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

Update prepared by
Climate Prediction Center / NCEP
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Outline

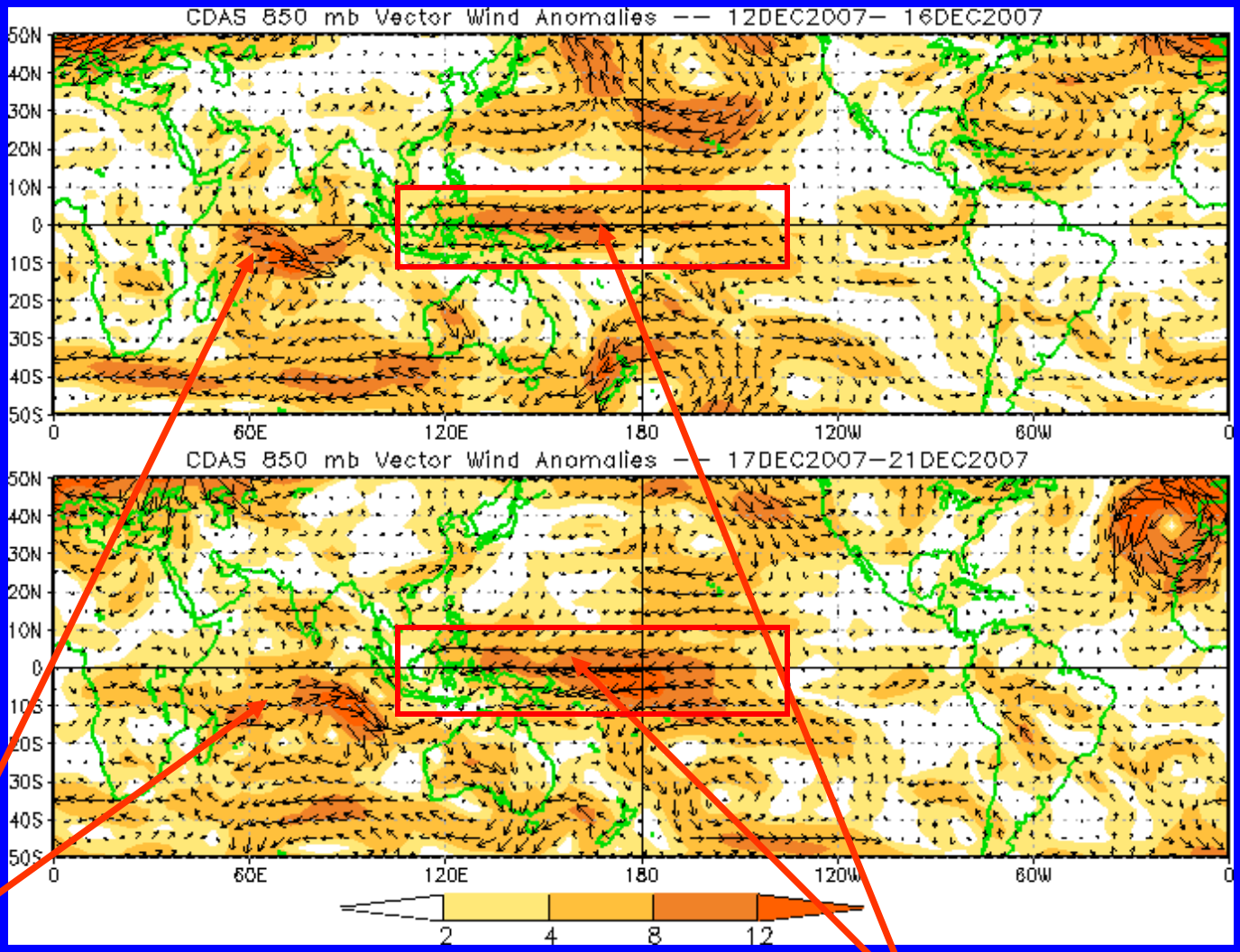
- Overview
- Recent Evolution and Current Conditions
- Madden-Julian Oscillation Forecast

Overview

- **Moderate MJO activity continues. After a short break, eastward propagation has resumed during the past week and the enhanced phase is currently centered in the western Maritime continent region.**
- **The latest observations and forecast tools indicate continued MJO activity but with reduced eastward propagation and a weakening signal during the period. Considerable spread is shown by the dynamical MJO forecast tools.**
- **It is likely that the enhanced phase of the MJO will be centered across the entire Maritime continent during most of the period.**
- **Likely impacts associated with the MJO include wet conditions stretching from the Maritime continent into the far western Pacific Ocean during the period and an elevated risk of tropical cyclogenesis for the waters northwest of Australia.**
- **Some potential exists for a heavy precipitation event tied to tropical convection during week 3. Currently, however, details of this potential event are unclear but interests along the west coast of the US should monitor the status of the MJO during the next 1-2 weeks.**

850-hPa Vector Wind Anomalies (m s^{-1})

