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

Update prepared by
Climate Prediction Center / NCEP
July 2, 2007

Outline

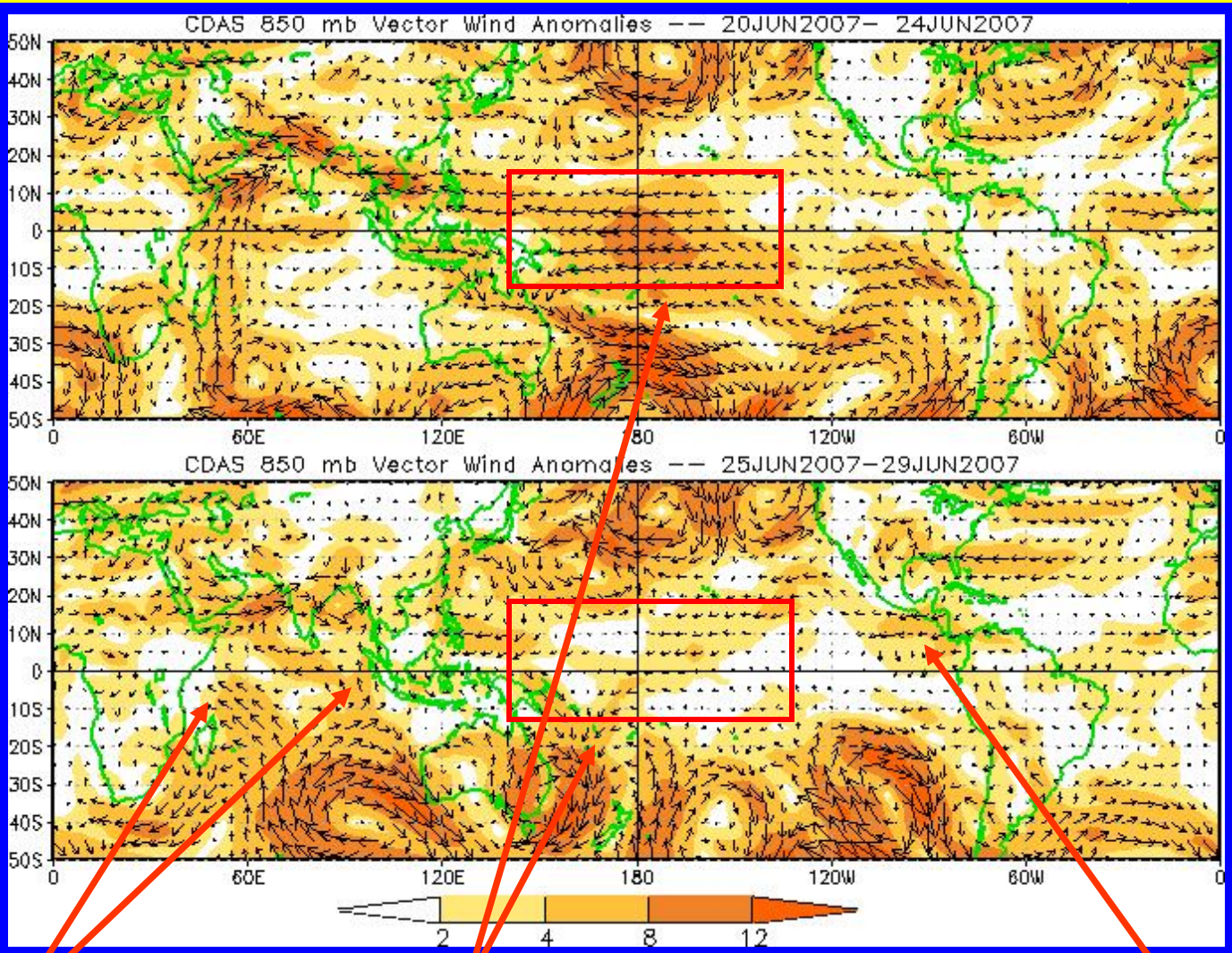
- Overview
- Recent Evolution and Current Conditions
- Madden-Julian Oscillation Forecast
- Summary

Overview

- The MJO remains weak with the enhanced phase centered across the eastern Maritime continent.
- Enhanced convection continued across areas stretching from the Arabian Sea to Southeast Asia. A noticeable increase in convection, however, has occurred across the western Pacific Ocean.
- Dry conditions were observed across parts of the equatorial Indian Ocean.
- Based on the latest monitoring and forecast tools, weak MJO activity is expected to continue during the next two weeks.

