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

Update prepared by
Climate Prediction Center / NCEP
December 18, 2006

Outline

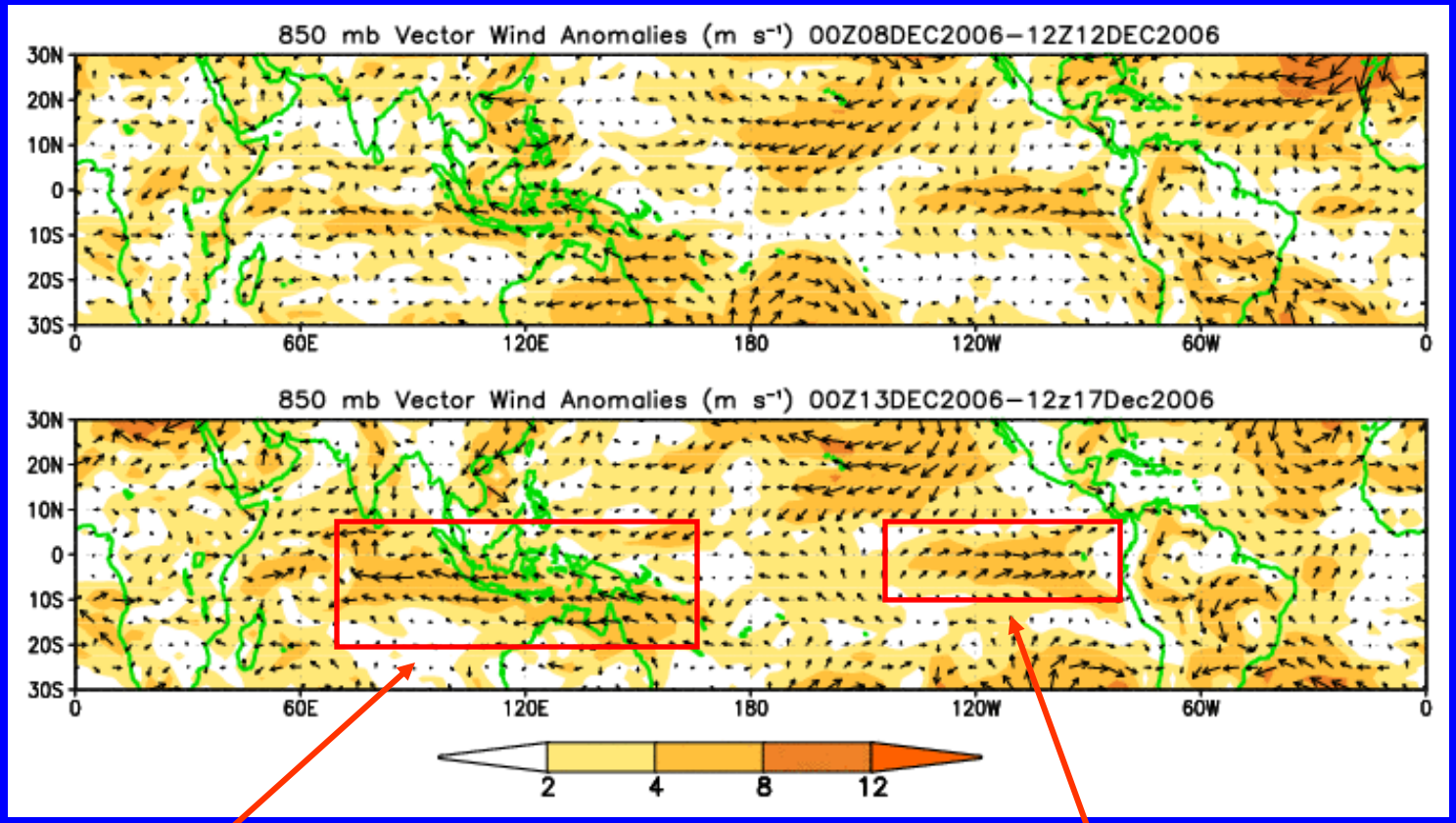
- Overview
- Recent Evolution and Current Conditions
- Madden Julian Oscillation Forecast
- Summary

Overview

- The latest observations indicate that the MJO remains weak. There are, however, some initial signs that the MJO may be strengthening which warrant close monitoring during the next few weeks.
- During week 1, there is an increased chance of above (below) normal rainfall for sections of the tropical western Pacific Ocean (southern Maritime Continent and northern Australia) due to the current El Nino conditions. Also, wet conditions are expected for much of the Indian Ocean.
- Storminess is expected to produce periods of heavy precipitation and strong winds for areas in the Southeast US, the Alaska Panhandle, western Canada, and the US Pacific Northwest.
- Wet conditions should extend from the Indian Ocean into the western Pacific Ocean during week 2 while dry conditions should persist for the Maritime Continent and northern Australia.
- Favorable conditions for tropical cyclogenesis are expected to exist for sections of the Indian Ocean during both weeks 1 and 2 and for the Pacific Ocean east of Australia for week 2 only.

