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

Update prepared by
Climate Prediction Center / NCEP
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Outline

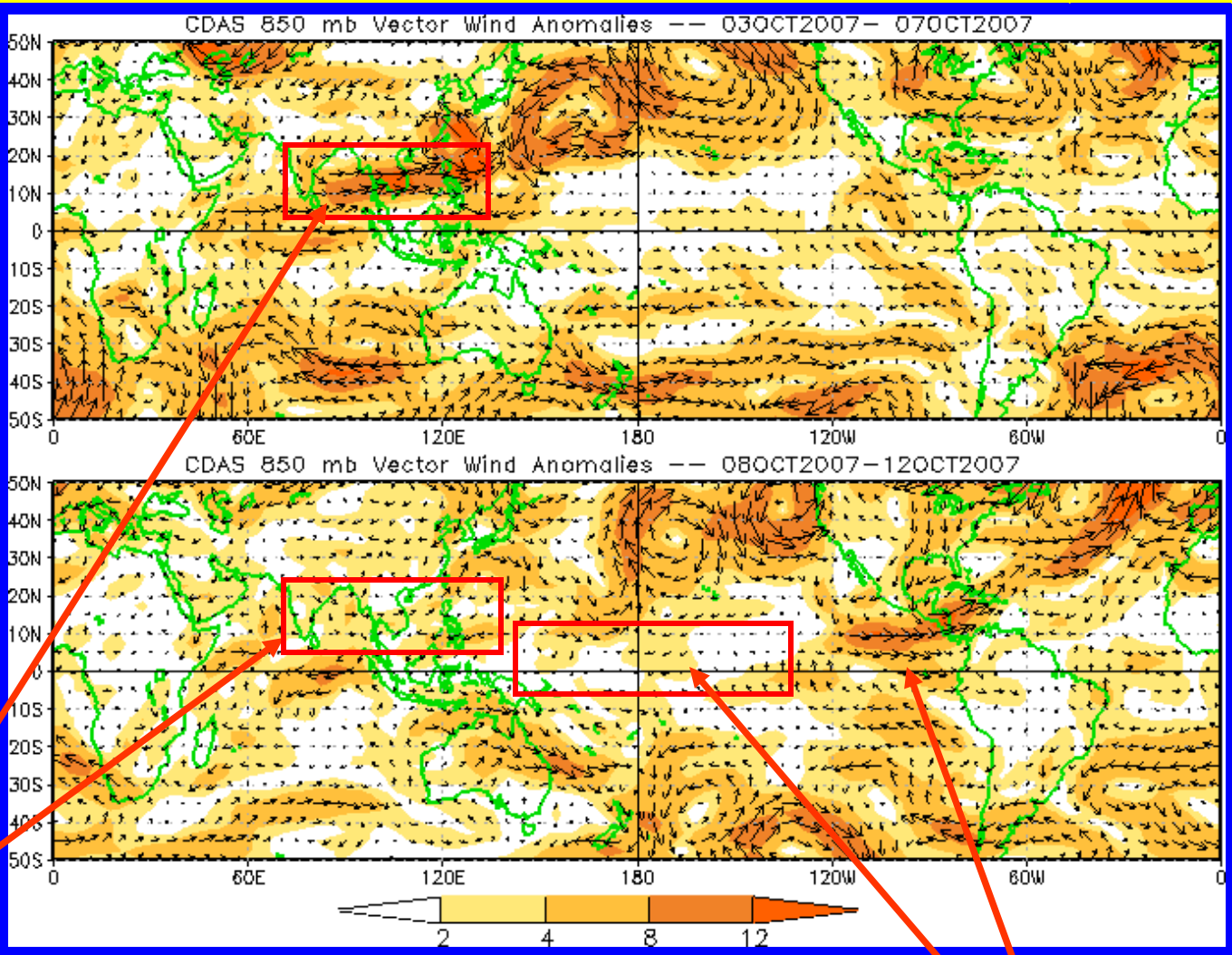
- Overview
- Recent Evolution and Current Conditions
- Madden-Julian Oscillation Forecast

Overview

- The MJO signal has become better organized during the past week.
- A couplet of large-scale upper-level convergence (divergence) centered along the equator exists across the eastern (western) hemisphere 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.
- It is somewhat unclear whether this activity will emerge as a robust coherent MJO event but currently this appears unlikely.
- 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})

