Meteorological Systems Acting during the GoAmazon Experiment and Impact on the Collected Data

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1. Introduction

The Amazon has great importance for the climate, both regionally and globally, acting as an important tropospheric source of heat. Thence, it is necessary to understand its climatology and the major weather systems that have an influence on it. For this purpose, there are large scientific projects operating in the region, as the latest GoAmazon, that had a number of sites of instrumental weather observations around the city of Manaus, collecting data during the years of 2014 and 2015.

So, this study has the purpose of evaluate the variability of the daily weather data during the GoAmazon experiment and associate the anomalies found with atmospheric systems operating in the region and large-scale systems.

2. Data and Methodology

To obtain the climatology of the region and the spatial precipitation field for the years of 2014 and 2015, it was used the CHIRPS data (Climate Hazards Group InfraRed precipitation with Station data), from 1981 to 2015, with a spatial resolution of 0,05°. Further, with the precipitation climatology, the dry (20th percentile) and rainy (90th percentile)daily percentiles were calculated.

The daily percentiles were used to identify the dry and rainy events of the precipitation series collected by the GoAmazon sites, and also the CHIRPS precipitation series. After identifying these events, to analyze the atmospheric systems associated with them, some meteorological fields were created with the GFS (Global Forecast System) analysis data, with spatial resolution of 0.5°.

In this paper is presented the results of only one instrumental site of the GoAmazon, the ATTO tower, located 150km northeast of Manaus.

3. Results

Figure 1 shows the spatial precipitation anomaly of 2014 and 2015, based on CHIRPS data, for the region of the five instrumental sites of GoAmazon. The year of 2014 showed above average precipitation in the region while the year of 2015 showed bellow average precipitation, this year was characterized by an intense El Niño event.

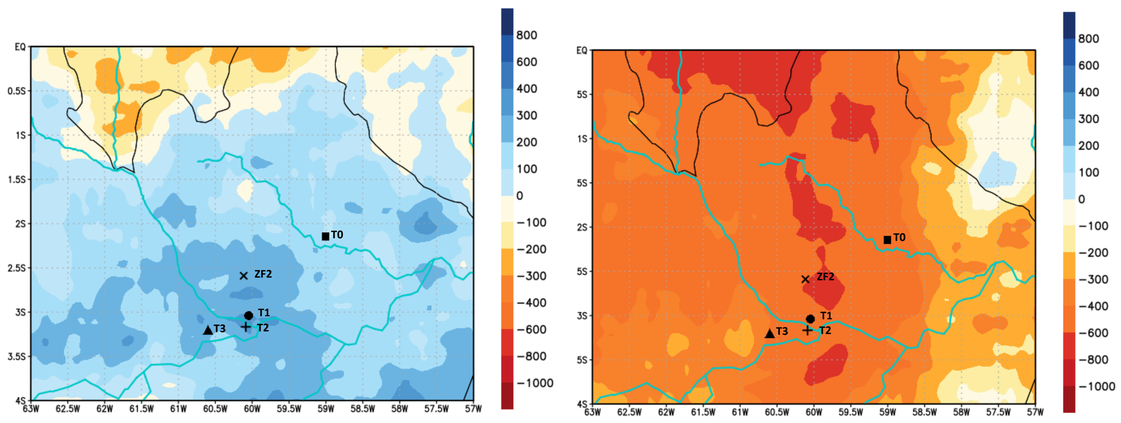

Figure 1: Precipitation anomaly (mm/year) of 2014 (left) and 2015 (right) based on the climatology of CHIRPS. The symbols represent the GoAmazon sites, where: T0 – ATTO Tower; T1 – INPA-Manaus; T2 – Iranduba; T3 – Manacapuru; ZF2 – Reserva do Cuieras.

The number of rainy and dry days, found by the percentiles, in the ATTO and CHIRPS two years series, and the days found in commom by both series, is presented in table 1. It is possible to see that 2015 had more dry days and less rainy days than 2014, which reinforce the impacts of El Niño in this site.

Table 1: Rainy and dry events identified in the ATTO, CHIRPS and both series.

	Rainy Events	Dry Events
ATTO	2014: 37 days 2015: 20 days	2014: 133 days 2015: 155 days
CHIRPS	2014: 47 days 2015: 25 days	2014: 197 days 2015: 223 days
ATTO and CHIRPS	2014: 15 days 2015: 7 days	2014: 109 days 2015: 136 days

The next figures are some composites that shows the main meteorological conditions associated with the 22 rainy events identified in both series for the two years, separated by the events that happened in the rainy season (right side) and dry season (left side). Individual analyzes of these events (not shown in this paper) were also made to identify the meteorological systems associated with each of them.