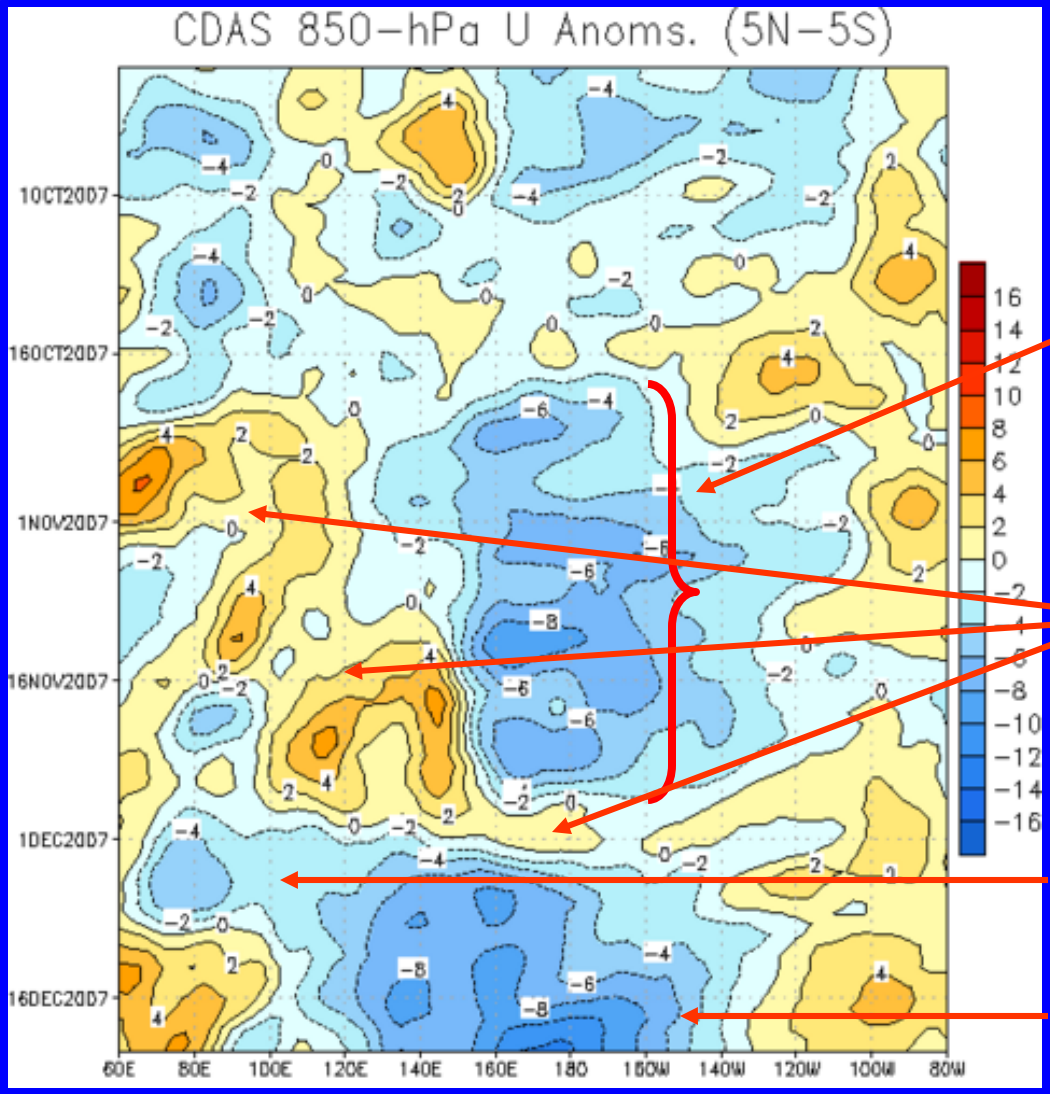
Note that shading denotes the magnitude of the anomalous wind vectors



Westerly anomalies developed in the Indian Ocean (mainly south of the equator) during the last ten days.

Easterly anomalies strengthened across the western Pacific Ocean during the last five days but have shown little eastward movement.

850-hPa Zonal Wind Anomalies (m s^{-1})



Time

Longitude

Westerly anomalies (orange/red shading) represent anomalous west-to-east flow.

Easterly anomalies (blue shading) represent anomalous east-to-west flow.

