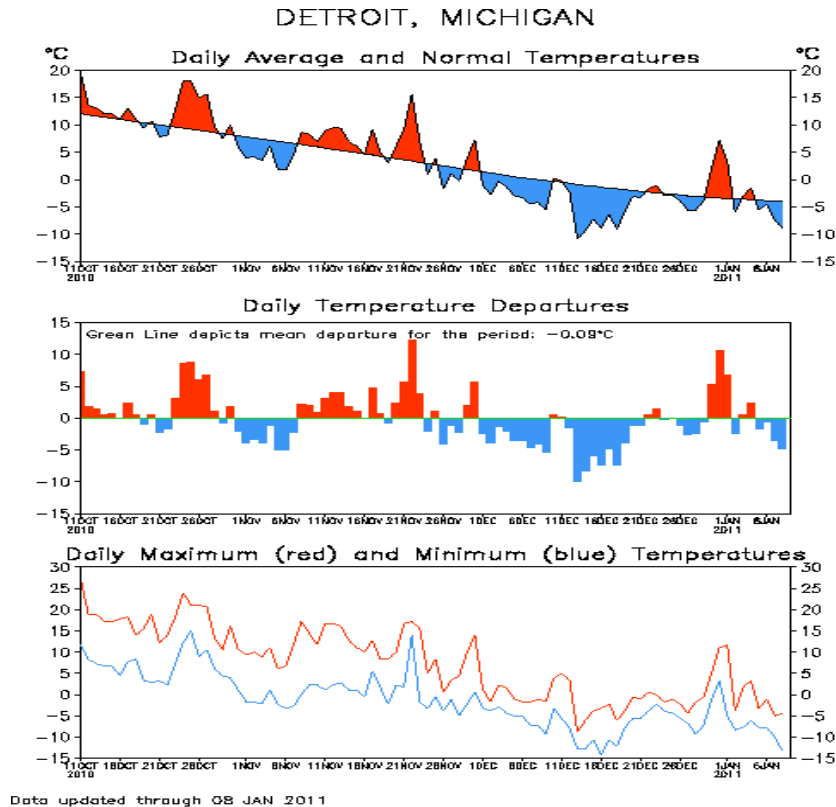


## Aggressive Polar Jet Stream Bringing Cold Winter Thus Far - Will It Persist? (Mid-Winter Update)

Written by: William R. Deedler, Weather Historian NWS White Lake 01/15/10

It has been a cold winter thus far across Southeast Lower Michigan as temperature the first six weeks of winter have averaged close to 3 degrees below normal. The coldest weather up until early January occurred a few weeks back in mid December when temperatures averaged in the upper teens across the region, about a dozen degrees below normal. The recent winter temperature is depicted here nicely with Detroit's temperatures comparing both actual and normals along with departures. The icy cold, below normal days resemble icicles hanging from a wire. Also note the short but sharply contrasting peak in the temperatures during our mini-New Year's Weekend Thaw.