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

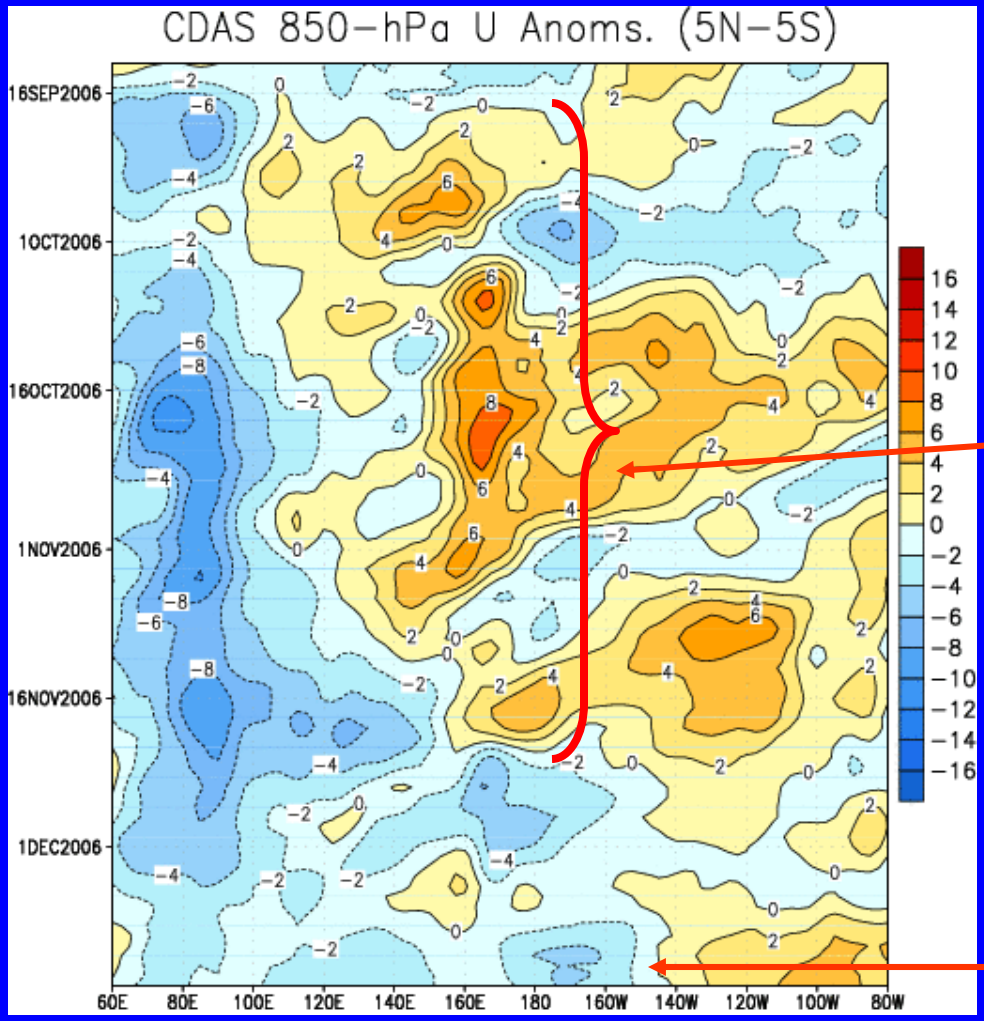
Note that shading denotes the magnitude of the anomalous wind vectors



Easterly anomalies have strengthened across the Maritime Continent, parts of Australia, and the eastern Indian Ocean.

Westerly anomalies have returned to the equatorial eastern Pacific Ocean.

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



Time

Longitude

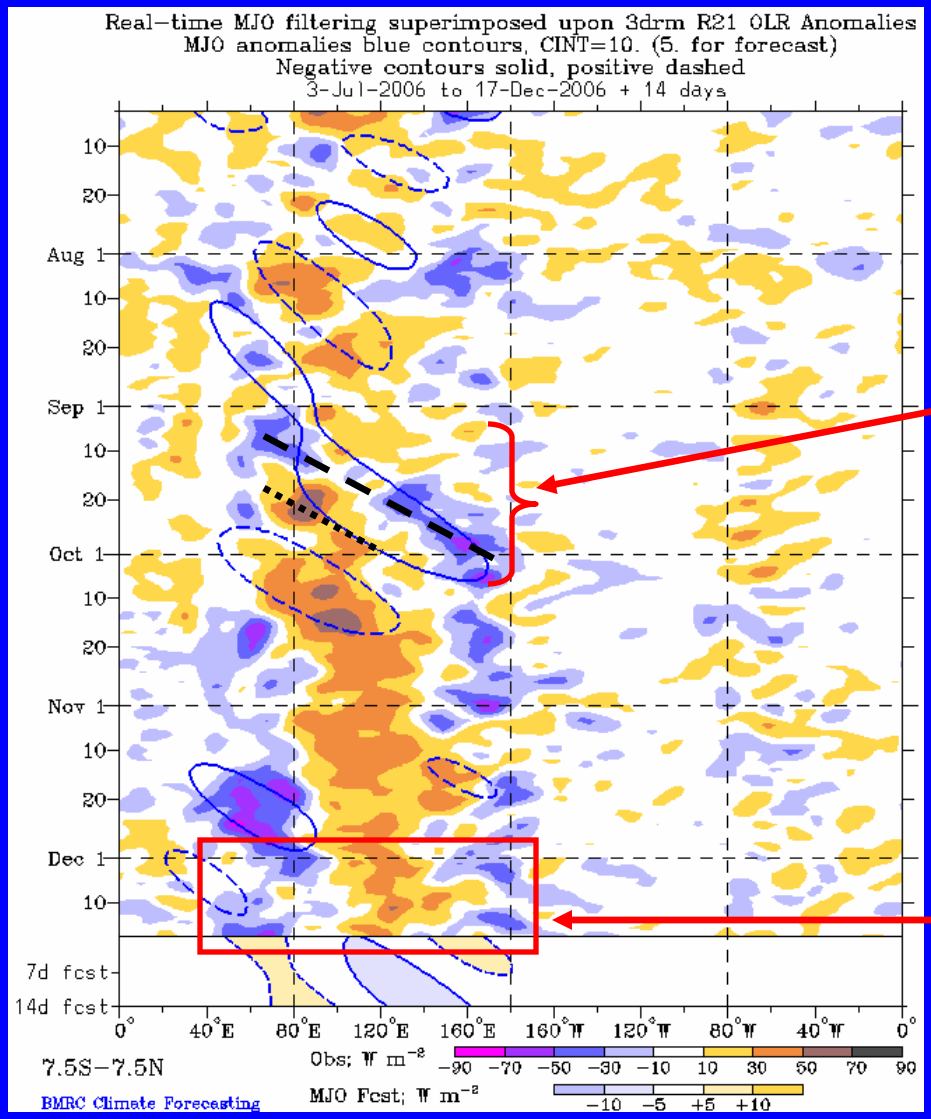
Weaker-than-average easterlies or westerlies (orange/red shading)

Stronger-than-average easterlies (blue shading)

Periods of westerly anomalies were frequent near and west of the Date Line during September, October, and early November.

