2024 Fall Outlook

For Northern & Central New Mexico

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Robert Pody – Magdalena Mountains


Robert Hill Cottonwood & Sandhill Cranes Bosque del Apache Wildlife Refuge


VisitAlbuquerque.com


Oscar Rafael – Hyde Park


Tom Kllroy USDA Forest Service - Fourth of July Canyon


Cita Dasheno – Hyde Park


US Forest Service -Mountainair Ranger District Cibola NF

After a wet June and near average monsoon, what will a weak La Niña mean for fall 2024 in central and northern NM?

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ENSO Alert System Status: La Niña Watch

ENSO-neutral conditions are present.

Equatorial sea surface temperatures (SSTs) are above average in the western Pacific and near-to-below-average in the eastern Pacific Ocean.

ENSO-neutral is expected to continue for the next several months, with La Niña favored to emerge during September-November (66% chance) and persist through the Northern Hemisphere winter 2024-25 (74% chance during November-January).

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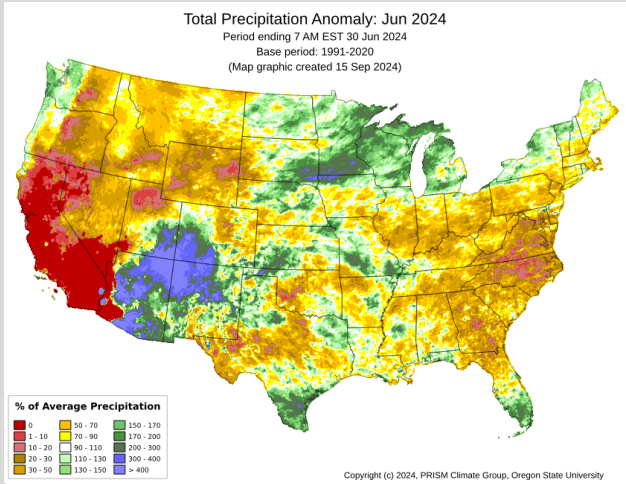

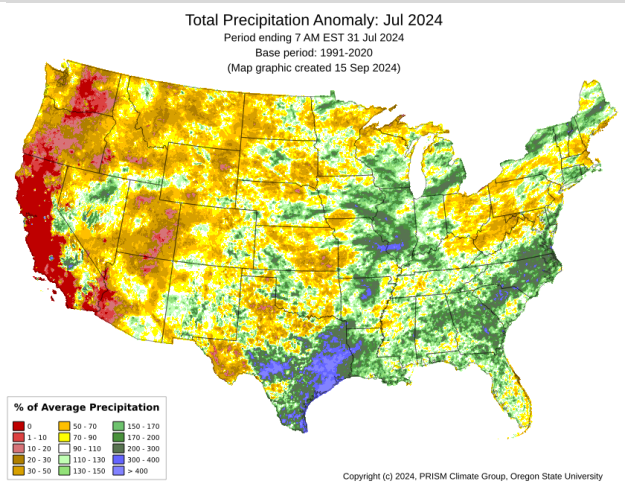

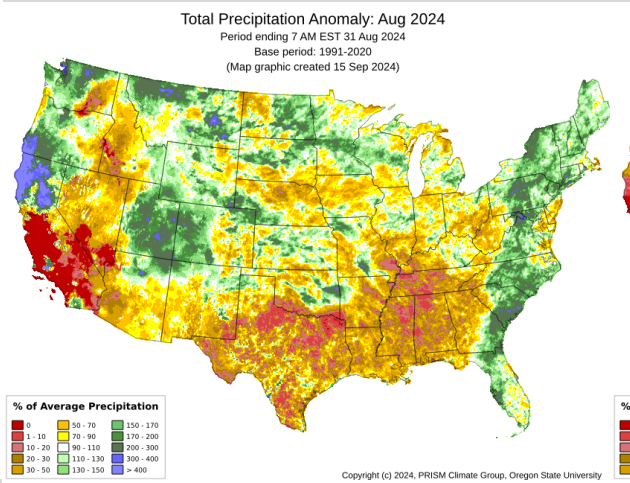

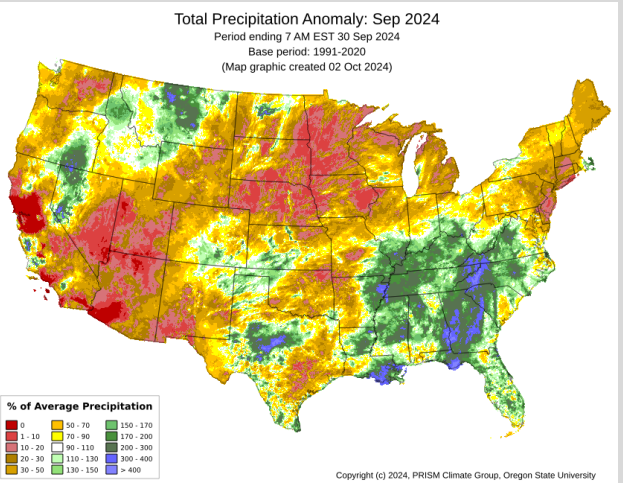

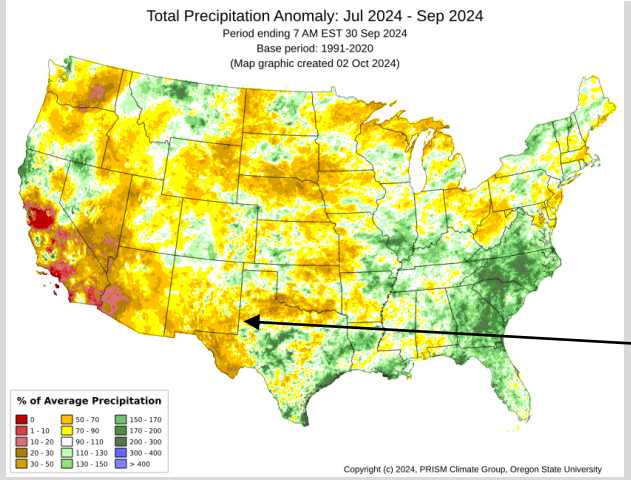

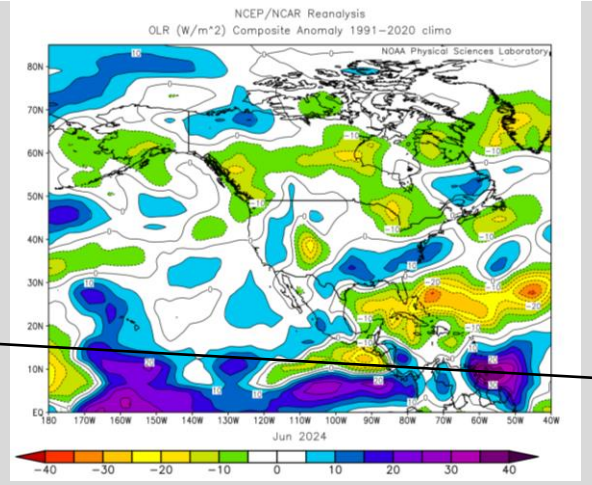

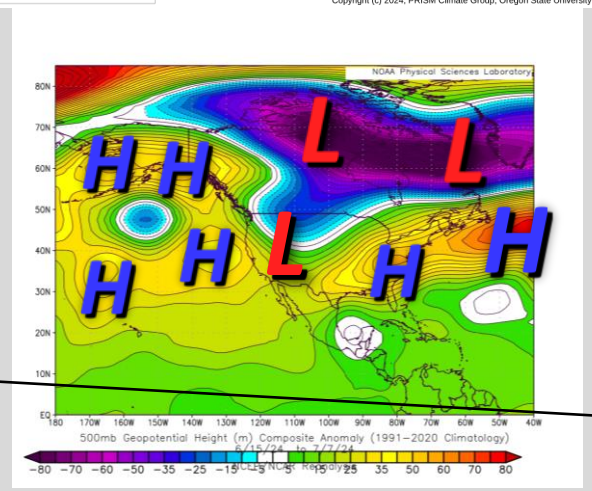

Without the moist "Junesoon" climate pattern, this year's monsoon (July through September for central & northern NM when the monsoon high is present) would have been mainly below average.

Here is a summary of the warm season precipitation difference in 2024 compared to the 1991-2020 average by month, along with the Outgoing Longwave Radiation (OLR) for June 2024 and 500 mb geopotential heights difference from average plots from mid-June through the first week of July 2024. The above-average rainfall in June 2024 over much of the northwest half of the state was not related to the North American Monsoon (NAM). This rainfall was due to a meteorological setup similar to the monsoon, but it was actually much stronger than the typical Bermuda High, thanks to the deep thunderstorm activity in the Gulf of Mexico and Caribbean. This weather pattern occurs after a strong El Niño climate pattern fades and rapid cooling in the equatorial eastern Pacific Ocean begins. It may need a specific name (e.g., "Junesoon") to avoid confusion with the NAM. This pattern increases the probability of severe weather for much of NM compared to the NAM and typically only appears after a moderate to super El Niño climate pattern followed by moderate to rapid cooling in spring and early summer.

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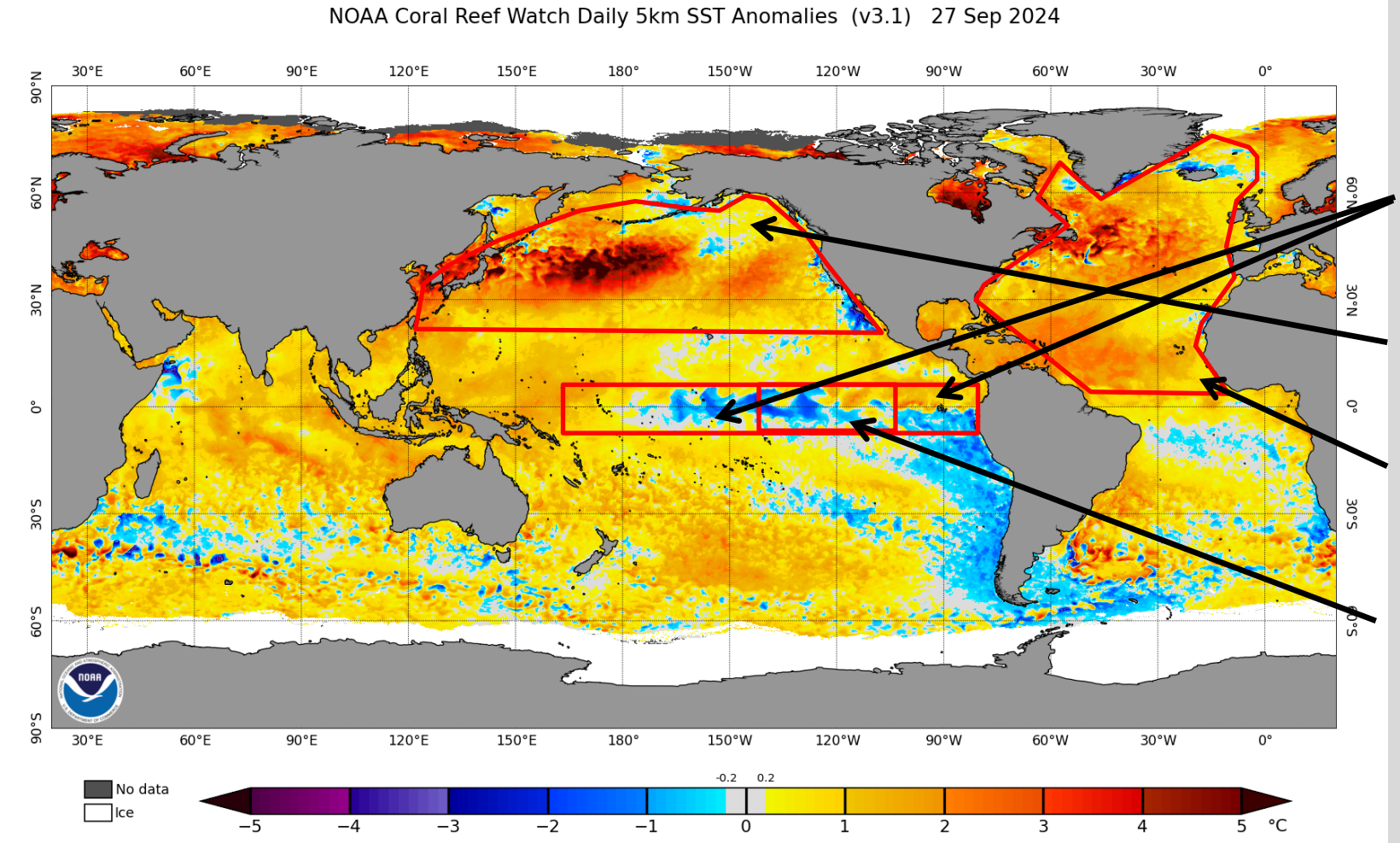

- Multivariate ENSO Index (**MEI**) for JUL-AUG 2024: **-0.7**
- Pacific Decadal Oscillation (**PDO**) for AUG 2024: **-1.85**
- Atlantic Multidecadal Oscillation (**AMO**) for AUG 2024: **+1.26**
- Oceanic Niño Index (**ONI**) (uses Niño 3.4 region - inner rectangle) for JJA 2024: **+0.1** (**+0.5C** = El Niño, La Niña = **-0.5C**)

Latest weekly global SST anomalies showing an area of cooler than is typical temperatures in the eastern equatorial Pacific nearing La Niña territory (-0.5ºC or cooler than average in Niño 3.4 region for 3 month period). Also note the large expanses of well above average SSTs in the North Pacific and North Atlantic and the cooler than average SSTs along the West Coast which is the result of a negative or cool phase of the Pacific Decadal Oscillation (PDO).

