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

Update prepared by the Climate Prediction Center
Climate Prediction Center / NCEP
12 August 2019

Overview

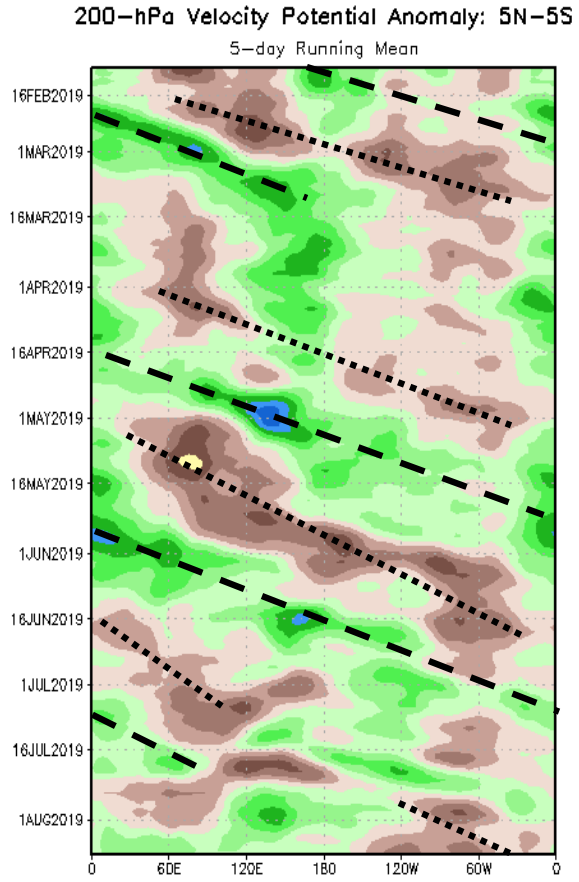
- The MJO remains weak as Rossby wave activity continues to prevail over the West Pacific.
- Dynamical models are in good agreement this week as the MJO is expected to rapidly weaken during Week-1, with some ensemble members suggesting slight re-strengthening during Week-2.
- Tropical cyclone activity is expected to remain high over the Pacific, with continued suppressed activity over the Atlantic basin.

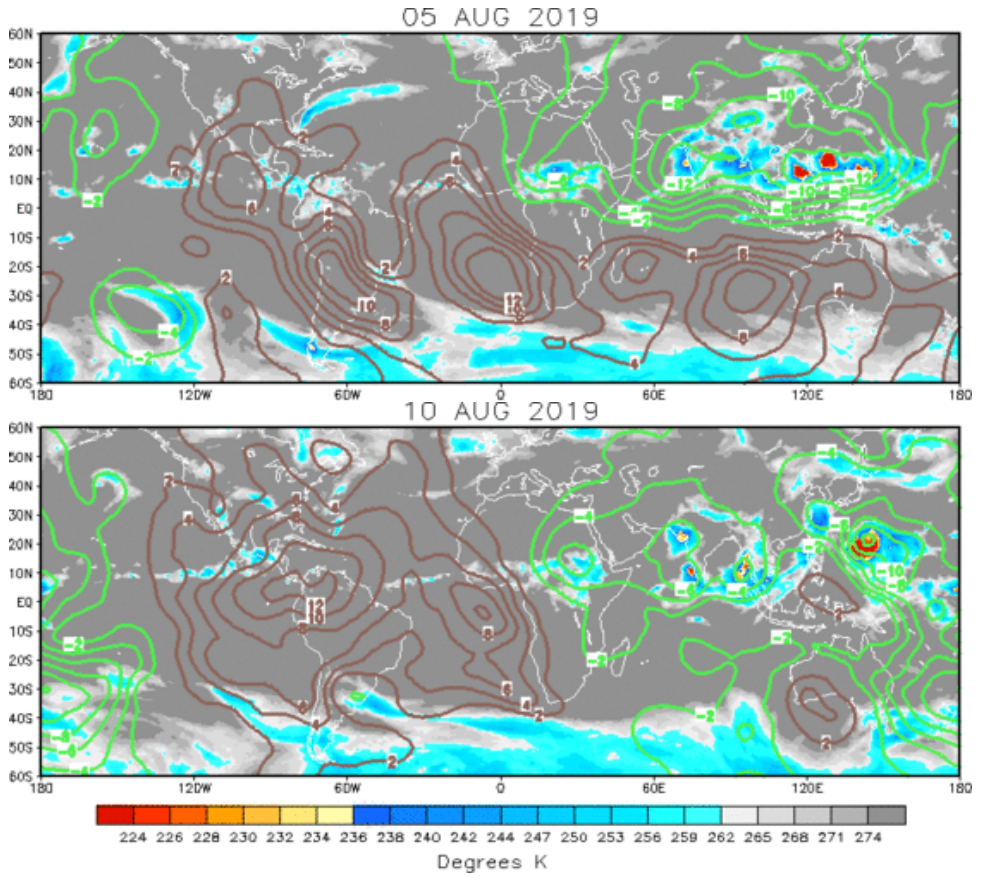
A discussion of potential impacts for the global tropics and those related to the U.S. are updated on Tuesday at:
http://www.cpc.ncep.noaa.gov/products/precip/CWlink/ghazards/index.php

200-hPa Velocity Potential Anomalies

Green shades: Anomalous divergence (favorable for precipitation).

Brown shades: Anomalous convergence (unfavorable for precipitation).

