

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

**Update prepared by  
Climate Prediction Center / NCEP  
October 10, 2006**

# Outline

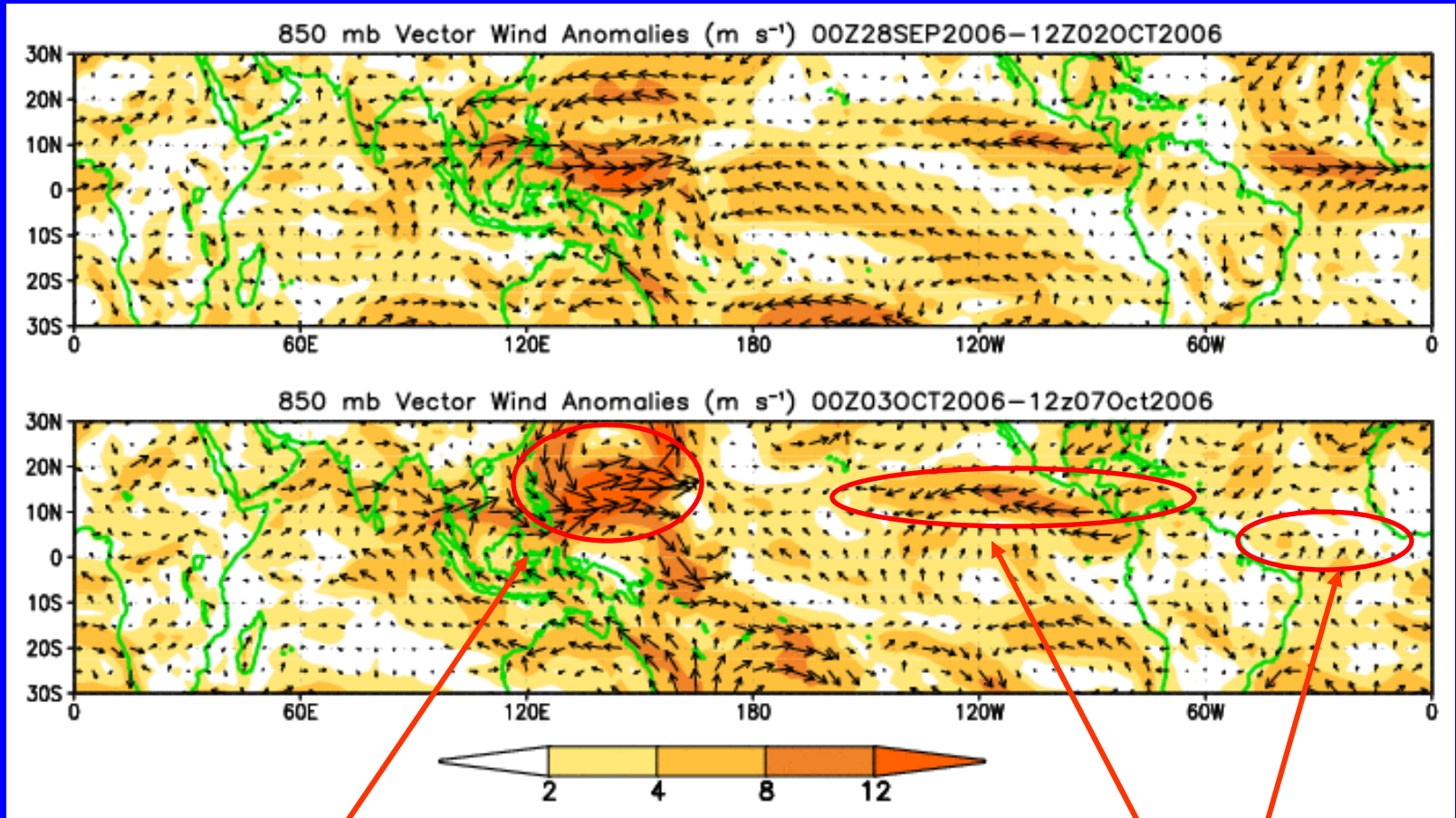
- **Overview**
- **Recent Evolution and Current Conditions**
- **Madden Julian Oscillation Forecast**
- **Summary**

# Overview

- The latest observations indicate that a moderate MJO is ongoing.
- Potential impacts during week 1 include an increased chance for above normal rainfall across the east tropical Pacific, Central America, and sections of South America and west Africa. Drier than normal conditions are expected for the eastern Indian Ocean and across the Maritime Continent. Favorable conditions exist for tropical cyclogenesis for sections of the central and eastern Pacific and Caribbean Sea. Also, tropical cyclones Norman/Olivia and Soulik will impact the eastern and western Pacific respectively during the period.
- During week 2, below average rainfall is expected for the Maritime Continent while above average rainfall is anticipated from equatorial Africa into the central Indian Ocean. Conditions may become favorable for tropical cyclone development in the Arabian Sea and Bay of Bengal.

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

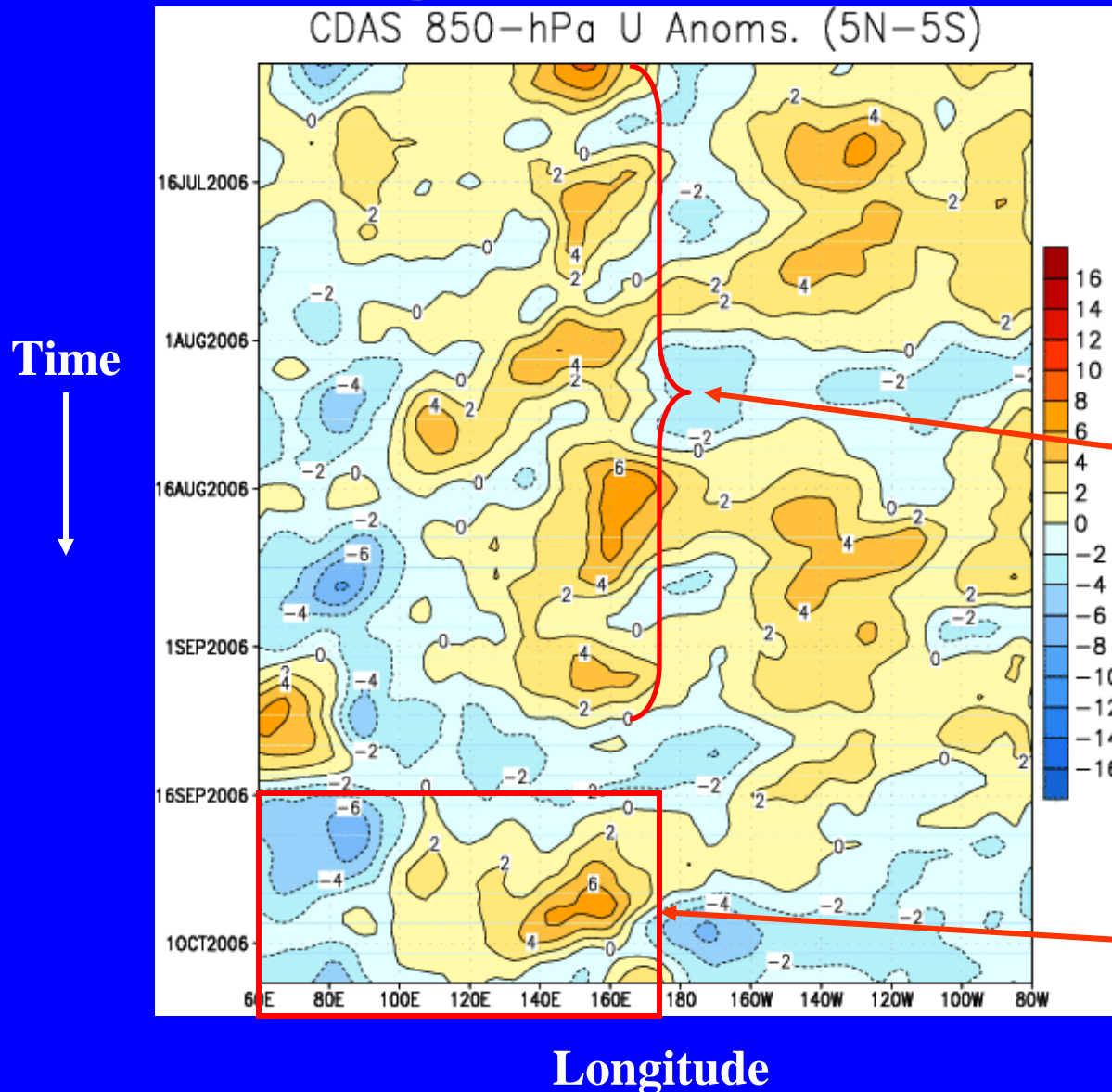
Note that shading denotes the magnitude of the anomalous wind vectors



