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

Update prepared by the Climate Prediction Center
NWS / NCEP / CPC
7 July 2025

Overview

- The MJO continues to be disorganized with other tropical modes providing the bulk of variability throughout the global tropics.

- Upper-level velocity potential anomalies reveal more of a wave-1 pattern during late June, however there is little to no sign of eastward propagation characteristic of a reorganizing MJO, with this pattern remaining stationary but growing stronger.

- A low-frequency response seems to be emerging, with some model guidance strengthening a stationary envelope of enhanced convection over the Maritime Continent and West Pacific, and suppressed convection favored over the central and eastern Pacific and the western Indian Ocean during July.

- Despite this recent history, model ensembles generally indicate a potential reemergence of MJO during the forecast period.

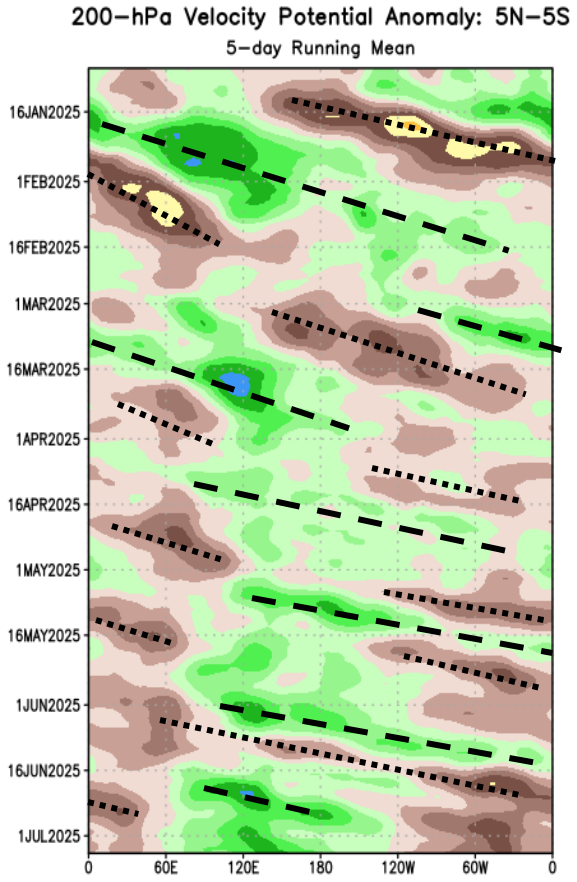
- The large scale environment looks to be less favorable for tropical cyclogenesis in the eastern Pacific and Atlantic basins during the next several weeks due to low-frequency forcing and poor phasing with the MJO. However, the same factors tend to favor tropical cyclone development over the Western Pacific.

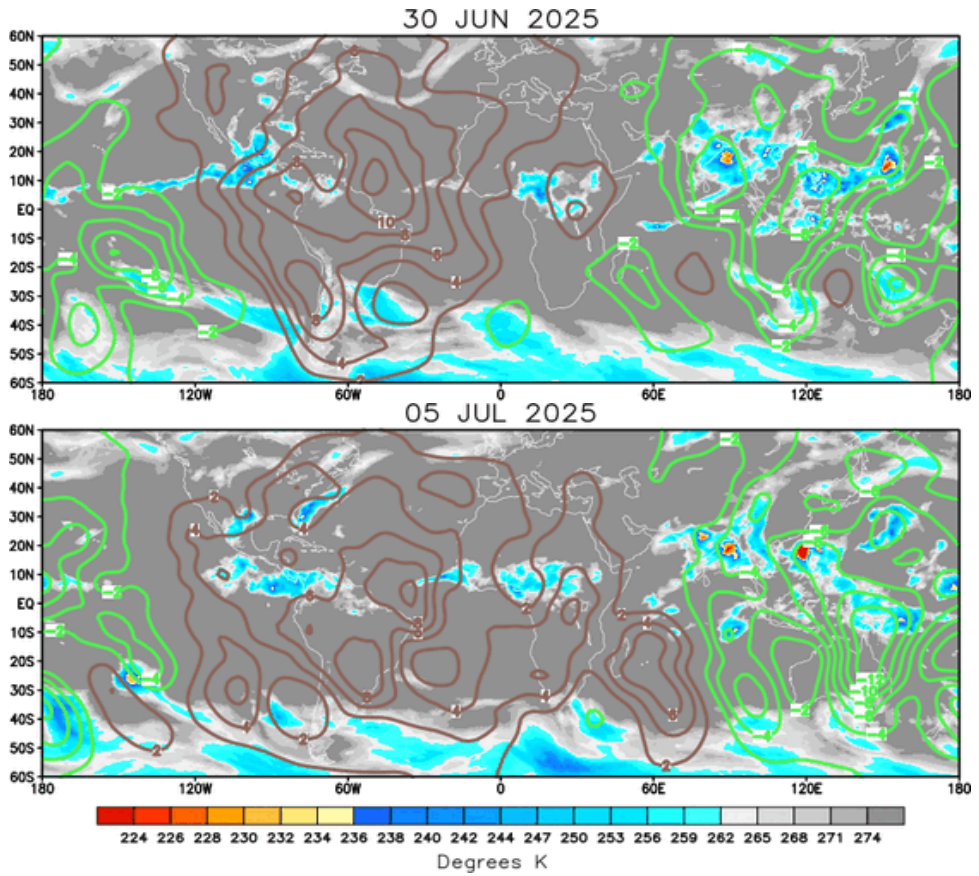
A discussion of potential impacts for the global tropics and those related to the U.S. are updated on Tuesday at:
http://www.cpc.ncep.noaa.gov/products/precip/CWlink/ghazards/index.php

200-hPa Velocity Potential Anomalies

Green shades: Anomalous divergence (favorable for precipitation)

Brown shades: Anomalous convergence (unfavorable for precipitation)

