



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

**Update prepared by  
Climate Prediction Center / NCEP  
April 30, 2007**



# Outline

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



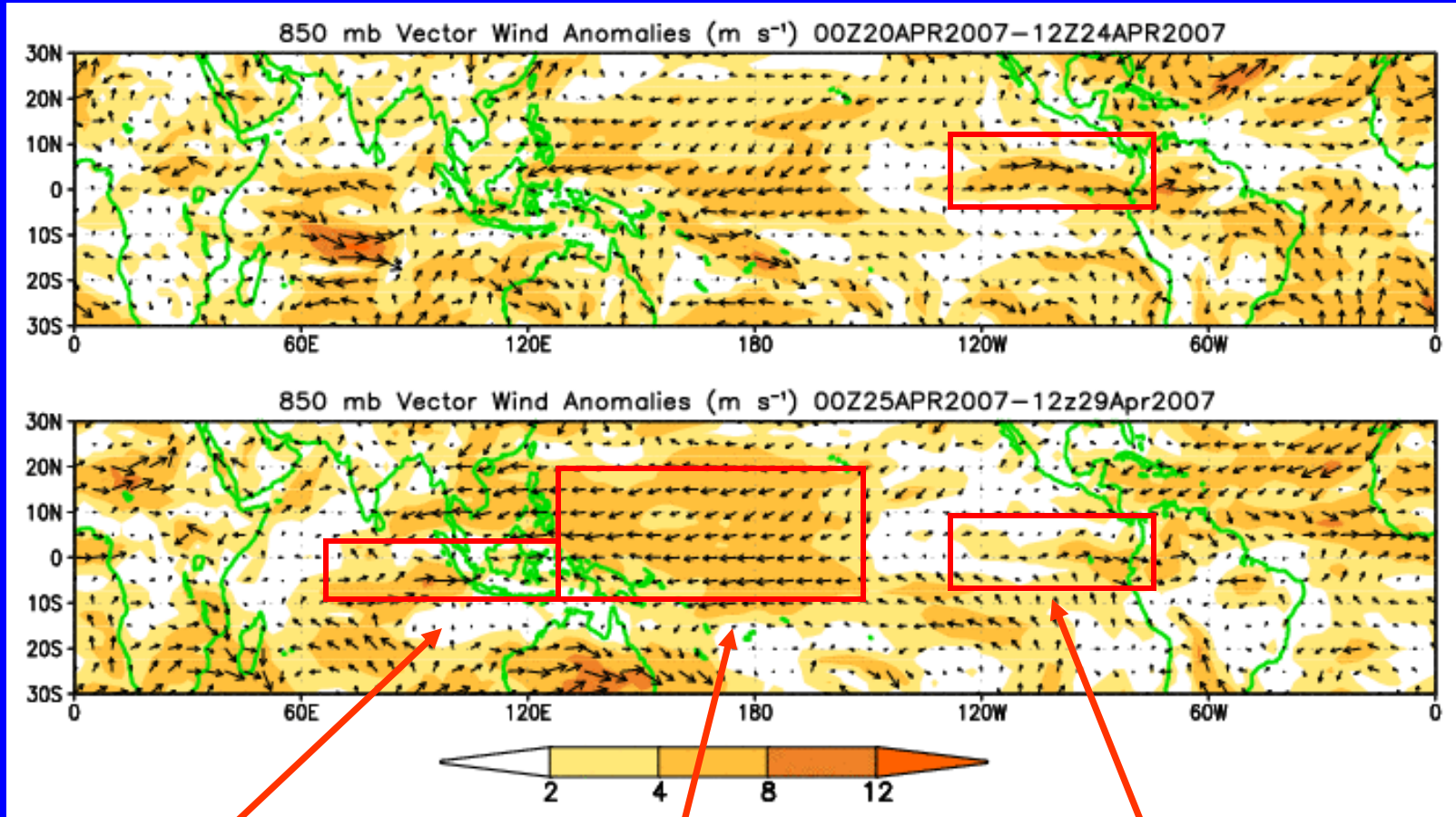
# Overview

- **The MJO remains incoherent.**
- **Convection has become more active across sections of the eastern Hemisphere, however, and it is likely that these areas will remain active based on a number of monitoring and forecast tools.**
- **During week 1, wetter than average conditions are expected for sections of the Bay of Bengal, the eastern Indian Ocean, the western Maritime continent and southeast Asia. These conditions are expected to persist during week 2.**
- **An increased chance of above average rainfall is expected for the Gulf of Guinea region of Africa.**
- **Also, favorable conditions for tropical cyclogenesis are anticipated for sections of the Bay of Bengal throughout the period.**



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

Note that shading denotes the magnitude of the anomalous wind vectors



Westerly anomalies are now evident across sections of the western Maritime continent and the eastern Indian Ocean.