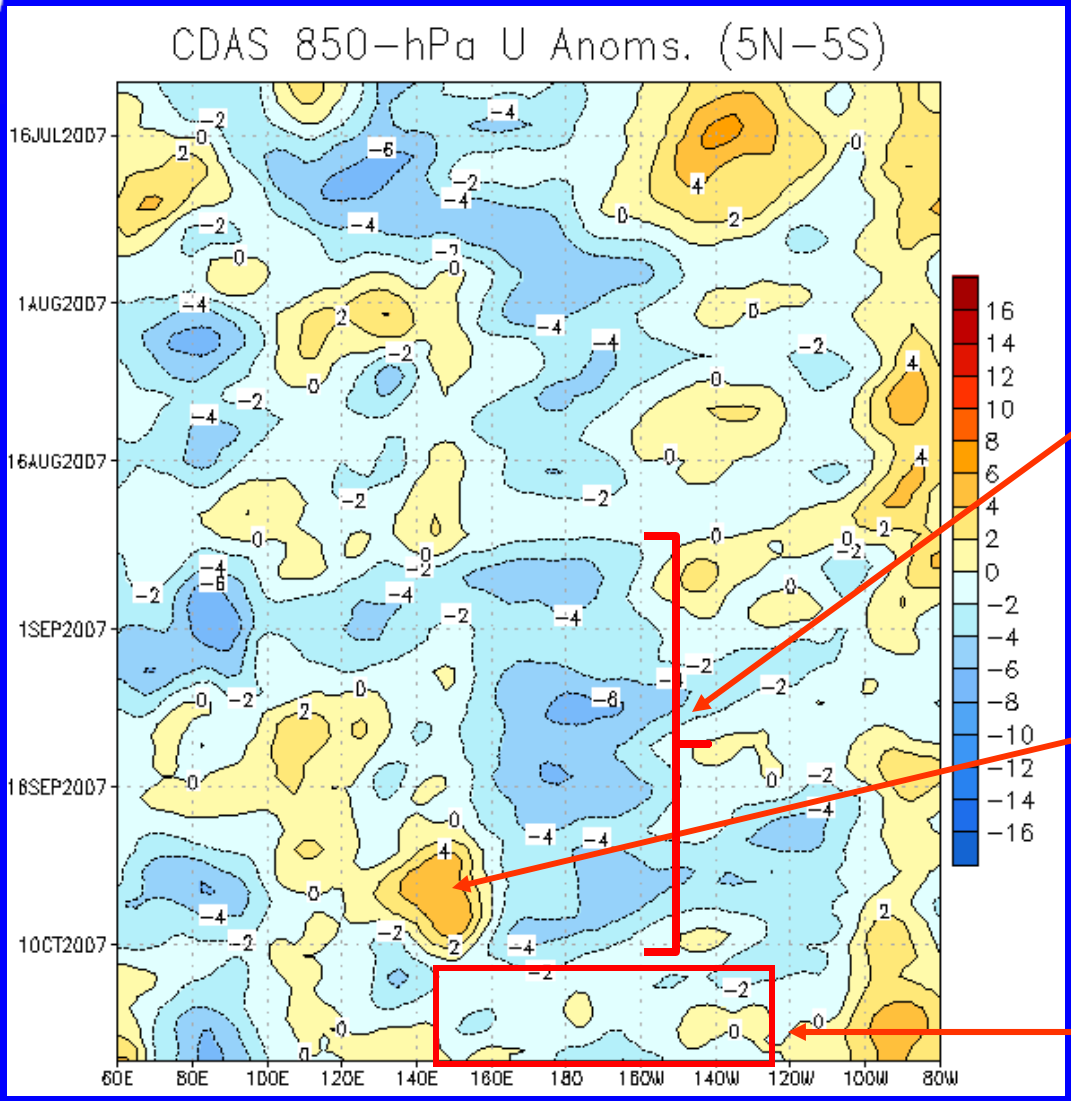
Note that shading denotes the magnitude of the anomalous wind vectors



Westerly anomalies in the Bay of Bengal and South China Sea weakened during the last five days.

Winds across the equatorial central Pacific Ocean were near average while westerly anomalies have developed 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.