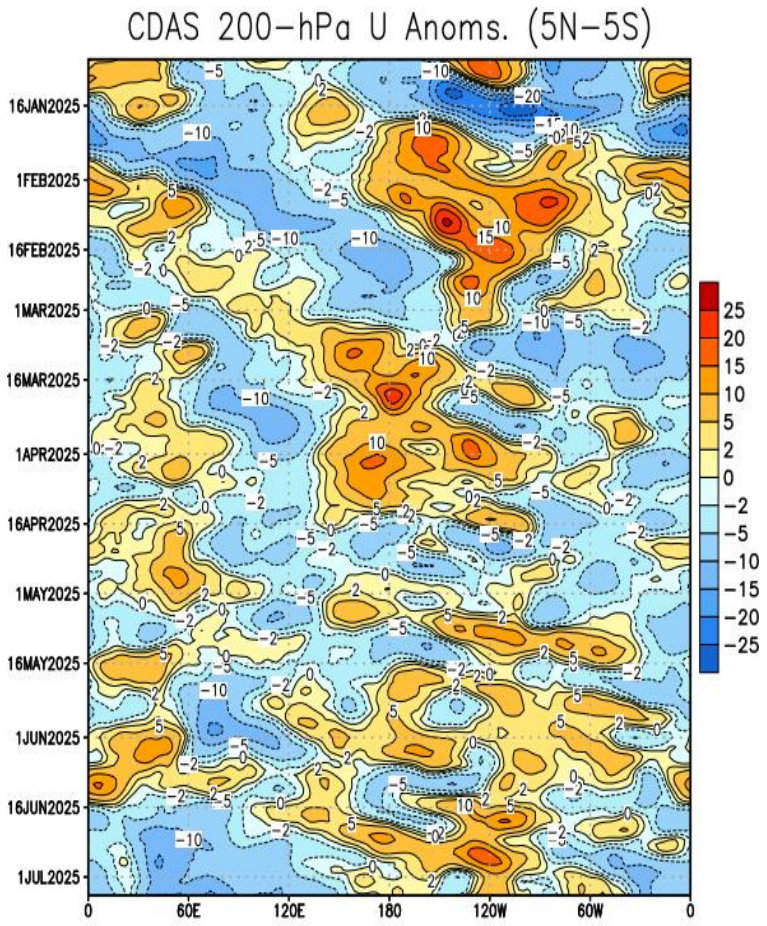


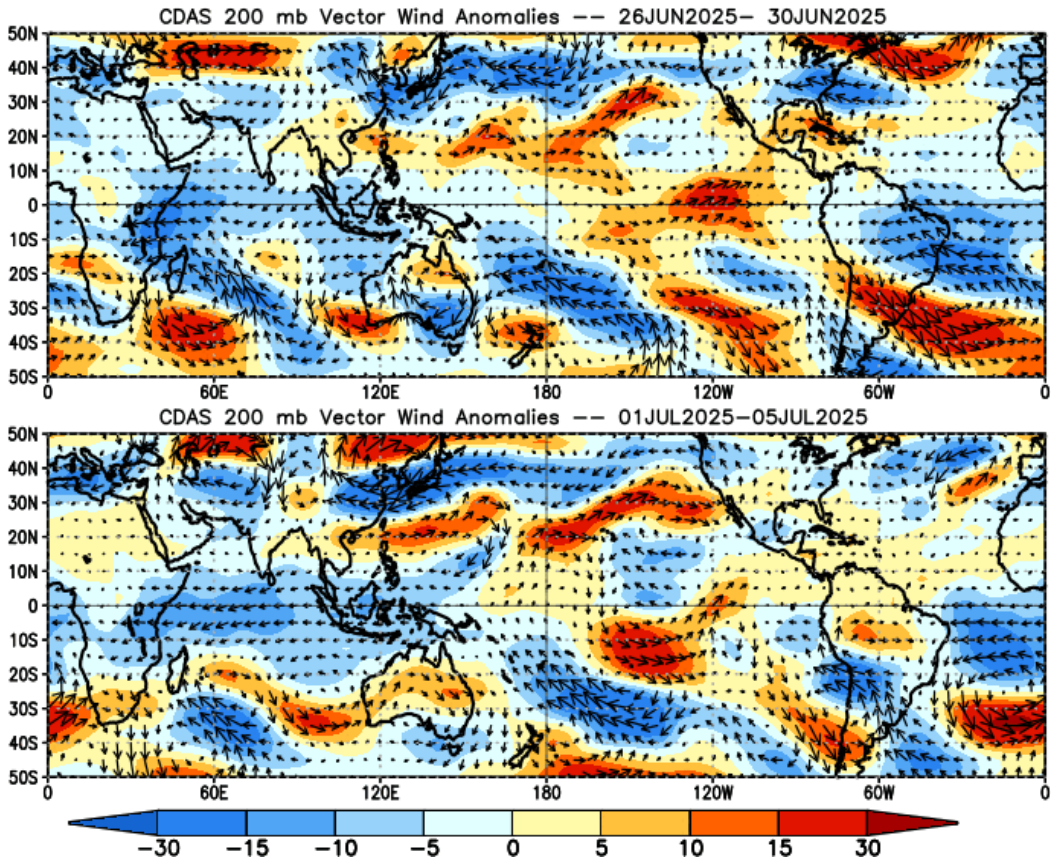


- The upper-level pattern remains in a wave-1 pattern as we enter July, but there is little to no sign of eastward prorogation characteristic of coherent MJO activity.
- Fast moving equatorial Kelvin Wave activity has been the main driver of tropical variability lately, however low frequency signal appears to be increasing as the global wave-1 pattern remains mostly stationary.

