Winter Forecast 2016-2017

Introduction

We currently have a weak La Nina pattern. THE KEY QUESTION IS, "WHEN WILL THE LA NINA BEGIN TO WEAKEN, AND HOW WEAK WILL IT BE?"
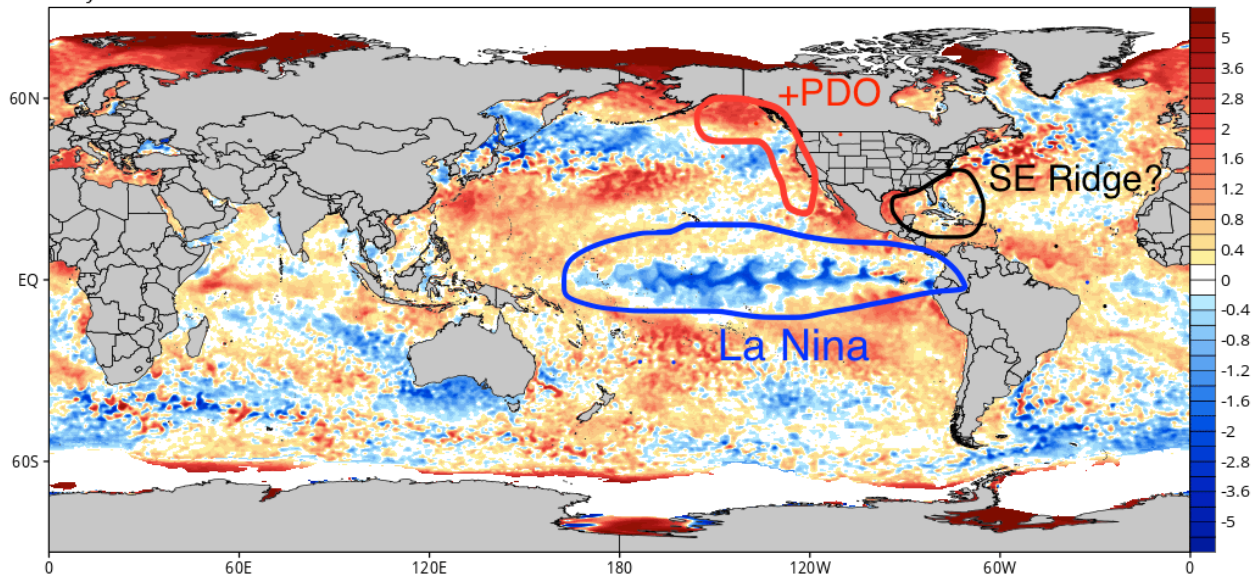
Key factors to watch:

Strength of Polar Vortex (NOT a massive factor but is a big source of COLD AIR)

PDO (warm water in Gulf of Alaska)

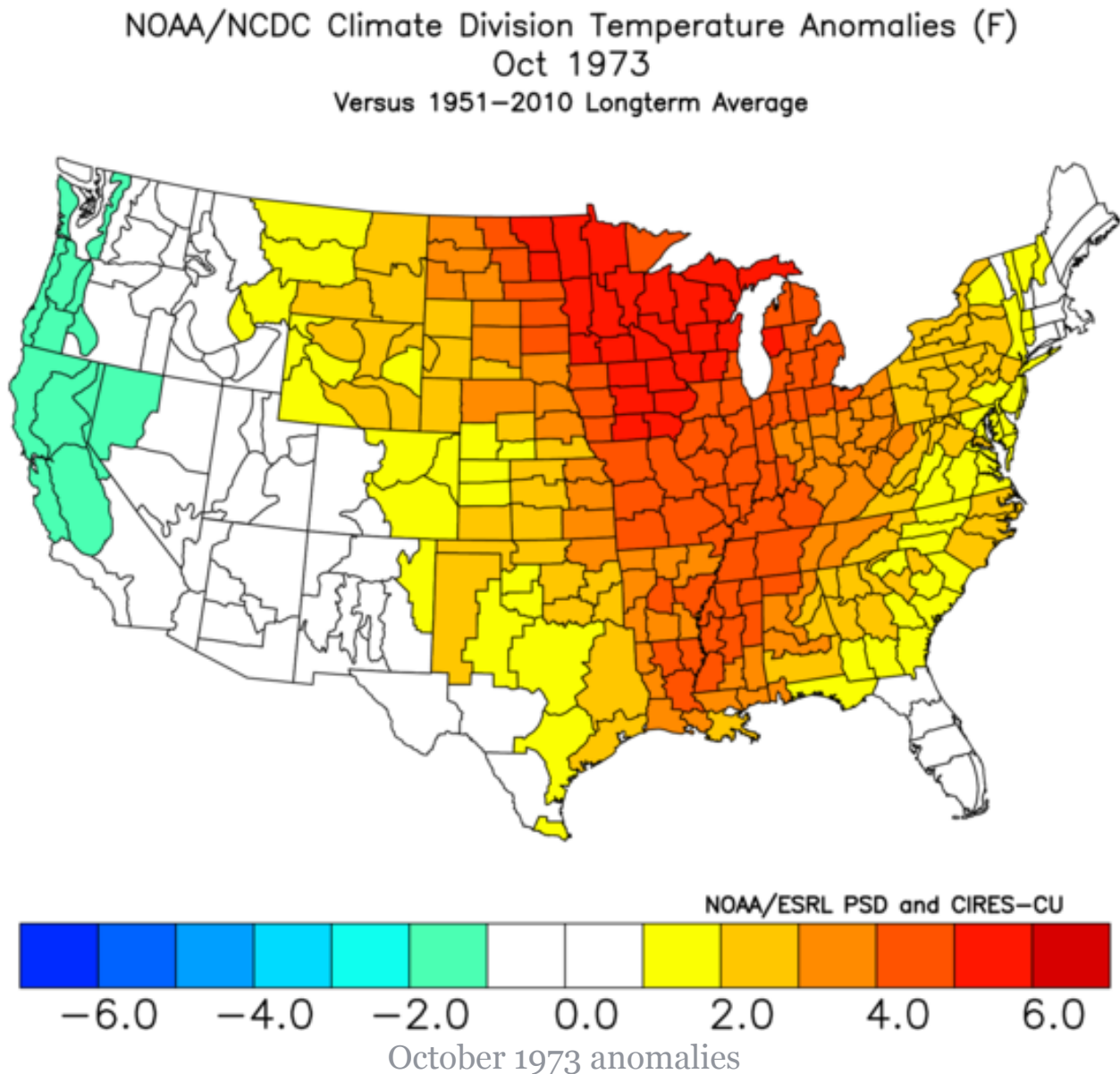La Nina strength (models weaken it, but the current La Nina has not been weakening)

Major Players to Watch Winter 2016-2017

Seasonal forecasting is one of the most difficult challenges for weather forecasters. Many different aspects affect the winter outcome in ways not well understood by forecasters at this time. In order to make a good winter forecast, it is necessary to study all these factors and then make a long range prediction based on the most probable outcome. As you can imagine, this is incredibly difficult and prone to mistakes!

Our forecasting method relies heavily on several of the key factors mentioned above. My favorite technique is analog forecasting, in which you compare similar weather patterns from years past with this year's patterns, then predict the winter based off of this information.

This year's forecast favors the analog years of 1961-62, 1973, 1995-96 and 2005-06, along with a few other years. The top analog is 1973-74 due to the placement of warm temperatures in September-October. This year featured a much warmer than usual September-October period similar to what we've seen this fall.

1973 October temperature anomalies

NOAA/NCDC Climate Division Temperature Anomalies (F)
Oct 1973
Versus 1951–2010 Longterm Average

NOAA/ESRL PSD and CIRES–CU

−6.0   −4.0   −2.0   0.0   2.0   4.0   6.0

October 1973 anomalies

Now compare the picture above with the anomalies observed through mid-late October (below). Notice the warmest air is centered up near the Great Lakes and across most of the US, while the extreme West Coast is the only region at or below normal.

