

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

**Update prepared by
Climate Prediction Center / NCEP
January 8, 2007**

Outline

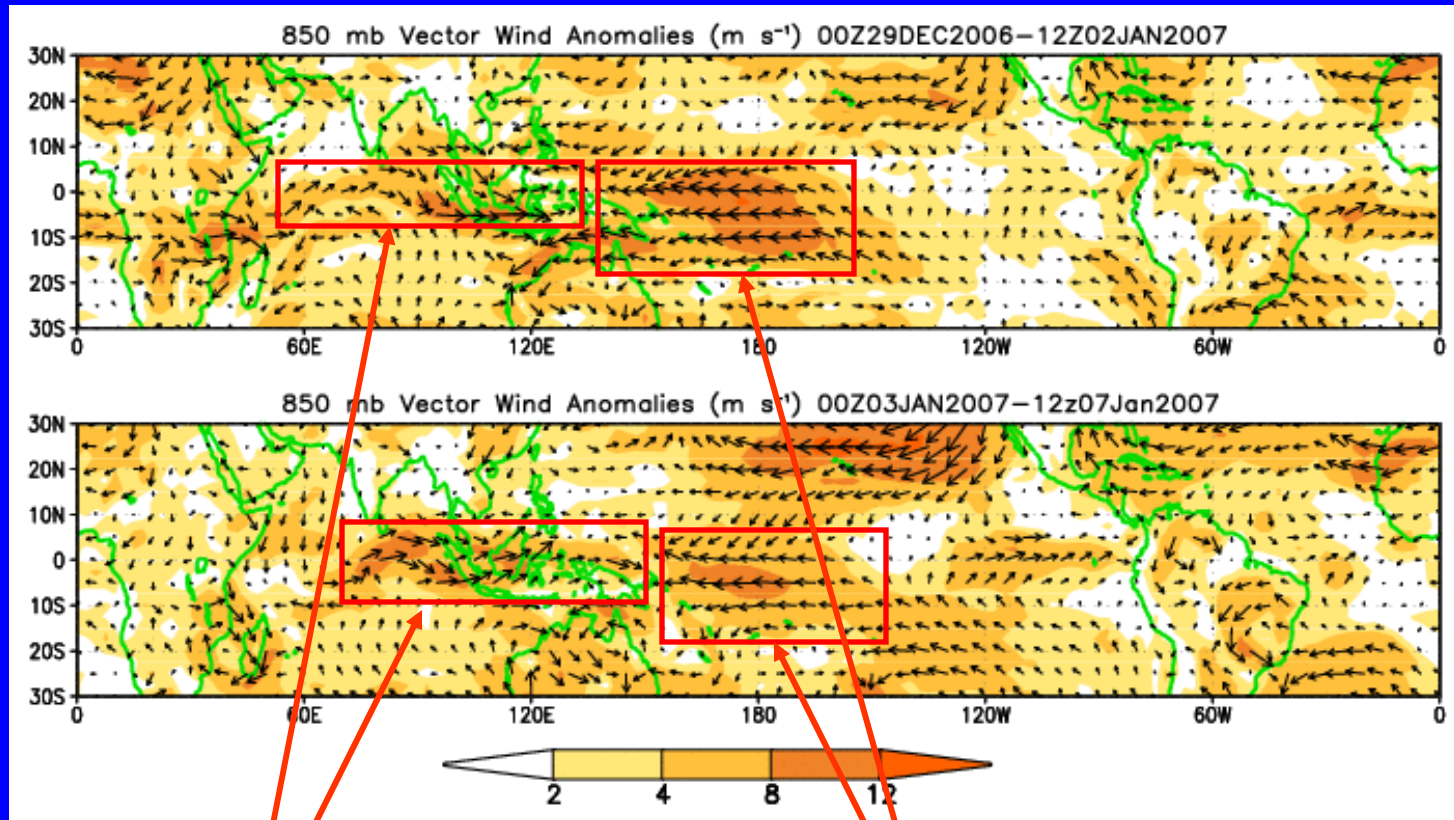
- **Overview**
- **Recent Evolution and Current Conditions**
- **Madden Julian Oscillation Forecast**
- **Summary**

Overview

- The latest observations indicate that a moderate MJO is in progress.
- During week 1, there is an increased chance for above-normal rainfall over the western and central tropical Pacific Ocean and below-normal rainfall over the central and eastern Indian Ocean due to the current MJO activity.
- Dry conditions are expected to shift to the eastern Indian Ocean and Maritime Continent and wet conditions are expected over the central tropical Pacific Ocean during week 2 due to the combined influences of the MJO and El Niño.
- Favorable conditions for tropical cyclogenesis are expected over the South Pacific Ocean east-northeast of Australia during week 2.

