



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

**Update prepared by
Climate Prediction Center / NCEP
December 3, 2007**



Outline

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



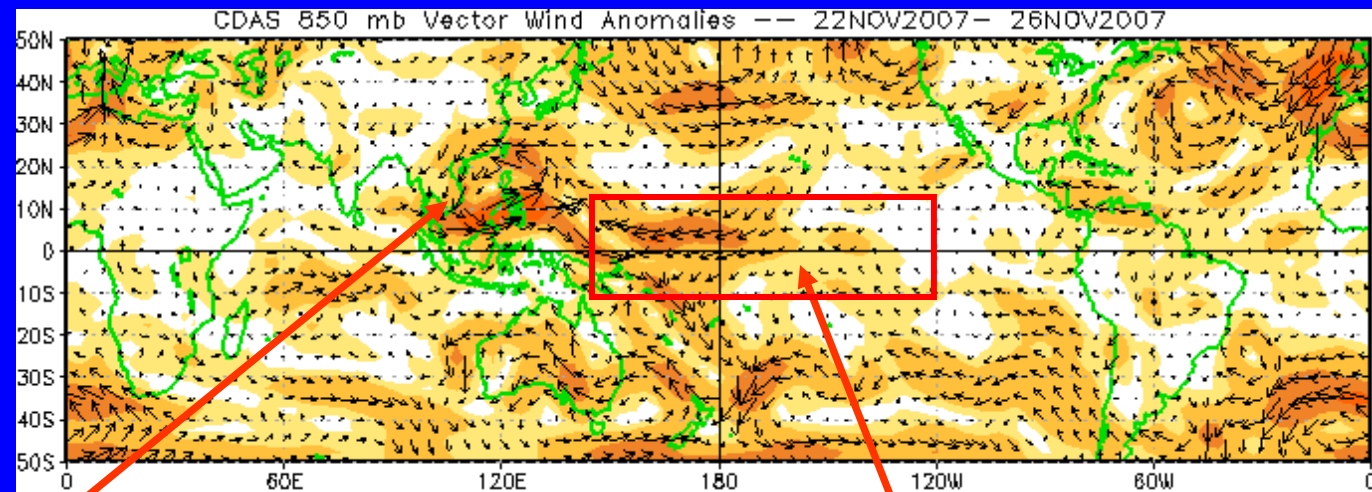
Overview

- **The MJO has strengthened to a moderate level during the past week.**
- **The enhanced phase has shifted eastwards and is now centered in the western hemisphere while large-scale suppressed convection is evident across much of the eastern hemisphere.**
- **Forecast tools, both statistical and dynamical, indicate continued propagation of the MJO at moderate strength for at least the next week with enhanced convection slowly shifting into the Indian Ocean by week 2.**
- **Likely near-term impacts across the global tropics include wet conditions for northeast South America and central and southeast Africa. Dry conditions can be expected from the eastern Maritime continent into the western Pacific Ocean.**
- **Other than the short-term cold across eastern areas, MJO associated impacts for the US are expected to be minimal during the upcoming week.**

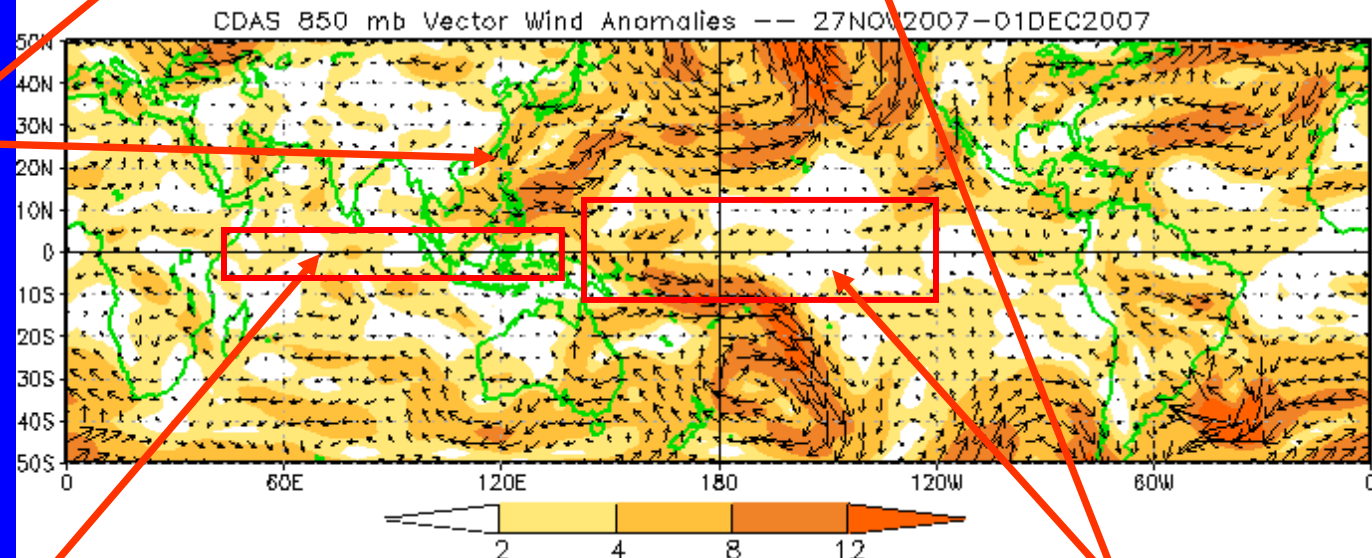


850-hPa Vector Wind Anomalies (m s^{-1})

Note that shading denotes the magnitude of the anomalous wind vectors



Anomalous cyclonic circulation in proximity to the Philippines indicative of the frequent tropical cyclone activity during the past ten days.



