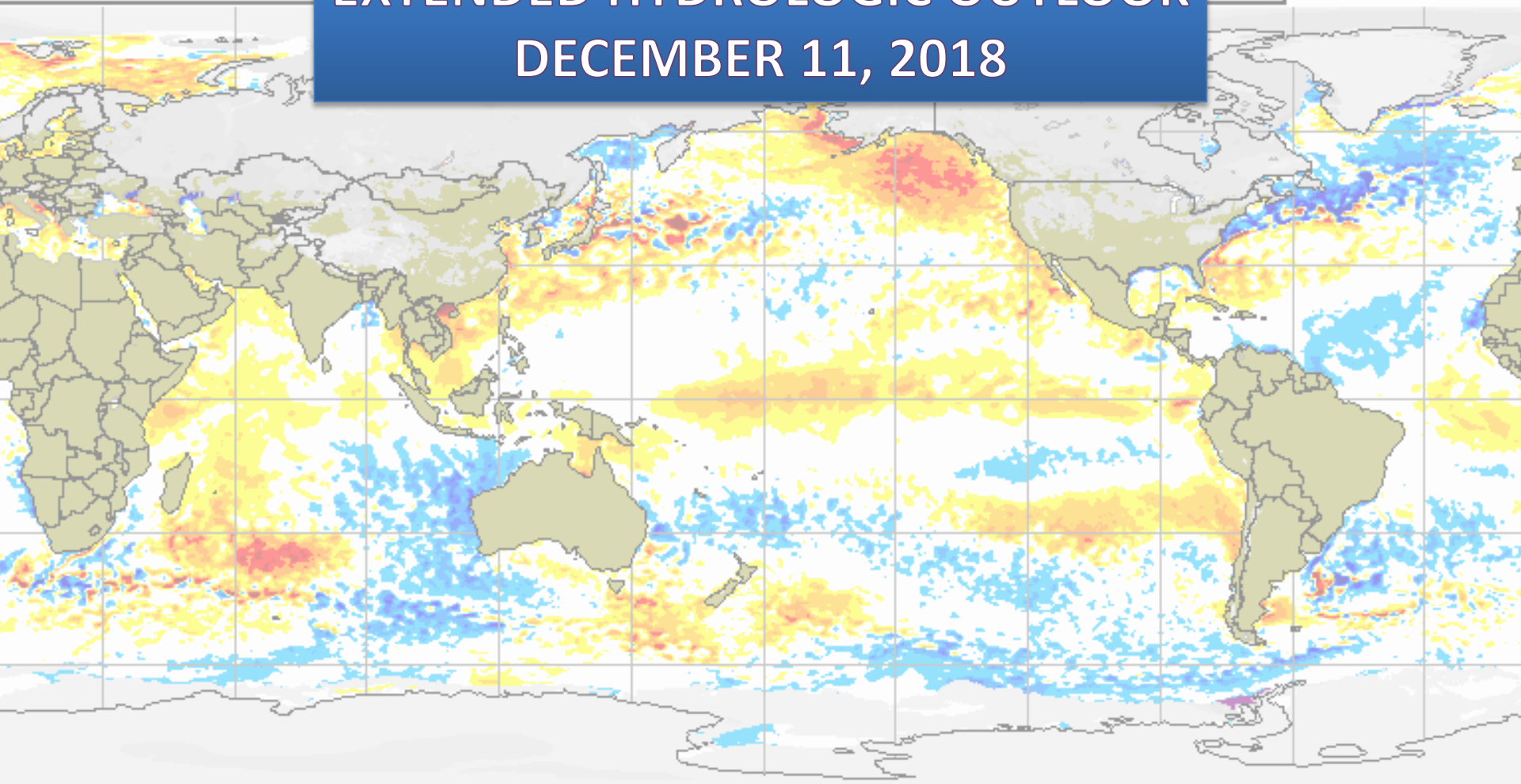
EXTENDED HYDROLOGIC OUTLOOK
DECEMBER 11, 2018



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

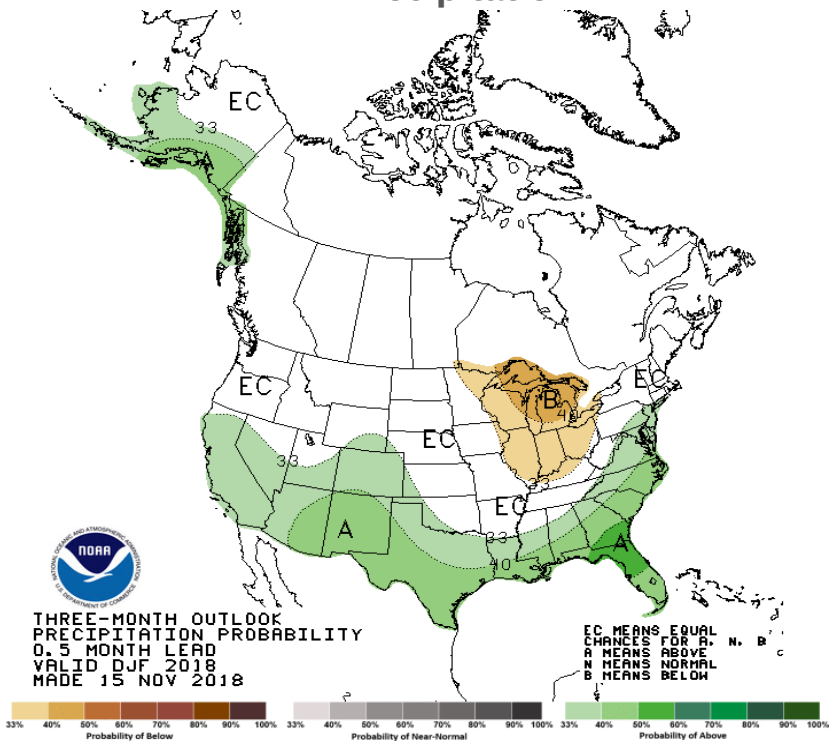
- **The Climate Prediction Center (CPC) is forecasting above normal rainfall for December through February.**
- **ENSO-neutral conditions are present. El Niño is expected to form and continue through winter 2018-19 (~80% chance) and into spring (55-60% chance).* El Niño increases the chances of a wetter-than-normal dry season.**
- **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

