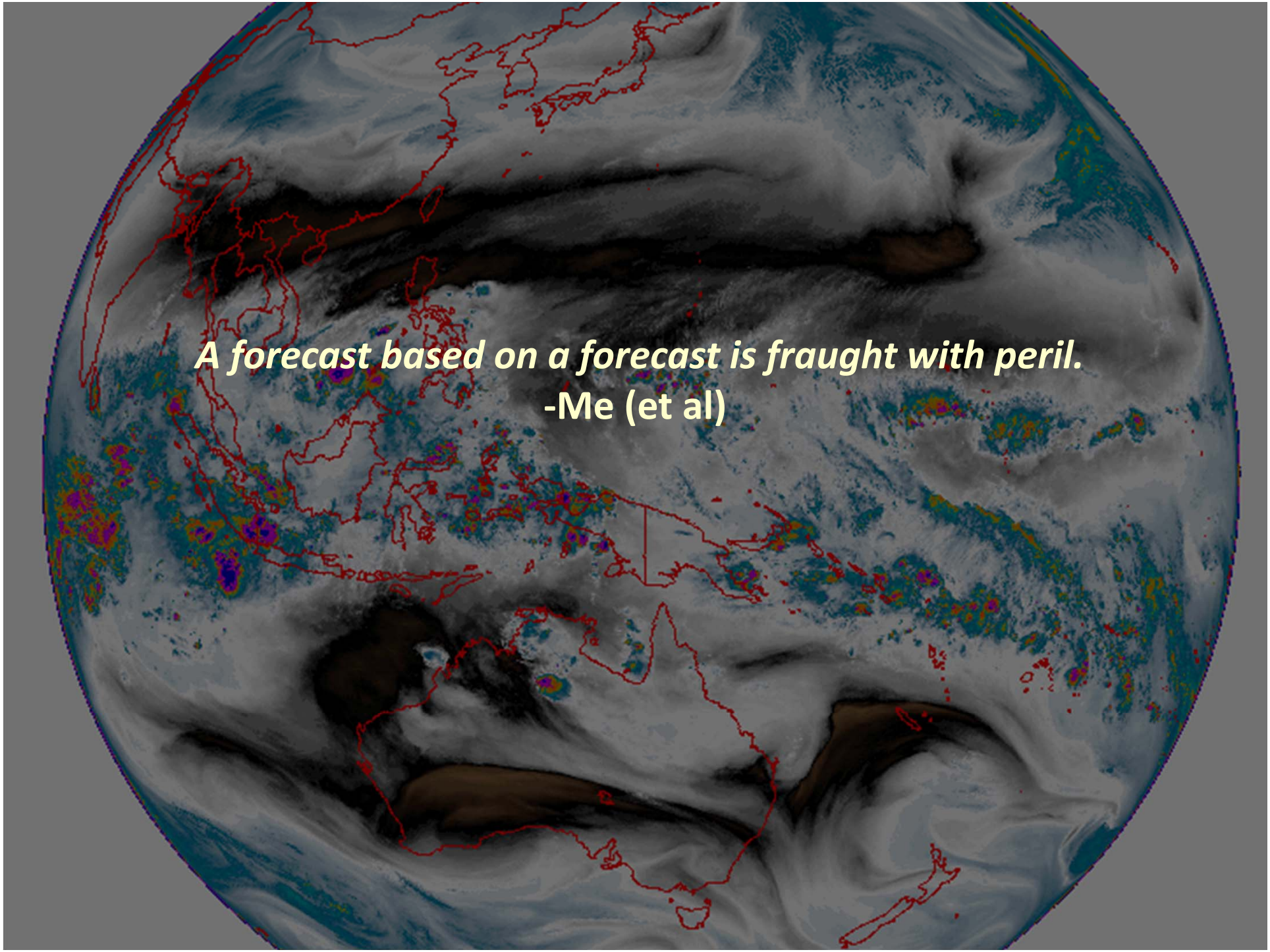
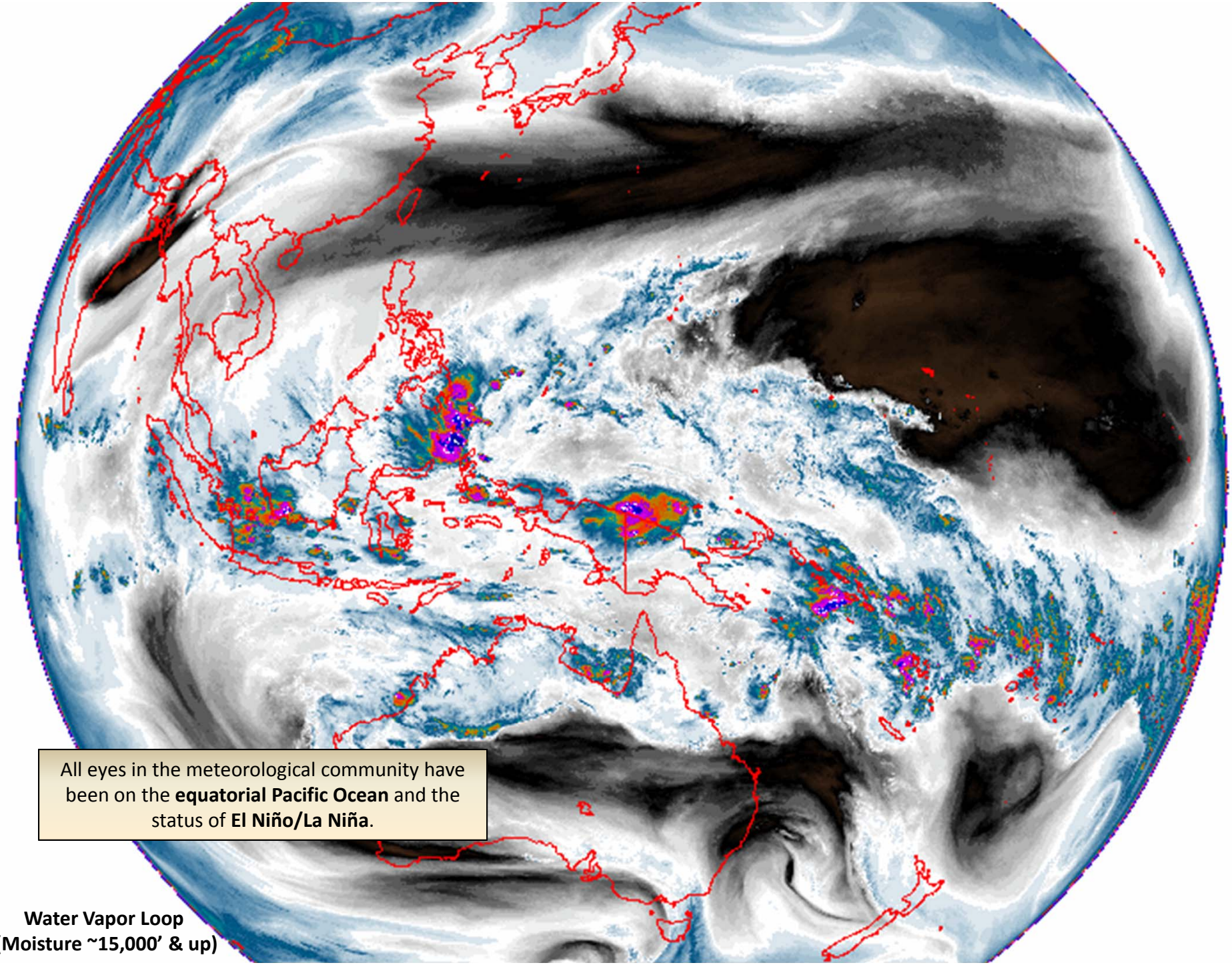
Long-Term Weather & Agricultural Outlooks

Revisiting the 2016 La Niña
&
Looking Ahead to Spring 2017

Washington, DC
February 24, 2017

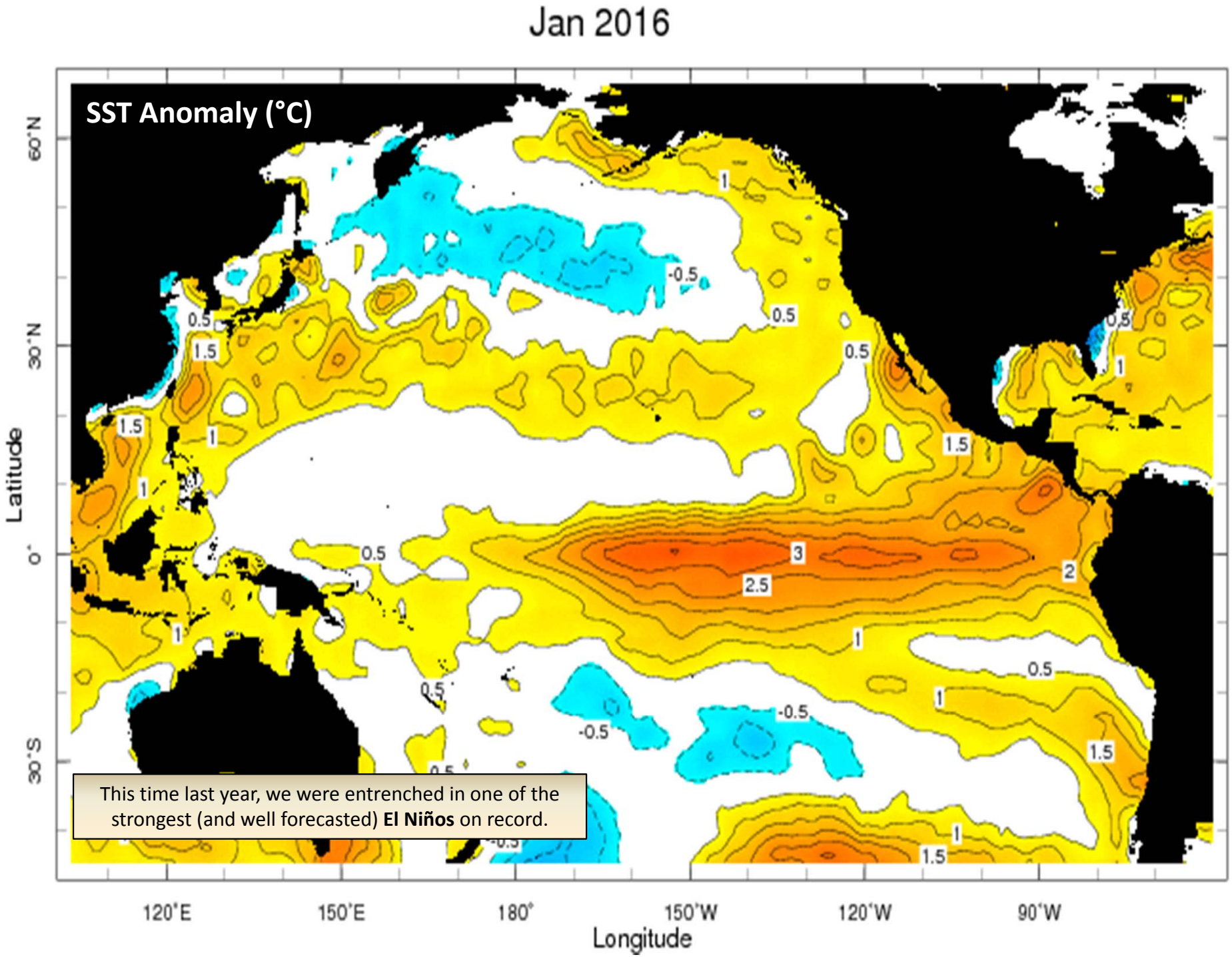
Eric Luebehusen
USDA/OCE/WAOB
Meteorologist

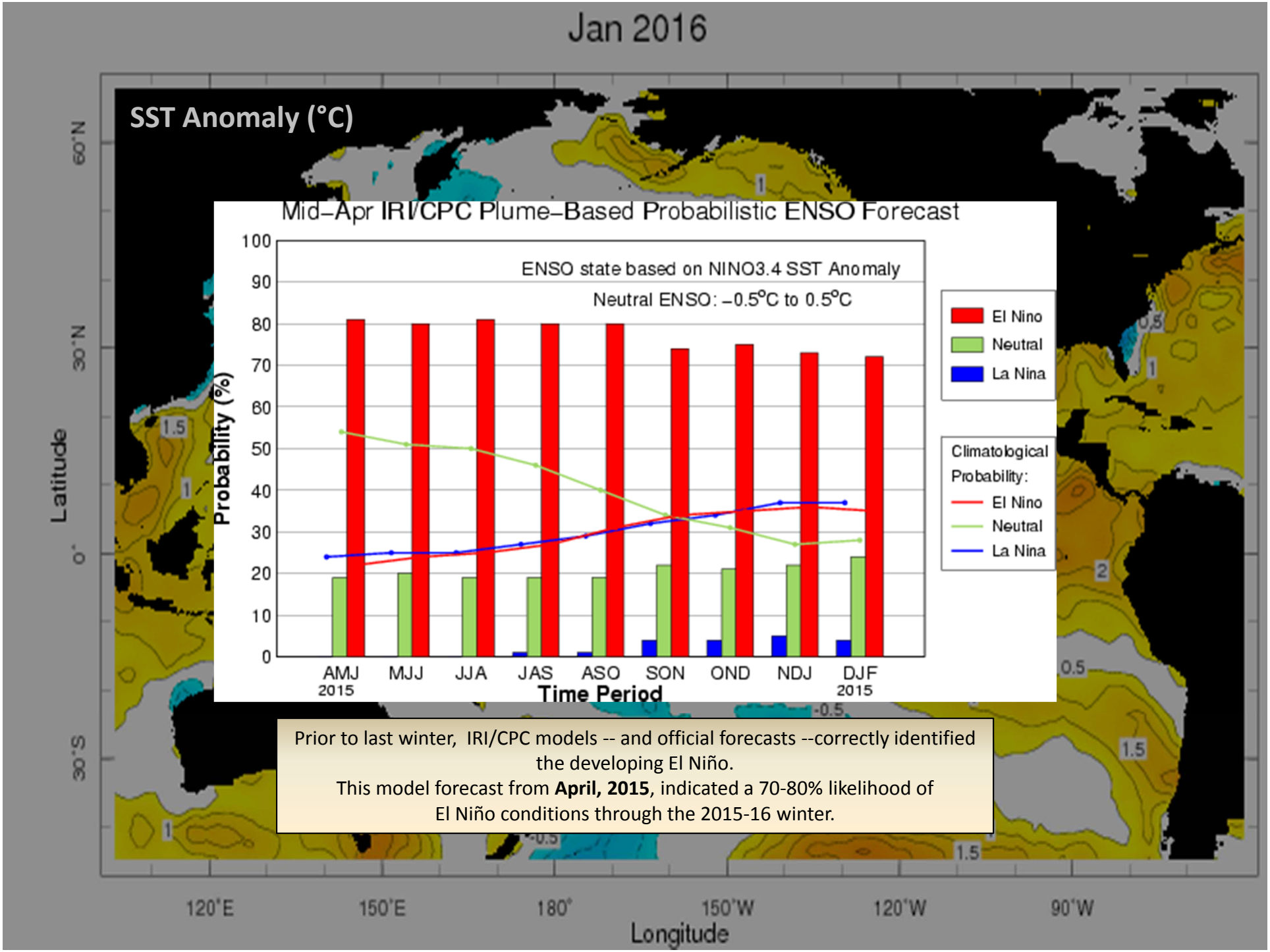

A forecast based on a forecast is fraught with peril.
-Me (et al)

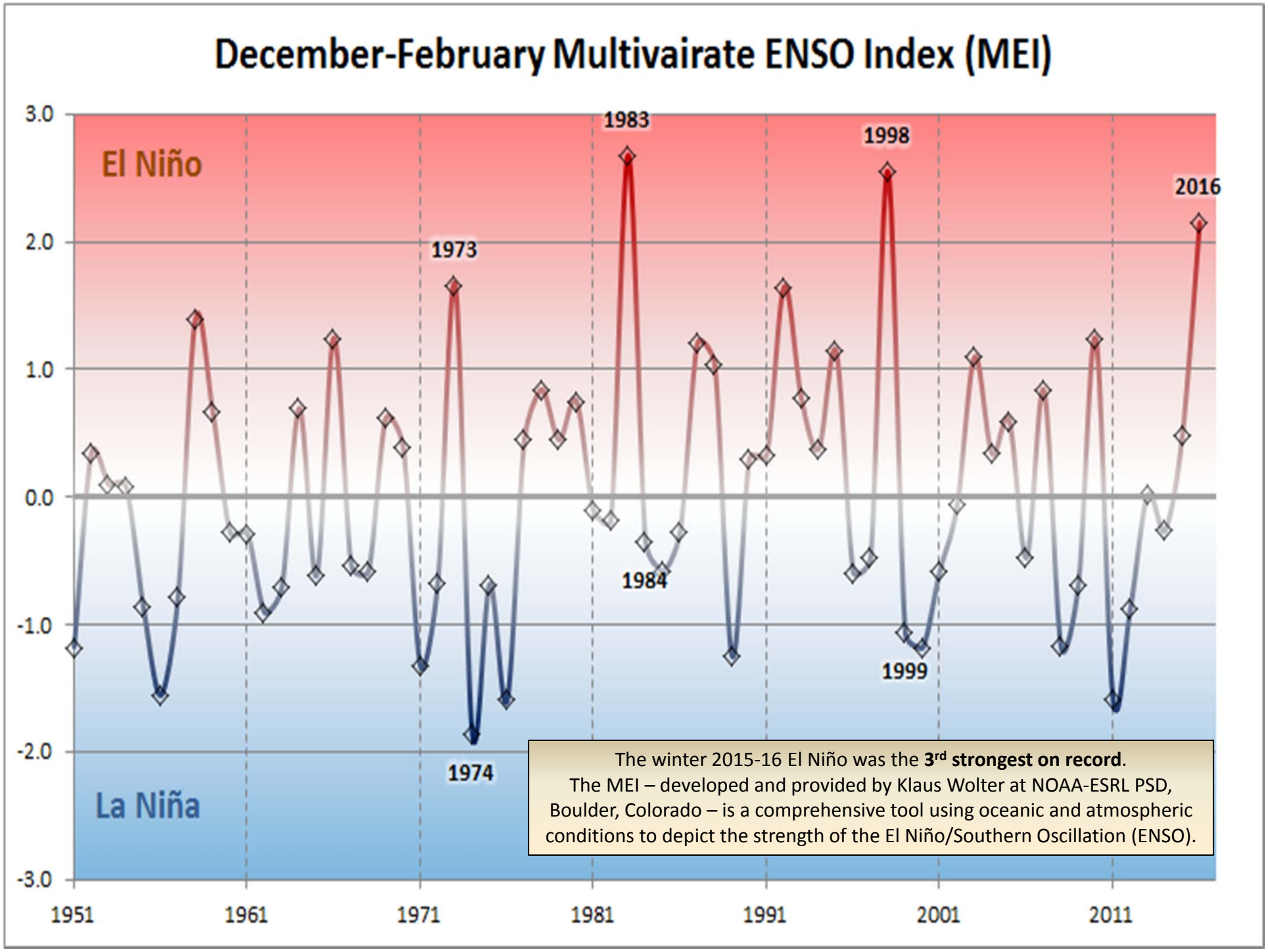


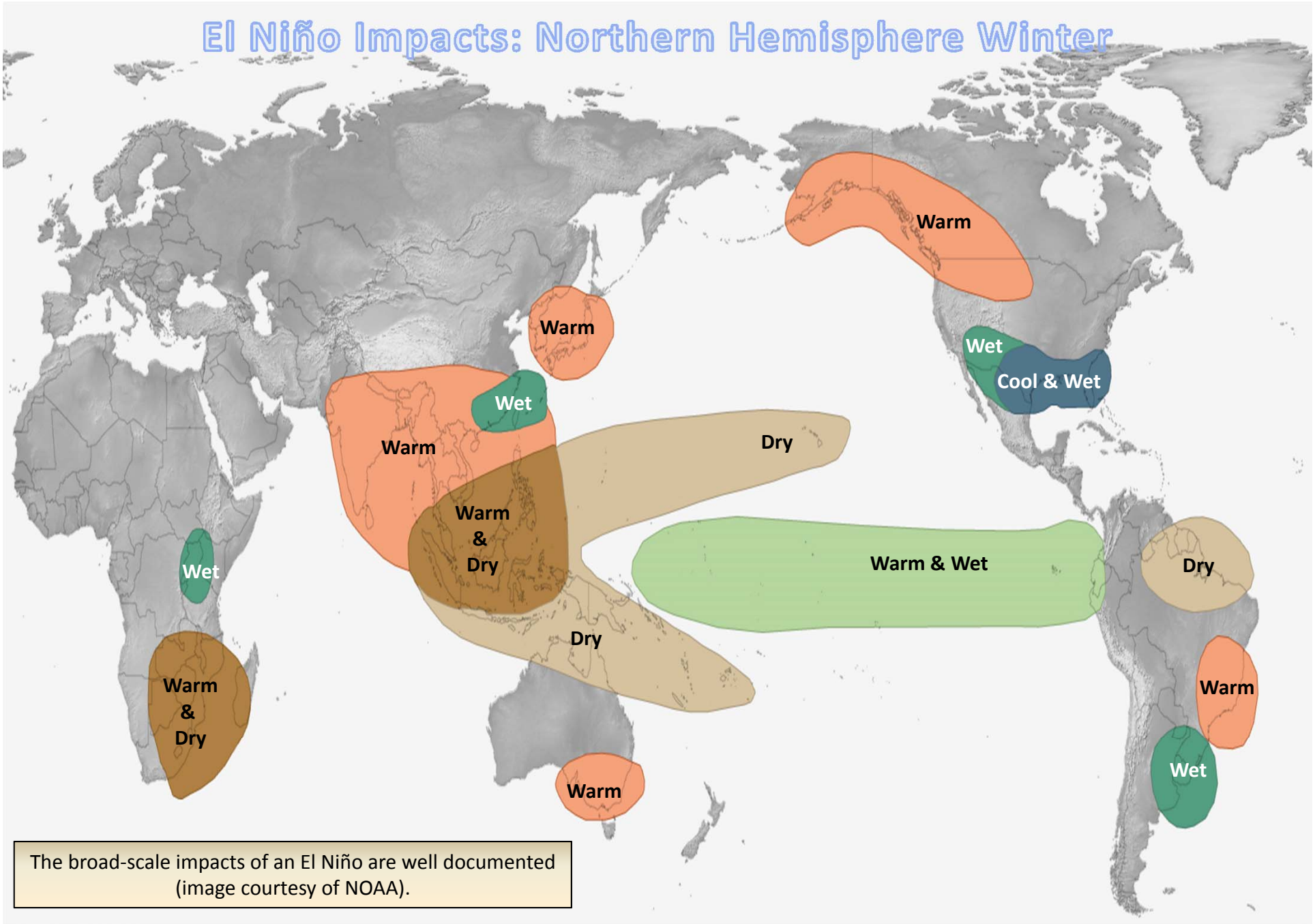
All eyes in the meteorological community have been on the **equatorial Pacific Ocean** and the status of **El Niño/La Niña**.

Water Vapor Loop
(Moisture ~15,000’ & up)


Jan 2016
SST Anomaly (°C)
60°N
30°N
0°
30°S
Latitude
120°E
150°E
180°
150°W
120°W
90°W
Longitude
This time last year, we were entrenched in one of the strongest (and well forecasted) **El Niños** on record.


Jan 2016
SST Anomaly (°C)
Mid–Apr IRI/CPC Plume–Based Probabilistic ENSO Forecast
ENSO state based on NINO3.4 SST Anomaly
Neutral ENSO: –0.5°C to 0.5°C
Probability (%)
Time Period
AMJ 2015
MJJ
JJA
JAS
ASO
SON
OND
NDJ
DJF 2015
El Nino
Neutral
La Nina
Climatological Probability:
El Nino
Neutral
La Nina
Latitude
Longitude
60°N
30°N
0°
30°S
120°E
150°E
180°
150°W
120°W
90°W
Prior to last winter, IRI/CPC models -- and official forecasts --correctly identified the developing El Niño.
This model forecast from **April, 2015**, indicated a 70-80% likelihood of El Niño conditions through the 2015-16 winter.


December-February Multivairate ENSO Index (MEI)
El Niño
La Niña
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
1951
1961
1971
1981
1991
2001
2011
1973
1974
1983
1984
1998
1999
2016
The winter 2015-16 El Niño was the 3rd strongest on record.
The MEI – developed and provided by Klaus Wolter at NOAA-ESRL PSD, Boulder, Colorado – is a comprehensive tool using oceanic and atmospheric conditions to depict the strength of the El Niño/Southern Oscillation (ENSO).



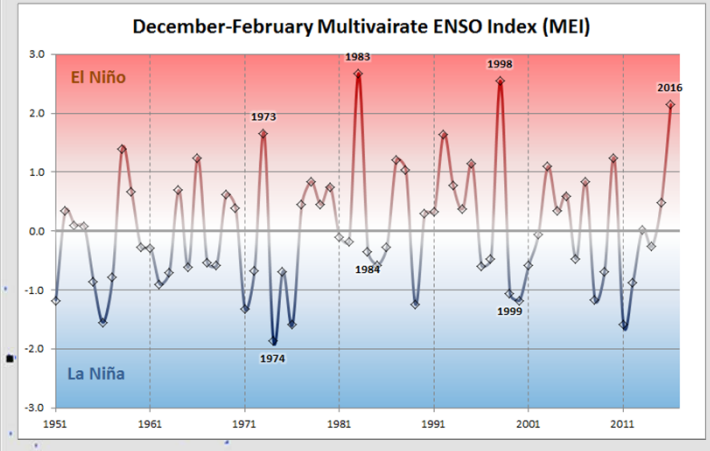
The broad-scale impacts of an El Niño are well documented (image courtesy of NOAA).

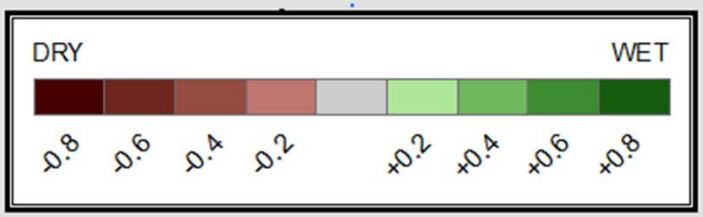
El Niño Winter Correlation

wet

dry

Looking more closely at **precipitation**, the accurately-forecasted and 3rd strongest El Niño on record certainly should have produced rainfall patterns matching the well-documented correlations.





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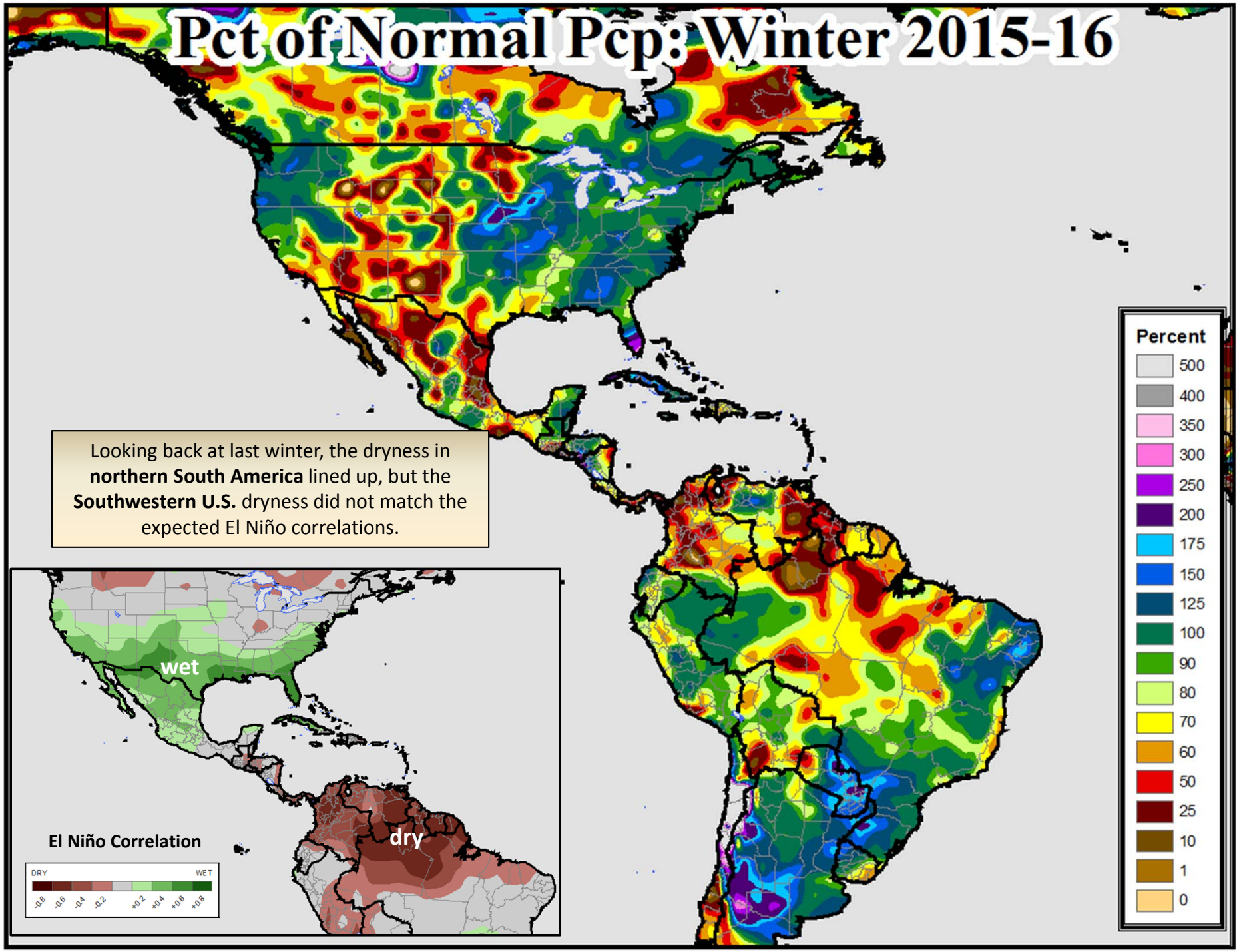
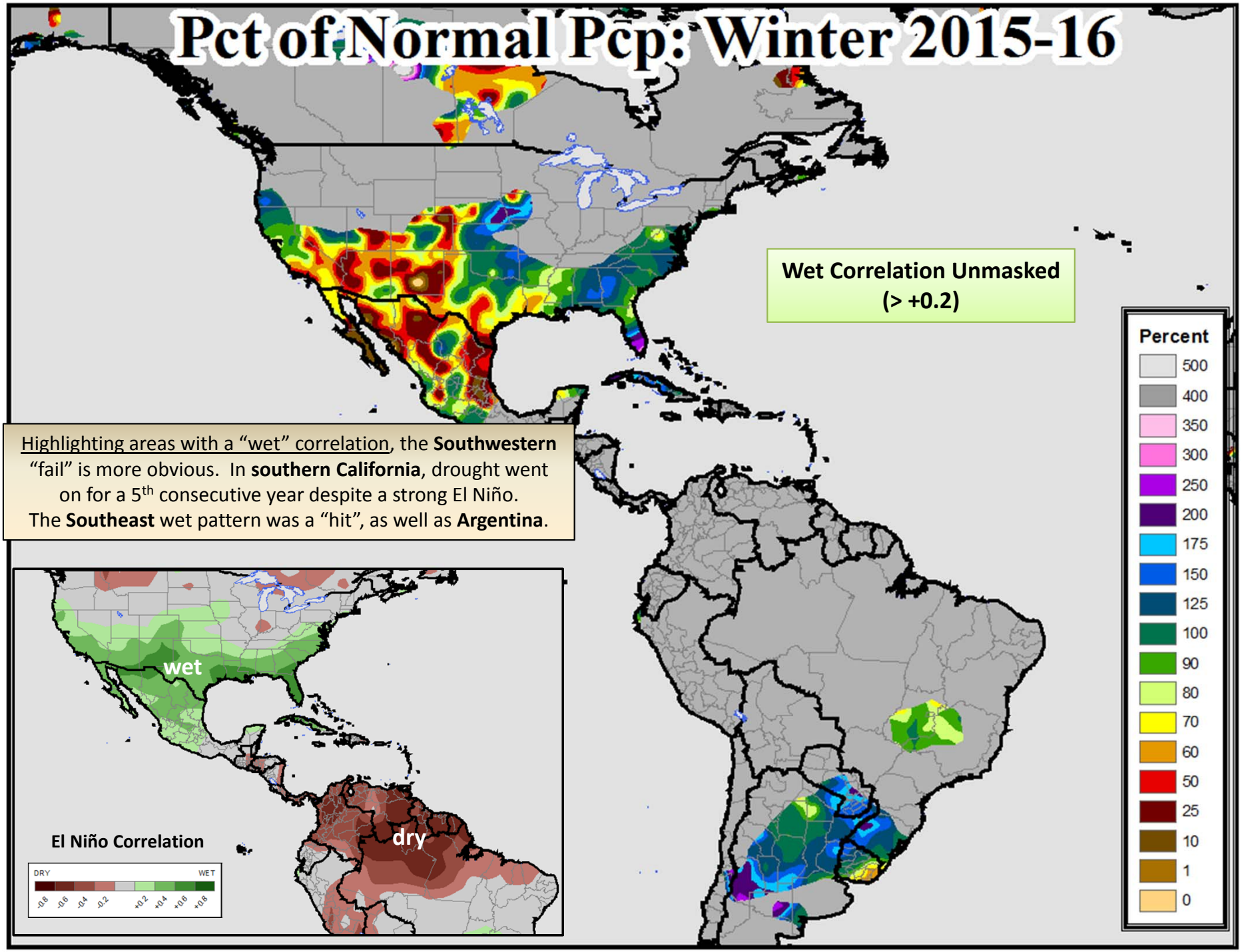
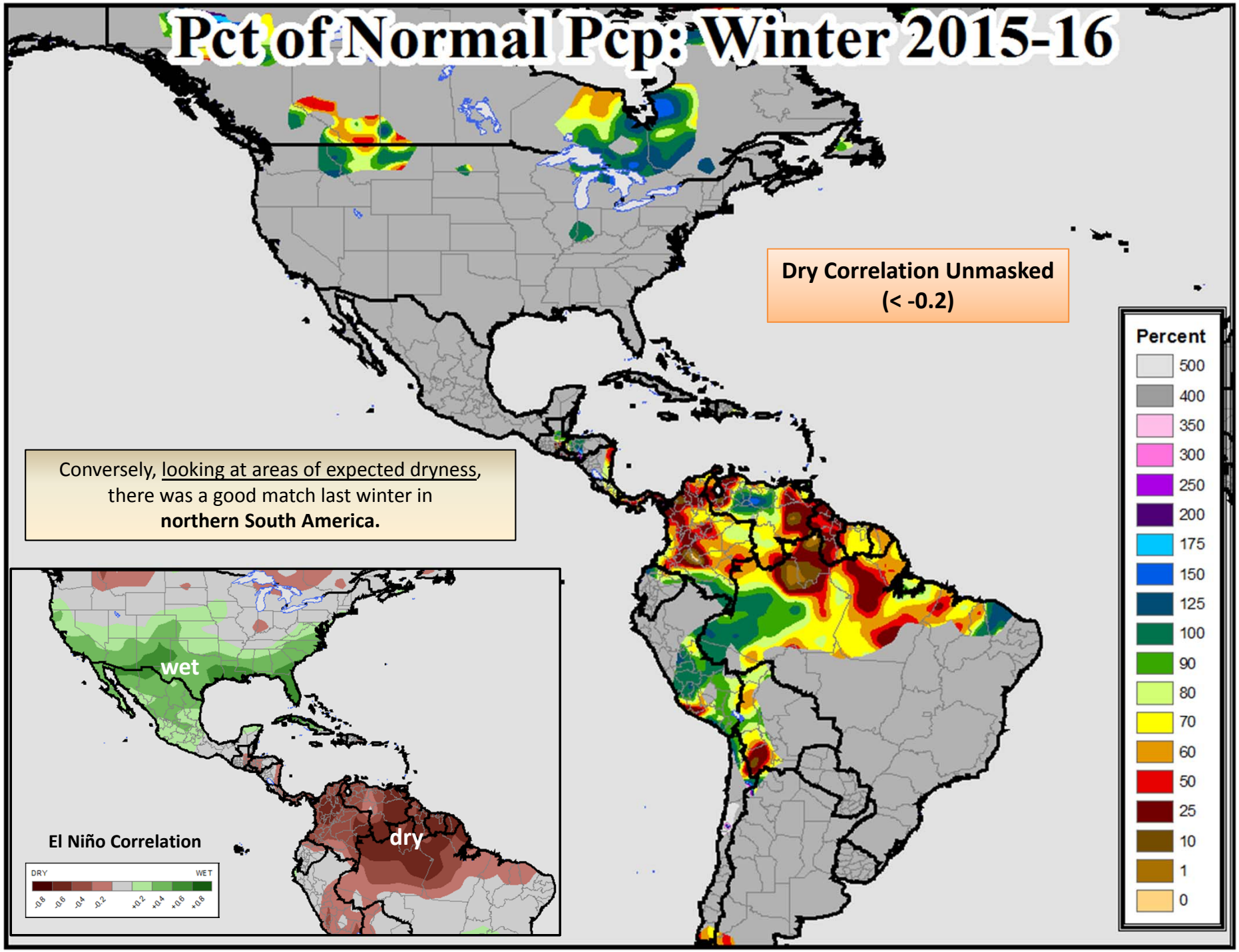
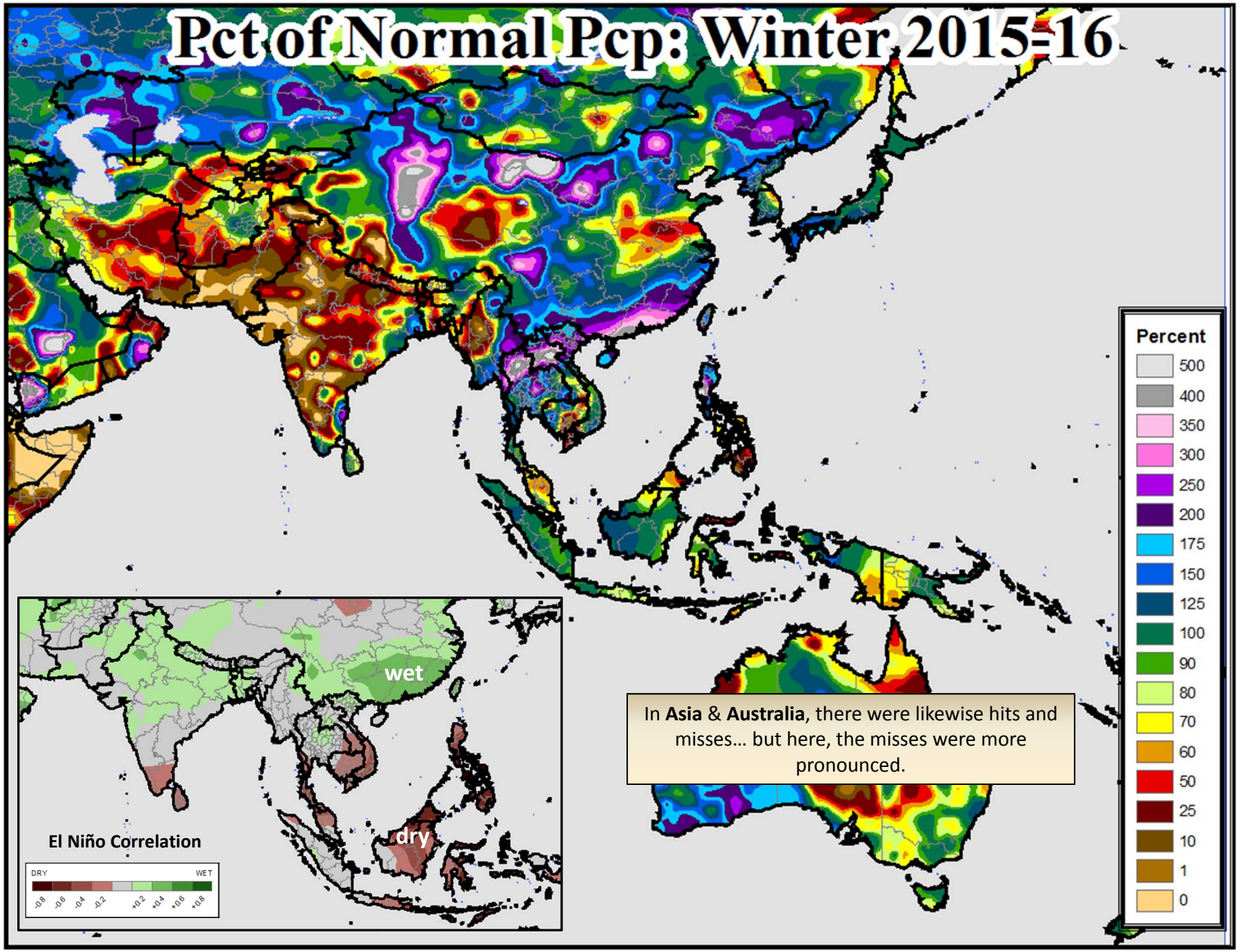
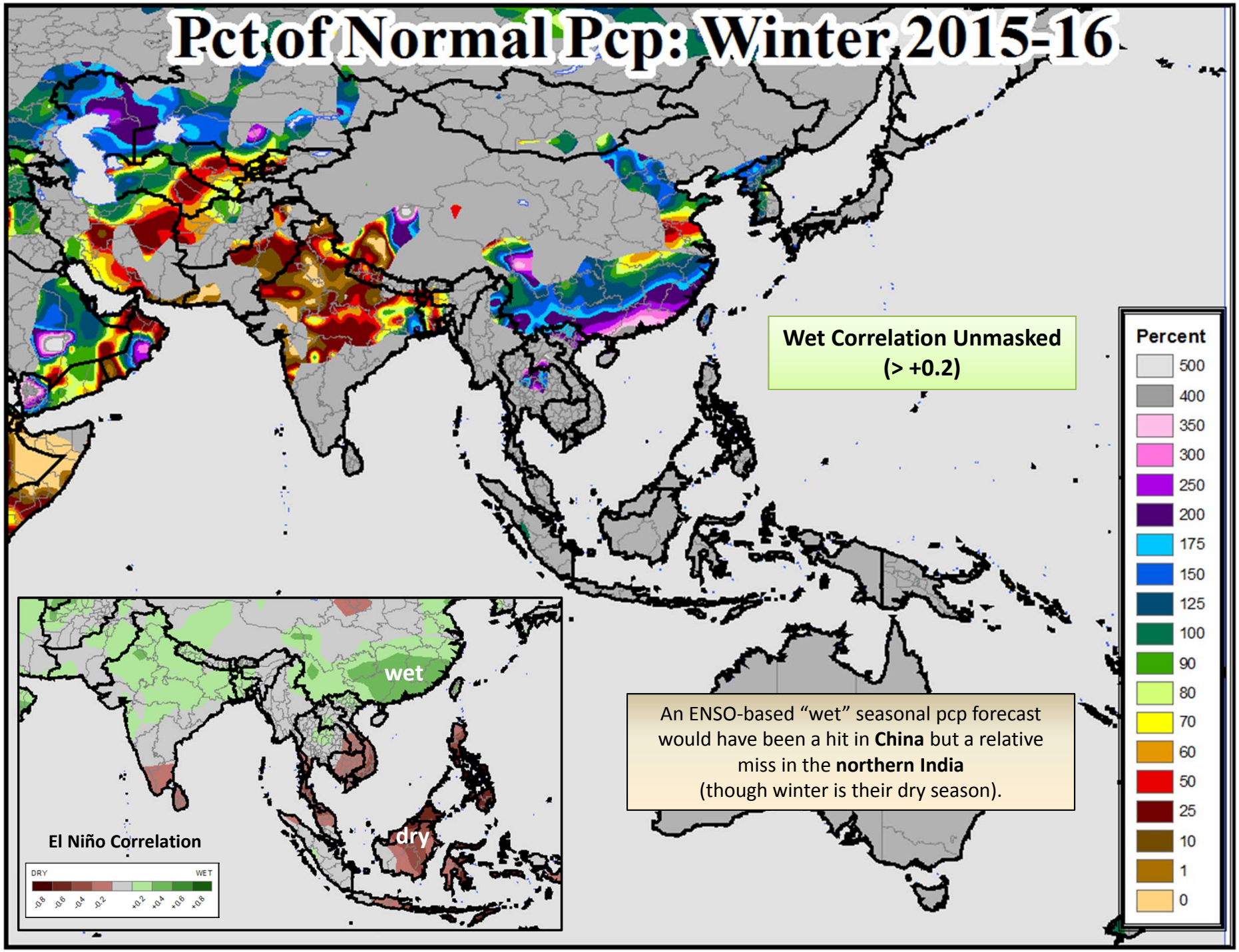
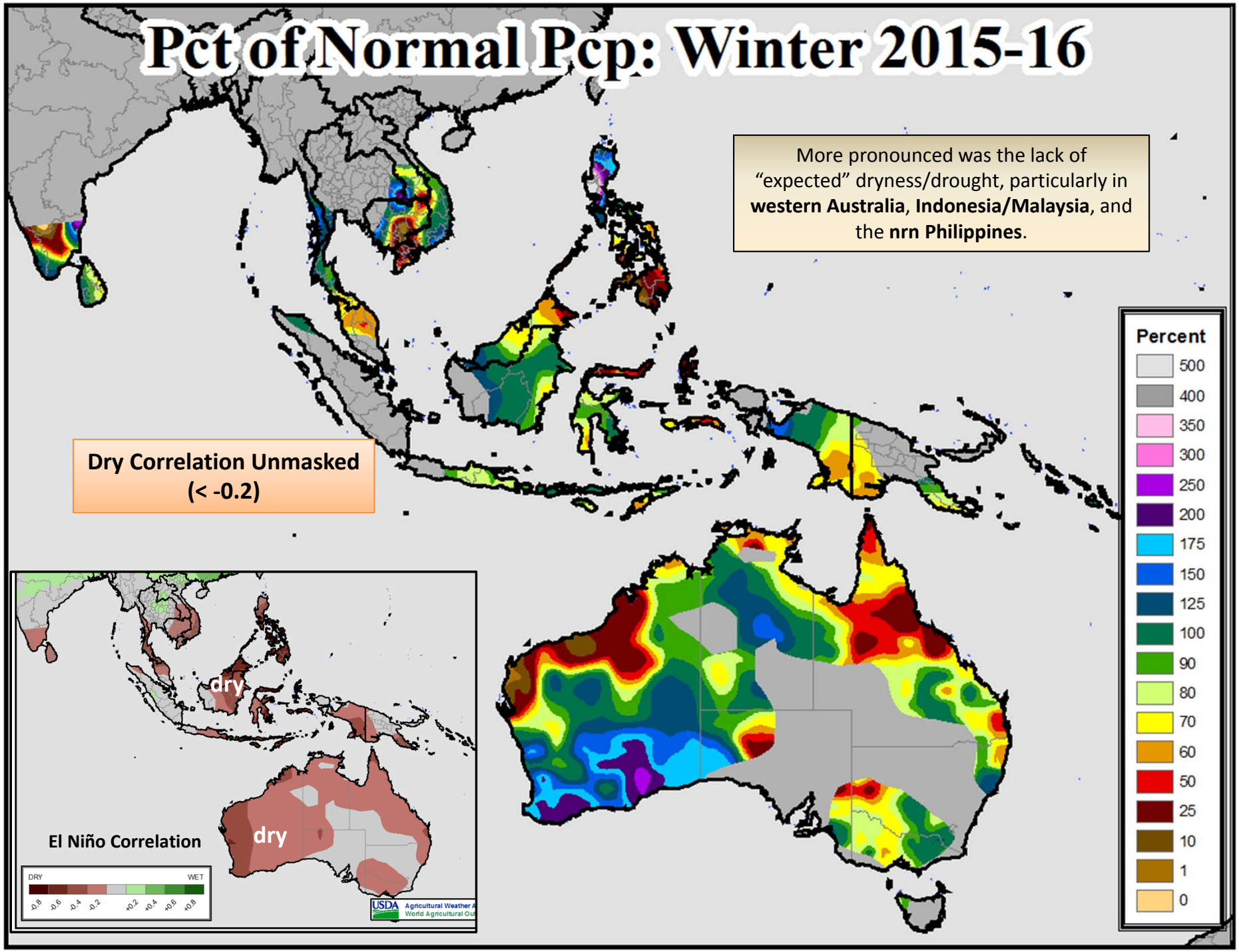

