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

Update prepared by
Climate Prediction Center / NCEP
March 19, 2007

Outline

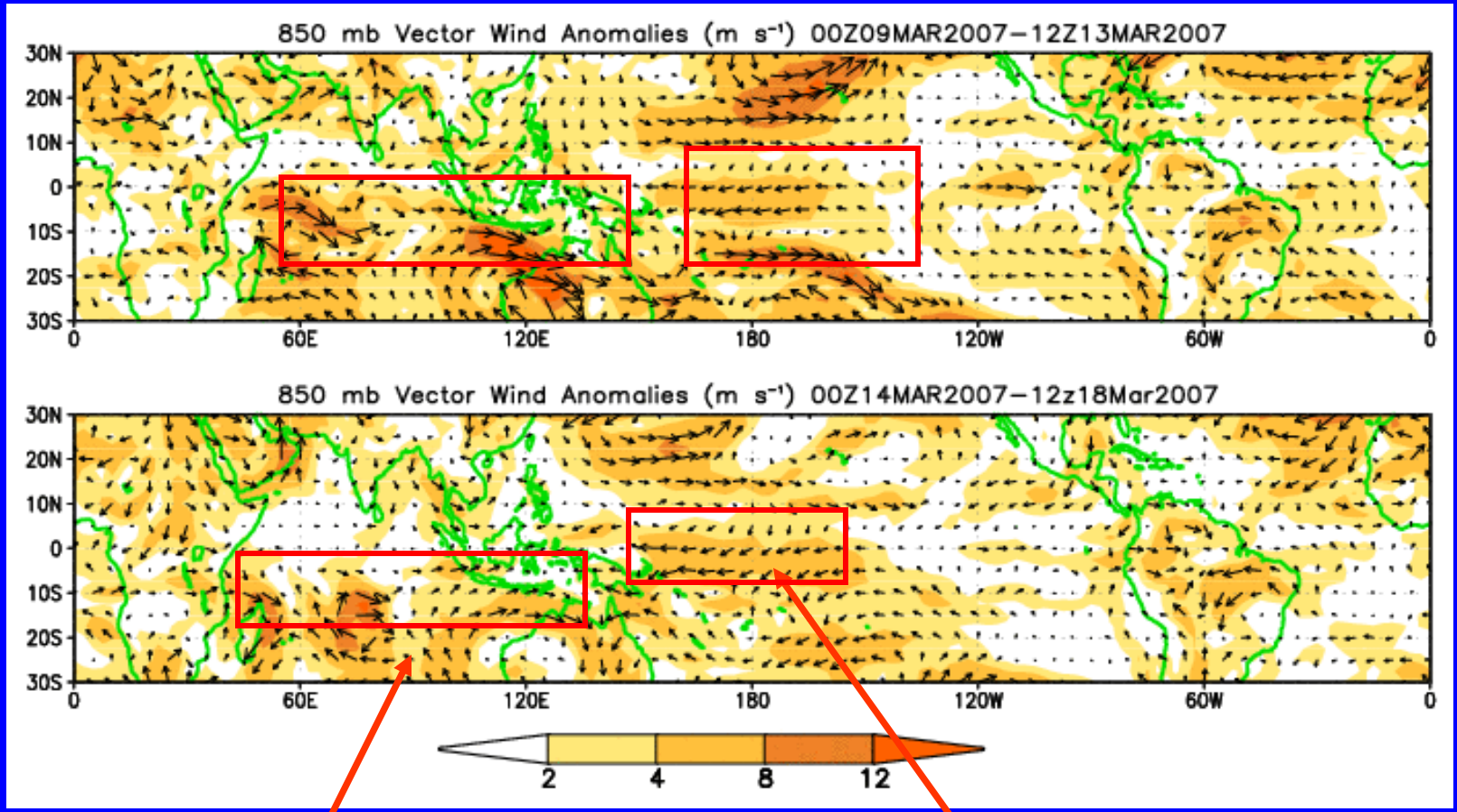
- Overview
- Recent Evolution and Current Conditions
- Madden Julian Oscillation Forecast
- Summary

Overview

- **The MJO remains weak.**
- **Throughout the period, there exists an increased chance for above normal rainfall for sections of northern Australia and the Maritime Continent.**
- **Wet conditions are expected to prevail for sections of west central Brazil during week1.**

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

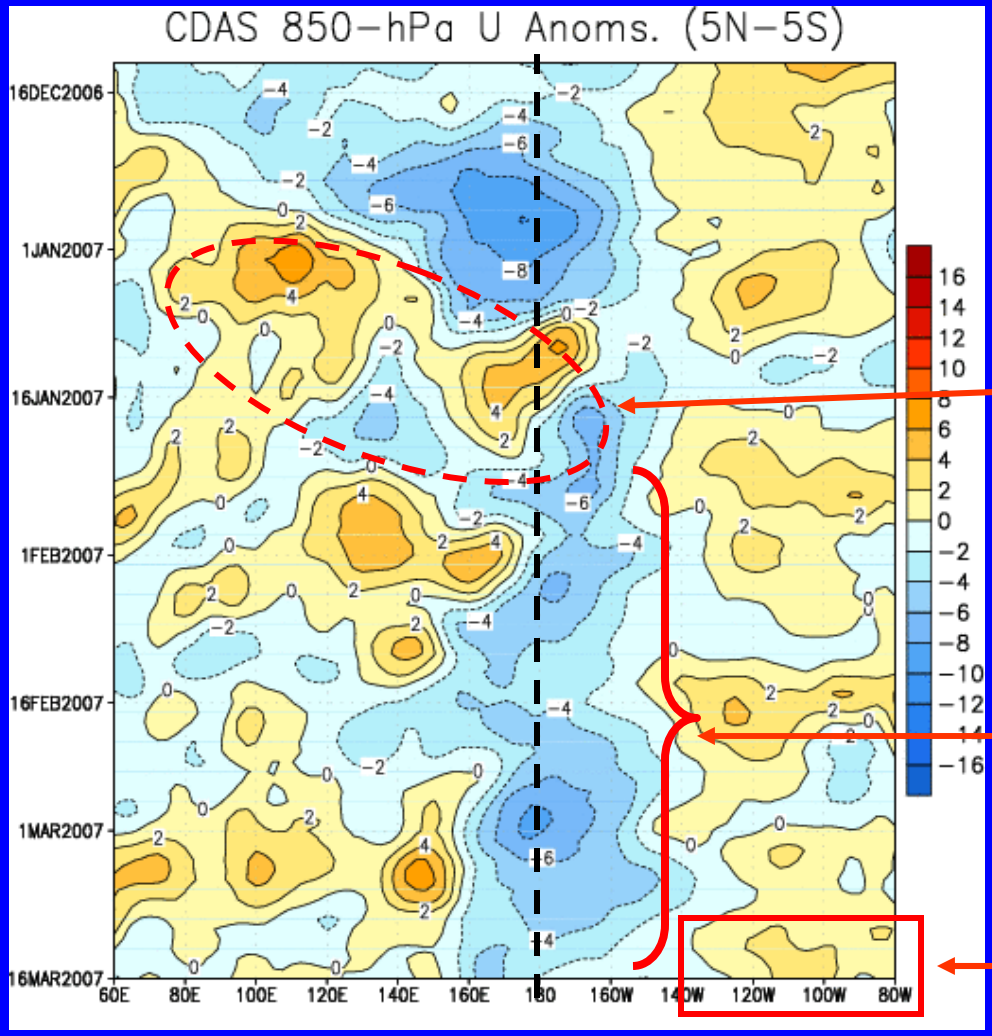
Note that shading denotes the magnitude of the anomalous wind vectors



