Diagnosis of Extreme Value Distribution of Rainfall in Selected Urban Areas in Kenya

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ABSTRACT

The understanding of temporal characteristics of extreme rainfall is critical in the management of urban floods and other water-related challenges brought about by extreme rainfall events. Climate change studies at global and continental scales indicate that extreme rainfall events are likely to increase in intensity and/ or frequency. Modes of climate variability that force rainfall extreme are also likely to change. In this paper, the feasibility of incorporating some of these modes of variability as climate covariates in describing non-stationarity of extreme rainfall time series using the Generalized Extreme Value (GEV) models was investigated. The highest daily rainfall recorded in each year (annual block Maxima) for stations in Nairobi, Mombasa, Kisumu and Nakuru urban areas were obtained from the Kenya Meteorological Department (KMD). Indices of ENSO, IOD, SOI and Global Temperature anomalies from global data banks were used as climate covariates. The Mann-Kendal trend test, linear correlations and, the generalized extreme value distribution analysis methods were applied on the time series of each station. Results indicated that the annual maximum daily rainfall series at each station had no autocorrelations or linear temporal trends, and that the stationary GEV models of the Gumbel type (shape parameter ~0) at each stations performed better that when the climate covariates were incorporated. The results of this Paper demonstrate that the variability of the global modes of climate variability does not significantly change the stationarity of the GEV distribution of rainfall extremes although extreme rainfall events witnessed during positive ENSO and /or IOD influence the upper tail of the Gumbel distribution.

Journal of Climate Change and Sustainability Vol.1 (8) pp.82-94 (2018)
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