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

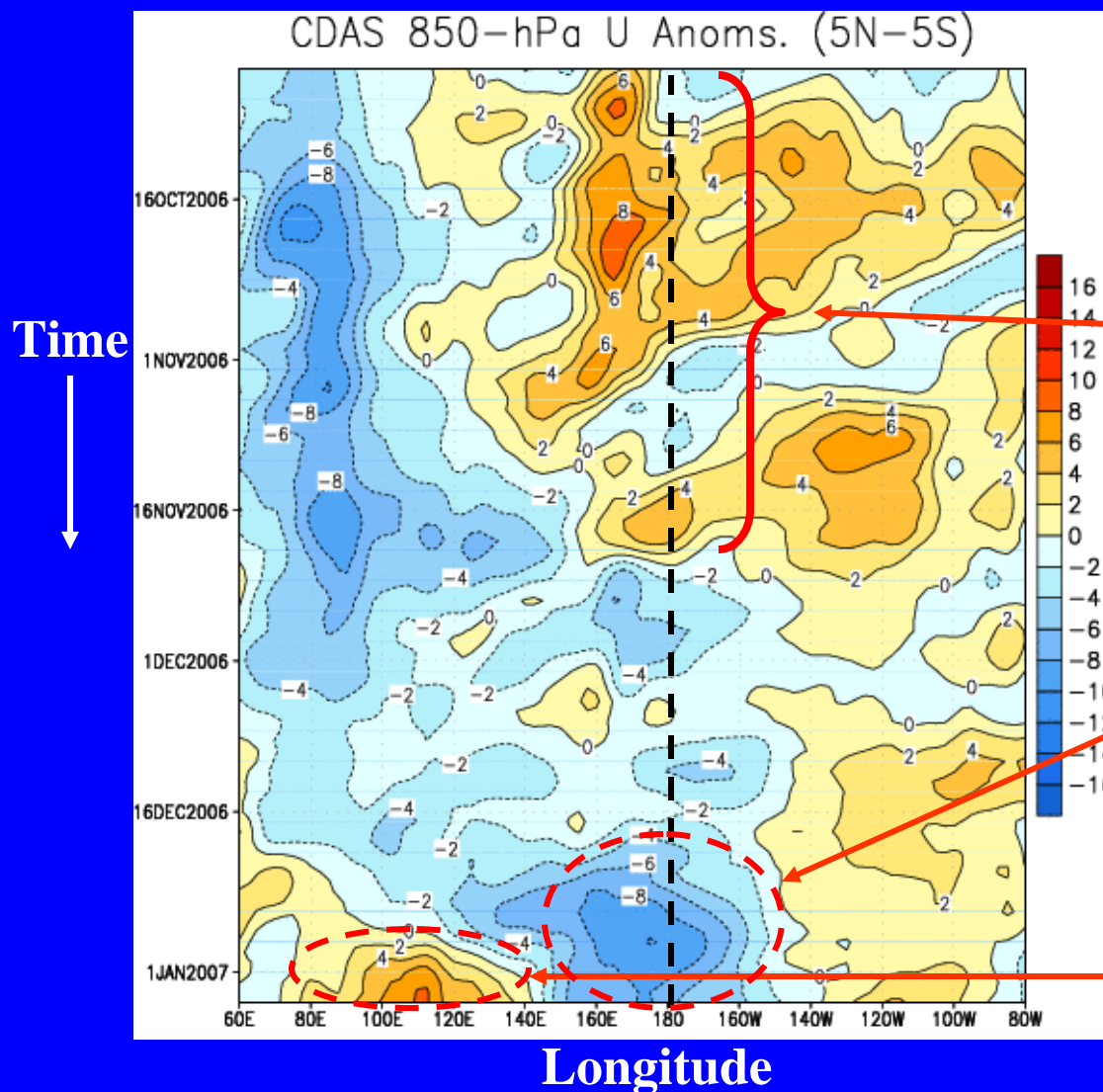
Note that shading denotes the magnitude of the anomalous wind vectors



Equatorial westerly anomalies over the Indian Ocean have strengthened and shifted east over Malaysia and Indonesia.

Easterly anomalies have weakened in the central equatorial Pacific (150° - 150° W).

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



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

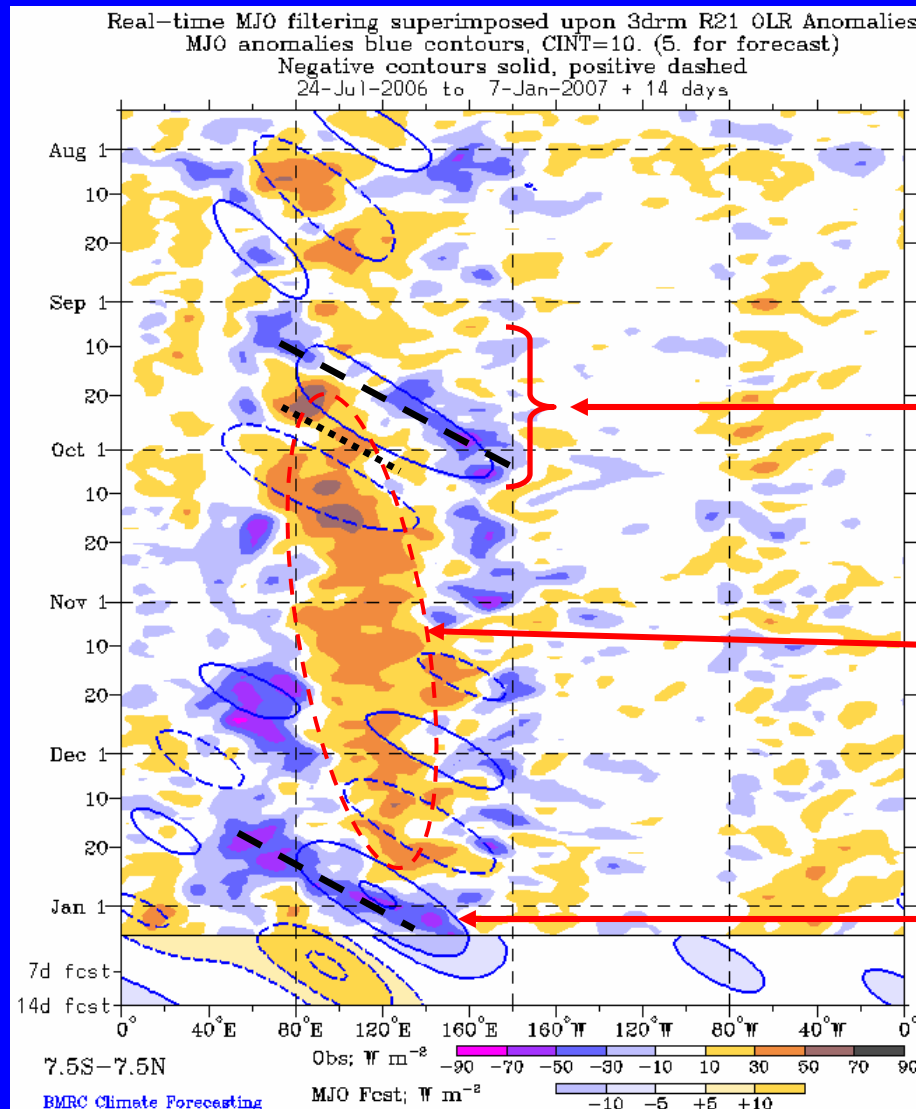
Easterly anomalies (blue shading) represent anomalous east-to-west flow.

Periods of westerly anomalies were frequent near and west of the Date Line (vertical dashed line) during September, October, and early November 2006.

Easterly anomalies have strengthened considerably near the Date Line since mid-December 2006.

For the first time in a few months, westerly anomalies are now evident over the equatorial Indian Ocean and Indonesia.

