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

Update prepared by the Climate Prediction Center
Climate Prediction Center / NCEP
15 June 2020

Overview

- Recent observations depict a disorganized and incoherent pattern, with most of the enhanced convection associated with Rossby wave activity.

- Dynamical models forecasts suggest a westward propagation of the subseasonal signal, with little to no indication for renewed MJO activity into late June.

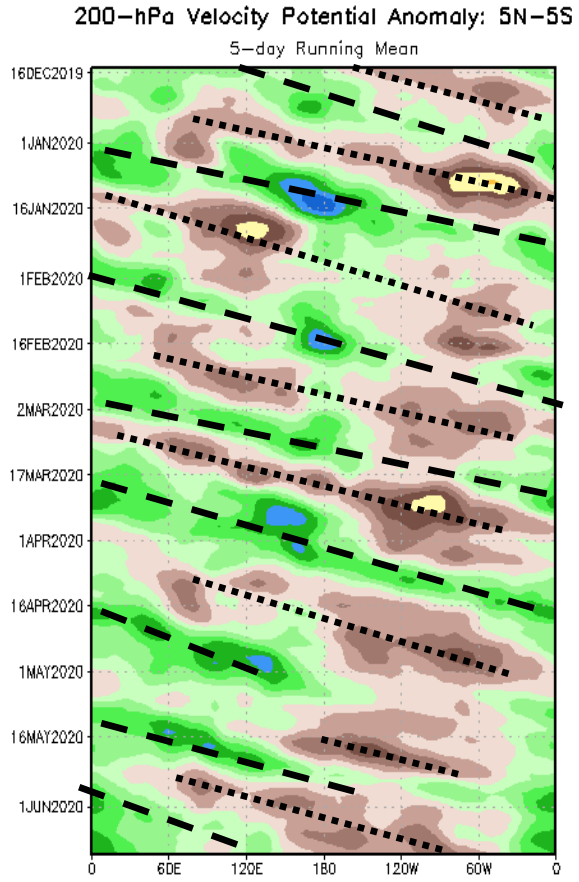
- Potential for tropical cyclone formation remains low during week-1, with increasing chances over the eastern Pacific late in week-1 and into week-2.

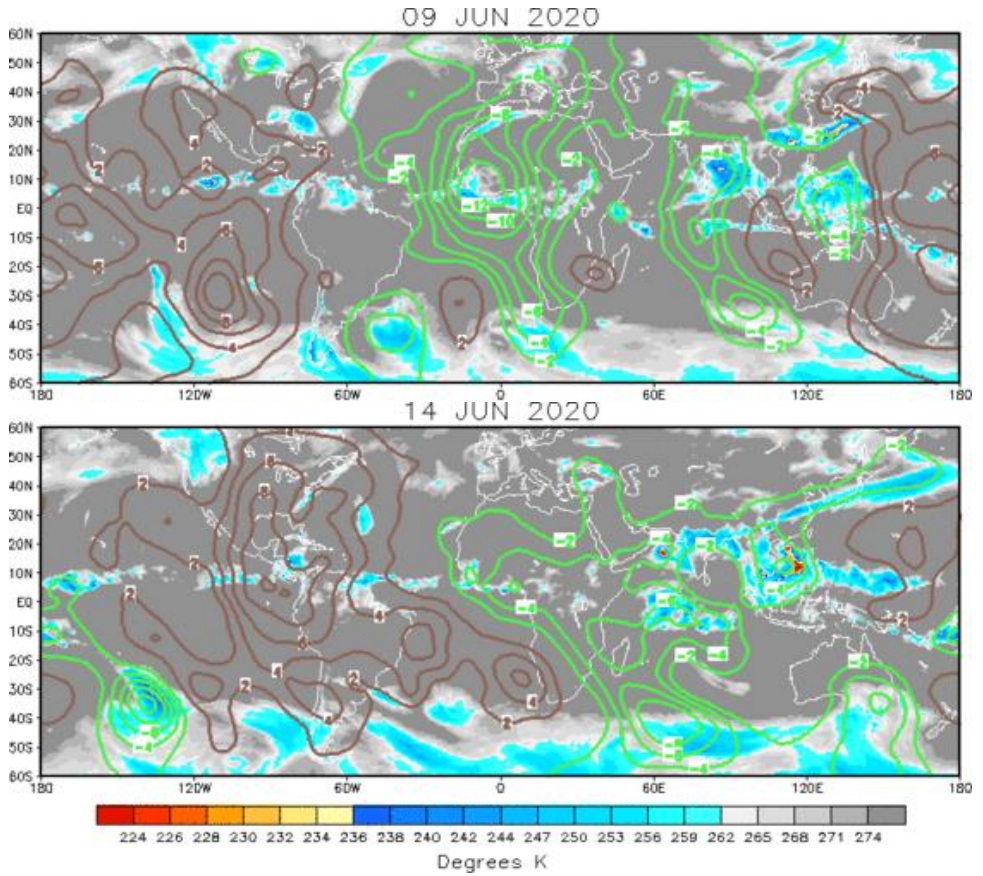
A discussion of potential impacts for the global tropics and those related to the U.S. are updated on Tuesday at:
http://www.cpc.ncep.noaa.gov/products/precip/CWlink/ghazards/index.php

200-hPa Velocity Potential Anomalies

Green shades: Anomalous divergence (favorable for precipitation).

Brown shades: Anomalous convergence (unfavorable for precipitation).

