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

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

Overview

- The RMM index has continued to weaken over the last week, with the RMM index currently near the center of the unit circle.

- Interference from the evolving Pacific base state and frequent Rossby wave activity appear to be weakening the intraseasonal signal.

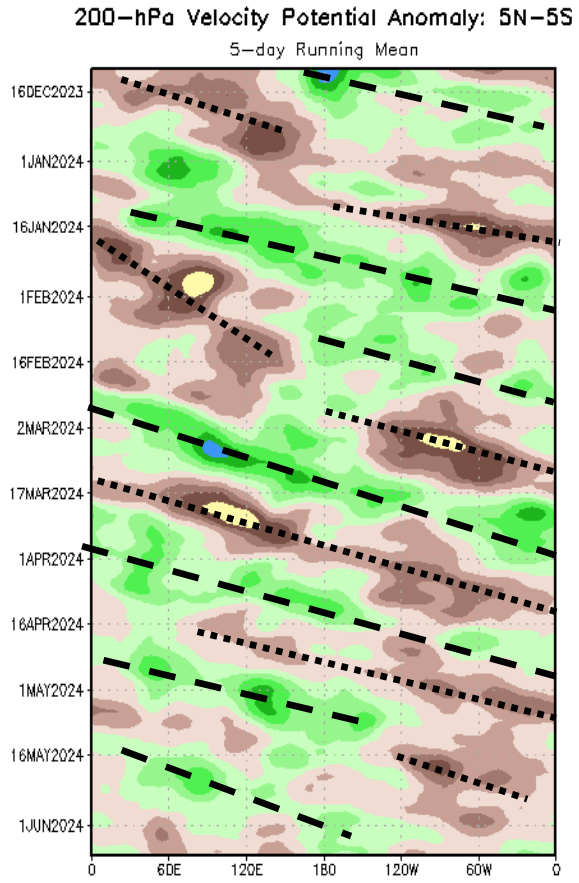
- Dynamical models depict a weak signal over the next few weeks, though the GEFS favors a coherent eastward propagation of the weak signal across the Pacific to the Western Hemisphere.

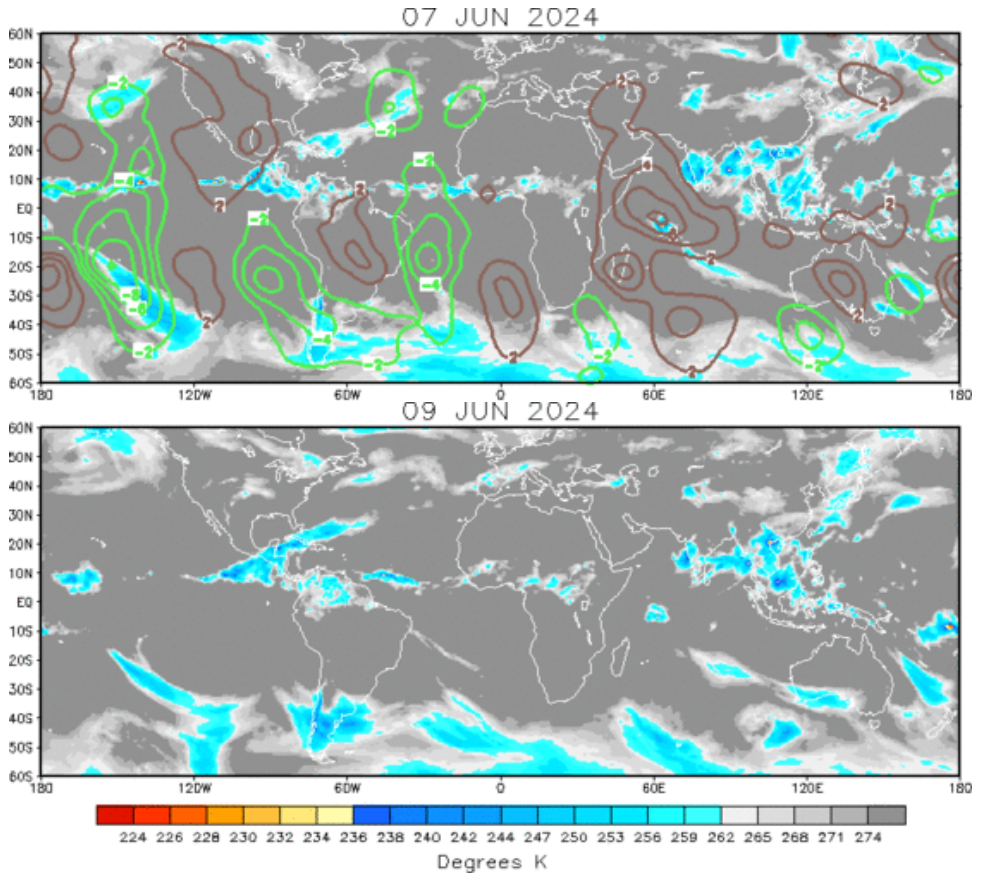
A discussion of potential impacts for the global tropics and those related to the U.S. are updated on Tuesday at:
http://www.cpc.ncep.noaa.gov/products/precip/CWlink/ghazards/index.php

200-hPa Velocity Potential Anomalies

Green shades: Anomalous divergence (favorable for precipitation)

Brown shades: Anomalous convergence (unfavorable for precipitation)

