



Madden-Julian Oscillation: Recent Evolution, Current Status and Predictions

**Update prepared by
Climate Prediction Center / NCEP
January 28, 2008**



Outline

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



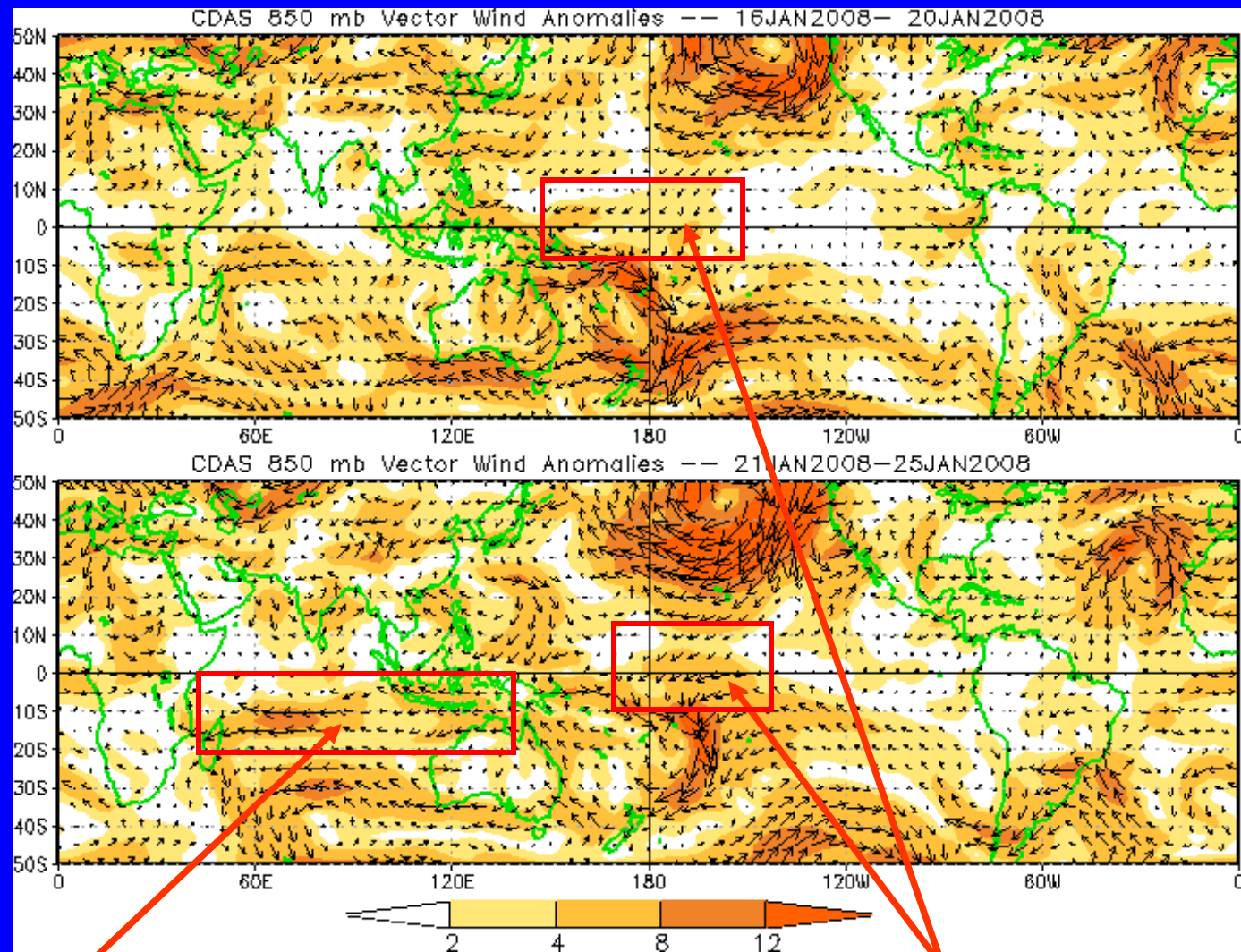
Overview

- **A moderate MJO continues with the enhanced phase now centered across Africa and the western Indian Ocean.**
- **Based on the latest observations and forecast data, the enhanced phase of the MJO is expected to continue shifting eastward towards Indonesia over the next 1-2 weeks.**
- **Impacts linked to the MJO across the tropics include enhanced rainfall for the Indian Ocean and later Indonesia with an elevated risk for tropical cyclogenesis across the Indian Ocean.**
- **For the US during the next 1-2 weeks, the expected pattern of tropical convection favors ridging in the central Pacific, subsequent troughs across the western US and an active storm track from the south-central US to the Great Lakes. Also, the MJO phase along with the ongoing La Nina favors warmer than average conditions across much of the eastern US.**



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

Note that shading denotes the magnitude of the anomalous wind vectors



Easterly anomalies are now evident across the Indian Ocean south of the equator and parts of Indonesia.

