



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

**Update prepared by  
Climate Prediction Center / NCEP  
June 4, 2007**



# Outline

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



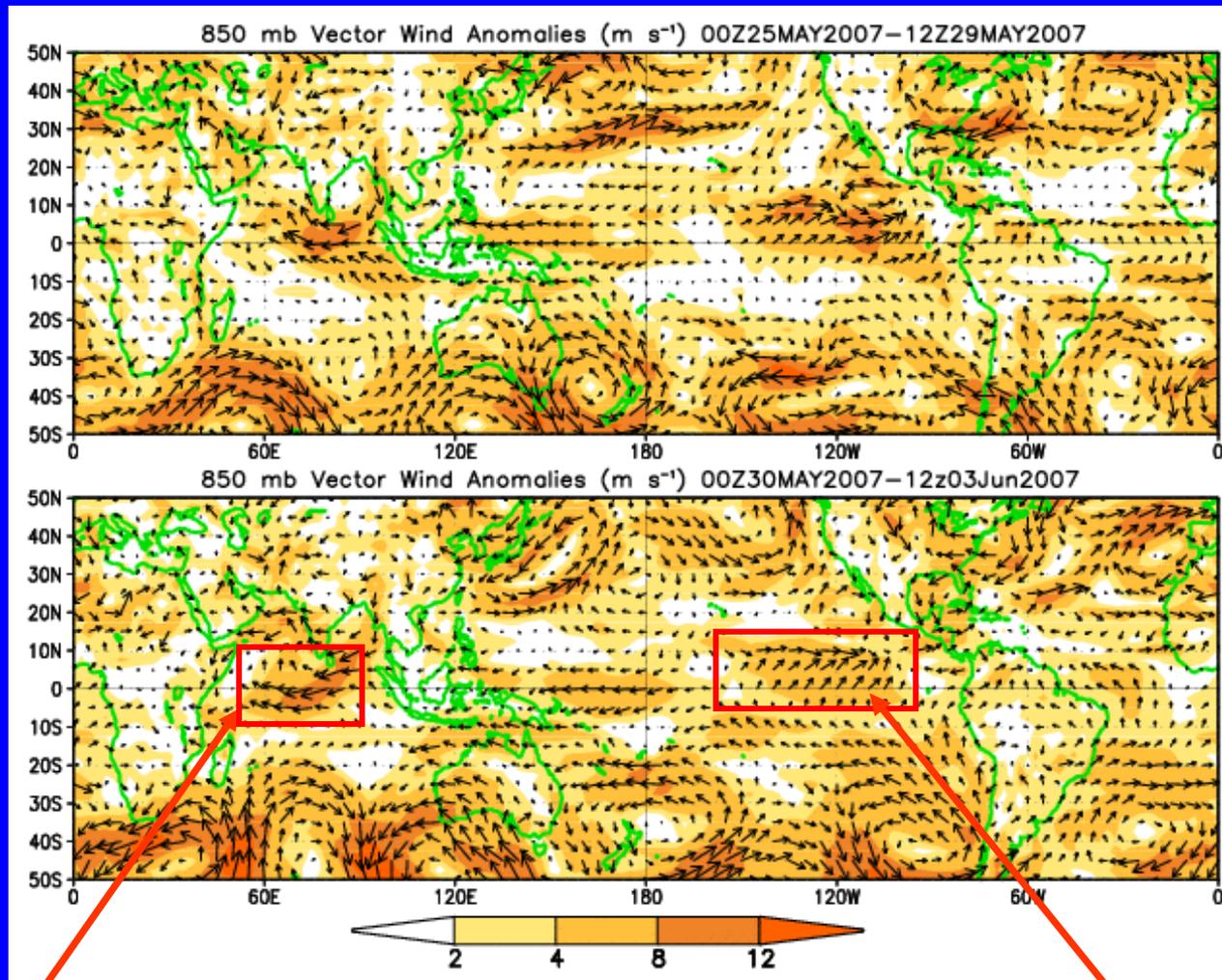
# Overview

- **The coherency of the MJO has decreased during the past week but a weak signal remains.**
- **Enhanced convection mainly occurred across sections of Africa, the western Indian Ocean and the Arabian Sea during the past week. Generally dry conditions remain across parts of the eastern Indian Ocean and Bay of Bengal.**
- **Based on the latest monitoring and forecast tools, weak MJO activity is expected during the upcoming 1-2 week period.**



