

# **Madden-Julian Oscillation:** Recent Evolution, Current Status and Predictions



**Update prepared by the Climate Prediction Center  
NWS / NCEP / CPC  
17 June 2024**

# Overview

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- The RMM-based MJO index has weakened into the unit circle, with little activity during the first half of June.
- Dynamical models indicate some potential for the MJO to amplify across the Western Hemisphere and propagate eastward to the Indian Ocean by the end of week-2.
- In the near-term, tropical cyclone (TC) formation is most favored across the western Caribbean and Gulf of Mexico where at least one TC could develop. By July, the highest chances of TC formation are forecast to shift to the Western Pacific, especially if the MJO redevelops across the region.

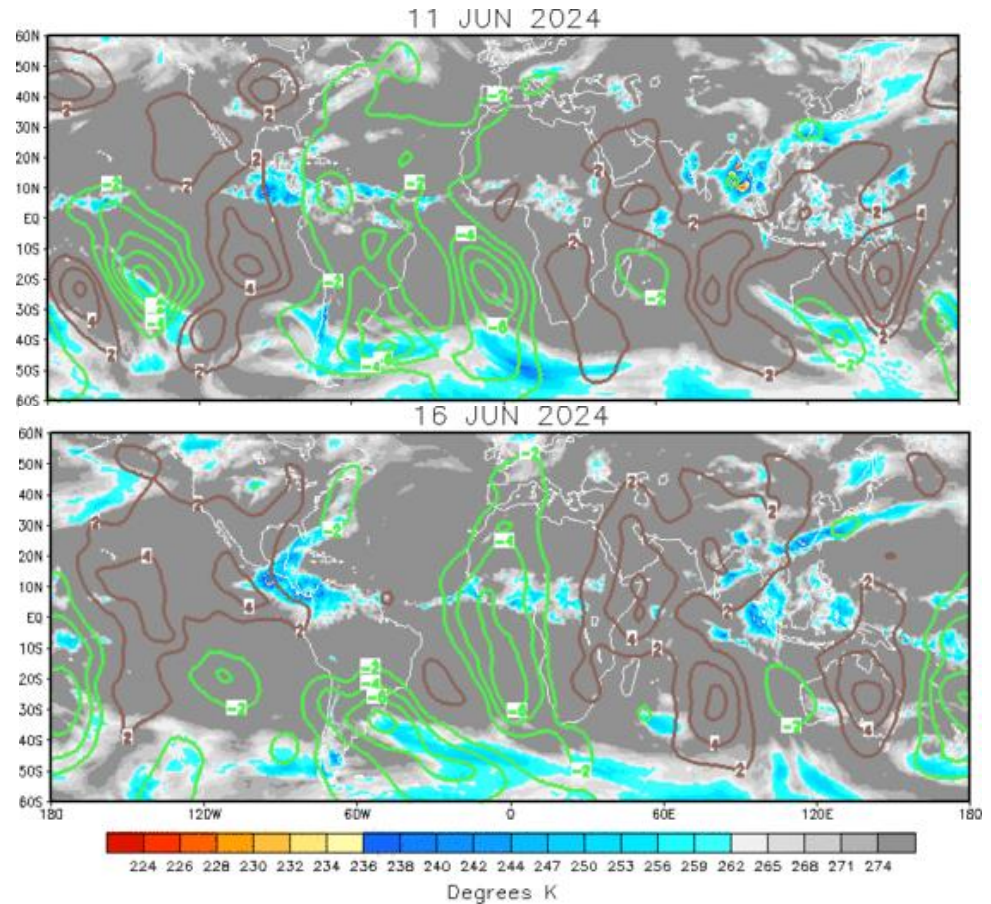
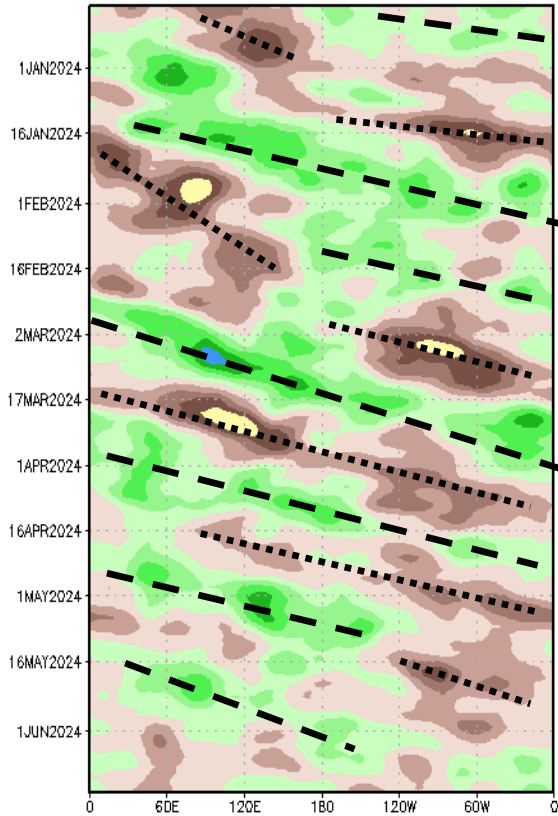
A discussion of potential impacts for the global tropics and those related to the U.S. are updated on Tuesday at:  
<http://www.cpc.ncep.noaa.gov/products/precip/CWlink/ghazards/index.php>

