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

Update prepared by
Climate Prediction Center / NCEP
May 8, 2006

Outline

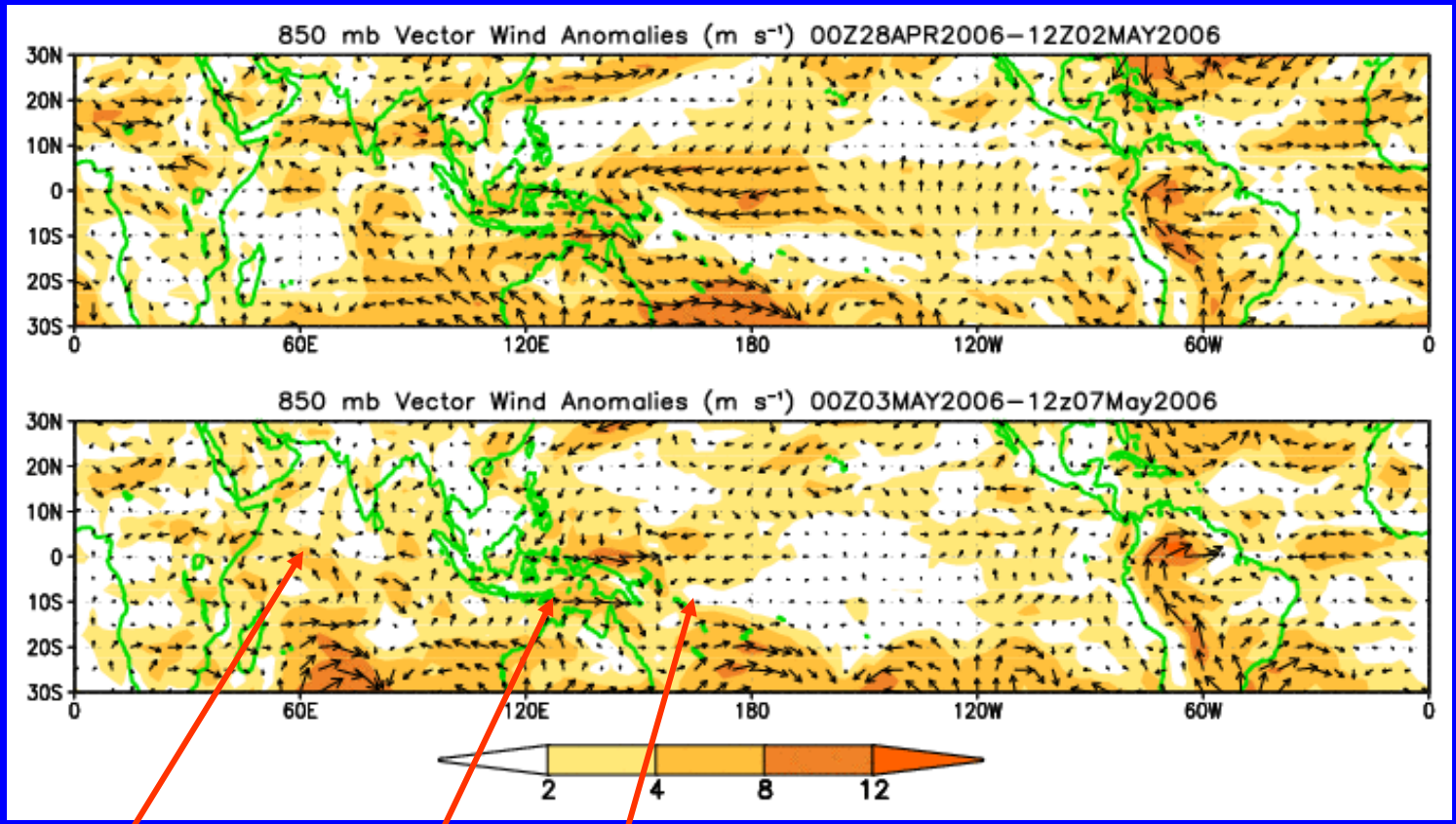
- Overview
- Recent Evolution and Current Conditions
- Madden Julian Oscillation Forecast
- Summary

Overview

- The latest observations indicate that the MJO remains weak. There is an increasingly lessening impact from La Nina.
- Based on the latest observational evidence, the MJO is expected to remain weak during the next 1-2 weeks.
- Potential hazards/benefits across the global tropics during week 1 include increased chances of above normal rainfall in northeast South America, equatorial Africa, and the western Pacific Ocean stretching from the Philippines across New Guinea. An increased likelihood of below normal rainfall exists in the eastern Indian Ocean and sections of Indonesia. Also, tropical cyclone activity may impact the area east and near the Philippines.
- Increased chances of above normal rainfall are expected to develop in the equatorial Indian Ocean during week 2.

