

Statistical Modeling of Extreme Drought Occurrence in Bellary District of Eastern Karnataka

N. M. Alam · A. Raizada · C. Jana ·
Rakesh Kumar Meshram · N. K. Sharma

Received: 21 February 2014/Revised: 25 April 2014/Accepted: 18 June 2014/Published online: 23 July 2014
© The National Academy of Sciences, India 2014

Abstract Drought is a natural hazard which may temporarily affect any region in the world by several means. In the present study frequency analysis of meteorological drought in the Bellary region of Karnataka has been investigated for 52 years (1961–2012) using the Standardized Precipitation Index (SPI) at short (SPI-1 and SPI-3), medium (SPI-6) and long (SPI-12) time scales. This method aims to provide a concise overall picture of drought, regardless of the actual probability distribution of the observed cumulative amount of rainfall for a given time scale. By applying the SPI methodology, results indicated that drought randomly affected a region and several drought events occurred during the period analyzed. The generalized extreme value (GEV) distribution was fitted to data from the location to describe the extremes of rainfall and to predict its future behavior. Minimum assured drought at 50 % probability level was observed to be a better representative of long-term average of drought (minimum SPI) in the region as depicted by the GEV distribution. The return period analysis indicate that the region experiences extreme drought ($SPI < -2$) every ten or less years for all time scales, whereas moderate to severe drought occurs every alternate year. There is thus a necessity to prepare contingency plans for the region and

focus on the cultivation of those crops with a capacity of withstanding droughts of moderate intensity which will be used as a guide for water resource management in the region during droughts.

Keywords Auto-correlation · Drought risk · Generalized extreme value distribution · Return levels · Standardized Precipitation Index

Introduction

During the last few decades water resource managers are facing severe challenges of ensuring water availability all over the world and increasing trends of higher temperature and decreasing precipitation have intensified the occurrence of drought [1]. Drought is a disastrous natural phenomenon that has significant impacts on the economy, environment, industries and the community. The absence of a precise and universal accepted definition of drought adds to the confusion about whether or not a drought exists and if it does what is its level of severity. Although Wilhite and Glantz [2] analyzed more than 150 definitions, many of them do not adequately define drought in meaningful terms for scientists and policy makers. Research has shown that the lack of a precise and