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

**Update prepared by the Climate Prediction Center**
**NWS / NCEP / CPC**
**1 December 2025**

# Overview

- The MJO resumed its eastward propagation while greatly strengthening in amplitude over the Western Pacific during the past week.
    - RMM observations currently show the signal at greater than 3 standard deviations in amplitude, the highest registered since March, 2024

- Based on objectively wave filtered upper-level velocity potential anomalies, the recent strengthening is likely tied to higher frequency wave modes constructively interfering with both the enhanced and suppressed MJO envelopes.

- The strong Western Pacific MJO has led to a weakening of the La Nina background circulation over the equatorial Pacific, with convective anomalies developing off the equator.

- As the faster propagating tropical variability moves away of the slower MJO envelopes, a transition towards more competing interference is favored, resulting in a substantially weakened MJO signal over the Western Hemisphere during the next two weeks.

- Even with a weakened MJO, subseasonal forcing still favors the greatest chances for tropical cyclone development over the South Pacific, with lowered chances over the Indian Ocean.

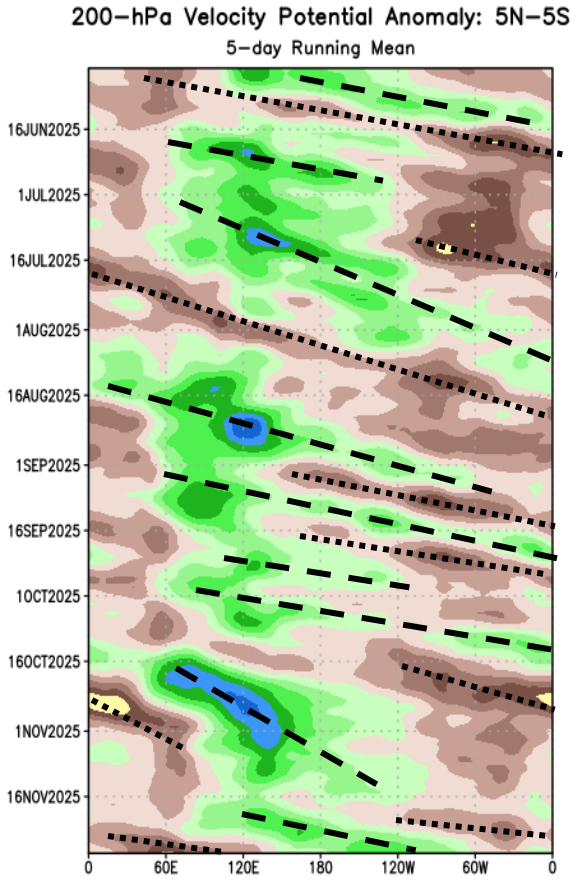
- The extratropical response associated with Western Hemisphere MJO events during December historically consists of development of high latitude blocking over/near Greenland, potentially allowing for Arctic air to be advected into portions of the central and eastern CONUS.

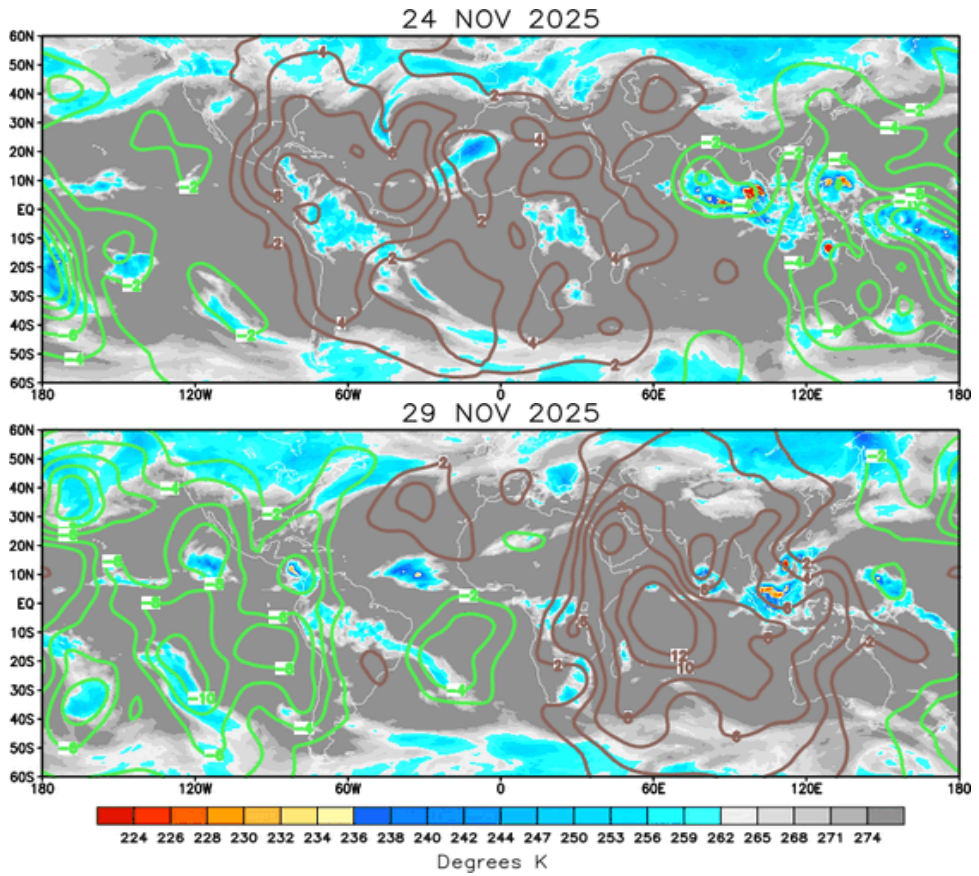
A discussion of potential impacts for the global tropics and those related to the U.S. are updated on Tuesday at:
http://www.cpc.ncep.noaa.gov/products/precip/CWlink/ghazards/index.php

