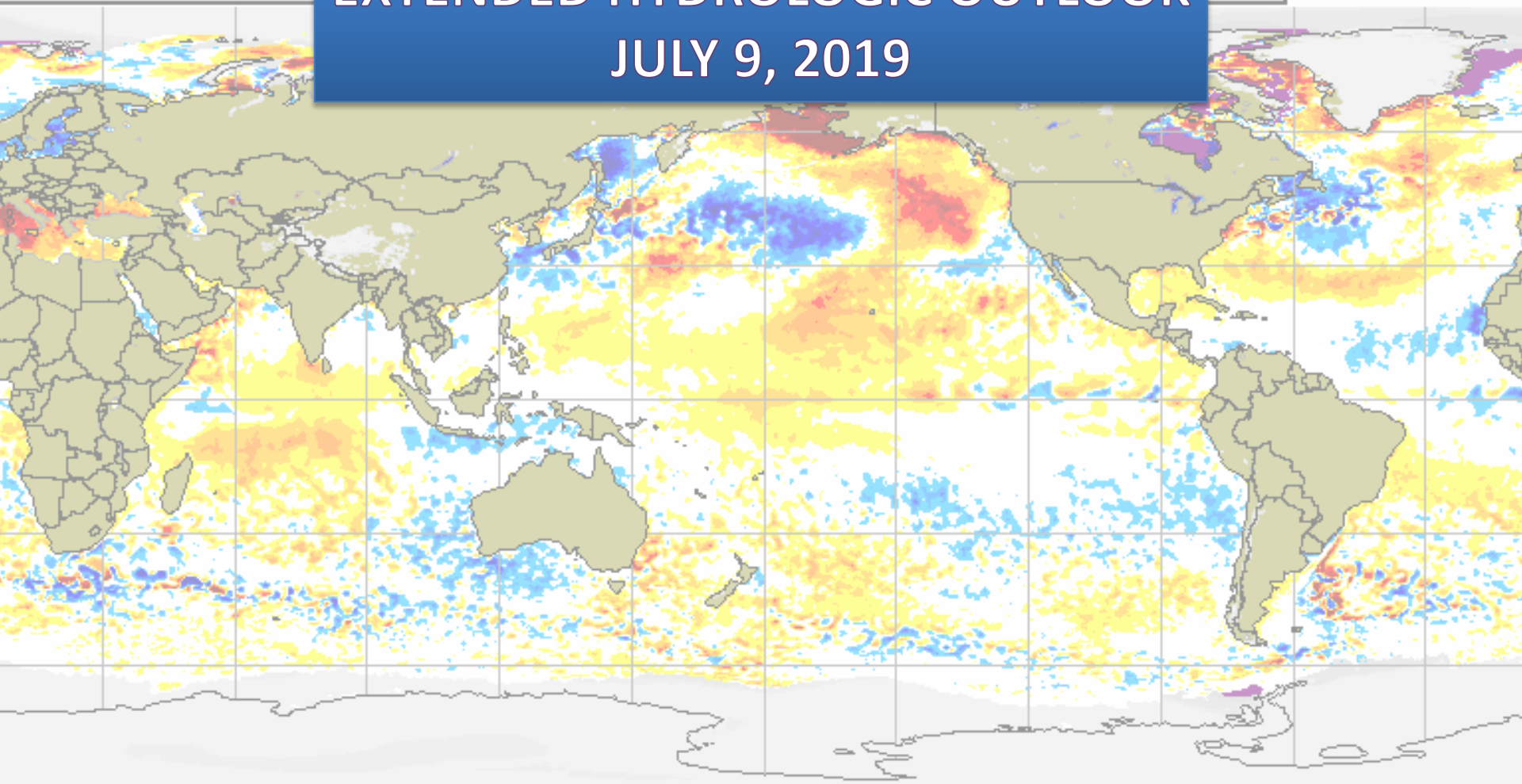
EXTENDED HYDROLOGIC OUTLOOK
JULY 9, 2019



Summary

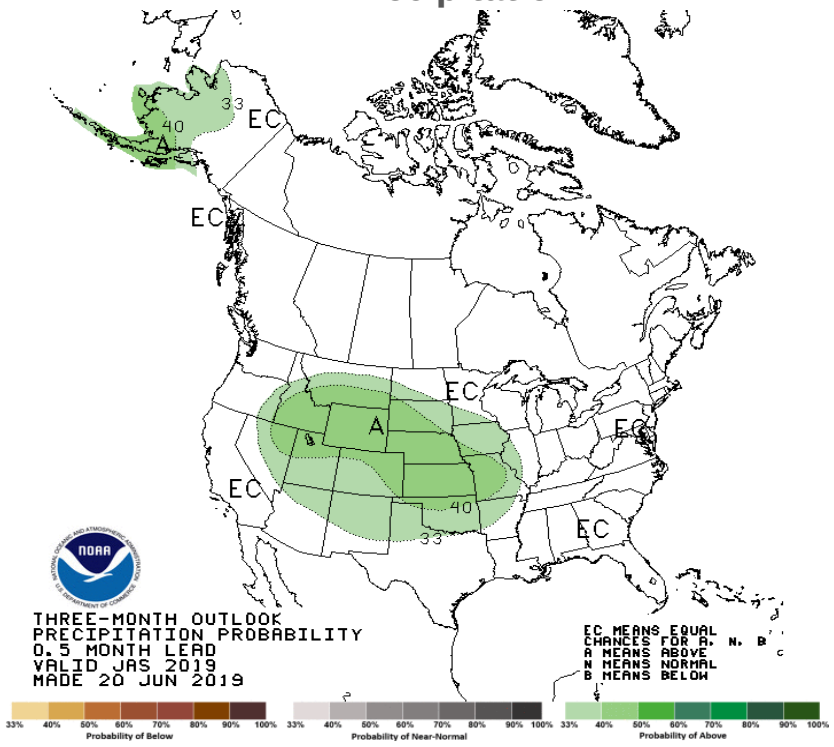
- The Climate Prediction Center (CPC) is forecasting equal chances of above normal, normal and below normal rainfall for July through September.
- El Niño is predicted to persist through the summer 2019 (66% chance), with lower odds of continuing through the fall and winter (50-55% chance). El Niño increases 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) index for switch to negative (cold) phase, this has the potential to contribute to drier-than-normal wet seasons.