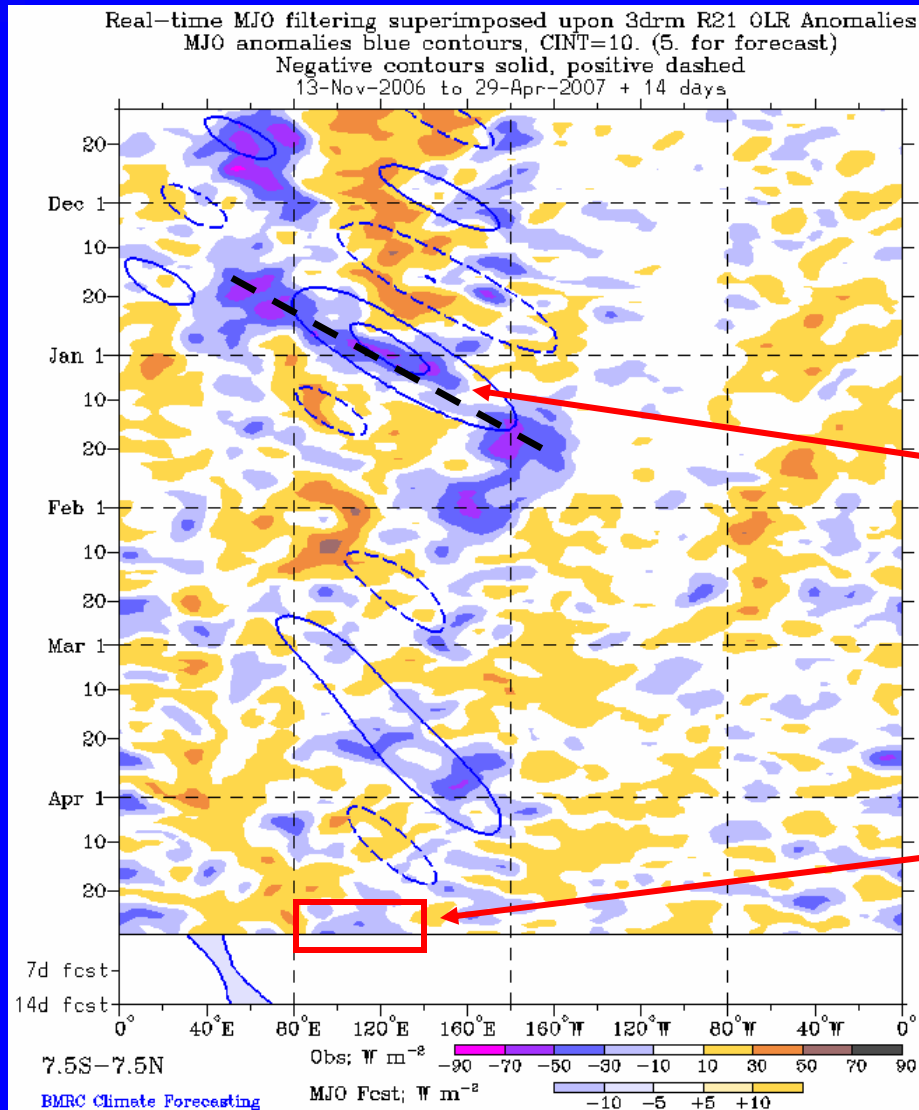
Easterly anomalies persist in the equatorial Pacific near the Date Line.

Westerly wind anomalies over the eastern equatorial Pacific have weakened during the last five days.





# 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)**

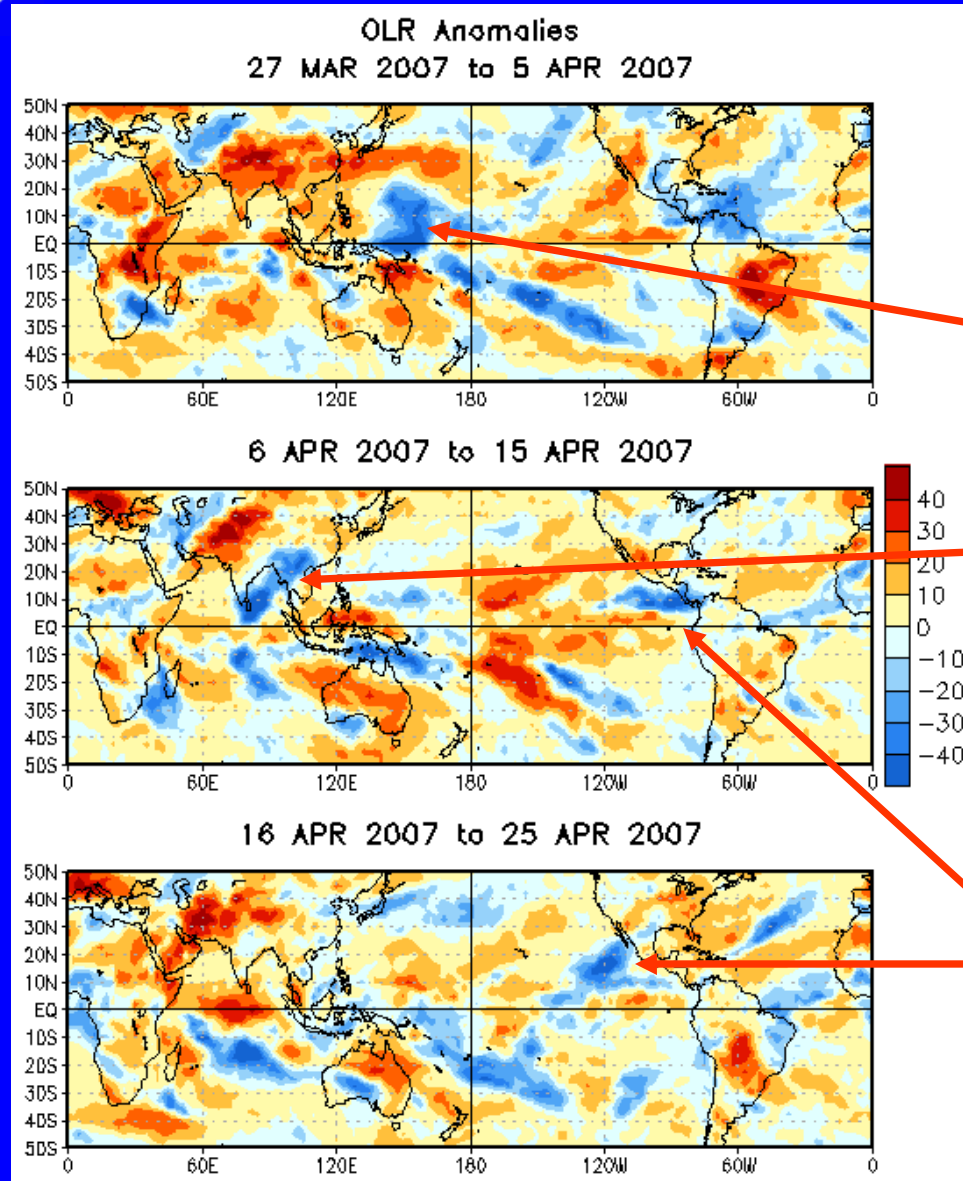
Enhanced convection, associated with the MJO in late December and January, shifted eastward from the Indian Ocean across the Maritime Continent and western Pacific.