Temperature (2-meter) Anomaly [°C] 00Z01OCT2016 --> 12Z20OCT2016 | Average
NCEP CFSv2   CONUS Anom: 1.298°C
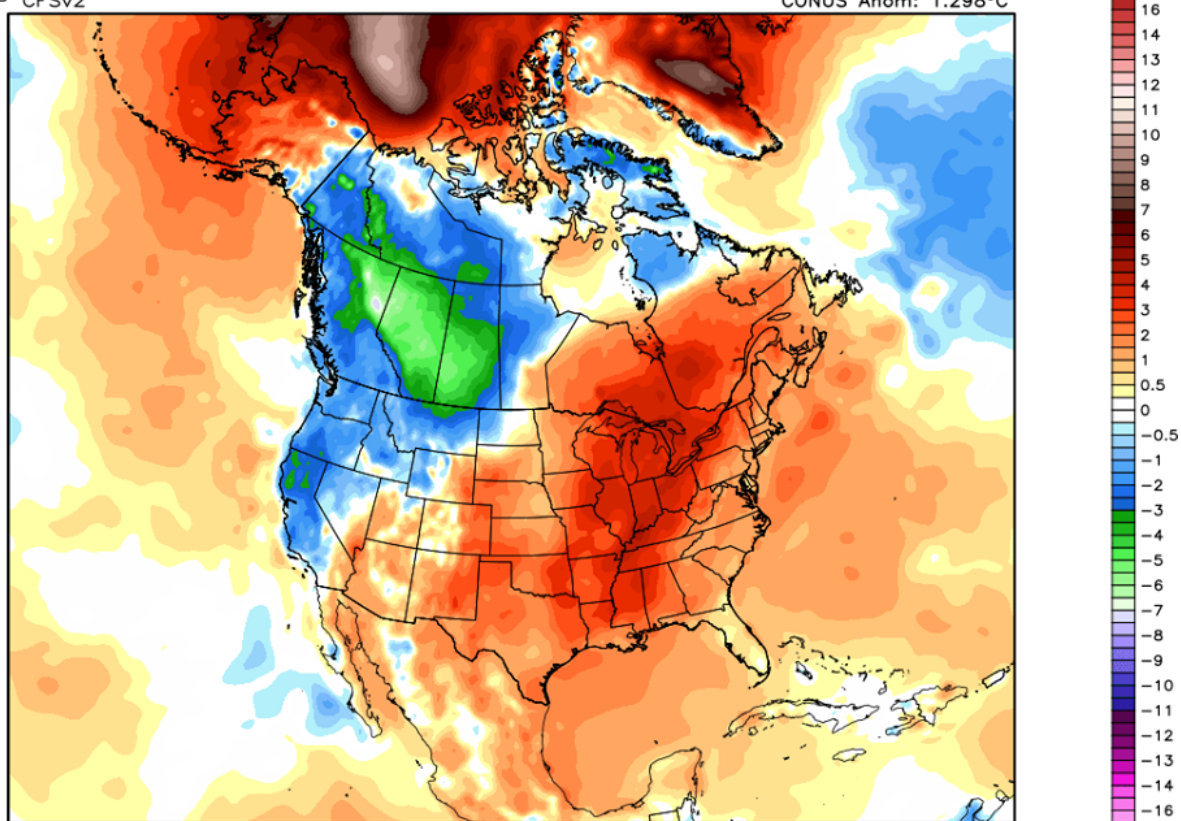
NCEP CFSR 1981-2010 Climatology | T574 CFSv2 Analysis Grid | Ryan N. Maue | WeatherBELL

With November already here, the focus of this winter forecast will be December 2016 through March 2017. However, for the sake of discussion, it appears things will begin to cool off by mid-November, in a gradual pattern transition to seasonal or slightly below normal weather. Read below for a month-by-month breakdown!
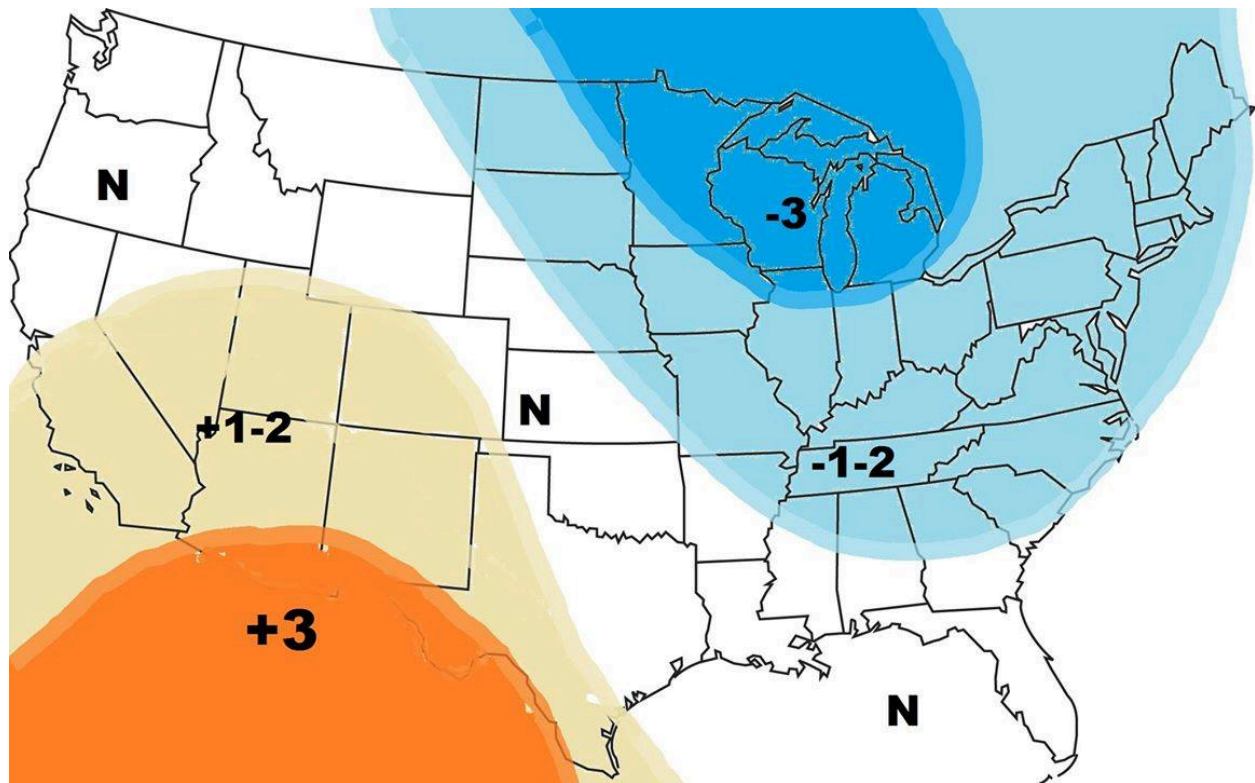
December

December will be our coolest month. You can see clearly that the trough will be firmly set over the East due to the -NAO. This pattern would produce conditions most conducive to snow. For the first time in several winters, we may see a front-end winter.

If you notice the analog we have picked for December, our forecast places the cold further east. This is due to various factors slightly different this winter from the aforementioned winters.

