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

Update prepared by
Climate Prediction Center / NCEP
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Outline

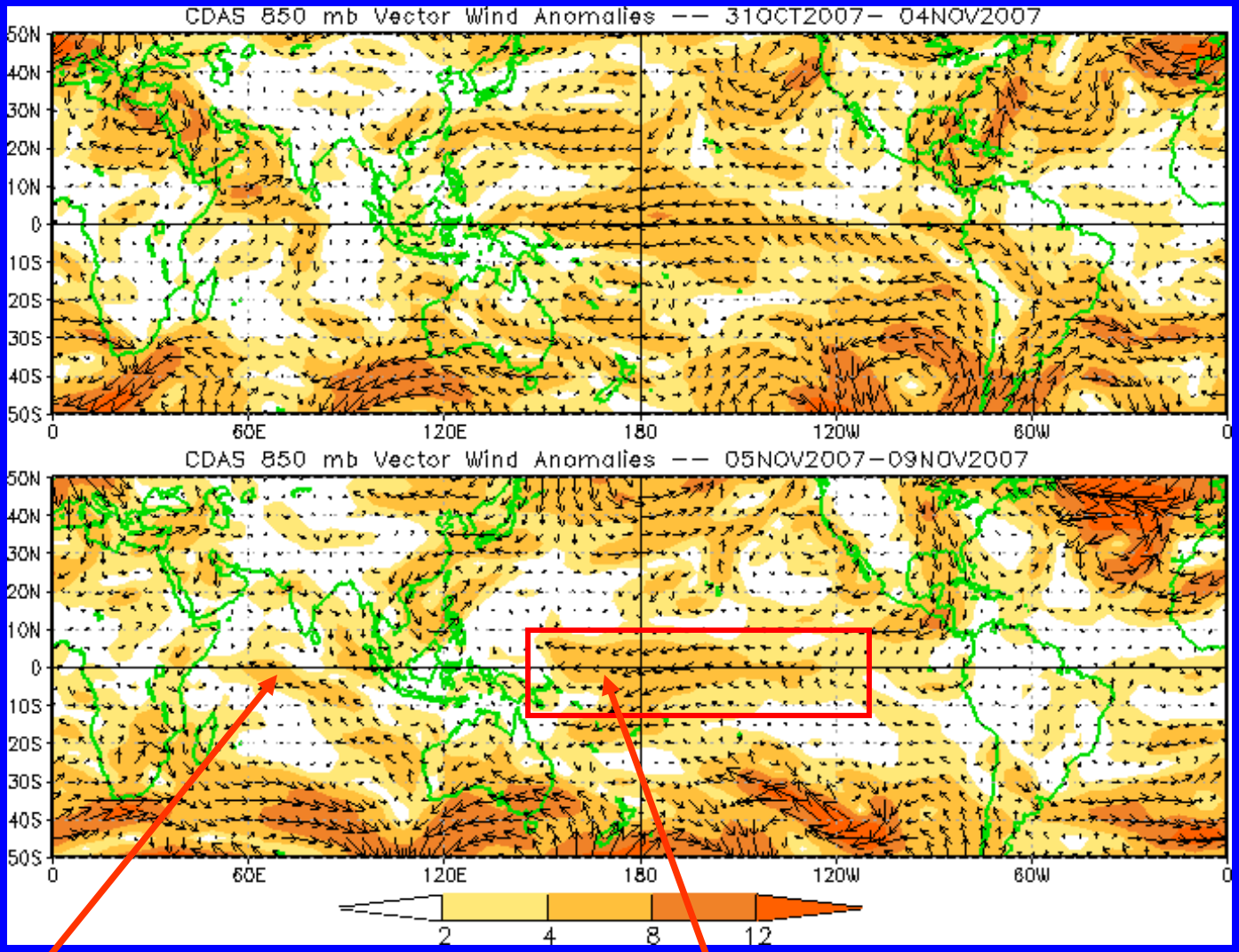
- Overview
- Recent Evolution and Current Conditions
- Madden-Julian Oscillation Forecast

Overview

- The MJO signal continues to be weak.
- During the past week, the enhanced phase of the MJO has remained in vicinity of the Maritime continent and enhanced convection has mainly been focused across the eastern Indian Ocean, Indonesia, and the far western Pacific Ocean.
- Based on the latest monitoring and forecast tools, weak MJO activity is expected during the next 1-2 weeks.