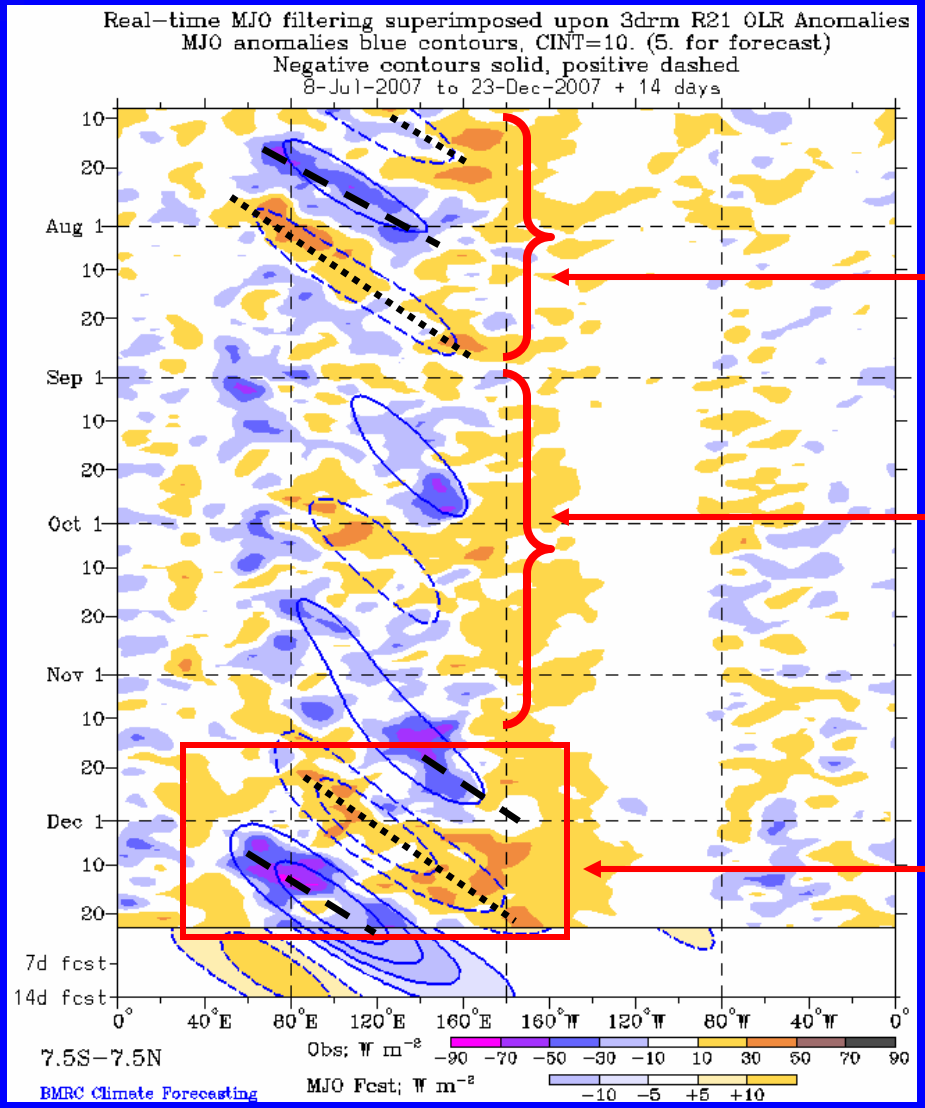
Strong easterlies were in place from mid-October through mid-November across much of the Pacific generally stretching from 150E to 150W.

Beginning in late October, anomalous westerlies shifted eastward, first slowly, from the Indian Ocean to the Maritime continent and later more quickly to the Date Line.

During early-mid December, easterly anomalies developed across the Indian Ocean and shifted eastwards.

Most recently, westerly anomalies are once again evident in the western Indian Ocean and the easterlies have strengthened near the Date Line.

Outgoing Longwave Radiation (OLR) Anomalies (7.5°S-7.5°N)



Time

Longitude

Drier-than-normal conditions, positive OLR anomalies (yellow/orange shading)

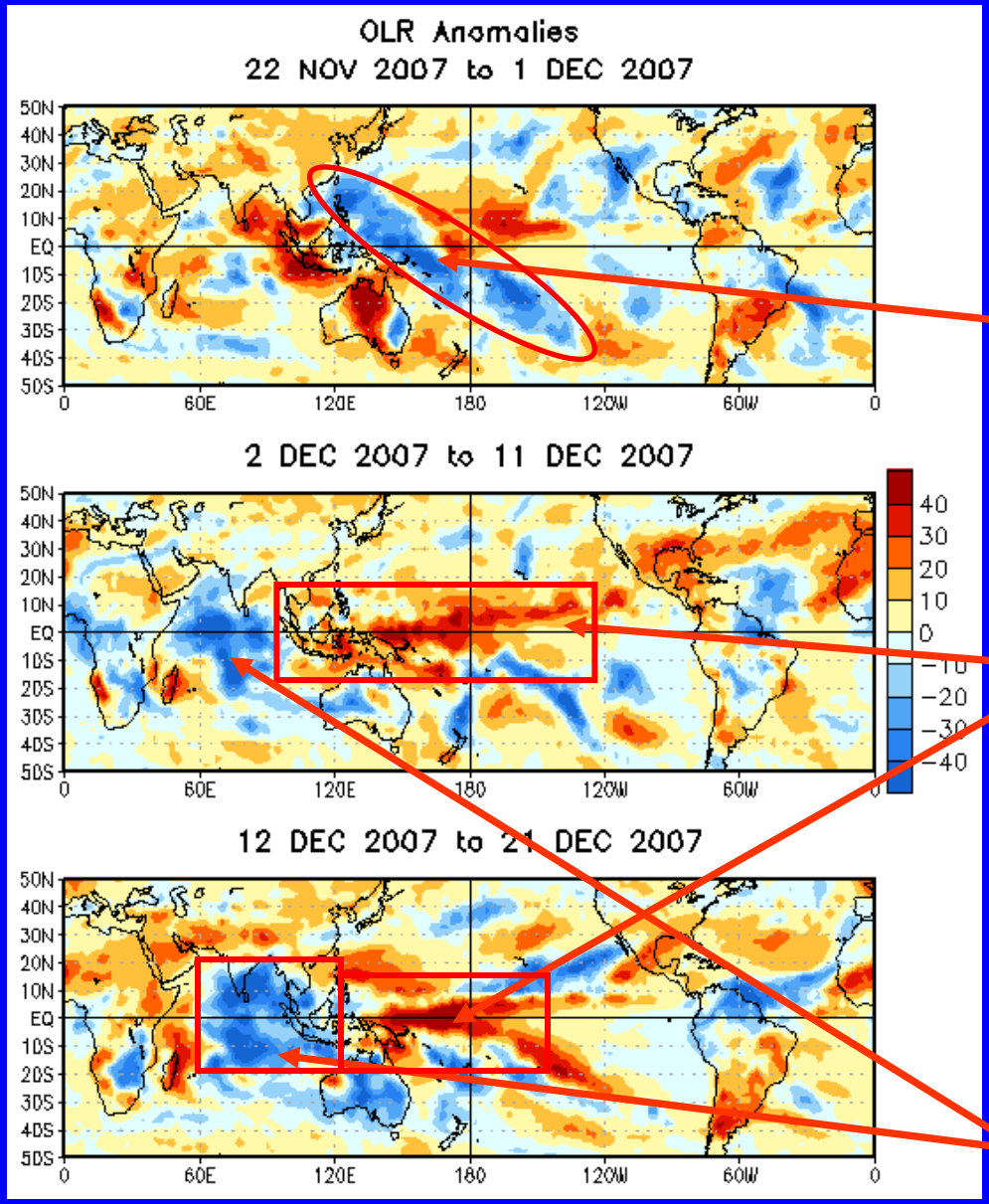
Wetter-than-normal conditions, negative OLR anomalies (blue shading)

