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

Update prepared by
Climate Prediction Center / NCEP
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Outline

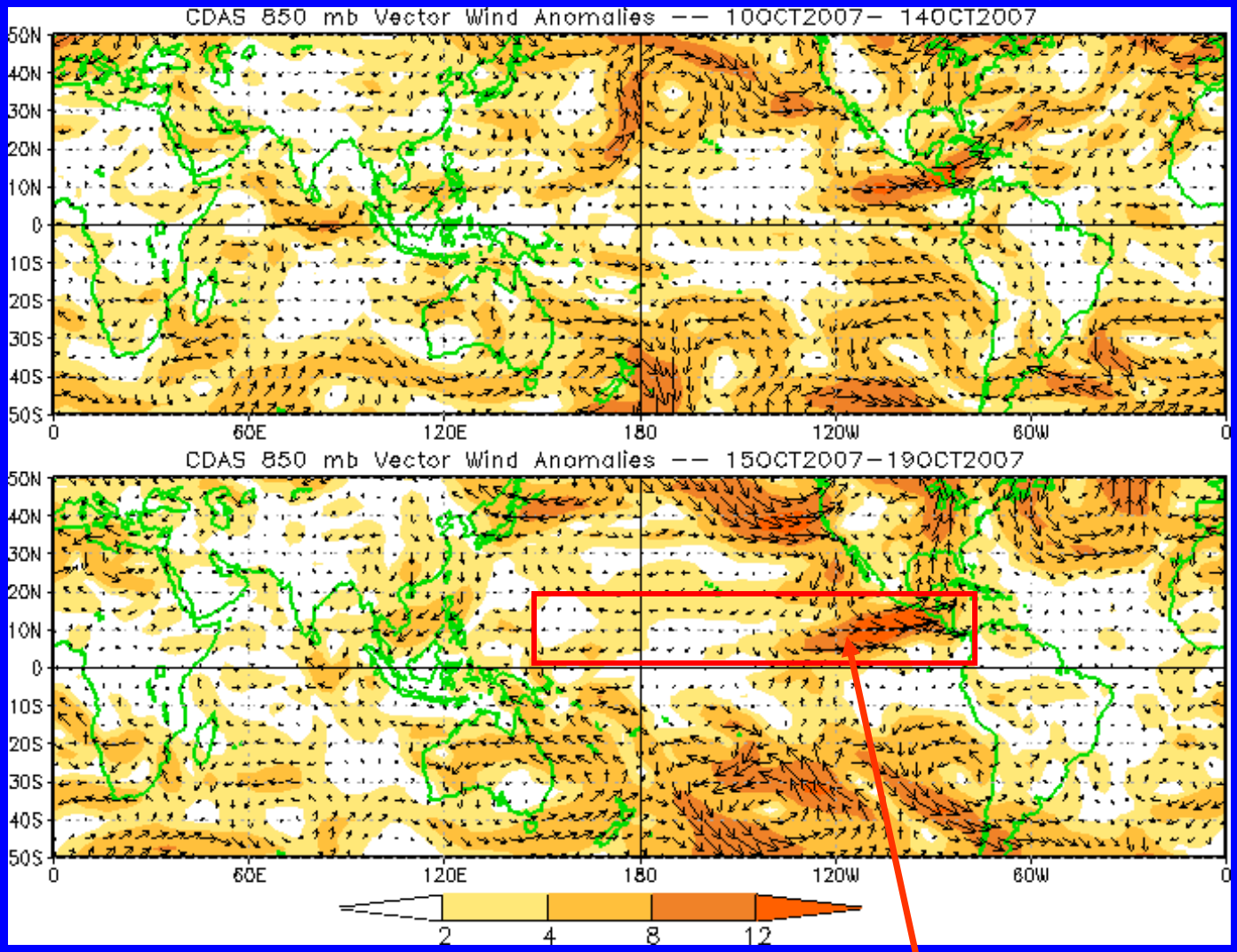
- Overview
- Recent Evolution and Current Conditions
- Madden-Julian Oscillation Forecast

Overview

- The MJO signal has weakened during the past several days.
- A couplet of large-scale upper-level convergence (divergence) exists from the Maritime continent into the central Pacific (the eastern Pacific to Africa) and represents a large change in tropical convection from previous weeks.
- Interaction with the extratropical circulation of both hemispheres is playing a large role in the current orientation of tropical convection.
- Based on the latest monitoring and forecast tools, weak MJO activity is expected during the next 1-2 weeks.

