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

Update prepared by
Climate Prediction Center / NCEP
July 31, 2006

Outline

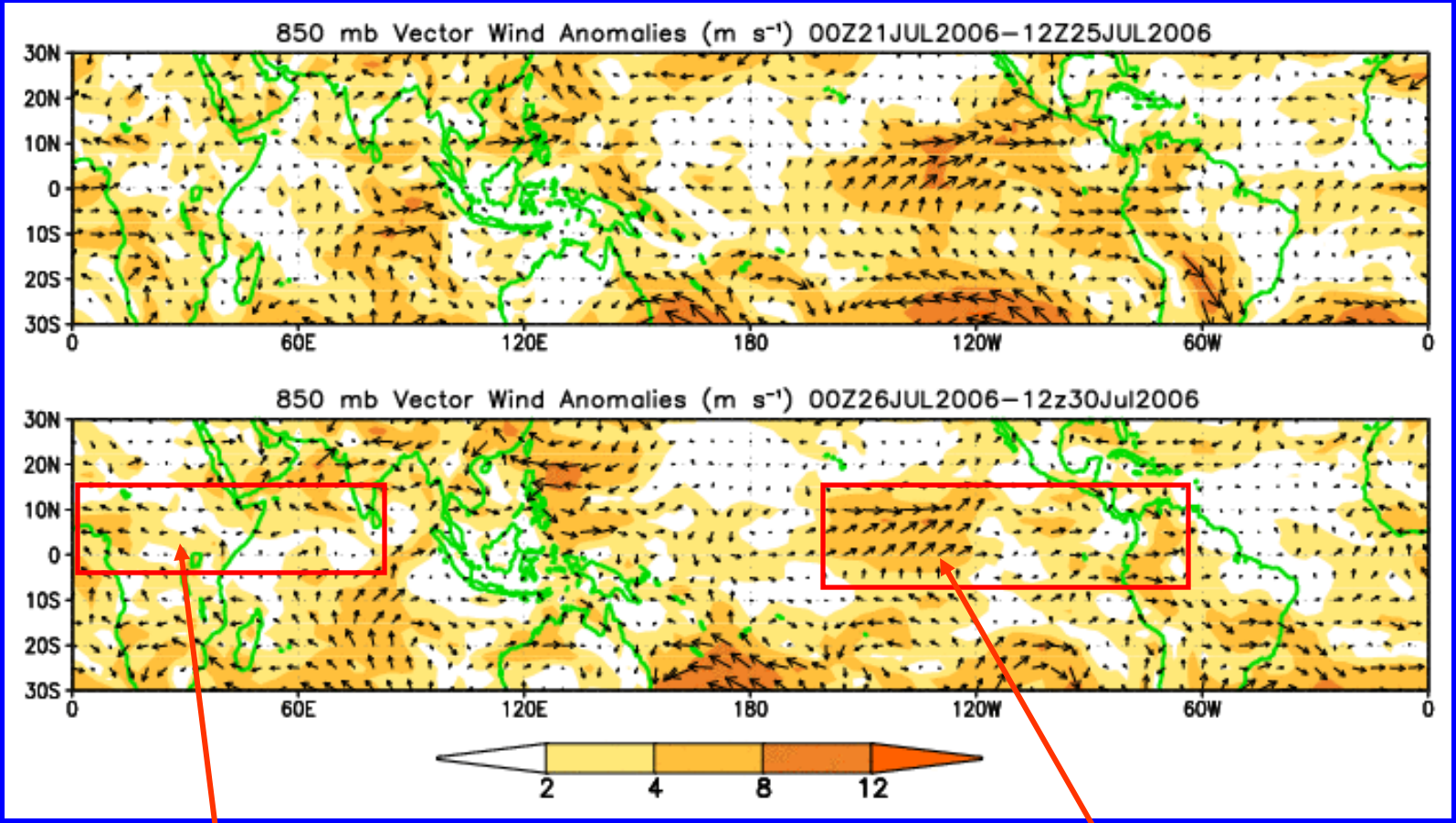
- Overview
- Recent Evolution and Current Conditions
- Madden Julian Oscillation Forecast
- Summary

Overview

- The MJO remains weak and the latest observations and model forecasts indicate continued weak MJO activity during the next 1-2 weeks.
- During week 1, there is an increased chance for above normal rainfall over southern Asia, the Philippines, Mexico, Central America and northern South America. Tropical Depression 7 is likely to strengthen and impact southern China and northern Vietnam.
- During week 2, there is an increased chance for above normal rainfall over Southeast Asia, the Philippines and the western Pacific.
- Although confidence is somewhat lower, there is the threat of tropical cyclone activity during both weeks 1 and 2 in the Atlantic Basin specifically in the western Atlantic, northeast Caribbean, and off the southeast US coast. On the other hand, the eastern Pacific may benefit from reduced tropical cyclone activity during week 2.

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

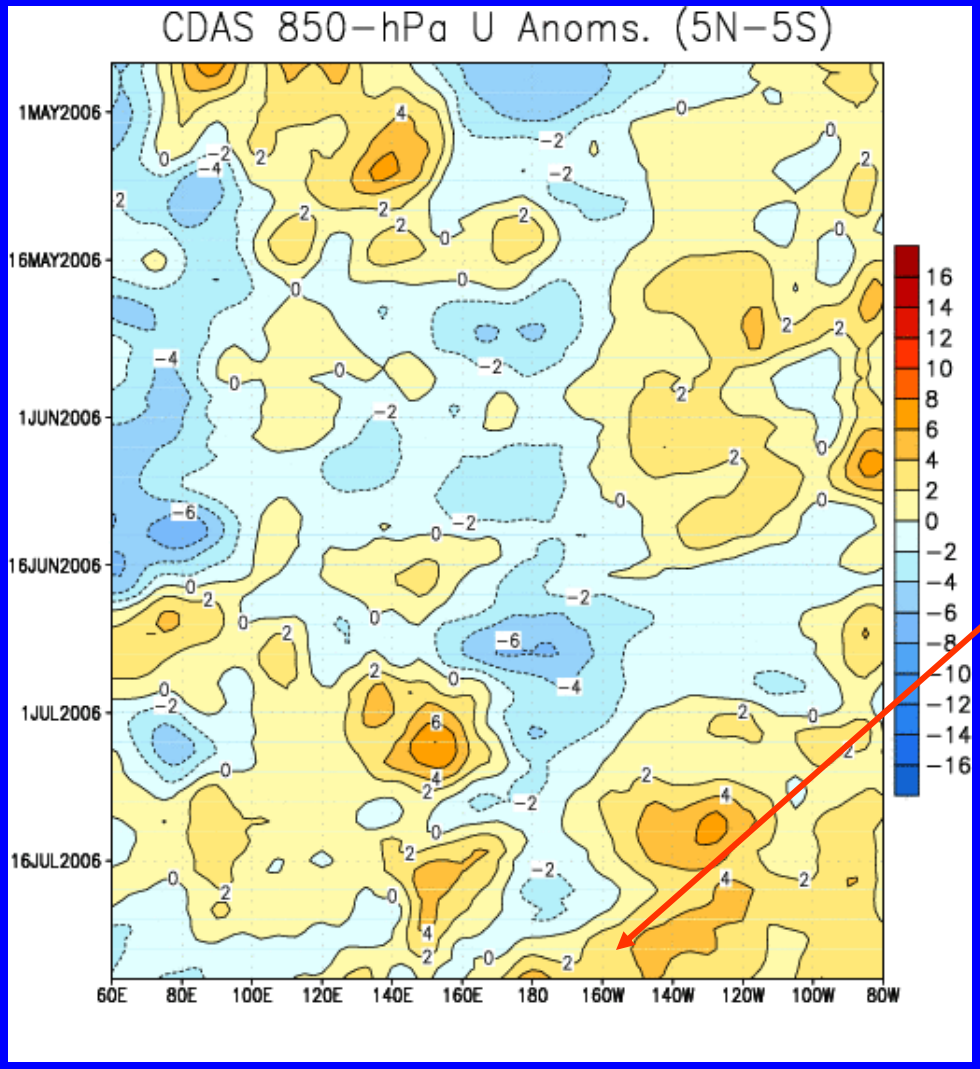
Note that shading denotes the magnitude of the anomalous wind vectors



