

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

Update prepared by
Climate Prediction Center / NCEP
March 26, 2007

Outline

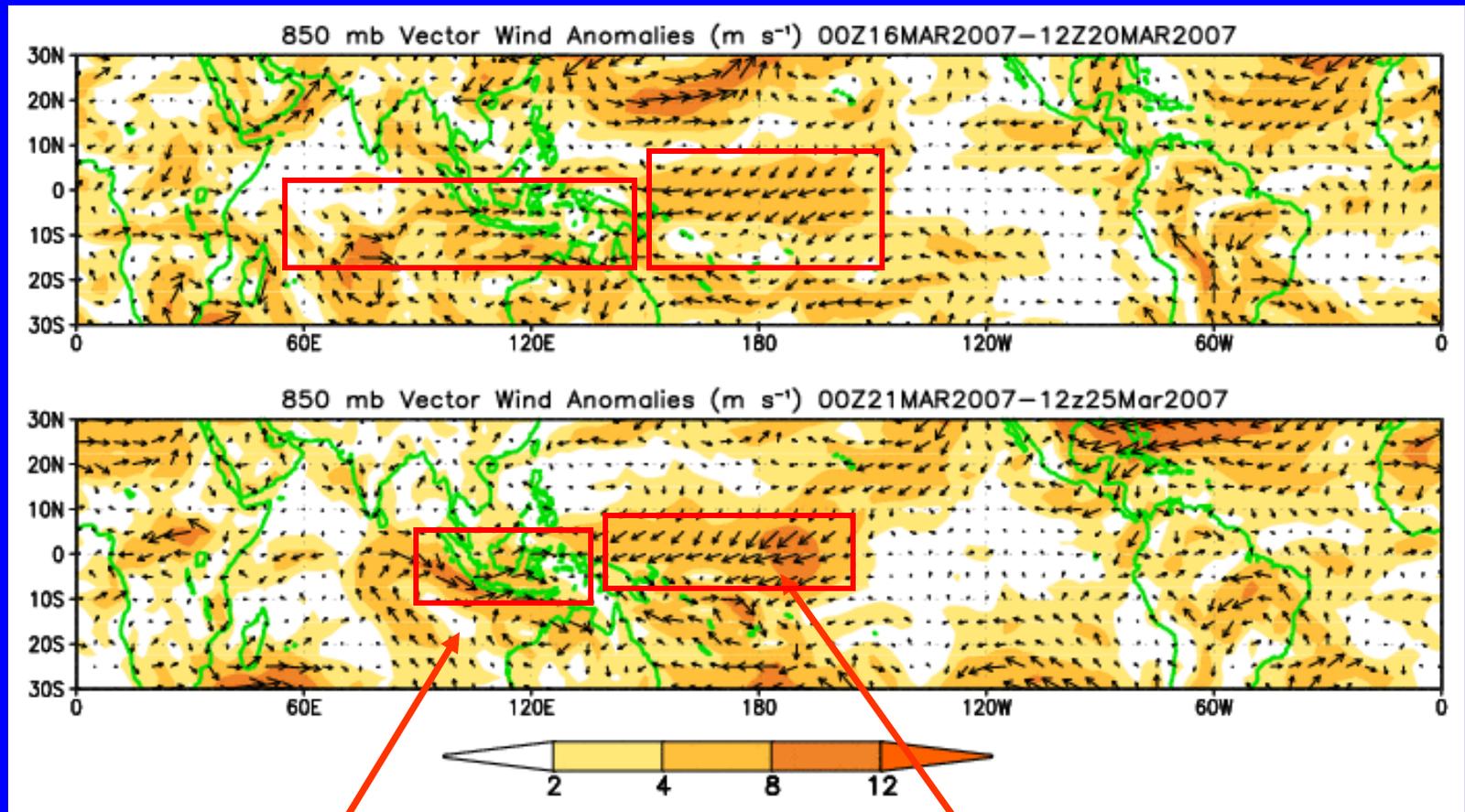
- **Overview**
- **Recent Evolution and Current Conditions**
- **Madden Julian Oscillation Forecast**
- **Summary**

Overview

- **The MJO has become incoherent.**
- **Throughout the period, there exists an increased chance for above average rainfall for sections of northern Australia and the Maritime Continent. The area of enhanced rainfall is expected to extend eastward to include the SPCZ east of the Date Line during week 1.**
- **Dry conditions are expected for sections of eastern Brazil during week 1.**
- **Tropical Cyclones Karla and 21P will impact sections of northern Australia and the South Pacific Islands respectively.**
- **Conditions are expected to be favorable for tropical cyclogenesis for the eastern Indian and South Pacific Oceans during week 1.**