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

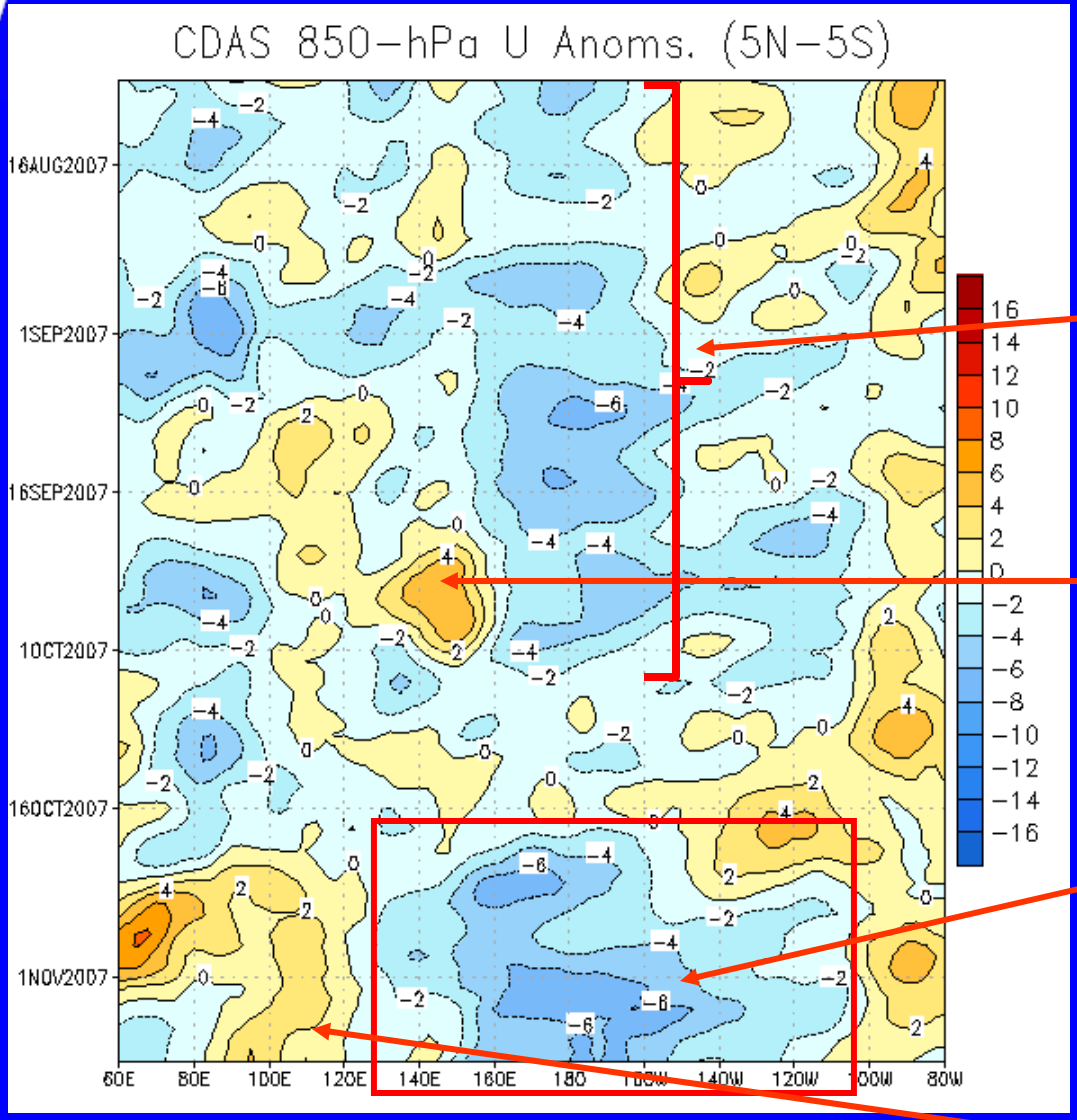
Note that shading denotes the magnitude of the anomalous wind vectors



In general, winds across the Indian Ocean have returned to near average from that observed during parts of October.

The easterlies across the equatorial central Pacific have remained strong – consistent with La Nina conditions.

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.