A large cyclonic wind anomaly remains over the Philippine Sea and has shifted north.

Easterly anomalies have increased in the eastern Pacific, while westerly anomalies have weakened over the equatorial Atlantic.

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



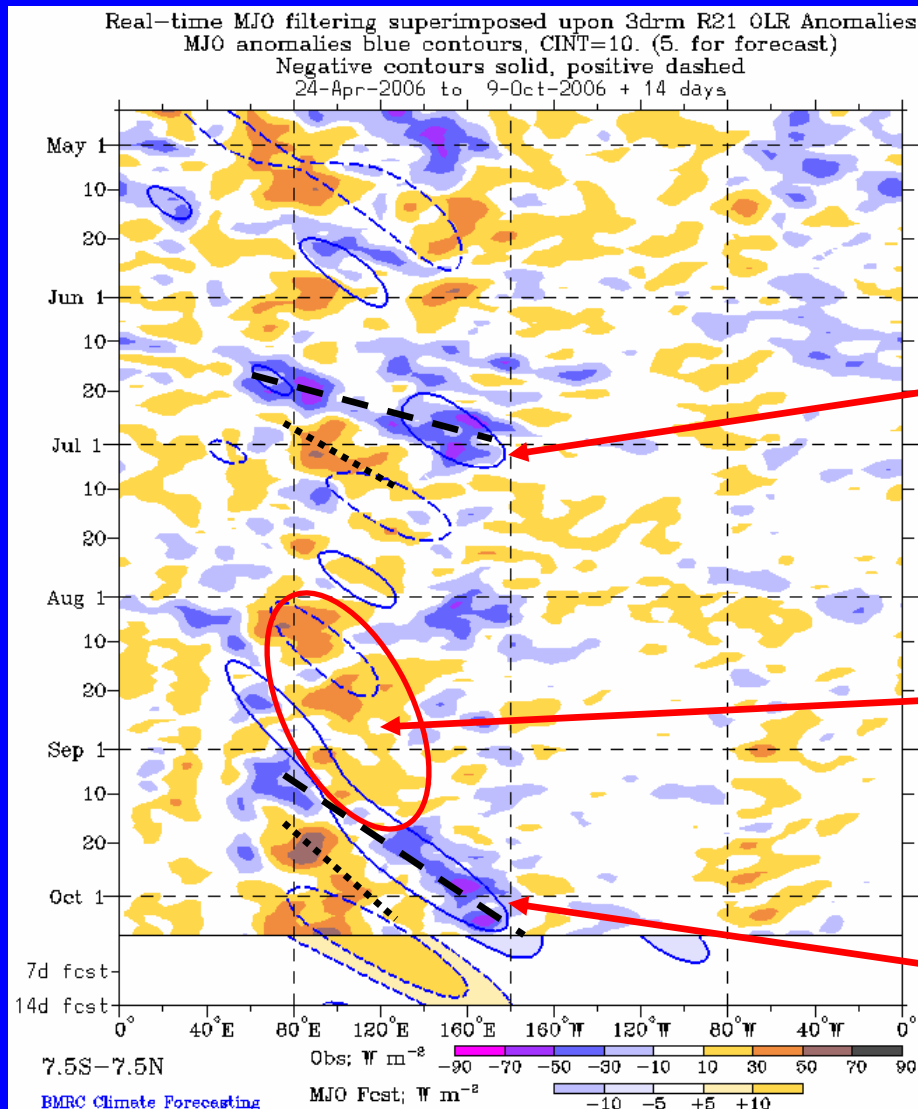
Weaker-than-average easterlies or westerlies (orange/red shading)

Stronger-than-average easterlies (blue shading)

From July until early September, anomalous westerly wind “bursts” were observed just west of the Date line. Also westerly anomalies were persistent in the eastern Pacific ocean.

Since mid-September, westerly anomalies have returned to the western Pacific, while stronger than normal easterlies enhanced upwelling west of Indonesia.

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



Drier-than-average conditions (/red shading)

