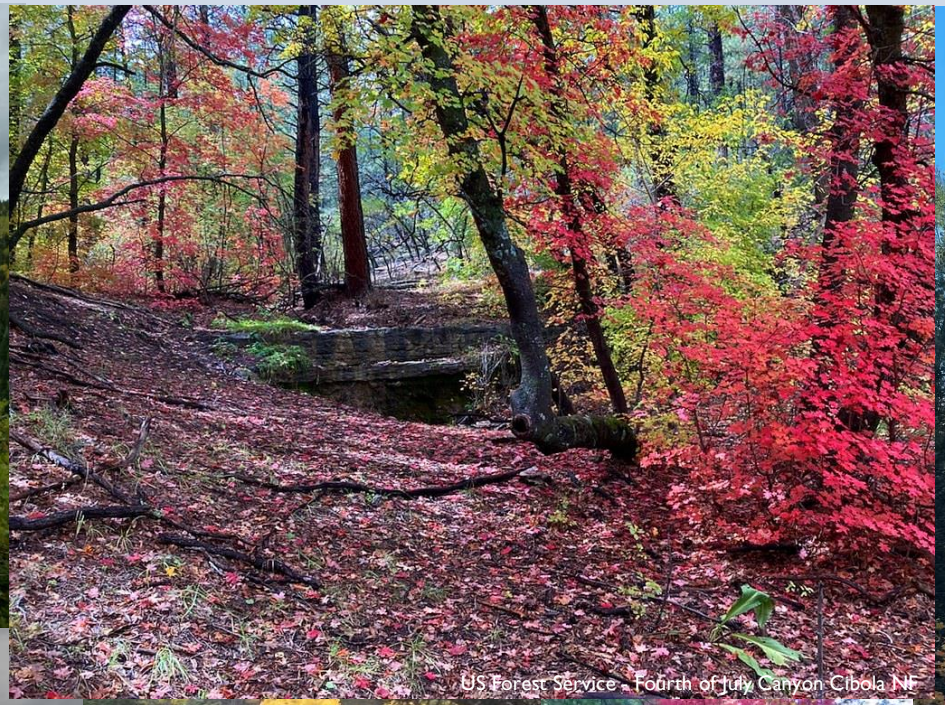
2023 Fall Outlook

For Northern & Central New Mexico

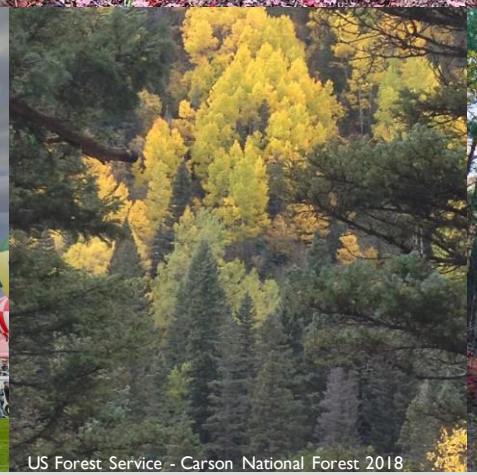
Albuquerque
WEATHER FORECAST OFFICE


US Forest Service - Carson National Forest 2018


US Forest Service - Fourth of July Canyon Cibola NF


US Forest Service -Mountainair Ranger District Cibola NF


Don Constantine 2022 AIBF


US Forest Service - Carson National Forest 2018


An Inspired Cook 2020


An Inspired Cook 20220

After one of the hottest and driest monsoons in recorded history, what will a moderate to strong El Niño mean for autumn?

El Niño Southern Oscillation (ENSO) Status from the Climate Prediction Center (CPC)

ENSO Alert System Status: **El Niño Advisory**

El Niño conditions are observed.

Equatorial sea surface temperatures (SSTs) are above average across the central and eastern Pacific Ocean.

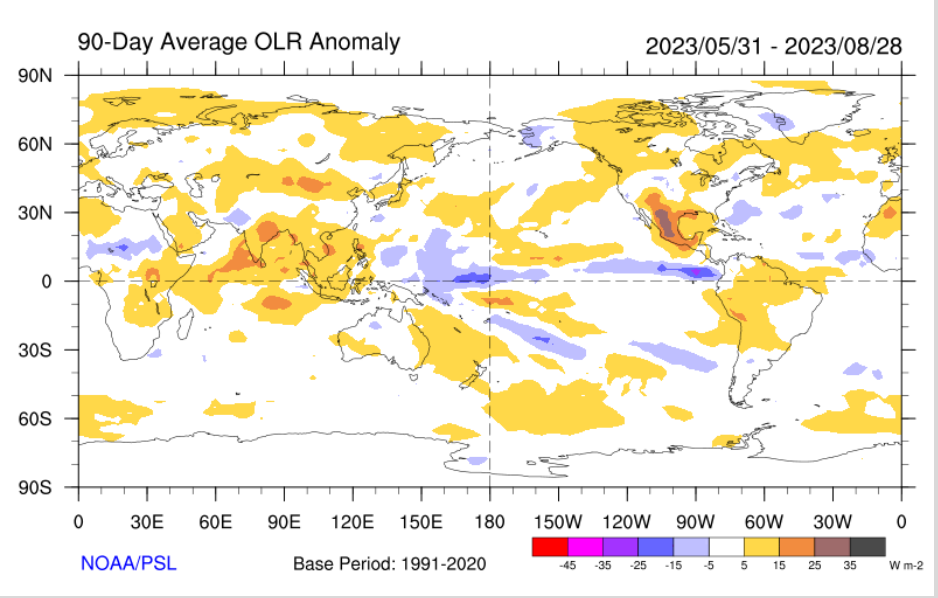
The tropical Pacific atmospheric anomalies are consistent with El Niño.

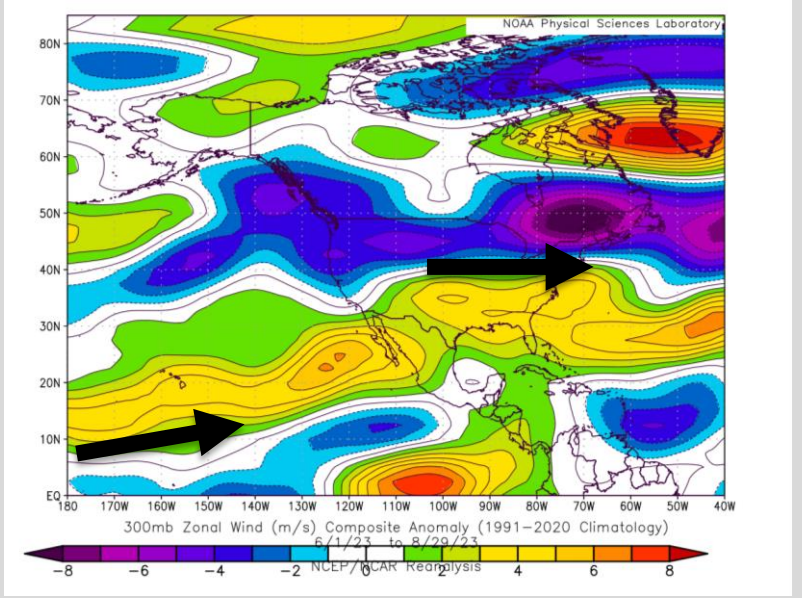
El Niño is anticipated to continue through the Northern Hemisphere winter (with greater than a 95% chance through January-March 2024).

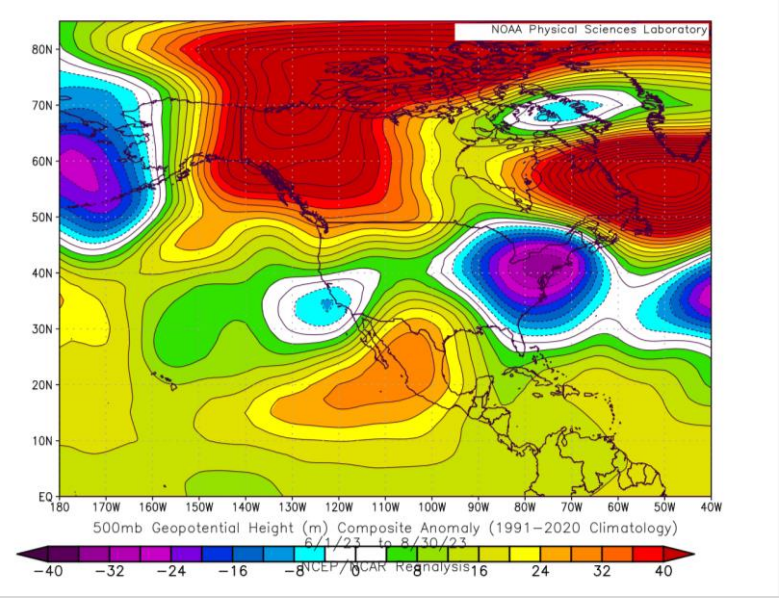
2023 Fall Outlook

For Northern & Central New Mexico

Albuquerque
WEATHER FORECAST OFFICE





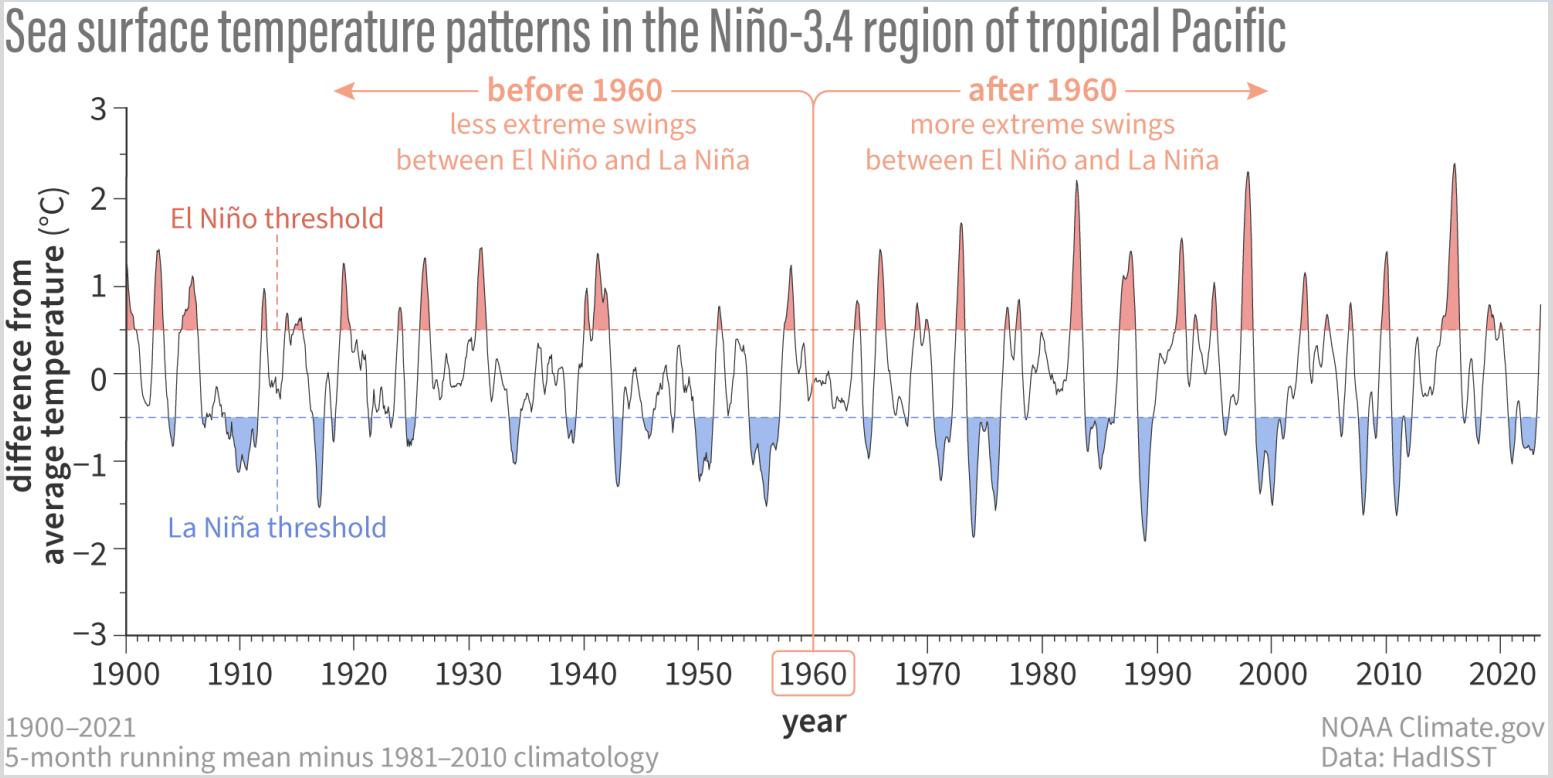


Why did a rapidly emerging El Niño climate pattern result in such a hot and dry summer in NM? In short, after three La Niña climate patterns over the past 3 years plus (coined a "triple-dip"), much warmer than average water was able to pile up in and near the Maritime Continent (MC). Introduce mid to late November 2022, earth's climate system reaches a tipping point after three cool seasons with the same climate pattern piling up warm water, seeks thermal balance, and now the bath water near the MC surges back eastward. Tropical convection eventually responds in kind, and, in turn, so do the polar and subtropical jet streams. What happened when the world's paramount climate shift took place in November 2022? Just the snowiest winter on record for the much of the Western U.S., which was experiencing widespread, long-lived drought. Fast forward to spring 2023 and the anomalous convection continuing in the EPAC leads to a much wetter and cooler spring season for much of NM. But by June 2023, the anomalous convection in the EPAC acts to strengthen the monsoon high/doldrum high pressure that results as Hadley/Ferrell cells shift northward along with the angle of the sun. Enter one of the hottest and driest monsoon seasons in recorded history. Why? Anomalous convection in the equatorial EPAC (cool colors left image) results not only in stronger than average sinking air or subsidence over NM, but a stronger than average subtropical jet stream (stronger temperature difference aloft between the poles and equatorial region is born). A moderate to strong El Niño's impacts to the monsoon are two fold. Initially, El Niño related convection keeps the subtropical jet stream stronger than average, delaying the monsoon onset with more frequent than average westerly dry air intrusions in late June/early July. In the troposphere or lower atmosphere during the warm season, what goes up in the tropics and subtropics, must come down in and near the middle latitudes. In 2023, it was northwest Mexico, well shy of 35°N. Above average thunderstorm activity off the coast of Guatemala and El Salvador results in a stronger than average monsoon high (right). Higher heights equate to warmer temperatures and less atmospheric instability. So despite hotter surface temperatures, cumulus updrafts struggle to blossom due to increased mid-level subsidence. Will this be the case for monsoons going forward during El Niño climate pattern? Not necessarily. The climate pattern transition that took place during late fall 2022 through summer 2023 is quite rare. In fact, the last triple-dip La Niña in the late 1990s through 2000 was followed by a neutral climate pattern. The one prior was in the early to mid 1970s and the transition to El Niño in 1976 was much more gradual. The rapid climate pattern transition that took place between November 2022 and spring 2023 was indeed rare when compared to past climate transitions, but as more and more climate models suggest, it could end up being more common in the future.

