

# 2024 North American Monsoon Forecast

**For Central & Northern New Mexico**



Issued: 6/14/2024

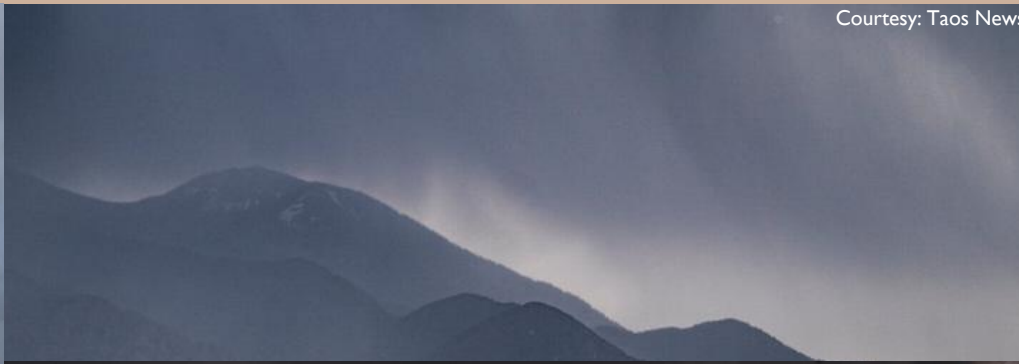
## Albuquerque

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Updated: 6/20/2024



Courtesy: Andrew Church



Courtesy: Taos News



Courtesy: NM Tech



Courtesy: Brett Walton



Courtesy: Angel Fire Resort



Courtesy: Andrew Church

Promises of a La Niña spell great news for the North American Monsoon (NAM) this year. Why? Less than average, long lived deep thunderstorm activity in the eastern equatorial Pacific results in a weaker subtropical jet stream and fewer dry air incursions from the west and northwest.

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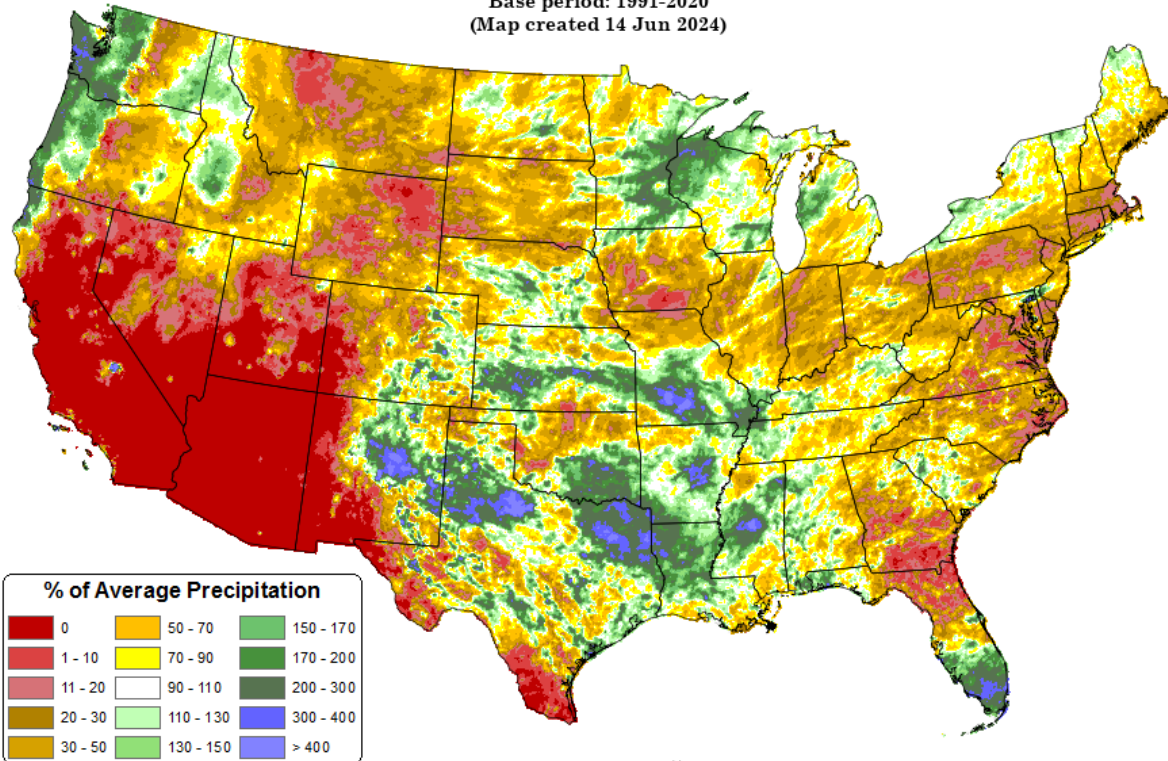
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## Total Precipitation Anomaly: 01 Jun 2024 - 13 Jun 2024

Period ending 7 AM EST 13 Jun 2024

Base period: 1991-2020

(Map created 14 Jun 2024)



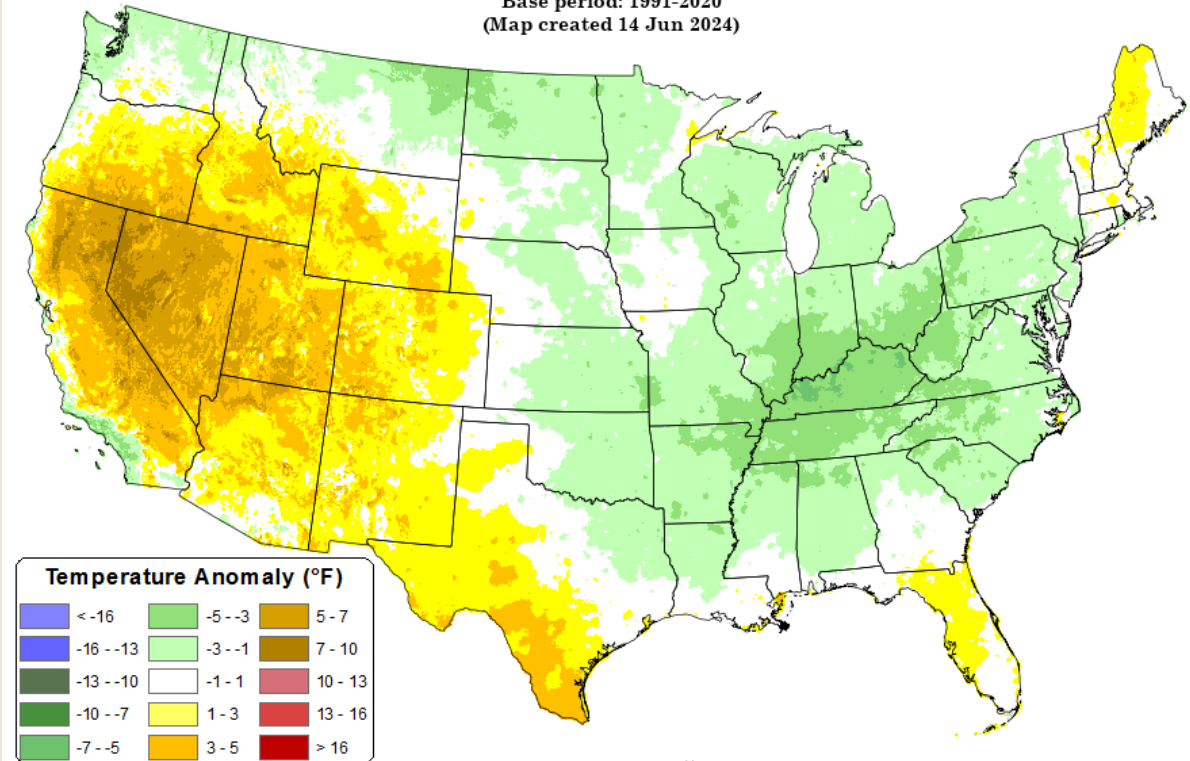
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## Daily Mean Temperature Anomaly: 01 Jun 2024 - 13 Jun 2024

Period ending 7 AM EST 13 Jun 2024

Base period: 1991-2020

(Map created 14 Jun 2024)



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So far during the first 13 days of June 2024, precipitation has fared well in portions of the state. Other areas in far western NM have missed out completely. High temperatures so far have averaged above average 1991-2020 values.



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Current ENSO Status from the Climate Prediction Center (CPC)



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ENSO Alert System Status: **El Niño Advisory** / **La Niña Watch**

El Niño is transitioning toward ENSO-neutral.\*

Equatorial sea surface temperatures (SSTs) are above average in the western and central Pacific Ocean, and below-average SSTs are emerging in the east-central and eastern Pacific Ocean.

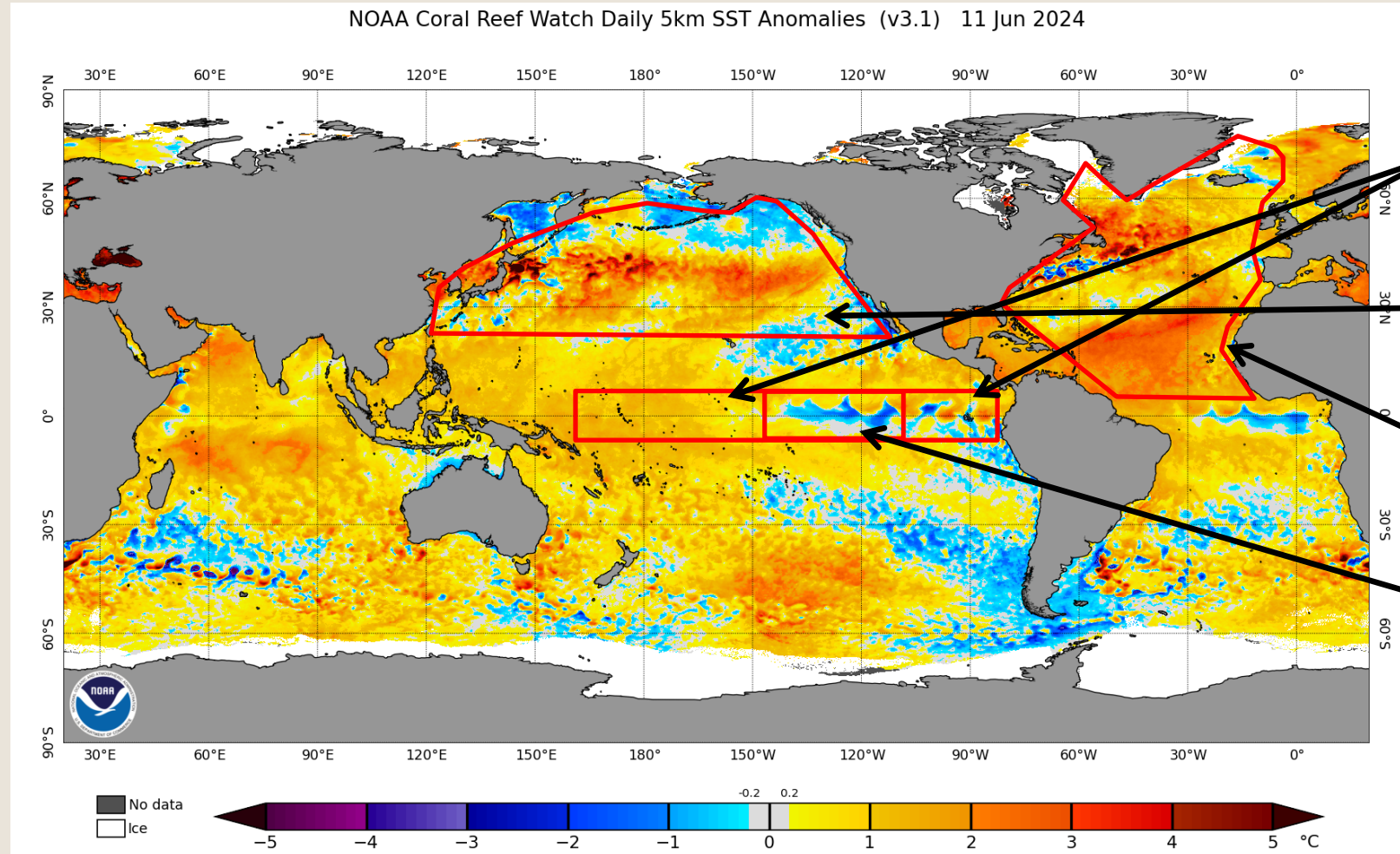
A transition from El Niño to ENSO-neutral is likely in the next month. La Niña may develop in June-August 2024 (49% chance) or July-September (69% chance).