NOAA/NCDC Climate Division Composite Temperature Anomalies (F)
Versus 1951−2010 Longterm Average
Dec 1956,1961,1962,1967,1973,1978,1983,1985,1995,1996
2000,2001,2005,2008,2011

NOAA/ESRL PSD and CIRES−CU

−3.0 −2.0 −1.0 0.0 1.0 2.0 3.0

Analog Anomalies for December
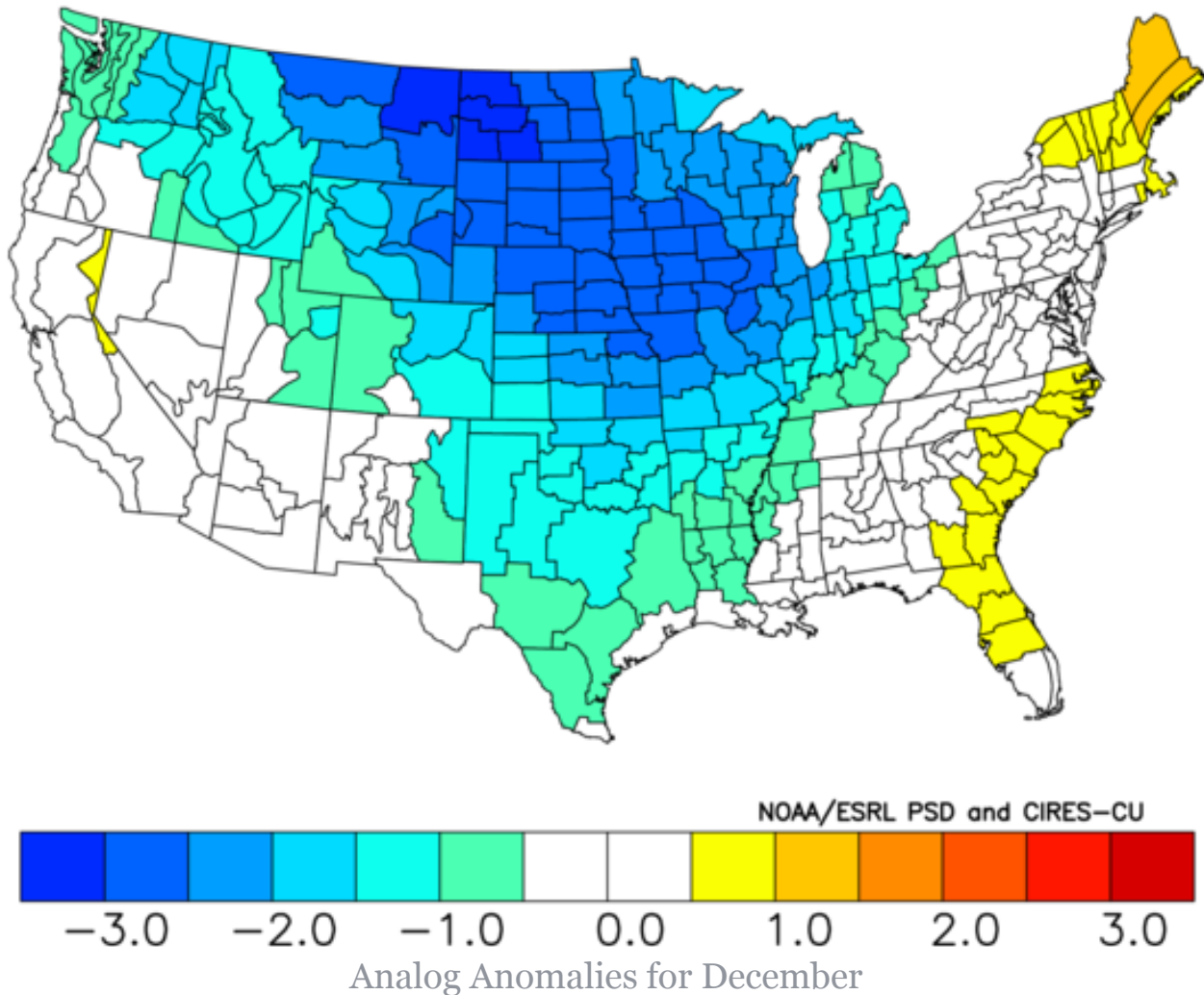
Here is our forecast map for December with the colder air entrenched over the Eastern US.

Forecast Temperature Anomalies for December

Summary
December will be favorable for snow. The trough in the east will help storms dig to our south and keep us in the cold air mass. This pattern will become solidly entrenched by mid-December and should hold through the end of the month. White Christmas, anyone?

January
January will feature a slow shift in the pattern. As we enter the first few weeks of January, the trough and Polar Vortex will be overwhelmed, and gradually, we will see warming across the East coast. **NOTICE THE DARK BLUE IN THE WESTERN US.** This tells me that the cold air will

become entrenched in the Rockies. The coldest air will stay well away from the East Coast; however, the East Coast may still experience brief shots of cold air.

NOAA/NCDC Climate Division Composite Temperature Anomalies (F)
Versus 1951−2010 Longterm Average
Jan 1957,1962,1963,1968,1974,1979,1984,1986,1996,1997
2001,2002,2006,2009,2012

Analog Years for January
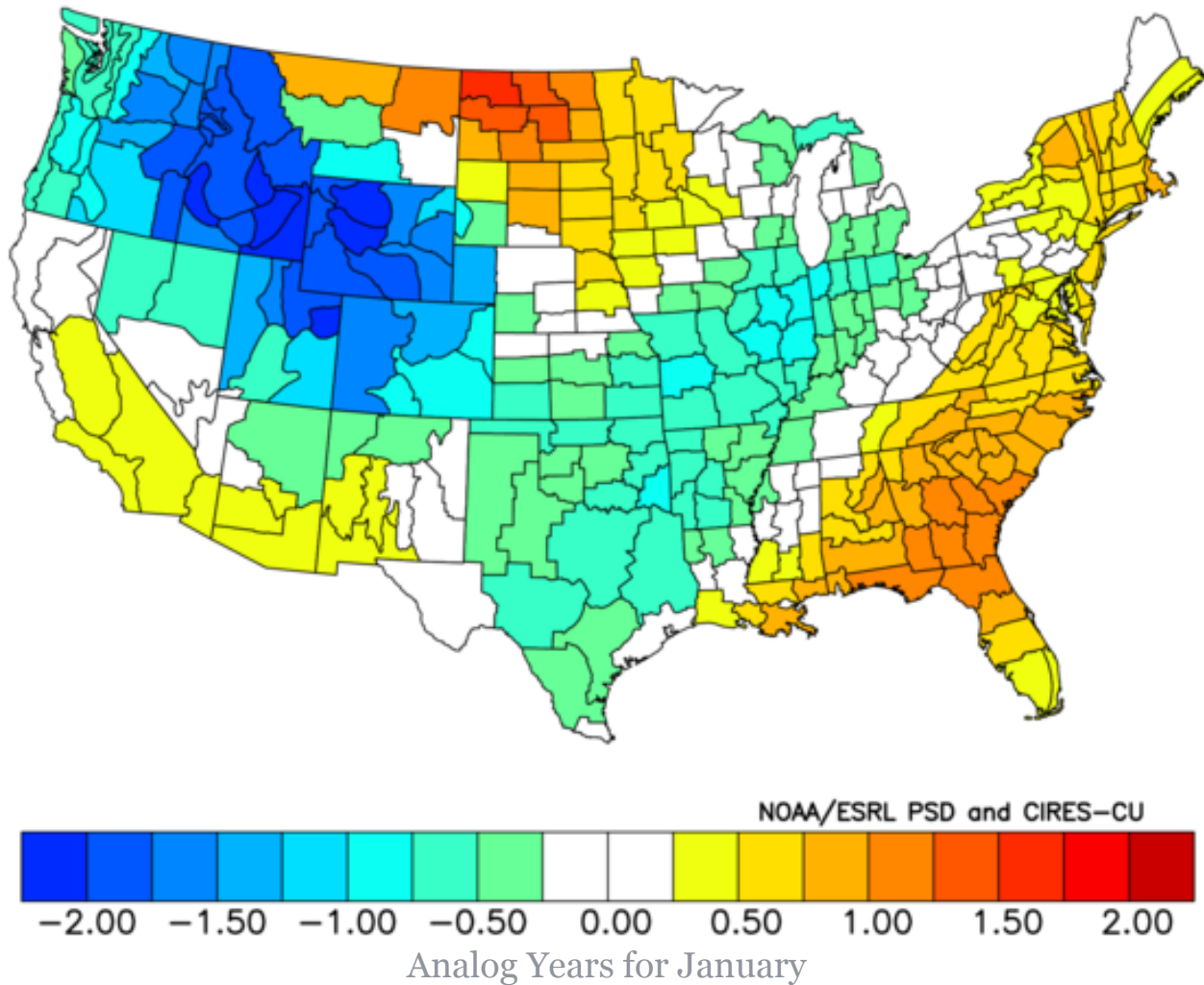
January will be very moody. We will start out cold until the pattern slowly flips. Then by mid-January we will be in a transient pattern. We will see 5 days of warm weather followed by a cold front that cools us for the next 3-5 days. January will be very moody. It will begin cold, then slowly change. By mid-January will bring a transient pattern. We

