Proceedings of 8 ICSHMO, Foz do Iguaçu, Brazil, April 24-28, 2006, INPE, p. 1237-1240.

CONVECTIVE CLOUD COVER IN TROPICAL REGION OF SOUTH AMERICA AND AROUND OCEAN USING FULLDISK GOES IMAGES

Marcus Jorge Bottino
Centro de Previsão de Tempo e Estudos Climáticos, Instituto Nacional de Pesquisas Espaciais, Cachoeira Paulista, Brasil

1. Introduction

Many features of the tropical climate are manifestations of dynamic and thermodynamic coupling of Northern and Southern hemispheres, and the Intertropical Convergence Zone (ITCZ) is the most notable phenomena that characterize this region. An extensive amount of research on many aspects concerning the ITCZ, we have comparing a satellite-derived climatology of the ITCZ using 17-year of highly reflective clouds dataset (Waliser and Gautier 1993) with a dataset computed over diary thermal infrared brightness temperature statistics. Both use the convective clouds frequency of occurrence days per month as a statistical measure. In this work we present some discursion about the mean spatial structure, meridional profiles and mean meridional migration of the ITCZ.

2. Data

The data used in this analysis is the lowly diary thermal infrared brightness temperature (LDT) dataset. This dataset was developed on CPTEC/INPE in 2000, which compute the minimum brightness temperature occurred during the eight (each tree hours) diary images. The images are a sample regular latitude-longitude grid, based on GOES-E fulldisk, with 0.1875° resolution (≈20 km) covering the intervals of longitudes 150°W - 0°E and latitudes 75°S - 35°N. The present study regarded the period 2003-2005 and the intervals of latitudes 25°S - 25°N. As a measure of monthly deep convection we are compute the frequency that a given grid point was the thermal infrared brightness temperature minor that 228 K in LDT dataset. The threshold value adopted is a mean founded in other study (Machado et al. 1998;

Maddox 1980). Thus we have 36 monthly fields with the frequency of occurrence days per month of convective clouds cover.

3. Results

The Figure 1 show the mean spatial structure on January, April, July and October monthly average of convective clouds frequency of occurrence (days per month). They resemble Waliser and Gautier (1993) in spatial distribution as well as the scale results. The convective cover zones are quite broad and irregular over tropical landmasses, and are often disconnected from their oceanic counterparts, this features is also founded by Waliser and Gautier (1993) and Machado et al. (1998).

The ITCZ over the oceans is narrow, and the Pacific presents a least displacements. The Atlantic Ocean seem halt in the eastern side, however the other side convective band "touch" since Venezuela to Brazilian Northeast Region in annual cycle.