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## Sea Surface Temperature Anomalies or Difference from Average



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➤ Multivariate ENSO Index (MEI)  
for JAN-FEB 2024: **+0.7**

➤ Pacific Decadal Oscillation (PDO)  
for MAY 2024: **-2.09**

➤ Atlantic Multidecadal Oscillation (AMO)  
for MAY 2024: **+1.35**

➤ Oceanic Niño Index (ONI) (uses  
Niño 3.4 region - inner rectangle)  
for MAM 2024: **+0.7** (3 month  
averages => **+0.5** = El Niño & **<= -0.5** = La Niña)

Latest weekly global SST anomalies showing an area of warmer than average temperatures in the eastern equatorial Pacific continuing to cool.

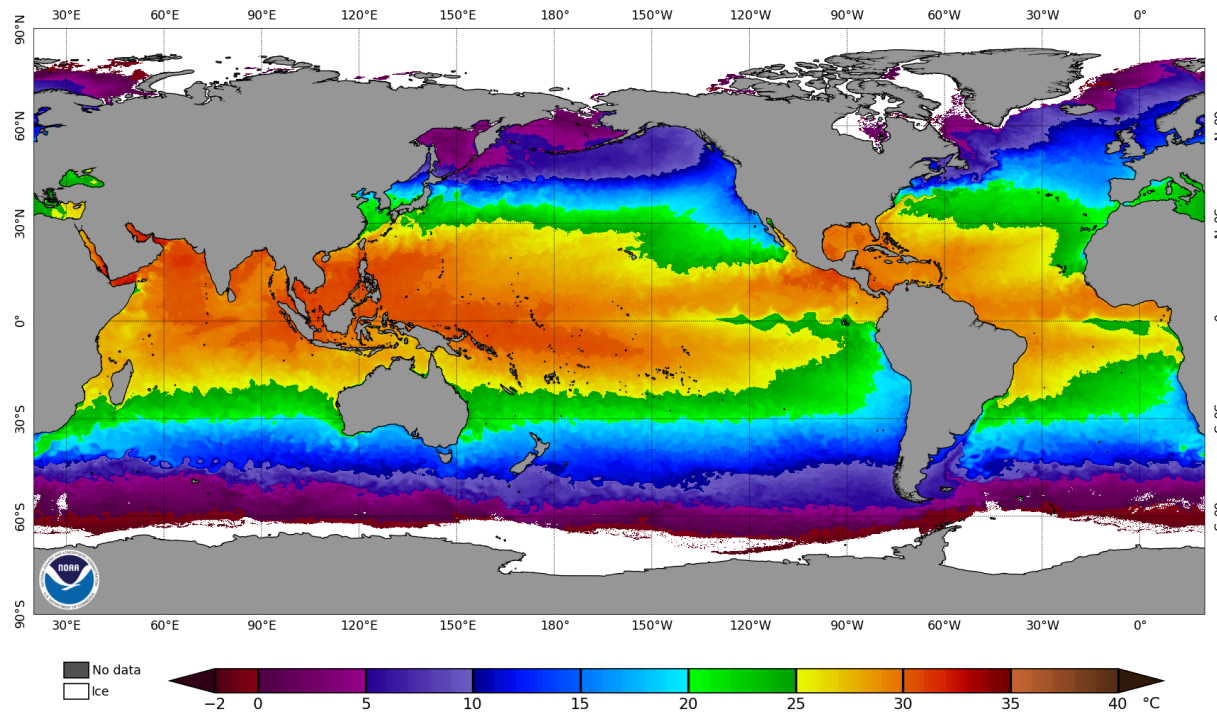
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## Sea Surface Temperatures (SSTs) & SST Anomalies

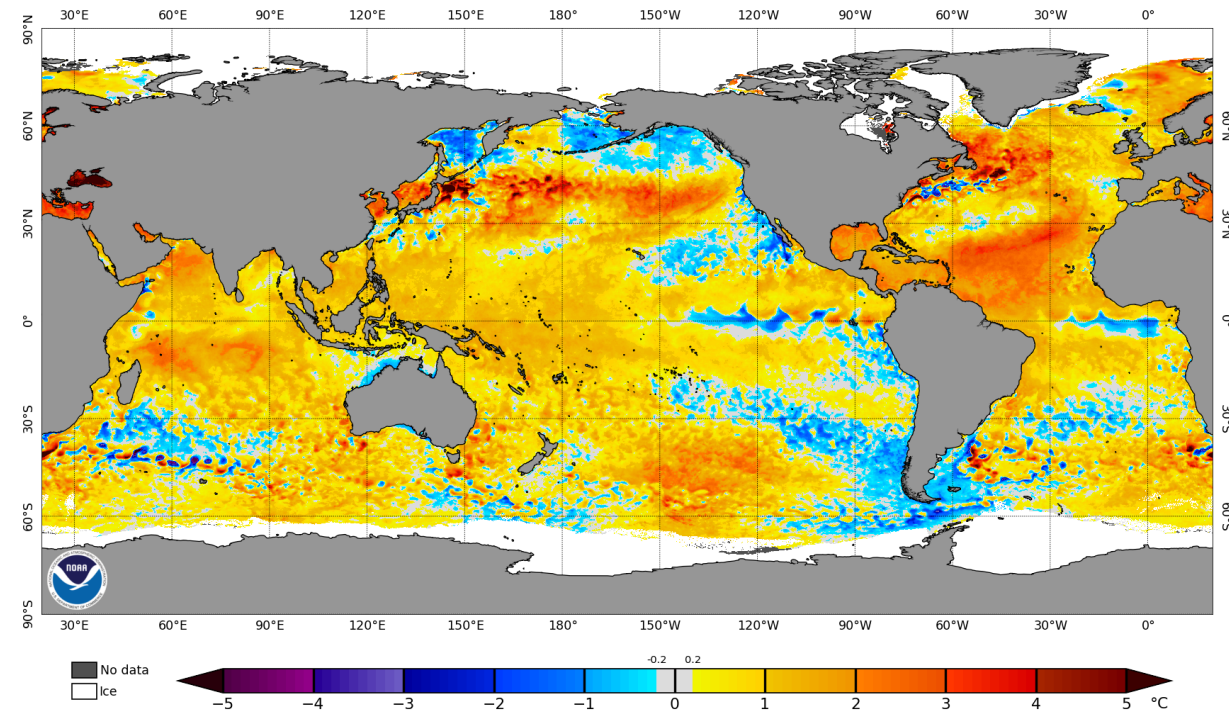


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NOAA Coral Reef Watch Daily 5km Sea Surface Temperatures (v3.1) 11 Jun 2024



NOAA Coral Reef Watch Daily 5km SST Anomalies (v3.1) 11 Jun 2024



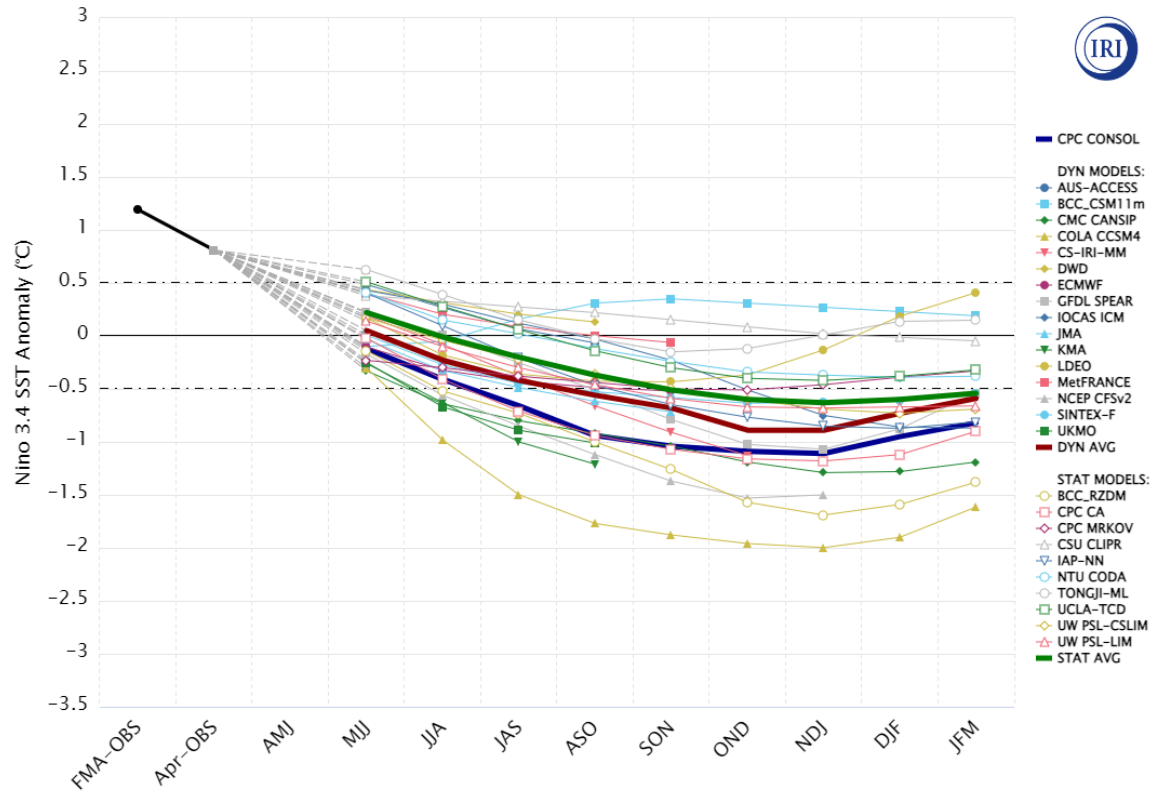
Global SSTs and the latest weekly SST trend. The eastern equatorial Pacific continues to cool rapidly.

