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

Update prepared by
Climate Prediction Center / NCEP
January 16, 2006

Outline

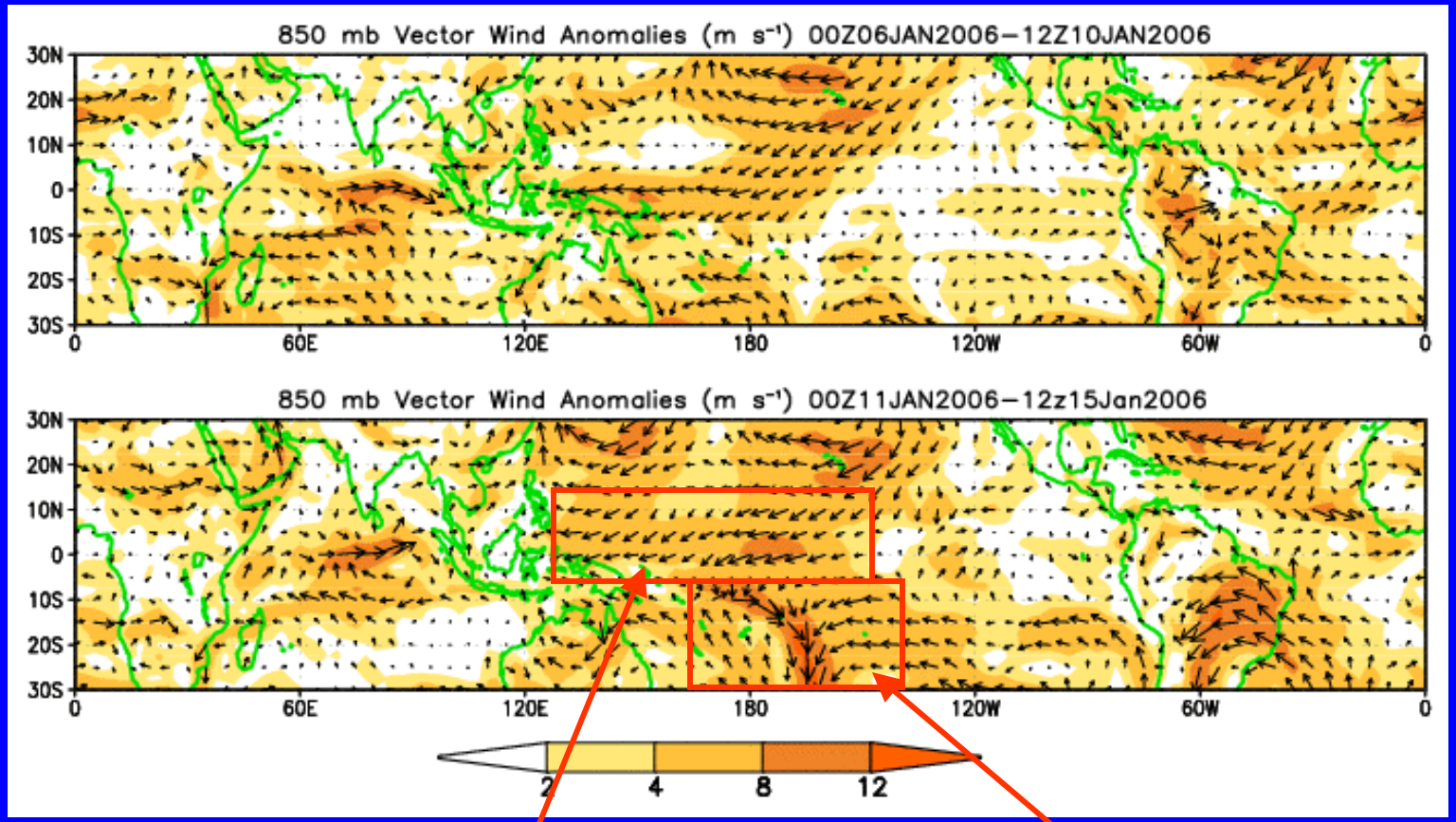
- Overview
- Recent Evolution and Current Conditions
- Madden Julian Oscillation Forecast
- Summary

Overview

- The MJO remains weak.
- During the past week, enhanced convection was observed across Africa, the Indian Ocean, parts of Indonesia, Australia and the southwestern Pacific. Suppressed convection was noted over the equatorial Pacific in the vicinity of the date line, and over eastern Brazil. Some of these conditions resemble those of La Nina conditions. The area of enhanced convection was shifting eastward.
- For week 1, there is an increased chance for above normal rainfall over the eastern Indian Ocean, Indonesia, northern Australia and the southwestern Pacific. There is also the potential for tropical cyclogenesis over eastern portions of the south Indian Ocean and over the southwestern Pacific. There is an increased chance for below average rainfall over eastern Brazil, the South Atlantic, and portions of southwestern Africa.
- During weeks 1 and 2, there is an increased chance for below normal rainfall over the central equatorial Pacific. There is also an increased chance for above normal rainfall over Indonesia, northern Australia and the southwestern Pacific during week 2.

