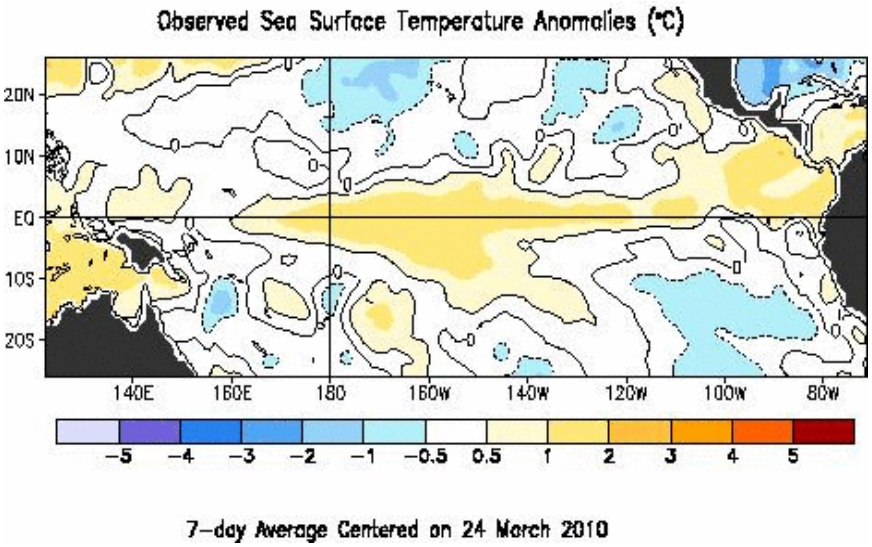
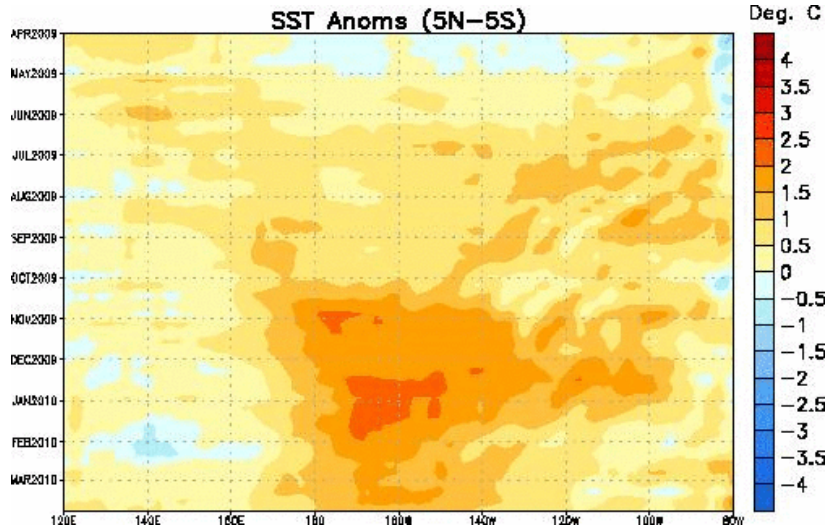
SUMMER 2010

El Nino, east QBO, low solar and high latitude volcanic ash resulted in a harsh mid-latitude winter and records snowfalls in places. The sun is slowly rebounding from the ultra-long solar minimum, the El Nino is centered in the east central Pacific and beginning to fade. ENSO models suggest the demise continues. Some models move to La Nina this summer. Volcanic ash from 2009 has been diminishing, but Iceland has had some moderate activity that could trigger nearby activity. All this portends an interesting summer and return of a cold northern US and Alaska/Canada winter next year.

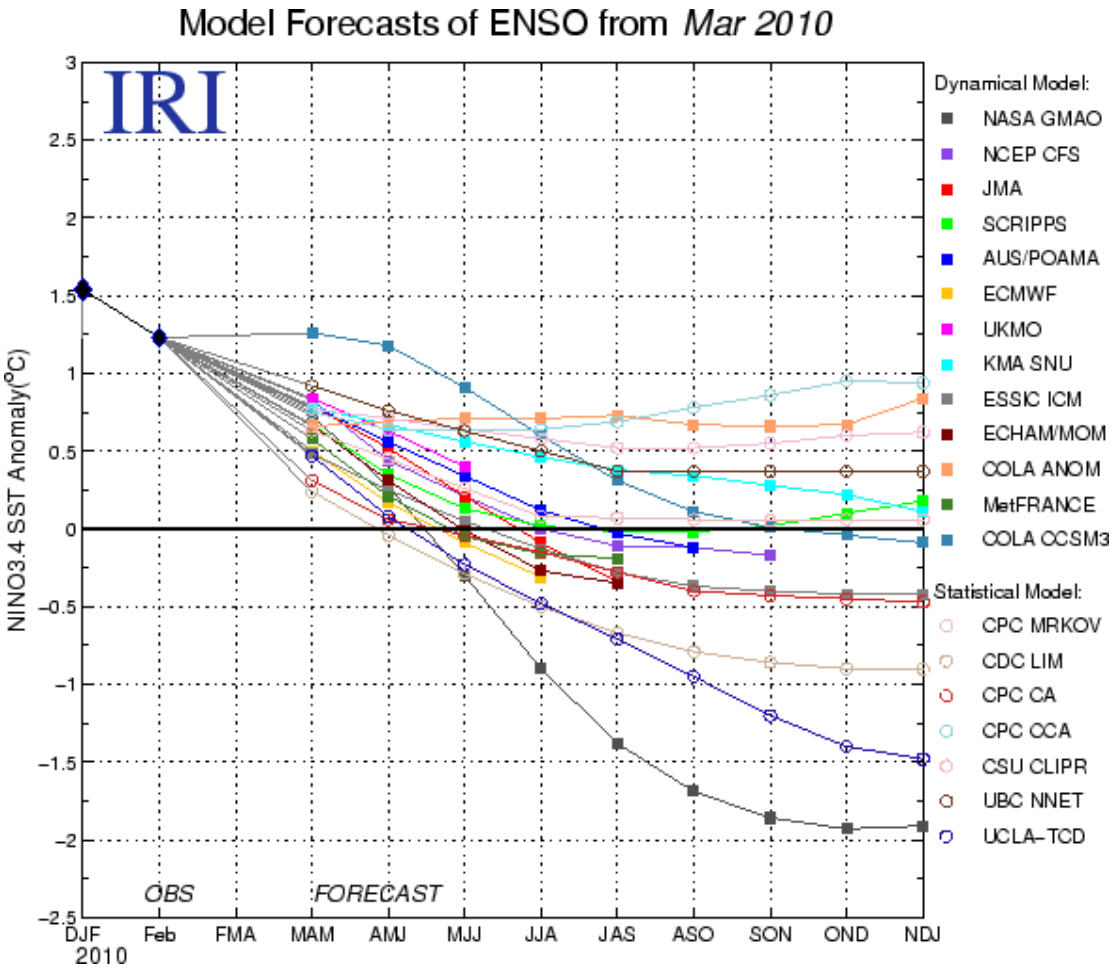
The latest tropical Pacific anomalies are seen below.