200-hPa Wind Anomalies

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

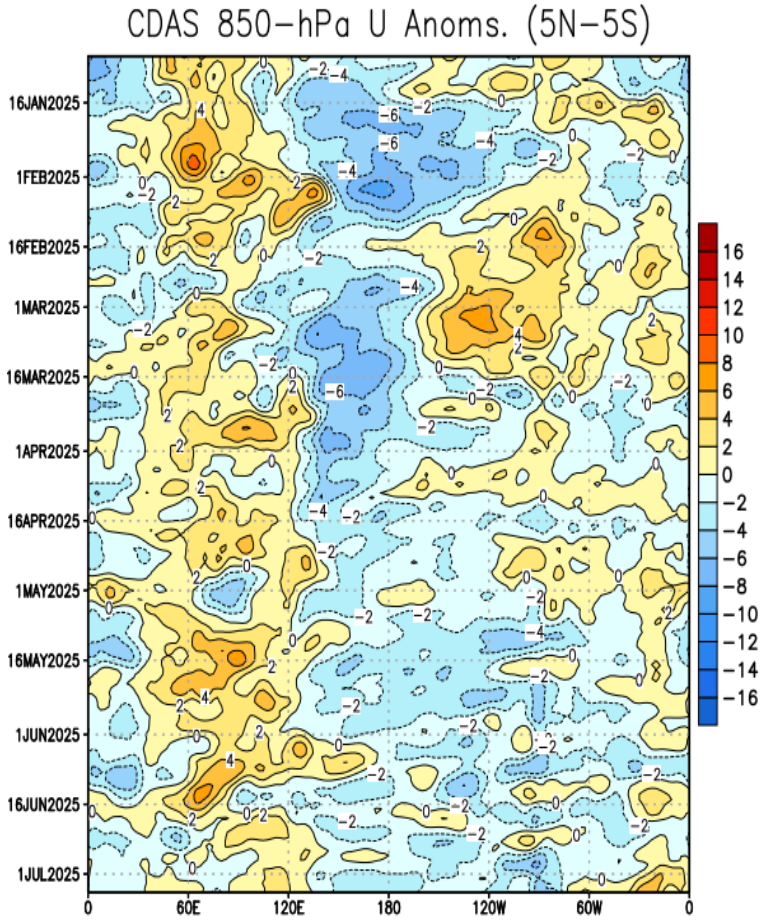


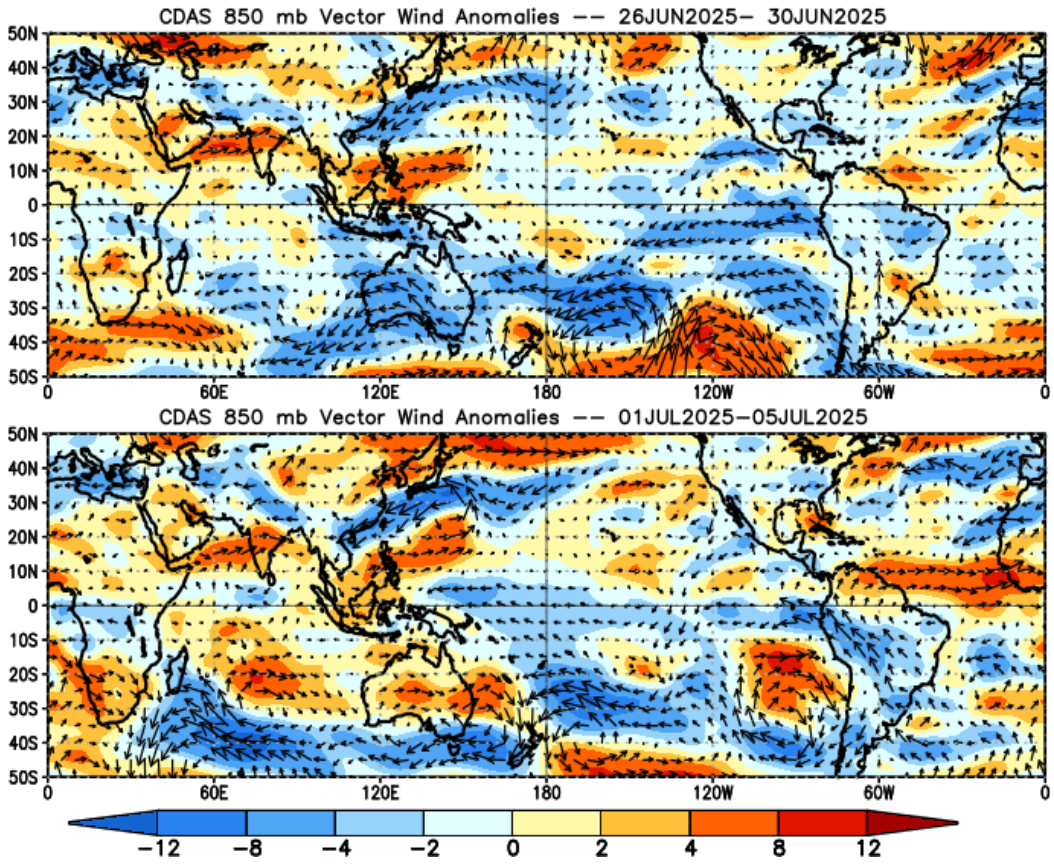


- Anomalous upper-level easterlies continue to be widespread across the eastern Hemisphere, particularly over the tropical Indian Ocean.
- The anomalous westerlies over the western Hemisphere have eased somewhat recently although a local maximum over 120W persists as of the latest observations.

850-hPa Wind Anomalies

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

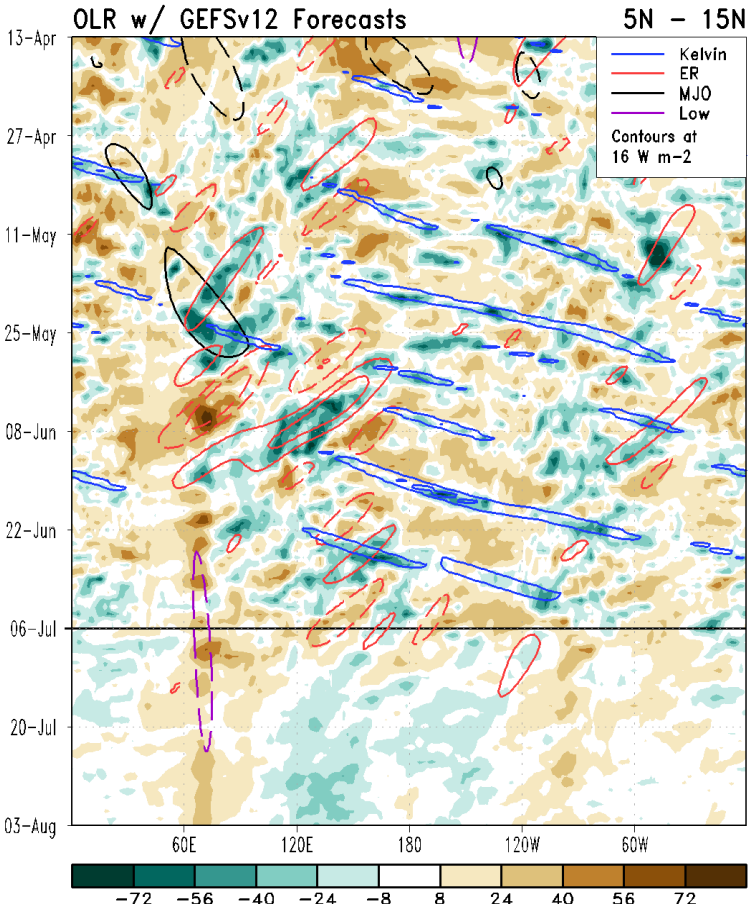


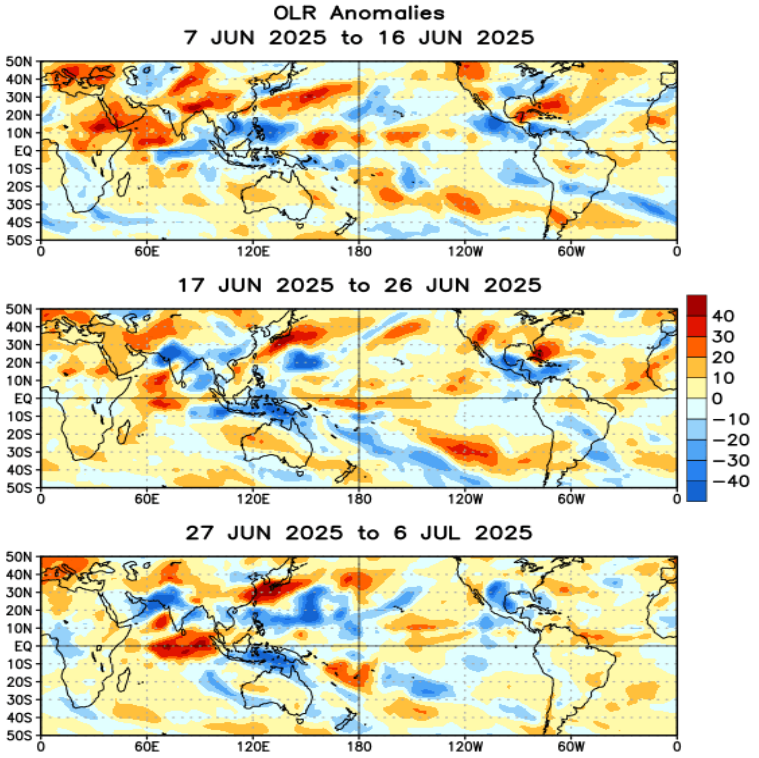


- Persistent low-level anomalous westerlies across the Indian Ocean and Maritime Continent continue in spite of recent weakening.
- Anomalous westerlies persist north of the equator in the western Pacific, maintaining a favorable environment for continued tropical cyclone development.
- Lower-level westerlies have emerged in the tropical Atlantic.