U. S. Seasonal Outlooks

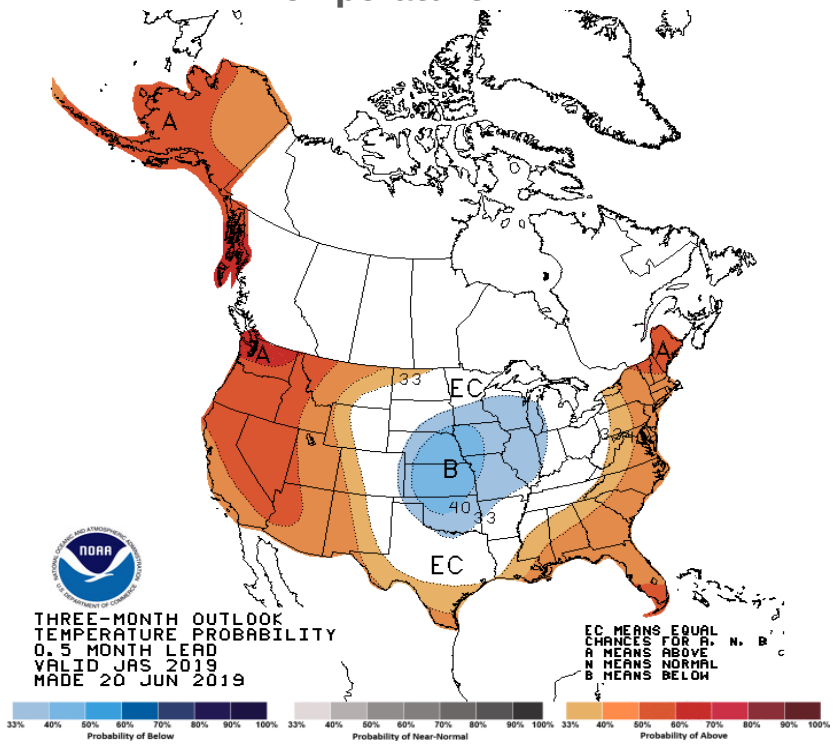
July-September 2019

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

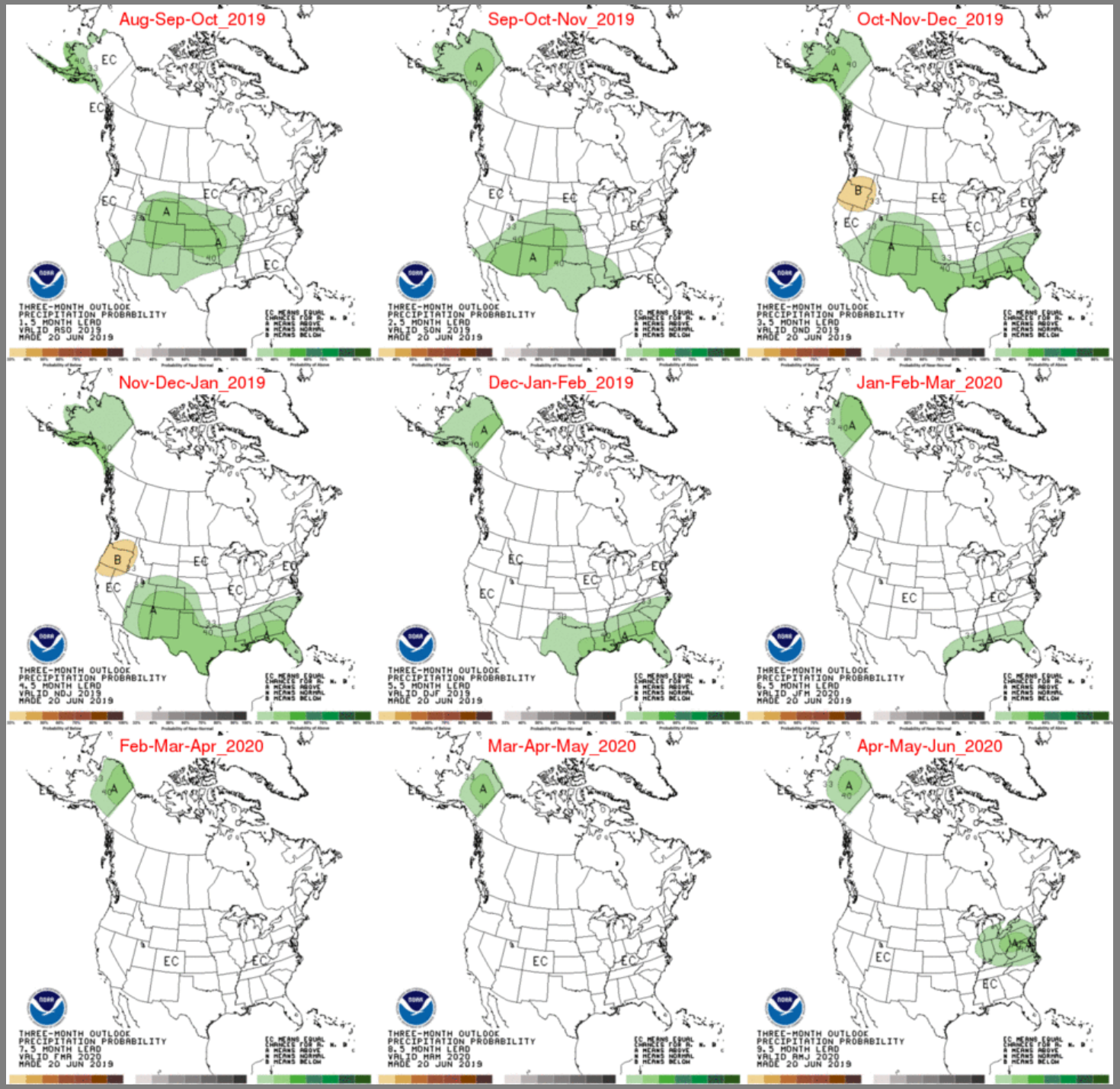
Precipitation



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**

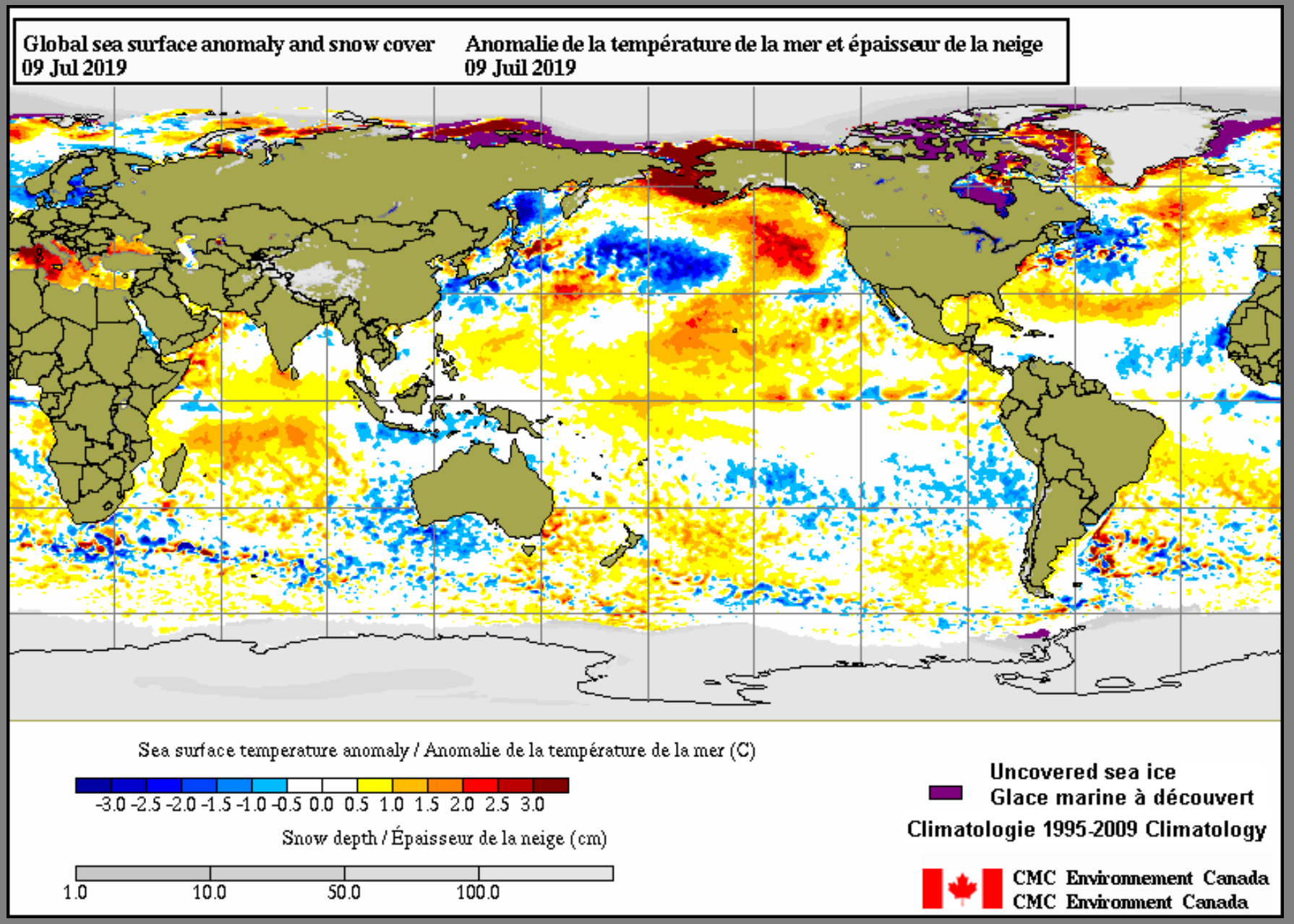
Atlantic Multidecadal Oscillation (AMO)

- **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**

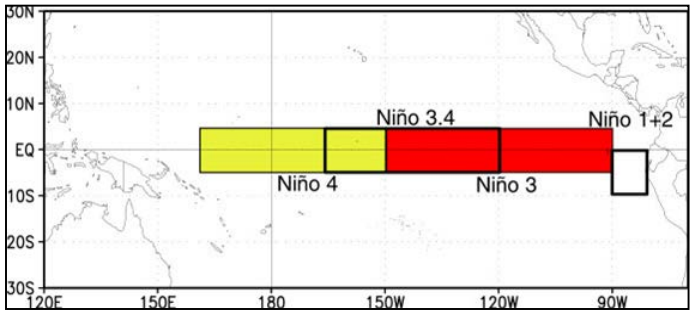
Current Global Sea Surface Temperature Anomalies

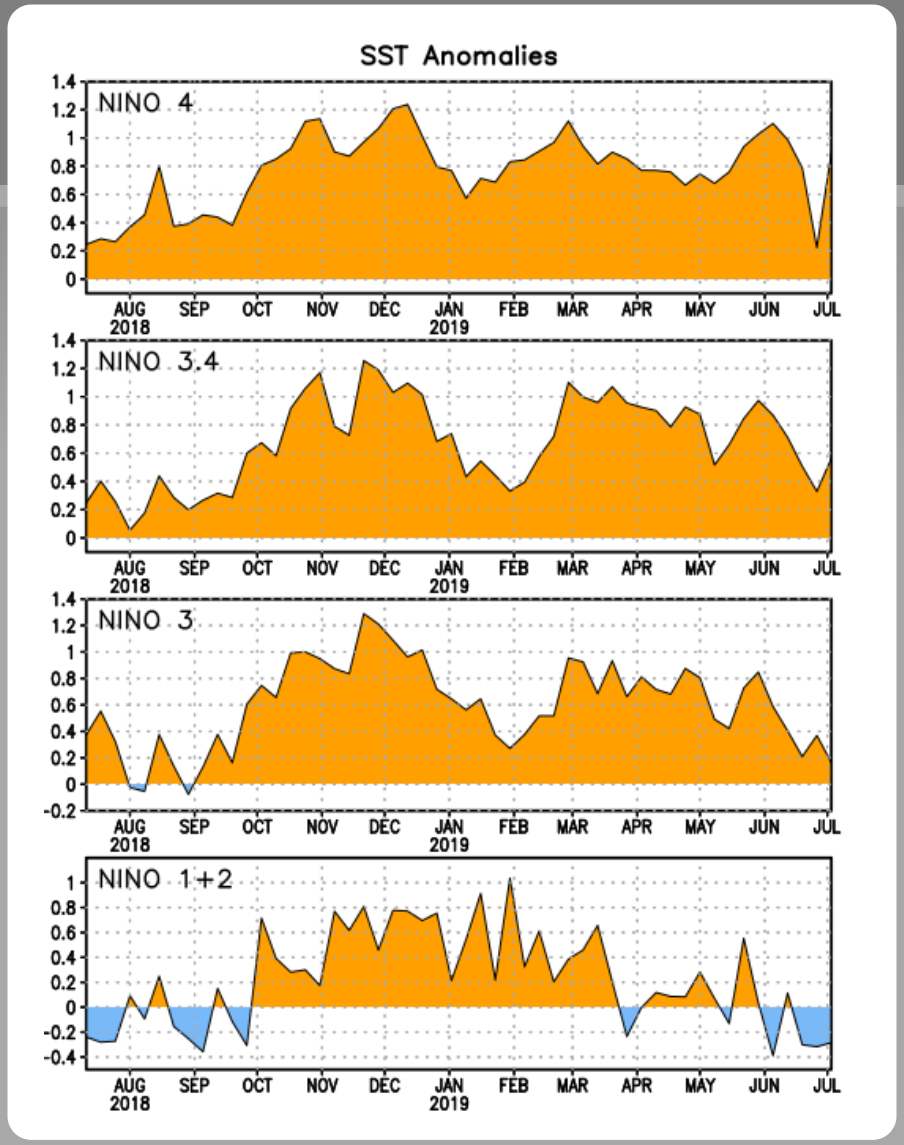


Niño Region SST Departures (ºC) Recent Evolution

The latest weekly SST departures are:

Niño 4	0.9ºC
Niño 3.4	0.6ºC
Niño 3	0.2ºC
Niño 1+2	-0.3ºC





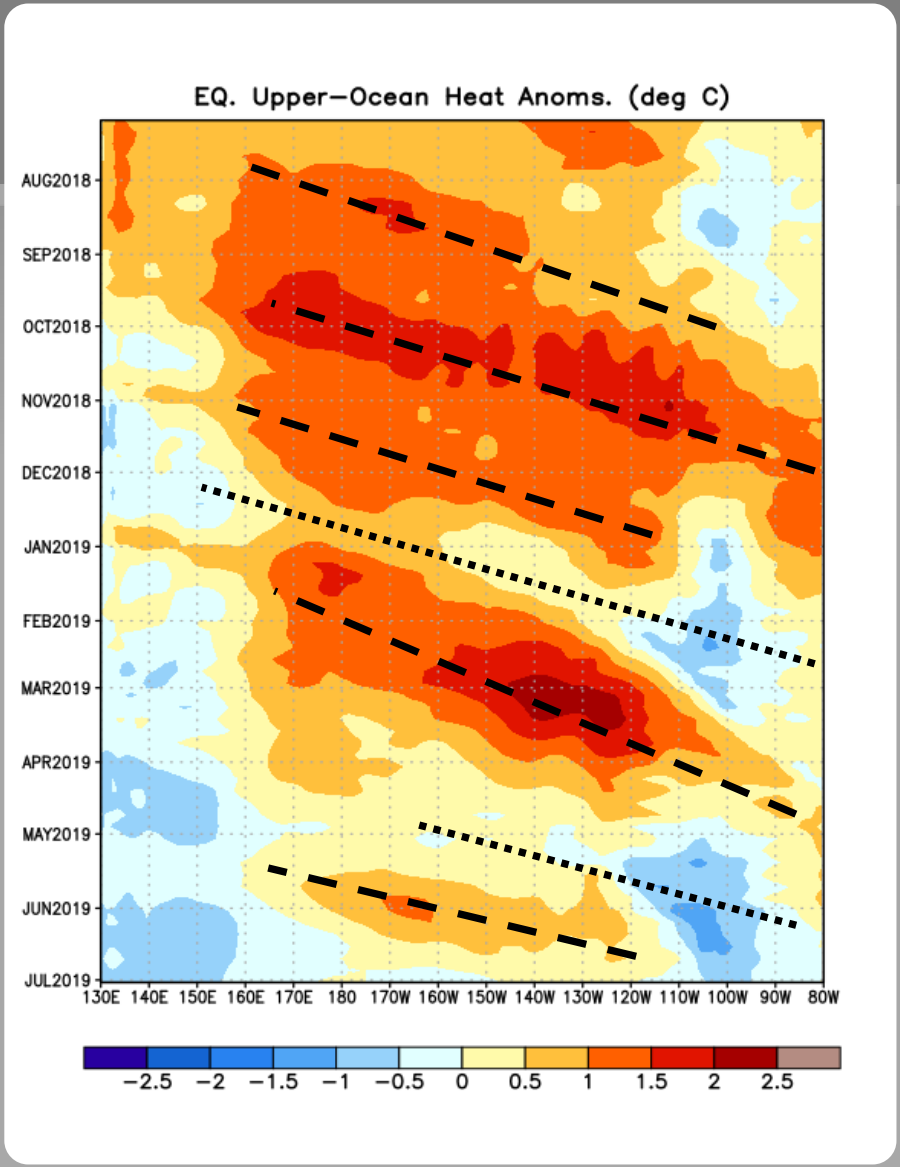
Prepared by: Climate Prediction Center/NCEP

Weekly Heat Content Evolution in the Equatorial Pacific

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

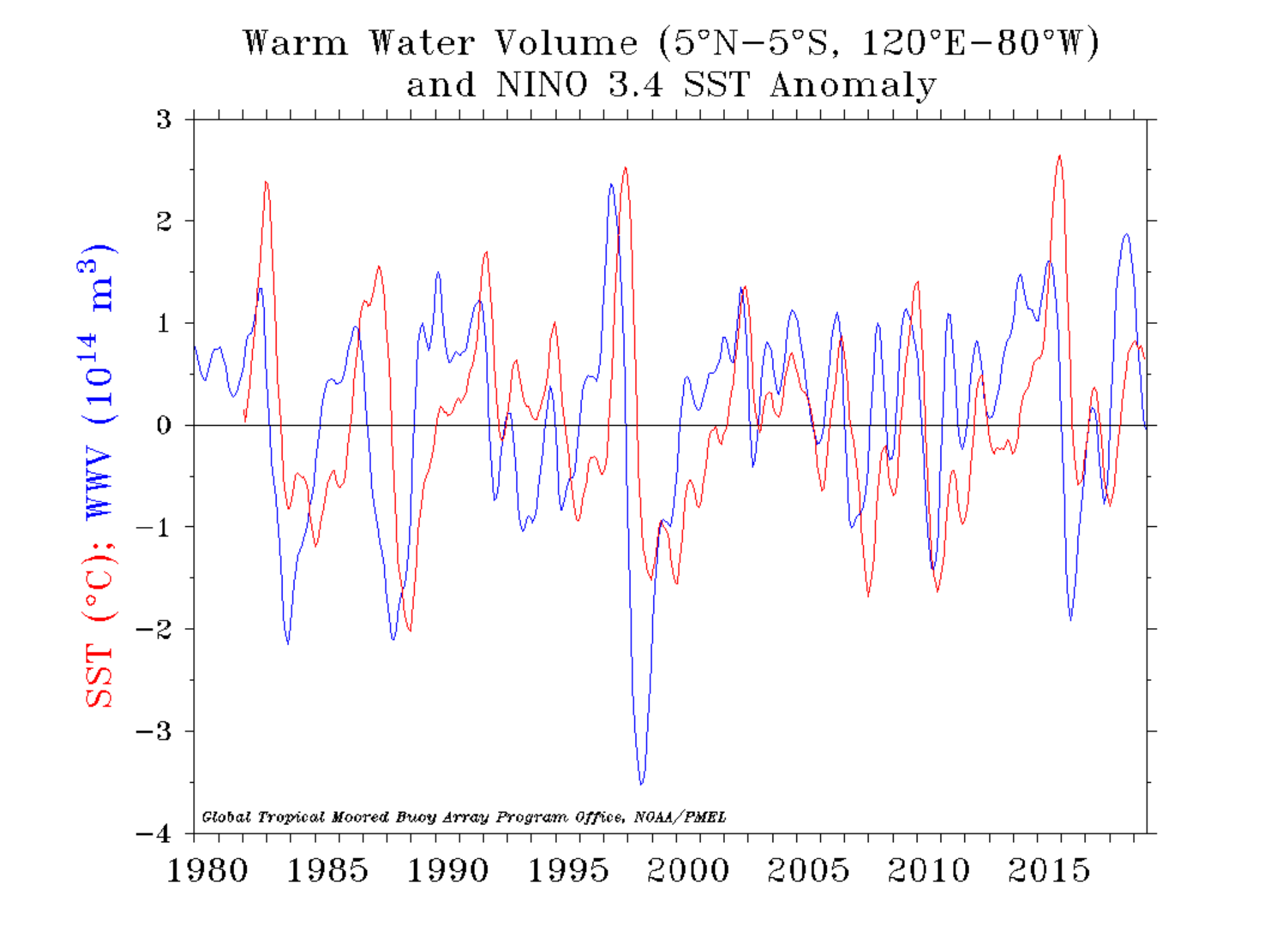
During May 2019, an upwelling Kelvin wave contributed to the reduction of positive subsurface anomalies and emergence of negative anomalies around 110°-90°W.

