2023 Monsoon Outlook

For Northern & Central New Mexico

Albuquerque
WEATHER FORECAST OFFICE
Issued March 3, 2023

Jemez Springs, NM Courtesy: NewMexico.org

Taos Pueblo Courtesy: NewMexico.org

Mogollon Mountains – Gila Wilderness Courtesy: David Thornburg

Placitas, NM Courtesy: Monica Wheeler

Courtesy: NewMexico.org

West Side ABQ Courtesy: Todd Shoemake

While last year's monsoon started early with quite the bang, this year is expected to be closer to a gradual whimper thanks in large part to an El Niño climate pattern.

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 east-central and eastern Pacific Ocean.

The tropical Pacific atmospheric anomalies are consistent with weak El Niño conditions.

El Niño conditions are expected to gradually strengthen into the Northern Hemisphere winter 2023-24.

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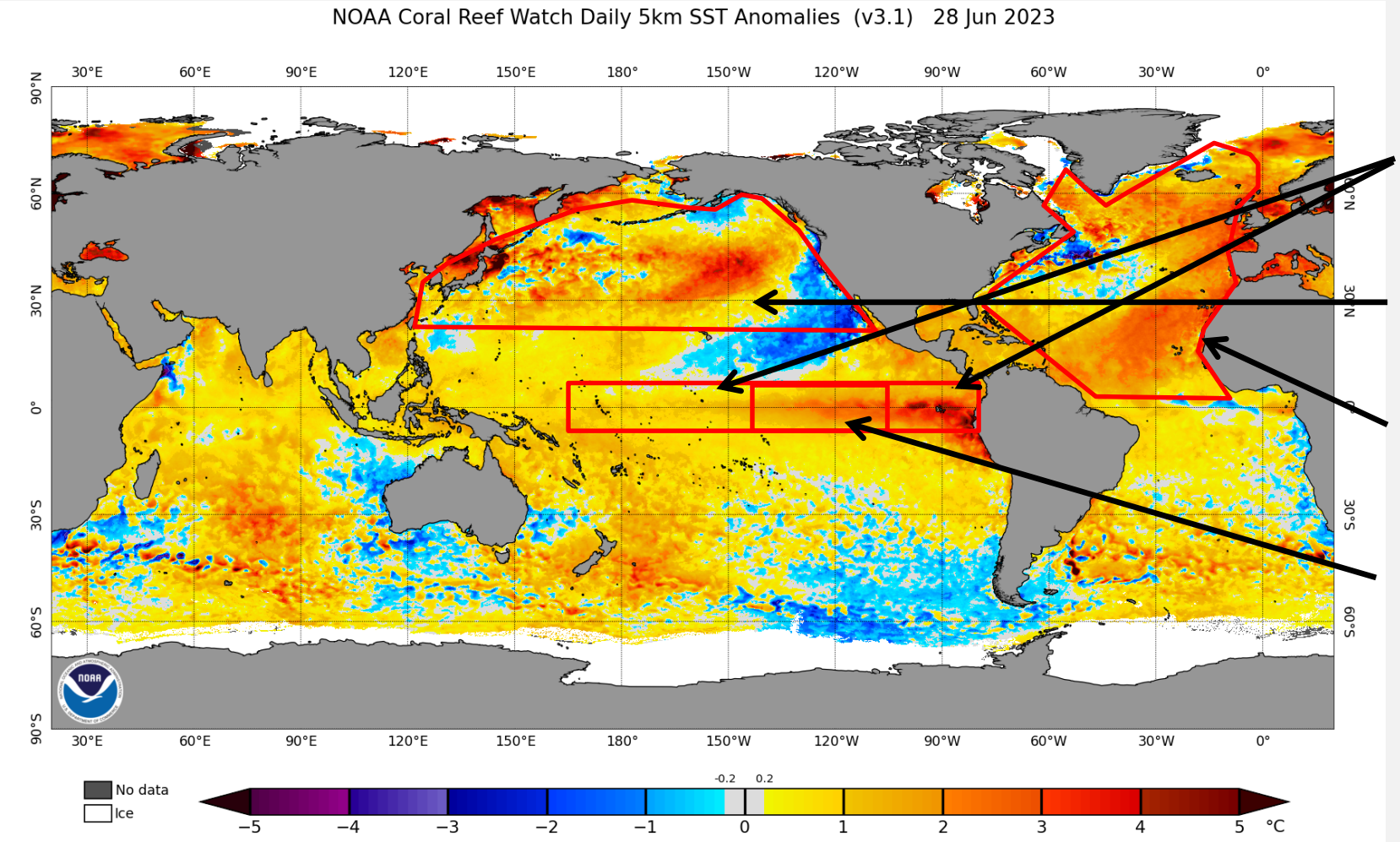

- Multivariate ENSO Index (**MEI**) for APR-MAY 2023: **-0.1**
- Pacific Decadal Oscillation (**PDO**) for MAR 2023: **-1.55**
- Atlantic Multidecadal Oscillation (**AMO**) for JAN 2023: **+0.192**
- Oceanic Niño Index (**ONI**) (uses Niño 3.4 region - inner rectangle) for MAM 2023: **+0.1**

Latest weekly global SST anomalies showing the area of 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).

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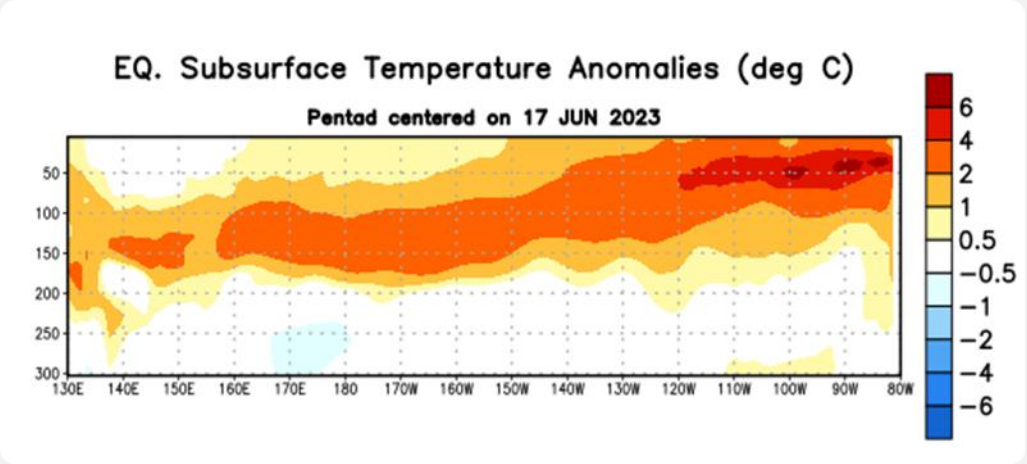

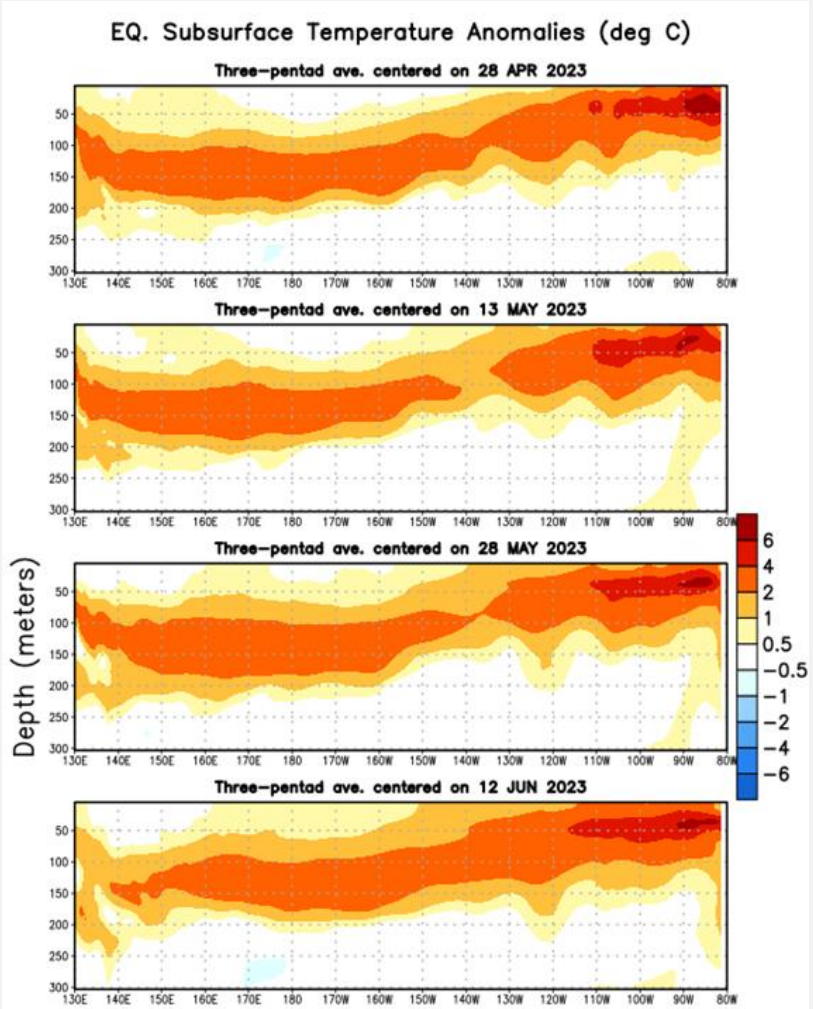

Negative subsurface temperature anomalies have all but disappeared. Three years of heat energy from well above average SSTs piled up near the equator in the West Pacific is now streaming eastward underneath the ocean surface.

