

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

Update prepared by
Climate Prediction Center / NCEP
April 16, 2007

Outline

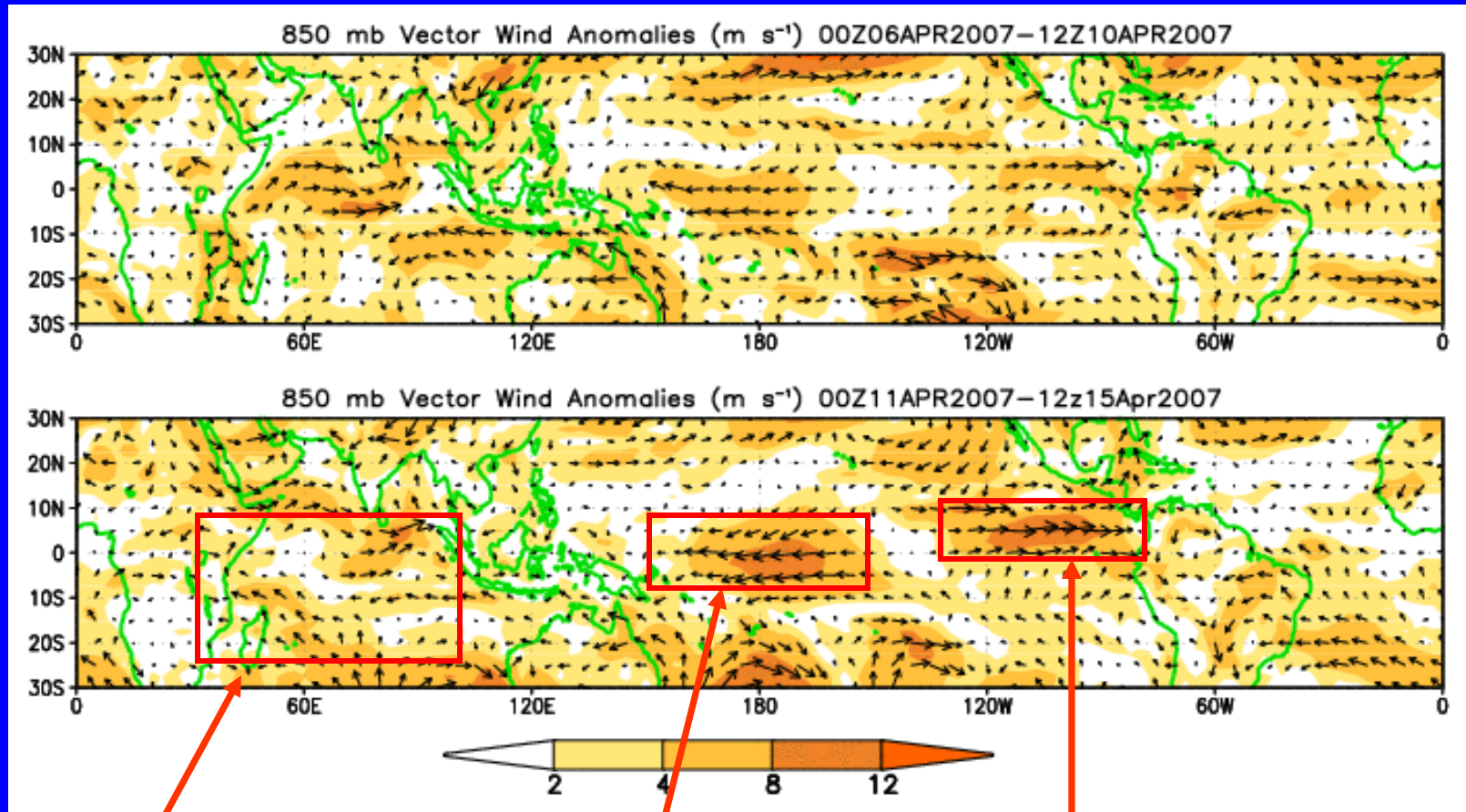
- **Overview**
- **Recent Evolution and Current Conditions**
- **Madden Julian Oscillation Forecast**
- **Summary**

Overview

- **The MJO remains incoherent.**
- **Large-scale organized OLR anomalies across the global tropics are limited at the current time and uncertainty remains high.**
- **During week 1, there exists an increased chance for above-average rainfall over the Greater Horn of Africa, the eastern Bay of Bengal, parts of Indo-China, across New Guinea, the Federated States of Micronesia, the Solomon Islands, Vanuatu and Fiji.**
- **The increased chance for above-average rainfall is expected to persist into week 2 across a smaller region near New Guinea, the Solomon Islands, Vanuatu and Fiji.**