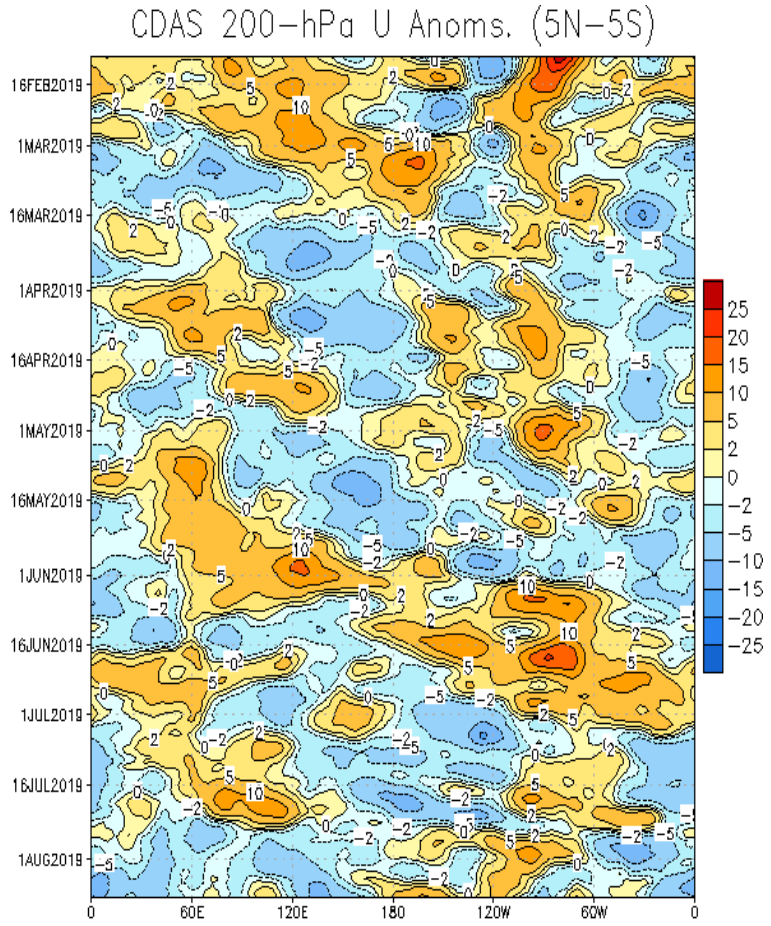


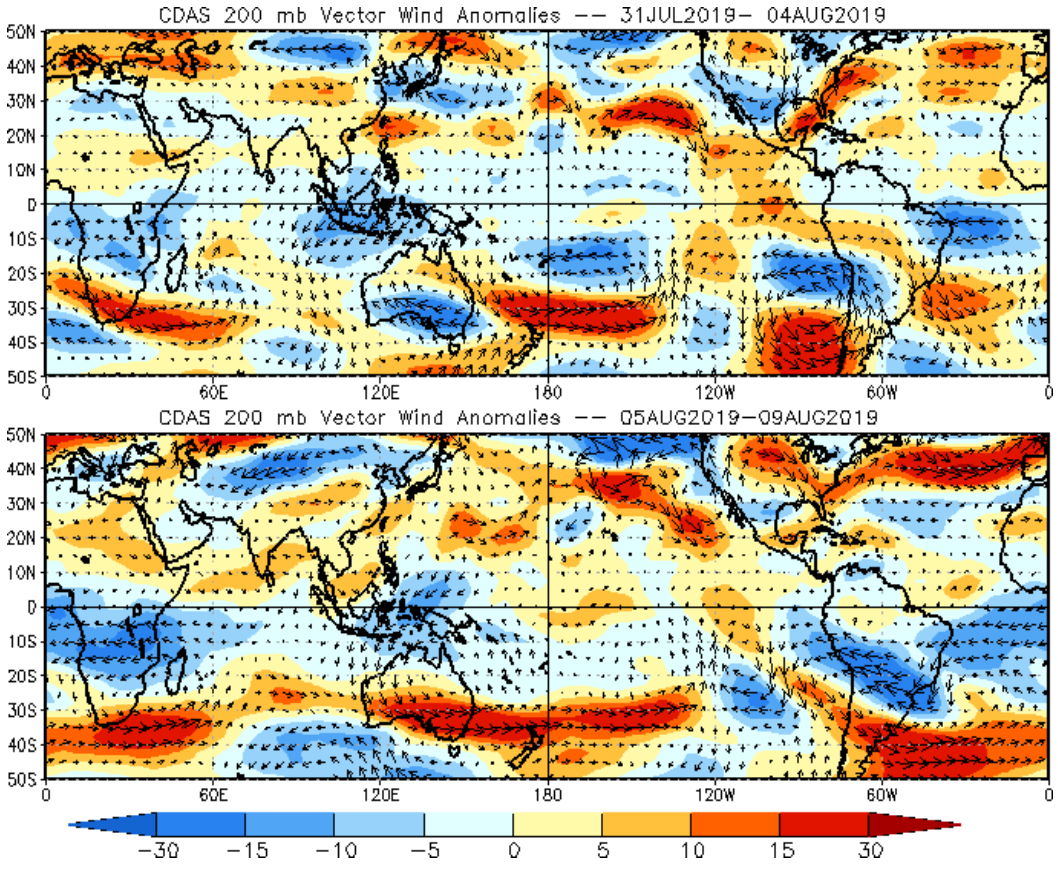


- Following two months of robust MJO activity, the intraseasonal signal remains less well defined in August due to Rossby wave interference.
- Upper-level velocity potential field more resembles a Wave-1 pattern compared to last week. Convection related to tropical cyclone activity has served to anchor the pattern over the western Pacific.
- Broadly suppressed convection remains centered from the eastern Pacific to the equatorial Atlantic.