Outgoing Longwave Radiation (OLR) Anomalies

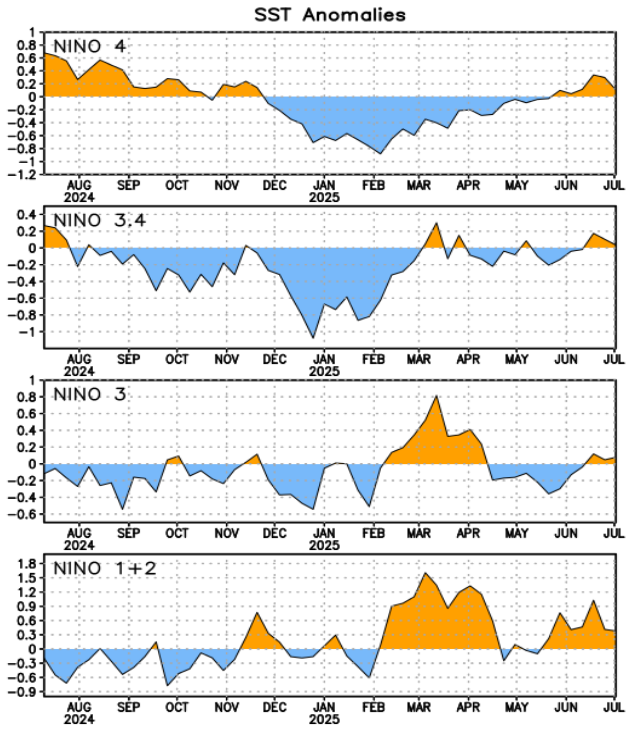
Green shades: Anomalous convection (wetness)
Brown shades: Anomalous subsidence (dryness)

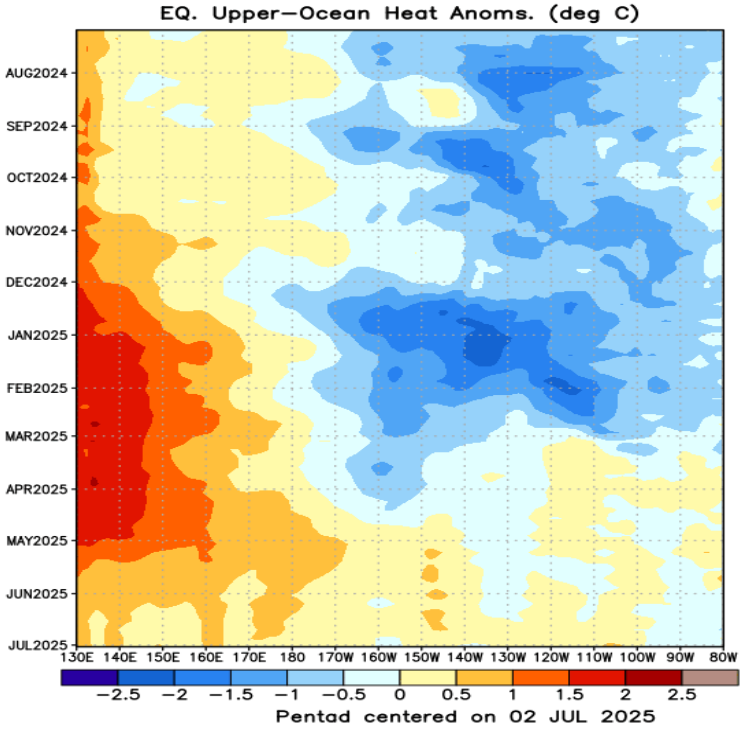




- Equatorial Rossby Wave and Kelvin waves, coming through the OLR objective filtering, have been the primary contributors to variability in tropical convection.
- OLR forecasts feature a strengthening low frequency signal, with enhanced convection developing from the Maritime Continent eastward to roughly 150W, while suppressed convection developing roughly over 60E and east of 120W.

SSTs and Weekly Heat Content Evolution in the Equatorial Pacific

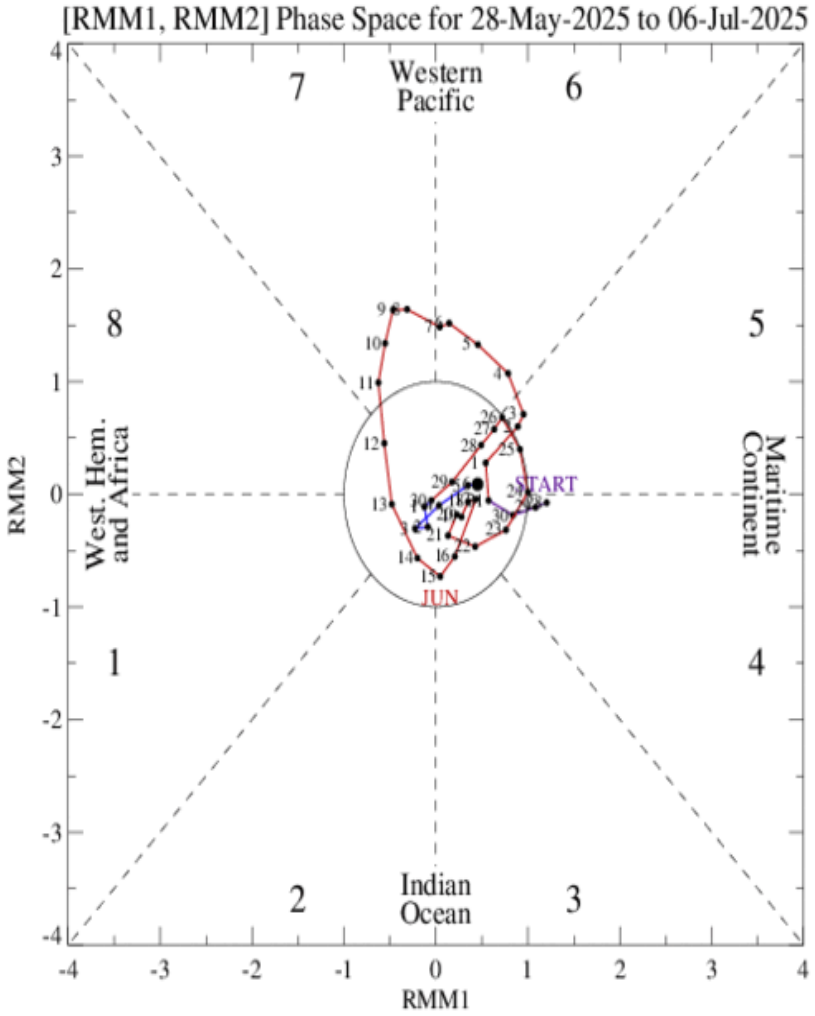




- During the past few weeks, there has been an upward trend in SST anomalies across all Nino regions, but all remain fairly neutral.
- Much of warm water in the western Pacific has cooled, with marginally positive anomalies now being observed throughout the entire Pacific.

