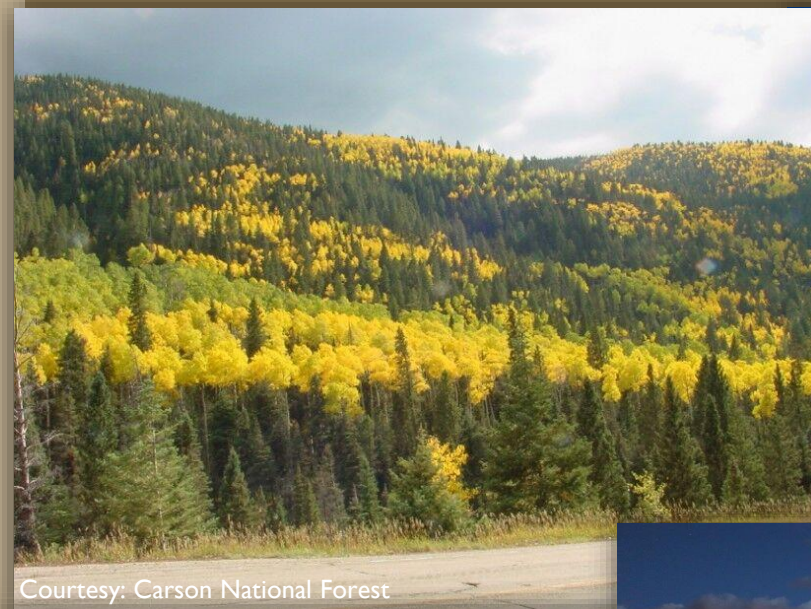


2021 Fall Outlook

For the Northern Two-thirds of New Mexico



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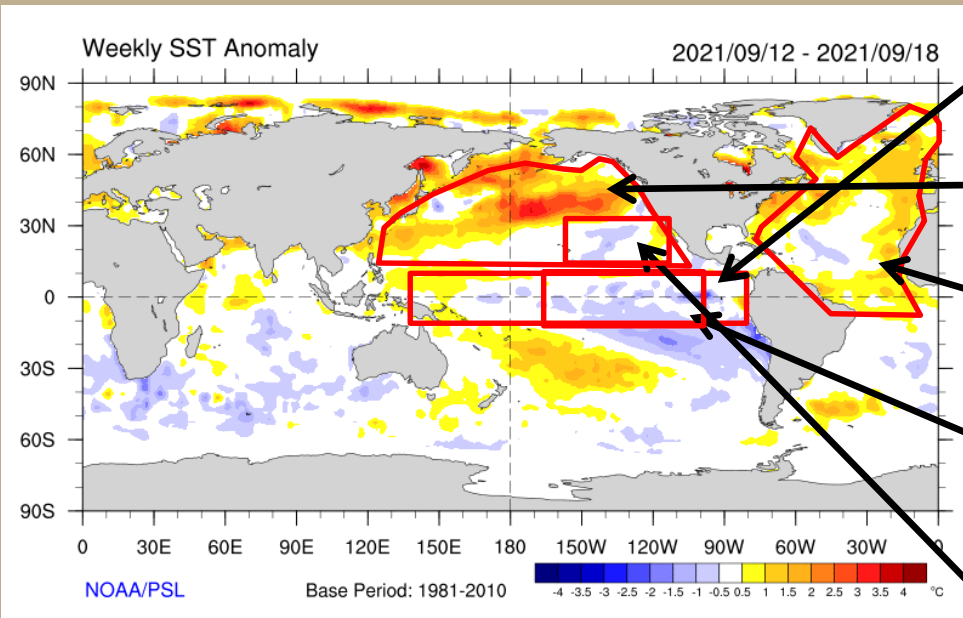
Why did this year's North American Monsoon (NAM) show up? A fading La Niña left a favorable temperature difference in the equatorial eastern Pacific Ocean. Sea Surface Temperatures (SSTs) in the equatorial Pacific are currently slightly below average or in a "neutral" state. A transition from ENSO-neutral to La Niña is favored in the next couple of months, with a 70-80% chance of La Niña during the Northern Hemisphere winter 2021-22. How will a cooling eastern equatorial Pacific Ocean impact weather across the northern two-thirds of the state?

2021 Fall Outlook



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Latest Sea Surface Temperature Observations & Oscillation Index Values



- [Multivariate ENSO Index \(MEI\)](#) for JUL-AUG 2021: **-1.3**
- [Pacific Decadal Oscillation \(PDO\)](#) for AUG 2021: **-1.12**
- [Atlantic Multidecadal Oscillation \(AMO\)](#) for AUG 2021: **+0.25**
- [Oceanic Niño Index \(ONI\)](#) (uses Niño 3.4 region - inner rectangle) for JJA 2021: **-0.4**
- [Pacific Meridional Mode \(PMM\)](#) for AUG 2021: **-0.34**

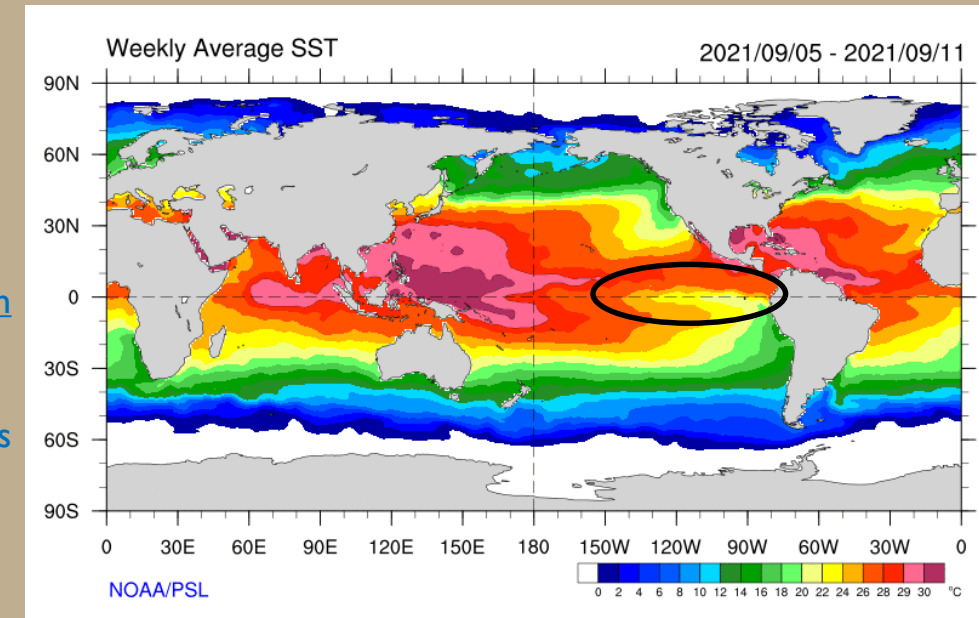


Figure 2. SST differences are what drive tropical & subtropical thunderstorms. It's these thunderstorms that drive global weather patterns/climate.

