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

Update prepared by
Climate Prediction Center / NCEP
July 30, 2007

Outline

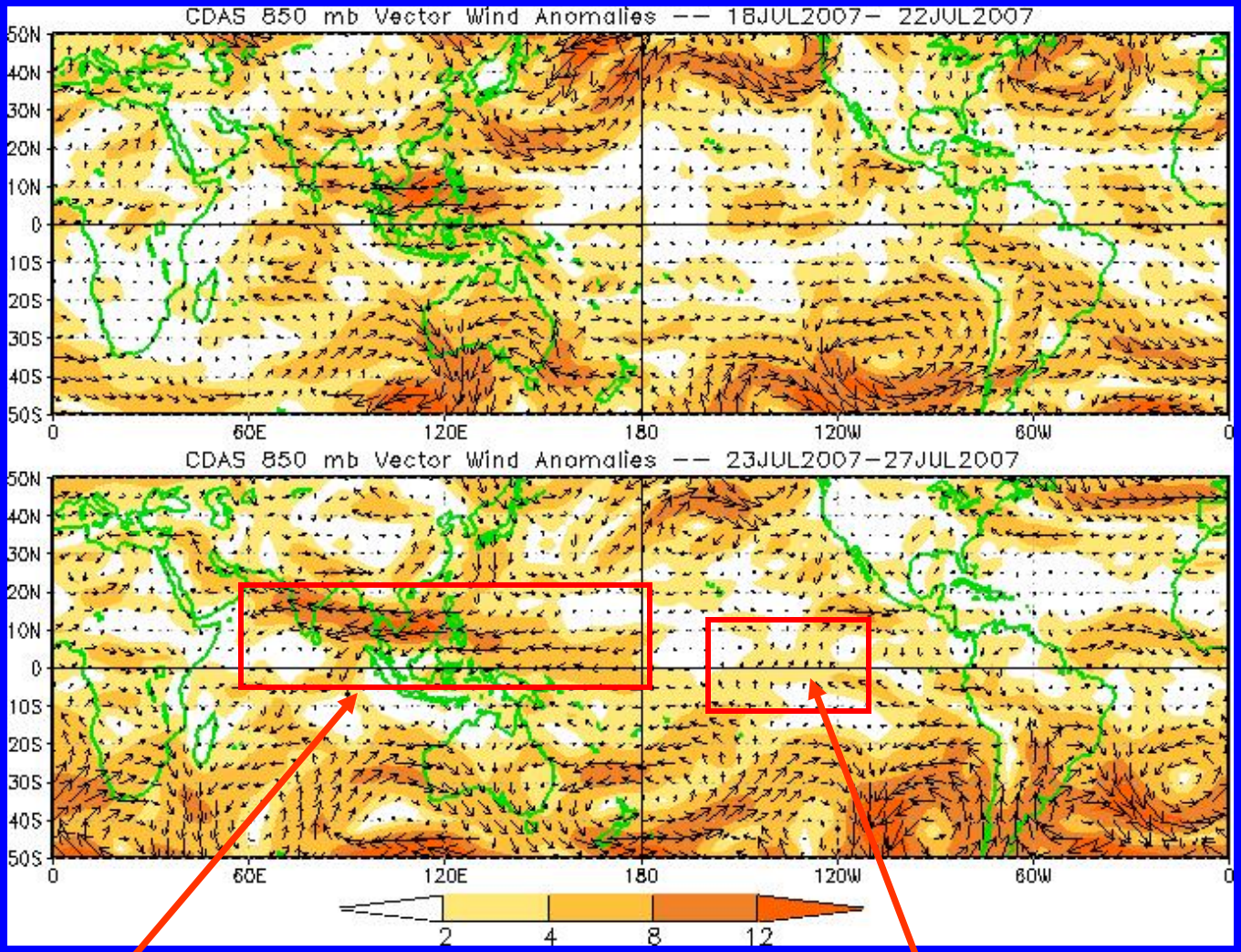
- Overview
- Recent Evolution and Current Conditions
- Madden-Julian Oscillation Forecast
- Summary

Overview

- The latest observations indicate that the MJO has weakened.
- During the past week, enhanced convection has been focused across the Maritime continent while dry conditions have been evident in the western Pacific Ocean east of China.
- An additional noteworthy change has been the development of wet conditions across western Africa.
- 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})

