



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

**Update prepared by  
Climate Prediction Center / NCEP  
September 10, 2007**



# Outline

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



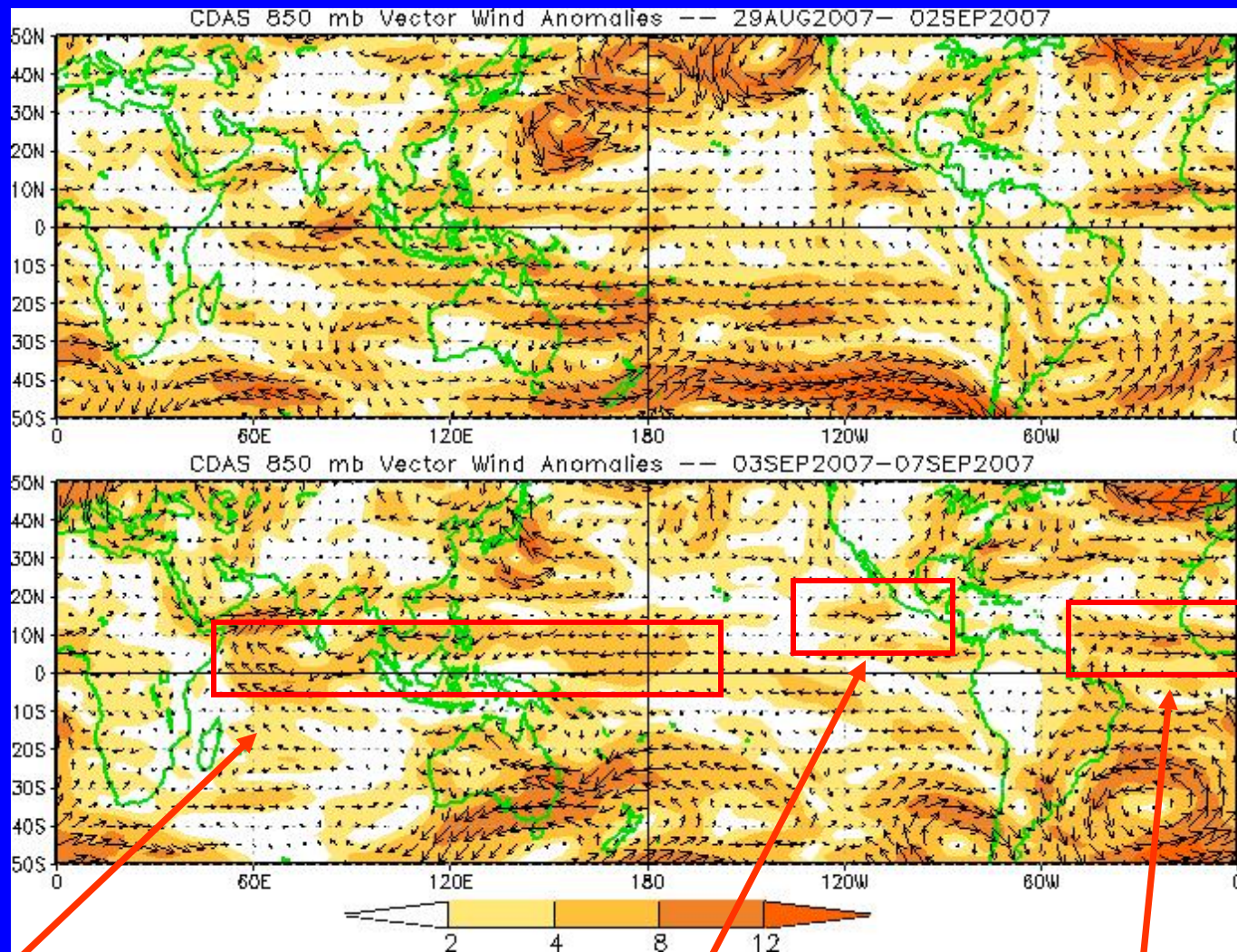
# Overview

- **The latest observations indicate that the MJO is incoherent.**
- **Enhanced convection continued across western Africa and the western Indian Ocean during the past week. Also, very wet conditions developed across much of India and Southeast Asia.**
- **Dry conditions were observed across the eastern Pacific Ocean.**
- **Based on the latest monitoring and forecast tools, weak MJO activity is expected during the next 1-2 weeks.**



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

Note that shading denotes the magnitude of the anomalous wind vectors



Easterly anomalies just north of the equator stretch from the Date Line to the Indian Ocean.

