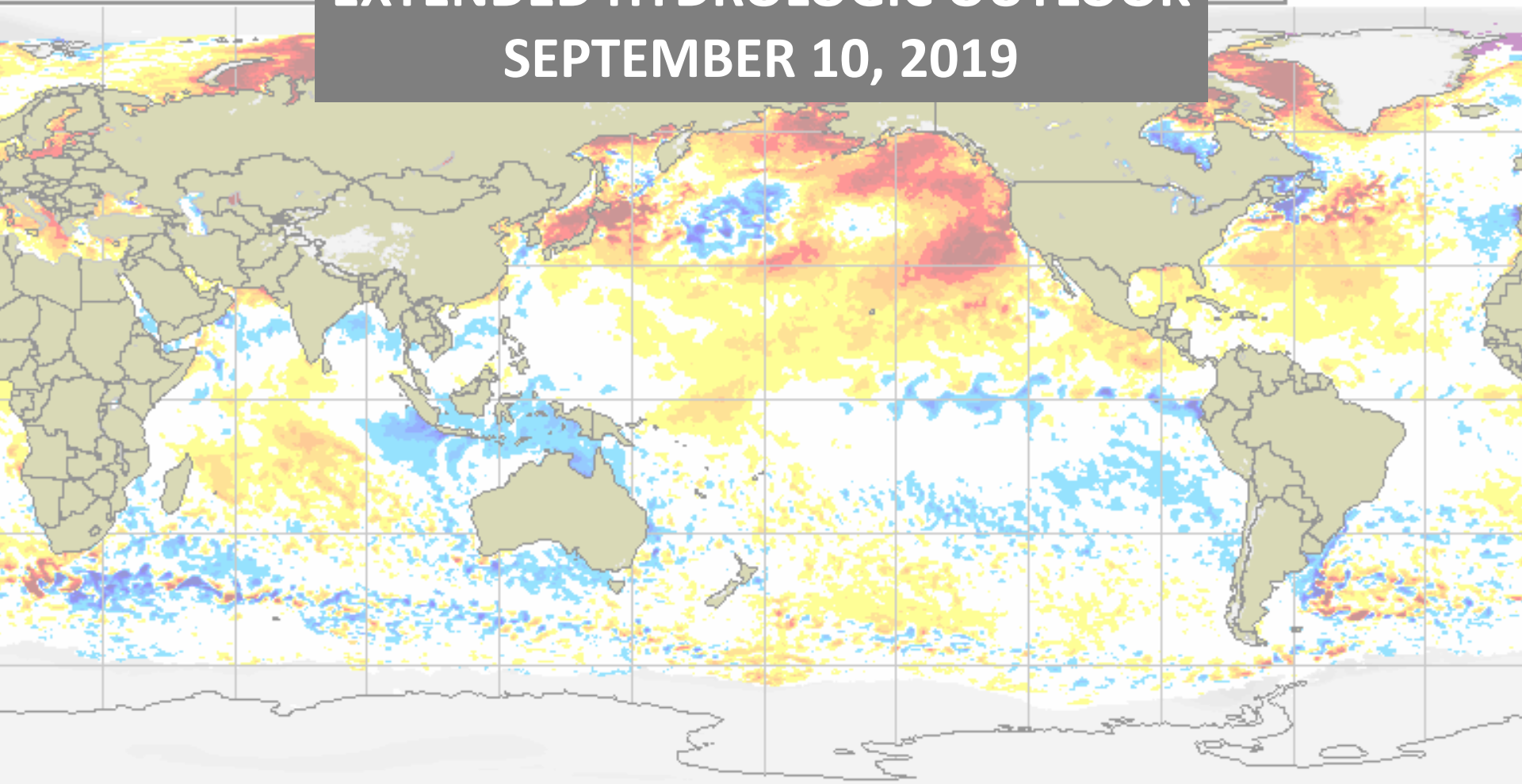
EXTENDED HYDROLOGIC OUTLOOK
SEPTEMBER 10, 2019



Sea surface temperature anomaly / Anomalie de la température de la mer (C)

-3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0

Snow depth / Épaisseur de la neige (cm)

1.0 10.0 50.0 100.0

Uncovered sea ice
Glace marine à découvert

Climatologie 1995-2009 Climatology

CMC Environnement Canada
CMC Environment Canada

Summary

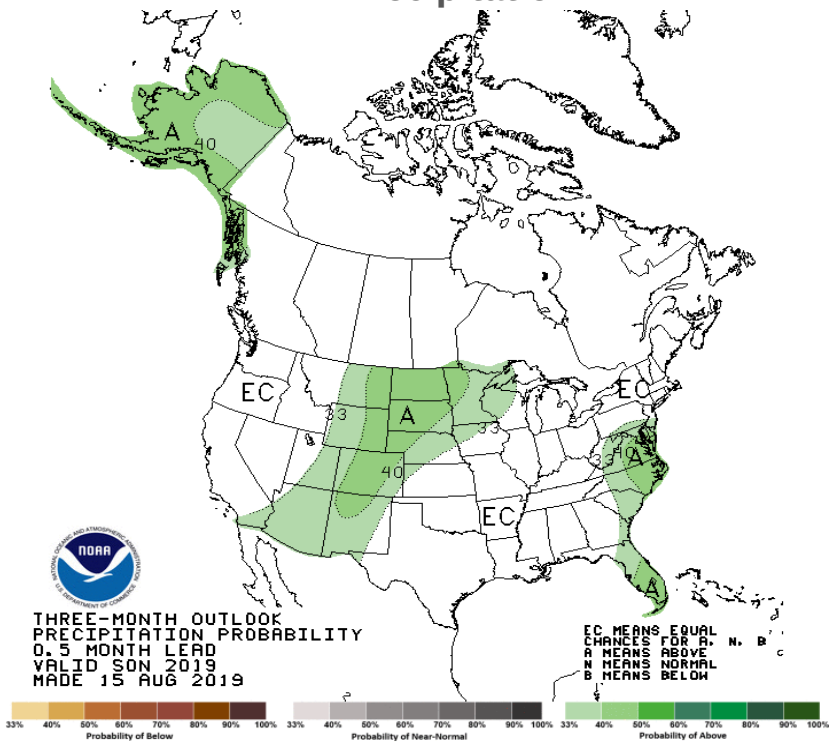
- The Climate Prediction Center (CPC) is forecasting above normal rainfall for September through November.
- El Niño has transitioned to ENSO-neutral, which is most likely to continue through winter 2019-20 (50-55% chance). El Niño increases the chances of a wetter-than-normal dry season and decreases the potential for tropical storm activity from the Main Development Region in the Atlantic Ocean.
- Monitoring Atlantic Multidecadal Oscillation (AMO) which is currently in the warm phase
  - Average annual inflow to Lake Okeechobee is nearly 50% greater during the warm phase compared to the cold phase