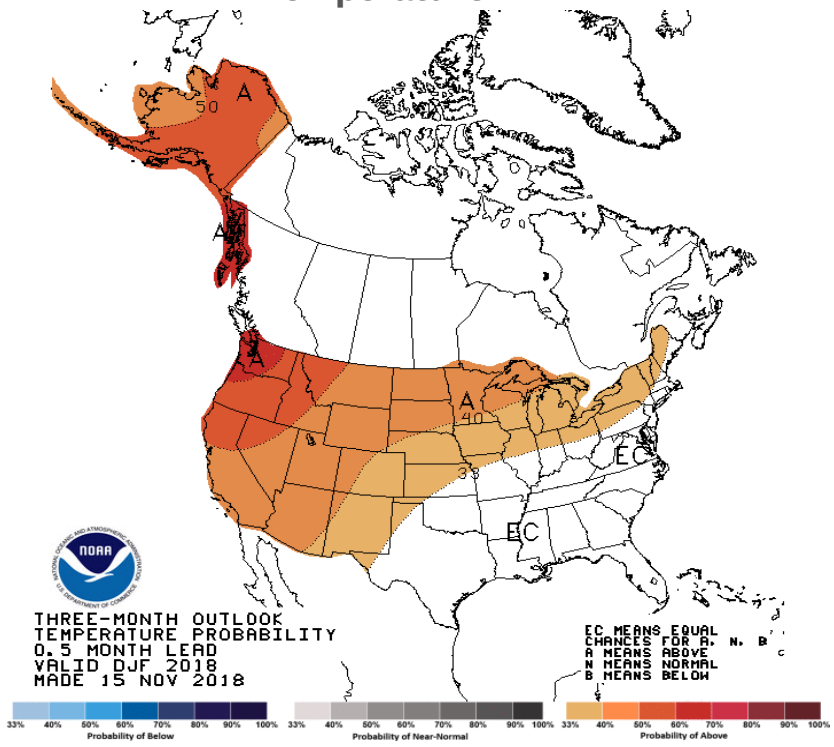
December 2018 - February 2019

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

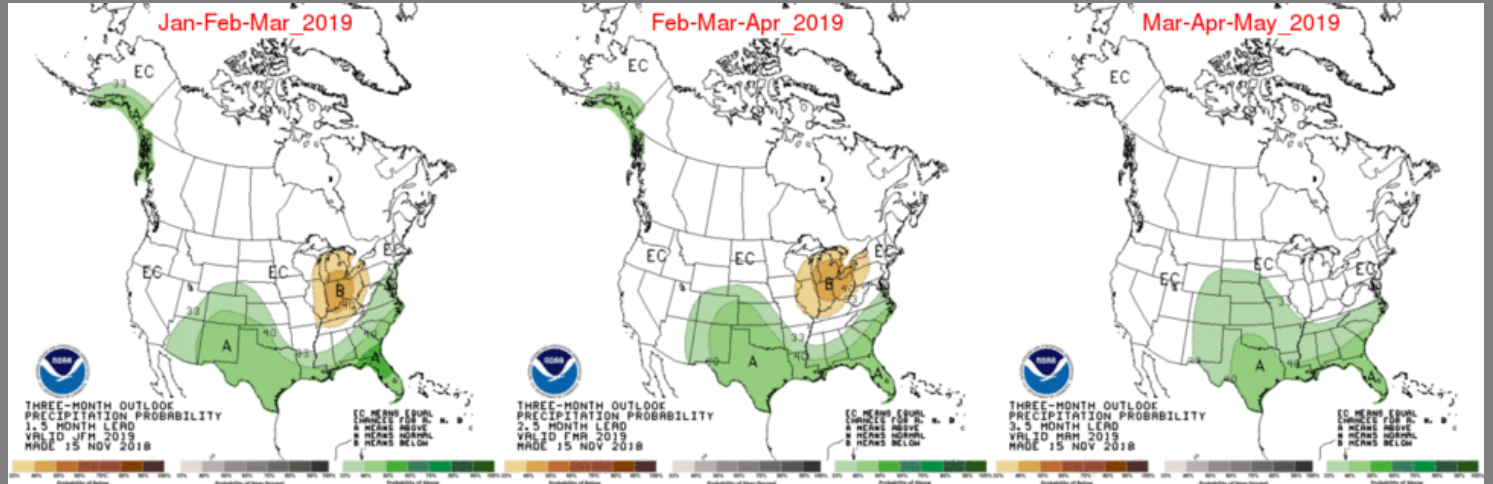
Precipitation

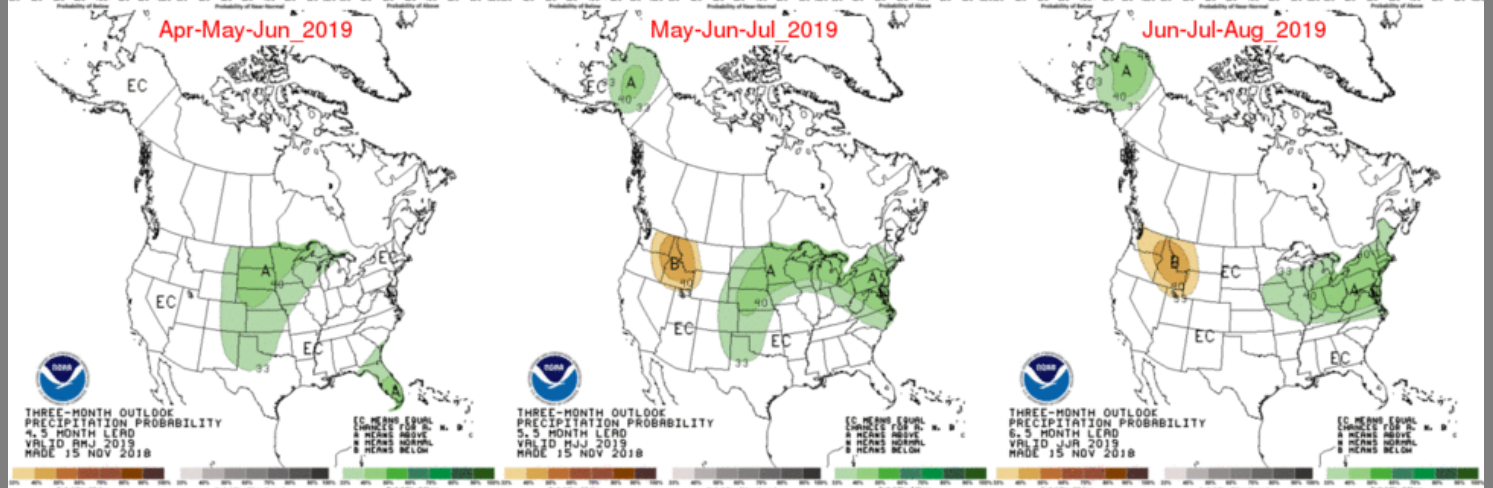


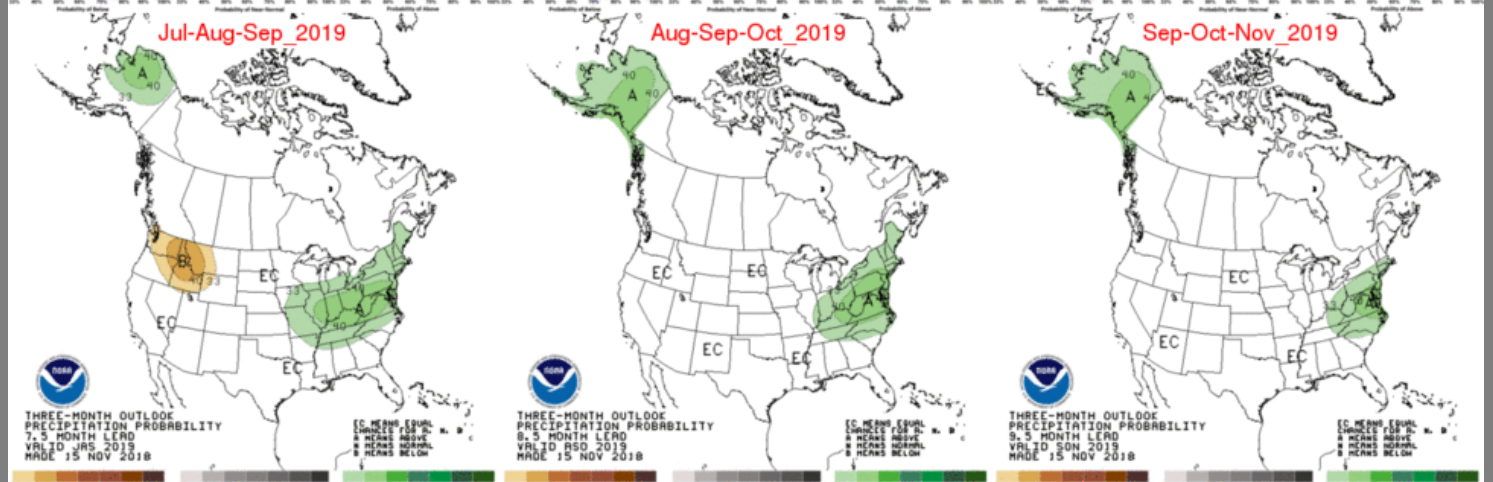
Temperature



Prepared by: Climate Prediction Center / NCEP



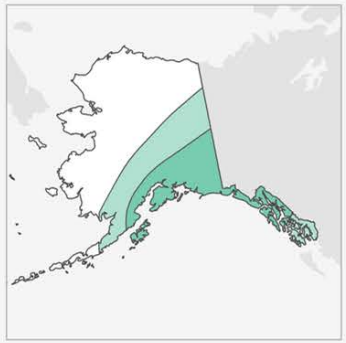


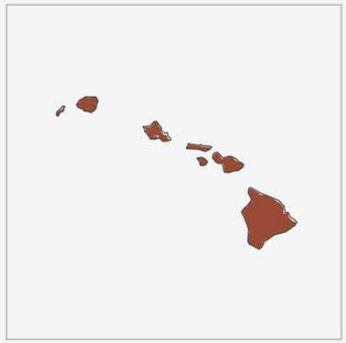


Prepared by: Climate Prediction Center / NCEP

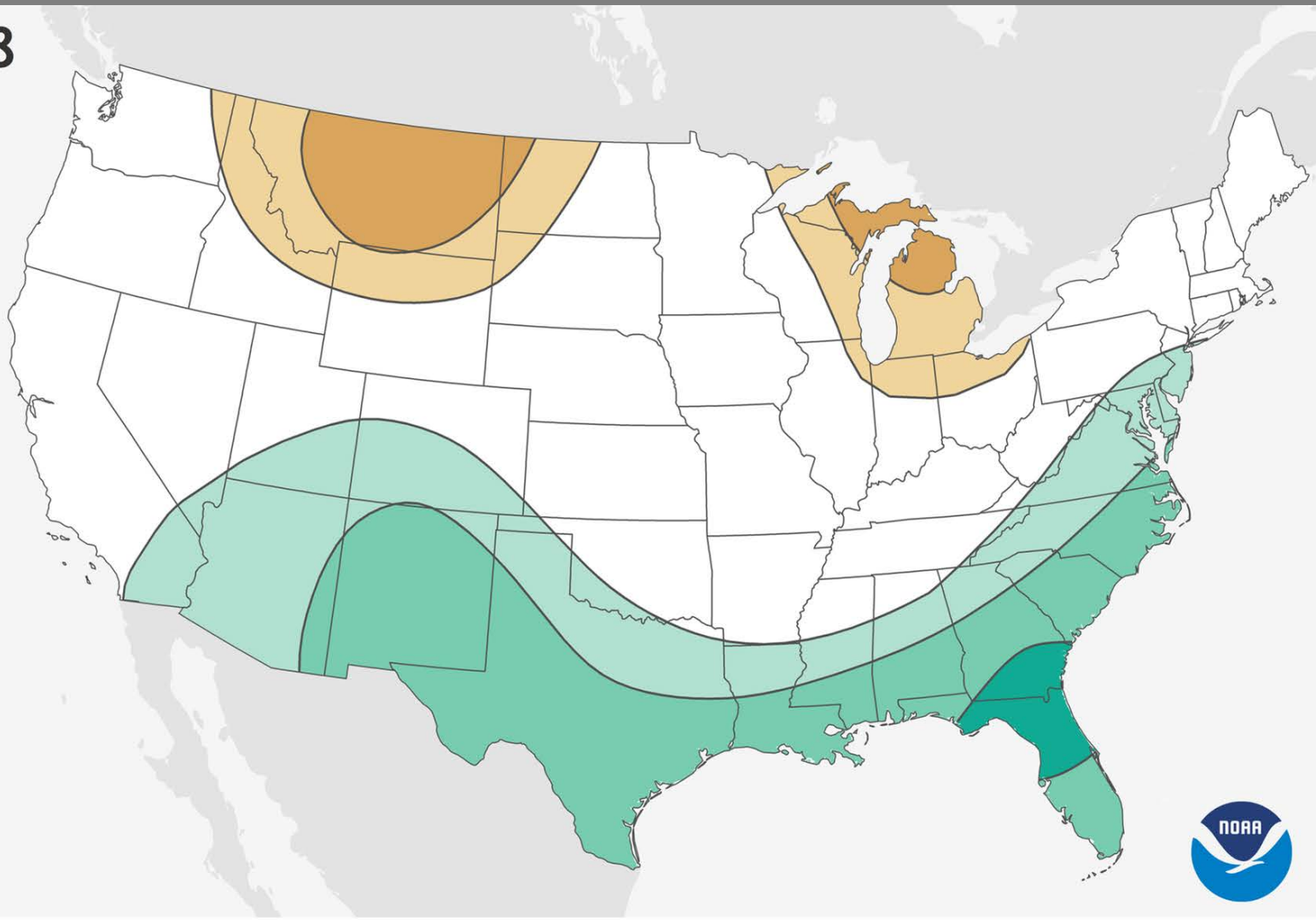
Winter 2018

U.S. Precipitation Outlook





AK and HI not to scale



Precipitation Outlook
for Dec 2018 – Feb 2019
Issued 18 October 2018

Probability (percent chance)