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



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

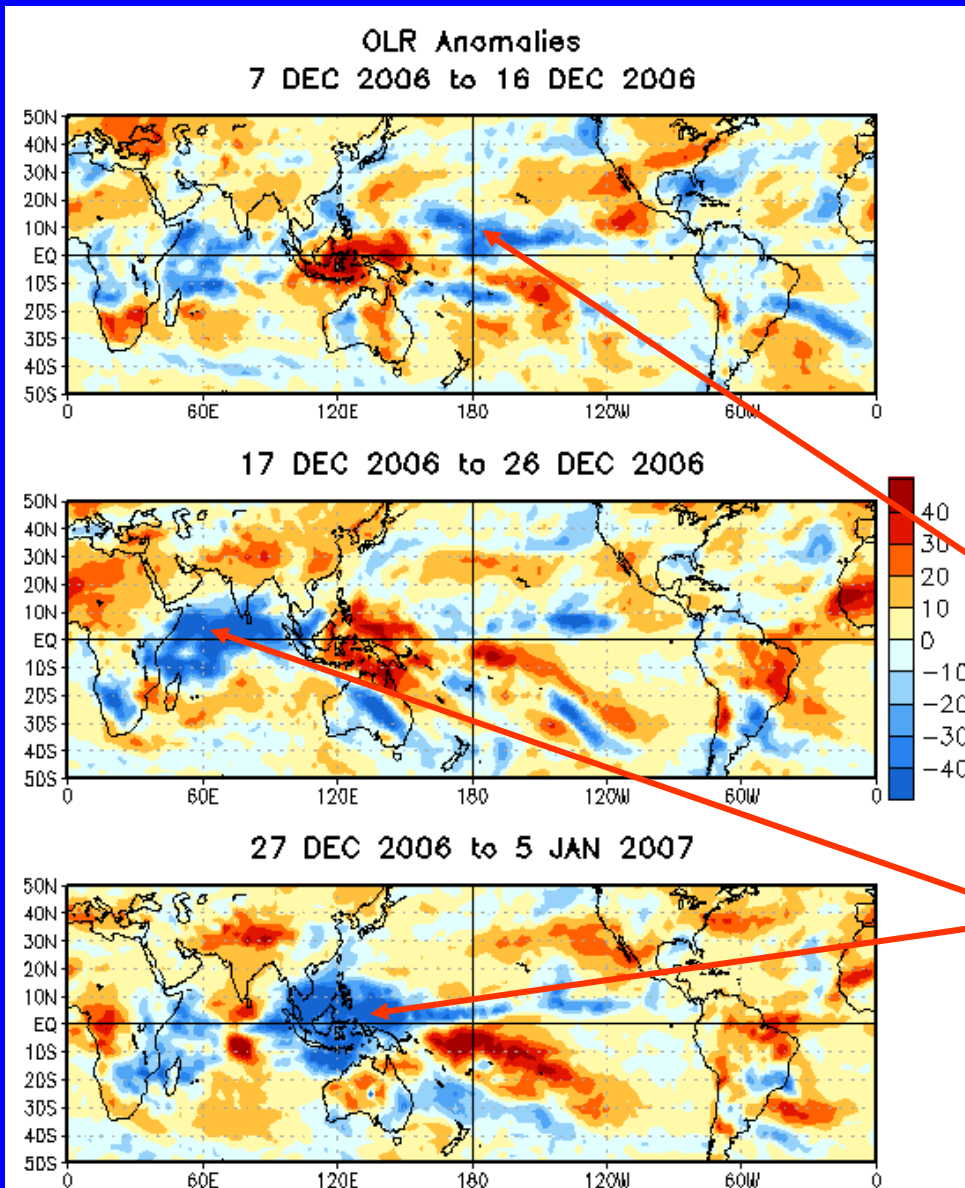
Wetter-than-average conditions, negative OLR anomalies (blue shading)

Negative OLR anomalies associated with the MJO propagated eastward from the Indian Ocean to the western Pacific Ocean beginning in early September.

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

Enhanced convection, associated with the current MJO event, shifted eastward from the Indian Ocean to the Maritime Continent and western Pacific during the past week.

Anomalous OLR: Last 30 days



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

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

Dry conditions prevailed across sections of the Maritime Continent and Australia during the first two-thirds of December.

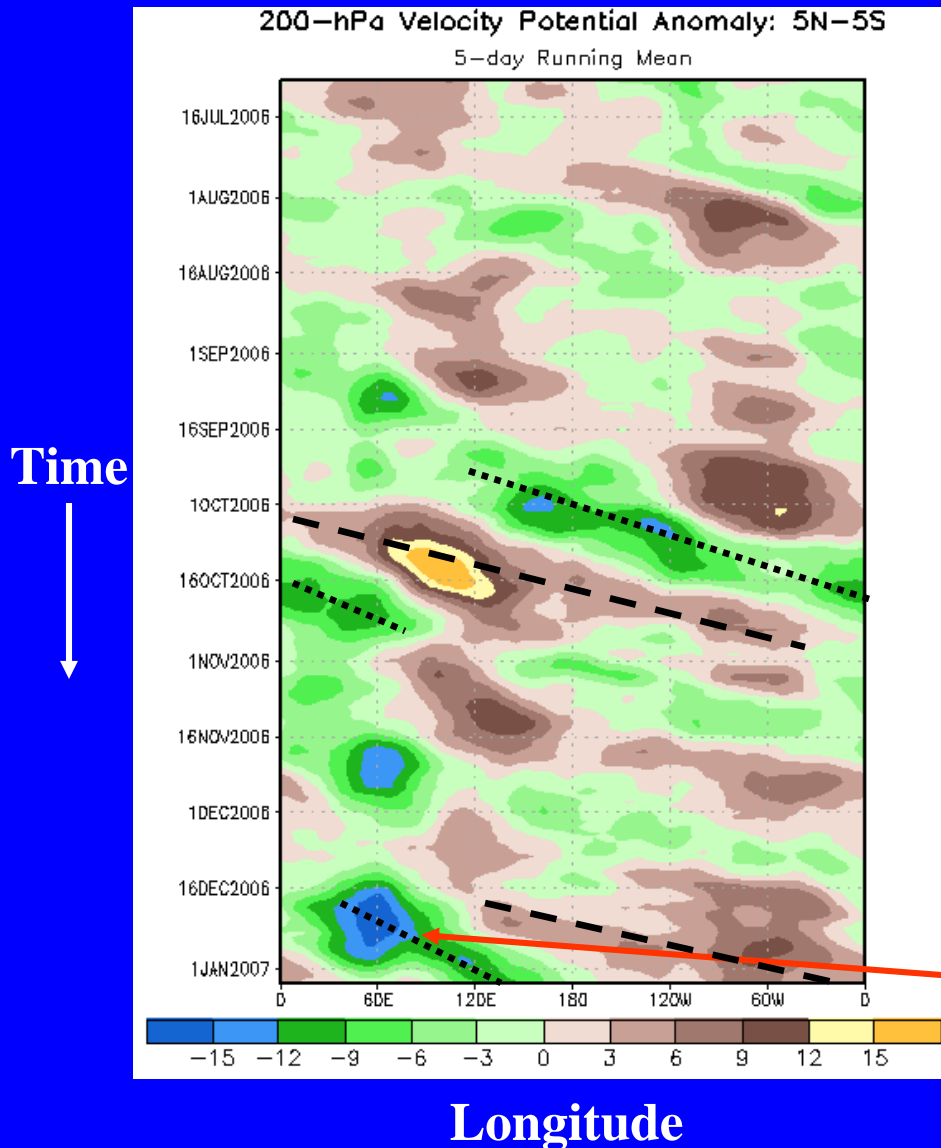
During the first half of December, enhanced convection was more prevalent in the central Pacific, particularly in areas north of the equator near the Date Line (180°W).

