



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

**Update prepared by
Climate Prediction Center / NCEP
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Outline

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



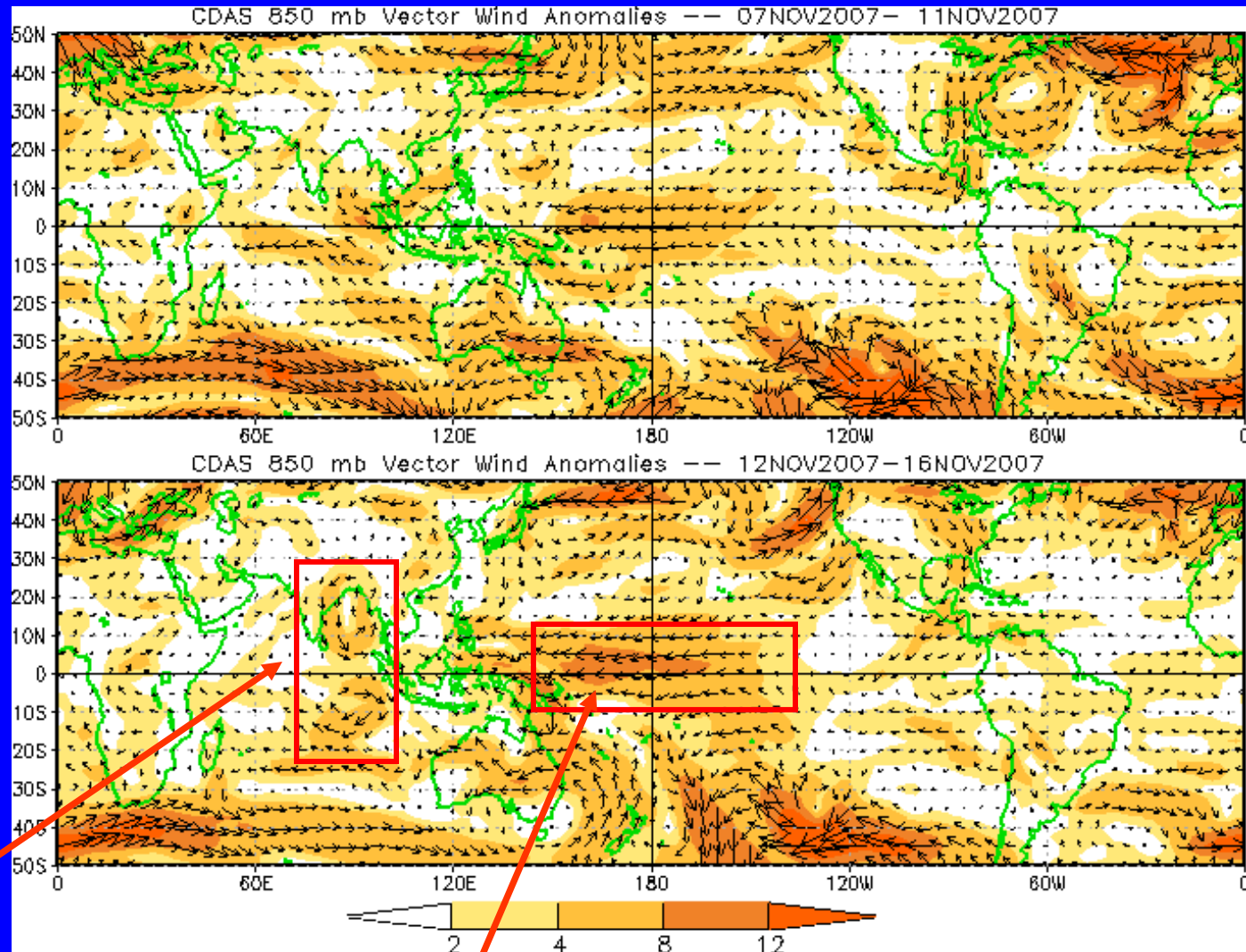
Overview

- **The MJO signal has increased in amplitude during the past week.**
- **The enhanced phase of the MJO has remained in the vicinity of the eastern Maritime continent with only a minor shift eastward into the western Pacific Ocean.**
- **Dry conditions have developed across much of the Indian Ocean mainly north of the equator.**
- **Based on the latest monitoring and forecast tools, weak MJO activity is expected during the next 1-2 weeks.**