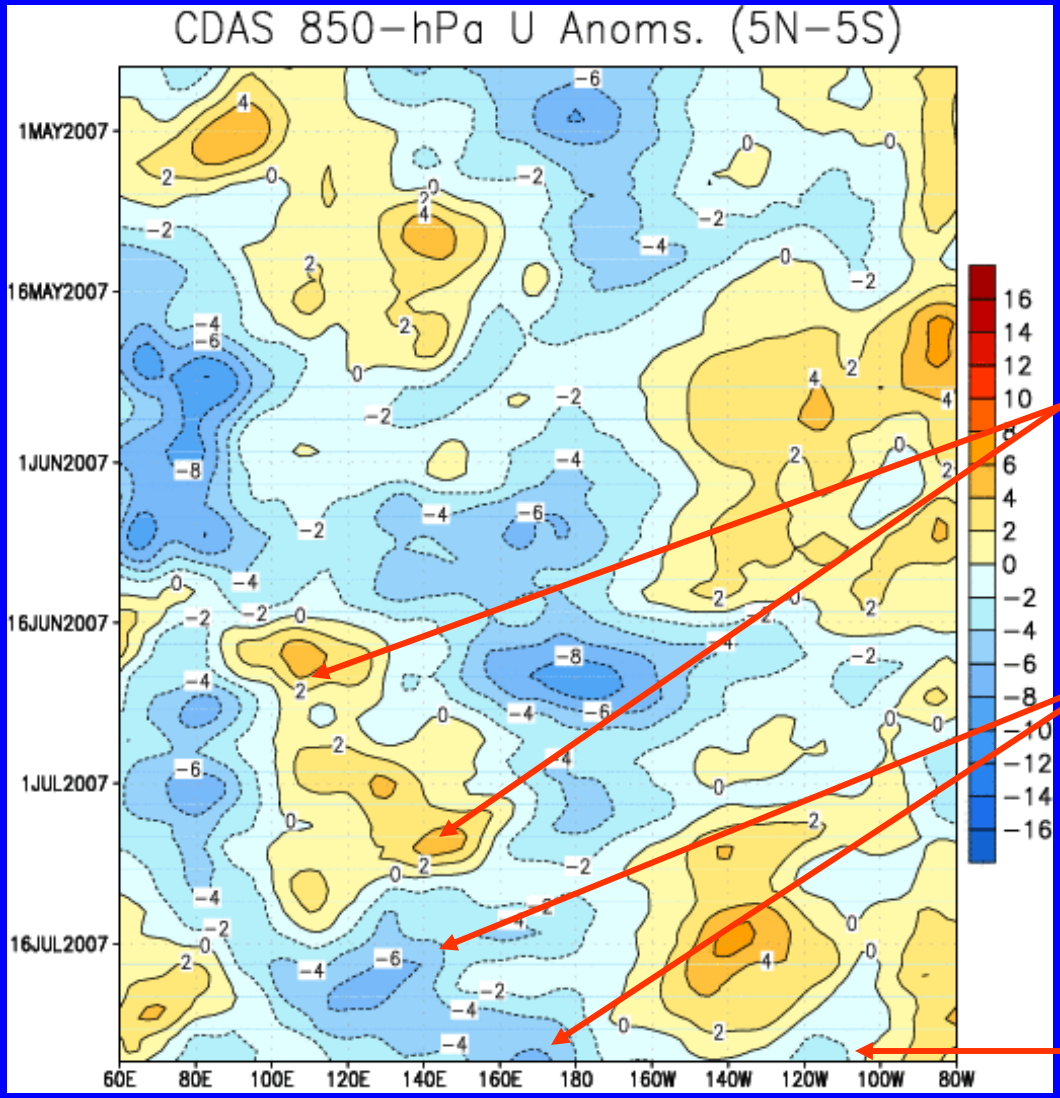
Note that shading denotes the magnitude of the anomalous wind vectors



Easterly anomalies have increased in coverage to include areas from India to the west Pacific Ocean.

Westerly anomalies have weakened across the east-central Pacific Ocean.

