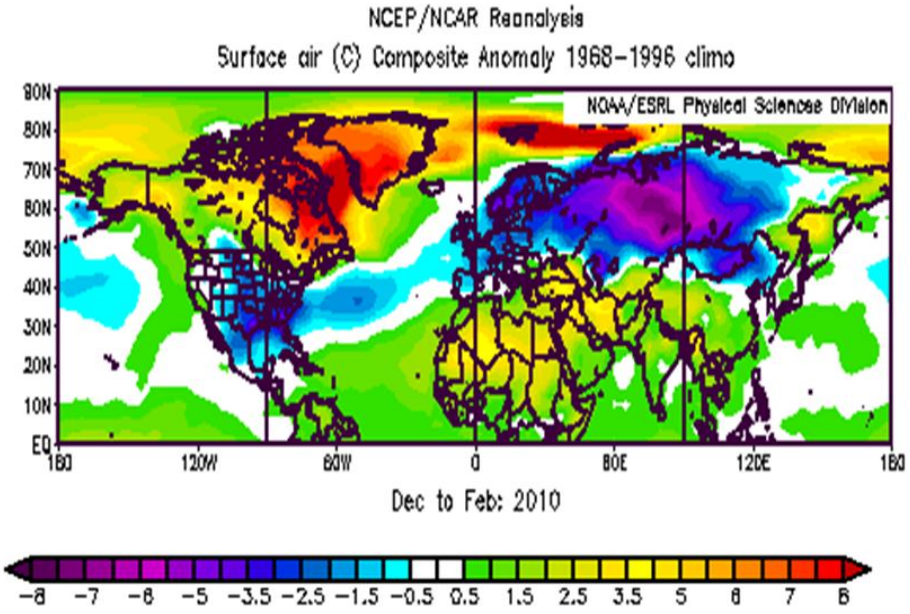
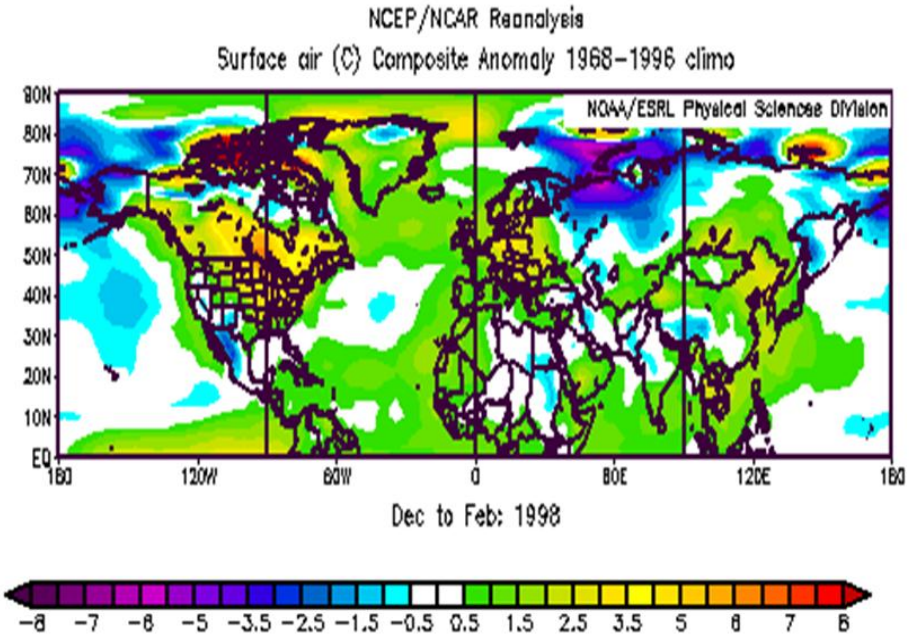
# 2009/10 Winter El Nino Very Different from 1997/98

*By Joseph D'Aleo, CCM*

Last winter with a strong El Nino, we had one of the coldest winters (in places like parts of the southeast United States and parts of Siberia, the coldest ever). It was warm though in Canada and the arctic (relative to normal) indicative of strong blocking high pressure.

