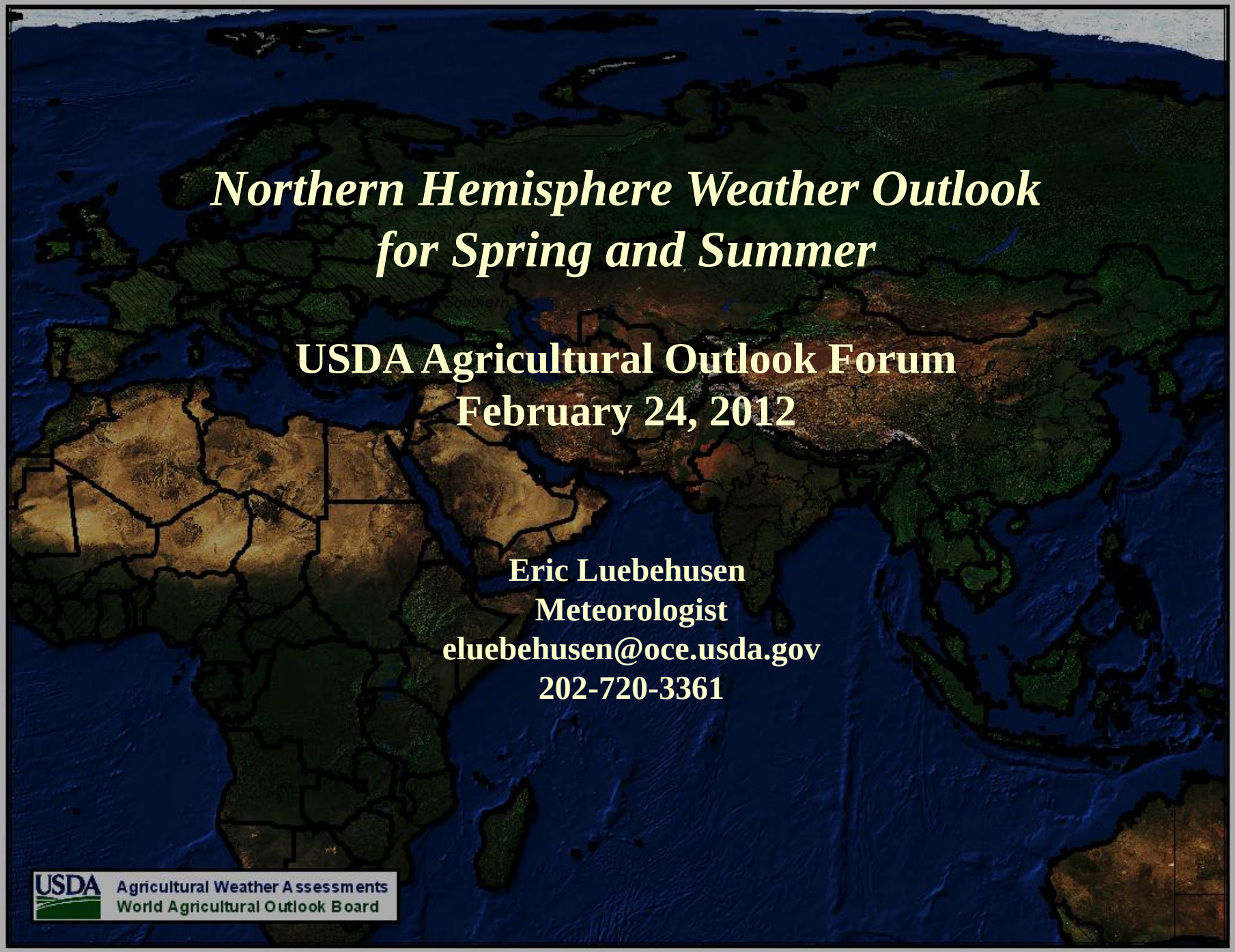


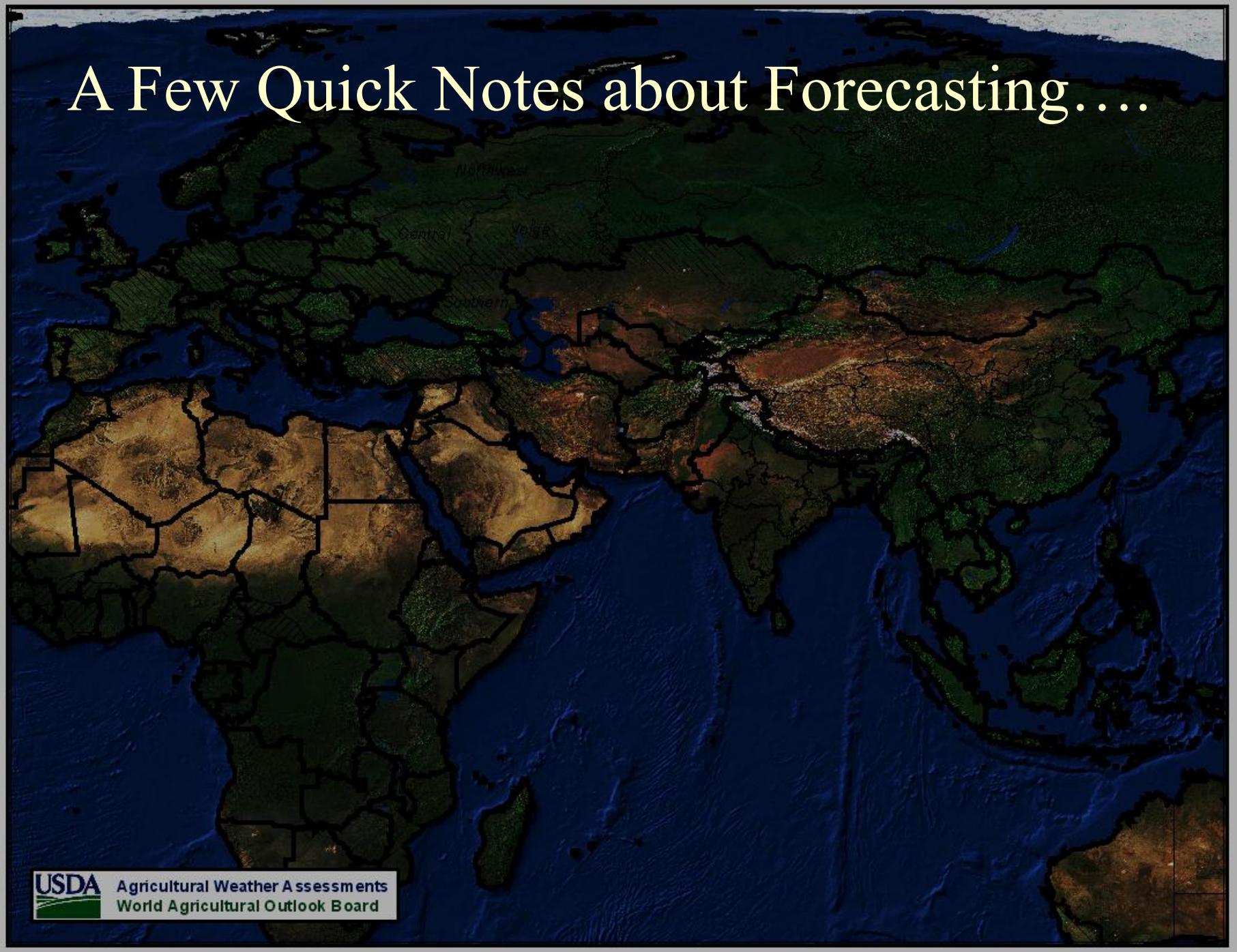
Northern Hemisphere Weather Outlook for Spring and Summer

USDA Agricultural Outlook Forum
February 24, 2012

Eric Luebehusen
Meteorologist
eluebehusen@oce.usda.gov
202-720-3361

USDA Agricultural Weather Assessments
World Agricultural Outlook Board

A Few Quick Notes about Forecasting….



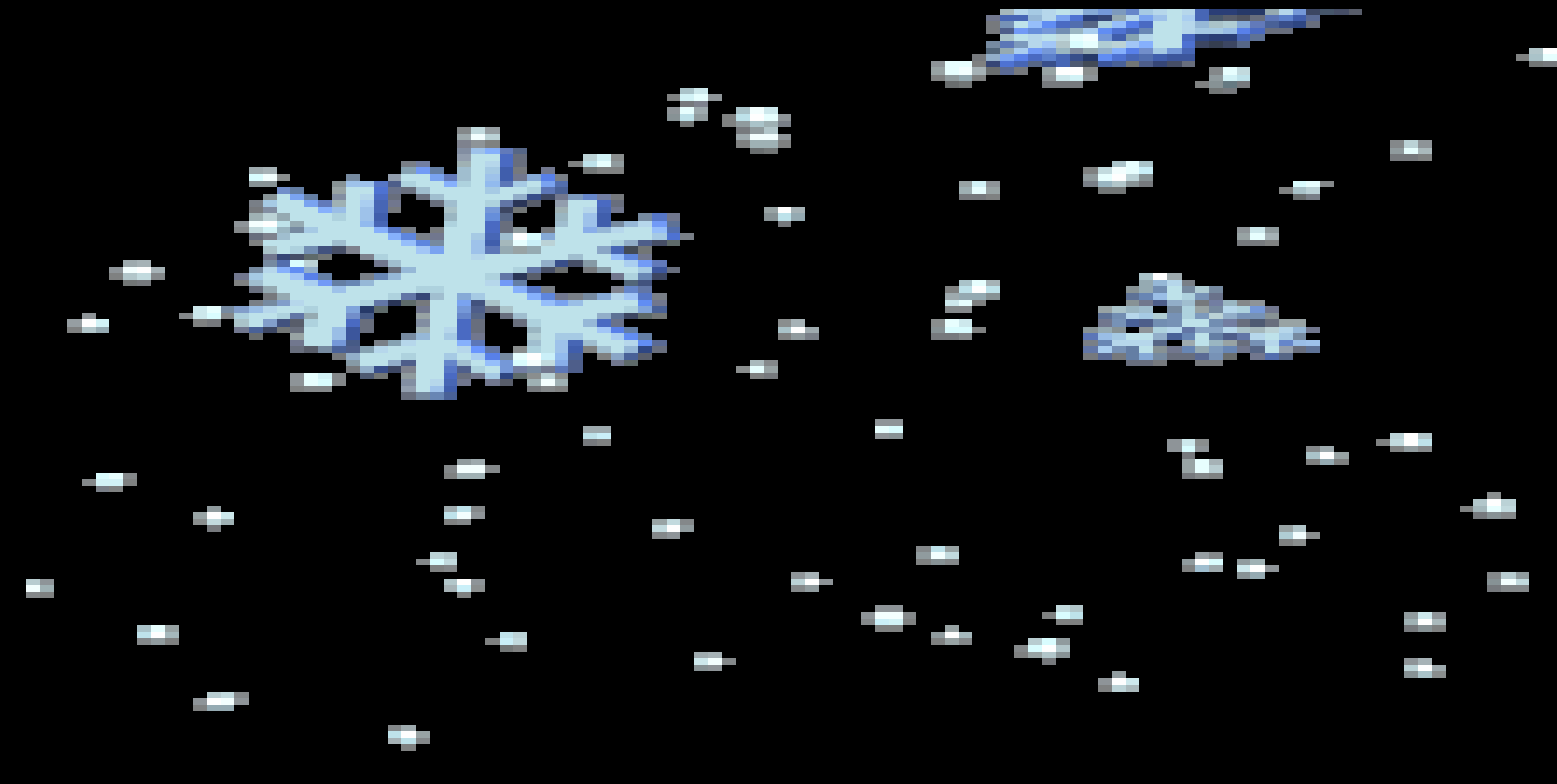
The primary difference among forecasters and their respective forecasts is the amount of time it takes people to figure out they were wrong.

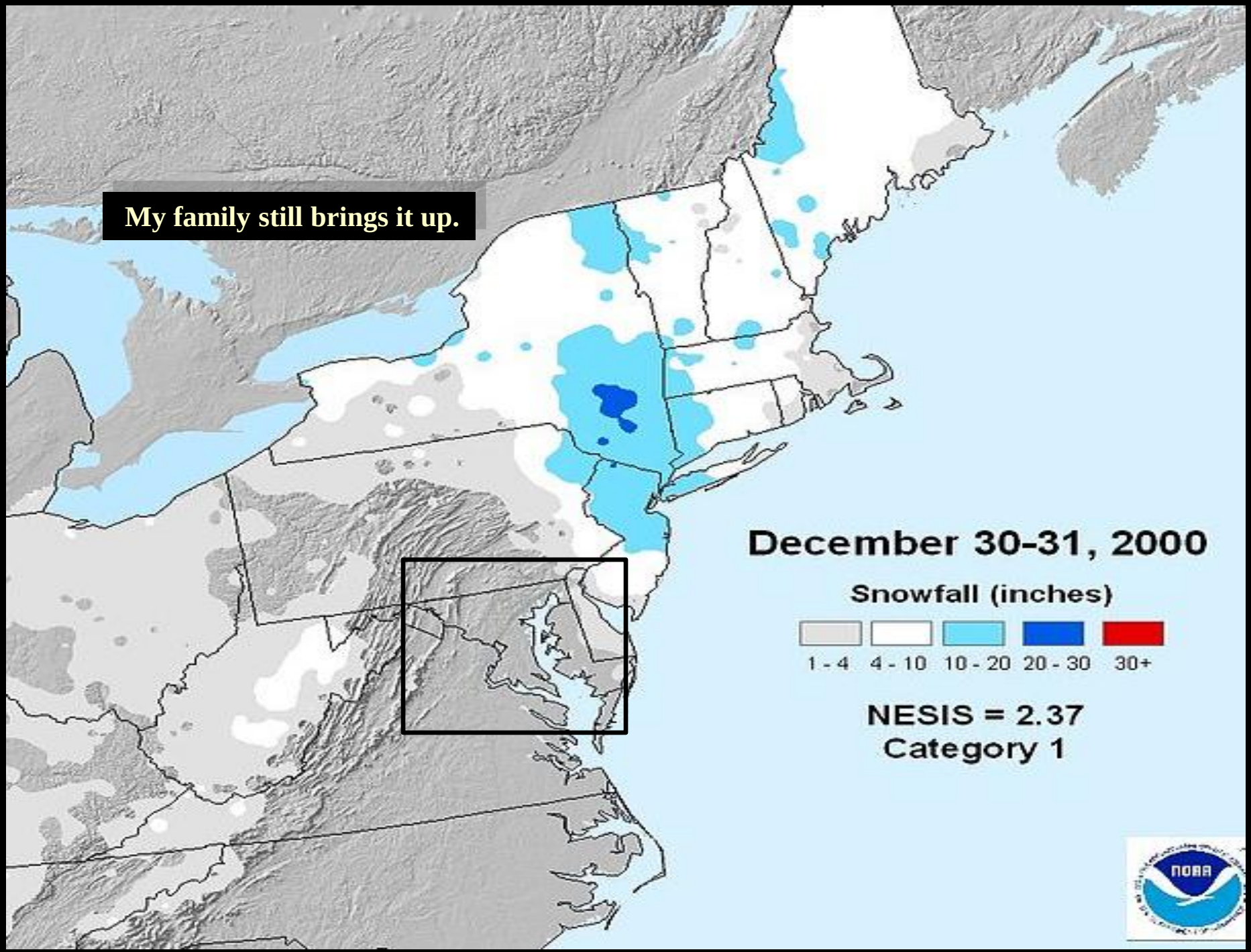
–Yours Truly

Case In Point: On December 29, 2000 (yes, I remember)…

In line with NWS and TV Meteorologists,

I strongly advised family and friends of an impending 12-18” snowstorm for much of central MD…




My family still brings it up.
December 30-31, 2000
Snowfall (inches)
1 - 4
4 - 10
10 - 20
20 - 30
30+
NESIS = 2.37
Category 1
NOAA

But it’s not just meteorologists…

"We see no serious broad spillover to banks or thrift institutions from the problems in the subprime market."

– Ben Bernanke, May 2007

"We see no serious broad spillover to banks or thrift institutions from the problems in the subprime market."

– Ben Bernanke, May 2007

… and then there’s sports.

Of the 12 ESPN "Experts", all failed to pick the eventual Super Bowl Winner, and none had the eventual winner even making it to the game (only 1 picked the Giants make the playoffs).

Our experts' NFL predictions for 2011

NFL Season Predictions

	Jeffri Chadiha, ESPN.com	John Clayton, ESPN.com	Ashley Fox, ESPN.com	Dan Graziano, ESPN.com
SUPER BOWL CHAMPION				
AFC East	Patriots	Patriots	Patriots	Jets
AFC North	Steelers	St		
AFC South	Colts	C		
AFC West	Chargers	Cl		
AFC wild cards	Ravens, Jets	R		
NFC East	Eagles	Ea		
NFC North	Packers	Pa		
NFC South	Falcons	Fa		
NFC West	Cardinals	R		
NFC wild cards	Vikings, Bucs	Sa		
AFC champion	Patriots	Pa		
NFC champion	Packers	Pa		
Coach of the year	Andy Reid	M		
MVP	Michael Vick	Aa		
Offensive ROY	Julio Jones	M		
Defensive ROY	Von Miller	V		

NFL Season Predictions

	Paul Kuharsky, ESPN.com	Mike Sando, ESPN.com	Adam Schefter, ESPN Insider	Kevin Seifert, ESPN.com
SUPER BOWL CHAMPION				
AFC East	Patriots	Patriots	Patriots	Patriots
AFC North	Steelers	Steelers	Ravens	Ravens
AFC South	Colts			
AFC West	Chargers			
AFC wild cards	Jets, Texans			
NFC East	Eagles			
NFC North	Packers			
NFC South	Saints			
NFC West	Rams			
NFC wild cards	Falcons, Lions			
AFC champion	Patriots			
NFC champion	Saints			
Coach of the year	Steve Spagnuolo			
MVP	Drew Brees			
Offensive ROY	Julio Jones			
Defensive ROY	Adrian Clayborn			

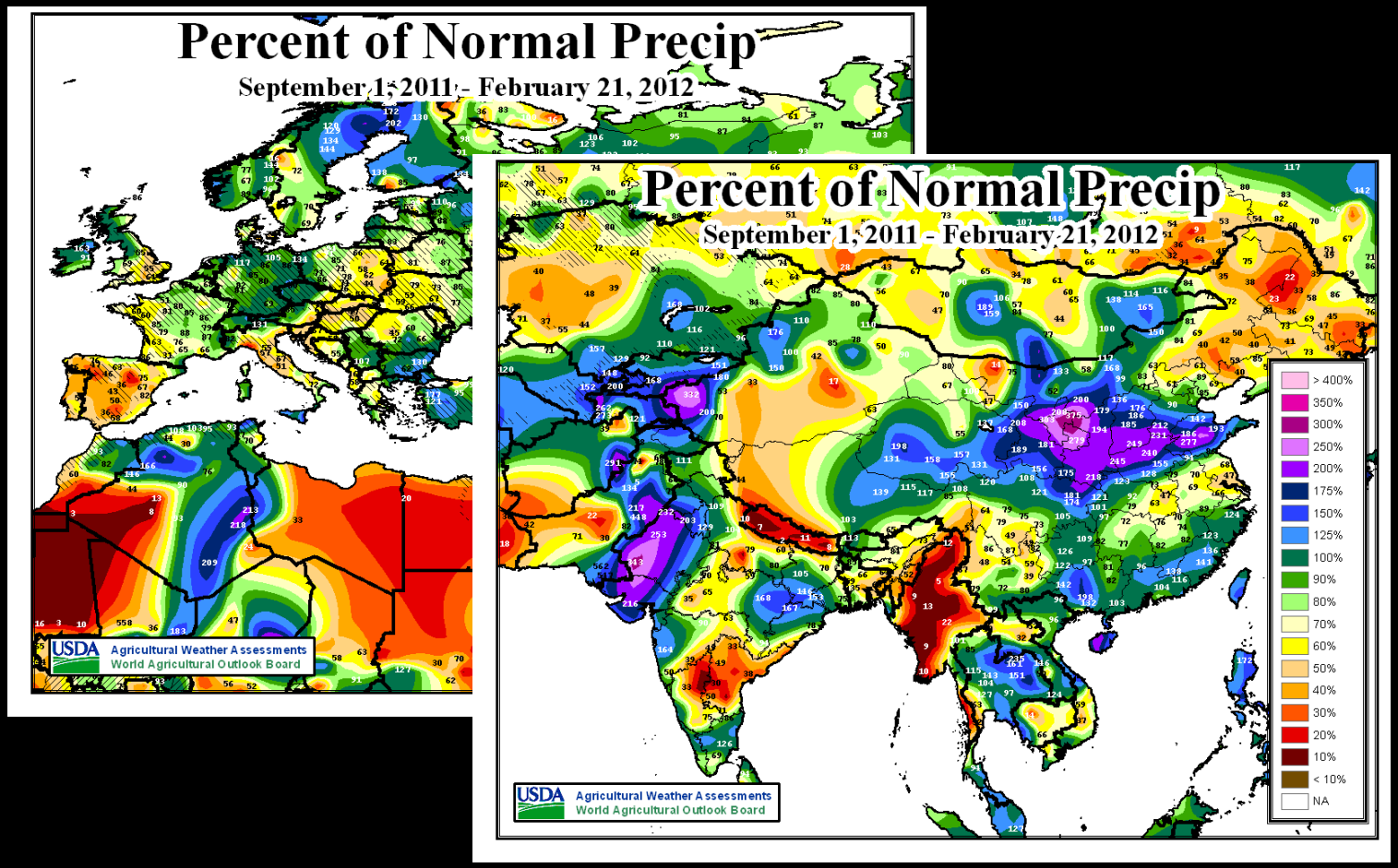
NFL Season Predictions

	James Walker, ESPN.com	Bill Williamson, ESPN.com	Matt Williamson, Scouts Inc.	Pat Yasinskas, ESPN.com
SUPER BOWL CHAMPION				
AFC East	Patriots	Jets	Patriots	Patriots
AFC North	Ravens	Steelers	Steelers	Steelers
AFC South	Colts	Texans	Texans	Texans
AFC West	Chargers	Chargers	Chargers	Chargers
AFC wild cards	Steelers, Jets	Patriots, Chiefs	Ravens, Colts	Colts, Ravens
NFC East	Eagles	Eagles	Eagles	Eagles
NFC North	Packers	Packers	Packers	Packers
NFC South	Saints	Falcons	Saints	Saints
NFC West	Rams	Rams	Rams	Rams
NFC wild cards	Falcons, Bucs	Saints, Bucs	Falcons, Lions	Falcons, Giants
AFC champion	Patriots	Jets	Patriots	Patriots
NFC champion	Eagles	Falcons	Saints	Eagles
Coach of the year	Sean Payton	Jim Schwartz	Bill Belichick	Gary Kubiak
MVP	Tom Brady	Aaron Rodgers	Philip Rivers	Tom Brady
Offensive ROY	Julio Jones	Cam Newton	Julio Jones	Julio Jones
Defensive ROY	Jimmy Smith	Von Miller	Von Miller	Von Miller

Now that I have set the stage…
let's give it a spin!

Primary Tools for Long Range Forecasts

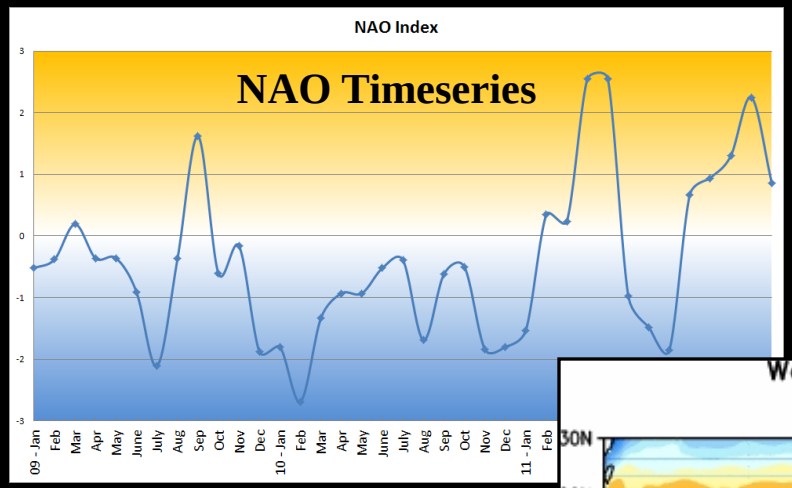
· Current: "Where do we stand heading into the spring?"

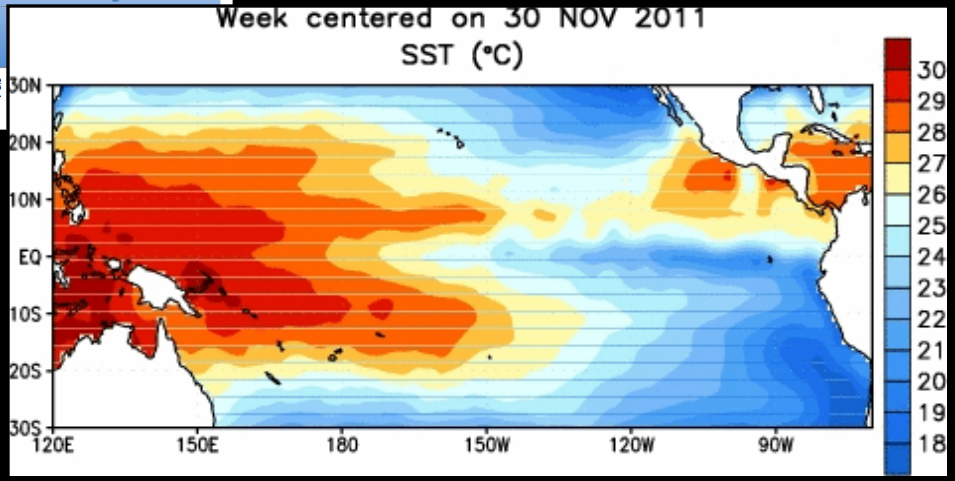


Primary Tools for Long Range Forecasts

· Current: "Where do we stand heading into the spring?"

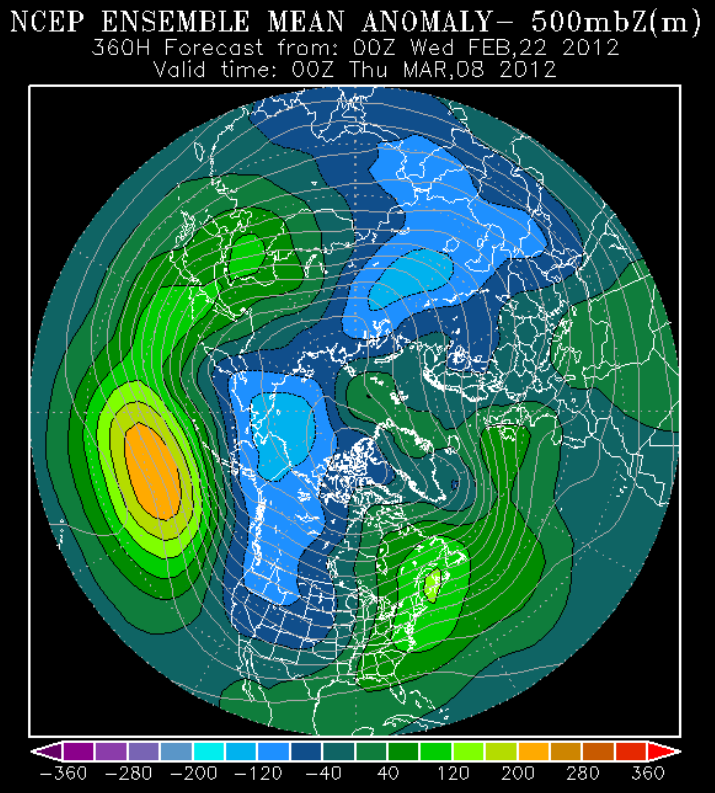
· Climate Indices: El Nino, La Nina, North Atlantic Oscillation (NAO), etc…

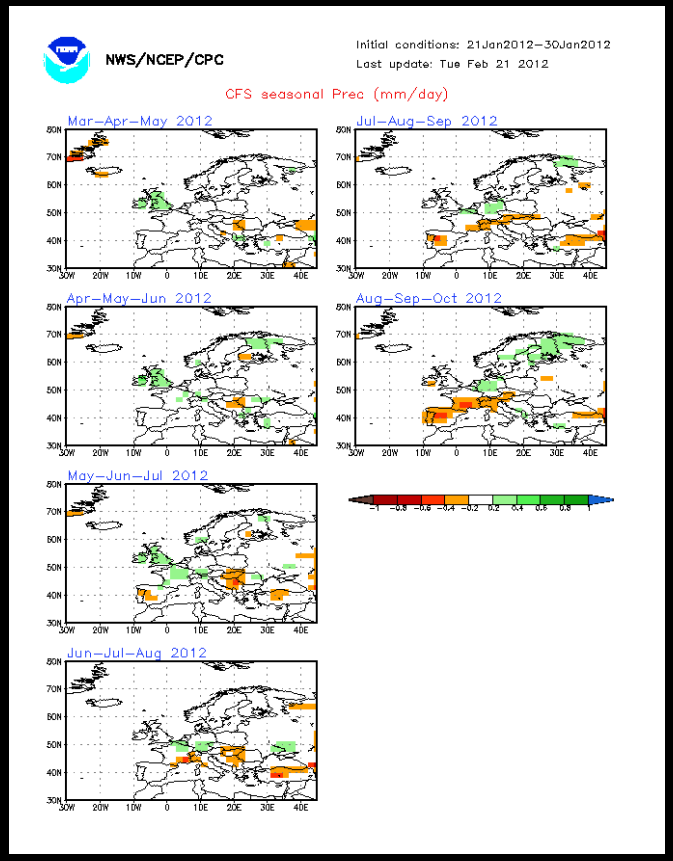




Primary Tools for Long Range Forecasts

- Current: "Where do we stand heading into the spring?"
- Climate Indices: El Nino, La Nina, North Atlantic Oscillation (NAO), etc…
- Models: GFS, Ensemble Means, CFS, etc…





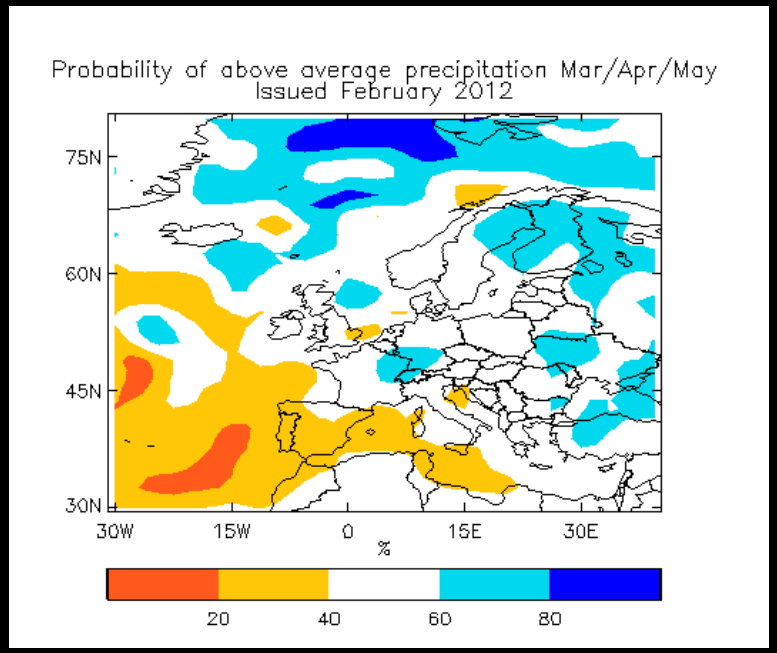
Primary Tools for Long Range Forecasts

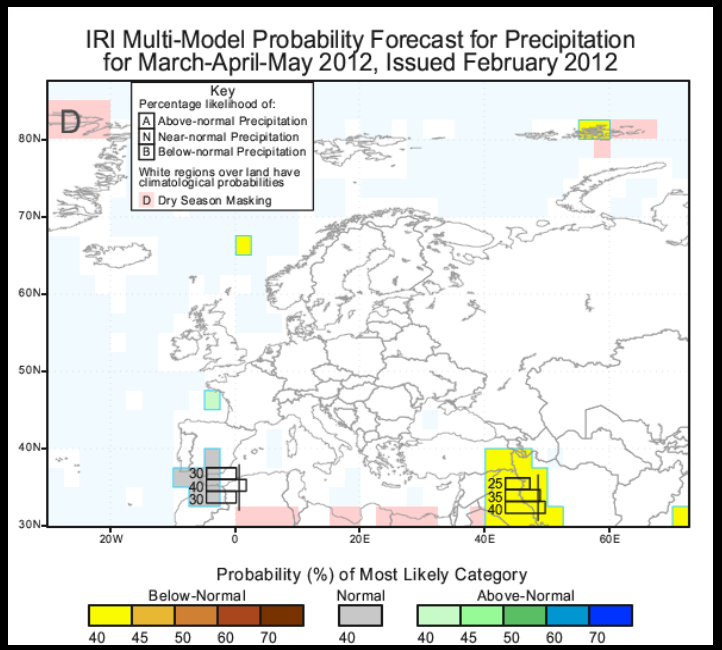
· Current: "Where do we stand heading into the spring?"

