



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**



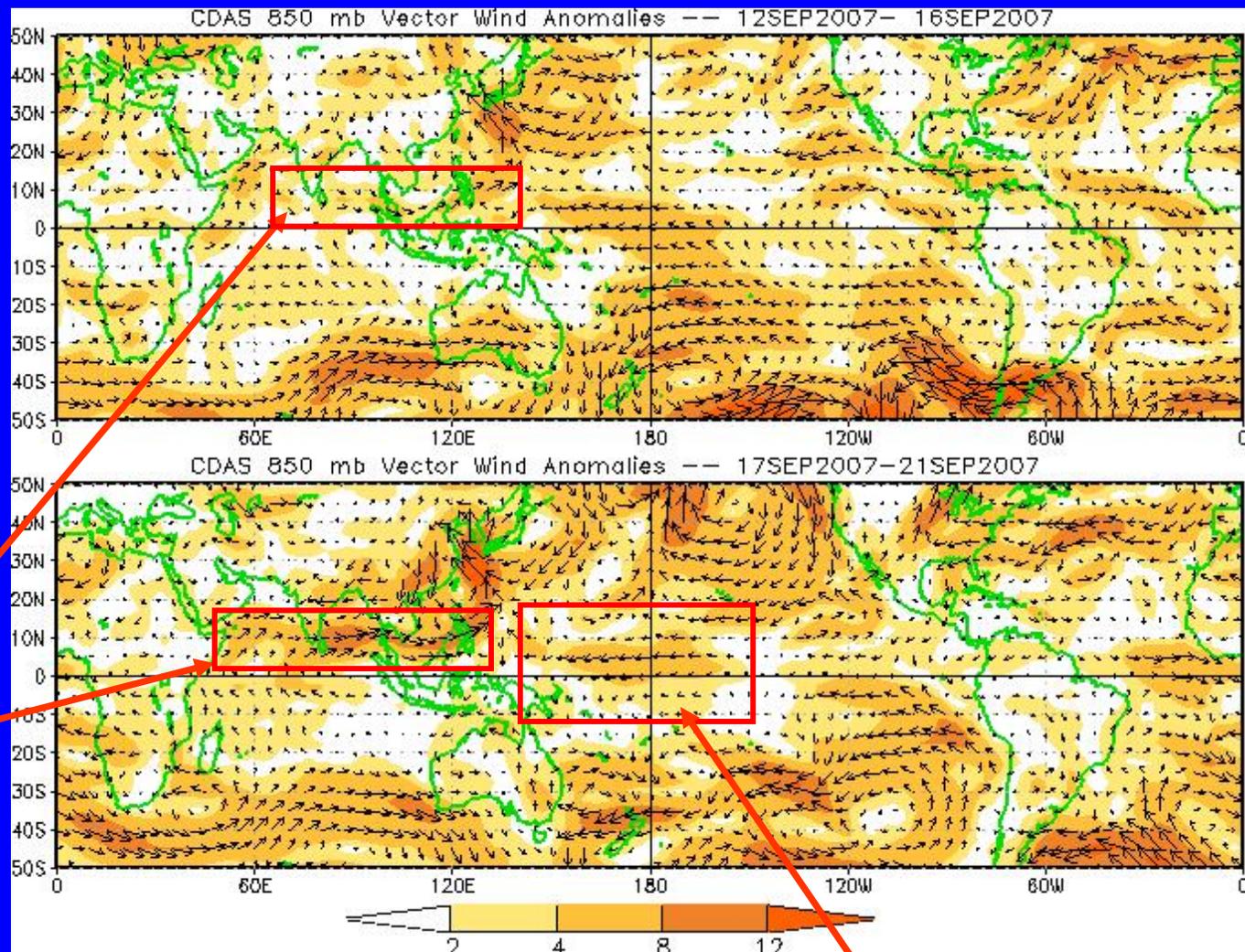
Overview

- **The latest observations indicate that the MJO is incoherent.**
- **Tropical convection continues to be enhanced from a region stretching from India across sections of the Maritime continent and Southeast Asia to the western Pacific Ocean – mainly north of the equator.**
- **A noticeable respite from rather wet conditions during mid-late August was observed across the far eastern Pacific Ocean and sections of the Caribbean Sea and Central America.**
- **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