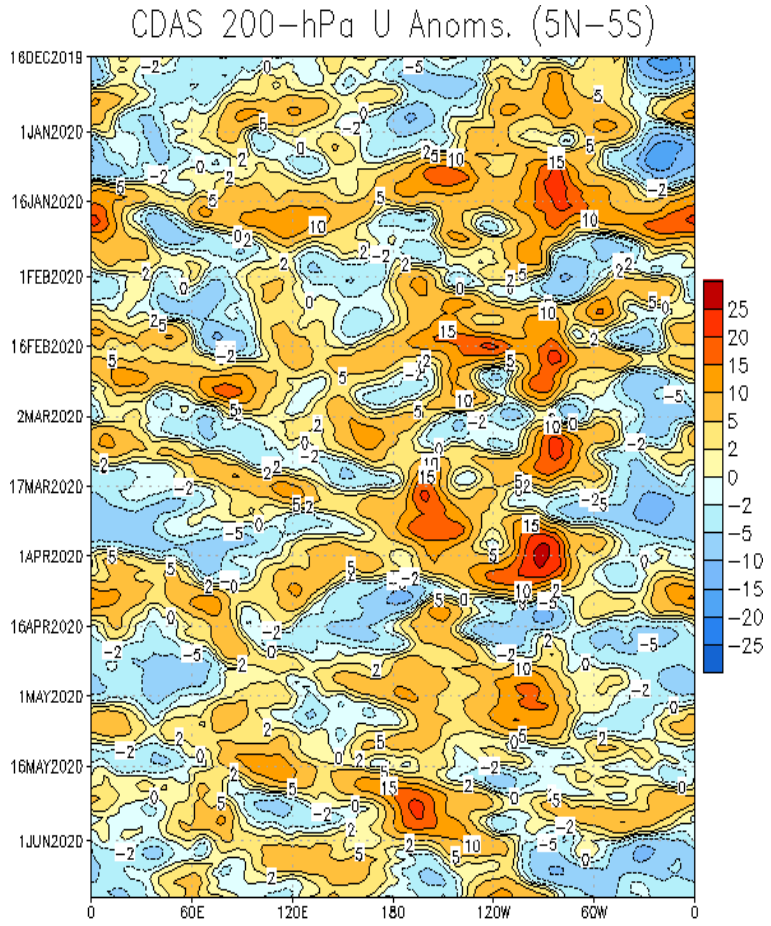


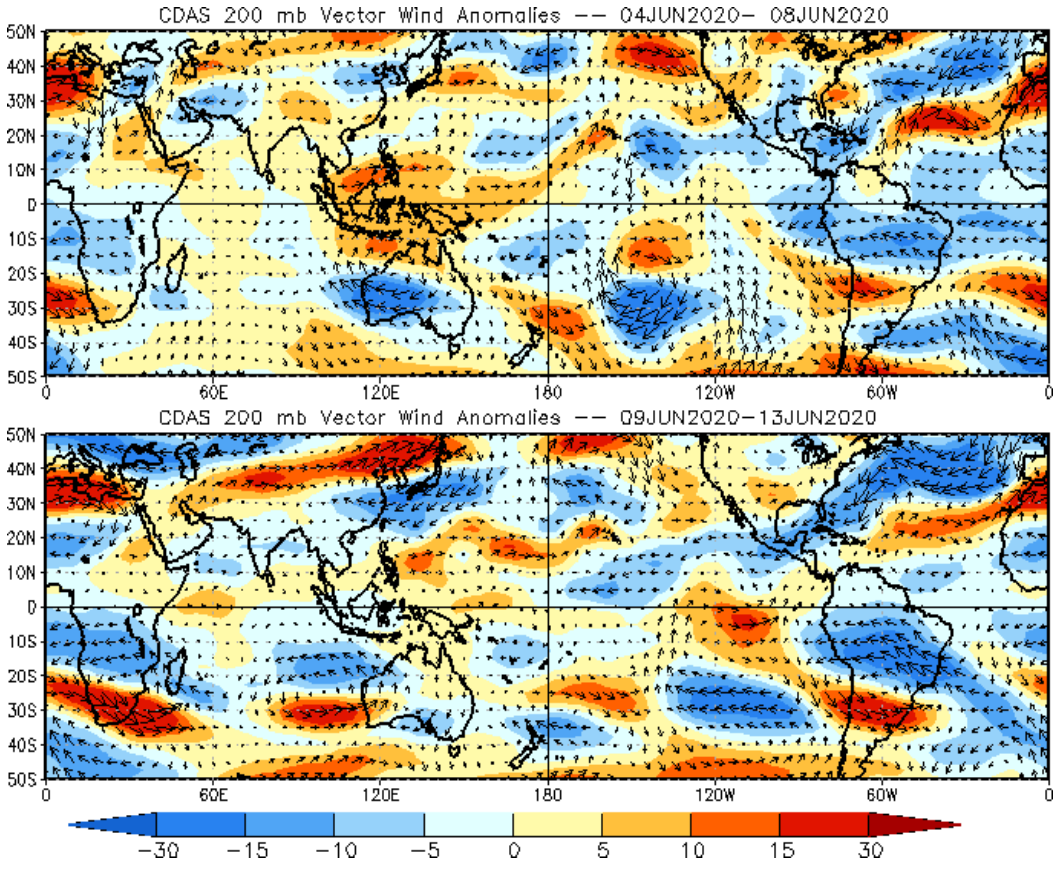


- The upper-level velocity potential pattern appears incoherent, with little to no eastward propagation of the convective envelope during the last week.
- Increased subsidence over the East Pacific and the western Atlantic is likely to quell tropical cyclone activity in these basins in the near term.

