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

Update prepared by
Climate Prediction Center / NCEP
July 24, 2006

Outline

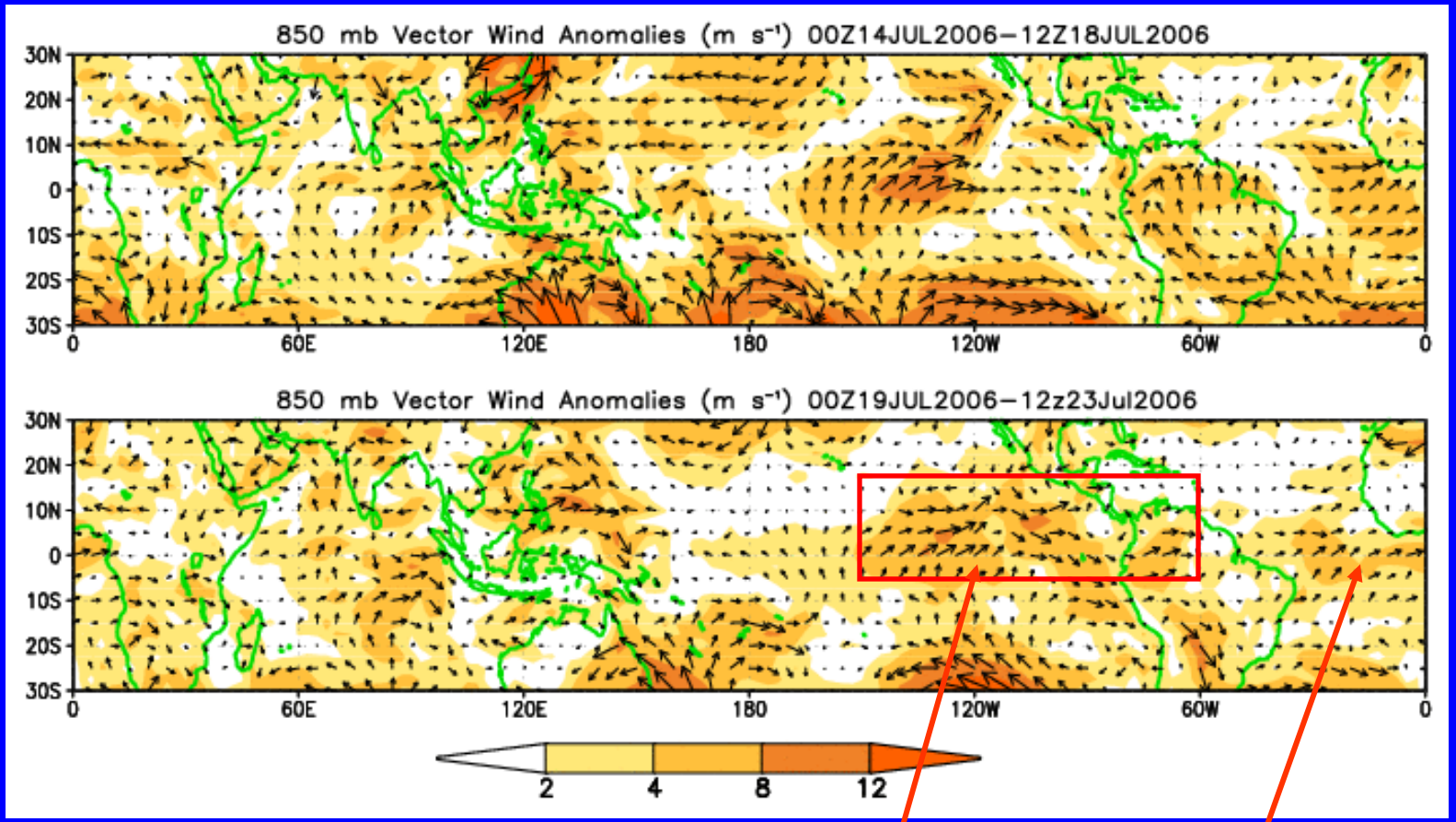
- Overview
- Recent Evolution and Current Conditions
- Madden Julian Oscillation Forecast
- Summary

Overview

- The latest observations indicate that the MJO remains weak.
- During week 1, hurricane Daniel and tropical storm Emilia are currently moving across the eastern Pacific. Daniel may affect Hawaii during the period while moisture from Emilia may enhance monsoonal rainfall across the southwest US. Conditions are expected to remain favorable for tropical development over the eastern Pacific. Above average rainfall is expected across the eastern Pacific Ocean, Central America, and sections of Mexico.
- Also during week 1, Typhoon Kaemi is expected to cross Taiwan before making landfall in southeastern China where above average rainfall is expected during the period.
- During week 2, conditions may become more favorable for tropical development in the Atlantic Basin.

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

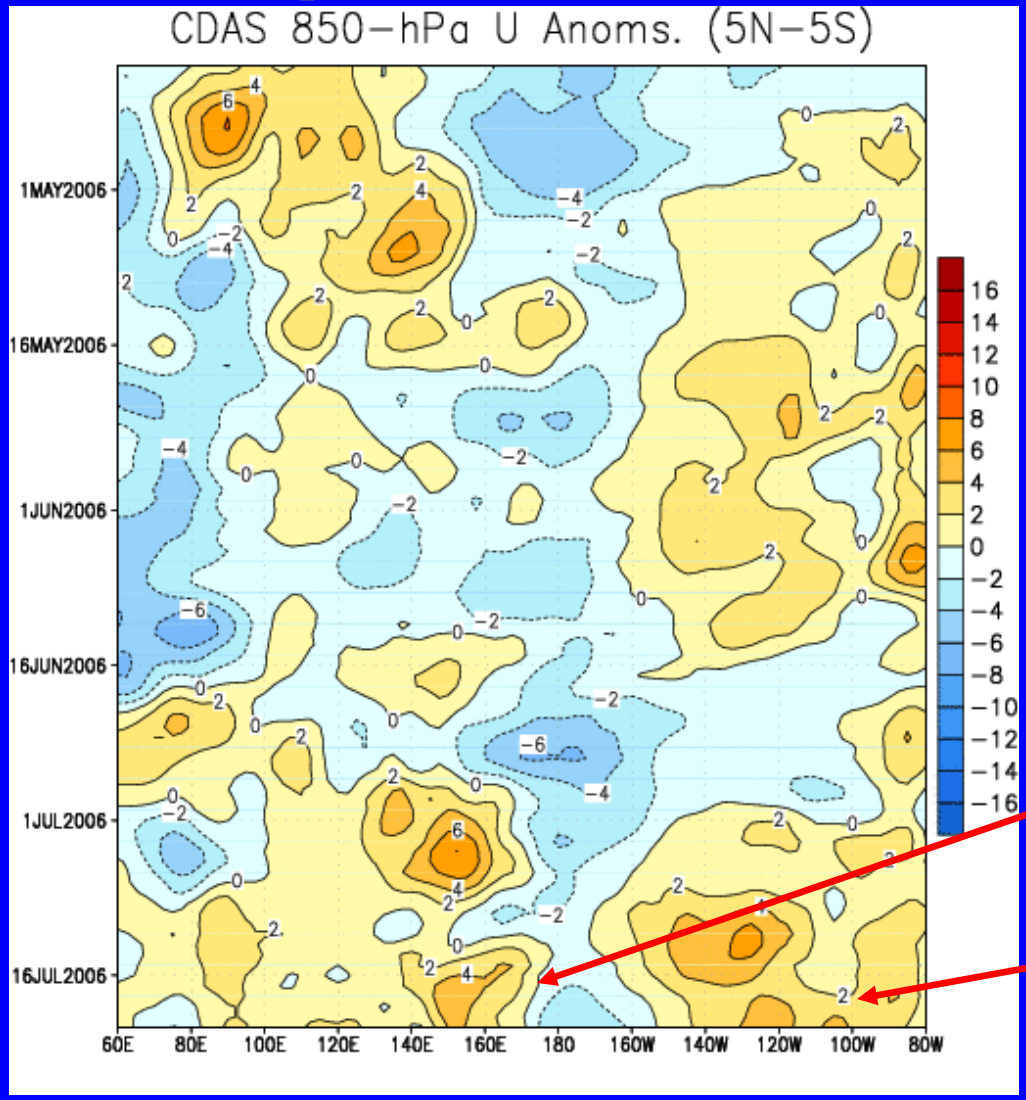
Note that shading denotes the magnitude of the anomalous wind vectors