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

Note that shading denotes the magnitude of the anomalous wind vectors

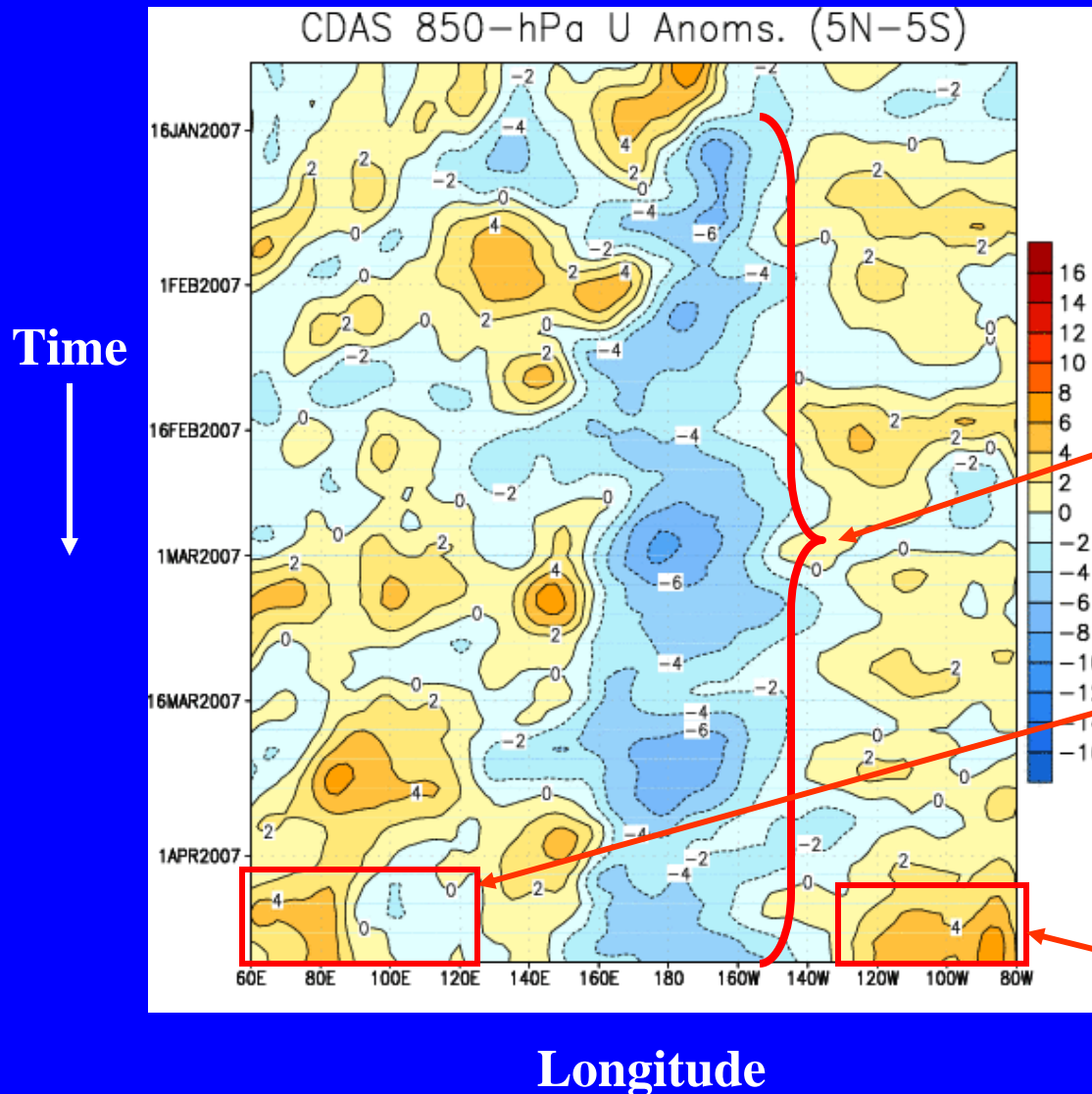


Anomalous westerlies began to ease over the equatorial Indian Ocean while enhanced southeasterly flow increased moisture advection into eastern Africa.

Anomalous easterlies persisted in the western equatorial Pacific.

Westerly wind anomalies strengthened over the eastern equatorial Pacific.

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



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

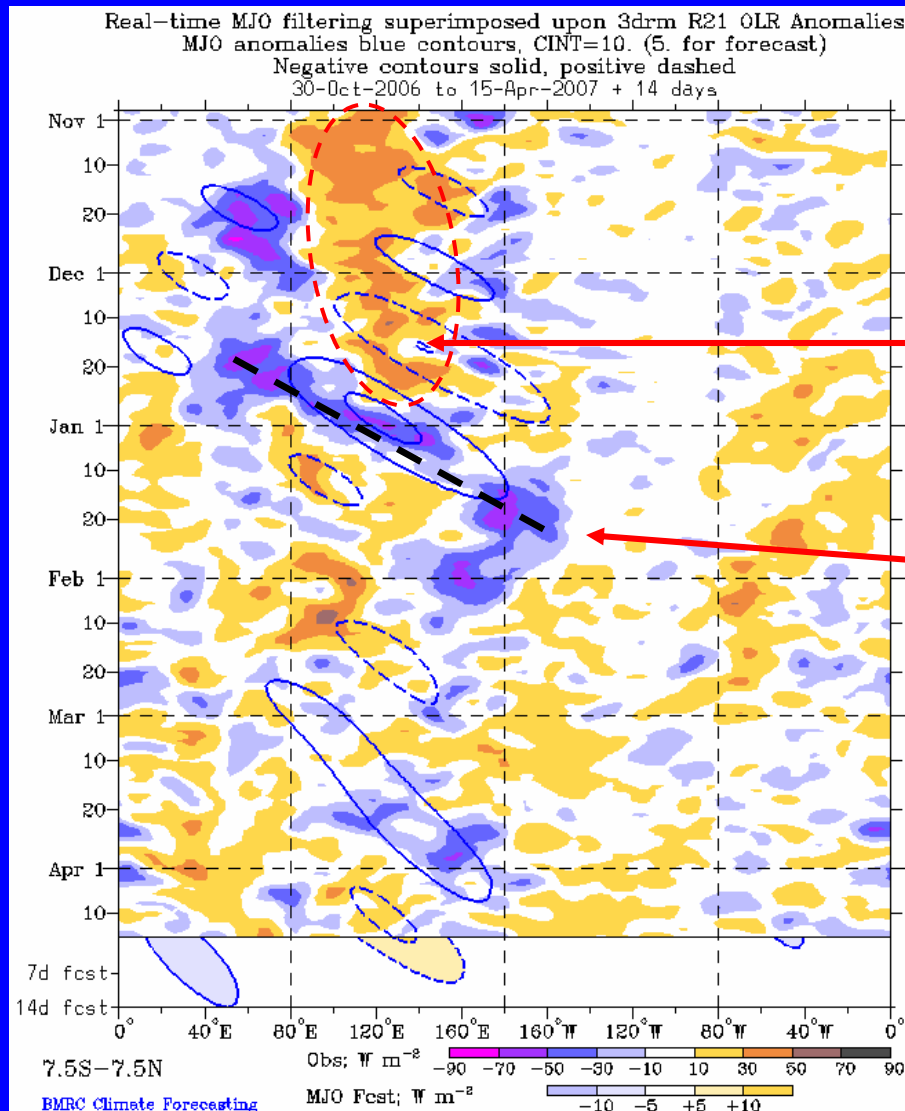
Easterly anomalies (blue shading) represent anomalous east-to-west flow.

