

# Application of $r^{\text{th}}$ Largest Order Statistics for Daily Rainfall in Trincomalee

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Heavy rainfall is one of the most severe weather hazards affect Sri Lanka. Modeling the extreme rainfall is important to protect the natural resources from the impact of climate change. This paper discusses the comparative assessment of two methods, Block Maxima (BM) approach and  $r^{\text{th}}$  Largest Order Statistics (rLOS) approach, to fit the best distribution and estimate the return level and their confidence band to the daily rainfall measured over the Trincomalee region for the years 1950-2007. In BM approach annual maximum rainfall and in the rLOS model,  $r$  number of maximum rainfall in each year were considered to fit the distribution. The Generalized Extreme Value distribution(GEV) and the limiting joint Generalized Extreme Value distribution (joint GEV) are the classical distributions corresponding to the BM approach and rLOS approach respectively to describe the extremes of daily rainfall and to predict its future behavior. Maximum Likelihood Estimation method was used to estimate the parameters of GEV and joint GEV distributions. From the results of Likelihood Ratio test, it was determined that the annual maximum rainfall fits well with the Gumbel distribution. In the rLOS method, joint GEV distribution was fitted to the  $r^{\text{th}}$  largest rainfall where the value of  $r$  was chosen as  $r=3$  by considering the parameter stability, standard error of the parameter estimates and the return level plot for different  $r$  varies from 2 to 10. This study also predicts the return levels of 5, 10, 50, 100 and 200 year return periods and their confidence band. Comparing with the BM method, rLOS gives the more stable parameter estimates and the narrowest confidence band for the return level.

**Keywords:** Annual Maximum, Generalized Extreme Value distribution,  $r^{\text{th}}$  Largest Order Statistics, Maximum Likelihood Estimation.