200-hPa Wind Anomalies

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

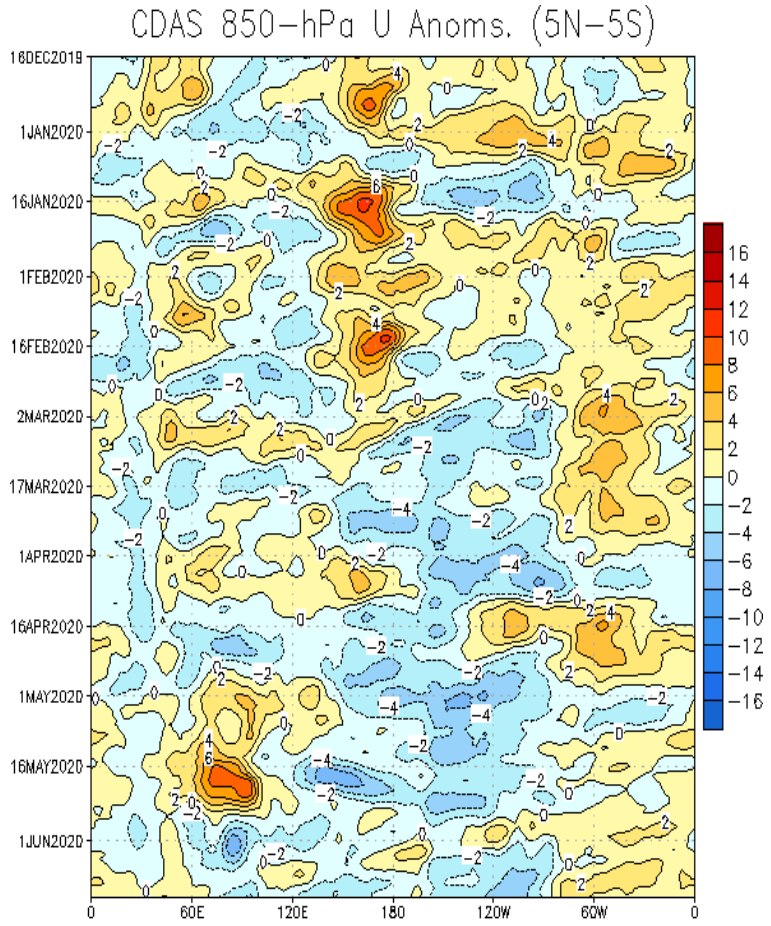


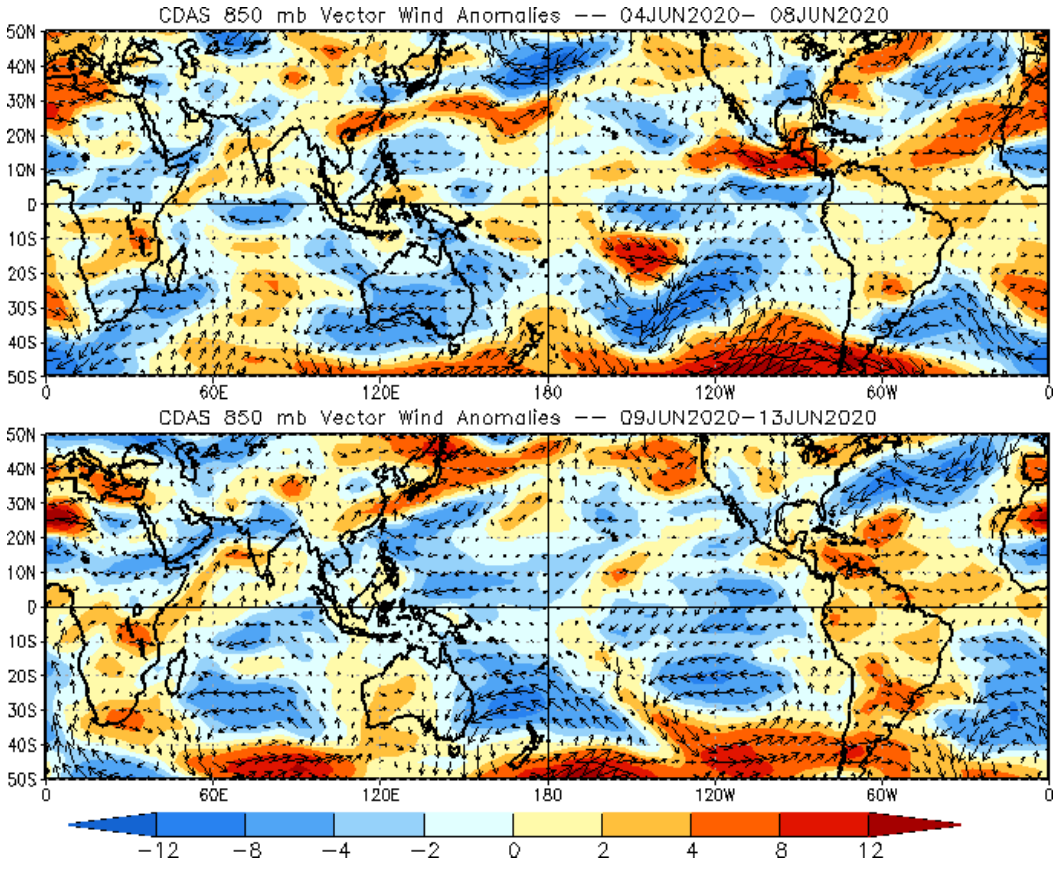


- Anomalous westerlies aloft have persisted from the Maritime Continent to the Date Line, with a zonal band of easterly anomalies extending from the equatorial central Pacific into the Caribbean and Atlantic.
- Wave breaking continues over the North Pacific, although the latitudinal exchange of mass appears less pronounced compared to previous weeks.

850-hPa Wind Anomalies

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

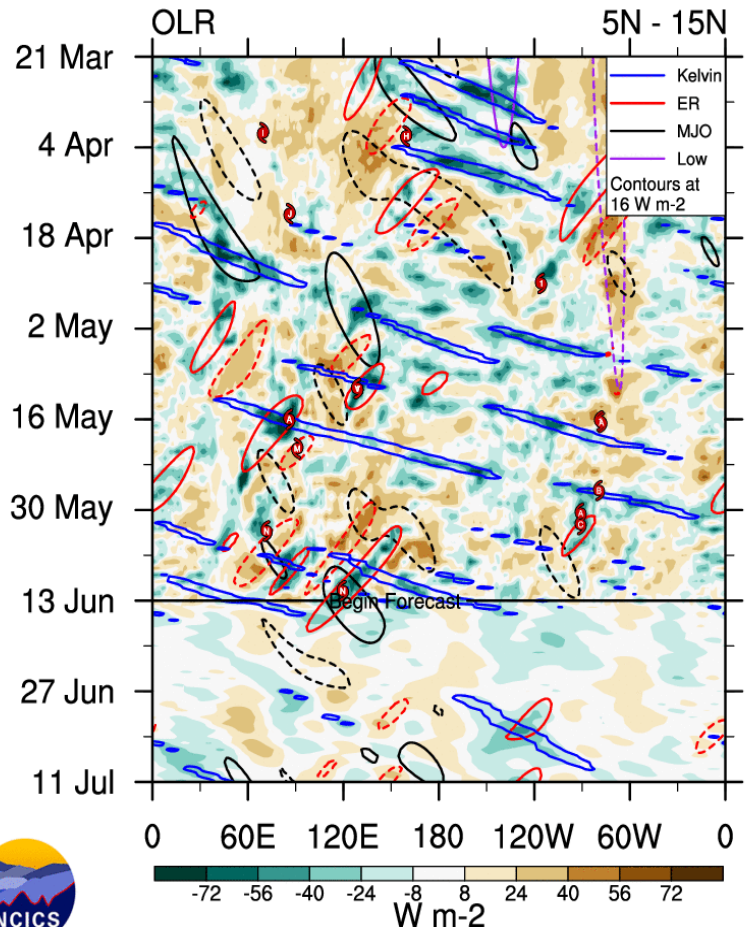


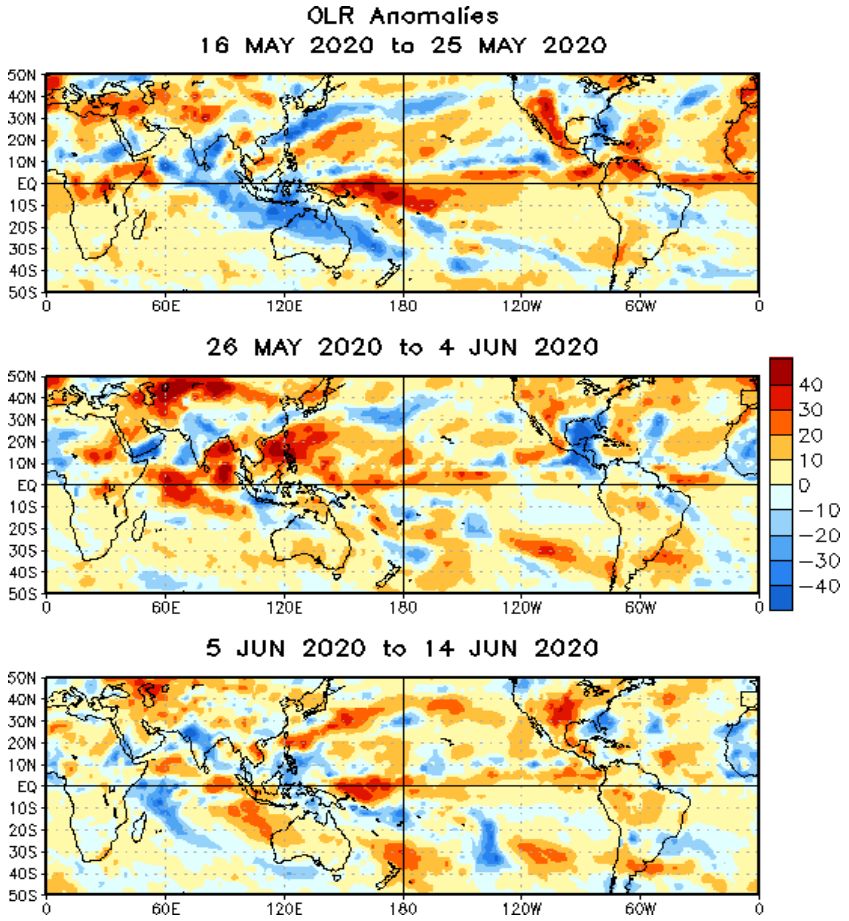


- Enhanced trade winds have expanded over much of the equatorial Pacific which may have implications to the low frequency base state.
- Anomalous westerlies remain across much of the tropical Atlantic.
- An anomalous lower level anti-cyclonic circulation resides over the East Pacific.