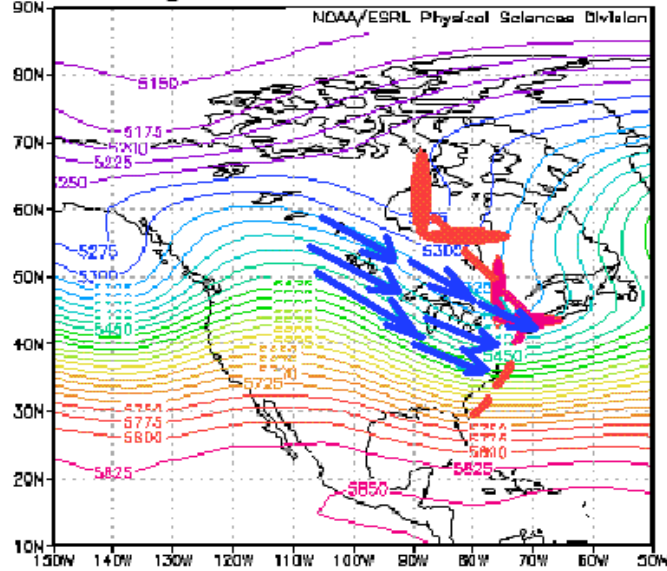
CLIMATE PREDICTION CENTER/NCEP

A large upper low over eastern Canada (Fig -1) has been primarily responsible for the nearly continuous delivery of the cold air. The 500 MB upper air pattern for December shows a predominant, aggressive northwesterly flow into the Great Lakes from the Arctic. Occasionally, secondary upper lows have formed further south across the eastern Great Lakes into New England. For the most part, this has continued during the first two weeks of January.

**Fig - 1**

lon: plotted from -150 to -50  
lat: plotted from 10.00 to 90.00  
lev: 500.00  
t: Dec 2010

