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

Update prepared by
Climate Prediction Center / NCEP
October 23, 2006

Outline

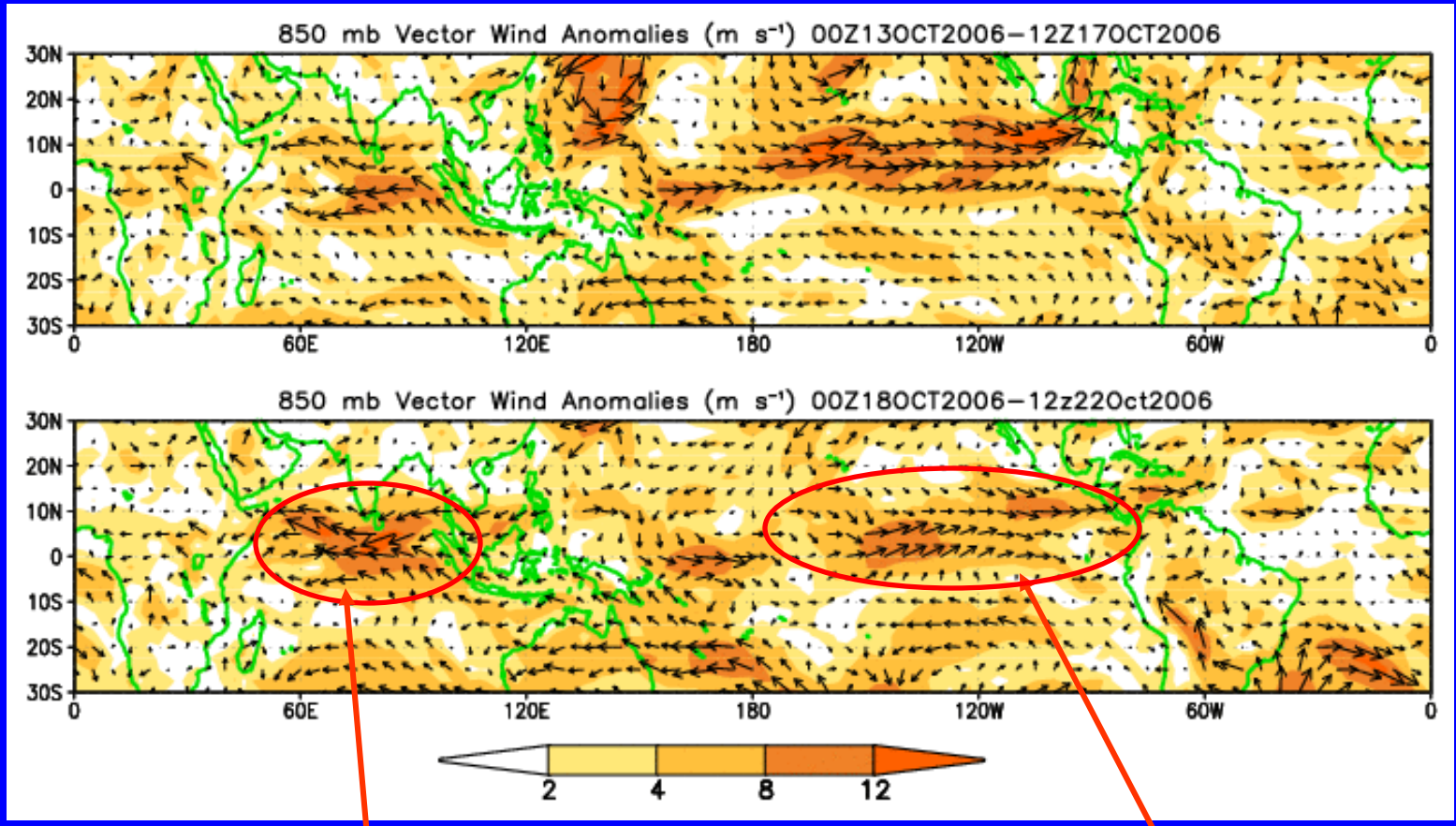
- Overview
- Recent Evolution and Current Conditions
- Madden Julian Oscillation Forecast
- Summary

Overview

- The latest observations indicate that a moderate MJO continues.
- During week 1, wetter than normal conditions are expected for equatorial Africa, the Indian Ocean, and parts of the south Pacific, while drier than normal conditions are expected for the Maritime Continent and surrounding waters. Tropical cyclone Xavier will remain nearly stationary and weaken in the south Pacific at 15S/170E. Elsewhere, in the east Pacific, Hurricane Paul will likely affect the southern Baja and western Mexico. Favorable conditions exist for tropical cyclone development in the eastern Arabian Sea and Bay of Bengal.
- During week 2, above average rainfall is expected for east Africa, the Indian Ocean, and Bay of Bengal. Below average rainfall is anticipated for Indonesia and northern South America. Favorable conditions may persist for tropical cyclone development in the Bay of Bengal.

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

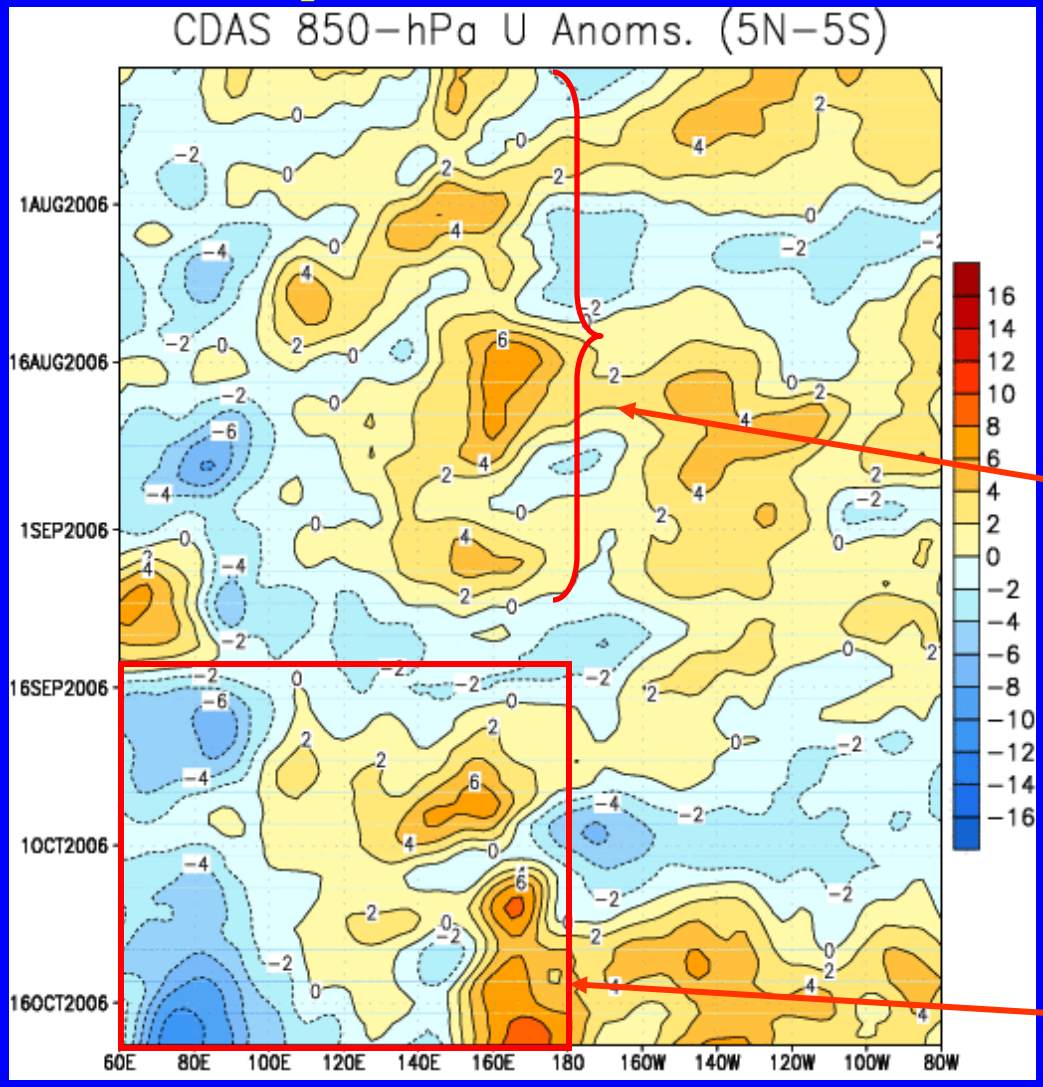
Note that shading denotes the magnitude of the anomalous wind vectors