Outgoing Longwave Radiation (OLR) Anomalies

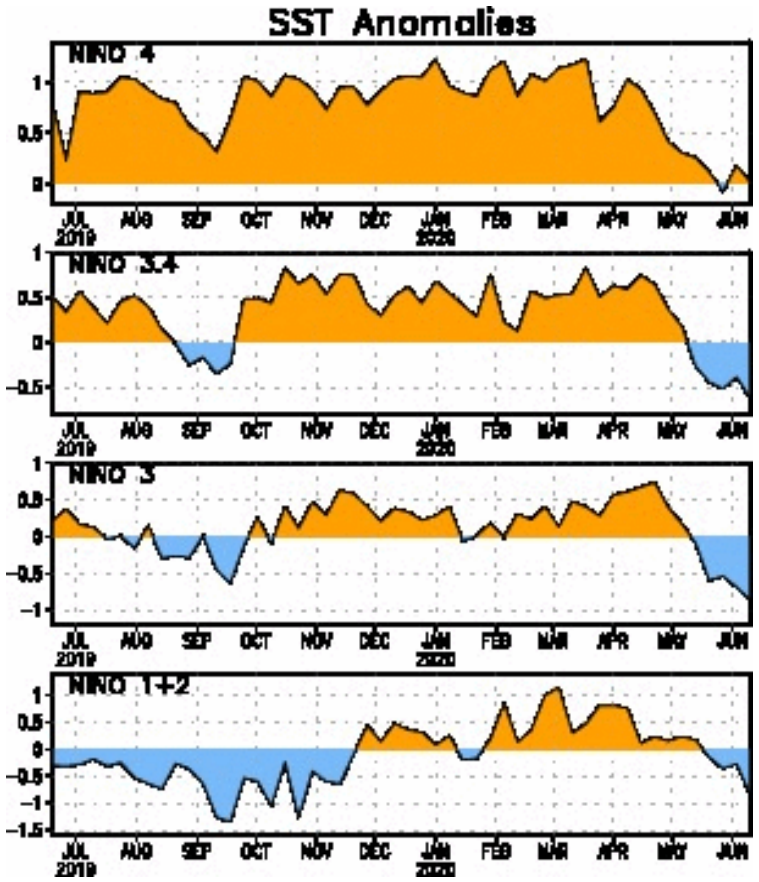
Blue shades: Anomalous convection (wetness). Red shades: Anomalous subsidence (dryness).

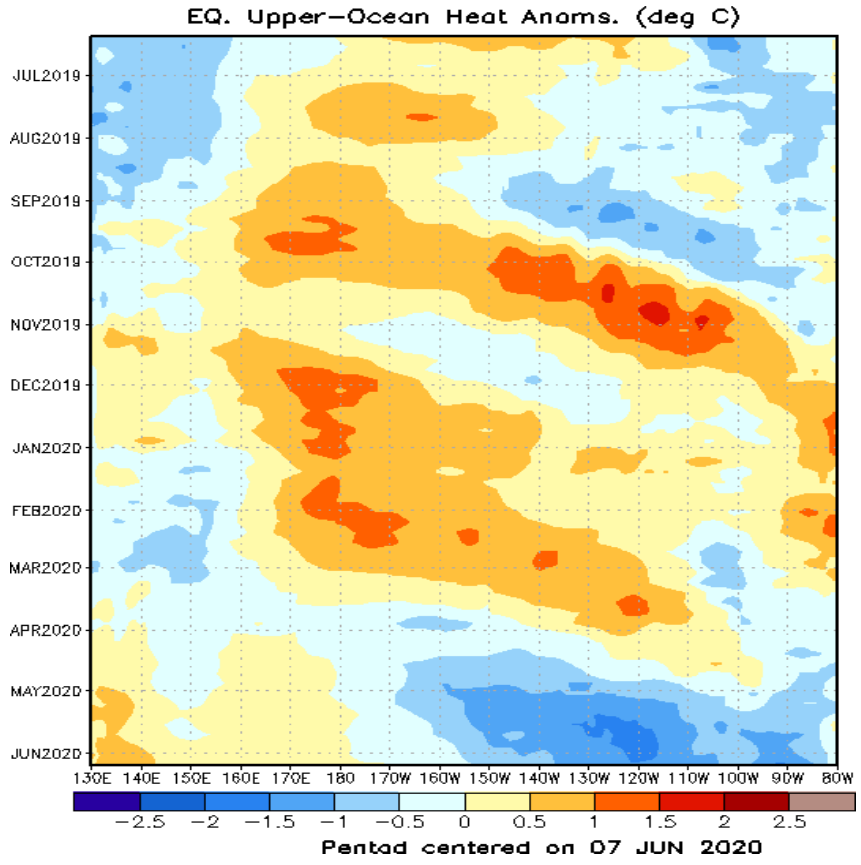




- Much of the recent enhanced convection over parts of the Indian Ocean and Maritime Continent is associated with Rossby wave activity and the remnants of TC Nuri.
- Convection across the equatorial Pacific continues to be predominately suppressed, with the largest anomalies centered west of the Date Line.

SSTs and Weekly Heat Content Evolution in the Equatorial Pacific

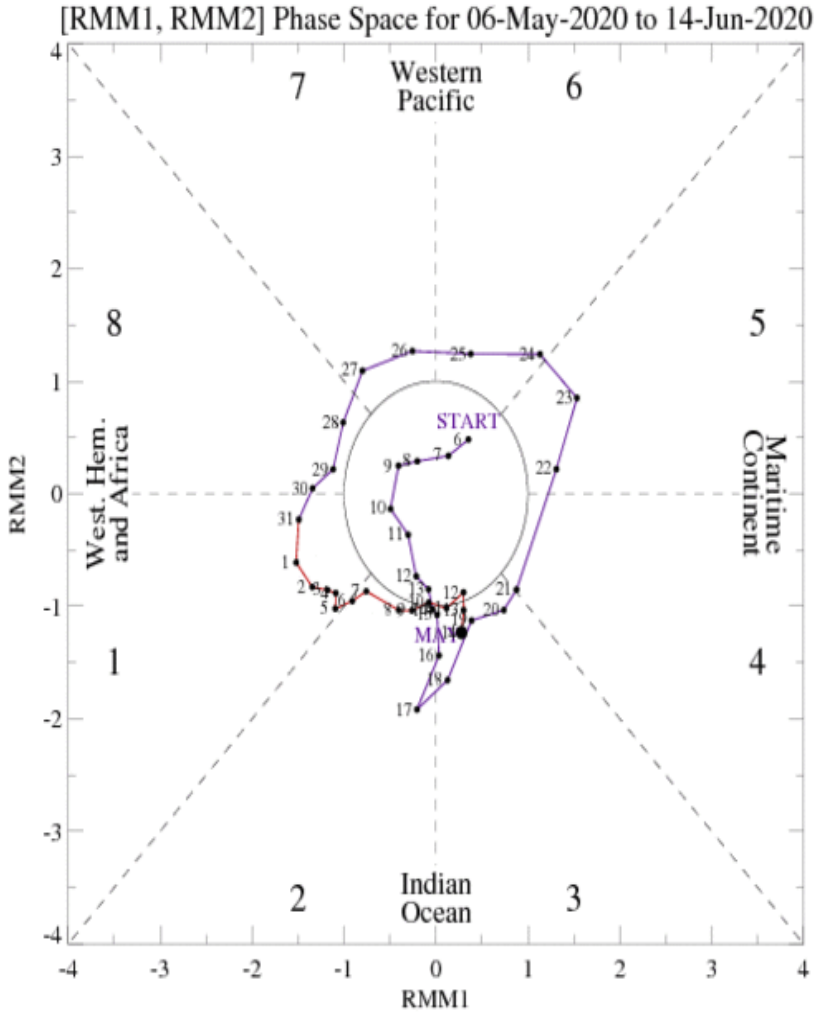




- Since May, the prevailing enhanced trades winds have generated an oceanic response as Nino regions have trended negative, with stronger negative upper-ocean heat content anomalies across much of the east-central Pacific.
- SSTs are now below-average in all of the Niño basins with the exception of a small increase recently over the Nino 4 region.