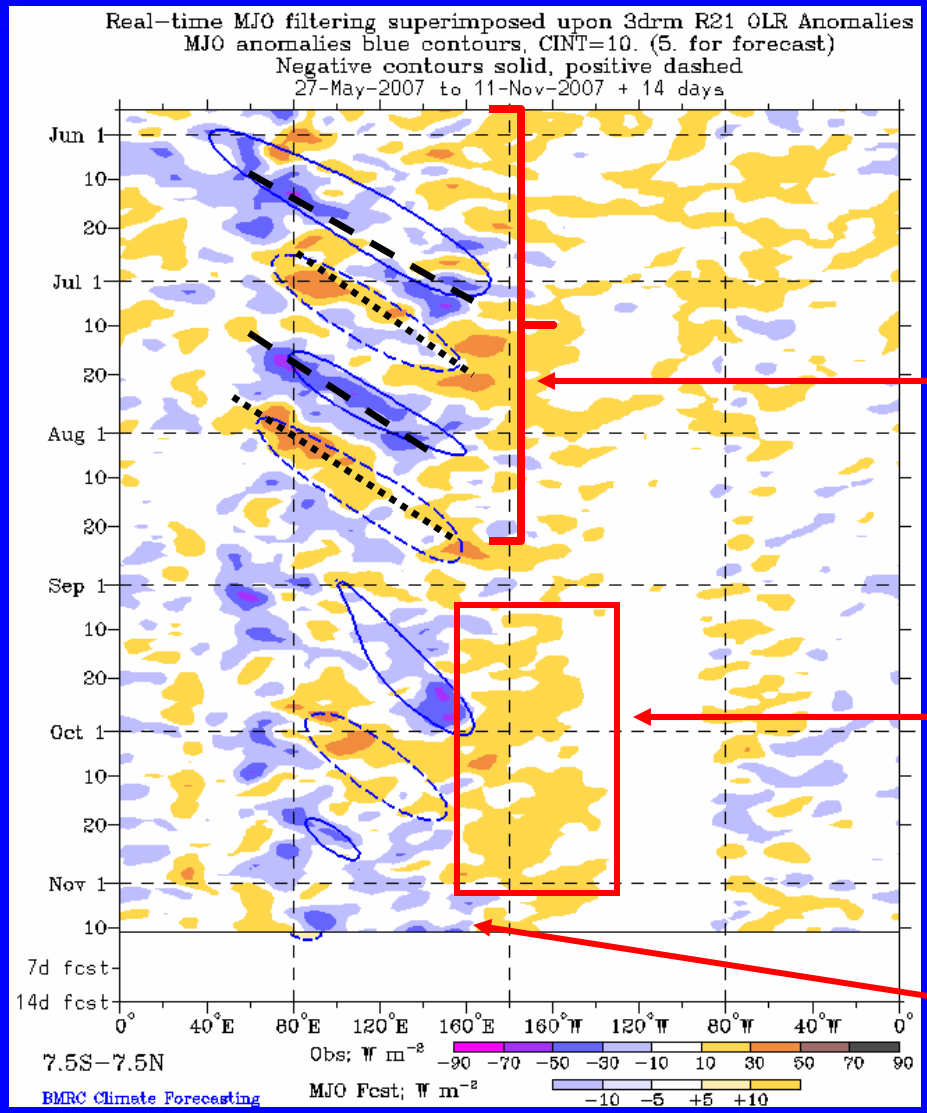
From August to early October, the easterlies were strong and anchored near the Date line.

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

A period of near average winds at the Date Line during early-mid October have been replaced with strong and widespread easterly anomalies across much of the Pacific.

Also, westerly anomalies have been evident in the Indian Ocean and western Maritime continent.

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



Time

Longitude

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

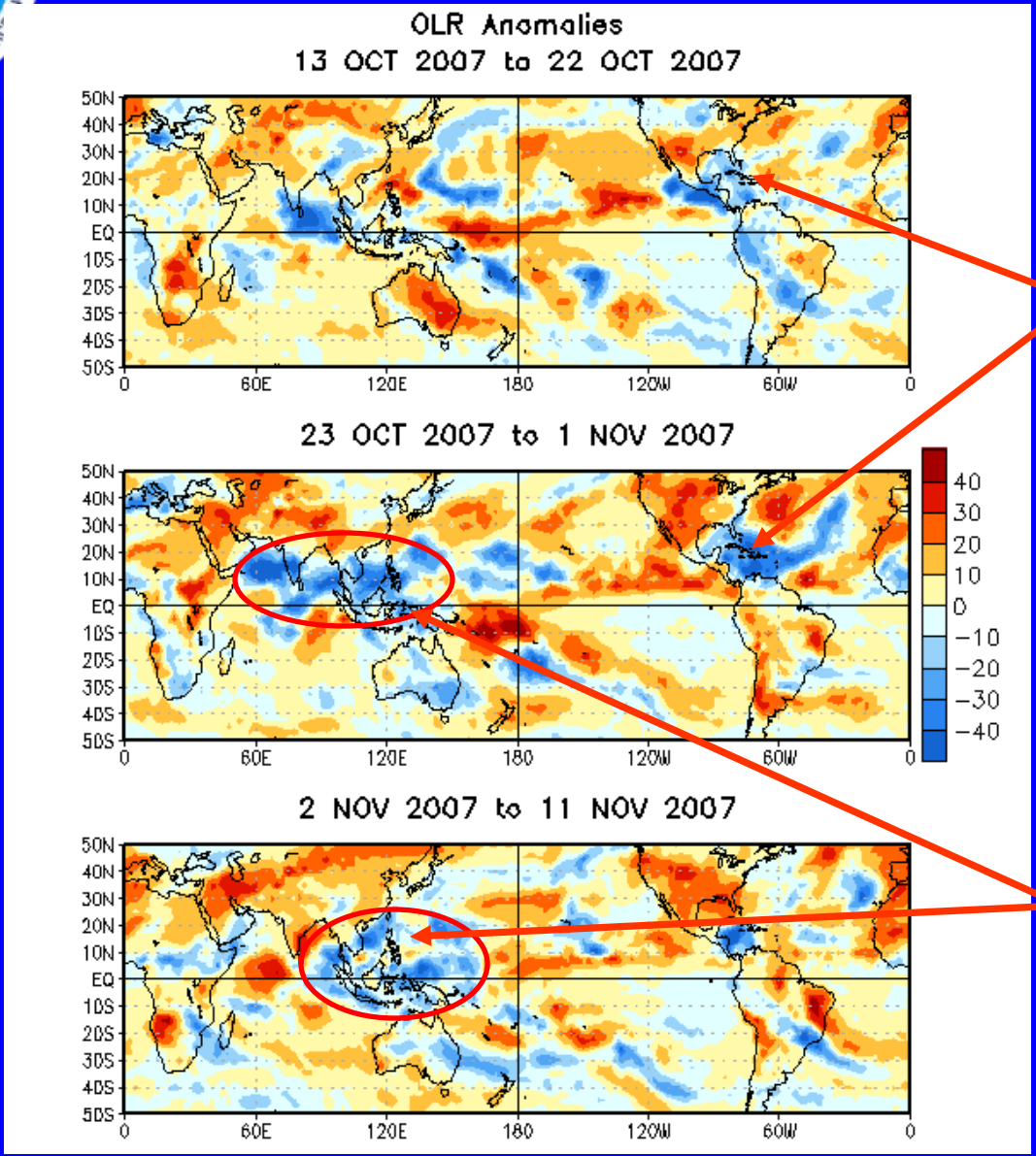
Wetter-than-normal conditions, negative OLR anomalies (blue shading)