Easterly anomalies have strengthened across the Indian Ocean.

Westerly anomalies persist east of the Date Line.

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



Time

Longitude

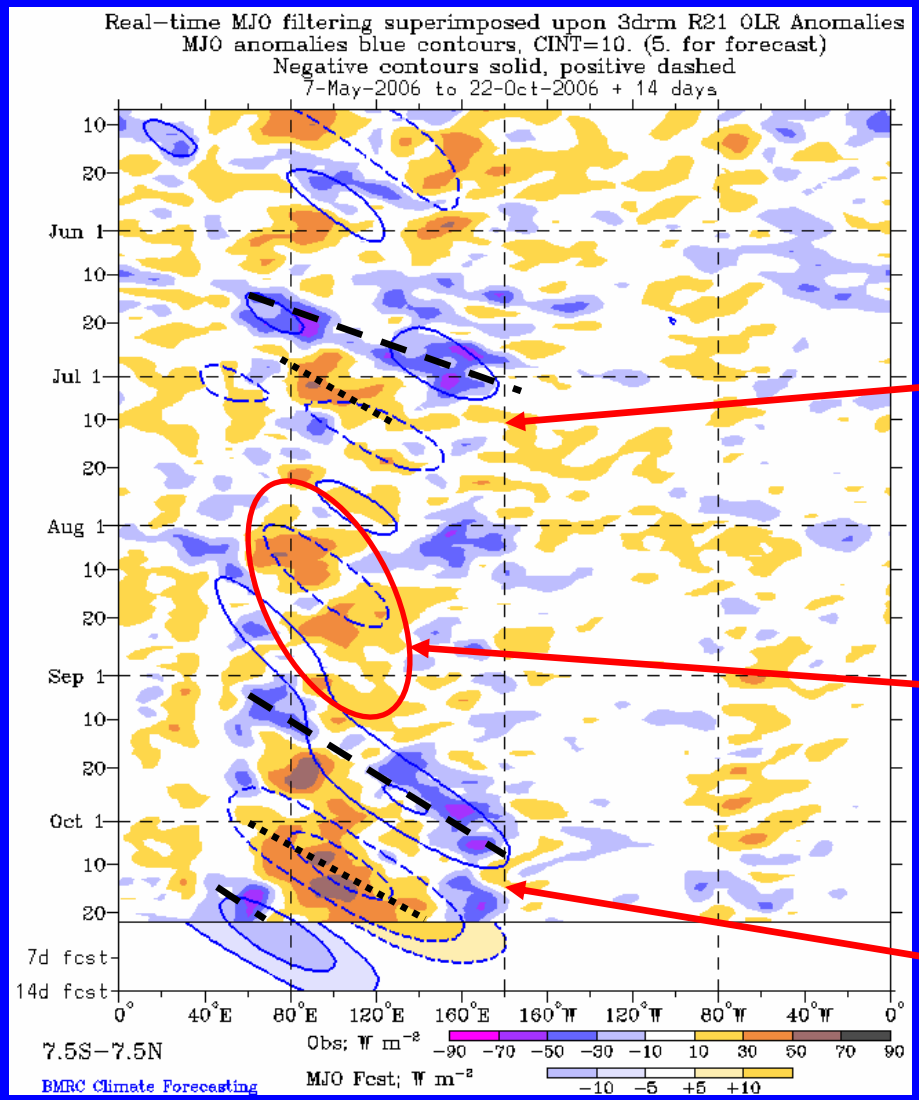
Weaker-than-average easterlies or westerlies (orange/red shading)

Stronger-than-average easterlies (blue shading)

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)



Time

Longitude

Drier-than-average conditions (/red shading)