200-hPa Wind Anomalies

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

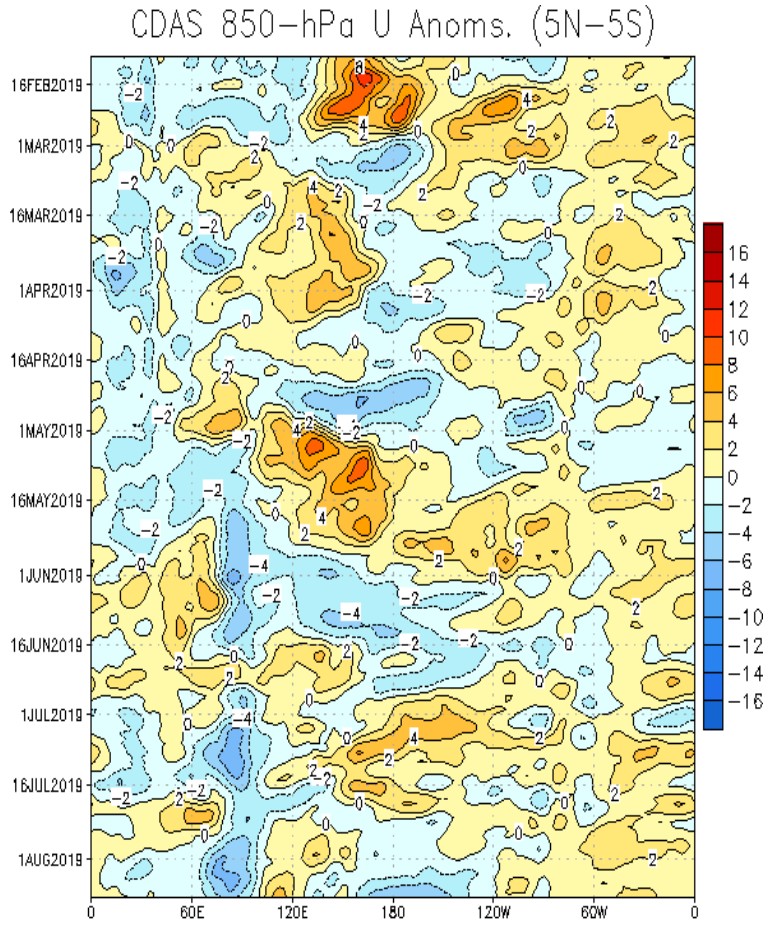


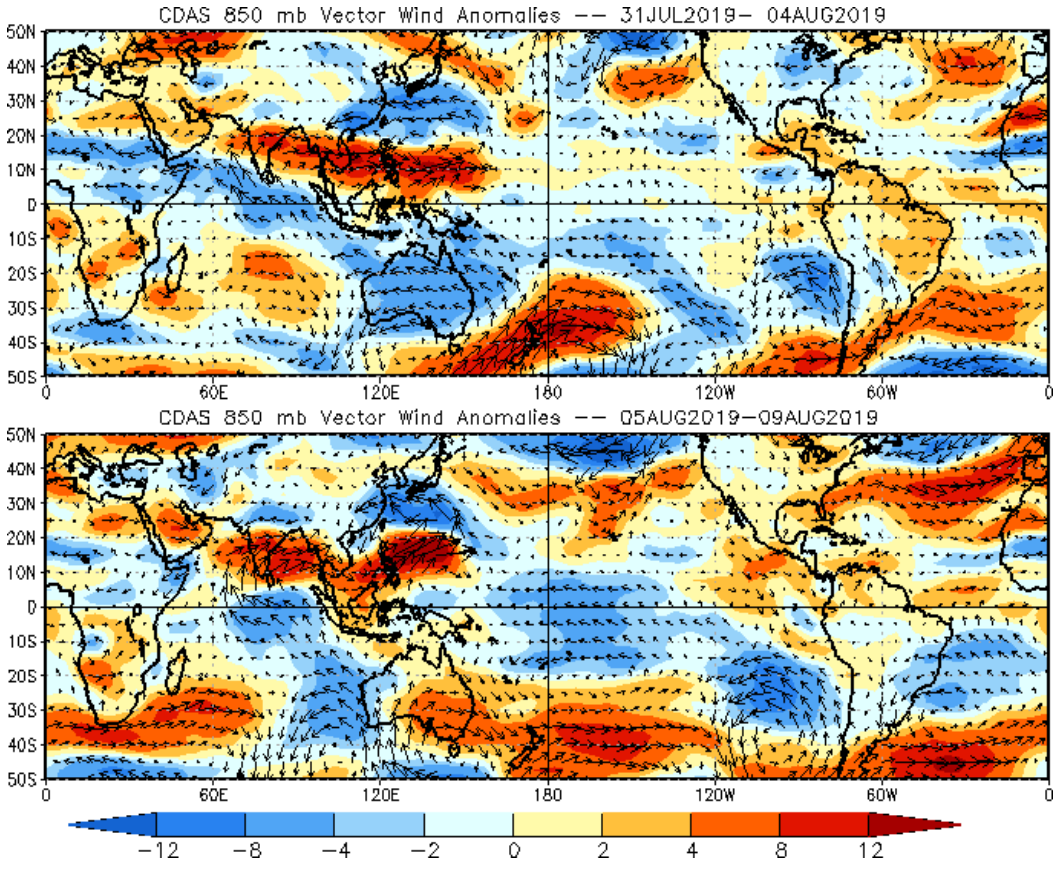


- Upper-level westerlies slightly strengthened over the central equatorial Pacific.
- Upper-level easterlies centered over the Maritime Continent shifted eastward during early August.

850-hPa Wind Anomalies

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

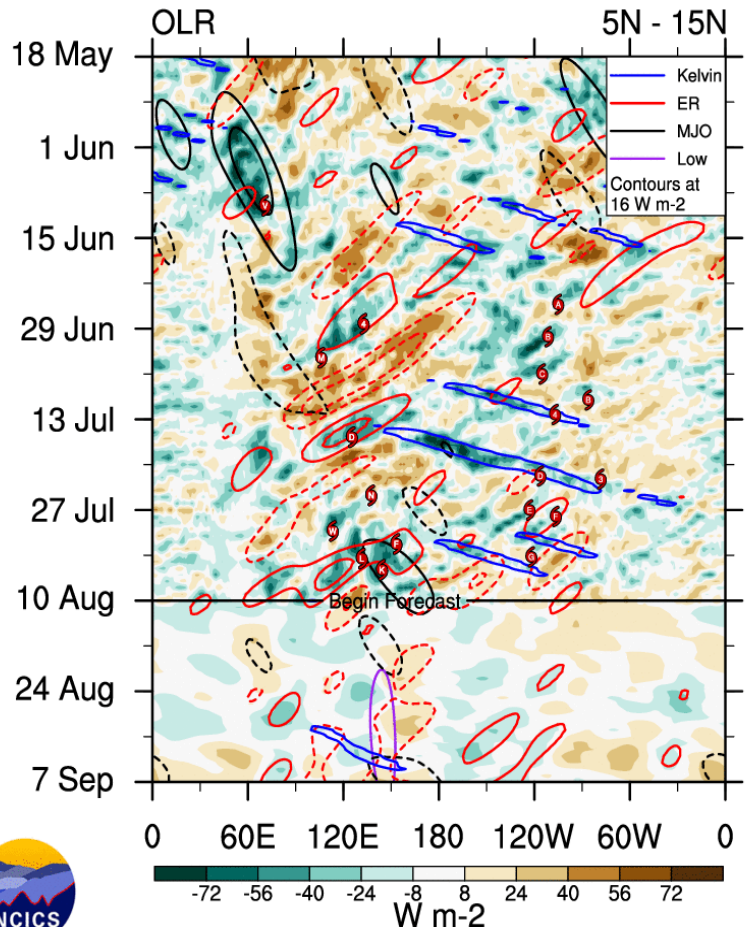


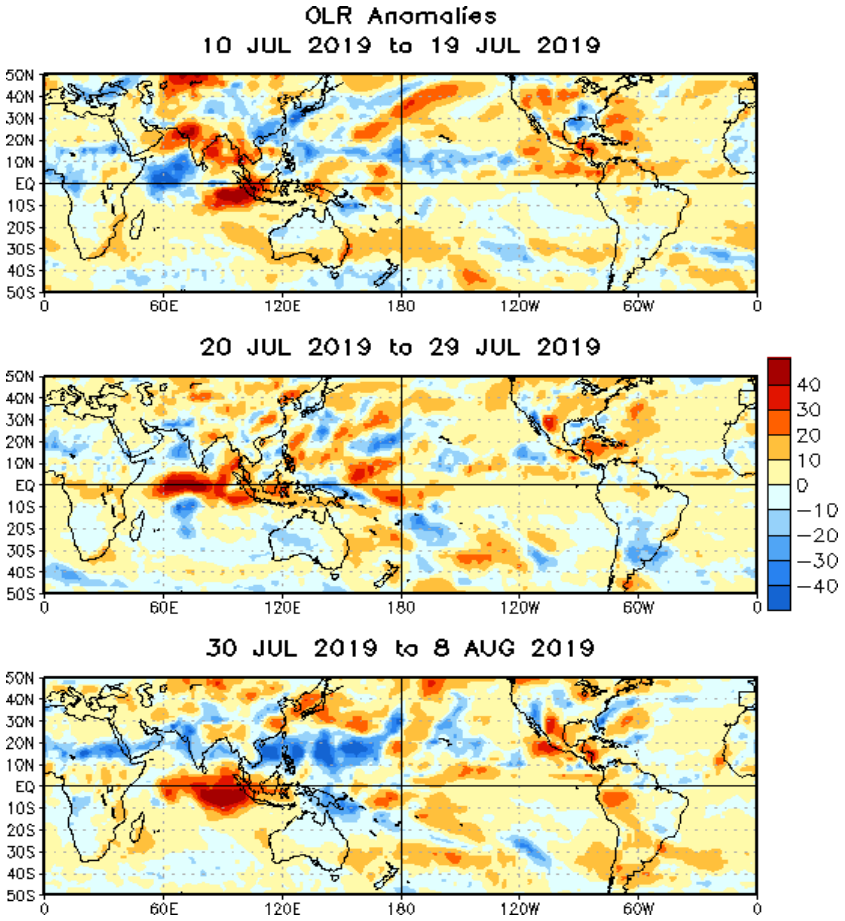


- Tropical cyclogenesis associated with Rossby wave activity remains over the Western Pacific. Little change is evident in the lower-level wind pattern over the Indian Ocean and West Pacific.
- Anomalous easterly flow strengthened over the central equatorial Pacific.