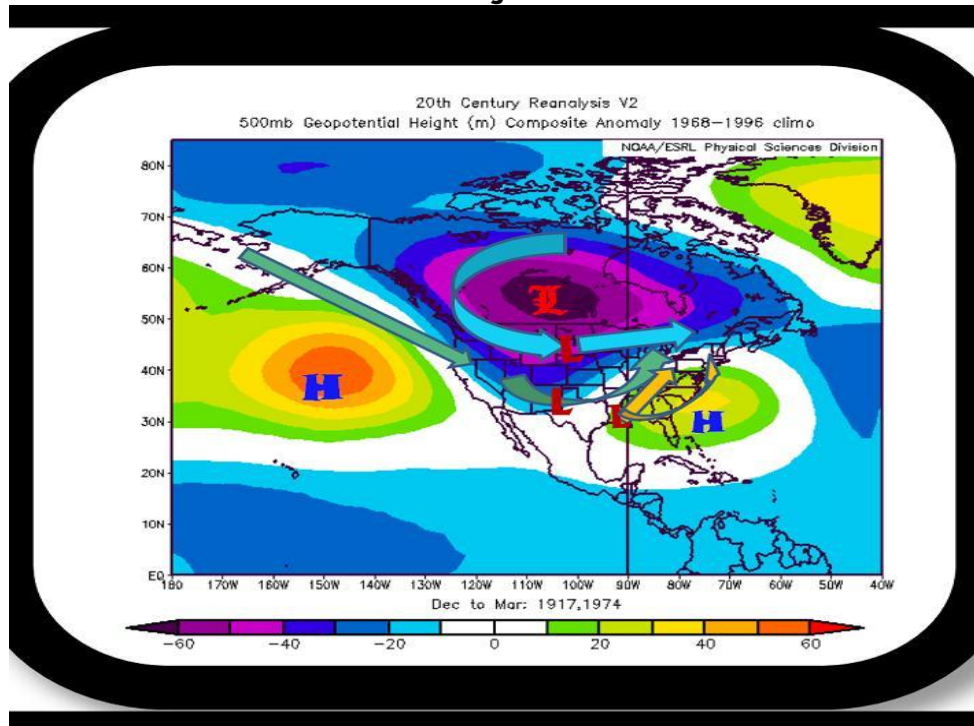
Mean hgt m



analysis Product Pressure Level GrADS image  
MIN=5140.42

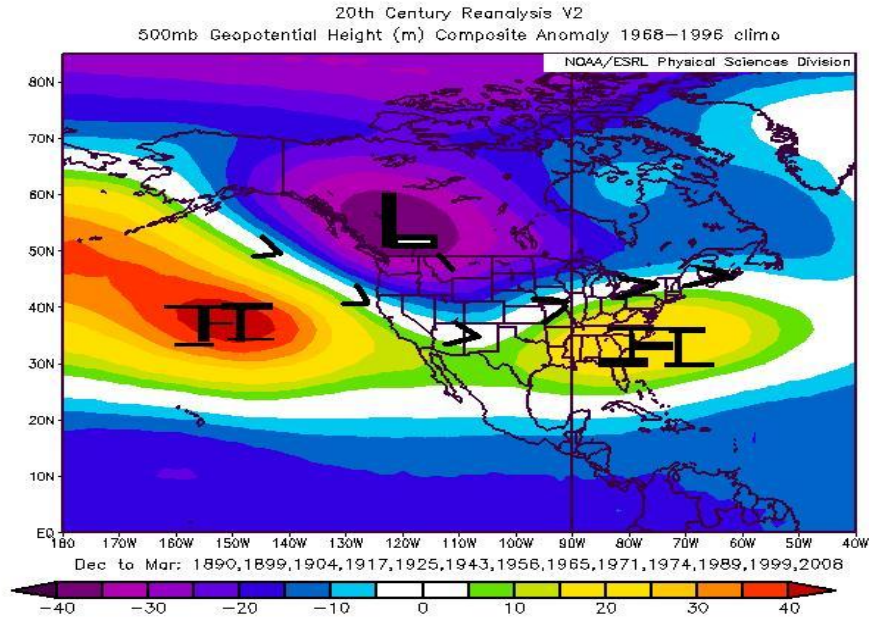
To visualize the upper air pattern in the stronger La Ninas, let's revisit the reanalysis of the upper pattern for the winters where the stronger La Ninas (Fig-2) were favored. This map was included in the Outlook with past 500 MB flow and estimated storm tracks for this winter.

**Fig-2**



In the strongest La Nina analogues (Fig-2 above), the cold core 500 MB low pressure was situated over south-central Canada. This was further east than the average of all La Nina winters (Fig-3, below) which placed the core of the cold low over western Canada. This winter so far has seen the 500 MB Low more dominant over the eastern half of Canada with the occasional retrograde back to the west.