# 200-hPa Velocity Potential Anomalies

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

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

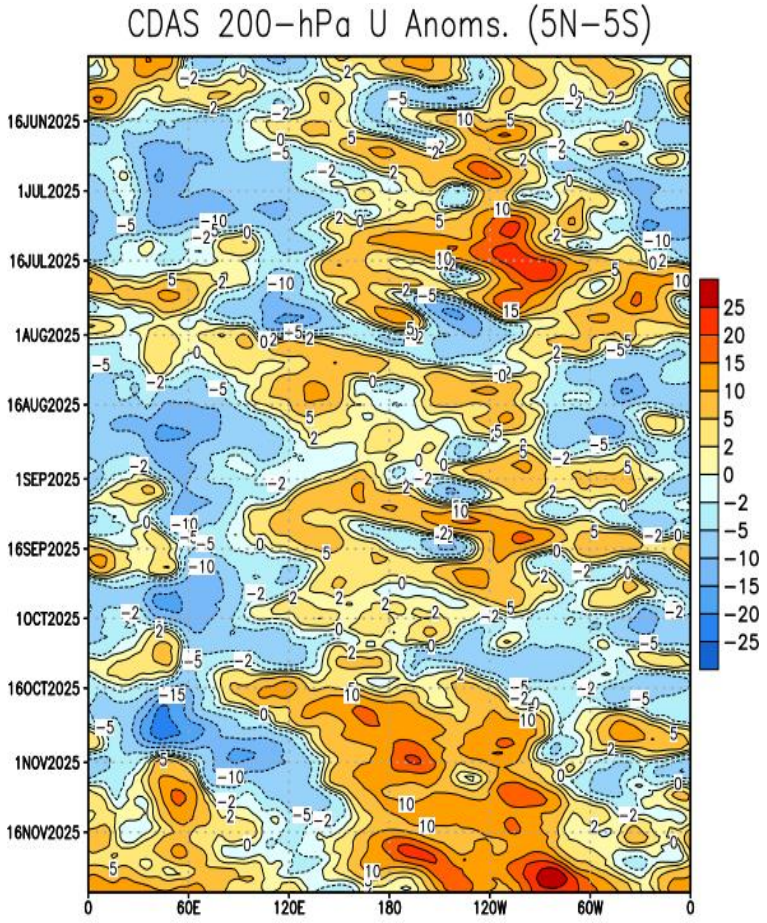


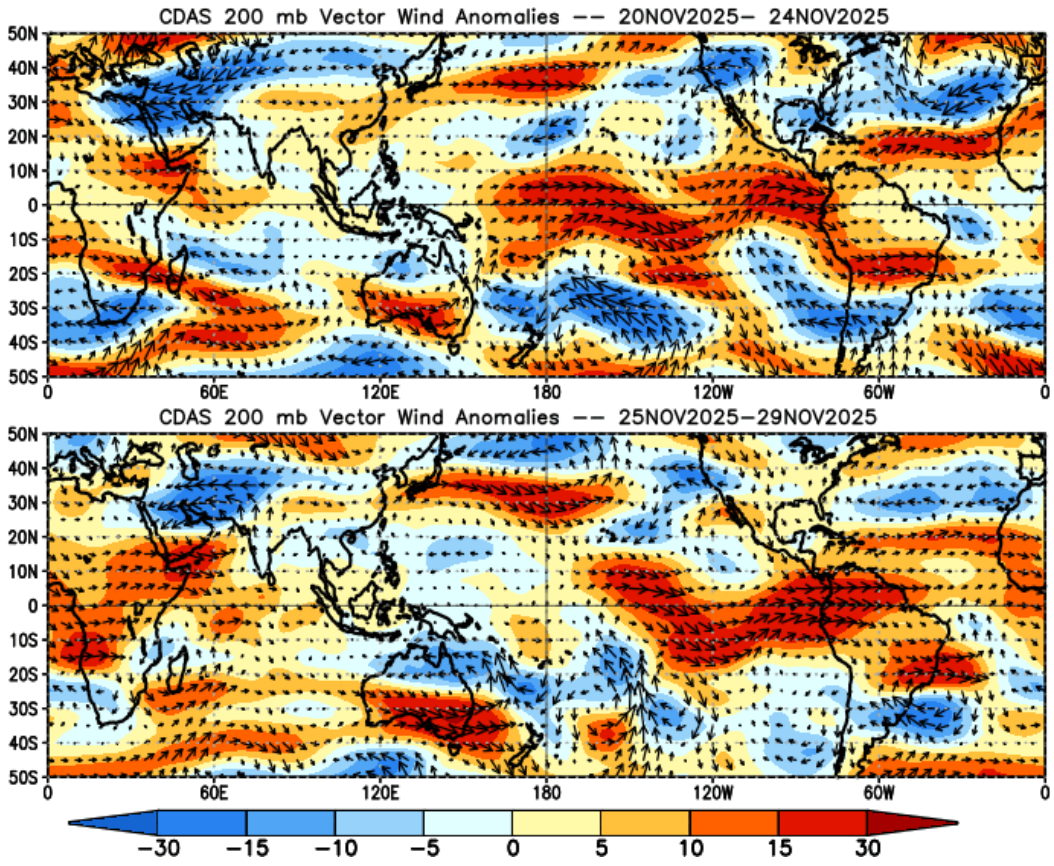




- During late November, the upper-level pattern regained more of a wave-1 like presentation, with both the enhanced and suppressed divergence phases propagating eastward across the global tropics
- The time/longitude reflects this renewed eastward propagation, but reveals a fairly fast phase speed consistent with higher frequency Kelvin wave activity which looks to be constructively interfering with the slower MJO.

