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

Update prepared by
Climate Prediction Center / NCEP
February 5, 2007

Outline

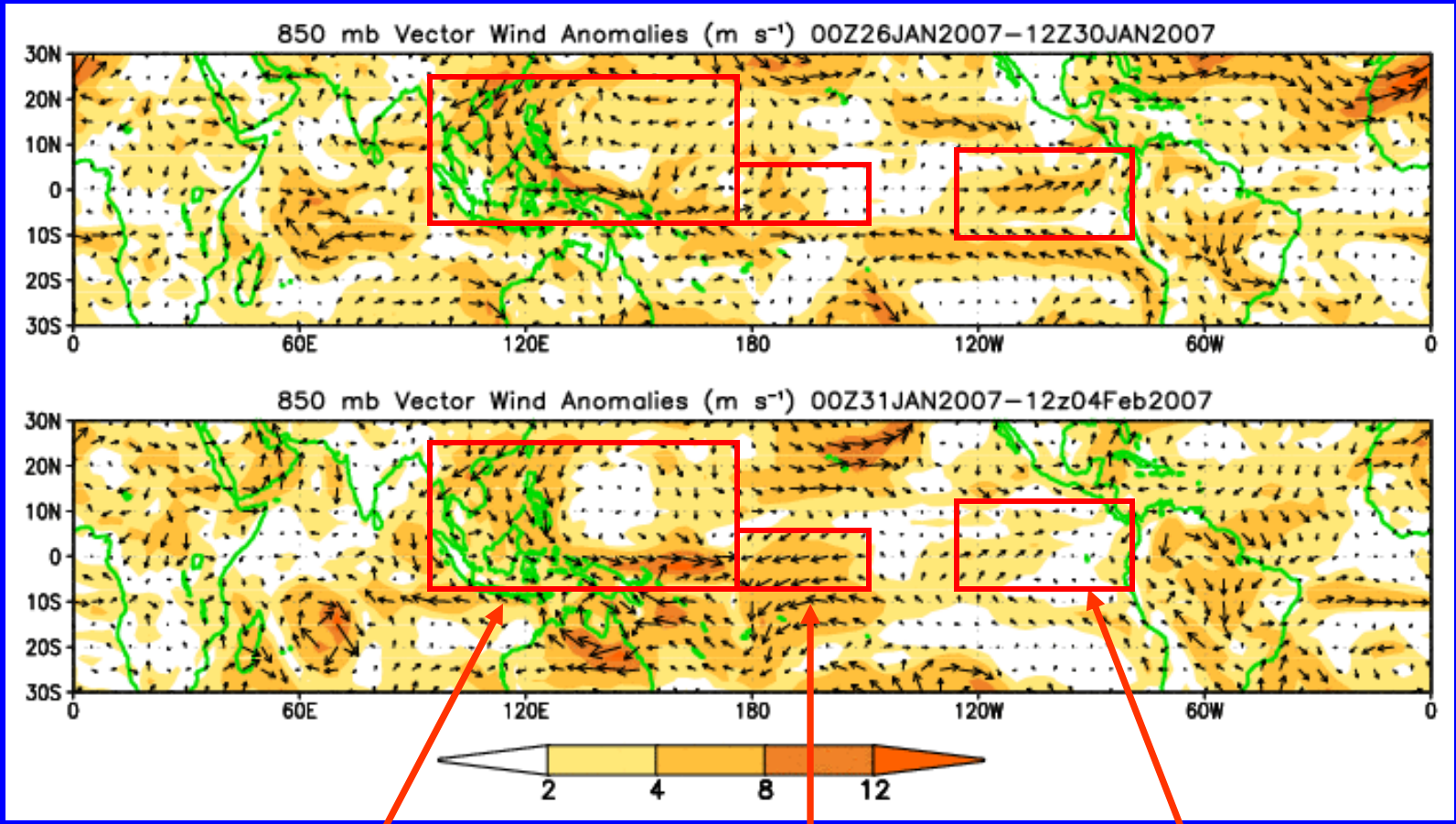
- Overview
- Recent Evolution and Current Conditions
- Madden Julian Oscillation Forecast
- Summary

Overview

- **The latest observations indicate that the MJO is incoherent.**
- **During weeks 1 and 2, there is an increased chance for above-normal rainfall over the central and western tropical Pacific Ocean, mainly south of the equator. Favorable conditions exist for tropical cyclogenesis extending from the north and northeast coast of Australia to the central Pacific throughout the period.**
- **Additional impacts for week 1 include an increased chance of below normal rainfall over the eastern Indian ocean and above normal rainfall for south-central Africa and Madagascar.**
- **Tropical cyclone Dora will continue to impact portions of the southern Indian Ocean east of Madagascar during week 1.**

