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Assessment of a Satellite Derived Evaporative Drought Index in the Umgeni Catchment, South Africa

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Climate change impact for southern Africa have been forecasted as increses in weather extremes, particularly floods and droughts. Currently droughts have plagued South Africa, an already semi arid country with highly variable rainfall. ET plays a significant role in the water cycle and is a contributor to drought and drought severity worldwide.The overall aim of this study was to investigate a satellite derived evaporative drought index in the Umngeni Catchment, South Africa. Earth observation in particular is seen to be an important tool in ET estimation over various spatial and temporal scales, as they are able cover large geographic scales as well as remote, ungauged areas In this study, the Standardized Precipitation Index (SPI), Standardized Precipitation Evaporative Index (SPEI) and the Evapotranspiration Drought Index (ETDI) were used to assess the spatial and temporal evolution of droughts for a selected catchment within the semi-arid country South Africa for 2011 to 2016. The ETDI was calculated using the Hargreaves-LST method with temperature input from the MOD11A2 dataset as well as the LandSAF (Land Surface Analyses Satellite Applications Facility) daily ETa product. Validation of the ETa product produced a correlation coefficient of 0.90 and a R2 of 0.81. The calibrated satellite derived Hargreaves-LST method produced correlation coefficients of $\geq$0.77. The satellite derived ETDI was able to detect the 2015/2016 El Niño drought event that occurred in South Africa. The ETDI, SPEI and SPI were able to detect wet and dry events within the study area. The results from this research study highlight the potential of utilizing satellite earth observation data as a data source to monitor droughts, assist in water resources and disaster management in countries with limited data availability.