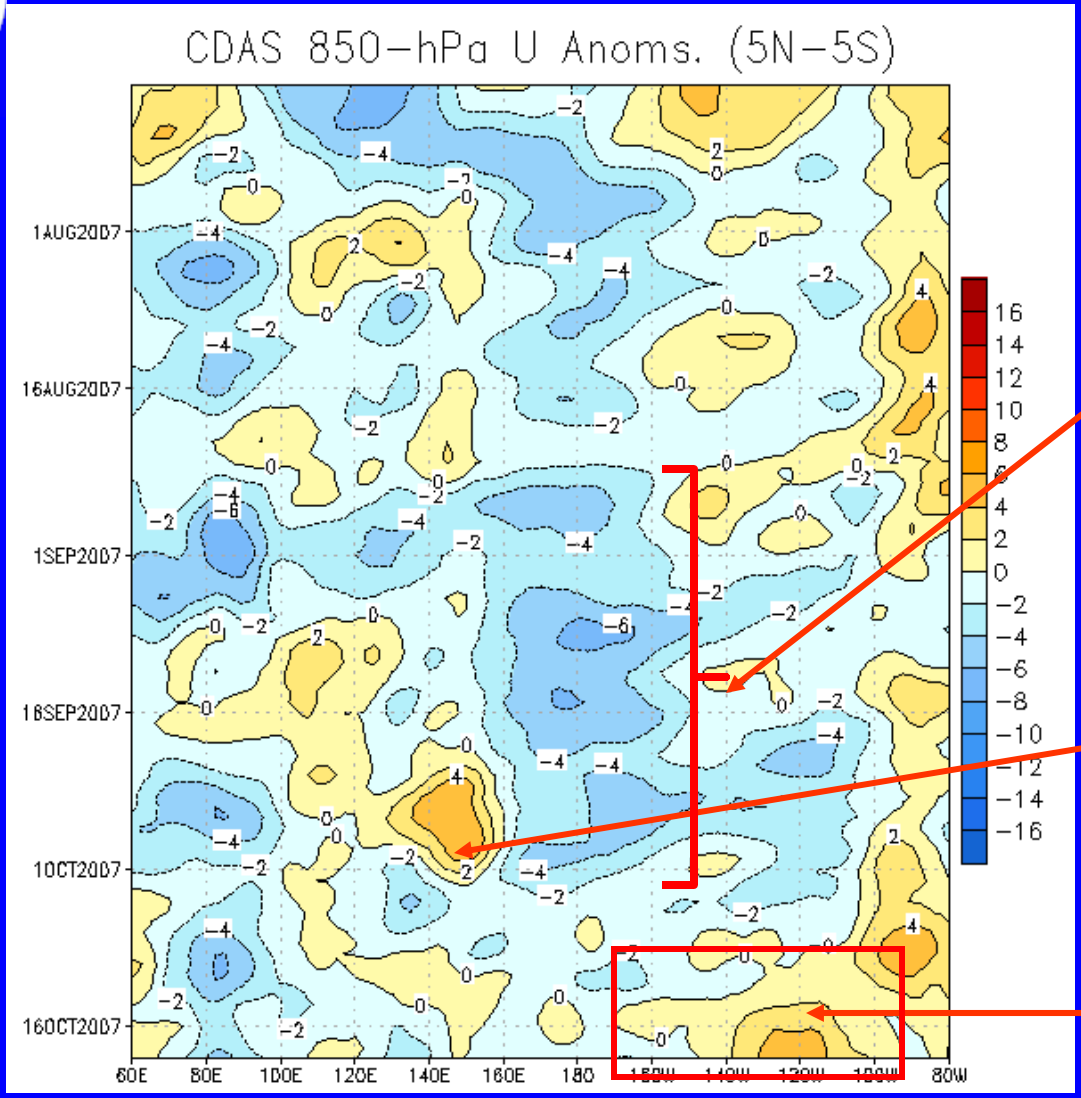
850-hPa Vector Wind Anomalies (m s^{-1})

Note that shading denotes the magnitude of the anomalous wind vectors



Winds across the equatorial central Pacific Ocean were near average while westerly anomalies persist across the far eastern Pacific.