U. S. Seasonal Outlooks

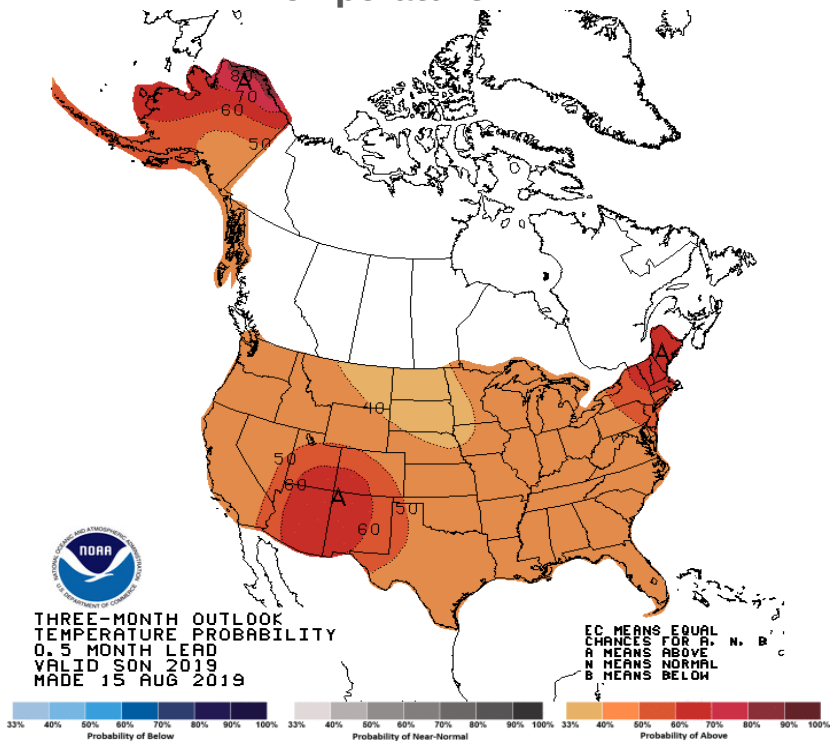
September-November 2019

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

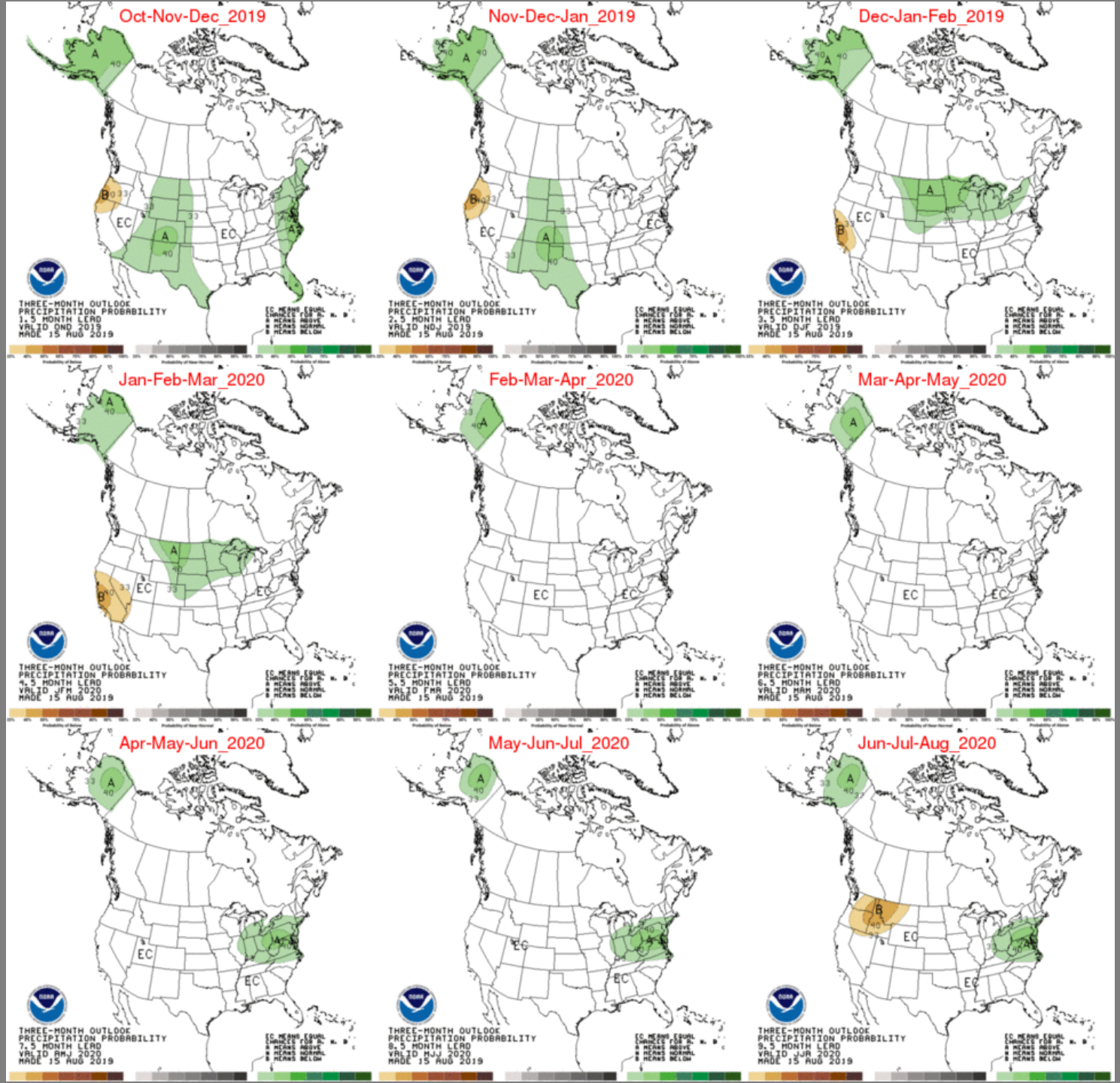
Precipitation



Temperature



Prepared by: Climate Prediction Center/NCEP



Prepared by: Climate Prediction Center/NCEP

Teleconnections to South Florida

Climate anomalies being related to each other at large distances:

El Niño Southern Oscillation (ENSO)

- South Florida dry season (November through May) rainfall is positively correlated with El Niño which has a frequency that ranges between 3 to 7 years while rainfall is negatively correlated with La Niña November through March with a potential increase in tropical rainfall during La Niña

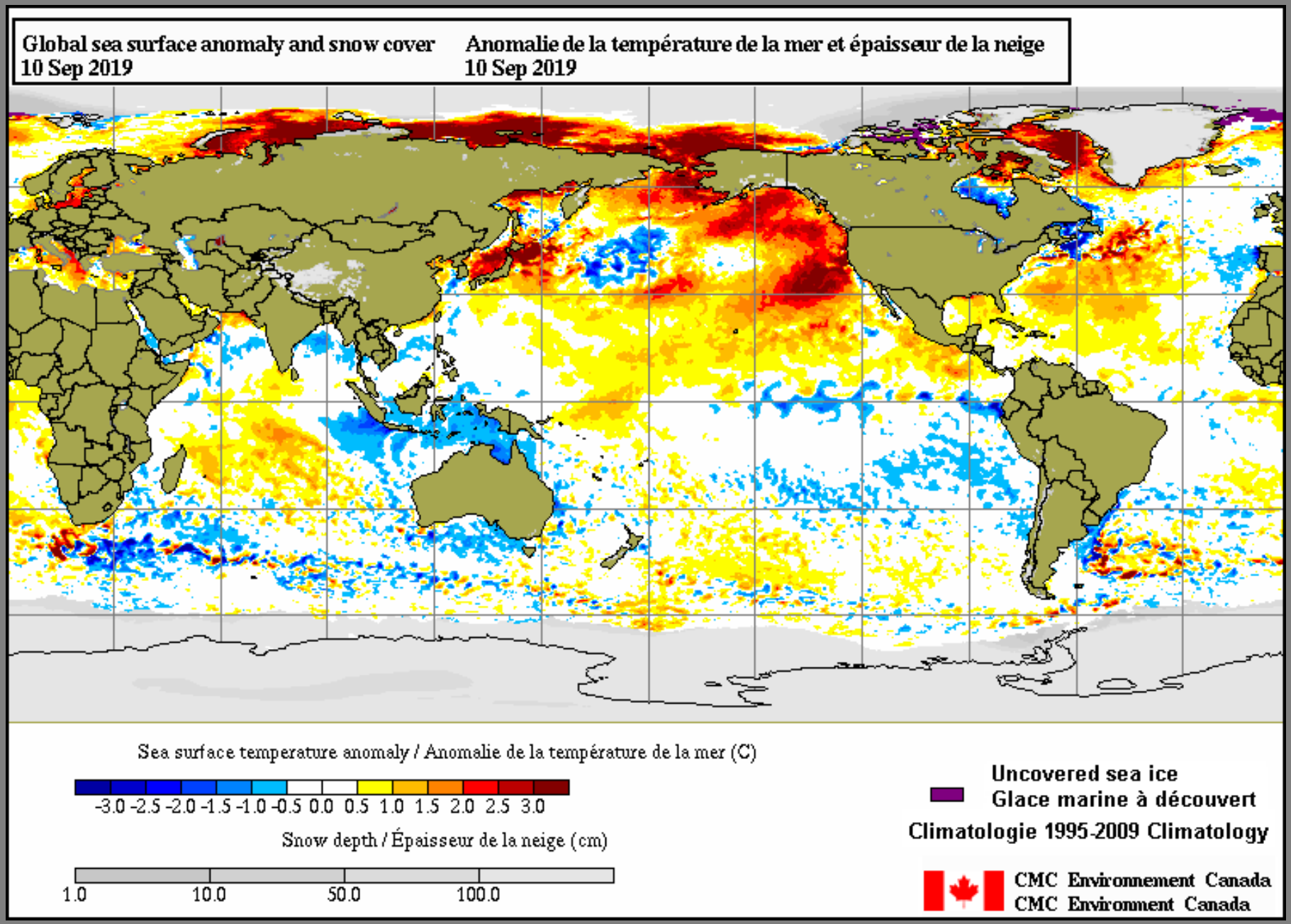
Atlantic Multidecadal Oscillation (AMO)

- Average annual inflow to Lake Okeechobee is nearly 50% greater during the warm phase compared to the cold phase of the AMO, easterly flow toward south Florida affected by phase

Pacific Decadal Oscillation (PDO)

- Increases variations of south Florida dry season rainfall

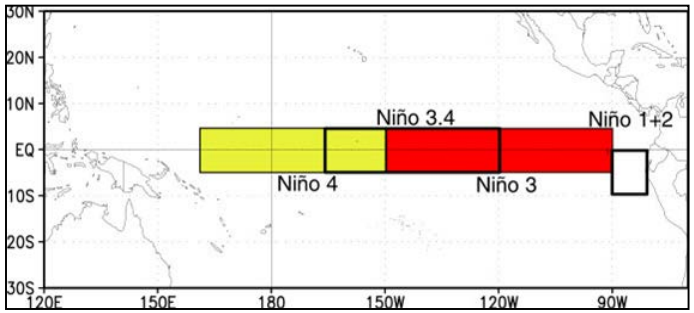
Current Global Sea Surface Temperature Anomalies