drier than normal *equal chances* *wetter than normal*

80 70 60 50 40 33 33 40 50 60 70 80

NWS Climate Prediction Center
Map by NOAA Climate.gov

Prepared by: Climate Prediction Center

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**

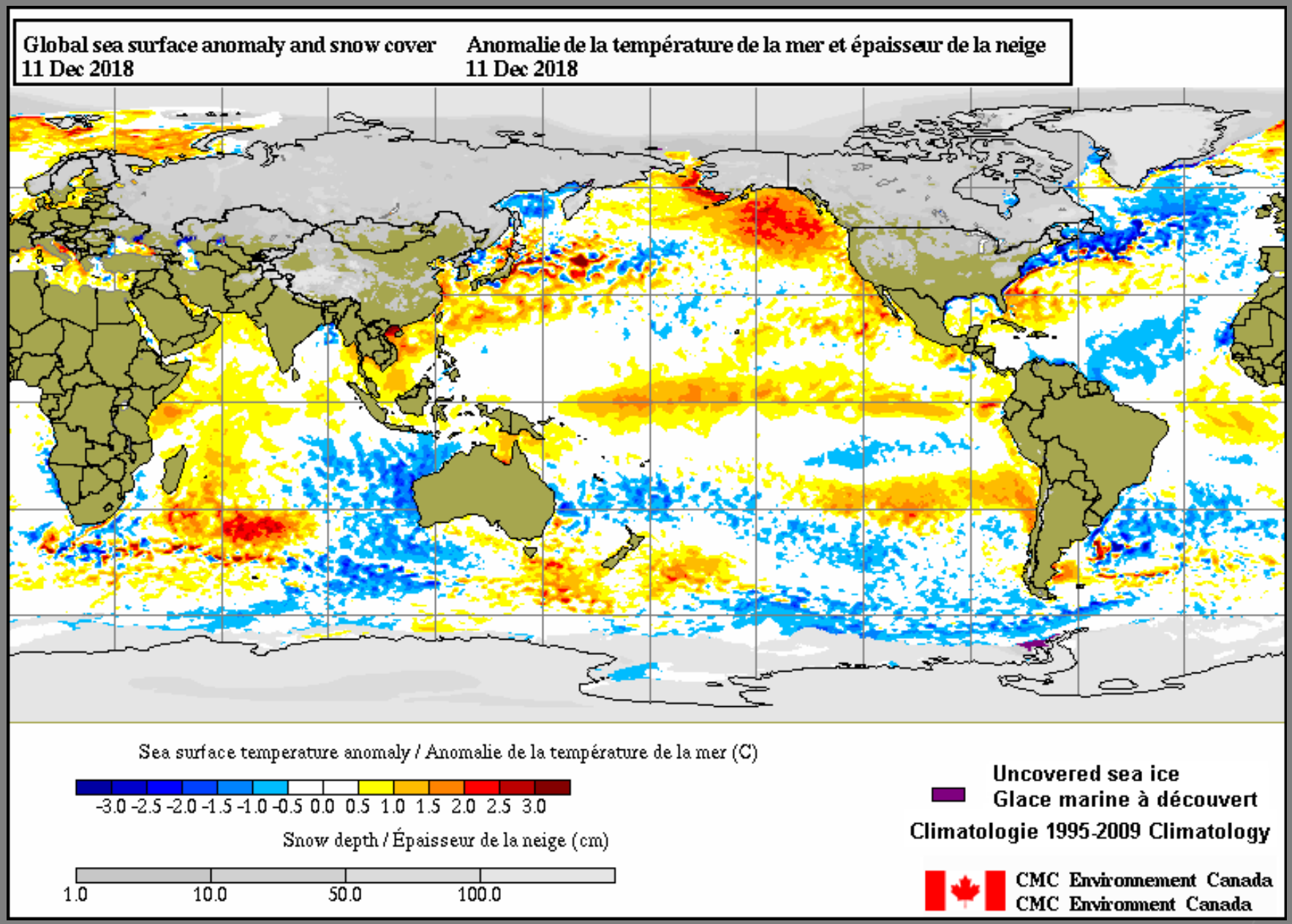
Atlantic Multidecadal Oscillation (AMO)

- **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**

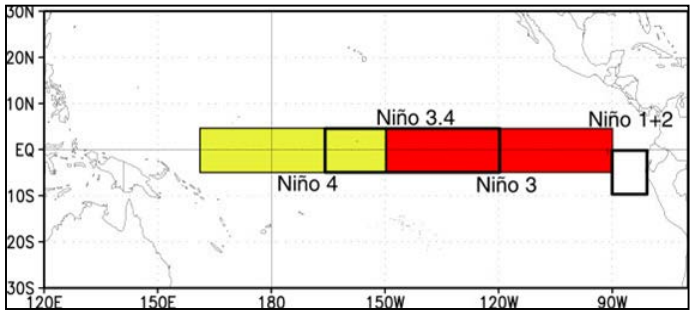
Current Global Sea Surface Temperature Anomalies

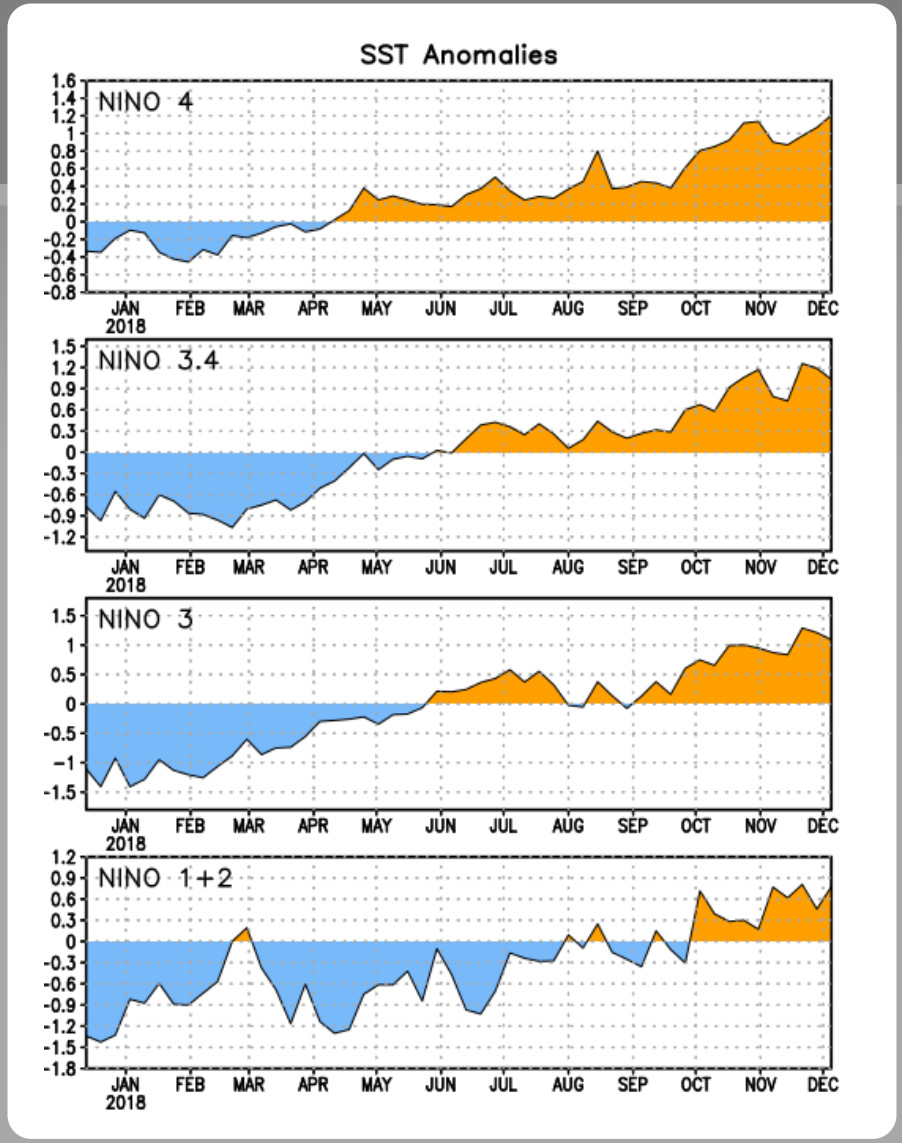


Niño Region SST Departures (ºC) Recent Evolution

The latest weekly SST departures are:

Niño 4	1.2ºC
Niño 3.4	1.0ºC
Niño 3	1.1ºC
Niño 1+2	0.8ºC





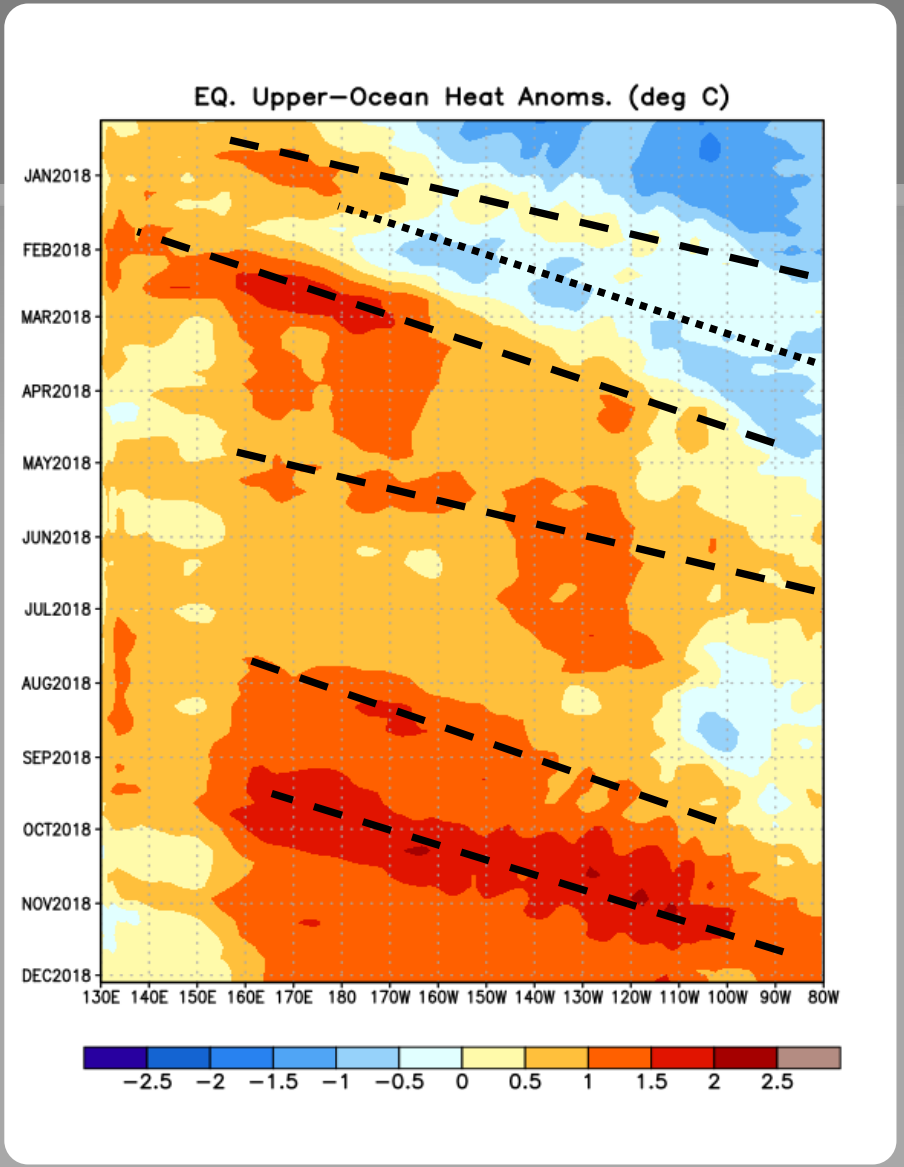
Prepared by: Climate Prediction Center / NCEP

Weekly Heat Content Evolution in the Equatorial Pacific

From December 2017- May 2018, successive Kelvin waves contributed to the eastward shift of positive and negative subsurface temperature anomalies.

During July-August 2018, positive subsurface temperature anomalies weakened in the eastern Pacific.

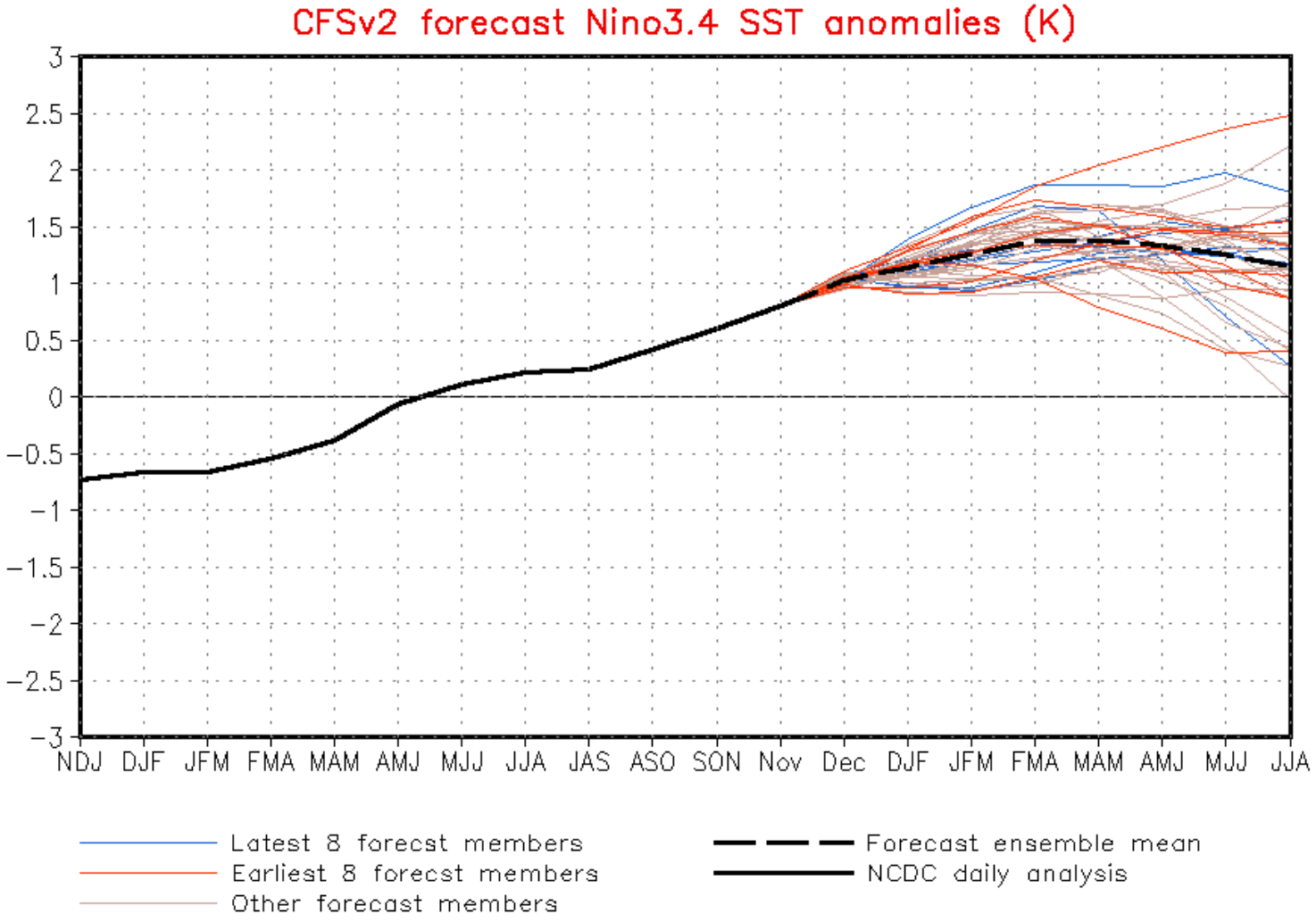
In early August and again in October and November 2018, positive subsurface anomalies increased, partly due to downwelling Kelvin waves.



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.

NWS/NCEP/CPC

Last update: Mon Dec 10 2018
Initial conditions: 30Nov2018-9Dec2018



IRI/CPC Pacific Niño 3.4 SST Model Outlook

The majority of models predict El Niño to develop and persist through at least Northern Hemisphere spring 2019.

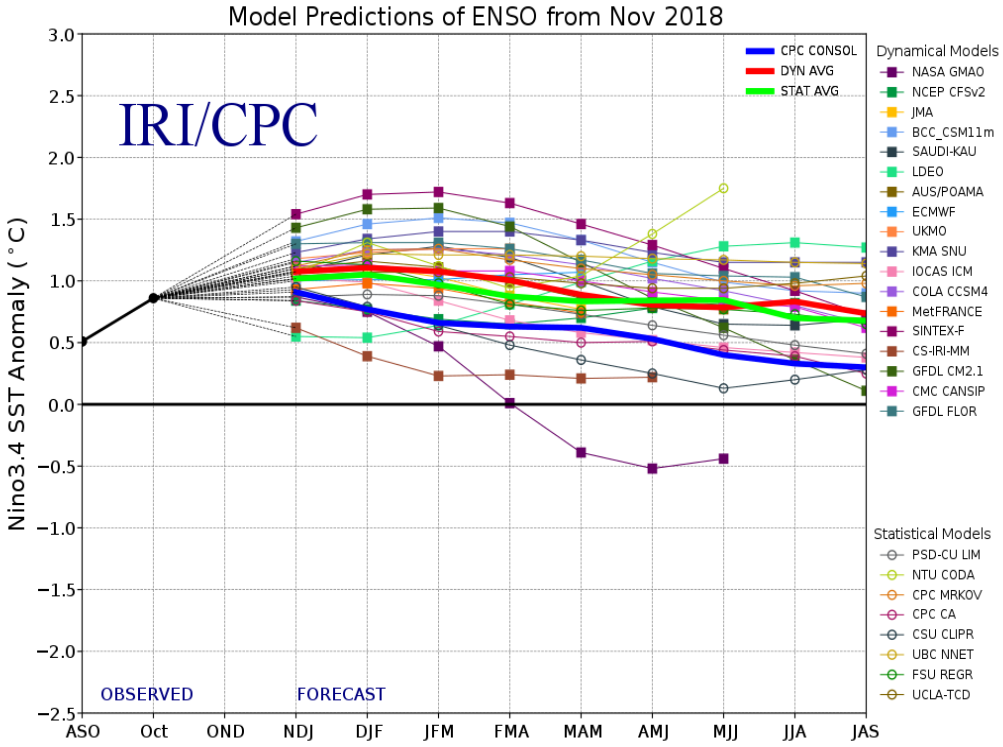


Figure provided by the International Research Institute (IRI) for Climate and Society (updated 19 November 2018).

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.