Westerly anomalies strengthened over the eastern Tropical Pacific.

Wind anomalies enhanced moisture transport into the Sahel and western Sahara

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)

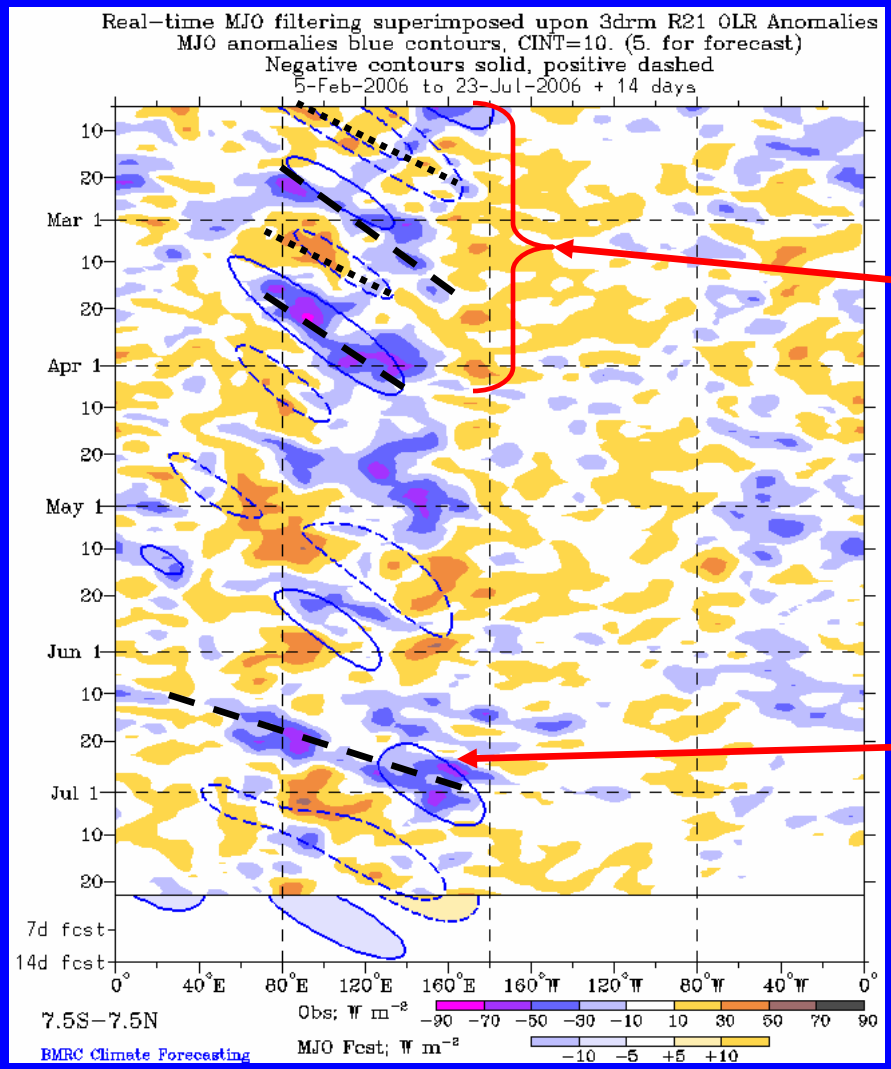
Weakened easterlies were also noted, to a lesser extent, over the eastern Indian and western Pacific.

Weakened easterlies were noted from 150 W to the South American Coast.

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

Drier-than-average conditions (/red shading)

Wetter-than-average conditions (blue shading)



