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Kevin Inscoe <kevin.inscoe@gmail.com>

2010-2011 WINTER FORECAST, October 30, 2010

LARRYCOSGROVE@aol.com <LARRYCOSGROVE@aol.com> **Fri, Oct 29, 2010 at 11:44 PM**
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Overview

A comprehensive outlook for weather during the upcoming winter season, defined here as December 2010 through March 2011. The emphasis is on temperature patterns through the United States and Canada. Predictions concerning snow and ice potential and general character of synoptic conditions in North America are also included.

A number of possible "contributors" to long-term weather forecasting were reviewed. Analog matches to currently evolving patterns and oscillations are averaged to produce a picture of apparent weather between December 1, 2010, and March 31, 2011.

In order to provide balance to the forecast against a possible warm or cold bias, past winters of a character that matched the evolution of the current ENSO signal (moderate, then in some cases strong La Nina episodes) were added together to derive a mean temperature. The analog years used are as follows:

1904-05 Close match to sunspot cycle evolution
1950-51 Moderate La Nina episode
1952-53 Close match to 250MB wind alignment (jet stream level)
1954-55 Moderate La Nina episode
1964-65 Moderate La Nina episode
1970-71 Moderate La Nina episode following moderate El Nino
1975-76 Strong La Nina episode with late autumn peak
1984-85 Moderate La Nina episode following a strong El Nino
1993-94 Close match to 2010 cryosphere
1998-99 Moderate La Nina episode following a strong El Nino,
Best match to evolution of -ENSO and -PDO in current times
1999-2000 Strong La Nina episode
Closest match to display of summer heat,

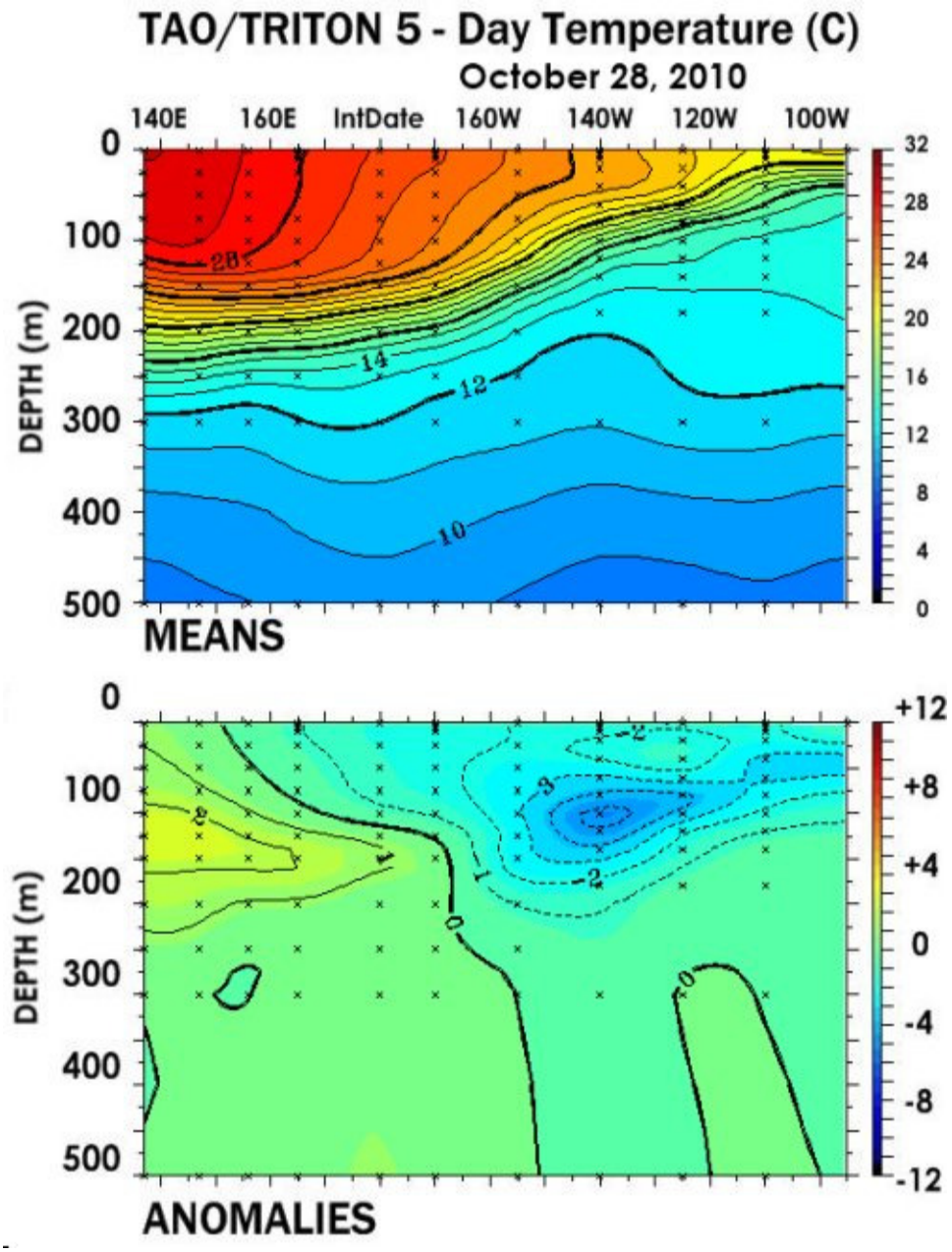
Similarity with expanse of summer heat, tropical cyclones

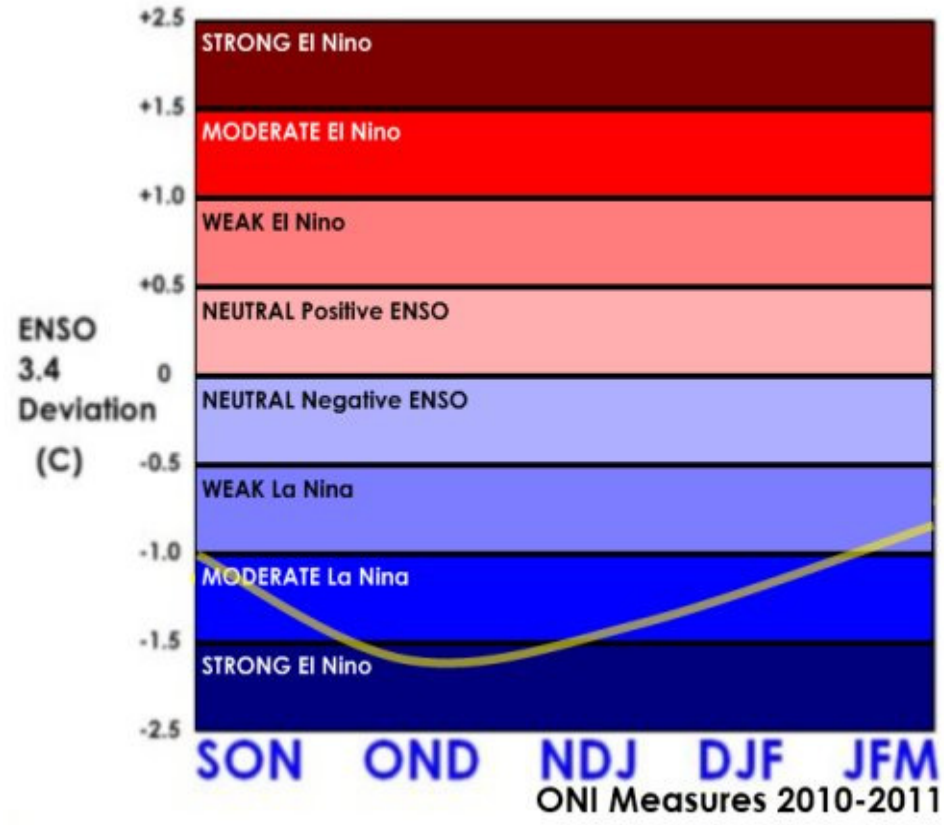
2007-08 Moderate La Nina episode

Closest match to 500MB longwave pattern in summer and fall

Here are the parameters used in creating the averaged analog forecast, with modification based on currently atmospheric trends:

1) El Nino Southern Oscillation (ENSO) Signature (Using Oceanic Nino Index)





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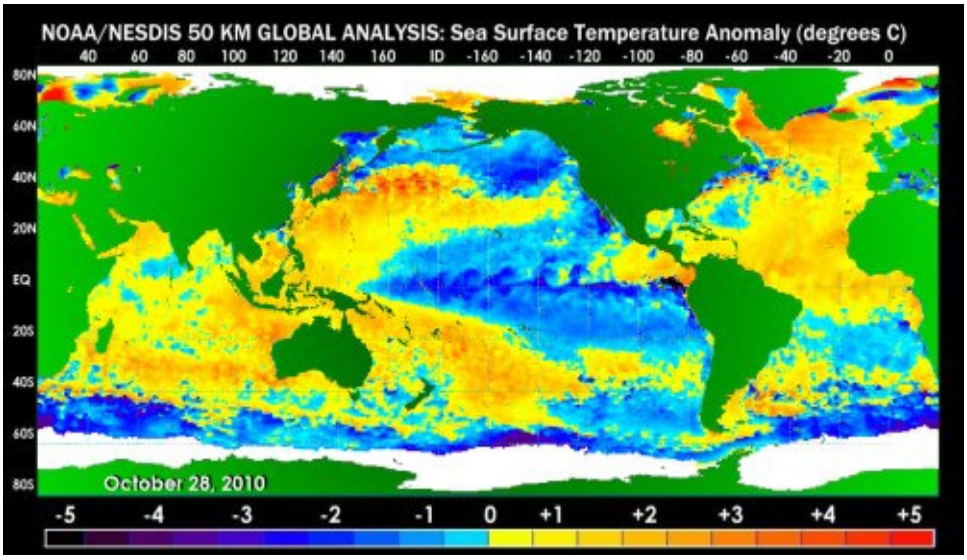
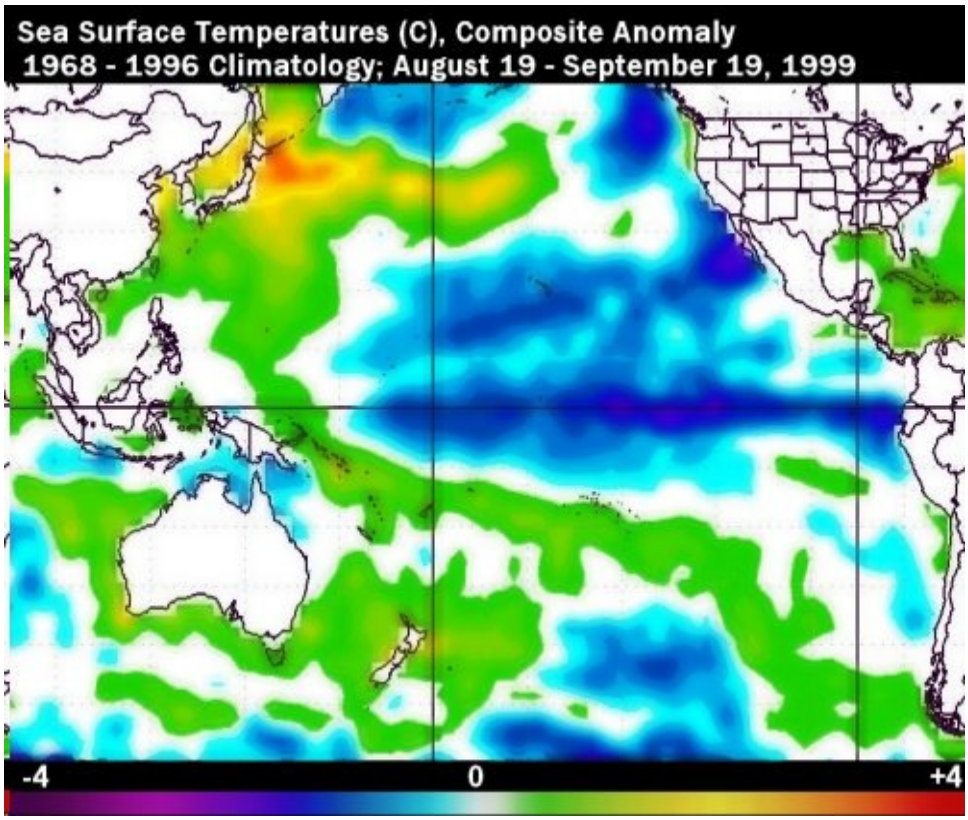


