

# 2018 Fall Outlook

## For Central and Northern New Mexico

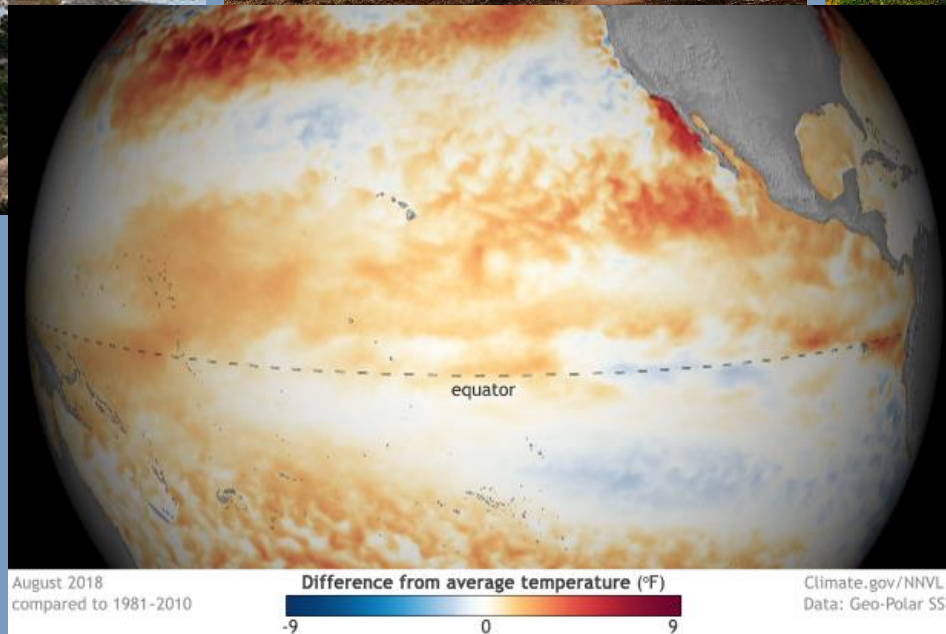


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Photo by Len Radin, New Mexico Magazine



Updated 9/20 to correct the PDO Index Value to +0.18

Sea Surface Temperatures (SSTs) in the equatorial Pacific are transitioning to above average (orange) and toward a possible weak to moderate El Niño. The odds of El Niño emerging in the tropical Pacific by fall have dropped slightly to 60% (from 65%), but remain at 70% by winter. What will this mean for October and November precipitation and temperatures in central and northern New Mexico?



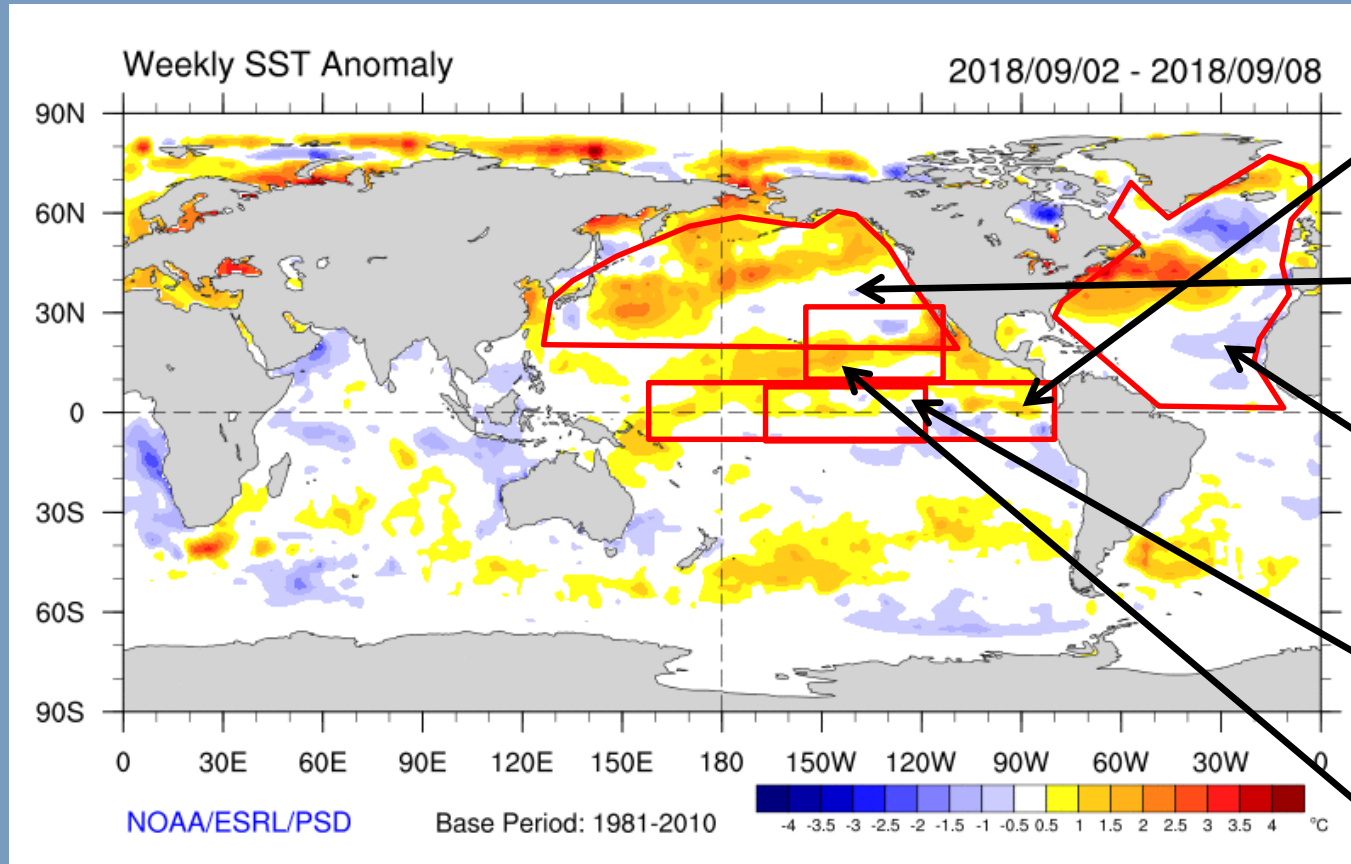
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## Latest Sea Surface Temperature Observations & Oscillation Index Values

\*SSTs are what drive tropical & subtropical thunderstorms. It's these thunderstorms that drive global weather patterns/climate.



➤ Multivariate ENSO Index (MEI) for JUL-AUG 2018: **+0.132**

➤ Pacific Decadal Oscillation (PDO) for AUG 2018: **+0.18**

➤ Atlantic Multidecadal Oscillation (AMO) for AUG 2018: **+0.018**

➤ Oceanic Niño Index (ONI) (uses Niño 3.4 region - inner rectangle) for JJA 2018: **+0.1**

➤ Pacific Meridional Mode (PMM) for AUG 2018: **+4.76**

**Figure 1.** SST Anomalies in the Equatorial Pacific Ocean in early September 2018 showing neutral conditions in the equatorial Pacific.