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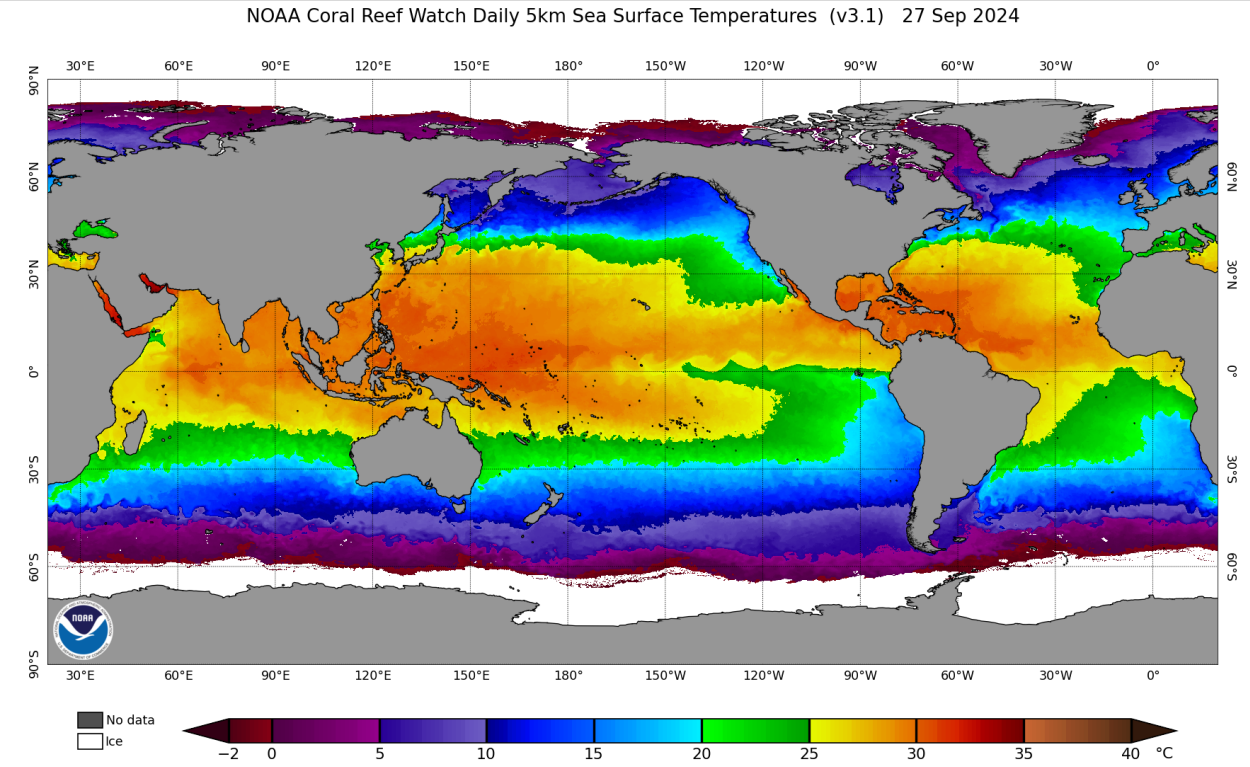

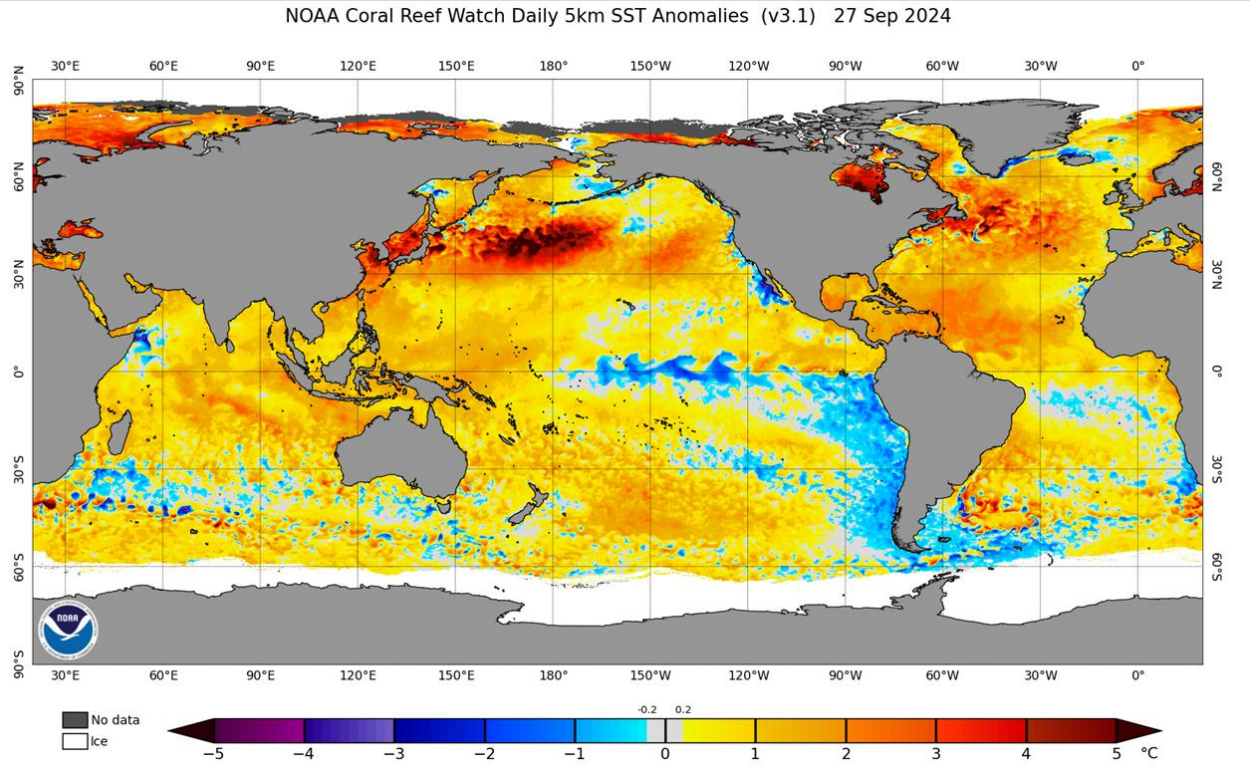

Sea surface temperatures (SSTs) on the left with difference from average SSTs on right. A La Niña transition is evident along with other areas of expansive well above average SSTs in the northern hemisphere. The "bath water" as it's often called in the northwest Pacific Ocean can be a moisture source for cool season Atmospheric Rivers.

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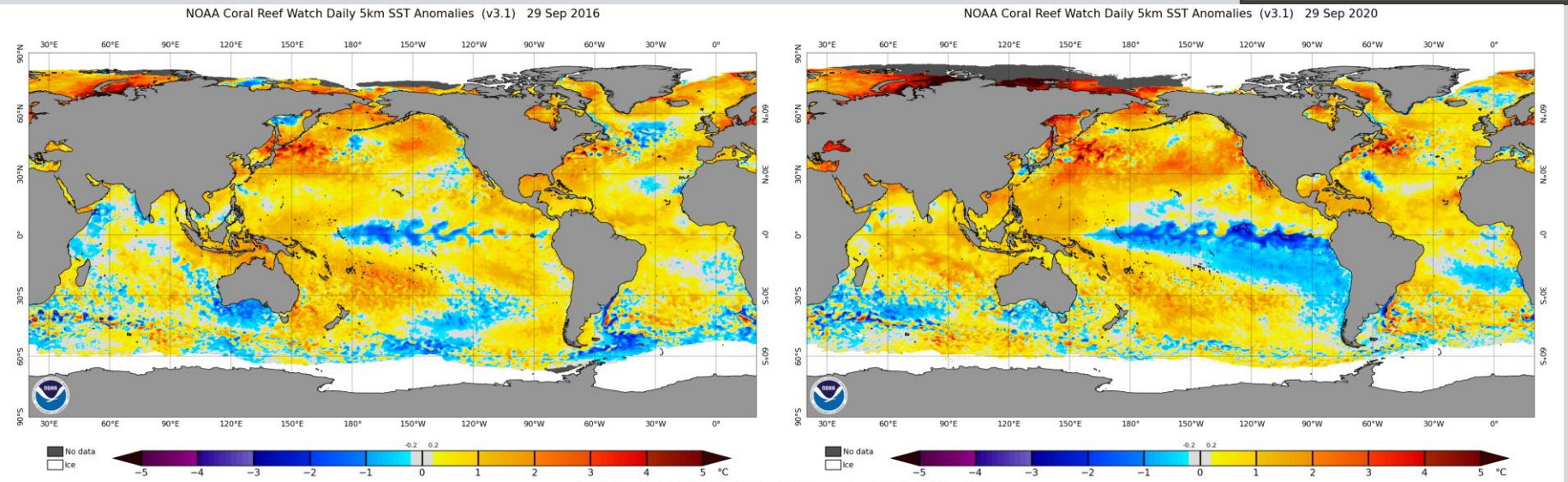

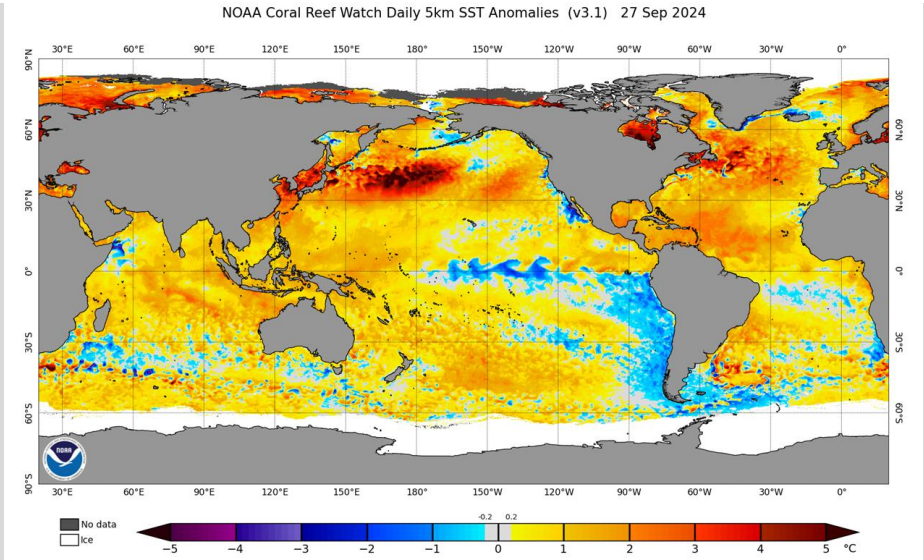

Comparing this year's cooling toward La Niña to recent events. SST gradients or difference from average are similar to 2020, perhaps just not as far along and with a PDO that has changed phase.