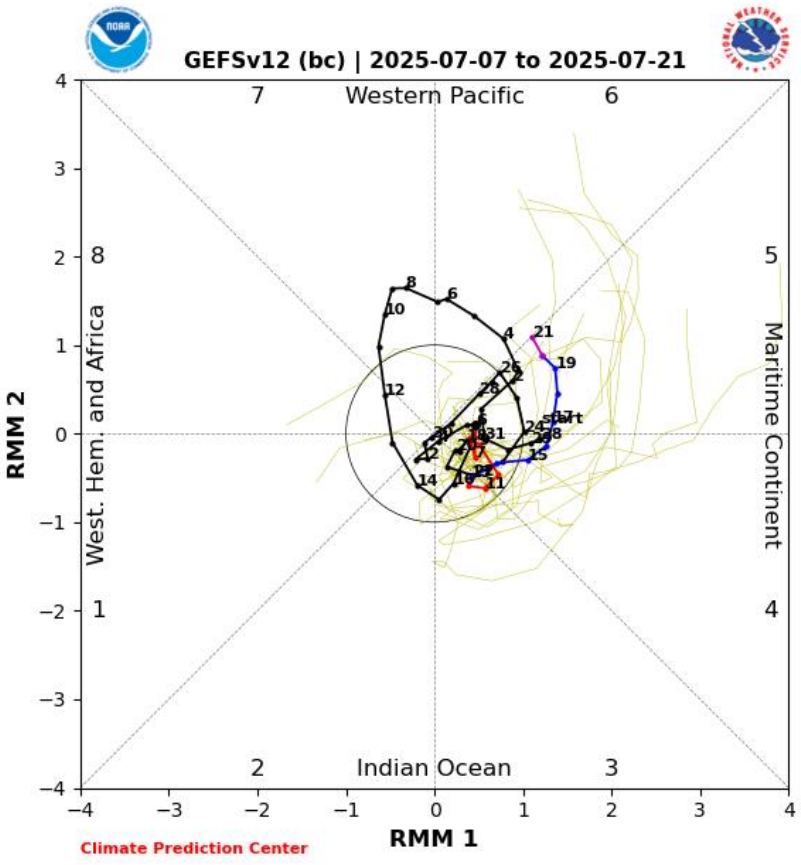
MJO Index: Recent Evolution

- The RMM index continues to meander over phases 4 and 5 with the MJO signal remaining at very low amplitude over the last week.

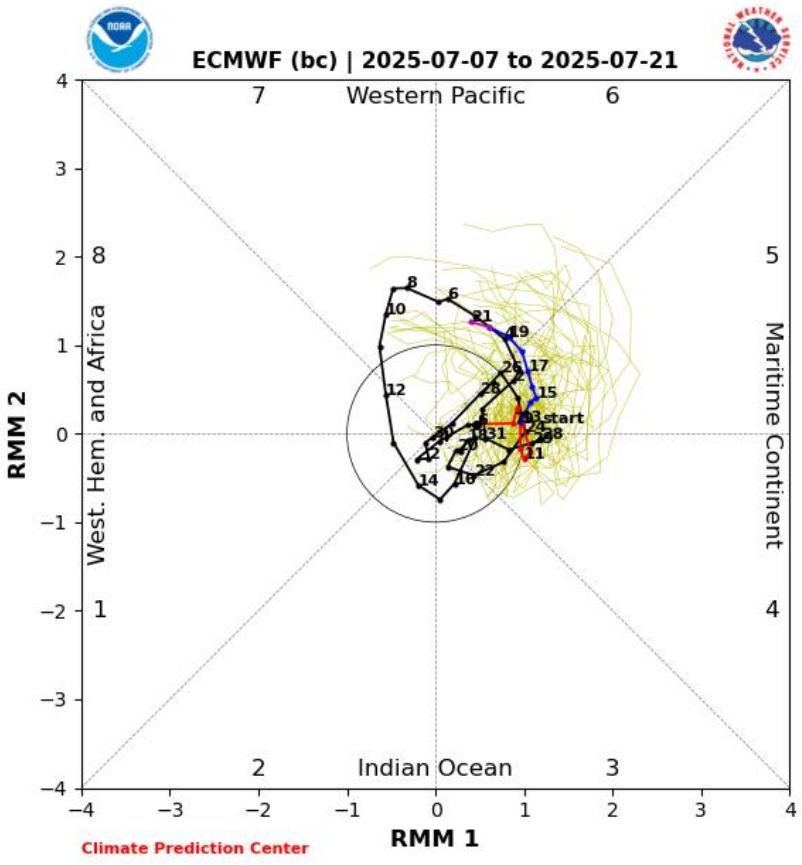


For more information on the RMM index and how to interpret its forecast please see:
https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CPC_MJOinformation.pdf