An extensive area of enhanced convection developed in the Indian Ocean in mid-December and expanded eastward to include the Maritime Continent by late December / early January.

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 was incoherent during much of July, August, and September.

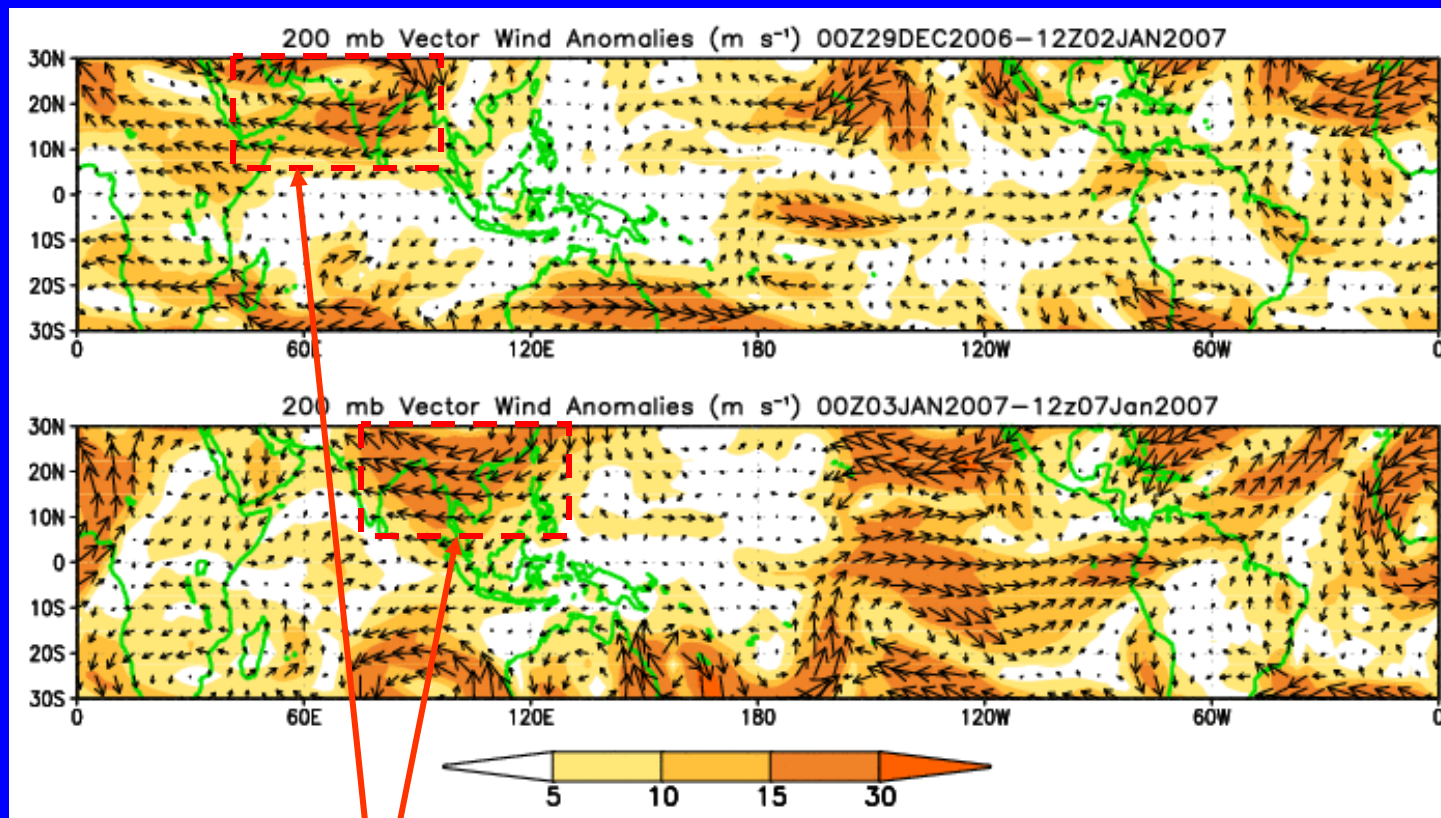
Moderate to strong MJO activity was observed from late-September to mid-October.

The MJO weakened considerably during the late October to early December time period.

Recently the MJO has intensified, as negative OLR anomalies have shifted eastward from the Indian Ocean to include Malaysia and Indonesia.