Outgoing Longwave Radiation (OLR) Anomalies

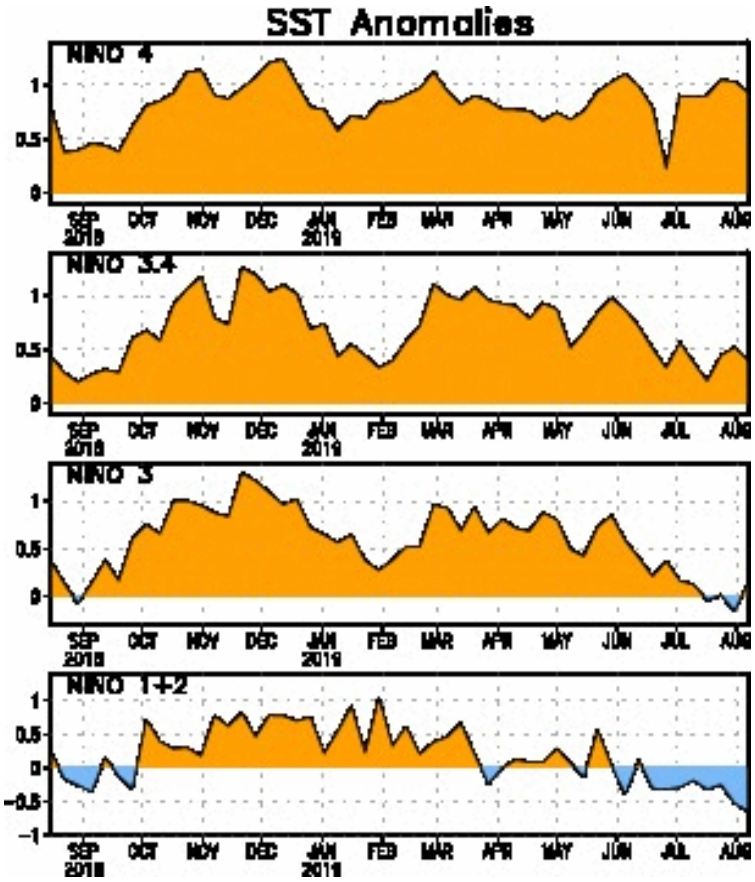
Blue shades: Anomalous convection (wetness). Red shades: Anomalous subsidence (dryness).

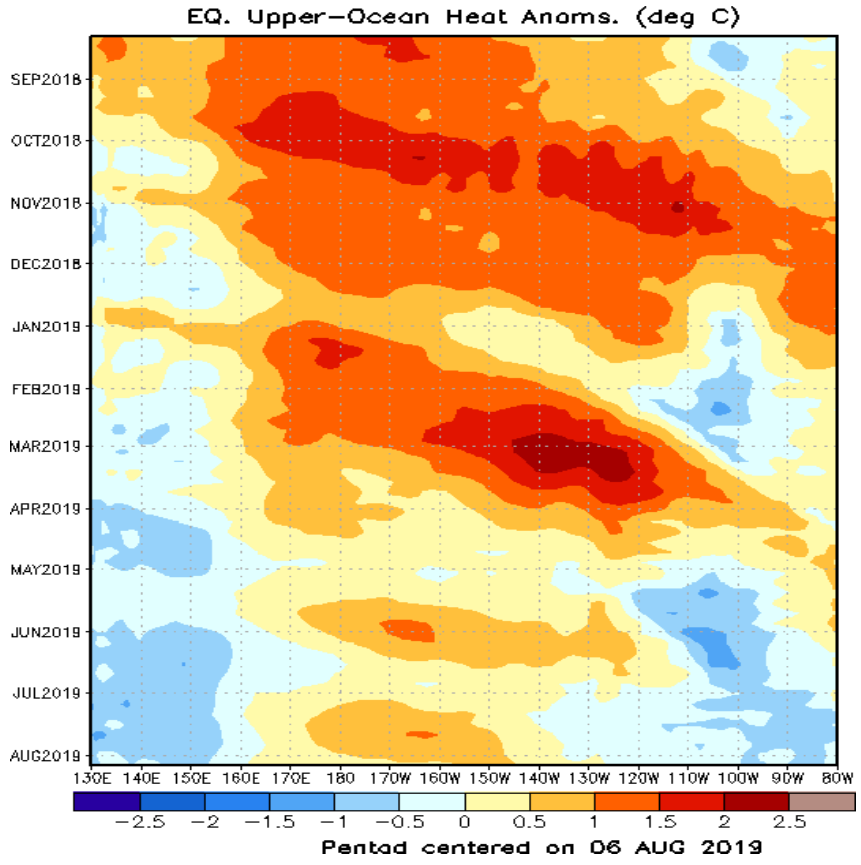




- A Kelvin wave crossing the Pacific and Western Hemisphere was the most coherent feature in the OLR field during late July and early August.
- Much of the western Pacific has been dominated by Rossby Wave activity associated with strong convection and the formation of at least three Tropical cyclones.
- Convection along the equatorial Indian Ocean continues to be suppressed.

SSTs and Weekly Heat Content Evolution in the Equatorial Pacific

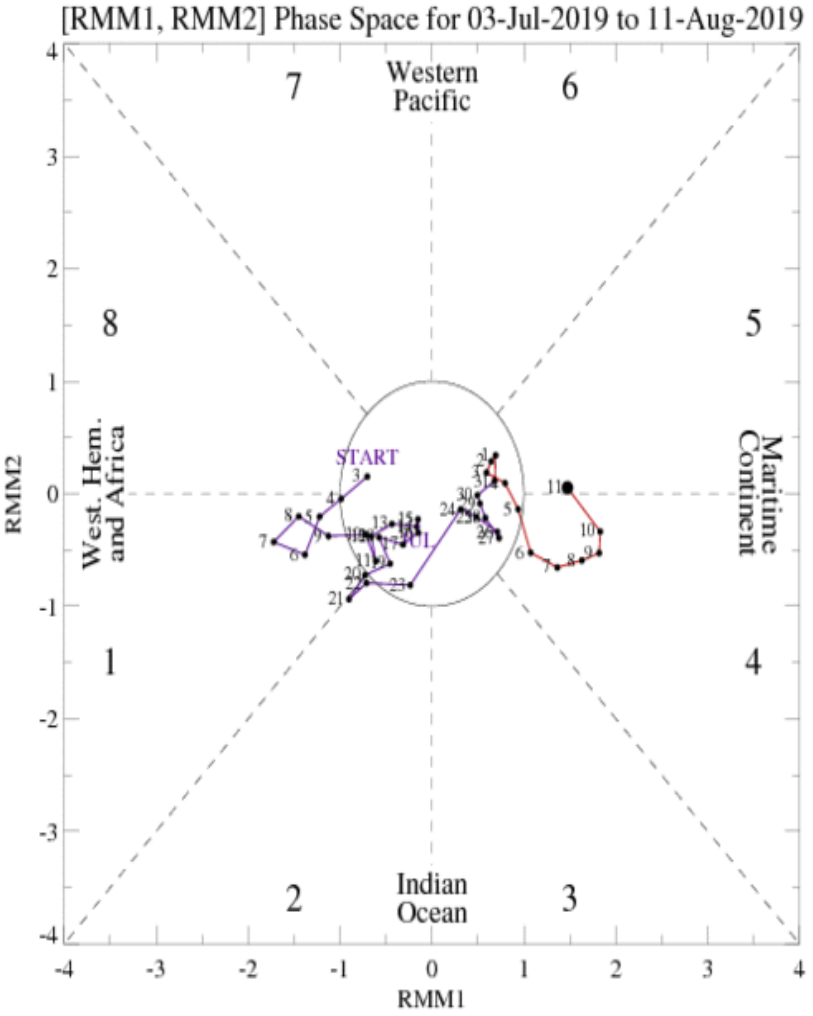




- Equatorial SST anomalies remain slightly positive across much of the equatorial Central and East Pacific, consistent with the weakening El Niño event.
- A downwelling Kelvin wave event was evident over the central and eastern Pacific during mid-May through mid-June, but its amplitude was weaker than what was observed in previous events. Overall, upper-ocean heat content has continued to steadily decline over the past several months.
- Another weak downwelling wave developed in response to recent period of anomalous westerlies over the central Pacific.