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



Time

Longitude

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

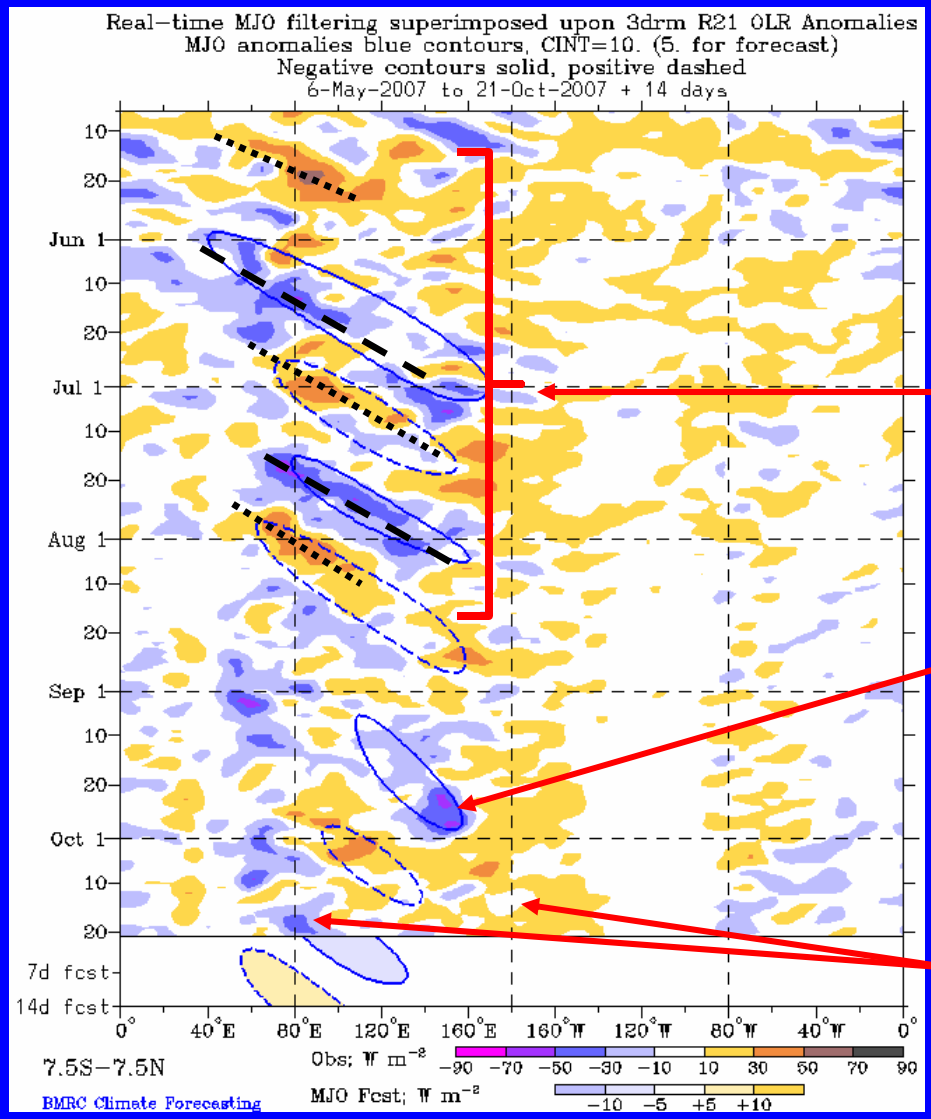
Easterly anomalies (blue shading) represent anomalous east-to-west flow.

From late 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.

During the past two weeks, easterly anomalies have been replaced by westerly anomalies across the east Pacific.

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



Time

Longitude

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

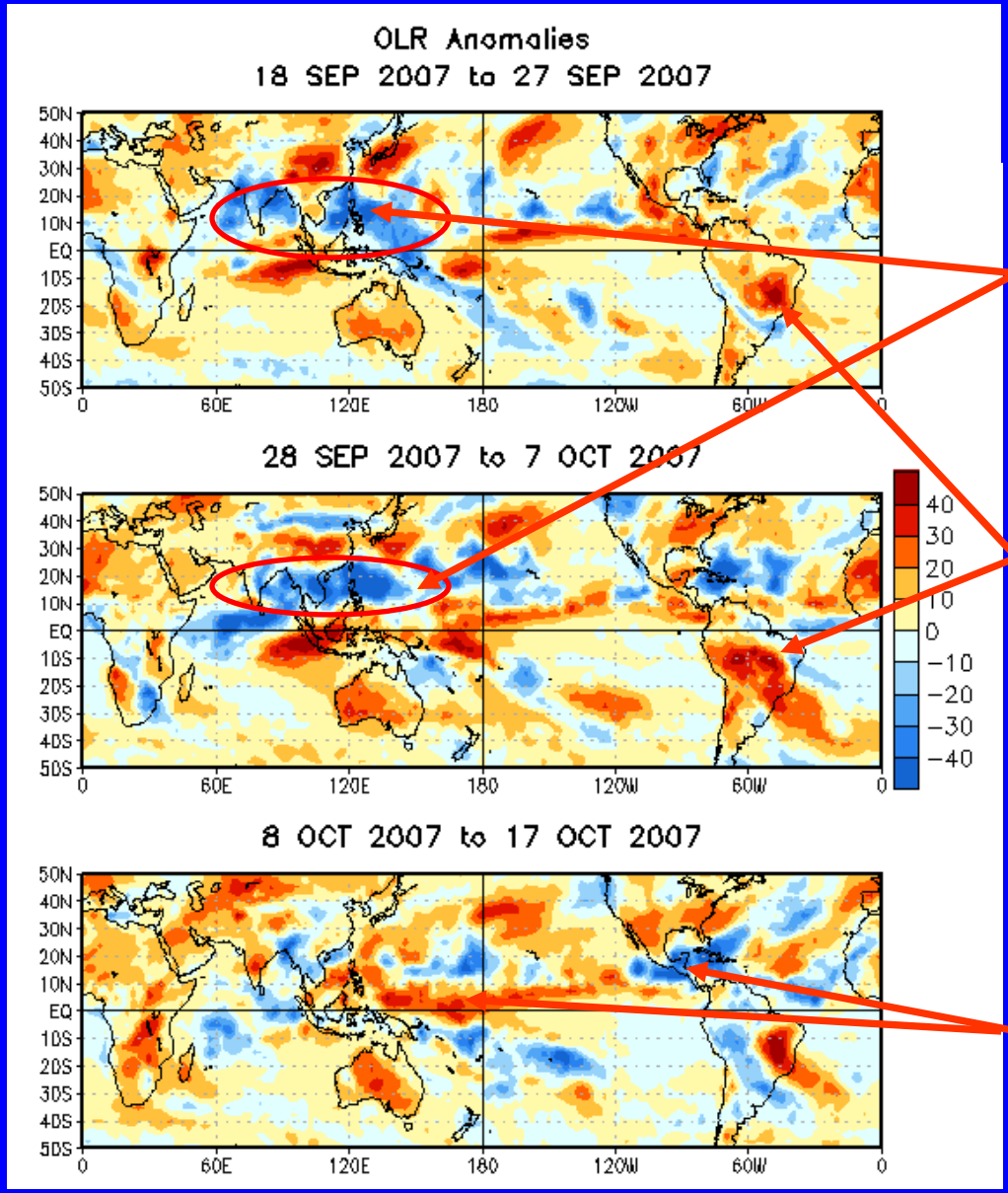
Wetter-than-normal conditions, negative OLR anomalies (blue shading)