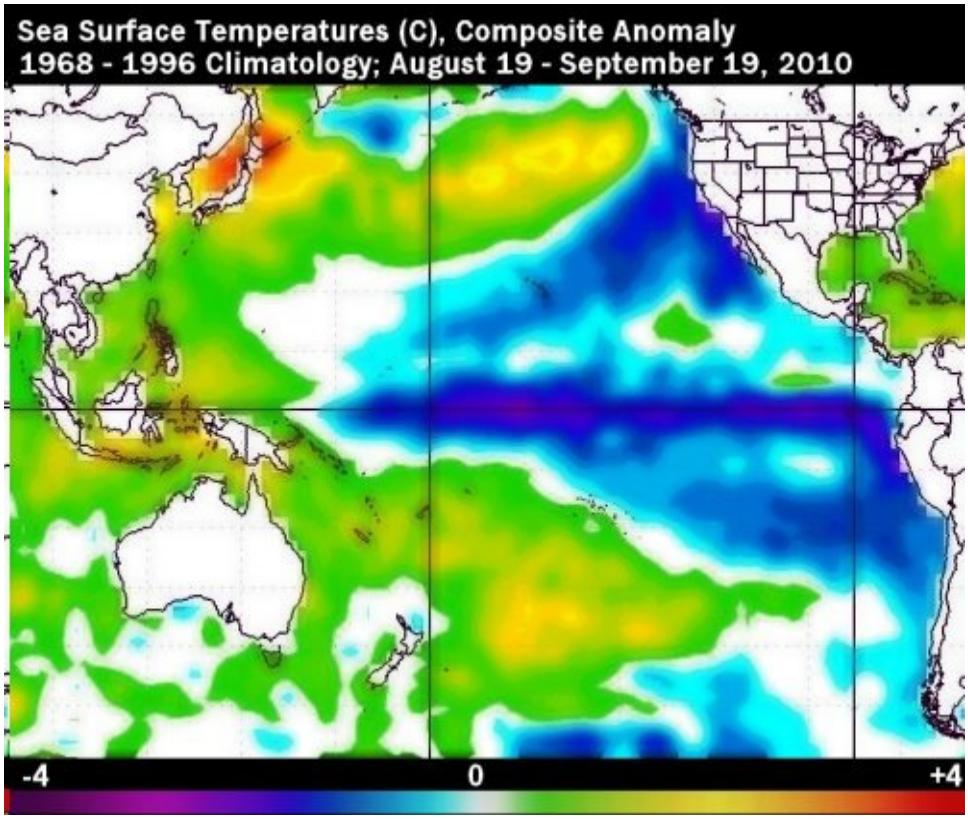
During the summer, the equatorial Pacific Ocean quickly cooled, replacing what had been a well-defined, Western sector based El Nino episode with an almost classic-looking, basin-wide La Nina. While some very cool anomalies exist below the surface in the central portion of the ENSO domain, sea surface temperatures have generally held steady during the past four weeks and look to remain so through the autumn. Most of the numerical models dealing with SST character between the

Philippines and the Galapagos Islands suggest this stable character will linger through late December before a gradual warming of waters in the central Pacific theater gets underway. Using the Oceanic Nino Index (three month average), a maximum deviation between -1.5 and -1.7 C can be expected, with a weakening -ENSO character setting in after New Year's Day 2011. So if we are to expect so-called "classic" La Nina winter season conditions (that is cold across the northern third of the U.S., with warmer than average anomalies along and below 40 N Latitude), that seasonal character would likely occur during December, with the rest of winter prone to volatility and a more indeterminate pattern.

The best match-up of the ONI designation for the current La Nina episode is to the same time frame in 1998.

2) Alignment Of Pacific Decadal Oscillation (PDO)

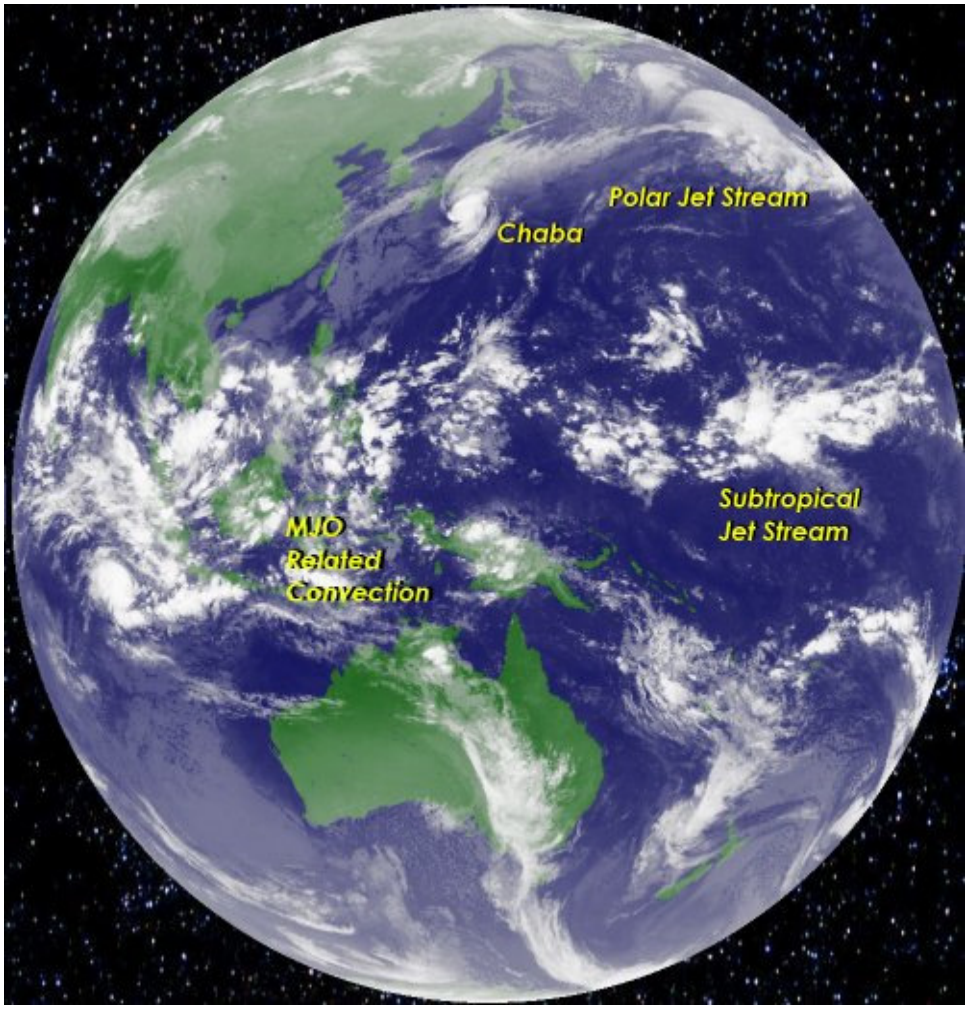




The Pacific Decadal Oscillation (PDO) is an index that follows swings in sea surface temperature across the northern Pacific Ocean. A negative phase implies colder than normal waters, whereas a positive measure suggests dominance of warm water. While a -PDO is said to favor occurrence of semizonal flow (and thus mild air temperatures in most of the U.S.), there have been notorious cases where bitterly cold DJFM periods in the lower 48 states have been concurrent with chilled seas in the sub-Aleutian sector. Often the computation of the index does not match the actual hydrothermal pattern, which can make predictive arguments all the more confusing.

The evolution of the hydrothermal deviations across the northern Pacific Ocean, in conjunction with the building La Nina episode, is a critical factor in how apparent weather through late autumn and winter will develop. Using actual SST displays across the northern and central Pacific Ocean as a guide, the best match for late summer of 2010 is that of 1999. While the late summers of 1988 and 1995 also bear resemblance to recent comparison tests, eleven years ago showed the juxtaposition of warmth in waters near the Orient vs. cooler seas along the West Coast of North America.

3) Character Of Madden Julian Oscillation (MJO)