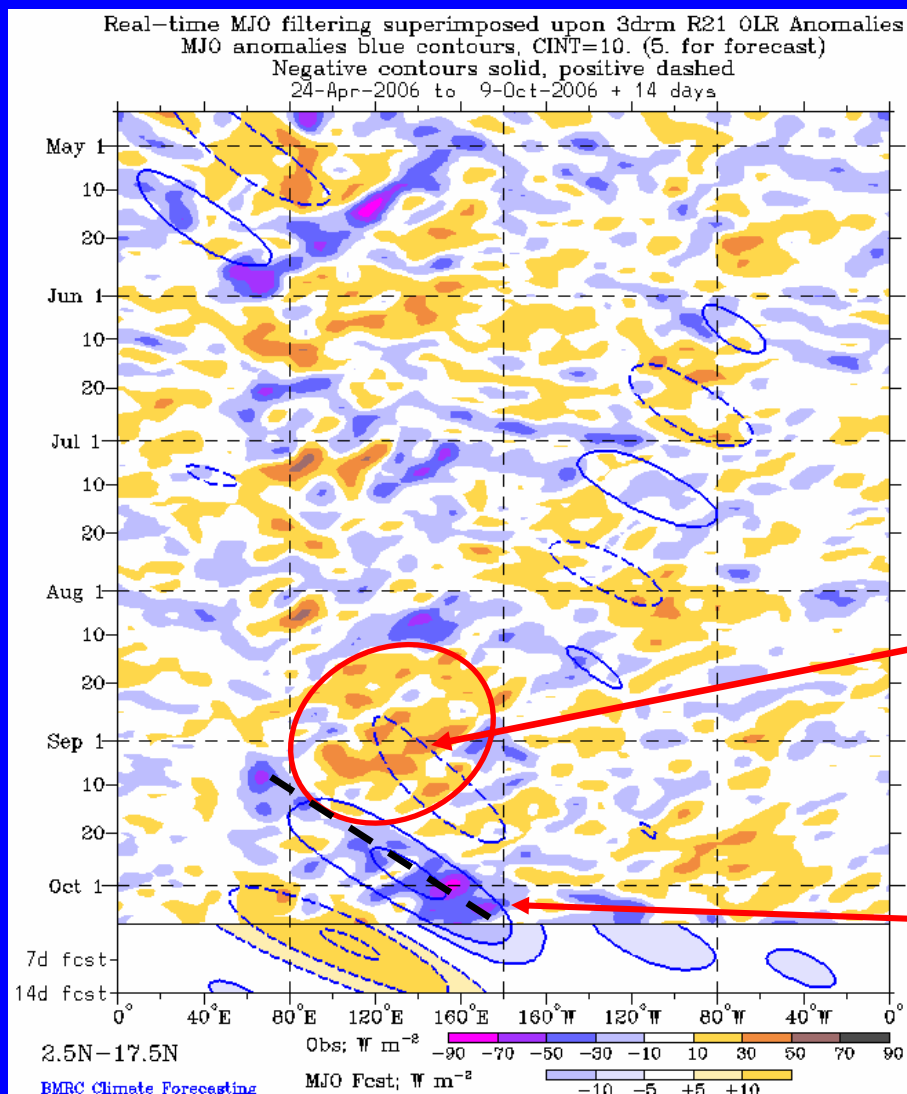
Wetter-than-average conditions (blue shading)

Coherent OLR anomalies moved across the Eastern Hemisphere in June.

Through August and the beginning of September, generally dry conditions were observed for the eastern Indian Ocean and the Maritime Continent.

OLR anomalies associated with the MJO have developed over the eastern Indian Ocean and shifted eastward into the western Pacific.

# Outgoing Longwave Radiation (OLR) Anomalies (2.5°N-17.5°N)



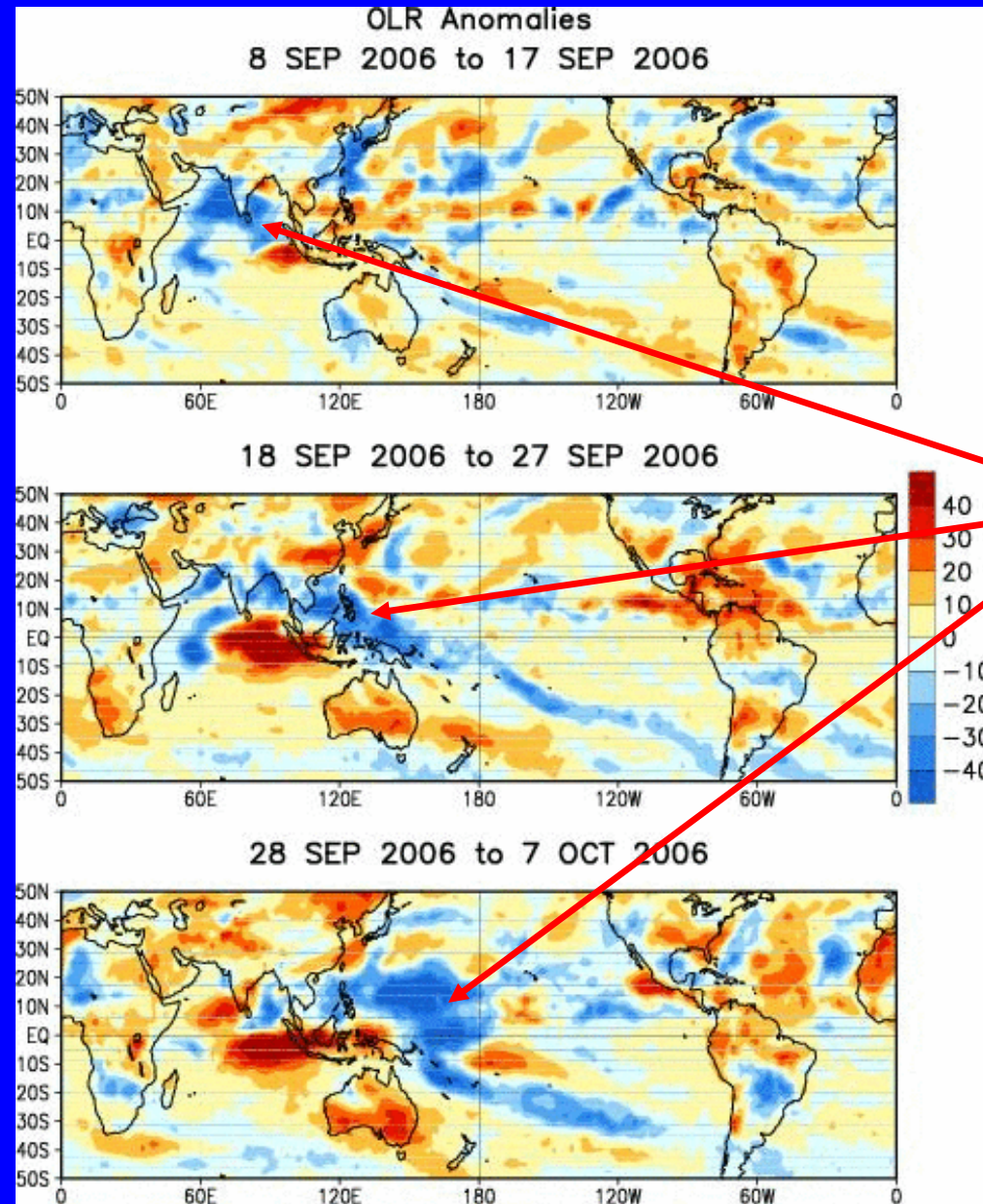
Drier-than-average conditions (/red shading)

Wetter-than-average conditions (blue shading)

From mid-August through mid-September, generally dry conditions were evident north of the equator across Indonesia and the western Pacific.

Enhanced convection associated with the MJO has shifted eastward from the Maritime Continent into the western Pacific during late September and early October.