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.

Convection increased markedly across sections of the western Pacific Ocean during late September.

Most recently suppressed convection has prevailed across much of the western Pacific Ocean with wet conditions now evident in the 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 the second half of September, enhanced convection became widespread across much of South Asia and the western Pacific Ocean.

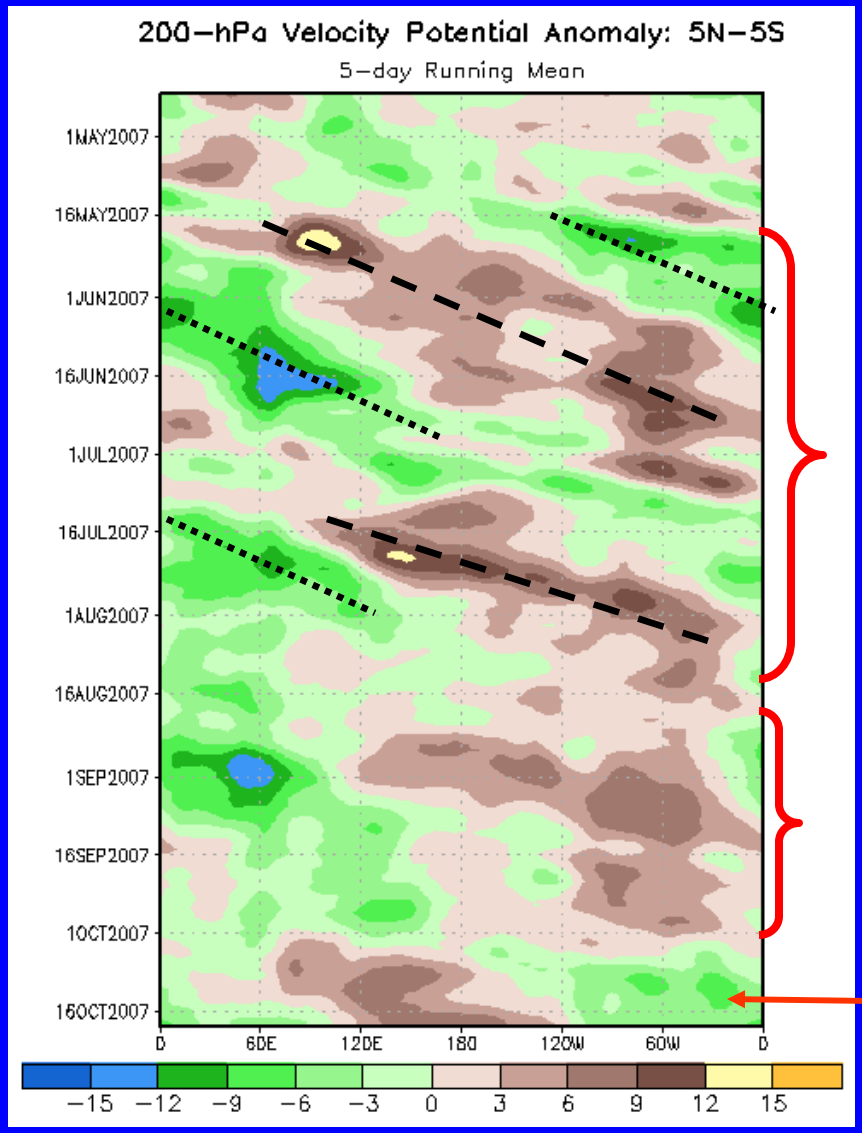
A delayed onset of the rainy season across South America has created very dry conditions across interior Brazil.

In early-mid October, dry conditions dominated the western Pacific with wet conditions over central America.