Anomalous westerlies across the Maritime continent and Indian Ocean have weakened.

Anomalous easterlies remain in the equatorial western Pacific, but have weakened.

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



Time

Longitude

Westerly anomalies (orange/red shading) represent anomalous west-to-east flow.

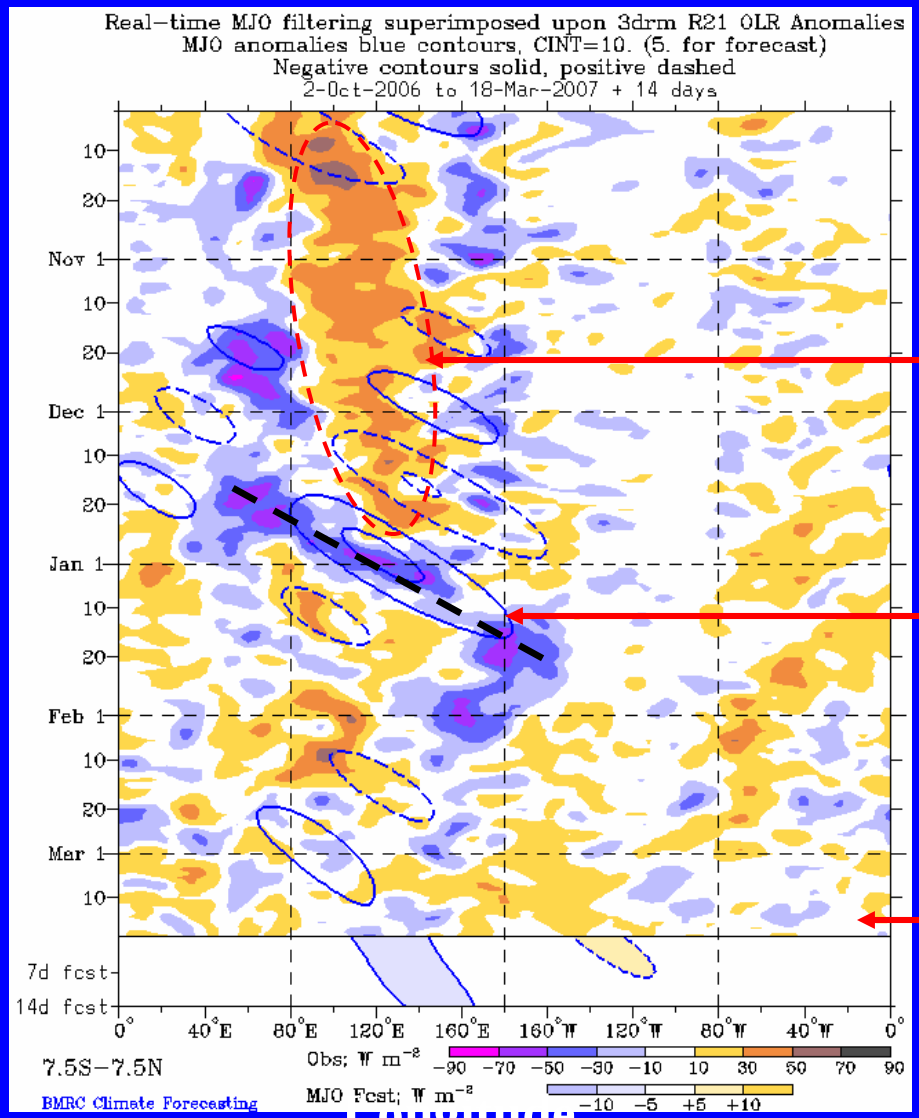
Easterly anomalies (blue shading) represent anomalous east-to-west flow.

Westerly anomalies associated with the MJO shifted from the equatorial Indian Ocean to the central equatorial Pacific during early January 2007.

Easterly anomalies continued to persist near the Date Line since mid-January.

Recently, weak westerly anomalies persisted over the eastern and central Pacific.

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



Time

Longitude

Drier-than-average conditions, positive OLR anomalies (/red shading)

