

Simulation of the wind power over Paraíba-BRA state using the Model BRAMS

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ABSTRACT

Introduction: Due to the population growth, energy demand is currently one of the major problems faced by the contemporary society. Energy consumption is increasing and if the rate of current consumption is kept the world's reserves could be depleted within decades, since the dependence of non-renewable resources is still quite large. In this context the numerical models are powerful tools that can be useful the identification of suitable areas for wind power generation.

Objectives: The aim of this study is to investigate the wind power of the State of Paraíba - Brazil, showing the regions where the behavior of the wind is more favorable for wind power generation. Thus, the model BRAMS - Brazilian Developments on the Regional Atmospheric Modeling System, is used to generate scenarios of wind conditions for that State.

Methodology: We performed simulations for the years of 2007, 2008 and 2009. The BRAMS model was integrated for four seasons with two nested grids. The external grid with 16 km resolution, and internal grid, with a resolution of 4 km. Discussions were based on the 4 km grid. Two points were chosen to be analyzed, one on the coast, P1 (7.38 ° S, 34.83 ° W) and another inland within the state, P2 (7.11 ° S, 36.56 ° W). We show mean values for each season for the chosen points. Model outputs will be analyzed at 70 m which is a typical height of wind turbine rotors. In addition, it will be shown the wind rose diagram for the selected points, which give an idea of the direction of the wind in the area.

Results: For Summer and Autumn the wind is more intense in the continental part of the state, especially in the region of Borborema plateau where the mean wind speed ranges from 4 to 7 m/s for the Summer and 3 to 8 m/s for the Autumn, reaching more than 9 m/s at some points. Both Winter and Spring presents more intense winds in the region of Borborema, as noted earlier for the Summer and Autumn. In this region the values range from 4 to 12 m/s in both

seasons. For the Spring, at some points one can see values above 12 m/s. In general, the lowest mean values of wind speed are found in the region west of the Paraíba state. This is probably due to the influence of the topography of the region. The prevailing wind direction is from southeast.

Conclusion: In general, the results suggest that the wind tends to be more intense in the center of state than in other regions and that Spring is the season with more wind energy.

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