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

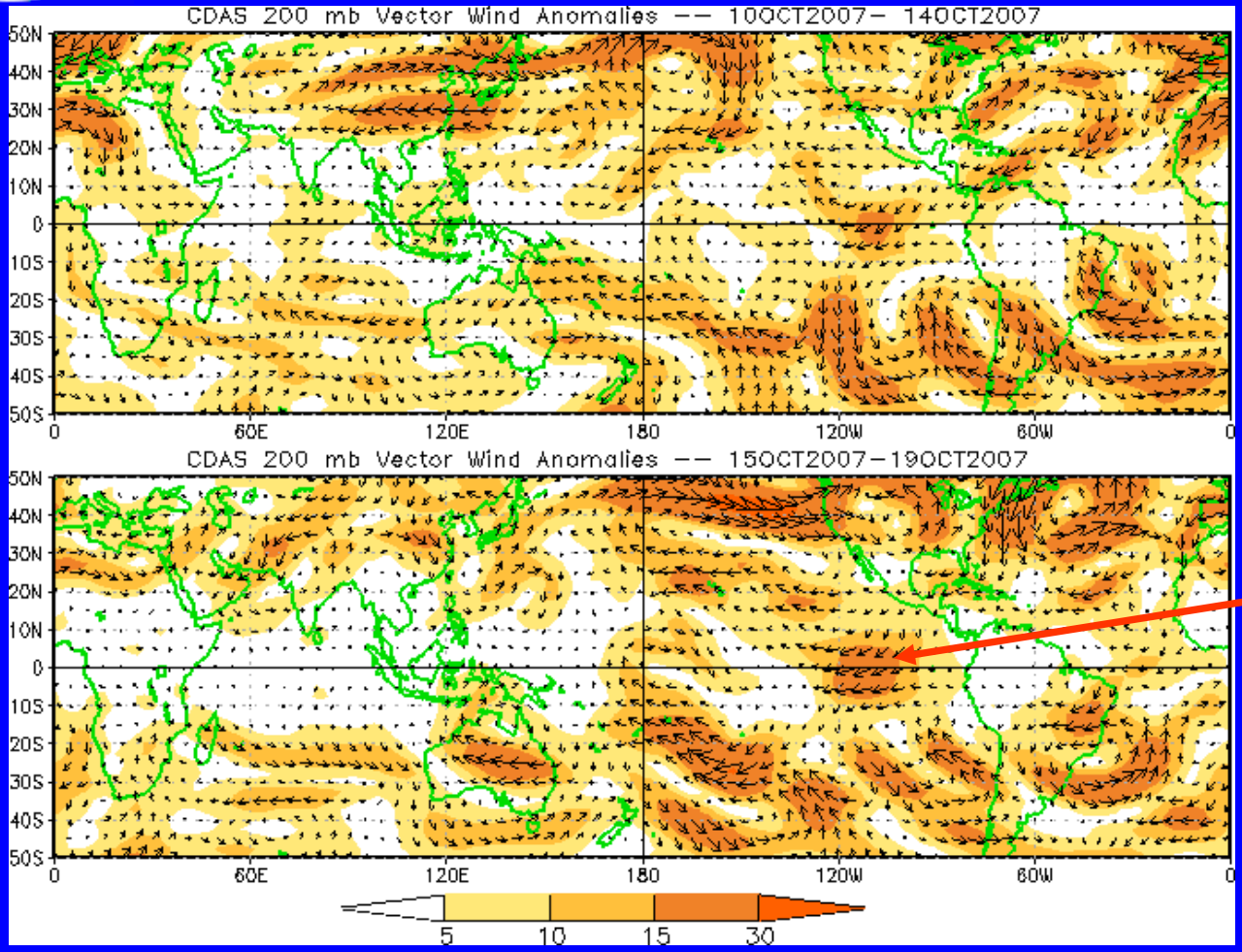
Longitude

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.

During the past few weeks, a substantial change has occurred globally in the sign of the velocity potential anomalies. Some eastward movement is evident.