Figure 1. SST Anomalies in the Equatorial Pacific Ocean in mid September 2021 showing cooler than average conditions in the equatorial Pacific.

2021 Fall Outlook

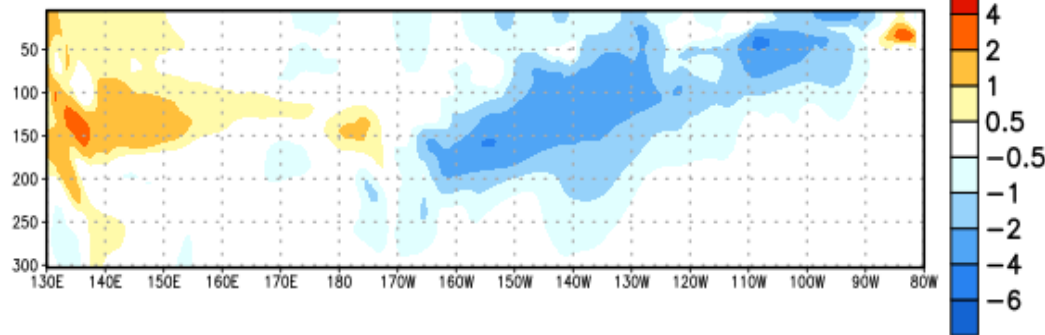
Sub-surface Temperatures



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EQ. Subsurface Temperature Anomalies (deg C)

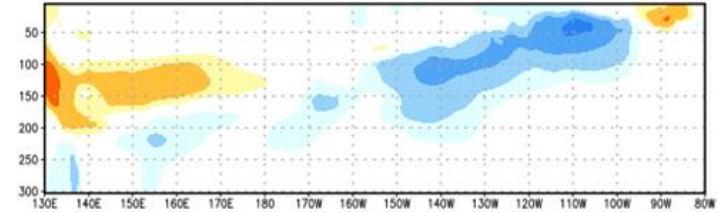
Pentad centered on 05 SEP 2021



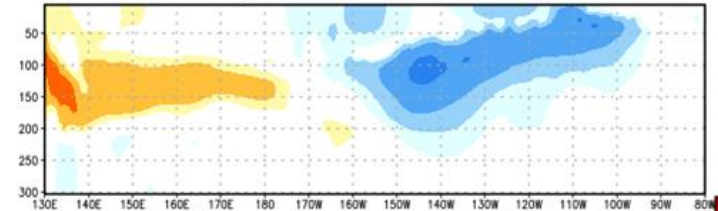
Most recent pentad analysis

EQ. Subsurface Temperature Anomalies (deg C)

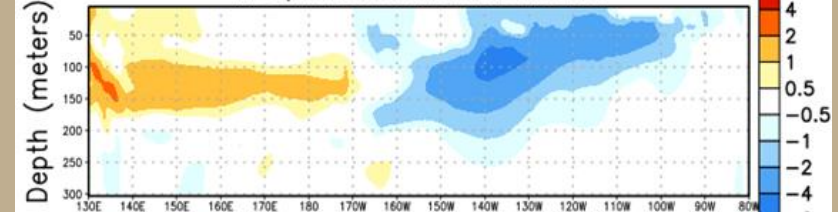
Three-pentad ave. centered on 17 JUL 2021



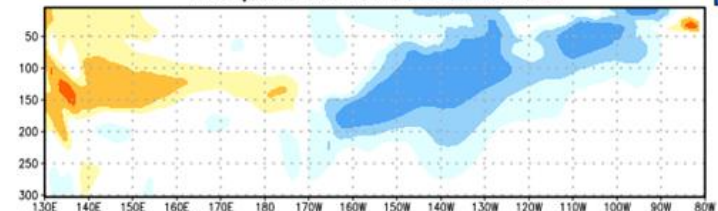
Three-pentad ave. centered on 01 AUG 2021



Three-pentad ave. centered on 16 AUG 2021



Three-pentad ave. centered on 31 AUG 2021



Figures 3-4. Sub-surface temperature anomalies at the equator. Sub-surface temperatures often precede surface temperatures by several months. An increasing amount of cooler than average water under the surface provides some additional confidence that in the fact climate models are on track forecasting a weak La Niña in fall 2021.

2021 Fall Outlook

Pacific-North American Teleconnection Pattern (PNA)



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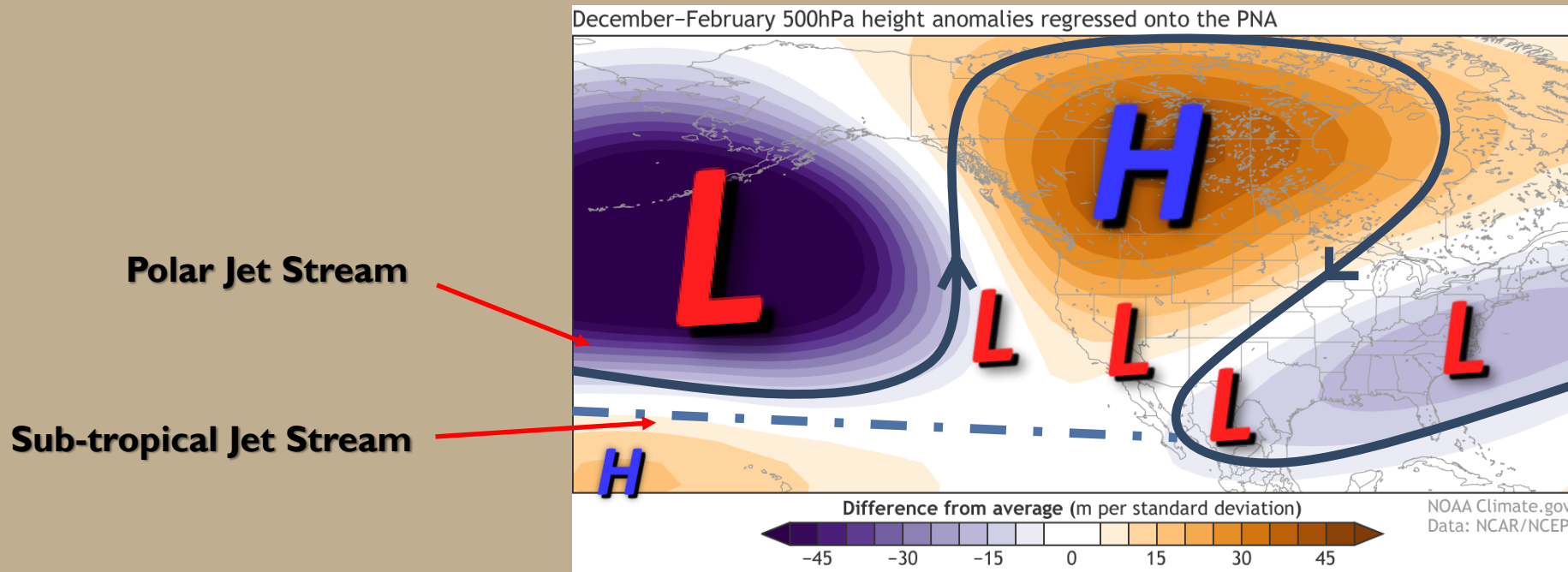