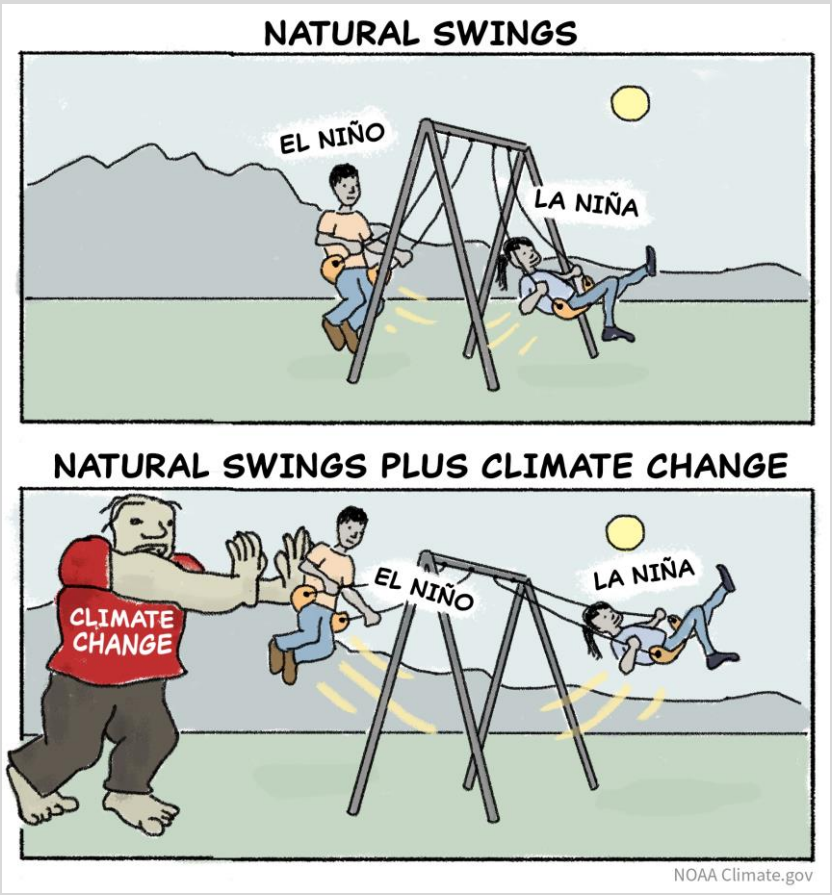
2023 Fall Outlook

For Northern & Central New Mexico

Albuquerque
WEATHER FORECAST OFFICE



Sea surface temperature in the Niño-3.4 region of the tropical Pacific from 1900 to 2023. Monthly data have been smoothed with a 5-month running mean after removing a seasonal climatology for 1981-2010. Red peaks are El Niño events and blue troughs La Niña events. The approximate mid-point of the time series is indicated by the vertical black line in 1960. The white area between ±0.5°C signifies neutral conditions. Data is from HadISST, which uses satellites and other in situ observational data.

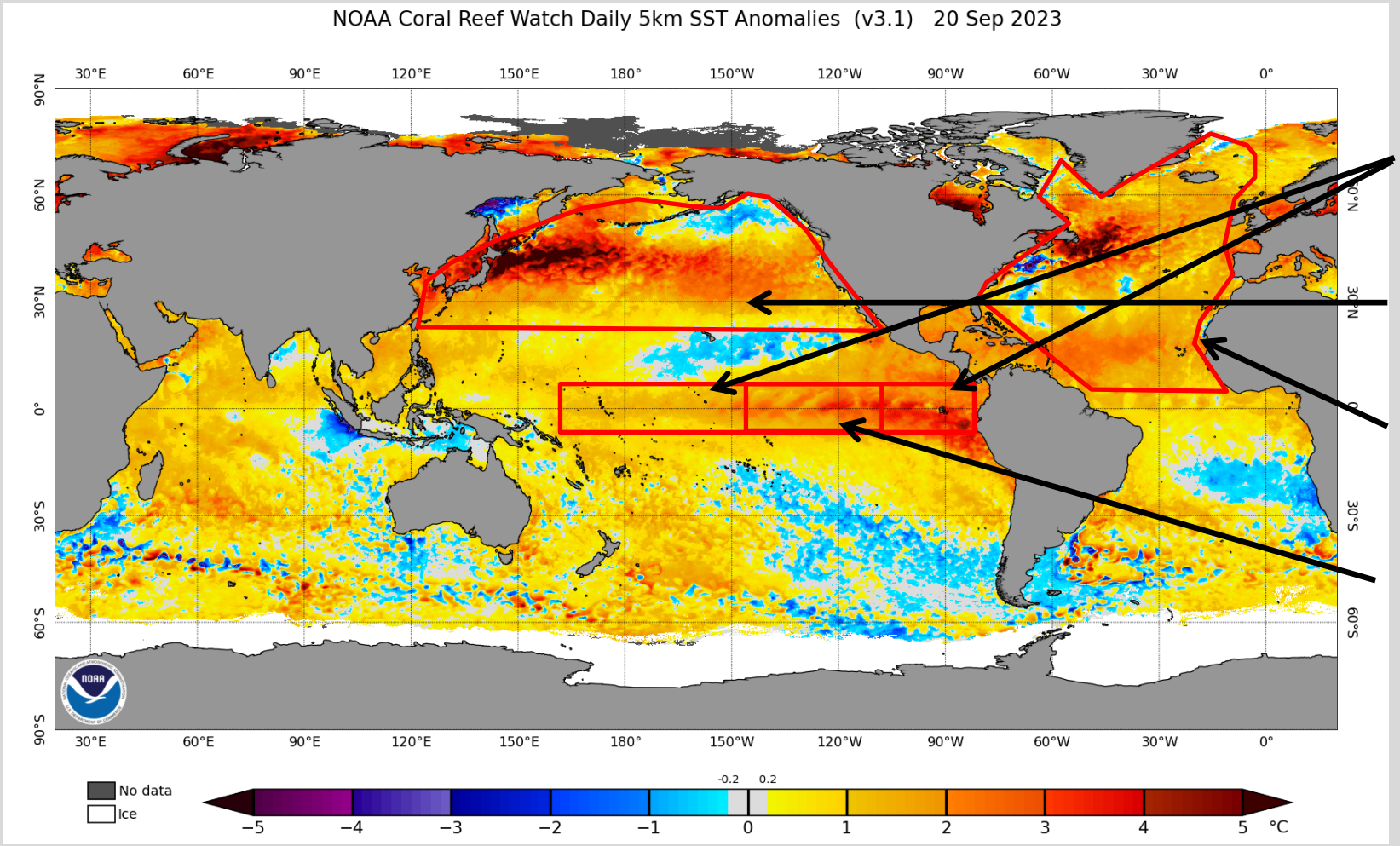


What about the role of climate change on ENSO and more specifically, this summer's extreme heat? The graphics above are perhaps the best way to illustrate climate change's influence on ENSO. "One manifestation of this amplified cycle is that strong El Niño and La Niña events are becoming stronger and more frequent, just as we've observed in the more recent historical record. The big events pack the most punch, so even though 10% doesn't sound like much, it juices up the strongest and most societally relevant year-to-year climate fluctuation on the planet. Combined with the other ways global warming has affected ENSO impacts (footnote #4), this amplified cycle translates into more extreme and frequent ENSO-linked droughts, floods, heat waves, wildfires and severe storms like we observed during the recent triple dip La Niña that ended last March and the major 2015-16 El Niño a few years ago." Michael Mcphaden – NOAA PMEL https://www.climate.gov/news-features/blogs/enso/has-climate-change-already-affected-enso

2023 Fall Outlook

For Northern & Central New Mexico

Albuquerque
WEATHER FORECAST OFFICE



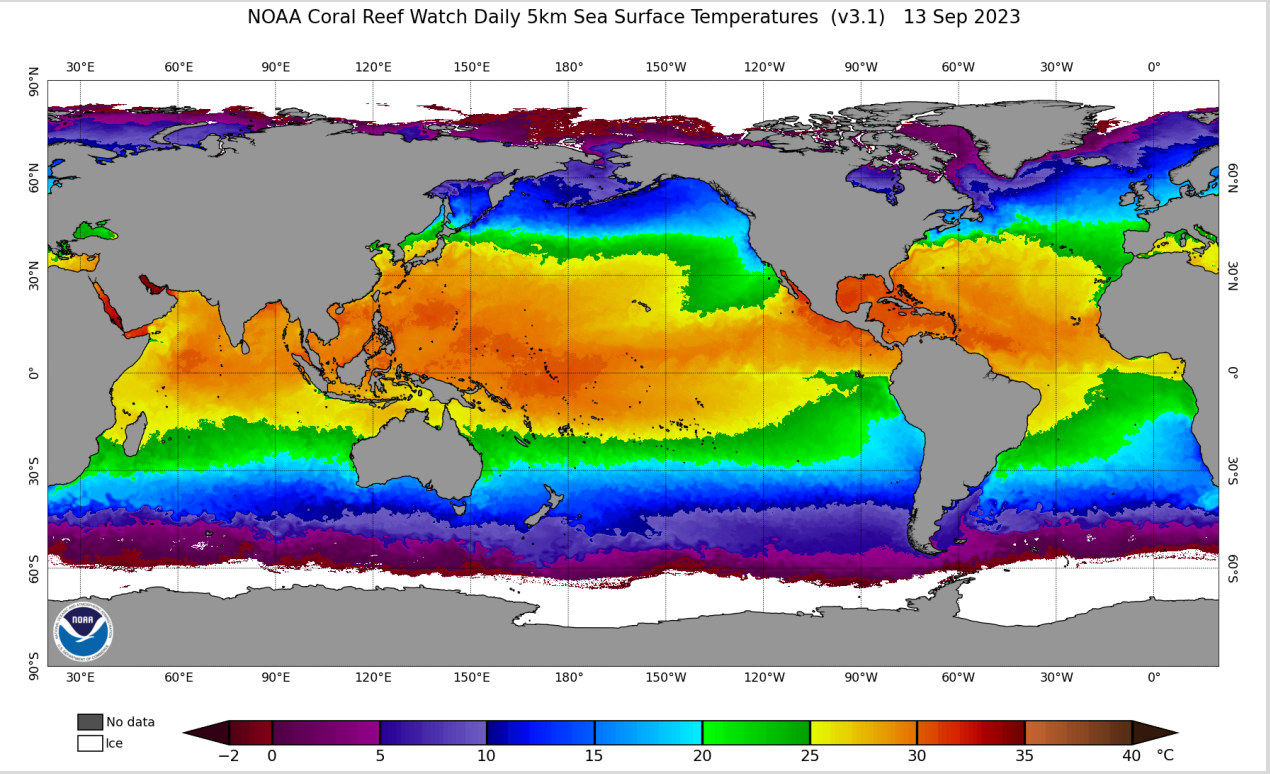
- Multivariate ENSO Index (**MEI**) for JUL-AUG 2023: +**0.4**
- Pacific Decadal Oscillation (**PDO**) for JUL 2023: **-1.86**
- Atlantic Multidecadal Oscillation (**AMO**) for JUL 2023: +**1.40**
- Oceanic Niño Index (**ONI**) (uses Niño 3.4 region - inner rectangle) for JJA 2023: **+1.1** (**0.5+** = El Niño)

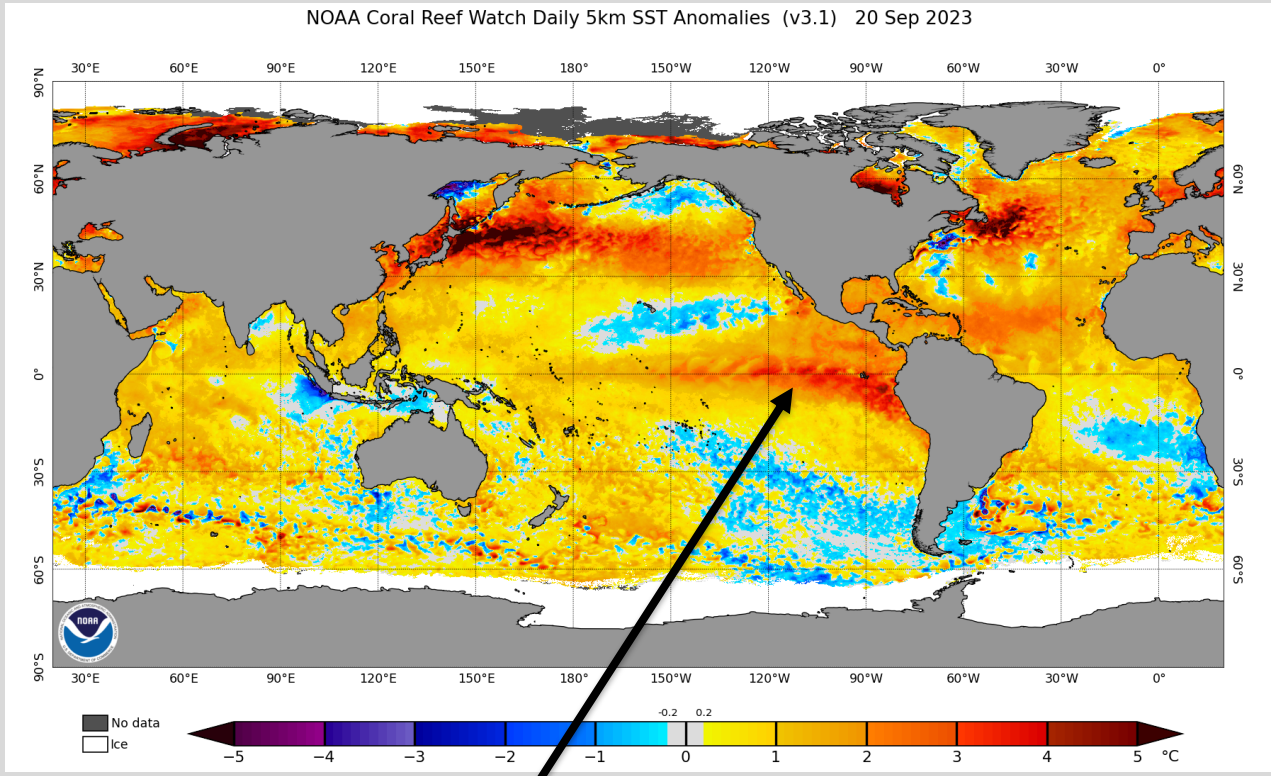
Latest weekly global SST anomalies showing an area of much warmer than average temperatures in the eastern equatorial Pacific in El Niño territory (+0.5°C or warmer than average in Niño 3.4 region for 3 month period). Also note the large expanses of well above average SSTs in the northern hemisphere.