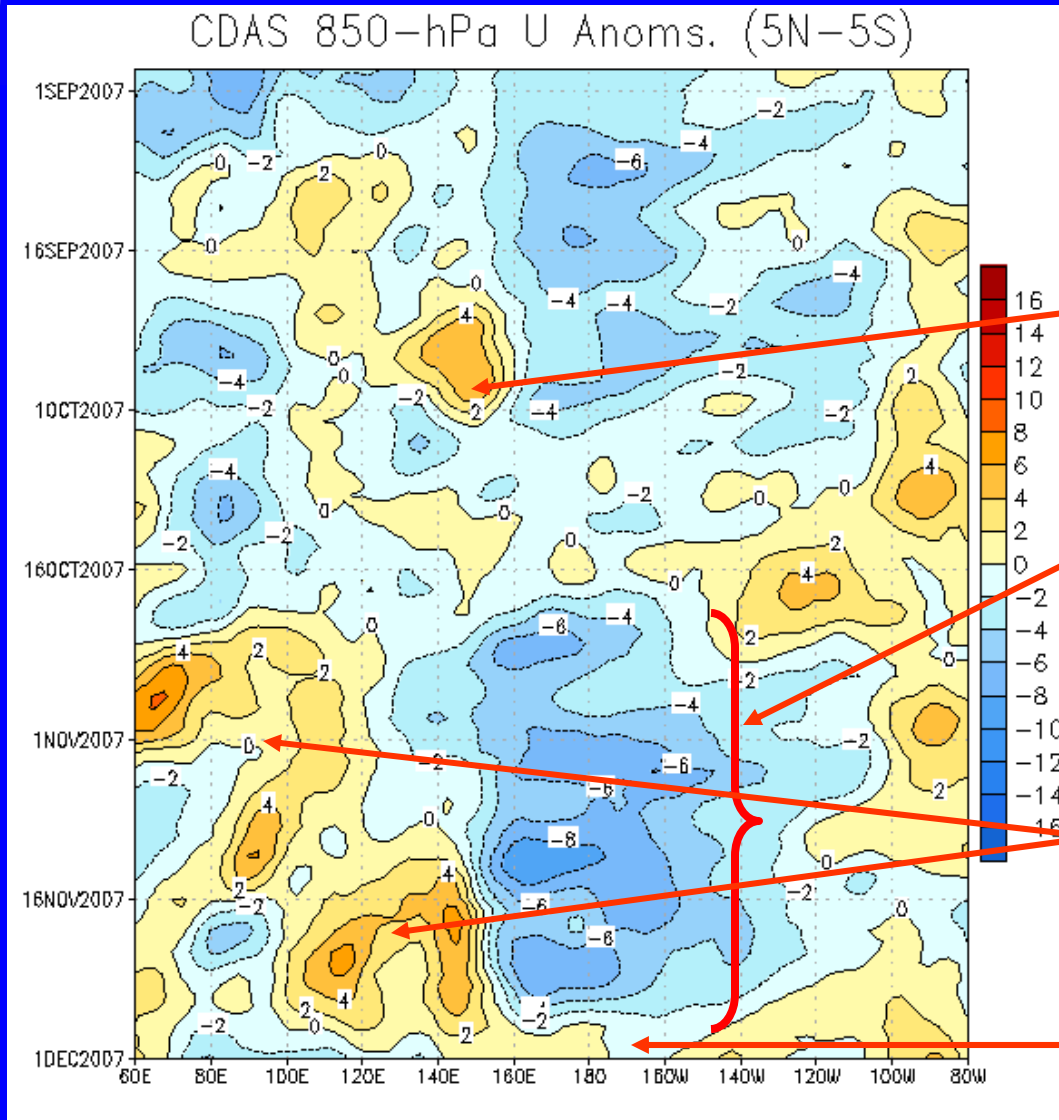
Winds are generally near average across most of the equatorial Indian Ocean and Maritime continent.

The easterlies across the equatorial western and central Pacific have weakened considerably during the last five days.



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.

Westerly anomalies increased during late September across the western Pacific in response to very active convection and tropical cyclone activity.