will see 5 days of warm weather followed by a cold front that cools us for the next several days.
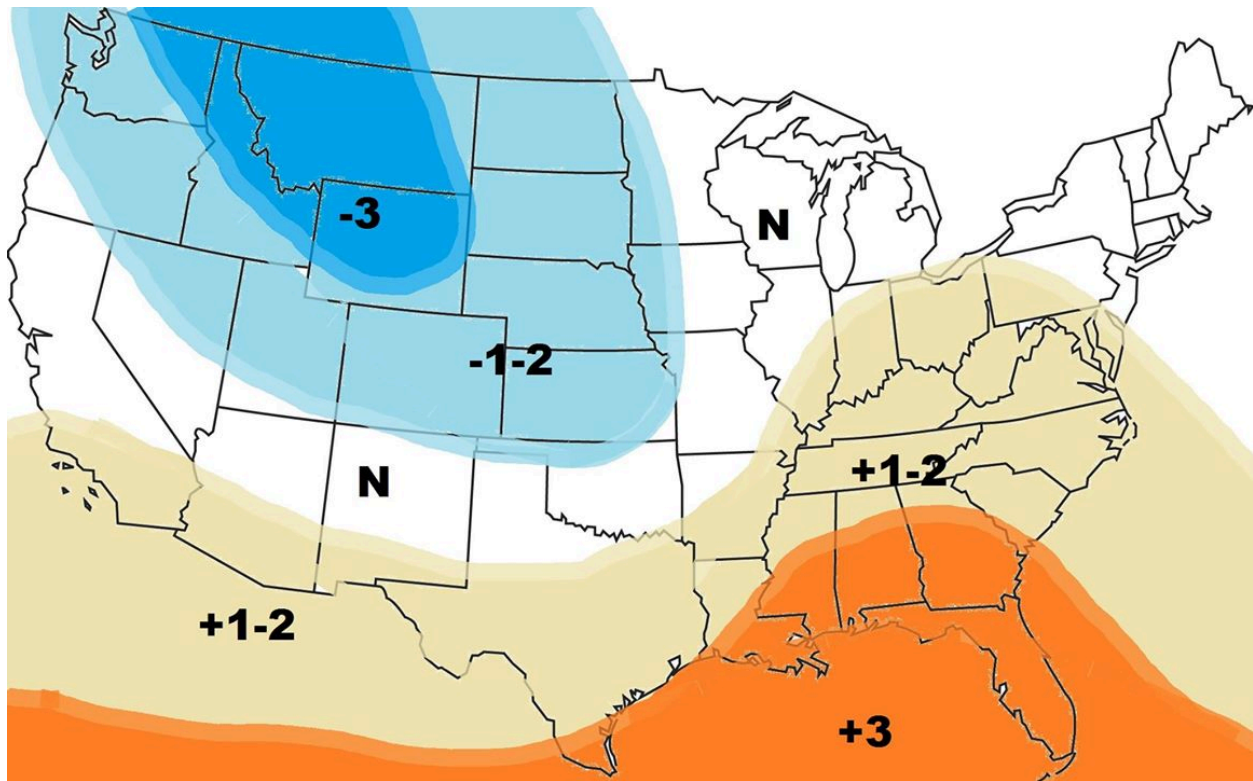
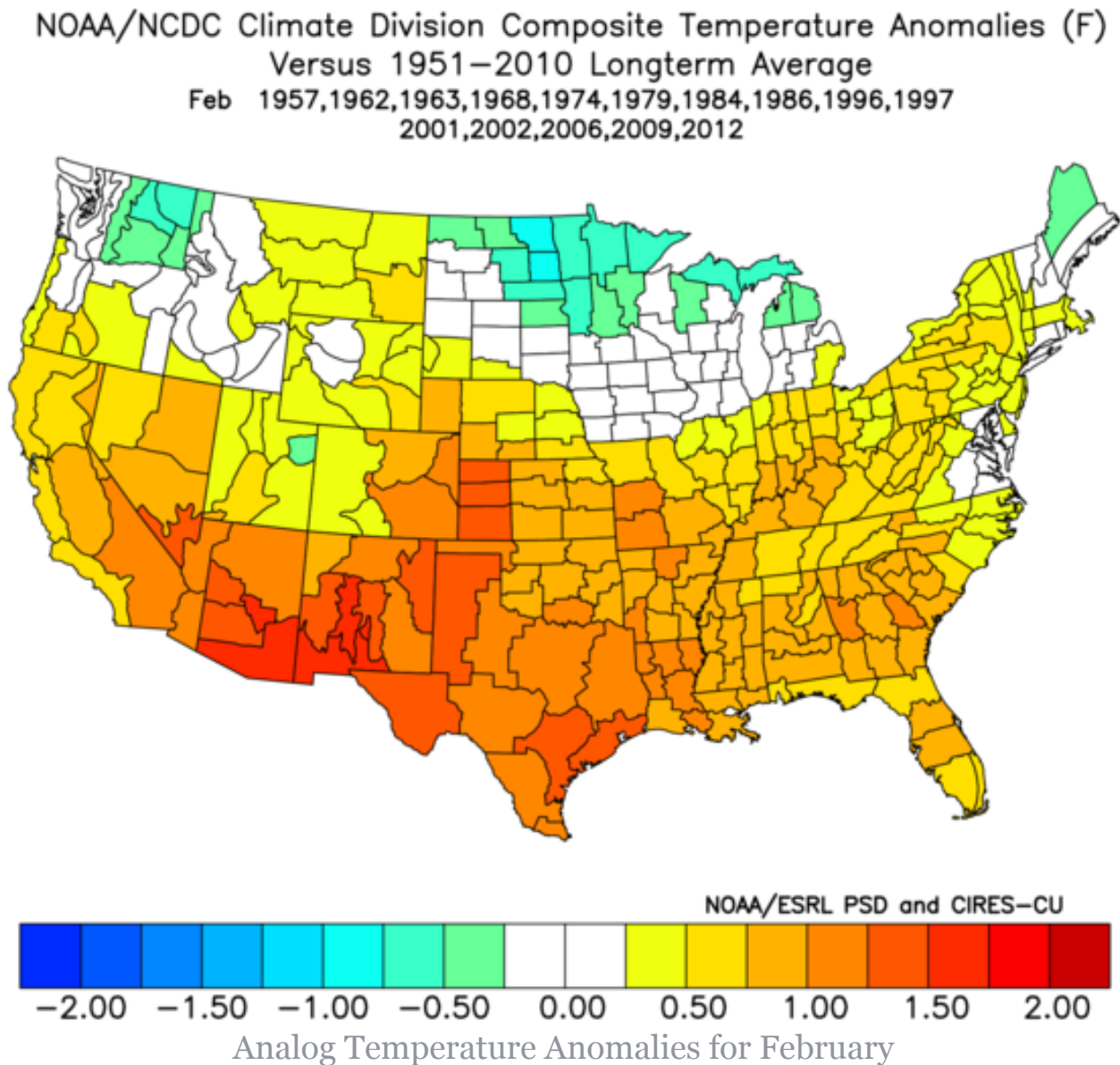January 2017 Forecast Temperature Anomalies