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

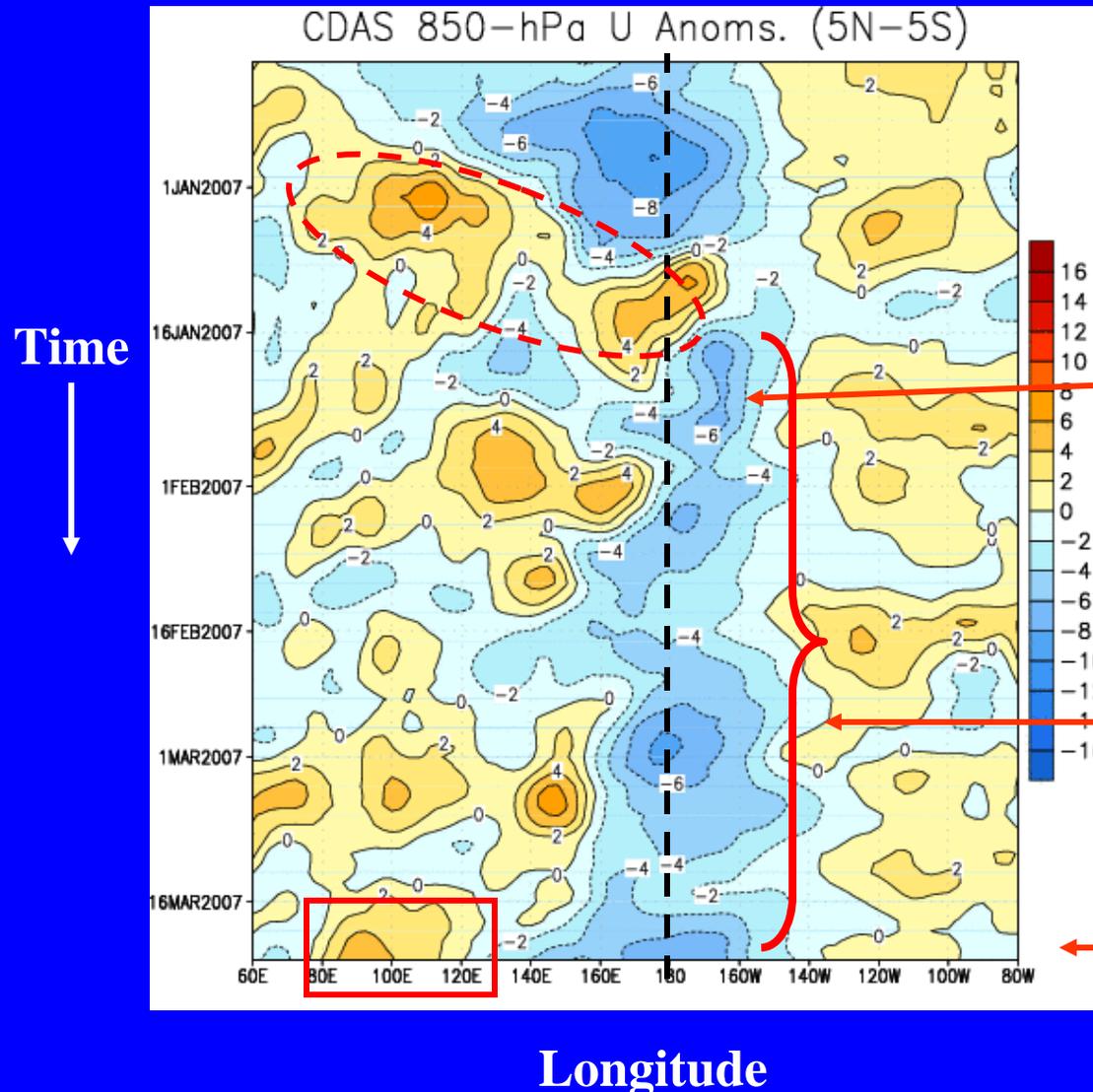
Note that shading denotes the magnitude of the anomalous wind vectors



Anomalous westerlies remain large across Indonesia.

Anomalous easterlies in the equatorial western Pacific have strengthened.

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



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

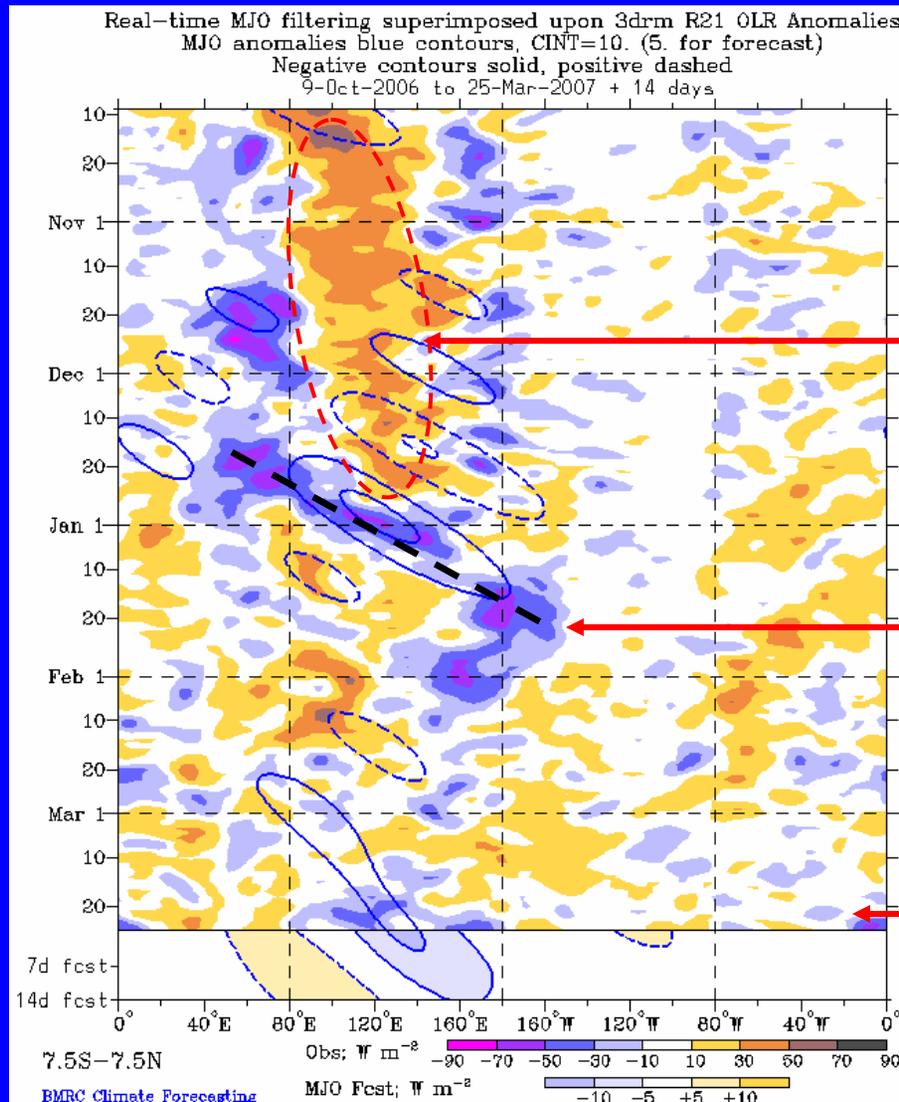
Easterly anomalies (blue shading) represent anomalous east-to-west flow.

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

Easterly anomalies near the Date Line have strengthened.

Recently, westerly anomalies developed over the eastern Indian Ocean and Indonesia.

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



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

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

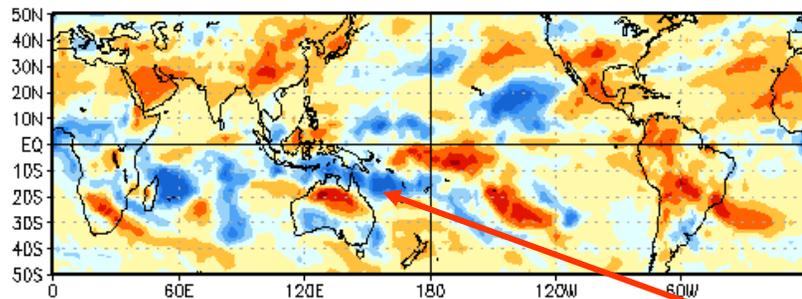
Strong suppressed convection was evident across the Maritime Continent (100E-150E) from late September to mid-December.