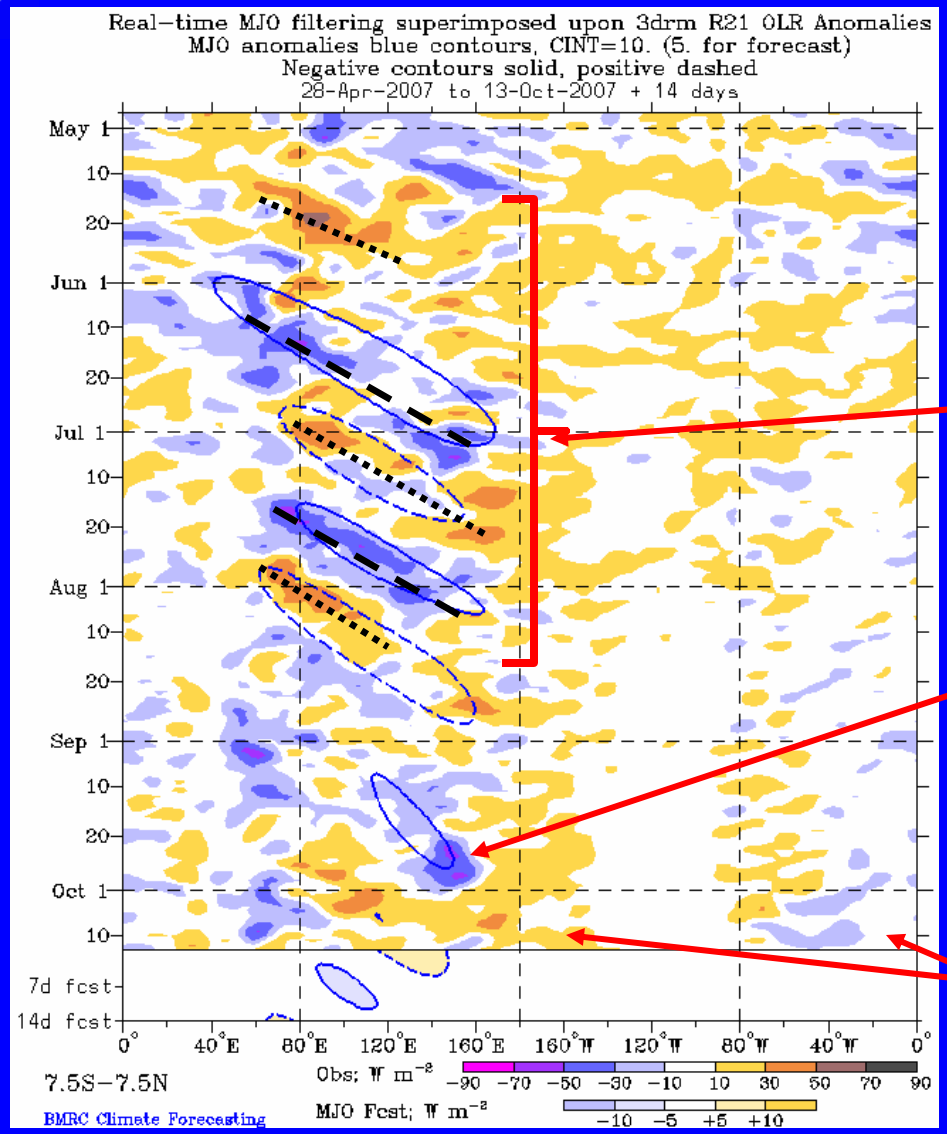
Easterly anomalies (blue shading) represent anomalous east-to-west flow.

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.

The easterlies have weakened dramatically across much of the Pacific during the past two weeks.

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



Time

Longitude

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

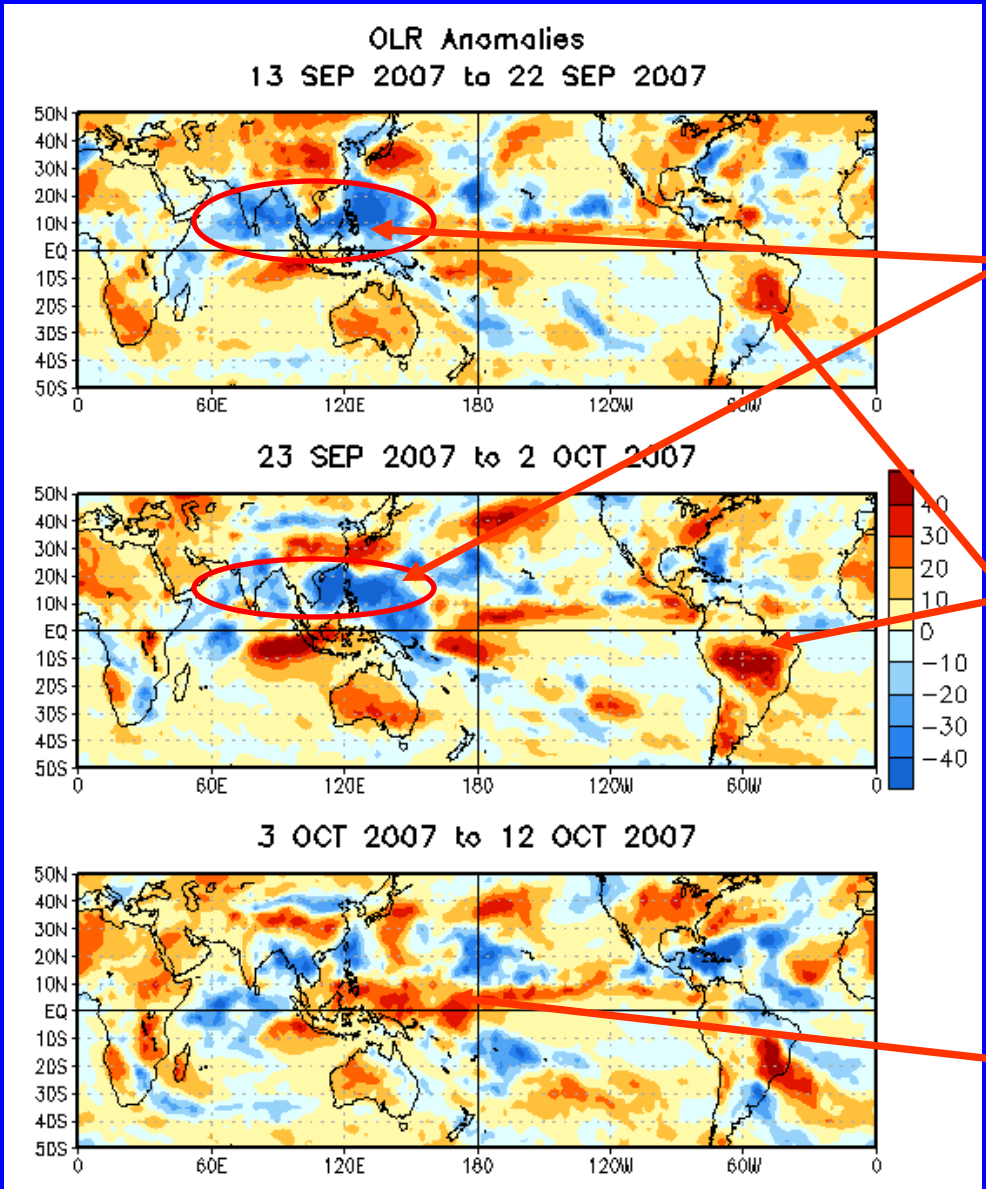
Wetter-than-normal conditions, negative OLR anomalies (blue shading)