# 850-hPa Vector Wind Anomalies ( $\text{m s}^{-1}$ )

Note that shading denotes the magnitude of the anomalous wind vectors

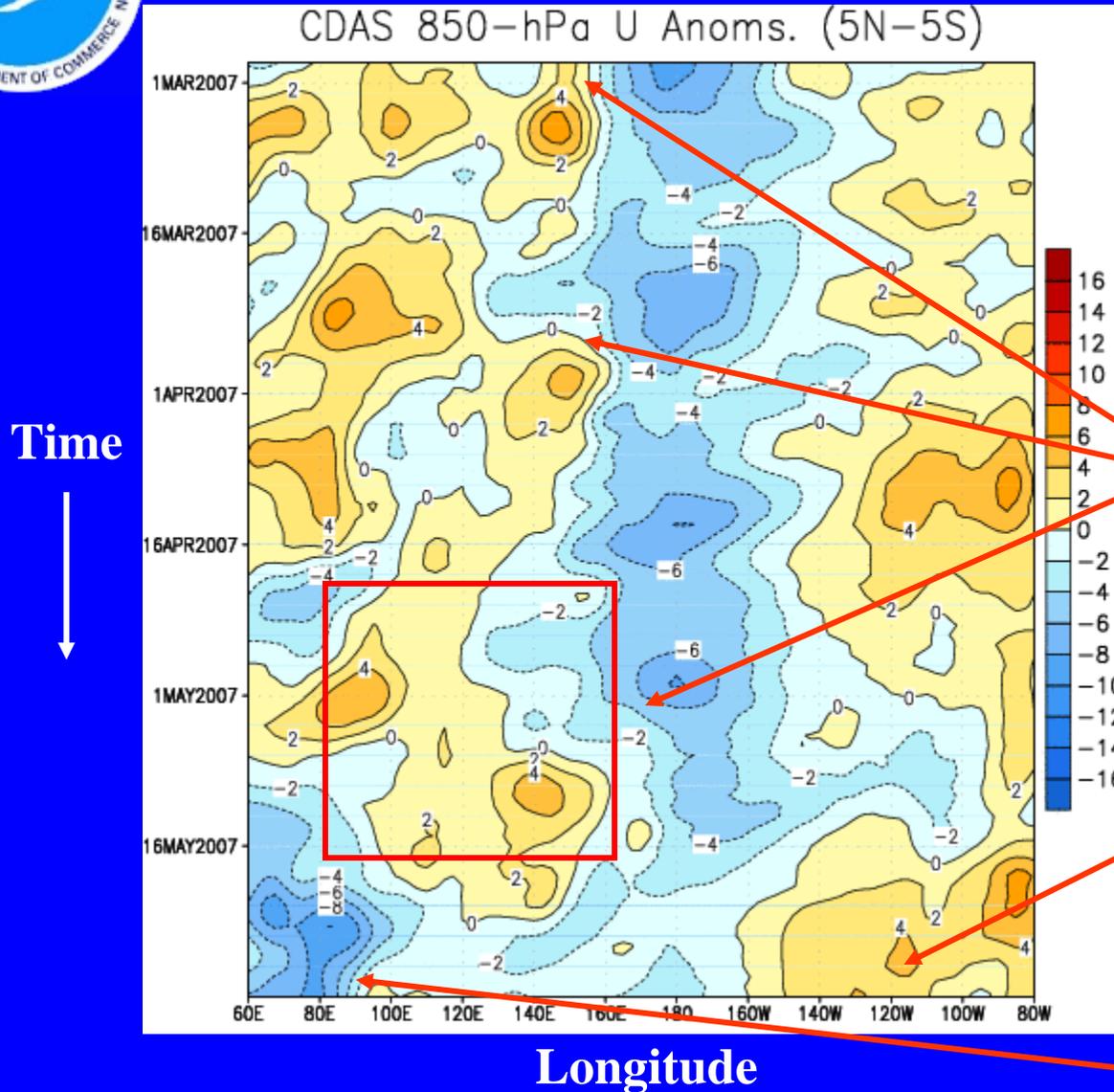


Easterly anomalies remain in the central equatorial Indian Ocean.

West-southwesterly anomalies remain evident across the east Pacific Ocean.



# 850-hPa Zonal Wind Anomalies ( $\text{m s}^{-1}$ )



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

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

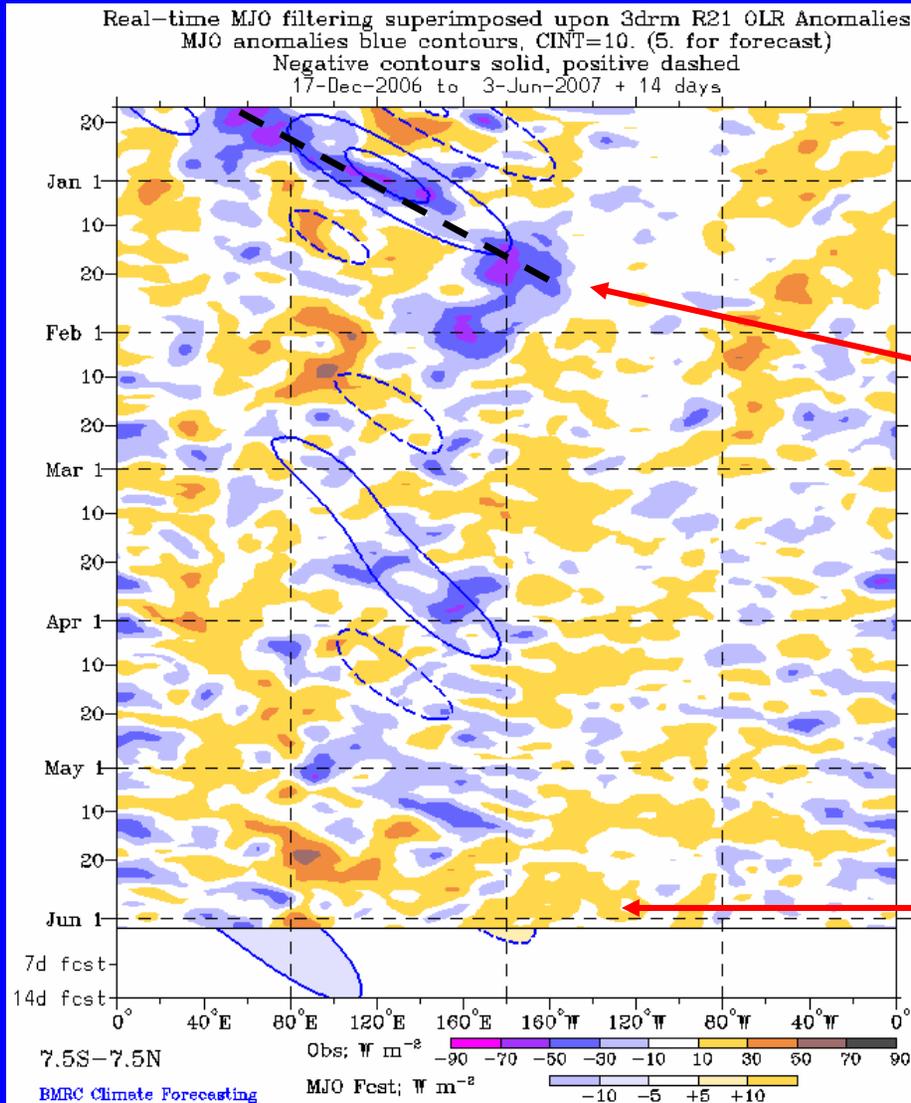
On three occasions during the past few months, there has been an extension of easterly anomalies to the west followed by the development of westerly anomalies across Indonesia into the far western Pacific Ocean. This pattern was observed in late February, March and April.