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

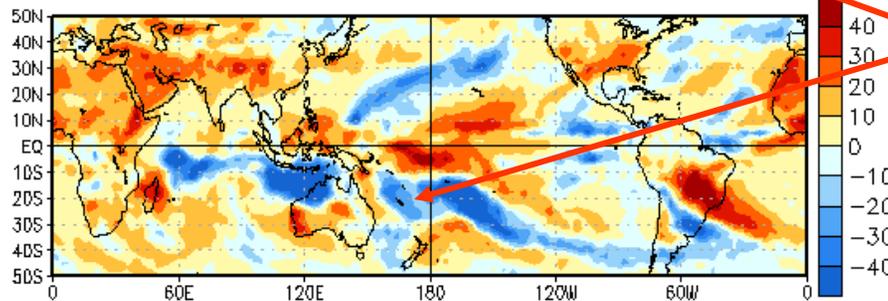
Currently, OLR anomalies along the equator remain small.

Anomalous OLR: Last 30 days

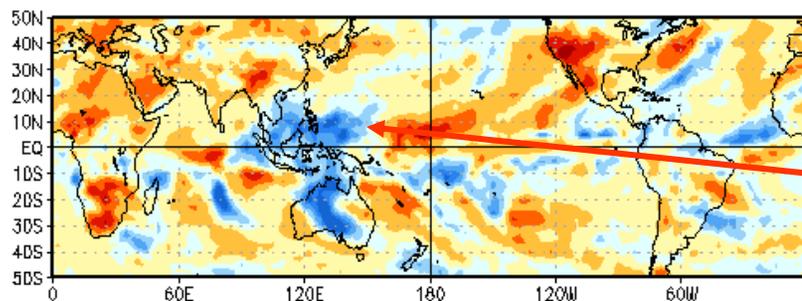
OLR Anomalies
20 FEB 2007 to 29 FEB 2007



2 MAR 2007 to 11 MAR 2007



12 MAR 2007 to 21 MAR 2007



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

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

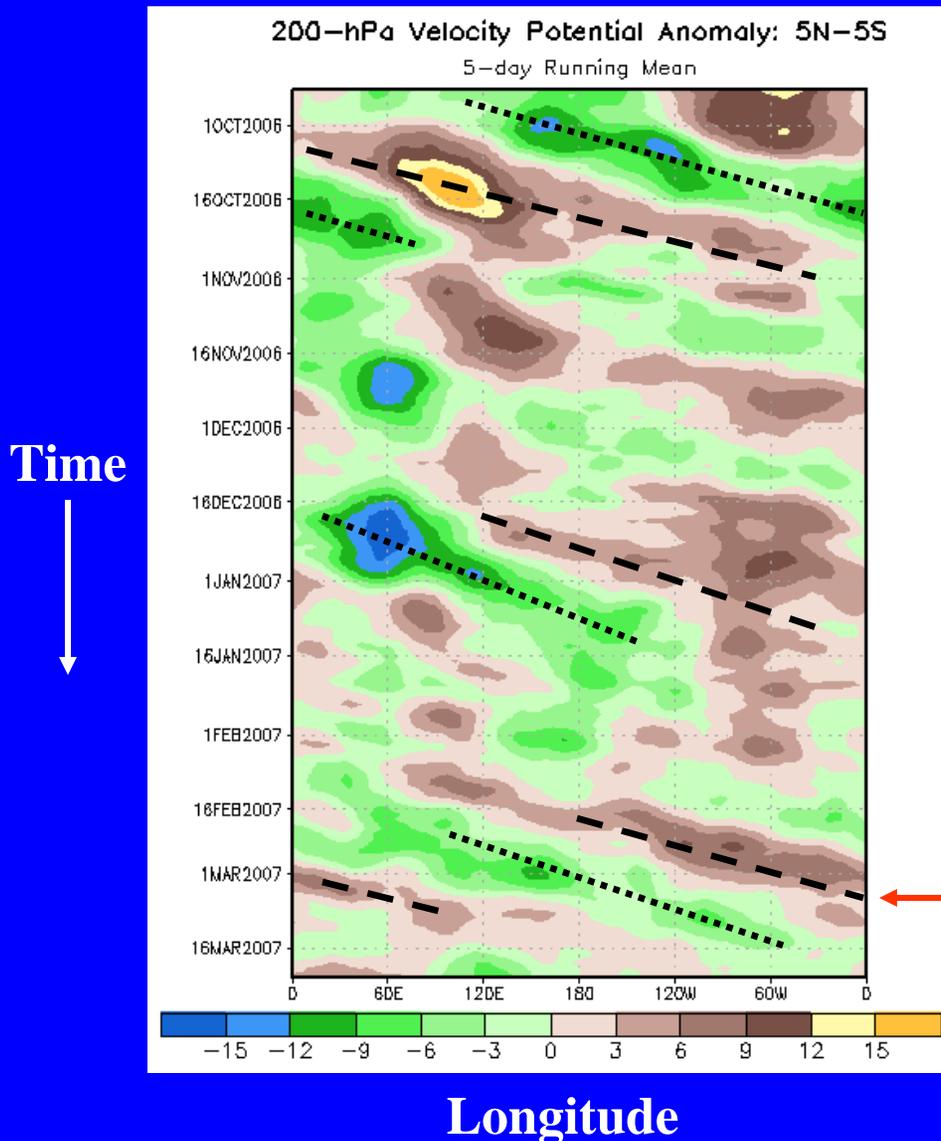
During late February and early March, enhanced convection developed across the southern Maritime continent, northern Australia and adjacent waters and extended eastward to include the South Pacific Convergence Zone east of the Date Line. Convection was also enhanced over the central Indian Ocean south of the equator.

Recently, enhanced convection over the Maritime continent extended northward to include the tropical western Pacific.

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.