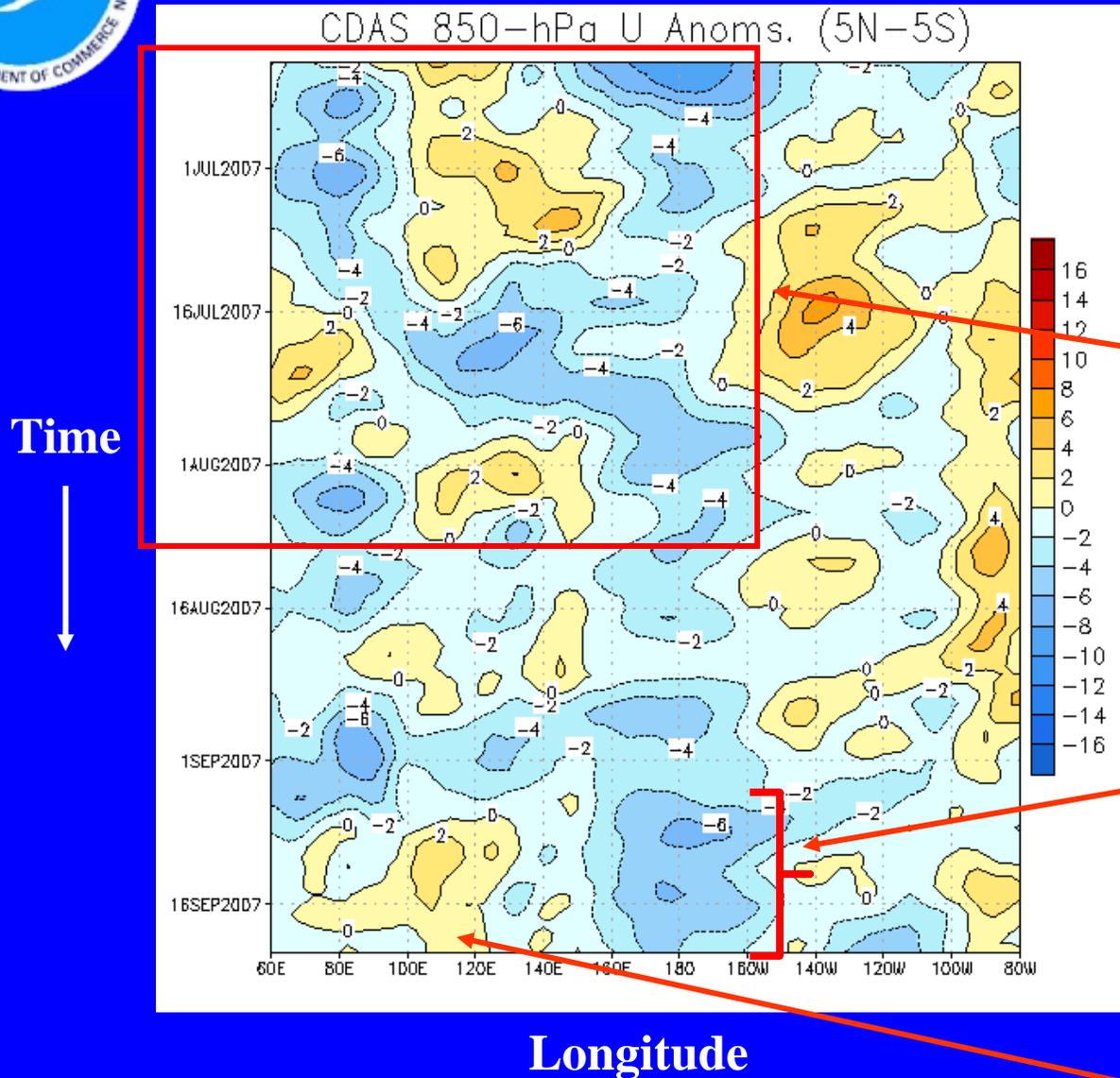


Westerly anomalies have developed from the Indian Ocean to the Philippines during the past five days.

Easterly anomalies centered along the equator continue near the Date Line during the past five days.



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.

