

**Madden/Julian Oscillation:**  
**Recent Evolution, Current**  
**Status and Forecasts**

**Update prepared by**  
**Climate Prediction Center / NCEP**  
**April 2, 2007**

# Outline

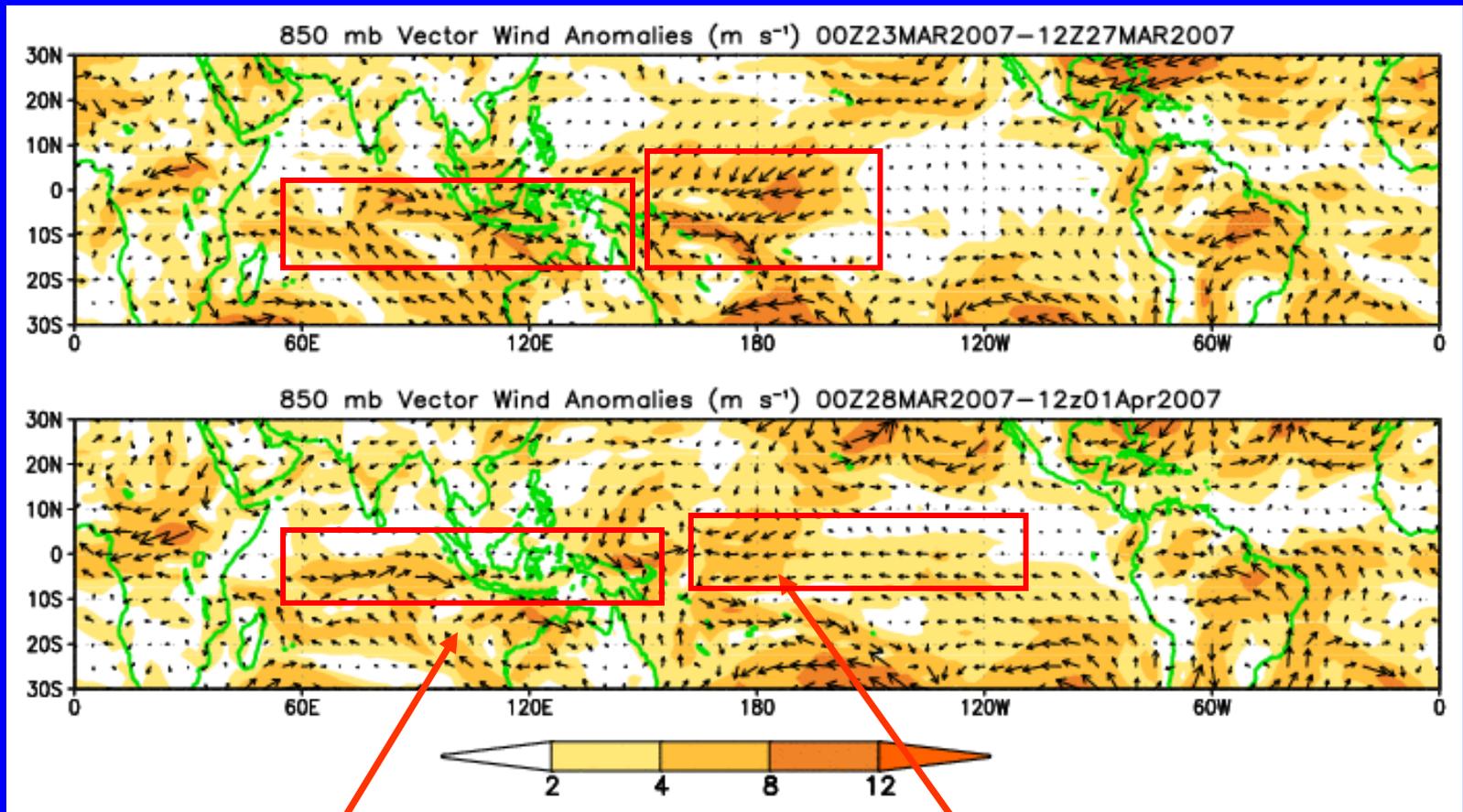
- **Overview**
- **Recent Evolution and Current Conditions**
- **Madden Julian Oscillation Forecast**
- **Summary**

# Overview

- **The MJO remains incoherent.**
- **During week 1 there exists an increased chance for above-average rainfall for sections of the south Pacific islands east of New Guinea with dry conditions continuing for sections of eastern Brazil.**
- **Tropical Cyclone Jaya will affect sections of Madagascar and eastern southern Africa with enhanced rainfall.**
- **Conditions are expected to be favorable for tropical cyclogenesis over sections of the southern Indian and southwest Pacific Oceans during week 1.**
- **Uncertainty is expected to be high during week 2 but some evidence supports the possibility of renewed enhanced rainfall across sections of the Indian Ocean.**