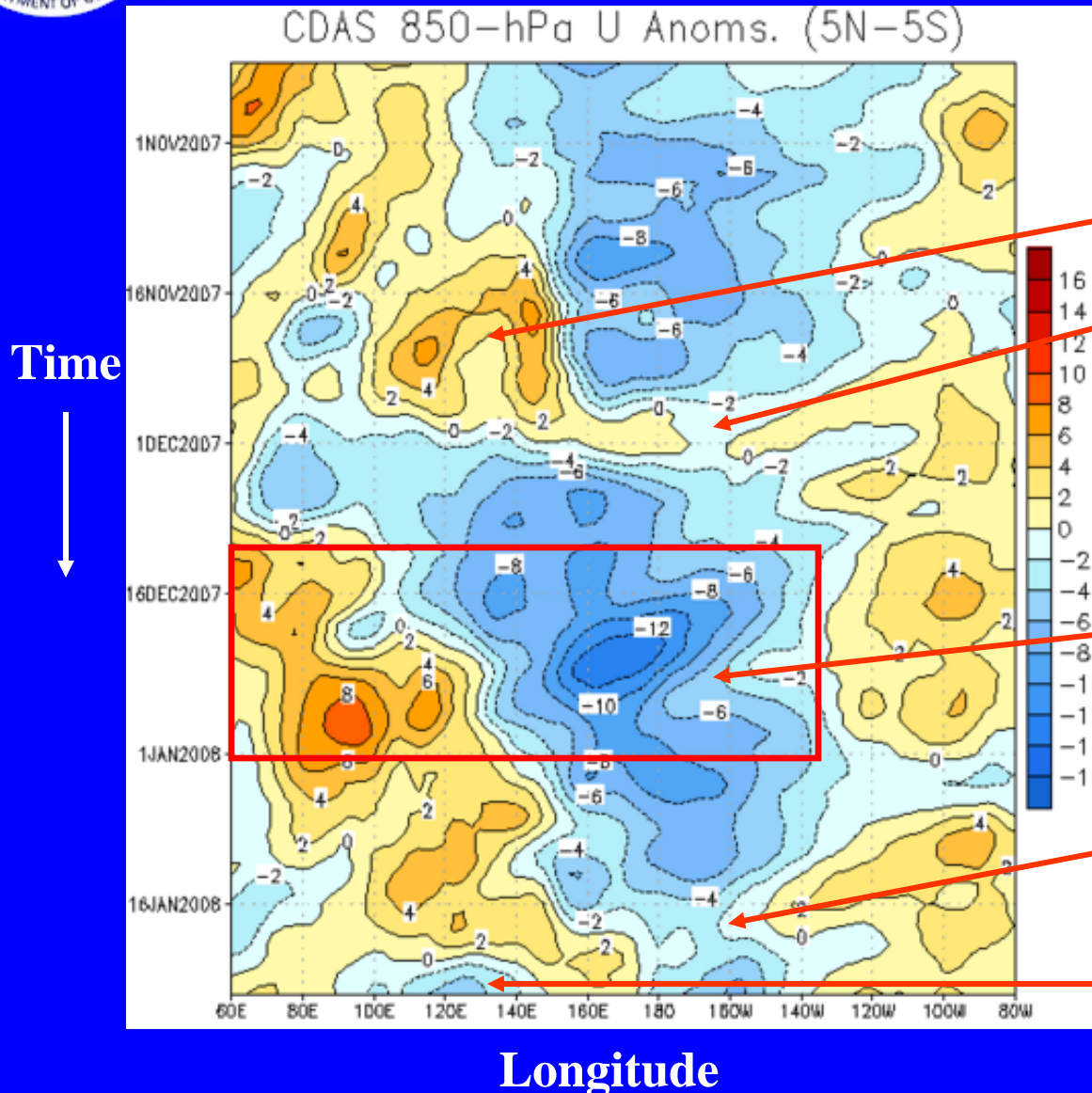
Easterly anomalies have strengthened slightly during the last five days but are confined to near and east of the Date Line.



850-hPa Zonal 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.



Westerly anomalies shifted eastward, first slowly, from the Indian Ocean to the Maritime continent and later more quickly to the Date Line during the previous MJO event.

