



Changes in temperature and heat waves over Africa using observational and reanalysis datasets

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Aiming to provide comprehensive information for climate change at regional level, we assess temperature and heat waves and their spatiotemporal trend and time of emergence over different regions of the African continent. We analyze observational data of Climate Research Unit Time Series version 4.03 (CRU TS) and the three state-of-the-art reanalysis datasets; European Center for Medium-Range Weather Forecasts Reanalysis 5 (ERA5), National Oceanic Atmospheric Administration's Modern-Era Retrospective analysis for Research and Applications, Version 2 (MERRA2) and the Japanese Meteorological Agency's 55 years reanalysis (JRA-55). We assess changes in monthly mean temperature and the agreement between observations and reanalyses. Changes in heat waves are analyzed based on reanalysis datasets because of their high temporal resolution. Heat waves are defined using absolute and relative thresholds, the number of summer days, tropical nights, the percentage of days with maximum and mean temperature above the 90th percentile, the warm nights and the warm spell duration index. The results show increasing trends in monthly mean temperature in all four regions of Africa with different rate of change. A statistically significant trends in heat waves is found in all the regions. Years of highest heat wave occurrence are identified in 2010 for Northern and Western Africa and 2016 for Eastern and Southern Africa. Minimum-temperature based indices, tropical nights and warm nights, show the highest increase in decadal trends and earliest time of emergence, respectively.

Key words: climate change; temperature; heat waves; time of emergence; reanalysis; Africa