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

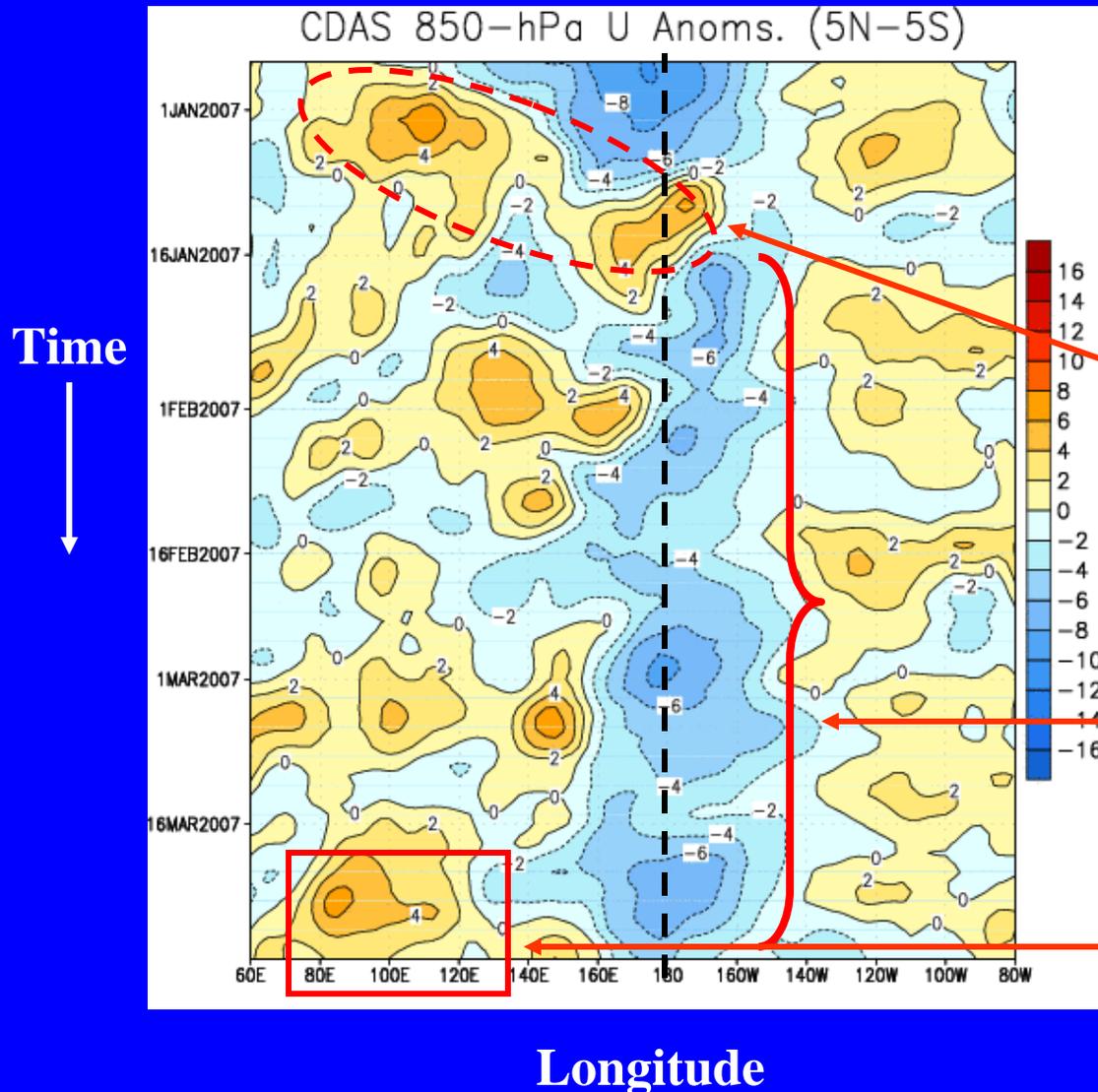
Note that shading denotes the magnitude of the anomalous wind vectors



Anomalous westerlies across Indonesia have extended to the western Pacific.

Anomalous easterlies in the equatorial western Pacific expanded eastward but have weakened near the Date Line.

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



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

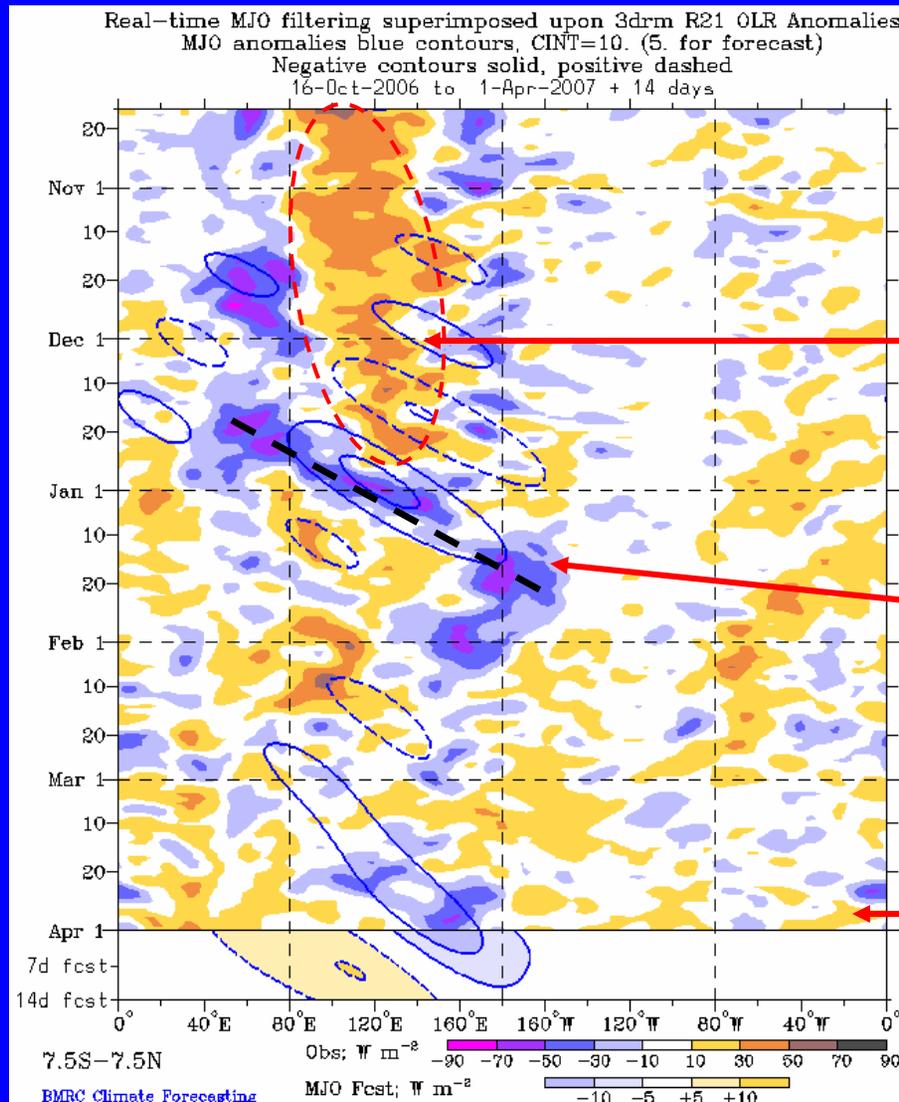
Easterly anomalies (blue shading) represent anomalous east-to-west flow.

Westerly anomalies associated with the MJO shifted from the equatorial Indian Ocean to the central equatorial Pacific during early January 2007.

Easterly anomalies have been persistent near the Date Line since mid-January.

Westerly anomalies over the eastern Indian Ocean have decreased.

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



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

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

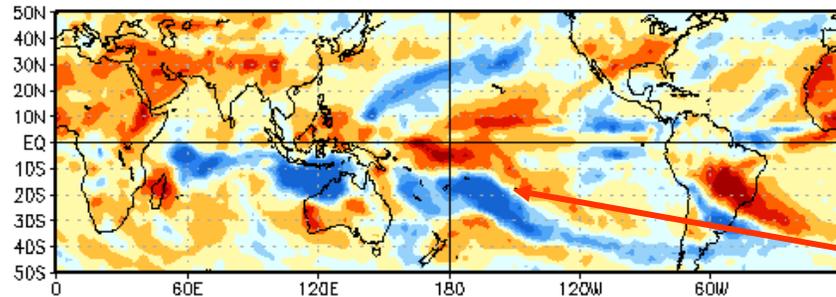
Strong suppressed convection was evident across the Maritime Continent (100E-150E) from late September to mid-December.

