



# Madden-Julian Oscillation: Recent Evolution, Current Status and Forecasts

Update prepared by  
Climate Prediction Center / NCEP  
March 13, 2006



# Outline

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



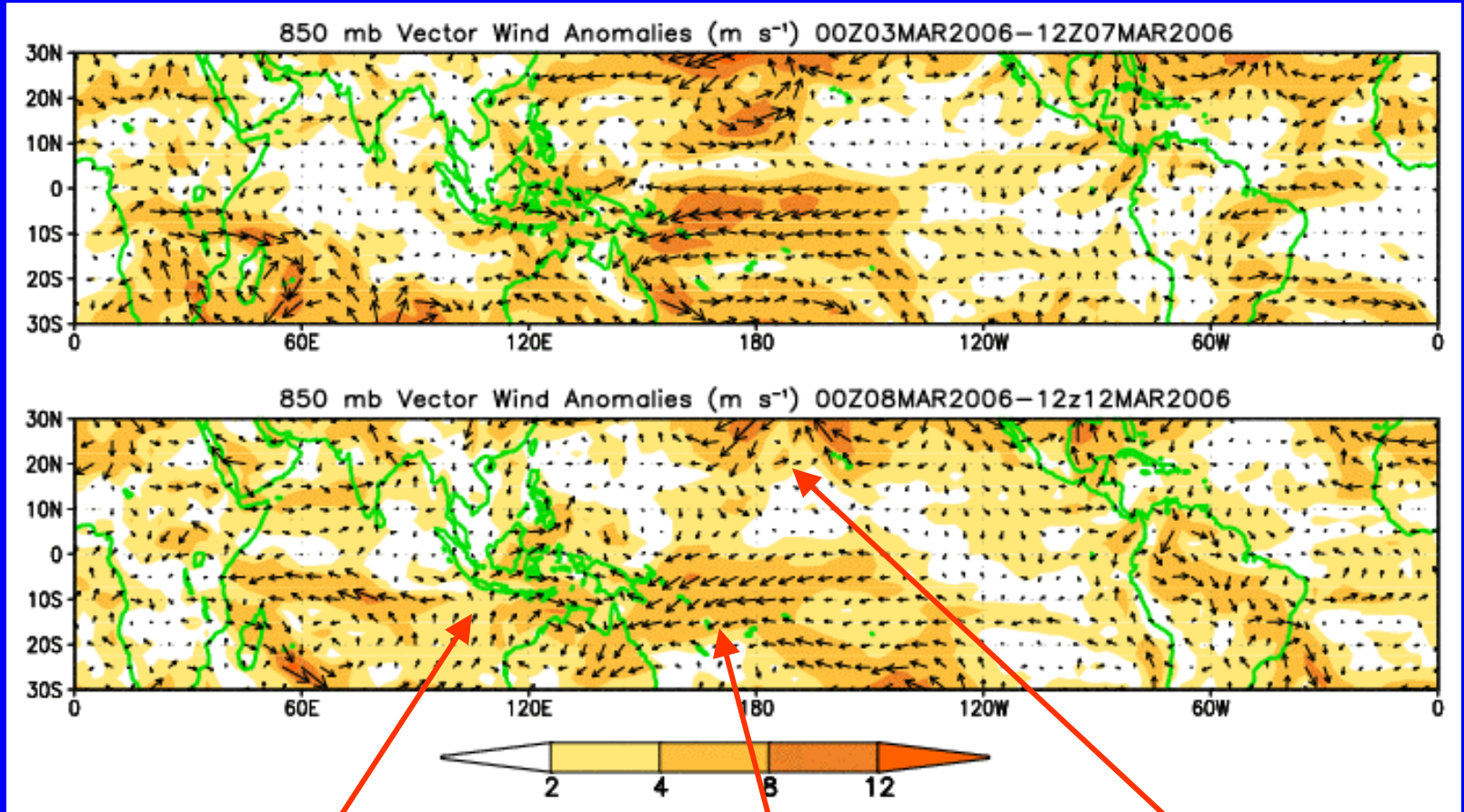
# Overview

- The latest observations indicate little if any MJO signal with the continuation of La Nina conditions.
- Based on the latest observational evidence, the MJO is expected to remain weak during the upcoming 1-2 week period.
- There exists several potential hazards/benefits across the global tropics during the upcoming period as conditions are expected to be dominated by La Nina. During week 1, there is an increased likelihood of enhanced precipitation in the eastern Indian Ocean, sections of the Maritime Continent, northern Australia, western Africa, sections of northern South America, and in the vicinity of Hawaii. During weeks 1 and 2, we anticipate diminished precipitation near the date line along the equator. During week 2, we expect enhanced precipitation over the Maritime Continent and south of India, and an increased risk of tropical cyclogenesis to the northwest of Australia.