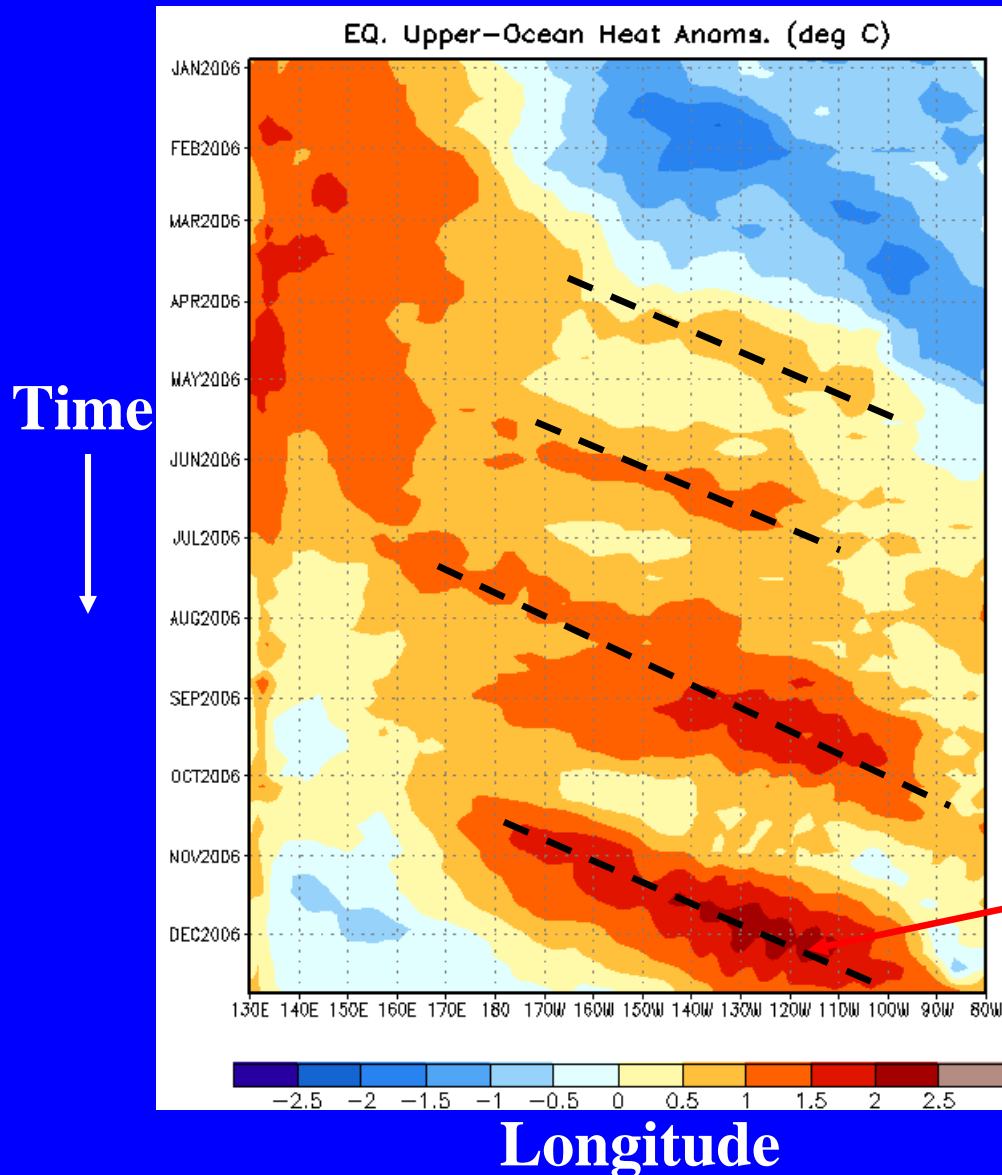
200-hPa Vector Winds and Anomalies (m s^{-1})

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



Clockwise circulation across South Asia during the last ten days associated with enhanced convection over the Indian Ocean.

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.

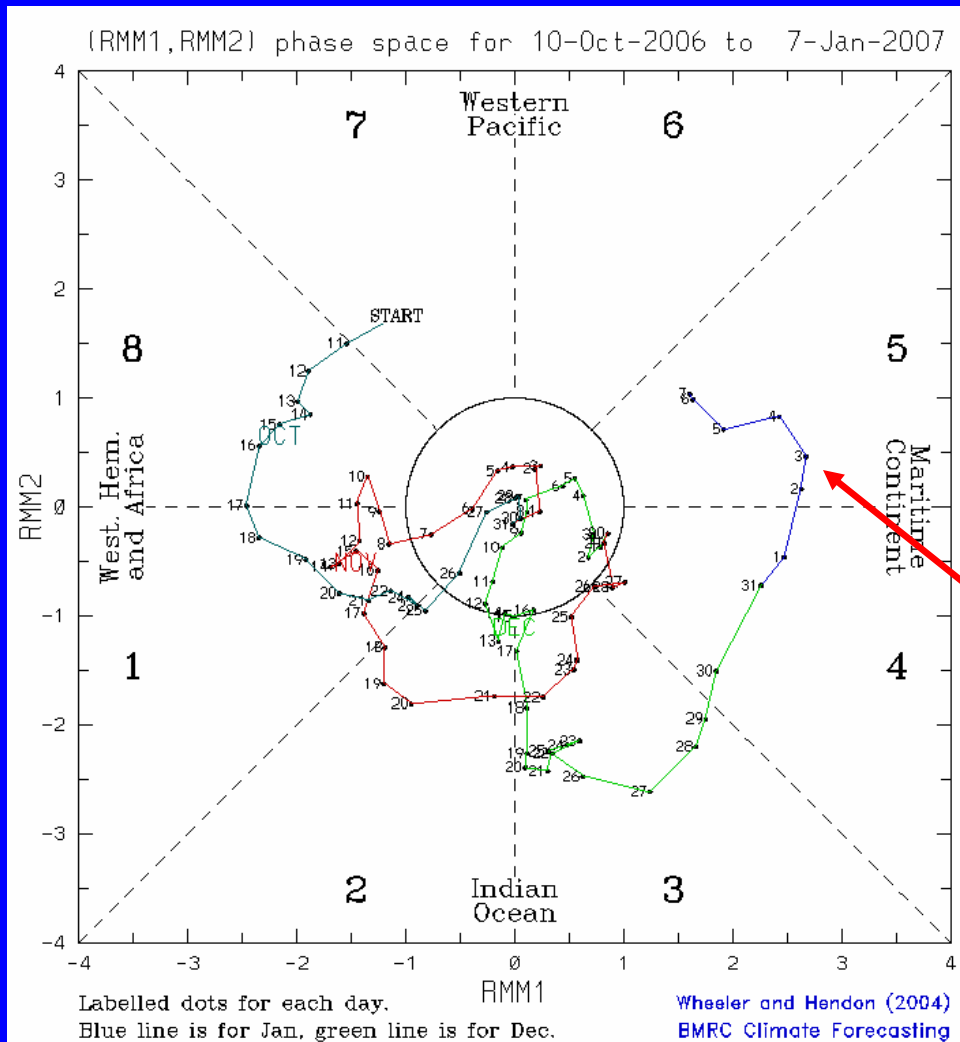
During this period eastward-propagating Kelvin waves (warm phases indicated by dashed lines) have caused considerable month-to-month variability in the upper-ocean heat content.

The latest Kelvin wave was initiated in early October and appears to be the strongest in over a year. Anomalously warm waters have reached the coast of South America.