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

Note that shading denotes the magnitude of the anomalous wind vectors

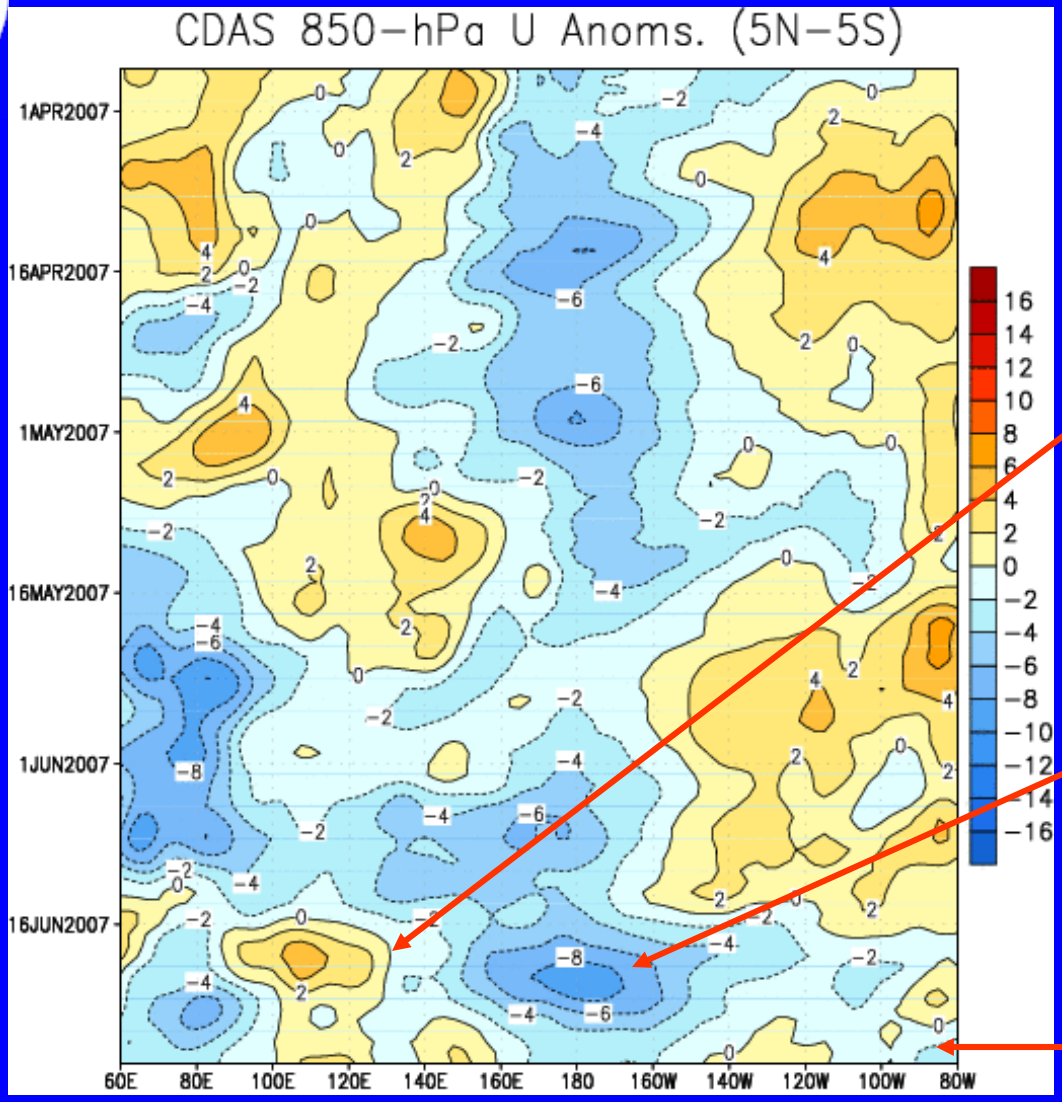


Monsoonal flow continues for The India and Southeast Asia regions.

Easterly anomalies in the west-central Pacific Ocean have decreased during the past five days.

Easterly anomalies have increased across the eastern Pacific.