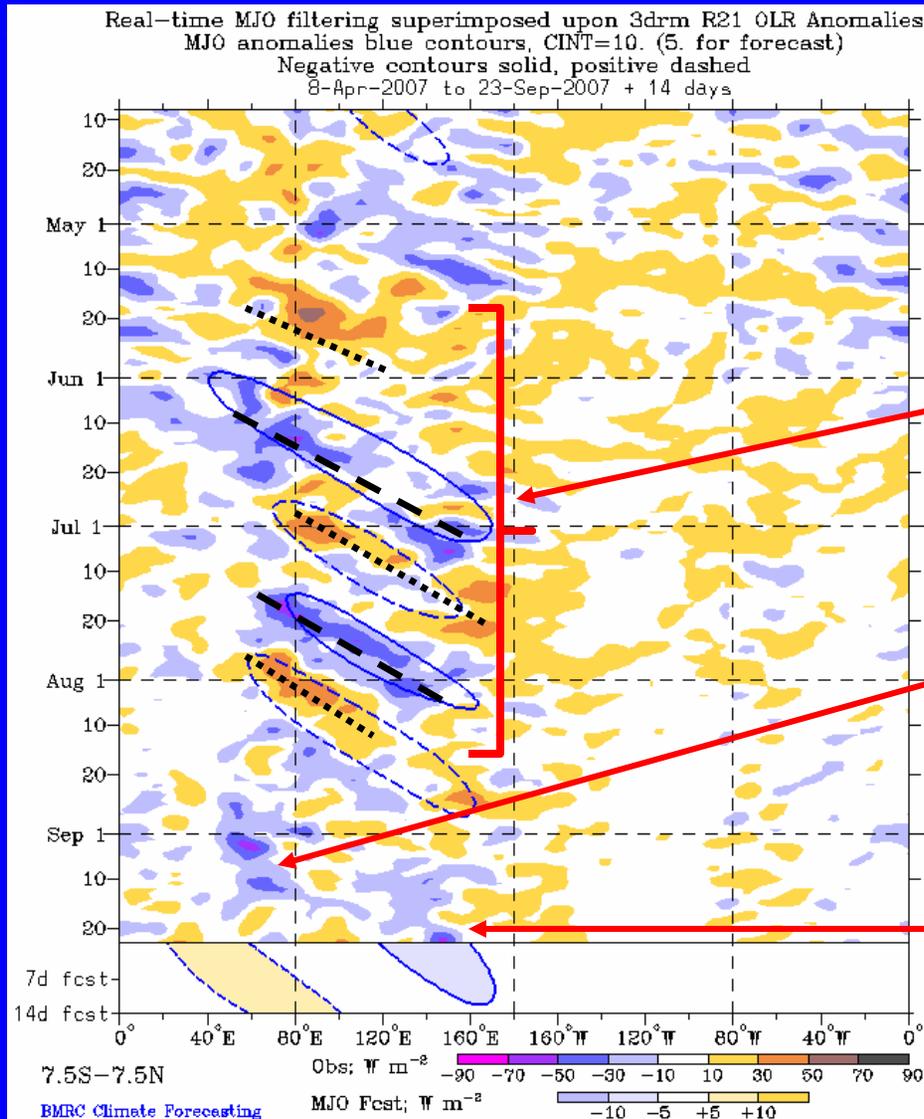
Coherent subseasonal variability, much of it related to the MJO, was observed from June into early August. Alternating periods of westerly and easterly anomalies propagated across the Maritime continent to the western Pacific Ocean.

During the last few weeks, we have seen the most persistent period of moderate easterly anomalies of anytime during the period.

Currently, weak westerly anomalies are evident along the equator near the Maritime continent.



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)

