

# **Madden-Julian Oscillation:**

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



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

# Overview

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- Although a more organized Wave-1 structure has recently emerged in the upper-level velocity potential field which is visually consistent with a Pacific MJO, other fields are not consistent with this signal.
- Dynamical model MJO forecasts show a rapid return towards an incoherent pattern overall, suggesting that recent organization may be due more to the superimposition of various other modes rather than an evolving MJO signal.
- Based on dynamical and statistical model guidance, both ENSO and the MJO are favored to remain weak over the next few weeks.
- While statistical guidance shows a suppressed signal over the South Asian Monsoon regions at the typical onset of the monsoon, dynamical guidance shows a more favorable signal.
- Any tropical cyclogenesis that occurs over the next few weeks is likely to be triggered by other modes of variability, such as Kelvin or equatorial Rossby waves.

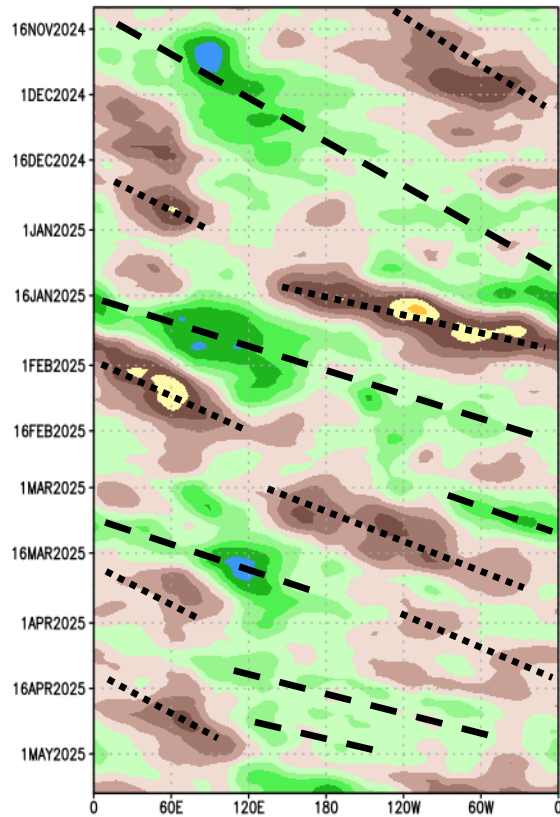
A discussion of potential impacts for the global tropics and those related to the U.S. are updated on Tuesday at:  
<http://www.cpc.ncep.noaa.gov/products/precip/CWlink/ghazards/index.php>

# 200-hPa Velocity Potential Anomalies

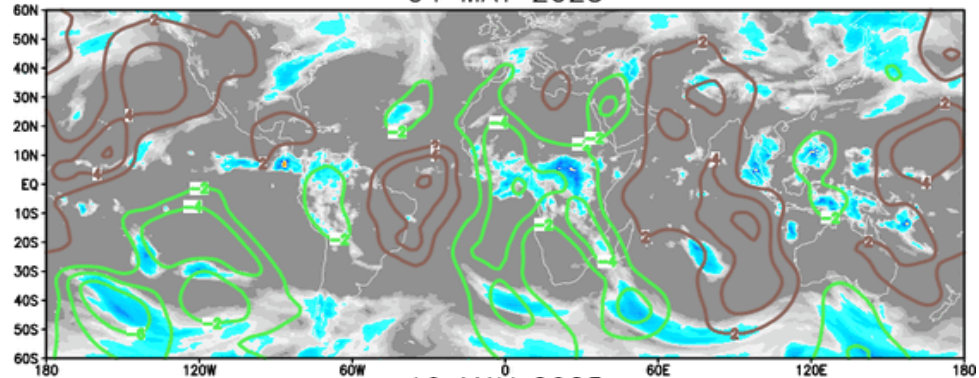
Green shades: Anomalous divergence (favorable for precipitation)

Brown shades: Anomalous convergence (unfavorable for precipitation)

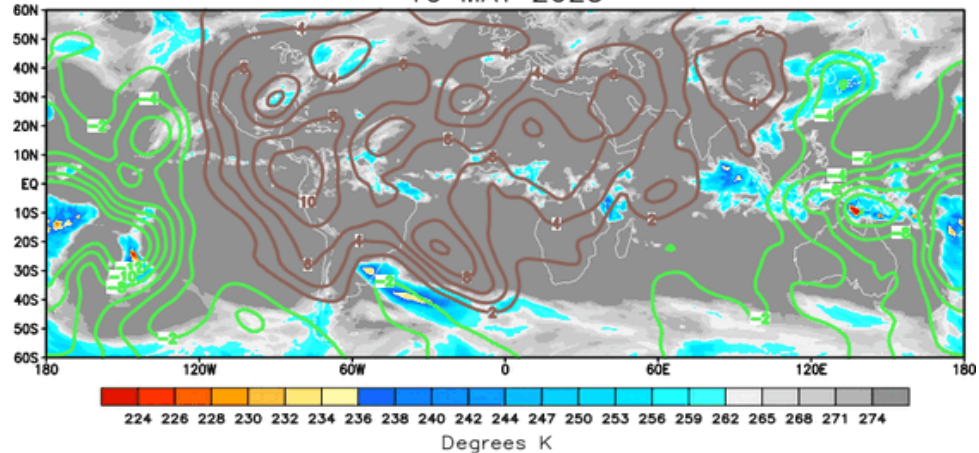
200-hPa Velocity Potential Anomaly: 5N–5S  
5-day Running Mean