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.

Dry conditions were evident near the Date Line during much of September and October.

During the past few weeks there has been a gradual re-development of enhanced convection (blue areas) across the Maritime continent and eastern Indian Ocean.

OLR Anomalies: Last 30 days



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

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

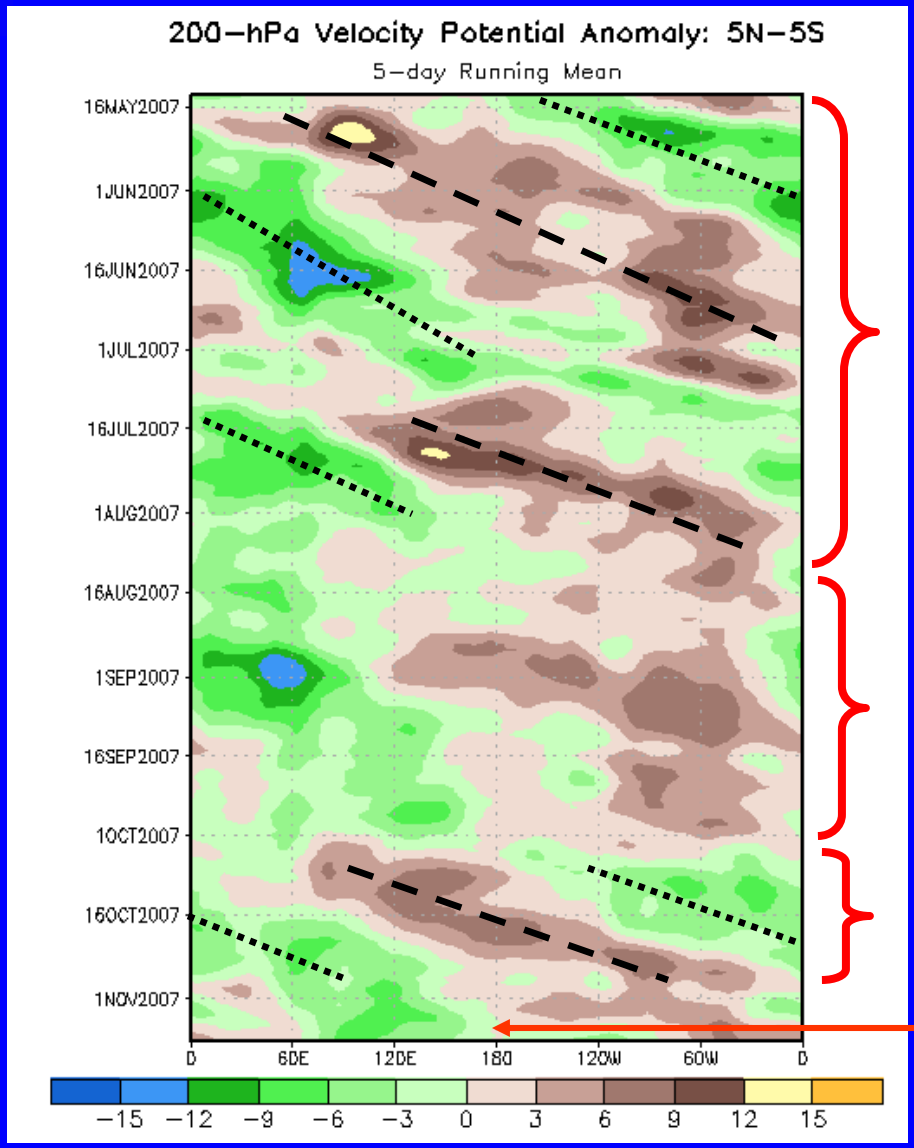
During much of October, wet conditions have been evident across the eastern Pacific Ocean, Central America, and the Caribbean Sea.

