



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

Update prepared by
Climate Prediction Center / NCEP
May 22, 2006



Outline

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



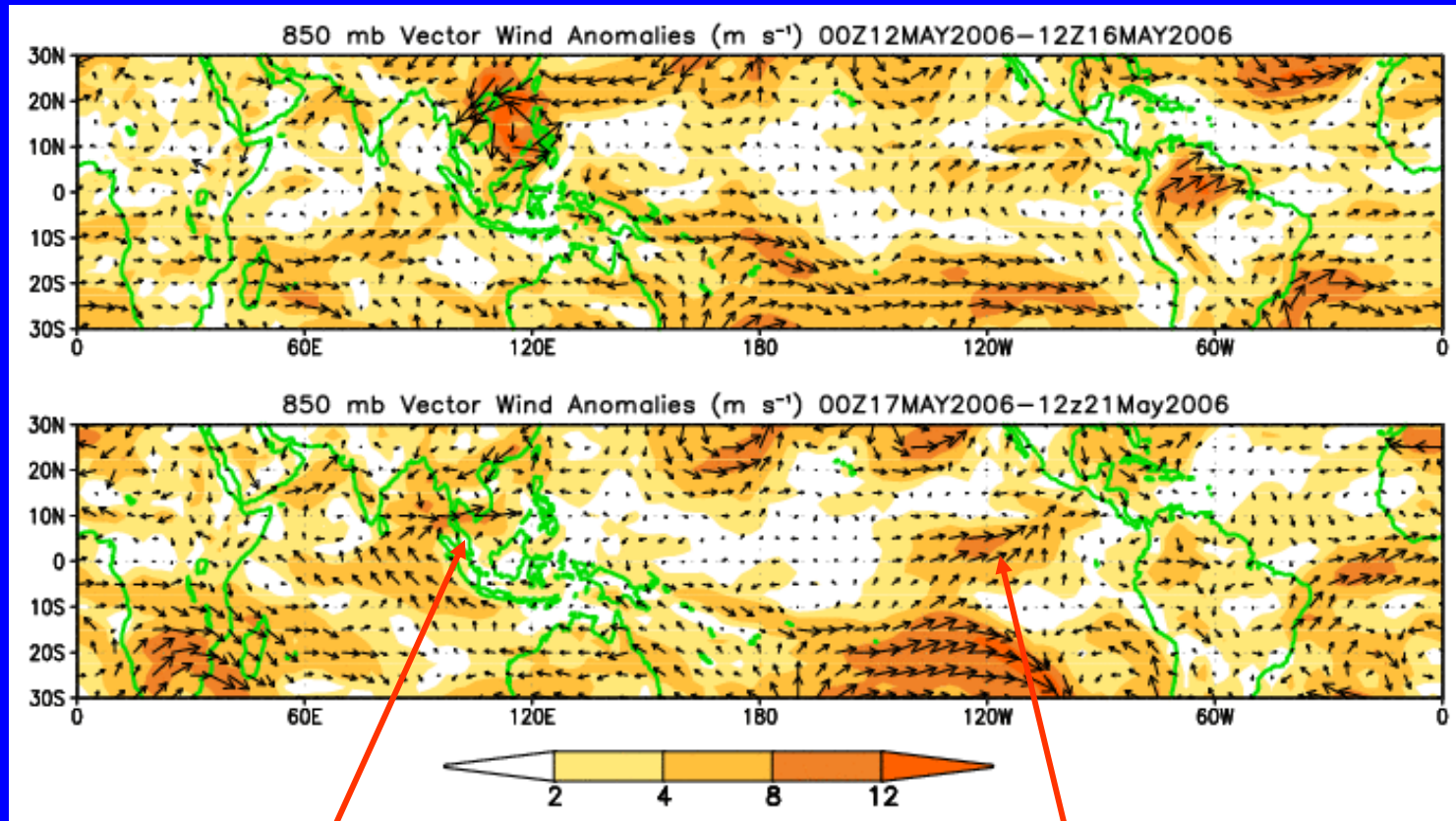
Overview

- The latest observations indicate that the MJO remains weak.
- Based on the latest observational evidence, there are some indications that the MJO may strengthen during the next 1-2 weeks.
- Potential hazards/benefits across the global tropics during week 1 include increased chances of above normal rainfall in proximity to Central America, west-central Africa north of the equator, the eastern Indian Ocean, Bay of Bengal and sections of Southeast Asia and Indonesia. Drier than normal conditions are expected across section of the western Pacific.
- There is an increased likelihood of tropical cyclogenesis in the Bay of Bengal during week 1. In addition, the east Pacific Ocean needs to be closely monitored for tropical activity south of Mexico.
- During week 2, there is an increased chance of above normal rainfall stretching from eastern India into the western Pacific Ocean.



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

Note that shading denotes the magnitude of the anomalous wind vectors



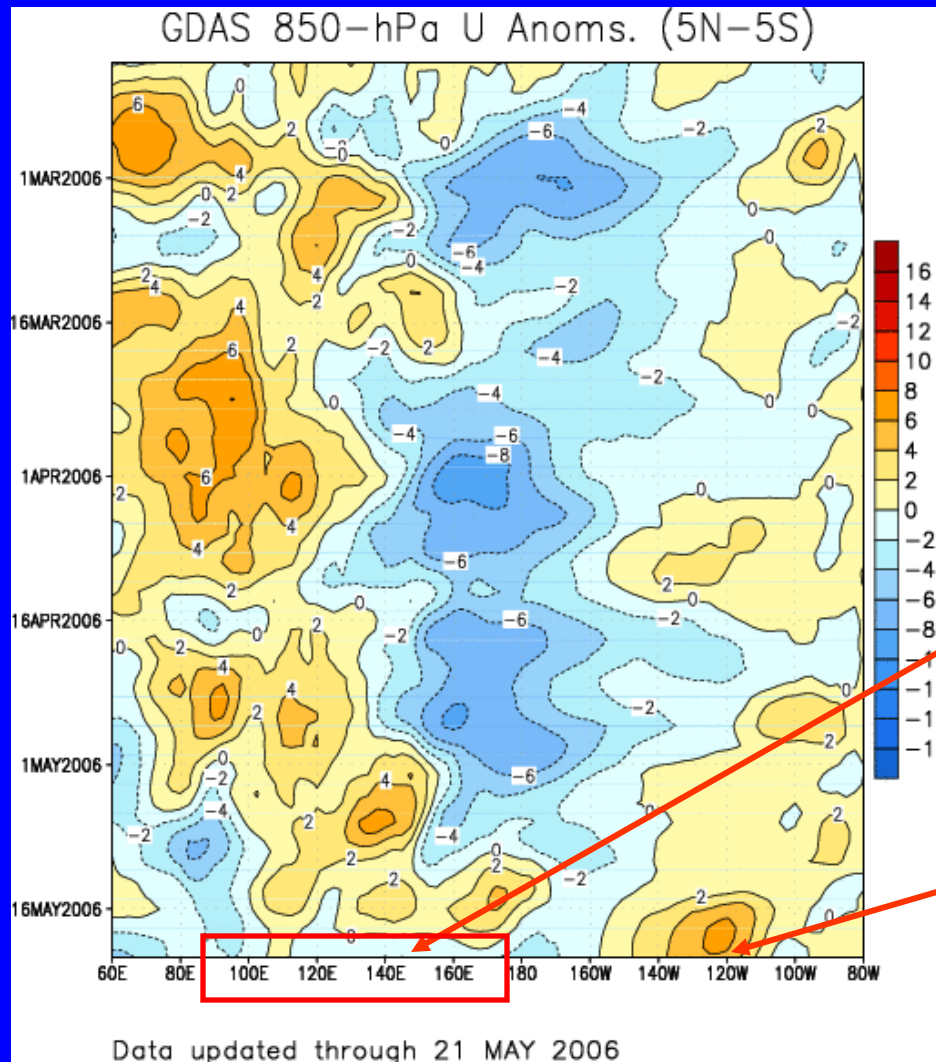
Wind anomalies north of the equator in the Indian Ocean and Indonesia associated with convection.