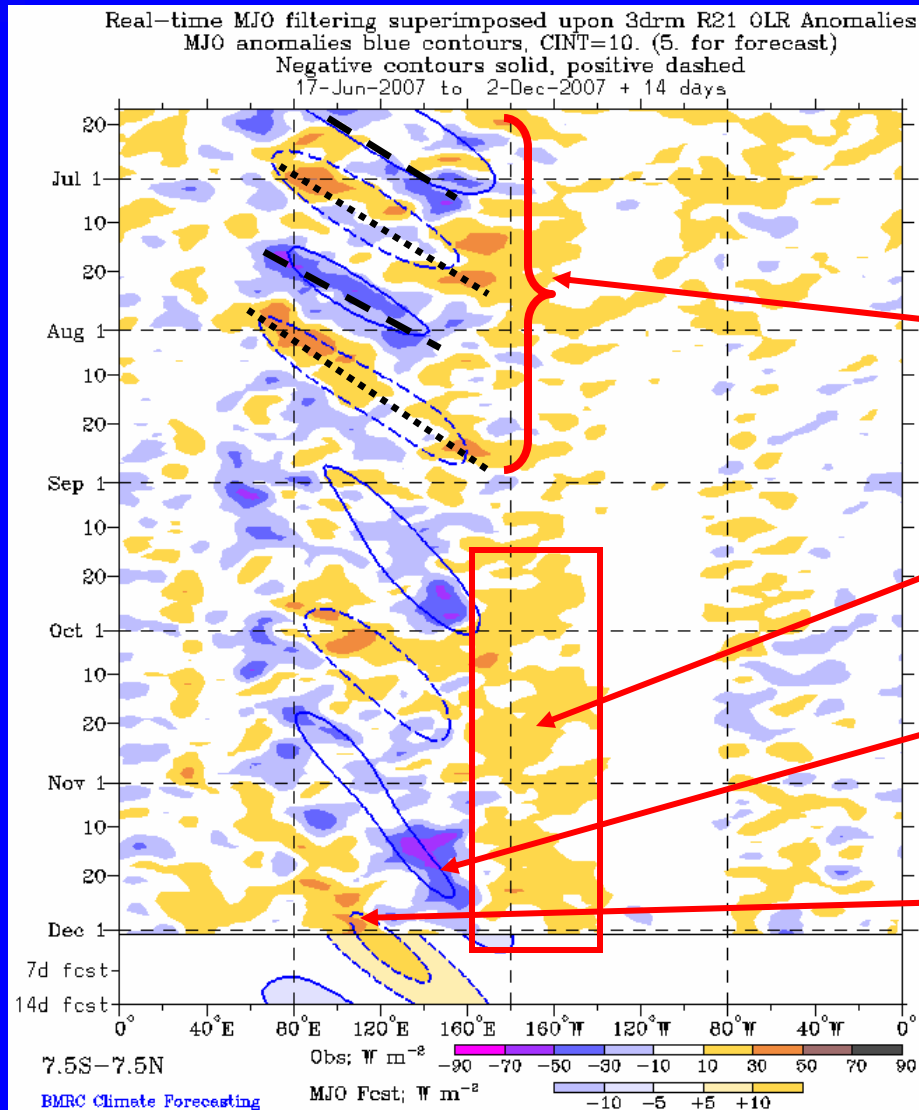
Strong easterlies were in place from mid-October through mid-November across much of the Pacific generally beginning near 160°E.

Since late October, strong anomalous westerlies have very slowly shifted eastward from the Indian Ocean to the Maritime continent and far western Pacific.

During the past week, easterly anomalies have decreased 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)

Beginning in mid May, weak-moderate MJO activity was observed as regions of suppressed and enhanced convection shifted eastward from the Indian Ocean into the far western Pacific.

