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

Update prepared by
Climate Prediction Center / NCEP
September 11, 2006

Outline

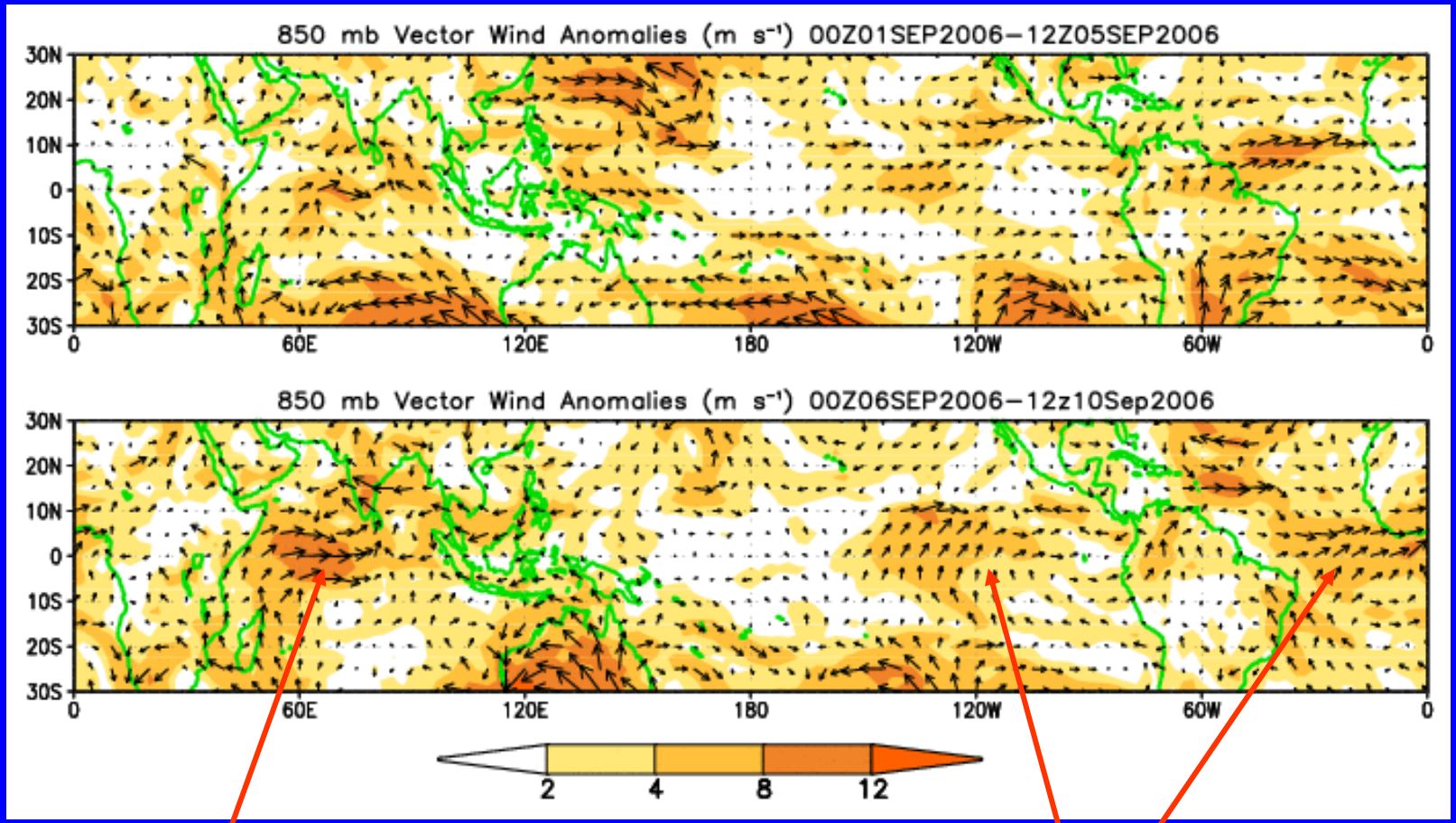
- Overview
- Recent Evolution and Current Conditions
- Madden Julian Oscillation Forecast
- Summary

Overview

- In recent days, the MJO has shown signs of strengthening but remains generally weak.
- The MJO needs to be closely monitored during the upcoming week for further strengthening.
- Potential benefits/hazards during week 1 include an increased chance for above normal rainfall for sections of India, the Indian Ocean, the Bay of Bengal, the central Pacific Ocean with drier than normal conditions expected for sections of the Maritime Continent and the western Pacific Ocean. Favorable conditions for tropical cyclogenesis are expected across the tropical Atlantic. Tropical systems (TD7 and Typhoon Shanshan) will impact sections of the Central Atlantic and the western Pacific near Japan respectively.
- The pattern of anomalous rainfall across the eastern Hemisphere and the Pacific Ocean is expected to persist during week 2.

850-hPa Vector Wind Anomalies (m s^{-1})

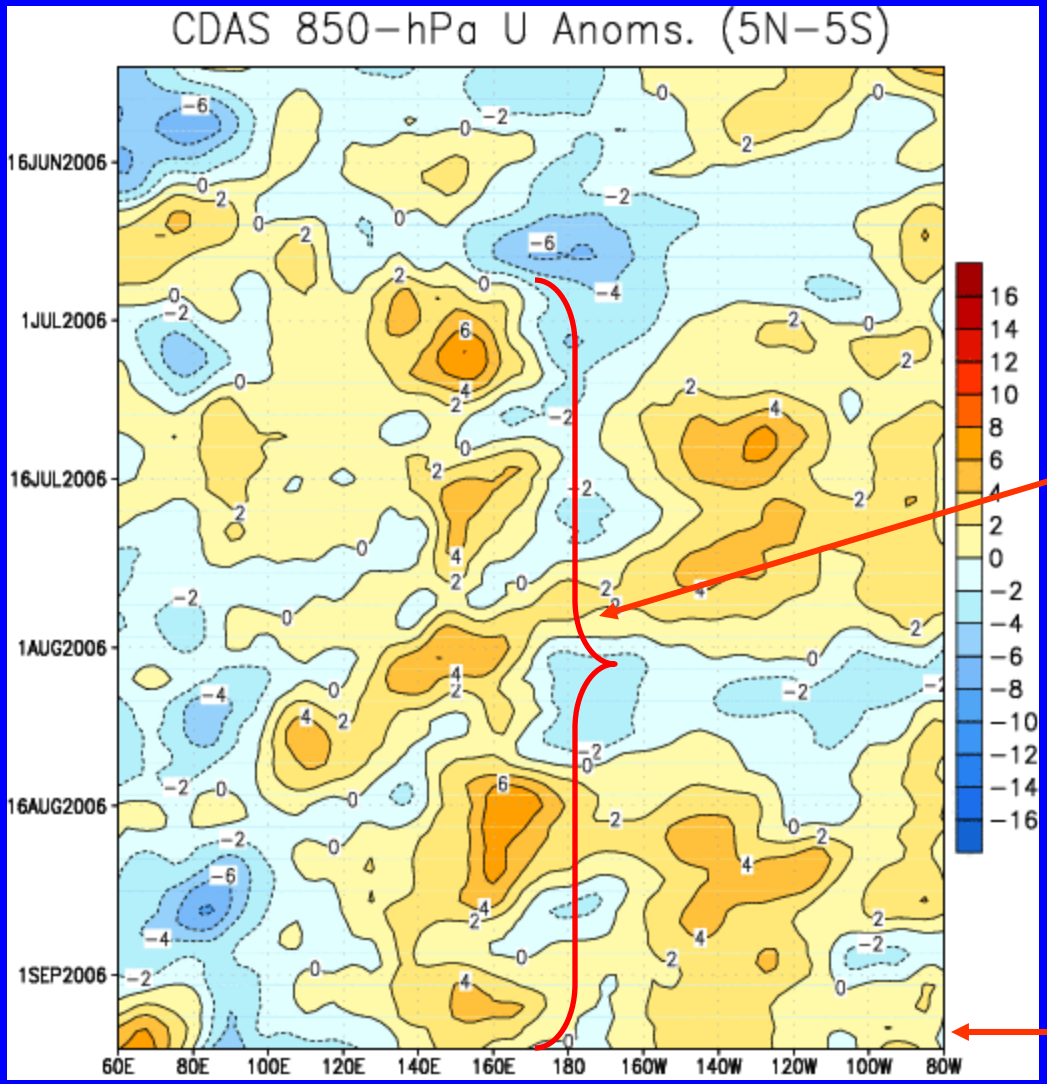
Note that shading denotes the magnitude of the anomalous wind vectors