Summary
January will not be as cold as normal BUT that does not mean it will not snow. The first 10 days of January will be favorable for a snow storm. As we begin to see the pattern break down, a Southeast Ridge will build (warmer temps for us). Because this ridge will be suppressed by storms, it will be possible to see snow during this timeframe.
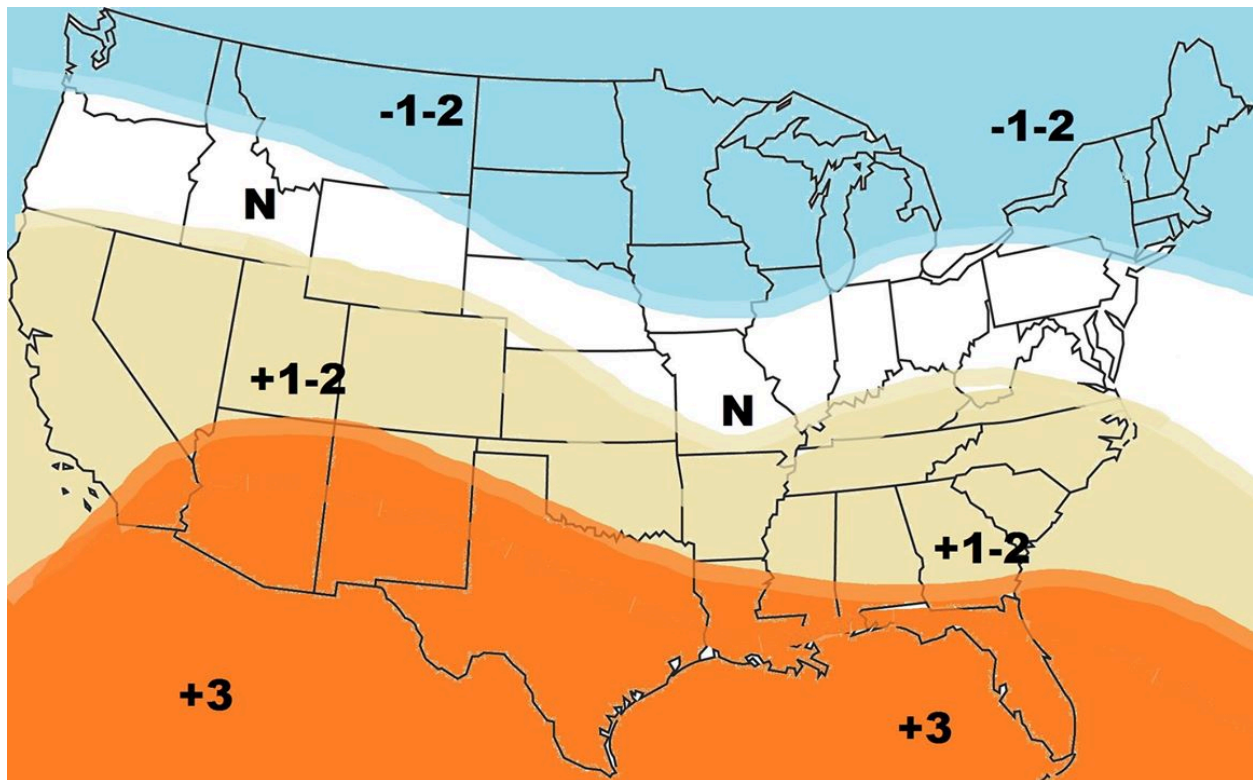
February
February will not be for the snow lover. We will see the trough in the west completely erode, leaving most of the US in above normal temps. The Pacific Jet Stream will begin to strengthen and build a ridge into the southern US (You can

see this signal showing due to the reds in the southern US), which means warmer weather and a drier pattern.

NOAA/NCDC Climate Division Composite Temperature Anomalies (F)
Versus 1951–2010 Longterm Average
Feb 1957,1962,1963,1968,1974,1979,1984,1986,1996,1997
2001,2002,2006,2009,2012

Analog Temperature Anomalies for February

Our forecast will feature a mildly warm pattern setting up across NC. While this is still not terribly hot our problem will now be storm track. The storms will be track well to our north or up along the Appalachian mountains. For snow we need the storm track to our south and east. This will greatly reduce snow chances in February.

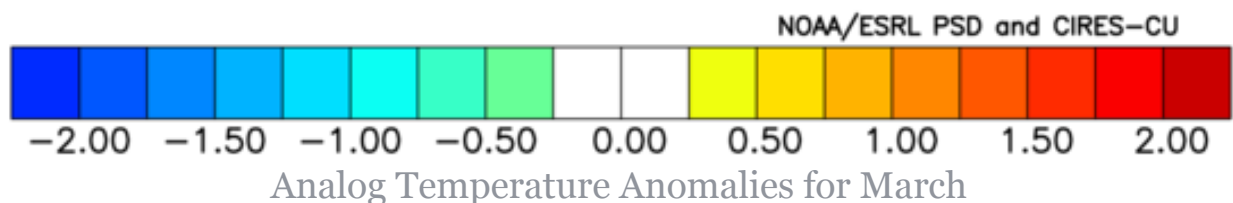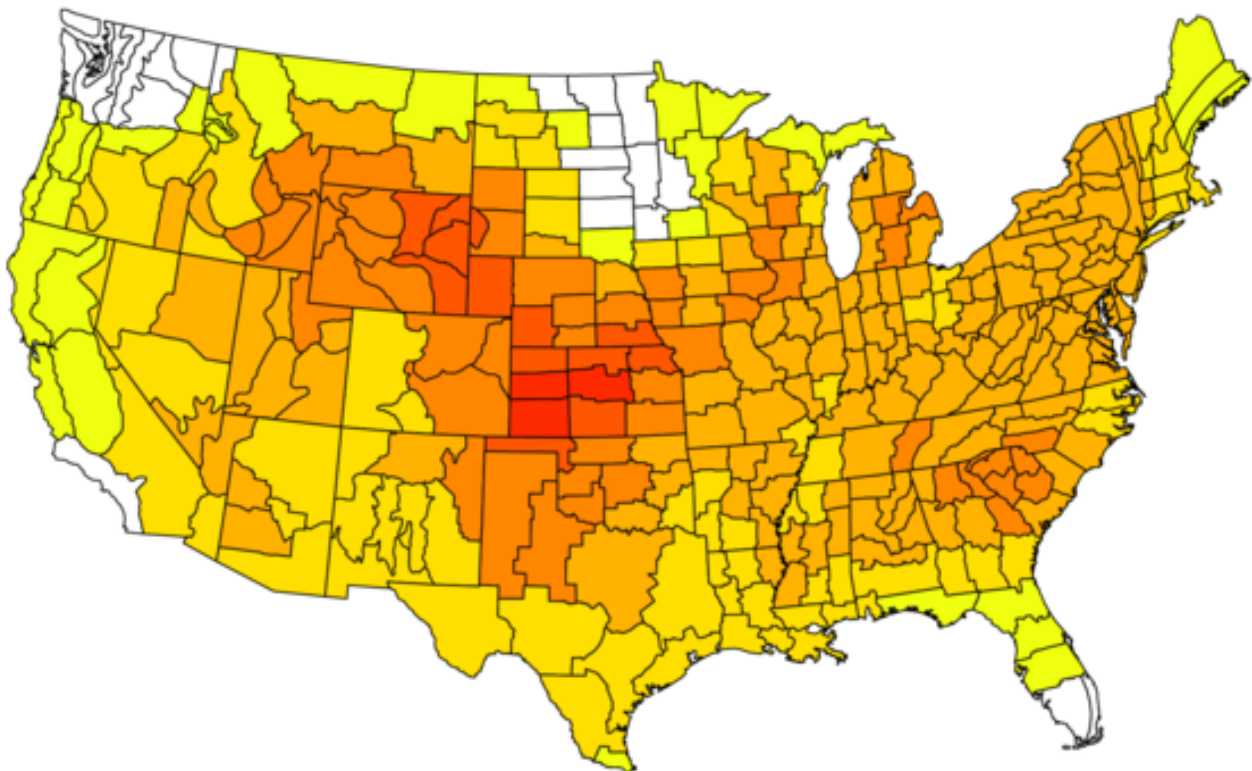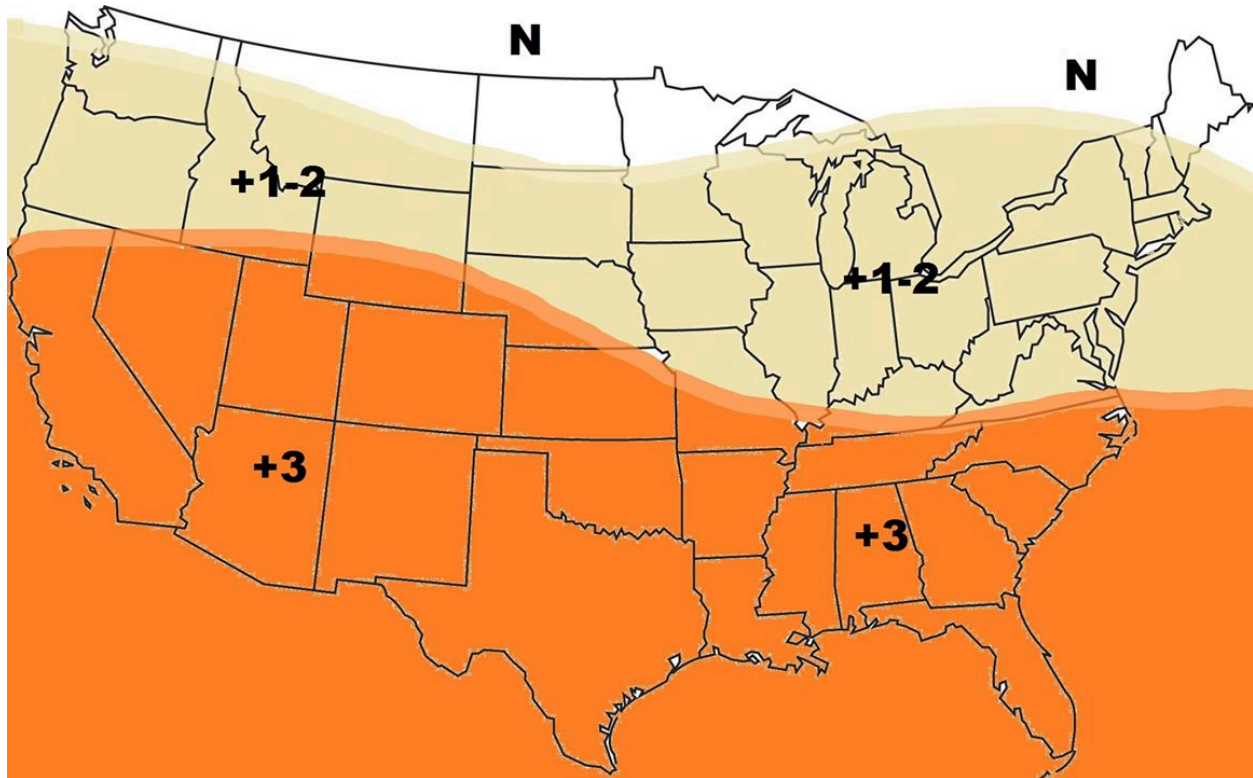February Forecast Temperature Anomalies