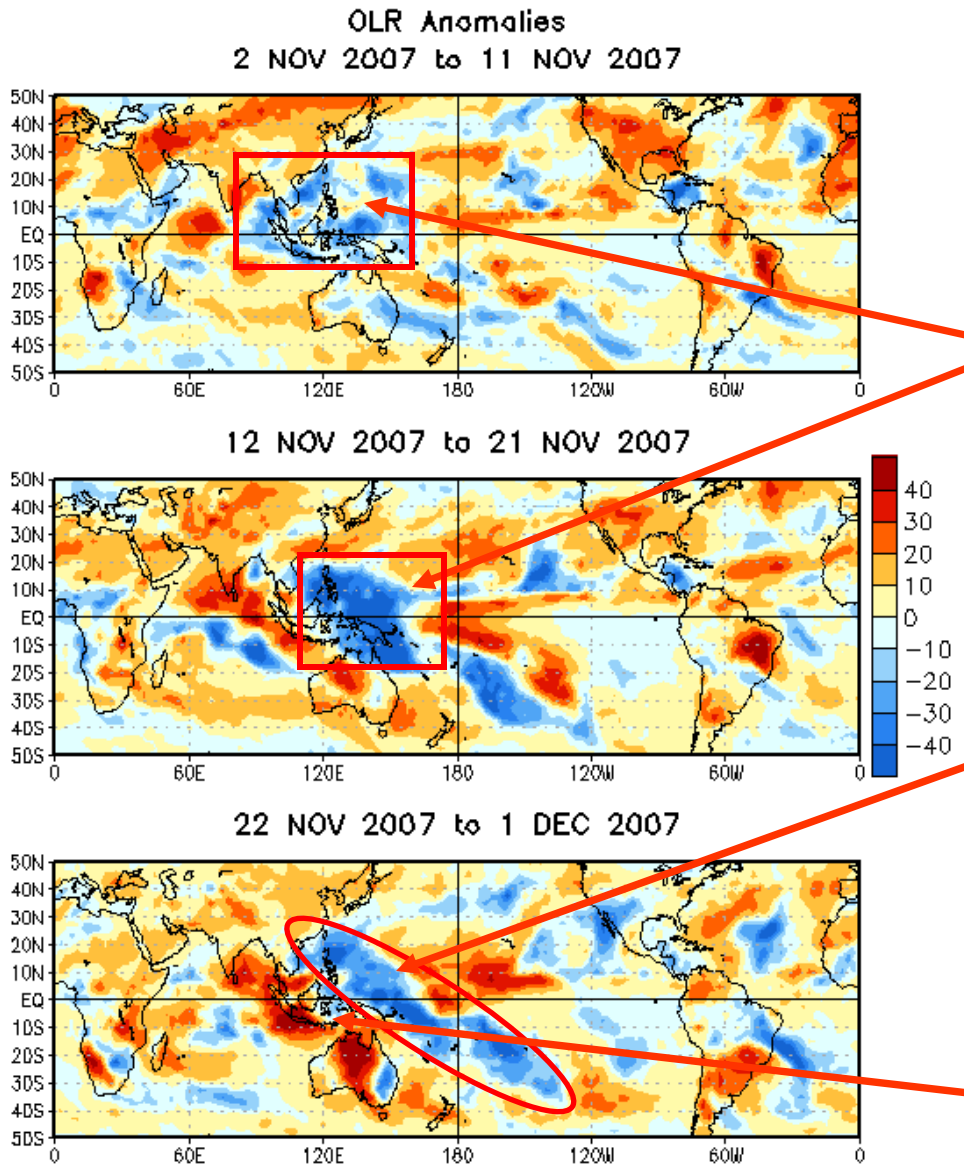
Persistent dry conditions have been evident near the Date Line since mid-September.

Substantially enhanced convection developed across the eastern Maritime continent and far western Pacific Ocean during November.

Dry conditions have developed across the Indian Ocean and Maritime continent during the past ten days.



OLR Anomalies: Last 30 days



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

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

During early-mid November, enhanced convection was evident across the Maritime continent and later the far western Pacific.

The orientation of enhanced convection was northwest to southeast from the Philippines to the South Pacific Convergence Zone during the second half of November.

Dry conditions developed across the eastern Indian Ocean into Australia by the end of November.