Easterlies near the Date Line have strengthened slightly.

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



Time

Longitude

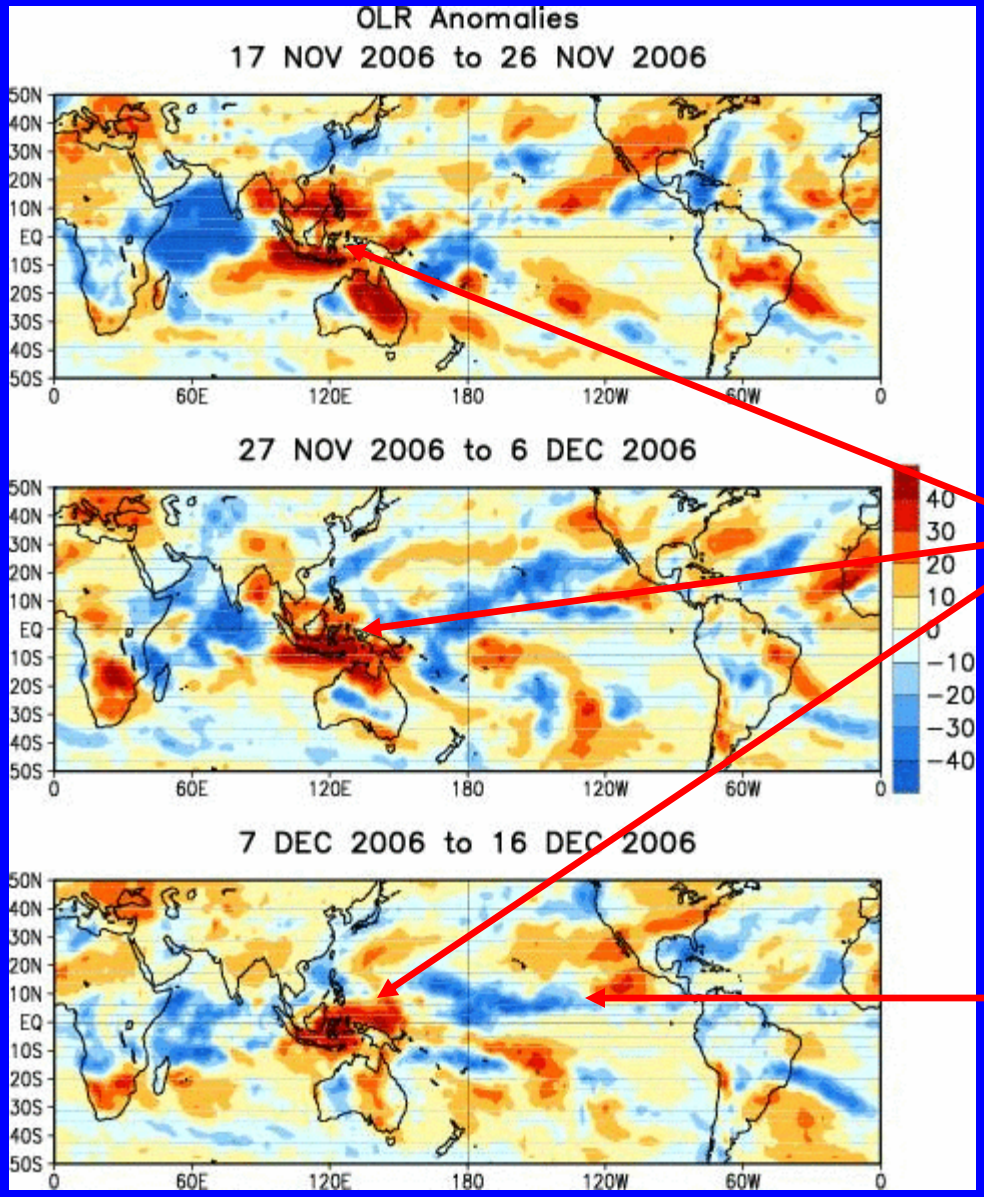
Drier-than-average conditions (/red shading)

Wetter-than-average conditions (blue shading)

OLR anomalies associated with the MJO propagated eastward from the Indian to western Pacific Oceans beginning in early-mid September.

The extent of suppressed convection across the Maritime Continent has decreased during the past week while enhanced convection has redeveloped in the Indian Ocean. Periodic areas of enhanced convection continue near the Date Line.

Anomalous OLR: Last 30 days



Drier-than-average conditions (red shading)

Wetter-than-average conditions (blue shading)