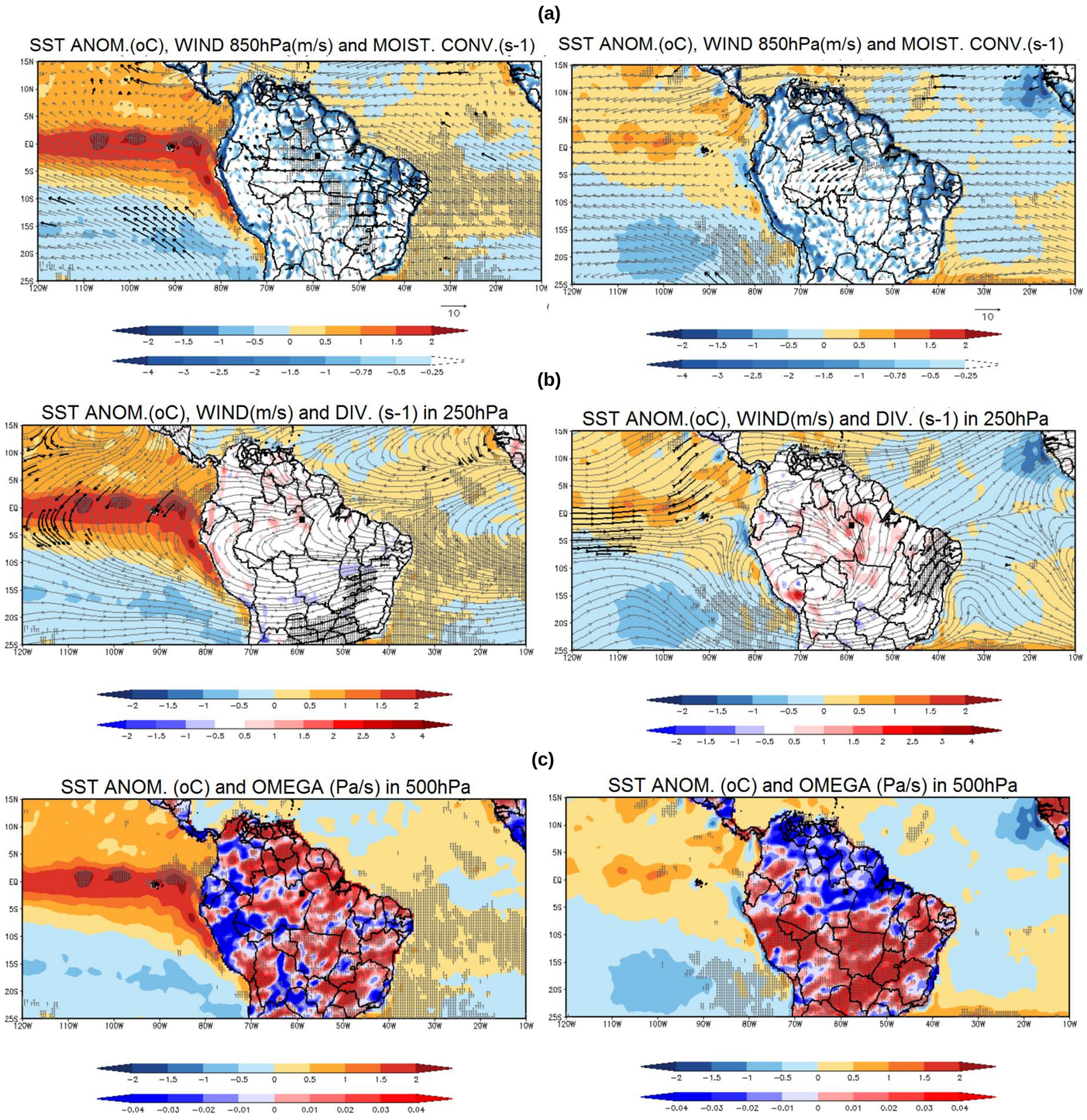

Figure 2:Composites of the synoptic fields for the rainy events occurred in the rainy (right) and dry (left) season: [a].SST anomaly (ºC), wind in 850hPa (m/s) and moisture convergence near the surface (s^-1); [b] SST anomaly (ºC), wind (m/s) and wind divergence (s^-1) in 250hPa; [c] SST anomaly (ºc) and omega in 500hPa (Pa/s). The ATTO tower is indicated as a black square. The statistically significant areas of the shaded fields are indicated by the gray dash and in the wind fields as bold black lines.

4.Conclusions

The results presented here show that in relation to the precipitation regime the years of 2014 and 2015 were the opposite in the GoAmazon sites, with a significant decrease of the rainfall and number of rainy events in the year of 2015, that is possibly an impact of the intense El Niño event occurred in that year.

In relation to the rainy events identified for the ATTO tower site, the events occurred in the rainy season were associated with some elements of atmospheric circulation that are characteristics of the South Atlantic Convergence Zone (SACZ) and Humidity Convergence Zone, that are responsible for a large amount of rainfall in north, central and southeast of Brazil in the austral summer. For the events occurred in the dry season, this elements were not presented, however there were favorable conditions to the precipitation, like local rainfall and the propagation of squall lines.

5.Acknowledgments

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