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

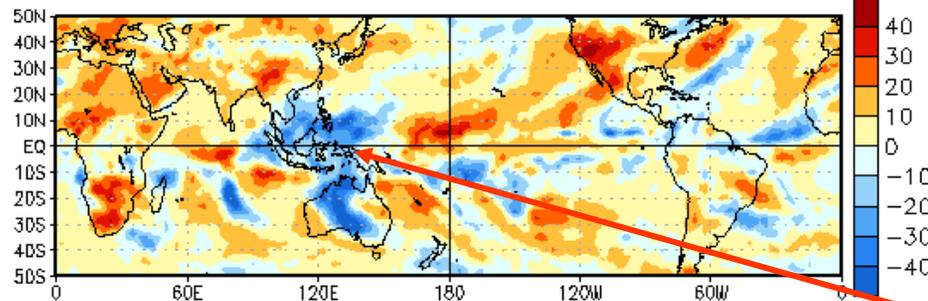
In general, OLR anomalies along the equator remain small. However, enhanced convection is evident over the western Pacific.

# Anomalous OLR: Last 30 days

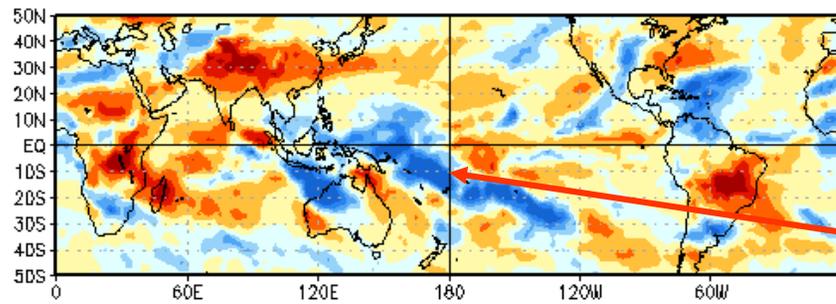
OLR Anomalies  
2 MAR 2007 to 11 MAR 2007



12 MAR 2007 to 21 MAR 2007



22 MAR 2007 to 31 MAR 2007



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

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

**During early March, enhanced convection developed across the southern Maritime continent, northern Australia and adjacent waters and extended eastward to include the South Pacific Convergence Zone east of the Date Line. Convection was also enhanced over the central Indian Ocean south of the equator.**

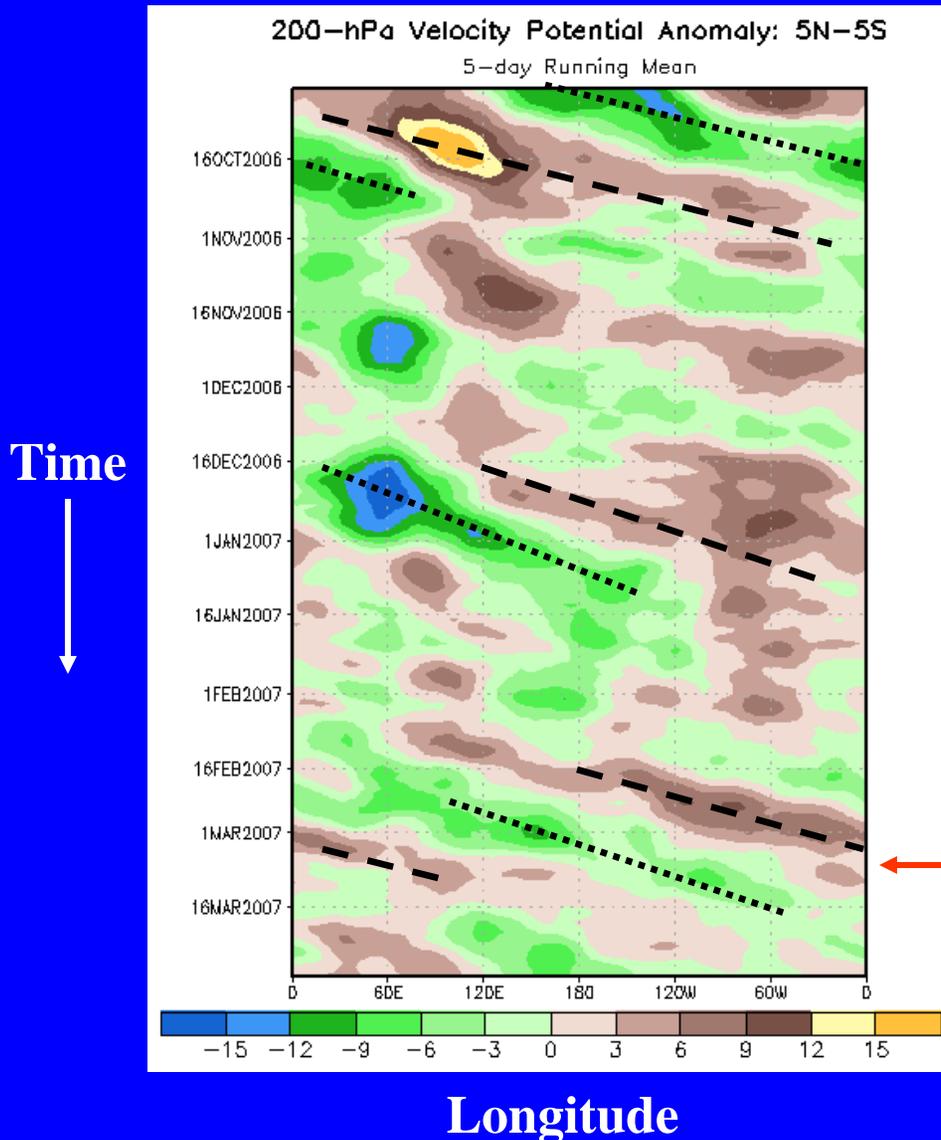
**In mid March, the SPCZ weakened and enhanced convection over the Maritime continent extended northward to include the tropical western Pacific.**

**Recently, strong enhanced convection returned over the SPCZ. Convection remains enhanced over the tropical 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.



