

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

Update prepared by
Climate Prediction Center / NCEP
February 12, 2007

Outline

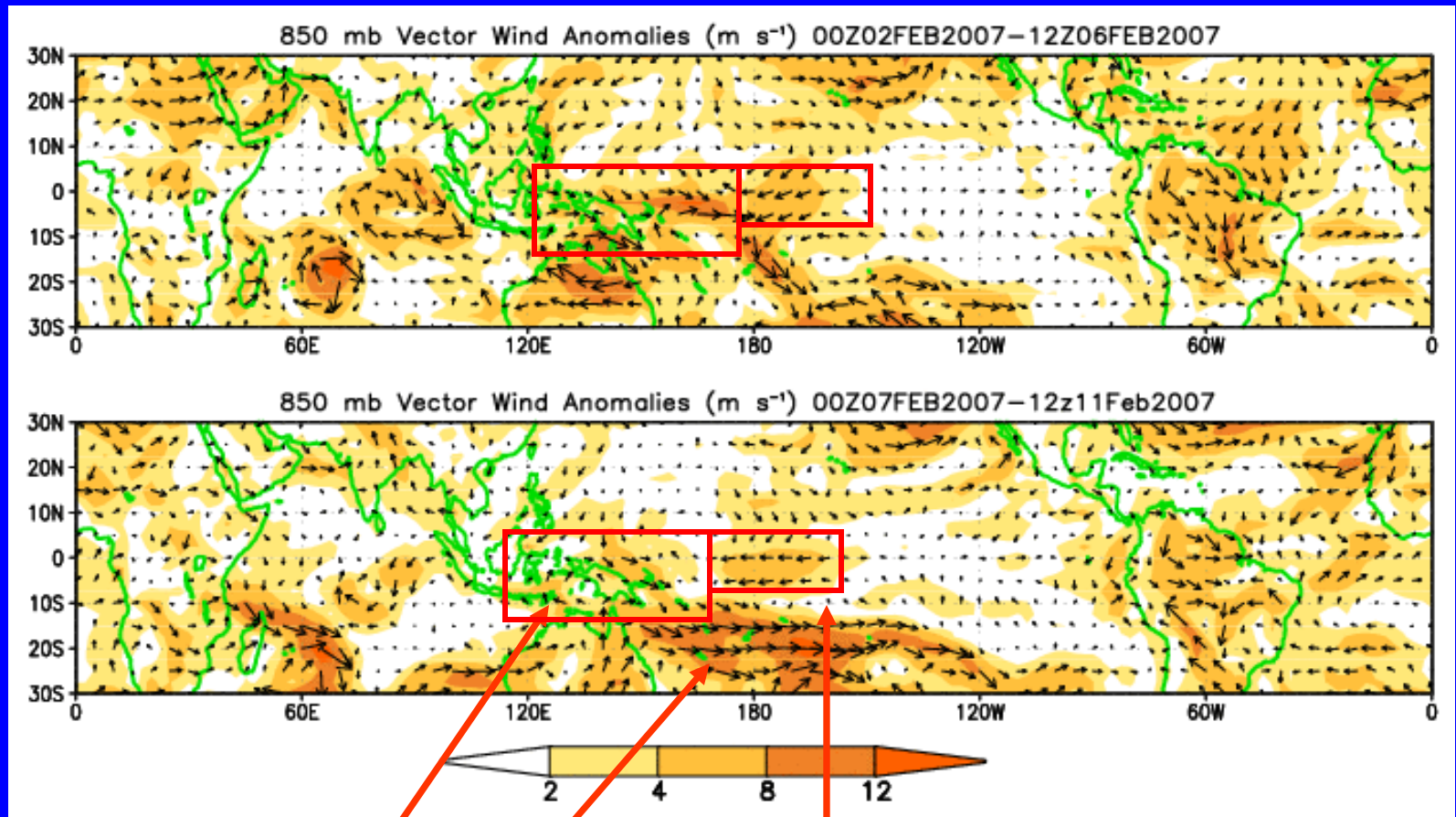
- **Overview**
- **Recent Evolution and Current Conditions**
- **Madden Julian Oscillation Forecast**
- **Summary**

Overview

- **The latest observations indicate that the MJO is incoherent.**
- **During both weeks 1 and 2, there is an increased chance for above-normal rainfall over the western Pacific Ocean, mainly south of the equator and below-normal rainfall for sections of the Maritime Continent and Australia. Favorable conditions for tropical cyclogenesis exist for the region southeast of Papua New Guinea to the Date Line.**
- **Additional impacts for week 1 only include an increased chance of above-normal rainfall for east-central Africa and northern Madagascar as well as a tropical cyclone risk for the central Indian Ocean.**

