

Report on 90-day Weather Projection for the Northern Half of New Mexico

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November 20, 2008

Introduction:

This is the latest 90-day weather forecast for the northern half of New Mexico. The forecast area covers a region bounded by the state borders on the north, west, and east, and Interstate 40 on the south.

The report contains a summary weather outlook for middle November through December (directly below), a brief review of the current El Nino Southern Oscillation (ENSO) condition, an overview of current weather trends, and a discussion about the Pacific Decadal Oscillation, a recently discovered geo-climatic phenomenon that is believed to control weather in US and whose current condition is indicating an extended period of dry weather for the forecast area. A final section discusses global warming and its connection to climate.

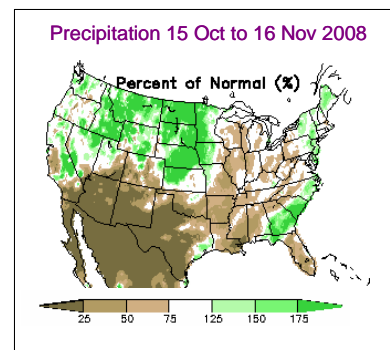
Summary, Ninety-day weather outlook for forecast area:

- ENSO neutral conditions (neither La Nina nor El Nino) are prevailing in the Pacific Ocean. This means that it should have no impact on the weather in the forecast area this fall and winter.
- *The 90 day outlook for the forecast area is for higher than normal temperatures and slightly below normal precipitation.*
- The weather in the forecast area has been extraordinarily dry over the past 30 days.
- *The Pacific Decadal Oscillation (PDO) is now believed to be responsible for the drying trend in the forecast area this fall, a condition that is expected to remain throughout early winter.* The PDO is similar to ENSO in that it affects the weather in North America. The differences are that it affects the northern Pacific ocean rather than the tropical areas and its oscillation frequency (hot to cold) is measured in years instead of months.

Review of Current El Nino Southern Oscillation Situation and Discussion:

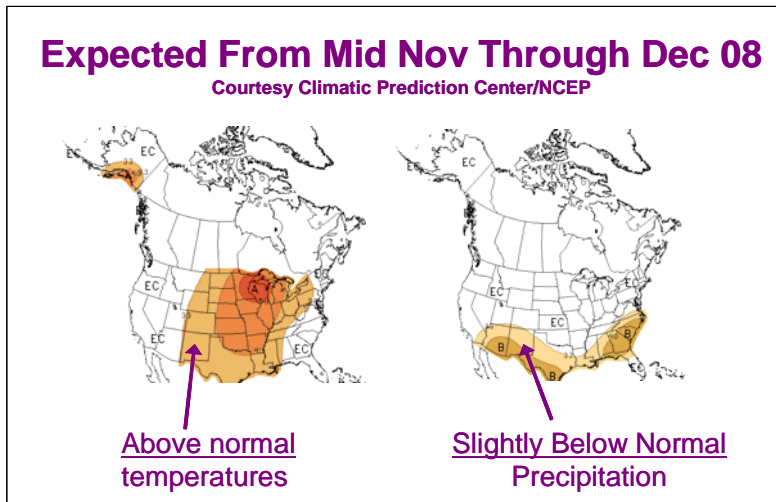
The Historic Oceanic Nino Index, which is the official metric from which a La Nina or El Nino is declared, is exactly 0.0, completely neutral. This means that there should be essentially no affect on the weather in the forecast area.

There are no remaining residual atmospheric indicators from the recent La Nina. This means that by all measures, it is completely gone.



Current Weather Trends.

It has been a very dry autumn thus far. The forecast area has been under high pressure conditions that have been created by the position of the Polar Jet. Only a few weak cold fronts have made their way into the state, but with the very dry air on the ground, there was little resulting precipitation. No meaningful cyclonic (storm) activity has been able to move into the area. The map figure on the previous page shows the precipitation pattern for NM over the past 30 days.