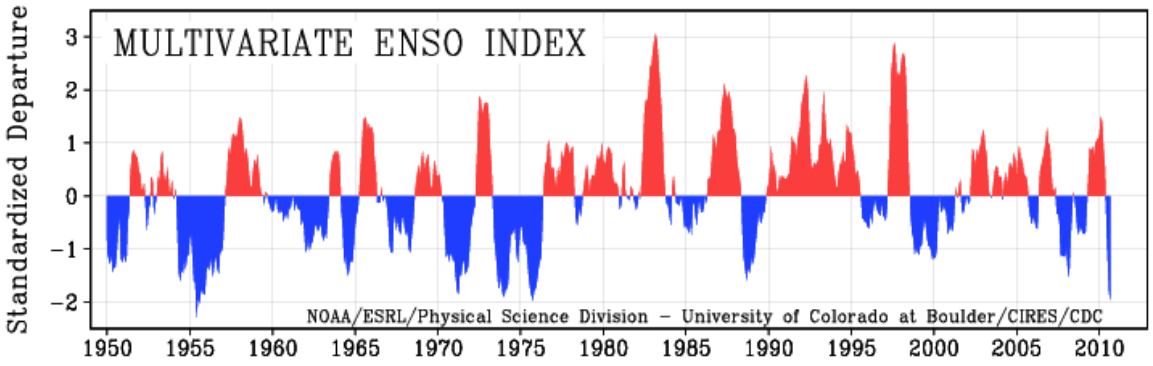



The super El Nino in 1997/98 was very different in most places. It was cold in northwest Russia but much warmer in most other areas it was cold last winter.

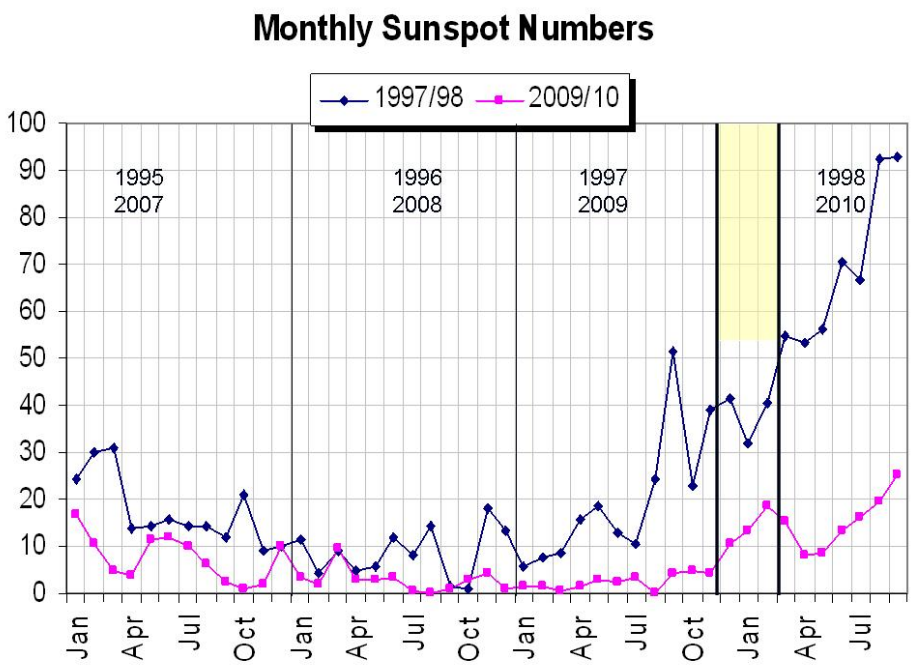



Why the big difference?

2009/10 was the strongest El Nino since 1997/98 but clearly not as strong as that super event. In many ways, it was more like the El Ninos of the last cold Pacific (PDO) era from 1947 to 1977). The El Ninos were stronger in the warm PDO phase from 1978 to 1998.