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

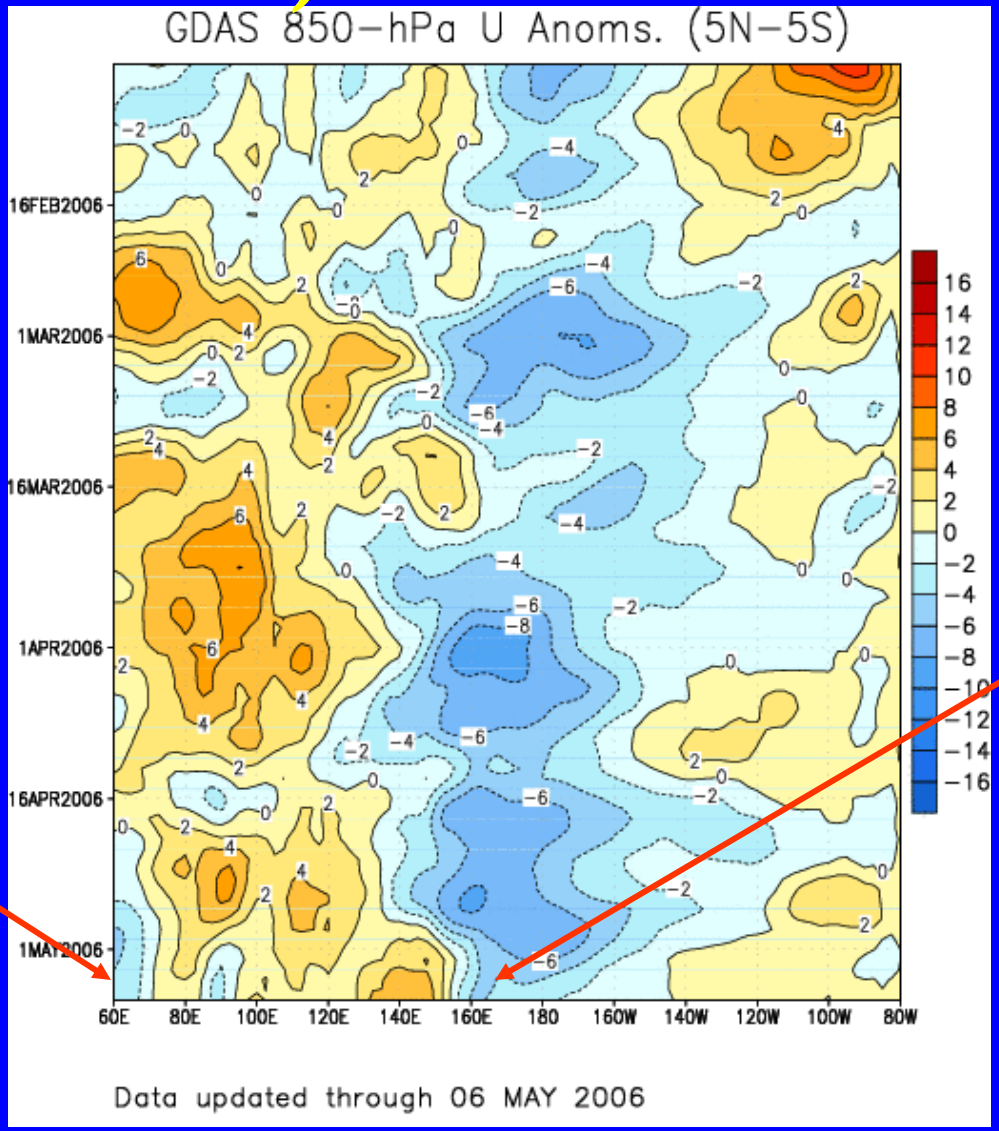
Note that shading denotes the magnitude of the anomalous wind vectors



Anti-cyclonic circulations associated with easterly anomalies on the equator

Westerlies (easterlies) remained over maritime continent (western 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)

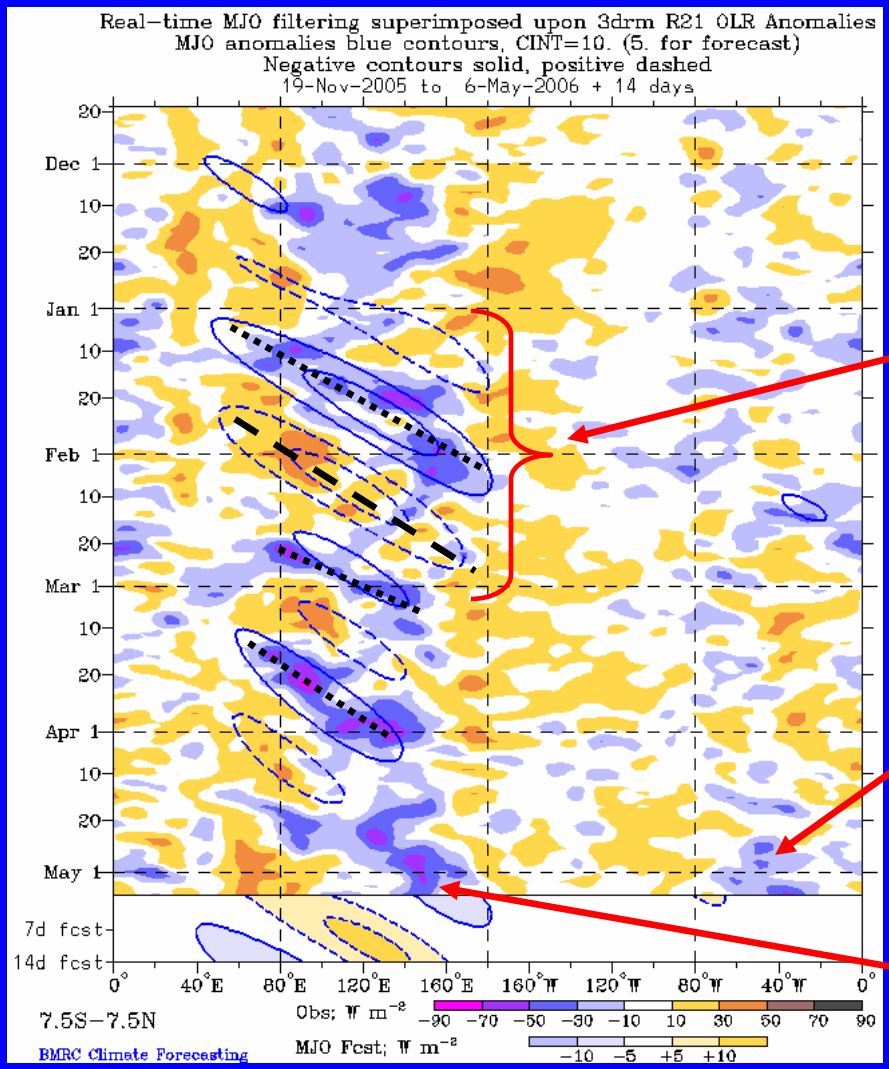
Westerly (easterly) anomalies remained over maritime continent (western Pacific).

Easterly anomalies developed in the western Indian Ocean.

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

Drier-than-average conditions (/red shading)

Wetter-than-average conditions (blue shading)



Time

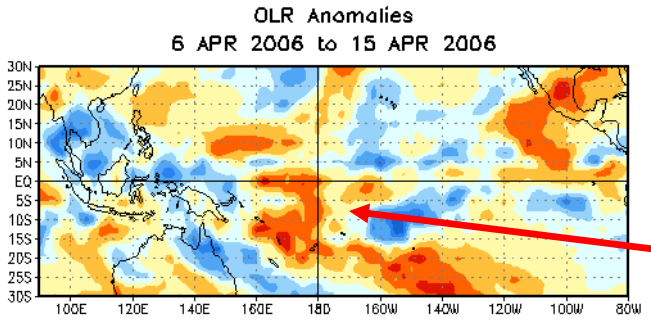
Longitude

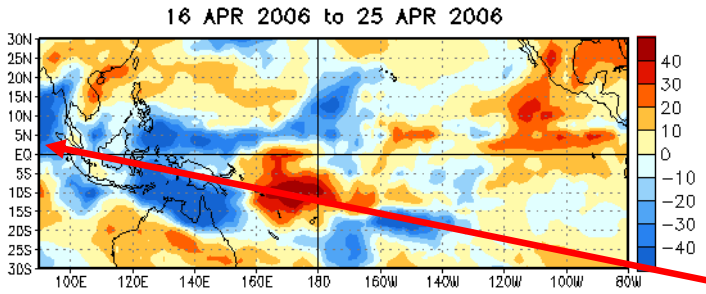
Eastward propagation of OLR anomalies was evident from mid-January through late February