# 850-hPa Vector Wind Anomalies ( $\text{m s}^{-1}$ )

Note that shading denotes the magnitude of the anomalous wind vectors



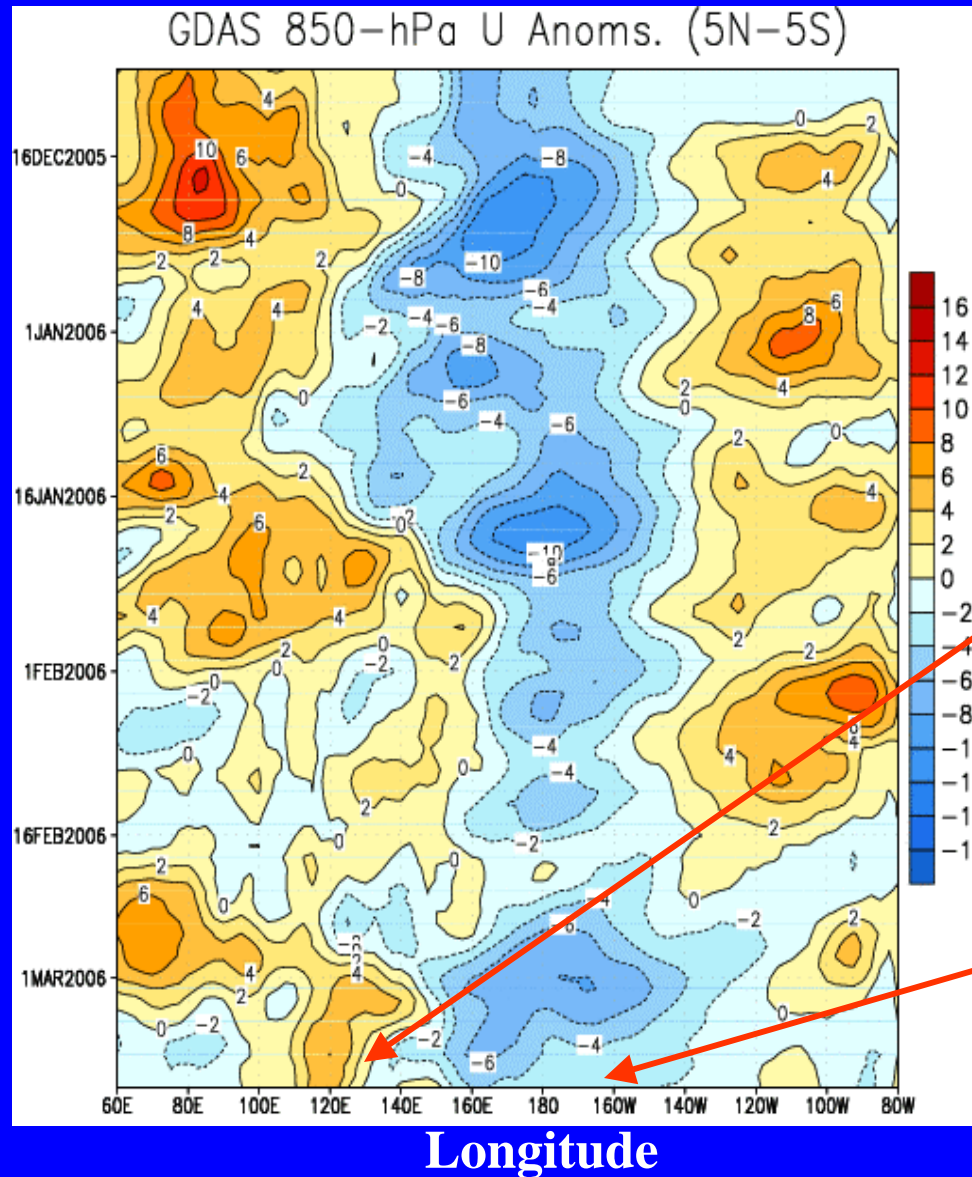
Westerlies are observed around Indonesia.

Easterlies weaken slightly in the Pacific

Cyclonic circulation weakens near Hawaii.



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



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

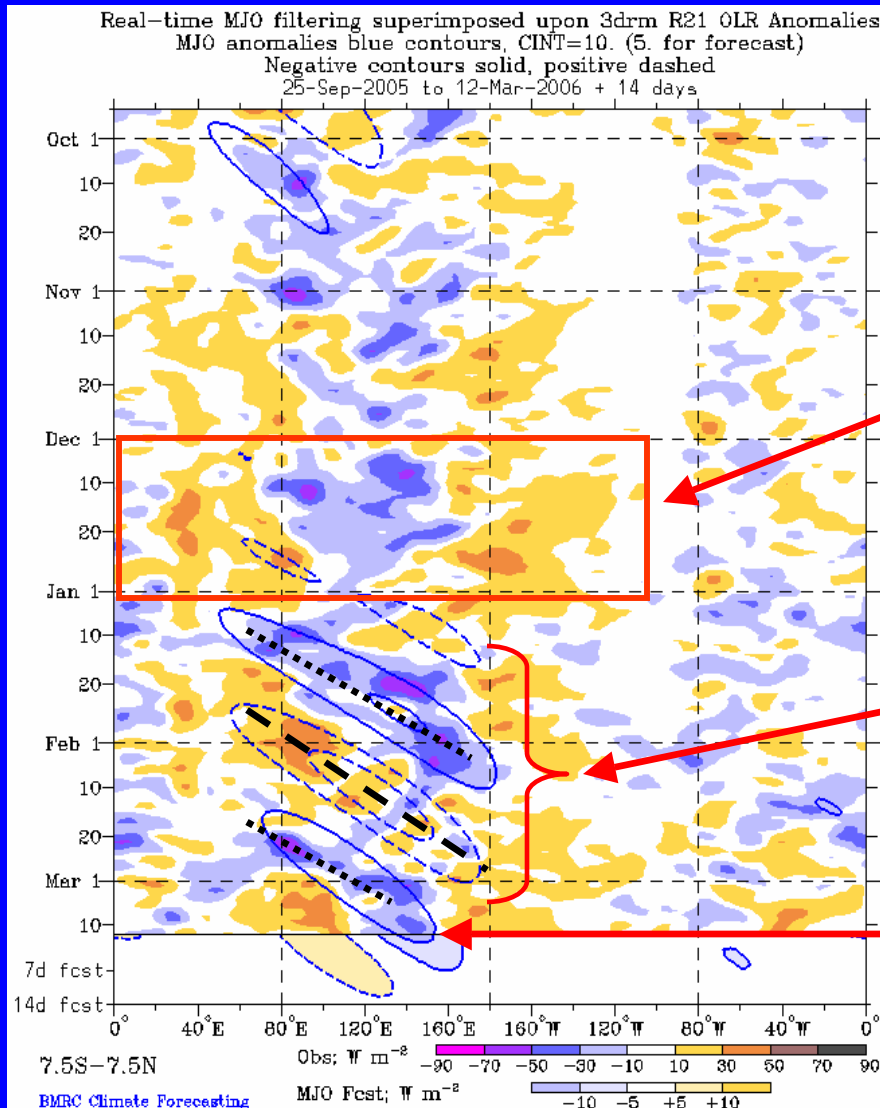
Stronger-than-average easterlies (blue shading).