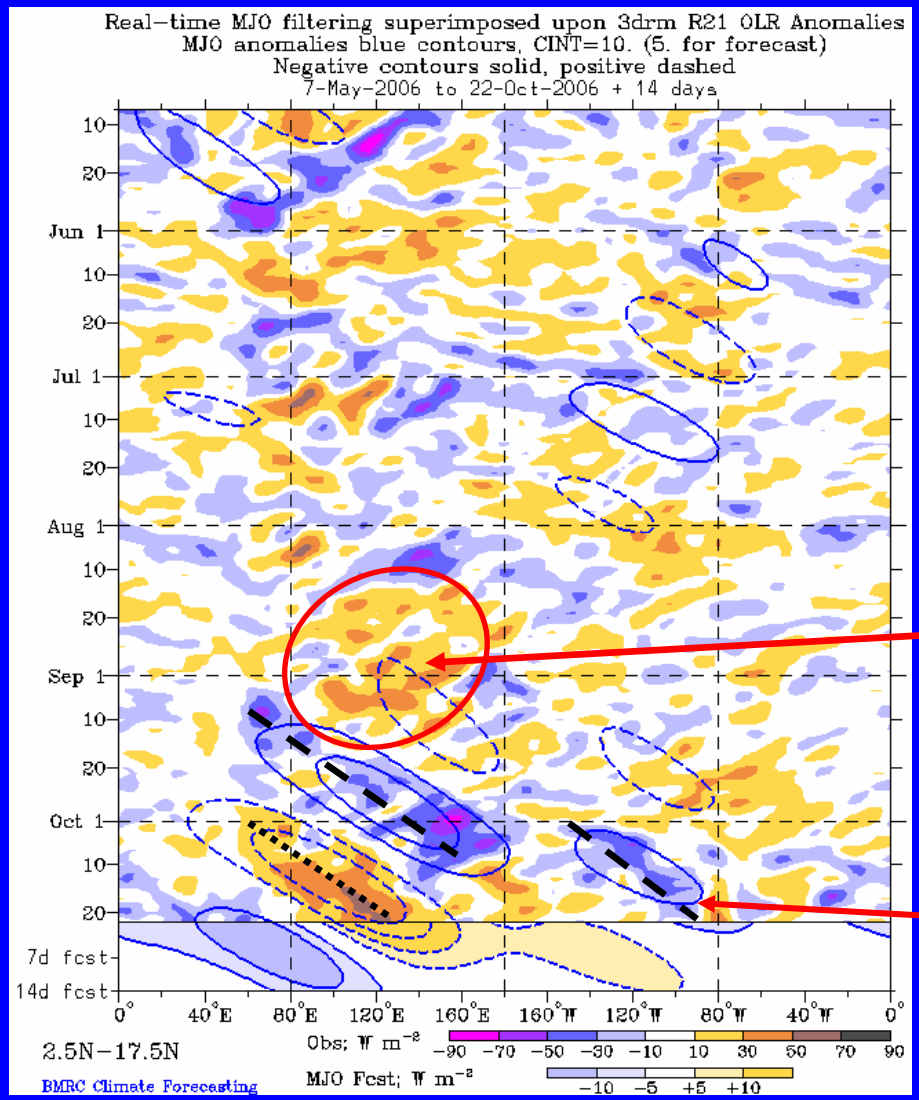
Wetter-than-average conditions (blue shading)

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 developed over the eastern Indian Ocean and shifted east.

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



Time

Longitude

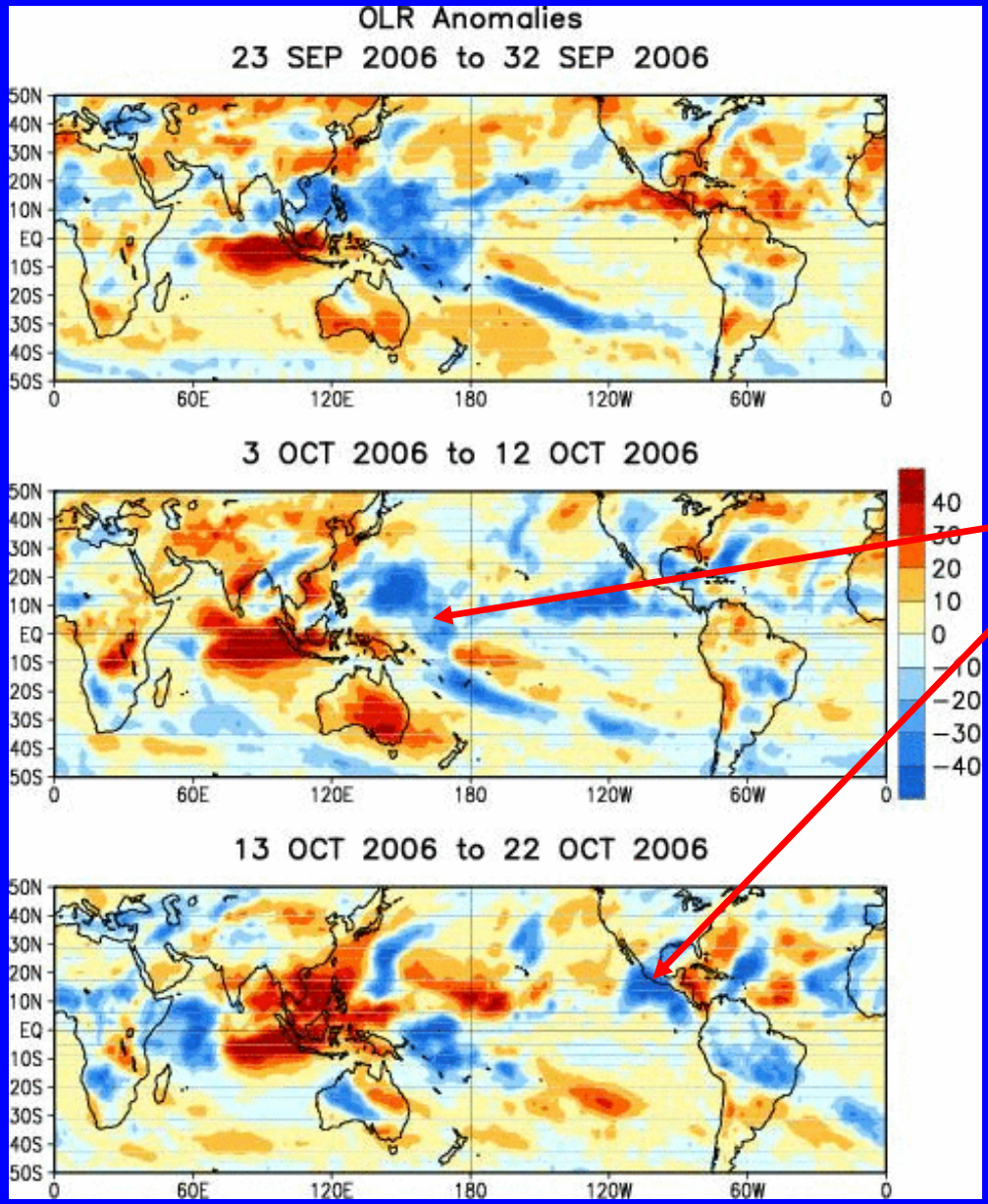
Drier-than-average conditions (/red shading)

Wetter-than-average conditions (blue shading)

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

From late September into mid October, enhanced convection associated with the MJO has shifted eastward across the Pacific Ocean.