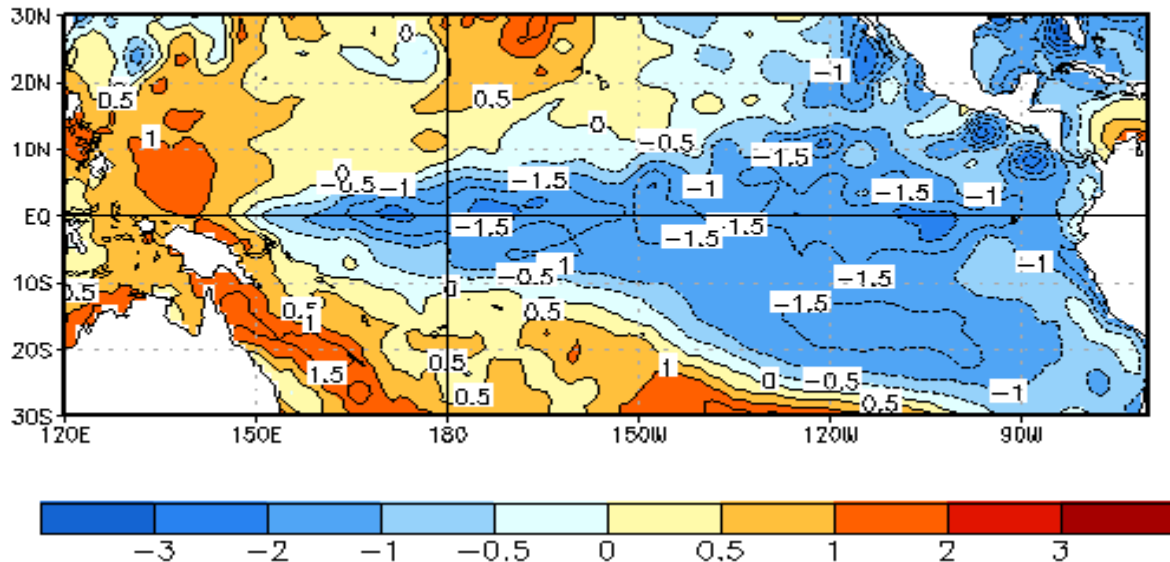
**Fig-3**



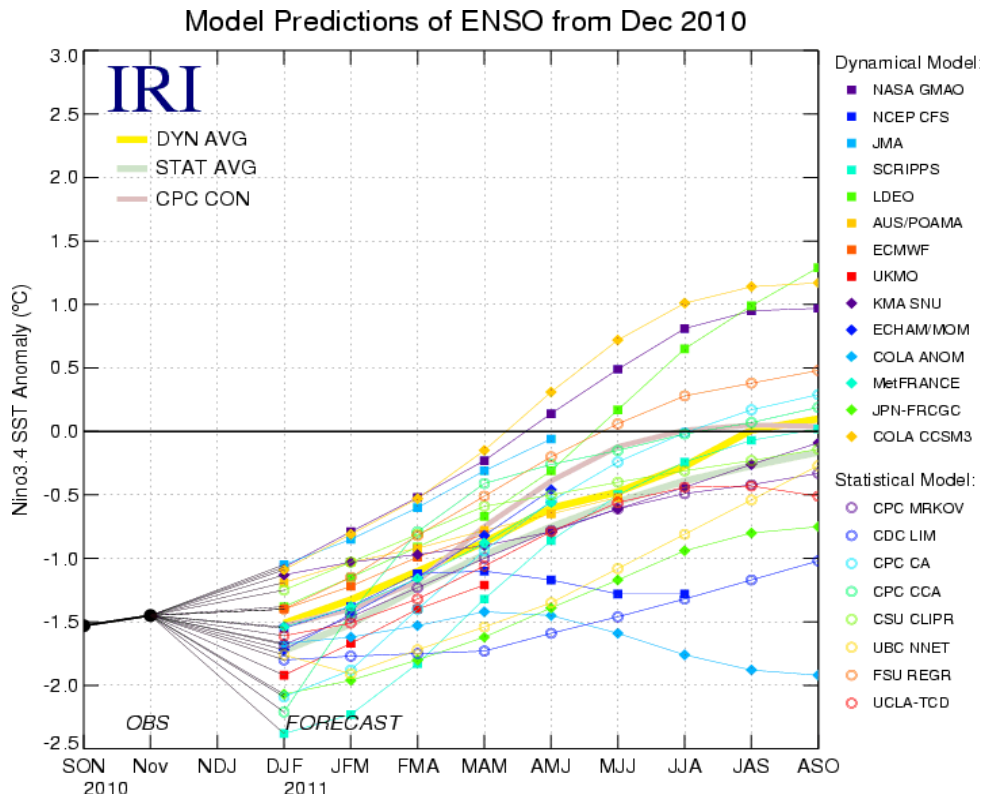
And, while on the subject of La Nina, the largest area of below normal anomalies are now over the western and central Pacific (Fig -4), further west from earlier in the cycle, when the largest below normal departures were over the eastern Pacific. Latest model projections (Fig - 4) indicate that La Nina is at, or near its peak (largest below normal departures).