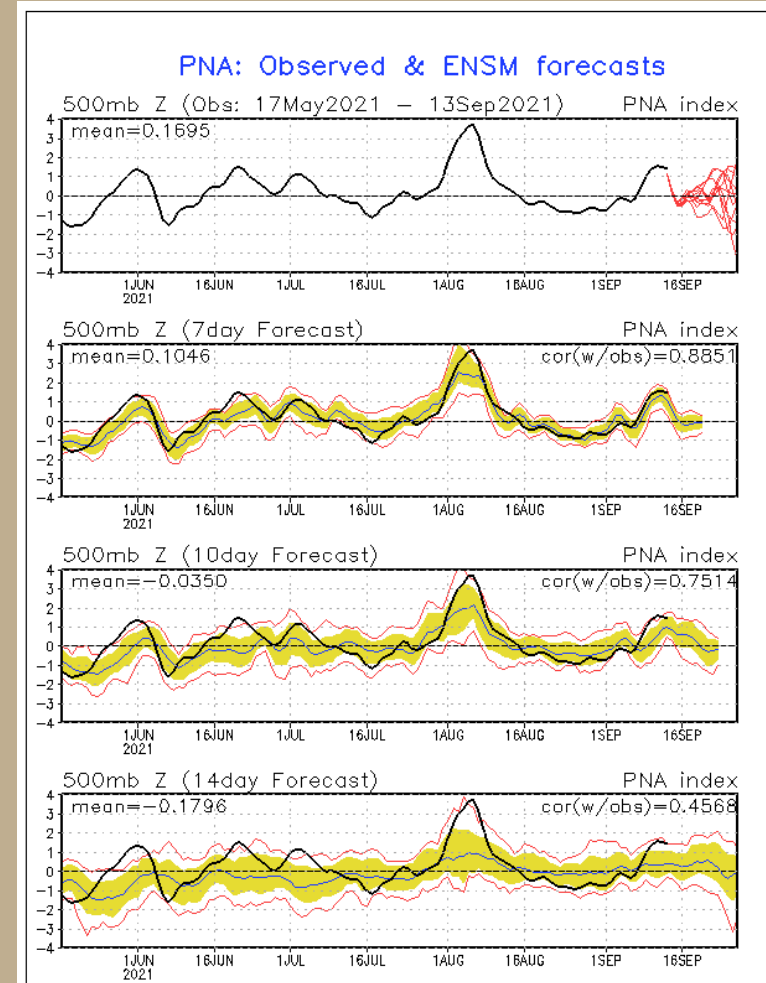
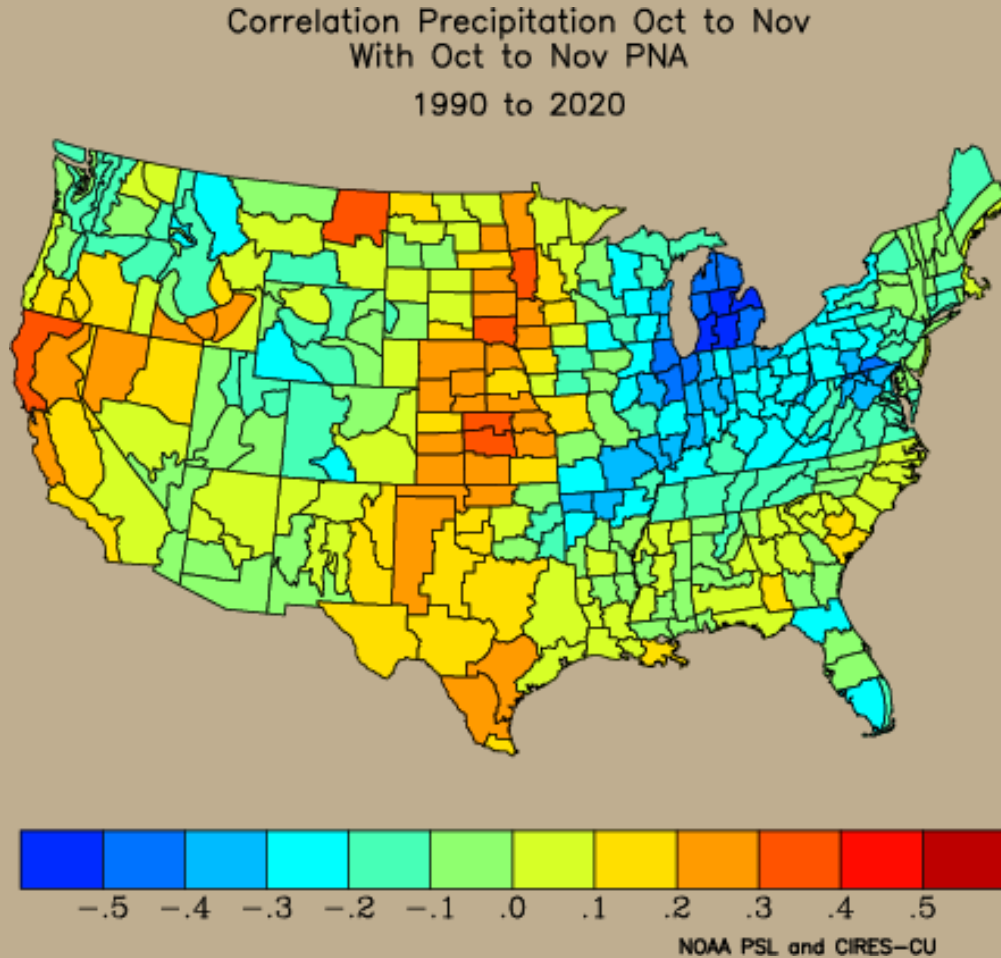
Figure 5. December-February 500-hPa geopotential height anomalies regressed onto the monthly PNA index (an idealized PNA graphic for winter). Data shown for 1979-80 to 2018-19. Purple shading indicates below-average pressure and winds that flow counter-clockwise following the contours. Orange shading denotes above-average pressure and winds that flow clockwise. The Pacific/ North American teleconnection pattern (PNA) is one of the most prominent modes of low-frequency variability in the Northern Hemisphere outside of the tropics. The positive phase of the PNA pattern typically features above-average heights in the vicinity of Hawaii and over the intermountain region of North America, and below-average heights located south of the Aleutian Islands and over the southeastern United States. The PNA pattern is associated with strong fluctuations in the strength and location of the East Asian Jet Stream. The positive phase is associated with an enhanced East Asian Jet Stream and with an eastward shift in the jet exit region toward the western United States. The negative phase is associated with a westward retraction of that jet stream toward eastern Asia, blocking activity over the high latitudes of the North Pacific, and a strong split-flow configuration over the central North Pacific. For New Mexico, often times the strong storms in the eastern Pacific will undercut the upper high over Canada, moving east or northeast through the southwest U.S.