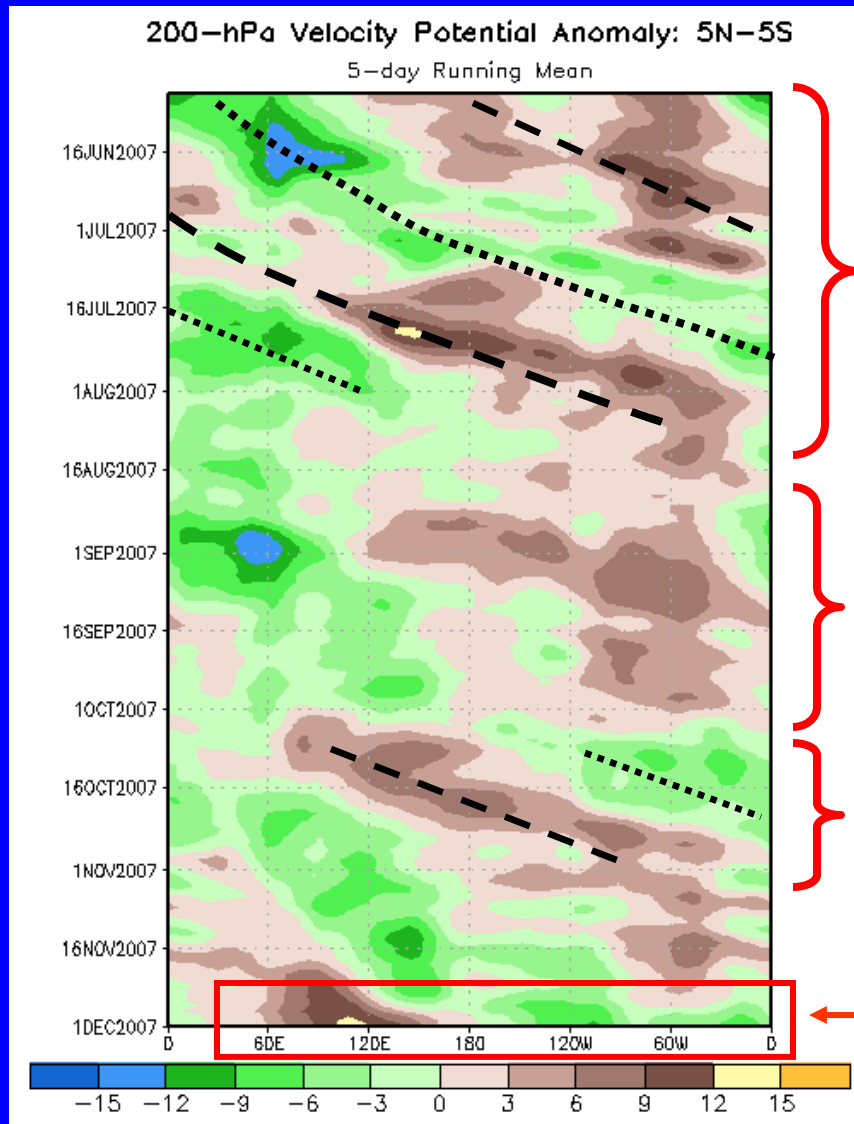


200-hPa Velocity Potential Anomalies (5°S-5°N)

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

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

Time



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 with fast eastward propagation.

Recently, divergence has shifted eastward into the western hemisphere while convergence has developed across the Indian Ocean and Indonesia. These changes indicate that the MJO has become better organized.

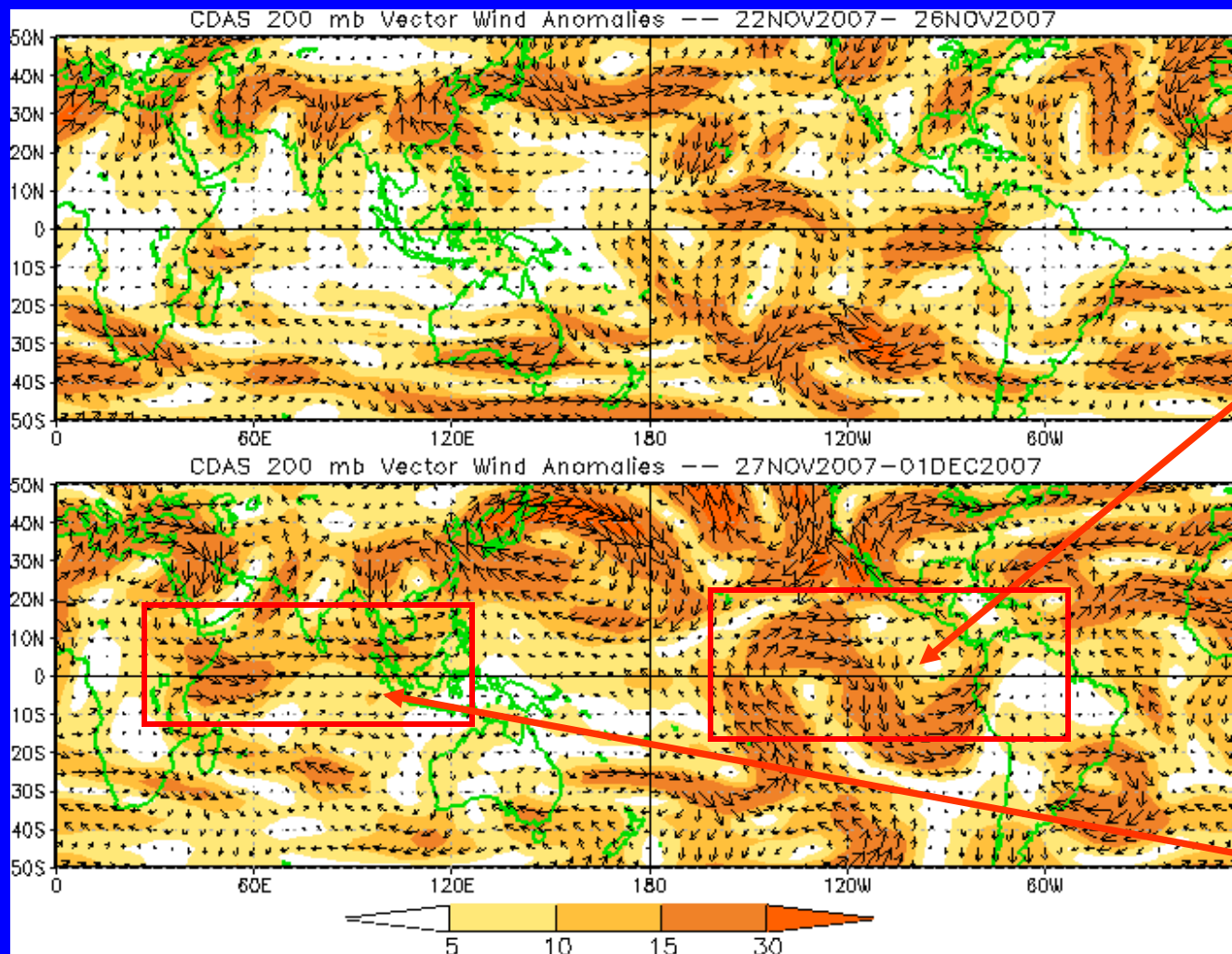


200-hPa Vector Wind Anomalies (m s^{-1})

Note that shading denotes the magnitude of the anomalous wind vectors

Equatorial westerly anomalies have shifted eastwards during the past five days.

