

# **Madden-Julian Oscillation:**

## **Recent Evolution, Current Status and Predictions**



**Update prepared by the Climate Prediction Center**  
**NWS / NCEP / CPC**  
**26 May 2025**

# Overview

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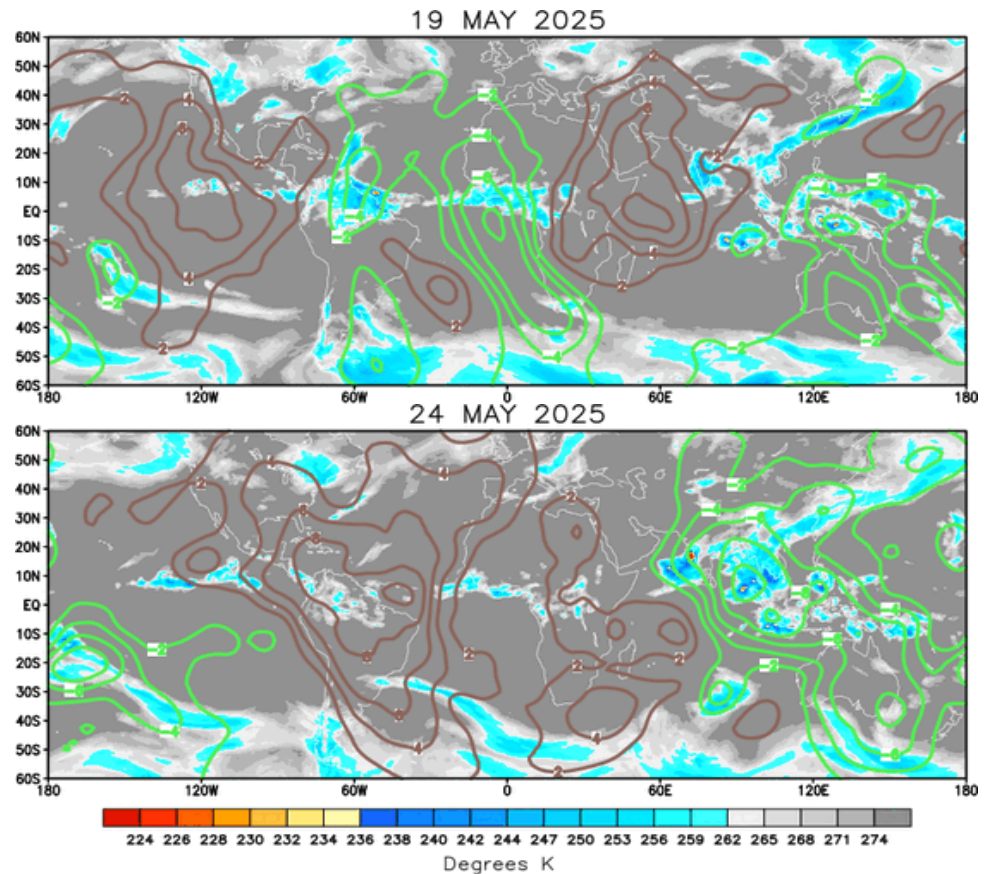
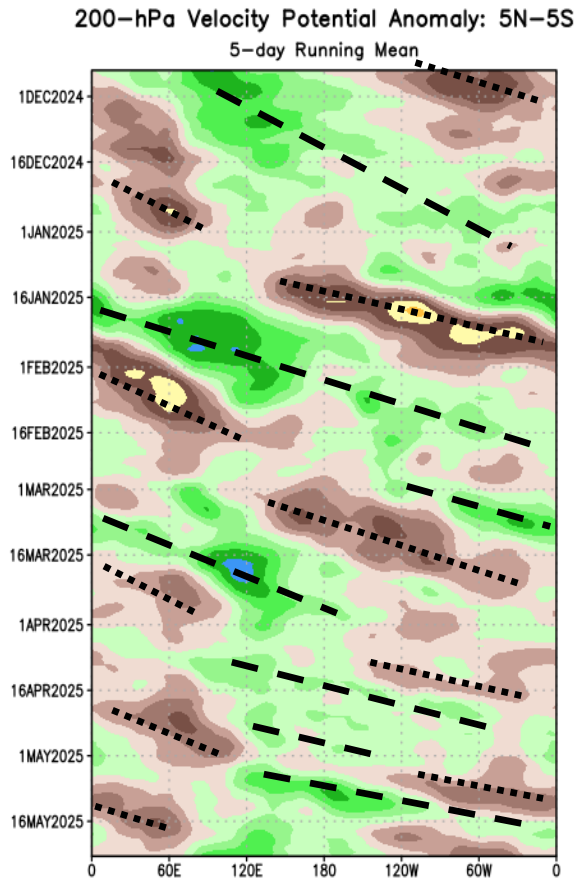
- The MJO remains incoherent based on RMM observations and other fields. Kelvin Wave activity and a low frequency convective footprint near the Maritime Continent appear to remain the predominant modes of tropical variability since late March.
- There is general agreement in the dynamical model RMM forecasts depicting eastward propagation from phase 4 to phase 7-8 in the coming weeks. However, there is a lot of spread with regard to signal strength and coherence.
- With the likely continuation of weak MJO activity and ENSO-neutral conditions, tropical variability that occurs over the next few weeks is likely to be triggered by other modes of variability, such as Kelvin or equatorial Rossby waves.

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)