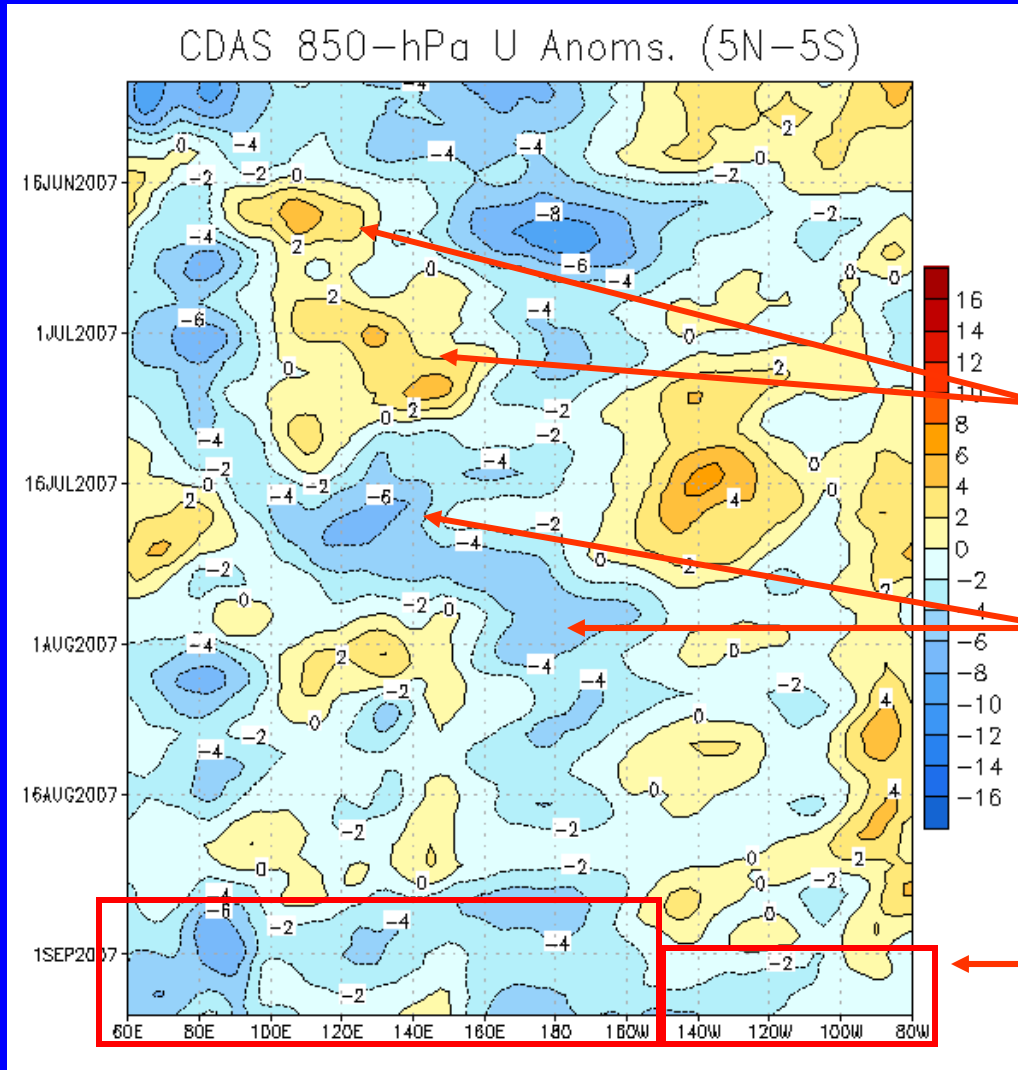
Westerly anomalies in the eastern Pacific have weakened.

Westerly anomalies continue in the Atlantic deep tropics and Africa.