Equatorial low-level westerly anomalies remain over the Maritime Continent

During the past week, the area of easterly anomalies have spread over the Pacific basin and have weakened slightly



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



Drier-than-average conditions (/red shading)  
Wetter-than-average conditions (blue shading)

Enhanced convection was quasi-stationary across sections of the eastern Indian Ocean, Indonesia and the western Pacific Ocean during December

Eastward propagation was evident from mid-January through late February.

During the past week, regions of enhanced and diminished convection have become more stationary

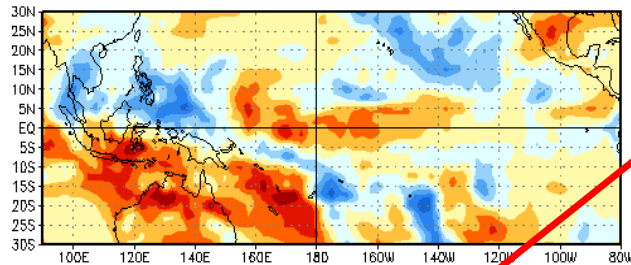




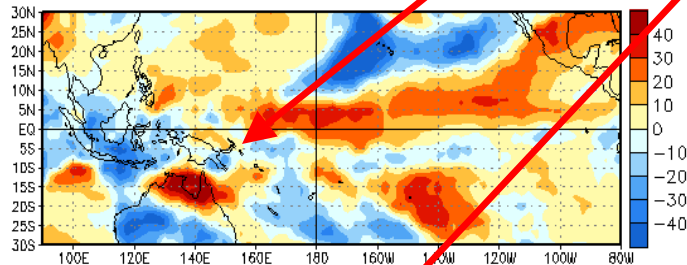
# Anomalous OLR and 850-hPa Wind

## Wind: Last 30 days

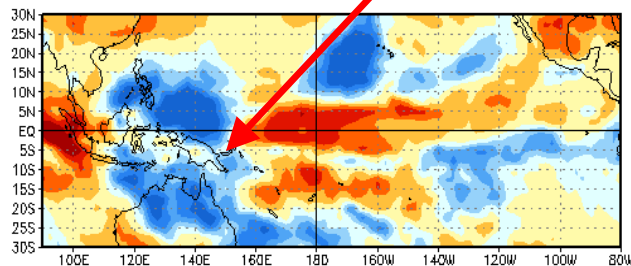
OLR Anomalies  
10 FEB 2006 to 19 FEB 2006



20 FEB 2006 to 1 MAR 2006



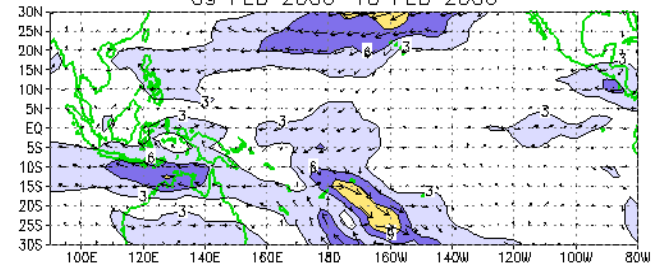
2 MAR 2006 to 11 MAR 2006



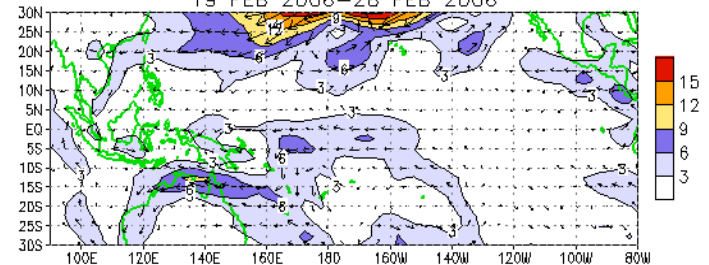
During the second 10 days, enhanced convection in the vicinity of the SPCZ continued to be weak, but during the most recent 10 days, enhanced convection has gradually returned to Indonesia, parts of Australia, and the western South Pacific.

During the past 10 days, easterlies anomalies have strengthened south of the equator near the dateline.