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 evident across the western hemisphere.

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.

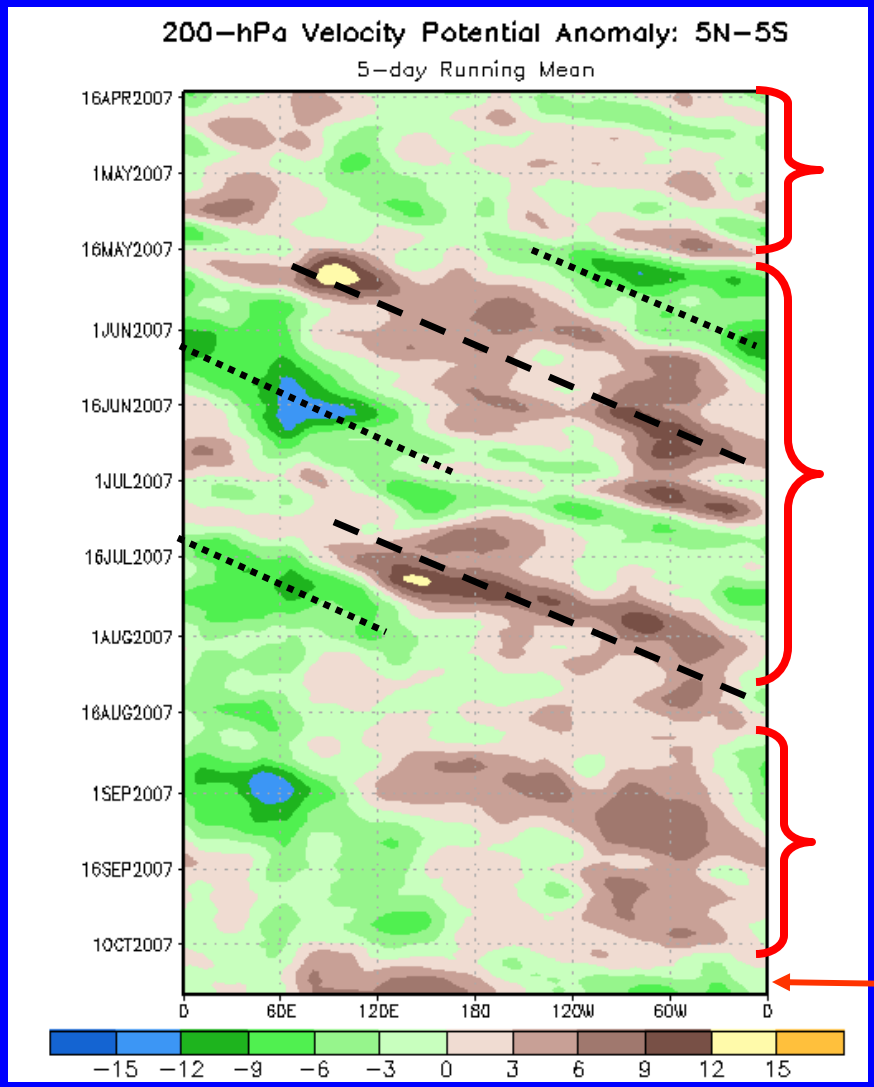
In late September, dry conditions became evident across sections of the eastern Indian Ocean and Maritime continent as the seasonal shift southward in convection has been delayed to date.

In early October, dry conditions dominated the Maritime continent and western Pacific.