Westerly anomalies in the eastern Pacific associated with anomalous convection.



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

Time
↓



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

Stronger-than-average easterlies (blue shading)

Equatorial anomalies from the Indian Ocean across western Pacific weakened substantially during the last few days.

Westerly anomalies over the eastern Pacific enhanced.

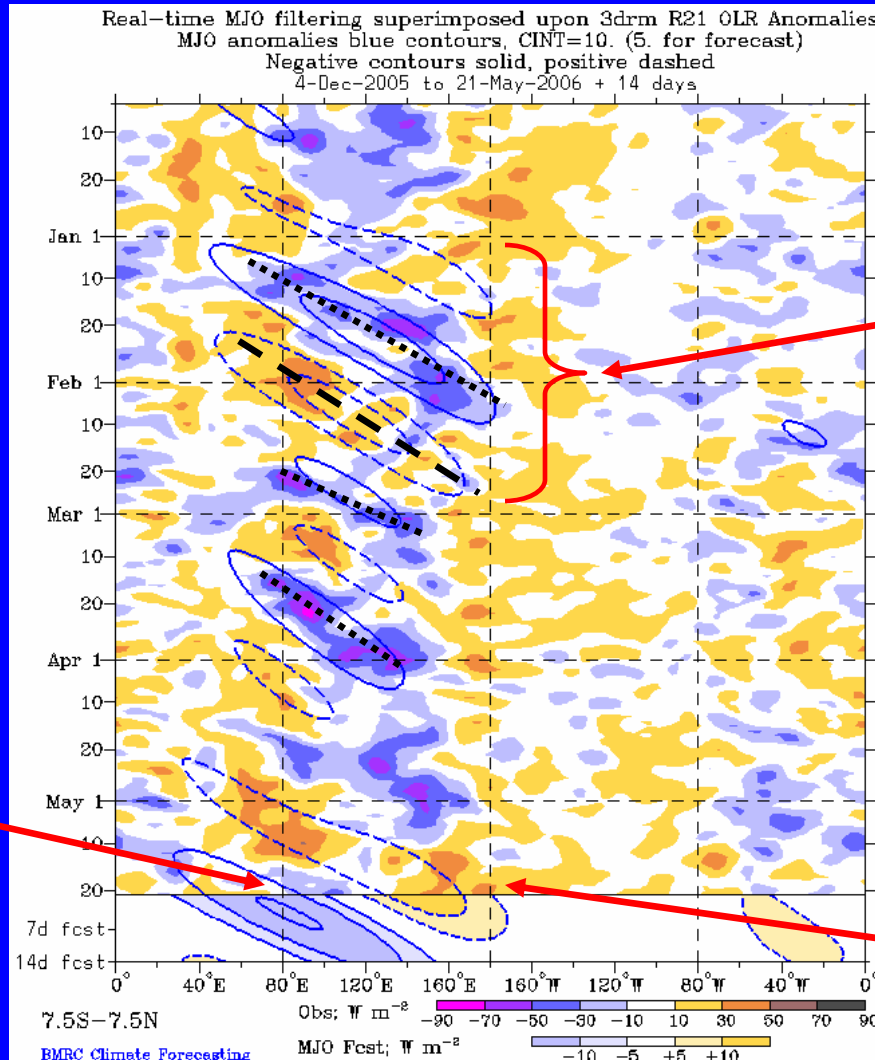
Longitude



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

Drier-than-average conditions (/red shading)

Wetter-than-average conditions (blue shading)



Eastward propagation of OLR anomalies associated with the MJO was evident from mid-January through late February

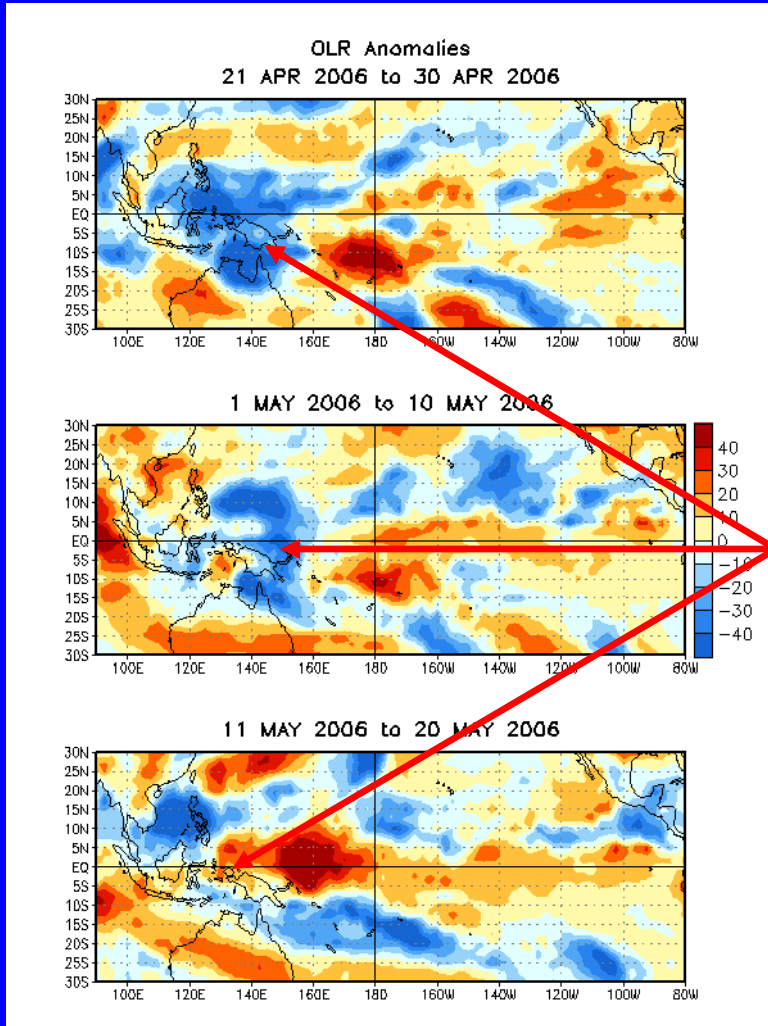
Wet conditions began to emerge in the Indian Ocean.