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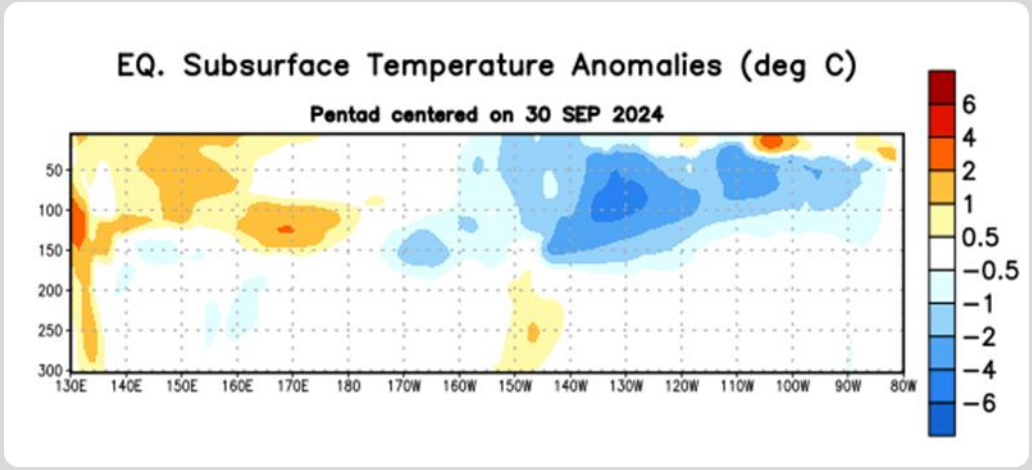

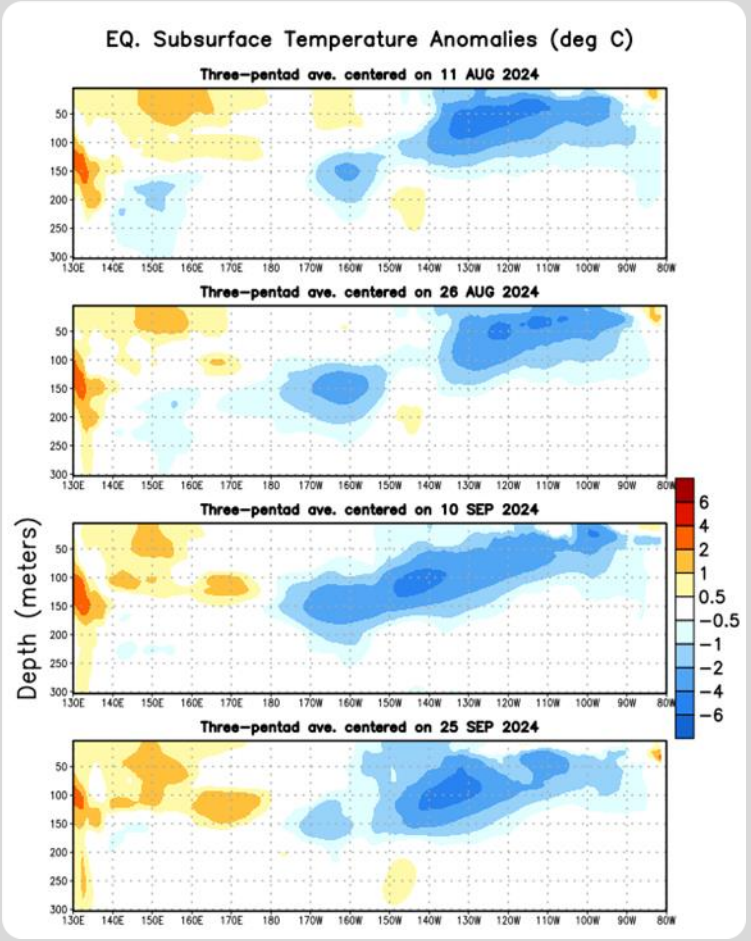

Below-average temperatures remain at depth in the central and eastern Pacific Ocean, while above-average temperatures prevail in the western Pacific.

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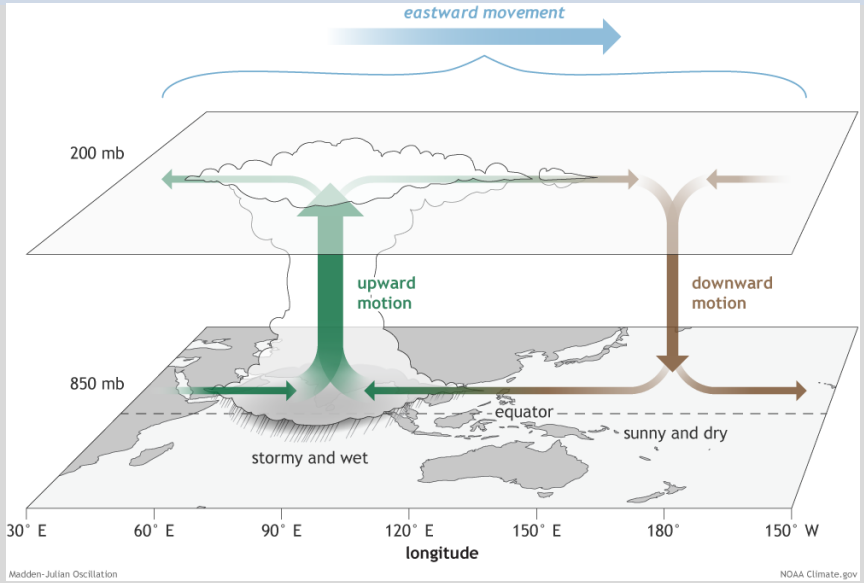

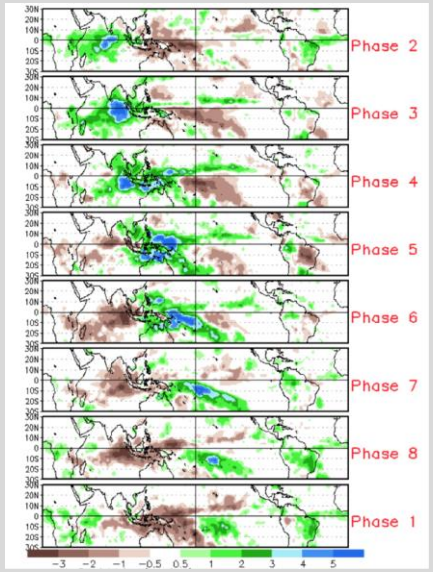

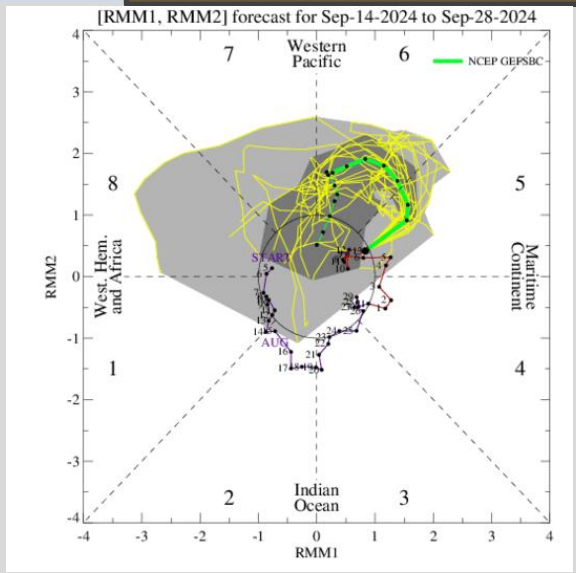

The Madden-Julian Oscillation (MJO) is an area of enhanced thunderstorms that travels around the world every 30 to 60 days from west to east along/near the equator. Ahead and behind the active stormy area are areas of suppressed convection and drier conditions. The MJO affects near-surface wind patterns, 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. The MJO is finally back and is expected to play a role in helping to draw storm systems farther south over/near NM as it enters phases 7, 8, and 1 from late October through early winter. Why? Thunderstorms associated with the ascending side of this atmospheric oscillation result in a stronger than is typical temperature/pressure difference between the tropics and the poles. The ideal gas law (PV = nRT) where P is pressure, V = volume, n = amount of substance, R = gas constant, and T = temperature, teaches us that if the temperature goes up or down, so must pressure and a stronger Asian-Pacific (AP) jet stream is enhanced. How? At the same level in the tropics, temperatures/pressures are much higher as water changes phase from a gas to a liquid. This phase change releases latent heat. Poles are much colder with lower pressure at the same height above ground level compared to the tropics. The AP jet becomes enhanced when there are more thunderstorms in the tropics as a result. What do the cool waters of La Niña do to this process? Lead to fewer tropical thunderstorms than are typical in the eastern equatorial Pacific. So how does that enhance the AP jet stream over North America in winter? When the AP jet encounters the lack of thunderstorms or a strong temperature/pressure change as it races eastward, it's forced to split to get back into (geostrophic) balance. A ridge of high pressure over the northeast Pacific is born. Upper level troughs in the northwest flow aloft on the downstream side of this ridge is what typically gives the PACNW above average precipitation during La Niña and a cold northwest flow aloft to much of the western U.S. mainly north of the 37th parallel or CO/NM border. What is it that climate change or a warming of these ocean waters doing to La Niña? A warmer planet is a thirstier planet and deep tropical convection as a whole is more prevalent globally as a result of the additional precipitable water or PWAT. Warmer waters also allow for more rapid intensification of organized convective systems as we've seen recently with Hurricane Alberto and Hurricane Helene. These rapid changes have been observed in the Central and West Pacific (WPAC), including influencing the MJO. These changes also make for a more volatile AP jet and since the earth still gets dark north and south of 66° latitude during winter, large swings in weather take place over much of the country, but especially for the Northern and Great Plains including the Upper Midwest. Stronger than average northwest flow aloft is notorious for bringing upper level troughs in faster than weather prediction models forecast. In NM, this pattern is likely to bring about an abrupt change in weather toward late October or early November along with making modified cold air outbreaks in the form of backdoor cold fronts more frequent than is typical.

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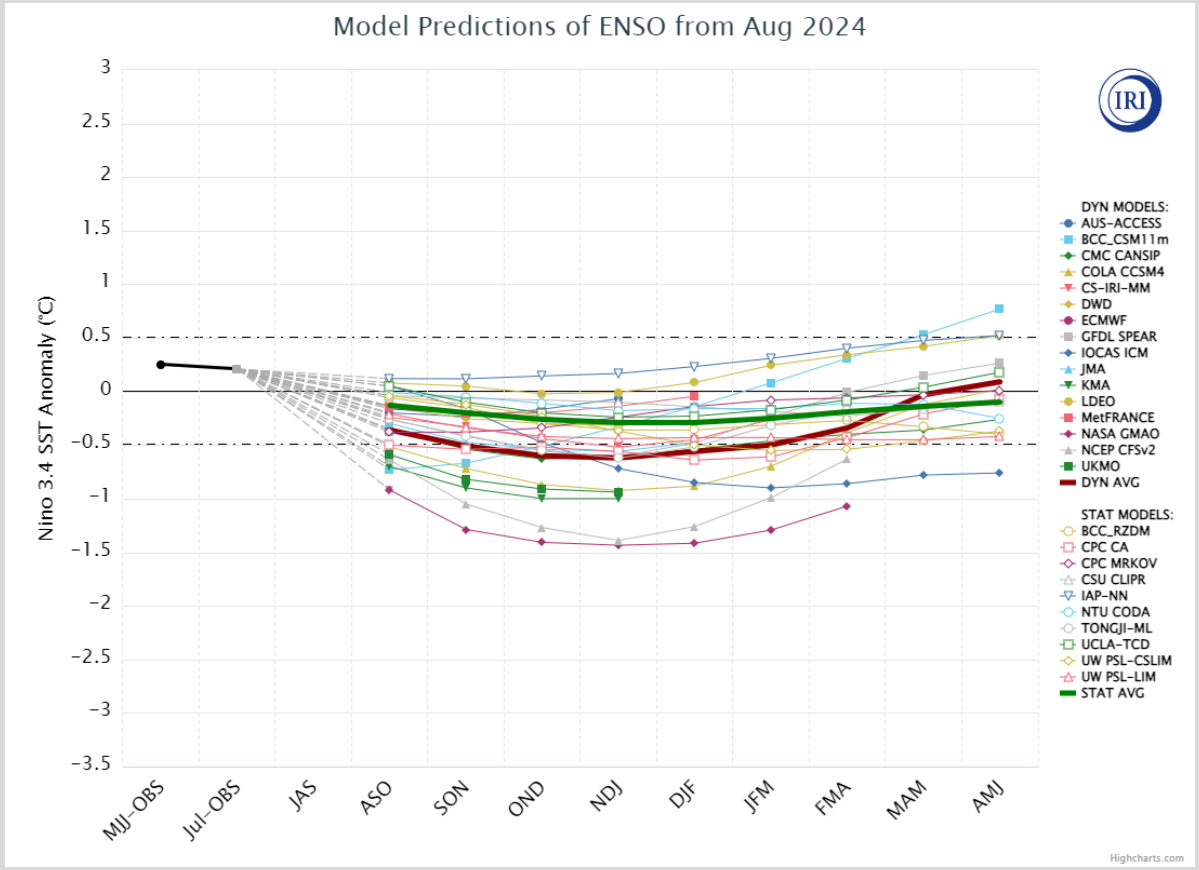