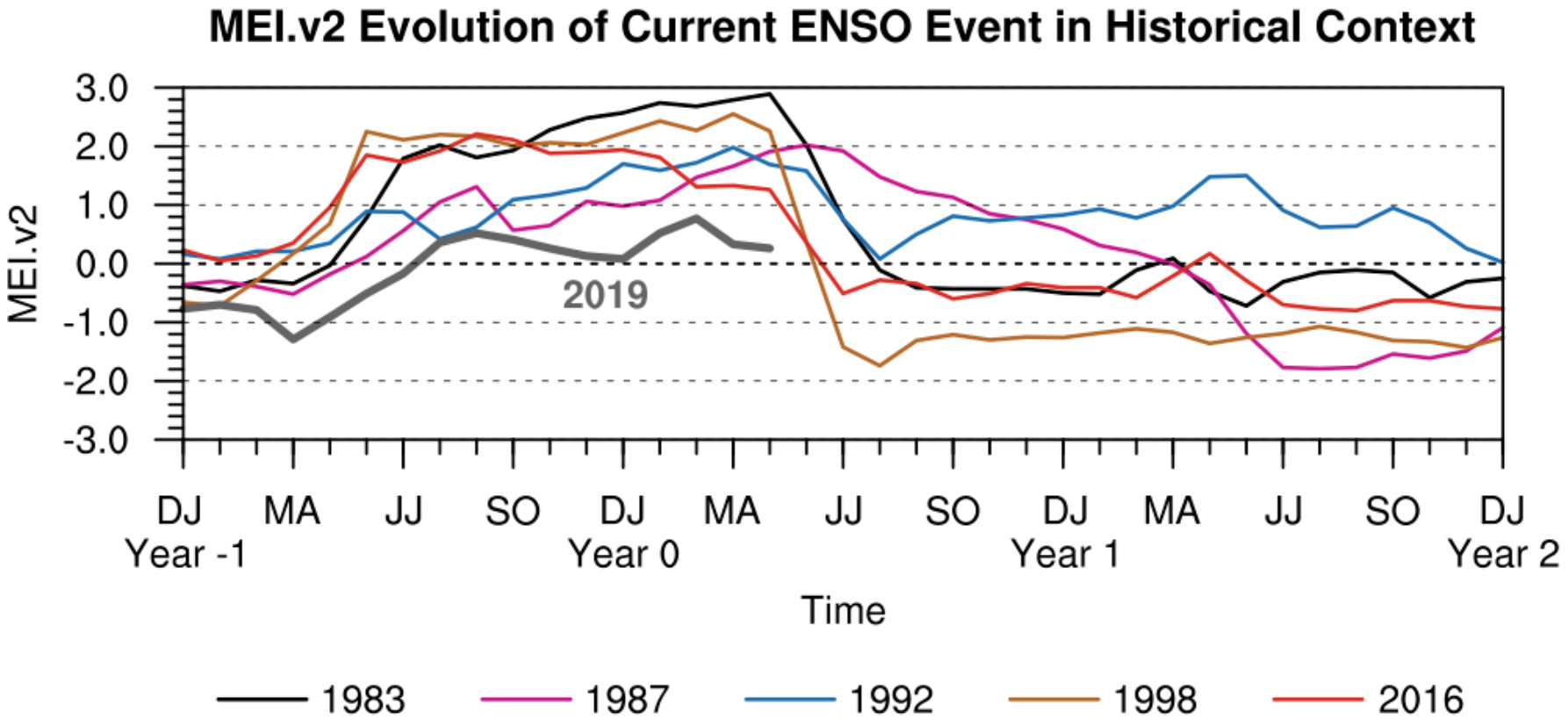
From mid-May through June, a downwelling Kelvin wave resulted in the increase of positive subsurface anomalies across the east-central Pacific.



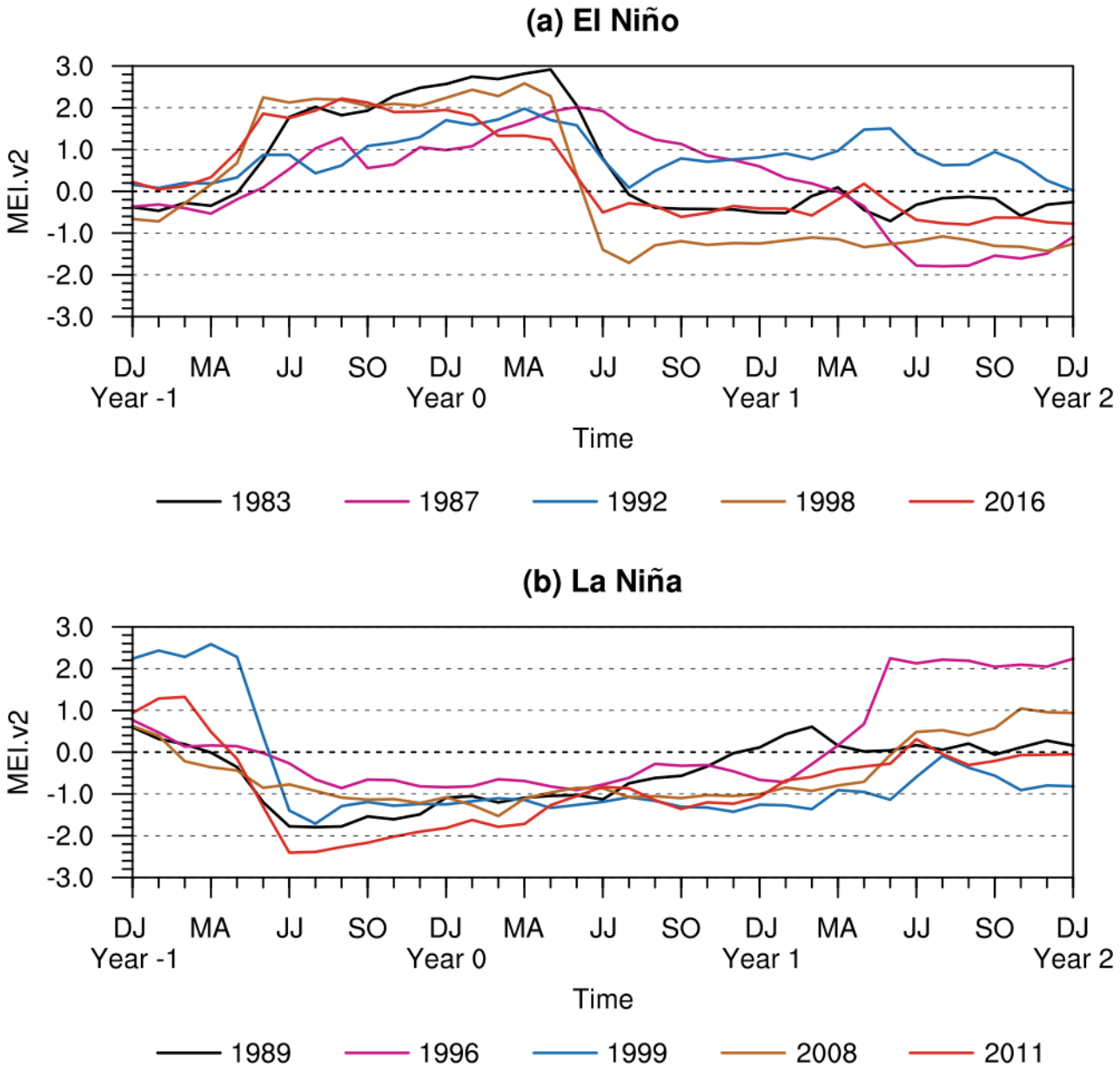
Equatorial oceanic Kelvin waves have alternating warm and cold phases. The warm phase is indicated by dashed lines. Down-welling and warming occur in the leading portion of a Kelvin wave, and up-welling and cooling occur in the trailing portion.

Prepared by: Climate Prediction Center/NCEP


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

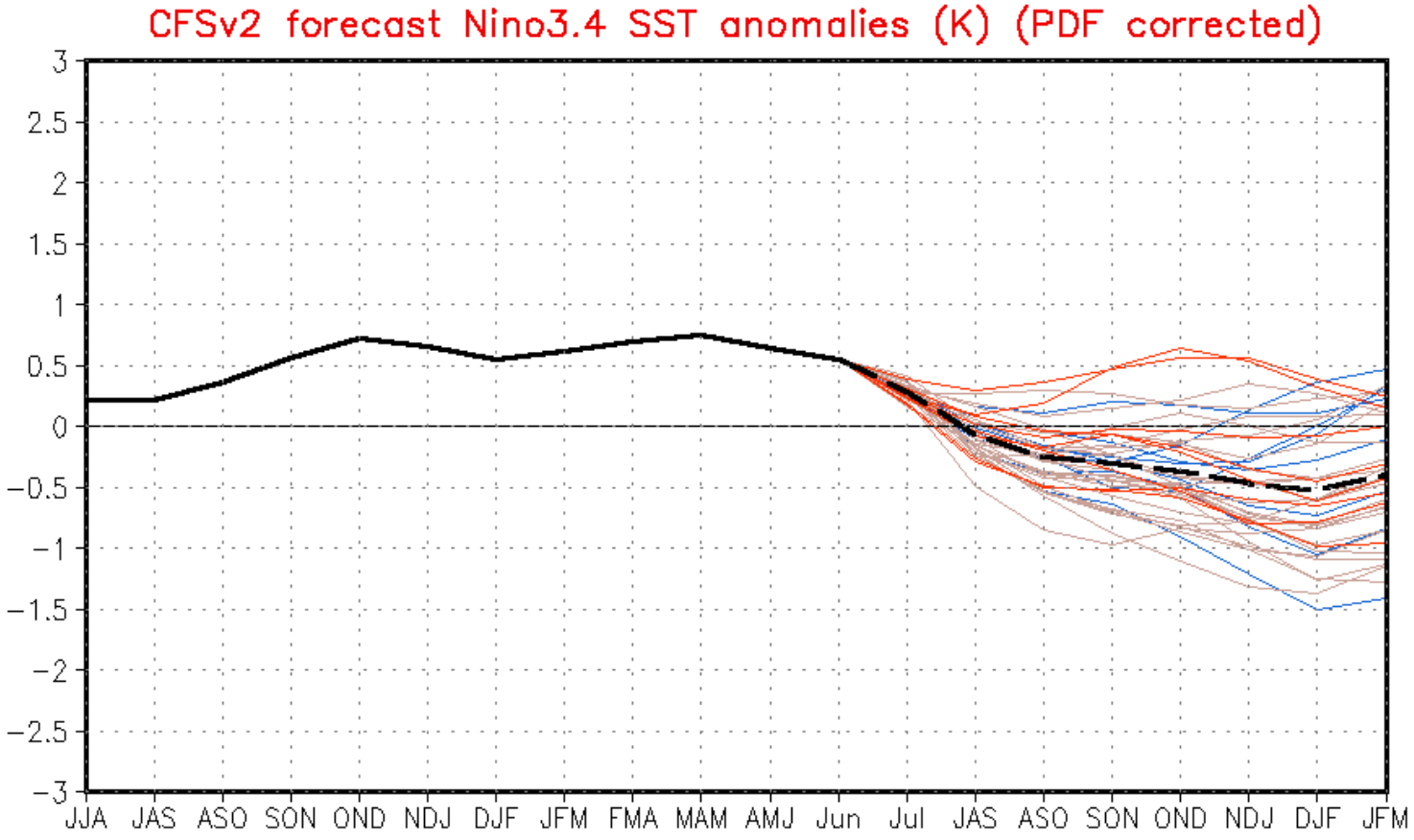

MEI.v2 Evolution of Current ENSO Event in Historical Context
MEI.v2
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
2019
DJ
MA
JJ
SO
DJ
MA
JJ
SO
DJ
MA
JJ
SO
DJ
Year -1
Year 0
Year 1
Year 2
Time
1983
1987
1992
1998
2016

MEI.v2 Evolution of Historical ENSO Events



NWS/NCEP/CPC

Last update: Tue Jul 9 2019
Initial conditions: 28Jun2019–7Jul2019



IRI/CPC Pacific Niño 3.4 SST Model Outlook

The majority of models predict a weak El Niño to continue into the Northern Hemisphere winter 2019-20.