Westerly anomalies have increased in the eastern Pacific Ocean similar to early April.

Easterly anomalies have been evident across the equatorial Indian Ocean since early-mid May.



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



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

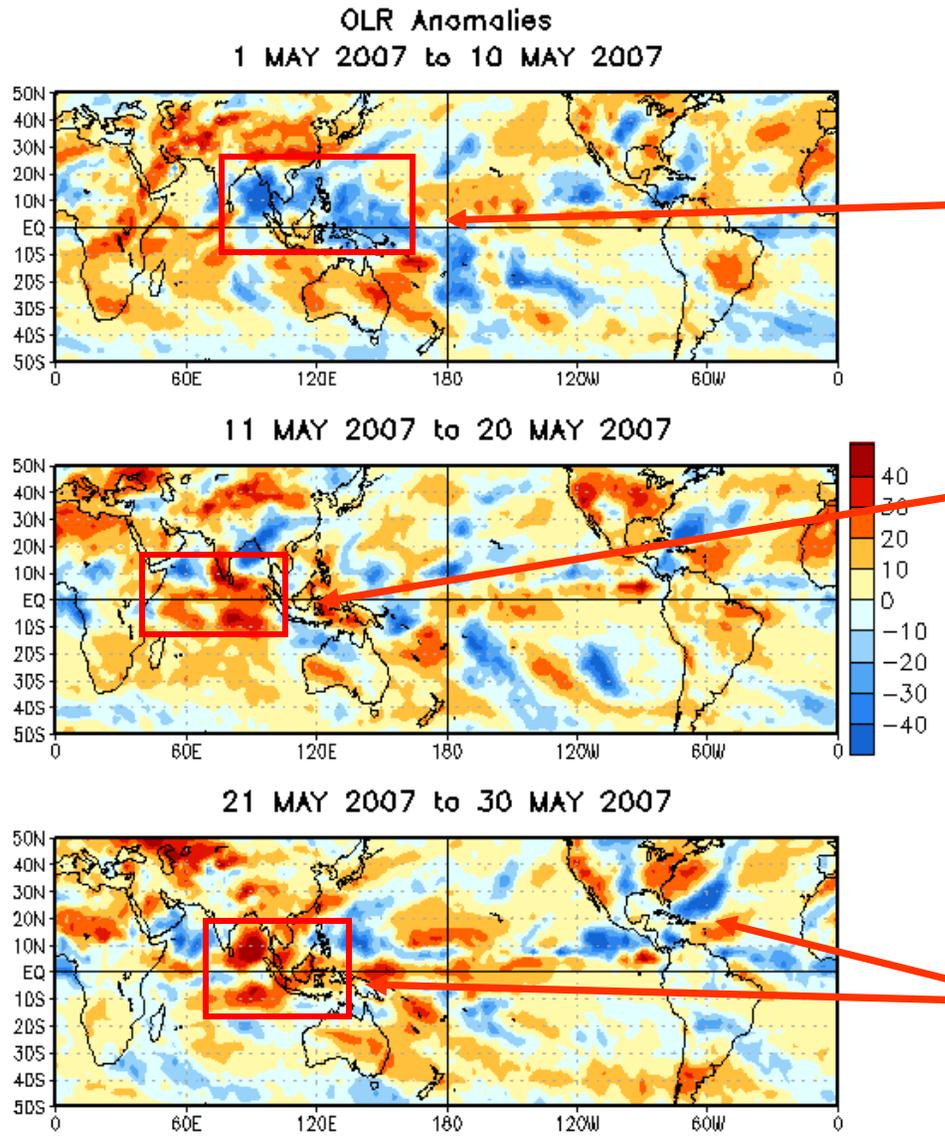
Wetter-than-normal conditions, negative OLR anomalies (blue shading)

Enhanced convection, associated with the MJO in late December and January, shifted eastward from the Indian Ocean across the Maritime continent and western Pacific.

During the past week, dry conditions are evident across the central Pacific Ocean. Wet (dry) conditions developed in the western (eastern) Indian Ocean during the last few days.



