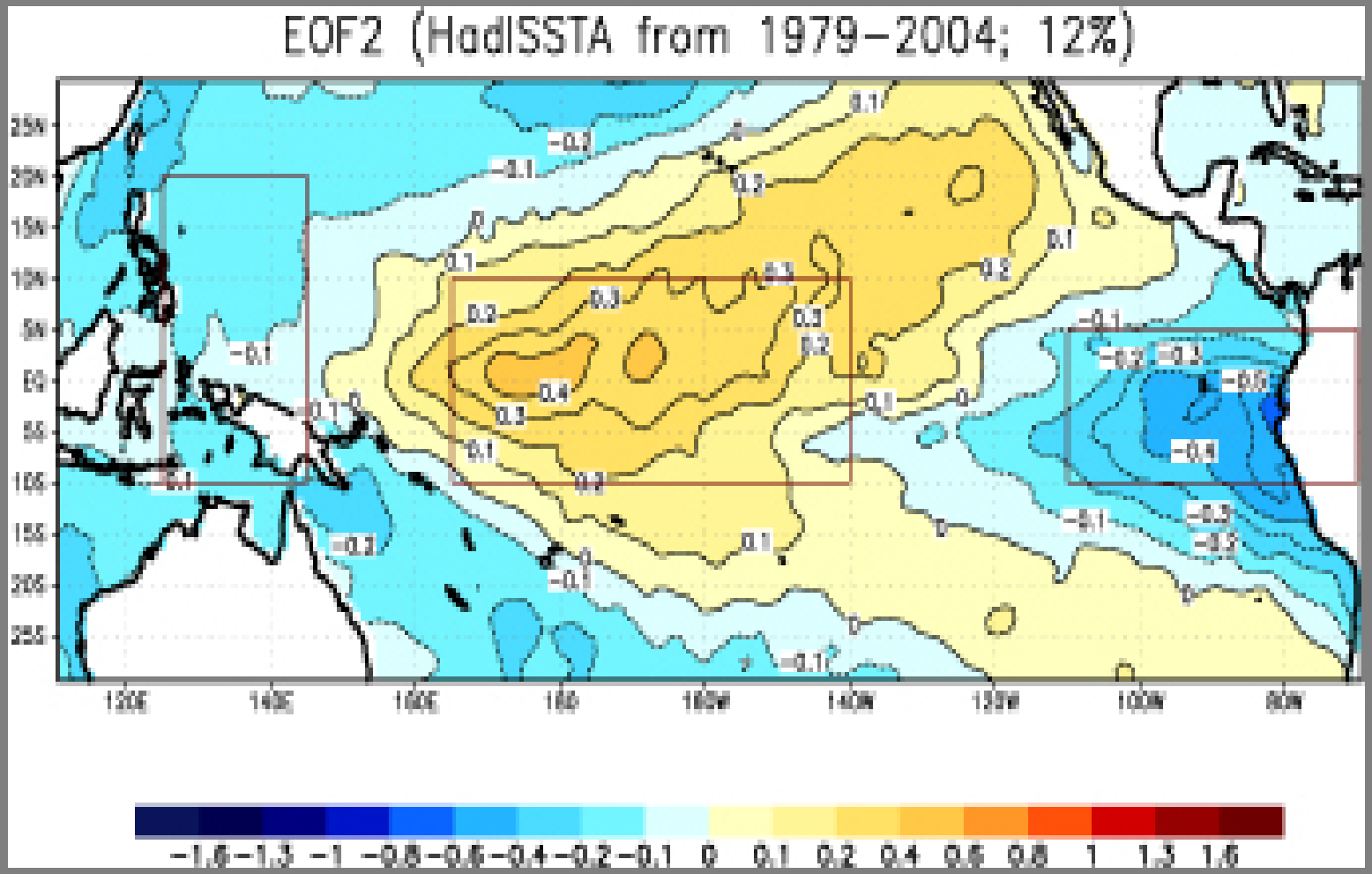
Sunspot Number




Distrct Rainfall Anomaly
November thru April
inches
15
10
5
0
-5
-10
-15
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
PDO Warm
PDO Cold


Pacific Decadal Oscillation
3
2
1
0
-1
-2
-3
1900
1905
1910
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015


a
El Niño
20°N
0°
20° S
120° E
160° E
160° W
120° W
80° W
b
El Niño Modoki


EOF2 (HadISSTA from 1979–2004; 12%)
25N
20N
15N
10N
5N
EQ
5S
10S
15S
20S
25S
120E
140E
160E
180
160W
140W
120W
100W
80W
−1.6 −1.3 −1 −0.8 −0.6 −0.4 −0.2 −0.1 0 0.1 0.2 0.4 0.6 0.8 1 1.3 1.6