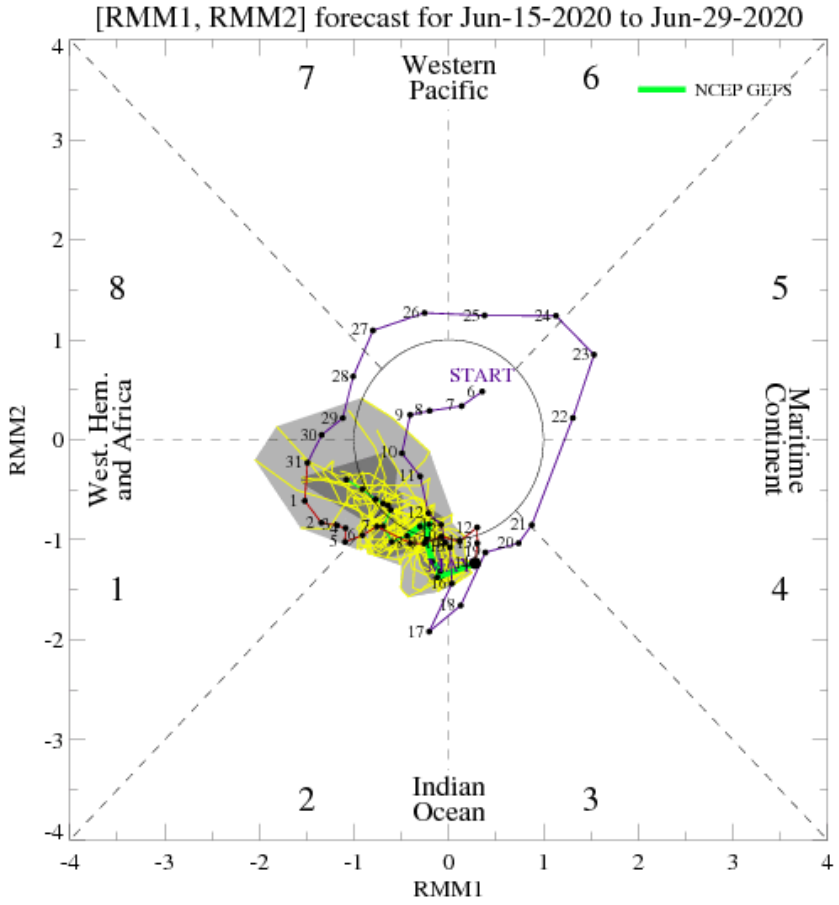
MJO Index: Recent Evolution

- The RMM index shows a slowed, low amplitude signal over Indian Ocean during the last week.

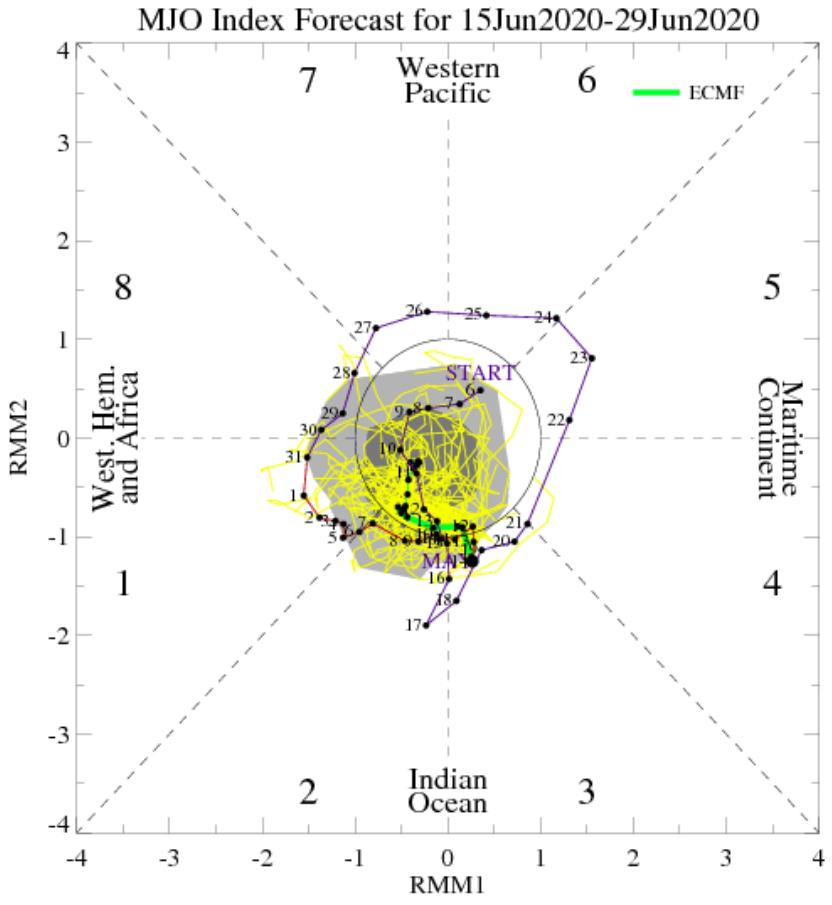


For more information on the RMM index and how to interpret its forecast please see:
https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CPC_MJOinformation.pdf