04 MAY 2025



10 MAY 2025

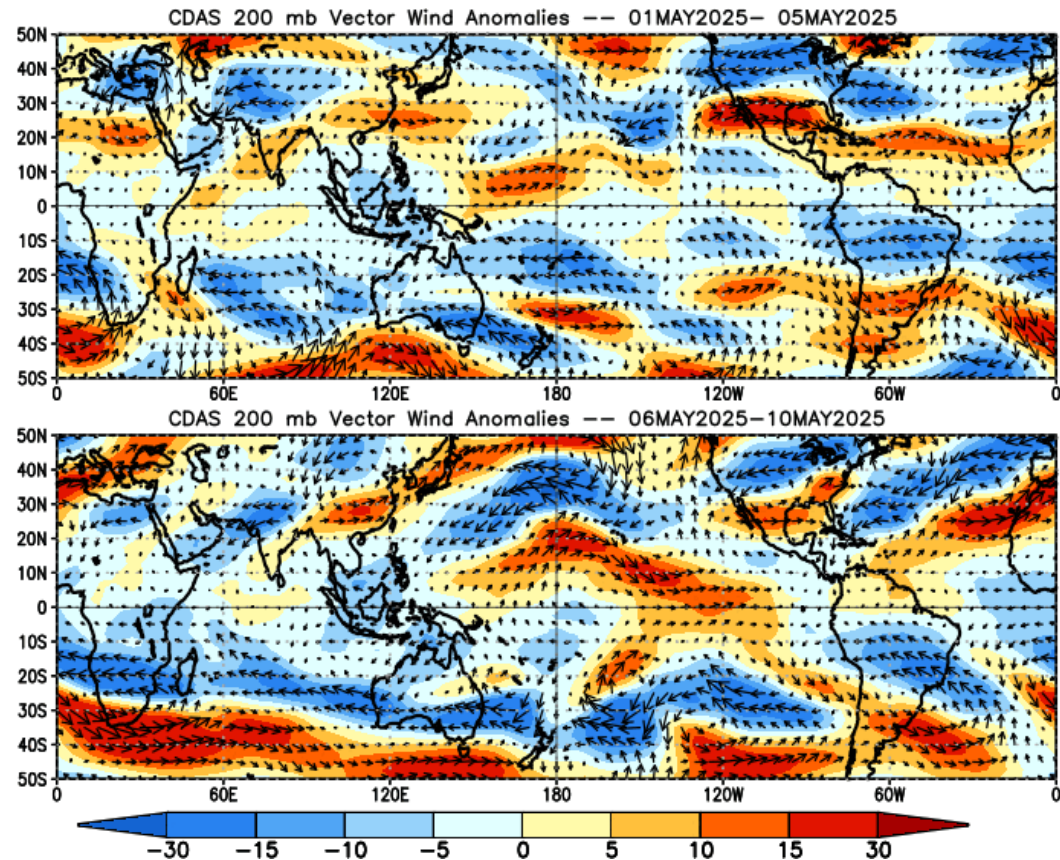
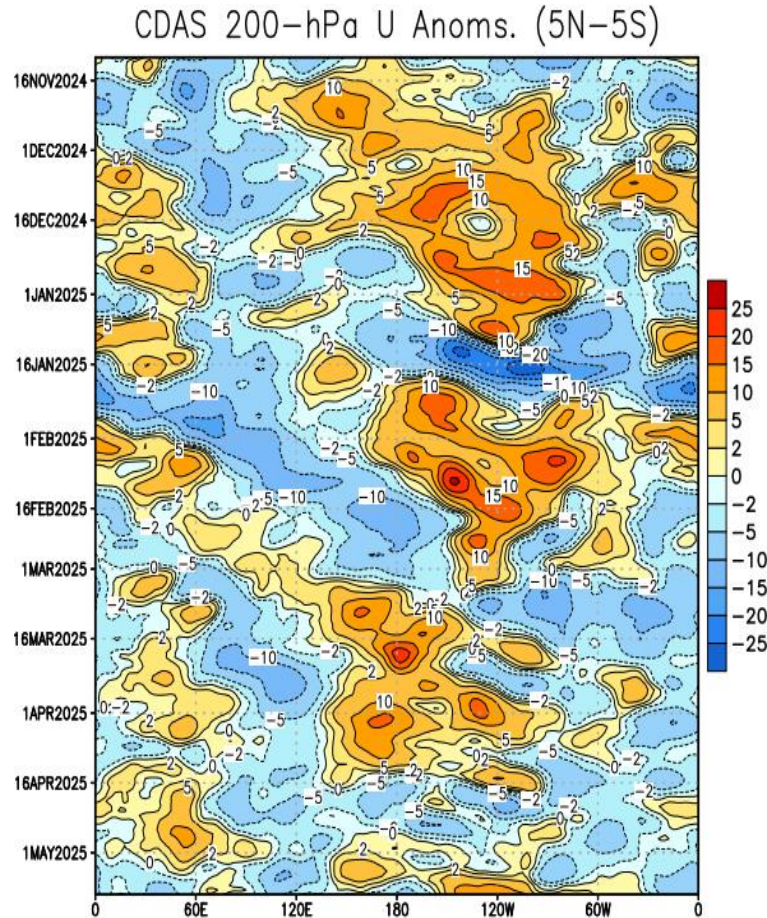


- The spatial pattern of upper-level velocity potential anomalies has become significantly more coherent over the last few days, with a robust Wave-1 pattern suggestive of MJO activity over the Pacific.
- Given the abrupt transition to this pattern and forecasts showing a resumption of incoherent intraseasonal activity, it is likely that superposition of other modes of variability is giving rise to this apparently more organized structure rather than an evolving MJO event.