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



Time

Longitude

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

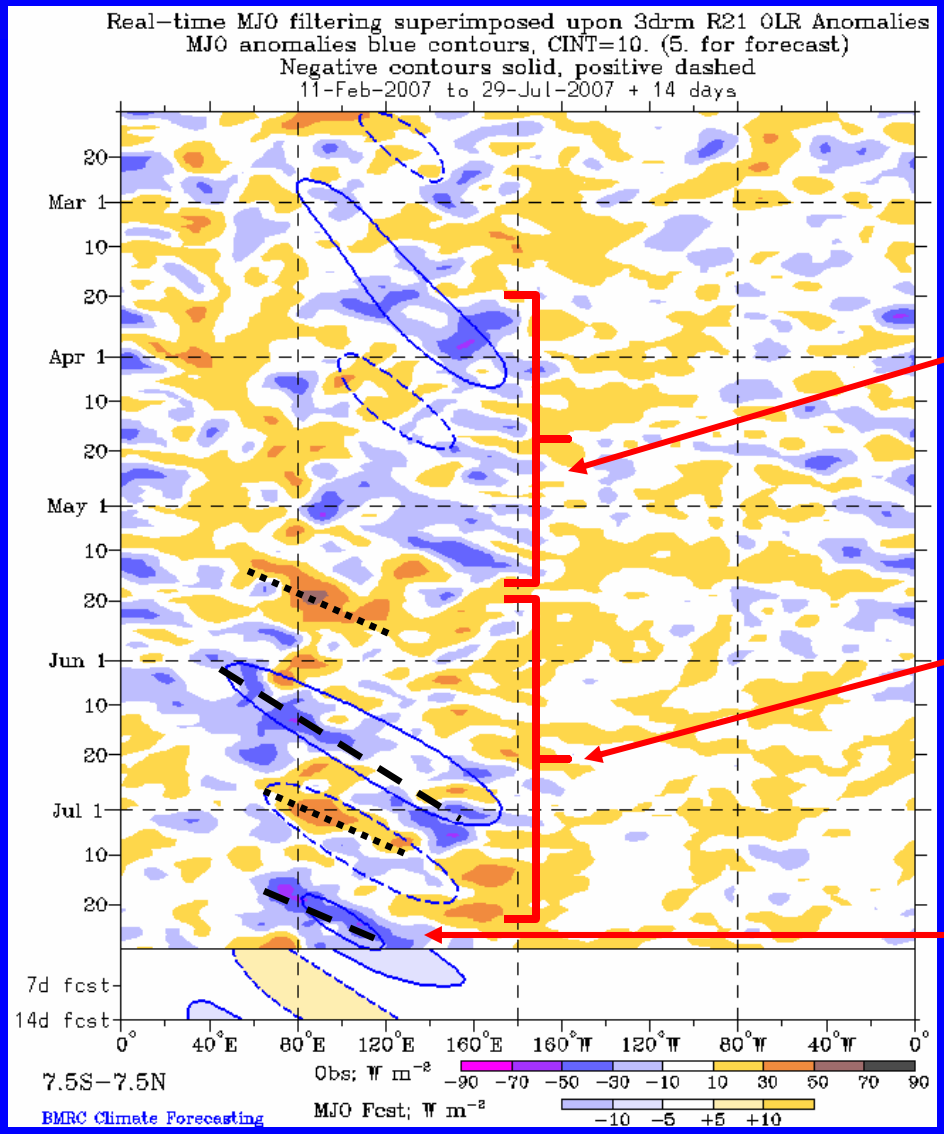
Easterly anomalies (blue shading) represent anomalous east-to-west flow.

Westerly anomalies were evident across sections of the Maritime continent and the western Pacific Ocean from the latter half of June into mid-July.

Easterly anomalies increased during mid-July over the Maritime continent and western Pacific and have shifted eastward during mid-late July.

Winds across much of the eastern Pacific Ocean have returned to near average.

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



Time

Longitude

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

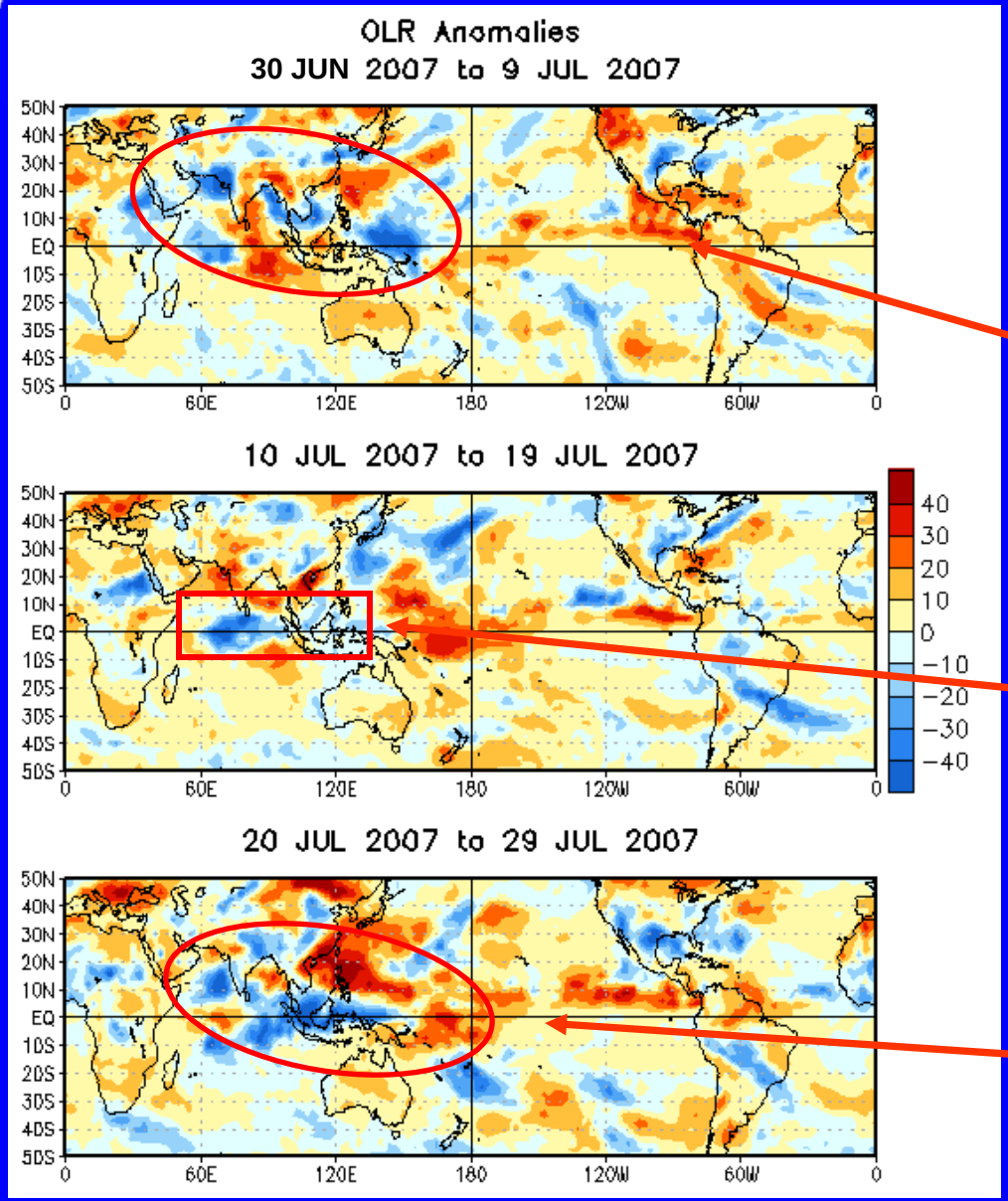
Wetter-than-normal conditions, negative OLR anomalies (blue shading)