2023 Fall Outlook

For Northern & Central New Mexico

Albuquerque
WEATHER FORECAST OFFICE



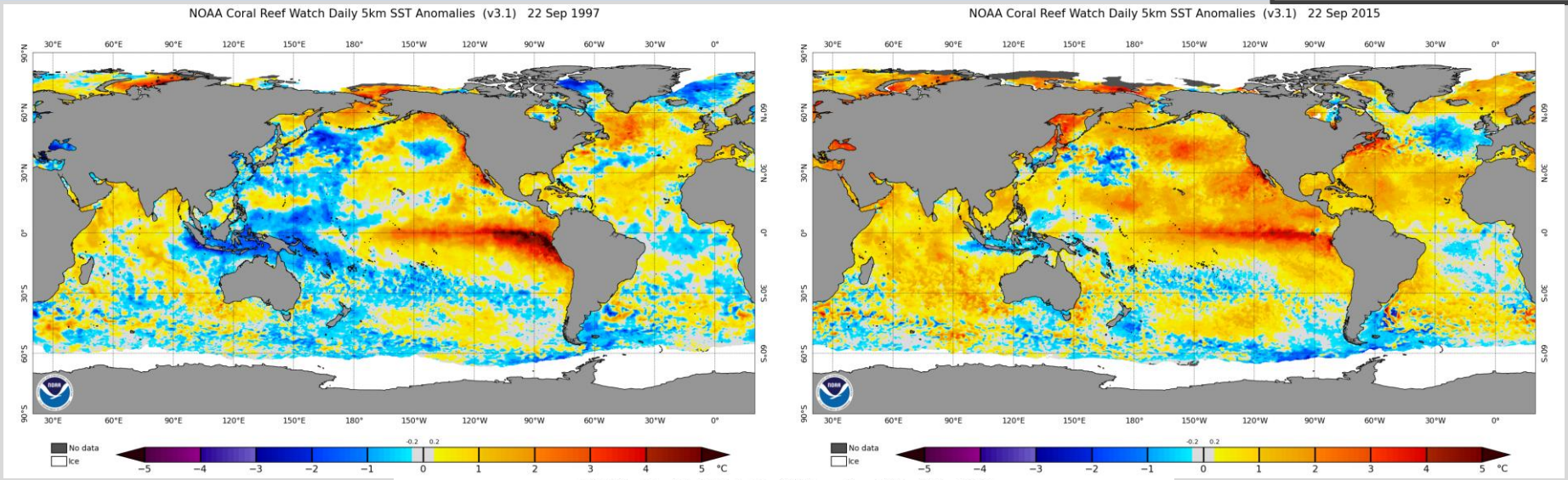


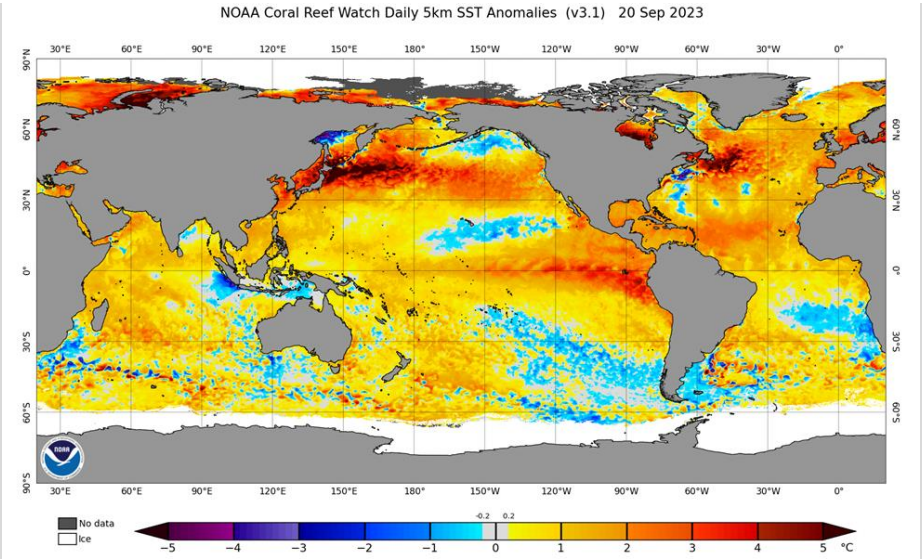
Sea surface temperatures (SSTs) on the left with difference from average SSTs on right. El Niño is very evident along with other areas of expansive well above average SSTs in the northern hemisphere.

2023 Fall Outlook

For Northern & Central New Mexico

Albuquerque
WEATHER FORECAST OFFICE



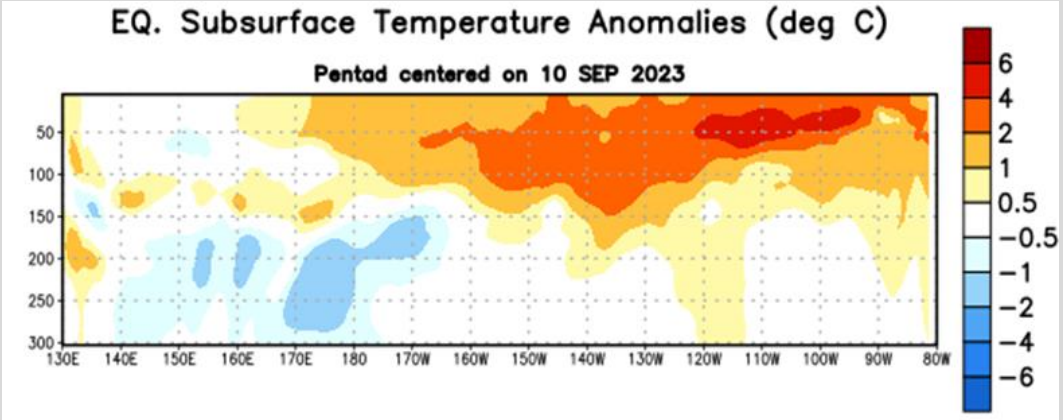


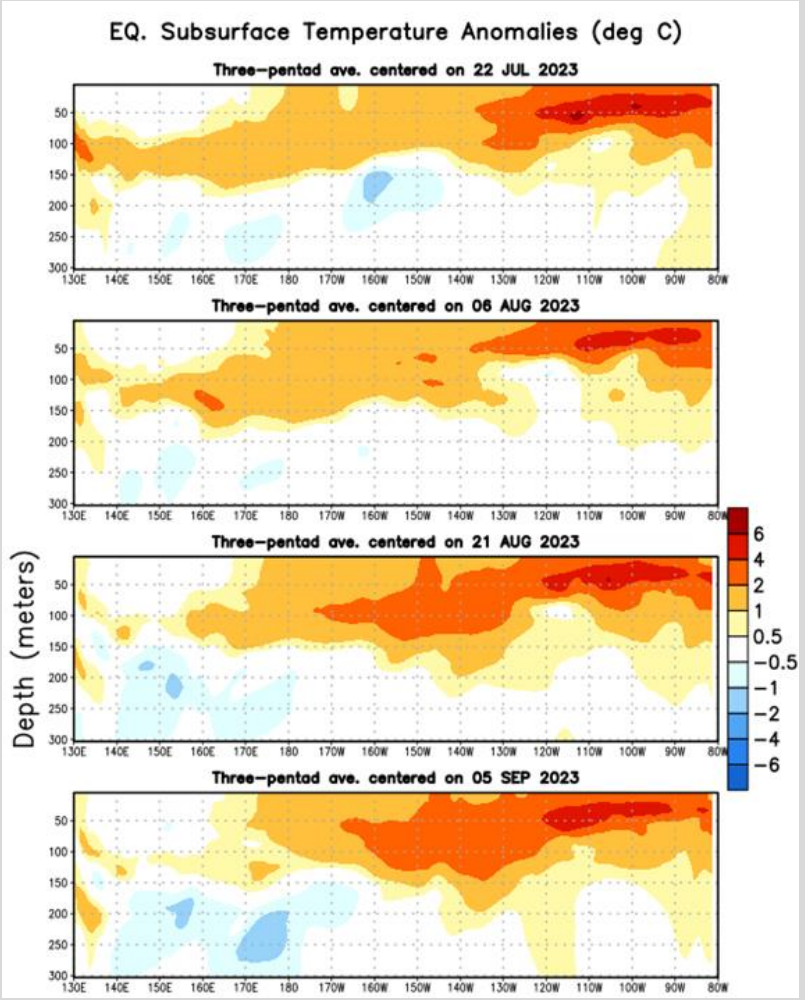
Comparing this year's El Niño to past strong events. SST gradients or difference from average are notably different when comparing 2023 to past events.

2023 Fall Outlook

For Northern & Central New Mexico

Albuquerque
WEATHER FORECAST OFFICE



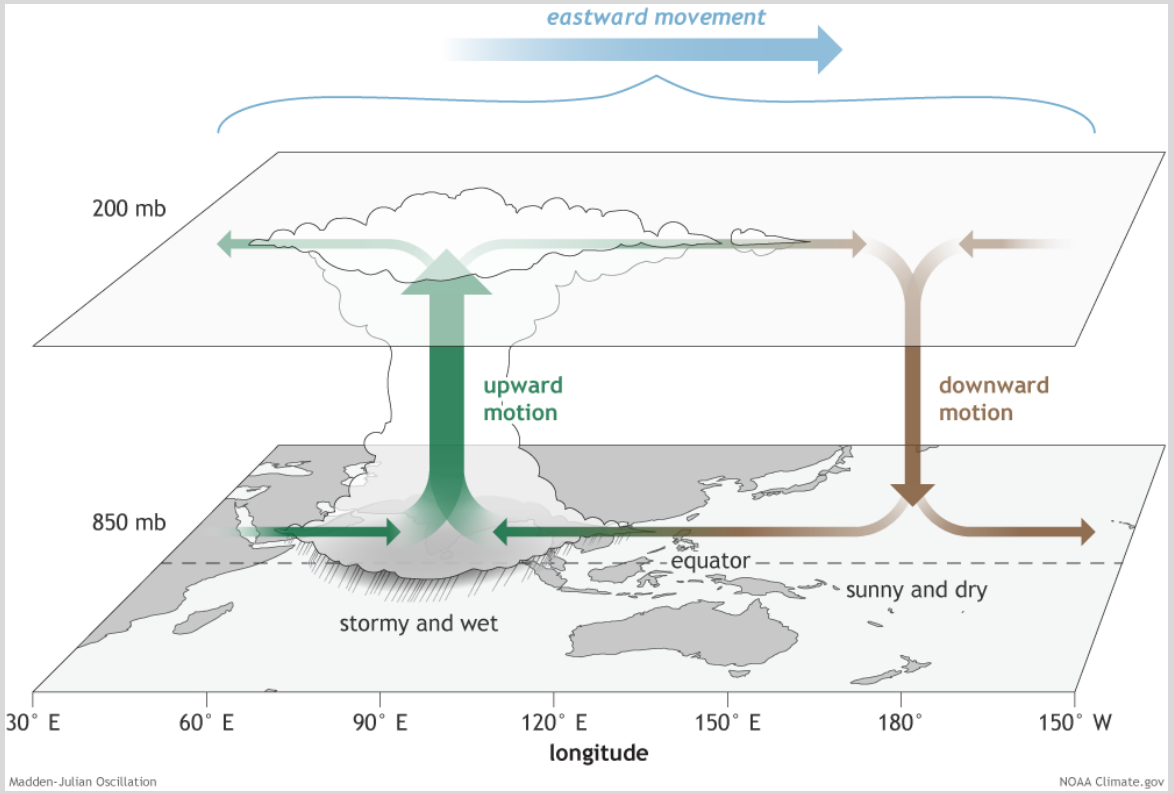


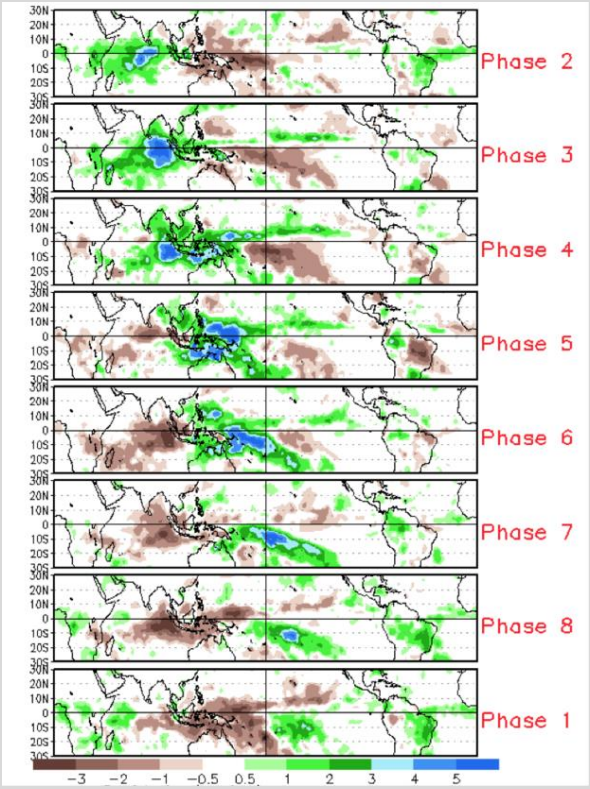
Positive subsurface temperature anomalies weakened in the western equatorial Pacific and near 120W at 50-300m.