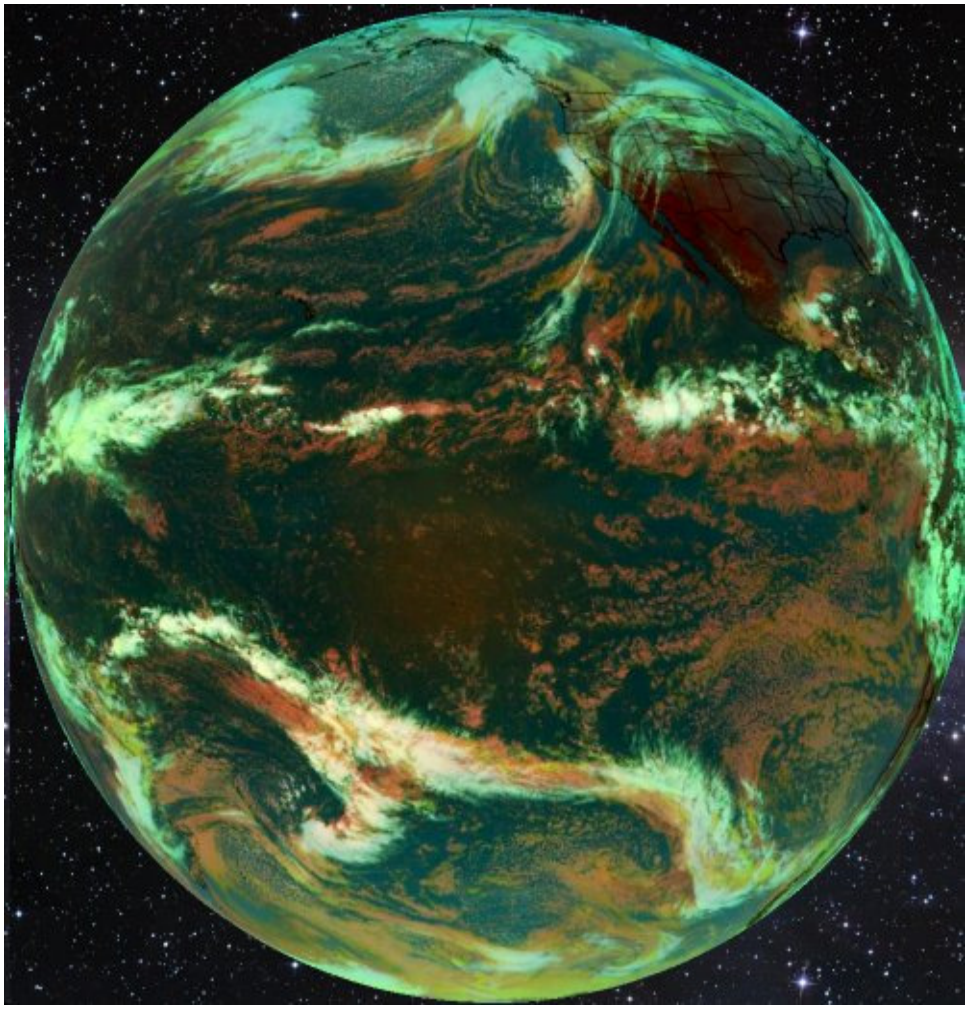


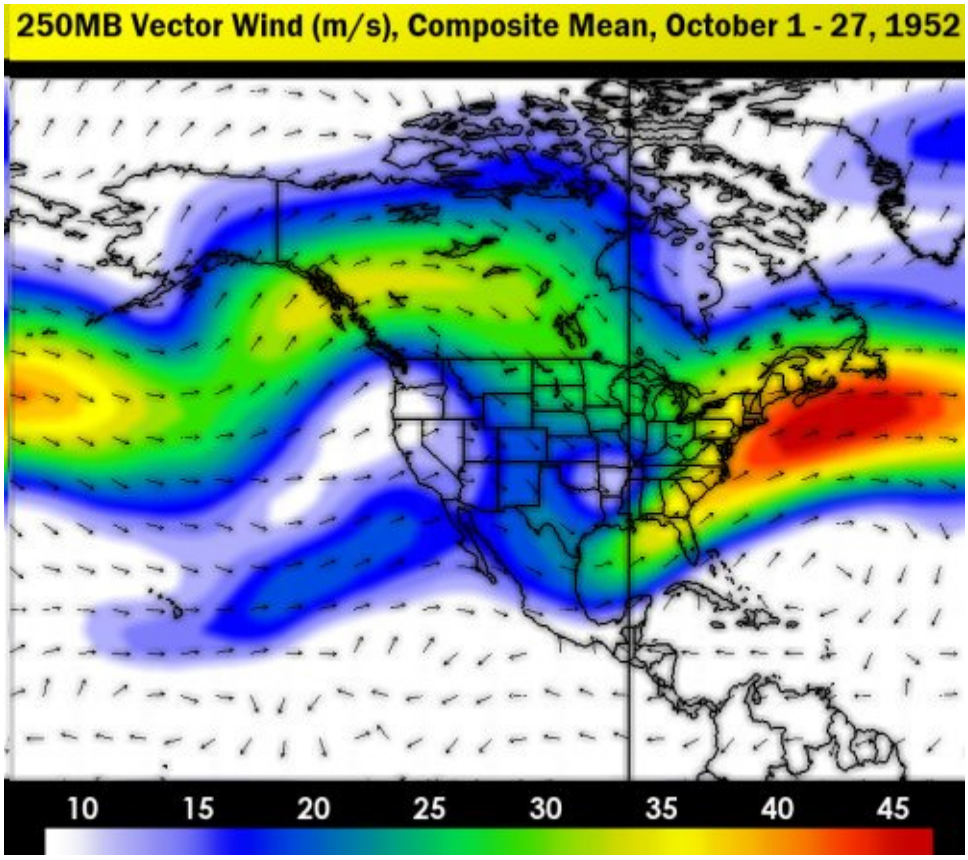
Displays of equatorial convective systems are very much different than that seen around the globe during the late summers of 2008 and 2009. Those were dominated by impressive thunderstorm production in the western Pacific Ocean, with repeated linkage to polar westerlies over the South China Sea. This time around, the northern branch jet stream has rarely been influenced by the MJO outside of Asia. The monsoonal fetches have been quite strong during the summer season, creating sometimes massive floods in Mexico and especially Pakistan/India /Bangladesh into the PRC.

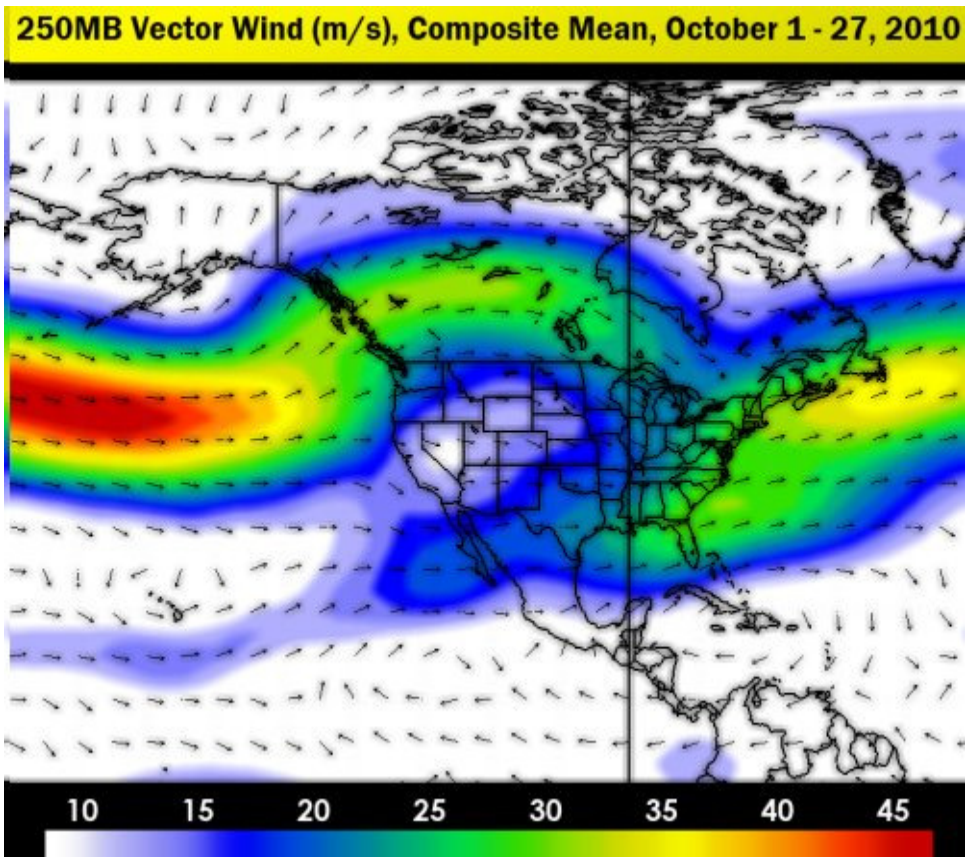
A trend of late has been for the strong convective clusters over Indonesia to act as a boost to the southern branch flow. Disturbances form and track eastward, later merging with the polar westerlies over North America. Should this pattern continue into the winter months, cyclogenesis over the High Plains would be energized over the eastern

half of the U.S., with perhaps some potential for secondary formation off of the Mid-Atlantic shoreline.

