

Abstract

The main objective of this research work is to make a statistical analysis of maximum annual rainfall frequency of the region North East India. An attempt has been made to find the best fitting model for the estimation of maximum rainfall of North East India.

For this study maximum annual rainfall data of 12 stations covering North East India have been considered. Four parameter estimation methods known as L-moments, LQ-moments, LH-moment and TL-moments are used for regional rainfall frequency analysis of the region. Firstly, regional maximum rainfall frequency analysis using L-moments has been carried out for the region. Using heterogeneity test, the homogeneity of the region has been tested. It is found that the region formed by 12 gauged stations, is a possibly homogeneous one. Five extreme value probability distributions namely generalized extreme value (GEV), generalized logistic (GLO), generalized Pareto (GPA), generalized log normal (GNO) and Pearson type III (PE3) are used for this study. Z-statistics criteria and L-moment ratio diagram are used as goodness of fit tests to select the best fitting distribution. PE3 distribution is identified as the best fit distribution for the region. Regional relationship has been developed using PE3 distribution.

Secondly, regional maximum rainfall frequency analysis has been carried out using LQ-moments for the region. Using heterogeneity test, it is found that the region is homogeneous one. Five extreme value probability distributions used for L-moment are also considered for this study. Using Z-statistics criteria and LQ-moment ratio diagram it is found that GPA distribution is identified as the best fit distribution for the region. Regional relationship has been developed using GPA distribution.

Thirdly, regional maximum rainfall frequency analysis has been carried out using LH-moments of four orders for the region. The four orders of LH-moments are known as L_1 -moment, L_2 -moment, L_3 -moment and L_4 -moments. Using heterogeneity test, it is found that the region is homogeneous for L_1 -moment and possibly homogeneous for other orders of LH-moments. Three extreme value probability distributions namely generalized extreme value (GEV), generalized logistic (GLO) and generalized Pareto (GPA) are considered for this study. Using Z-statistics criteria and LH-moment ratio diagram it is found that for L_1 -moment GPA distribution is

identified as the best fit distribution and for other orders of LH-moments GLO distribution has been identified as the best fit distribution for maximum rainfall estimates of the region. Regional relationship has been developed using GPA and GLO distributions.

Fourthly, regional maximum rainfall frequency analysis has been carried out using TL-moments for the region. Using heterogeneity test, it is found that the region is possibly homogeneous one. Three extreme value probability distributions namely generalized extreme value (GEV), generalized logistic (GLO) and generalized Pareto (GPA) are considered for this study. Using Z-statistics criteria and TL-moment ratio diagram it is found that for GPA distribution is identified as the best fit distribution for maximum rainfall estimates of the region. Regional relationship has been developed using GPA distribution.

A comparative study among the estimation methods has been done using Monte Carlo simulation. For this purpose, two error functions namely relative root mean square error (RRMSE) and relative bias (RBIAS) have been employed. From the comparison it is found that the GPA distribution designated by L_1 -moment is the most suitable and the best fit distribution for maximum rainfall estimates of the region North East India. Also L_1 -moment method is significantly more efficient than the other methods used in this study.