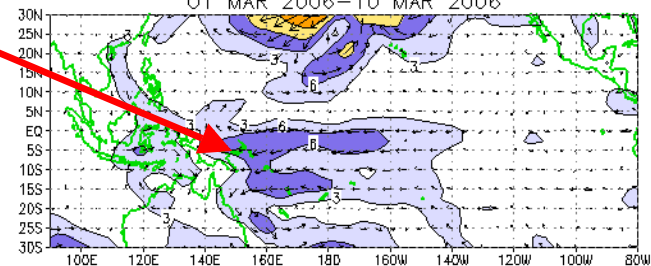
CDAS 850-hPa Wind Anoms  
09 FEB 2006-18 FEB 2006



19 FEB 2006-28 FEB 2006

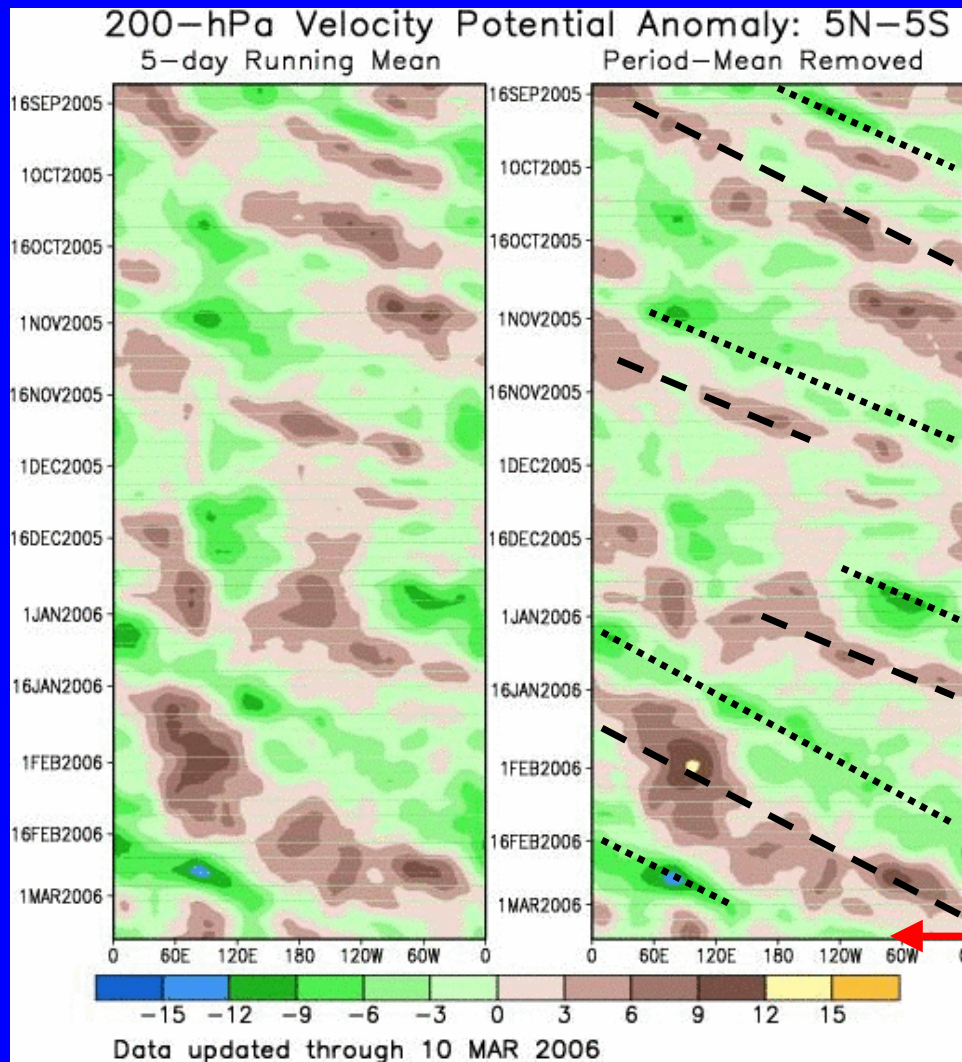


01 MAR 2006-10 MAR 2006





# 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 during the period from August into November

Eastward propagation was also evident from January until the end of February