Equatorial OLR anomalies continue to be generally small across much of the tropics. A noticeable increase in convection is evident during the past several days from 80°E to 120°E.

Longitude



# OLR Anomalies: Last 30 days



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

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

During late March and early April, wet conditions were observed over the western Pacific and along the SPCZ. East Africa and Brazil were quite dry.

Early to mid April saw a period of enhanced convection across the Bay of Bengal and sections of southeast Asia.

During mid-late April, convection across the eastern Pacific Ocean was enhanced. Also, active convection developed across the Gulf of Guinea region of Africa.

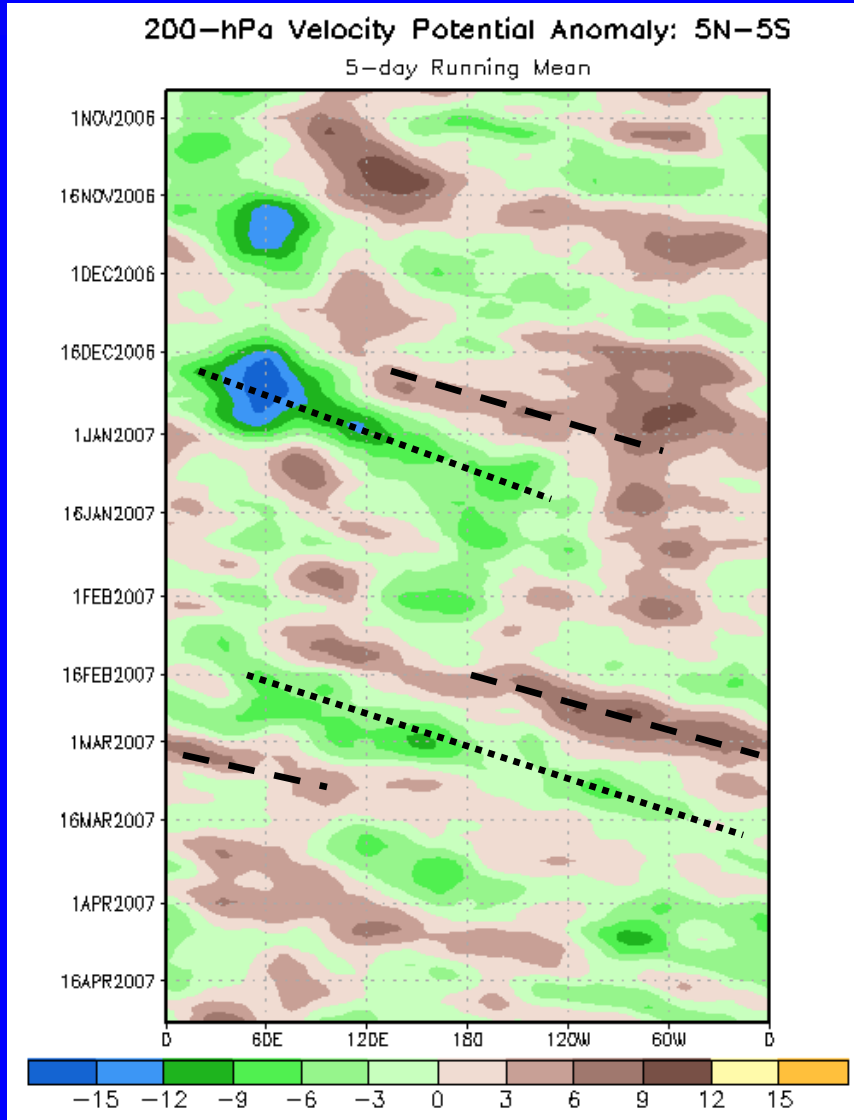


# 200-hPa Velocity Potential Anomalies (5°S-5°N)

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.