2021 Fall Outlook

Positive Pacific-North American Pattern (PNA)



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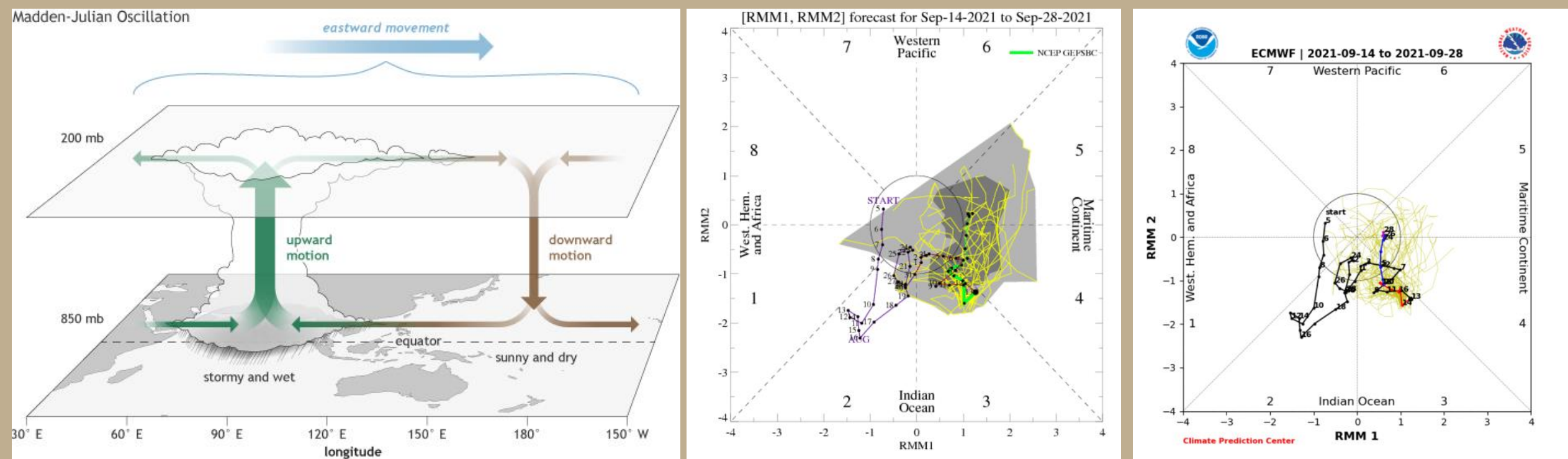
Figures 6-7. 1990 to 2020 (left image) correlations between the PNA Index and precipitation show that the eastern plains is the most likely area in New Mexico to have above average precipitation during a positive PNA in October and November. Ensemble model forecasts keep the PNA index mainly positive through late September.

2021 Fall Outlook

Madden-Julian Oscillation (MJO)



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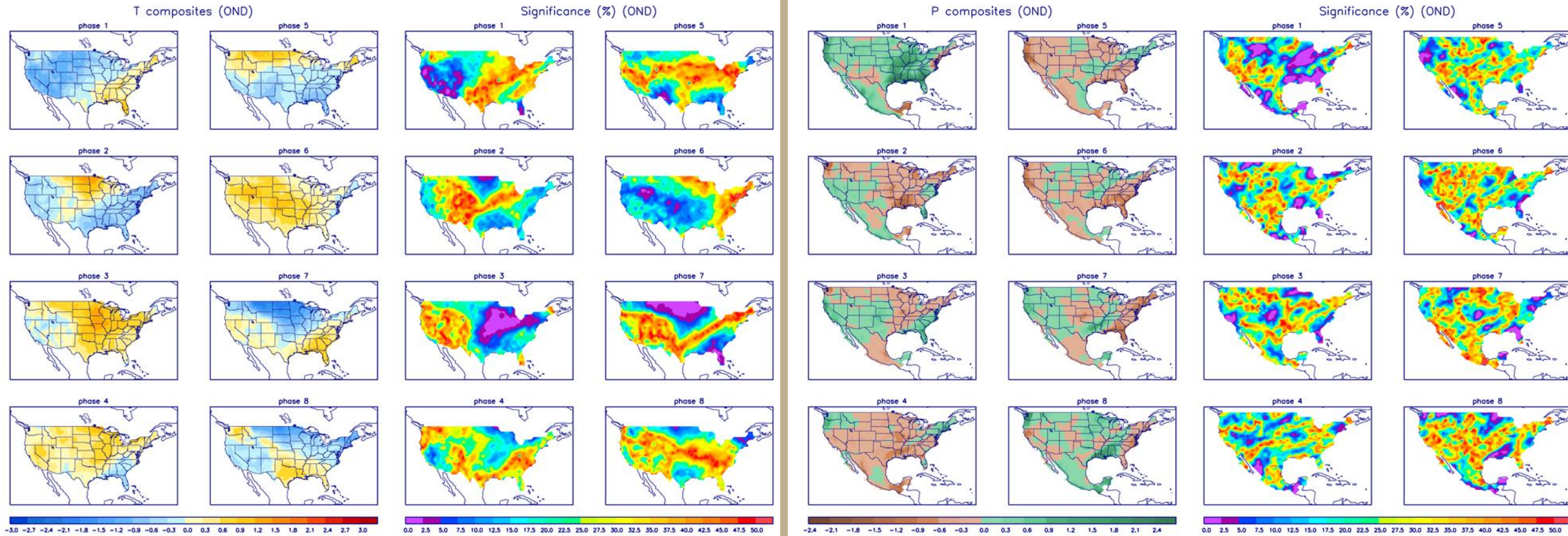
Figures 8-9. The MJO is an area of enhanced thunderstorms that travels around the world every 30 to 60 days from west to east near the equator. Ahead and behind the active stormy area are areas of suppressed convection and drier conditions. The MJO affects near-surface wind patterns, because the rising 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. Forecast models keep the MJO keep the stormy an wet side of the MJO in the western Pacific through September 28, 2021.