# 200-hPa Velocity Potential Anomalies

**Green shades: Anomalous divergence (favorable for precipitation)**

**Brown shades: Anomalous convergence (unfavorable for precipitation)**

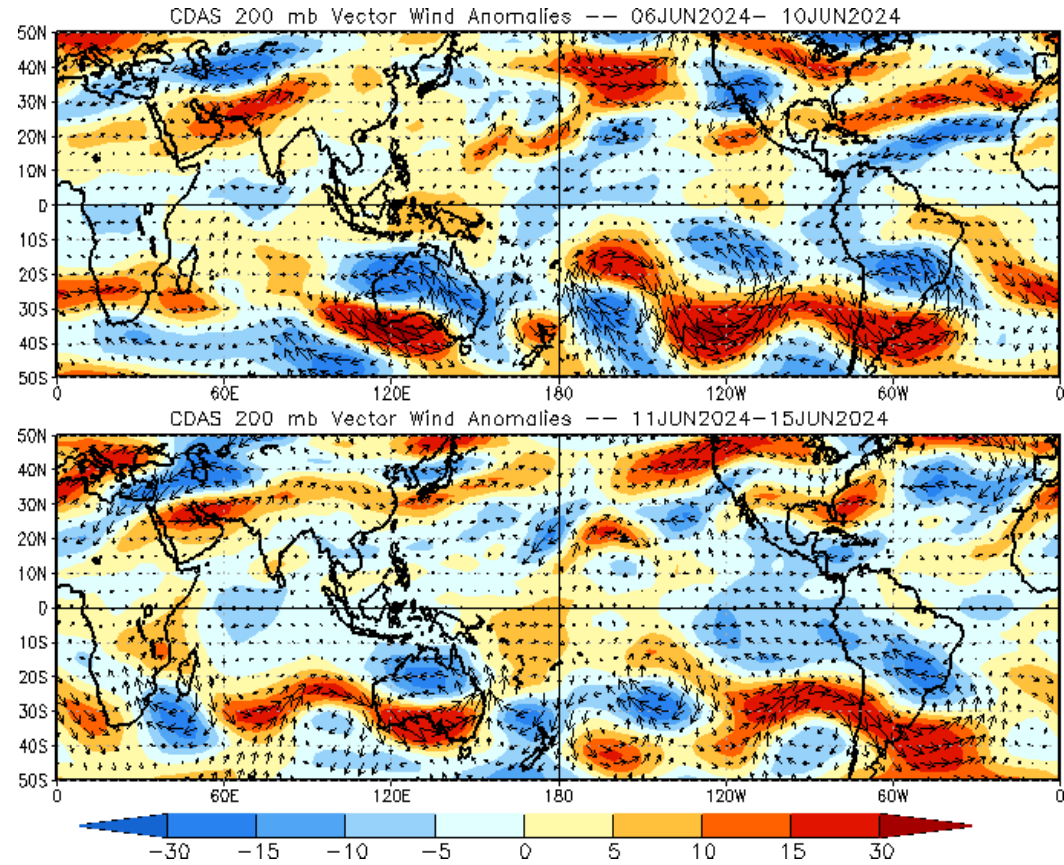
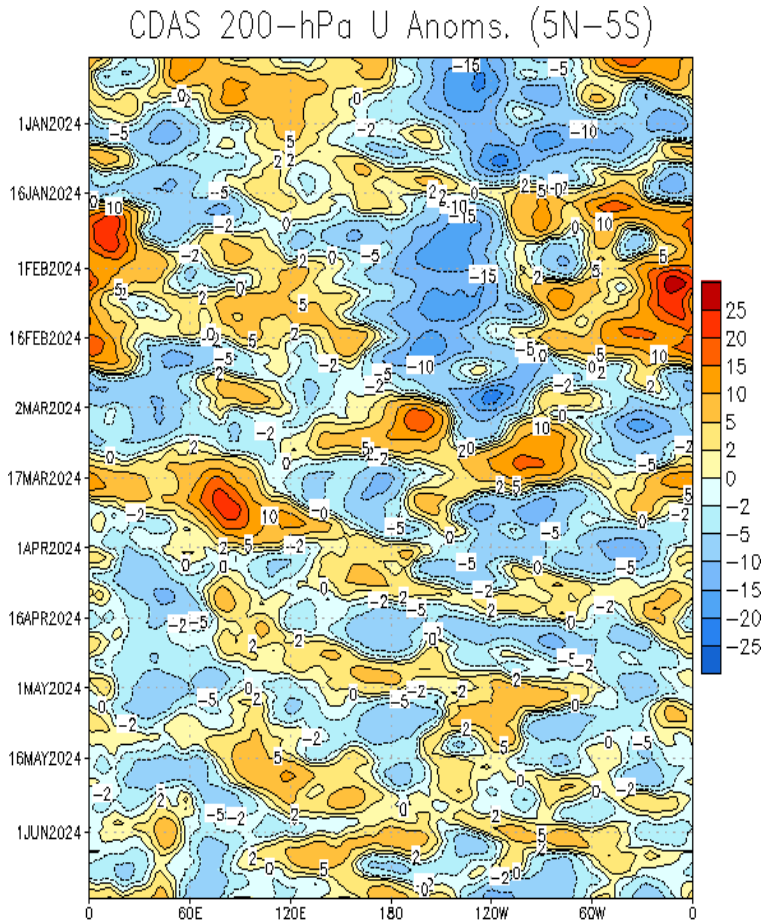
200-hPa Velocity Potential Anomaly: 5N-5S  
5-day Running Mean



- During June, the upper-level velocity potential pattern has become incoherent across much of the Northern Hemisphere due to a weak MJO and transition into summer.
- Some areas of anomalous convergence are noted across the eastern Pacific and contiguous U.S., and over parts of eastern Africa eastward through the Indian Ocean and Asia.
- Anomalous divergence is observed across western Africa