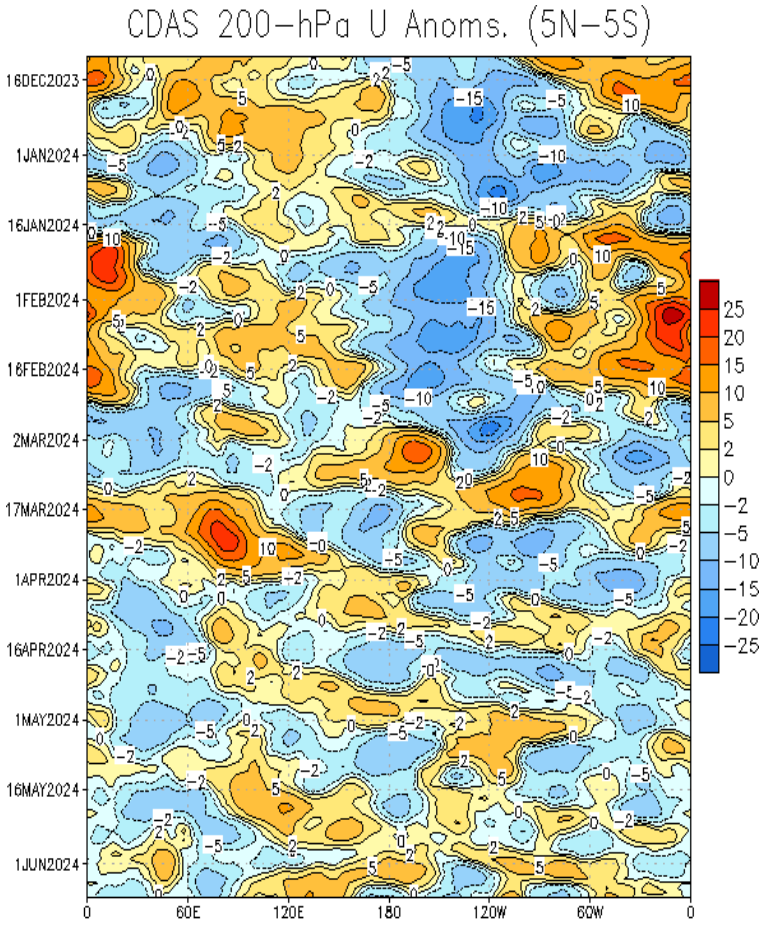


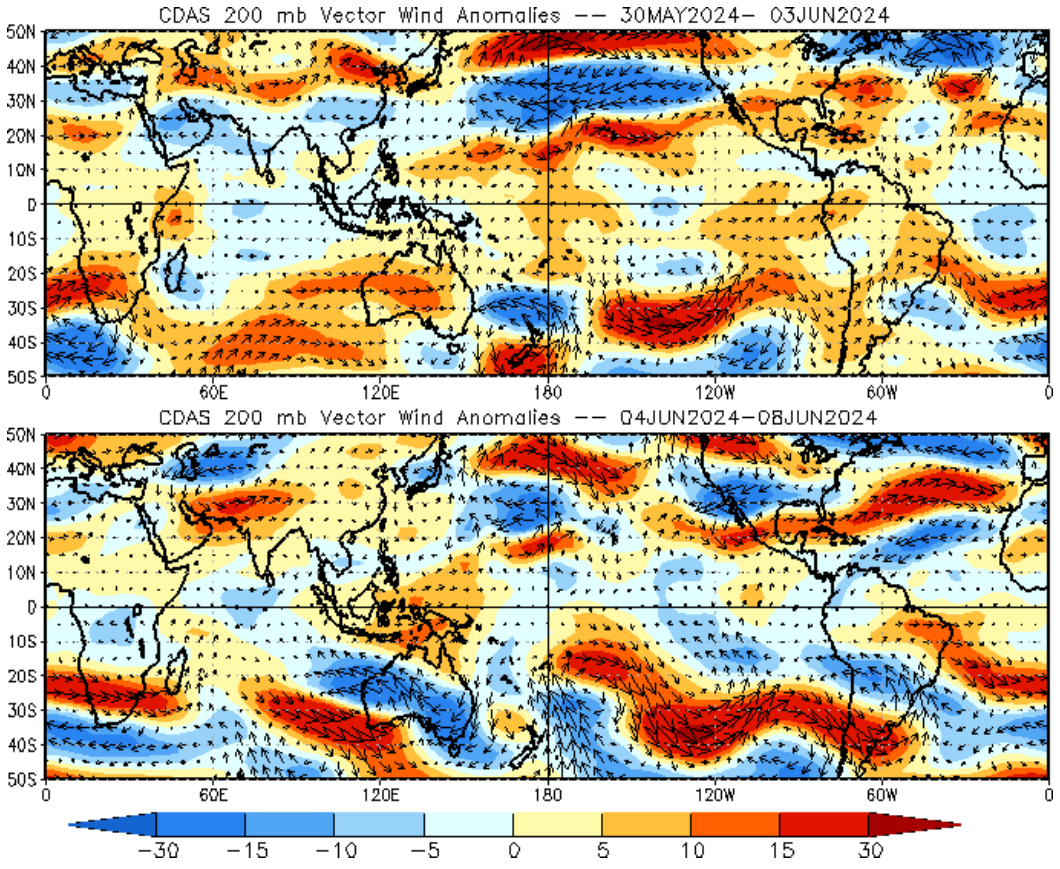


- The spatial pattern of global velocity potential anomalies has become quite jumbled in the last few weeks. The much-diminished signal strength of the MJO likely contributes to this breakdown of a wave-like structure in the VP anomalies.