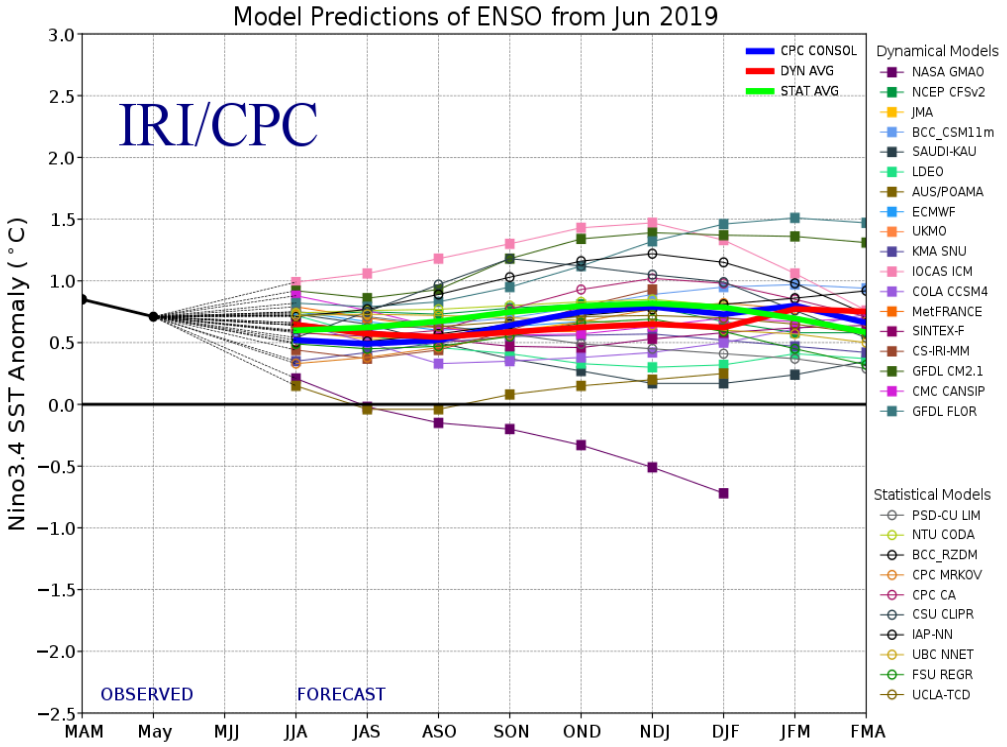


Figure provided by the International Research Institute (IRI) for Climate and Society (updated 19 June 2019).

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.

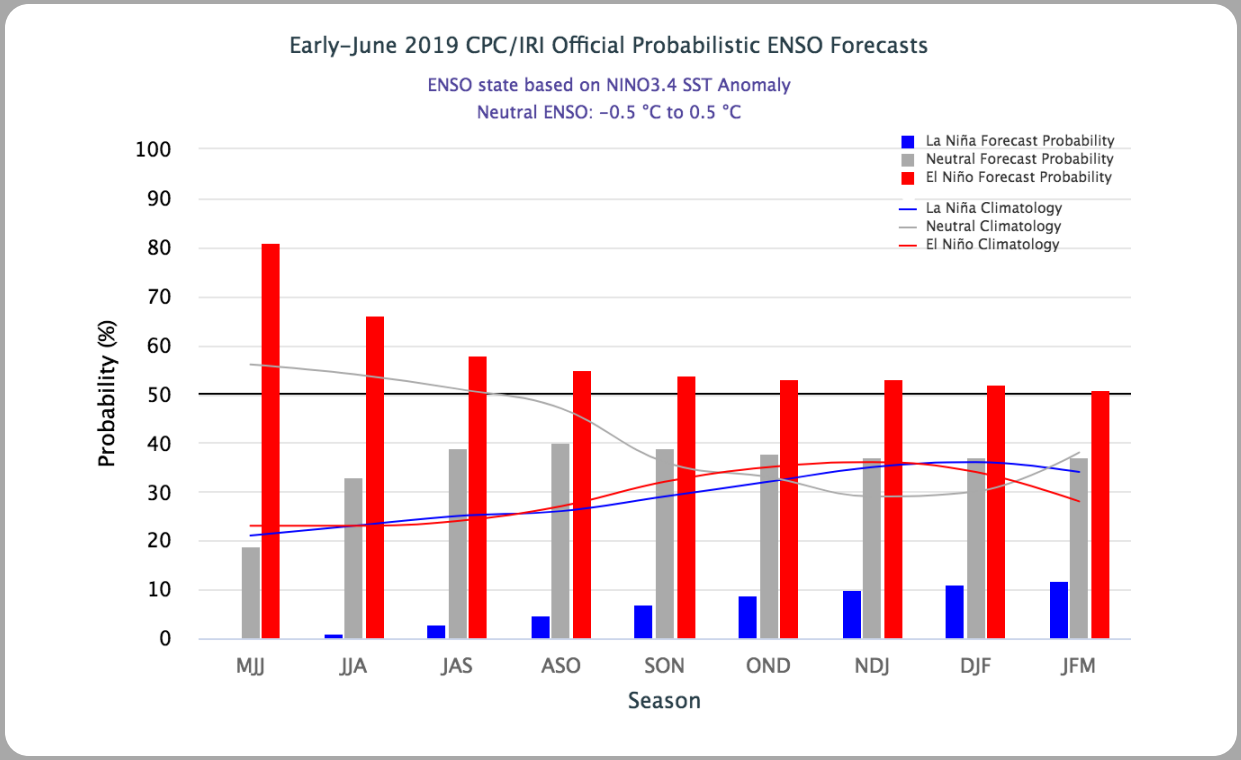
Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2007	0.7	0.3	0.0	-0.2	-0.3	-0.4	-0.5	-0.8	-1.1	-1.4	-1.5	-1.6
2008	-1.6	-1.4	-1.2	-0.9	-0.8	-0.5	-0.4	-0.3	-0.3	-0.4	-0.6	-0.7
2009	-0.8	-0.7	-0.5	-0.2	0.1	0.4	0.5	0.5	0.7	1.0	1.3	1.6
2010	1.5	1.3	0.9	0.4	-0.1	-0.6	-1.0	-1.4	-1.6	-1.7	-1.7	-1.6
2011	-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	0.7							