· Climate Indices: El Nino, La Nina, North Atlantic Oscillation (NAO), etc…

· Models: GFS, Ensemble Means, CFS, etc…

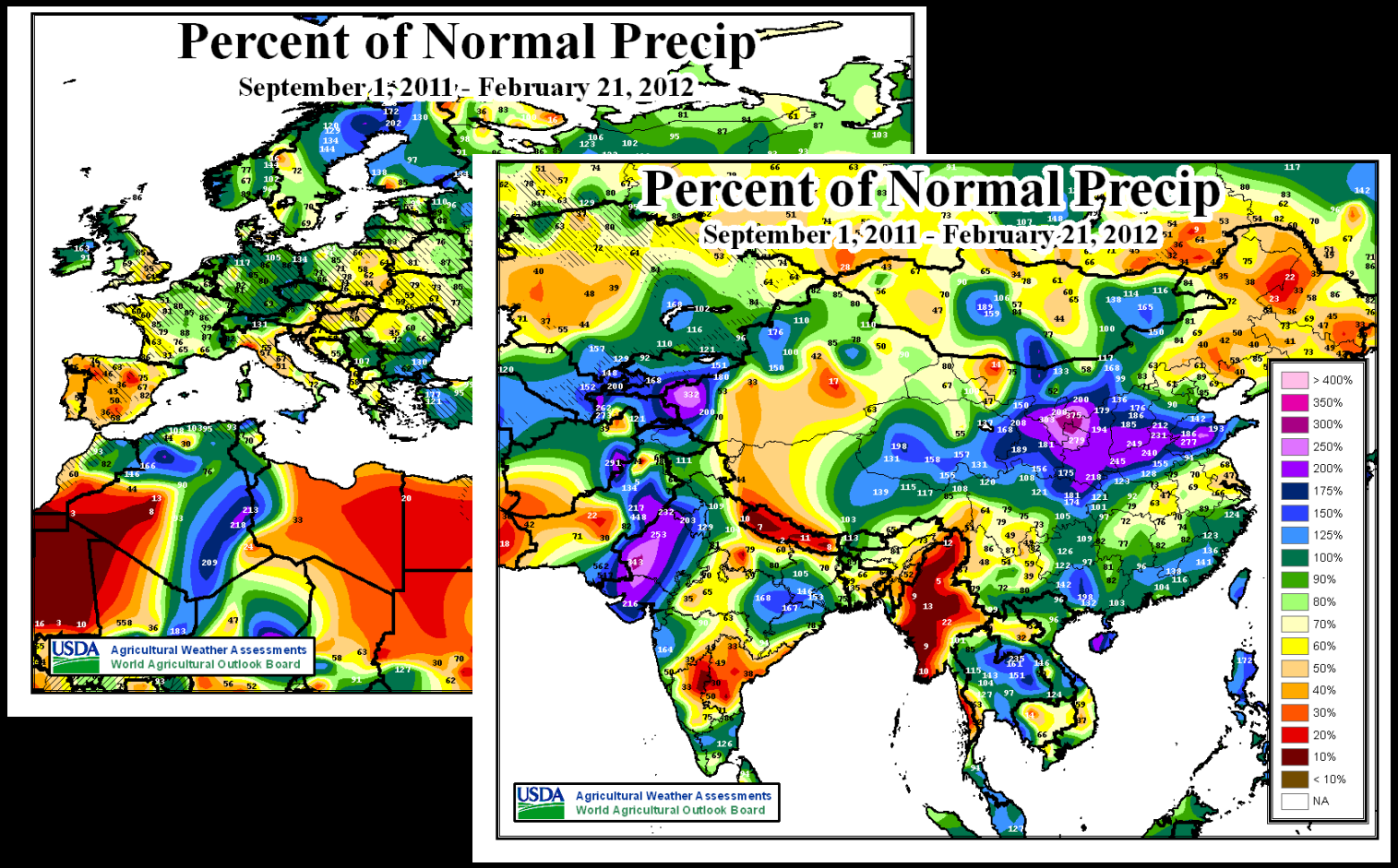
· Agency: Experts from NWS-CPC, IRI, UK Met Office, etc…

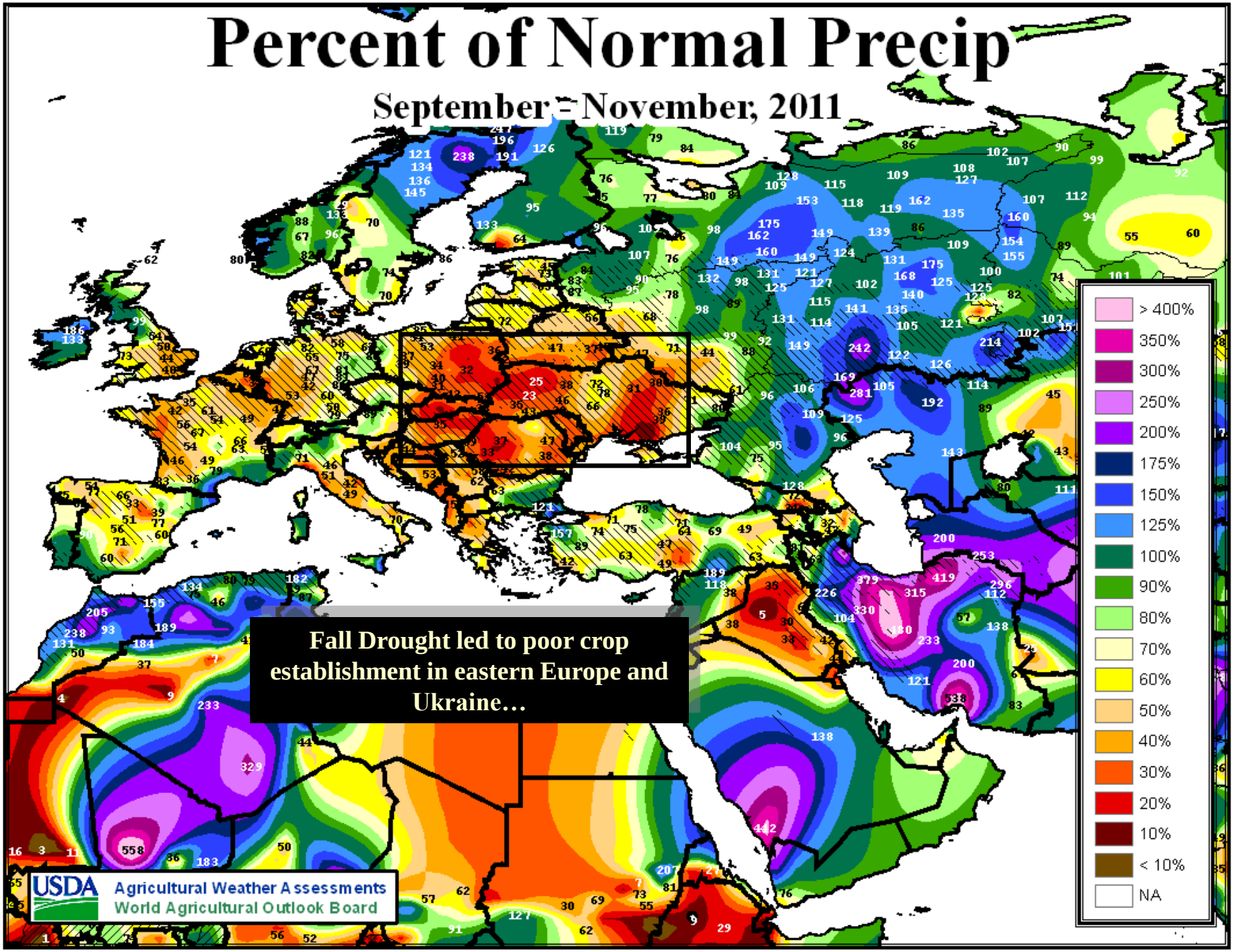


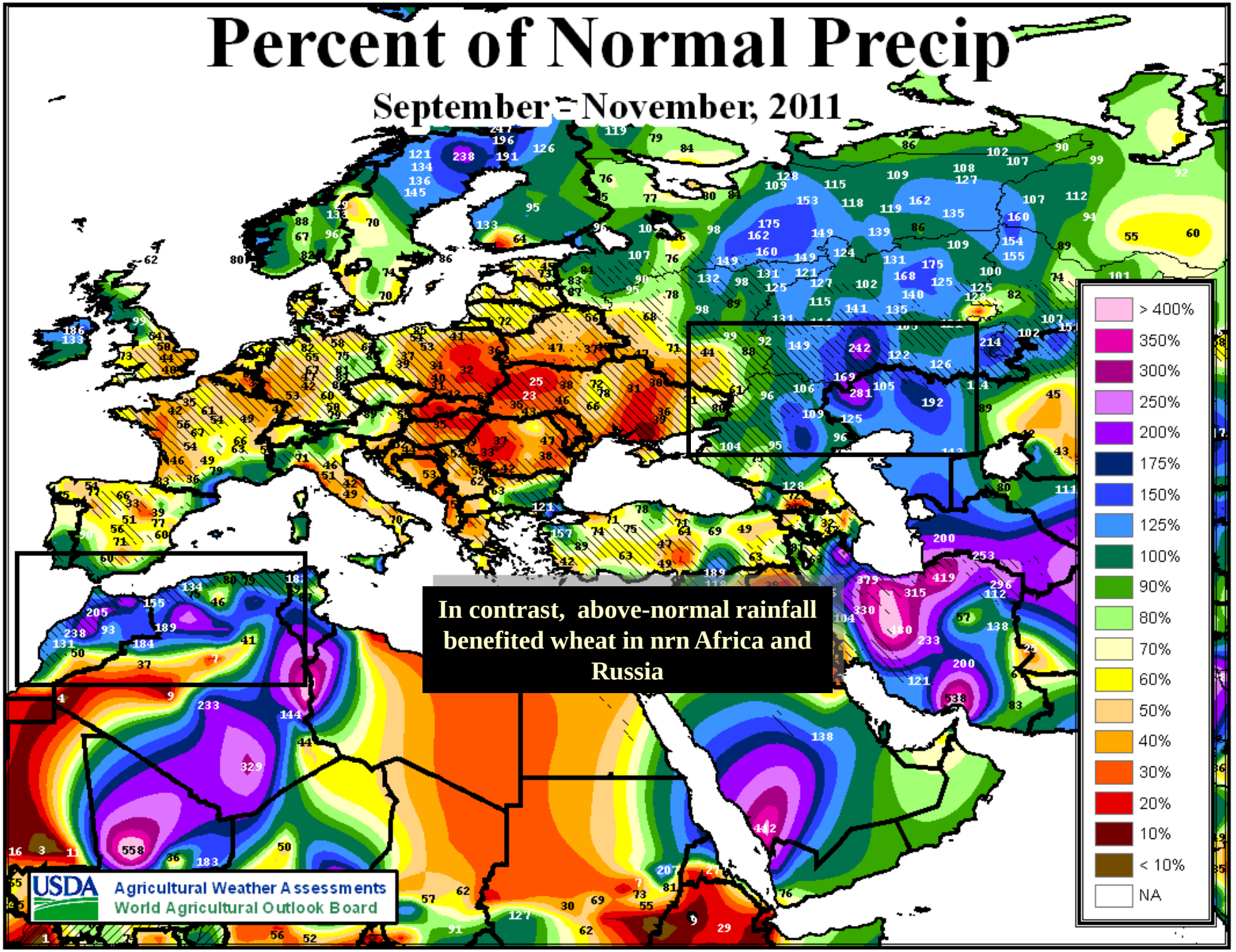


Primary Tools for Long Range Forecasts

· Current: "Where do we stand heading into the spring?"

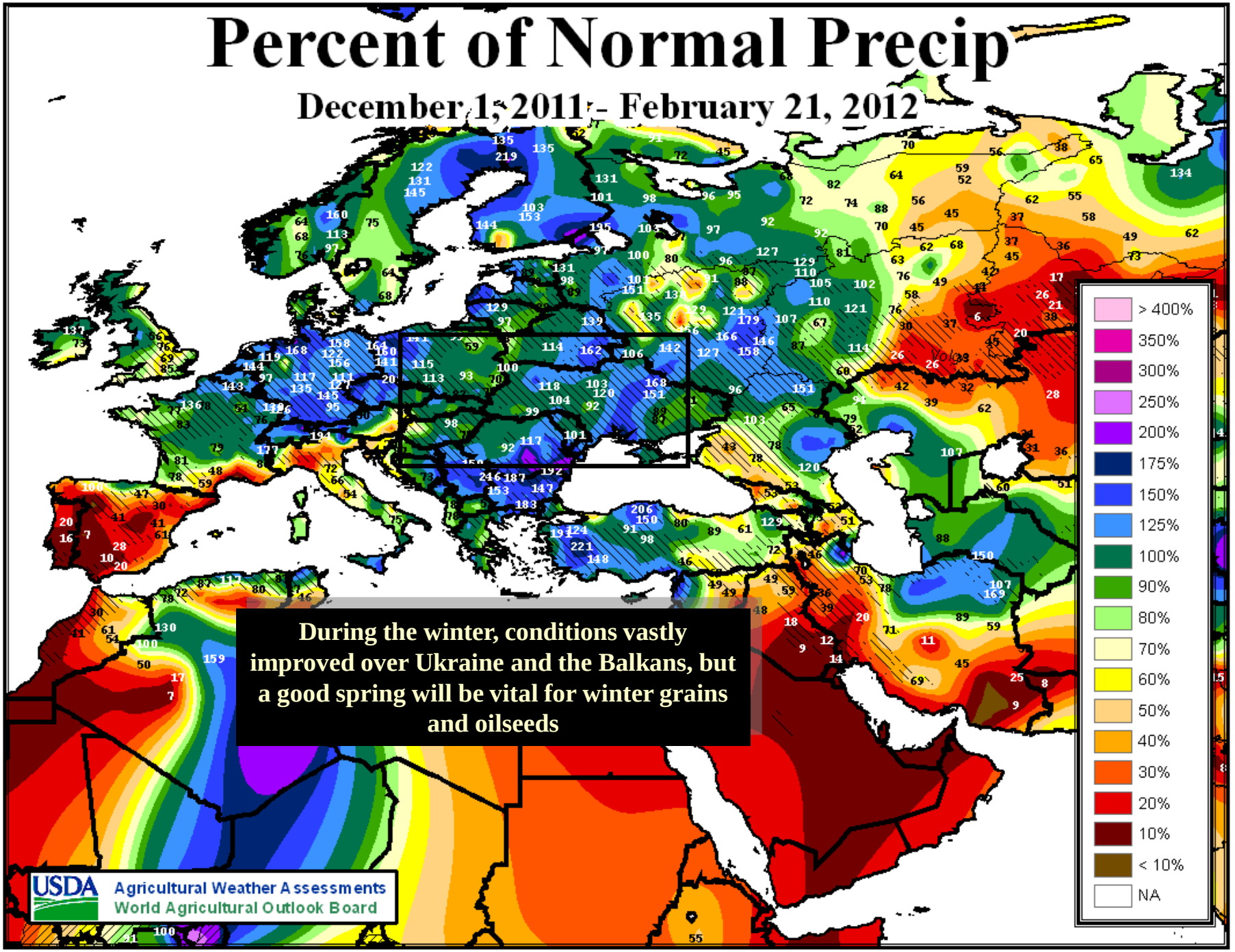



Percent of Normal Precip
September - November, 2011
Fall Drought led to poor crop establishment in eastern Europe and Ukraine…
USDA
Agricultural Weather Assessments
World Agricultural Outlook Board
> 400%
350%
300%
250%
200%
175%
150%
125%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
< 10%
NA


Percent of Normal Precip
September - November, 2011
> 400%
350%
300%
250%
200%
175%
150%
125%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
< 10%
NA
In contrast, above-normal rainfall benefited wheat in nrn Africa and Russia
USDA
Agricultural Weather Assessments
World Agricultural Outlook Board

Percent of Normal Precip

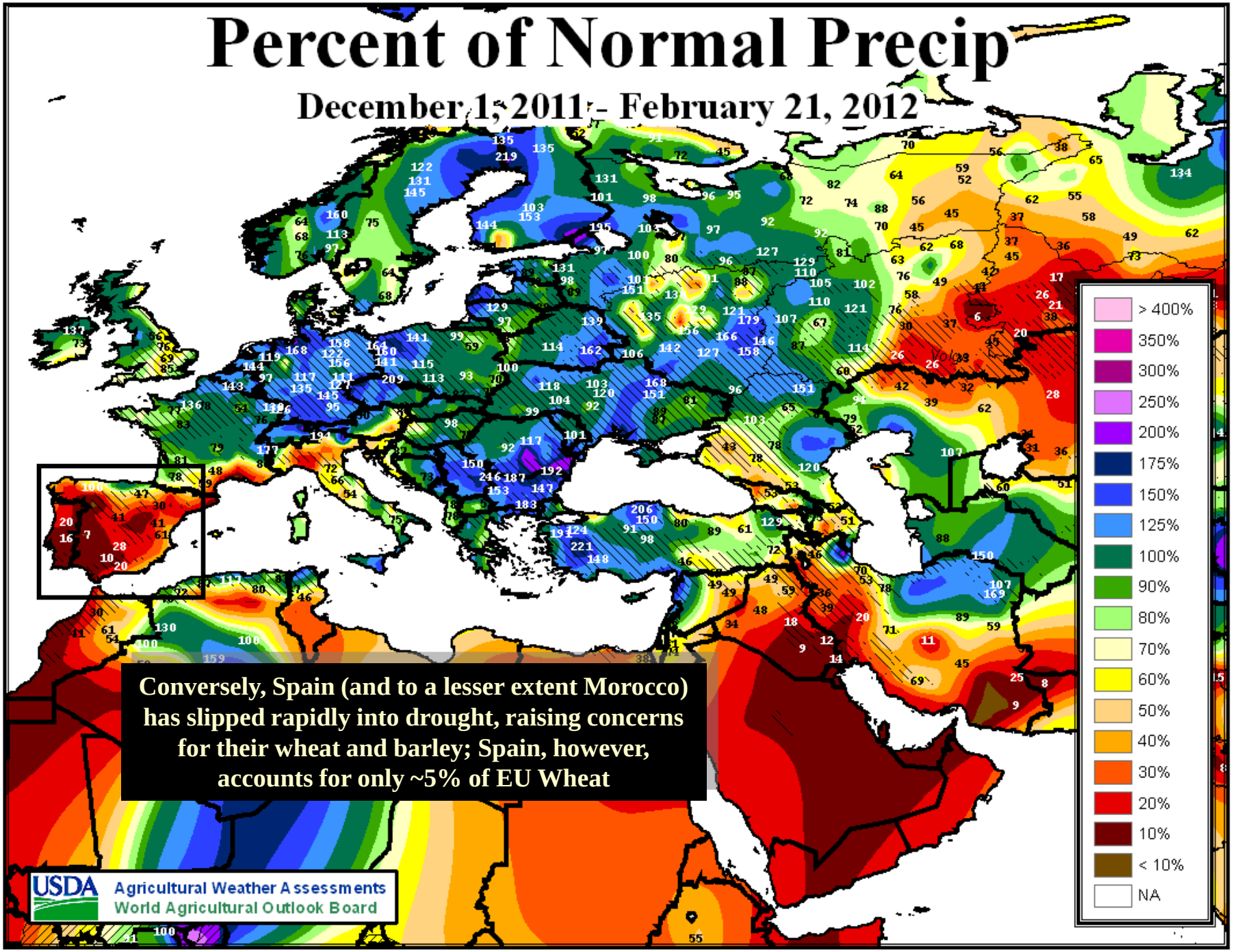
December 1, 2011 - February 21, 2012



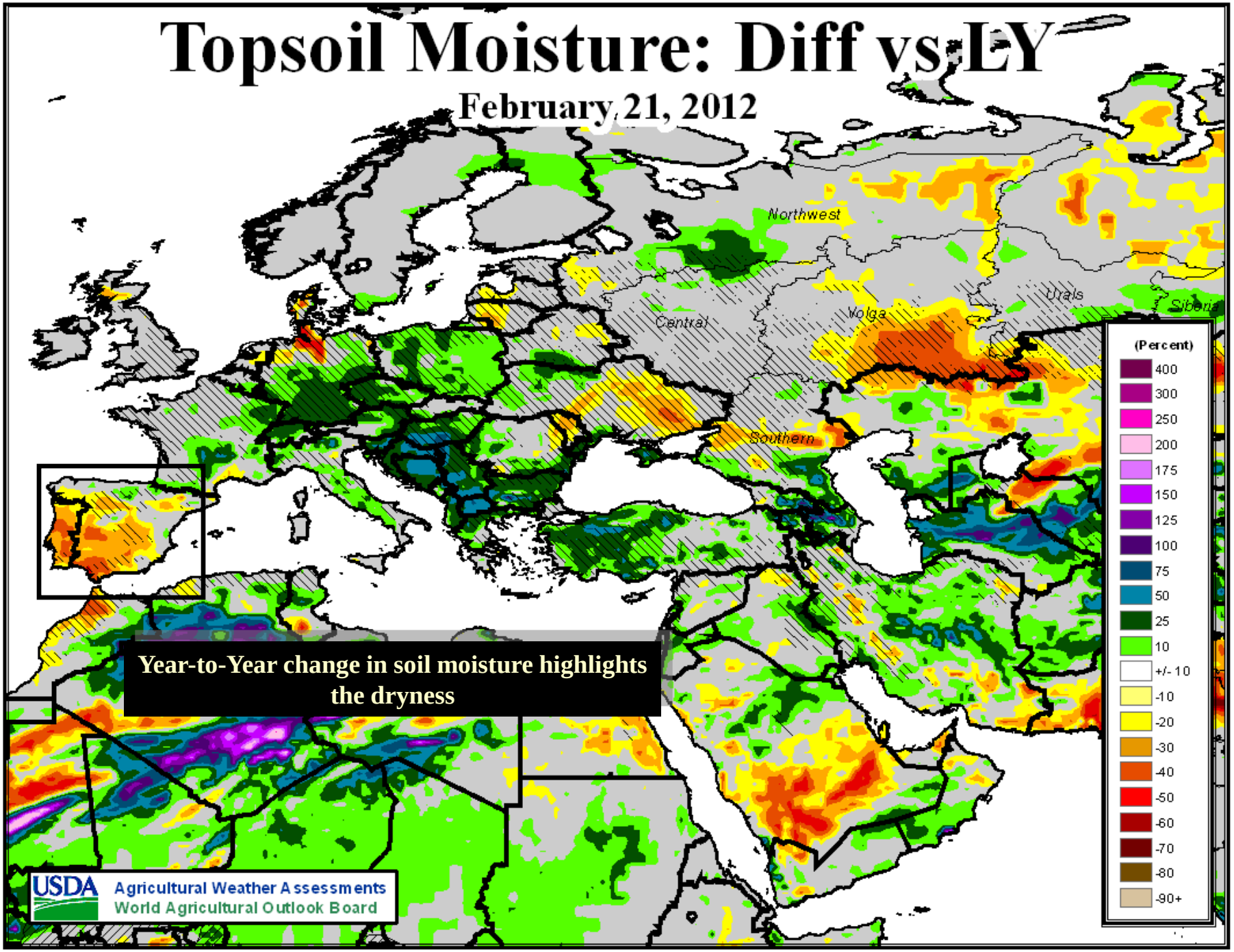
During the winter, conditions vastly improved over Ukraine and the Balkans, but a good spring will be vital for winter grains and oilseeds

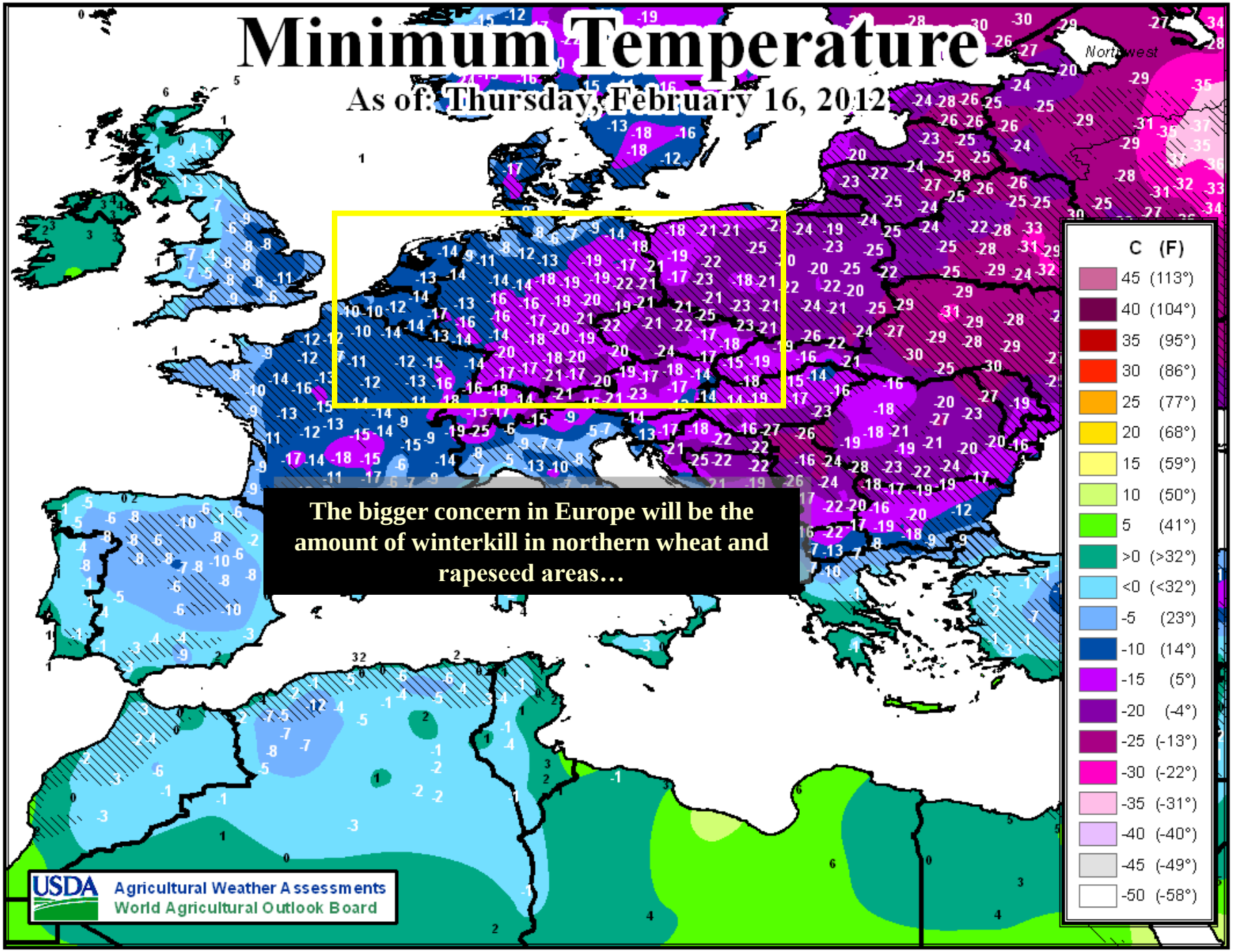
Percent of Normal Precip

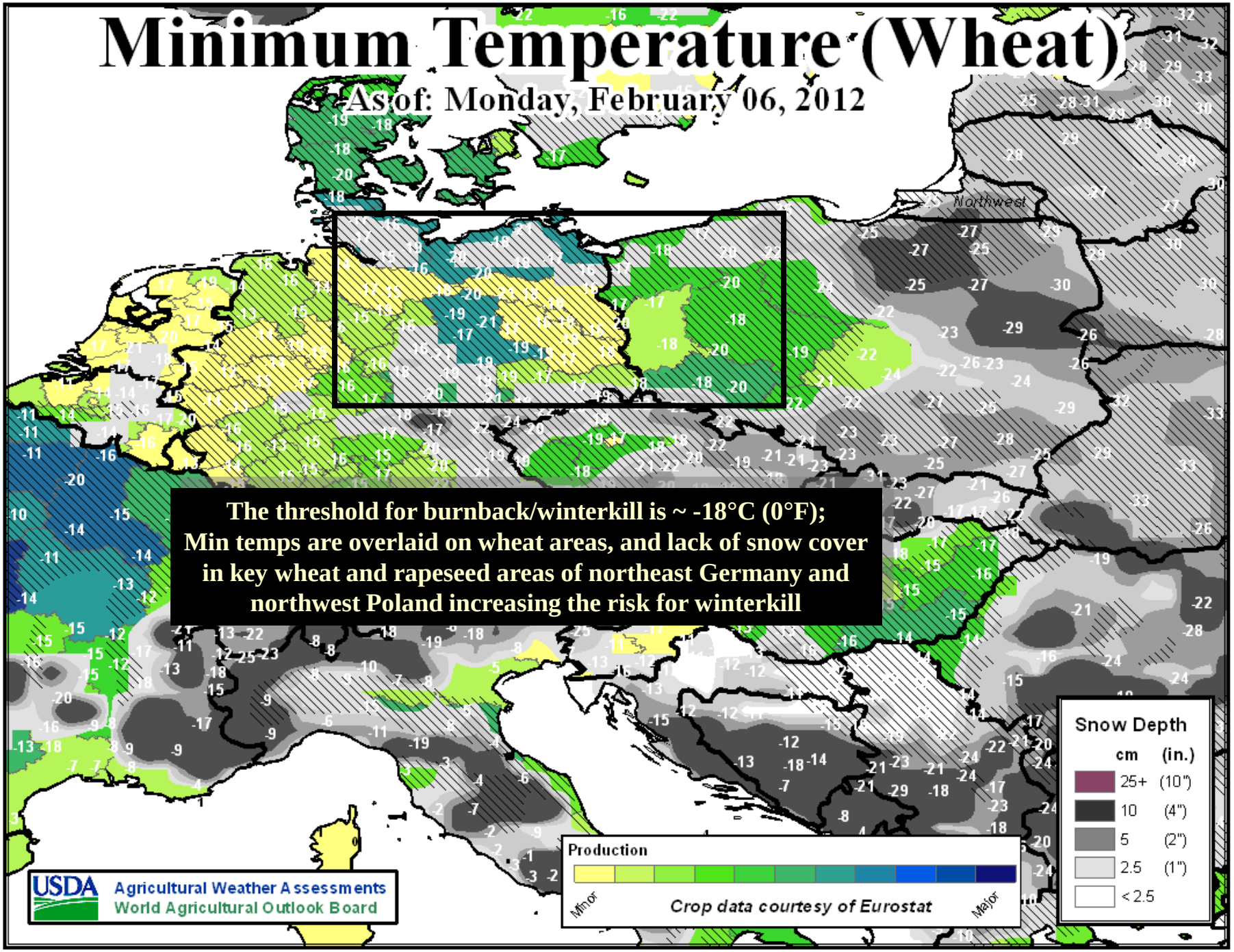
December 1, 2011 - February 21, 2012

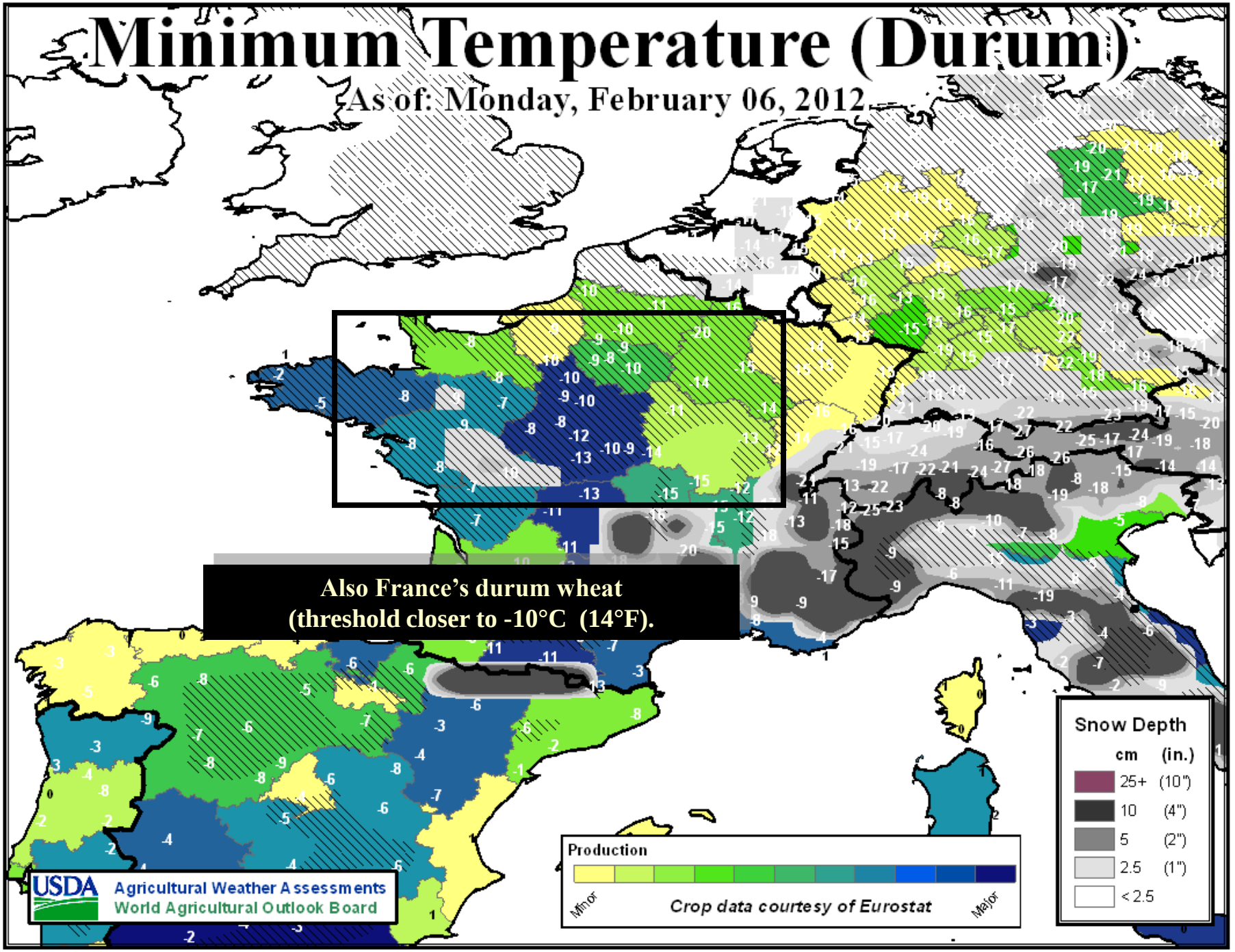


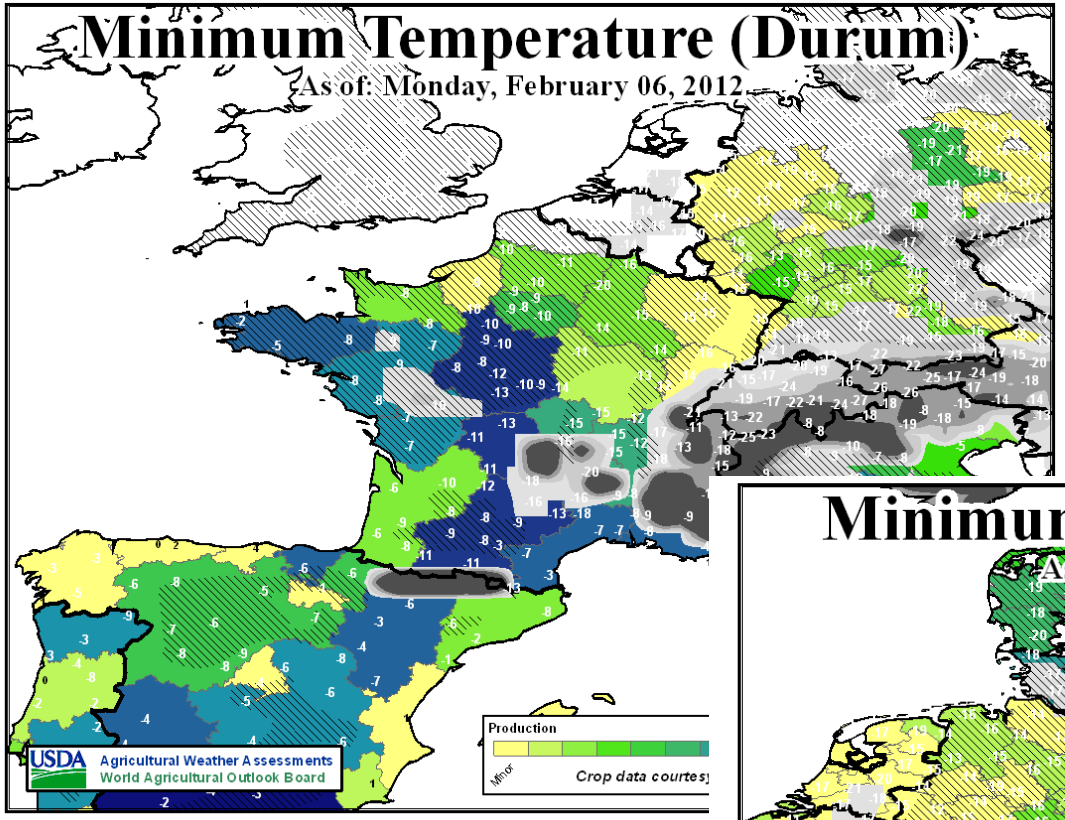
Conversely, Spain (and to a lesser extent Morocco) has slipped rapidly into drought, raising concerns for their wheat and barley; Spain, however, accounts for only ~5% of EU Wheat