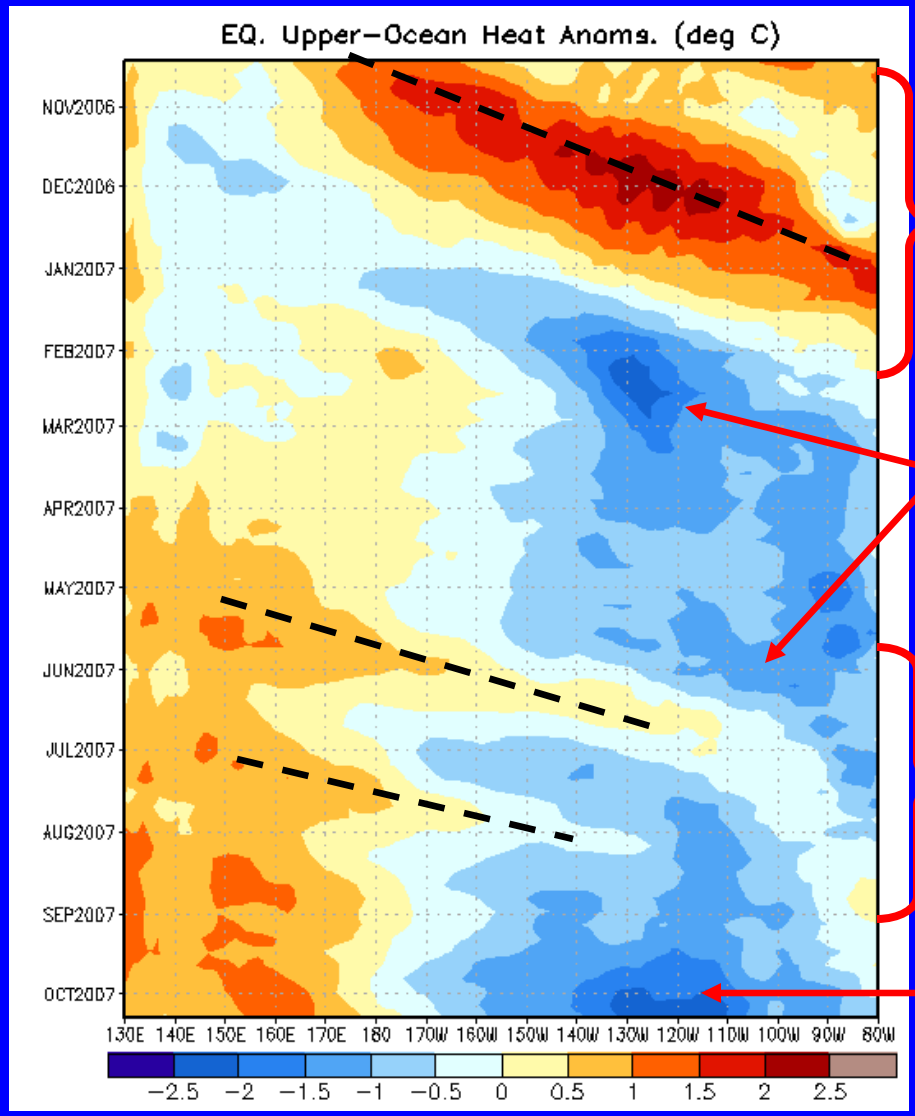
200-hPa Vector Wind Anomalies (m s^{-1})



Note that shading denotes the magnitude of the anomalous wind vectors

Easterly anomalies across the equatorial eastern Pacific Ocean continue.

Weekly Heat Content Evolution in the Equatorial Pacific



Time

Longitude

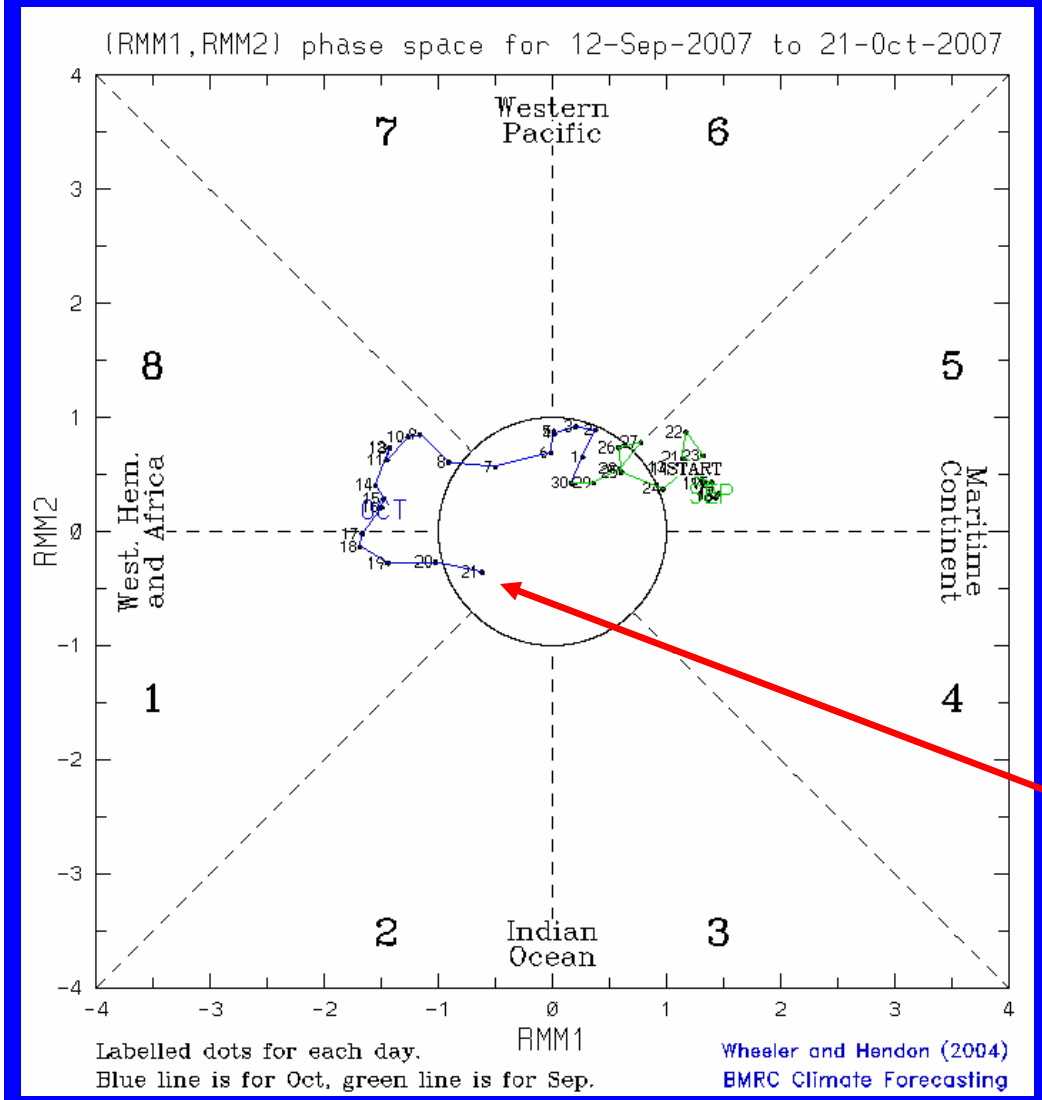
During late 2006, eastward-propagating Kelvin waves (warm phases indicated by dashed lines) caused considerable month-to-month variability in the upper-ocean heat content.