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

Time  
↓



Longitude

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

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

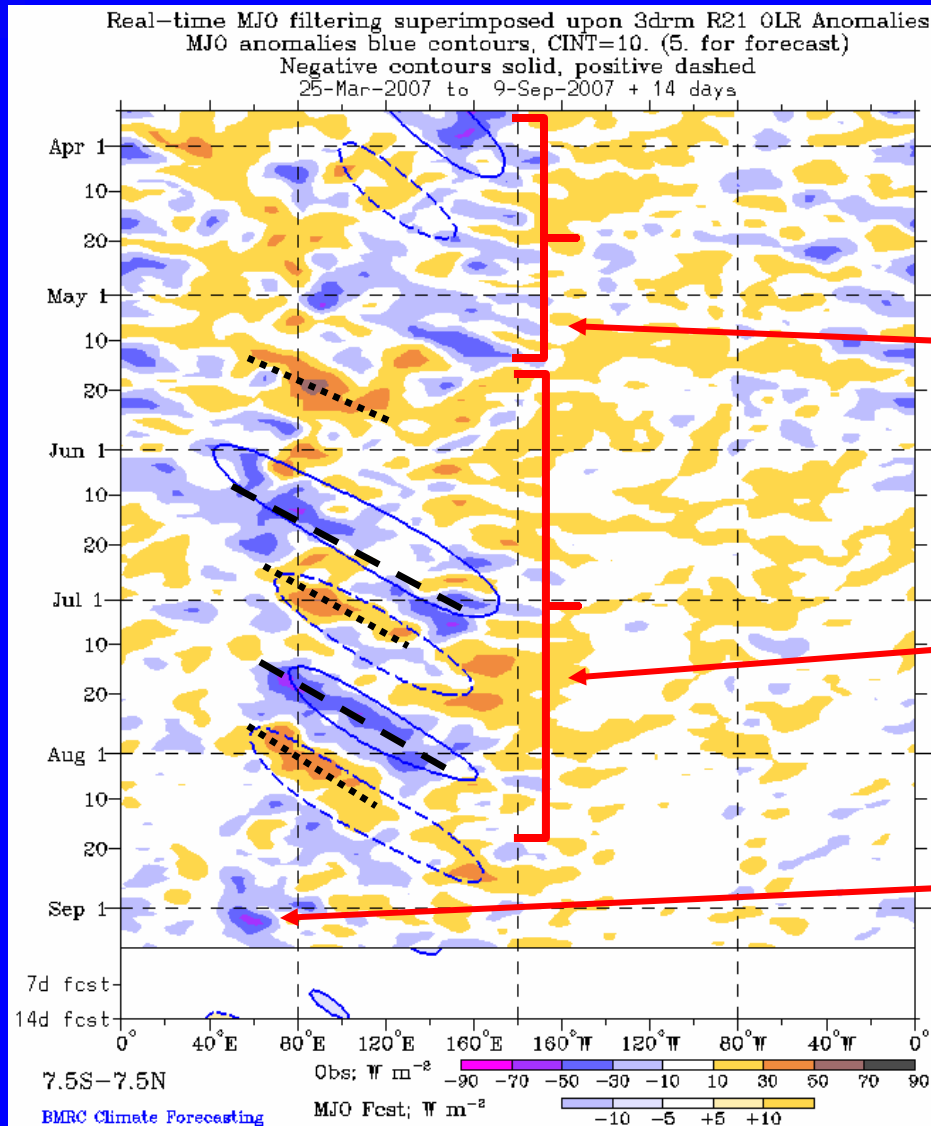
Westerly anomalies were evident across sections of the Maritime continent and the western Pacific Ocean from the latter half of June into mid-July.

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

Easterly anomalies have been prevalent since mid-August across much of the Indian and Pacific Oceans. During the past week, these anomalies have extended eastward over the eastern Pacific Ocean.