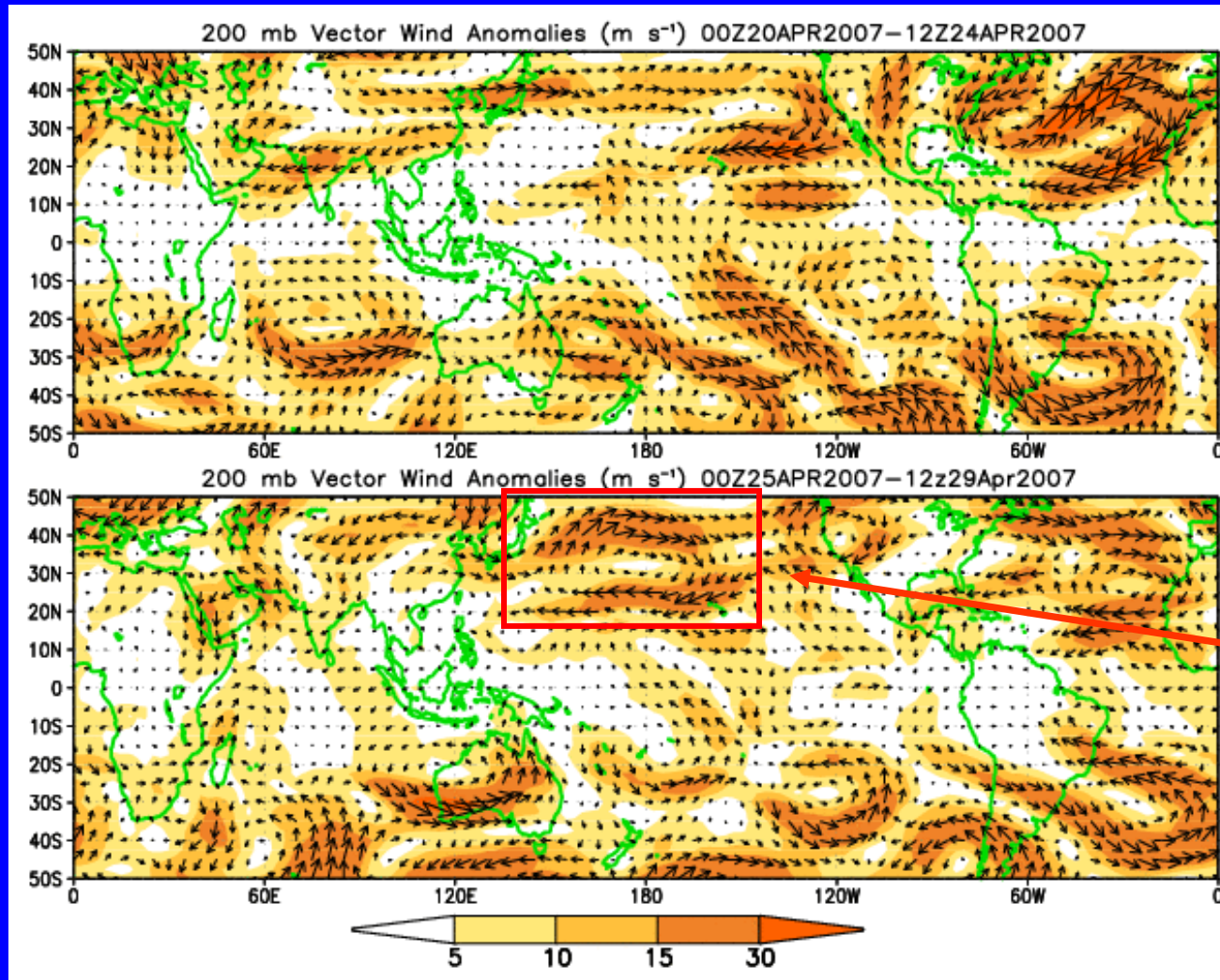
The MJO has been weak or incoherent since mid-March.