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

Note that shading denotes the magnitude of the anomalous wind vectors

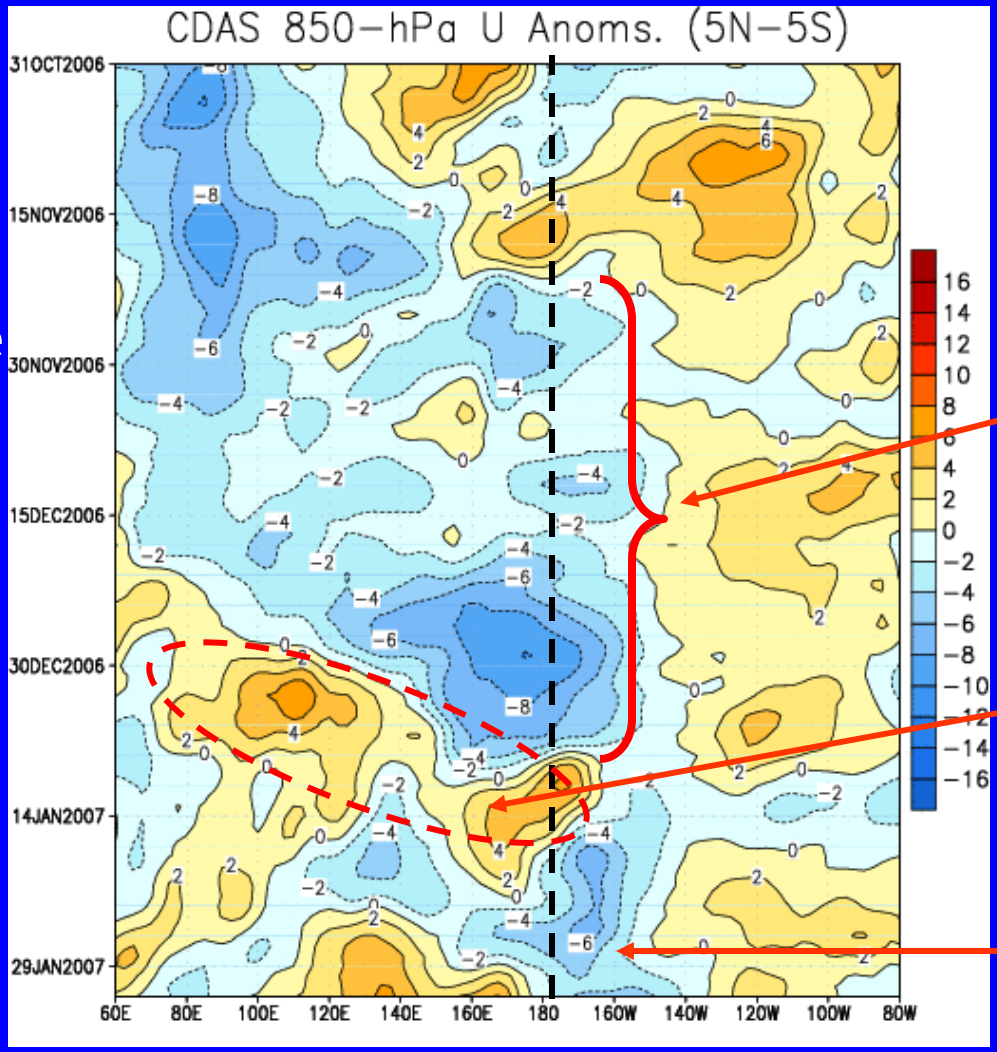


Northerly flow is enhanced north of the equator. Anomalous westerlies have strengthened at the equator.

Easterly anomalies have strengthened just east of the Date Line.

Westerly anomalies in the eastern Pacific have diminished.

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



Time

Longitude

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

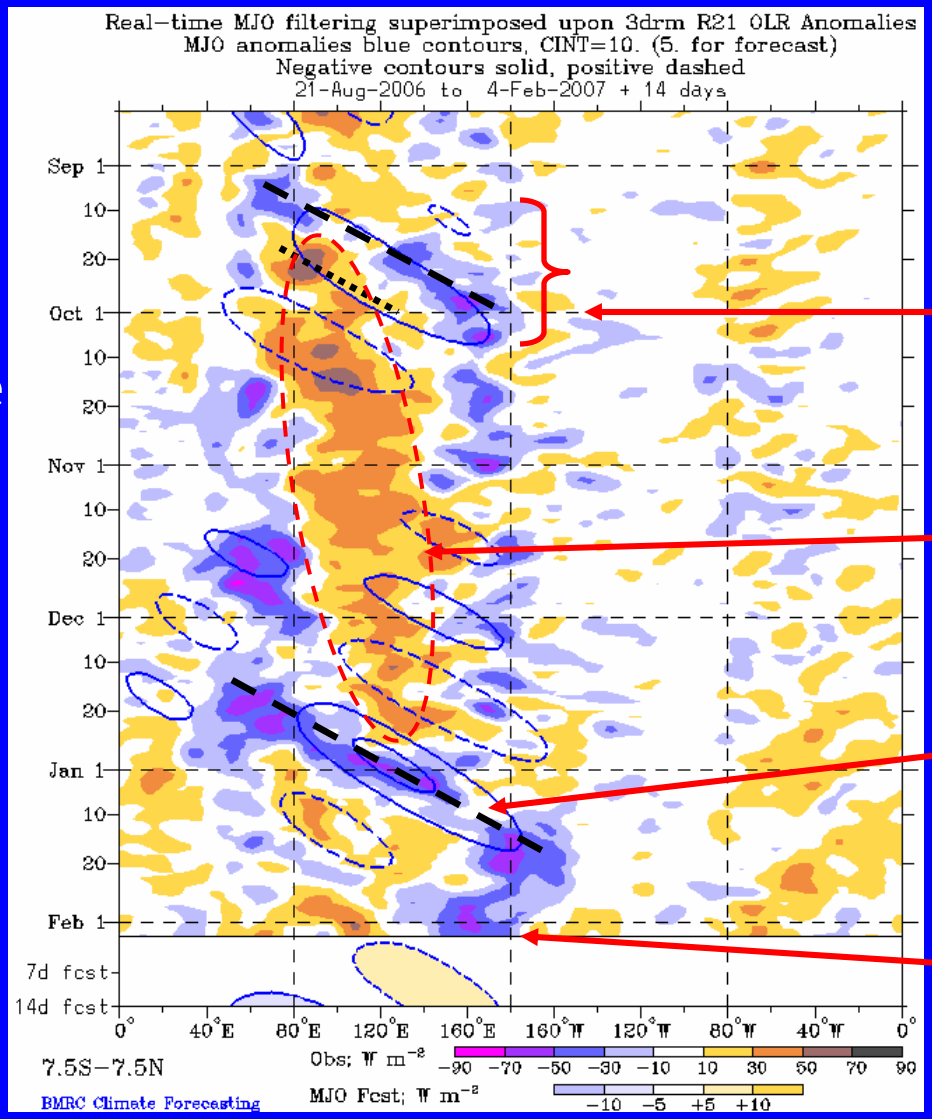
Easterly anomalies (blue shading) represent anomalous east-to-west flow.