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

Note that shading denotes the magnitude of the anomalous wind vectors



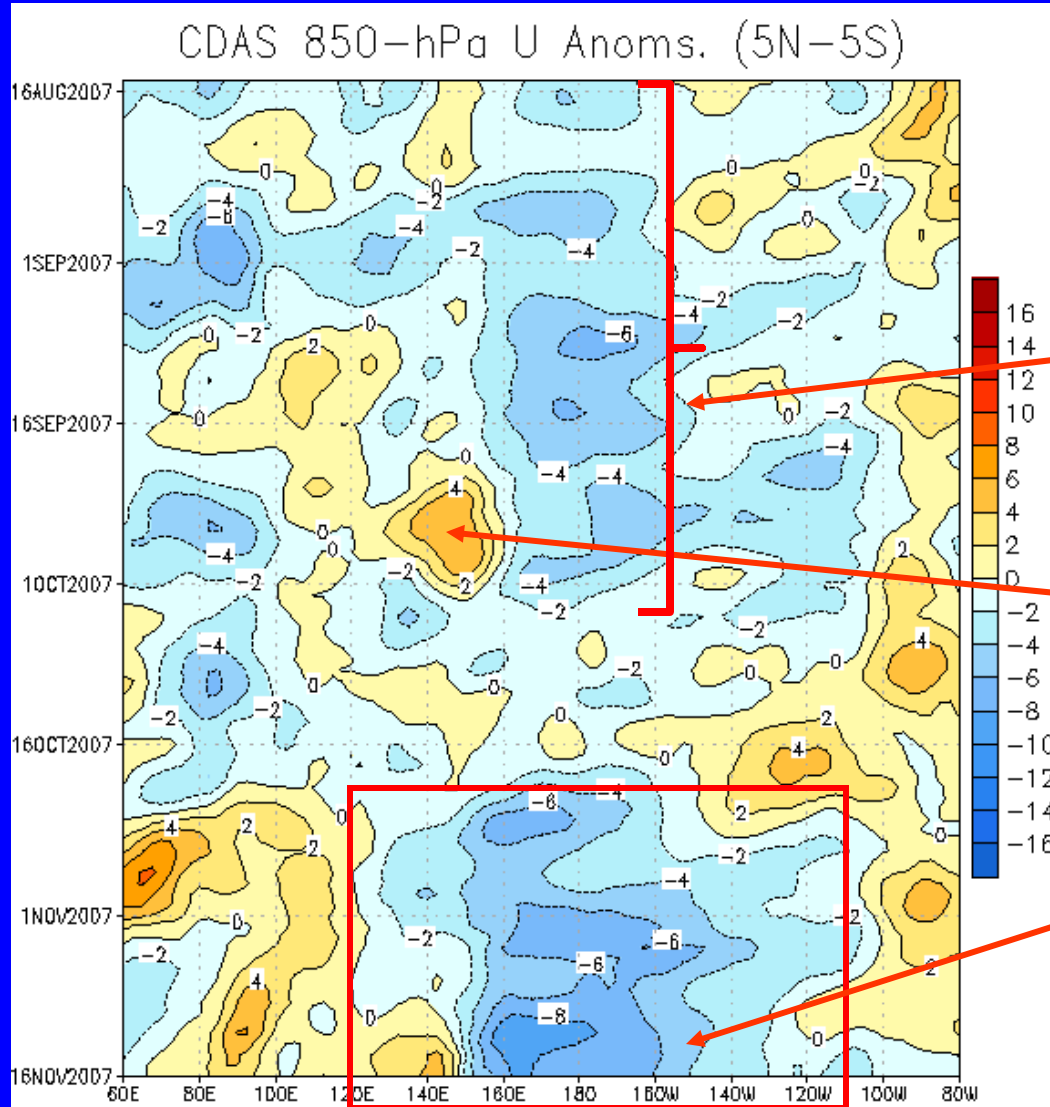
The signature of twin tropical cyclones in the eastern Indian Ocean and Bay of Bengal is evident.

The easterlies across the equatorial central Pacific have remained quite strong.



850-hPa Zonal 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.

From August to early October, the easterlies were strong and anchored near the Date line.