Weak-moderate MJO activity was observed during July and August as regions of suppressed and enhanced convection shifted eastward.

Intraseasonal variability was also evident during September and October with a longer period and included some extended periods of more stationary anomalous convection.

The MJO became strong in mid-November and continues at a more moderate strength. Currently, enhanced convection is shifting to the Maritime continent region with suppressed convection near the Date Line.

OLR Anomalies: Last 30 days



Drier-than-normal conditions, positive OLR anomalies (/red shading)

Wetter-than-normal conditions, negative OLR anomalies (blue shading)

During late November, enhanced convection stretched from the western Pacific Ocean to the South Pacific Convergence Zone (SPCZ) and began to shift eastwards as the MJO strengthened.

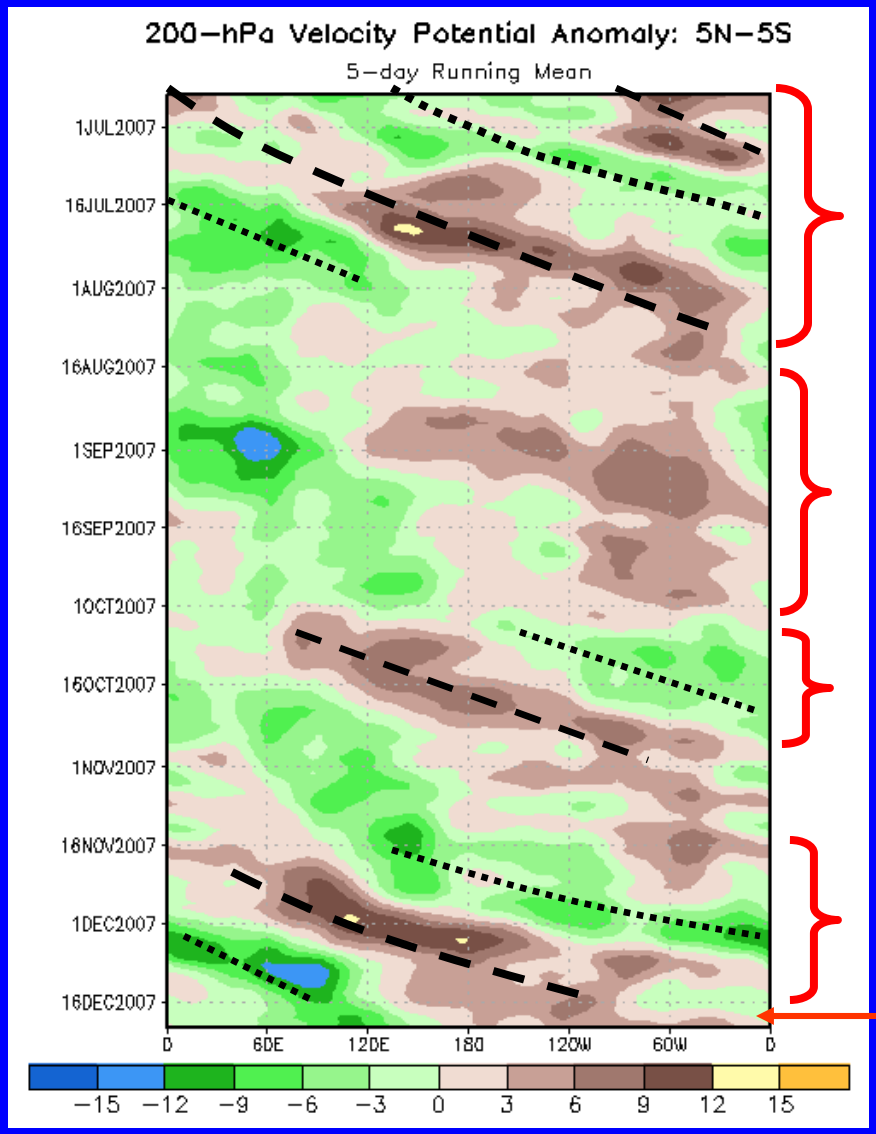
Mainly dry conditions prevailed across much of the Maritime continent and western Pacific Ocean during early-mid December as the MJO phase shifted eastwards.