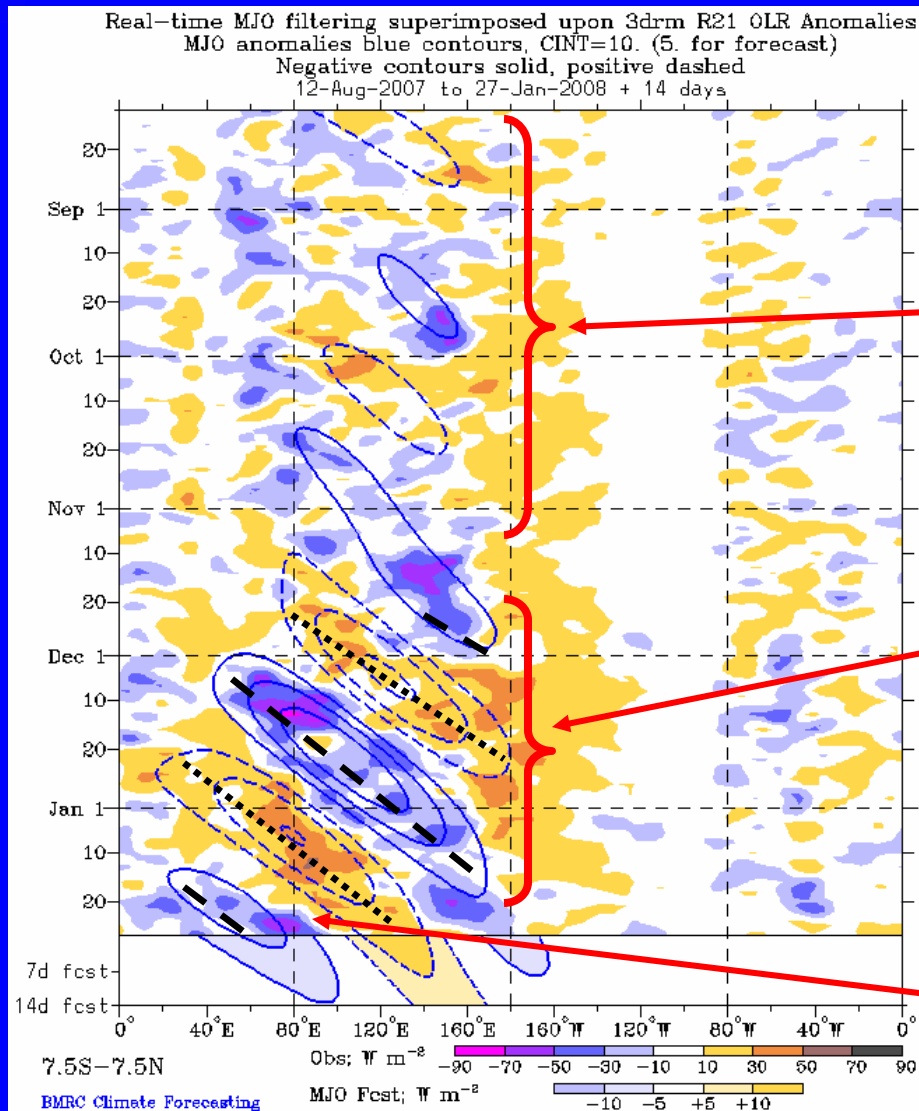
During mid December, westerly anomalies developed across the Indian Ocean and shifted eastward. At the same time, easterly anomalies strengthened in the western and central Pacific.

Easterly anomalies near the Date Line decreased in mid-January.

Easterly anomalies have developed across parts of Indonesia during the past week – a marked change from the last few weeks.



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



Drier-than-normal conditions, positive OLR anomalies (yellow/orange shading)

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

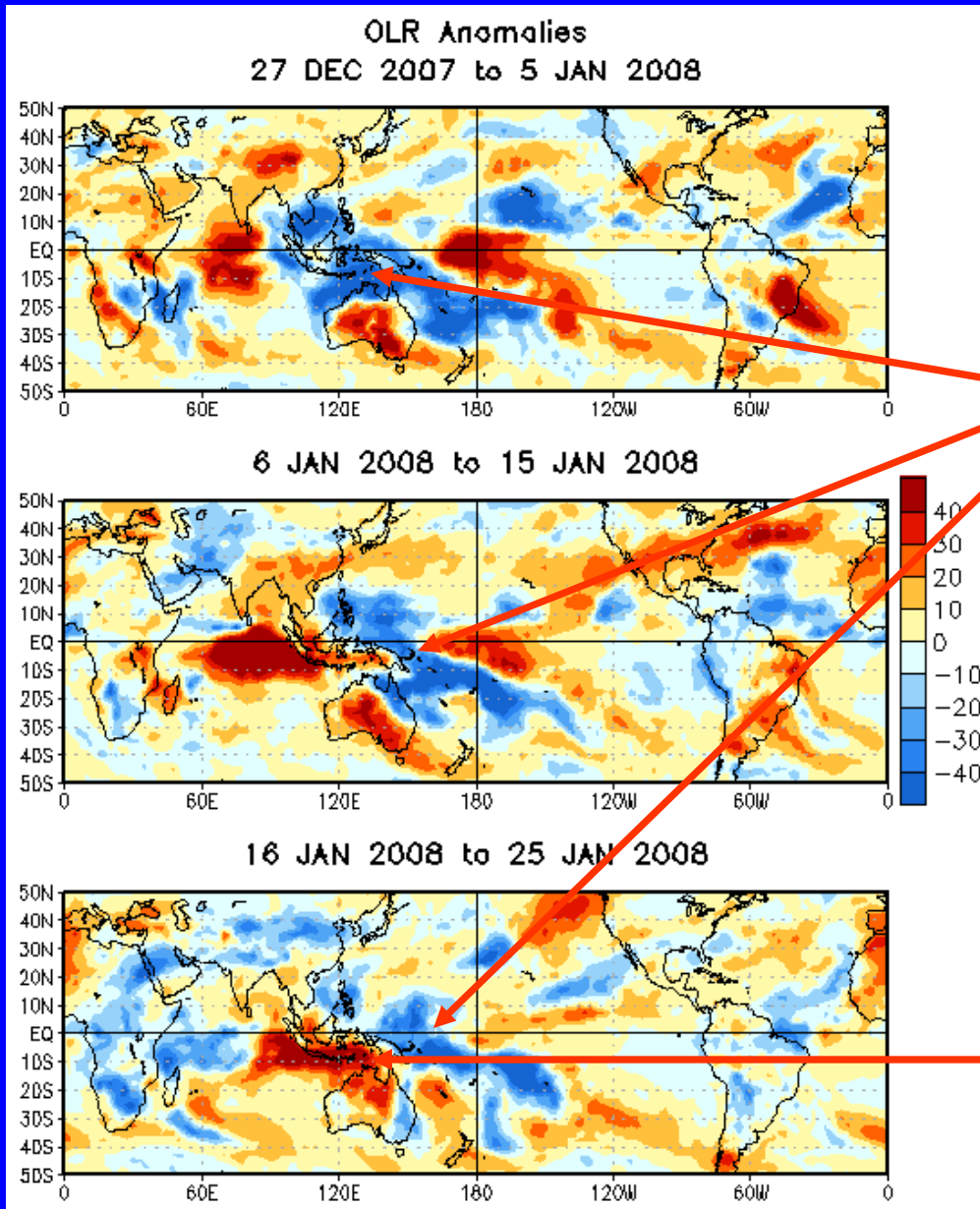
Intraseasonal variability was evident during September and October with a longer period and included some extended regimes of more stationary anomalous convection.