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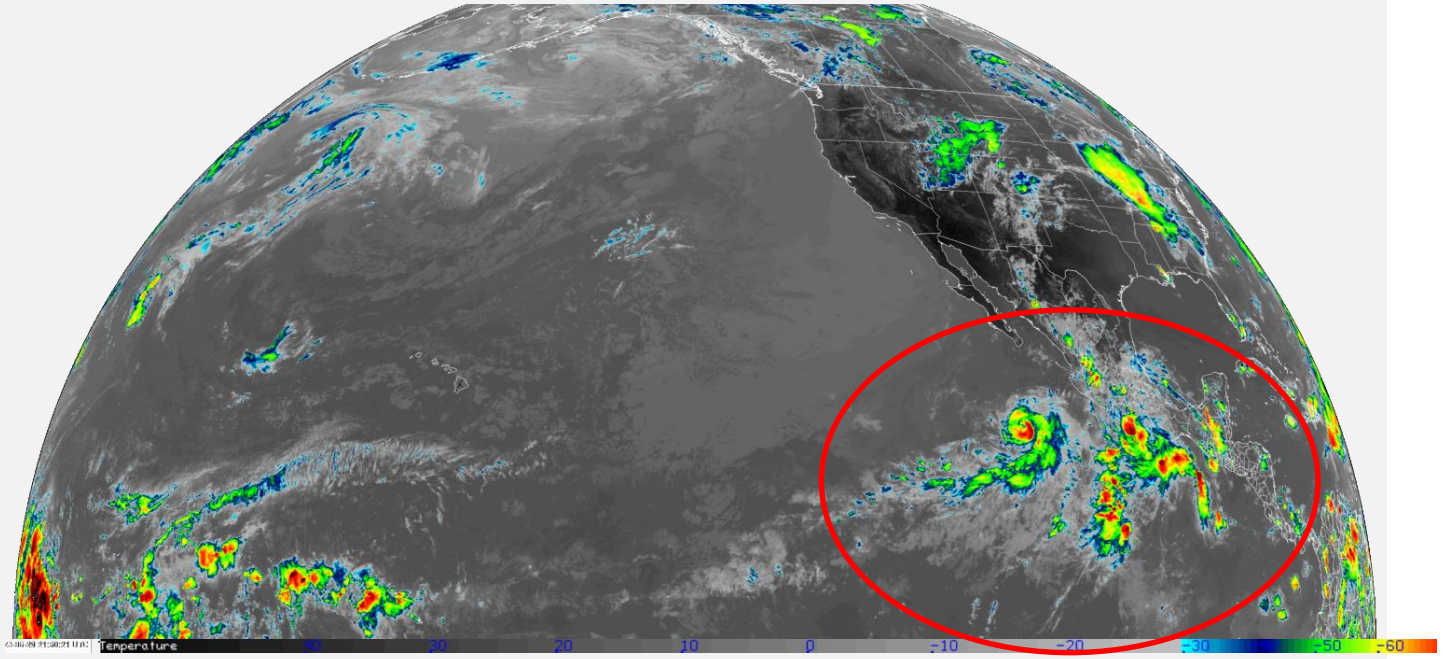
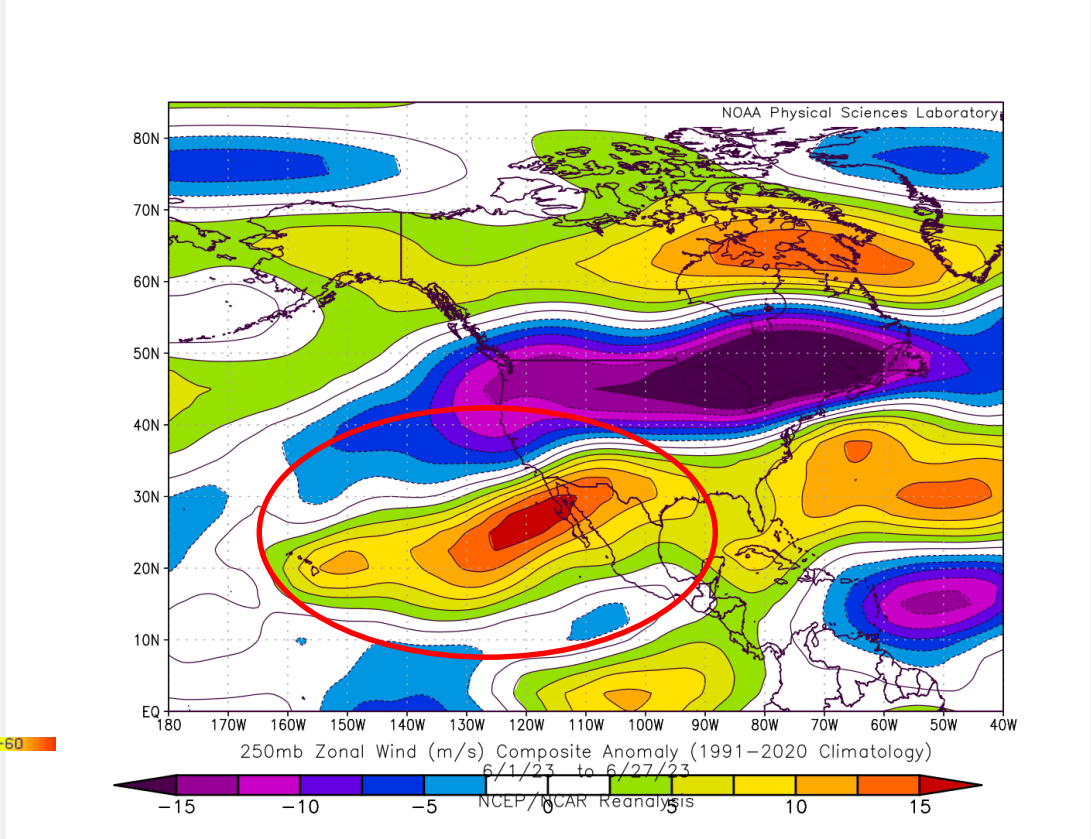


Infrared satellite imagery from 6/29/2023. Warmer than average SSTs in the eastern Pacific lead to above average thunderstorm activity in the eastern Pacific. This increased temperature difference between the subtropics and the poles results in an enhanced subtropical jet stream and more frequent than average dry air intrusions from the west during July, August and September.



Zonal (west to east) winds at 250 hPa or ~30,500 feet above ground level. A much stronger than average subtropical jet stream developed in June 2023.

Why is monsoon precipitation typically below average during an El Niño climate pattern? It has to do with a strengthened subtropical jet stream. The west winds associated with this jet allow dry air intrusions from the west to be more frequent compared to average. Why is the subtropical jet stream stronger than average during El Niño? Warmer than average surface waters associated with El Niño lead to above average thunderstorm activity. It's this increased thunderstorm activity that leads to stronger than average temperature differences between the tropics and the poles and a stronger subtropical jet stream.

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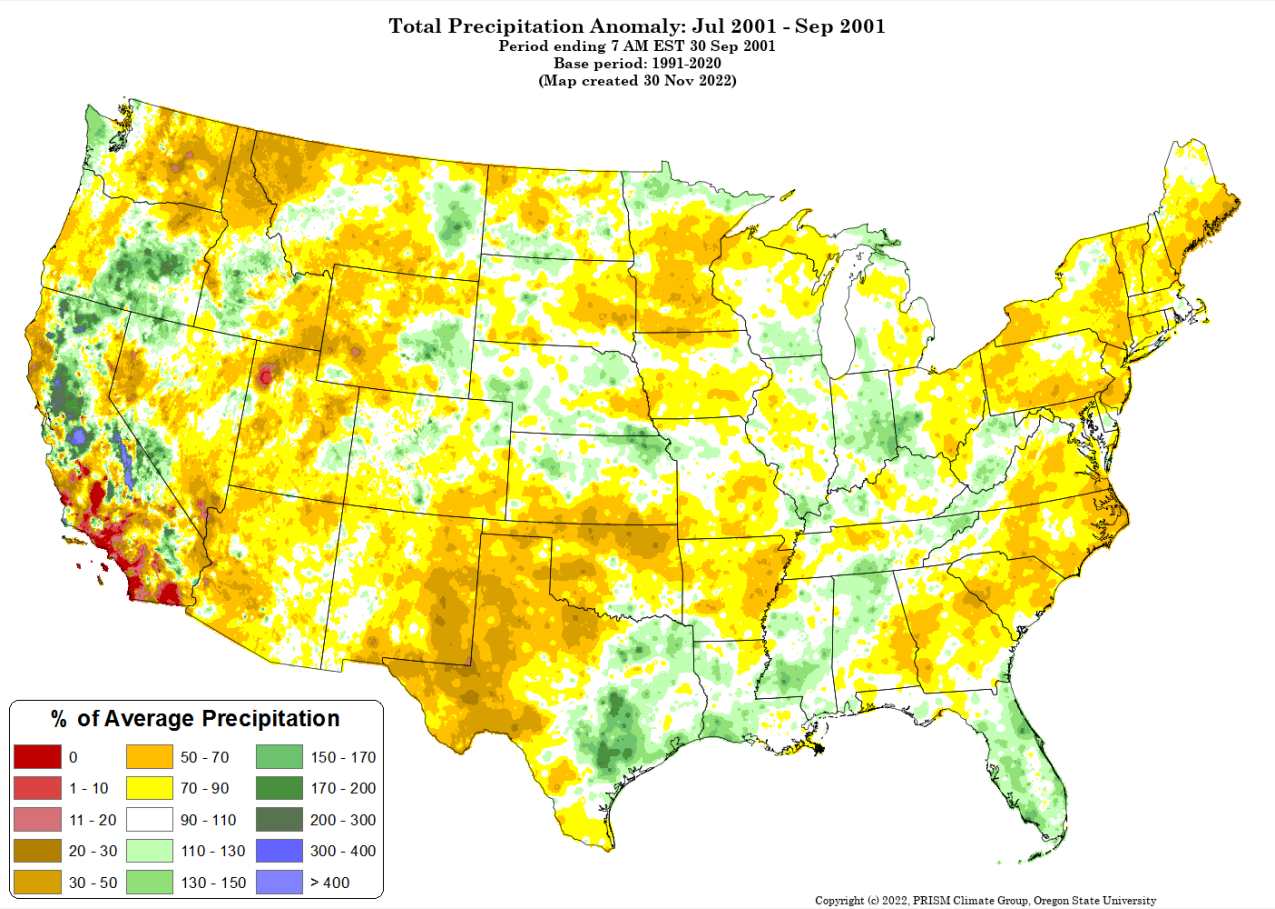

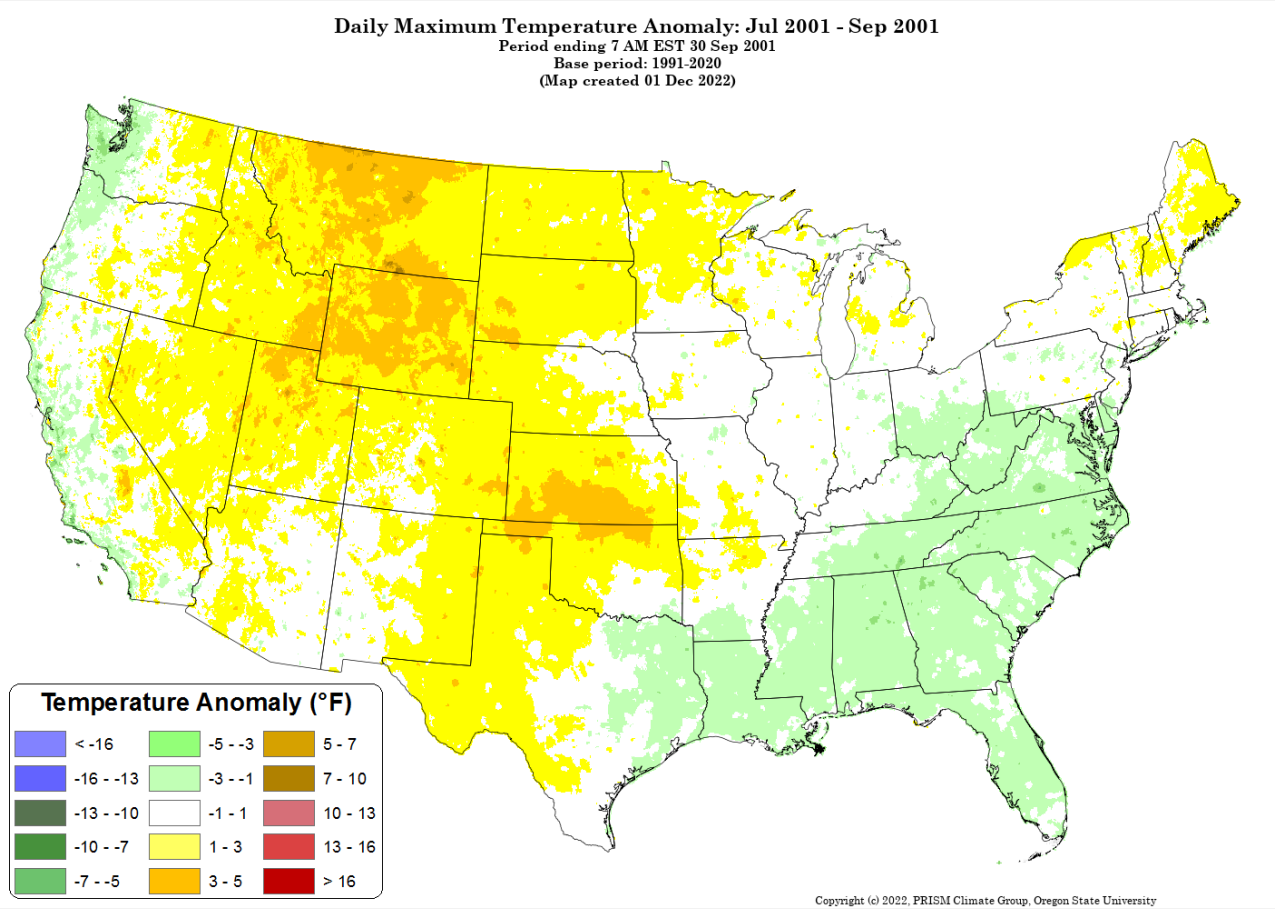

What was the monsoon like after the last triple-dip La Niña? Monsoon season (July, August and September) 2001 was the year and precipitation ended up slightly below average central and west and well below average east. High temperatures ended up slightly above average east.