2023 Fall Outlook

For Northern & Central New Mexico

Albuquerque
WEATHER FORECAST OFFICE



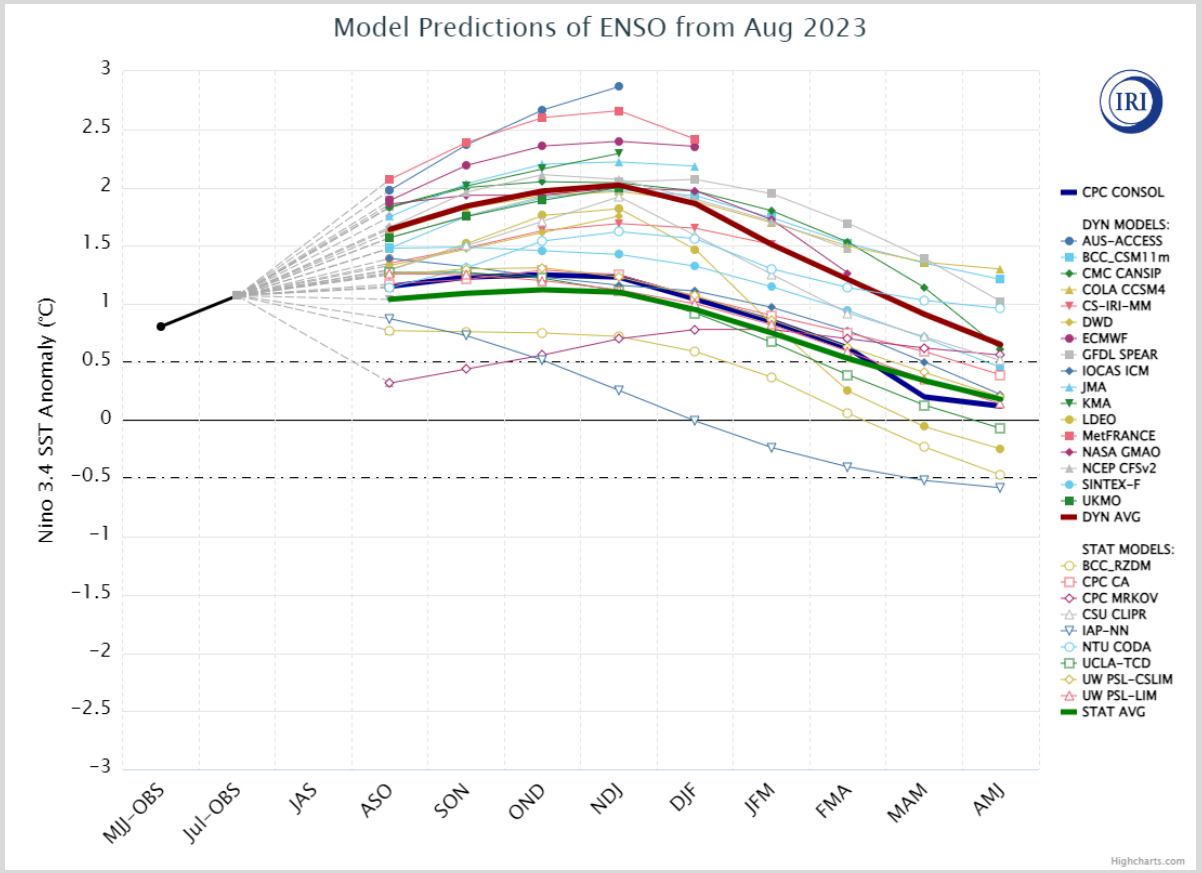


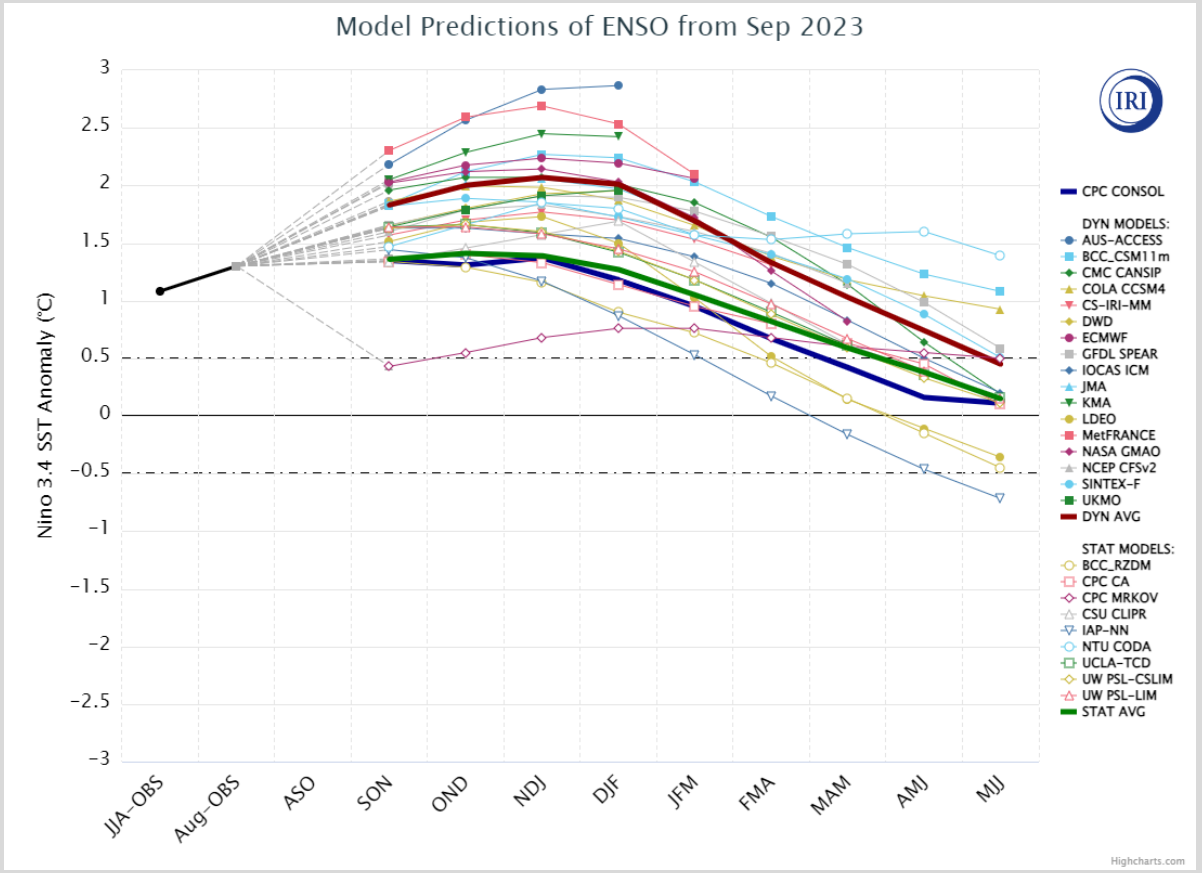
The Madden-Julian Oscillation (MJO) is an area of enhanced thunderstorms that travels around the world every 30 to 60 days from west to east along/near the equator. Ahead and behind the active stormy area are areas of suppressed convection and drier conditions. The MJO affects near-surface wind patterns, because the rising air in the stormy region cause surface winds to blow toward the active area. During a developing La Niña, the trade winds are stronger than average, helping to bring cooler waters up to the surface. When La Niña comes to an end, the enhanced trade winds weaken, allowing warmer water to return to the eastern Pacific and either neutral conditions or an El Niño to develop. This warmer water allow thunderstorms related to the MJO to continue eastward into the EPAC, influencing the jet stream. Typically, El Niño results in above average precipitation in New Mexico during the cool season. This year, however, El Niño related convection is forecast to keep the monsoon high (sinking air side of Hadley and Ferrell Cells) too strong for MJO related convection to overcome (i.e., destructive interference of ENSO base state) in September. October now looks like the timeframe when the MJO could result in constructive interference with ENSO.