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



Time

Longitude

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

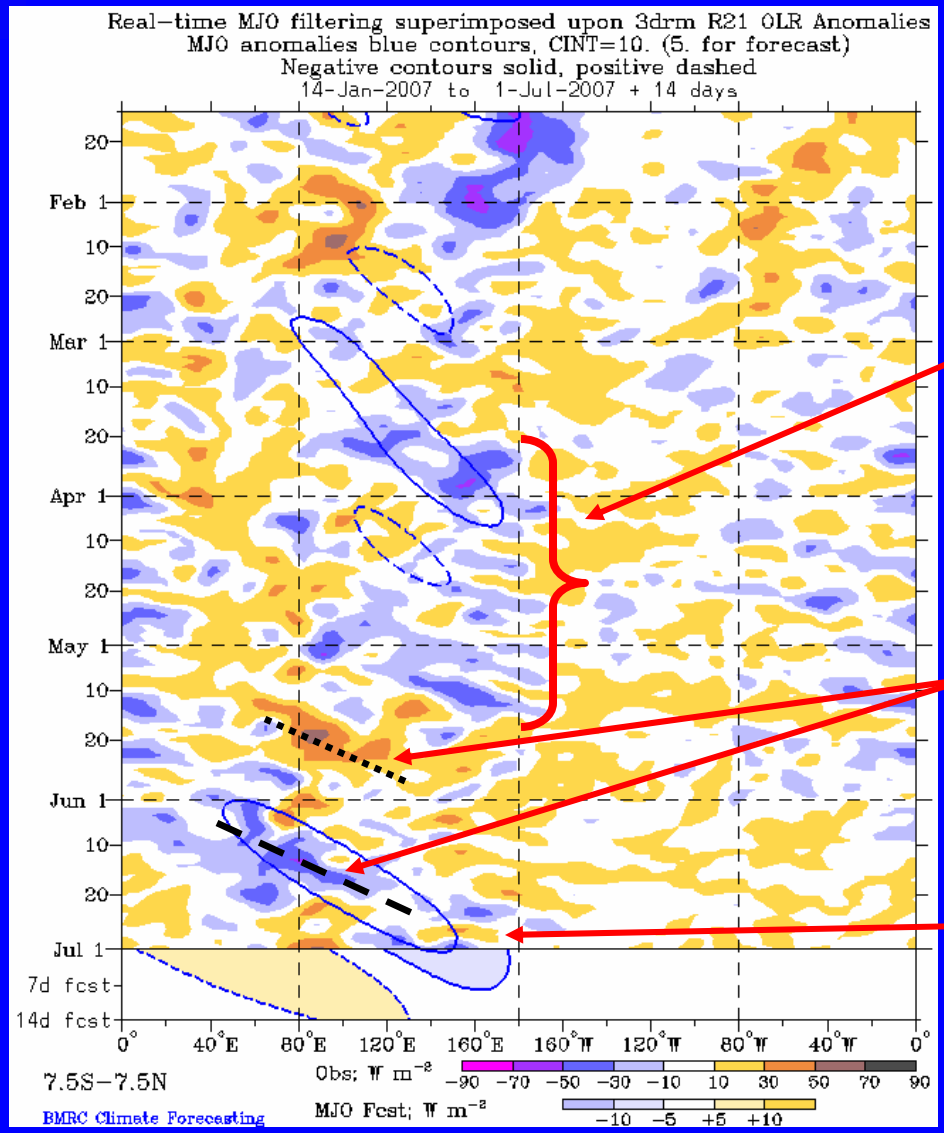
Easterly anomalies (blue shading) represent anomalous east-to-west flow.

Small westerly anomalies have been evident across sections of the Maritime continent and the western Pacific Ocean during the second half of June.

The strengthening of the easterlies in mid-late June near the Date Line has recently ended.

Anomalies have been small across the equatorial eastern Pacific Ocean during the last few weeks.

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



Time

Longitude

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

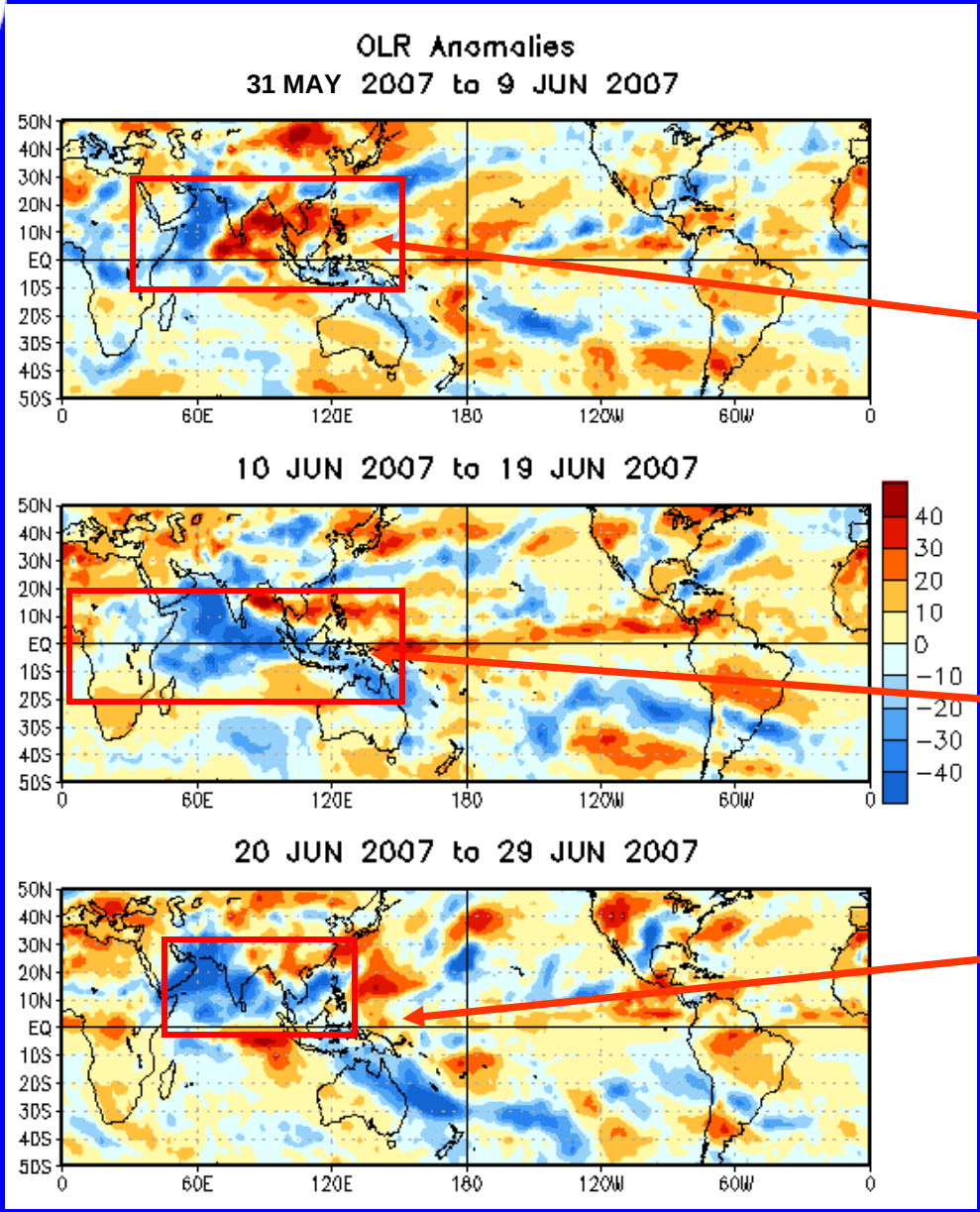
Wetter-than-normal conditions, negative OLR anomalies (blue shading)