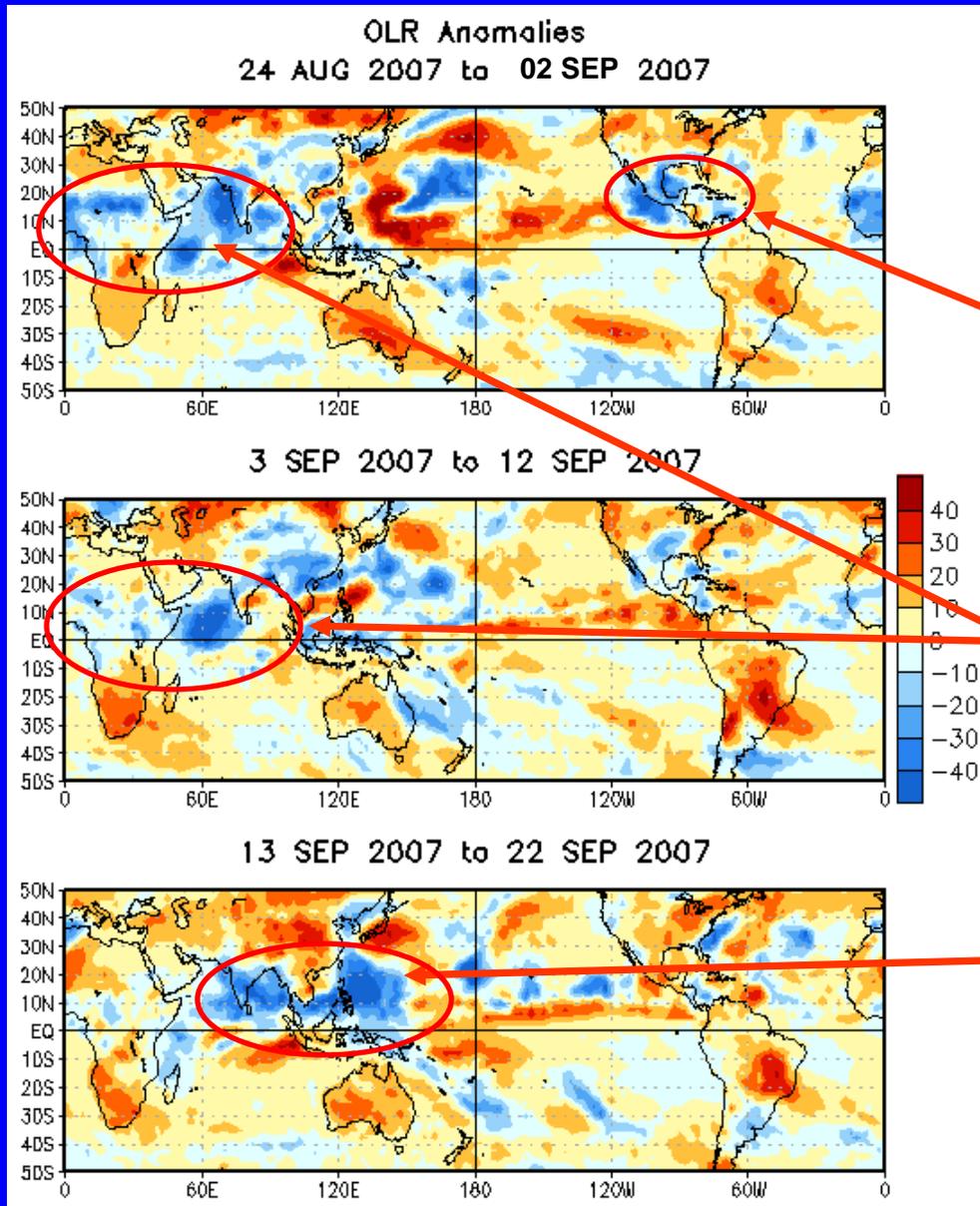
Beginning in mid May, weak-moderate MJO activity was observed as regions of suppressed and enhanced convection shifted eastward from the Indian Ocean into the far western Pacific.

Convection increased markedly across sections of Africa and the Indian Ocean in early September.

Most recently, weak enhanced (suppressed) convection has been evident across the western Pacific (eastern Indian) oceans.



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 were observed across the eastern Pacific Ocean, Caribbean Sea, Gulf of Mexico, and Mexico during late August.

Enhanced convection was evident across much of Africa and the Arabian Sea beginning in mid-late August and continued into early September.

A large change occurred across the western Pacific Ocean between late August and mid-September as dry conditions transitioned quickly to wet conditions.

A large region is of enhanced convection stretches from India into the western Pacific. now evident