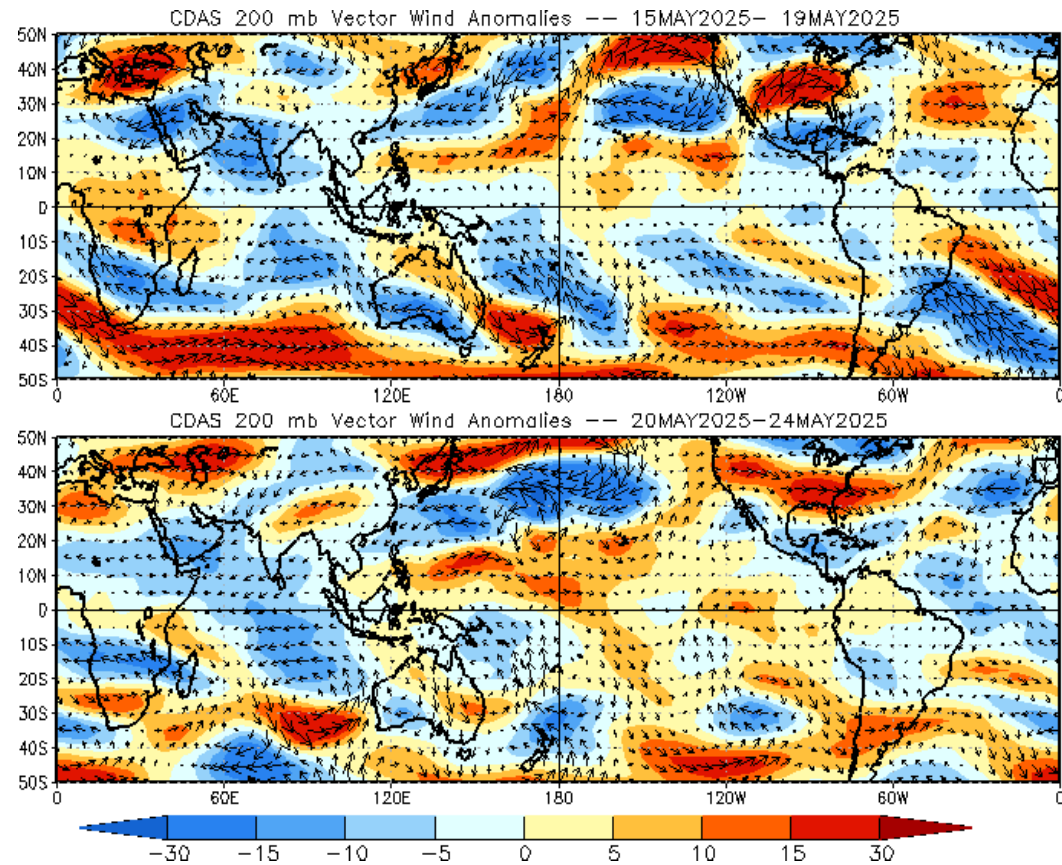
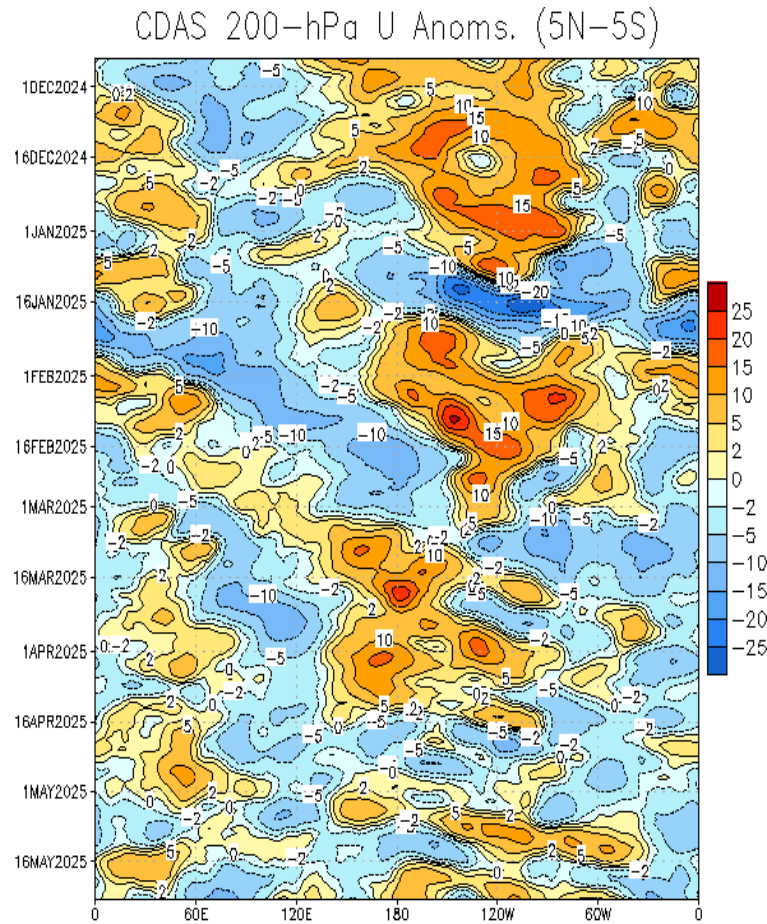
Brown shades: Anomalous convergence (unfavorable for precipitation)



- The time/longitude plot shows several eastward propagating features this spring, but these appear to be more characteristic of equatorial Kelvin Wave passages rather than a canonical MJO activity.
- The map plots indicate the global tropics are lacking consistent coherent structure, switching between wave-1 and wave-2 asymmetries, once again hinting at the dominance of Kelvin waves in the current regime.

# 200-hPa Wind Anomalies

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

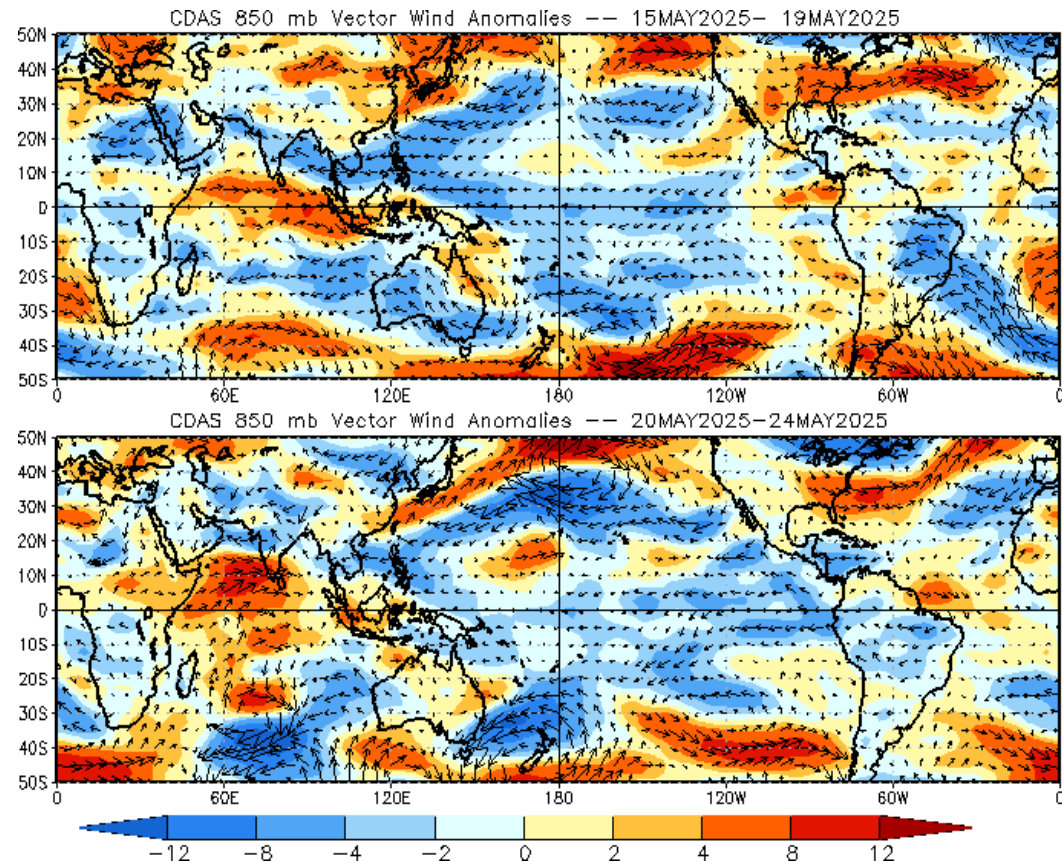
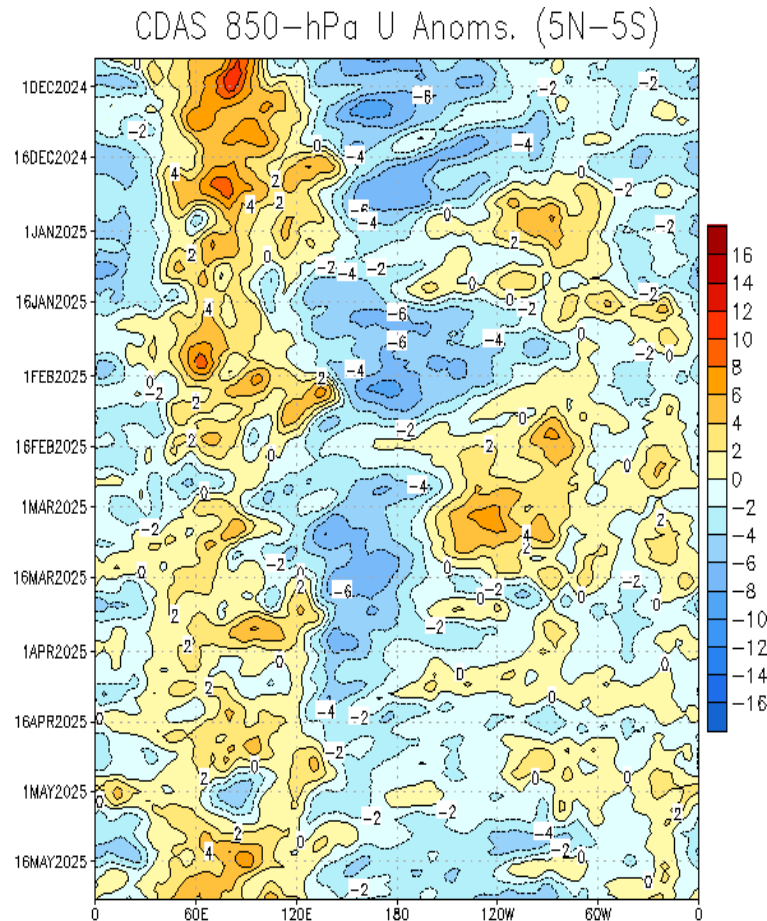