# 200-hPa Wind Anomalies

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

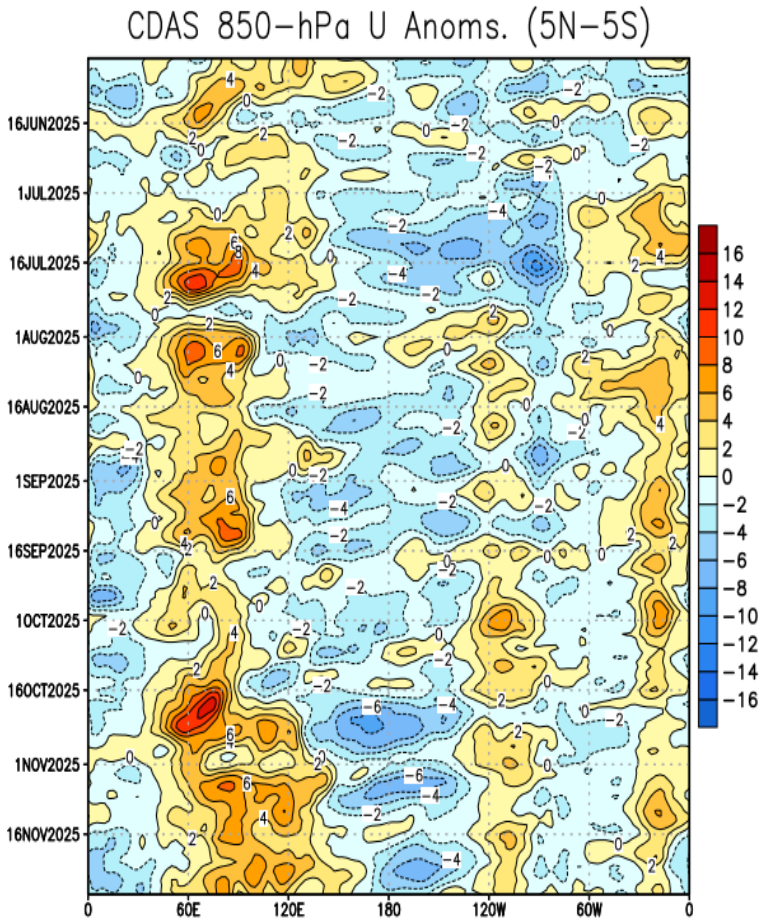


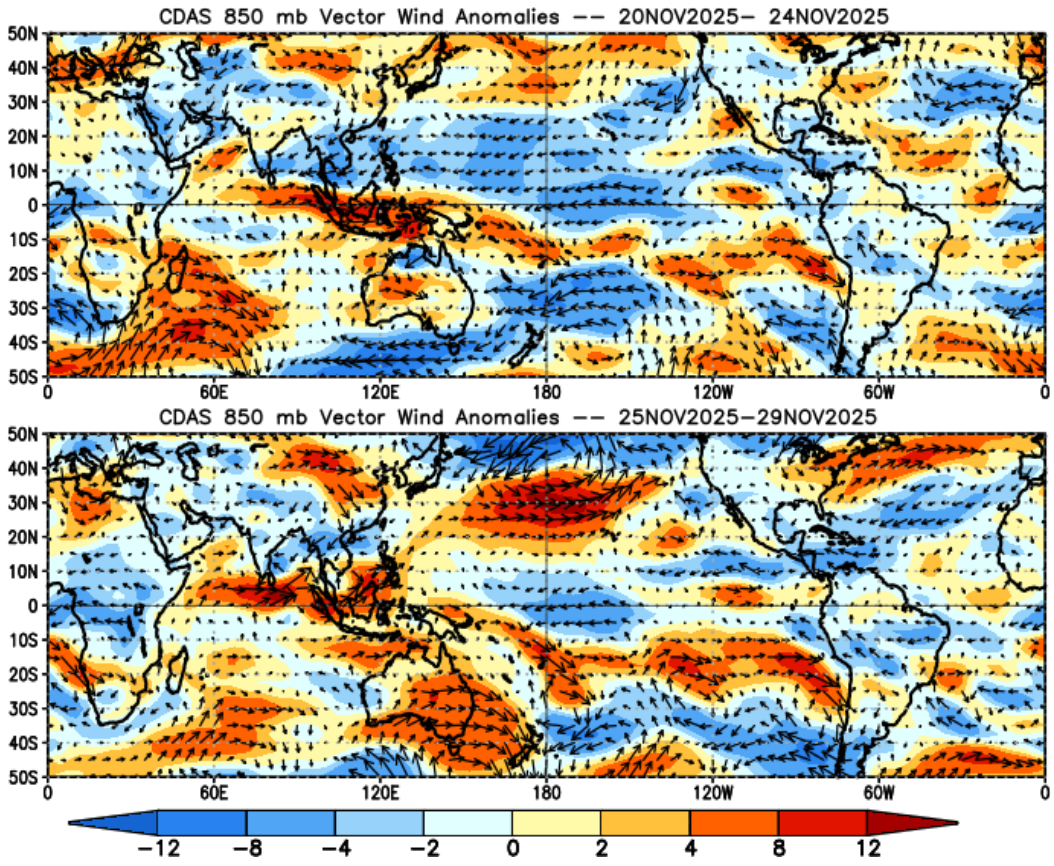




- Earlier this month, there was a marked disruption of the negative Indian Ocean Dipole upper-level circulation which has continued to persist through late November.
- Anomalous easterlies have begun to emerge across portions of the Western Pacific on both sides of the equator, as strong La Nina induced westerlies have relaxed closer to the Date Line.

# 850-hPa Wind Anomalies

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

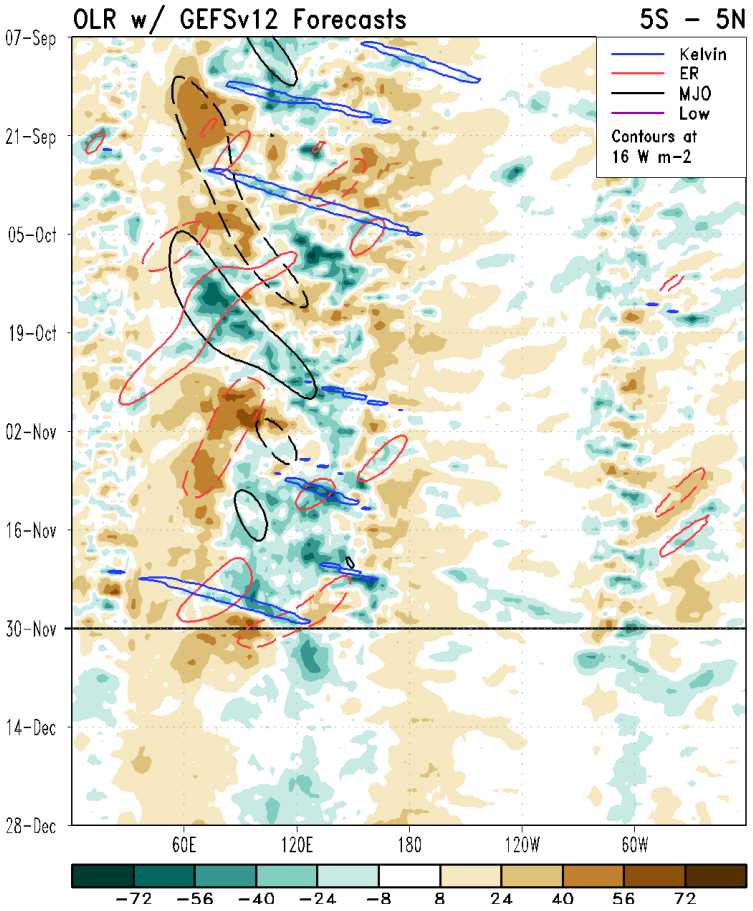


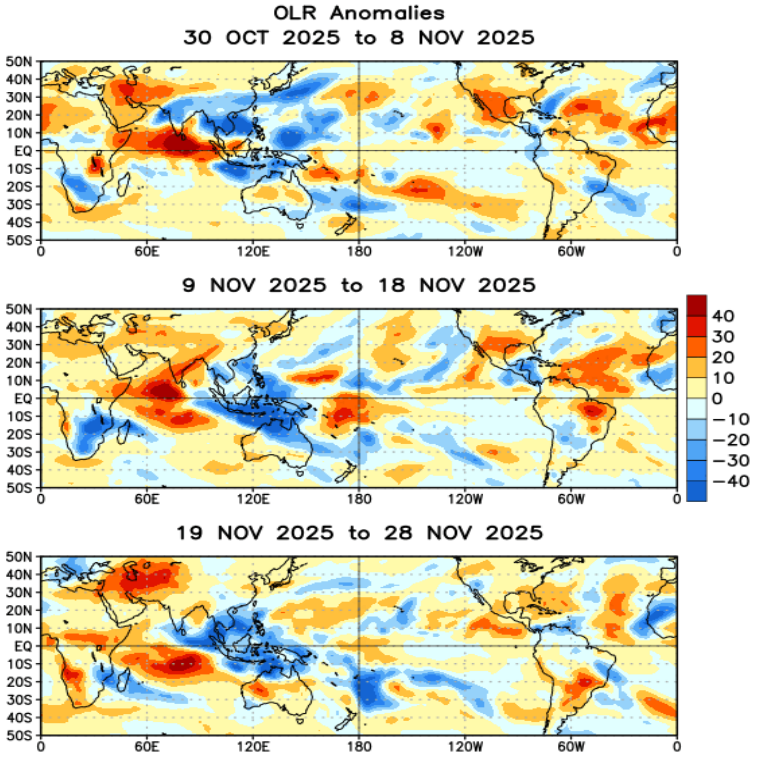




- Although slow, the lower-level westerly phase of the MJO progressed eastward, reducing the western extent of the enhanced trades regime over the Central Pacific.
- Anomalous lower-level easterlies have strengthened over equatorial Africa. An extension of these easterlies are observed across the Indian Ocean mainly south of the equator, which my be the MJO expressing itself amid the weakening Indian Ocean dipole circulation.