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

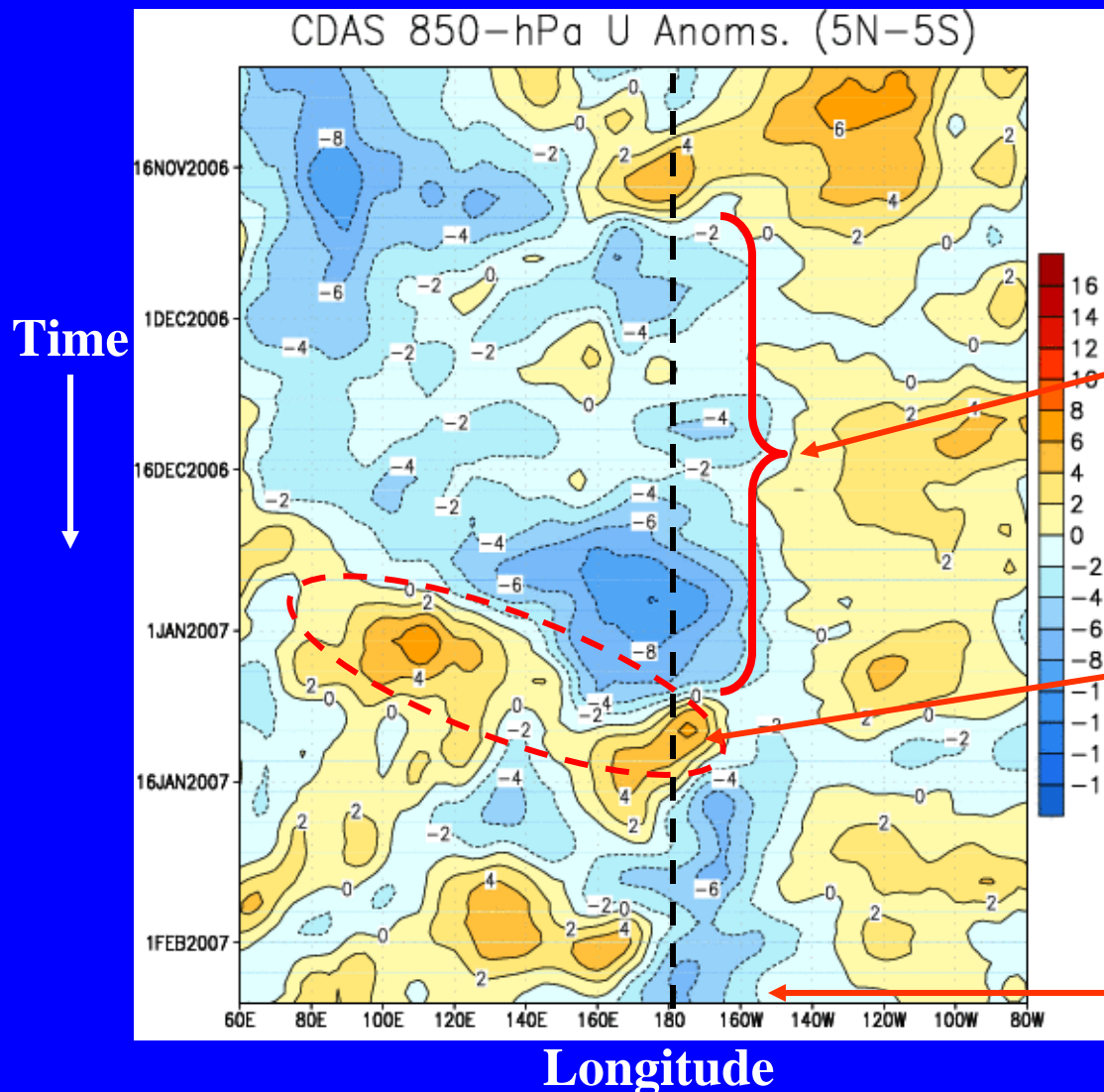
Note that shading denotes the magnitude of the anomalous wind vectors



Anomalous westerlies have dissipated near the equator and shifted into the Southern Hemisphere subtropics.

Easterly anomalies have shifted slightly westward.

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



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

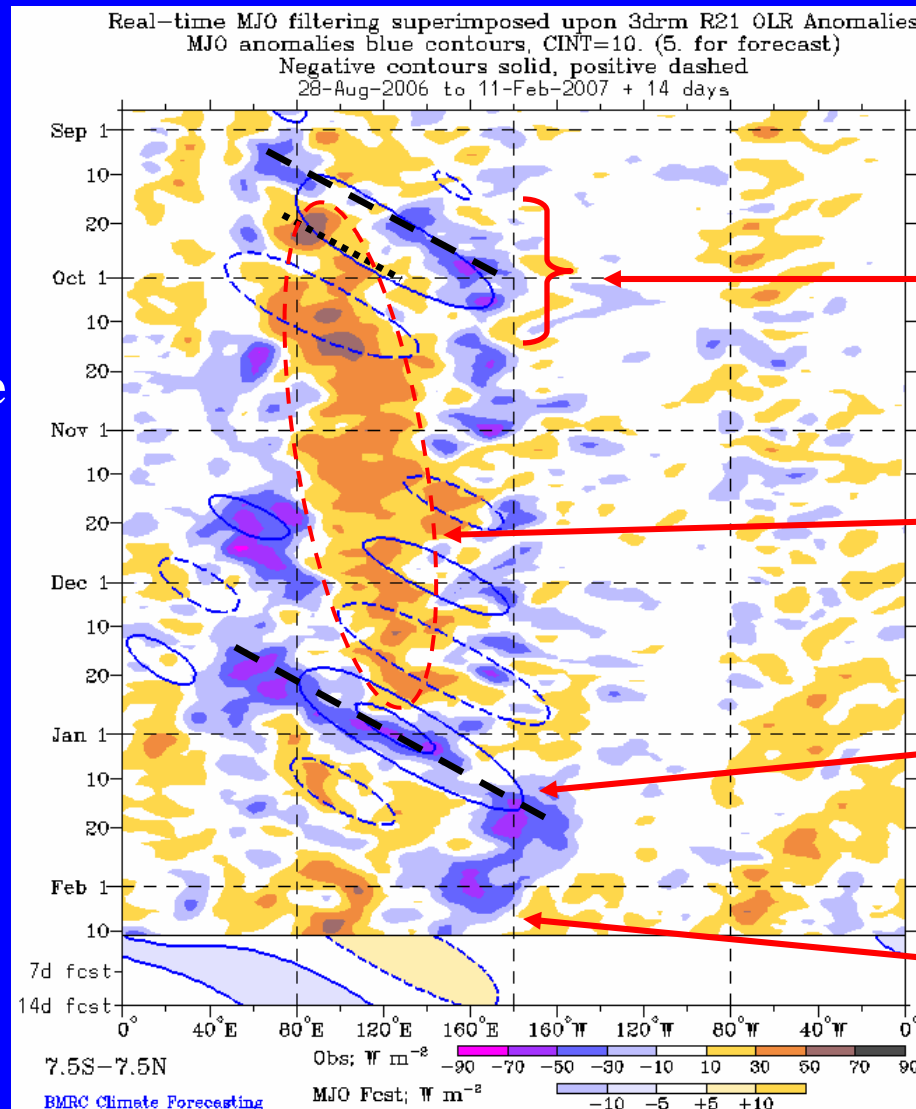
Easterly anomalies (blue shading) represent anomalous east-to-west flow.