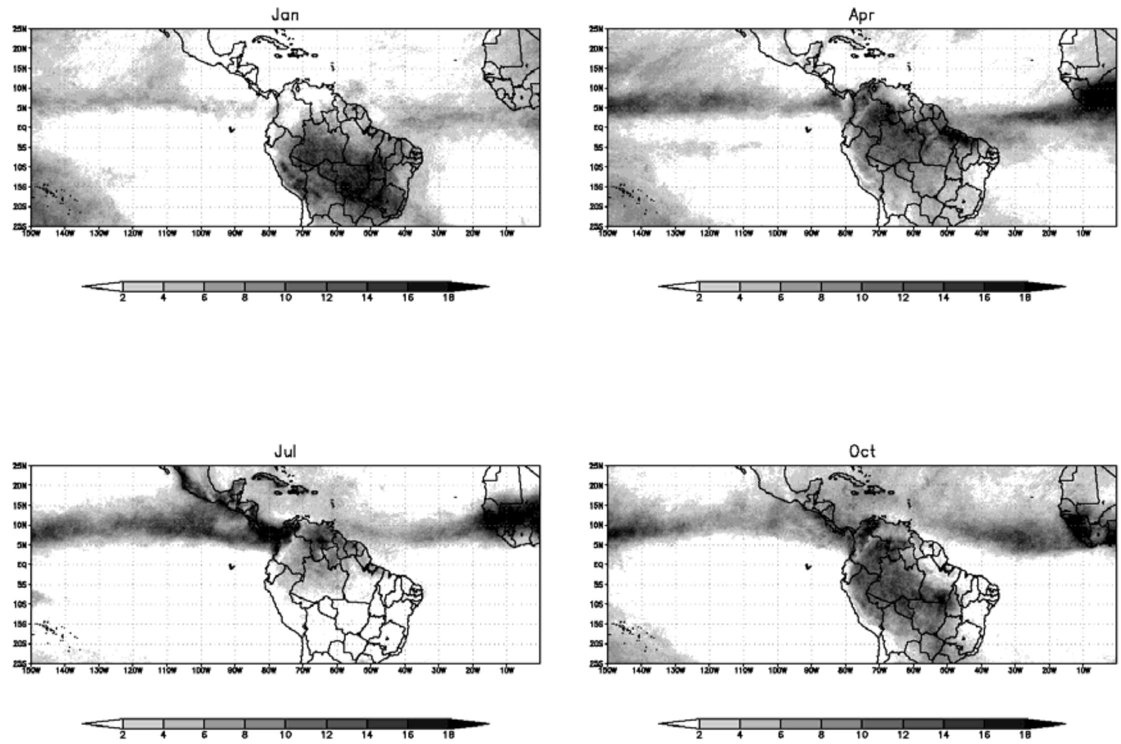

Fig. 1. Mean monthly convective cover occurrence for: (a) January, (b) April, (c) July, and (d) October. Each one were computed from the tree years 2003-2005. Value represent the number of days per month the given grid point was the infrared brightness temperature minor that 228 K.

Table 1. Regions and longitude limits analyzed.

East Pacific	140°W – 100°W
South America	75°W – 45°W
Atlantic	40°W - 10°W

In order to verified the mean meridional position, we select longitude limits in tree regions (Table 1), and calculate zonal and temporal means and monthly standard deviation (same adopted by Waliser and Gautier 1993).

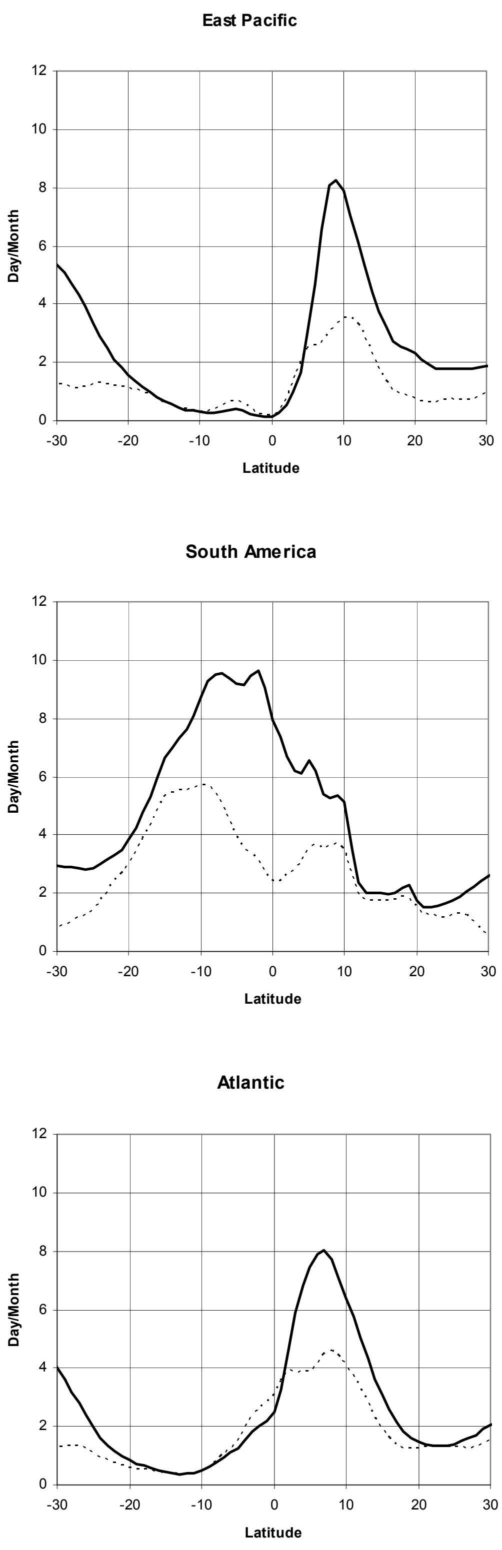

Fig. 2. Meridional profiles of convective cover occurrence for the regions given in Table 1. These profile are the zonal and temporal mean (solid lines) and standard deviation (dotted lines). The standard deviation was computed from 12 (Jan-Dec) mean monthly.

Meridional profiles is presented in Fig. 2 for the tree regions. How above mentioned, the meridional South America convection is broad and more locate in South Hemisphere. In the Atlantic and Pacific Oceans, the great occurrence is about the latitudes 6°N and 9°N, respectively.