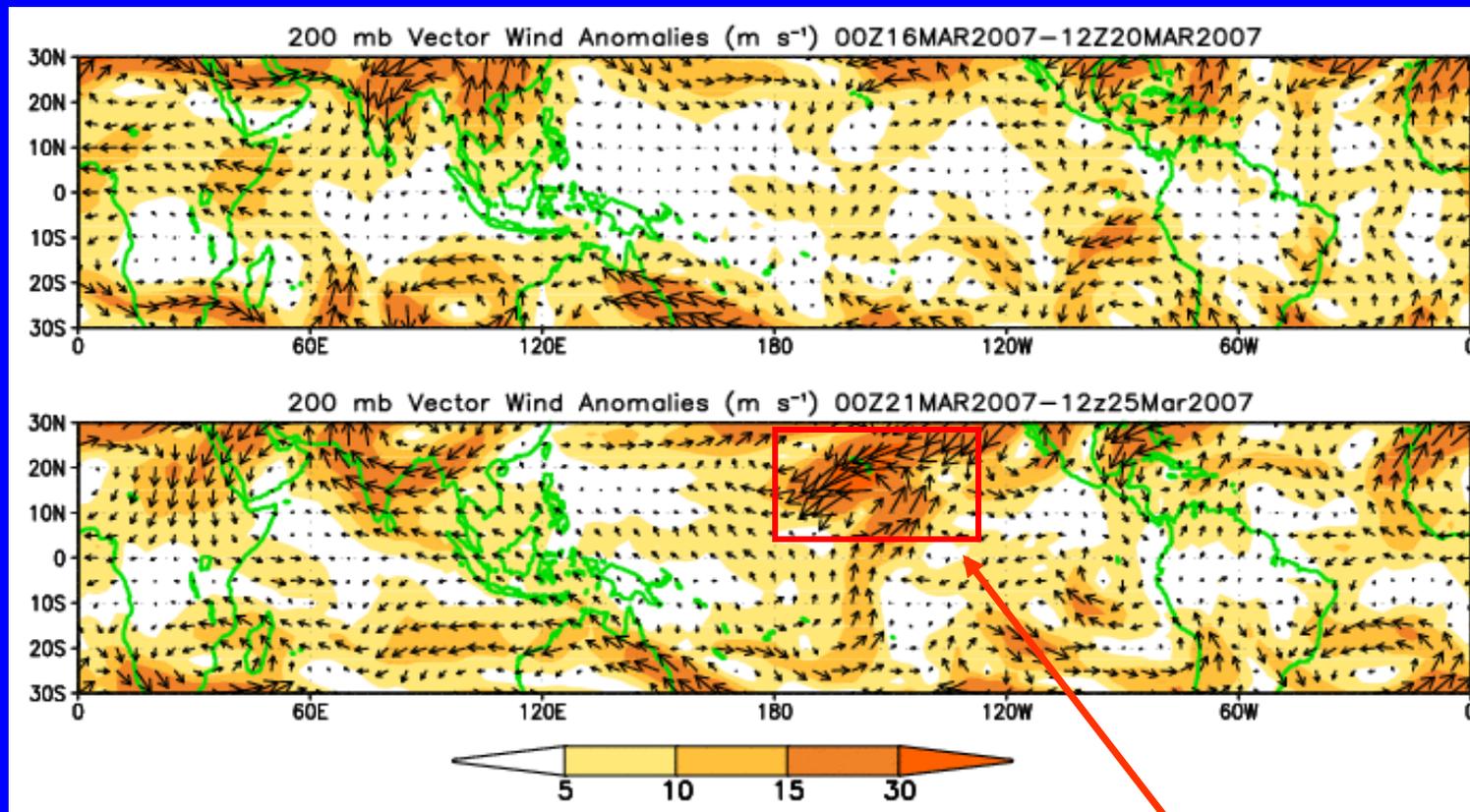
Moderate to strong MJO activity was observed from late-September to mid-October.

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.

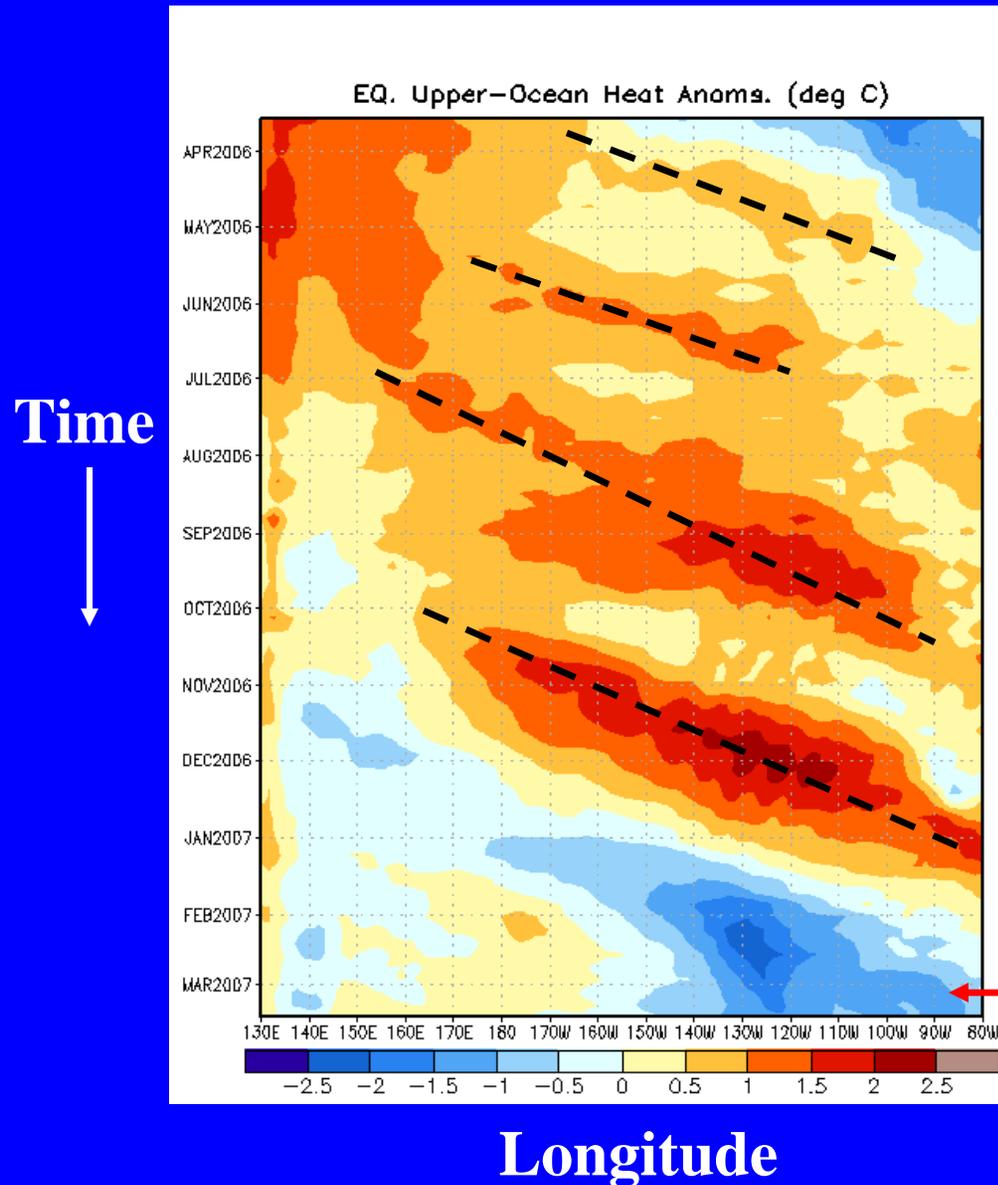
200-hPa Vector Winds and Anomalies (m s^{-1})