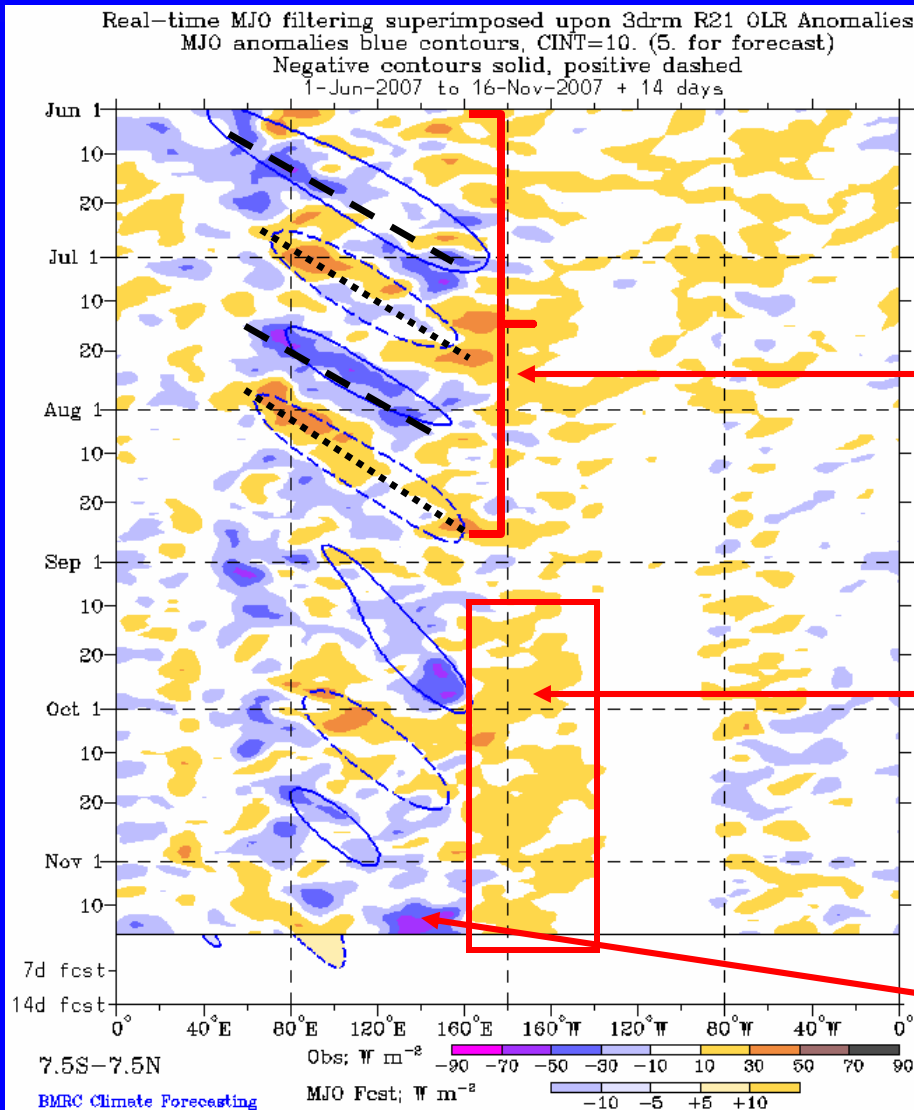
Westerly anomalies increased across the western Pacific during late September in response to very active convection and tropical cyclone activity.

A period of near average winds at the Date Line during early-mid October have been replaced with strong and widespread easterly anomalies across much of the Pacific.

Also, westerly anomalies have developed near 140°E during the last several days.



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)

Beginning in mid May, weak-moderate MJO activity was observed as regions of suppressed and enhanced convection shifted eastward from the Indian Ocean into the far western Pacific.

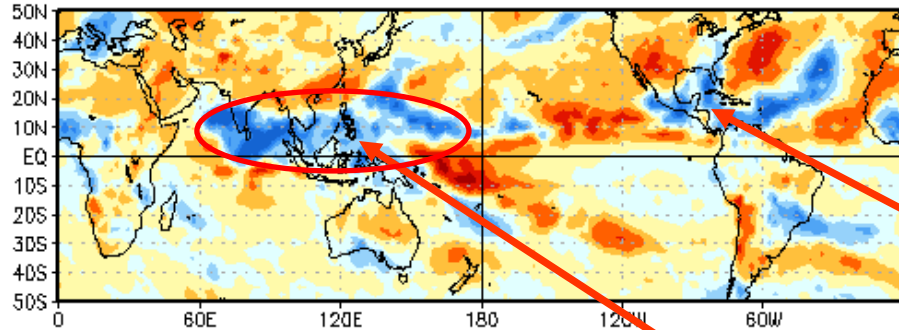
Persistent dry conditions have been evident near the Date Line since mid-September.

During the last week there has been a substantial enhancement of convection across the eastern Maritime continent and western Pacific with a slight eastward shift. Dry conditions have developed across the eastern Indian Ocean.