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.

Easterly anomalies are persisting near the Date Line and extending westward.

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)

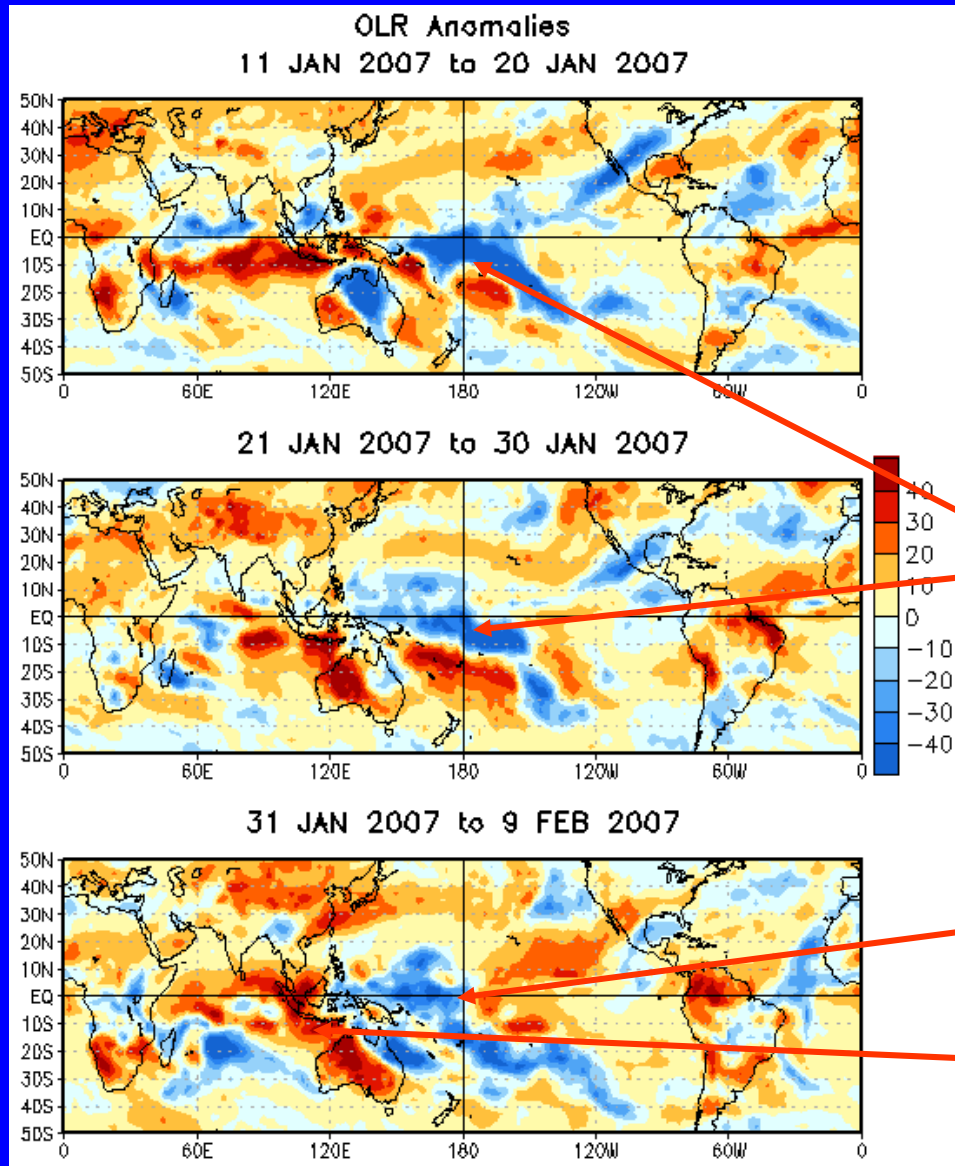
Negative OLR anomalies associated with the MJO propagated eastward beginning in early September.

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 suppressed convection in the Indian Ocean and slightly 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)

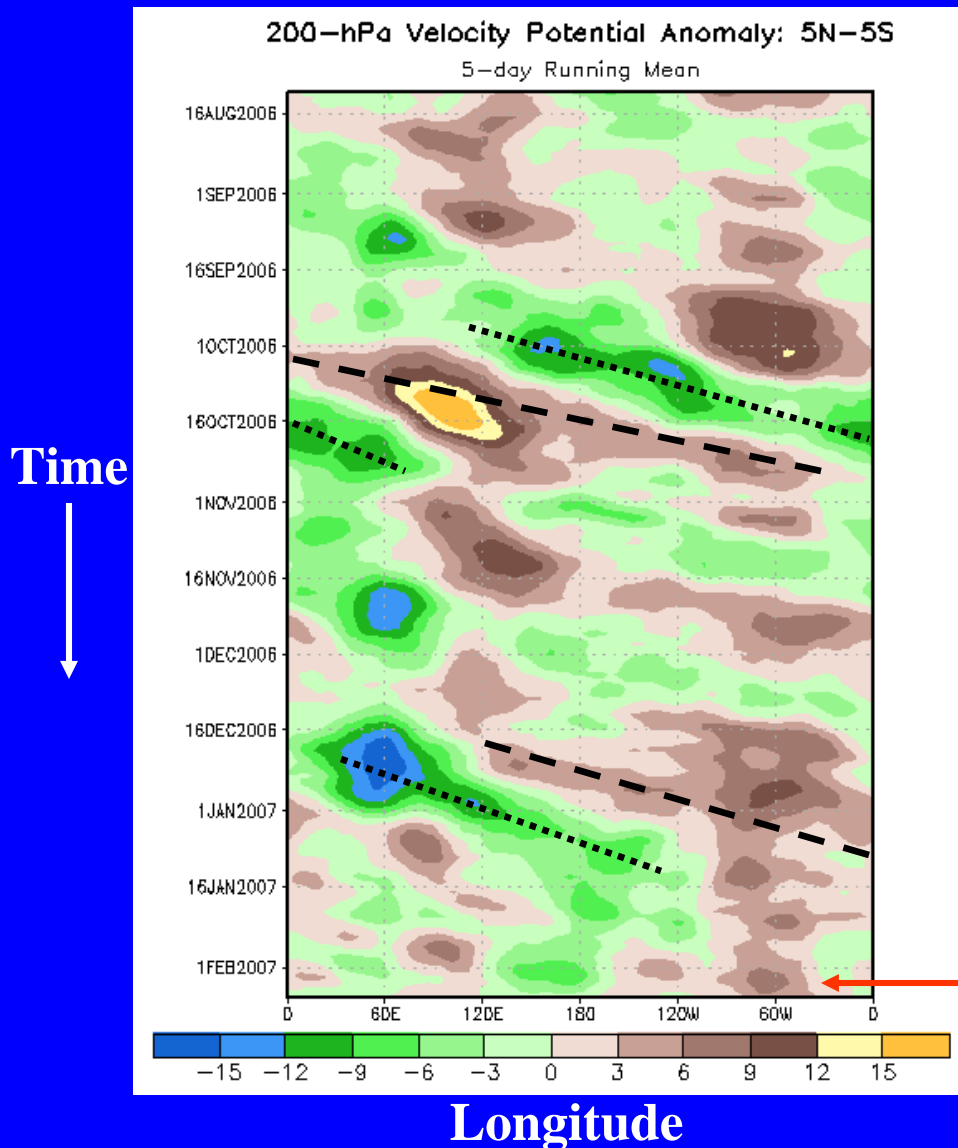
During the later half of January, an area of enhanced convection persisted near the Date Line. The region in the eastern Indian Ocean and western Maritime Continent have had suppressed convection mainly south of the equator.