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



Anomalous upper-level cyclonic circulation persists in the central Pacific north of the equator.

Heat Content Evolution in the Eq. Pacific



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

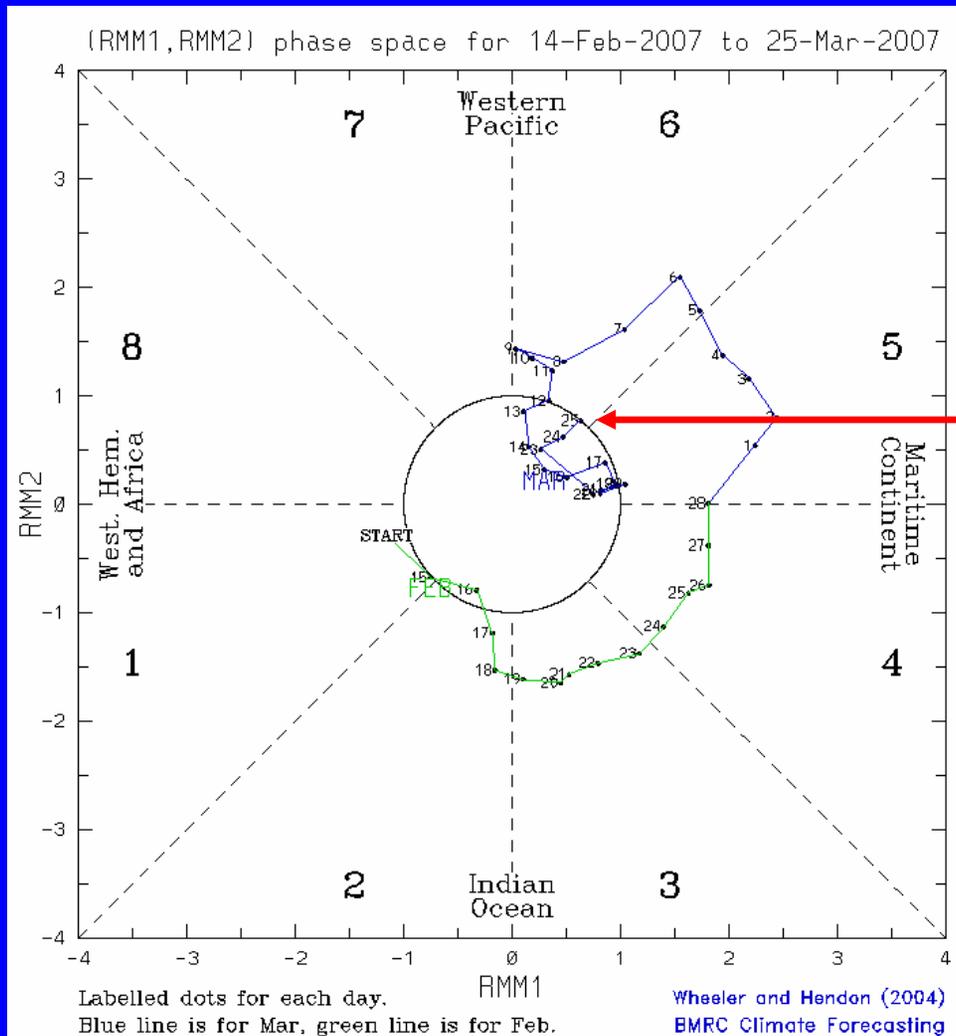
During this period eastward-propagating Kelvin waves (warm phases indicated by dashed lines) have caused considerable month-to-month variability in the upper-ocean heat content.

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

MJO Index (Magnitude and Phase)