An extended period of easterly anomalies persisted near and west of the Date Line (vertical dashed line) line from mid-November through early January.

Westerly anomalies were observed over the equatorial Indian Ocean and Indonesia in late December 2006, and over the central equatorial Pacific during early January 2007.

Recently easterly anomalies have reemerged near the Date Line and westerly anomalies are observed west of the Date Line.

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



Time

Longitude

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

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

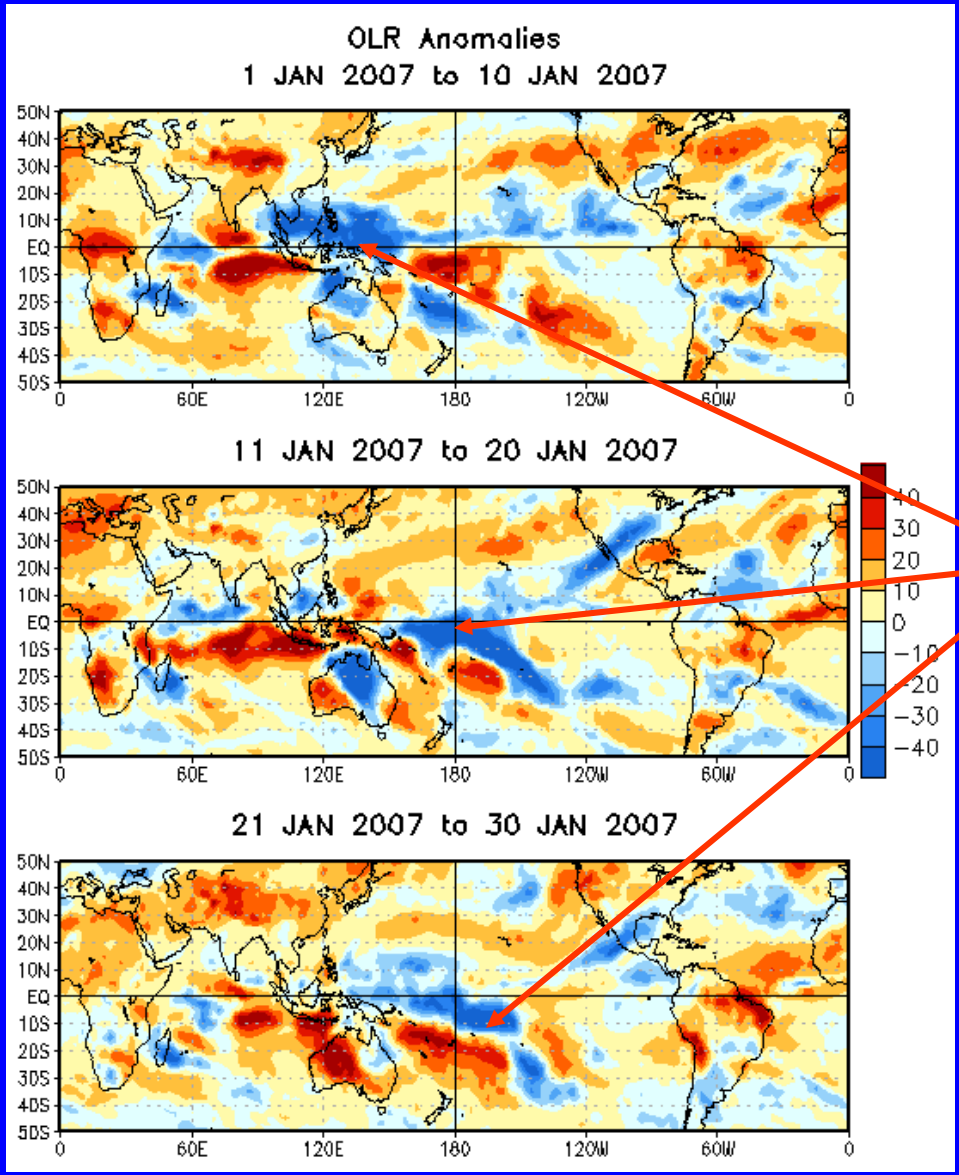
Negative OLR anomalies associated with the MJO propagated eastward beginning in early September.

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

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

Recently, OLR anomalies have been weak with slightly suppressed convection in the Indian Ocean and enhanced convection west of the Date Line.

Anomalous OLR: Last 30 days



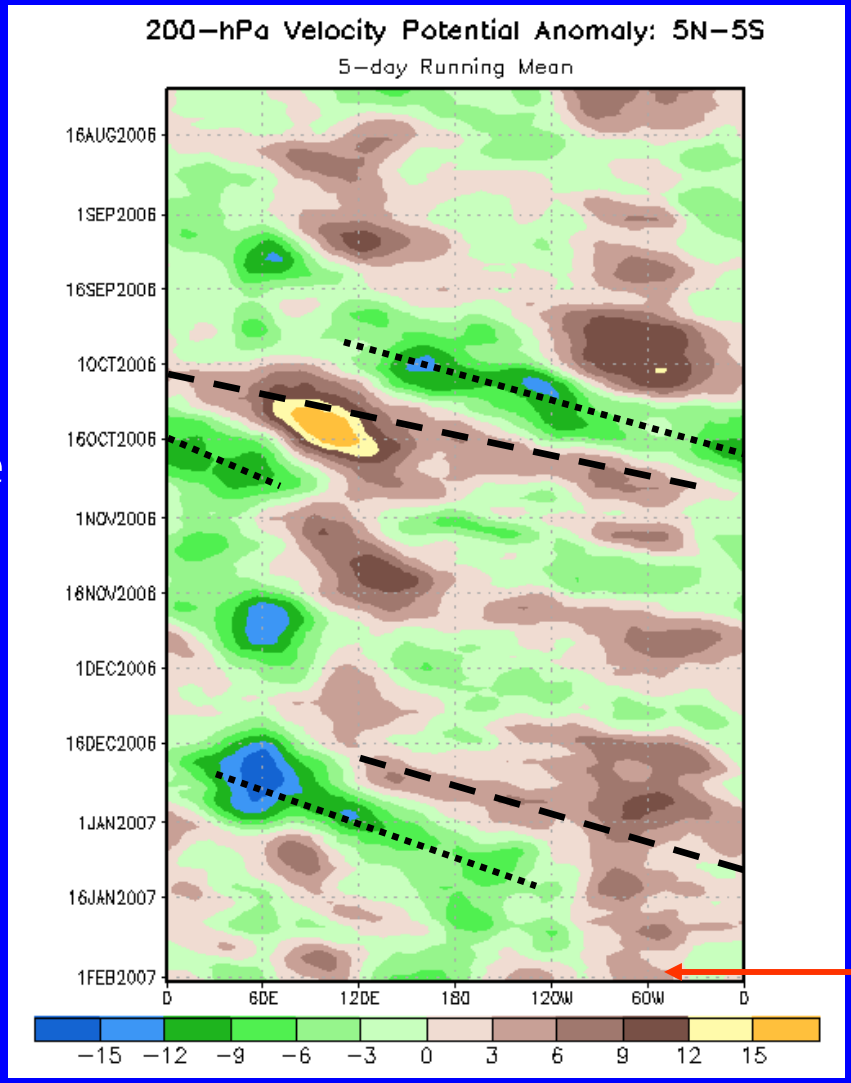
Drier-than-average conditions, positive OLR anomalies (red shading)