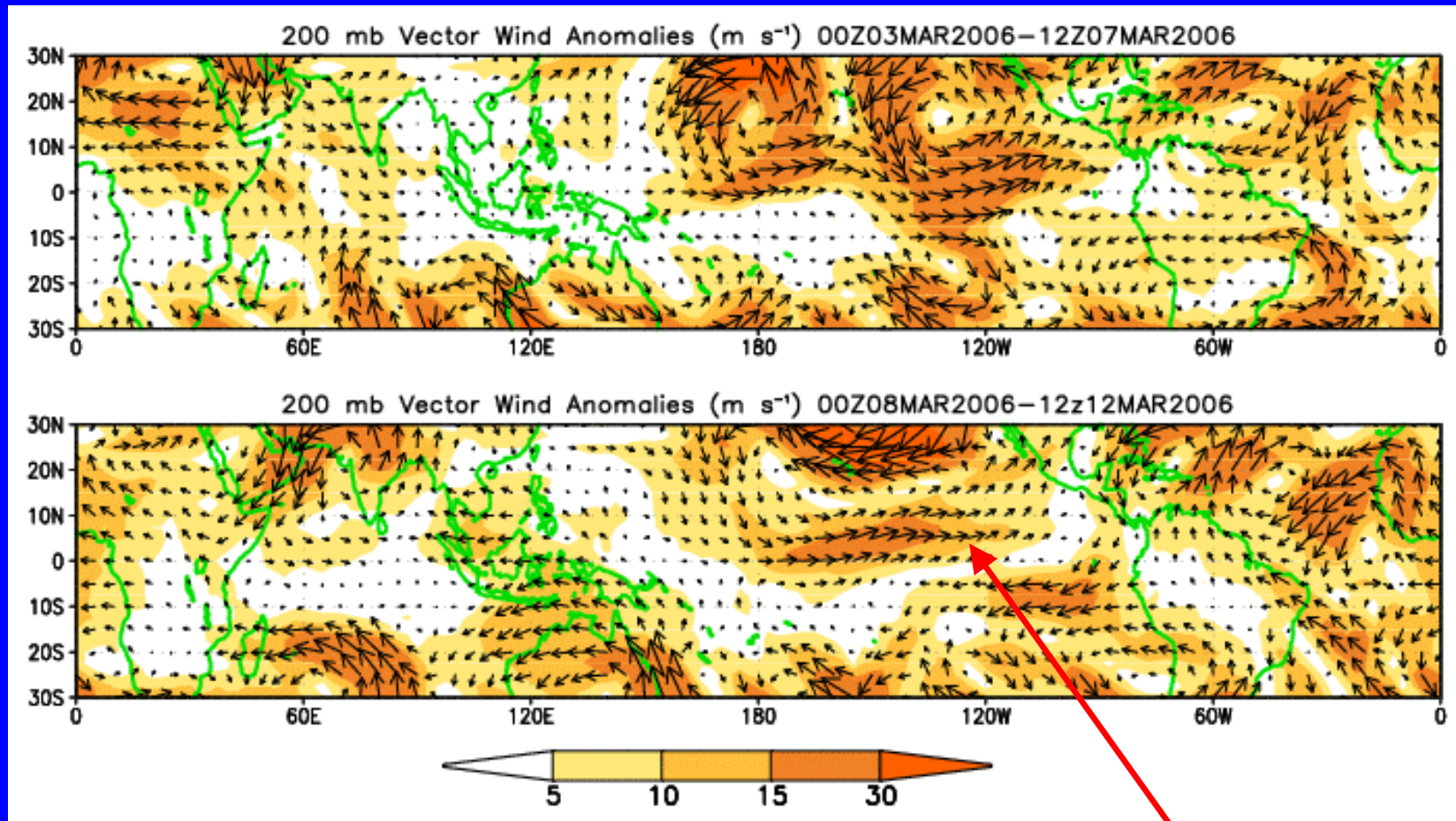
During the past week, regional anomalies of upper level divergence and convergence are weak





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

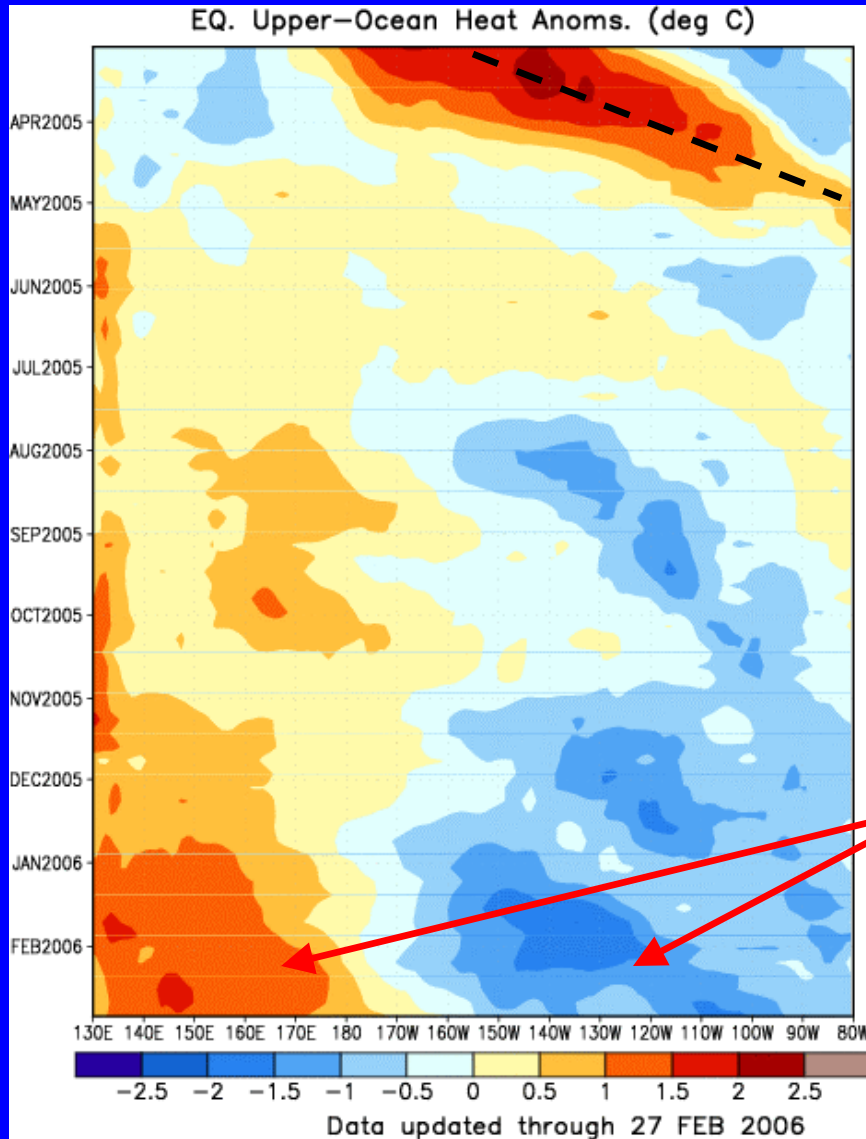
Note that shading denotes the magnitude of the anomalous wind vectors.