Anomalous OLR: Last 30 days

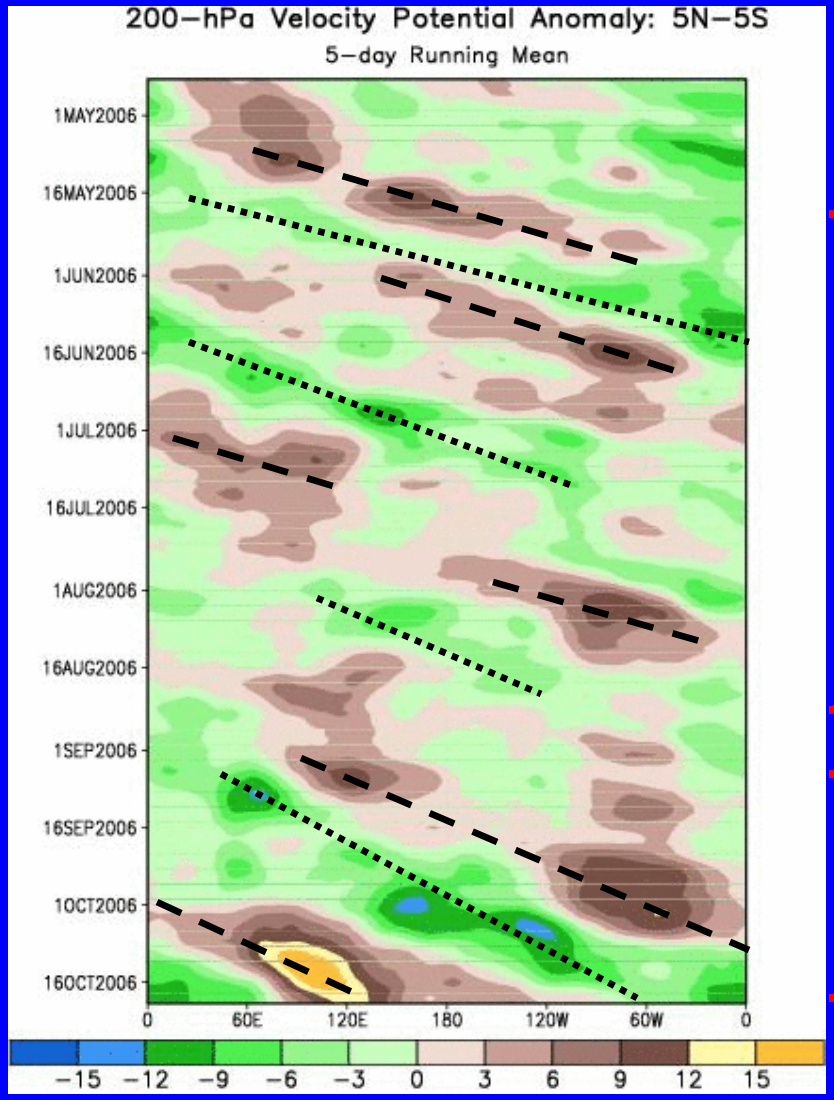


Drier-than-average conditions (red shading)

Wetter-than-average conditions (blue shading)

Beginning mid-September as the MJO developed, wet conditions have shifted east across the Pacific Ocean while dry conditions have recently spread across Southeast Asia.

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



Time

Longitude

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

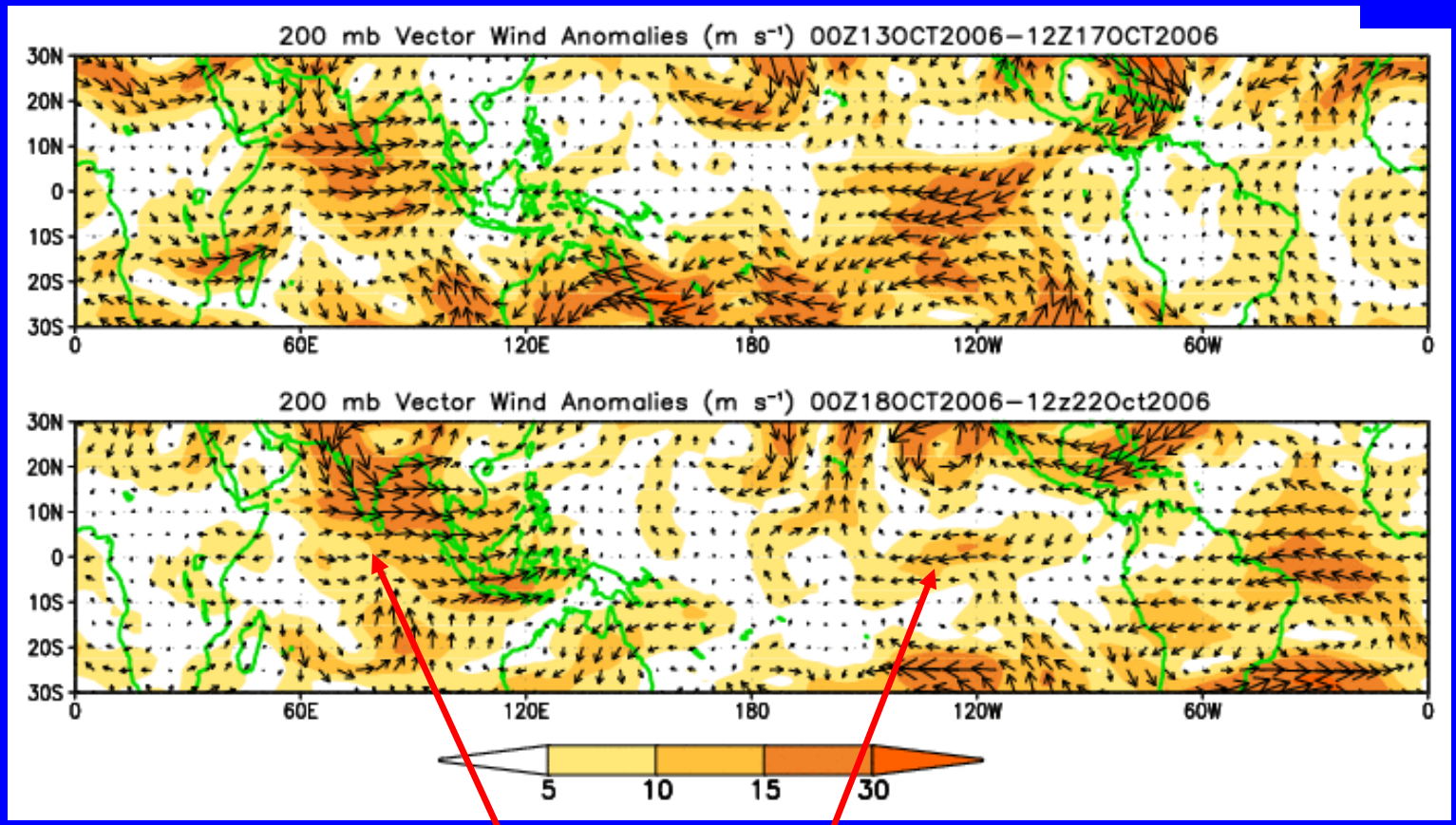
Negative anomalies (green shading) indicate favorable conditions for precipitation.

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

The MJO strengthened during early October as upper-level divergence (convergence) over the Indian ocean (western Pacific) shifted east.