2023 Fall Outlook

For Northern & Central New Mexico

Albuquerque
WEATHER FORECAST OFFICE



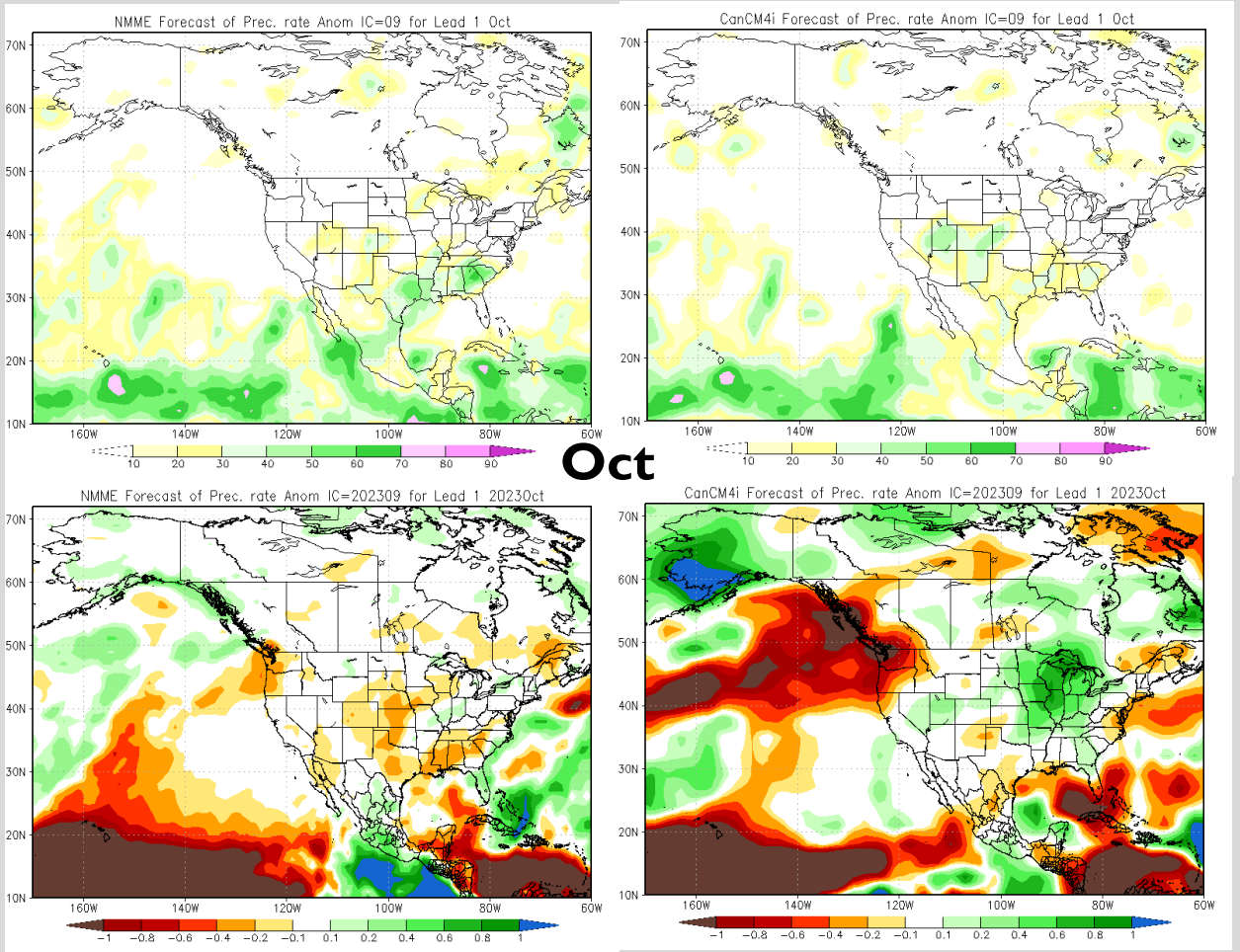


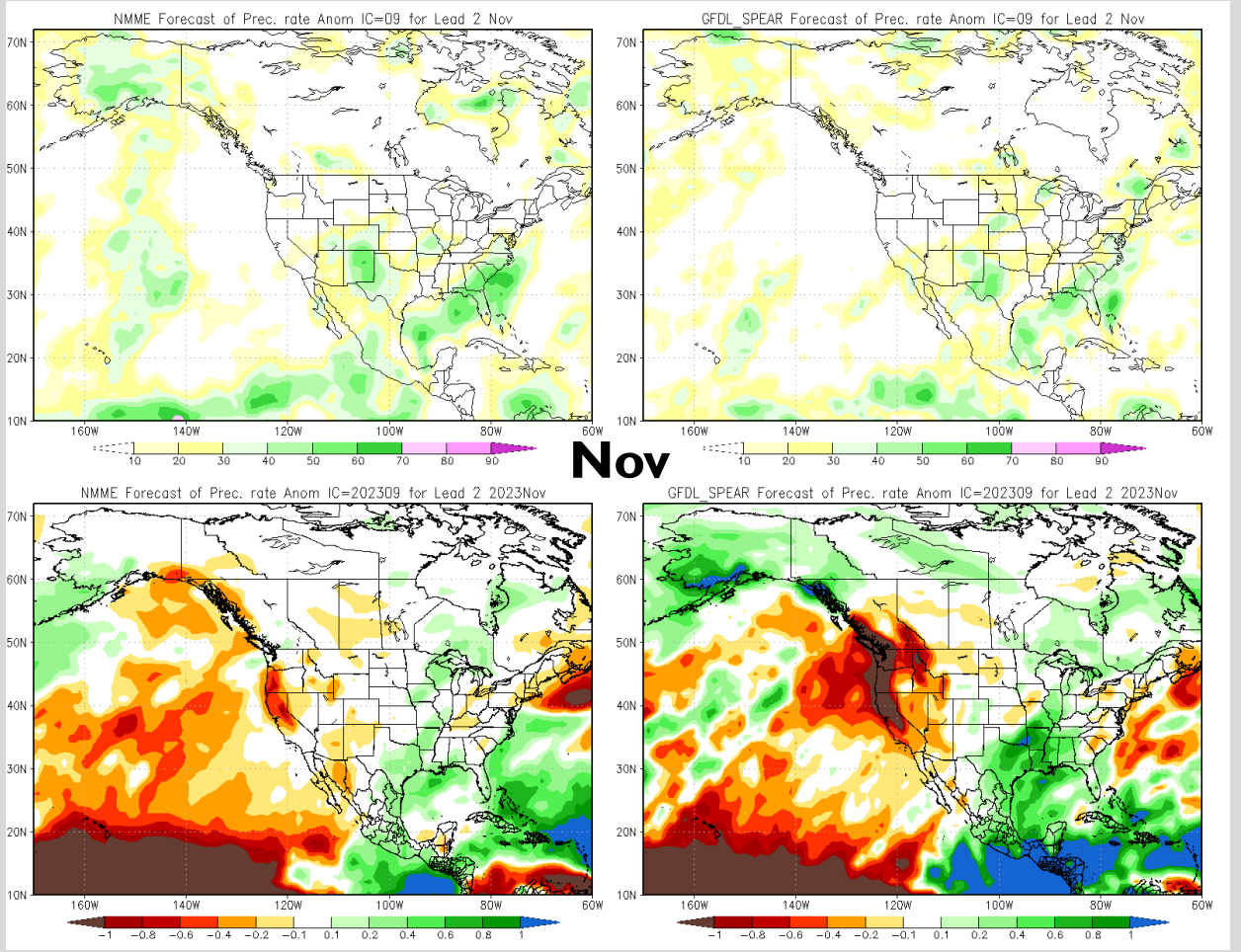
Model prediction of ENSO from August and September 2023. Dynamical model average for October, November and December is 2.0 C or a strong El Niño. SST model forecasts, however, keep El Niño mainly in the moderate range through spring 2024.

2023 Fall Outlook

For Northern & Central New Mexico

Albuquerque
WEATHER FORECAST OFFICE



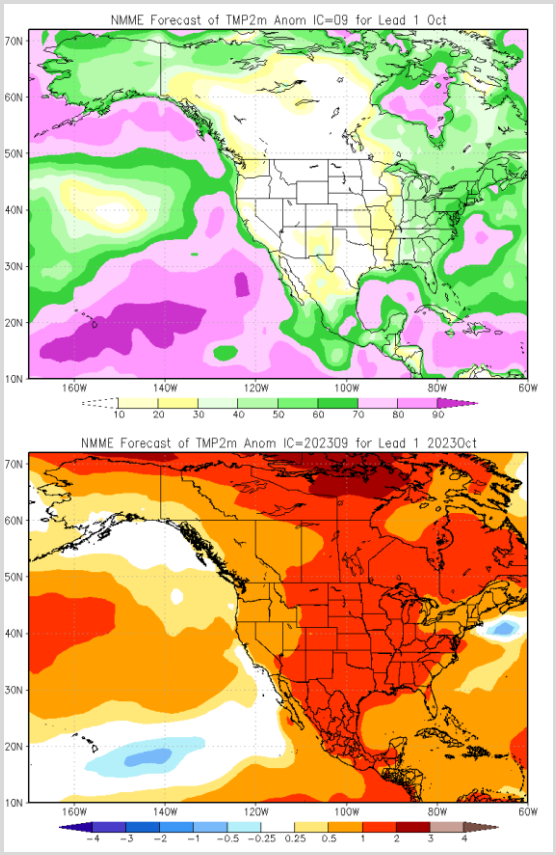


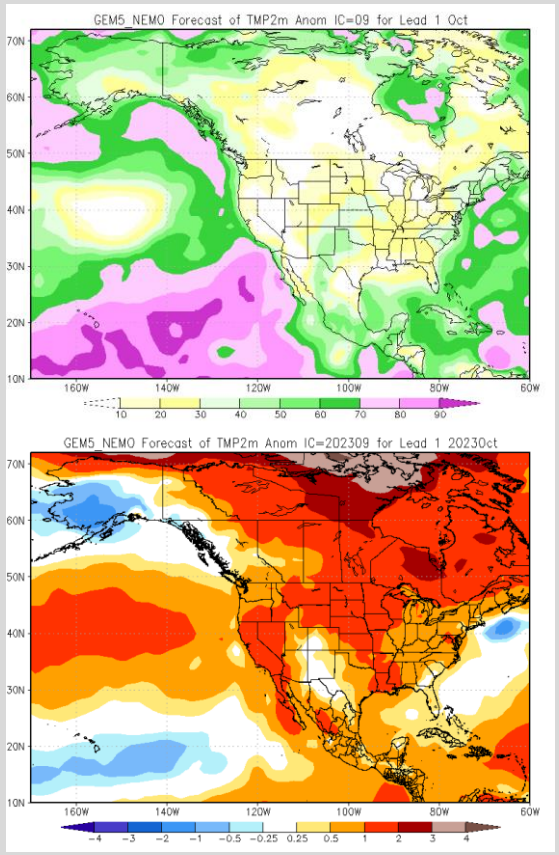
Model precipitation rate anomaly from the two U.S. climate models that have the highest forecast skill percentages (top row), the North American Multi-Model Ensemble (NMME) and the Canadian (CanCM4i) for October, and the GFDL_SPEAR model for November. Both models show fair to good forecast skill for NM during October and November and are forecasting near to slightly below average precipitation.

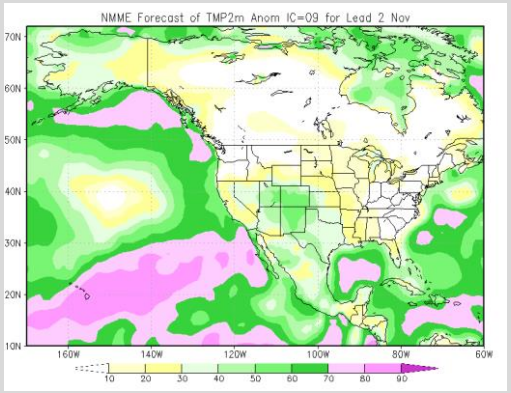
2023 Fall Outlook

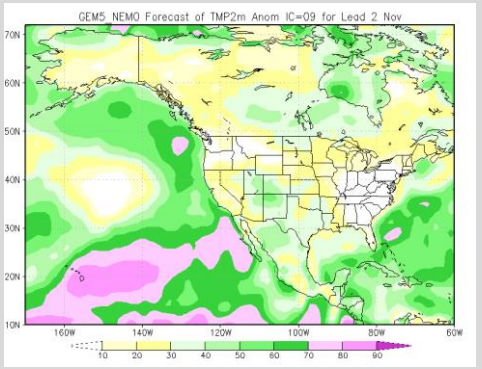
For Northern & Central New Mexico

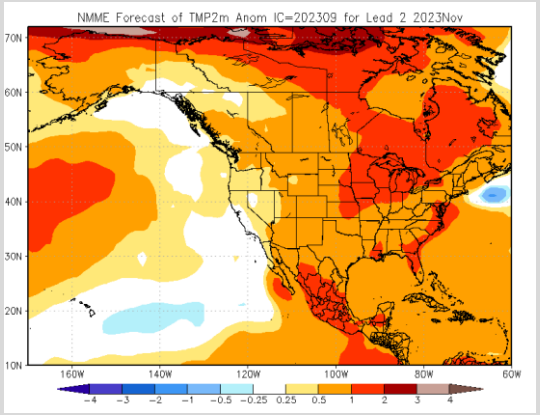
Albuquerque
WEATHER FORECAST OFFICE

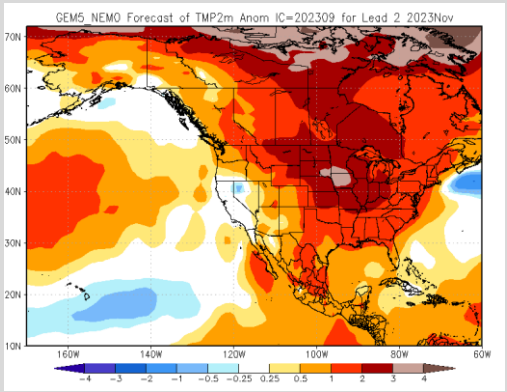










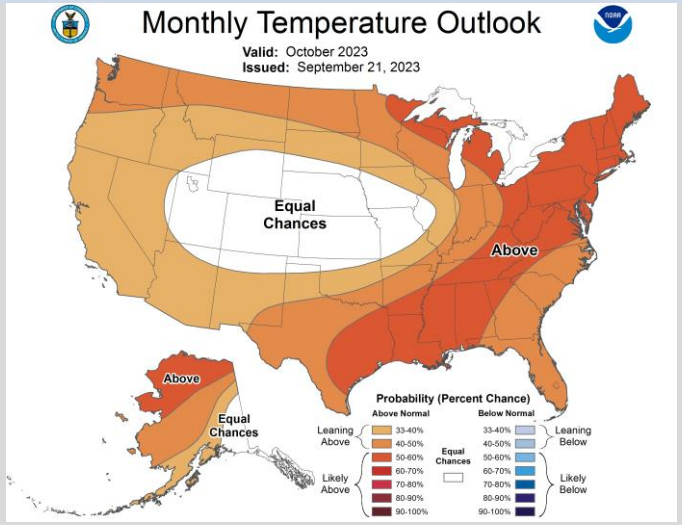


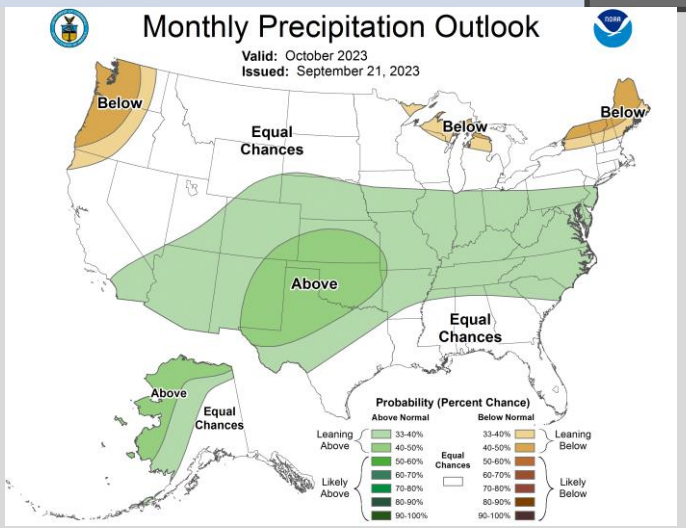
Temperature difference from average forecasts from the two climate models that have the highest temperature forecast skill (top row), the North American Multi-Model Ensemble (NMME) and GEM5_ NEMO model. Both model forecasts are predicting above t above average temperatures during October and November.