Intermittent periods of enhanced convection were evident in the western Pacific Ocean from late March into May.

Beginning in mid May, moderate MJO activity was observed as first suppressed convection and later enhanced convection shifted eastward from the Indian Ocean into the far western Pacific and Maritime continent.

During the last several days, enhanced convection has developed in the far western Pacific while dry conditions are evident across 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 early June, enhanced rainfall continued over sections of the Arabian Sea and Africa while dry conditions prevailed across Southeast Asia.

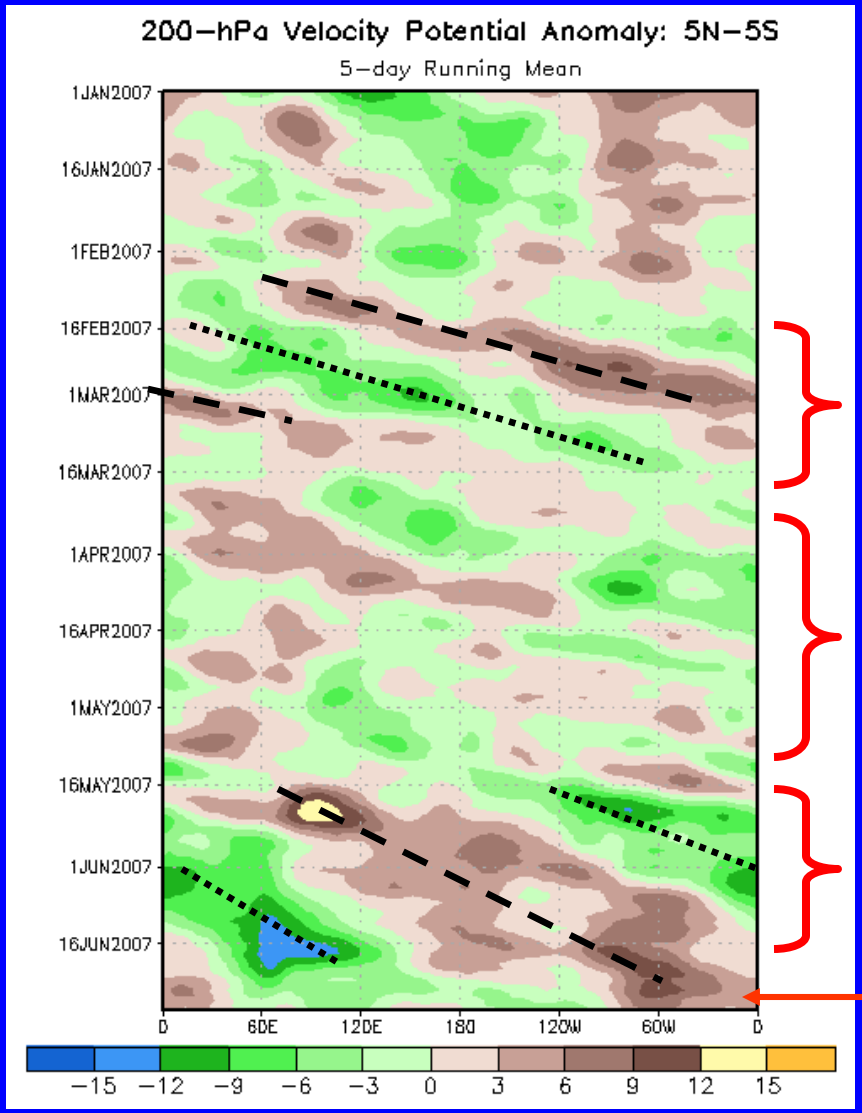
During mid-June, wet conditions expanded eastward across the Indian Ocean and Maritime Continent associated with the MJO.

The enhanced convection across the Eastern Hemisphere shifted northward during late June.

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.