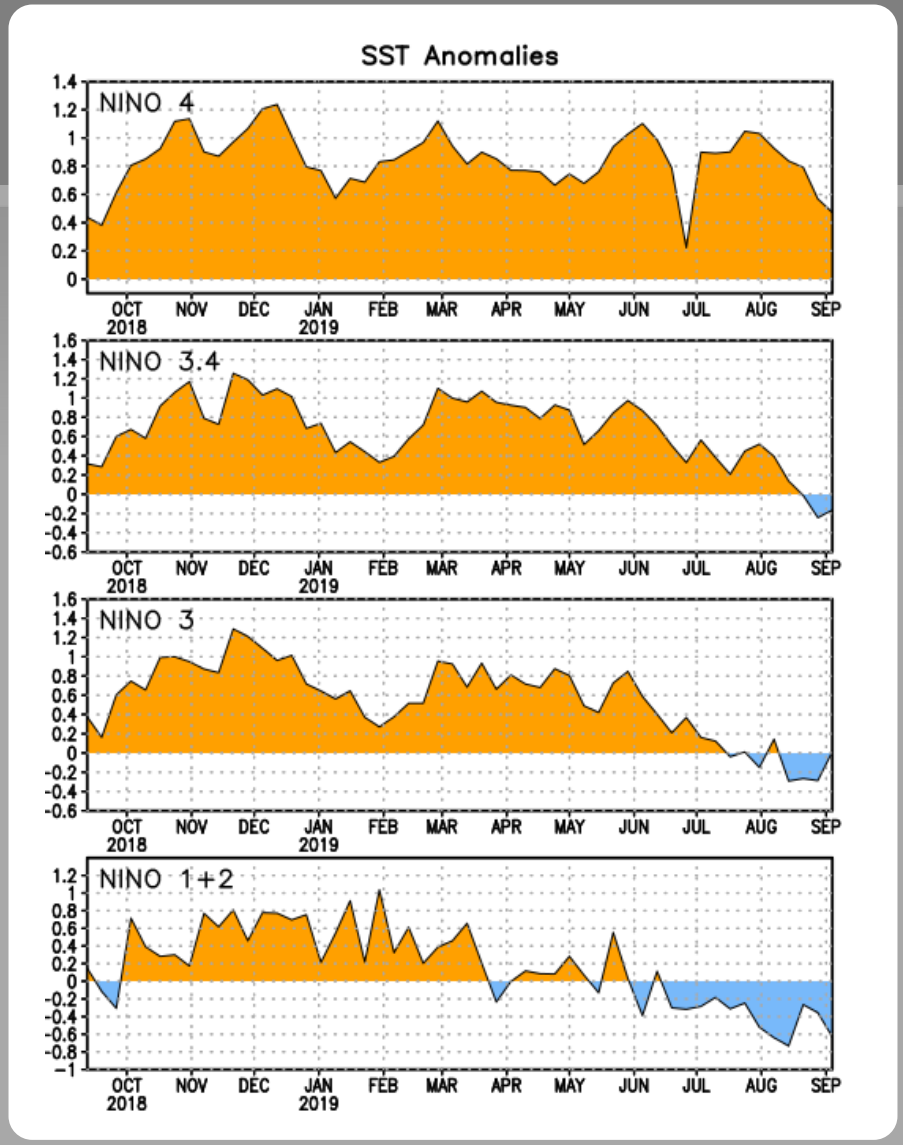


Niño Region SST Departures (ºC) Recent Evolution

The latest weekly SST departures are:

Niño 4	0.5ºC
Niño 3.4	-0.2ºC
Niño 3	0.0ºC
Niño 1+2	-0.6ºC





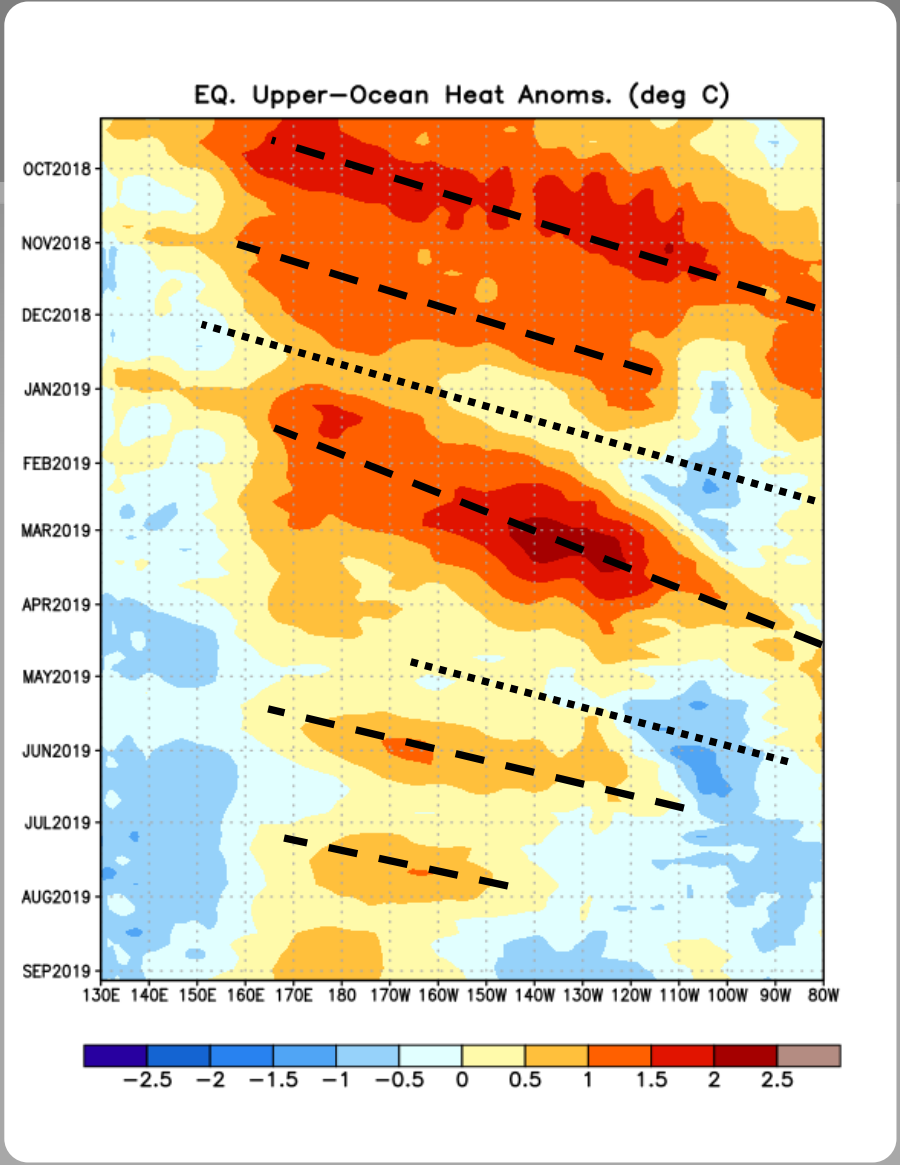
Prepared by: Climate Prediction Center/NCEP

Weekly Heat Content Evolution in the Equatorial Pacific

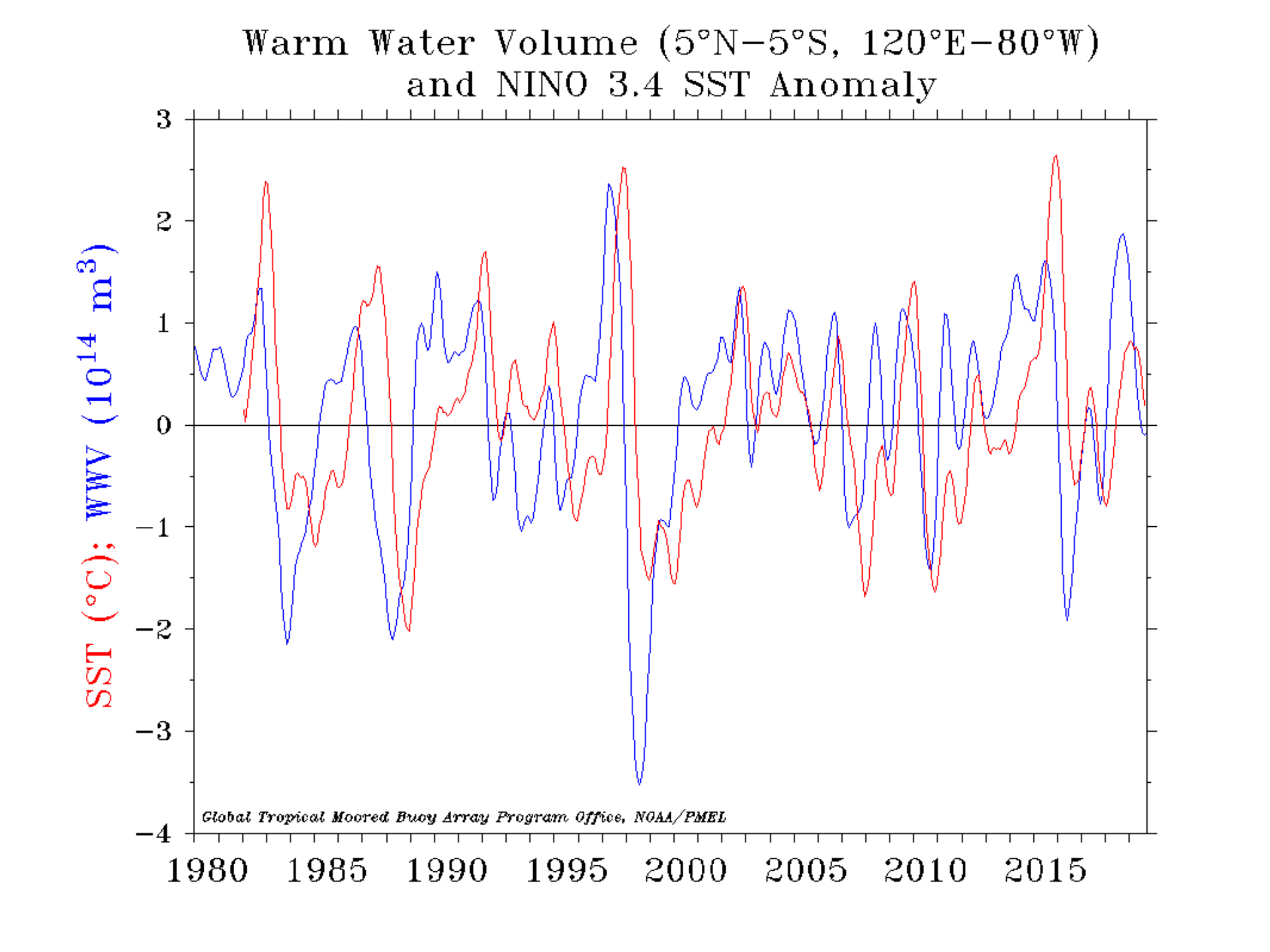
In October, November 2018, and in January-March 2019, positive subsurface temperature anomalies increased, partly due to downwelling Kelvin waves.