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

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

Most recently, enhanced convection has shifted east from the Indian Ocean across the Maritime continent.

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 July, wet conditions stretched from India into the far western Pacific Ocean with dry conditions across the eastern Indian Ocean.

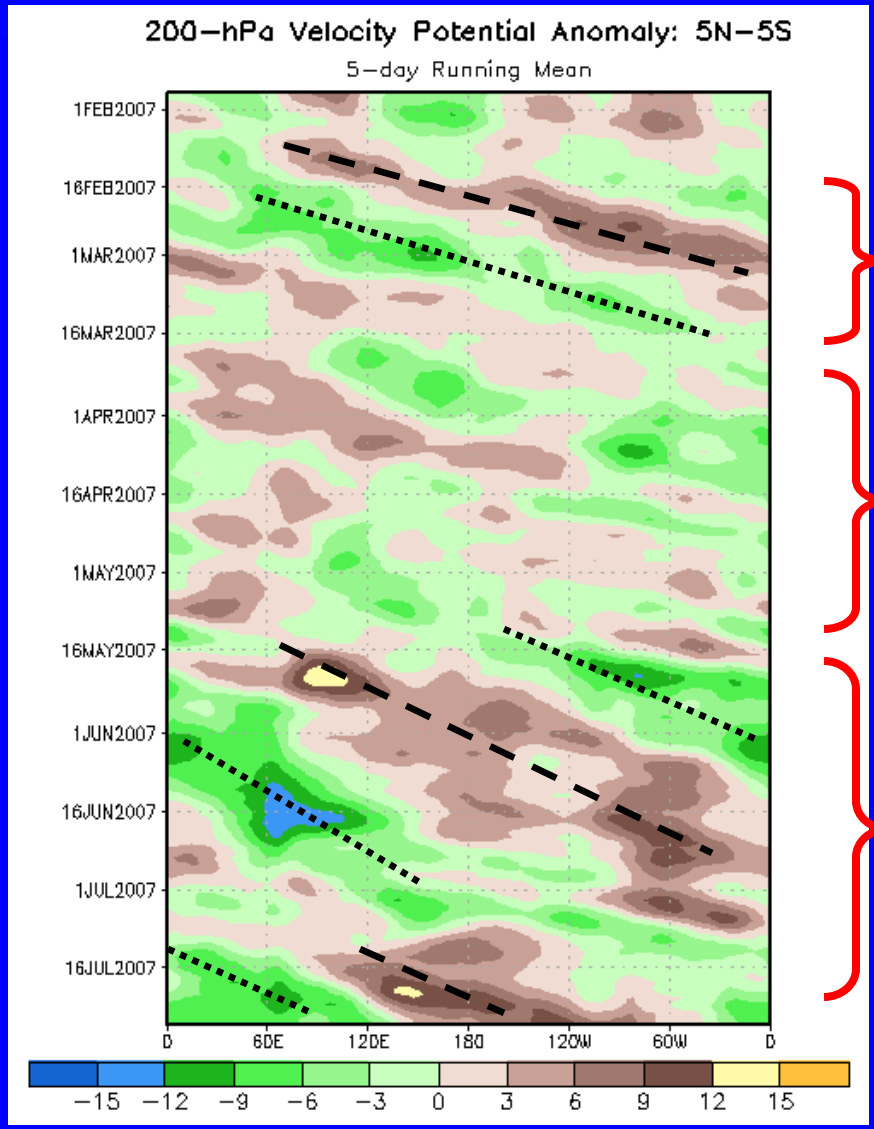
Wet conditions developed in the Indian Ocean during mid-July

Enhanced (suppressed) convection shifted northeastwards in the eastern Hemisphere. Wet conditions are now evident across the Maritime continent with dry conditions across the Philippines.