Westerly anomalies evident in the central Indian Ocean associated with enhanced convection.

Westerly anomalies remain in both the eastern Pacific and Atlantic.

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



Time

Longitude

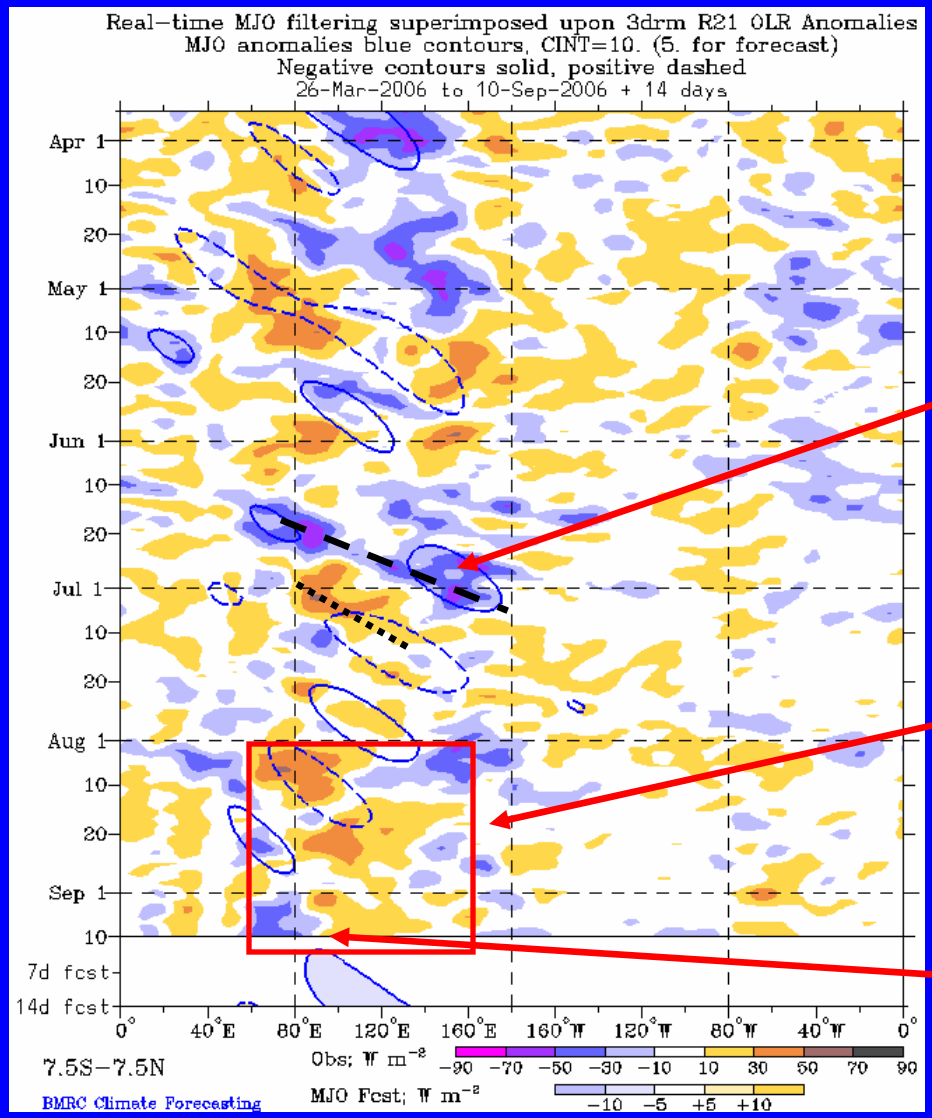
Weaker-than-average easterlies or westerlies (orange/red shading)

Stronger-than-average easterlies (blue shading)

Since early July, anomalous westerly wind "bursts" have been observed just west of the Date line.

Recently, westerly anomalies continue to cover much of the Pacific Ocean.

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



Time

Longitude

Drier-than-average conditions (/red shading)