Dry conditions remain in the western Pacific.

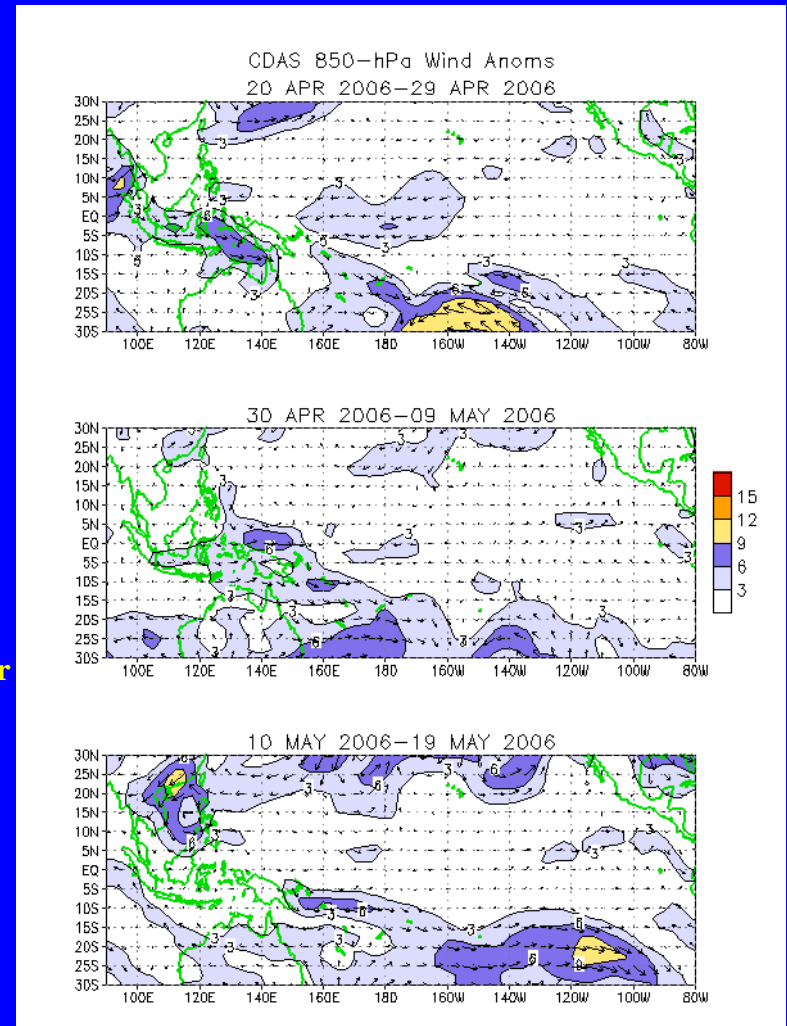


Anomalous OLR and 850-hPa Wind

Wind: Last 30 days



Enhanced convection across Indonesia has weakened from mid-April to mid-May and has been replaced with drier than normal conditions.



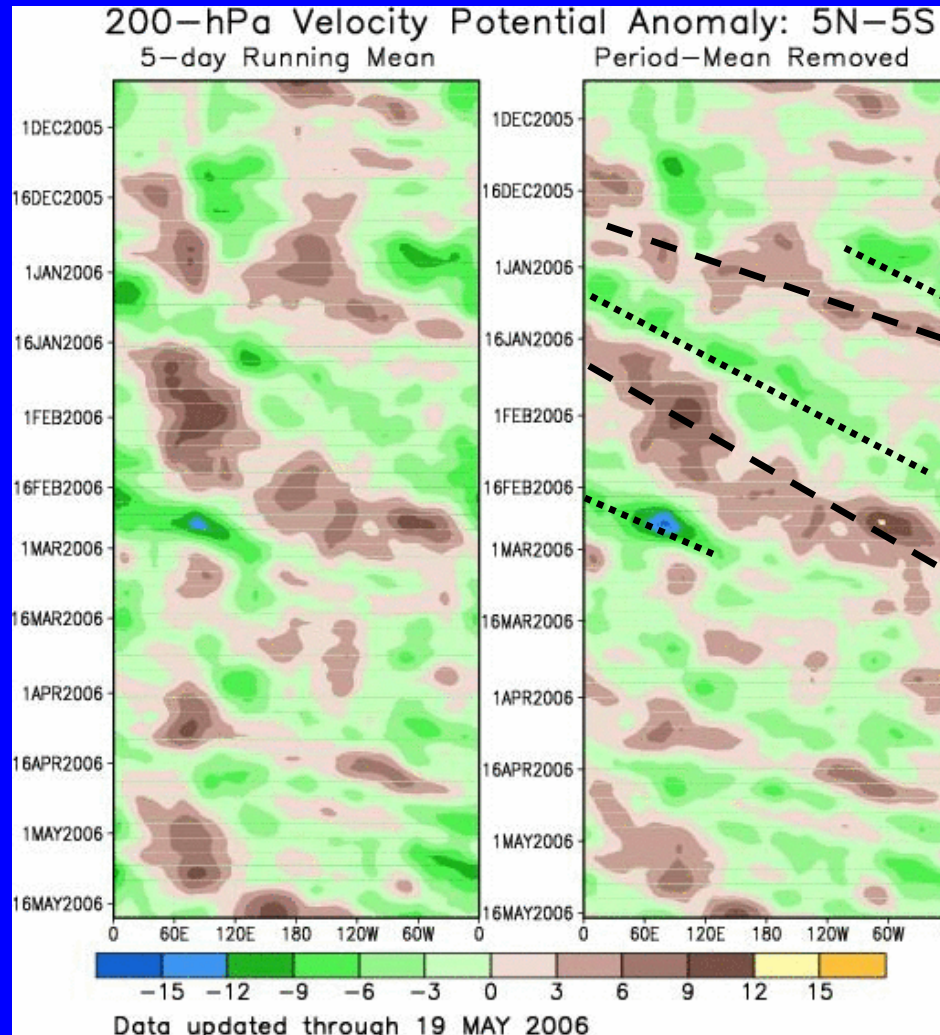


200-hPa Velocity Potential Anomalies (5°S-5°N)

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

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

Time



Weak to moderate MJO activity was observed during January and February.