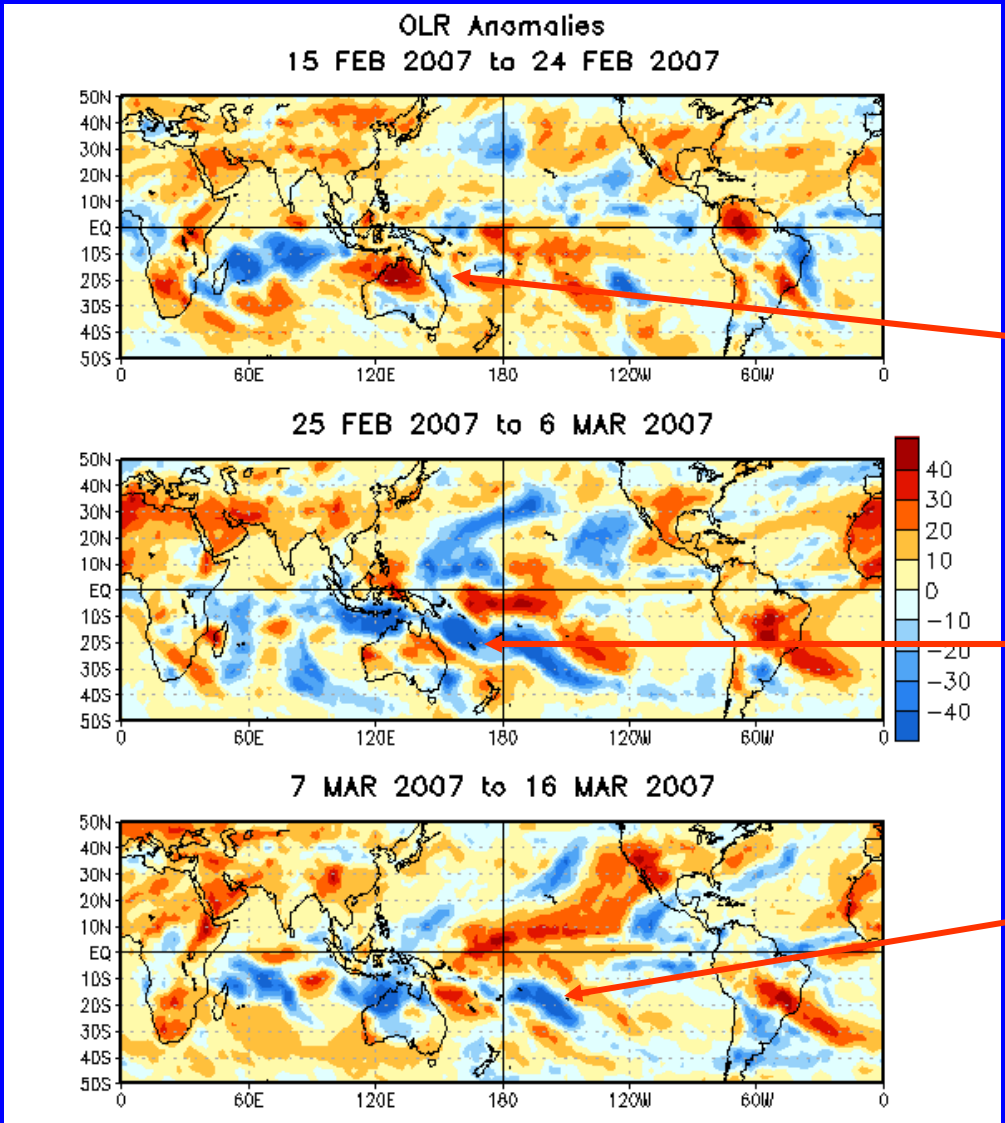
Wetter-than-average conditions, negative OLR anomalies (blue shading)

Strong suppressed convection was evident across the Maritime Continent (100E-150E) from late September to mid-December.

Enhanced convection, associated with the MJO in late December and January, shifted eastward from the Indian Ocean across the Maritime Continent and western Pacific.

Currently, OLR anomalies along the equator remain small. Weak suppressed (enhanced) convection is evident across sections of the western Pacific Ocean (Indonesia).

Anomalous OLR: Last 30 days



Drier-than-average conditions, positive OLR anomalies (red shading)

Wetter-than-average conditions, negative OLR anomalies (blue shading)

During mid February, dry conditions prevailed across sections of the eastern Indian Ocean, Maritime continent, and Australia.

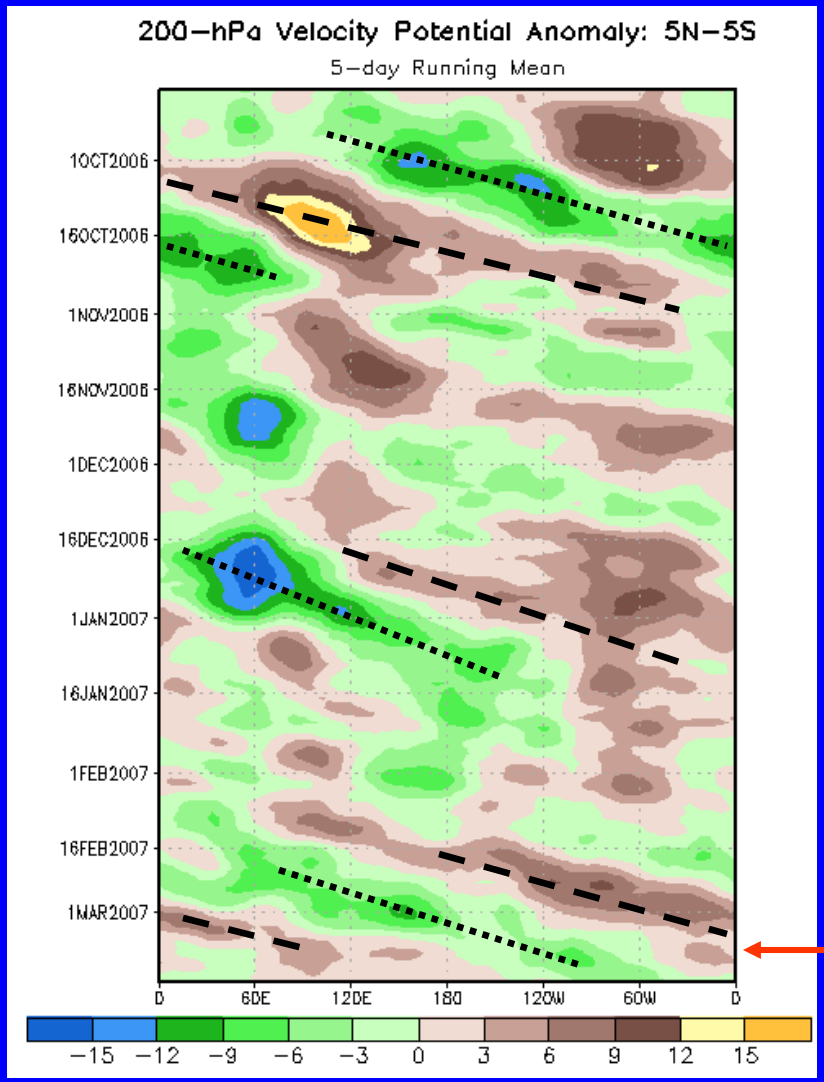
During late February and early March, enhanced convection developed across the southern Maritime continent, northern Australia and adjacent waters and extended eastward to include the South Pacific Convergence Zone.