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

During January, an extensive area of enhanced convection in the Maritime continent shifted east to the central tropical Pacific.

The eastern Indian Ocean, western parts of the Maritime continent, and west Australia, have had suppressed convection south of the equator. The latest twenty day period indicates the SPCZ is shifted anomalously eastward.

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.

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

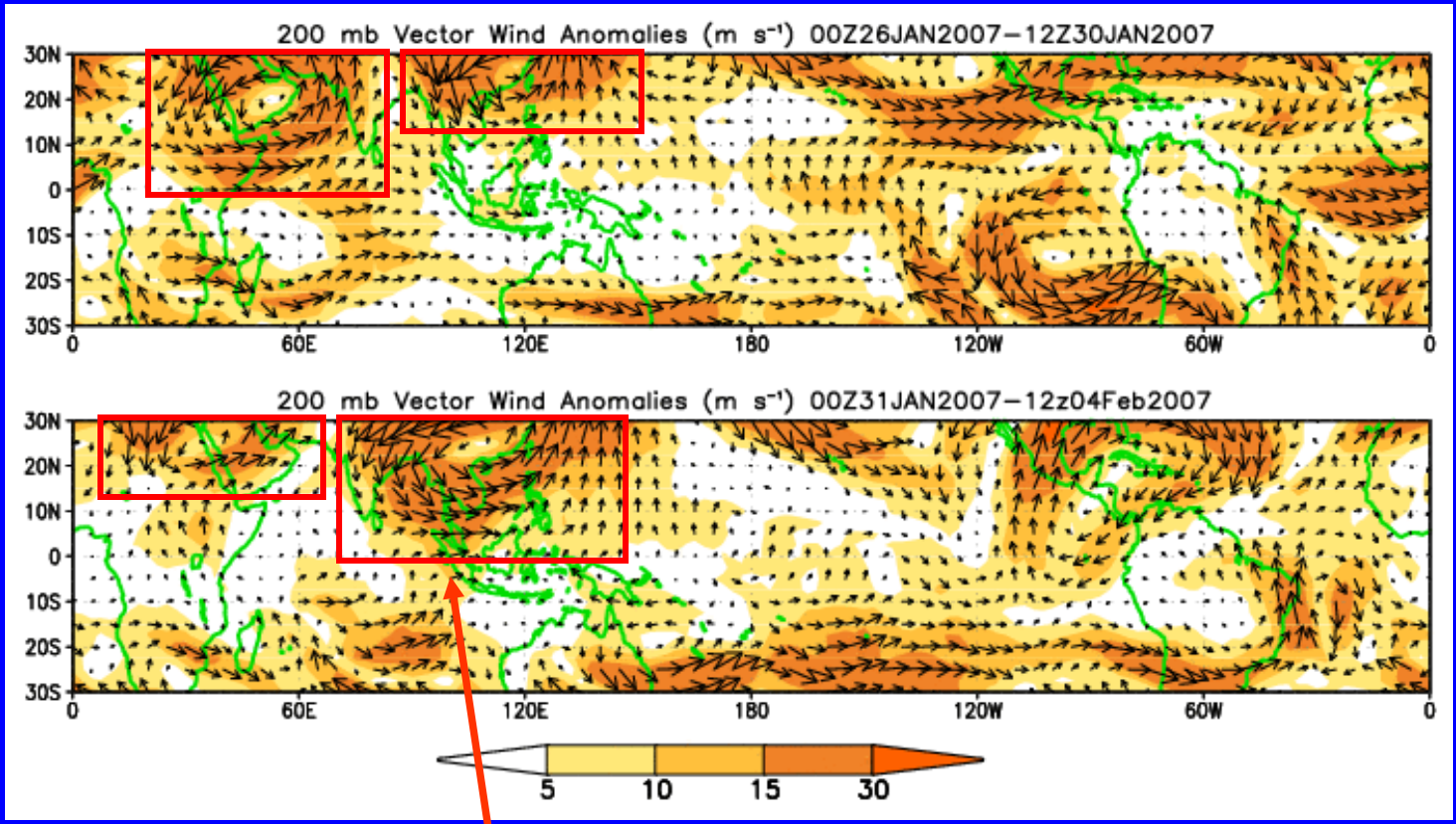
Moderate to strong MJO activity was observed from late-September to mid-October.

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

Recently the velocity potential anomalies have become more stationary.