# 200-hPa Wind Anomalies

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

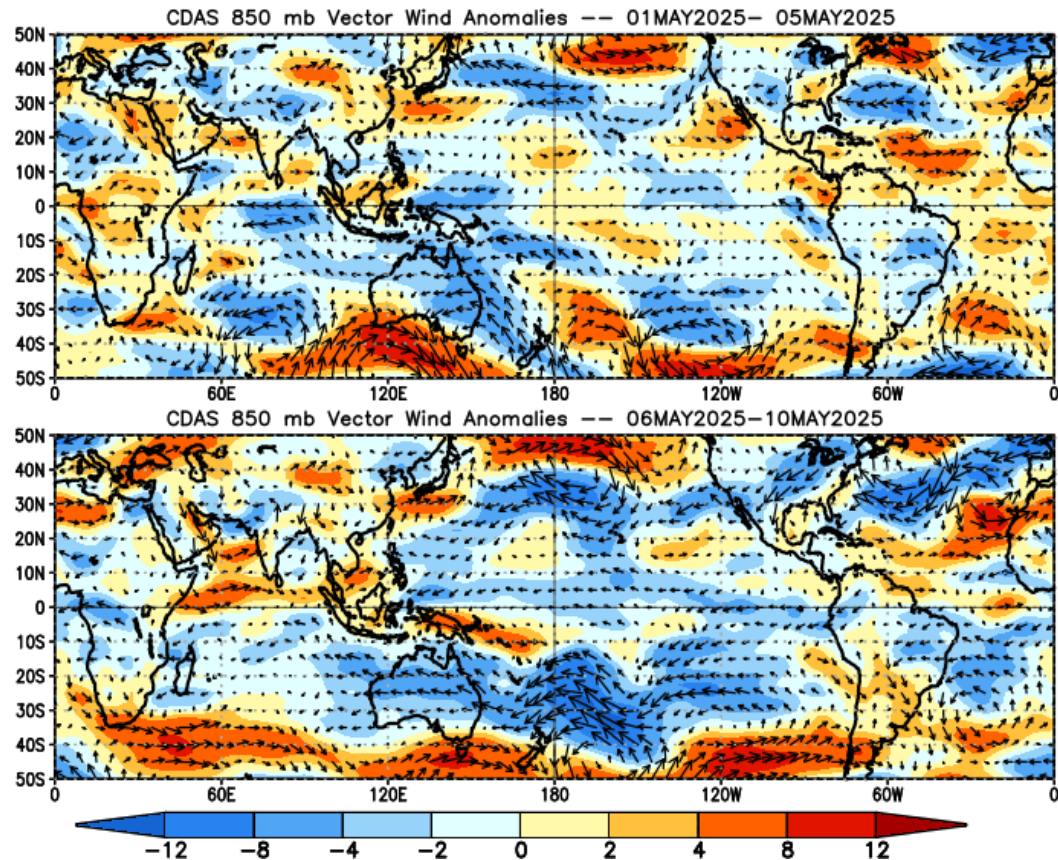
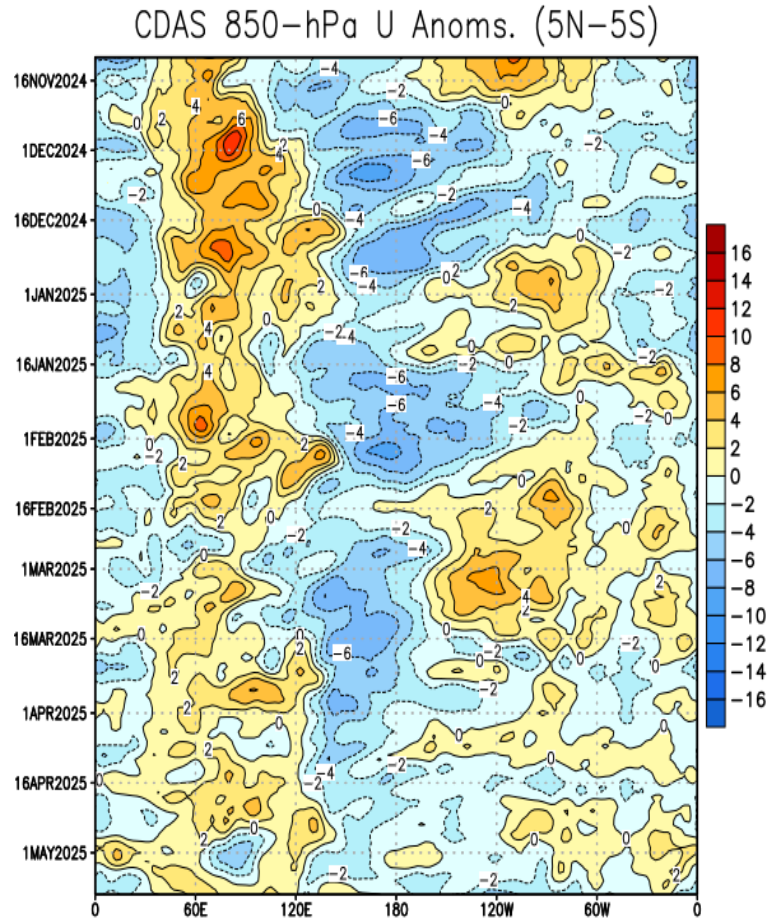


- Rapid shifts in sign from westerlies to easterlies across portions of the Indian Ocean and Pacific, as well as rapid eastward propagation of westerly anomalies aloft over the Pacific are more consistent with Kelvin wave activity than an active MJO.
- There is evidence of Rossby wave activity as well over the central Indian Ocean and Maritime Continent.



# 850-hPa Wind Anomalies

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

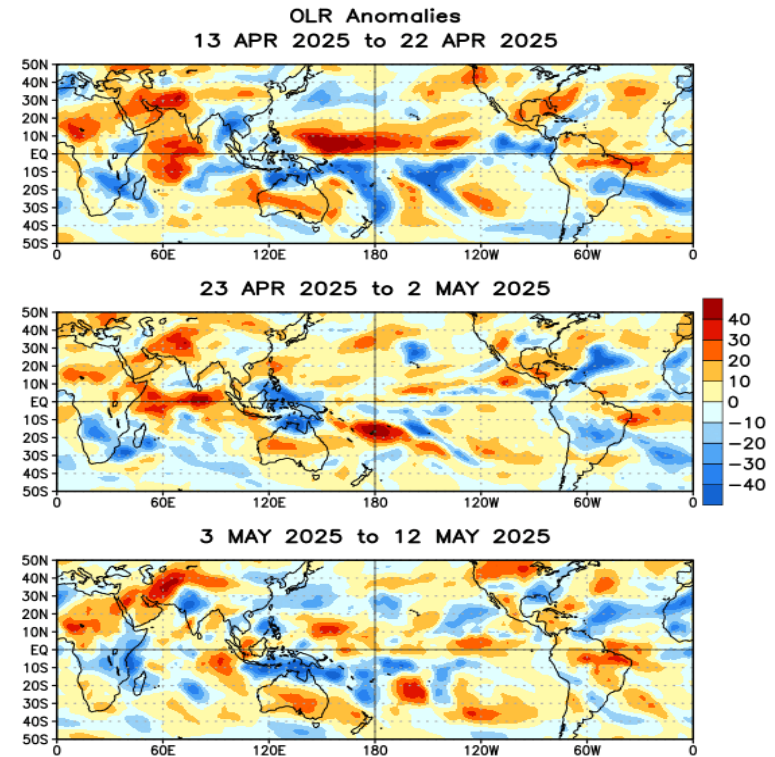
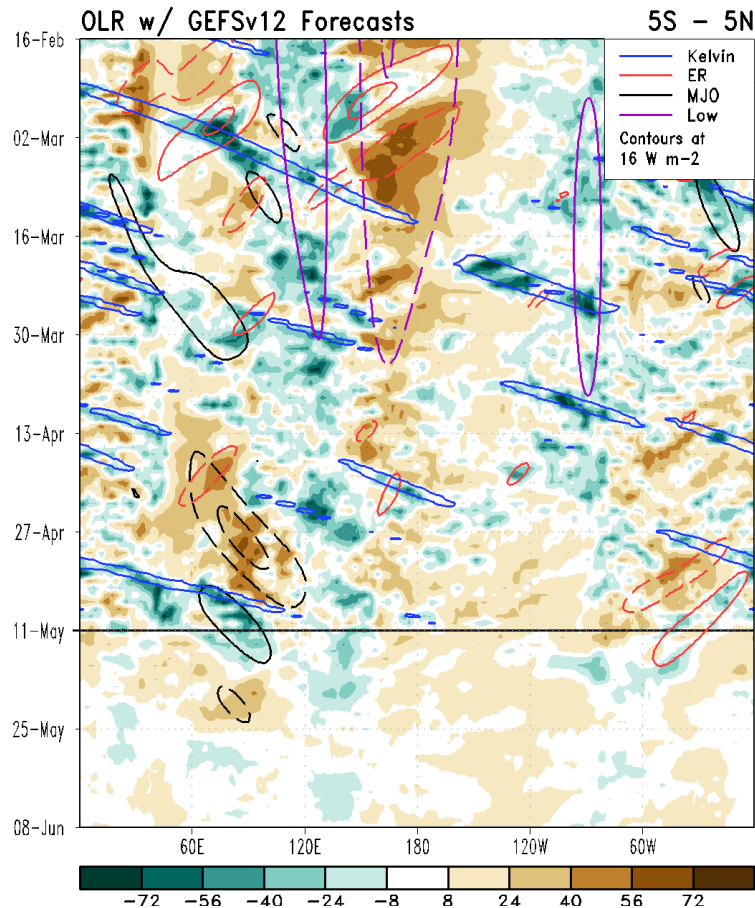


- Easterly anomalies that developed over the eastern Indian Ocean broke down rapidly, with easterly anomalies now present across much of the Pacific basin.
- The overall presentation of the low-level wind field is fairly weak and disorganized.