The expectation for the next 90 days is shown in the dual maps at left. Models predict above normal temperatures and slightly below normal precipitation.

This dry forecast has persisted for the past few months. The situation was somewhat confusing because many thought that the waning La Nina should allow more

normal condition to prevail. The confusion was intensified late last summer when climate models were predicting above normal temperatures but normal precipitation. These two elements are coupled, so we expected to see a consistent trend—dry weather associated with warmer conditions. However, now the climate models are showing the expected coupled trends.

The Pacific Decadal Oscillation and the Influence on Weather

The expected elevated temperatures and dry conditions are now thought to be related to the Pacific Decadal Oscillation (PDO), which is creating cool ocean conditions in the Northern Pacific. This condition is expected to produce dryer than normal weather.

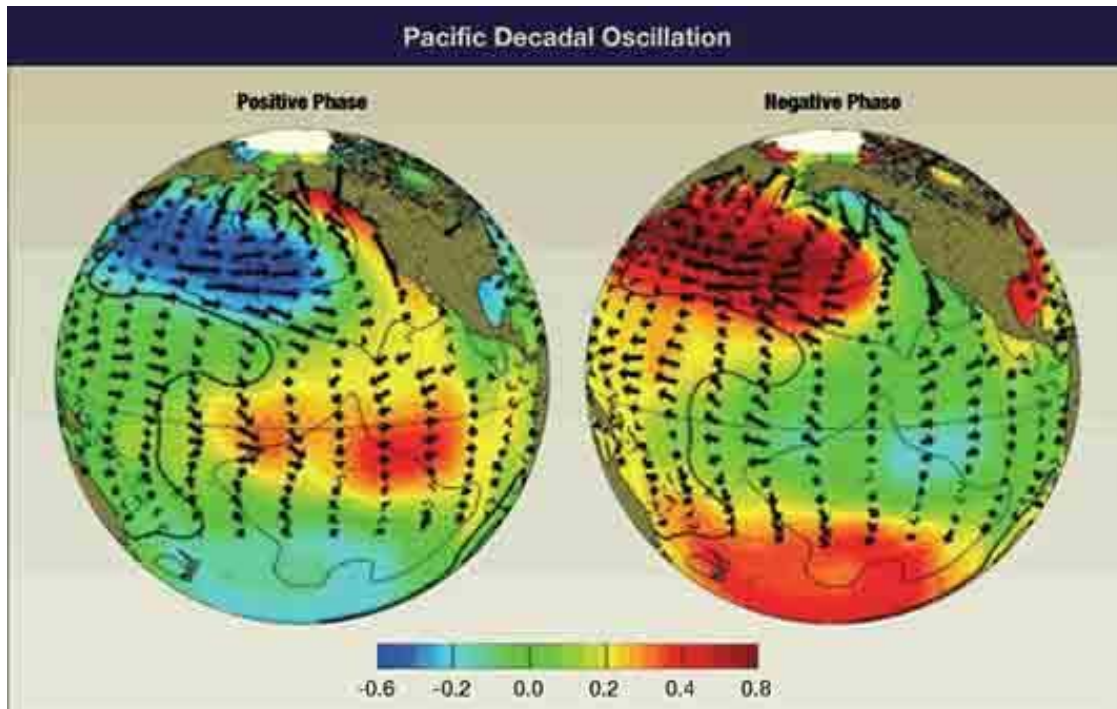
The PDO is similar to the ENSO in that it is a reflection of the Pacific Ocean's surface temperature. But it differs in that the portion of the ocean that it affects is just off the northwest coast of the US rather than the ENSO region near South America. But its most ominous difference is its frequency of oscillation (hot to cold sea surface temperatures), which is measured in years—decades, in fact—and that is the basis for its namesake. Basically, the pattern is slow to change; slow at least by ENSO standards.