Easterly anomalies have been persistent near the Date Line since mid-January.

Westerly anomalies continued over the eastern equatorial Indian Ocean, while anomalies were small over the Maritime Continent.

Westerly wind anomalies emerged in April over the equatorial Pacific east of 130°W .

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 (100°E-150°E) from late October to mid-December.

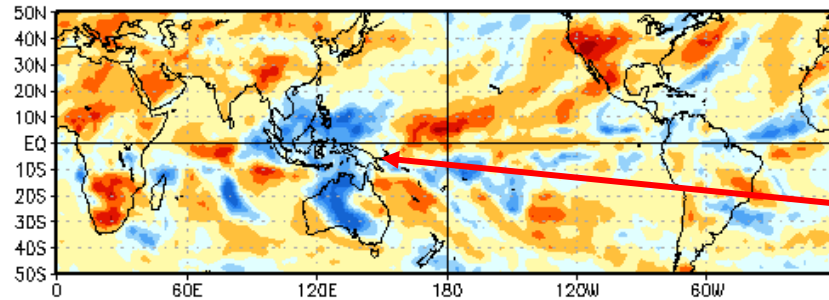
Enhanced convection, associated with the MJO in late December and January, shifted eastward from the Indian Ocean across the Maritime Continent and western Pacific.

Except for a few convective “flare ups”, OLR anomalies were generally small across the Equatorial Belt during the first half of April.

Longitude

Anomalous OLR: Last 30 days

OLR Anomalies
12 MAR 2007 to 21 MAR 2007

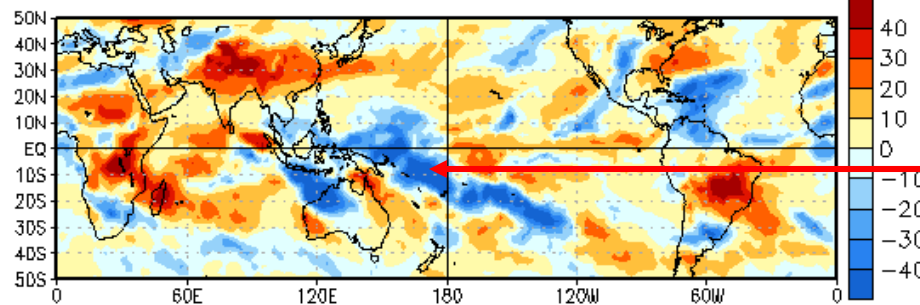


Drier-than-normal conditions, positive OLR anomalies (red shading)

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

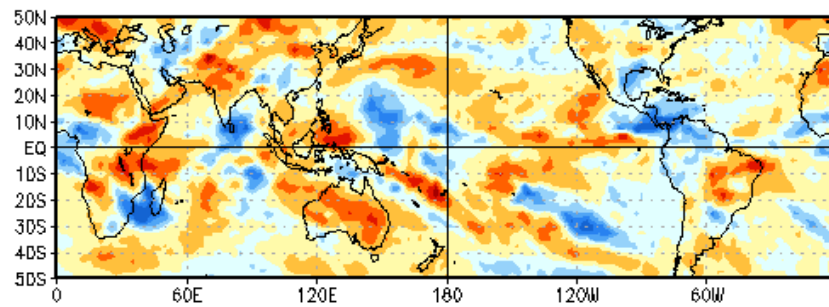
In mid March, the SPCZ weakened and enhanced convection over the Maritime continent extended northward to include the tropical western Pacific.

22 MAR 2007 to 31 MAR 2007



In late March, convection increased markedly on the SPCZ while dry conditions were observed over eastern Africa and Brazil.