# Anomalous OLR: Last 30 days



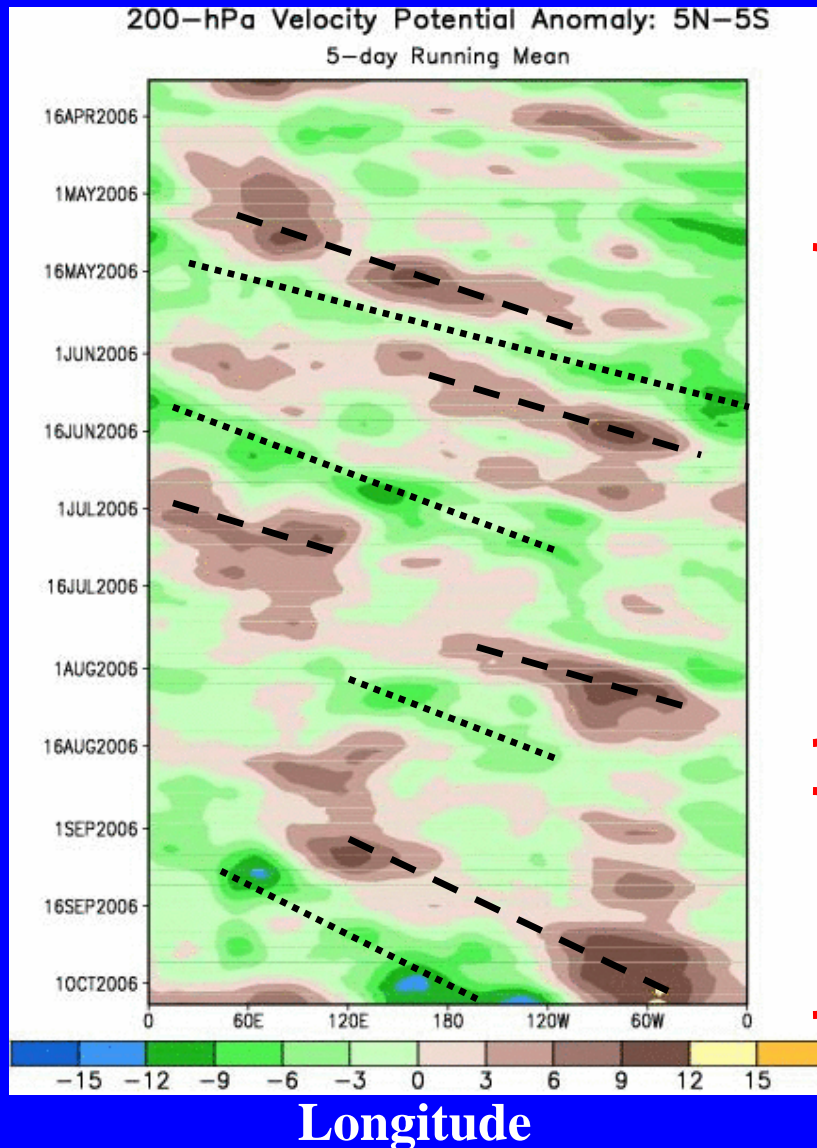
Drier-than-average conditions (red shading)

Wetter-than-average conditions (blue shading)

Beginning in early-mid September as the MJO developed, wet conditions in the Indian Ocean have shifted north and east into the western Pacific while drier than normal conditions developed across the equatorial Indian Ocean and areas in the western Hemisphere.



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



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

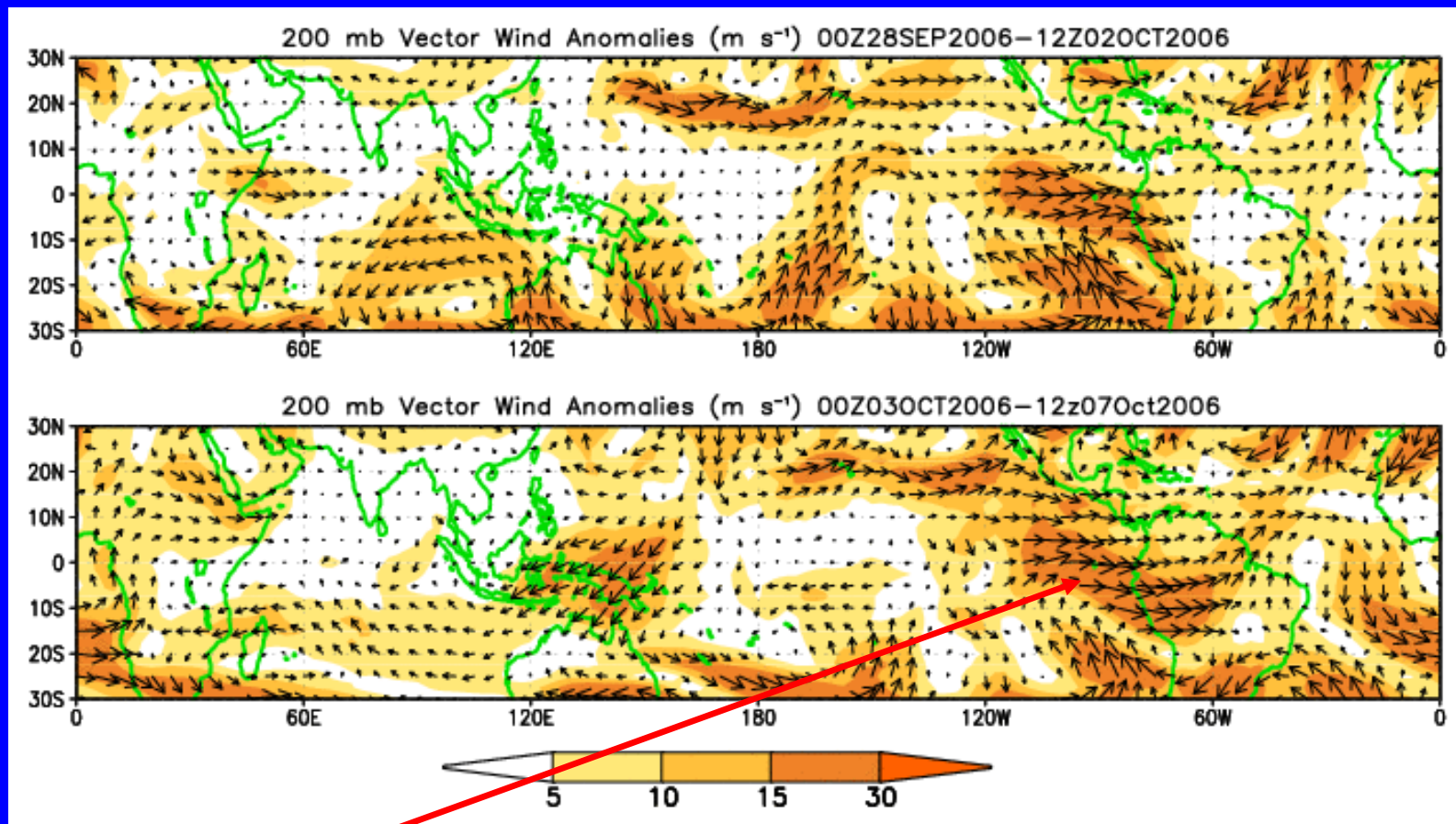
Negative anomalies (green shading) indicate favorable conditions for precipitation.