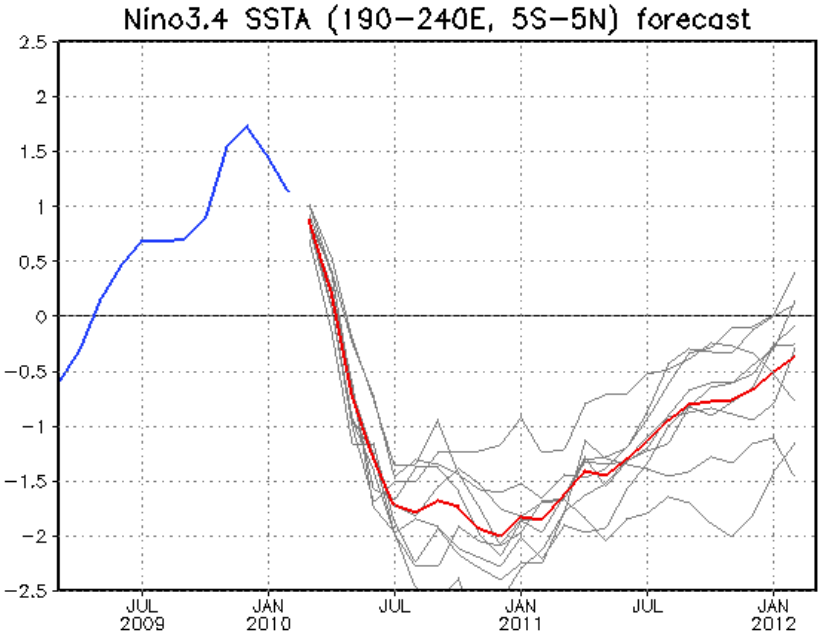
Last summer the ENSO was strongest in the eastern Pacific. This past winter the strongest anomalies moved to the central pacific where they continue to diminish.



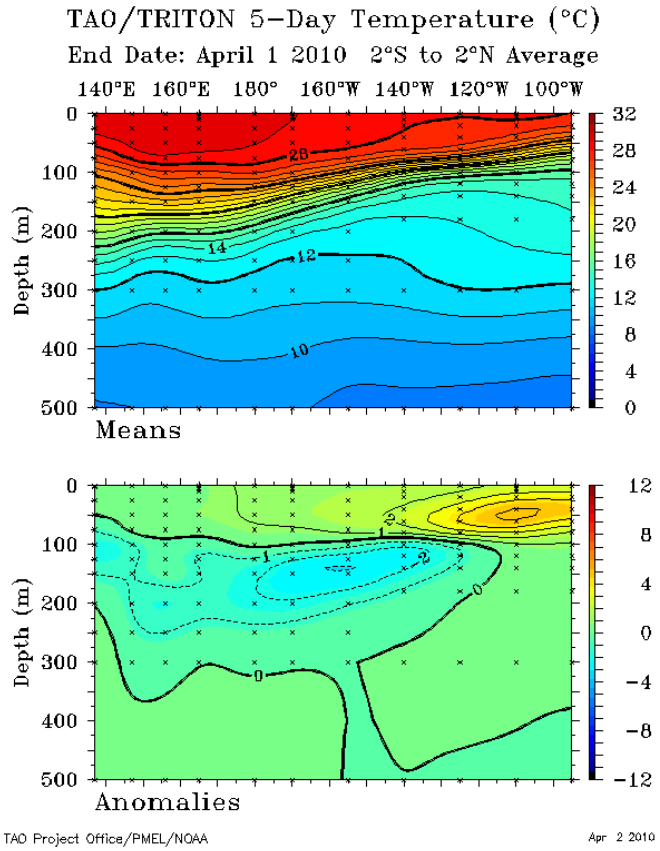
You can see mot ENSO models in March showed the El Nino continuing to weaken to anywhere from weak El Nino to strong La Nina by mid to late summer.



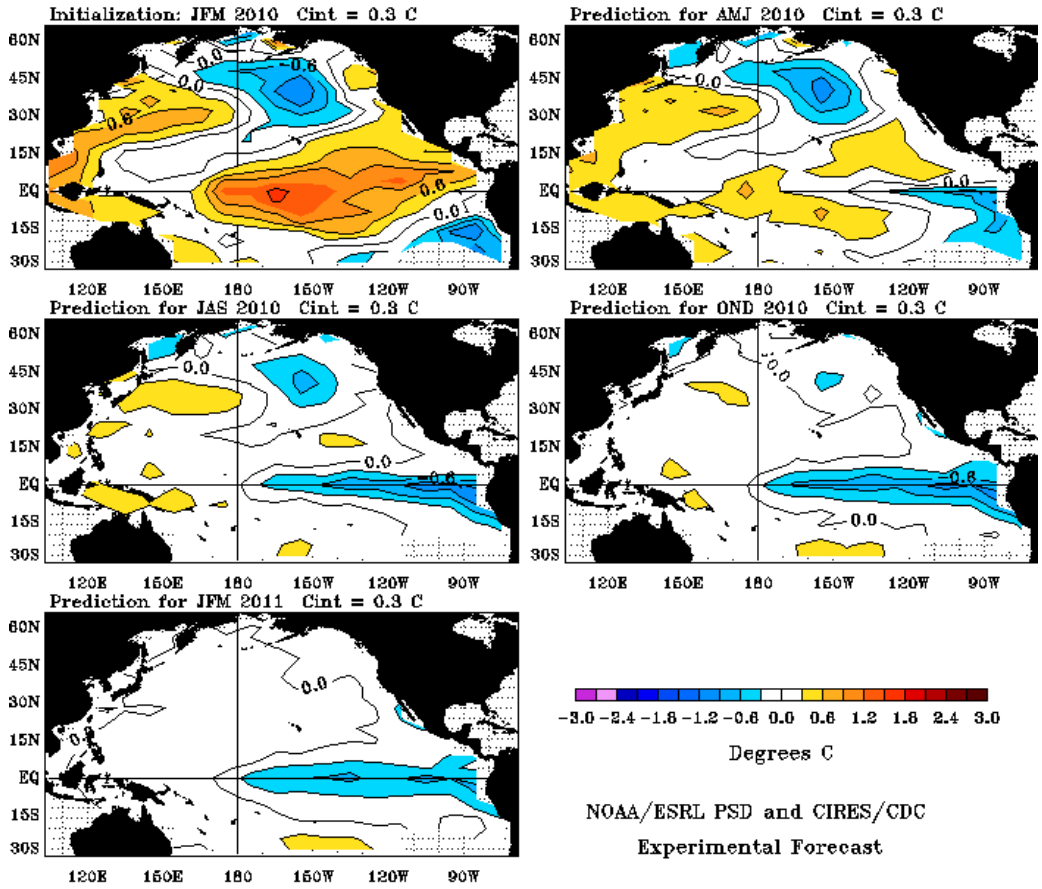
One of the strongest changes comes from the JAMSTEC model which takes the El Nino all the way to a strong La Nina by July and persists the La Nina state to 2012.



We can see the residual warmth in the eastern Pacific top waters, cold water (an elevated thermocline is seen in the central Pacific. The warm water should be mixed out by the equatorial easterlies and cold water upwelling should follow from the South American coast to the east central Pacific.



One example evolution is shown in this NOAA experimental model.



PDO popped slightly positive in the moderately strong El Nino this winter. This happened in the negative PDO phase of 1947 to 1977 during the similarly strong 1957-1958 El Nino and in the negative post 1998 PDO phase in the moderately strong El Nino of 2002/03.