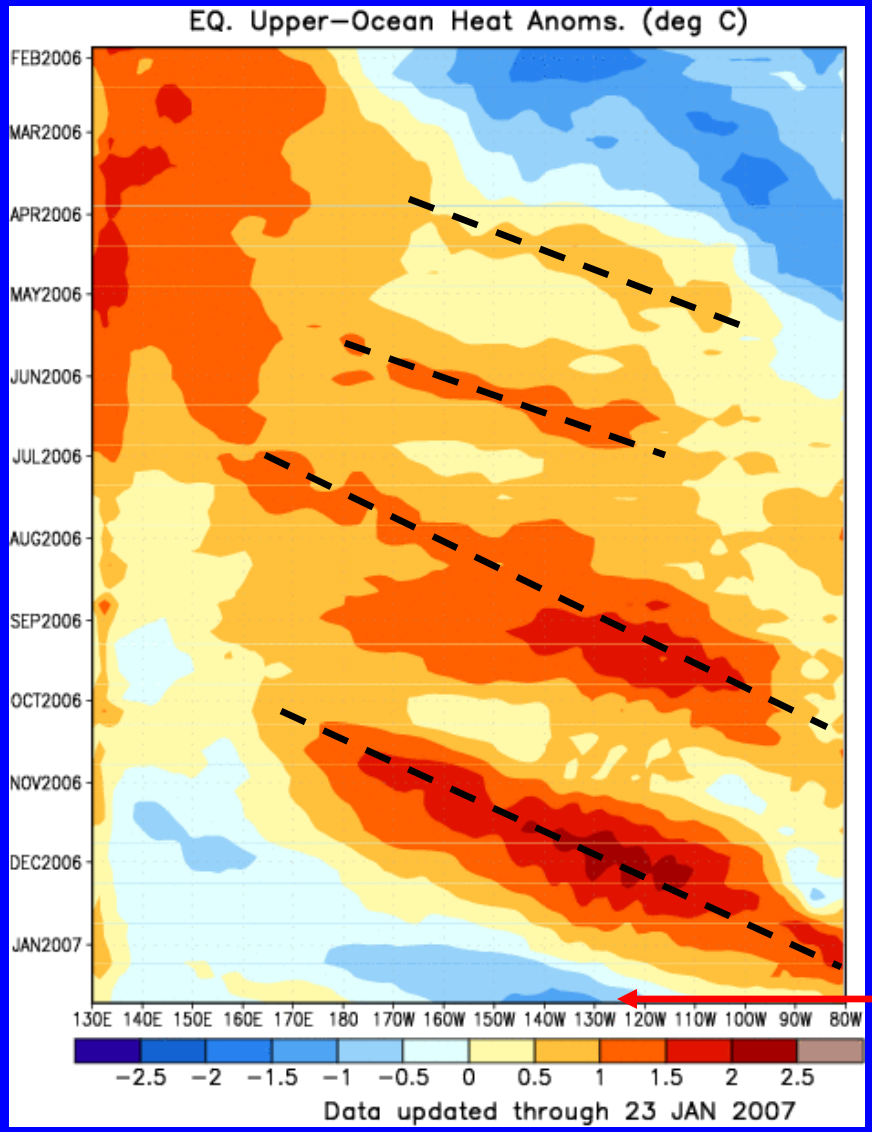
200-hPa Vector Winds and Anomalies ($m\ s^{-1}$)

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



Anomalous upper-level cyclone has amplified over Southeast Asia.

