AN ANALYSIS WITH THE BRAMS MODEL FOR IDENTIFYING BREEZE OCCURRENCE AND PRECIPITATION IN THE CITY OF FORTALEZA-CE IN APRIL 2011 (RAINY SEASON)

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1.INTRODUCTION

The city of Fortaleza - CE presents coast in all its extension in the to the north, being bathed by the Atlantic Ocean. This city to be near to the sea undergoes small variations in its temperature, but result in a pressure gradient due to a temperature variation between the surface and sea surface, being induced by the surface heat flux in the planetary boundary layer. Such phenomena occurring at low levels characterize the breezes that can be terrestrial and maritime.

In this context, it is necessary to analyze the direction and velocity of the wind in this city, as well as its relation with rainfall In this context, it is necessary to analyze the direction and velocity of the wind in this city (North-east coast of Brazil), as well as its relation with rainfall.

2.METHODS

This analyze consisted by done with BRAMS model looking for a relationship between simulated data and observed data. The dates observed were obtained Automated Weather Station (AWS) also called Plataforma de Coleta de Dados – PCD (in Portuguese) for provide direction and wind speed and a disdrometer located in Civil Defense to measure the precipitation per minute in same city. The results in the disdrometer showed different values precipitation; since small values of precipitation until high values of precipitation.

For the simulation, real soil moisture conditions were used according to the CPTEC global model data. The parameterizations were done according to Almeida et al. (2011) the BRAMS version 4.2 model was used in the simulations. For startup, the CPTEC global model was used, with 63x63 Km resolution. Being carried out from 04/17/2011 to 04/21/2011. With two nested crates, both centered in 22 Fortaleza, with horizontal spacing of 10 and 2 km. Possessing 51 vertical levels, initial spacing of 20 m and enlargement ratio of 1.1 to 1,000 m. Being activated the nudging on the sides, top and center.

3.RESULTS

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Figure 1 –Hourly precipitation simulated from April 17 to 22, 2011

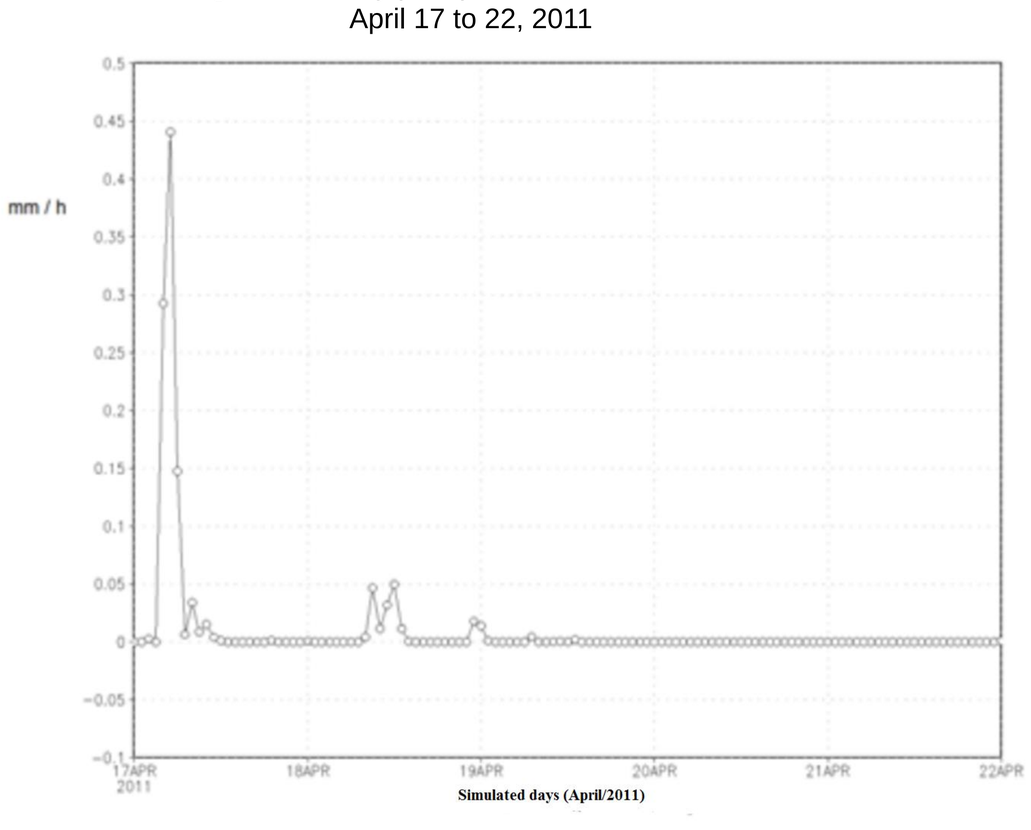


Figure 2 –Representation of droplets and ice crystals on the dysdrometer sensor.