# Outgoing Longwave Radiation (OLR) Anomalies

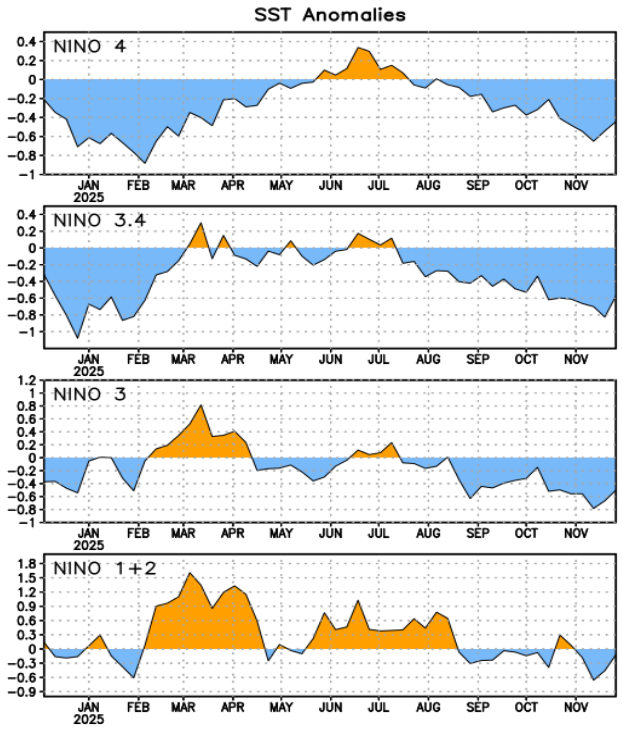
**Green shades: Anomalous convection (wetness)**
**Brown shades: Anomalous subsidence (dryness)**

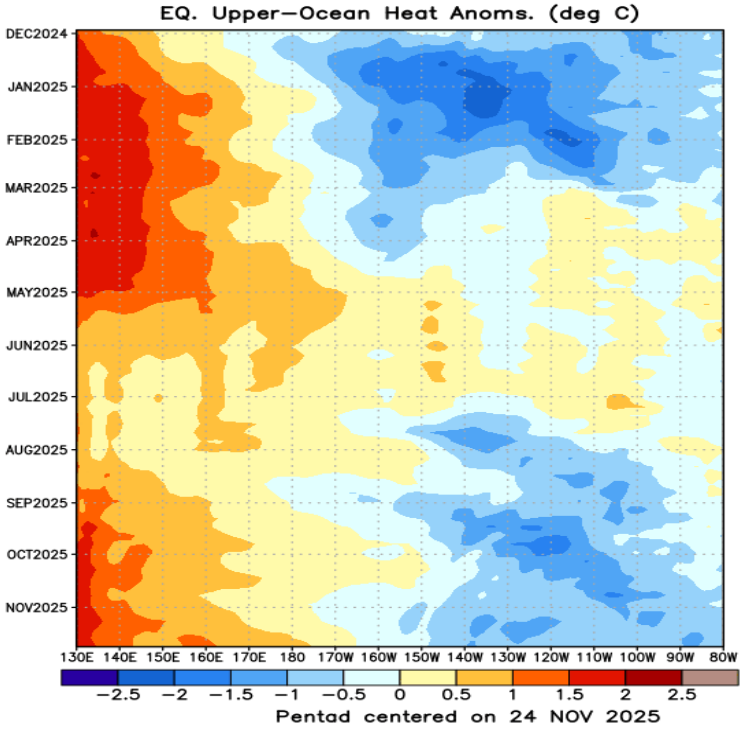



- Enhanced convection has persisted over the Maritime Continent over the past month, consistent with ongoing La Nina conditions.
- Enhanced convection developed across the South Pacific, with more suppressed convection emerging across the southern Indian Ocean.

# SSTs and Weekly Heat Content Evolution in the Equatorial Pacific

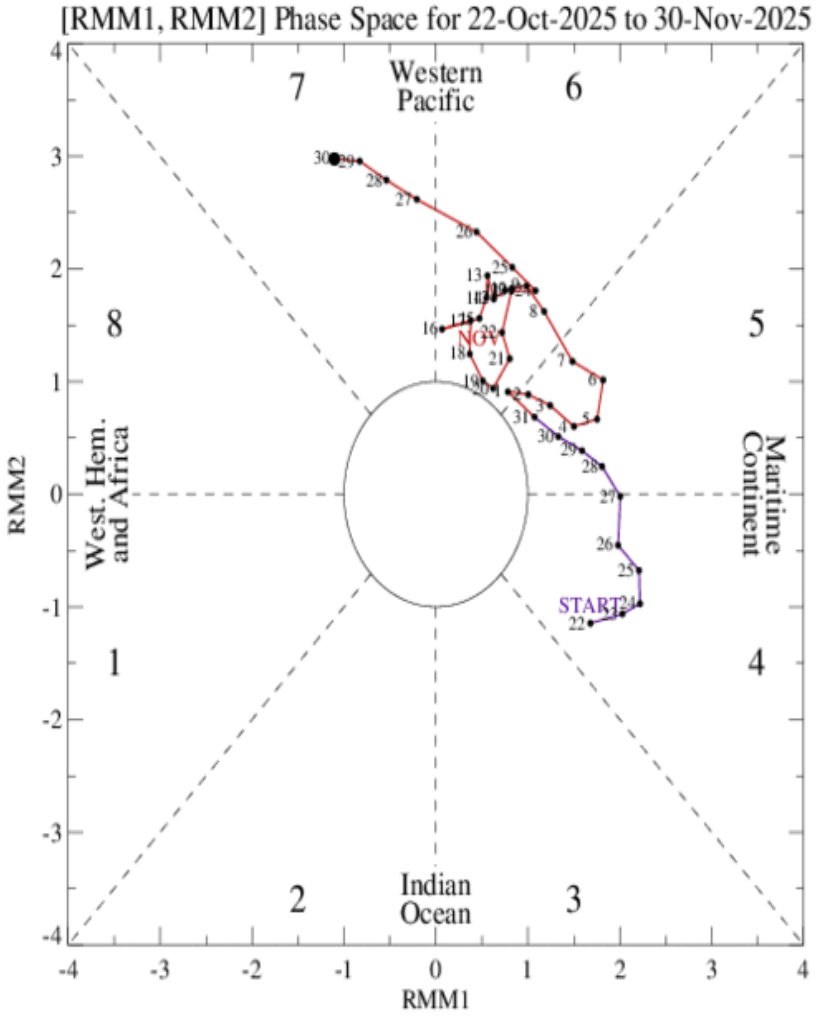



- Below-normal SSTs are observed across all Niño regions, though a slight warming is depicted during the past few weeks.
- Below-normal subsurface temperatures envelop nearly the entire Western Hemisphere, with the strongest negative anomalies concentrated over the eastern Pacific consistent with the ongoing La Niña event.