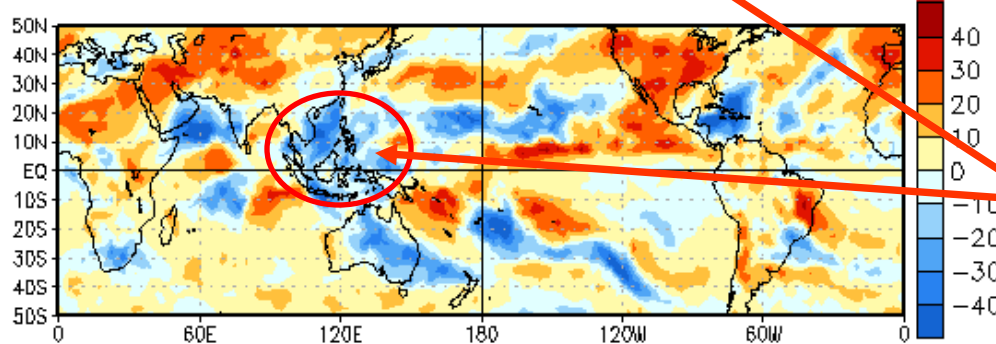


OLR Anomalies: Last 30 days

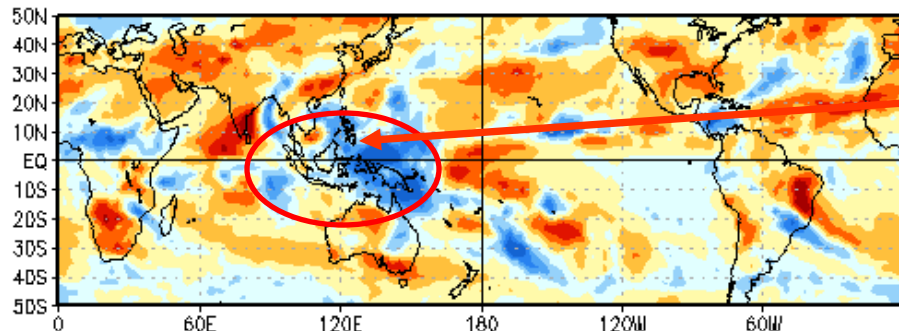
18 OCT 2007 to 27 OCT 2007



28 OCT 2007 to 6 NOV 2007



7 NOV 2007 to 16 NOV 2007



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

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

During much of October, wet conditions were evident across the eastern Pacific Ocean, Central America, and the Caribbean Sea.

Enhanced convection prevailed across the Maritime continent during much of the period.

In early-mid November the area of enhanced convection shifted slightly eastward and now includes the eastern Maritime continent and the far western Pacific Ocean.

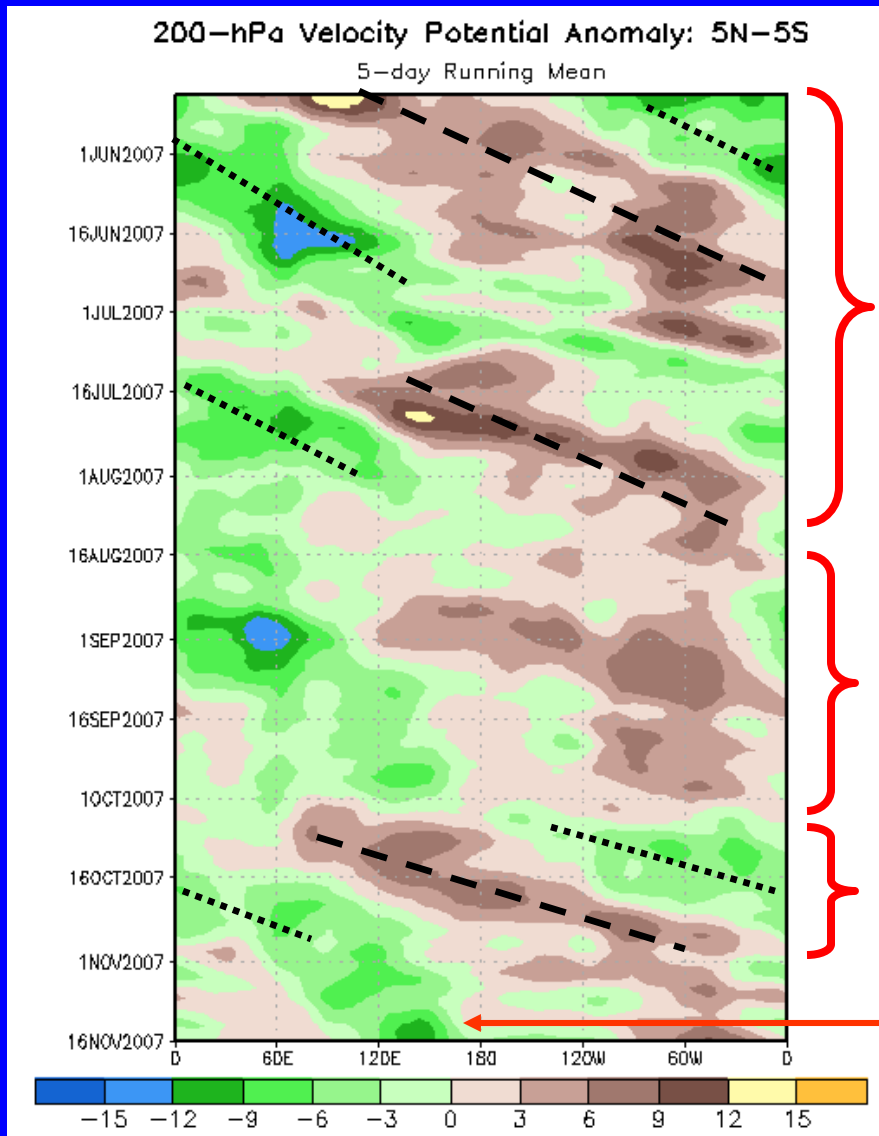


200-hPa Velocity Potential Anomalies (5°S-5°N)

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

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

Time



From mid-May into early August, weak to moderate MJO activity was observed as velocity potential anomalies increased and propagated eastwards.