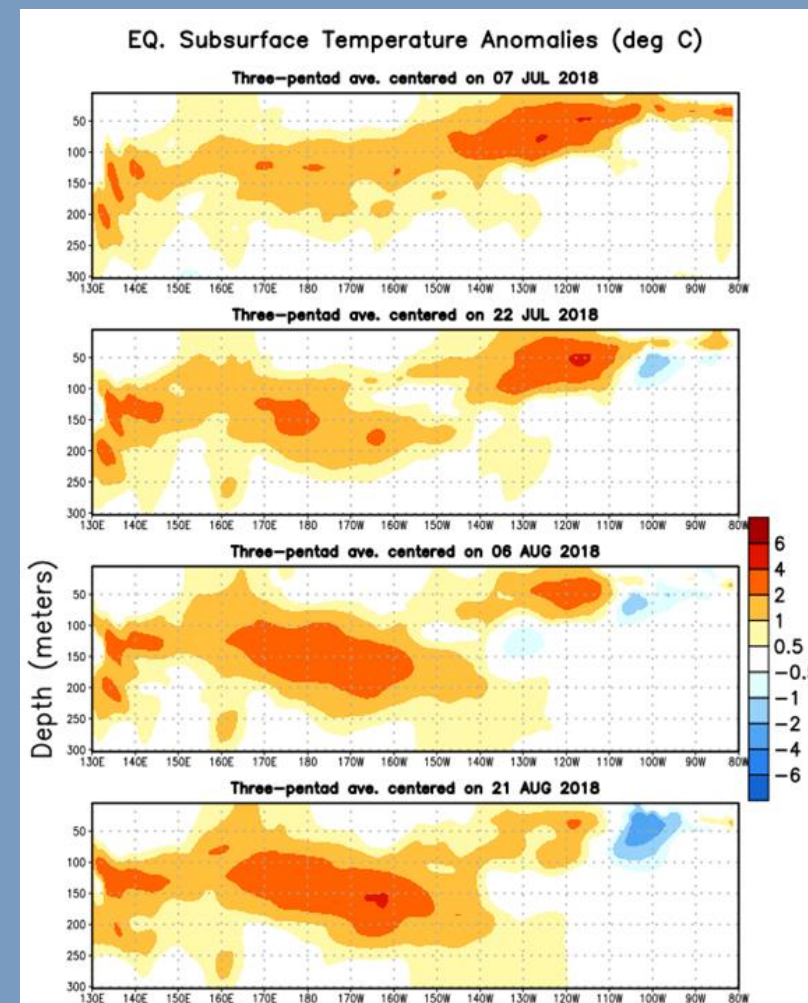
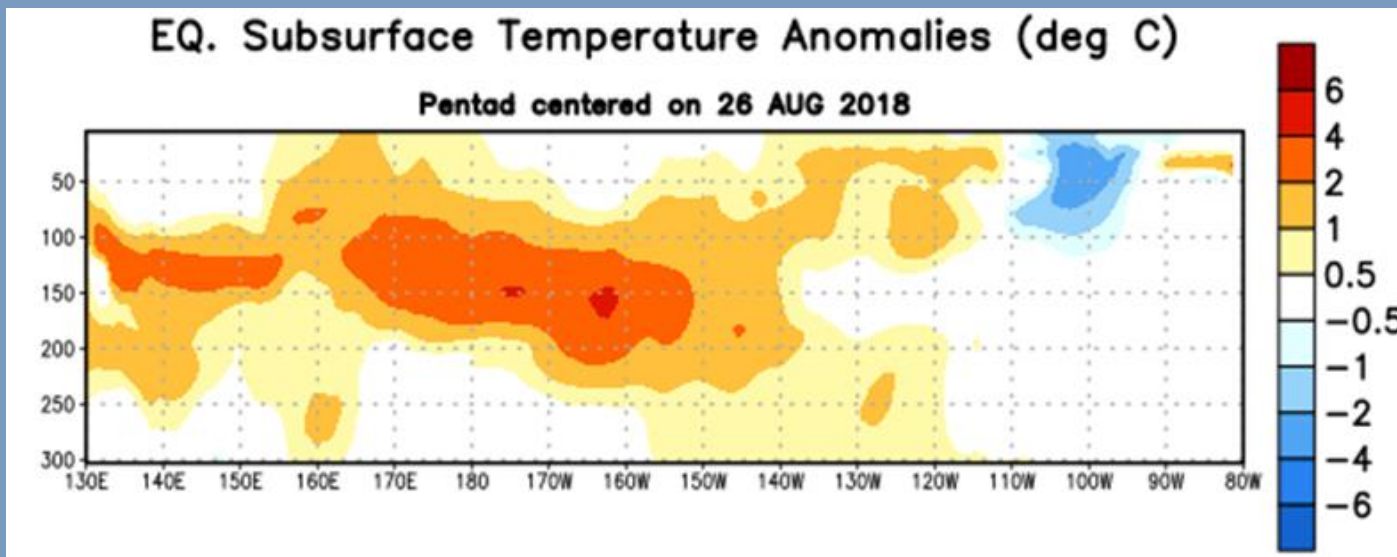
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## Sub-surface Temperatures

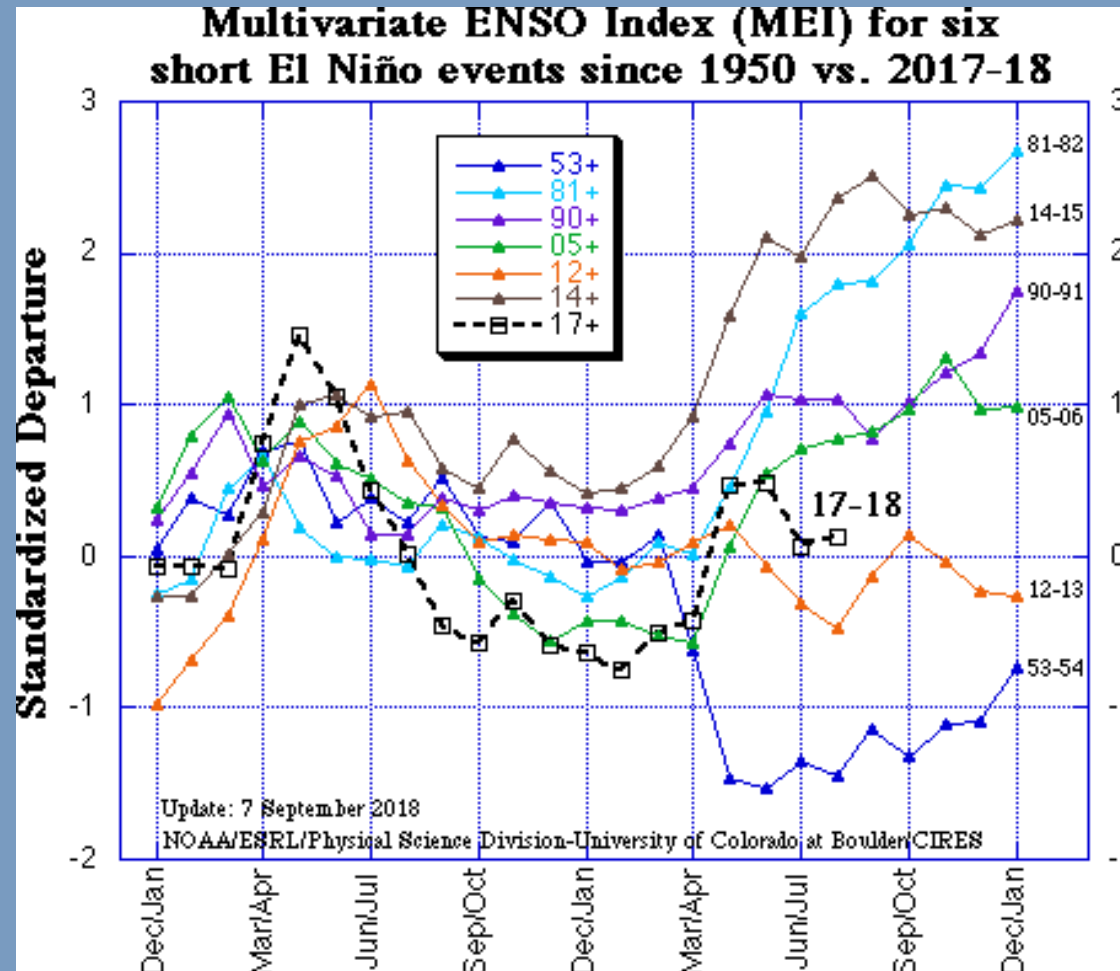


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**Figures 2 & 3.** Sub-surface temperature anomalies at the equator. Sub-surface temperatures often precede the surface temperatures by several months. An increasing amount of warmer than average water under the surface provides some additional confidence in the fact climate models are forecasting a weak to moderate El Niño.



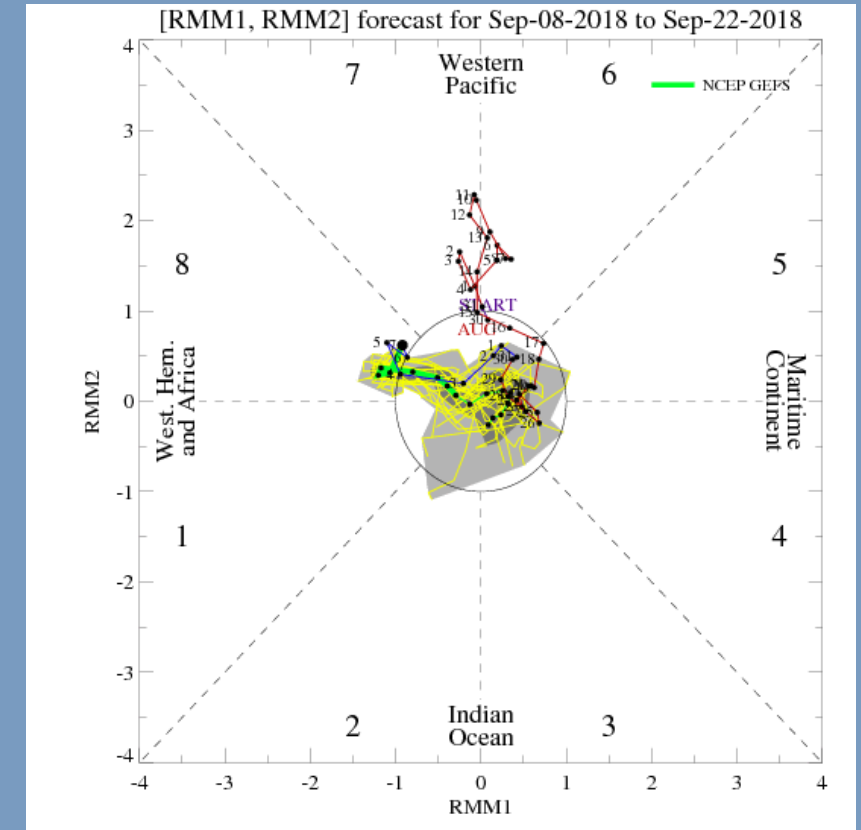
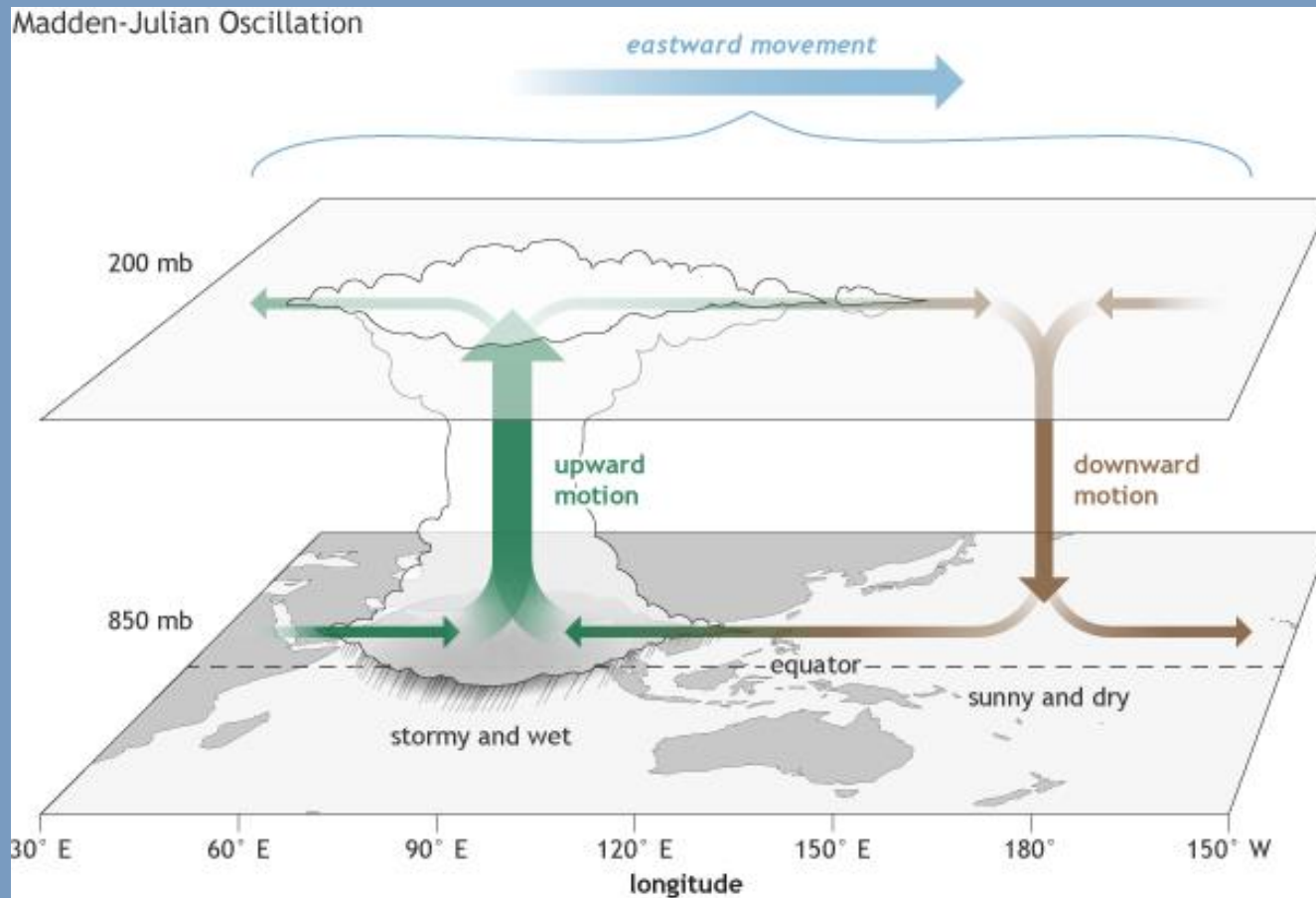
**Figure 4.** Six short-lived El Niño events using the Multivariate El Niño Southern Oscillation Index since 1950. Four of the years became moderate to strong El Niño events while one remained in neutral territory and one became a weak La Niña.