The annual meridional cycle of convection over South America (see Fig. 3) seem follow the sun declination, like other studies, January and July is when convection occur more southern and northern respectively. Waliser and Gautier (1993) suggest that surface underlying the ITCZ is largely responsible for the cycle asymmetry. In northern cycle phase the convection reside almost fixed at latitudes range 5°N-10°N during June – October period, that precedes the short transition of the dry-to-wet season in the Amazon Basin, this is also noted by Horel et al. (1993).

The eastern Pacific and Atlantic oceans have similar annual cycles, the ITCZ remains primarily in the Northern Hemisphere, with a two month delay phase respect the sun declination. However, in Atlantic ocean the ITCZ appear slightly more sinuousness and greater amplitude. These features is also founded in Waliser and Gautier (1993).

The continental – ocean lag phase of convective activities produce in Brazilian North Coast: when southward migration period, a strongly subsidence is verified due the two ascending branch (see Fig. 1.d) and the monthly precipitation is null (Bottino et al., 2003); in northward go back migration, the continental convection is faster then it align with Atlantic ITCZ and a intense precipitation occur on coast.

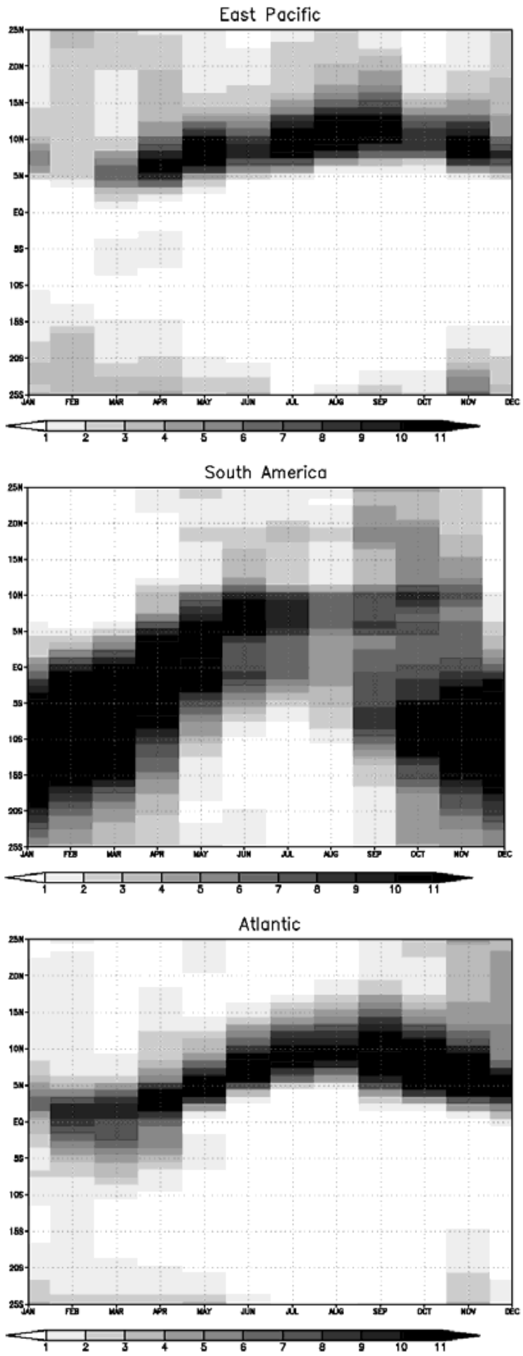

Fig. 3. Time-latitude diagrams of the mean annual cycle of ITCZ for the regions given in Table 1. The value represent a 3 years average of the number of days per month with convective cover.

REFERENCES

Machado, L. A. T., W. B. Rossow, R. L. Guedes and A. Walker, 1998. Life cycle variations of mesoscale convective systems over the Americas. Mon. Weather Rev., 126, 1630-1654.

Maddox, R. A., 1980. Mesoscale convective complexes. Bull. Amer. Meteor. Soc., 61, 1374-1387.

Waliser, D. E., C. Gautier, 1993. A satellite-derived climatology of the ITCZ. Journal of Climate, 6, 2162-2174.

Horel, J. D., A. N. Hahmann and J. E. Geisler, 1989. An investigation of the annual cycle of convective activity over the tropical Americas. Journal of Climate, 2, 1388-1403.

Philander S. G. H., D. Gu, G. Lambert, T. Li, D. Halpern, N.-C. Lau and R.C. Pacanowski, 1996. Why the ITCZ is mostly North of the Equator. Journal of Climate, 9, 2958-2972.

Bottino, M. J., Nobre, P., Carneiro, G. M., 2003: Detecção de Sistemas Convectivos nos Trópicos Utilizando Imagens Multiespectrais do Satélite Geoestacionário GOES-8. *Revista Climanálise*.