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

Note that shading denotes the magnitude of the anomalous wind vectors

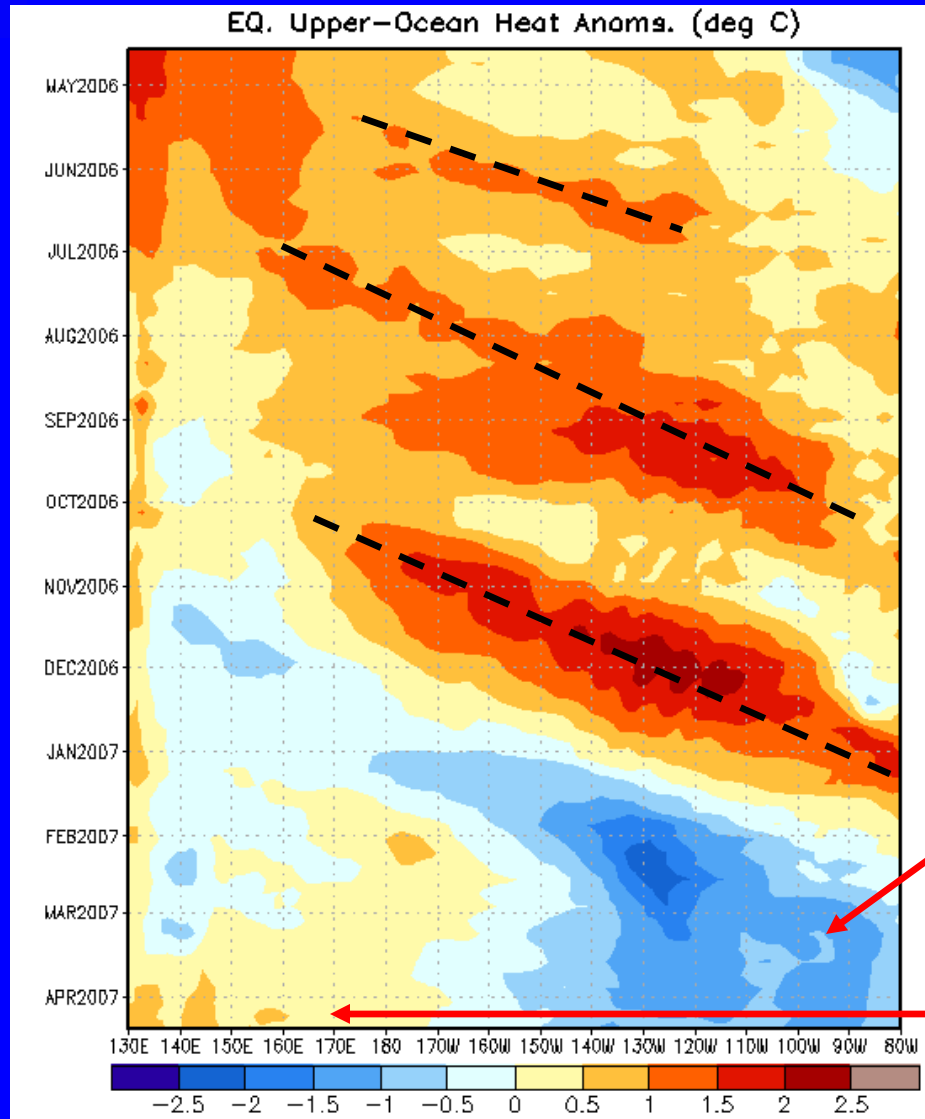


Anomalous anticyclonic circulation has developed across the Pacific Ocean in recent days.



# Weekly Heat Content Evolution in the Equatorial Pacific

Time



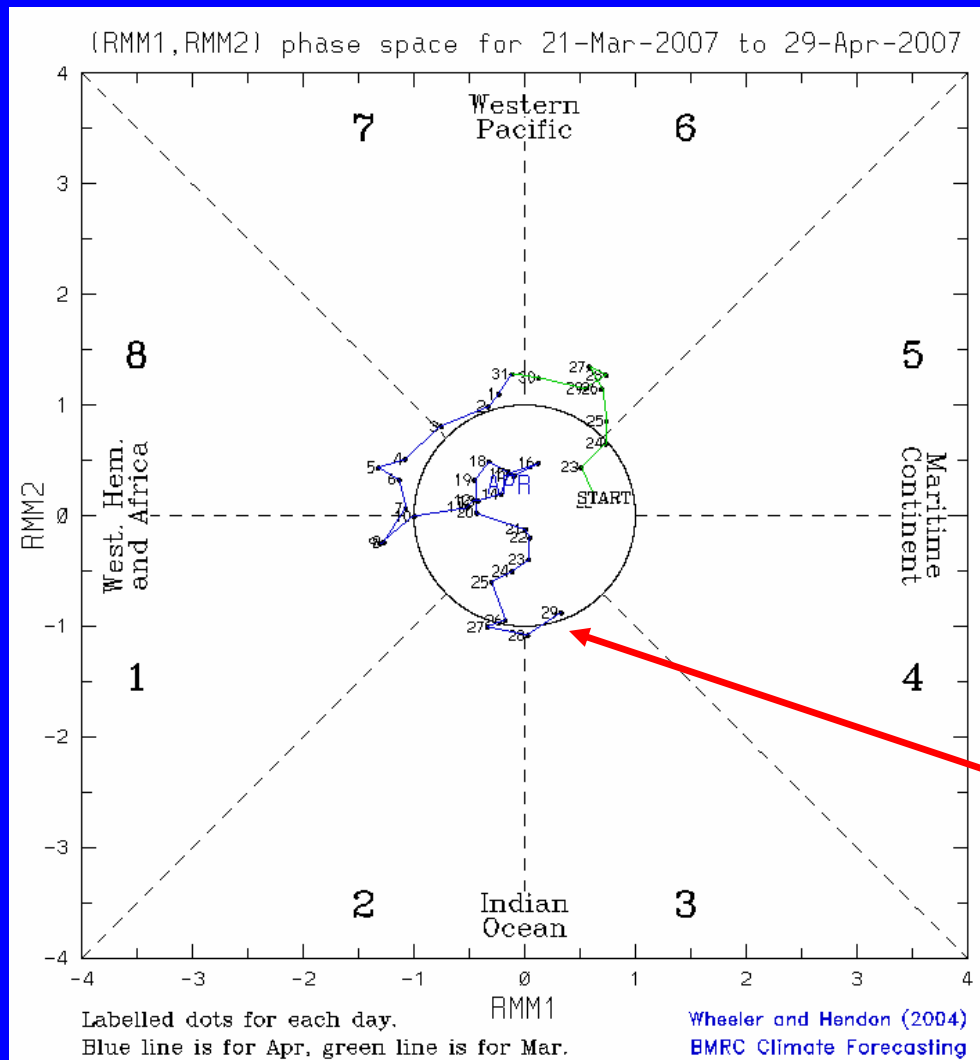
During this period eastward-propagating Kelvin waves (warm phases indicated by dashed lines) have caused considerable month-to-month variability in the upper-ocean heat content.