MJO Index: Forecast Evolution



GEFS Forecast

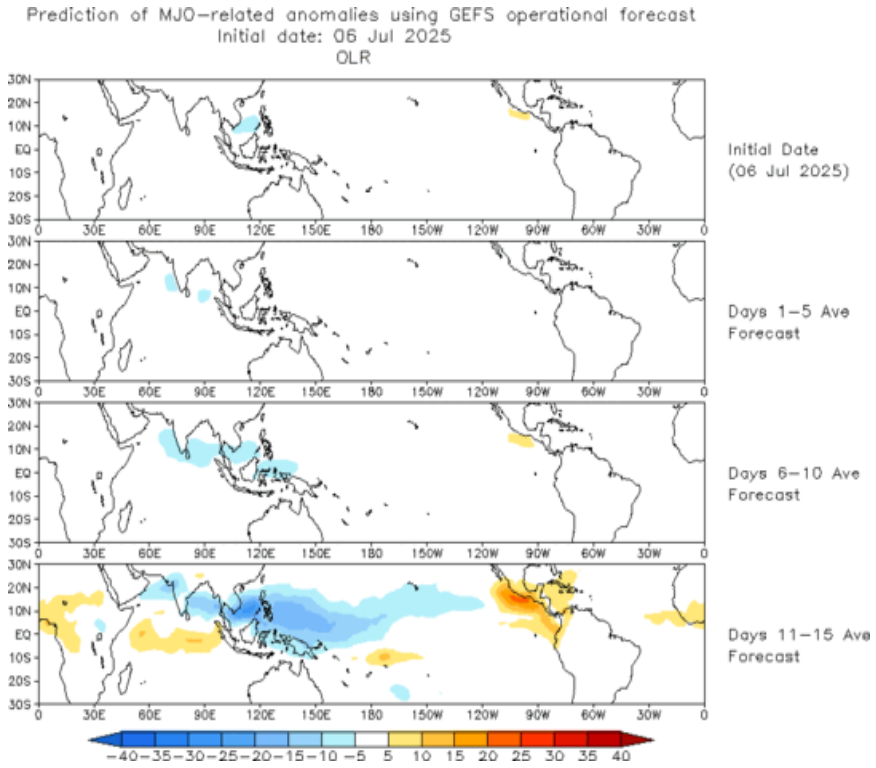


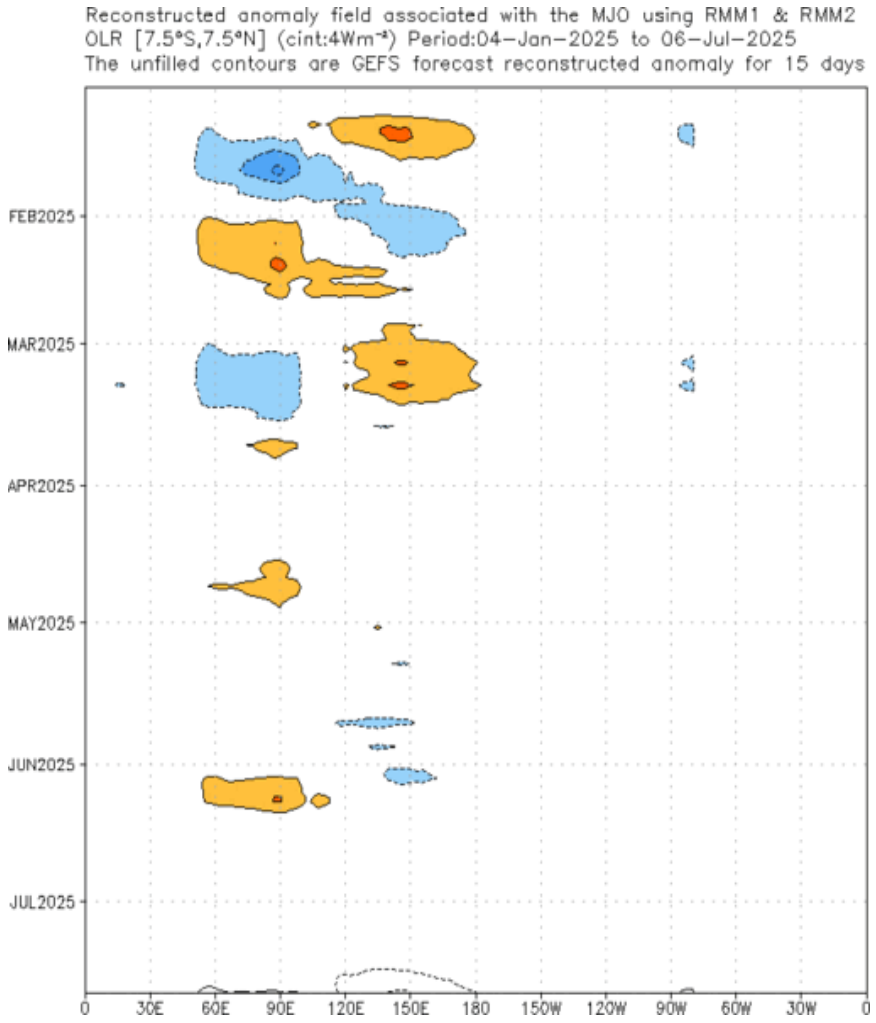
ECMWF Forecast

- The GEFS and ECMWF ensembles initially favor a continued weak, quasi-stationary RMM signal initially, but both models increase the signal strength late in week-1 and depict a resumption of eastward propagation during week-2, with the RMM index moving roughly through phase 4-6.

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.)

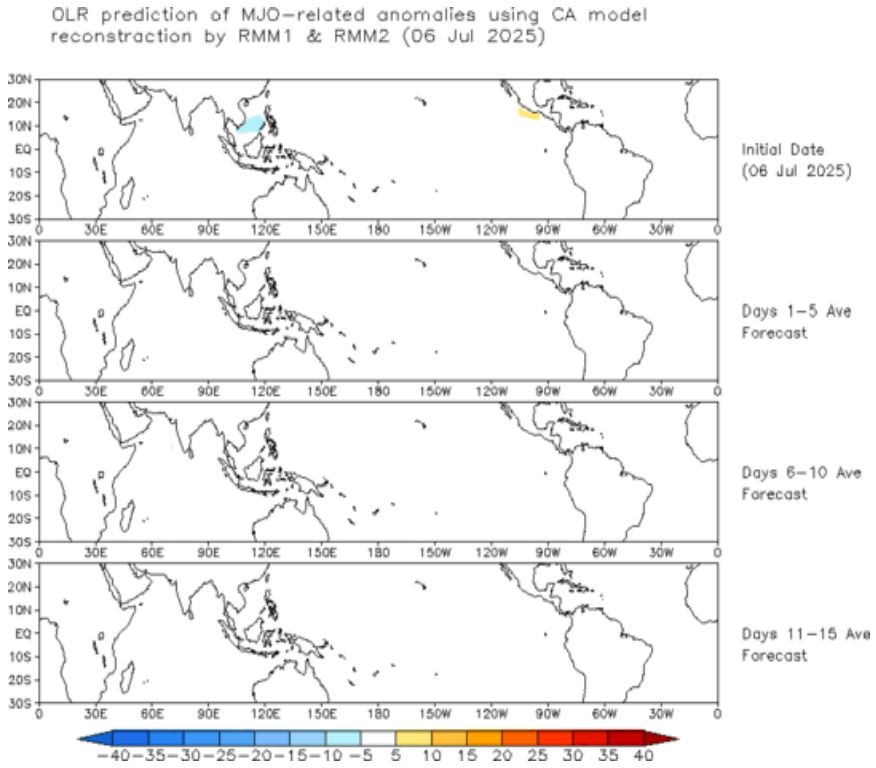


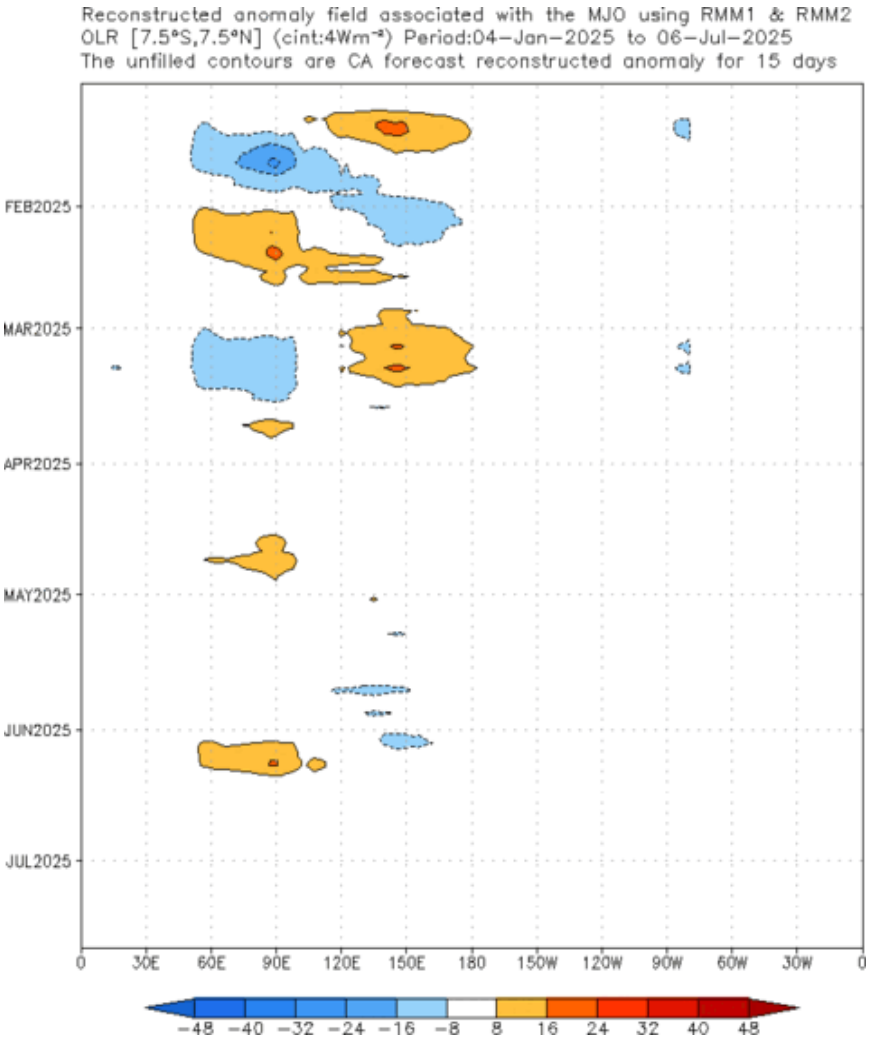


- The GEFS depicts very weak anomalies initially but develops enhanced (suppressed) convection over the Western Pacific (Eastern Pacific) by the end of week-2.