Prepared by: Climate Prediction Center/IRI

CPC/IRI Probabilistic ENSO Outlook

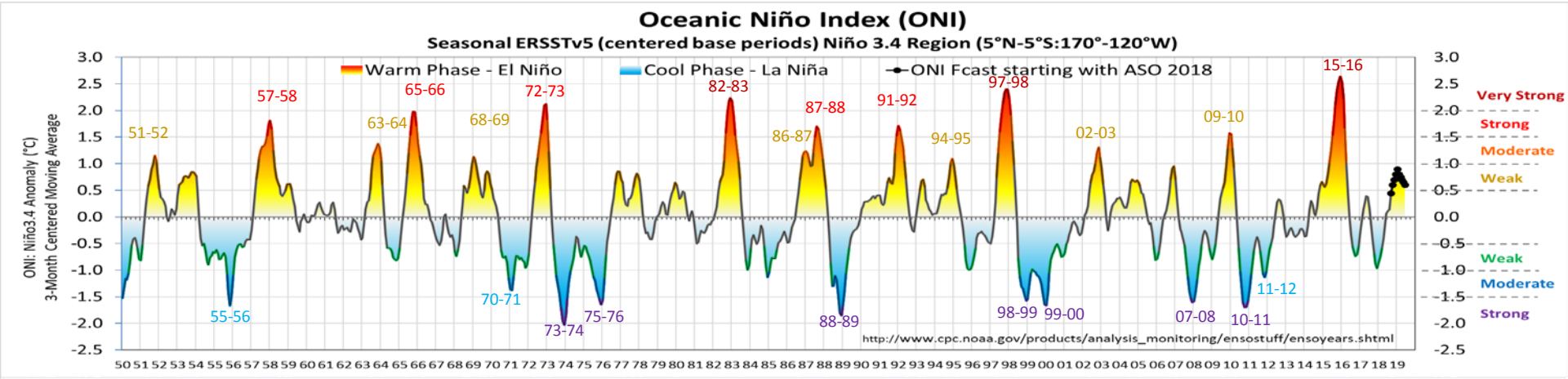
Updated: 13 June 2019

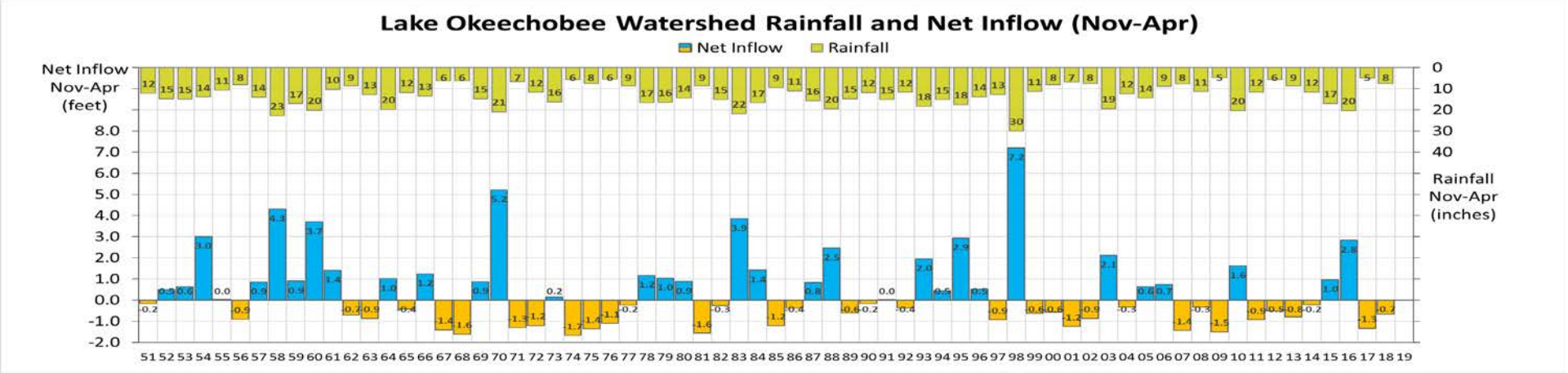
El Niño is favored to continue with chances nearing 50% in Northern Hemisphere fall and winter.



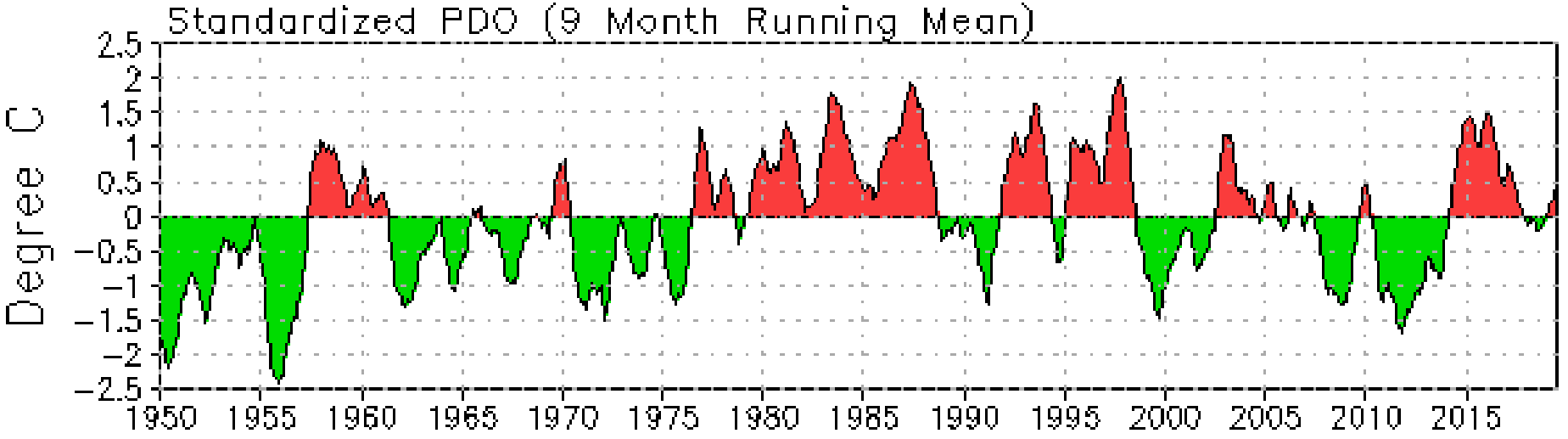
Prepared by: Climate Prediction Center/IRI

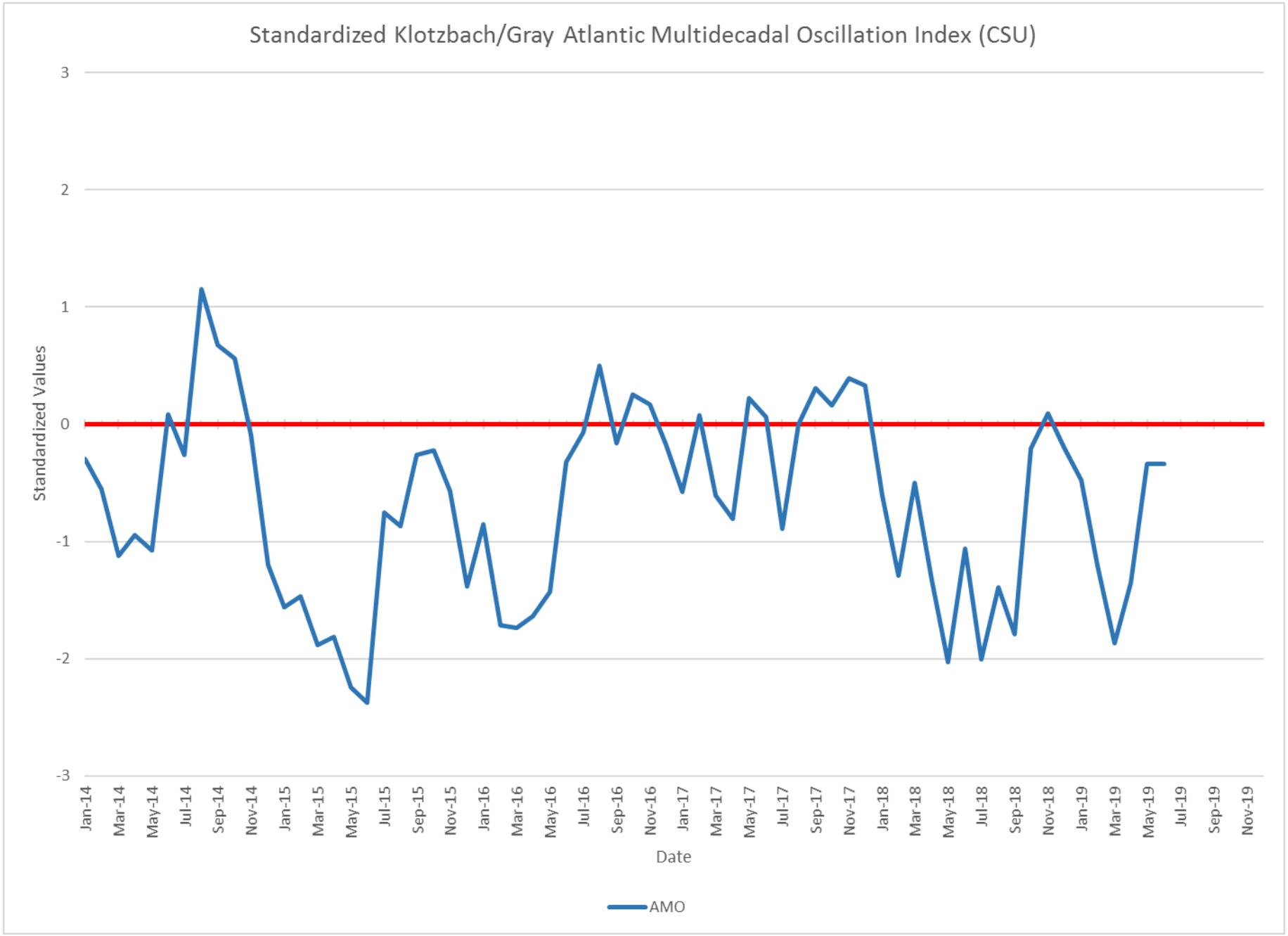
El Niño & La Niña Events (1950-2018), and Lake Okeechobee Watershed Rainfall & Net Inflow





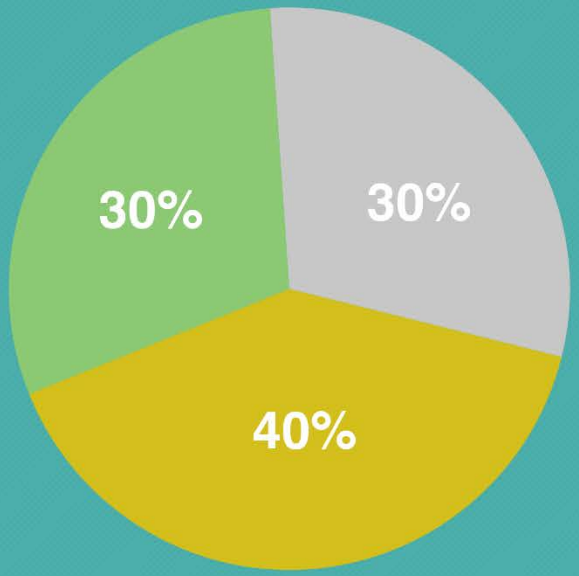
Source: Cal Neidrauer (SFWMD)