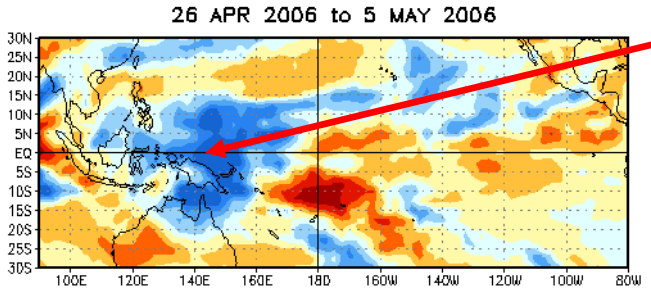
Enhanced convection over South America during the last two weeks.

Enhanced convection propagated from the eastern Indian Ocean to the western Pacific during the last few weeks.

Anomalous OLR and 850-hPa Wind: Last 30 days

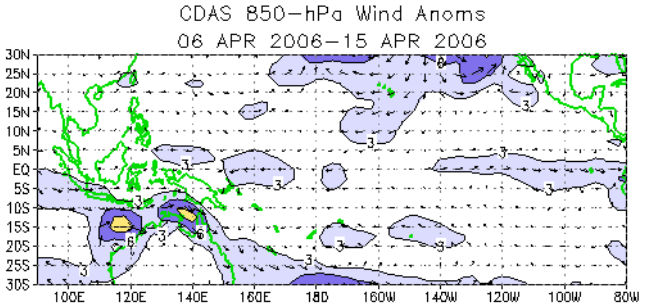


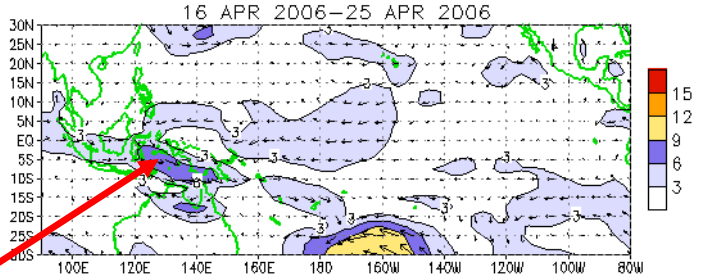


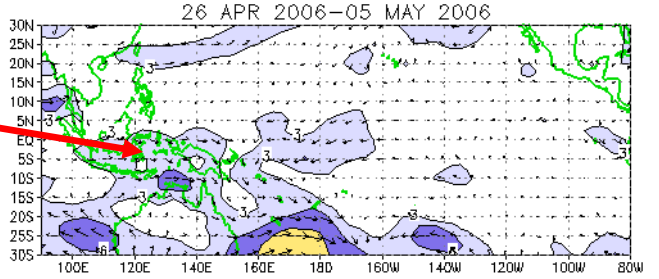


Suppressed convection near the date line in the equatorial Pacific Ocean has weakened considerably during April.

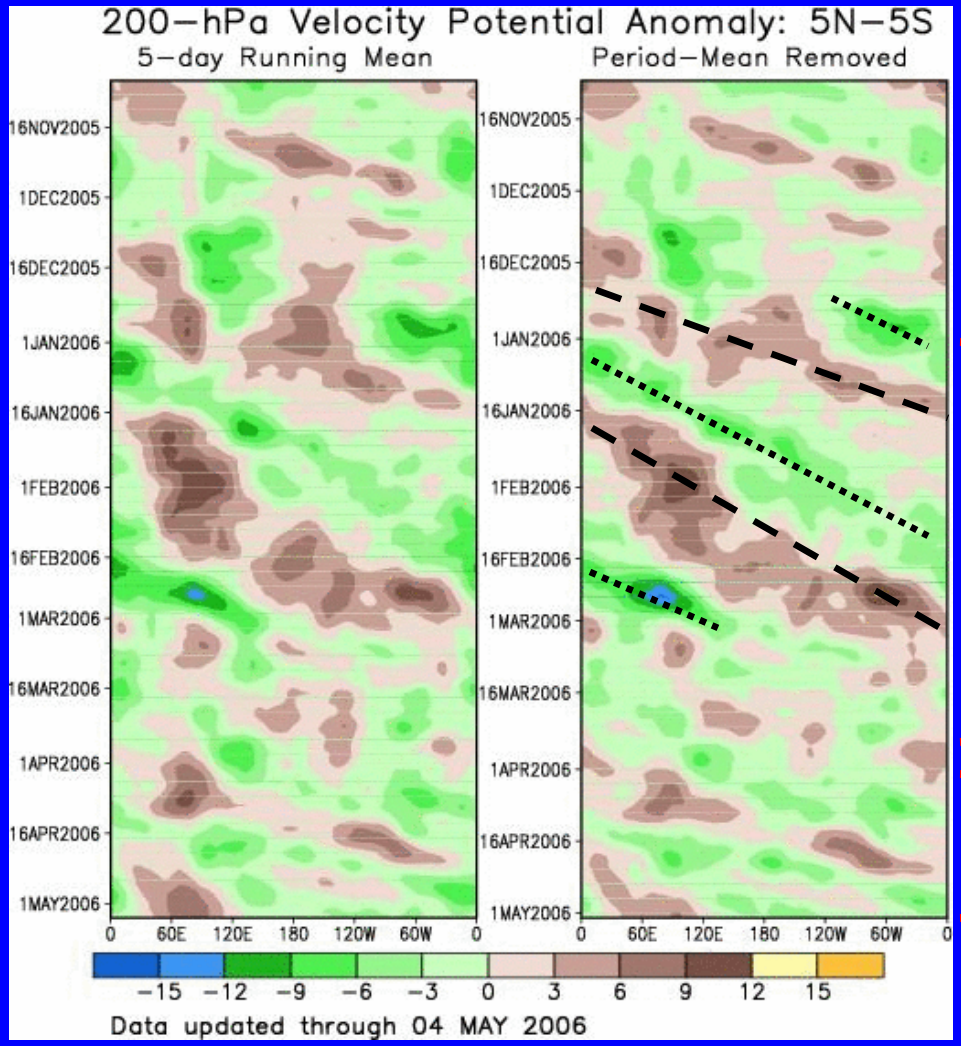
Enhanced convection and associated wind anomalies propagated eastward during the last 20 days.