Pct of Normal Pcp: Winter 2015-16
Looking back at last winter, the dryness in **northern South America** lined up, but the **Southwestern U.S.** dryness did not match the expected El Niño correlations.
wet
dry
El Niño Correlation
DRY
WET
-0.8
-0.6
-0.4
-0.2
+0.2
+0.4
+0.6
+0.8
Percent
500
400
350
300
250
200
175
150
125
100
90
80
70
60
50
25
10
1
0


Pct of Normal Pcp: Winter 2015-16
Wet Correlation Unmasked
(> +0.2)
Percent
500
400
350
300
250
200
175
150
125
100
90
80
70
60
50
25
10
1
0
Highlighting areas with a "wet" correlation, the Southwestern "fail" is more obvious. In southern California, drought went on for a 5th consecutive year despite a strong El Niño.
The Southeast wet pattern was a "hit", as well as Argentina.
wet
dry
El Niño Correlation
DRY
WET
-0.8
-0.6
-0.4
-0.2
+0.2
+0.4
+0.6
+0.8

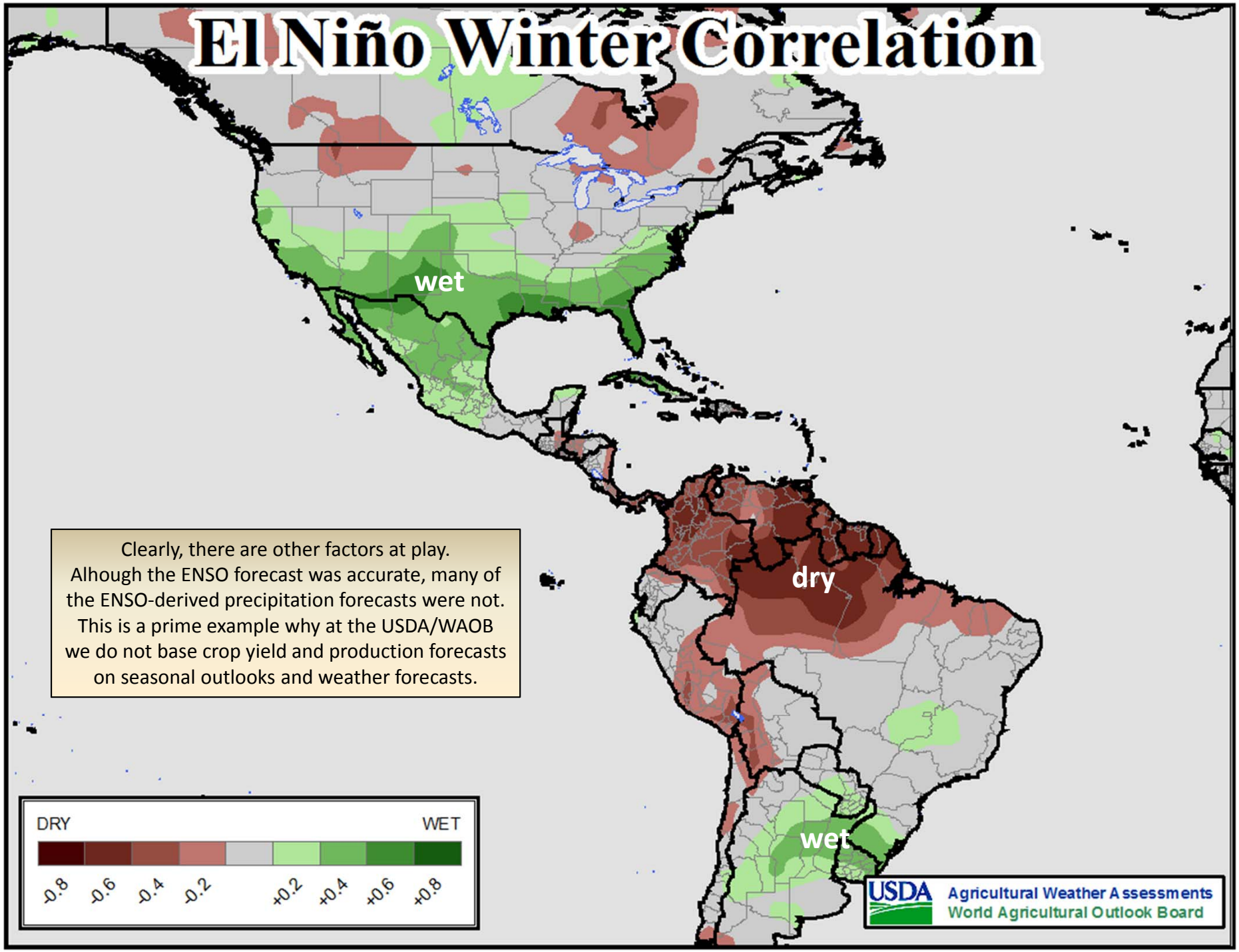

Pct of Normal Pcp: Winter 2015-16
Dry Correlation Unmasked
(< -0.2)
Percent
500
400
350
300
250
200
175
150
125
100
90
80
70
60
50
25
10
1
0
Conversely, looking at areas of expected dryness,
there was a good match last winter in
northern South America.
wet
dry
El Niño Correlation
DRY
WET
-0.8
-0.6
-0.4
-0.2
+0.2
+0.4
+0.6
+0.8


Pct of Normal Pcp: Winter 2015-16
Percent
500
400
350
300
250
200
175
150
125
100
90
80
70
60
50
25
10
1
0
In **Asia** & **Australia**, there were likewise hits and misses… but here, the misses were more pronounced.
wet
dry
El Niño Correlation
DRY
WET
-0.8
-0.6
-0.4
-0.2
+0.2
+0.4
+0.6
+0.8

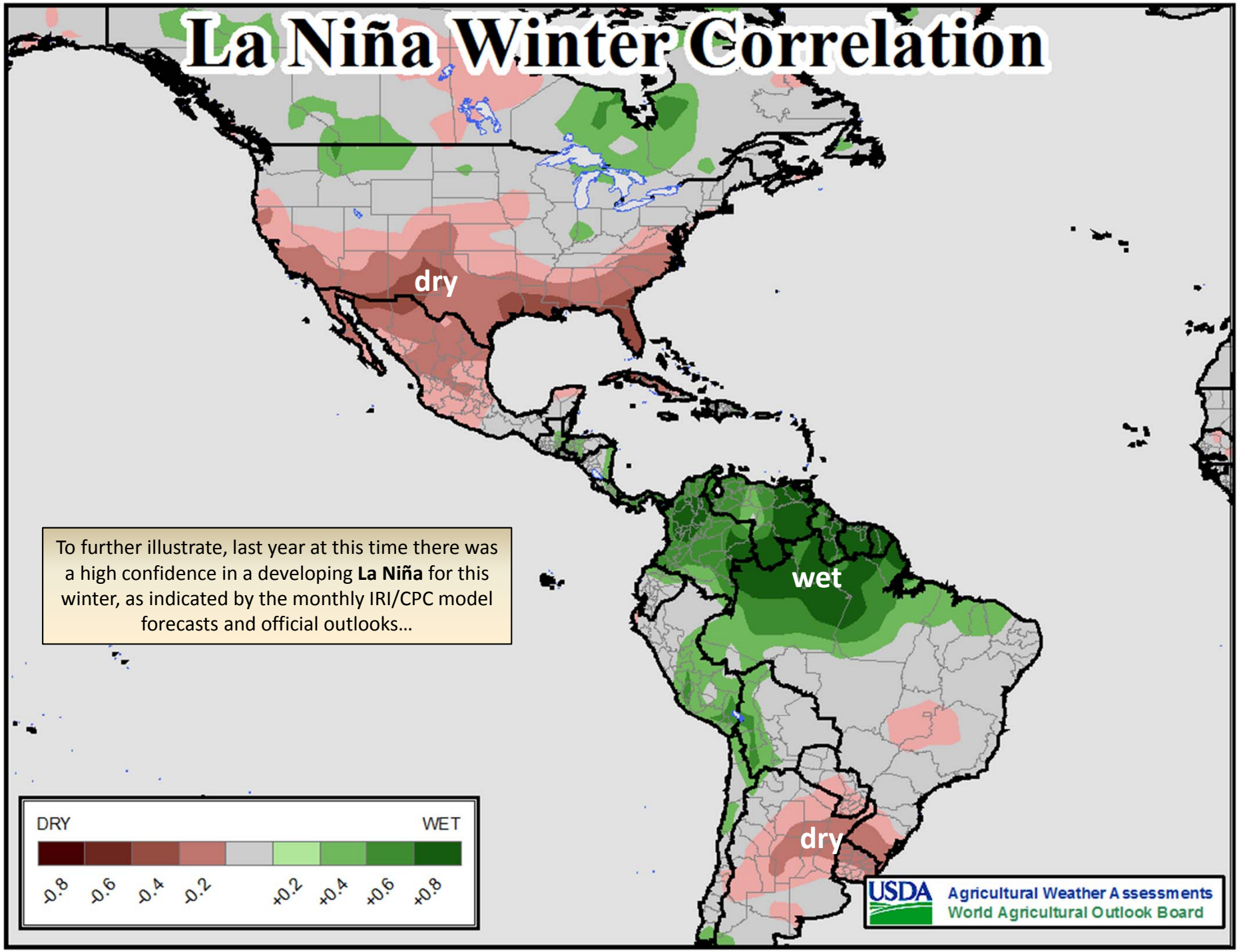

Pct of Normal Pcp: Winter 2015-16
Wet Correlation Unmasked
(> +0.2)
Percent
500
400
350
300
250
200
175
150
125
100
90
80
70
60
50
25
10
1
0
wet
dry
El Niño Correlation
DRY
WET
-0.8
-0.6
-0.4
-0.2
+0.2
+0.4
+0.6
+0.8
An ENSO-based “wet” seasonal pcp forecast would have been a hit in **China** but a relative miss in the **northern India**
(though winter is their dry season).

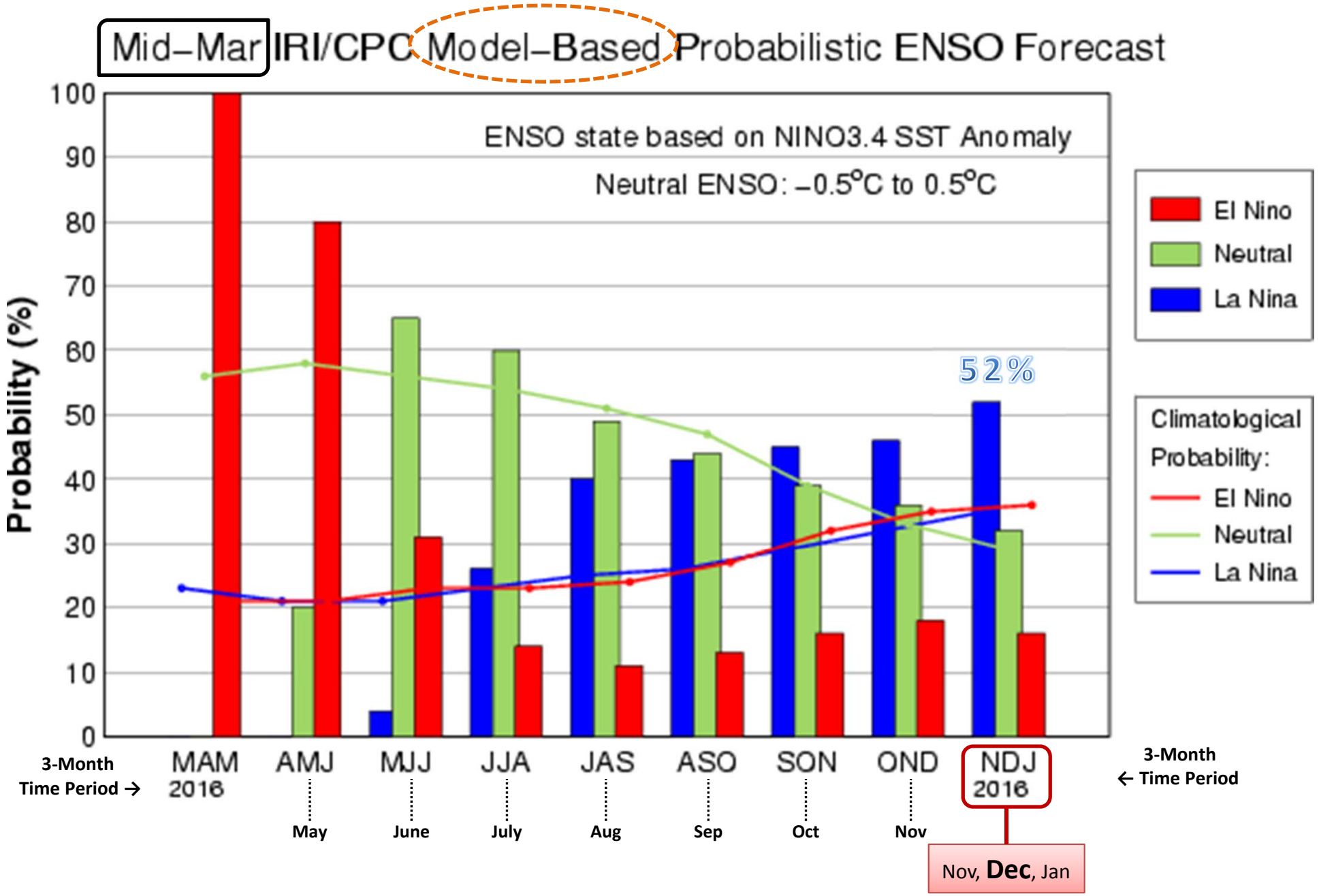

Pct of Normal Pcp: Winter 2015-16
More pronounced was the lack of "expected" dryness/drought, particularly in **western Australia**, **Indonesia/Malaysia**, and the **nrn Philippines**.
Dry Correlation Unmasked (< -0.2)
Percent
500
400
350
300
250
200
175
150
125
100
90
80
70
60
50
25
10
1
0
El Niño Correlation
dry
dry
DRY
WET
-0.8
-0.6
-0.4
-0.2
+0.2
+0.4
+0.6
+0.8
USDA

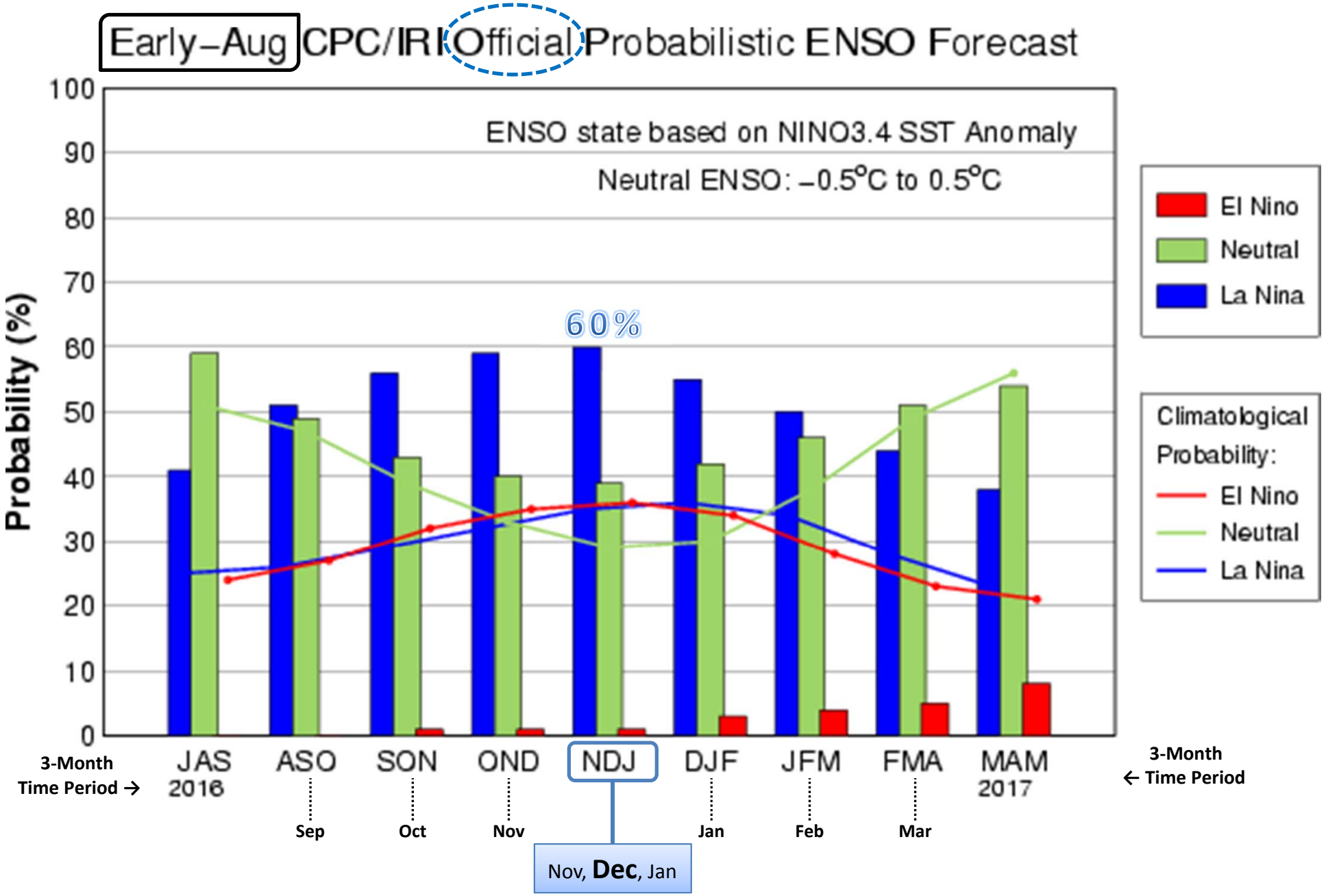
El Niño Winter Correlation

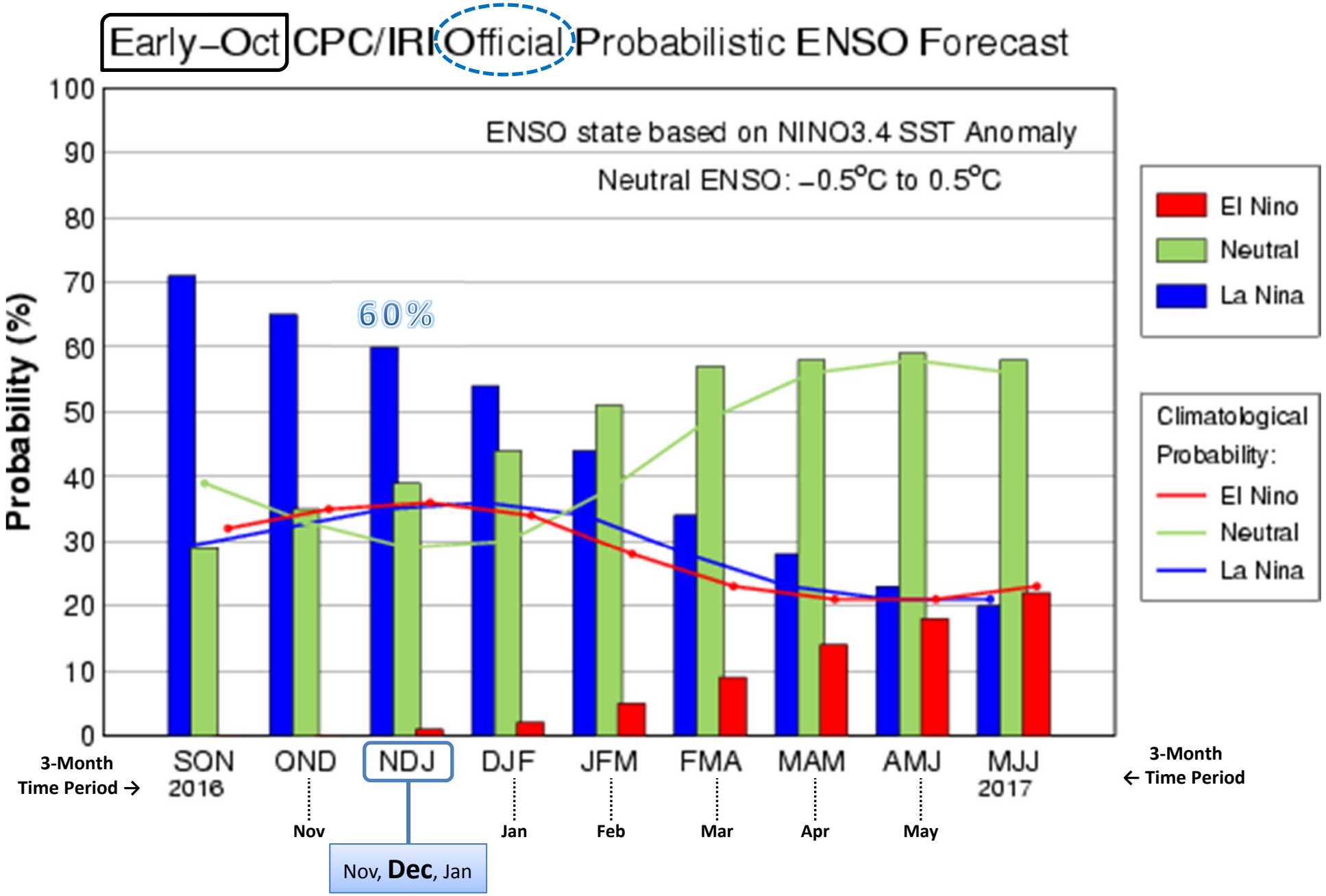


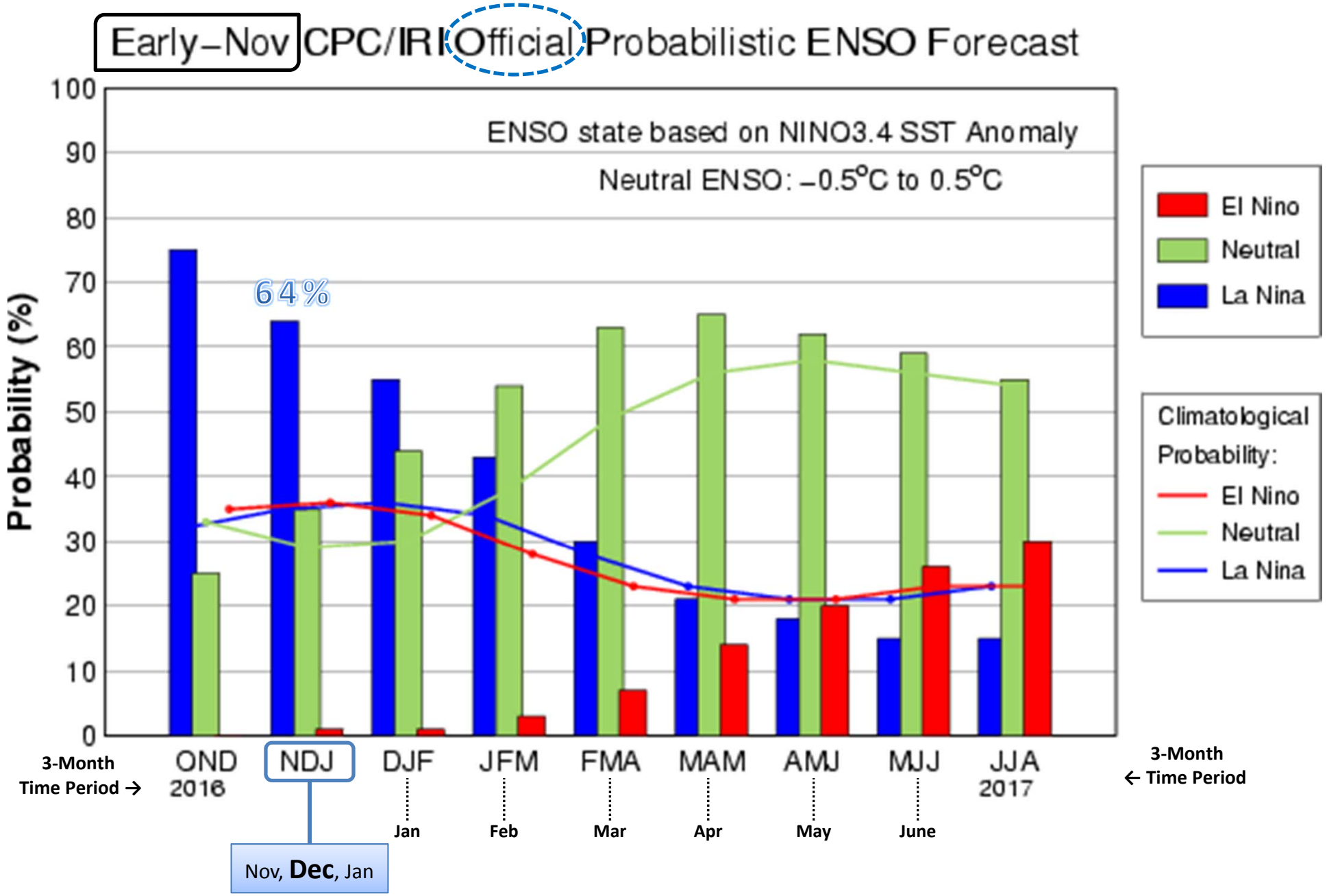
Clearly, there are other factors at play. Alhough the ENSO forecast was accurate, many of the ENSO-derived precipitation forecasts were not. This is a prime example why at the USDA/WAOB we do not base crop yield and production forecasts on seasonal outlooks and weather forecasts.

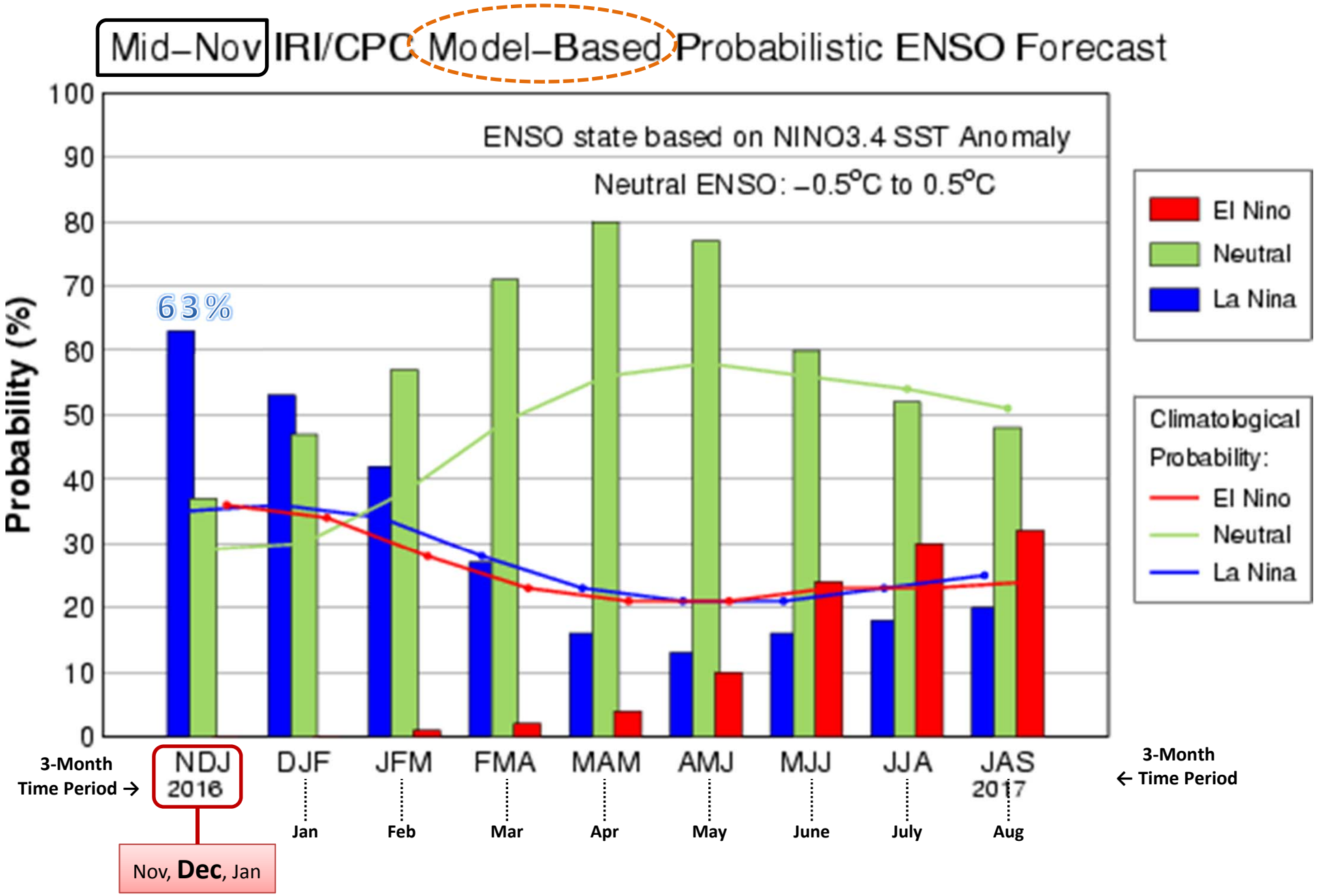

La Niña Winter Correlation
dry
wet
dry
To further illustrate, last year at this time there was a high confidence in a developing **La Niña** for this winter, as indicated by the monthly IRI/CPC model forecasts and official outlooks…
DRY
WET
-0.8
-0.6
-0.4
-0.2
+0.2
+0.4
+0.6
+0.8
USDA
Agricultural Weather Assessments
World Agricultural Outlook Board


Mid–Mar IRI/CPC Model–Based Probabilistic ENSO Forecast
ENSO state based on NINO3.4 SST Anomaly
Neutral ENSO: –0.5°C to 0.5°C
Probability (%)
100
90
80
70
60
50
40
30
20
10
0
52%
El Nino
Neutral
La Nina
Climatological Probability:
El Nino
Neutral
La Nina
3-Month Time Period →
MAM 2016
AMJ
MJJ
JJA
JAS
ASO
SON
OND
NDJ 2016
May
June
July
Aug
Sep
Oct
Nov
← Time Period
Nov, Dec, Jan