- Consistent with the upper-level velocity potential anomalies, rapid shifts between westerlies to easterlies across portions of the Indian Ocean and Pacific point more towards Kelvin wave activity than an active MJO.
- Anomalous westerlies have weakened somewhat but remain across equatorial Africa and the western Indian Ocean, and appear to be a part of a low frequency response established since last year.



# 850-hPa Wind Anomalies

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

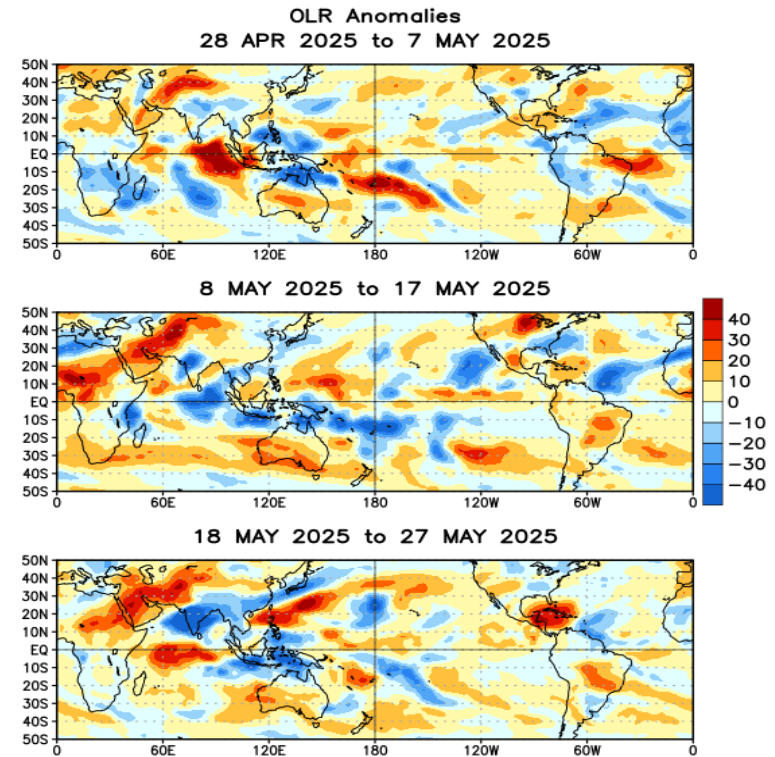
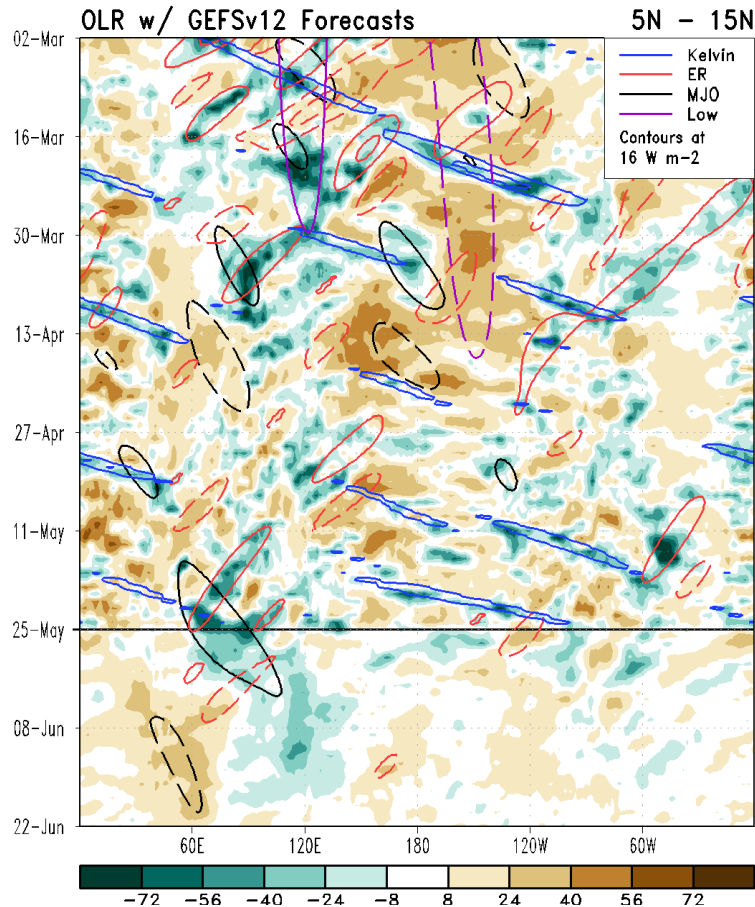


- Anomalous westerlies strengthened over the Indian Ocean, spreading to cover much of the Arabian Sea and Bay of Bengal and continuing to cover much of the Indian Ocean as far south as 10°S.
- Enhanced trades envelope much of the equatorial Pacific and extending into the northwestern Pacific, contributing to a delayed start of the Western Pacific Tropical Cyclone season.
- Overall, the lower-level pattern is not reflective of coherent subseasonal activity.