200-hPa Wind Anomalies

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

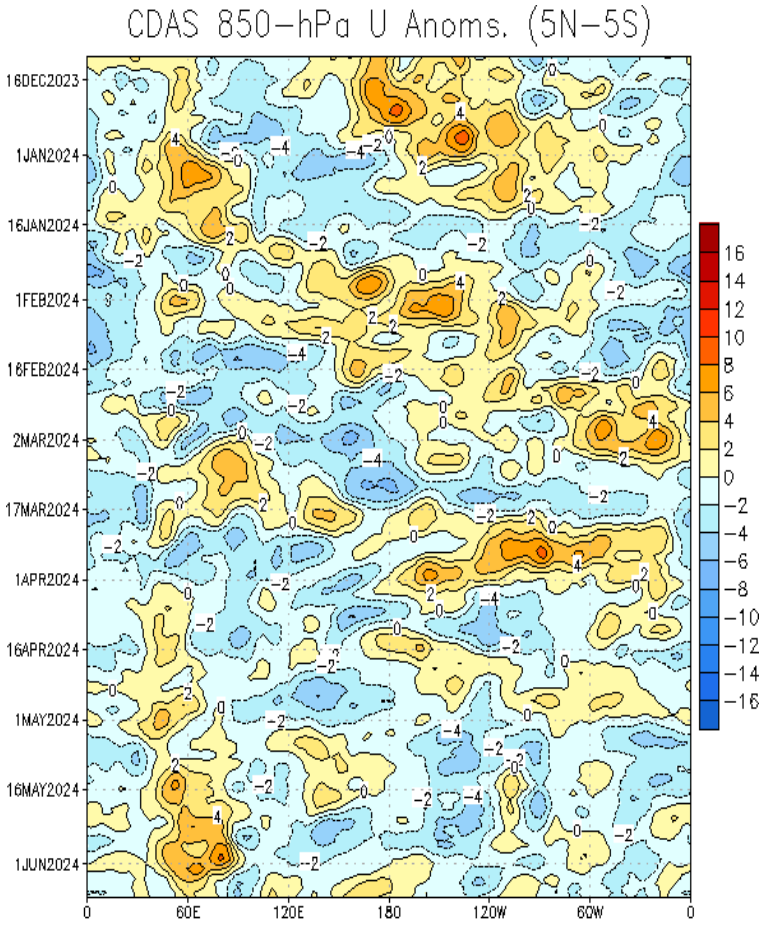


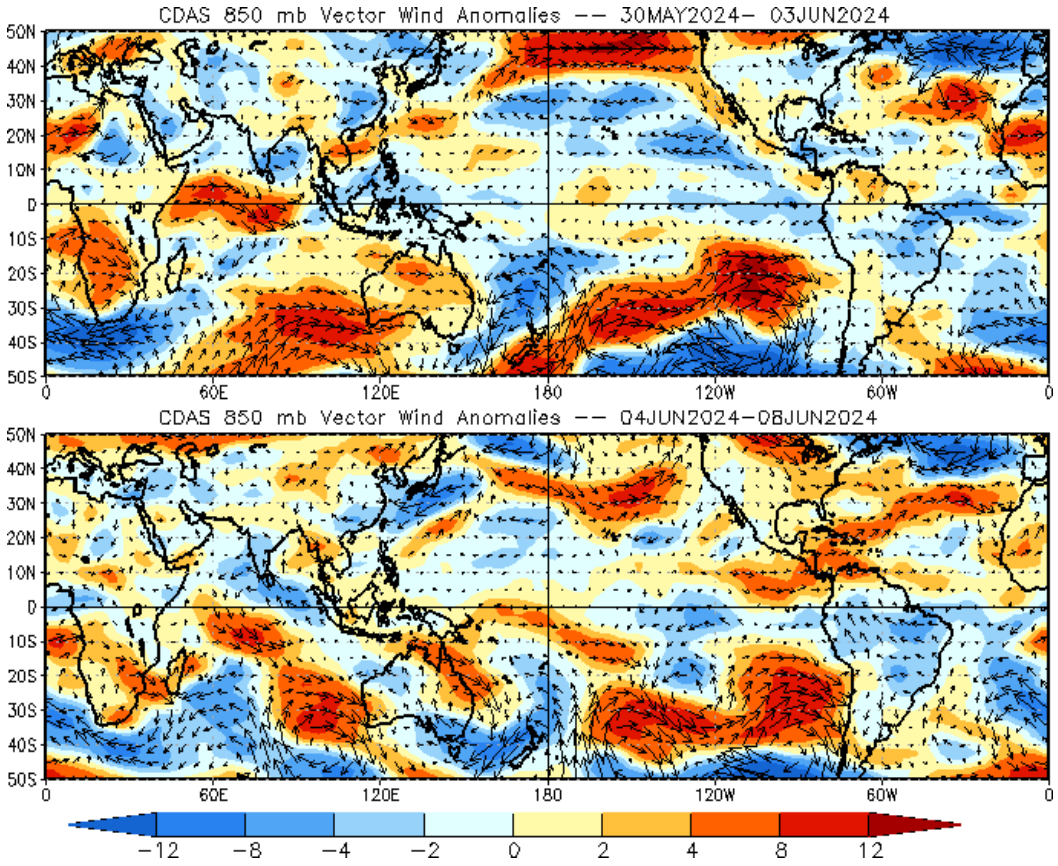


- Pronounced eastward propagation of westerly anomalies reflective of MJO activity is apparent in the Hovmoller since the beginning of March. Recently however this regular progression appears to have been disrupted over the Maritime Continent.
- A pronounced subtropical jet remains in place from the eastern Pacific through the southern CONUS.

