

Use of Probability Distribution in Analysing Winter Rainfall Statistics over the Western Himalayas of India

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Abstract—The climate of Himalayan region is regulated through the occurrences of the western disturbances (WD) during winter (Dec-Feb) season and the southwest monsoon during rainy season (Jun-Sep). During the winter months westerly winds associated with WDs cause precipitation. The primary aim is to identify any inhomogeneity (shift) in the rainfall records of 22-numbers of station data during the period of 1901-2005 over the Western Himalayas. Majority of the stations showed that the most probable year of rainfall shift is 1961. Secondly station-wise rainfall statistics were carried during a recent homogeneous period of 1971-2005 after shift year. Highest amount of rainfall is recorded during the February month along with lowest variability (CV), indicating successive rainfall events. However, less occurrence of rainfall events in December month arises due to higher CV values. Three statistical goodness of fit (GOF) tests namely Kolmogorov Smirnov (KS), Anderson Darling (AD) and Chi-squared (CS) were carried out in order to select the best fit from the four probability distributions functions namely Johnsons SB (JSB), Generalised Extreme Value (GEV), Generalised Pareto (GEP) and Normal distributions. In general results from the three goodness of fit test indicates that GEV is the best fit distribution for winter rainfall whereas JSB is found to be best fit distribution in December and February months. Conditional probability analysis shows that there is nearly 70% and 50% chance of getting more than 40 mm of rainfall during the January and February months respectively while during the whole winter season, the probability of getting more than 100 mm of rainfall is 60%.

Keywords: Western Himalaya, Winter rainfall, Goodness of fit, Probability distribution function, Conditional probability