Summary

February will be ugly. There will not be many IF ANY threats of decent snowfall especially for C&E NC. While not particularly hot we will still be in the transient pattern with multiple warm days followed by multiple cold days.

March

March will be warm across the entire US. The ridge will keep building and most of the US will see warmer than average temps. Storm track will be well to the north as well. An EARLY SPRING is possible.

NOAA/NCDC Climate Division Composite Temperature Anomalies (F)
Versus 1951−2010 Longterm Average
Mar   1957,1962,1963,1968,1974,1979,1984,1986,1996,1997
2001,2002,2006,2009,2012

NOAA/ESRL PSD and CIRES−CU

Analog Temperature Anomalies for March

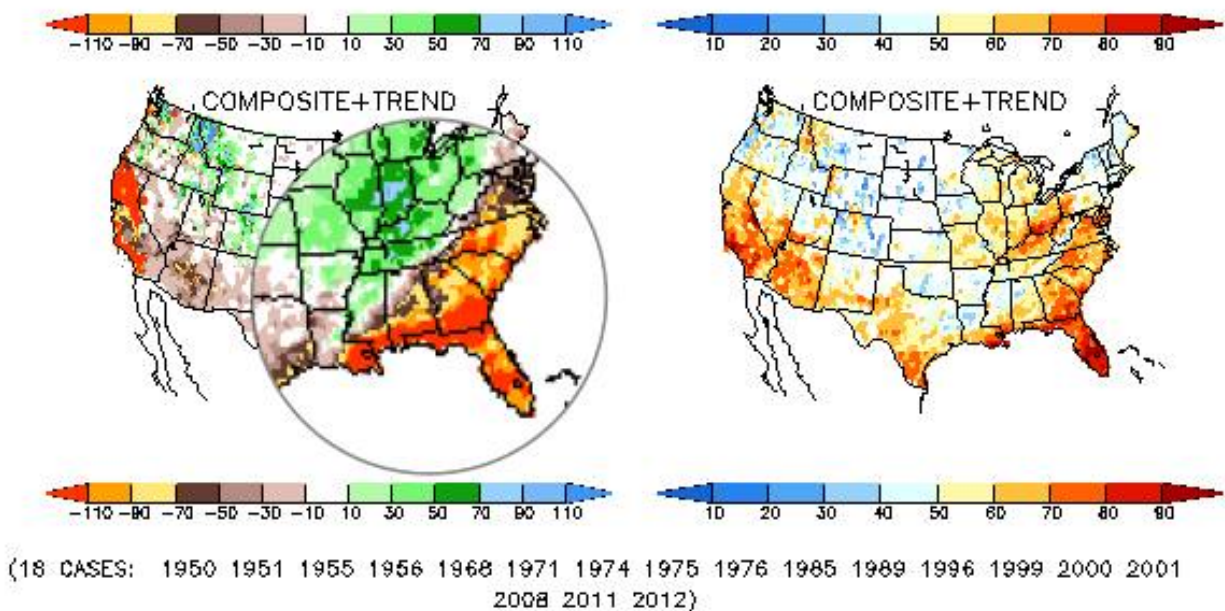Forecast Temperature Anomalies for March

Summary
March will bring an early spring!

Summary

Precip anomalies for La Nina winters indicate a drier than usual pattern across the SE states. This means a dry winter for us but also reduces snow opportunities. The storms need to track to our SOUTHEAST.

This is where the forecast could change. If the La Nina weakens into the Neutral zone we could see more storms tracking further east and the cold may stick around longer.