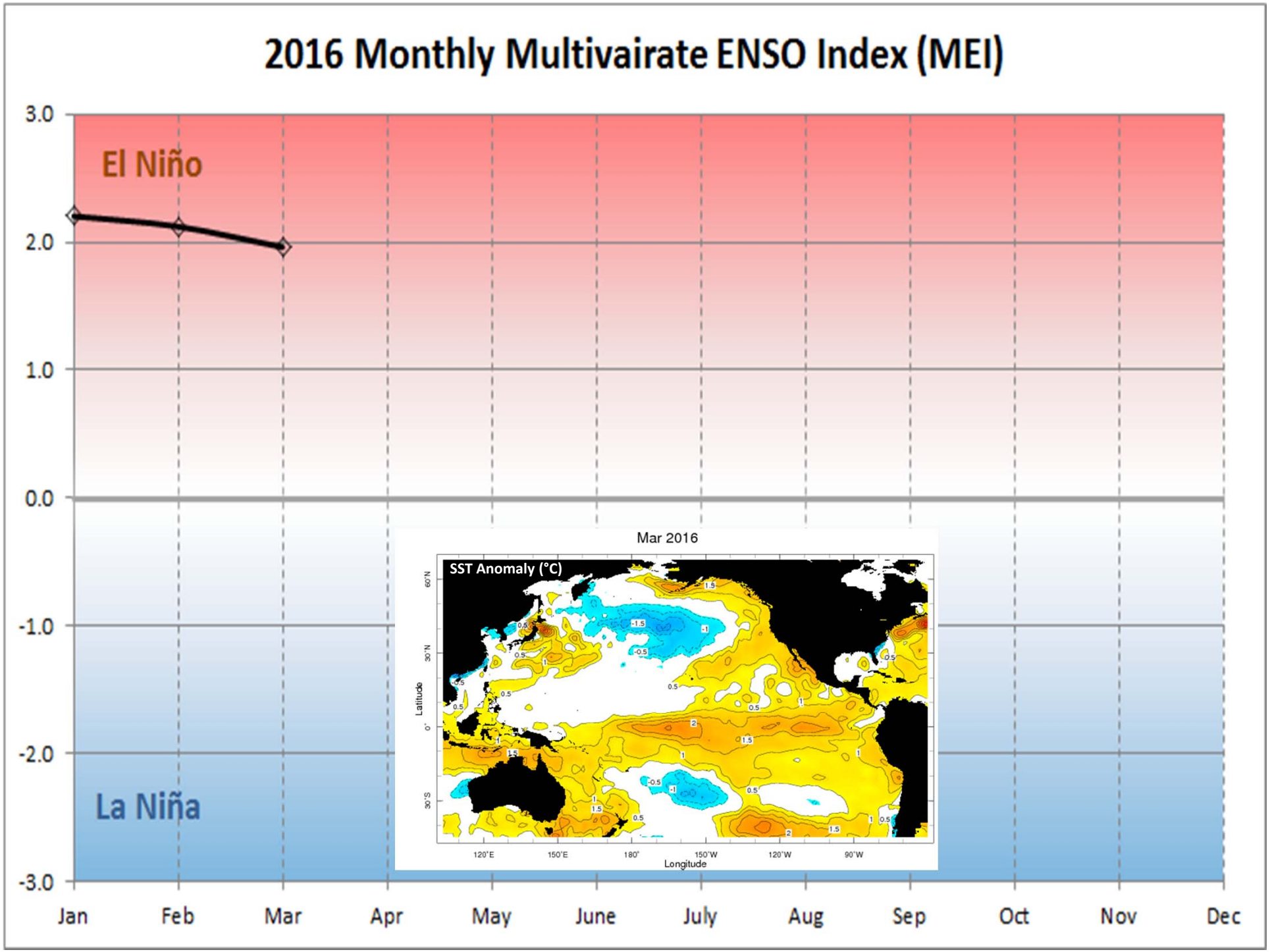

Early–Aug CPC/IRI Official Probabilistic ENSO Forecast
ENSO state based on NINO3.4 SST Anomaly
Neutral ENSO: –0.5°C to 0.5°C
Probability (%)
100
90
80
70
60
50
40
30
20
10
0
60%
El Nino
Neutral
La Nina
Climatological Probability:
El Nino
Neutral
La Nina
3-Month Time Period →
JAS 2016
ASO
SON
OND
NDJ
DJF
JFM
FMA
MAM 2017
Sep
Oct
Nov
Jan
Feb
Mar
Nov, Dec, Jan
3-Month ← Time Period


Early–Oct CPC/IRI Official Probabilistic ENSO Forecast
ENSO state based on NINO3.4 SST Anomaly
Neutral ENSO: –0.5°C to 0.5°C
Probability (%)
100
90
80
70
60
50
40
30
20
10
0
60%
El Nino
Neutral
La Nina
Climatological Probability:
El Nino
Neutral
La Nina
3-Month Time Period →
SON 2016
OND
NDJ
DJF
JFM
FMA
MAM
AMJ
MJJ 2017
← Time Period
Nov
Jan
Feb
Mar
Apr
May
Nov, Dec, Jan

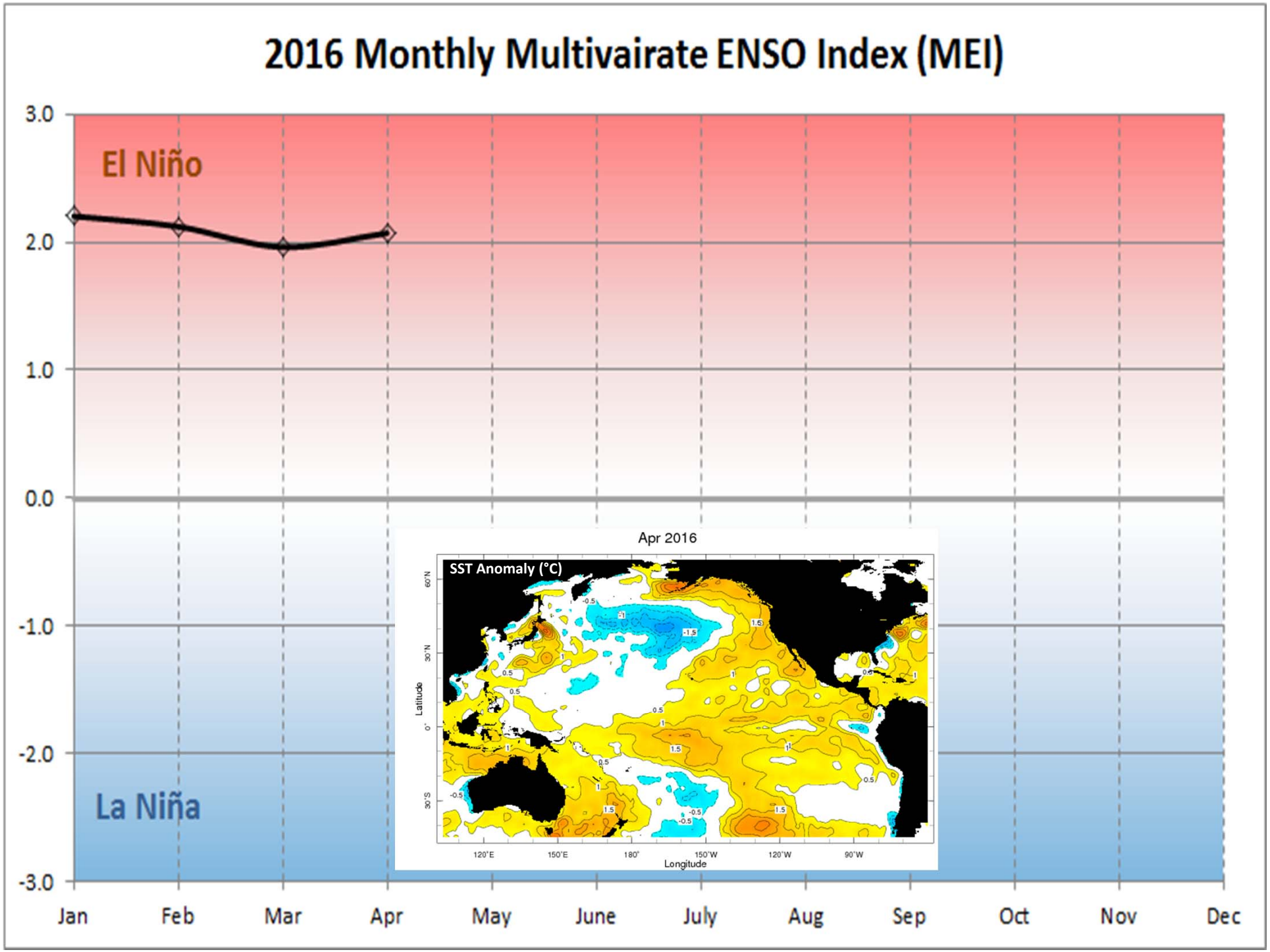

Early–Nov CPC/IRI Official Probabilistic ENSO Forecast
ENSO state based on NINO3.4 SST Anomaly
Neutral ENSO: –0.5°C to 0.5°C
Probability (%)
100
90
80
70
60
50
40
30
20
10
0
64%
El Nino
Neutral
La Nina
Climatological Probability:
El Nino
Neutral
La Nina
3-Month Time Period →
OND 2016
NDJ
DJF
JFM
FMA
MAM
AMJ
MJJ
JJA 2017
← Time Period
Jan
Feb
Mar
Apr
May
June
Nov, Dec, Jan


Mid–Nov IRI/CPC Model–Based Probabilistic ENSO Forecast
ENSO state based on NINO3.4 SST Anomaly
Neutral ENSO: –0.5°C to 0.5°C
Probability (%)
100
90
80
70
60
50
40
30
20
10
0
63%
El Nino
Neutral
La Nina
Climatological Probability:
El Nino
Neutral
La Nina
3-Month Time Period →
NDJ 2016
DJF
JFM
FMA
MAM
AMJ
MJJ
JJA
JAS 2017
Jan
Feb
Mar
Apr
May
June
July
Aug
← Time Period
Nov, Dec, Jan

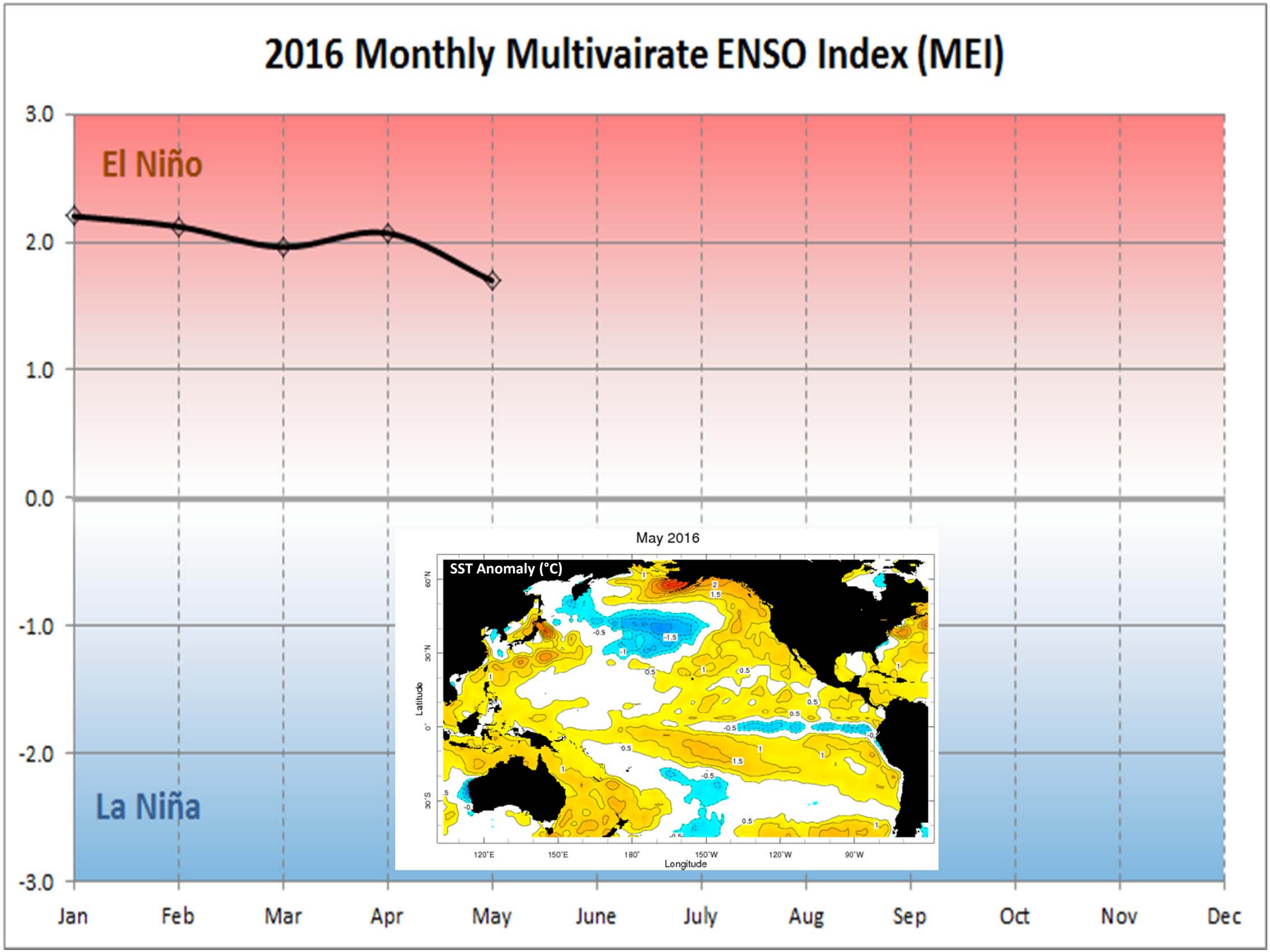
2016 Monthly Multivairate ENSO Index (MEI)



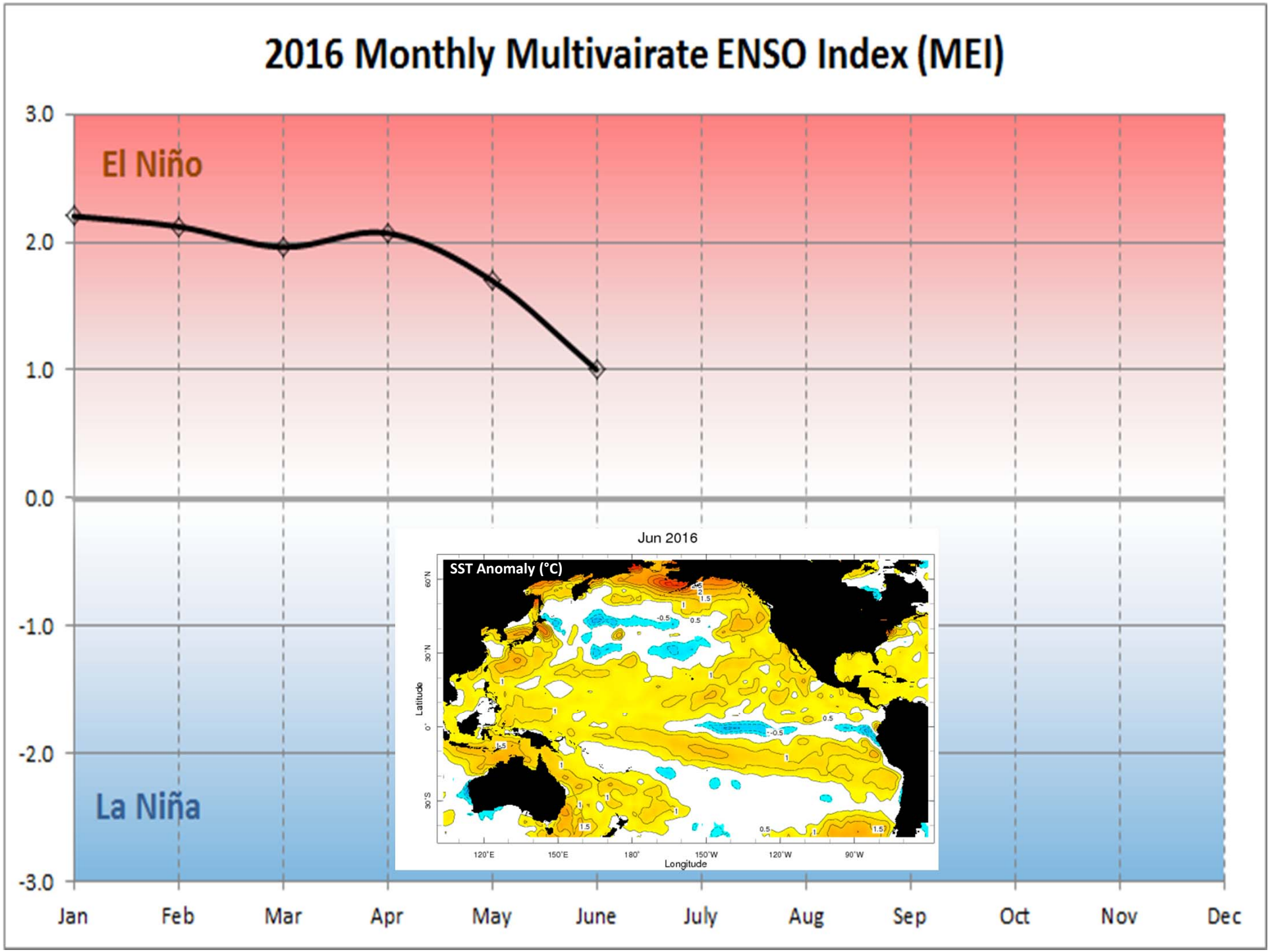
2016 Monthly Multivairate ENSO Index (MEI)



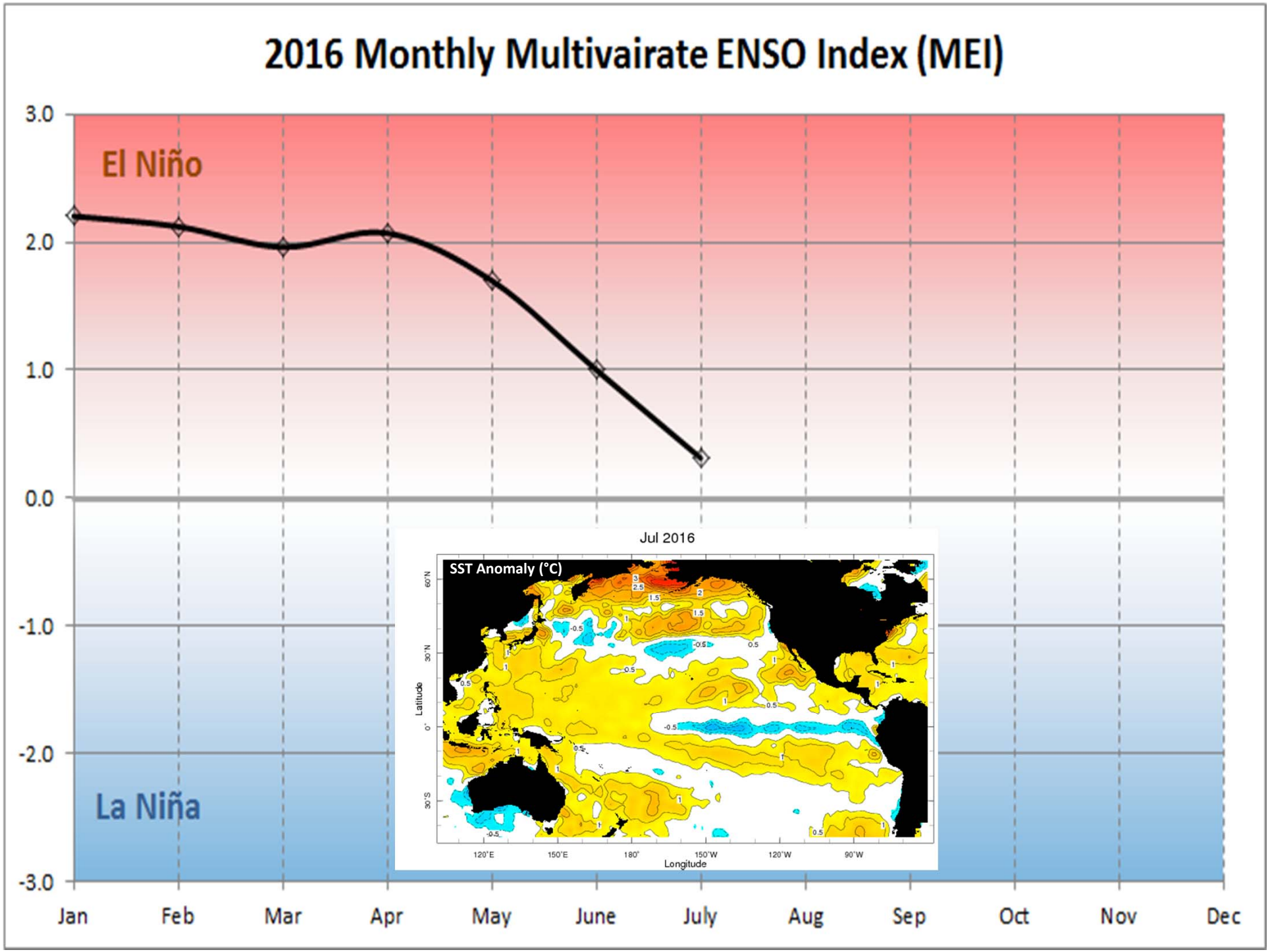
2016 Monthly Multivairate ENSO Index (MEI)



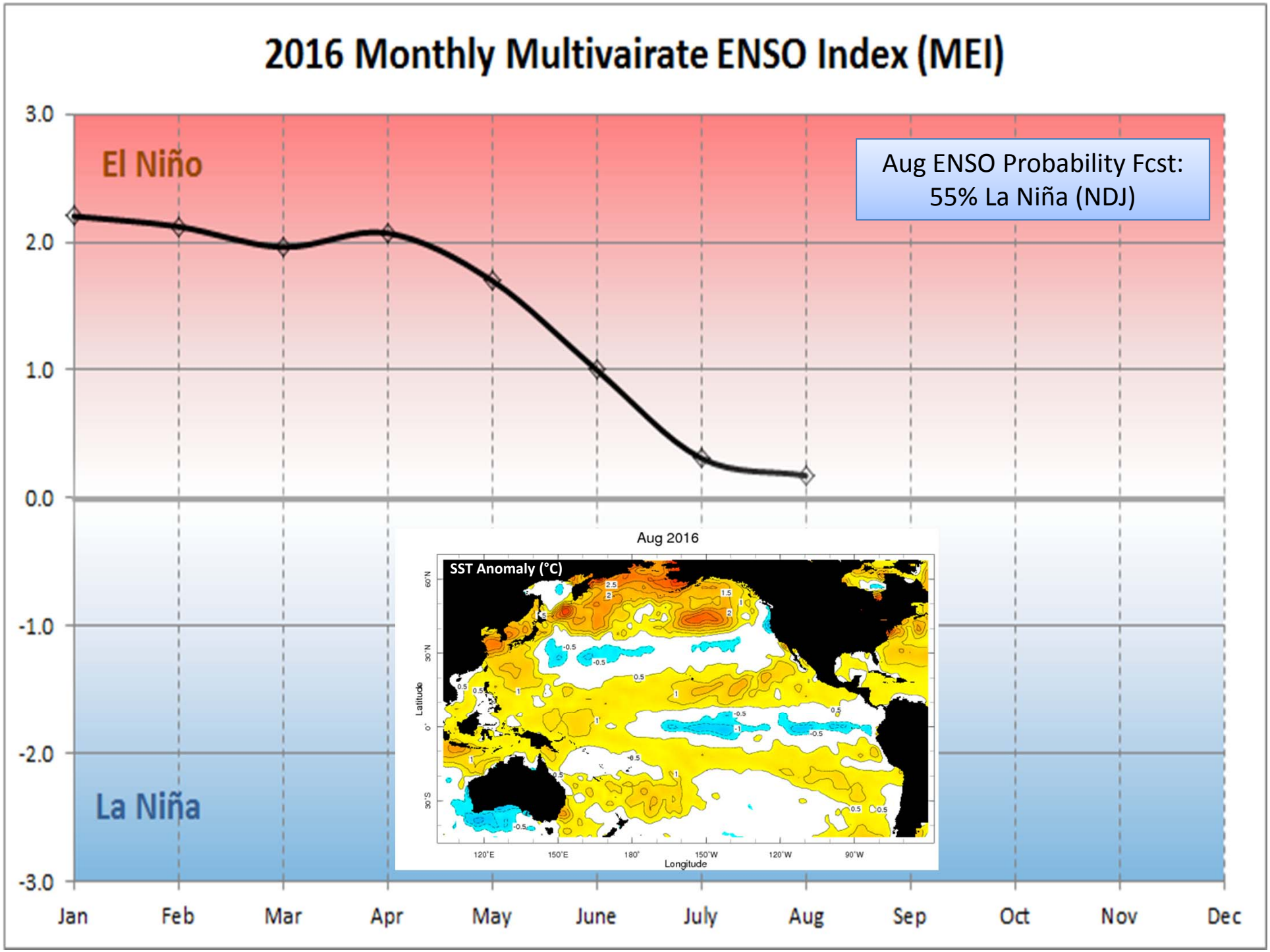
2016 Monthly Multivairate ENSO Index (MEI)



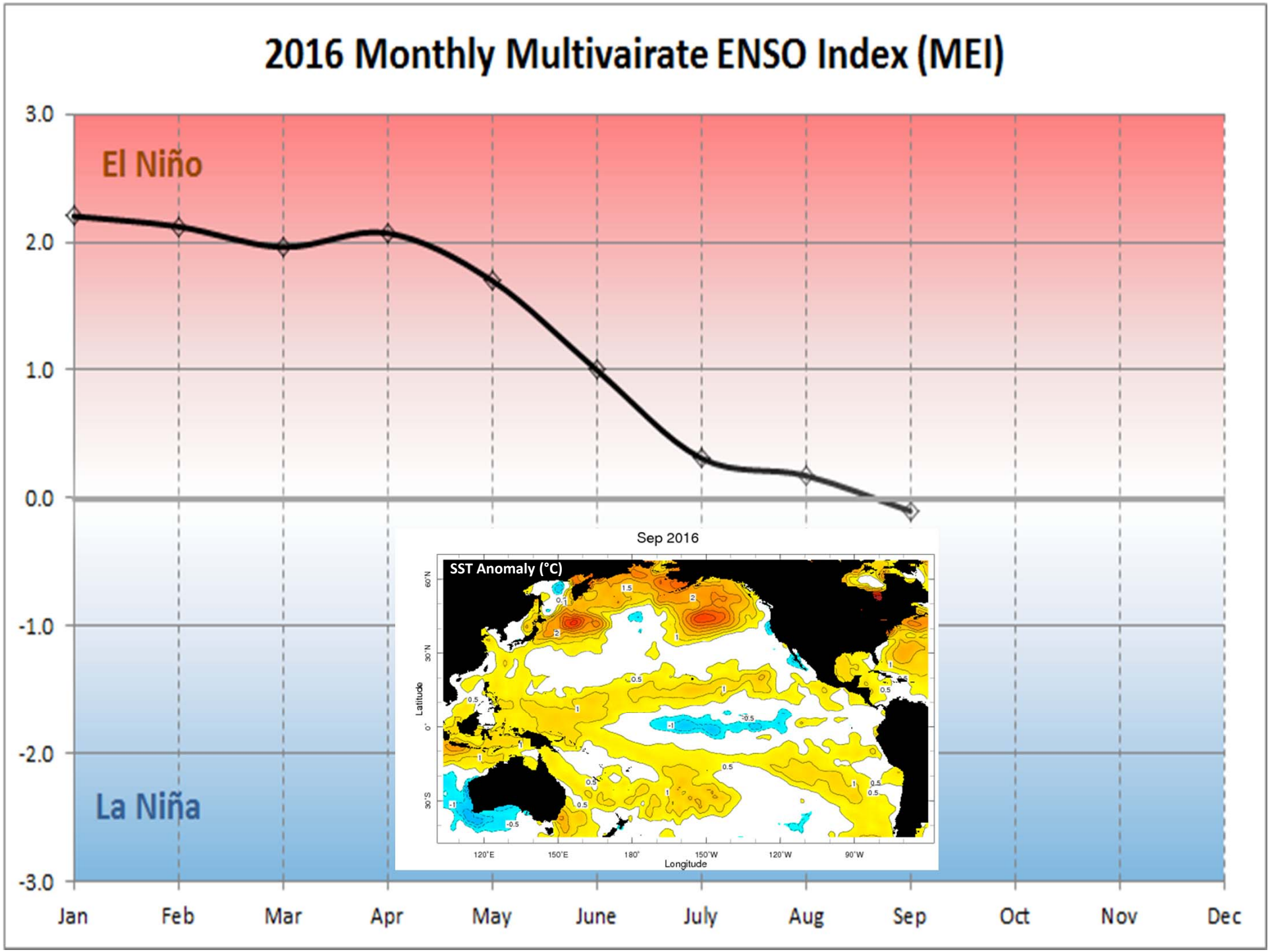
2016 Monthly Multivairate ENSO Index (MEI)



2016 Monthly Multivairate ENSO Index (MEI)



2016 Monthly Multivairate ENSO Index (MEI)



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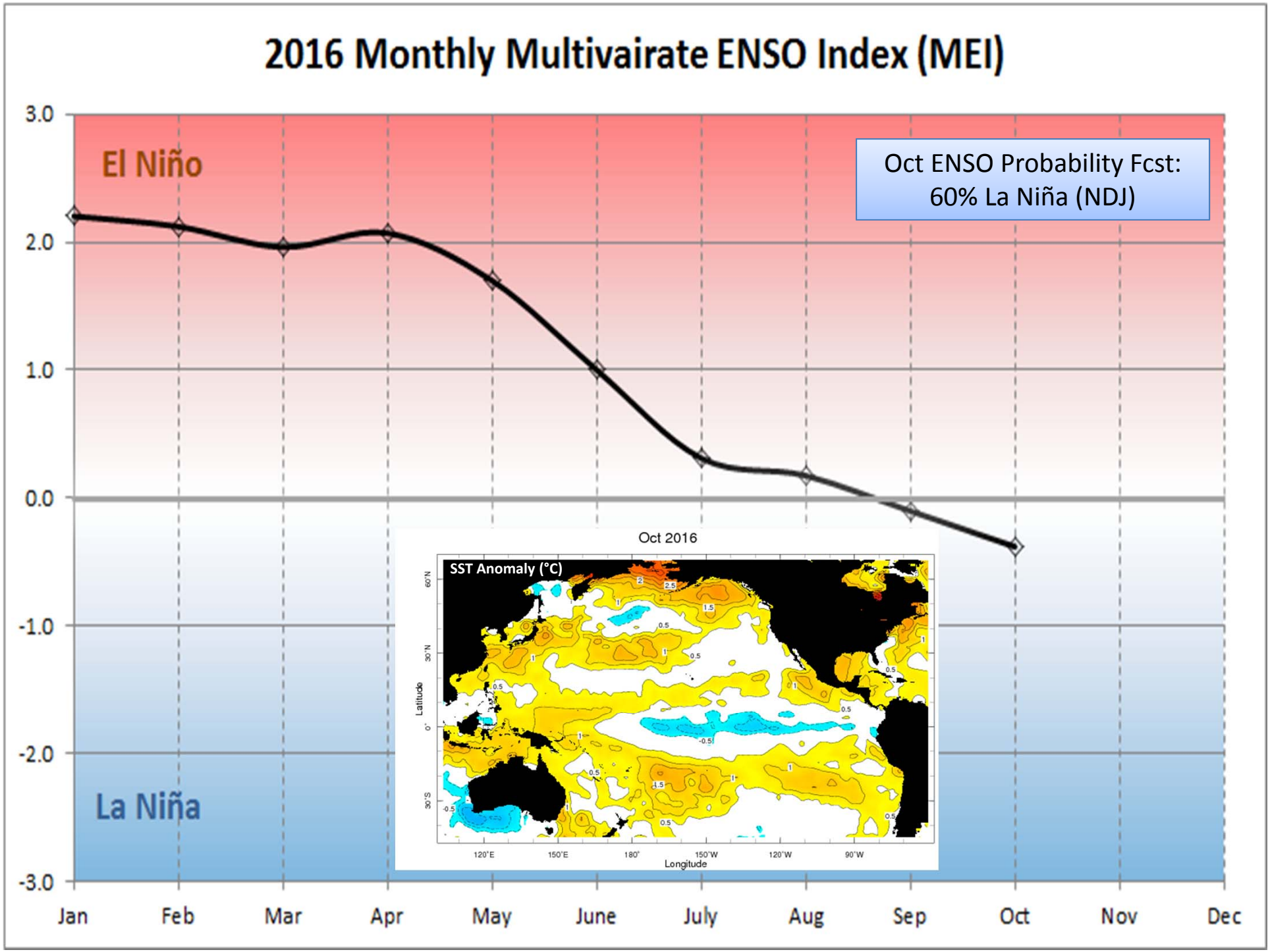

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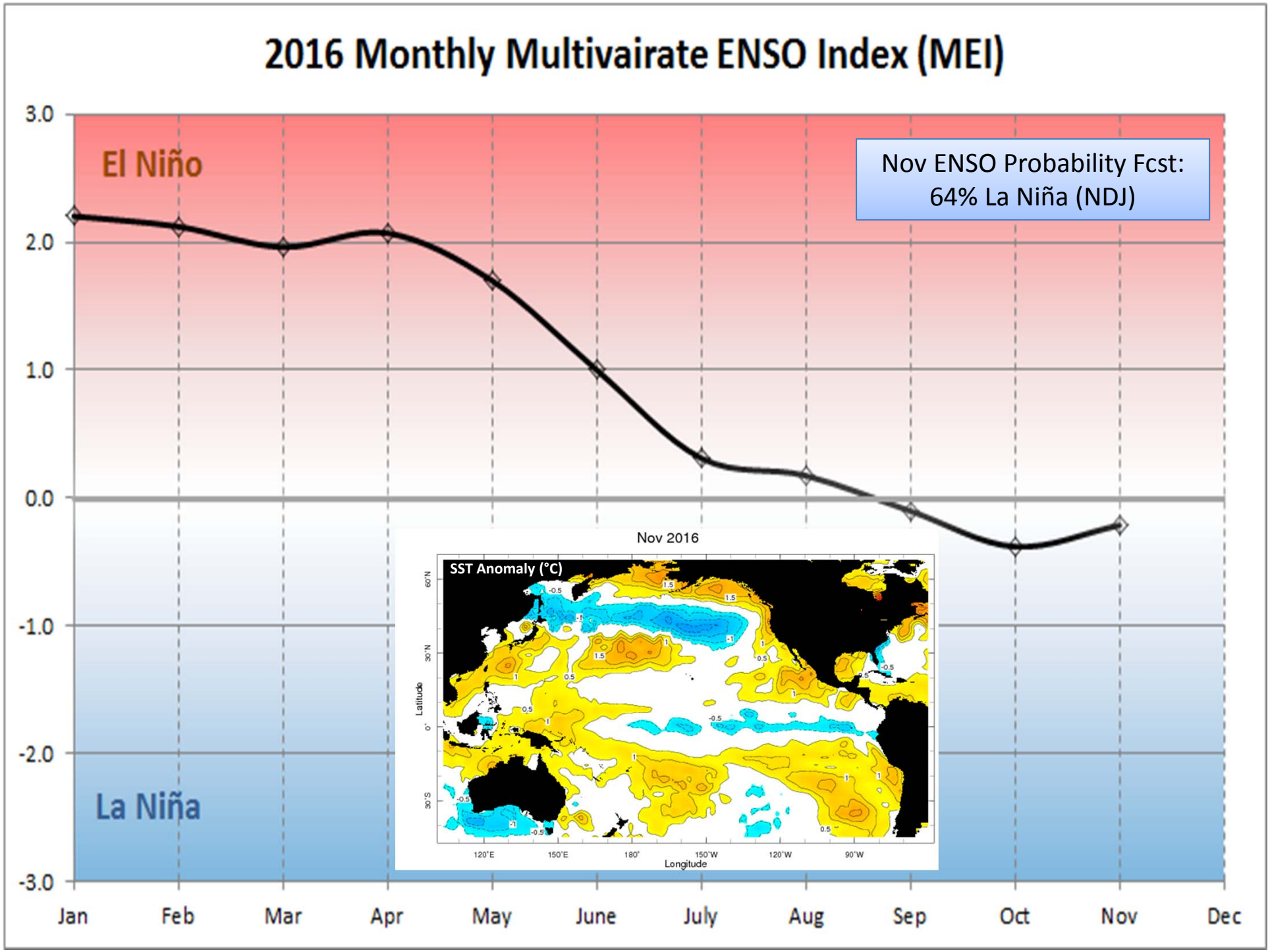
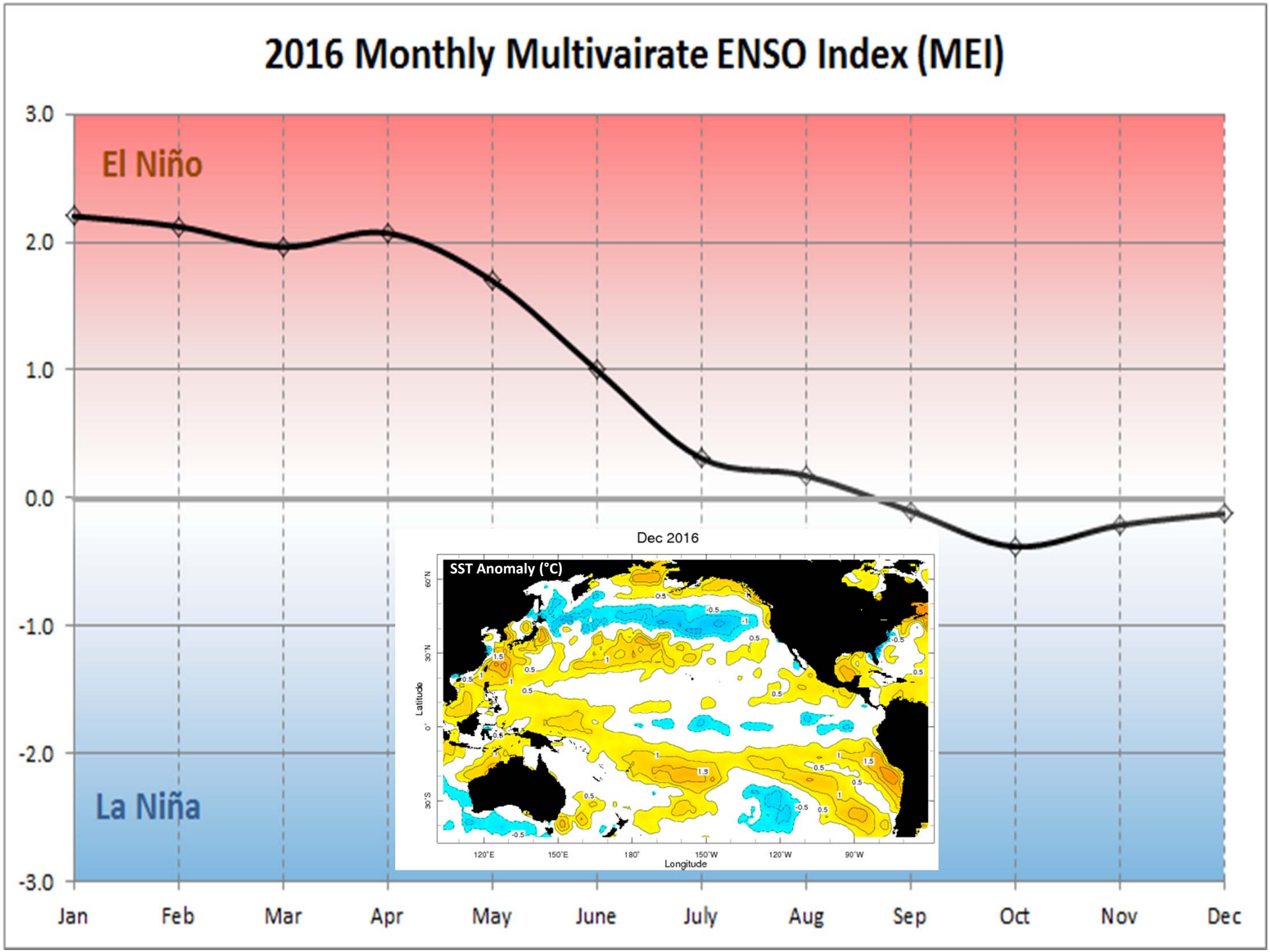
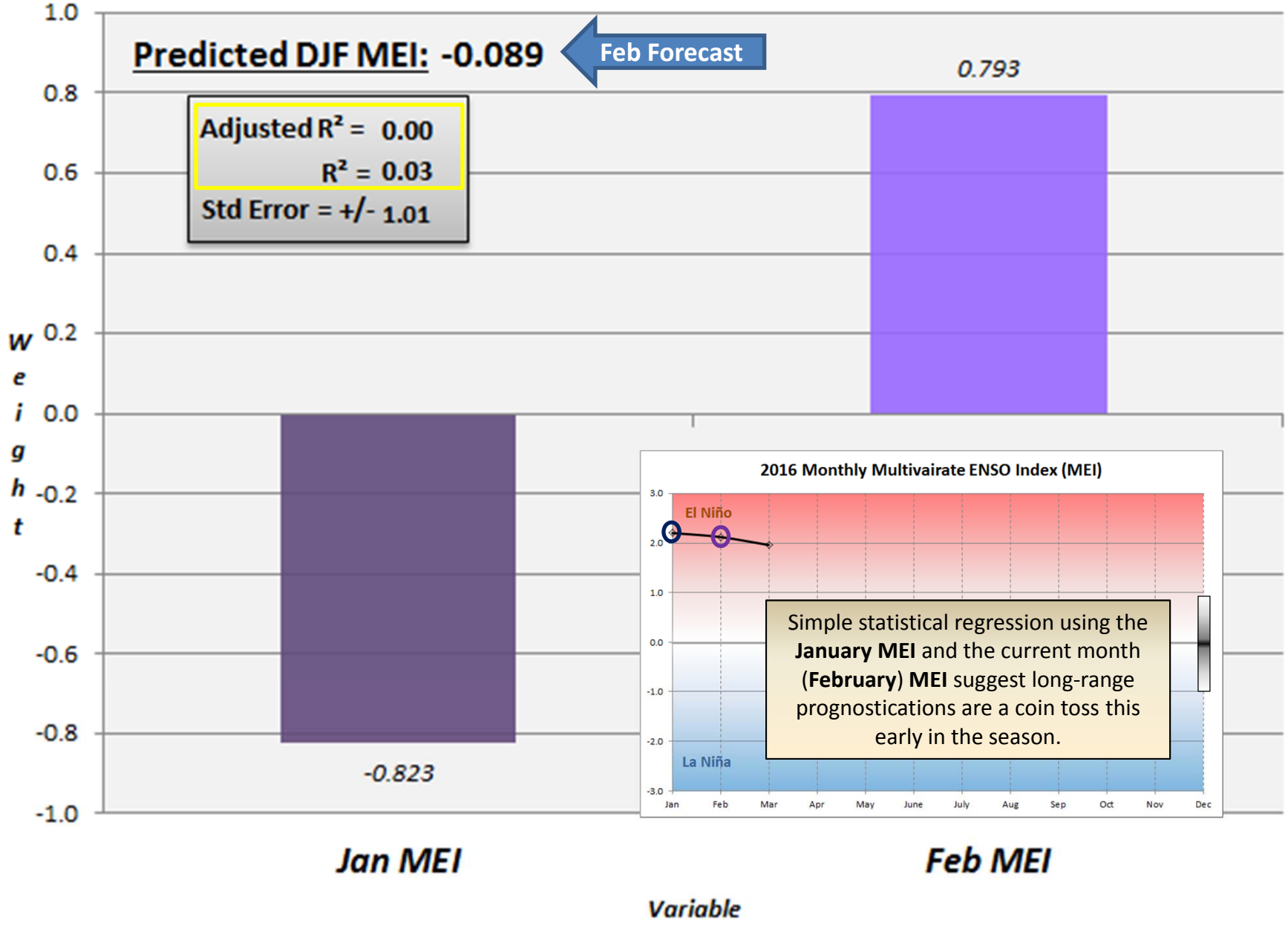