After a break in convection across much of the Maritime continent and the western Pacific Ocean during early-mid October, enhanced rainfall more typical during La Nina has developed across the eastern hemisphere during late October and early 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

Longitude

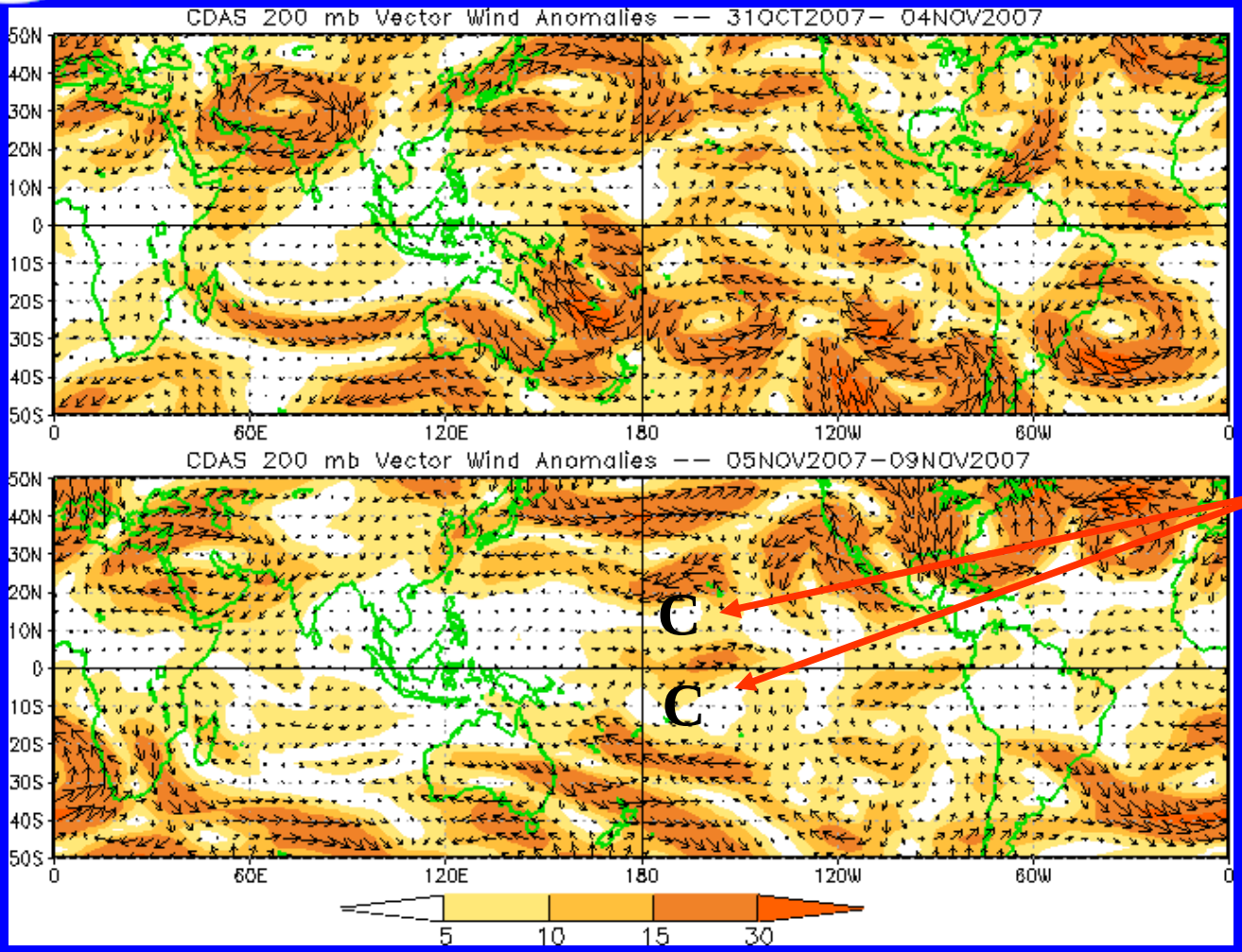
From mid-May into early August, weak to moderate MJO activity was observed as velocity potential anomalies increased and propagated eastwards.

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

The MJO strengthened during October with fast eastward propagation.

Most recently, however, the pattern has become more stationary in nature.