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

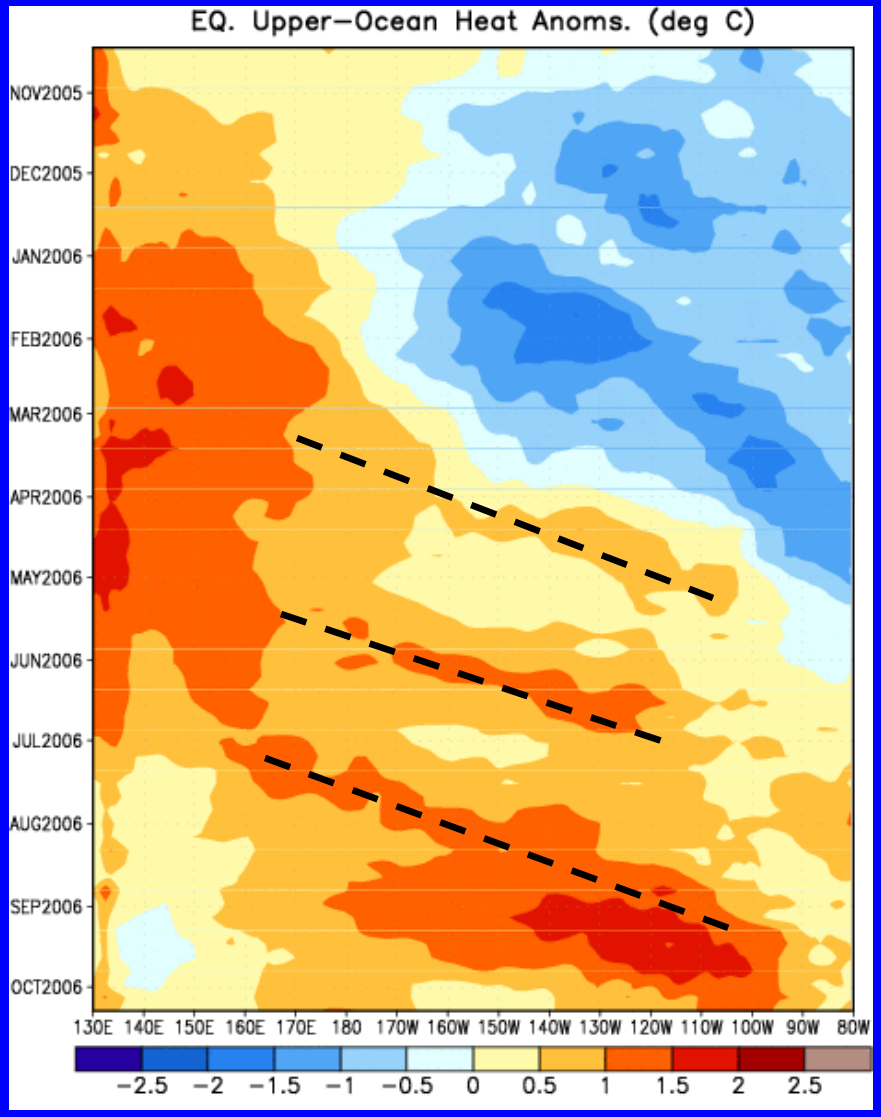
Note that shading denotes the magnitude of the anomalous wind vectors.



Westerly anomalies consistent with an established MJO have shifted into the Indian Ocean with easterly anomalies weakening over the east Pacific.

Heat Content Evolution in the Eq. Pacific

Time



Longitude

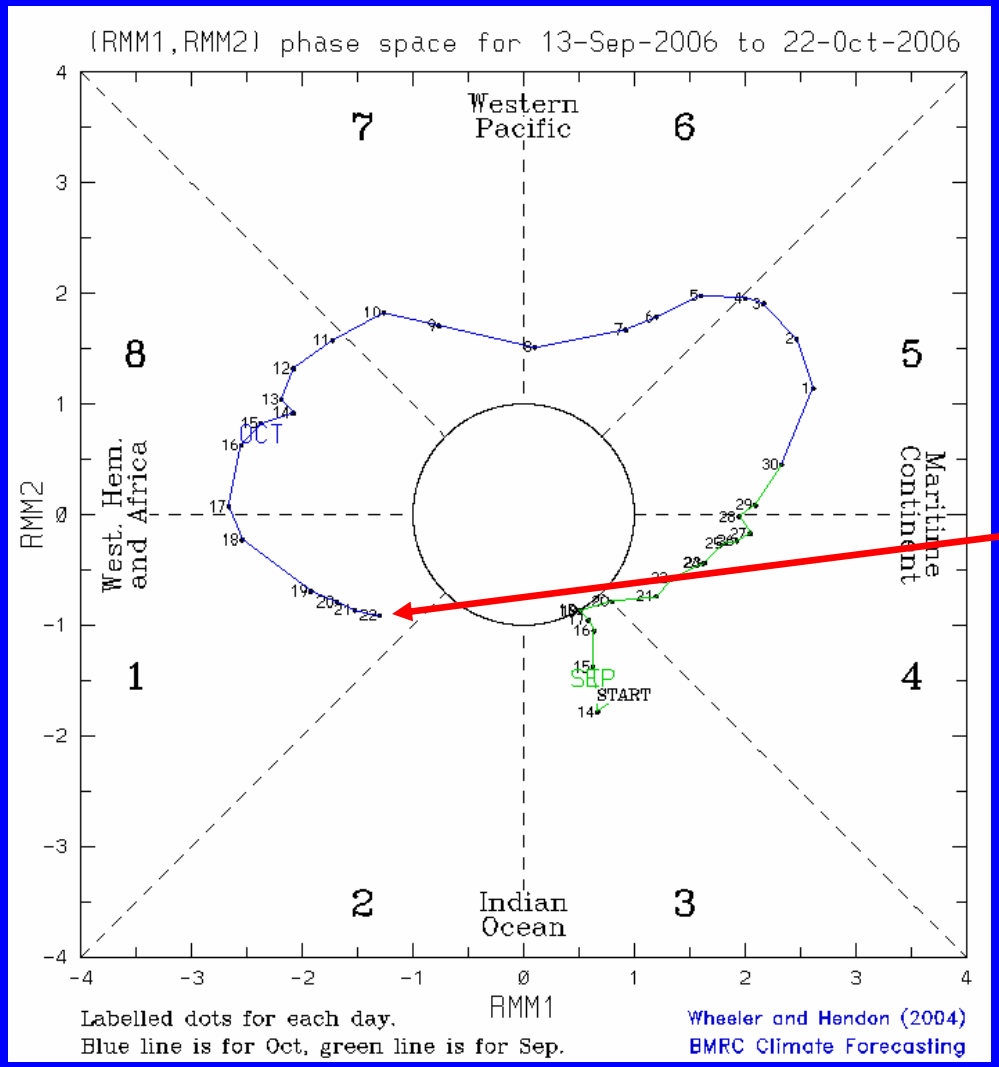
Starting in April, above normal upper oceanic water temperatures expanded from the western Pacific into the eastern Pacific in part due to Kelvin wave activity.

Currently, positive upper oceanic heat content anomalies are observed throughout the central and eastern equatorial Pacific.

