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ORIGINAL PAPER

Variability of temperature properties over Kenya based on observed and reanalyzed datasets

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Abstract Updated information on trends of climate extremes is central in the assessment of climate change impacts. This work examines the trends in mean, diurnal temperature range (DTR), maximum and minimum temperatures, 1951–2012 and the recent (1981–2010) extreme temperature events over Kenya. The study utilized daily observed and reanalyzed monthly mean, minimum, and maximum temperature datasets. The analysis was carried out based on a set of nine indices recommended by the Expert Team on Climate Change Detection and Indices (ETCCDI). The trend of the mean and the extreme temperature was determined using Mann-Kendall rank test, linear regression analysis, and Sen's slope estimator. December–February (DJF) season records high temperature while June–August (JJA) experiences the least temperature. The observed rate of warming is + 0.15 °C/decade. However, DTR does not show notable annual trend. Both seasons show an overall warming trend since the early 1970s with abrupt and significant changes happening around the early 1990s. The warming is more significant in the highland regions as compared to their lowland counterparts. There is increase variance in temperature. The percentage of warm days and warm nights is observed to increase, a further affirmation of warming. This work is a synoptic scale study that exemplifies how seasonal and decadal analyses, together with the annual assessments, are important in the understanding of the temperature variability which is vital in vulnerability and adaptation studies at a local/regional scale. However, following the quality of observed data used herein, there remains need for further studies on the subject using longer and more data to avoid generalizations made in this study.

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1 Introduction

The potential adverse impacts of climate change on human life, ecosystem, and infrastructure have led to increased research on the subject globally (Meehl et al. 2000; Alexander et al. 2006; Myoung et al. 2013). Temperature is one of the most important climate factors that affect agriculture, hydrological cycle, and to a significant extent, thermal comfort (Walther et al. 2002; Diaz et al. 2005). According to the Intergovernmental Panel on Climate Change (IPCC), the mean global surface temperature computed using a linear trend indicated a general warming of 0.85 (0.65 to 1.06) °C between 1880 and 2012 (IPCC 2014). Further, it was observed that the warmest 30-year period in the last 1400 years might have been between 1983 and 2012. The Fifth Assessment Report (AR5) of the IPCC approximated an average increase of global temperature in the period 1951–2012 to be 0.72 °C (IPCC 2013). The rapid warming is mainly attributed to increase in Greenhouse Gases (GHGs) linked to anthropogenic activities (IPCC 2007). The ongoing global warming is unequivocal (IPCC 2007, 2014); however, its extent varies from one region to another. For instance, over Africa, Collins (2011) observed increasing temperature trends in many parts including tropical region, with significantly warmer

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