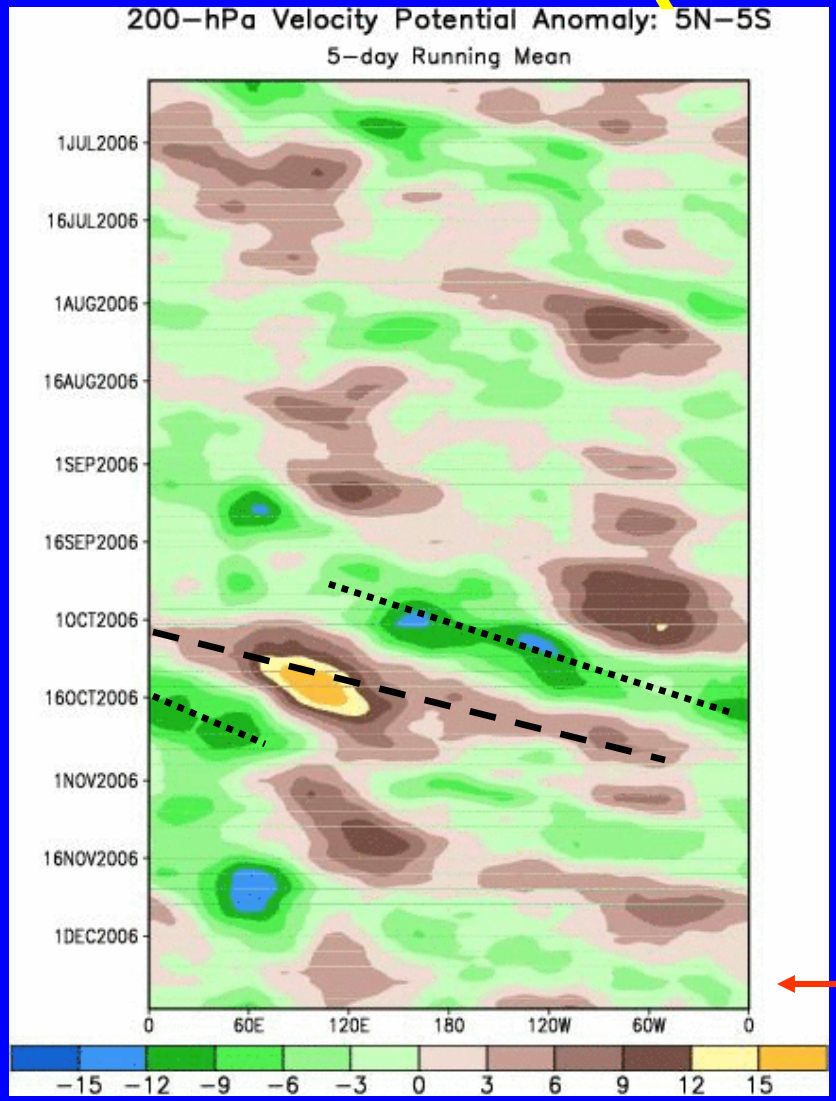
Dry conditions have been persistent across sections of the Maritime Continent and Australia throughout the period.

During the last ten days, enhanced convection has been more prevalent across the Pacific Ocean.

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

<u>Positive</u> anomalies (brown shading) indicate unfavorable conditions for precipitation.

<u>Negative</u> anomalies (green shading) indicate favorable conditions for precipitation.



Time

Longitude

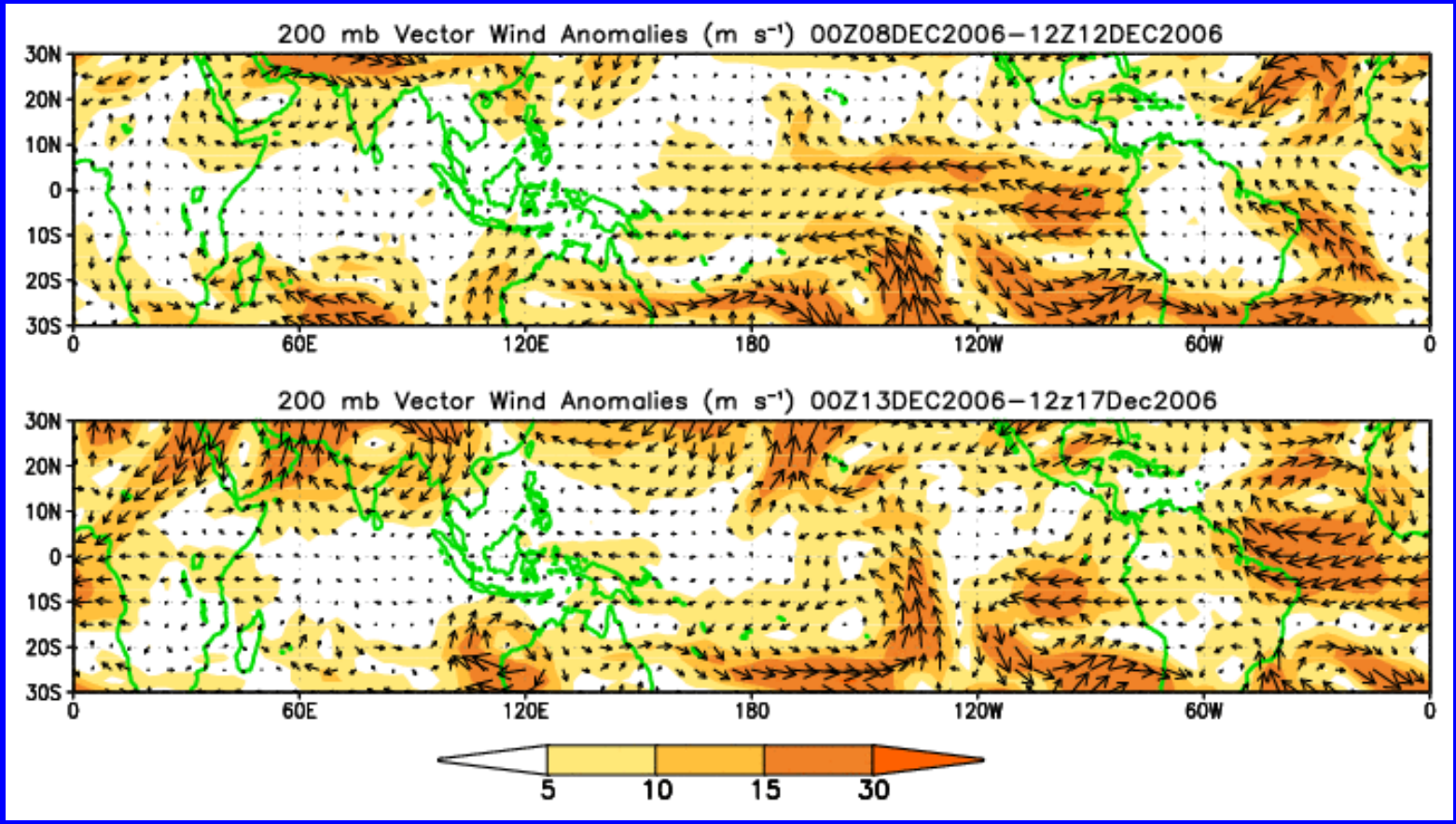
The MJO was incoherent during much of August and September.