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## Madden-Julian Oscillation (MJO)



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**Figures 5 & 6.** The MJO is an area of enhanced thunderstorms that travels around the world every 30 to 60 days from west to east along/near the equator. Ahead and behind the active stormy area are areas of suppressed convection and drier conditions. The MJO affects near-surface wind patterns, because the rising air in the stormy area causes surface winds to blow toward the active area. The MJO can play a role in New Mexico's weather at any time of year but it tends to have its greatest impacts during the fall. The majority of forecast models for the third week in September bring the MJO into phase 8 (right image).

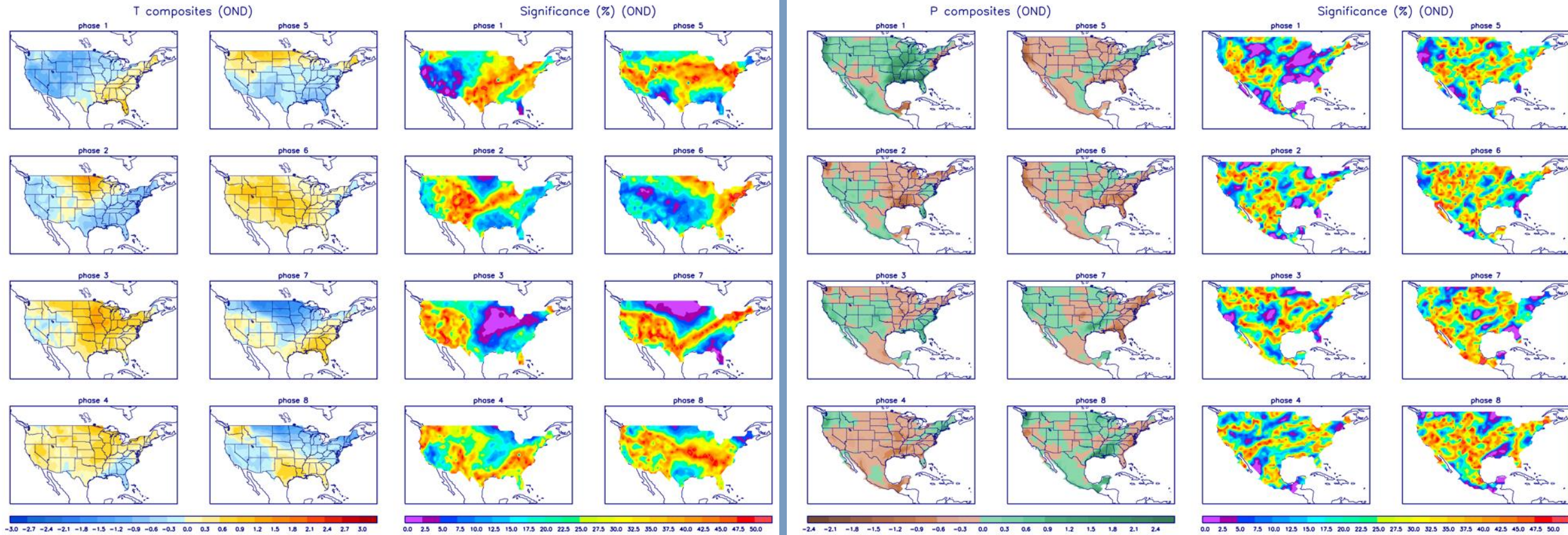


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## Madden-Julian Oscillation (MJO) - Phases



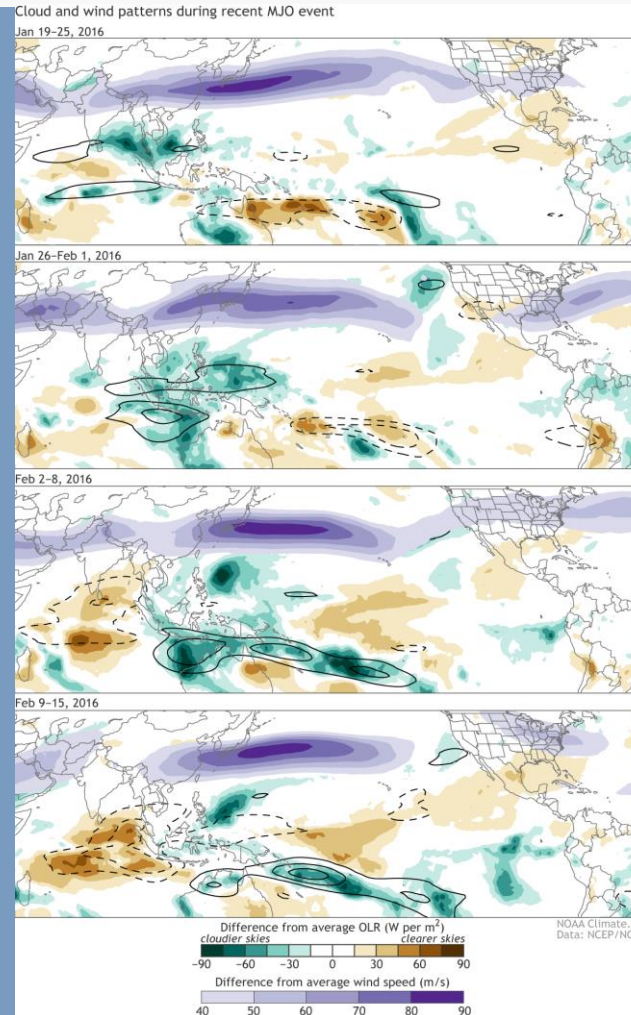
**Figures 7 & 8.** Temperature and precipitation anomalies during October, November, and December (OND) with each phase of the MJO. Note the above average precipitation across northern New Mexico during phase 1 as well as the above average precipitation over western NM during phases 8 and 2. Global model mean indicates that the MJO will strengthen as it transitions into phases 8 and then 1 during the third week of September 2018.

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## Why the MJO is So Important?



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**Figure 9.** Clouds and wind patterns for the MJO event that occurred from late-January to mid-February 2016. Black contours highlight the OLR (outgoing longwave radiation, or heat energy) signals directly associated with the MJO. The MJO also affects the jet stream over the United States. When the MJO is over the Maritime Continent (Indonesia, Philippines and Papua New Guinea), the jet stream typically shifts northward over the western part of the country and southward over the east. That configuration leads to unseasonably warm temperatures in the west and cool temperatures in the east during the cool season. As the MJO moves eastward into the Pacific, the Pacific jet weakens and the pattern over the U. S. flips.