# Outgoing Longwave Radiation (OLR) Anomalies

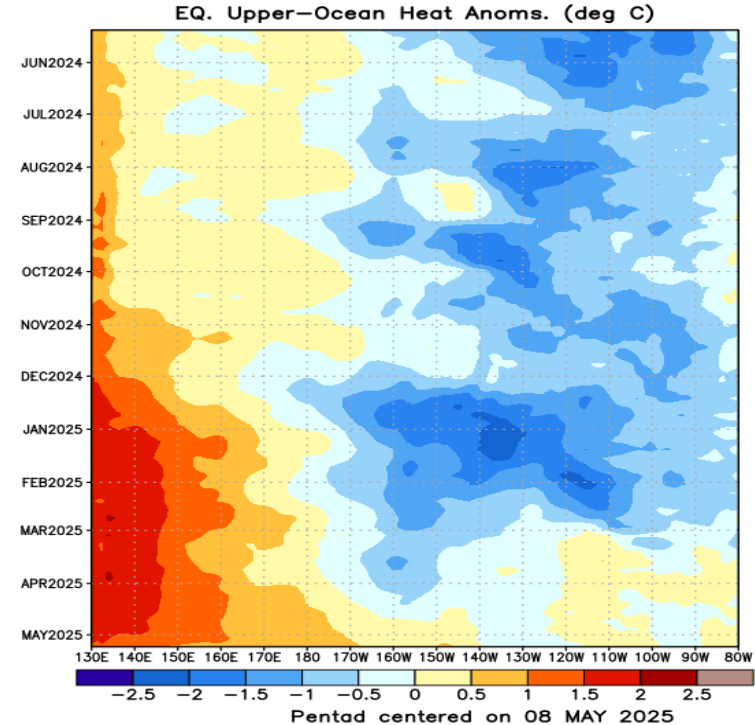
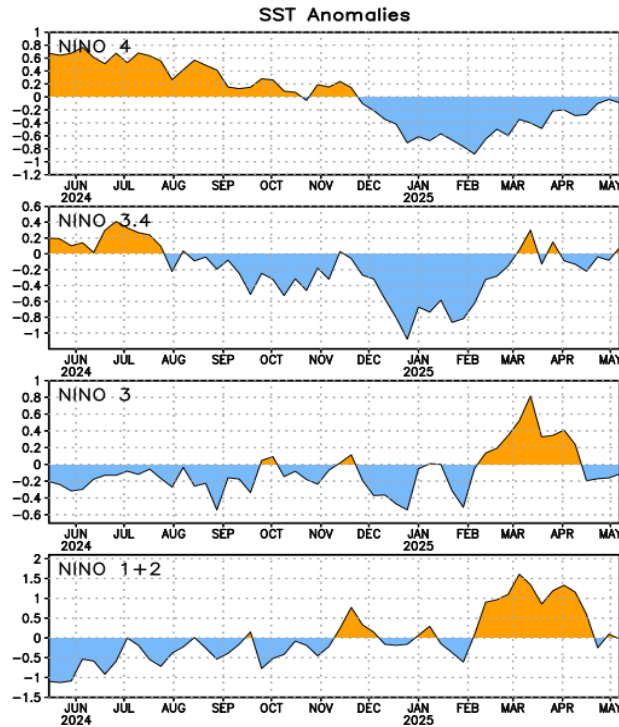
**Green shades:** Anomalous convection (wetness)

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



- Low frequency suppressed convection over the central Pacific has yielded to a more chaotic pattern during May. An enhanced convective signal north of Australia continues to persist.
- The GEFS-based OLR anomaly forecasts show a weak field overall through early June, consistent with an overall lack of both ENSO and subseasonal MJO activity.