2016 Monthly Multivairate ENSO Index (MEI)



Regression: Jan MEI & Feb MEI



Regression: Jan MEI & June MEI

Predicted DJF MEI: 0.010

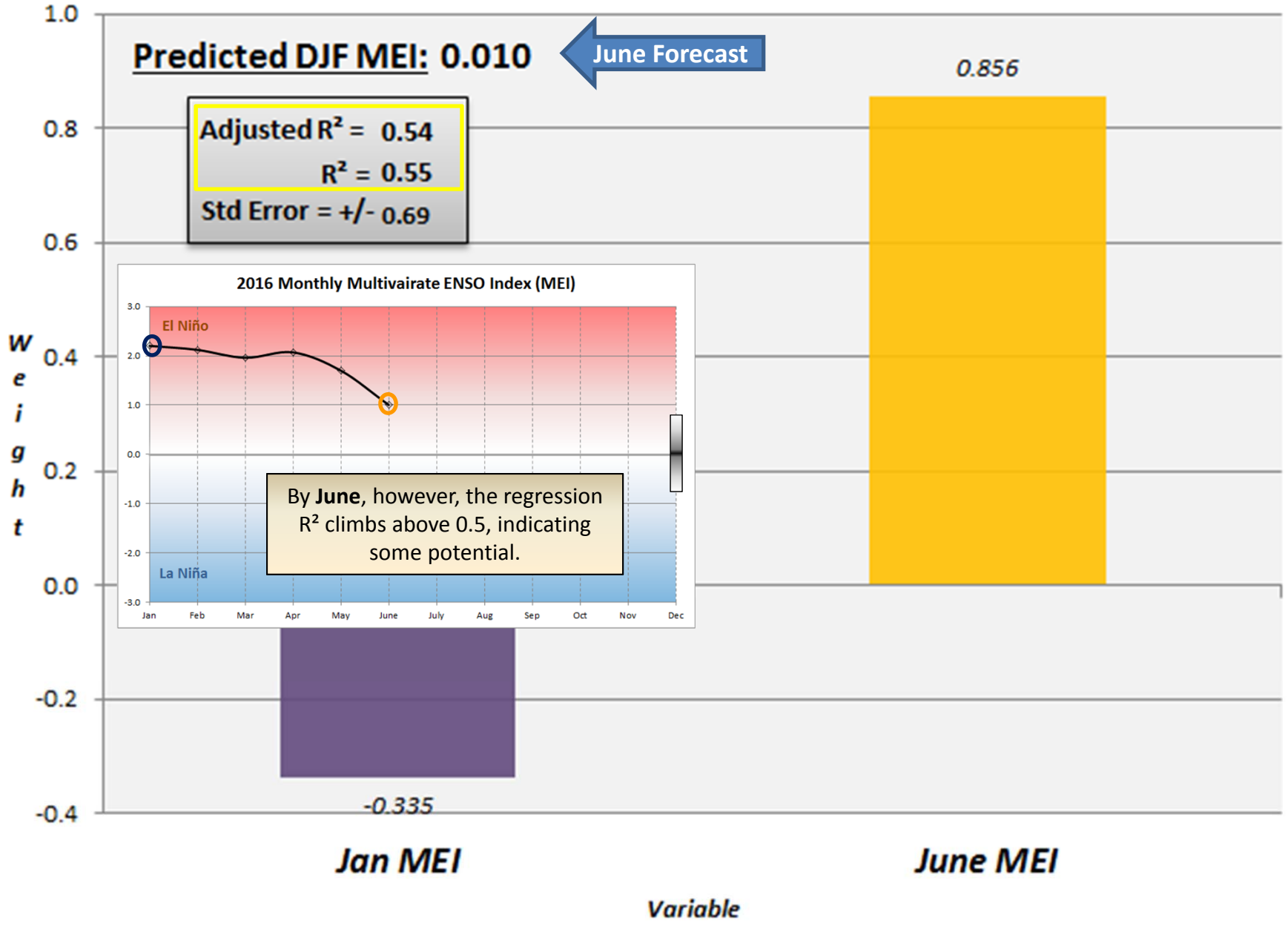
June Forecast

Adjusted R^2 = 0.54

R^2 = 0.55

Std Error = +/- 0.69

By **June**, however, the regression R^2 climbs above 0.5, indicating some potential.



Regression: Jan MEI & Oct MEI

Predicted DJF MEI: -0.502

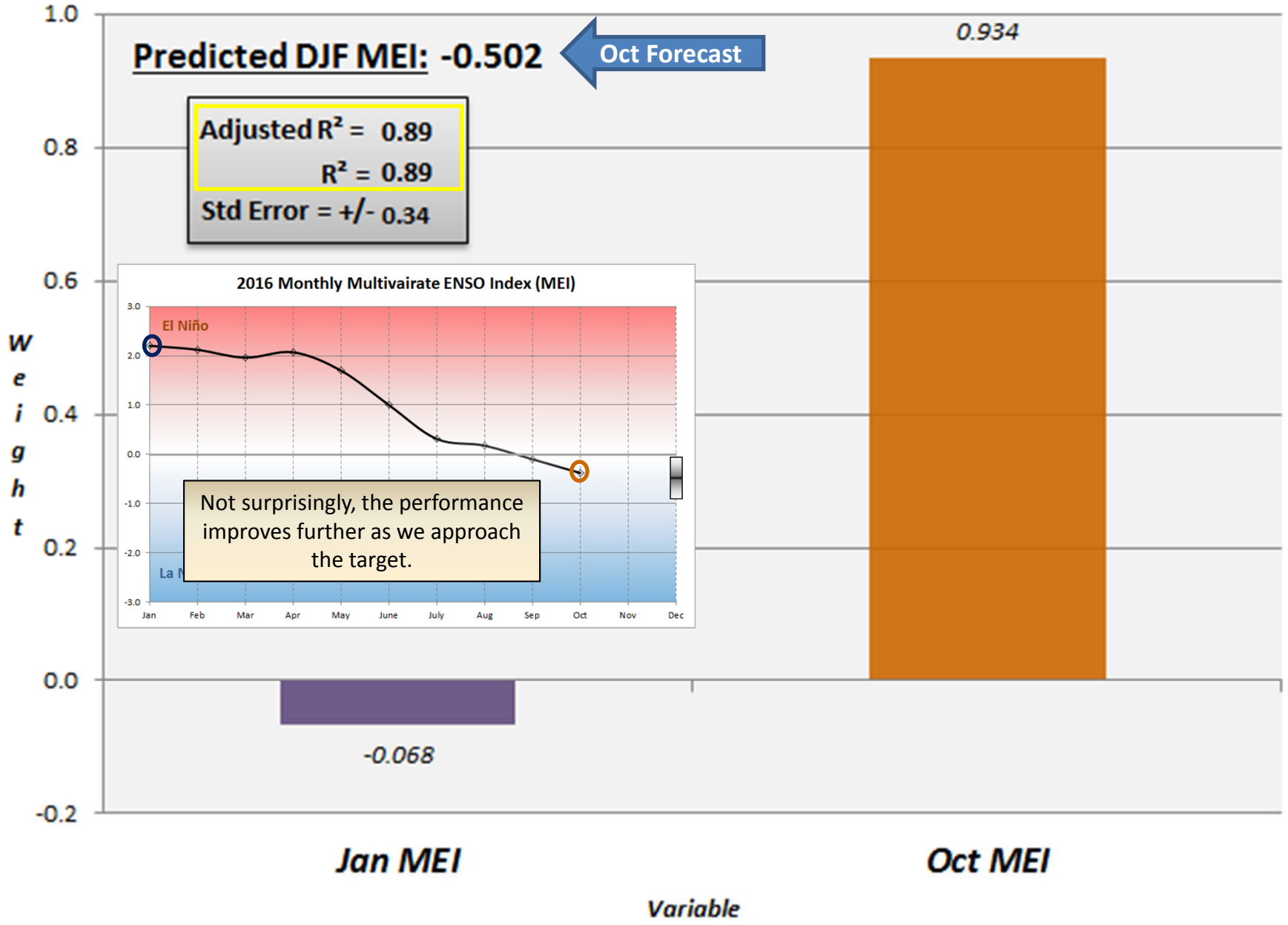
Oct Forecast

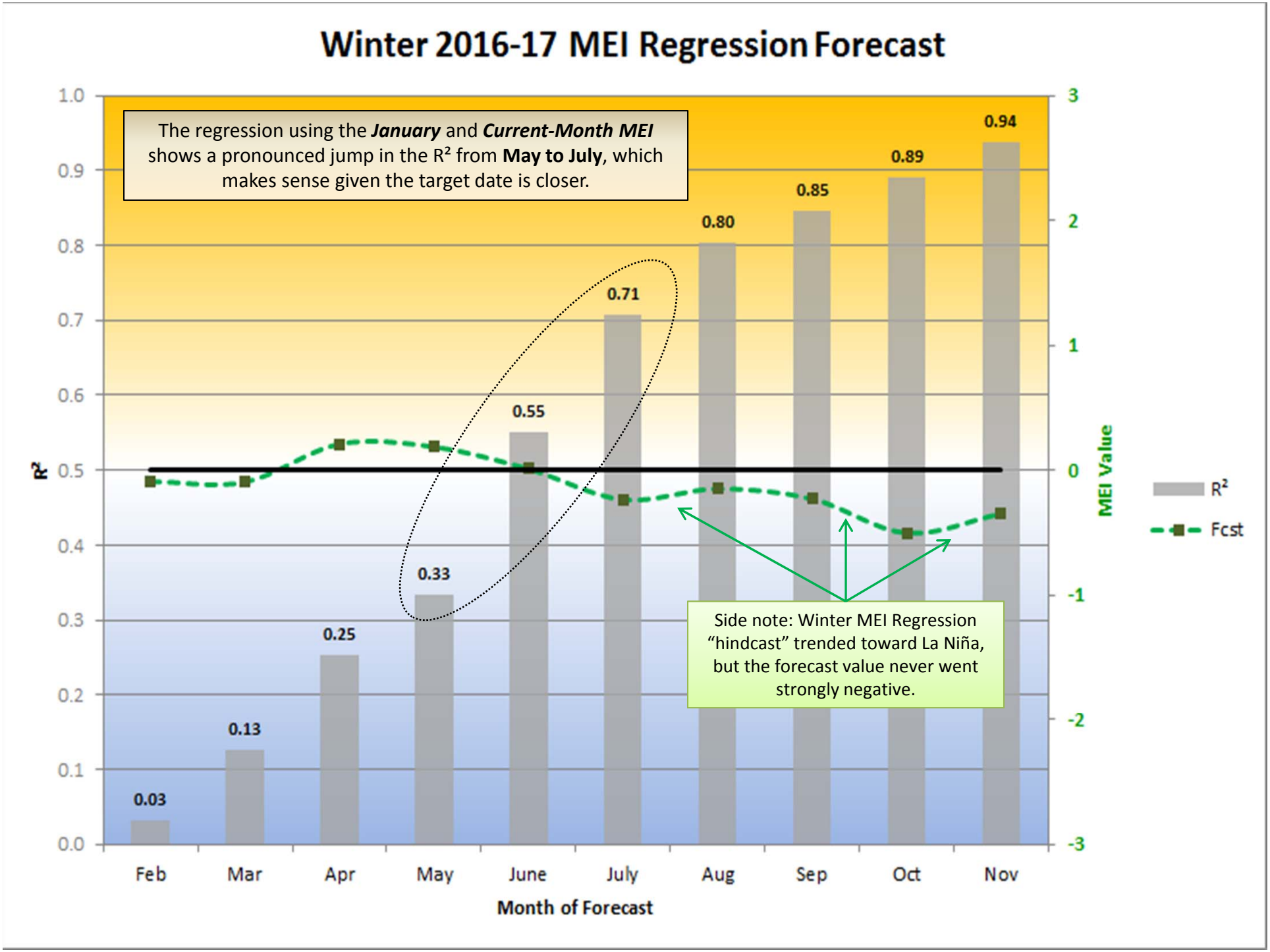
Adjusted R^2 = 0.89

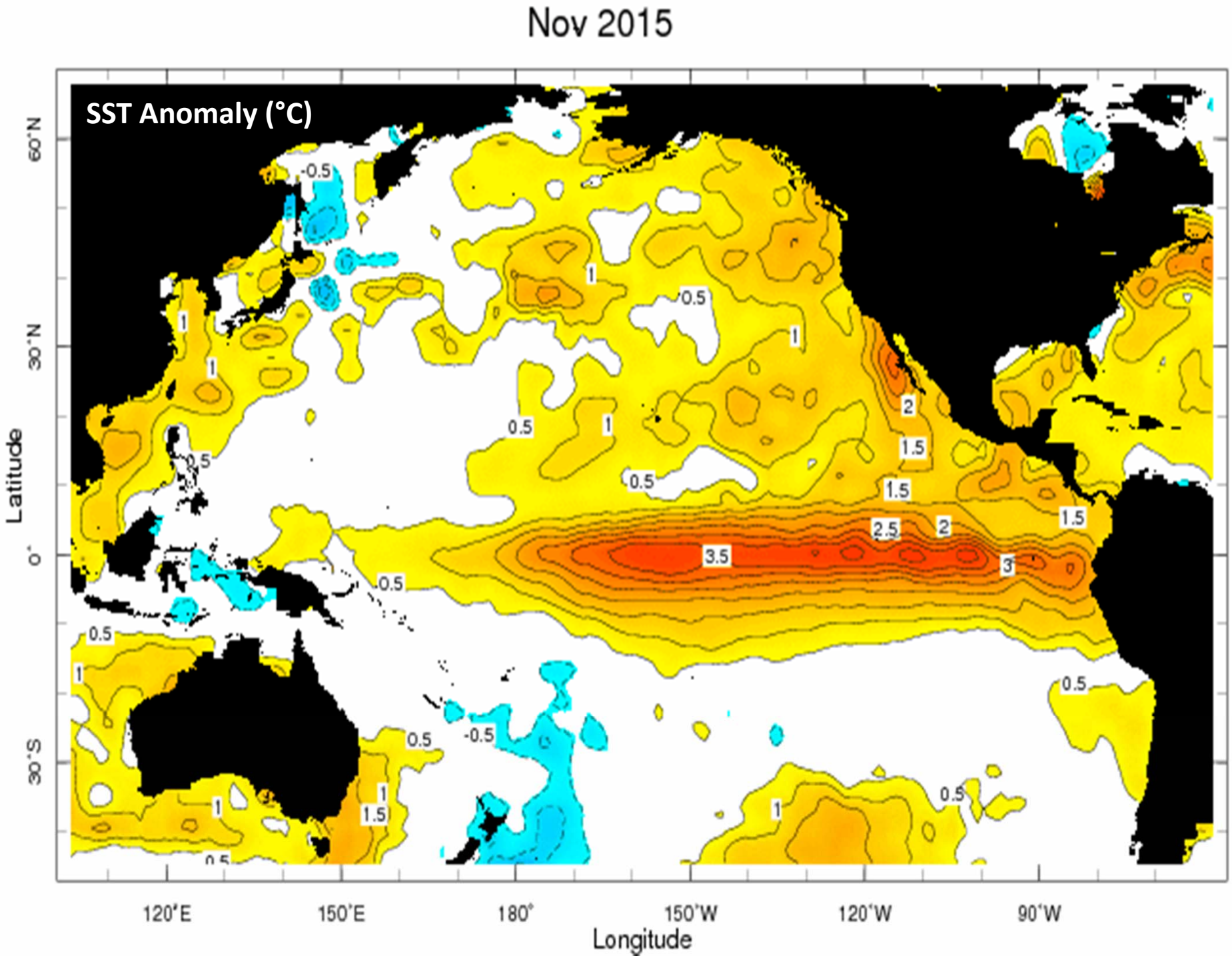
R^2 = 0.89

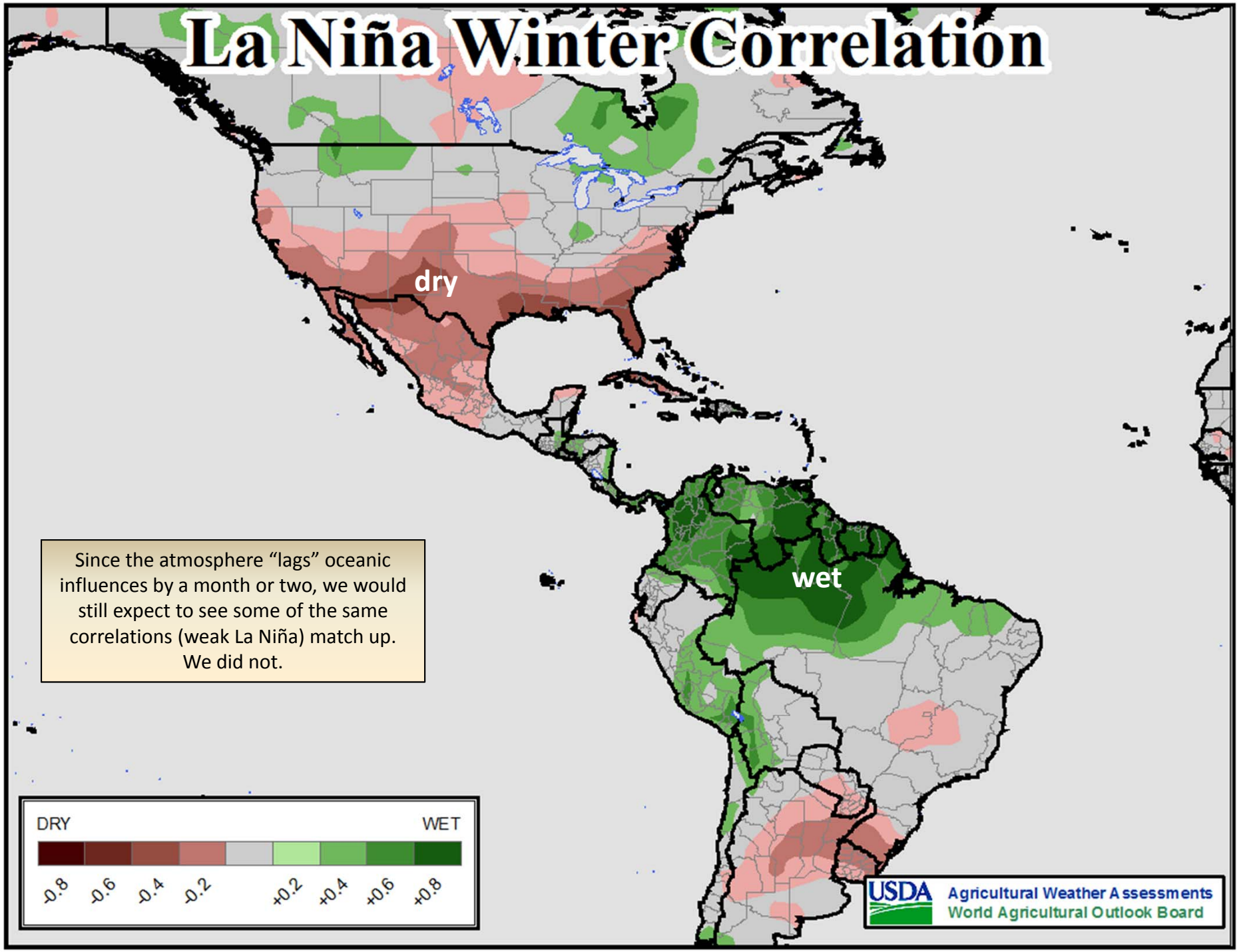
Std Error = +/- 0.34

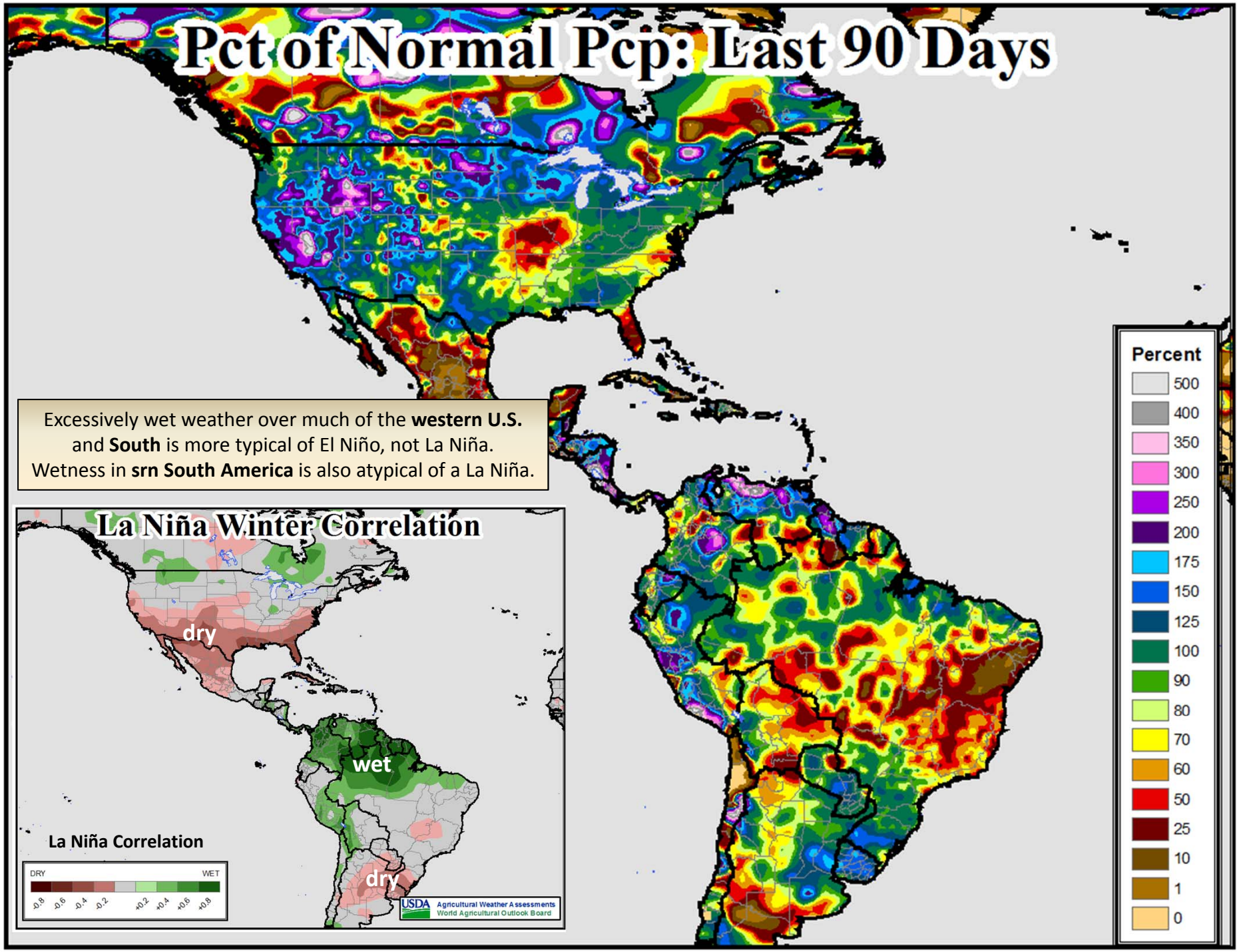
Not surprisingly, the performance improves further as we approach the target.

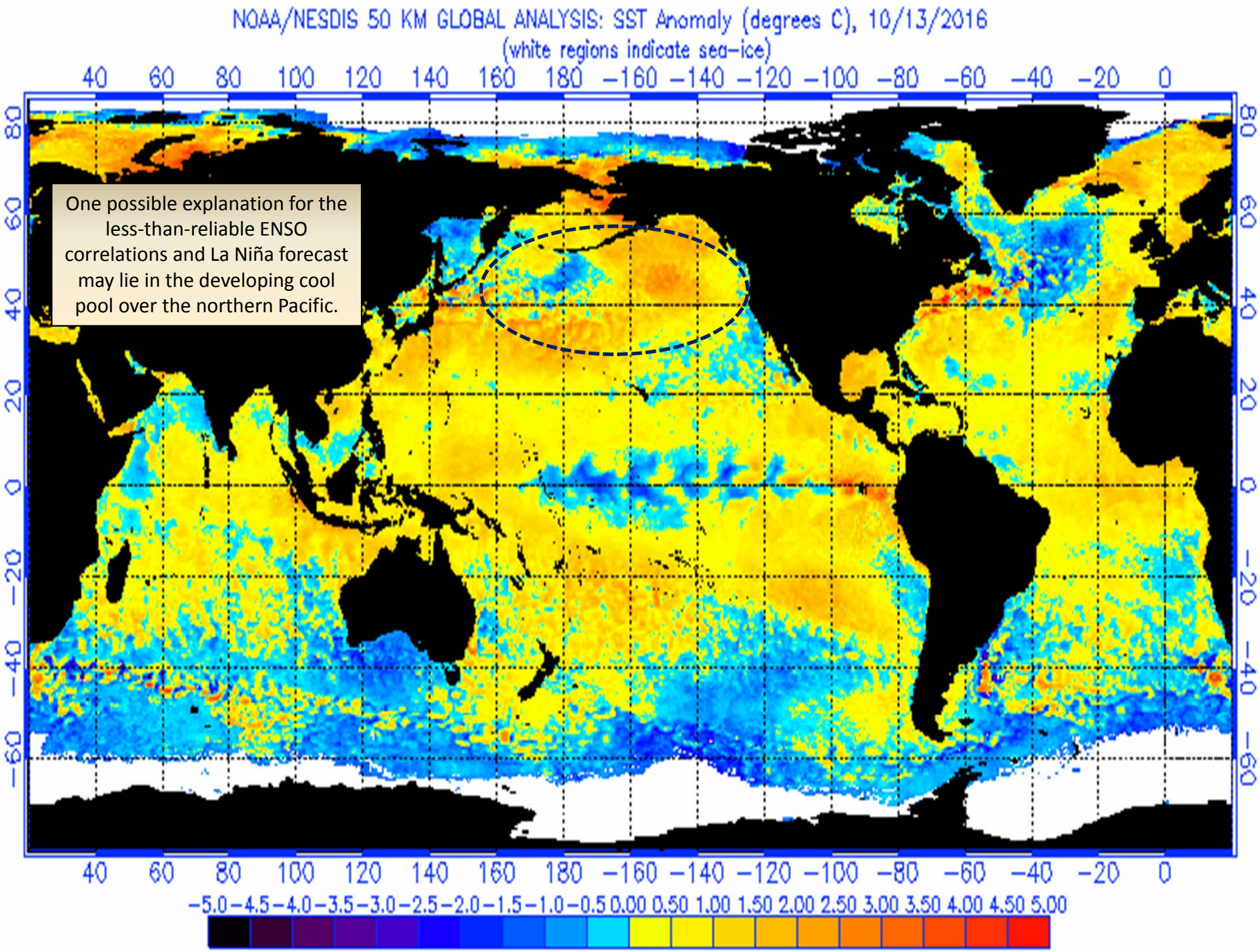


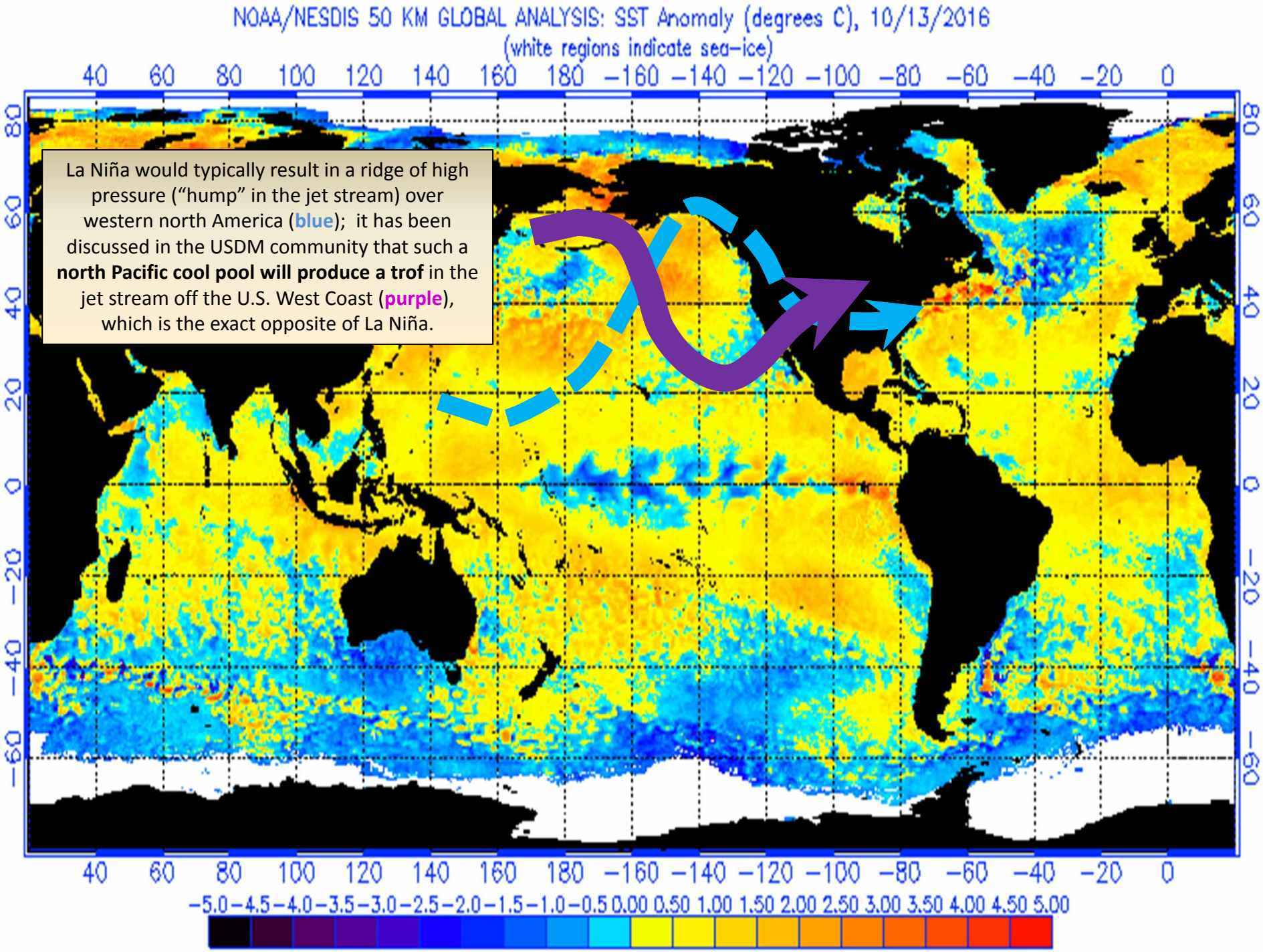

Winter 2016-17 MEI Regression Forecast
The regression using the ***January*** and ***Current-Month MEI*** shows a pronounced jump in the R^2 from **May to July**, which makes sense given the target date is closer.
Side note: Winter MEI Regression "hindcast" trended toward La Niña, but the forecast value never went strongly negative.
0.03
0.13
0.25
0.33
0.55
0.71
0.80
0.85
0.89
0.94
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
R²
3
2
1
0
-1
-2
-3
MEI Value
Feb
Mar
Apr
May
June
July
Aug
Sep
Oct
Nov
Month of Forecast
R²
Fcst

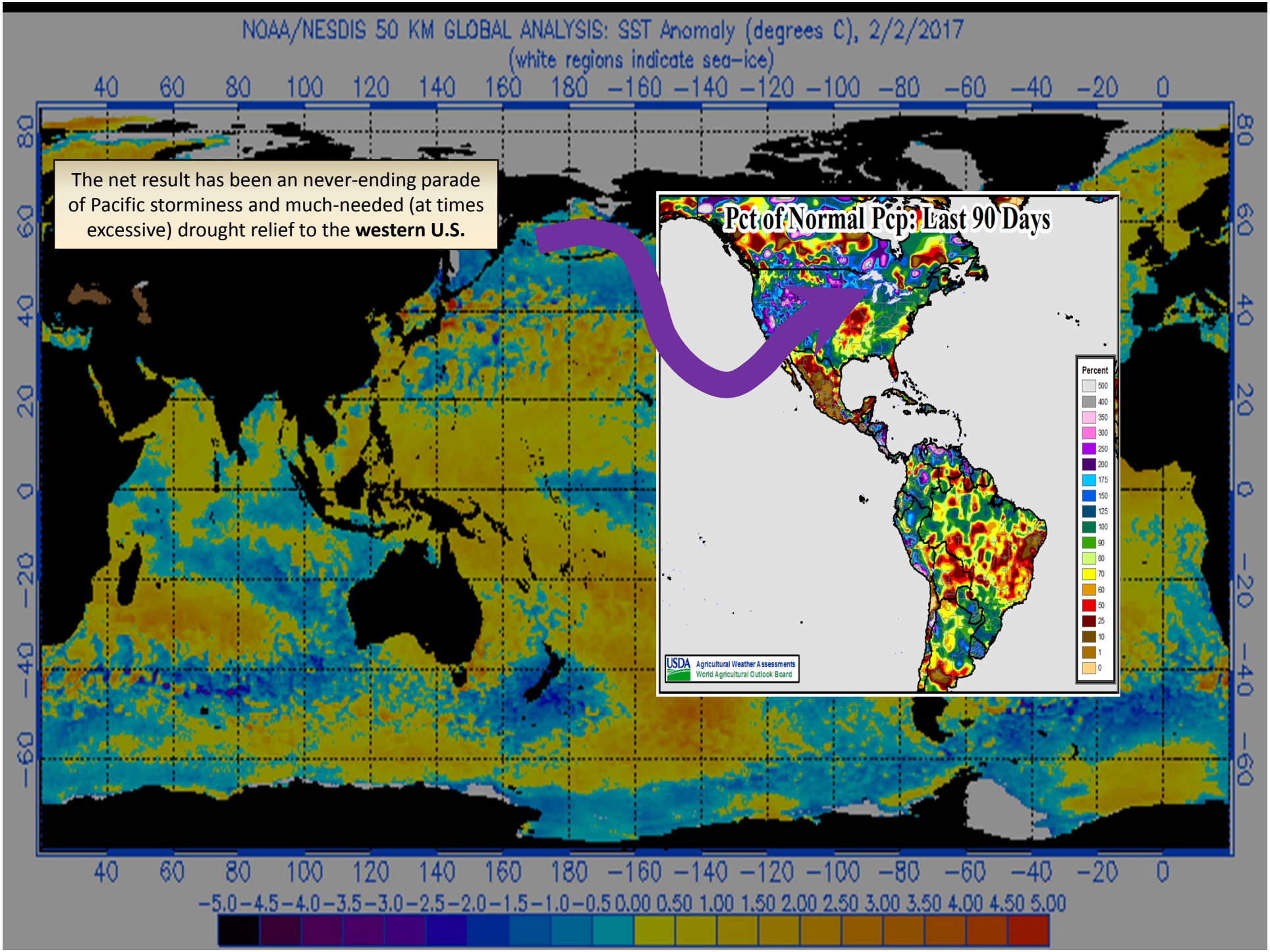

Nov 2015
SST Anomaly (°C)
60°N
30°N
0°
30°S
Latitude
120°E
150°E
180°
150°W
120°W
90°W
Longitude
-0.5
0.5
1
1.5
2
2.5
3
3.5

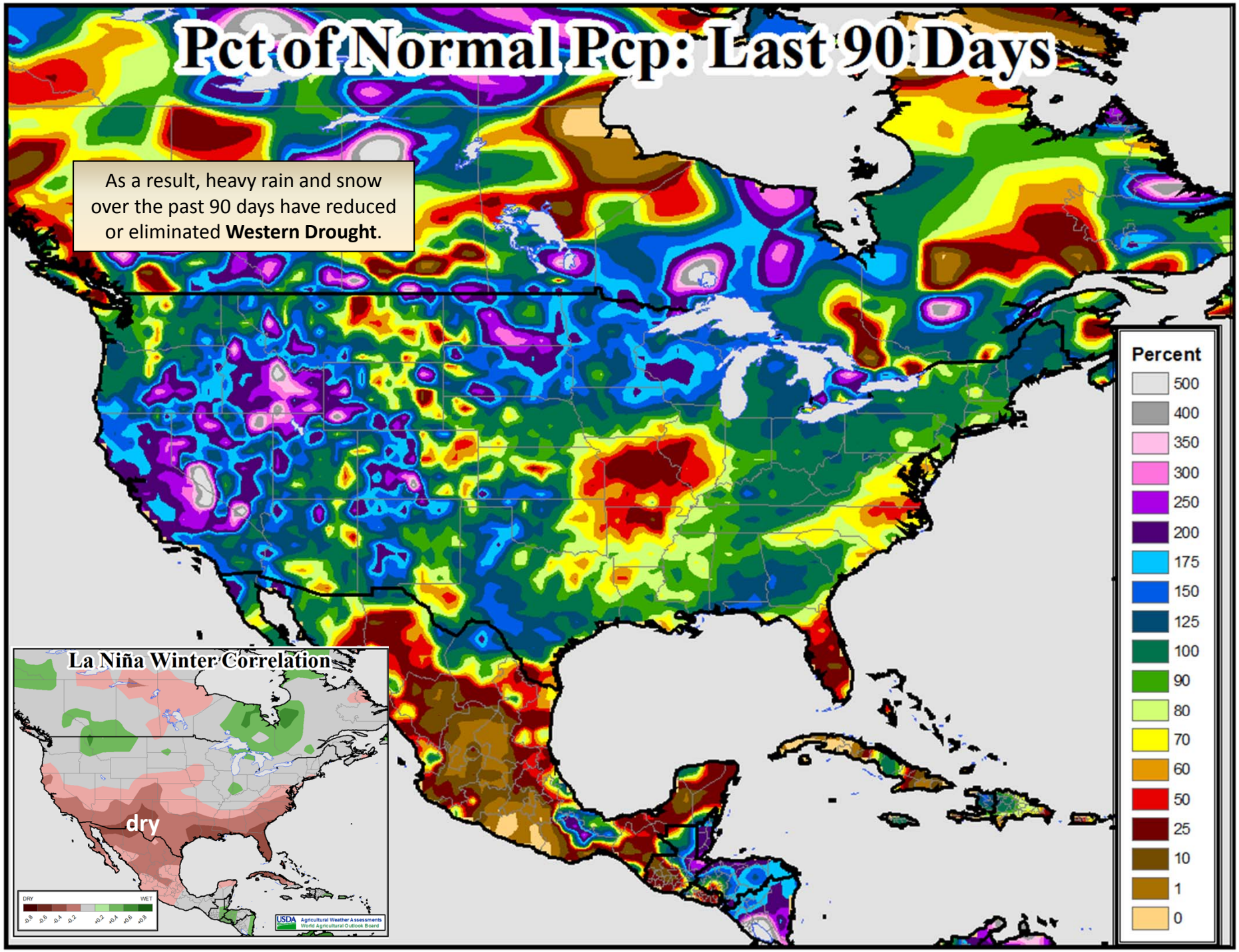

La Niña Winter Correlation
dry
wet
Since the atmosphere "lags" oceanic influences by a month or two, we would still expect to see some of the same correlations (weak La Niña) match up. We did not.
DRY
WET
-0.8
-0.6
-0.4
-0.2
+0.2
+0.4
+0.6
+0.8
USDA
Agricultural Weather Assessments
World Agricultural Outlook Board