850-hPa Wind Anomalies

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

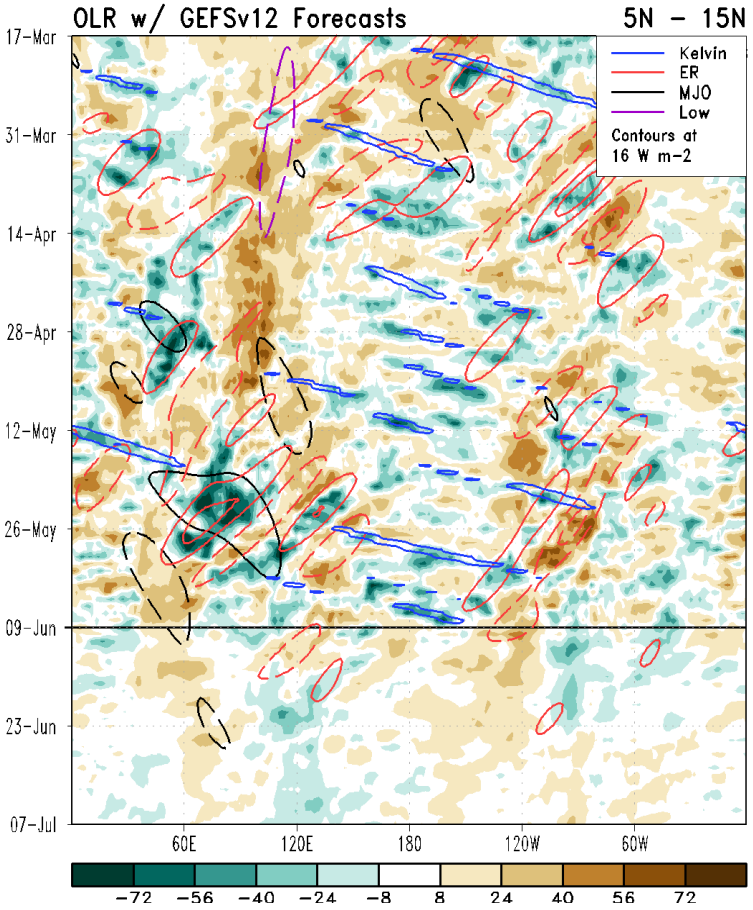


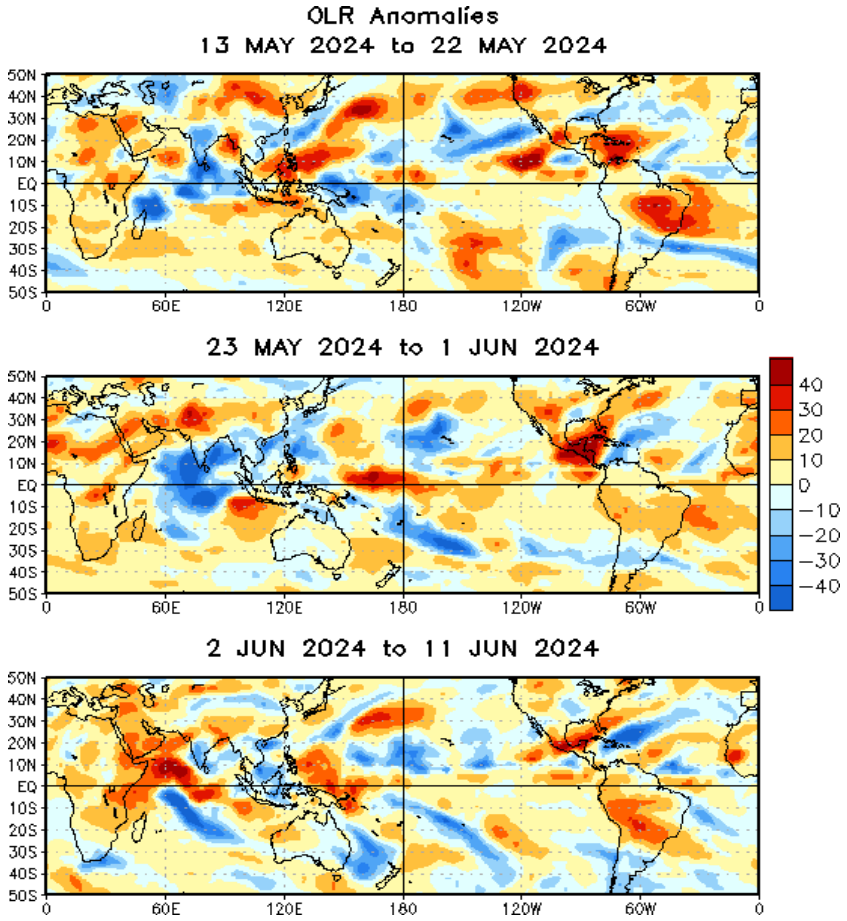


- Westerly anomalies over the western and central Indian Ocean have weakened a little over the last week.
- Easterly anomalies have also diminished slightly over the tropical Pacific, with little in the way of MJO-induced synoptic structure.

Outgoing Longwave Radiation (OLR) Anomalies

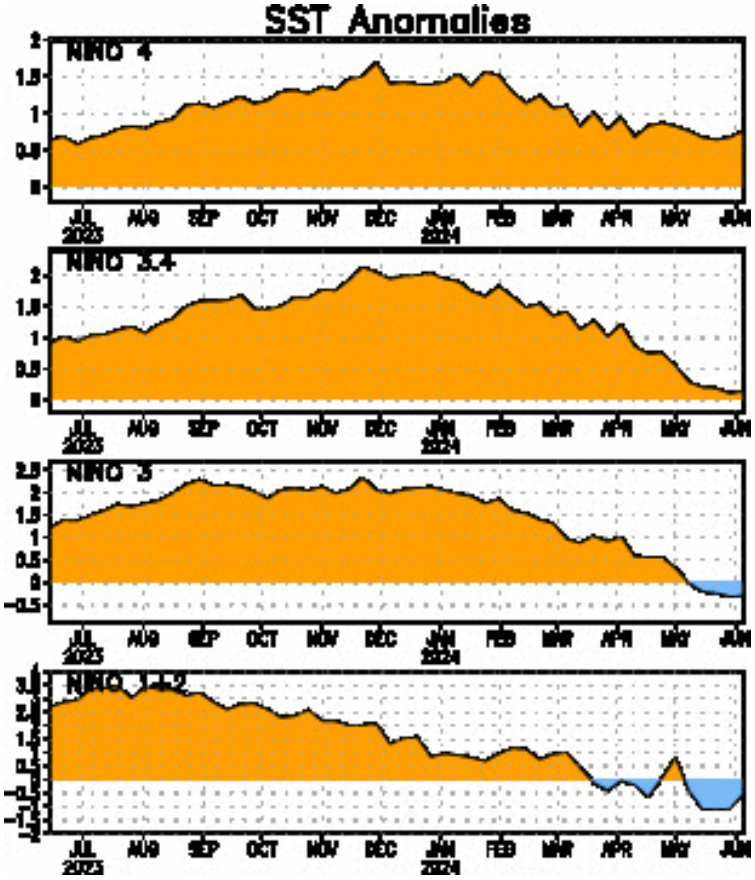
Green shades: Anomalous convection (wetness)
Brown shades: Anomalous subsidence (dryness)