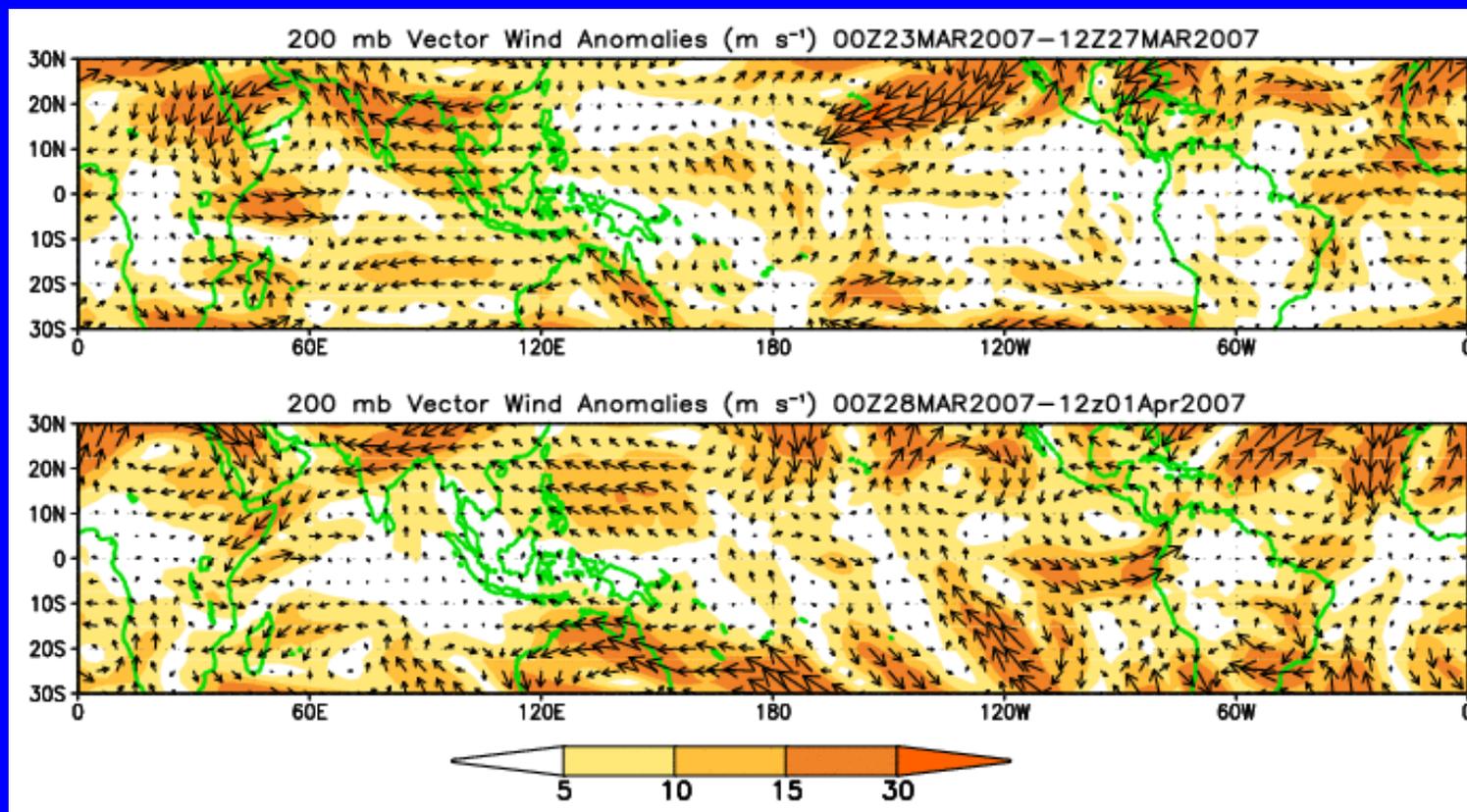
Moderate to strong MJO activity was observed from late-September to mid-October.

The MJO intensified in late December 2006, as 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.

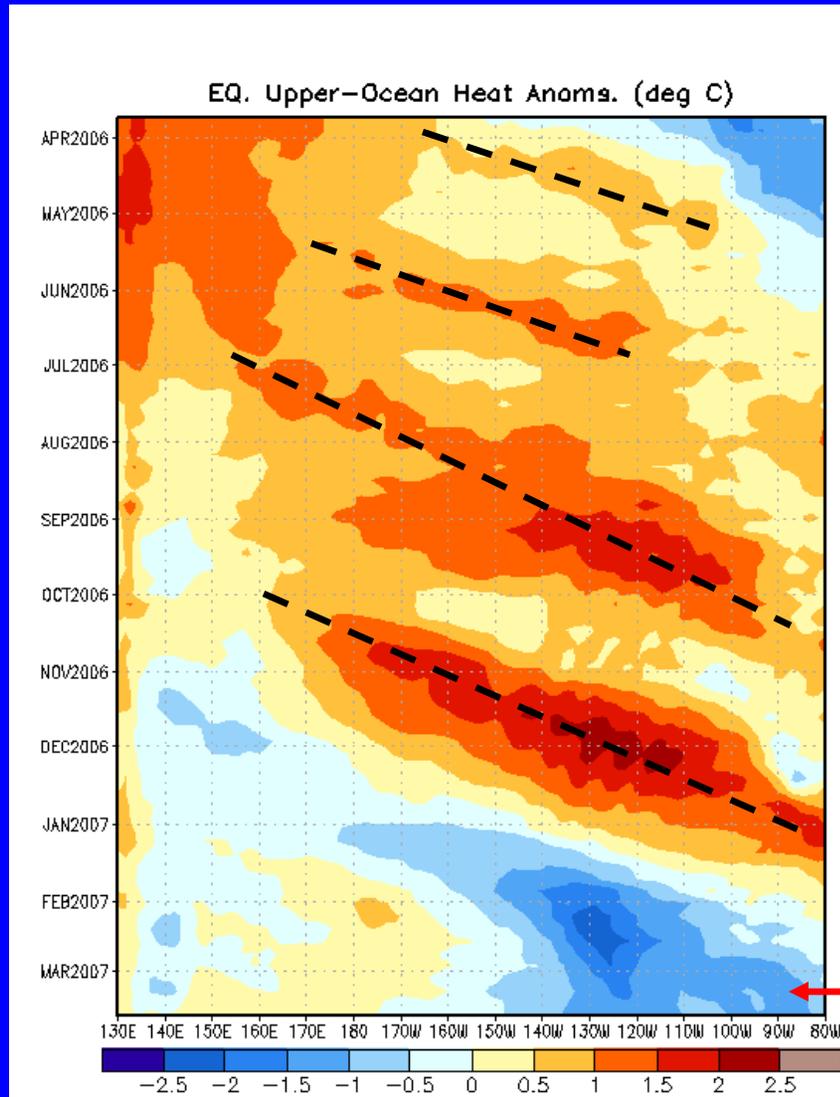
# 200-hPa Vector Winds and Anomalies ( $\text{m s}^{-1}$ )

Note that shading denotes the magnitude of the anomalous wind vectors.