MJO Index (Magnitude and Phase)

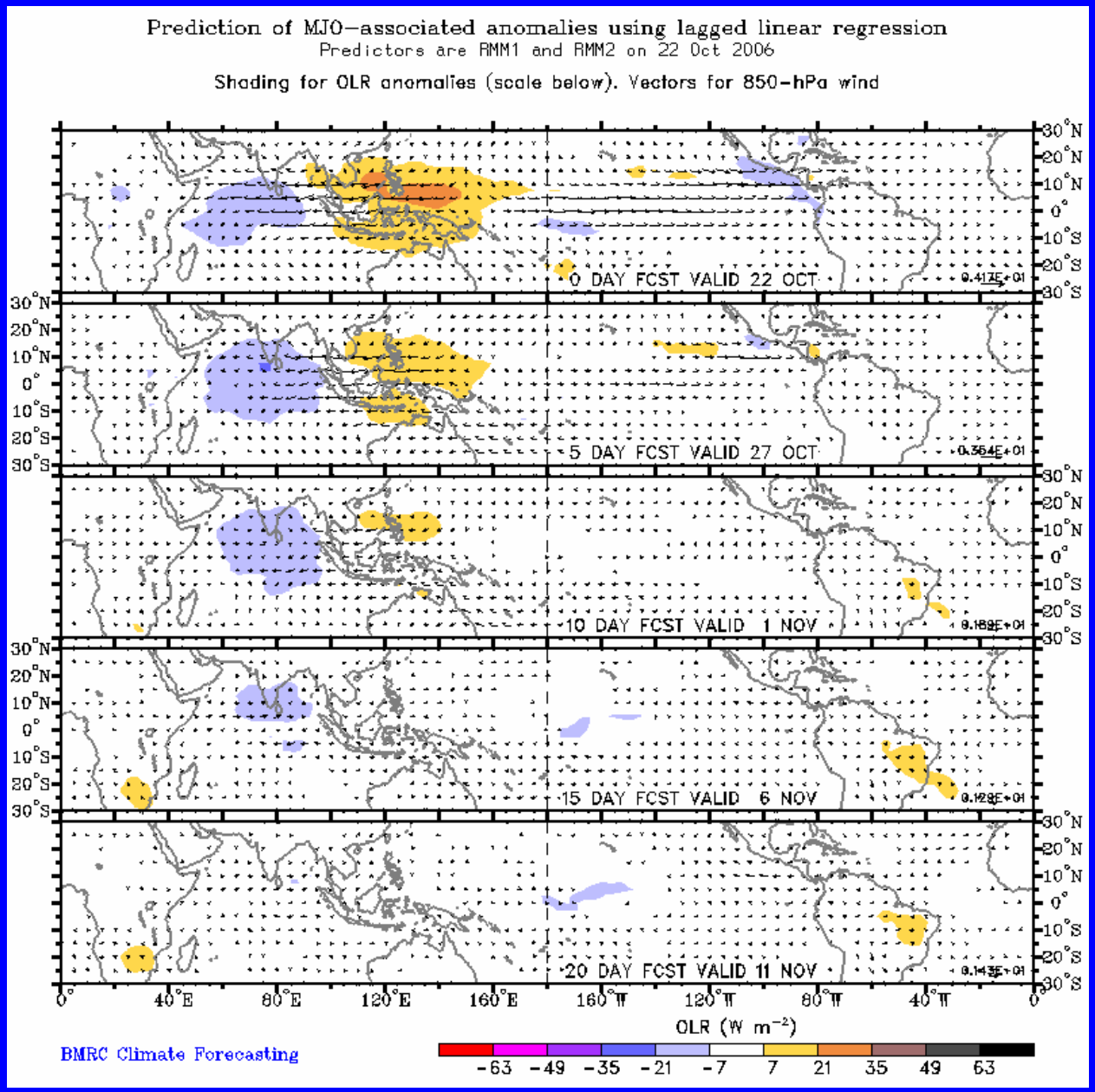
The current state of the MJO as determined by an index based on Empirical Orthogonal Function (EOF) analysis using combined fields of near-equatorially-averaged 850 hPa zonal wind, 200 hPa zonal wind, and satellite-observed outgoing longwave radiation (OLR) (Wheeler and Hendon, 2004).

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.



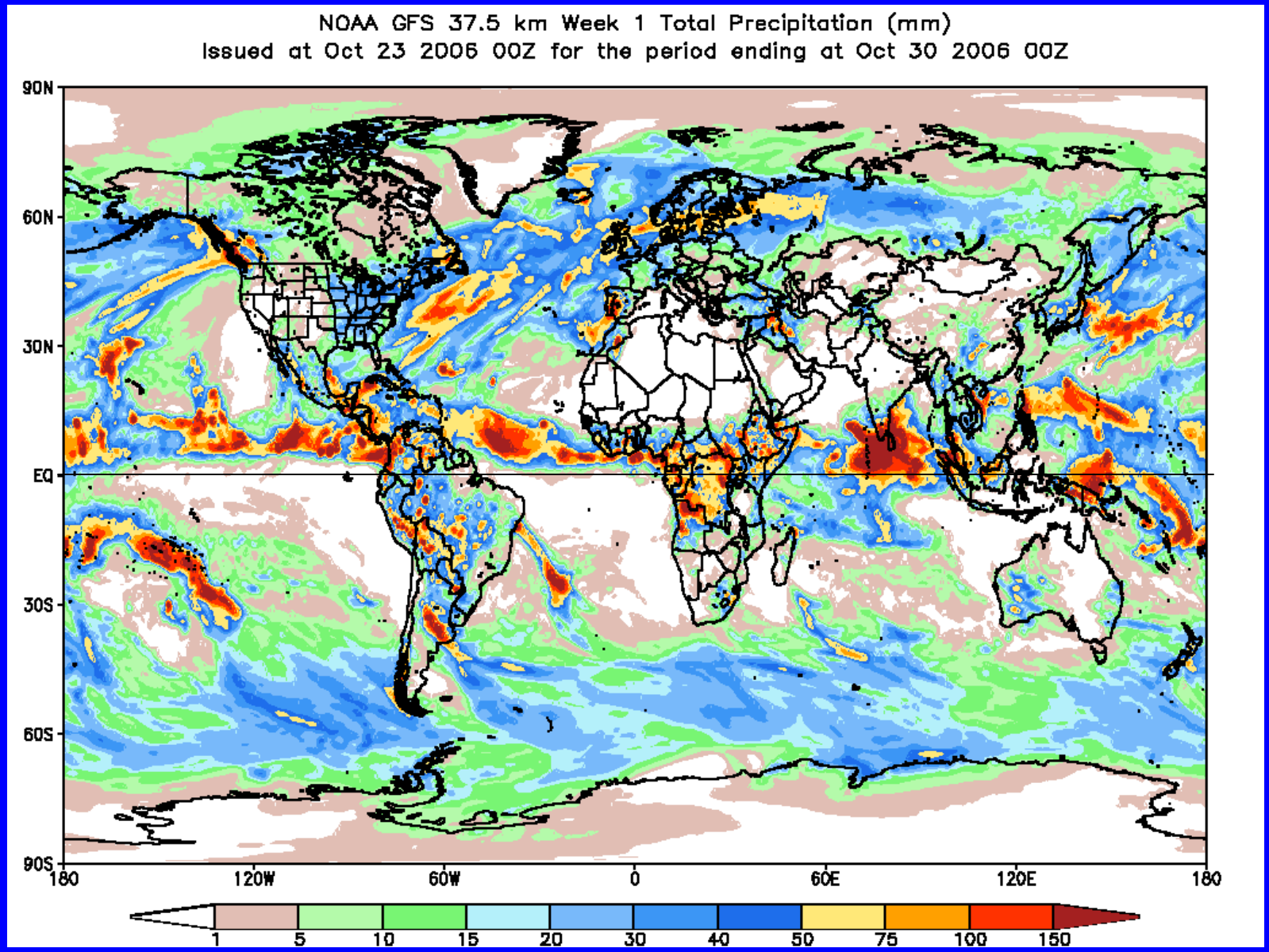
A moderate MJO continues with the enhanced phase entering the eastern Hemisphere.