4) Position And Intensity Of 250MB Subtropical And Polar Jet Streams

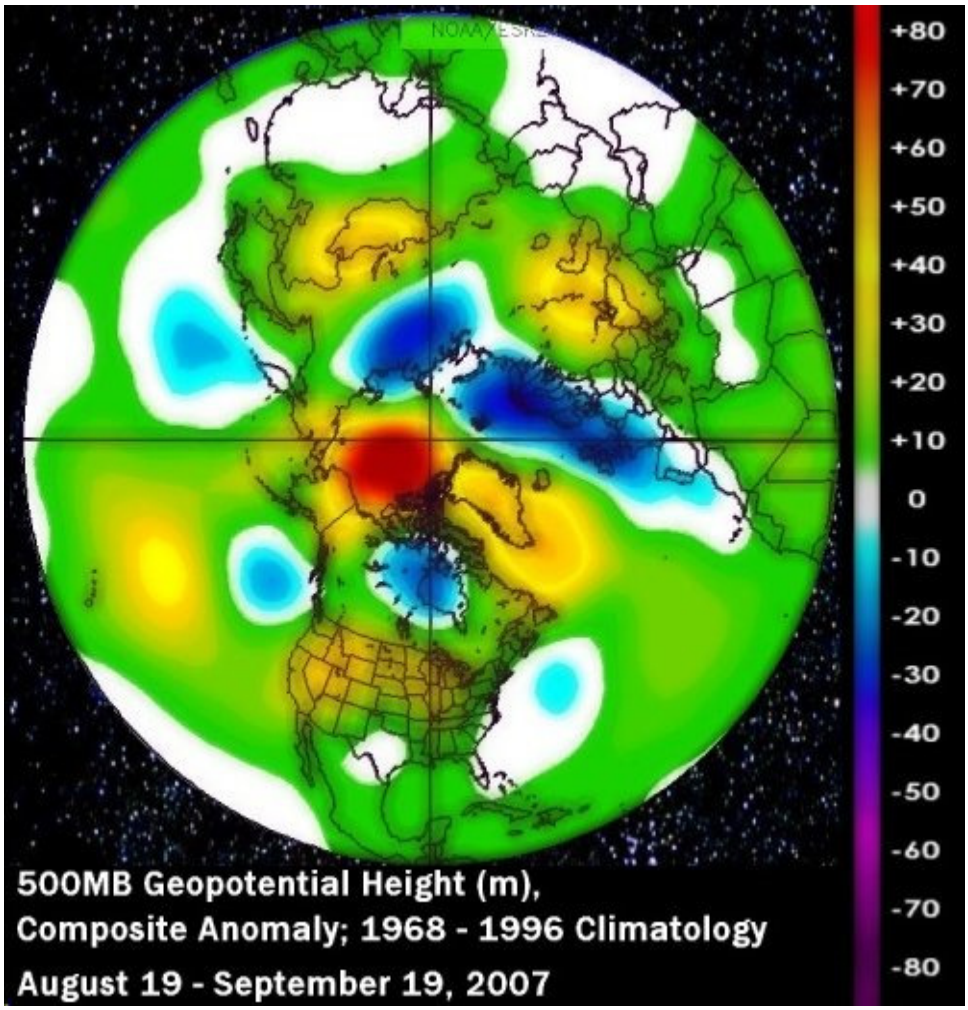


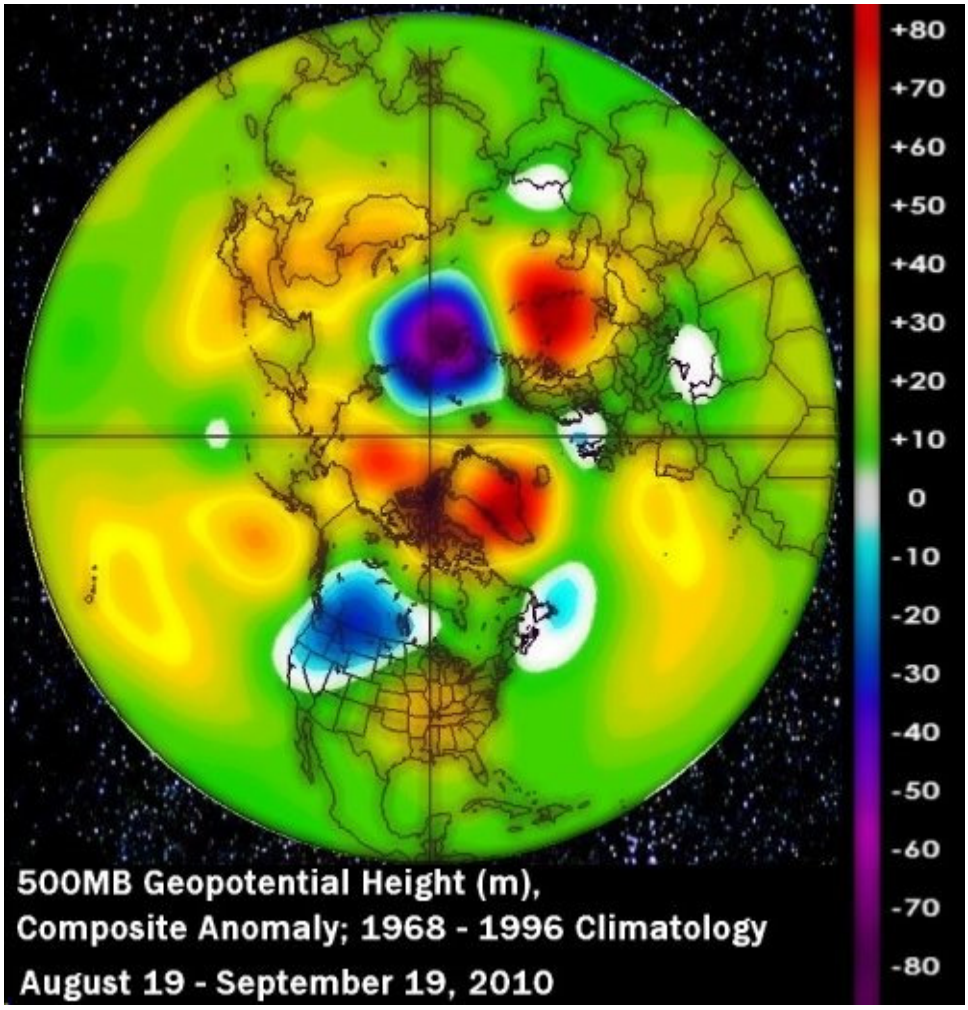

250MB Vector Wind (m/s), Composite Mean, October 1 - 27, 1952
10
15
20
25
30
35
40
45

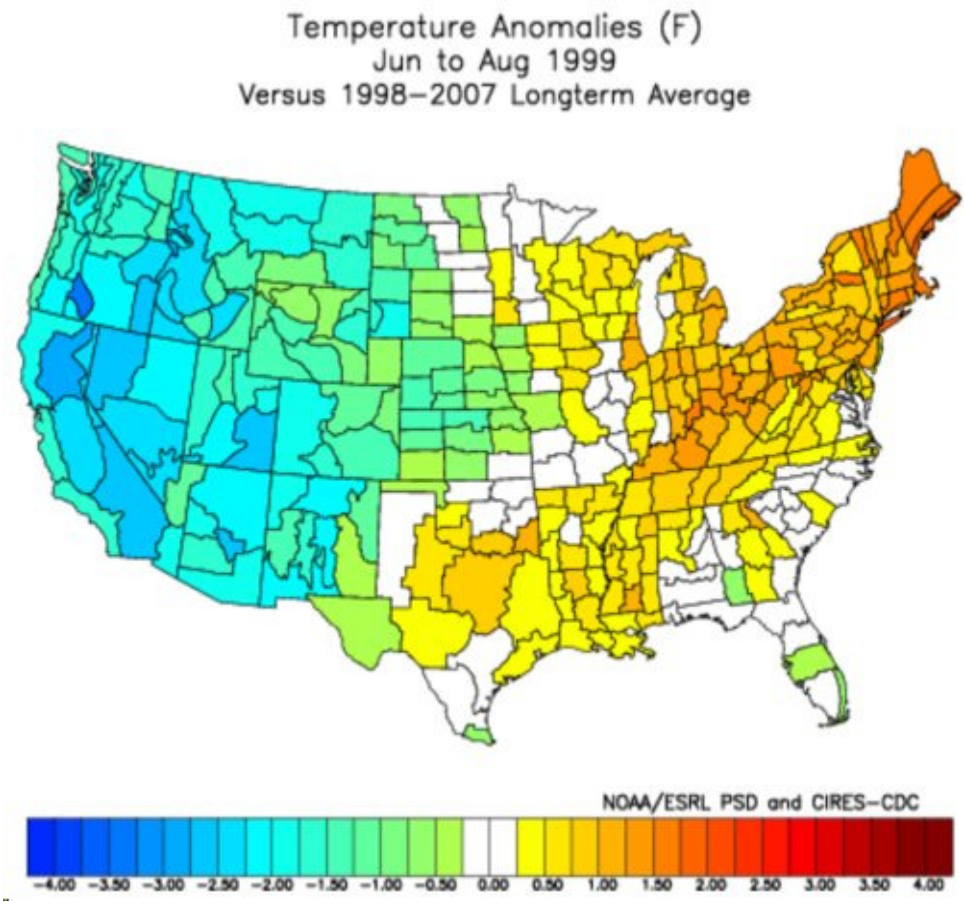

250MB Vector Wind (m/s), Composite Mean, October 1 - 27, 2010
10
15
20
25
30
35
40
45

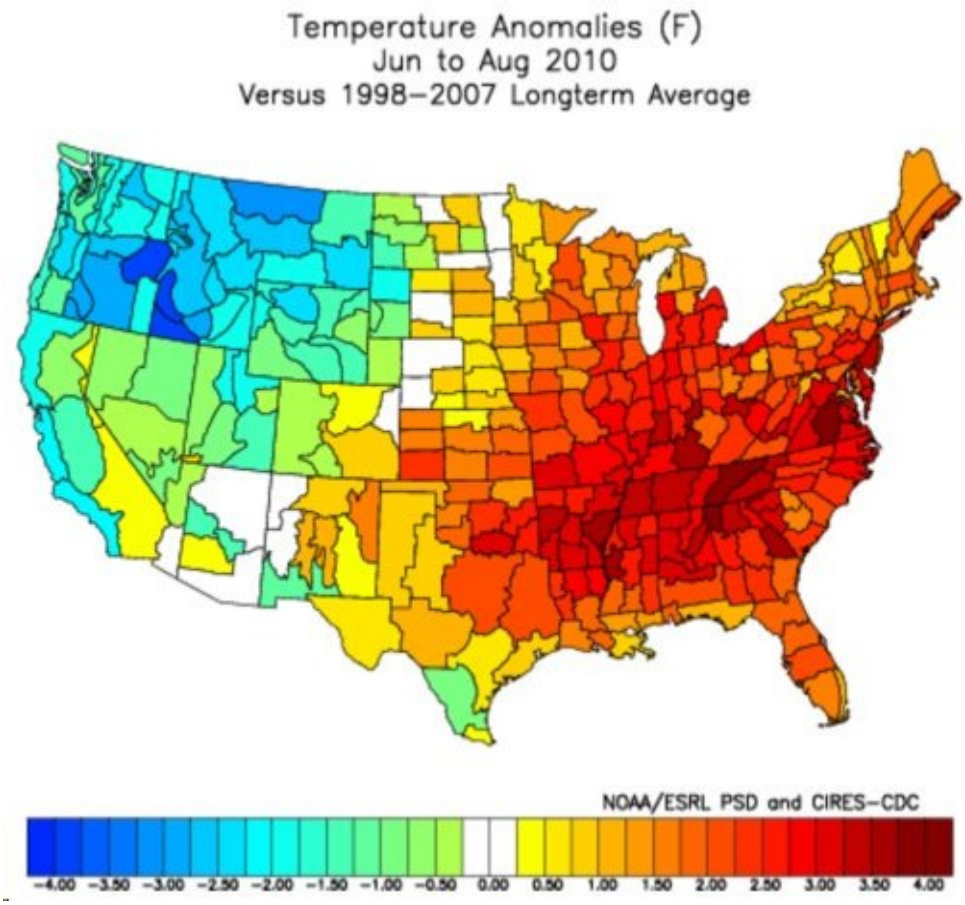
Showing similarities to previous La Nina episodes, a strong and unified polar jet stream has become established across the northern half of the U.S. (note the wind maximum across the northern Great Plains). What is unusual about this evolving -ENSO episode is that a fairly well-defined subtropical branch continues to be observed. The origin of this feature is with the MJO actions in the Maritime Continent and Indian Ocean. Note the anticyclonic curvature of the wind field over the western states, which may favor some shifts to a low-amplitude +PNA signature. In time, this upper wind array would favor a "cold North, warm South" split with formation of Colorado/Trinidad cyclones (both 'A' and 'B' variants). The best match-up of 250MB flow to recent weeks is to the October 1 - 27 period of 1952.

5) Comparison Of 500MB Longwave Pattern And Similarity Of Apparent Weather To Previous Summers




+80
+70
+60
+50
+40
+30
+20
+10
0
-10
-20
-30
-40
-50
-60
-70
-80
500MB Geopotential Height (m),
Composite Anomaly; 1968 - 1996 Climatology
August 19 - September 19, 2010

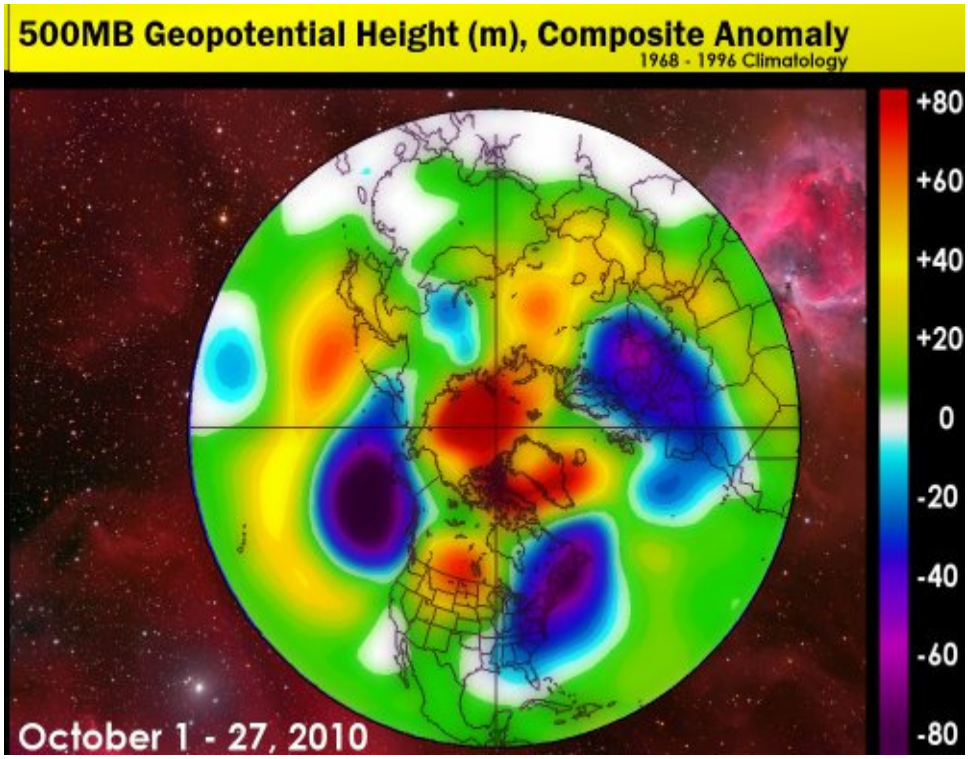

Temperature Anomalies (F)
Jun to Aug 1999
Versus 1998–2007 Longterm Average
NOAA/ESRL PSD and CIRES–CDC
−4.00 −3.50 −3.00 −2.50 −2.00 −1.50 −1.00 −0.50 0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00



In terms of 500MB flow, the late summer and early fall has had a look that is very similar to that for this time frame in 2007. A pervasive -AO/-NAO couplet with strong ridge signatures occurred over Russia (mirroring the summer heat wave there), eastern Asia and the eastern two-thirds of the U.S.