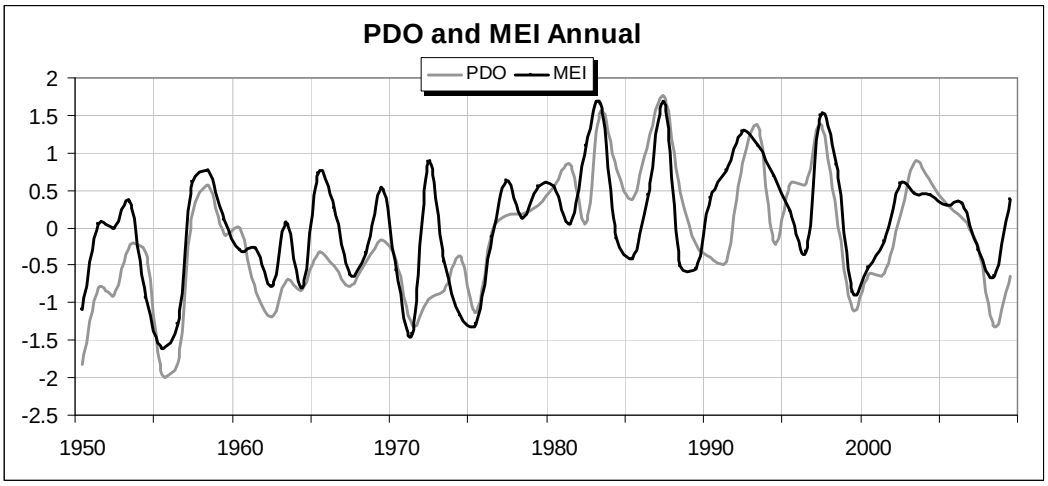
MULTIVARIATE ENSO INDEX (MEI)

Wolter in 1987 attempted to combine oceanic and atmospheric variables to track and compare ENSO events. He developed the Multivariate ENSO Index (MEI) using the six main observed variables over the tropical Pacific. These six variables are: sea-level pressure (P), zonal (U) and meridional (V) components of the surface wind, sea surface temperature (S), surface air temperature (A), and total cloudiness fraction of the sky (C).

The MEI is calculated as the first unrotated Principal Component (PC) of all six observed fields combined. This is accomplished by normalizing the total variance of each field first, and then performing the extraction of the first PC on the co-variance matrix of the combined fields (Wolter and Timlin, 1993).

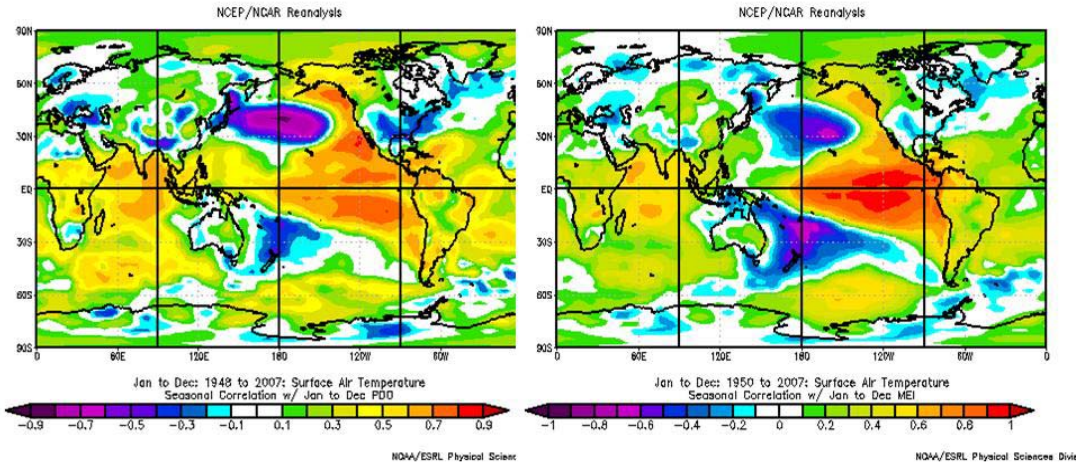
In order to keep the MEI comparable, all seasonal values are standardized with respect to each season and to the 1950-93 reference period. Negative values of the MEI represent

the cold ENSO phase, (La Niña), while positive MEI values represent the warm ENSO phase (El Niño).



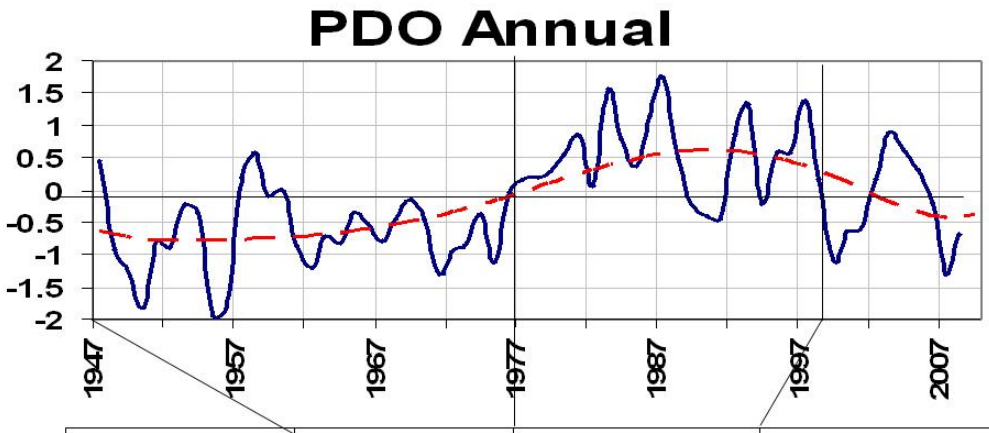
The ENSO and PDO patterns mirror each other. PDO is a “multidecadal” ENSO signal. The anomalies are similar. However the PDO mean state does not preclude the opposing ENSO state, just modulate the frequency and strength.

Temperature Correlations



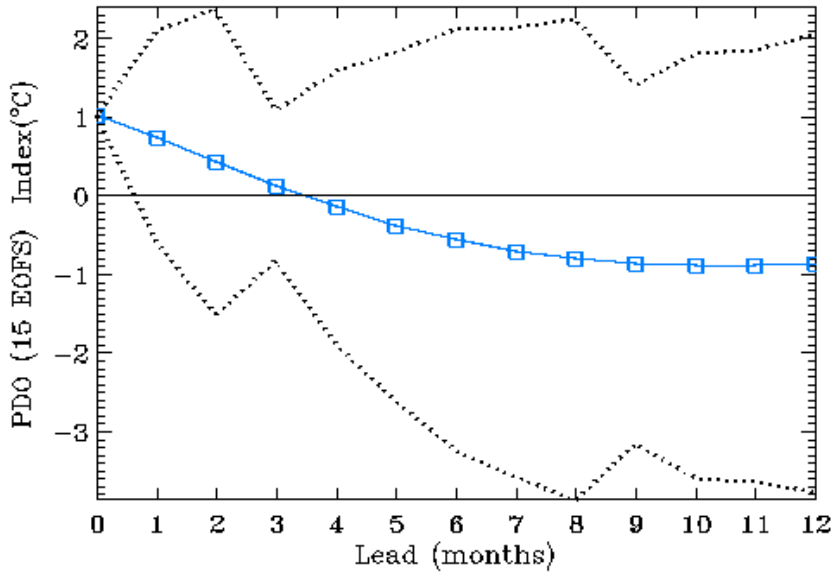
Pacific Decadal Oscillation **ENSO**

You can see the frequency of the favored state is 2 to 3 to 1.



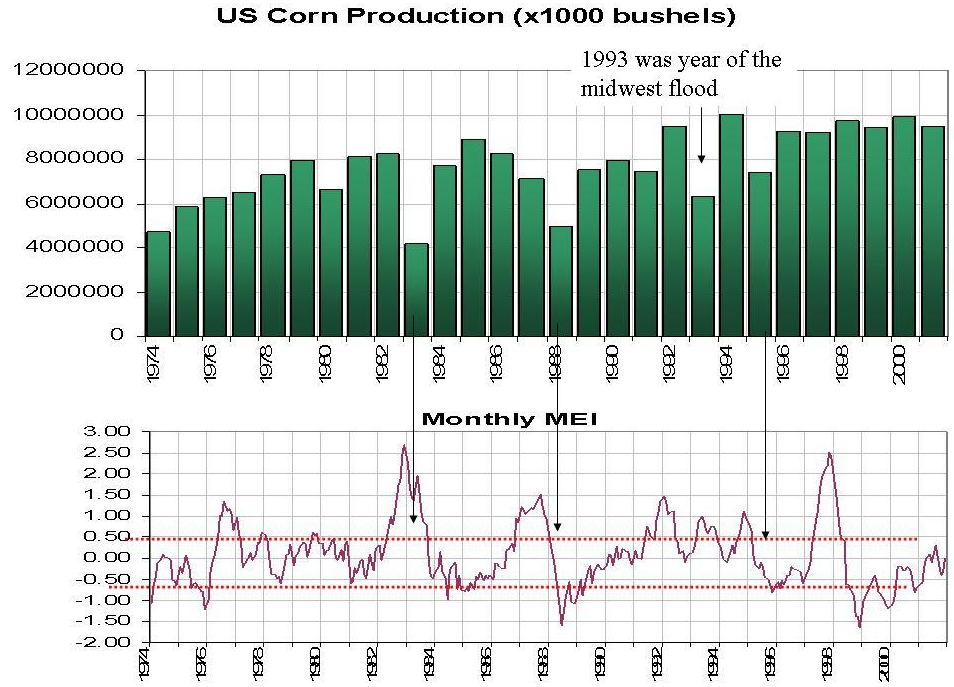
PDO	Cold	Warm	Cold
	1947-1977	1978-1998	1999-2009
El Nino	7	10	3
La Nina	14	3	5

Indeed as La Nina returns, CDC PDO model suggests PDO drops strongly negative again later this year, reinforcing the La Nina effects.