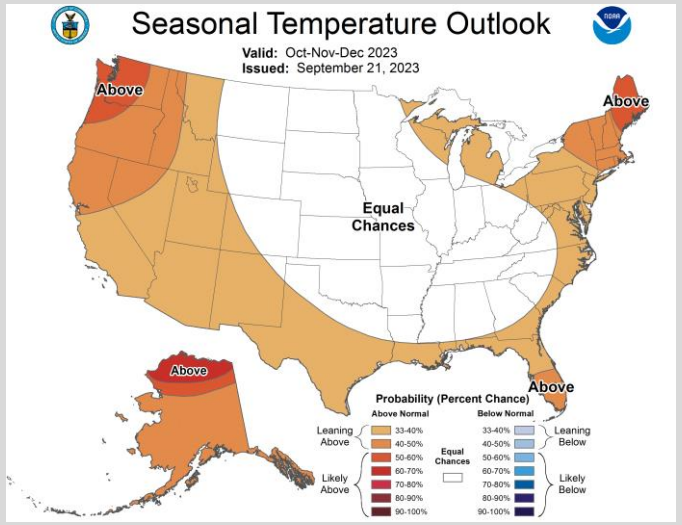
2023 Fall Outlook

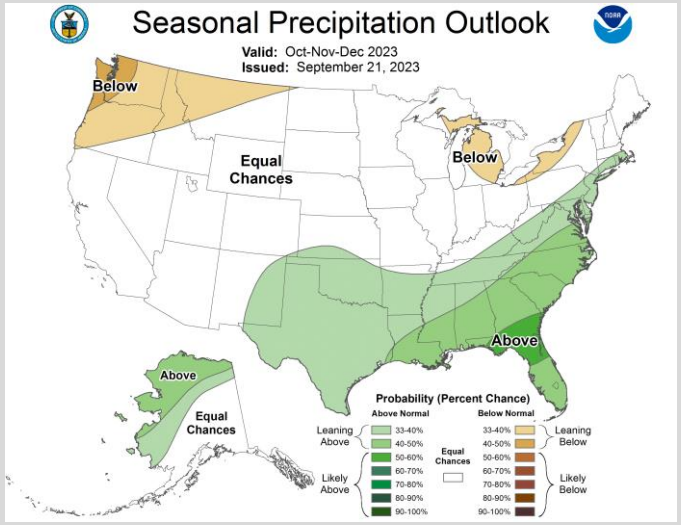
For Northern & Central New Mexico

Albuquerque
WEATHER FORECAST OFFICE









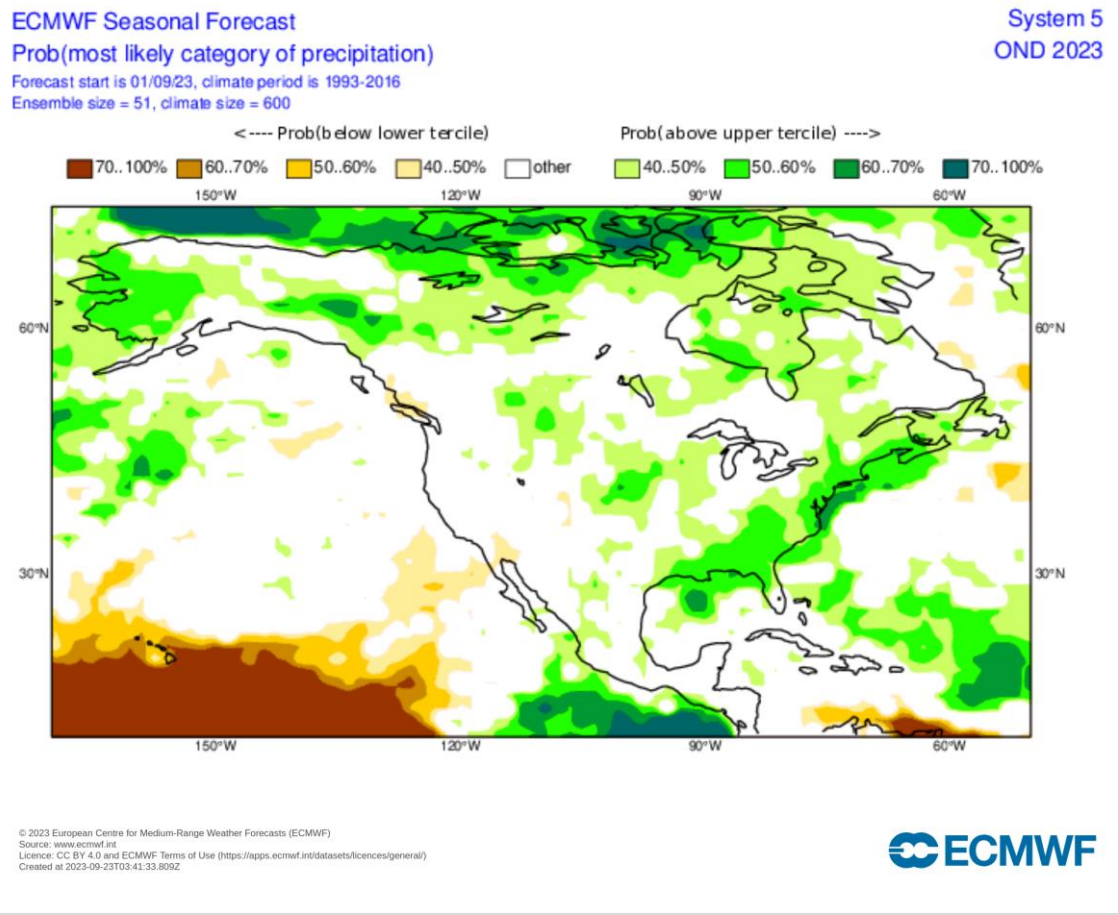
NWS's Climate Prediction Center's Official 2023 Climate Outlook for October and November showing probabilities favoring above average precipitation and slightly above average temperature in ON and OND.

2023 Fall Outlook

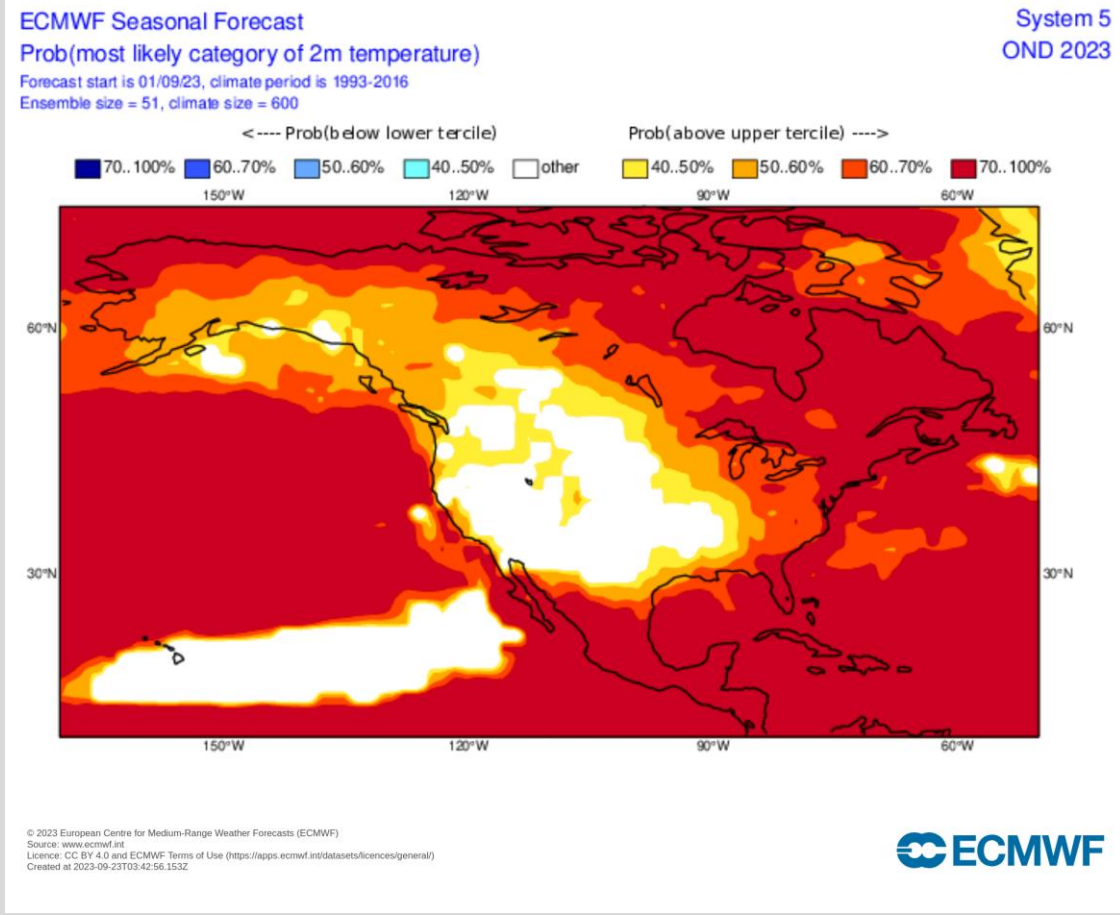
For Northern & Central New Mexico

Albuquerque
WEATHER FORECAST OFFICE

Precipitation – SEAS5



2m Temperature Anomaly – SEAS5

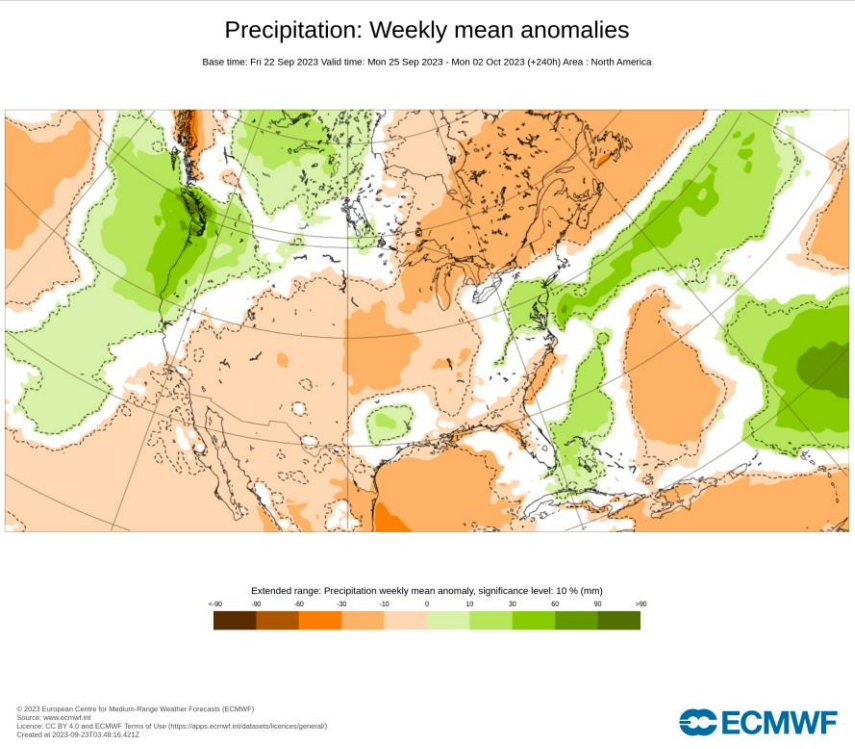


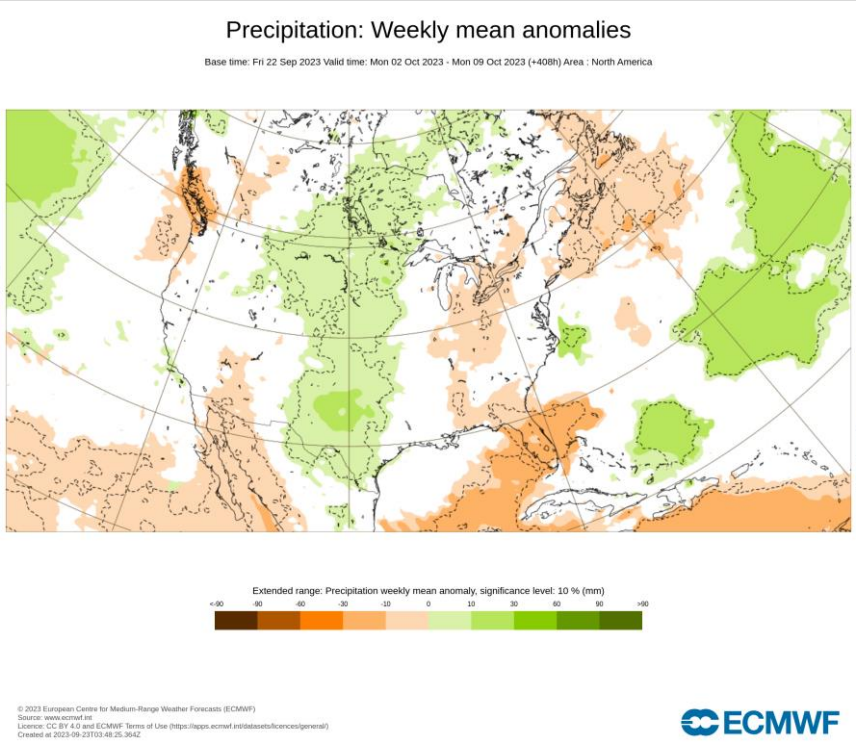
Seasonal precipitation and temperature difference from average forecast from the European Center for Medium Range Weather Forecasts (ECMWF) seasonal model forecasting near average fall precipitation and average temperatures.