# 200-hPa Wind Anomalies

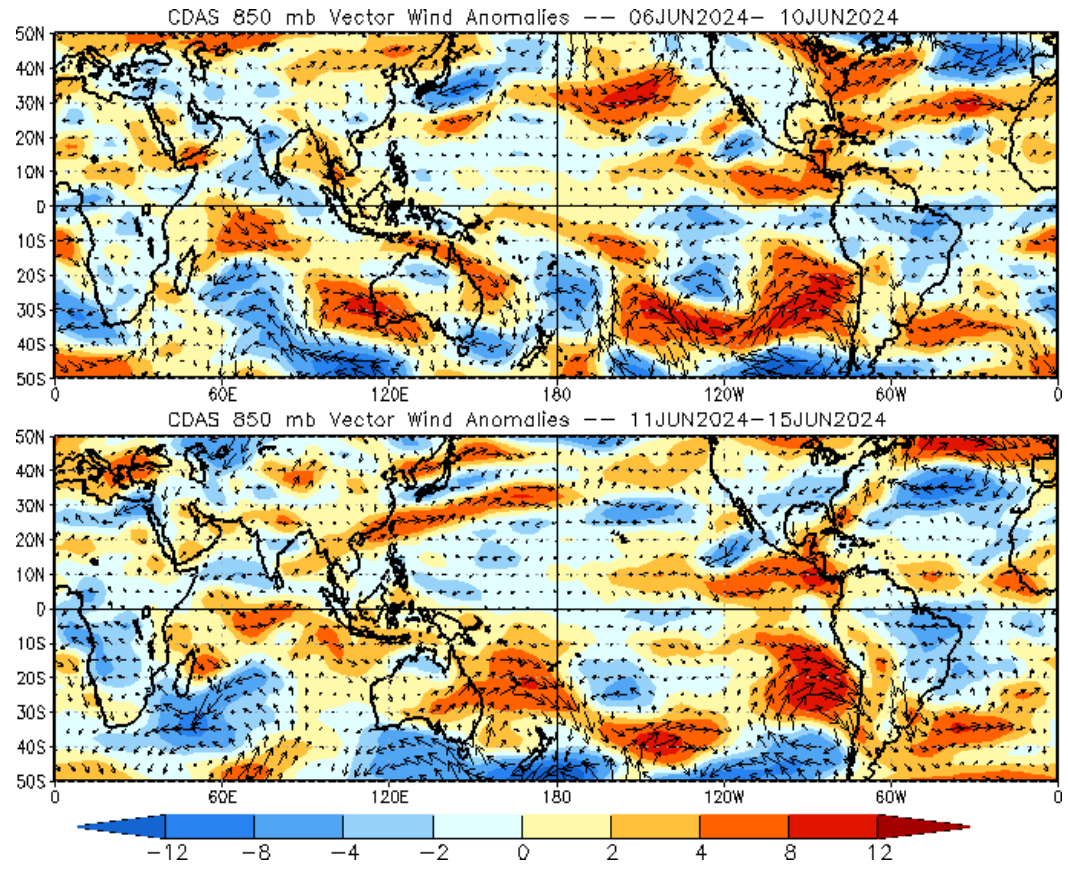
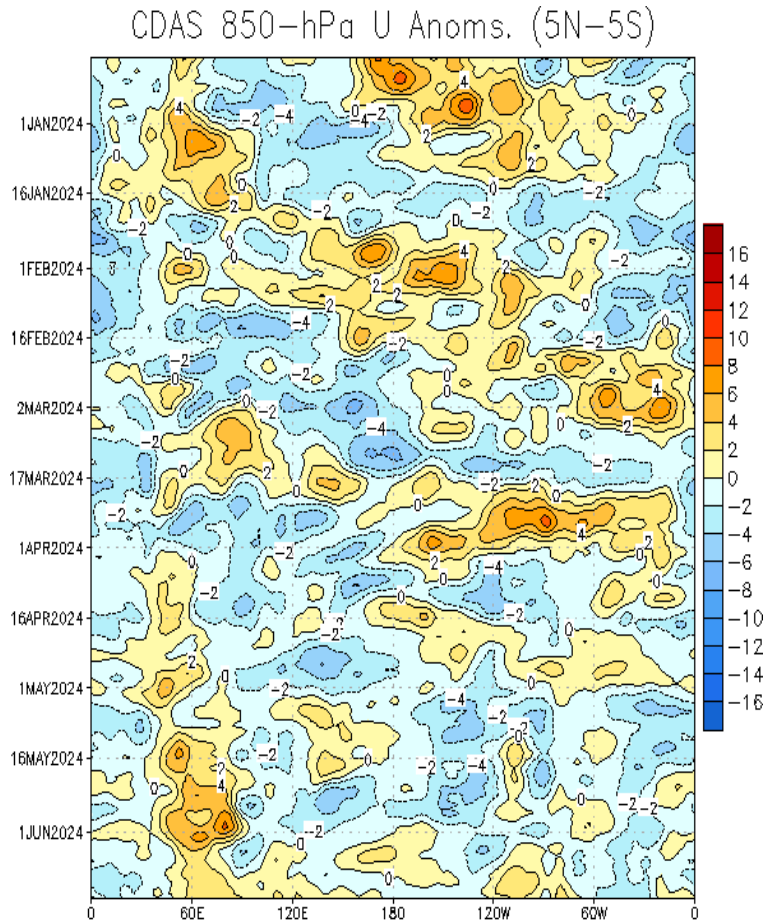
Shading denotes the zonal wind anomaly. **Blue shades:** Anomalous easterlies. **Red shades:** Anomalous westerlies.



- Upper-level wind anomalies are generally weak at the lower latitudes.
- There has been some increase in anomalous equatorial upper-level westerlies (easterlies) over the Date Line (eastern Pacific and South America)
- An enhanced subtropical jet continues to be observed across the south-central and southeastern U.S bringing heavy rainfall to portions of Florida.

# 850-hPa Wind Anomalies

Shading denotes the zonal wind anomaly. **Blue shades:** Anomalous easterlies. **Red shades:** Anomalous westerlies.