# Outgoing Longwave Radiation (OLR) Anomalies

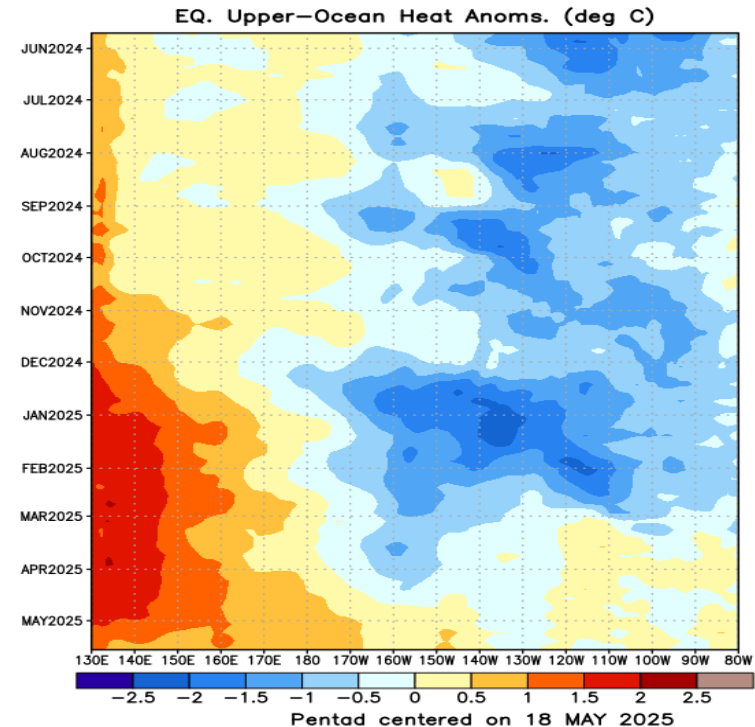
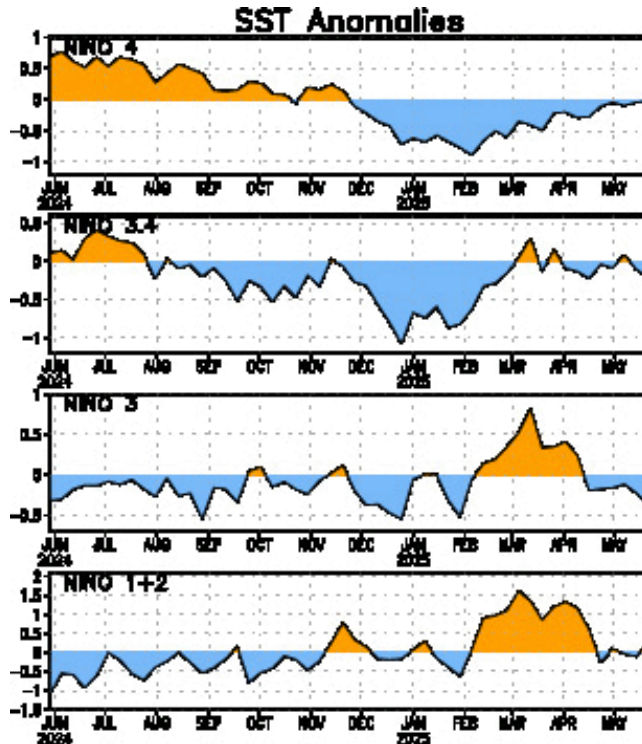
**Green shades: Anomalous convection (wetness)**

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



- Consistent with a band of anomalous lower-level westerlies, convection remained enhanced north of Australia while less convection is noted in the SPCZ region where the anomalous westerlies recently weakened.
- Tied to the outgoing La Nina, residual suppressed convection remains observed mostly north of the equator.
- Enhanced convection persists along and to the east of 120E, with Kelvin wave activity remaining the predominant eastward propagating tropical mode since late March .

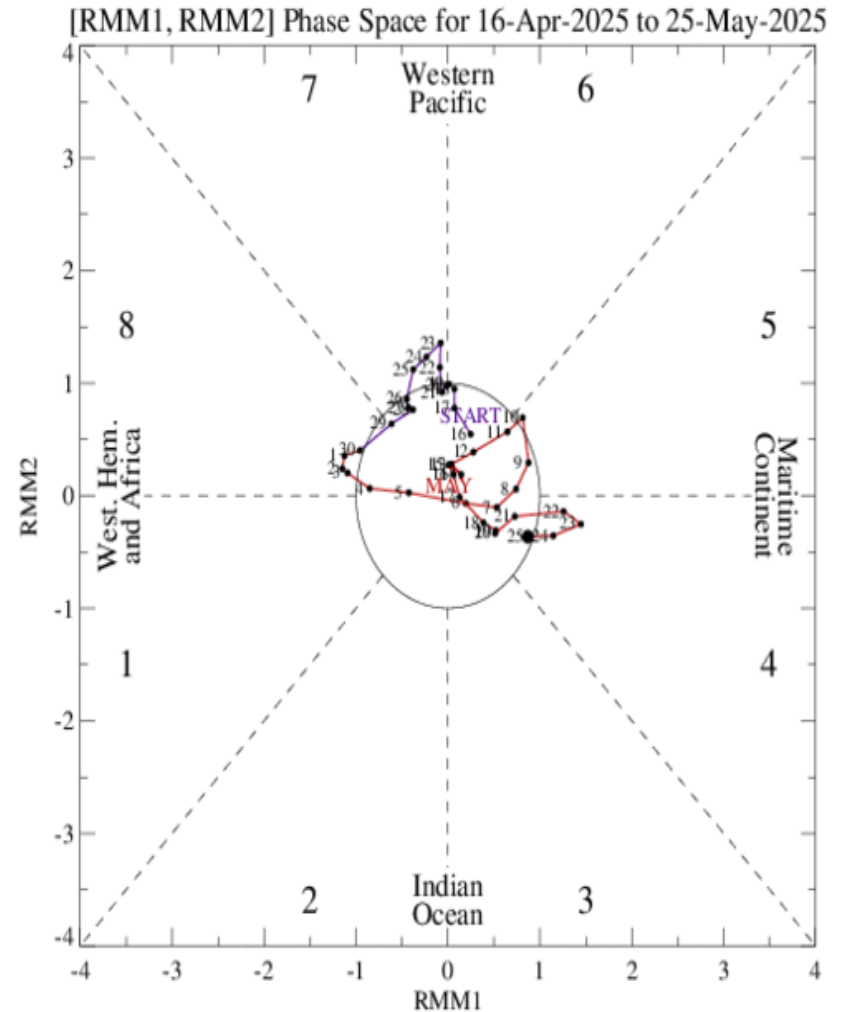
# SSTs and Weekly Heat Content Evolution in the Equatorial Pacific



- Consistent with the transition to ENSO-neutral conditions, SST anomalies in Niño regions remain near zero with much of the warming in the eastern equatorial Pacific also returning to more neutral conditions within the past few weeks.
- Large positive heat anomalies in the Western Pacific have weakened slightly, while warmer waters continue to expand eastward west of the Date Line.