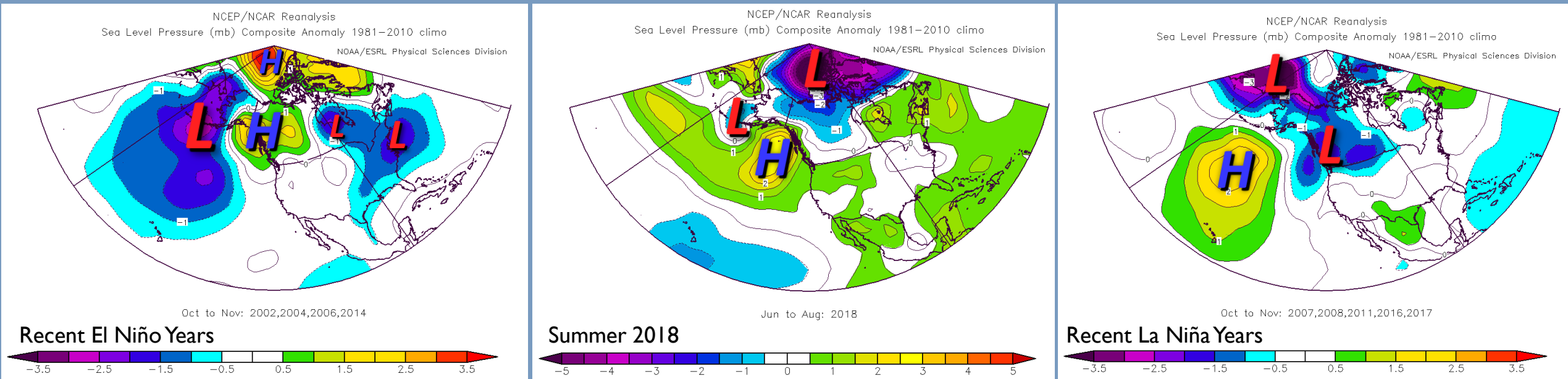


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## Aleutian Low - El Niño vs. La Niña



**Figures 10-12.** The Aleutian Low is a climatic feature centered near the Aleutian Islands on charts of mean sea level pressure (MSLP). It represents one of the main “centers of action” in the atmospheric circulation of the Northern Hemisphere. The Aleutian Low is most intense (lowest pressure) during winter and nearly disappears in summer (S.N. Rodionov et. al 2007). The Aleutian Low remained near average strength over the Aleutian Islands since spring 2018, behaving as though the tropical Pacific was in a neutral state. Typically, a stronger than average Aleutian Low in winter, leads to more frequent upper-level troughs for the western United States.



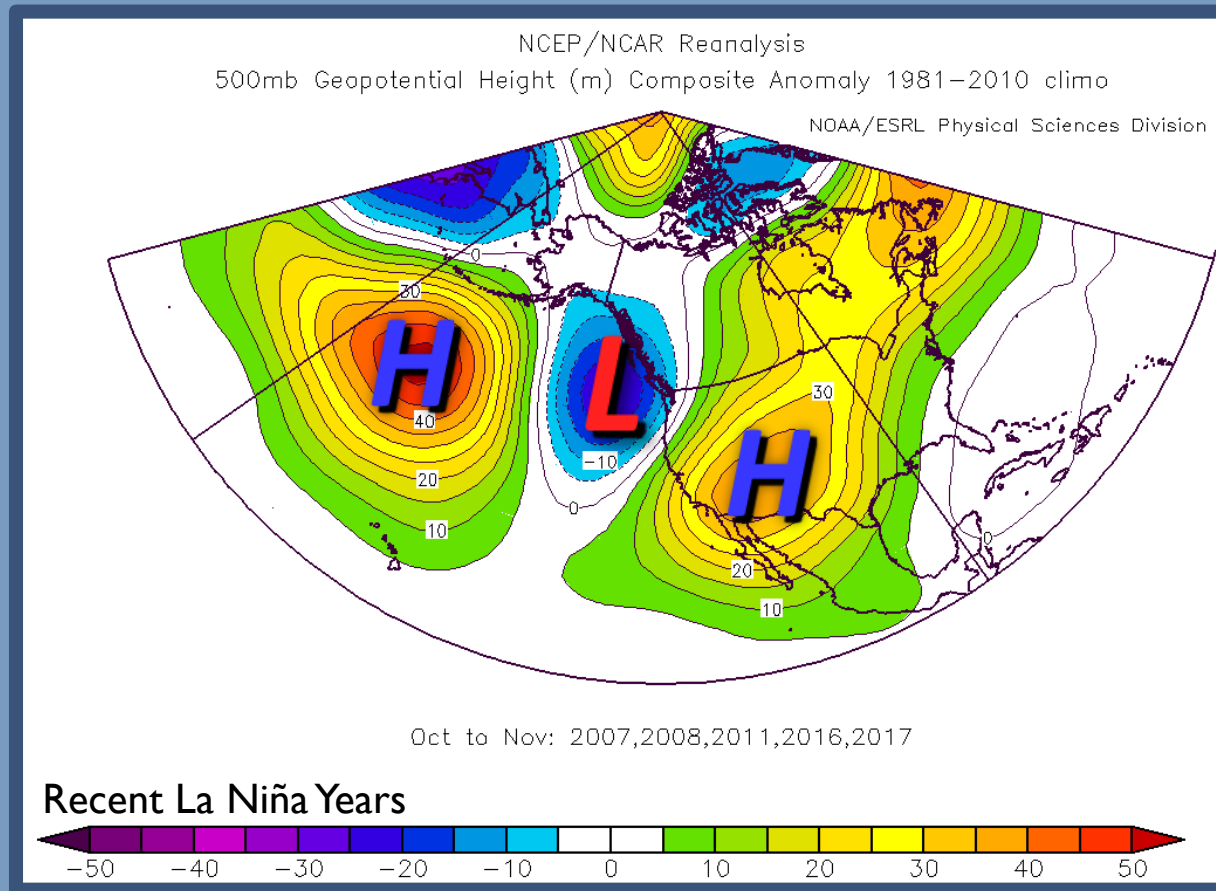
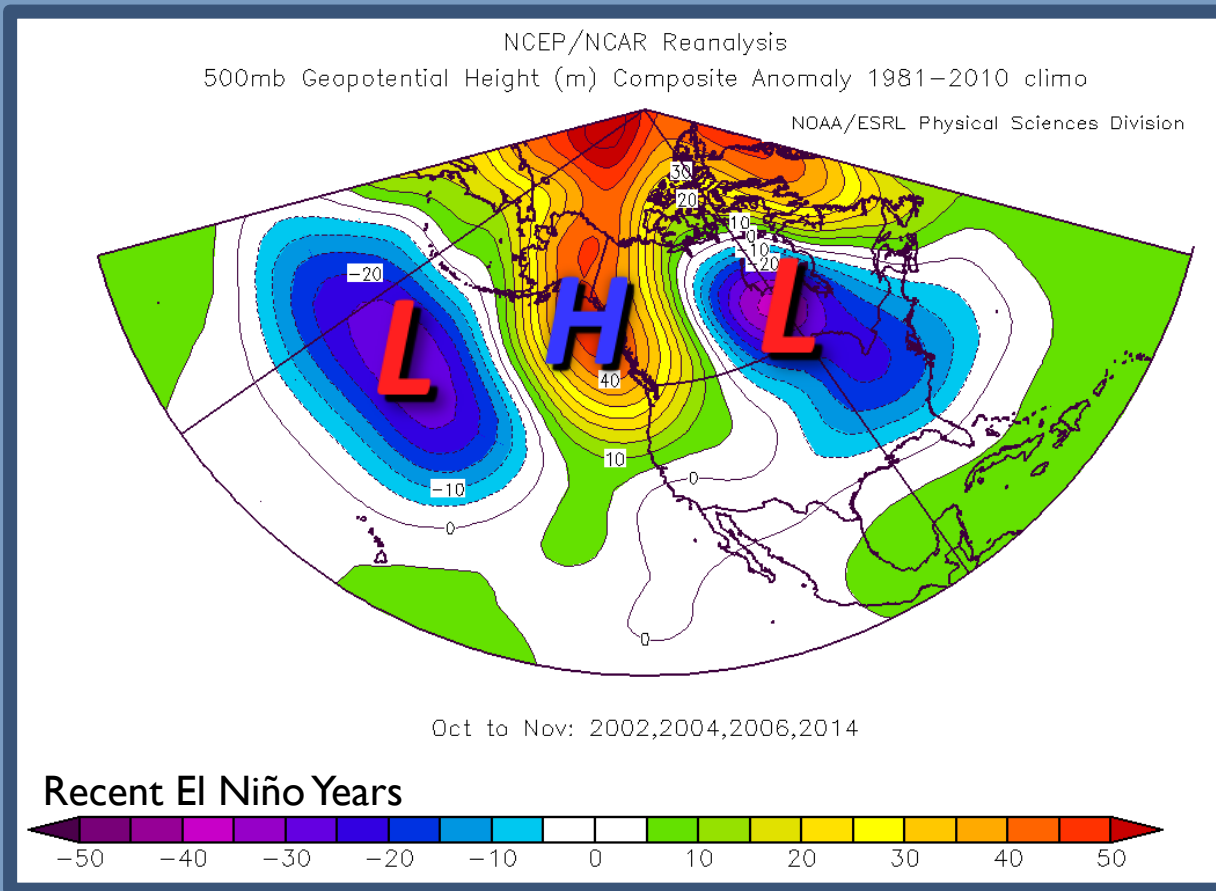
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### 500mb Heights in Oct, Nov; El Niño vs. La Niña Years