**Fig-4**

**Average SST Anomalies  
12 DEC 2010 - 8 JAN 2011**

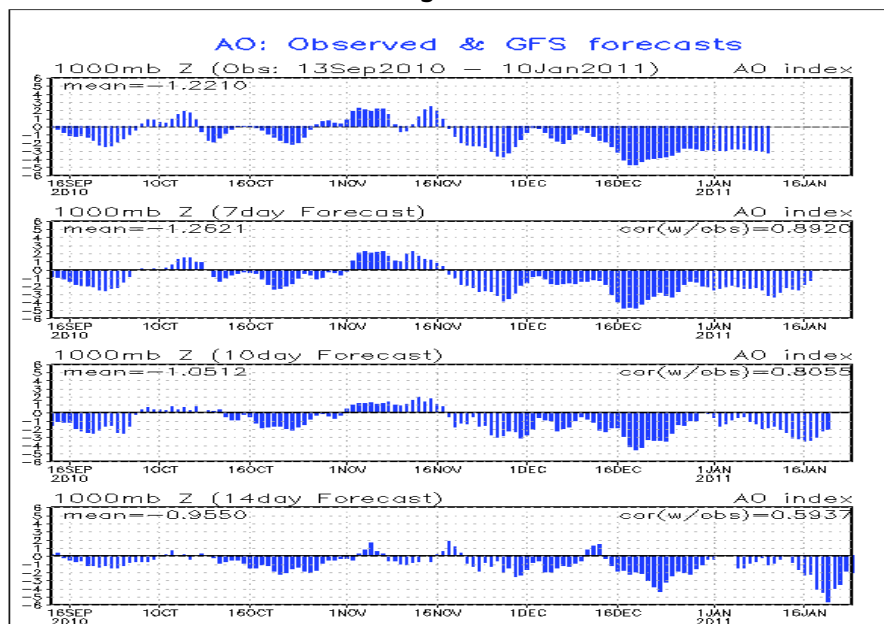


**Fig-5**



In addition, the Arctic Oscillation has been negative to strongly negative much of the period since late last fall. A negative Arctic Oscillation phase encourages troughing over eastern North America which in turn, supports Arctic air mass outbreaks into the eastern half of the US.

**Fig-6**



## Remainder of the Winter Outlook:

### Temperatures

In my earlier outlook for this winter, I looked for the winter to be “somewhat colder than last winter with temperatures numerically averaging as low as -2.0 (or the lower side of normal) across Southeast Lower Michigan.” As mentioned above, the prevailing pattern thus far has indeed been cold with below normal temperatures. Looking at the 500 MB pattern that has set up thus far this winter, I feel my earlier call may not be quite cold enough. I mentioned that risk in the original outlook as I was concerned with a more dominant negative North Atlantic/Arctic Oscillation (and why I leaned toward the colder side of average). Generally, the colder winters in the study occurred with a predominately negative NAO /AO/. I stated “**If the Polar/Arctic jet is more aggressive, then colder weather with less precipitation and snow is likely - with the dominant storm tracks further south and east.**”, which exactly is what has happened thus far this winter season.

I feel looking back at the six coldest winters in our study (the majority) and plotting those gives us a good idea of the below normal departure of the past coldest La Nina winters. In the past, the coldest winters gave us an average departure of around -3.0. This looks reasonable given the pattern Mother Nature has decided to grace us with thus far. **Therefore, I'll bring the departure down into the 2.0 to 4.0 below normal range for the entire winter (Dec-Feb). However, it should be noted, the month of February in these six coldest winters were mixed with three continuing the cold below normal temperatures, one averaging normal and two, above normal. Dissecting this further, in the three winters that both December and January were below normal, one February contained below normal temperatures while two others were above. I think there is a good chance for a more moderate period later this January or February. As stated in the Outlook, many of our winters had a decided mild period or thaw mid winter “January Thaw”” as it has been coined. Let us hope that the New Year’s warm up was not it.**

### Snowfall

Of course with the dominant colder and drier pattern seen thus far, our snowfall has just barely crept up close to the average range we would expect by the second week of January. **As mentioned in the statement above, the fallout of a colder pattern would be a drier winter and that too has been the case. Many storms this winter so far have stirred south and east of the Great Lakes with just the occasional hit here in Southeast Lower Michigan. Will it continue?**

**More than half of the analogue winters were mid to late or “back-end loaded” winters (especially in March) with the majority of snow falling mid January and after. The original call for snowfall in the Outlook was normal to above (with the best chance for that above over the northern two thirds of Southeast Michigan). With the track further south thus far this winter, snowfalls have been near to slightly below normal most locations. I still think more than half of our snow is yet to come and all areas will see around normal to locally above snowfall (without the area delineation).**