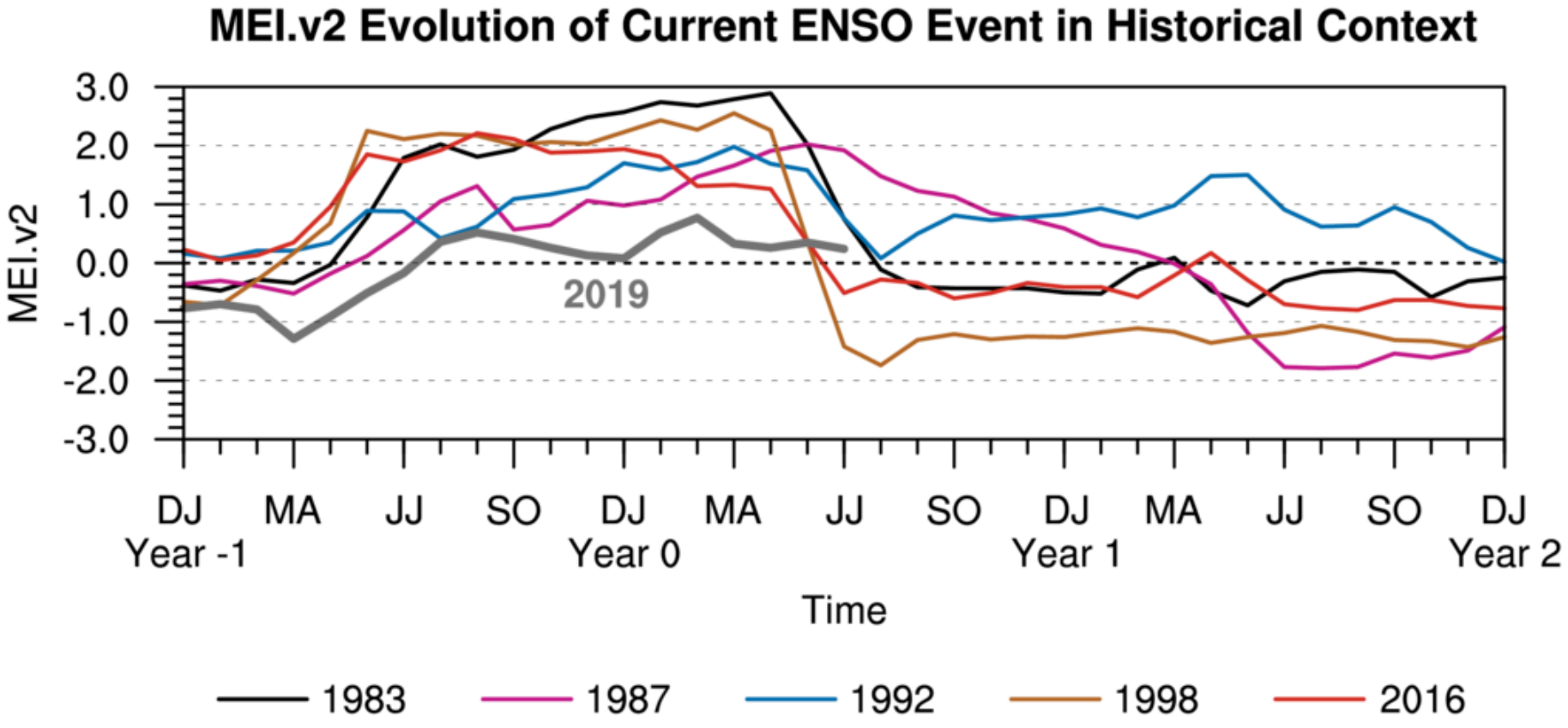
During May 2019, an upwelling Kelvin wave contributed to a reduction of positive subsurface temperature anomalies and the emergence of negative anomalies around 110°-90°W.

Since July, negative subsurface temperature anomalies expanded westward from the eastern Pacific. Positive anomalies have remained in the central Pacific.



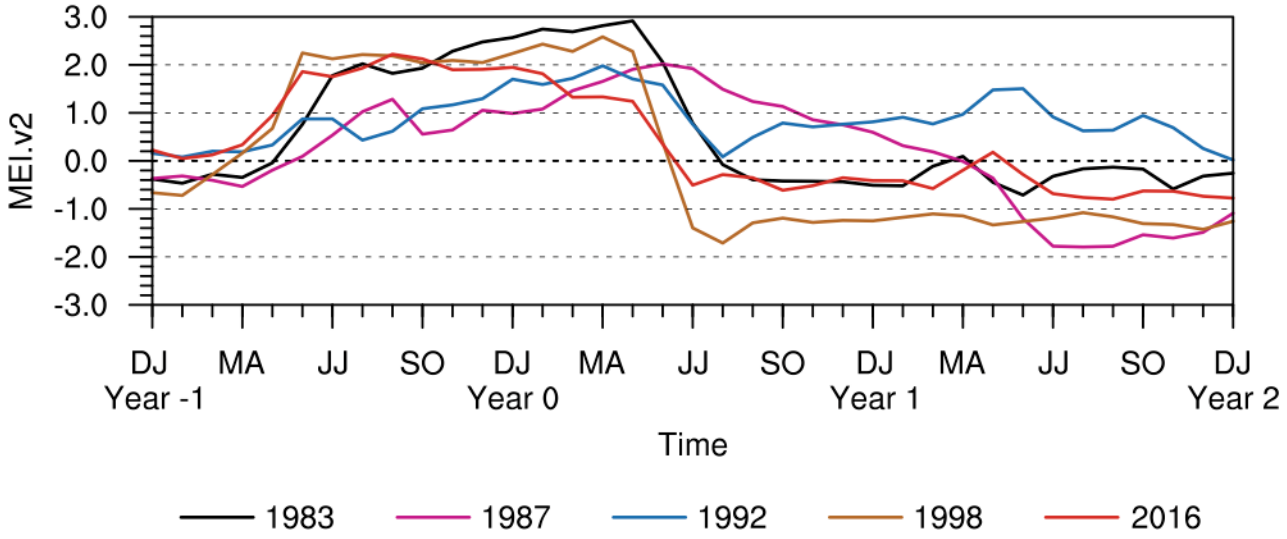
Equatorial oceanic Kelvin waves have alternating warm and cold phases. The warm phase is indicated by dashed lines. Down-welling and warming occur in the leading portion of a Kelvin wave, and up-welling and cooling occur in the trailing portion.


Warm Water Volume (5°N–5°S, 120°E–80°W)
and NINO 3.4 SST Anomaly
SST (°C); WWV (10^{14} m^3)
3
2
1
0
−1
−2
−3
−4
1980
1985
1990
1995
2000
2005
2010
2015
Global Tropical Moored Buoy Array Program Office, NOAA/PMEL

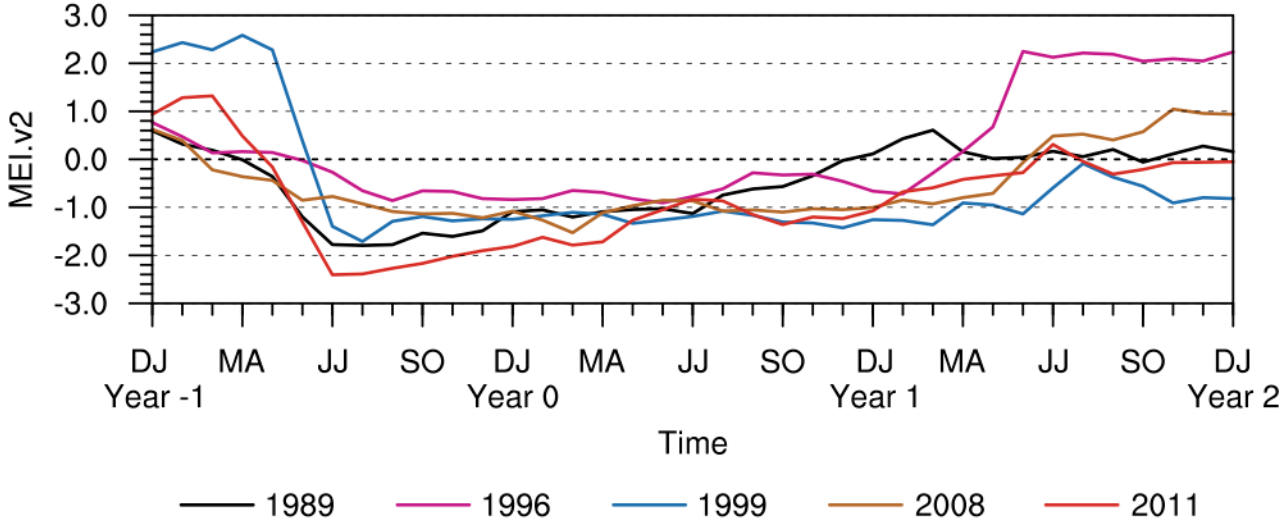

MEI.v2 Evolution of Current ENSO Event in Historical Context
MEI.v2
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
2019
DJ
MA
JJ
SO
DJ
MA
JJ
SO
DJ
MA
JJ
SO
DJ
Year -1
Year 0
Year 1
Year 2
Time
1983
1987
1992
1998
2016