Moderate-to-strong MJO activity has been evident since mid-November. Enhanced convection shifted from the Indian Ocean to the southwest Pacific during December and January while suppressed convection has shifted from Africa to Indonesia.

During the past week, enhanced convection has now redeveloped across Africa and the Indian Ocean.



OLR Anomalies: Last 30 days



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

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

Wet conditions have shifted eastwards from the eastern Indian Ocean and Maritime continent to the western Pacific during late December and January as the MJO progressed.

Suppressed convection redeveloped across the Indian Ocean during early January and has slowly shifted eastwards to include most of the Maritime Continent.

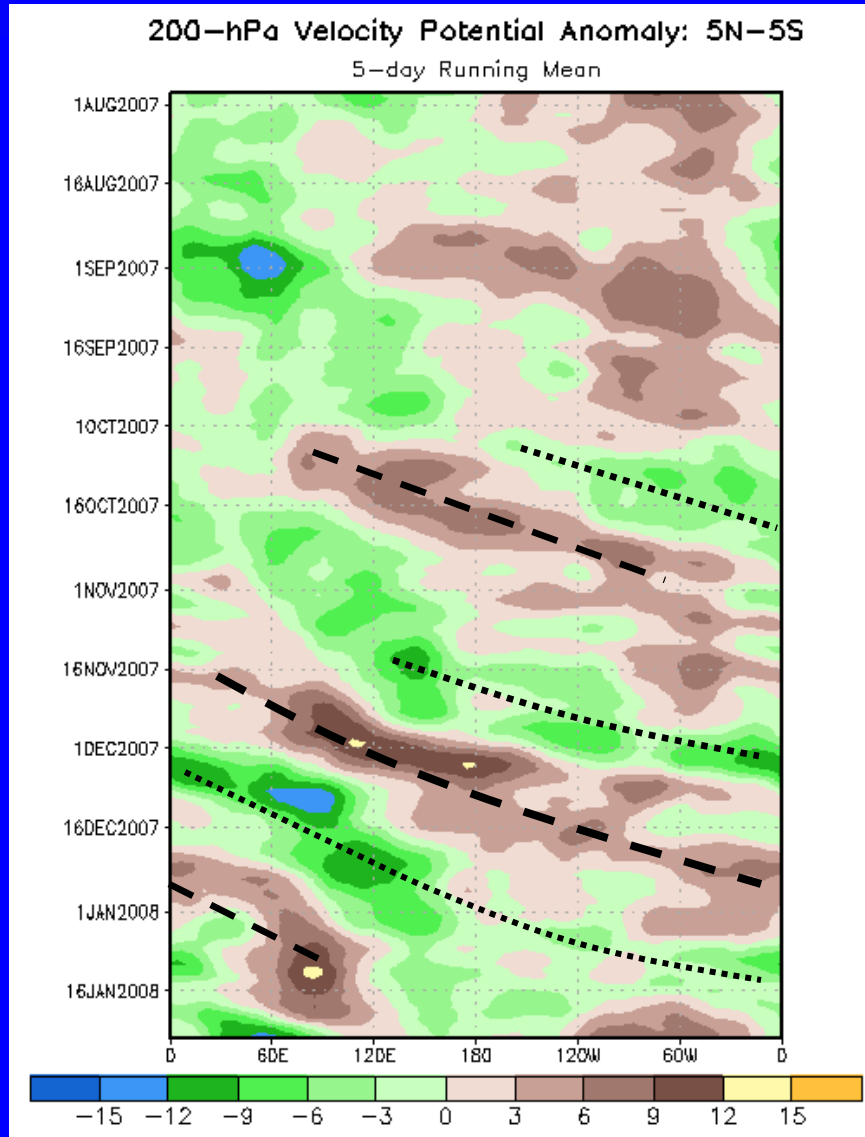


200-hPa Velocity Potential Anomalies (5°S-5°N)

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

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

Time
↓



Longitude

The MJO was weak or incoherent during much of August and September.