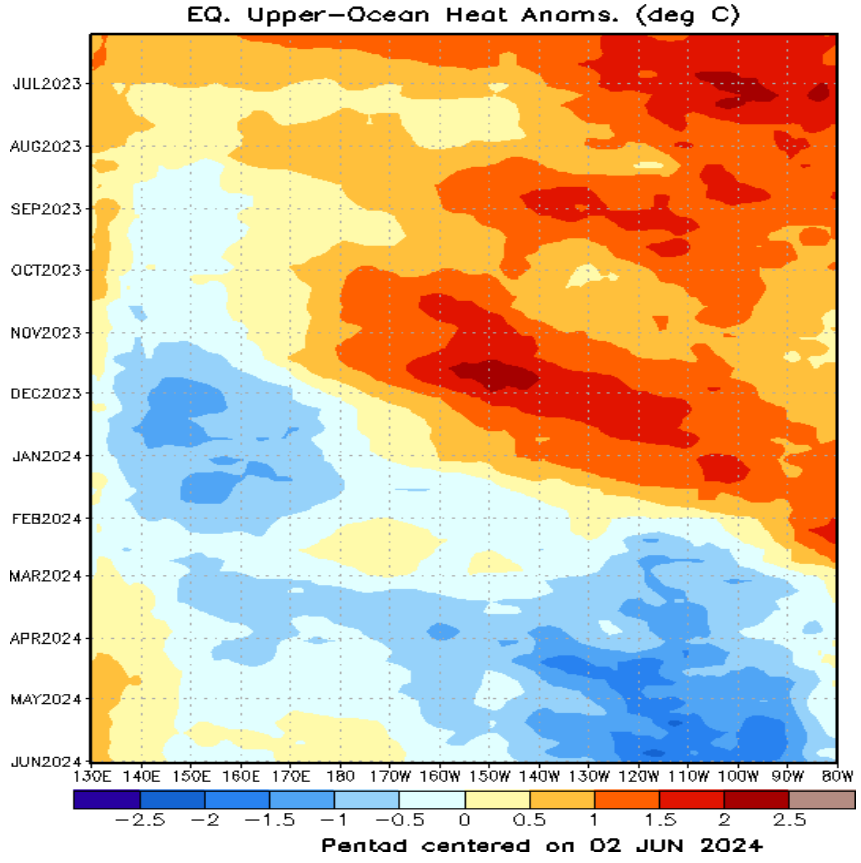




- Persistent enhanced convection over the western Indian Ocean has given way to suppressed convection over the last few weeks.
- Suppressed convection remains across the far East Pacific, western Caribbean, and southern Gulf of Mexico regions, although this feature has weakened somewhat in the last week.

SSTs and Weekly Heat Content Evolution in the Equatorial Pacific

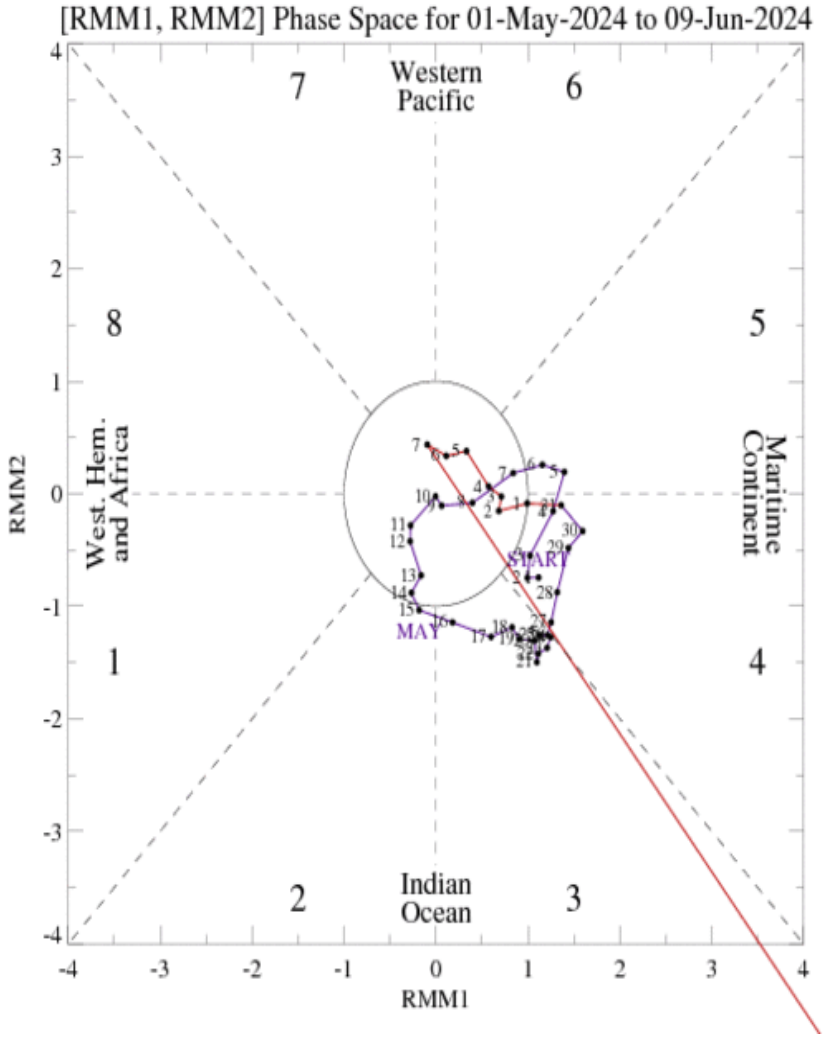




- SSTs in the easternmost Niño regions continue to trend downward since February, indicative of a decaying El Niño and potentially developing La Niña.
- Negative subsurface temperature anomalies continue to be observed across nearly the entire Pacific, with cooling most pronounced across the Eastern Pacific.

