

Unidirectional trends in rainfall and temperature of Bangladesh

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Abstract To quantify the human-induced changes in precipitation and temperature, it is required to remove the natural climate variability from corresponding time series. Natural climate variability can be explained by the multi-scale variability of hydro-meteorological time series or the scaling effect, which denotes the invariance properties of a time series aggregated on different time scales. A number of studies have been carried out on rainfall and temperature trends in Bangladesh in recent years, but none of the studies considered the natural variability of climate that is present in time series in the form of auto-correlation that inflates the variance of the test statistics and changes the chance of significance. In the present paper the modified Mann-Kendall test, which can discriminate multi-scale variability from unidirectional trends, is used to analyse the trends in rainfall and temperature of Bangladesh over the period 1958–2007. The study shows that significant trends obtained in rainfall amount and extremes at many stations of Bangladesh by previous studies without considering the natural climate variability are due to the scaling effect. After removing the scaling effect, it was found that the annual rainfall only increased in north Bangladesh. Analysis of seasonal rainfall trends only shows a significant increase in pre-monsoon rainfall in Bangladesh. However, temperature was found to increase over the entire country, a similar trend to that suggested by other authors.

Key words unidirectional trends; modified Mann-Kendall test; climate variability; Bangladesh