2021 Fall Outlook



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Madden-Julian Oscillation (MJO) - Phases



Figures 10-11. 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 models are in good agreement that the MJO will strengthen as it transitions into phases 5/6 during late September 2021 (previous slide).

2021 Fall Outlook

ENSO SST Predictions



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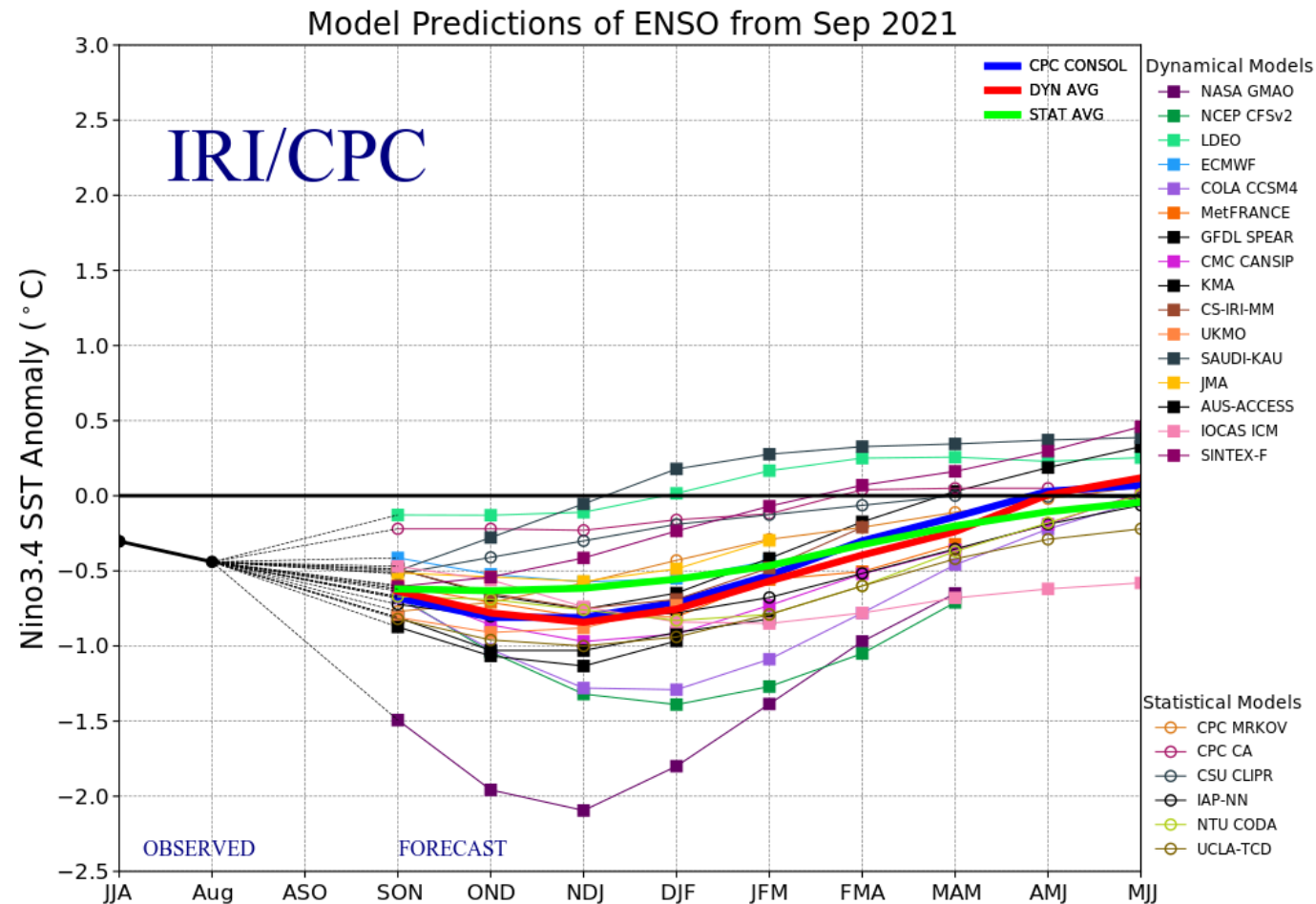