Temperature anomalies for La Nina Winters.
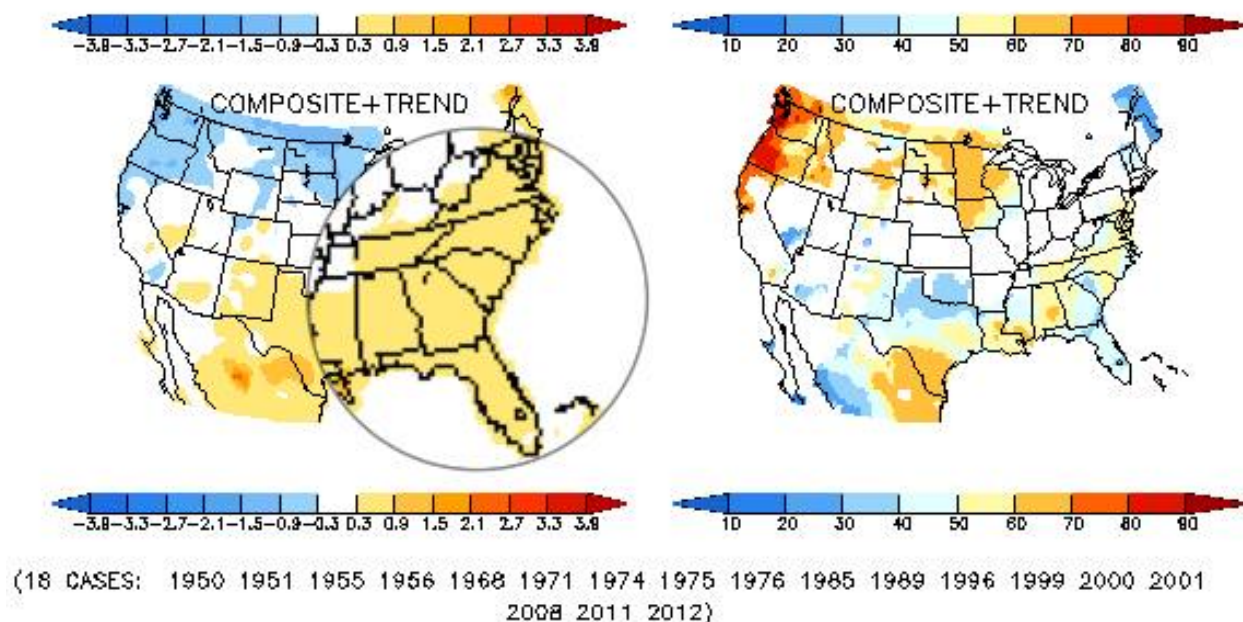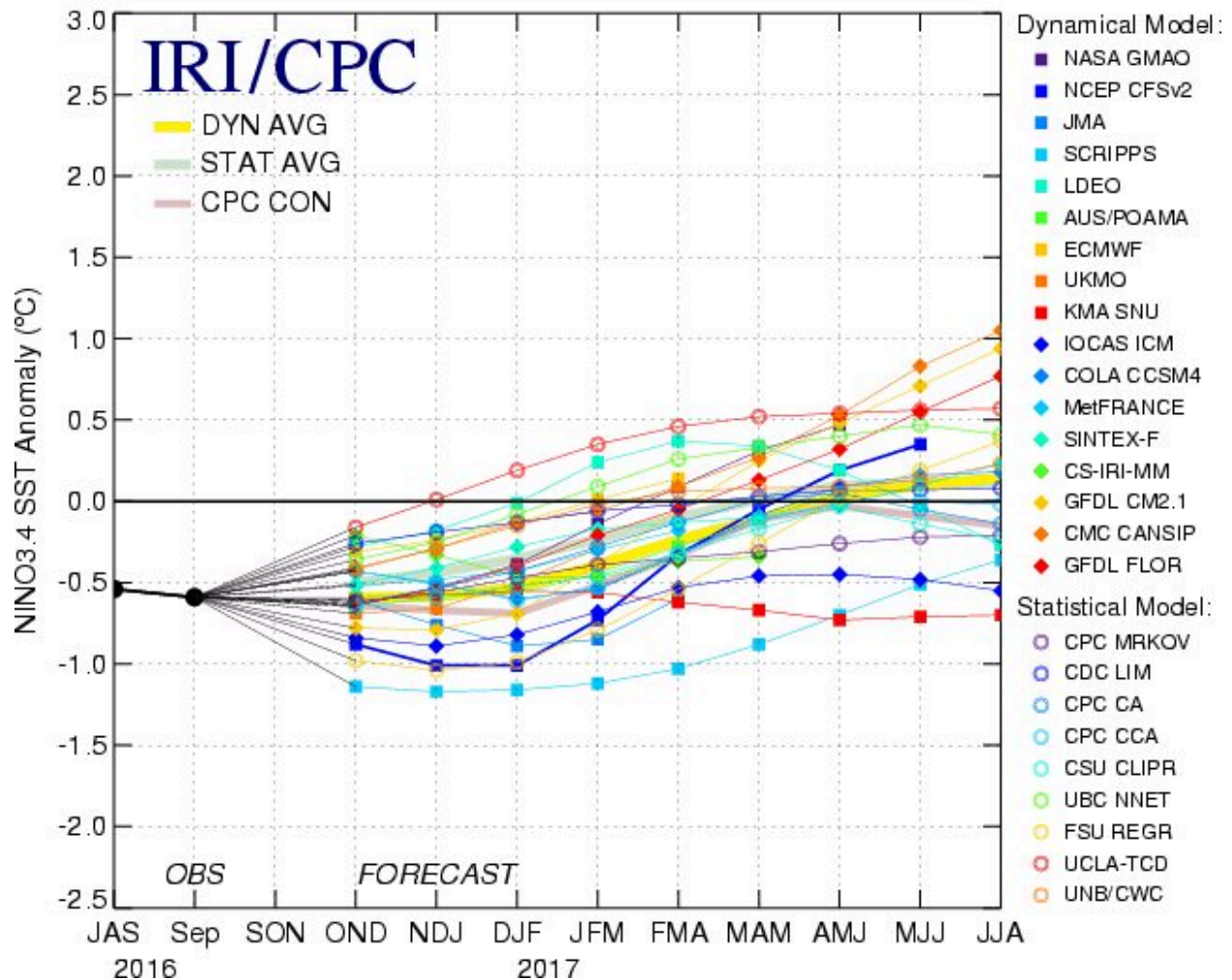
Also the La Nina is forecast to strengthen slightly or begin weakening depending on which model you believe. The final outcome of this will have a significant impact on our winter
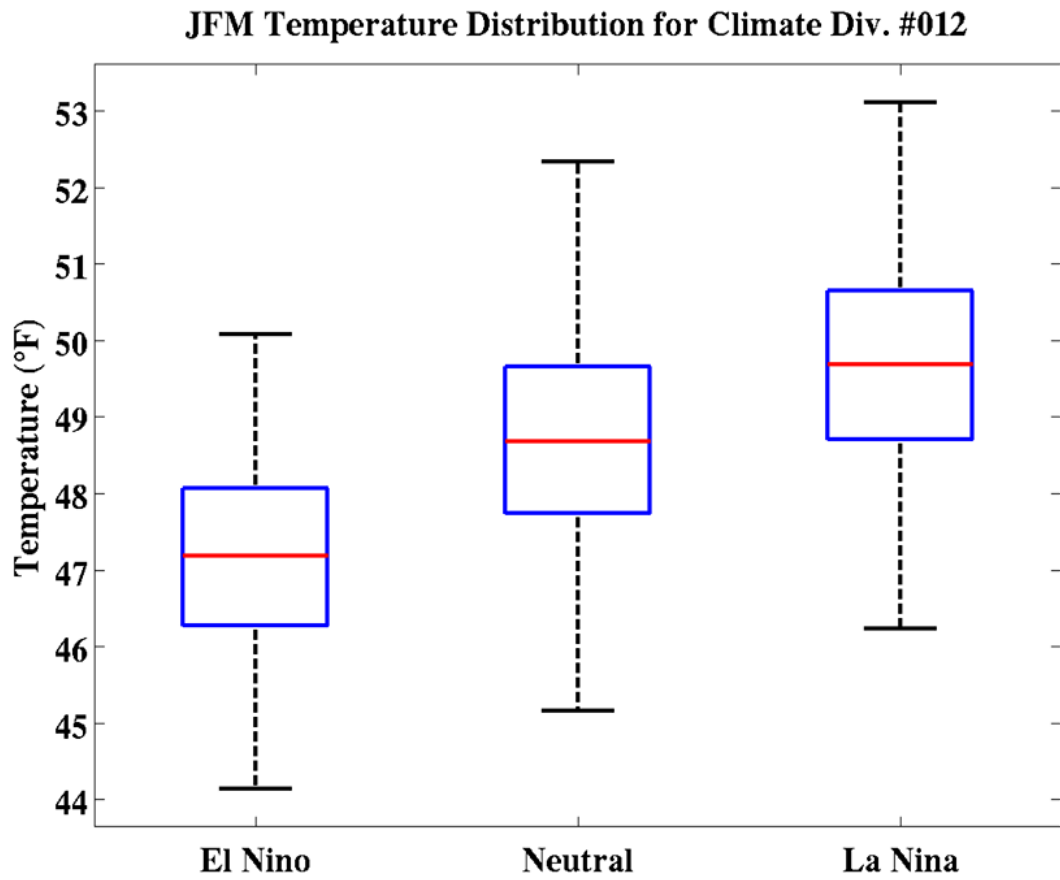
weather and how quickly the transition to warmer weather occurs.

Model forecast for La Nina intensity

Historical average of temperatures during El Nino, Neutral and La Nina phases indicates higher than normal temperatures across NC during Neutral and La Nina winters.