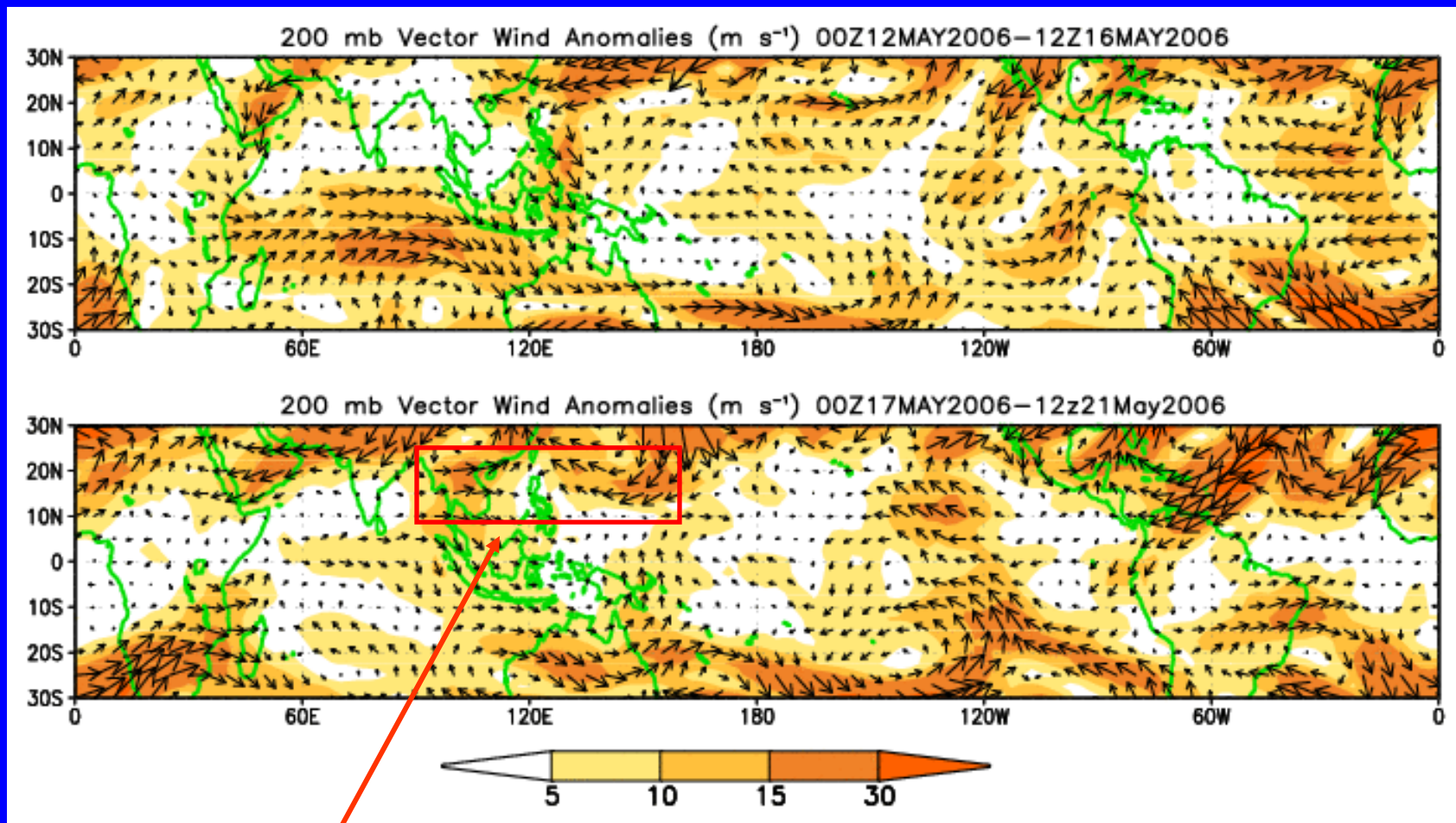
The MJO has generally been weak since early March.

