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A probabilistic model for predicting seasonal rainfall in semi-arid lands of northeast Brazil

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Abstract In most of the northeast region of Brazil rainfall is relatively low, presenting significant inter-annual fluctuations, especially when compared to rainfall in other areas of Brazil. Moreover, evaporative rates (like the ones found in the northeast semi-arid region) are too high, sometimes reaching over 2800 mm annually. Owing to such a climate character, very large areas in northeast Brazil are subjected to recurrent droughts. This paper presents a methodology for the prediction of seasonal rainfall in semi-arid lands of northeast Brazil. A total of 72 raingauge stations of Paraiba State, and 84 in Ceará State were employed, all of them distributed in three and seven homogeneous areas, respectively. A rainy season with different subdivisions was established for each homogeneous area. The z_i proportions – the ratio between the cumulative rainfall of the first rainy season period and the rain that falls during the whole rainy season were made to fit the Beta probabilistic model used for calculating the second and eighth deciles and the probability of rainfall above the average rainfall for the second period of the rainy season. The performance of the prognostic model for individual stations of Paraíba State in the period 1996–2000 was evaluated. In the period 1996 to 2000, with rainfall above average, the error was less than 20%. The methodology adopted proved very accurate for forecasting droughts in northeast Brazil.

Key words seasonal forecast; Beta probability model; drought; Brazil