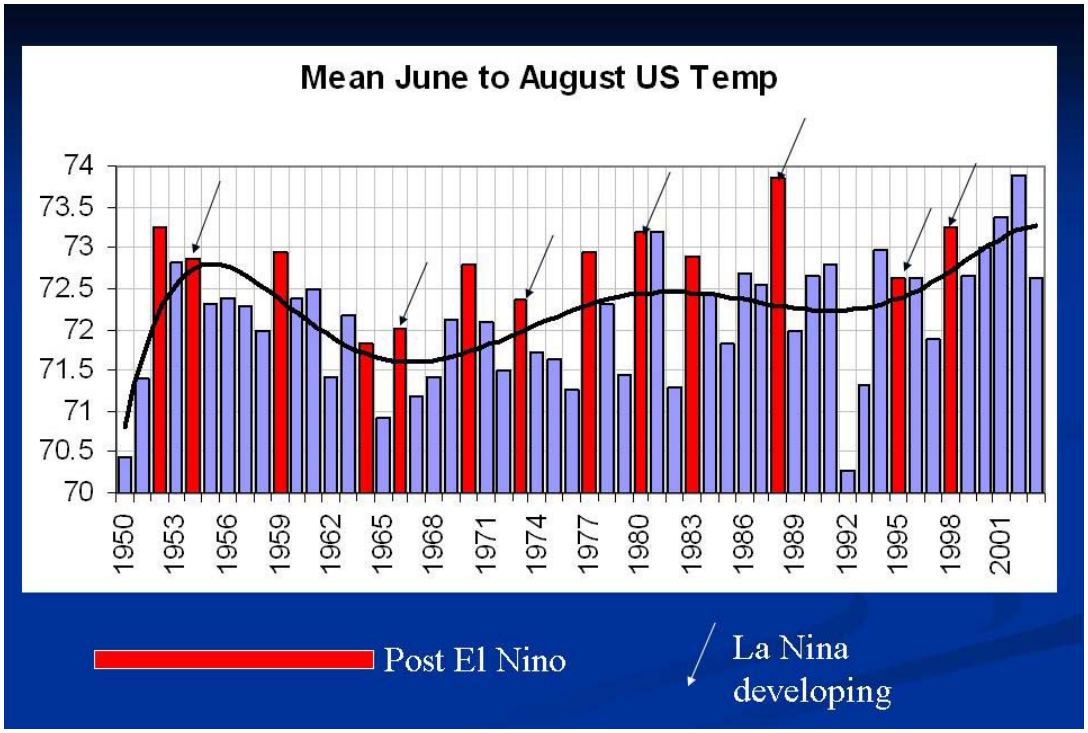


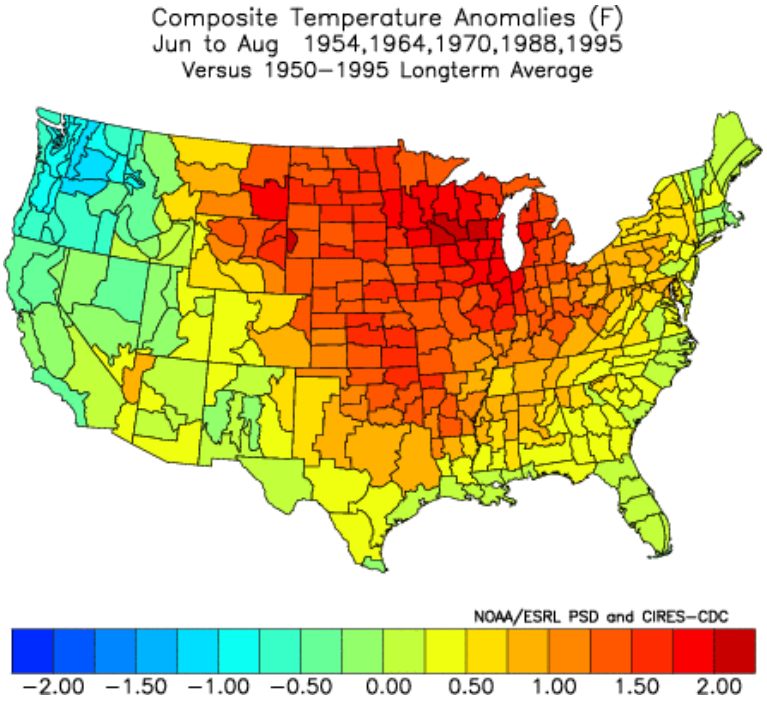
The concern would be historically, a rapid decline out of El Nino into La Nina during the spring and early summer has led to summer heat and drought issues in some years see below. 1999 was an exception to that rule with a good crop. 2007 likewise was an exception though, the El Nino was slow to press westward into the central Pacific, not arriving there until the end of summer.

Right now soil moisture says no to this kind of an issue and most climate models agree. The storm tracks and precipitation the next month or so will tell us a lot. If they maintain soil moisture west and south and improve it north and east we will escape a serious issue.