Longitude



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

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

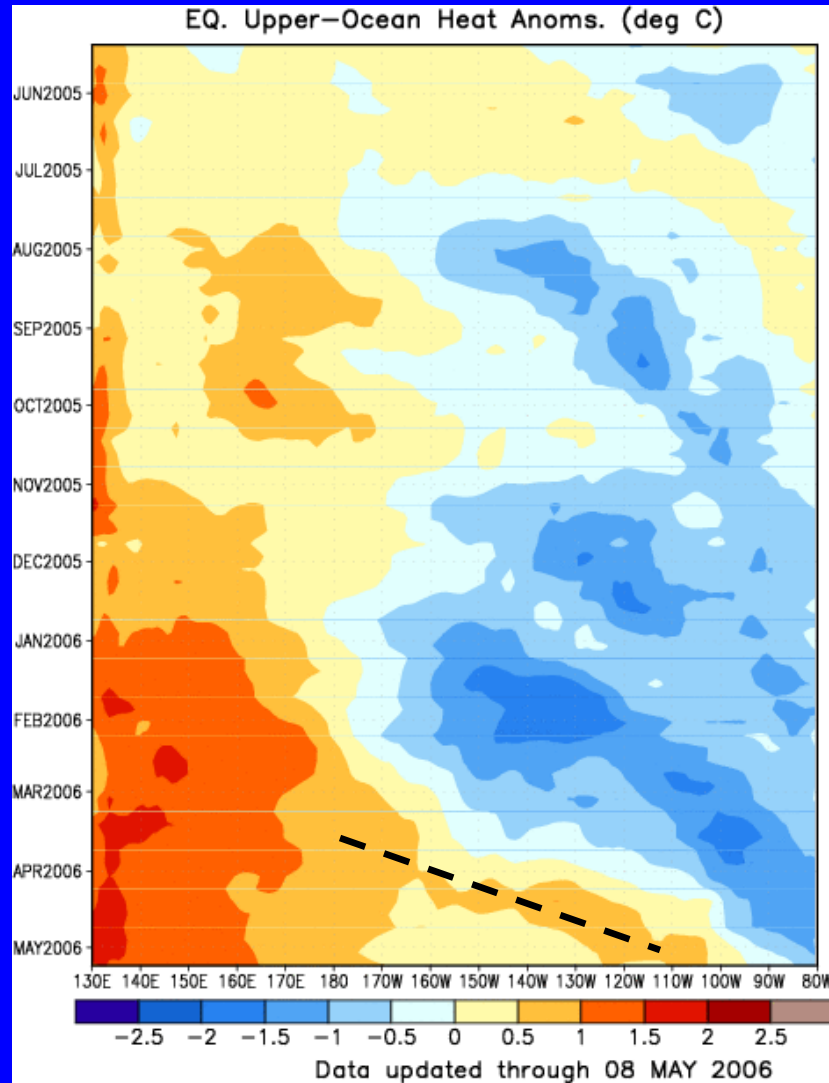


Anomalies over south Asia consistent with enhanced local convection.



Heat Content Evolution in the Eq. Pacific

Time



Longitude

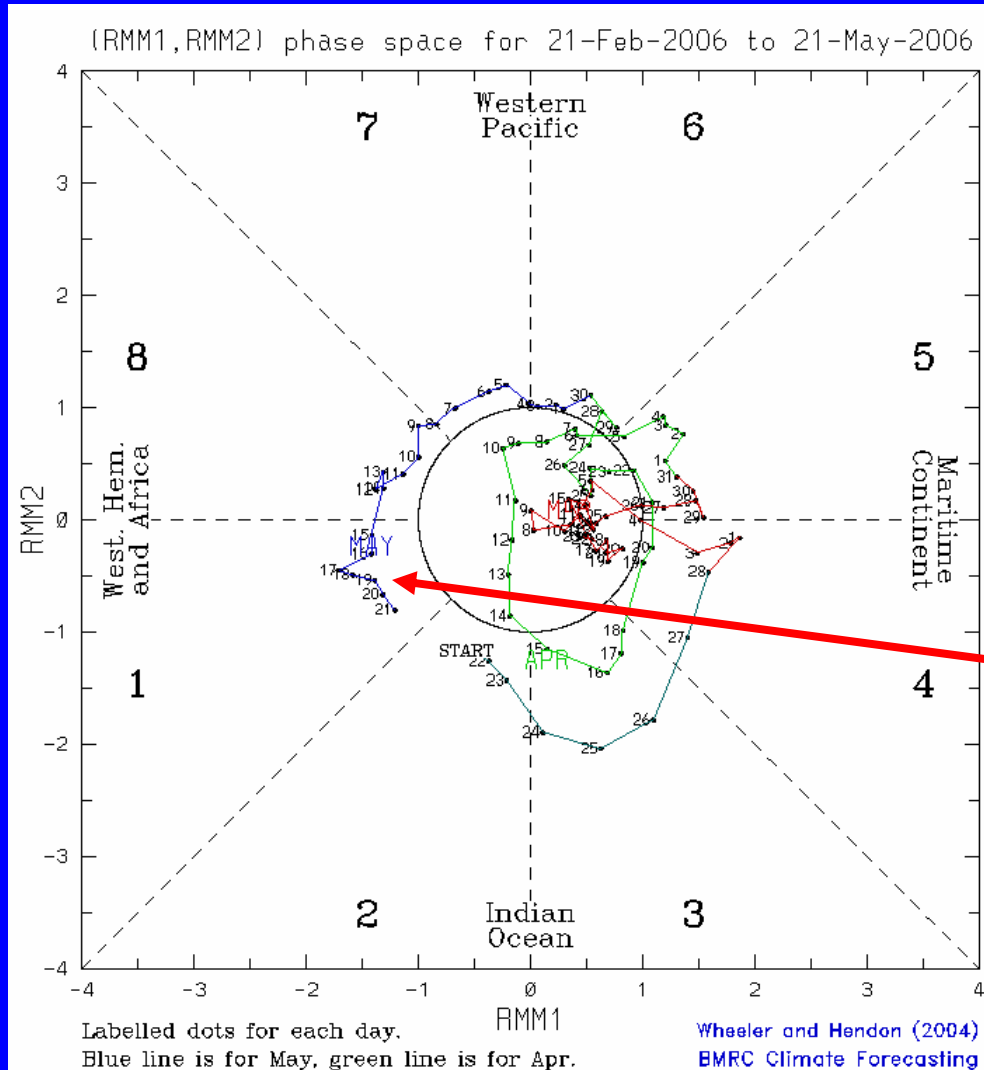
Above normal heat content expanded into the eastern Pacific during April and early May 2006 associated with the latest Kelvin wave.



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.