1 APR 2007 to 10 APR 2007

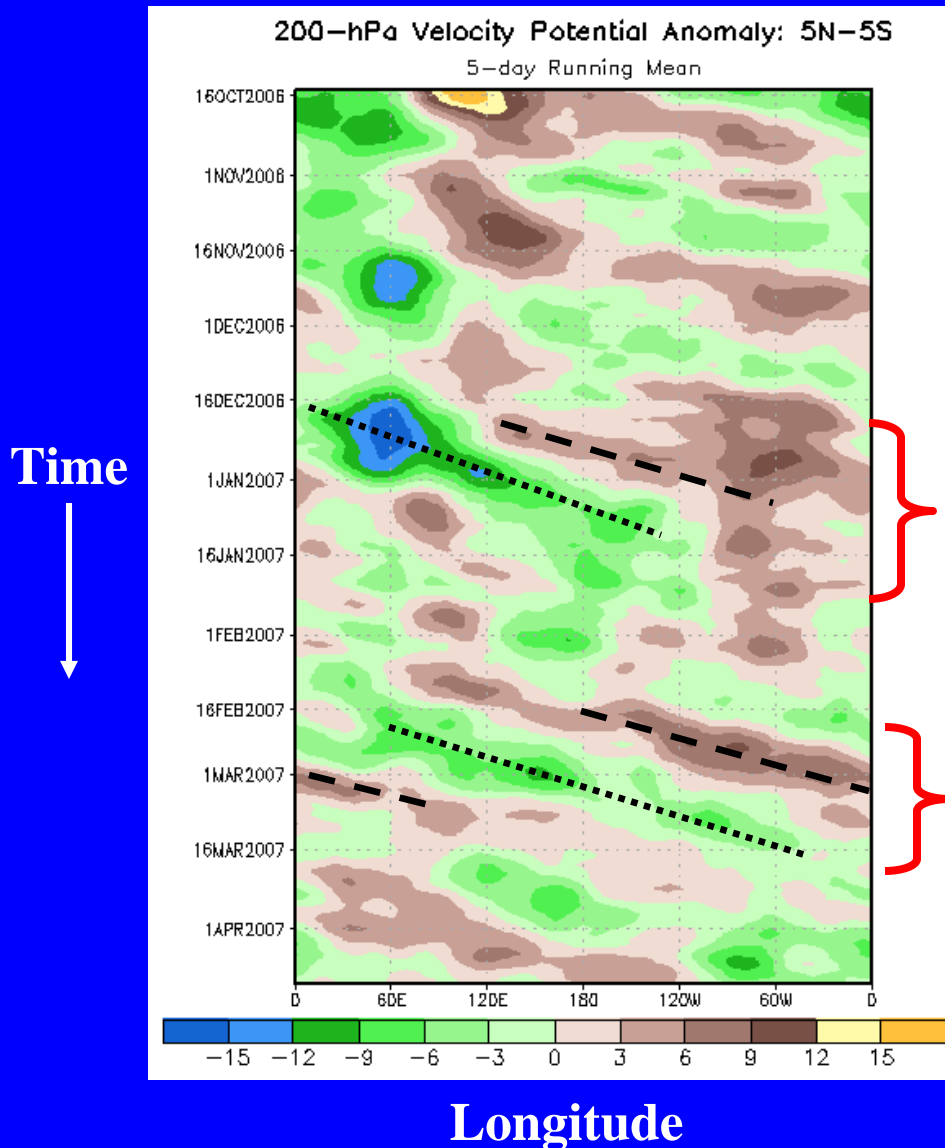


During early April, OLR anomalies generally decreased across the tropics. However, convection remained suppressed over eastern Africa and enhanced over Central America.

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.

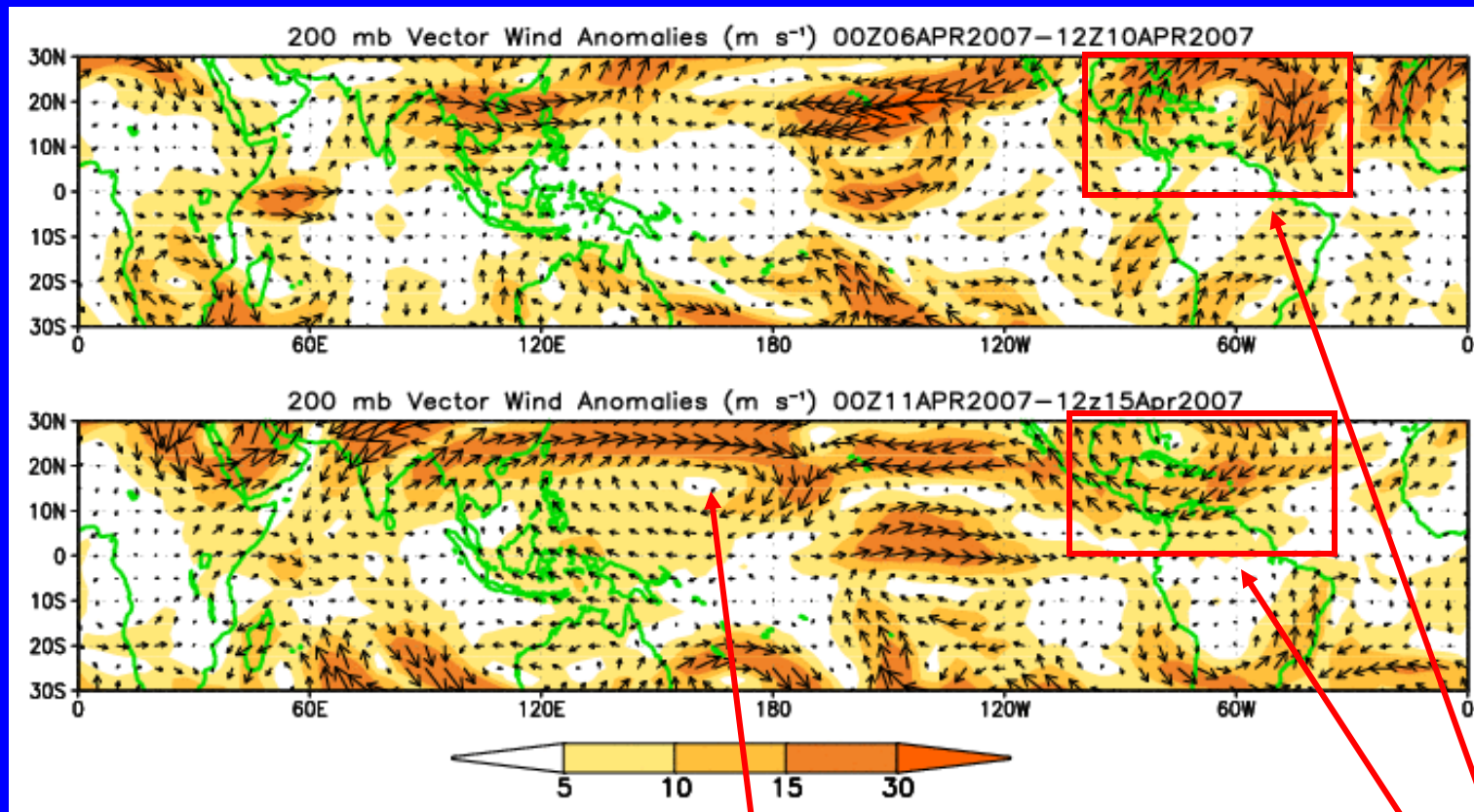


The MJO intensified in late December 2006, as negative OLR anomalies shifted eastward from the Maritime continent into the central tropical Pacific.