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.

Most recently, negative heat content anomalies have increased across much of the central and eastern Pacific Ocean.

MJO Index

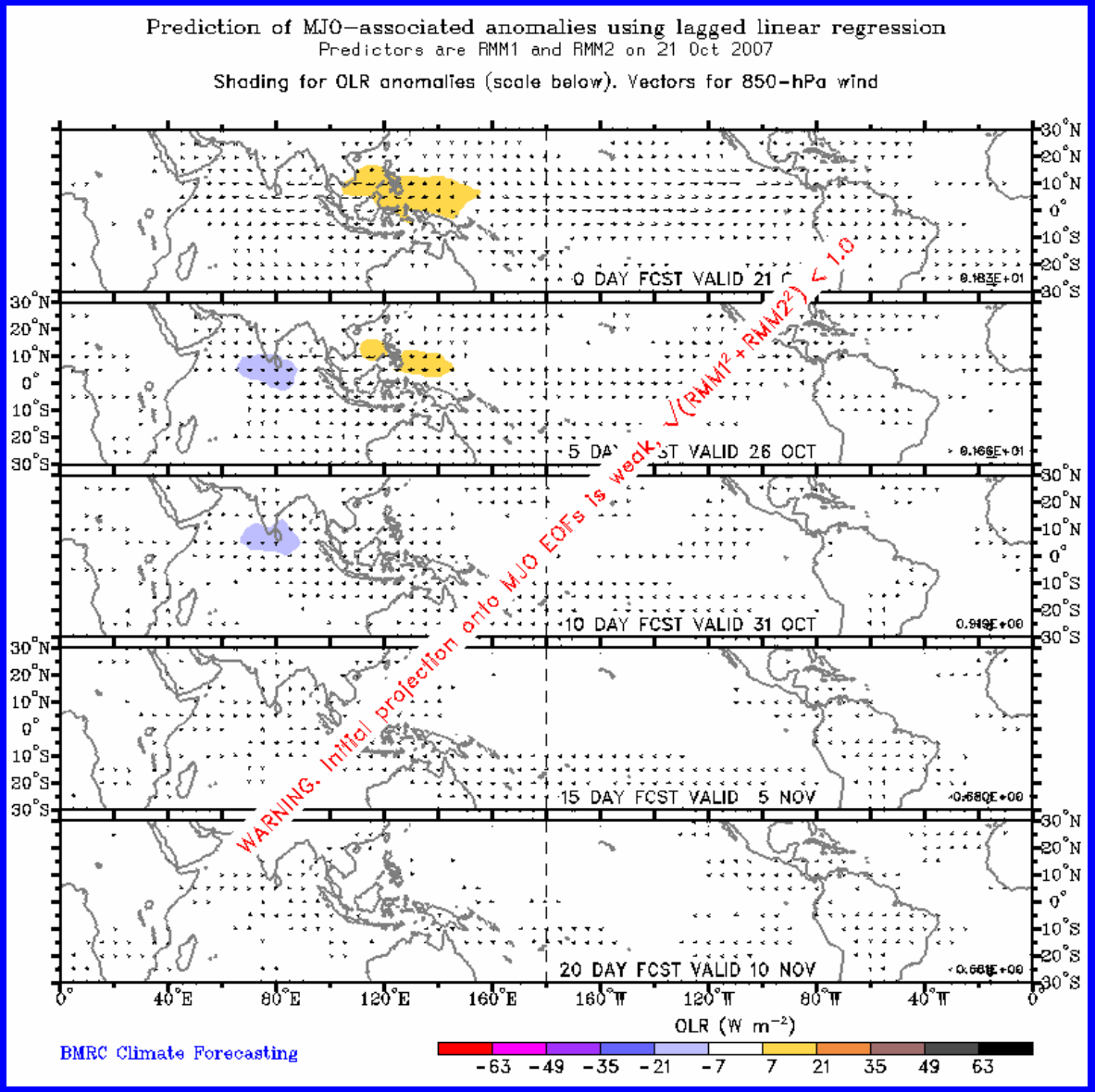


The current state of the MJO as determined by an index based on Empirical Orthogonal Function (EOF) analysis using combined fields of near-equatorially-averaged 850-hPa and 200-hPa zonal wind and outgoing longwave radiation (OLR) (Wheeler and Hendon, 2004).