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

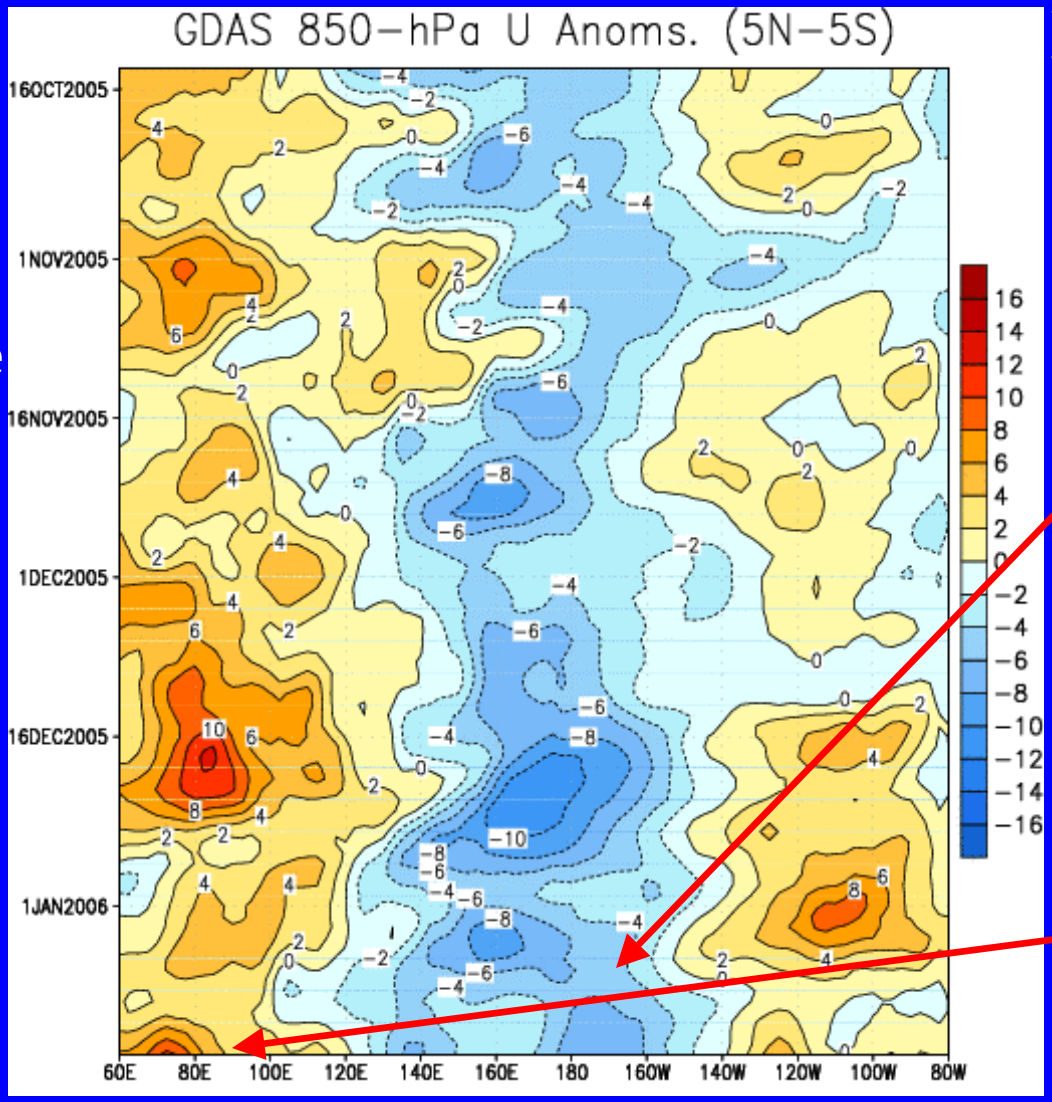
Note that shading denotes the magnitude of the anomalous wind vectors.



Easterly wind anomalies increased across the western Pacific Ocean

Convergence along the SPCZ

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



Time

Longitude

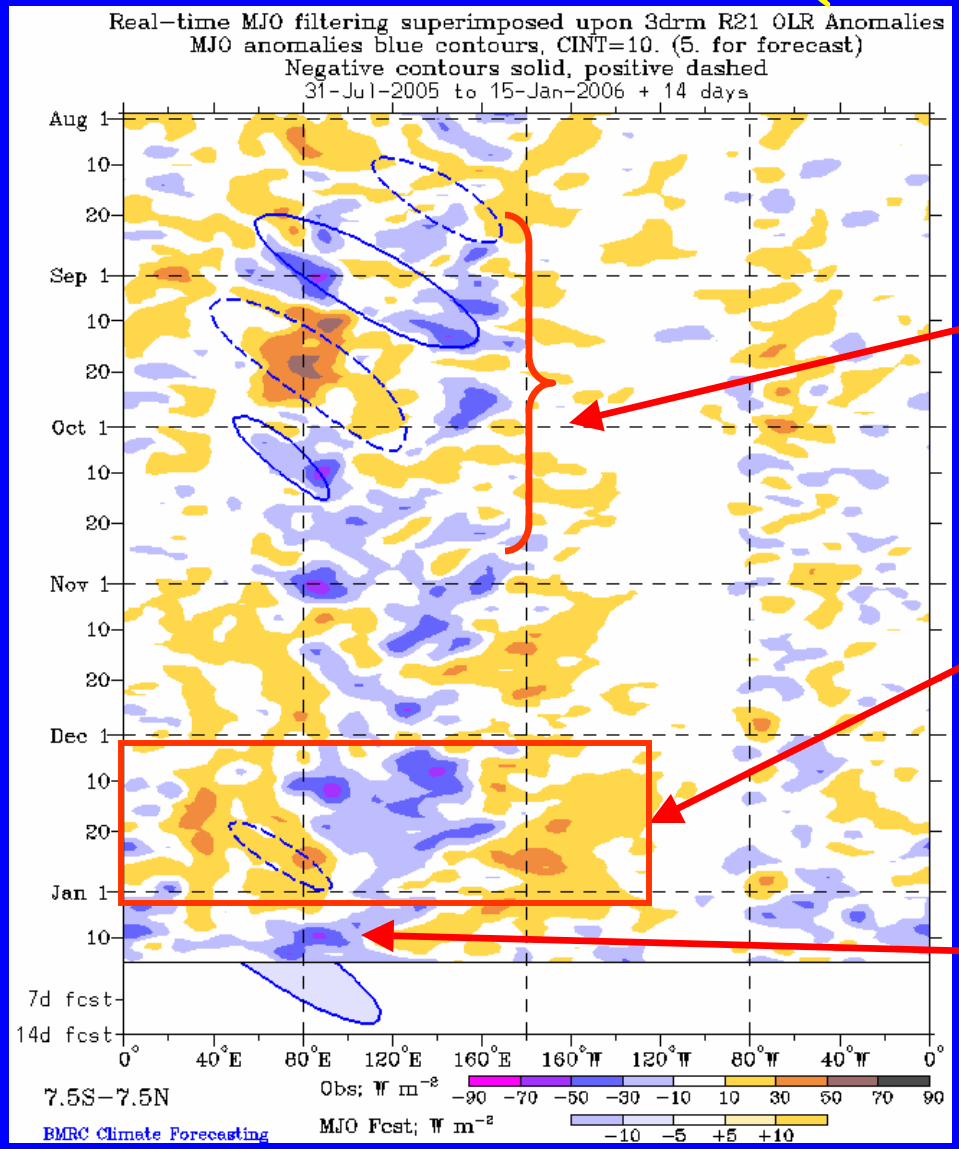
Weaker-than-average easterlies or westerlies (orange/red shading).