Easterlies were stronger than normal over West Africa and the southern Arabian Sea.

Westerly anomalies persisted over the eastern Tropical Pacific.

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



Time

Longitude

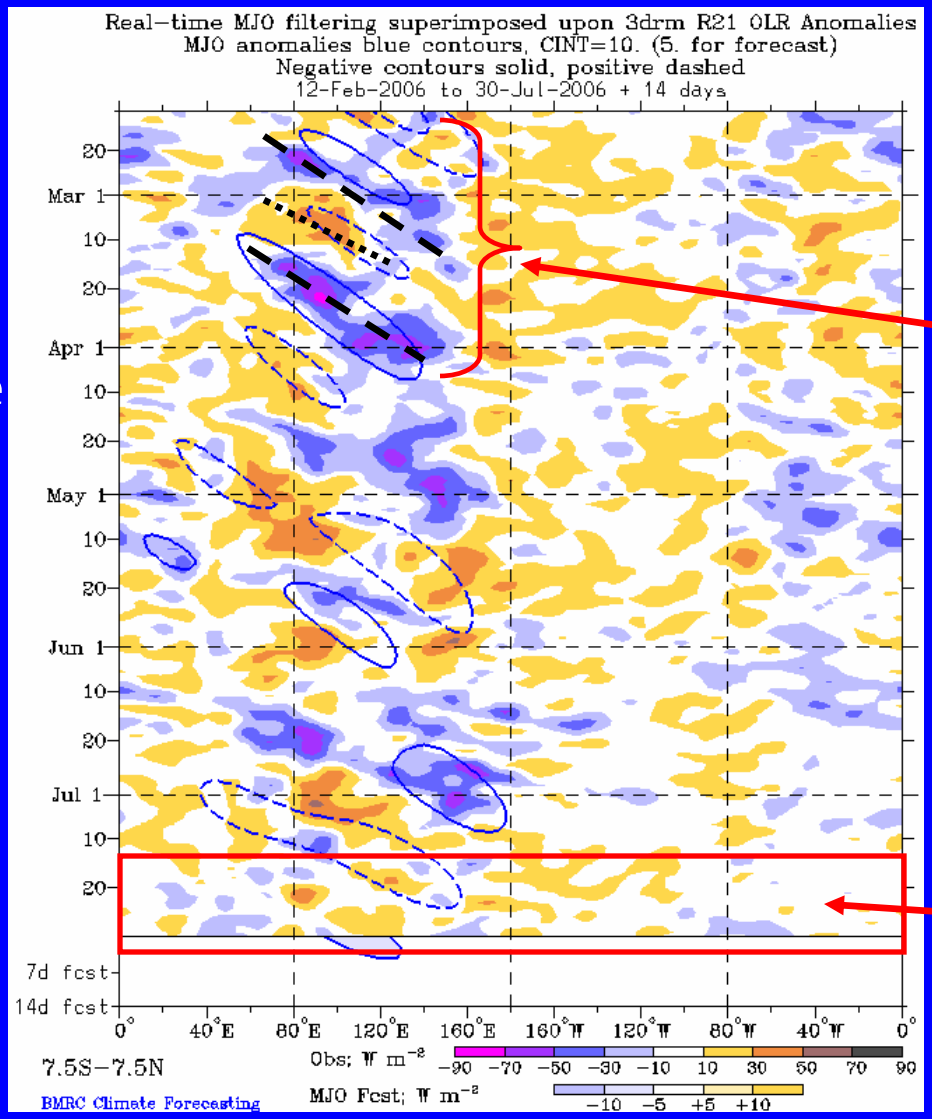
Weaker-than-average easterlies or westerlies (orange/red shading)

Stronger-than-average easterlies (blue shading)

Weakened easterlies were noted from the Date Line to the South American Coast.

The low level easterlies were generally near normal across the equatorial Indian Ocean and Indonesia.