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

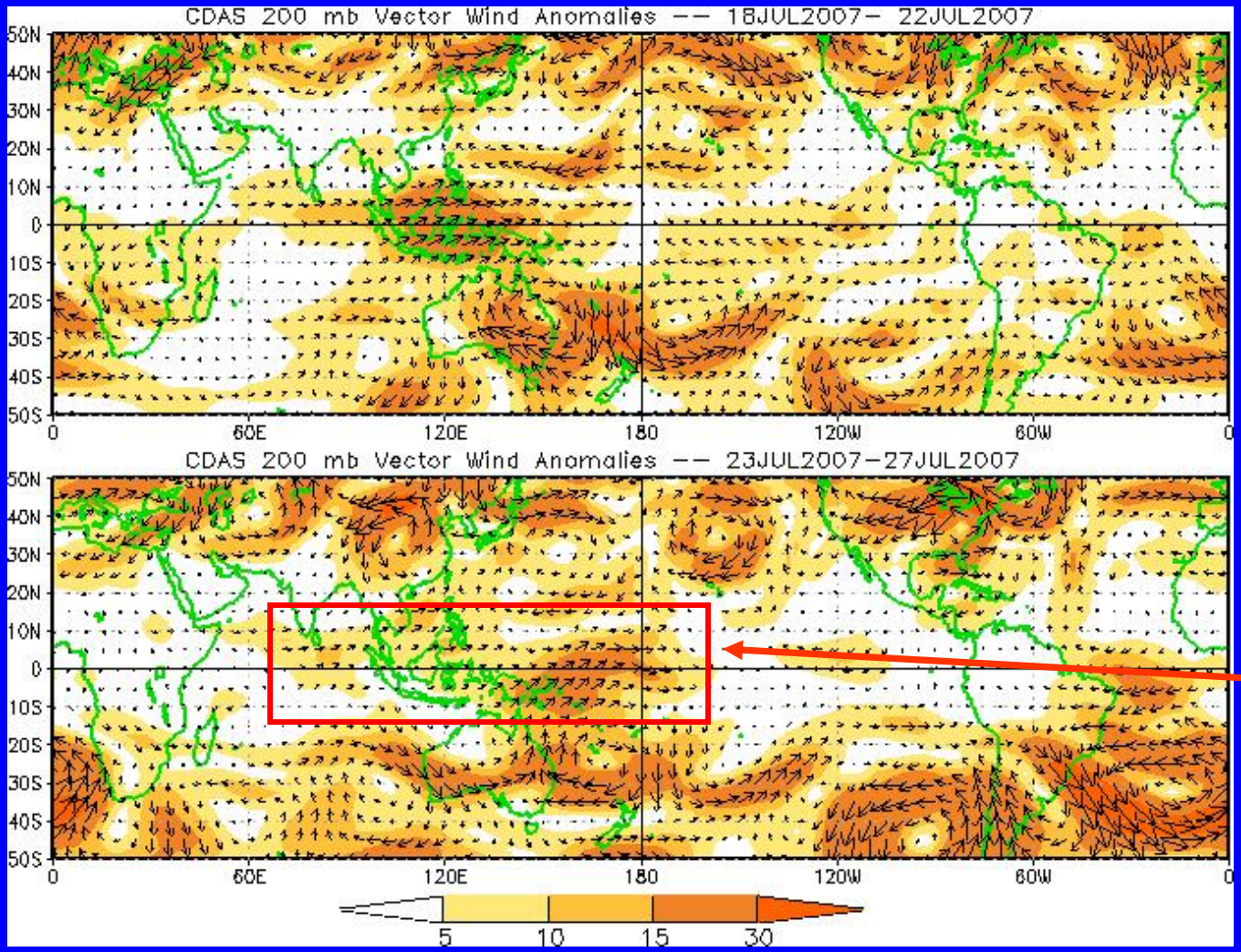
Longitude

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.

Since mid-May, weak to moderate MJO activity has been observed. The MJO has strengthened during late July has velocity potential anomalies have increased and shifted eastward.