Time

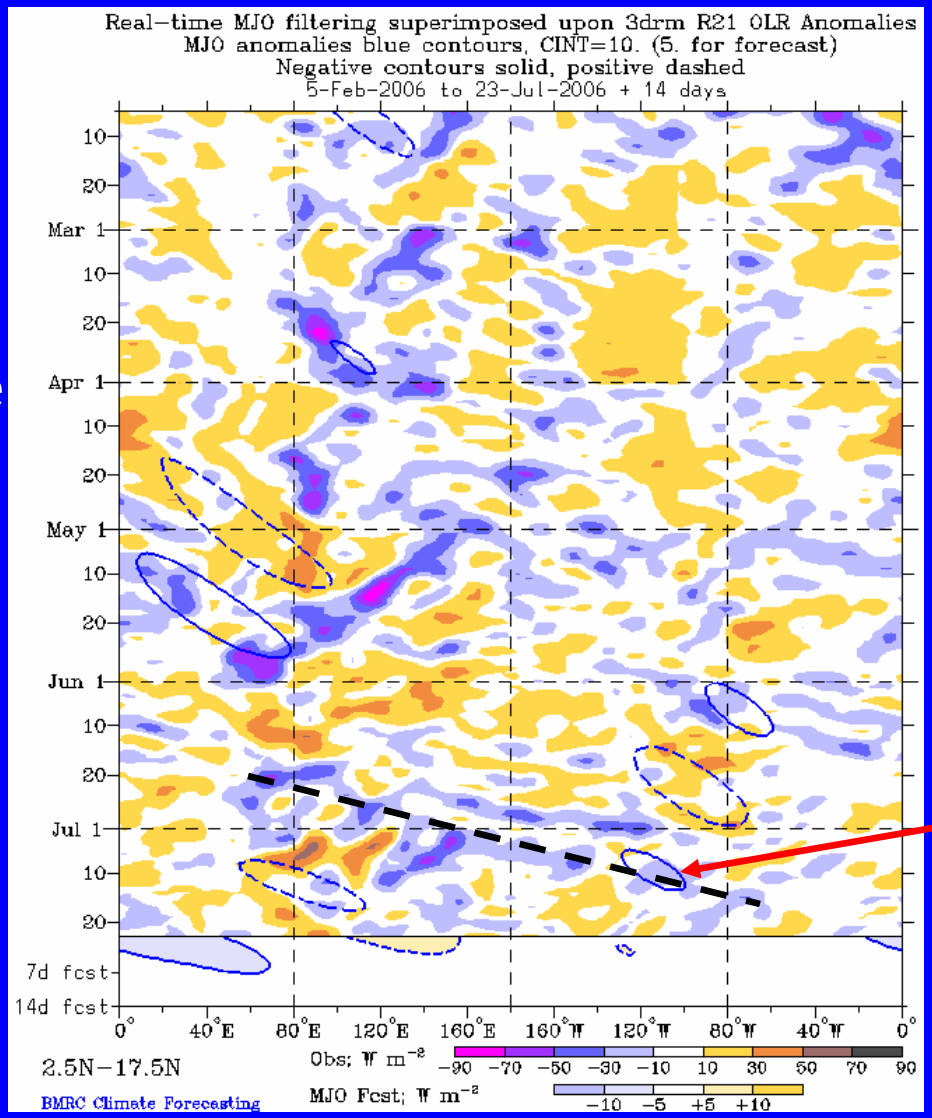
Longitude

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

A coherent OLR anomaly moved across the Eastern Hemisphere in June.

In recent days, little in the way of coherent anomalies were observed.

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



Time

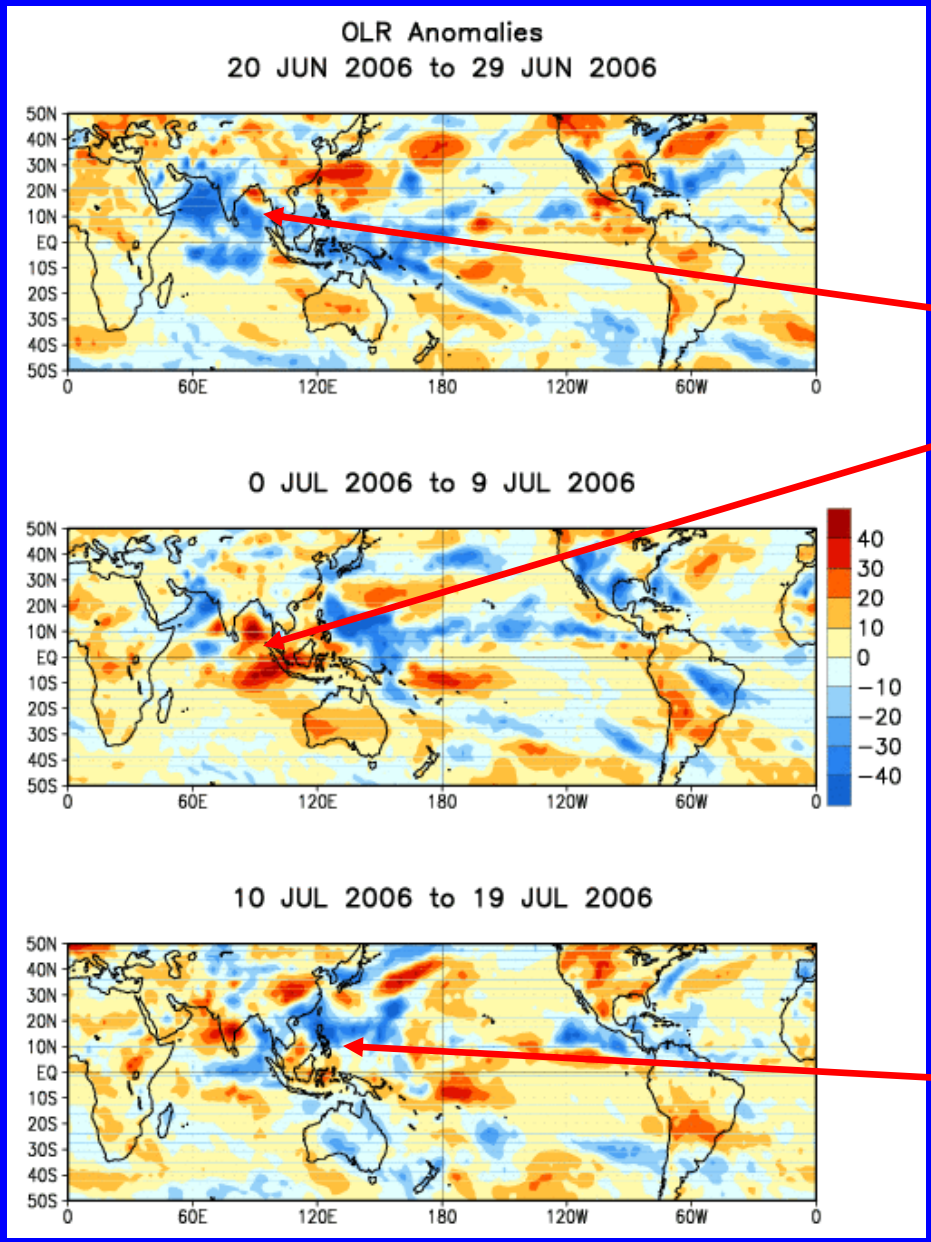
Longitude

Drier-than-average conditions (/red shading)

Wetter-than-average conditions (blue shading)

Eastward propagation of a weak, yet coherent OLR anomaly from the Indian Ocean to Central America occurred from late June trough mid July.

