NCEP/NCAR Reanalysis
200mb Geopotential Height (m) Climatology 1968-1996

NCEP/NCAR Reanalysis
200mb Vector Wind (m/s) Climatology 1968-1996
(b) Contours of perturbation pressure $p$ (contour interval 0.2) which is everywhere negative. There is a trough at the equator in the easterly régime to the east of the forcing region. On the other hand, the pressure in the westerlies to the west of the forcing region, though depressed, is high relative to its value off the equator.

Two cyclones are found on the north-west and south-west flanks of the forcing region.
Geopotential height anomalies during a major El Nino

lat: plotted from -40 to 40.00  
lon: plotted from 0.00 to 357.50  
lev: 200.0000  
t: averaged over Nov 1982 to Jan 1983  

Anomaly Eddy hgt m

MAX=76.7988  
MIN=-83.3232  
NCEP GrADS image
NCEP/NCAR Reanalysis
850mb Geopotential Height (m) Climatology 1968–1996

(b) Contours of perturbation pressure $p$ (contour interval 0.5) which is everywhere negative. There is a trough at the equator in the easterly régime to the east of the forcing region. On the other hand, the pressure in the westerlies to the west of the forcing region, though depressed, is high relative to its value off the equator. Two cyclones are found on the north-west and south-west flanks of the forcing region.
Traveling equatorial waves

Fig. 4.25. Time-height sections for the equatorial lower stratosphere, showing evidence of Kelvin-wave activity. (a) Zonal wind and (b) temperature at Canton Island (3°S). Note the westerly phase of the QBO encroaching from upper levels in (a): see Chapter 8. [From Giu
Fig. 1. Zonal wavenumber-frequency power spectra of the (a) antisymmetric component and (b) symmetric component of OLR, calculated for the entire period of record from 1979 to 1996. For both components, the power has been summed over 15°S–15°N lat. and the base-10 logarithm taken for plotting. Contour interval is 0.1 arbitrary units (see text). Shading is incremented in steps of 0.2. Certain erroneous spectral peaks from artifacts of the satellite sampling (see text) are not plotted.
Fig. 1. Zonal wavenumber-frequency power spectra of the (a) antisymmetric component and (b) symmetric component of OLR, calculated for the entire period of record from 1979 to 1994. For both components, the power has been averaged over 15°S-15°N lat. and the base-10 logarithm taken for plotting. Contour interval is 0.1 arbitrary units (see text). Shading is incremented in steps of 0.2. Certain spurious spectral peaks from artifacts of the satellite sampling rate texts are not plotted.

Fig. 2. Zonal wavenumber-frequency spectrum of the base-10 logarithm of the "background" power calculated by averaging the individual power spectra of Figs. 1a and 1b, and smoothing many times with a 1-2-1 filter in both wavenumber and frequency. The contour interval and shading are the same as in Fig. 1.
Figu. 3. (a) The antisymmetric OLR power of Fig. 1a divided by the background power of Fig. 2. Contour interval is 0.1, and shading begins at a value of 1.1 for which the spectral signatures are statistically significantly above the background at the 95% level (based on 500 dof). Superimposed are the dispersion curves of the even meridional mode-numbered equatorial waves for the three equivalent depths of \( h = 12, 25, \) and 50 m. (b) Same as in panel a except for the symmetric component of OLR of Fig. 1b and the corresponding odd meridional mode-numbered equatorial waves. Frequency spectral bandwidth is 1/96 cpd.
Fig. 3. (a) The antisymmetric OLR power of Fig. 1a divided by the background power of Fig. 2. Contour interval is 0.1, and shading begins at a value of 1.1 for which the spectral signatures are statistically significantly above the background at the 95% level (based on 500 dof). Superimposed are the dispersion curves of the even meridional mode-numbered equatorial waves for the three equivalent depths of \( h = 12, 25, \) and 50 m. (b) Same as in panel a except for the symmetric component of OLR of Fig. 1b and the corresponding odd meridional mode-numbered equatorial waves. Frequency spectral bandwidth is 1/66 cpd.
Fig. 4. Coherence squared (contours) and phase (vectors) of cross-spectra between (a) antisymmetric MSU34 and antisymmetric MSU23, (b) symmetric MSU34 and symmetric MSU23, (c) antisymmetric OLR and antisymmetric MSU23, (d) symmetric OLR and symmetric MSU23, (e) antisymmetric 1000-hPa geopotential height and antisymmetric MSU34, and (f) symmetric 1000-hPa geopotential height and symmetric MSU34. The cross-spectra are calculated for the 1979–93 period, and are summed for the latitudes between 15°S and 15°N. The contour interval for coherence-squared is 0.05. In (a), (b), (c), and (f) an additional contour is drawn at 0.02, whereas in (c) and (d) the contouring starts at the level of 0.15. Phase vectors are drawn only
Fig. 6. As in Fig. 3 excluding contours less than 1.1 and greater than 1.4. Thick boxes indicate the regions of the wavenumber-frequency domain used for filtering of the OLR dataset to retrieve the longitude-time information of the convectively coupled tropical waves for the (a) antisymmetric component and (b) symmetric component of the OLR. The thin lines are the various equatorial wave dispersion curves for the five different equivalent depths of $h = 8, 12, 25, 50,$ and $90$ m.
Fig. 7. Geographical distributions of the OLR variance for various parts of the wavenumber-frequency domain of interest. (a) and (b) All planetary to synoptic scales for southern summer and northern summer, respectively. (c) and (d) The MJO-filtered band. (e) and (f) The Kelvin wave-filtered band.
Easterly waves

Thorncroft et al., QJRMS, 1994
[Hodges et al., Mon. Wea. Rev, 2003]
JJA $u, \theta$
over west Africa

PV on 314K