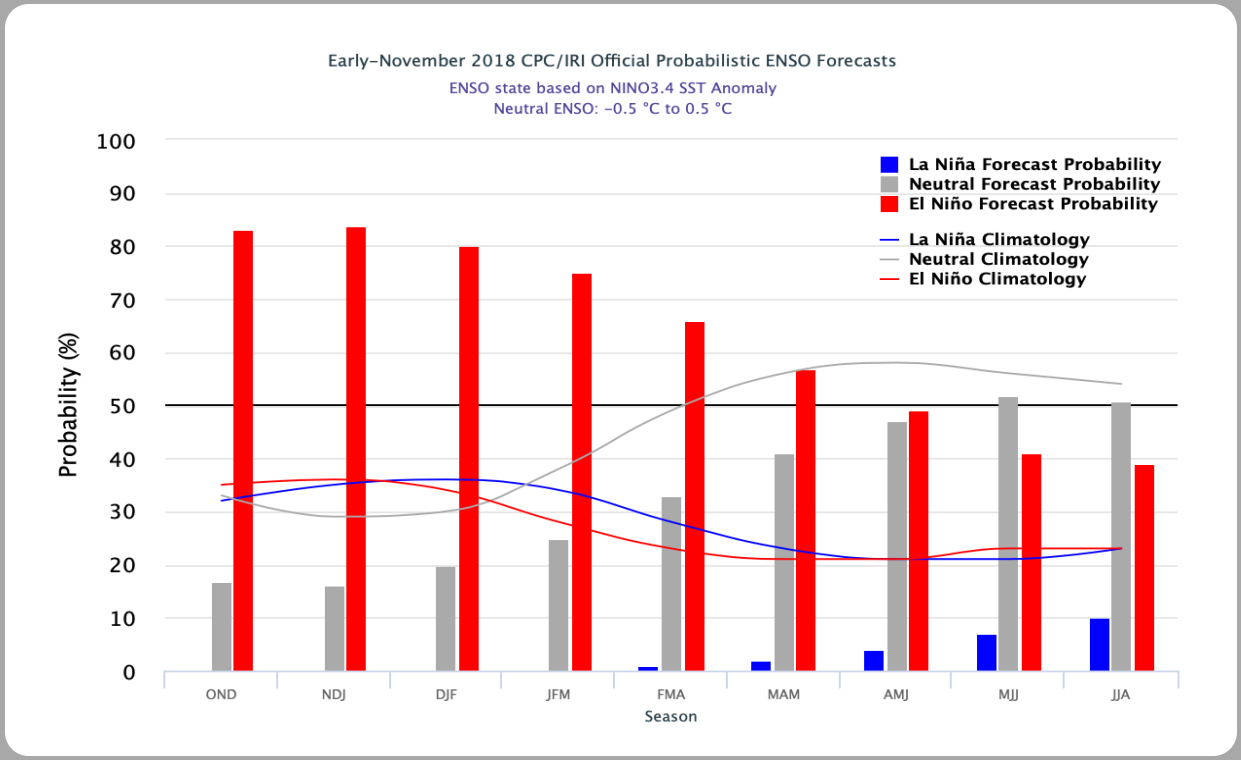
Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2006	-0.8	-0.7	-0.5	-0.3	0.0	0.0	0.1	0.3	0.5	0.7	0.9	0.9
2007	0.7	0.3	0.0	-0.2	-0.3	-0.4	-0.5	-0.8	-1.1	-1.4	-1.5	-1.6
2008	-1.6	-1.4	-1.2	-0.9	-0.8	-0.5	-0.4	-0.3	-0.3	-0.4	-0.6	-0.7
2009	-0.8	-0.7	-0.5	-0.2	0.1	0.4	0.5	0.5	0.7	1.0	1.3	1.6
2010	1.5	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		

Prepared by: Climate Prediction Center / IRI

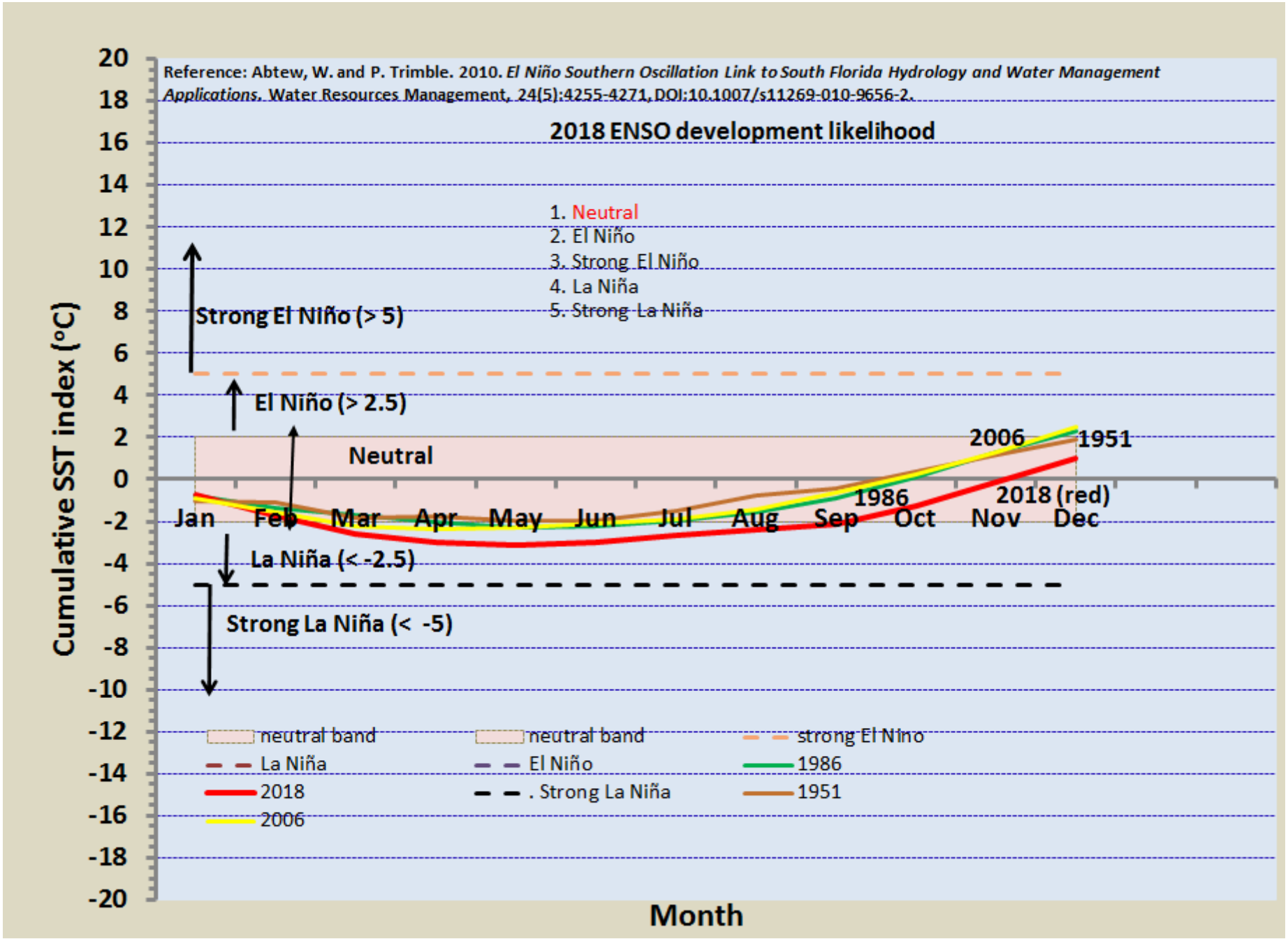
CPC/IRI Probabilistic ENSO Outlook

Updated: 8 November 2018

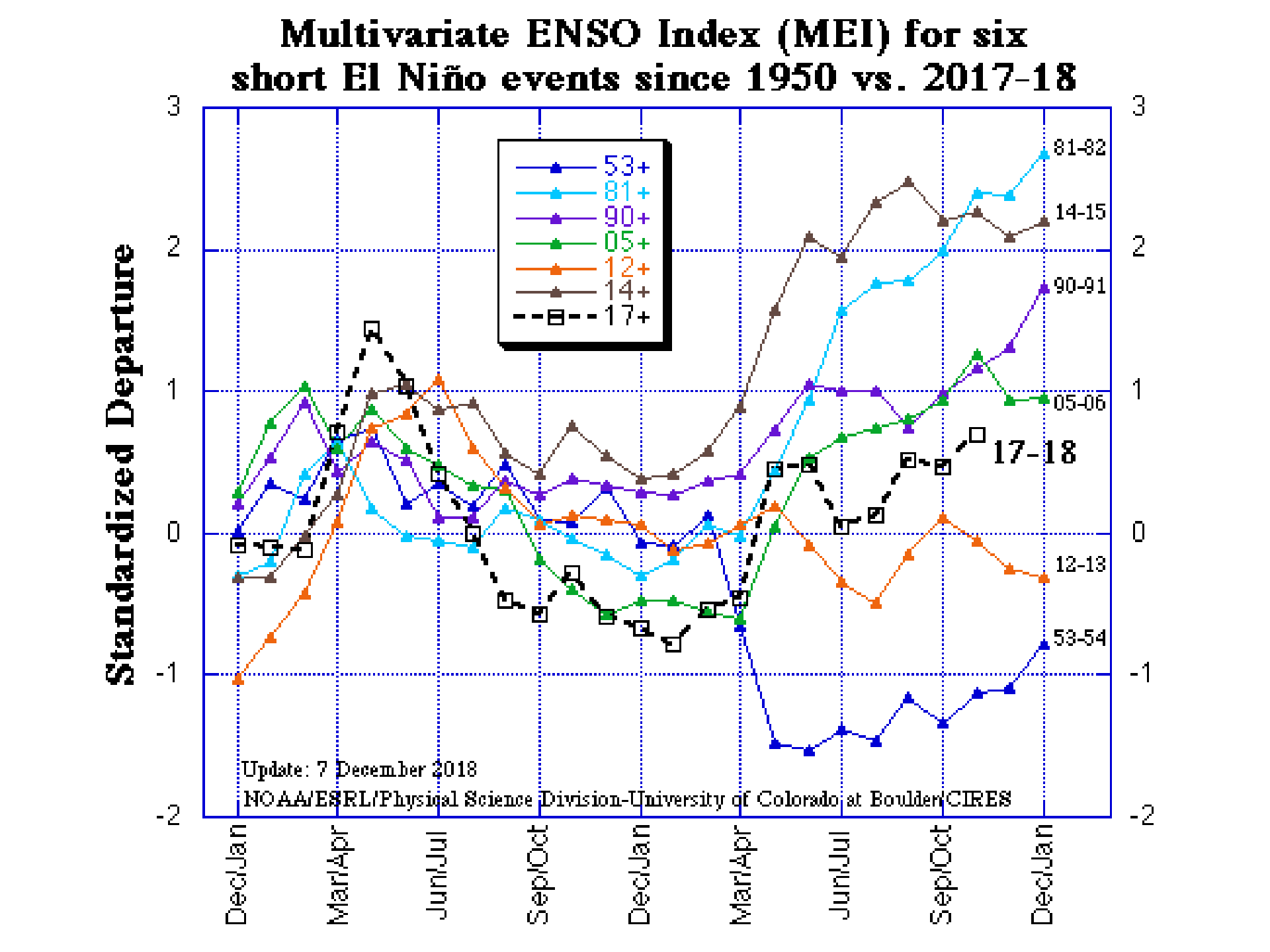
El Niño is expected to form and continue through the Northern Hemisphere winter 2018-19 (~80% chance) and into spring (55-60% chance).