Anomalous OLR: Last 30 days

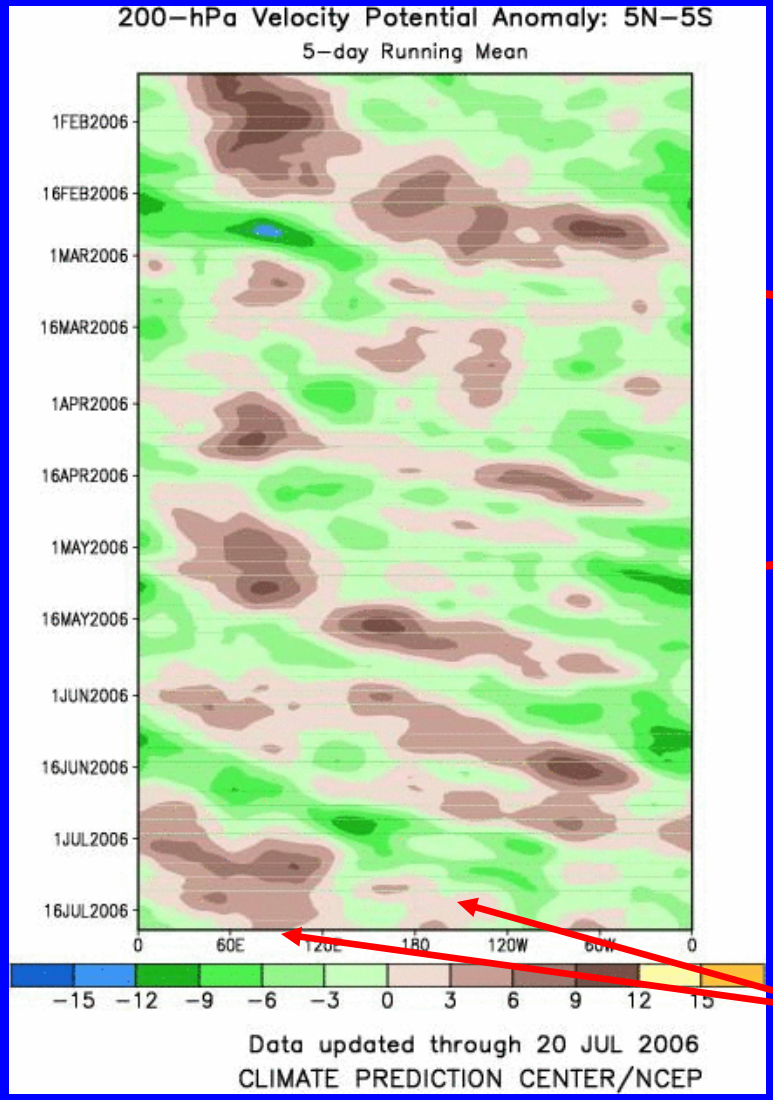


Wet conditions over India, the Indian Ocean and Indonesia in late June were replaced by dry conditions during early July.

Enhanced convection persisted over the western Pacific east of the Philippines, while convection was suppressed over India.

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

Weak to moderate MJO activity was observed during February.

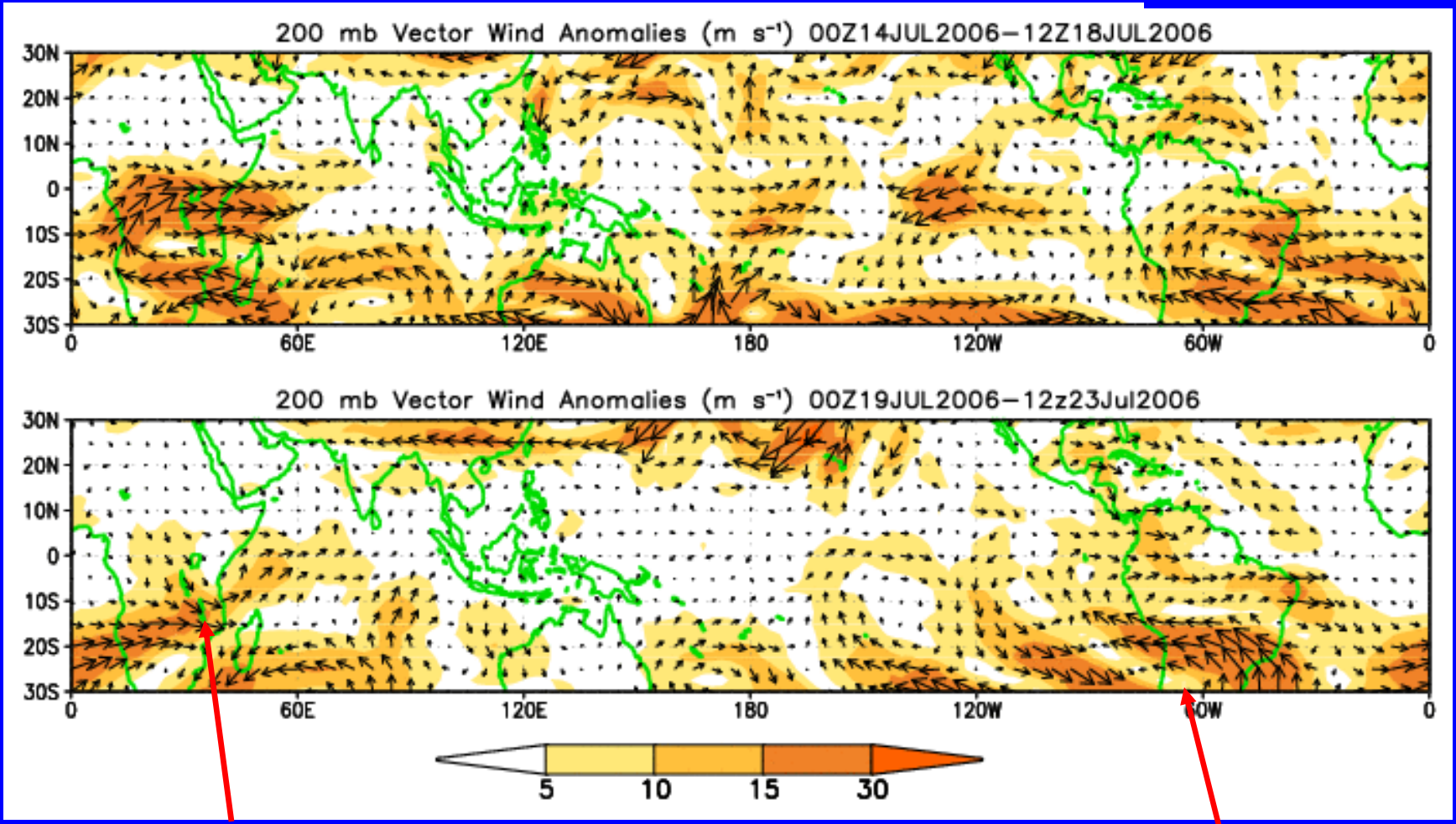
The MJO was incoherent during much of March and April.

MJO activity strengthened during May and June. In late June and early July, velocity potential anomalies accompanied OLR anomalies in the Northern Hemisphere Tropics.