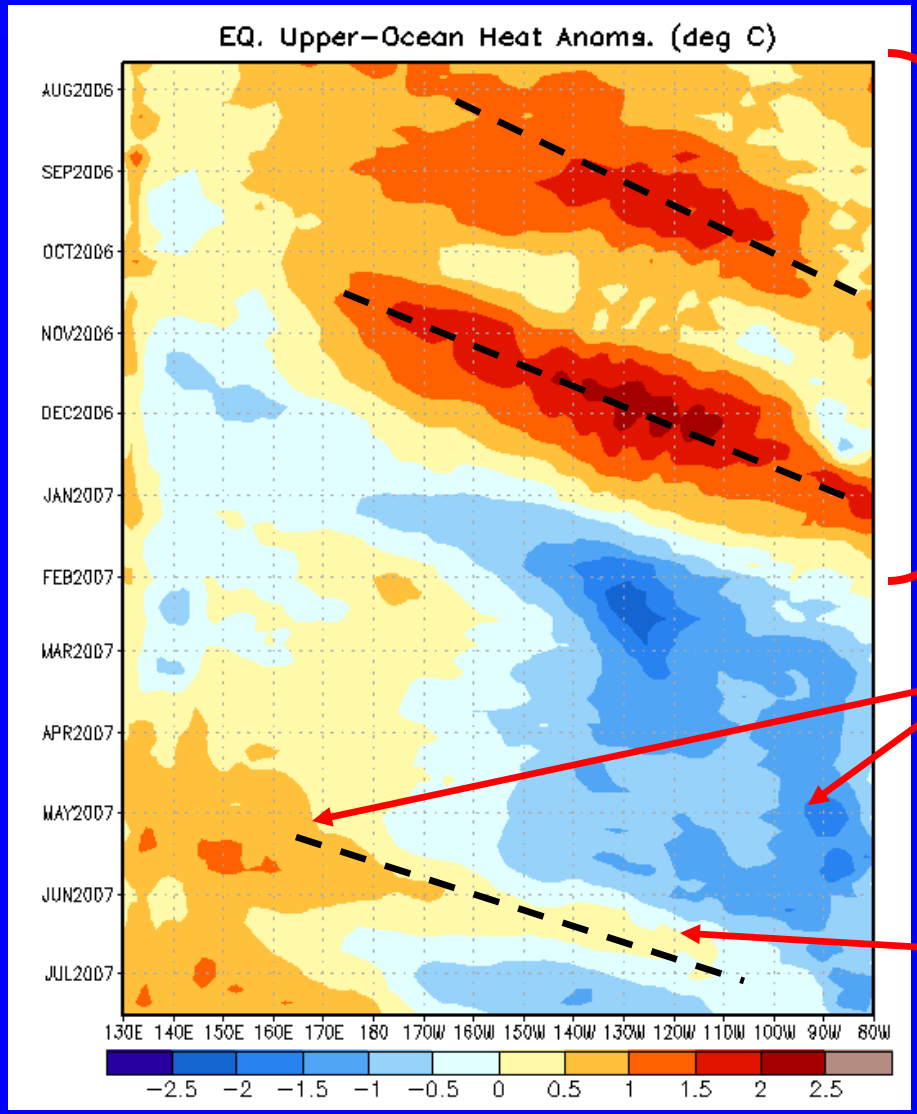
200-hPa Vector Wind Anomalies (m s^{-1})



Note that shading denotes the magnitude of the anomalous wind vectors

Westerly anomalies have shifted eastwards during the last five days.