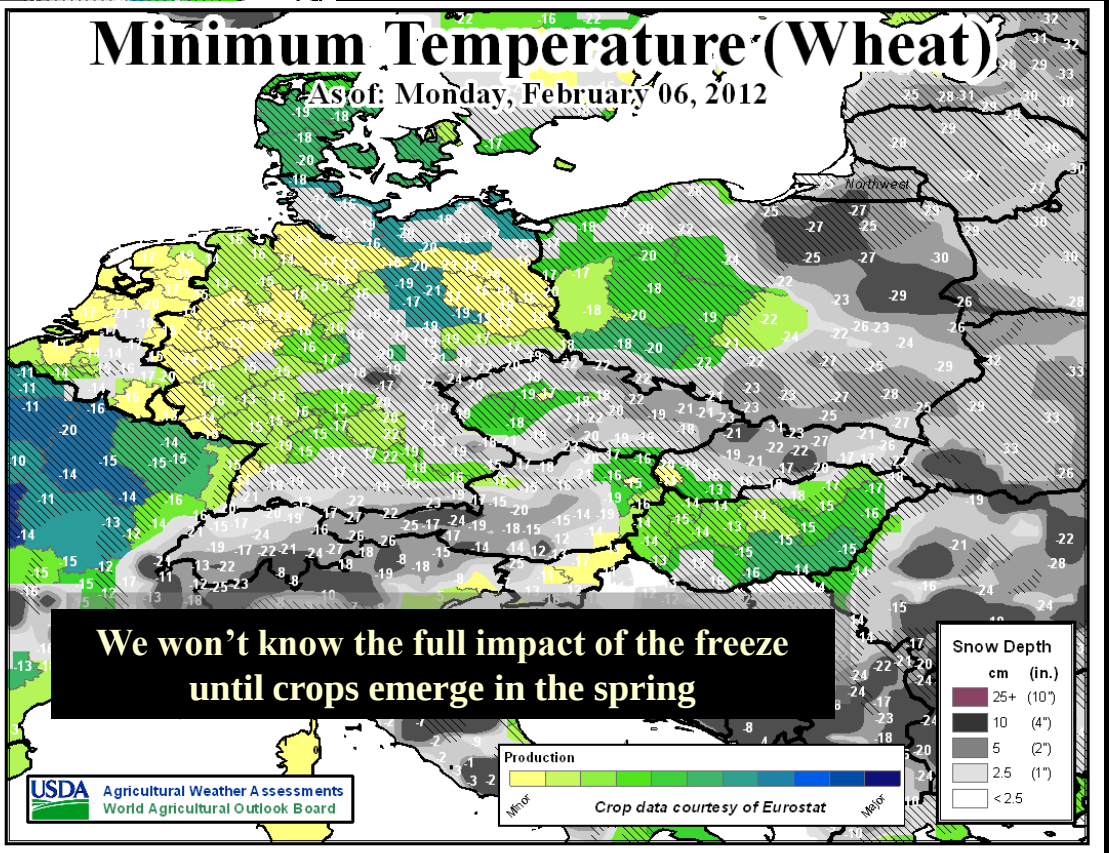

Topsoil Moisture: Diff vs LY
February 21, 2012
Northwest
Central
Volga
Urals
Siberia
Southern
(Percent)
400
300
250
200
175
150
125
100
75
50
25
10
+/- 10
-10
-20
-30
-40
-50
-60
-70
-80
-90+
Year-to-Year change in soil moisture highlights the dryness
USDA
Agricultural Weather Assessments
World Agricultural Outlook Board

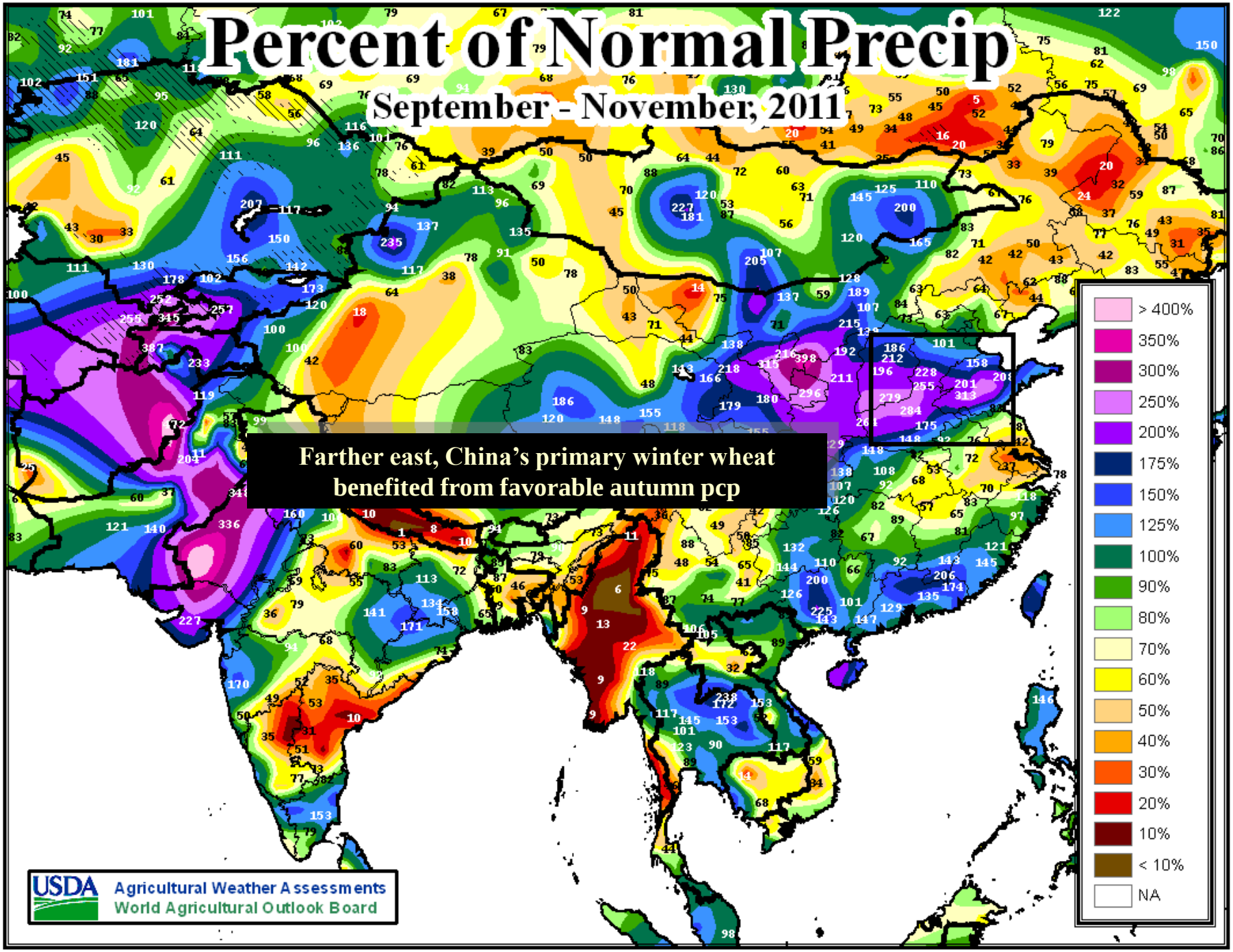

Minimum Temperature
As of: Thursday, February 16, 2012
The bigger concern in Europe will be the amount of winterkill in northern wheat and rapeseed areas…
USDA
Agricultural Weather Assessments
World Agricultural Outlook Board
C (F)
45 (113°)
40 (104°)
35 (95°)
30 (86°)
25 (77°)
20 (68°)
15 (59°)
10 (50°)
5 (41°)
>0 (>32°)
<0 (<32°)
-5 (23°)
-10 (14°)
-15 (5°)
-20 (-4°)
-25 (-13°)
-30 (-22°)
-35 (-31°)
-40 (-40°)
-45 (-49°)
-50 (-58°)

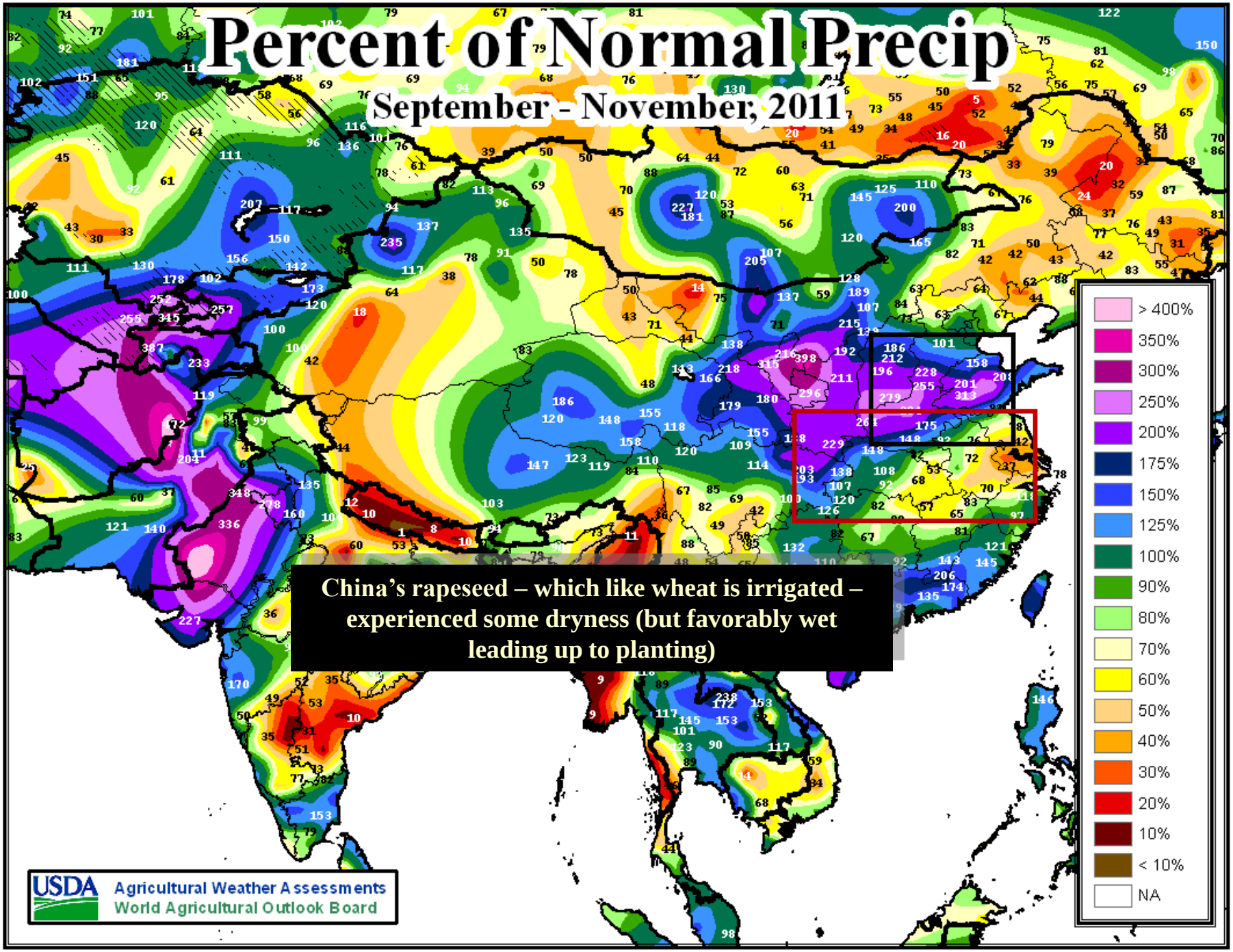

Minimum Temperature (Wheat)
As of: Monday, February 06, 2012
Northwest
The threshold for burnback/winterkill is ~ -18°C (0°F);
Min temps are overlaid on wheat areas, and lack of snow cover
in key wheat and rapeseed areas of northeast Germany and
northwest Poland increasing the risk for winterkill
Snow Depth
cm (in.)
25+ (10")
10 (4")
5 (2")
2.5 (1")
< 2.5
Production
Minor
Major
Crop data courtesy of Eurostat
USDA
Agricultural Weather Assessments
World Agricultural Outlook Board

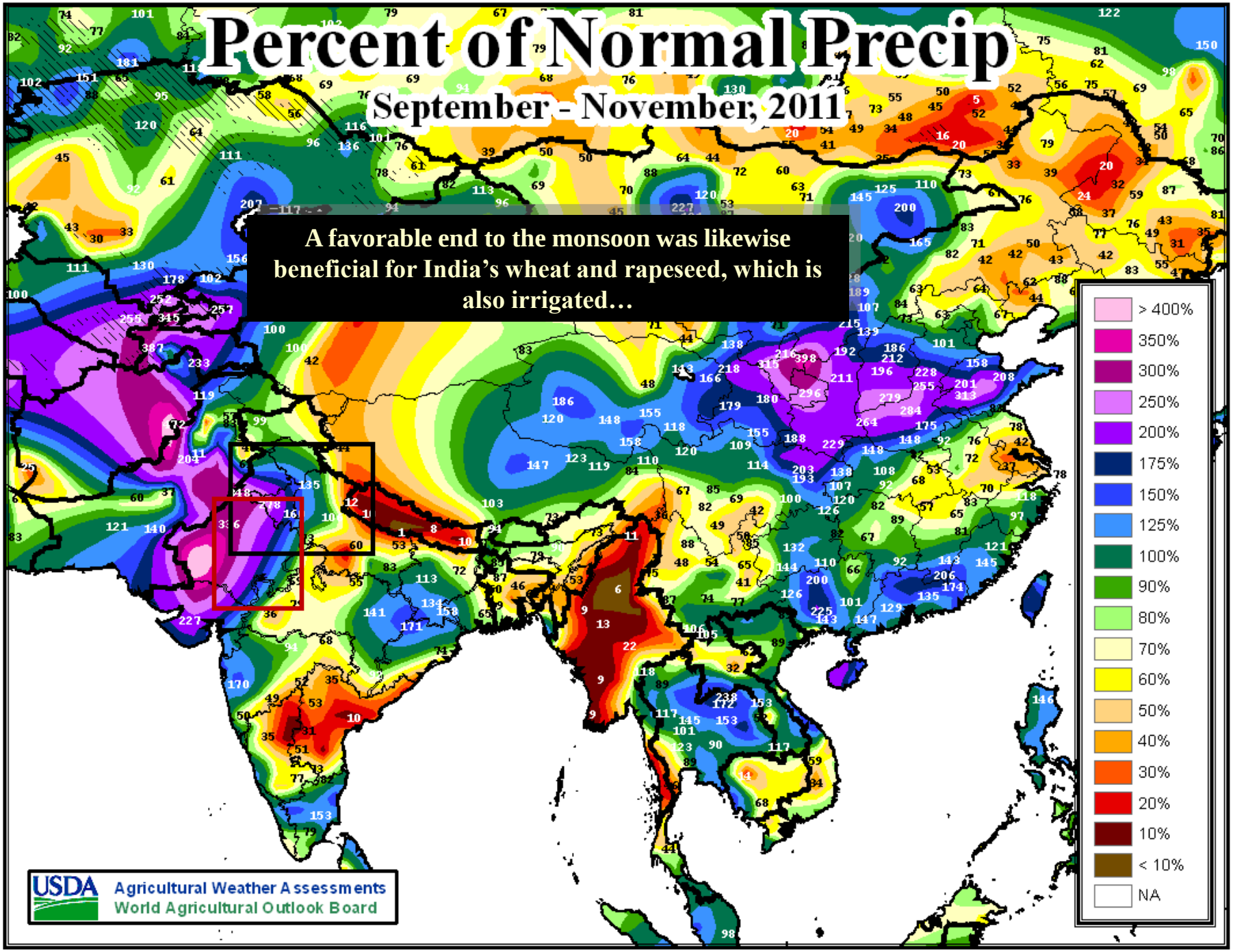

Minimum Temperature (Durum)
As of: Monday, February 06, 2012
Also France's durum wheat
(threshold closer to -10°C (14°F).
Snow Depth
cm (in.)
25+ (10")
10 (4")
5 (2")
2.5 (1")
< 2.5
Production
Minor
Major
Crop data courtesy of Eurostat
USDA
Agricultural Weather Assessments
World Agricultural Outlook Board


Minimum Temperature (Durum)
As of: Monday, February 06, 2012
USDA
Agricultural Weather Assessments
World Agricultural Outlook Board
Production
Minor
Crop data courtesy


Minimum Temperature (Wheat)
As of: Monday, February 06, 2012
Northwest
We won't know the full impact of the freeze
until crops emerge in the spring
Snow Depth
cm (in.)
25+ (10")
10 (4")
5 (2")
2.5 (1")
< 2.5
USDA
Agricultural Weather Assessments
World Agricultural Outlook Board
Production
Minor
Crop data courtesy of Eurostat
Major


Percent of Normal Precip
September - November, 2011
Farther east, China's primary winter wheat benefited from favorable autumn pcp
> 400%
350%
300%
250%
200%
175%
150%
125%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
< 10%
NA
USDA
Agricultural Weather Assessments
World Agricultural Outlook Board


Percent of Normal Precip
September - November, 2011
China's rapeseed – which like wheat is irrigated – experienced some dryness (but favorably wet leading up to planting)
> 400%
350%
300%
250%
200%
175%
150%
125%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
< 10%
NA
USDA
Agricultural Weather Assessments
World Agricultural Outlook Board


Percent of Normal Precip
September - November, 2011
A favorable end to the monsoon was likewise beneficial for India's wheat and rapeseed, which is also irrigated…
> 400%
350%
300%
250%
200%
175%
150%
125%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
< 10%
NA
USDA
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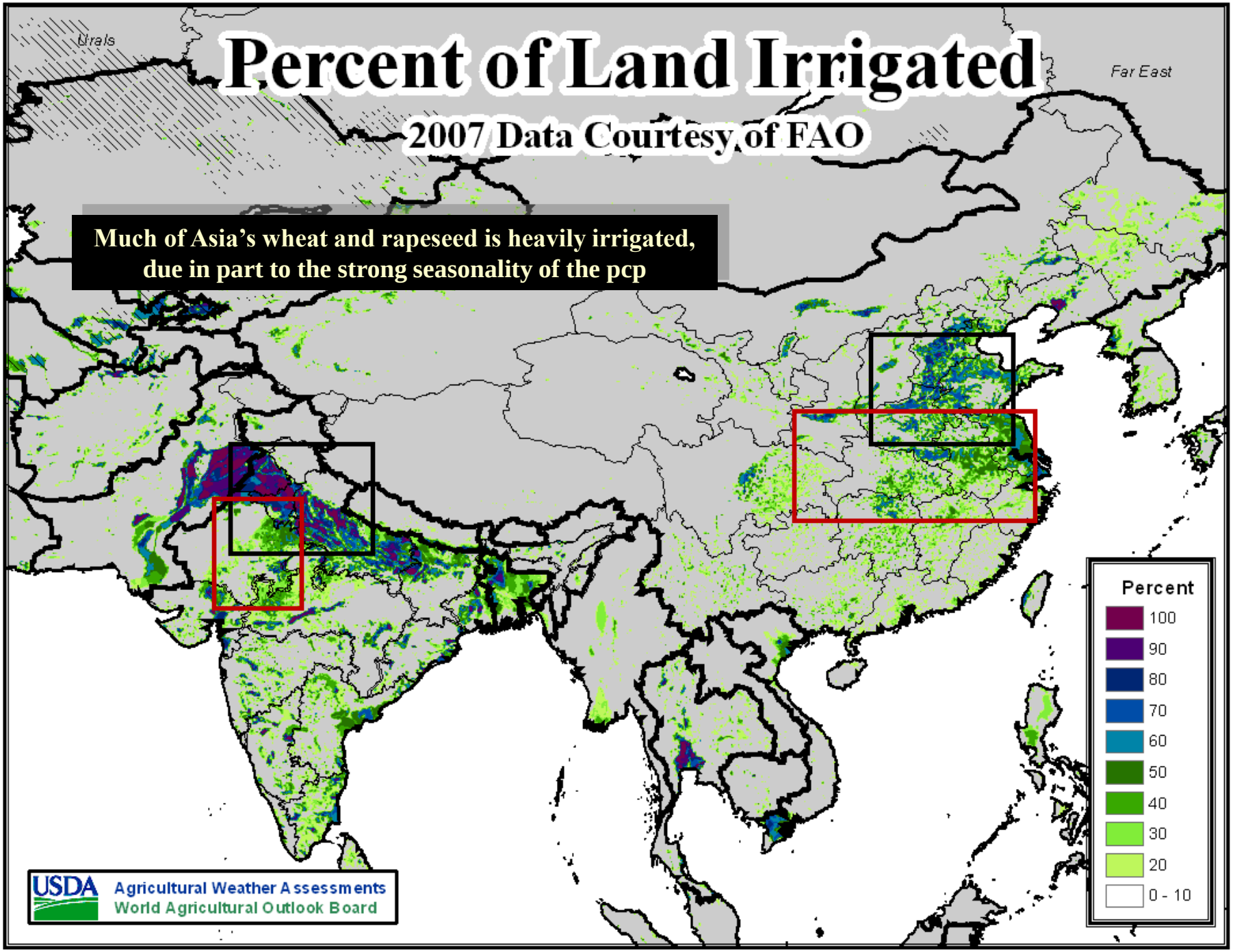
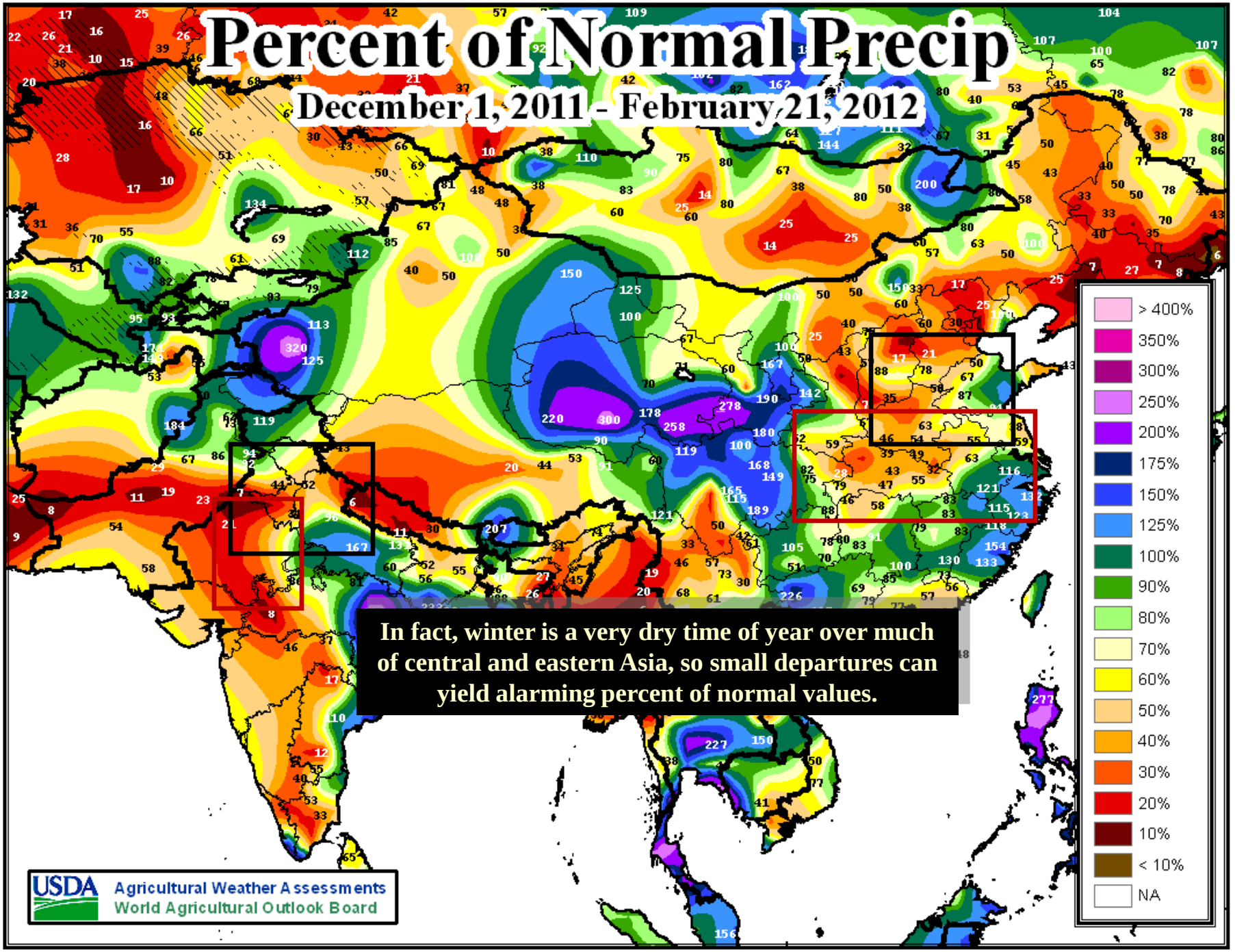
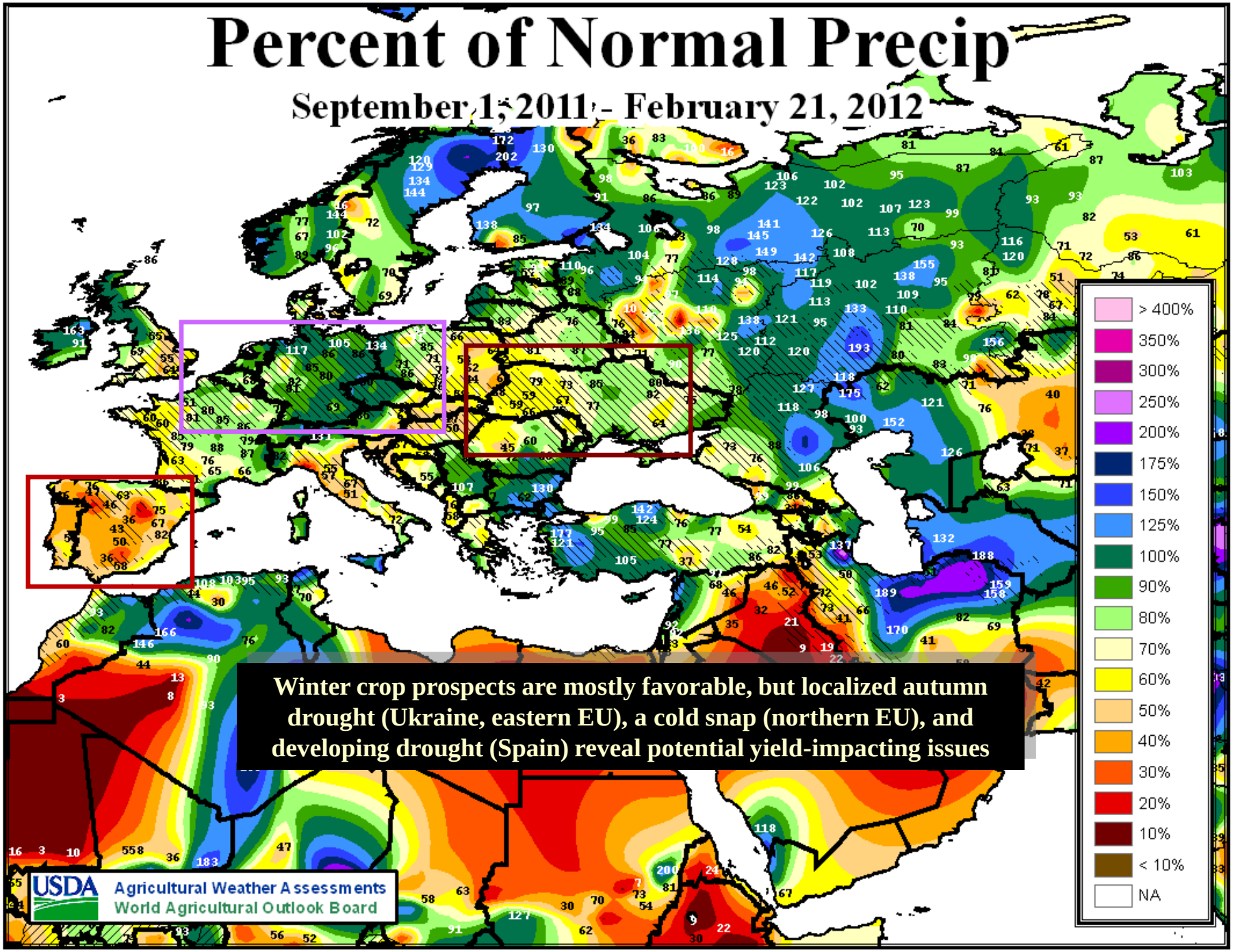

Urals
Far East
Percent of Land Irrigated
2007 Data Courtesy of FAO
Much of Asia's wheat and rapeseed is heavily irrigated, due in part to the strong seasonality of the pcp
Percent
100
90
80
70
60
50
40
30
20
0 - 10
USDA
Agricultural Weather Assessments
World Agricultural Outlook Board

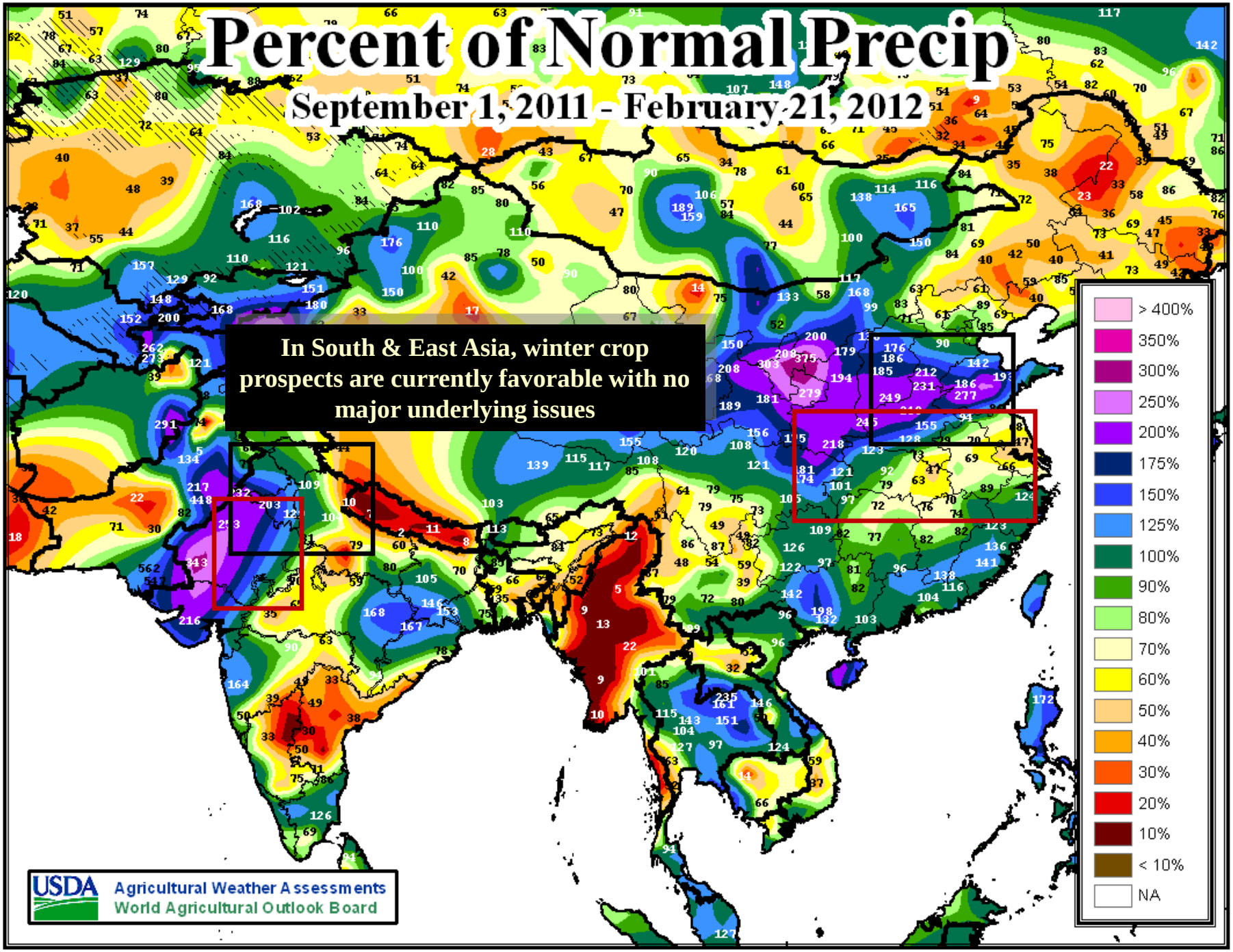

Percent of Normal Precip
December 1, 2011 - February 21, 2012
In fact, winter is a very dry time of year over much of central and eastern Asia, so small departures can yield alarming percent of normal values.
USDA Agricultural Weather Assessments
World Agricultural Outlook Board
> 400%
350%
300%
250%
200%
175%
150%
125%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
< 10%
NA