During mid July, the pattern weakened, and became quasi-stationary

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

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

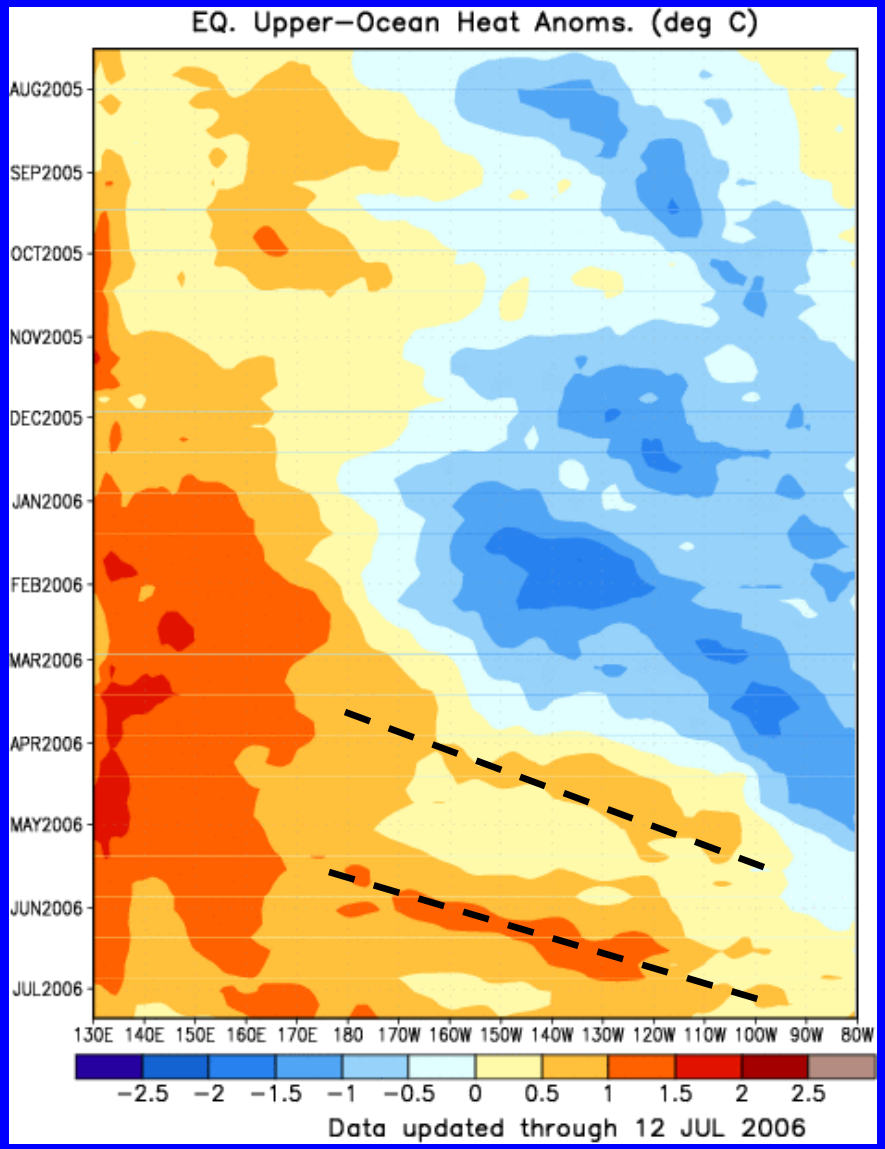


The cyclonic wind anomaly over Sub-Saharan Africa and the Mozambique Channel weakened.

Mid-latitude ridging dominated the pattern over central South America.

Heat Content Evolution in the Eq. Pacific

Time



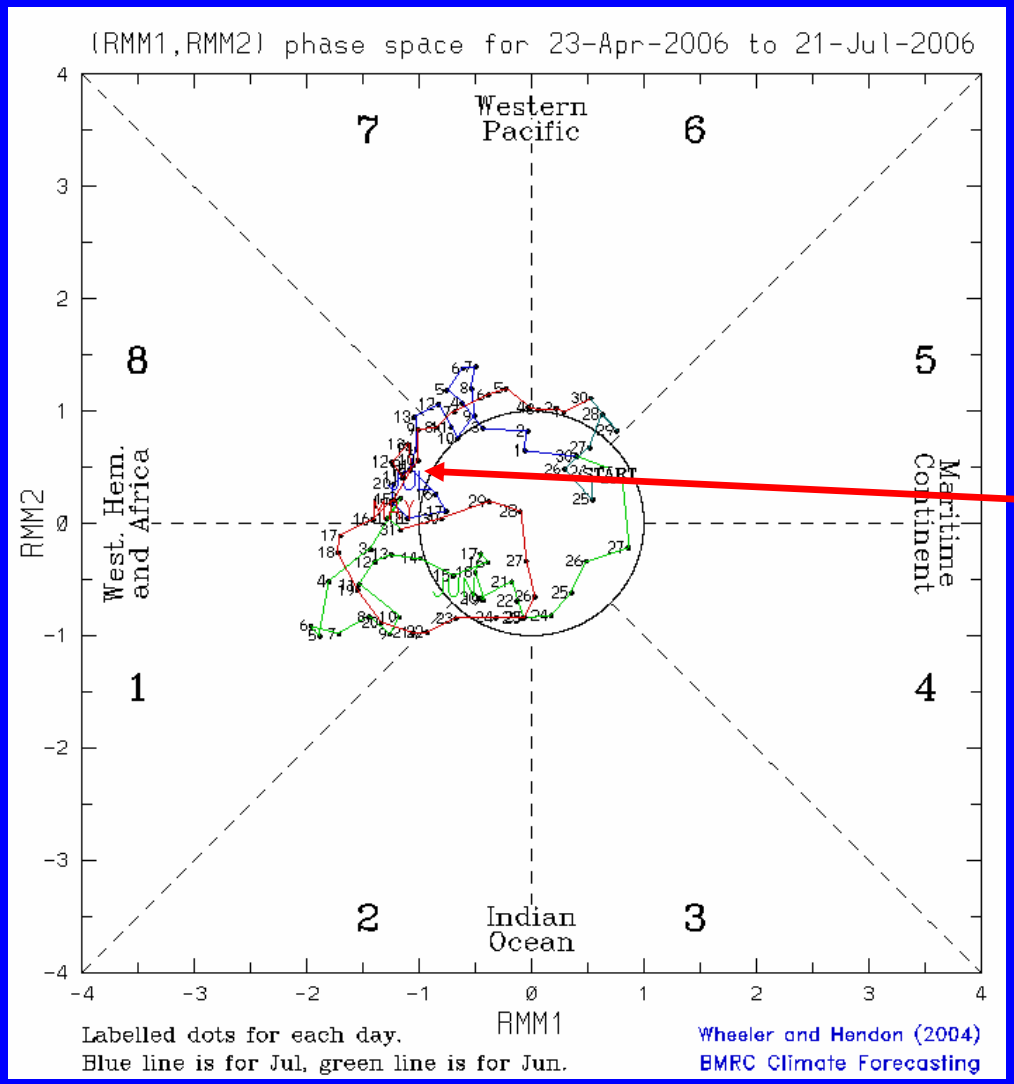
Longitude

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

MJO Index (Magnitude and Phase)

