JUST HOW MUCH *WILL EL NINO INFLUENCE OUR WINTER?*
THAT IS THE QUESTION!

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November 5th, 2009

Local Data suggests:

Temperatures:

What was interesting in this year's analogue winters is that even though the monthly temperatures were quite variable (still a few patterns were discernable), the overall final winter temperature mainly hugged near normal mean (within a few degrees). Look for temperatures to average -1.5 to +1.5 in the end for Winter 2009-10. The major challenge with this winter's outlook is how do we get to the near normal averages? How strong the present El Nino ultimately gets along with its interaction with the Eastern Pacific /EPO/ and North Atlantic Oscillation /NAO/ will be the telling tale for this winter.

Expanding on this "normal" idea, it is interesting to note that the 100 year winter mean temperature for Detroit is approximately 26.7 degrees with a one standard deviation spread of 3.5 degrees either side of that 26.7. Statistically speaking, based on this data the temperatures could average as low 23.2 degrees or as high as 30.2 and still be considered within a "normal" range of the mean. Basically, this just supports the idea that winter temperatures in these parts, by nature, have a wide statistical range and this winter should be no exception!

Snowfall and Rainfall:

After two very snowy winters, this year's analogues averaged closer to normal. I say averaged because that is exactly what this winter's analogue data projected for snowfall, a true average. Most of the data seen says snowfall will likely be notably above, below or near normal and thus, this projected average is the medium of the extremes and normal amounts, both. That being said, one can hardly ignore the impressive snowy winters in the mix (ex; Detroit in the 1925-26 winter had 78" which ranks second for snowiest winters). At the same time, there were more very light snow years seen this go around (as opposed to last years) representing the well below normal snowfall. Therefore, generally as many snowy years as snowless were noted. There in-lies the problem, the lack of a winter snowfall pattern. I'll try my best to resolve this by looking at more recent storm track trend of the past few winters along with the trend the past six months. Concluding, while I'm calling for less snow than the last few winters, I still expect snowfalls to range within a half of foot of the average or normal, rather than below each area's perspective mean).

Broad Scale Discussion

As we move toward the winter of 2009-10, the El Nino sea surface temperatures /SST in section 3.4/ have risen to 0.8C in the 3.4 area of the Pacific waters for the three month average (Jul-Sep). A brief recollect; El Nino refers to warmer than normal sea surface temperatures in the equatorial pacific (as opposed to La Nina, which indicates cooler than normal sea surface temperatures). La Nina dominated the Pacific "picture" more or less for the past few years. Our autumn upper air and surface pattern is also beginning to reflect and behave more like an El Nino and this is expected to continue throughout the winter. There are definitely a few wild cards in this season's outlook and just how strong El Nino becomes is one of the most important features of the winter and will have a marked influence on our winter weather.

El Nino

Checking out the Pacific water temperatures in Nino 1+2, 3 and 4 (Fig-1), shows the warming of all areas. For scientific purposes, area Nino 3.4 is used to determine officially, whether or not El Nino exists. See the notable warm-up in October (one of the reasons to wait for the latest data) this expansion of warmth from the west (Nino 4) was spread east into section 3.4 by down welling from propagating Kelvin through the region. This should warm the three month average for Aug-Oct.

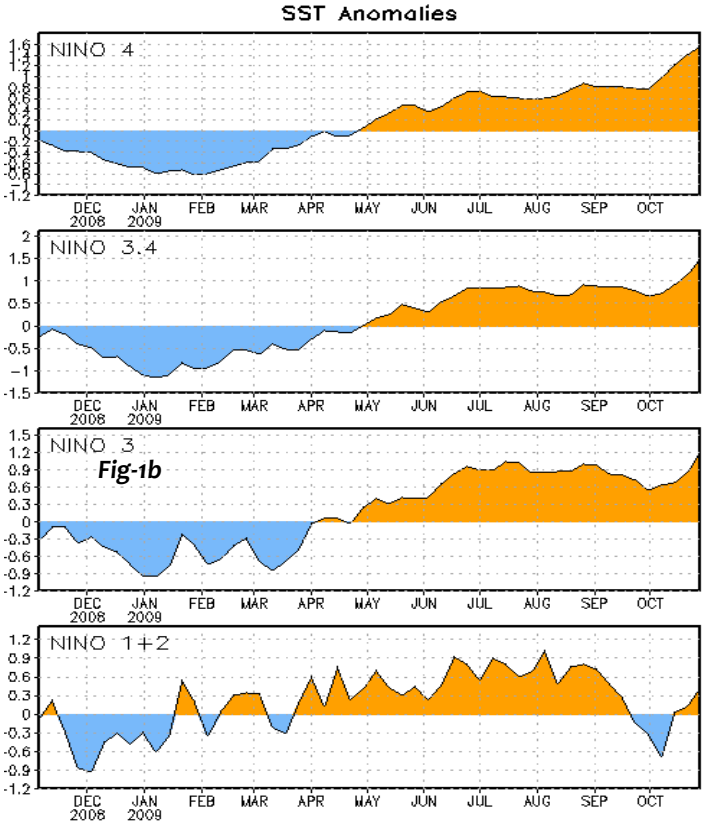
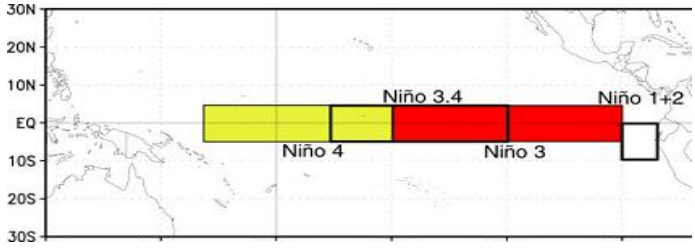