# 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)**

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

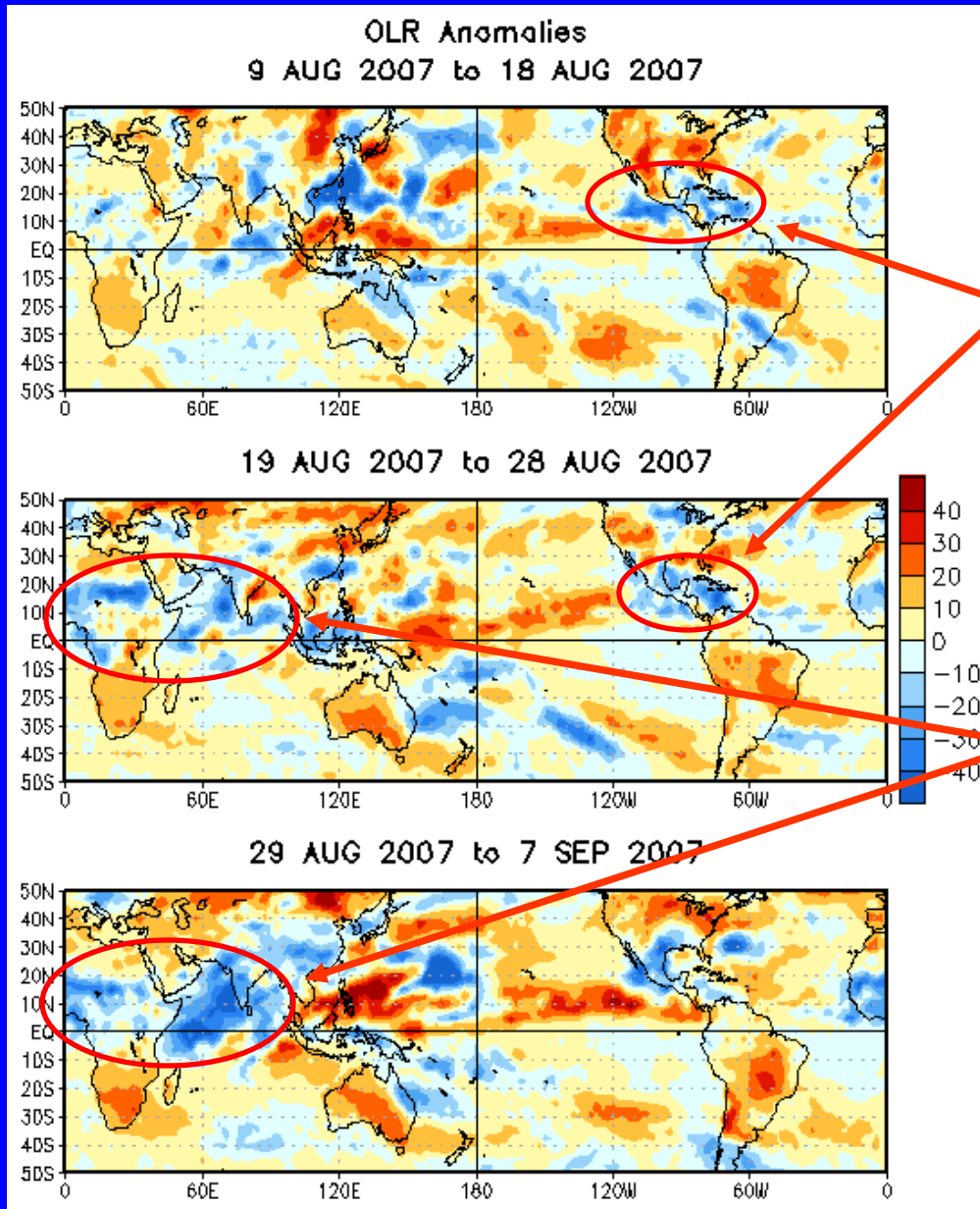
**Beginning in mid May, weak-moderate MJO activity was observed as regions of suppressed and enhanced convection shifted eastward from the Indian Ocean into the far western Pacific.**

**Convection increased markedly across sections of Africa and the Indian Ocean in early September.**

**Recently, convection is near average across the equatorial region.**



# OLR Anomalies: Last 30 days



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

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

Wet conditions were observed across the Caribbean Sea, Central America, Mexico, and the eastern Pacific during mid-late August. Much off this activity was associated with tropical cyclone activity.

Enhanced convection developed across much of western Africa and the Indian Ocean beginning in mid-August.

Convection was highly variable across the western Pacific Ocean during the entire period.