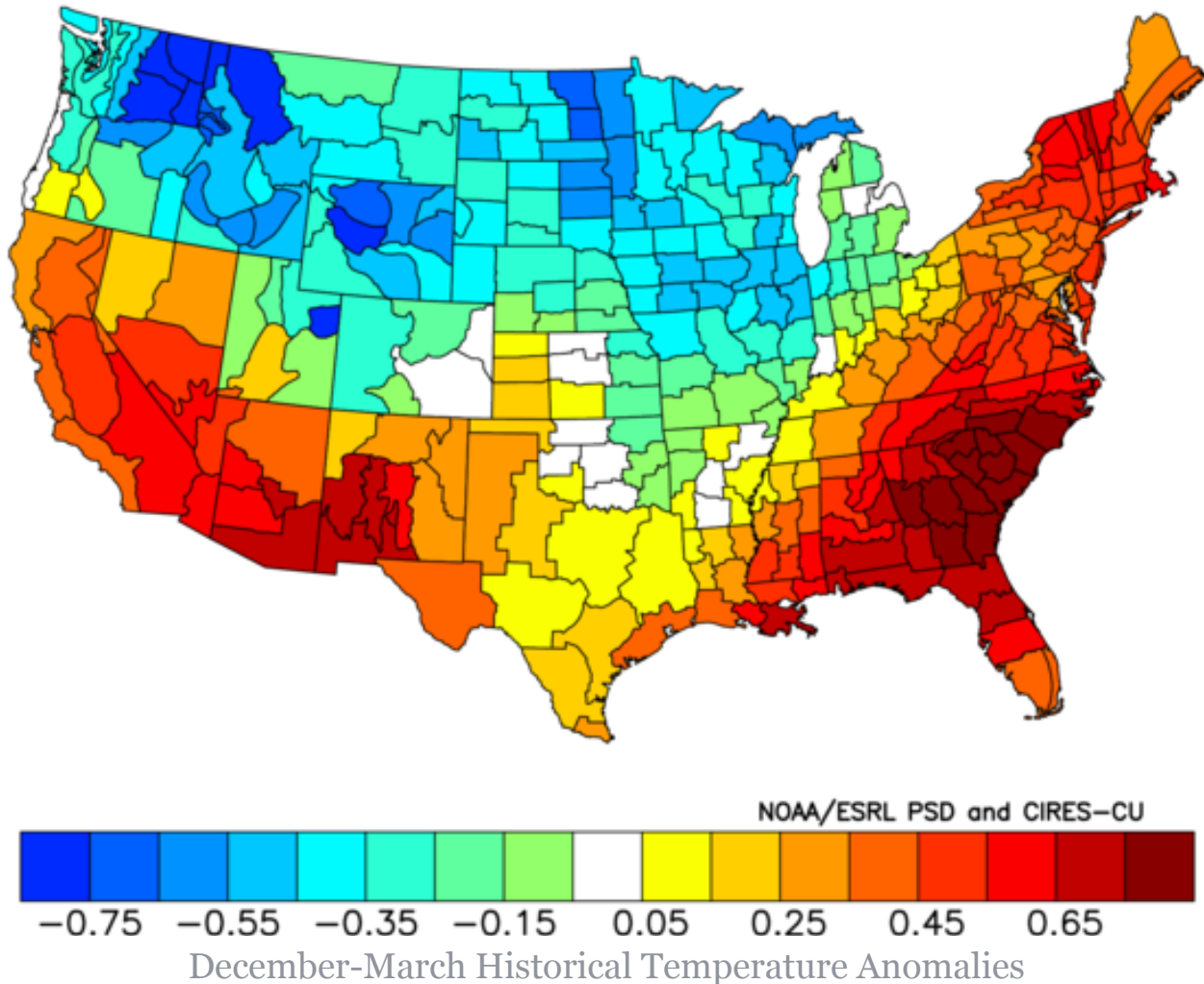JFM Temperature Distribution for Climate Div. #012

Average temperatures for El Nino, Neutral and La Nina Phases in NC

Winter 2016-17 analogs for the entire year suggest AN temps albeit slightly (+1F).

NOAA/NCDC Climate Division Composite Temperature Anomalies (F)
Versus 1951–2010 Longterm Average
Dec to Mar   1956–57,1961–62,1962–63,1967–68,1973–74,1978–79,1983–84,1985–86
1995–96,1996–97,2000–01,2001–02,2005–06,2008–09,2011–12,

NOAA/ESRL PSD and CIRES–CU

−0.75 −0.55 −0.35 −0.15   0.05   0.25   0.45   0.65

December-March Historical Temperature Anomalies

Snow Forecast
Now its time for the snow! Overall we will end up seeing close to average snowfall across NC. The big question is how does this fall? The pattern for December and January has historically brought large snow storms to NC. While it is not a guarantee that we will see ONE BIG Storm there is a

possibility based on historical analogs that we will see MOST of our normal snowfall in one or two larger events.
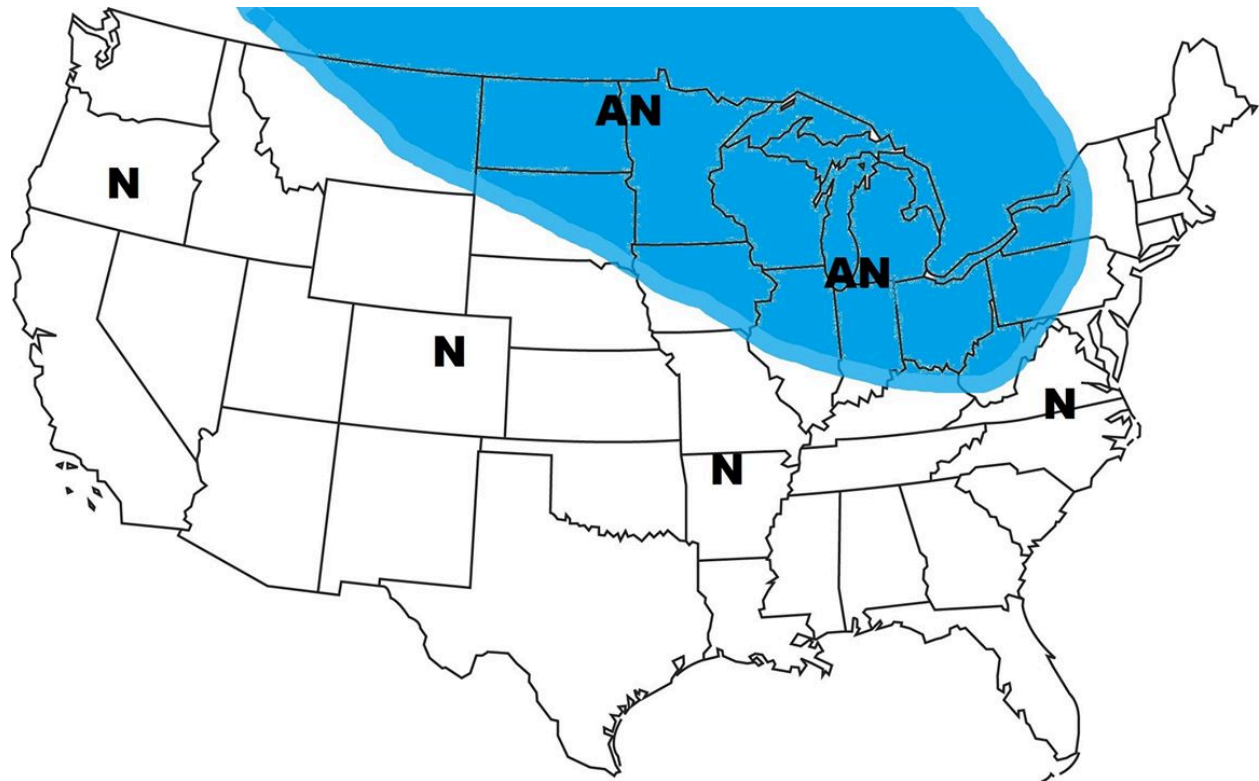
AN= Above normal snowfall. N= Normal

Overall our winter will be fairly close to normal. While temperatures will lean toward the ABOVE AVERAGE side of the scale it is not an all out heatwave. Also our snowfall looks to be close to normal with our biggest chance of snow in December and into the first few weeks of January before the pattern becomes transient and warms up.

Ice Risk
The best risk for ice would be December into early January when the La Nina pattern favors it. If it weakens quicker to neutral then this could extend the cold longer into February.

Final thoughts
Expect an early start to the winter with temperatures cooling down by late November and early December. A weaker La Nina would also extend the cold air for longer, while a stronger PDO could keep the cold air in place for longer. The rapid advance of the Siberian snow cover could also indicate a chance for colder temperatures than forecast.

This year's forecast has been the most difficult to predict and uncertain to predict. Overall it will be a fairly typical winter in North Carolina, with the best snow chances occurring in December and early January. Temperatures will begin to slowly warm by mid-January and snow chances will drop off quickly due to the expected pattern change.