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})

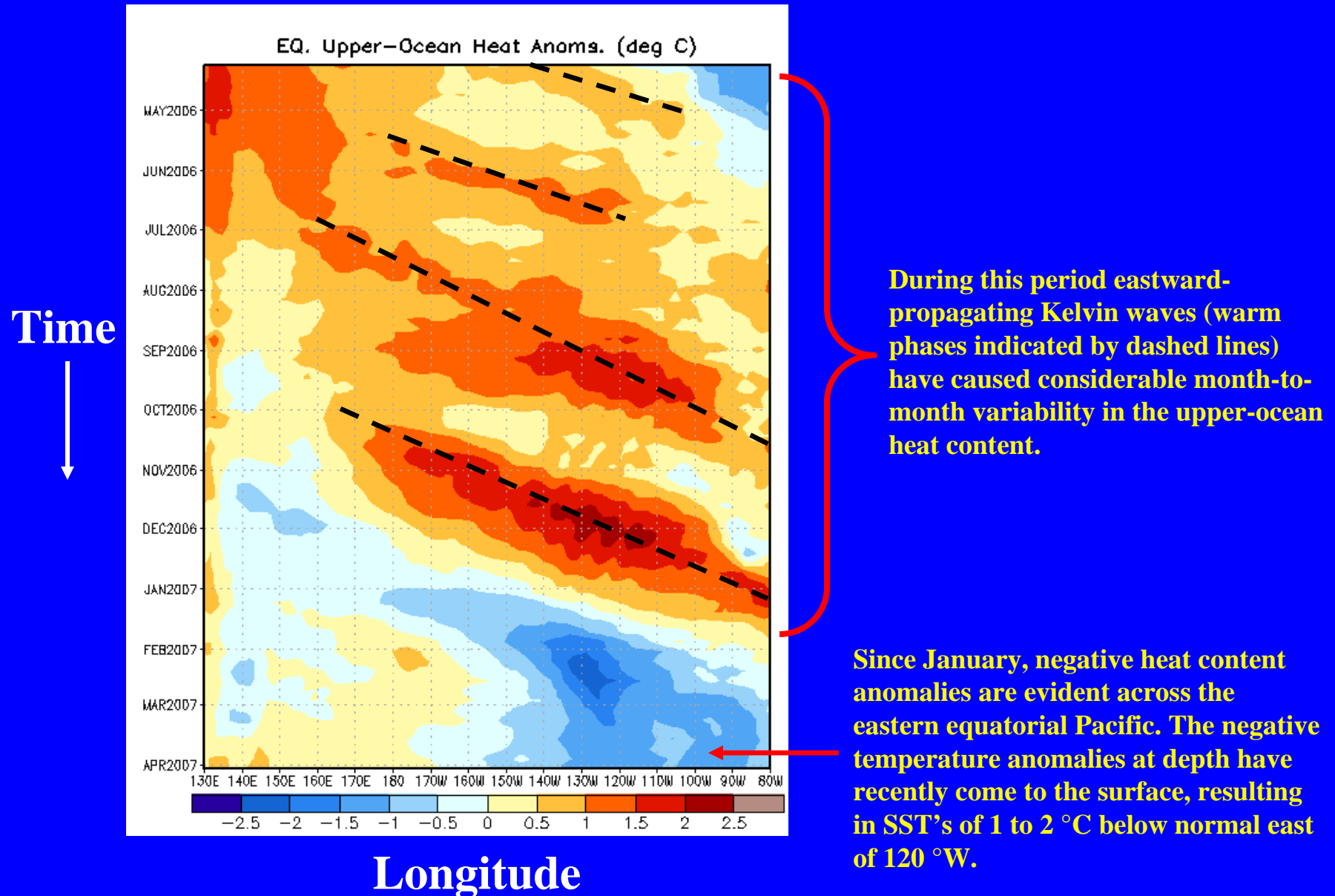
Note that shading denotes the magnitude of the anomalous wind vectors.



Anomalous anti-cyclonic circulation developed over the western Pacific.

Anomalous anti-cyclonic circulation in part due to the enhanced convection in this region.

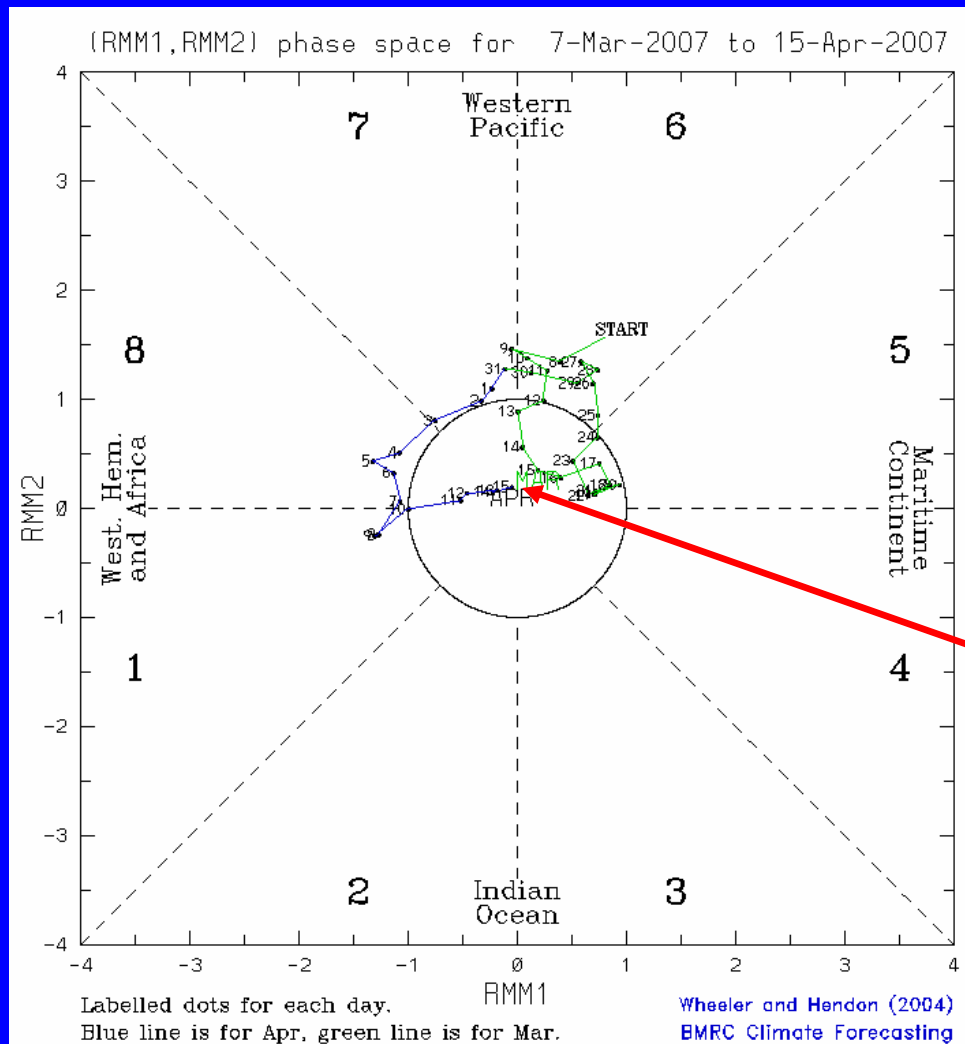
Heat Content Evolution in the Eq. Pacific



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).

