Abstract

Non-homogeneous hidden Markov model (NHMM) is applied in modeling of daily rainfall occurrences across 16 synoptic stations in Kenya. The time series of the data sets was during the October–December (OND "short rains") season from 1979 to 2005. The tool assumes that the diurnal rainfall events at a network of observing stations are influenced by unobserved states, that is, "weather states." These states' evolution is modeled based on a first-order Markov criterion with state-to-state transition probabilities conditioned on some atmospheric variable indices. The five states are selected using the Bayes information criterion (BIC). To downscale daily rainfall occurrences across 16 stations, a NHMM employed global circulation model (GCM) projection outputs for daily precipitation and sea surface temperatures during the study period. The interannual variability of the mean GCM simulated precipitation and mean historical stations rainfall depicts a weak correlation though significant at 90% confidence level. Thus, it implies that GCM-NHMM simulations do not simulate the rainfall occurrences well. The consecutive wet spell length between the historical rainfall datasets and GCM-NHMM simulated precipitation for 90-day frequencies shows a strong positive correlation significant at 95% confidence level. The findings from this study reveal that the modeling tool is suitable for statistical downscaling of daily rainfall occurrences at multisite stations network. The statistical inference from the model is applicable for drought/flood preparedness, water resource management, and inputs into crop models.