Stronger-than-average easterlies (blue shading).

Equatorial easterly anomalies persist from New Guinea eastward to the central equatorial Pacific.

The strong westerly anomalies over the Indian Ocean and Indonesia persist, although they are not as strong as in mid December

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



Time

Longitude

Drier-than-average conditions (/red shading)

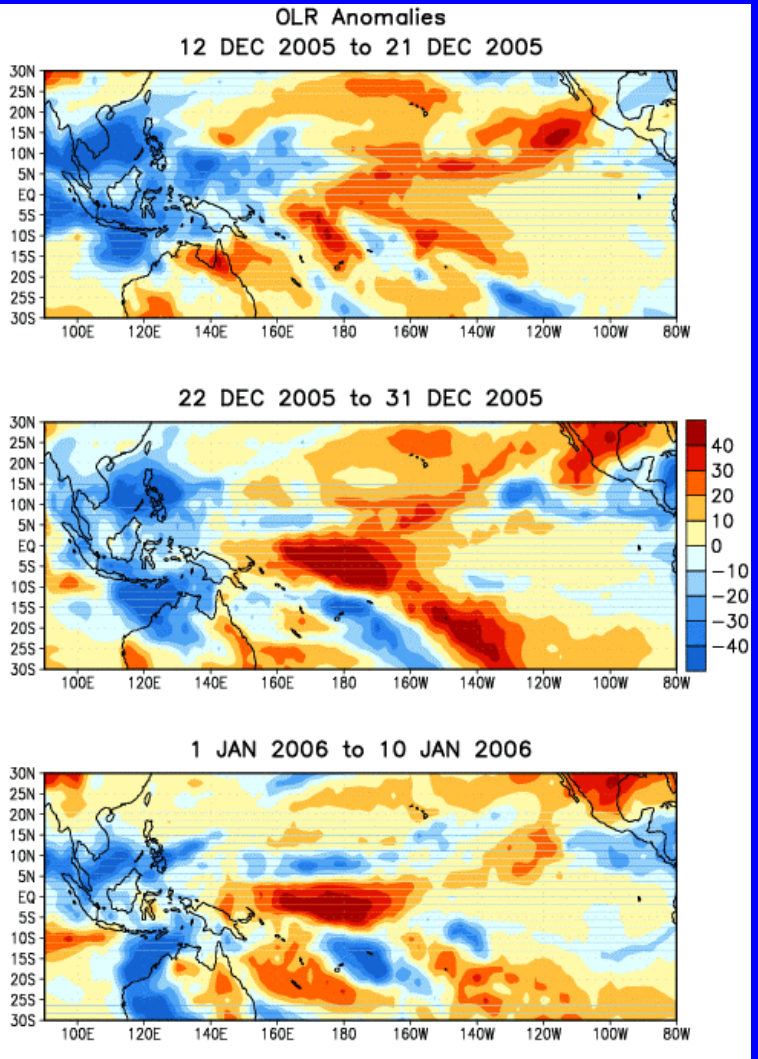
Wetter-than-average conditions (blue shading)

Weak MJO activity was evident during September and October as OLR anomalies propagated eastward from the Indian Ocean to the western Pacific Ocean.

Enhanced convection was quasi-stationary across sections of the eastern Indian Ocean, Indonesia and the western Pacific Ocean while suppressed convection was evident both across Africa and in the central Pacific Ocean during late November and December.

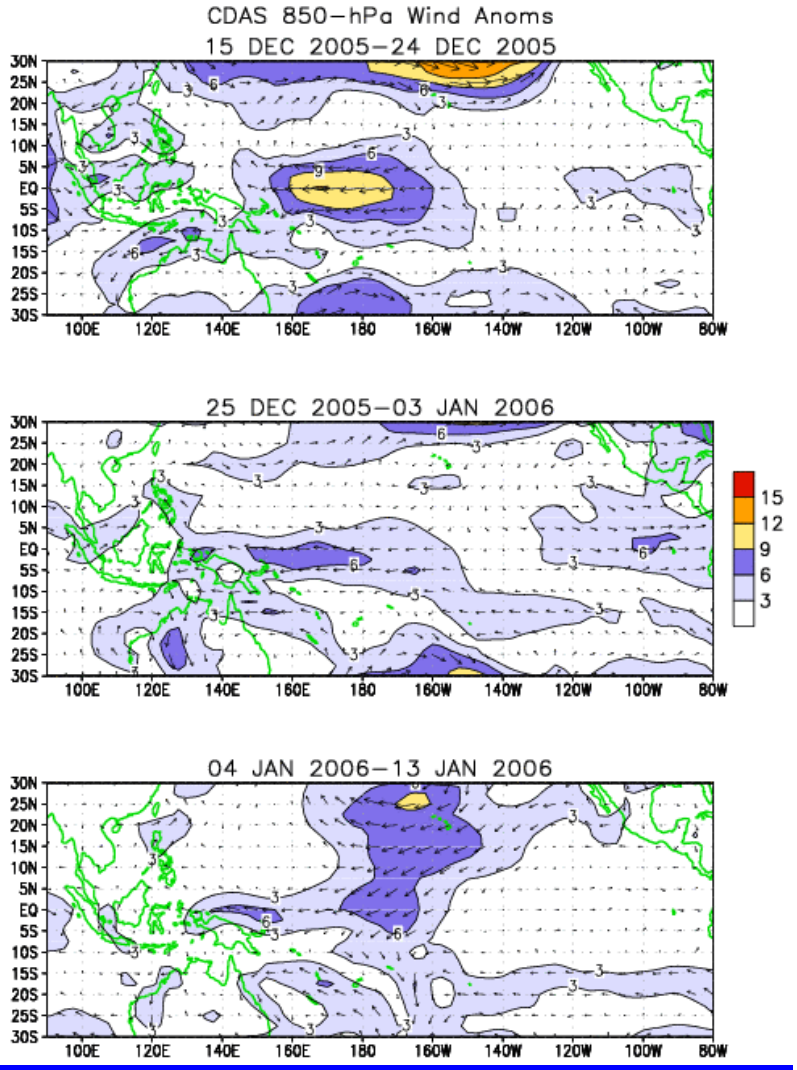
During the first part of January there was a shift westward in the region of enhanced convection in the eastern Hemisphere.