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


Standardized Klotzbach/Gray Atlantic Multidecadal Oscillation Index (CSU)
3
2
1
0
-1
-2
-3
Standardized Values
Jan-14
Mar-14
May-14
Jul-14
Sep-14
Nov-14
Jan-15
Mar-15
May-15
Jul-15
Sep-15
Nov-15
Jan-16
Mar-16
May-16
Jul-16
Sep-16
Nov-16
Jan-17
Mar-17
May-17
Jul-17
Sep-17
Nov-17
Jan-18
Mar-18
May-18
Jul-18
Sep-18
Nov-18
Jan-19
Mar-19
May-19
Jul-19
Sep-19
Nov-19
Date
AMO

2019 Tropical Outlook

2019 Atlantic Hurricane Season Outlook



Above-normal | Near-normal | Below-normal season

Season probability

Named storms
9-15

Hurricanes
4-8

Major hurricanes
2-4

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

May 23, 2019

NOAA

ATLANTIC BASIN SEASONAL HURRICANE FORECAST FOR 2019*

Forecast Parameter and 1981-2010 Average (in parentheses)	Issue Date 4 April 2019	Issue Date 4 June 2019	Issue Date 9 July 2019	Observed Activity Through June 2019	9 July Forecast for Remainder of 2019
Named Storms (NS) (12.1)	13	14	14	1	13
Named Storm Days (NSD) (59.4)	50	55	55	0.75	54.25
Hurricanes (H) (6.4)	5	6	6	0	6
Hurricane Days (HD) (24.2)	16	20	20	0	20
Major Hurricanes (MH) (2.7)	2	2	2	0	2
Major Hurricane Days (MHD) (6.2)	4	5	5	0	5
Accumulated Cyclone Energy (ACE) (106)	80	100	100	1	99
Net Tropical Cyclone Activity (NTC) (116%)	90	105	105	3	102

*Seasonal forecast numbers in the first three forecast columns in the above table include tropical cyclones that formed prior to the date of the forecast release (e.g., Andrea in May).

We estimate that 2019 will have an additional 6 hurricanes (average is 6.4), 13 named storms (average is 12.1), 54.25 named storm days (average is 59.4), 20 hurricane days (average is 24.2), 2 major (Category 3-4-5) hurricanes (average is 2.7) and 5 major hurricane days (average is 6.2). The probability of U.S. major hurricane landfall is estimated to be about 105 percent of the long-period average. We expect Atlantic basin Accumulated Cyclone Energy (ACE) and Net Tropical Cyclone (NTC) activity for the remainder of the season to be approximately 95 percent of their long-term average values.

Next Update: August 5, 2019

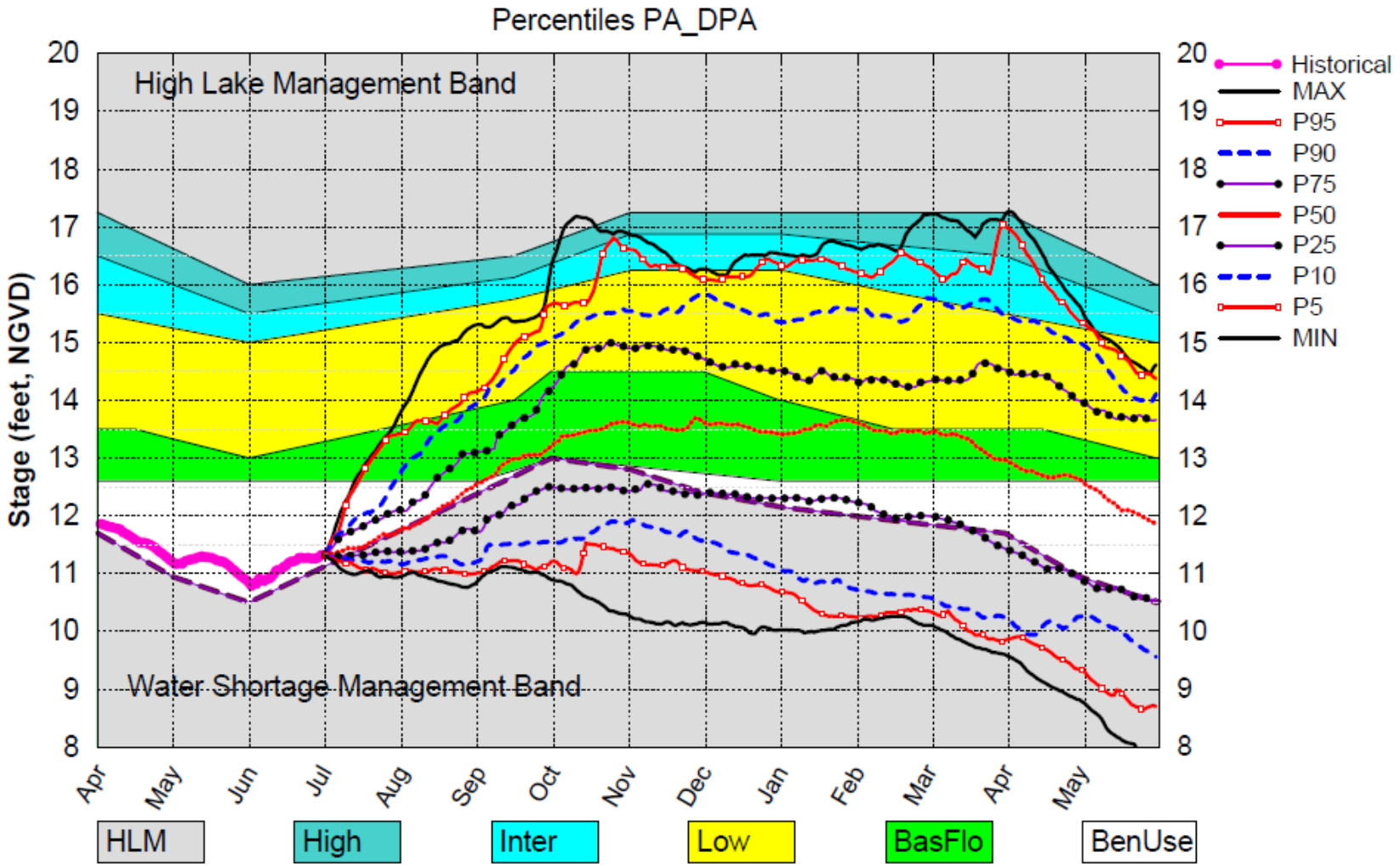
https://tropical.colostate.edu/

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-July-2019)
  - 41 1-year simulations of system response to historical rainfall conditions
  - Statistical summaries used to display projections