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

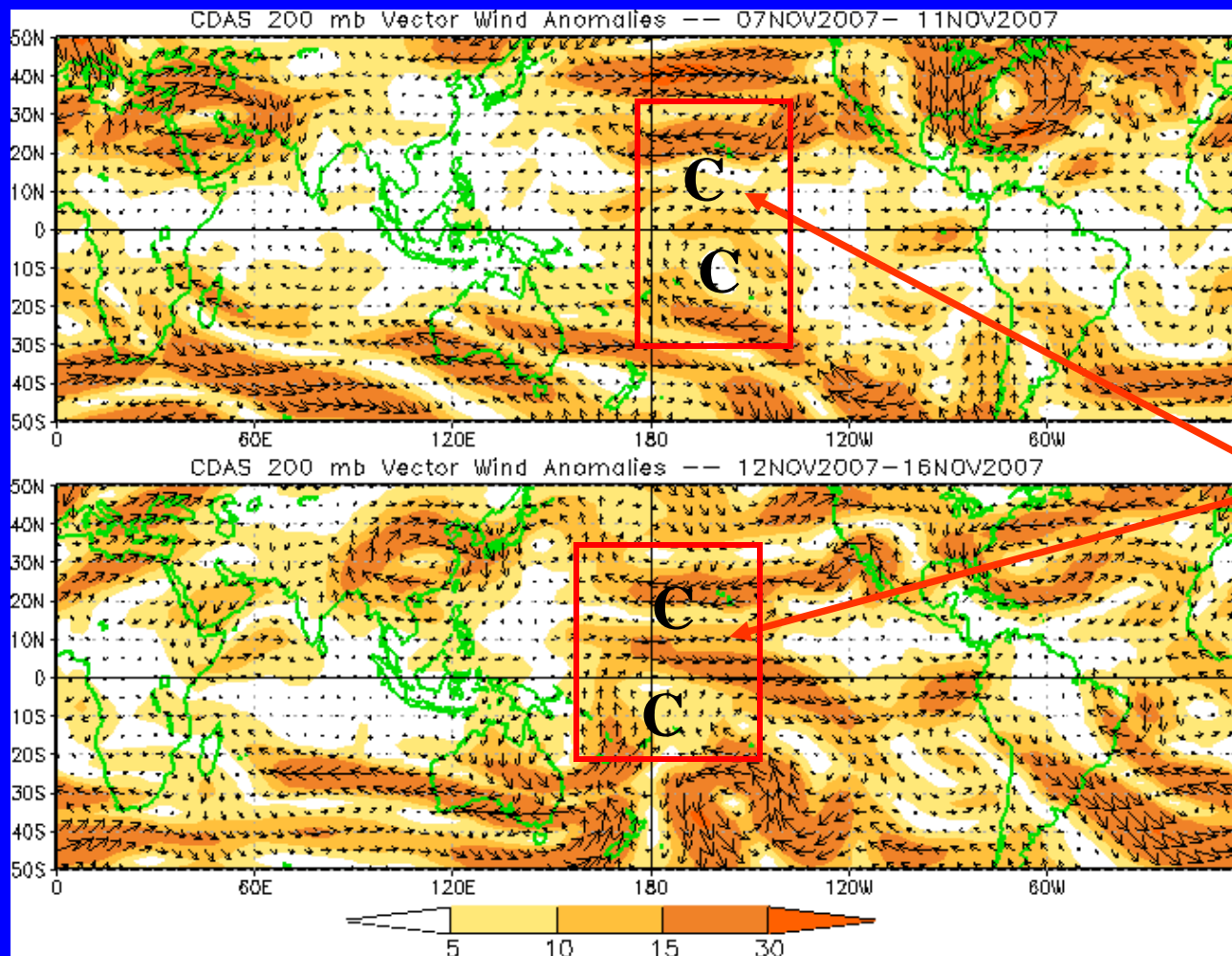
The MJO strengthened during October with fast eastward propagation.

Most recently, however, the pattern has become more stationary in nature.