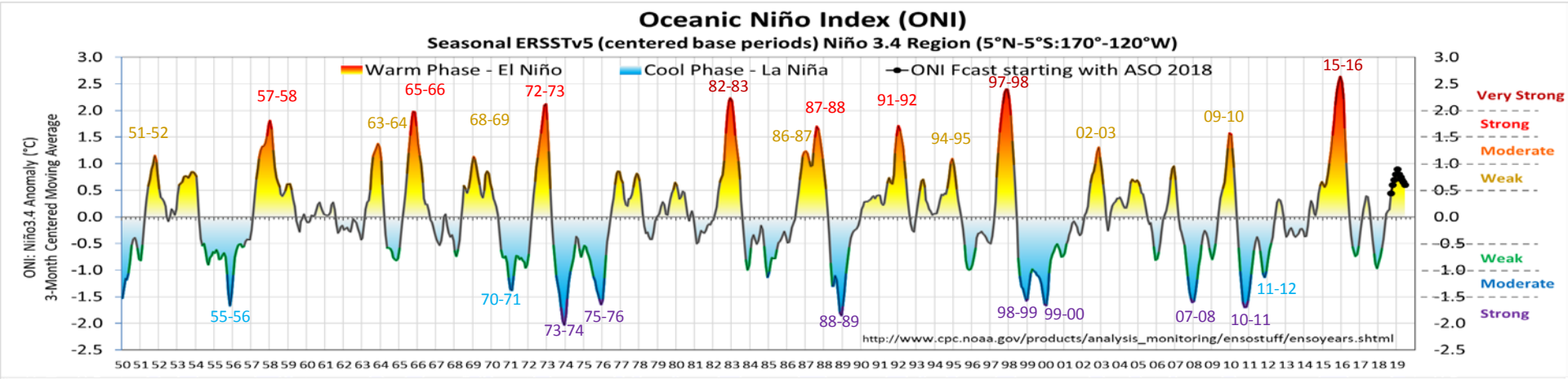
Prepared by: Climate Prediction Center / IRI

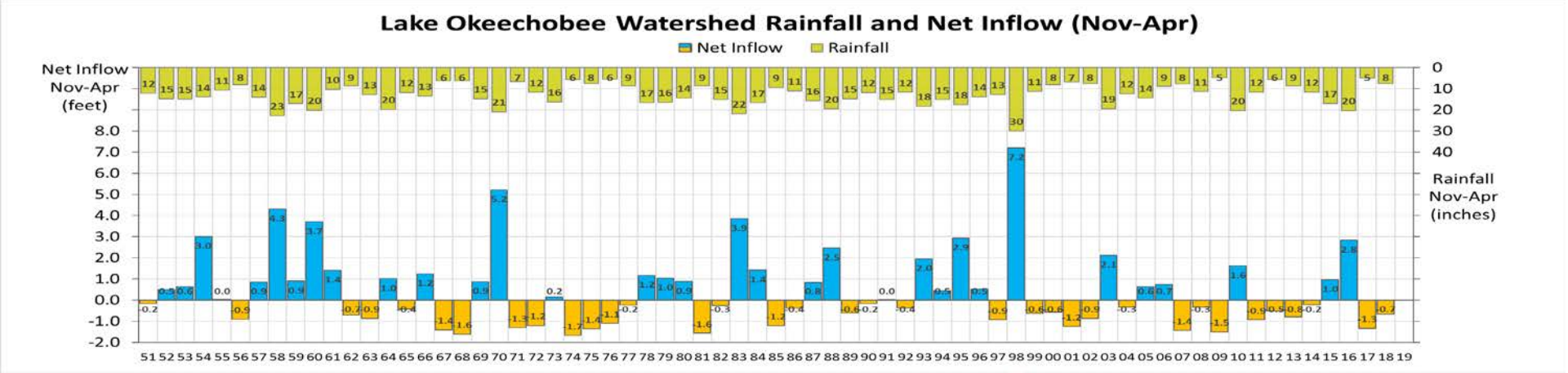


Source: Wossenu Abtew (SFWMD)

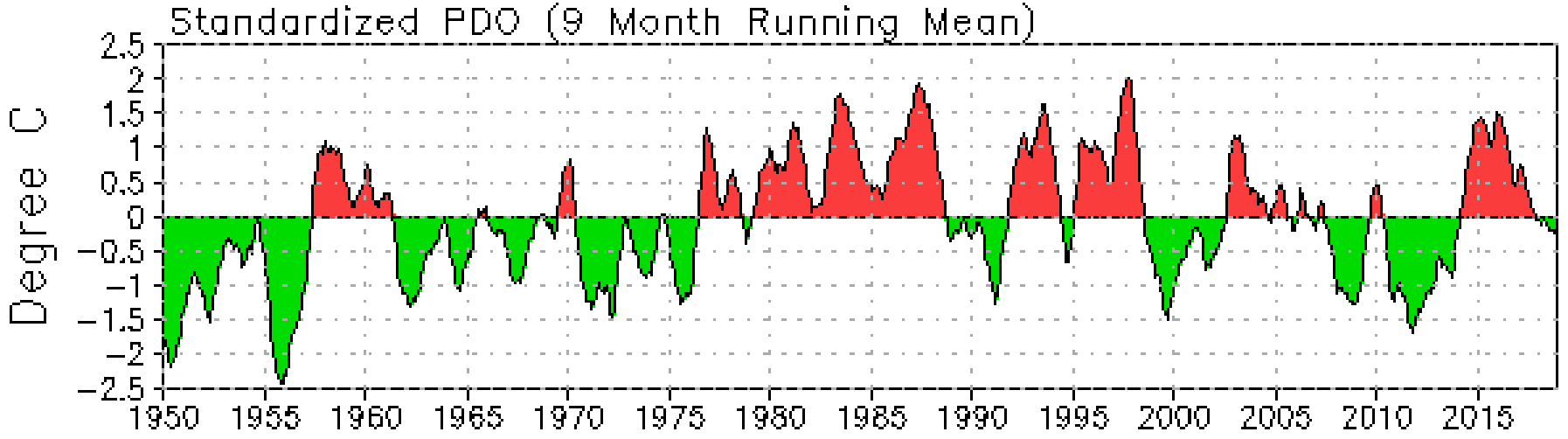

Multivariate ENSO Index (MEI) for six short El Niño events since 1950 vs. 2017-18
Standardized Departure
3
2
1
0
-1
-2
53+
81+
90+
05+
12+
14+
17+
81-82
14-15
90-91
05-06
17-18
12-13
53-54
Update: 7 December 2018
NOAA/ESRL/Physical Science Division-University of Colorado at Boulder/CIRES
Dec|Jan
Mar|Apr
Jun|Jul
Sep|Oct
Dec|Jan
Mar|Apr
Jun|Jul
Sep|Oct
Dec|Jan