Percent of Normal Precip

September 1, 2011 - February 21, 2012



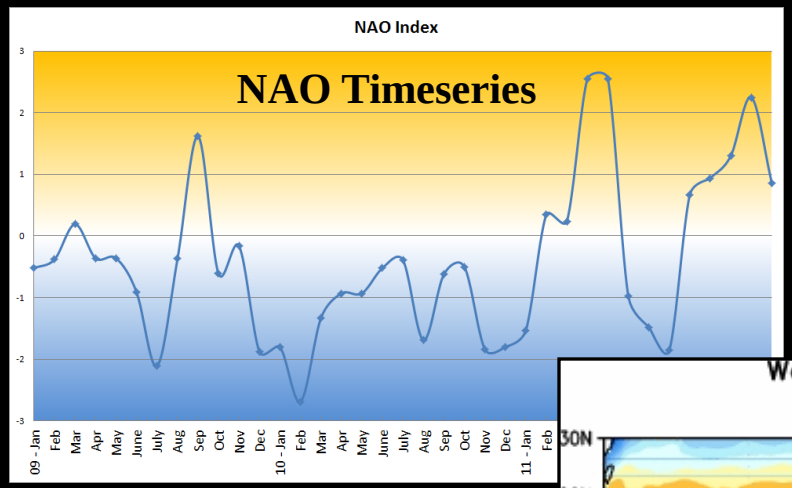
Winter crop prospects are mostly favorable, but localized autumn drought (Ukraine, eastern EU), a cold snap (northern EU), and developing drought (Spain) reveal potential yield-impacting issues

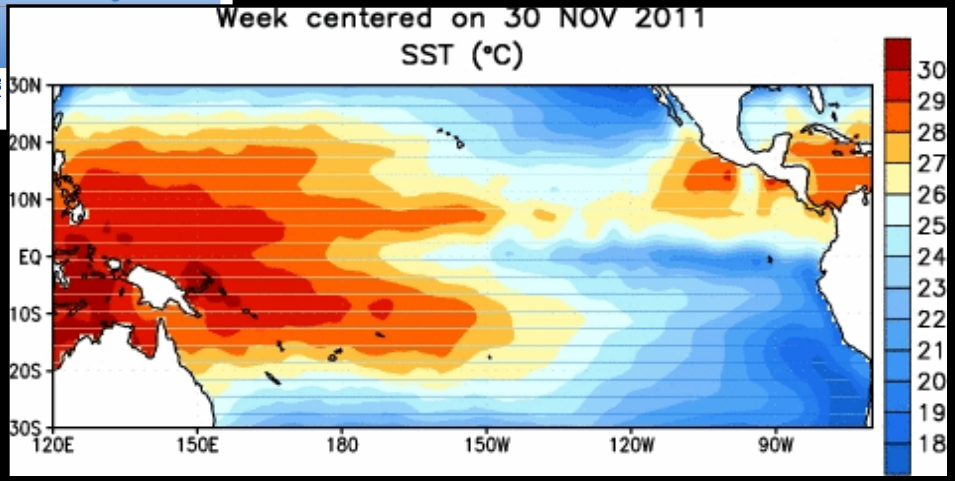

Percent of Normal Precip
September 1, 2011 - February 21, 2012
In South & East Asia, winter crop prospects are currently favorable with no major underlying issues
> 400%
350%
300%
250%
200%
175%
150%
125%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
< 10%
NA
USDA
Agricultural Weather Assessments
World Agricultural Outlook Board

Primary Tools for Long Range Forecasts

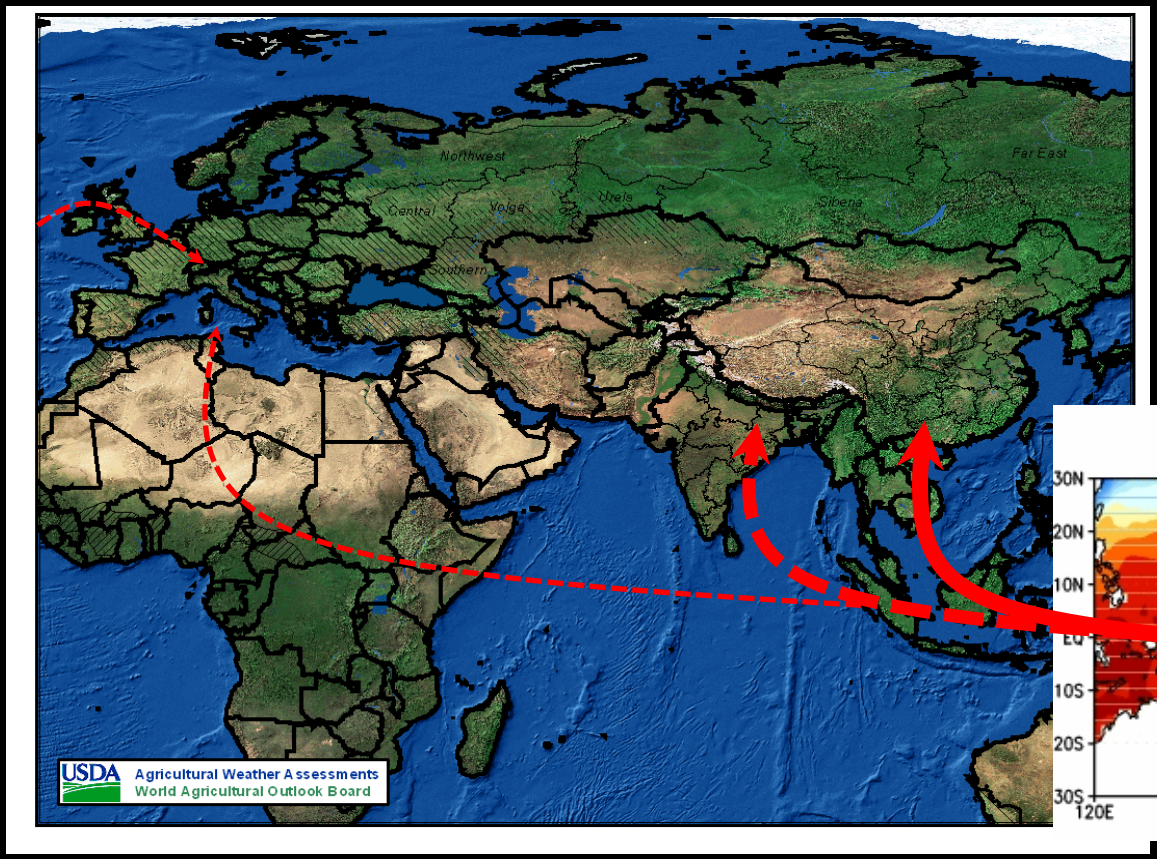
· Currently: "Where do we stand heading into the spring?"

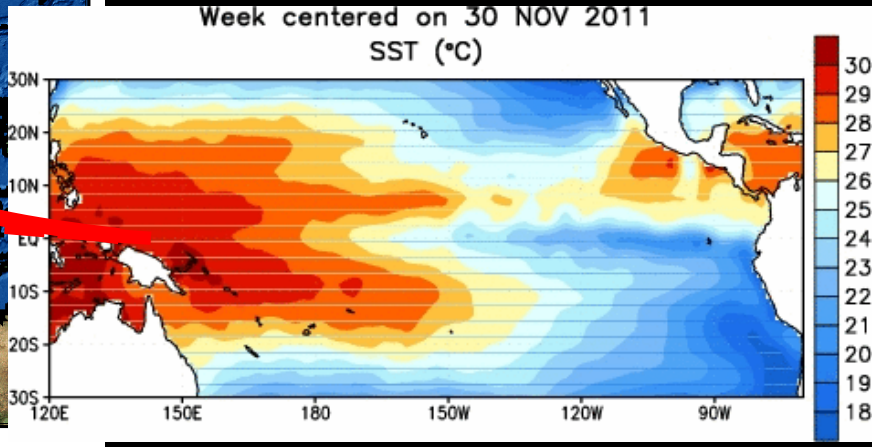
· Climate Indices: El Nino, La Nina, North Atlantic Oscillation (NAO), etc…





La Niña/El Niño Impacts

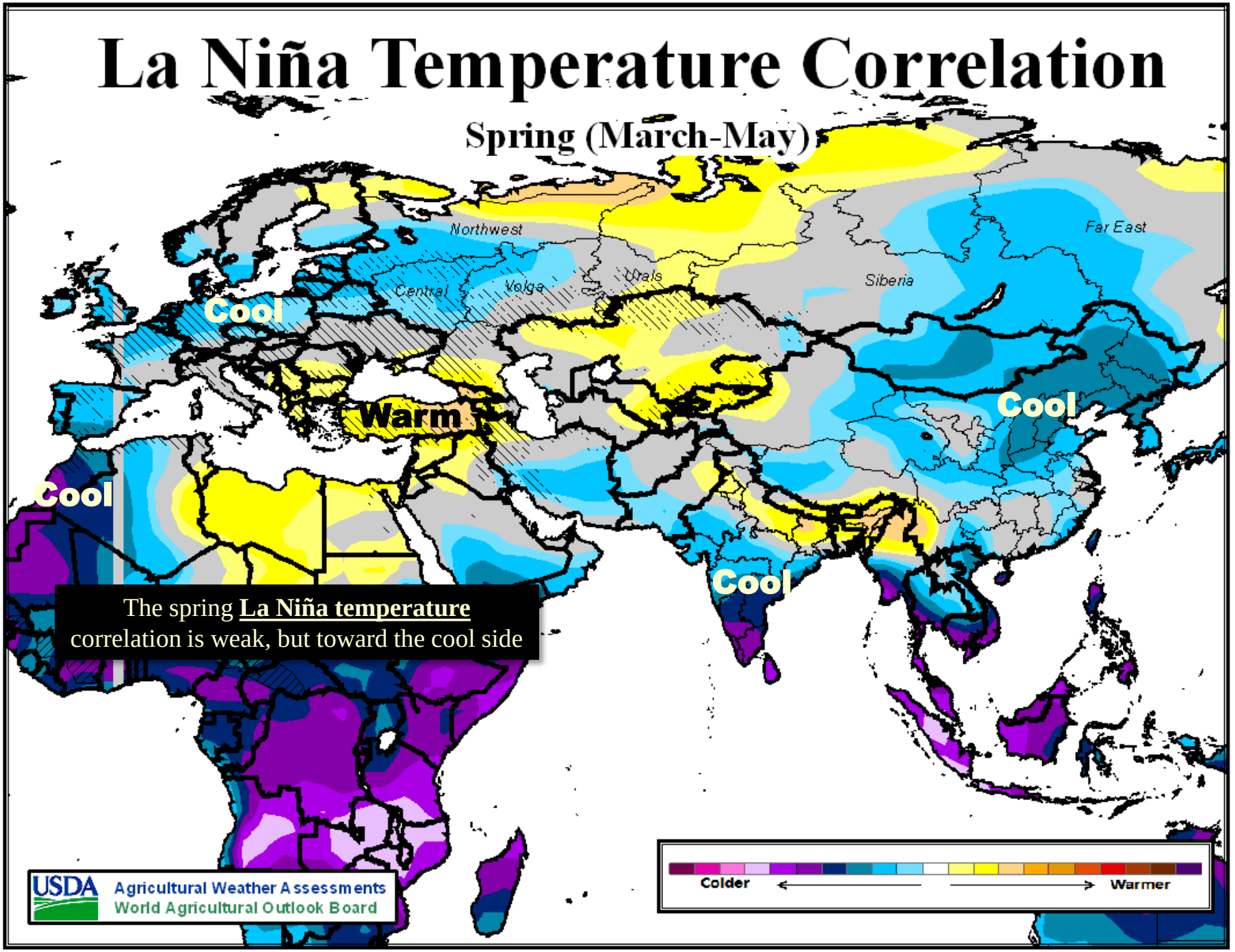




La Niña weather impacts are greatest the closer you are to the actual phenomenon

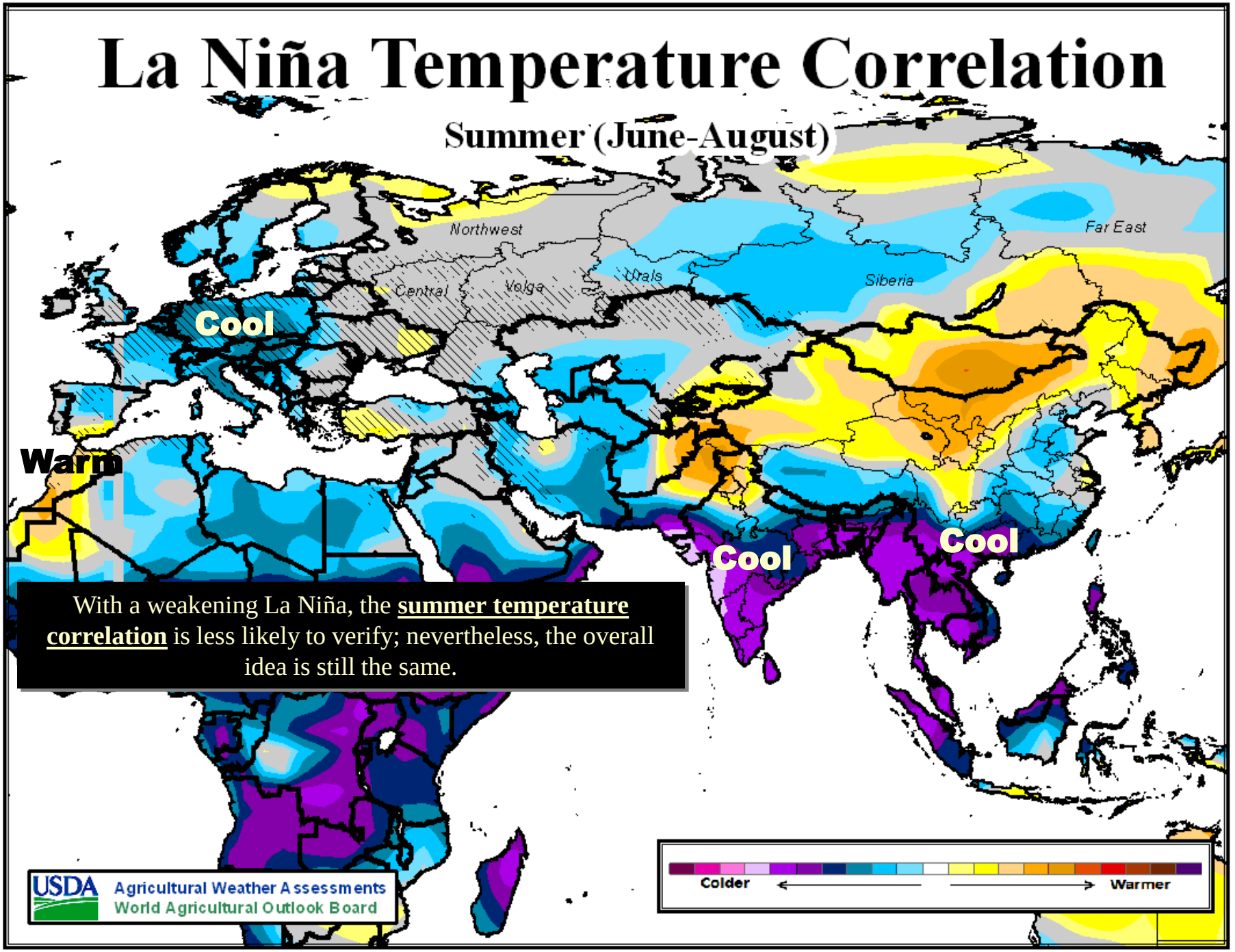
La Niña Temperature Correlation

Spring (March-May)



Data provided by the NOAA/ESRL Physical Sciences Division, Boulder Colorado from their Web site at *http://www.esrl.noaa.gov/psd*

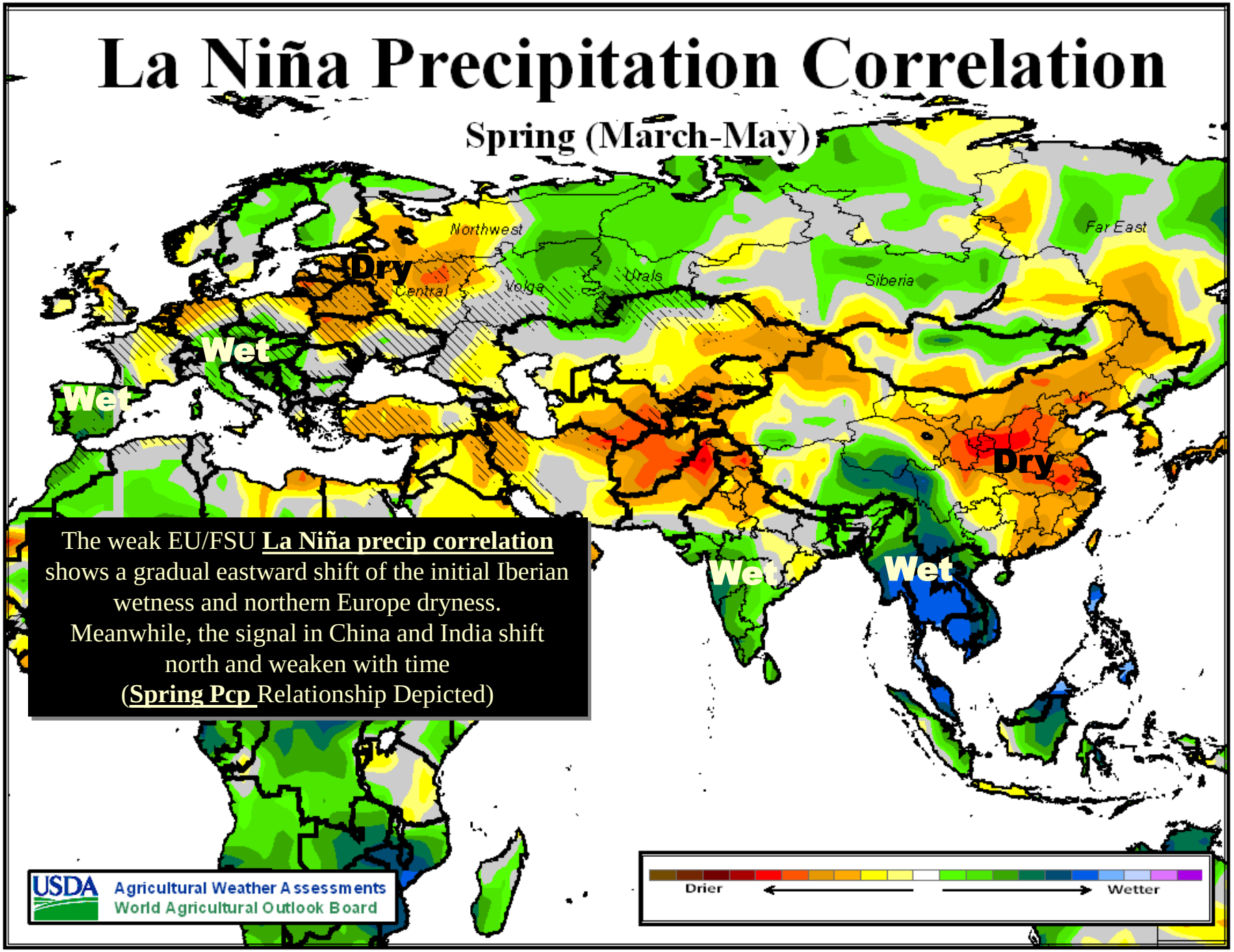
La Niña Temperature Correlation



Data provided by the NOAA/ESRL Physical Sciences Division, Boulder Colorado from their Web site at *http://www.esrl.noaa.gov/psd*

La Niña Precipitation Correlation

Spring (March-May)



The weak EU/FSU **La Niña precip correlation** shows a gradual eastward shift of the initial Iberian wetness and northern Europe dryness. Meanwhile, the signal in China and India shift north and weaken with time (**Spring Pcp** Relationship Depicted)

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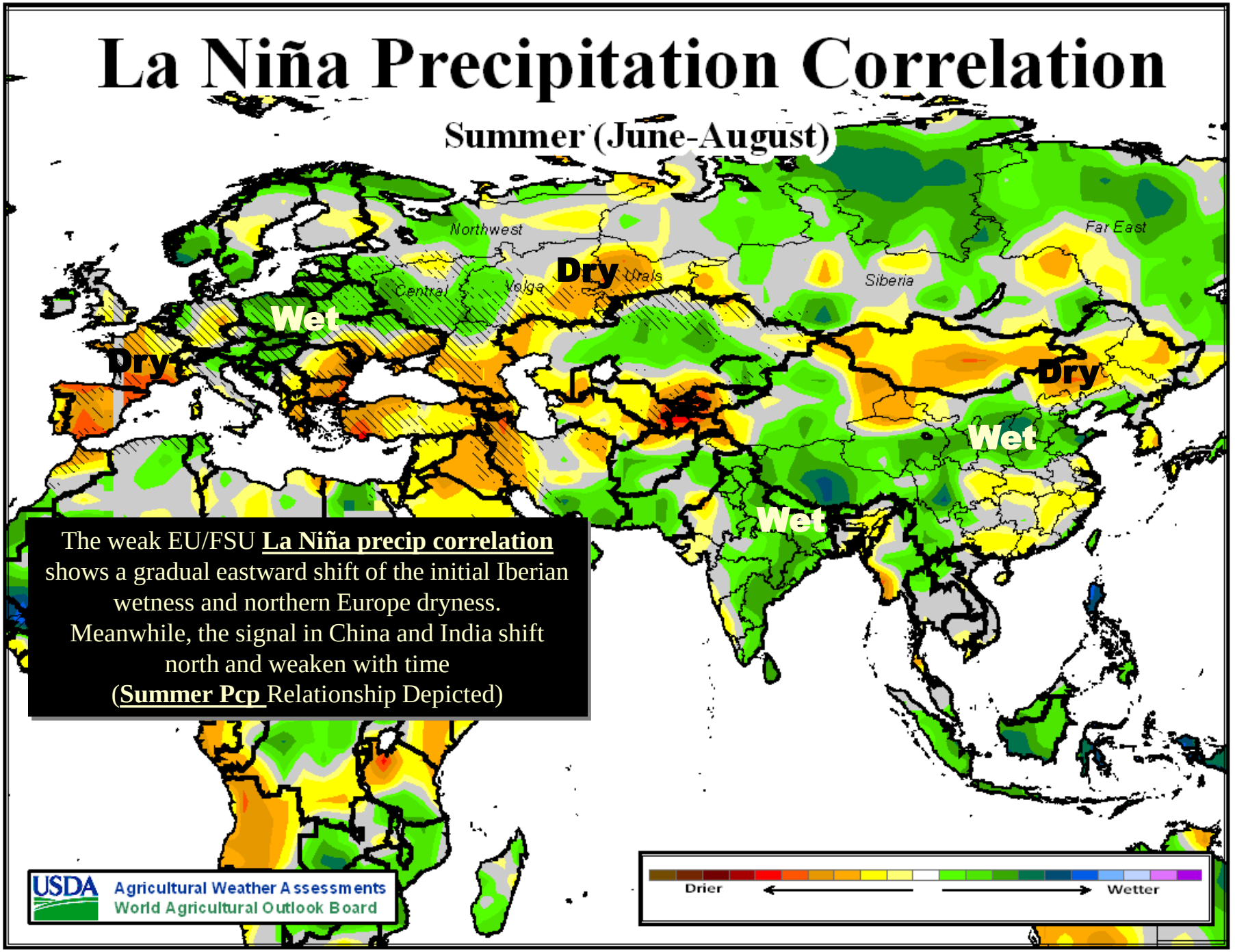
Data provided by the NOAA/ESRL Physical Sciences Division, Boulder Colorado from their Web site at *http://www.esrl.noaa.gov/psd*

La Niña Precipitation Correlation

Summer (June-August)



The weak EU/FSU **La Niña precip correlation** shows a gradual eastward shift of the initial Iberian wetness and northern Europe dryness. Meanwhile, the signal in China and India shift north and weaken with time (**Summer Pcp** Relationship Depicted)

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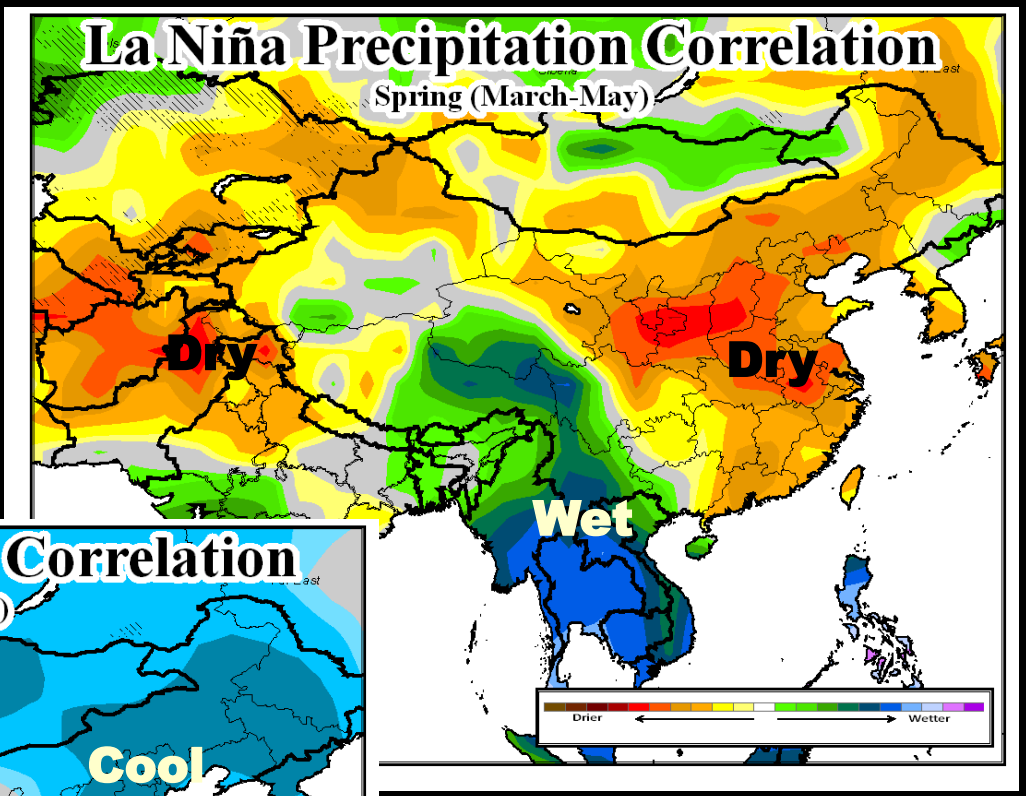
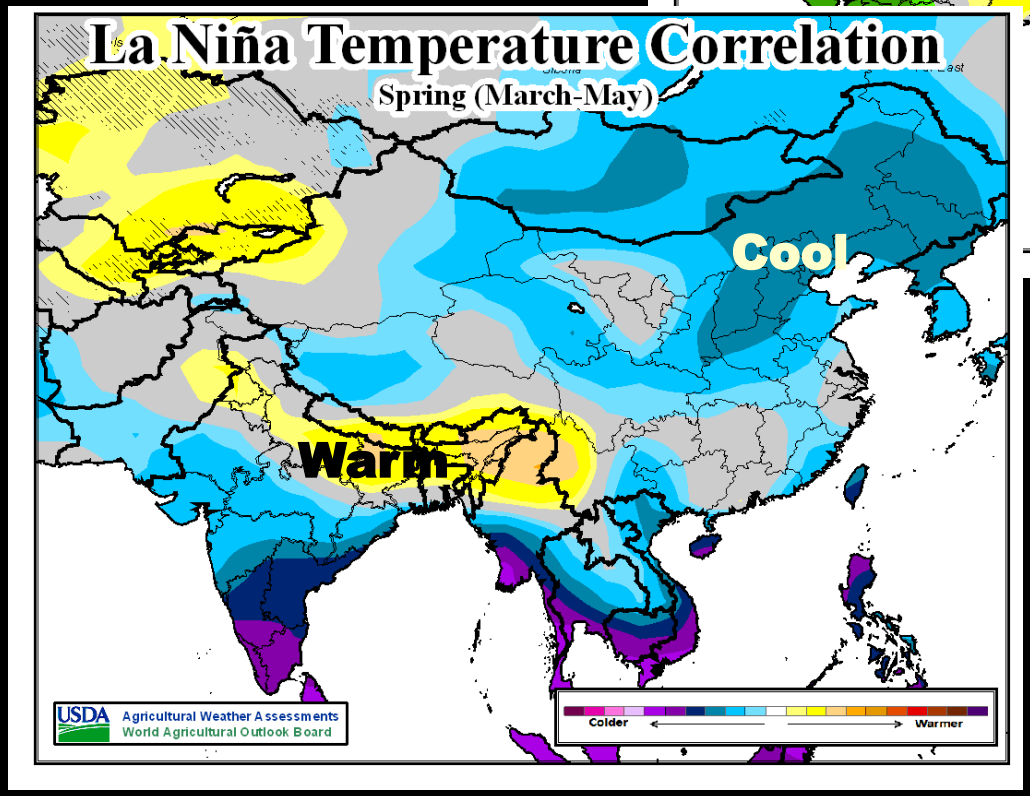
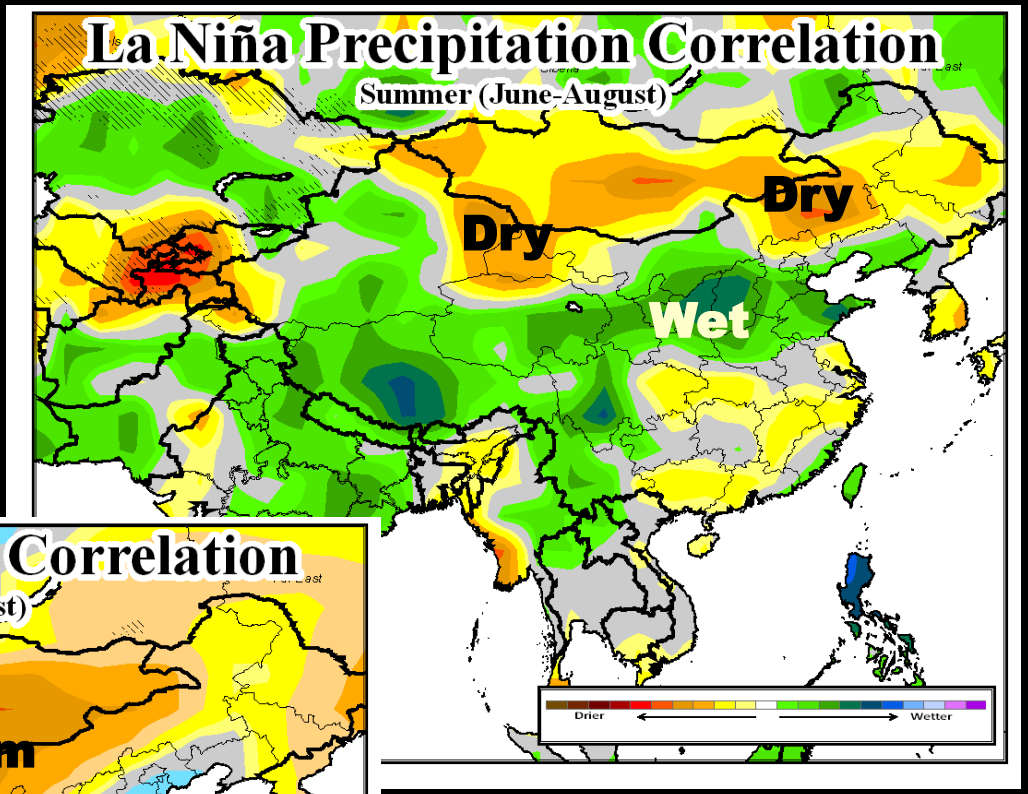
Data provided by the NOAA/ESRL Physical Sciences Division, Boulder Colorado from their Web site at *http://www.esrl.noaa.gov/psd*

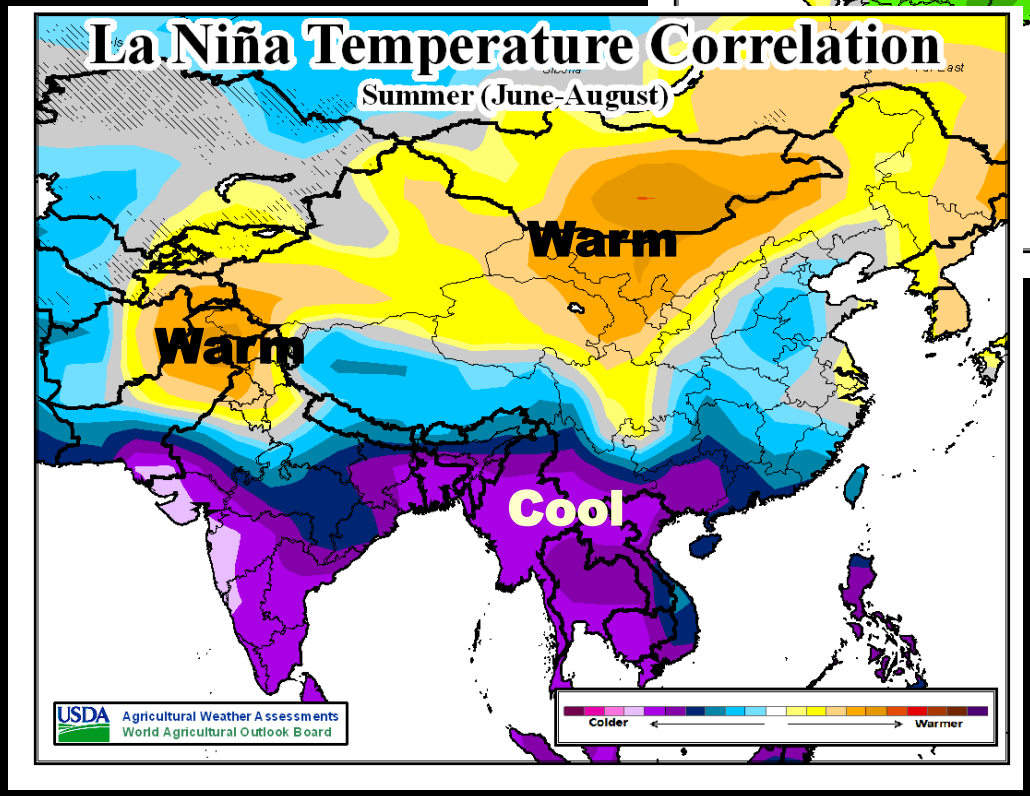
In short, La Niña supports a cooler- and drier-than-normal **spring** in nrn India and much of China