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.)

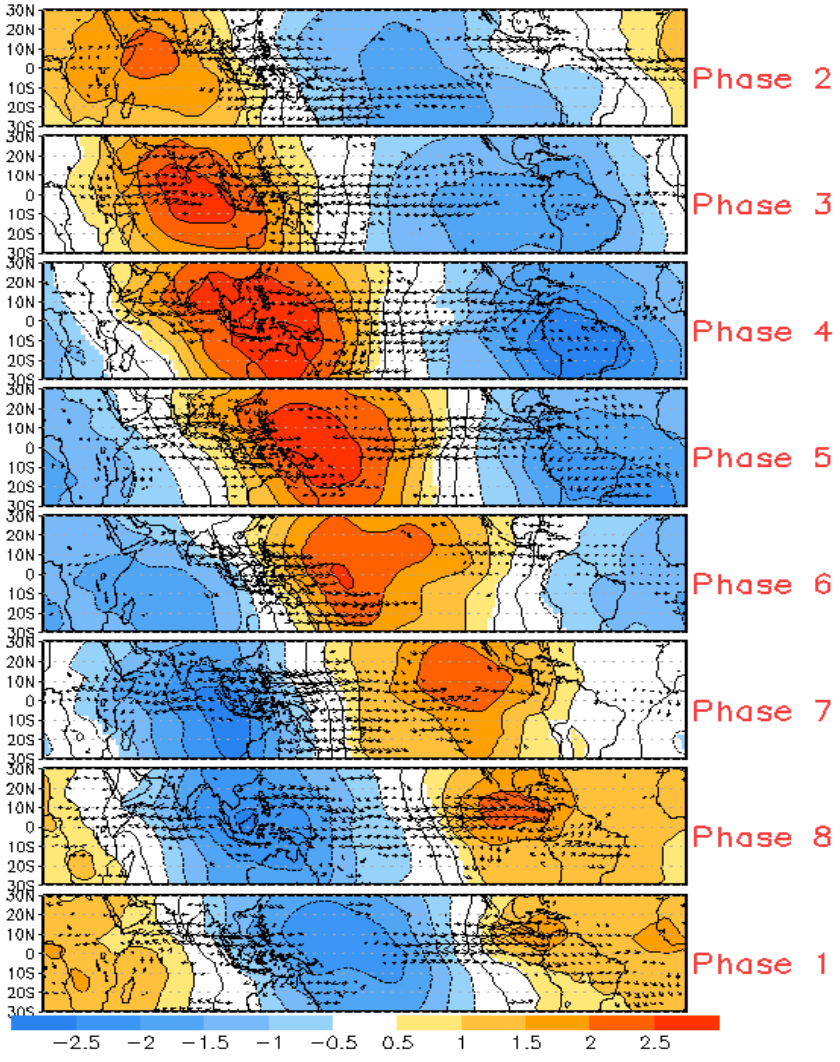




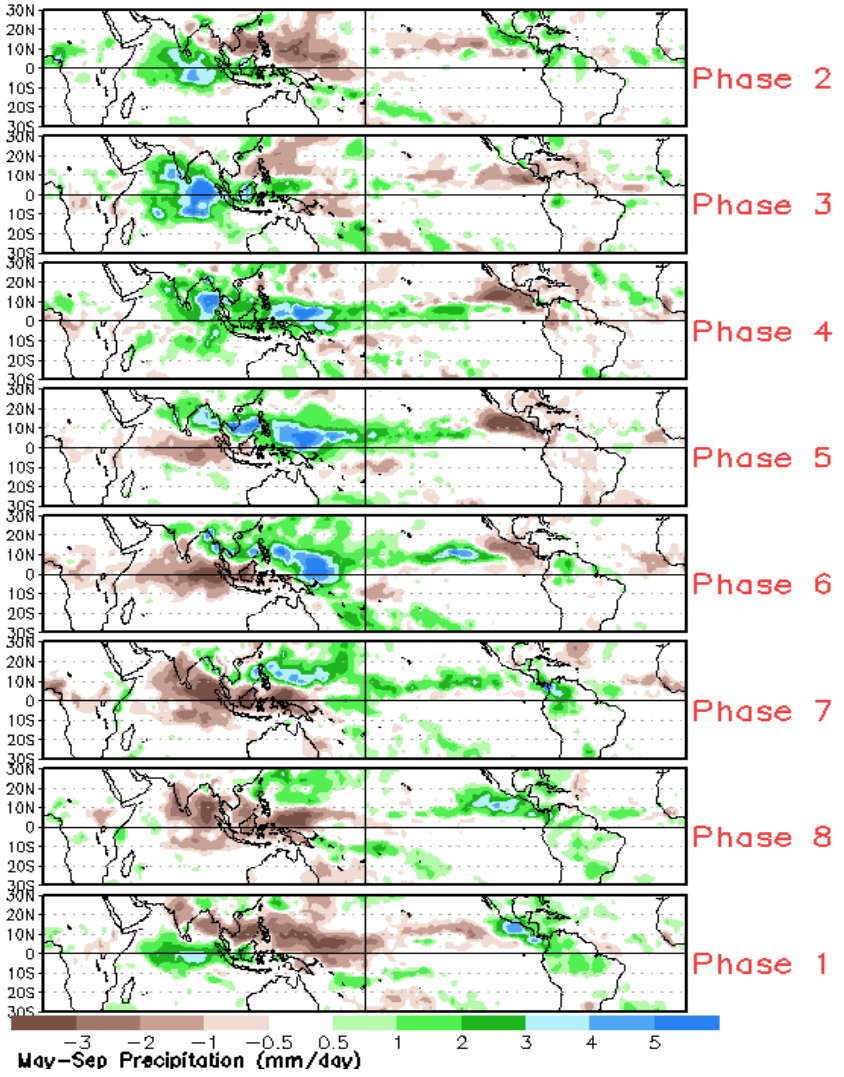
- The Constructed Analog tool is nearly flat with respect to MJO-associated OLR anomalies.

