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Analysis of Trend and Variability of Rainfall in the Mid-Mahanadi River Basin of Eastern India

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Abstract : The major objective of this study was to analyze the trend and variability of rainfall in the middle Mahandi river basin located in eastern India. The trend of variation of extreme rainfall events has predominant effect on agricultural water management and extreme hydrological events such as floods and droughts. Mahanadi river basin is one of the major river basins of India having an area of 1,41,589 km² and divided into three regions: Upper, middle and delta region. The middle region of Mahanadi river basin has an area of 48,700 km² and it is mostly dominated by agricultural land, where agriculture is mostly rainfed. The study region has five Agro-climatic zones namely: East and South Eastern Coastal Plain, North Eastern Ghat, Western Undulating Zone, Western Central Table Land and Mid Central Table Land, which were numbered as zones 1 to 5 respectively for convenience in reporting. In the present study, analysis of variability and trends of annual, seasonal, and monthly rainfall was carried out, using the daily rainfall data collected from the Indian Meteorological Department (IMD) for 35 years (1979-2013) for the 5 agro-climatic zones. The long term variability of rainfall was investigated by evaluating the mean, standard deviation and coefficient of variation. The long term trend of rainfall was analyzed using the Mann-Kendall test on monthly, seasonal and annual time scales. It was found that there is a decreasing trend in the rainfall during the winter and pre monsoon seasons for zones 2, 3 and 4; whereas in the monsoon (rainy) season there is an increasing trend for zones 1, 4 and 5 with a level of significance ranging between 90-95%. On the other hand, the mean annual rainfall has an increasing trend at 99% significance level. The estimated seasonality index showed that the rainfall distribution is asymmetric and distributed over 3-4 months period. The study will help to understand the spatio-temporal variation of rainfall and to determine the correlation between the current rainfall trend and climate change scenario of the study region for multifarious use.

Keywords : Eastern India, long-term variability and trends, Mann-Kendall test, seasonality index, spatio-temporal variation
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