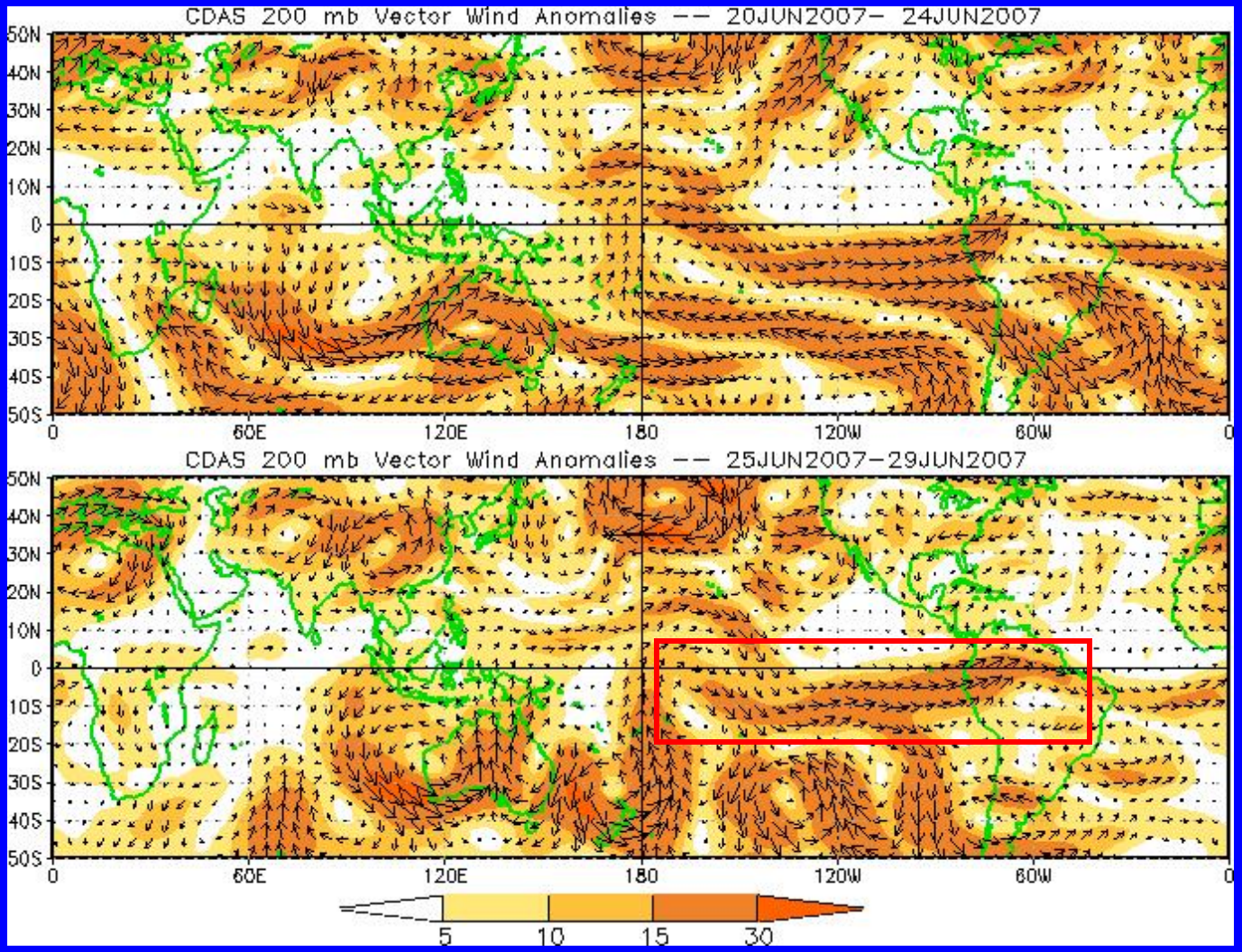
Weak to moderate MJO activity was observed during late February and early March as velocity potential anomalies shifted eastward.

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

A moderate MJO developed in mid-May as velocity potential anomalies increased and shifted eastward until mid-late June.

Recently the MJO has weakened.