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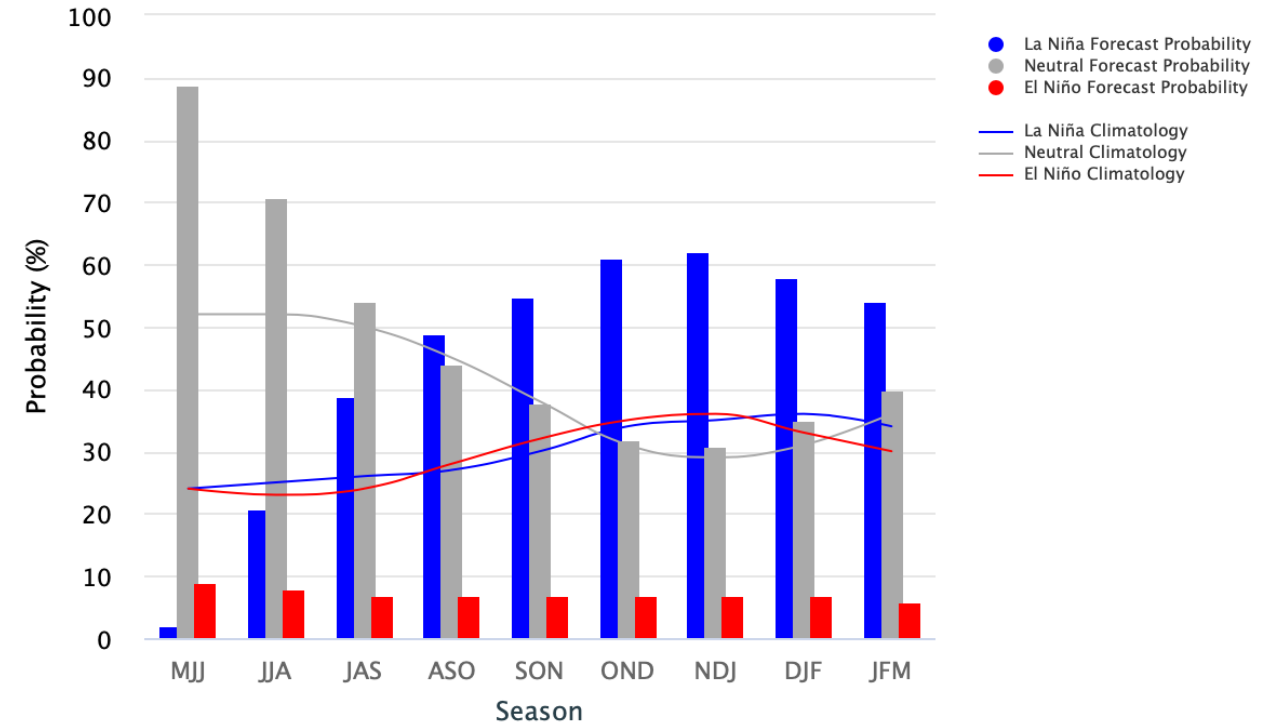
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Model Predictions of ENSO from May 2024



Mid-May 2024 IRI Model-Based Probabilistic ENSO Forecasts

ENSO state based on NINO3.4 SST Anomaly Neutral ENSO:  $-0.5^{\circ}\text{C}$  to  $0.5^{\circ}\text{C}$



The graph on the left and table show forecasts made by dynamical and statistical models for SST in the Nino 3.4 region for nine overlapping 3-month periods. Image on the right is forecast probabilities for either neutral, El Niño, or a La Niña climate pattern. La Niña is heavily favored by this summer.



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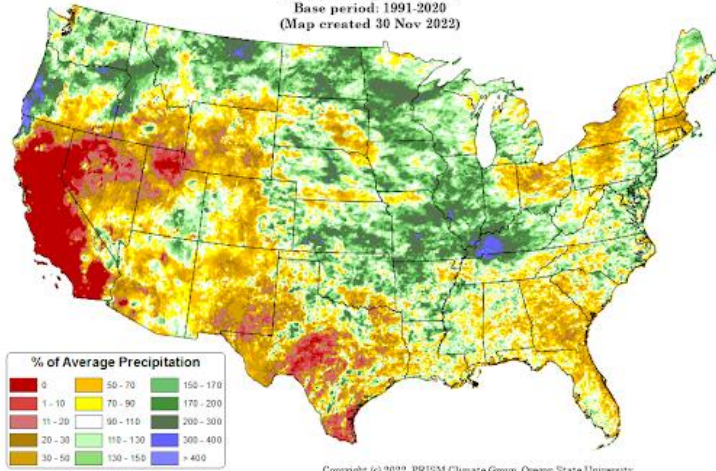
2016 Was A Similar Climate Pattern Change



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Total Precipitation Anomaly: Jul 2016

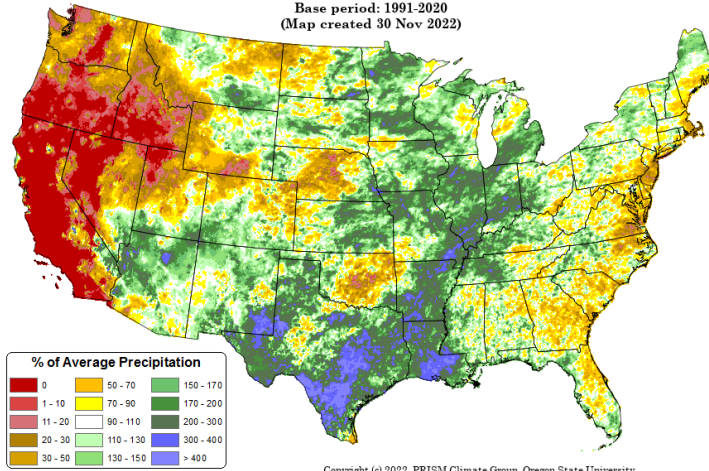
Period ending 31 Jul 2016  
Base period: 1991-2020  
(Map created 30 Nov 2022)



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Total Precipitation Anomaly: Aug 2016

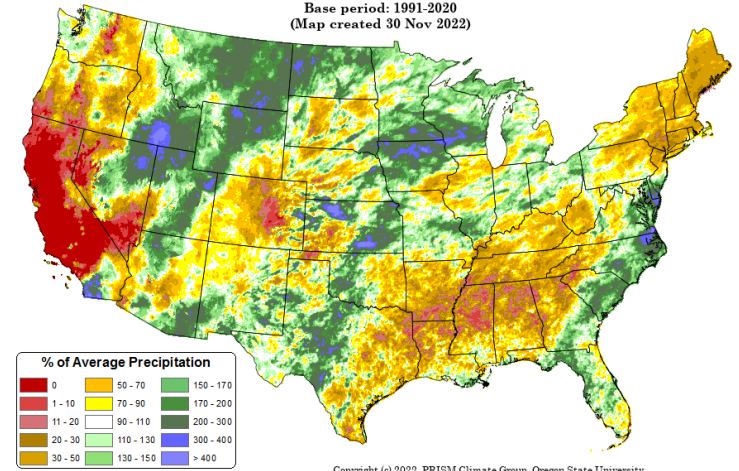
Period ending 31 Aug 2016  
Base period: 1991-2020  
(Map created 30 Nov 2022)



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Total Precipitation Anomaly: Sep 2016

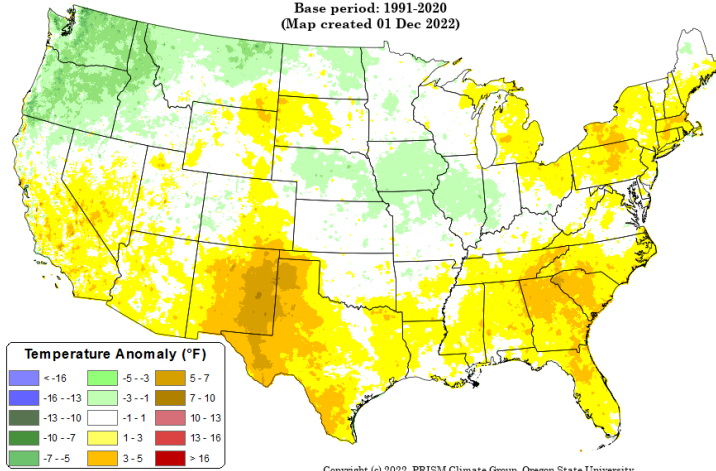
Period ending 30 Sep 2016  
Base period: 1991-2020  
(Map created 30 Nov 2022)



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Daily Maximum Temperature Anomaly: Jul 2016

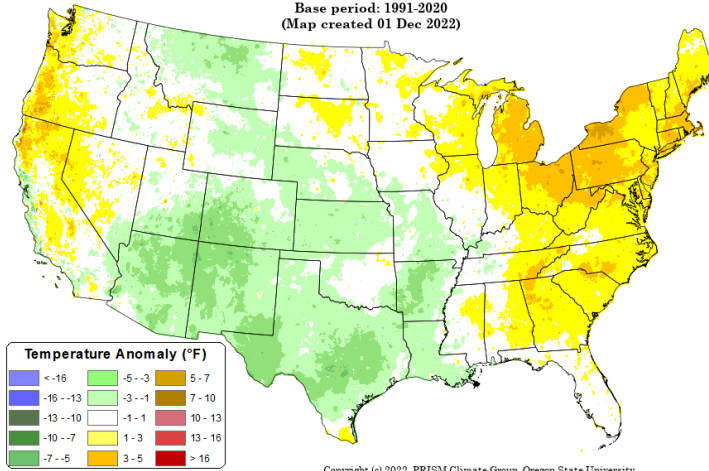
Period ending 31 Jul 2016  
Base period: 1991-2020  
(Map created 01 Dec 2022)



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Daily Maximum Temperature Anomaly: Aug 2016

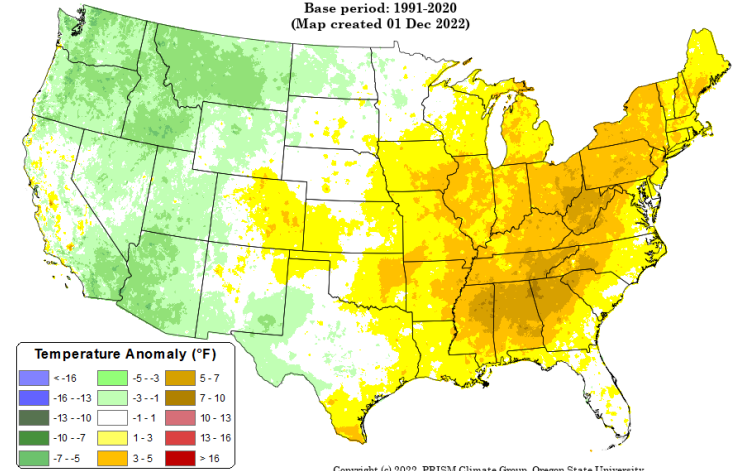
Period ending 31 Aug 2016  
Base period: 1991-2020  
(Map created 01 Dec 2022)