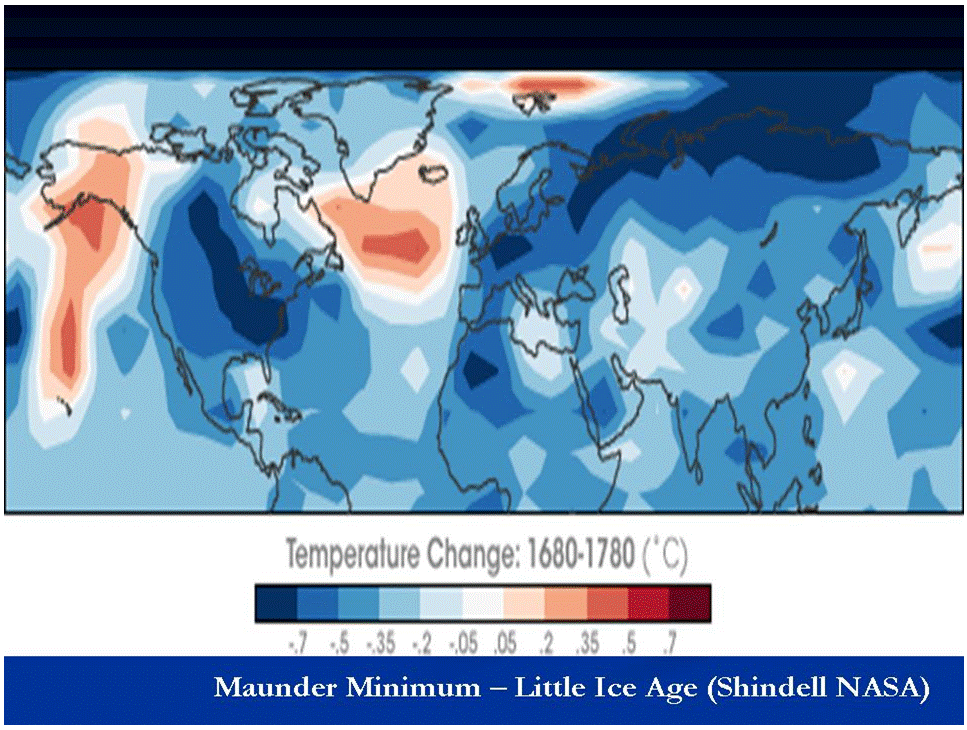



Another very key difference was the solar – the 2009/10 El Nino was during the later part of the ultra-long solar minimum between cycles 23 and 24. 1997/98 winter was much further into a rebound after a much briefer and less deep solar minimum.



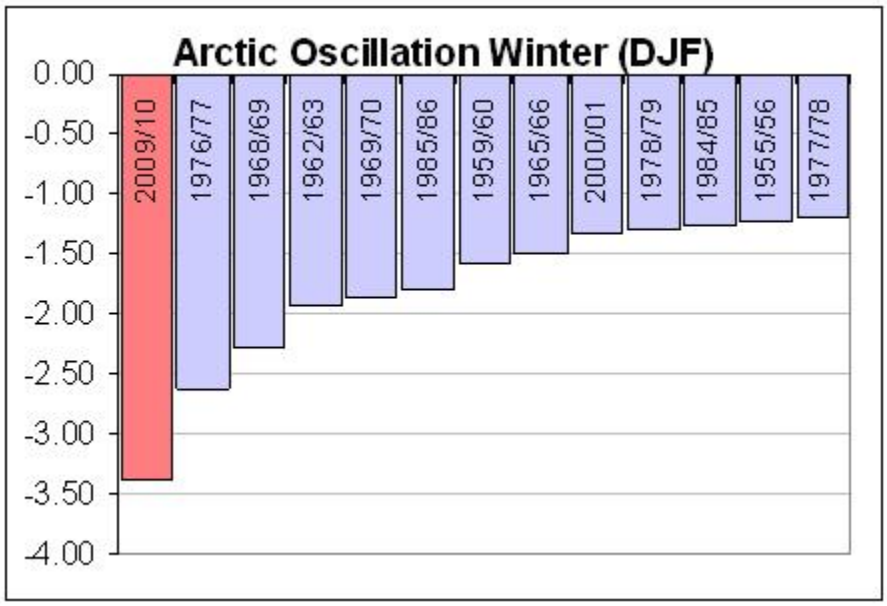

Drew Shindell, NASA modeller who works with James Hansen showed here in a paper in Science (2001) how low solar periods with reduced ultraviolet leads to less ozone chemistry warming in high altitudes over low and mid latitudes. This apparently allows for cooling and expansion of the polar vortex and more blocking in high latitudes (a negative NAO/AO).

Here Shindell shows the difference between the Maunder Minimum temperatures of 1680 and those of much more active sun period 1780. You clearly see the negative NAO and AO and a cold winter in the continents in the low sun period..




Writing in Environmental Research Letters (2010), Mike Lockwood et al. have verified that solar activity does seem to have a direct correlation with Earth's climate by influencing North Atlantic blocking (NAO) as Shindell has shown.

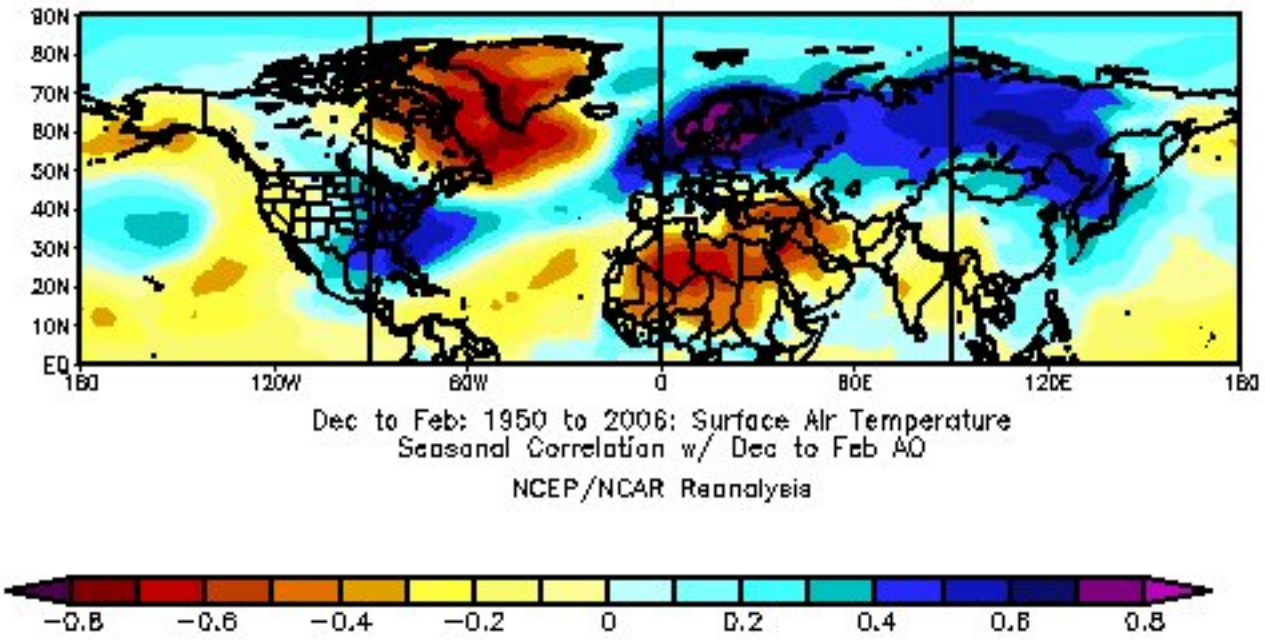
Last winter had a record negative AO/NAO for the winter season, beating out 1976/77 at the end of the last quieter sun period.