# Heat Content Evolution in the Eq. Pacific

Time



Longitude

Starting in April, above normal upper oceanic water temperatures expanded from the western Pacific into the eastern Pacific.

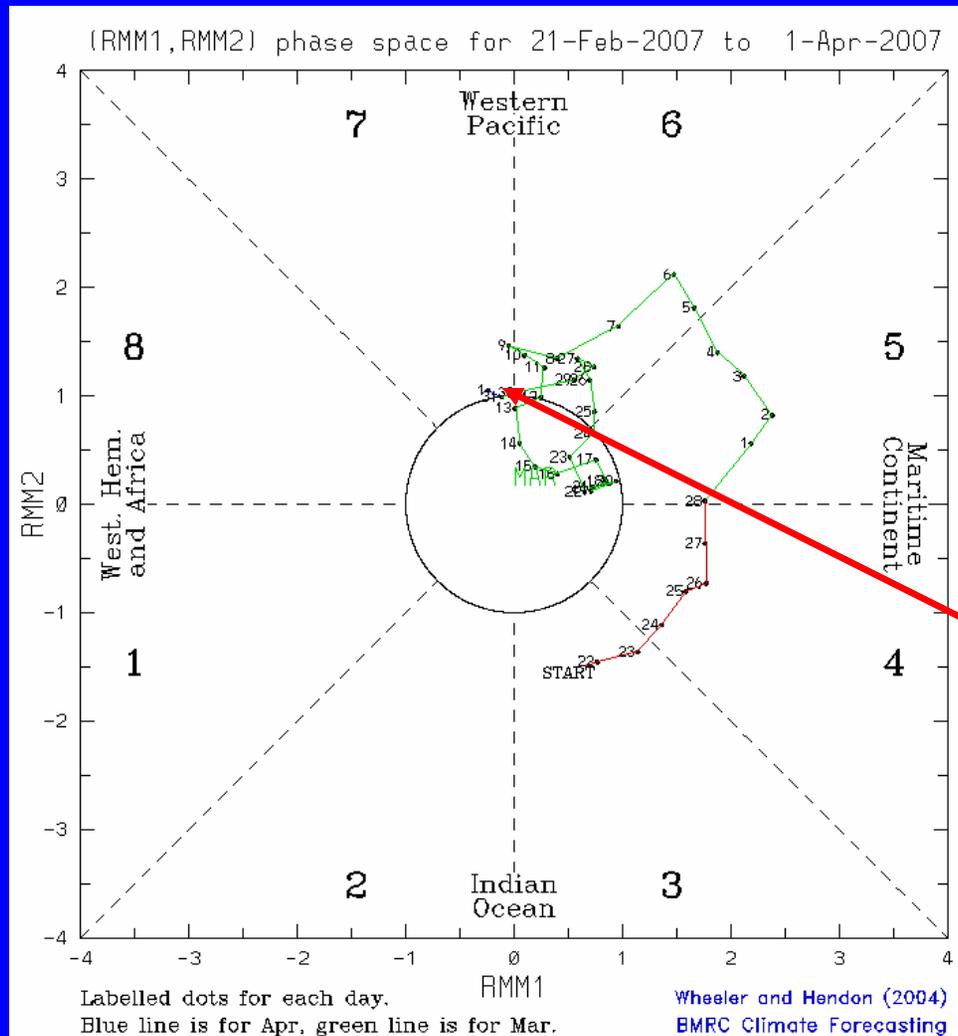
During this period eastward-propagating Kelvin waves (warm phases indicated by dashed lines) have caused considerable month-to-month variability in the upper-ocean heat content.

Recently, negative heat content anomalies are evident across the eastern equatorial Pacific.

# MJO Index (Magnitude and Phase)

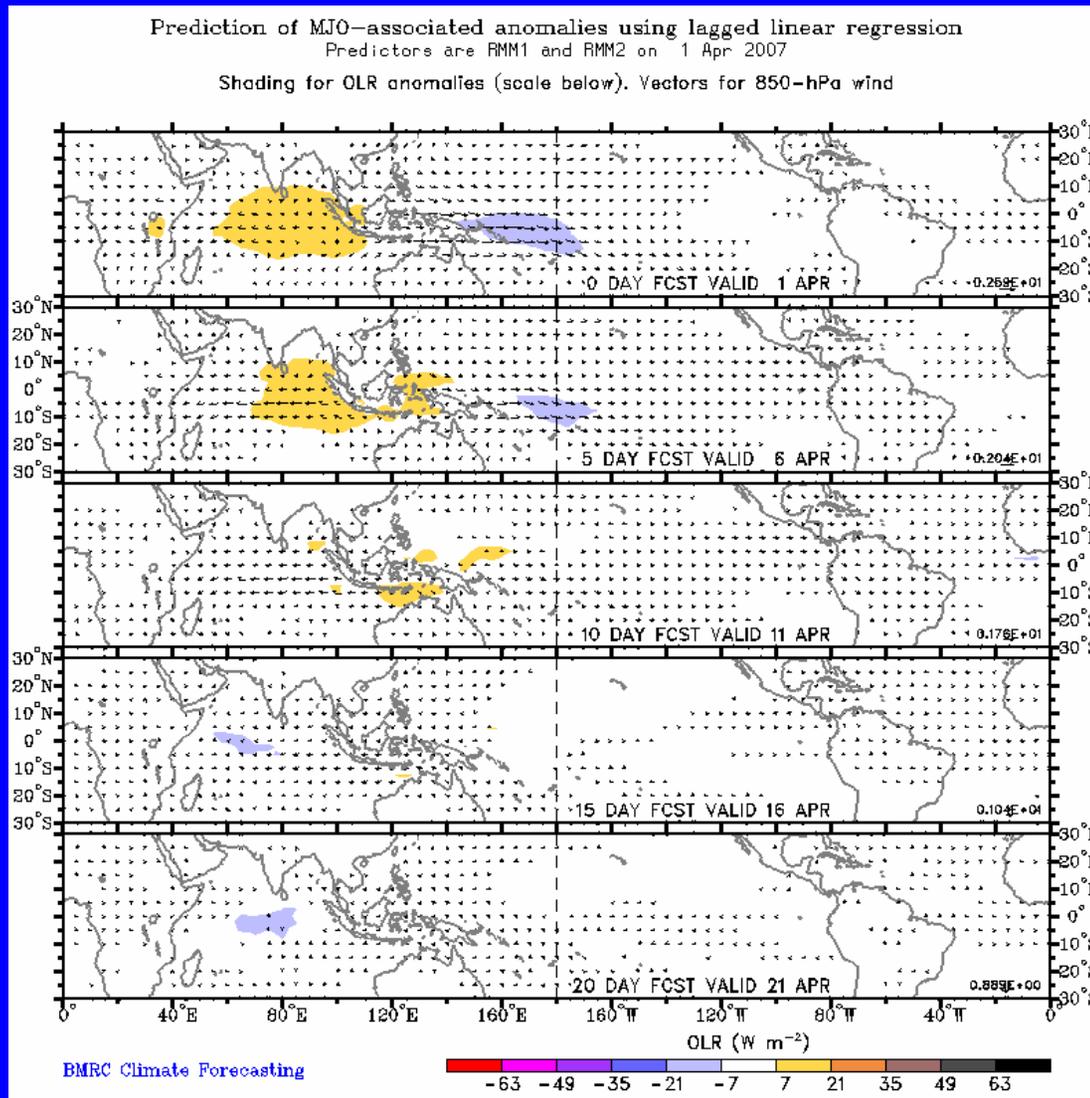
The current state of the MJO as determined by an index based on Empirical Orthogonal Function (EOF) analysis using combined fields of near-equatorially-averaged 850-hPa zonal wind, 200- hPa zonal wind, and satellite-observed outgoing longwave radiation (OLR) (Wheeler and Hendon, 2004).