Recently, enhanced convection persisted in the South Pacific Convergence Zone east of the dateline, across the southern Maritime continent, northern Australia and adjacent waters, and over the central Indian Ocean.

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

<u>Positive</u> anomalies (brown shading) indicate unfavorable conditions for precipitation.

<u>Negative</u> anomalies (green shading) indicate favorable conditions for precipitation.



Time

Longitude

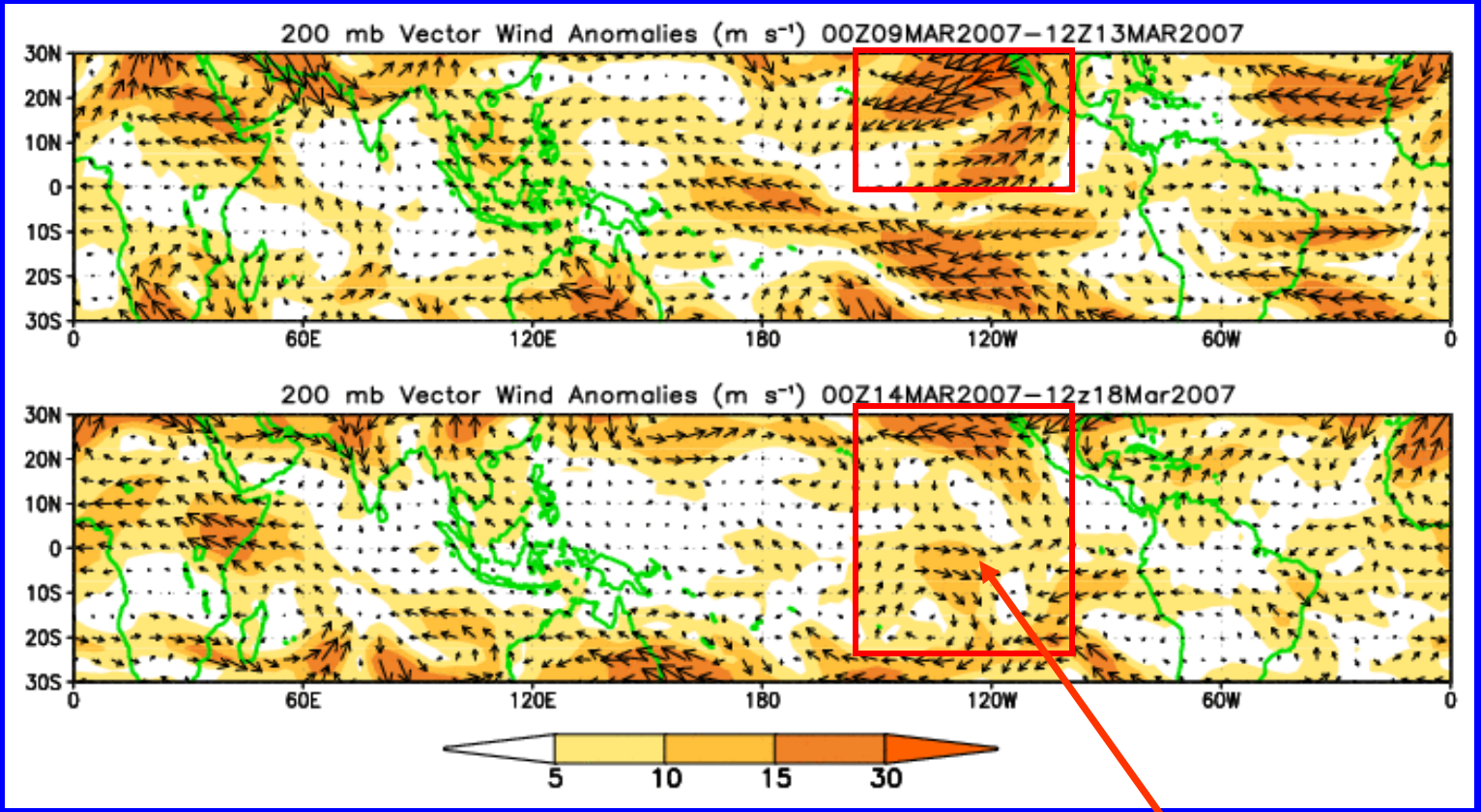
Moderate to strong MJO activity was observed from late-September to mid-October.

The MJO intensified in late December 2006, as negative OLR anomalies shifted eastward from the Maritime continent into the central tropical Pacific.

Weak to moderate MJO activity was observed during late February and early March as velocity potential anomalies shifted eastward.

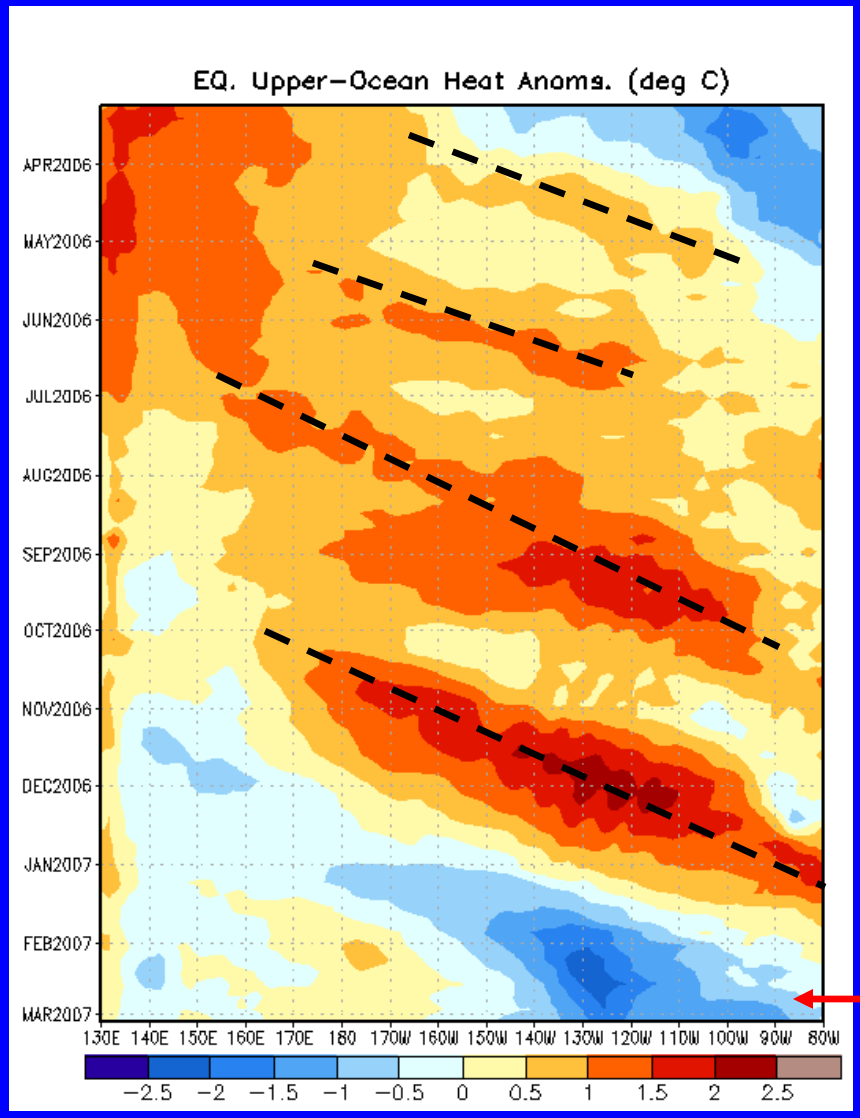
200-hPa Vector Winds and Anomalies ($m\ s^{-1}$)