# OLR Anomalies: Last 30 days



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

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

In early May, enhanced convection was observed across the Bay of Bengal, the western Pacific Ocean, and the South China Sea.

Dry conditions were evident across the Indian Ocean during the mid-late May.

During late May, enhanced rainfall has occurred across the eastern Pacific Ocean, Caribbean Sea, the West Indies, and off of the southeast US coast. The dry conditions in the eastern Indian Ocean propagated northward into the Bay of Bengal.

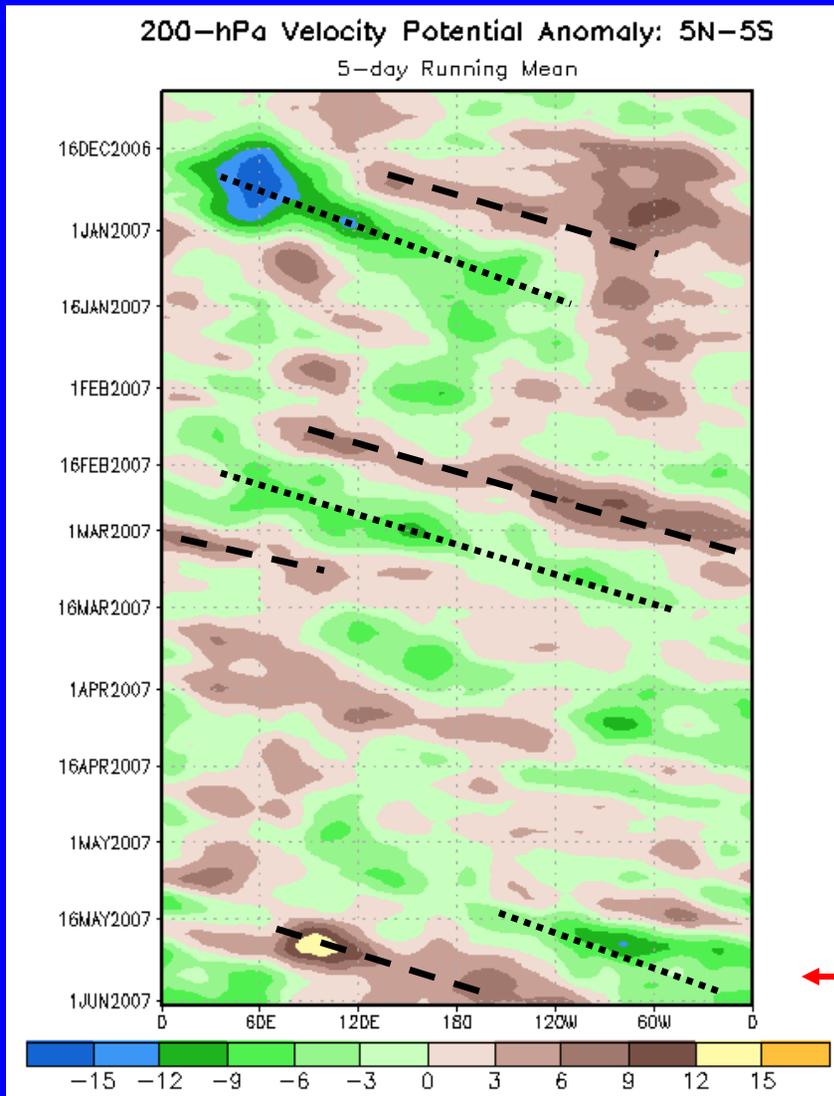


# 200-hPa Velocity Potential Anomalies (5°S-5°N)

Positive anomalies (brown shading) indicate unfavorable conditions for precipitation.

Negative anomalies (green shading) indicate favorable conditions for precipitation.

Time



Longitude

The MJO intensified in late December 2006. Negative OLR anomalies shifted eastward from the Maritime continent into the central tropical Pacific.