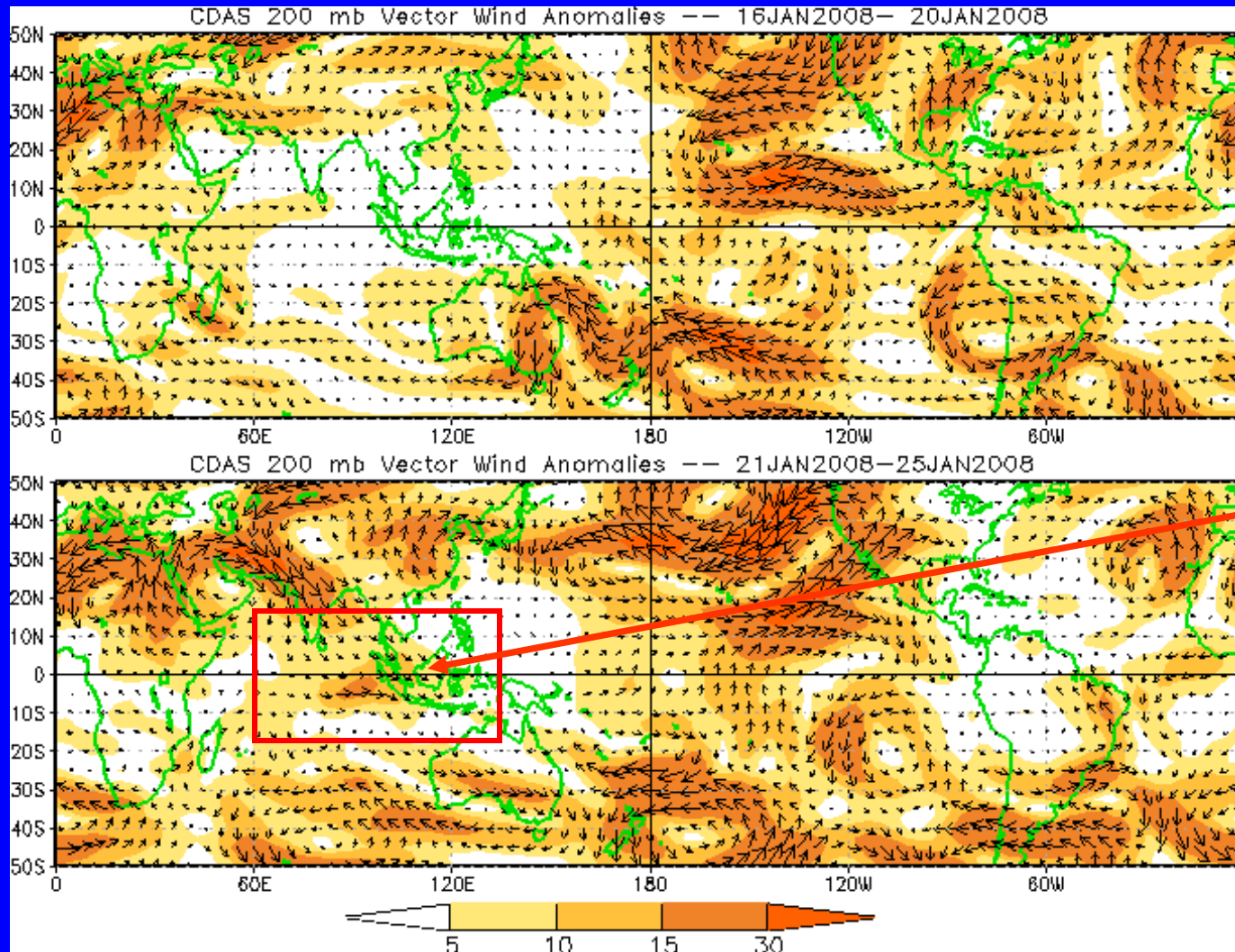
The MJO strengthened during October but coherent propagation was short-lived.

Moderate-to-strong MJO activity developed in mid-November and has continued into January. The MJO did weaken some in early January as velocity potential anomalies became somewhat less coherent.