MJO Index (Magnitude and Phase)

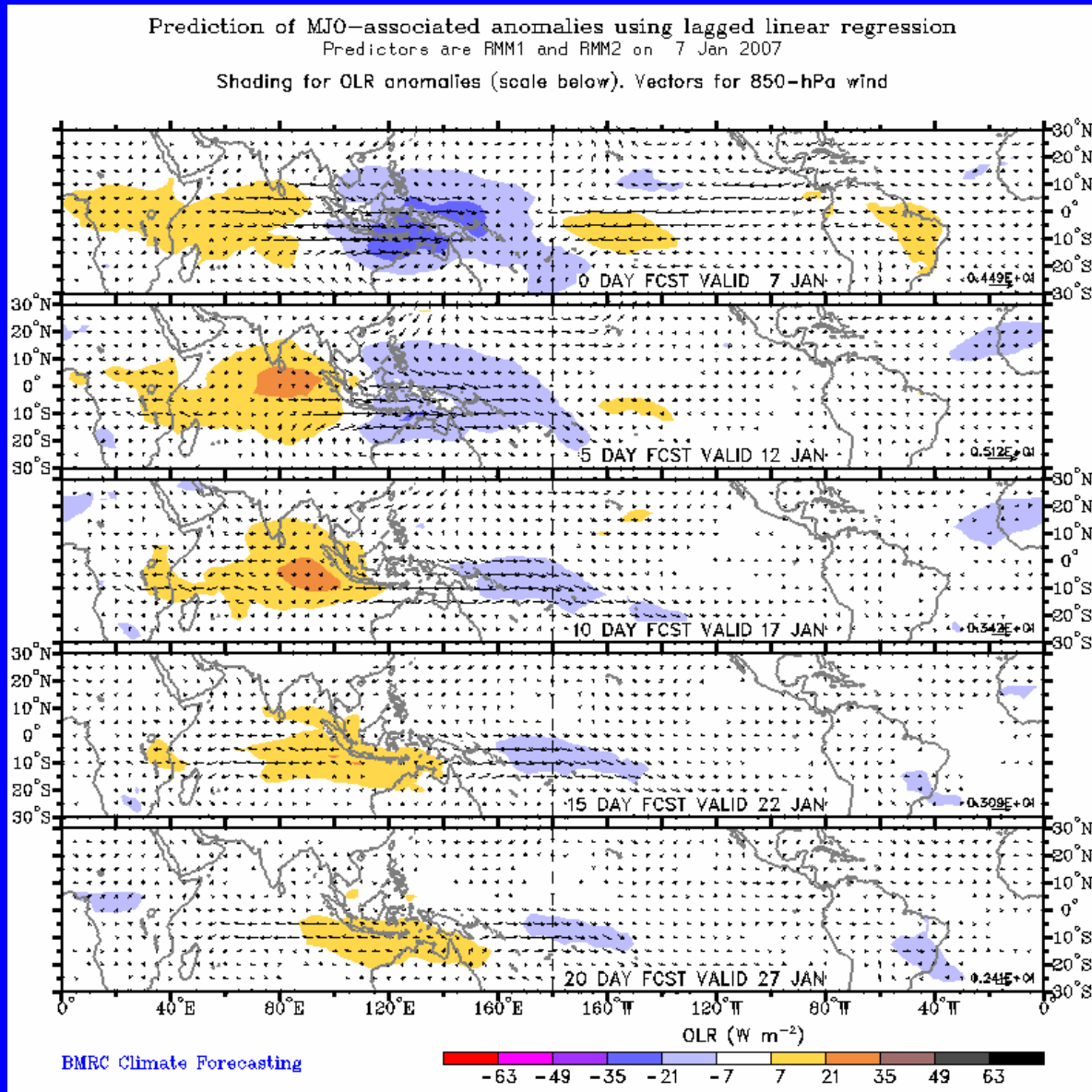
The current state of the MJO as determined by an index based on Empirical Orthogonal Function (EOF) analysis using combined fields of near-equatorially-averaged 850-hPa zonal wind, 200-hPa zonal wind, and satellite-observed outgoing longwave radiation (OLR) (Wheeler and Hendon, 2004).

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 enhanced precipitation phase of the MJO is currently centered over the Maritime Continent, having shifted eastward during the last two weeks.