Anomalous OLR and 850-hPa Wind: Last 30 days

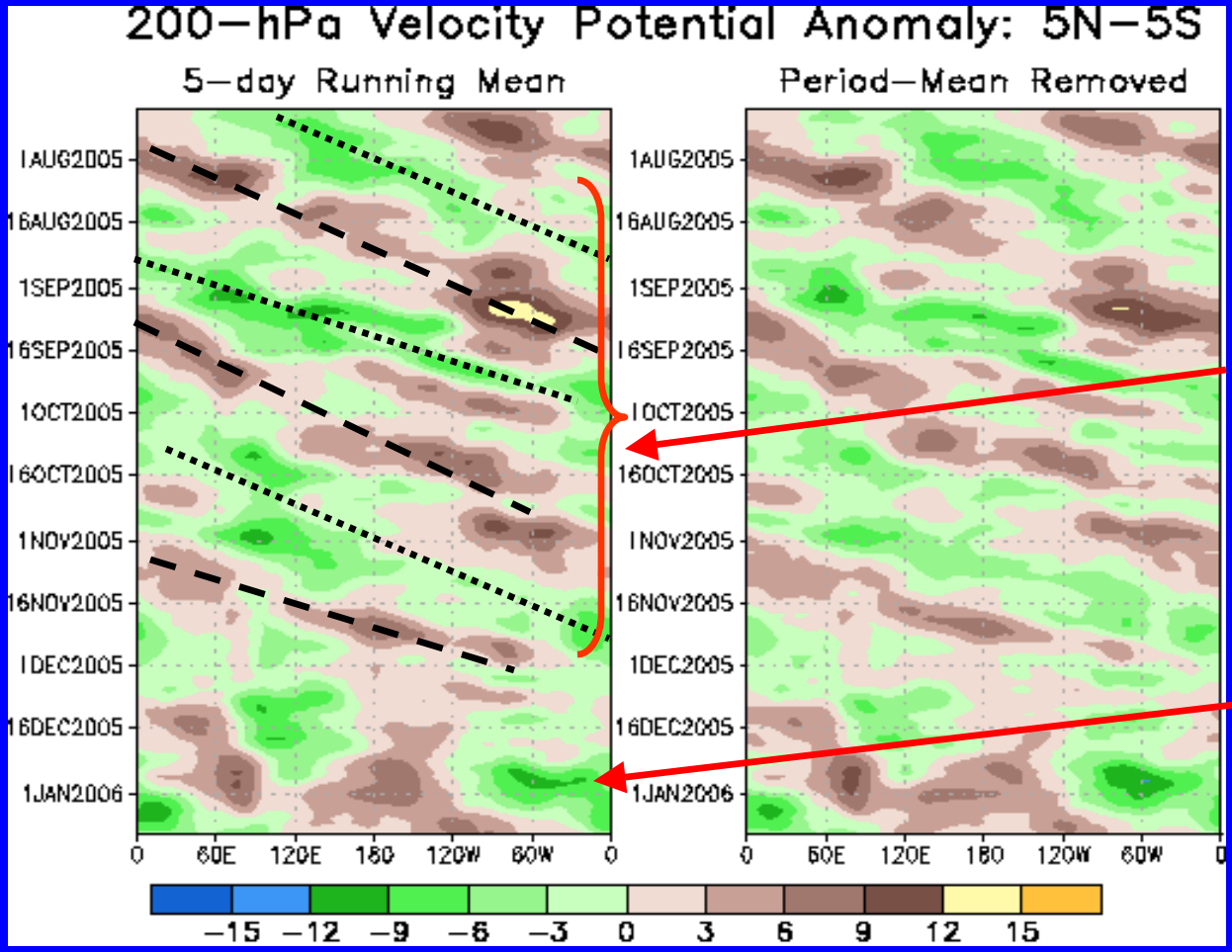


During the past 30 days, a pattern of enhanced (suppressed) convection has been evident across Indonesia (west-central Pacific Ocean)

Easterly anomalies have been evident in the western Pacific Ocean during the past month.