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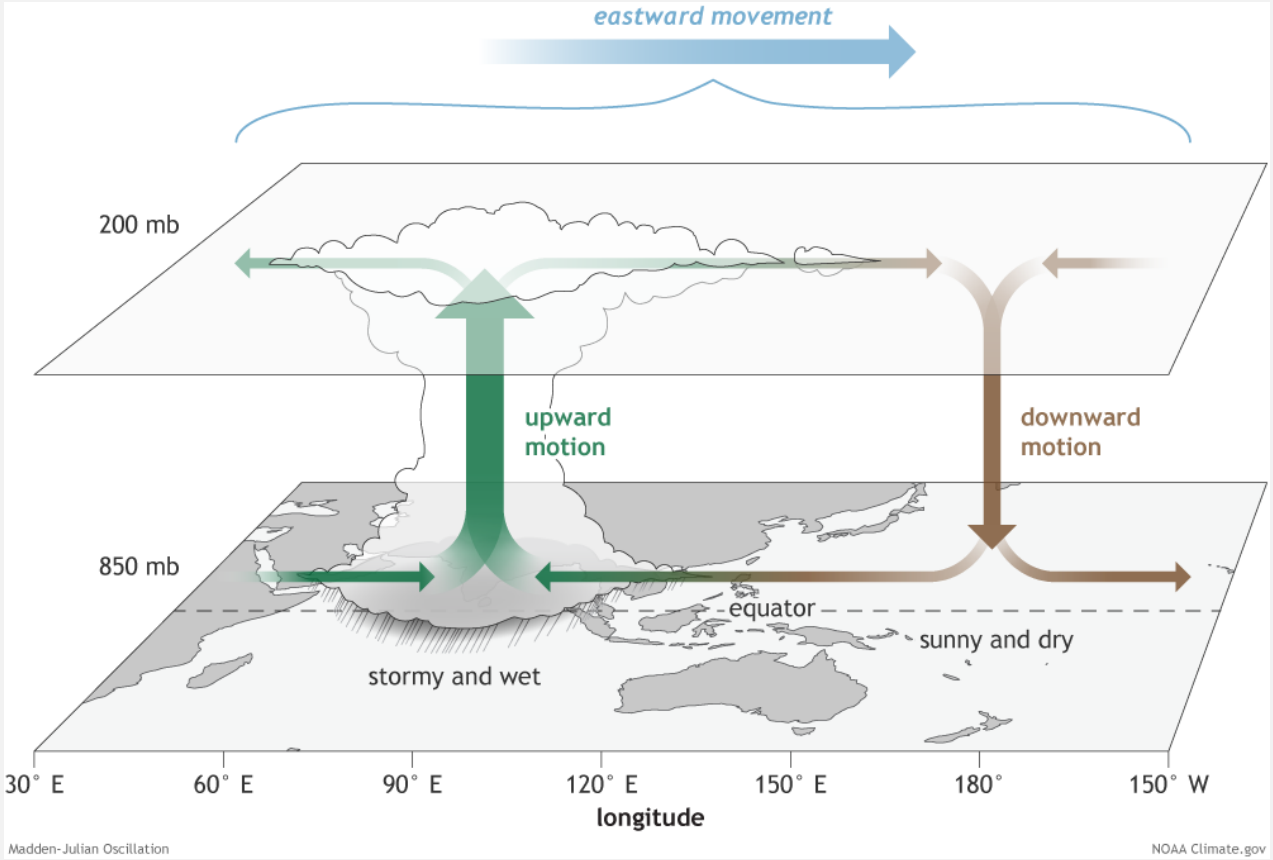

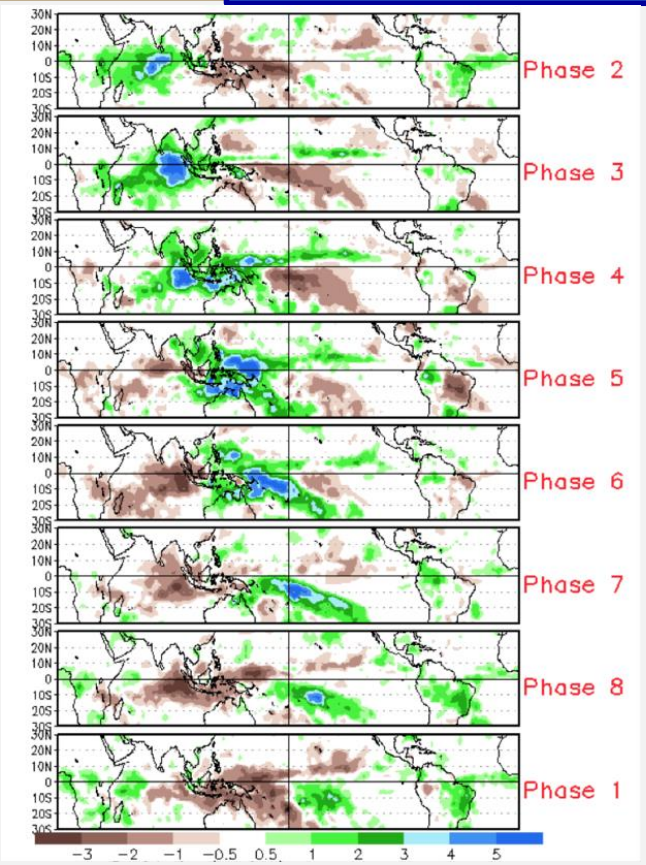

The Madden-Julian Oscillation (MJO) is an area of enhanced thunderstorms that travels around the world every 30 to 60 days from west to east along/near the equator. Ahead and behind the active stormy area are areas of suppressed convection and drier conditions. The MJO affects near-surface wind patterns, 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. 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. Expect a major weather pattern shift at some point in fall 2023 when MJO related thunderstorms combine with El Niño to start influencing both the polar and subtropical jets.

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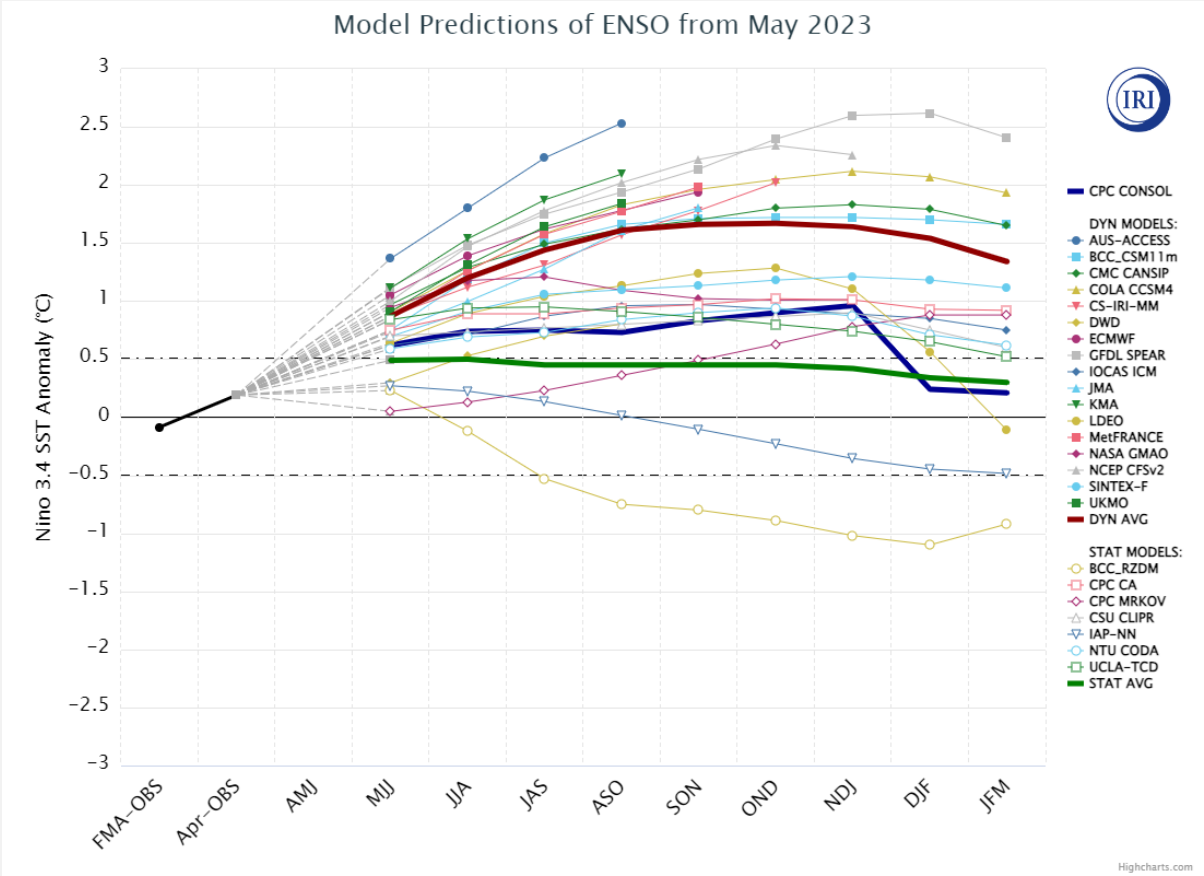

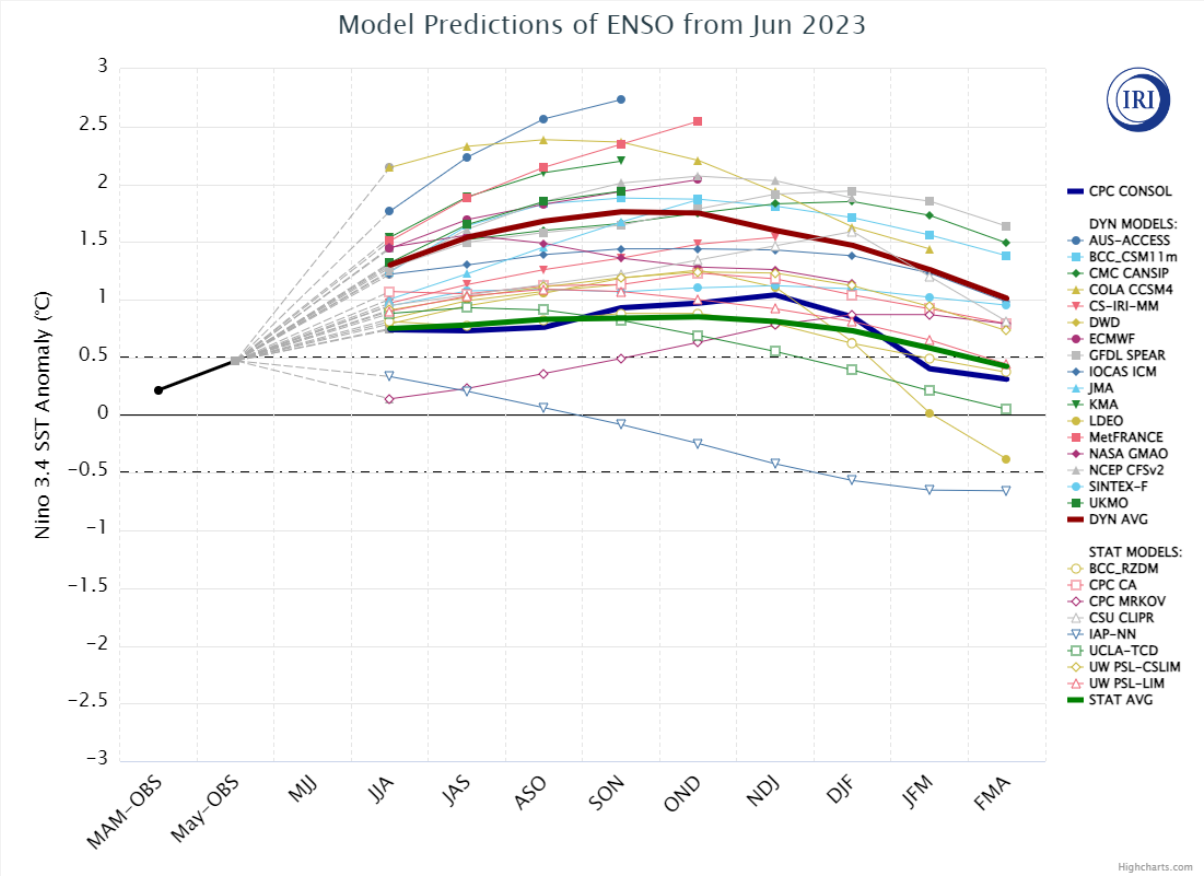

The vast majority of climate model forecasts continue to warm the eastern equatorial Pacific Ocean through summer.