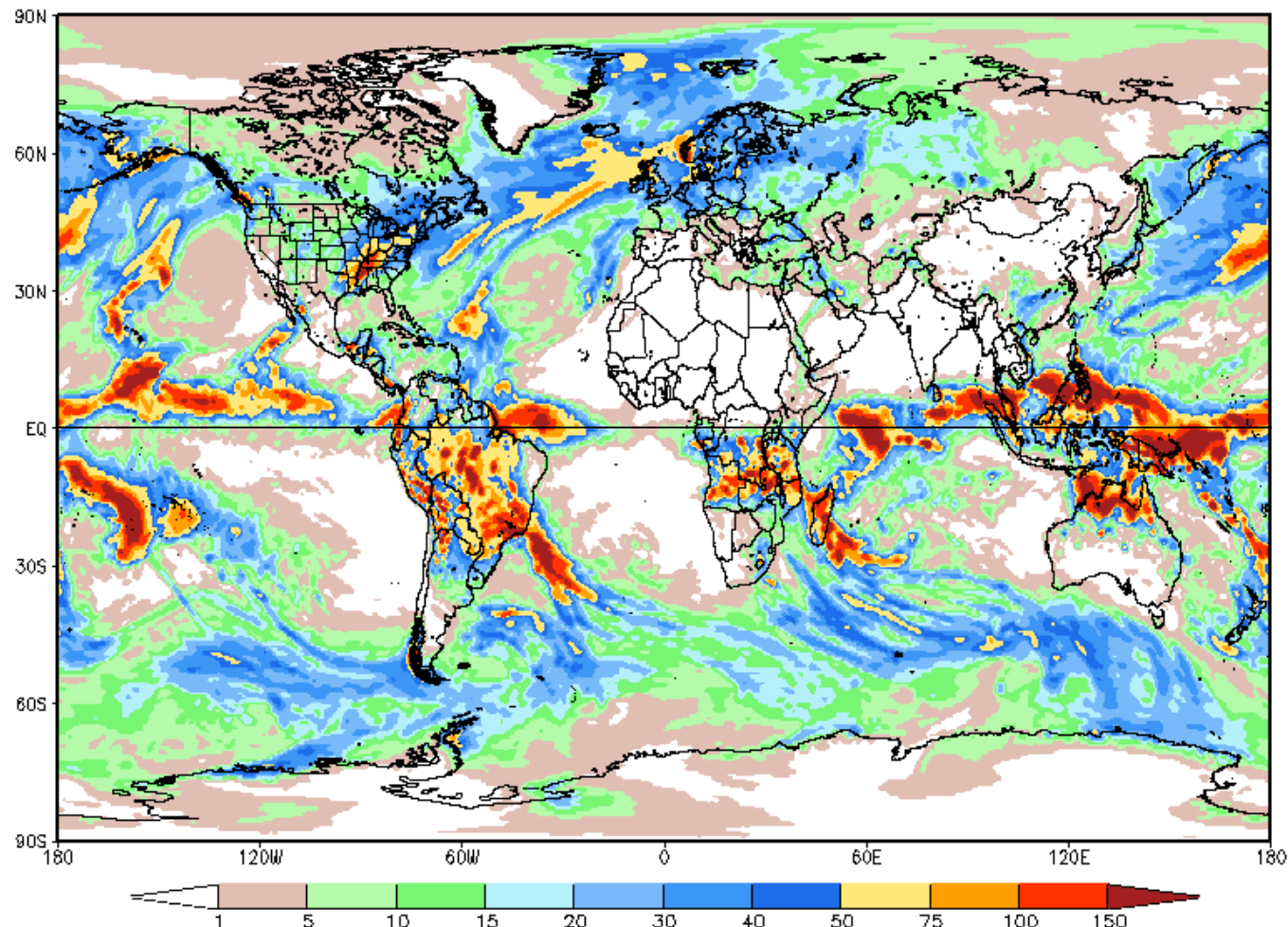
Statistical OLR MJO Forecast



The forecast indicates enhanced convection shifting eastward from the Maritime Continent to the western and central Pacific during the next 5-10 days, while suppressed convection shifts eastward over the Indian Ocean and Malaysia/ Indonesia.

Global Forecast System (GFS) Week 1 Precipitation Forecast

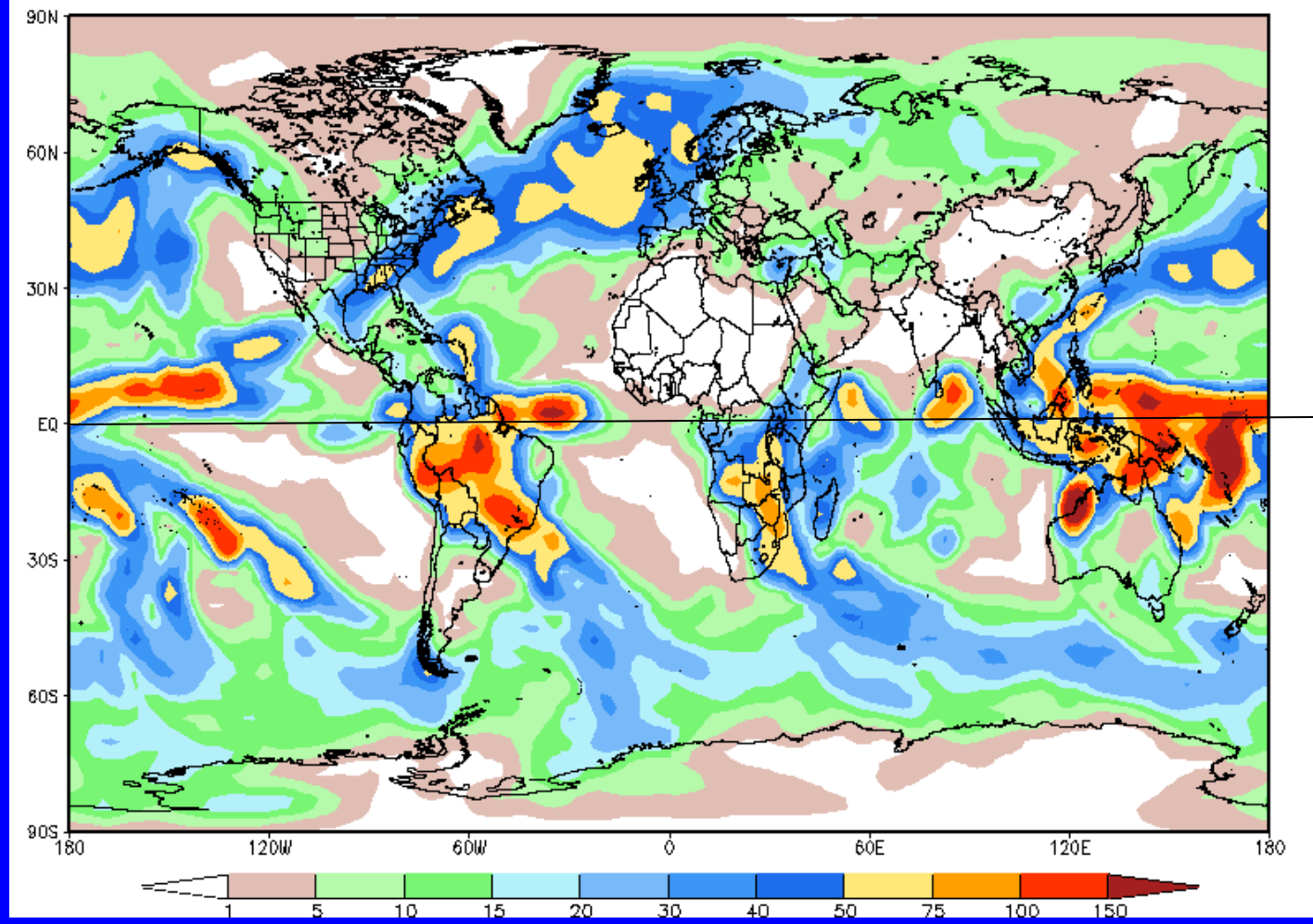
NOAA GFS 37.5 km Week 1 Total Precipitation (mm)
Issued at Jan 08 2007 00Z for the period ending at Jan 15 2007 00Z