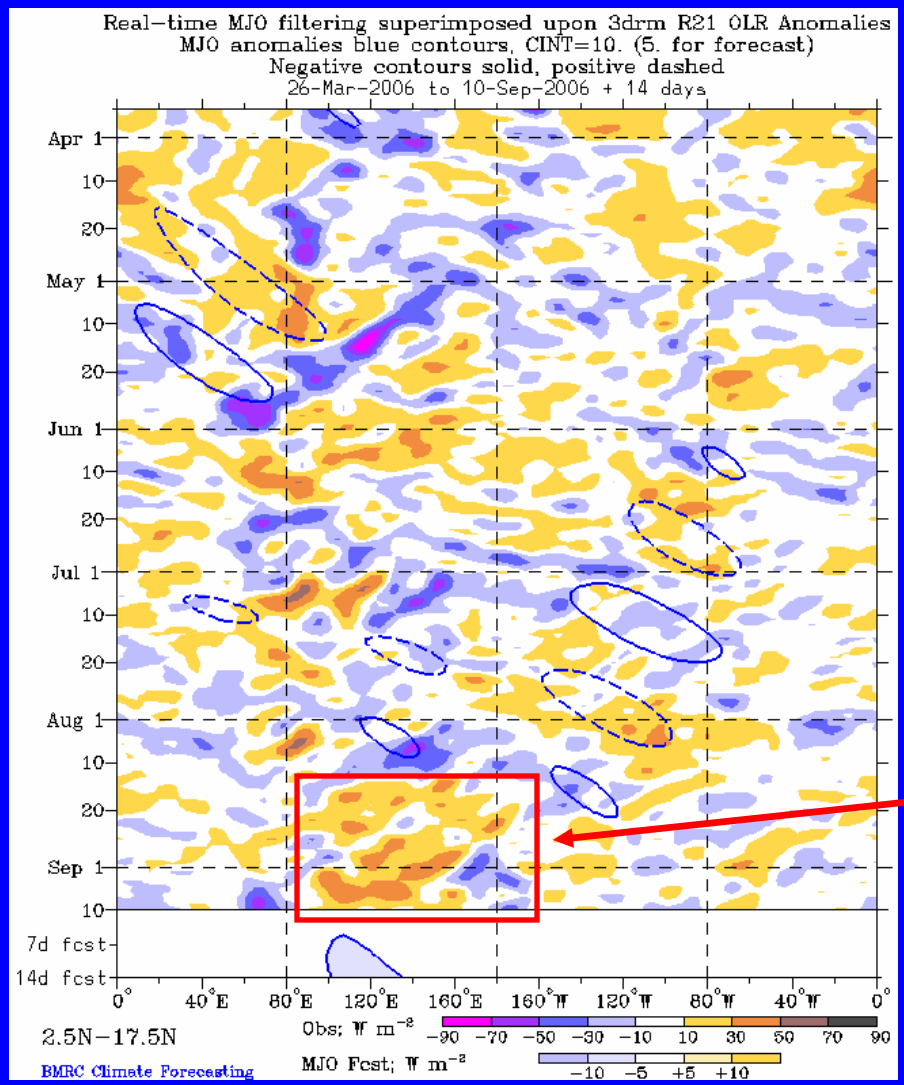
Wetter-than-average conditions (blue shading)

Coherent OLR anomalies moved across the Eastern Hemisphere in June.

Since early August, generally dry conditions have been observed for the eastern Indian Ocean and the Maritime Continent.

During the past ten days, enhanced convection has developed in the equatorial central Indian ocean.

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



Time

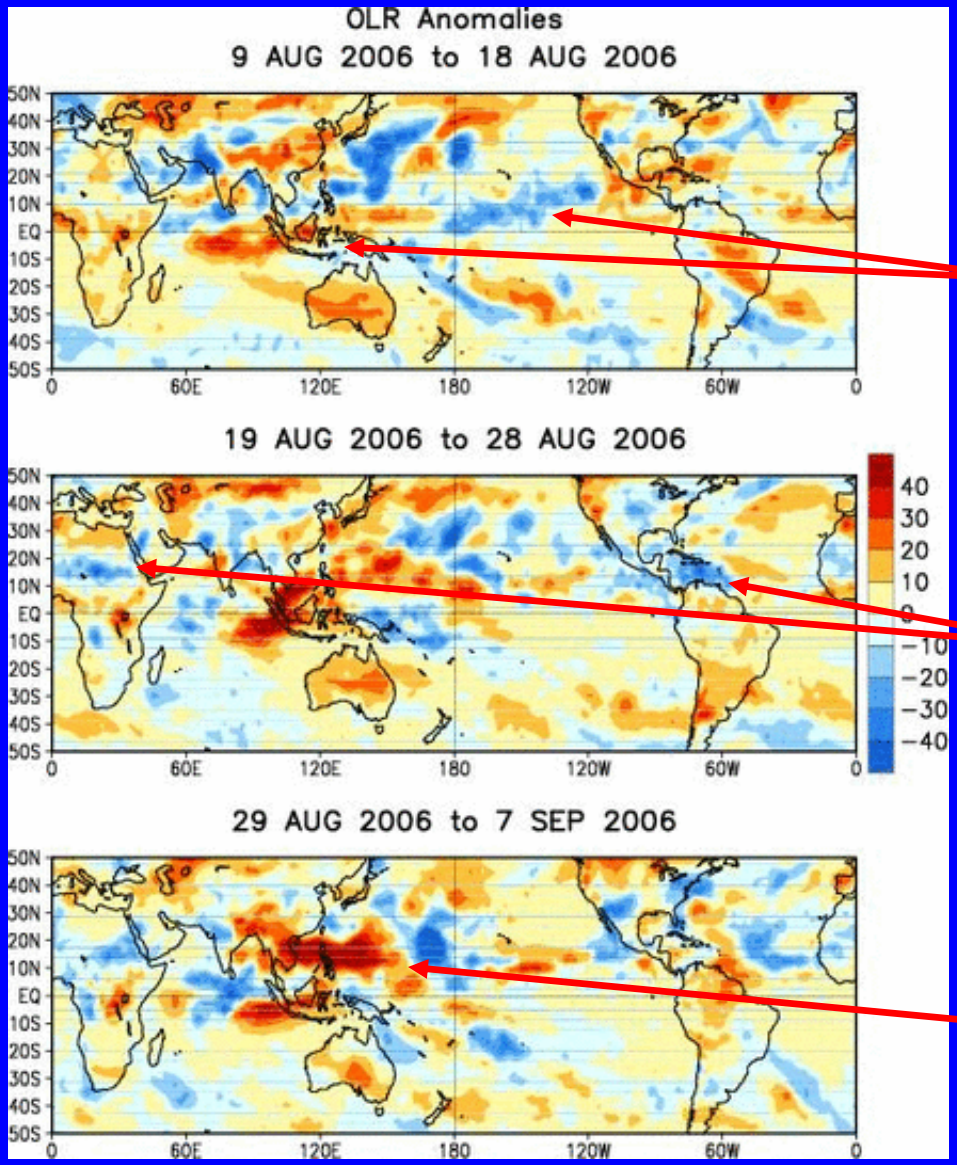
Longitude

Drier-than-average conditions (/red shading)

Wetter-than-average conditions (blue shading)

Generally dry conditions have been evident north of the equator across Indonesia and the western Pacific. Recently, however, wetter than average conditions have been observed near the date line.