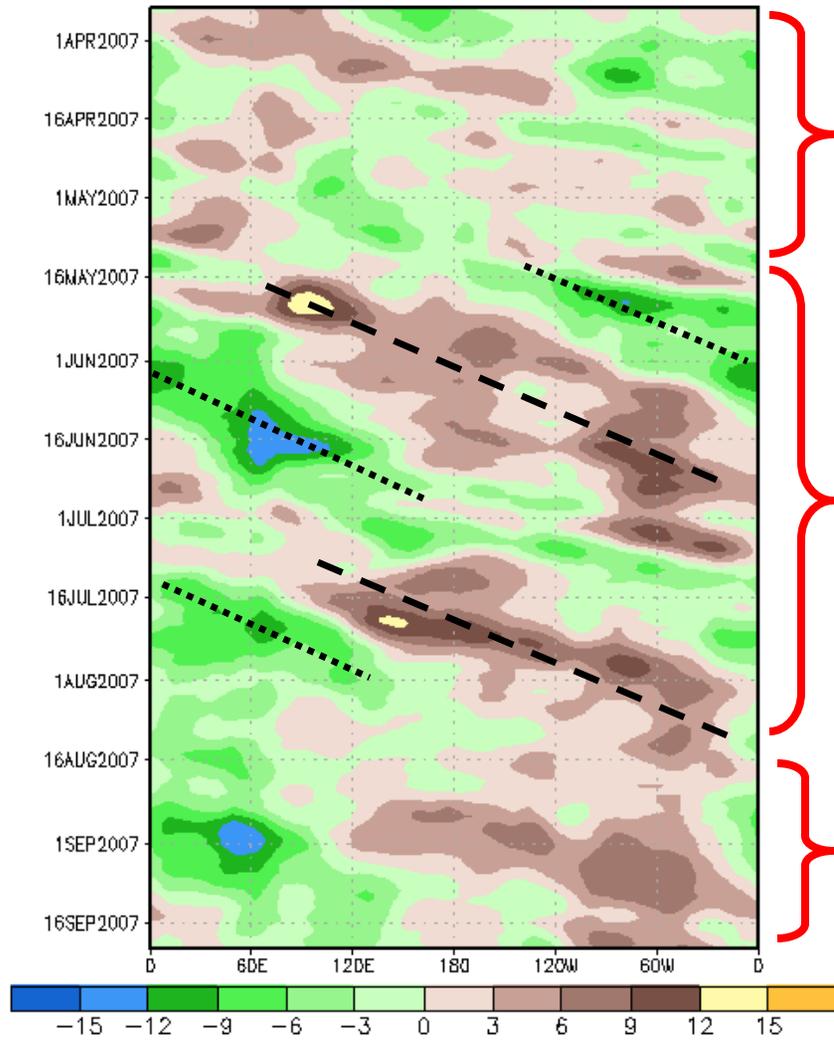
200-hPa Velocity Potential Anomalies (5°S-5°N)

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

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

200-hPa Velocity Potential Anomaly: 5N-5S
5-day Running Mean

Time
↓



The MJO was weak or incoherent from mid-March to mid-May.

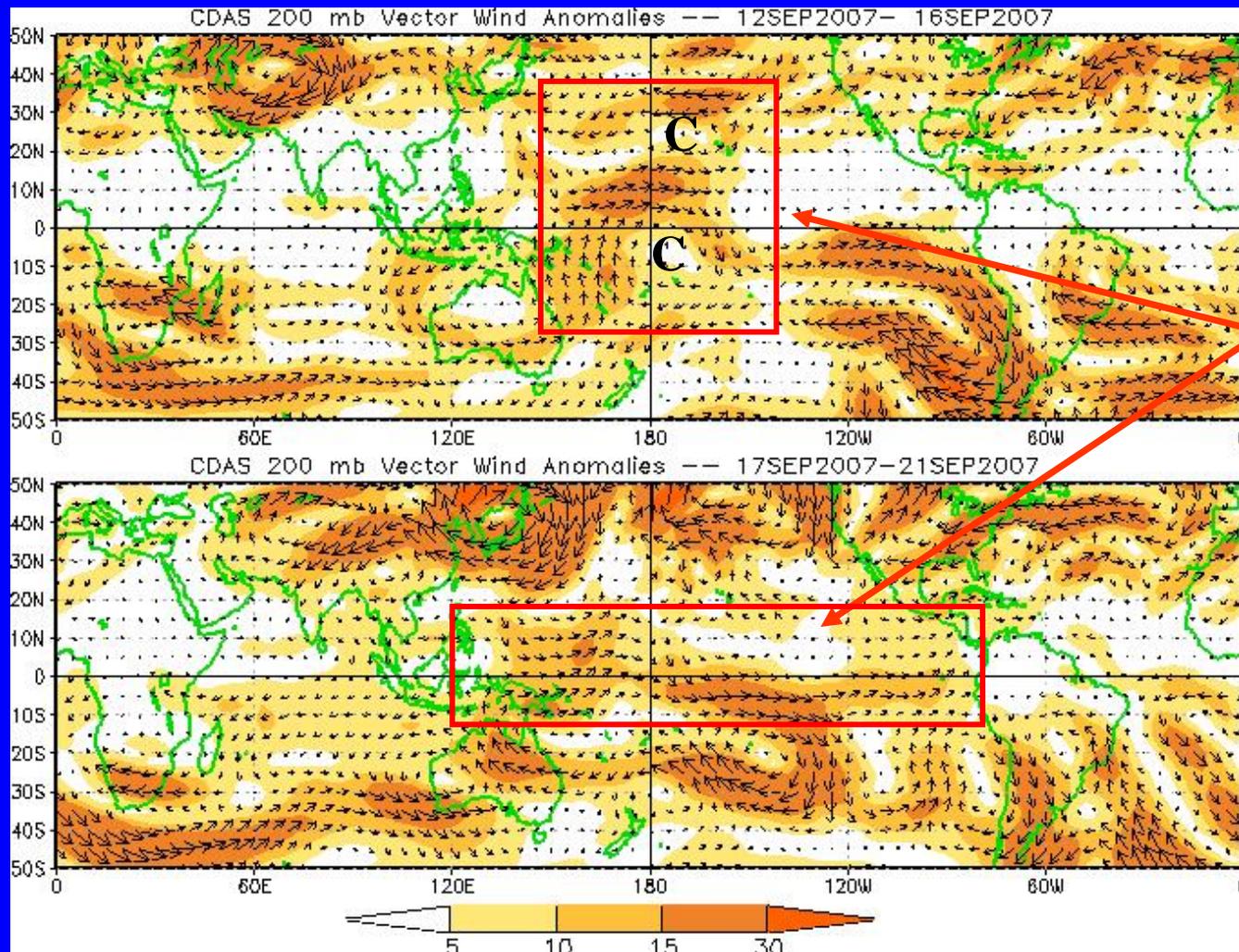
From mid-May into early August, weak to moderate MJO activity was observed as velocity potential anomalies increased and propagated eastwards.