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Daily Maximum Temperature Anomaly: Sep 2016

Period ending 30 Sep 2016  
Base period: 1991-2020  
(Map created 01 Dec 2022)



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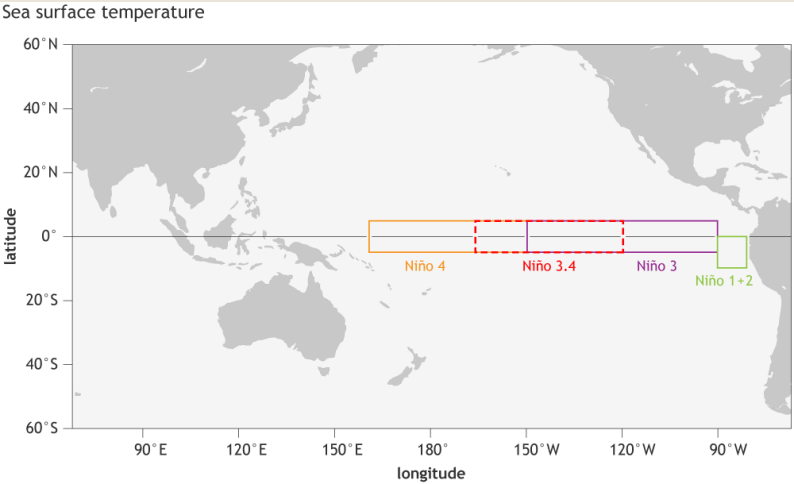
Comparing this year's El Niño ending to a recent super event in 2016. A transition from a strong El Niño to a La Niña like we did in 2016, results in a slow onset or delay, but like it did in 2016, late July and August into early September were very active convective periods.

# 2024 North American Monsoon Forecast

## Oceanic Niño Index (ONI)



Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2014	-0.4	-0.5	-0.3	0.0	0.2	0.2	0.0	0.1	0.2	0.5	0.6	0.7
2015	0.5	0.5	0.5	0.7	0.9	1.2	1.5	1.9	2.2	2.4	2.6	2.6
2016	2.5	2.1	1.6	0.9	0.4	-0.1	-0.4	-0.5	-0.6	-0.7	-0.7	-0.6
2022	-1.0	-0.9	-1.0	-1.1	-1.0	-0.9	-0.8	-0.9	-1.0	-1.0	-0.9	-0.8
2023	-0.7	-0.4	-0.1	0.2	0.5	0.8	1.1	1.3	1.6	1.8	1.9	2.0
2024	1.8	1.5	1.1	0.7								



The Oceanic Niño Index (ONI) is NOAA's primary indicator for monitoring the ocean part of the seasonal climate pattern called the El Niño-Southern Oscillation, or “ENSO” for short. The ONI tracks the running 3-month average sea surface temperatures in the east-central tropical Pacific between 120°-170°W (red dashed rectangle), near the International Dateline, and whether they are warmer or cooler than average. 2016 was a similar ENSO year to 2024 due to the El Niño climate patterns evolving similarly.



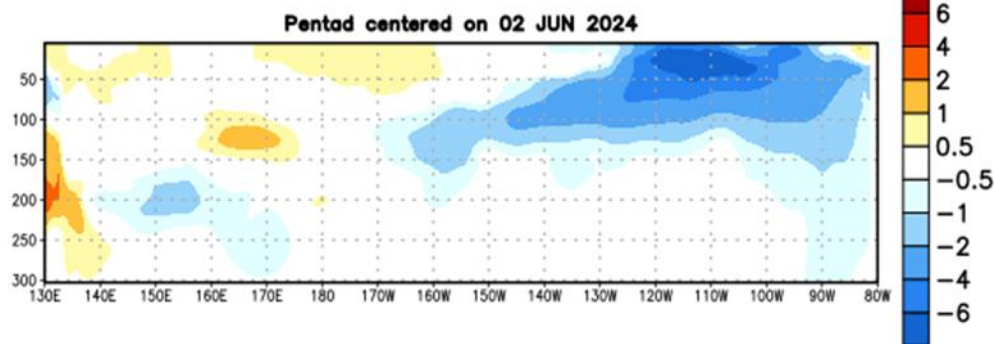
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## Subsurface Pacific Ocean Temperatures

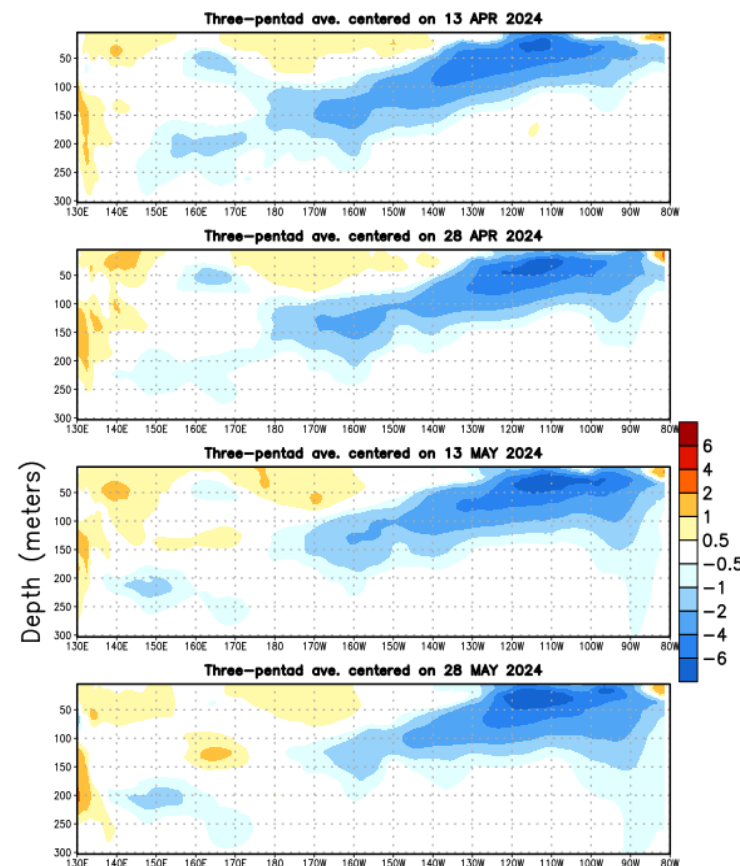


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EQ. Subsurface Temperature Anomalies (deg C)



EQ. Subsurface Temperature Anomalies (deg C)



Below-average temperatures have remained near the surface in the eastern Pacific Ocean near 130°-90°W.

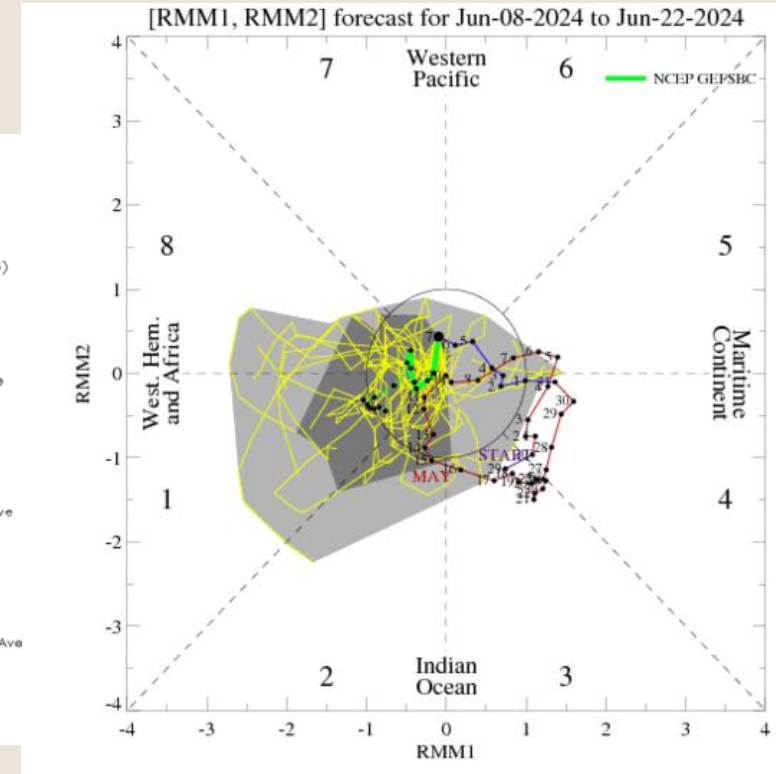
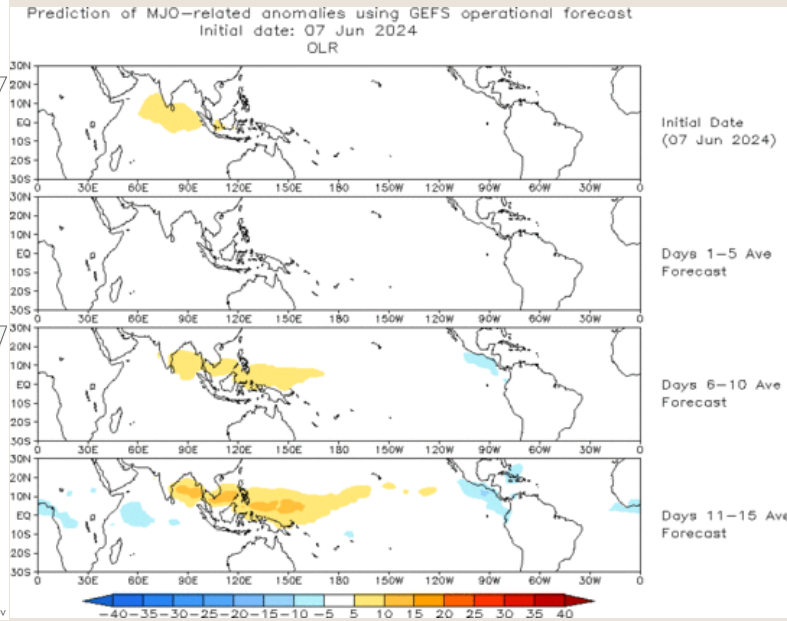
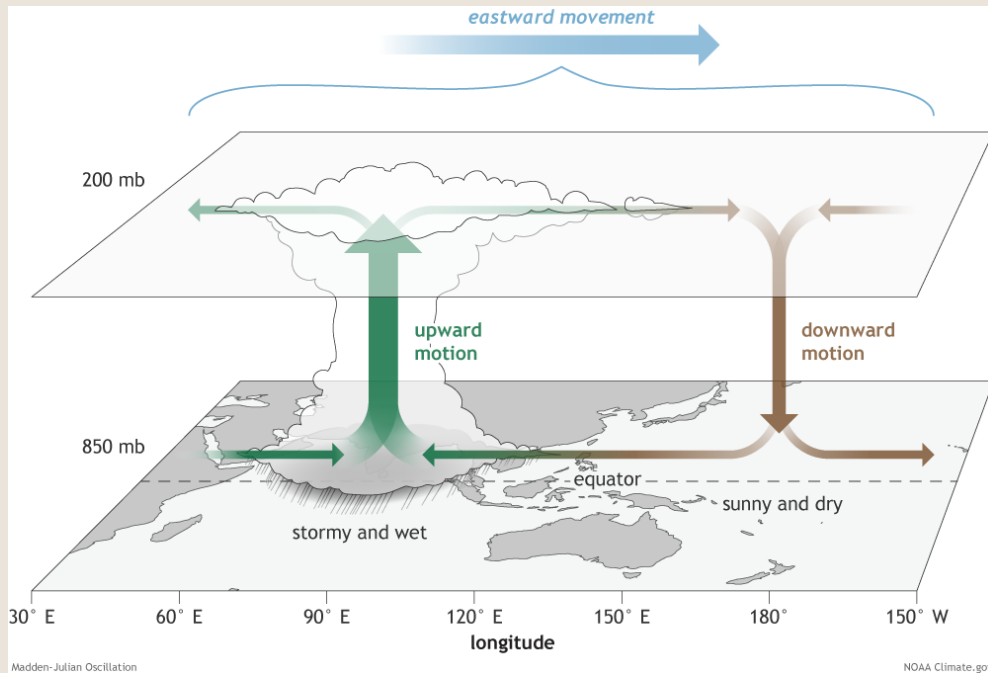
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## Madden-Julian Oscillation (MJO)