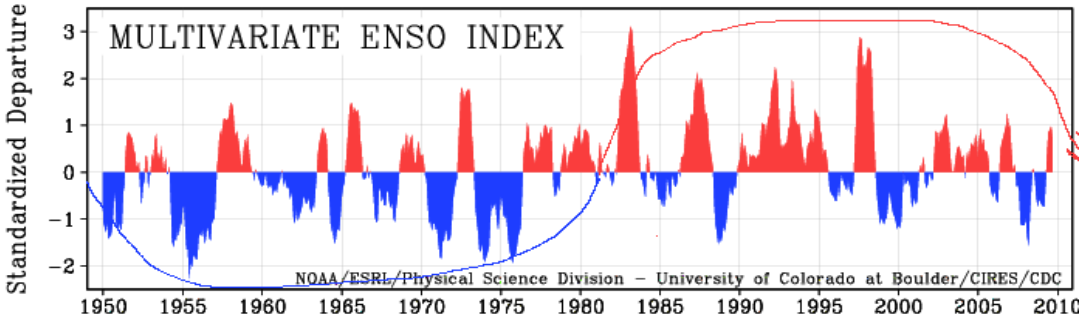
Fig-1b

Fig-1a /b



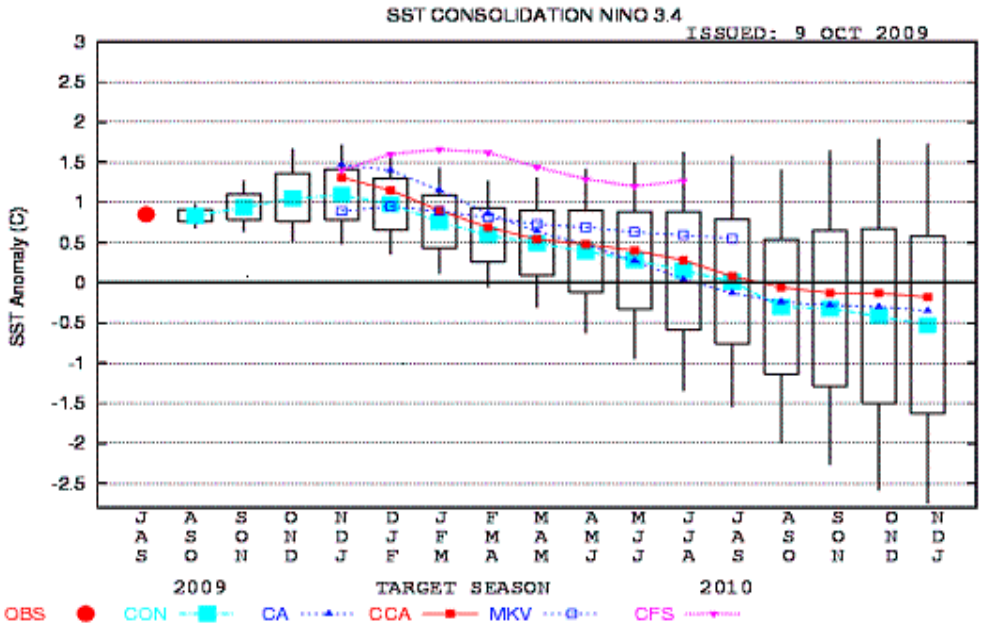
On a longer scale view, the oscillation of the ENSO is clearly displayed here (Fig-2). Also note that La Nina's dominated the picture from the 1950s into the mid 1970s. After, from the 1980s into the early 2000s, El Nino's have been the rule. If the past trend continues, it appears that in the next few decades, La Nina's will begin to become more commonplace.

Fig-2



The latest computer projections (as of October, Fig-3) shows that the SST's are expected to rise and max around 1.6C into early winter, near the moderate El Nino strength.

Fig-3



NAO/AO

The other important wild card this winter is the trend of the North Atlantic Oscillation / Arctic Oscillation throughout the winter. Of course, this is the biggest challenge to the forecast and potentially, has the biggest bust potential. While weather trends with La Ninas and El Ninos are seen (and even these aren't always consistent), the NAO pattern remains highly elusive and generally, trends are seen only a week or two out. Our colder winters, particularly 1976-77, in the study surely reflect a predominately negative NAO / AO in conjunction with a weak El Nino.

The winter of 1976-77 from the analogue winters was a neutral to weak El Nino (reaching its strength around the Christmas holidays, as many El Ninos do) and was one of our coldest on record and was one brutal winter. Many of our analogue winters, however, start out on the mild side but deteriorate during the winter (more in the analogue section below).

The long term trend of the NAO/AO (Fig-4 a, b), clearly shows the oscillations (long and short term) from positive to negative to positive and just recently, settling toward neutral and below.

Fig-4a

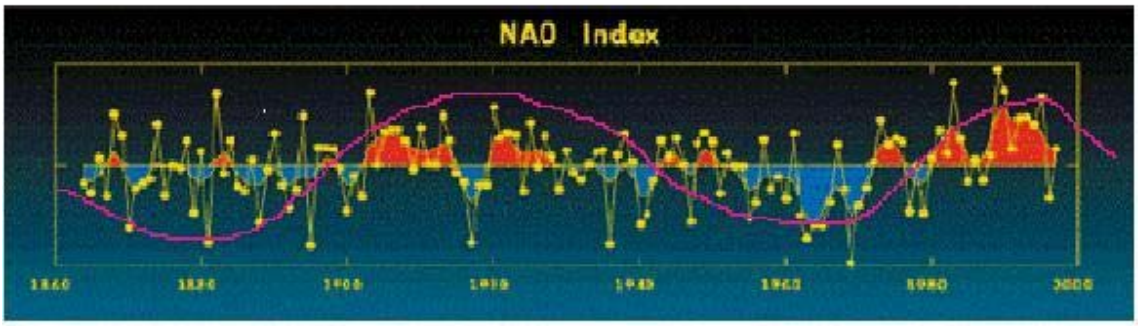
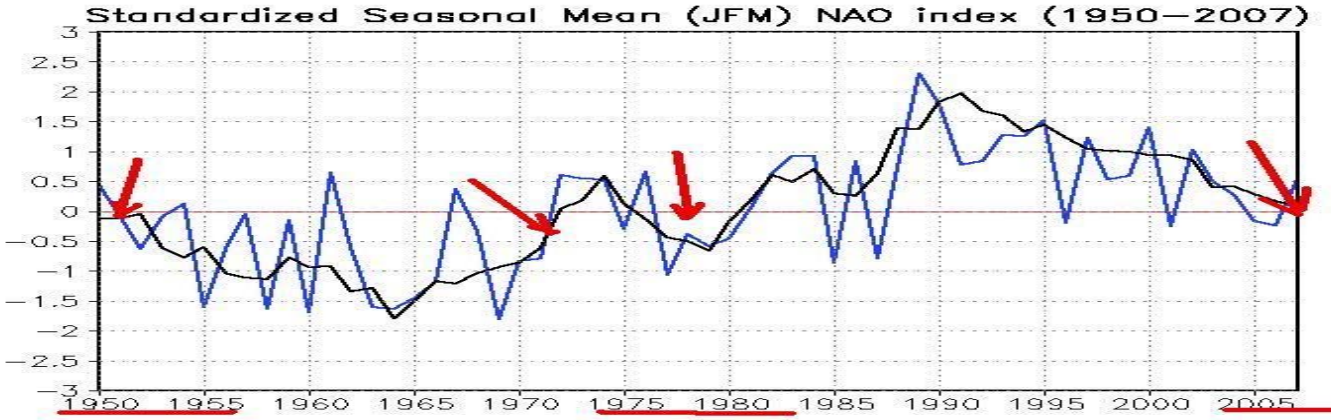
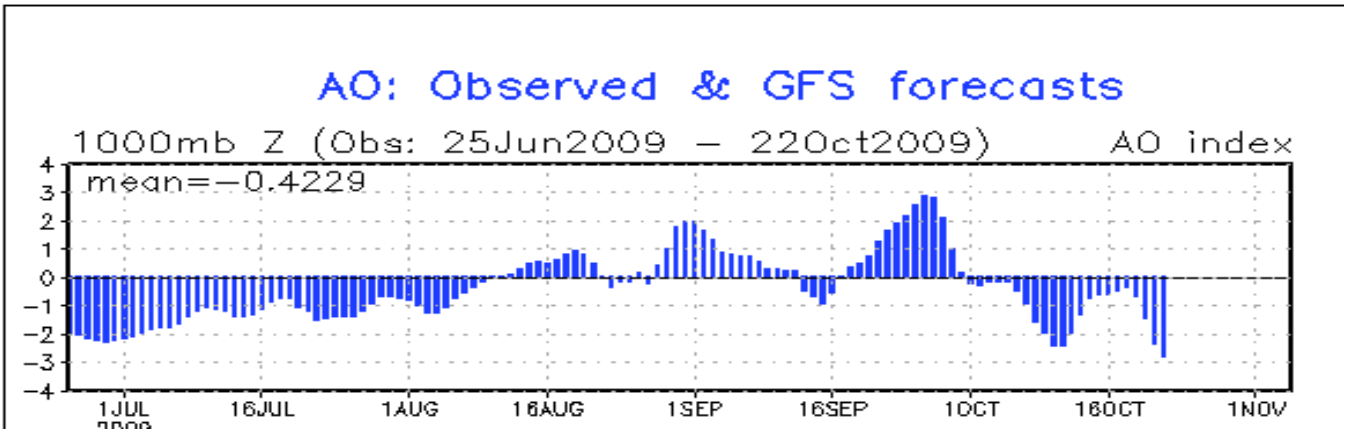