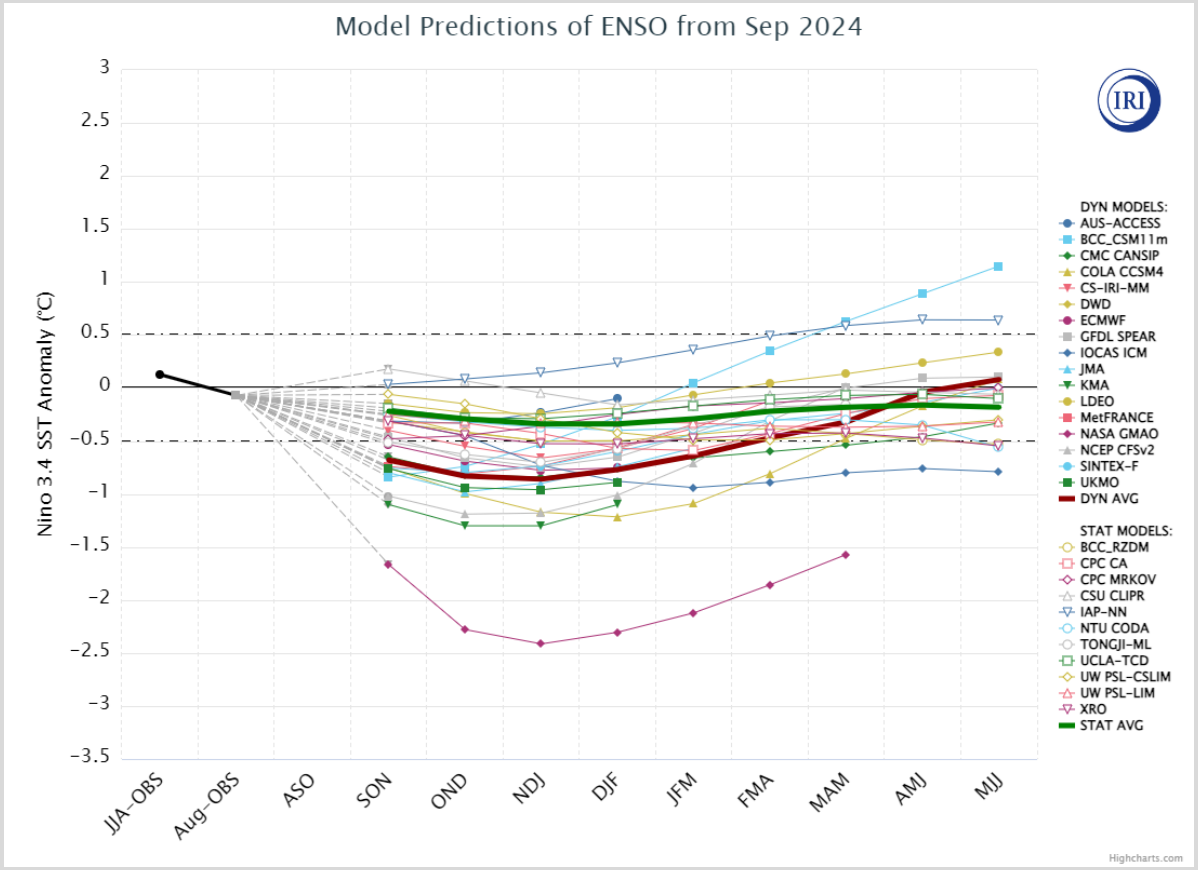

Model prediction of ENSO from August and September 2024. Dynamical model average for October, November and December is just below -0.5C, which would result in a weak La Niña climate pattern. September models have trended cooler, resulting in greater odds for La Niña to develop in October. Both forecast clusters would result in a weak but influential La Niña event during late fall and winter 2024-25.

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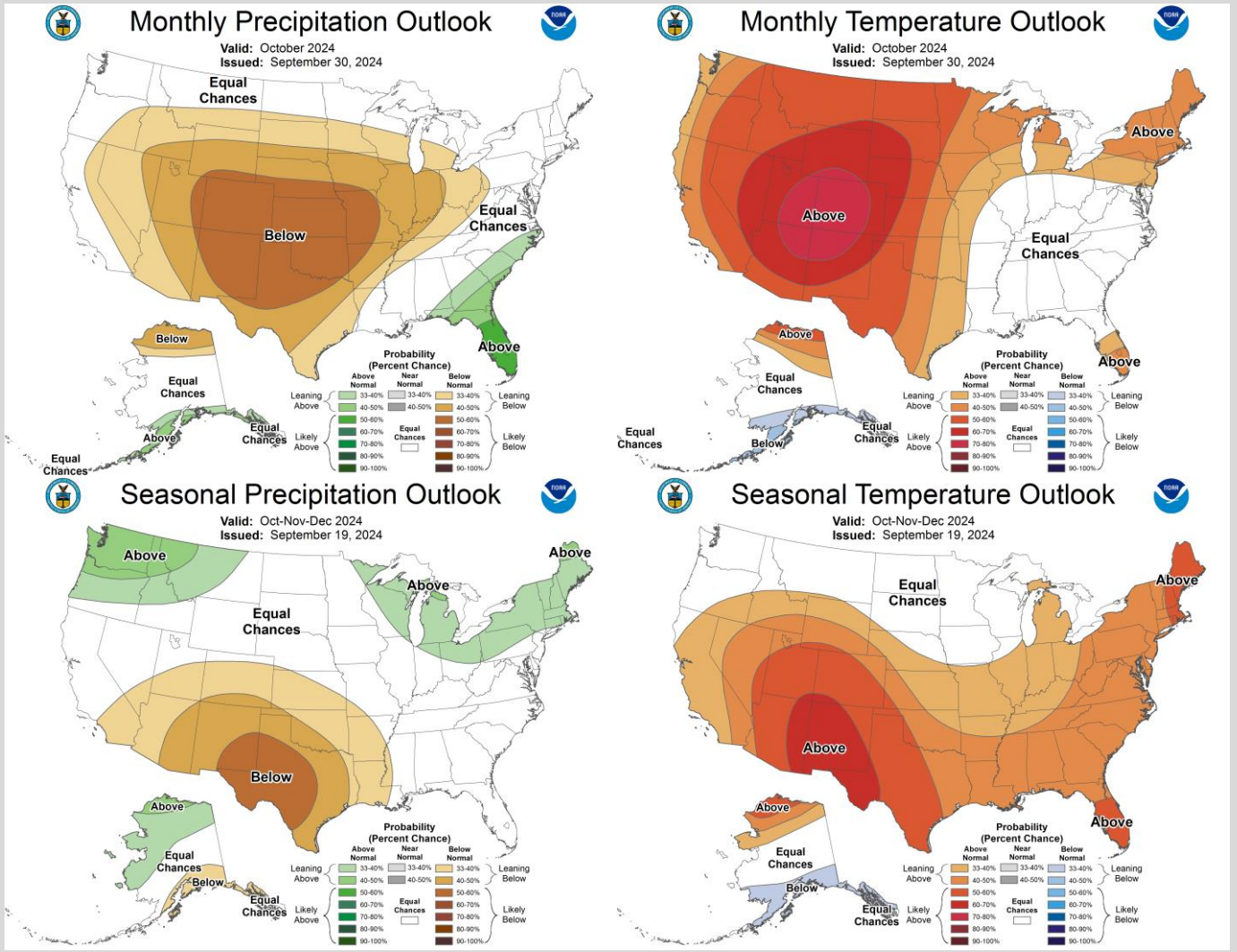

NWS's Climate Prediction Center's Official 2024 Climate Outlook for October (top) and October, November and December (OND) showing probabilities favoring below average precipitation and above to well average temperatures.

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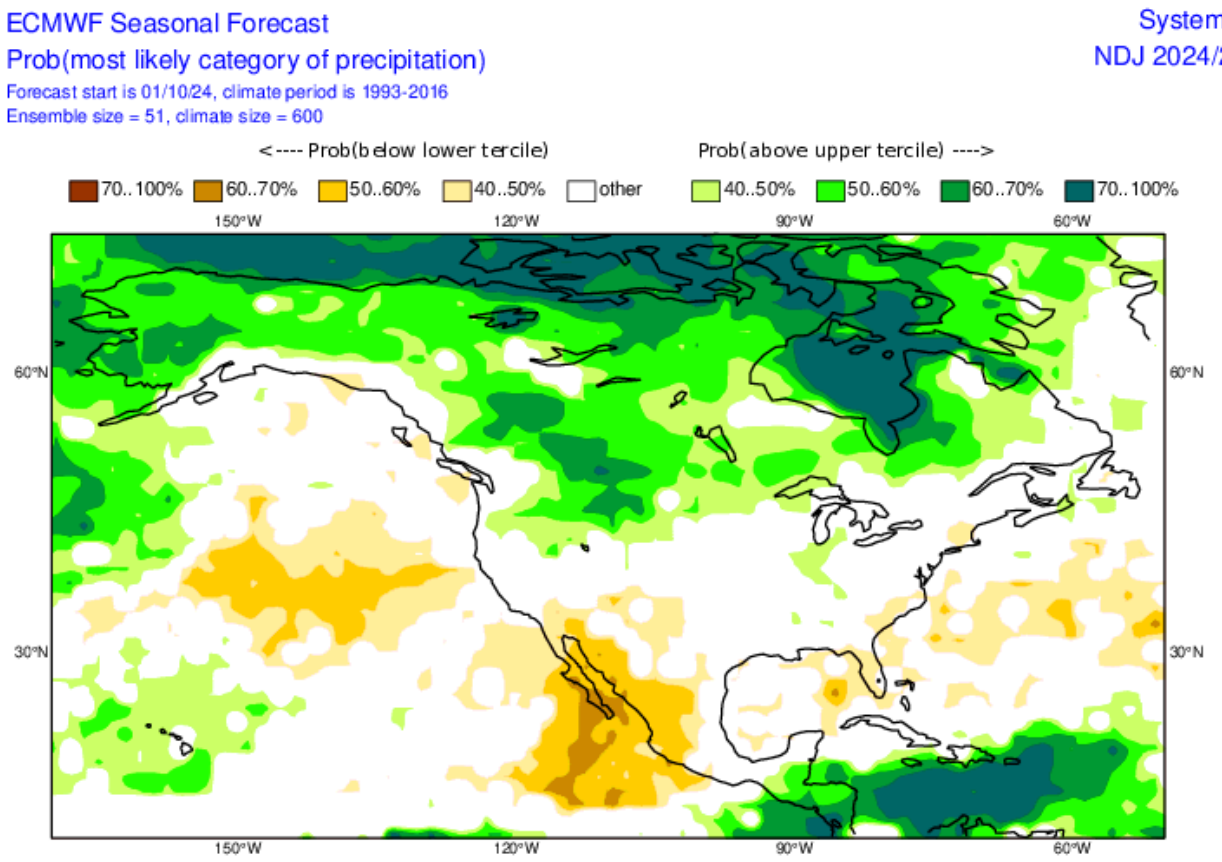