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

Note that shading denotes the magnitude of the anomalous wind vectors

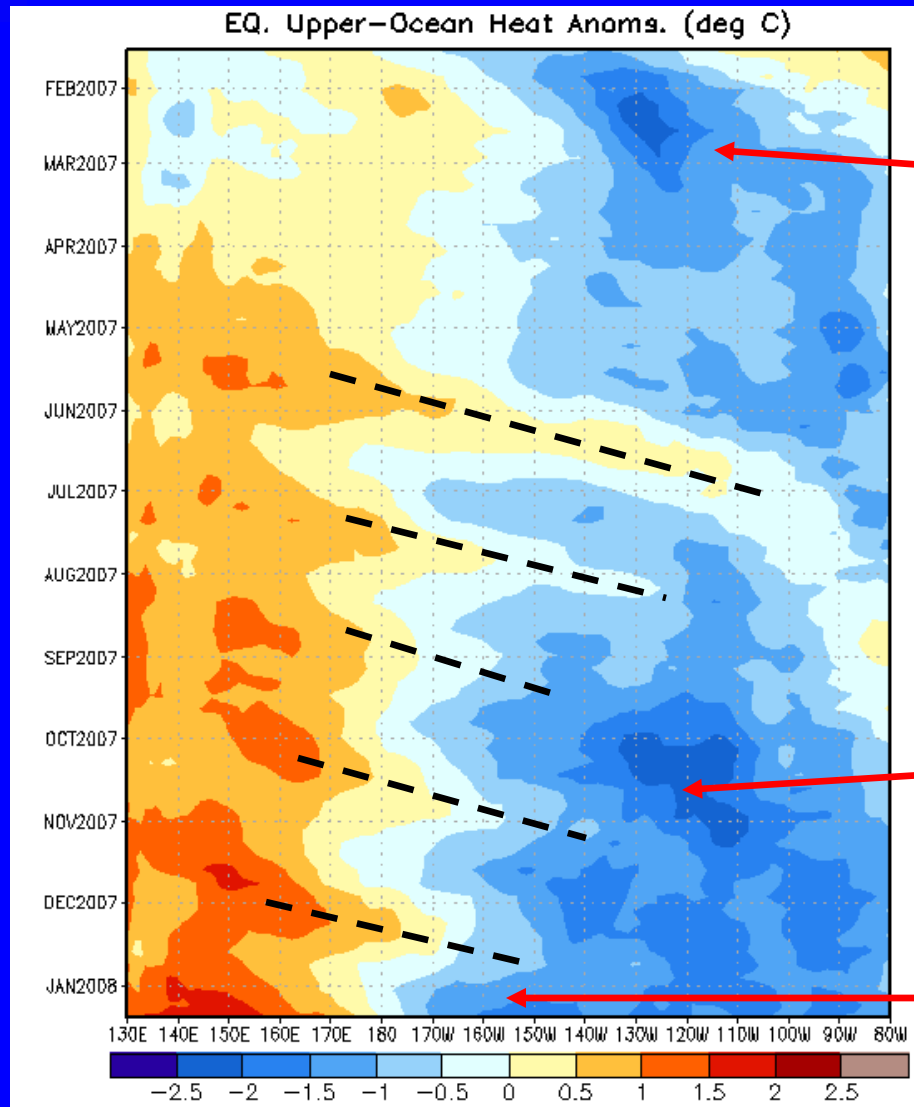


Westerly anomalies have developed across the Indian Ocean and parts of the Maritime continent during the last five days.



Weekly Heat Content Evolution in the Equatorial Pacific

Time
↓



Longitude

Beginning in February, negative heat content anomalies developed across the eastern equatorial Pacific and continued until June 2007.

Weak Kelvin wave activity has been observed since May and has affected the sub-surface temperature departures at varying levels across the Pacific Ocean. The strongest wave occurred during May and June.

During September and October, negative heat content anomalies increased markedly across the eastern Pacific Ocean.