MJO: Tropical Composite Maps by RMM Phase

850-hPa Velocity Potential and Wind Anomalies



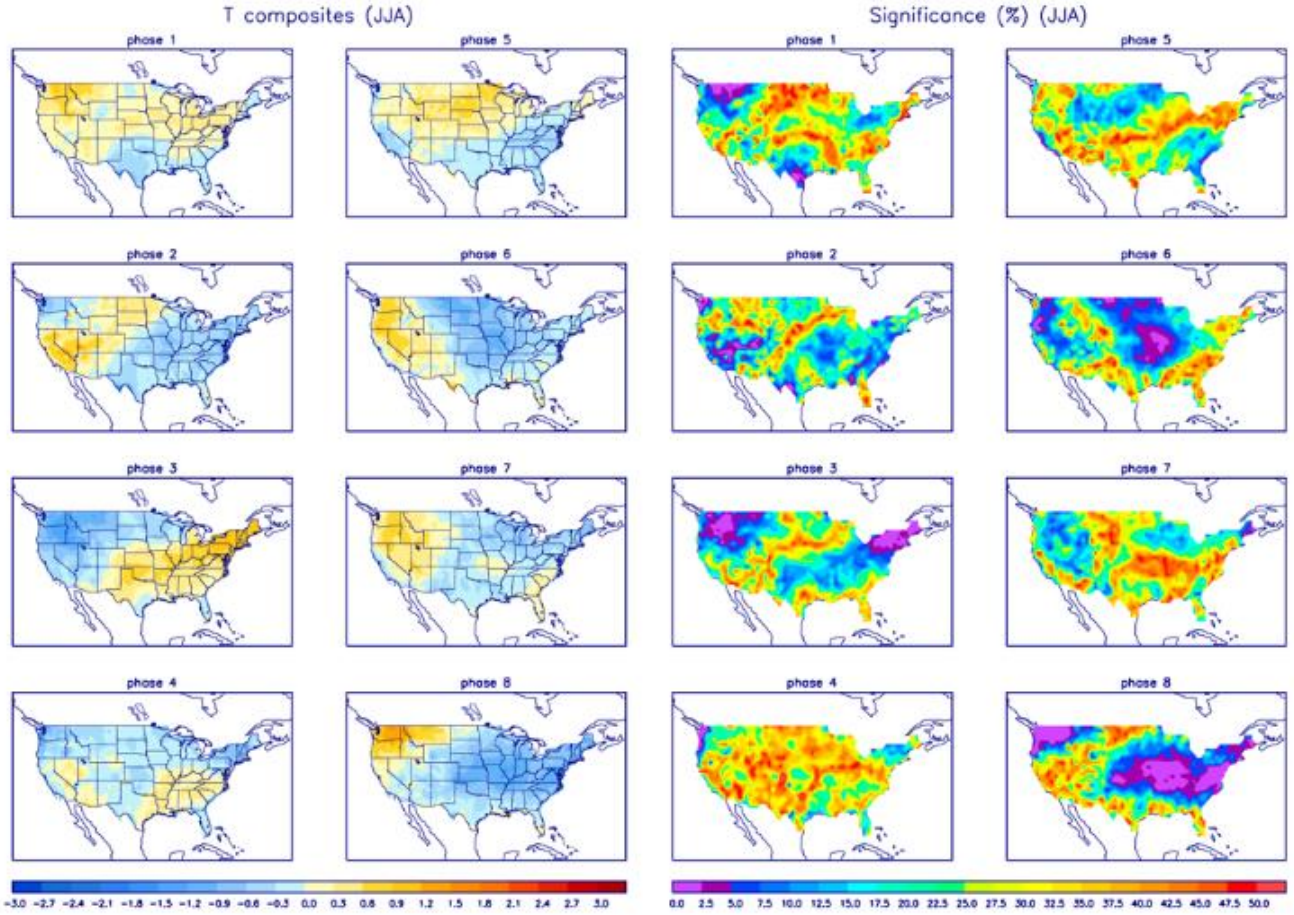
Precipitation Anomalies



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.

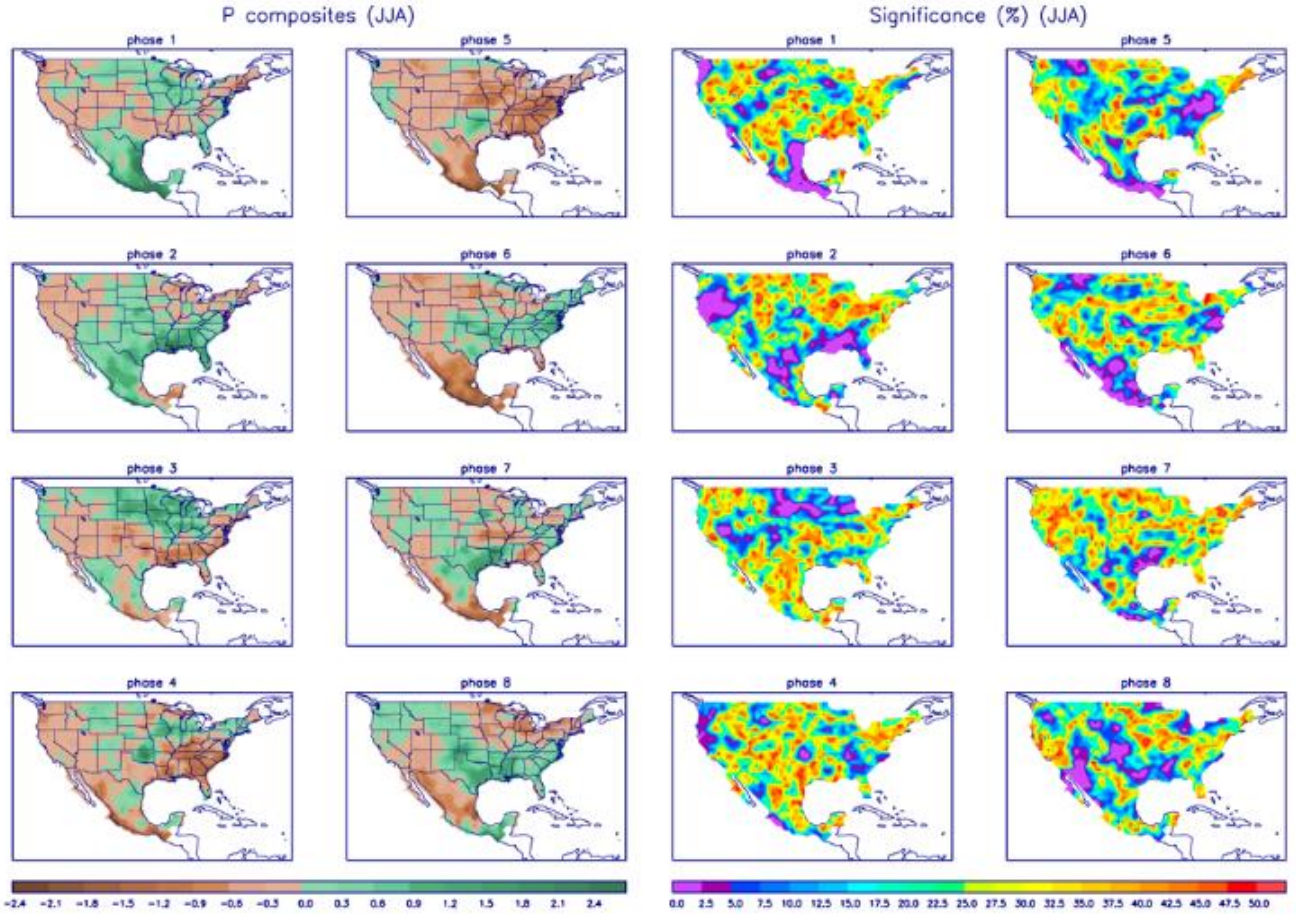


More information: http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/mjo.shtml

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.



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