Broad cyclonic circulation north of the equator



# 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

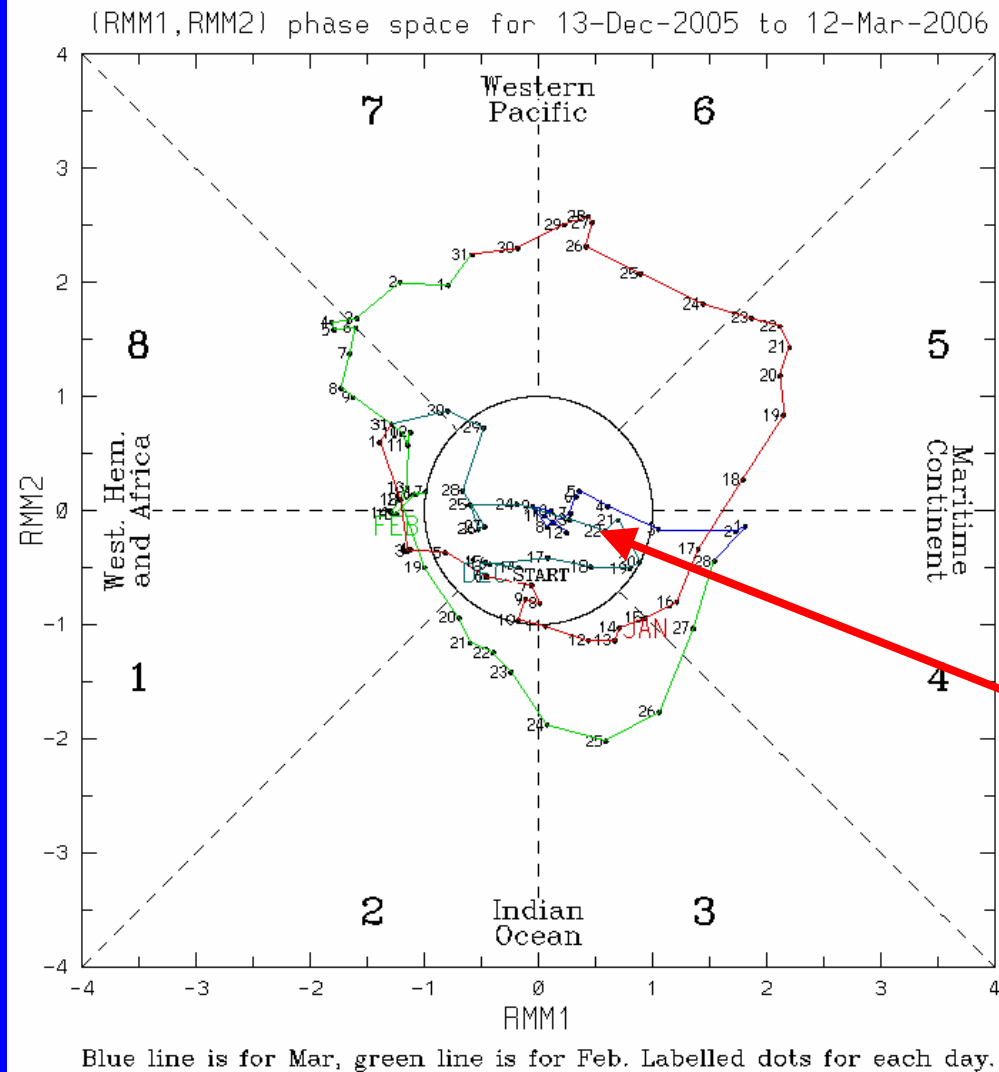
Heat content has been above average in the western Pacific since June while cooler water has been observed across the central and eastern Pacific.