# MJO Index: Recent Evolution

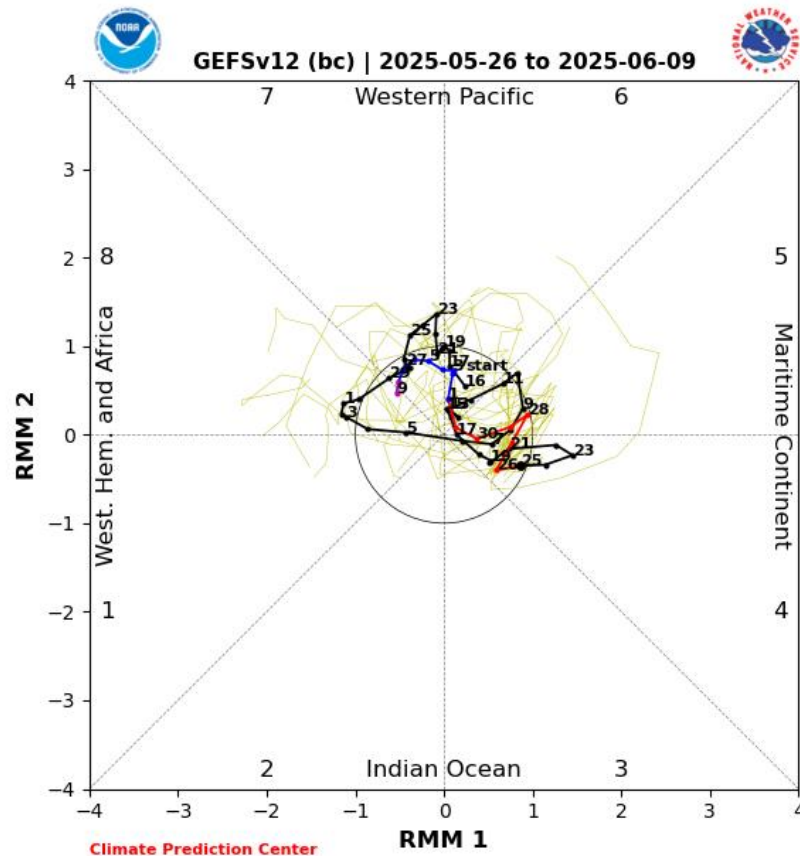
- The RMM-index continues to reflect a weak and incoherent MJO signal, with the latest observations residing on the unit circle in phase 4.
- Over the past 40 days, only a small fraction of observations were spent outside the RMM unit circle.



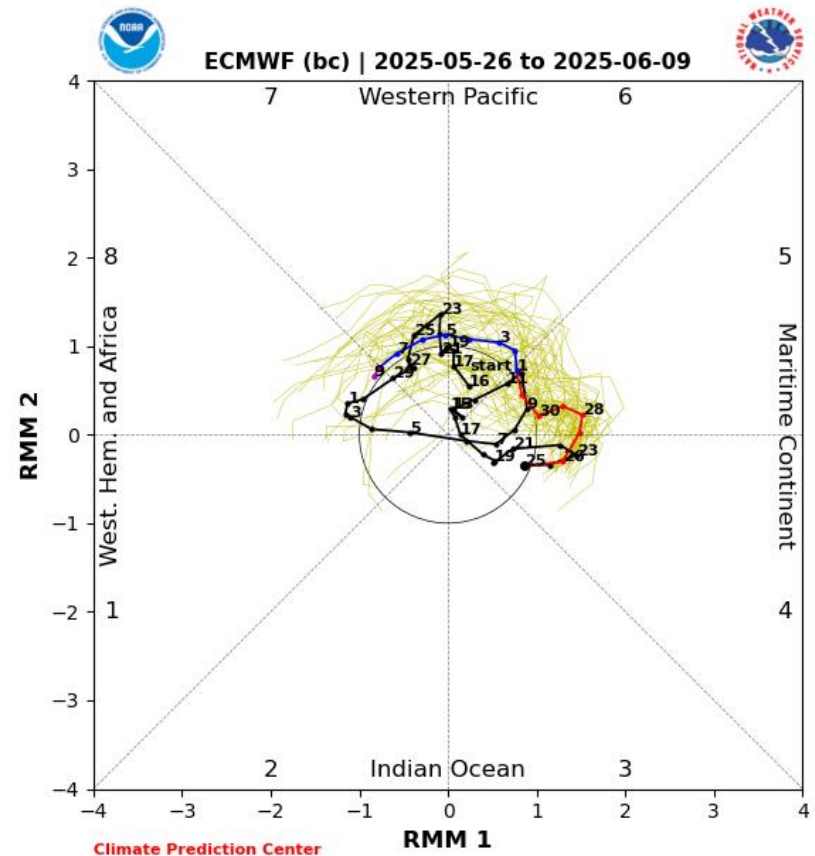
For more information on the RMM index and how to interpret its forecast please see:  
[https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CPC\\_MJOinformation.pdf](https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CPC_MJOinformation.pdf)