Labitzke (2001), Baldwin and Dunkerton (2004) and others have shown a tendency for stratospheric warming events in low solar easterly QBO winters (like 2009/10, 1976/77, 1965/66). More on the sun here and here.

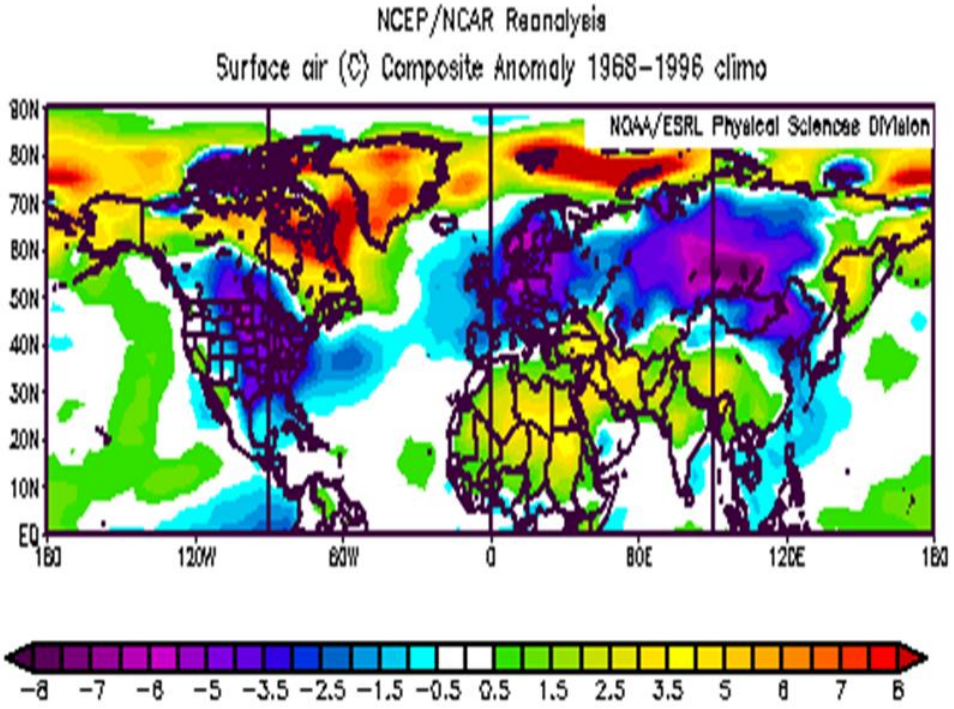
Another factor in the anomalous AO was the prior spring high latitude volcanoes in Alaska (Redoubt) and Russia (Sarychev). Oman etal (2003) found high latitude volcanoes lead to enhance winter time high latitude blocking.

A correlation of the AO (reversed colors to show cold (blues) and warm (reds) for a negative value show the pattern last winter very well.




Indeed if we do what Shindell did and subtract the temperatures during the latest low solar El Nino and that of 1997/98 we fit the pattern of 2009/10 and in the correlation to a tee.

# Sfc Temps 2009/10 minus 1997/98




Thus last winter was largely anomalous because the El Nino came along in a year of high latitude volcanoes and in a very quiet sun which led to record high latitude blocking.

El Nino has given way to a strong La Nina, the sun is slowly rebounding. The effects of Redoubt and Sarychev are likely faded but Iceland's volcano last year MIGHT have some effect. What will that mean for this upcoming winter. More tomorrow.