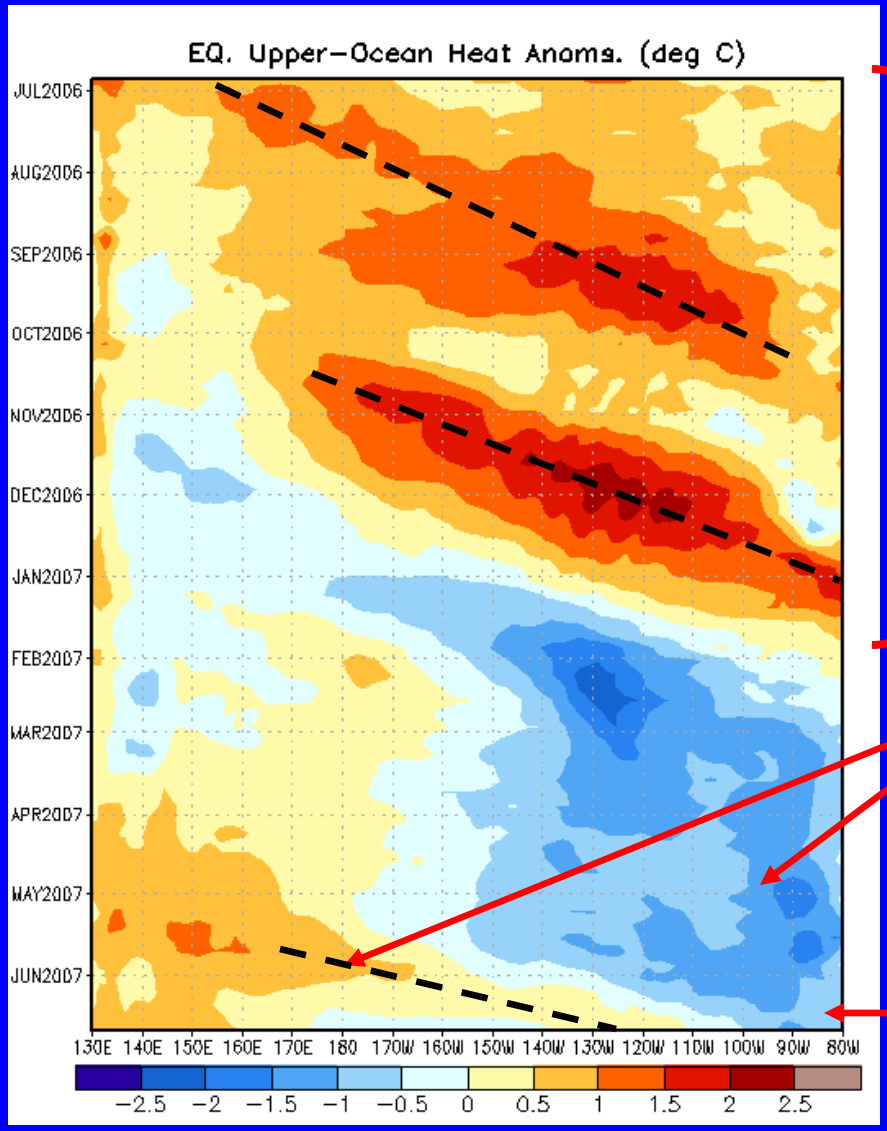
200-hPa Vector Wind Anomalies (m s^{-1})



Note that shading denotes the magnitude of the anomalous wind vectors

South of the equator, westerly anomalies continue across the eastern Pacific Ocean.