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

Note that shading denotes the magnitude of the anomalous wind vectors

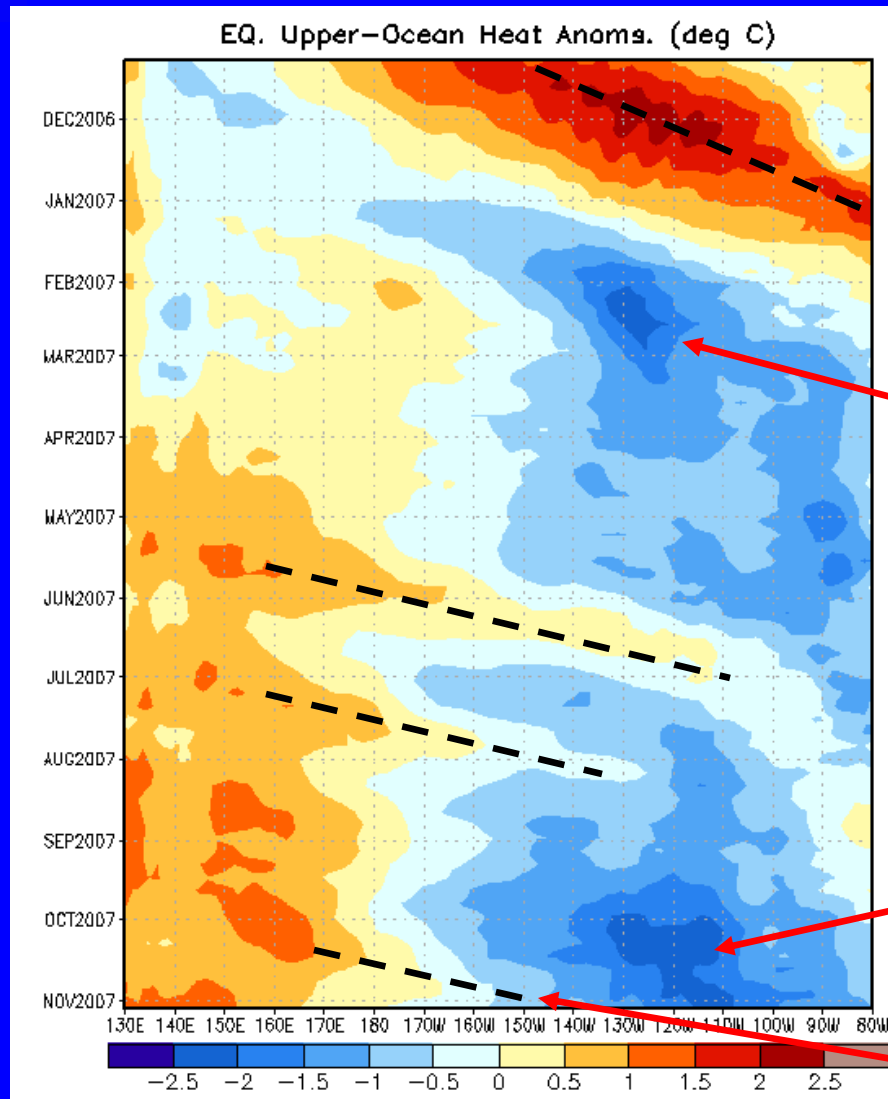


Upper-level cyclones typical during La Nina are evident across the central Pacific Ocean. during the last ten days.



Weekly Heat Content Evolution in the Equatorial Pacific

Time
↓



Longitude

During late 2006, an eastward-propagating Kelvin wave (warm phase indicated by the dashed line) caused considerable month-to-month variability in the upper-ocean heat content.

Beginning in February, negative heat content anomalies prevailed across the eastern equatorial Pacific.

Weak Kelvin wave activity was observed from May into August and affected the sub-surface temperature departures.

During October, negative heat content anomalies have increased across much of the central and eastern Pacific Ocean.

Most recently, a decrease in the negative heat content anomalies indicate Kelvin wave activity.