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 weak MJO activity.

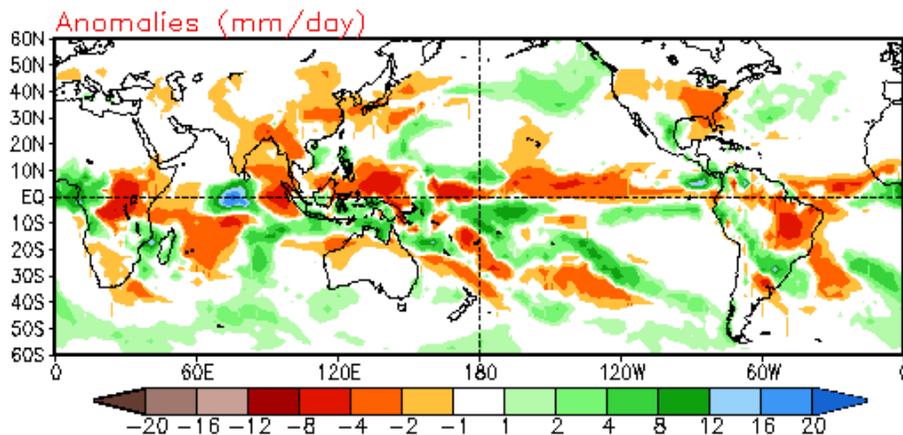
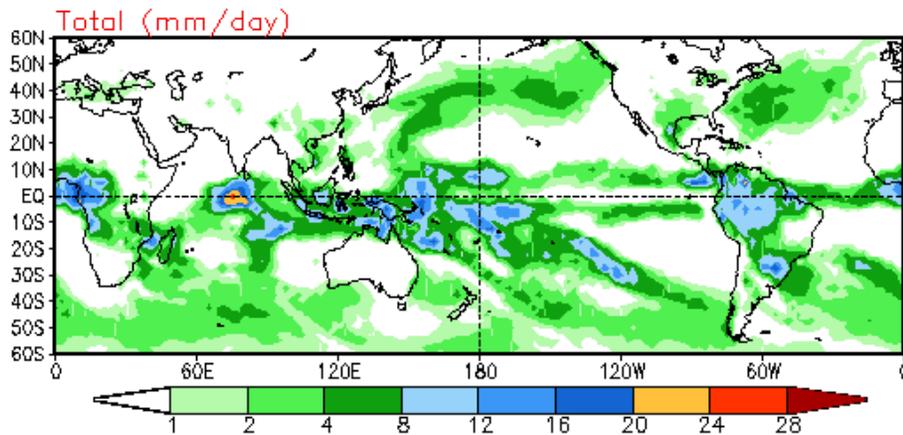
# Statistical OLR MJO Forecast



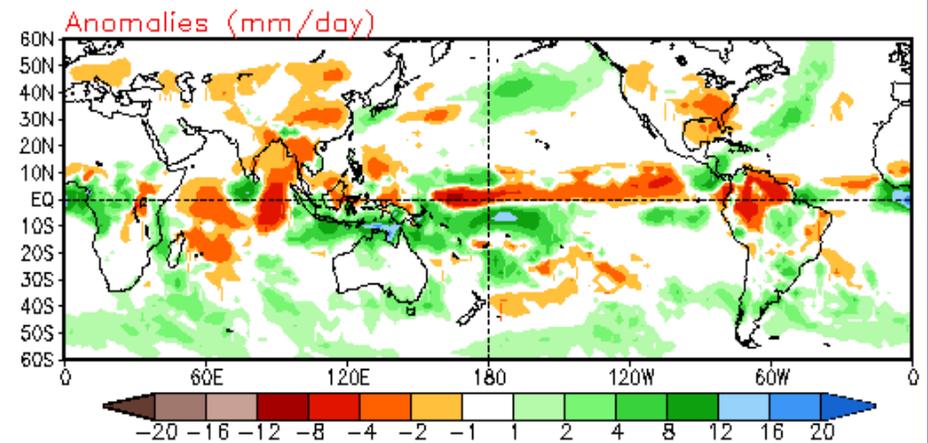
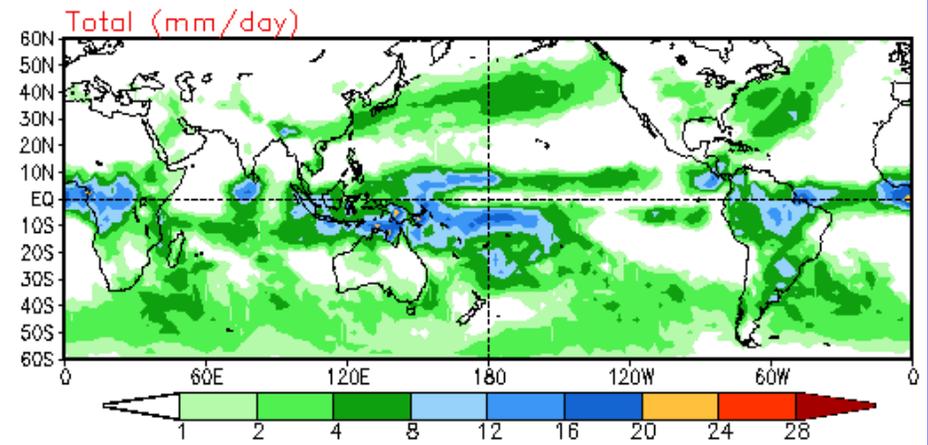
The forecast indicates weak enhanced convection for the western Pacific Ocean and drier than normal conditions for the Indian Ocean during the next 5-10 days.