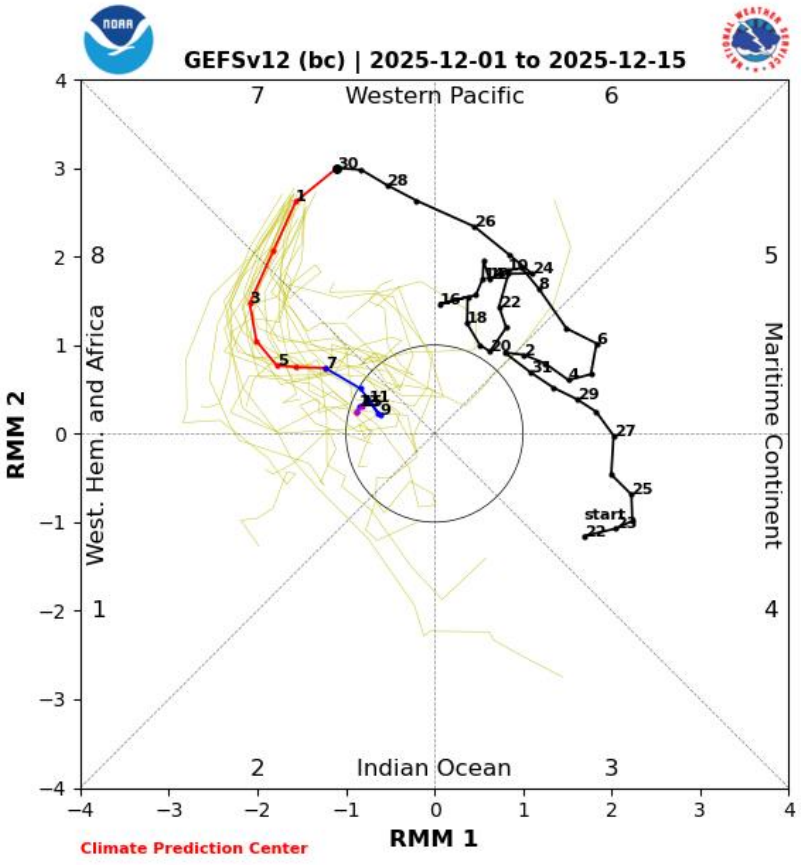
# MJO Index: Recent Evolution

- RMM observations show the MJO signal resuming its eastward propagation from phase 6 and greatly strengthened in amplitude while entering phase 7 during the past week.
- The amplitude is currently registering greater than 3 standard deviations, the highest amplitude since boreal spring of 2024.
- Based on objectively wave filtered upper-level velocity potential observations, the high amplitude is tied to constructively interfering Kelvin wave activity

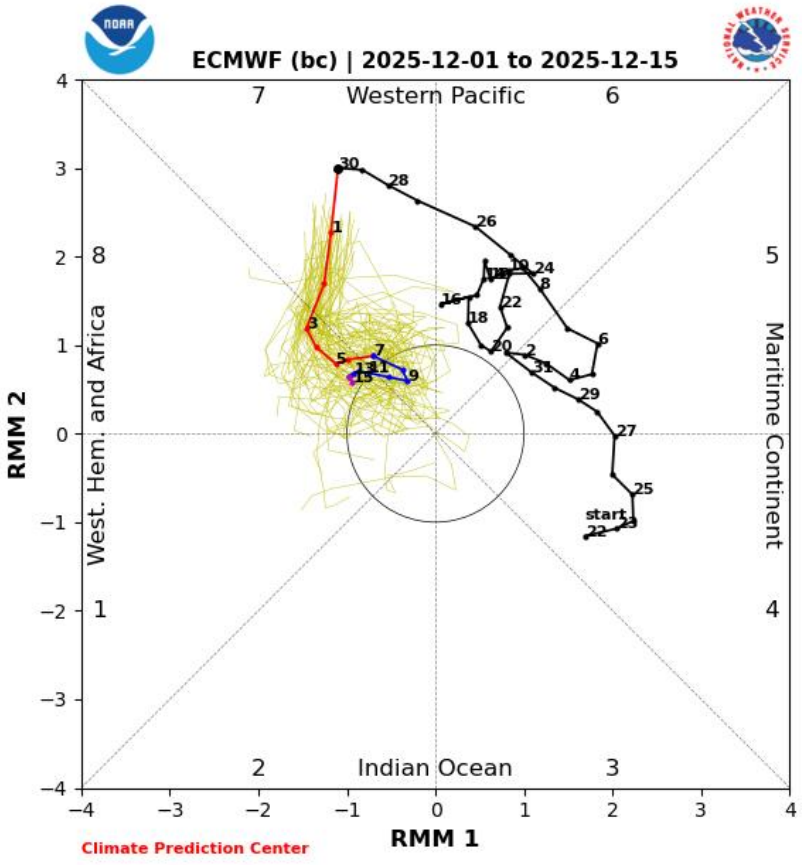



For more information on the RMM index and how to interpret its forecast please see:
https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CPC_MJOinformation.pdf