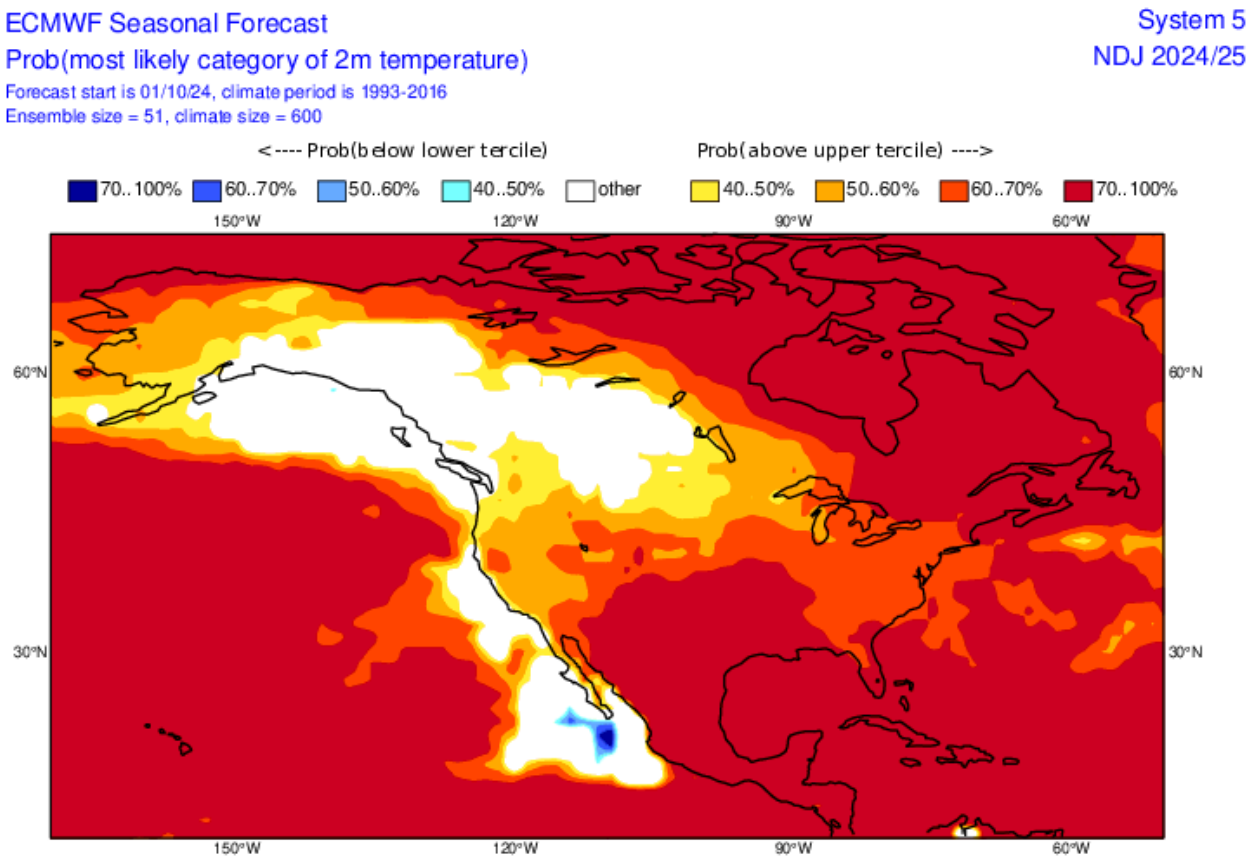

Seasonal precipitation and temperature difference from average forecast from the European Center for Medium Range Weather Forecasts (ECMWF) seasonal model forecasting near to slightly below average precipitation in NDJ and above average temperatures.

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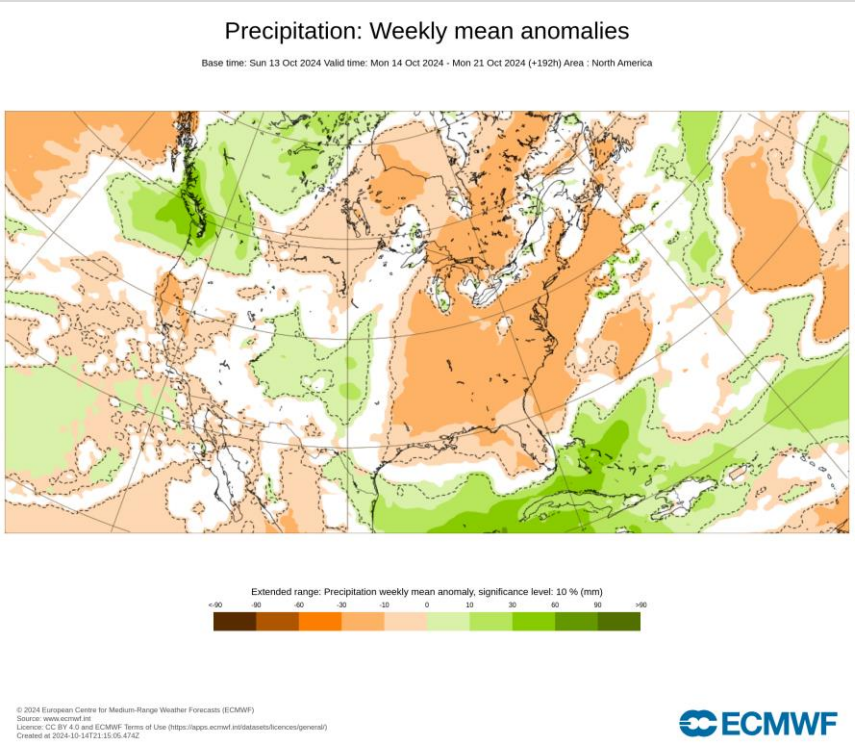

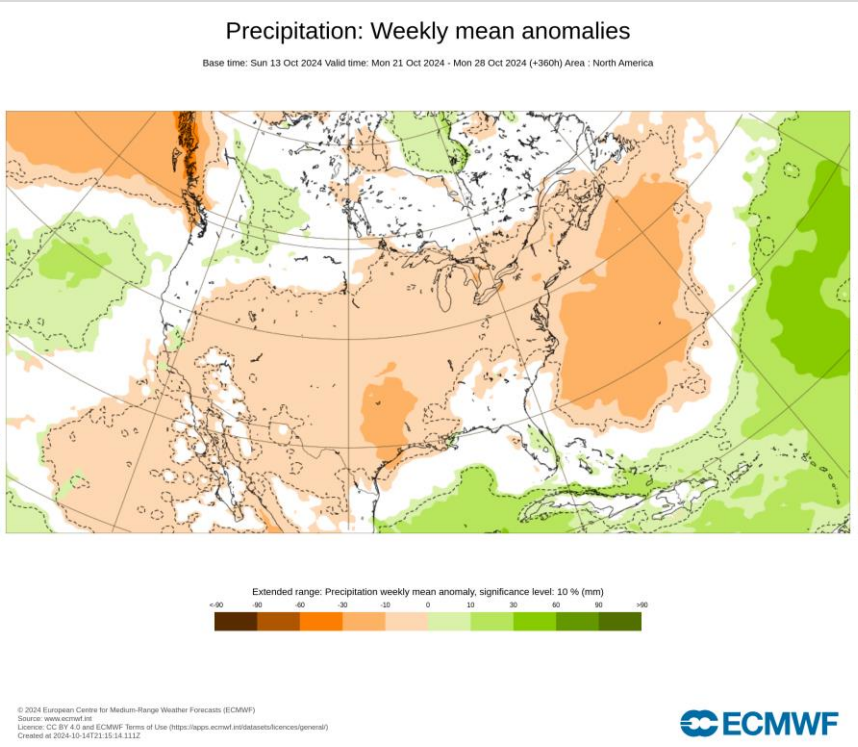

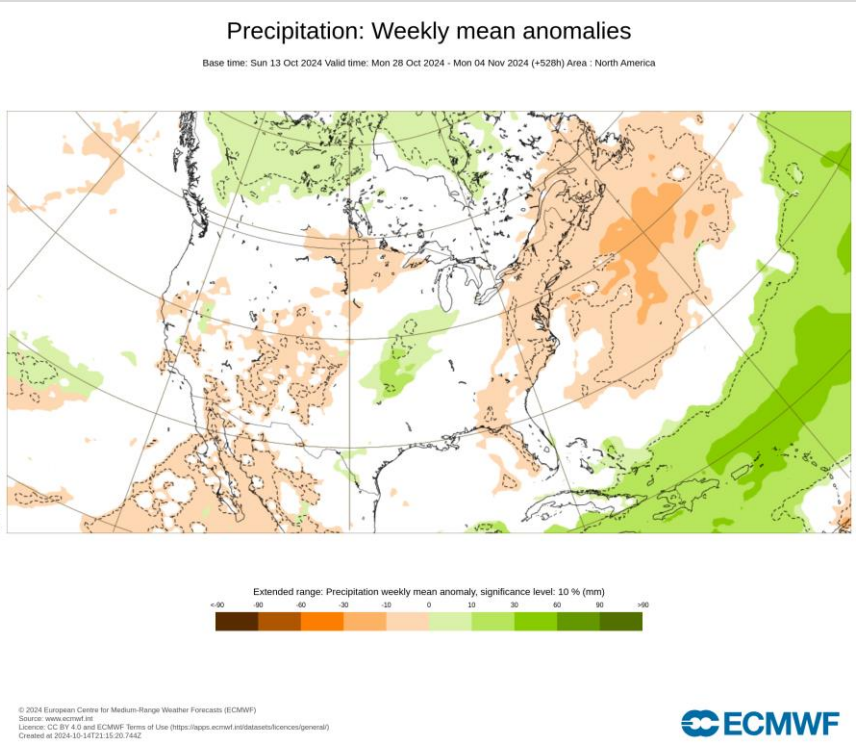

Weekly difference from average precipitation forecasts from the ECMWF (ENS) model. Near average precipitation is favored for central and northern NM during the remainder of October and into early November.

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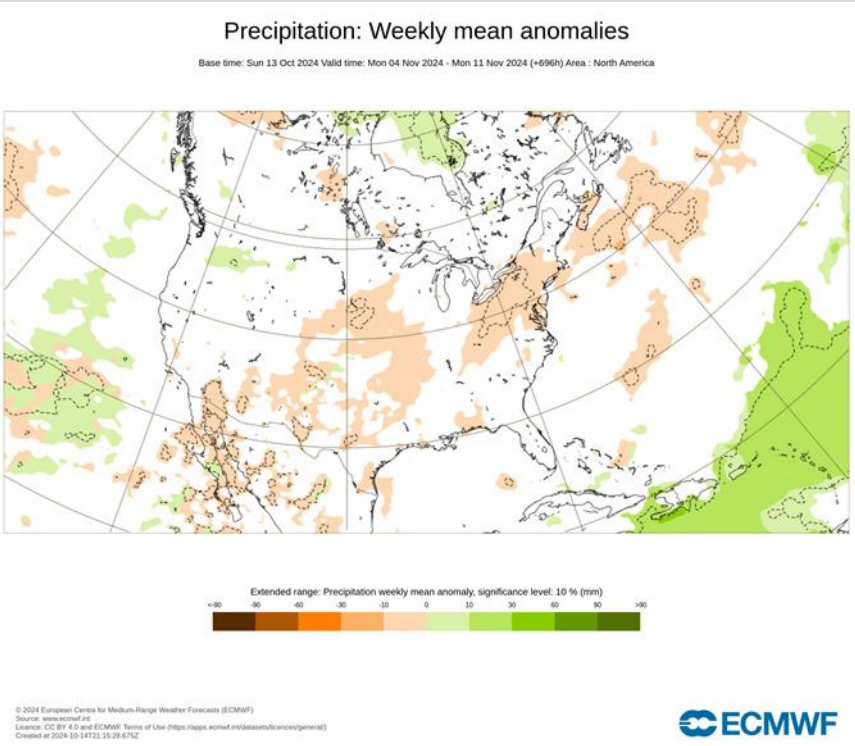