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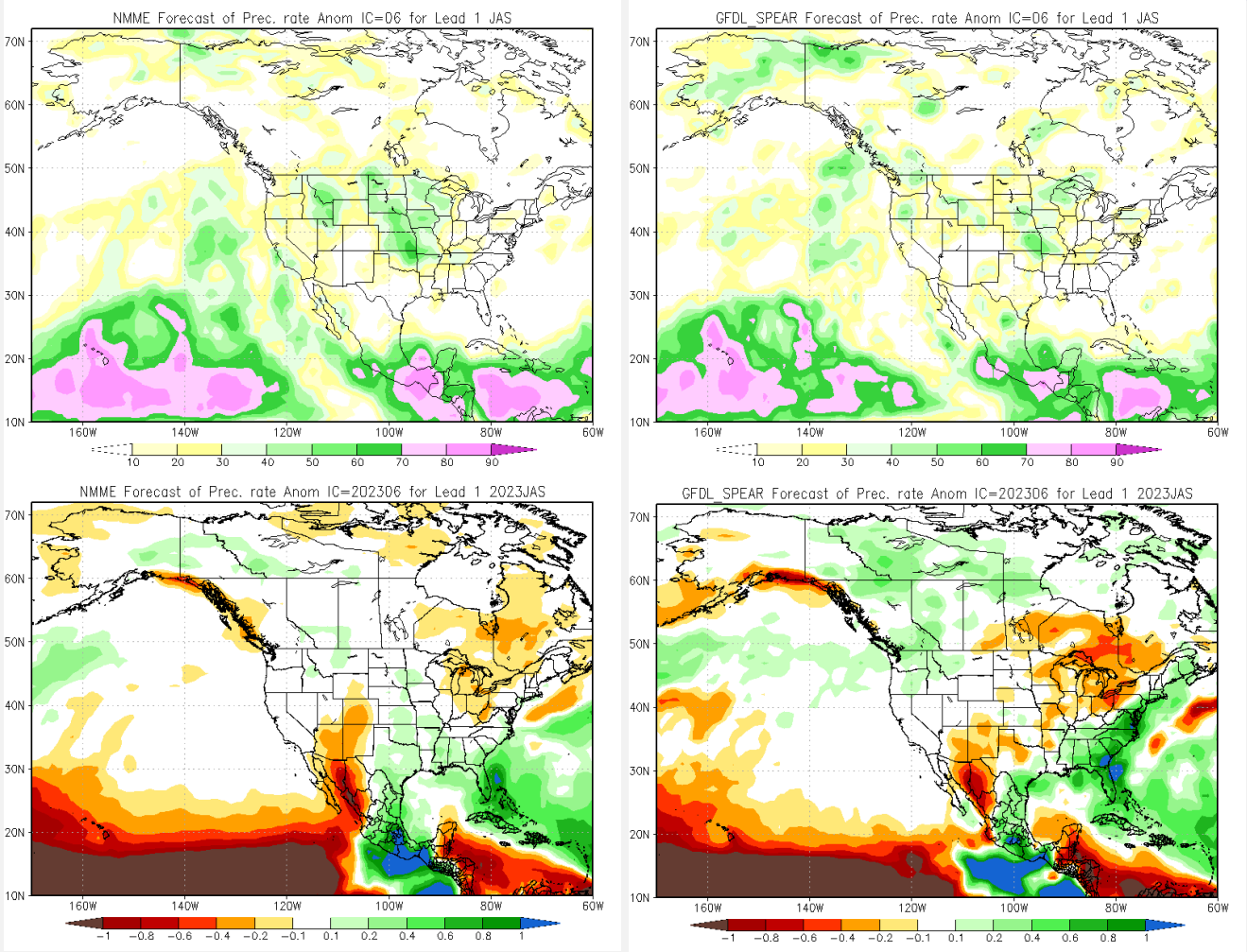

Model precipitation rate anomaly from the two U.S. climate models that typically have the highest forecast skill percentages (top row), the North American Multi-Model Ensemble (NMME) and the Geophysical Fluid Dynamics Laboratory (GFDL_SPEAR). Both models, however, show a lack of skill or ability to accurately forecast precipitation during the monsoon in 2023. The NMME forecast is particularly out of character with a near zero skill showing up for much of NM in 2023.

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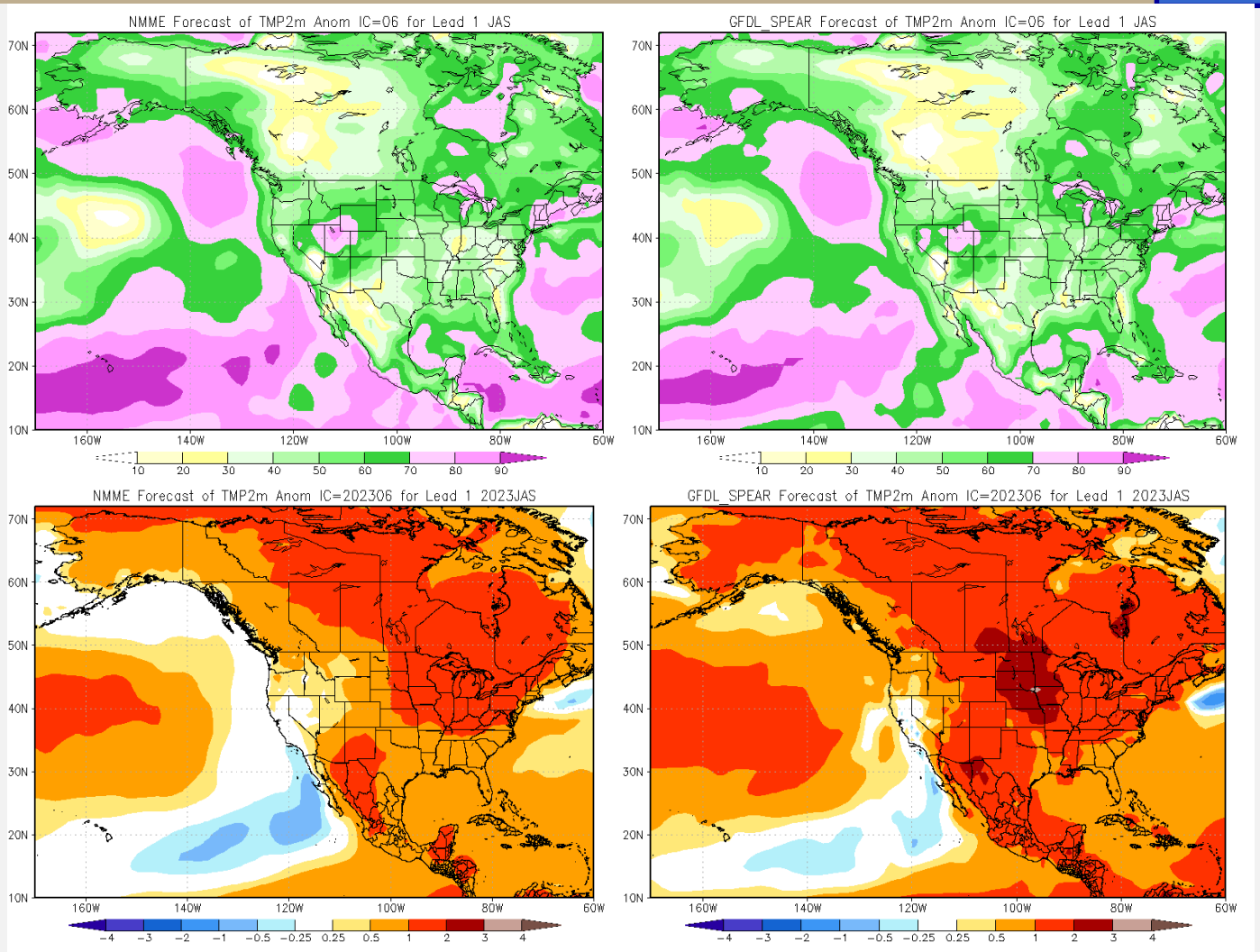

Temperature difference from average forecasts from the two climate models that have the highest forecast skill (top row), the North American Multi-Model Ensemble (NMME), GFDL_ SPEAR, GEM5_NEMO (Canadian) models. Both model forecasts are predicting above to well above average temperatures during July, August and September 2023.

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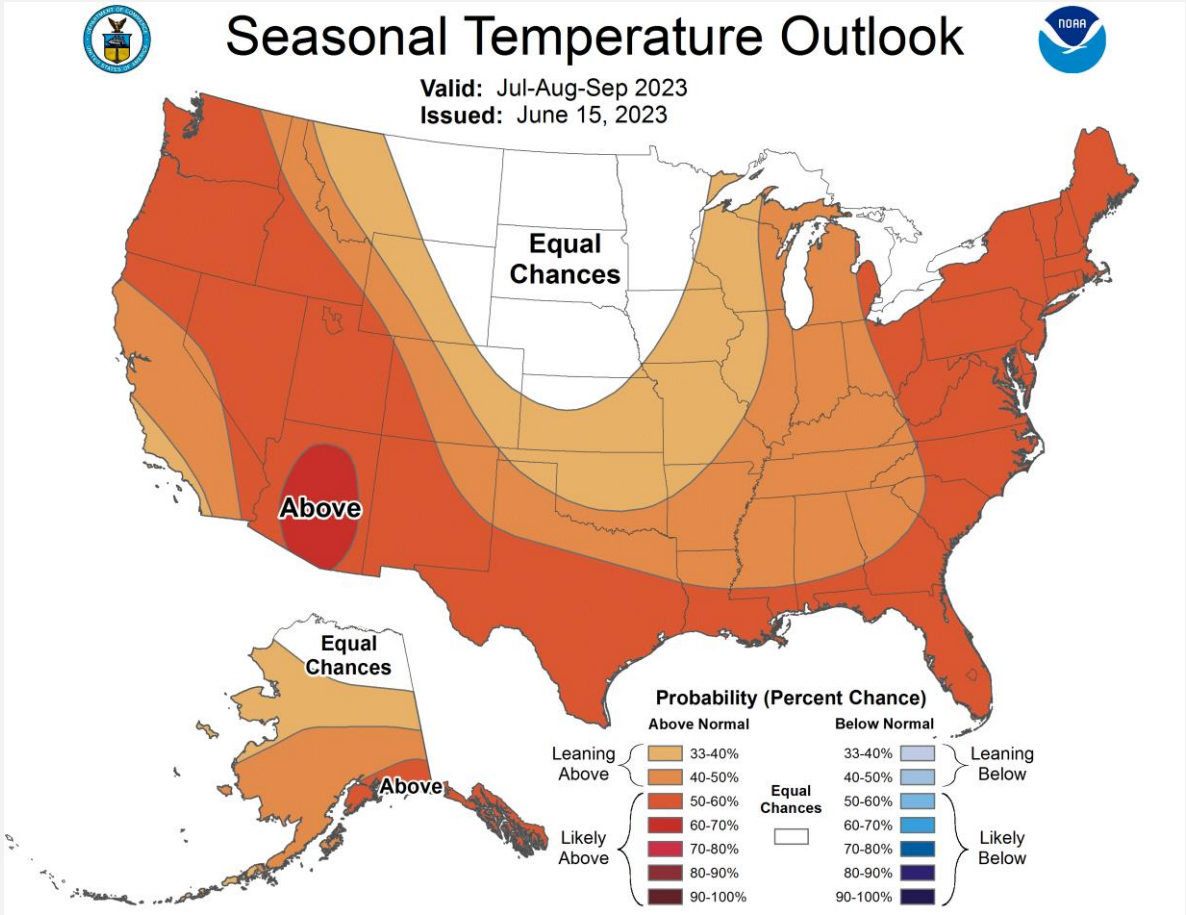