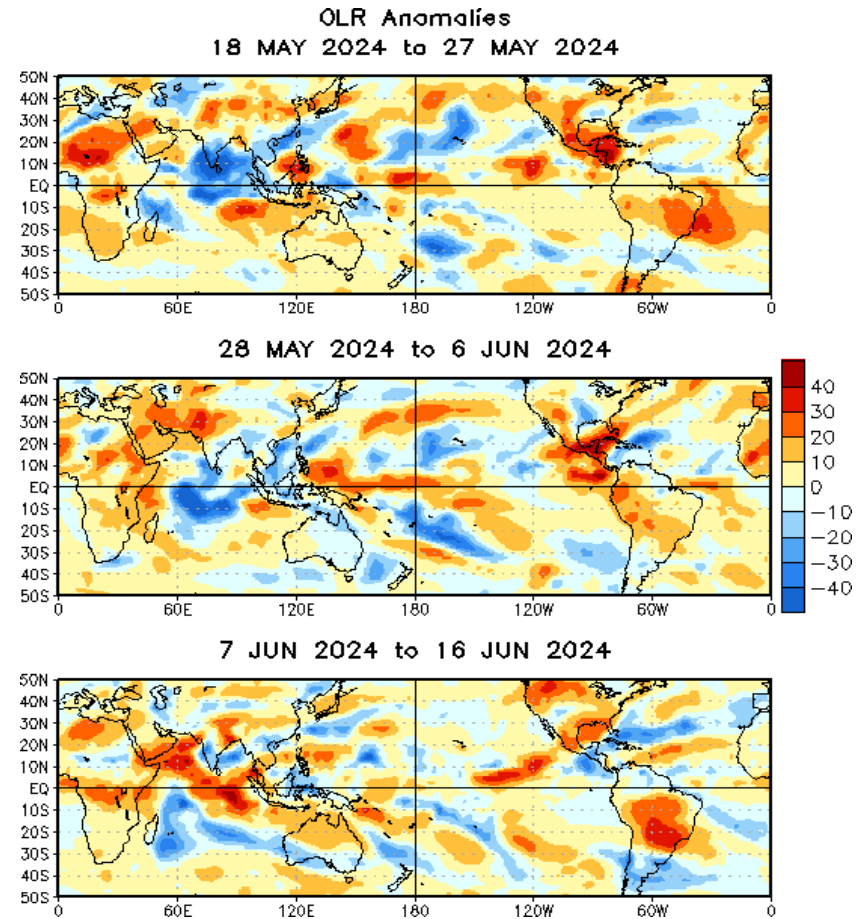
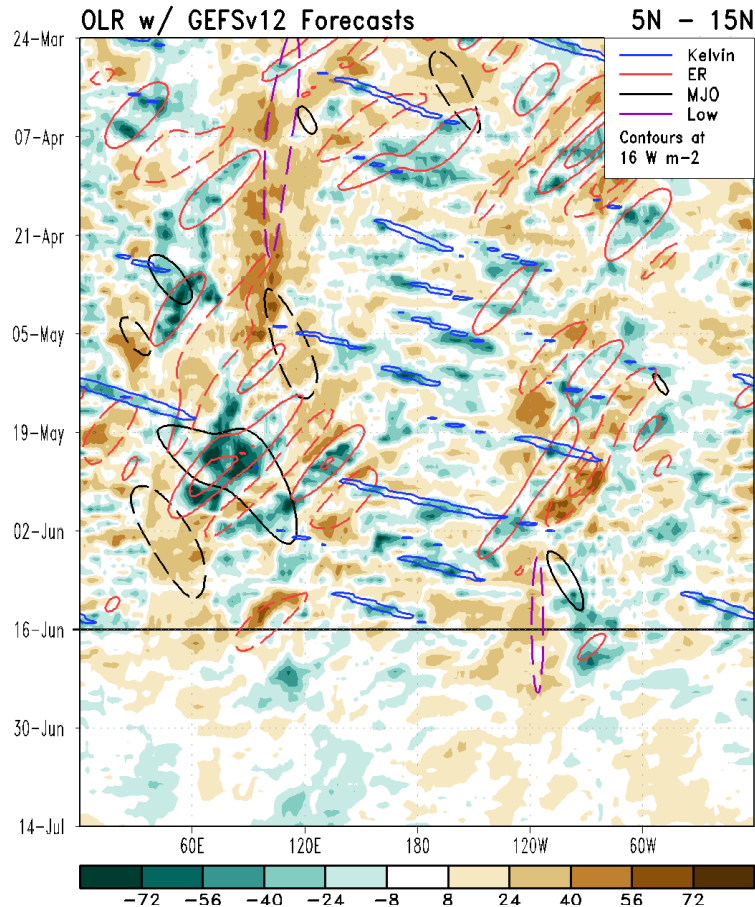


- Persistent area of anomalous equatorial low-level westerlies noted around 60°E, recently spreading into more of the Indian Ocean and Maritime Continent.
- Low level cyclonic flow apparent across the Gulf of Mexico favoring increasing precipitation chances along the U.S. Gulf Coast, along with potential tropical cyclone development.