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



Time

Longitude

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

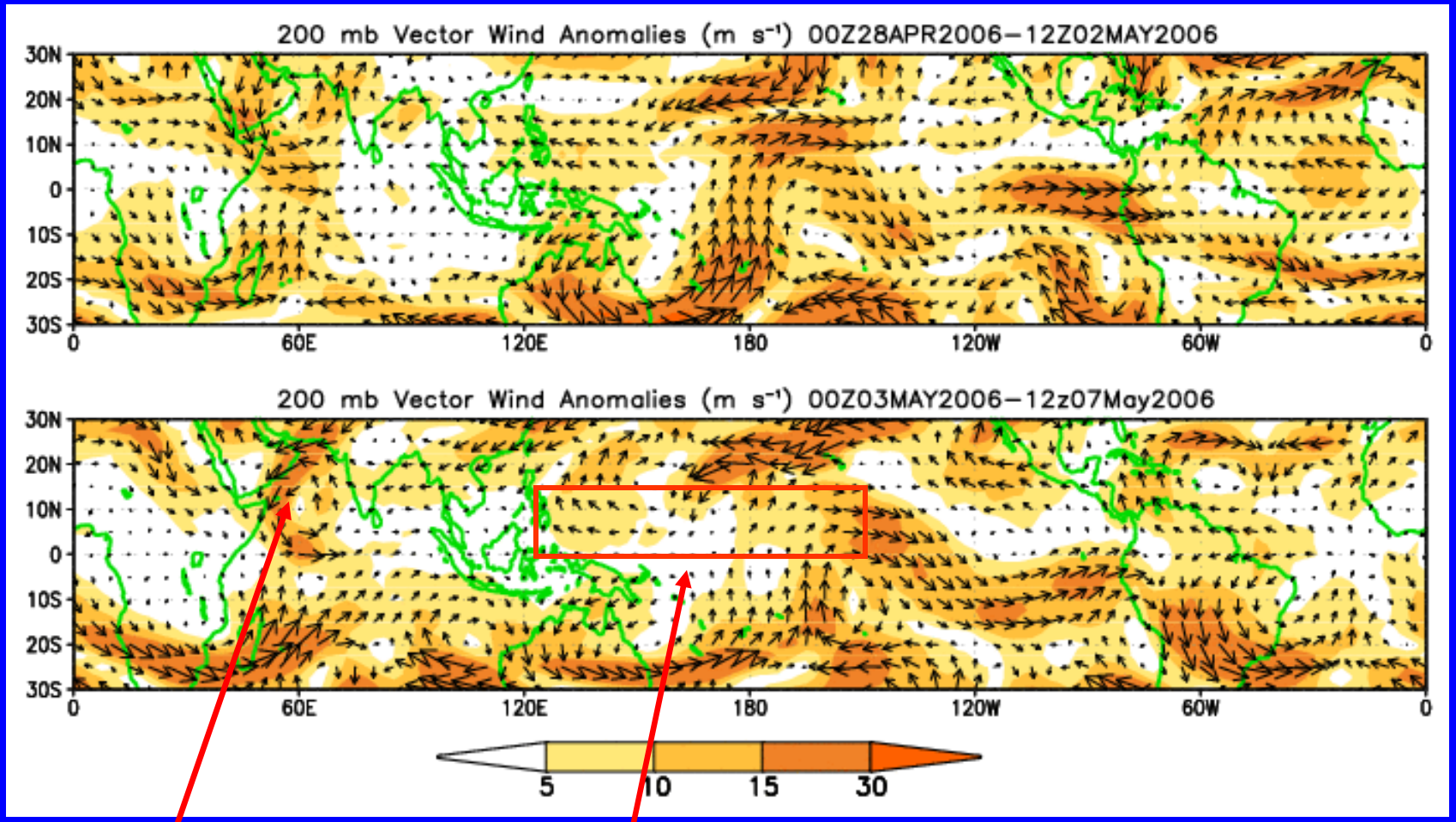
Negative anomalies (green shading) indicate favorable conditions for precipitation.

Weak to moderate MJO activity was observed during November and January-February time periods.

During April and early May, the MJO has been weak.

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

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

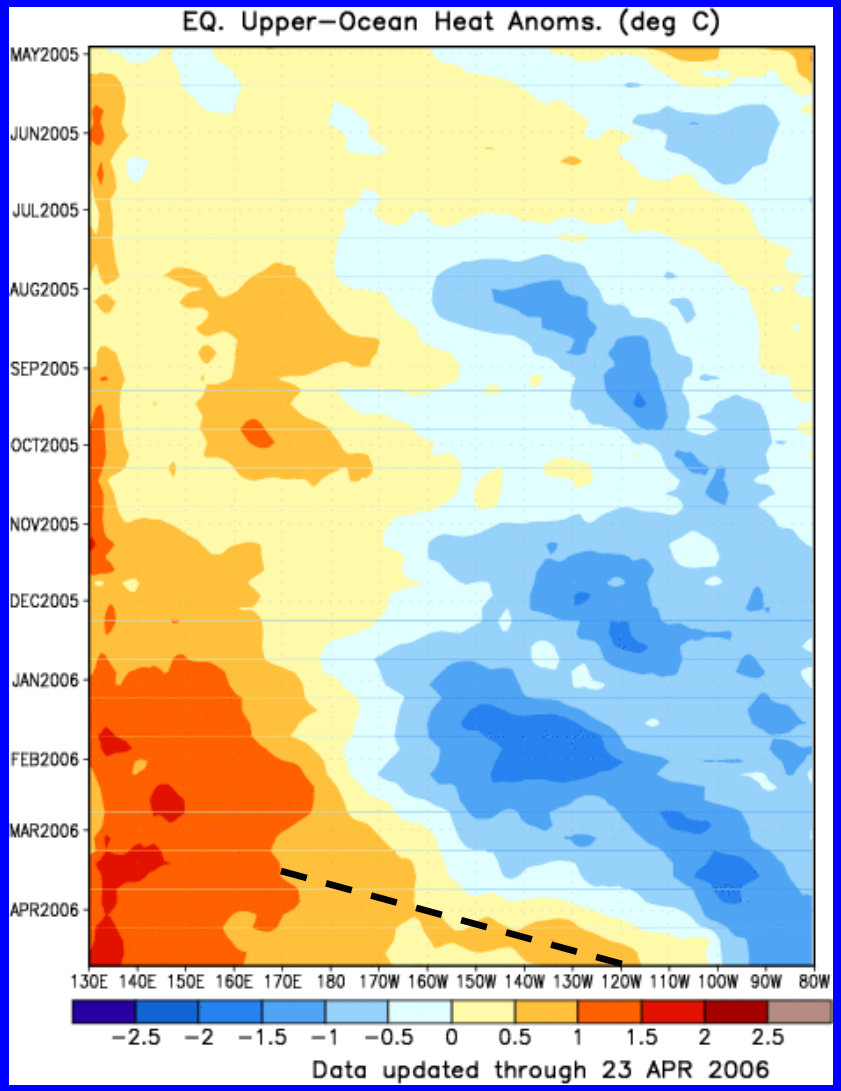


Cyclonic circulation in Arabian Sea.