# SSTs and Weekly Heat Content Evolution in the Equatorial Pacific

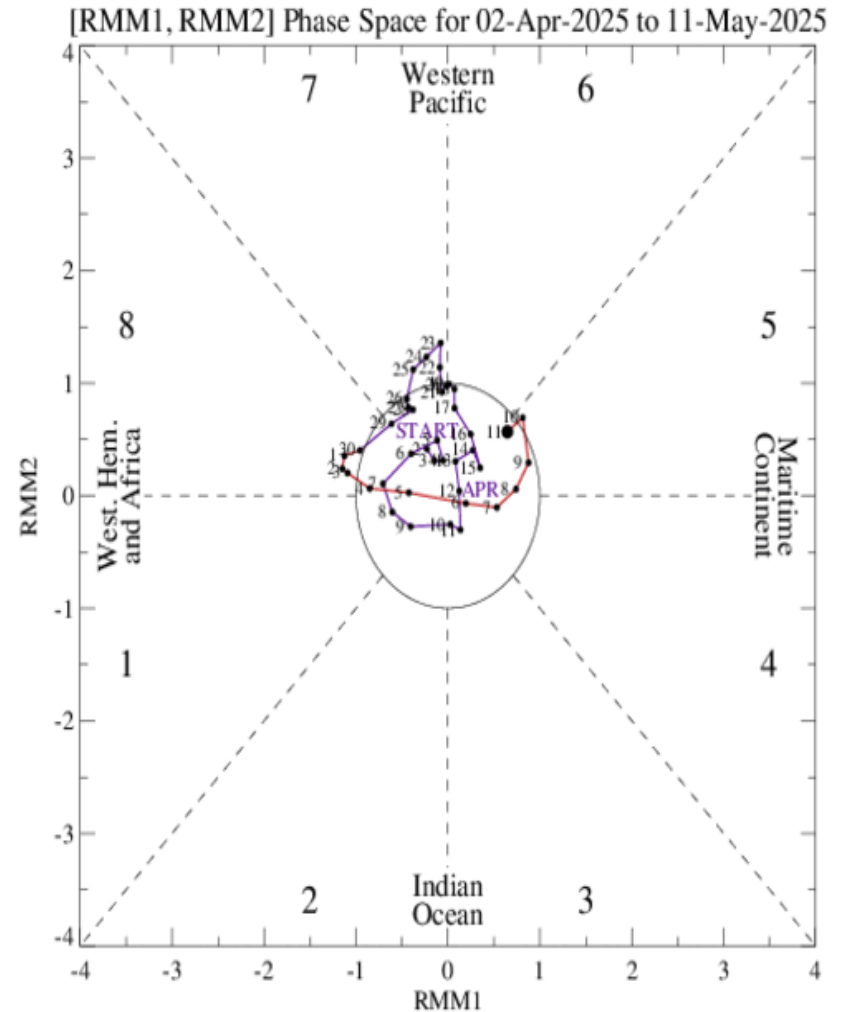


- Consistent with the transition to ENSO-neutral conditions, SST anomalies in Niño regions remain near zero with much of the warming in the eastern equatorial Pacific also returning to more neutral conditions within the past few weeks.
- Subsurface negative temperature anomalies continue to weaken across the central Pacific, with positive anomalies emerging east of 120°W. Positive heat content anomalies remain well above average west of the Date Line.



# MJO Index: Recent Evolution

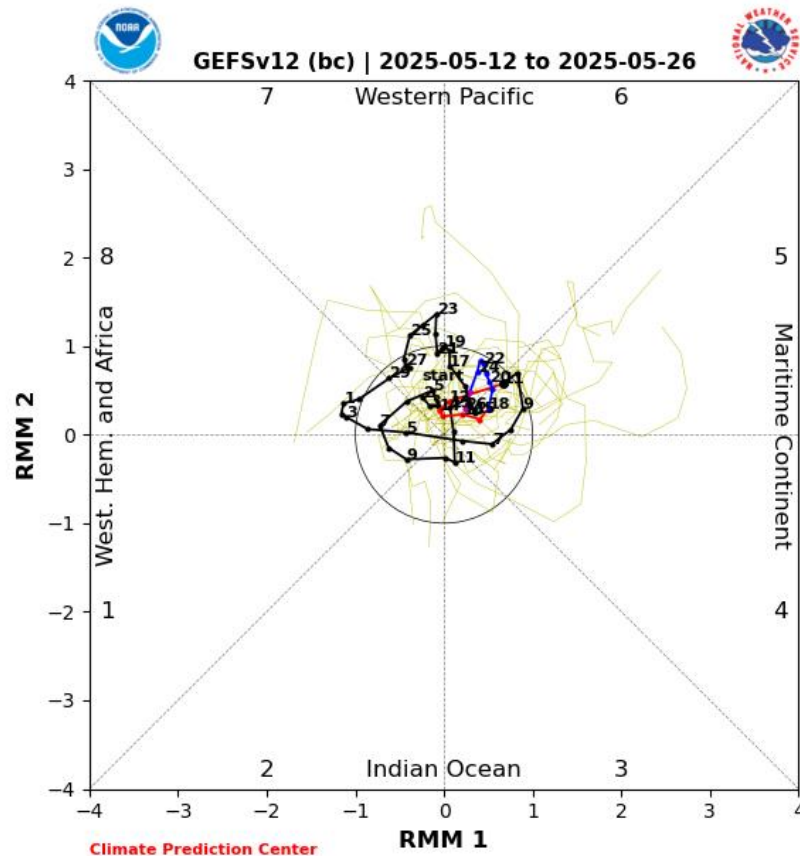
- The RMM-index transitioned rapidly from the Western Hemisphere to the Maritime Continent over the past week, with weak amplitude overall.
- The rapid shifts in phase indicate other modes of activity, such as Kelvin waves.



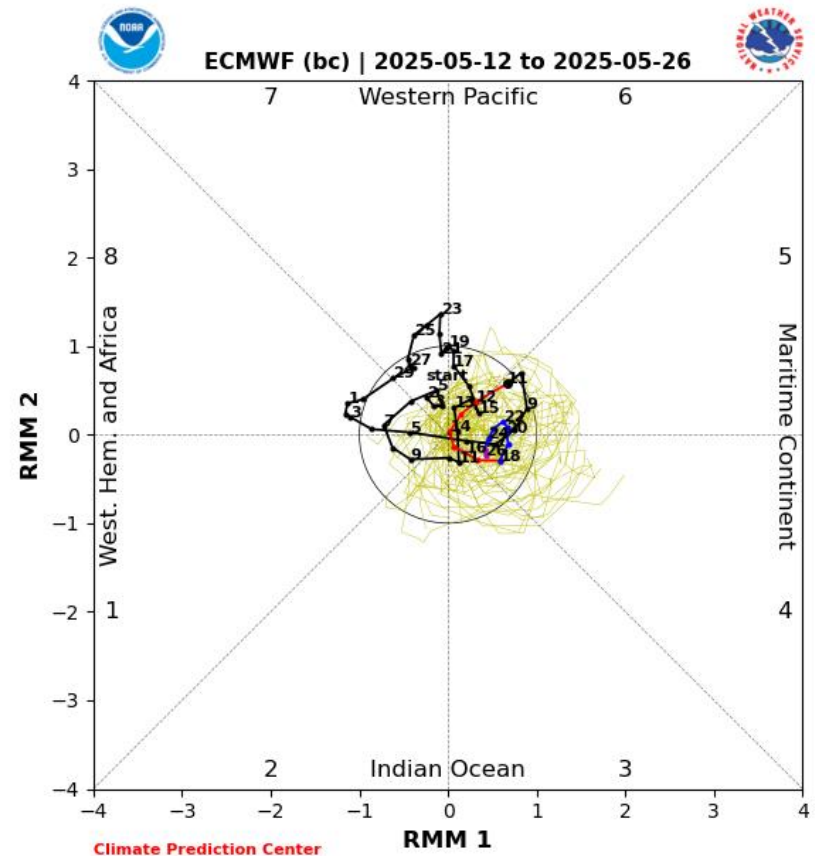
For more information on the RMM index and how to interpret its forecast please see:  
[https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CPC\\_MJOinformation.pdf](https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CPC_MJOinformation.pdf)