The MJO has been weak or incoherent since mid-August.

Longitude



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



Note that shading denotes the magnitude of the anomalous wind vectors

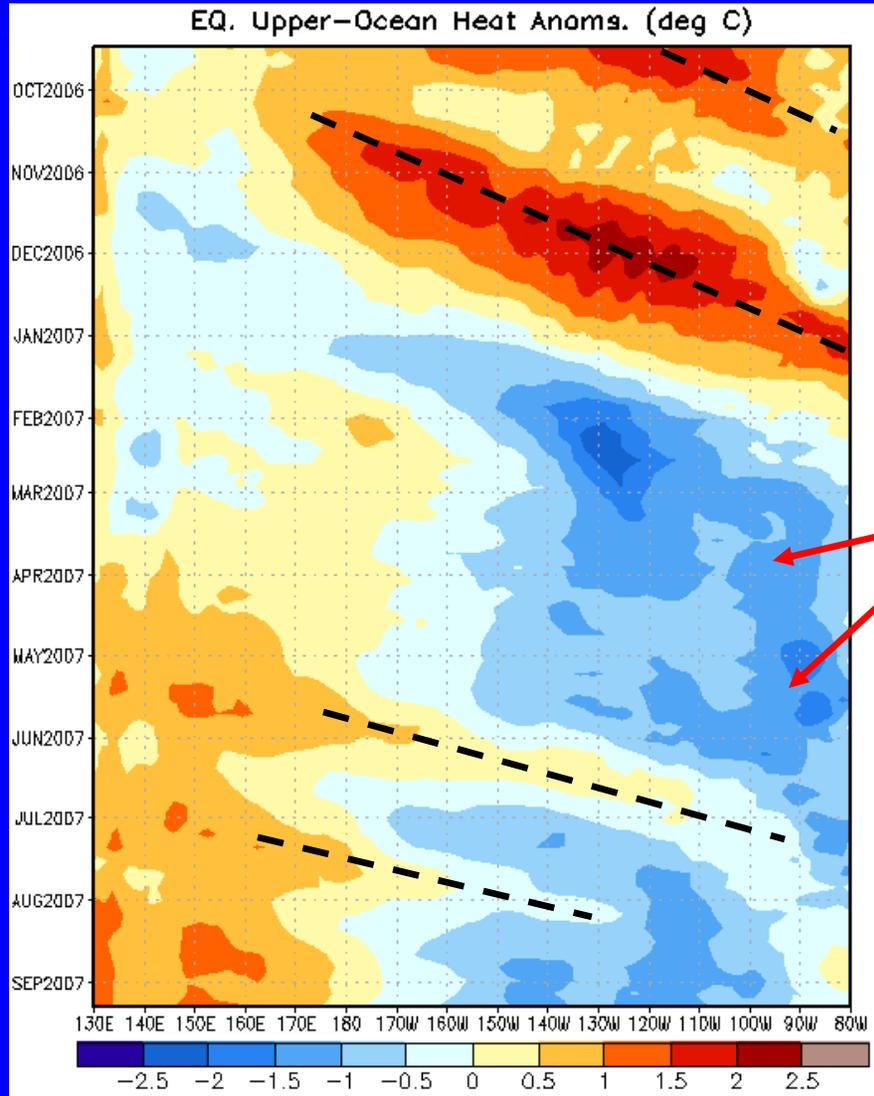
The area of westerly anomalies along and near the equator has increased in size across the Pacific Ocean.