MJO activity strengthened some during May through early August but remained weak.

Recently, the MJO has strengthened as upper-level divergence (convergence) over the Indian ocean (western Pacific) has shifted east during September and early October.

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

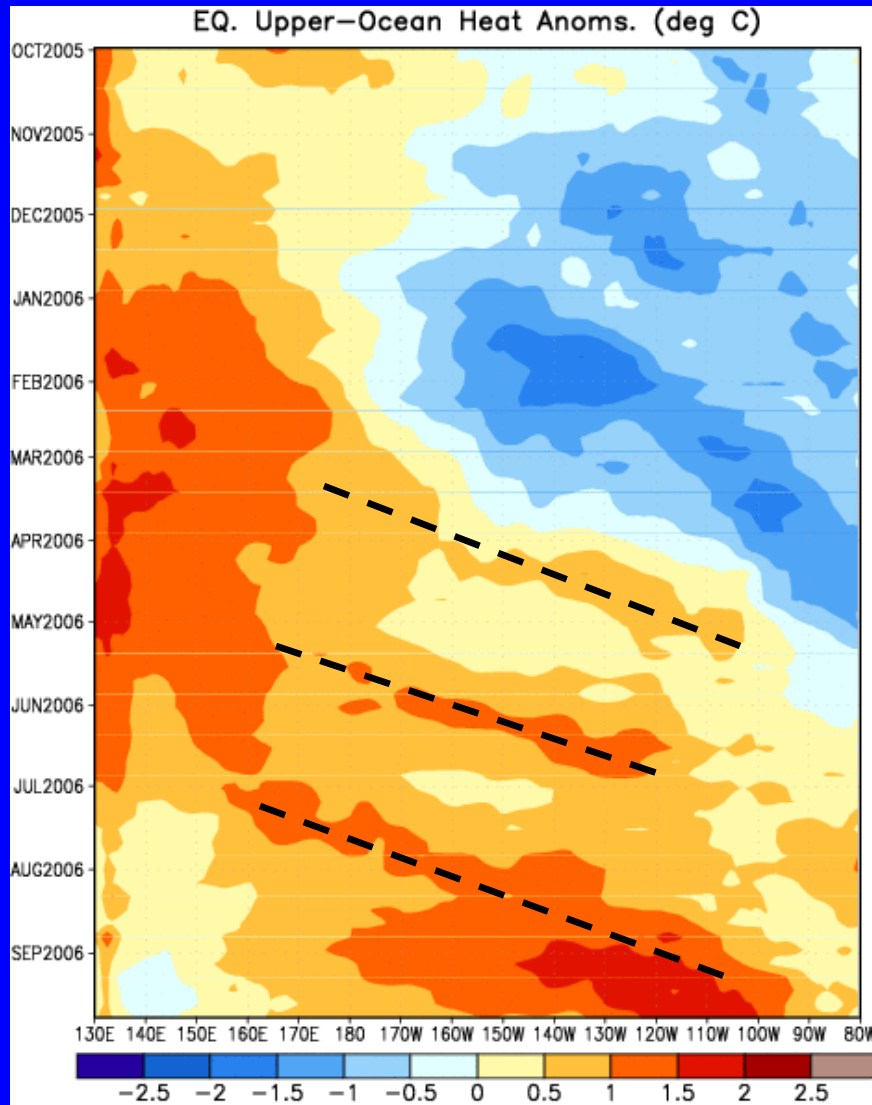
Note that shading denotes the magnitude of the anomalous wind vectors.



Westerly anomalies consistent with an established MJO have shifted eastward across South America and over Africa.

# Heat Content Evolution in the Eq. Pacific

Time



Longitude

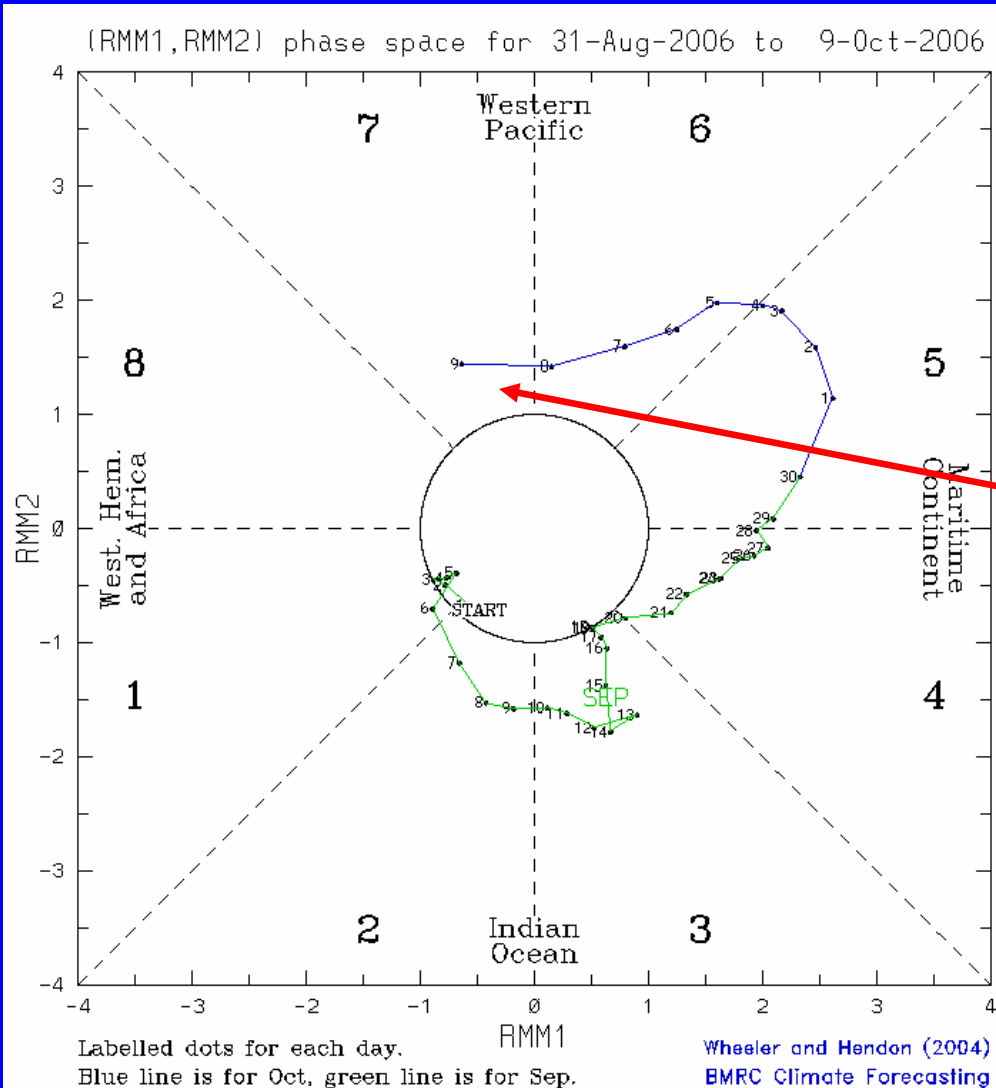
Starting in April, above normal upper oceanic water temperatures expanded from the western Pacific into the eastern Pacific in part due to Kelvin wave activity.