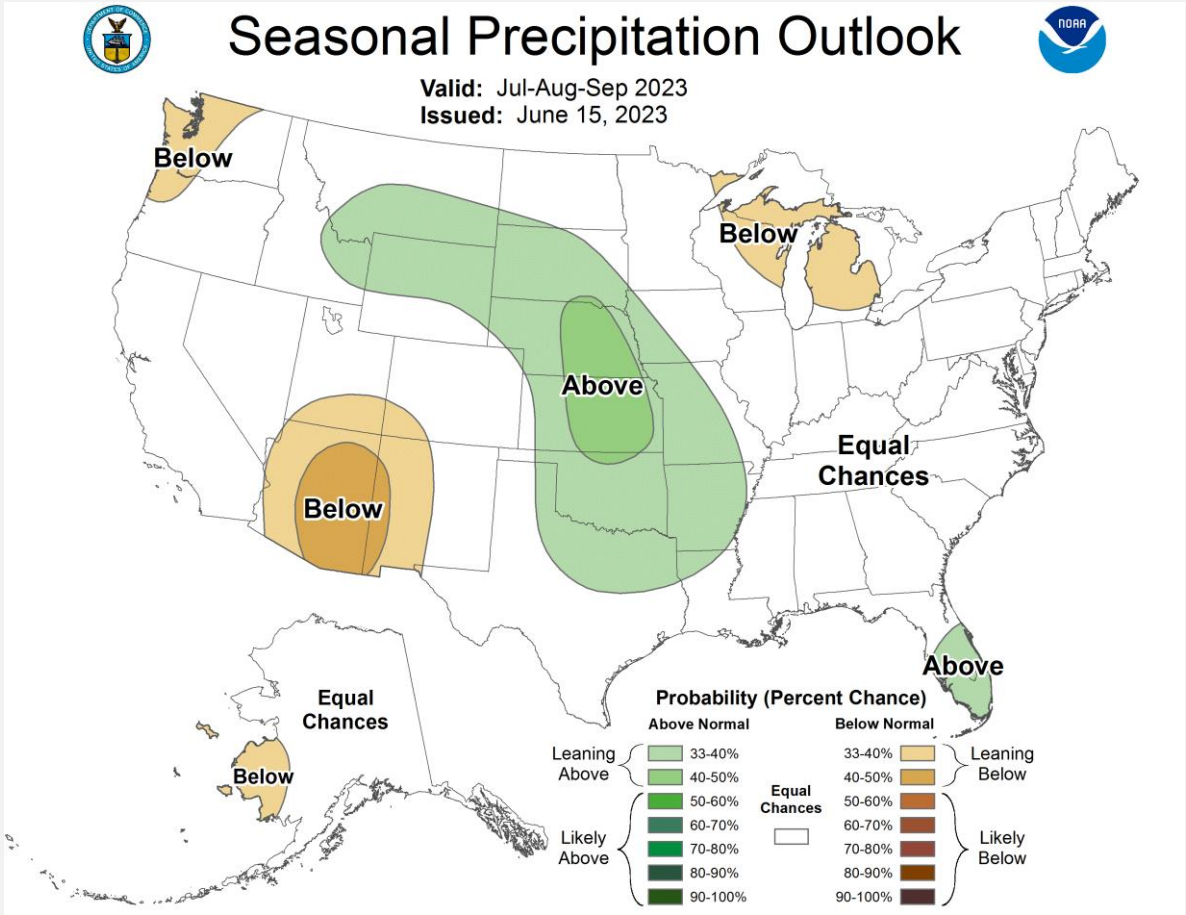

NWS's Climate Prediction Center's Official 2023 Climate Outlook for July, August and September showing probabilities favor above average temperatures and below average precipitation.

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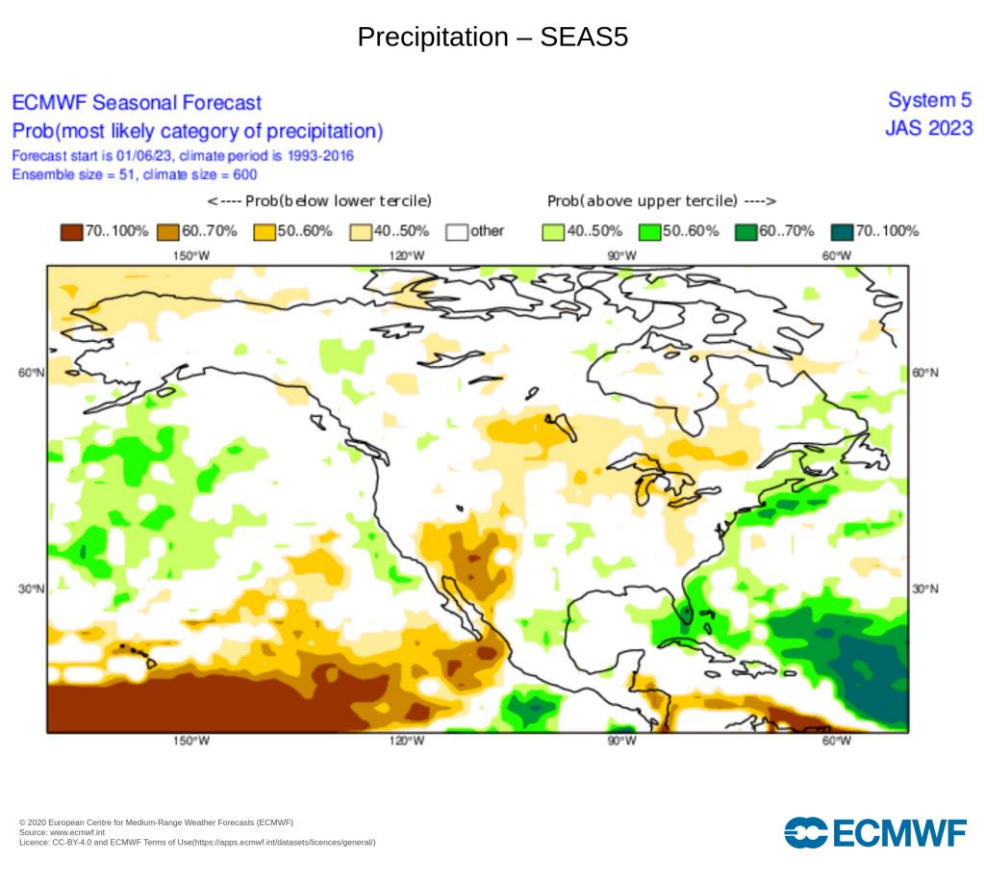

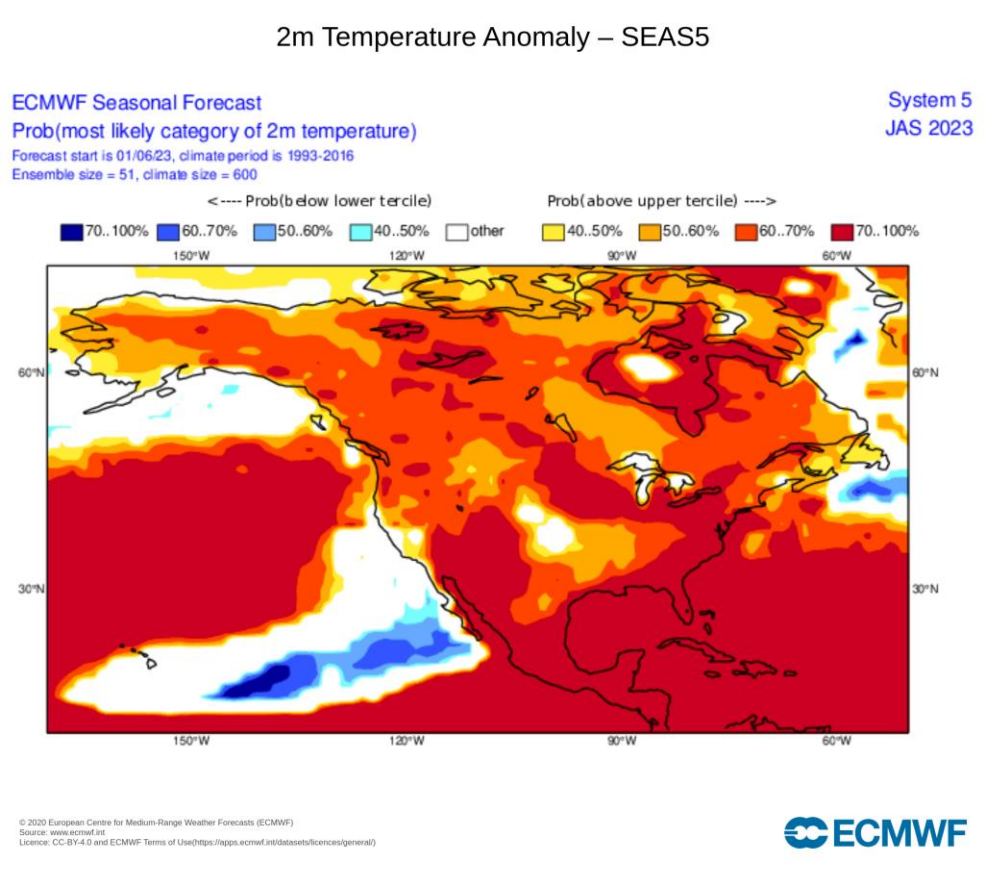

Seasonal precipitation and temperature difference from average forecast from the European Center for Medium Range Weather Forecasts (ECMWF) seasonal model showing below average precipitation and above to well above average temperatures.