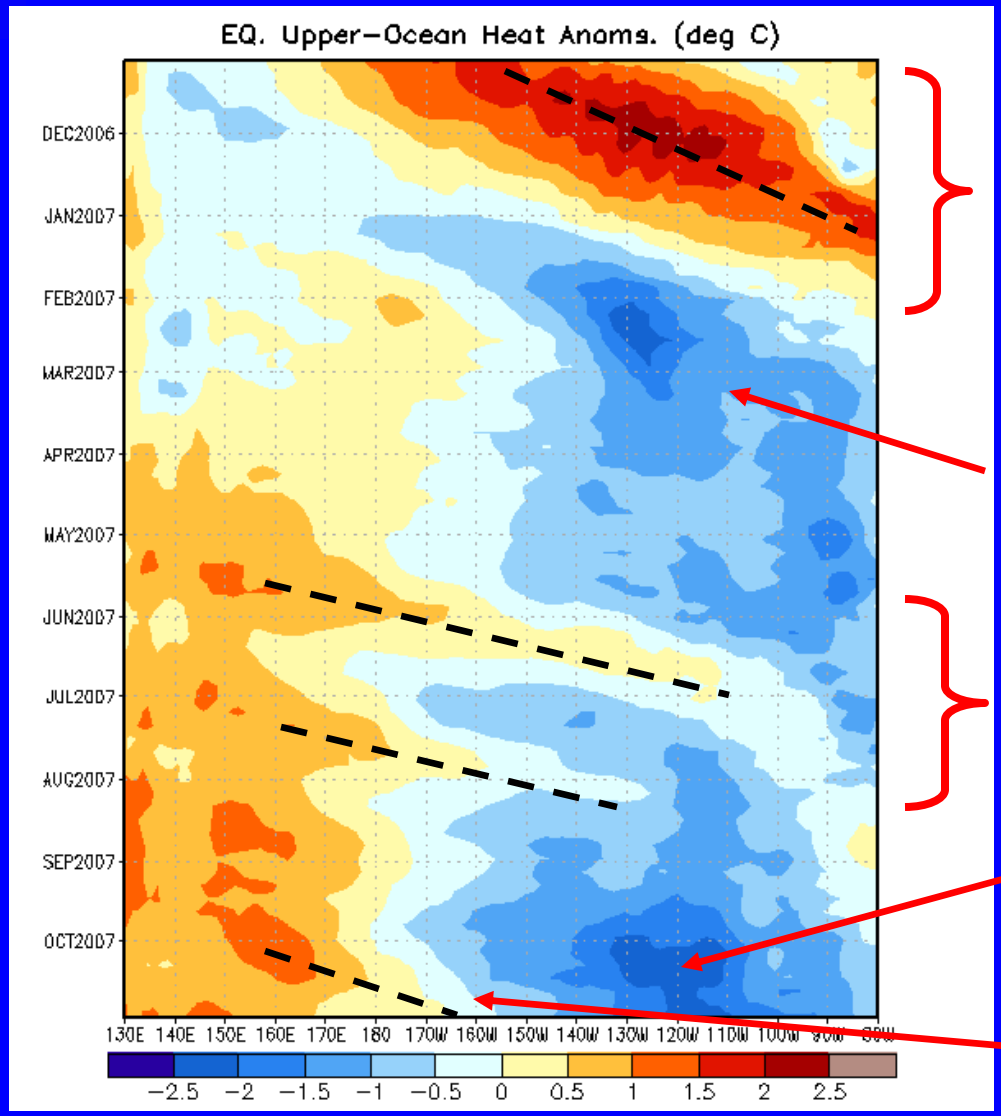
200-hPa Vector Wind Anomalies (m s^{-1})



Note that shading denotes the magnitude of the anomalous wind vectors

Upper-level cyclones evident across the Pacific Ocean on both sides of the equator is consistent with La Nina conditions.

Weekly Heat Content Evolution in the Equatorial Pacific



Time

Longitude

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

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

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

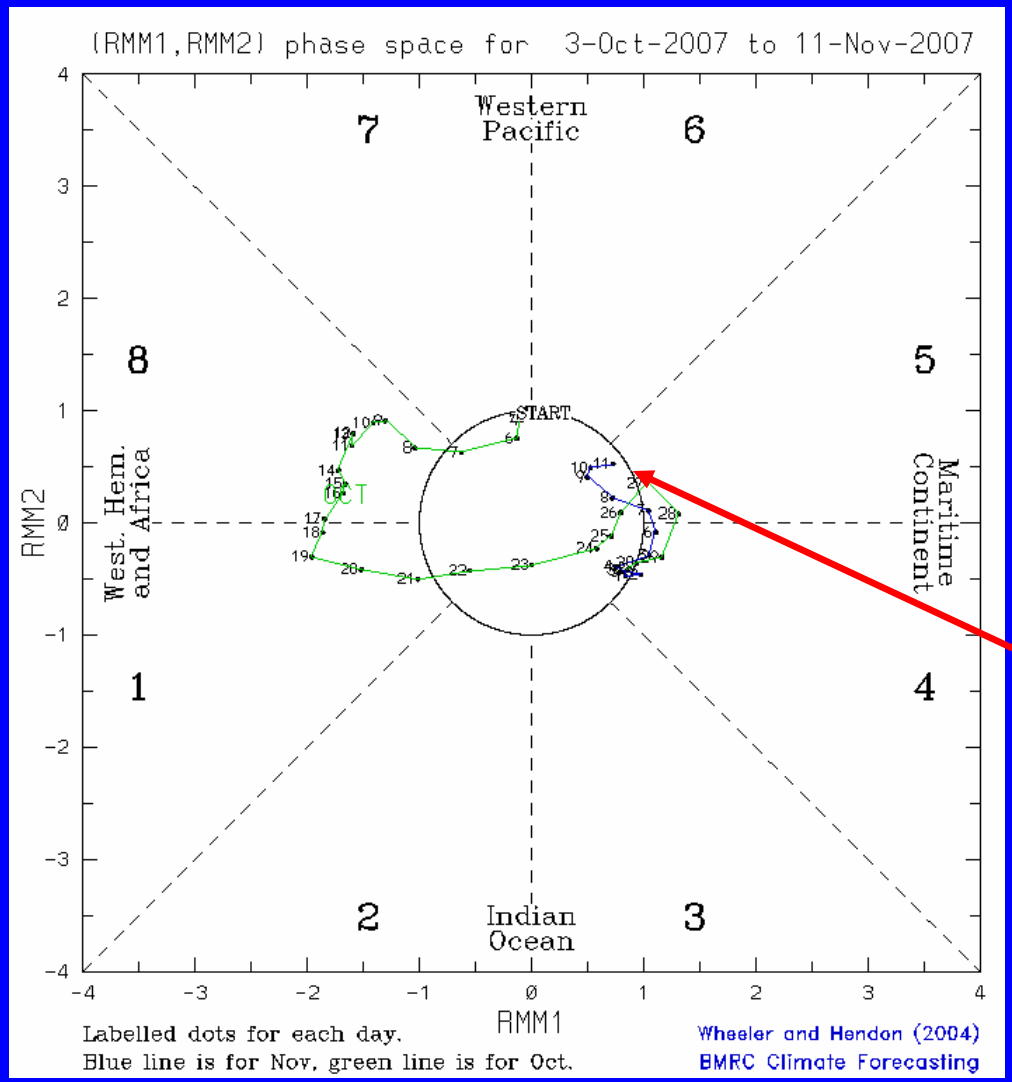
During October negative heat content anomalies have increased across much of the central and eastern Pacific Ocean.