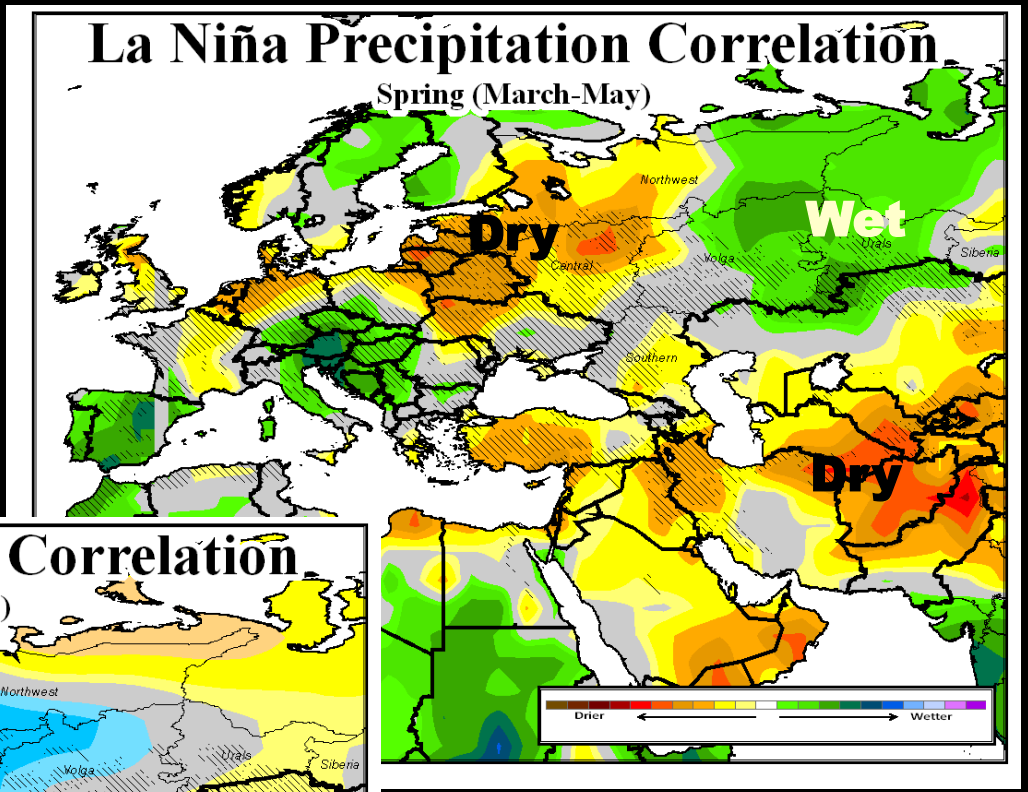


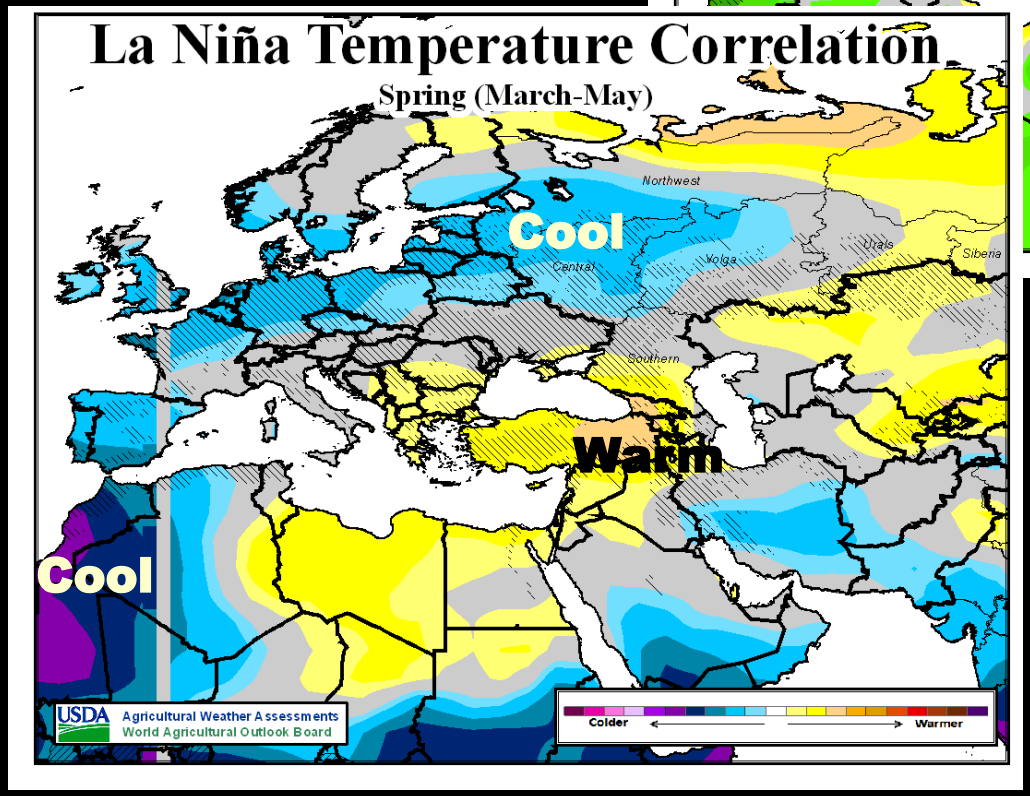
If La Niña holds on into the **summer**, it would suggest cooler summer weather and some enhanced nrn rainfall in Asia





While La Niña does play a small role in **Europe**, there's a much closer, larger-impacting phenomenon to assess…





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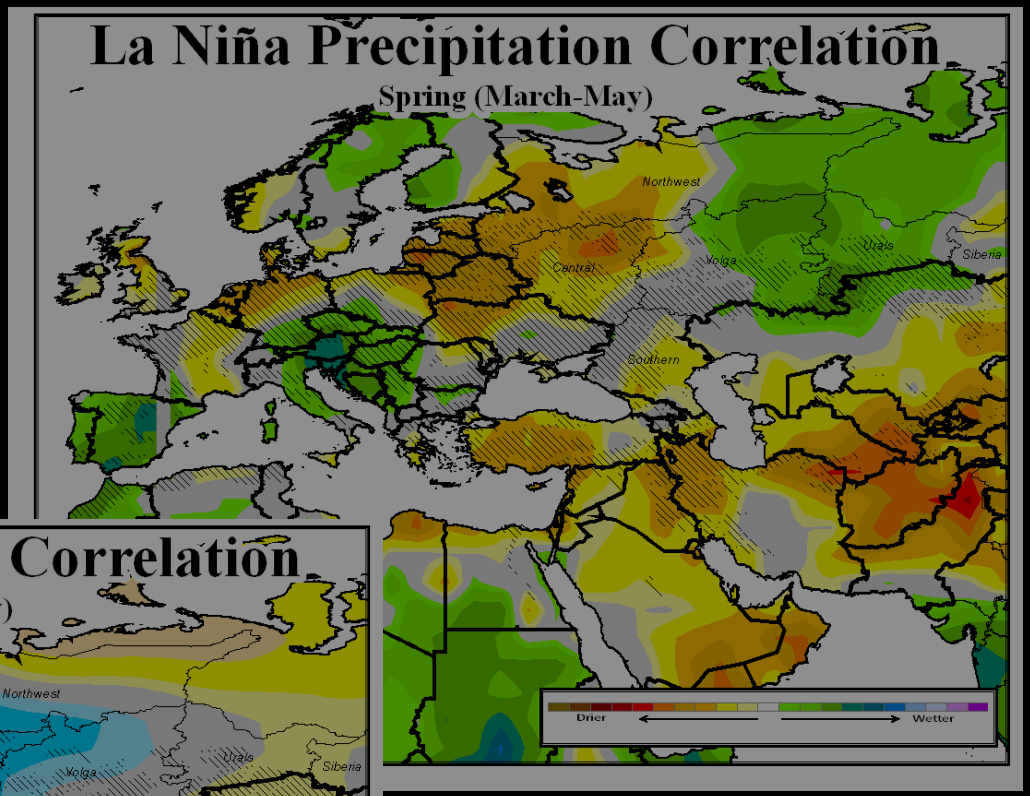
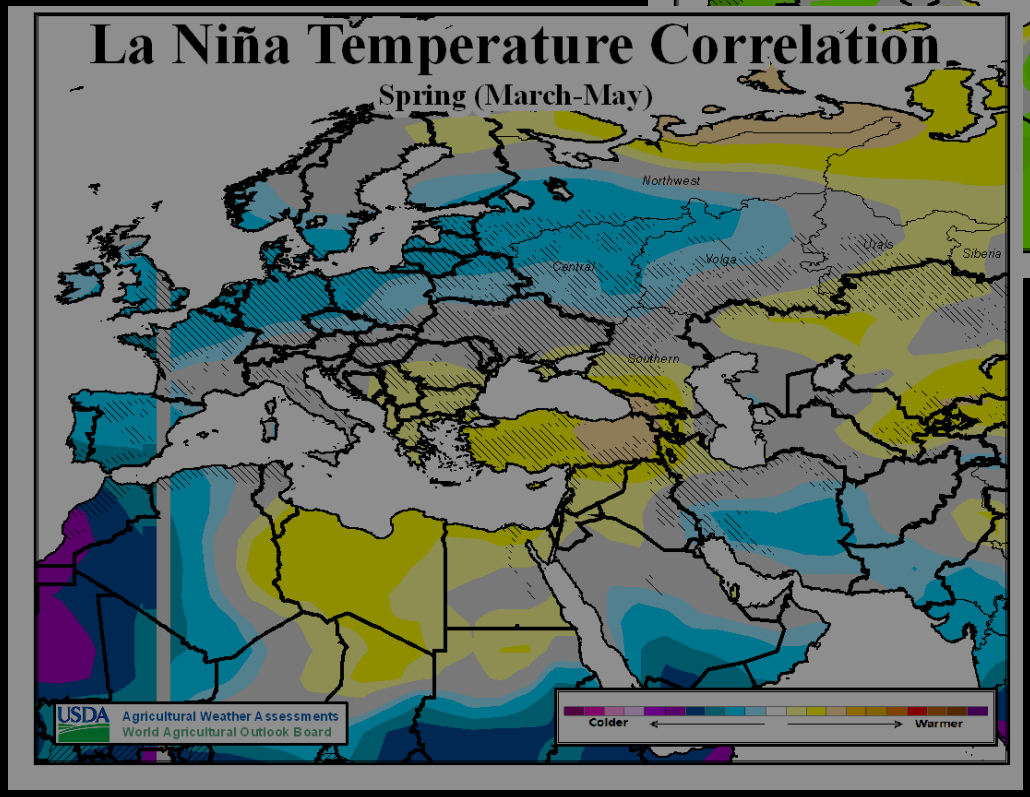
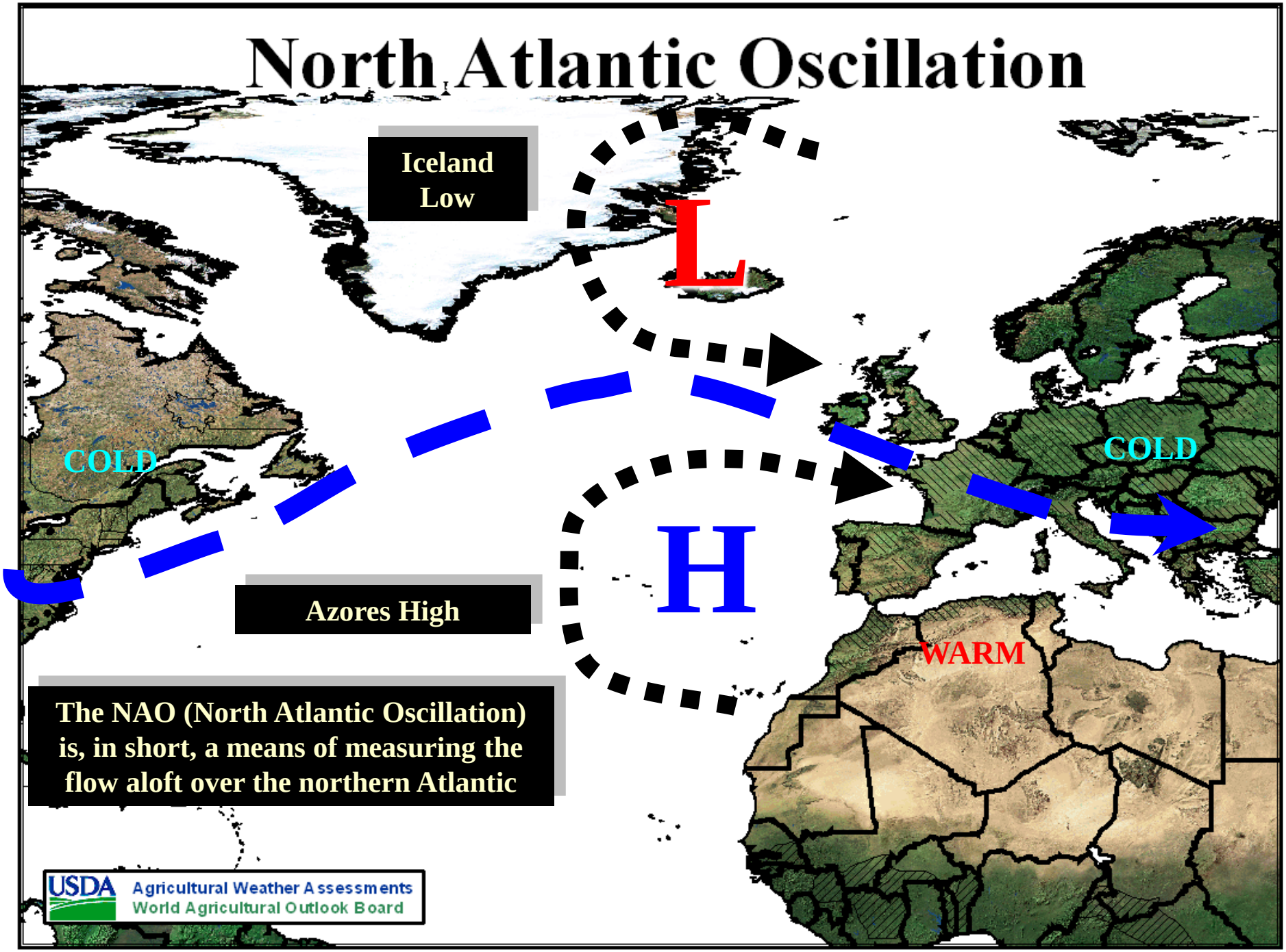
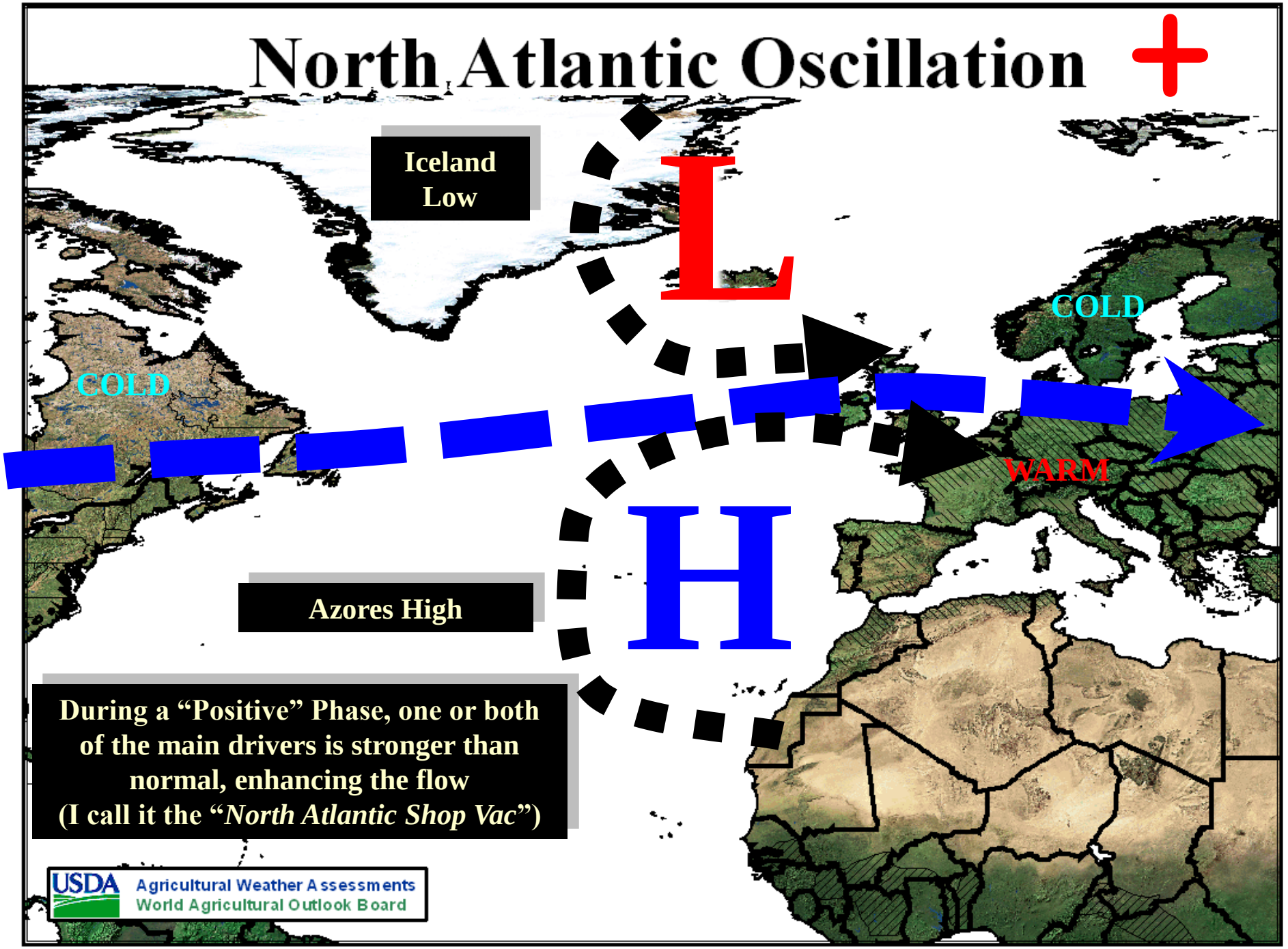




North Atlantic Oscillation




North Atlantic Oscillation
+
Iceland Low
L
COLD
COLD
WARM
H
Azores High
During a "Positive" Phase, one or both of the main drivers is stronger than normal, enhancing the flow
(I call it the "*North Atlantic Shop Vac*")
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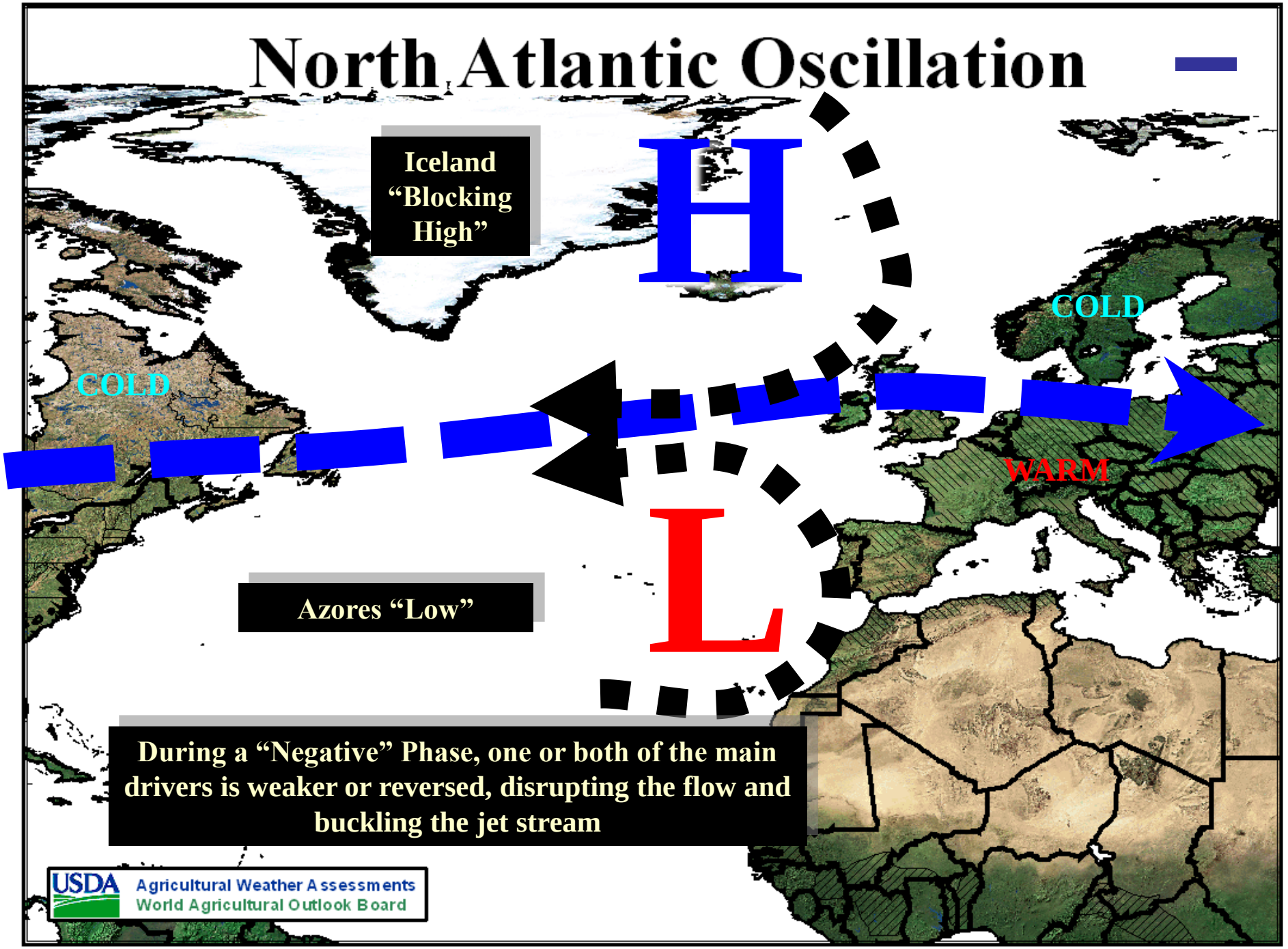
North Atlantic Oscillation
Iceland "Blocking High"
H
COLD
COLD
WARM
L
Azores "Low"
During a "Negative" Phase, one or both of the main drivers is weaker or reversed, disrupting the flow and buckling the jet stream
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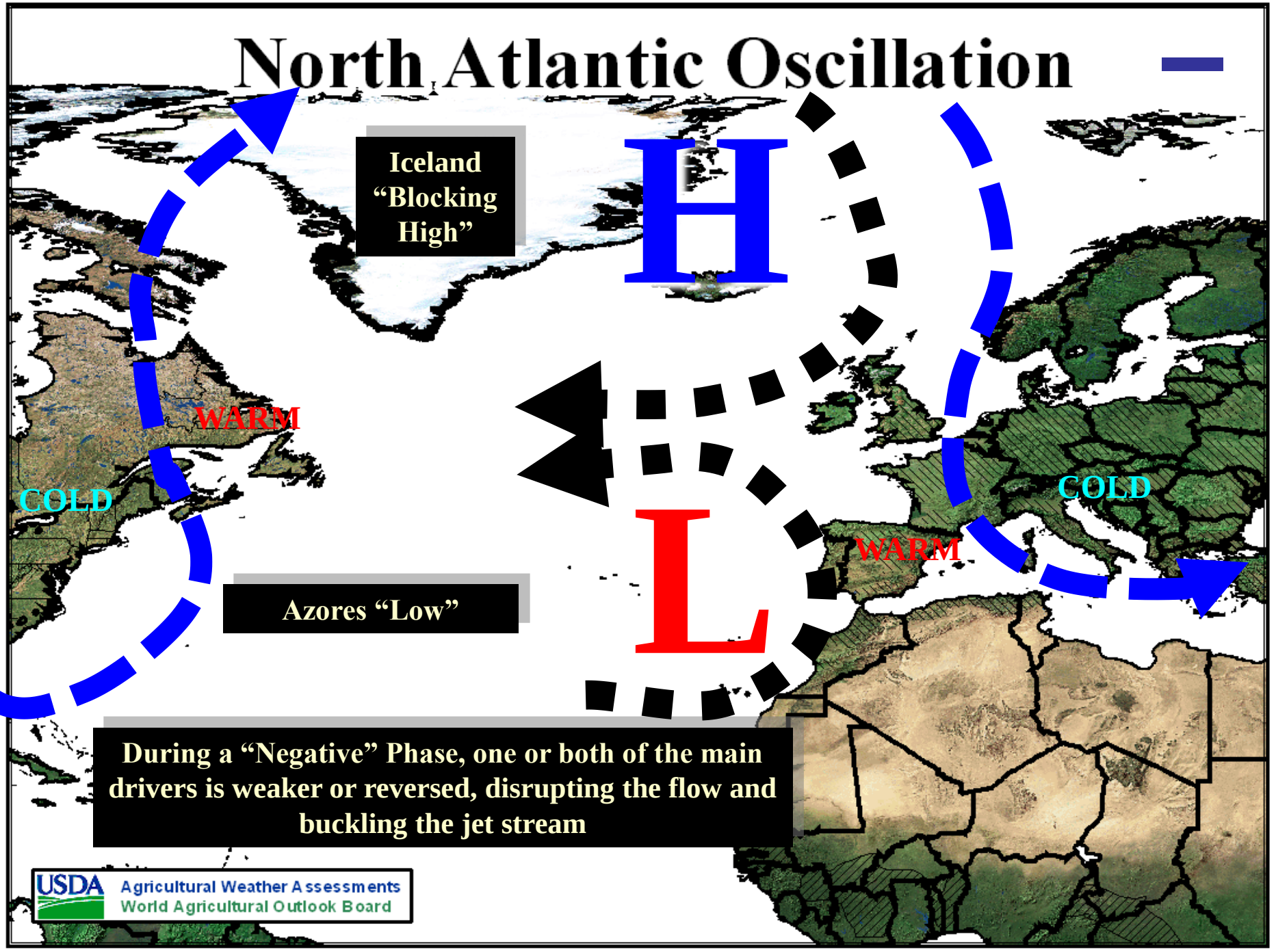
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H
WARM
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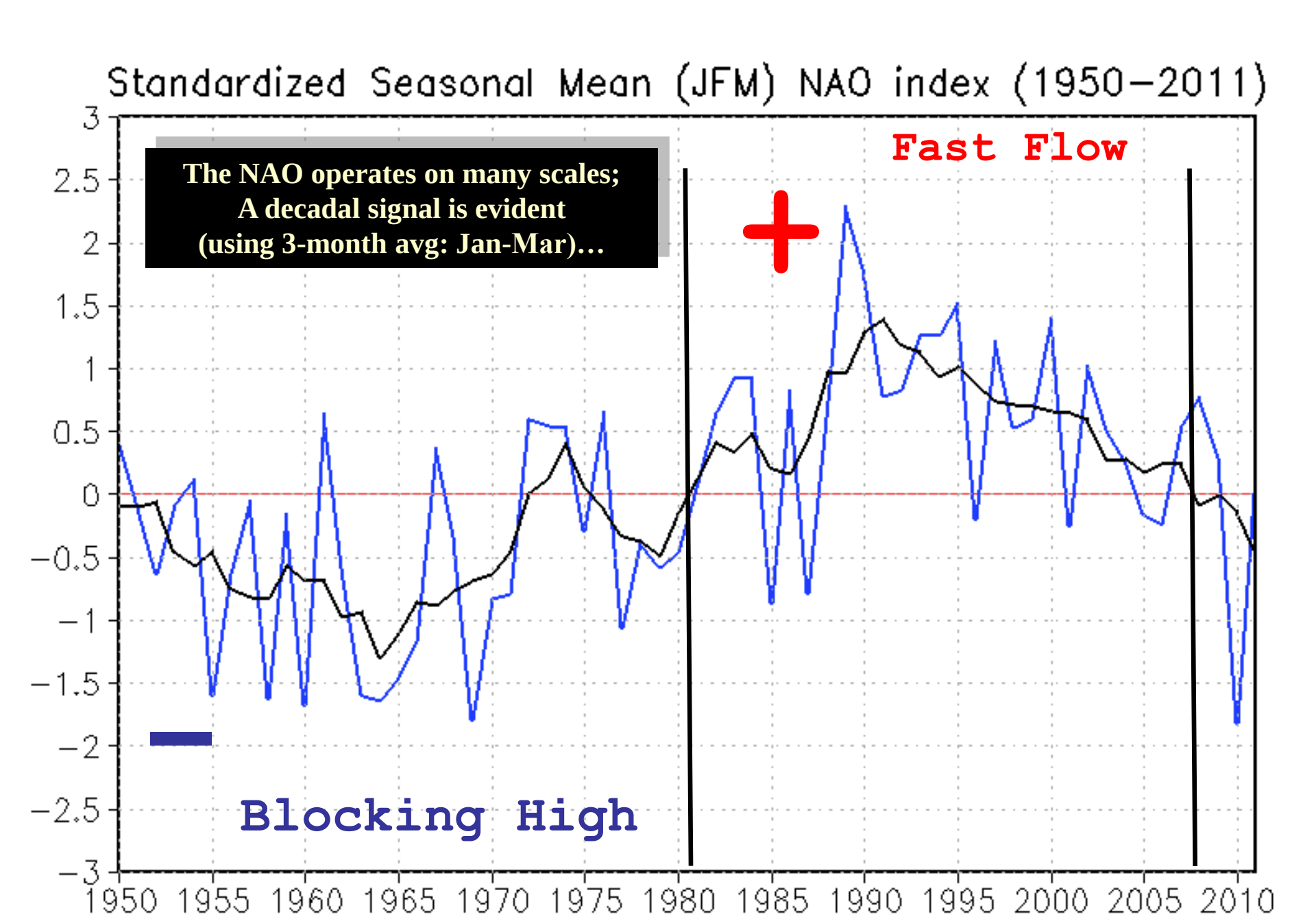
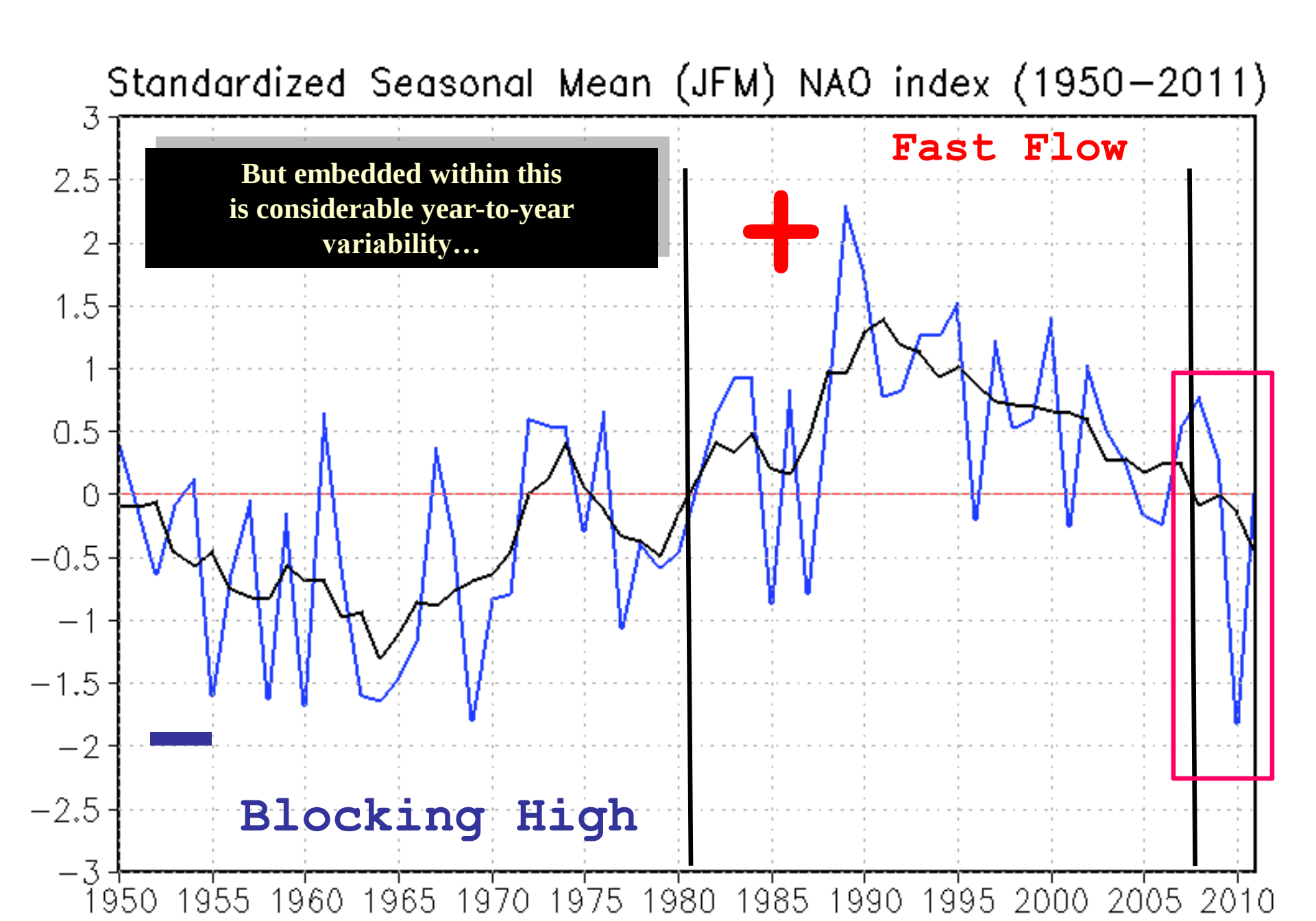