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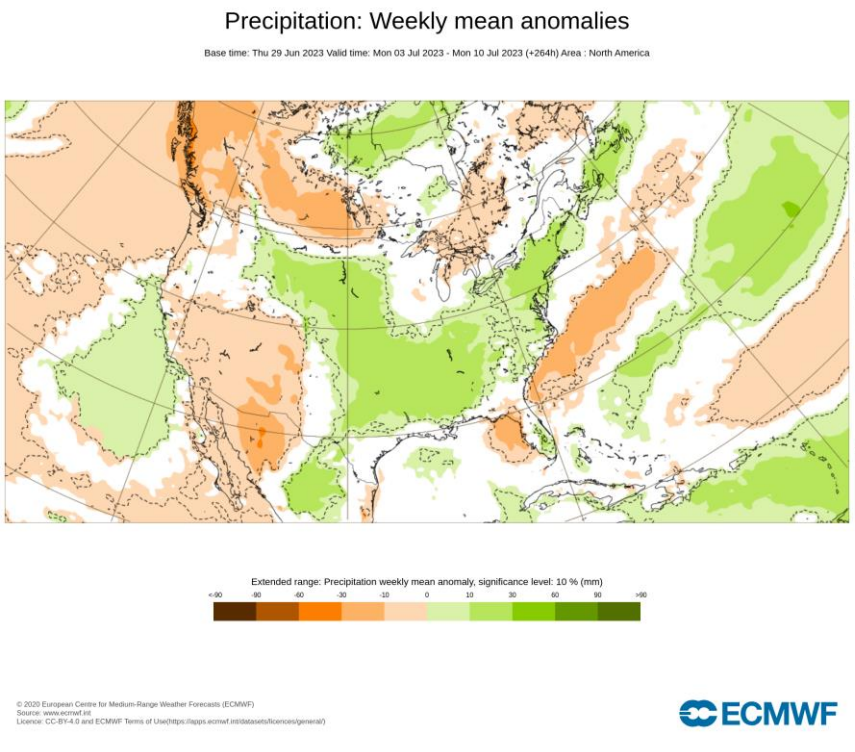

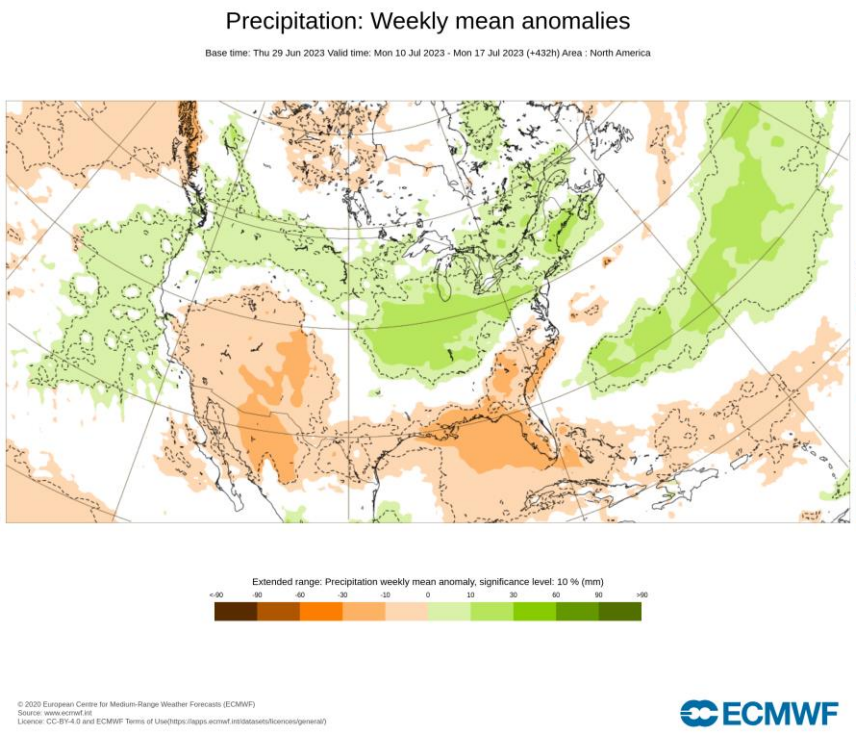

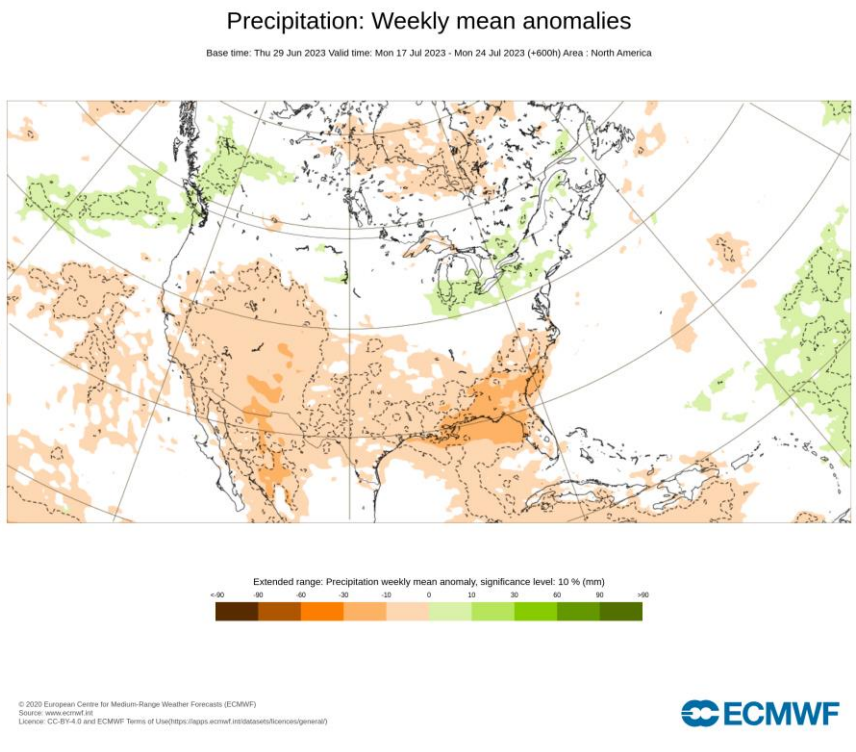

Weekly difference from average precipitation forecasts from the ECMWF. ECMWF's extended ensemble model keeps the Southwest U.S. drier than average through late July.

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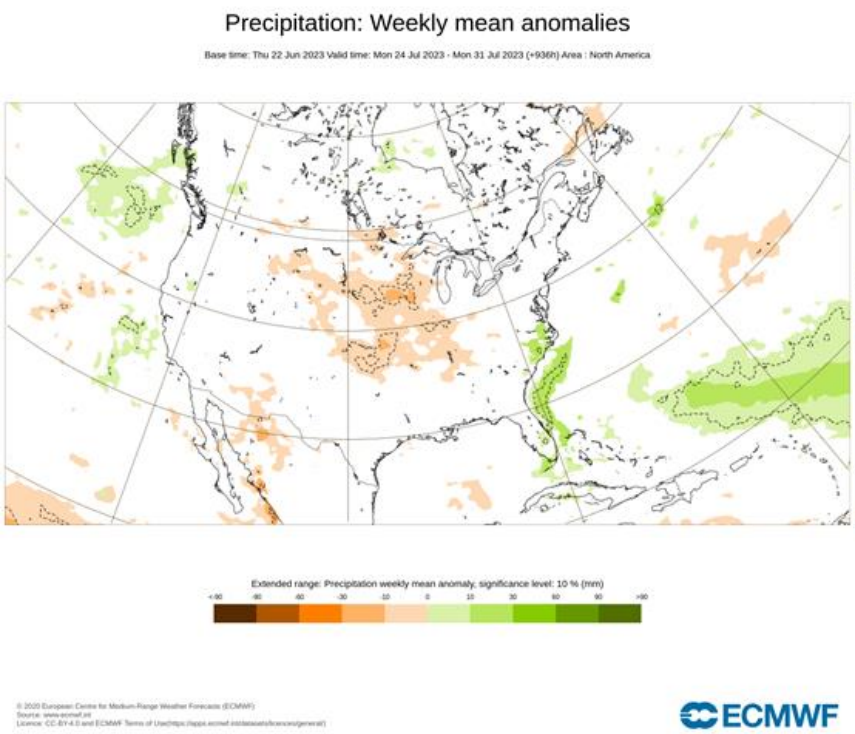

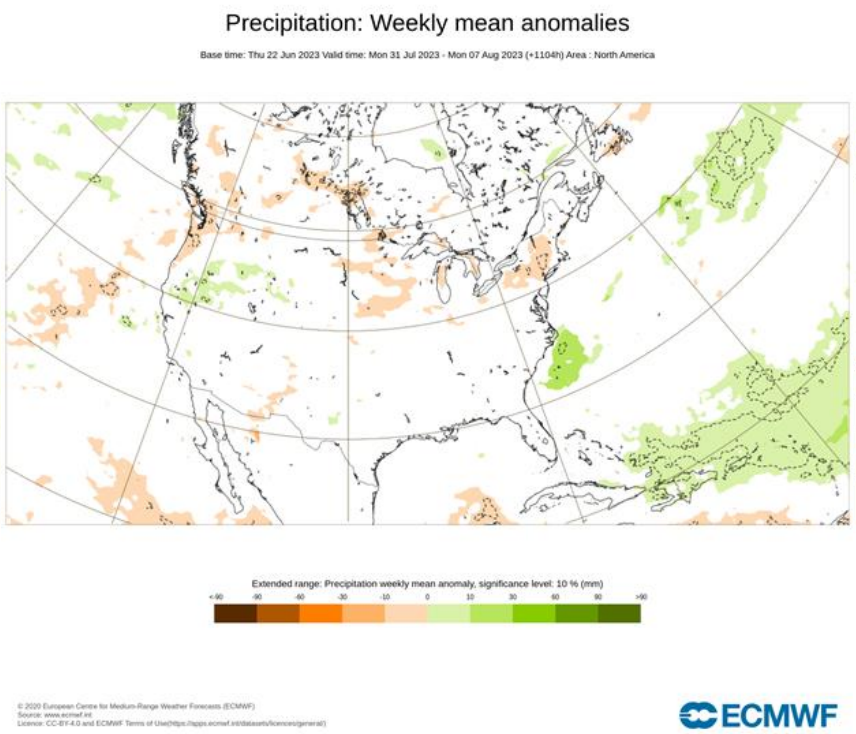

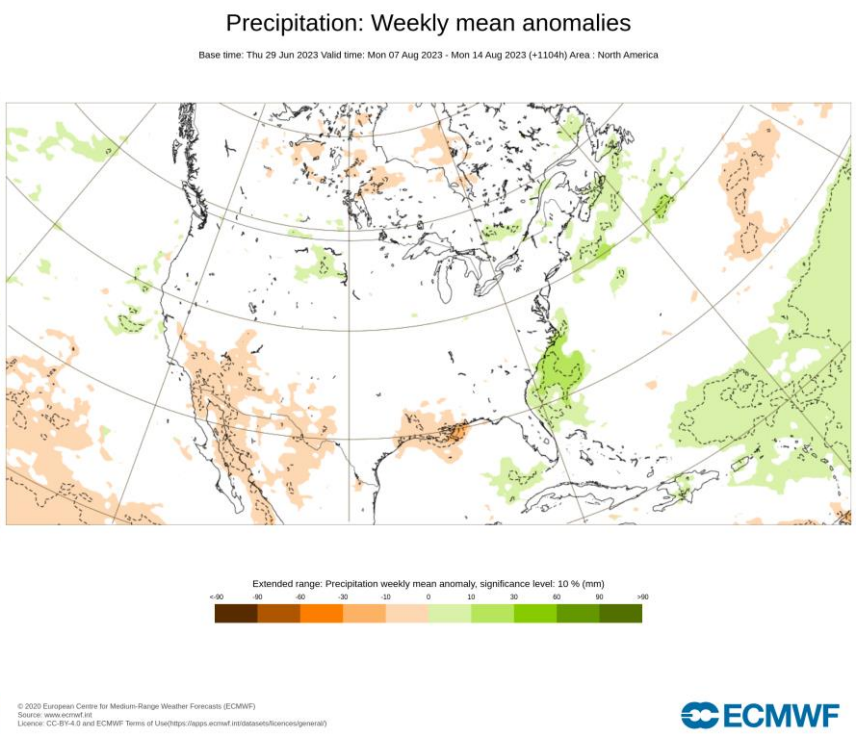

Weekly difference from average precipitation forecasts from the ECMWF for late July through mid August 2023. The ensemble model is forecasting near average August precipitation.