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



Time

Longitude

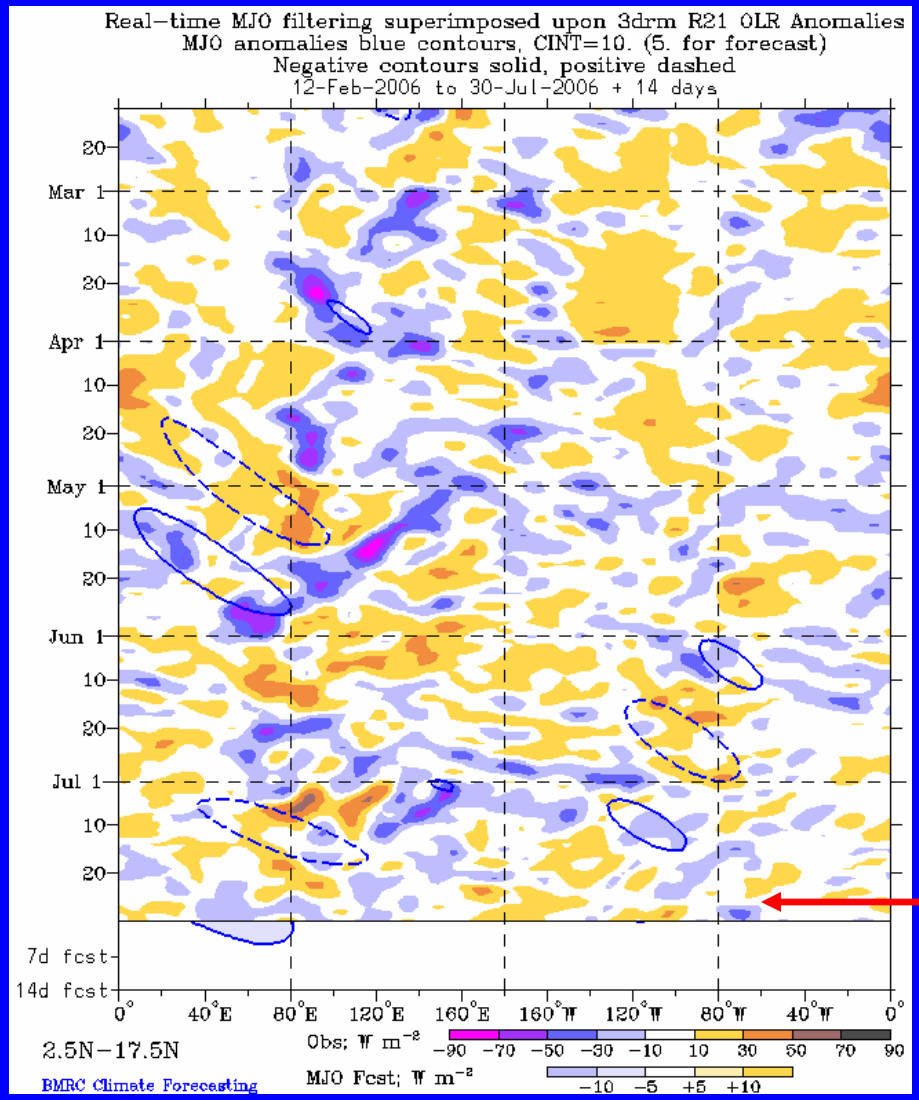
Drier-than-average conditions (/red shading)

Wetter-than-average conditions (blue shading)

Eastward propagation of OLR anomalies associated with the MJO was evident from February into early April.

Anomalies during the last half of July have been quite weak.

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



Time

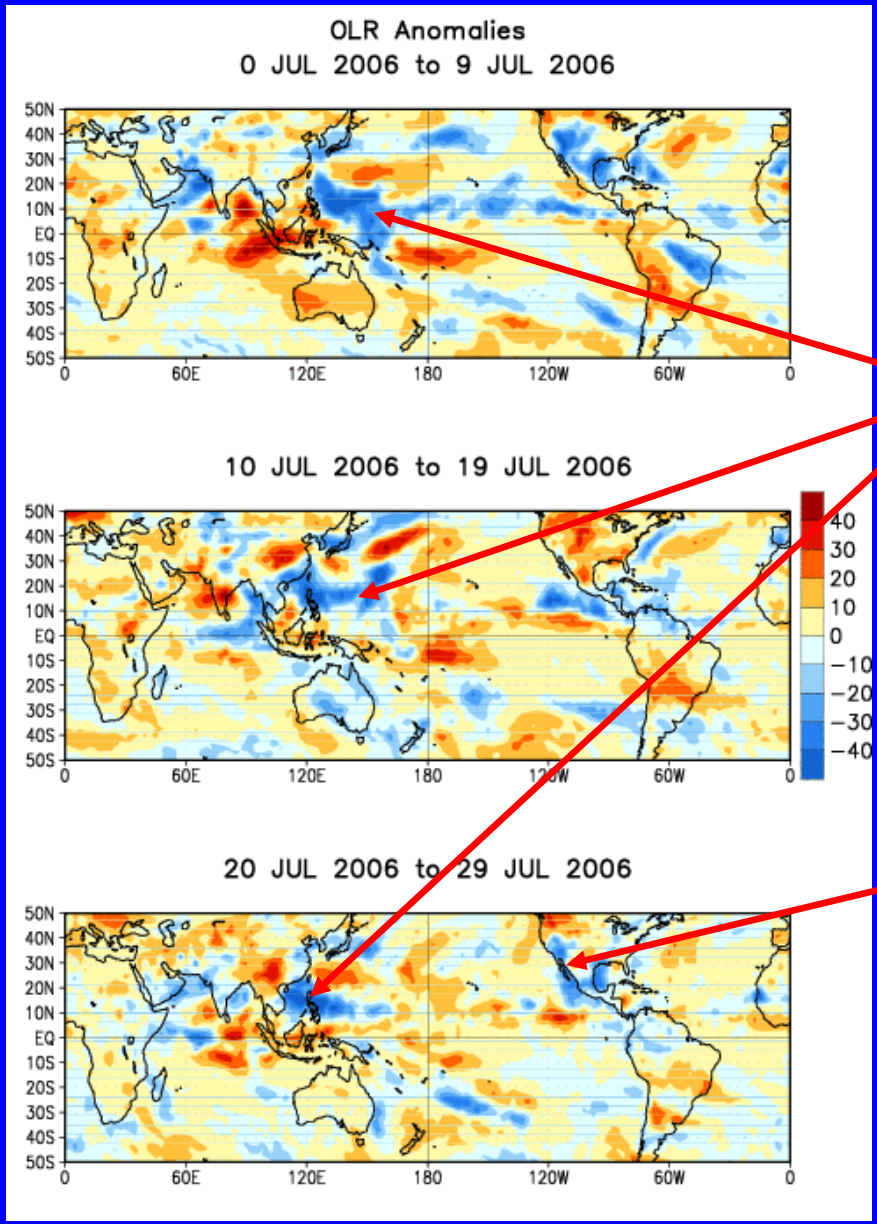
Longitude

Drier-than-average conditions (/red shading)

Wetter-than-average conditions (blue shading)

Weak enhanced convection in the western Hemisphere.