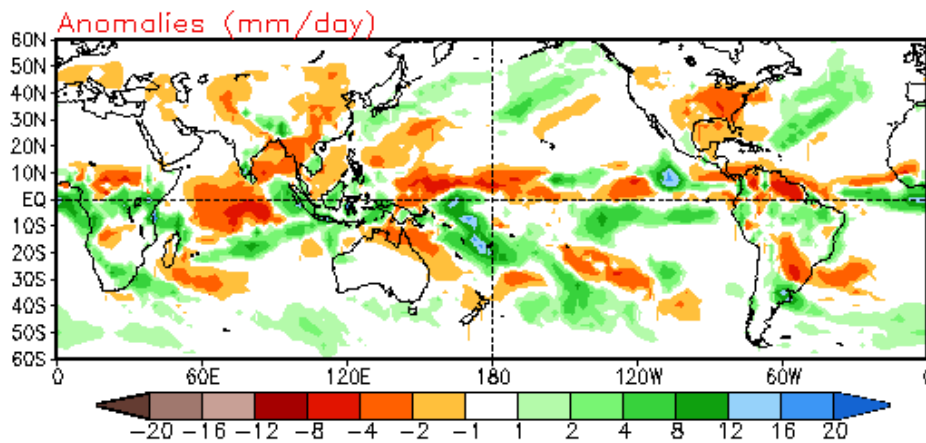
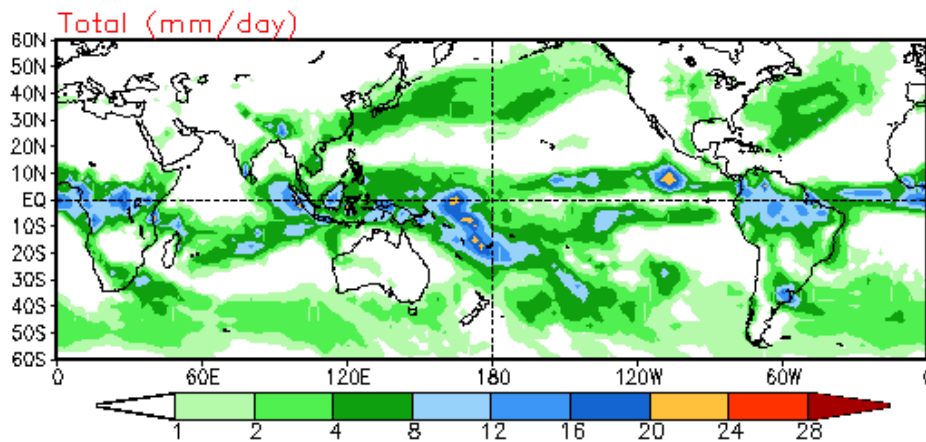
The axes represent the time series of the two leading modes of variability and are used to measure the amplitude while the triangular areas indicate the phase or location of the enhanced phase of the MJO. The farther away from the center of the circle the stronger the MJO. Different color lines indicate different months.



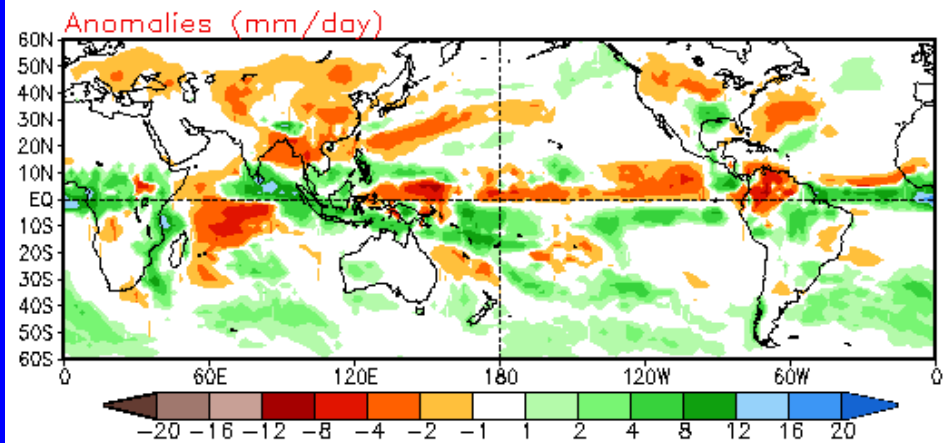
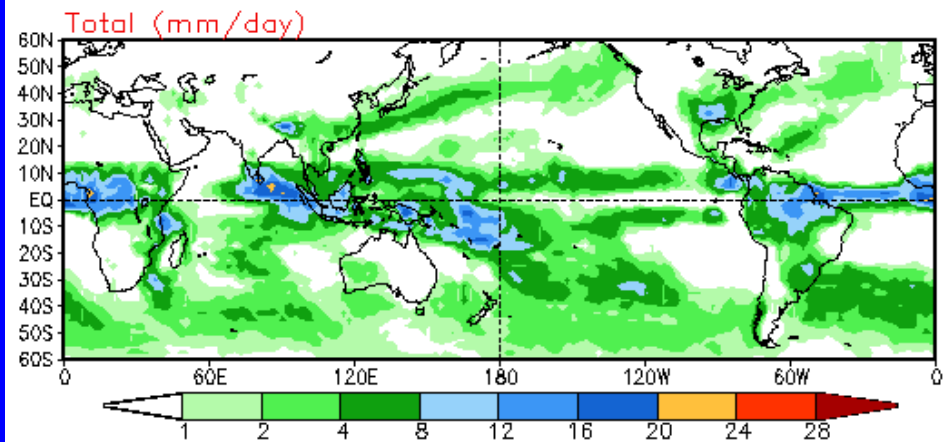
The MJO index indicates that the MJO signal is incoherent.