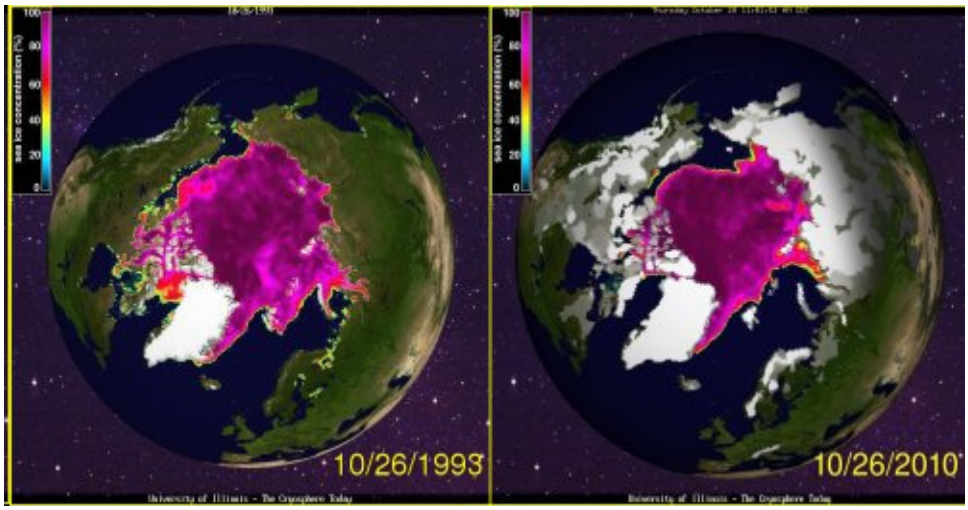
The summer of 2010 saw what can only be described as the worst heat in recorded U.S. history! Although The JJA periods of 1980, 1988, and 1998 also displayed huge blocks of excessively hot weather, none matched up with the recent summer in terms of geographic placement. The closest analog of well-developed La Nina years was in 1999, a clearly cool West, hot East alignment.

6) Recent Tendency Of 500MB Longwave Pattern



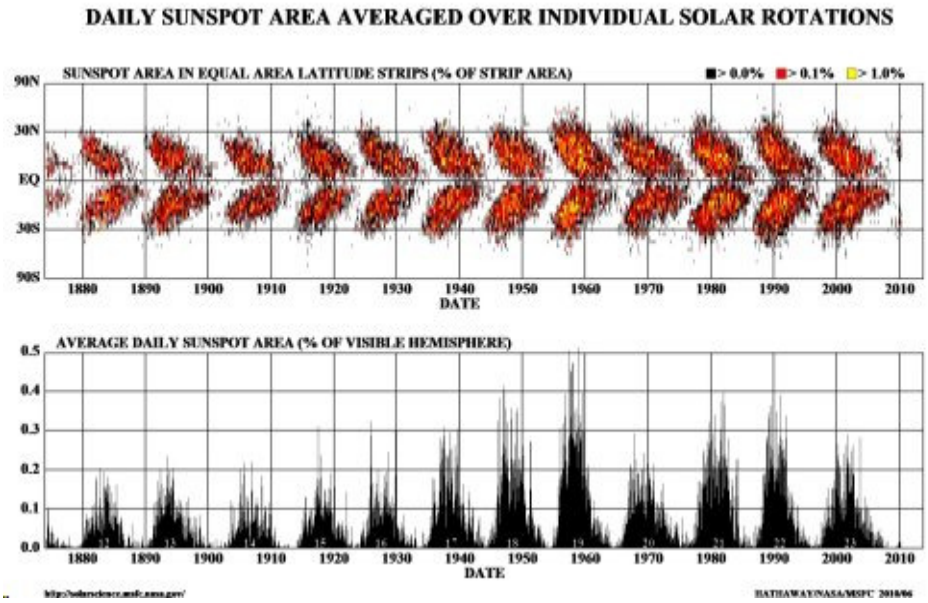
Through October, there have been pronounced anomalies in the +PNA, -AO, and -NAO positions. Given the frequency of the latter two signals in analog years (strongest presence January and March), it seems likely that what has been called a "typical" la Nina character to weather across the U.S. may be distorted in a colder and stormier direction. If we add the potential presence of a recurrent subtropical jet stream, then increased snow and ice threats may accompany the favored Colorado 'A' and 'B' storm tracks.

7) State Of The Cryosphere



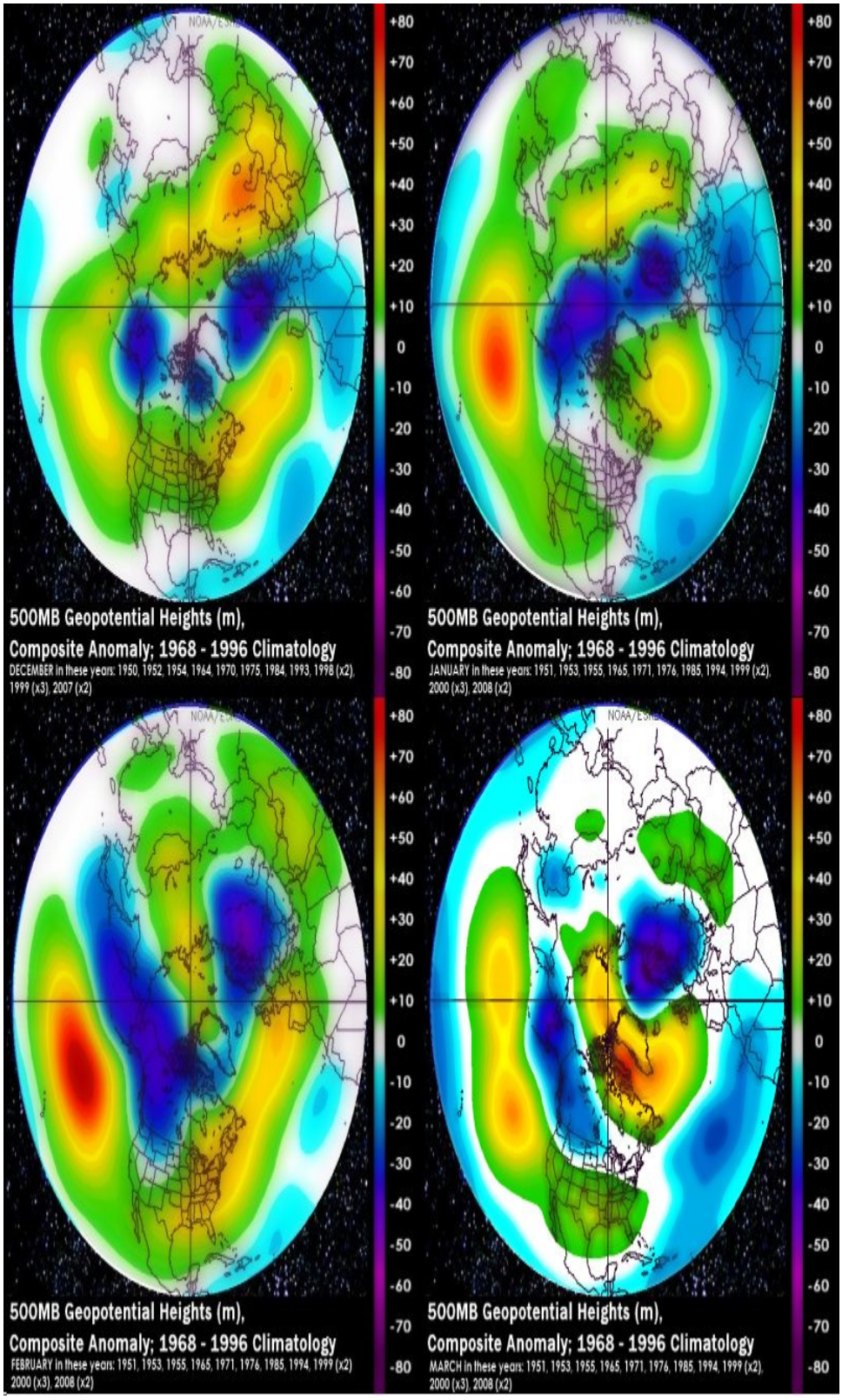
There have been comments in the media recently how once again the polar ice cap melt has been the most noticeable in history, with comparisons to the late summer cryosphere of 2007. But when you look the current very small area of sea ice at the North Pole, the closest resemblance of the evolution of marine ice cover is to that of this time in 1993. Note the recent rapid expansion of the snow shield through Canada into the U.S., as well as through Siberia. So I believe it wise to add the 1993-94 winter as an analogue, despite the fact that its ENSO episode shows no similarity to that ongoing in 2010.

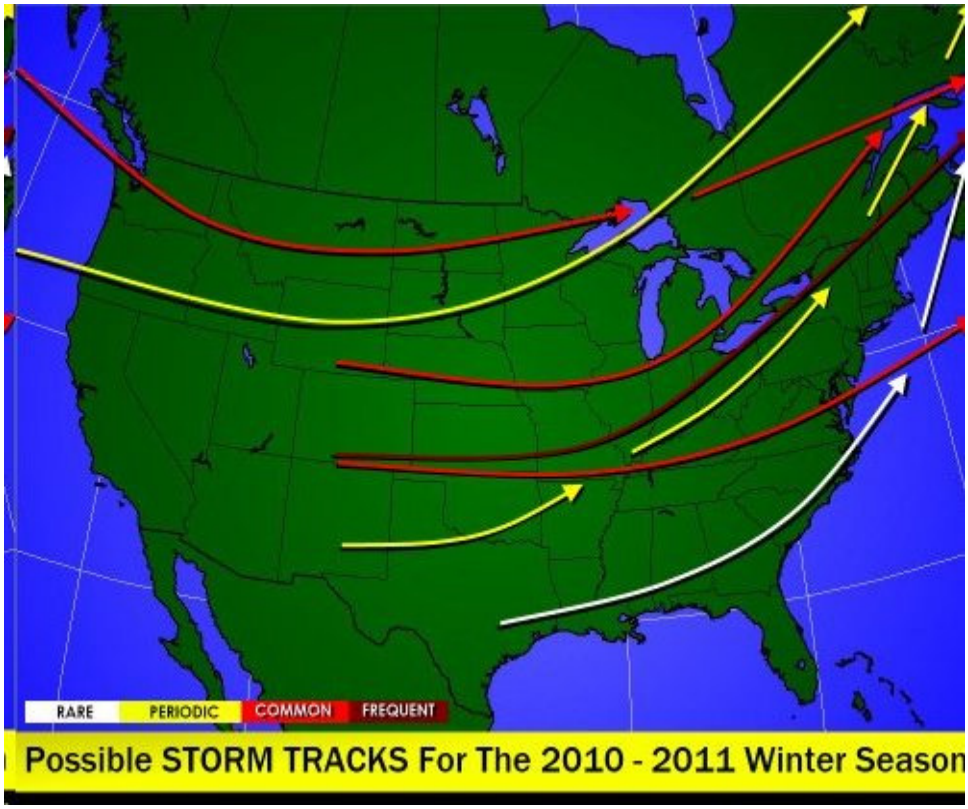
8) Solar Minimum



The earth is emerging from the deepest solar minimum (lack of sunspot activity) since 1903-04. While solar flaring and spotting have increased somewhat into Cycle 24, current astronomic status is that of a waning solar minimum. That means an apt comparison (or analog) to sunspot potential would be to the winter of 1904-05.