# MJO Index: Forecast Evolution



**GEFS Forecast**



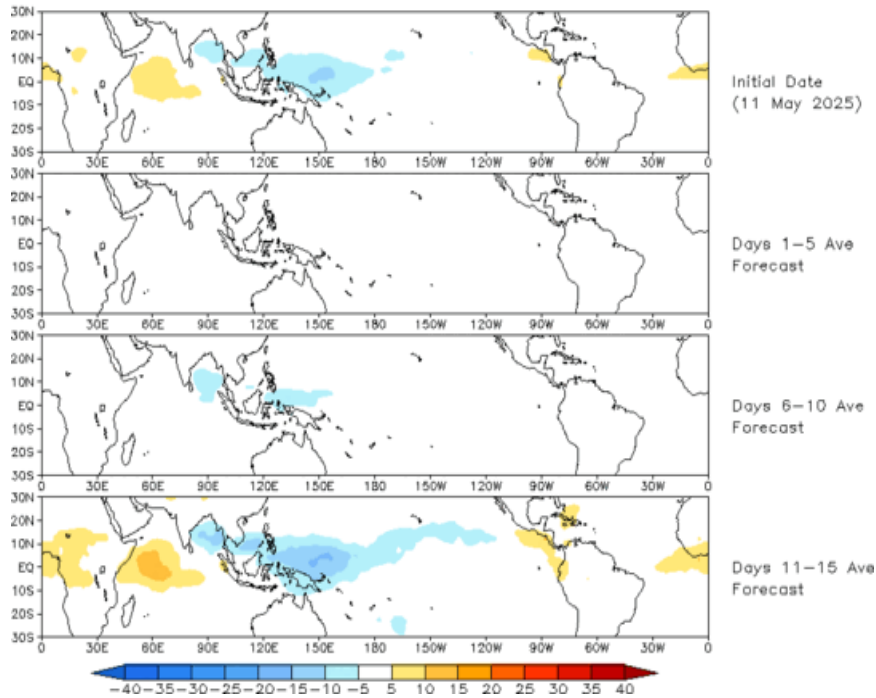
**ECMWF Forecast**

- RMM-index forecasts from both the GEFS and ECMWF depict weak MJO activity over the next two weeks.
- An amplified signal within the model ensemble members emerges over the Maritime Continent, with some GEFS members showing rapid transitions across the Pacific.

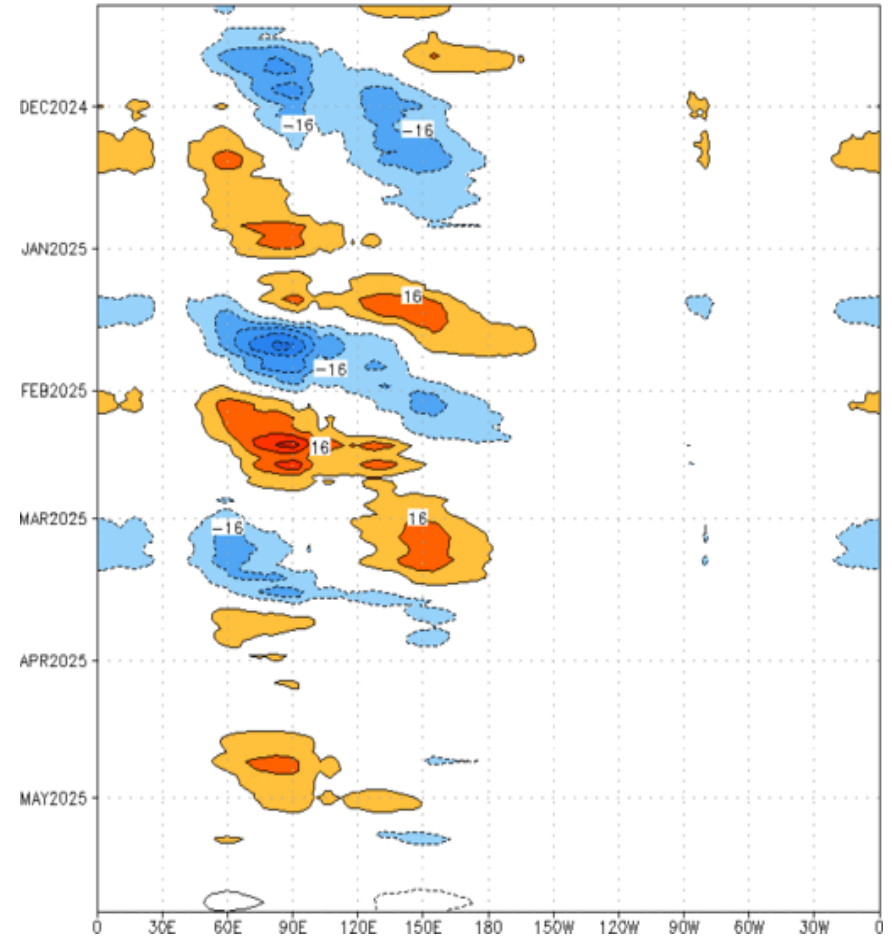
# MJO: GEFS Forecast Evolution

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: 11 May 2025  
OLR



Reconstructed anomaly field associated with the MJO using RMM1 & RMM2  
OLR [ $7.5^{\circ}S, 7.5^{\circ}N$ ] (cont:  $4Wm^{-2}$ ) Period: 09-Nov-2024 to 11-May-2025  
The unfilled contours are GEFS forecast reconstructed anomaly for 15 days

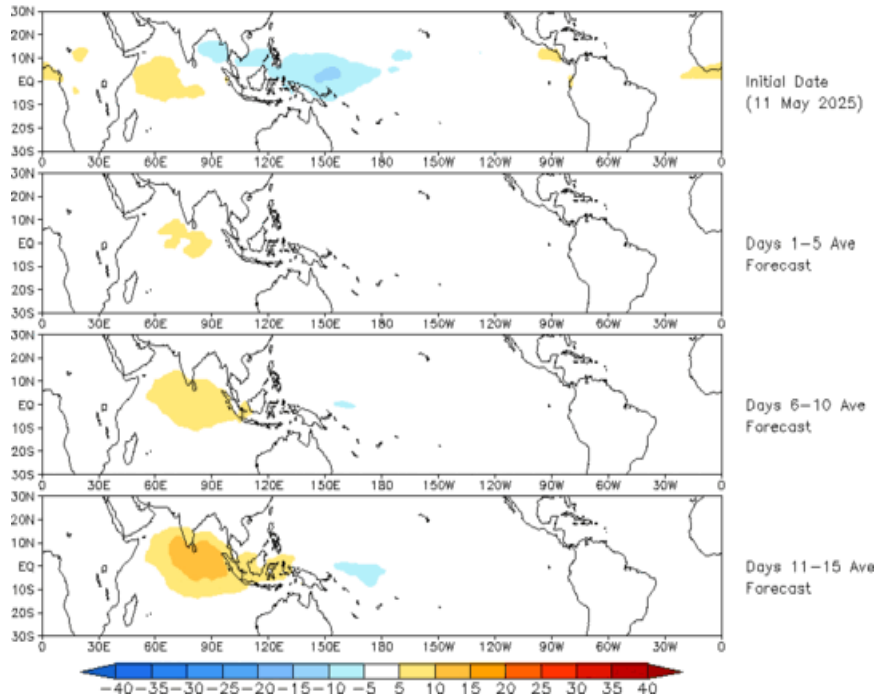


- The GEFS OLR forecast shows a weak signal during the next two weeks, with some amplification over the Pacific at the end of the period due to the more amplified ensemble members.