# Outgoing Longwave Radiation (OLR) Anomalies

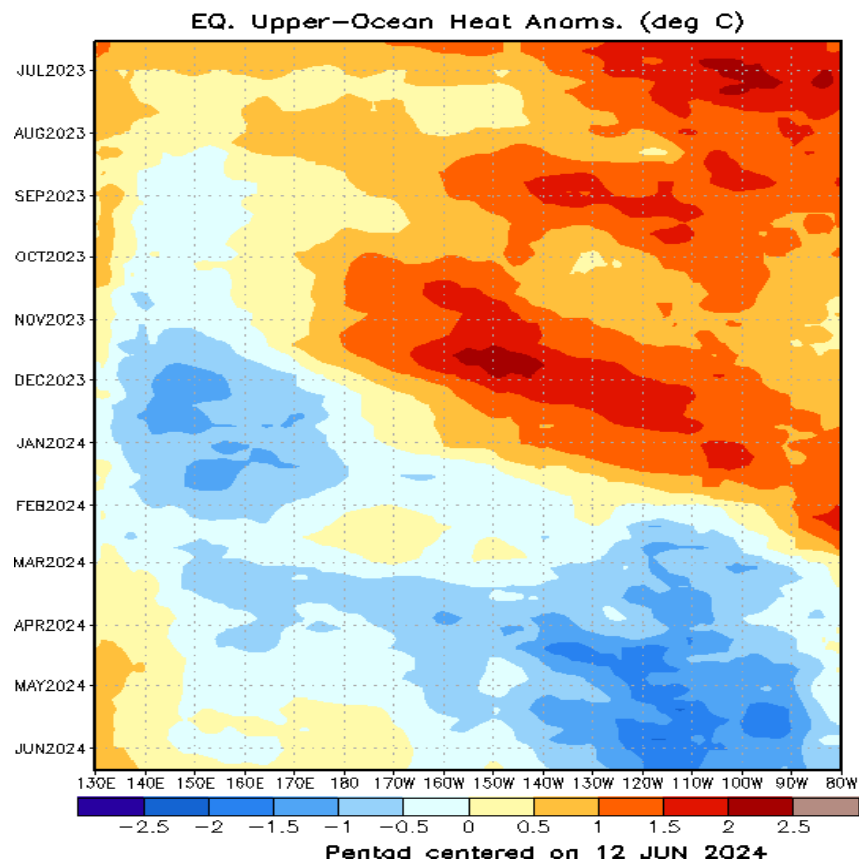
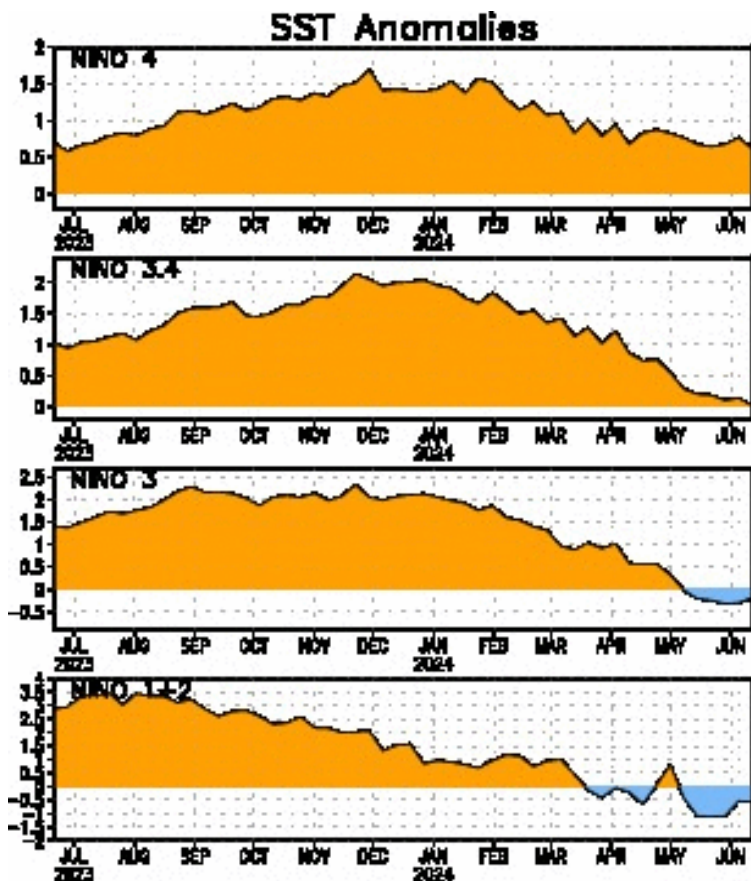
**Green shades: Anomalous convection (wetness)**

**Brown shades: Anomalous subsidence (dryness)**



- Suppressed convection was observed across much of the northern Indian Ocean and contiguous U.S. during the past week.
- Areas of enhanced convection have developed across the Western Atlantic.
- The GEFS OLR forecast anomalies are largely incoherent through mid-July, with no significant modes of tropical variability coming through the objective filtering.

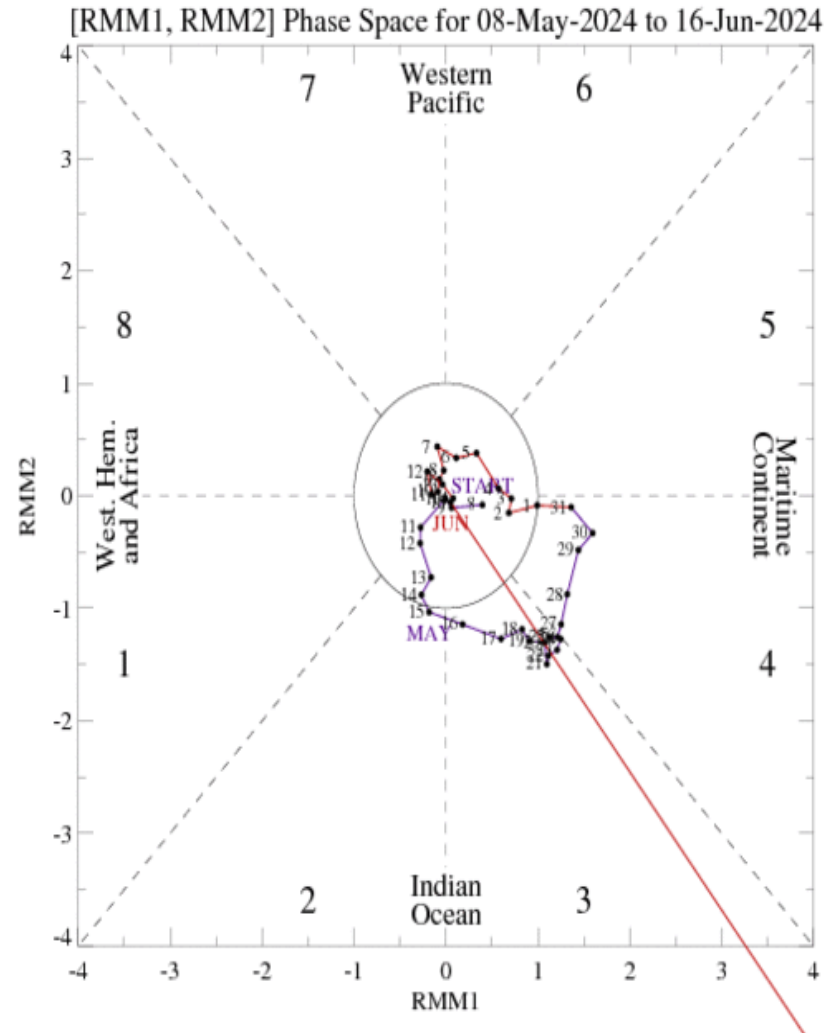
# SSTs and Weekly Heat Content Evolution in the Equatorial Pacific