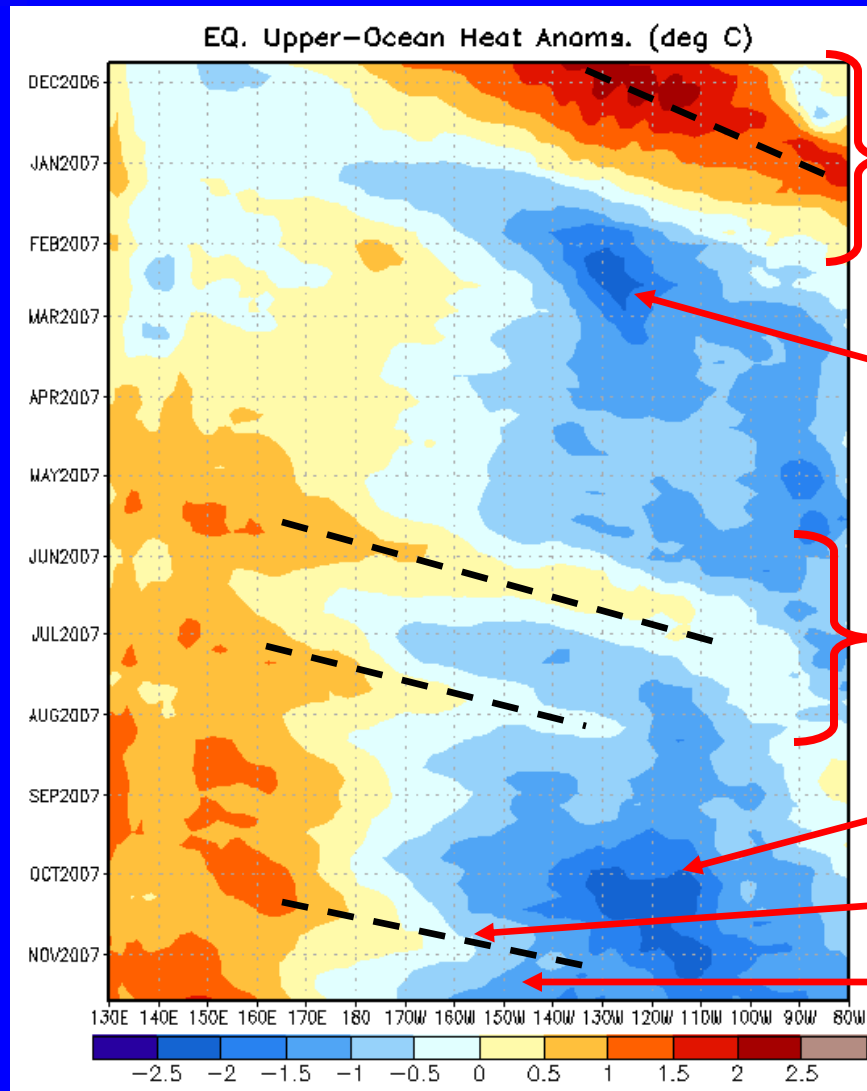
Westerly anomalies are now evident across much of the Indian Ocean.





Weekly Heat Content Evolution in the Equatorial Pacific

Time
↓



During late 2006, an eastward-propagating Kelvin wave (warm phase indicated by the dashed line) caused considerable positive anomalies in the upper-ocean heat content.

Beginning in February, negative heat content anomalies developed prevailed across the eastern equatorial Pacific.

Weak Kelvin wave activity was observed from May into August and affected the sub-surface temperature departures.

During October, negative heat content anomalies increased across the eastern Pacific Ocean, but weakened slightly in the central and east-central Pacific in association with a weak Kelvin wave.

Most recently, negative heat content anomalies have increased.