During September, strong positive upper oceanic heat content anomalies were observed throughout the central and 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.



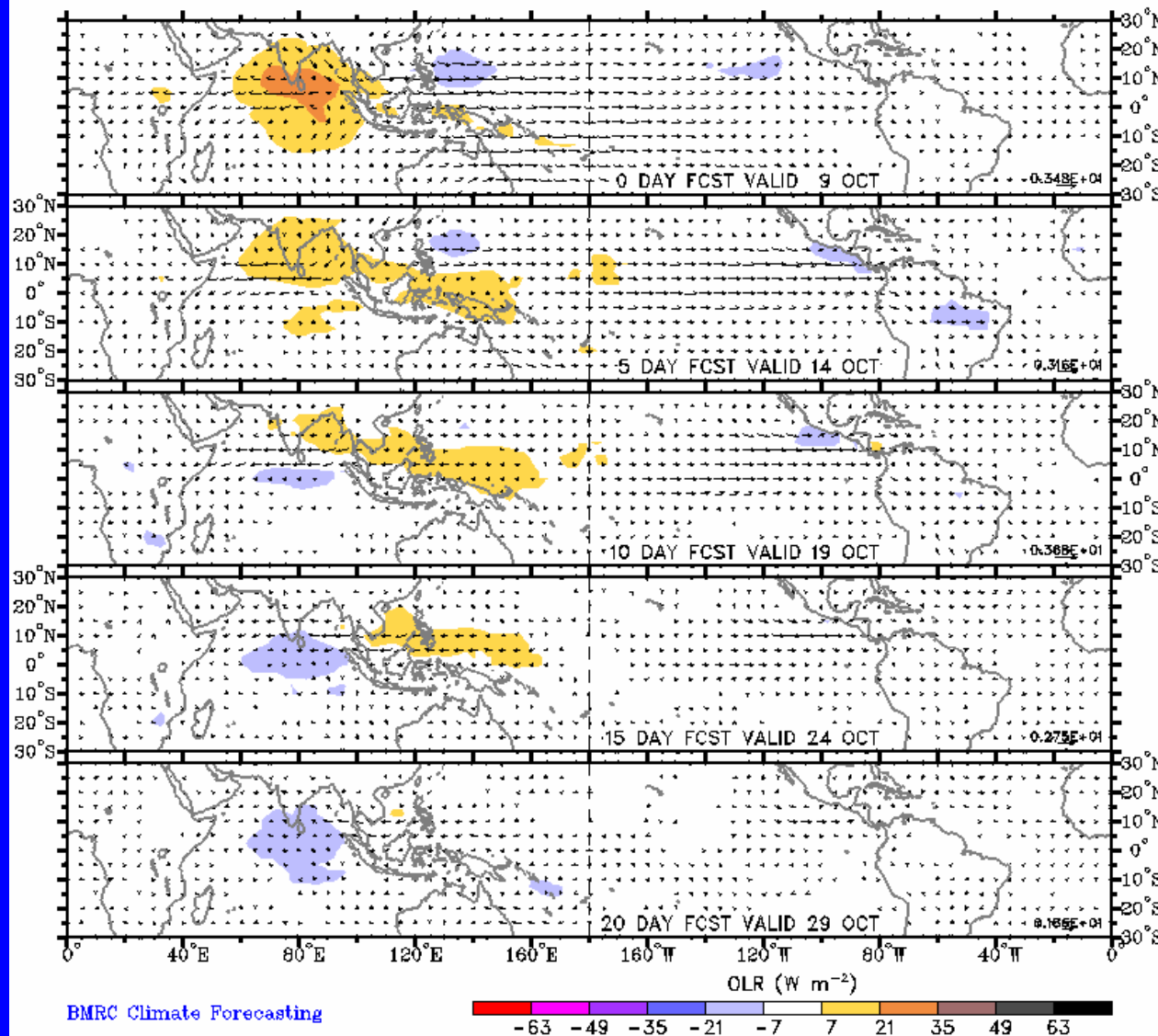
A moderate MJO continues with the enhanced phase currently entering the western Hemisphere.

# Statistical OLR MJO Forecast

Prediction of MJO-associated anomalies using lagged linear regression

Predictors are RMM1 and RMM2 on 9 Oct 2006

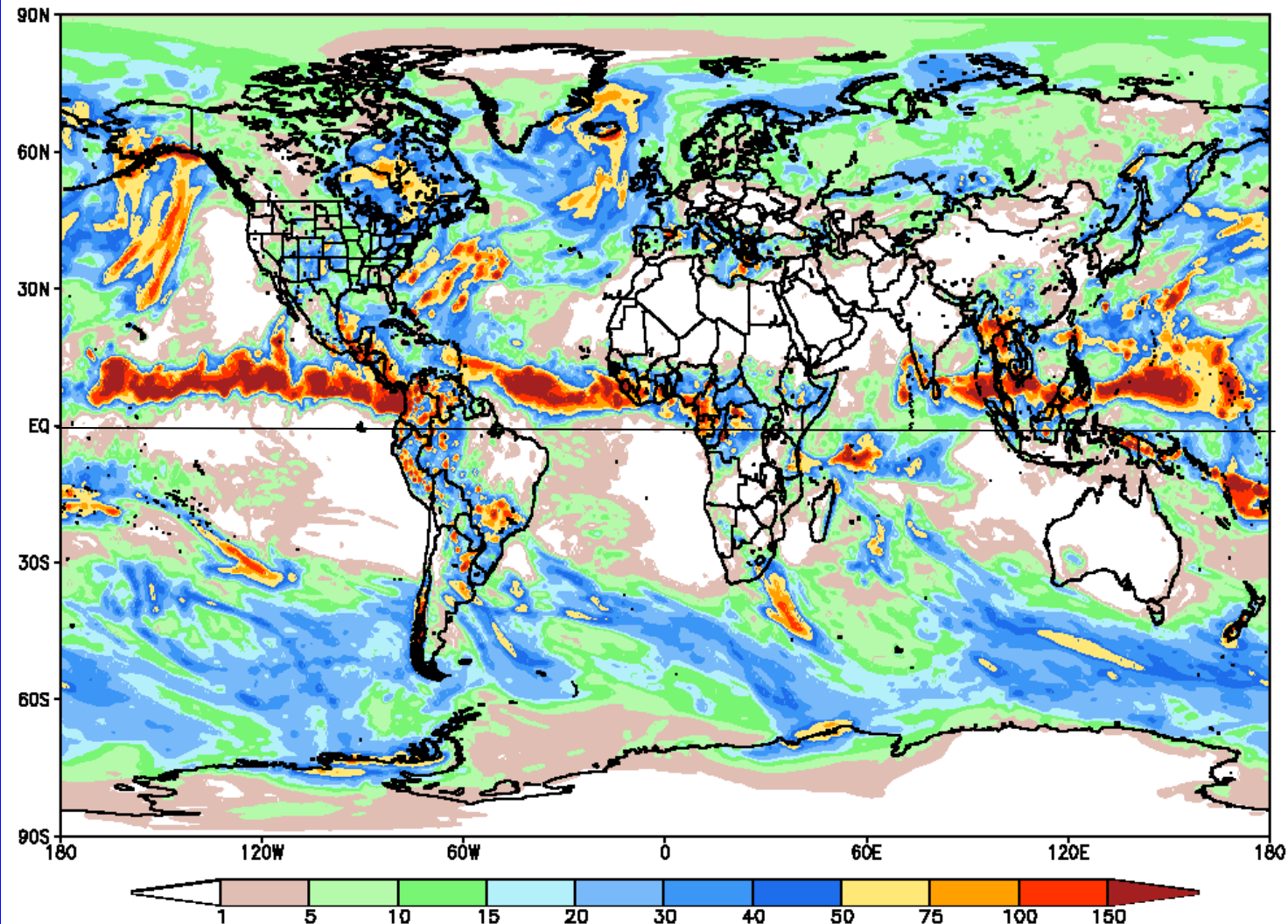
Shading for OLR anomalies (scale below). Vectors for 850-hPa wind