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

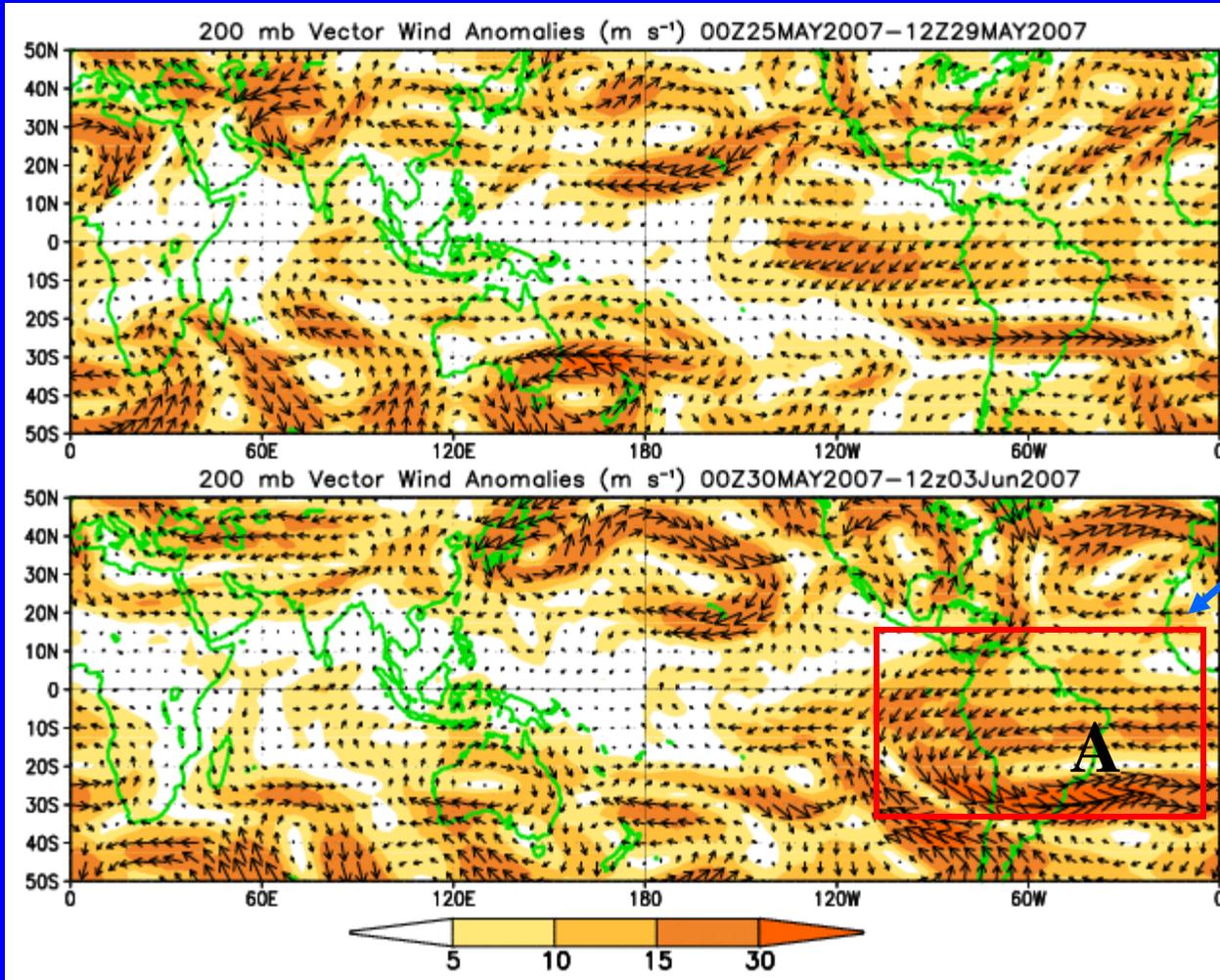
The MJO has been weak or incoherent since mid-March

The MJO strengthened in late May as 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

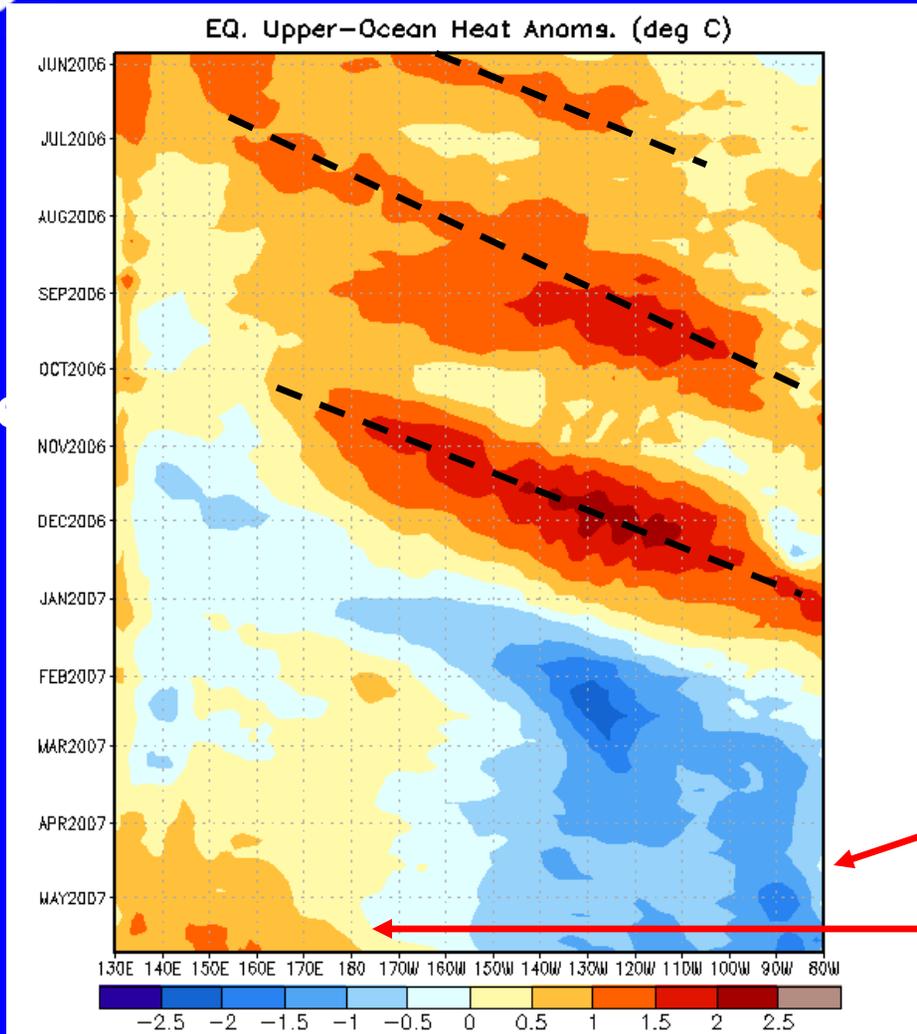


Anomalous anticyclonic circulation remains south of the equator and is centered across South America and the Atlantic Ocean.