Recently, the area of enhanced convection near the Date Line has shifted south of the equator and also into the western Pacific Ocean. The region of suppressed convection has persisted and expanded north of the equator.

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.

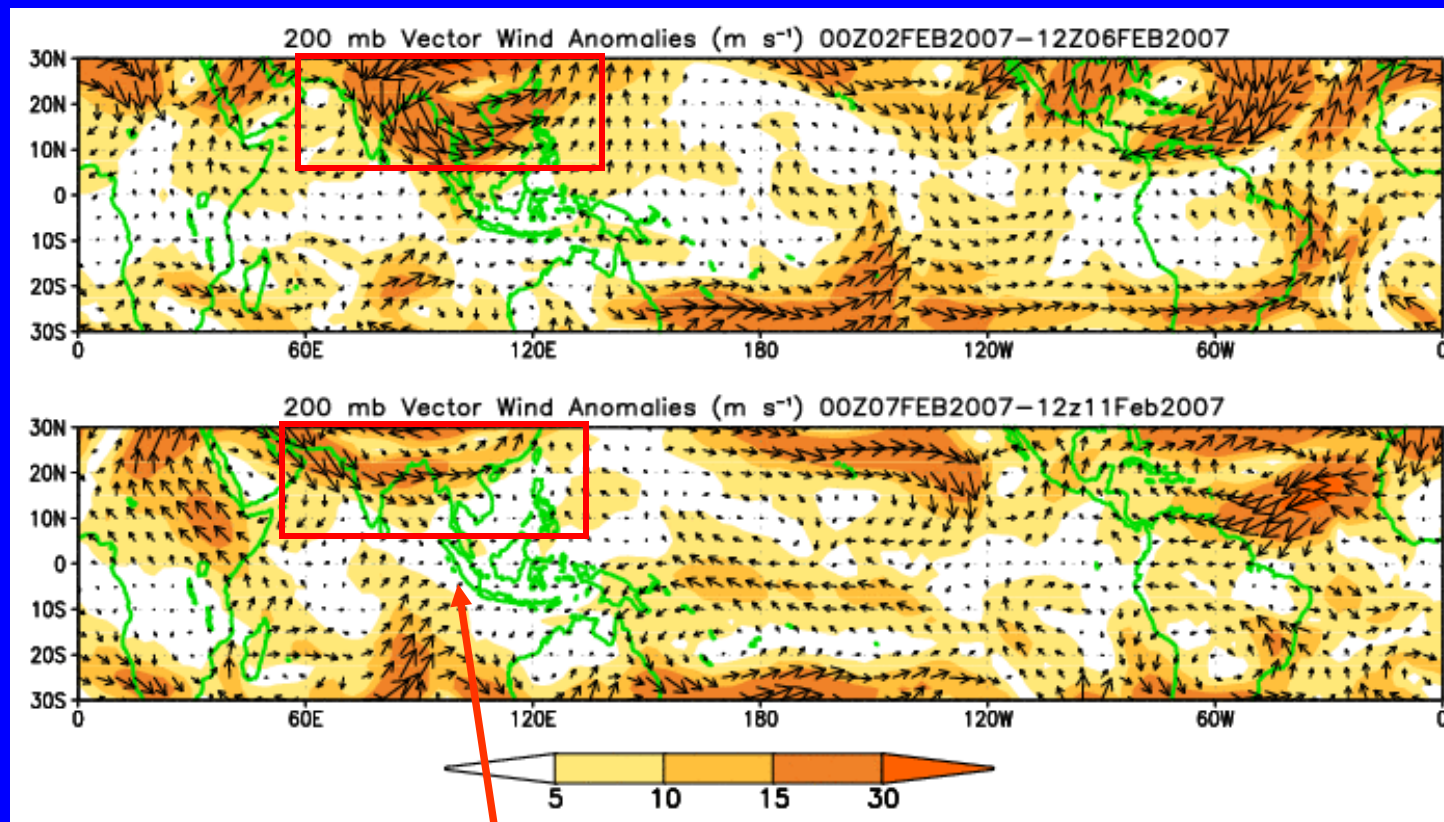
Moderate to strong MJO activity was observed from late-September to mid-October.

The MJO 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 weak and more stationary.