Anomalies in the western Pacific Ocean consistent with enhanced convection.

Heat Content Evolution in the Eq. Pacific

Time



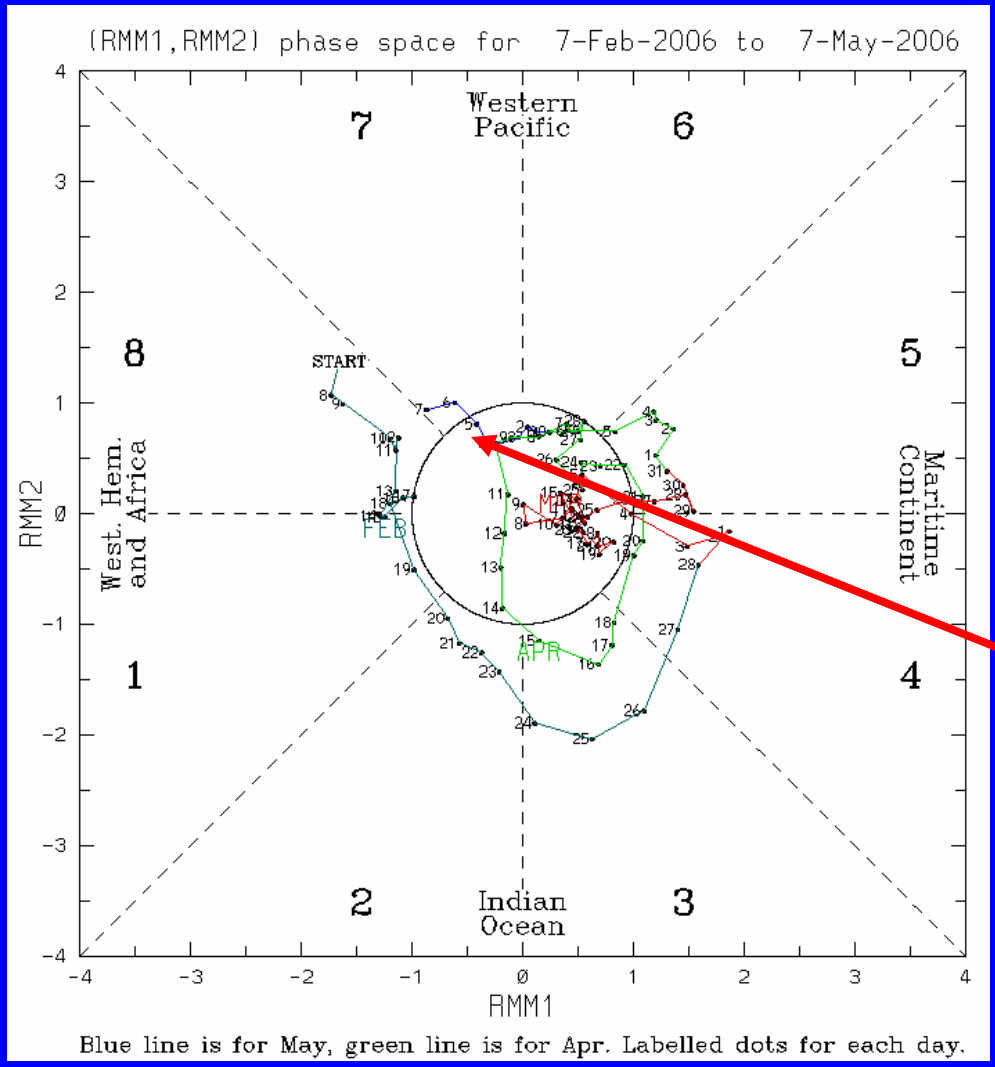
Longitude

Above normal heat content expanded into the central Pacific during April 2006.

MJO Index (Magnitude and Phase)