Fig-4b/4c

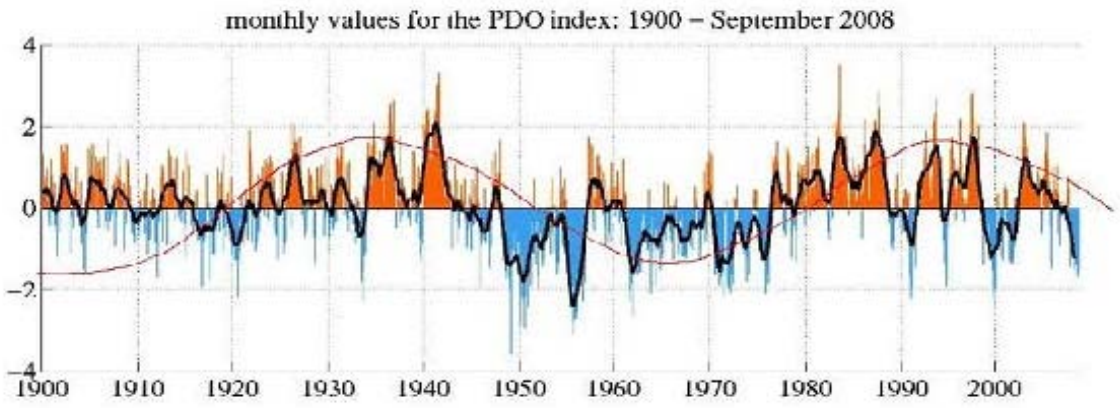




The latest trace of the AO (Fig-4c) reflects our temperature pattern since late June 2009 nicely. The summer period (including May) was also primarily negative in the negative phase of the AO which one of the main reasons for our cool but comfortable summer with a few warm spells. Since the summer, the AO oscillations have been more mixed this fall (this, by the way is not unlike last fall). September's warmth is clearly represented by the positive hatch marks but this has been replaced by the strong negative readings in much of October (and we all know what October was mainly like).

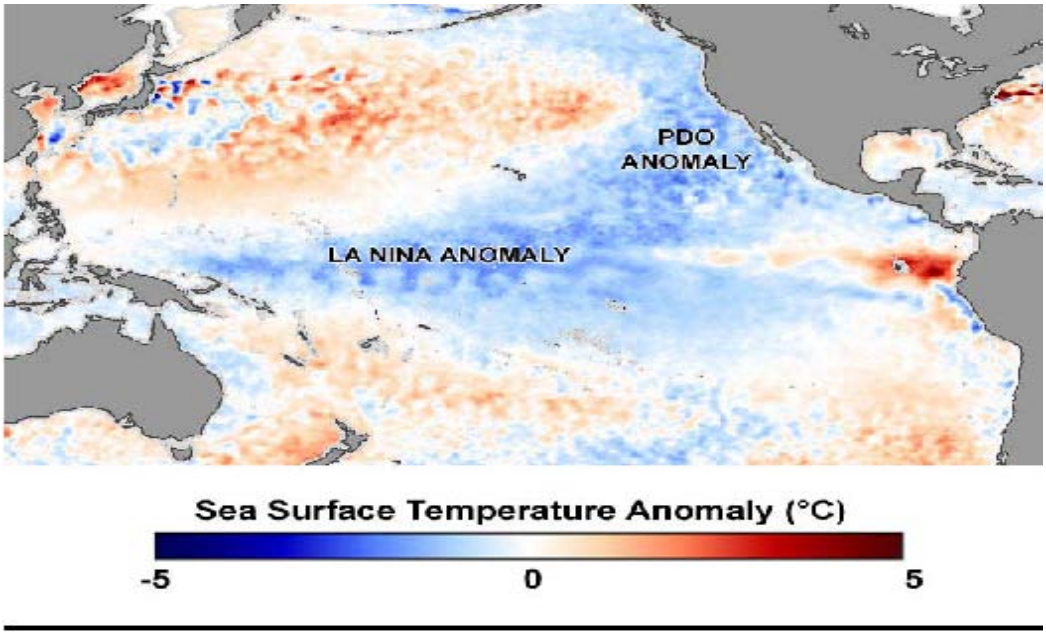
The Pacific Decadal Oscillation

Fig-5



The Pacific Decadal Oscillation (PDO) is the long-term ocean fluctuation of the Pacific Ocean. The PDO waxes and wanes approximately every 20 to 30 years. Many scientists think we have just entered the "cool" phase (see Fig -5/6). The cool phase is characterized by a cool wedge of lower than normal sea-surface heights/ocean temperatures in the eastern Pacific and a warm horseshoe pattern of higher than normal sea-surface heights connecting the north. The last time the PDO trended into the negative phase was also in the early 1950s, lasting into the late 1970s. There is evidence that during the cooler phase, La Nina's tend to be more commonplace (as in our recent La Nina, pictured here in 2008) and last longer. Compare the pattern likenesses of the ENSO, PDO and NAO trace/phases of the 1950s-70s). It will be interesting to see how close our winter patterns of the next few decades resemble those of the 1950s-70s.