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

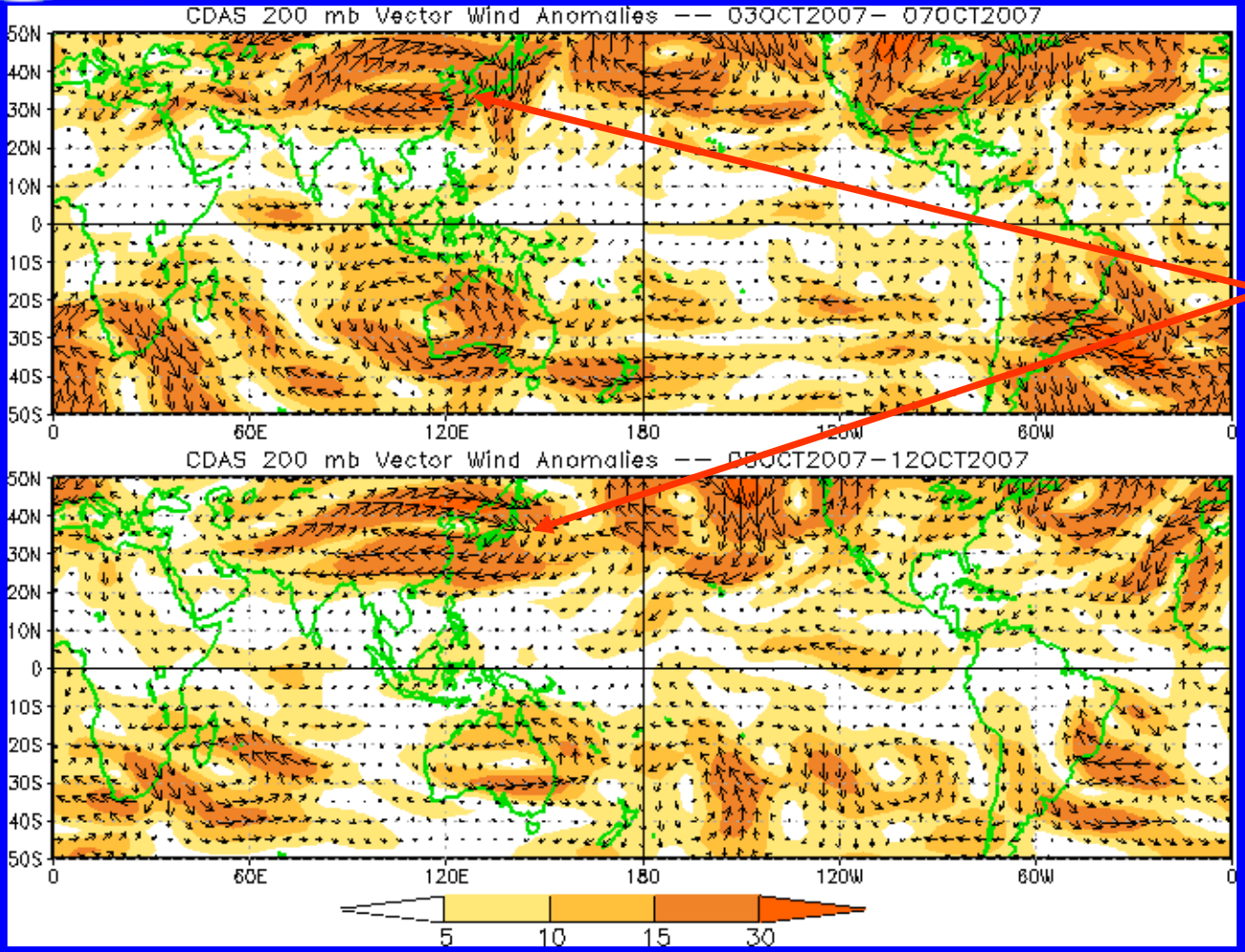
The MJO was weak or incoherent from mid-March to mid-May.

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

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

During the past week, a substantial change has occurred globally in the sign of the velocity potential anomalies.