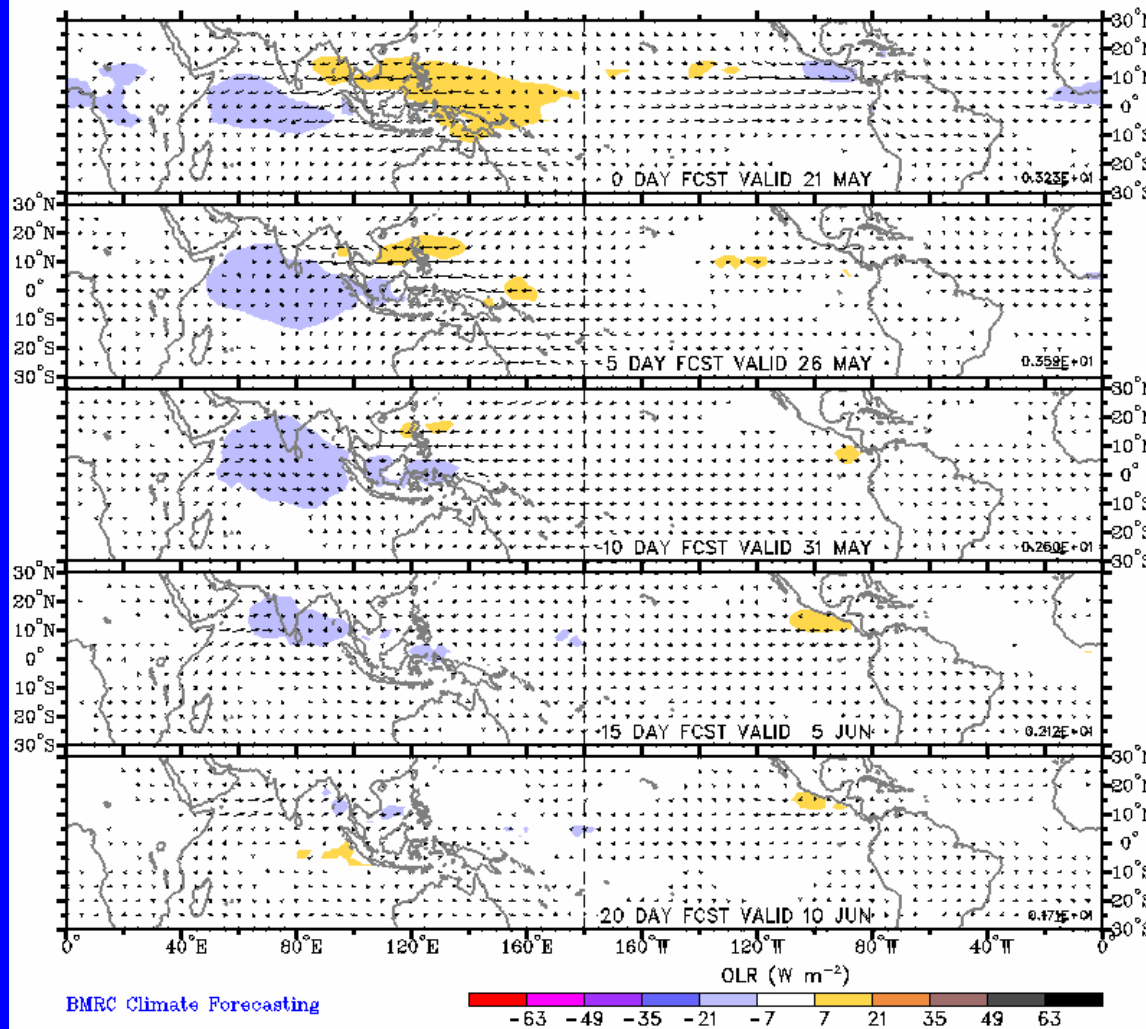


The MJO signal has been weak during late April and early May, however, the MJO signal has strengthened during the last two weeks.



Statistical OLR MJO Forecast

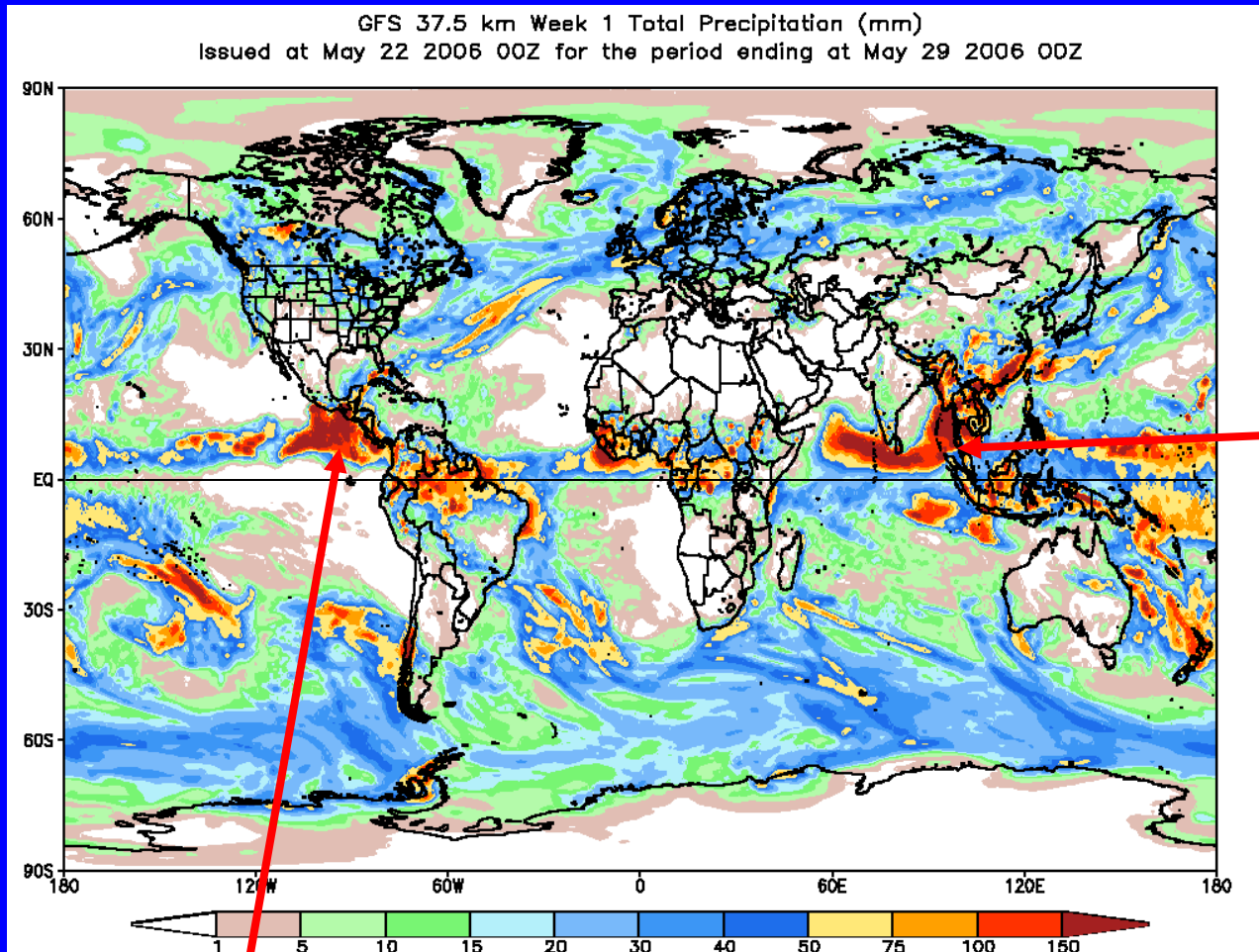
Prediction of MJO-associated anomalies using lagged linear regression
Predictors are RMM1 and RMM2 on 21 May 2006
Shading for OLR anomalies (scale below). Vectors for 850-hPa wind



A statistical MJO forecast indicates wet conditions slowly evolving from the Indian Ocean to the north and across Indonesia during next two weeks.



