

Extreme value analysis of wind speed in Puttalam, Sri Lanka

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Geographically there is a possibility of having high wind speeds in Puttalam. This can cause damages to man-made structures such as bridges, wind-turbines, buildings, radio masts, etc. Therefore assessment of wind speed is utmost important to prevent from such disasters to some extent. Daily wind speed (kmh^{-1}) data for Puttalam from January 2007 to April 2014 was used in the analysis. “Extremes” package of R software was used for the data analysis. In this study we present two different methods for extreme value analysis, Peak-Over-Threshold method, which is based on Generalized Pareto Distribution and Block Maxima approach, which is based on Generalized Extreme Value distribution. Parameter estimation was done using Maximum Likelihood estimation and L-moments method. Hypothesis testing on the shape parameter confirmed the type of the distribution to be used. According to Peak-Over-Threshold method, using the Mean residual life plot, threshold stability plot and diagnostic plots the best threshold value was found as 12.25 kmh^{-1} . The shape parameter was negative and the null hypothesis of data fits exponential distribution was rejected ($p\text{-value} < 0.05$). Hence the best distribution was identified as the Beta distribution. According to the Block Maxima method the null hypothesis that the data fits Gumbel distribution was rejected ($p\text{-value} < 0.05$). Since the shape parameter was negative, data fitted well with the Weibull distribution. Using the identified distributions return levels and their 95% confidence bands were obtained. The 100 year return level using Peak-Over-Threshold method was 18.29 kmh^{-1} whereas according to the Block Maxima method it was 17.99 kmh^{-1} .

Key words: Generalized Extreme Value Distribution, Generalized Pareto Distribution, Peak-Over-Threshold method, Return period, Wind speed

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