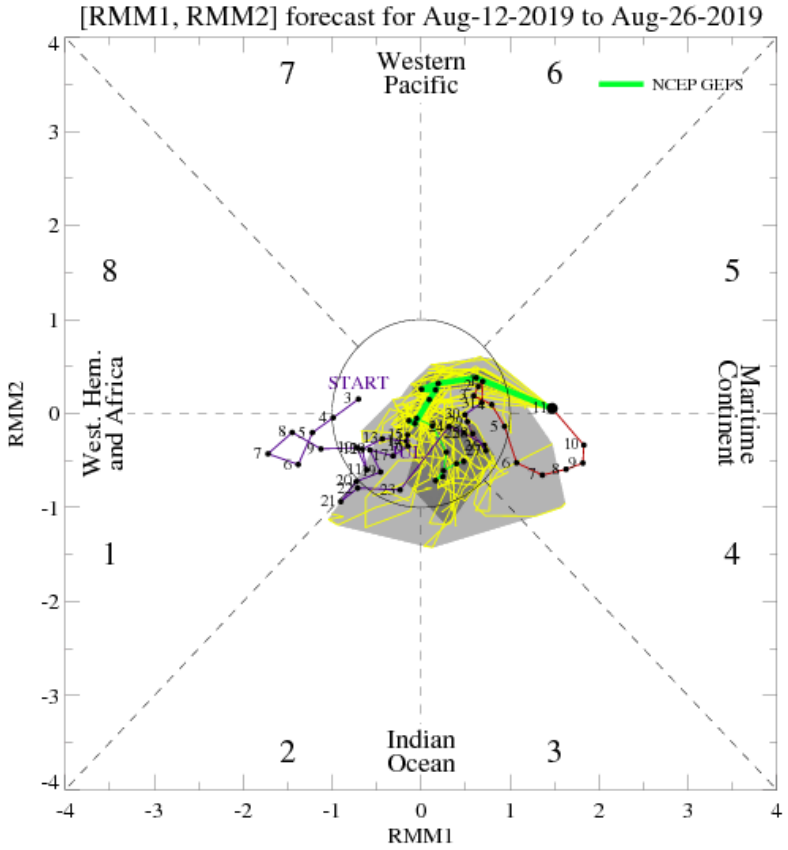
MJO Index: Recent Evolution

- The projection of the intraseasonal signal in RMM space remains weak.

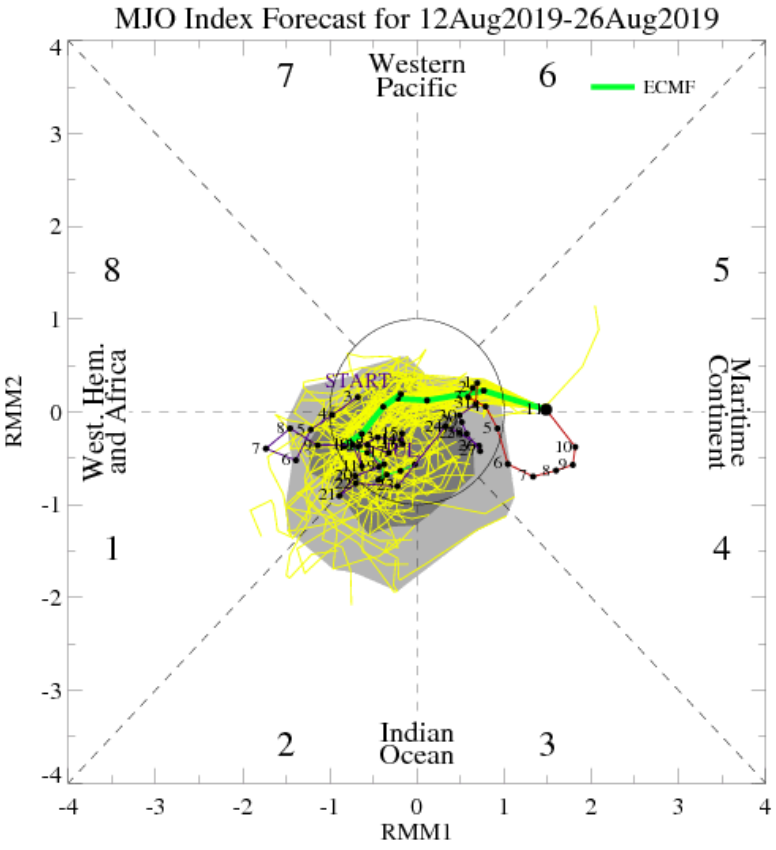


For more information on the RMM index and how to interpret its forecast please see:
https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CPC_MJOinformation.pdf