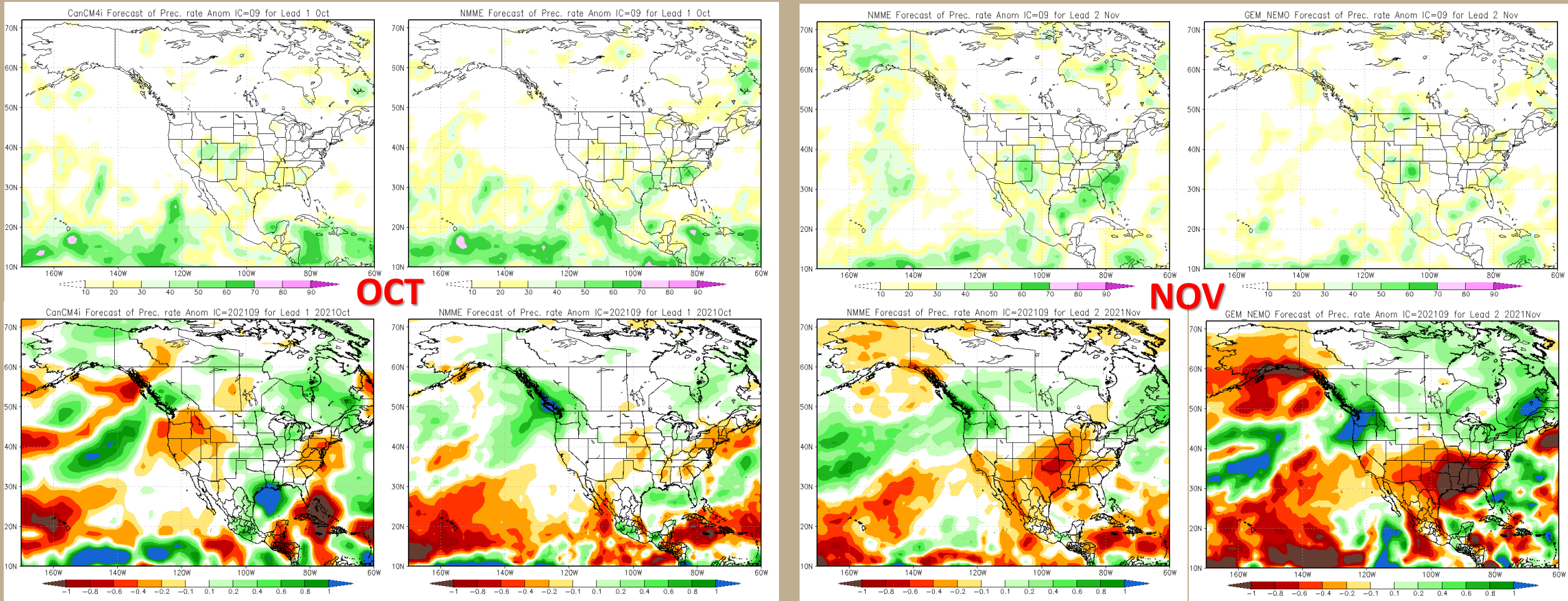
Figure 12. The vast majority of both dynamical (thick red line) models indicate weak La Niña conditions in fall 2021 and early winter, warming to a neutral state by late winter.

2021 Fall Outlook

Oct-Nov Climate Model Forecasts - *Precipitation*



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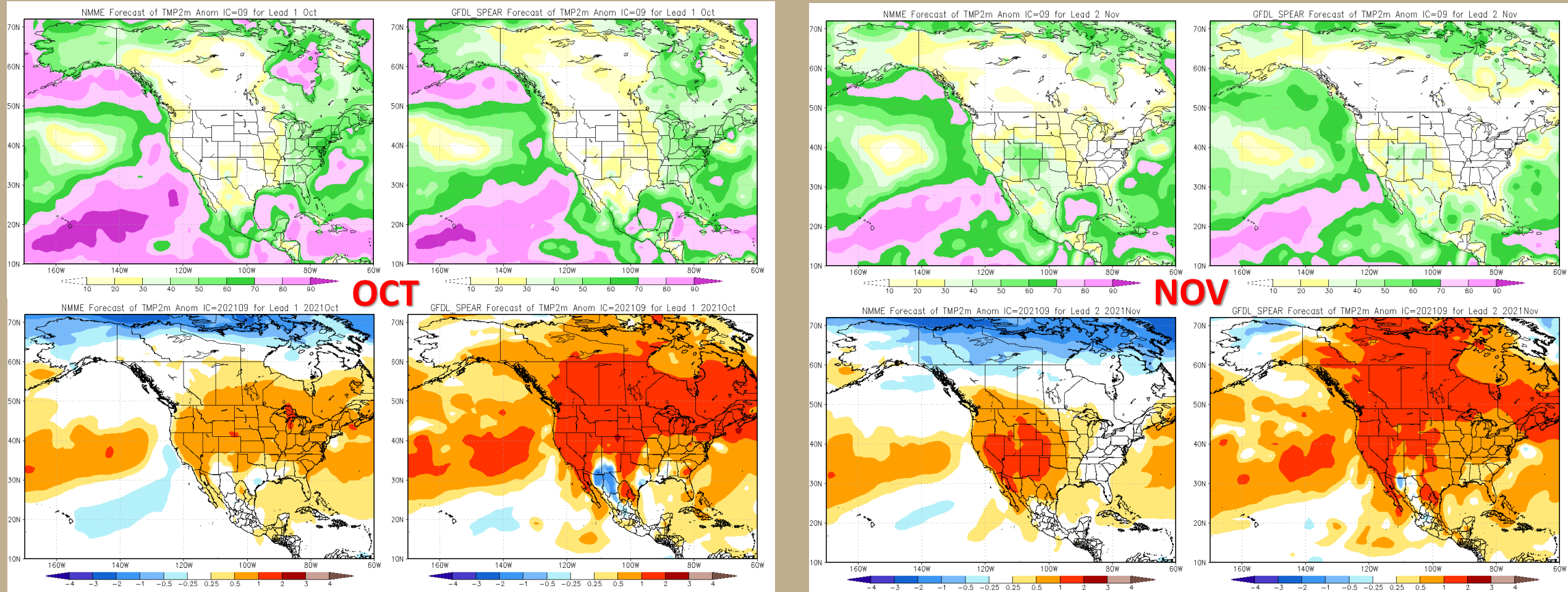
Figures 13-20. Top two climate model precipitation rate skill percentages (top row) for October and November 2021. Model forecasts (bottom row) are near average with regard to precipitation in October and below to well below average for November.

2021 Fall Outlook

Oct-Nov Climate Model Forecasts - Temperature



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Figures 33-40. 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 near to below average temperatures for southwest NM (possibly convection/thunderstorms continuing?) in October and above average for November. The temperature trend during autumn in New Mexico since around 1982 has been steadily increasing.