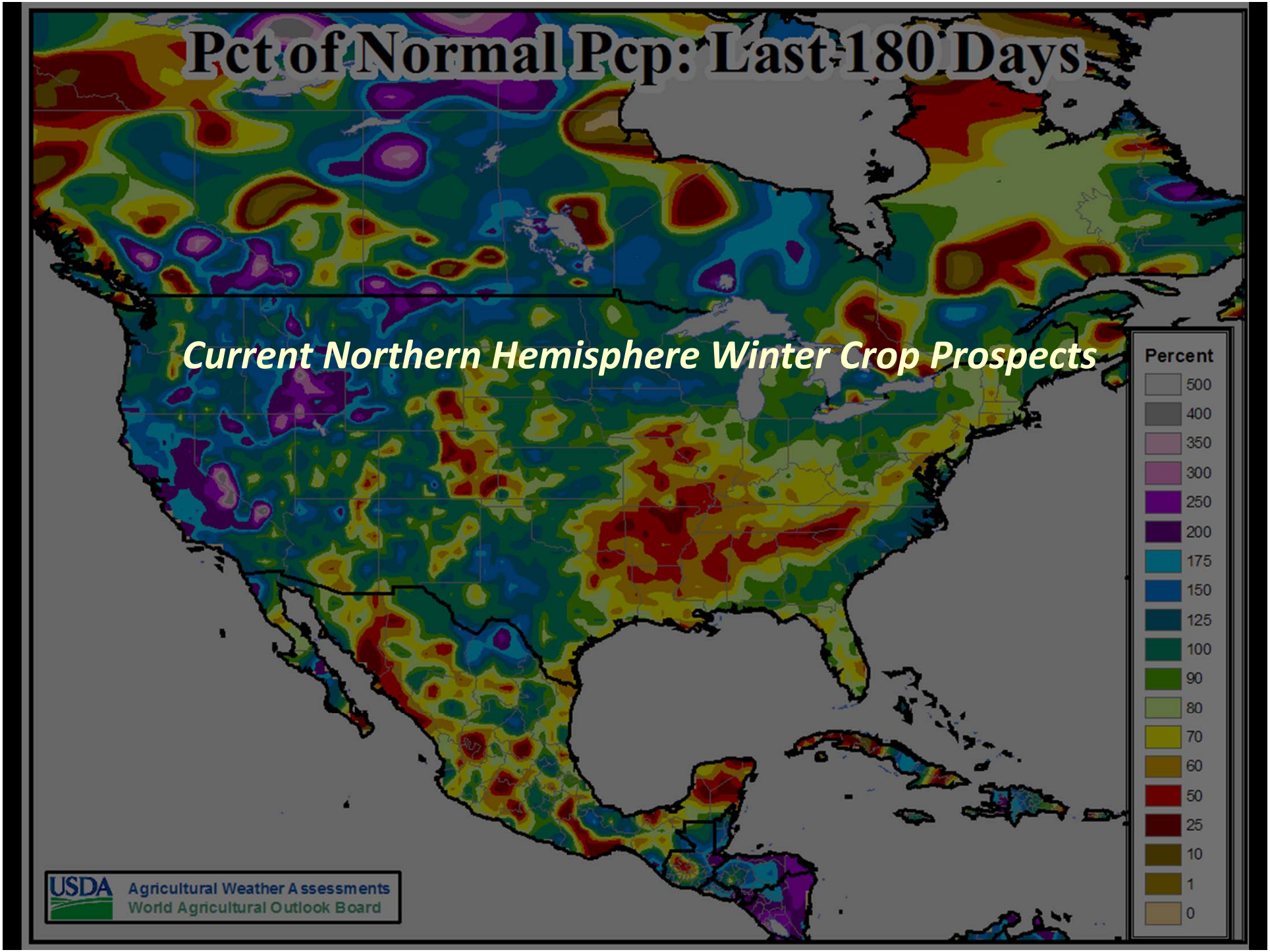

Pct of Normal Pcp: Last 90 Days
Excessively wet weather over much of the western U.S. and South is more typical of El Niño, not La Niña. Wetness in srn South America is also atypical of a La Niña.
La Niña Winter Correlation
dry
wet
dry
La Niña Correlation
DRY
WET
-0.8 -0.6 -0.4 -0.2 +0.2 +0.4 +0.6 +0.8
USDA Agricultural Weather Assessments
World Agricultural Outlook Board
Percent
500
400
350
300
250
200
175
150
125
100
90
80
70
60
50
25
10
1
0

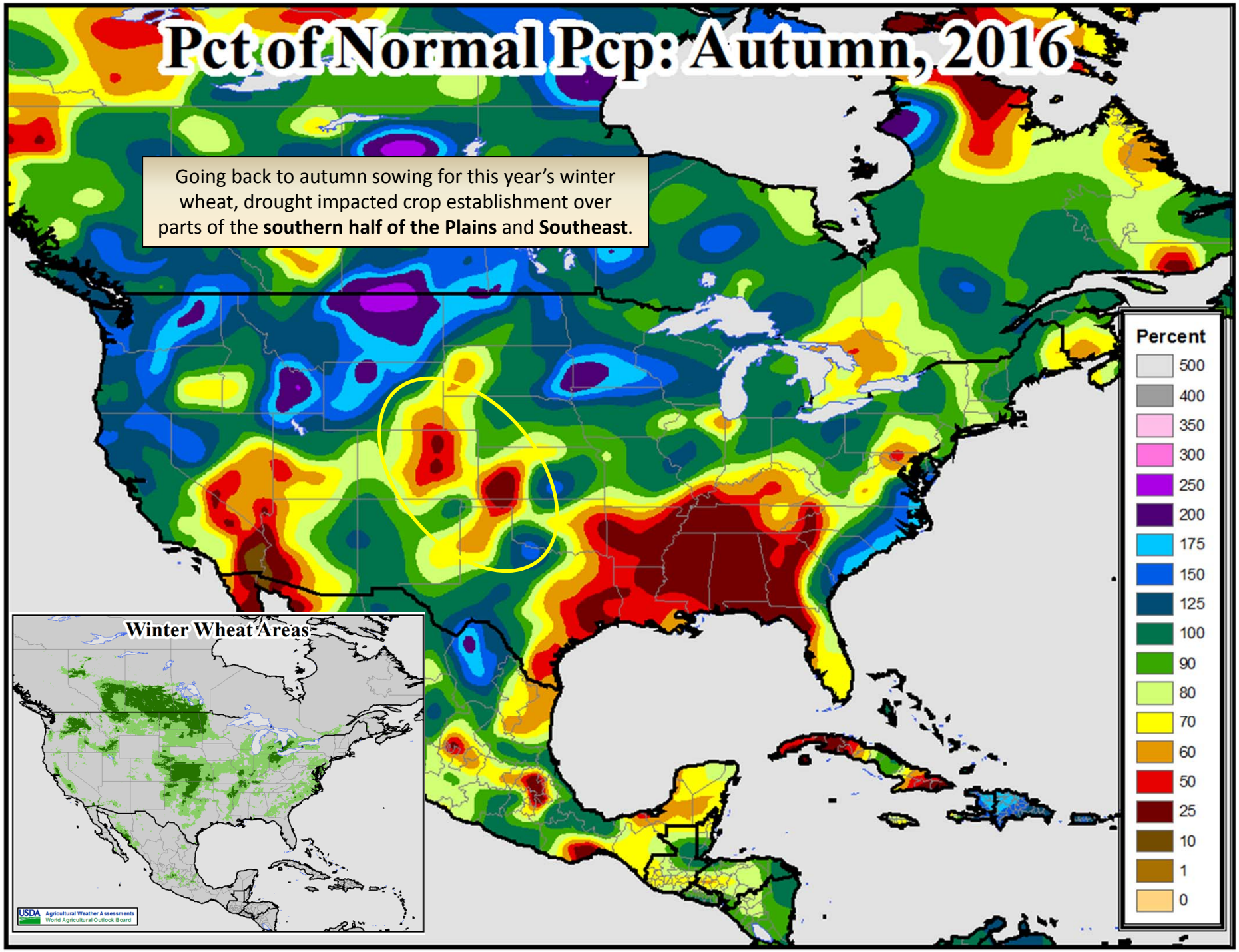

NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 10/13/2016
(white regions indicate sea-ice)
40 60 80 100 120 140 160 180 −160 −140 −120 −100 −80 −60 −40 −20 0
80 60 40 20 0 −20 −40 −60
One possible explanation for the less-than-reliable ENSO correlations and La Niña forecast may lie in the developing cool pool over the northern Pacific.
−5.0 −4.5 −4.0 −3.5 −3.0 −2.5 −2.0 −1.5 −1.0 −0.5 0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00

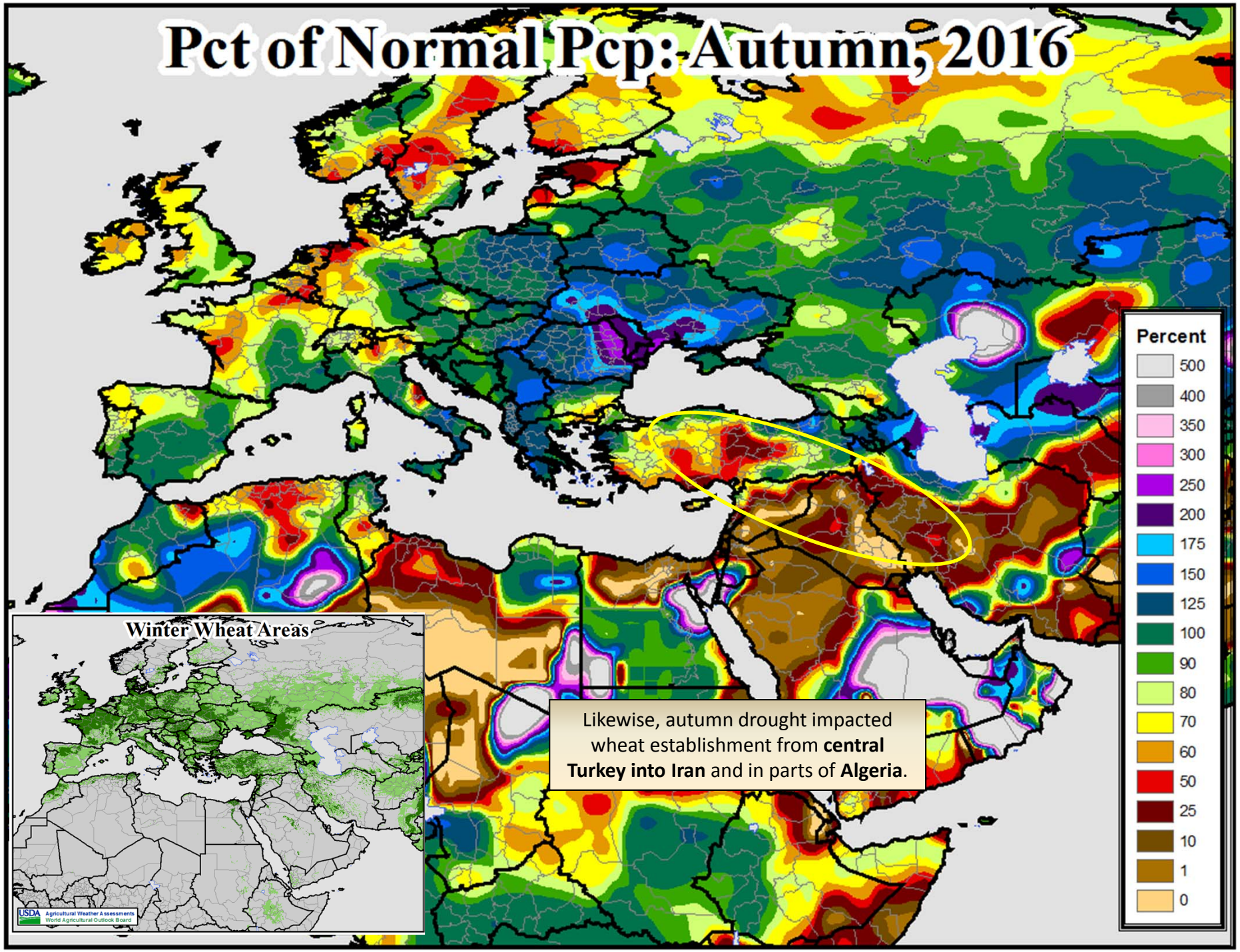

NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 10/13/2016
(white regions indicate sea-ice)
40 60 80 100 120 140 160 180 −160 −140 −120 −100 −80 −60 −40 −20 0
80 60 40 20 0 −20 −40 −60
La Niña would typically result in a ridge of high pressure (“hump” in the jet stream) over western north America (blue); it has been discussed in the USDM community that such a north Pacific cool pool will produce a trof in the jet stream off the U.S. West Coast (purple), which is the exact opposite of La Niña.
−5.0 −4.5 −4.0 −3.5 −3.0 −2.5 −2.0 −1.5 −1.0 −0.5 0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00


NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 2/2/2017
(white regions indicate sea-ice)
40 60 80 100 120 140 160 180 −160 −140 −120 −100 −80 −60 −40 −20 0
80 60 40 20 0 −20 −40 −60
−5.0 −4.5 −4.0 −3.5 −3.0 −2.5 −2.0 −1.5 −1.0 −0.5 0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00
The net result has been an never-ending parade of Pacific storminess and much-needed (at times excessive) drought relief to the **western U.S.**
Pct of Normal Pcp: Last 90 Days
Percent
500
400
350
300
250
200
175
150
125
100
90
80
70
60
50
25
10
1
0
USDA Agricultural Weather Assessments
World Agricultural Outlook Board

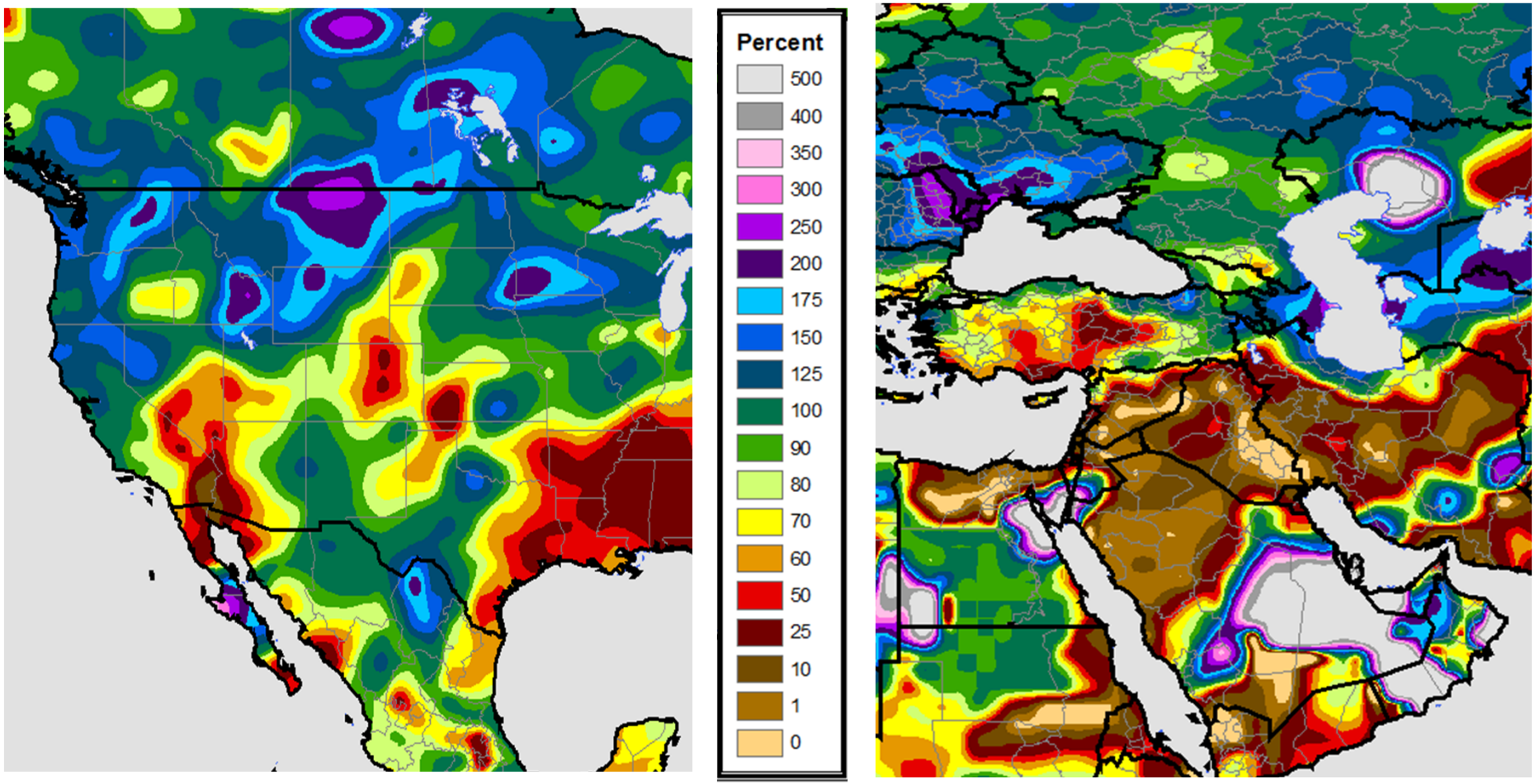

Pct of Normal Pcp: Last 90 Days
As a result, heavy rain and snow over the past 90 days have reduced or eliminated **Western Drought**.
Percent
500
400
350
300
250
200
175
150
125
100
90
80
70
60
50
25
10
1
0
La Niña Winter Correlation
dry
DRY
WET
USDA Agricultural Weather Assessments
World Agricultural Outlook Board


Pct of Normal Pcp: Last 180 Days
Current Northern Hemisphere Winter Crop Prospects
Percent
500
400
350
300
250
200
175
150
125
100
90
80
70
60
50
25
10
1
0
USDA
Agricultural Weather Assessments
World Agricultural Outlook Board


Pct of Normal Pcp: Autumn, 2016
Going back to autumn sowing for this year's winter wheat, drought impacted crop establishment over parts of the **southern half of the Plains** and **Southeast**.
Percent
500
400
350
300
250
200
175
150
125
100
90
80
70
60
50
25
10
1
0
Winter Wheat Areas
USDA Agricultural Weather Assessments
World Agricultural Outlook Board


Pct of Normal Pcp: Autumn, 2016
Percent
500
400
350
300
250
200
175
150
125
100
90
80
70
60
50
25
10
1
0
Winter Wheat Areas
USDA Agricultural Weather Assessments
World Agricultural Outlook Board
Likewise, autumn drought impacted wheat establishment from **central Turkey into Iran** and in parts of **Algeria**.

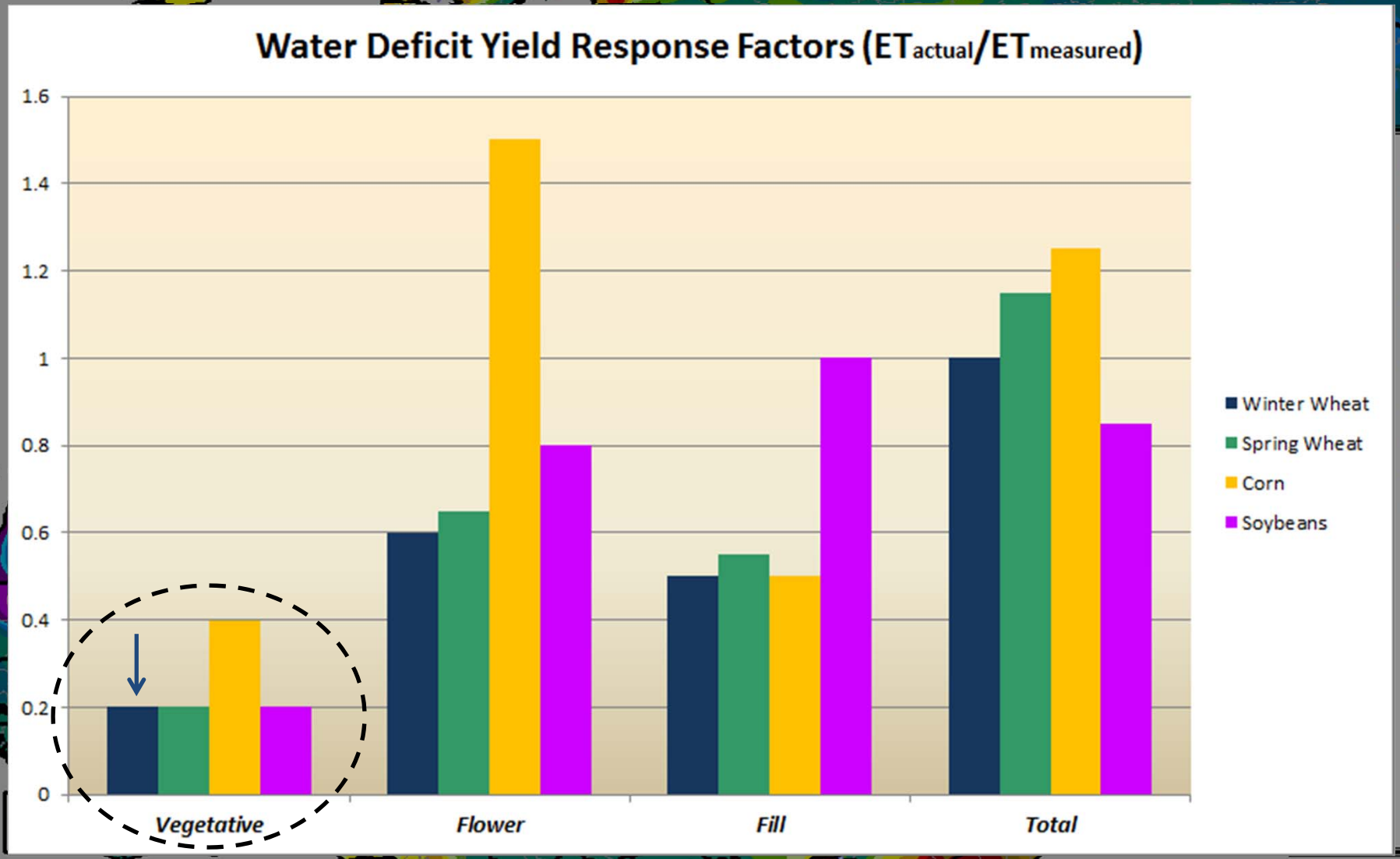
Autumn, 2016, Percent of Normal Precipitation



Impact?

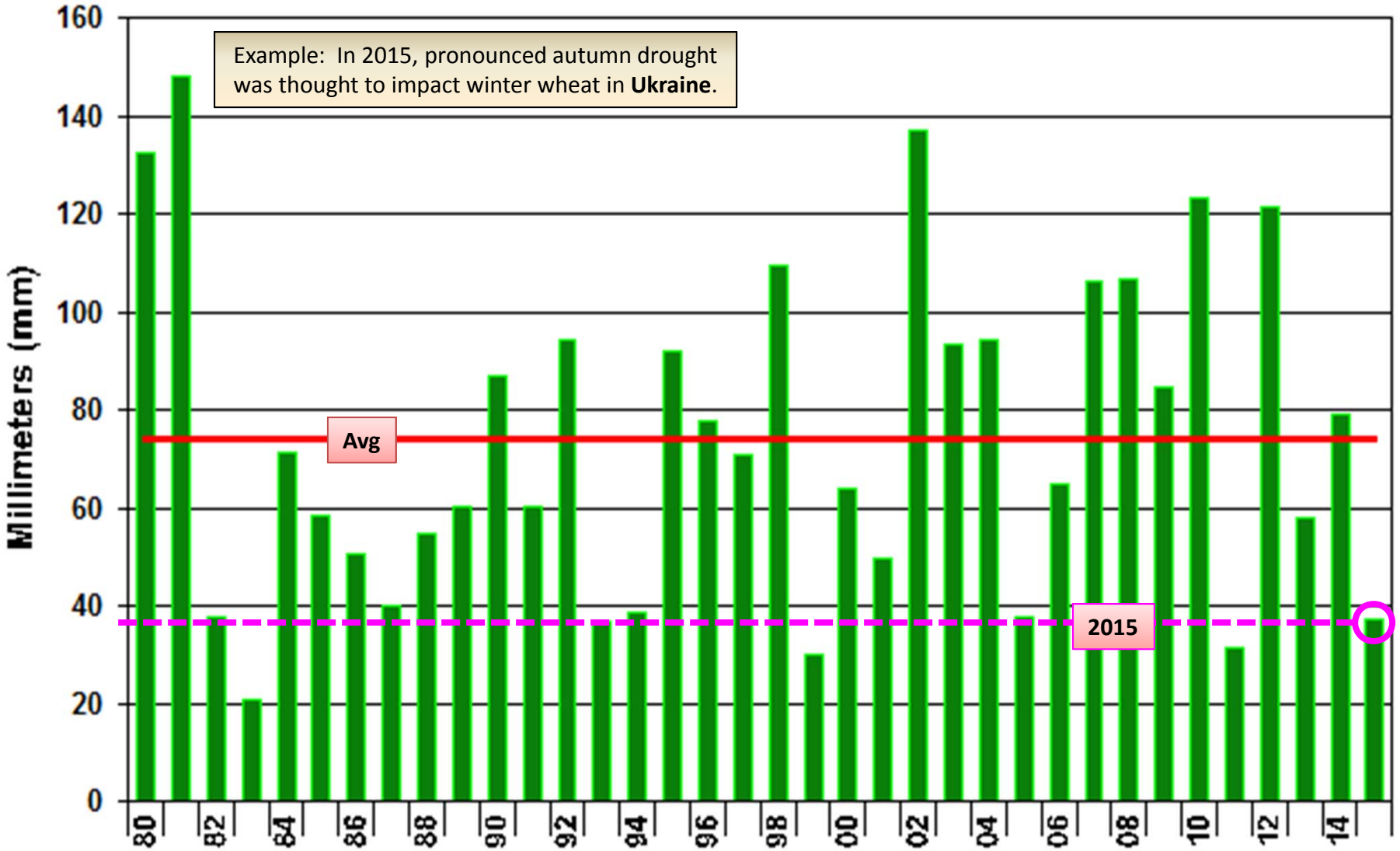
Pct of Normal Precip Autumn, 2016

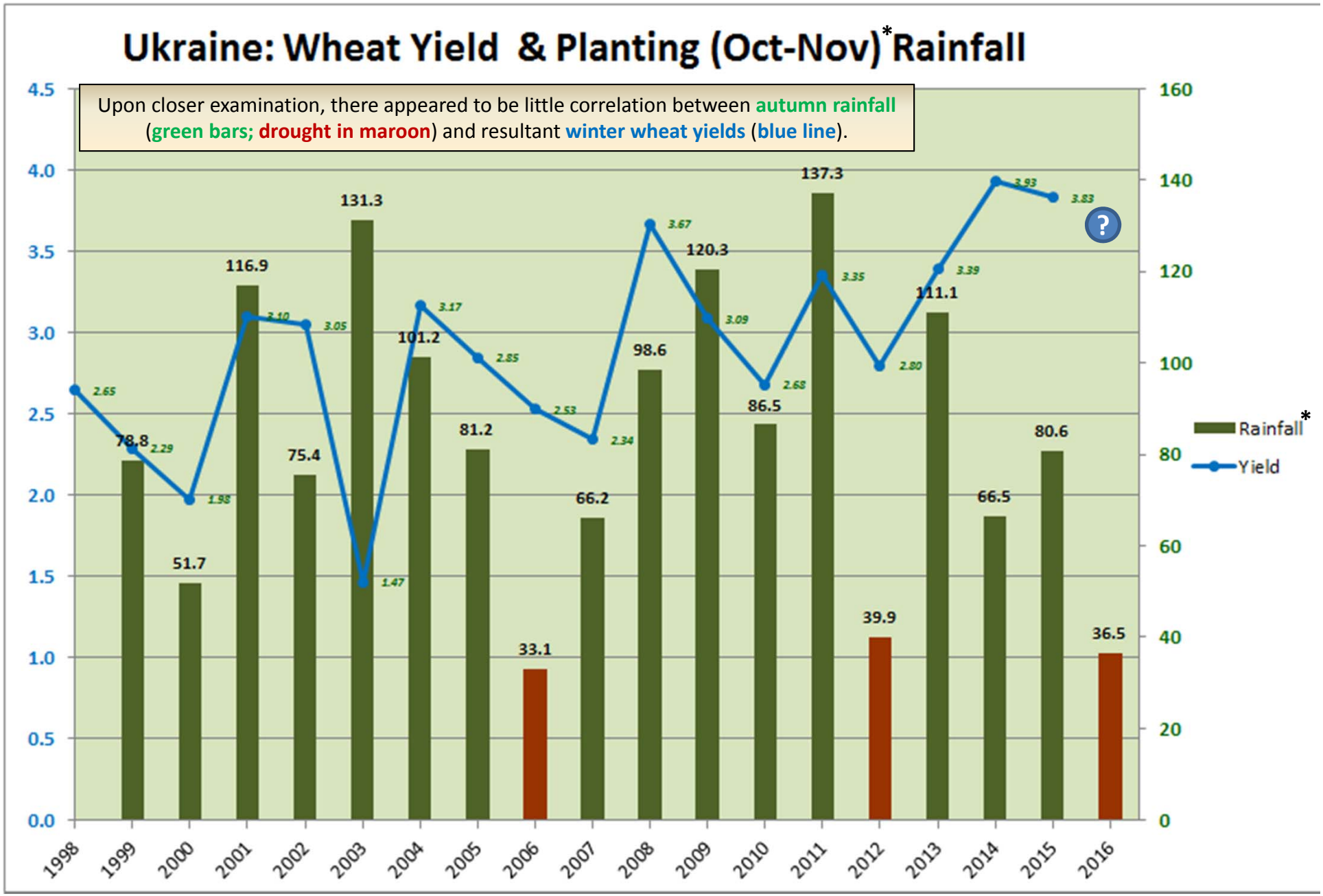
Moisture Yield Response Factors (courtesy of FAO) indicate wheat yields are not driven by autumn rain (vegetative).
Area? Yes.
Yield? Not so much.



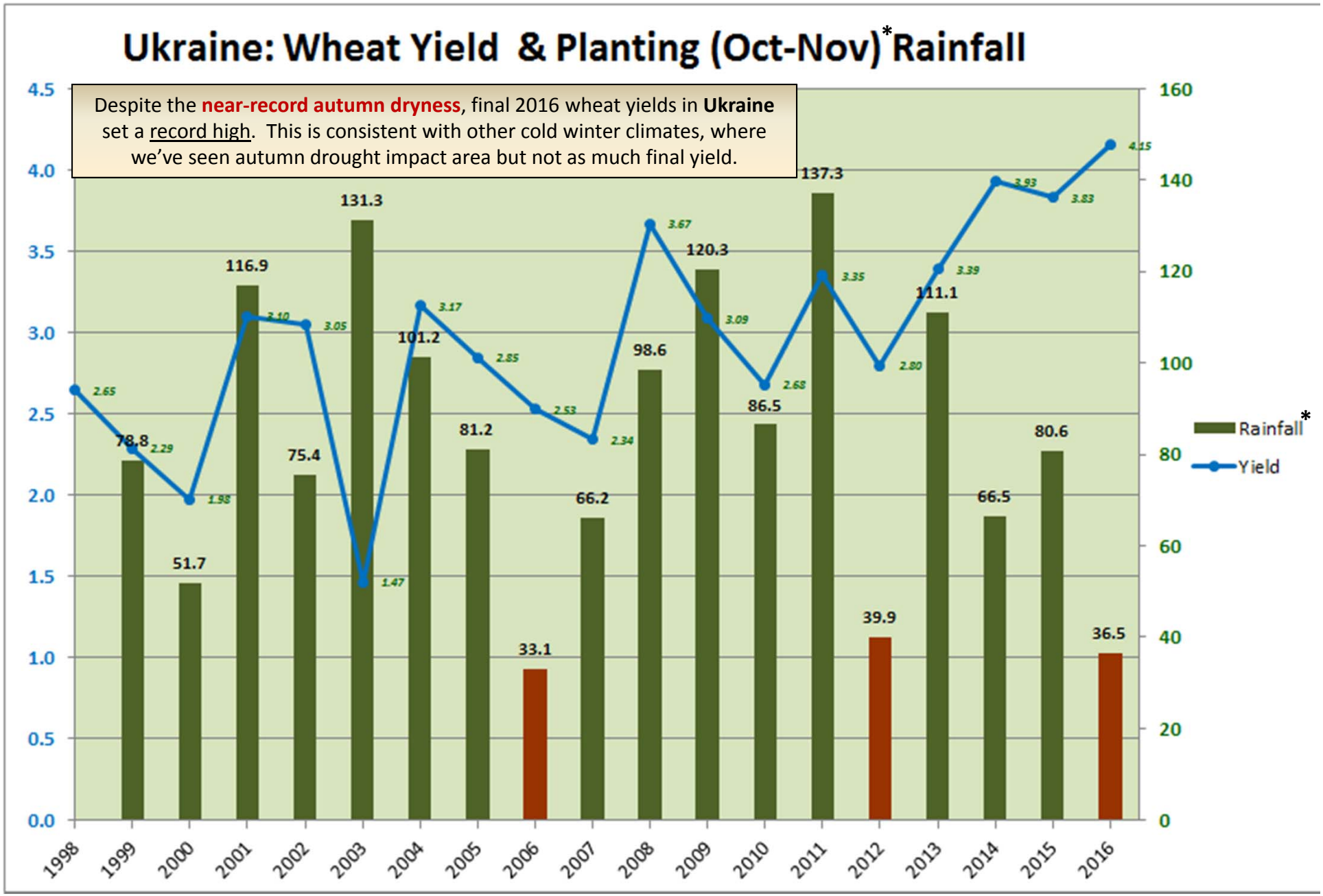
6 - UKRAINE - SOUTH CENTRAL

September 15 – November 15 Total Precipitation

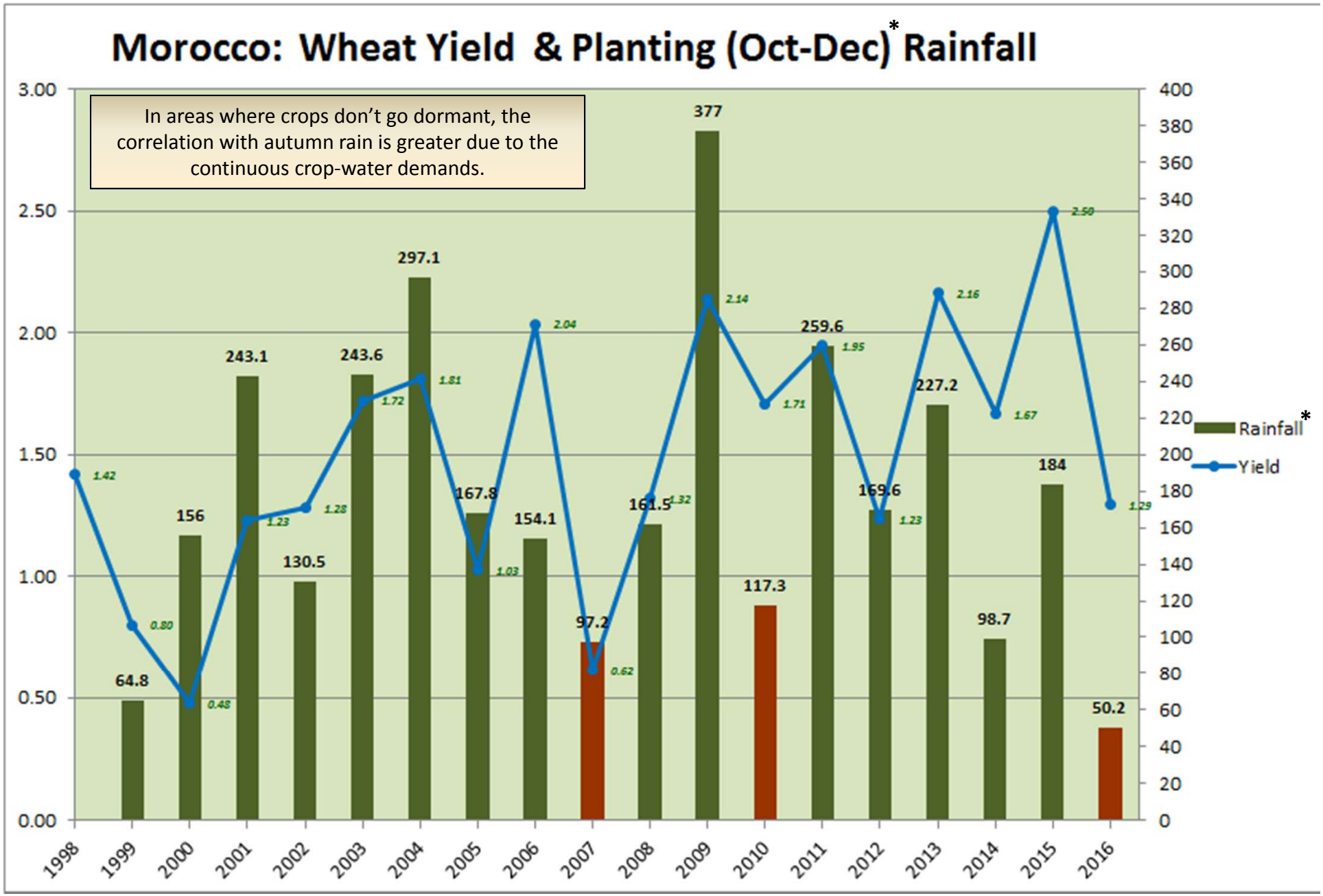




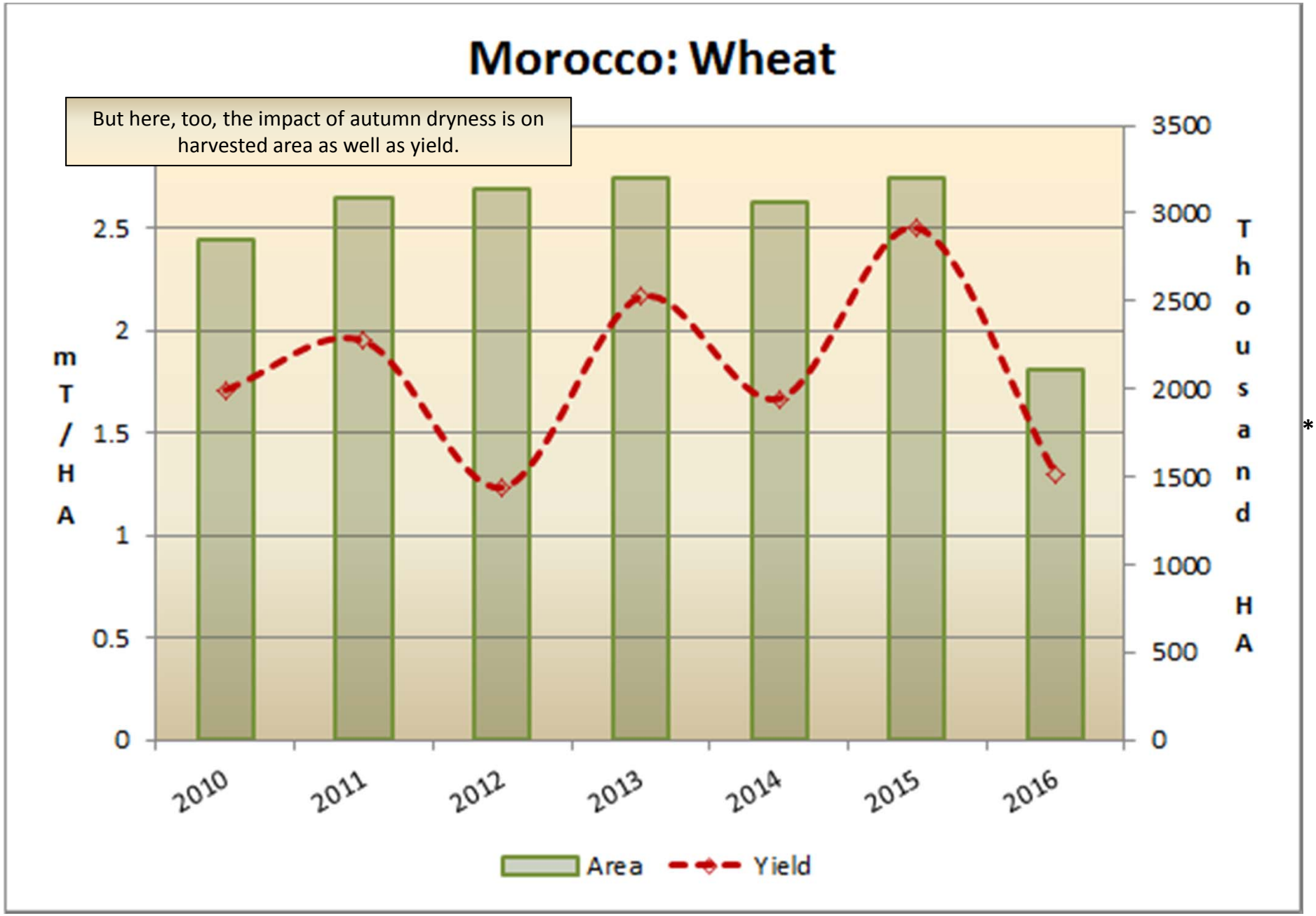
** Refers to crop year, so 2016 refers to the 2015-16 winter wheat growing season; depicted rainfall is autumn, the year prior.*