Experimental Bias-Corrected GFS Precipitation

Week 1 Precipitation
Forecast from 16Apr2007



Week 2 Precipitation
Forecast from 16Apr2007

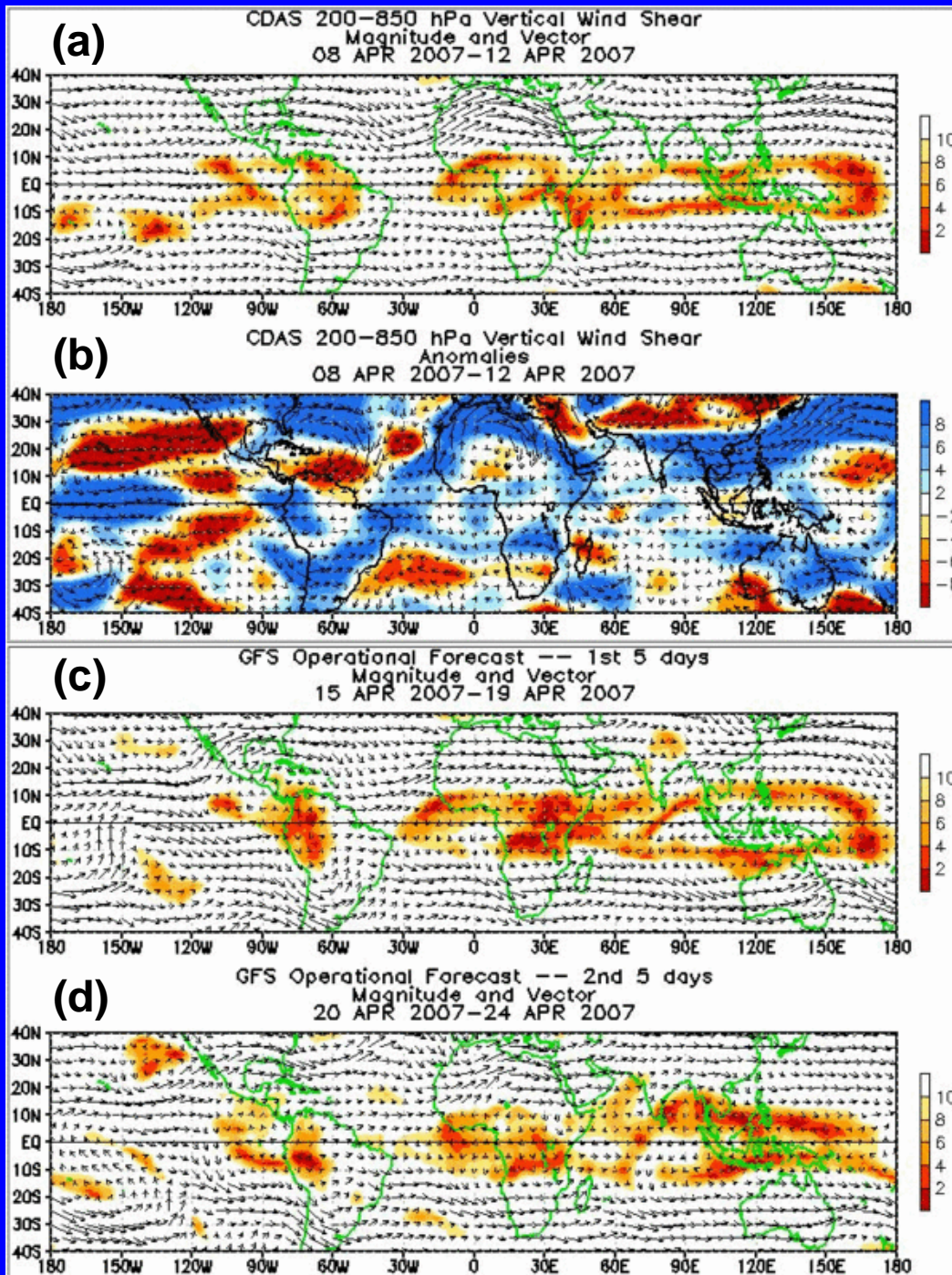


200 – 850 hPa Vertical Wind Shear

All plots: Shading denotes magnitude of vectors

Plots (a),(c),(d): low shear (red), high shear (yellow/white)