MJO Index: Forecast Evolution



GEFS Forecast

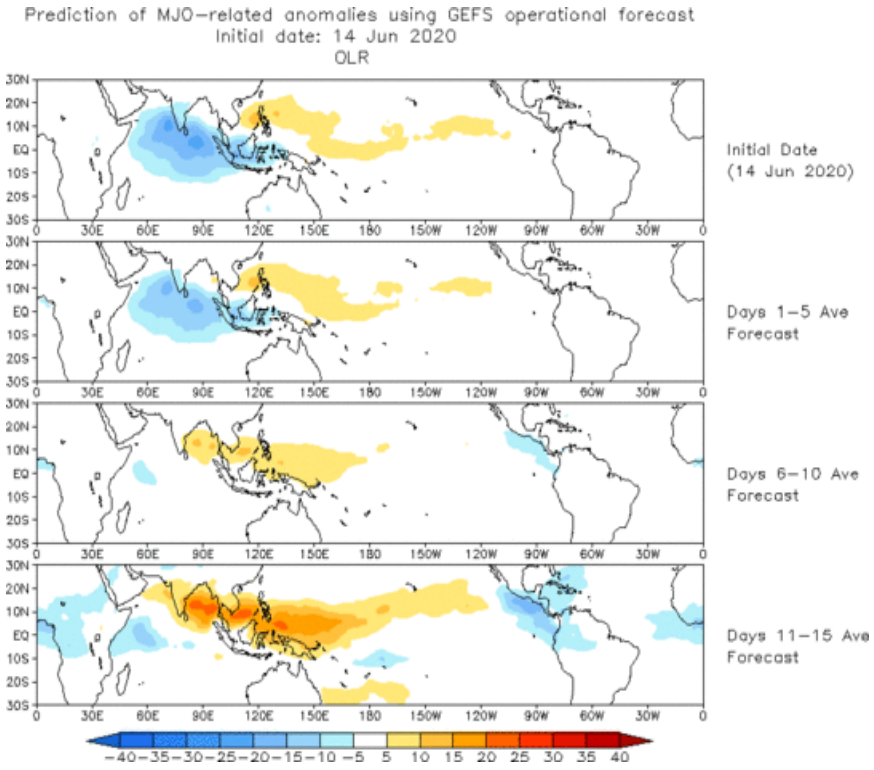


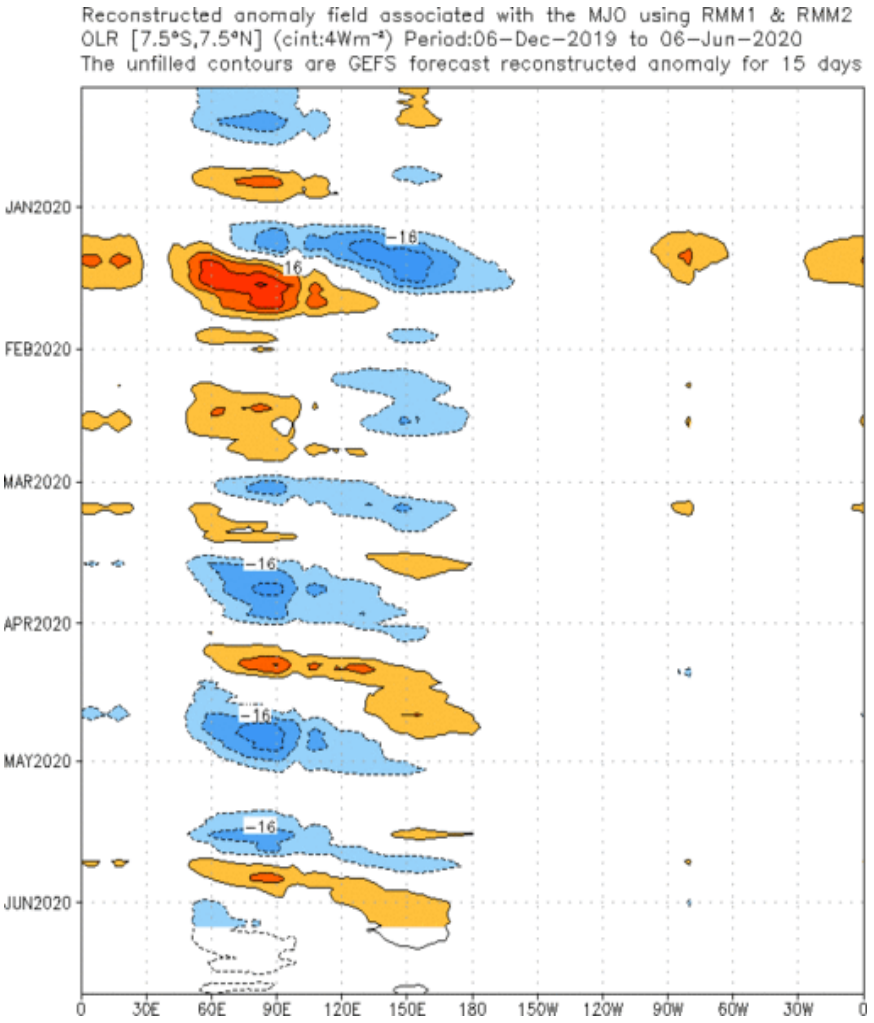
ECMWF Forecast

- Most dynamical models point to a slowed, westward propagating signal over the Indian Ocean during the next two weeks with little indication for renewed MJO activity.

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.)

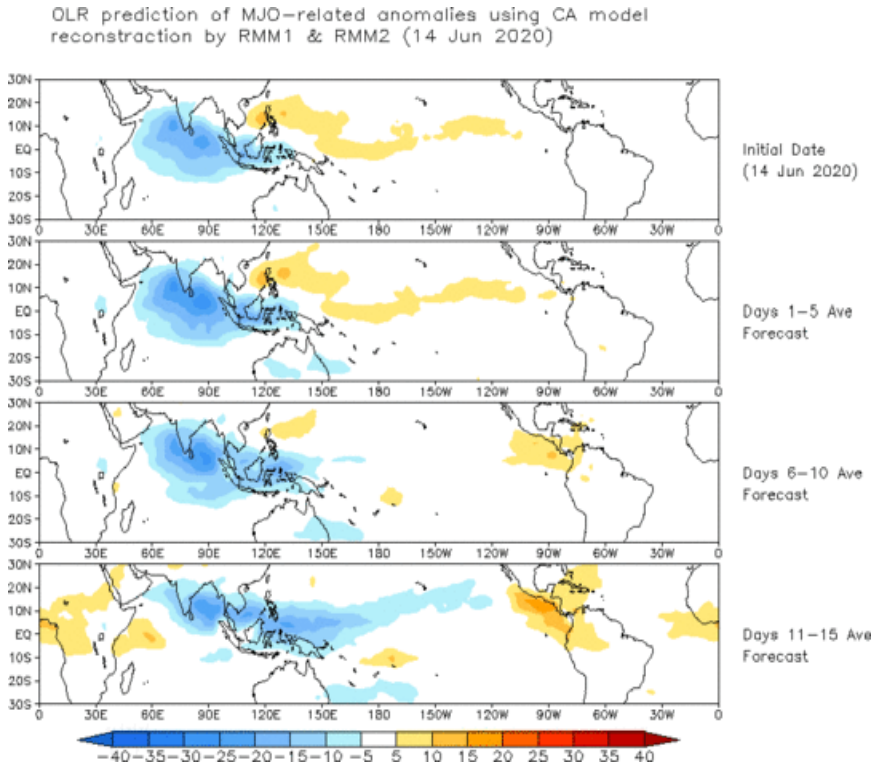


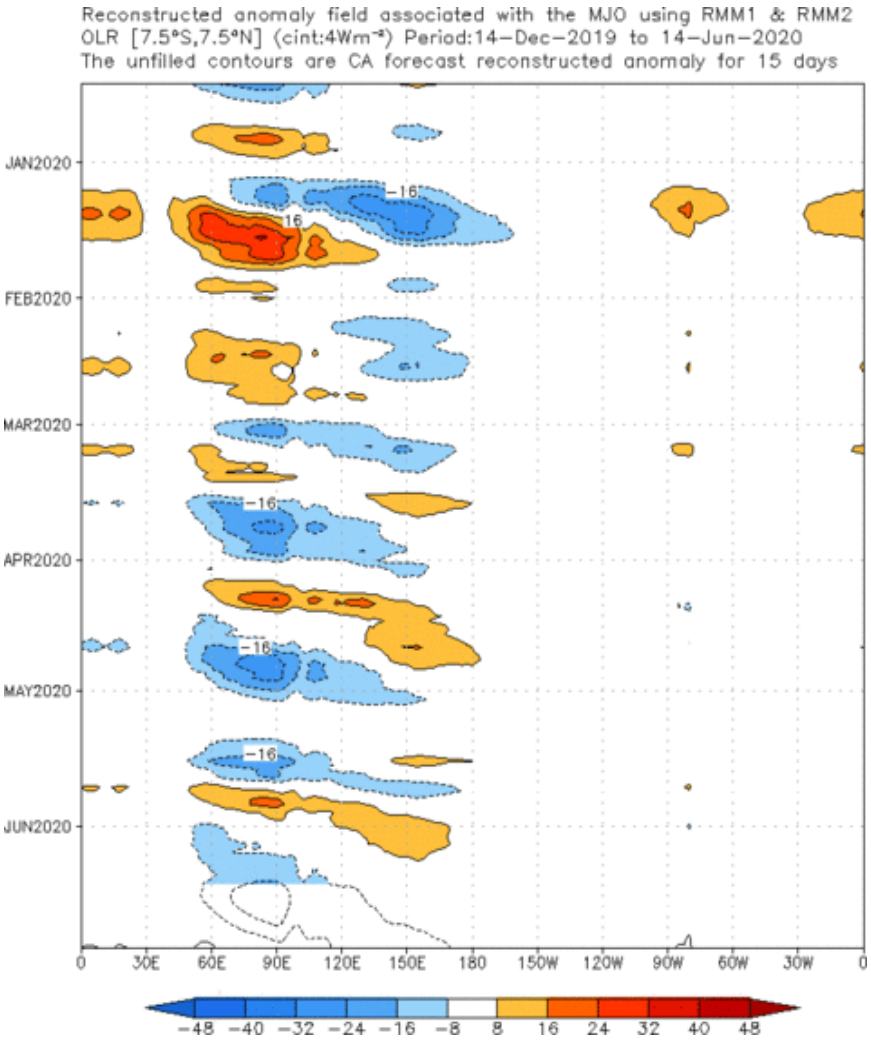


- The GEFS spatial pattern reflects a weakening convective pattern while shifting westward into week-2.