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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. Currently, El Niño's lasting effects continue to keep the MJO weak. It's expected to be more of a player later in fall.

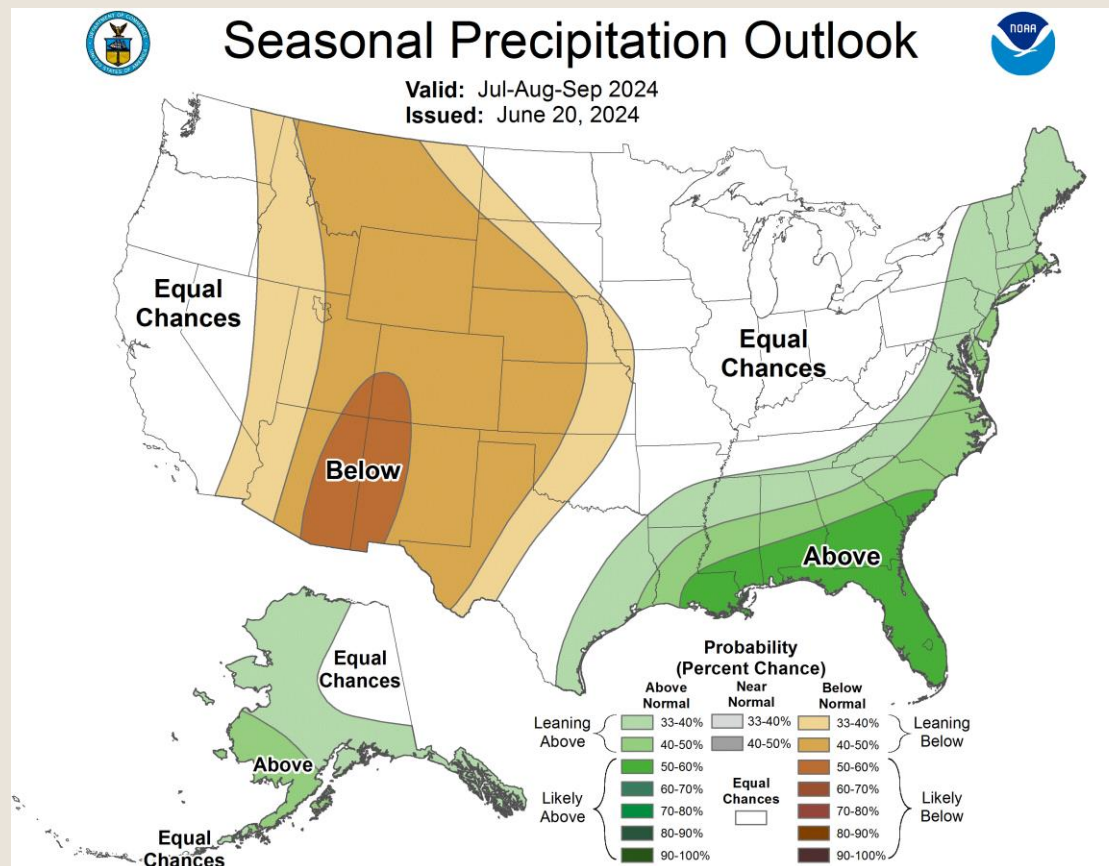
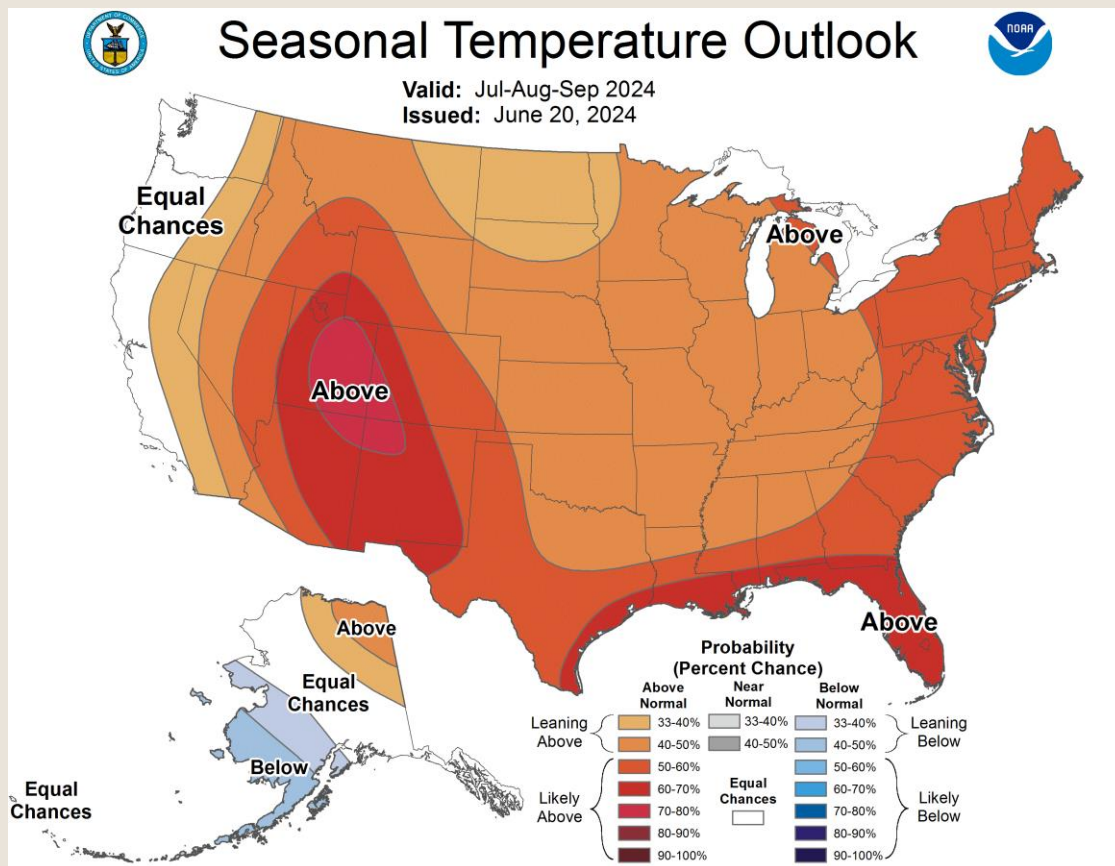
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Climate Prediction Center (CPC)



NWS's Climate Prediction Center's Official 2024 Outlook for July, August and September 2024 showing temperature probabilities leaning toward likely above and precipitation leaning below average. Typically in New Mexico, a transition from a strong warm phase of ENSO to a cool phase of ENSO leads to a delayed but active to very active monsoon.



# 2024 North American Monsoon Forecast



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## European Center for Medium Range Weather Forecasts (ECMWF)

### ECMWF Seasonal Forecast

Prob(most likely category of precipitation)

Forecast start is 01/06/24, climate period is 1993-2016

Ensemble size = 51, climate size = 600

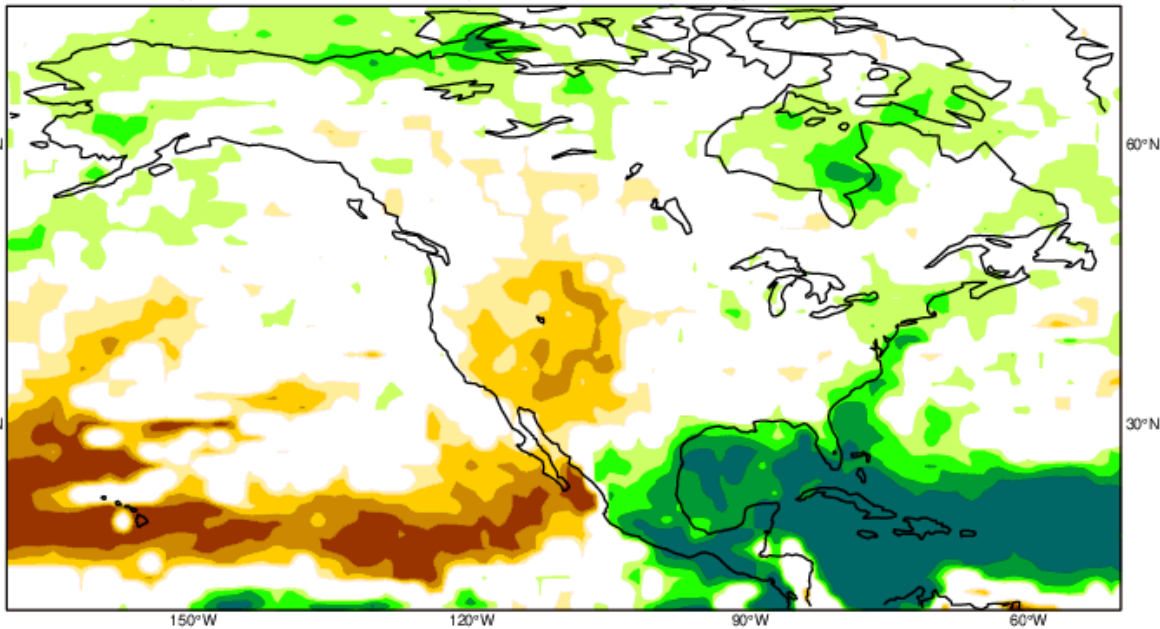
System 5

JAS 2024

<---- Prob(below lower tercile)