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

The MJO weakened considerably during late October and remains weak.

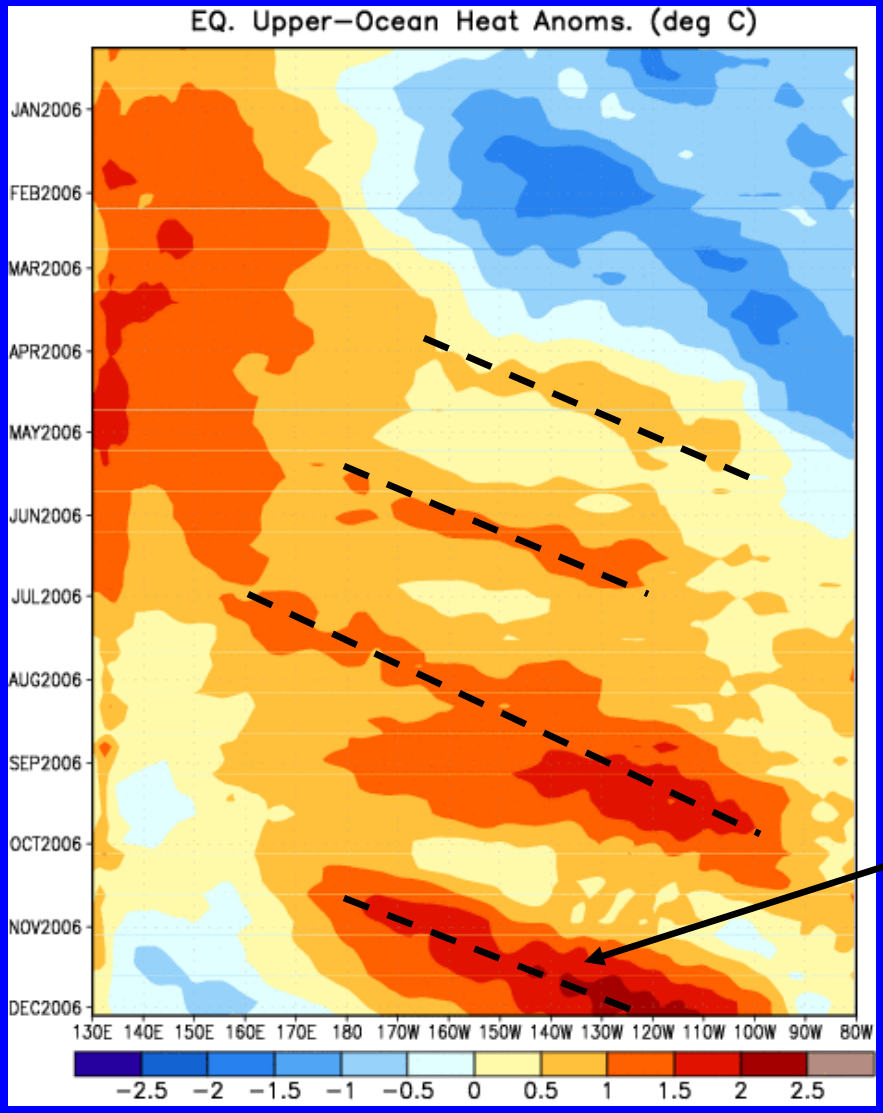
200-hPa Vector Winds and Anomalies (m s^{-1})

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



Heat Content Evolution in the Eq. Pacific

Time



Longitude

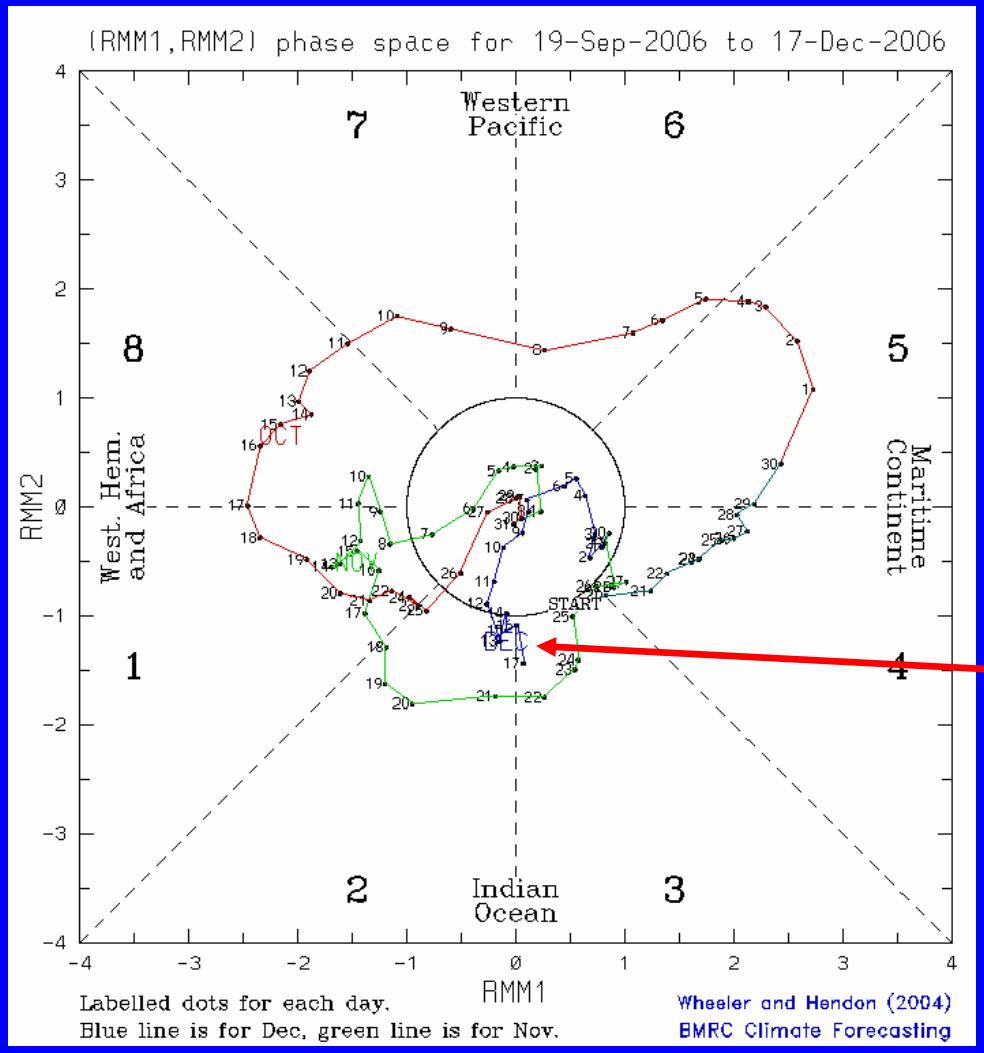
Starting in April, above normal upper oceanic water temperatures expanded from the western Pacific into the eastern Pacific in part due to Kelvin wave activity.