# MJO Index: Forecast Evolution



**GEFS Forecast**



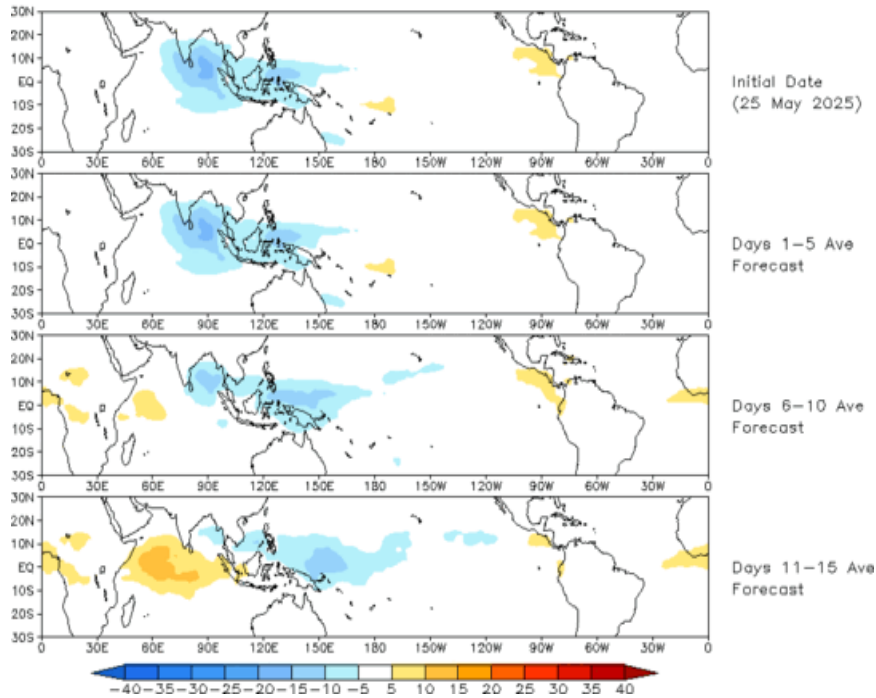
**ECMWF Forecast**

- RMM-index forecasts from both the GEFS and ECMWF favor a shift from phase 4 to phase 7-8 over the next two weeks, although they differ quite a bit with regard to signal strength and coherence.
- With other models also generally favoring further weak/incoherent MJO activity, tropical variability is likely to continue to be driven by other modes such as Kelvin or equatorial Rossby waves.

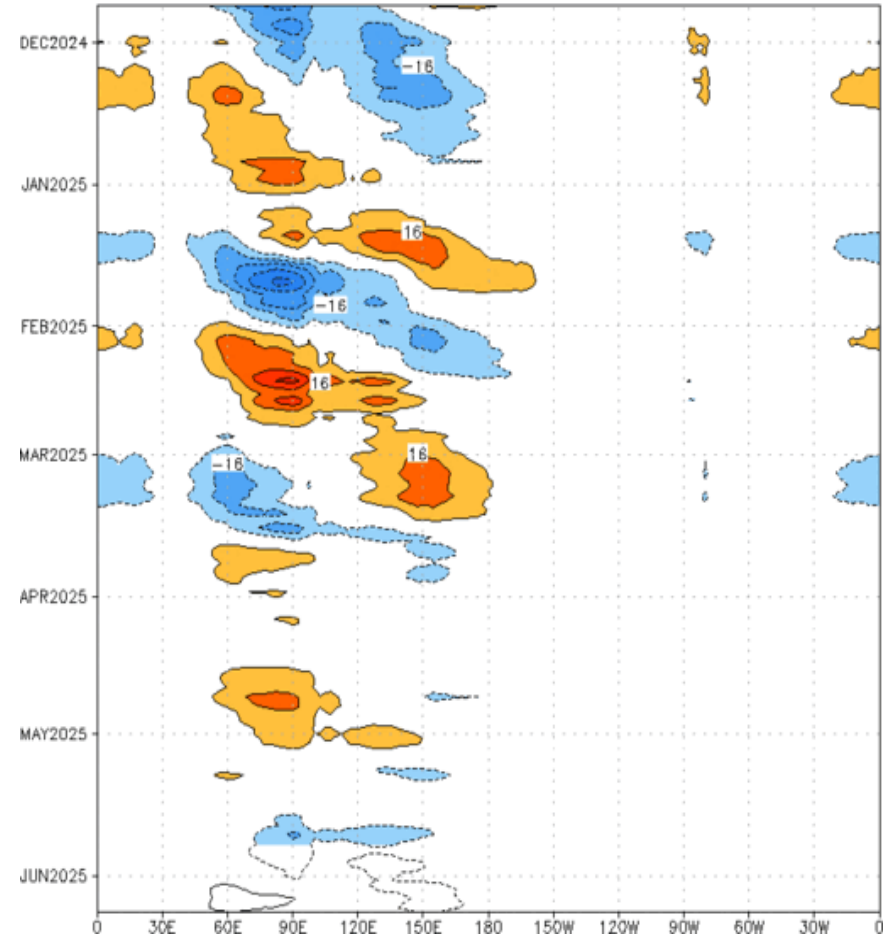
# MJO: GEFS Forecast Evolution

Figures below show MJO associated OLR anomalies only (reconstructed from RMM1 and RMM2) and do not include contributions from other modes (*i.e.*, ENSO, monsoons, etc.)

Prediction of MJO-related anomalies using GEFS operational forecast  
Initial date: 25 May 2025  
OLR



Reconstructed anomaly field associated with the MJO using RMM1 & RMM2  
OLR [7.5°S,7.5°N] ( $\text{cint:4Wm}^{-2}$ ) Period:23-Nov-2024 to 25-May-2025  
The unfilled contours are GEFS forecast reconstructed anomaly for 15 days

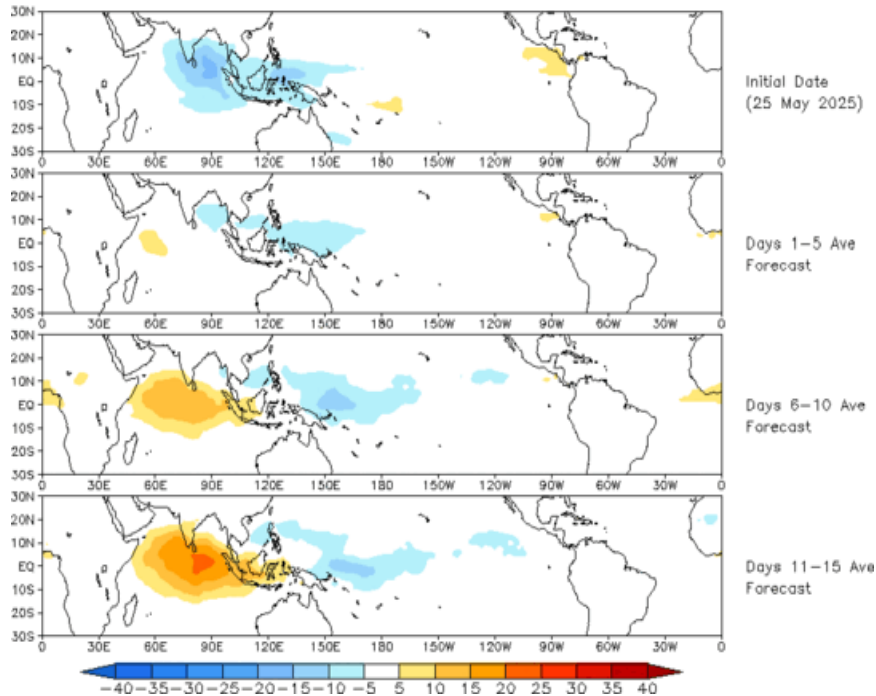


- The GEFS OLR forecast depicts a nearly stationary convective pattern, with enhanced conditions shifting slowly eastward from the eastern Indian Ocean into the Maritime Continent while suppressed conditions emerge over the western Indian Ocean.