2021 Fall Outlook

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



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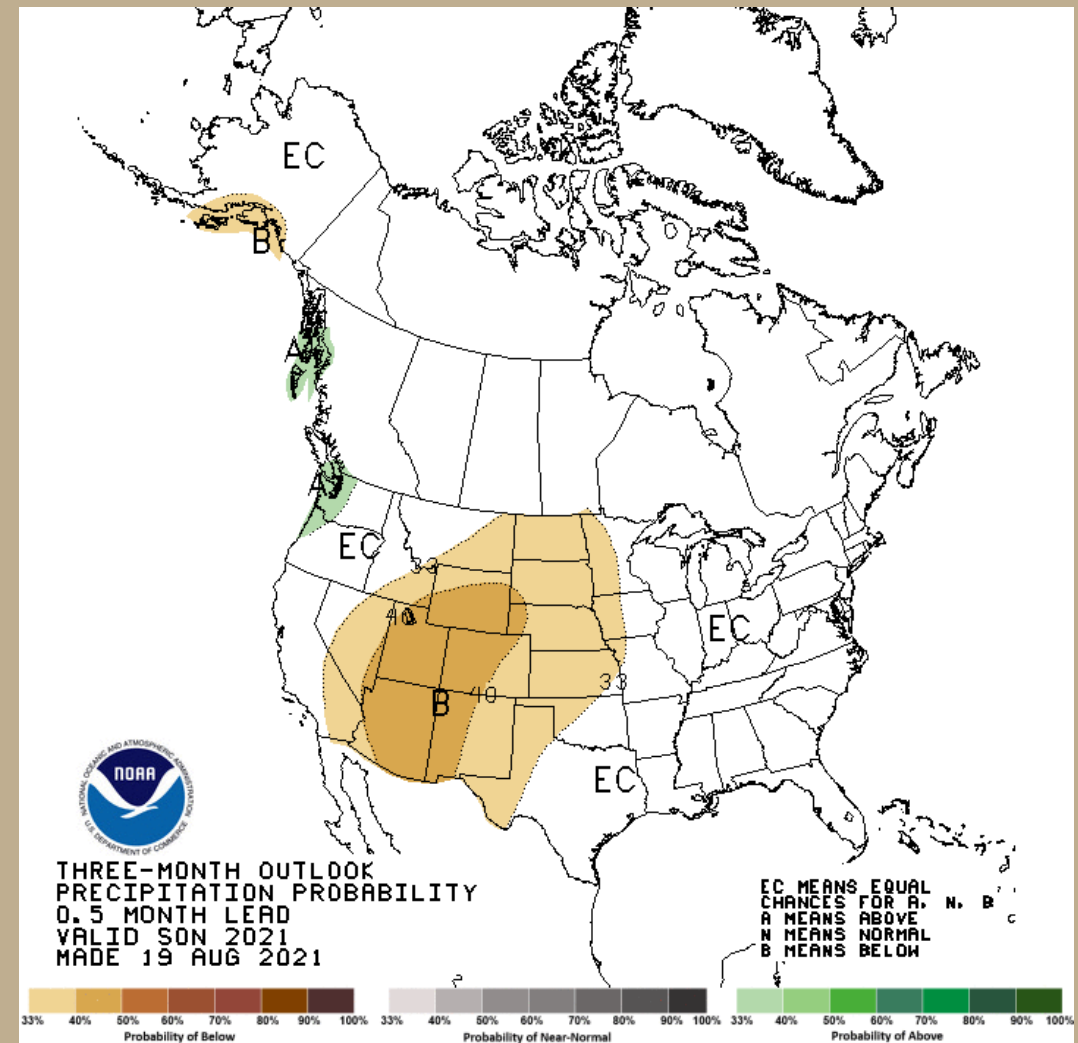
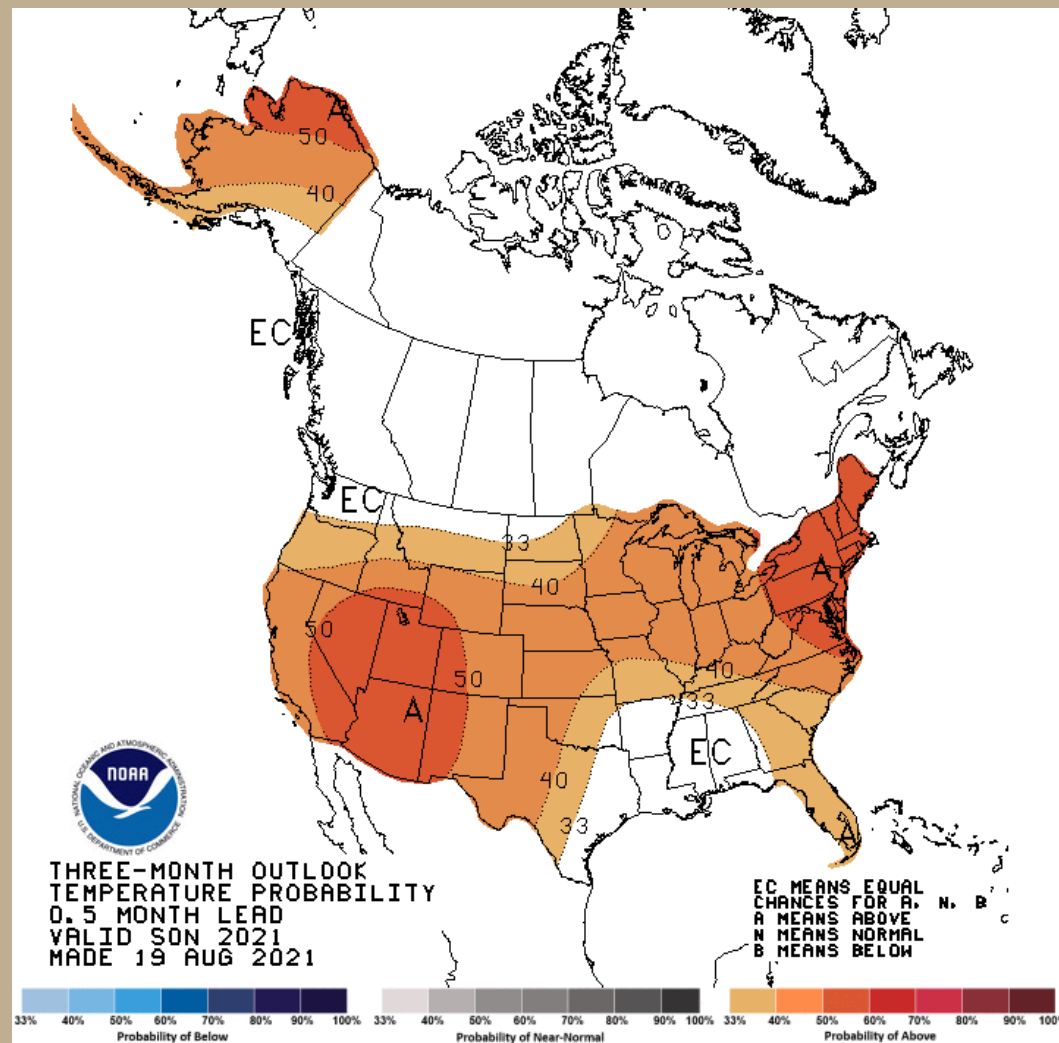
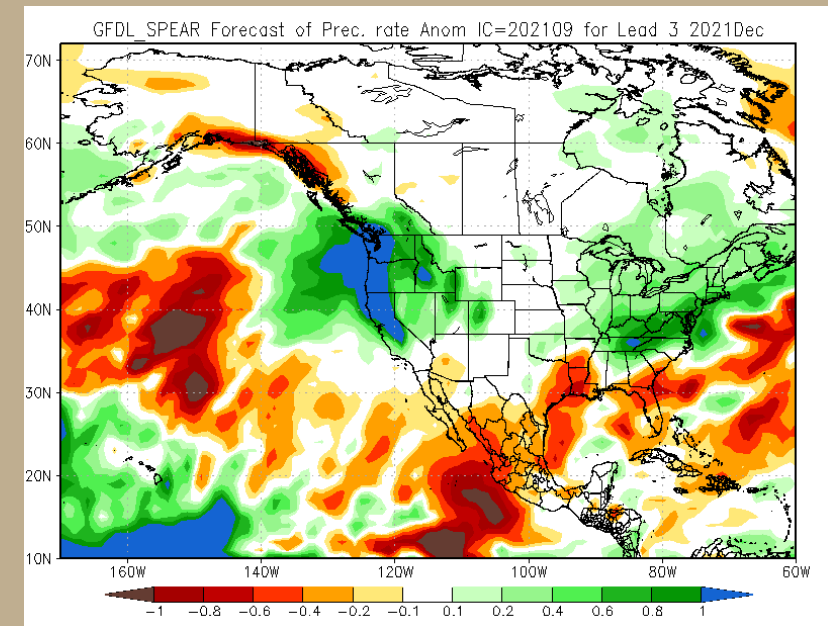
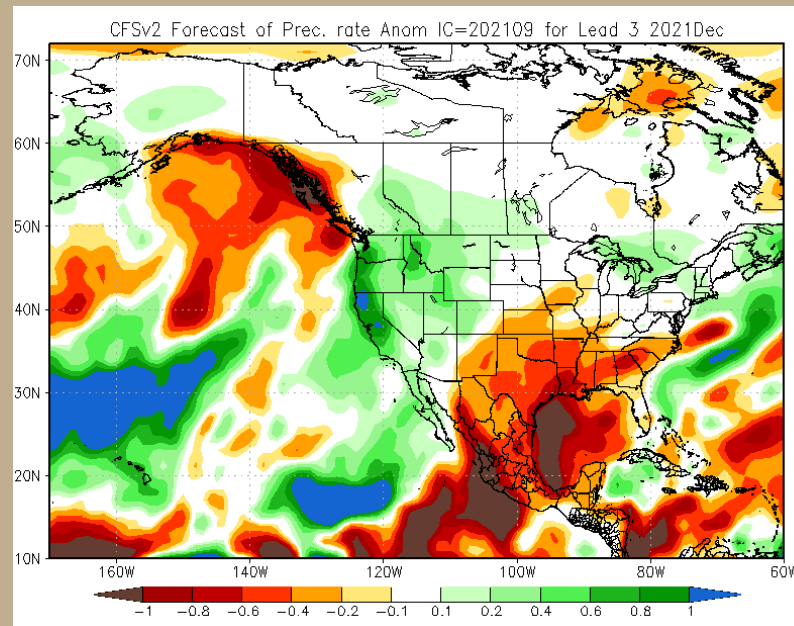
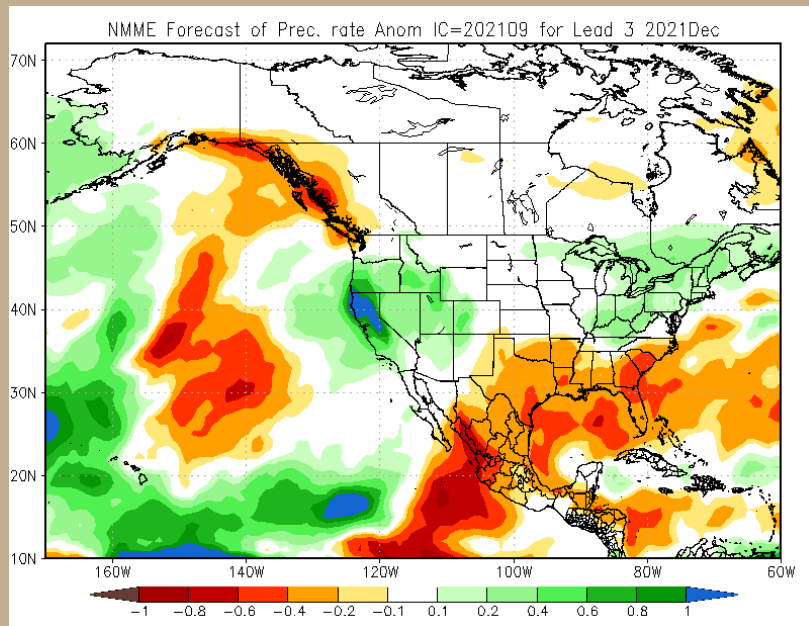


