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Statistical Modelling of Maximum Temperature in Rwanda Using Extreme Value Analysis

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Abstract : Temperature is one of the most important climatic factors for crop production. However, severe temperatures cause drought, feverish and cold spells that have various consequences for human life, agriculture, and the environment in general. It is necessary to provide reliable information related to the incidents and the probability of such extreme events occurring. In the 21st century, the world faces a huge number of threats, especially from climate change, due to global warming and environmental degradation. The rise in temperature has a direct effect on the decrease in rainfall. This has an impact on crop growth and development, which in turn decreases crop yield and quality. Countries that are heavily dependent on agriculture use to suffer a lot and need to take preventive steps to overcome these challenges. The main objective of this study is to model the statistical behaviour of extreme maximum temperature values in Rwanda. To achieve such an objective, the daily temperature data spanned the period from January 2000 to December 2017 recorded at nine weather stations collected from the Rwanda Meteorological Agency were used. The two methods, namely the block maxima (BM) method and the Peaks Over Threshold (POT), were applied to model and analyse extreme temperature. Model parameters were estimated, while the extreme temperature return periods and confidence intervals were predicted. The model fit suggests Gumbel and Beta distributions to be the most appropriate models for the annual maximum of daily temperature. The results show that the temperature will continue to increase, as shown by estimated return levels.

Keywords : climate change, global warming, extreme value theory, rwanda, temperature, generalised extreme value distribution, generalised pareto distribution
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