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.

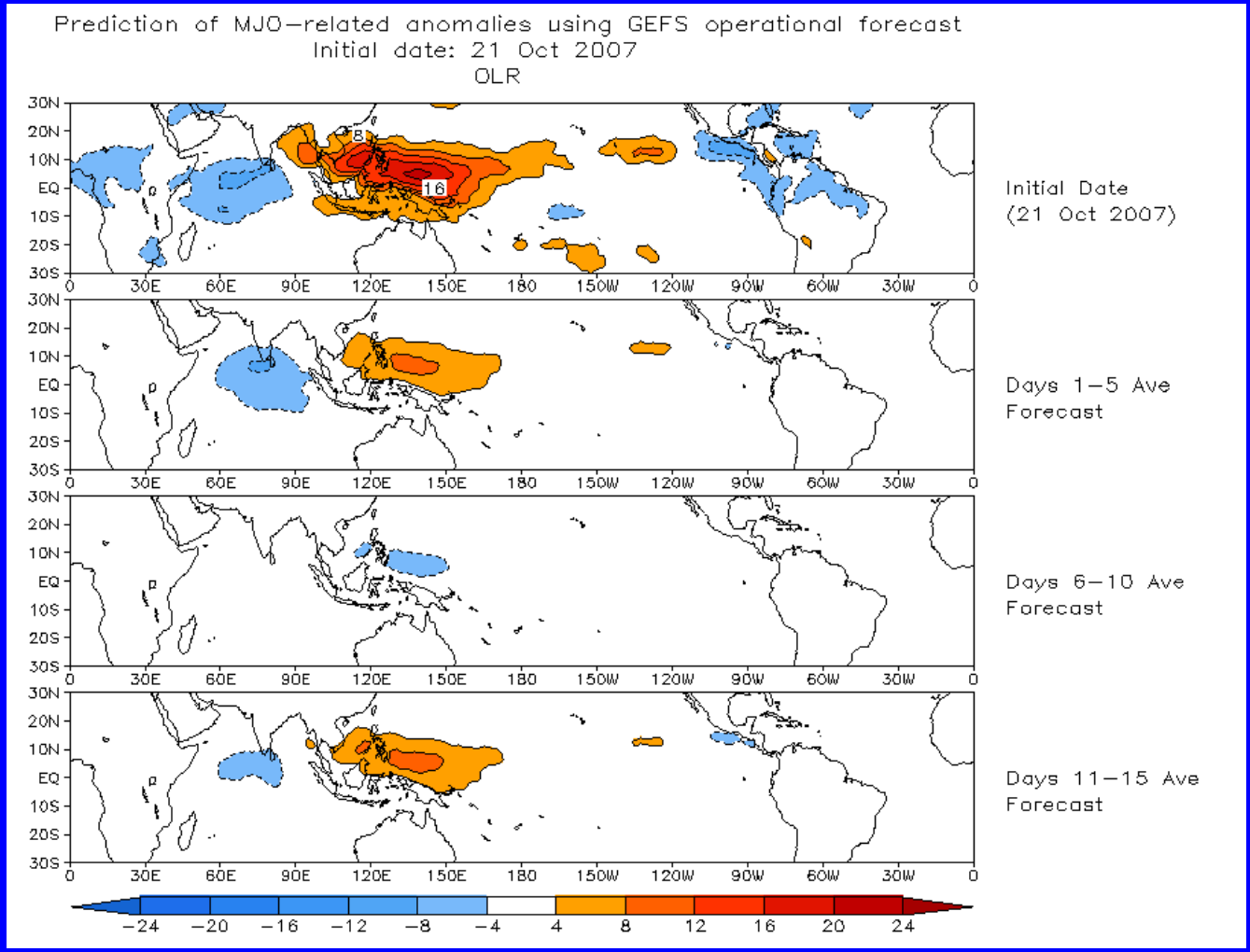
During the past several days, the MJO index has decreased in amplitude with little eastward movement.

Statistical MJO OLR Forecast



A statistical MJO forecast indicates that the MJO will remain weak during the next two weeks.

Experimental GFS MJO OLR Forecast



The GFS forecasts a weakening MJO signal during the upcoming period.