# MJO Index: Forecast Evolution




**GEFS Forecast**

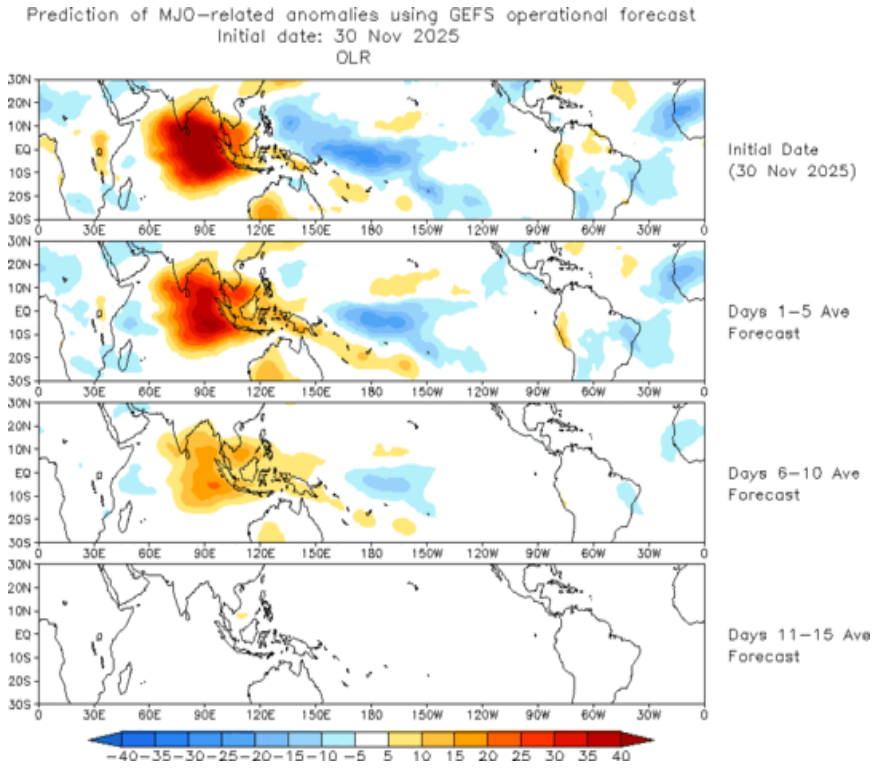


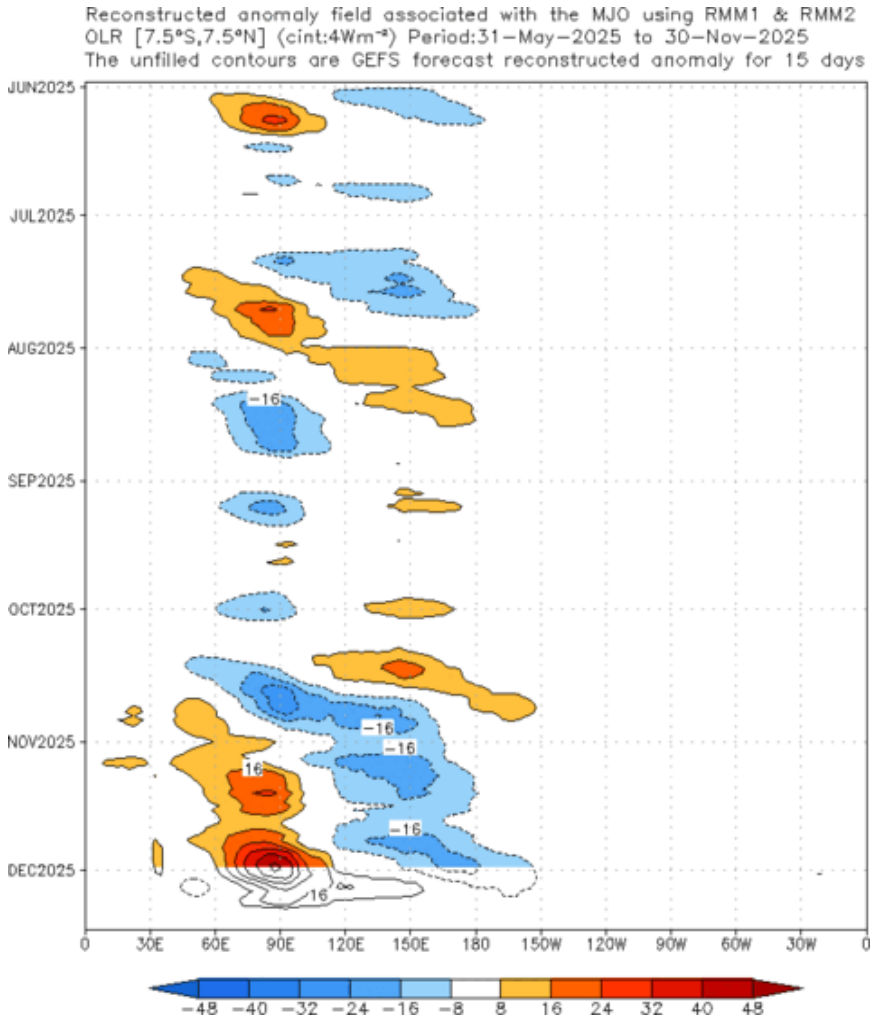

**ECMWF Forecast**

- There is good model support indicating a high amplitude western Pacific MJO that loses amplitude while entering the Western Hemisphere during the next two weeks.
- The loss of amplitude favored is likely associated with Kelvin wave activity moving out ahead of the main MJO envelope, leading to increasing destructive interference with this tropical wave mode that peaks during the week-2 period.
- Extended range solutions show the MJO to potentially reorganizing later in December.

# 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.)

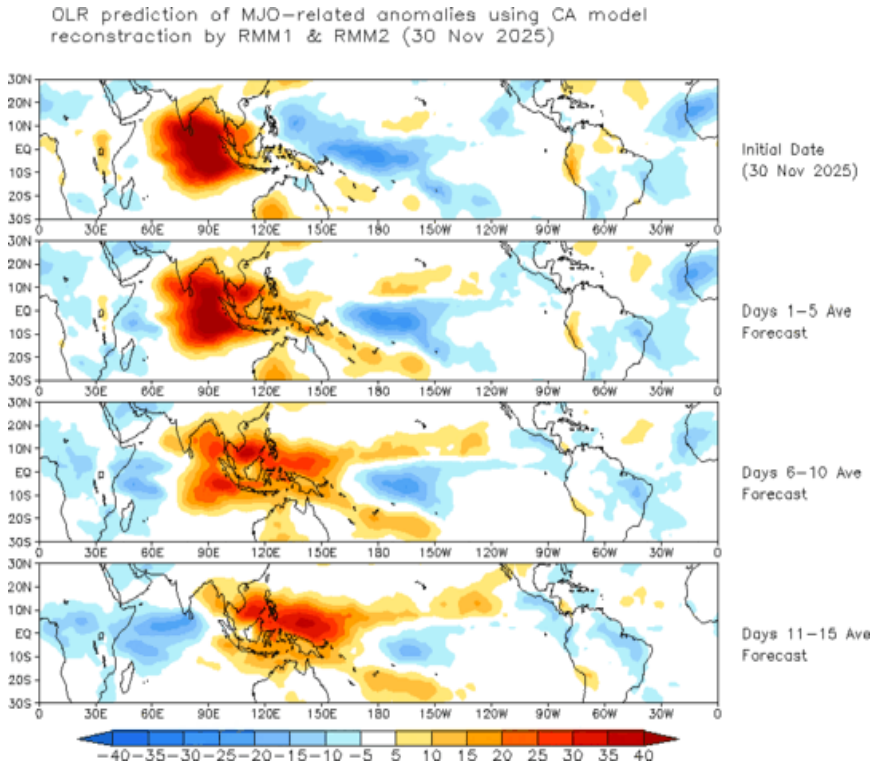


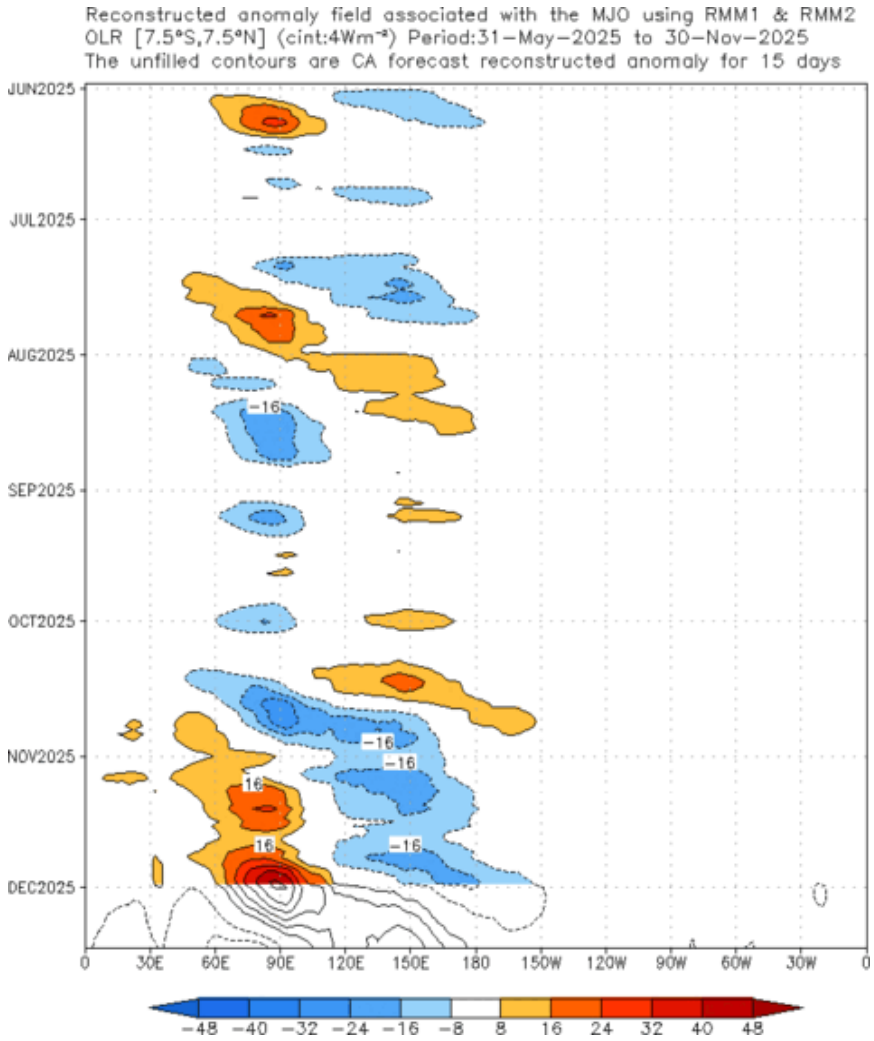




- The GEFS OLR anomaly forecast based on the RMM index shows a robust MJO weakening to near zero convective anomalies over the next two weeks.