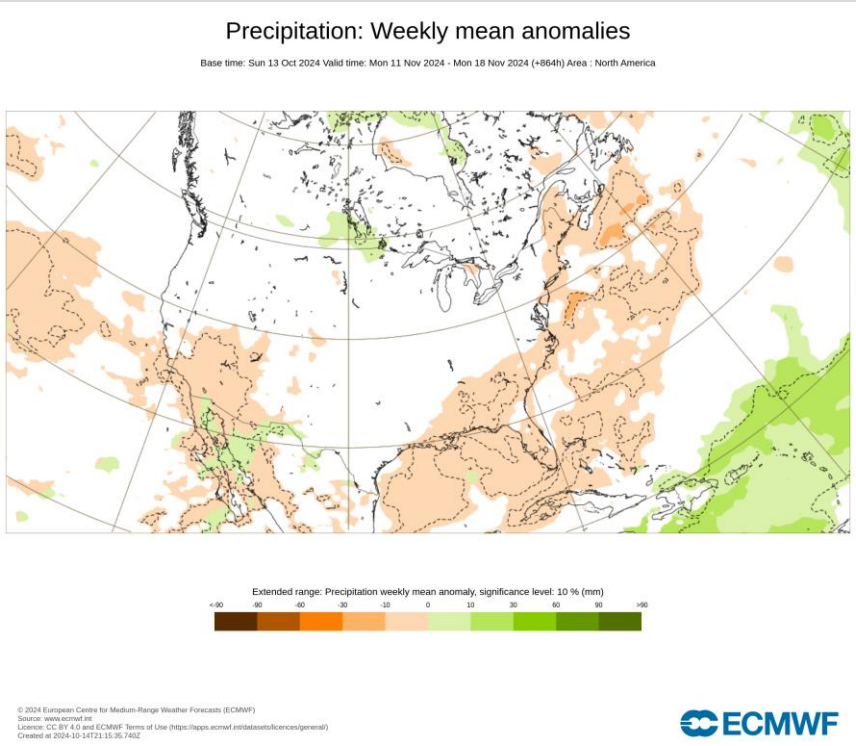

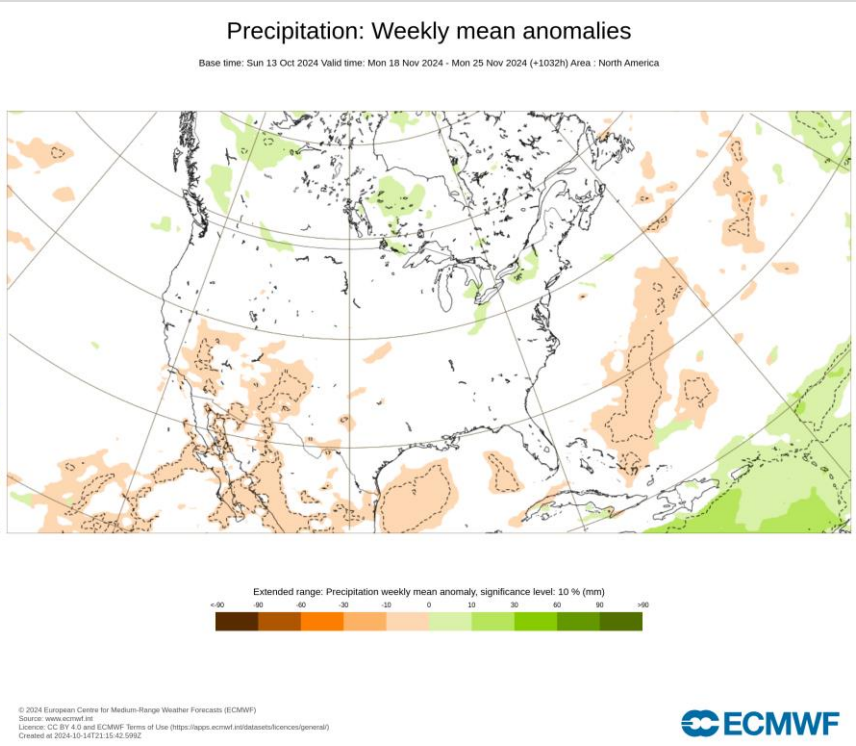

Weekly difference from average precipitation forecasts from the ECMWF for much of November 2024. The ensemble model is forecasting near average November precipitation. Green against brown colors indicate convective precipitation.

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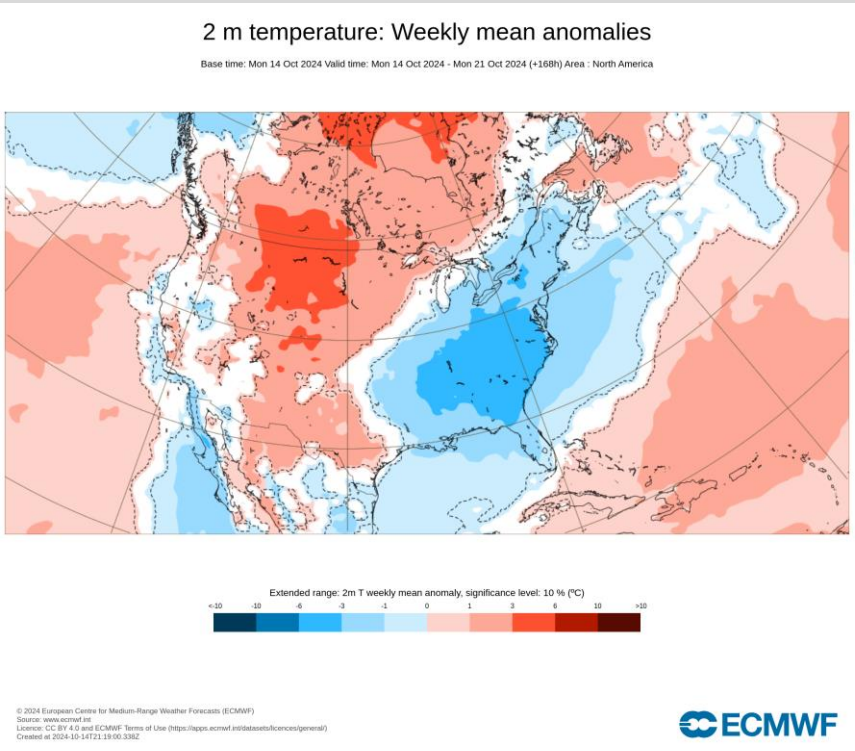

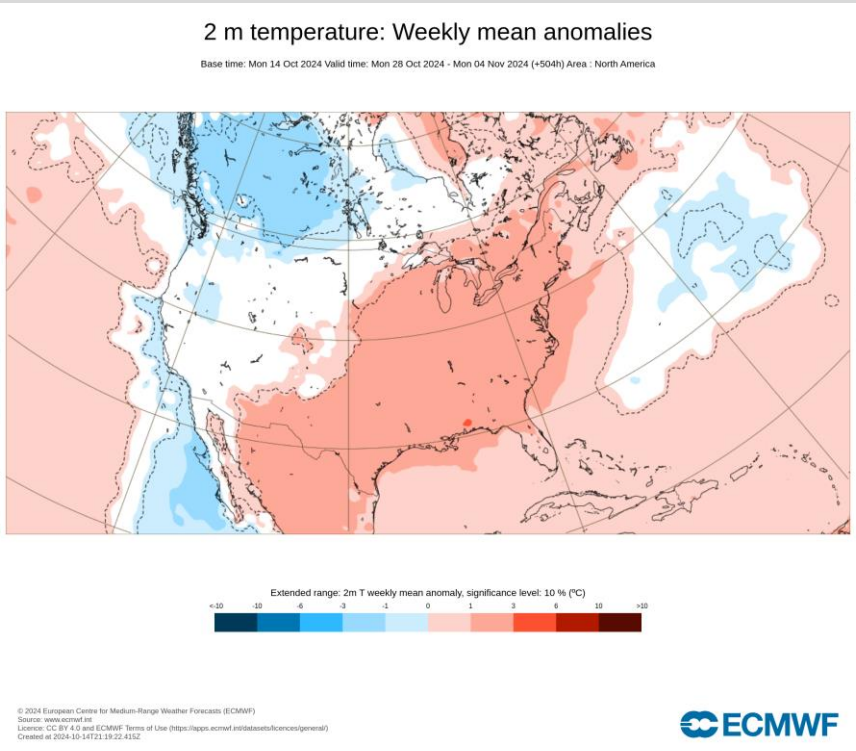

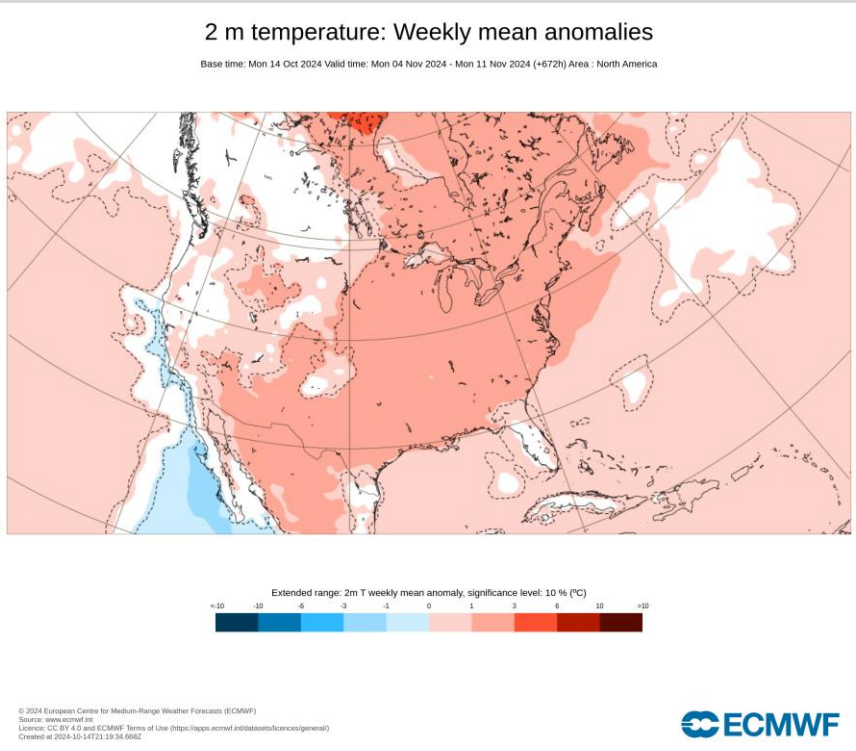

Weekly difference from average temperature forecasts from the European Center for Medium Range Weather Forecasts (ECMWF) for latter October. ECMWF's extended ensemble model keeps the Southwest U.S. warmer than average through the month.

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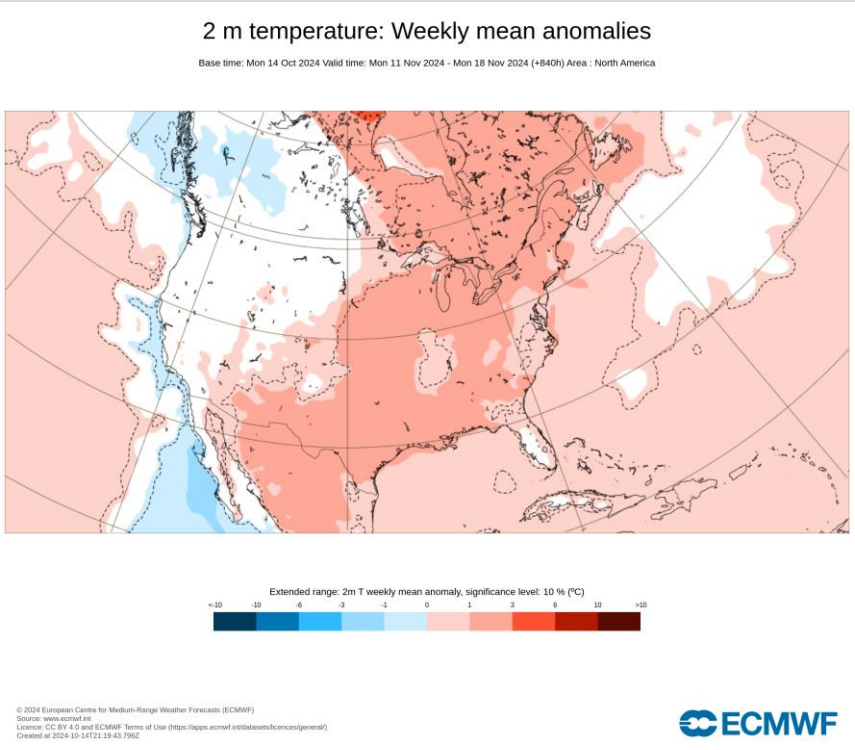