Anomalous OLR: Last 30 days

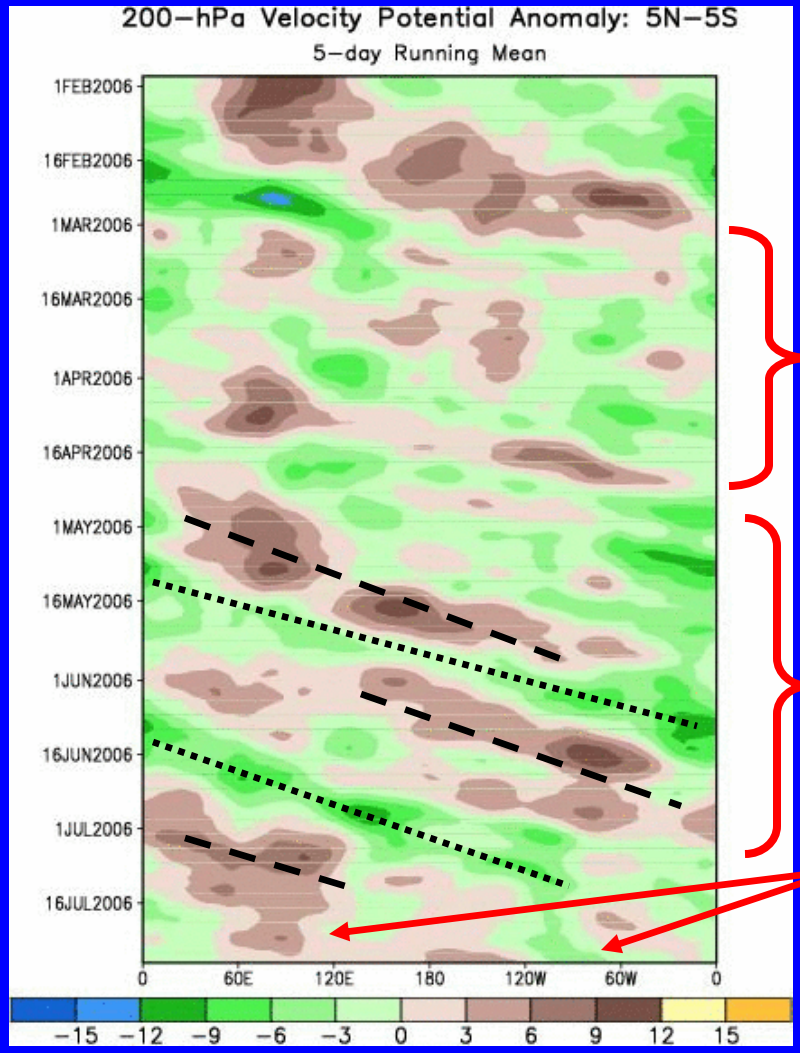


Enhanced convection and tropical cyclone activity were observed in the western Pacific during July.

After a period of suppressed convection during mid July over the North American monsoon area, enhanced convection was noted during late July.

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

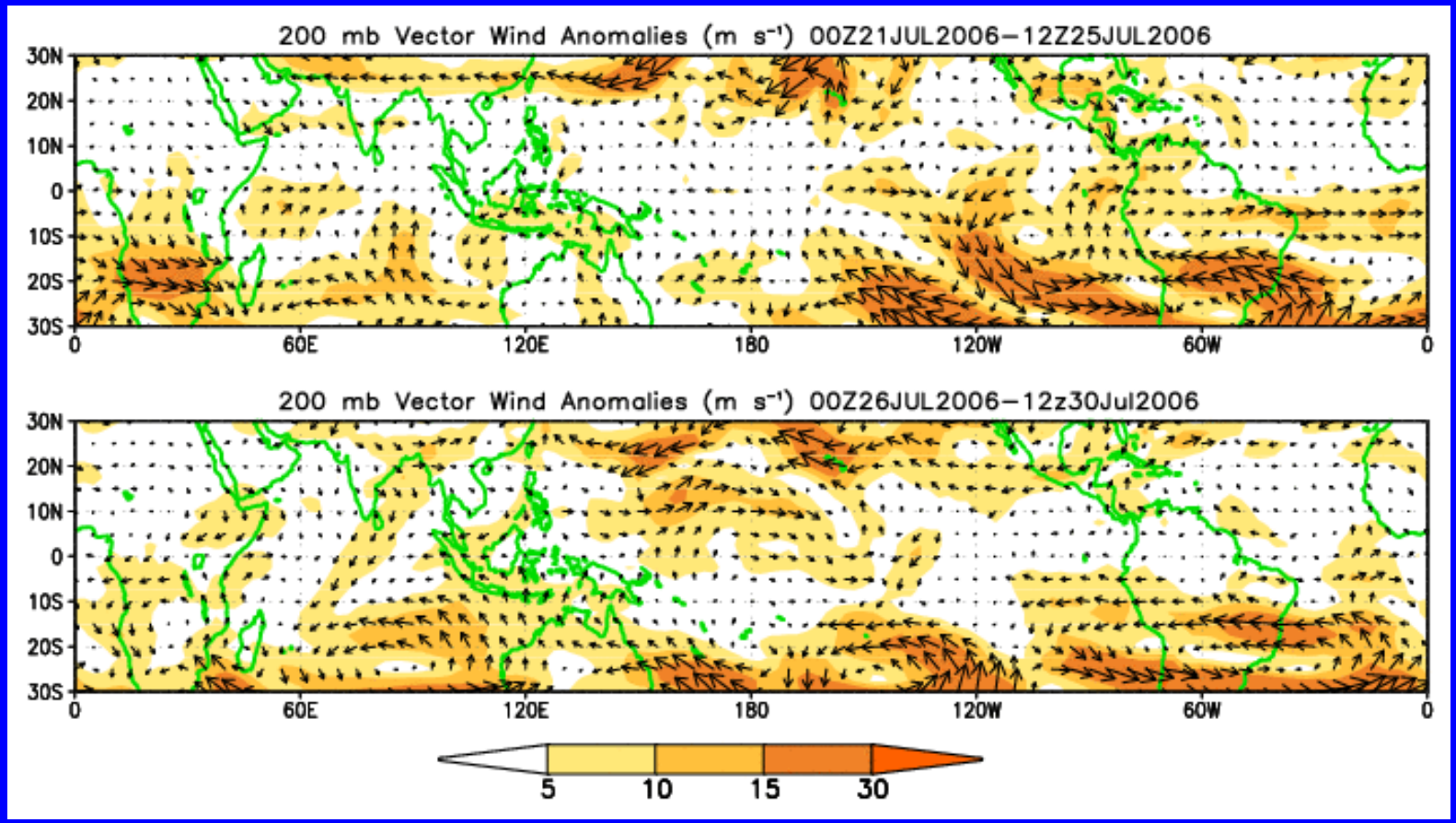
The MJO was incoherent during much of March and April.

MJO activity strengthened during May and June.

During mid July, the pattern became more stationary, with enhanced divergence over the eastern tropical Pacific and convergence over the Indian Ocean and Indonesia.