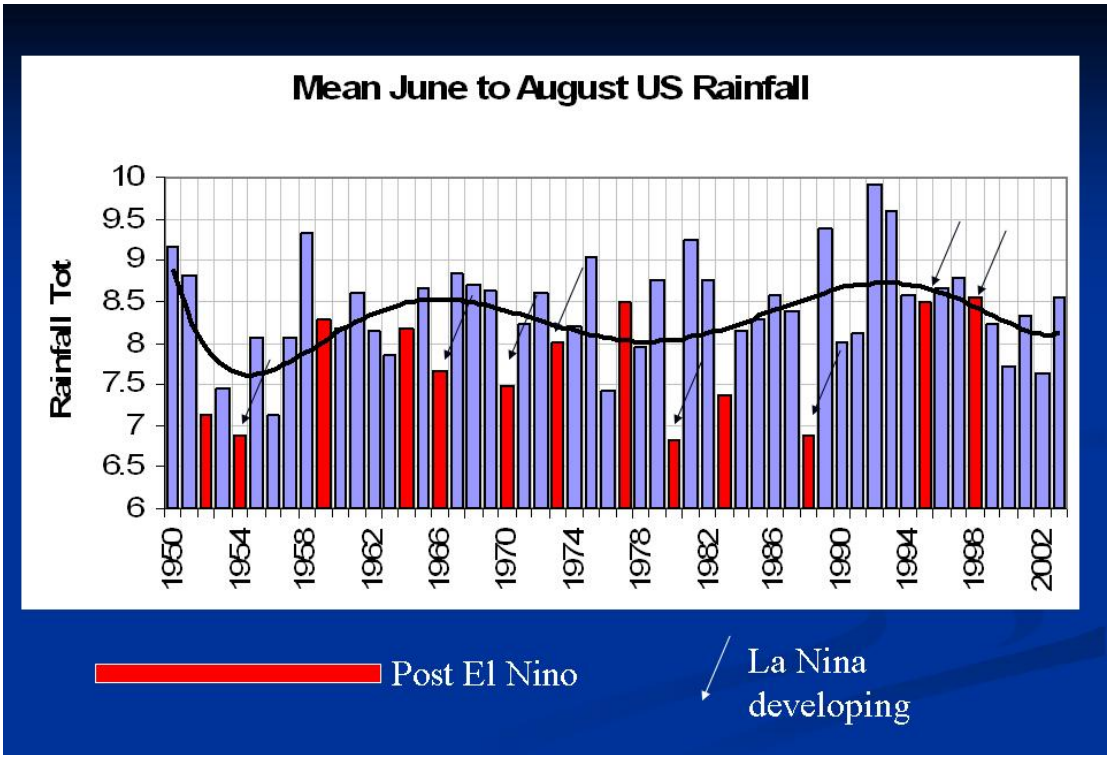


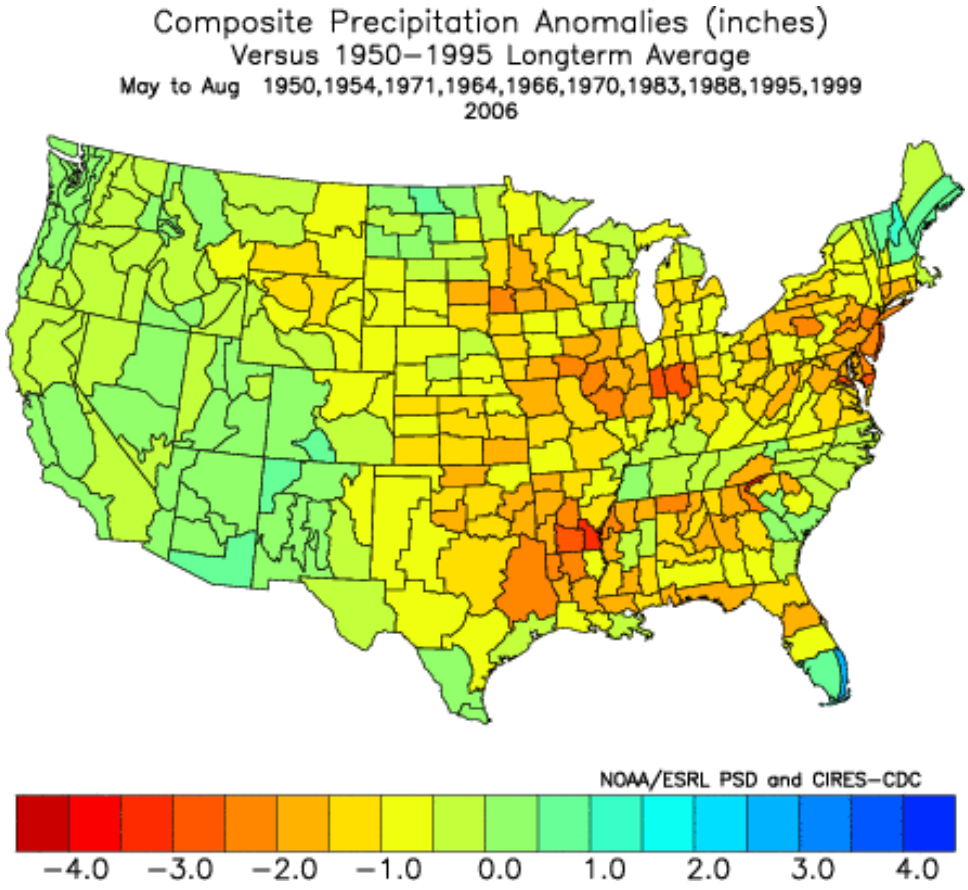
Note how temperatures spike during summers when La Ninas develop following El Nino winters.



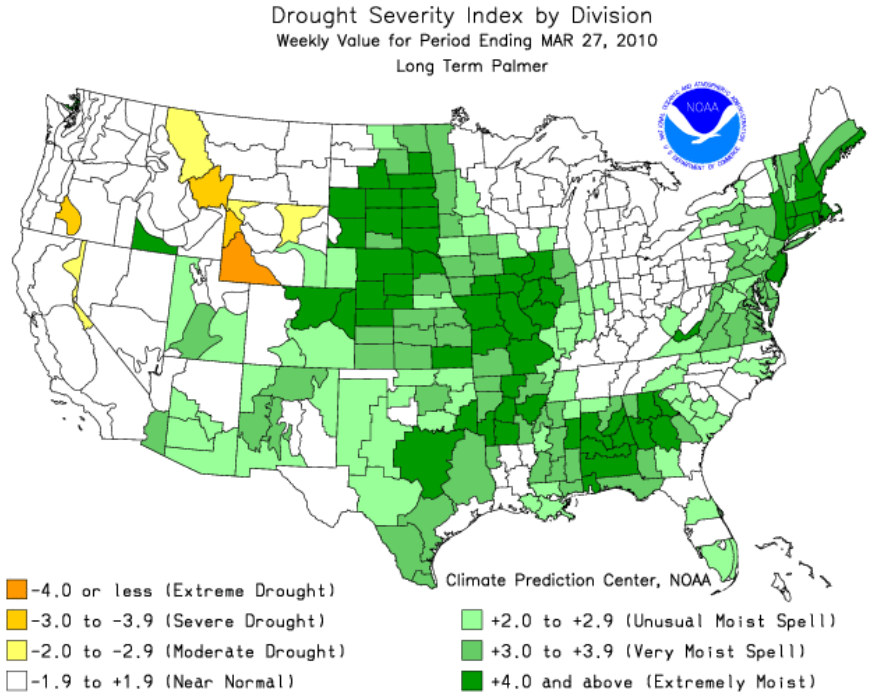


Rainfall also shows a tendency towards being below normal in the Corn Belt in those years.