Most recently, a decrease in the negative heat content anomalies indicate Kelvin wave currently.

MJO Index

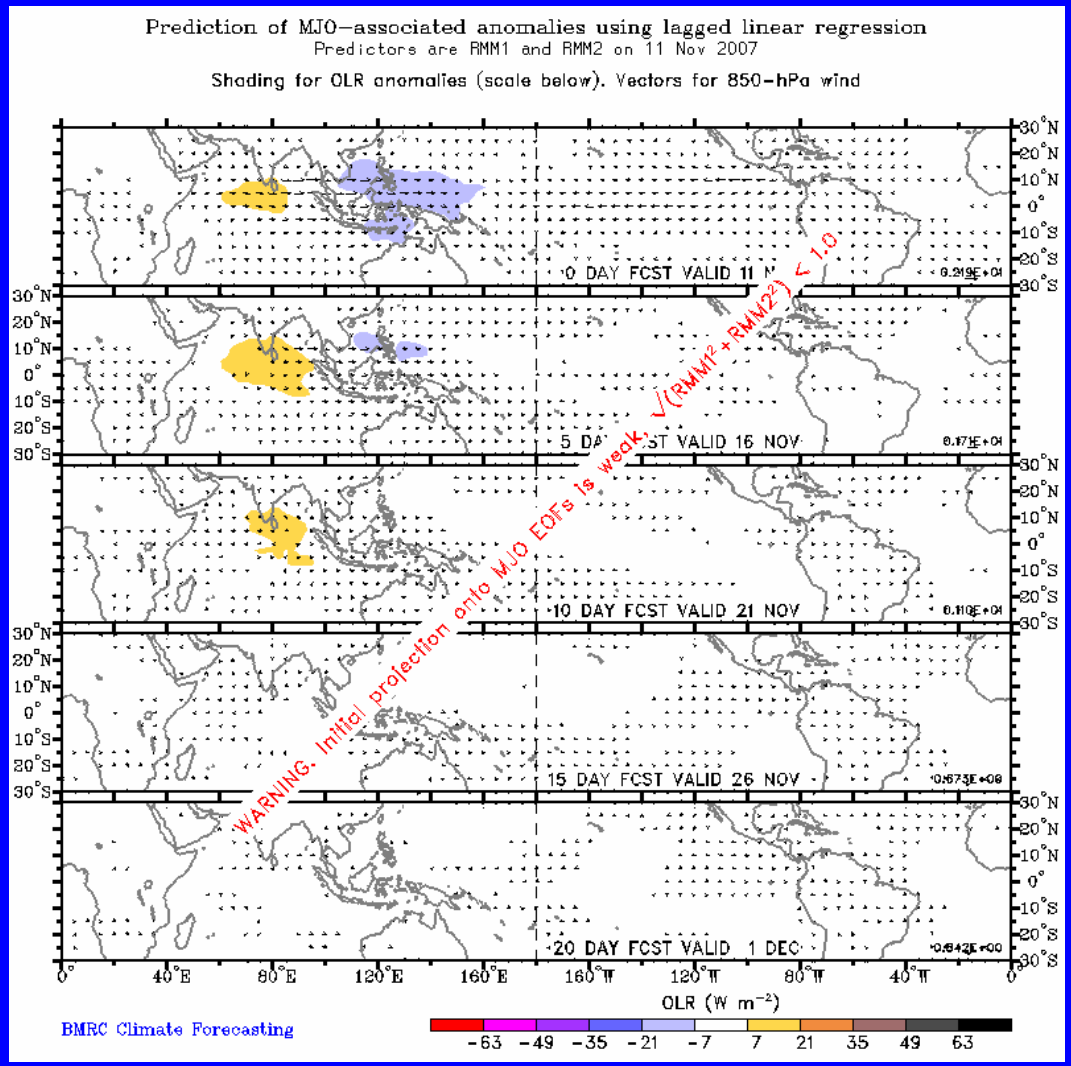
The current state of the MJO as determined by an index based on Empirical Orthogonal Function (EOF) analysis using combined fields of near-equatorially-averaged 850-hPa and 200-hPa zonal wind and outgoing longwave radiation (OLR) (Wheeler and Hendon, 2004).