The latest downwelling Kelvin wave was initiated in early October and appears to be the strongest in over a year.

MJO Index (Magnitude and Phase)

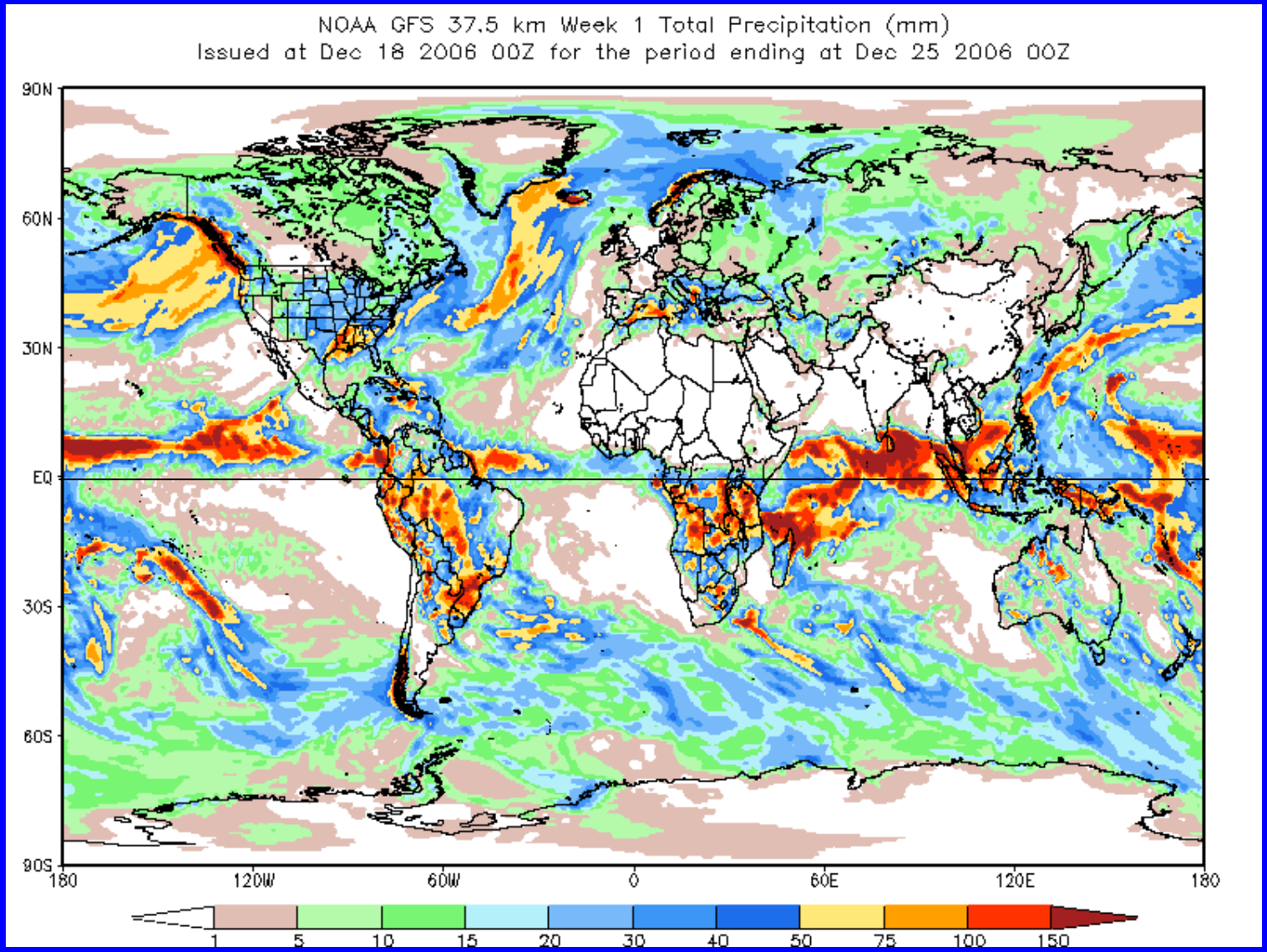
The current state of the MJO as determined by an index based on Empirical Orthogonal Function (EOF) analysis using combined fields of near-equatorially-averaged 850 hPa zonal wind, 200 hPa zonal wind, and satellite-observed outgoing longwave radiation (OLR) (Wheeler and Hendon, 2004).

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.