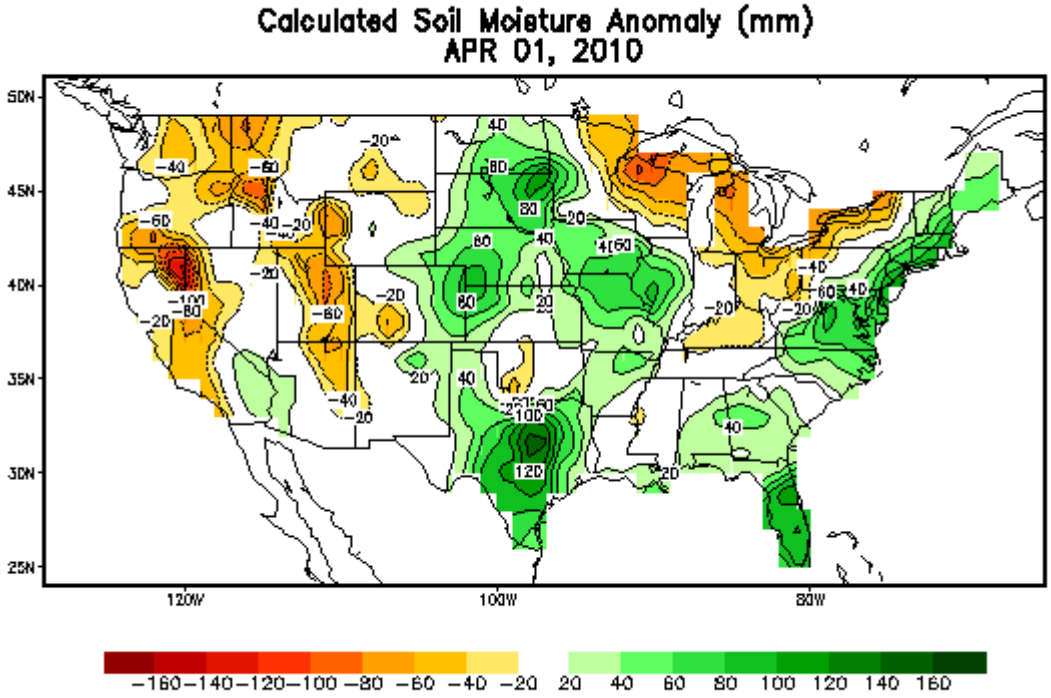




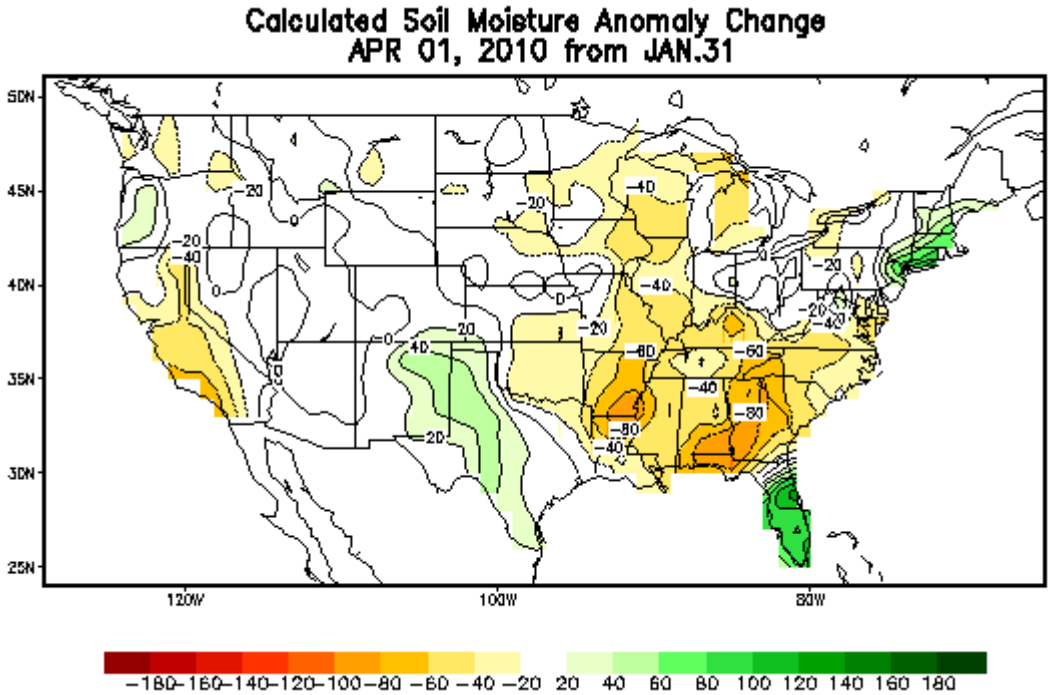
We do however start out with good deep moisture conditions.



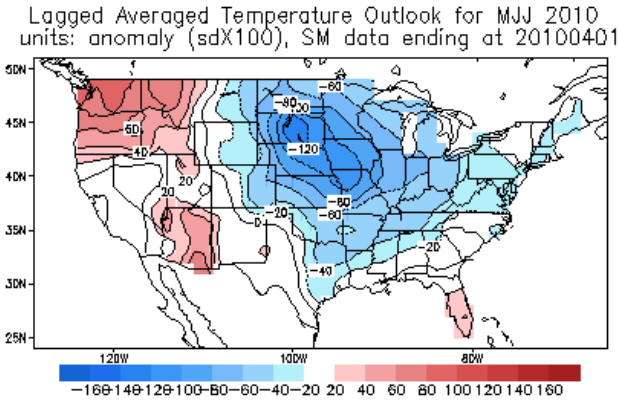
Recent dryness has shown itself in the Great Lakes and eastern Ohio Valley.

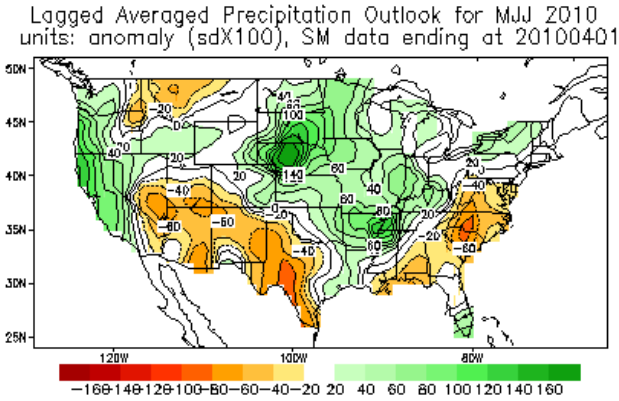


This has resulted from reduced precipitation since January.

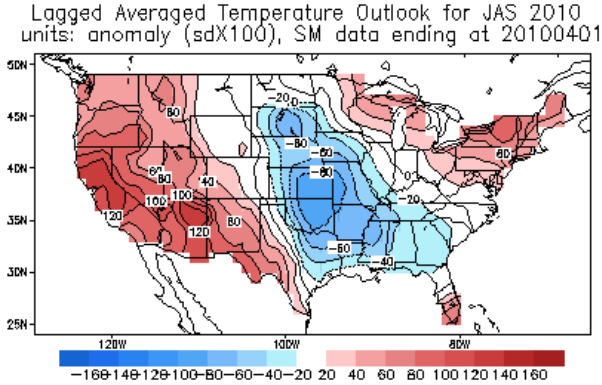


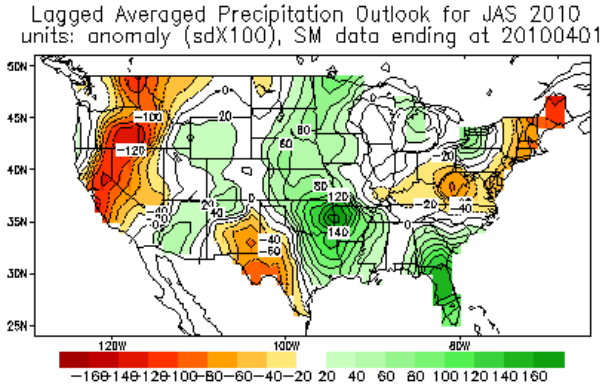
Soil moisture models suggest this leads to a cool wet spring.





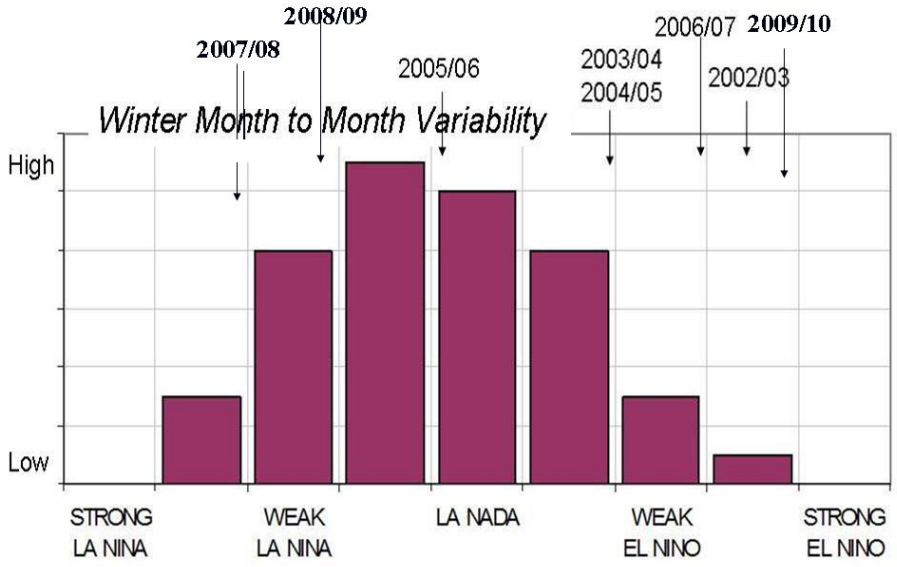
But with some tendency for warming and dryness east by late summer.