Drier than normal conditions across the Indian Ocean are forecast to spread into the western Pacific during the next 1-2 weeks.

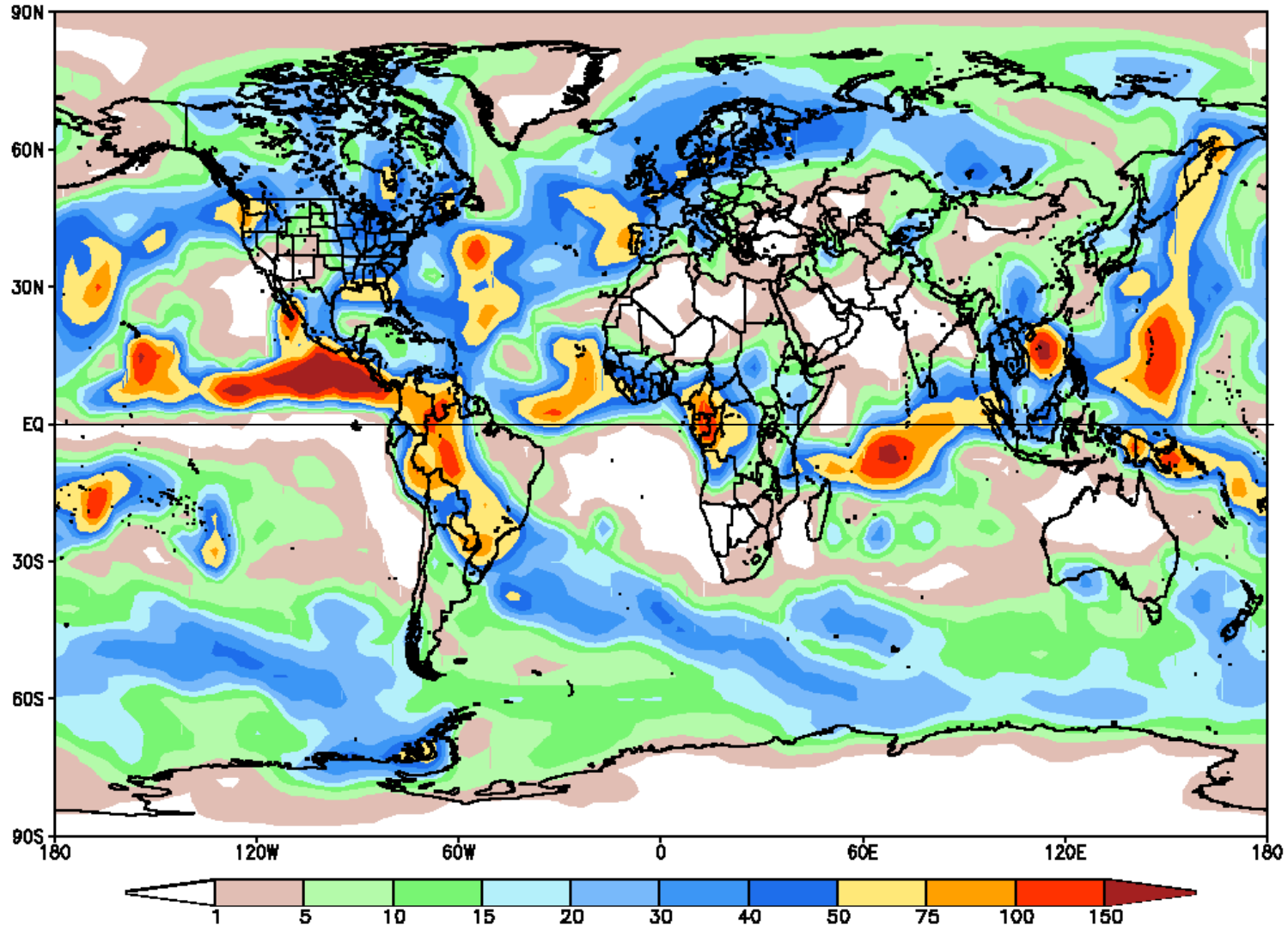
# Global Forecast System (GFS) Week 1 Precipitation Forecast

NOAA GFS 37.5 km Week 1 Total Precipitation (mm)  
Issued at Oct 10 2006 00Z for the period ending at Oct 17 2006 00Z



