

ABSTRACT

Analysis of spatial and temporal drought variability in the upper Tana River basin using Palmer Drought Severity Index (PDSI) was conducted. The drought is critical for formulation of mitigation measures in the river basin. A monthly temporal and 90-m spatial resolution was applied. This was achieved within ArcGIS environment. Climatic data for 1970 to 2010 was used for computation of the PDSI while the missing data sets were filled using Artificial Neural Networks (ANNs). The results of PDSI for dry and wet seasons at meteorological stations indicate that the time series plots for the PDSI values for dry season are generally lower than those for the wet seasons. The PDSI values for meteorological stations located at the lower elevation of the basin are lower than those located at higher elevation. On the other hand, spatially distributed drought severity based on PDSI show that the ranges of maximum and minimum drought severity values in 1970 are -0.868 to -0.804 and -0.675 to -0.610 respectively. These values of drought severity occur respectively in the north-western and south-eastern areas of the basin. PDSI values increased from the range -0.675 to -0.610 in 1970 and from -1.087 to 0.957 in 2010 for the north-eastern areas of the upper basin. The south eastern areas of the basin are more prone to drought risks than north-western parts. Use of the PDSI reflects the spatial heterogeneity and temporal variability of drought across the basin. The drought assessment offer technical approach for comprehensive understanding of drought for effective drought-induced disaster mitigation and its management, with a view to reducing adverse effects on livelihoods.