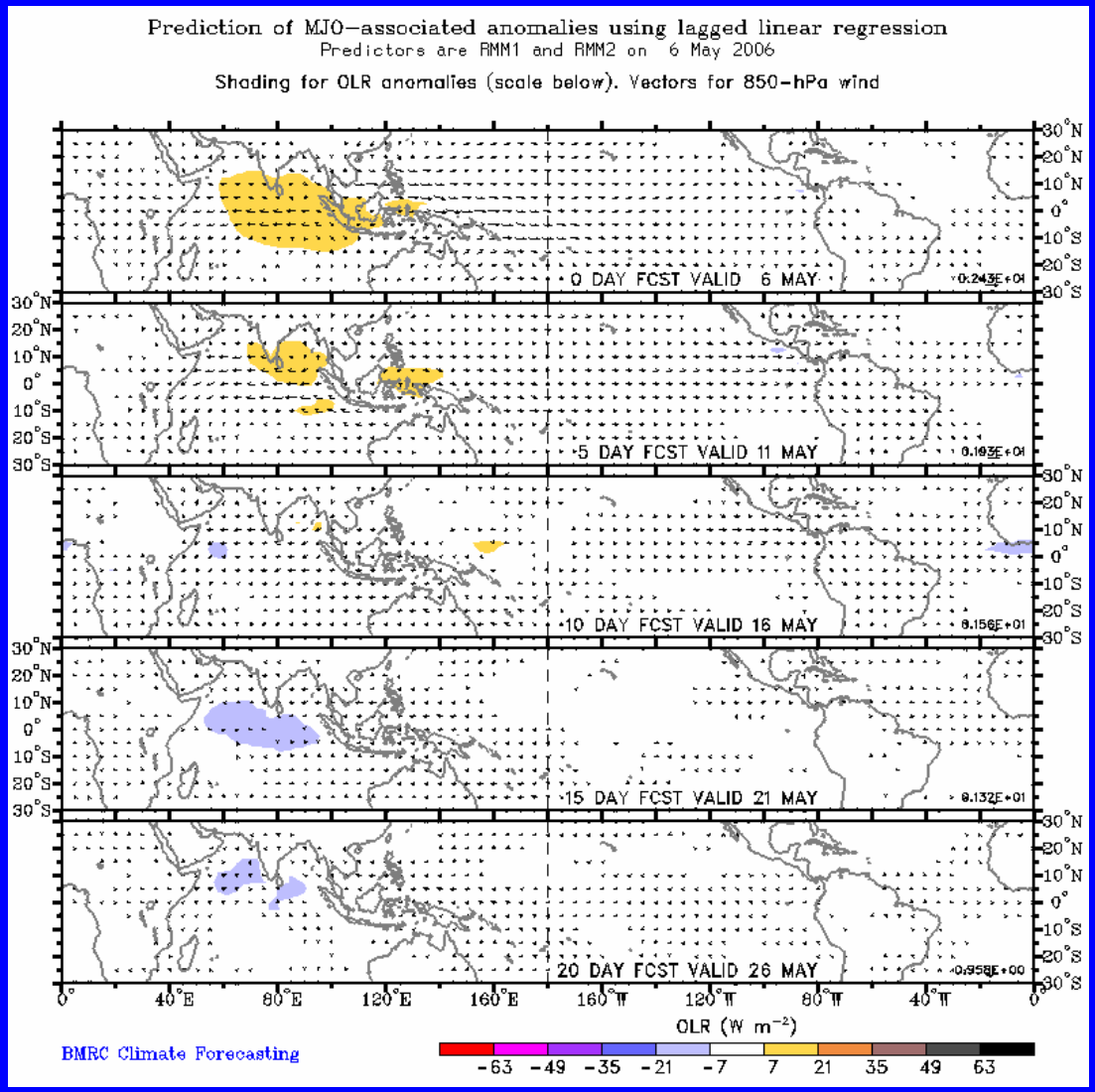
The current state of the MJO as determined by an index based on Empirical Orthogonal Function (EOF) analysis using combined fields of near-equatorially-averaged 850 hPa zonal wind, 200 hPa zonal wind, and satellite-observed outgoing longwave radiation (OLR) (Wheeler and Hendon, 2004).

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.



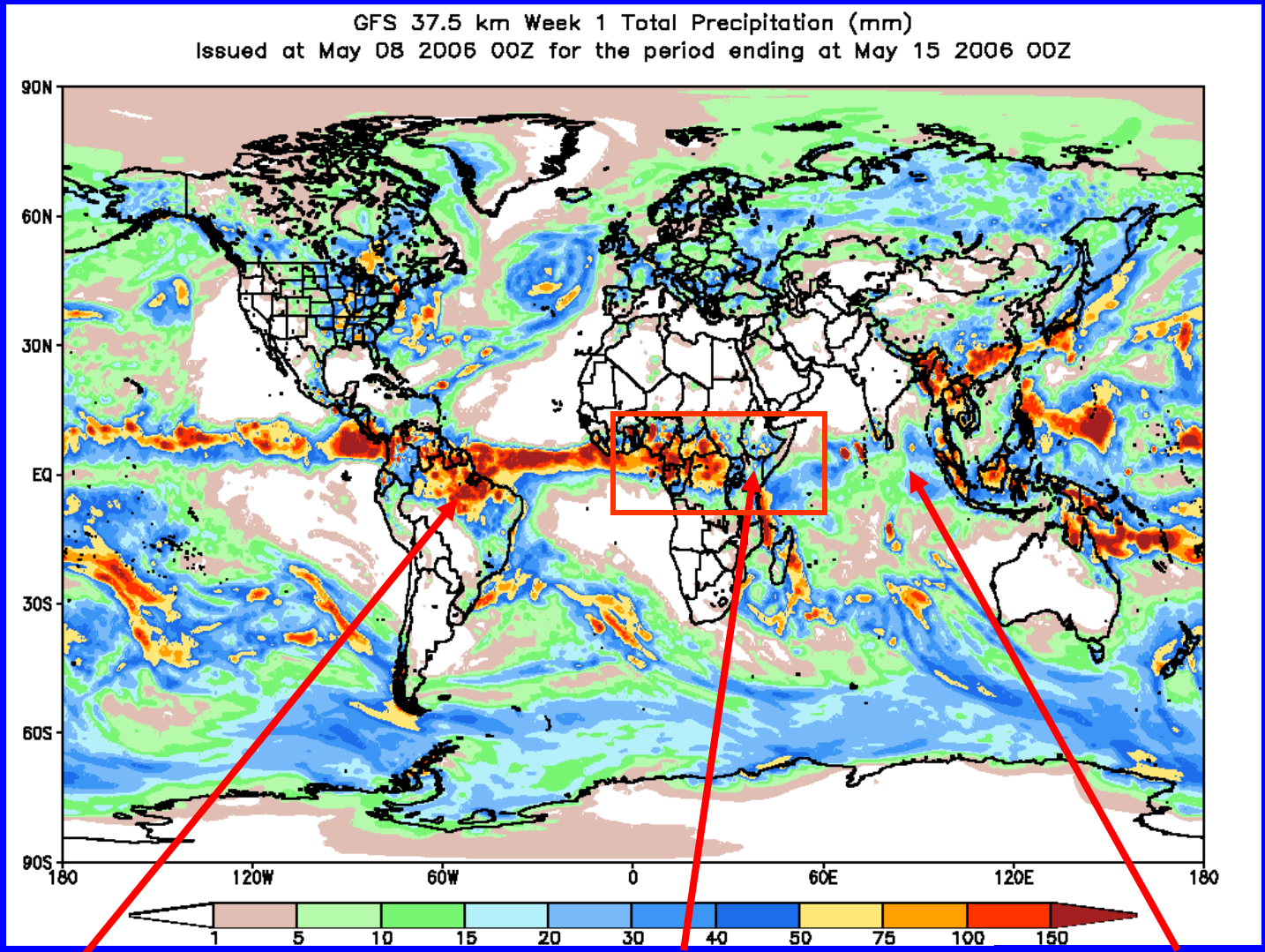
The MJO signal has been weak during late April and early May, however, the MJO signal has strengthened during the last few days.

Statistical OLR MJO Forecast



A statistical MJO forecast indicates dry conditions across the Indian Ocean during week 1.