Lake Okeechobee SFWMM July 2019 Position Analysis

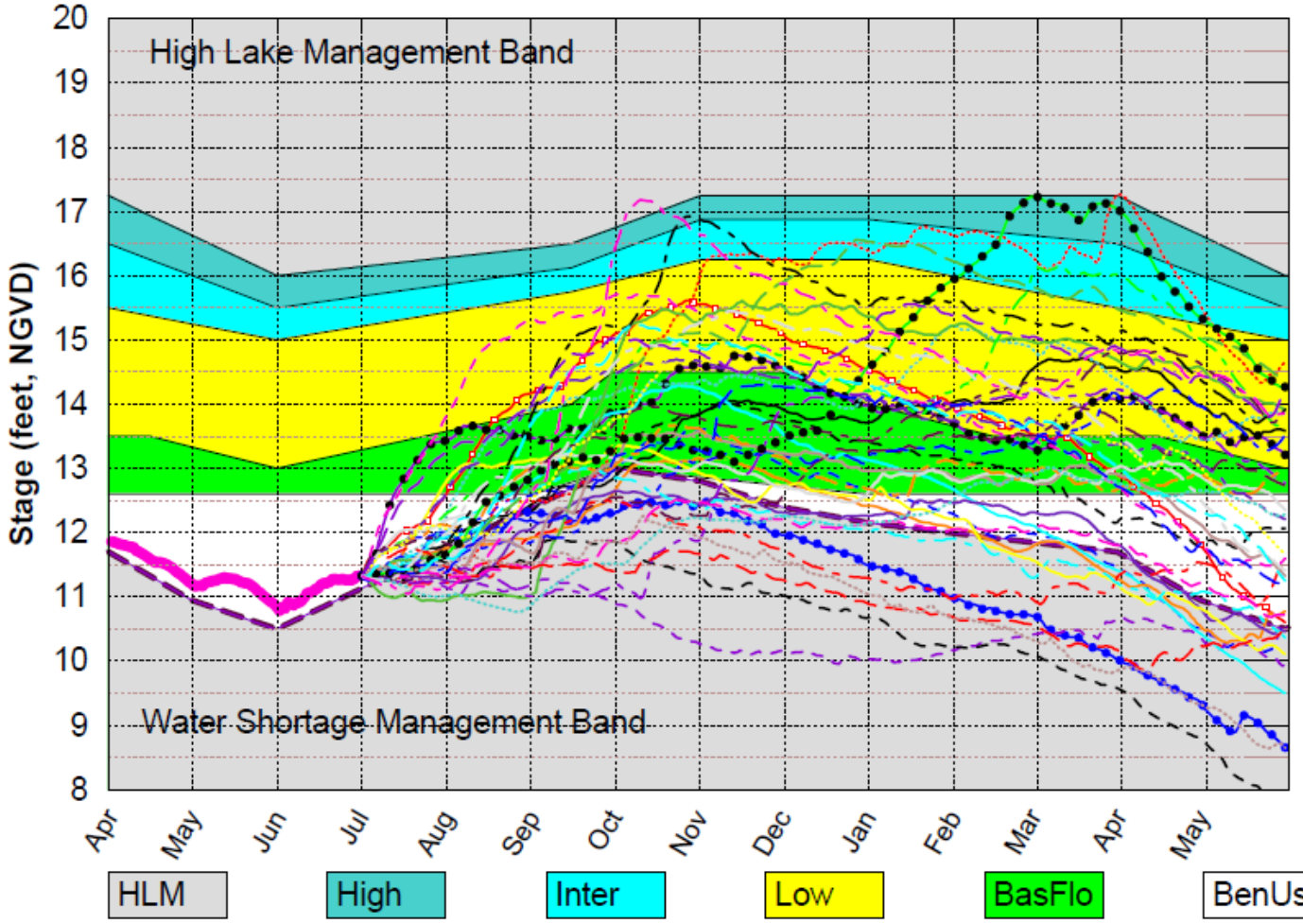


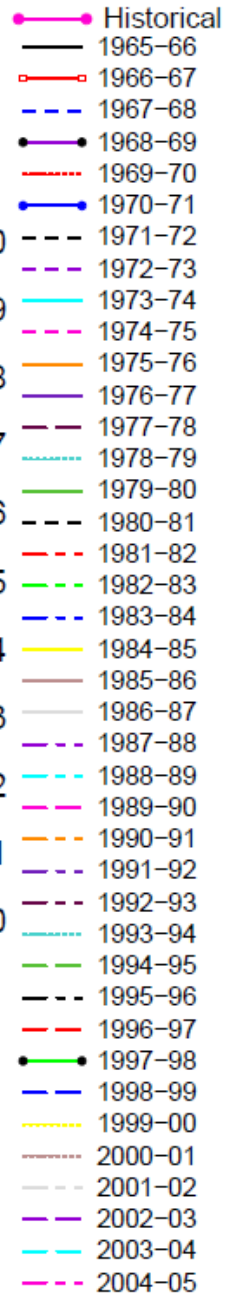
(See assumptions on the Position Analysis Results website)

Mon Jul 8 23:12:00 2019

Lake Okeechobee SFWMM July 2019 Position Analysis

All Simulated Years Plot PA_DPA

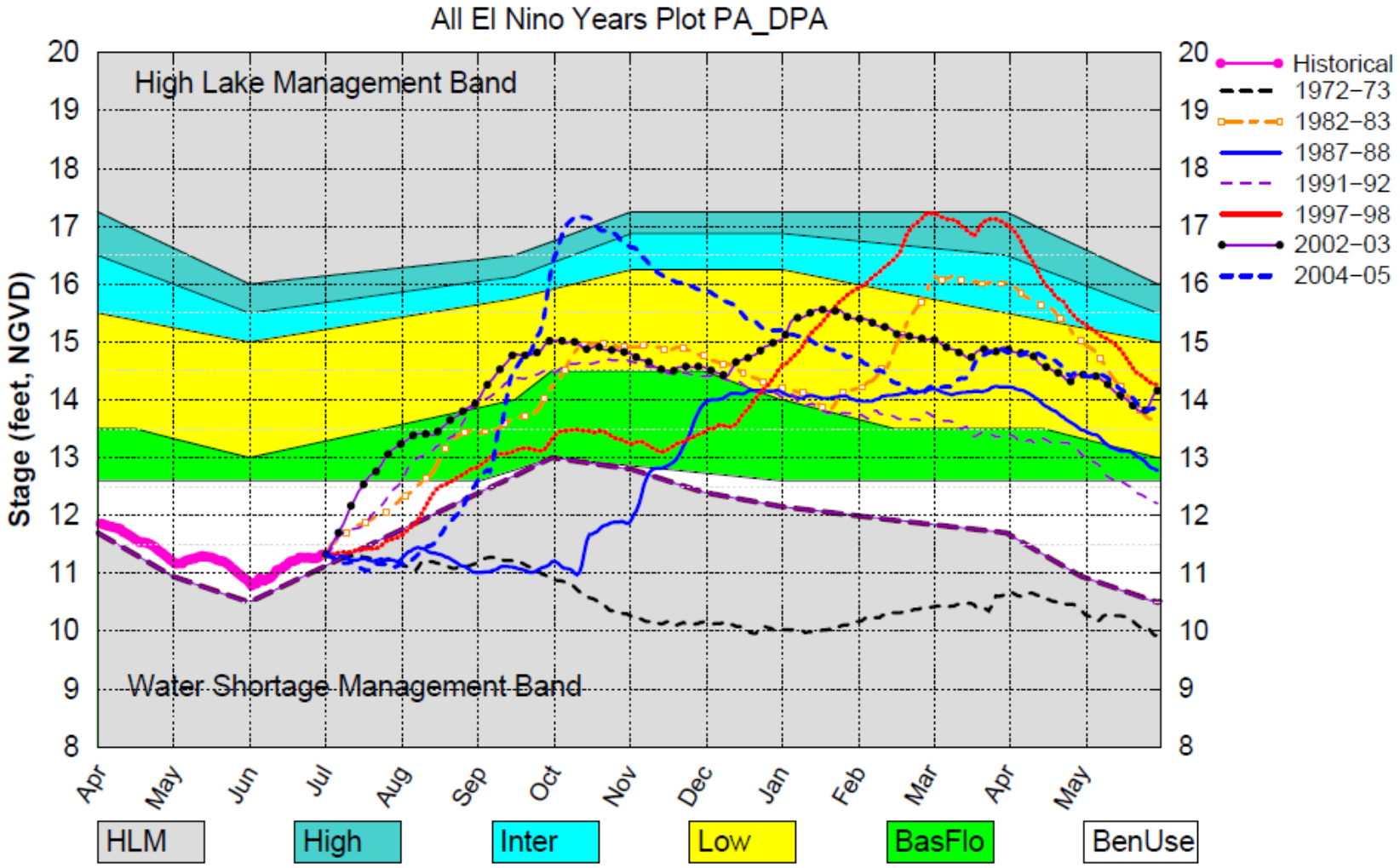




(See assumptions on the Position Analysis Results website)

Mon Jul 8 23:14:43 2019

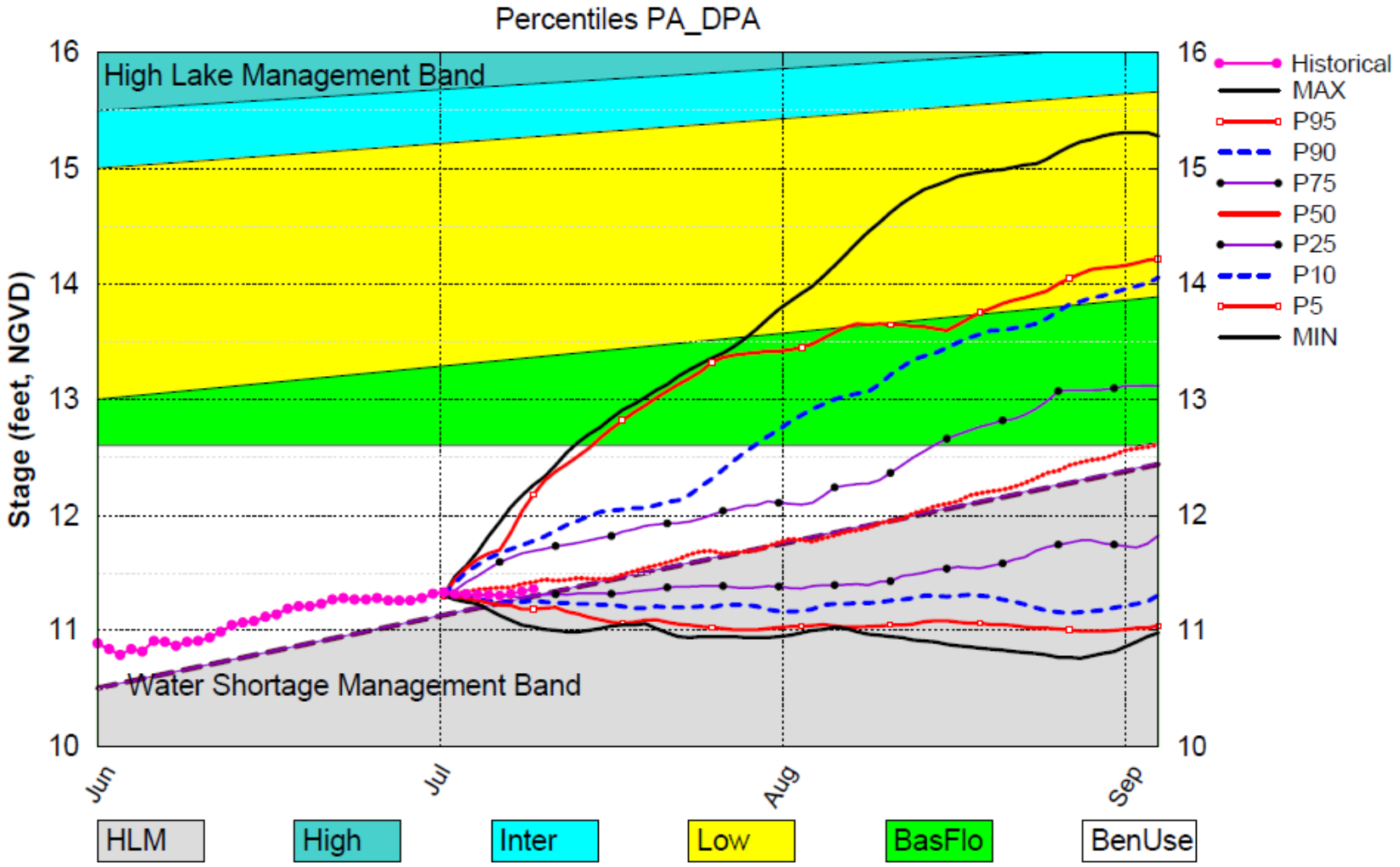
Lake Okeechobee SFWMM July 2019 Position Analysis



(See assumptions on the Position Analysis Results website)

Mon Jul 8 23:12:30 2019

Lake Okeechobee SFWMM July 2019 Position Analysis



(See assumptions on the Position Analysis Results website)

Tue Jul 9 00:56:11 2019