- SSTs continue to trend downward, with negative SST anomalies observed in the easternmost Niño regions, indicative of a transitioning ENSO pattern.
- Negative subsurface temperature anomalies continue to build across the equatorial eastern Pacific.

# MJO Index: Recent Evolution

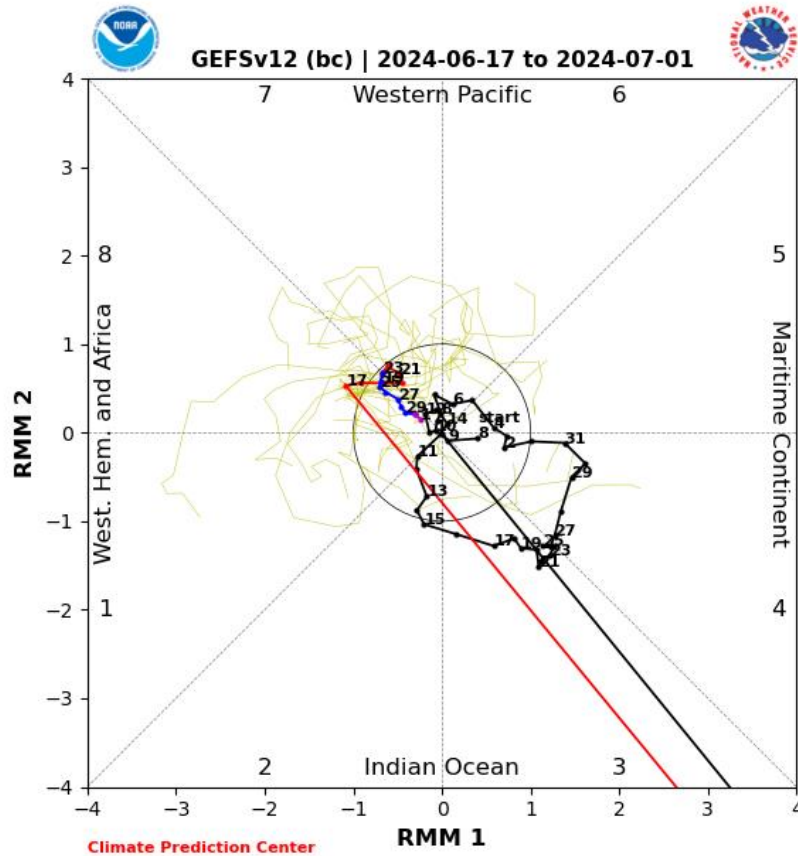
- Following an active MJO across the Indian Ocean and Maritime Continent at the end of May, the RMM-based MJO index has weakened into the unit circle with little activity through the first half of June.



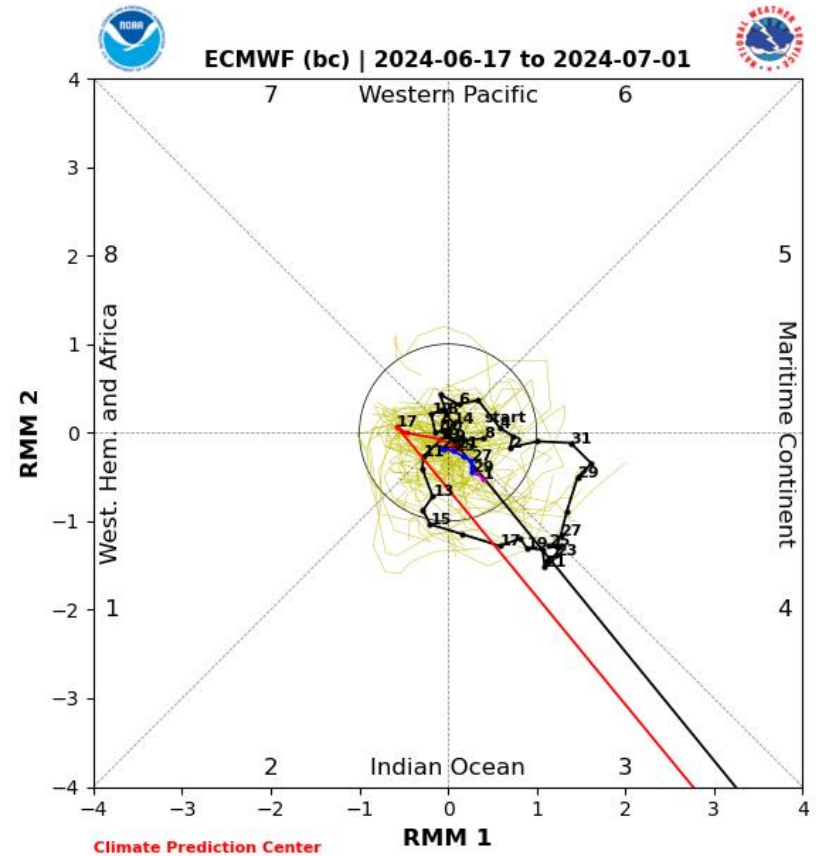
For more information on the RMM index and how to interpret its forecast please see:  
[https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CPC\\_MJOinformation.pdf](https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CPC_MJOinformation.pdf)