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



Time

Longitude

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

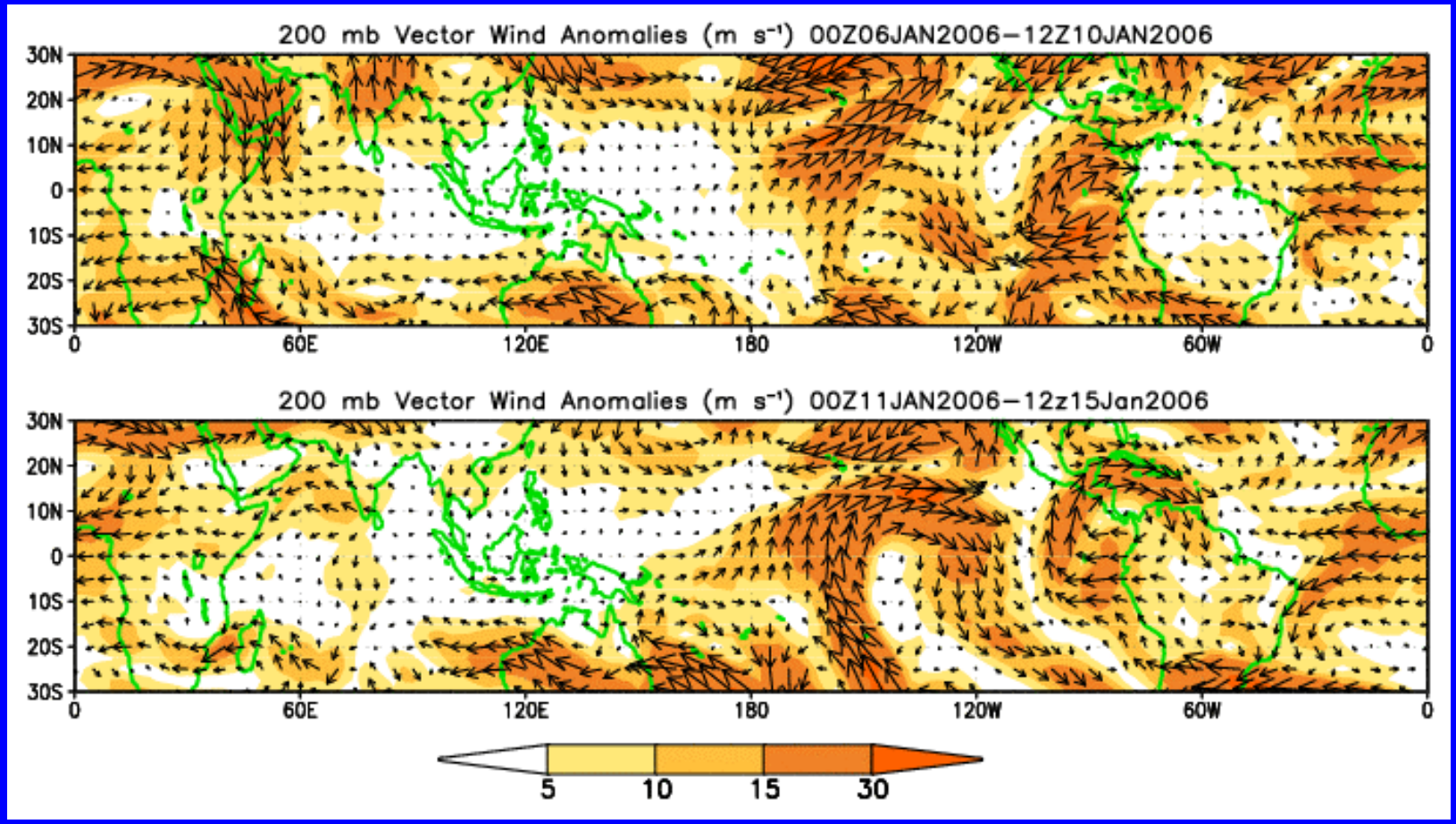
Negative anomalies (green shading) indicate favorable conditions for precipitation.

Weak to moderate MJO activity was observed from July into November.

Along the equator, upper-level divergence (green) was strong during late December into the first weeks of January across Latin America and the Atlantic. This enhanced divergence has shifted over Africa and into the Indian Ocean.

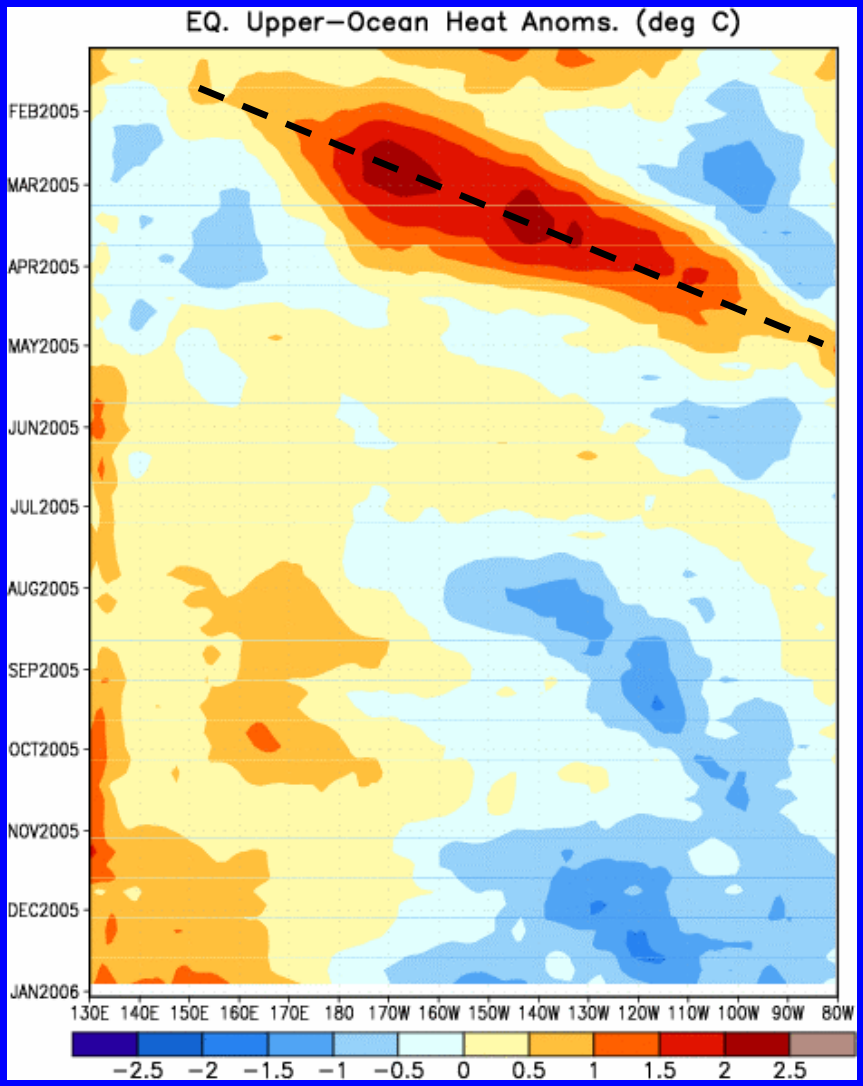
200-hPa Vector Winds and Anomalies (m s^{-1})

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



Mid-latitude anomalies extend into the sub-tropics and tropics over the Western Hemisphere.