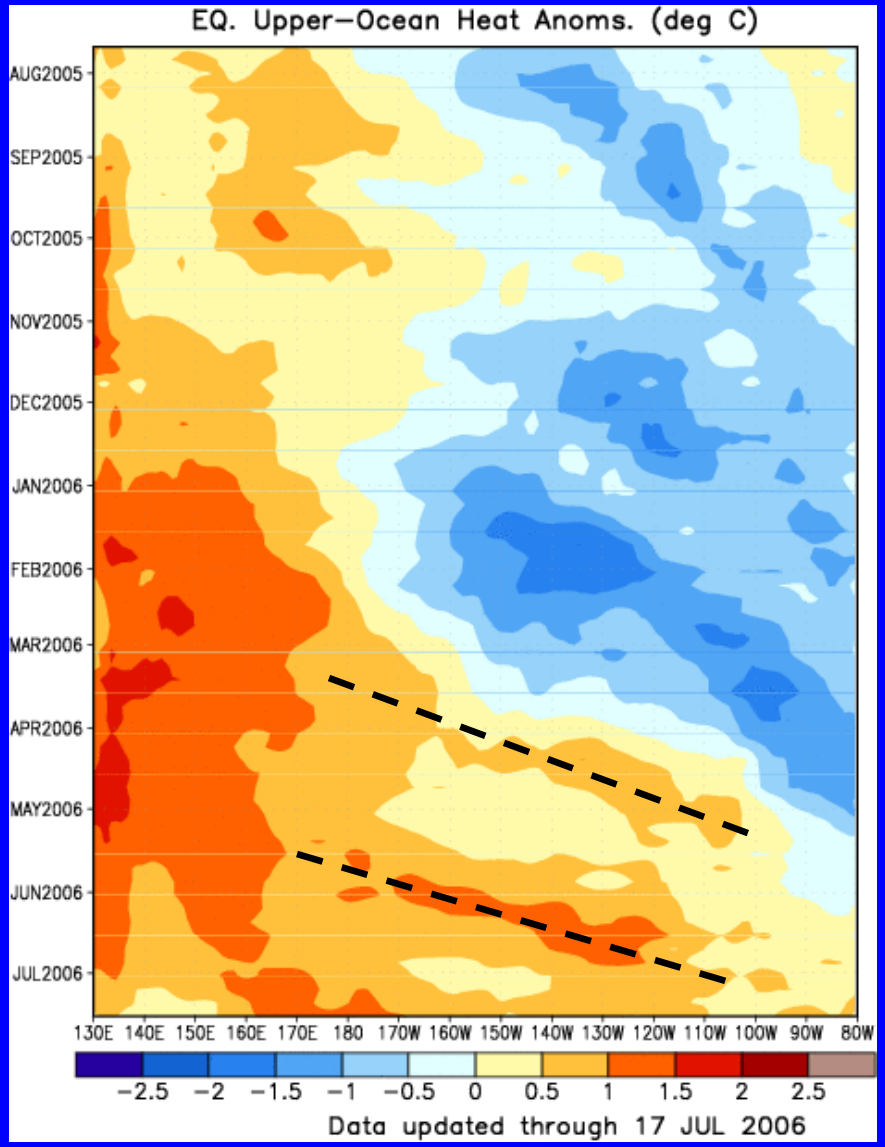
200-hPa Vector Winds and Anomalies (m s^{-1})

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



Heat Content Evolution in the Eq. Pacific

Time

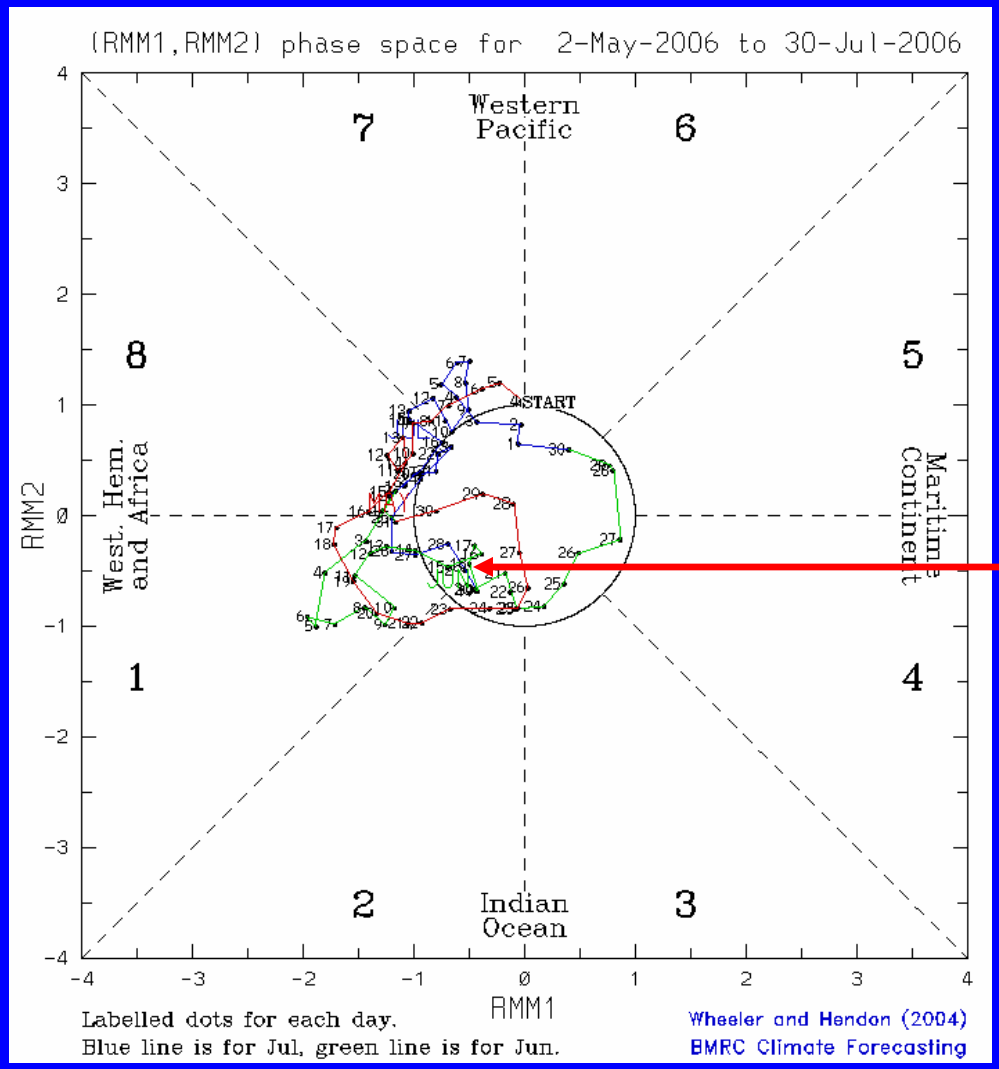


Longitude

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

In recent weeks, relaxed easterlies and warm sub-surface water has resulted in warmer than normal SST's over parts of the eastern equatorial Pacific.