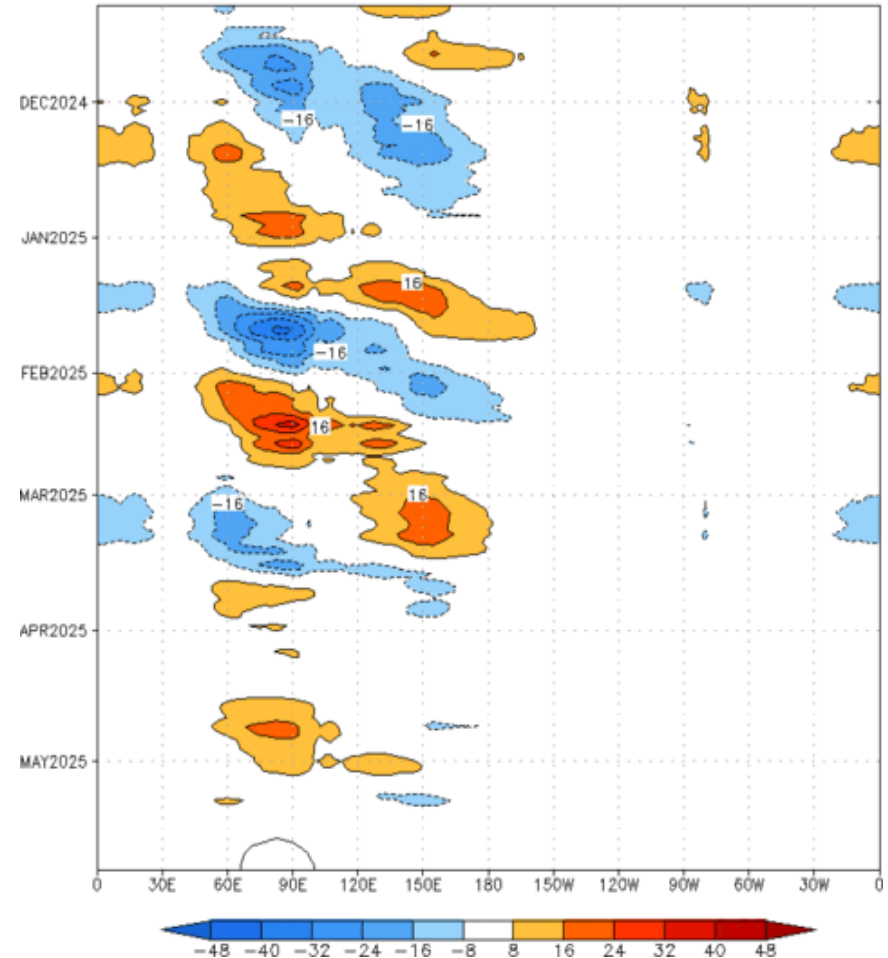
# MJO: Constructed Analog Forecast Evolution

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 (11 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: 09–Nov–2024 to 11–May–2025  
The unfilled contours are CA forecast reconstructed anomaly for 15 days

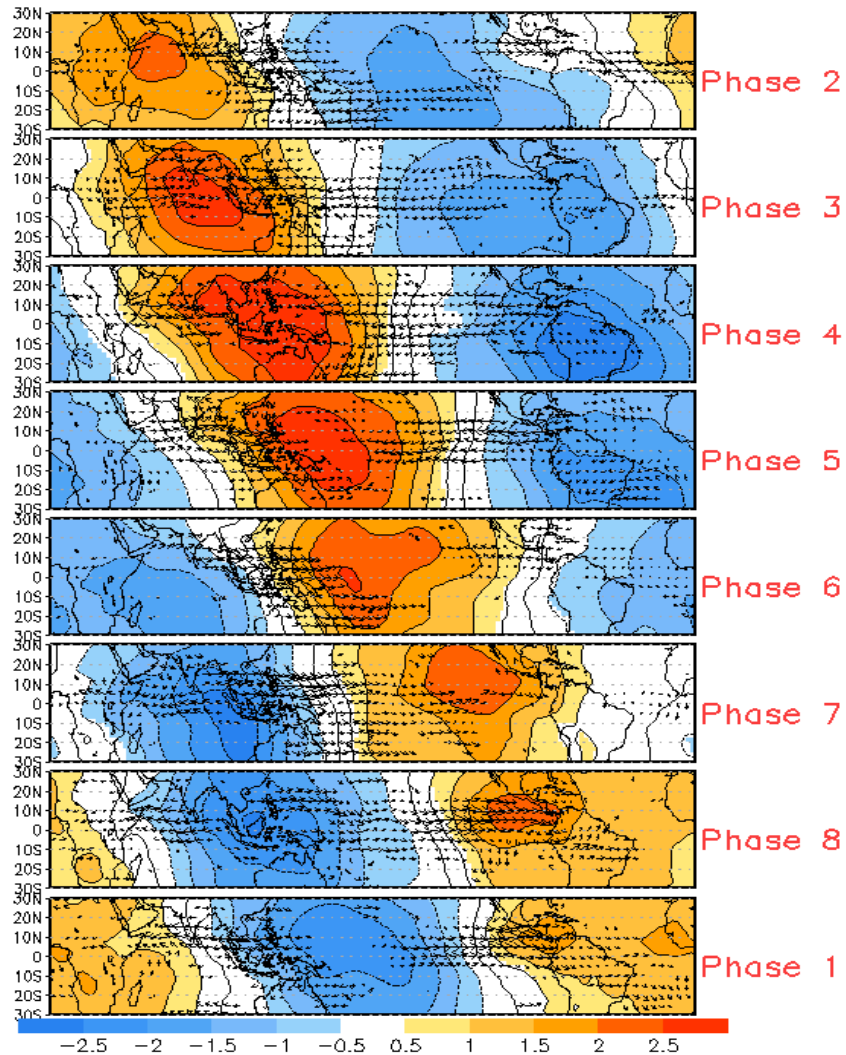


- The constructed analog forecast also shows a weak pattern overall, with no enhanced convective envelope. Suppressed convection is depicted slowly building over the Indian Ocean basin during the time of initial south Asian monsoon onset.