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



Anomalous upper-level cyclonic couplet on both sides of the equator in the eastern Pacific has weakened.

Heat Content Evolution in the Eq. Pacific



Time

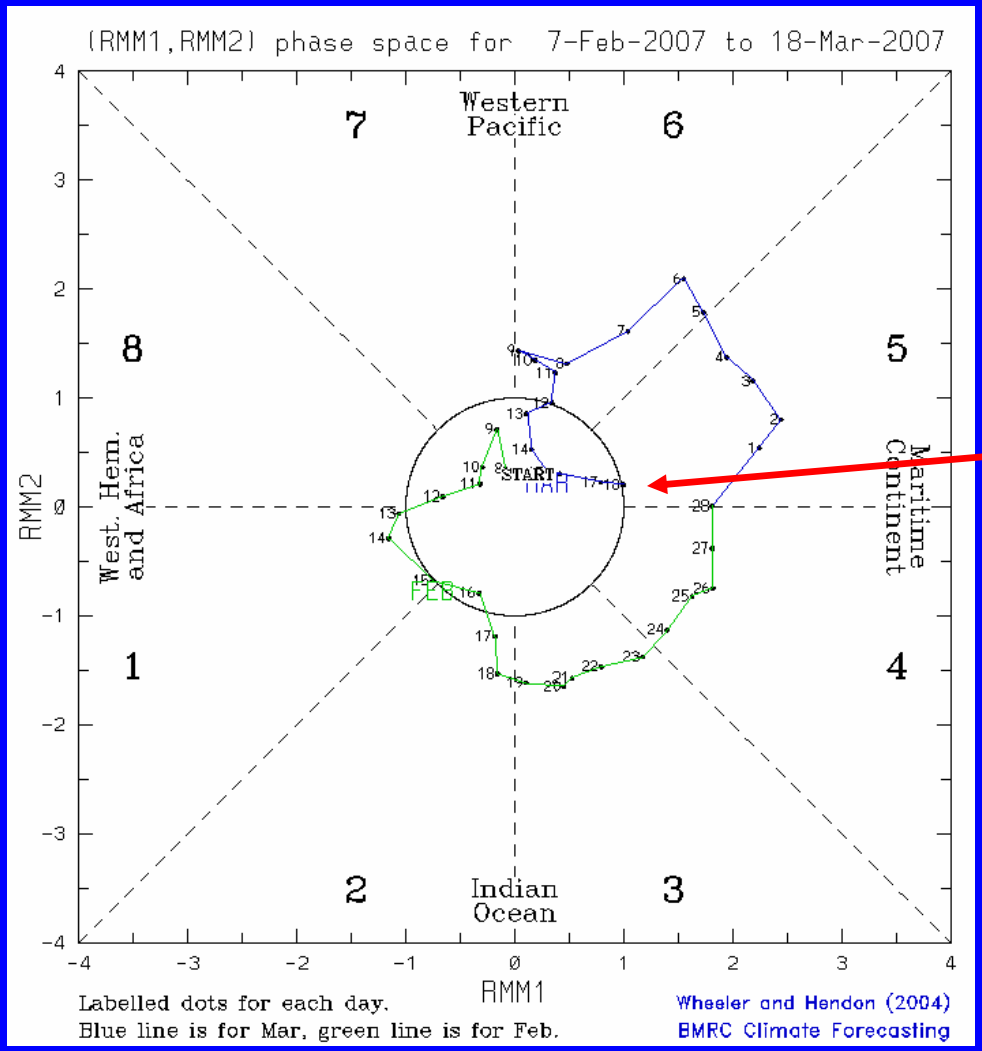
Longitude

Starting in April, above normal upper oceanic water temperatures expanded from the western Pacific into the eastern Pacific.

During this period eastward-propagating Kelvin waves (warm phases indicated by dashed lines) have caused considerable month-to-month variability in the upper-ocean heat content.

Recently, negative heat content anomalies are evident across the eastern equatorial Pacific.

MJO Index (Magnitude and Phase)