Global Forecast System (GFS) Week 1 Precipitation Forecast

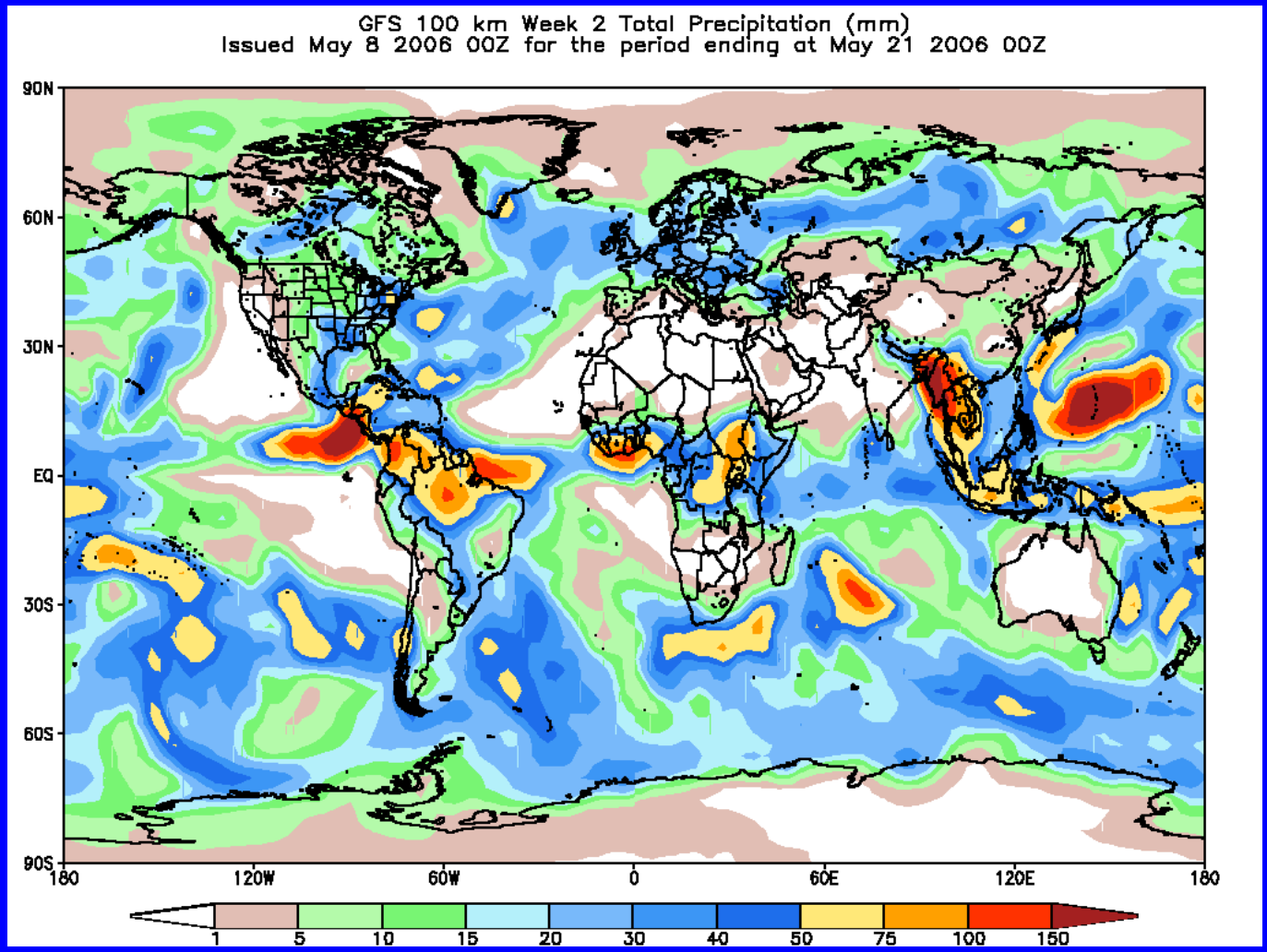


Heavy rainfall in equatorial northern Brazil

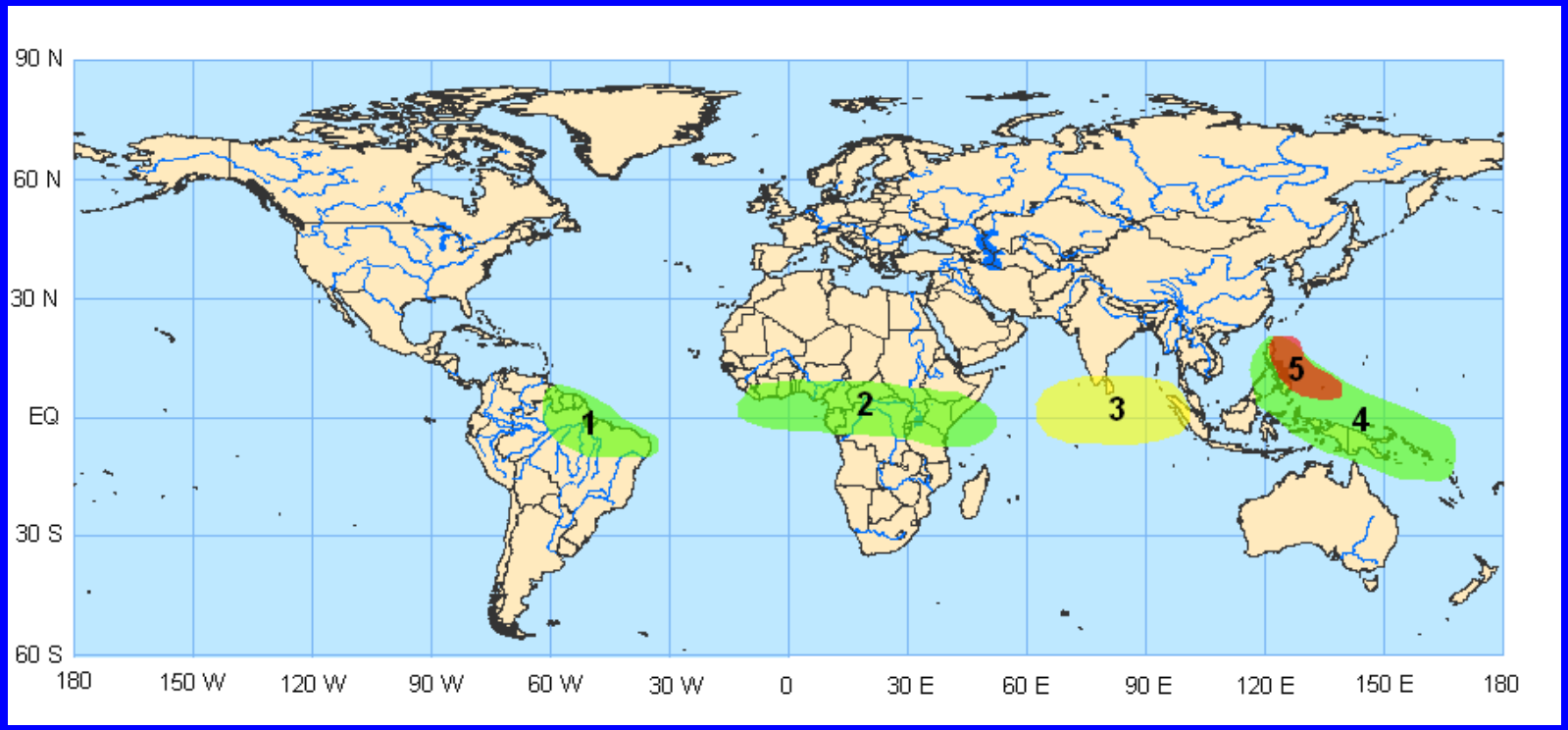
Abundant rainfall in equatorial Africa and western Indian Ocean