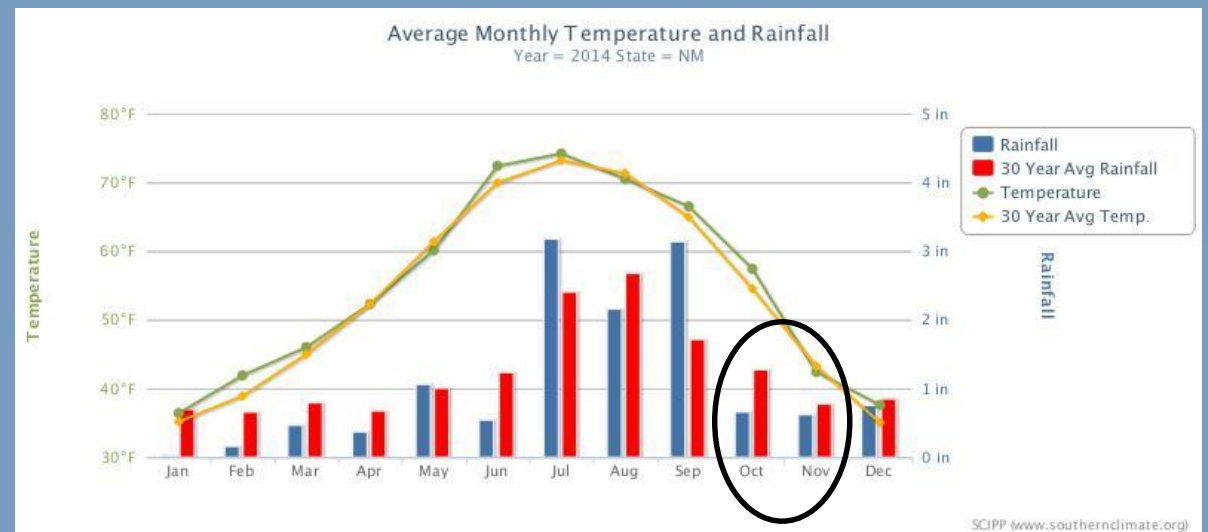
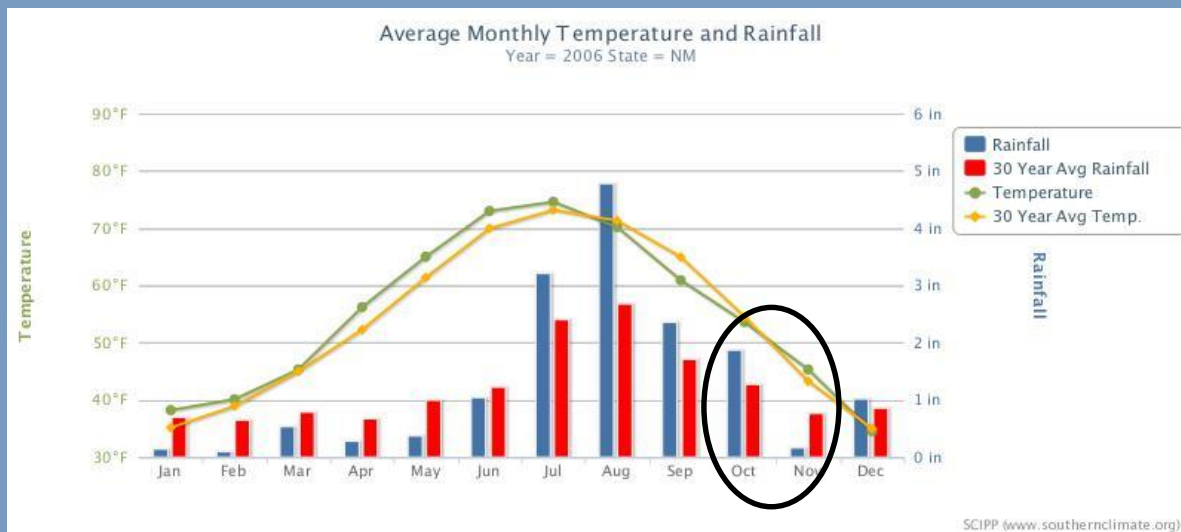
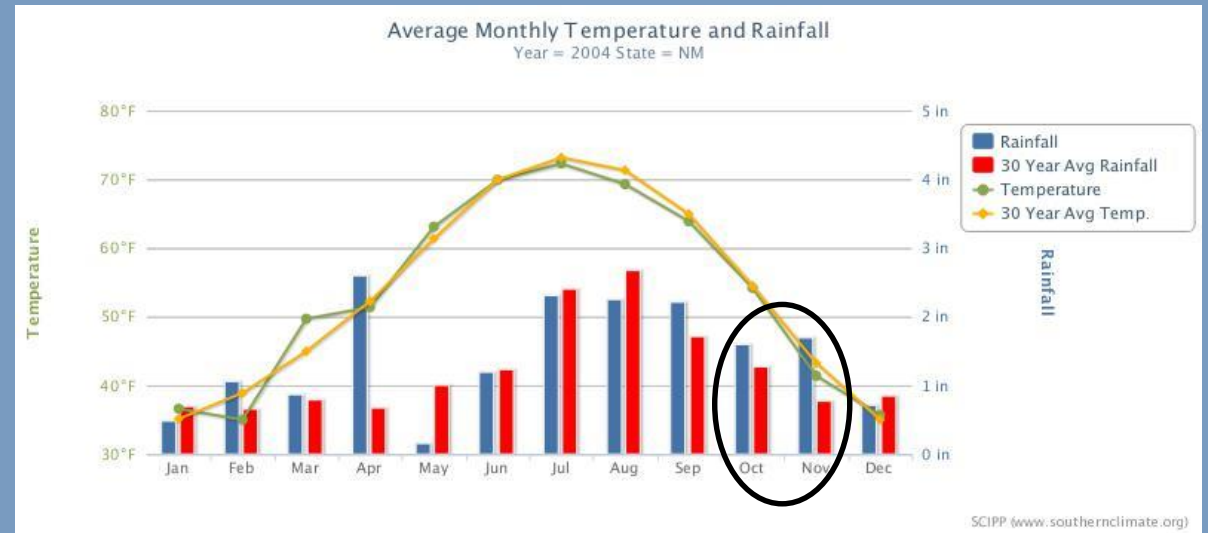
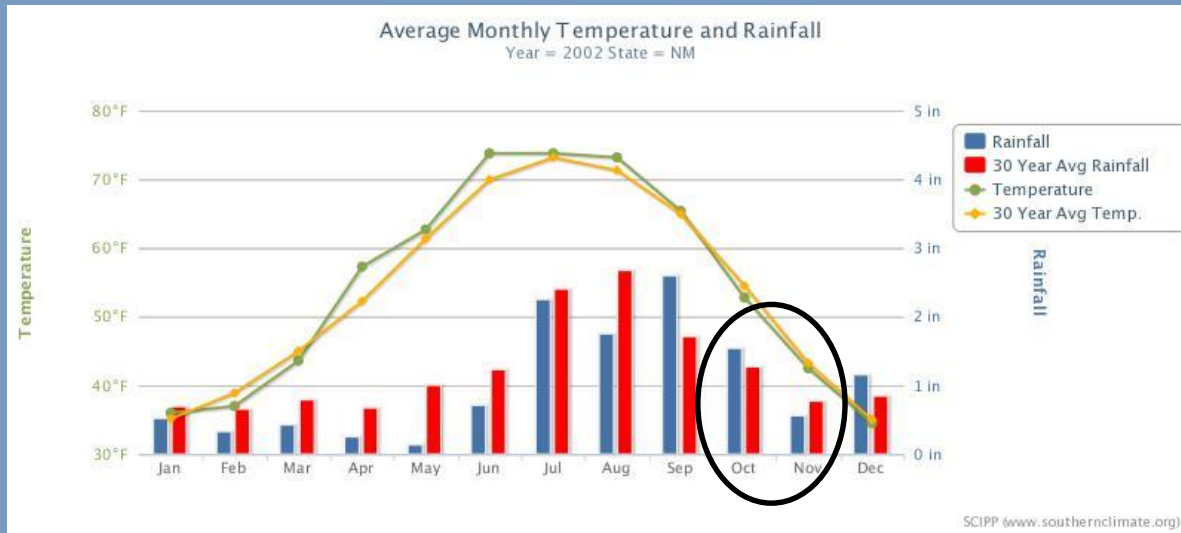
**Figures 13 & 14.** 500mb height anomalies from recent El Niño and La Niña events during October and November. Note how tropical convection influences upper-level highs and lows over the eastern Pacific Ocean and especially how it impacts the strength of the sub-tropical/Four Corners' high over the southwest U.S. A sub-tropical upper-level high over the southwest U.S. lasting well into meteorological fall during recent La Niña events has resulted in well above-average temperatures in New Mexico and much of the southwestern U.S.

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“Analog” Years – 2002, 2004, 2006, 2014



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**Figures 15 & 18.** Statewide temperature and precipitation for four recent weak to moderate El Niño events since 2000. Note that fall temperatures were near average all four years while fall precipitation was near to above average in three of the years and below average in 2014 .