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.)

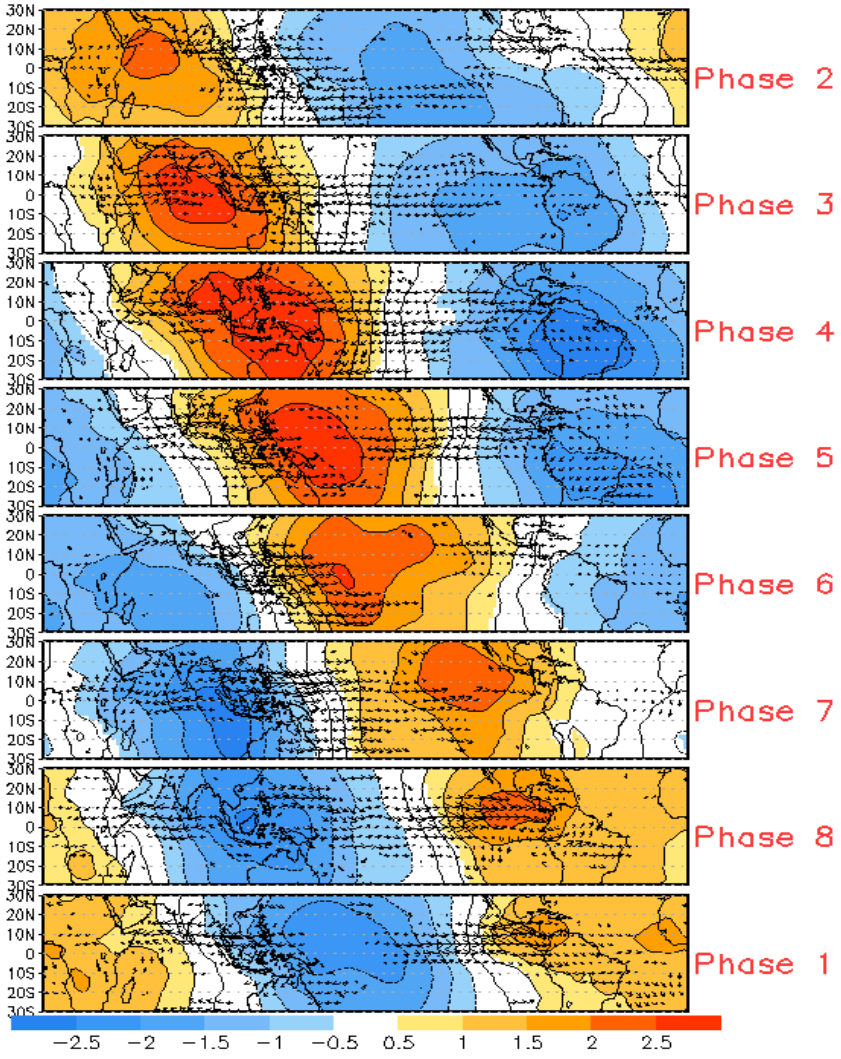




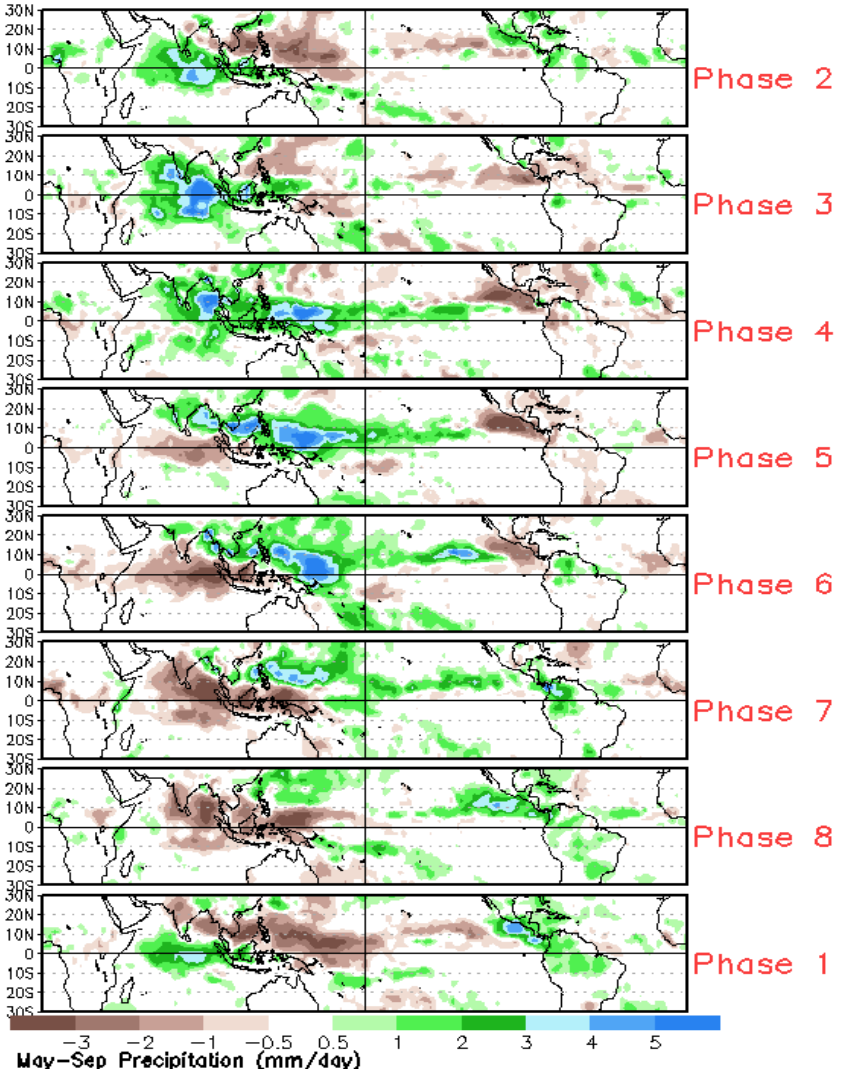
- The constructed analog forecast maintains enhanced convection over the Indian Ocean and Maritime Continent, with suppressed convection emerging over the Eastern Pacific in late June.