Fig-6



2009-10 Analogue Winters

These selected analogue winters below, followed a similar sequence of events (though timing may vary a bit) that were recently observed over the Eastern Pacific during the past few seasons. La Nina prevailed through much of that time with a short Neutral period before El Nino set in during summer and fall, lasting through the winter. El Nino's strength maxed-out weak to moderate with the majority 1.0-1.6 strength (as is expected this time). The 1972-73 winter was the strongest at over +2.0C.

DETROIT

ANALOGUE EL NINO

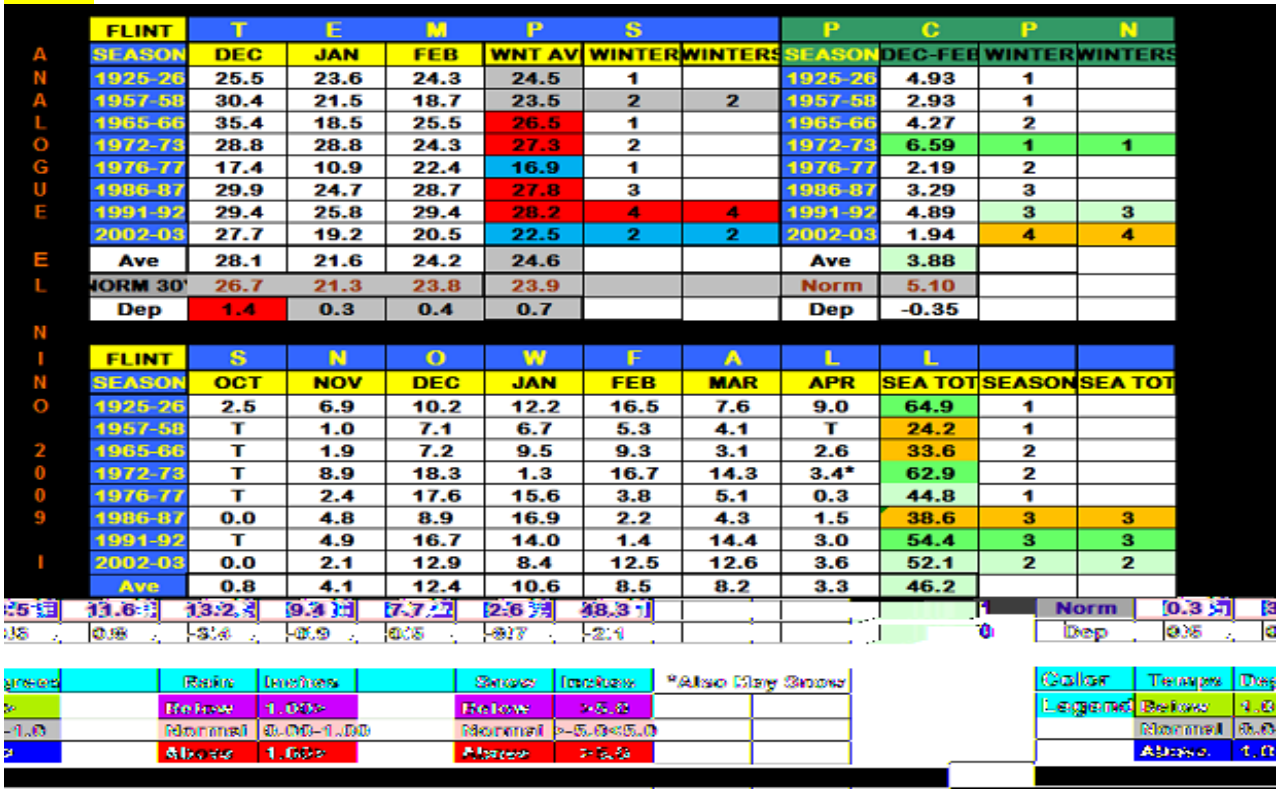
DETROIT	T	E	M	P	S		P	C	P	N
SEASON	DEC	JAN	FEB	WNT AVE	WINTER	WINTERS	SEASON	DEC-FEB	WINTER	WIN TOT
1888-89	31.4	29.8	19.4	26.9	1		1888-89	3.43	1	
1896-97	30.3	23.0	27.5	26.9	2		1896-97	3.72	2	
1911-12	33.9	13.1	18.3	21.8	1		1911-12	5.58	1	
1918-19	36.4	31.1	29.4	32.3	1		1918-19	6.00	2	
1925-26	27.0	25.4	25.8	26.1	3		1925-26	7.96	1	1
1957-58	34.1	26.6	22.8	27.8	4		1957-58	6.07	3	
1965-66	35.9	21.4	28.3	28.5	2		1965-66	5.99	4	
1972-73	29.4	28.8	25.3	27.8	5	5	1972-73	5.84	5	5
1976-77	21.5	12.8	25.2	19.8	2		1976-77	3.41	3	
1986-87	31.7	26.1	29.6	29.1	3		1986-87	5.16	4	
1991-92	32.1	28.3	30.8	30.4	4	4	1991-92	5.23	5	
2002-03	28.7	20.5	23.1	24.1	3	3	2002-03	2.24	6	6
Ave	31.0	23.9	25.5	26.8			Ave	5.20		
NORM 30'	29.6	24.5	27.2	27.1	100YR -	26.7	Norm	6.30		
Dep	1.4	-0.6	-1.7	-0.3			Dep	-1.10		

2009

DETROIT	S	N	O	W	F	A	L	L		
SEASON	OCT	NOV	DEC	JAN	FEB	MAR	APR	SEA TOT	SEASON	SEA TOT
1888-89	T	0.9	1.2	9.8	5.3	4.1	1.9	23.2	1	
1896-97	T	T	7.4	8.7	8.2	10.4	T	34.7	2	
1911-12	0.0	7.0	3.8	15.1	14.8	15.8	1.5*	58.0	1	
1918-19	T	2.4	1.7	3.1	8.0	T	0.0	15.2	3	
1925-26	2.0	7.8	10.1	15.6	28.0	5.5	9.0	78.0	2	
1957-58	[illegible]								45.0	1---
1965-66	[illegible]								43.9	2
1972-73	[illegible]								49.7	3
1976-77	[illegible]								43.5	3
1986-87	[illegible]								60.0	4
1991-92	[illegible]									
2002-03	[illegible]									
Ave	1.0	[illegible]						40.5		
Norm	0.3	2.7	11.1	11.9	9.3	7.0	1.7	44.0		
Dep	0.7	0.8	-3.9	-0.2	0.6	2.2	0.3	-3.5		

