

Spatial and temporal variability studies of precipitation considering the future climate scenarios, with emphasis on extreme events

Luiza M. Bezerra*, Ana Maria H. de Avila, Vânia R. Pereira.

Abstract

The Intergovernmental Panel on Climate Change (IPCC) affirms that in future climate scenarios, the frequency and intensity of extreme weather events may intensify as a result of changes in the global climate, causing negative impacts on the population and natural ecosystems. Therefore, the impacts caused by these events will require adaptations which, in turn, will be based on future projections carried out through simulations of various global and regional models. Thus, this scientific initiation project had the objective of studying the frequency and spatial variability of extreme rainfall events in the city of Campinas, through simulations carried out using the regional model ETA-HADGEM2-ES and surface meteorological data, considering present and future scenarios.

Key words:

Precipitation, Regional Model, Extreme Events.

Introduction

The regional model ETA-HADGEM2-ES was used for analyzes of two scenarios: the present, period 1961-1990, and the future, period 2021-2050. Simulations were carried out on the frequency of precipitation in Campinas, following the threshold of heavy rains proposed by the Civil Defense of the municipality. This threshold considers that events of rain above 80mm in 3 days can potentiate the risks of natural disasters such as floods and landslides. Precipitation data, from 1961-1990, were also obtained from the meteorological station of the Instituto Agrônômico de Campinas (IAC), which served as reference for the analyzes. The data obtained from the IAC station were also used to verify the performance of the Eta-HADGEM2-ES model for the present scenario.

Results and Discussion

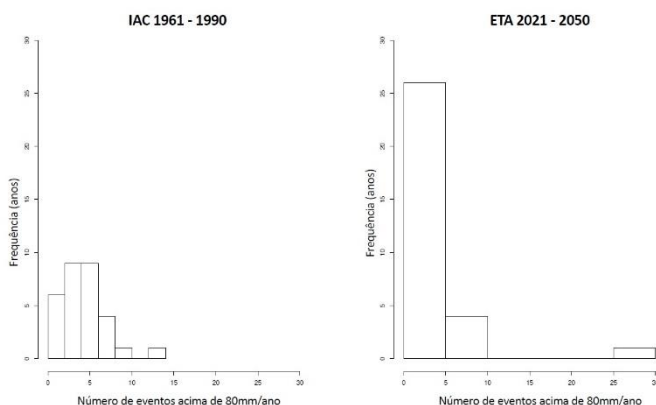


Figure 1. Frequency of events above 80mm / year for different scenarios.

The simulations performed with the ETA-HADGEM2-ES model showed that there will be an increase in extreme events, over 80 mm in the accumulated three consecutive days. This result corroborates the results found by Cavalcanti et al (2017). The authors also used the model ETA-HADGEM2-ES, period 2011-2040 and the simulations indicated an increase of intense rains for the Metropolitan Region of Campinas. It is noted that between the period 2021 to 2050, there will be a single year in which there will

be about 30 extreme events of rain. It is also observed the increase in the number of years with the occurrence of 0 to 5 events per year, from 9 years, as presented by IAC data, to 26 years, according to the model data.

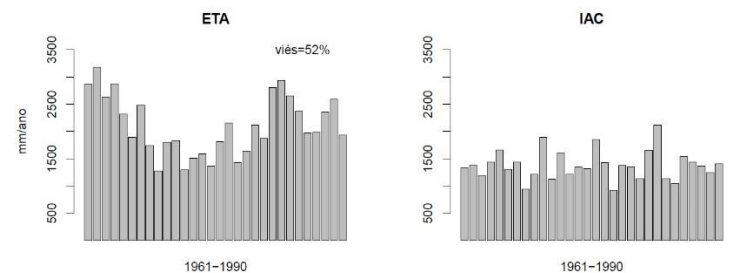


Figure 2. Analysis of the performance of the model concerning to the data observed.

The result of this analysis shows that the model overestimates the IAC data in 726.9 mm of rainfall, thus presenting a more humid climate. The bias between the simulated and observed data is 52.6%.

Conclusions

The analysis of the frequency of heavy rains between the two scenarios and the bias of 52.6% show that there is still much to be done in the accuracy of the model, where more refined techniques aimed at its accuracy should continue to be developed in order that these models can will be taken as an important management tool for public policies aimed at adaptation and mitigation of extreme events in the face of climate change.

Acknowledgement

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Cavalcanti, I.F.A., Nunes, L.H., Marengo, J.A., Gomes, J.L., Silveira, V.P. and Castellano, M.S. (2017) Projections of Precipitation Changes in Two Vulnerable Regions of Sao Paulo State, Brazil. American Journal of Climate Change, 6, 268-293. <https://doi.org/10.4236/ajcc.2017.62014>.