# Weekly Heat Content Evolution in the Equatorial Pacific

Time



During this period 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.

Since late March, larger positive anomalies are evident in the far western Pacific Ocean.

Longitude

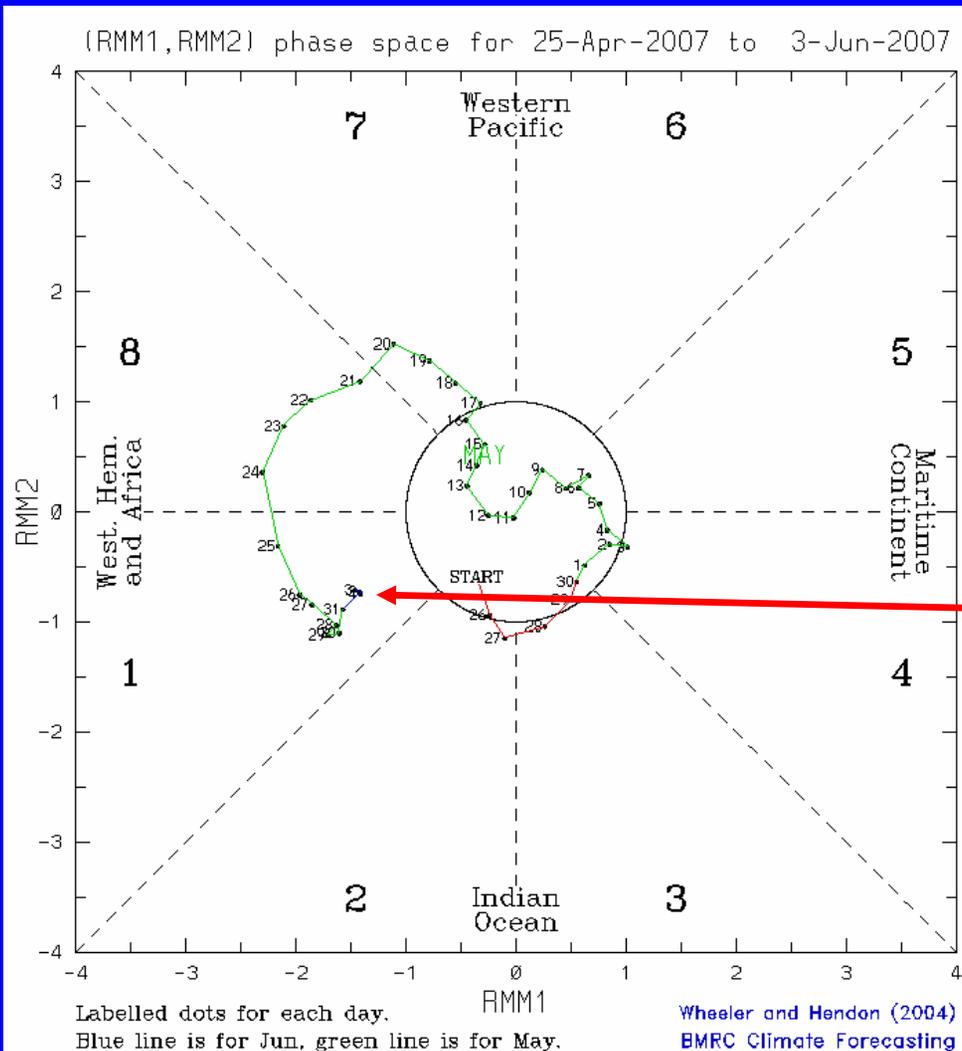


# MJO Index

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).

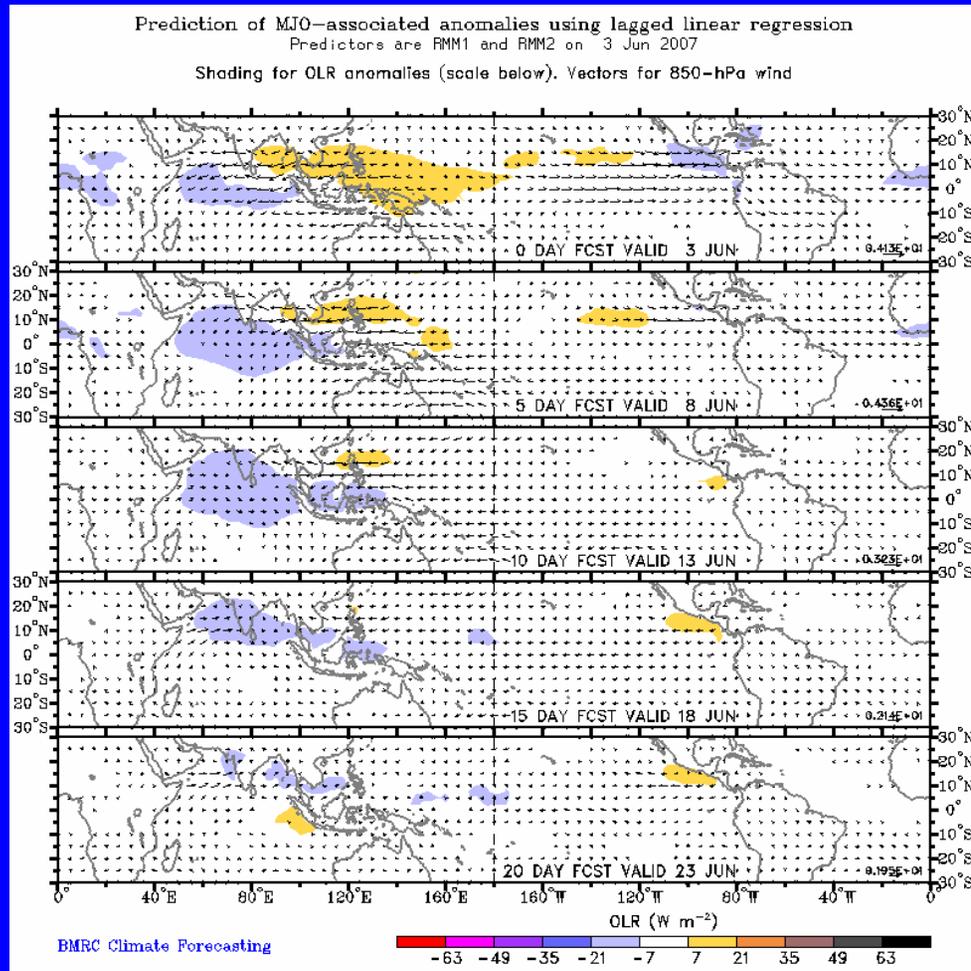
The axes represent the time series of the two leading modes of variability and are used to measure the amplitude while the triangular areas indicate the phase or location of the enhanced phase of the MJO. The farther away from the center of the circle the stronger the MJO. Different color lines indicate different months.