MEI.v2 Evolution of Historical ENSO Events

(a) El Niño

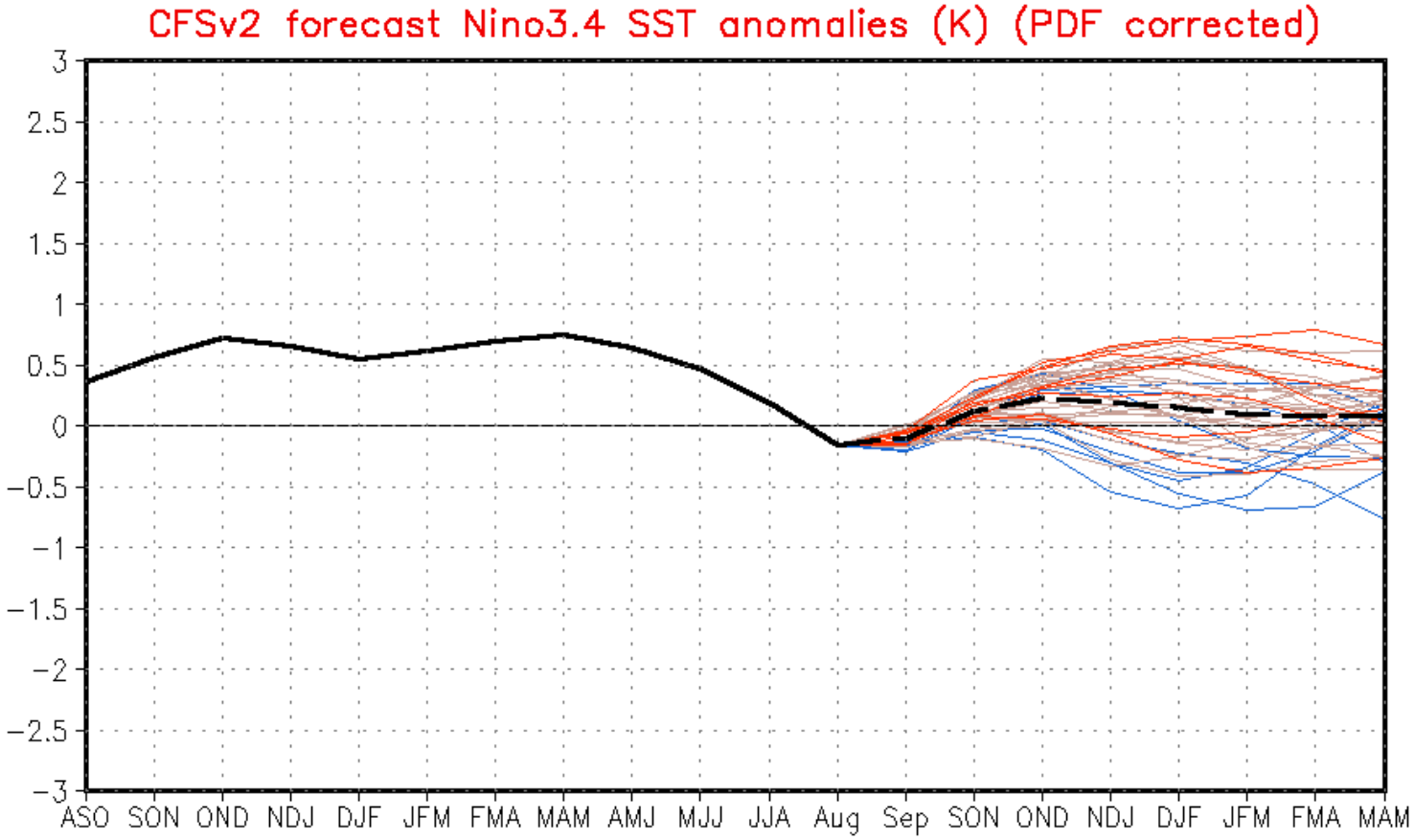


(b) La Niña



NWS/NCEP/CPC

Last update: Tue Sep 10 2019
Initial conditions: 30Aug2019–8Sep2019



IRI/CPC Pacific Niño 3.4 SST Model Outlook

The average of the dynamical models (thick red line) predicts ENSO-neutral through Northern Hemisphere winter 2019-20.

The average of the statistical models (thick green line) predicts a weak El Niño through the Northern Hemisphere winter 2019-20.

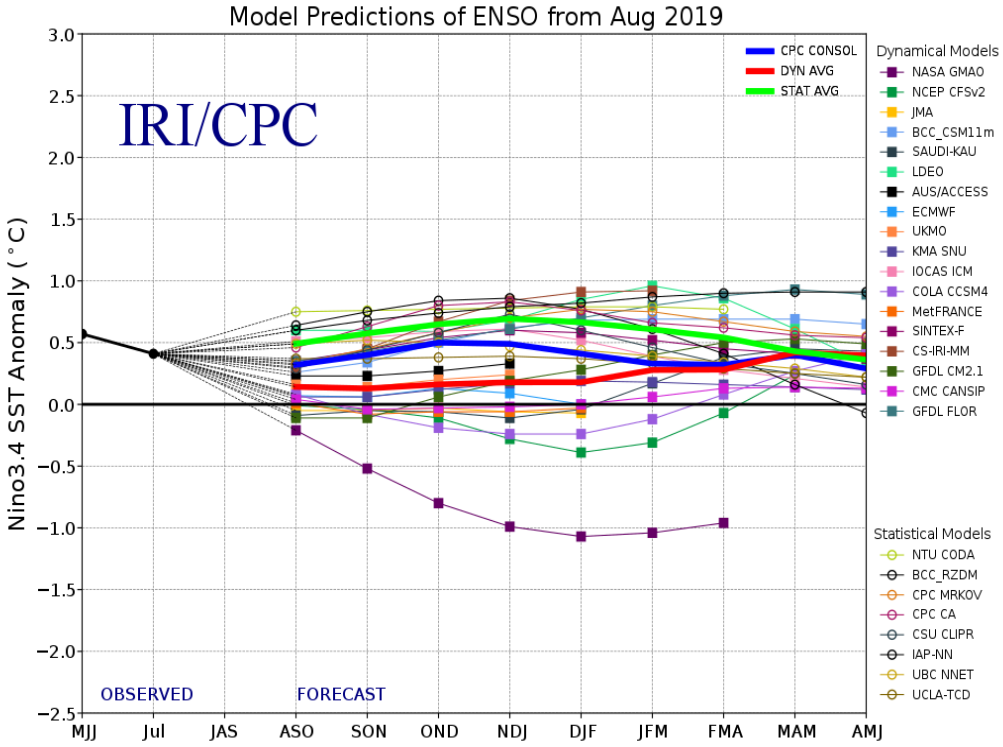


Figure provided by the International Research Institute (IRI) for Climate and Society (updated 19 August 2019).

Prepared by: Climate Prediction Center/NCEP

Historical El Niño and La Niña Episodes Based on the ONI computed using ERSST.v5

Recent Pacific warm (red) and cold (blue) periods based on a threshold of +/- 0.5 ºC for the Oceanic Nino Index (ONI) [3 month running mean of ERSST.v5 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.

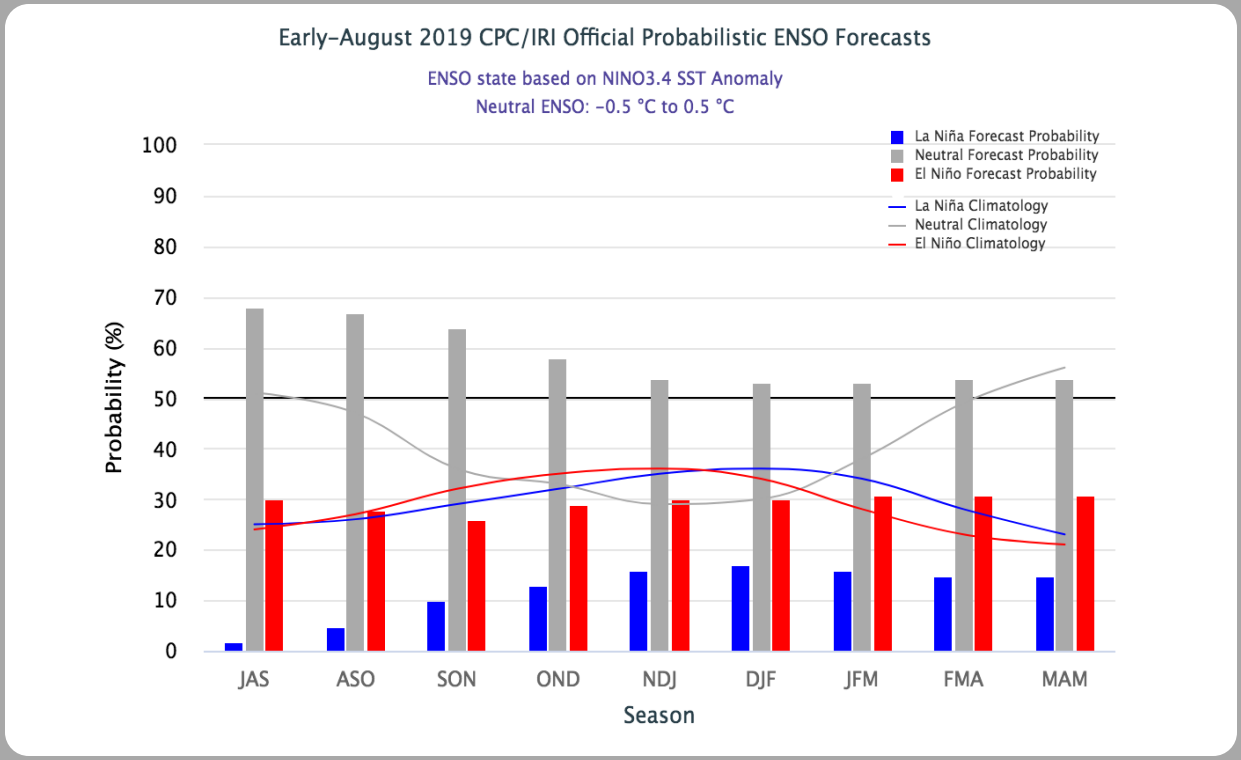
Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2007	0.7	0.3	0.0	-0.2	-0.3	-0.4	-0.5	-0.8	-1.1	-1.4	-1.5	-1.6
2008	-1.6	-1.4	-1.2	-0.9	-0.8	-0.5	-0.4	-0.3	-0.3	-0.4	-0.6	-0.7
2009	-0.8	-0.7	-0.5	-0.2	0.1	0.4	0.5	0.5	0.7	1.0	1.3	1.6
2010	1.5	1.3	0.9	0.4	-0.1	-0.6	-1.0	-1.4	-1.6	-1.7	-1.7	-1.6
2011	-1.4	-1.1	-0.8	-0.6	-0.5	-0.4	-0.5	-0.7	-0.9	-1.1	-1.1	-1.0
2012	-0.8	-0.6	-0.5	-0.4	-0.2	0.1	0.3	0.3	0.3	0.2	0.0	-0.2
2013	-0.4	-0.3	-0.2	-0.2	-0.3	-0.3	-0.4	-0.4	-0.3	-0.2	-0.2	-0.3
2014	-0.4	-0.4	-0.2	0.1	0.3	0.2	0.1	0.0	0.2	0.4	0.6	0.7
2015	0.6	0.6	0.6	0.8	1.0	1.2	1.5	1.8	2.1	2.4	2.5	2.6
2016	2.5	2.2	1.7	1.0	0.5	0.0	-0.3	-0.6	-0.7	-0.7	-0.7	-0.6
2017	-0.3	-0.1	0.1	0.3	0.4	0.4	0.2	-0.1	-0.4	-0.7	-0.9	-1.0
2018	-0.9	-0.8	-0.6	-0.4	-0.1	0.1	0.1	0.2	0.4	0.7	0.9	0.8
2019	0.8	0.8	0.8	0.8	0.6	0.5	0.3					