Prob(above upper tercile) ---->

70..100% 60..70% 50..60% 40..50% other 40..50% 50..60% 60..70% 70..100%



### ECMWF Seasonal Forecast

Prob(most likely category of 2m temperature)

Forecast start is 01/06/24, climate period is 1993-2016

Ensemble size = 51, climate size = 600

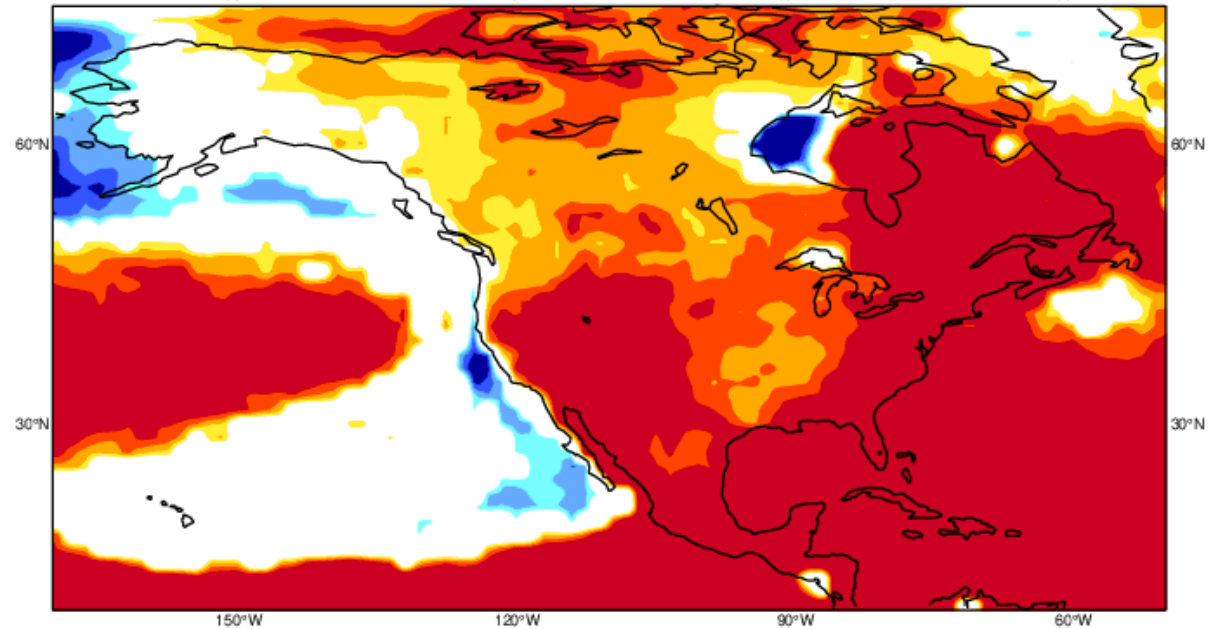
System 5

JAS 2024

<---- Prob(below lower tercile)

Prob(above upper tercile) ---->

70..100% 60..70% 50..60% 40..50% other 40..50% 50..60% 60..70% 70..100%



Seasonal precipitation and temperature difference from average forecast from the European Center for Medium Range Weather Forecasts (ECMWF) model forecasting below-average precipitation for NM and above average temperatures during the monsoon. Keep in mind, however, that what matters for this type of climate forecasting happens at the sub seasonal level (Prein et., al 2022).

# 2024 North American Monsoon Forecast

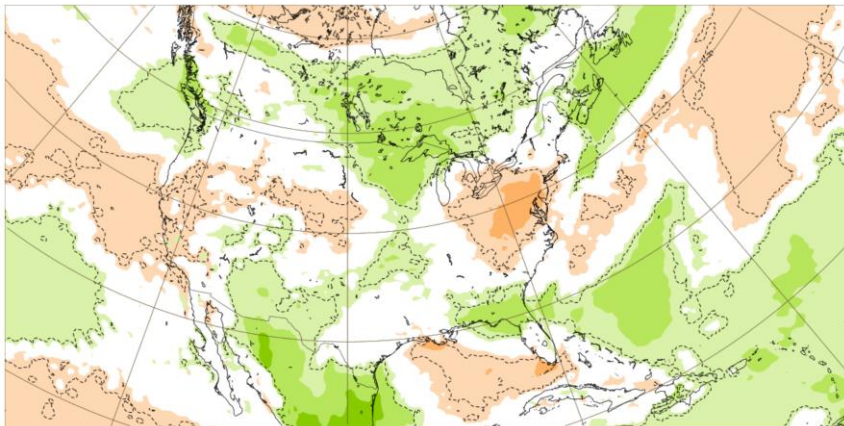
## ECMWF (ENS) - Precipitation



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Precipitation: Weekly mean anomalies

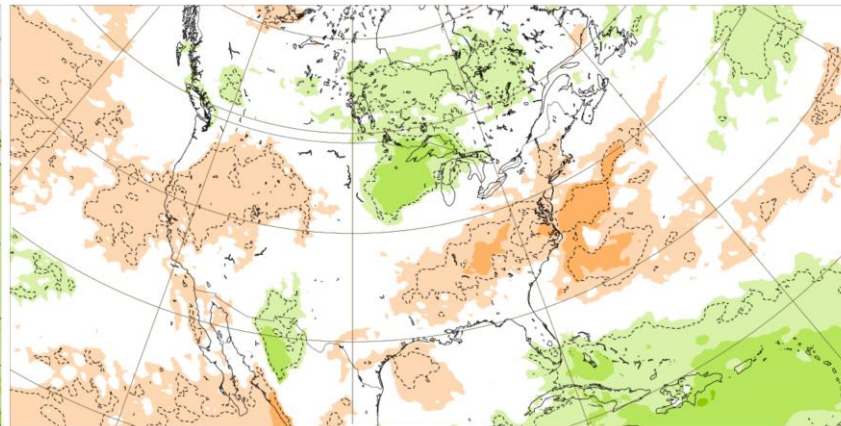
Base time: Wed 19 Jun 2024 Valid time: Mon 24 Jun 2024 - Mon 01 Jul 2024 (+288h) Area: North America



Extended range: Precipitation weekly mean anomaly, significance level: 10 % (mm)

Precipitation: Weekly mean anomalies

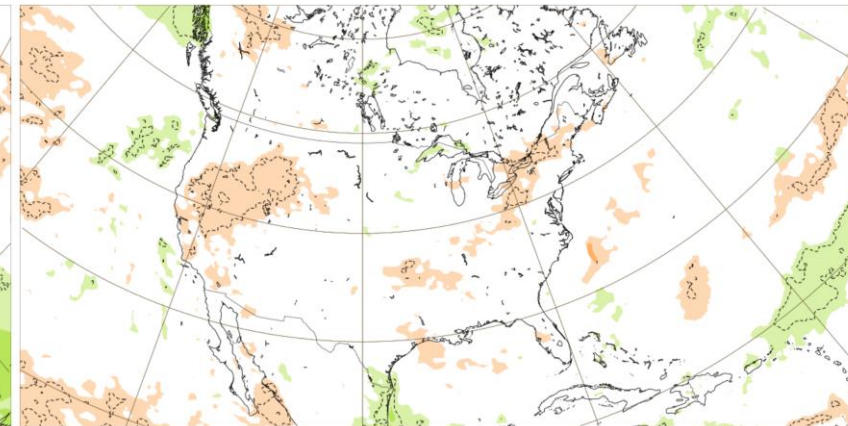
Base time: Wed 19 Jun 2024 Valid time: Mon 01 Jul 2024 - Mon 08 Jul 2024 (+456h) Area: North America



Extended range: Precipitation weekly mean anomaly, significance level: 10 % (mm)

Precipitation: Weekly mean anomalies

Base time: Wed 19 Jun 2024 Valid time: Mon 08 Jul 2024 - Mon 15 Jul 2024 (+624h) Area: North America



Extended range: Precipitation weekly mean anomaly, significance level: 10 % (mm)

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Created at 2024-06-20T15:35:48.484Z



ECMWF ENS model is forecasting near to slightly below average precipitation for much of NM through the remainder of June and into the first week of July 2024. A monsoon onset looks subtle with Gulf of Mexico moisture making it into NM on southeast return flow.



# 2024 North American Monsoon Forecast

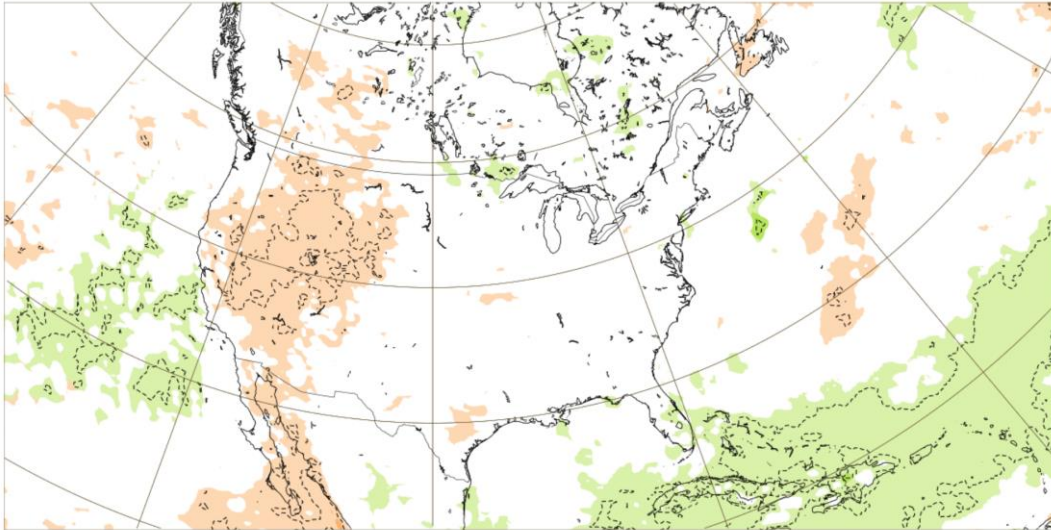
## ECWMF (ENS) - Precipitation



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Precipitation: Weekly mean anomalies

Base time: Wed 19 Jun 2024 Valid time: Mon 15 Jul 2024 - Mon 22 Jul 2024 (+792h) Area : North America