Relatively sparse rainfall in central eastern equatorial Indian Ocean

Global Forecast System (GFS) Week 2 Precipitation Forecast



Potential Benefits/Hazards – Week 1
Valid May 9 - 15, 2006



1. Increased chances of above normal rainfall in northeast South America

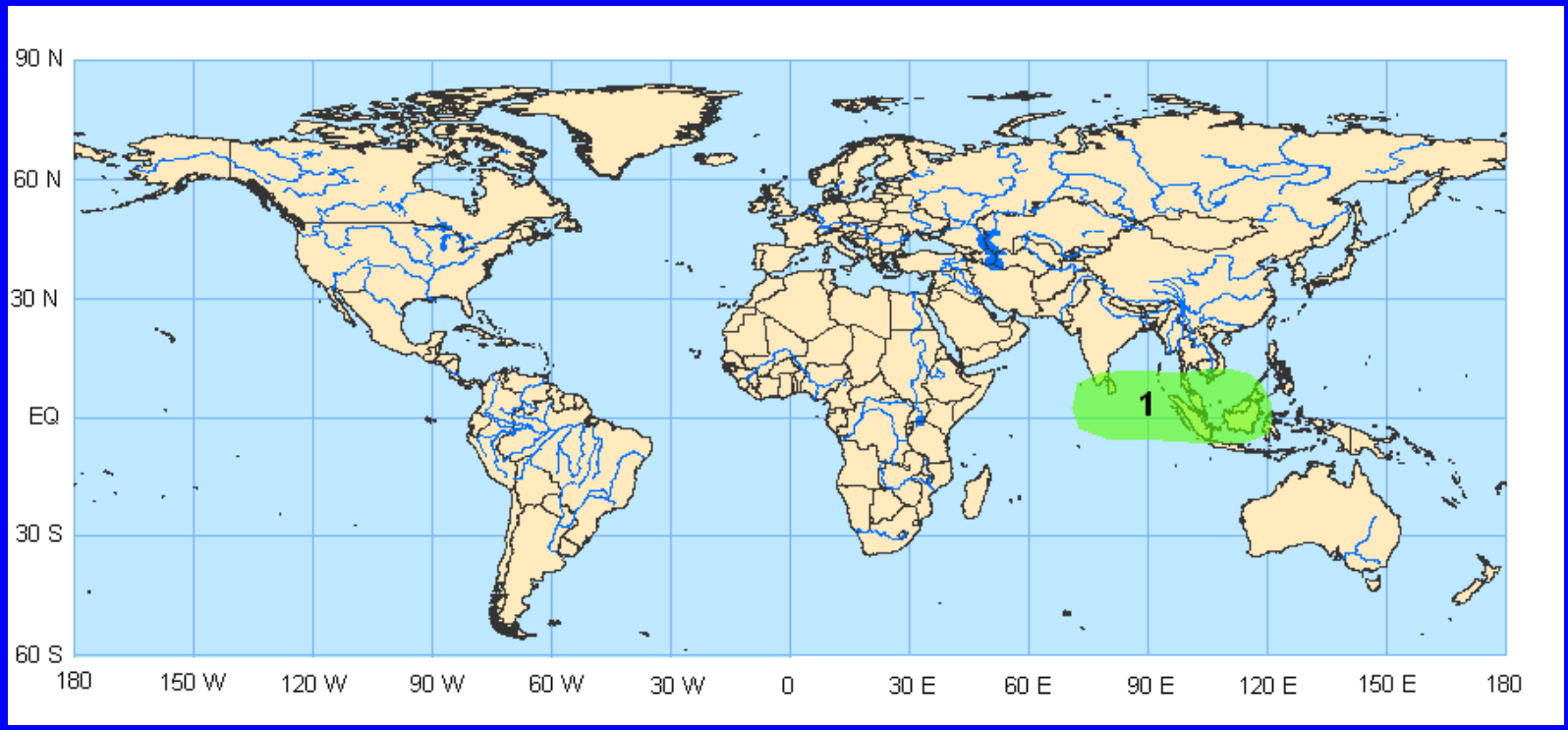
2. Increased chances of above normal rainfall in equatorial Africa and the western Indian Ocean associated with the continued evolution of intraseasonal variability and localized above normal SSTs

3. Increased chances of below normal rainfall in the eastern Indian Ocean and sections of Indonesia associated with the continued evolution of intraseasonal variability.

4. Increased chance of above normal rainfall from Philippines across New Guinea associated with evolution of existing weather systems and diminishing impact from La Nina

5. Increased chance of tropical cyclone activity east of the Philippines.

Potential Benefits/Hazards – Week 2
Valid May 16 – May 22, 2006



1. Above normal rainfall in the tropical Indian Ocean associated with continued evolution of intraseasonal variability, localized above normal SSTs, and convection associated with the diminishing impact from La Nina.

Summary

- The latest observations indicate that the MJO remains weak. There is an increasingly lessening impact from La Nina.
- Based on the latest observational evidence, the MJO is expected to remain weak during the next 1-2 weeks.
- Potential hazards/benefits across the global tropics during week 1 include increased chances of above normal rainfall in northeast South America, equatorial Africa, and the western Pacific Ocean stretching from the Philippines across New Guinea. An increased likelihood of below normal rainfall exists in the eastern Indian Ocean and sections of Indonesia. Also, tropical cyclone activity may impact the area east and near the Philippines.
- Increased chances of above normal rainfall are expected to develop in the equatorial Indian Ocean during week 2.