TREND ANALYSIS AND VARIABILITY OF HYDROLOGIC TIME SERIES IN THE MBULUZI CATCHMENT

Coli Ndzabandzaba1* and Denis A. Hughes1
1Institute for Water Research, Rhodes University, Grahamstown 6140, South Africa.
*E-mail address: ndzabandzabac@gmail.com

Water resources are increasingly being threatened globally and southern Africa is no exception. Policies and practices aimed at sustainable water resources management are required to respond to these trends to effectively manage freshwater resources. However, these can only be developed based on adequate information about the natural resource availability, variability in time and space, as well as information about existing and future uses. Climate change and variability has proved to be one of the major threats to water resources and human survival. In Swaziland, pressure on water resources is increasing because of the ever-increasing agricultural water demands. The water resources within the Mbuluzi catchment are over-exploited resulting in water scarcity, indicating an unsustainable management of the fragile resource. The aim of the study was to detect any trend in hydrologic time series and to establish the linkages between precipitation and streamflow trends in the Mbuluzi catchment of Swaziland. Variability and trend analyses in water resources have a scientific and practical significance and are often conducted to understand availability of water for future uses. The trend analysis results could help inform policy and contribute to informed decision making for future water allocations and use. Trend detection within a catchment is crucial for successful planning and designing of management for regional water resources. Therefore, trend analysis is of paramount importance to understand the impact that man is having on the natural environment. In this study the CRU rainfall and WR90 streamflow data were used for the analyses. The Mann-Kendall test and Sen’s slope estimator were adopted to detect any hydrological trends in the catchment and to estimate the slope of the linear trends respectively. This was done by applying the Finnish Meteorological Institute MAKESENS v1.0. The results show that there is a positive trend for rainfall in both Black and White Mbuluzi sub-basins while a negative trend is observed for streamflow in the entire catchment. These trends show a slight increase and a slight decrease in rainfall and streamflow respectively in the entire catchment. Therefore, based on the results it can be concluded that rainfall trend is not directly proportional to streamflow trend within the catchment. This can be attributed to the ever-increasing abstractions which are due to increasing agricultural water demand within the catchment.

Keywords: CRU, hydrological trend analysis, Mbuluzi catchment, streamflow, sustainable management, WR90

Topic: Environmental water, and water resources