# 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.



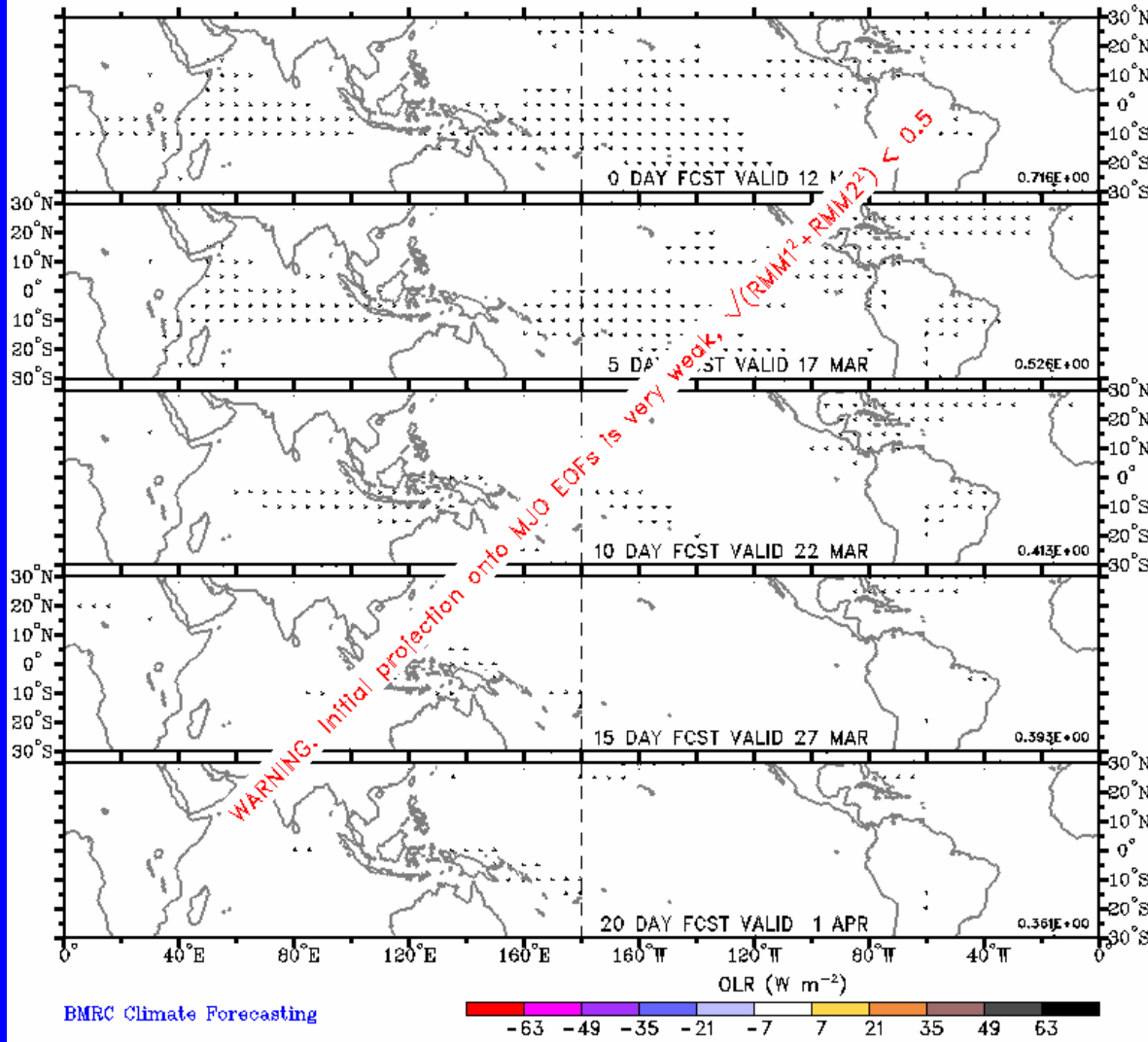
The MJO signal dissipated over the last week.



# Statistical OLR MJO Forecast

Prediction of MJO-associated anomalies using lagged linear regression  
Predictors are RMM1 and RMM2 on 12 Mar 2006

Shading for OLR anomalies (scale below). Vectors for 850-hPa wind



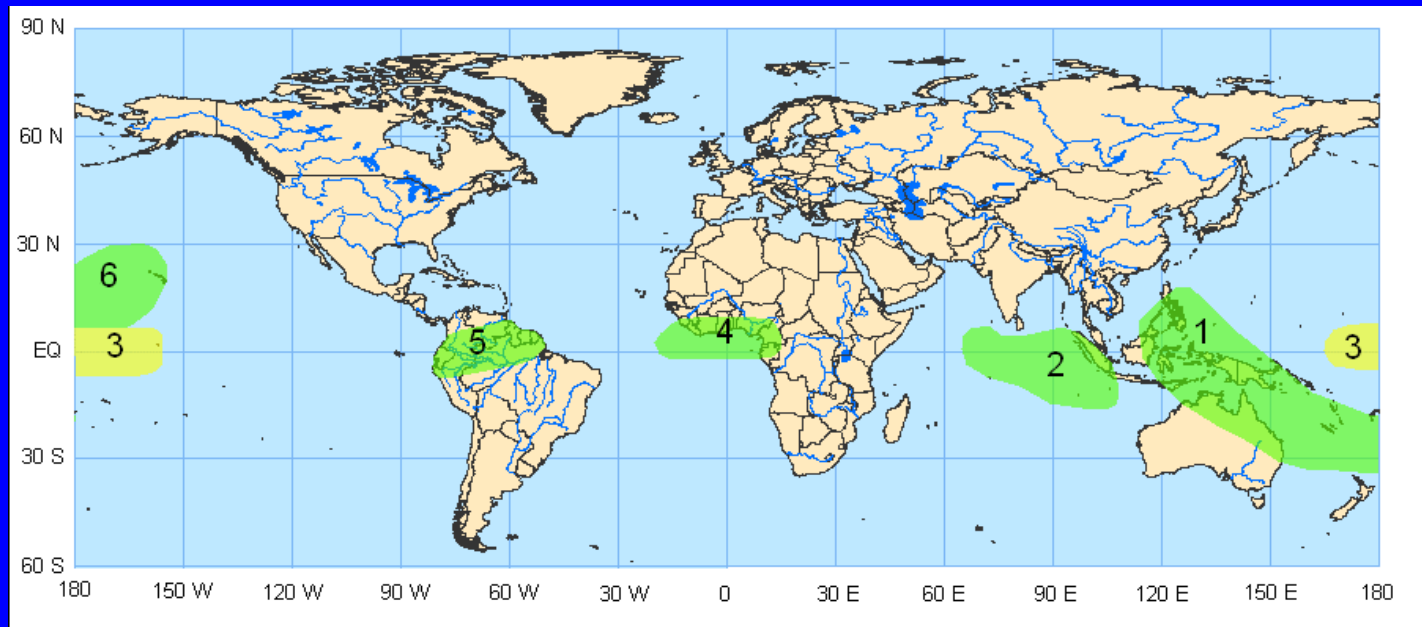
A statistical MJO forecast indicates no signal