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

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



# 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).

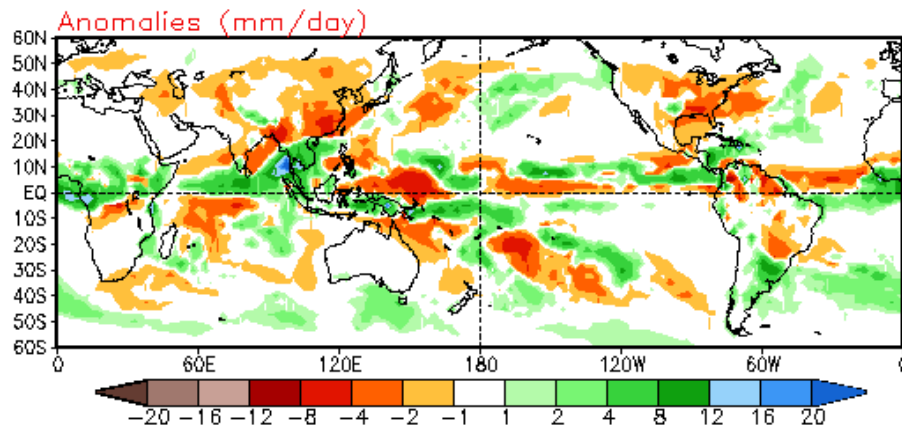
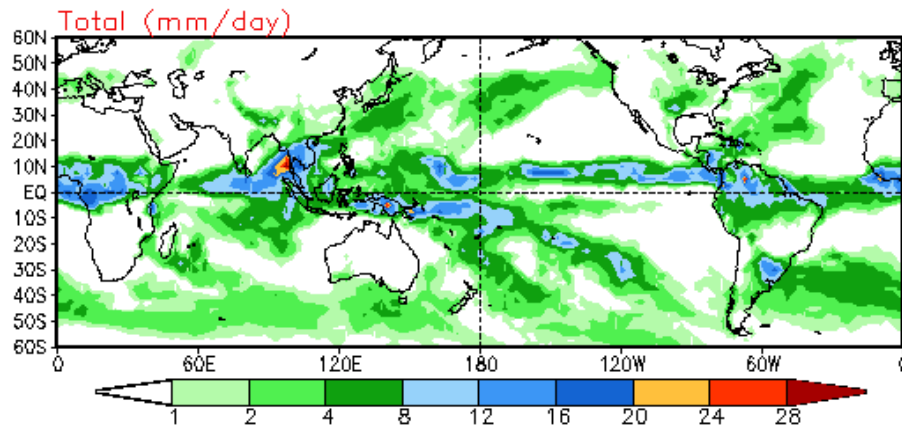
The axes represent the time series of the two leading modes of variability and are used to measure the amplitude while the triangular areas indicate the phase or location of the enhanced phase of the MJO. The farther away from the center of the circle the stronger the MJO. Different color lines indicate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

The MJO index amplitude has increased in recent days but the MJO remains weak.

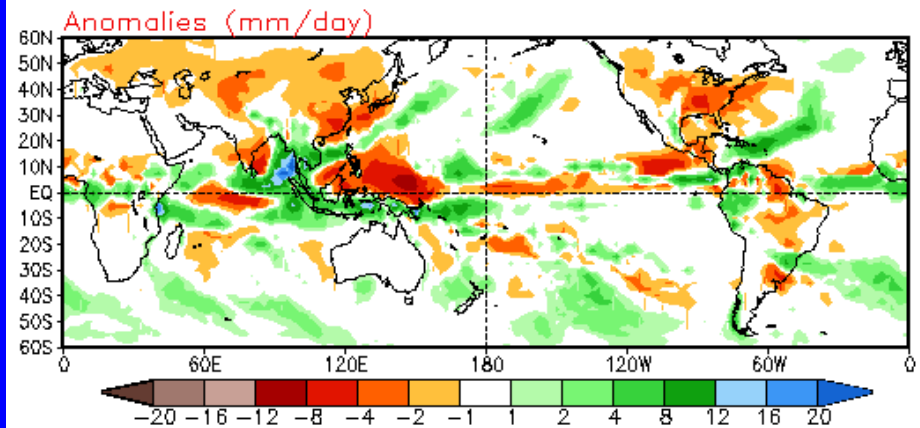
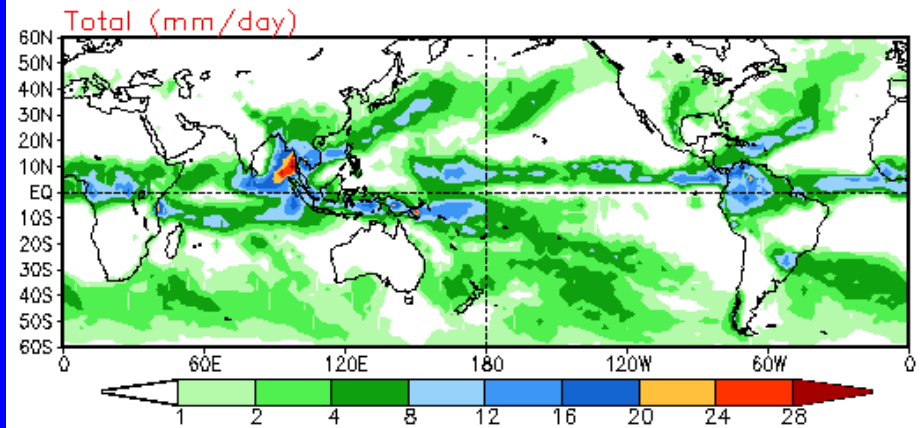