MJO Index: Forecast Evolution



GEFS Forecast

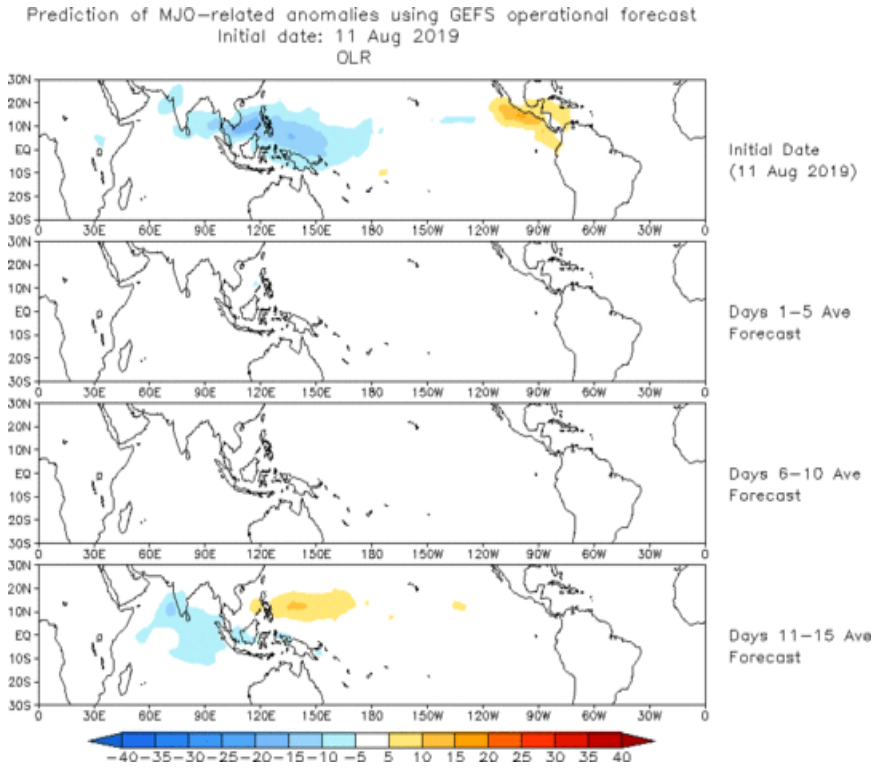


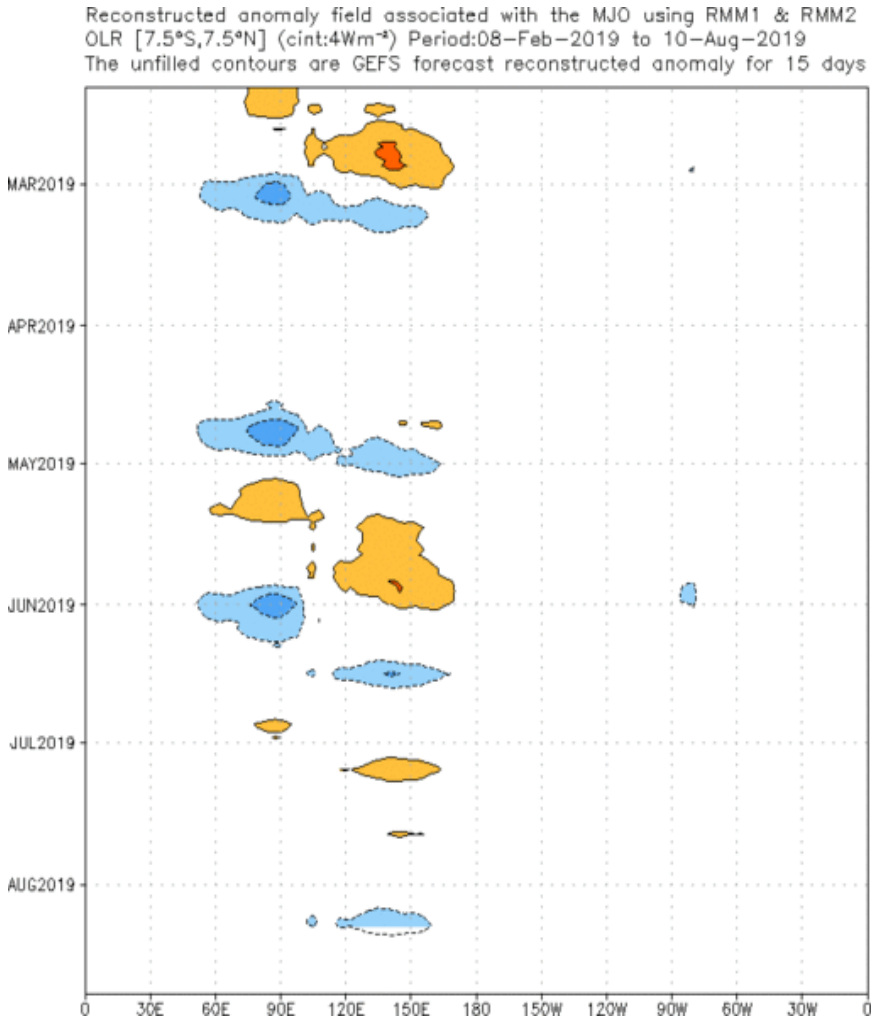
ECMWF Forecast

- Both the GEFS and ECMWF rapidly weaken the RMM signal over the Maritime Continent during the early potion of Week-1.
- The GEFS forecast suggests some reemergence of the MJO signal during Week-2, but generally favors a weak MJO outlook. Few ensemble members show robust eastward propagation of the signal.

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.)

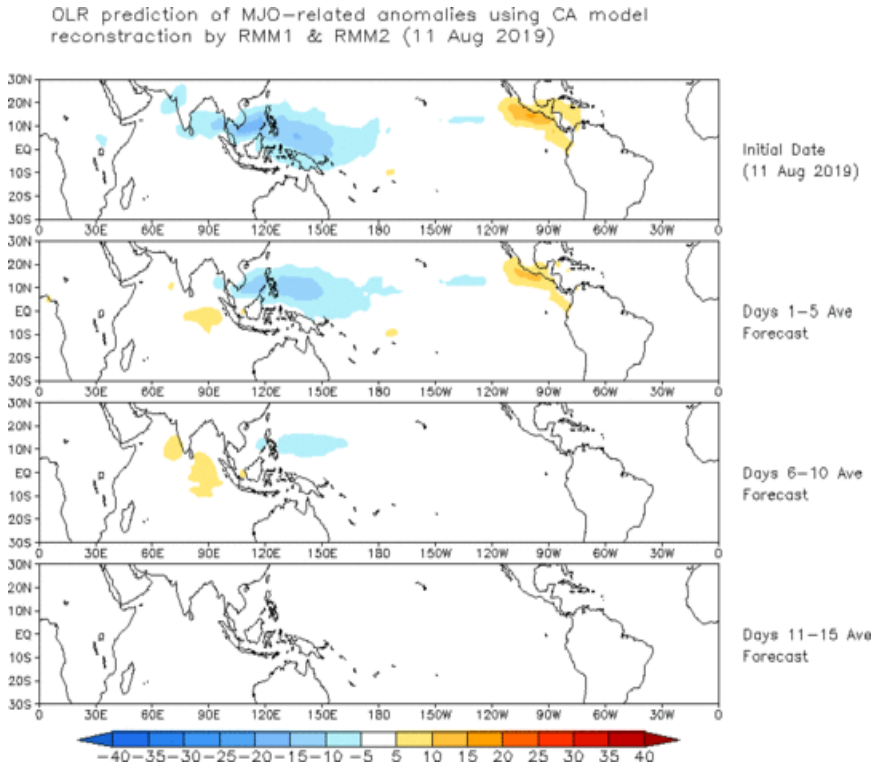


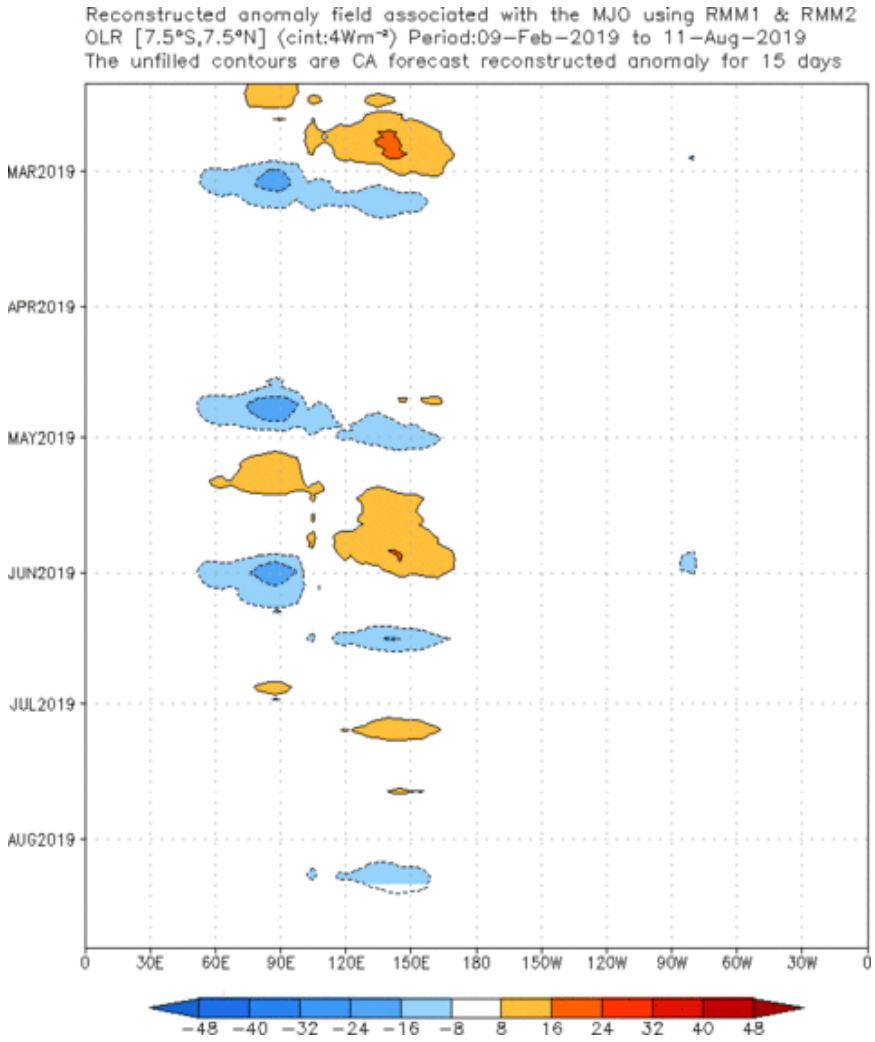


- The spatial depiction of OLR anomalies based on the GEFS RMM index shows a weakly amplified signal initially.