# MJO Index: Forecast Evolution



**GEFS Forecast**

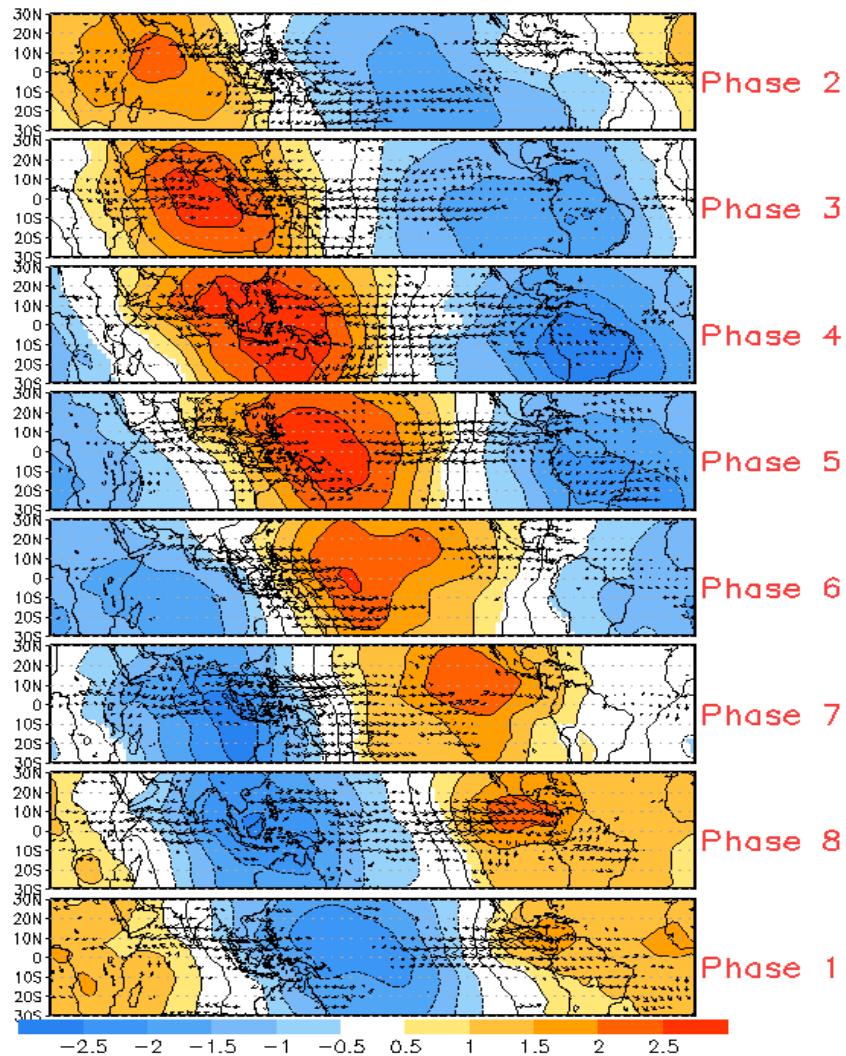


**ECMWF Forecast**

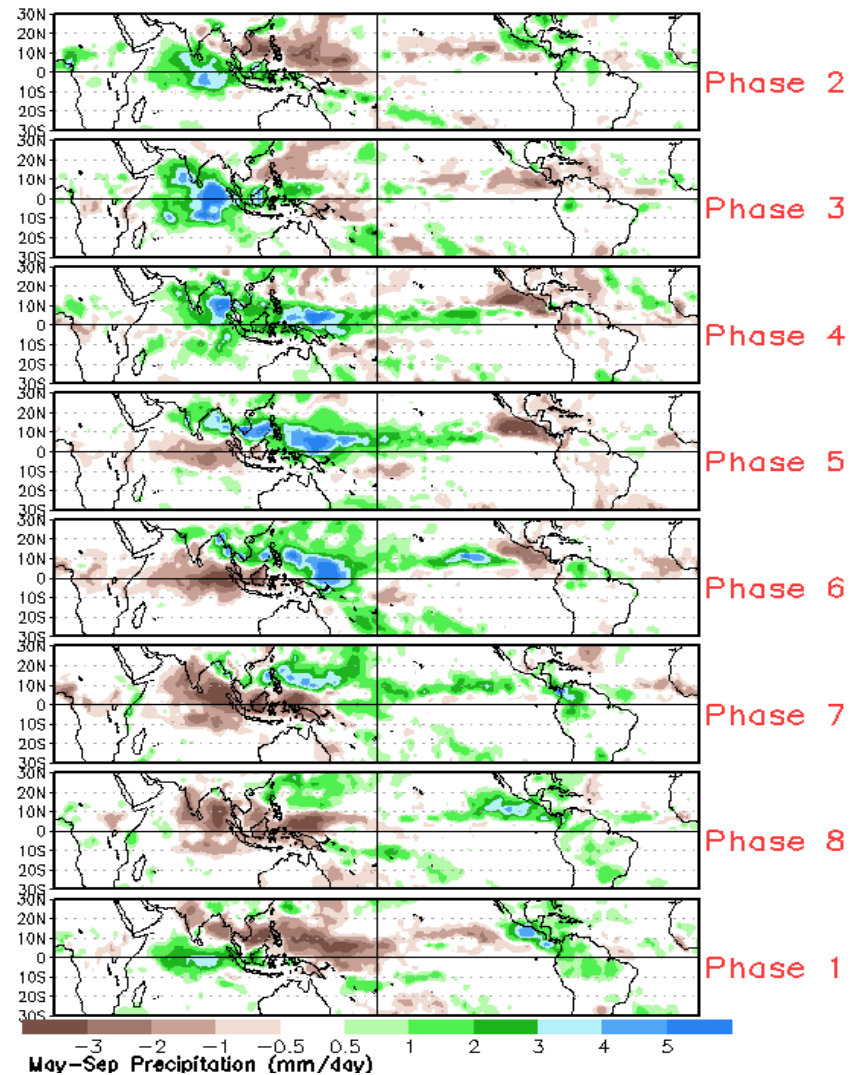
- The ECMWF and GEFS ensembles are generally incoherent, but there are some hints of the MJO re-emerging across the Western Hemisphere and propagating toward the Indian Ocean by the end of week-2.