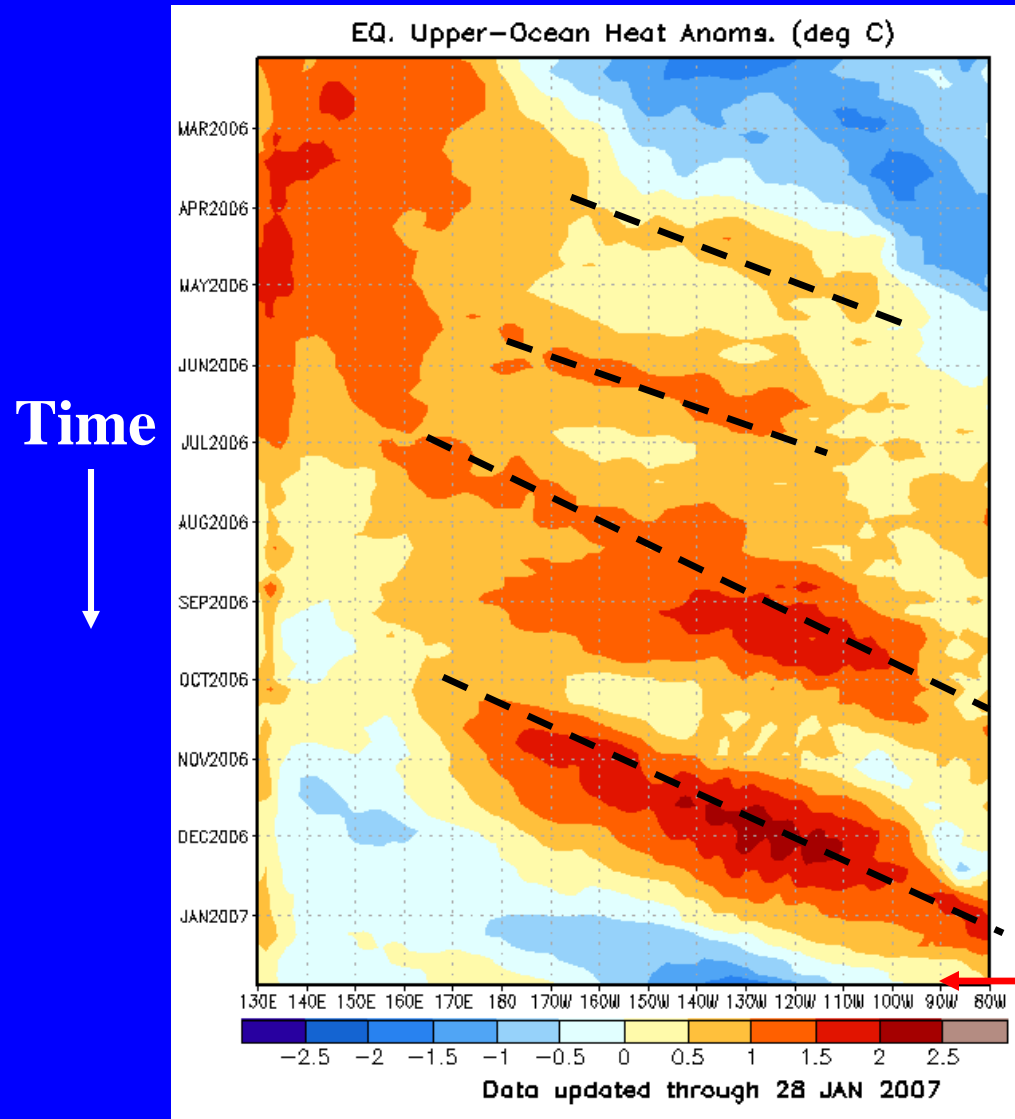
200-hPa Vector Winds and Anomalies (m s^{-1})

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



**Anomalous upper-level cyclone
has diminished over Southeast
Asia.**

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.

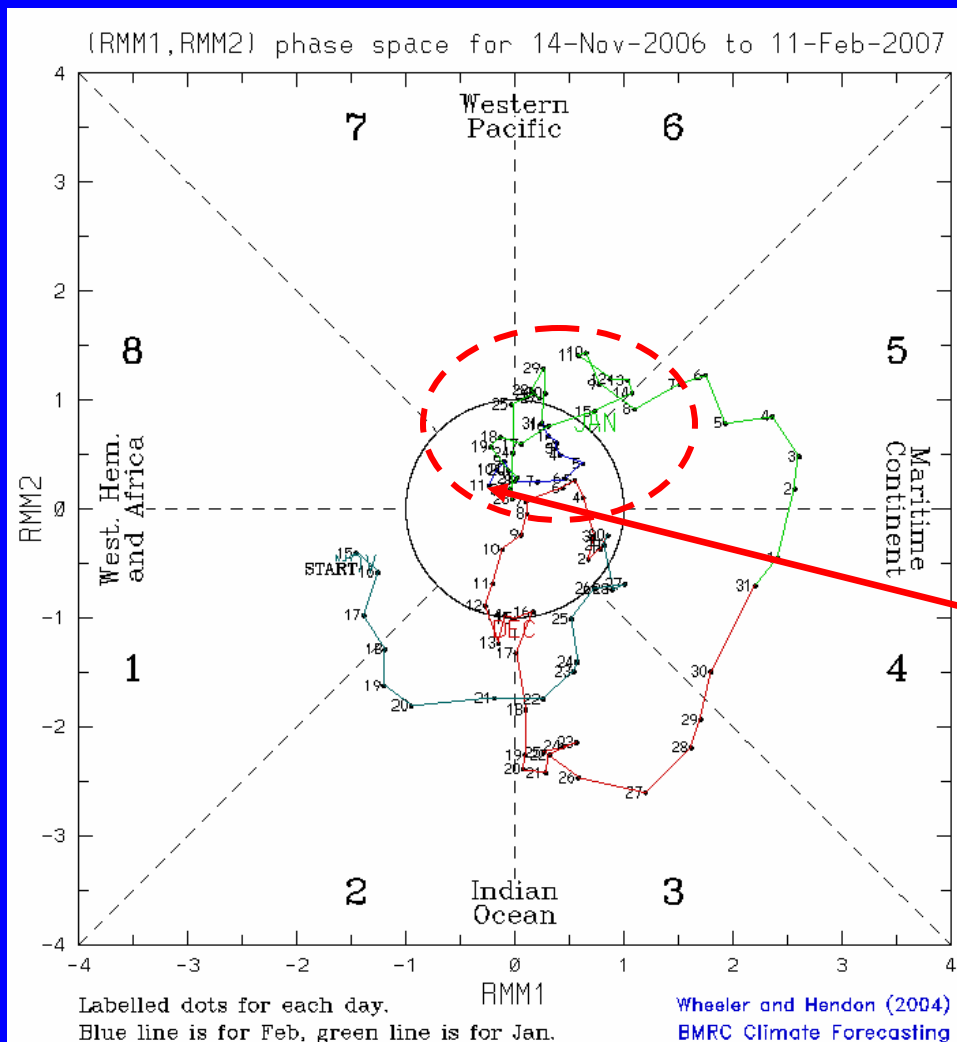
Recently, negative heat content anomalies have been propagating eastward to the eastern equatorial Pacific.