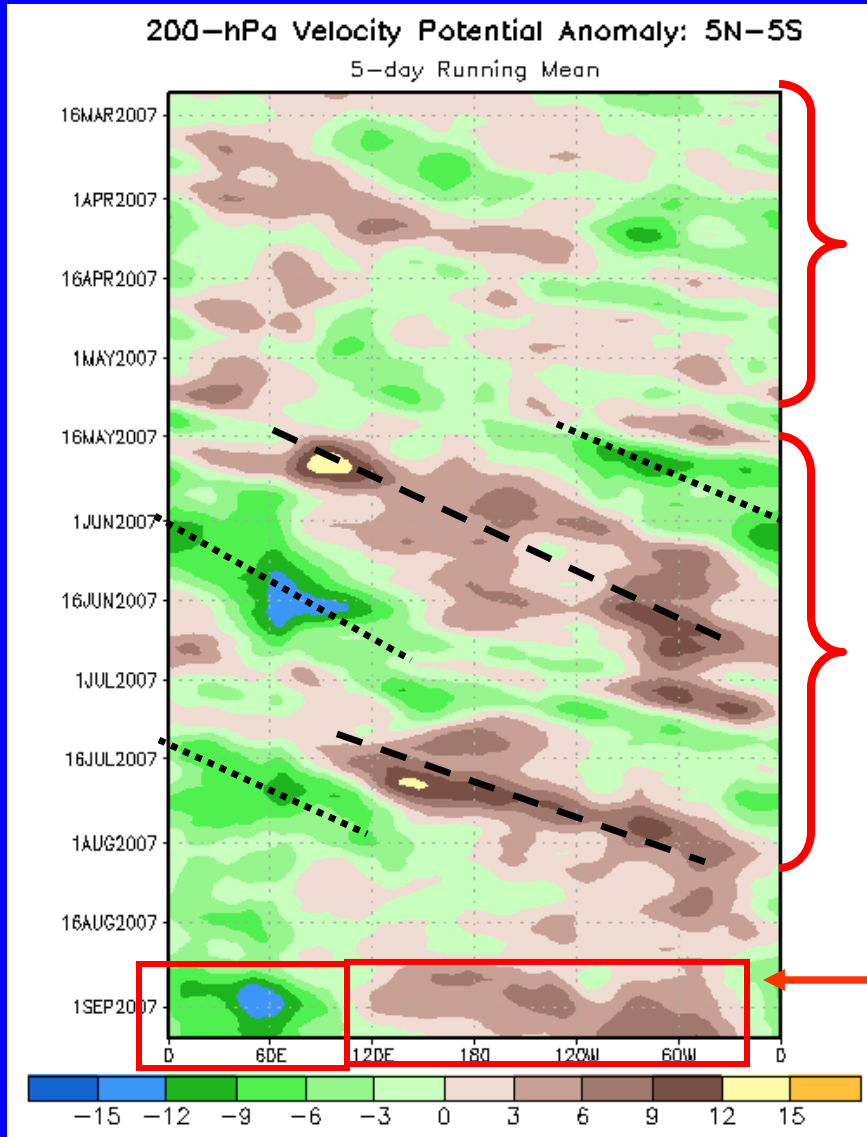


# 200-hPa Velocity Potential Anomalies (5°S-5°N)

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

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

Time  
↓



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.

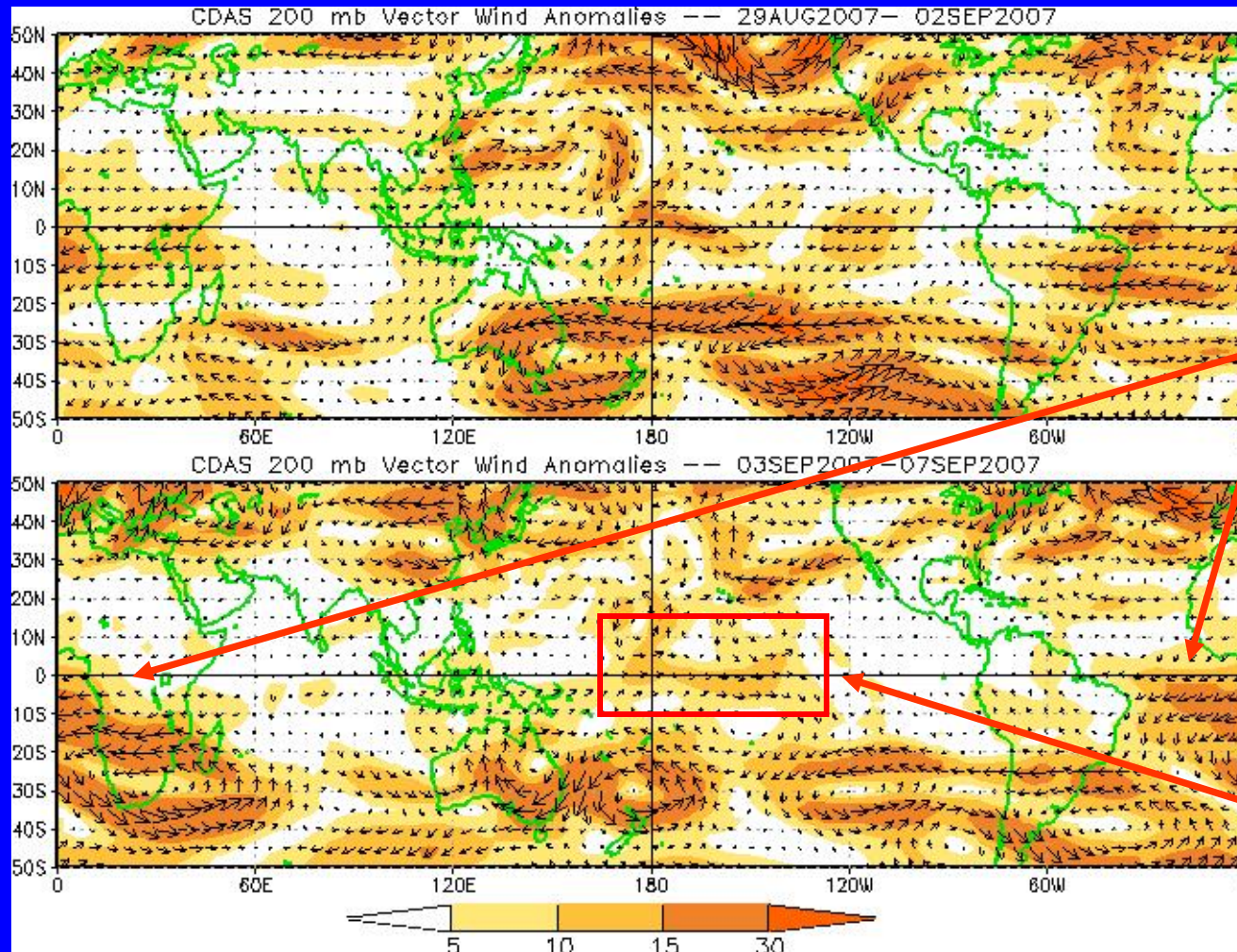
Since late August, velocity potential anomalies have become more stationary although the core of the upper-level convergence has shifted to South America.