Global Forecast System (GFS) Week 2

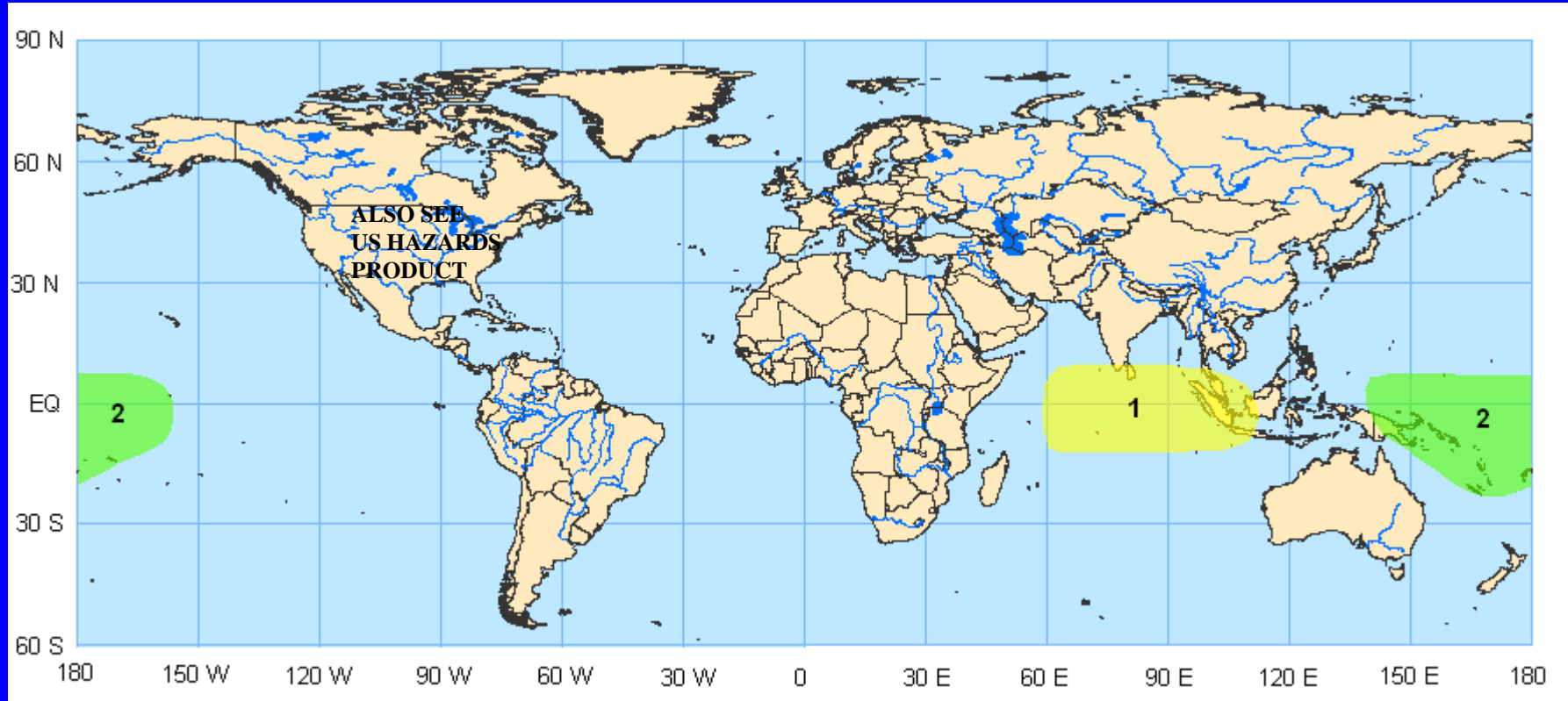
Precipitation Forecast

NOAA GFS 100 km Week 2 Total Precipitation (mm)
Issued Jan 8 2007 00Z for the period ending at Jan 21 2007 00Z



Potential Benefits/Hazards – Week 1

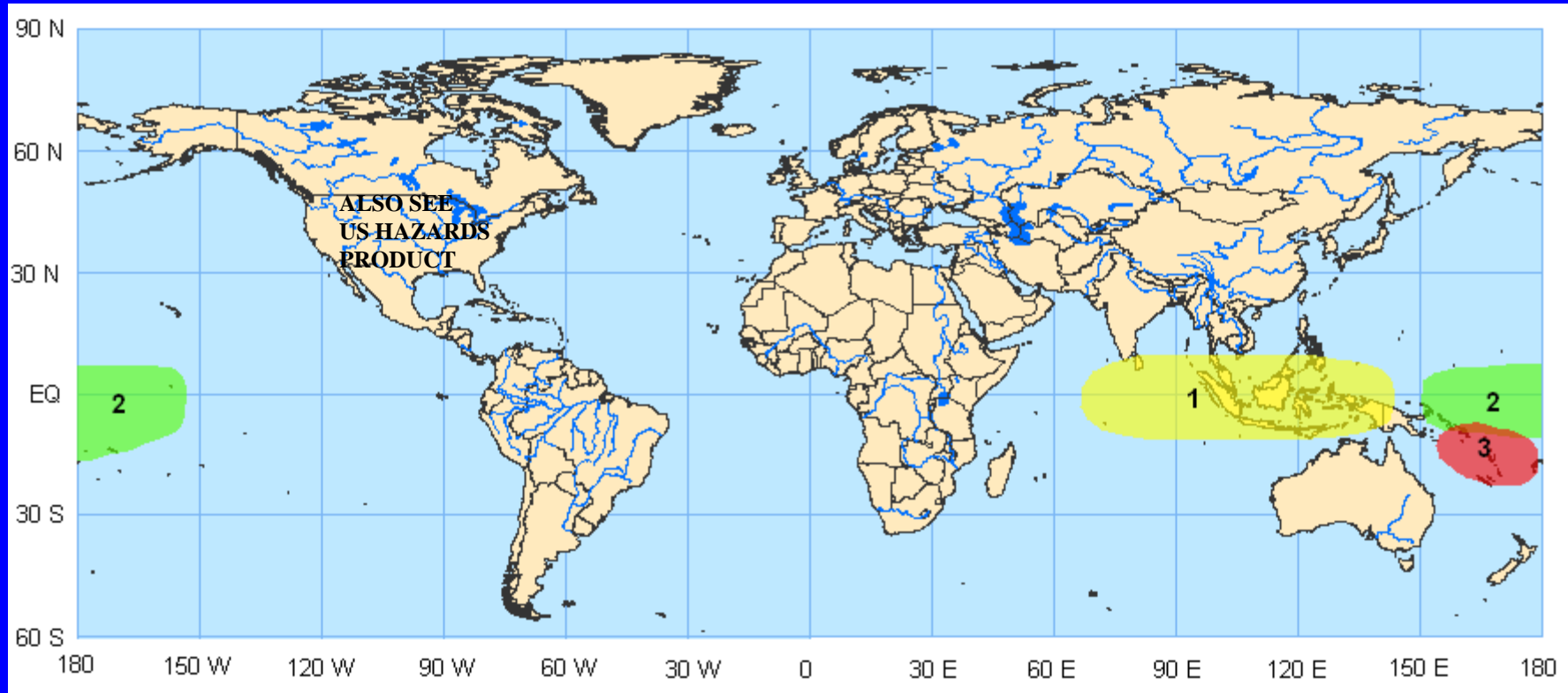
Valid January 9 – January 15, 2007



1. An increased chance for below normal rainfall over the tropical Indian Ocean and the western portions of Malaysia and Indonesia.
2. An increased chance for above normal rainfall for the western and central tropical Pacific Ocean.

Potential Benefits/Hazards – Week 2

Valid January 16 – January 22, 2007



1. An increased chance for below normal rainfall for the central and eastern Indian Ocean and most of the Maritime Continent.
2. An increased chance for above normal rainfall for the western and central Pacific Ocean.
3. Favorable conditions exist for tropical cyclogenesis east-northeast of Australia.

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