Favored Ridge Signals And Storm Tracks

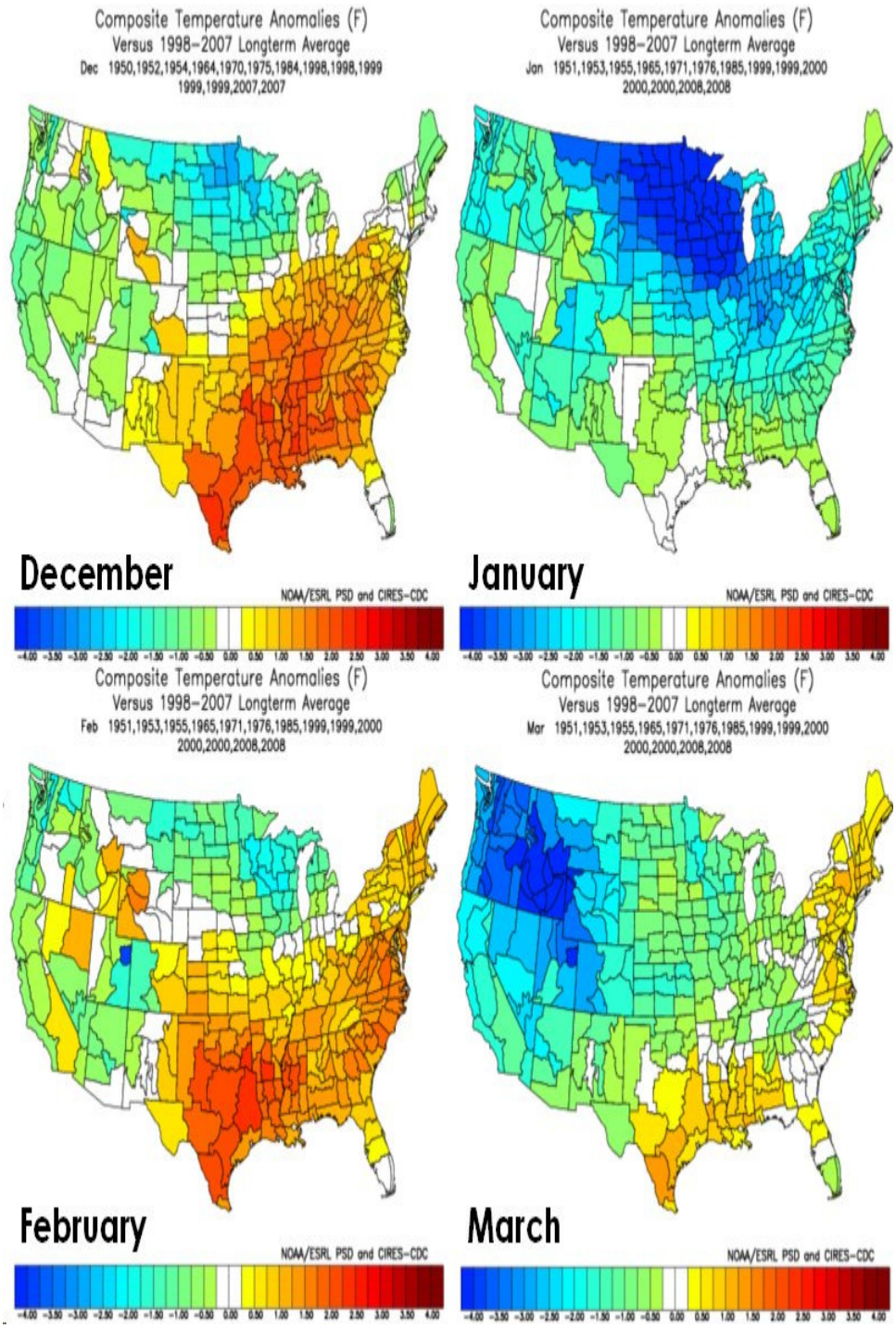

500MB Geopotential Heights (m),
Composite Anomaly; 1968 - 1996 Climatology
DECEMBER in these years: 1950, 1952, 1954, 1964, 1970, 1975, 1984, 1993, 1998 (x2), 1999 (x3), 2007 (x2)
500MB Geopotential Heights (m),
Composite Anomaly; 1968 - 1996 Climatology
JANUARY in these years: 1951, 1953, 1955, 1965, 1971, 1976, 1985, 1994, 1999 (x2), 2000 (x3), 2008 (x2)
500MB Geopotential Heights (m),
Composite Anomaly; 1968 - 1996 Climatology
FEBRUARY in these years: 1951, 1953, 1955, 1965, 1971, 1976, 1985, 1994, 1999 (x2) 2000 (x3), 2008 (x2)
500MB Geopotential Heights (m),
Composite Anomaly; 1968 - 1996 Climatology
MARCH in these years: 1951, 1953, 1955, 1965, 1971, 1976, 1985, 1994, 1999 (x2), 2000 (x3), 2008 (x2)
+80 +70 +60 +50 +40 +30 +20 +10 0 -10 -20 -30 -40 -50 -60 -70 -80

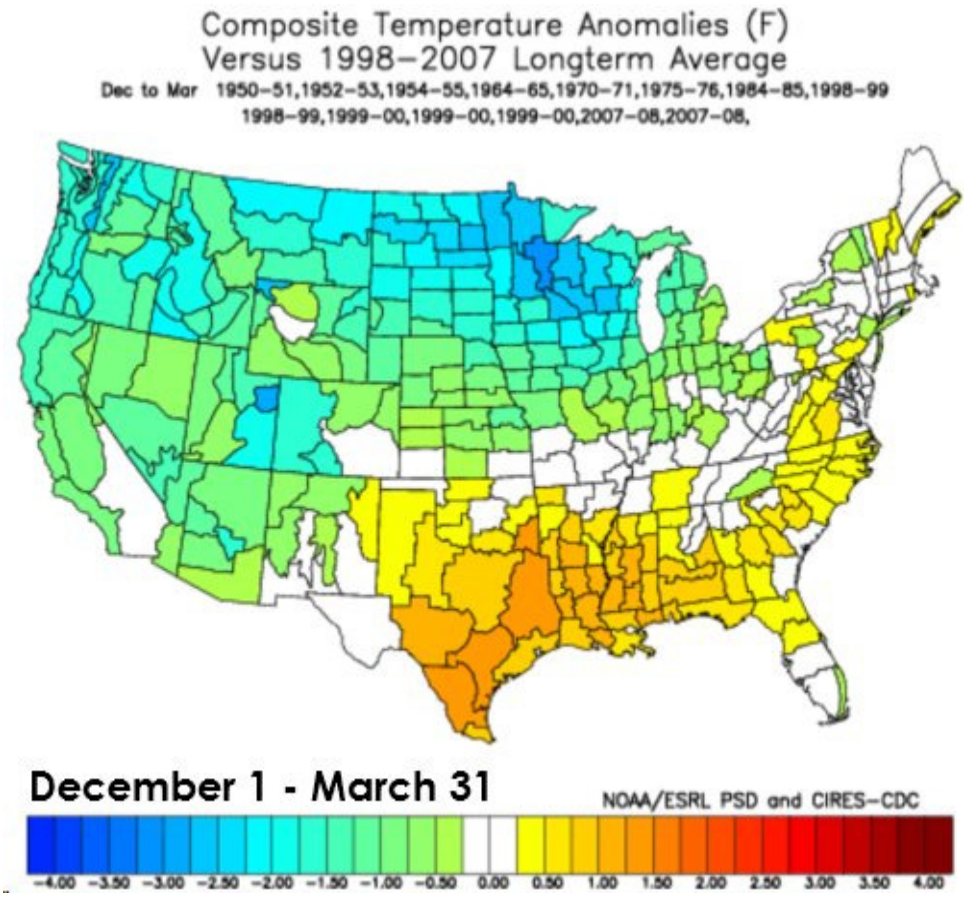


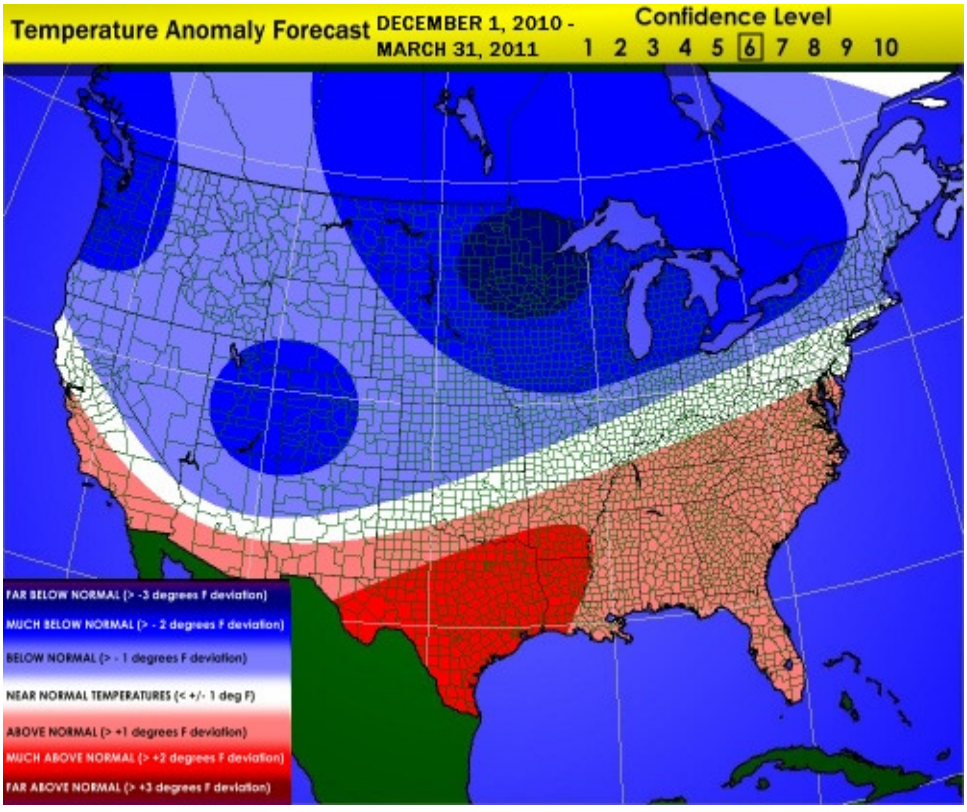
When analogues are blended, the 500MB height anomaly charts are bunched into two groupings. December and February, with little blocking and extensive ridge placement over the eastern half of the U.S. (favoring warmer responses in the Old South and East Coast). January and (to some extent) March, meanwhile, have a profound -NAO signal (Davis Strait block) that if it verifies would point to bitter cold temperatures and repeated ice and snow events across the eastern two-thirds of the U.S., mostly above the Interstate 20 corridor.