** Refers to crop year, so 2016 refers to the 2015-16 winter wheat growing season; depicted rainfall is autumn, the year prior.*

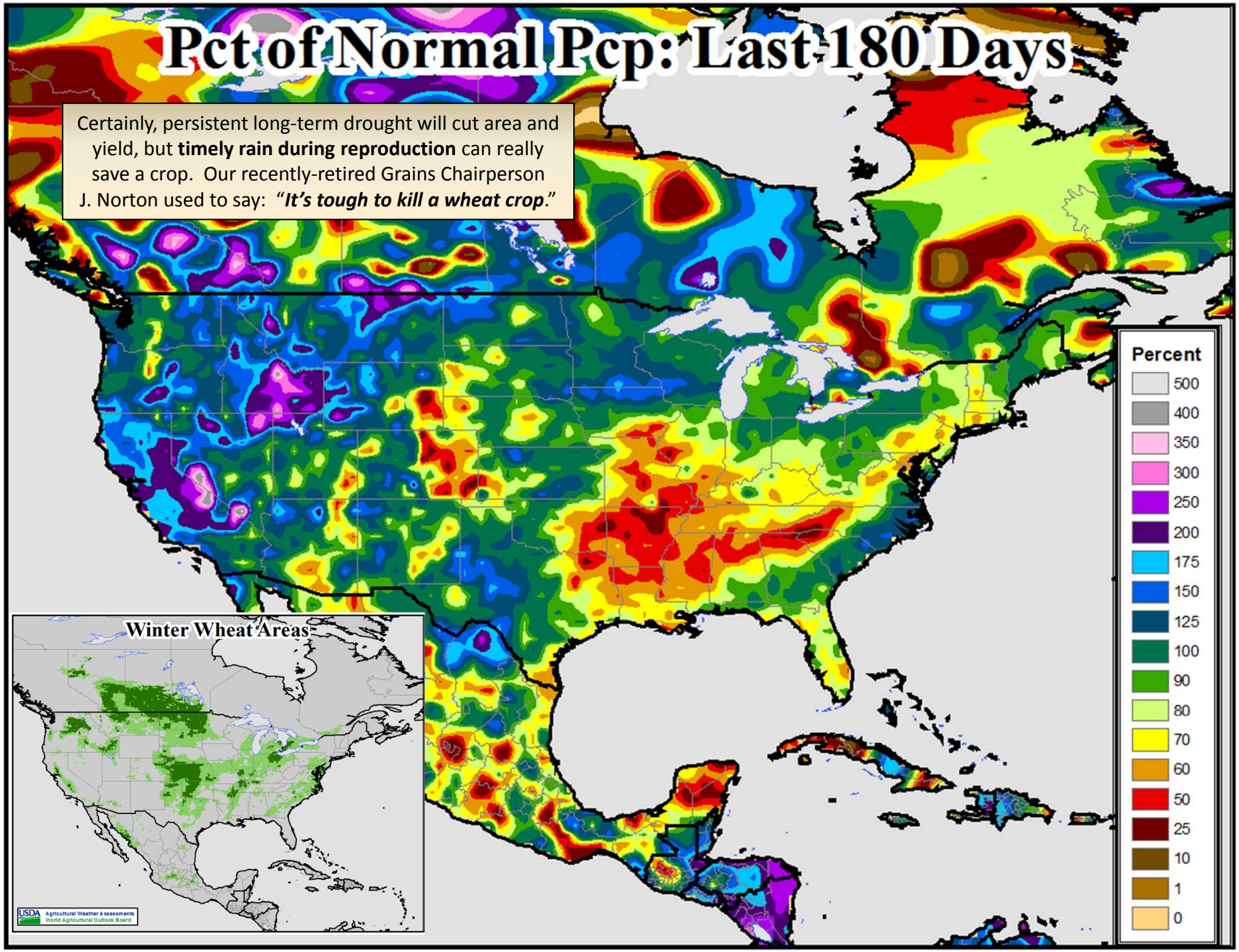


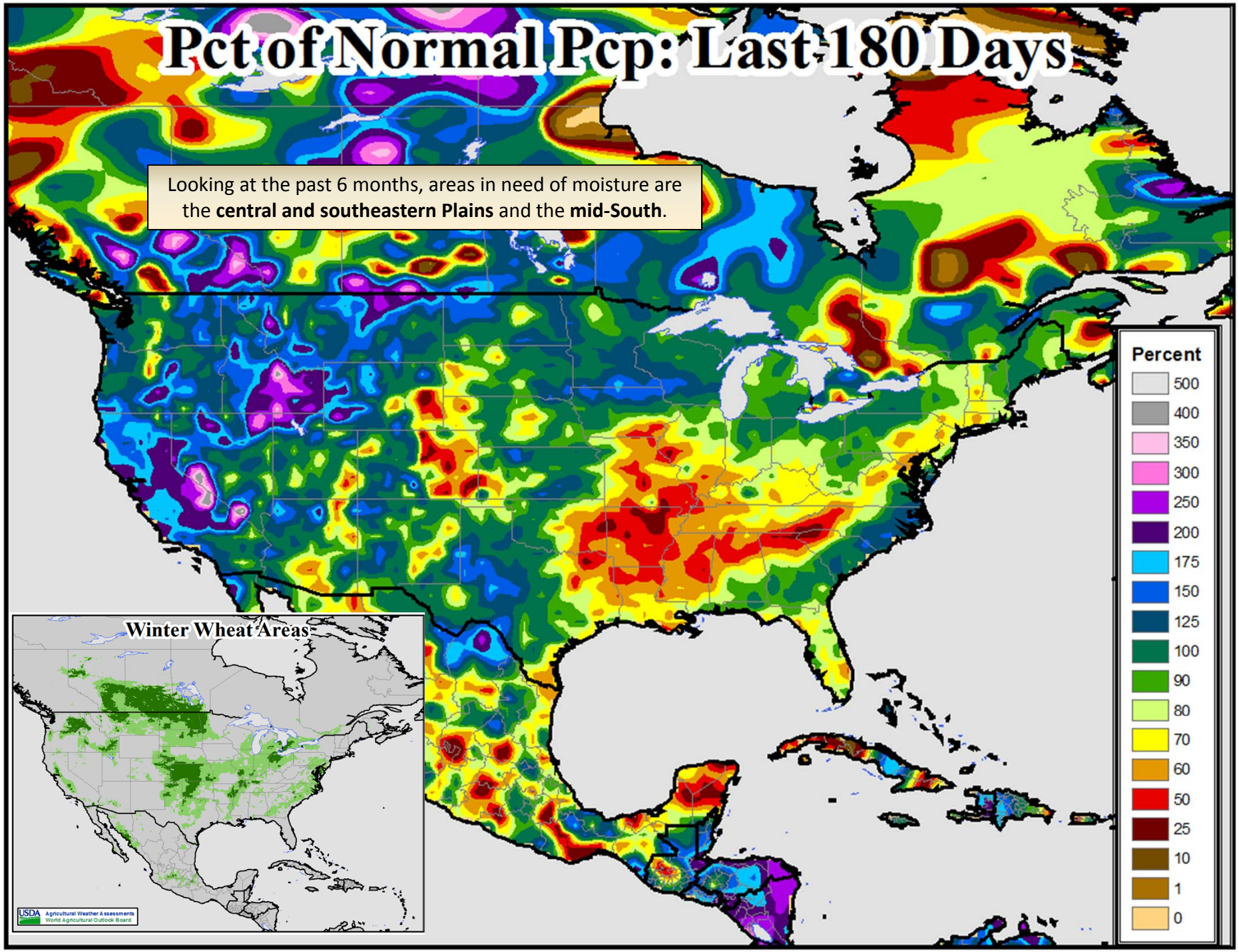
** Refers to crop year, so 2016 refers to the 2015-16 winter wheat growing season; depicted rainfall is autumn, the year prior.*

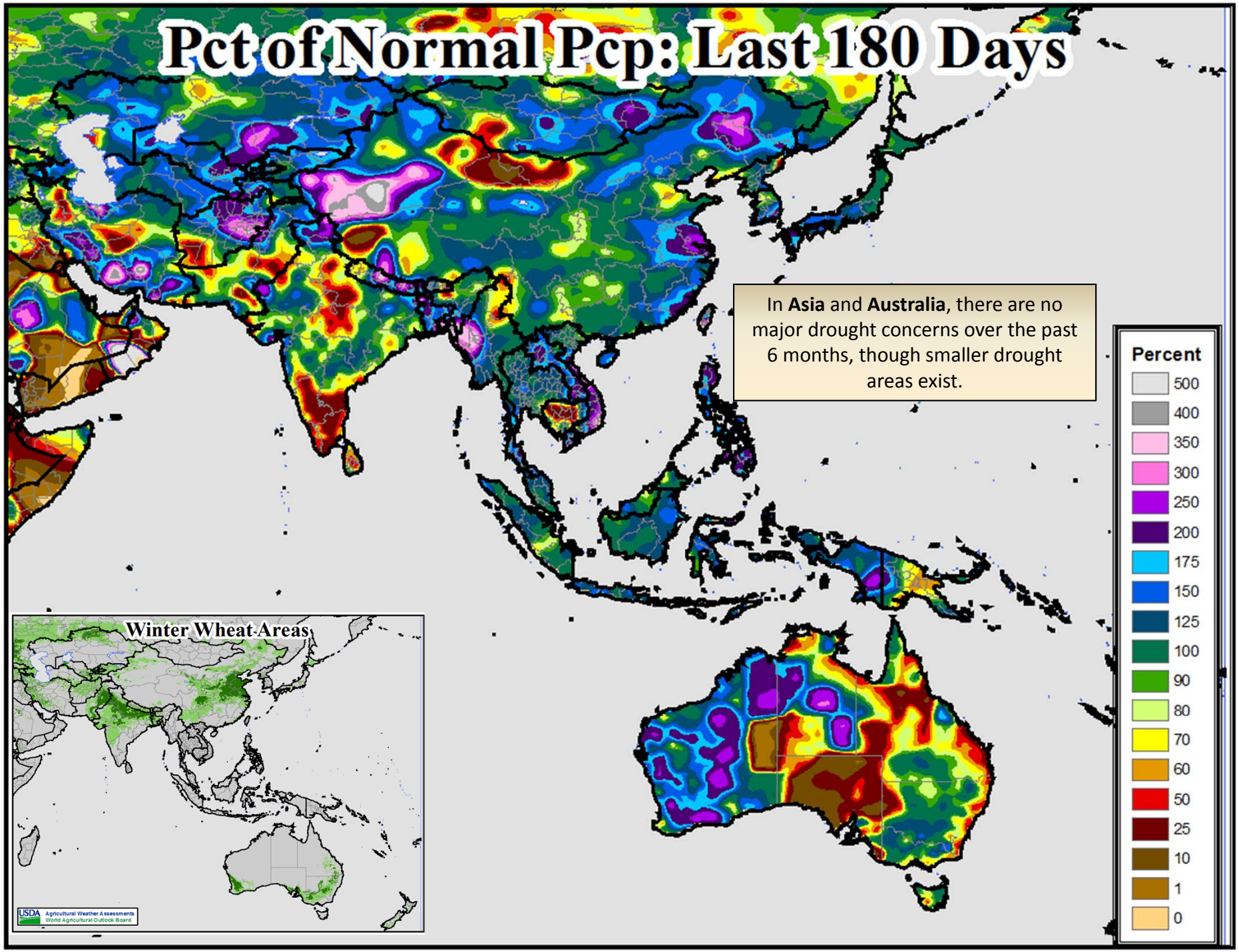


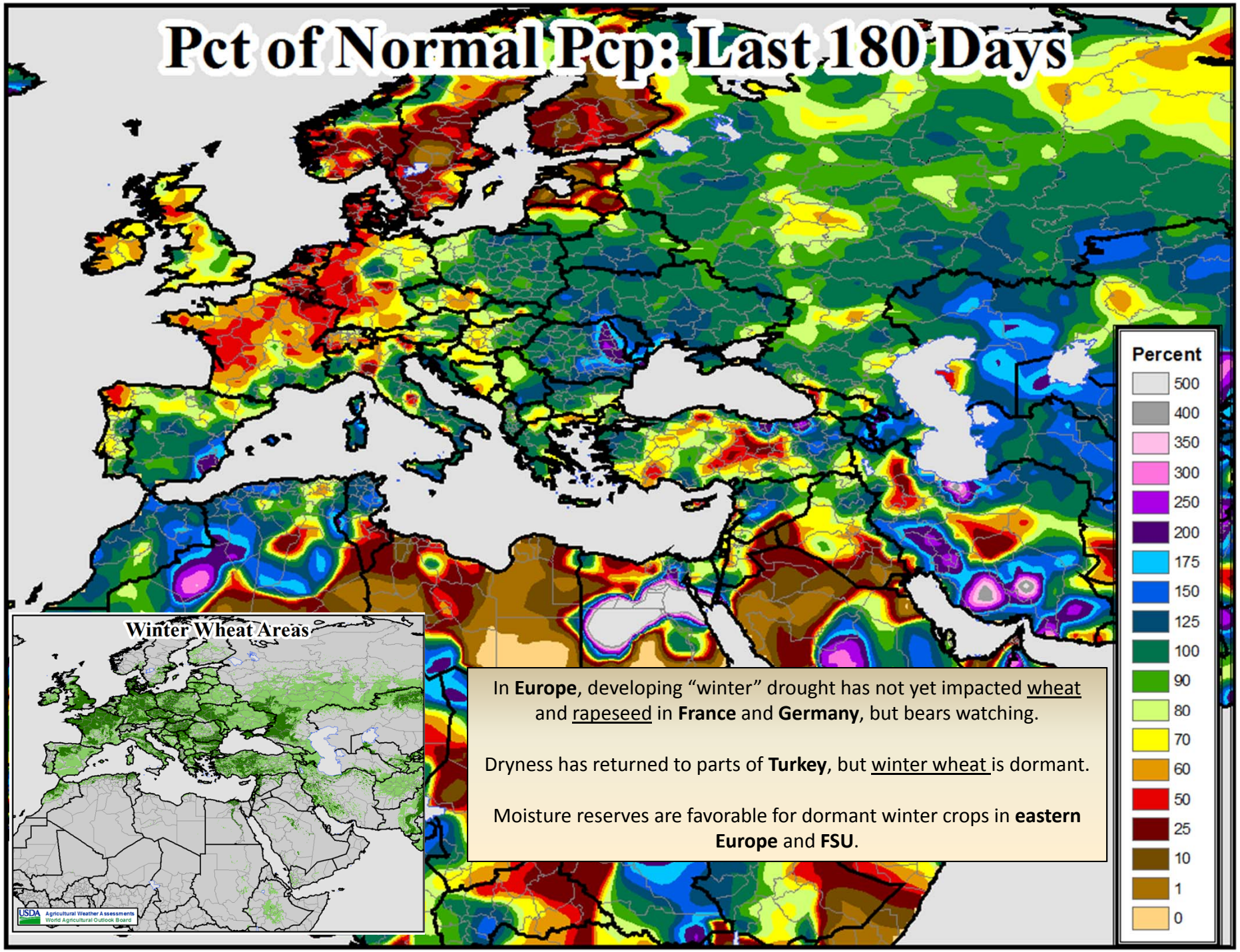
*

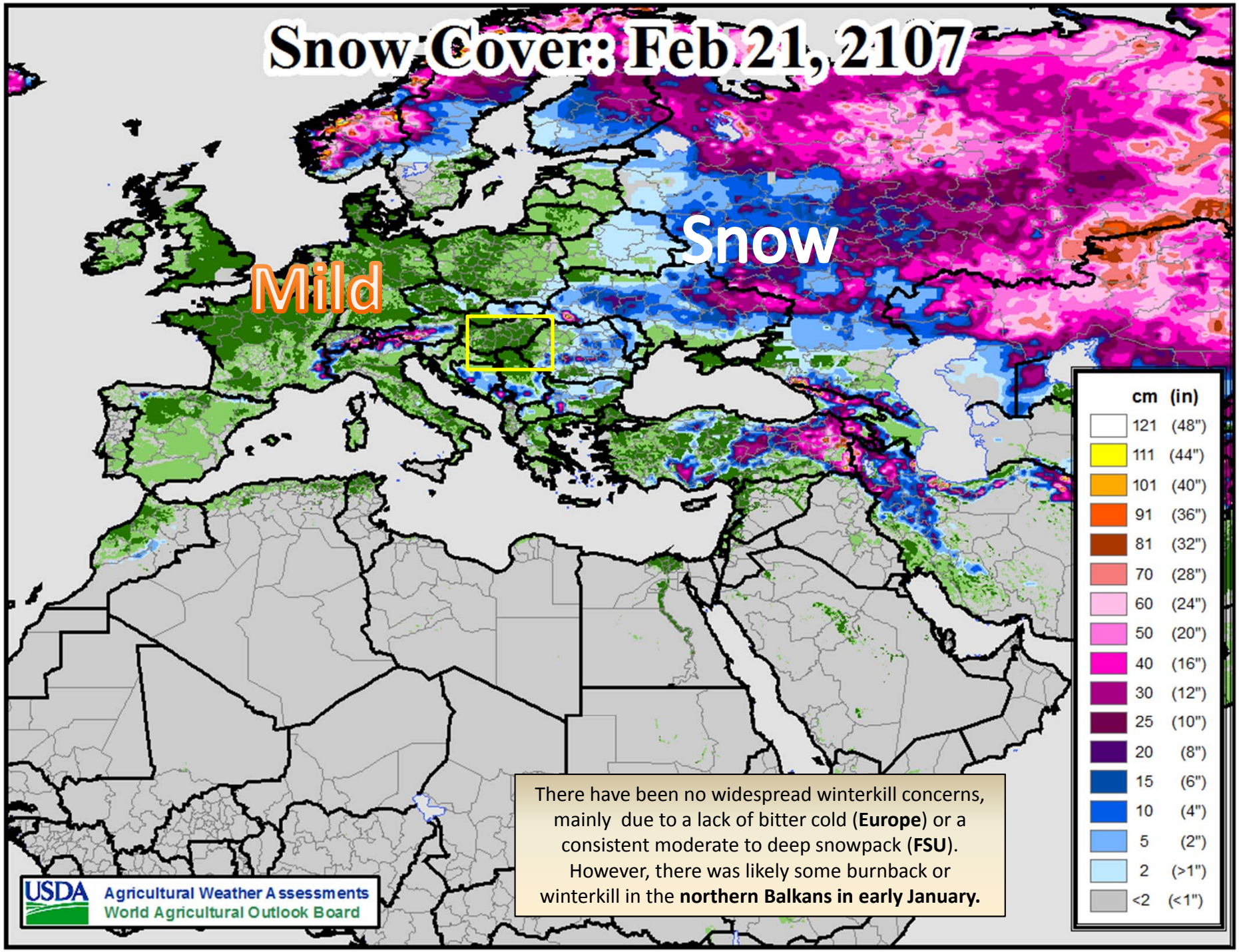
** Refers to crop year, so 2016 refers to the 2015-16 winter wheat growing season; depicted rainfall is autumn, the year prior.*

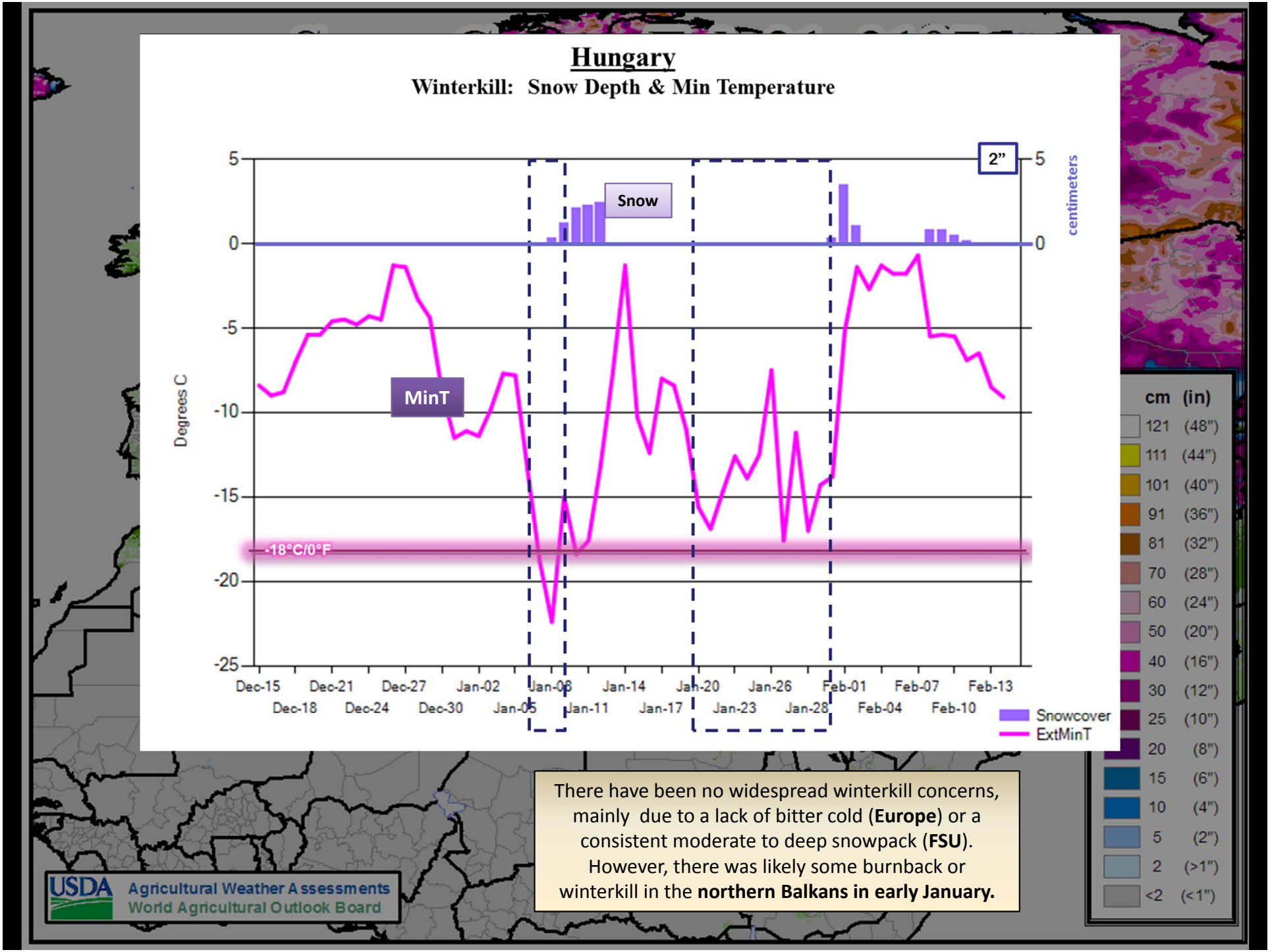

Pct of Normal Pcp: Last 180 Days
Certainly, persistent long-term drought will cut area and yield, but **timely rain during reproduction** can really save a crop. Our recently-retired Grains Chairperson J. Norton used to say: "***It's tough to kill a wheat crop***."
Percent
500
400
350
300
250
200
175
150
125
100
90
80
70
60
50
25
10
1
0
Winter Wheat Areas
USDA Agricultural Weather Assessments
World Agricultural Outlook Board

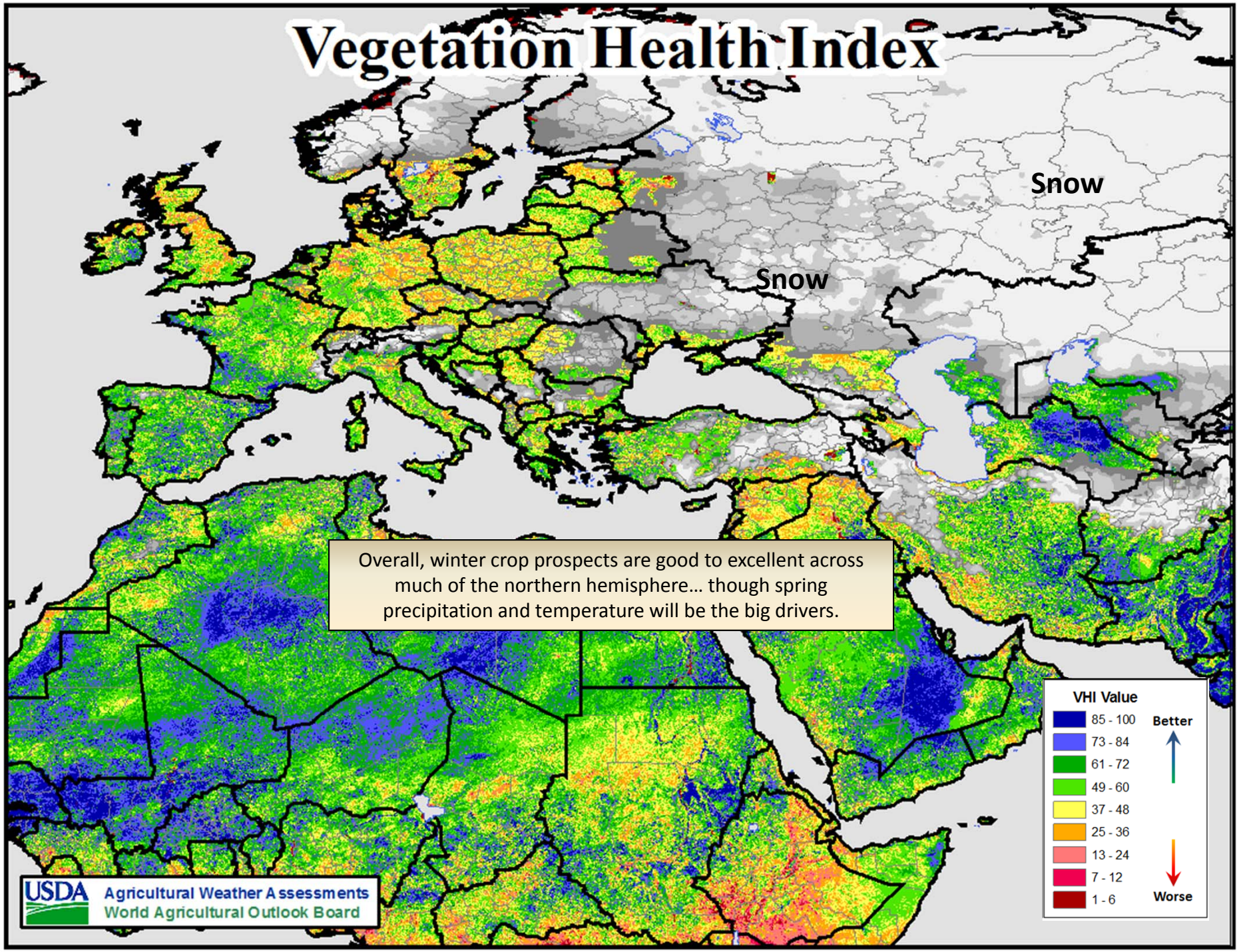

Pct of Normal Pcp: Last 180 Days
Looking at the past 6 months, areas in need of moisture are the central and southeastern Plains and the mid-South.
Percent
500
400
350
300
250
200
175
150
125
100
90
80
70
60
50
25
10
1
0
Winter Wheat Areas
USDA Agricultural Weather Assessments
World Agricultural Outlook Board

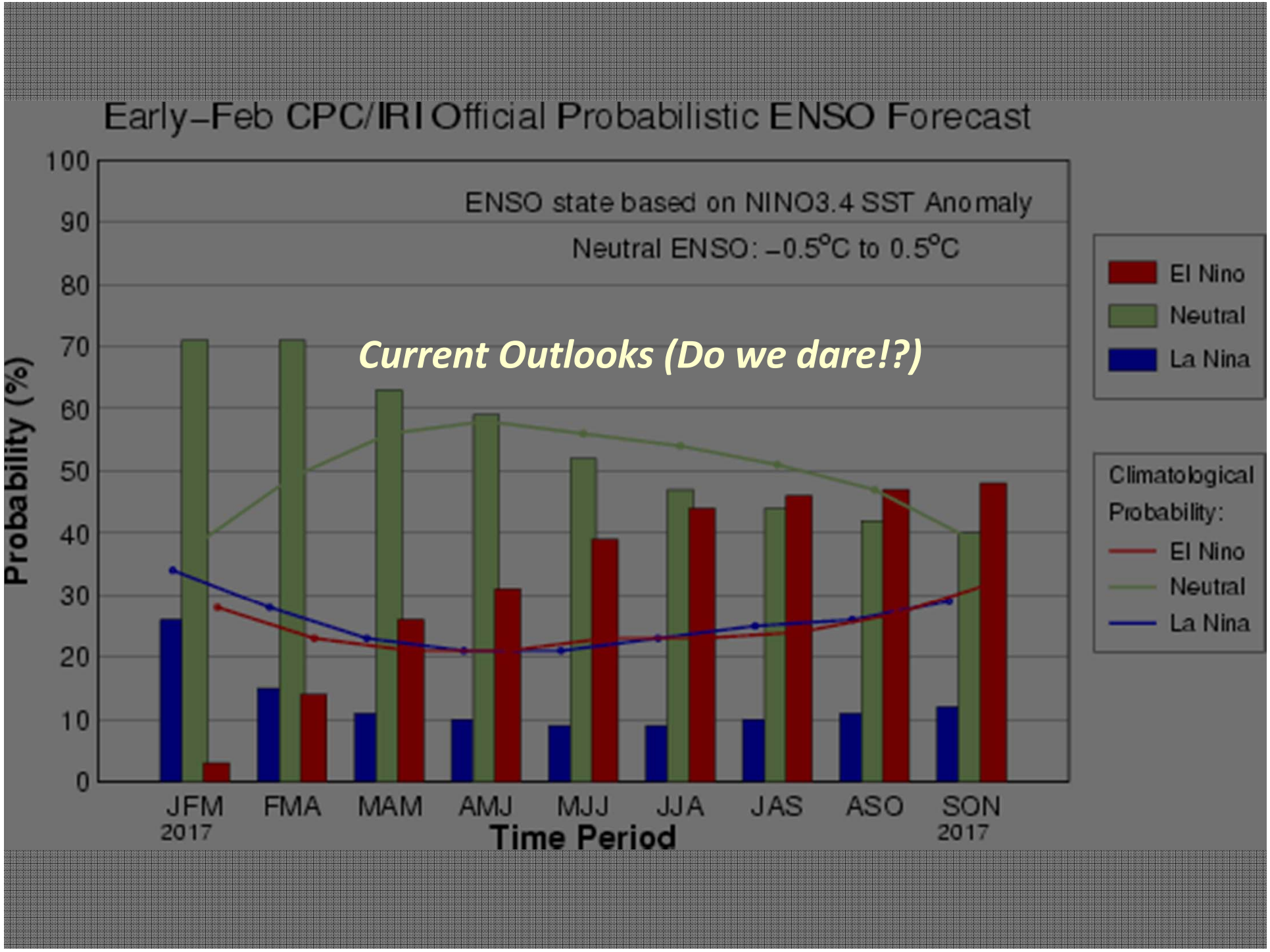

Pct of Normal Pcp: Last 180 Days
In Asia and Australia, there are no major drought concerns over the past 6 months, though smaller drought areas exist.
Percent
500
400
350
300
250
200
175
150
125
100
90
80
70
60
50
25
10
1
0
Winter Wheat Areas
USDA Agricultural Weather Assessments
World Agricultural Outlook Board

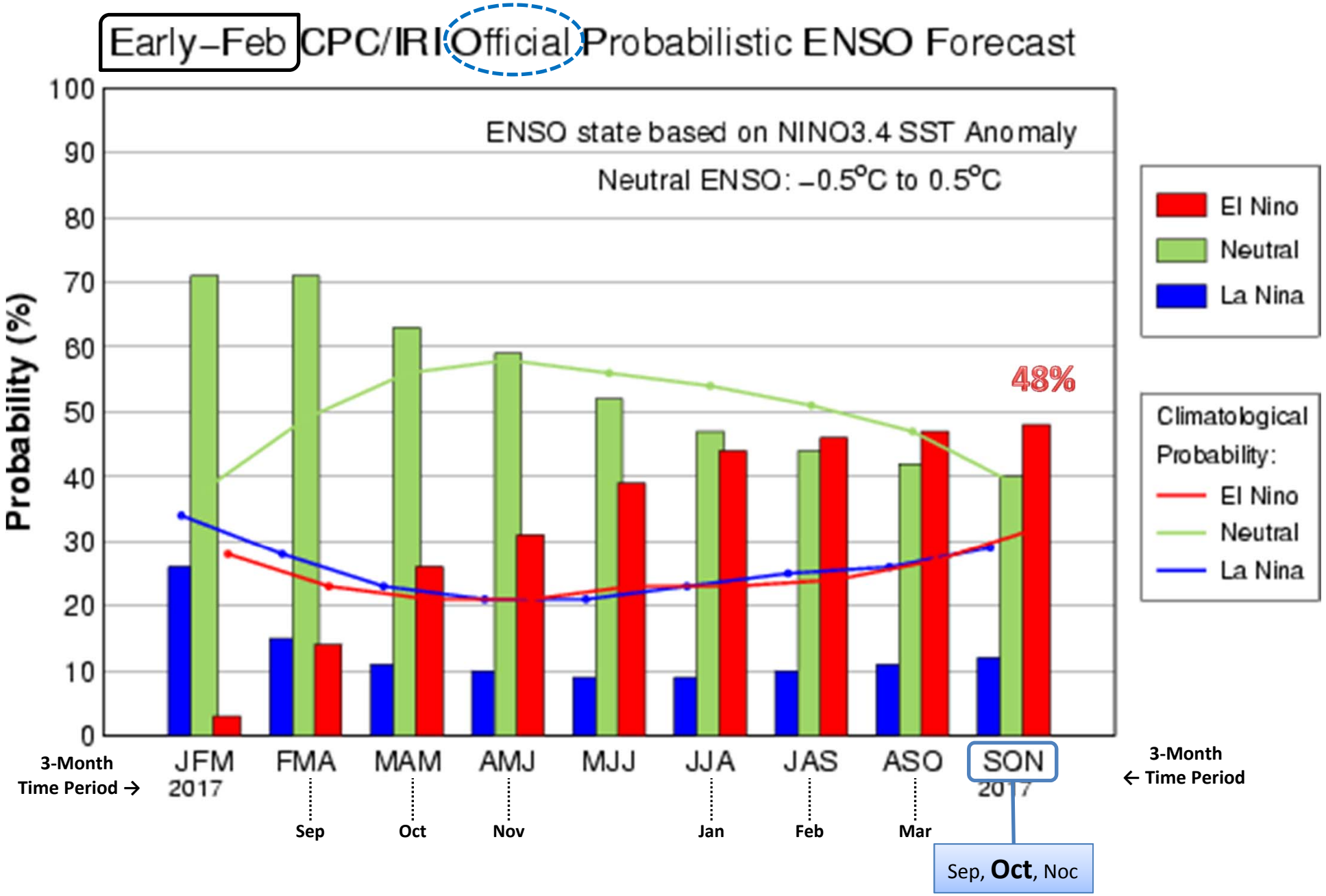

Pct of Normal Pcp: Last 180 Days
Percent
500
400
350
300
250
200
175
150
125
100
90
80
70
60
50
25
10
1
0
Winter Wheat Areas
USDA Agricultural Weather Assessments
World Agricultural Outlook Board
In **Europe**, developing “winter” drought has not yet impacted wheat and rapeseed in **France** and **Germany**, but bears watching.
Dryness has returned to parts of **Turkey**, but winter wheat is dormant.
Moisture reserves are favorable for dormant winter crops in **eastern Europe** and **FSU**.