During mid December, very wet conditions again developed in the Indian Ocean and Australia.

200-hPa Velocity Potential Anomalies (5°S-5°N)

Positive anomalies (brown shading) indicate unfavorable conditions for precipitation.

Negative anomalies (green shading) indicate favorable conditions for precipitation.



Time

Longitude

From mid-May into early August, weak to moderate MJO activity was observed as velocity potential anomalies increased and propagated eastwards.

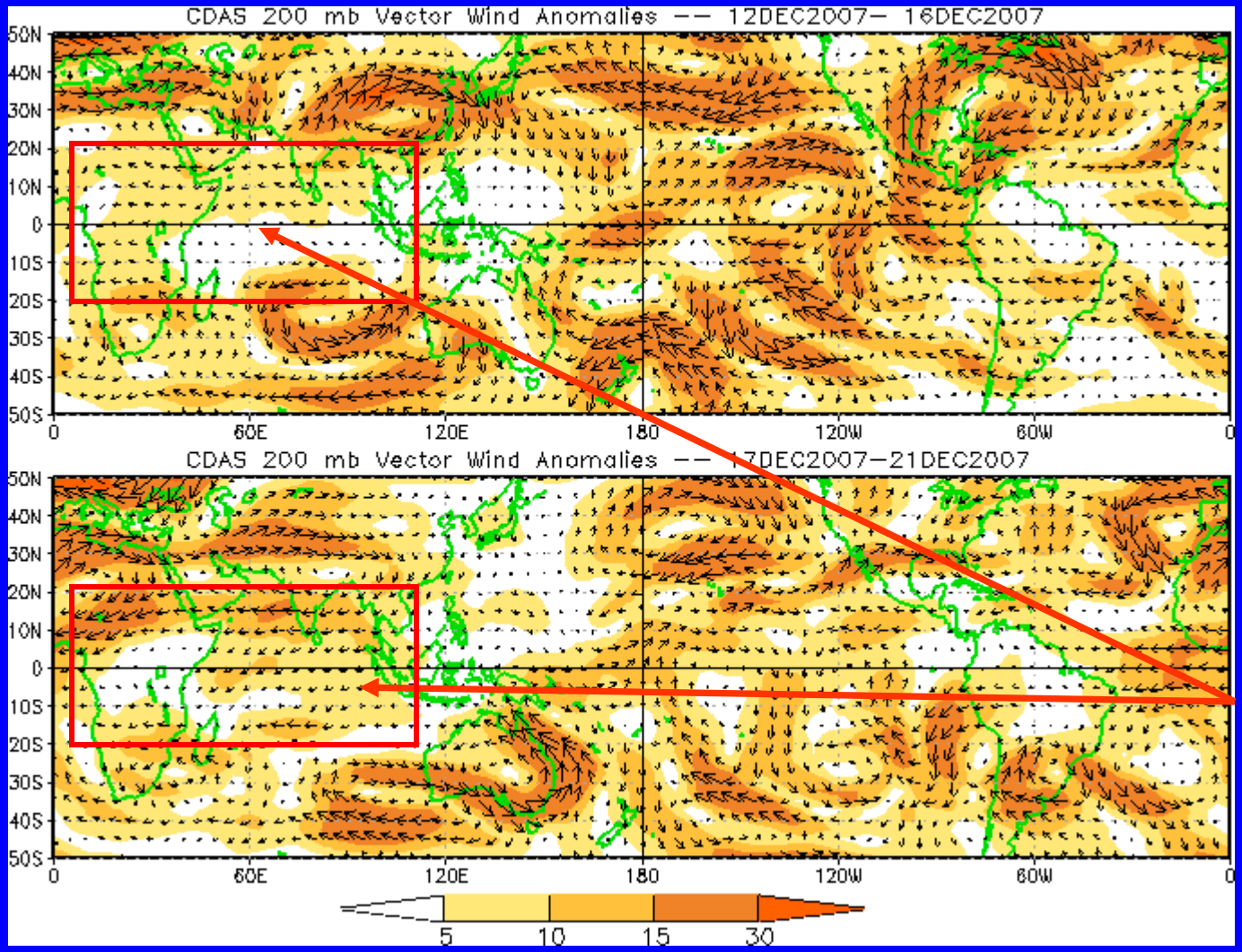
The MJO was weak or incoherent during much of August and September.

The MJO strengthened during October but coherent propagation was somewhat short-lived.

The strongest and most coherent MJO activity since the summer period developed during the second half of November and continues.

Eastward propagation, however, has decreased markedly as indicated by the more stationary nature of the velocity potential anomalies and indicates that the MJO may have weakened somewhat.