MJO Index (Magnitude and Phase)

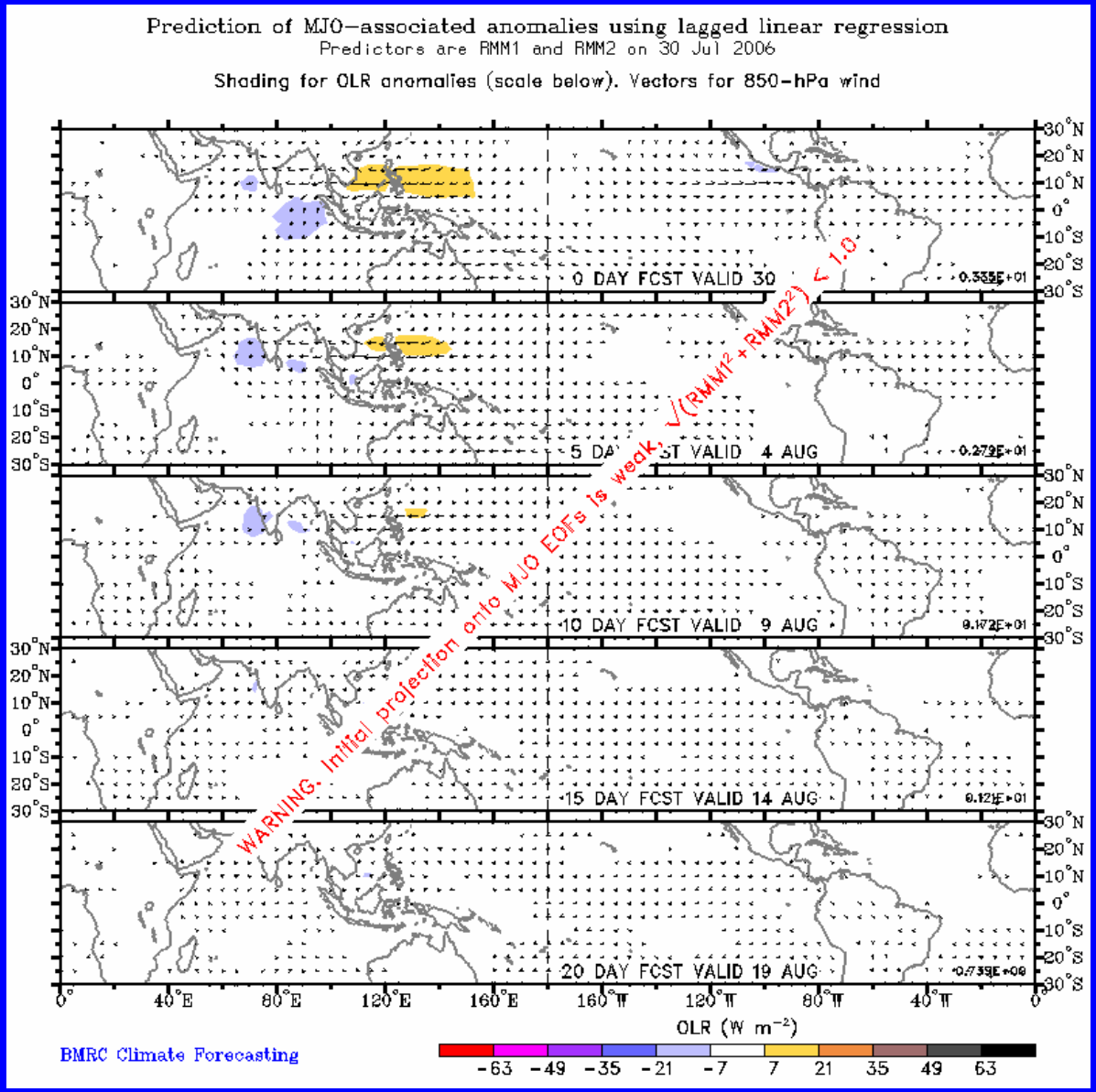


The current state of the MJO as determined by an index based on Empirical Orthogonal Function (EOF) analysis using combined fields of near-equatorially-averaged 850 hPa zonal wind, 200 hPa zonal wind, and satellite-observed outgoing longwave radiation (OLR) (Wheeler and Hendon, 2004).

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.

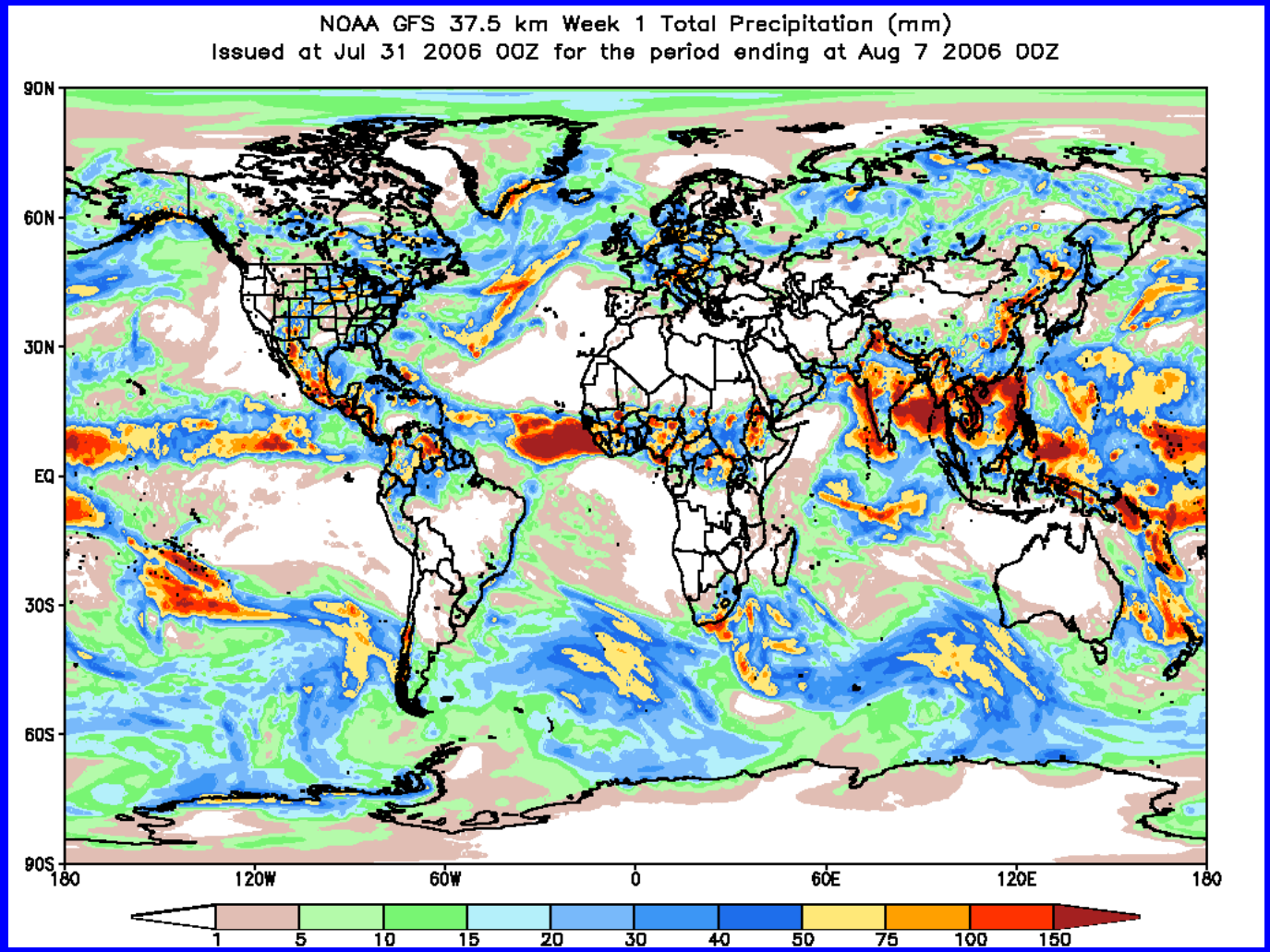
The MJO signal remains weak but has shifted eastward and is now centered in the western Indian Ocean.