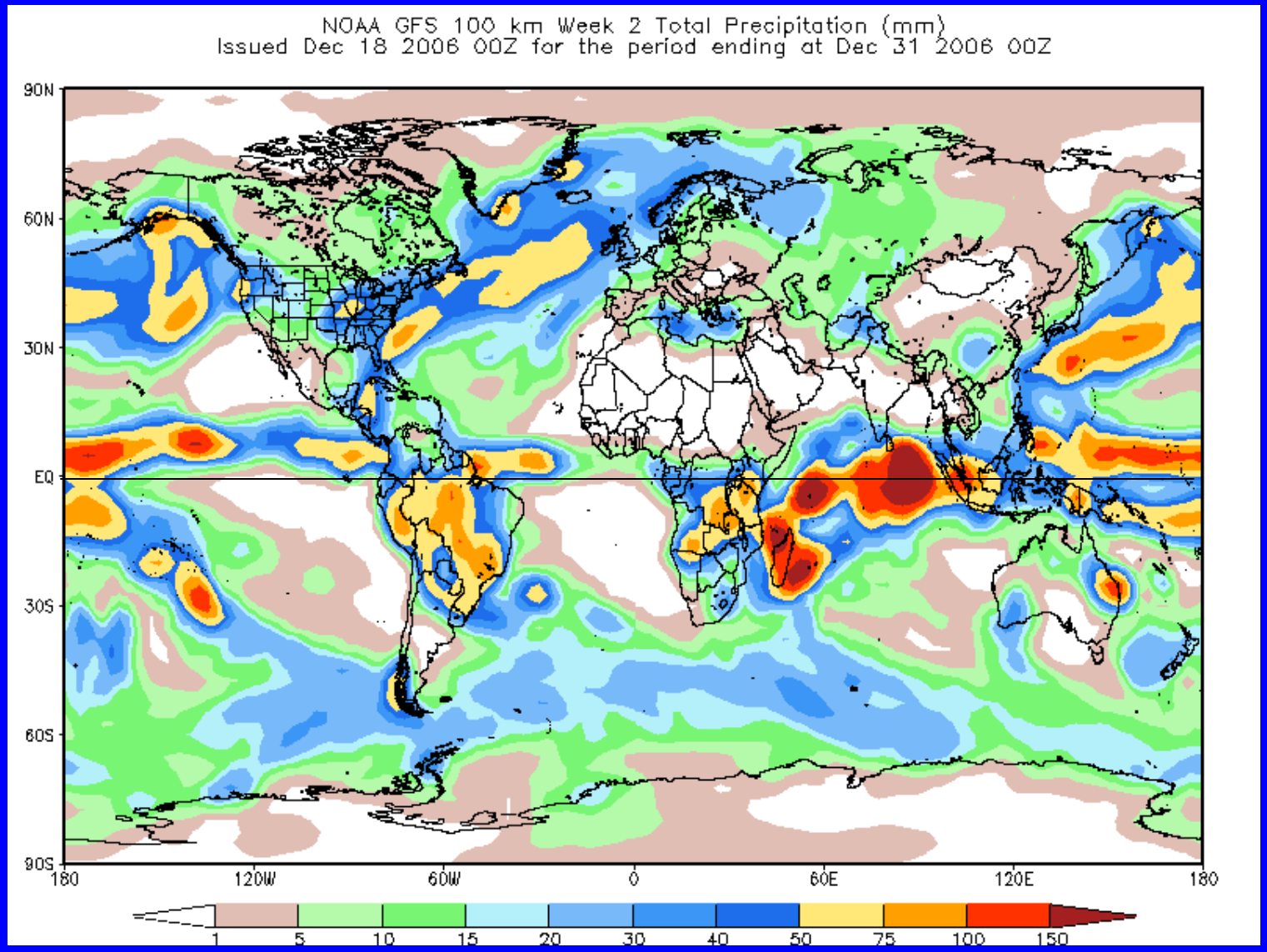


The MJO signal has strengthened in recent days but remains weak and is currently located in the Indian Ocean.

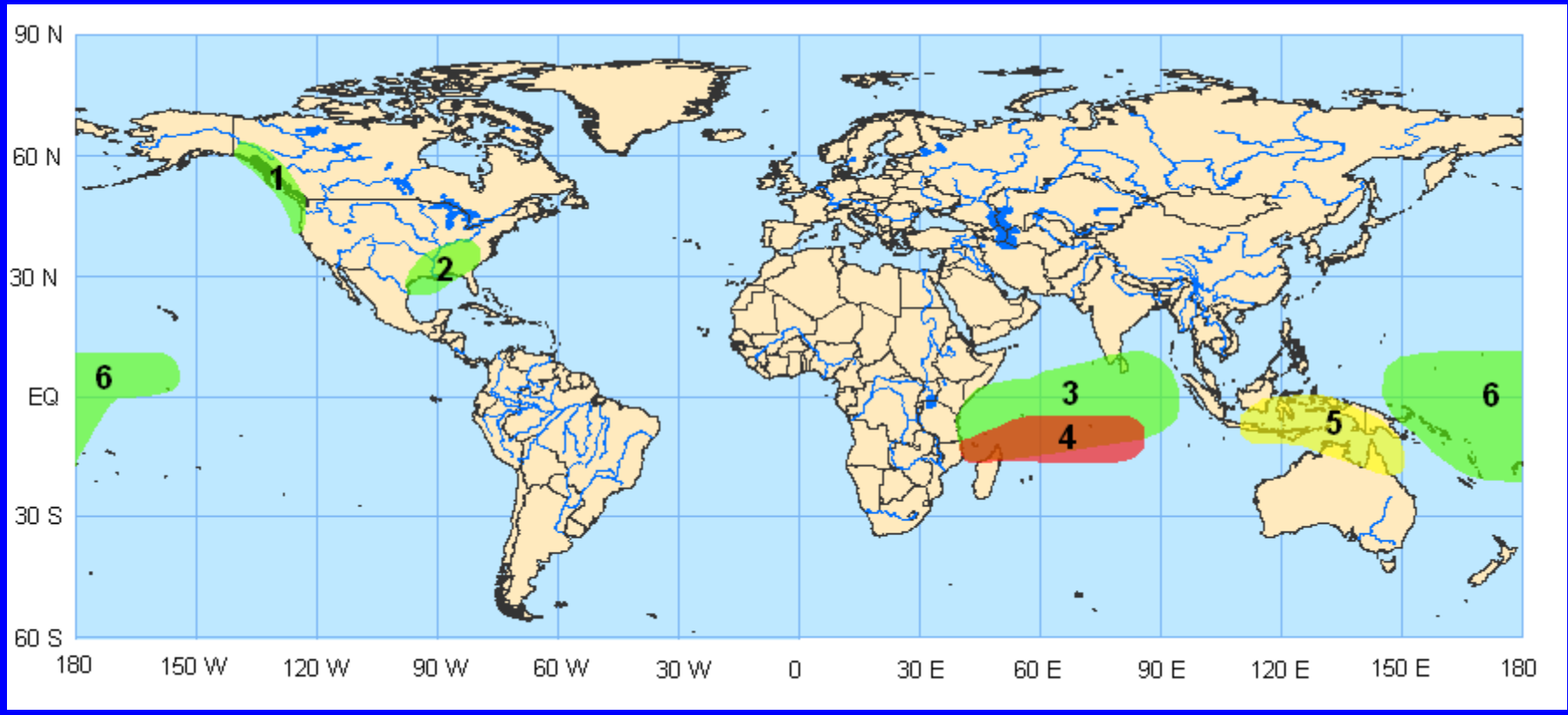
Global Forecast System (GFS) Week 1 Precipitation Forecast