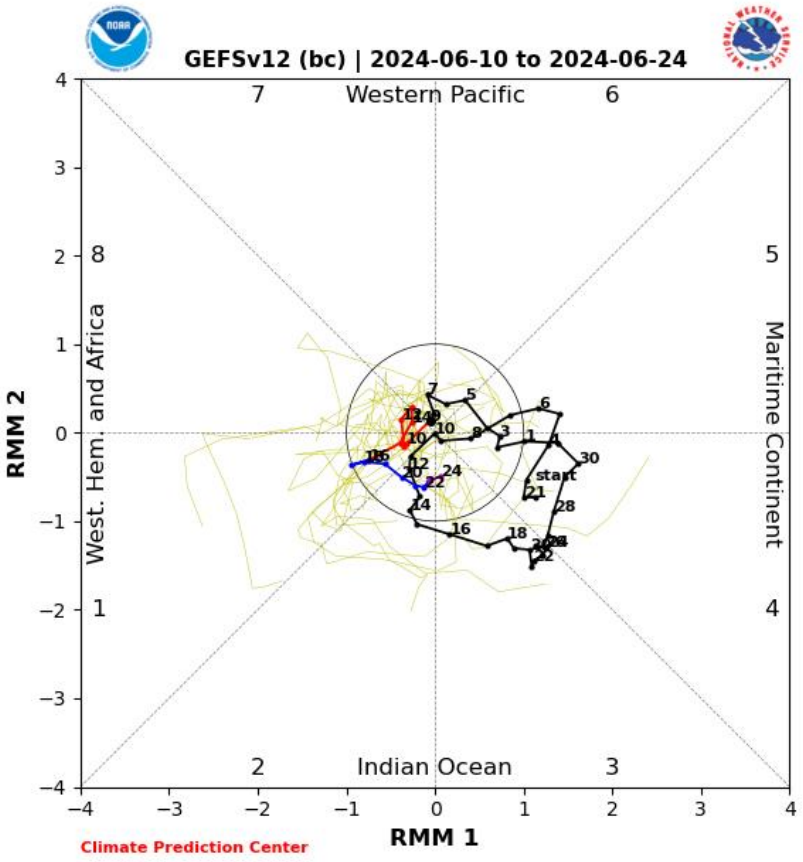
MJO Index: Recent Evolution

- The RMM index indicated an active MJO over the Indian Ocean and Maritime Continent during the second half of May. However, since the beginning of June the amplitude of the RMM index has dropped to almost zero, with the index sitting near the center of the unit circle. Possible reasons for this decline include a changing low frequency (i.e. ENSO state) and interference from Rossby wave activity.

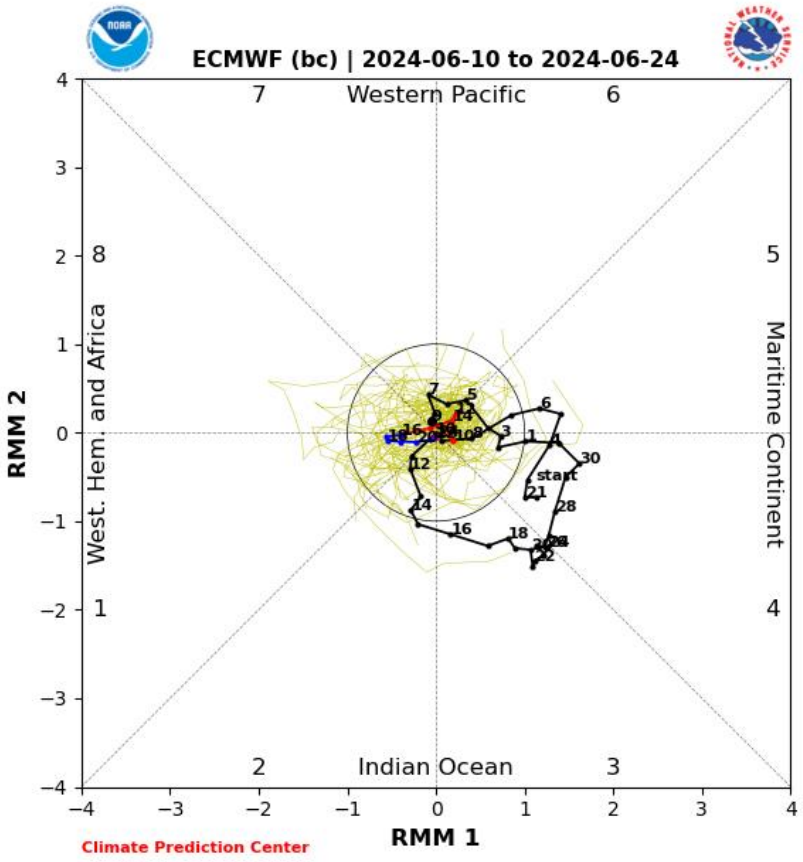


For more information on the RMM index and how to interpret its forecast please see:
https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CPC_MJOinformation.pdf