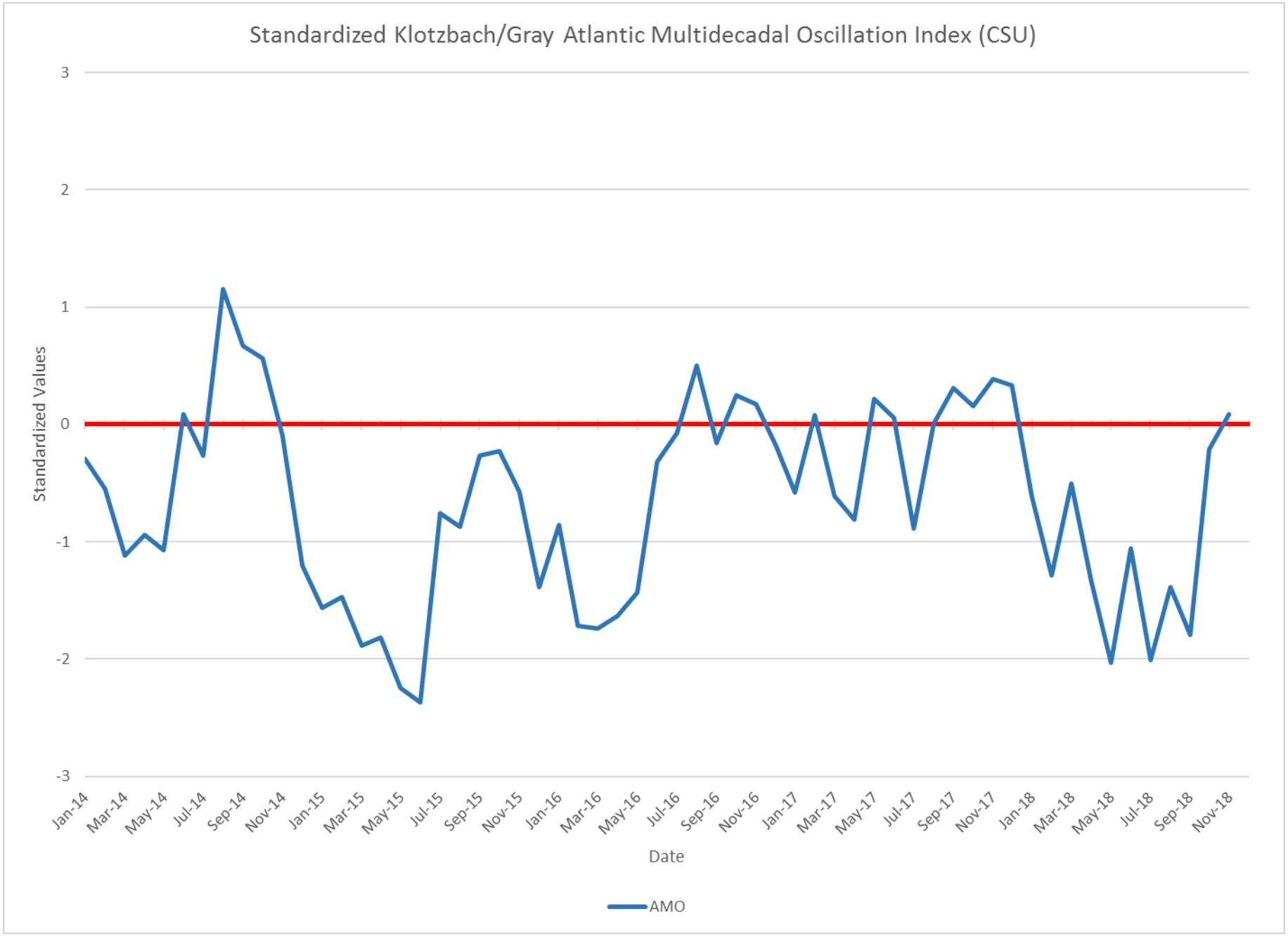
El Niño & La Niña Events (1950-2018), and Lake Okeechobee Watershed Rainfall & Net Inflow





Source: Cal Neidrauer (SFWMD)

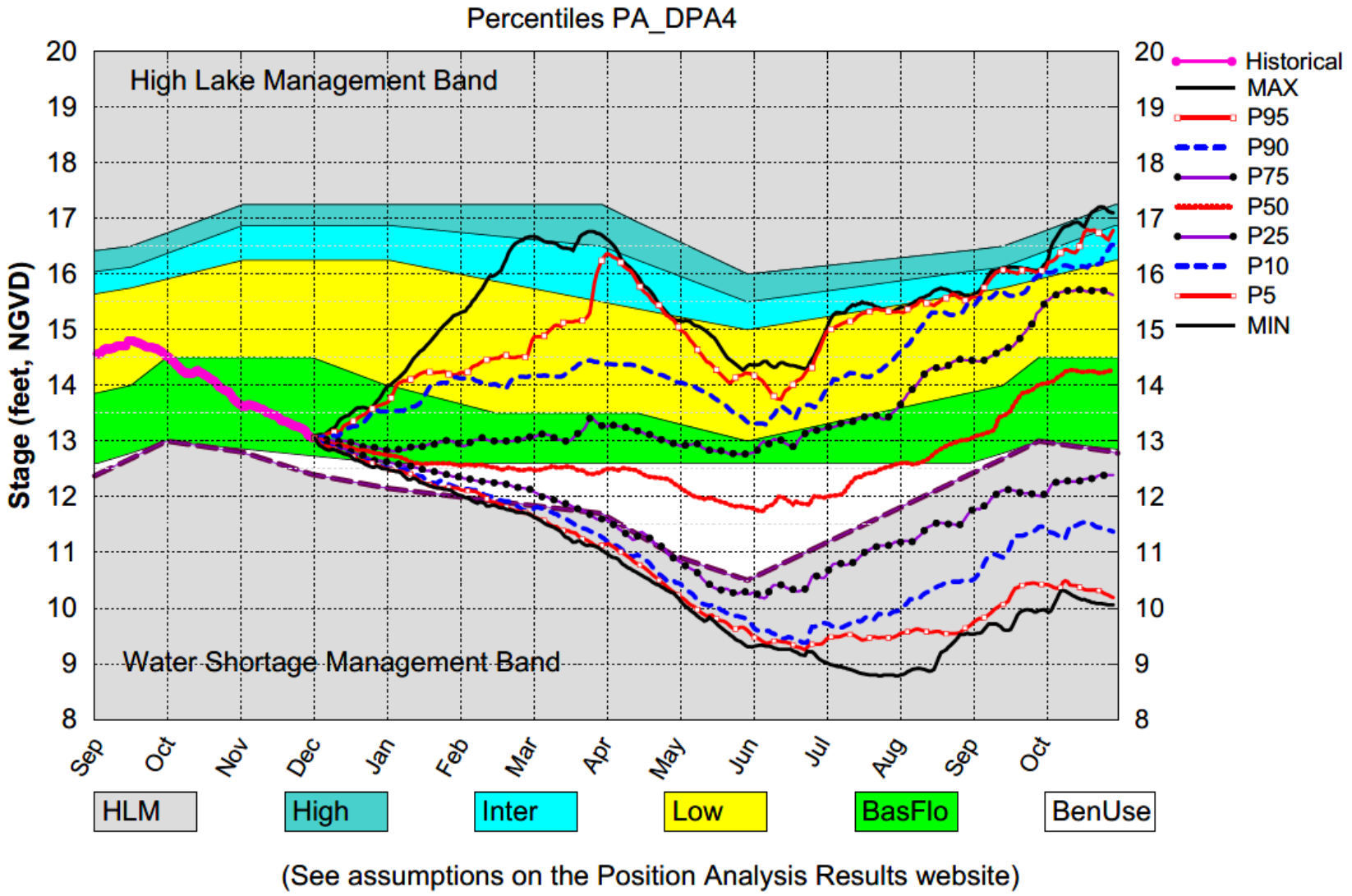

Standardized PDO (9 Month Running Mean)
Degree C
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015


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
Date
AMO

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-Dec-2018)
  - 41 1-year simulations of system response to historical rainfall conditions
  - Statistical summaries used to display projections