Weekly Heat Content Evolution in the Equatorial Pacific



Time

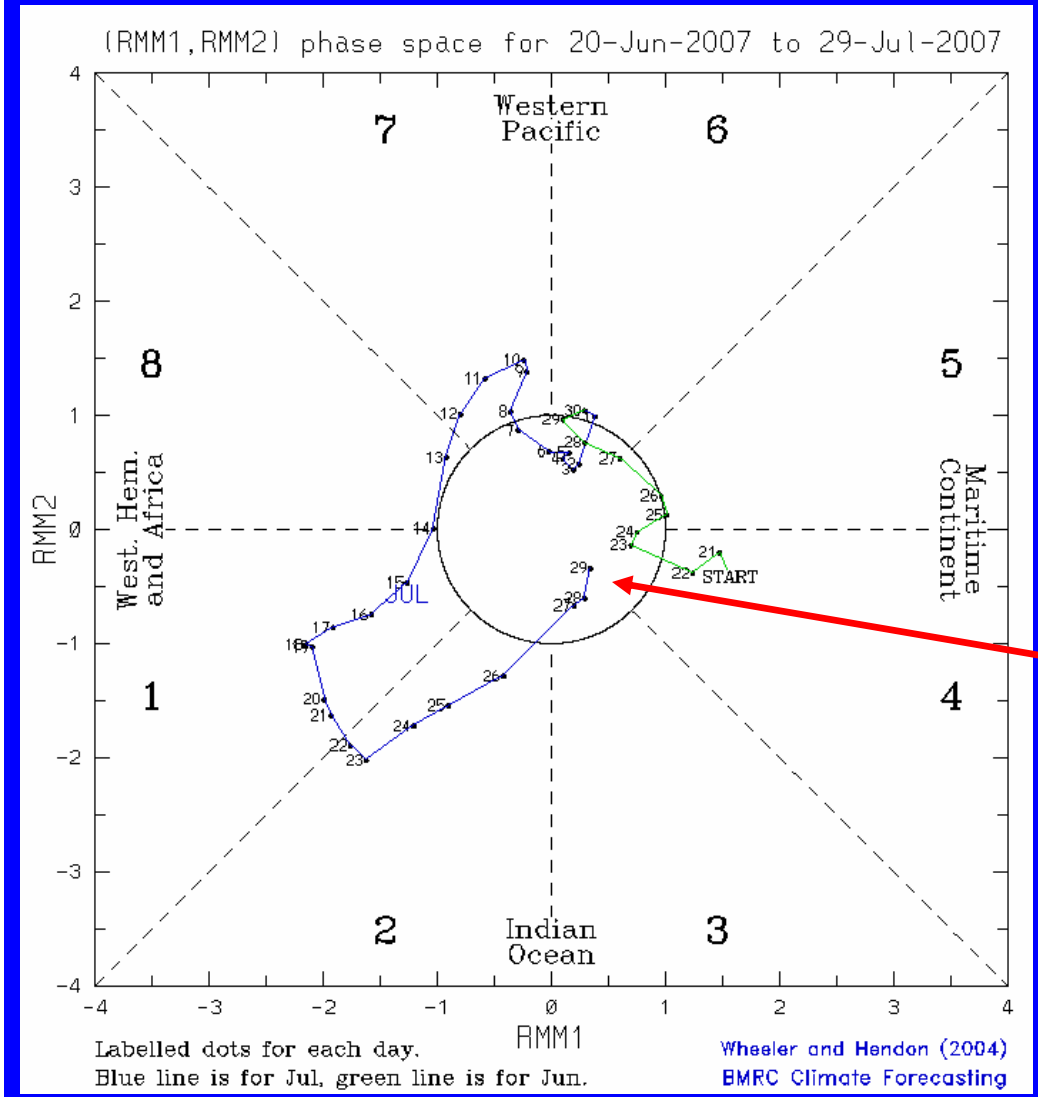
Longitude

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.

A weak Kelvin wave developed in mid-May and propagated eastwards and reached the eastern Pacific in early July.