MJO: Tropical Composite Maps by RMM Phase

850-hPa Velocity Potential and Wind Anomalies



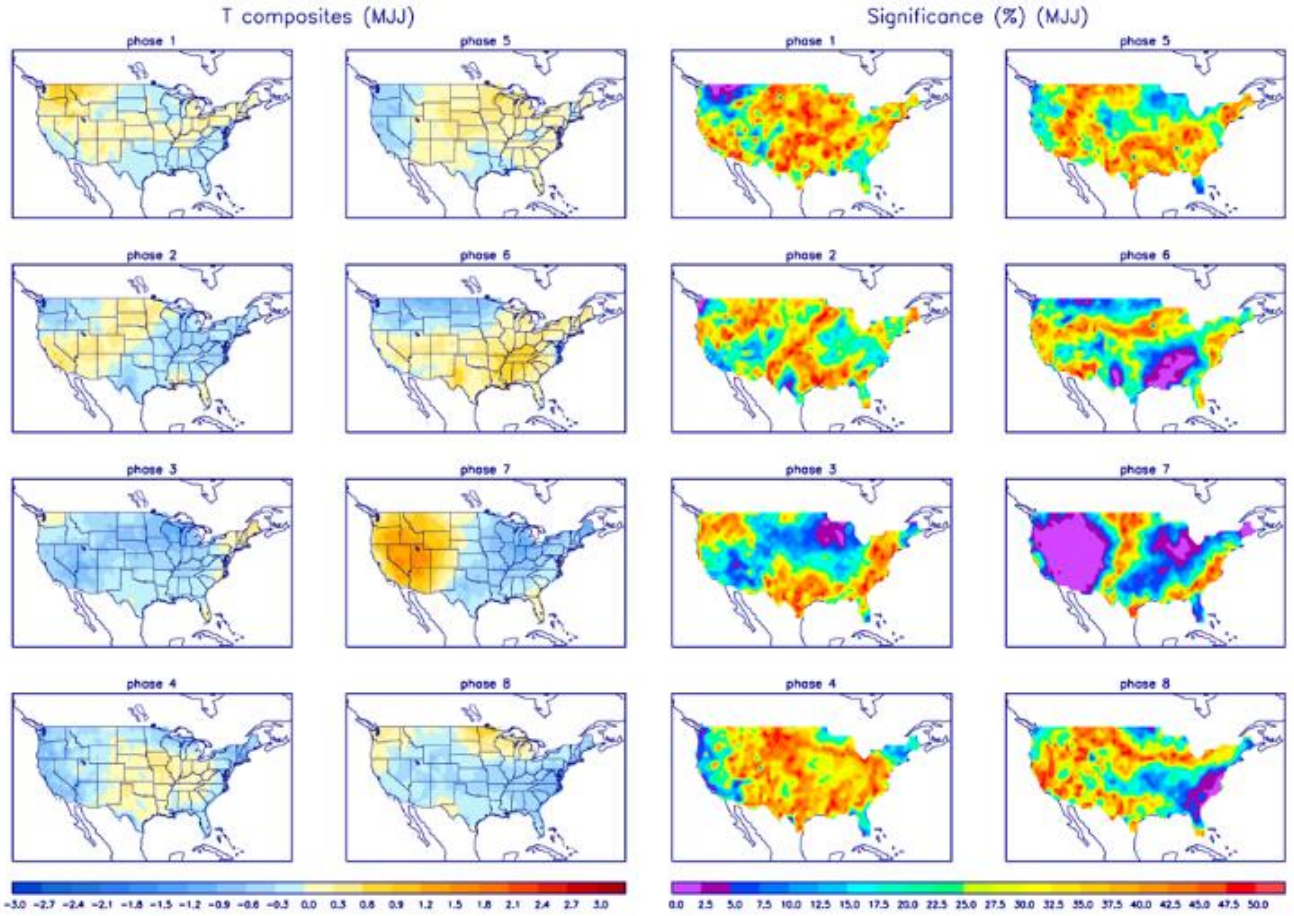
Precipitation Anomalies



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.

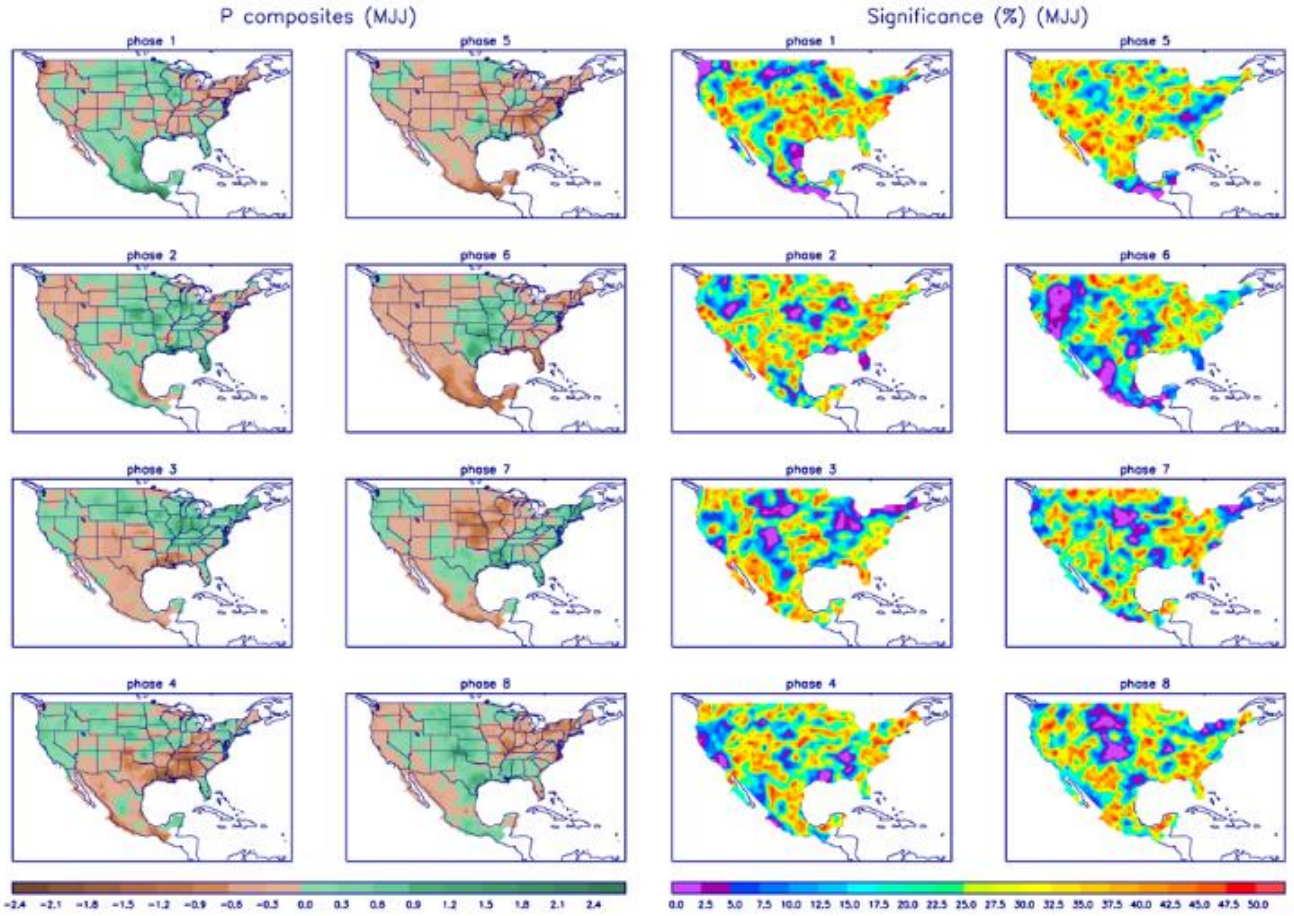


More information: http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/mjo.shtml

MJO: CONUS Composite Maps by RMM Phase - Temperature

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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