

ABSTRACT

This study uses Sentinel-3 SLSTR data to analyze short-term drought events between 2019 and 2021. It investigates the crucial role of vegetation cover, land surface temperature, and water vapor amount associated with drought over Kenya's lower eastern counties. Therefore, three essential climate variables (ECVs) of interest were derived, namely Land Surface Temperature (LST), Fractional Vegetation Cover (FVC), and Total Column Water Vapor (TCWV). These features were analyzed for four counties between the wettest and driest episodes in 2019 and 2021. The study showed that Makueni and Taita Taveta counties had the highest density of FVC values (60–80%) in April 2019 and 2021. Machakos and Kitui counties had the lowest FVC estimates of 0% to 20% in September for both periods and between 40% and 60% during wet seasons. As FVC is a crucial land parameter for sequestering carbon and detecting soil moisture and vegetation density losses, its variation is strongly related to drought magnitude. The land surface temperature has drastically changed over time, with Kitui and Taita Taveta counties having the highest estimates above 20 °C in 2019. A significant spatial variation of TCWV was observed across different counties, with values less than 26 mm in Machakos county during the dry season of 2019, while Kitui and Taita Taveta counties had the highest estimates, greater than 36 mm during the wet season in 2021. Land surface temperature variation is negatively proportional to vegetation density and soil moisture content, as non-vegetated areas are expected to have lower moisture content. Overall, Sentinel-3 SLSTR products provide an efficient and promising data source for short-term drought monitoring, especially in cases where in situ measurement data are scarce. ECVs-produced maps will assist decision-makers with a better understanding of short-term drought events as well as soil moisture loss episodes that influence agriculture under arid and semi-arid climates. Furthermore, Sentinel-3 data can be used to interpret hydrological, ecological, and environmental changes and their implications under different environmental conditions.