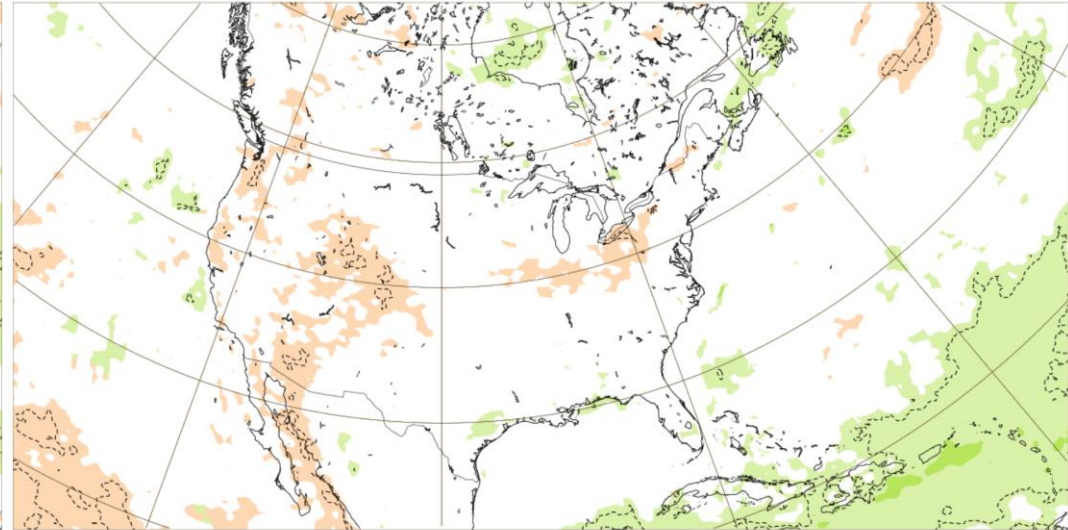


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Created at 2024-06-20T16:35:56.395Z



Precipitation: Weekly mean anomalies

Base time: Wed 19 Jun 2024 Valid time: Mon 22 Jul 2024 - Mon 29 Jul 2024 (+960h) Area : North America



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Weekly difference from average precipitation forecasts from the ECMWF for 2 weeks in late July, 2024. The ensemble model is forecasting near to slightly below average precipitation for portions of the Southwest U.S. during from early to late July. This 101 member ensemble model continues trending slightly wetter for July (more white or climatology color is now more apparent).



# 2024 North American Monsoon Forecast

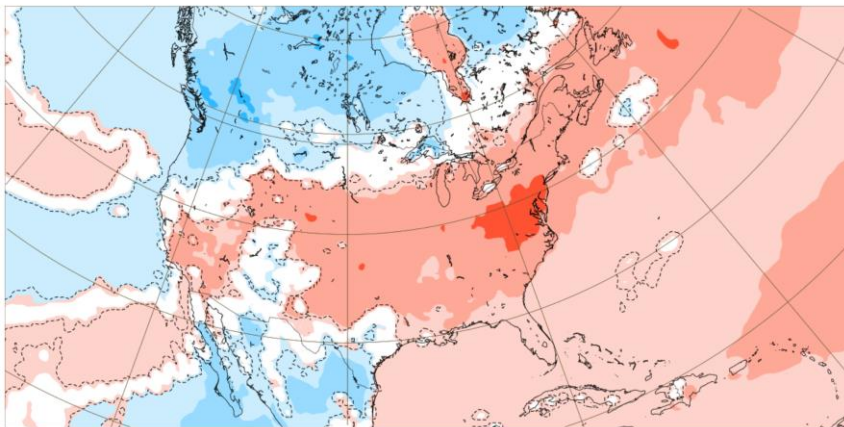
## ECWMF (ENS) - Temperature



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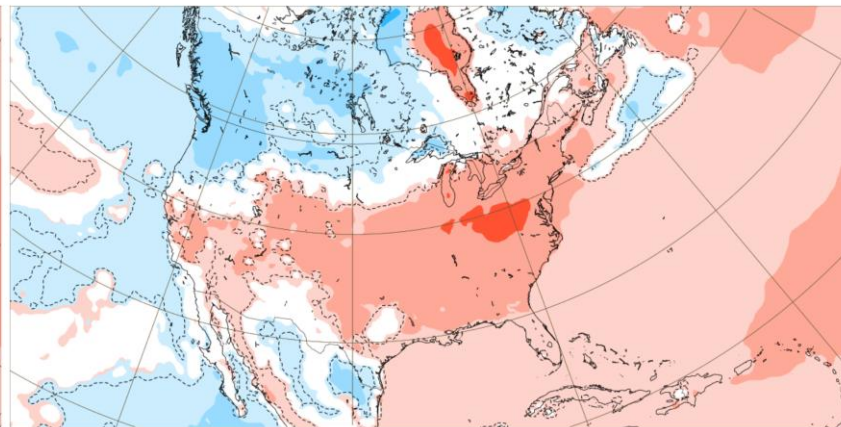
2 m temperature: Weekly mean anomalies

Base time: Wed 19 Jun 2024 Valid time: Mon 24 Jun 2024 - Mon 01 Jul 2024 (+288h) Area: North America



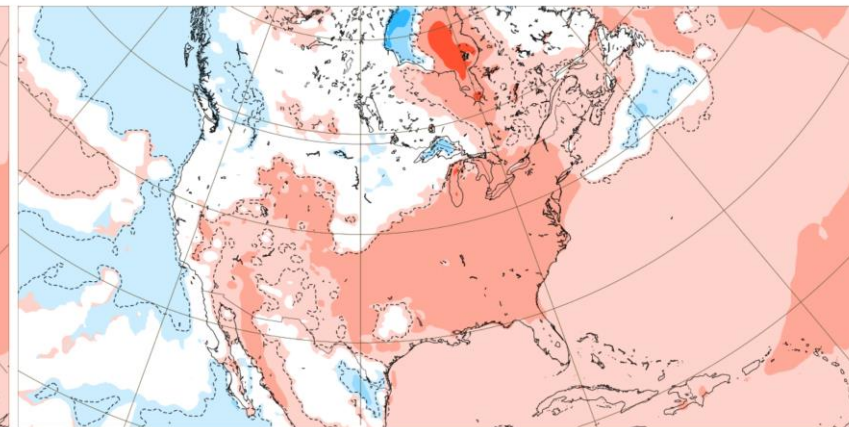
2 m temperature: Weekly mean anomalies

Base time: Wed 19 Jun 2024 Valid time: Mon 01 Jul 2024 - Mon 08 Jul 2024 (+456h) Area: North America



2 m temperature: Weekly mean anomalies

Base time: Wed 19 Jun 2024 Valid time: Mon 08 Jul 2024 - Mon 15 Jul 2024 (+624h) Area: North America



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Weekly difference from average temperature forecasts from the European Center for Medium Range Weather Forecasts (ECMWF) for late June into early July. ECMWF's extended ensemble model keeps the Southwest U.S. warmer than average from the last week of June through much of July. August, like 2016, is forecast to trend more toward or below average (slide 18).

# 2024 North American Monsoon Forecast

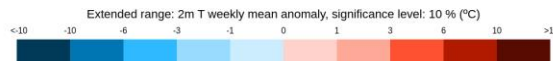
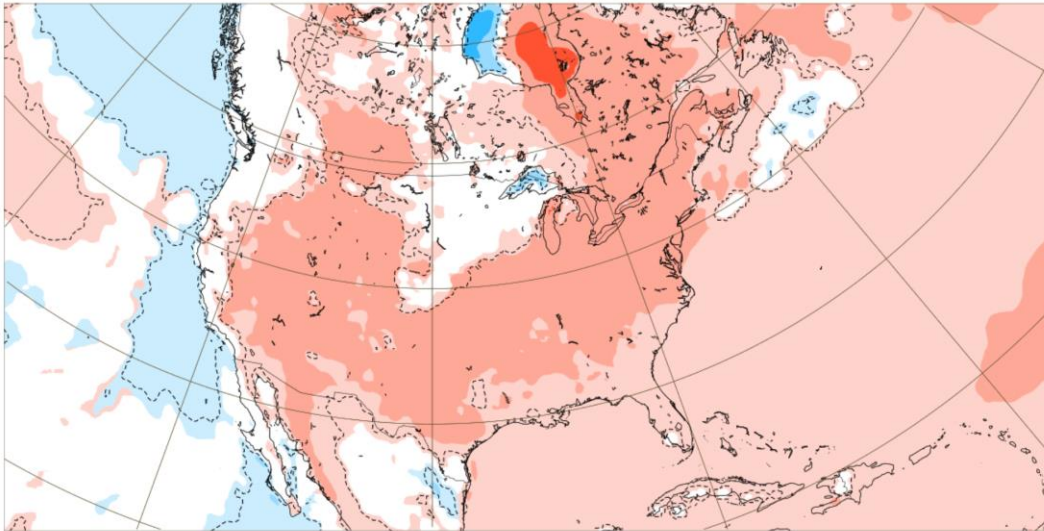
## ECMWF (ENS) - Temperature



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### 2 m temperature: Weekly mean anomalies

Base time: Wed 19 Jun 2024 Valid time: Mon 15 Jul 2024 - Mon 22 Jul 2024 (+792h) Area : North America

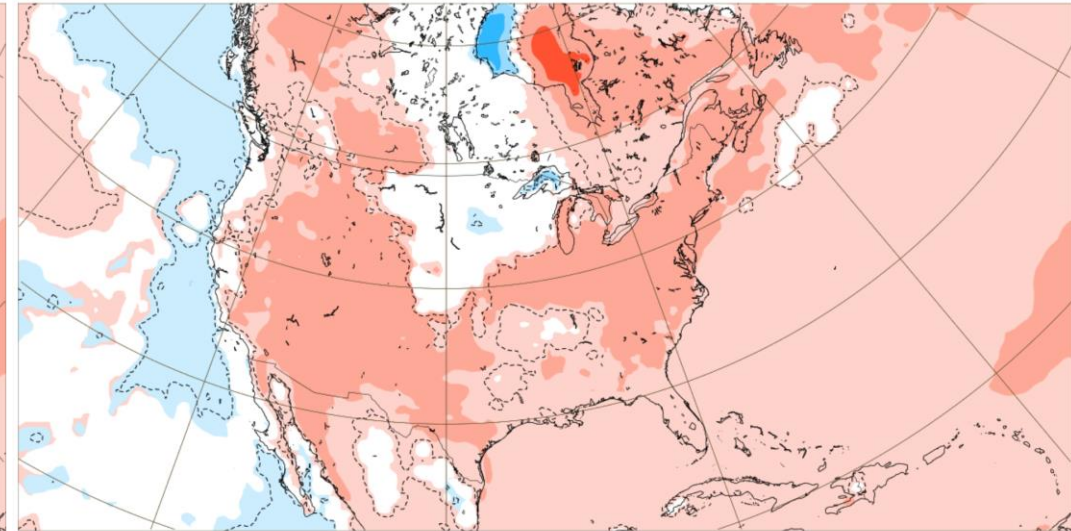


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### 2 m temperature: Weekly mean anomalies

Base time: Wed 19 Jun 2024 Valid time: Mon 22 Jul 2024 - Mon 29 Jul 2024 (+960h) Area : North America



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Weekly difference from average temperature forecasts from the European Center for Medium Range Weather Forecasts (ECMWF) for late July. ECMWF's extended ensemble model keeps the Southwest U.S. temperatures above average mainly in late July.