Anomalous OLR: Last 30 days



Drier-than-average conditions (/red shading)

Wetter-than-average conditions (blue shading)

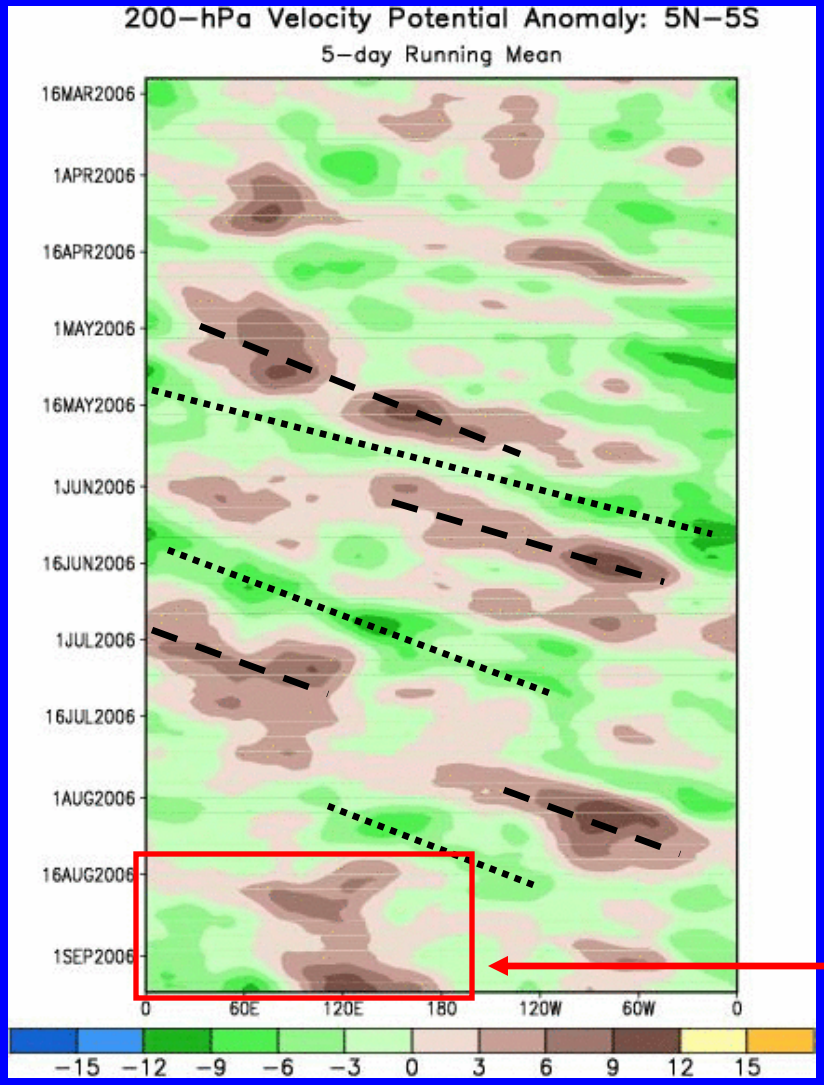
During mid August, dry (wet) conditions impacted areas in the Indian Ocean/Maritime Continent (central Pacific).

During late August, dry conditions remained across sections of the Maritime Continent while wet conditions were observed across north-central Africa and the Caribbean Sea.

During the most recent ten days, very dry conditions have been observed across sections of Southeast Asia and the western Pacific ocean.

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

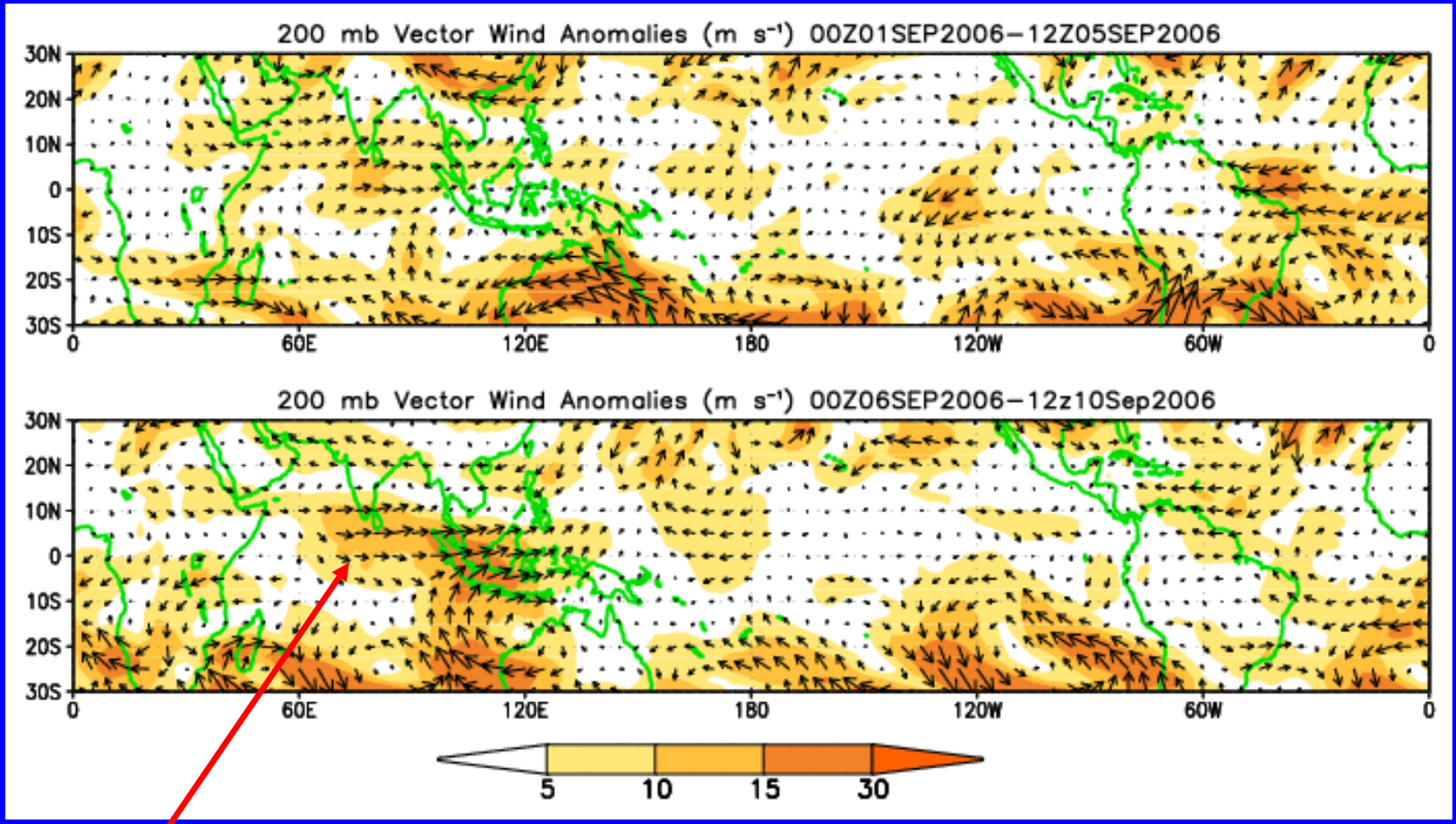
The MJO was incoherent during much of March and April.

MJO activity strengthened some during parts of May through June and early August but remained weak.

Most recently, upper-level divergence (convergence) over Africa/Indian ocean (Maritime Continent/western Pacific) has shifted eastward.