Color	Temps	Degrees		Rain	Inches		Snow	Inches	*Also May Snow!
Legend	Below	1.0<		Below	1.00<		Below	>5.0	
	Normal	0.6-1.0		Normal	0.60-1.00		Normal	>=5.0<=8.0	
	Above	0.6>		Above	1.00>		Above	>8.0	

FLINT



ANALOGUE EL NINO 2009

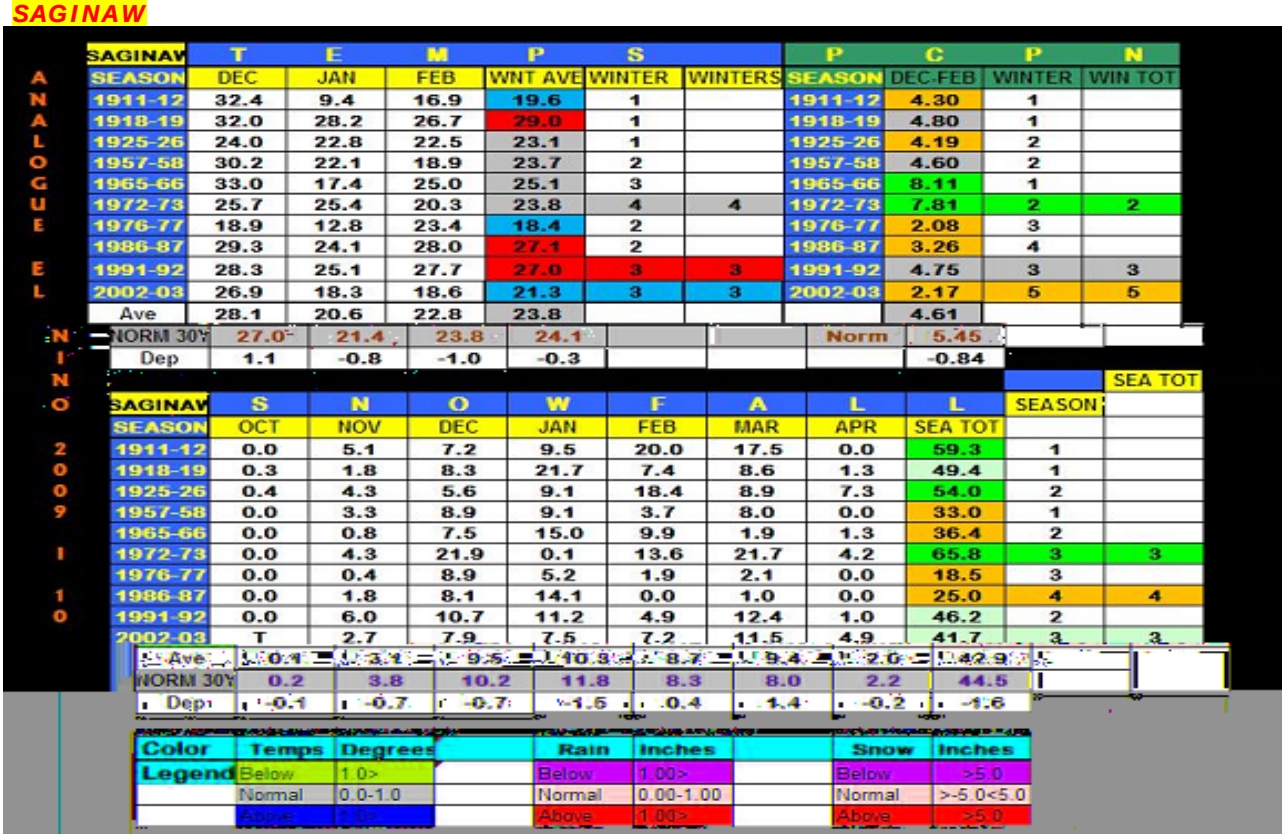
FLINT	T	E	M	P	S		P	C	P	N
SEASON	DEC	JAN	FEB	WNT AV	WINTER	WINTERS	SEASON	DEC-FEB	WINTER	WINTERS
1925-26	25.5	23.6	24.3	24.5	1		1925-26	4.93	1	
1957-58	30.4	21.5	18.7	23.5	2	2	1957-58	2.93	1	
1965-66	35.4	18.5	25.5	26.5	1		1965-66	4.27	2	
1972-73	28.8	28.8	24.3	27.3	2		1972-73	6.59	1	1
1976-77	17.4	10.9	22.4	16.9	1		1976-77	2.19	2	
1986-87	29.9	24.7	28.7	27.8	3		1986-87	3.29	3	
1991-92	29.4	25.8	29.4	28.2	4	4	1991-92	4.89	3	3
2002-03	27.7	19.2	20.5	22.5	2	2	2002-03	1.94	4	4
Ave	28.1	21.6	24.2	24.6			Ave	3.88		
NORM 30'	26.7	21.3	23.8	23.9			Norm	5.10		
Dep	1.4	0.3	0.4	0.7			Dep	-0.35		

FLINT	S	N	O	W	F	A	L	L		
SEASON	OCT	NOV	DEC	JAN	FEB	MAR	APR	SEA TOT	SEASON	SEA TOT
1925-26	2.5	6.9	10.2	12.2	16.5	7.6	9.0	64.9	1	
1957-58	T	1.0	7.1	6.7	5.3	4.1	T	24.2	1	
1965-66	T	1.9	7.2	9.5	9.3	3.1	2.6	33.6	2	
1972-73	T	8.9	18.3	1.3	16.7	14.3	3.4*	62.9	2	
1976-77	T	2.4	17.6	15.6	3.8	5.1	0.3	44.8	1	
1986-87	0.0	4.8	8.9	16.9	2.2	4.3	1.5	38.6	3	3
1991-92	T	4.9	16.7	14.0	1.4	14.4	3.0	54.4	3	3
2002-03	0.0	2.1	12.9	8.4	12.5	12.6	3.6	52.1	2	2
Ave	0.8	4.1	12.4	10.6	8.5	8.2	3.3	46.2		
25-[illegible]	11.6-[illegible]	13.2-[illegible]	9.4-[illegible]	7.7-2	2.6-[illegible]	48.3-1			1	Norm 0.3
[illegible]	0.8	-3.4	-0.9	0.5	-9.7	-2.1			0	Dep 0.5

greed	Rain	Inches		Snow	Inches	*Also May Snow
	Below	1.00>		Below	>5.0	
-1.0	Normal	0.00-1.00		Normal	>-5.0<5.0	
	Above	1.00>		Above	>5.0	