Heat Content Evolution in the Eq. Pacific



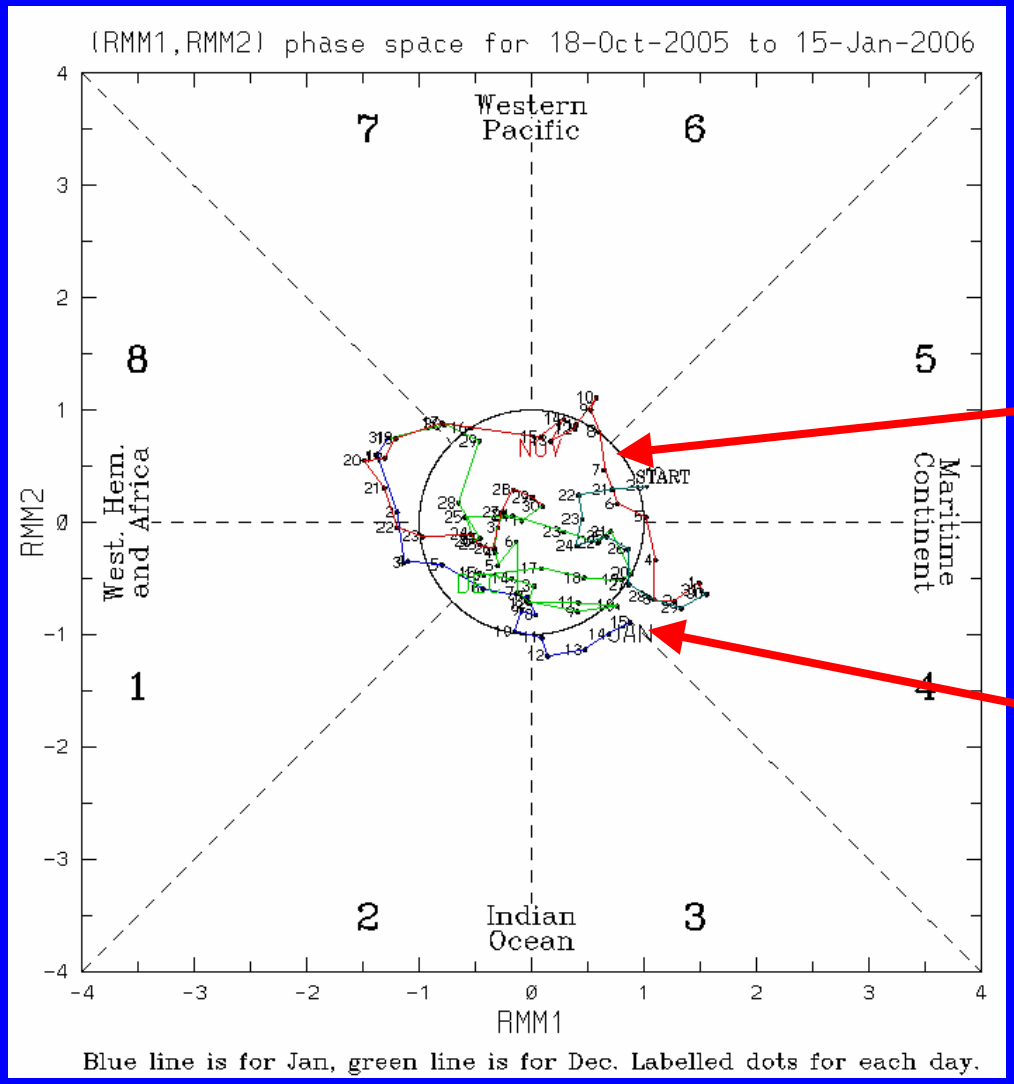
Time

Longitude

During February 2005, a strong Kelvin wave developed and continued to strengthen during March and reached the South American coast during early April. The Kelvin wave was initiated when the easterlies weakened over the equatorial Pacific in association with MJO activity.

Heat content has been above average in the western Pacific since June while cooler water has been observed across the eastern Pacific with a westward extension evident during November, December and early January.

MJO Index (Magnitude and Phase)