Cyclonic upper-level circulations near the Date Line are most evident in the previous five day average.



Weekly Heat Content Evolution in the Equatorial Pacific

Time
↓



Longitude

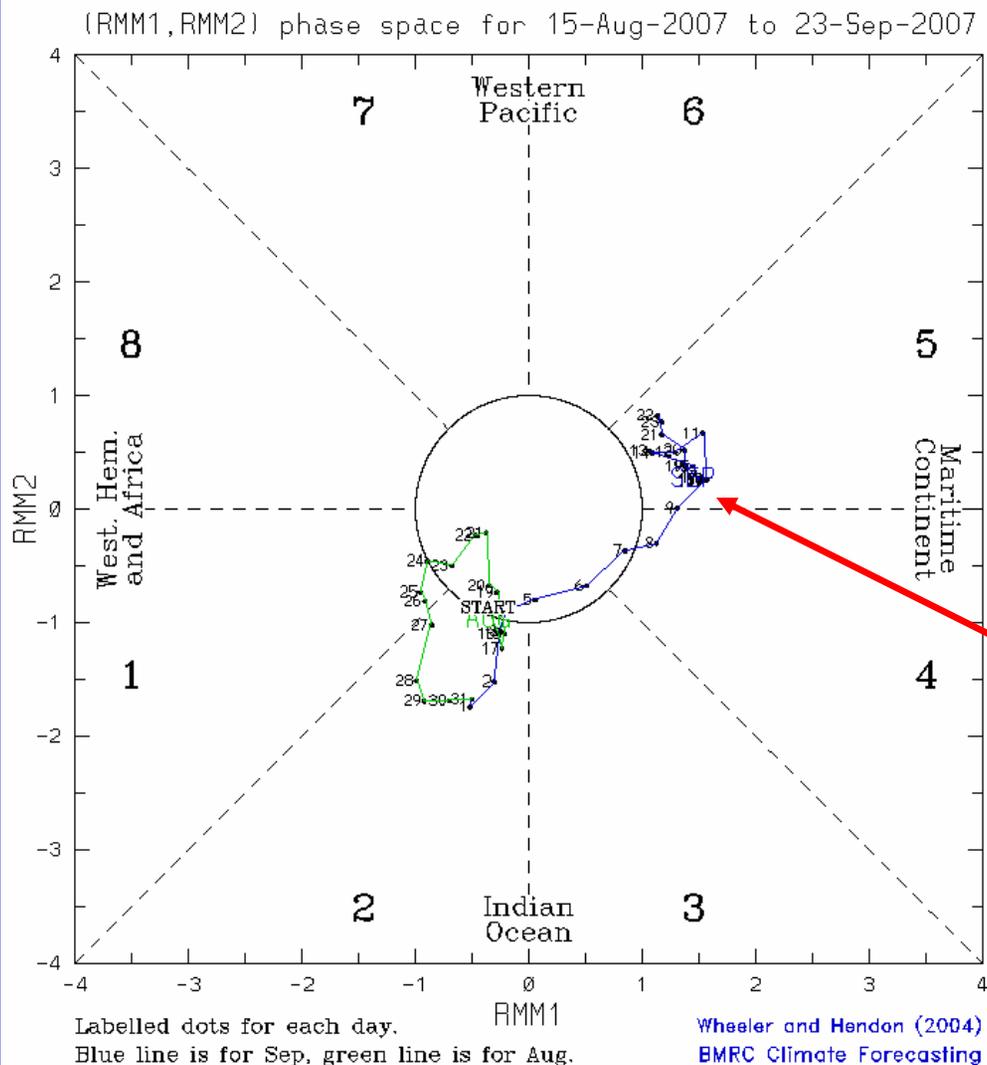
During late 2006, eastward-propagating Kelvin waves (warm phases indicated by dashed lines) caused considerable month-to-month variability in the upper-ocean heat content.