Weekly Heat Content Evolution in the Equatorial Pacific



Time

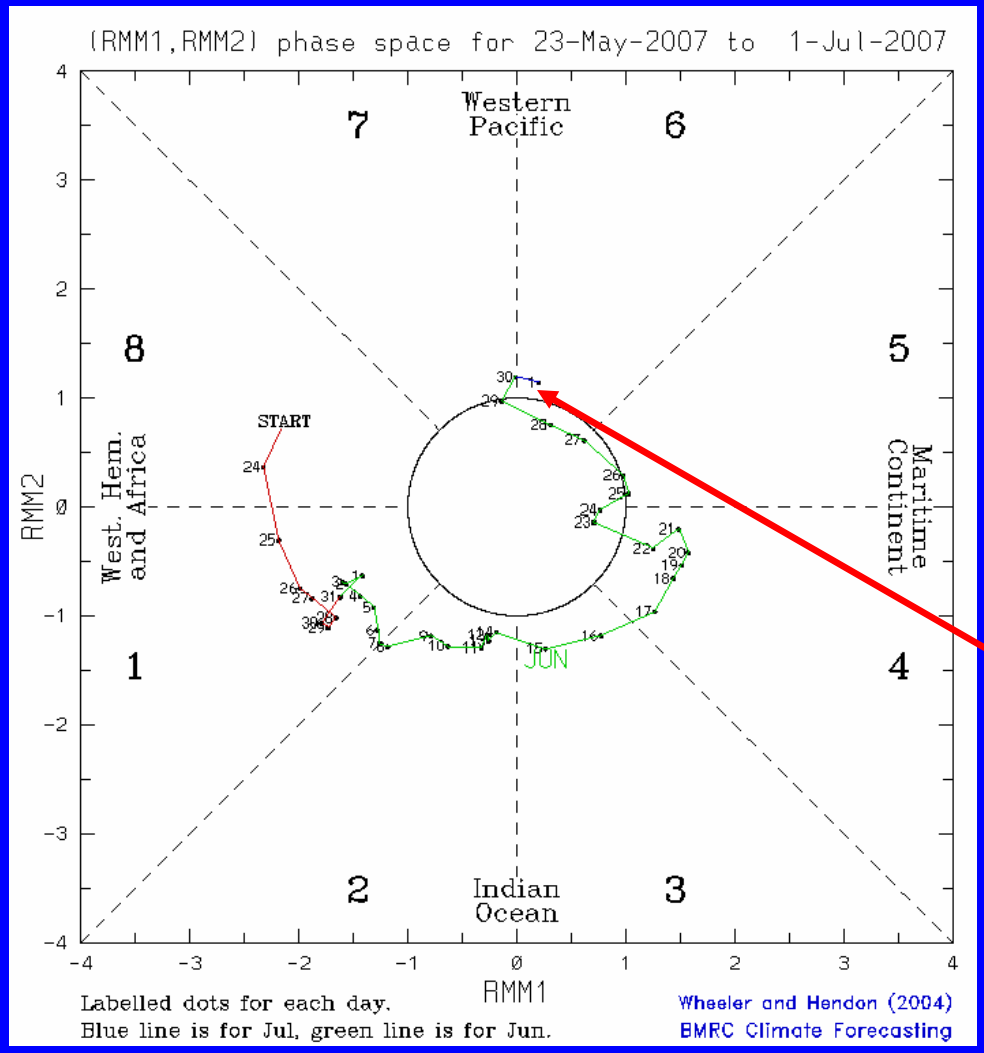
Longitude

During this period two eastward-propagating Kelvin waves (warm phases indicated by dashed lines) have caused considerable month-to-month variability in the upper-ocean heat content.

Since January, negative heat content anomalies are evident across the eastern equatorial Pacific and since late March larger positive anomalies are evident in the far western Pacific Ocean.

Most recently, negative heat content anomalies have decreased in the east Pacific Ocean while a weak Kelvin wave has resulted in small positive anomalies as far east as 110° W.

MJO Index

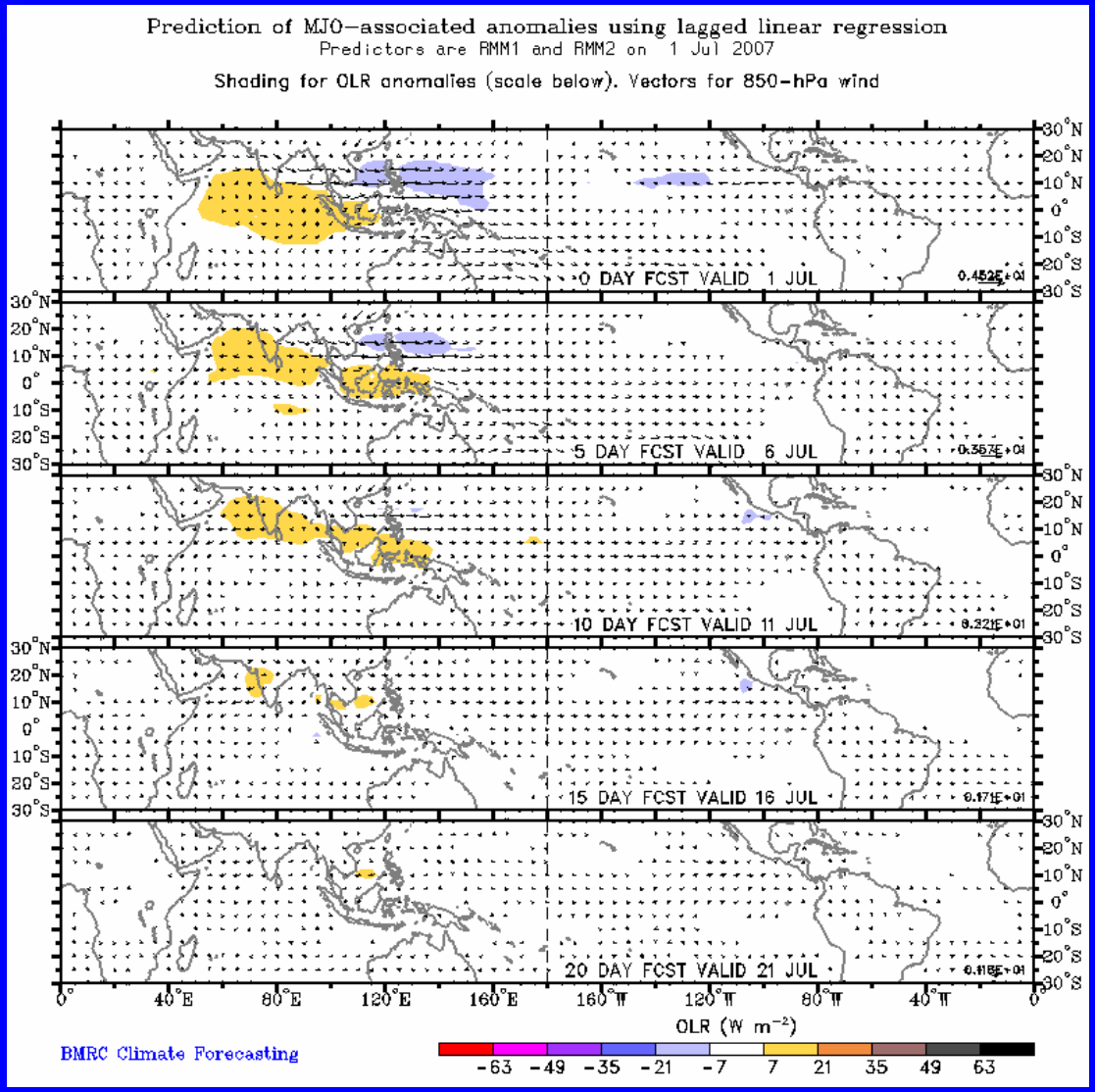


The current state of the MJO as determined by an index based on Empirical Orthogonal Function (EOF) analysis using combined fields of near-equatorially-averaged 850-hPa and 200-hPa zonal wind and outgoing longwave radiation (OLR) (Wheeler and Hendon, 2004).