Color	Temps	Deg
Legend	Below	1.0
	Normal	0.0
	Above	1.0

SAGINAW



ANALOGUE EL NINO 2009

SAGINAW	T	E	M	P	S		P	C	P	N
SEASON	DEC	JAN	FEB	WNT AVE	WINTER	WINTERS	SEASON	DEC-FEB	WINTER	WIN TOT
1911-12	32.4	9.4	16.9	19.6	1		1911-12	4.30	1	
1918-19	32.0	28.2	26.7	29.0	1		1918-19	4.80	1	
1925-26	24.0	22.8	22.5	23.1	1		1925-26	4.19	2	
1957-58	30.2	22.1	18.9	23.7	2		1957-58	4.60	2	
1965-66	33.0	17.4	25.0	25.1	3		1965-66	8.11	1	
1972-73	25.7	25.4	20.3	23.8	4	4	1972-73	7.81	2	2
1976-77	18.9	12.8	23.4	18.4	2		1976-77	2.08	3	
1986-87	29.3	24.1	28.0	27.1	2		1986-87	3.26	4	
1991-92	28.3	25.1	27.7	27.0	3	3	1991-92	4.75	3	3
2002-03	26.9	18.3	18.6	21.3	3	3	2002-03	2.17	5	5
Ave	28.1	20.6	22.8	23.8				4.61		
NORM 30Y	27.0	21.4	23.8	24.1			Norm	5.45		
Dep	1.1	-0.8	-1.0	-0.3				-0.84		

SAGINAW	S	N	O	W	F	A	L	L		SEA TOT
SEASON	OCT	NOV	DEC	JAN	FEB	MAR	APR	SEA TOT	SEASON	
1911-12	0.0	5.1	7.2	9.5	20.0	17.5	0.0	59.3	1	
1918-19	0.3	1.8	8.3	21.7	7.4	8.6	1.3	49.4	1	
1925-26	0.4	4.3	5.6	9.1	18.4	8.9	7.3	54.0	2	
1957-58	0.0	3.3	8.9	9.1	3.7	8.0	0.0	33.0	1	
1965-66	0.0	0.8	7.5	15.0	9.9	1.9	1.3	36.4	2	
1972-73	0.0	4.3	21.9	0.1	13.6	21.7	4.2	65.8	3	3
1976-77	0.0	0.4	8.9	5.2	1.9	2.1	0.0	18.5	3	
1986-87	0.0	1.8	8.1	14.1	0.0	1.0	0.0	25.0	4	4
1991-92	0.0	6.0	10.7	11.2	4.9	12.4	1.0	46.2	2	
2002-03	T	2.7	7.9	7.5	7.2	11.5	4.9	41.7	3	3
Ave	0.1	3.1	9.5	10.8	8.7	9.4	2.6	42.9		
NORM 30Y	0.2	3.8	10.2	11.8	8.3	8.0	2.2	44.5		
Dep	-0.1	-0.7	-0.7	-1.5	0.4	1.4	-0.2	-1.6		

Color	Temps	Degrees		Rain	Inches		Snow	Inches
Legend	Below	1.0>		Below	1.00>		Below	>5.0
	Normal	0.0-1.0		Normal	0.00-1.00		Normal	>-5.0<5.0
	Above	1.0>		Above	1.00>		Above	>5.0

Local Comparisons/Results:

Temperatures:

Clearly, the trend seen in this year's analogue winters is a wide array of solutions, both in temperatures and snowfalls. While several winters averaged around normal, most of those traveled different paths to get to that "near normal". Some of the winters where normal temperatures were the end result came from high temperature variability and thus, were the "average of the extremes". In the full temperature categories at Detroit (with the longest record of data), five winters averaged within a degree of normal, and four averaged above that "normal range" and three below. When all winters are averaged, the average temperature is 26.8, just one tenth of a degree from the 100 year average of 26.7. The outlier winters averaged 32.3 on the warm side to 19.8 on the cold side. The most notable trend found was the milder Decembers or in the early winter period. Eight out of the 12 Decembers at Detroit averaged above the December normal of 29.6 (so, two-thirds or 67% of the time). After December, results became more variable in January and February but with trend toward colder weather (or more typical winter weather). This is what you would expect if the El Nino does weaken (which is expected) mid to late winter. These winters also show some impressive cold shots (periods) which offset the milder weather experienced. As always, while these trends may evolve, the timing may present a problem. The last few winters this hasn't been the case but in this set of winters, when dealing with both El Nino timing and NAO timing, the predictability is simply, more challenging.

Snowfall:

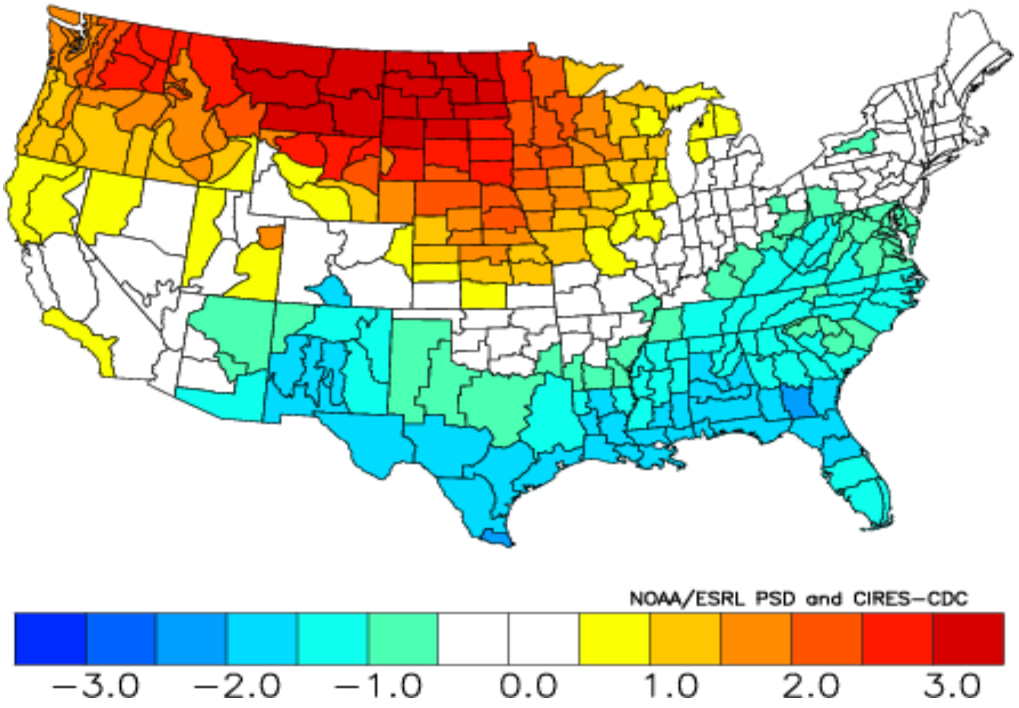
Like the temperature data, our snowfall data and amounts are all over the board. Looking again at the longest data source /Detroit/, reflects this in spades with five light snow winters, 3 average snow winters and 3 snowy winters. Actual snowfall amounts at Detroit range from lows of 15.2" /1918-19/ & 15.4" /1965-66/ to our second highest in history at Detroit with 78.0" /1925-26/. In addition, nearly all of our summer-fall period has been similar (temps/wetness) in 1925 to this year. The variability of snowfalls really presents a dilemma and represents the closeness (or farness) of the storm track. All that being said, one pattern that did show up was that the majority of the winters contained their best snows mid-late season and therefore, tended to be back-end loaded. Best snows were found February and March (especially if we weren't hit January). March was a snowy month overall with seven out of the 12 years containing above normal snowfall.

COMPOSITE MAPS OF ANALOGUE WINTER YEARS

Below are the composite maps for the analogue years in the local study. Remember these maps are composites what happened over the region and do not take into account any recent trend observed over the region. They are only a "guidance tool" to past analogue El Nino winters that followed a moderate to strong La Nina. One must also remember that these maps are just composites of the years blended together; therefore to get a better idea of the winters as a whole, it is better to look at the analogue winters locally. Note that the earliest winter at Detroit is not included in the maps since the composite data set only goes back to 1895.

Composite Temperature Anomalies (F)
Versus 1895–2000 Longterm Average

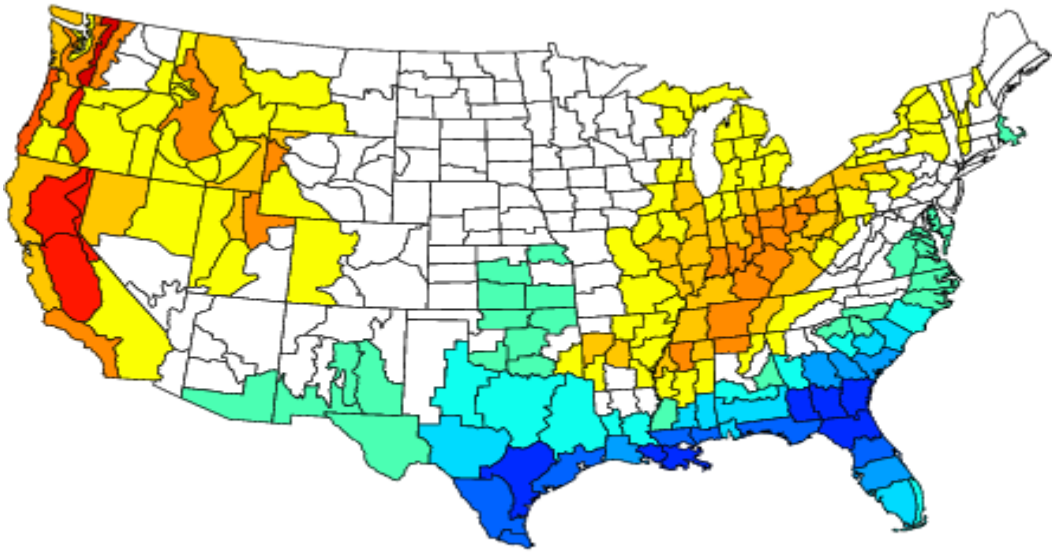
Dec to Feb 1896–97,1911–12,1918–19,1925–26,1957–58,1965–66,1972–73,1976–77
1986–87,1991–92,2002–03,



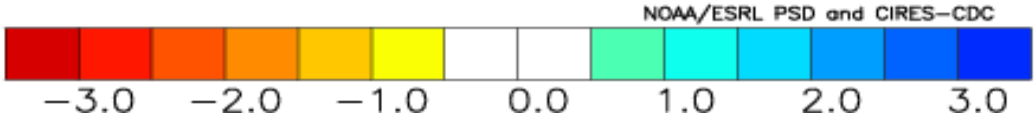
NOAA/ESRL PSD and CIRES–CDC

Composite Precipitation Anomalies (inches)
Versus 1895–2000 Longterm Average

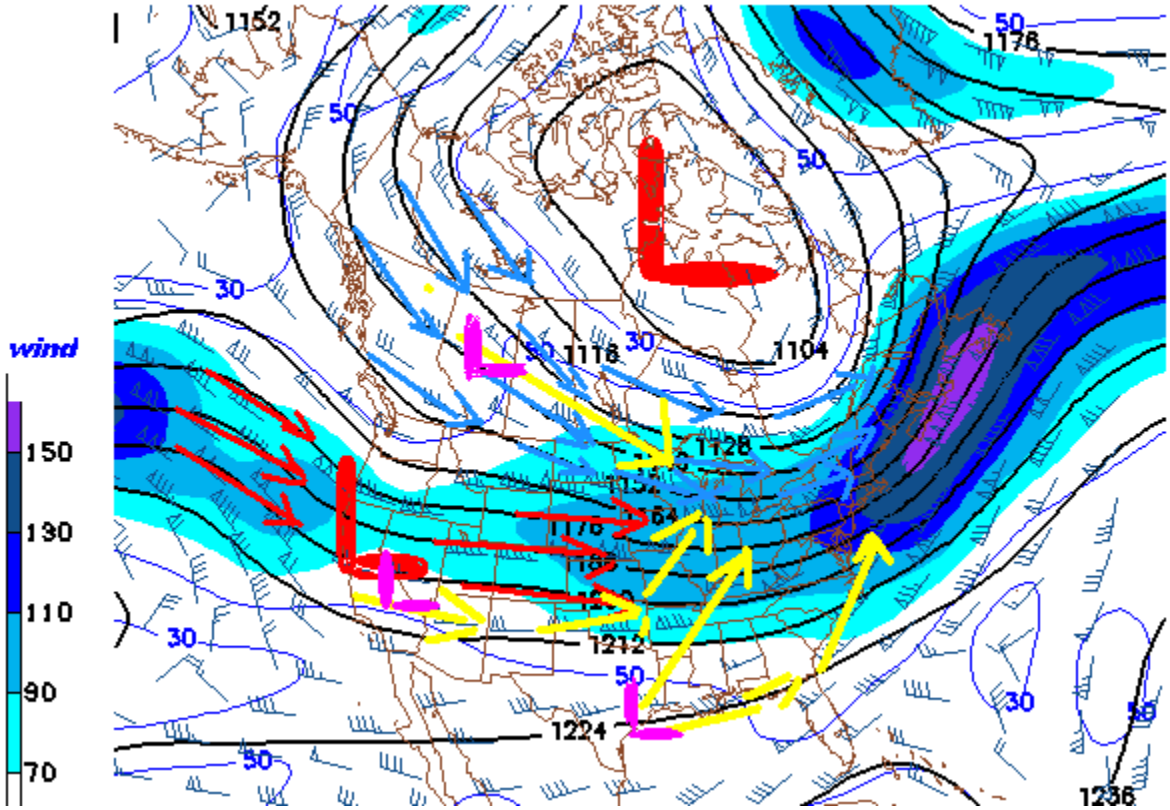
Dec to Feb 1896–97,1911–12,1918–19,1925–26,1957–58,1965–66,1972–73,1976–77
1986–87,1991–92,2002–03,