Statistical OLR MJO Forecast



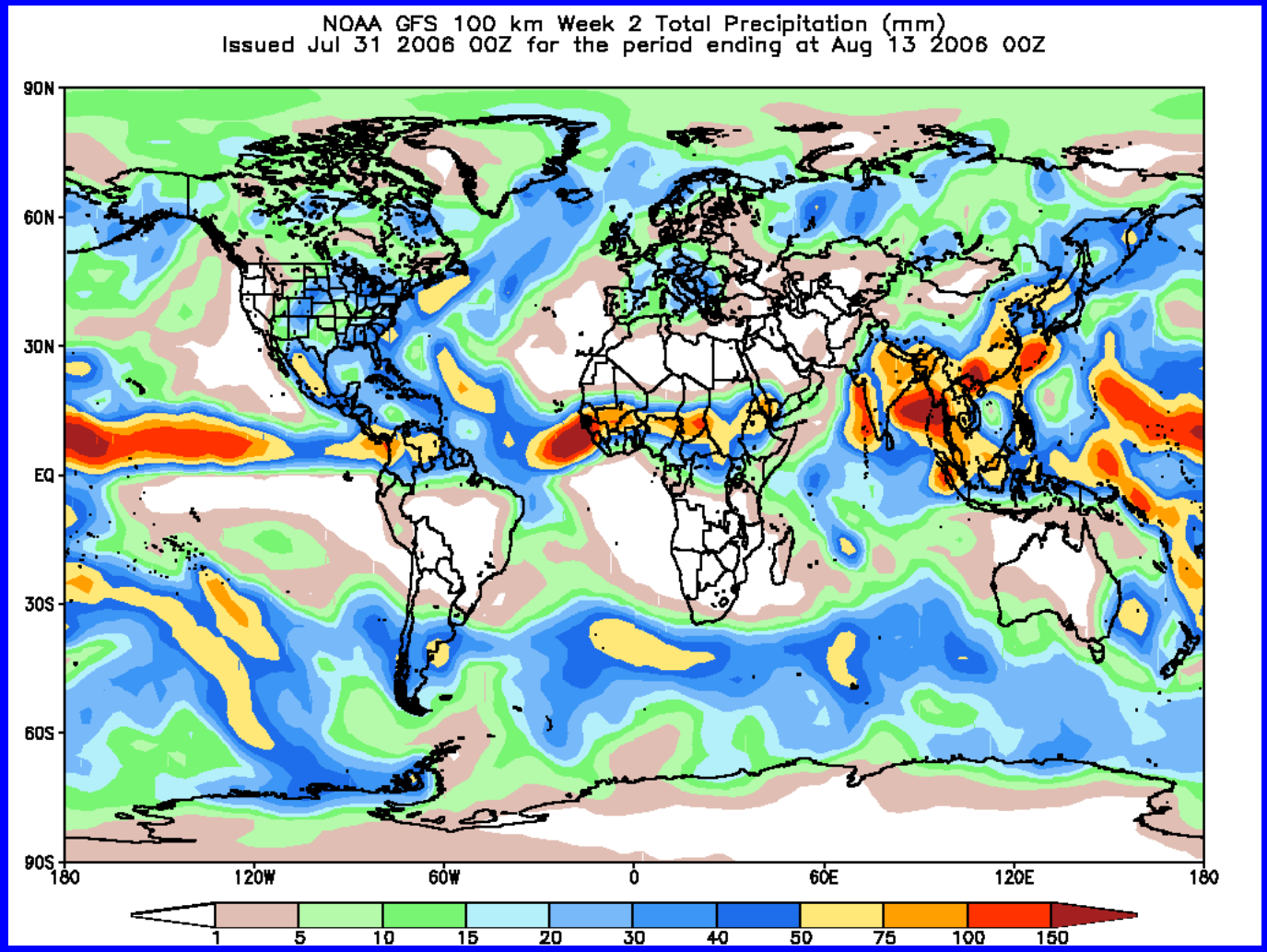
The initial projection of the MJO is weak.