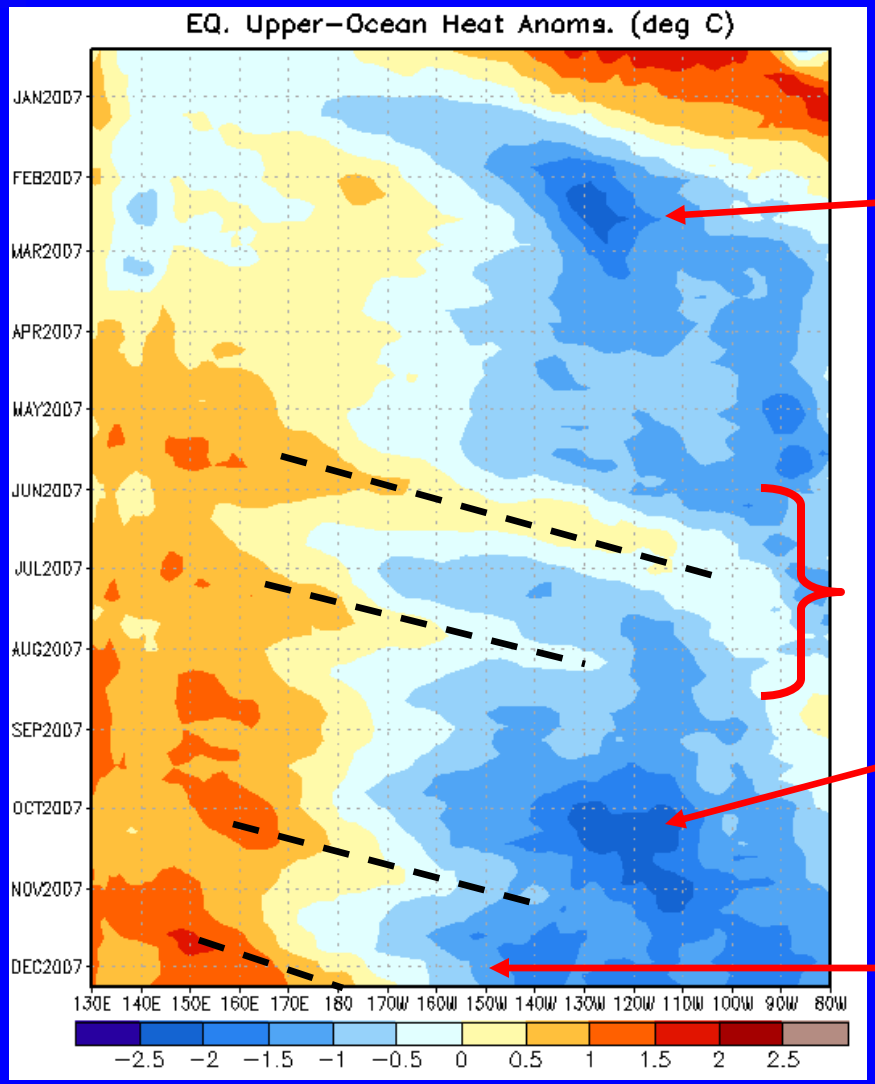
200-hPa Vector Wind Anomalies (m s^{-1})



Note that shading denotes the magnitude of the anomalous wind vectors

Easterly anomalies have increased across the Indian Ocean during the last five days.

Weekly Heat Content Evolution in the Equatorial Pacific



Time

Longitude

Beginning in February, negative heat content anomalies developed across the eastern equatorial Pacific and continued until June 2007.

Weak Kelvin wave activity was observed from May into August and affected the sub-surface temperature departures and resulted in slightly positive anomalies during June.

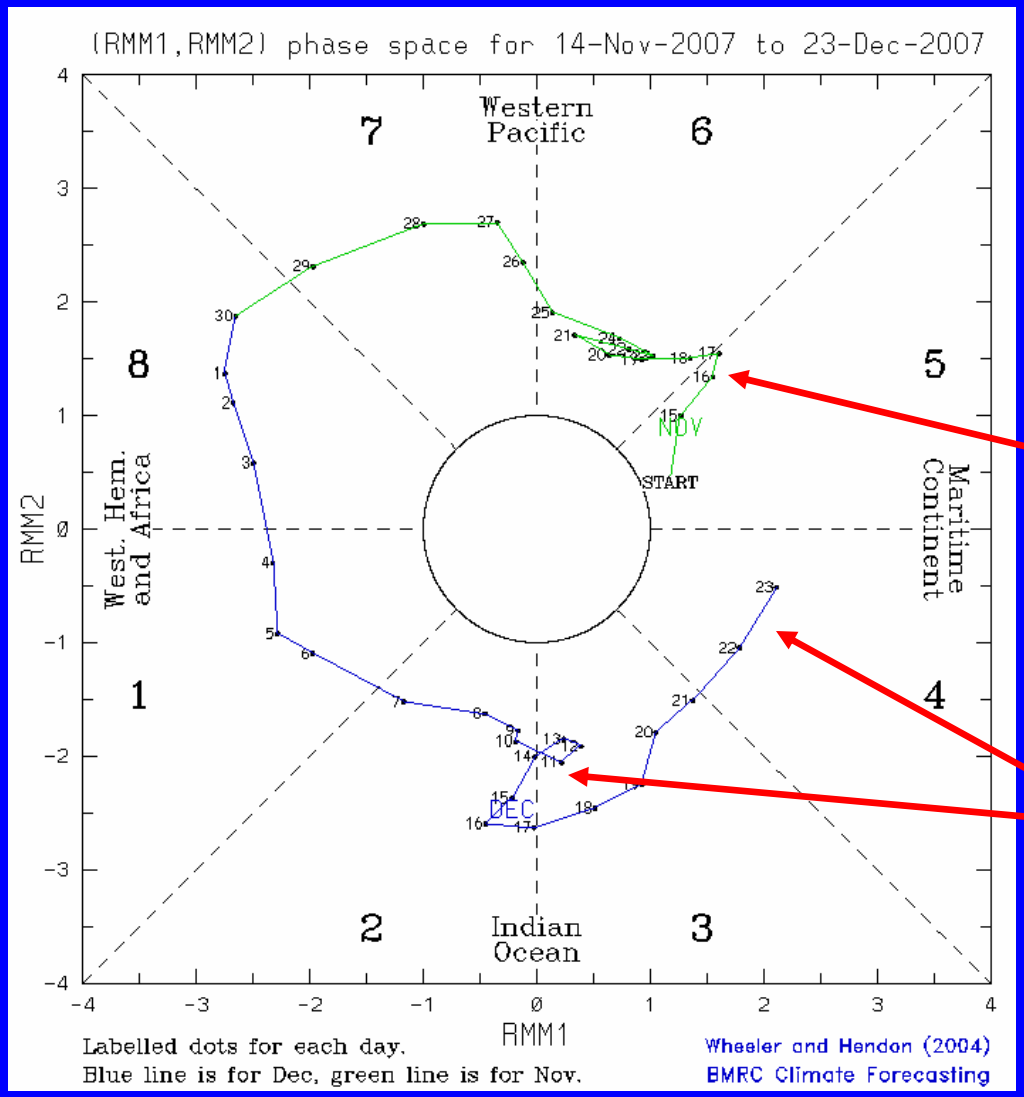
During September and October, negative heat content anomalies increased markedly across the eastern Pacific Ocean.