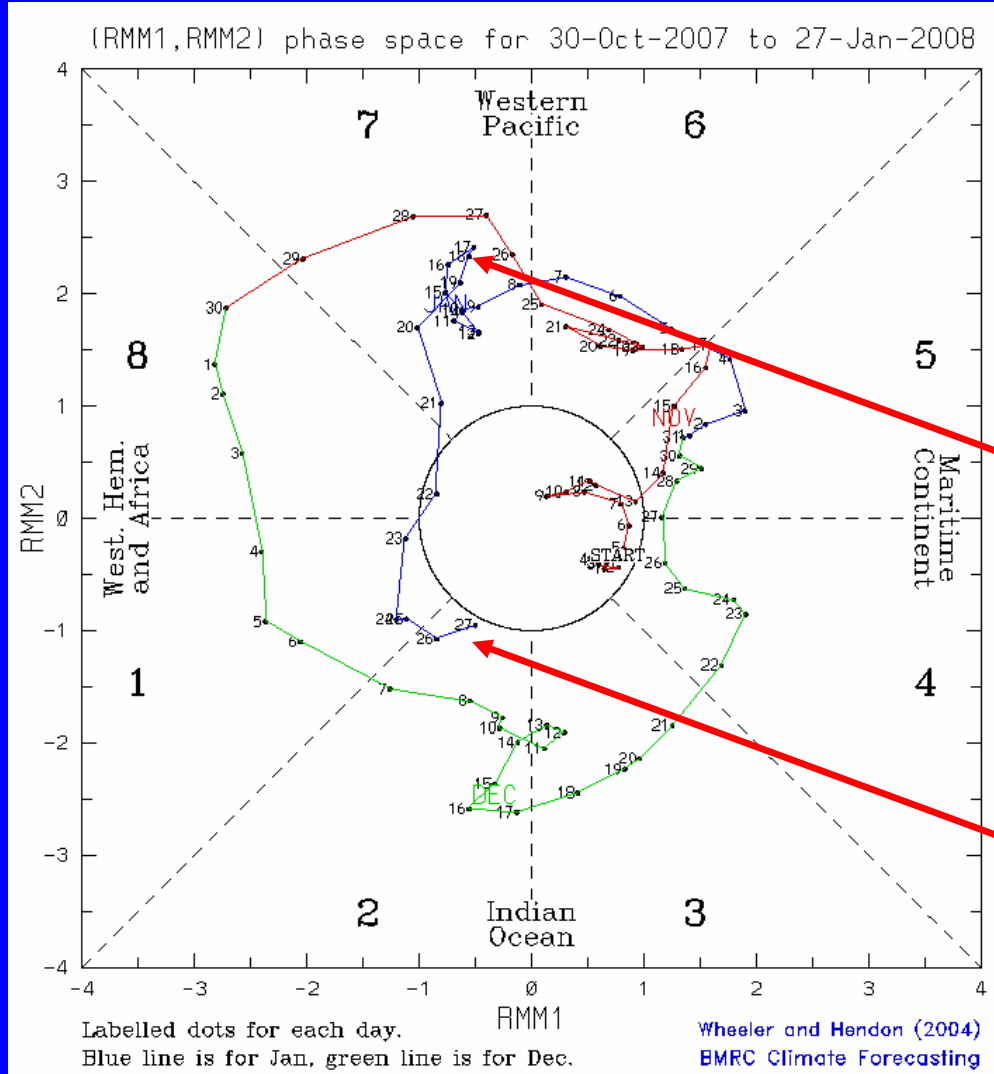
Most recently, the upwelling portion of the latest Kelvin wave is contributing to increasingly negative sub-surface temperature departures near and just east of the Date Line.



MJO Index

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 and 200-hPa zonal wind and 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.