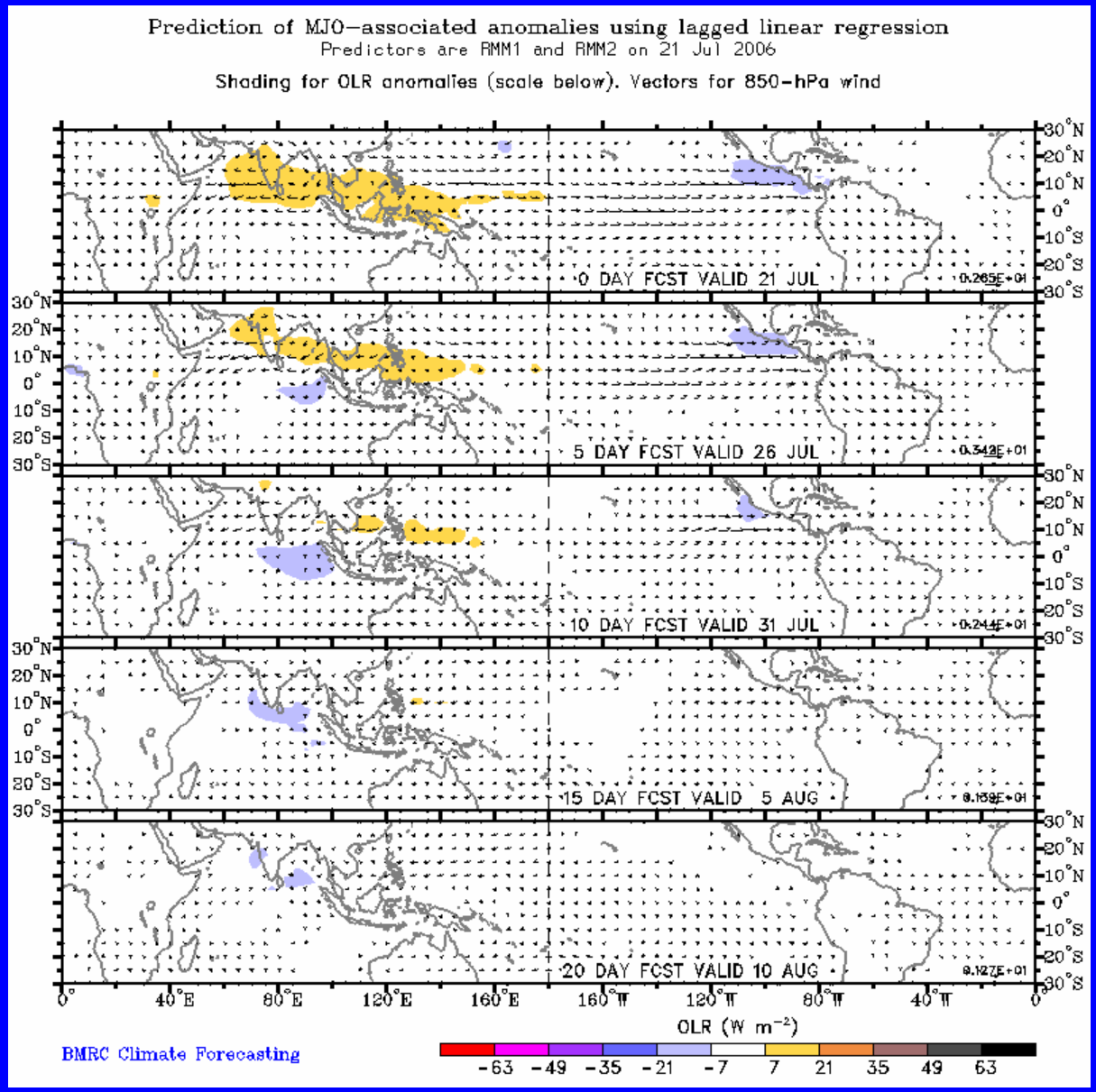
The current state of the MJO as determined by an index based on Empirical Orthogonal Function (EOF) analysis using combined fields of near-equatorially-averaged 850 hPa zonal wind, 200 hPa zonal wind, and satellite-observed outgoing longwave radiation (OLR) (Wheeler and Hendon, 2004).

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.



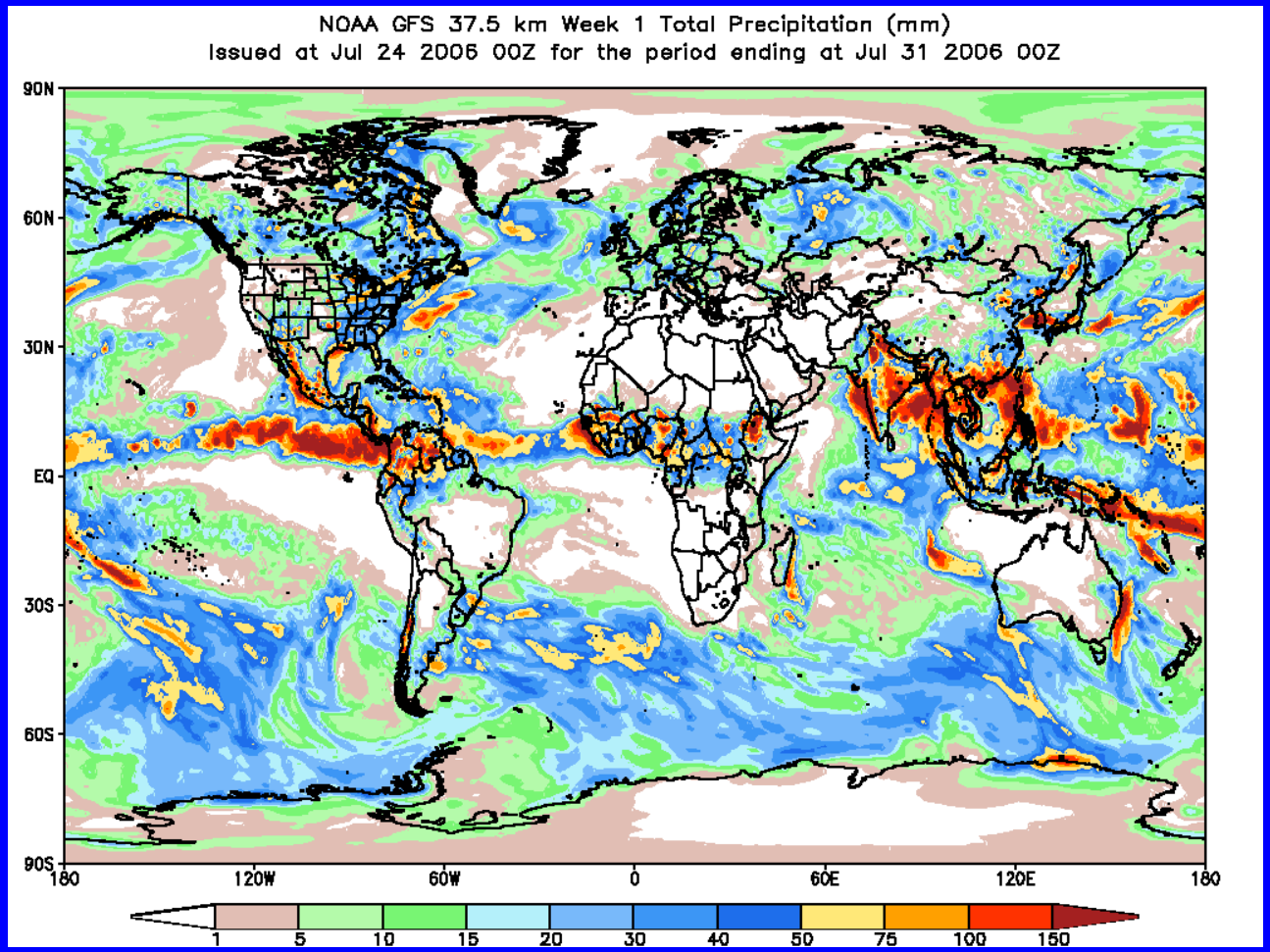
The MJO signal remains weak.