The MJO index has shown little propagation during the past few days but a substantial amplitude remains.





# MJO Forecasts

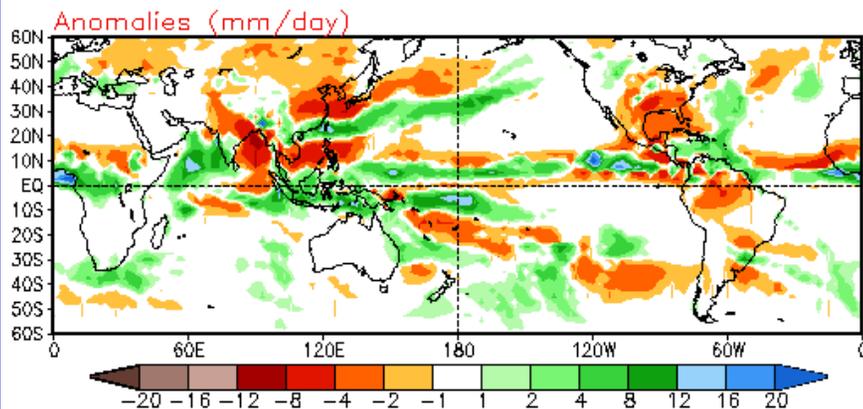
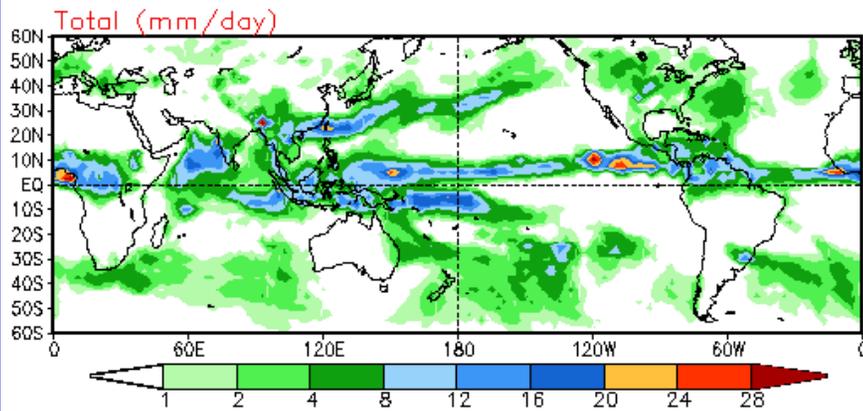


The forecast indicates enhanced convection across sections of the Indian Ocean throughout much of the period.

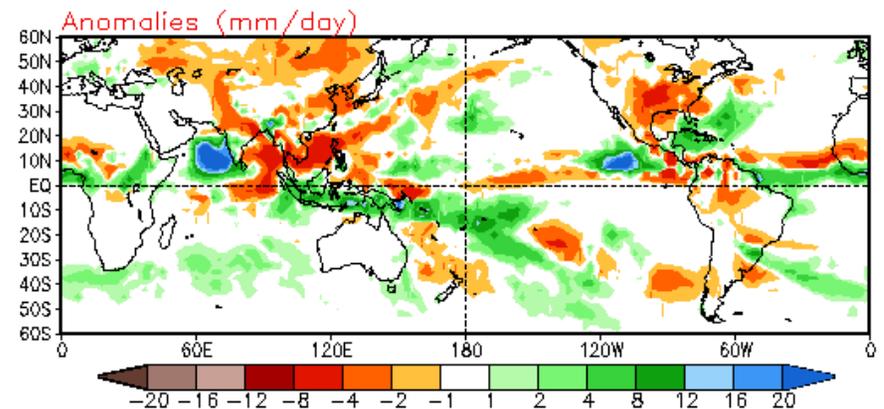
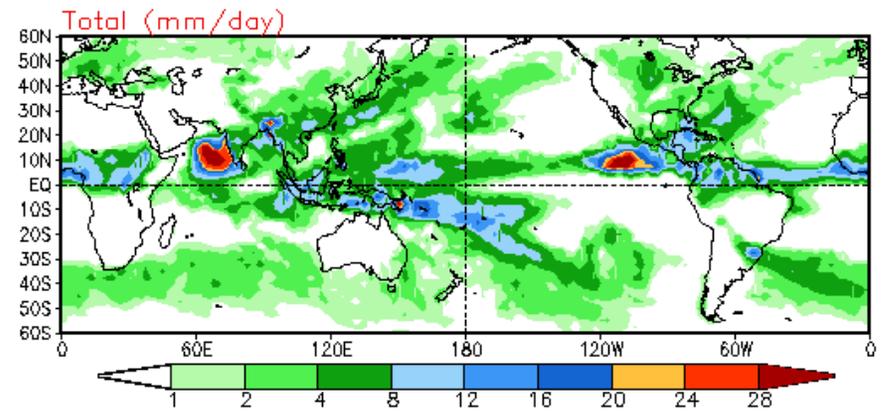