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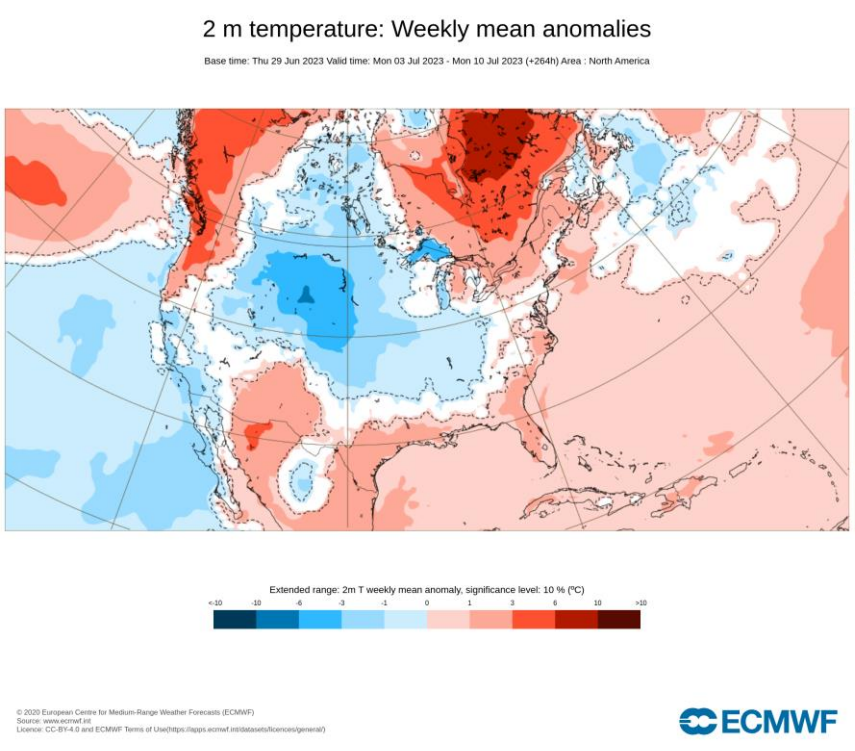

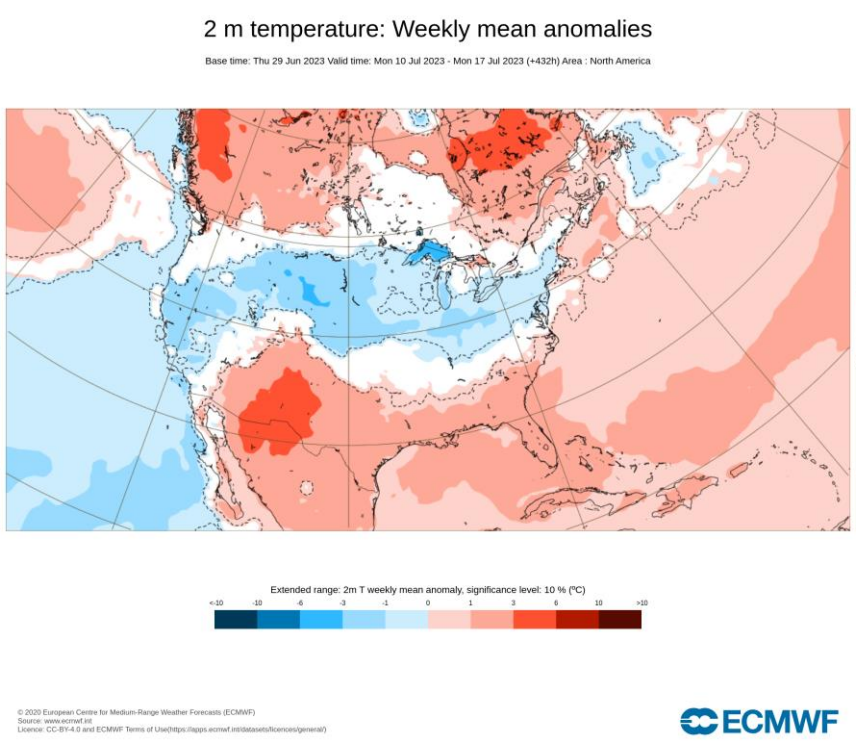

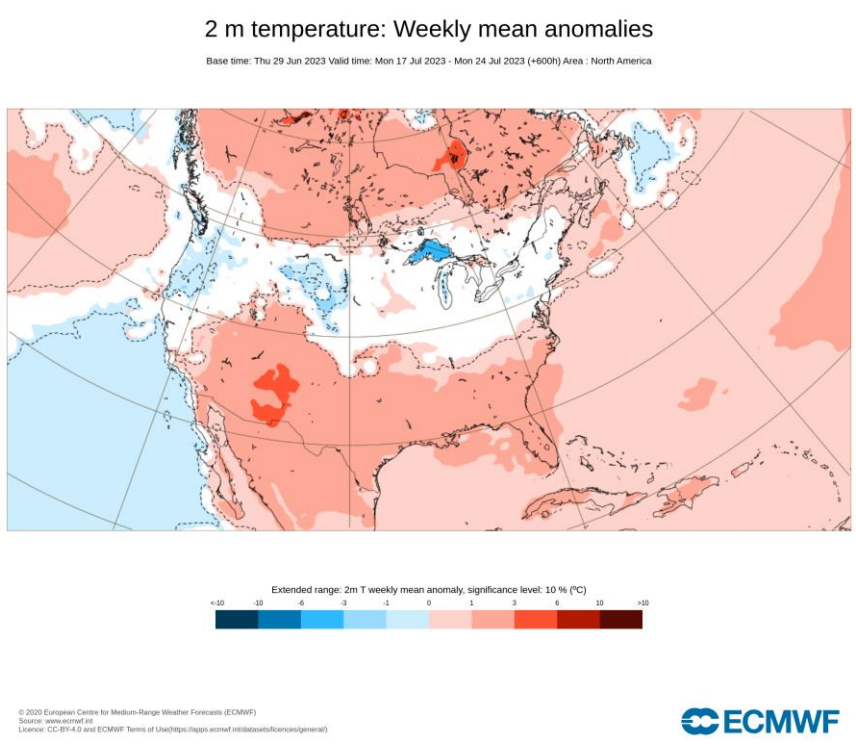

Weekly difference from average temperature forecasts from the European Center for Medium Range Weather Forecasts (ECMWF) for much of July. ECMWF's extended ensemble model keeps the Southwest U.S. warmer than average through late July.

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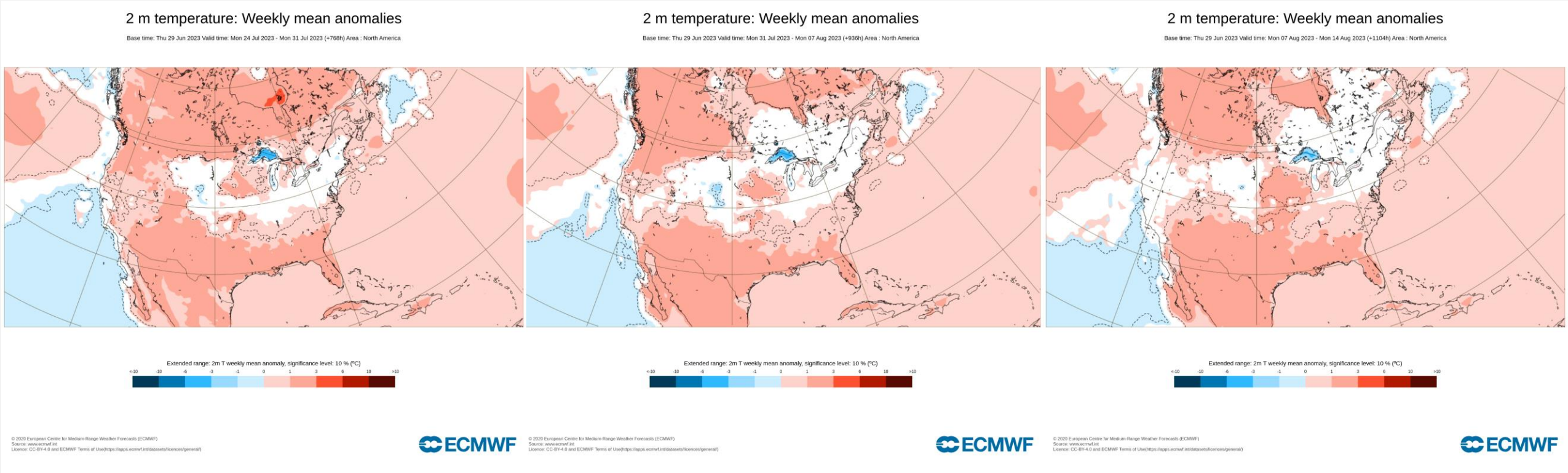

Weekly difference from average temperature forecasts from the European Center for Medium Range Weather Forecasts (ECMWF) for late July into August. ECMWF's extended ensemble model keeps the Southwest U.S. warmer than average through at least mid August.

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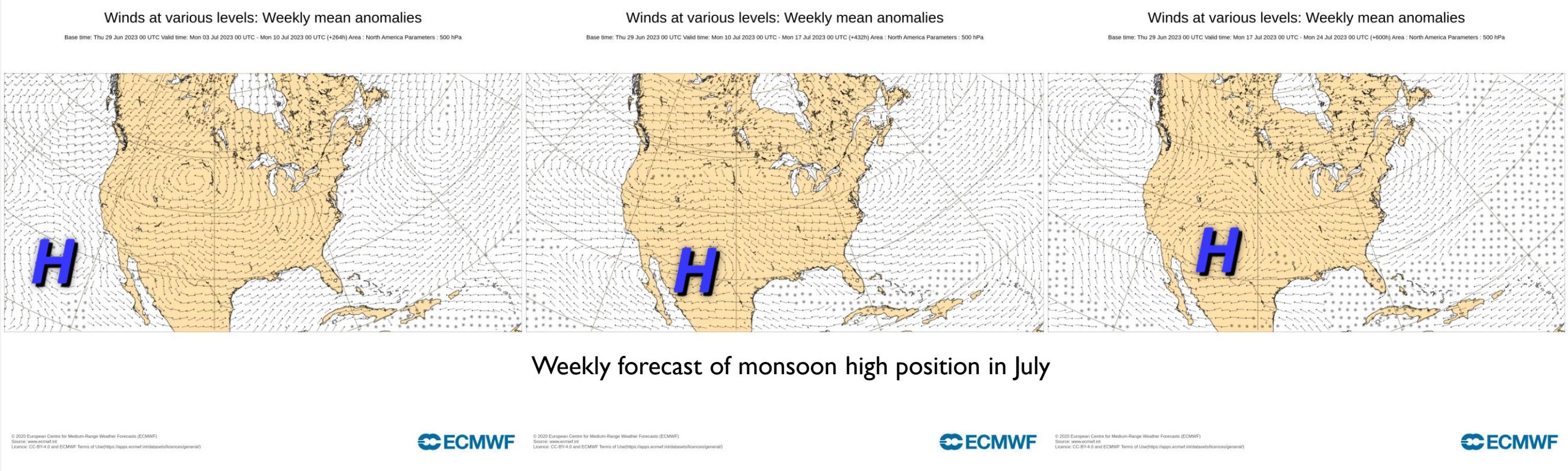

Weekly forecast of monsoon high position in July

Weekly 500 hPa or ~18,000 ft MSL wind forecasts for much of July 2023 from the ECMWF extended ensemble model. During a moderate to strong El Niño, dry air intrusions from enhanced westerly winds in the middle and upper atmosphere in July, August and September are not only more common than average, but much more common compared to La Niña years like last year. There are no bigger climate pattern shifts on Earth than the one that recently took place in the Pacific during the past 8 months (going from 3 cool seasons in a row with La Niña to an El Niño). The above ECMWF wind forecast for the monsoon high shows just how difficult it may be this year to get a traditional southerly or stand-up plume of moisture.