Lake Okeechobee SFWMM Dec 2018 Position Analysis

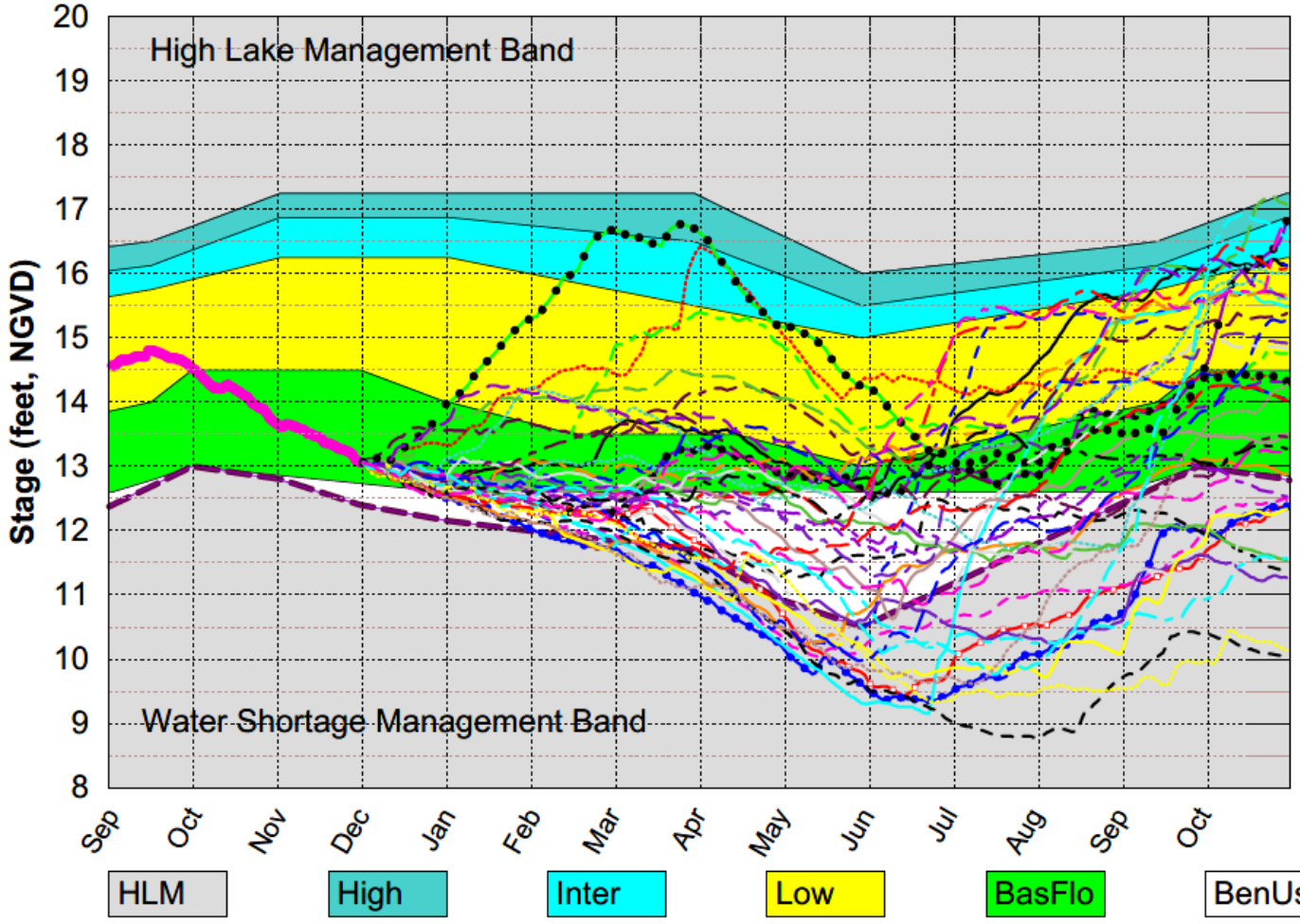


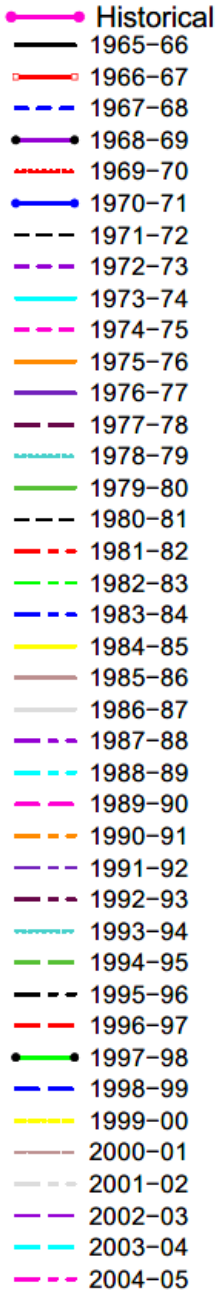
(See assumptions on the Position Analysis Results website)

Wed Dec 5 09:44:27 2018

Lake Okeechobee SFWMM Dec 2018 Position Analysis

All Simulated Years Plot PA_DPA4

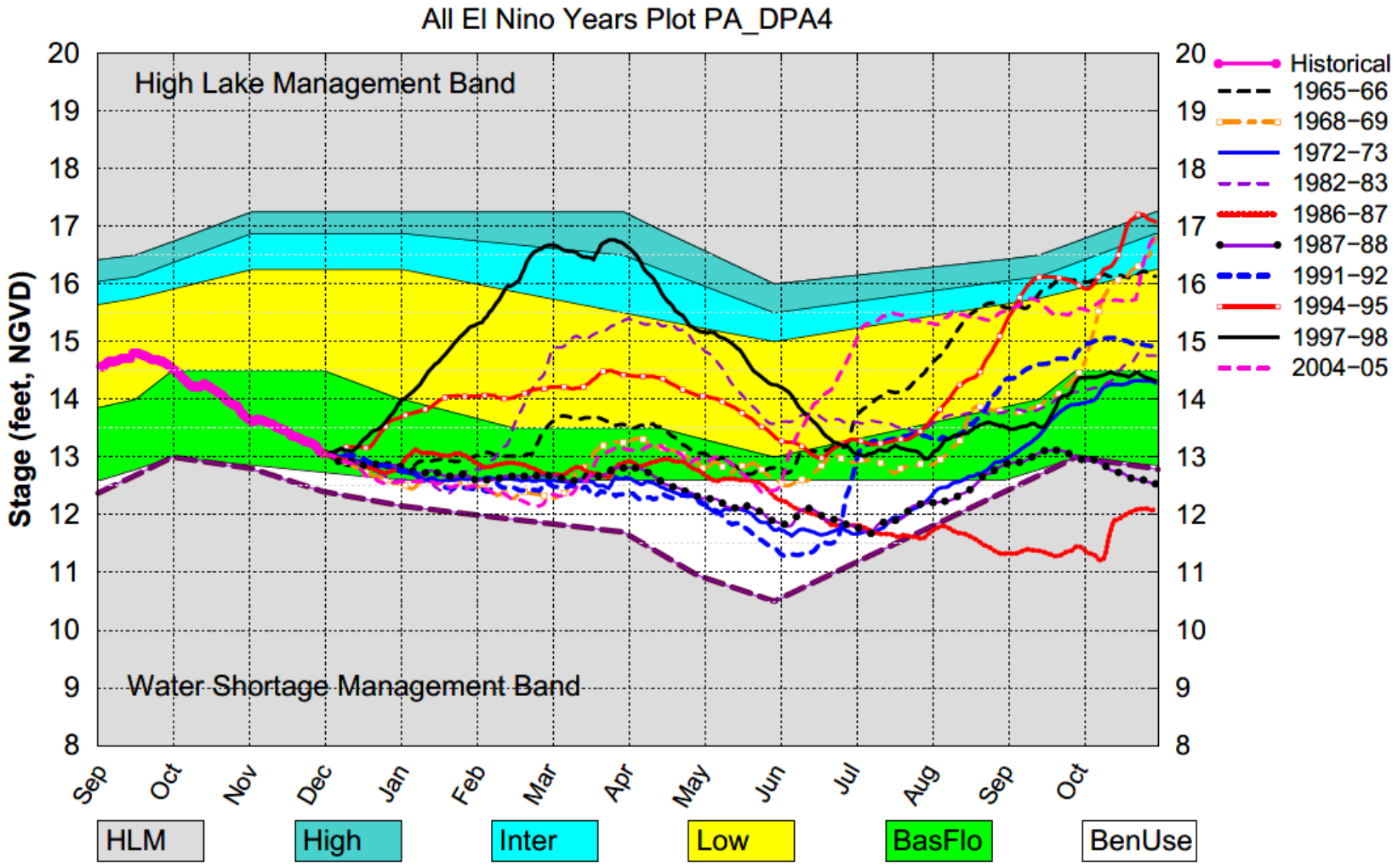




(See assumptions on the Position Analysis Results website)

Wed Dec 5 09:47:19 2018

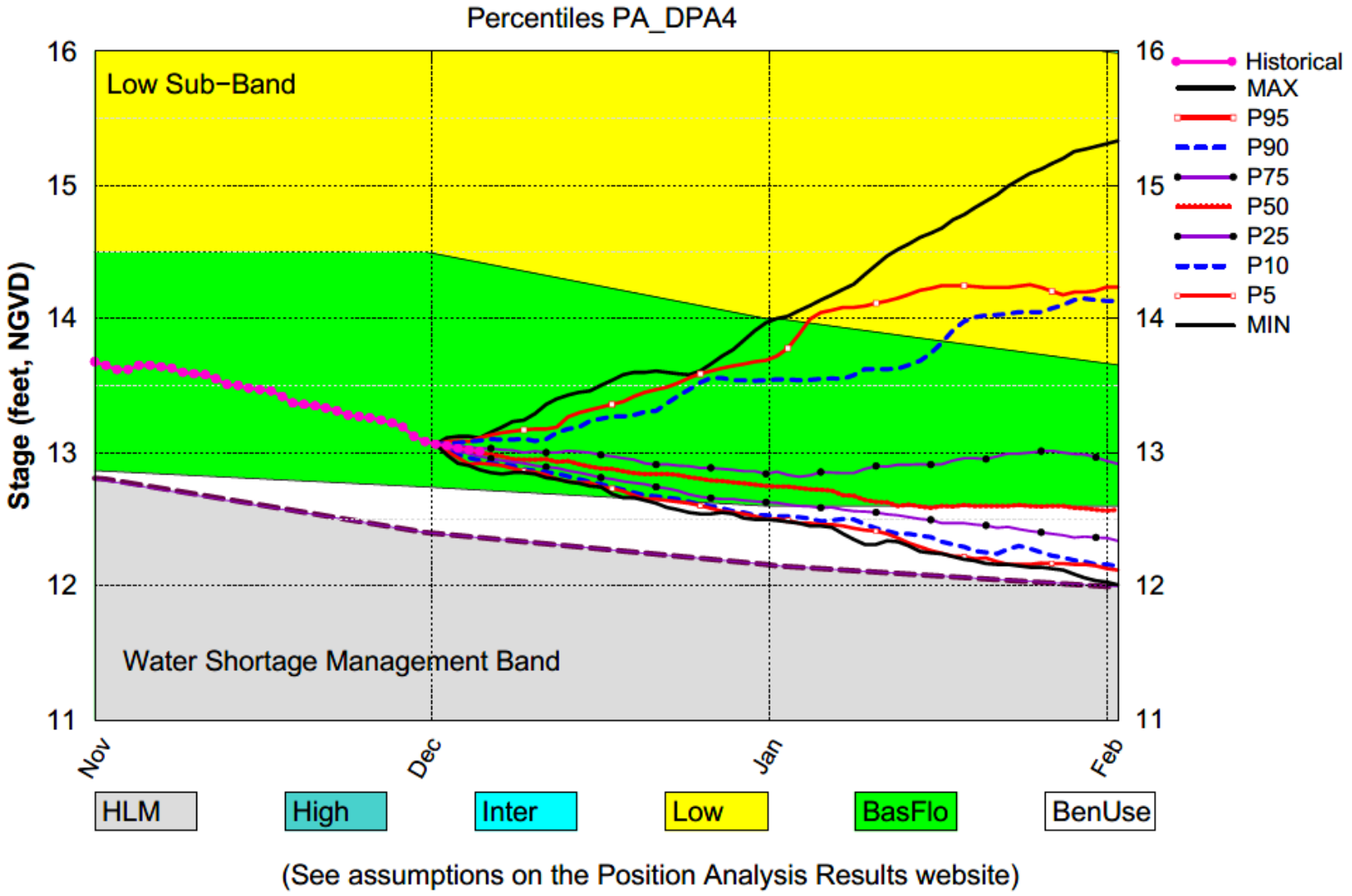
Lake Okeechobee SFWMM Dec 2018 Position Analysis



(See assumptions on the Position Analysis Results website)

Wed Dec 5 09:44:59 2018

Lake Okeechobee SFWMM Dec 2018 Position Analysis



(See assumptions on the Position Analysis Results website)

Thu Dec 6 14:34:19 2018