Prepared by: Climate Prediction Center/IRI

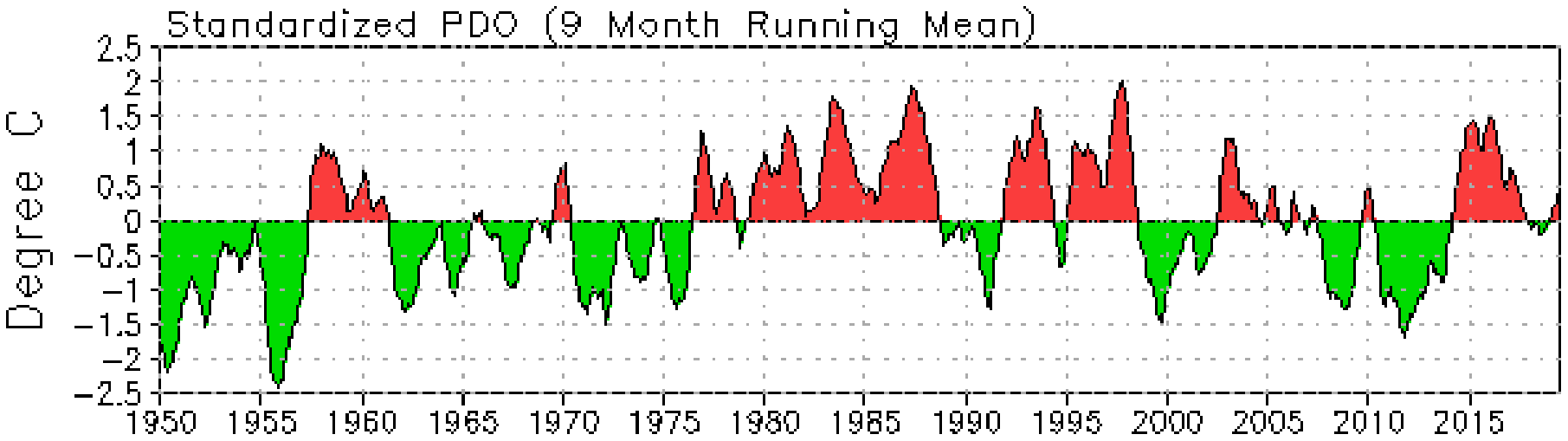
CPC/IRI Probabilistic ENSO Outlook

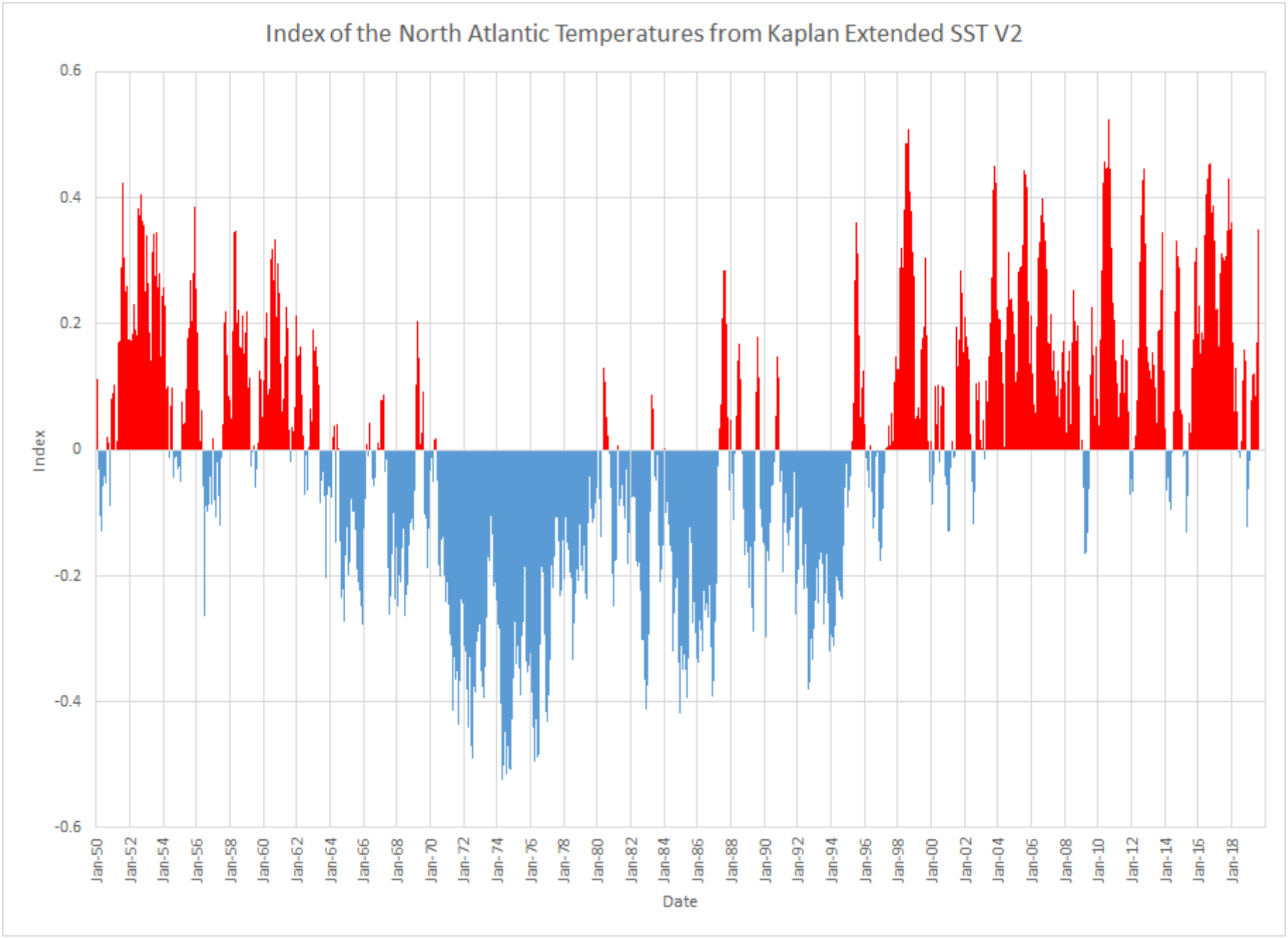
Updated: 8 August 2019

ENSO-neutral is most likely to continue through the Northern Hemisphere winter 2019-20.



Prepared by: Climate Prediction Center/IRI

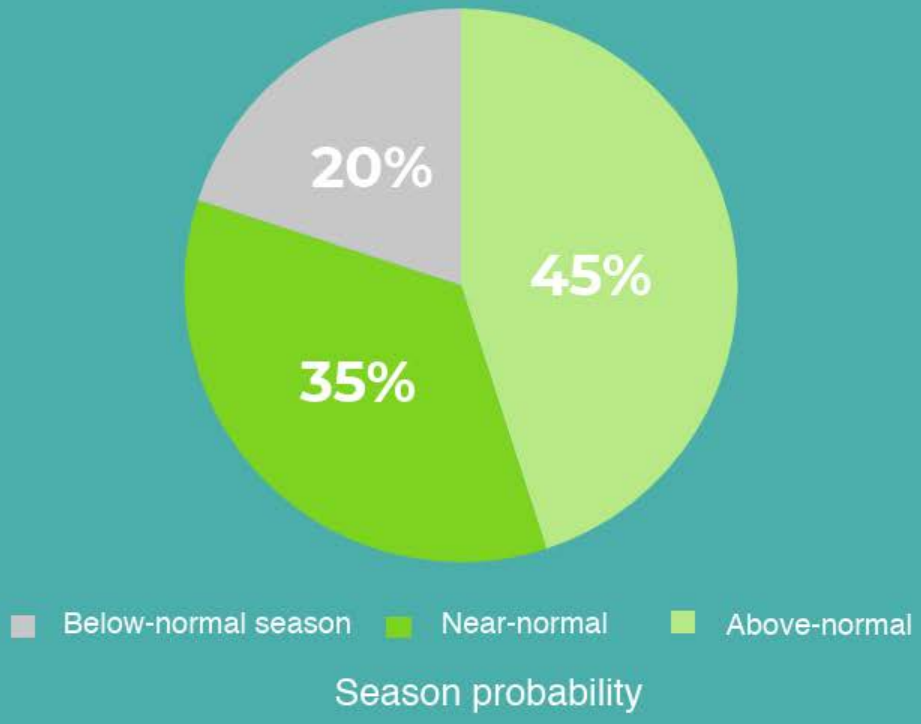

Standardized PDO (9 Month Running Mean)
Degree C
2.5
2
1.5
1
0.5
0
−0.5
−1
−1.5
−2
−2.5
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015