Statistical OLR MJO Forecast

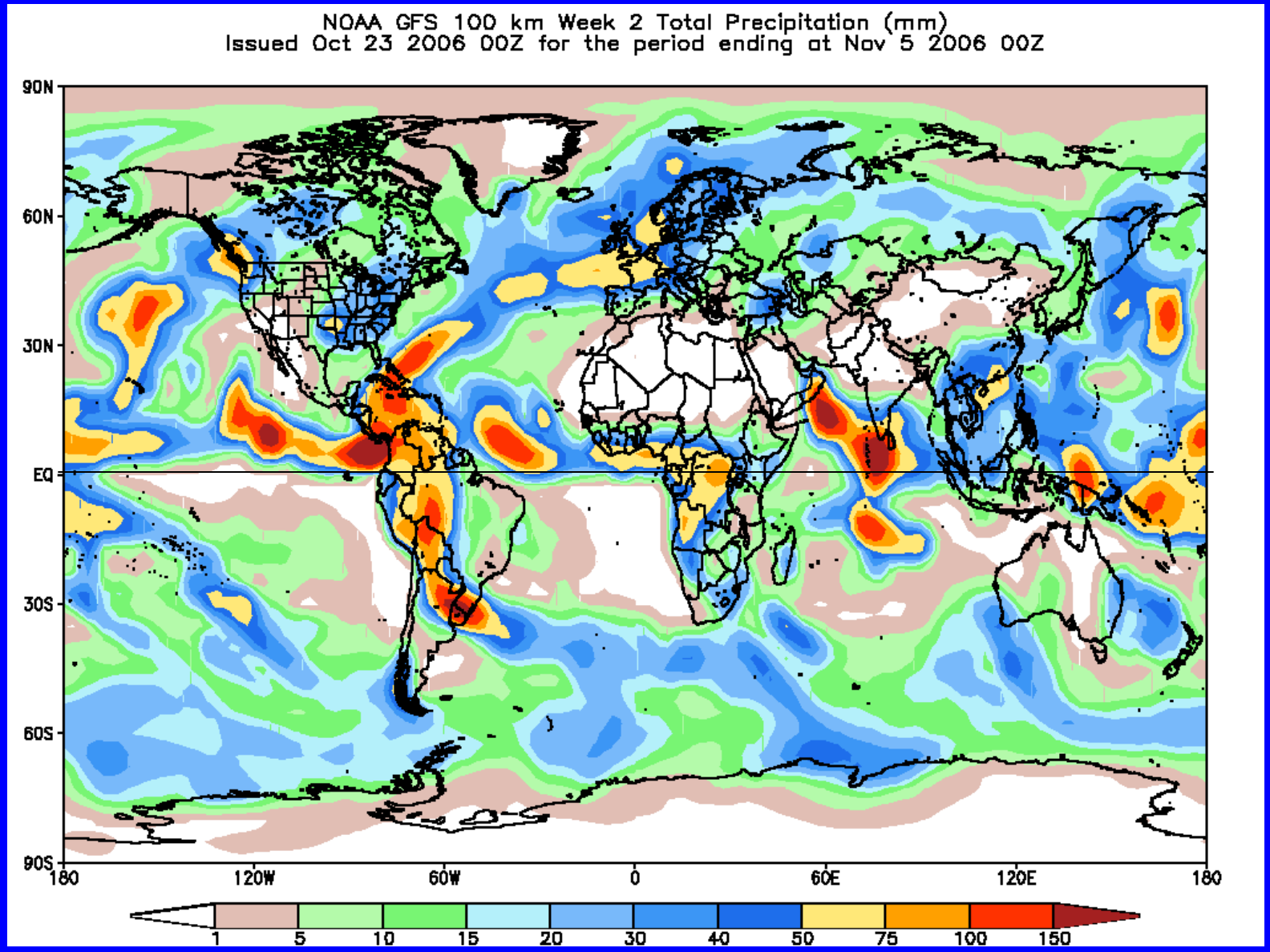


Drier than normal conditions are forecast to gradually diminish over the Maritime Continent with wetter than normal conditions across the Indian Ocean during weeks 1 & 2.