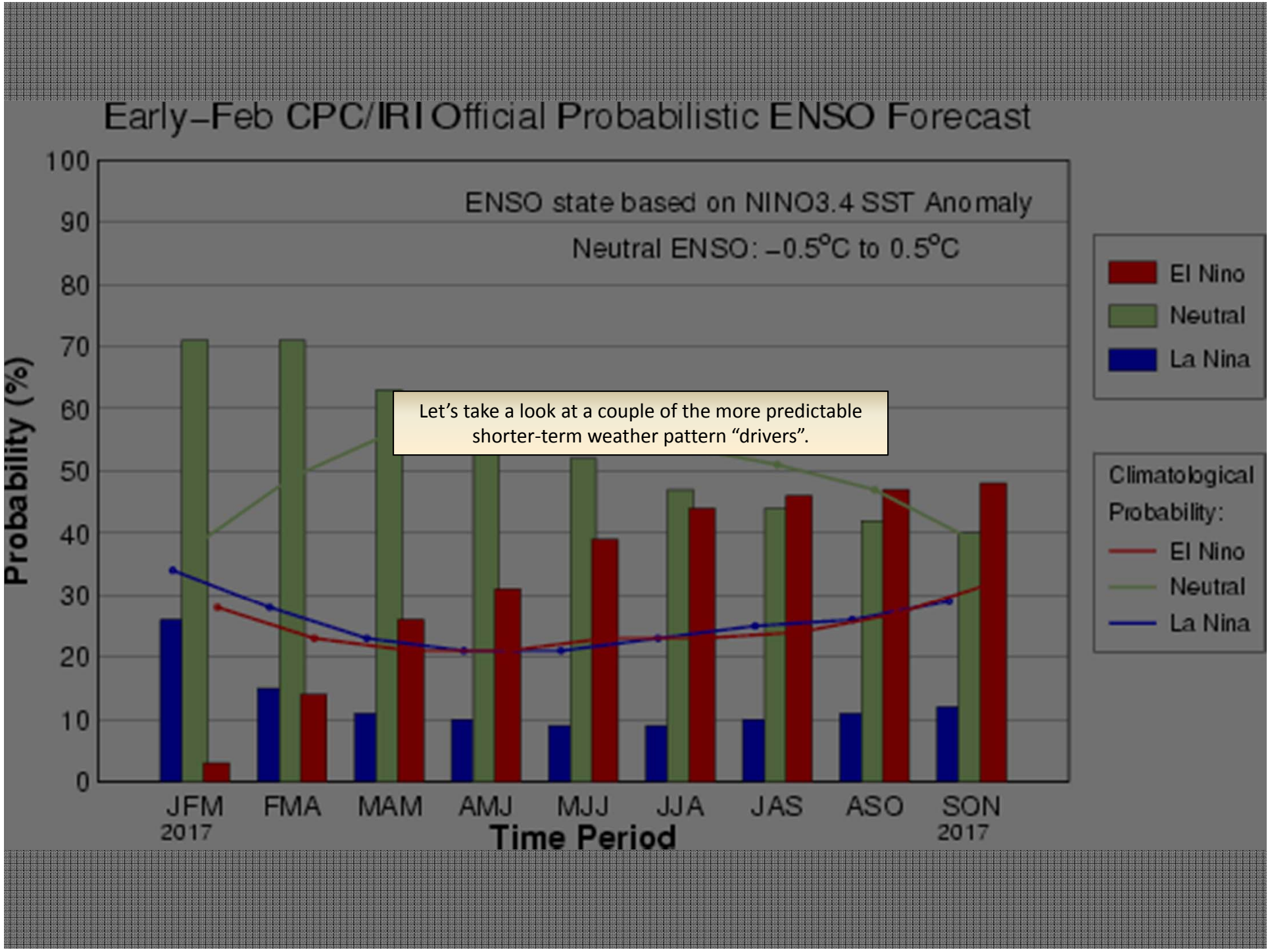

Snow Cover: Feb 21, 2107
Mild
Snow
cm (in)
121 (48")
111 (44")
101 (40")
91 (36")
81 (32")
70 (28")
60 (24")
50 (20")
40 (16")
30 (12")
25 (10")
20 (8")
15 (6")
10 (4")
5 (2")
2 (>1")
<2 (<1")
There have been no widespread winterkill concerns, mainly due to a lack of bitter cold (**Europe**) or a consistent moderate to deep snowpack (**FSU**). However, there was likely some burnback or winterkill in the **northern Balkans in early January.**
USDA Agricultural Weather Assessments
World Agricultural Outlook Board


Hungary
Winterkill: Snow Depth & Min Temperature
2"
Snow
MinT
-18°C/0°F
Degrees C
centimeters
5
0
-5
-10
-15
-20
-25
Dec-15
Dec-18
Dec-21
Dec-24
Dec-27
Dec-30
Jan-02
Jan-05
Jan-08
Jan-11
Jan-14
Jan-17
Jan-20
Jan-23
Jan-26
Jan-28
Feb-01
Feb-04
Feb-07
Feb-10
Feb-13
Snowcover
ExtMinT
cm (in)
121 (48")
111 (44")
101 (40")
91 (36")
81 (32")
70 (28")
60 (24")
50 (20")
40 (16")
30 (12")
25 (10")
20 (8")
15 (6")
10 (4")
5 (2")
2 (>1")
<2 (<1")
USDA
Agricultural Weather Assessments
World Agricultural Outlook Board
There have been no widespread winterkill concerns, mainly due to a lack of bitter cold (**Europe**) or a consistent moderate to deep snowpack (**FSU**). However, there was likely some burnback or winterkill in the **northern Balkans in early January.**

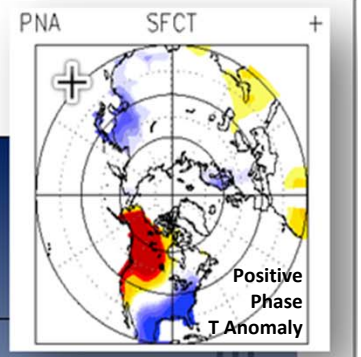

Vegetation Health Index
Snow
Snow
Overall, winter crop prospects are good to excellent across much of the northern hemisphere… though spring precipitation and temperature will be the big drivers.
VHI Value
85 - 100
73 - 84
61 - 72
49 - 60
37 - 48
25 - 36
13 - 24
7 - 12
1 - 6
Better
Worse
USDA
Agricultural Weather Assessments
World Agricultural Outlook Board


Early–Feb CPC/IRI Official Probabilistic ENSO Forecast
ENSO state based on NINO3.4 SST Anomaly
Neutral ENSO: –0.5°C to 0.5°C
Current Outlooks (Do we dare!?)
Probability (%)
100
90
80
70
60
50
40
30
20
10
0
JFM
2017
FMA
MAM
AMJ
MJJ
JJA
JAS
ASO
SON
2017
Time Period
El Nino
Neutral
La Nina
Climatological Probability:
El Nino
Neutral
La Nina


Early–Feb CPC/IRI Official Probabilistic ENSO Forecast
ENSO state based on NINO3.4 SST Anomaly
Neutral ENSO: –0.5°C to 0.5°C
Probability (%)
100
90
80
70
60
50
40
30
20
10
0
48%
El Nino
Neutral
La Nina
Climatological Probability:
El Nino
Neutral
La Nina
3-Month Time Period →
JFM 2017
FMA
MAM
AMJ
MJJ
JJA
JAS
ASO
SON
Sep
Oct
Nov
Jan
Feb
Mar
← 3-Month Time Period
Sep, Oct, Noc


Early–Feb CPC/IRI Official Probabilistic ENSO Forecast
ENSO state based on NINO3.4 SST Anomaly
Neutral ENSO: –0.5°C to 0.5°C
Probability (%)
100
90
80
70
60
50
40
30
20
10
0
JFM
2017
FMA
MAM
AMJ
MJJ
JJA
JAS
ASO
SON
2017
Time Period
El Nino
Neutral
La Nina
Climatological Probability:
El Nino
Neutral
La Nina
Let's take a look at a couple of the more predictable shorter-term weather pattern "drivers".

Pacifc-North American Pattern (PNA)



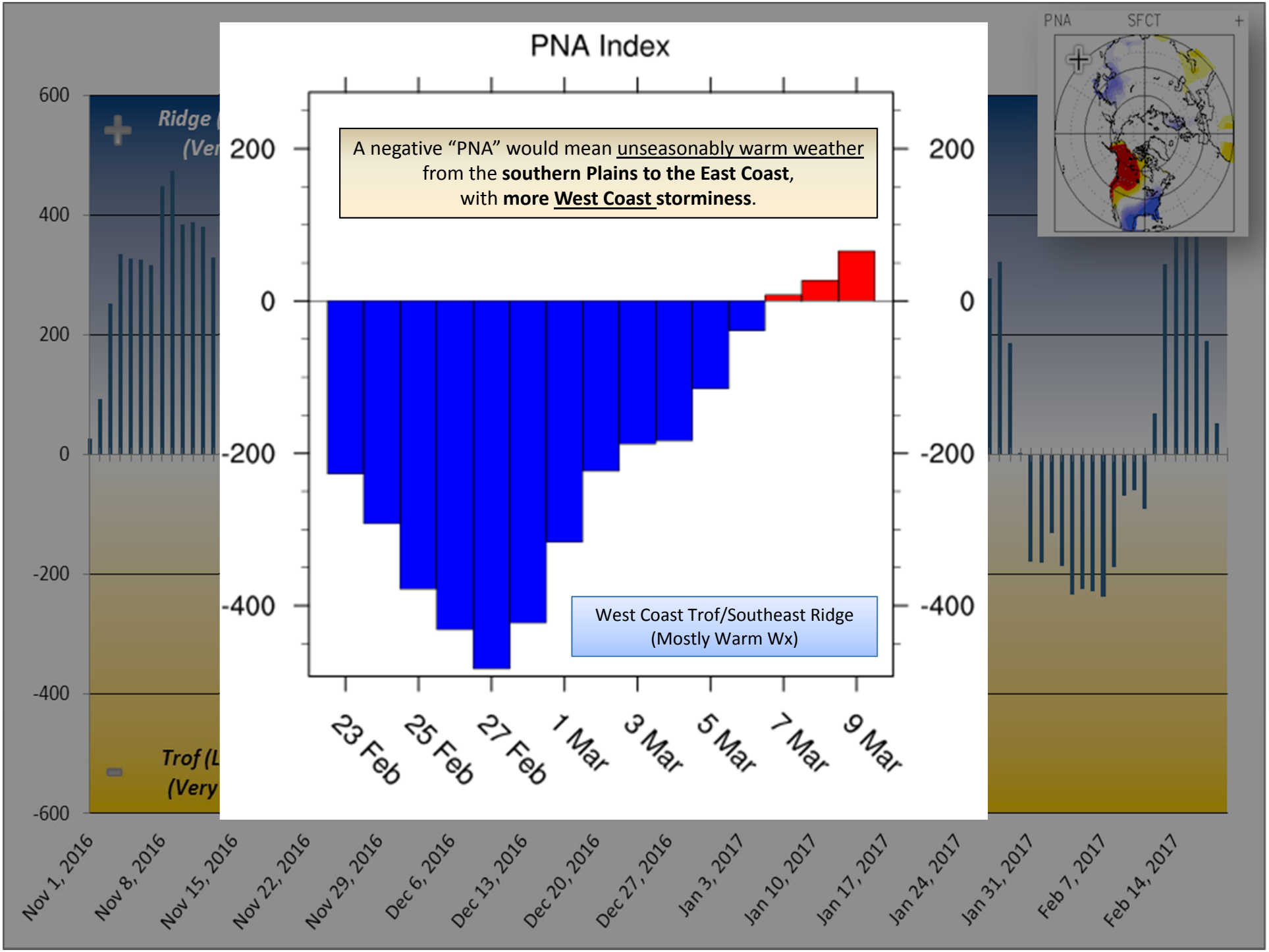
Ridge (High Pressure) over w N. America
(Very Cold: Srn Plains to East Coast)

The PNA is a good surrogate for capturing the atmospheric drivers impacting eastern Asia as well as much of North America.

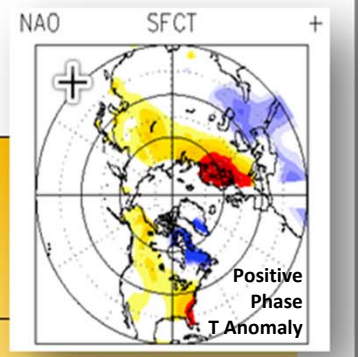
Trof (Low Pressure) over w N. America
(Very Warm: Srn Plains to East Coast)

600
400
200
0
-200
-400
-600

Nov 1, 2016
Nov 8, 2016
Nov 15, 2016
Nov 22, 2016
Nov 29, 2016
Dec 6, 2016
Dec 13, 2016
Dec 20, 2016
Dec 27, 2016
Jan 3, 2017
Jan 10, 2017
Jan 17, 2017
Jan 24, 2017
Jan 31, 2017
Feb 7, 2017
Feb 14, 2017


PNA Index
A negative "PNA" would mean unseasonably warm weather from the southern Plains to the East Coast, with more West Coast storminess.
West Coast Trof/Southeast Ridge (Mostly Warm Wx)
200
0
-200
-400
23 Feb
25 Feb
27 Feb
1 Mar
3 Mar
5 Mar
7 Mar
9 Mar
PNA
SFCT
600
400
200
0
-200
-400
-600
Nov 1, 2016
Nov 8, 2016
Nov 15, 2016
Nov 22, 2016
Nov 29, 2016
Dec 6, 2016
Dec 13, 2016
Dec 20, 2016
Dec 27, 2016
Jan 3, 2017
Jan 10, 2017
Jan 17, 2017
Jan 24, 2017
Jan 31, 2017
Feb 7, 2017
Feb 14, 2017

North Atlantic Oscillation (NAO)



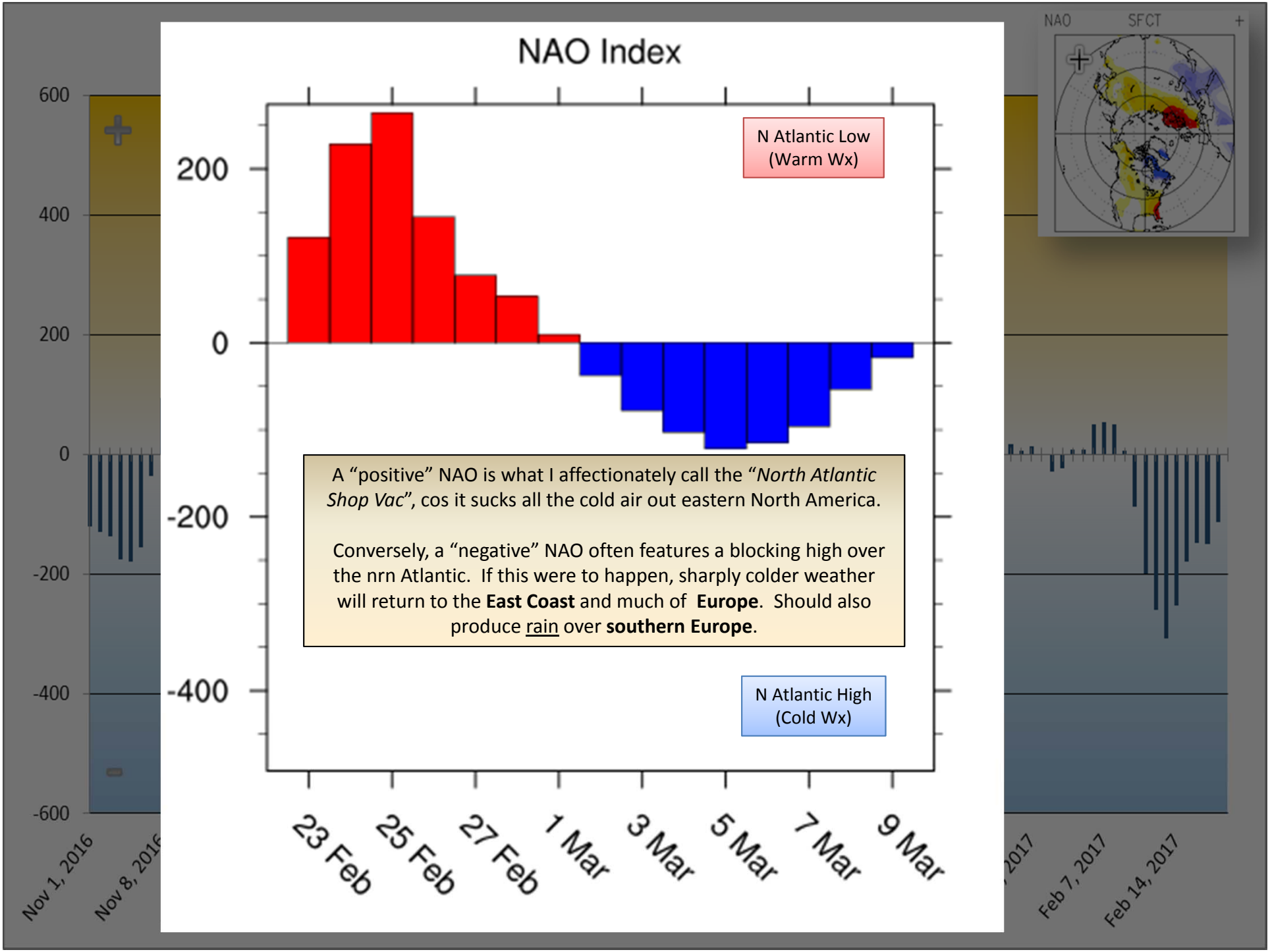
Strong Low over N. Atlantic
(Warm in the East, except New Eng)

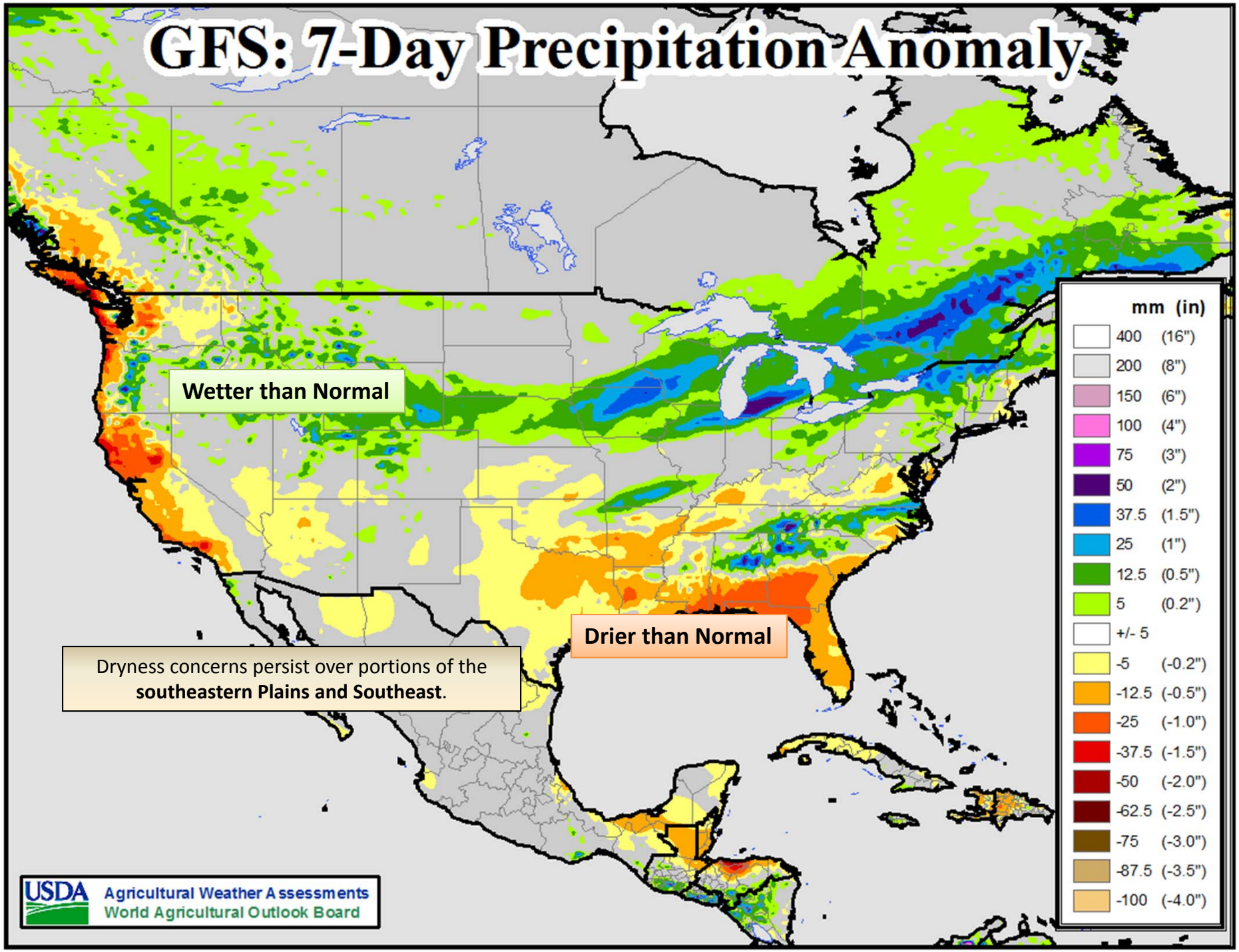
The NAO is a good surrogate for capturing the atmospheric drivers impacting the East Coast as well as much of Europe and the Mediterranean.

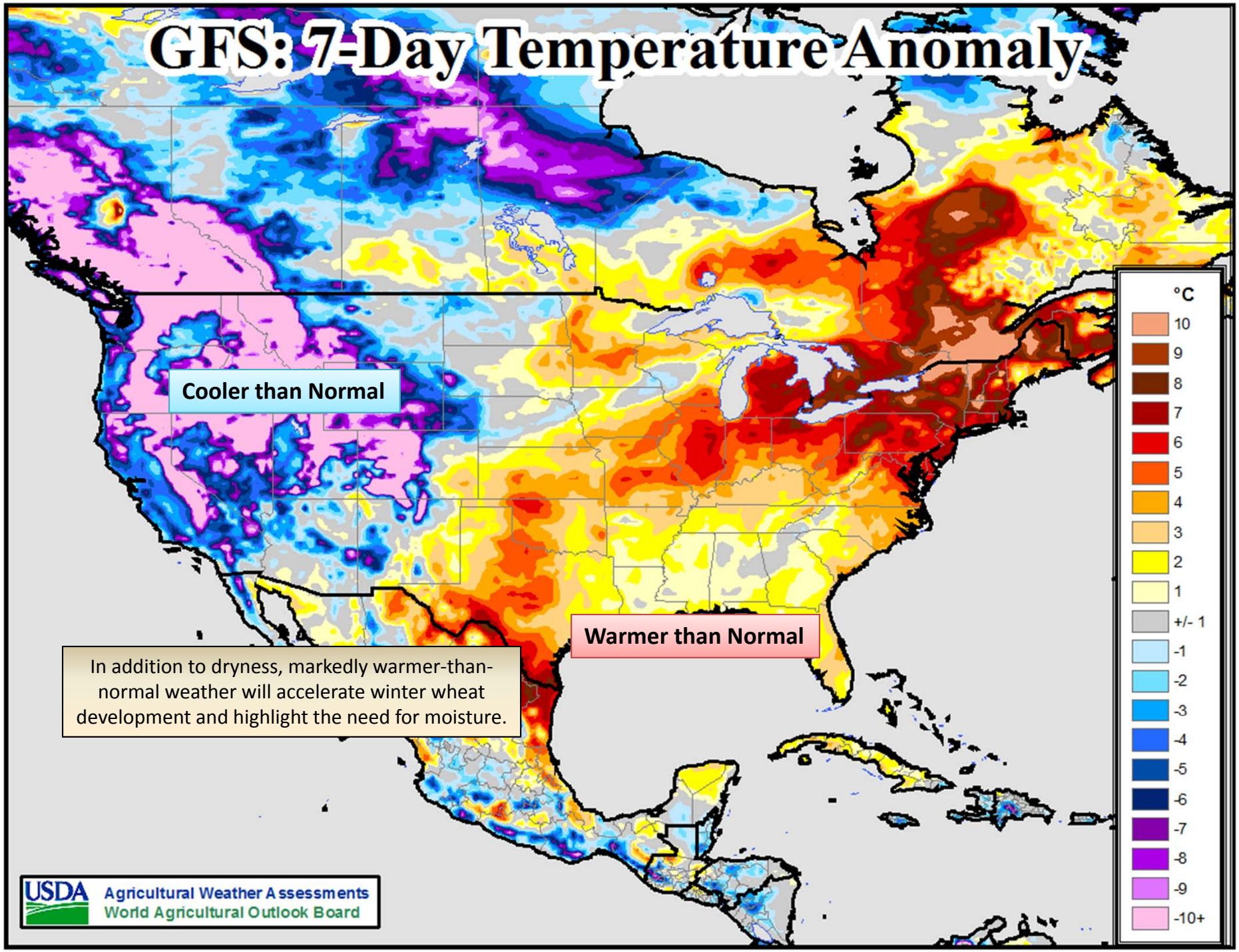
Blocking High over N. Atlantic
(Cold in the East, except New Eng)

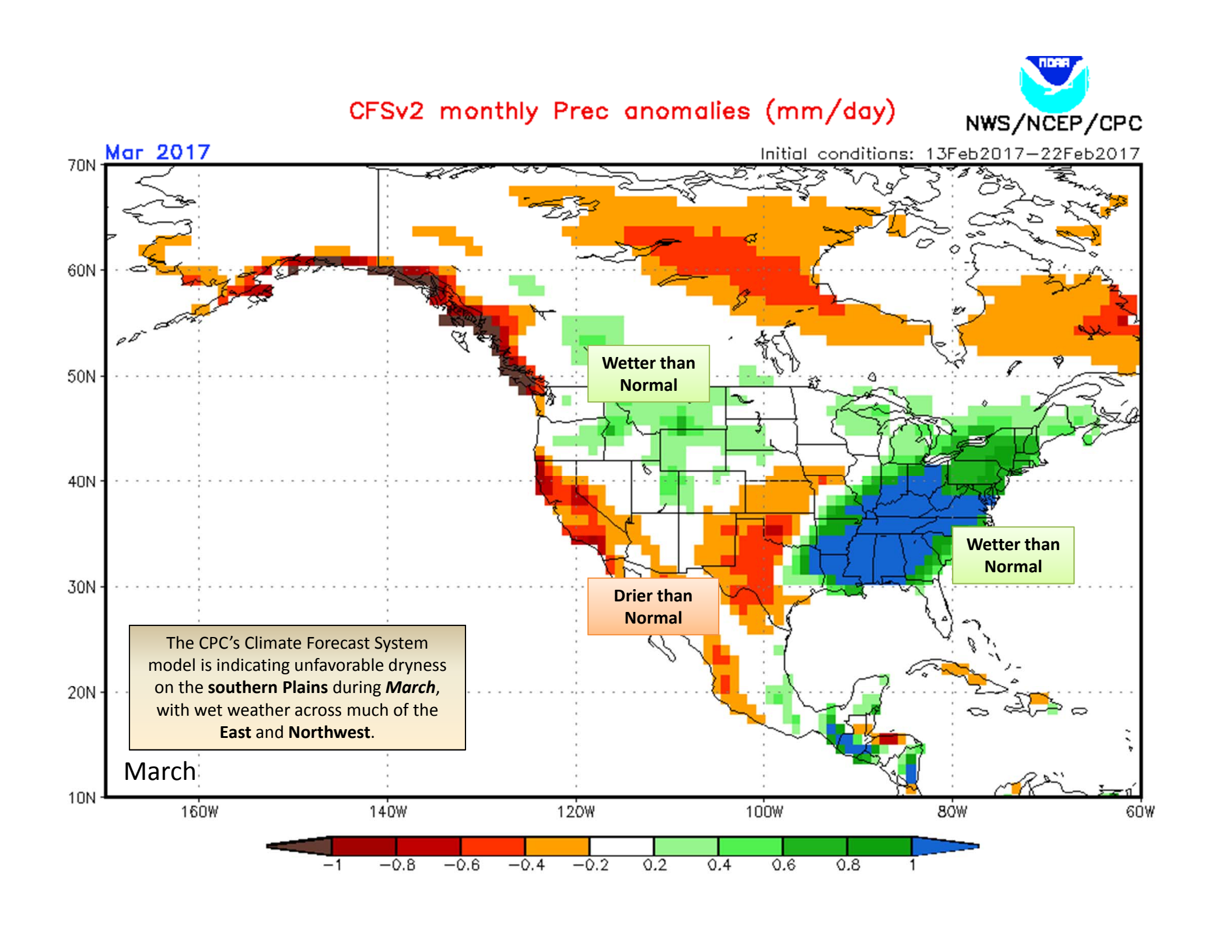
600
400
200
0
-200
-400
-600

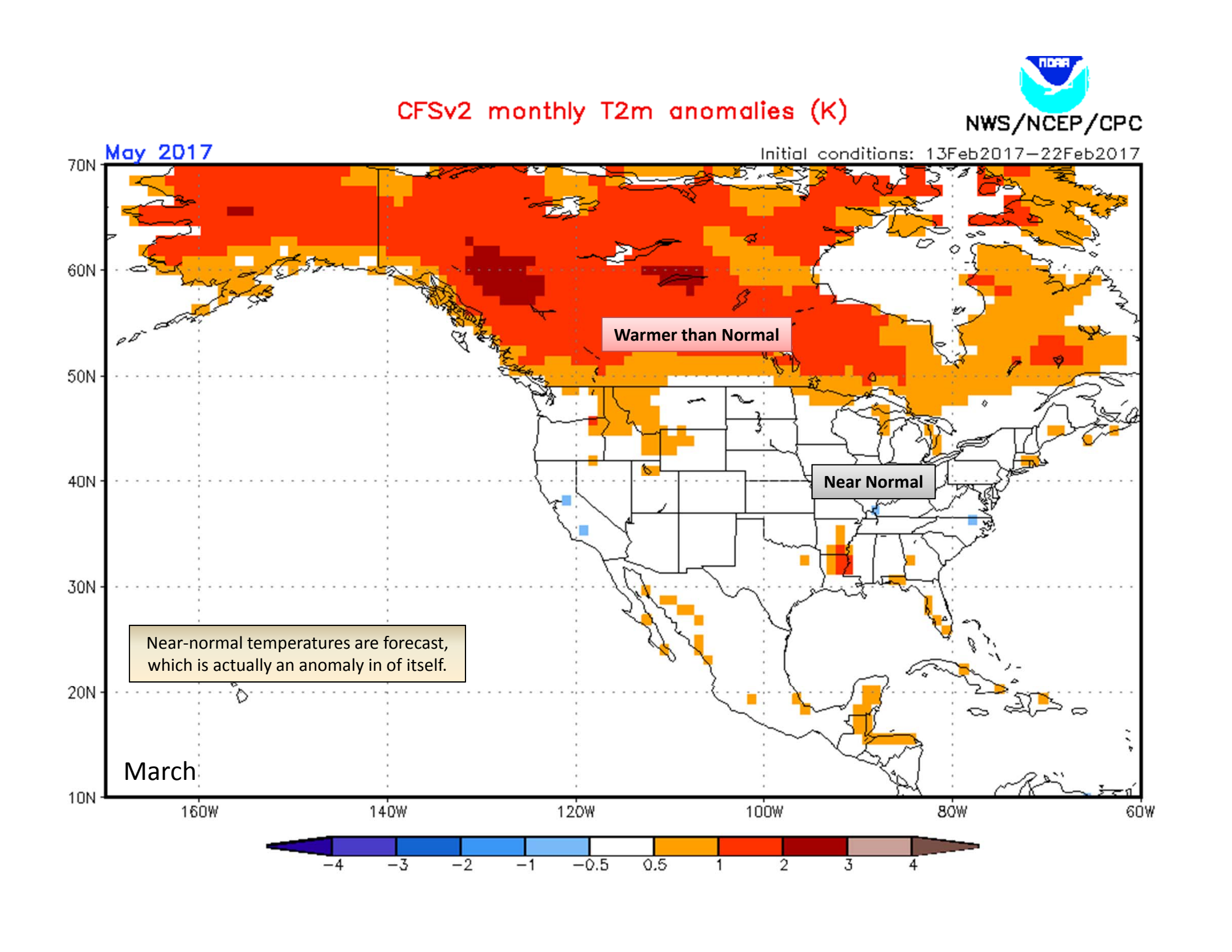
Nov 1, 2016
Nov 8, 2016
Nov 15, 2016
Nov 22, 2016
Nov 29, 2016
Dec 6, 2016
Dec 13, 2016
Dec 20, 2016
Dec 27, 2016
Jan 3, 2017
Jan 10, 2017
Jan 17, 2017
Jan 24, 2017
Jan 31, 2017
Feb 7, 2017
Feb 14, 2017

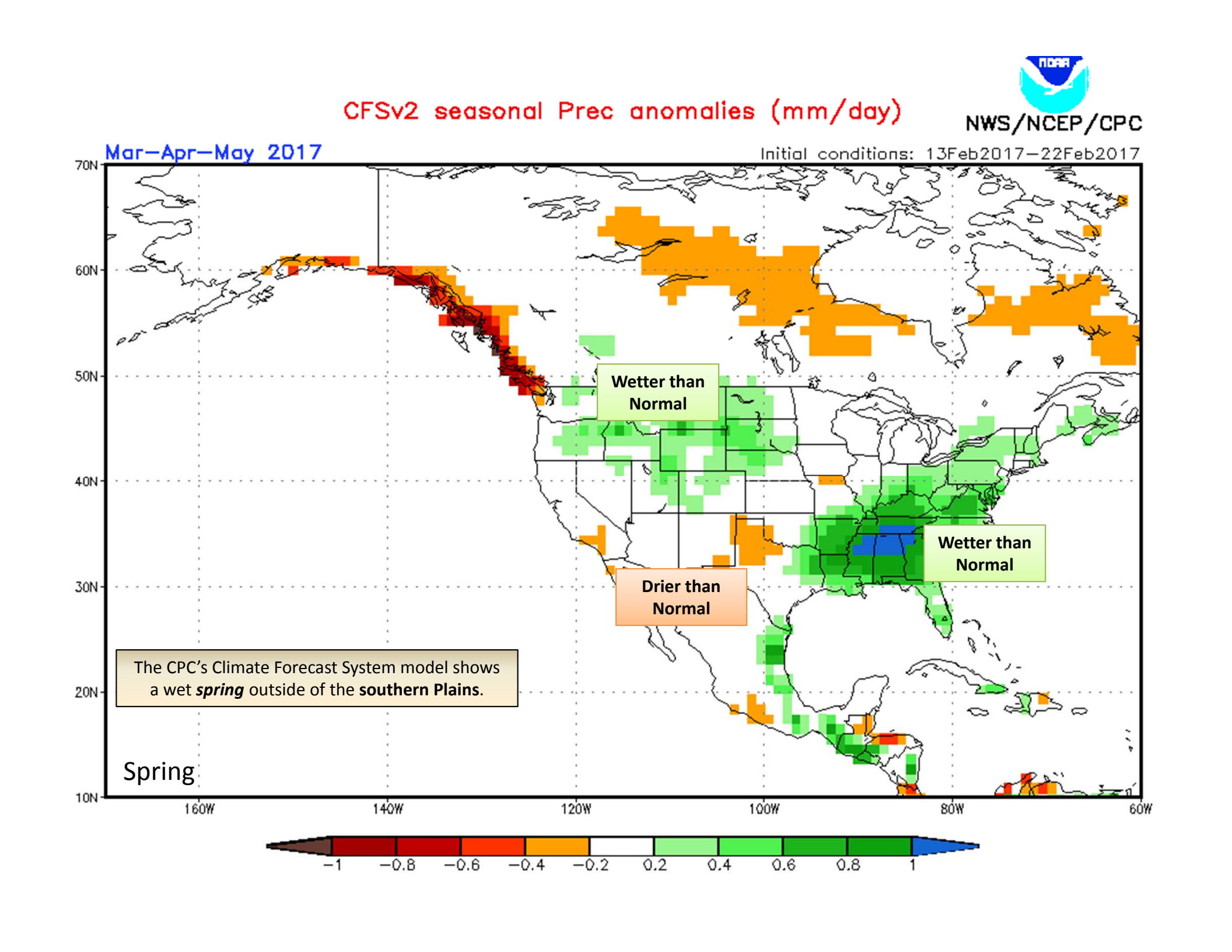

NAO Index
N Atlantic Low
(Warm Wx)
A “positive” NAO is what I affectionately call the “*North Atlantic Shop Vac*”, cos it sucks all the cold air out eastern North America.
Conversely, a “negative” NAO often features a blocking high over the nrn Atlantic. If this were to happen, sharply colder weather will return to the **East Coast** and much of **Europe**. Should also produce rain over **southern Europe**.
N Atlantic High
(Cold Wx)
200
0
-200
-400
23 Feb
25 Feb
27 Feb
1 Mar
3 Mar
5 Mar
7 Mar
9 Mar
NAO
SFCT
600
400
200
0
-200
-400
-600
Nov 1, 2016
Nov 8, 2016
Feb 7, 2017
Feb 14, 2017

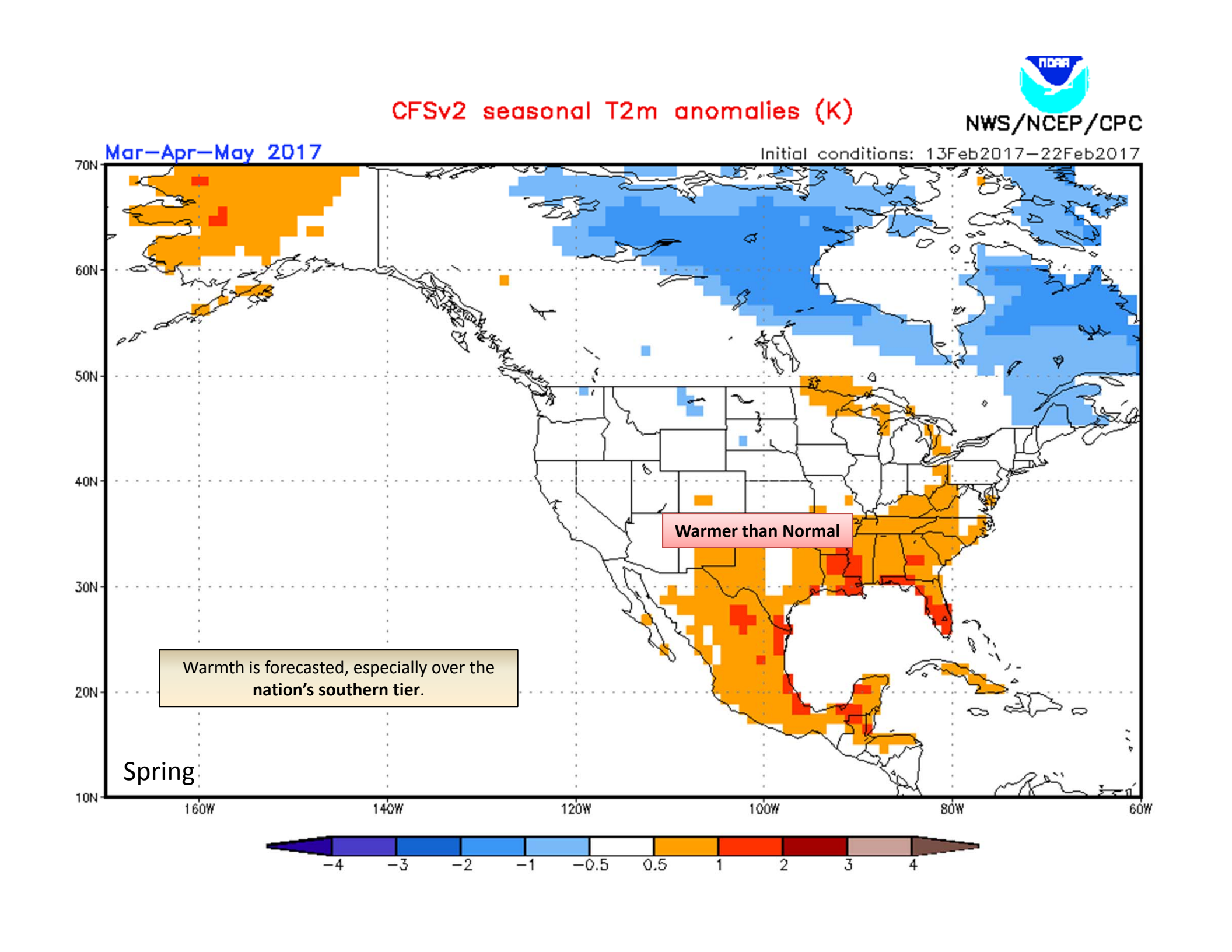

GFS: 7-Day Precipitation Anomaly
Wetter than Normal
Drier than Normal
Dryness concerns persist over portions of the southeastern Plains and Southeast.
USDA Agricultural Weather Assessments
World Agricultural Outlook Board
mm (in)
400 (16")
200 (8")
150 (6")
100 (4")
75 (3")
50 (2")
37.5 (1.5")
25 (1")
12.5 (0.5")
5 (0.2")
+/- 5
-5 (-0.2")
-12.5 (-0.5")
-25 (-1.0")
-37.5 (-1.5")
-50 (-2.0")
-62.5 (-2.5")
-75 (-3.0")
-87.5 (-3.5")
-100 (-4.0")


GFS: 7-Day Temperature Anomaly
Cooler than Normal
Warmer than Normal
In addition to dryness, markedly warmer-than-normal weather will accelerate winter wheat development and highlight the need for moisture.
USDA Agricultural Weather Assessments
World Agricultural Outlook Board
°C
10
9
8
7
6
5
4
3
2
1
+/- 1
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10+