MJO Index: Forecast Evolution



GEFS Forecast

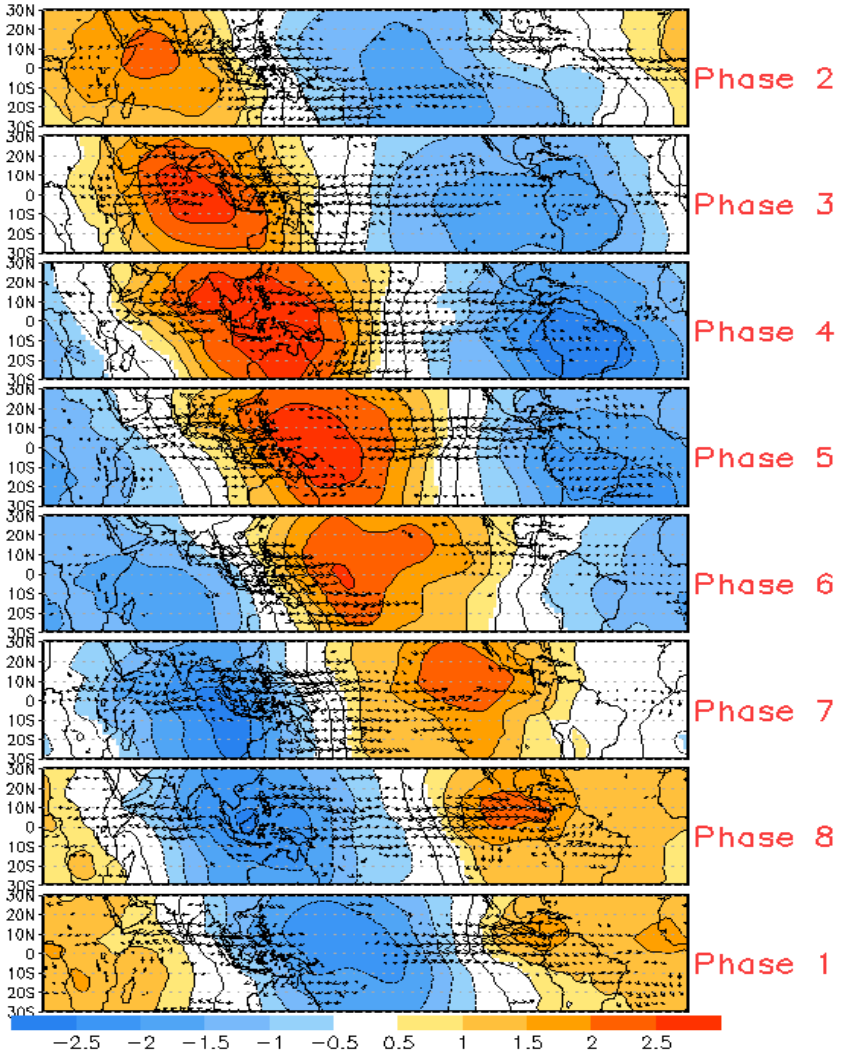


ECMWF Forecast

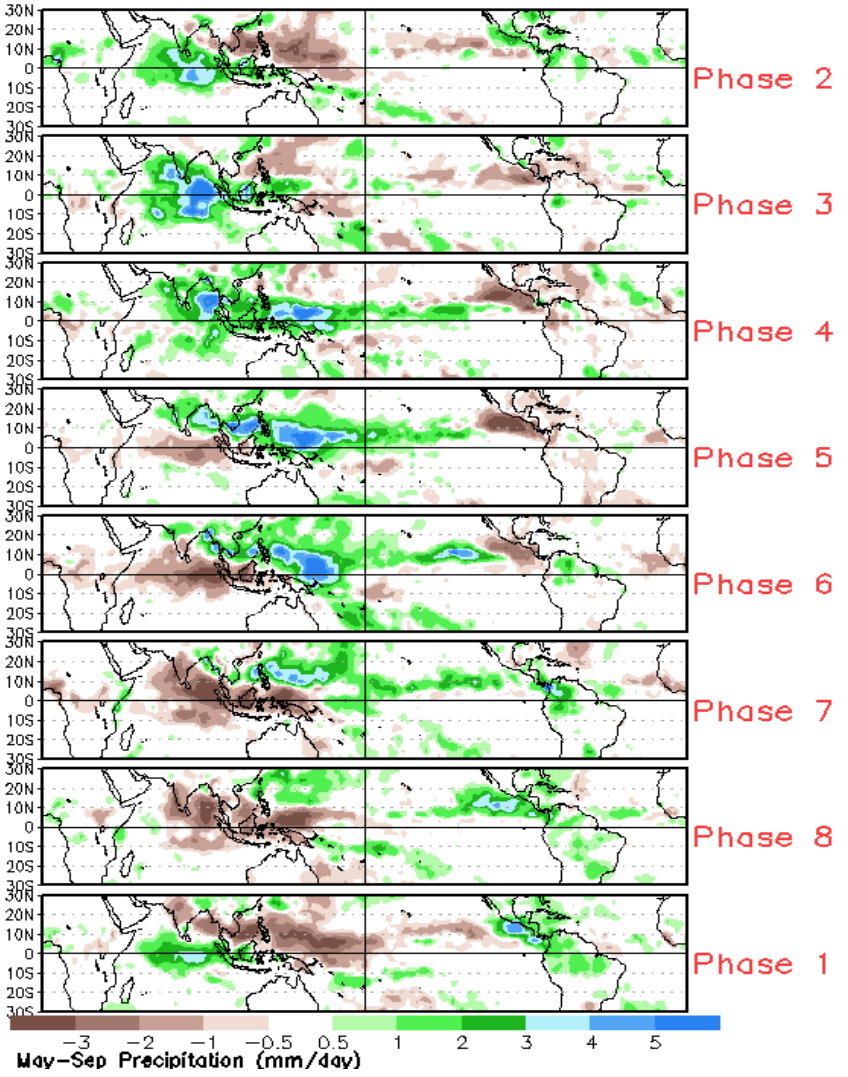
- The ECMWF and GEFS (as well as most other operational models) favor a continuation of very weak MJO activity over the coming weeks.