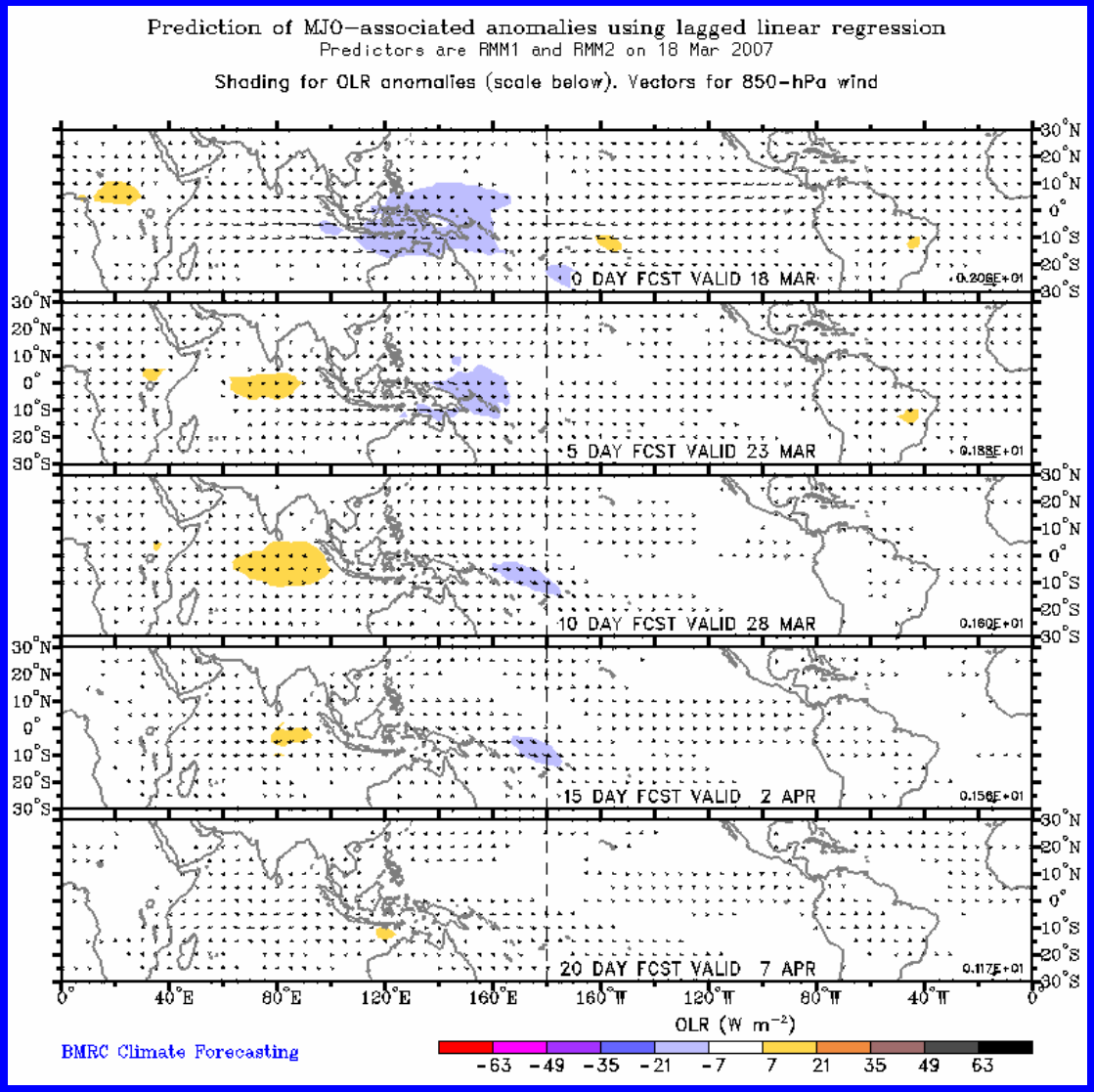


The current state of the MJO as determined by an index based on Empirical Orthogonal Function (EOF) analysis using combined fields of near-equatorially-averaged 850-hPa zonal wind, 200- hPa zonal wind, and satellite-observed outgoing longwave radiation (OLR) (Wheeler and Hendon, 2004).

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.

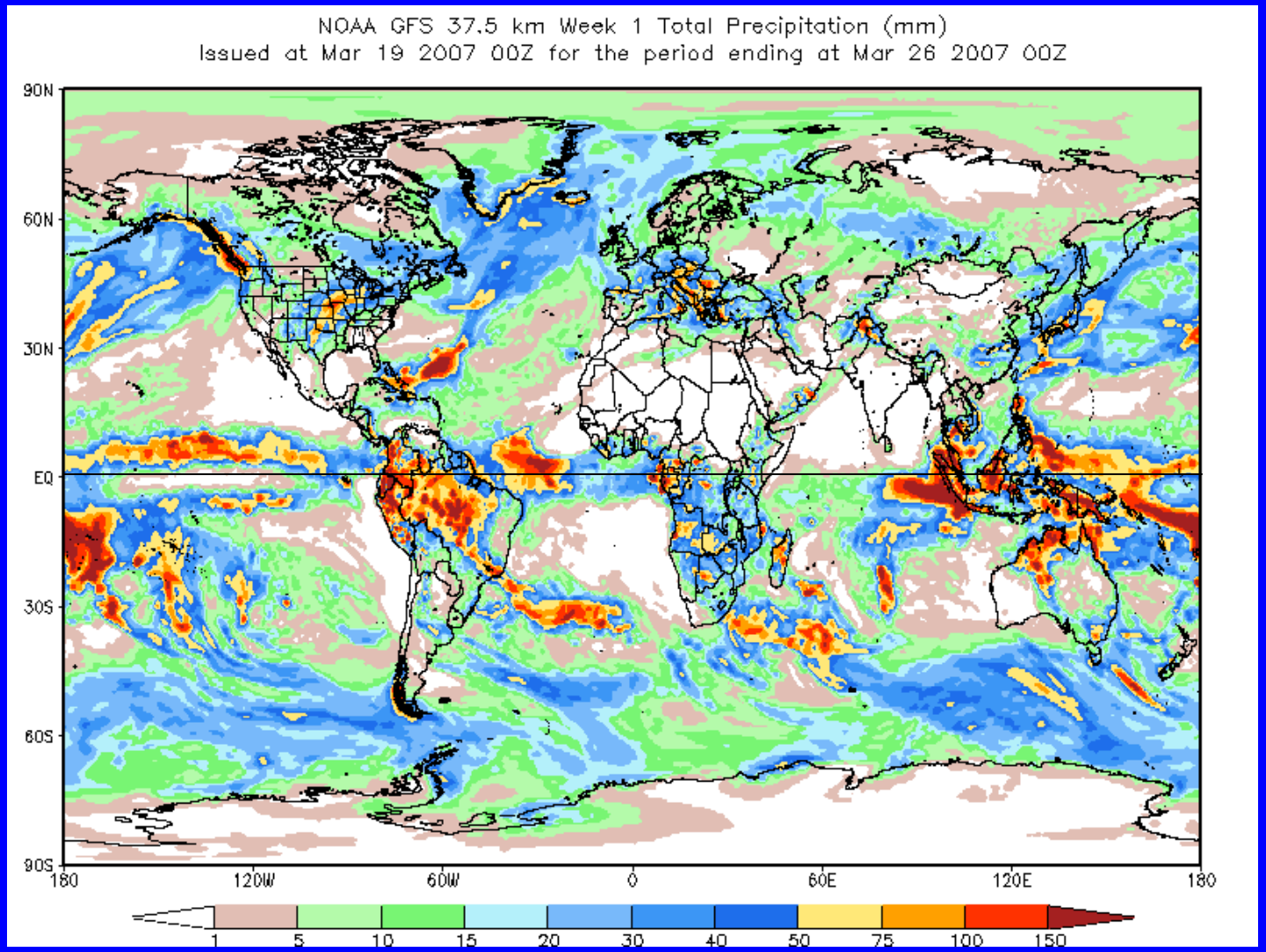
The MJO index indicates weak MJO activity.