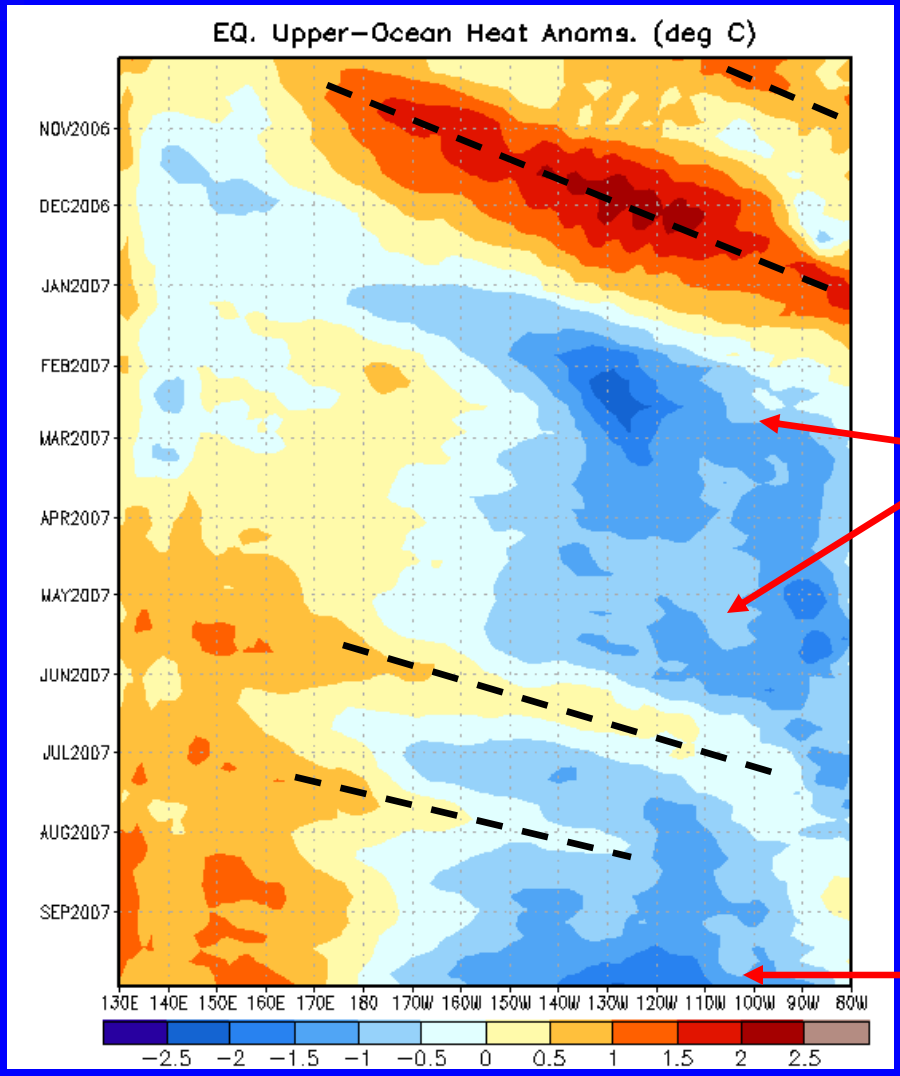
200-hPa Vector Wind Anomalies (m s^{-1})



Note that shading denotes the magnitude of the anomalous wind vectors

Anomalous anticyclone persists across eastern Asia in the northern hemisphere mid-latitudes.

Weekly Heat Content Evolution in the Equatorial Pacific



Time

Longitude

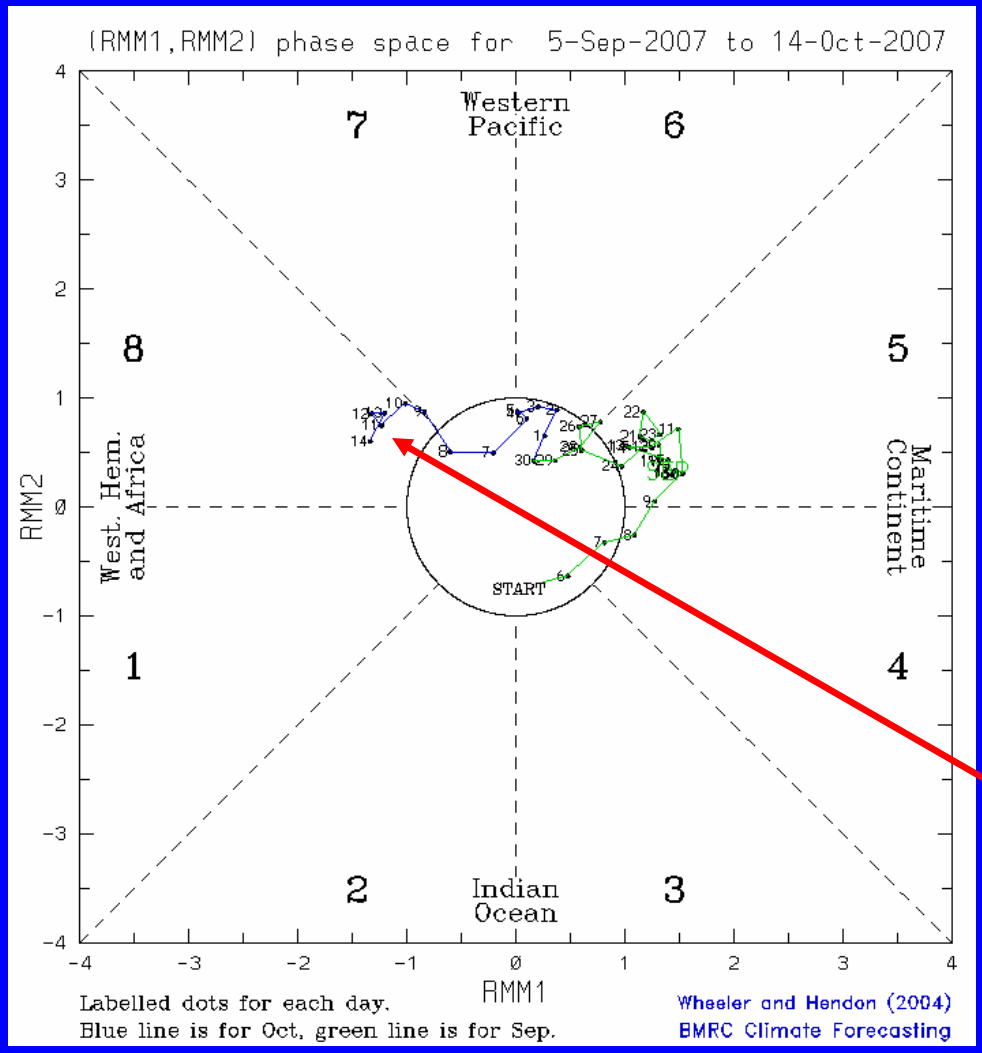
During late 2006, eastward-propagating Kelvin waves (warm phases indicated by dashed lines) caused considerable month-to-month variability in the upper-ocean heat content.