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).

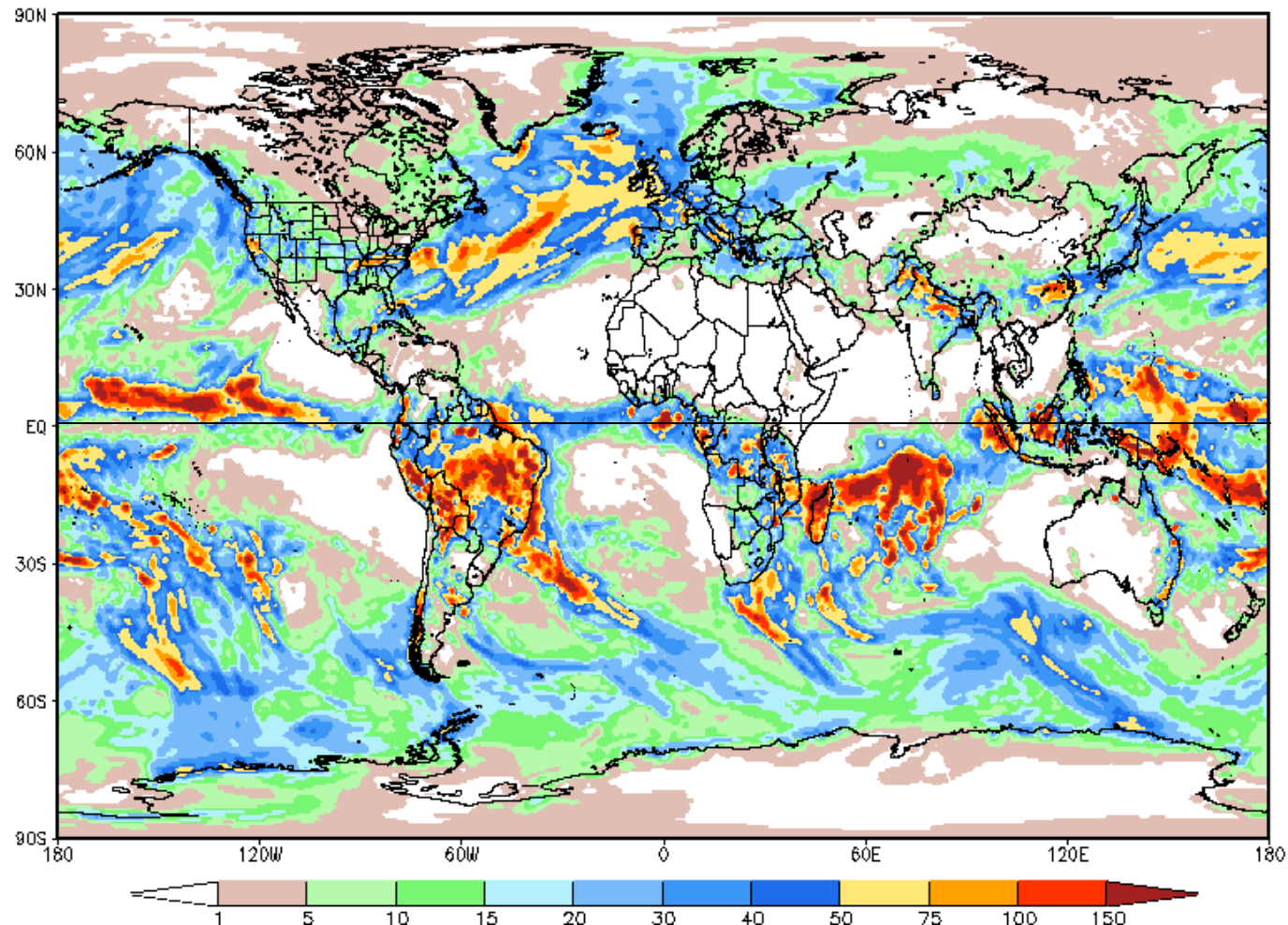
The axes represent the time series of the two leading modes of variability and are used to measure the amplitude while the triangular areas indicate the phase or location of the enhanced phase of the MJO. The farther away from the center of the circle the stronger the MJO. Different color lines indicate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

The MJO weakened and has been incoherent since early January.