# Experimental Bias-Corrected GFS Precipitation

Week 1 Precipitation  
Forecast from 02Apr2007



Week 2 Precipitation  
Forecast from 02Apr2007

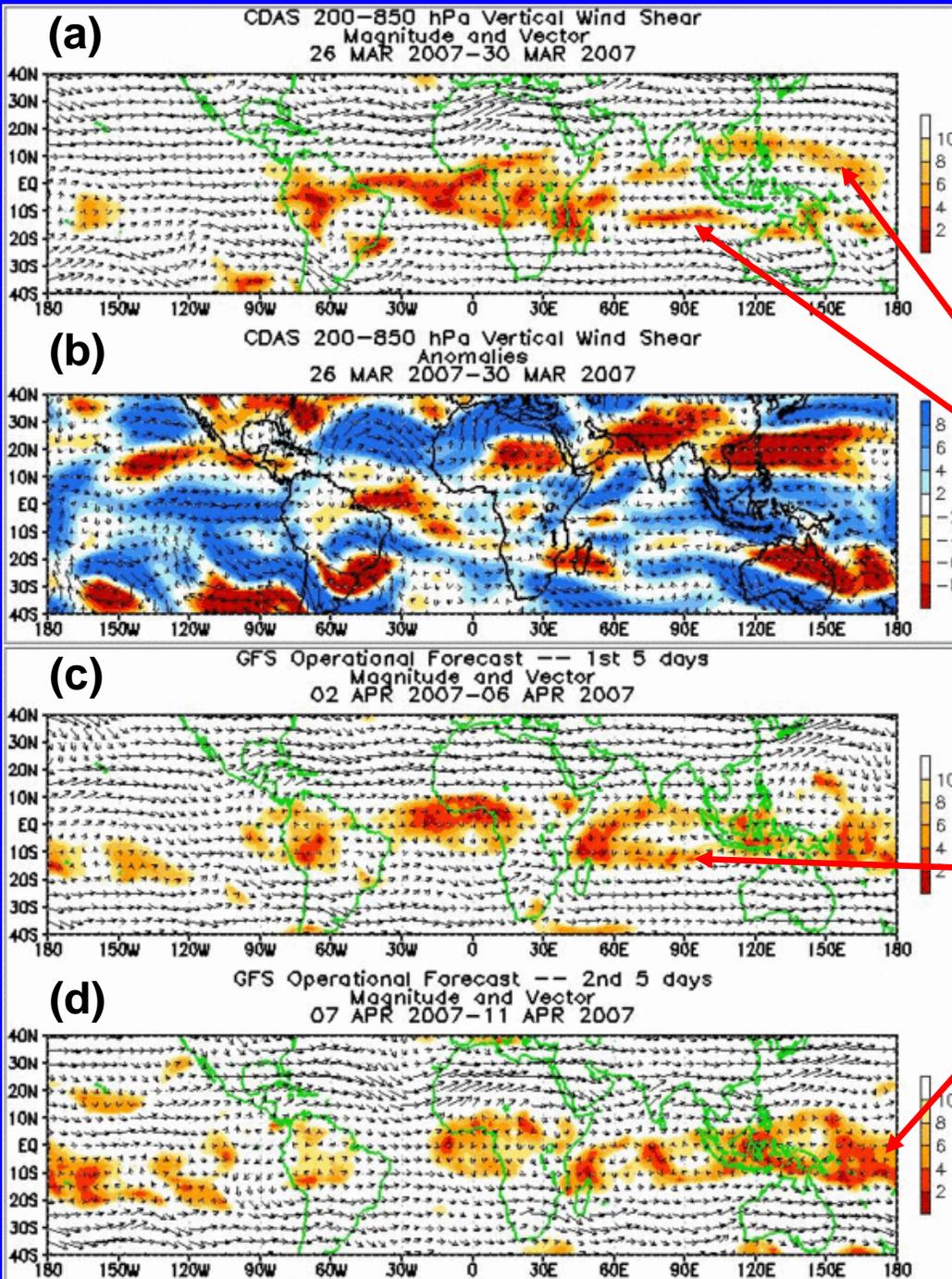


# 200 – 850 hPa Vertical Wind Shear

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)