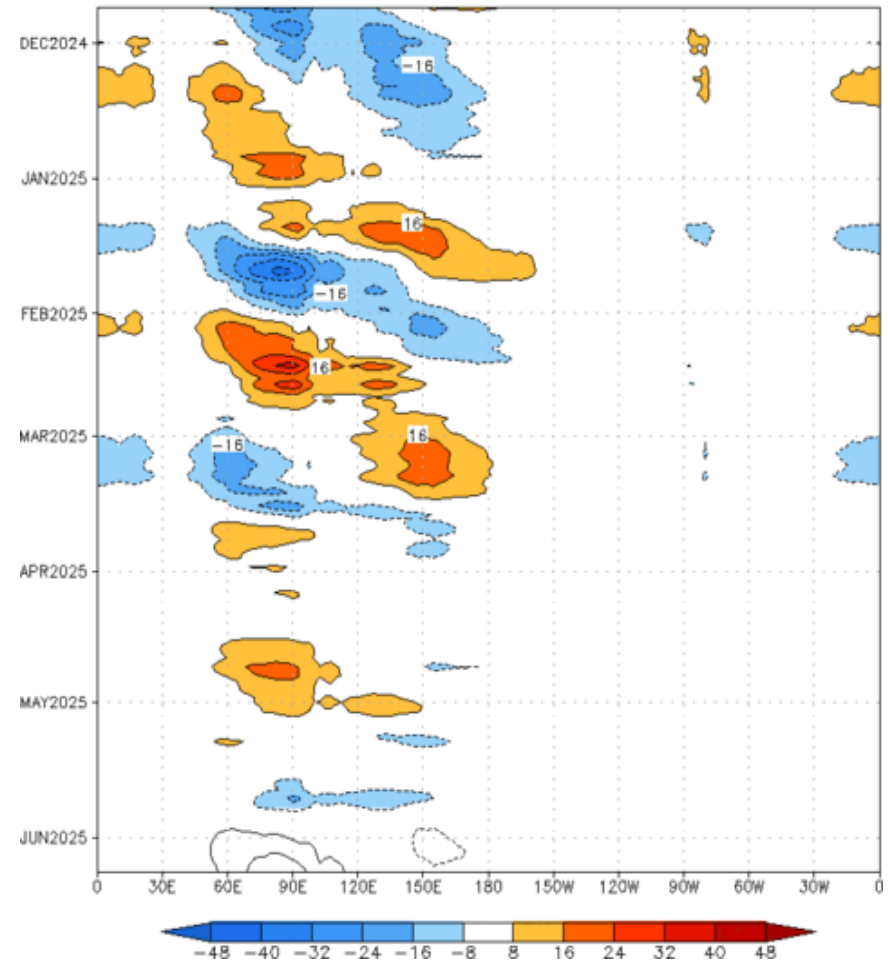
# MJO: Constructed Analog Forecast Evolution

Figures below show MJO associated OLR anomalies only (reconstructed from RMM1 and RMM2) and do not include contributions from other modes (*i.e.*, ENSO, monsoons, etc.)

OLR prediction of MJO-related anomalies using CA model reconstruction by RMM1 & RMM2 (25 May 2025)



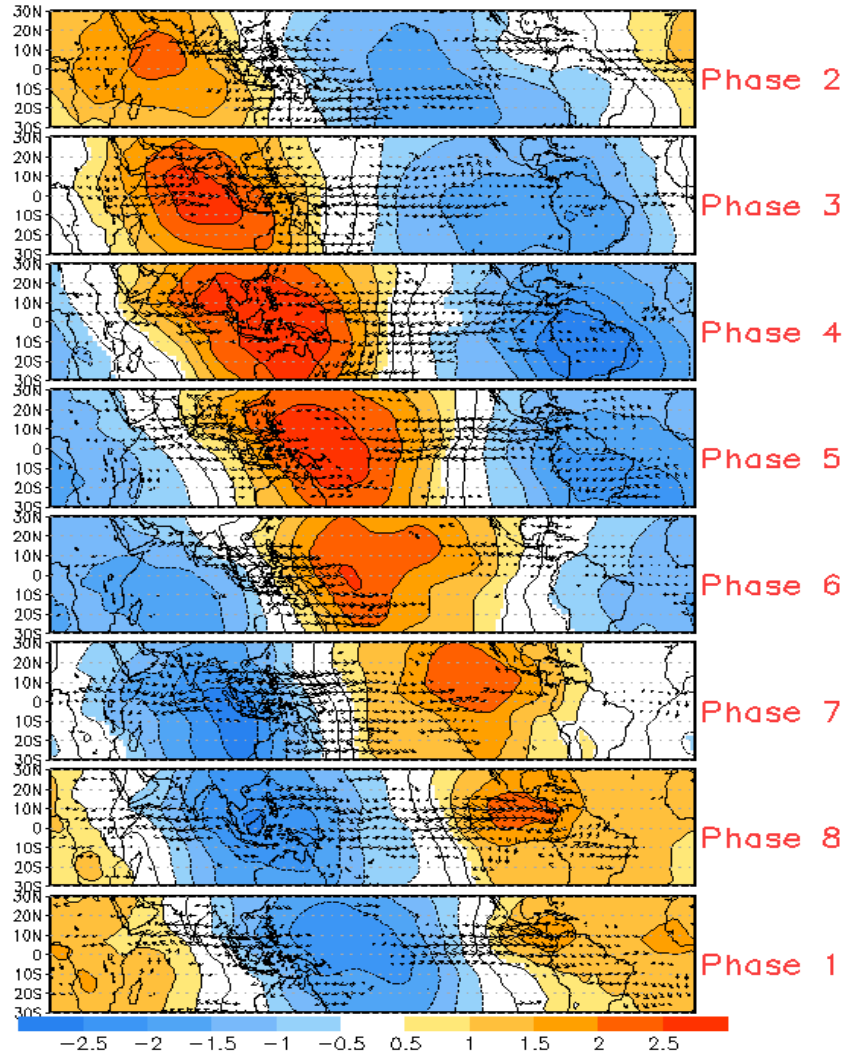
Reconstructed anomaly field associated with the MJO using RMM1 & RMM2 OLR [7.5°S,7.5°N] (cont:4Wm<sup>-2</sup>) Period:23–Nov–2024 to 25–May–2025  
The unfilled contours are CA forecast reconstructed anomaly for 15 days