Source: NOAA/NCEP Climate Prediction Center



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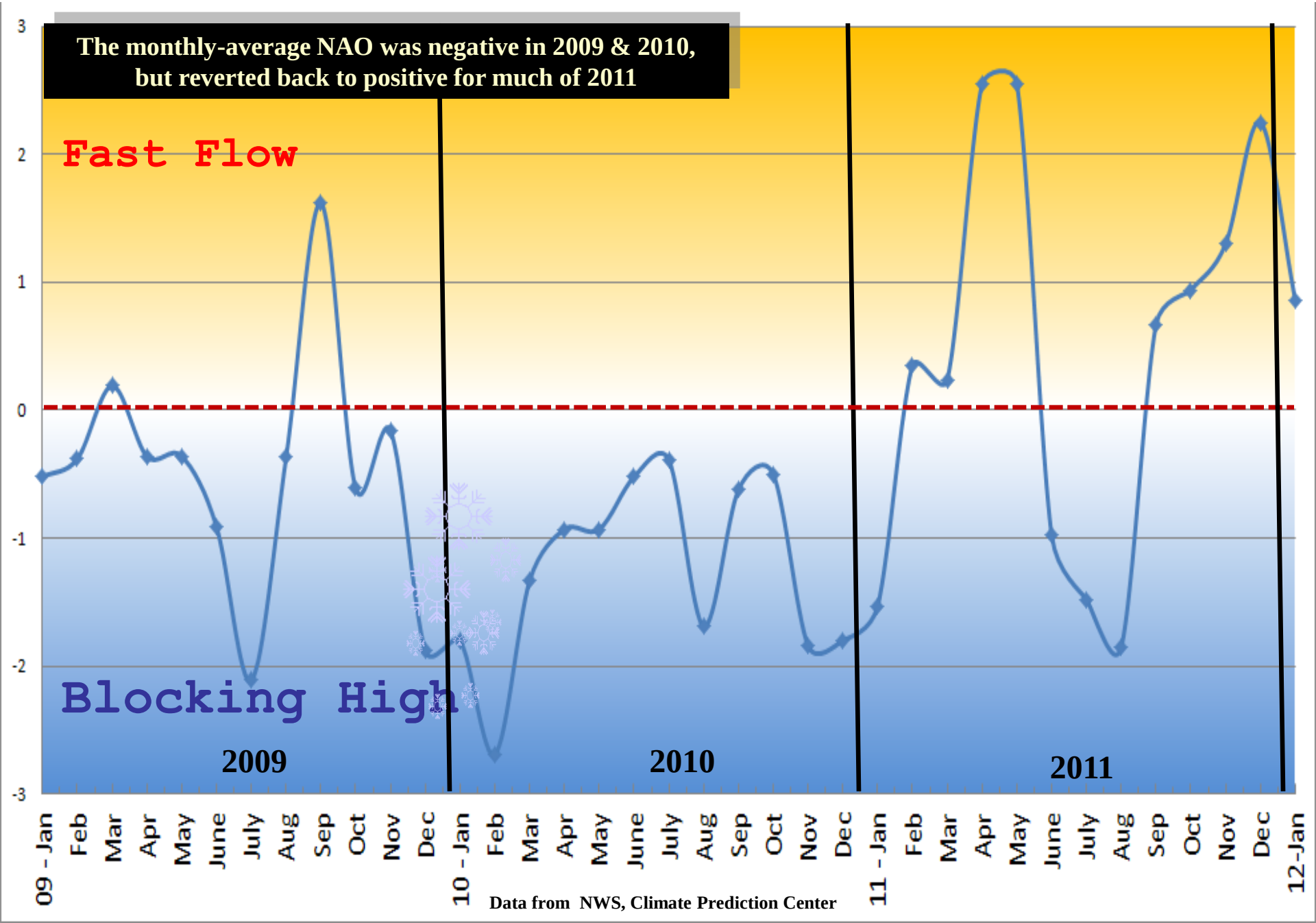
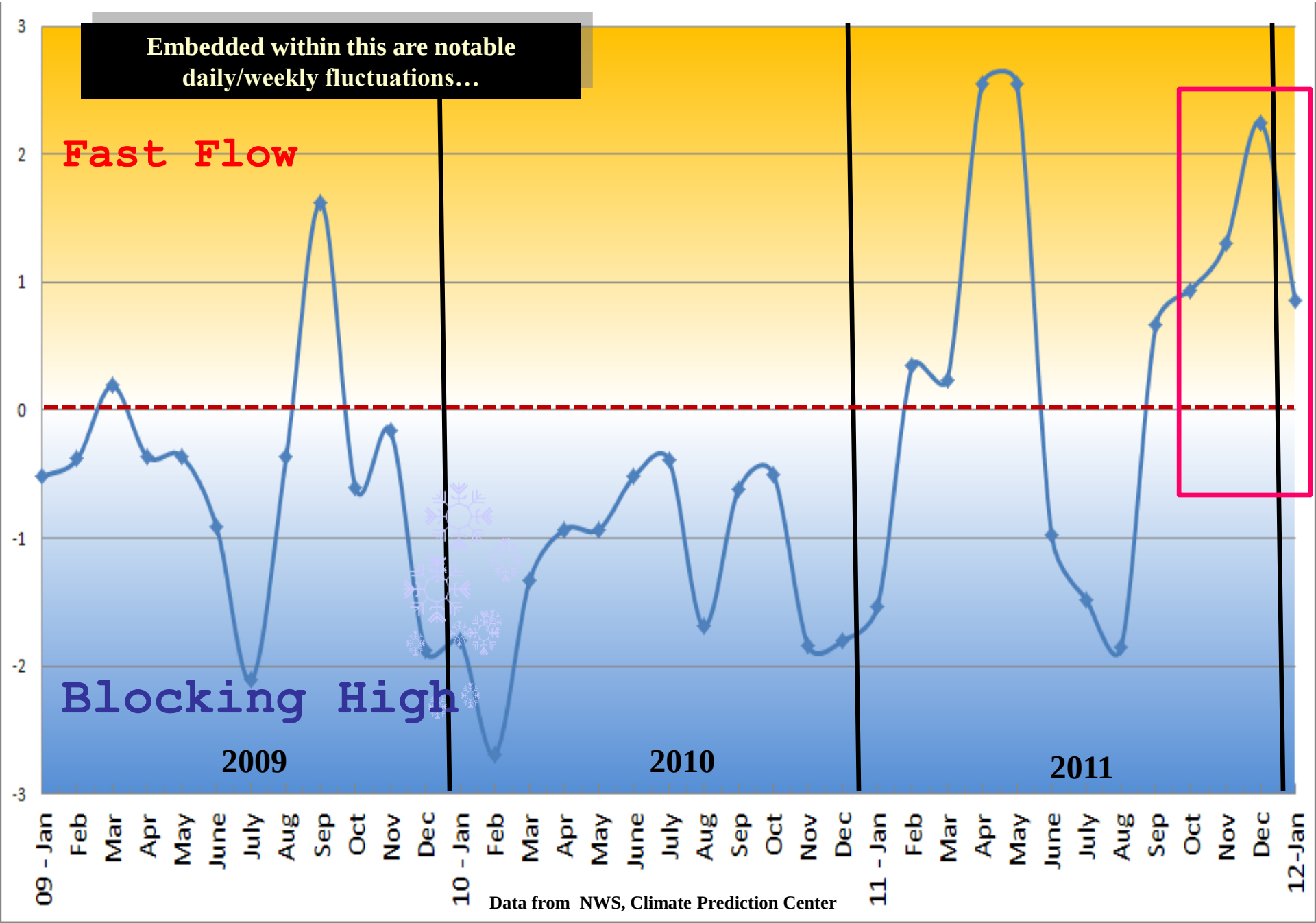
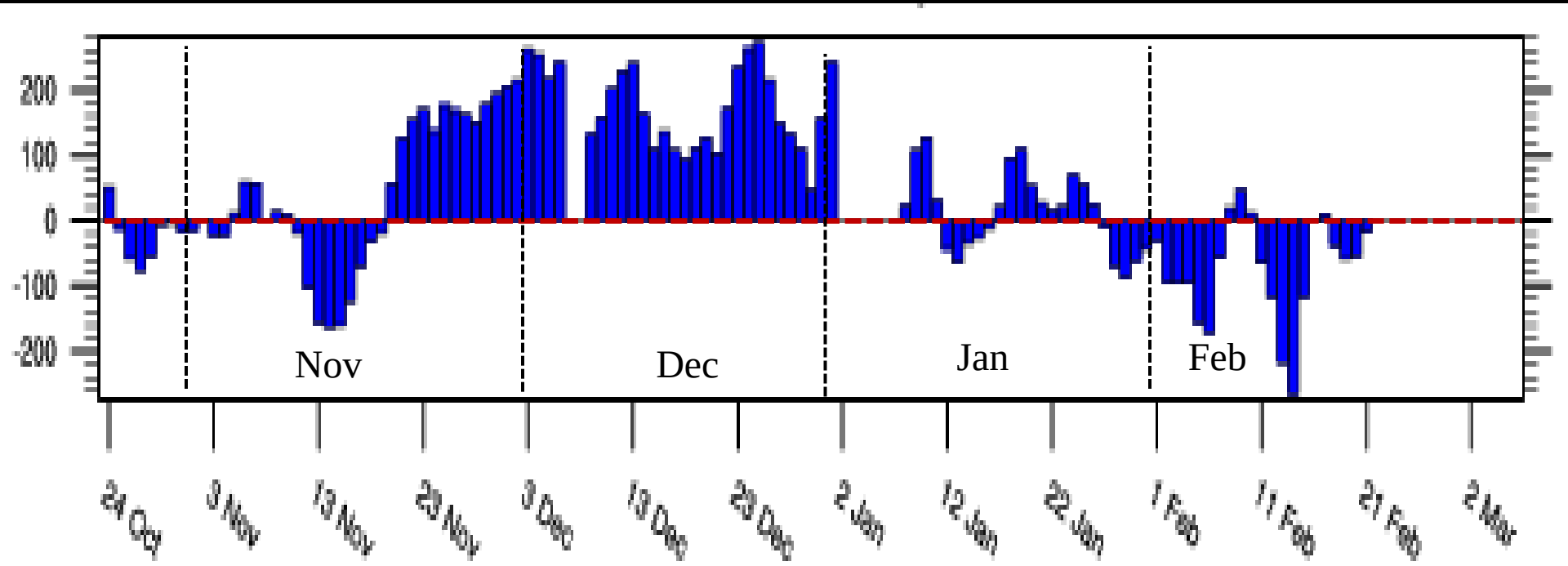
Monthly NAO Index



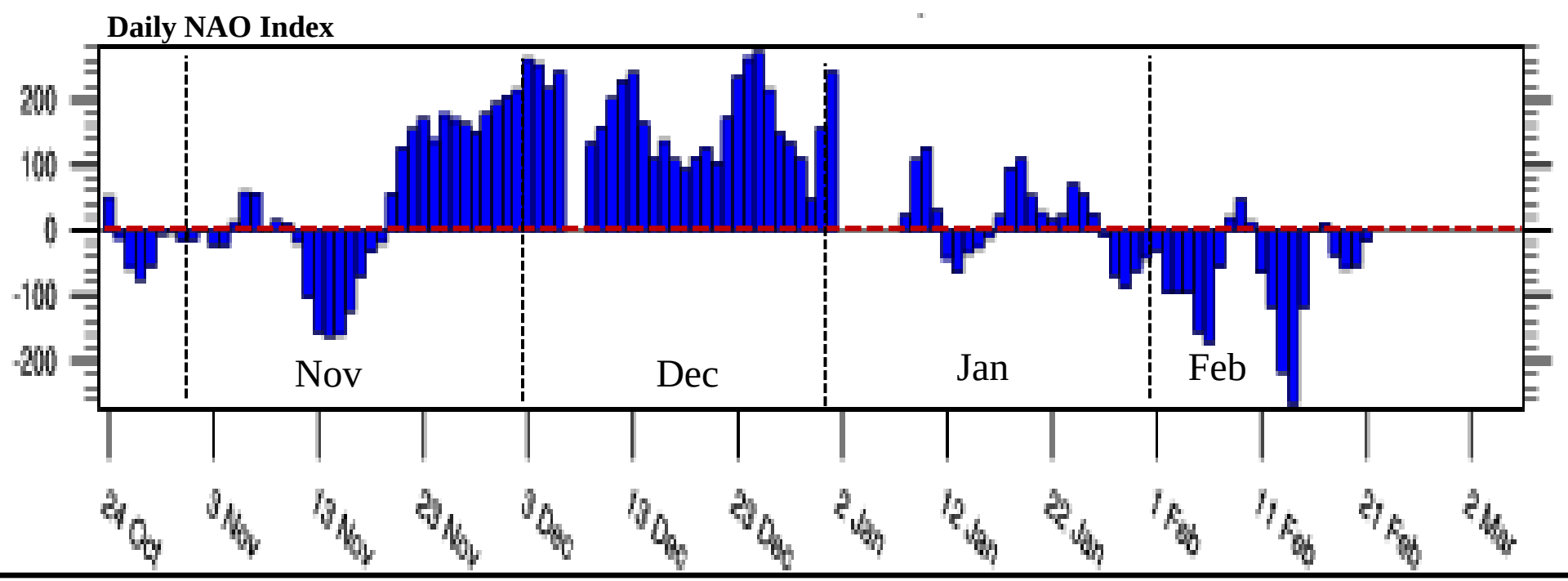
Monthly NAO Index

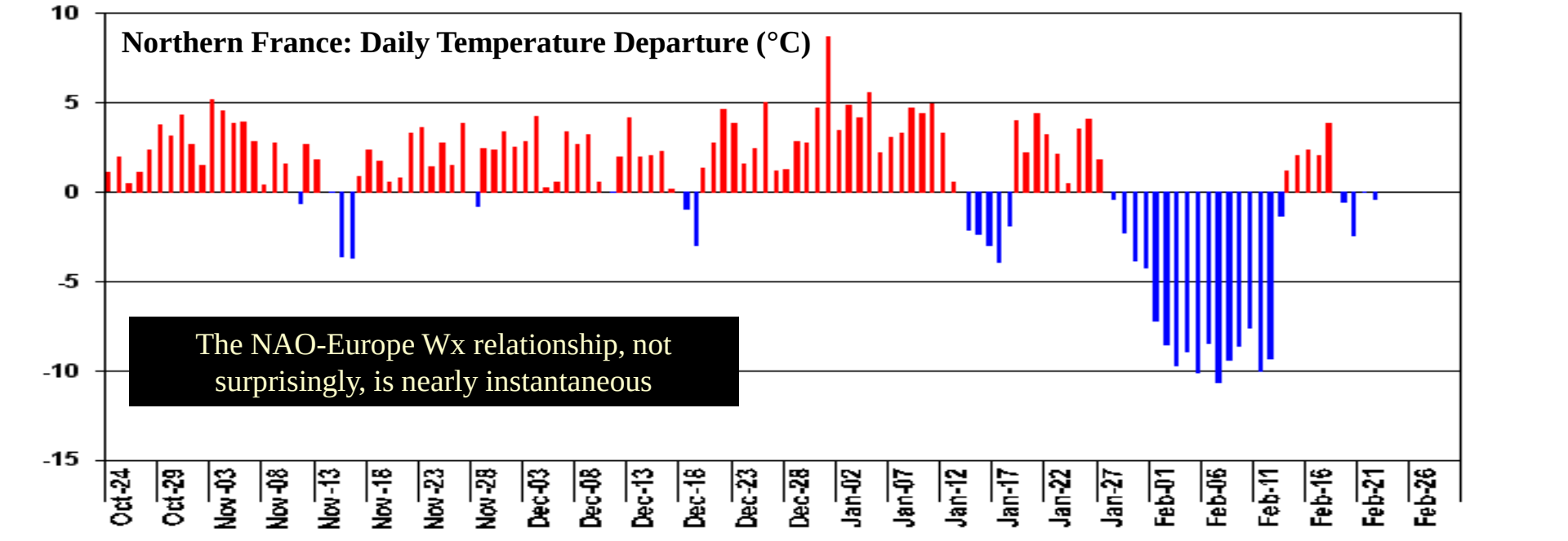


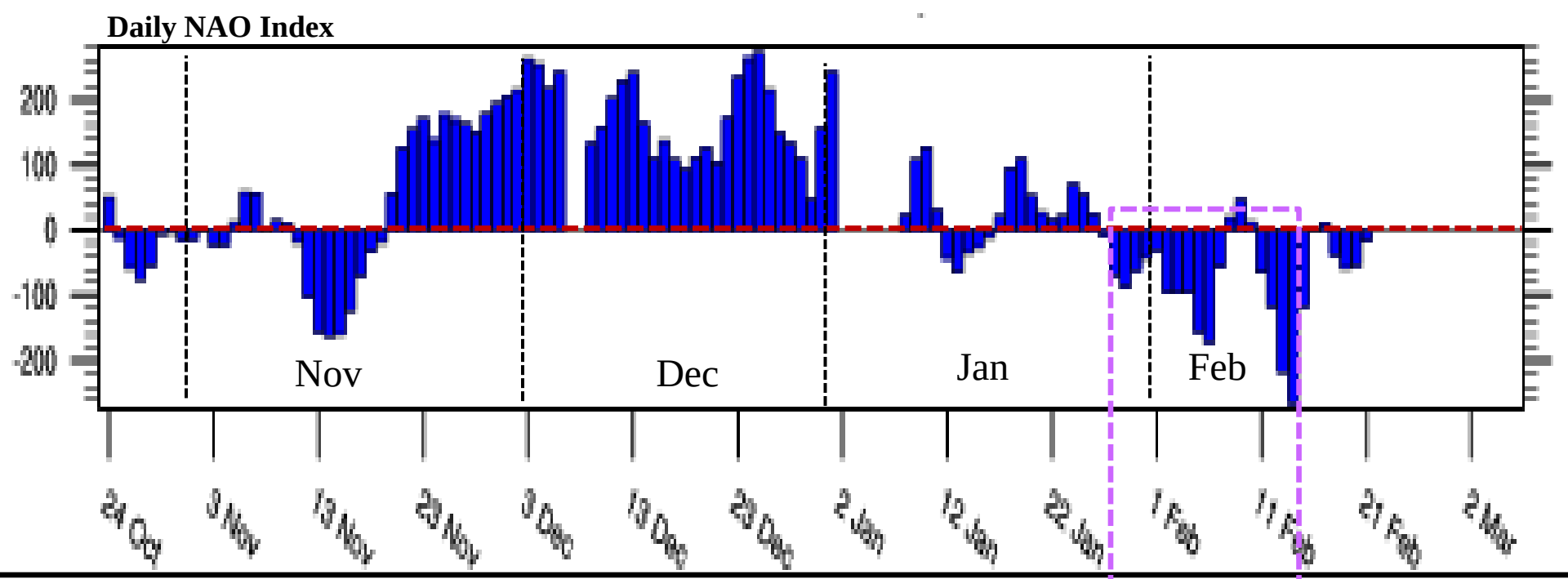
This Season's Daily NAO – Since October 24, 2011

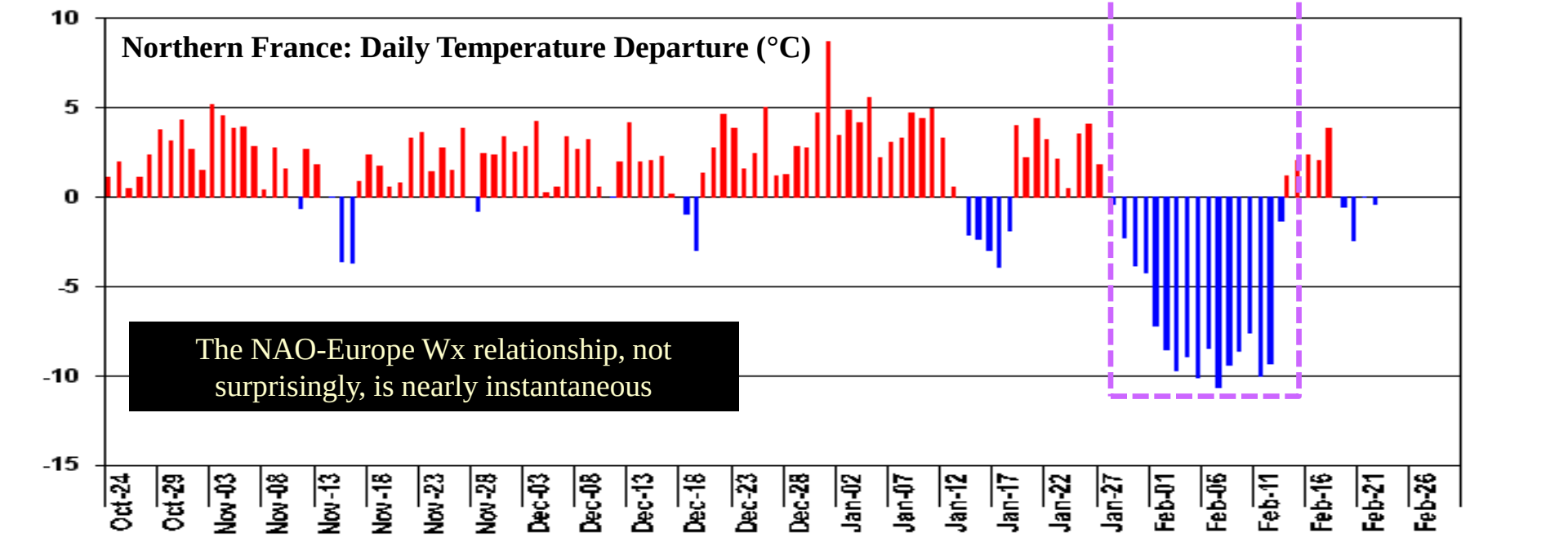


Data provided by the NOAA/ESRL Physical Sciences Division, Boulder Colorado from their Web site at *http://www.esrl.noaa.gov/psd*


Daily NAO Index
200
100
0
-100
-200
Nov
Dec
Jan
Feb
24 Oct
3 Nov
13 Nov
23 Nov
3 Dec
13 Dec
23 Dec
2 Jan
12 Jan
22 Jan
1 Feb
11 Feb
21 Feb
2 Mar


Northern France: Daily Temperature Departure (°C)
10
5
0
-5
-10
-15
The NAO-Europe Wx relationship, not surprisingly, is nearly instantaneous
Oct-24
Oct-29
Nov-03
Nov-08
Nov-13
Nov-18
Nov-23
Nov-28
Dec-03
Dec-08
Dec-13
Dec-18
Dec-23
Dec-28
Jan-02
Jan-07
Jan-12
Jan-17
Jan-22
Jan-27
Feb-01
Feb-06
Feb-11
Feb-16
Feb-21
Feb-26


Daily NAO Index
200
100
0
-100
-200
Nov
Dec
Jan
Feb
24 Oct
3 Nov
13 Nov
23 Nov
3 Dec
13 Dec
23 Dec
2 Jan
12 Jan
22 Jan
1 Feb
11 Feb
21 Feb
2 Mar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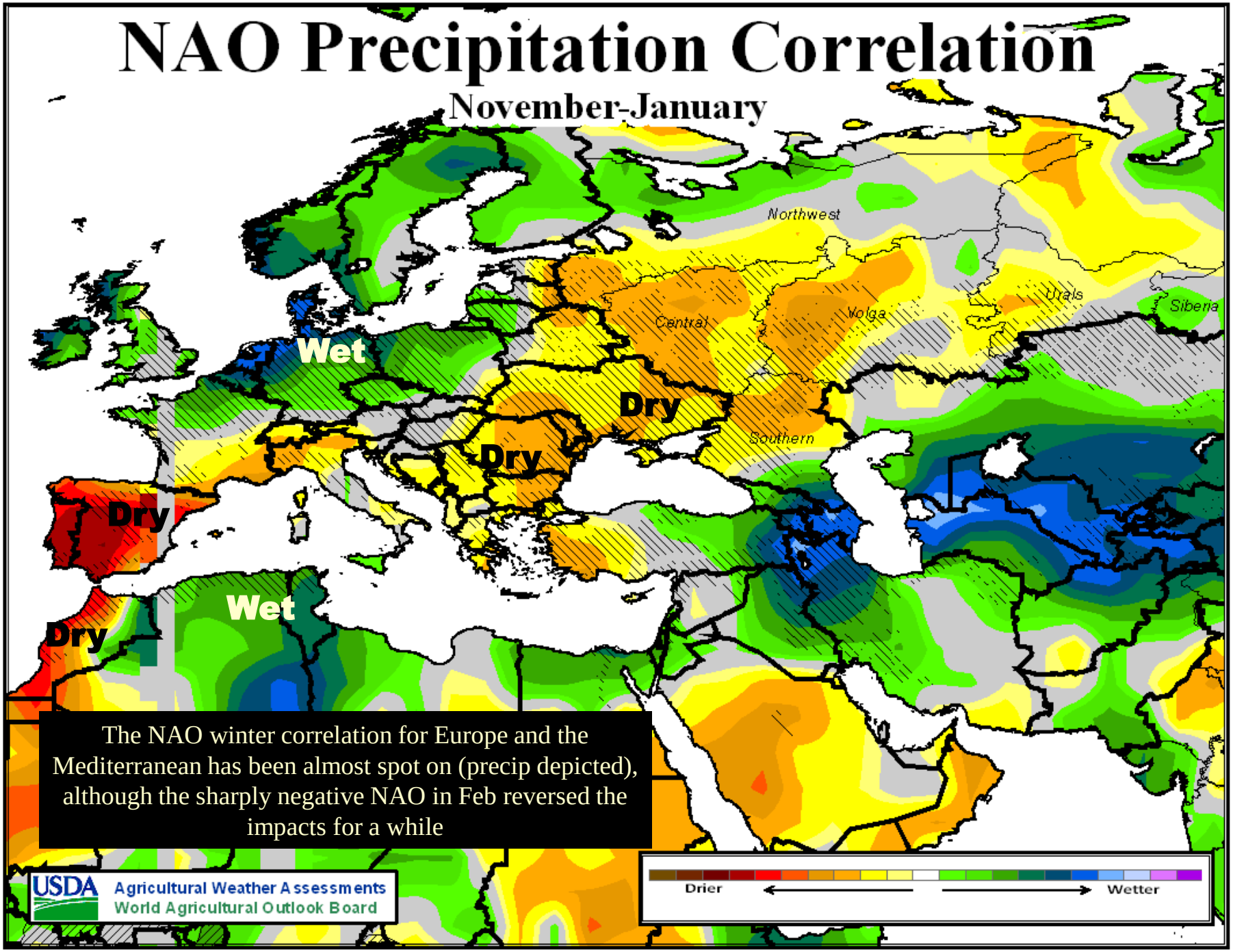
Dec-28
Jan-02
Jan-07
Jan-12
Jan-17
Jan-22
Jan-27
Feb-01
Feb-06
Feb-11
Feb-16
Feb-21
Feb-26

NAO Precipitation Correlation

November-January



The NAO winter correlation for Europe and the Mediterranean has been almost spot on (precip depicted), although the sharply negative NAO in Feb reversed the impacts for a while

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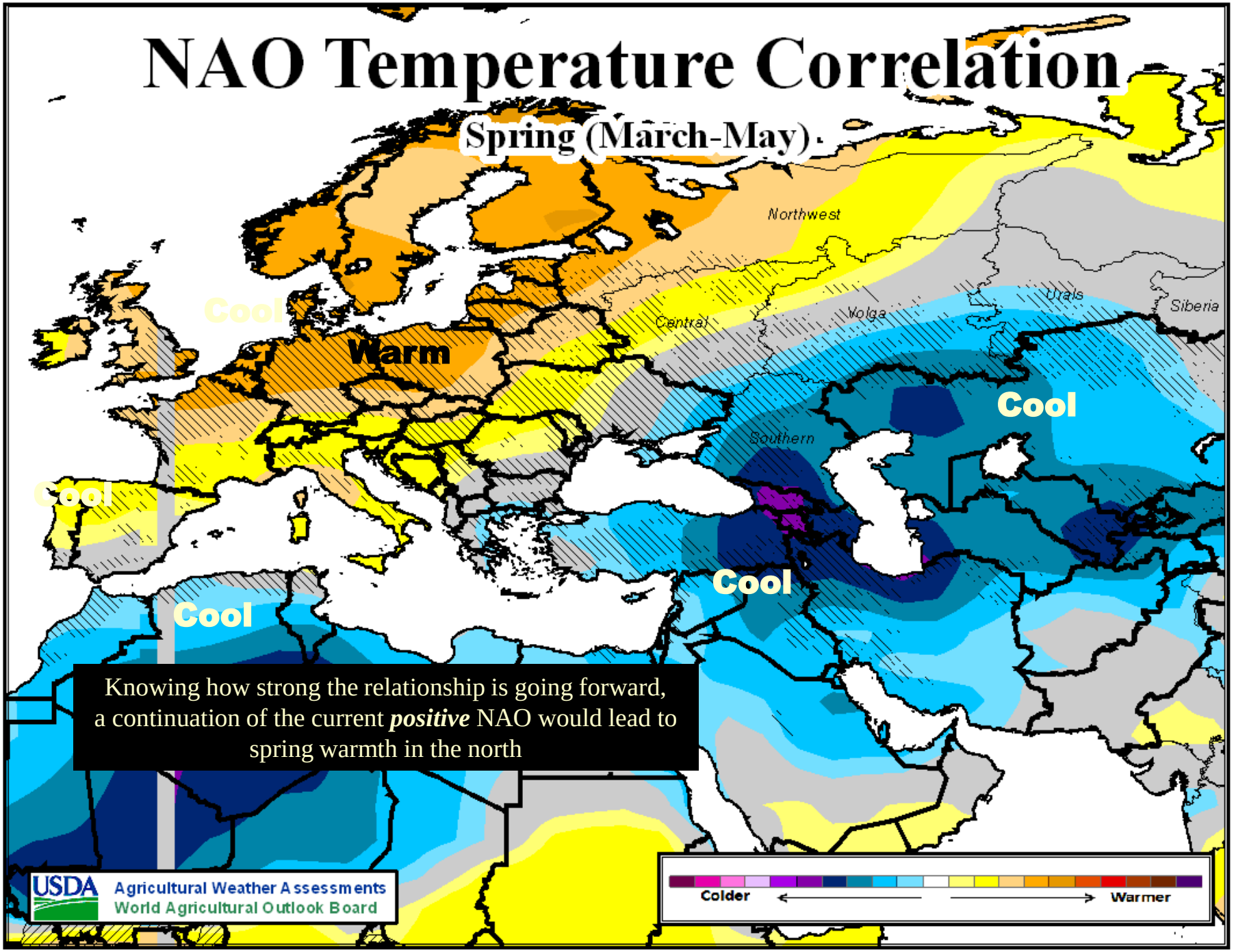
World Agricultural Outlook Board

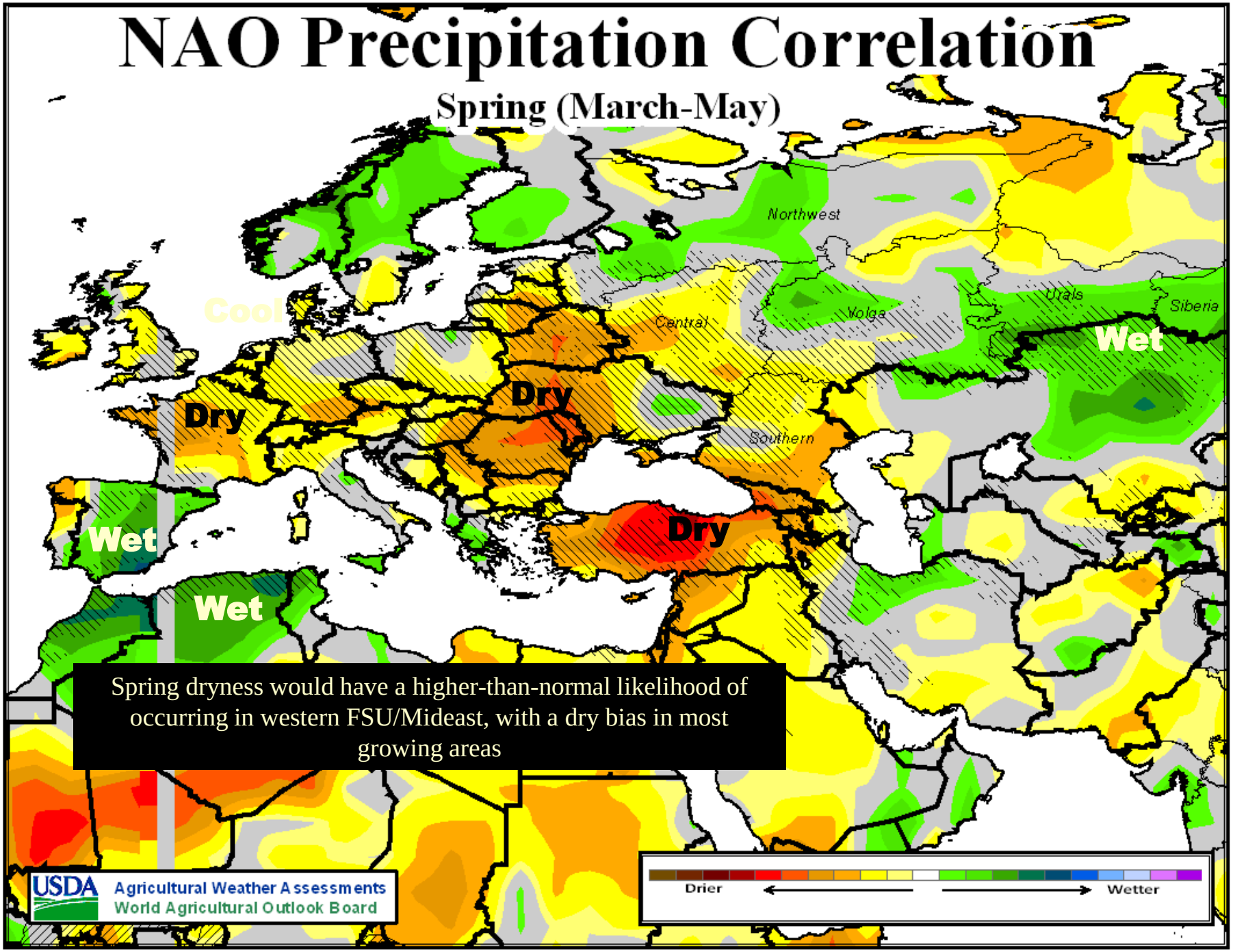
Data provided by the NOAA/ESRL Physical Sciences Division, Boulder Colorado from their Web site at *http://www.esrl.noaa.gov/psd*



Data provided by the NOAA/ESRL Physical Sciences Division, Boulder Colorado from their Web site at *http://www.esrl.noaa.gov/psd*

NAO Precipitation Correlation

Spring (March-May)