Global Forecast System (GFS) Week 1 Precipitation Forecast

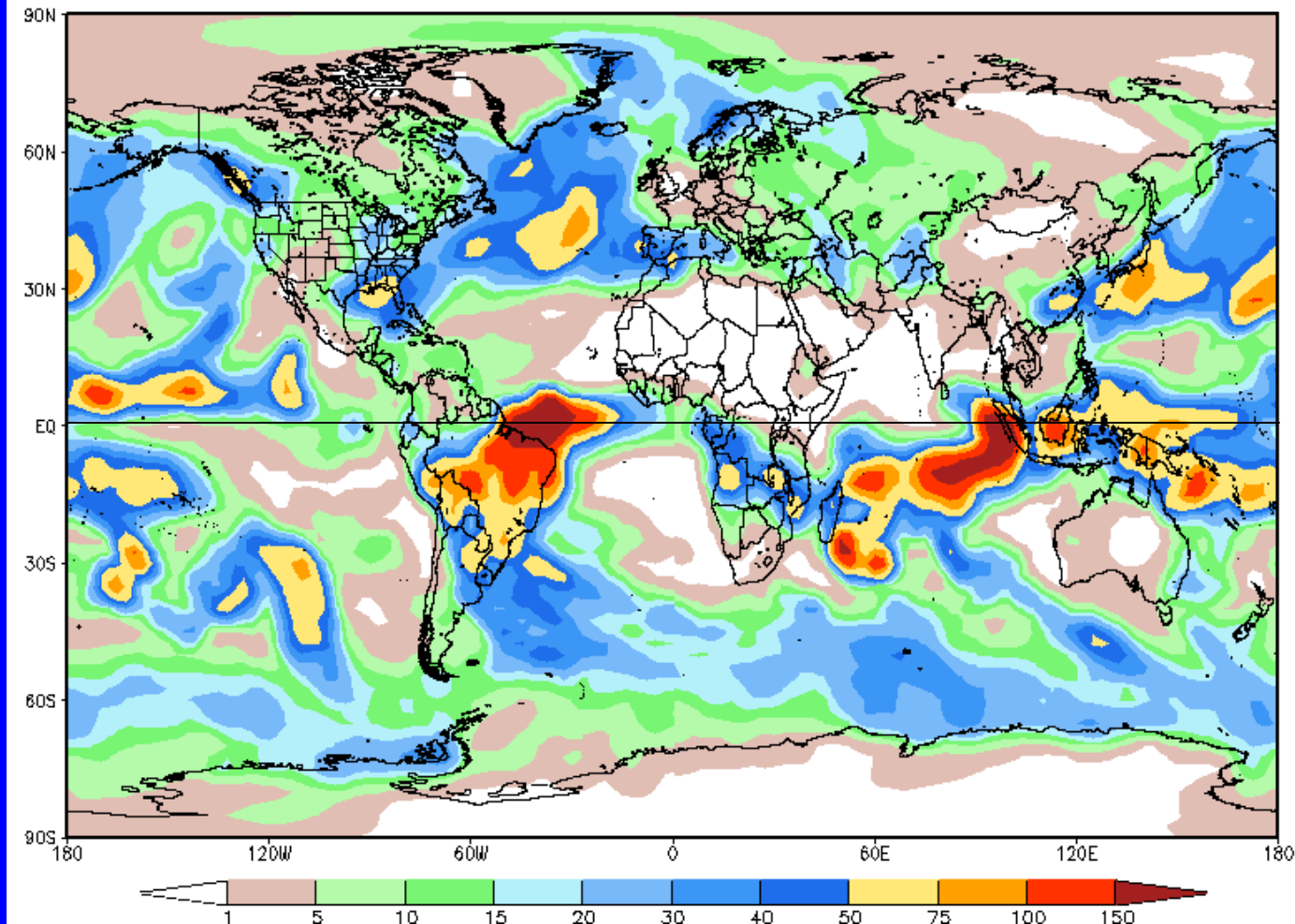
NOAA GFS 37.5 km Week 1 Total Precipitation (mm)
Issued at Feb 10 2007 00Z for the period ending at Feb 17 2007 00Z