Most recently, a stronger downwelling Kelvin wave is indicated with positive sub-surface temperature departures extending to 170W.

MJO Index

The current state of the MJO as determined by an index based on Empirical Orthogonal Function (EOF) analysis using combined fields of near-equatorially-averaged 850-hPa and 200-hPa zonal wind and outgoing longwave radiation (OLR) (Wheeler and Hendon, 2004).

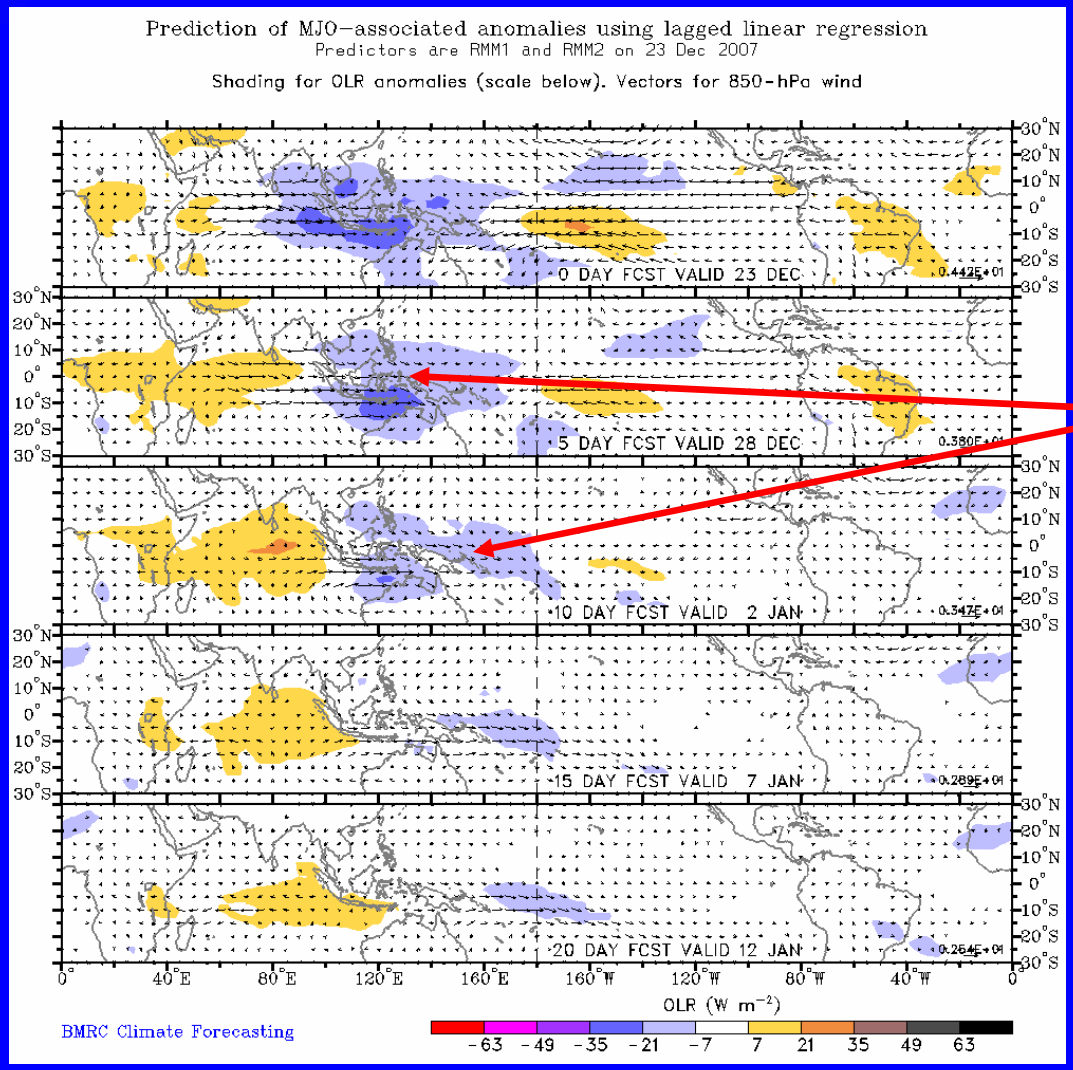
The axes represent the time series of the two leading modes of variability and are used to measure the amplitude while the triangular areas indicate the phase or location of the enhanced phase of the MJO. The farther away from the center of the circle the stronger the MJO. Different color lines indicate different months.