Index of the North Atlantic Temperatures from Kaplan Extended SST V2
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
Index
Jan-50
Jan-52
Jan-54
Jan-56
Jan-58
Jan-60
Jan-62
Jan-64
Jan-66
Jan-68
Jan-70
Jan-72
Jan-74
Jan-76
Jan-78
Jan-80
Jan-82
Jan-84
Jan-86
Jan-88
Jan-90
Jan-92
Jan-94
Jan-96
Jan-98
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Date

2019 Tropical Outlook

2019 Atlantic Hurricane Season Outlook

AUGUST 8 UPDATE



Named storms
10-17

Hurricanes
5-9

Major hurricanes
2-4

NOAA

Be prepared: Visit hurricanes.gov and follow @NWS and @NHC_Atlantic on Twitter.

August 8, 2019

2019 FORECAST AS OF 5 AUGUST 2019

Forecast Parameter	CSU* Forecast	1981-2010 Average
Named Storms (NS)	14	12.1
Named Storm Days (NSD)	55	59.4
Hurricanes (H)	7	6.4
Hurricane Days (HD)	20	24.2
Major Hurricanes (MH)	2	2.7
Major Hurricane Days (MHD)	5	6.2
Accumulated Cyclone Energy (ACE)	105	106
Net Tropical Cyclone Activity (NTC)	110	116

*Forecast numbers include Andrea and Barry

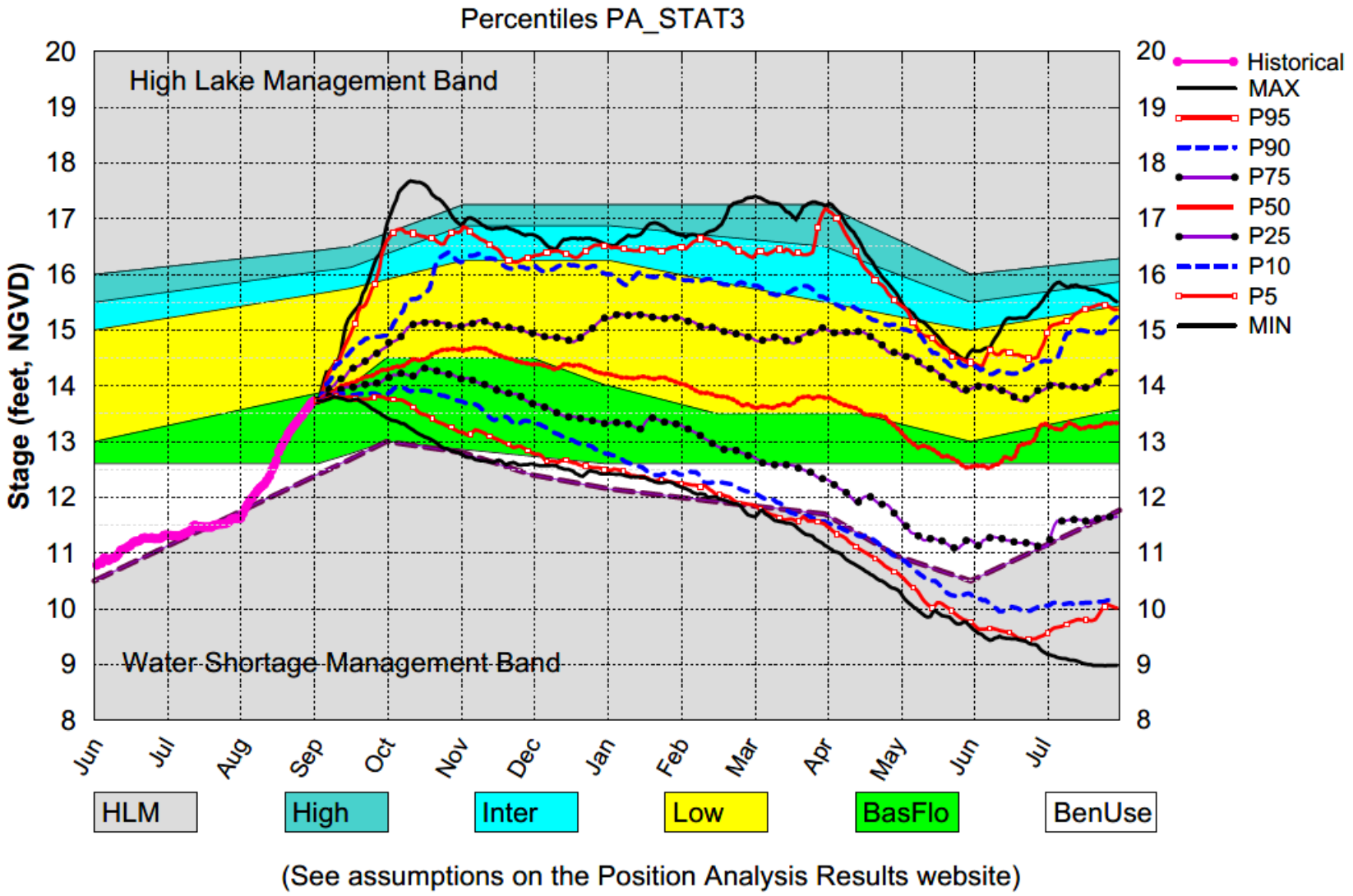
https://tropical.colostate.edu/

Source: Colorado State University/Tropical Meteorology Project

Dynamic Position Analysis

- Based on historical climatic conditions spanning the period 1965-2005
- Each year the model resets the initial stages for Lake Okeechobee (LOK) and the Water Conservation Areas (WCAs) to value on the 1st of the previous month and conditions the simulation using real time data during the previous month to achieve real time stage on the 1st of the current month for both Lake Okeechobee and the Water Conservation Areas
- Dynamic Position Analysis
  - Each 1-year simulation starts with current hydrologic conditions (e.g., 1-September-2019)
  - 41 1-year simulations of system response to historical rainfall conditions
  - Statistical summaries used to display projections

Lake Okeechobee SFWMM Sep 2019 Position Analysis

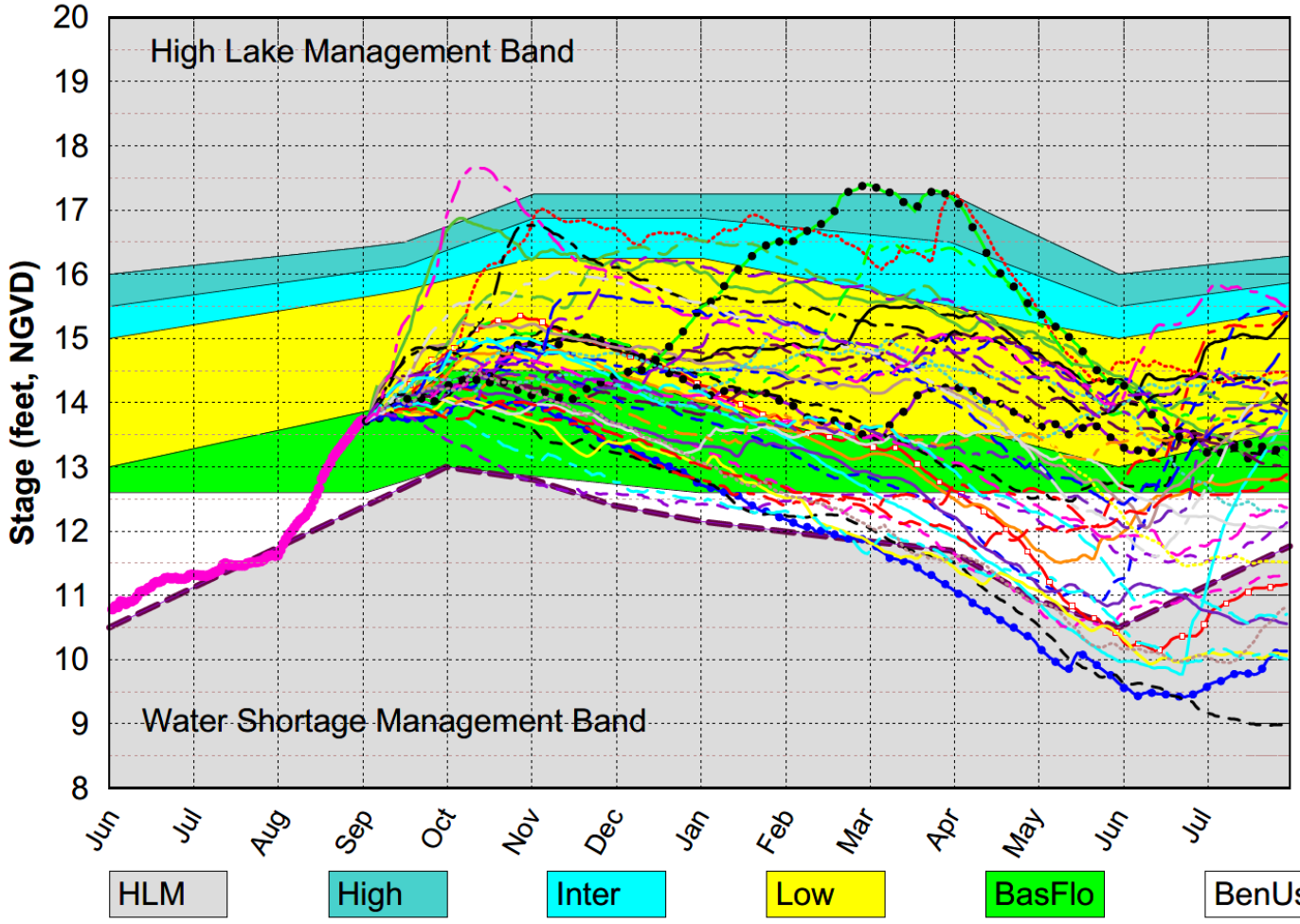


(See assumptions on the Position Analysis Results website)