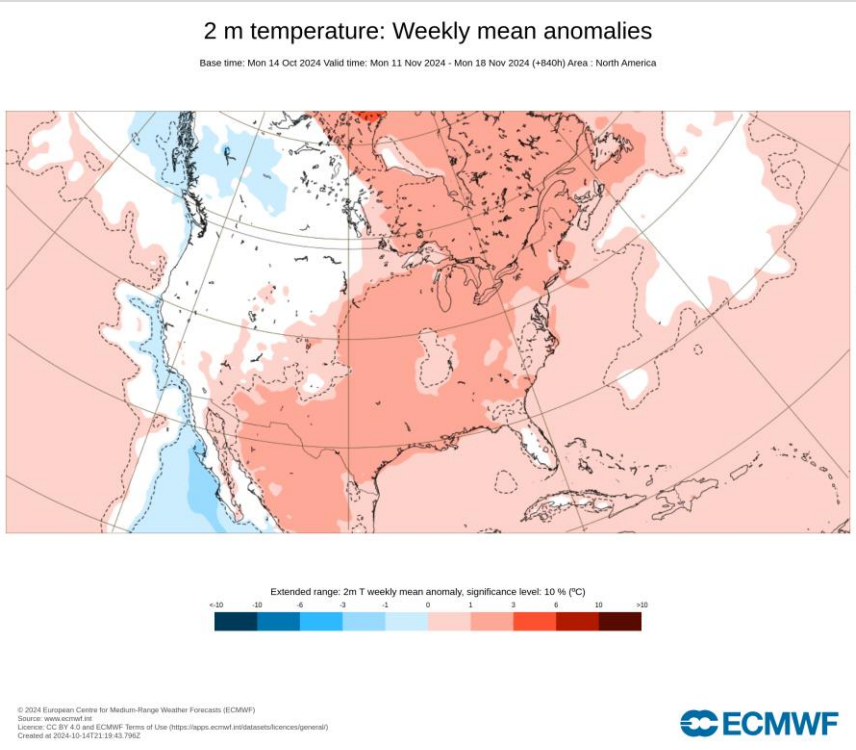

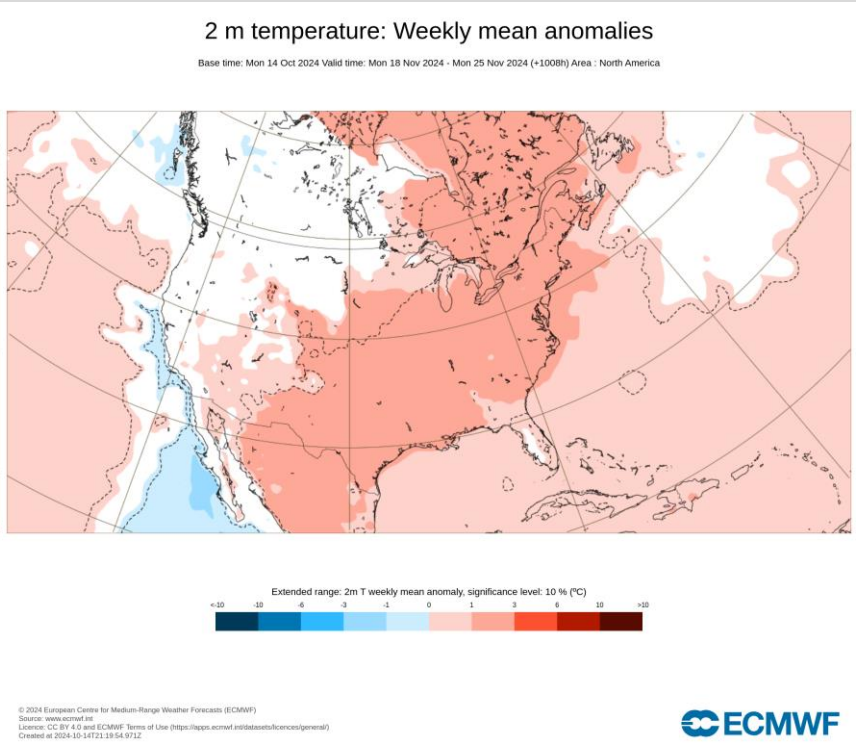

Weekly difference from average temperature forecasts from the European Center for Medium Range Weather Forecasts (ECMWF) for much of November. ECMWF's extended ensemble model keeps the Southwest U.S. slightly warmer than average through much of November.

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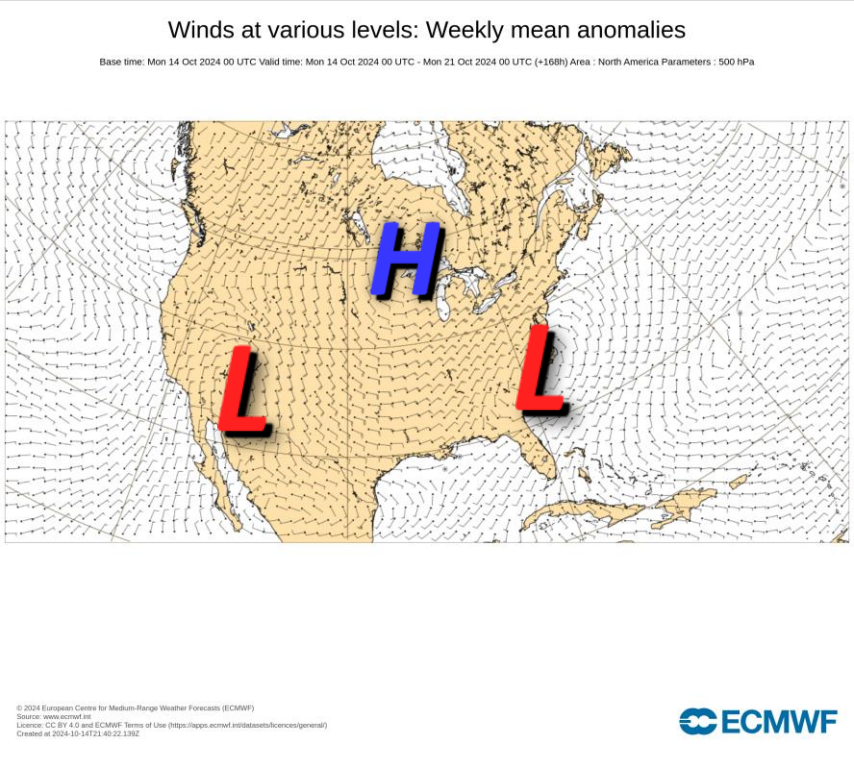

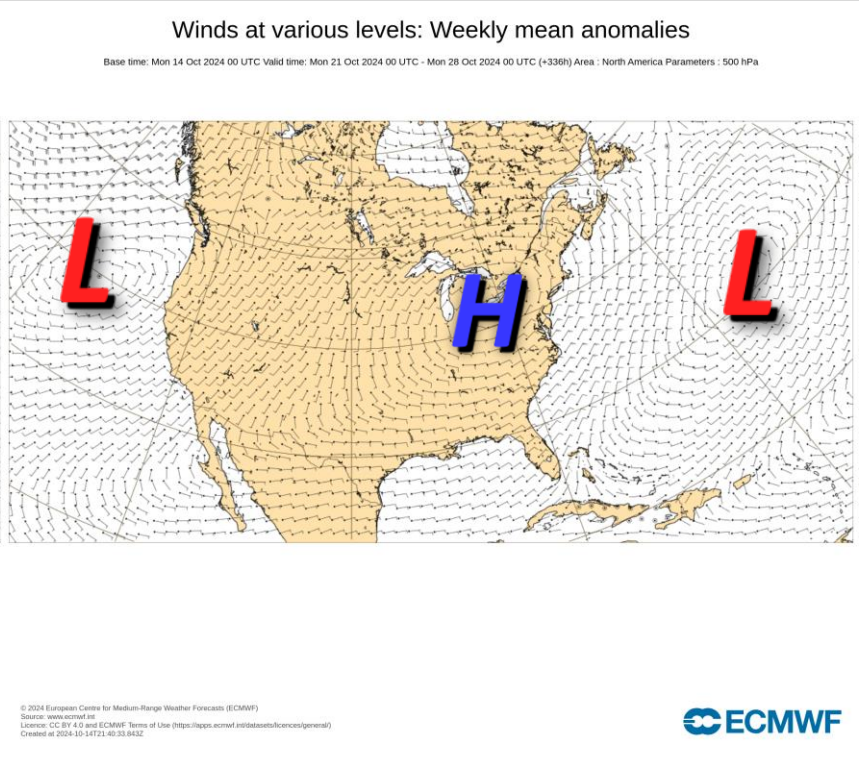

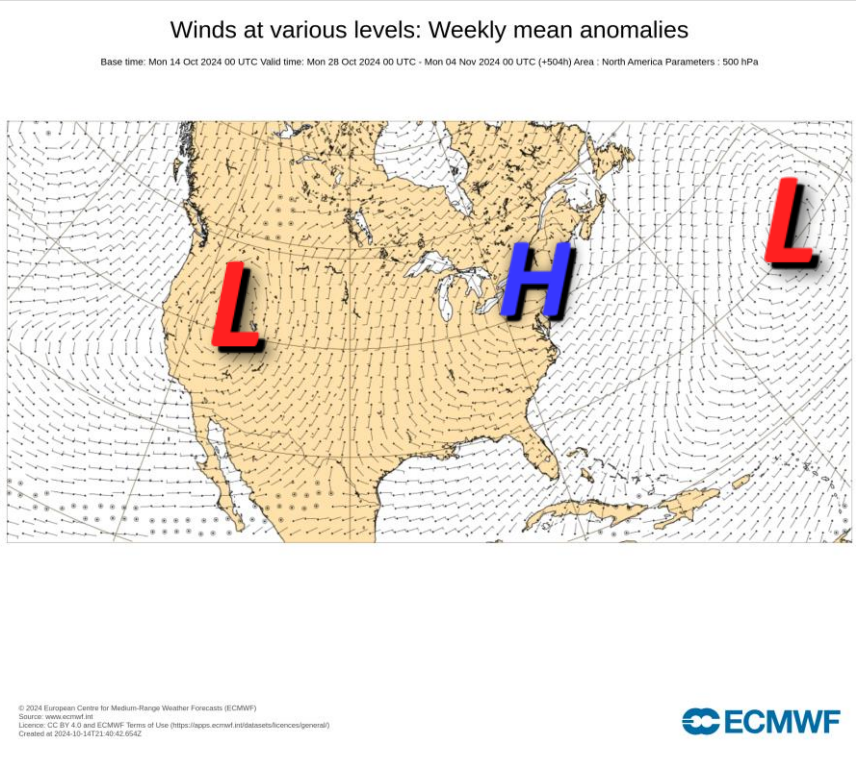

Weekly 500 hPa or ~18,000 ft MSL wind forecasts for the remainder of October 2024 from the ECMWF extended ensemble model. During a weak to moderate La Niña. The above ECMWF wind forecast is indicative of a negative Pacific Decadal Oscillation (PDO) set up (at times) for the upcoming winter.

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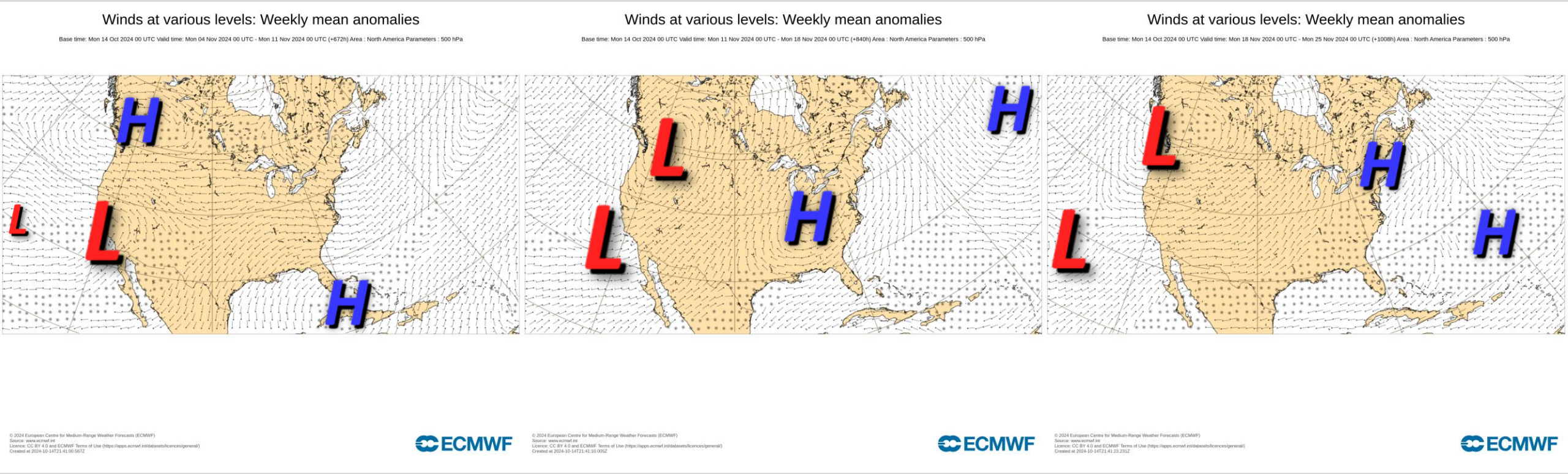

Weekly 500 hPa or ~18,000 ft MSL wind forecasts for November from the ECMWF extended ensemble model. During a weak to moderate La Niña, the monsoon high hangs on longer than average due to all of deep thunderstorms in the tropics and subtropics continuing beyond what is typical. This year, however, if this forecast pans out, this could be the latest in the historical record that the monsoon climate pattern continues into mid November.