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

Weak Kelvin wave activity has been observed since mid-May and has affected the sub-surface temperature departures. Currently below average heat content anomalies are consistent with the upwelling portion of the most recent Kelvin wave.



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.

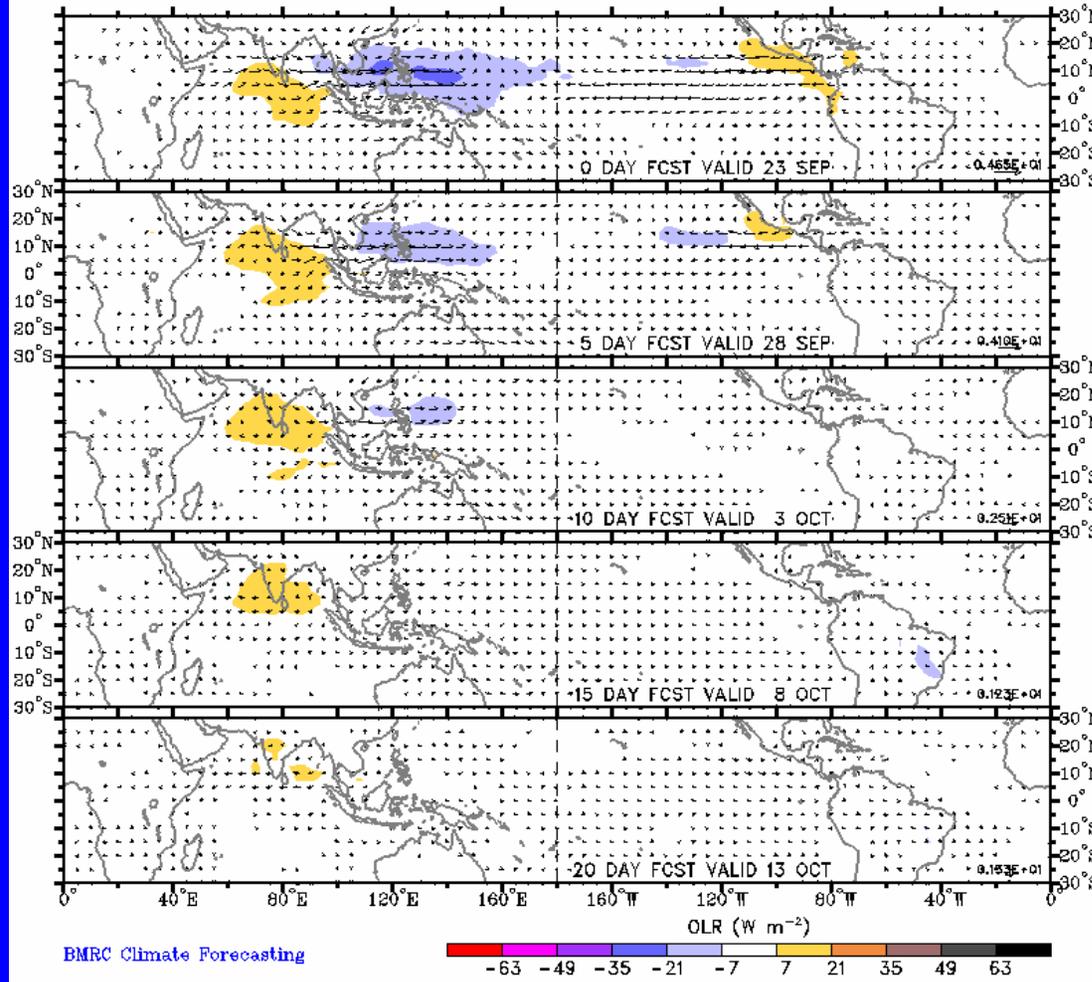
The MJO index amplitude has remained generally constant with no eastward movement during the last ten days.



Statistical MJO OLR Forecast

Prediction of MJO-associated anomalies using lagged linear regression
Predictors are RMM1 and RMM2 on 23 Sep 2007

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



The statistical method continues to forecast enhanced convection for the western Pacific Ocean with dry conditions expected to develop across the Indian Ocean during the next 5-10 days.