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.)

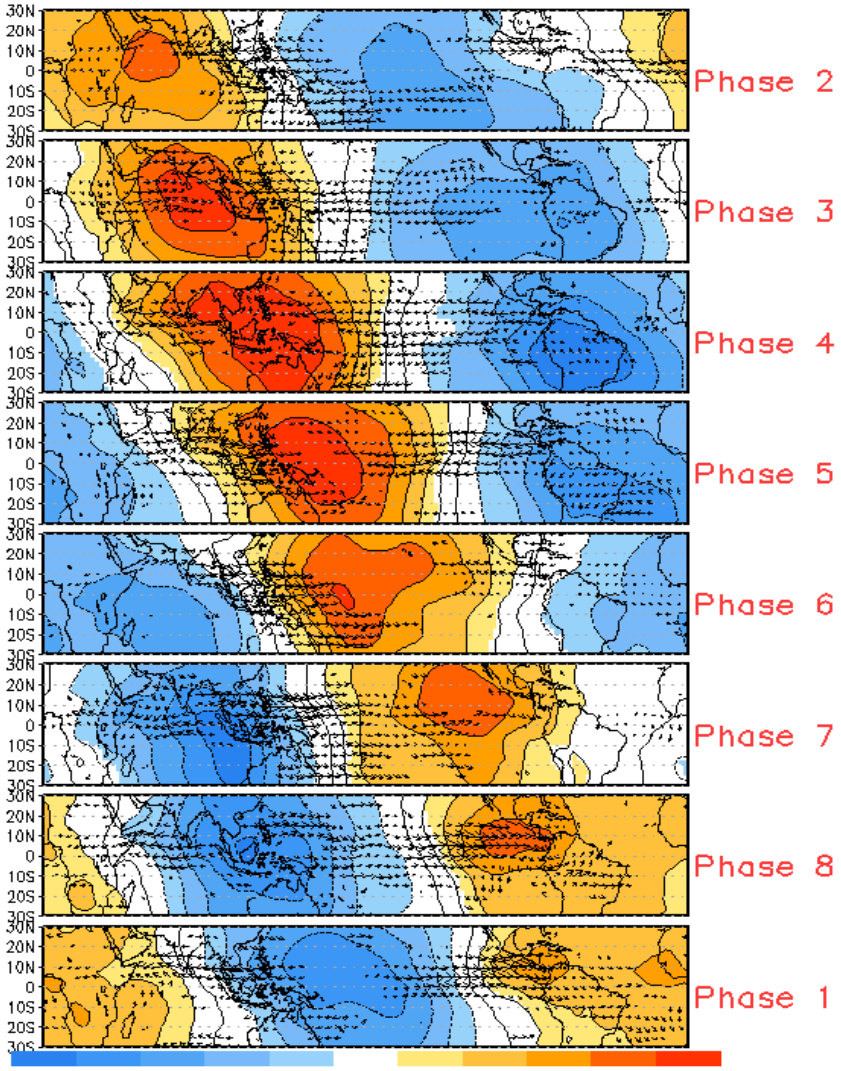




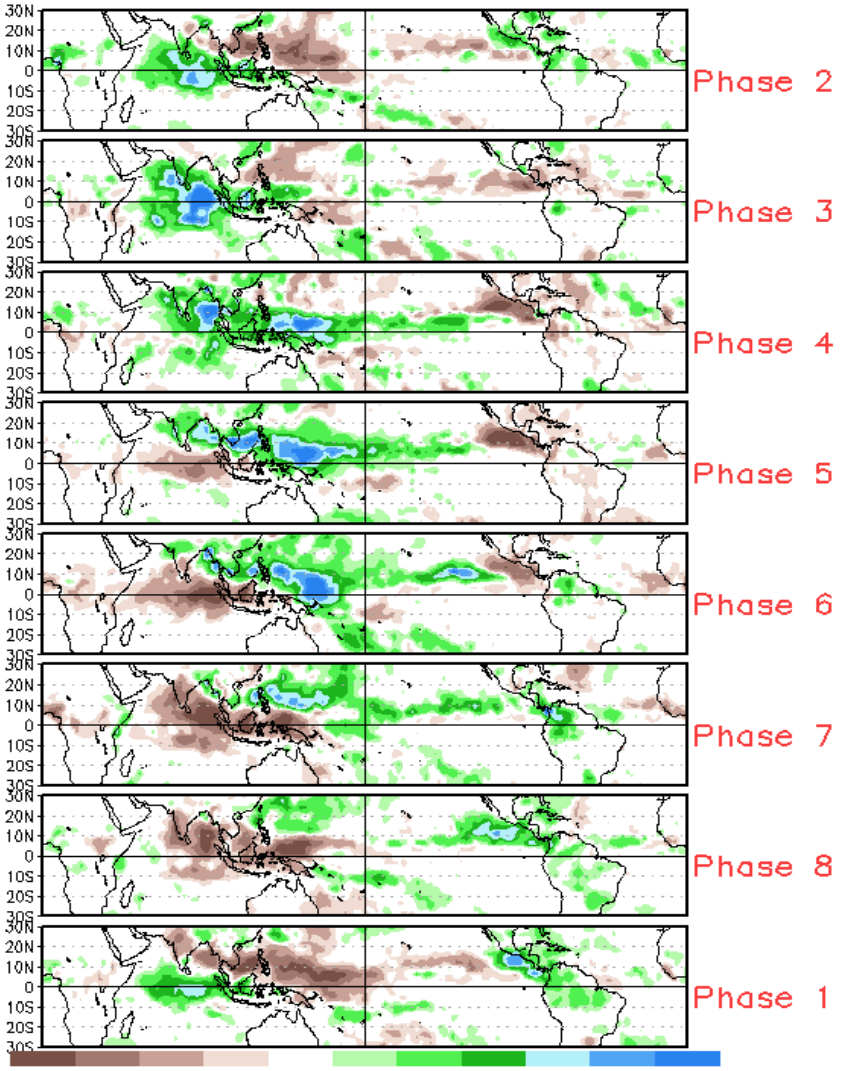
- The constructed analog MJO forecast also shows a stationary and weak predicted OLR signal.