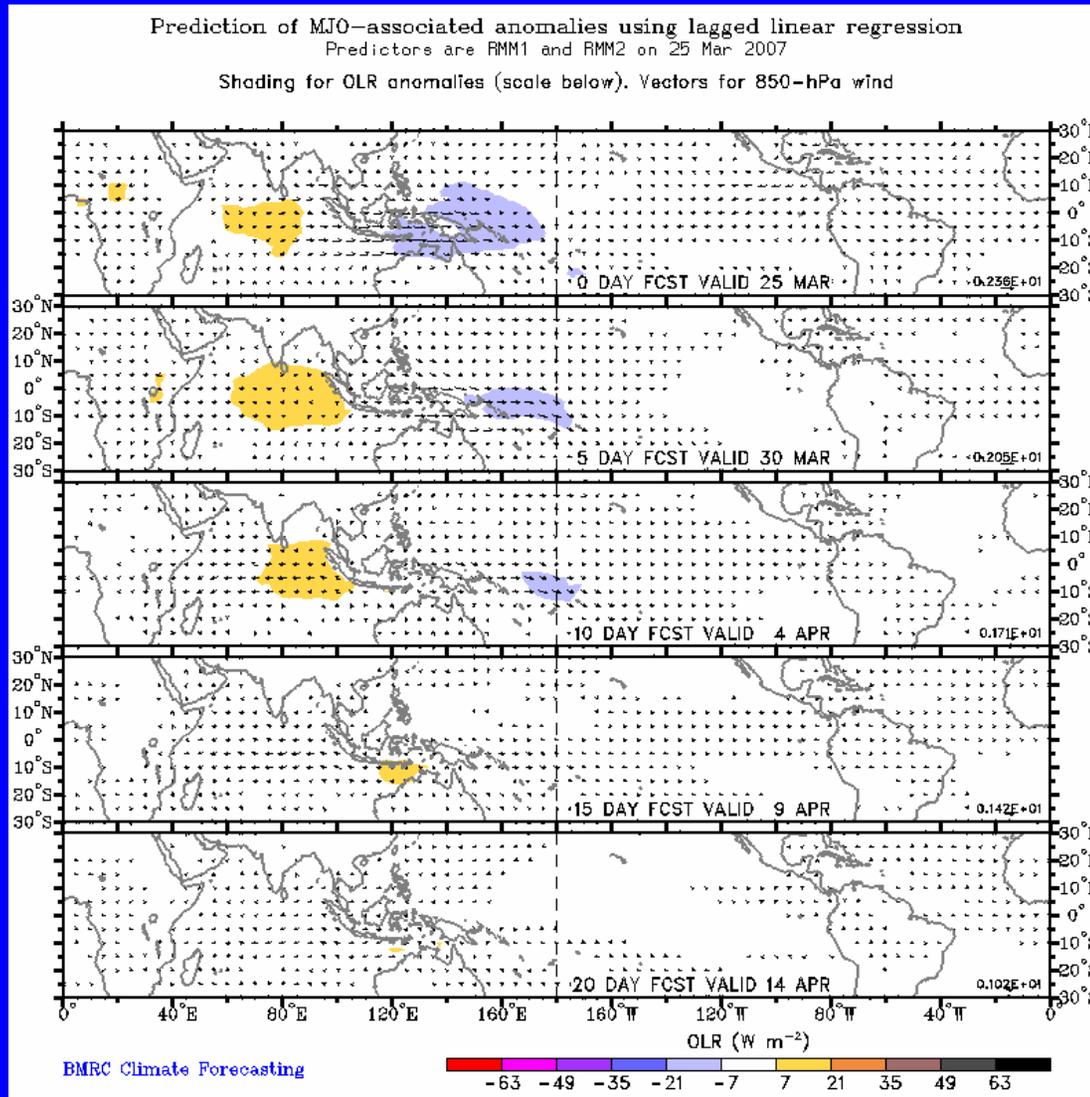
The current state of the MJO as determined by an index based on Empirical Orthogonal Function (EOF) analysis using combined fields of near-equatorially-averaged 850-hPa zonal wind, 200- hPa zonal wind, and satellite-observed outgoing longwave radiation (OLR) (Wheeler and Hendon, 2004).

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.