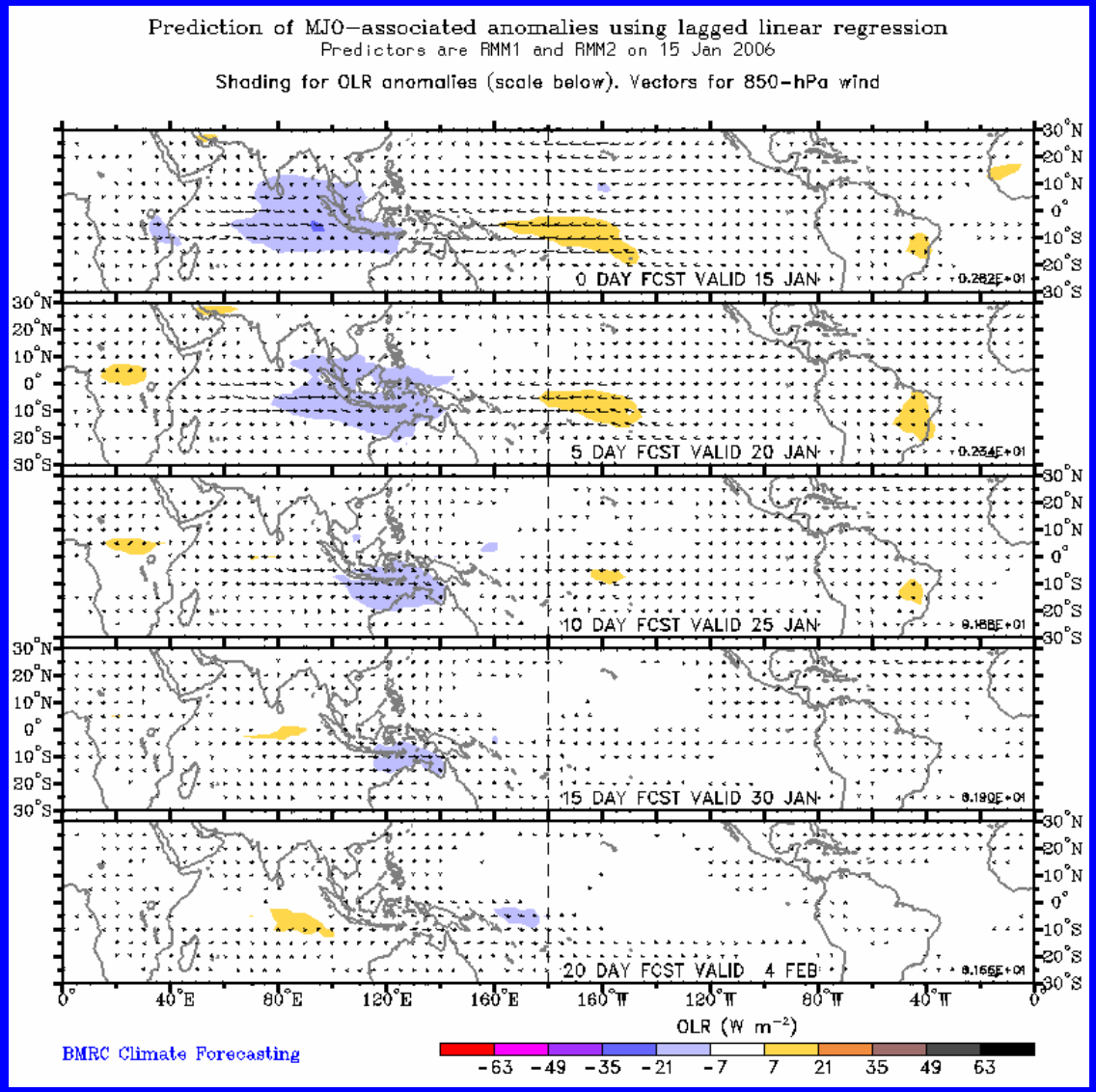
The current state of the MJO as determined by an index based on Empirical Orthogonal Function (EOF) analysis using combined fields of near-equatorially-averaged 850 hPa zonal wind, 200 hPa zonal wind, and satellite-observed outgoing longwave radiation (OLR) (Wheeler and Hendon, 2004).

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 has been weak during the months of October, November and December indicated by periods of low amplitude eastward propagation

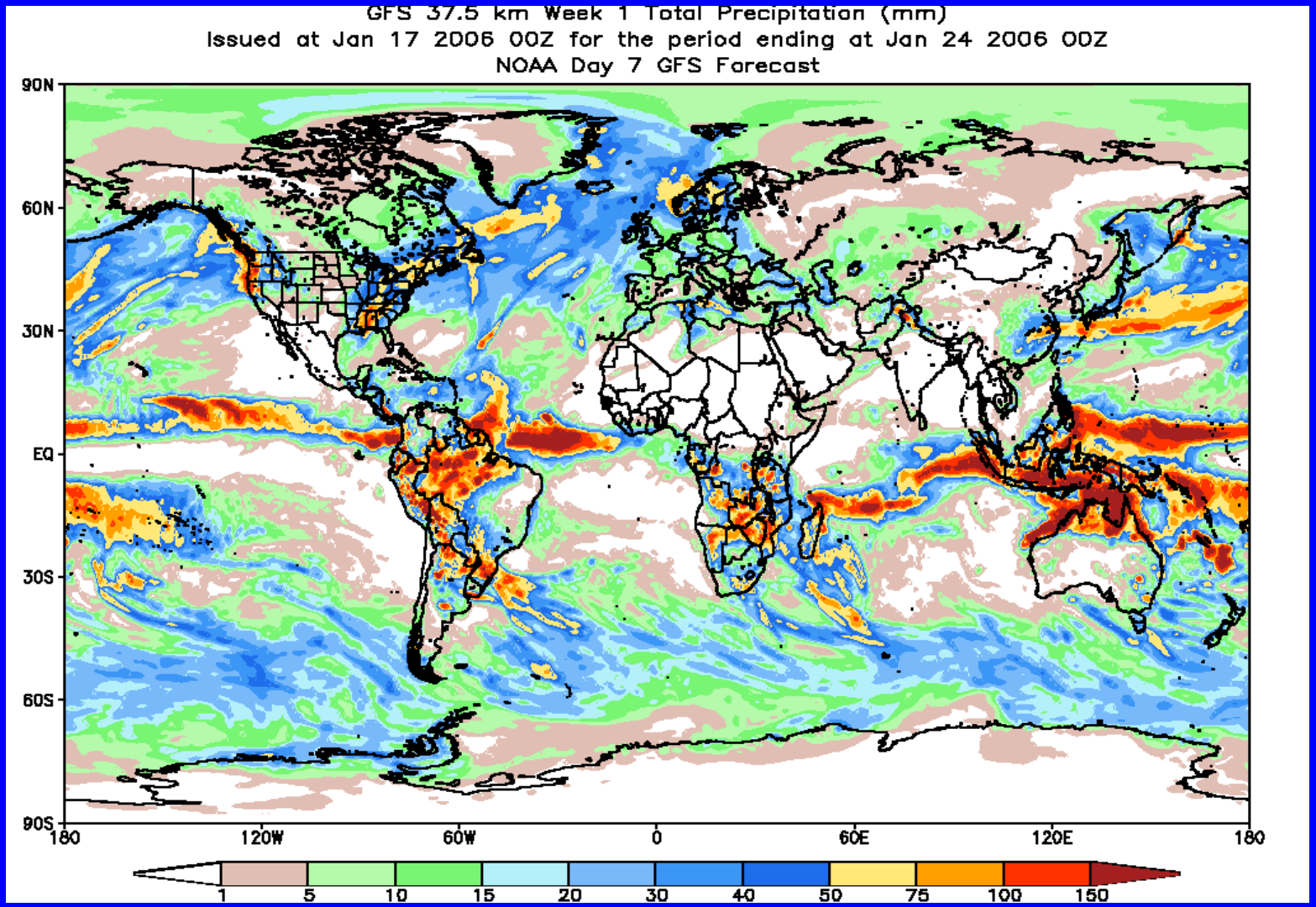
Currently, the MJO remains weak, however the upper level divergence and OLR fields indicate that a weak coherent wave has developed.