Longitude



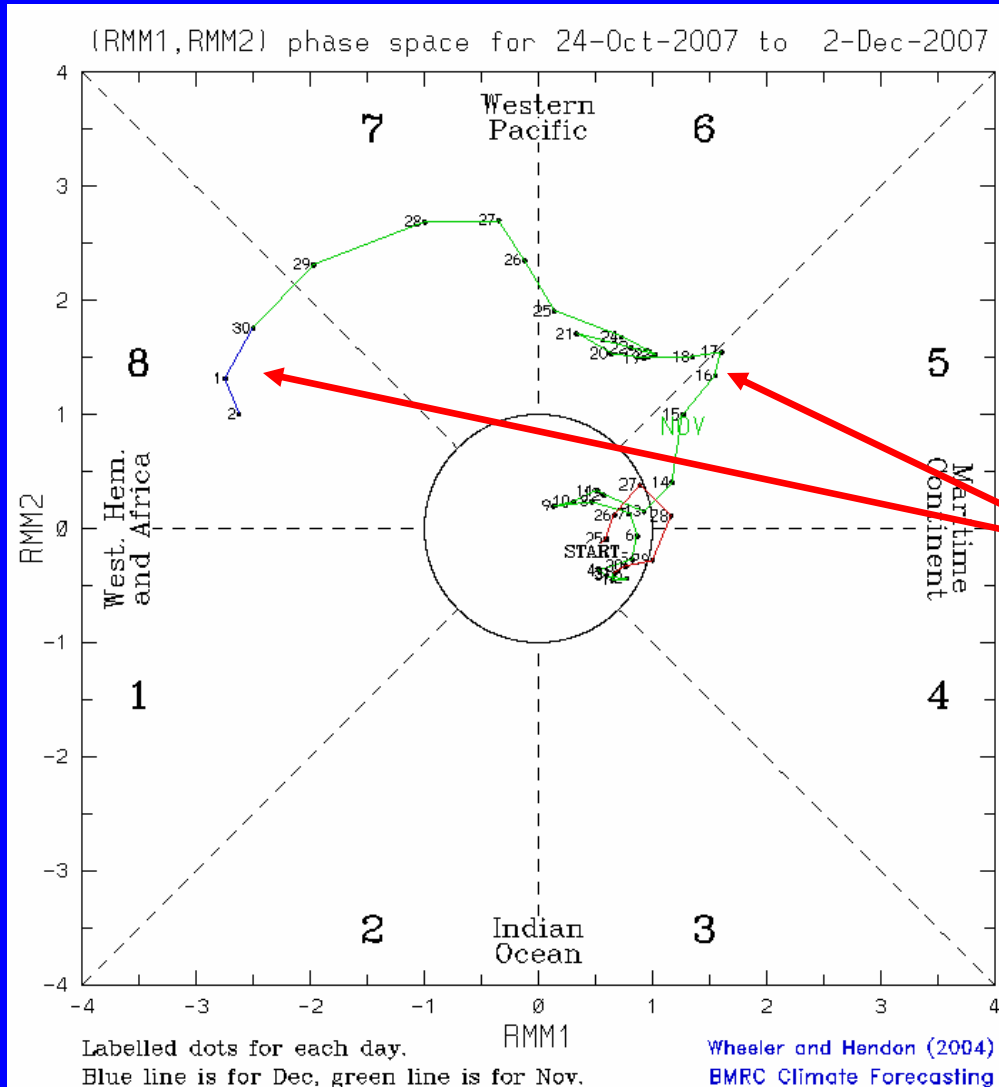
MJO Index

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.

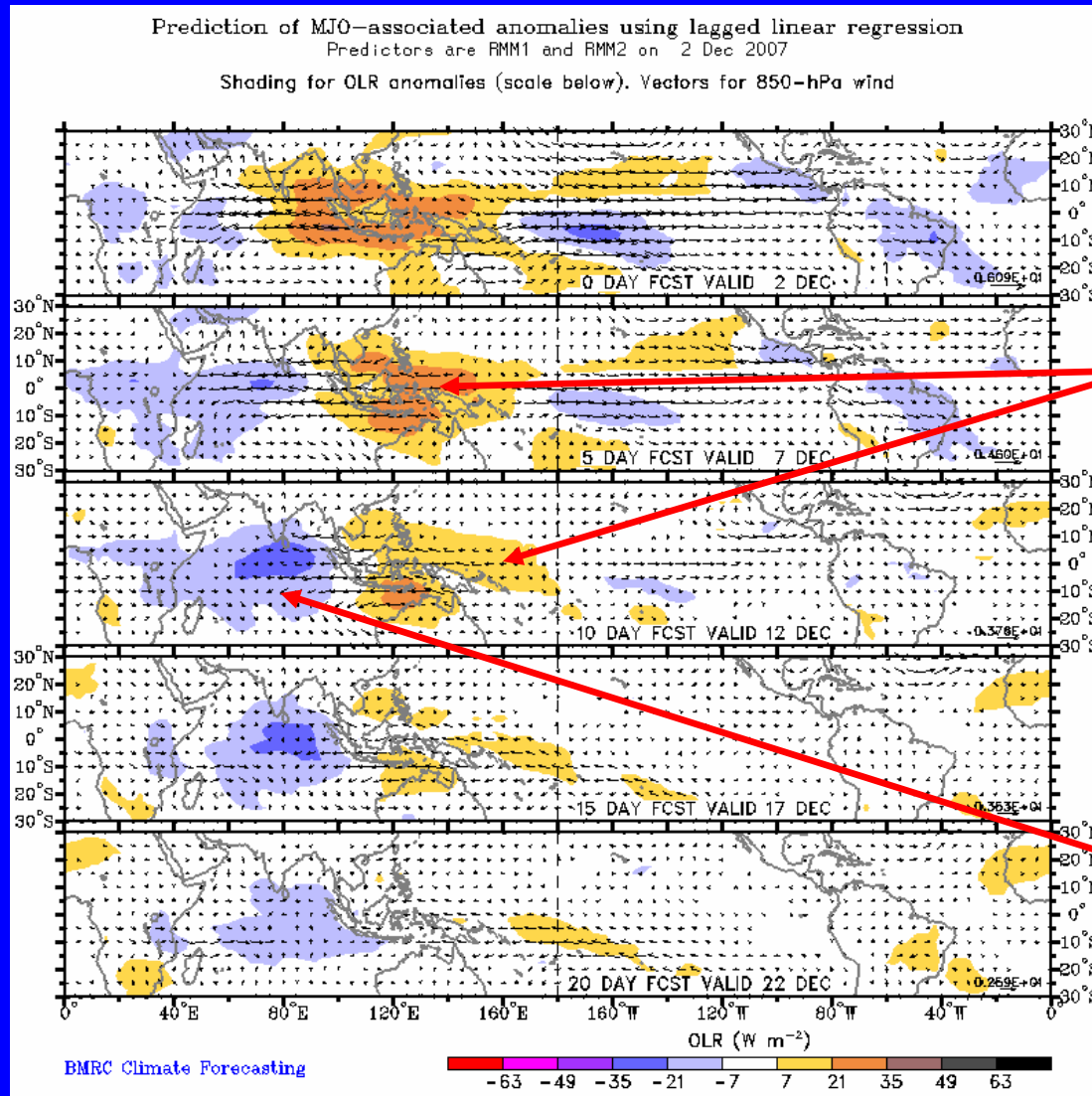
The MJO index increased in amplitude during mid-late November.