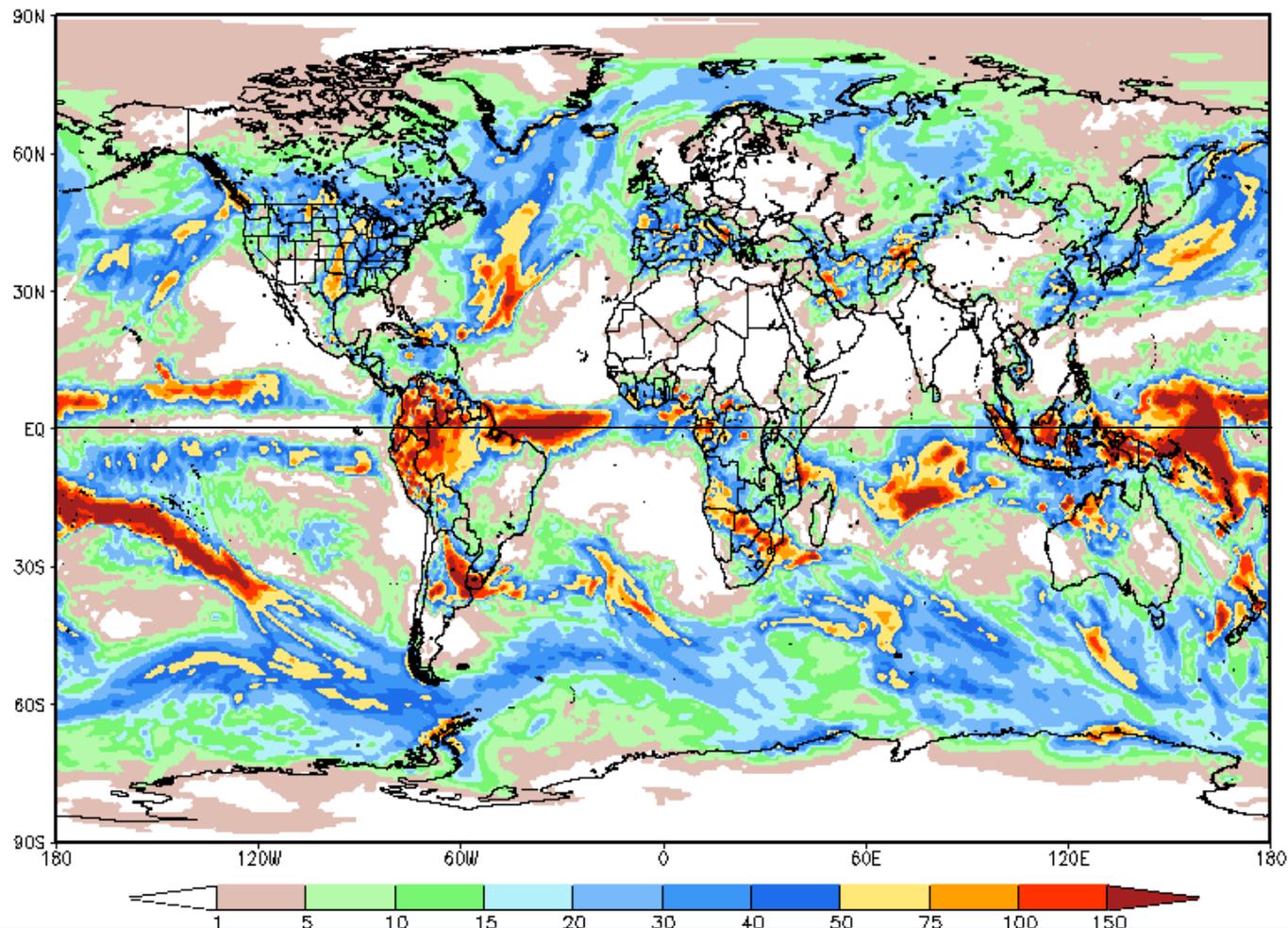
Statistical OLR MJO Forecast



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

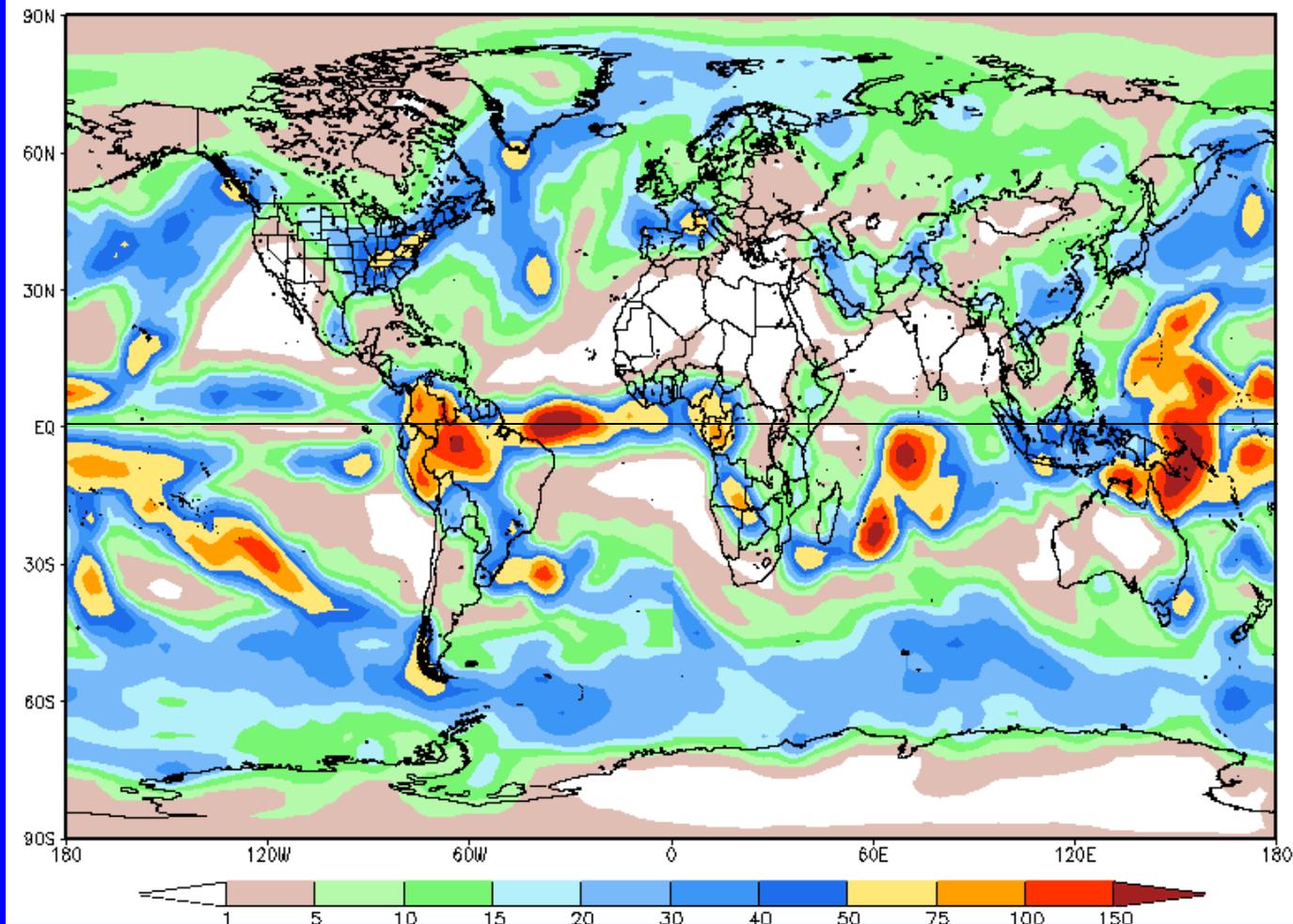
NOAA GFS 37.5 km Week 1 Total Precipitation (mm)
Issued at Mar 26 2007 00Z for the period ending at Apr 2 2007 00Z