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

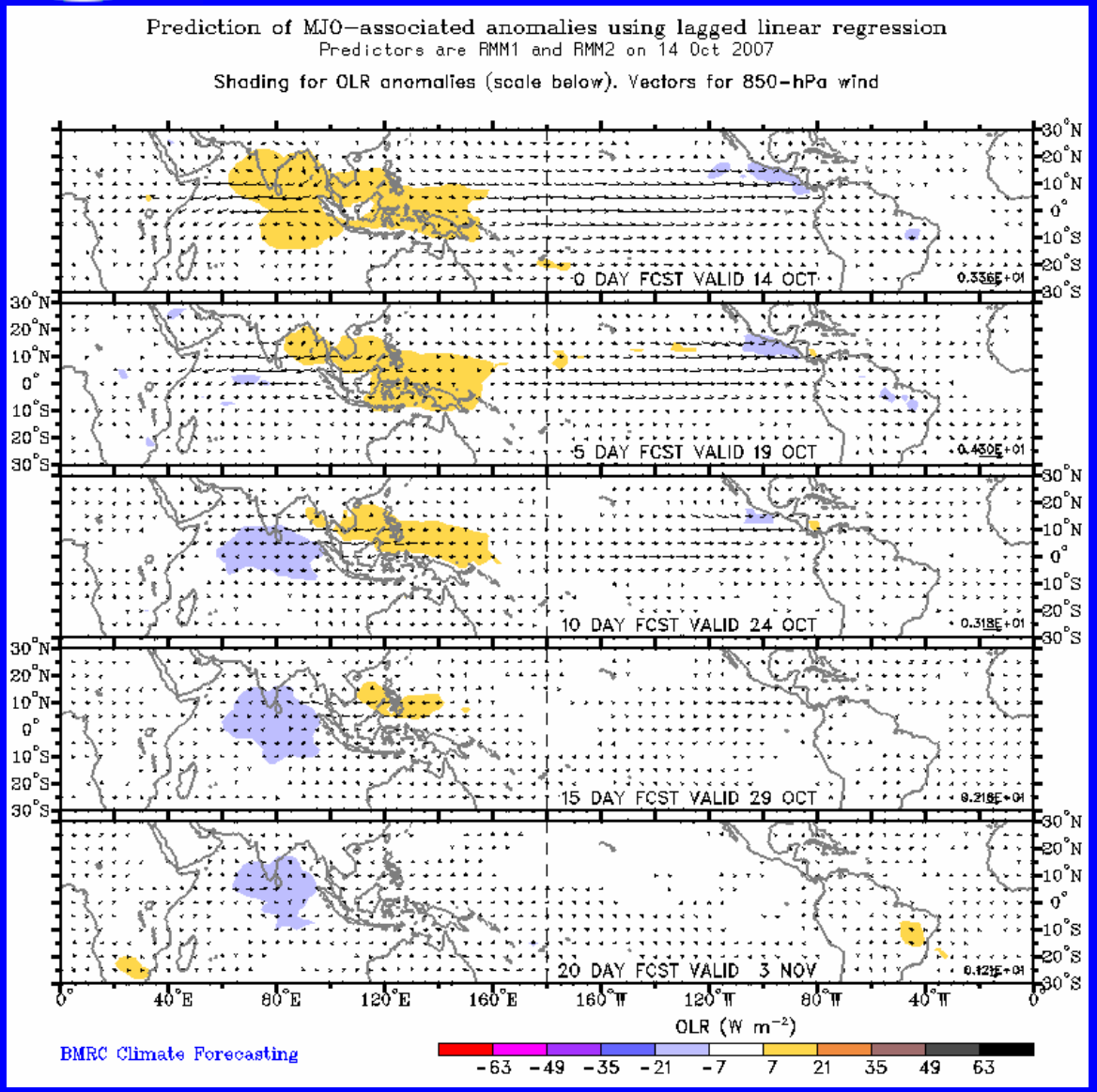


The current state of the MJO as determined by an index based on Empirical Orthogonal Function (EOF) analysis using combined fields of near-equatorially-averaged 850-hPa and 200-hPa zonal wind and outgoing longwave radiation (OLR) (Wheeler and Hendon, 2004).