MJO: Tropical Composite Maps by RMM Phase

850-hPa Velocity Potential and Wind Anomalies



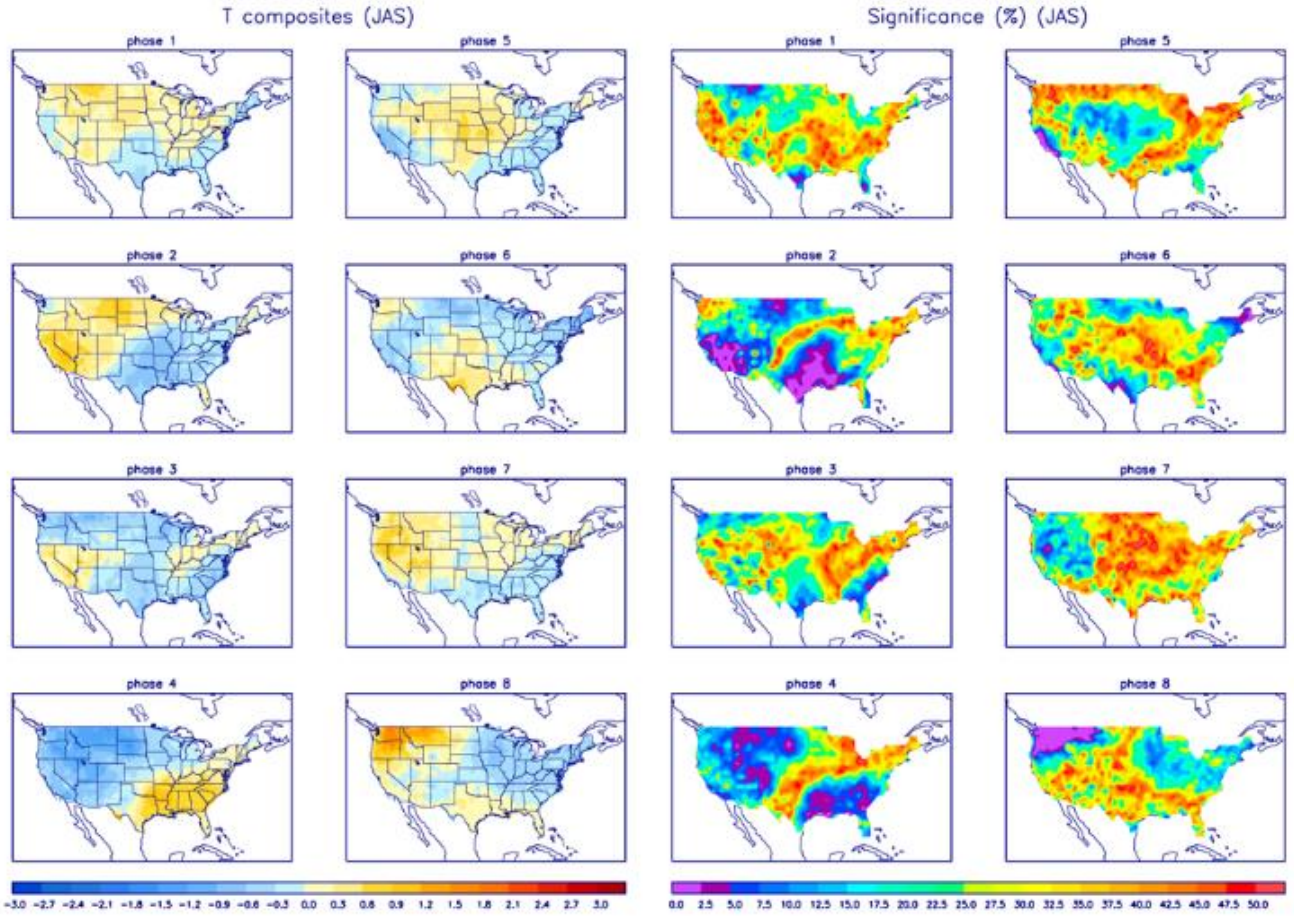
Precipitation Anomalies



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.

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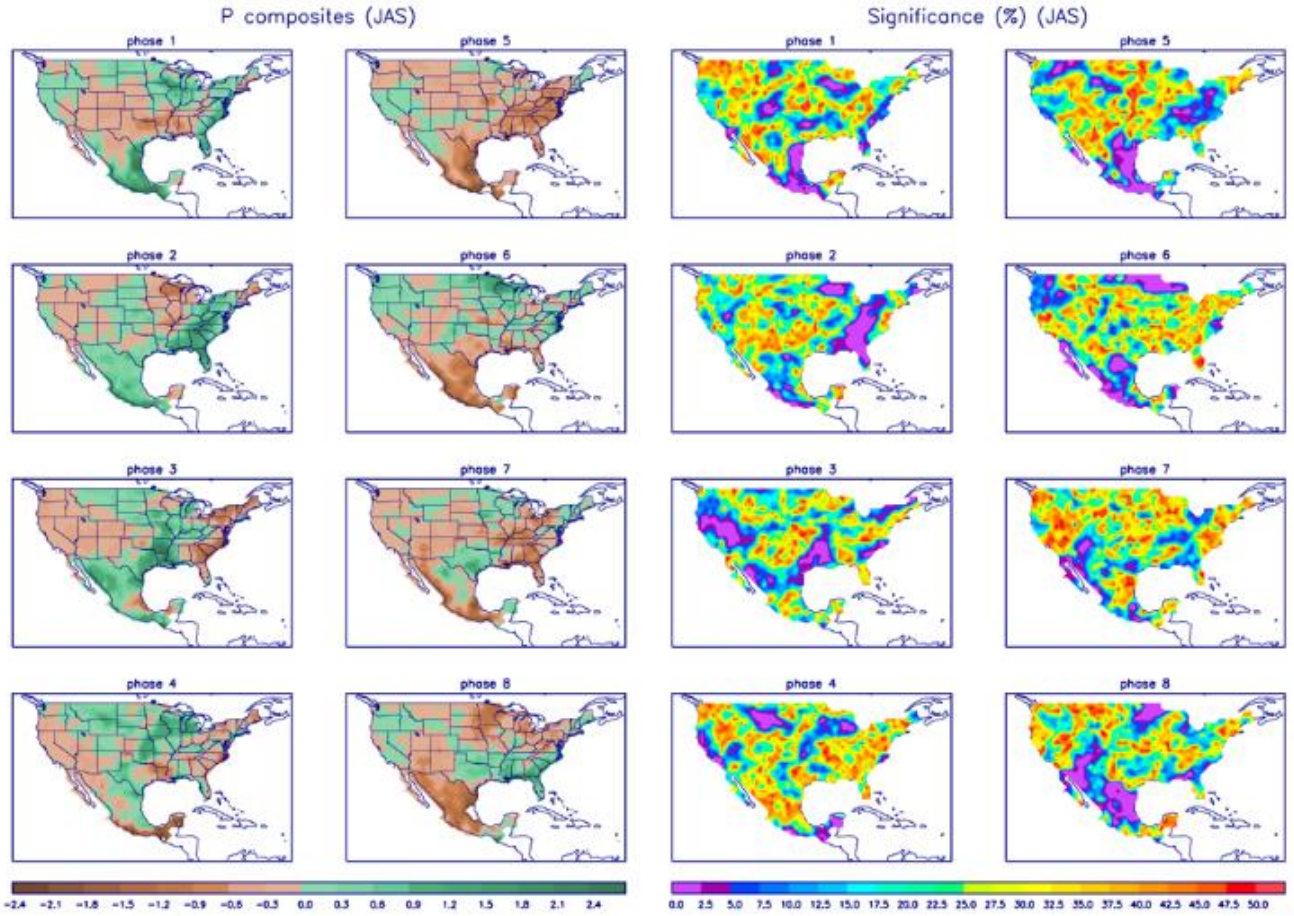

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