

# Temporal and spatial variability of temperature and precipitation over East Africa from 1951 to 2010

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**Abstract** This study presents temporal and spatial changes in temperature and precipitation over East Africa (EA) from 1951 to 2010. The study utilized monthly Climate Research Unit (CRU) rainfall and temperature datasets, and Global Precipitation Climate Centre (GPCC) rainfall datasets. Sequential Mann–Kendall test statistic was used for trend analysis. The CRU data performs better than GPCC data in reproducing EA annual rainfall cycle. Overall decrease and increase in rainfall and temperature trends were observed, respectively, with the reduction in the March–May rainfall being significant. The highest rate of change in annual rainfall was experienced in the 1960s at  $-21.76$  mm/year. Although there has been increase in temperature from the late 1960s to date, sudden change in its trend change happened in 1994. The increase in temperature reached a significant level in the year 1992. The highest warming rate of  $0.05$  °C/year was observed in the 1990s. The highest drying rate was recorded in the 1960s at  $-21.76$  mm/year. There was an observed change in rainfall trend in the year 1953 and about four times in 1980,

although the changes are insignificant throughout the study period except for 1963 when a positive significant change occurred at 5 % significance level. The highest amount of rainfall was recorded in the 1960s. Generally, positive rainfall and temperature anomalies are observed over the northern sector of the study area and opposite conditions are noted in the southern sector. The results of this study provide a reliable basis for future climate monitoring, as well as investigating extreme weather phenomena in EA.

## 1 Introduction

Climate change is a global phenomenon, with varying indicators and impacts from one region to another. The impacts of the changing climate are high in developing countries that are mainly dependent on climate driven economic sectors. Most studies have reported and projected possible increase in frequency and intensity of extreme weather events (IPCC 2007; Niang et al. 2014). Globally, statistics show that temperature is on the rise since the late nineteenth-century, with the last three successive decades being warmer than all previous decades (Hartmann et al. 2013). The variability in rainfall on the other hand varies from one region to another (IPCC 2007).

East Africa (EA; Kenya-Uganda-Tanzania) region despite being located in the tropics, it is mainly made up of Arid and Semi Arid Land (ASAL). Climate variability and climate change in EA region has been studied widely with the main focus on rainfall as compared to temperature (Nicholson 2014; Lyon and Dewitt 2012; Anyah and Qiu 2012; Shongwe et al. 2011). This is explained mainly by the importance of rainfall over temperature in the region. In EA and in this study, precipitation and rainfall are used interchangeably.

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