Global Forecast System (GFS) Week 2

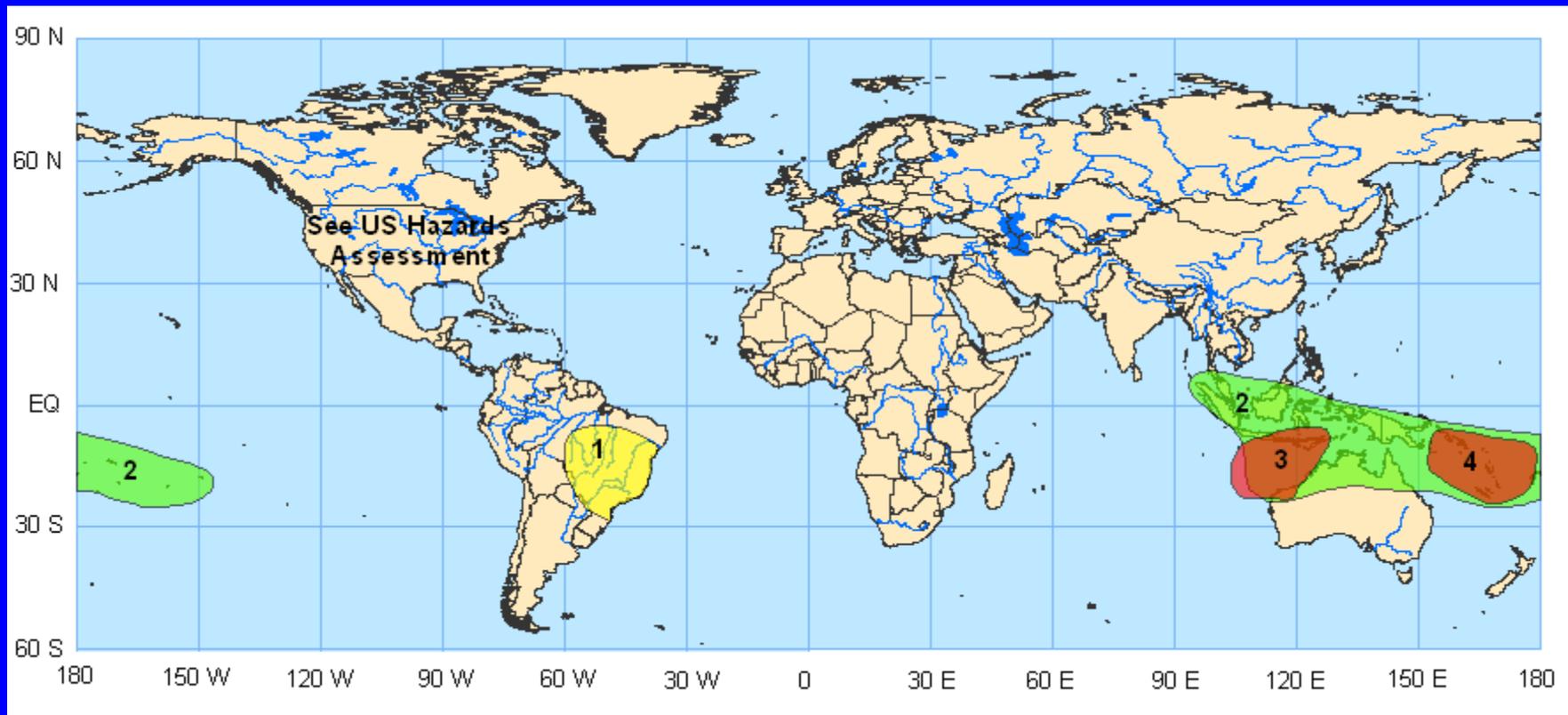
Precipitation Forecast

NOAA GFS 100 km Week 2 Total Precipitation (mm)
Issued Mar 26 2007 00Z for the period ending at Apr 8 2007 00Z



Potential Benefits/Hazards – Week 1

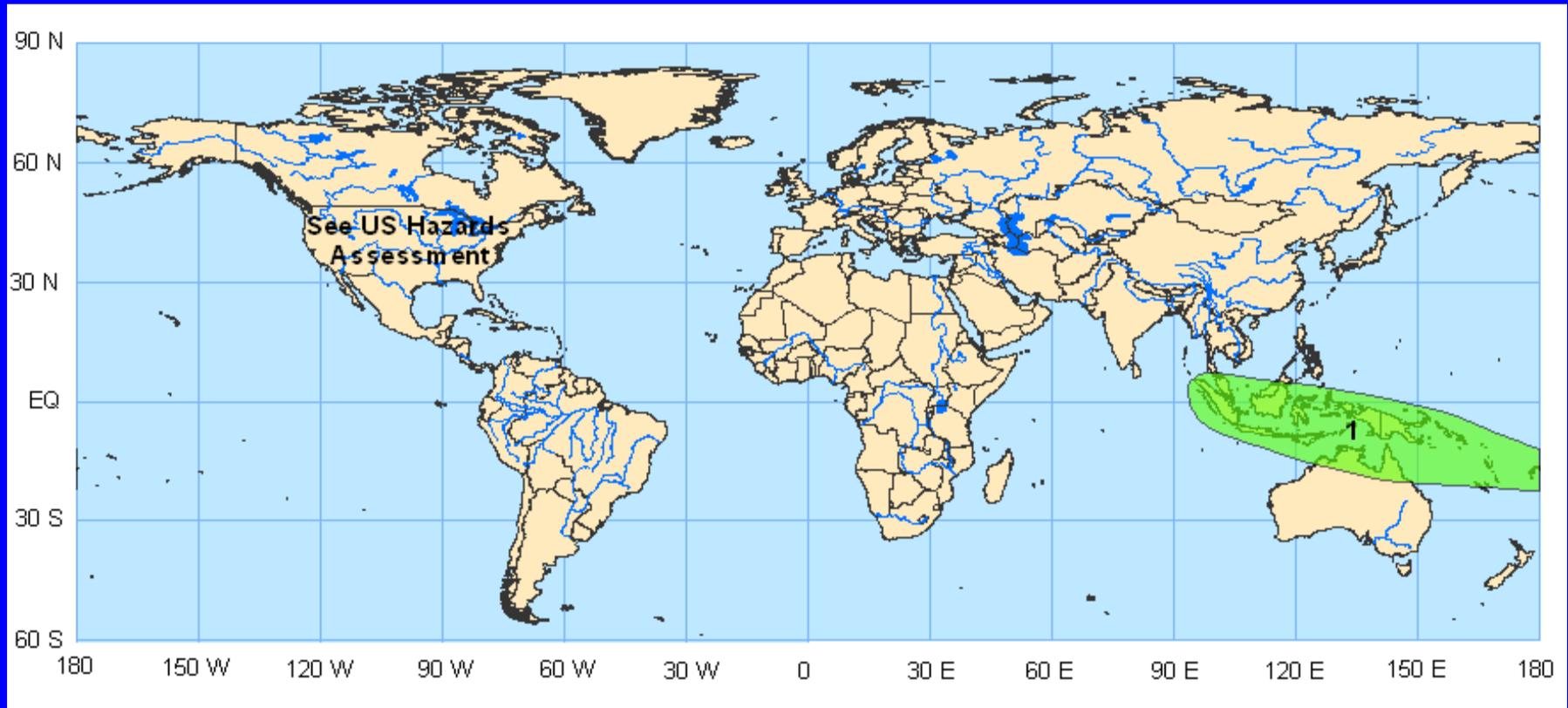
Valid: 27 March – 2 April 2007



- 1. An increased chance of below-average rainfall for sections of eastern Brazil.**
- 2. An increased chance of above-average rainfall for sections of northern Australia, Indonesia, and the south Pacific islands.**
- 3. Conditions are expected to be favorable for tropical cyclogenesis over the eastern Indian Ocean south of Indonesia. Tropical cyclone Kara may impact northern Australia early in the period.**
- 4. Conditions are expected to be favorable for tropical cyclogenesis over the southwest Pacific Ocean. Tropical cyclone 21P will impact the water southeast of Papua-New Guinea.**

Potential Benefits/Hazards – Week 2

Valid: 3-9 April 2007



1. An increased chance of above-average rainfall for sections of northern Australia, the maritime Continent, and the western Pacific Ocean.

Summary

- **The MJO has become incoherent.**
- **Throughout the period, there exists an increased chance for above average rainfall for sections of northern Australia and the Maritime Continent. The area of enhanced rainfall is expected to extend eastward to include the SPCZ east of the Date Line during week 1.**
- **Dry conditions are expected for sections of eastern Brazil during week 1.**
- **Tropical Cyclones Karla and 21P will impact sections of northern Australia and the South Pacific Islands respectively.**
- **Conditions are expected to be favorable for tropical cyclogenesis for the eastern Indian and South Pacific Oceans during week 1.**