During the past week, the index indicates both a further increase in amplitude and considerable eastward propagation indicating a strengthening MJO.





Statistical MJO OLR Forecast



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

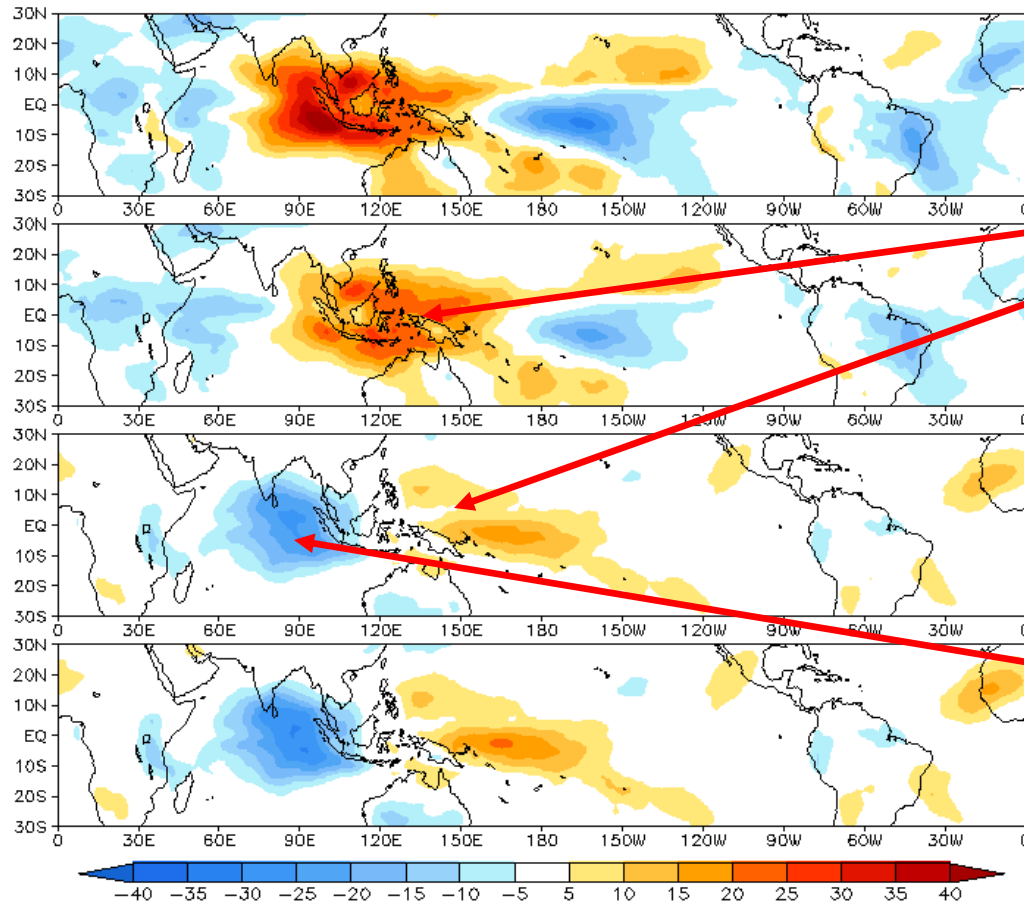
Dry conditions are expected for the Maritime continent during weeks 1-2 while wet conditions are forecast for northeast South America early during the period.

Enhanced convection is expected to enter the Indian Ocean during week 2.



Experimental GFS MJO OLR Forecast

Prediction of MJO-related anomalies using GEFS operational forecast
Initial date: 02 Dec 2007
OLR



The GFS forecasts a moderate MJO for the coming 1-2 weeks with suppressed convection impacting the Maritime continent and far western Pacific Ocean during much of the period.

Wet conditions are expected across northeast South America early in the period while convection is forecast to enter the Indian Ocean during week 2.