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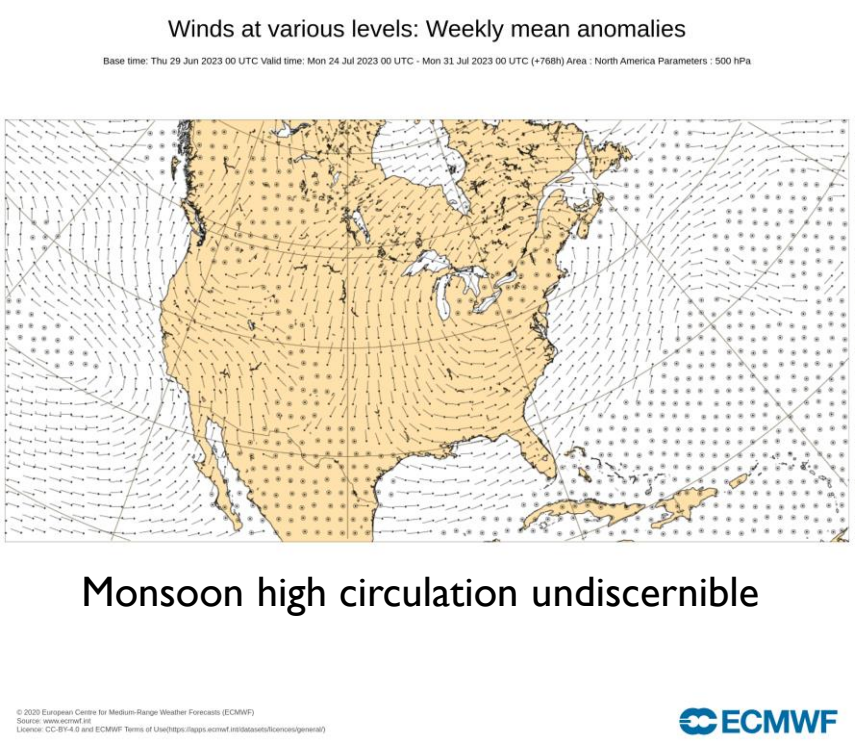

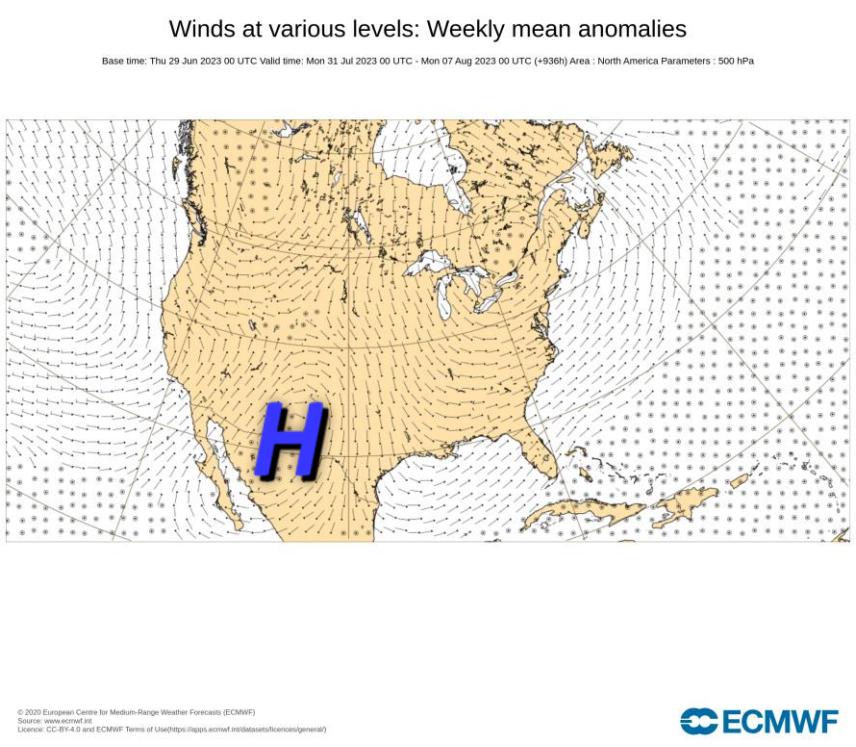

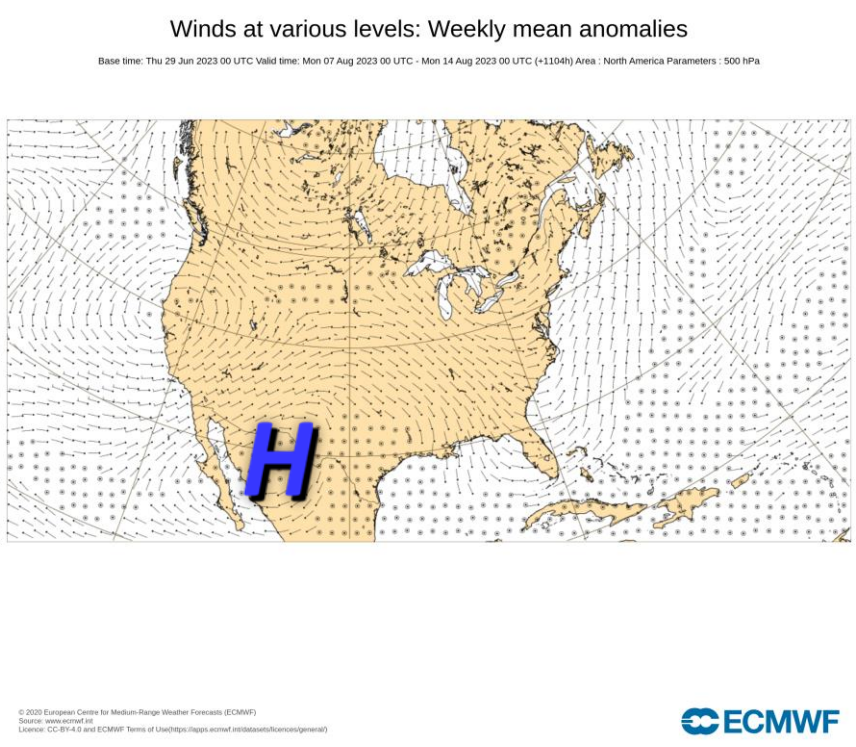

Monsoon high circulation undiscernible

Weekly 500 hPa or ~18,000 ft MSL wind forecasts for late July through mid August 2023 from the ECMWF extended ensemble model. During a moderate to strong El Niño, dry air intrusions from enhanced westerly winds in the middle and upper atmosphere in July, August and September are not only more common than average, but much more common compared to La Niña years like last year.

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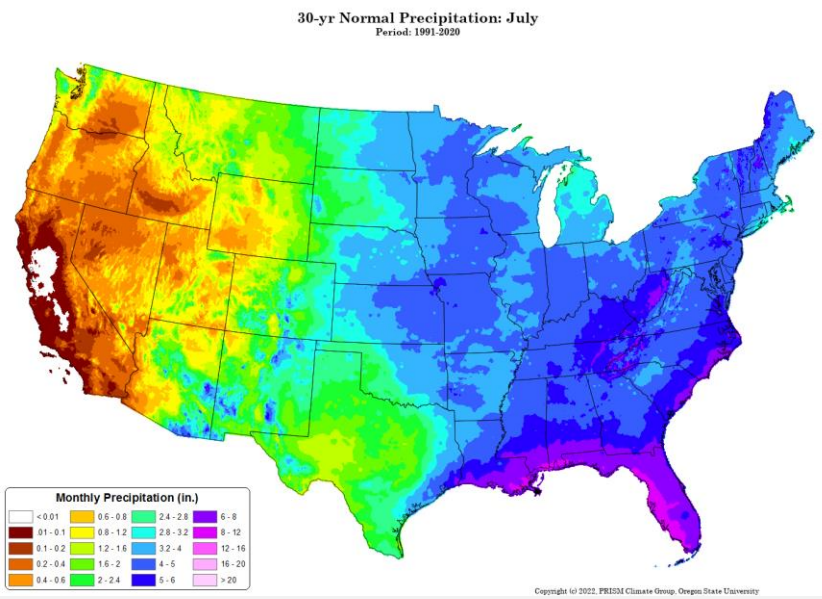

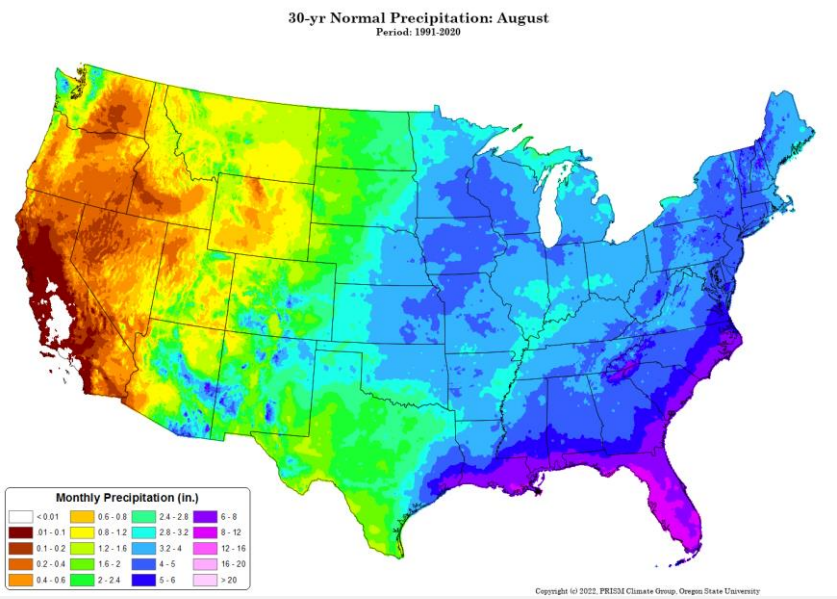

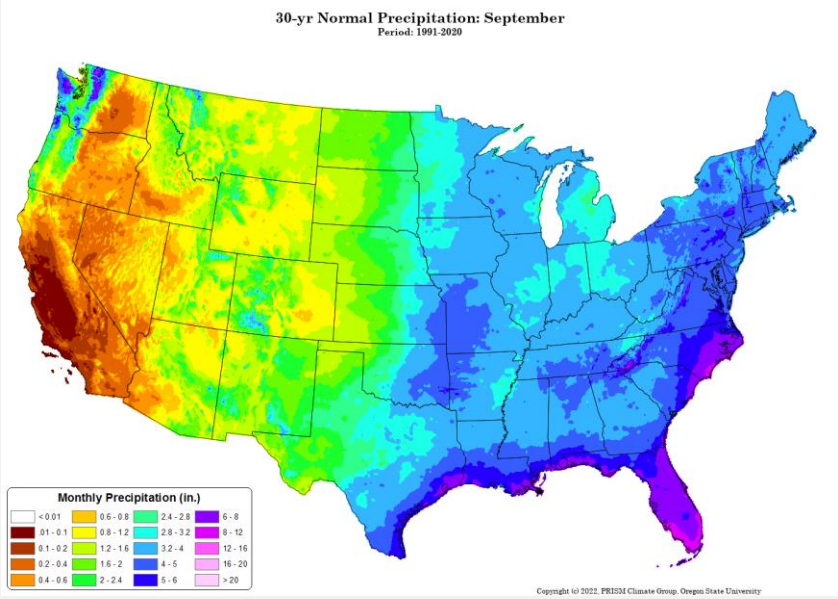

What is average or normal precipitation during the monsoon? These charts show normal or average precipitation for each month during July, August and September.

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July: Forecast confidence is high for a late monsoon onset with below average precipitation and above average high and low temperatures in central and northern NM.

August: Forecast confidence is moderate for near average precipitation and above average high and low temperatures.

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

Wind: Confidence is high in above average sustained wind speeds in July, August and September thanks to the El Niño climate pattern and the enhanced subtropical jet stream that results.

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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