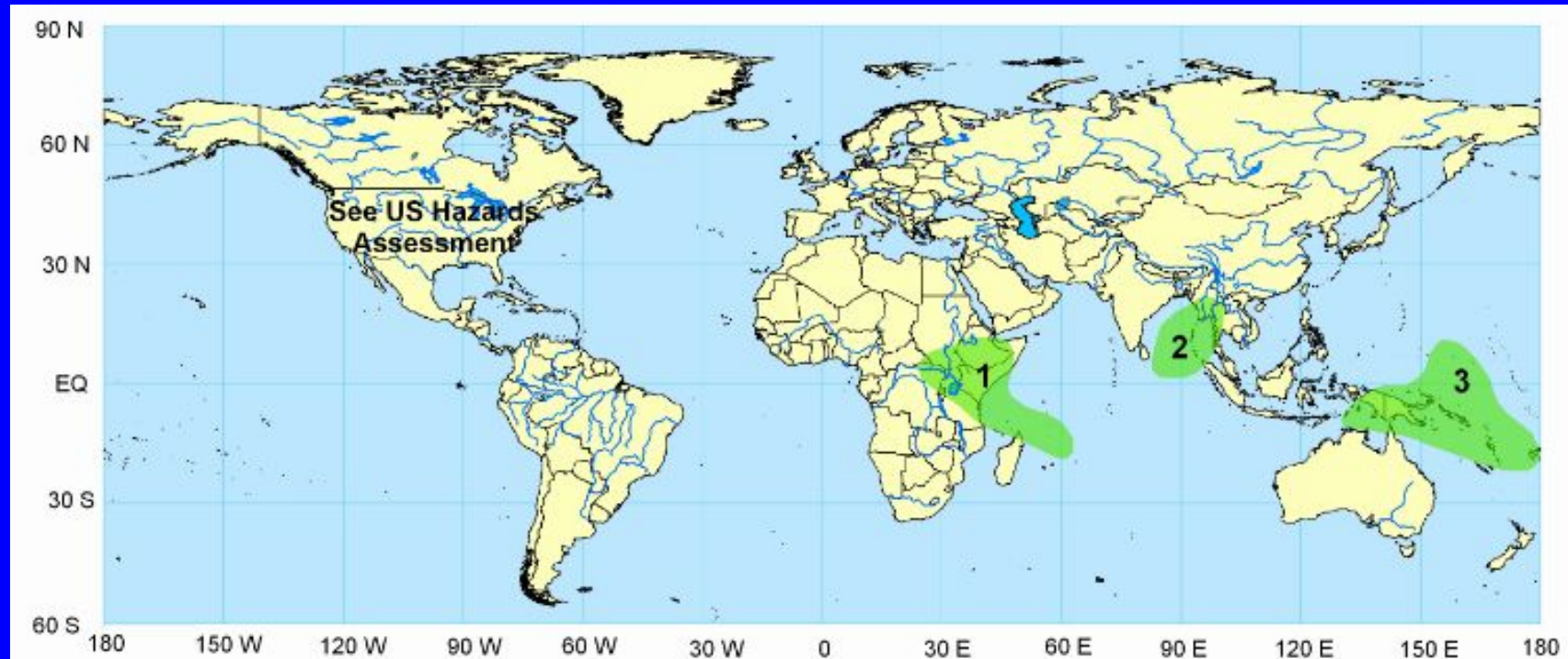
Plot (b): Shear greater than average (blue) Shear less than average (yellow/red)



The GFS forecast indicates low shear over sections of the western tropical Indian Ocean during the next 5-10 days.

Potential Benefits/Hazards – Week 1

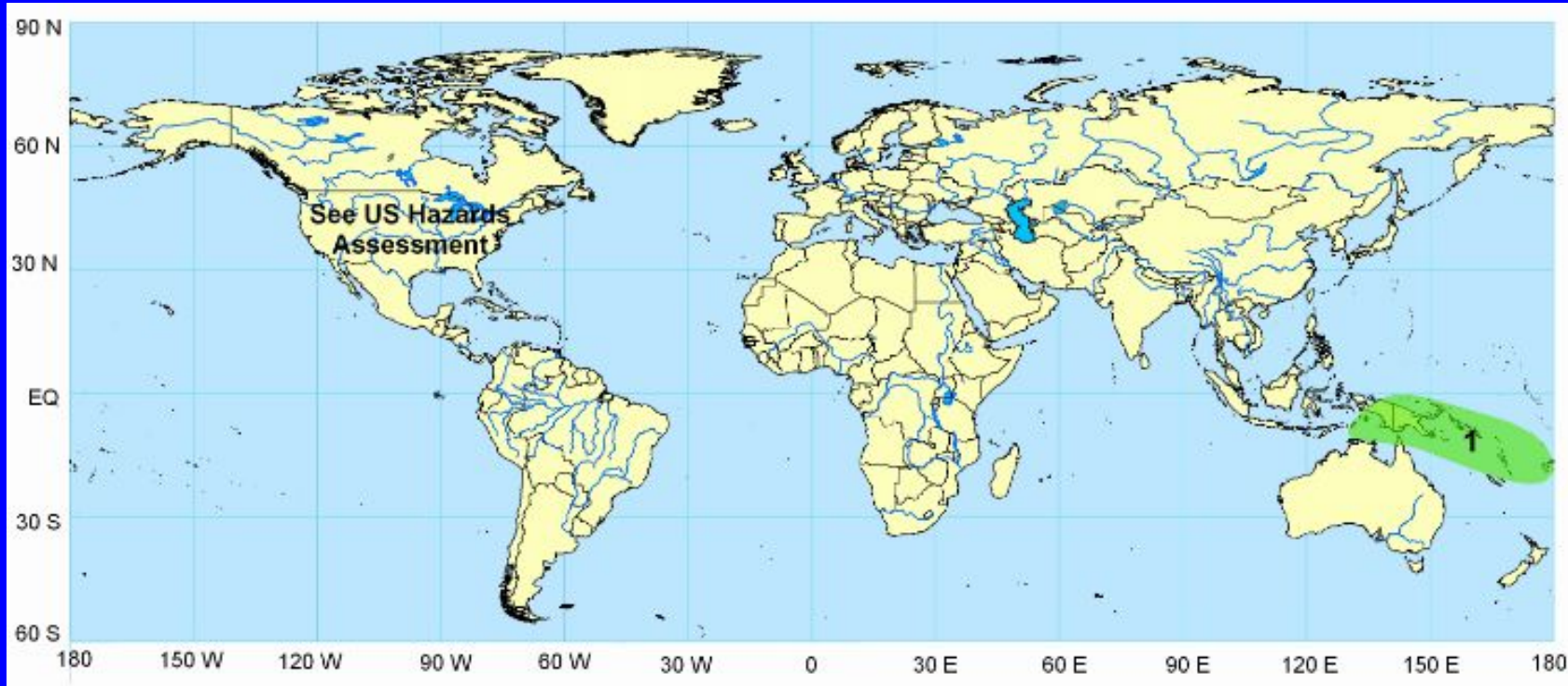
Valid: 17 - 23 April 2007



- 1. An increased chance for above-average rainfall over the Greater Horn of Africa.**
- 2. An increased chance for above-average rainfall over the eastern Bay of Bengal (including the Nicobar and Andaman Islands) and parts of Indo-China.**
- 3. An increased chance for above-average rainfall over New Guinea, the Federated States of Micronesia, the Solomon Islands, Vanuatu and Fiji.**

Potential Benefits/Hazards – Week 2

Valid: 24 - 30 April 2007



1. An increased chance for above-average rainfall over New Guinea, the Solomon Islands, Vanuatu and Fiji.

Summary

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