Statistical OLR MJO Forecast



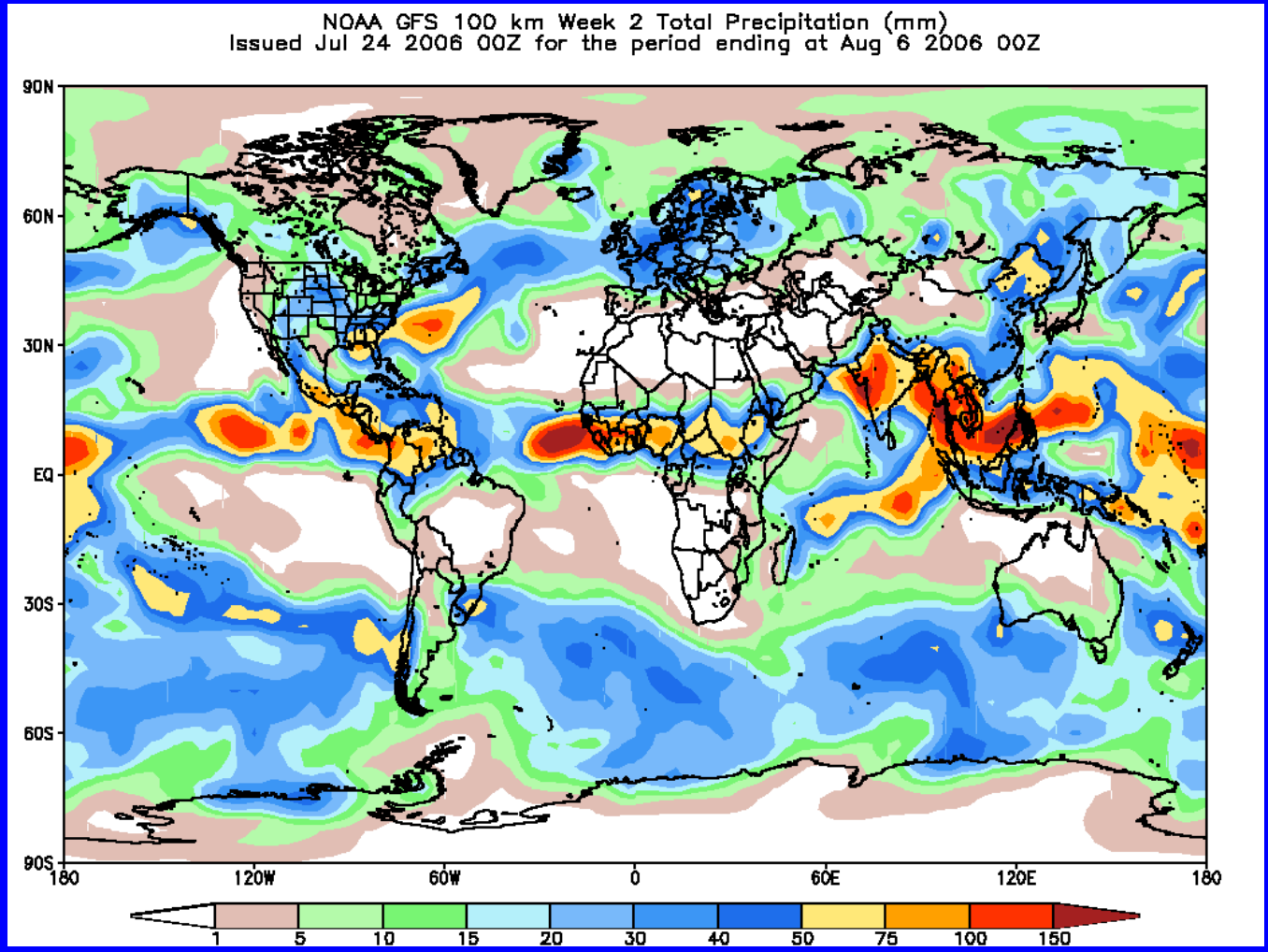
The statistical MJO forecast indicates suppressed convection over South Asia, Malaysia, southern Philippines and the South China Sea during week 1. However, the initial projection of the MJO is weak.

Global Forecast System (GFS) Week 1 Precipitation Forecast



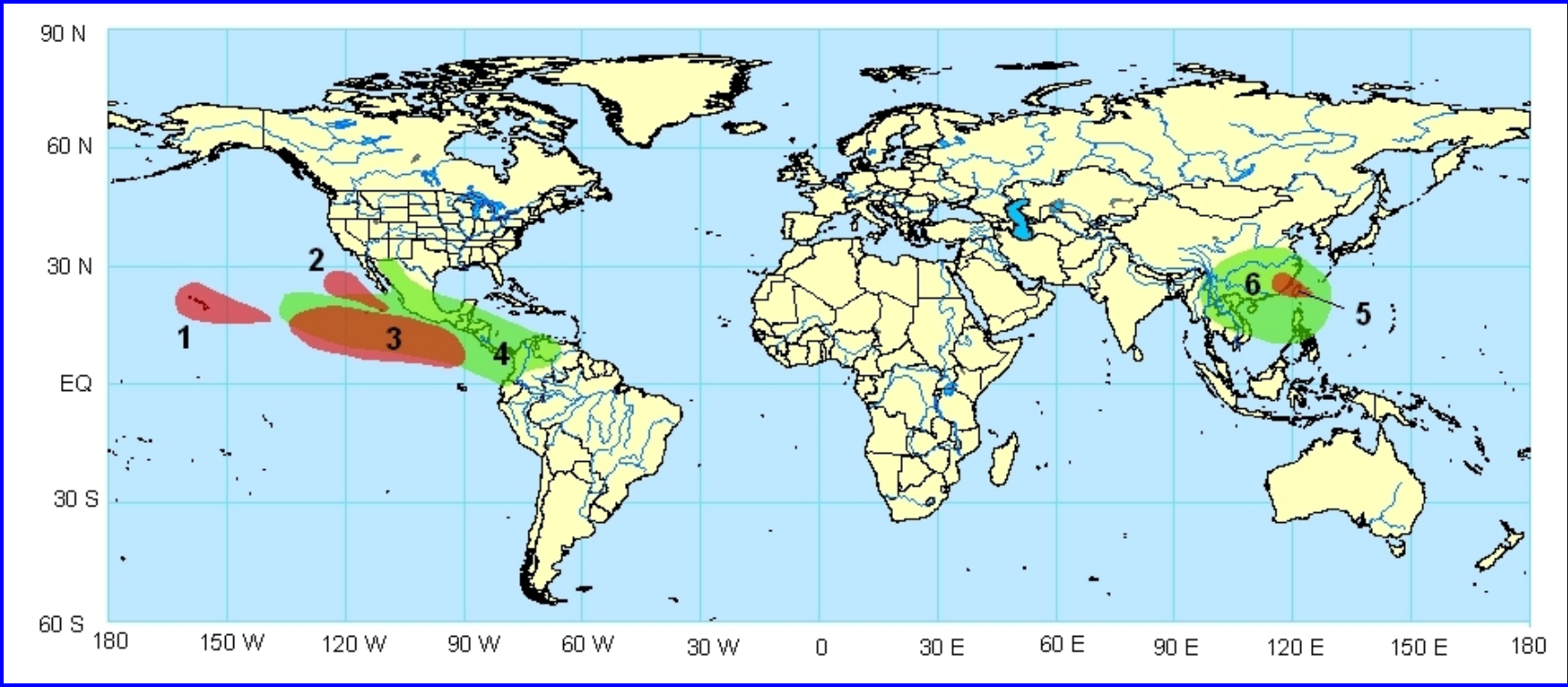
Abundant precipitation expected over the eastern tropical Pacific, Central America, and Southeast Asia.