200-hPa Vector Winds and Anomalies (m s^{-1})

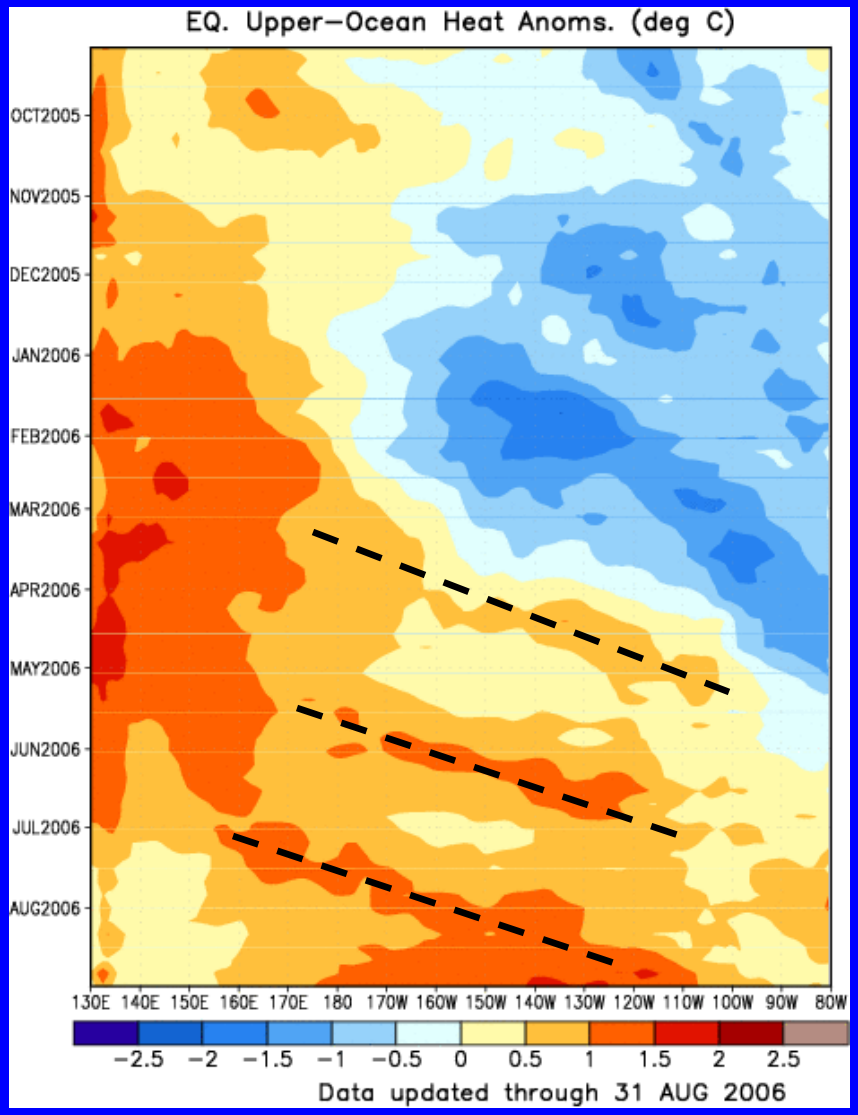
Note that shading denotes the magnitude of the anomalous wind vectors.



Westerly anomalies have strengthened over the Indian Ocean and Maritime Continent in part associated with enhanced convection in that region.

Heat Content Evolution in the Eq. Pacific

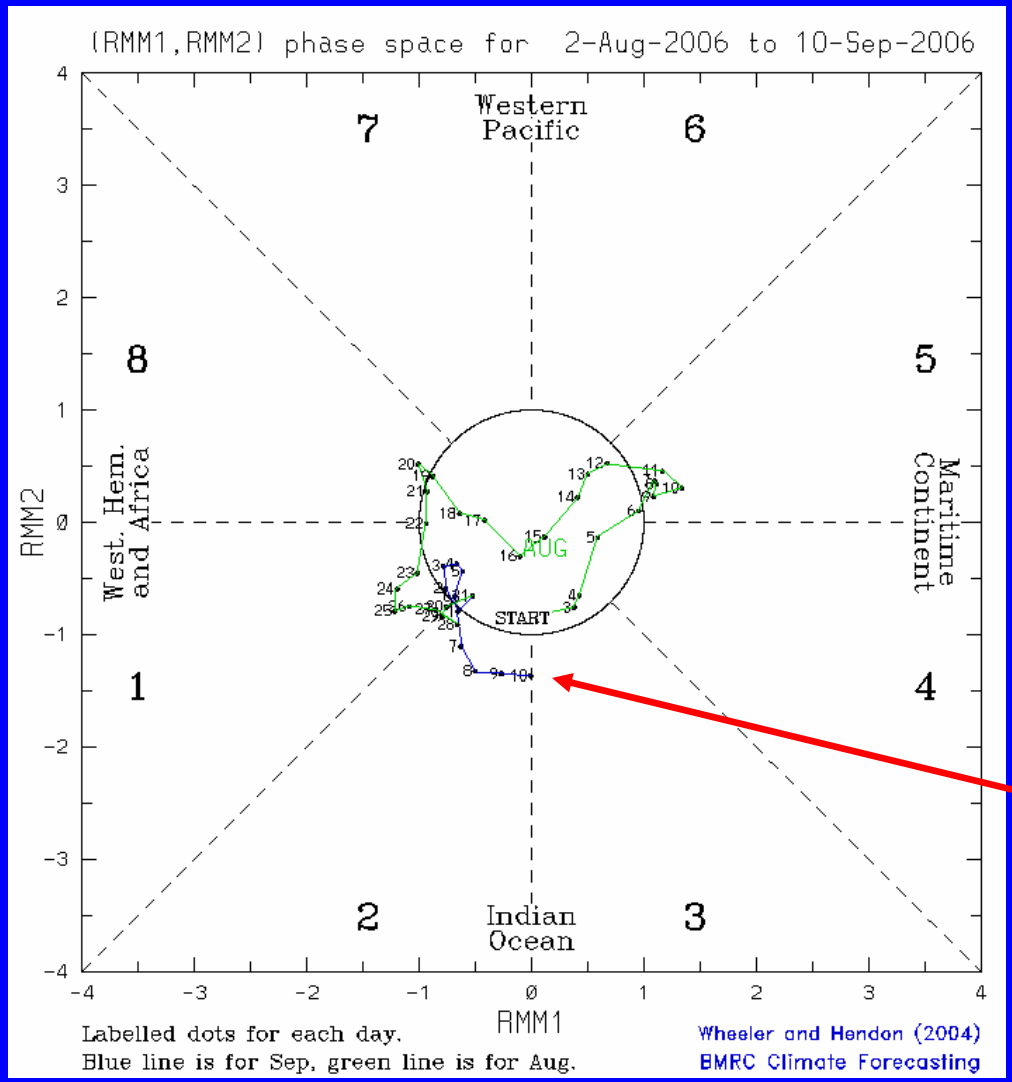
Time



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.