# MJO: Tropical Composite Maps by RMM Phase

## 850-hPa Velocity Potential and Wind Anomalies



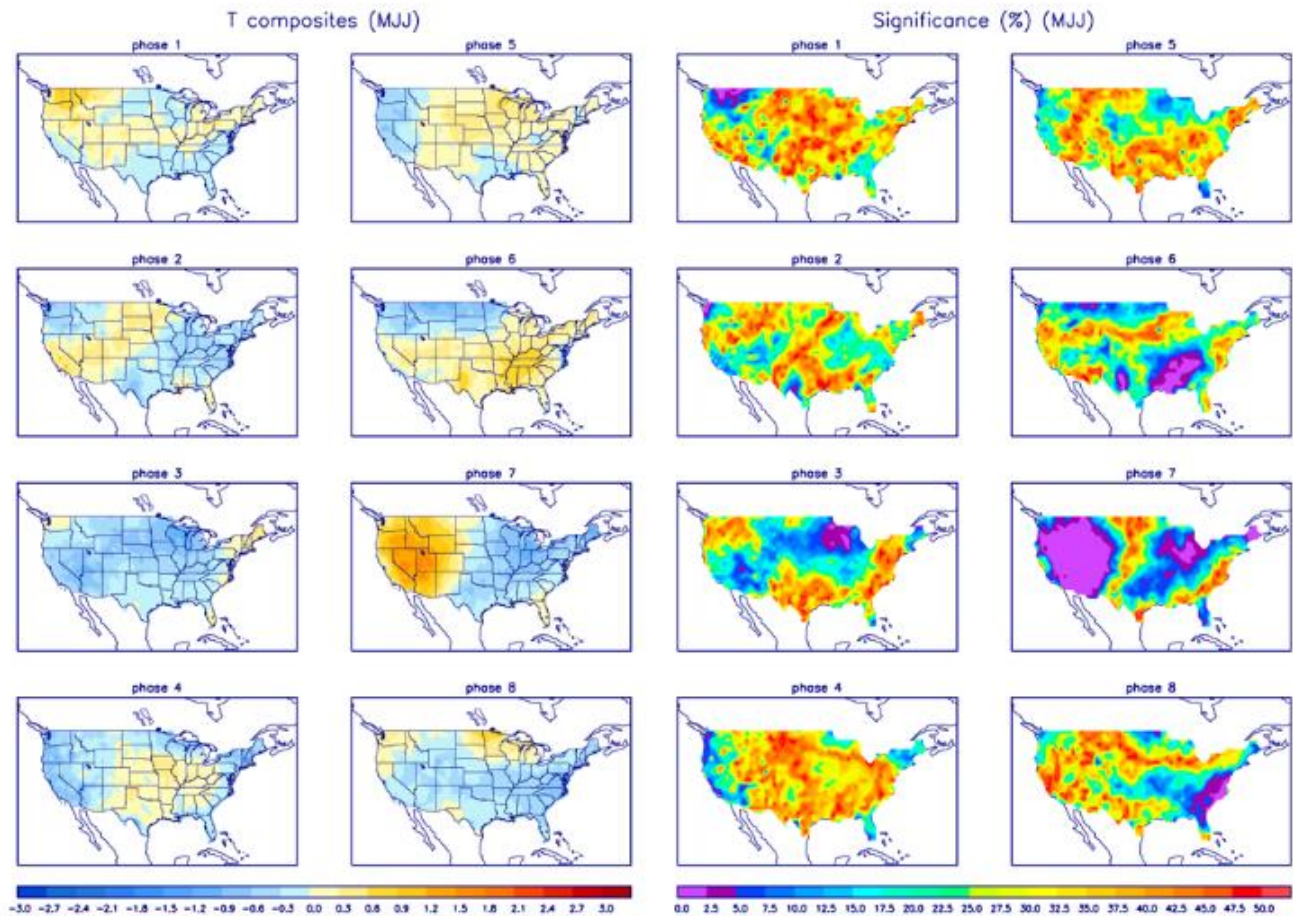
## Precipitation Anomalies



# MJO: CONUS Composite Maps by RMM Phase - Temperature

Left hand side plots show temperature anomalies by MJO phase for MJO events that have occurred over the three month period in the historical record. Blue (red) shades show negative (positive) anomalies respectively.

Right hand side plots show a measure of significance for the left hand side anomalies. Purple shades indicate areas in which the anomalies are significant at the 95% or better confidence level.



# MJO: CONUS Composite Maps by RMM Phase - Precipitation

Left hand side plots show precipitation anomalies by MJO phase for MJO events that have occurred over the three month period in the historical record. Brown (green) shades show negative (positive) anomalies respectively.

Right hand side plots show a measure of significance for the left hand side anomalies. Purple shades indicate areas in which the anomalies are significant at the 95% or better confidence level.