Longitude





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



Note that shading denotes the magnitude of the anomalous wind vectors

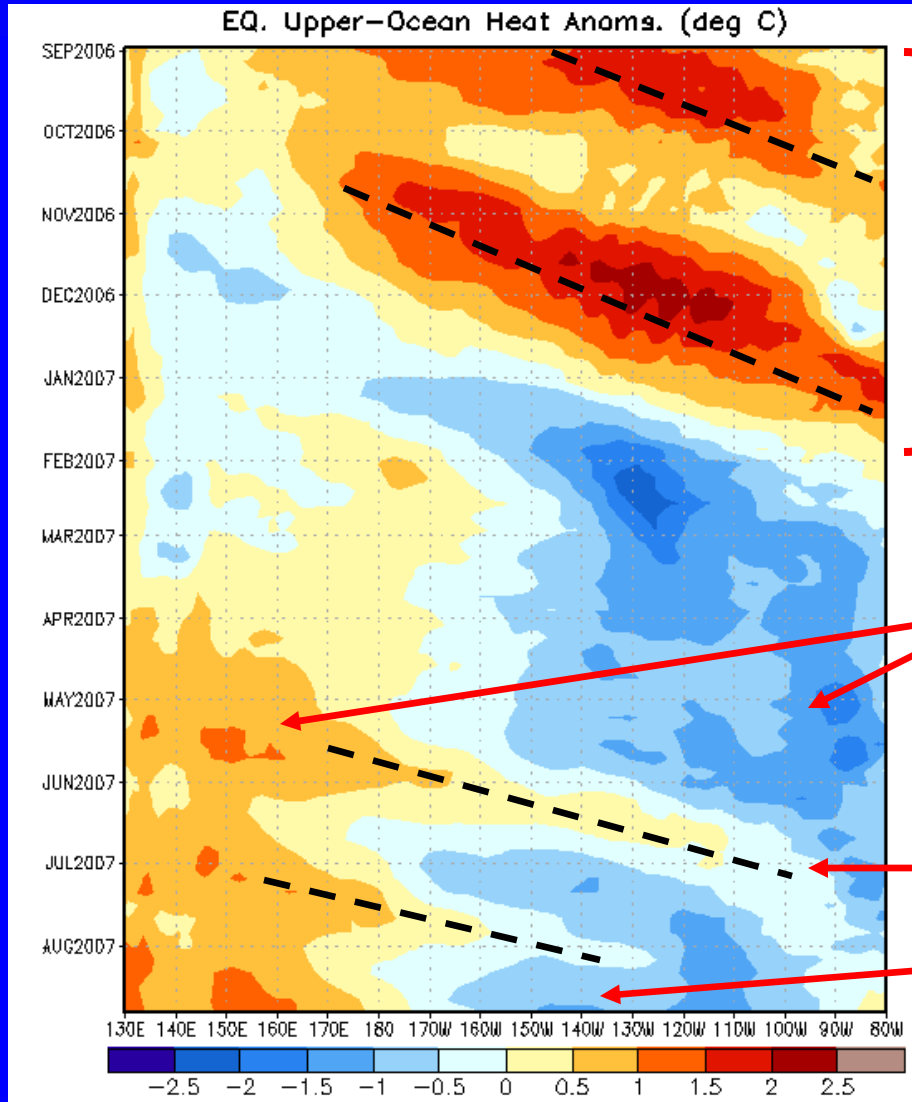
Easterly wind anomalies have weakened across the Atlantic Ocean and Africa and are mainly confined south of the equator.