Heat Content Evolution in the Eq. Pacific



Time

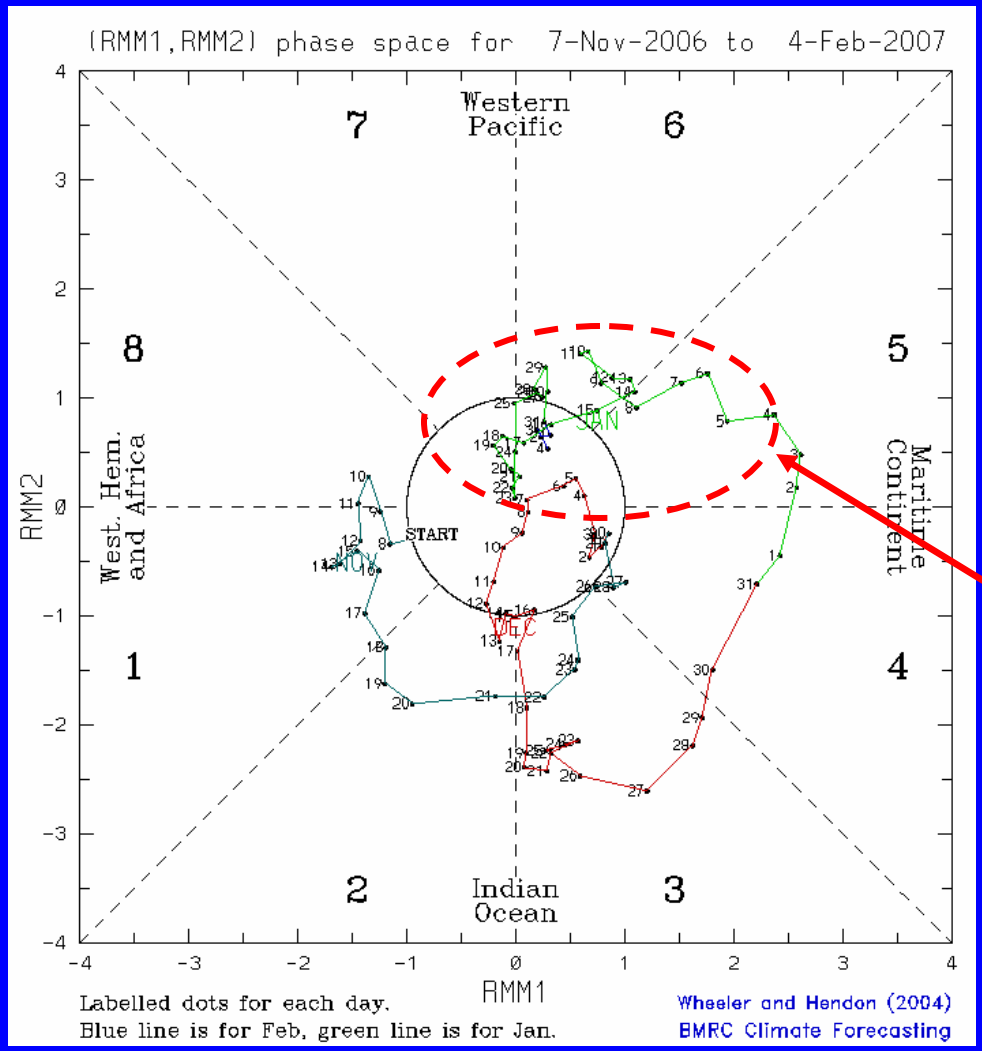
Longitude

Starting in April, above normal upper oceanic water temperatures expanded from the western Pacific into the eastern Pacific.

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.

Recently, negative heat content anomalies have been propagating eastward to the east-central equatorial Pacific.

MJO Index (Magnitude and Phase)

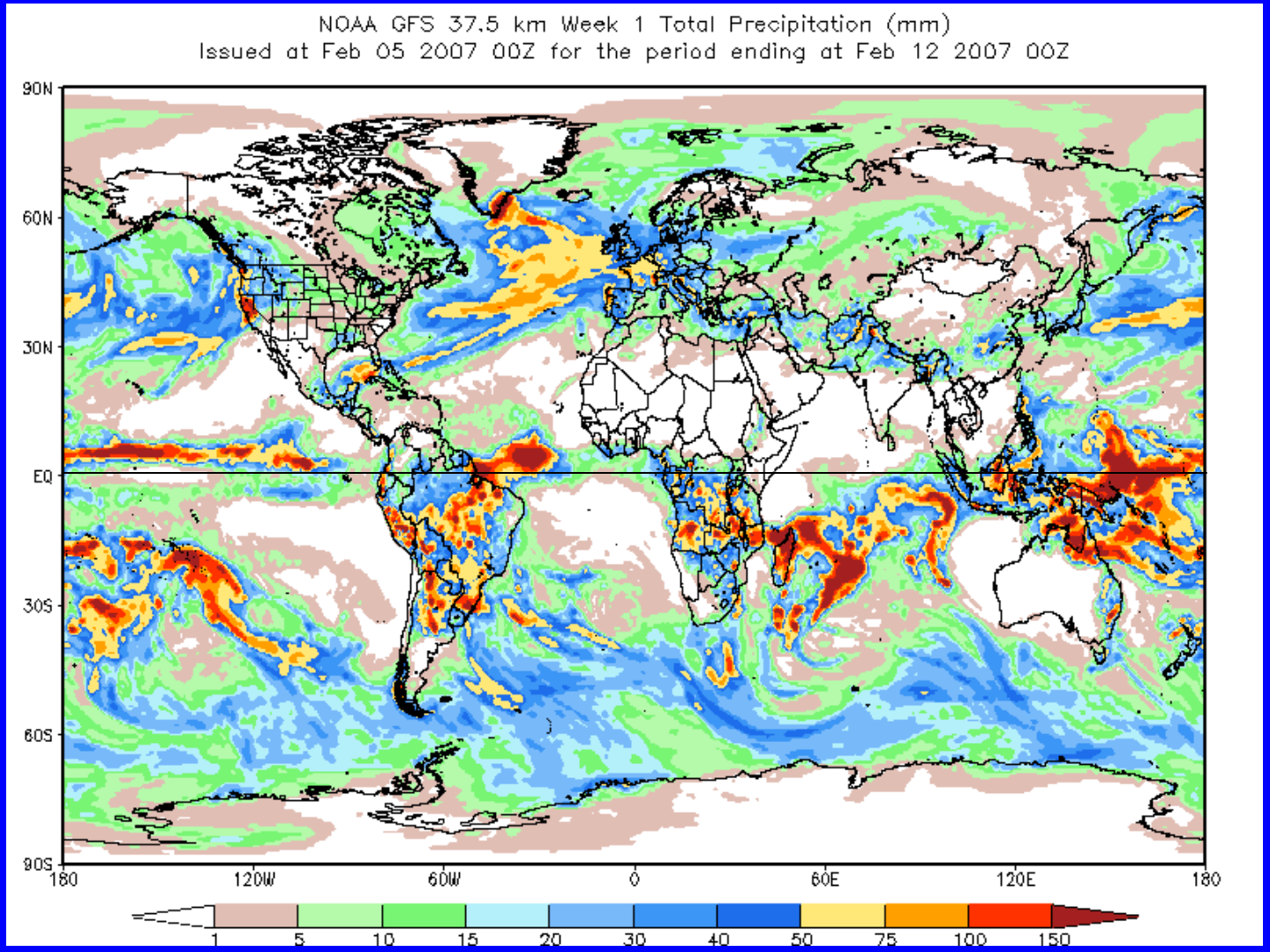


The current state of the MJO as determined by an index based on Empirical Orthogonal Function (EOF) analysis using combined fields of near-equatorially-averaged 850-hPa zonal wind, 200- hPa zonal wind, and satellite-observed outgoing longwave radiation (OLR) (Wheeler and Hendon, 2004).