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.



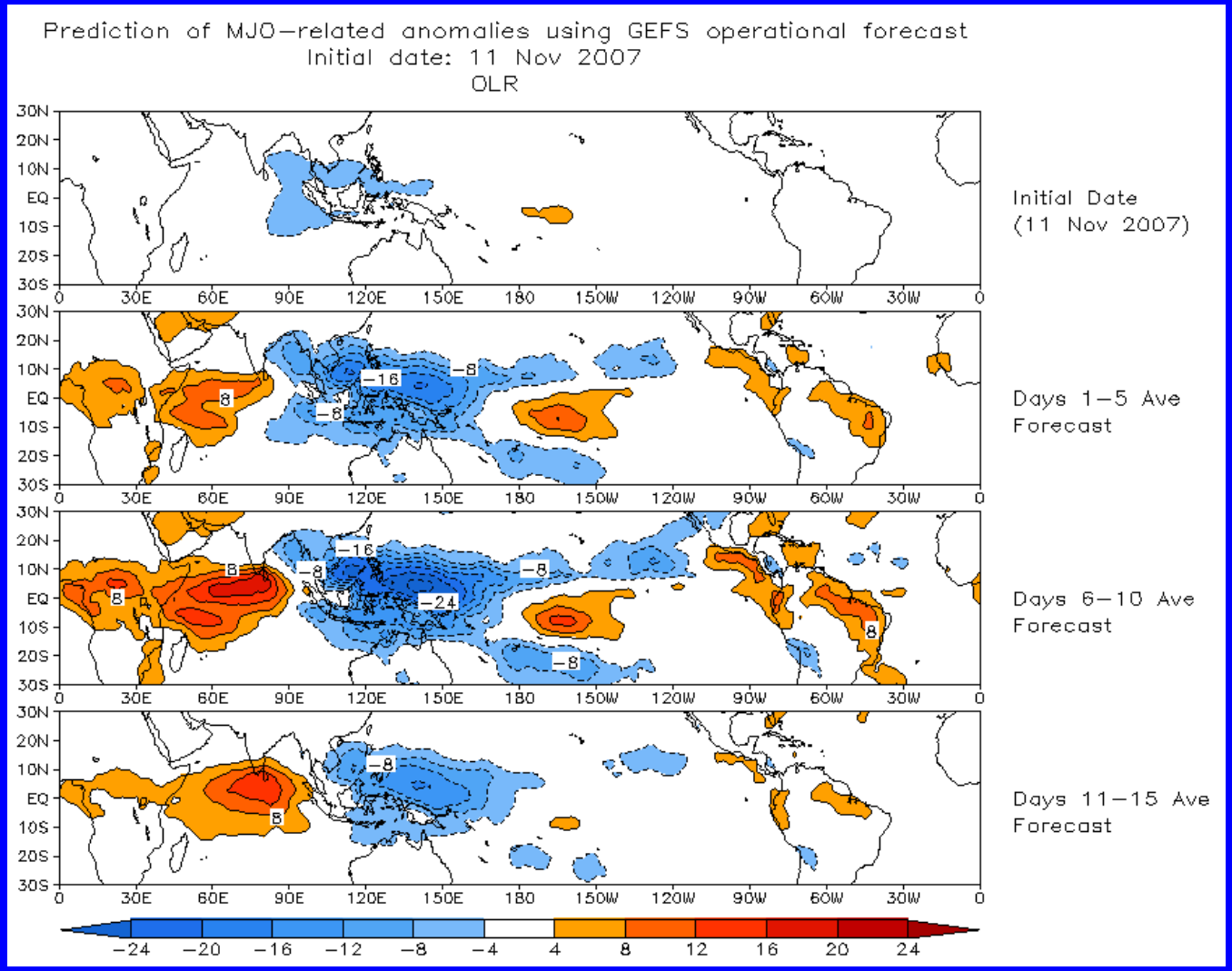
The MJO index indicates a weak amplitude with only minor eastward movement during the past week.

Statistical MJO OLR Forecast



A statistical MJO forecast indicates weak MJO activity during the next two weeks.

Experimental GFS MJO OLR Forecast



The GFS forecasts a moderate MJO amplitude for the coming two weeks but only minor eastward movement.

Enhanced convection is expected over the Maritime continent and western Pacific during the period.