# 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.)

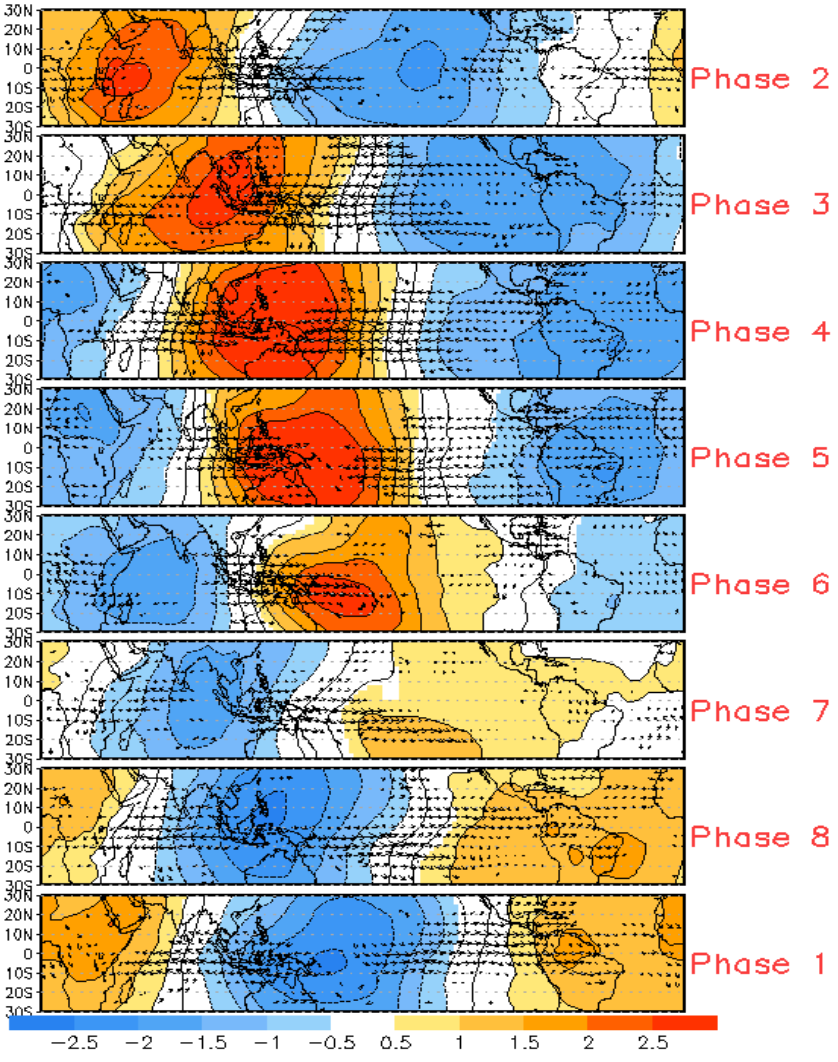


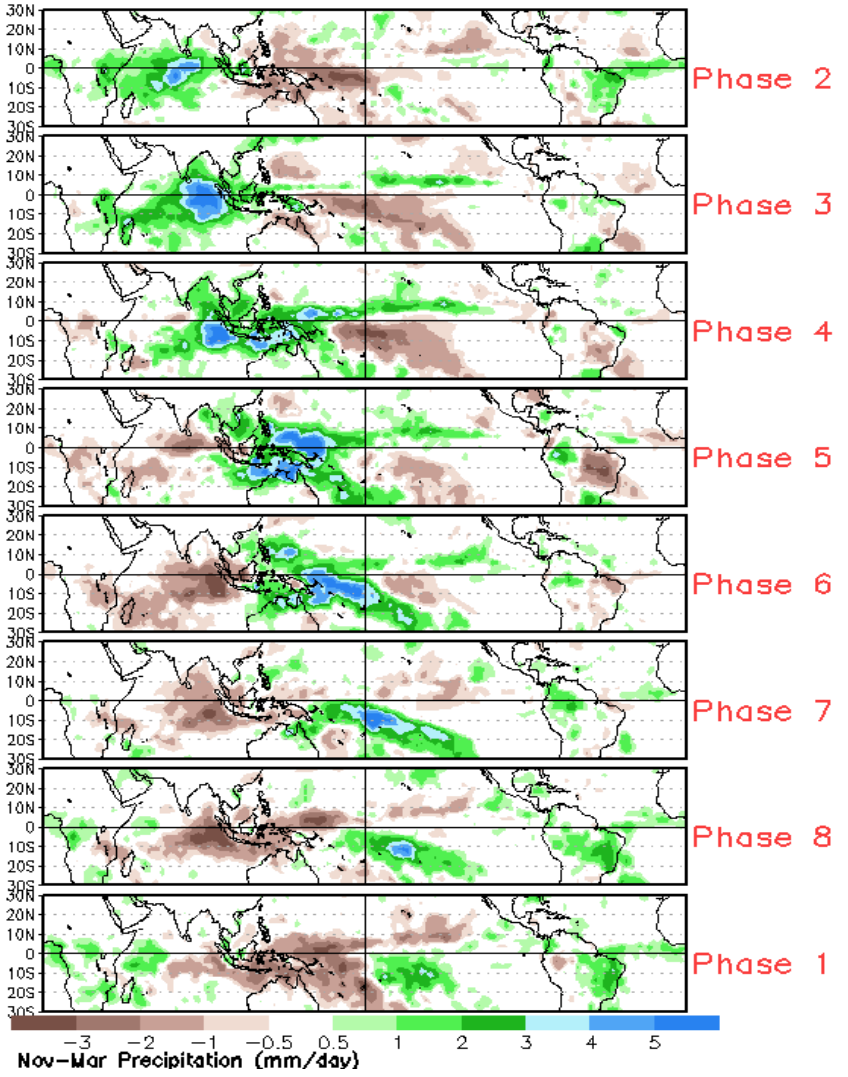

- Contrast to the GEFS, the constructed analog favors a more canonical MJO that maintains its strength over time.

