

Abstract

Drought and wet-event patterns in the Upper Tana River basin have significantly been changing due to variation of climatic and human-induced factors. This paper presents the analysis of drought and wet-events using Severity-Duration-Frequency (SDF) curves for the Upper Tana River basin, Kenya based on Surface Water Supply Index (SWSI). The extreme value EV1 (Gumbel) frequency distribution function was used to formulate SDF curves. The developed SDF curves were used to develop isoseverity maps for the basin. From the results, the event-probability show that likelihood of drought events increased linearly with increase in magnitude of SWSI while the return period of drought events increased exponentially with decrease in magnitude of SWSI. The findings show that the probability and magnitude, the return period and magnitude of drought have linear and exponential regression coefficients of 0.984 and 0.980 respectively. On the other hand the probability of wet-period events decreased linearly with increase in magnitude of SWSI while the return period of the events increased exponentially with increase in magnitude of SWSI with regression coefficients of the linear and exponential functions of 0.804 and 0.881 respectively. This indicates that both the drought and wet-events probability and magnitude, and the return period and magnitude have a strong correlation. Spatially, it was found that generally the river basin exhibit an increasing pattern in cumulative SWSI in south-eastern areas than the north-eastern and generally a more increase in extreme wet-events than droughts in the basin. The developed (SDF) curves are critical for design of hydrologic, hydraulic and water resources supply systems while the spatial event-patterns can be incorporated in prioritized mitigation of extreme events.