Thu Sep 5 13:12:26 2019

Lake Okeechobee SFWMM August 2019 Position Analysis

All Simulated Years Plot PA_STAT3C



Historical
1965-66
1966-67
1967-68
1968-69
1969-70
1970-71
1971-72
1972-73
1973-74
1974-75
1975-76
1976-77
1977-78
1978-79
1979-80
1980-81
1981-82
1982-83
1983-84
1984-85
1985-86
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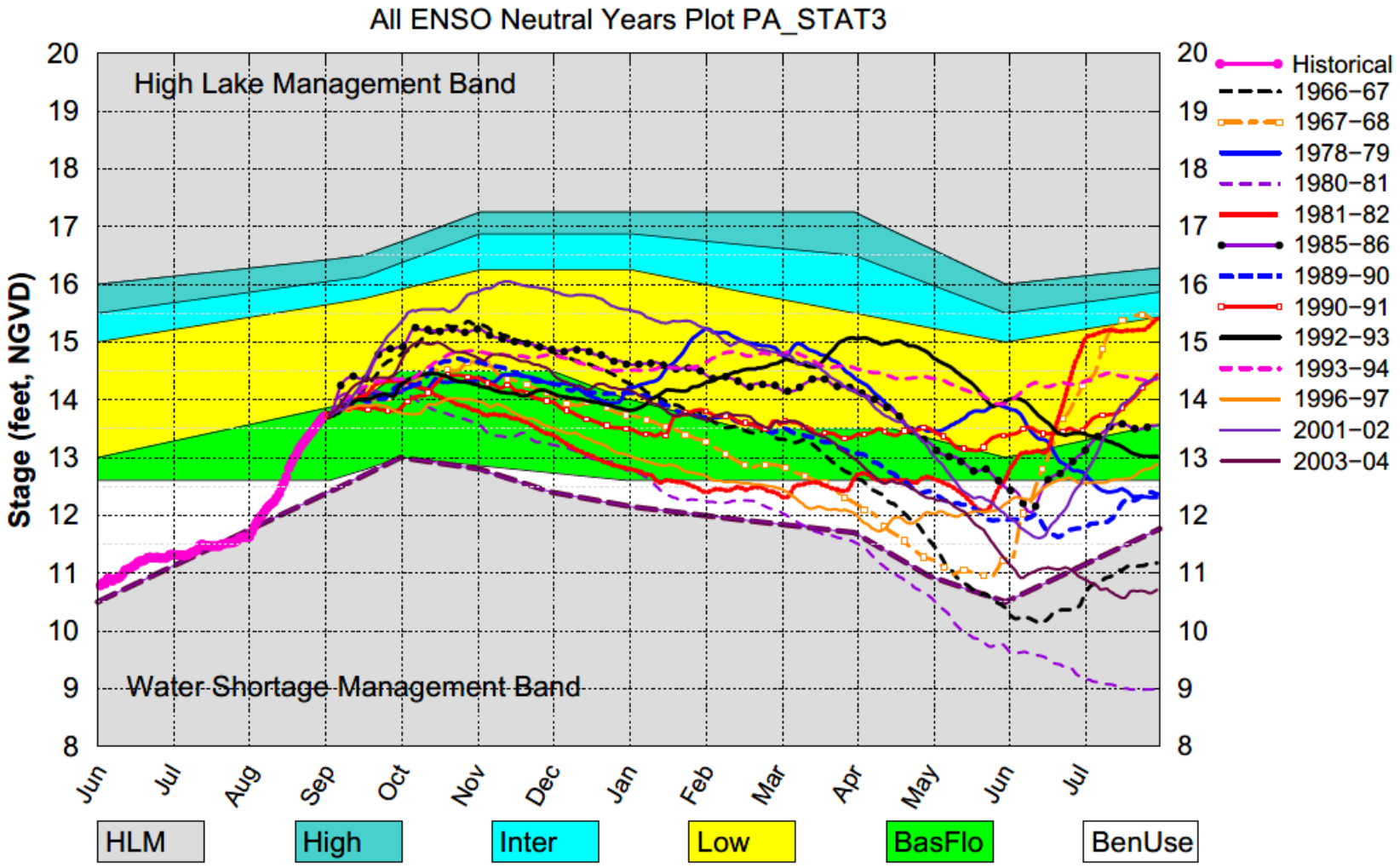
1988-89
1989-90
1990-91
1991-92
1992-93
1993-94
1994-95
1995-96
1996-97
1997-98
1998-99
1999-00
2000-01
2001-02
2002-03
2003-04
2004-05

(See assumptions on the Position Analysis Results website)

Thu Sep 5 13:48:25 2019

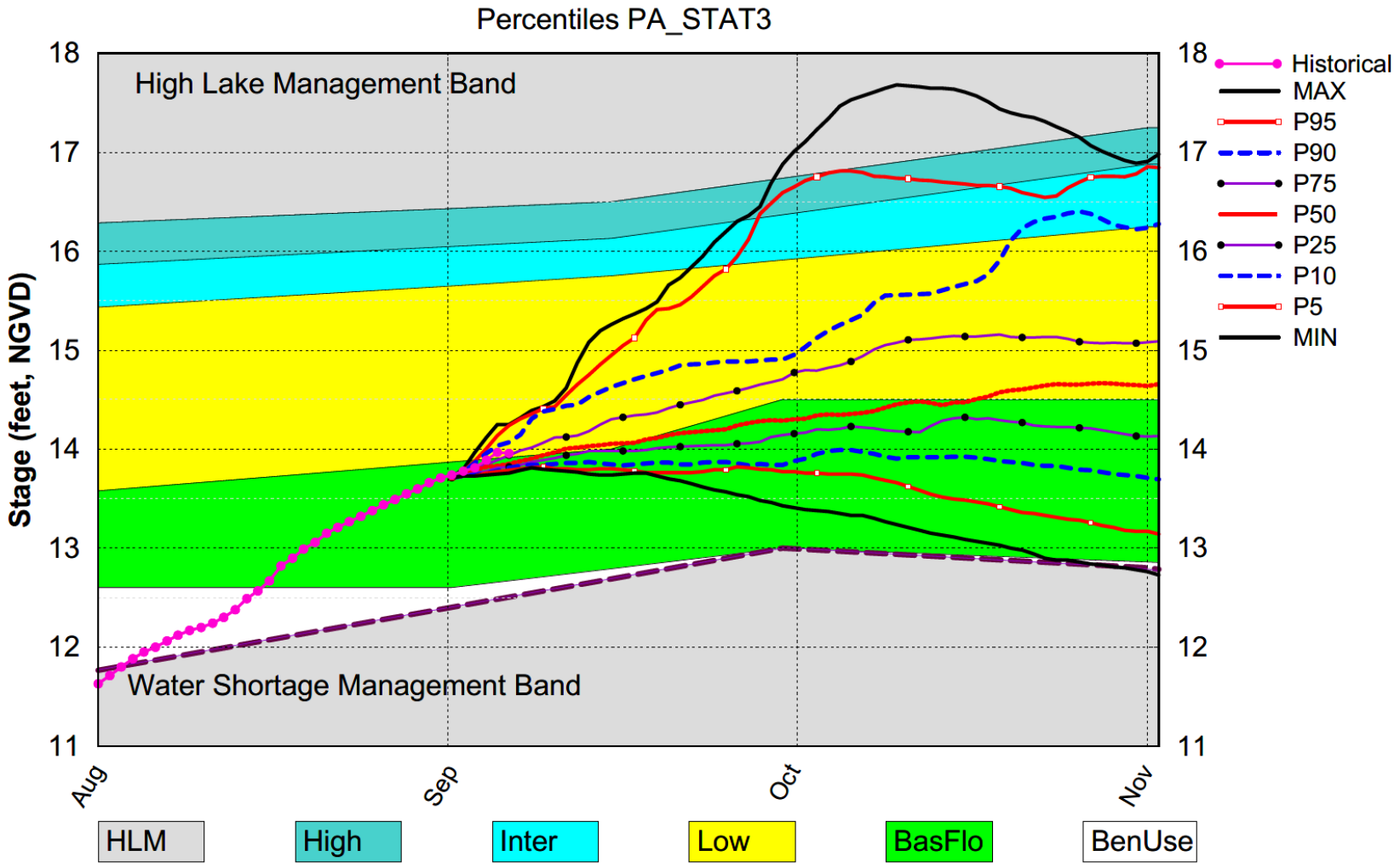
Lake Okeechobee SFWMM Sep 2019 Position Analysis



(See assumptions on the Position Analysis Results website)

Thu Sep 5 13:13:07 2019

Lake Okeechobee SFWMM Sep 2019 Position Analysis



(See assumptions on the Position Analysis Results website)

Thu Sep 05 13:16:18 EDT 2019