Westerly wind anomalies continue along the equator near the Date Line.



# Weekly Heat Content Evolution in the Equatorial Pacific

Time  
↓



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

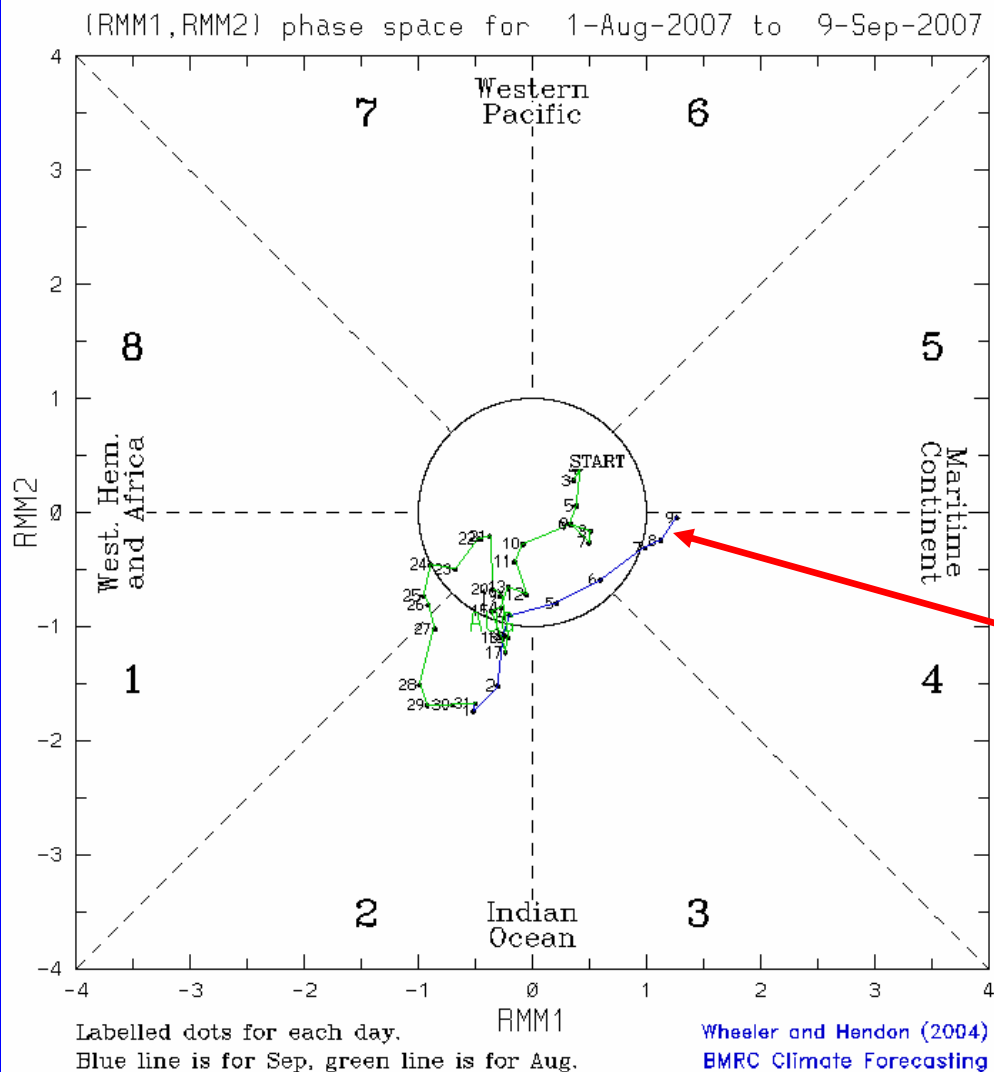
Since January, negative heat content anomalies are evident across the eastern equatorial Pacific and since late March larger positive anomalies have prevailed in the far western Pacific Ocean.