Generally, cooler temperatures in the PDO's Pacific region generally mean dryer weather in the Southwest US. The mechanisms of this relationship are complex, but simply put it tends to create high pressure areas over the SW US and helps to position the Polar Jet so that storms are ushered to the north of the forecast area.

The PDO is not well understood. The first problem is that due to its lethargic pattern of changing ocean temperatures, it was difficult to recognize and measure. The slower the frequency of change in a climatic pattern, the longer the period of time it takes to

differentiate it from other atmospheric variations. The second problem is that once it is recognized, it takes time and study to understand its connection to the weather patterns in the US. The PDO was first suggested about 15 years ago, but only recently has it started to be quantified and studied with vigor.

The figure below shows the phases of the PDO, which are thought to change about every 10 years. (Graphic courtesy NOAA.)



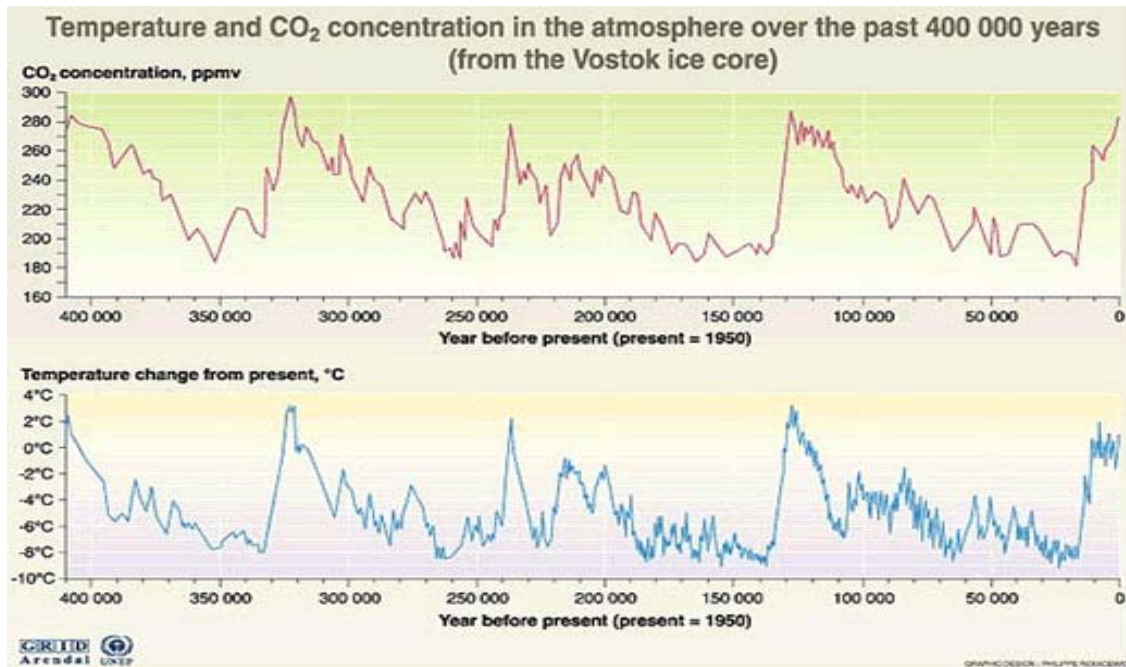
Climatologists believe we are entering the negative phase. If that is true, and confirmation is expected in the next year, then a prolonged period of dryer than normal weather might be in the offing for the forecast area. This dryness could be offset by an El Nino.

Climate Connection to Global Warming

Many people, including scientists, are quick to point to global warming as the instigator for less than desirable weather patterns, particularly droughts. But the connection between observed weather patterns and global warming is not as clear as many proclaim. We simply do not understand yet how much the earth is warming (but it is indeed warming) and we know even less about how that temperature increase will affect climate.