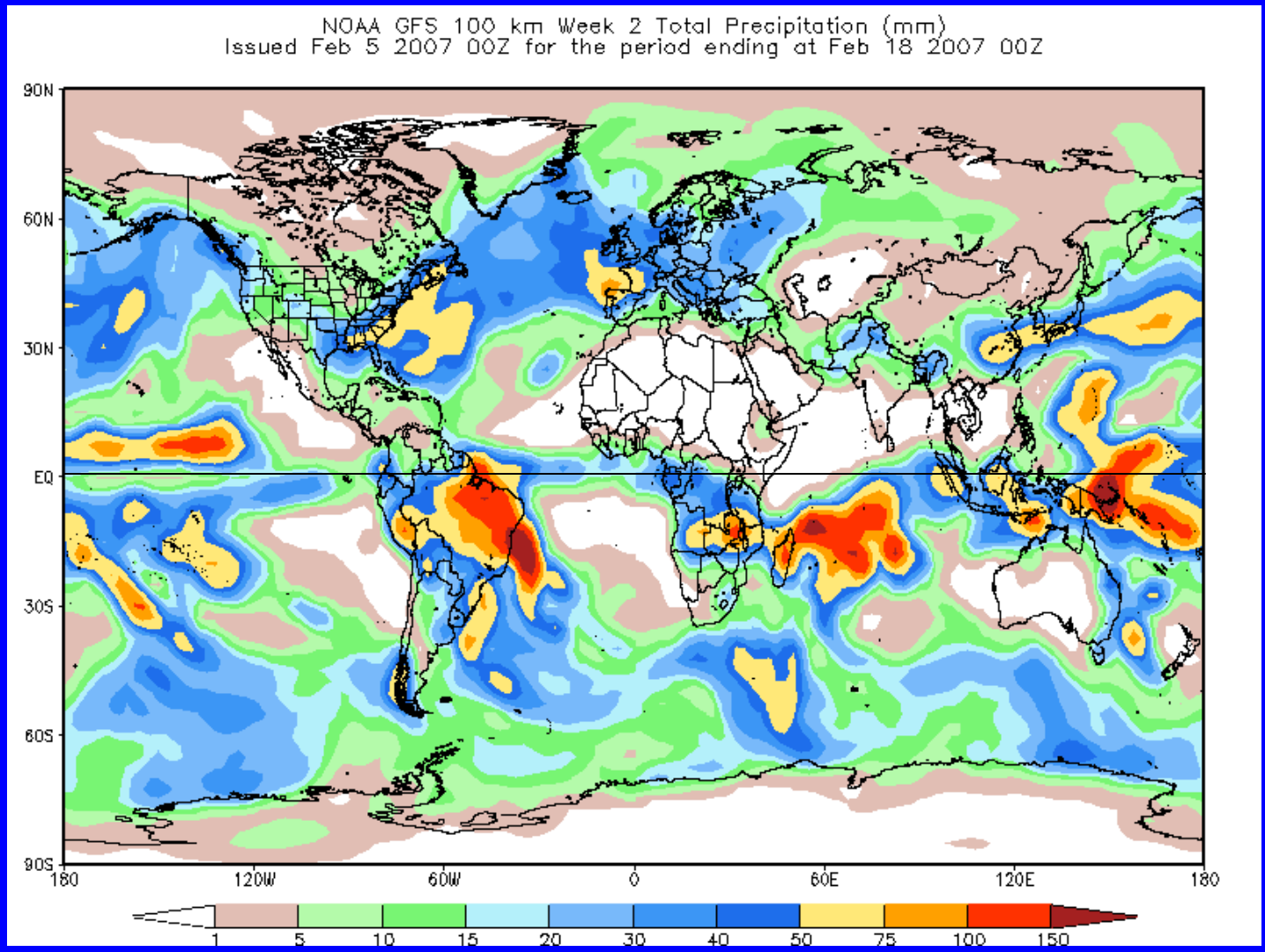
The axes represent the time series of the two leading modes of variability and are used to measure the amplitude while the triangular areas indicate the phase or location of the enhanced phase of the MJO. The farther away from the center of the circle the stronger the MJO. Different color lines indicate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

The MJO weakened and became incoherent in early January.

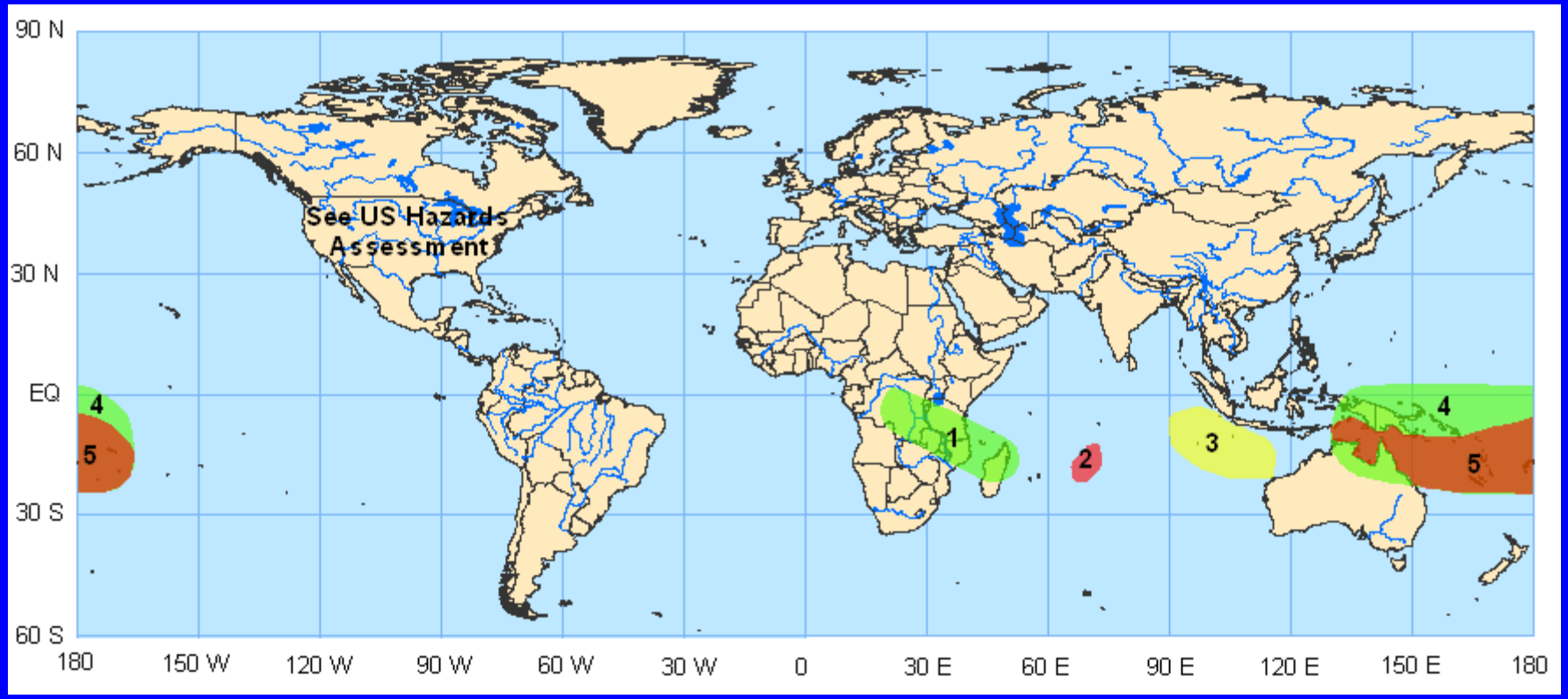
Global Forecast System (GFS) Week 1 Precipitation Forecast