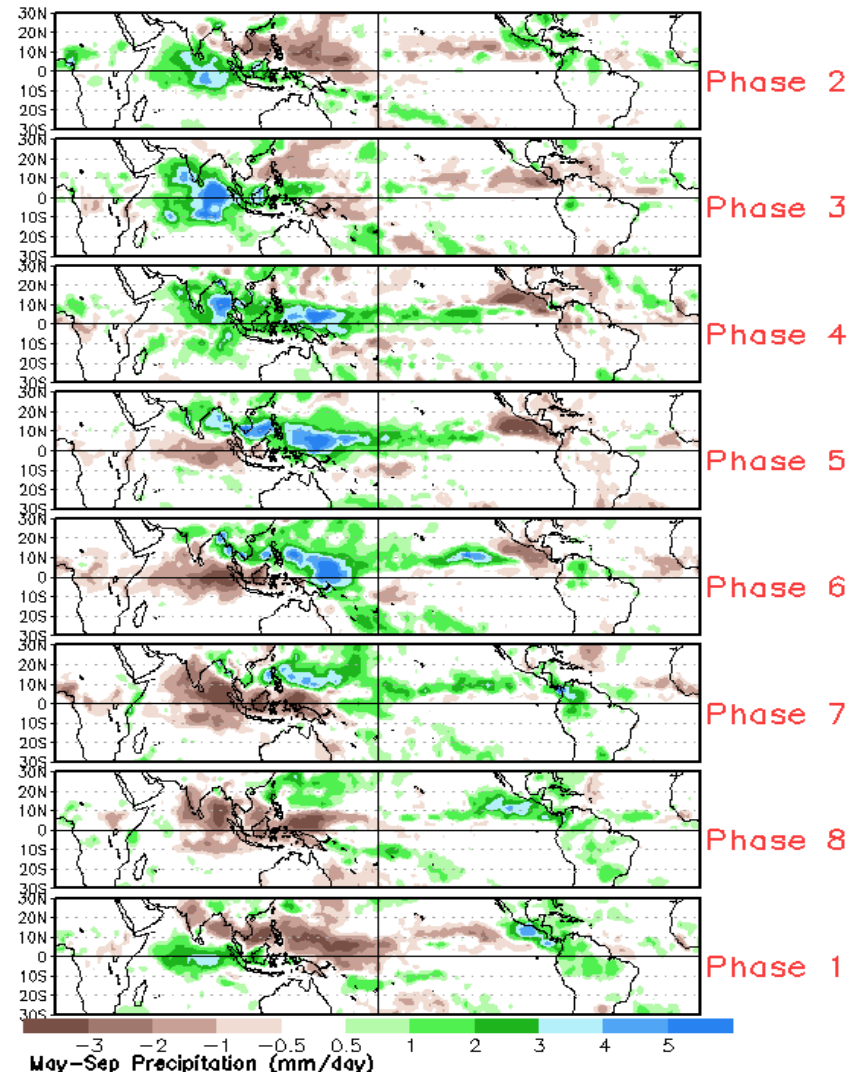


# MJO: Tropical Composite Maps by RMM Phase

850-hPa Velocity Potential and  
Wind Anomalies



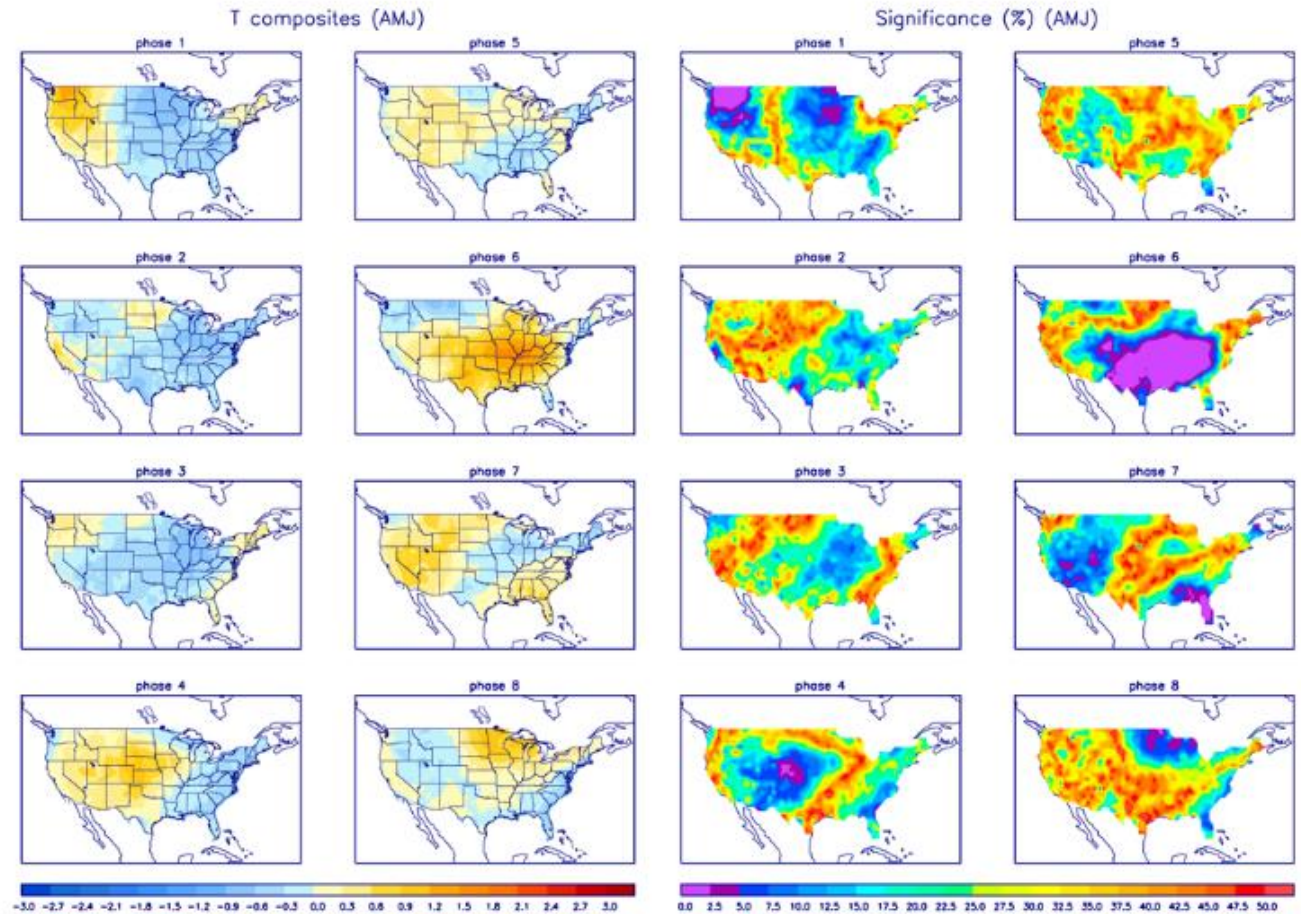
Precipitation Anomalies



# 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.