MJO: Tropical Composite Maps by RMM Phase

850-hPa Velocity Potential and Wind Anomalies



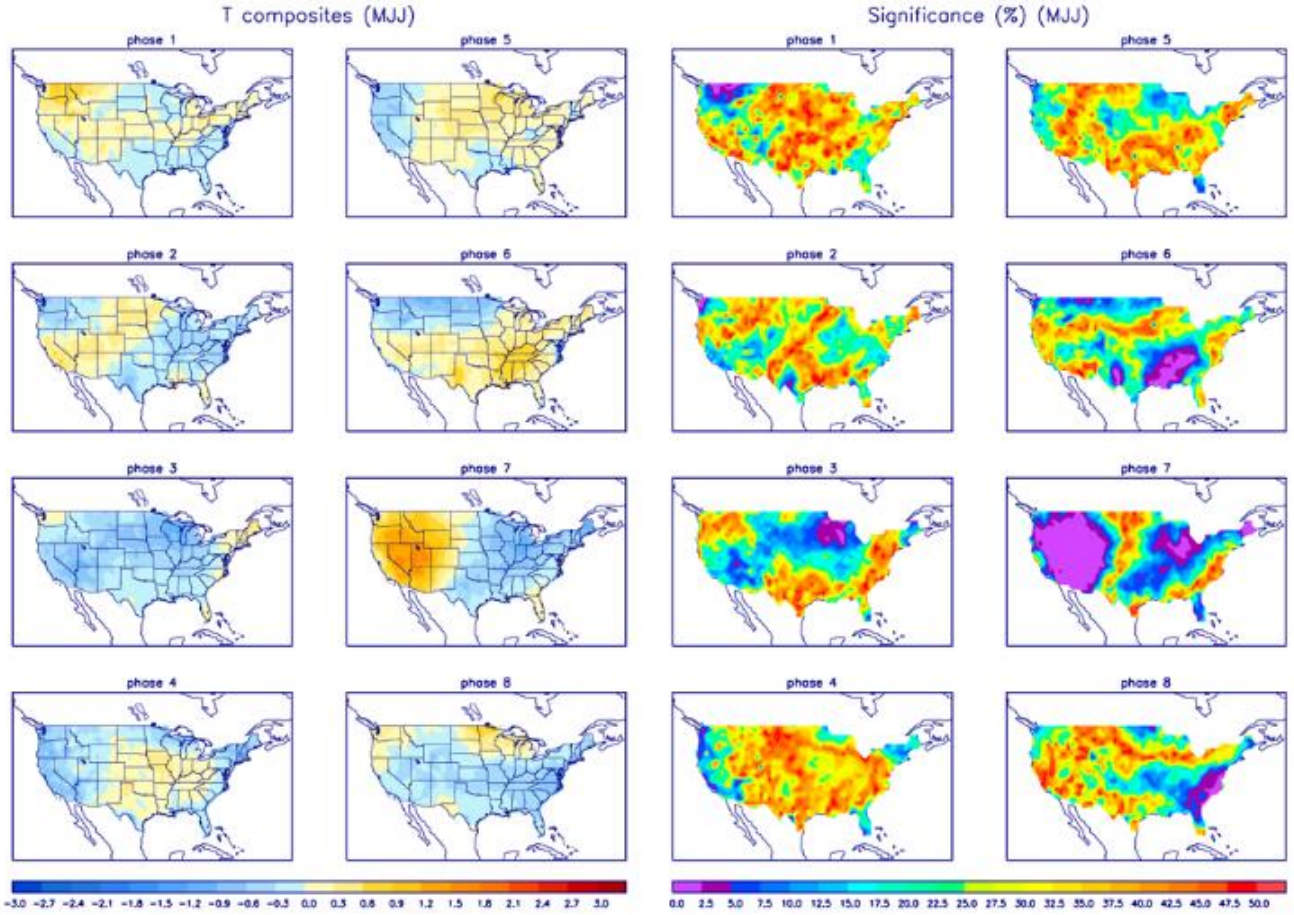
Precipitation Anomalies



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.

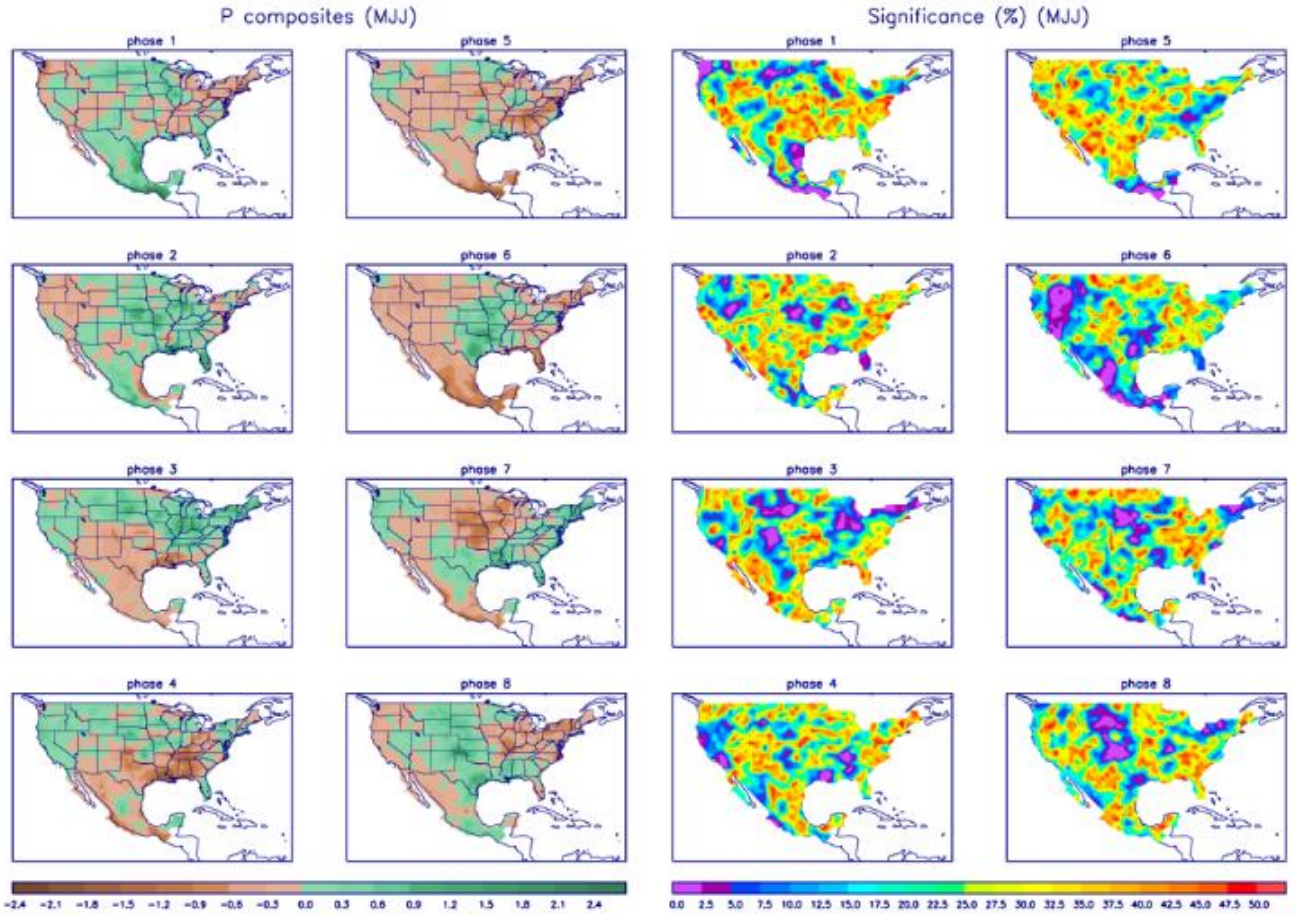


More information: http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/mjo.shtml

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