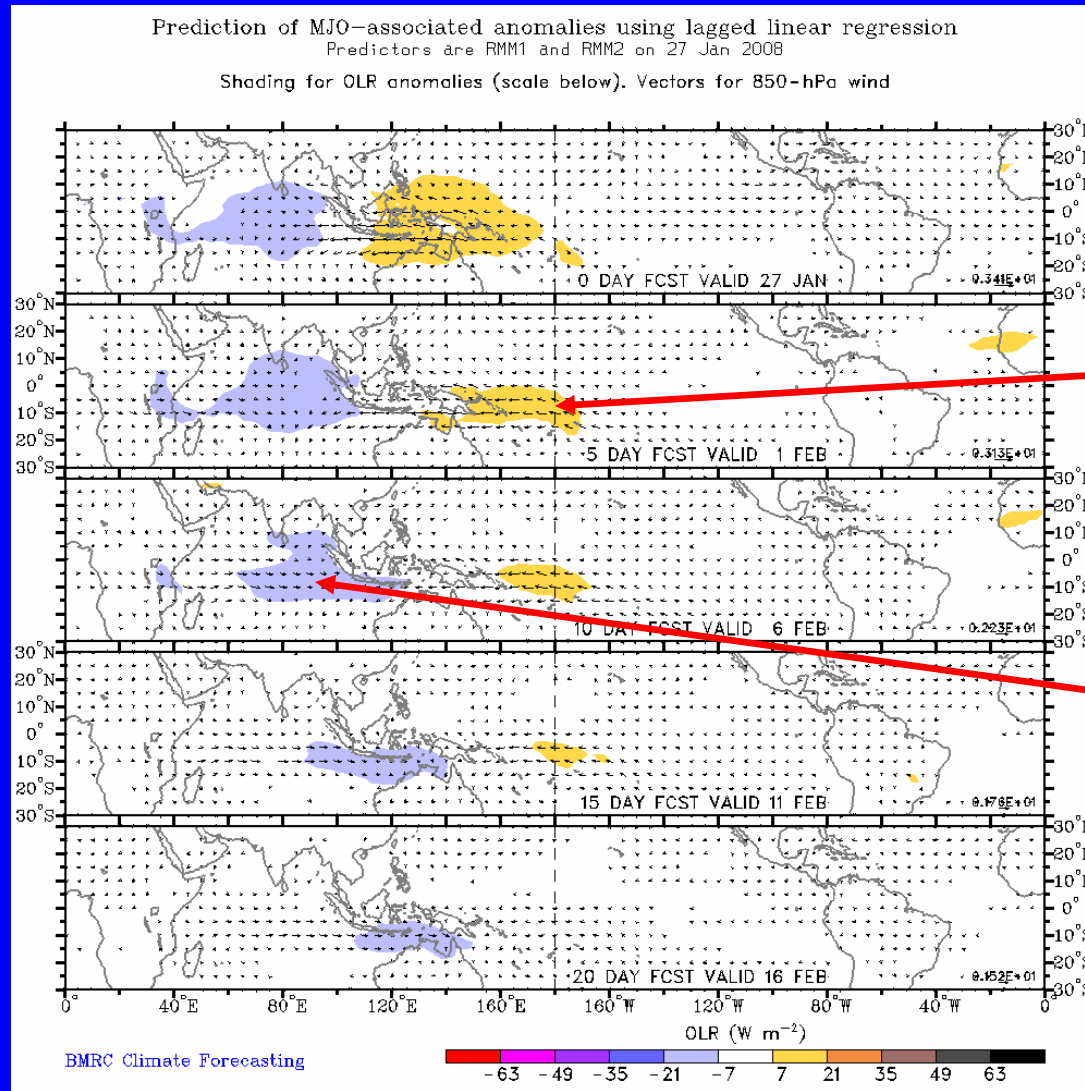


The second cycle of the current MJO activity slowed during mid-January as eastward propagation decreased markedly. The enhanced phase was centered across the central Pacific Ocean and had a large amplitude.

During the past week, rapid eastward propagation has taken place at moderate strength.



Statistical MJO OLR Forecast



The statistical MJO forecast indicates weak-to-moderate MJO activity during the upcoming 1-2 week period.

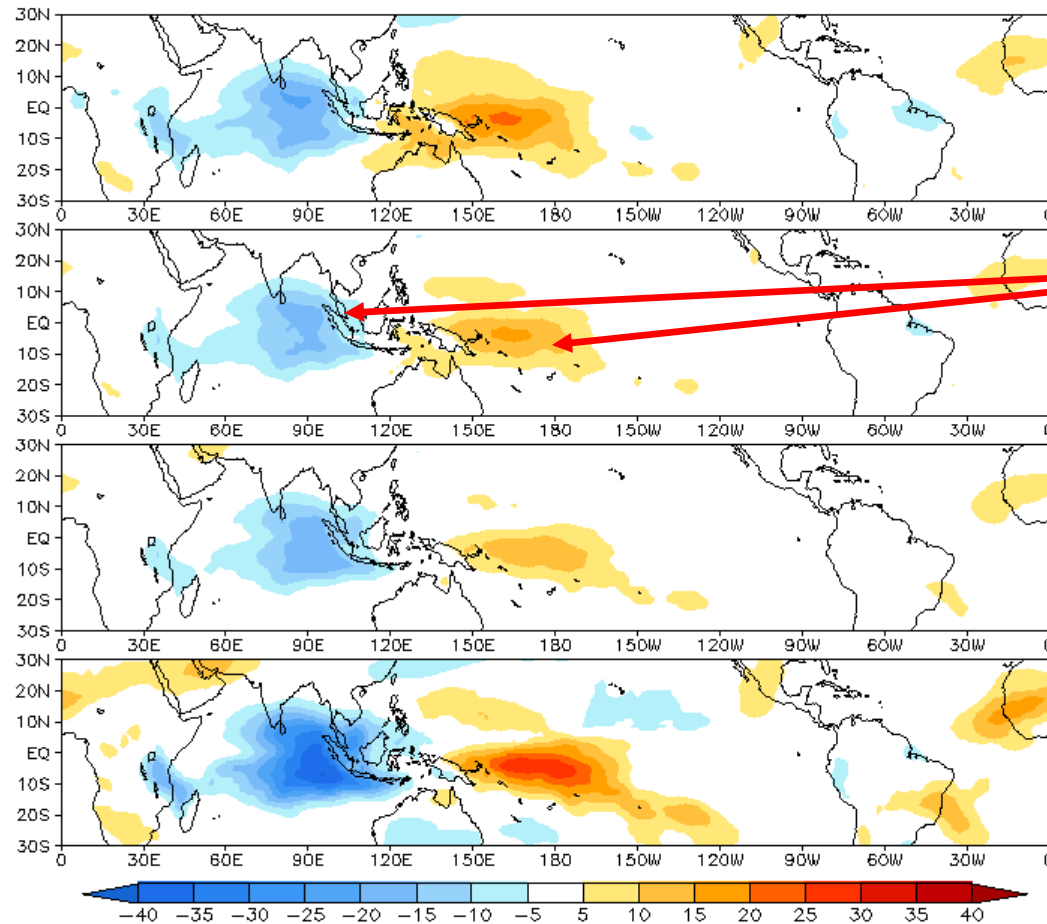
Dry conditions are forecast for the western Pacific mainly early during the period.

Wet conditions are expected for the Indian Ocean throughout the period.



Experimental GFS MJO OLR Forecast

Prediction of MJO-related anomalies using GFS operational forecast
Initial date: 27 Jan 2008
OLR



Initial Date
(27 Jan 2008)

Days 1-5 Ave
Forecast

Days 6-10 Ave
Forecast

Days 11-15 Ave
Forecast

The GFS forecasts a moderate MJO signal with little eastward propagation during the period.

Dry conditions are forecast for the western Pacific Ocean with wet conditions across the Indian Ocean.

The MJO amplitude is forecast to increase during week 2.