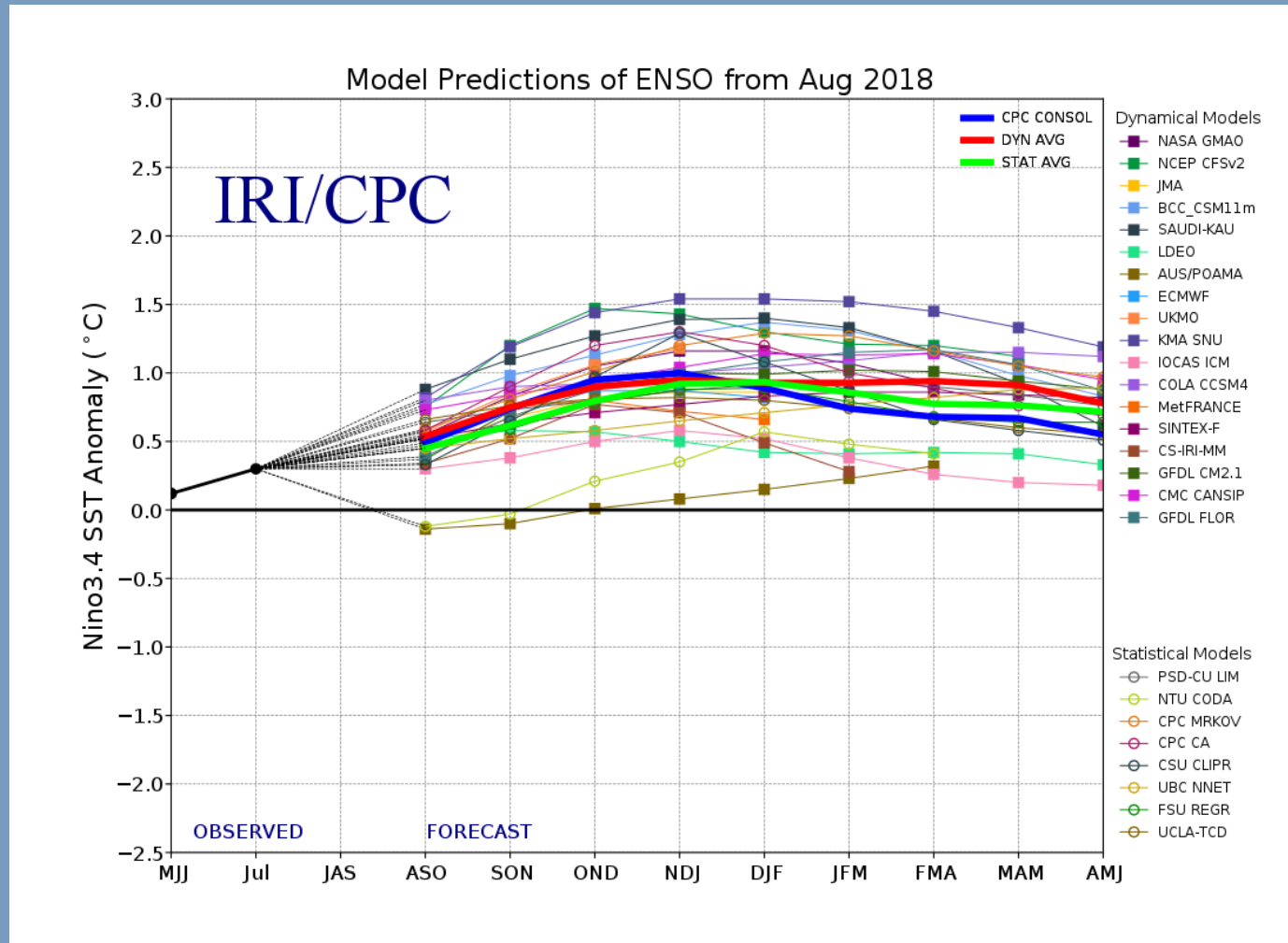


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## ENSO SST Predictions



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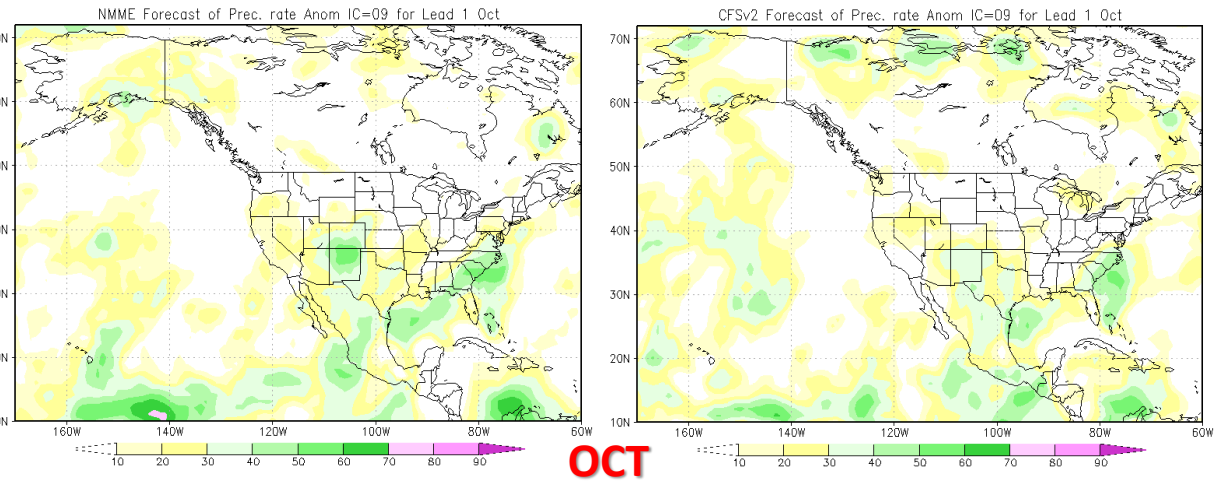
**Figure 19.** The vast majority of both dynamical and statistical models indicate a weak to moderate El Niño by late fall or early winter. Current atmospheric variables in the equatorial Pacific Ocean continue to reflect a neutral pattern but that should change in October and November.

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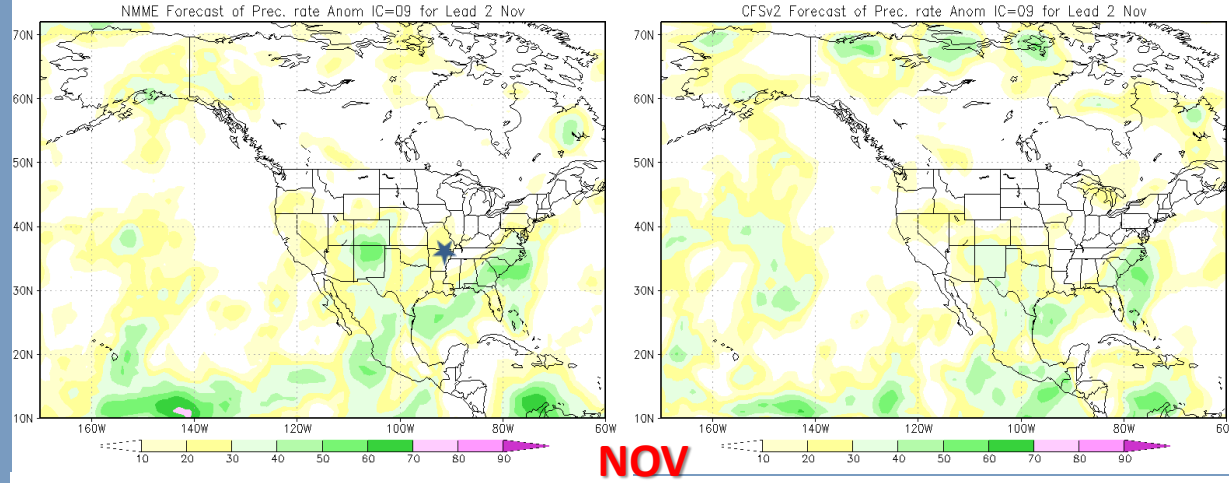
## Oct-Nov Climate Model Forecasts - Precipitation