Figure 41. CPC agrees with the climate model consensus of higher than average chances for above average temperatures and below average precipitation.

A Quick Peek at December 2021



While climate model forecast skill out that far remains relatively low, the three climate models with the highest forecast skill for NM are indicating a relatively wet December for much of the western U.S. despite a weak La Niña.

2021 Fall Outlook

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 near to slightly above average, chances for strong wind events for the middle Rio Grande Valley and the north valley of Albuquerque are as well. This is based on the climate model forecasts which indicate that backdoor cold fronts (precipitation bullseye over northeast NM and the Southern Plains) during early October could be of concern for the north Valley of Albuquerque.

2021 Fall Outlook

Summary



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- Forecasts from the most highly-skilled climate models indicate that precipitation in central and northern New Mexico during **October 2021** will most likely be near to slightly above 1991-2020 climatological averages while climate model forecast favor below to well below average precipitation in **November 2021**.
- Climate model forecasts along with recent temperature trends indicate that temperatures in central and northern New Mexico during October and November 2021 will most likely range from slightly above to above seasonal averages.

2021 Fall Outlook

Outlook Information



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- **Outlook provided by National Weather Service Forecast Office Albuquerque, NM.**
- **For further information contact Andrew Church: andrew.church@noaa.gov (505) 244-9150**