

**A Sea-Level Pressure Index
and the
Warm Events in the Tropical Atlantic Ocean**

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A 16-year data set (1964-1979) of Sea Level Pressure (SLP) from ship observations has been compiled on a $2^{\circ} \times 2^{\circ}$ grid-point system using data from the National Climatic Center, Asheville, North Carolina. Empirical Orthogonal Function analysis were performed on the correlation matrix from data straddling the equatorial rail (between 6°N and 6°S).

The first spatial function, which accounts for 72% of the total variance, displays maximum values on the western equator. The associated amplitude function, which modulates the spatial patterns, shows a powerful interannual signal, with clearly defined periods linked to El Nino/Southern Oscillation episodes (ENSO) (1965, 1972, 1976) (Figure 1 a,b).

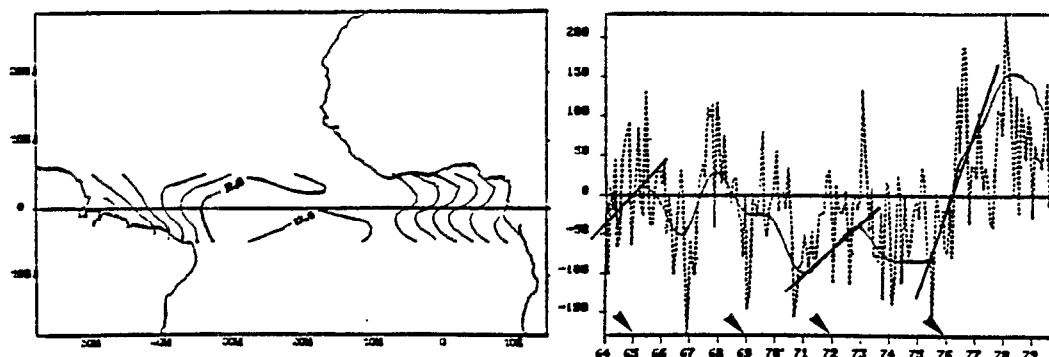


Figure 1-a) First empirical spatial function of SLP for the equatorial rail. This pattern accounts for 72% of the total variance.

1-b) Time history of first amplitude function that modulates the spatial pattern shown in Figure 1-a. Heavy line indicates low-pass filtered data (11-month Gaussian filter). Arrow indicates El Nino years.

Accordingly, a SLP index between Tahiti and Saint Peter and Saint Paul Rocks (SPP), located in the area of maximum amplitude of the first spatial function, is tested against the Southern Oscillation Index (SOI) and the Sea Surface Temperature (SST) of the equatorial Atlantic.

The new Tropical Oceans Index (TOI) is not only in phase with the SOI (0.83 correlation at lag 0 and 95% significance) but precedes the warm events in the tropical Atlantic Ocean by almost one year (0.41 correlation at lag 11 months and 95% significance) (Figure 2 a,b).

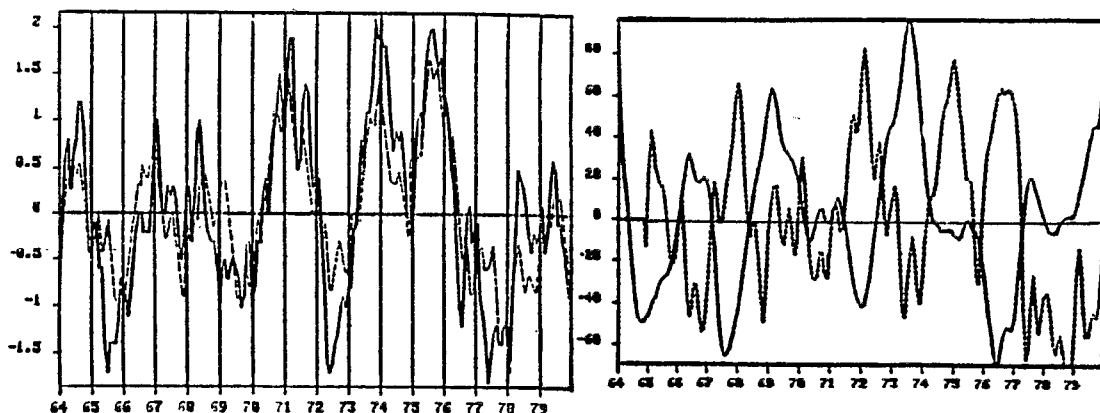


Fig. 2-a) Time histories of standardized SOI and TOI. Solid line indicates Tahiti minus Darwin, surface-pressure-difference anomaly. Dashed line indicates Tahiti minus SPP surface-pressure-difference anomaly.

Fig. 2-b) Time histories of SST (solid line) and TOI (dashed line) for the equatorial rail. Note+ The TOI is 11-month lagged.

It is shown that the global redistributions of atmospheric mass, along with a strong south equatorial trapped signal (SO) is not only associated to El Nino episodes through subtle air/sea interactions but has a positive feedback on the Tropical Atlantic warmings, which are due to tropospheric teleconnection. The fact that the warmings lag the TOI should facilitate their forecast and aid the studies of the interannual variations of Sahelian rainfall.