The MJO index increased in amplitude during mid-late November and propagated rapidly eastward until mid-December.

Eastward propagation ceased briefly in mid-December but has since renewed with the enhanced phase now centered in the western Maritime continent.

Statistical MJO OLR Forecast

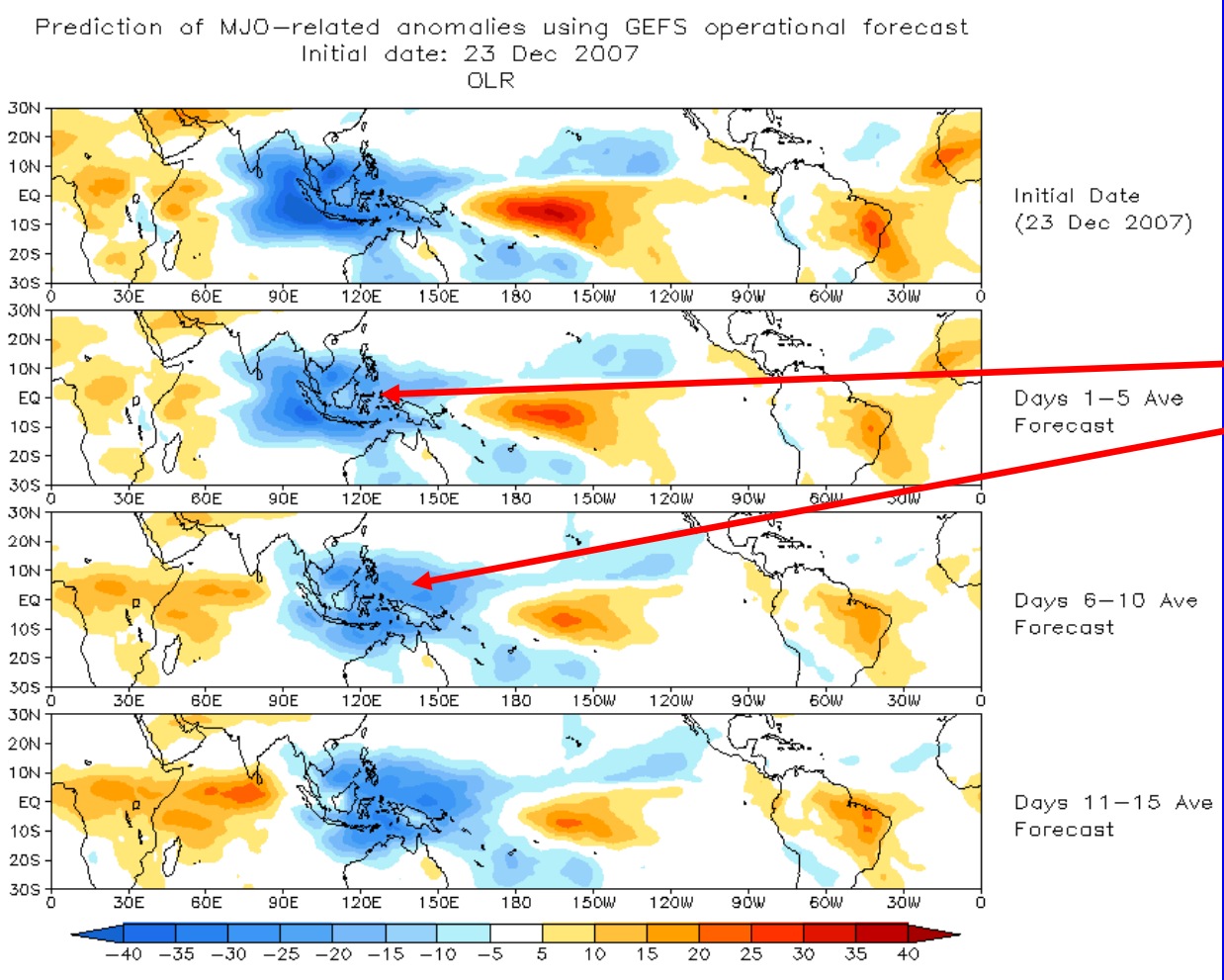


The statistical MJO forecast indicates moderate MJO activity during the upcoming 1-2 week period.

Wet conditions are forecast for the Maritime continent during the period with an increase in convection across the western Pacific Ocean during week 2.

Dry conditions are forecast across sections of South America and Africa during week 1 and in the Indian ocean by week 2.

Experimental GFS MJO OLR Forecast



The GFS forecasts a moderate to strong MJO signal but with little eastward propagation during the period.

Wet conditions are expected for the Maritime continent throughout the period with suppressed convection forecast for South America and Africa.