Global Forecast System (GFS) Week 1 Precipitation Forecast



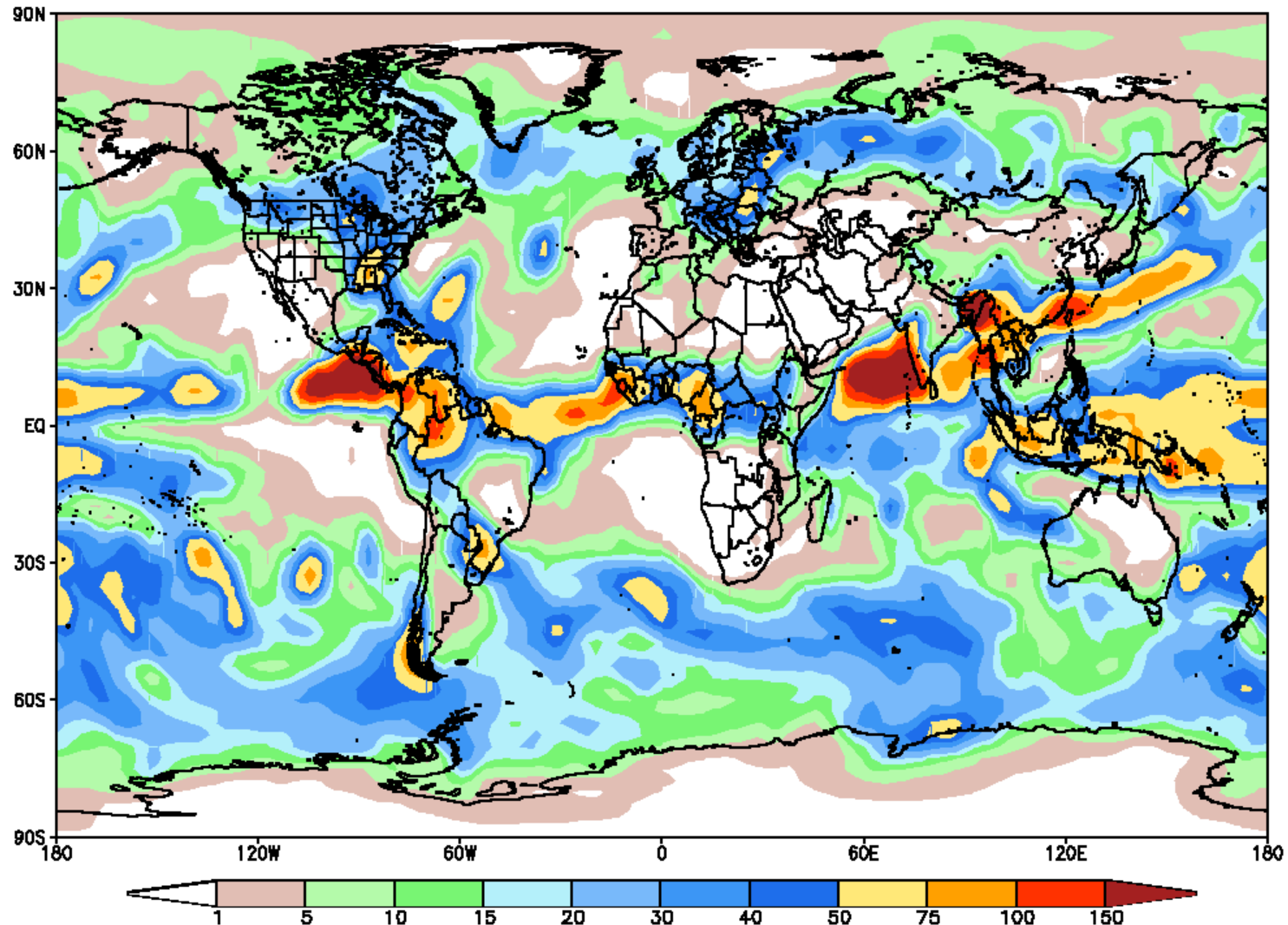
Heavy rainfall in the Arabian Sea, Bay of Bengal, Thailand, and Vietnam.

Abundant rainfall in the tropical northeastern Pacific Ocean



Global Forecast System (GFS) Week 2 Precipitation Forecast

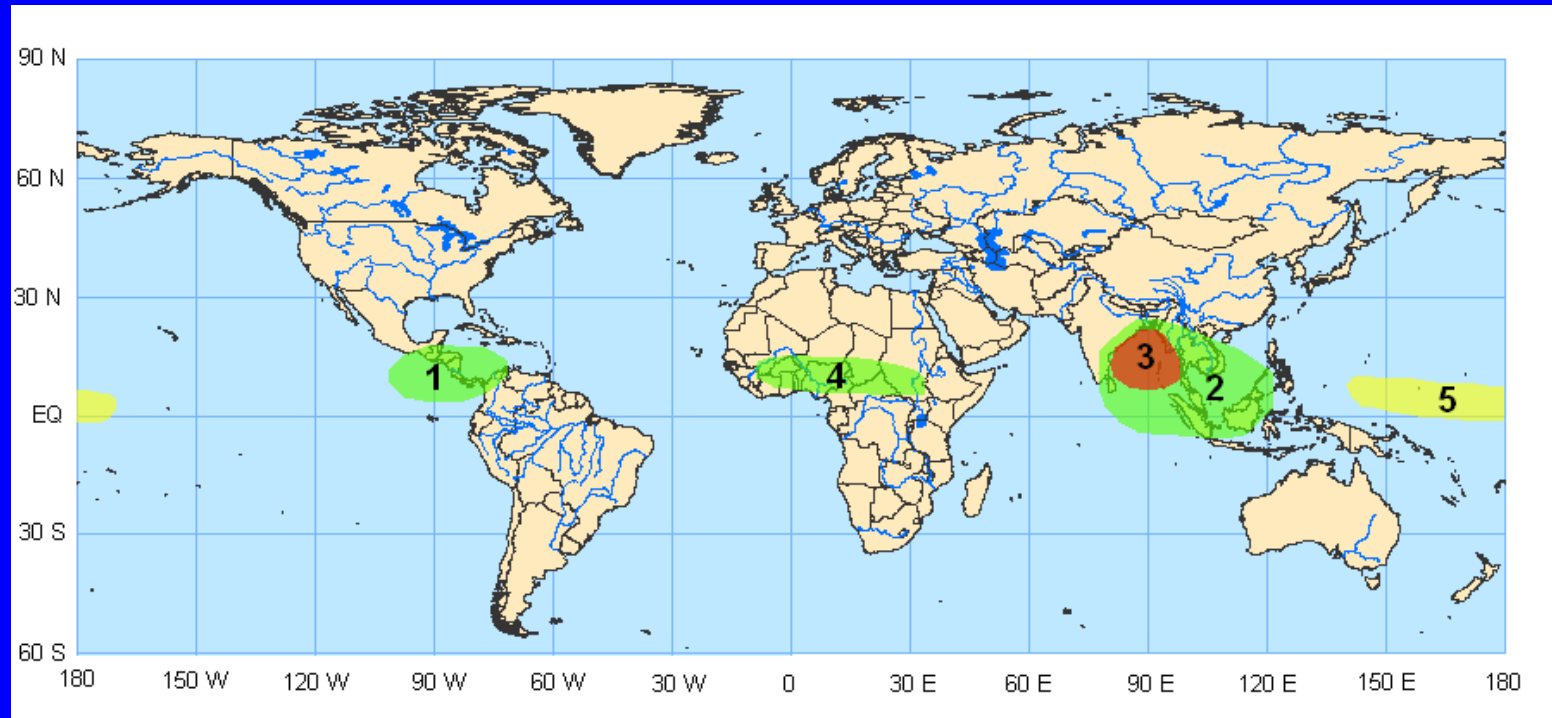
GFS 100 km Week 2 Total Precipitation (mm)
Issued May 22 2006 00Z for the period ending at Jun 4 2006 00Z