Global Forecast System (GFS) Week 2 Precipitation Forecast



Potential Benefits/Hazards – Week 1
Valid December 19 – December 25, 2006



1. Storminess is expected to produce periods of heavy precipitation, strong winds, and heavy surf for sections of the Alaska Panhandle, western Canada, and the US Pacific Northwest.

2. Storminess is expected to produce a period of heavy precipitation for the southeast US.

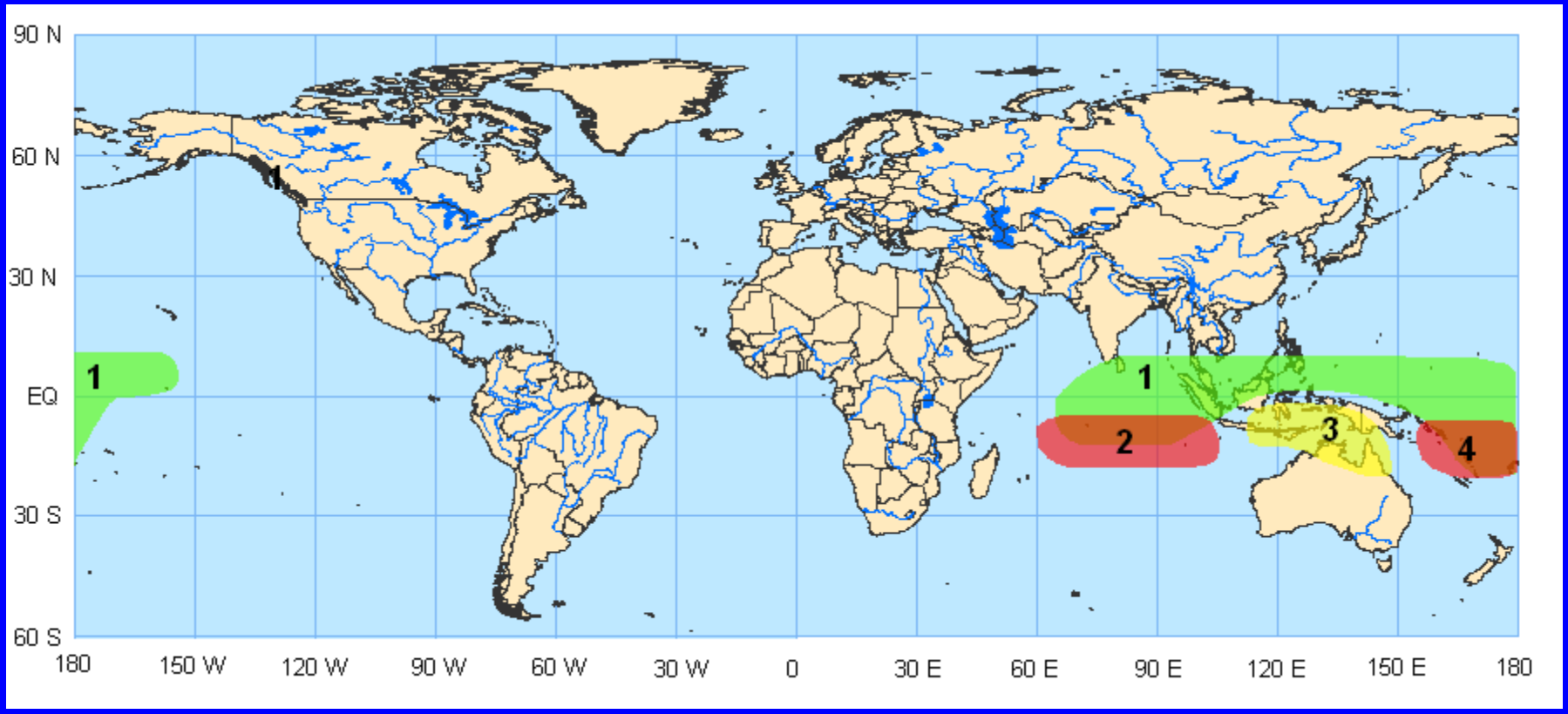
3. An increased chance for above normal rainfall for much of the Indian Ocean.

4. Favorable conditions exist for tropical cyclogenesis for the western Indian Ocean.

5. An increased chance for below normal rainfall across the southern Maritime Continent and northern Australia.

6. An increased chance for above normal rainfall for sections of the western Pacific Ocean.

Potential Benefits/Hazards – Week 2
Valid December 26 – January 1, 2006



1. An increased chance for above normal rainfall stretching from the Indian Ocean into the western Pacific Ocean.
2. Favorable conditions exist for tropical cyclogenesis for the Indian Ocean.
3. An increased chance for below normal rainfall across the southern Maritime Continent and northern Australia.
4. Favorable conditions exist for tropical cyclogenesis for the Pacific Ocean east of Australia.

Summary

- The latest observations indicate that the MJO remains weak. There are, however, some initial signs that the MJO may be strengthening which warrant close monitoring during the next few weeks.
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