Statistical OLR MJO Forecast

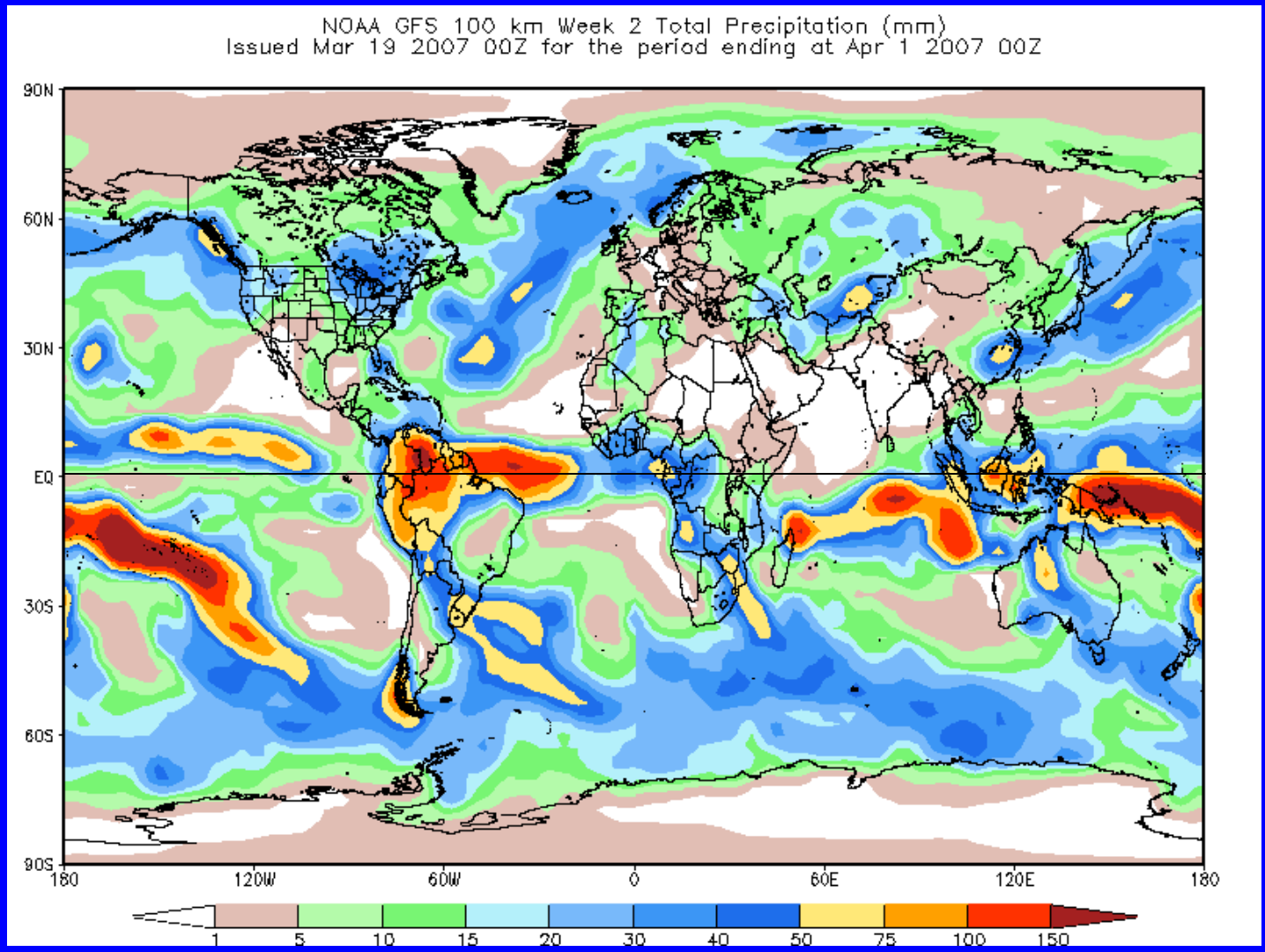


The forecast indicates weak enhanced convection for the western Pacific Ocean and drier than normal conditions for the Indian Ocean during the next 5-10 days.