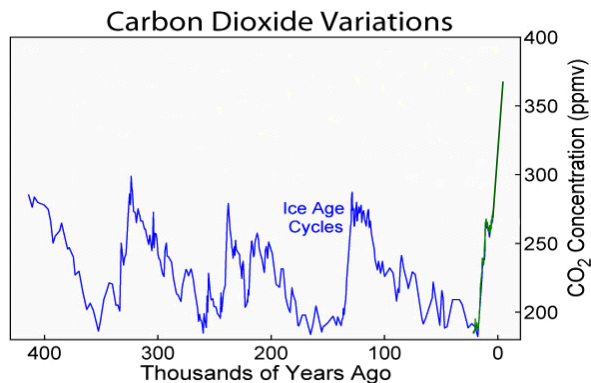
We must also be cautious about garnering information and drawing conclusion too quickly. For example, there have been reports about the polar ice caps *growing* in recent years. They have been accompanied by pictures that seem to confirm the assertion. In fact, pictures are no proof due to the ease of digital alteration. Even untouched photos can sometimes be misleading if they were taken with certain filters. The trends of the past decade, confirmed by climatic experts such as those in NOAA, are of shrinking ice caps and no confirmation of a counter-trend is yet to be substantiated.

We do, however, have some historical information that will put global warming in perspective. The graphs below show the earth's historic temperature and carbon dioxide levels—all estimated based on ice-core data (graphs supplied by the National Forest Service Climatic Change Center).



As can be seen, there is considerable historical variation in the earth's temperature and carbon dioxide levels over the past 400,000 years. It is also clear that temperature is correlated to carbon dioxide levels, but that is expected because these temperature values are estimated using carbon dioxide as one of the input parameters to the estimating technique.

Based on this graphic, one might conclude that the earth is simply behaving as it always has. But on closer inspection, one can see that the zero year line (i.e., "present") in the graph is for 1950, 58 years ago. Also note that over 400,000 years carbon dioxide concentrations never rose above about 300ppmv.



In the graphic at left (supplied by the Forest Service Climatic Change Center) the green line shows carbon dioxide levels over the past few hundred years. (The past 50 years the Carbon Dioxide concentrations have been directly measured). Carbon dioxide levels are now around 370ppmv, the highest in the knowable atmospheric history of the earth.

It is easy to conclude that carbon dioxide

measures are rising to unprecedented heights and temperatures must be quick to follow. A natural reaction is that higher temperatures would be catastrophic to the globe and its inhabitants.

However, the conclusion is not that unambiguous. These records only date to about one-half million years ago, but warm blooded mammals have existed on this planet for at least 300 million years. It is possible that the earth has experienced—and survived—much higher carbon dioxide levels and associated high global temperatures. We are also uncertain about how accurately we can compare the recent direct carbon dioxide measures with the historical estimates. Additionally, we are not sure how much global temperature rise might be associated with the projected carbon dioxide levels—that relationship is not established with 100% certainty.

Some climatologists suggest that a warmer earth might promote a general improvement in livability and open more land area to habitation. Others believe that an increase in carbon dioxide would benefit farming, producing a boon to food production to fill the world's coffers.

Some of the greatest uncertainty in the global warming situation is its climatic impact. It is difficult to know with certainty about the weather in the distant term. Dynamic models are very accurate up to 72 hours in advance. Some longer-range dynamic models can provide reasonable guidance about the weather to 10 days in advance. Statistical models can project general trends to about a year in advance, but their accuracy is at best good and often they are very wrong. Nobody understands this better than the forecasters who projected that the winter of 2007/2008 would be dry in Northern New Mexico. These time periods are a long way from the 50 or 100 year time horizons that are typically bantered about in news reports involving forecasts about global warming.

However, the data that exist are the only ones available and the best we have. While this author is not a catastrophist, it is probably sensible to conclude that environmental conditions and trends are such that prudent intervention is warranted. We simply cannot risk the future of the earth on the hopes that the data are wrong.

Follow-up reports:

The next report is scheduled for late-December.