# Experimental Bias-Corrected GFS Precipitation

Week 1 Precipitation  
Forecast from 04Jun2007



Week 2 Precipitation  
Forecast from 04Jun2007





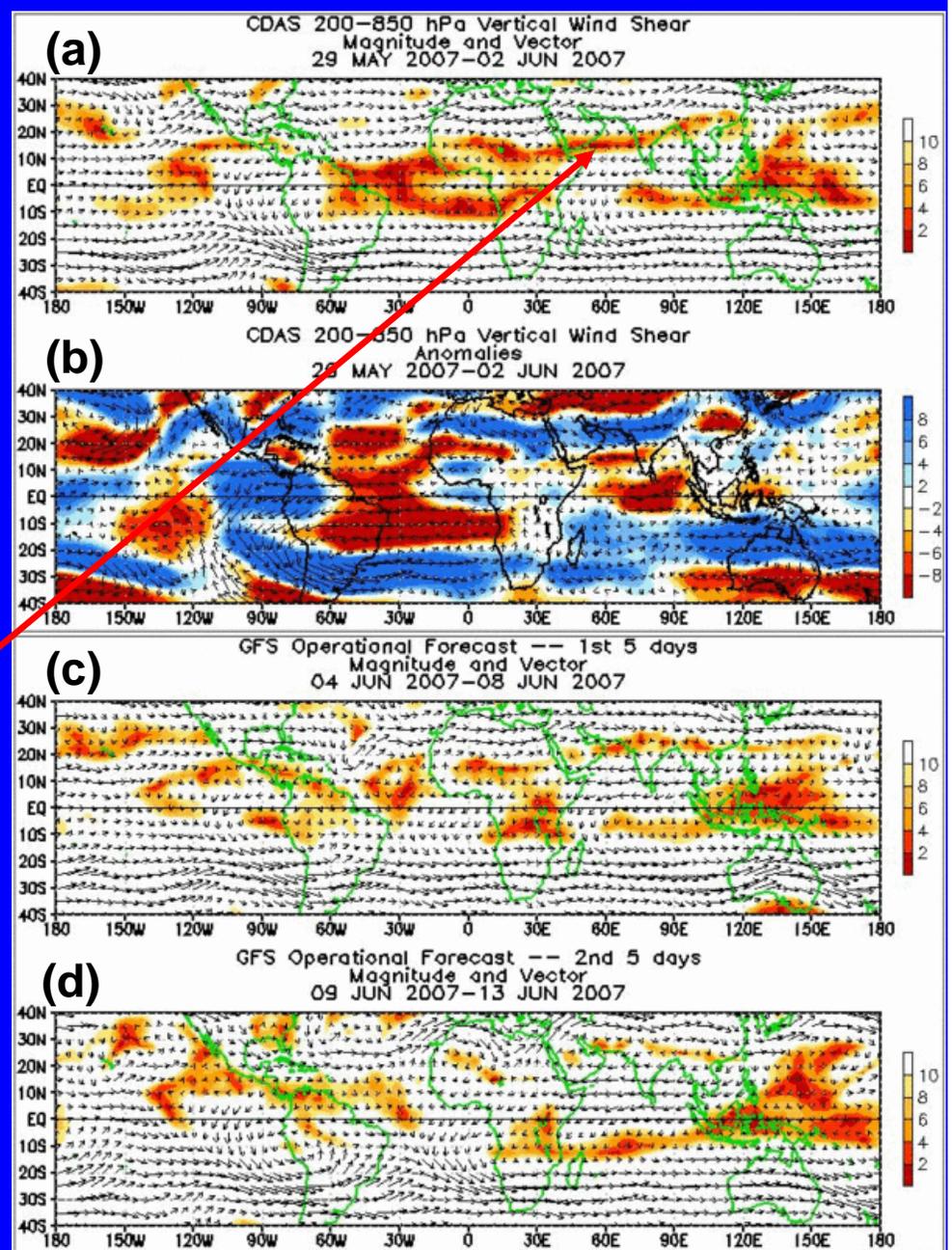
# 200–850 hPa Vertical Wind Shear

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)

Weak vertical wind shear aided the development and strengthening of a tropical cyclone across the Arabian Sea during the past week.





## **\*\*\*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**

**[Jon.Gottschalck@noaa.gov](mailto:Jon.Gottschalck@noaa.gov)**