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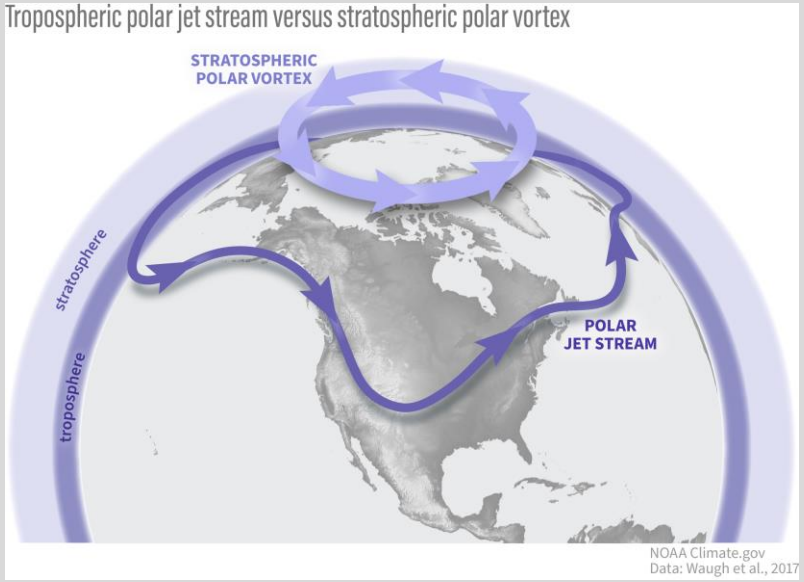

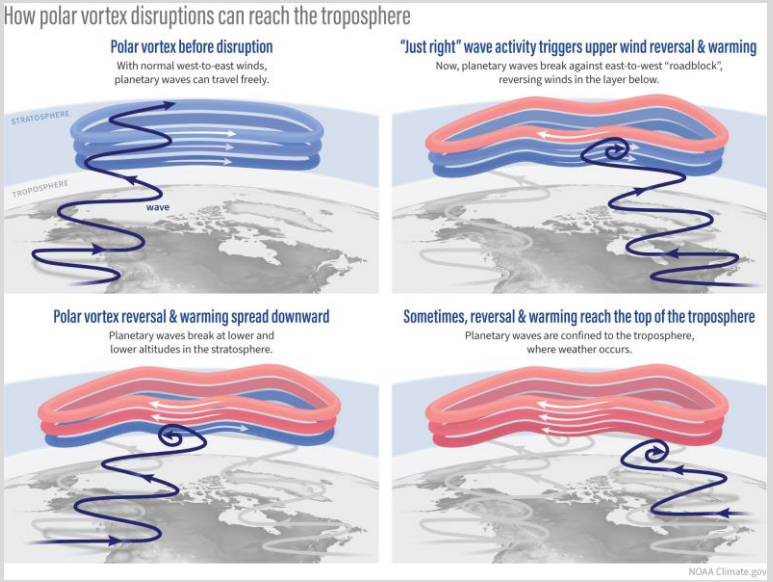

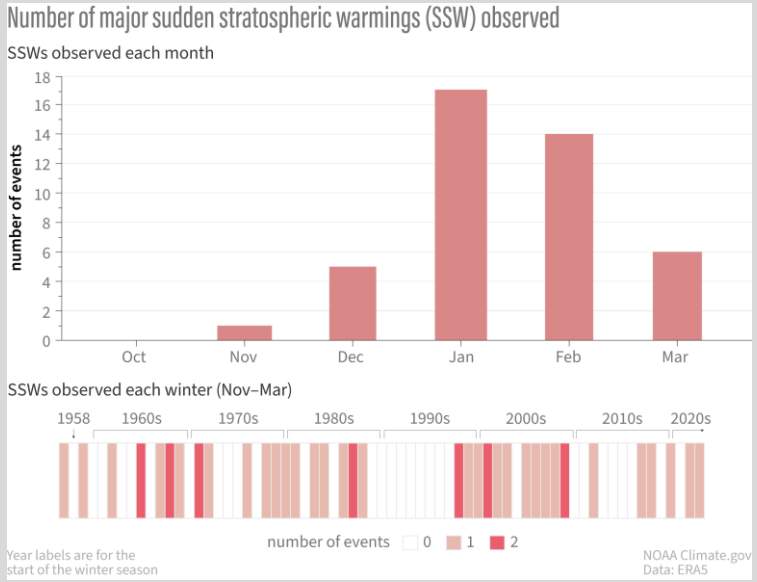

The Stratospheric Polar Vortex (SPV) is not just another term for a "cold snap." It's actually a well-known feature of Earth's atmosphere that refers to the high-altitude winds circling the pole every winter, miles above us in an area called the stratosphere. The polar vortex begins to form in late summer as the amount of sunlight reaching the poles diminishes. Because the North Pole is in complete darkness for several months during the winter, it receives less sunlight than the tropics. This causes the air in the polar stratosphere to become colder than the air in the tropical stratosphere. To balance out this temperature difference, warm tropical air moves north toward the cold polar air. Earth's west-to-east rotation causes the wind to veer to the right in the Northern Hemisphere, and the winds become primarily westerly (moving from west to east). These winds are connected to the strength of the polar vortex and are powerful enough to act as a barrier between the midlatitudes and polar air, reinforcing the cold stratospheric air within the vortex. What matters with the PV? Sudden stratospheric warmings (SSWs) in late fall and especially winter. How does La Niña typically influence the PV and SSW's? Typically, SSWs are more frequent during a La Niña climate pattern, but often not as strong as during El Niño. Interestingly, however, the last "true" arctic air intrusion into NM in 2011 was during a moderate La Niña with a single SSW. 2011 was the second year in a double-dip La Niña. Courtesy: Amy Butler and Laura Ciasto @ NOAA/Climate.gov

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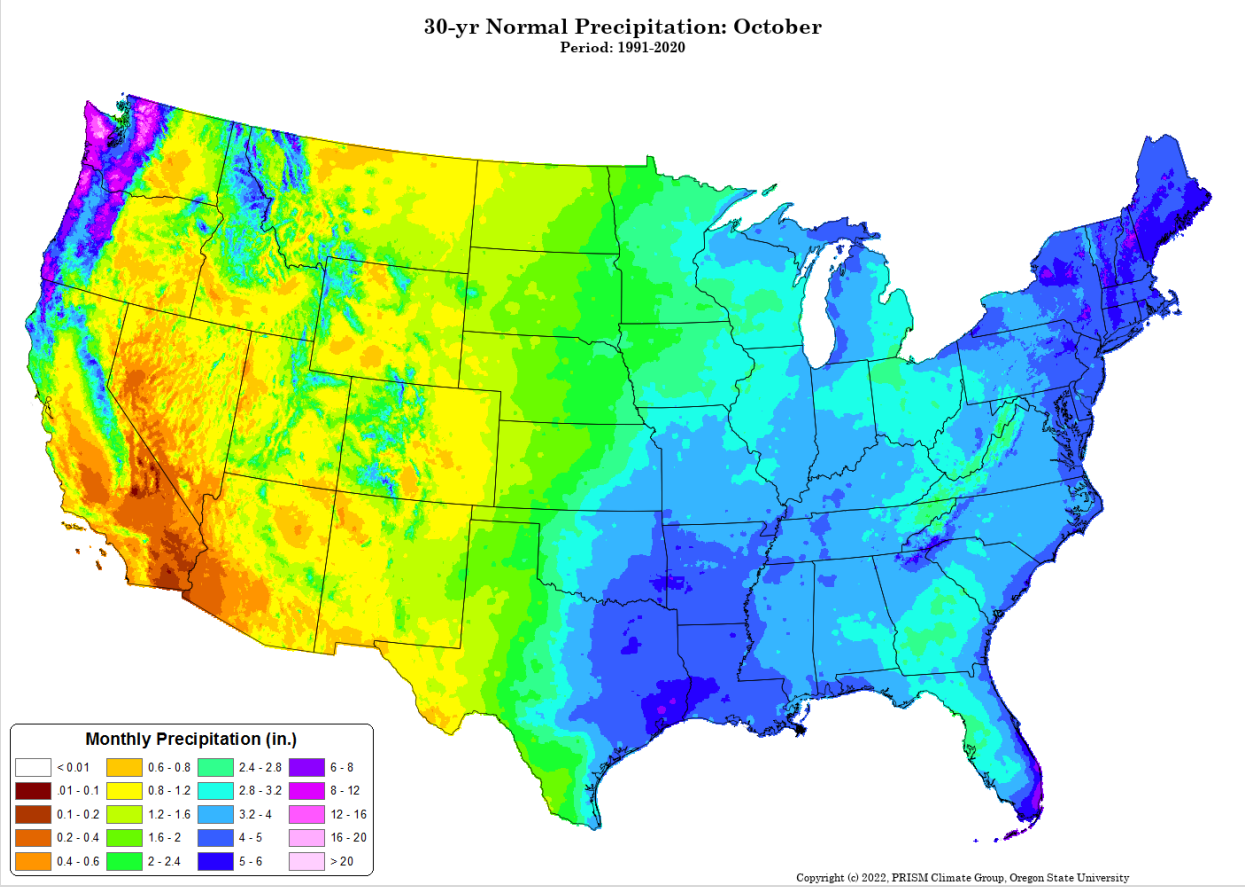

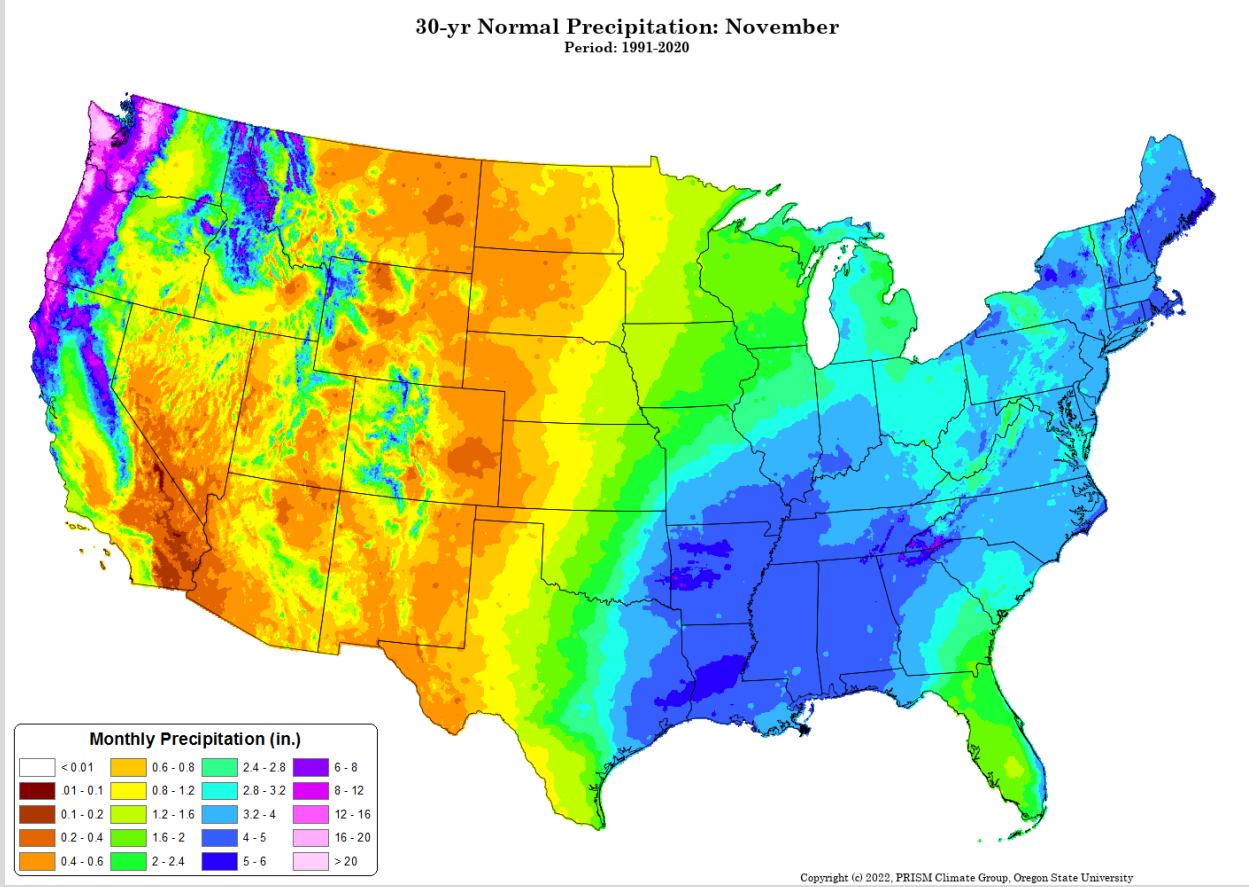

What is average or normal precipitation during fall? These charts show normal or average precipitation for each month during October and November. During the fall months, heavier precipitation gradually shifts to the mountains.

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In October, forecast confidence is high for near to slightly above average precipitation, primarily for areas north of I-40 and along and east of I-25 with slightly below average precipitation expected elsewhere.

In November, forecast confidence is high for near to slightly below average precipitation and above to well above average temperatures. A well-known climate pattern (Pacific North American or PNA) continues to set up in the north Pacific. It's this pattern, the one that is bringing the closed low/storm system on Friday and Saturday 10/18/24 and 10/19/24, that is forecast for the upcoming winter season. Winter is coming, we just have to get through at least mid-November and possibly the longest recorded North American Monsoon pattern in history first.

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