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.

In recent days, the MJO index has increased in amplitude and has shown some signs of eastward movement.

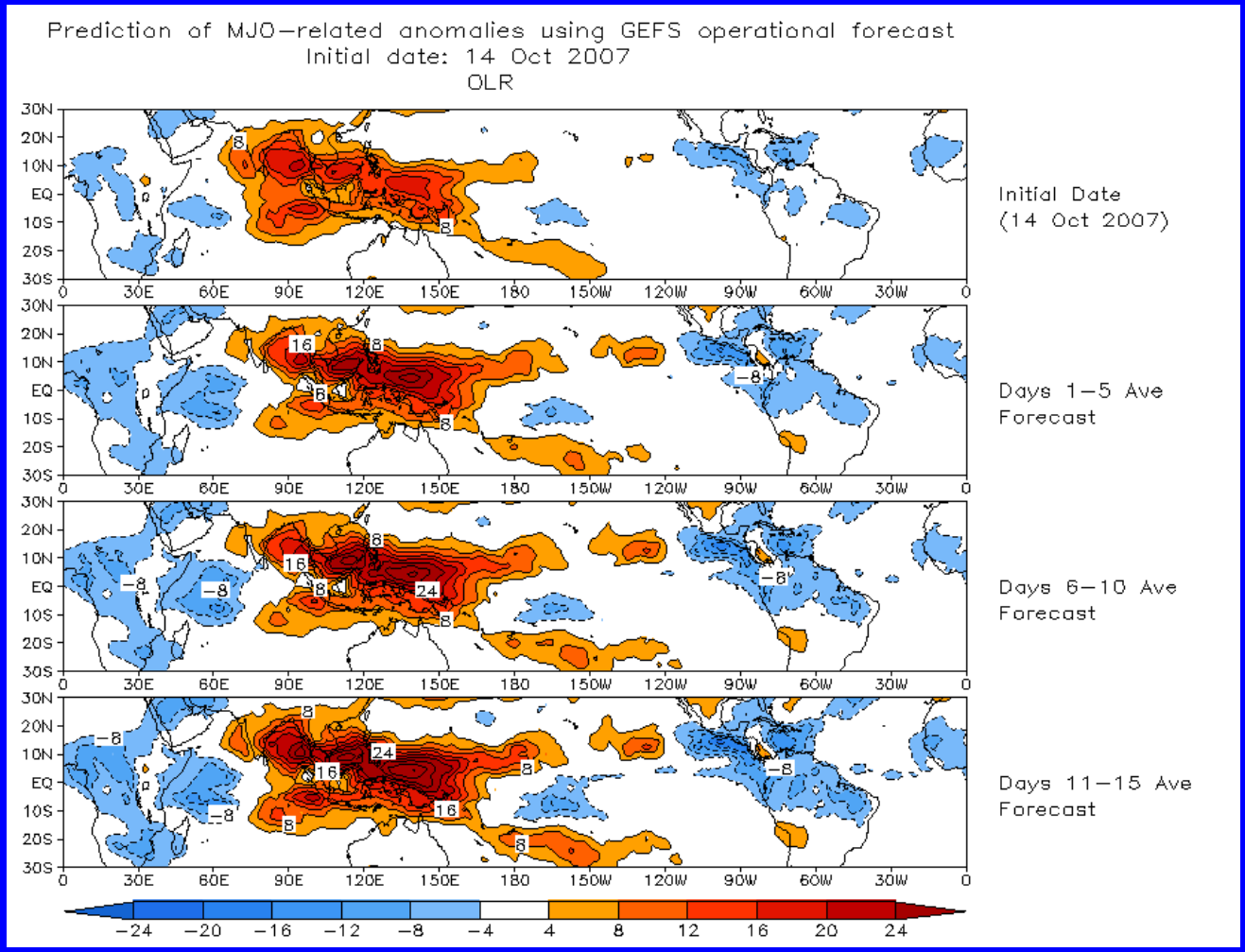
Statistical MJO OLR Forecast



The statistical method forecasts weak to moderate MJO activity during the upcoming ten day period.

Dry conditions are expected across mainly the Maritime Continent and the far western Pacific while wet conditions develop in the Indian Ocean.

Experimental GFS MJO OLR Forecast



The GFS forecasts a stronger MJO associated amplitude but little in the way of eastward propagation.

Dry conditions are expected throughout the period across the Maritime continent and west Pacific.

Wet conditions are anticipated across sections of the eastern Pacific Ocean and Caribbean Sea throughout much of the period.