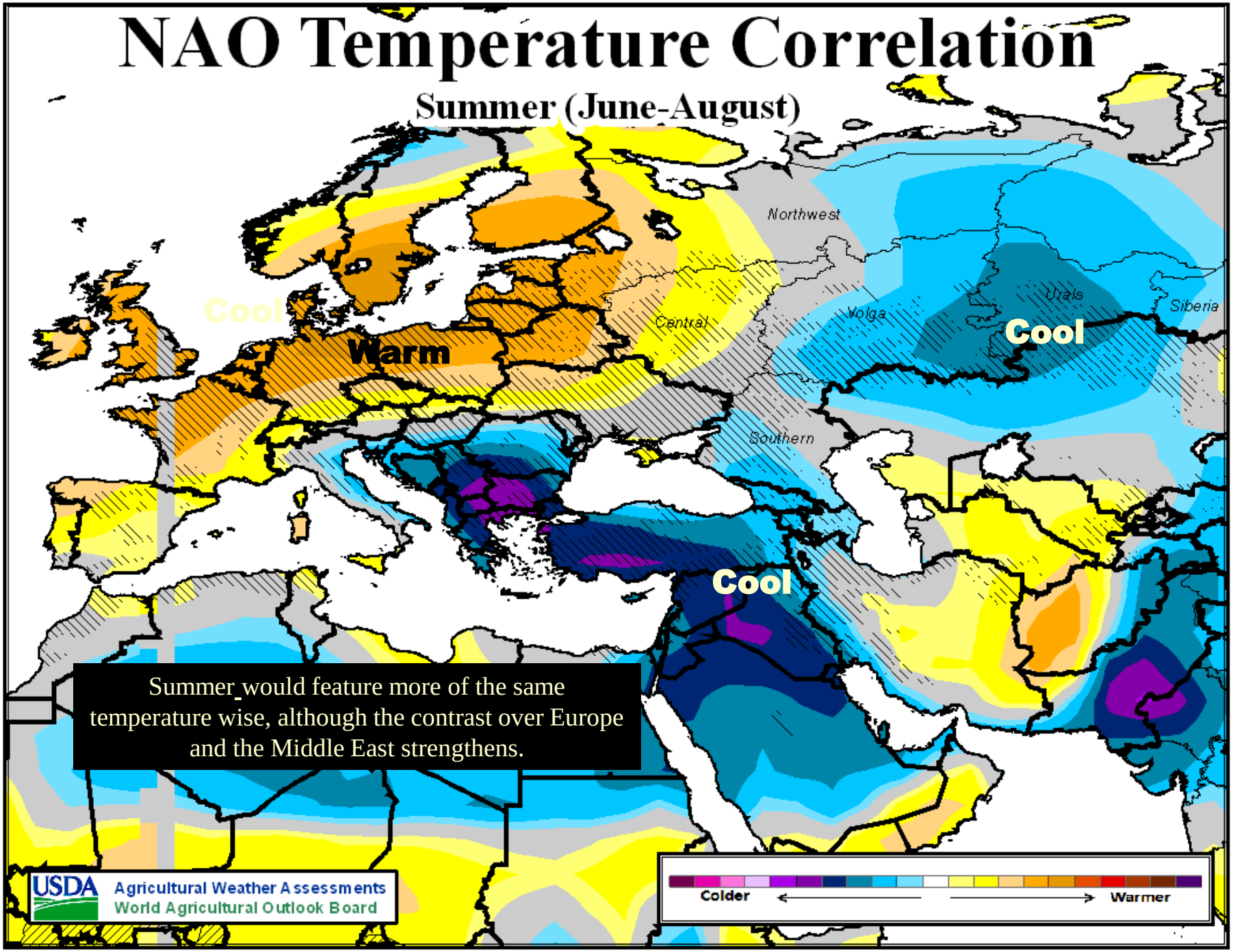


Spring dryness would have a higher-than-normal likelihood of occurring in western FSU/Mideast, with a dry bias in most growing areas

Data provided by the NOAA/ESRL Physical Sciences Division, Boulder Colorado from their Web site at *http://www.esrl.noaa.gov/psd*

NAO Temperature Correlation

Summer (June-August)



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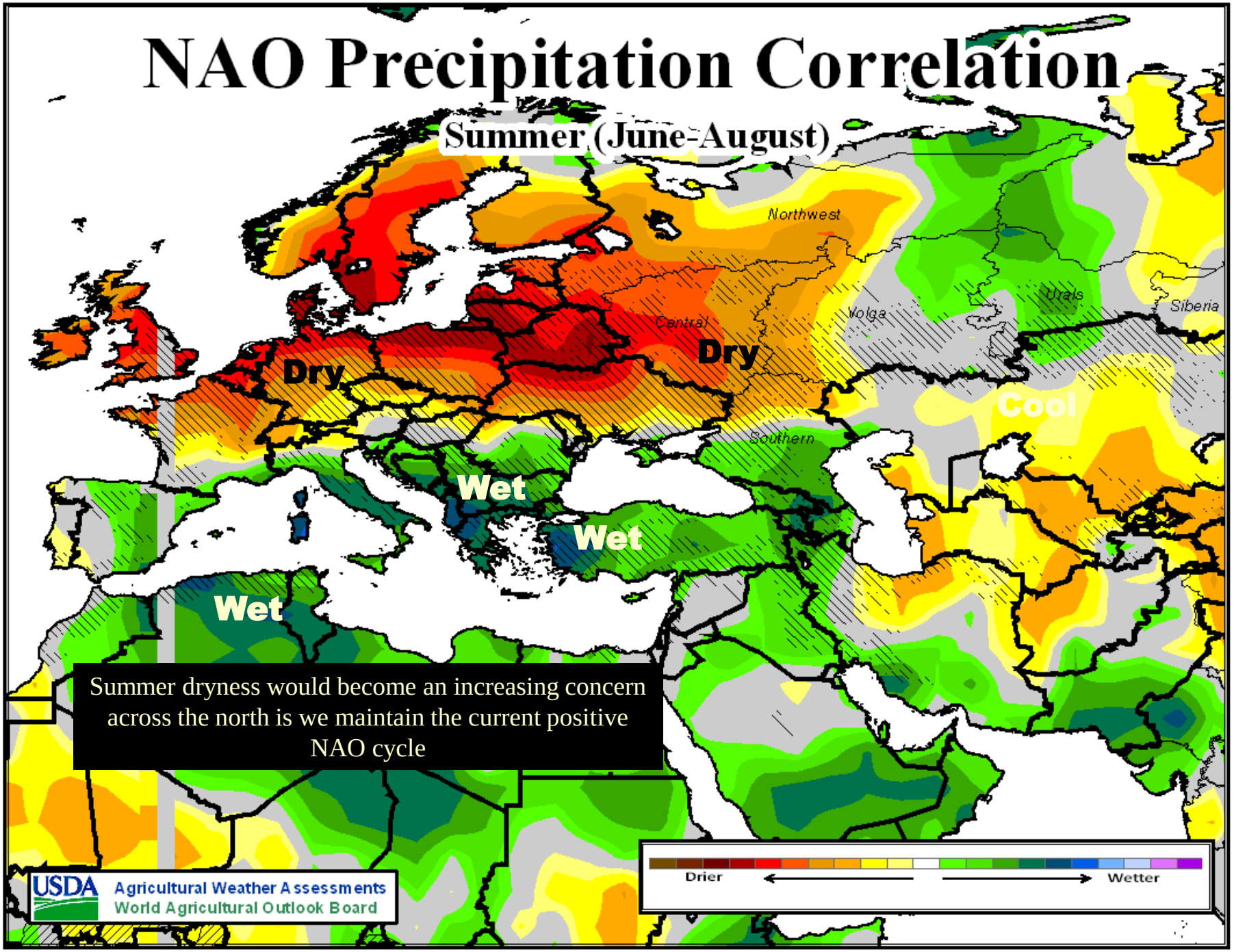
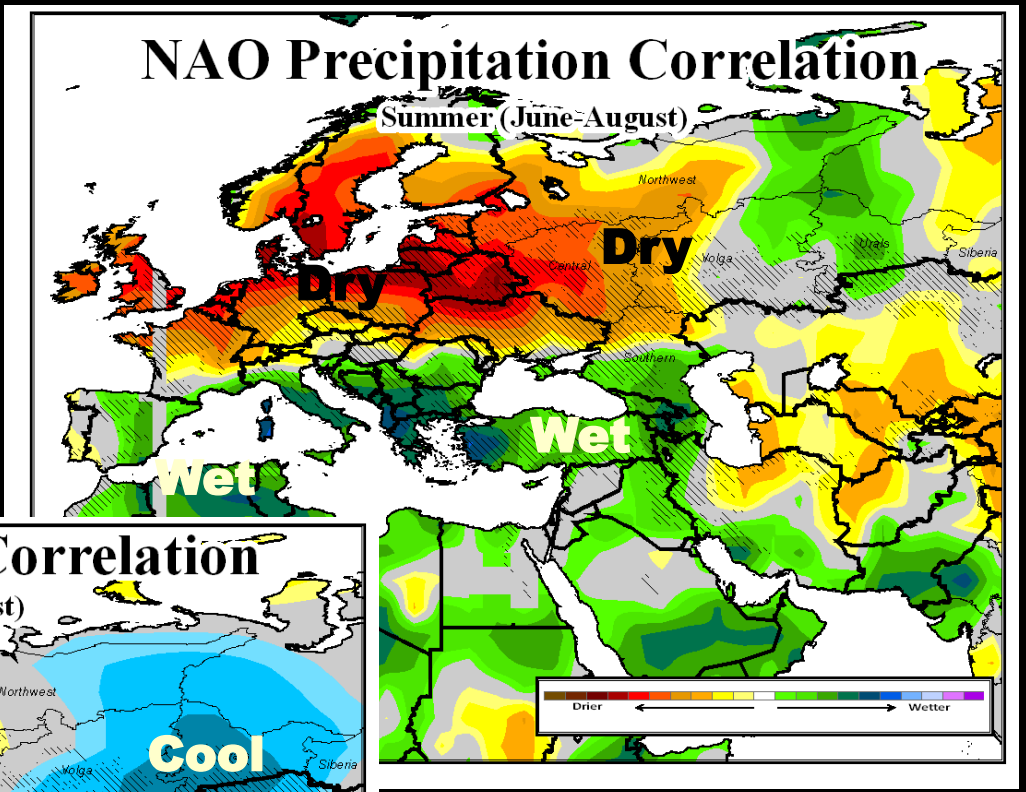
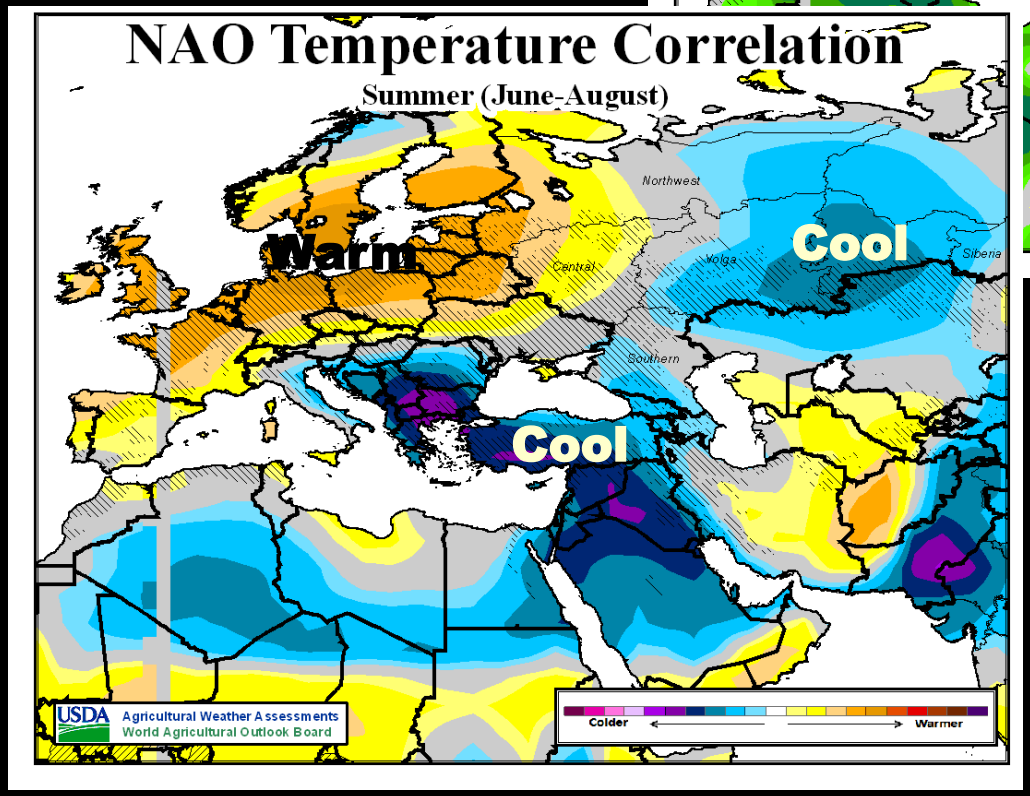


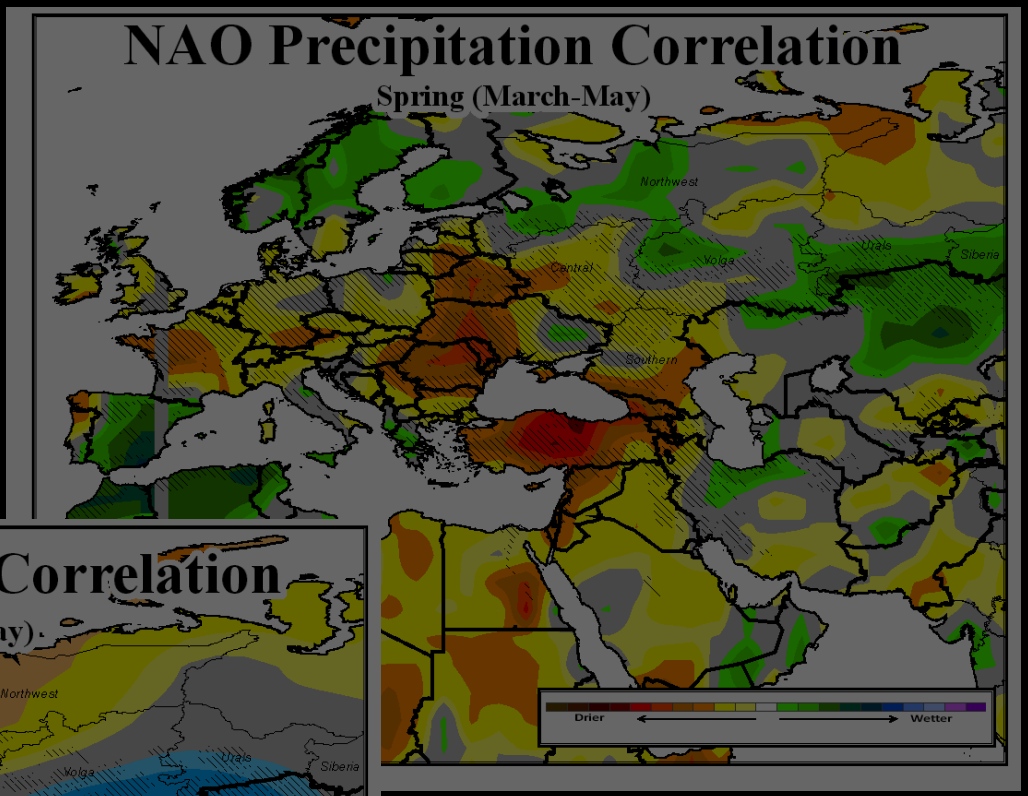
Data provided by the NOAA/ESRL Physical Sciences Division, Boulder Colorado from their Web site at *http://www.esrl.noaa.gov/psd*

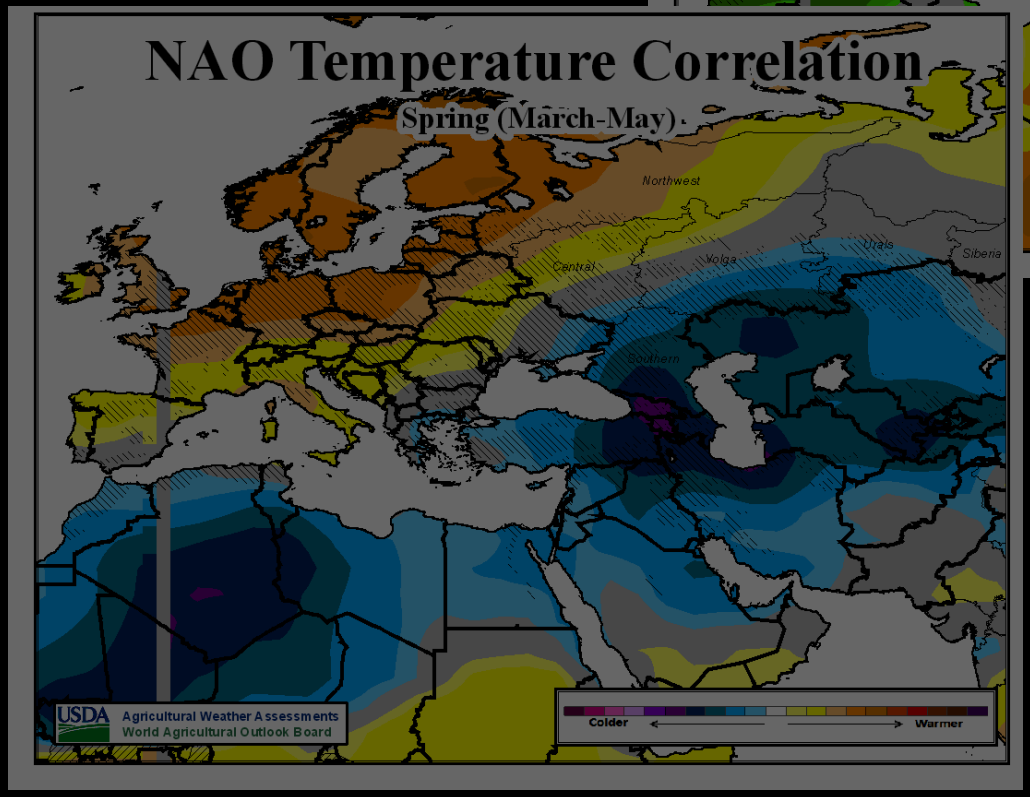
In short, a continuation of a ***positive*** NAO would point to increasingly warm, dry conditions in nrn Europe contrasting with cooler, wetter weather farther south and east





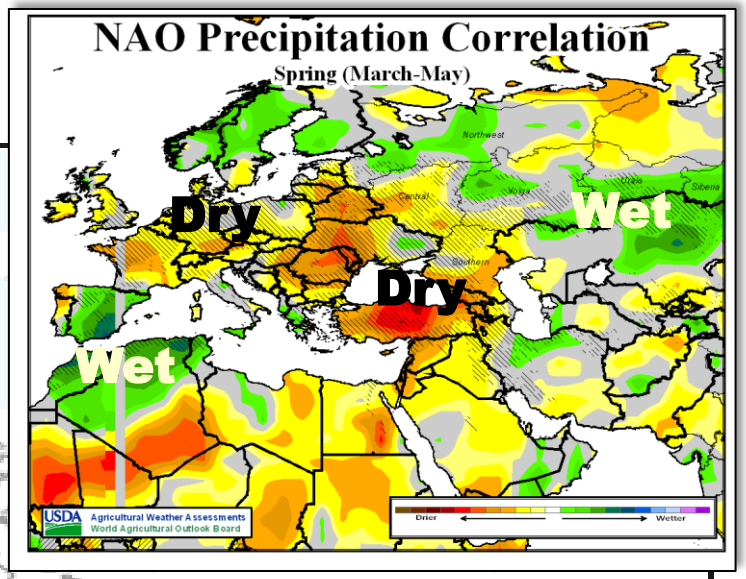
How does this compare with the latest **IRI Spring forecast**?





IRI Multi-Model Probability Forecast for Precipitation for March-April-May 2012, Issued February 2012

The **IRI Spring Precip Outlook** does not lean in either direction, except for depicting some dryness in the Mideast, while the NAO supports more widespread dry weather



D

80N
70N
60N
50N
40N
30N
20W
0
20E
40E
60E

30
40
30

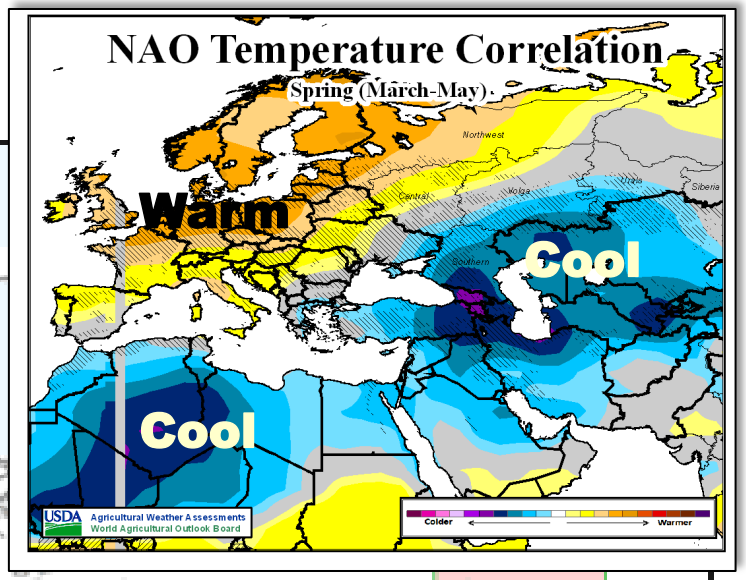
25
35
40

Probability (%) of Most Likely Category

Below-Normal					Normal	Above-Normal				
40	45	50	60	70	40	40	45	50	60	70

IRI Multi-Model Probability Forecast for Temperature for March-April-May 2012, Issued February 2012

The **IRI Spring Temperature Outlook** supports the NAO's warm EU signal but is opposite of the NAO's Mideast/Black Sea region's cool



80N
70N
60N
50N
40N
30N
20W
0
20E
40E
60E

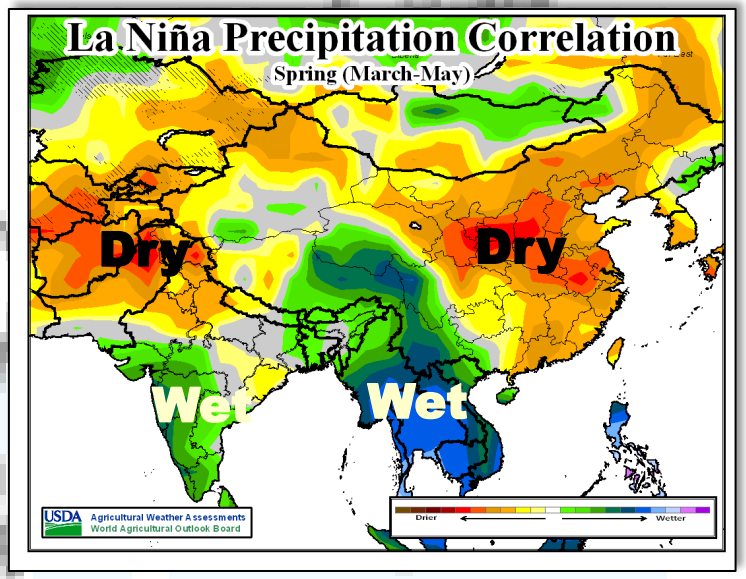
Probability (%) of Most Likely Category

Below-Normal: 40 45 50 60 70

Normal: 40

Above-Normal: 40 45 50 60 70

IRI Multi-Model Probability Forecast for Precipitation for March-April-May 2012, Issued February 2012



Farther East, the IRI Asia **Spring Precip Outlook** more or less lines up with the La Niña signal, which would dominate due to the proximity to the Pacific Ocean

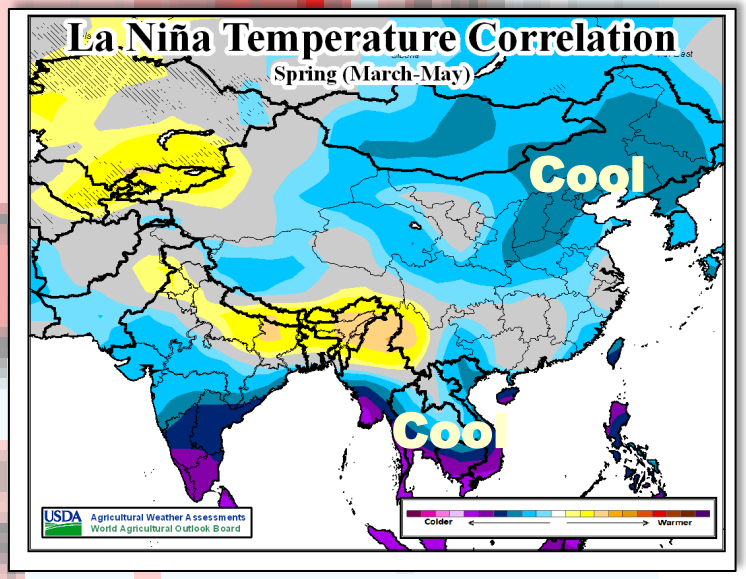
Probability (%) of Most Likely Category

Below-Normal: 40 45 50 60 70

Normal: 40

Above-Normal: 40 45 50 60 70

IRI Multi-Model Probability Forecast for Temperature for March-April-May 2012, Issued February 2012



Conversely, outside of equatorial areas, the IRI **Spring Temperature Outlook** quite different from the La Niña correlation, strongly suggesting other overwhelming factors at play

Probability (%) of Most Likely Category

Below-Normal					Normal	Above-Normal				
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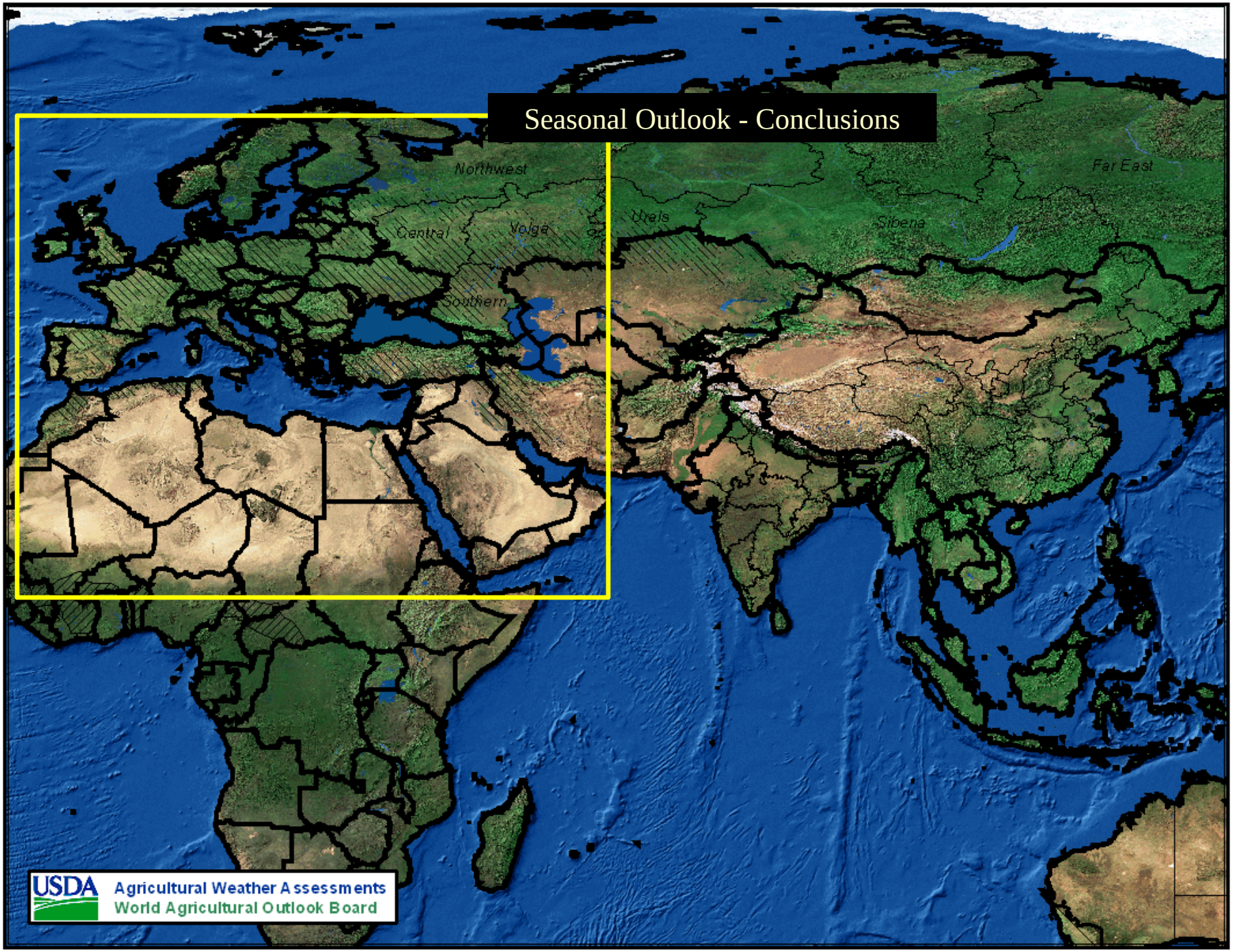
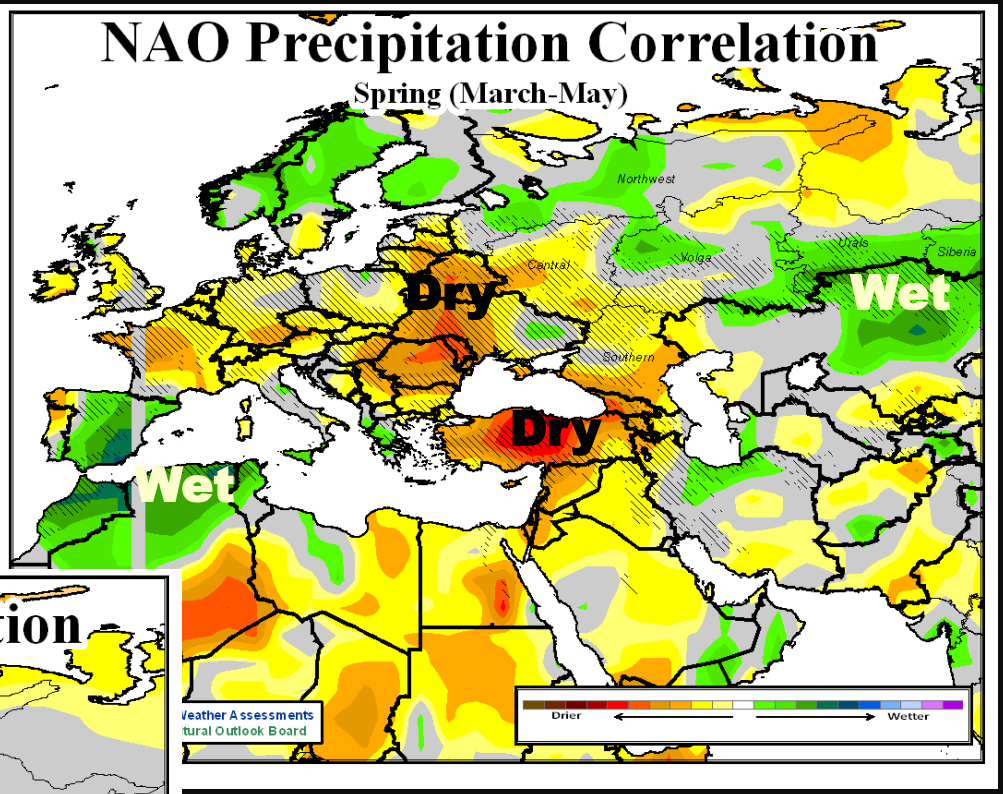
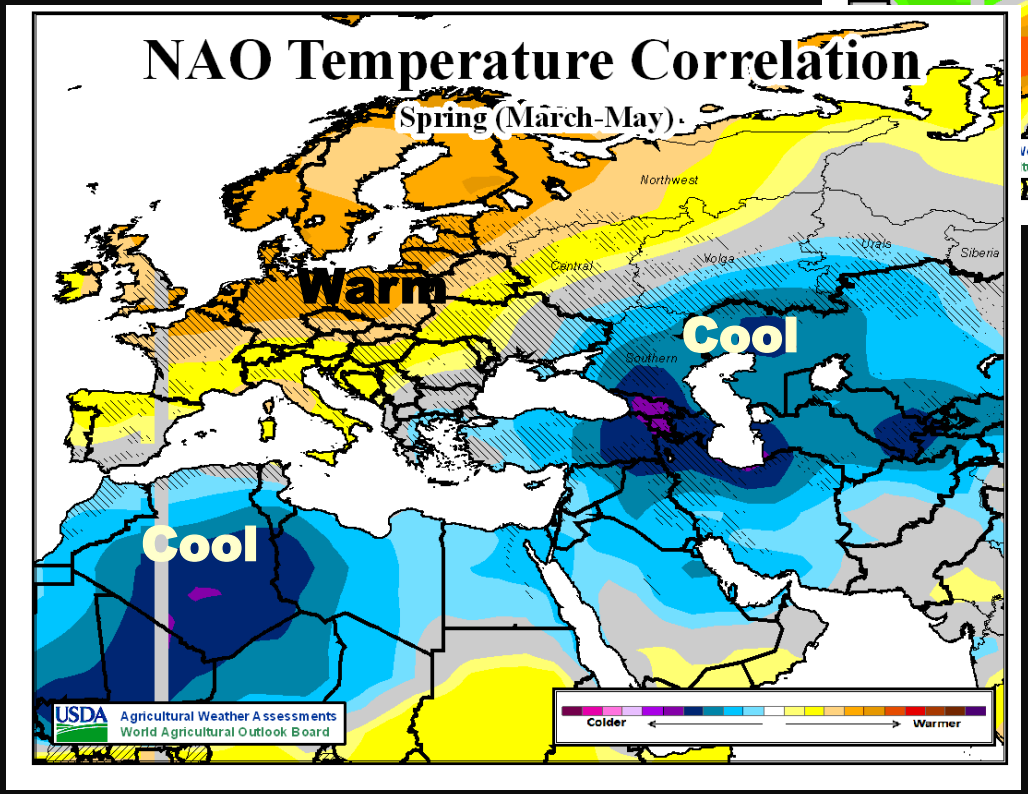
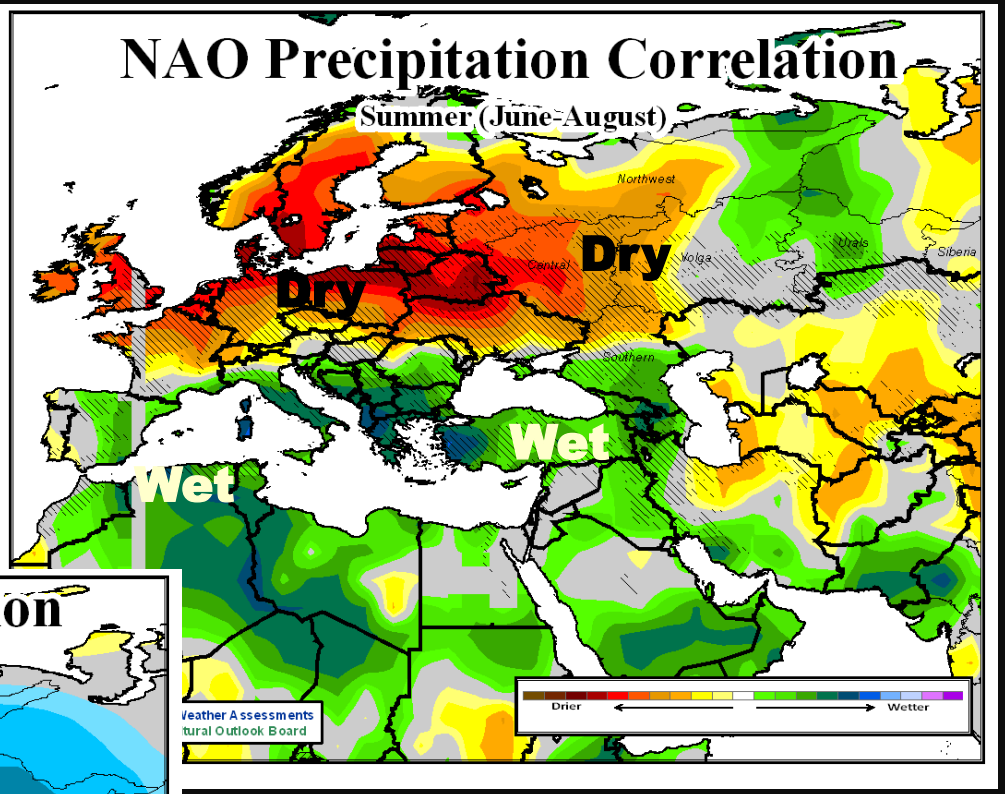