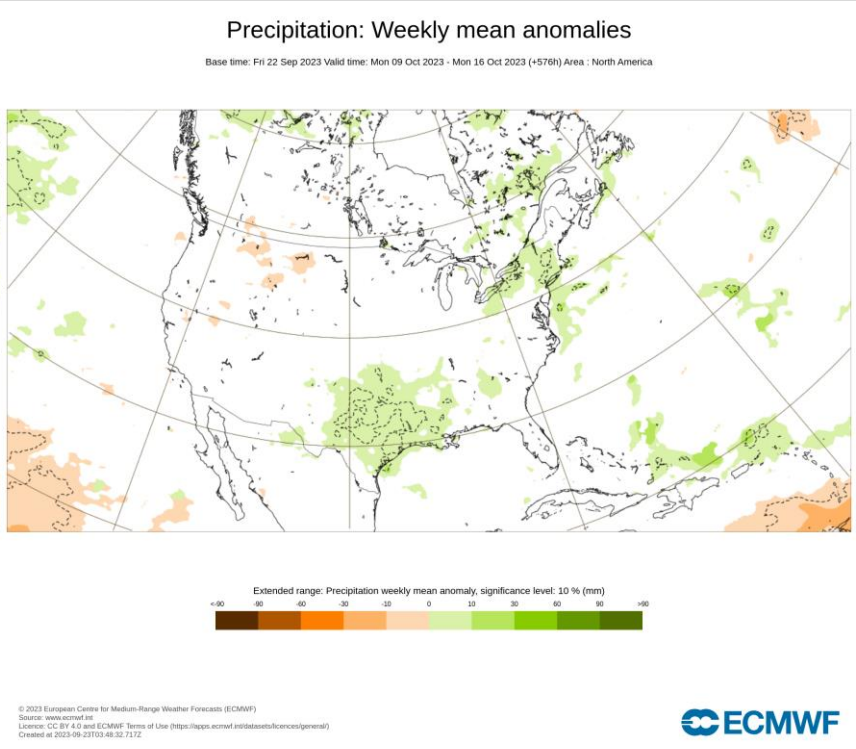
2023 Fall Outlook

For Northern & Central New Mexico

Albuquerque
WEATHER FORECAST OFFICE





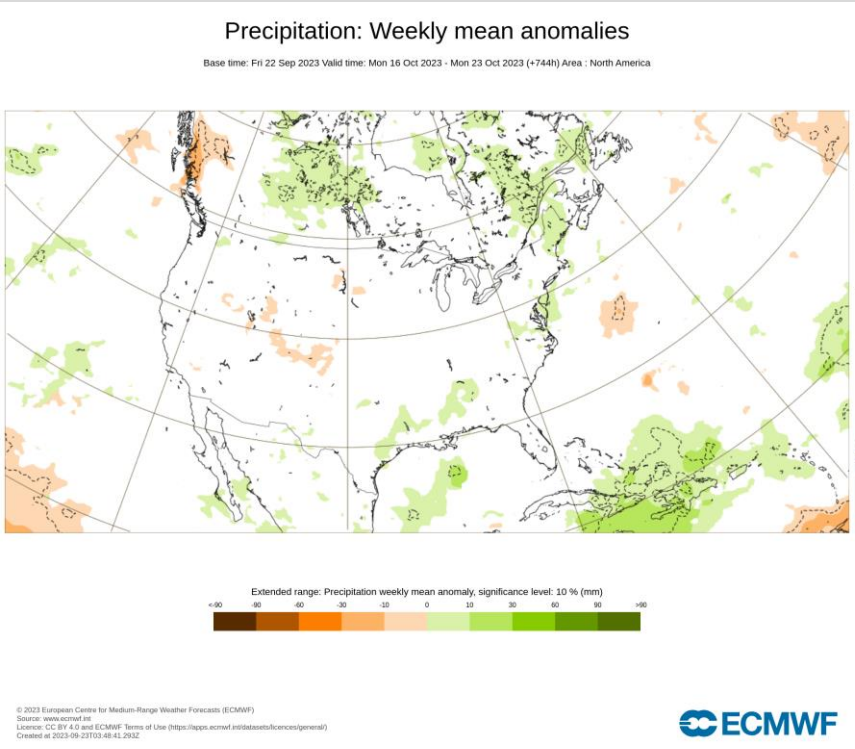


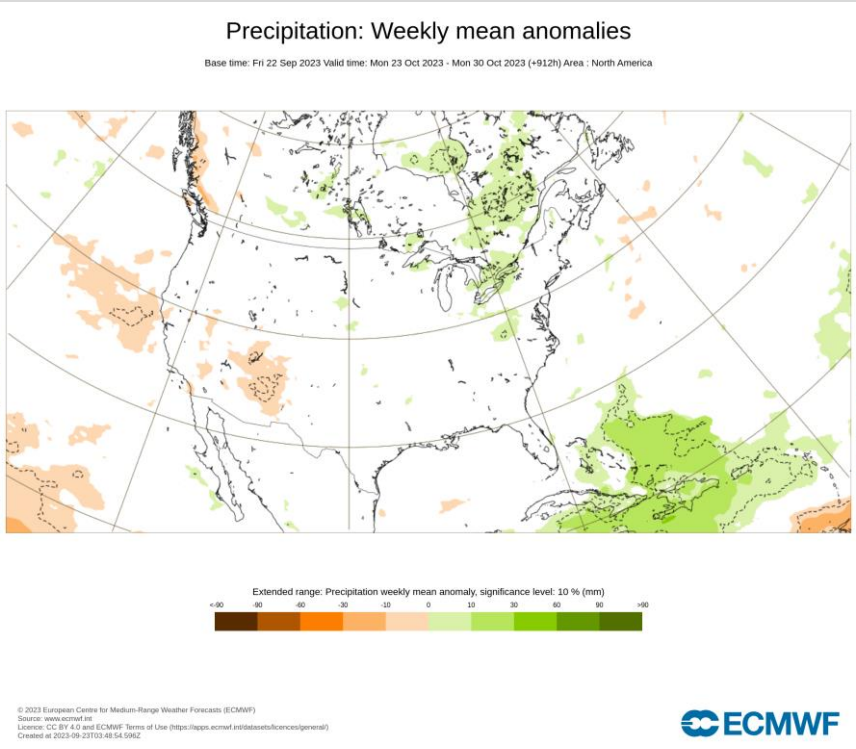
Weekly difference from average precipitation forecasts from the ECMWF (ENS) model. Eastern NM is favored for above average precipitation with much of the remainder of northern and central NM near average precipitation during late September through mid October.

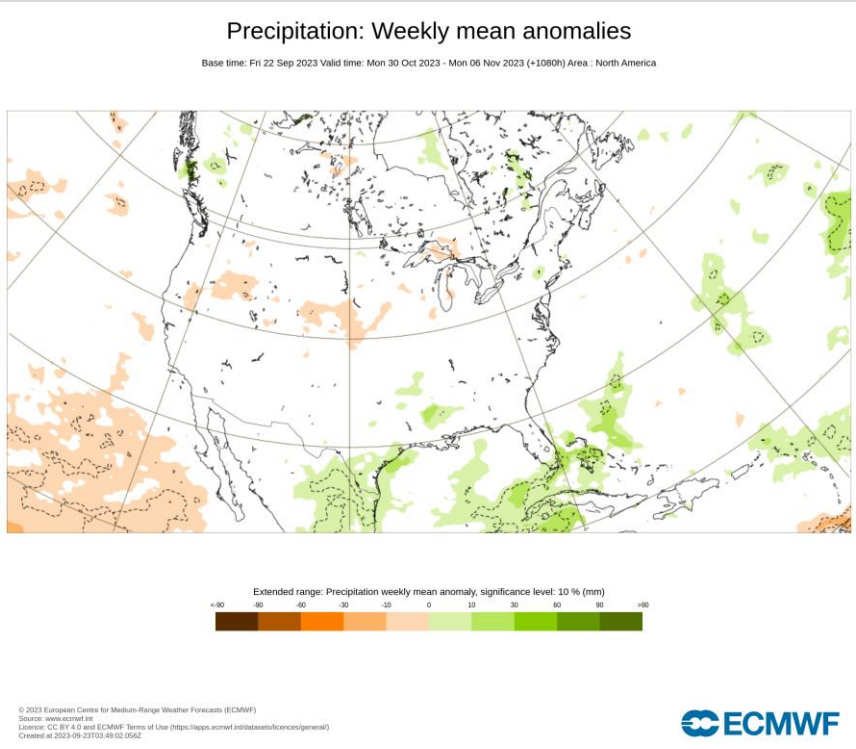
2023 Fall Outlook

For Northern & Central New Mexico

Albuquerque
WEATHER FORECAST OFFICE





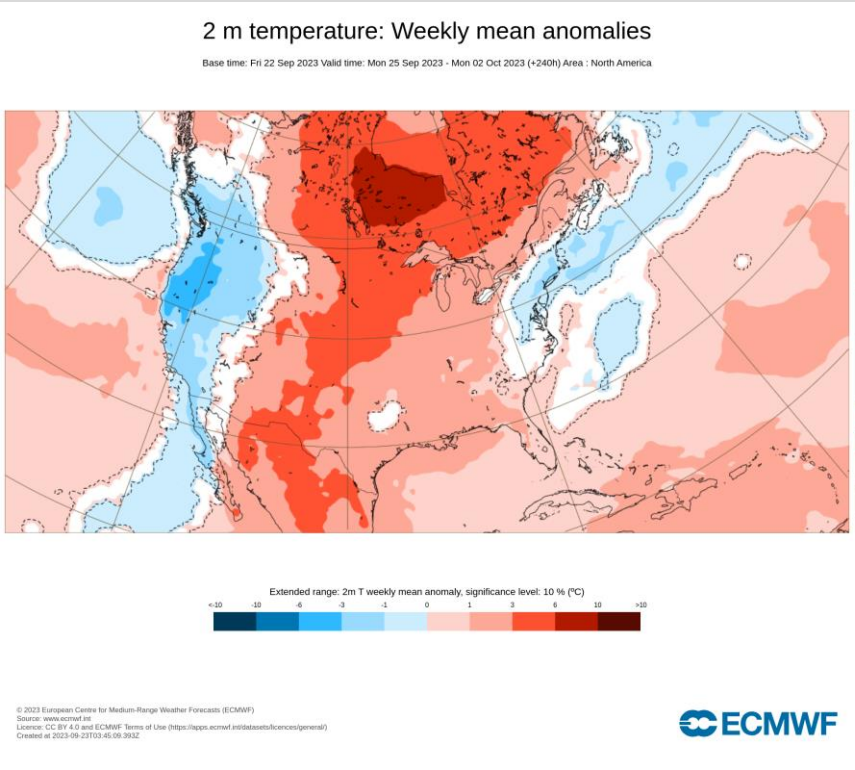


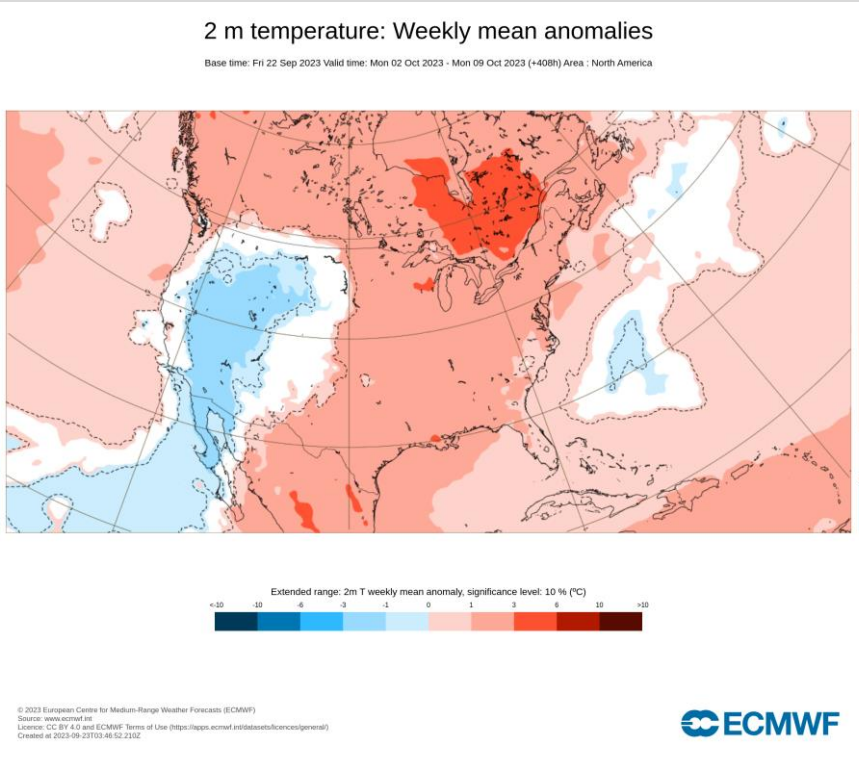
Weekly difference from average precipitation forecasts from the ECMWF for mid October through early November 2023. The ensemble model is forecasting near average October precipitation.