Global Forecast System (GFS) Week 2 Precipitation Forecast

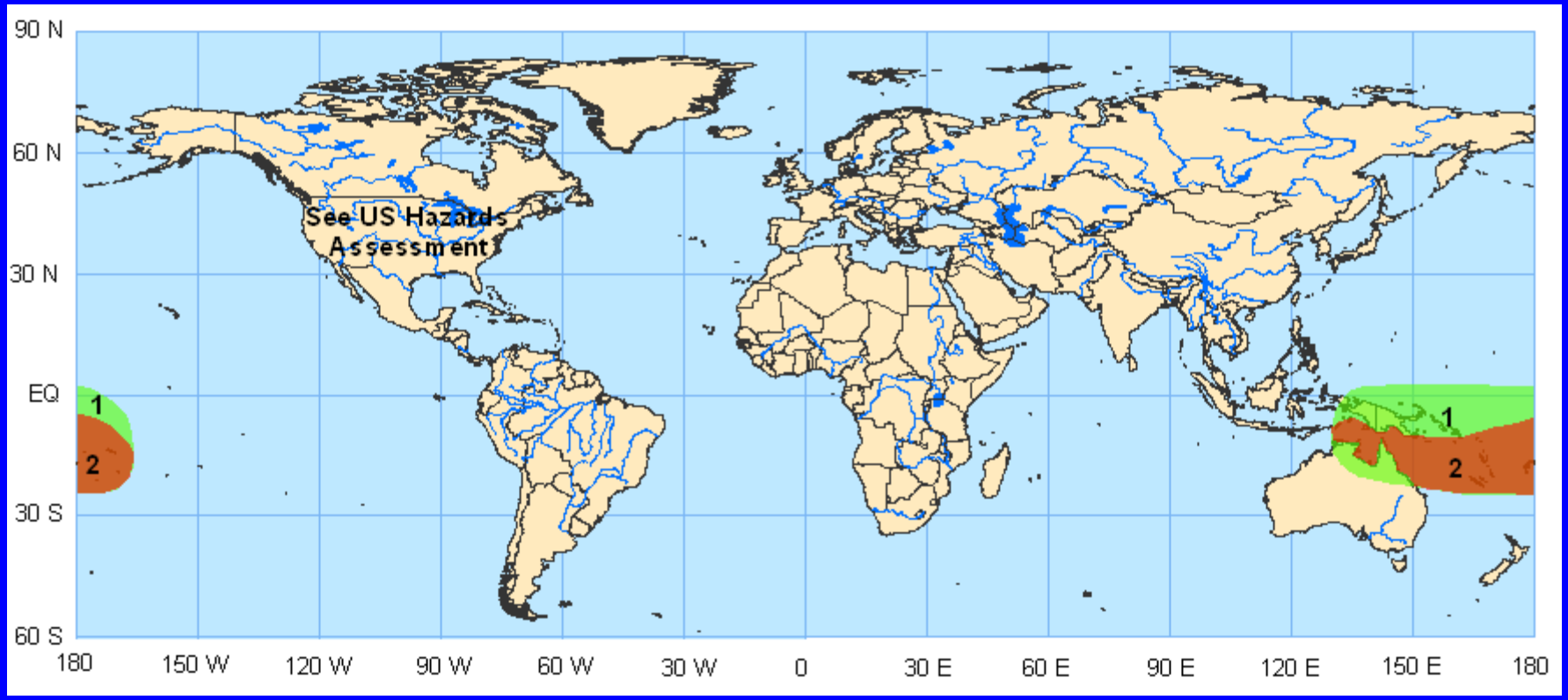


Potential Benefits/Hazards – Week 1
Valid 6 February-12 February 2007



1. An increased chance for above normal rainfall over Madagascar and south-central Africa.
2. Tropical cyclone Dora will impact sections of the southern Indian Ocean east of Madagascar.
3. An increased chance for below normal rainfall in the eastern Indian Ocean, south of the equator.
4. An increased chance for above normal rainfall over portions of the central and western tropical Pacific.
5. Conditions favorable for tropical cyclogenesis from the north and northeast coast of Australia to the central Pacific.

Potential Benefits/Hazards – Week 2
Valid 13 February-19 February 2007



1. **An increased chance for above normal rainfall over portions of the western and central tropical Pacific and over eastern Indonesia.**
2. **Conditions favorable for tropical cyclogenesis extending from the north and northeast coast of Australia to the central Pacific.**

Summary

- **The latest observations indicate that the MJO is incoherent.**
- **During weeks 1 and 2, there is an increased chance for above-normal rainfall over the central and western tropical Pacific Ocean, mainly south of the equator. Favorable conditions exist for tropical cyclogenesis extending from the north and northeast coast of Australia to the central Pacific throughout the period.**
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