Seasonal Outlook - Conclusions
Northwest
Central
Volga
Southern
Urals
Siberia
Far East
USDA
Agricultural Weather Assessments
World Agricultural Outlook Board

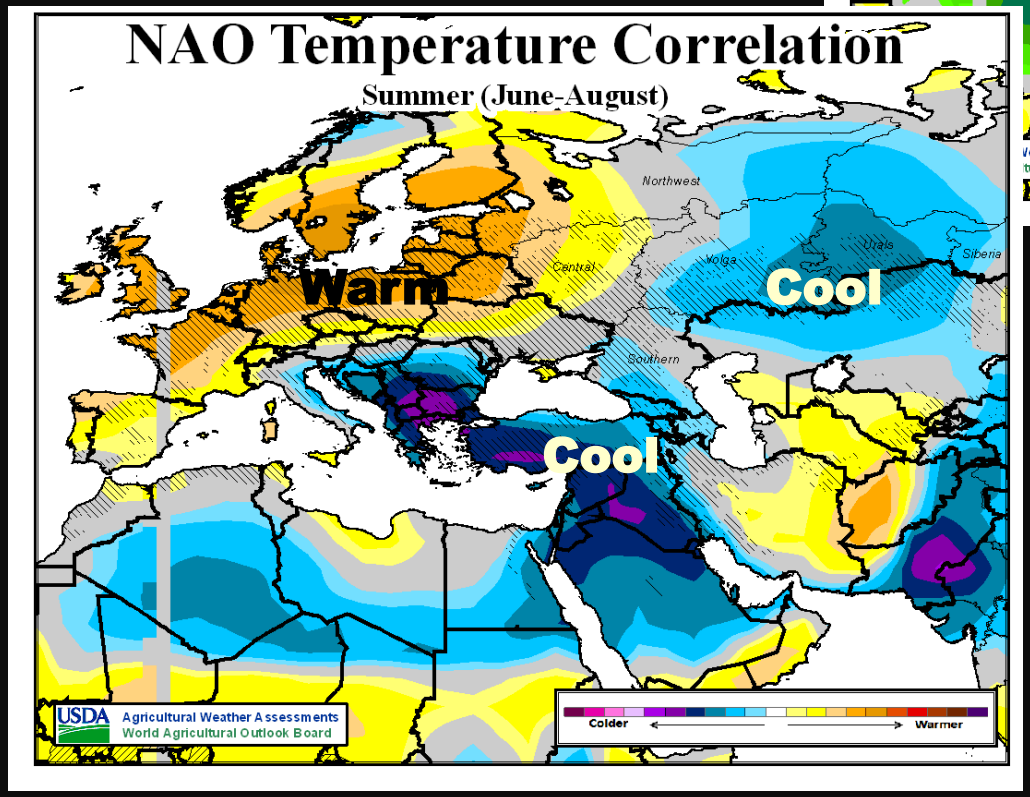
The NAO is forecast to remain in a positive phase into early March, which supports a warmer- and drier-than-normal weather to begin the **spring** from Europe into western portions of the FSU

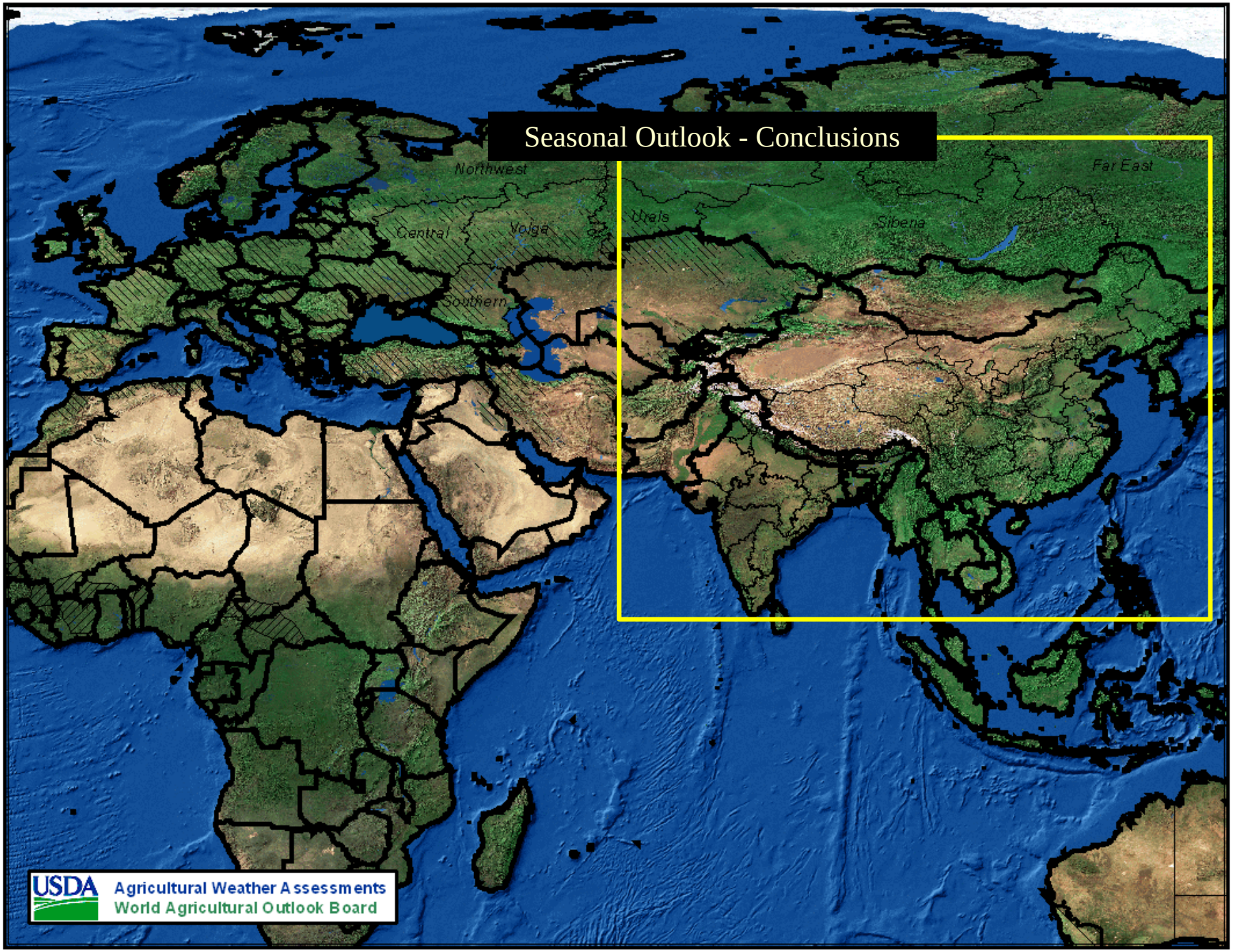




Persistence would support an unfavorable forecast of warmth and dryness during the **summer** in Europe and western FSU, while favorable weather would persist in the Mediterranean






Seasonal Outlook - Conclusions
Northwest
Central
Volga
Southern
Urals
Siberia
Far East
USDA
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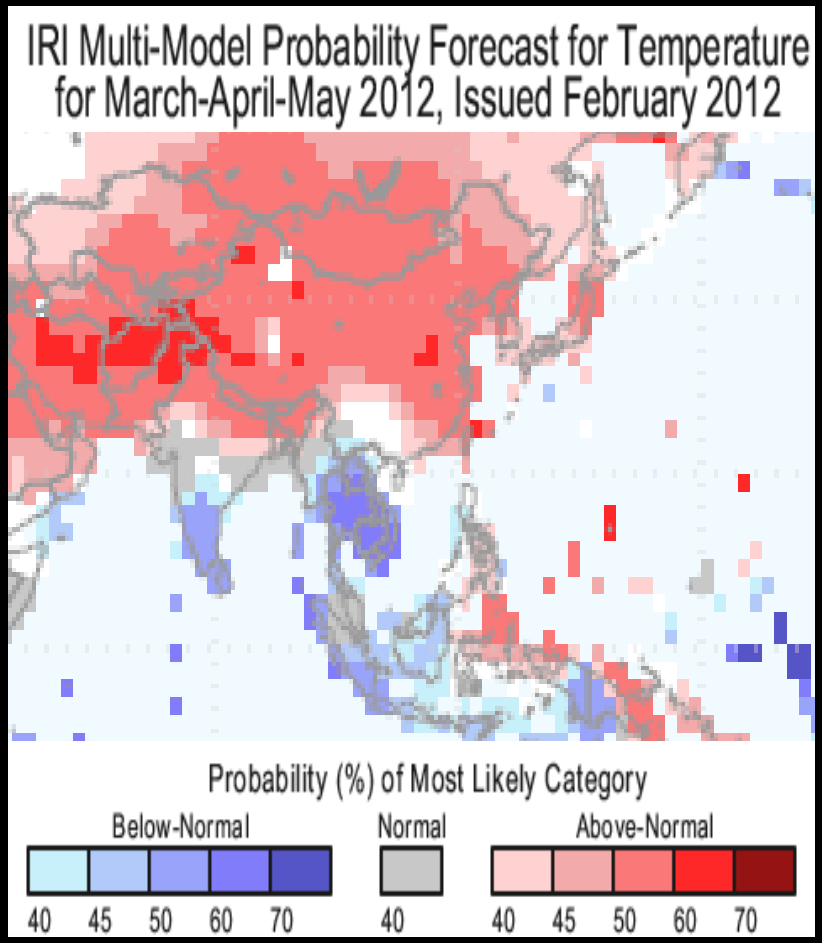
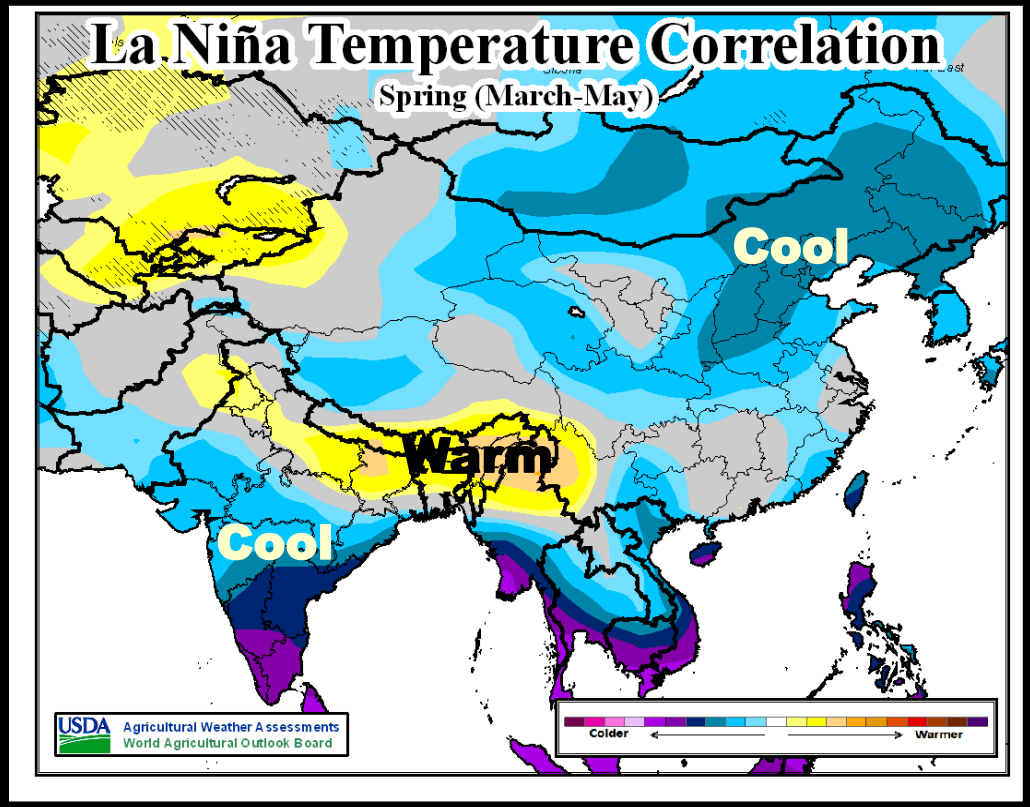
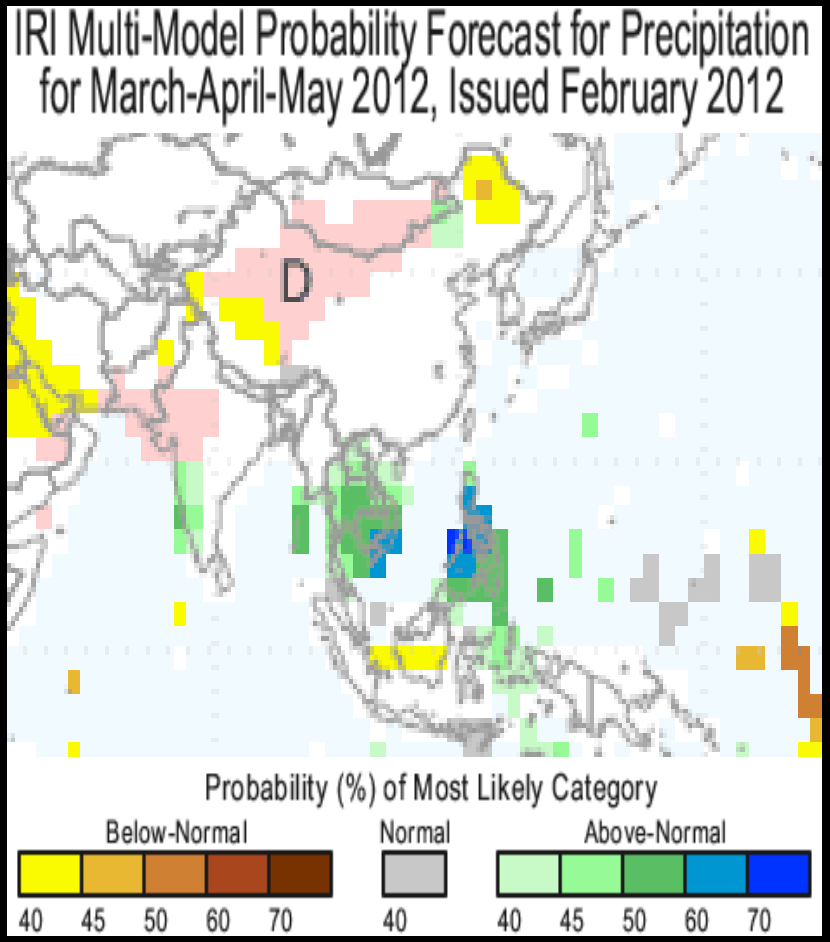
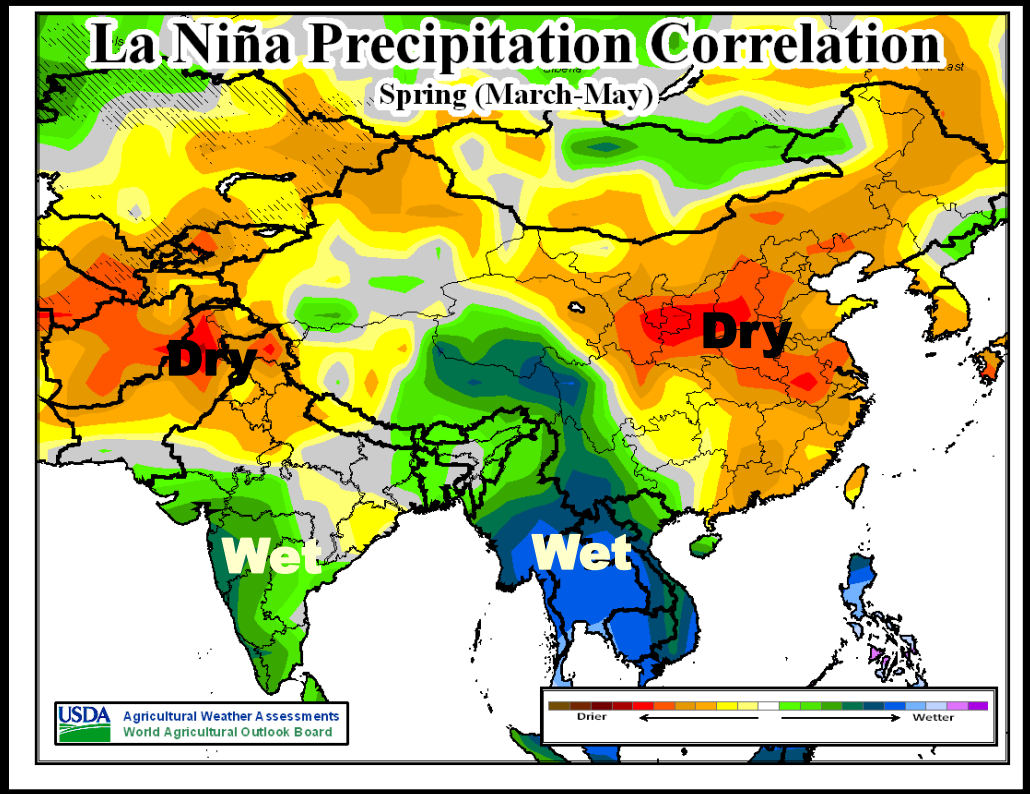
In Asia, the disparity between expert IRI outlooks and La Niña temperature correlation means – as one would expect – that other issues are weighing heavily into the equation. Given the IRI high probability and the waning La Niña, it is hard to discount the warmer-than-normal weather forecast by IRI for the spring.



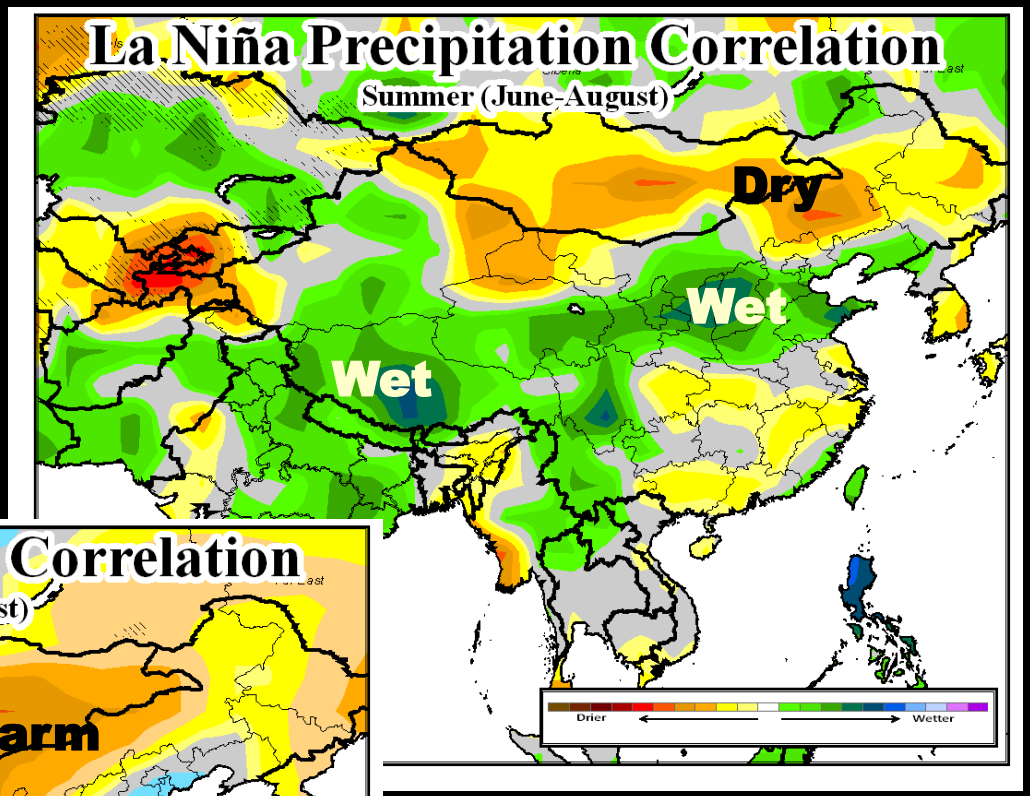


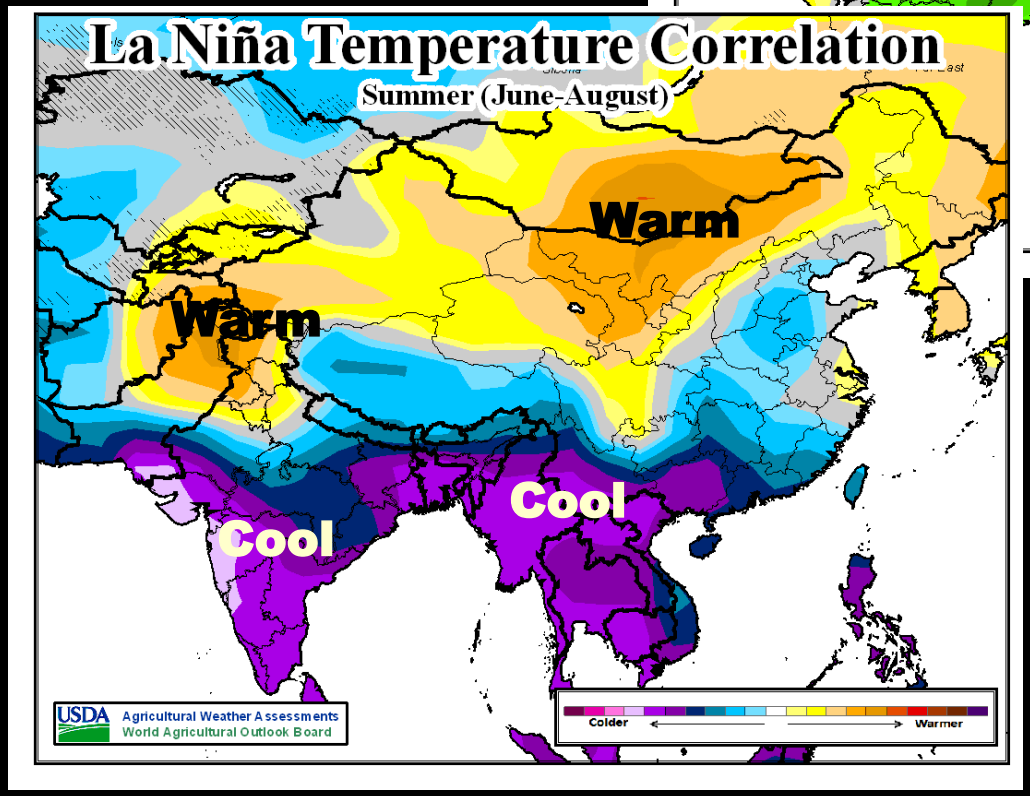
The spring precipitation correlation and IRI forecast line up better, leading to the expectation of wet weather in Indochina and southern India to contrast with drier conditions in the primary winter wheat and rapeseed areas.





A waning La Niña does not offer much confidence, but lingering **summer** impacts would include cooler conditions in the south with wetter weather in northern China






Northwest
Far East
Urals
Central
Volga
Siberia
Southern
How about the next week?
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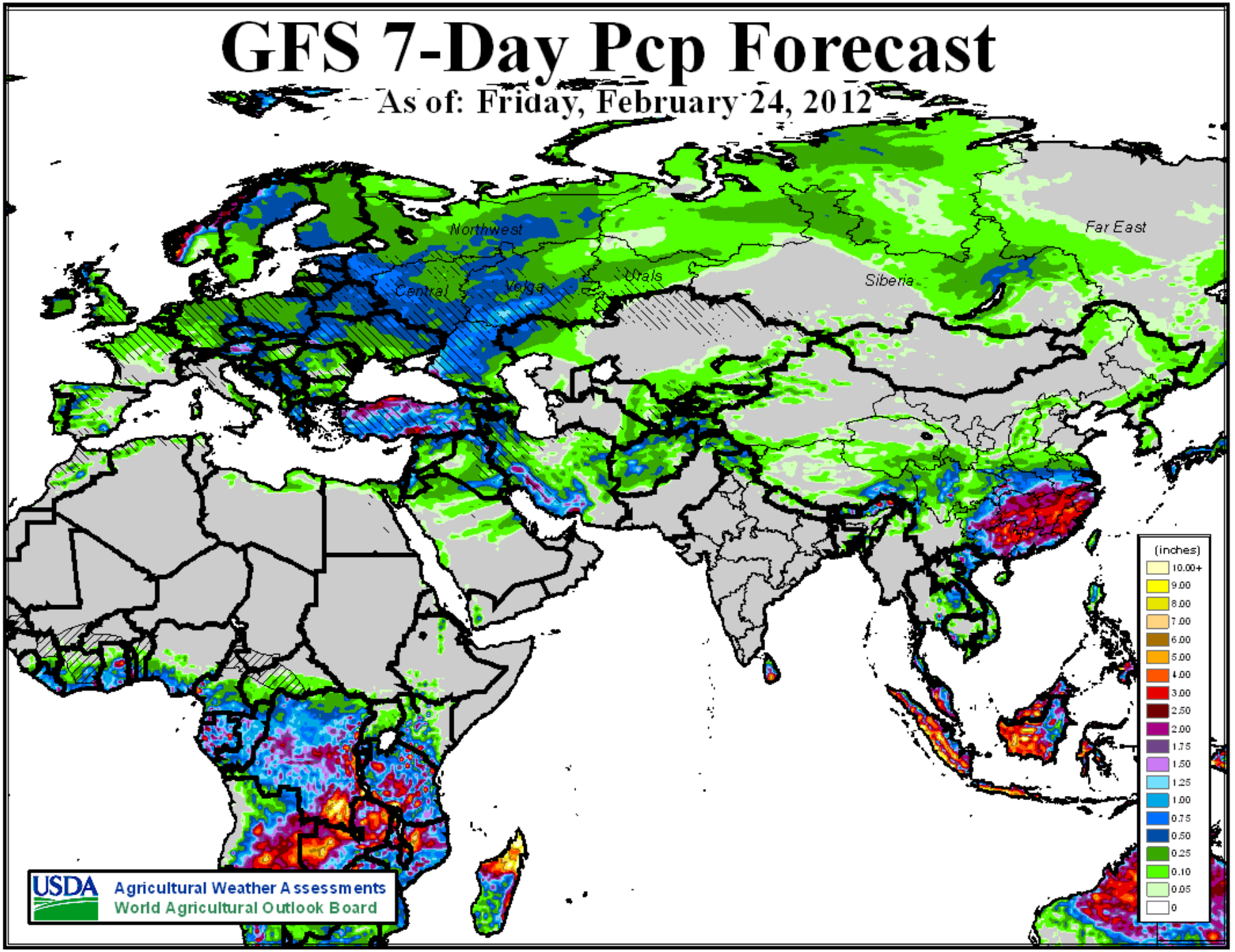
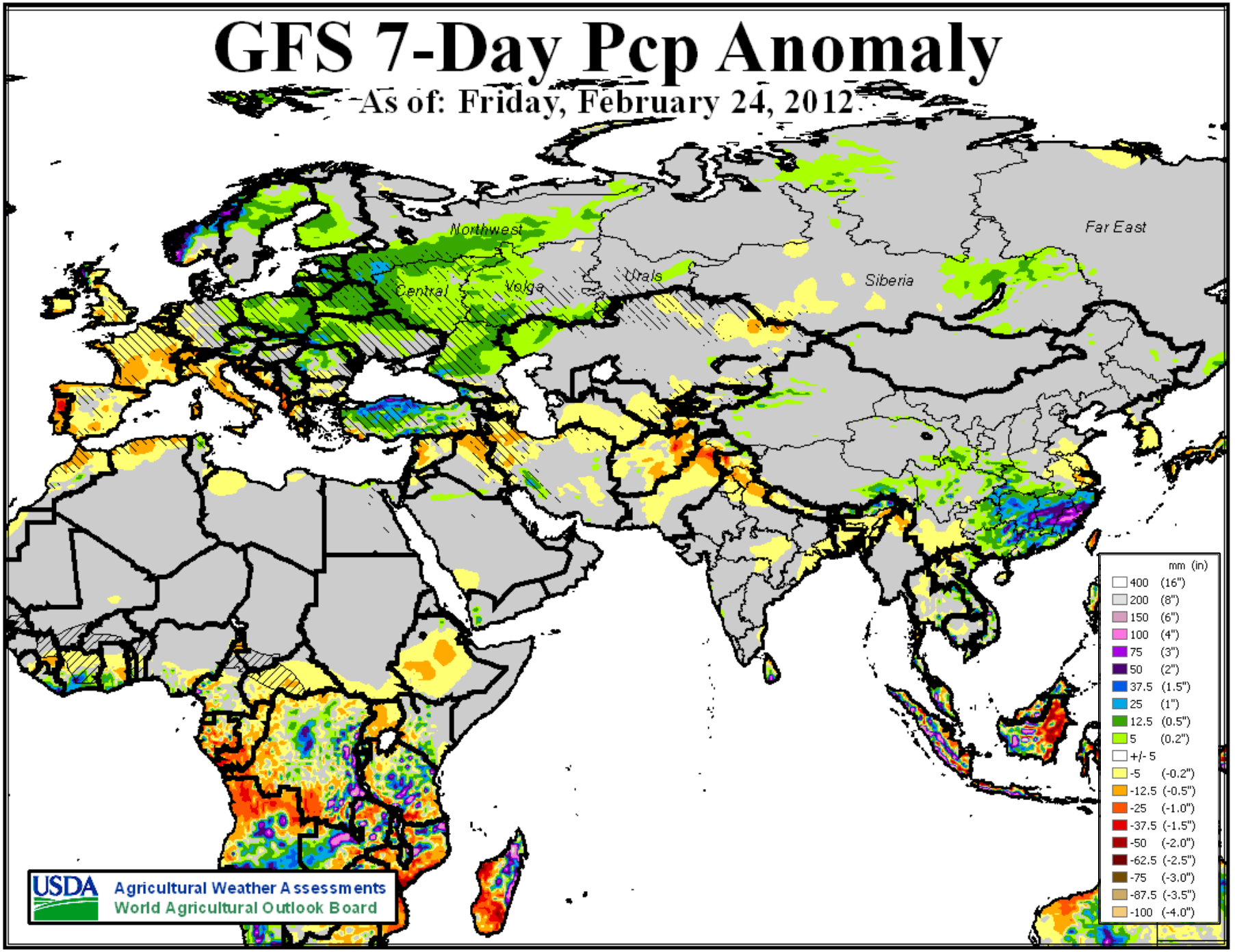
GFS 7-Day Pcp Forecast

As of: Friday, February 24, 2012



GFS Pcp Data provided in GIS format by the NOAA/NWS Climate Prediction Center, Washington, D.C.


GFS 7-Day Pcp Anomaly
As of: Friday, February 24, 2012
Northwest
Central
Volga
Urals
Siberia
Far East
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")
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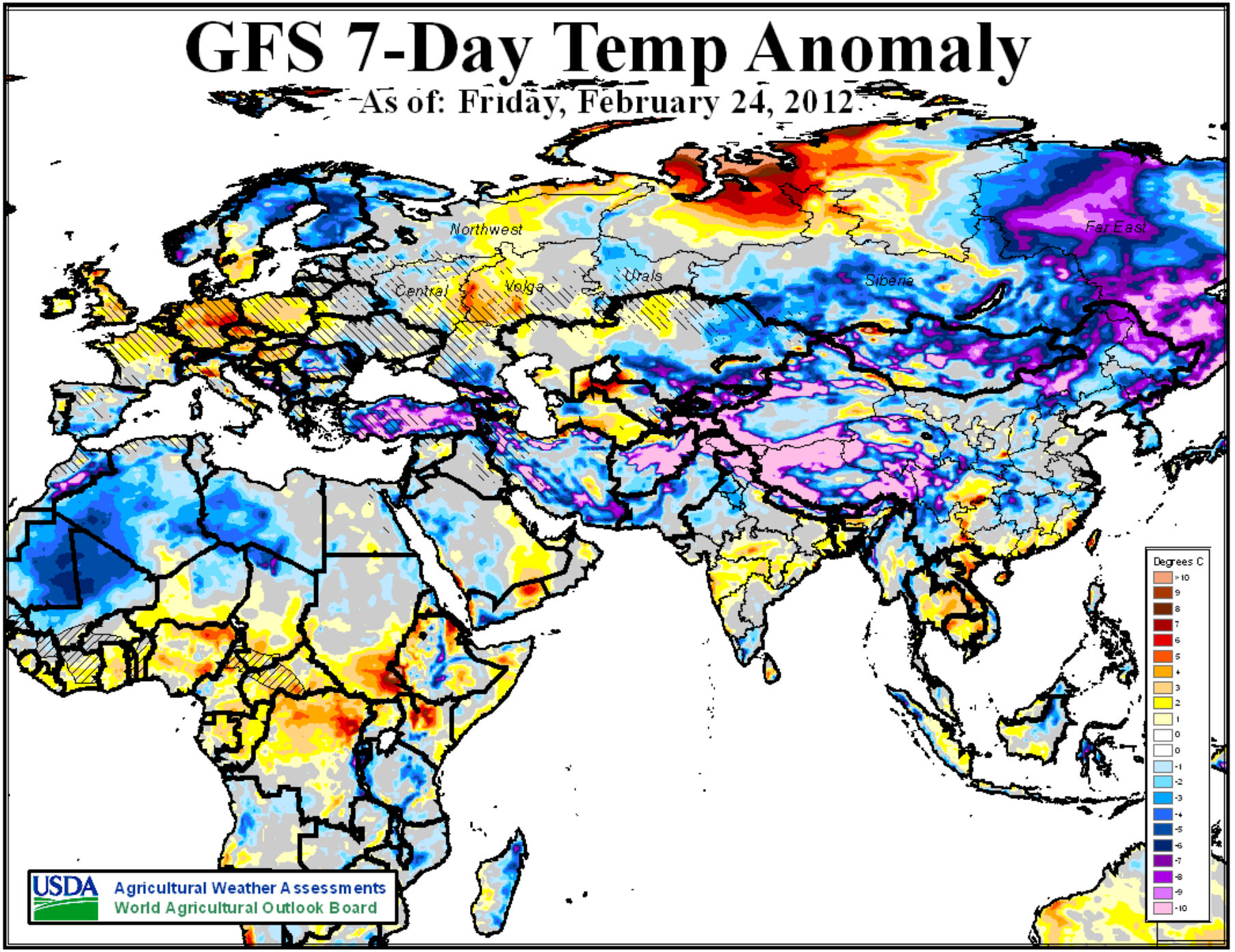
GFS 7-Day Temp Anomaly

As of: Friday, February 24, 2012



Example: Hi-resolution Ensemble Forecast Model

Questions?

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202-720-3361

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