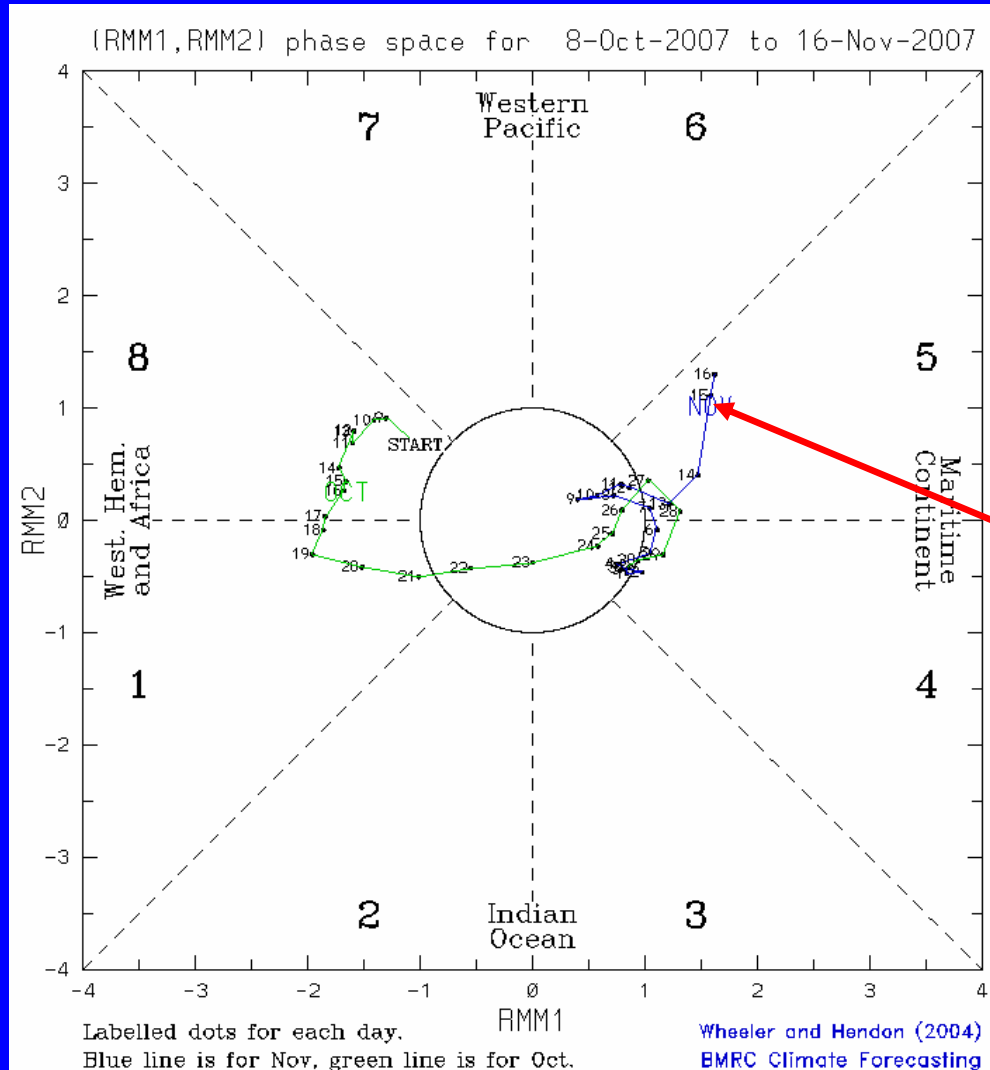


MJO Index

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).

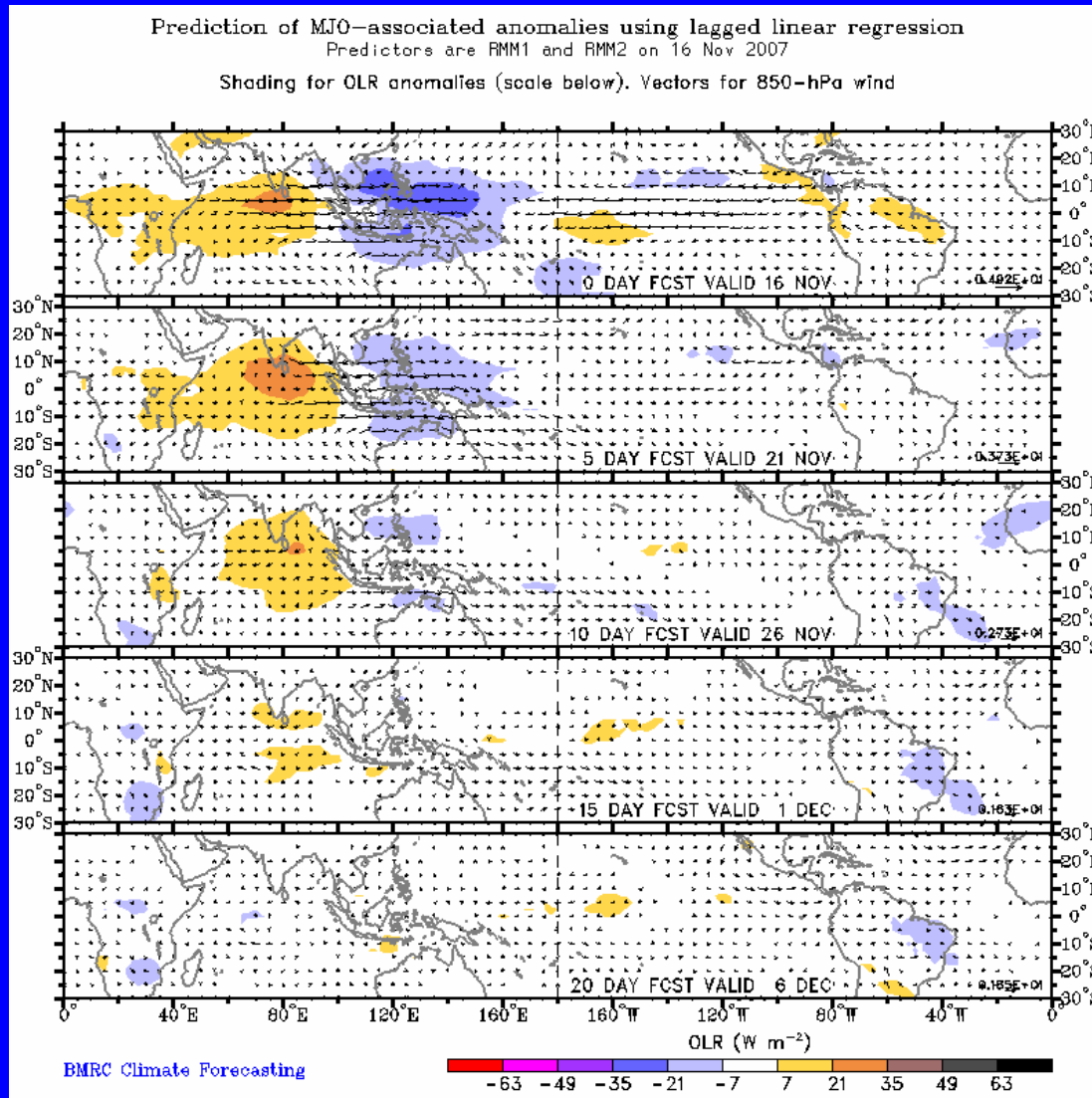
The axes represent the time series of the two leading modes of variability and are used to measure the amplitude while the triangular areas indicate the phase or location of the enhanced phase of the MJO. The farther away from the center of the circle the stronger the MJO. Different color lines indicate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

