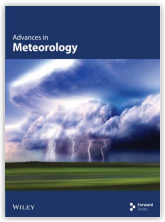
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Historical Rainfall and Evapotranspiration Changes over Mpologoma Catchment in Uganda

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Abstract

Changes in the long-term (1948–2016) rainfall and evapotranspiration over Mpologoma catchment were analysed using gridded (0.25° × 0.25°) Princeton Global Forcing data. Trend and variability were assessed using a nonparametric approach based on the cumulative sum of the difference between exceedance and nonexceedance counts of data. Annual and March-May (MAM) rainfall displayed a positive trend ($p < 0.05$), whereas October-December (OND) and June-September rainfall exhibited negative trends with $p > 0.05$ and $p < 0.05$, respectively. Positive subtrends in rainfall occurred in the 1950s and from the mid-2000s till 2016; however, negative subtrends existed between 1960 till around 2005. Seasonal evapotranspiration exhibited a positive trend ($p > 0.05$). For the entire period (1948–2016), there was no negative subtrend in the OND and MAM evapotranspiration. Rainfall and evapotranspiration trends and oscillatory variation in subtrends over multidecadal time scales indicate the need for careful planning of predictive adaptation to the impacts of climate variability on environmental applications which depend on water balance in the Mpologoma catchment. It is recommended that future studies quantify possible contributions of human factors on the variability of rainfall and evapotranspiration. Furthermore, climate change impacts on rainfall and evapotranspiration across the study area should be investigated.

1. Introduction

Analyses of the spatial and temporal changes in rainfall and evapotranspiration provide an insight into the influences of anthropogenic factors on the catchment hydrological processes [1–3]. In Uganda, approximately 70% of the population depends on agriculture [4], which contributes about 25% of the country's Gross Domestic Product (GDP) [5]. Rainfall plays a key role in the livelihood of agricultural households in low-income countries, Uganda being inclusive, as most farmers primarily depend on rain-fed agriculture [6], hence vulnerable to extreme weather events like drought, floods, etc. Similarly, evapotranspiration is an important element of the soil water balance serving a significant part in determining the potential harvest in the agricultural sector. Therefore, the variations in rainfall and evapotranspiration result in disasters such as drought and floods which impact on a number of sectors [7, 8].

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