Statistical OLR MJO Forecast



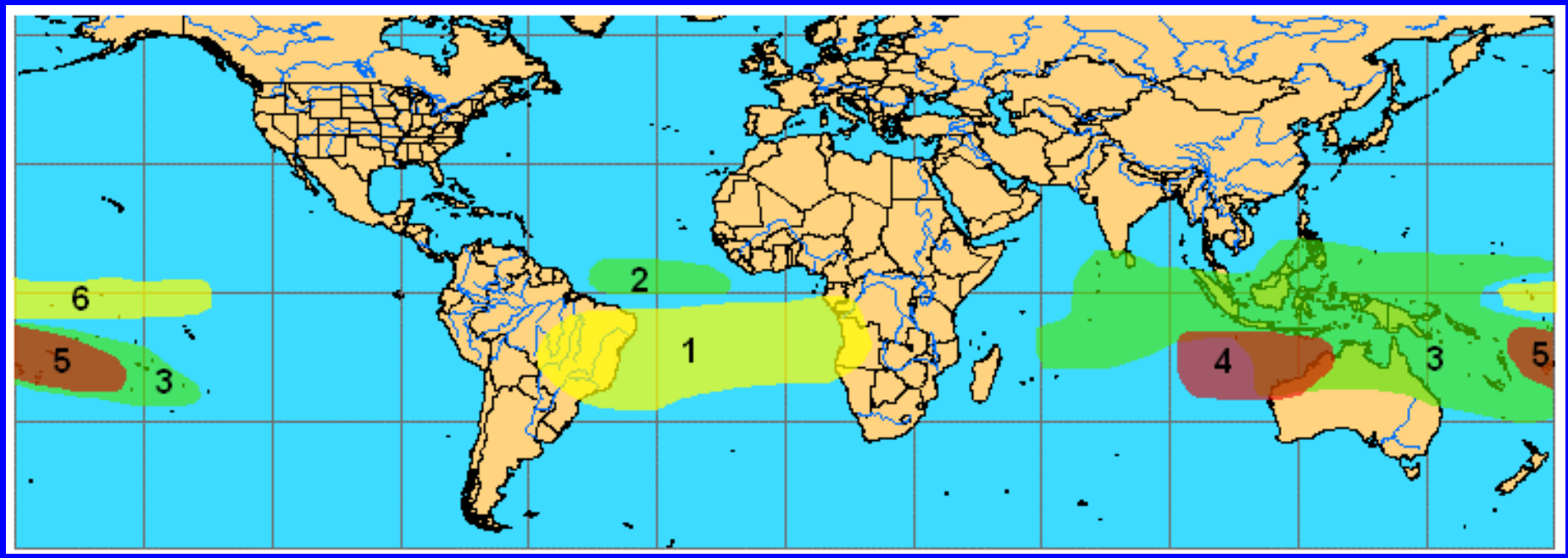
The statistical MJO forecast indicates that enhanced convection will occur over the Maritime Continent, with suppression over the central Pacific.

Global Forecast System Precipitation Forecast



The GFS is indicating enhanced rainfall over Indonesia and northern Australia, and dry conditions over eastern Brazil and the central Pacific. Normal rainfall is indicated over Africa and the Amazon.

Potential Benefits/Hazards – Week 1
Valid January 17 – 23, 2006



1. An increased chance for below normal rainfall over eastern Brazil, the South Atlantic and western portions of Angola in Africa.
2. An increased chance for above normal rainfall over the equatorial Atlantic.
3. An increased chance for above normal rainfall over the eastern Indian Ocean, Indonesia, northern Australia and the southwestern Pacific.
4. An increased chance for tropical cyclogenesis over the southern Indian Ocean east of 90E. The potential exists for tropical cyclogenesis anywhere in the tropical Indian Ocean.
5. An increased chance for tropical cyclogenesis in the southwestern Pacific.
6. An increased chance for below normal rainfall across the central equatorial Pacific.

Potential Benefits/Hazards – Week 2
Valid January 24 - 30, 2006

1. An increased chance for above normal rainfall over eastern Indonesia, northern Australia and much of the southwestern Pacific.
2. There is an increased chance for below normal rainfall across the central equatorial Pacific.

Summary

- The MJO remains weak.
- During the past week, enhanced convection was observed across Africa, the Indian Ocean, parts of Indonesia, Australia and the southwestern Pacific. Suppressed convection was noted over the equatorial Pacific in the vicinity of the date line, and over eastern Brazil. Some of these conditions resemble those of La Nina conditions. The area of enhanced convection was shifting eastward.
- For week 1, there is an increased chance for above normal rainfall over the eastern Indian Ocean, Indonesia, northern Australia and the southwestern Pacific. There is also the potential for tropical cyclogenesis over eastern portions of the south Indian Ocean and over the southwestern Pacific. There is an increased chance for below average rainfall over eastern Brazil, the South Atlantic, and portions of southwestern Africa.
- During weeks 1 and 2, there is an increased chance for below normal rainfall over the central equatorial Pacific. There is also an increased chance for above normal rainfall over Indonesia, northern Australia and the southwestern Pacific during week 2.