Global Forecast System (GFS) Week 2

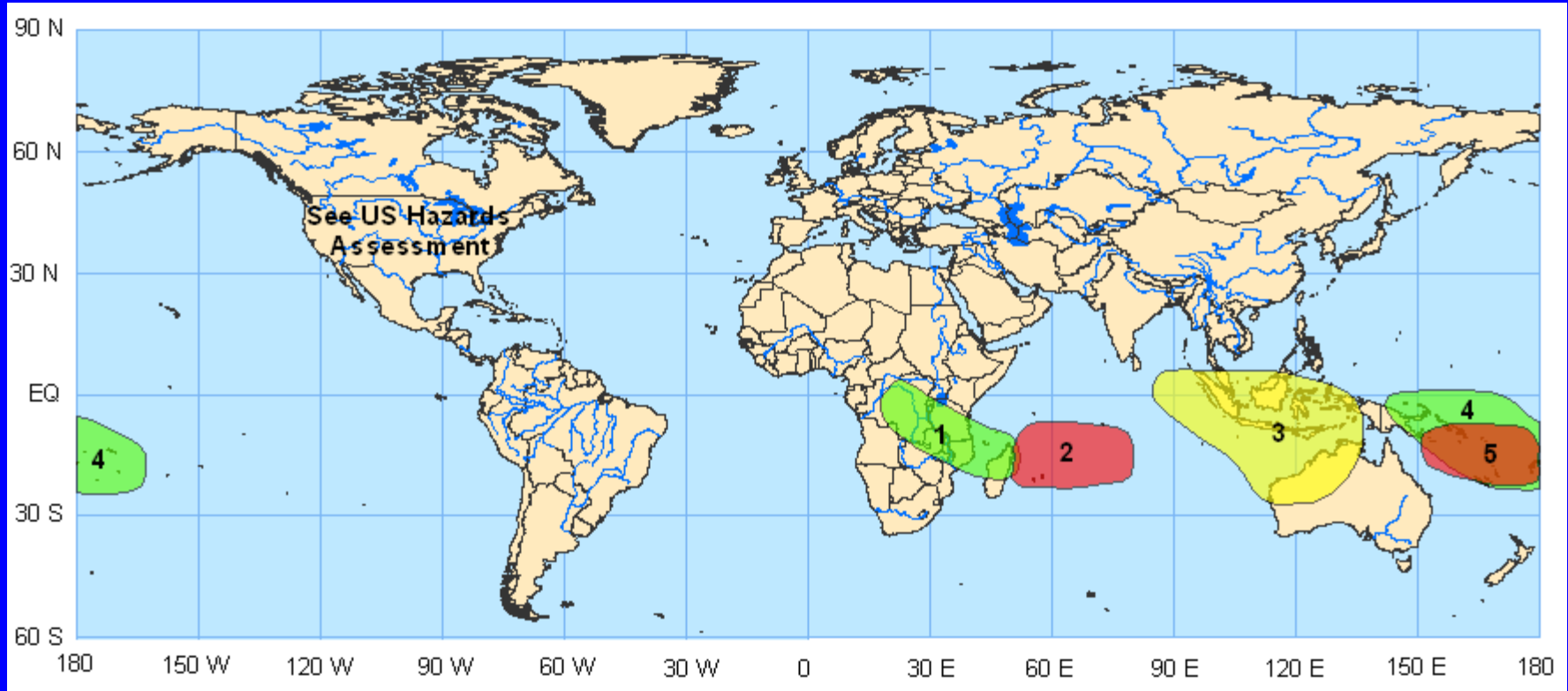
Precipitation Forecast

NOAA GFS 100 km Week 2 Total Precipitation (mm)
Issued Feb 10 2007 00Z for the period ending at Feb 23 2007 00Z



Potential Benefits/Hazards – Week 1

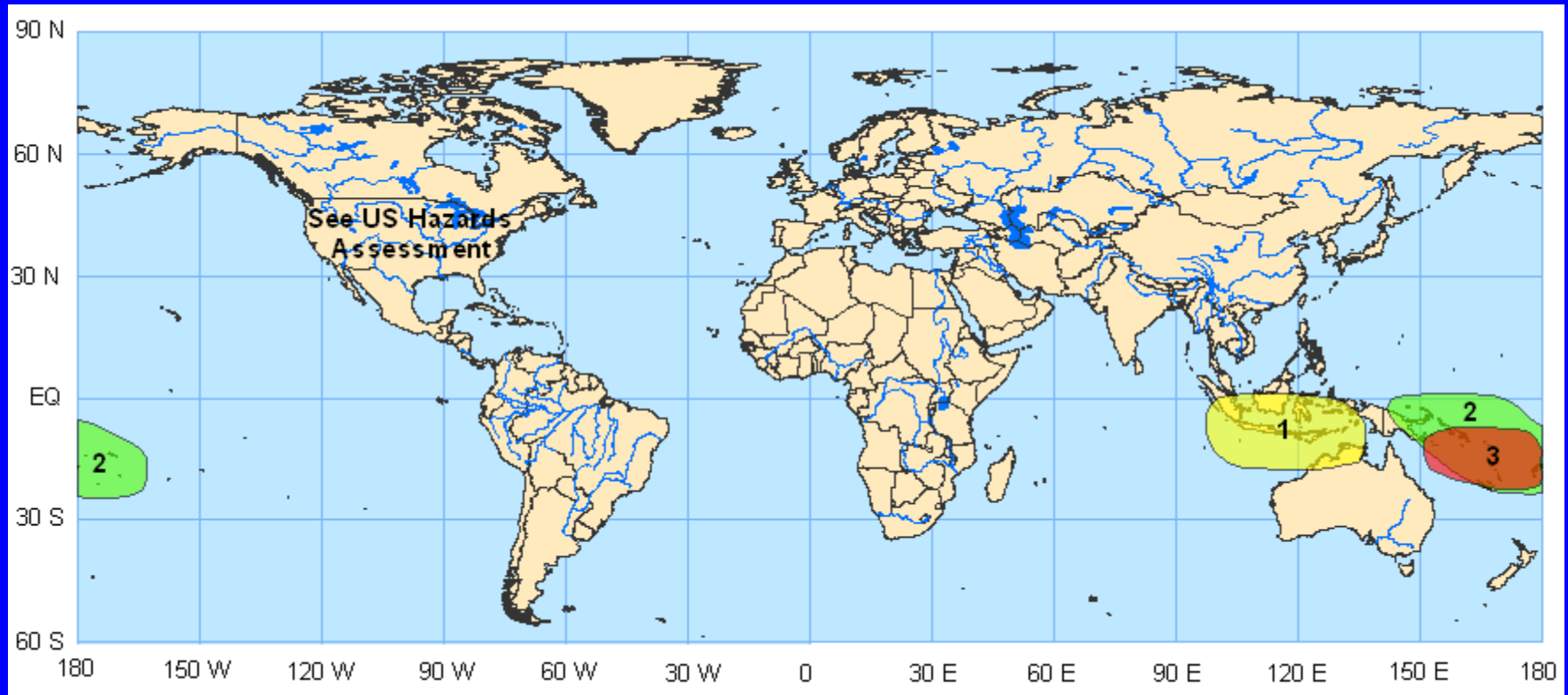
Valid 13 February-19 February 2007



1. An increased chance for above normal rainfall for east-central Africa and northern Madagascar.
2. Conditions favorable for tropical cyclogenesis to the east of Madagascar in the central Indian Ocean.
3. An increased chance for below normal rainfall for most of the Maritime Continent and northwestern Australia.
4. An increased chance for above normal rainfall in the western Pacific Ocean, mainly south of the equator.
5. Conditions favorable for tropical cyclogenesis to the southeast of Papua New Guinea extending towards the Date Line.

Potential Benefits/Hazards – Week 2

Valid 20 February-26 February 2007



1. An increased chance for below normal rainfall for most of the Maritime Continent and northwestern Australia.
2. An increased chance for above normal rainfall in the western Pacific Ocean, mainly south of the equator.
3. Conditions favorable for tropical cyclogenesis to the southeast of Papua New Guinea extending towards the Date Line.

Summary

- **The latest observations indicate that the MJO is incoherent.**
- **During both weeks 1 and 2, there is an increased chance for above-normal rainfall over the western Pacific Ocean, mainly south of the equator and below-normal rainfall for sections of the Maritime Continent and Australia. Favorable conditions for tropical cyclogenesis exist for the region southeast of Papua New Guinea to the Date Line.**
- **Additional impacts for week 1 only include an increased chance of above-normal rainfall for east-central Africa and northern Madagascar as well as a tropical cyclone risk for the central Indian Ocean.**