# 2024 North American Monsoon Forecast

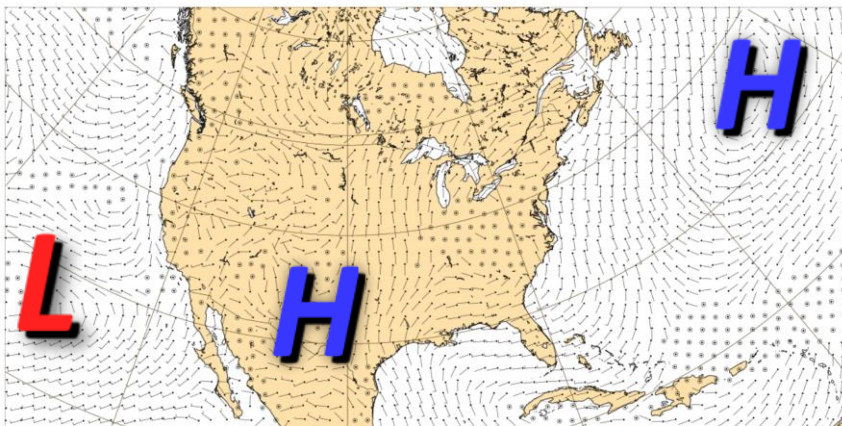
## Monsoon High Set Up During July



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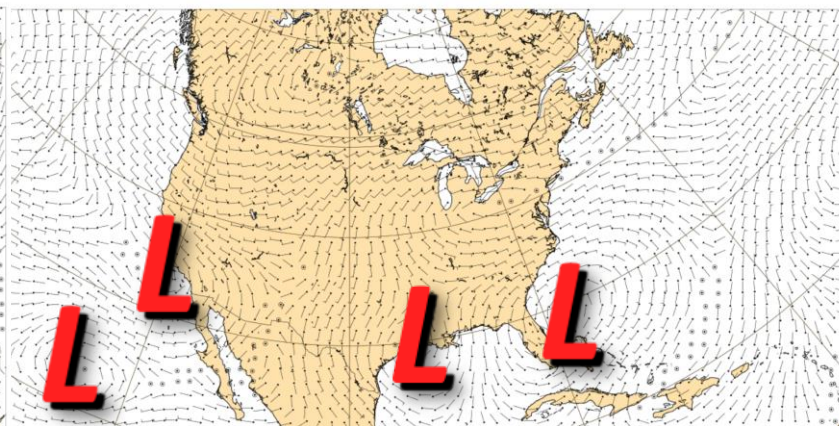
Winds at various levels: Weekly mean anomalies

Base time: Wed 19 Jun 2024 00 UTC Valid time: Mon 24 Jun 2024 00 UTC - Mon 01 Jul 2024 00 UTC (+288h) Area : North America Parameters : 100m



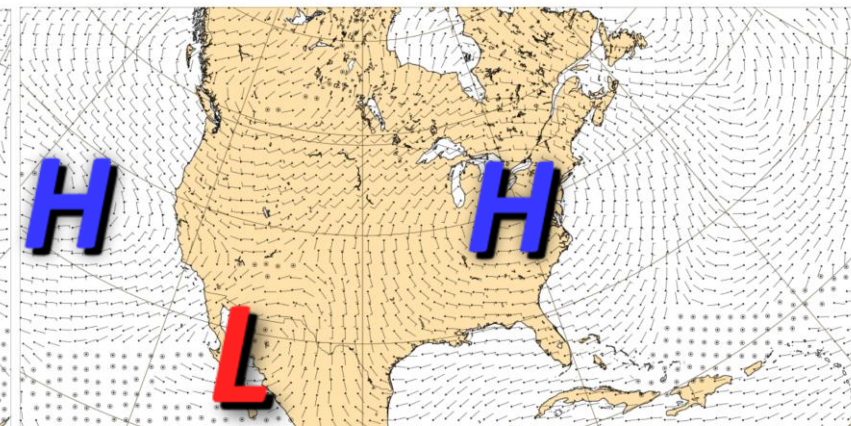
Winds at various levels: Weekly mean anomalies

Base time: Wed 19 Jun 2024 00 UTC Valid time: Mon 24 Jun 2024 00 UTC - Mon 01 Jul 2024 00 UTC (+288h) Area : North America Parameters : 500 hPa



Winds at various levels: Weekly mean anomalies

Base time: Wed 19 Jun 2024 00 UTC Valid time: Mon 01 Jul 2024 00 UTC - Mon 08 Jul 2024 00 UTC (+456h) Area : North America Parameters : 500 hPa



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Wind difference from average forecasts for late June into early July 2024 at 500 mb or ~18,000 ft MSL. Monsoon high is largely missing from these wind anomaly forecasts through early July. This is common after a strong El Niño climate pattern.



# 2024 North American Monsoon Forecast

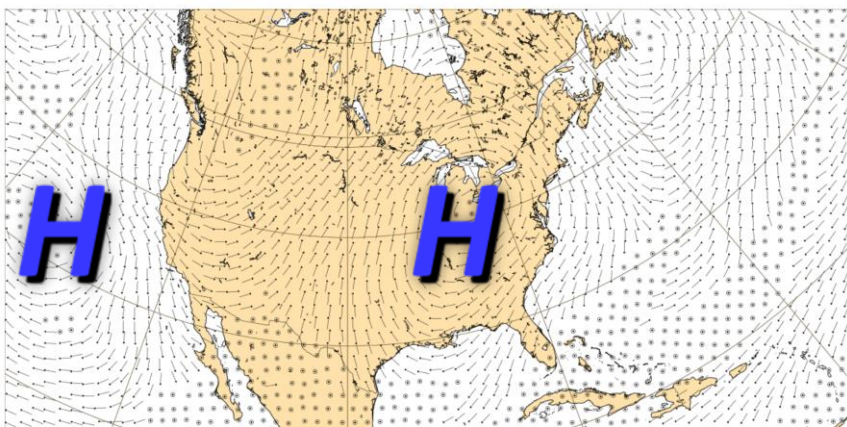
## 500 mb Wind



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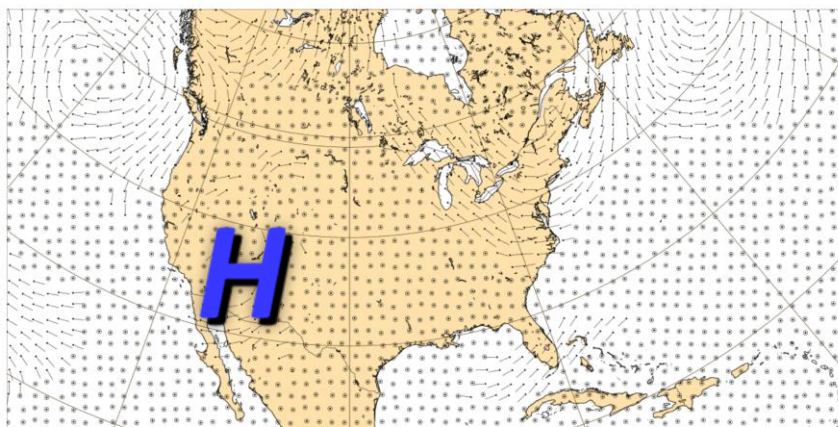
Winds at various levels: Weekly mean anomalies

Base time: Wed 19 Jun 2024 00 UTC Valid time: Mon 08 Jul 2024 00 UTC - Mon 15 Jul 2024 00 UTC (+624h) Area : North America Parameters : 500 hPa



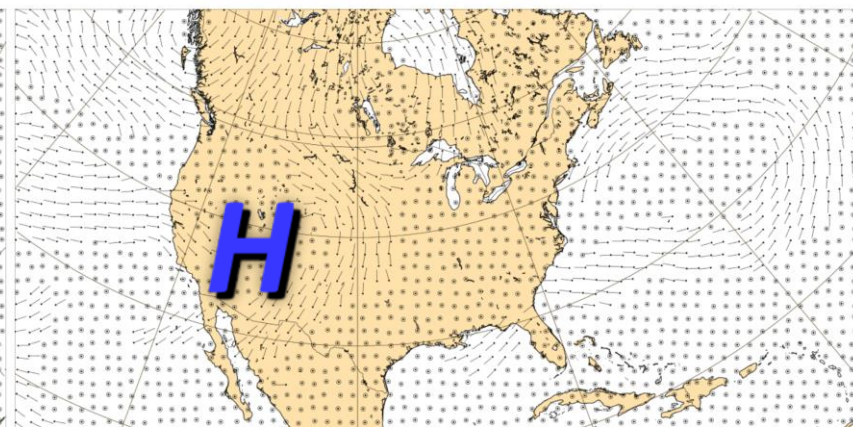
Winds at various levels: Weekly mean anomalies

Base time: Wed 19 Jun 2024 00 UTC Valid time: Mon 15 Jul 2024 00 UTC - Mon 22 Jul 2024 00 UTC (+792h) Area : North America Parameters : 500 hPa



Winds at various levels: Weekly mean anomalies

Base time: Wed 19 Jun 2024 00 UTC Valid time: Mon 22 Jul 2024 00 UTC - Mon 29 Jul 2024 00 UTC (+960h) Area : North America Parameters : 500 hPa



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Monsoon high appears during the second week of July 2024. 500 mb wind anomaly forecasts from the ECMWF ENS model are indicative of a slow and dispersed monsoon onset. Northeasterly steering flow is looking like the mostly likely set up in mid to late July over NM.

# 2024 North American Monsoon Forecast

## 2024 Monsoon Forecast Summary By Month



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**Remainder of June:** This is not the North American Monsoon (NAM). It's a climate pattern that mimics the monsoon where the Bermuda high shifts westward in response to all the anomalous convection in the Gulf of Mexico and Caribbean. It's the same overall concept, but technically the monsoon high (Prein et al., 2022) is thwarted by an intensified subtropical jet stream (think hangover from the previous El Nino climate pattern) and will appear in a couple of weeks. It's the same overall idea of high pressure aloft over NM with low level moisture moving in and resulting in thunderstorm activity. Much of the forecast area is expected to have above average precipitation during the remainder of June thanks to this climate pattern set up.

**July:** Forecast confidence is high for slightly below to below precipitation and slightly above to above average temperatures for central and northern NM. Traditional monsoon onset will be later than average and is expected to become active during mid to late July. The last two weeks of the month have the highest probability that temperatures will be above average.

**August:** Forecast confidence is moderate to high for above average precipitation and near to slightly below average temperatures.

**September:** Forecast confidence is moderate for near to slightly above average precipitation and near to slightly below average temperatures during the first two weeks of the month. Southern and eastern NM stand the best chances for above average precipitation in September.

# 2024 North American Monsoon Forecast



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- Outlook provided by National Weather Service Forecast Office Albuquerque, NM.
- [Comments? Questions? Please contact us.](#) (505) 243-0702