# Experimental Bias-Corrected GFS Precipitation

Week 1 Precipitation  
Forecast from 30Apr2007



Week 2 Precipitation  
Forecast from 30Apr2007





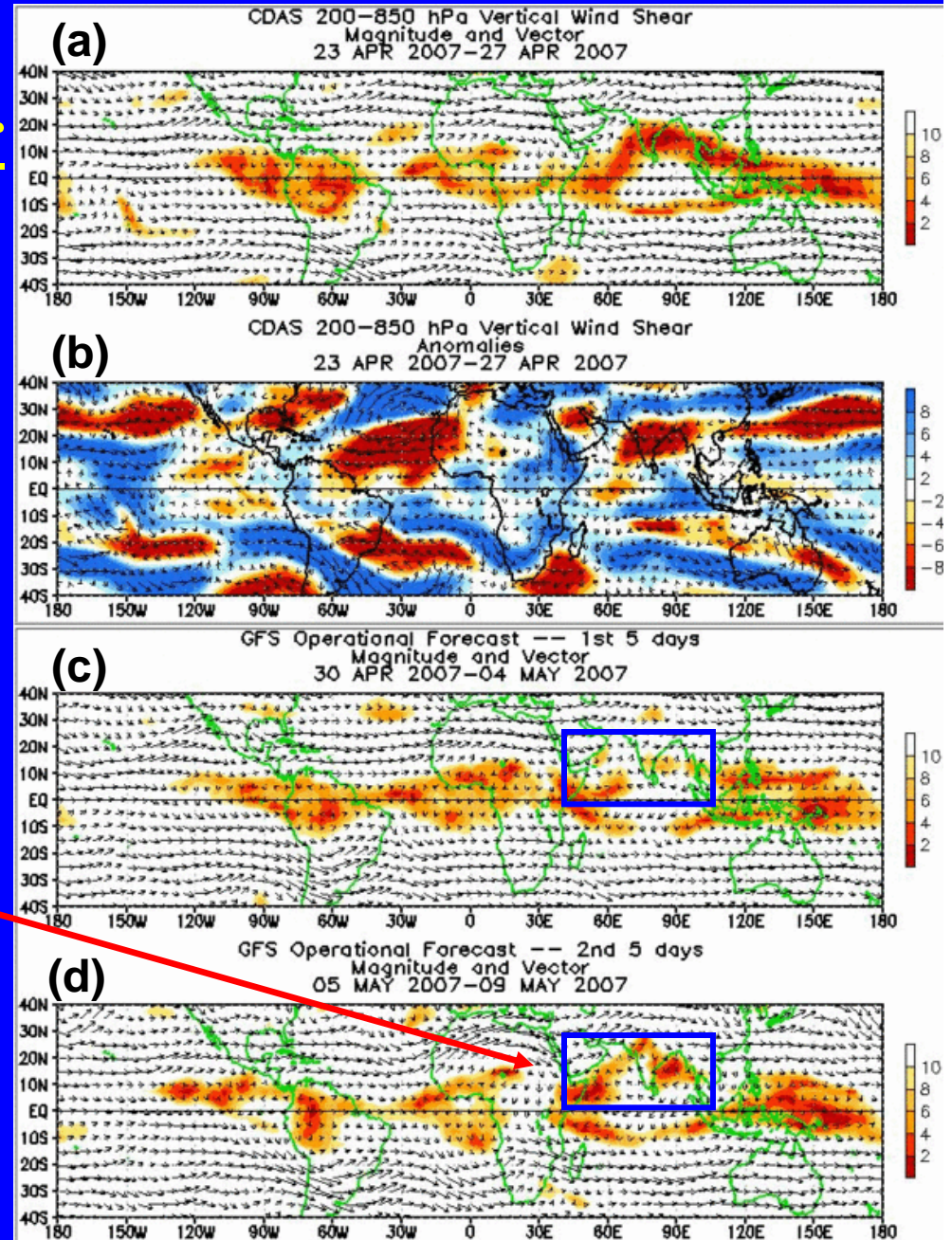
# 200–850 hPa Vertical Wind Shear

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)

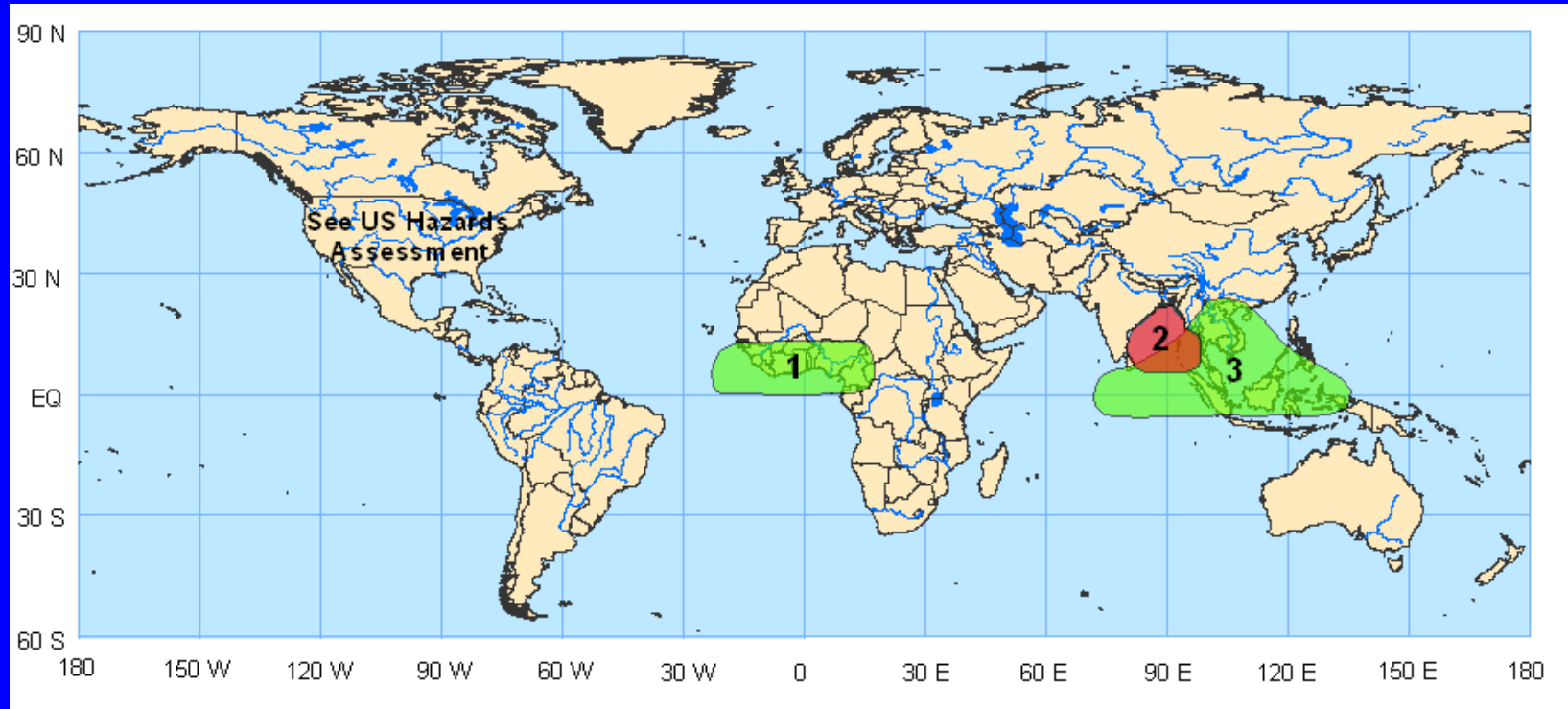
The GFS forecast indicates areas of low shear over sections of the Bay of Bengal during the period. This area needs to be monitored as convection is expected to remain or become more active in this region.