MJO Index (Magnitude and Phase)

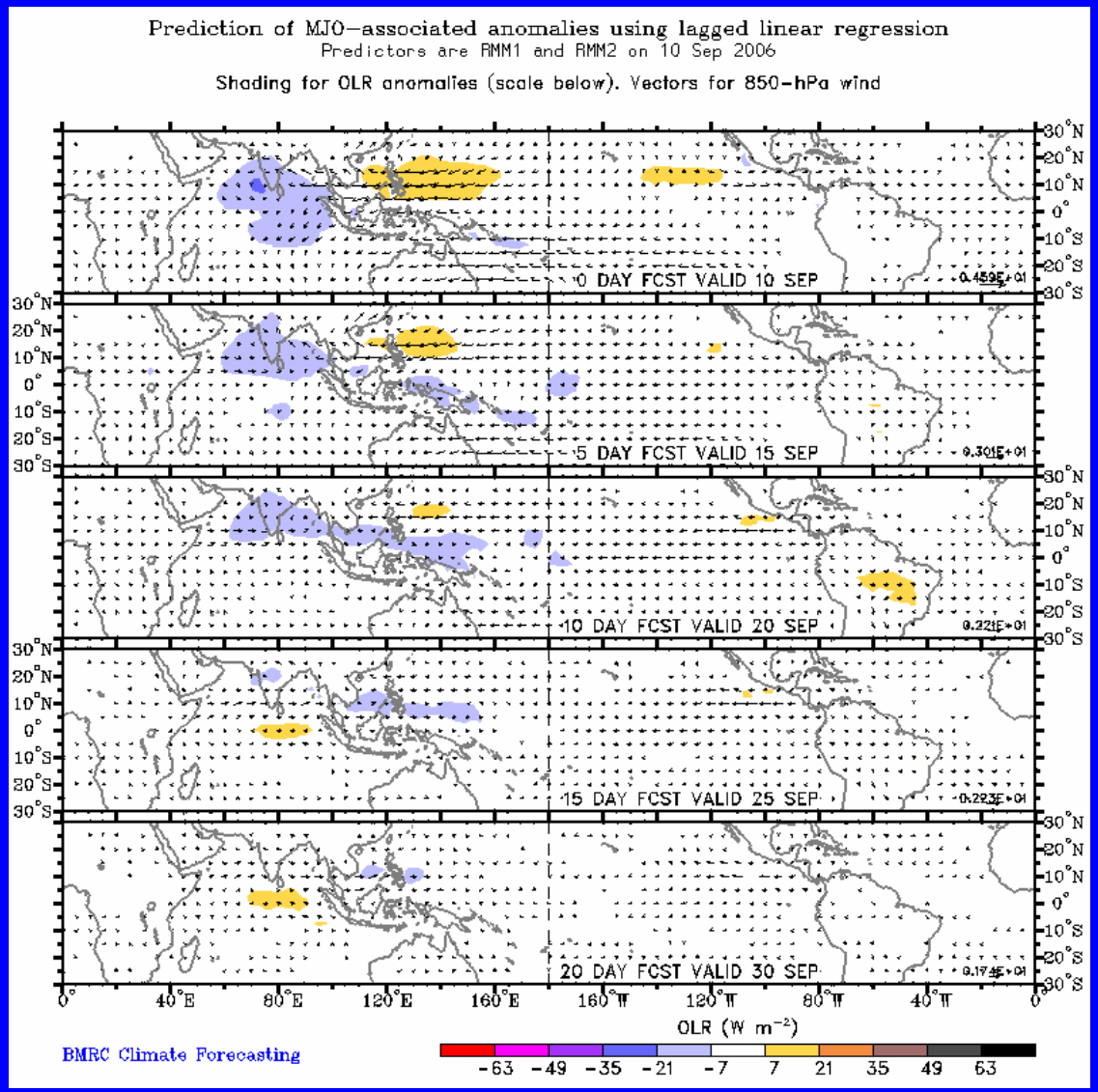


The current state of the MJO as determined by an index based on Empirical Orthogonal Function (EOF) analysis using combined fields of near-equatorially-averaged 850 hPa zonal wind, 200 hPa zonal wind, and satellite-observed outgoing longwave radiation (OLR) (Wheeler and Hendon, 2004).

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.

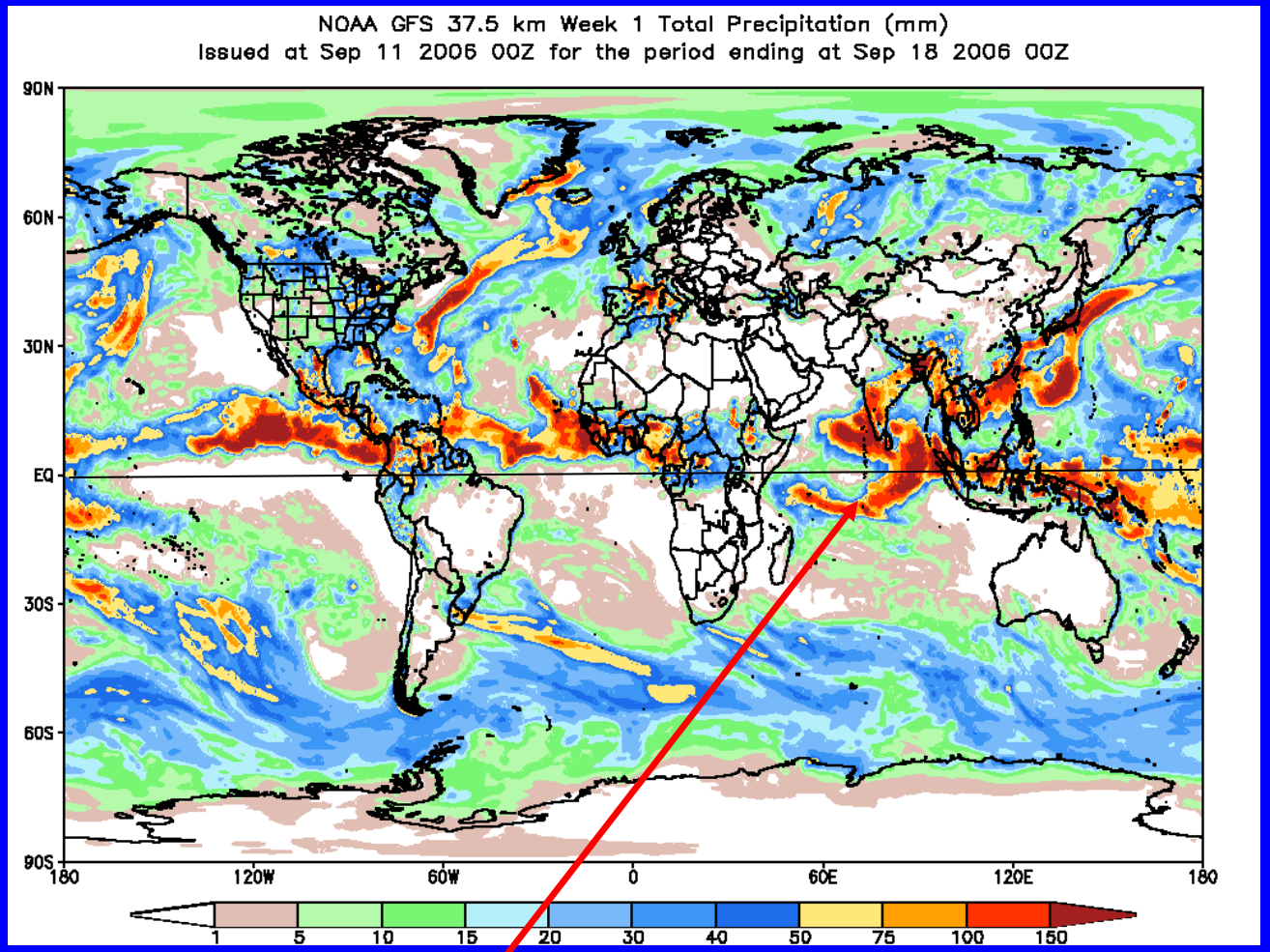
In recent days, the MJO signal has strengthened and is centered in the Indian Ocean.