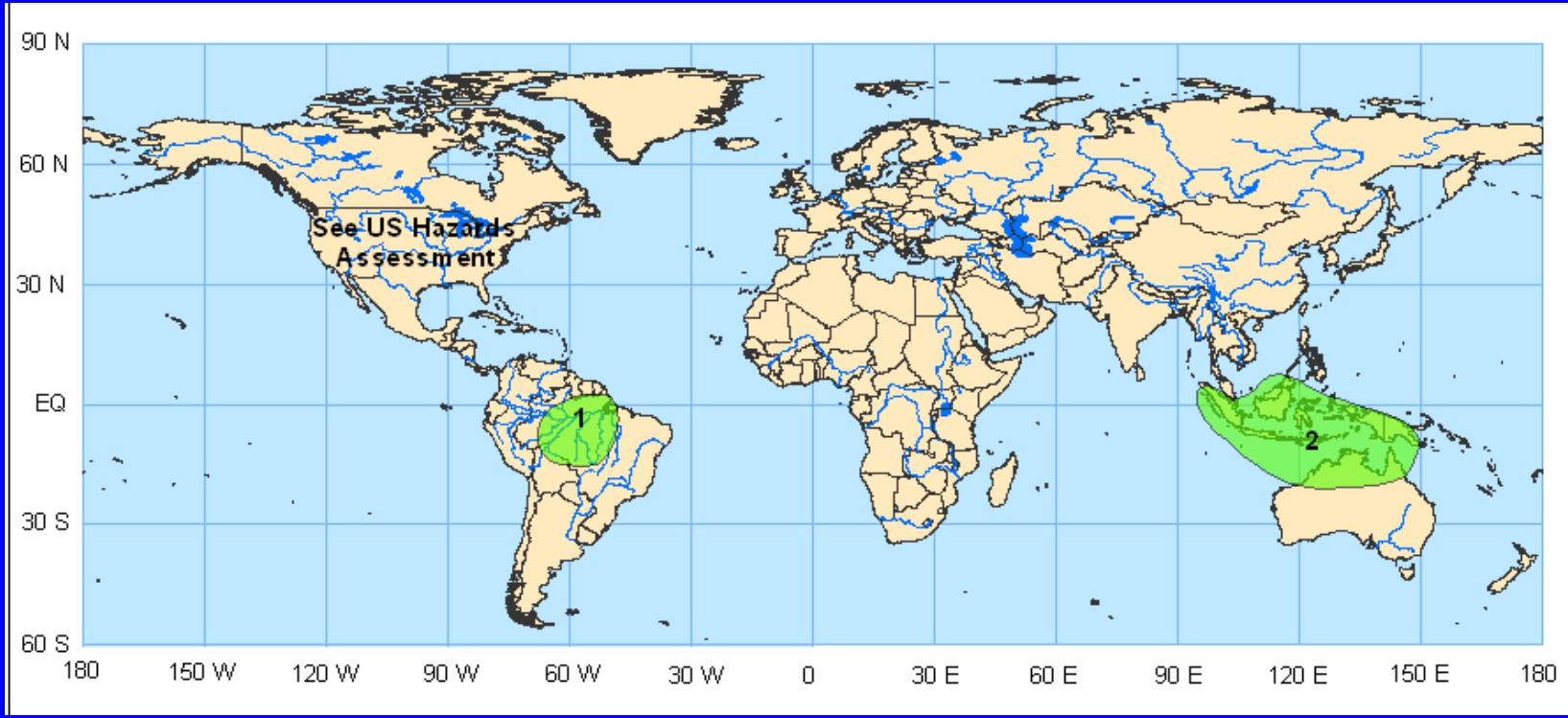
Global Forecast System (GFS) Week 1 Precipitation Forecast



Global Forecast System (GFS) Week 2 Precipitation Forecast



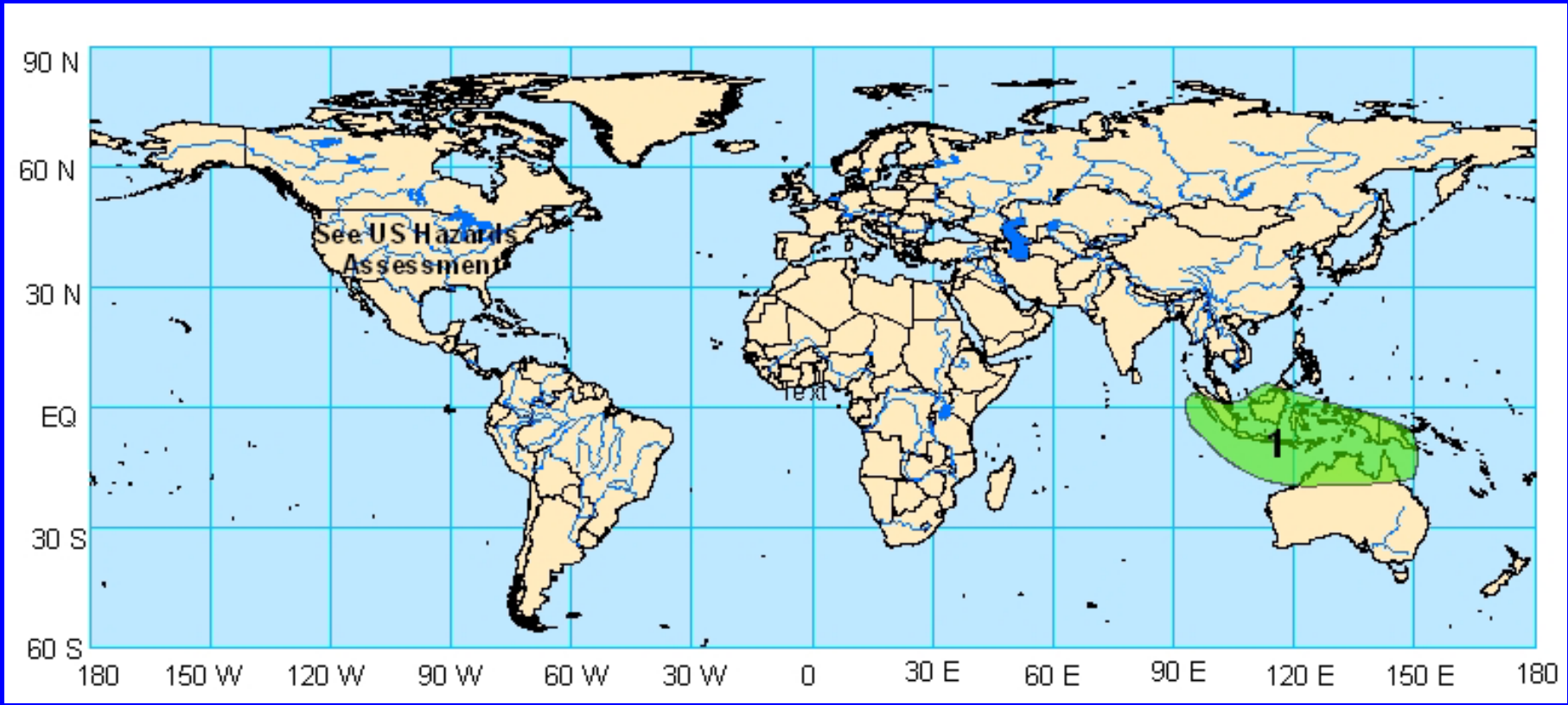
Potential Benefits/Hazards – Week 1
Valid: 20-26 March 2007



1. **An increased chance of above-rainfall over northwestern Brazil.**
2. **An increased chance of above-normal rainfall for sections of northern Australia and the Maritime Continent.**

Potential Benefits/Hazards – Week 2

Valid: 27 March - 2 April 2007



1. **An increased chance of above-normal rainfall for sections of northern Australia and the Maritime Continent.**

Summary

- **The MJO remains weak.**
- **Throughout the period, there exists an increased chance for above normal rainfall for sections of northern Australia and the Maritime Continent.**
- **Wet conditions are expected to prevail for sections of west central Brazil during week1.**