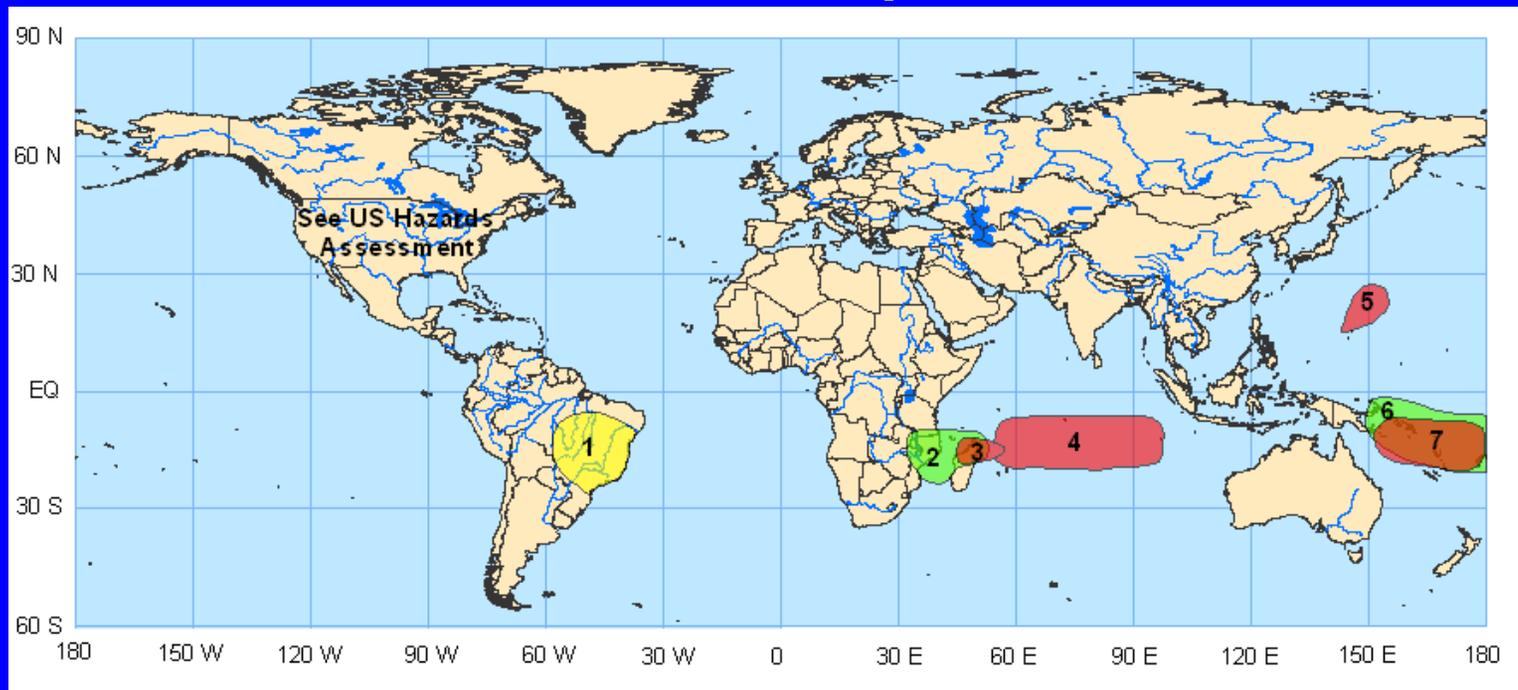


Low shear has been evident across sections of the western Pacific Ocean and southern Indian Ocean.

The GFS forecast indicates areas of low shear over sections of the southern Indian and southwest Pacific Oceans during the next ten days.

# Potential Benefits/Hazards – Week 1

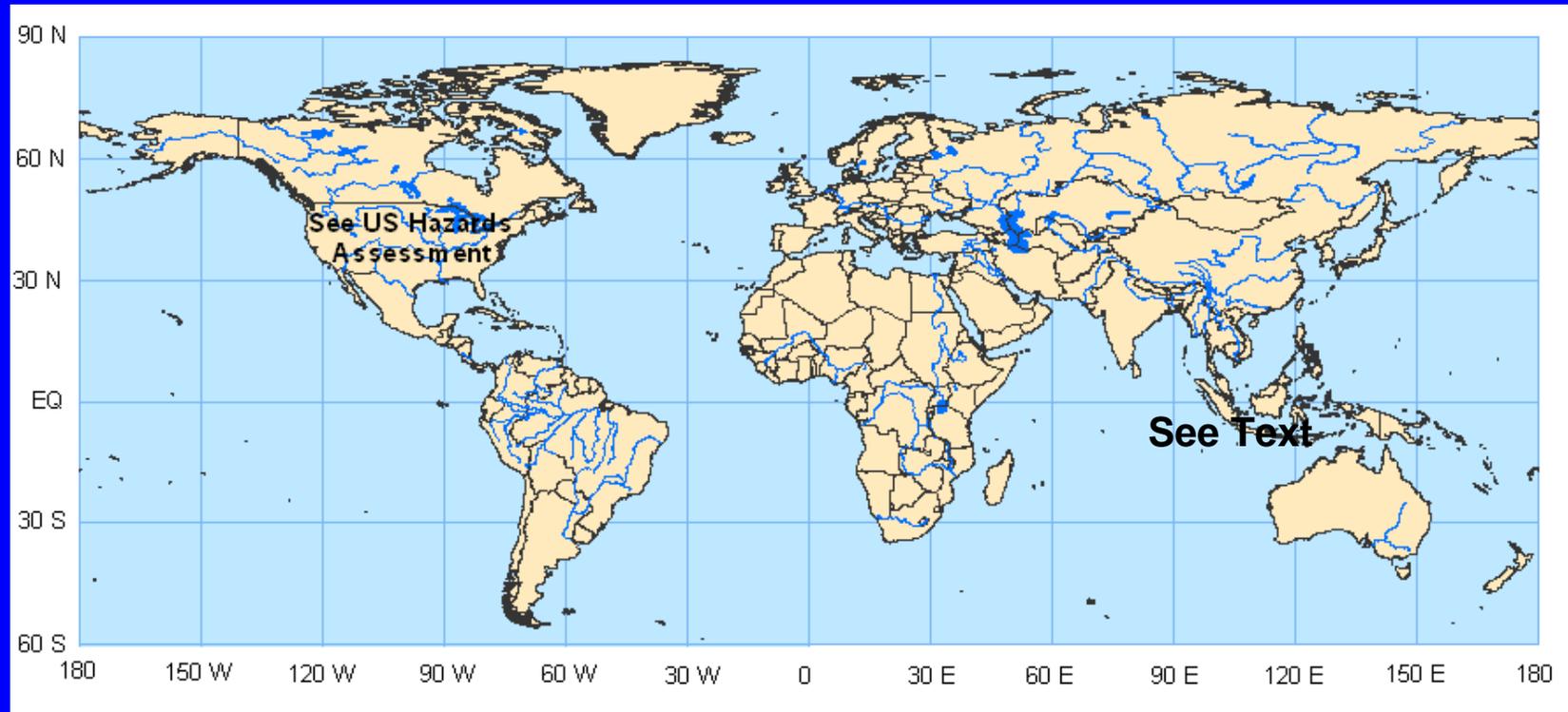
## Valid: 3 – 9 April 2007



1. An increased chance of below-average rainfall for sections of eastern Brazil.
2. An increased chance for above-average rainfall for sections of northern Madagascar and northern Mozambique.
3. Tropical Cyclone Jaya will impact northern Madagascar and potentially eastern southern Africa.
4. Conditions are expected to be favorable for tropical cyclogenesis over sections of the southern Indian Ocean.
5. Typhoon Kong-Rey will affect waters northeast of Guam in the western Pacific Ocean early in the period.
6. An increased chance for above-average rainfall for the South Pacific Islands east of New Guinea.
7. Conditions are expected to be favorable for tropical cyclogenesis over sections of the southwest Pacific Ocean.

# Potential Benefits/Hazards – Week 1

Valid: 10 -16 April 2007



**No definitive statements for potential benefits and hazards can be made during the time period**

# Summary

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