Using La Nina climatology and the analog-derived 500MB height anomaly potential, Colorado/Trinidad (both A and B variants) will be the most recurrent storm tracks this winter. This implies a fairly brutal winter for cities such as Kansas City MO, Chicago IL, Detroit MI, and Buffalo NY. Great Plains Dusters and "Border Trackers" are also probable, with Panhandle Hook B and even the extraneous Hatteras Low/Nor'easter event possible.

Temperature Forecasts

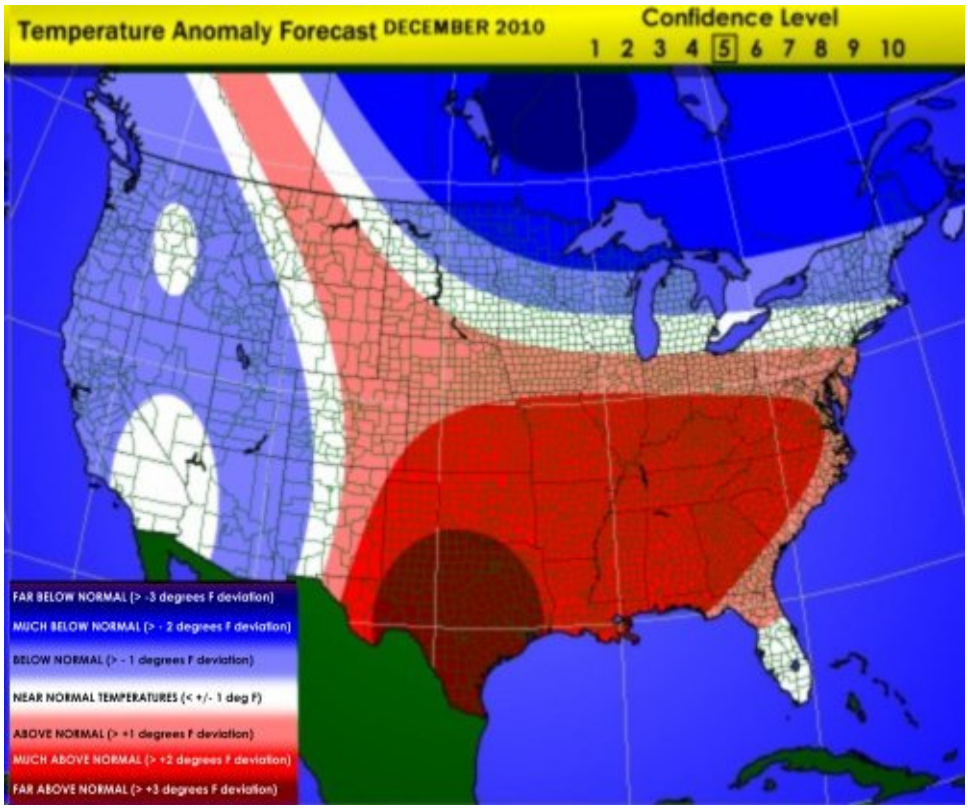

Composite Temperature Anomalies (F)
Versus 1998–2007 Longterm Average
Dec 1950,1952,1954,1964,1970,1975,1984,1998,1998,1999
1999,1999,2007,2007
December
NOAA/ESRL PSD and CIRES–CDC
Composite Temperature Anomalies (F)
Versus 1998–2007 Longterm Average
Jan 1951,1953,1955,1965,1971,1976,1985,1999,1999,2000
2000,2000,2008,2008
January
NOAA/ESRL PSD and CIRES–CDC
Composite Temperature Anomalies (F)
Versus 1998–2007 Longterm Average
Feb 1951,1953,1955,1965,1971,1976,1985,1999,1999,2000
2000,2000,2008,2008
February
NOAA/ESRL PSD and CIRES–CDC
Composite Temperature Anomalies (F)
Versus 1998–2007 Longterm Average
Mar 1951,1953,1955,1965,1971,1976,1985,1999,1999,2000
2000,2000,2008,2008
March
NOAA/ESRL PSD and CIRES–CDC


Composite Temperature Anomalies (F)
Versus 1998–2007 Longterm Average
Dec to Mar 1950–51,1952–53,1954–55,1964–65,1970–71,1975–76,1984–85,1998–99
1998–99,1999–00,1999–00,1999–00,2007–08,2007–08,
December 1 - March 31
NOAA/ESRL PSD and CIRES–CDC
-4.00 -3.50 -3.00 -2.50 -2.00 -1.50 -1.00 -0.50 0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00


Temperature Anomaly Forecast
DECEMBER 1, 2010 -
MARCH 31, 2011
Confidence Level
1 2 3 4 5 6 7 8 9 10
FAR BELOW NORMAL (> -3 degrees F deviation)
MUCH BELOW NORMAL (> - 2 degrees F deviation)
BELOW NORMAL (> - 1 degrees F deviation)
NEAR NORMAL TEMPERATURES (< +/- 1 deg F)
ABOVE NORMAL (> +1 degrees F deviation)
MUCH ABOVE NORMAL (> +2 degrees F deviation)
FAR ABOVE NORMAL (> +3 degrees F deviation)

While many associate well-defined La Nina episodes with very warm winters, statistics using analogues imply that this DJFM period will not follow that line of thought. Consider the very cold look for the Midwest and Great Lakes, with the January exhibiting widespread negative thermal anomalies. While December and February are shown to be quite mild (indeed warm) over Texas and the Old South, the character of the 2010-2011 winter season appears quite volatile, a mimic of the same time frame in 1964-65, 1999-2000, 2007-8.

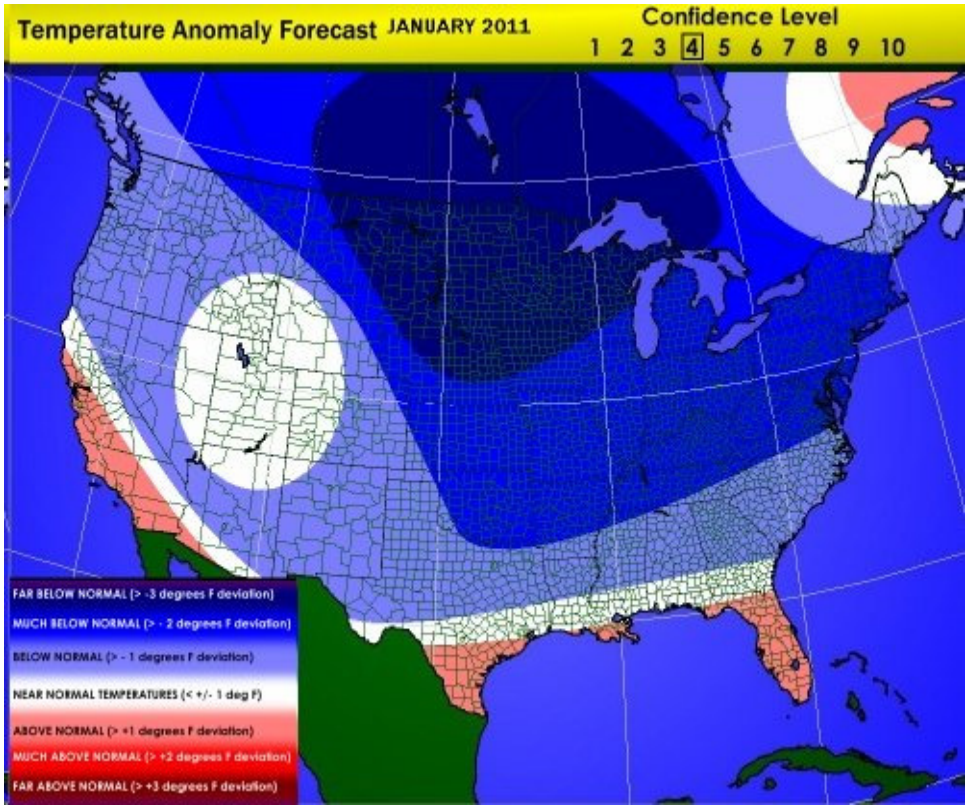
December



Character:
Very warm in Texas and most of the Old South. The West looks cool but nothing of a dramatic nature. Strong cold intrusions limited to the Great Lakes and New England.

Best bet for snow and cold:
Minneapolis MN, Milwaukee WI, Detroit MI and Buffalo NY vicinities.

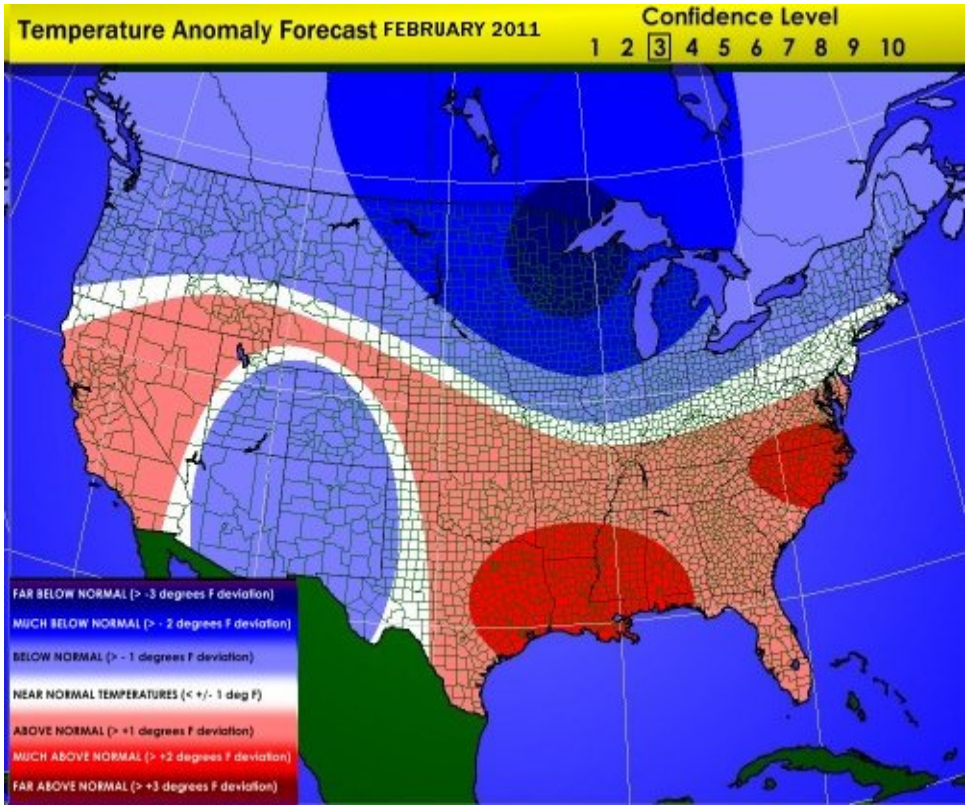
January



Character:
Brutal month with repeated Arctic intrusions east of the Rocky Mountains. Some of the cold regimes will reach the Deep South.