MJO Index

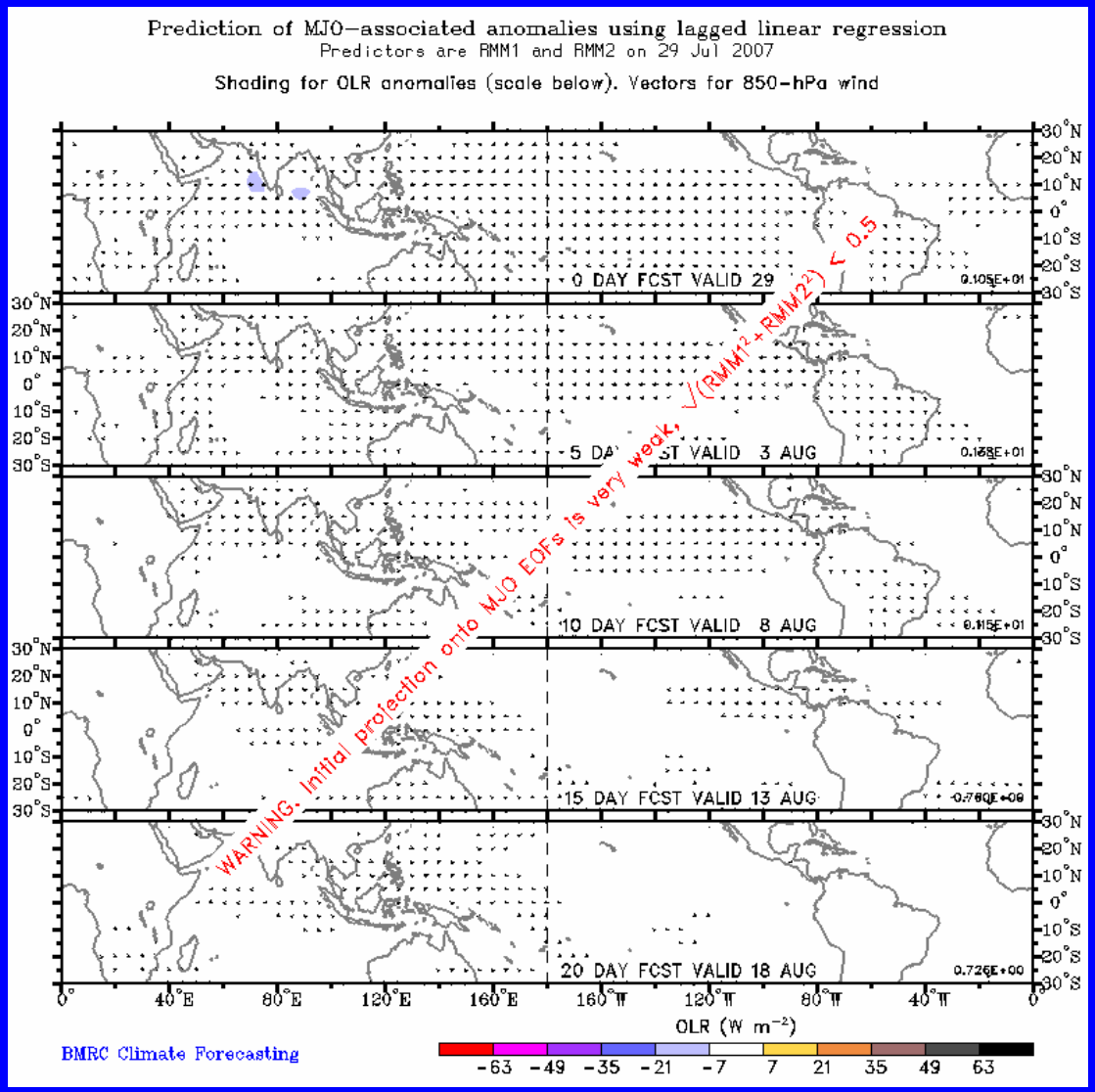


The current state of the MJO as determined by an index based on Empirical Orthogonal Function (EOF) analysis using combined fields of near-equatorially-averaged 850-hPa and 200-hPa zonal wind and outgoing longwave radiation (OLR) (Wheeler and Hendon, 2004).

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 that the MJO signal has weakened rapidly during the past week.

MJO OLR Forecast



The statistical method forecasts little if any MJO activity during the next 5-10 days.

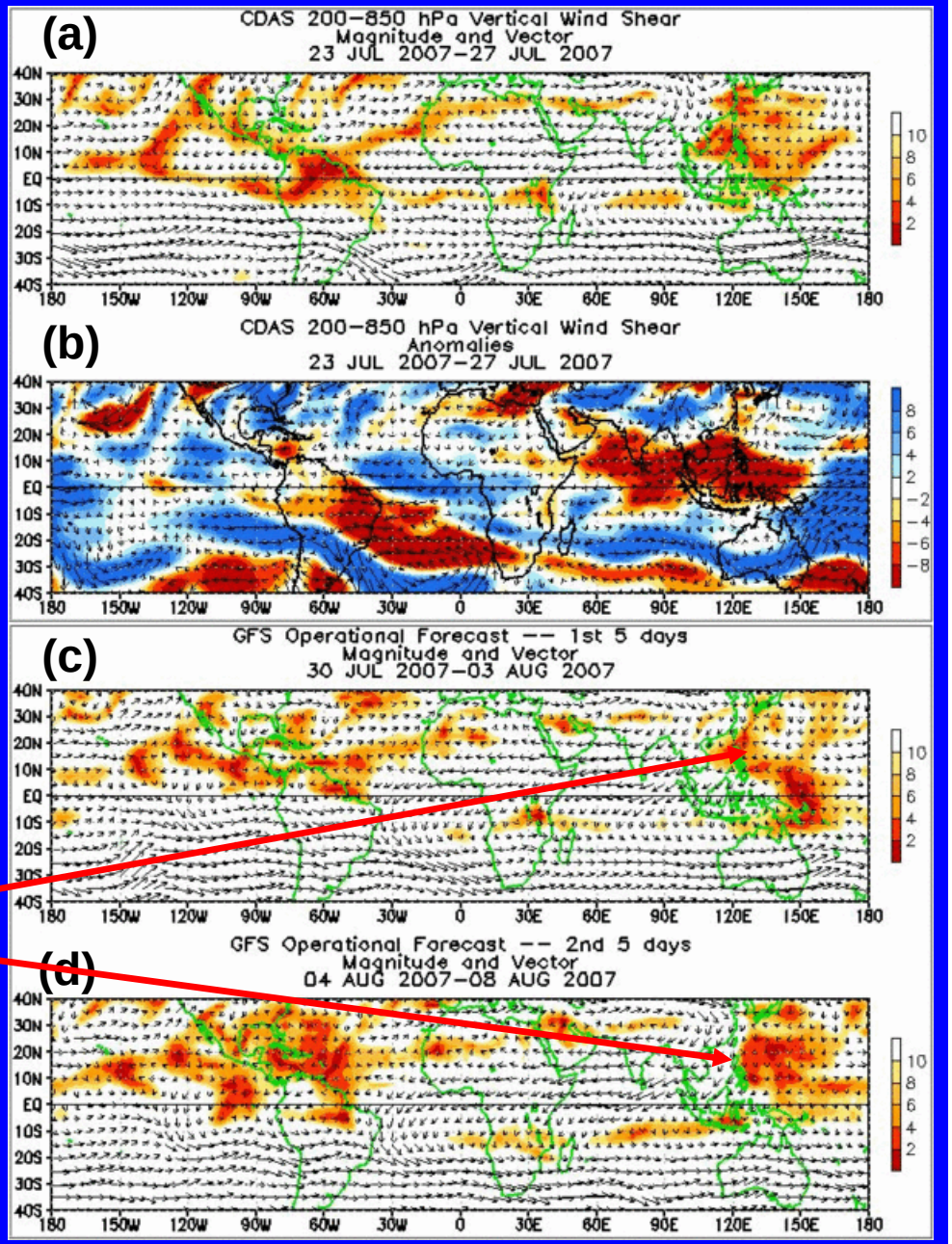
200–850 hPa Vertical Wind Shear

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)

The GFS forecast indicates low shear across the west Pacific Ocean during the next 10 days.



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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