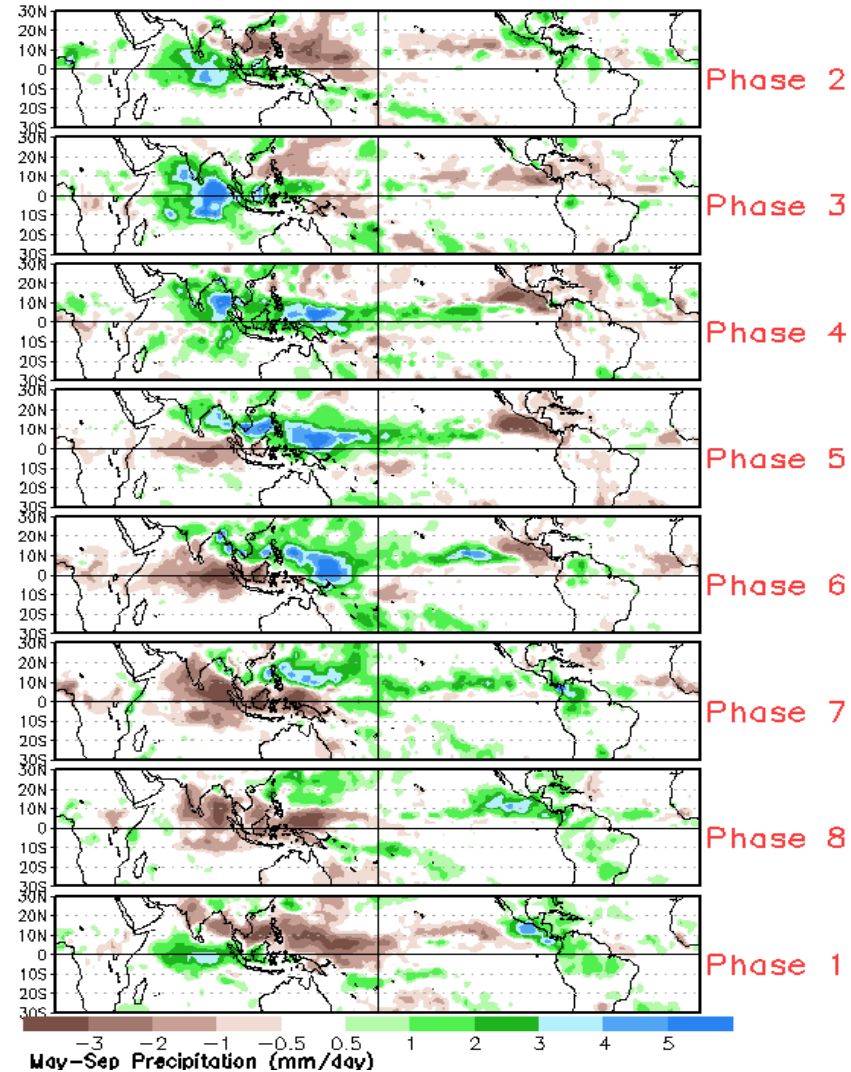
- The constructed analog forecast is a little more progressive than the GEFS and also favors stronger and more widespread suppressed conditions to emerge over the Indian Ocean.

# MJO: Tropical Composite Maps by RMM Phase

850-hPa Velocity Potential and  
Wind Anomalies



Precipitation Anomalies

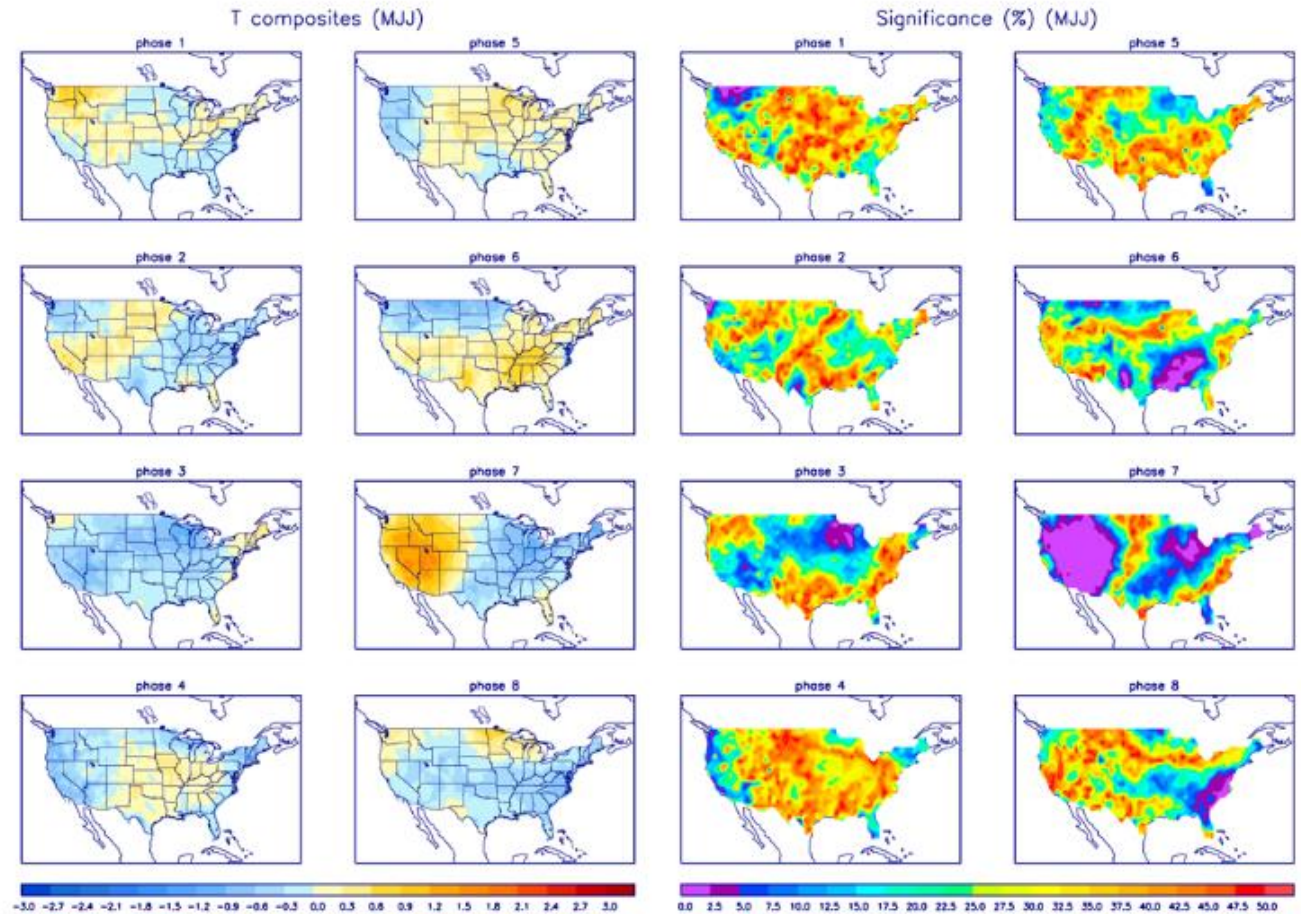




# MJO: CONUS Composite Maps by RMM Phase - Temperature

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.