Global Forecast System (GFS) Week 1 Precipitation Forecast

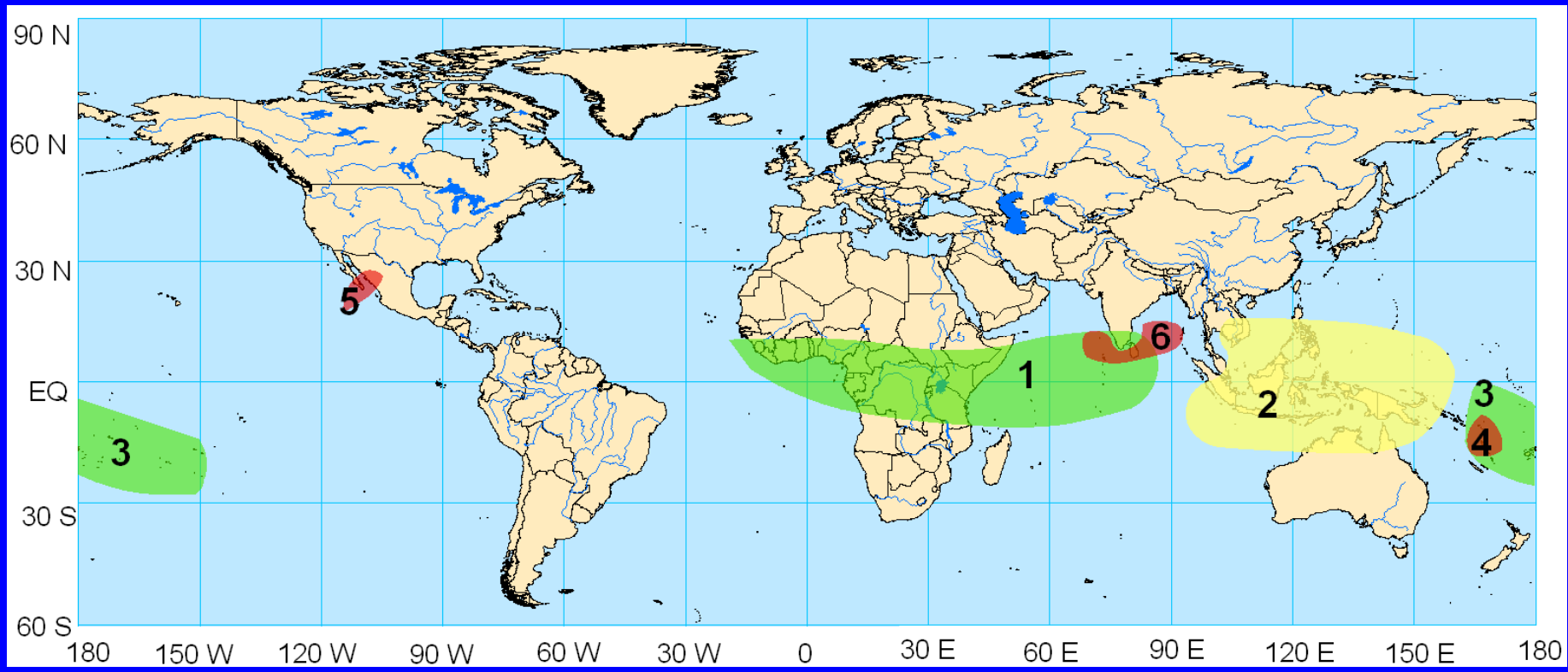


Global Forecast System (GFS) Week 2 Precipitation Forecast



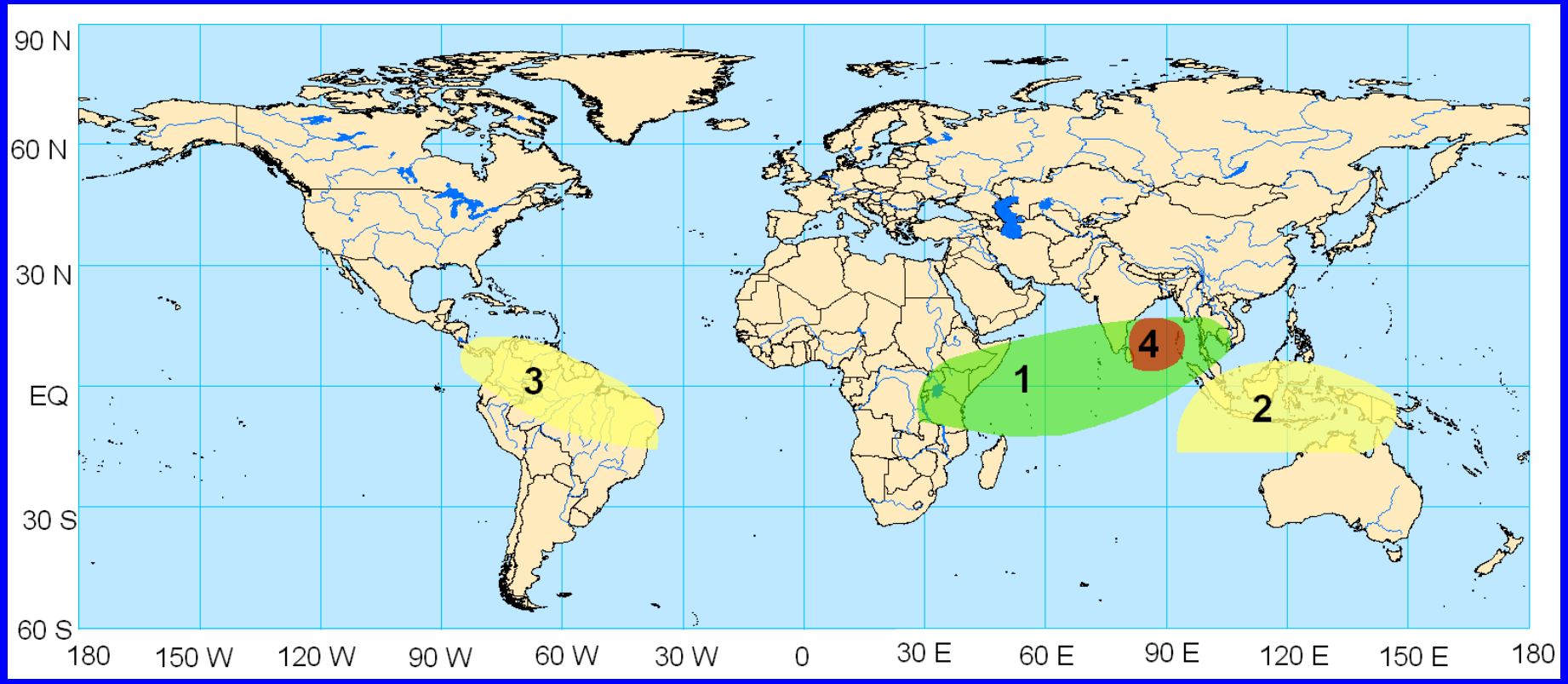
Potential Benefits/Hazards – Week 1

Valid October 24 - 30, 2006



1. An increased chance for above normal rainfall across equatorial Africa and the Indian Ocean.
2. An increased chance for below normal rainfall across the Maritime Continent and adjacent waters.
3. An increased chance for above normal rainfall across the south Pacific surrounding the Date Line.
4. Across the south Pacific, Tropical Cyclone Xavier will remain nearly stationary and gradually weaken.
5. Hurricane Paul will affect the southern Baja and western Mexico.
6. Favorable conditions for tropical cyclone development in the eastern Arabian Sea and Bay of Bengal.

Potential Benefits/Hazards – Week 2
Valid October 31 – November 6, 2006



1. An increased chance for above normal rainfall across east Africa, the Indian Ocean, southern India, and the Bay of Bengal.
2. An increased chance for below normal rainfall across Indonesia.
3. An increased chance for below normal rainfall across Panama and northern South America.
4. Favorable conditions for tropical cyclone development in the Bay of Bengal.

Summary

- The latest observations indicate that a moderate MJO continues.
- During week 1, wetter than normal conditions are expected for equatorial Africa, the Indian Ocean, and parts of the south Pacific, while drier than normal conditions are expected for the Maritime Continent and surrounding waters. Tropical cyclone Xavier will remain nearly stationary and weaken in the south Pacific at 15S/170E. Elsewhere, in the east Pacific, Hurricane Paul will likely affect the southern Baja and western Mexico. Favorable conditions exist for tropical cyclone development in the eastern Arabian Sea and Bay of Bengal.
- During week 2, above average rainfall is expected for east Africa, the Indian Ocean, and Bay of Bengal. Below average rainfall is anticipated for Indonesia and northern South America. Favorable conditions may persist for tropical cyclone development in the Bay of Bengal.