Global Forecast System (GFS) Week 1 Precipitation Forecast



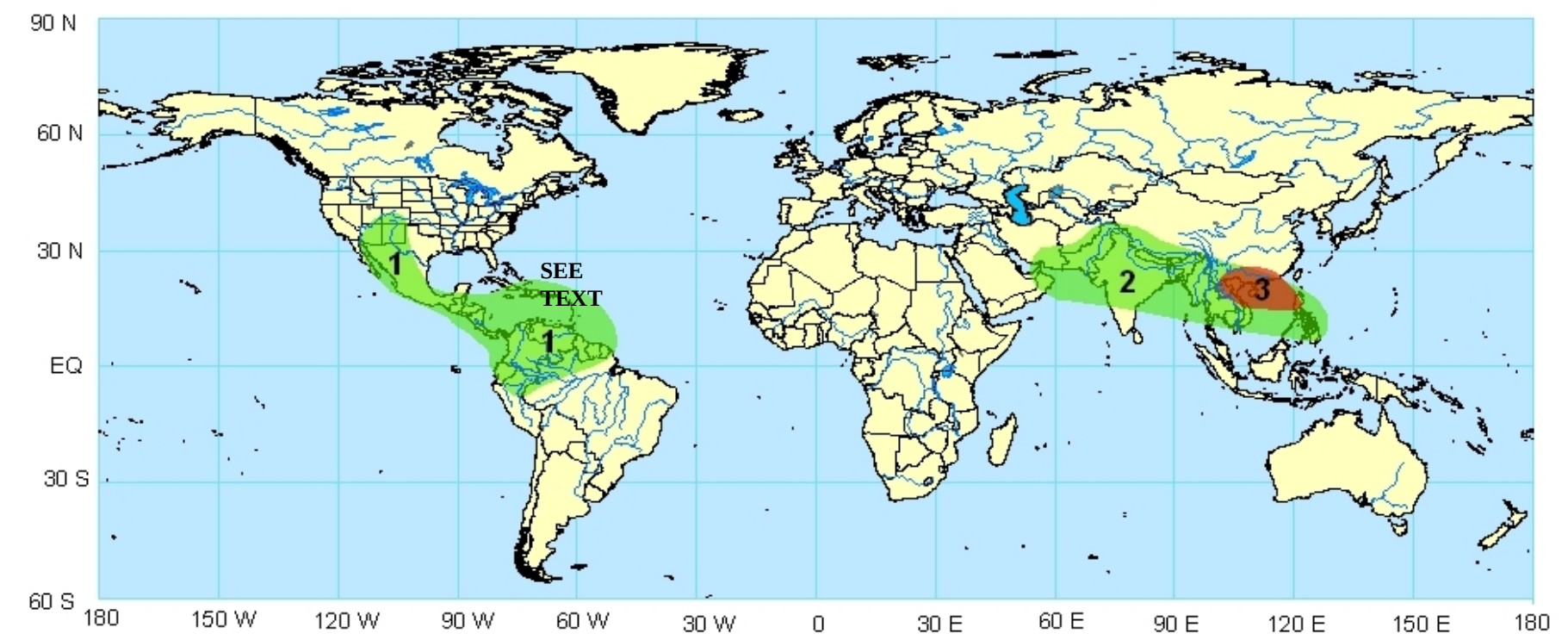
A reduction in rainfall over the eastern tropical Pacific and an increase in rainfall over India and Southeast Asia is expected during week 1.

Global Forecast System (GFS) Week 2 Precipitation Forecast



Abundant precipitation over South and Southeast Asia is expected to remain during week 2.

Potential Benefits/Hazards – Week 1
Valid August 1 - 7, 2006

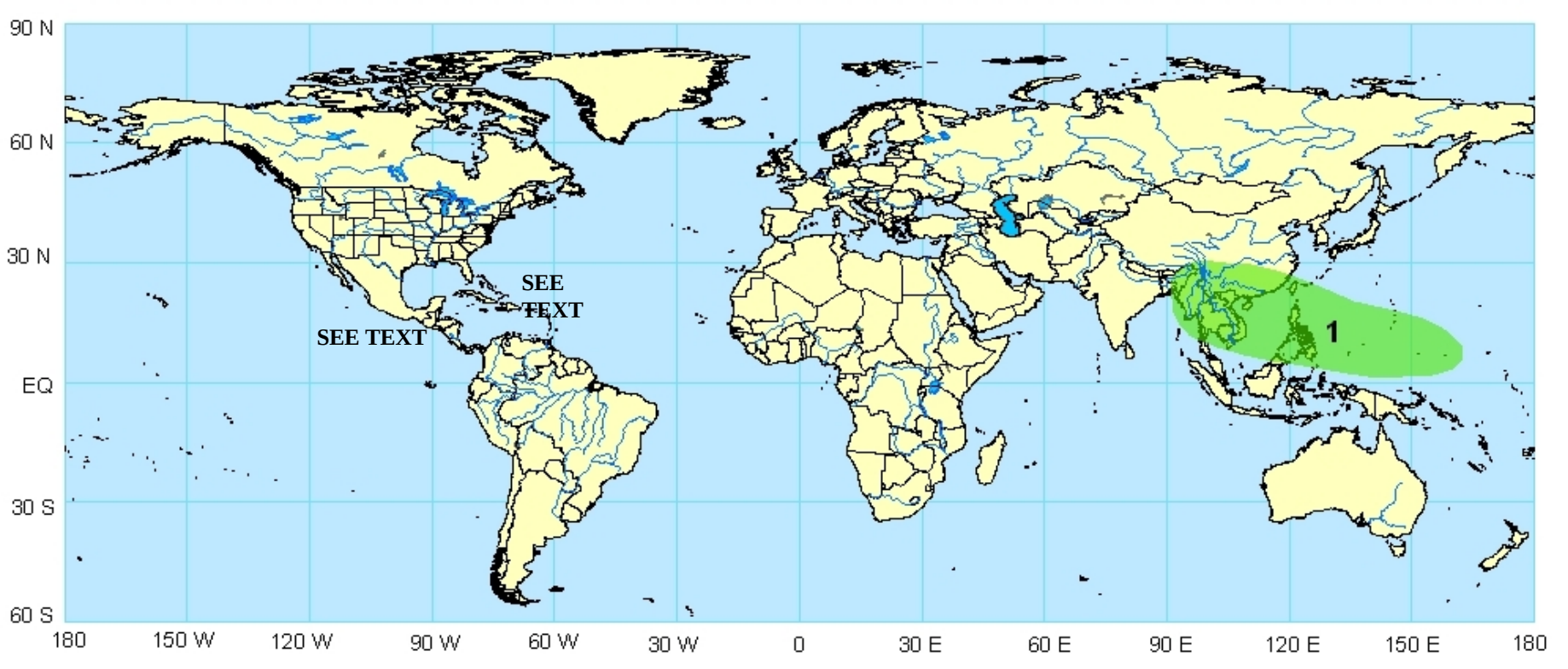


1. There is an increased chance for above normal rainfall over Mexico, Central America, the Caribbean and northern South America.

2. There is an increased chance for above normal rainfall over South Asia, Southeast Asia, the Philippines, the South China Sea and the Bay of Bengal. Tropical cyclone development is also possible over the western tropical Pacific and the Bay of Bengal.

3. Tropical Depression 7 will most likely strengthen into a tropical storm as it moves across the South China Sea and is expected to have an impact on southern China and northern Vietnam.

Potential Benefits/Hazards – Week 2
Valid August 8 - 14, 2006



1. There is an increased chance for above normal rainfall over Southeast Asia, the Philippines and the western tropical Pacific. Conditions are also expected to be favorable for tropical cyclone development.

Summary

- The MJO remains weak and the latest observations and model forecasts indicate continued weak MJO activity during the next 1-2 weeks.
- During week 1, there is an increased chance for above normal rainfall over southern Asia, the Philippines, Mexico, Central America and northern South America. Tropical Depression 7 is likely to strengthen and impact southern China and northern Vietnam.
- During week 2, there is an increased chance for above normal rainfall over Southeast Asia, the Philippines and the western Pacific.
- Although confidence is somewhat lower, there is the threat of tropical cyclone activity during both weeks 1 and 2 in the Atlantic Basin specifically in the western Atlantic, northeast Caribbean, and off the southeast US coast. On the other hand, the eastern Pacific may benefit from reduced tropical cyclone activity during week 2.