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 has increased in amplitude but has shown little eastward propagation in recent days.

MJO OLR Forecast



The statistical method forecasts weak MJO activity during the next two weeks with dry conditions across the Indian Ocean expected.

200–850 hPa Vertical Wind Shear

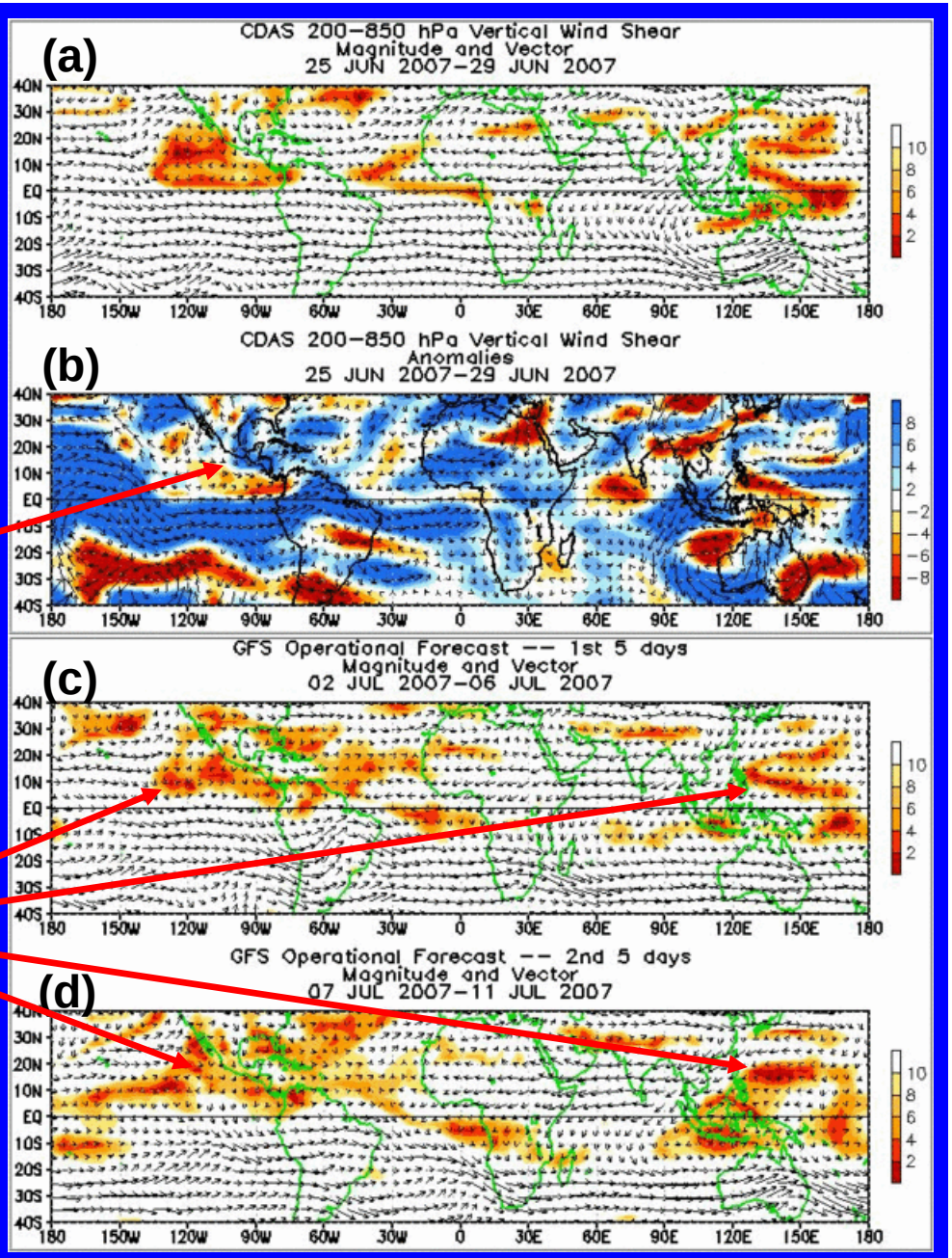
All plots: Shading denotes magnitude of vectors

Plots (a),(c),(d): low shear (red), high shear (yellow/white)

Plot (b): Shear greater than average (blue) Shear less than average (yellow/red)

Vertical wind shear greater than average is noted across the eastern Pacific Ocean.

The GFS forecast indicates low shear across sections of the western and eastern Pacific Ocean.



NOTICE OF CHANGE

The slides depicting potential benefits and hazards normally located here will no longer be placed within the MJO weekly update. Expected impacts during the upcoming 1-2 week time period can now be found as part of a new product:

Experimental Global Tropics Benefits/Hazards Assessment

The product can be found at:

http://www.cpc.ncep.noaa.gov/products/precip/CWlink/ghazards/ghaz.shtml

Please send questions/comments/suggestions to

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