Global Forecast System (GFS) Week 2 Precipitation Forecast



Continued abundant precipitation over Southeast Asia with an increase (decrease) in rainfall over West Africa (eastern tropical Pacific).

Potential Benefits/Hazards – Week 1
Valid July 25 – July 31, 2006



1. Hurricane Daniel is expected to continue moving across the central Pacific, and may have an impact on Hawaii.

2. Tropical storm Emilia is expected to strengthen into a hurricane before dissipating off the coast of Baja California. Moisture from Emilia may enhance monsoonal rains over the southwestern U.S including southern California.

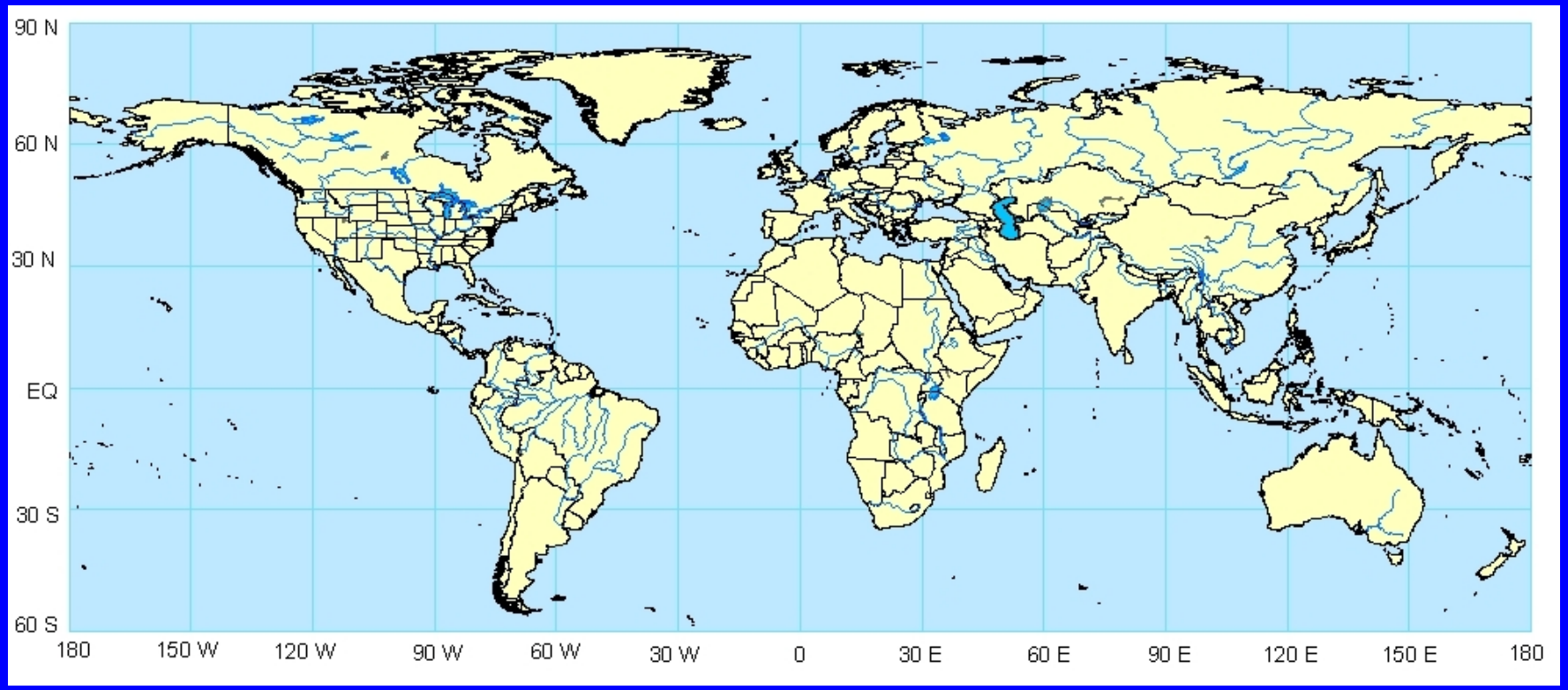
3. Conditions are expected to remain favorable for tropical development over the eastern tropical Pacific.

4. There is an increased probability for above normal rainfall over the eastern Pacific, Central America, and sections of Mexico.

5. Typhoon Kaemi is expected to cross Taiwan before making landfall in southeastern China early in the period.

6. The remnants of Kaemi will likely produce torrential rains over southeastern China. Above normal rainfall is possible over northern Indochina and the northern Philippines.

Potential Benefits/Hazards – Week 2
Valid August 1 – 7, 2006



No benefits/hazards posted. However, conditions may become more favorable for tropical development over the Atlantic Basin.

Summary

- The latest observations indicate that the MJO remains weak.
- During week 1, hurricane Daniel and tropical storm Emilia are currently moving across the eastern Pacific. Daniel may affect Hawaii during the period while moisture from Emilia may enhance monsoonal rainfall across the southwest US. Conditions are expected to remain favorable for tropical development over the eastern Pacific. Above average rainfall is expected across the eastern Pacific Ocean, Central America, and sections of Mexico.
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