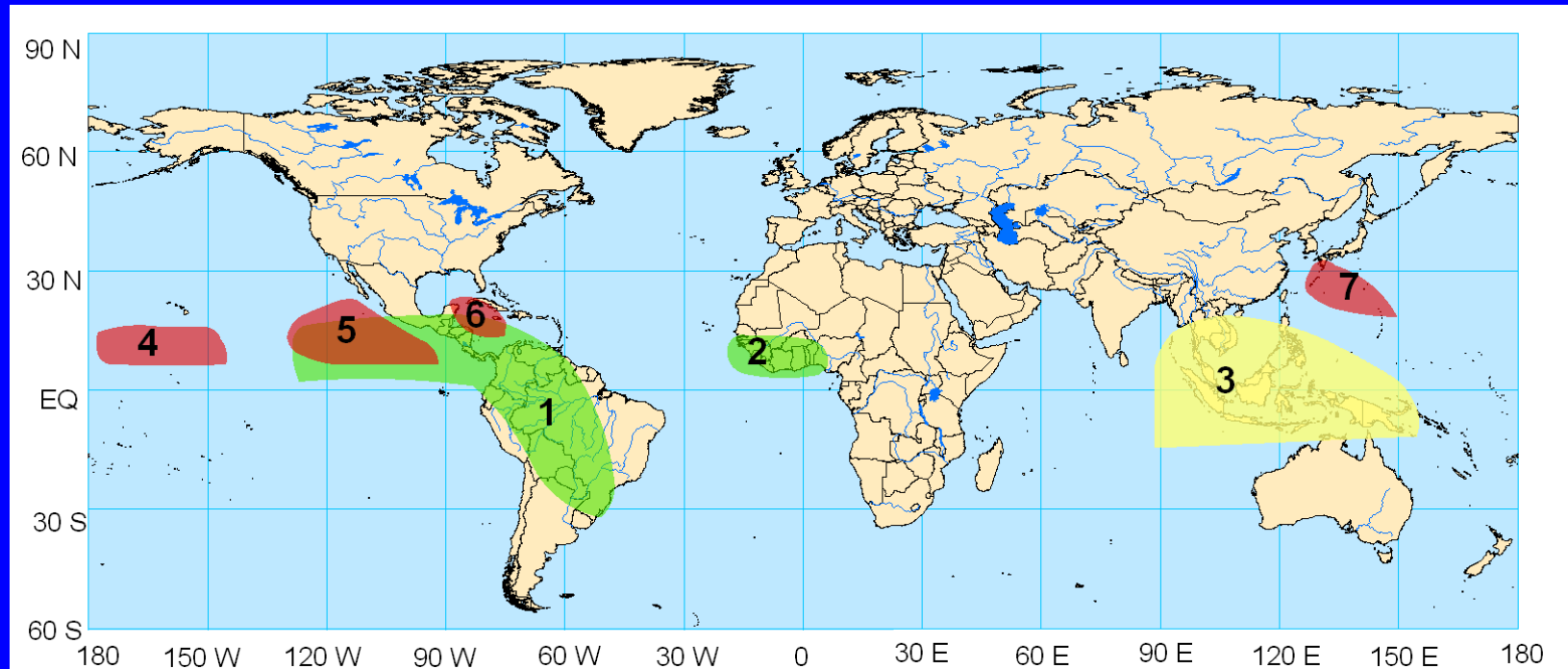
# Global Forecast System (GFS) Week 2 Precipitation Forecast

NOAA GFS 100 km Week 2 Total Precipitation (mm)  
Issued Oct 10 2006 00Z for the period ending at Oct 23 2006 00Z



# Potential Benefits/Hazards – Week 1

## Valid October 10 - 16, 2006

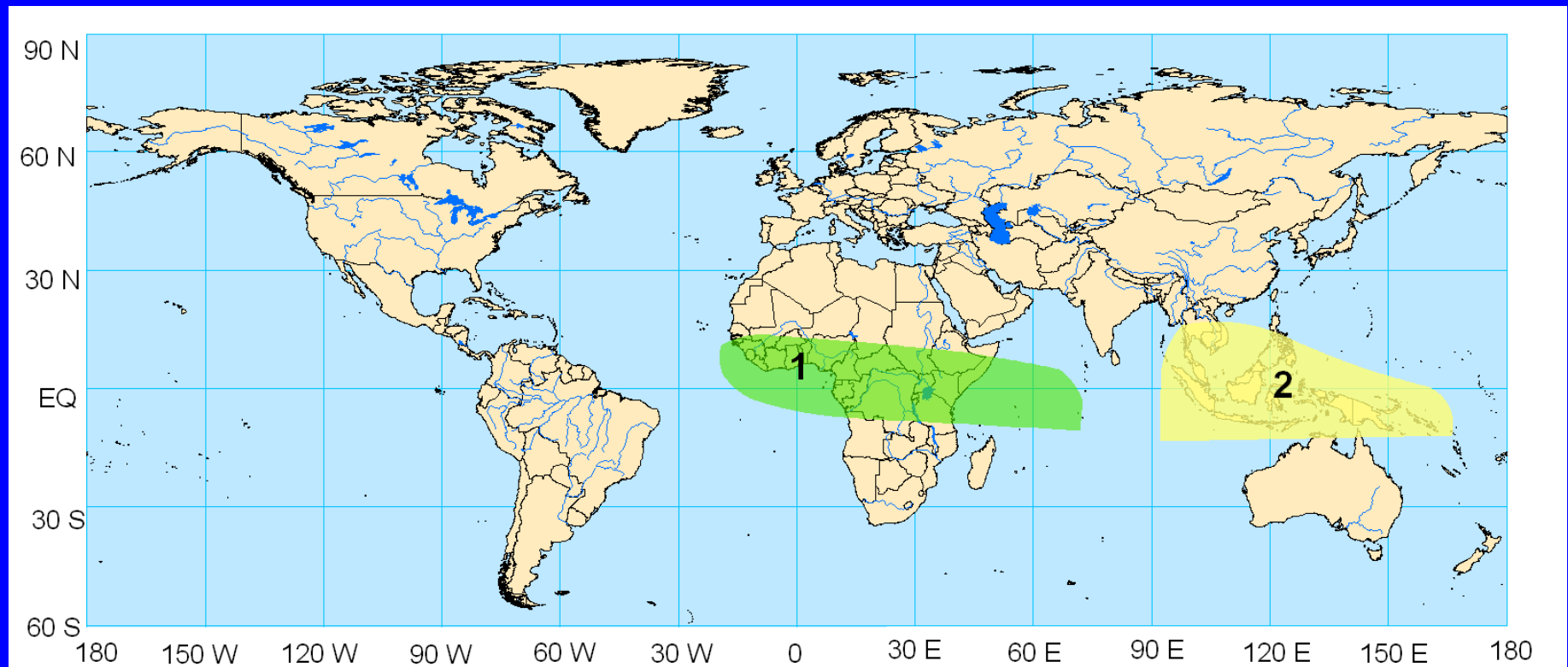


1. An increased chance for above normal rainfall for the eastern Pacific, Central America, and sections of South America
2. An increased chance for above normal rainfall for sections of west Africa.
3. An increased chance for below normal rainfall for the eastern Indian Ocean and across the Maritime Continent.
4. Conditions are favorable for tropical cyclogenesis for the central Pacific.
5. Conditions are favorable for tropical cyclogenesis for the eastern Pacific and tropical storms Norman and Olivia will impact areas across the east Pacific.
6. Conditions may become favorable for tropical cyclone development in the western Caribbean Sea.
7. Typhoon Soulik will strengthen and track across the northwest Pacific.



# Potential Benefits/Hazards – Week 2

## Valid October 17 - 23, 2006



1. An increased chance for above normal rainfall from equatorial Africa into the central Indian Ocean.
2. An increased chance for below normal rainfall across the Maritime Continent.

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