Figure 3 –Average wind direction profile in (degrees) at 10 m height in the PCD of Fortaleza during the period from April 17 to 30, 2011.

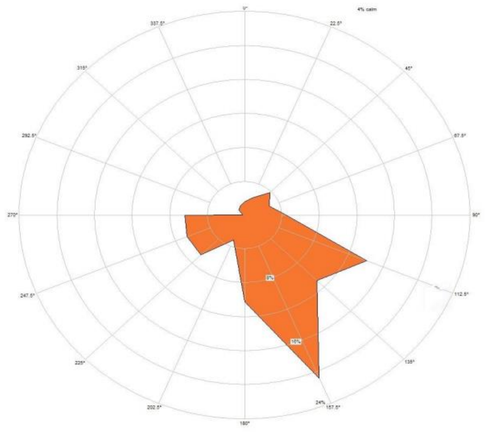
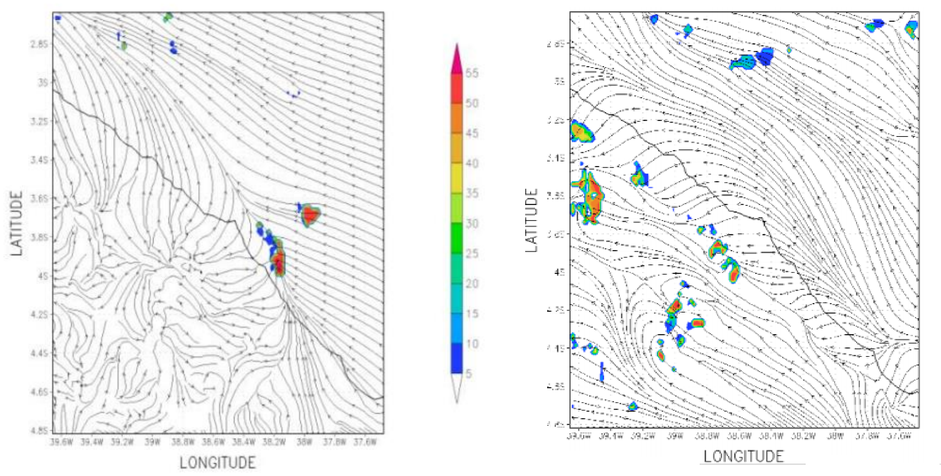


Figure 4 –Occurrence of land breeze and precipitable water (mm/day) on April 18, 2011.

Figure 5 –Occurrence of sea breeze and precipitable water (mm/day) on April 18, 2011.



4.CONCLUSIONS

According to the results obtained in the characterization of wind speed and direction by the Data Collection Platform, the profiles indicated in the graphs show the interaction between the sea-land breeze circulation and the trade winds. During the day the trade winds would be coupled with the sea breeze, intensifying the speed of the wind and at night, the coupling would reduce the same, with predominance of the breezes, as it is observed in the profiles of direction of the wind.

The BRAMS model presented results close to those collected by the dysdrometer. This second showed many occurrences of short rainfall, that is, less than 1 mm. There were simulations that indicated high values of precipitation: 0.4 mm/hour and 0.3 mm/hour. These values agree with the rainfall occurrences with approximately 70% of the occurrences, because when converting these values to the unit of millimeter per minute (mm / min), both precipitation intensities would be concordant with the actual values obtained by disdrometer.

The interpretation of the wind slope shows that some moments have high-speed peaks, agreeing with the wind speed graph as of April 17, 2011. The initial soil moisture conditions provided by CPTEC used to configure this simulation provided satisfactory results. For both the simulated breeze and precipitation agreed with the actual data observed in the DDR and the Data Collection Platform (PCD) used in the RAIN Project located in Fortaleza Civil Defense. The simulations also showed the time interval of occurrence of the breezes: being 4 hours of duration of the terrestrial breeze and 3 hours of duration of the maritime breeze.

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