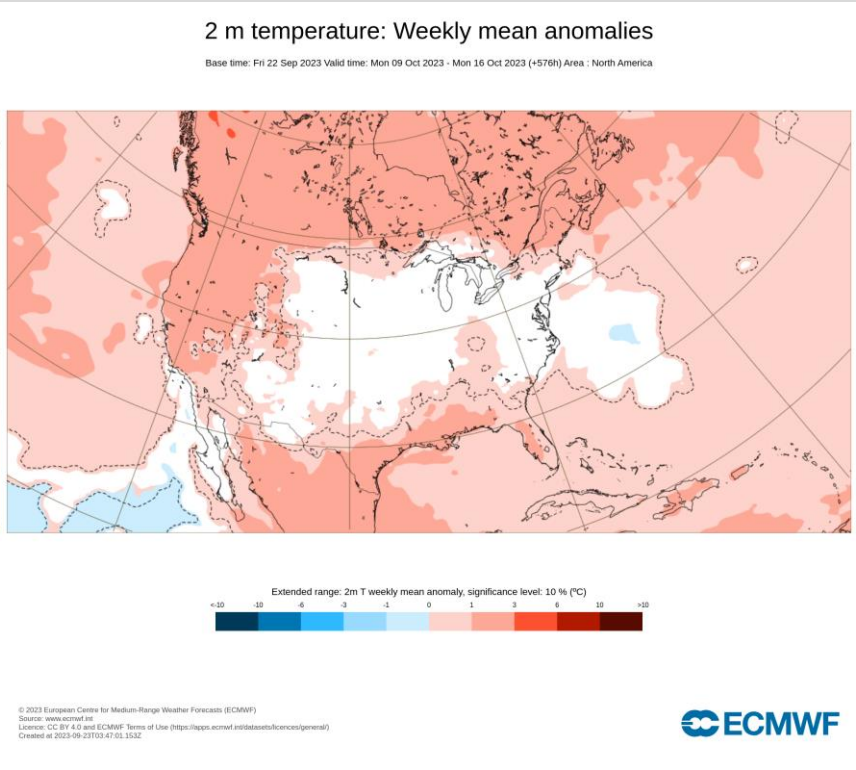
2023 Fall Outlook

For Northern & Central New Mexico

Albuquerque
WEATHER FORECAST OFFICE





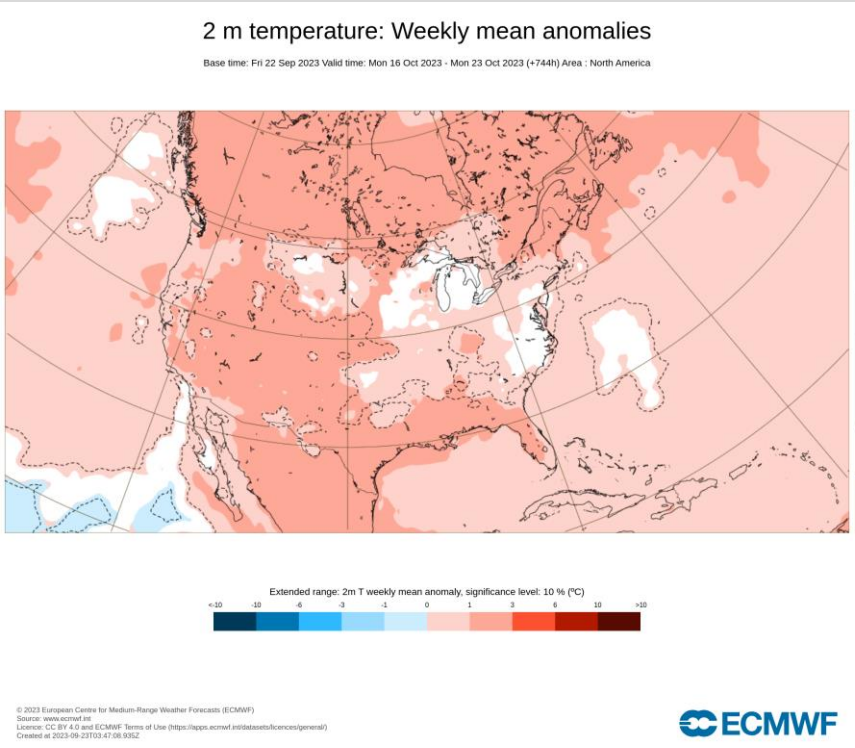


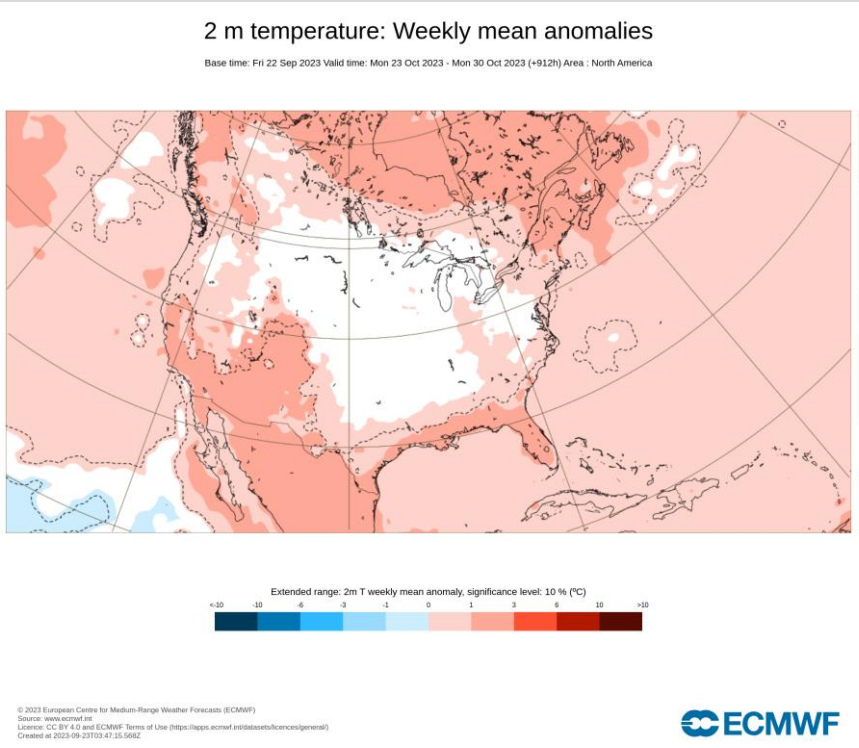
Weekly difference from average temperature forecasts from the European Center for Medium Range Weather Forecasts (ECMWF) for much of October. ECMWF's extended ensemble model keeps the Southwest U.S. warmer to much warmer than average through early October, trending cooler during the first full week of the month.

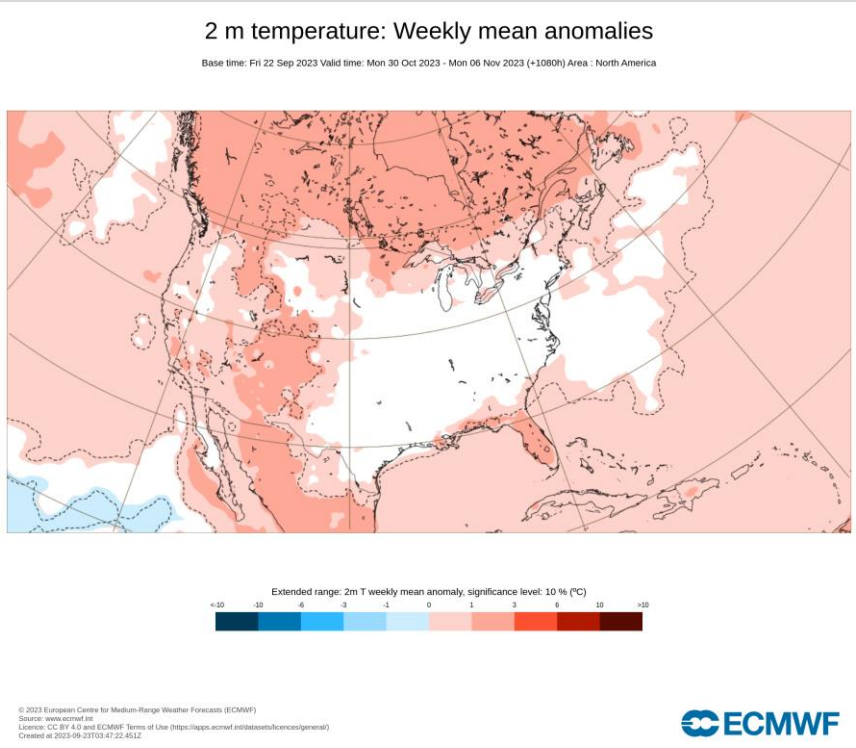
2023 Fall Outlook

For Northern & Central New Mexico

Albuquerque
WEATHER FORECAST OFFICE





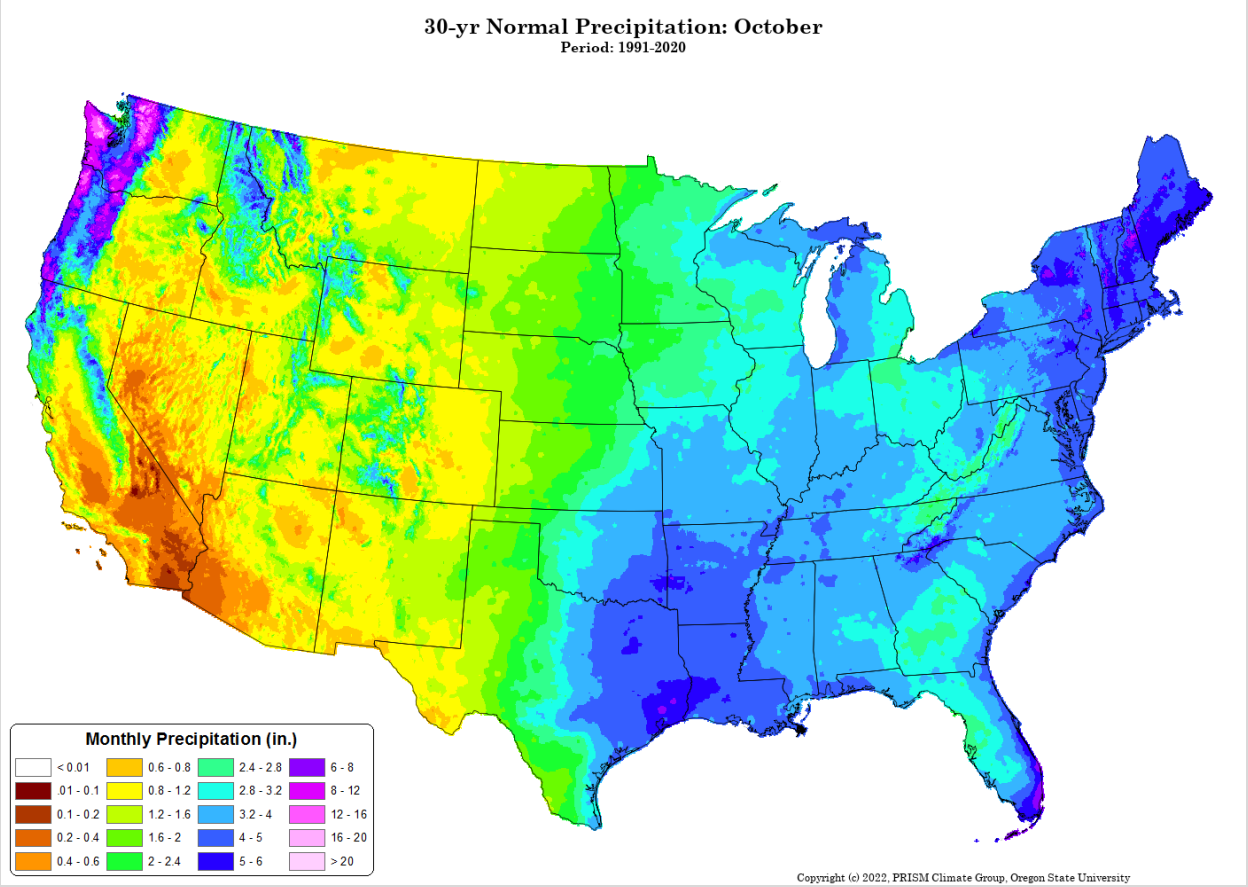


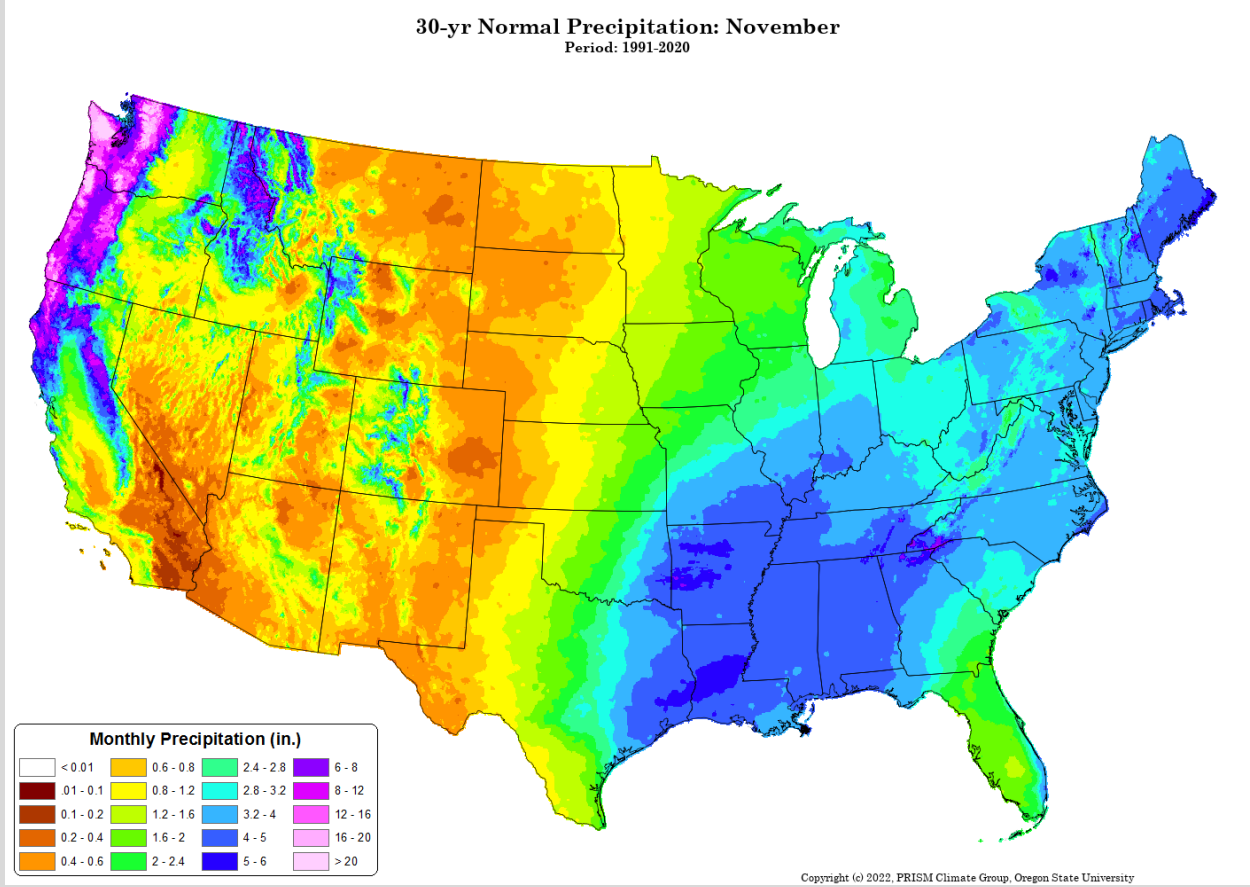
Weekly difference from average temperature forecasts from the European Center for Medium Range Weather Forecasts (ECMWF) for mid October through early November. ECMWF's extended ensemble model keeps the Southwest U.S. slightly warmer than average through early November.

2023 Fall Outlook

For Northern & Central New Mexico

Albuquerque
WEATHER FORECAST OFFICE





What is average or normal precipitation during fall? These charts show normal or average precipitation for each month during October and November. During the fall months, heavier precipitation gradually shifts to the mountains.

2023 Fall Outlook

For Northern & Central New Mexico

Albuquerque
WEATHER FORECAST OFFICE

October: Forecast confidence is high for near average precipitation central and west and above average eastern plains. Forecast confidence is also high for near to slightly above average. Forecast confidence is low to moderate for a relatively abrupt change sometime in late October toward wetter and cooler than average weather thanks to the Madden-Julian Oscillation (MJO) teaming up with El Niño.

November: Forecast confidence is moderate for near to slightly above average precipitation and near average temperature.

Notable items: MJO remains relatively weak in fall during a moderate to strong El Niño. Montior its strength in October.

Comparing this year's El Niño to past events is tricky business given that the state of the world's ocean's are different (slide 7)

2023 Fall Outlook

For Northern & Central New Mexico

Albuquerque
WEATHER FORECAST OFFICE

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