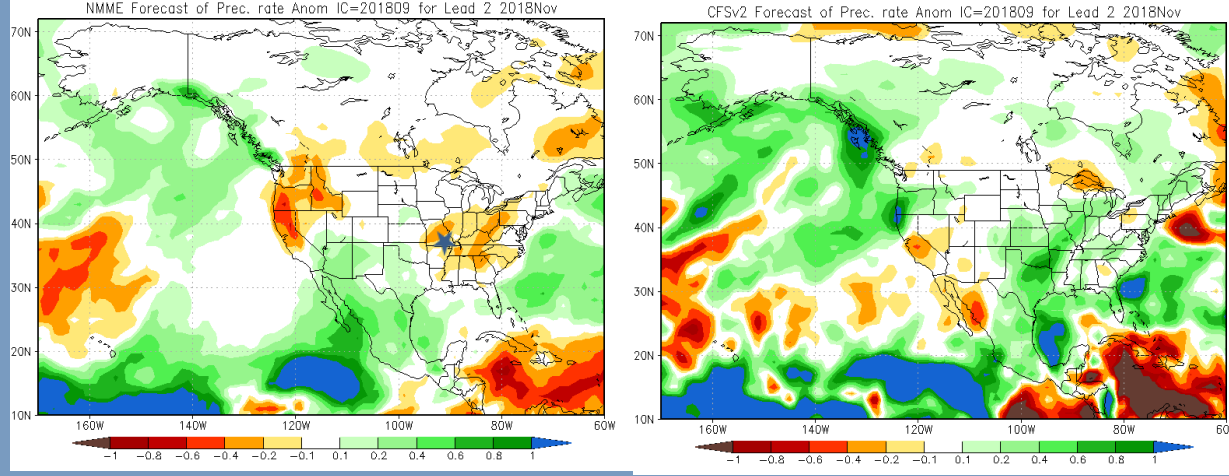
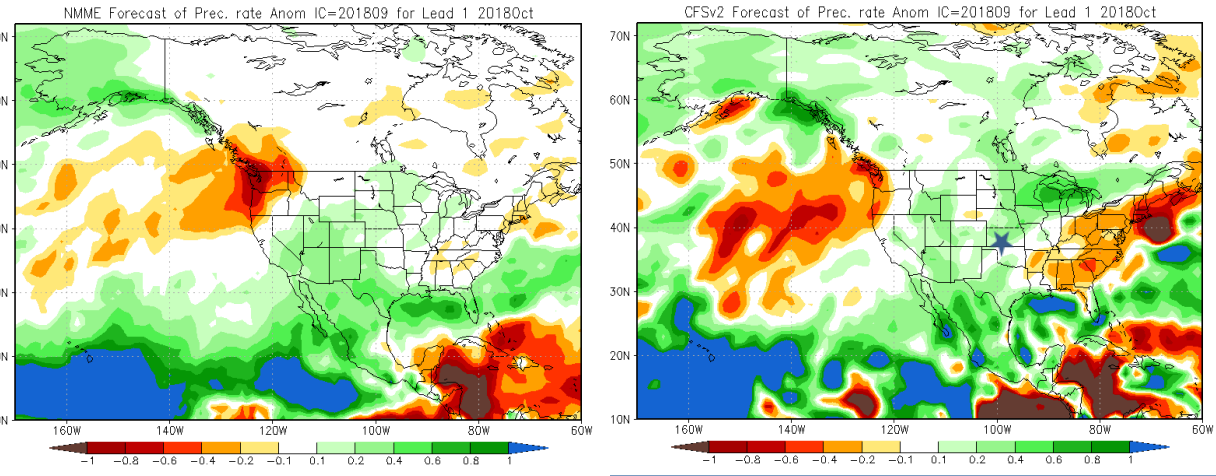
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**OCT**



**NOV**



**Figures 20-27.** Top two climate model precipitation rate skill percentages (top row) for October and November 2018. Model forecasts (bottom row) are slightly above to above average with precipitation, particularly in October. Model forecasts for November are not much different, ranging from near average to slightly above average.

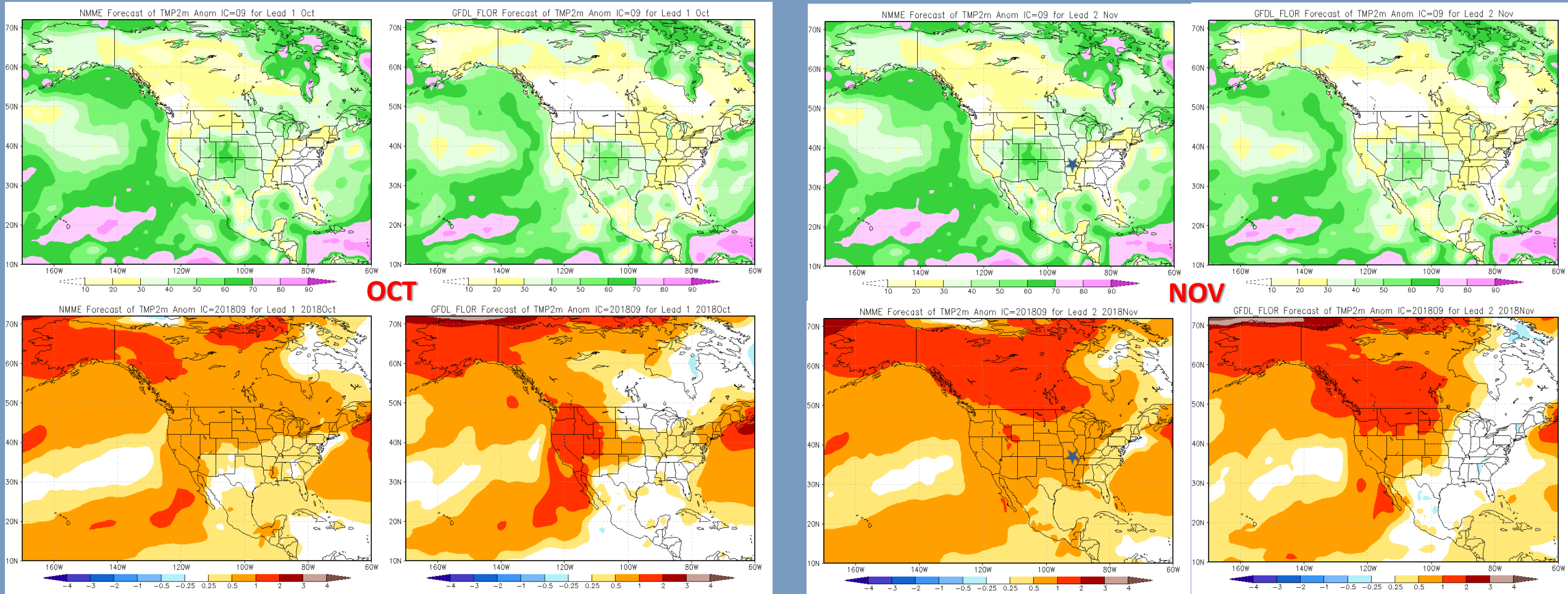


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## Oct-Nov Climate Model Forecasts - Temperature



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**Figures 28-35.** Climate model temperature anomaly plots from the two climate models which have the highest skill percentages for October and November (top four images). Model forecasts (bottom four images) indicate slightly above average to above average temperatures during both months. The temperature trend during autumn in New Mexico since around 1982 has been steadily increasing.