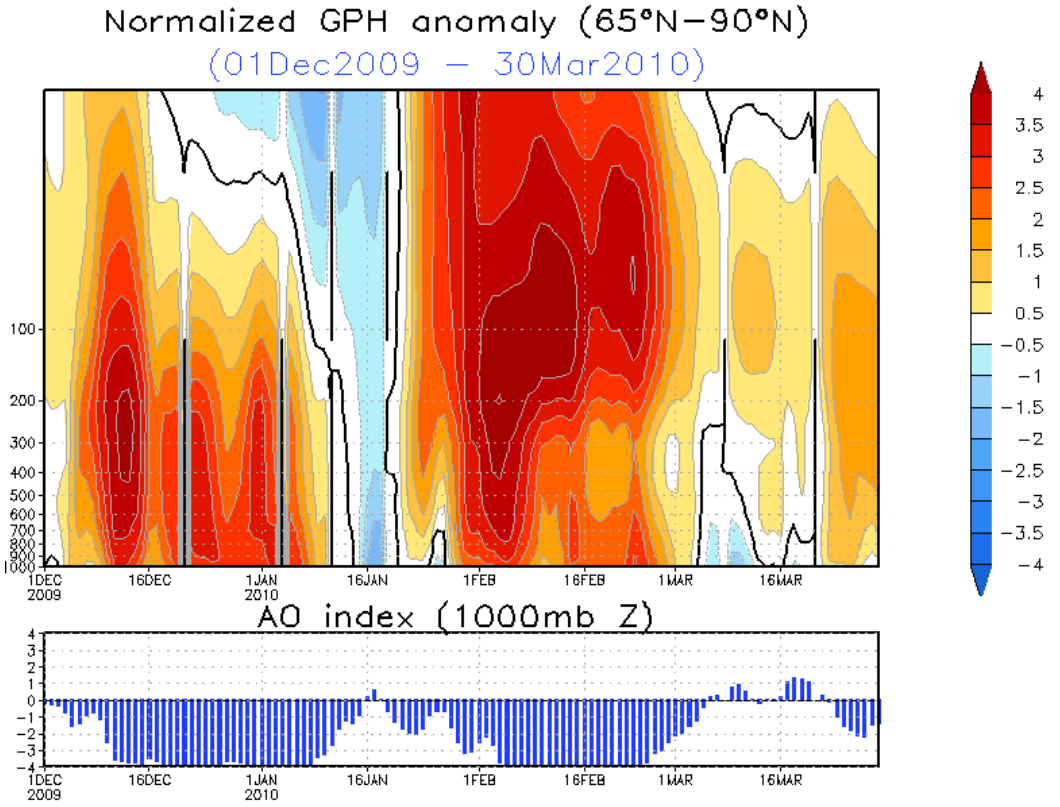
VARIABILITY

The intraseasonal variability was lacking for the last few years given moderate to strong La Ninas and El Ninos which favor lower variability.



Largely the MJO favorability

You can see how persistent the high latitude blocking was this summer.



The sun also favors this low variability. We were in the phase of the 22 Hale cycle favoring low variability.

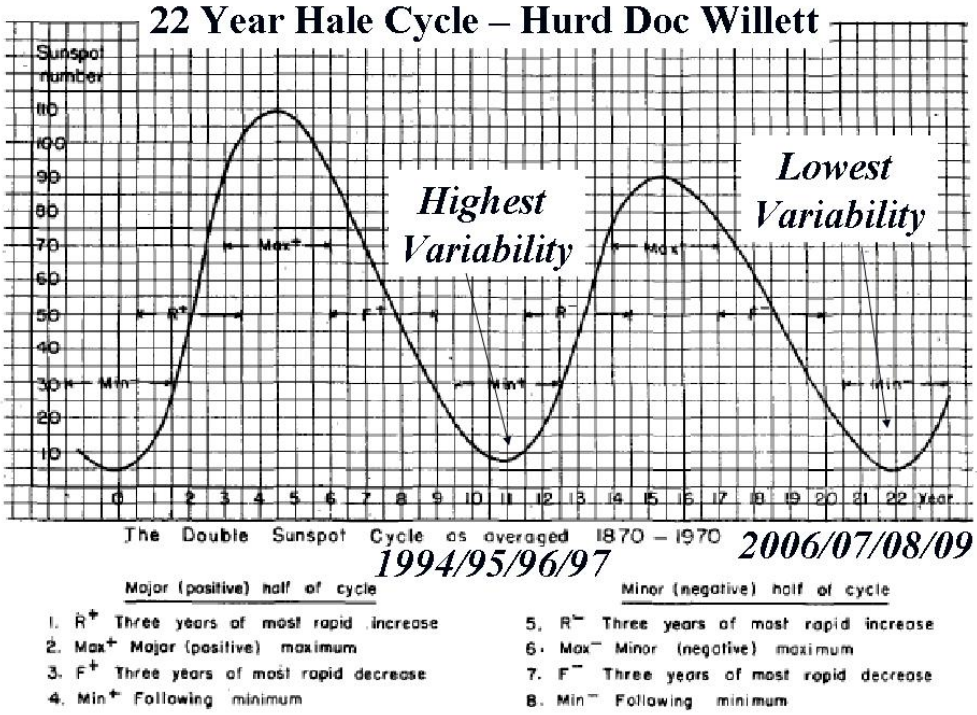
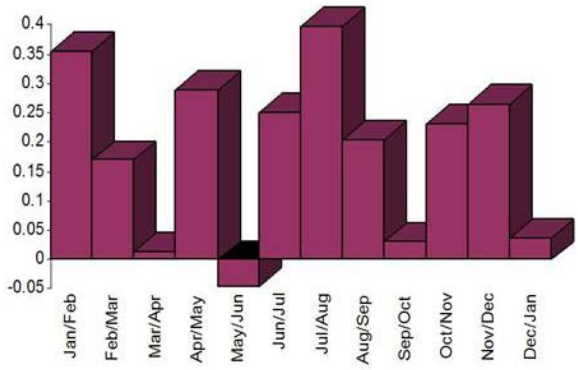
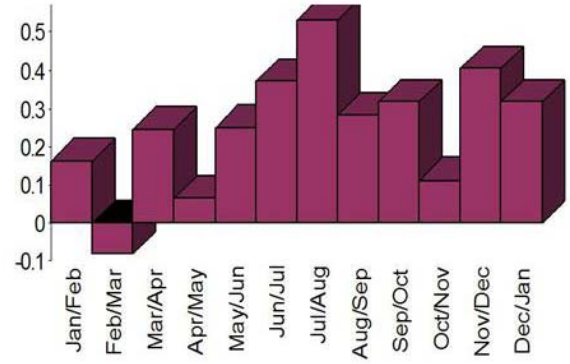


FIG. 1. Scheme of the double sunspot cycle.

Climatologically persistence is highest in the summer and winter for temperatures, summer and fall for precipitation.