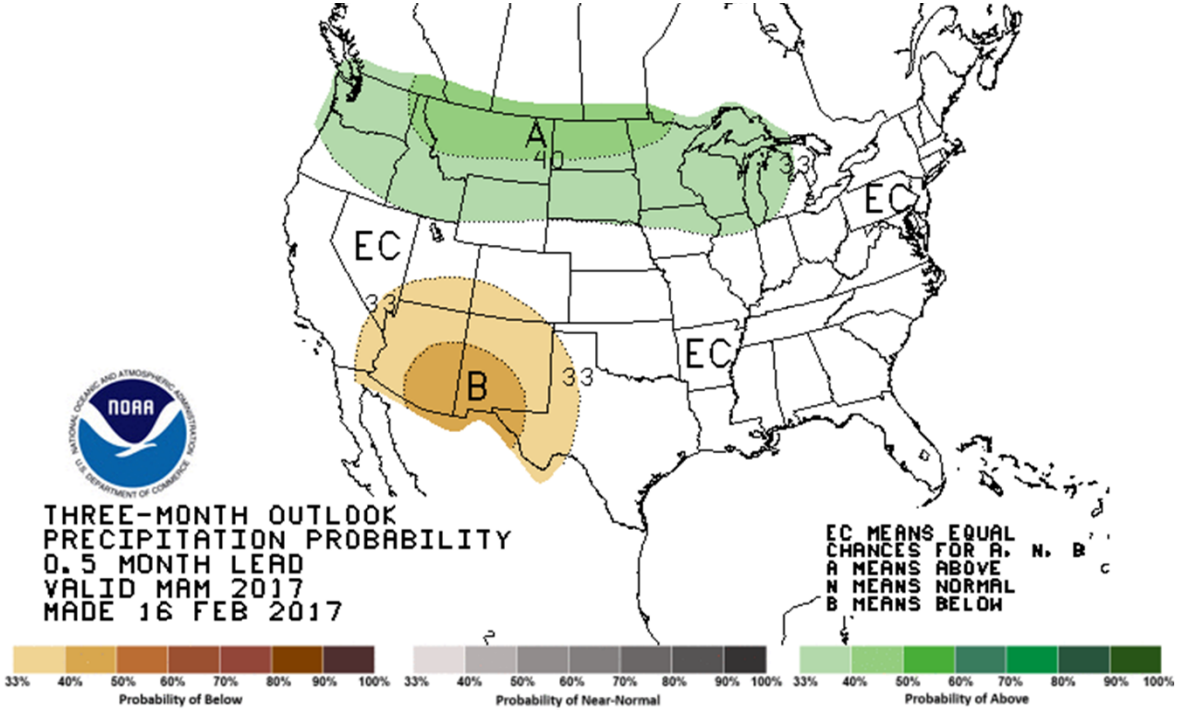

CFSv2 monthly Prec anomalies (mm/day)
NWS/NCEP/CPC
Mar 2017
Initial conditions: 13Feb2017–22Feb2017
70N
60N
50N
40N
30N
20N
10N
160W
140W
120W
100W
80W
60W
Wetter than Normal
Wetter than Normal
Drier than Normal
The CPC's Climate Forecast System model is indicating unfavorable dryness on the **southern Plains** during ***March***, with wet weather across much of the **East** and **Northwest**.
March
−1
−0.8
−0.6
−0.4
−0.2
0.2
0.4
0.6
0.8
1

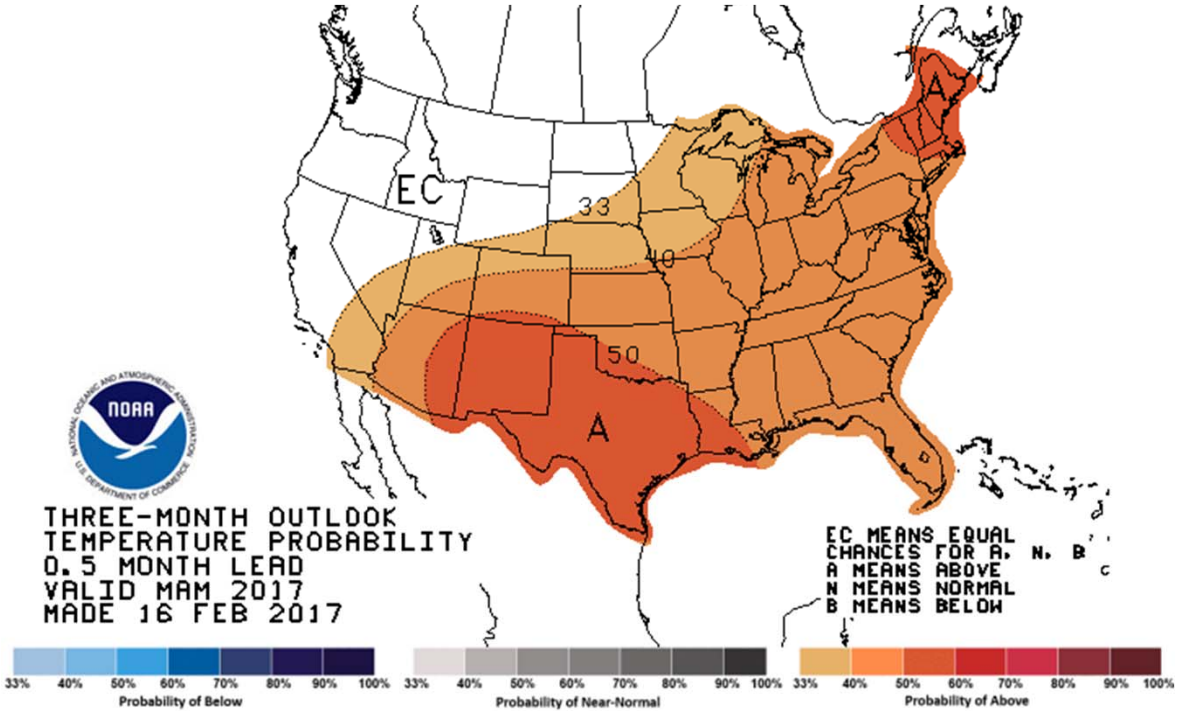

CFSv2 monthly T2m anomalies (K)
NWS/NCEP/CPC
May 2017
Initial conditions: 13Feb2017–22Feb2017
70N
60N
50N
40N
30N
20N
10N
160W
140W
120W
100W
80W
60W
Warmer than Normal
Near Normal
Near-normal temperatures are forecast, which is actually an anomaly in of itself.
March
−4
−3
−2
−1
−0.5
0.5
1
2
3
4

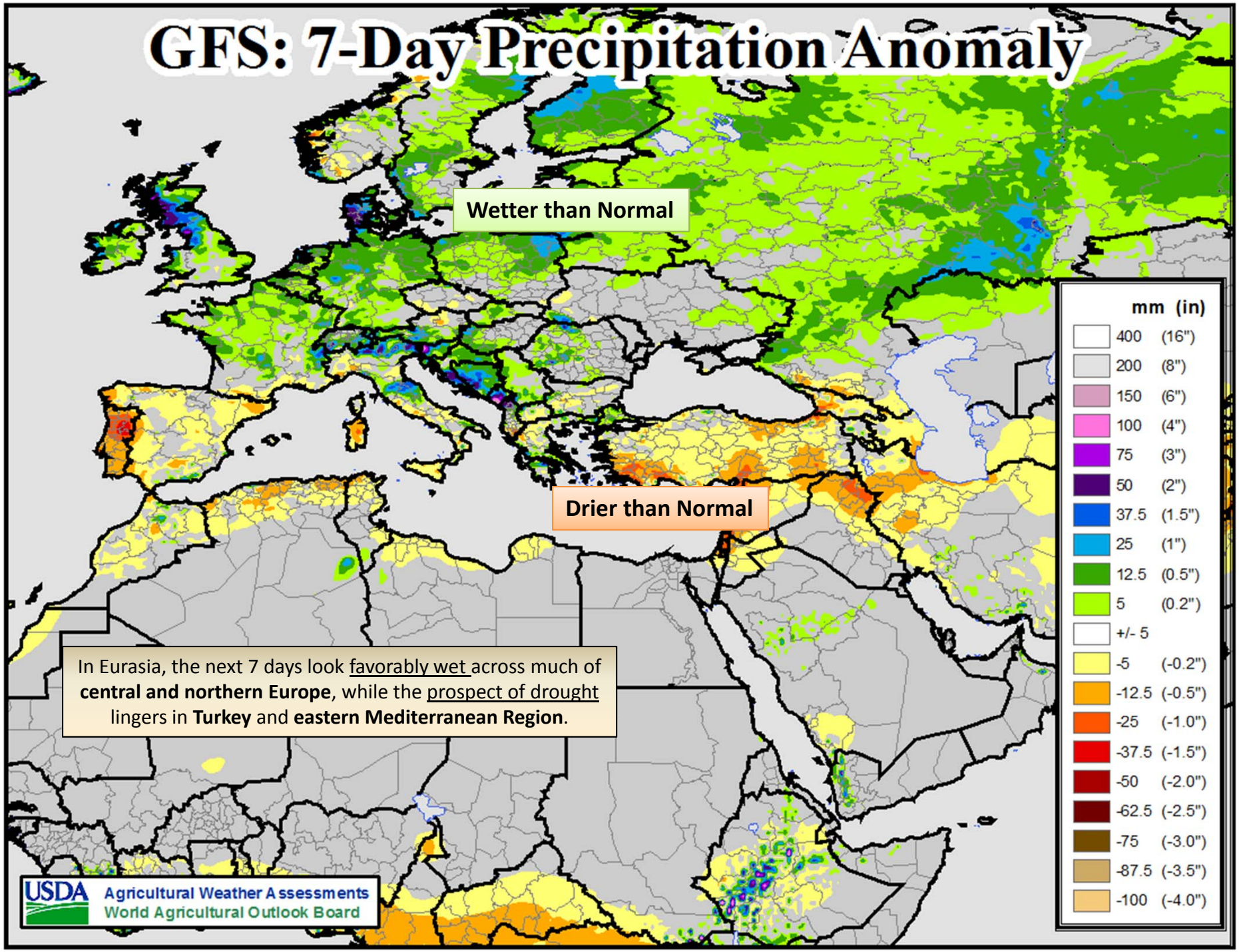

CFSv2 seasonal Prec anomalies (mm/day)
NWS/NCEP/CPC
Mar–Apr–May 2017
Initial conditions: 13Feb2017–22Feb2017
70N
60N
50N
40N
30N
20N
10N
160W
140W
120W
100W
80W
60W
Wetter than Normal
Drier than Normal
Wetter than Normal
The CPC's Climate Forecast System model shows a wet *spring* outside of the **southern Plains**.
Spring
−1
−0.8
−0.6
−0.4
−0.2
0.2
0.4
0.6
0.8
1

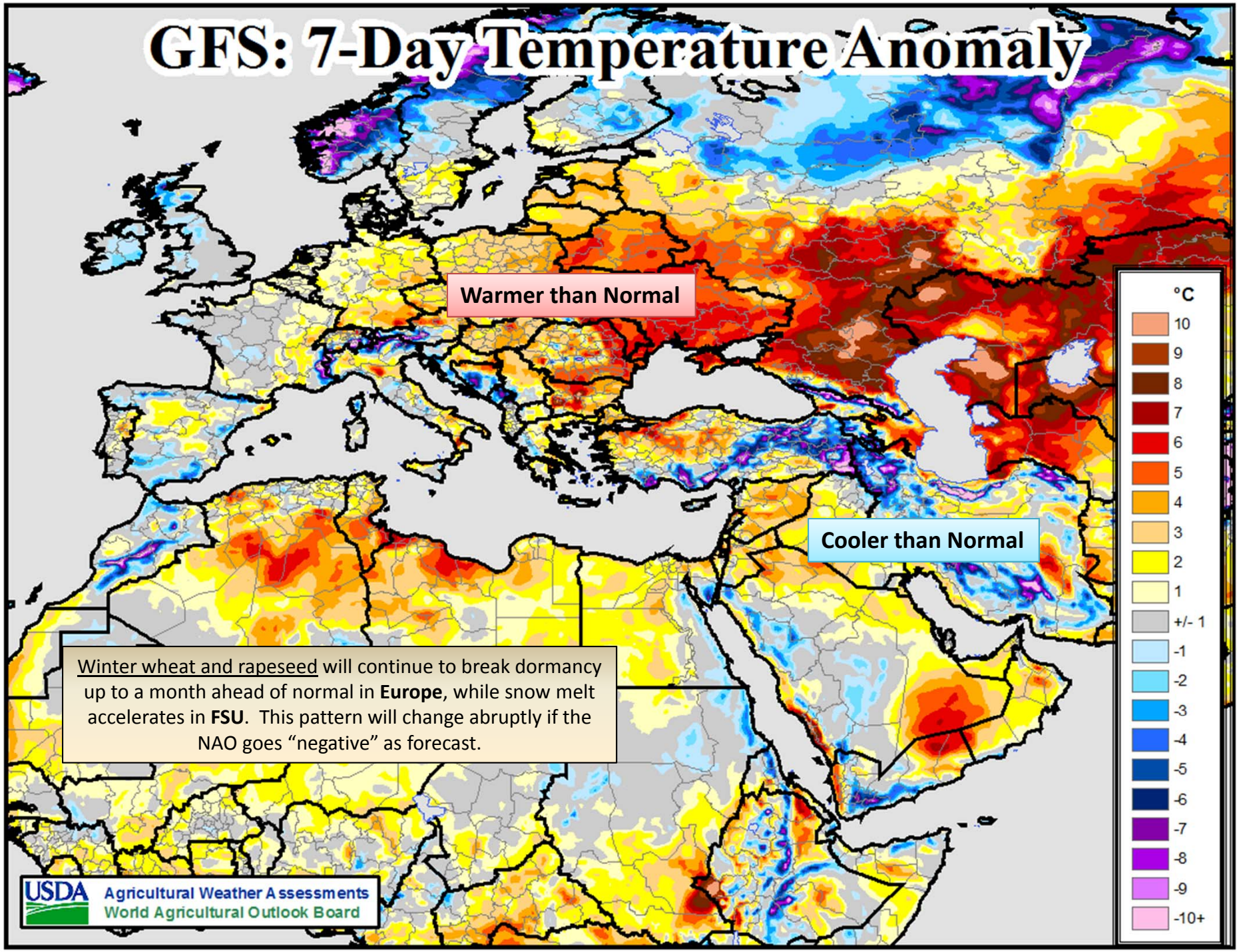

CFSv2 seasonal T2m anomalies (K)
NWS/NCEP/CPC
Mar–Apr–May 2017
Initial conditions: 13Feb2017–22Feb2017
70N
60N
50N
40N
30N
20N
10N
160W
140W
120W
100W
80W
60W
Warmer than Normal
Warmth is forecasted, especially over the nation's southern tier.
Spring
−4
−3
−2
−1
−0.5
0.5
1
2
3
4

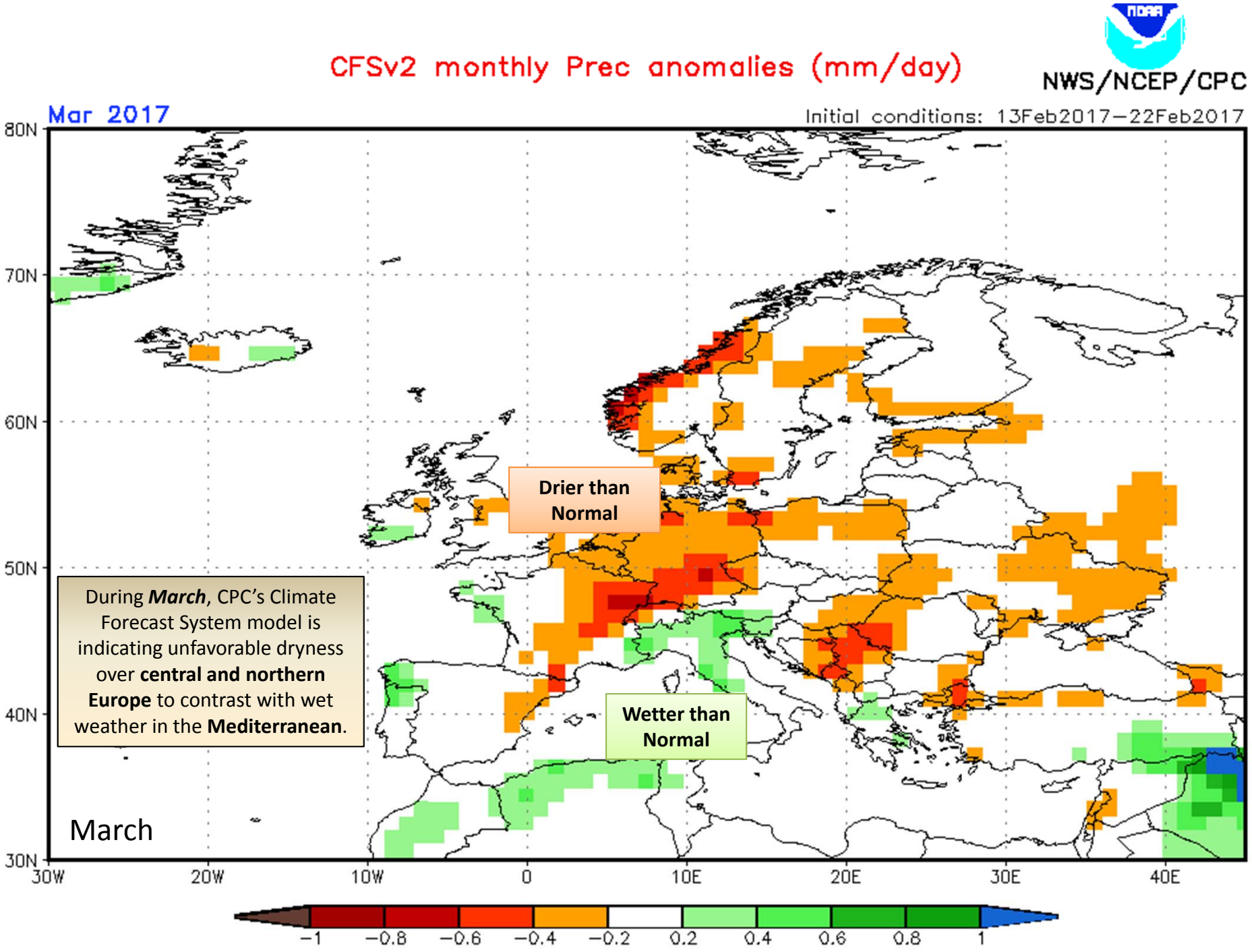
CPC's ***spring*** outlook is for **warmer-than-normal weather**, but for "Equal Chances" of above-, near,- or below-normal precipitation outside of **northern** wetness and dry conditions in the **Southwest**.

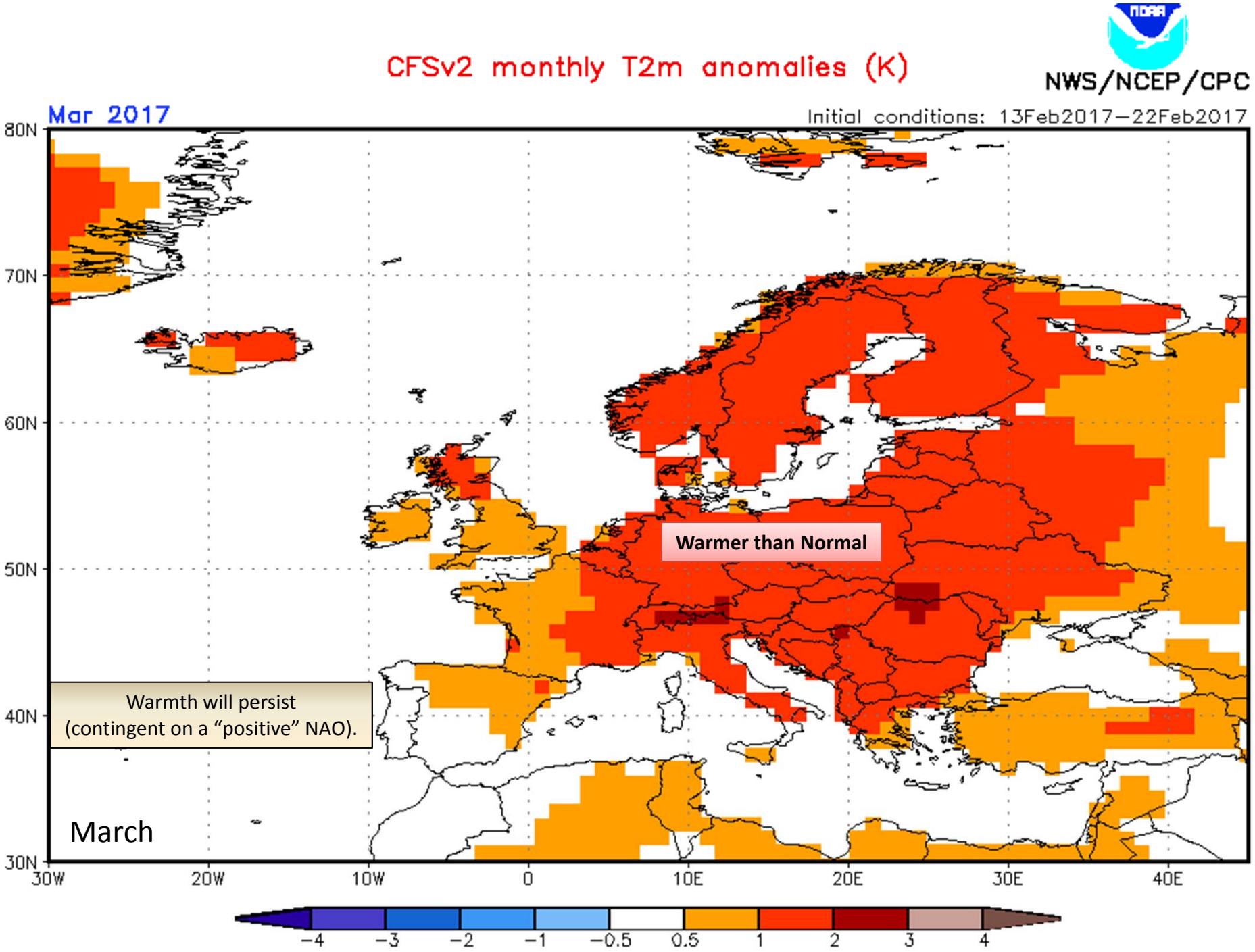


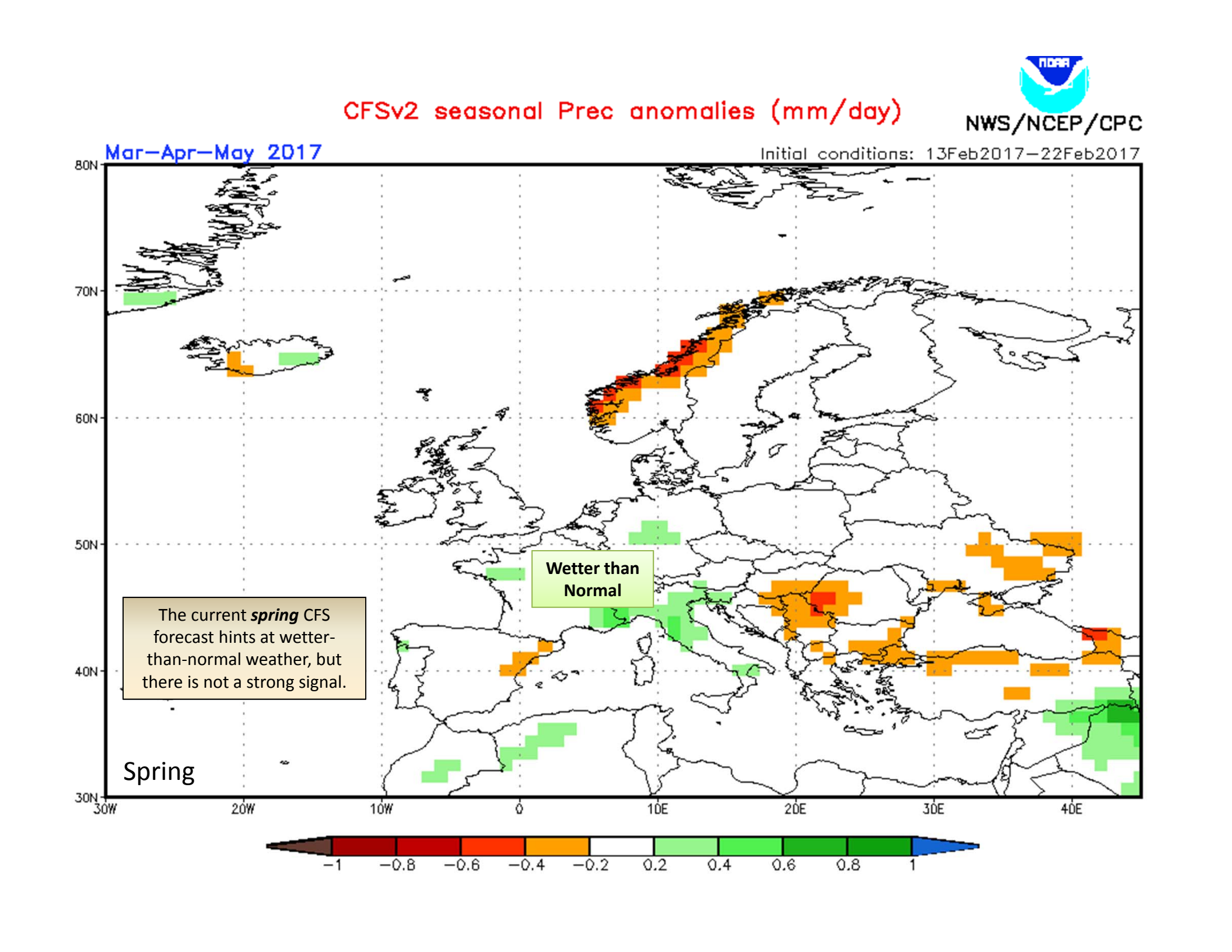


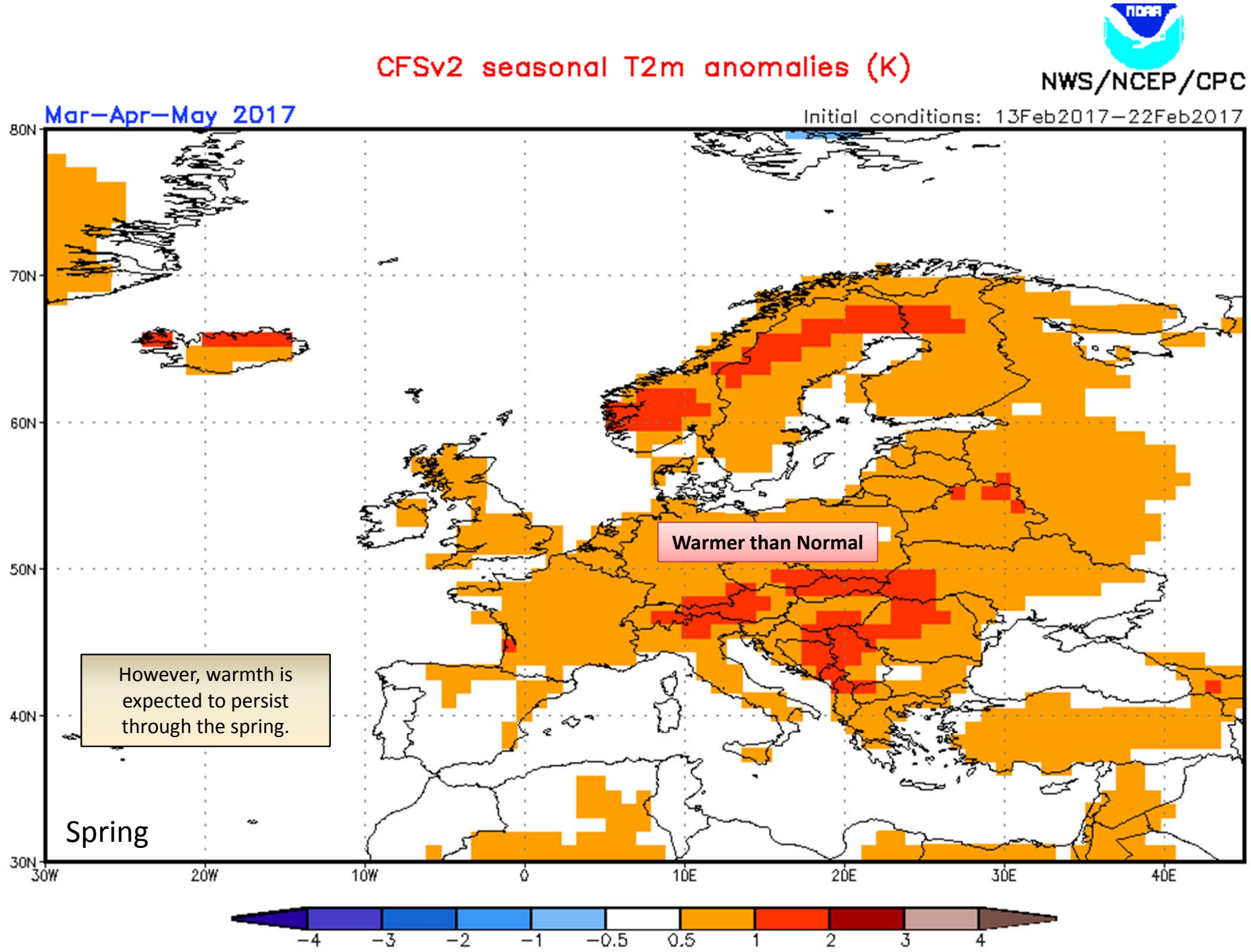

GFS: 7-Day Precipitation Anomaly
Wetter than Normal
Drier than Normal
mm (in)
400 (16")
200 (8")
150 (6")
100 (4")
75 (3")
50 (2")
37.5 (1.5")
25 (1")
12.5 (0.5")
5 (0.2")
+/- 5
-5 (-0.2")
-12.5 (-0.5")
-25 (-1.0")
-37.5 (-1.5")
-50 (-2.0")
-62.5 (-2.5")
-75 (-3.0")
-87.5 (-3.5")
-100 (-4.0")
In Eurasia, the next 7 days look favorably wet across much of central and northern Europe, while the prospect of drought lingers in Turkey and eastern Mediterranean Region.
USDA Agricultural Weather Assessments
World Agricultural Outlook Board

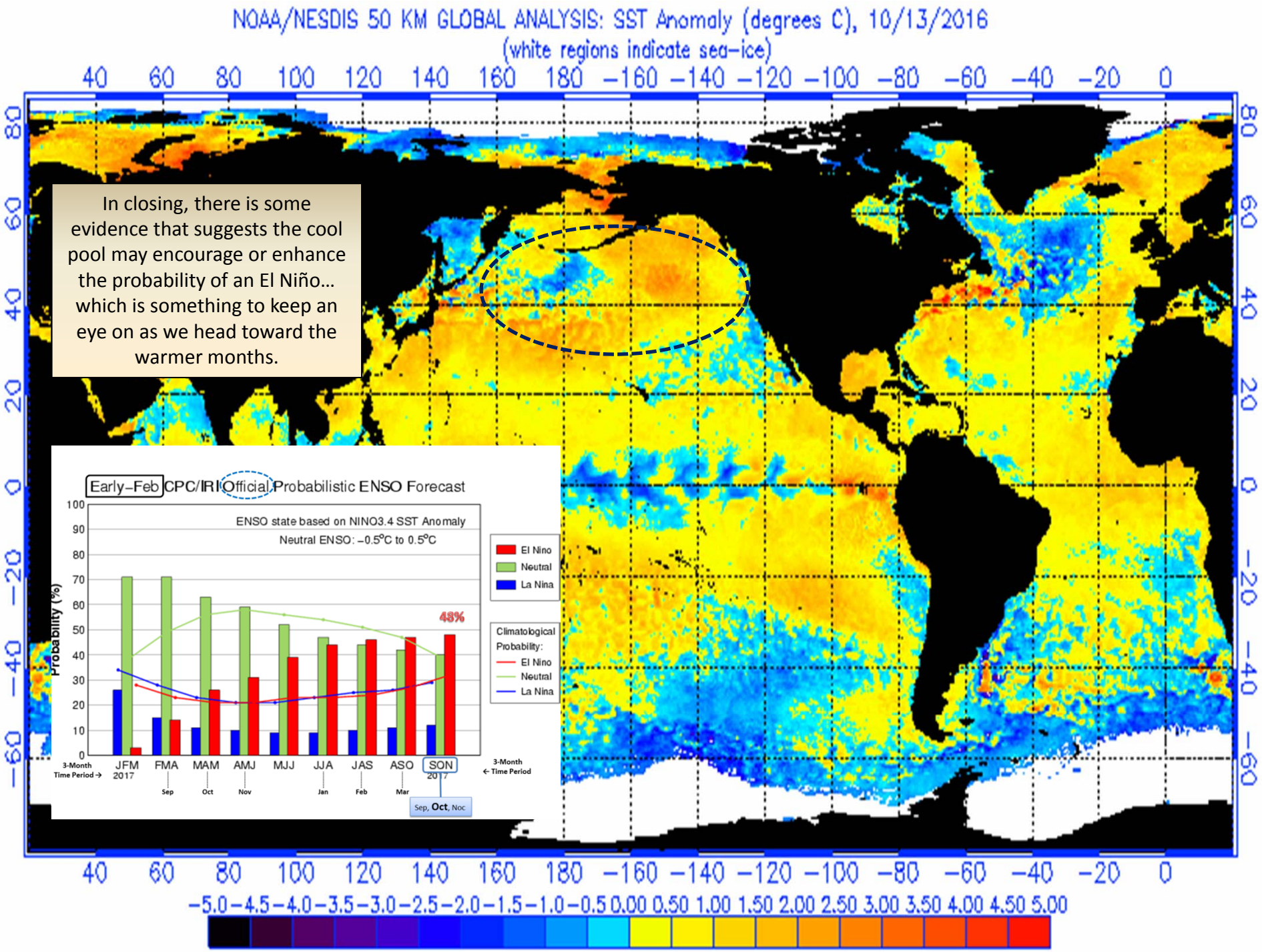

GFS: 7-Day Temperature Anomaly
Warmer than Normal
Cooler than Normal
°C
10
9
8
7
6
5
4
3
2
1
+/- 1
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10+
Winter wheat and rapeseed will continue to break dormancy up to a month ahead of normal in Europe, while snow melt accelerates in FSU. This pattern will change abruptly if the NAO goes "negative" as forecast.
USDA Agricultural Weather Assessments
World Agricultural Outlook Board

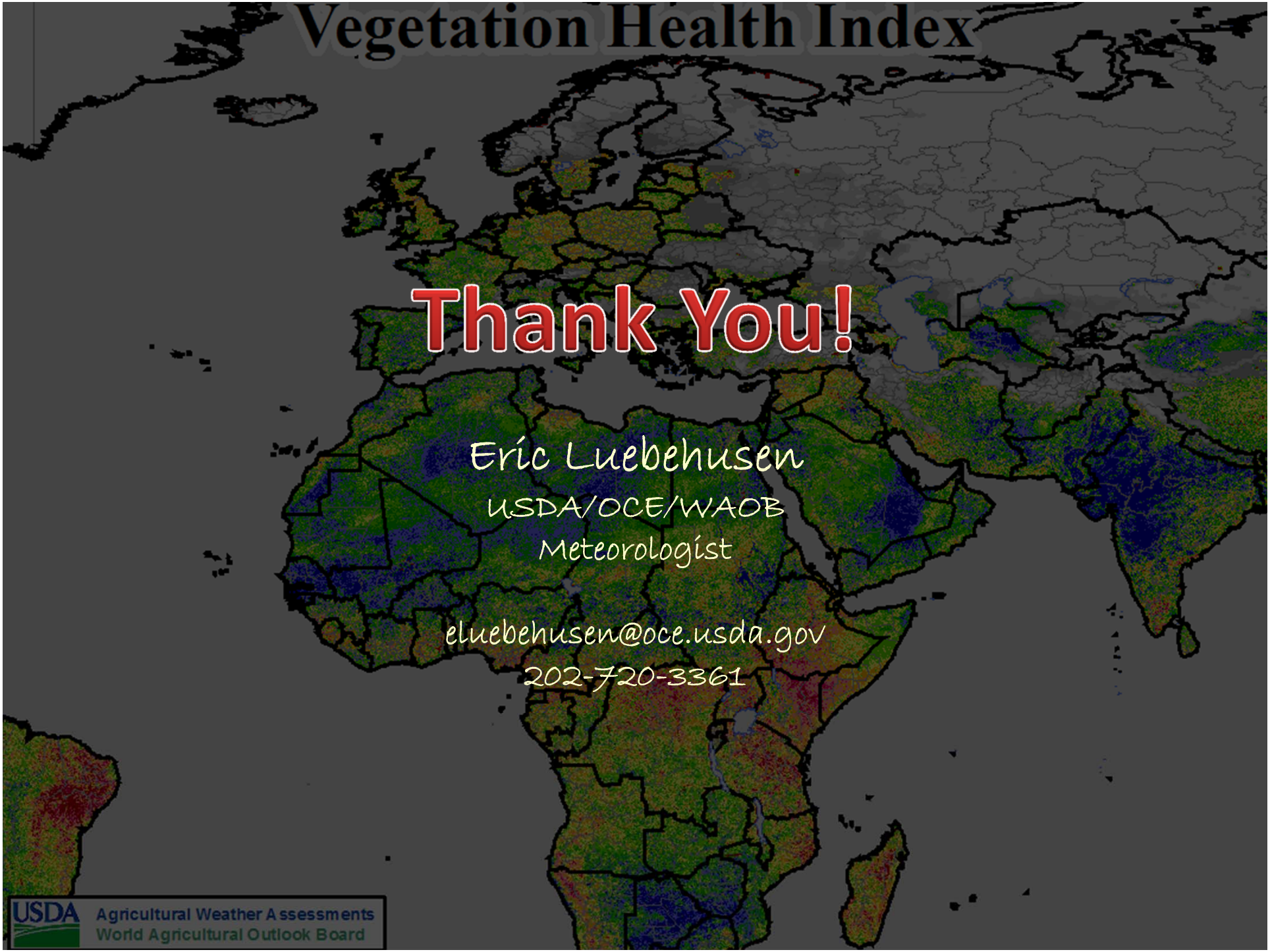

CFSv2 monthly Prec anomalies (mm/day)
NWS/NCEP/CPC
Mar 2017
Initial conditions: 13Feb2017–22Feb2017
80N
70N
60N
50N
40N
30N
30W
20W
10W
0
10E
20E
30E
40E
Drier than Normal
Wetter than Normal
During *March*, CPC's Climate Forecast System model is indicating unfavorable dryness over **central and northern Europe** to contrast with wet weather in the **Mediterranean**.
March
−1
−0.8
−0.6
−0.4
−0.2
0.2
0.4
0.6
0.8
1


CFSv2 monthly T2m anomalies (K)
NWS/NCEP/CPC
Mar 2017
Initial conditions: 13Feb2017–22Feb2017
80N
70N
60N
50N
40N
30N
30W
20W
10W
0
10E
20E
30E
40E
Warmer than Normal
Warmth will persist
(contingent on a “positive” NAO).
March
−4
−3
−2
−1
−0.5
0.5
1
2
3
4


CFSv2 seasonal Prec anomalies (mm/day)
NWS/NCEP/CPC
Mar–Apr–May 2017
Initial conditions: 13Feb2017–22Feb2017
80N
70N
60N
50N
40N
30N
30W
20W
10W
0
10E
20E
30E
40E
Wetter than Normal
The current *spring* CFS forecast hints at wetter-than-normal weather, but there is not a strong signal.
Spring
−1
−0.8
−0.6
−0.4
−0.2
0.2
0.4
0.6
0.8
1


CFSv2 seasonal T2m anomalies (K)
NWS/NCEP/CPC
Mar–Apr–May 2017
Initial conditions: 13Feb2017–22Feb2017
80N
70N
60N
50N
40N
30N
30W
20W
10W
0
10E
20E
30E
40E
Warmer than Normal
However, warmth is expected to persist through the spring.
Spring
−4
−3
−2
−1
−0.5
0.5
1
2
3
4


NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 10/13/2016
(white regions indicate sea-ice)
40 60 80 100 120 140 160 180 −160 −140 −120 −100 −80 −60 −40 −20 0
80 60 40 20 0 −20 −40 −60
In closing, there is some evidence that suggests the cool pool may encourage or enhance the probability of an El Niño… which is something to keep an eye on as we head toward the warmer months.
Early-Feb CPC/IRI Official Probabilistic ENSO Forecast
ENSO state based on NINO3.4 SST Anomaly
Neutral ENSO: −0.5°C to 0.5°C
Probability (%)
El Nino
Neutral
La Nina
48%
Climatological Probability:
El Nino
Neutral
La Nina
3-Month Time Period →
JFM 2017
FMA
MAM
AMJ
MJJ
JJA
JAS
ASO
SON 2017
Sep
Oct
Nov
Jan
Feb
Mar
Sep, Oct, Nov
← Time Period
−5.0 −4.5 −4.0 −3.5 −3.0 −2.5 −2.0 −1.5 −1.0 −0.5 0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00


Vegetation Health Index
Thank You!
Eric Luebehusen
USDA/OCE/WAOB
Meteorologist
eluebehusen@oce.usda.gov
202-720-3361
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