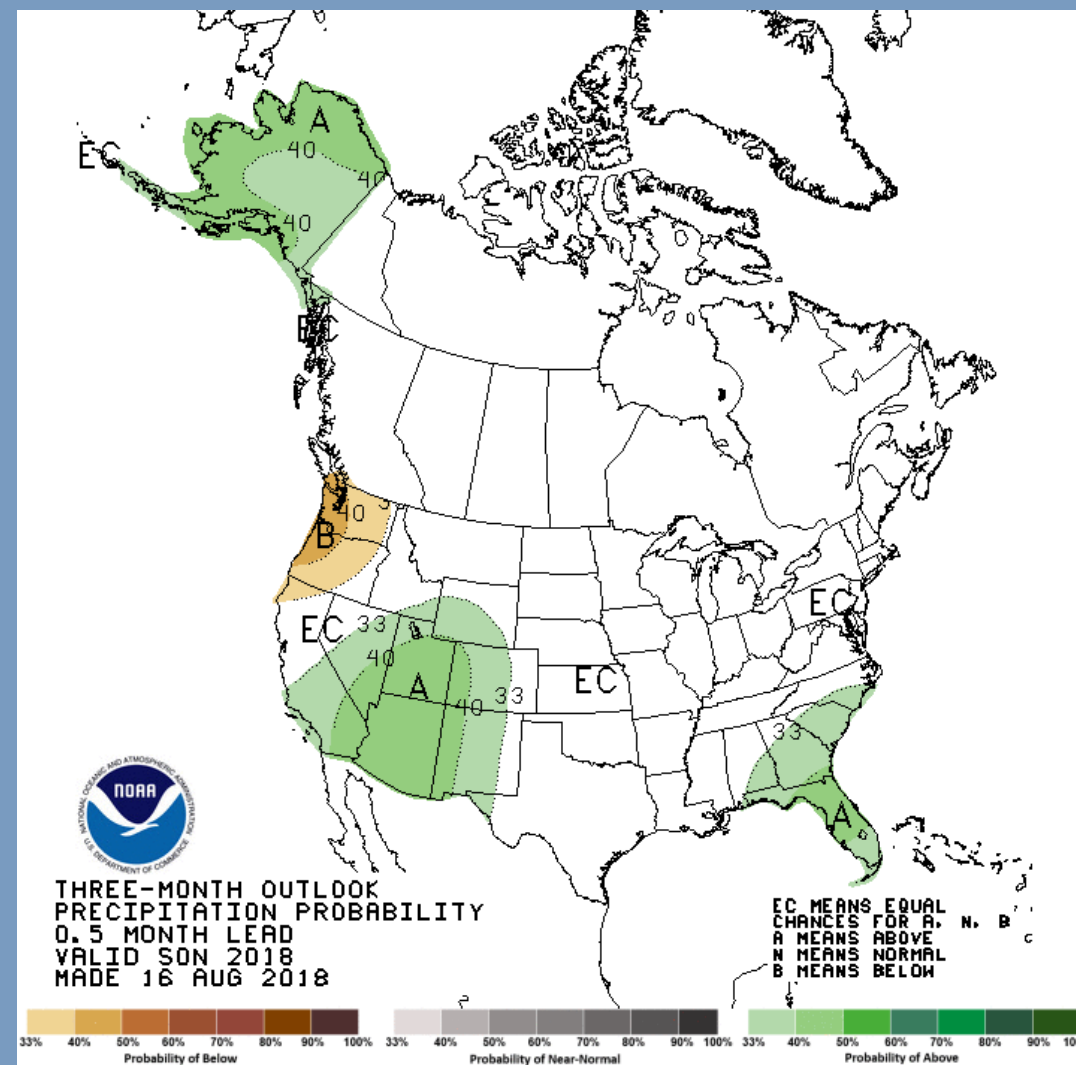
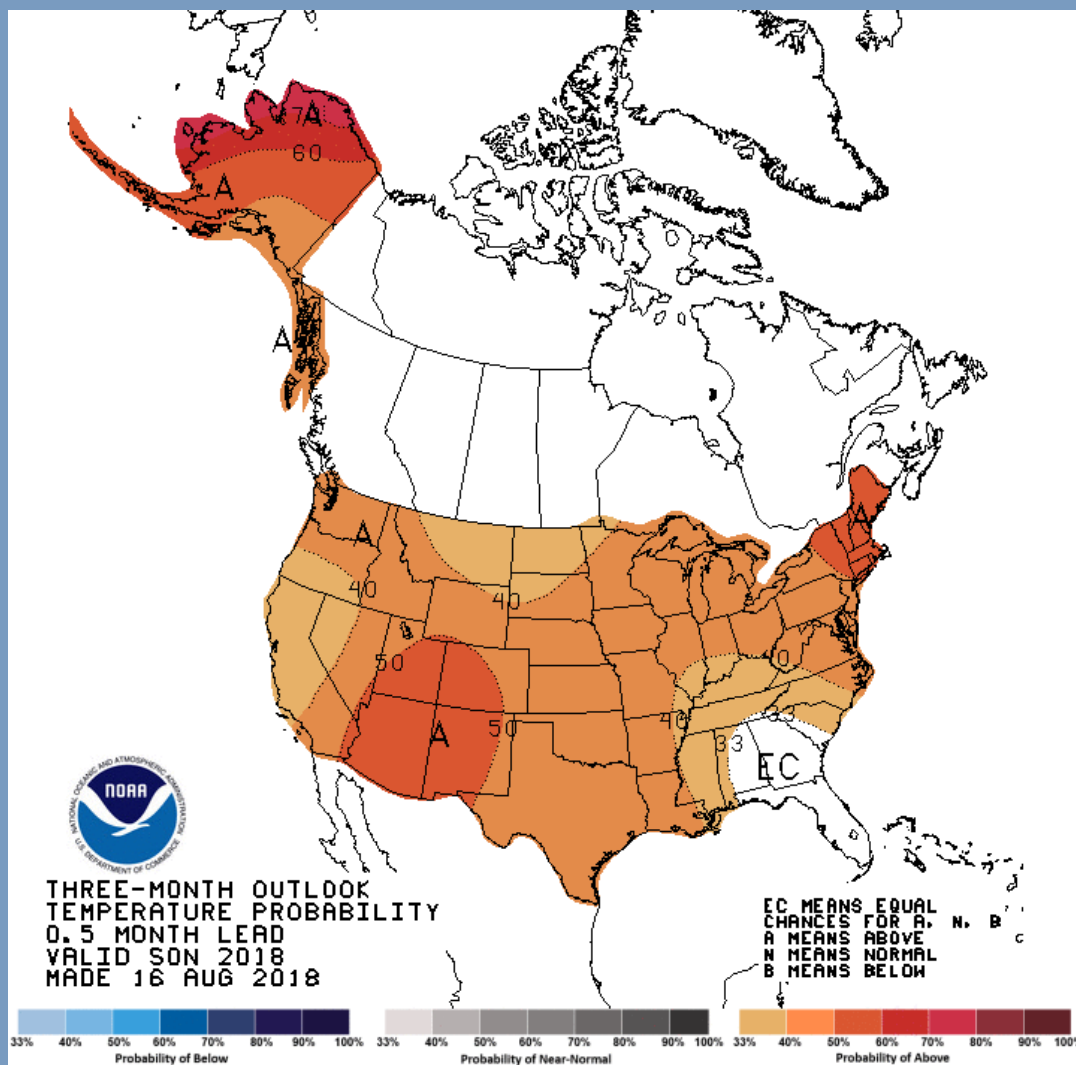
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## Climate Prediction Center's (CPC) SON/Fall Outlook



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**Figures 36 & 37.** CPC agrees with the climate model consensus of higher than average chances for above average temperatures and above average chances for precipitation for central and western NM.

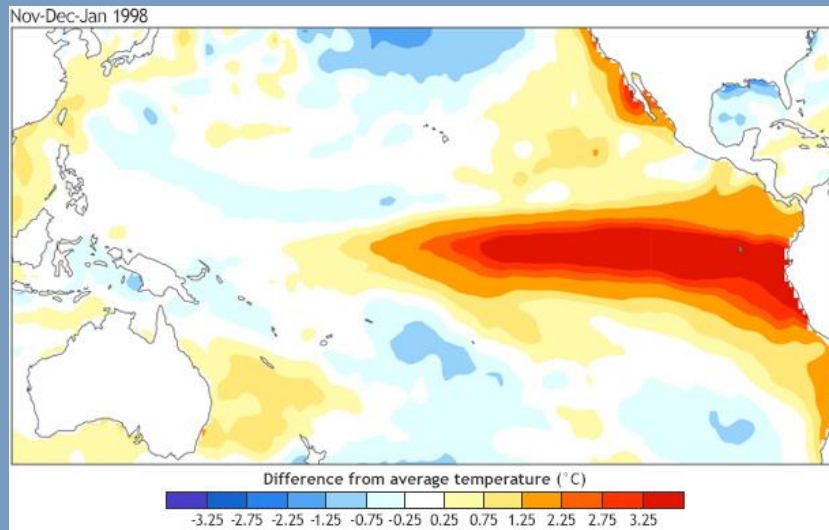


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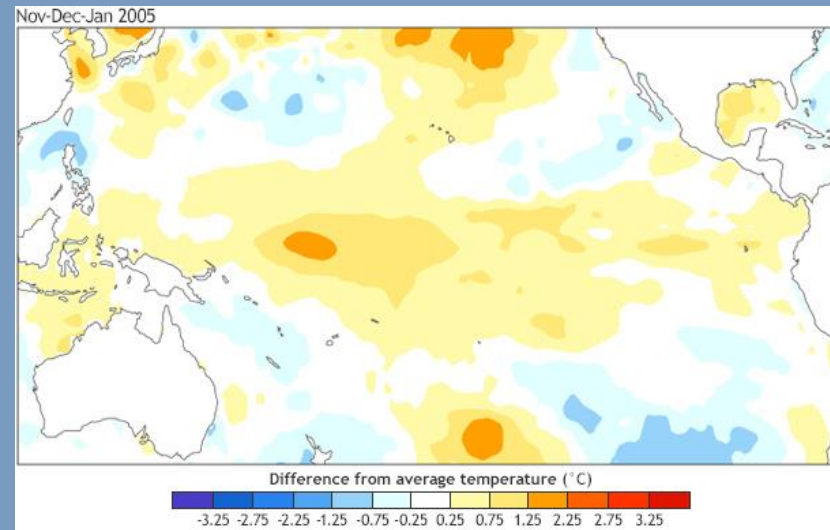
## Different Flavors of El Niño



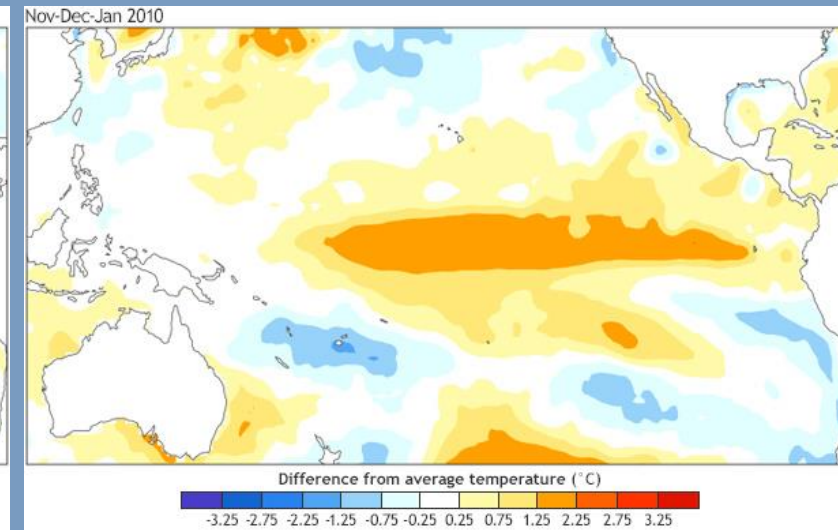
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**Eastern Pacific El Niño** (a.k.a. Cold Tongue, Conventional, or Canonical El Niño)



**Central Pacific El Niño** (a.k.a. Modoki, Warm Pool, or Dateline El Niño)



**Hybrid(s)** - a *continuum* of different types

**Figures 38-40.** The two main or most common El Niño flavors are the Eastern Pacific and Central Pacific. There are also hybrids which are somewhere in the middle. Latest climate models continue to suggest a Central Pacific or Hybrid flavor.



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## How About Wind and Precipitation During the First Two Weeks of October?



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While chances for precipitation in early October will be slightly above to above average, chances for strong wind events are below average .



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## Summary



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- Forecasts from the most highly skilled climate forecast models indicate that precipitation in central and northern New Mexico during October and November 2018 will most likely range from near to above 1981-2010 climatological averages.
- Climate model forecasts along with recent temperature trends indicate that temperatures in central and northern New Mexico during October and November 2018 will most likely range from slightly above to above average.



### References

- Rodionov, S.N., Overland, J.E., Bond, N.A., 2007. The Aleutian Low, storm tracks, and winter climate variability in the Bering Sea. *Deep-Sea Research II* 54 (2007) 2560–2577.

- **Outlook provided by National Weather Service Forecast Office Albuquerque, NM.**
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