NOAA/ESRL PSD and CIRES–CDC



This model projected 200 MB height/jet from a recent computer run demonstrates nicely the key upper air players discussed about above for the upcoming winter.



STORM TRACKS AND UPPER WIND PATTERNS AFFECTING SE MICH

The most dominant of the storm tracks expected this winter are:

- Alberta Clippers which usher in polar or arctic air originating from western Canada or the Arctic.

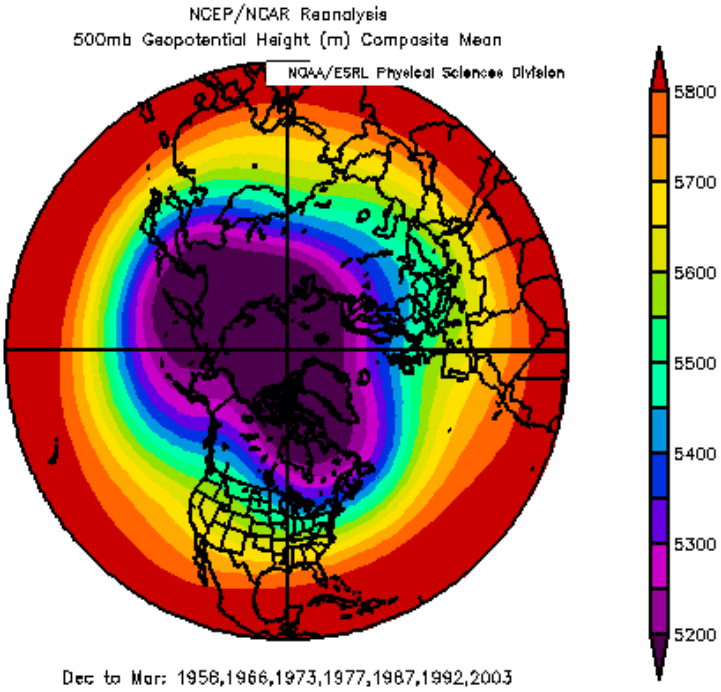
-Two other tracks should share the spotlight this season to supply much of the rain and snow this winter which are:

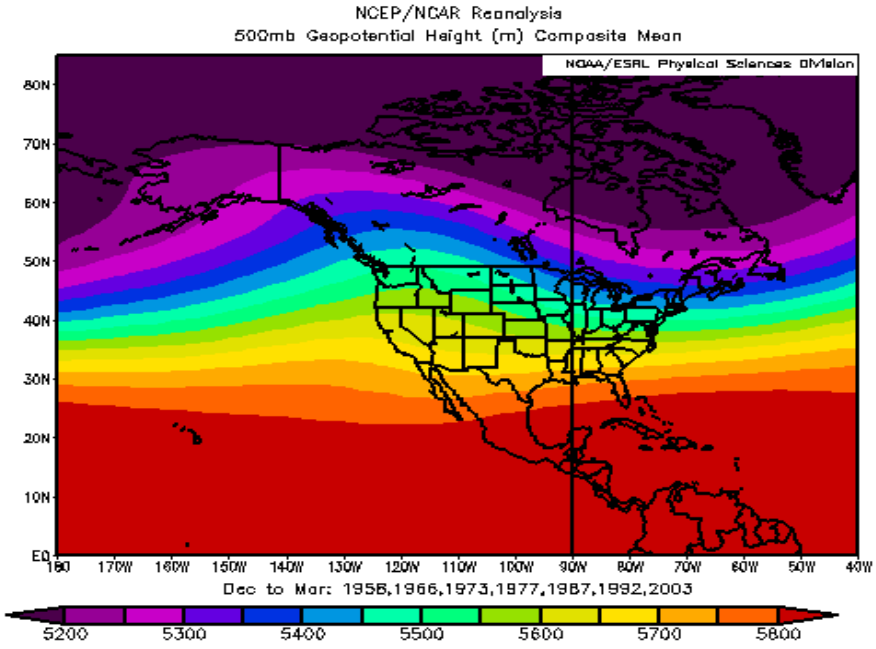
1-Southern Plains/Texas Low which hooks northeast through the Midwest and into the Great Lakes

2- Gulf of Mexico Low which moves north northeast through the Ohio Valley and into the eastern Great Lakes...and/or develops along the East Coast. This storm track up the East Coast was noted more in the El Ninos (especially in the 1970s) with a negative NAO and troughing was more prevalent in the eastern half of the county.

It will be interesting to see whether or not more Gulf Lows make their appearance this season.

The 500 MB maps below, show the mean upper wind flow for the winters (Dec-Mar) in the study back to 1957-58 winter from a Polar Northern hemisphere projection and North American projection. Note the strong cross Polar connection of the Arctic jet and the El Nino influence in the sub tropical region (our key players this winter).





Some Winter Dates:

Winter Begins early on December 21st, 2009 at 1247 pm EST.
Christmas: Friday December 25th, 2009
New Years: Friday January 1st, 2010
Ground Hogs Day: Tuesday February 2nd, 2010
Valentine's Day: Sunday February 14th, 2010

Try to get out and enjoy the nice days for winter sports during this winter season. Look for news stories and possible updates during the winter season.