# Potential Benefits/Hazards – Week 1

Valid: 1 – 7 May 2007

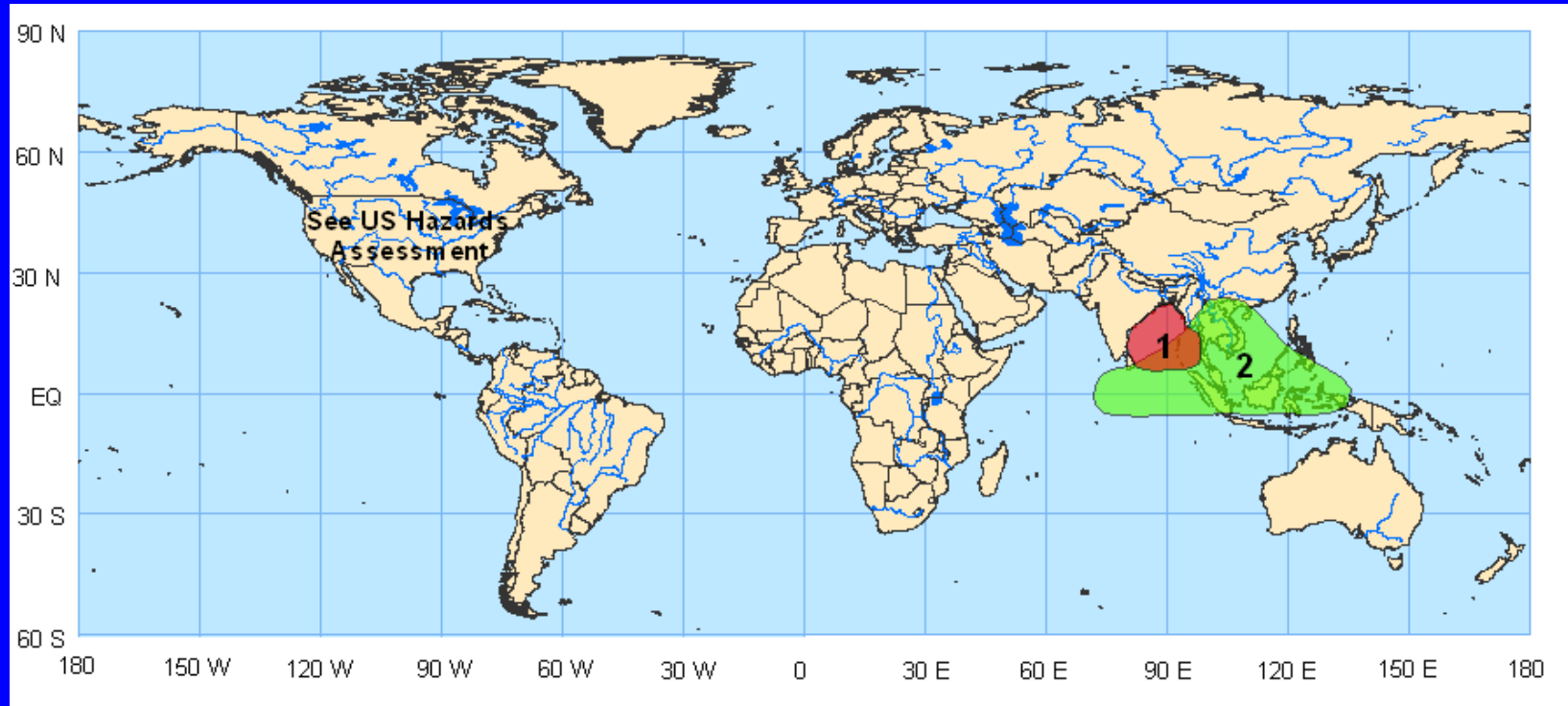


- 1. An increased chance for above-average rainfall across sections of the Gulf of Guinea region of Africa.**
- 2. Favorable conditions exist for tropical cyclogenesis across the Bay of Bengal.**
- 3. An increased chance for above-average rainfall across sections of the Bay of Bengal, the eastern Indian Ocean, the western Maritime continent and southeast Asia.**



# Potential Benefits/Hazards – Week 2

## Valid: 8 – 14 May 2007



- 1. Favorable conditions exist for tropical cyclogenesis across the Bay of Bengal.**
- 2. An increased chance for above-average rainfall across sections of the Bay of Bengal, the eastern Indian Ocean, the western Maritime continent and southeast Asia.**



## **Summary**

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