Best bets for snow and cold:
Huge lake-effect snowfall possible in MI, IN, OH, NW PA, and W NY. Midwest locations look to deal with blizzard threats. Fair chance at a high-impact ice and snow event hitting the Mid-South and Eastern Seaboard.

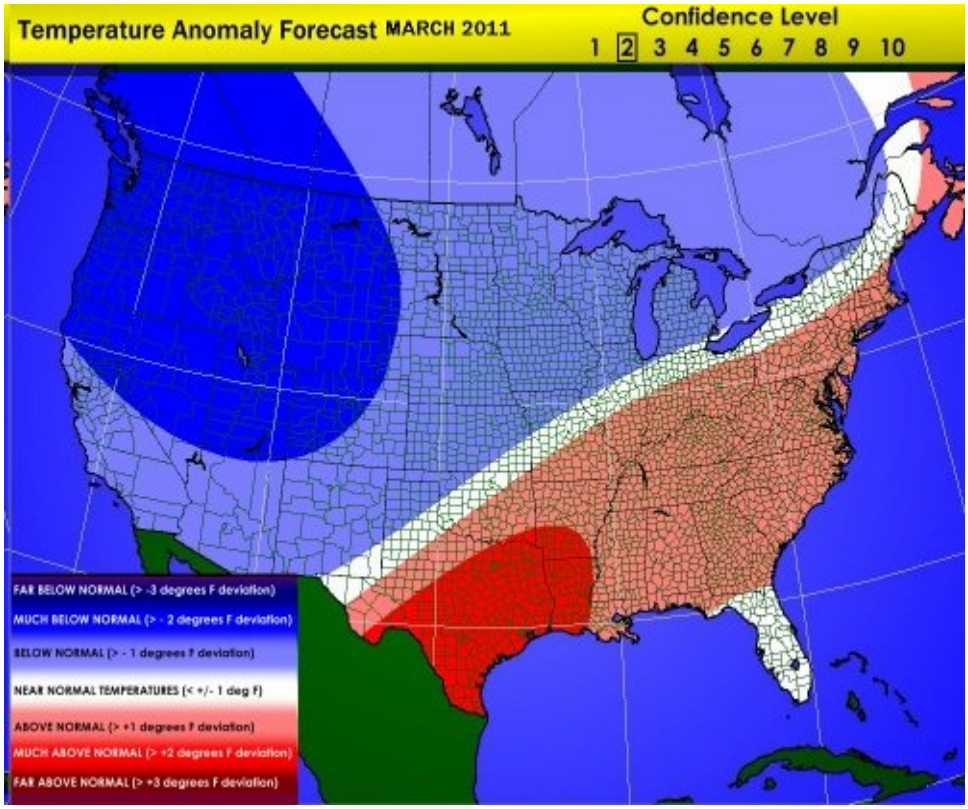
February



Character:
Very cold again in the Upper Midwest and Great Lakes, but warmth returns to most of the Old South. Some potential for Santa Ana wind/heat episodes in California after a cold snap in the Southwest and southern Rocky Mountains.

Best bets for snow and cold:
The Interstate 80 corridor (involving Omaha NE; Des Moines IA; Chicago IL; Cleveland OH; and perhaps New York NY) have the highest potential for important snow and ice events, followed by Arctic air masses in the central and western portions of that highway arc.

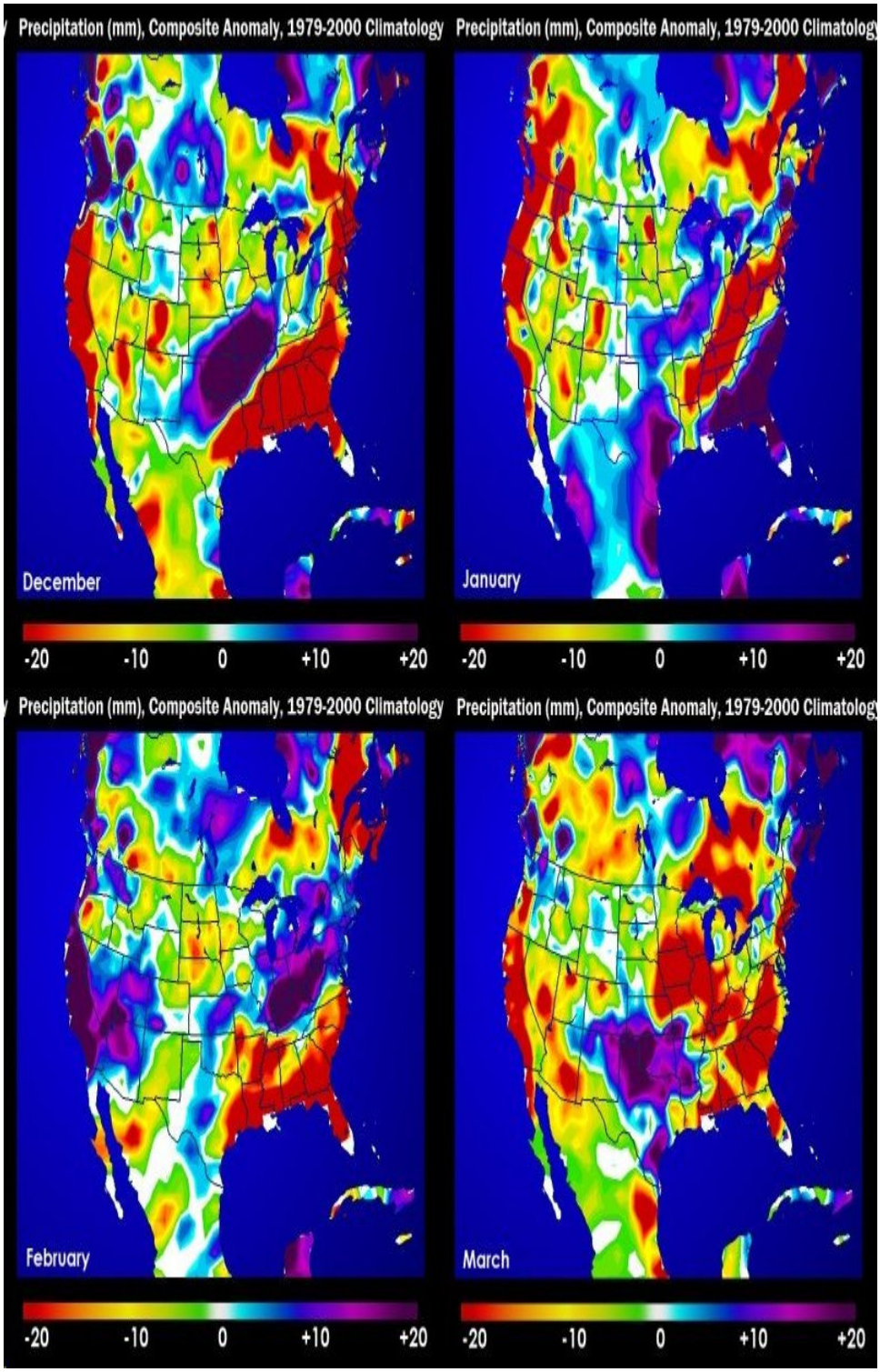
March



Character:
Coldest air trends to the west with time, with evidence of spring increasing across the Eastern Seaboard. A complication here: the -NAO signal warns of one or two surprise cold intrusions across the Midwest and especially the Northeast, possibly on the heels of Colorado/Trinidad A and B storms which reform near the Virginia Capes. Texas and the Deep South turns warm and humid, while the Pacific Northwest has an ugly, cold end to winter.

Best bets for snow and cold:
Incredibly, the Portland OR and Seattle WA markets may have to handle an accumulating snowfall; but the Great Lakes, Mid-Atlantic and New England states are also likely to have issues with wet snow as well.

Precipitation (Emphasis On Ice And Snow) Forecasts


Precipitation (mm), Composite Anomaly, 1979-2000 Climatology
December
-20 -10 0 +10 +20
Precipitation (mm), Composite Anomaly, 1979-2000 Climatology
January
-20 -10 0 +10 +20
Precipitation (mm), Composite Anomaly, 1979-2000 Climatology
February
-20 -10 0 +10 +20
Precipitation (mm), Composite Anomaly, 1979-2000 Climatology
March
-20 -10 0 +10 +20

A recurring theme in analog-blended forecasts is for a concentration of high precipitation potential in the Midwest. If indeed a Colorado/Trinidad storm track series does occur, the Corn Belt and Great Lakes will be buried with snowfall this winter. The juxtaposition of blocking ridges, a lateral subtropical high and low pressure moving along 35 N Latitude may favor one or two ice storms, much like what happened in 2007 over the major cities of the Interstate 95 corridor. Remember that a deep snowpack is essential for maintenance and ejection of cold air. Snows should be deep across much of Canada by mid-November for meaningful cold in the U.S. during the winter season, and the snow line must at least reach the Interstate 80 corridor by Christmas for the cold January forecast to verify.

Here are some "guesstimates" at the seasonal snowfall total in selected cities; the sharp gradient across the Midwest and Mid-Atlantic regions are symptomatic of the expected storm track tendency.

Minneapolis MN: 60"
Milwaukee WI: 55"
Chicago IL: 50"
Detroit MI: 48"

Cleveland OH: 48"
Buffalo NY: 80"
Toronto ON: 62"
Montreal QB: 66"
Portland ME: 50"
Albany NY" 54"
Boston MA: 46"
New York NY: 35"
Philadelphia: 29"
Baltimore MD: 19"
Washington DC: 12"
Richmond VA: 6"
Raleigh NC: 2"
Charlotte NC: 1"
Atlanta GA: Trace
Nashville TN: 3"
Memphis TN: 1"
Louisville KY: 4"
Cincinnati OH: 5"
Columbus OH: 8"
Indianapolis IN: 20"
St. Louis MO: 22"
Des Moines IA: 47"
Omaha NE: 42"
Wichita KS: 8"
Kansas City MO: 18"
Little Rock AR: 1"
Tulsa OK: 2"
Oklahoma City OK: 1"
Dallas-Fort Worth TX: Trace
Amarillo TX: 6"
Denver CO: 33"
Salt Lake City UT: 55"
Portland OR: 2"
Seattle WA: 8"
Vancouver BC: 12"

Summary

The recent emergence of a weak +PNA/-moderate -AO/strong -NAO

configuration, along with a deep tropical moisture and energy connection out of the Maritime Continent, may be a prelude to a very volatile winter season between December 1, 2010 and March 31, 2011.

While the La Nina signal is well-defined, other factors such as the solar minimum, growing snow and sea ice display and synoptic similarities to the summer and fall of 1999 lead me to believe that volatility will be the key issue facing forecasters of the 2010-2011 winter.

I suspect that the Midwest and Great Lakes will have a notably cold and snowy winter, with the Minneapolis MN, Chicago IL, and Detroit MI markets seeing a number of impressive cold snaps and snowstorms. But it seems likely that cities further to the south and east will be dealing with cold weather and frozen precipitation issues as well, particularly in January but perhaps again in portions of March.

Texas and the Deep South should enjoy a very warm winter, with only January deviating from the pattern. The West, meanwhile, shows little potential for extremes of either kind until March, when a period of unseasonably cold and snowy conditions will target the Pacific Northwest and perhaps the Salt Lake and Front Range metro areas.

Prepared by Meteorologist LARRY COSGROVE on
Friday, October 29, 2010 at 8:30 P.M. CT

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