

Eastward and Northward Propagation of Tropical Intraseasonal Convection: MJO and Non-MJO Components

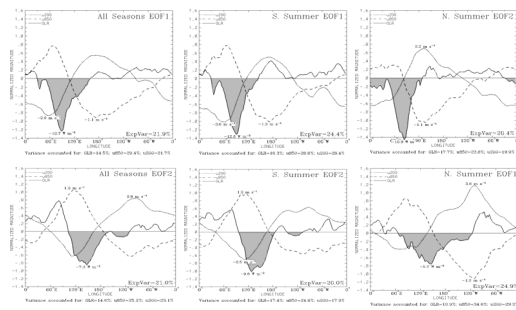
H.H. Hendon and M.C. Wheeler

CAWCR/BoM

Wheeler and Hendon defined the MJO using seasonally invariant EOFs of equatorially averaged zonal winds and OLR (rainfall)

- How seasonally-invariant are the EOFs and structure/eastward propagation of MJO?
- How well is the seasonality of the MJO captured by the seasonally invariant EOFs from Wheeler and Hendon?
- How much of the poleward propagation of convection in the monsoon is attributed to the MJO?
- What is character of poleward propagation independent of the MJO?

Recompute the EOFs northern and southern summer separately



Only minor differences: in NH summer, more elongated convective signal in central Pacific and stronger convective signal in east Pac

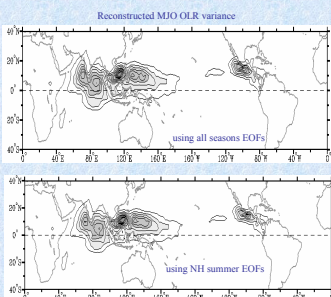
Reconstruct using all-season, northern and southern summer PCs and compare MJO and non-MJO behavior

Represent all fields through their multiple linear regression with the daily PCs (RMM1 and RMM2):

$$OLR_{MJO}(x,y,t) = a(x,y) + b(x,y) \times RMM1(t) + c(x,y) \times RMM2(t)$$

where regression coefficients are function of season

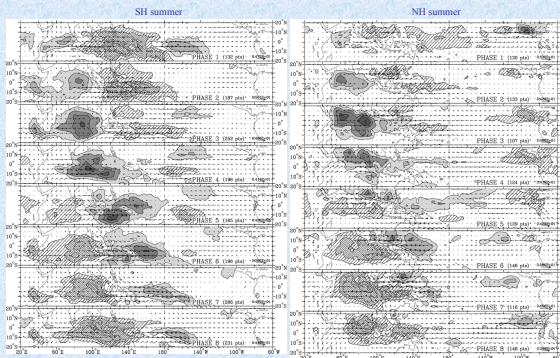
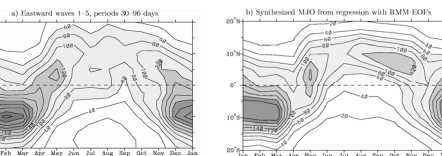
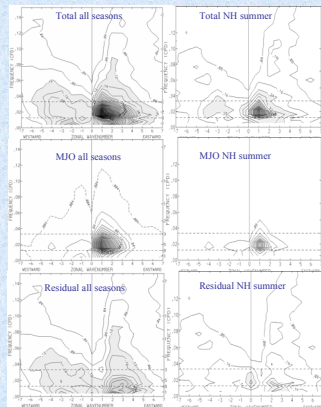
Define MJO part and a residual $OLR_{ANOM} = OLR_{MJO} + OLR_{RESIDUAL}$



Eastward propagation

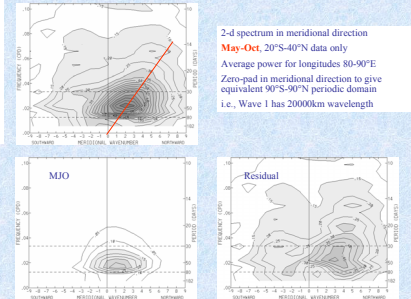
Reconstruction using seasonally invariant EOFs captures all of the MJO spectral peak and all its seasonality (shift into summer hemisphere)

Eastward peak is weaker in NH summer, but equally well defined: eastward propagation is seasonally invariant



Details of phasing of convection and winds for MJO vary seasonally, especially east of date line: needs explanation

Northward propagation



~1/2 of poleward propagation in monsoon stems from MJO: mechanism of poleward propagation independent of that for MJO

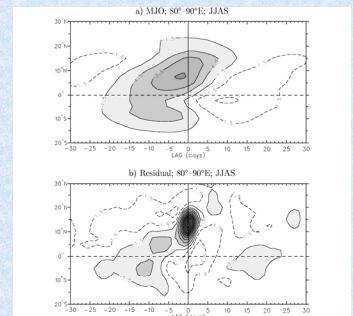
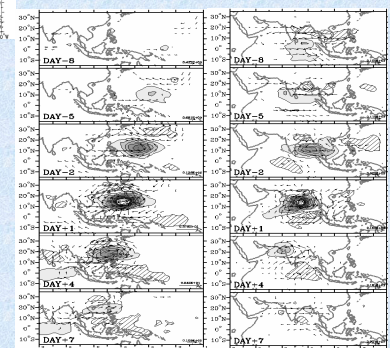


FIG. 9. Latitudinal plots of regressed OLR relative to a 1 std dev in JJAS OLR in the base region 10°-15°N, 80°-90°E, using (a) MJO synthesized fields, and (b) residual anomaly fields. The field is averaged from 80°-90°E, with a contour interval of 3 W m⁻² and positive contours dashed.



Non-MJO (residual) has shorter meridional wavelength with evidence of poleward and westward propagation with Rossby wave structure, especially in west Pacific

Capture same variability with all seasons or NH summer EOFs, despite some minor differences in longitudinal variation of the EOFs