Statistical OLR MJO Forecast



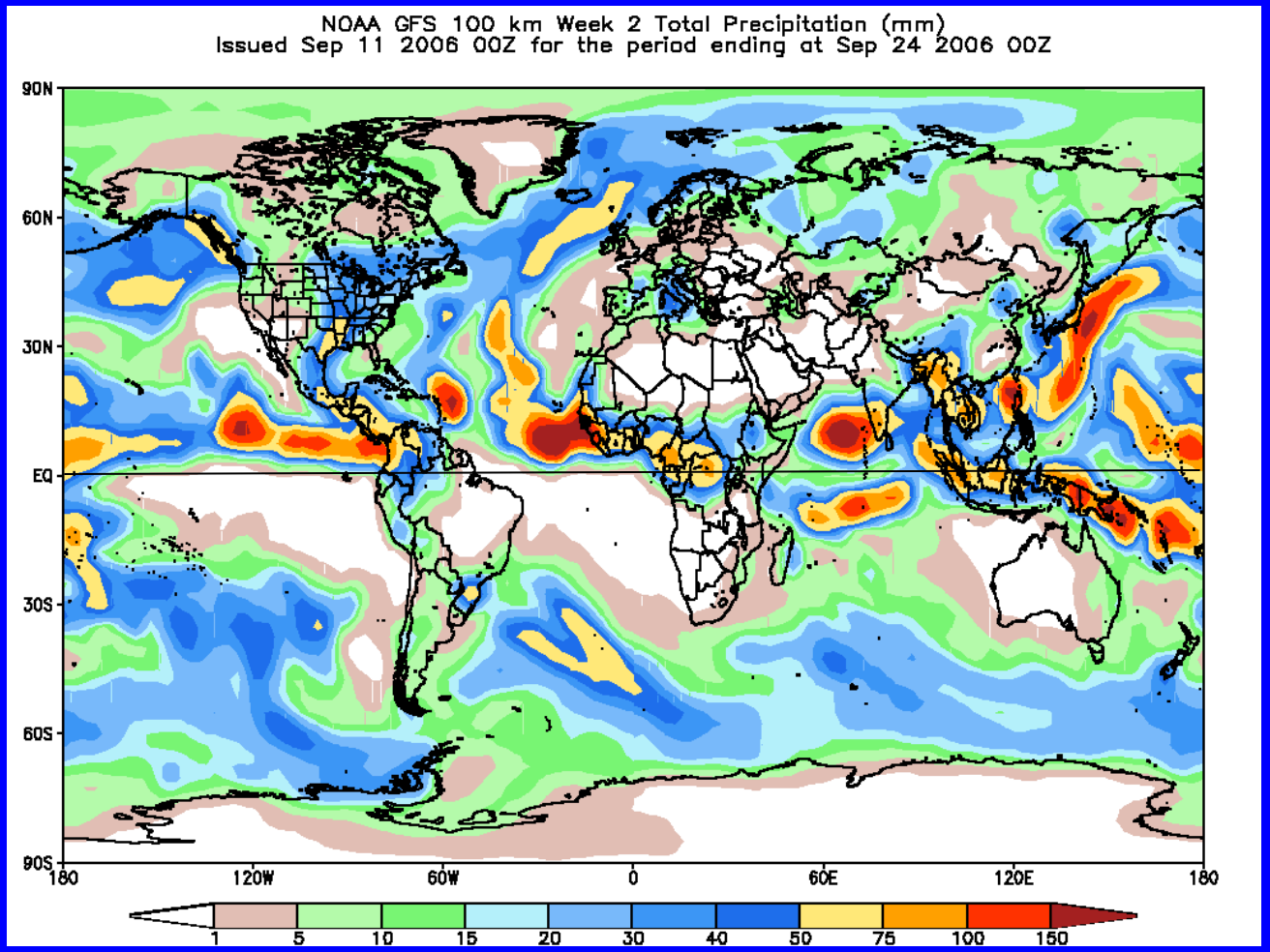
Wet conditions are forecast to persist in the Indian Ocean and slowly shift north and east over the next 10 days. Dry conditions expected for the western Pacific Ocean early in the period.