Weak Kelvin wave activity has been observed since mid-May. Currently below average heat content anomalies are consistent with the upwelling portion of the most recent Kelvin wave.

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.

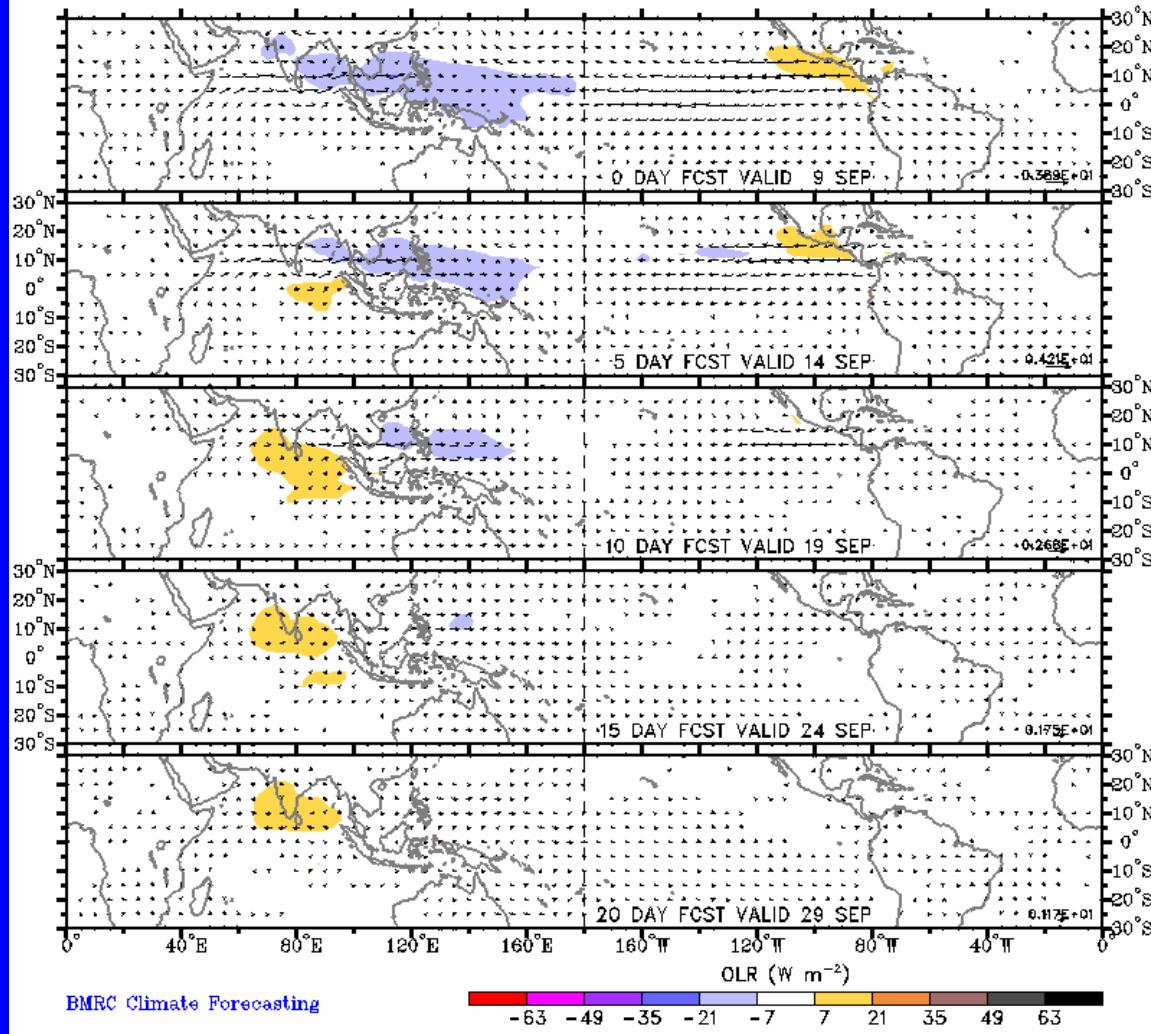
The MJO index amplitude has increased and shown some eastward movement during the past week.



# MJO OLR Forecast

Prediction of MJO-associated anomalies using lagged linear regression  
Predictors are RMM1 and RMM2 on 9 Sep 2007

Shading for OLR anomalies (scale below). Vectors for 850-hPa wind



The statistical method forecast indicates enhanced convection for the western Pacific Ocean while dry conditions are expected to develop across the Indian Ocean during the next 5-10 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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