The MJO index has increased in amplitude but only minor eastward movement has been observed during the past week.





Statistical MJO OLR Forecast

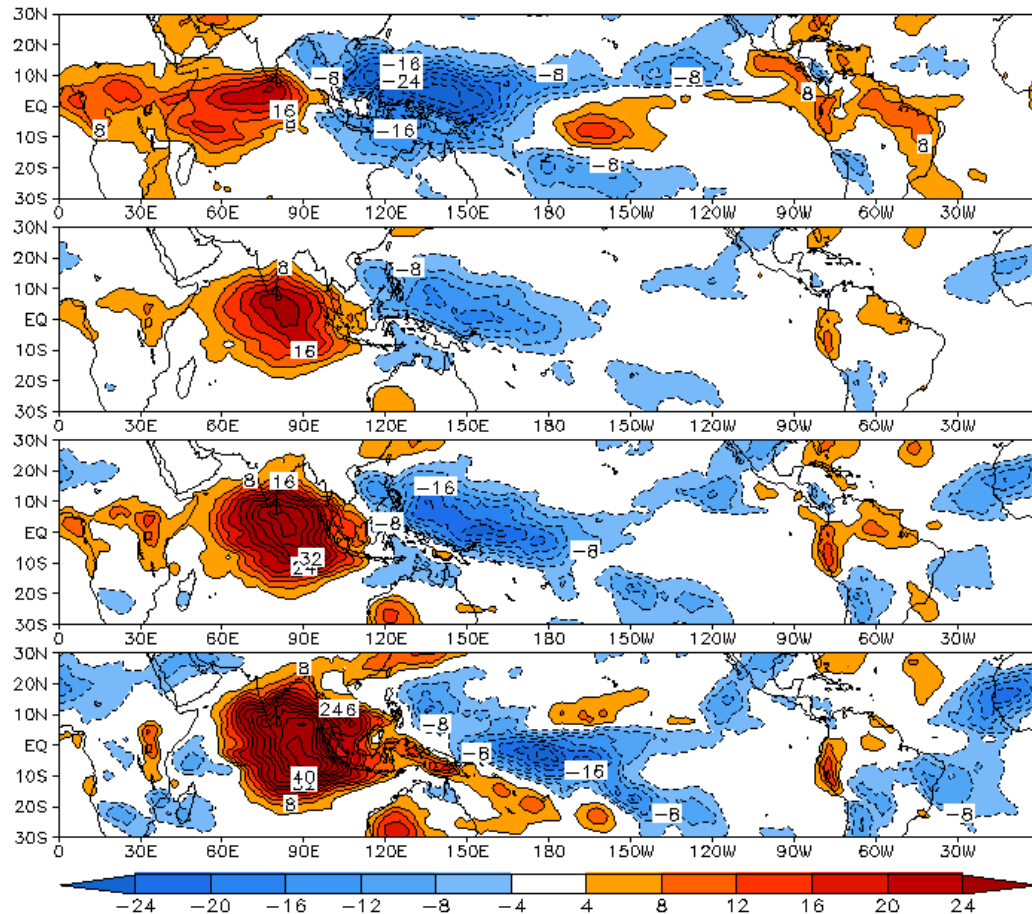


A statistical MJO forecast indicates weak to moderate MJO activity with dry (wet) conditions expected over the Indian Ocean and Maritime continent during the first 10 days.



Experimental GFS MJO OLR Forecast

Prediction of MJO-related anomalies using GFS operational forecast
Initial date: 18 Nov 2007
OLR



Initial Date
(18 Nov 2007)

Days 1–5 Ave
Forecast

Days 6–10 Ave
Forecast

Days 11–15 Ave
Forecast

The GFS forecasts a moderate-strong MJO amplitude for the coming two weeks with enhanced convection over the Maritime continent and western Pacific Ocean and dry conditions in the Indian Ocean.