# MJO: Tropical Composite Maps by RMM Phase

850-hPa Velocity Potential and Wind Anomalies



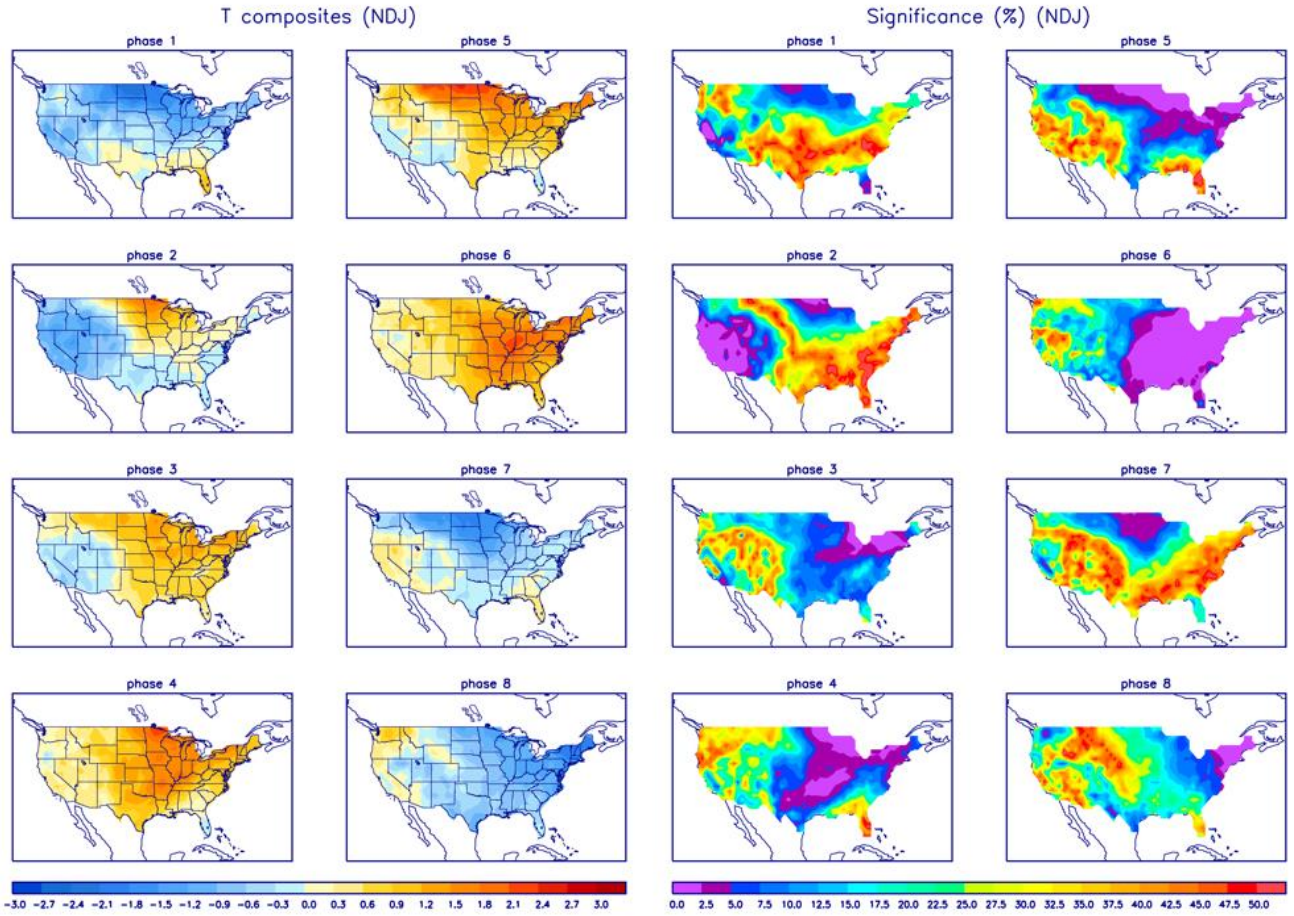

Precipitation Anomalies



# 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.

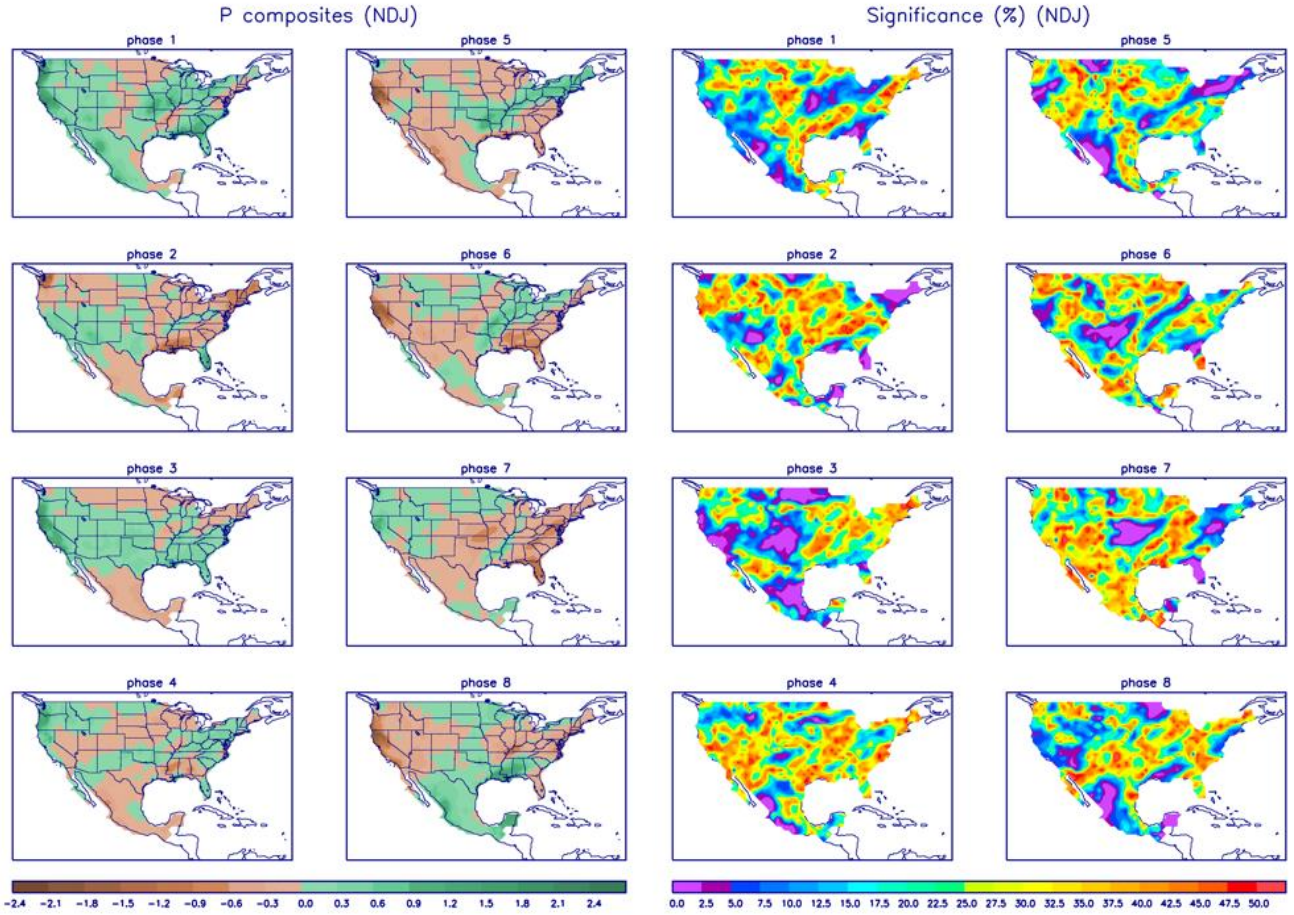



More information: http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/mjo.shtml

# 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.




More information: http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/mjo.shtml