Potential Benefits/Hazards – Week 1

Valid May 23 - 29, 2006

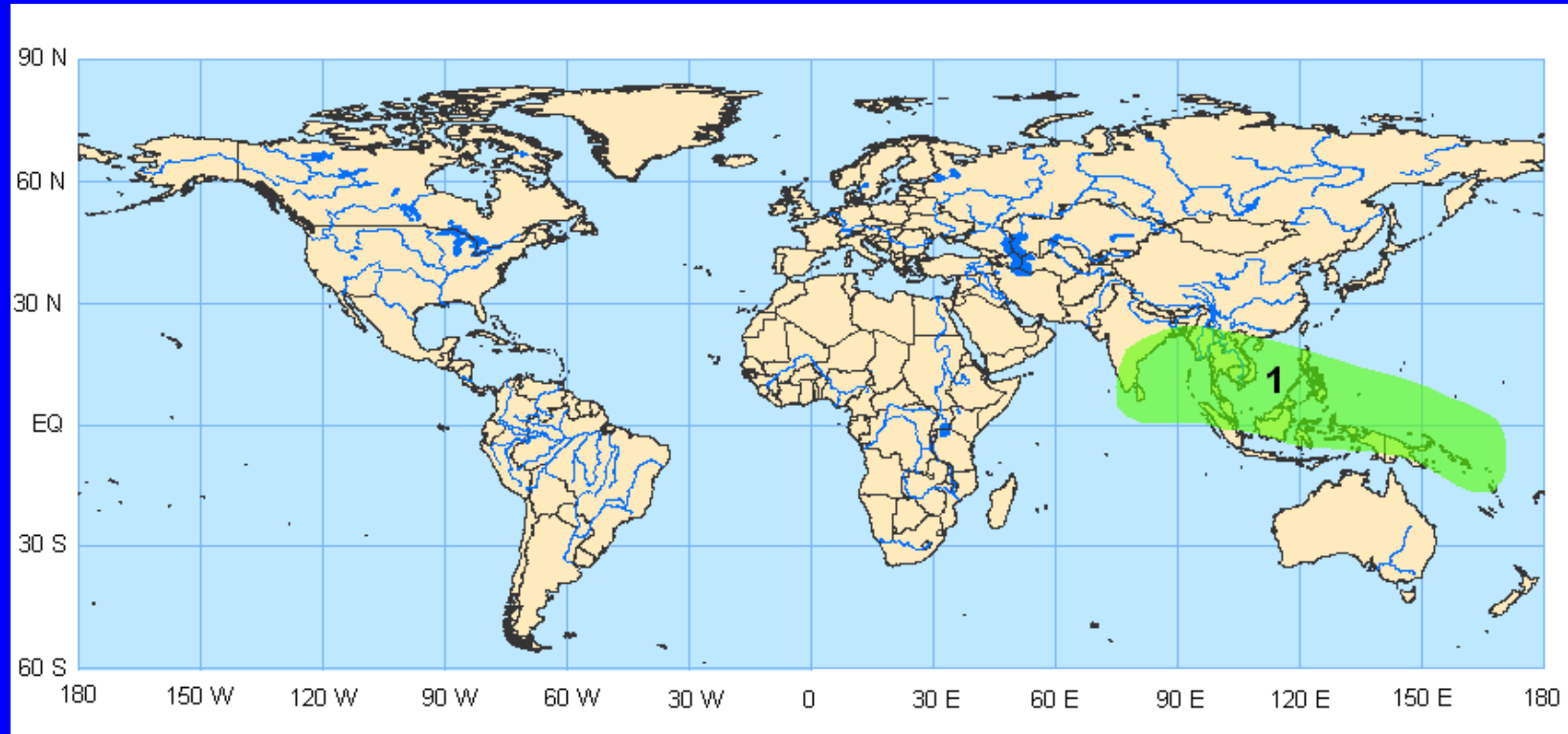


1. Increased chances of above normal rainfall in the tropical eastern Pacific Ocean and Central America
2. Increased chances of above normal rainfall in the eastern Indian Ocean, Bay of Bengal, and sections of Southeast Asia and Indonesia associated with the enhanced phase of the MJO
3. Increased chances of tropical cyclogenesis in the Bay of Bengal as conditions are expected to be favorable
4. Increased chances of above normal rainfall in west-central Africa north of the equator due to the enhanced phase of the MJO
5. Increased chances of below normal rainfall over the equatorial western Pacific due to the suppressed phase of the MJO



Potential Benefits/Hazards – Week 2

Valid May 30 – June 5, 2006



1. Increased chances of above normal rainfall from eastern India to the far western Pacific Ocean associated with the enhanced phase of the MJO and localized positive SST anomalies



Summary

- The latest observations indicate that the MJO remains weak.
- Based on the latest observational evidence, there are some indications that the MJO may strengthen during the next 1-2 weeks.
- Potential hazards/benefits across the global tropics during week 1 include increased chances of above normal rainfall in proximity to Central America, west-central Africa north of the equator, the eastern Indian Ocean, Bay of Bengal and sections of Southeast Asia and Indonesia. Drier than normal conditions are expected across section of the western Pacific.
- There is an increased likelihood of tropical cyclogenesis in the Bay of Bengal during week 1. In addition, the east Pacific Ocean needs to be closely monitored for tropical activity south of Mexico.
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