Global Forecast System (GFS) Week 1 Precipitation Forecast

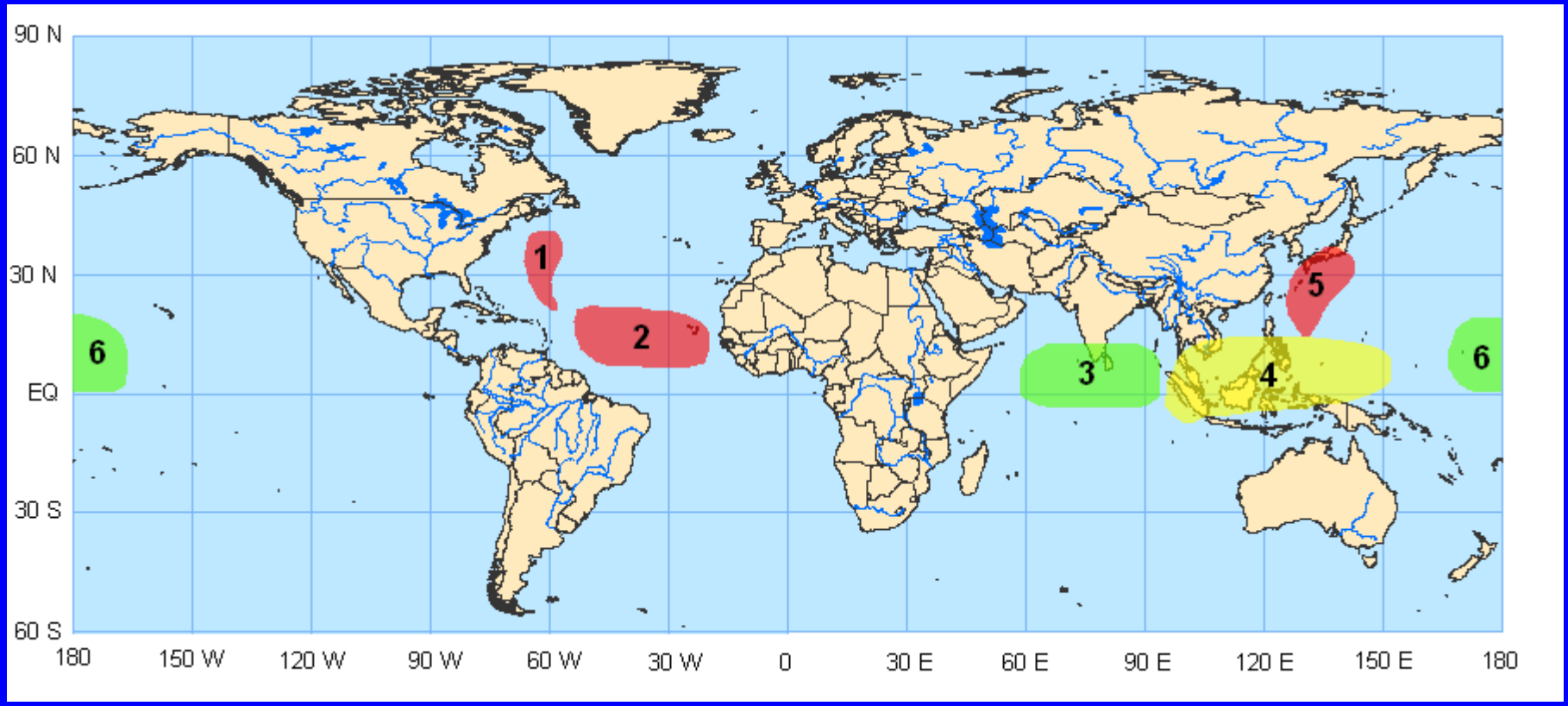


Wet conditions are expected to remain for the Indian Ocean.

Global Forecast System (GFS) Week 2 Precipitation Forecast

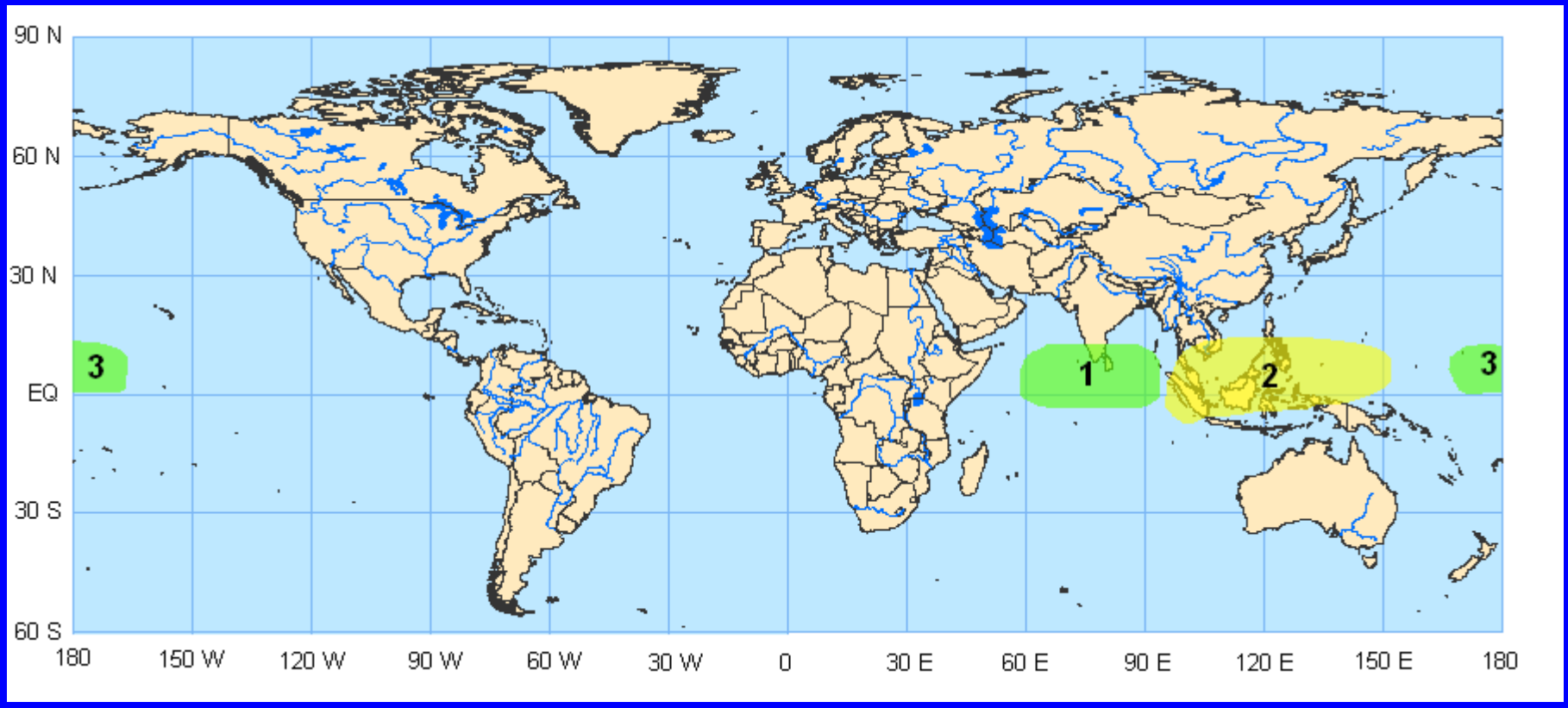


Potential Benefits/Hazards – Week 1
Valid September 12 – September 18, 2006



1. Tropical depression 7 is expected to strengthen and impact shipping in the central Atlantic.
2. Favorable conditions exist for tropical cyclogenesis in the deep tropical Atlantic Ocean.
3. An increased chance of above normal rainfall for sections of India, the Indian Ocean, and the Bay of Bengal.
4. An increased chance of below normal rainfall for sections of the Maritime Continent and western Pacific Ocean.
5. Typhoon Shanshan will impact the Pacific Ocean south of Japan.
6. An increased chance of above normal rainfall in the Central Pacific near the date line north of the equator.

Potential Benefits/Hazards – Week 2
Valid September 19 – 25, 2006



1. An increased chance of above normal rainfall for sections of India, the Indian Ocean, and the Bay of Bengal.
2. An increased chance of below normal rainfall for sections of the Maritime Continent and western Pacific Ocean.
3. An increased chance of above normal rainfall in the Central Pacific near the date line north of the equator.

Summary

- In recent days, the MJO has shown signs of strengthening but remains generally weak.
- The MJO needs to be closely monitored during the upcoming week for further strengthening.
- Potential benefits/hazards during week 1 include an increased chance for above normal rainfall for sections of India, the Indian Ocean, the Bay of Bengal, the central Pacific Ocean with drier than normal conditions expected for sections of the Maritime Continent and the western Pacific Ocean. Favorable conditions for tropical cyclogenesis are expected across the tropical Atlantic. Tropical systems (TD7 and Typhoon Shanshan) will impact sections of the Central Atlantic and the western Pacific near Japan respectively.
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