# Potential Benefits/Hazards – Week 1

## Valid March 13, 2006-March 20, 2006

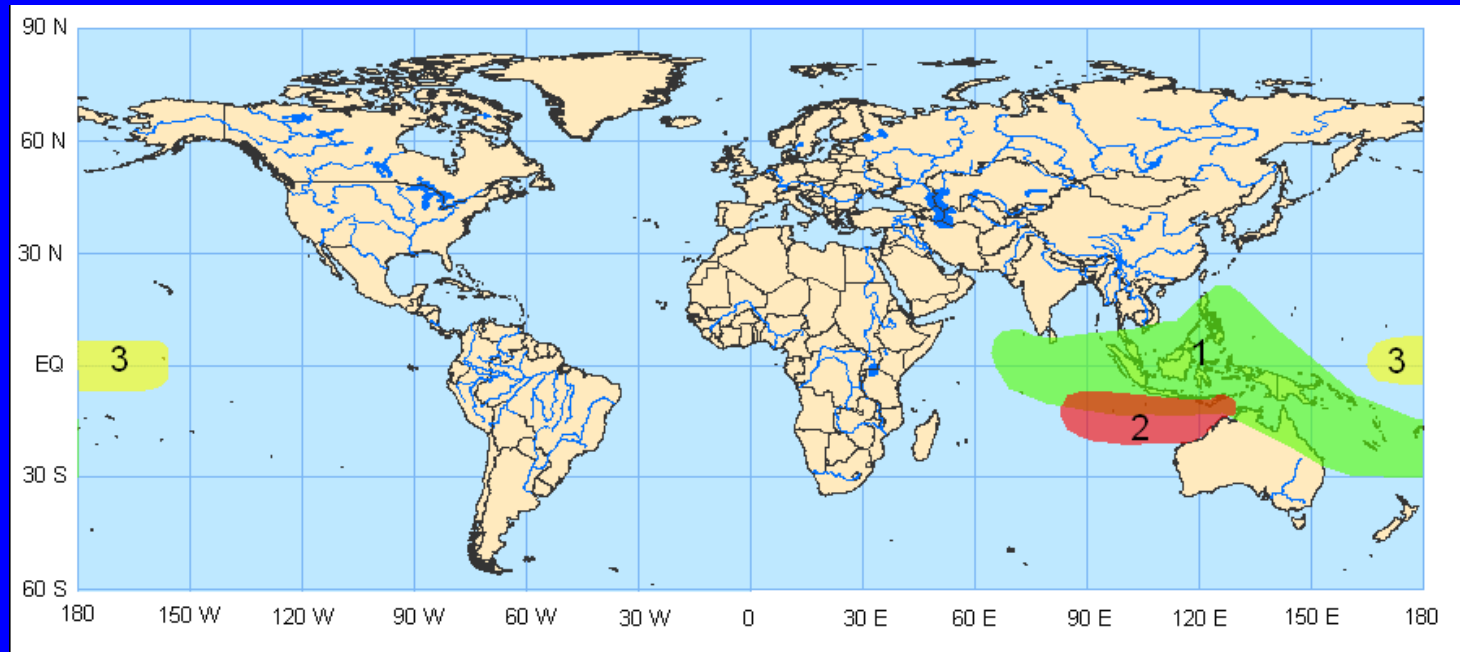


1. An increased chance for above normal rainfall across Indonesia into sections of the western Pacific Ocean due to convection typical during La Nina.
2. An increased chance for above normal rainfall in the Indian Ocean due to convection typical during La Nina and above normal SSTs in the Indian Ocean.
3. An increased chance for below average rainfall due to the cool sea surface temperatures associated with La Nina.
4. An increased chance for above normal rainfall.
5. An increased chance for above normal rainfall due to convection typical during La Nina.
6. An increased chance for above normal rainfall due to frequent low pressure systems common during La Nina.



# Potential Benefits/Hazards – Week 2

## Valid March 21-March 27, 2006



1. An increased chance for above normal rainfall across Indonesia into sections of the western Pacific Ocean due to convection typical during La Nina.
2. Increased chances for tropical cyclogenesis northwest of Australia due to the return of favorable atmospheric conditions (enhanced convection, large scale upper-level divergence, and westerly low-level wind anomalies).
3. An increased chance for below average rainfall due to the cool sea surface temperatures associated with La Nina.



# Summary

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- There exists several potential hazards/benefits across the global tropics during the upcoming period as conditions are expected to be dominated by La Nina. During week 1, there is an increased likelihood of enhanced precipitation in the eastern Indian Ocean, sections of the Maritime Continent, northern Australia, western Africa, sections of northern South America, and in the vicinity of Hawaii. During weeks 1 and 2, we anticipate diminished precipitation near the date line along the equator. During week 2, we expect enhanced precipitation over the Maritime Continent and south of India, and an increased risk of tropical cyclogenesis to the northwest of Australia.