Month-to-month Correlation of Temperature US Corn Belt



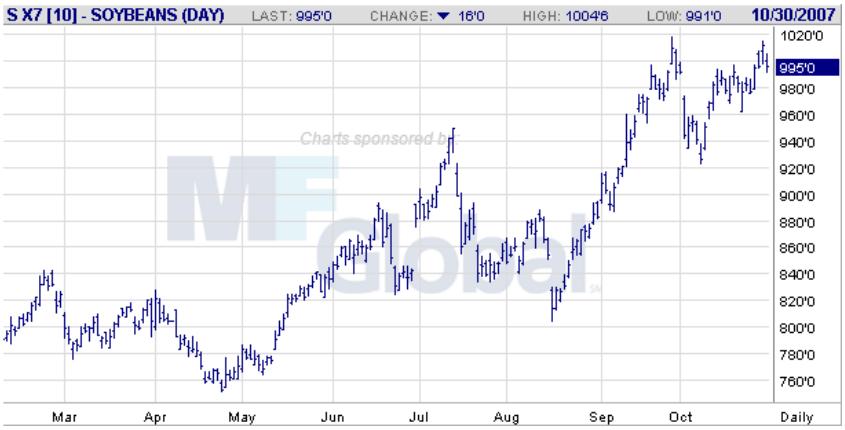
Month-to-month Correlation of Precipitation US Corn Belt

Expect month-to-month variability to be somewhat greater this summer as El Nino transitions through la Nada to La Nina and solar activity slowly ramps up.

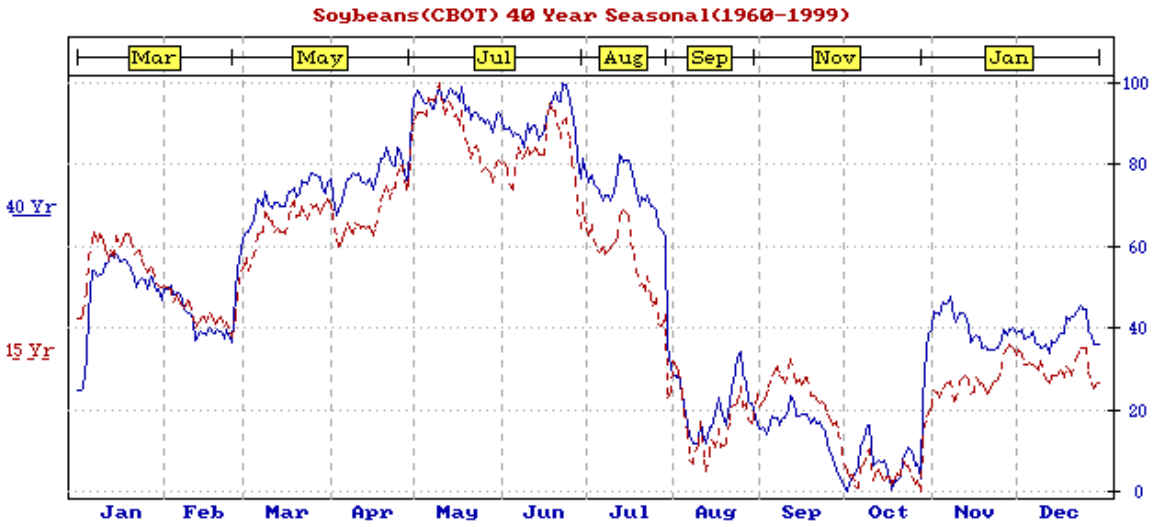
FORECAST

El Nino gives way to La Nina by late summer. PDO is likely also to decline tyo negative again.

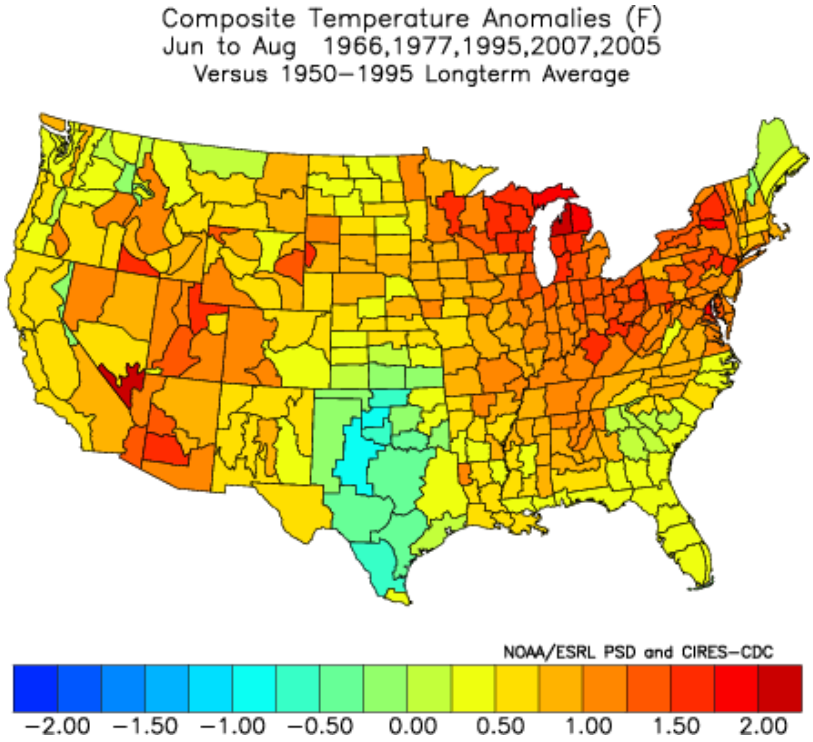
The recent most similar year is 2007 when El Nino peaked in January and strong la Nina developed in the late summer and became strong by the winter. The transitional spring and early summer limited the effects on agriculture affecting mainly soybeans which heat and dryness stress late has most effect during the filling period in August (versus the corn in which the most important period is July). Notice how beans rallied late in 2007.



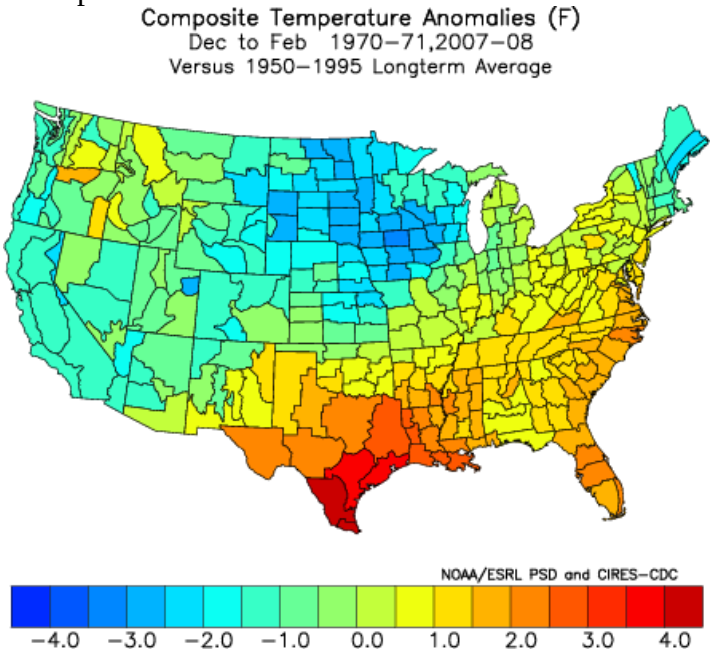
Normally beans sell off during harvest season as crops come in and long speculators liquidate.



In the most similar summers from a multi CSI perspective, a warm summer is seen.



Looking beyond, the two years with strong La Nina and an east QBO were 1970/71 and 2007/08. Looks like a break for the southeast but the fourth straight cold winter in places like Iowa. Heavy snows across the northern tier and maybe another shot at -50F for Maine where this winter was unusually mild thanks to the dominance of Maritime Atlantic air around the persistent North Atlantic block.



Global temperatures which have spiked with warm oceans in the tropics and subtropics from this El Nino and the weak winds in the subtropics with the suppressed subtropical

high pressure driven by a record negative arctic oscillation will collapse like in 2007 in the last 7 months of the year. As La Nina develops and the Pacific PDO reemerges, globally cold will return to southern Asia while the UK and Europe east to Siberia are much less cold. This could change if high latitude volcanism from Iceland persists and develops further or activity in Alaska and Kamchatka repeats. This would push the blocking from Scandinavia more towards the Iceland/Greenland region again