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# HISTORICAL TRENDS IN AVERAGES AND EXTREMES OF RAINFALL, TEMPERATURE, AND RUNOFF OF SRI LANKA

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## ABSTRACT

Historical trend assessment is an essential part of the climate change investigation efforts. Due to several reasons, including regional climatic fluctuations, Sri Lanka is likely to have a feedback effect on the local climate, especially the changes in the trends of averages and extremes of rainfall, temperature and runoff events. In this study, a comprehensive set of climate indices was used to investigate the historical trends in averages and extremes of rainfall, temperature and runoff in Sri Lanka. The dataset comprised 55 years (1961–2015) of unadjusted daily rainfall and temperature records from 20 synoptic meteorological stations, as well as 53 years (1961–2013) of monthly runoff data collected from 28 gauging stations distributed across Sri Lanka. The linear trends were analysed using the nonparametric Mann–Kendall test and Sen–Theil regression. The pre-whitening method was first used to remove autocorrelation from the time series and the modified seasonal Mann–Kendall test was then applied to the seasonal data. Although variable rainfall pattern is typical in Sri Lanka, during the southwest monsoon (SWM), 15% of the stations showed a statistically significant ( $p < 0.05$ ) decrease in wet days. The increasing tendency in 2-day, 3-day and 7-day mean rainfall events indicates consistent trends in short-duration rainfall events. Warming of nighttime and daytime temperatures is apparent due to the increase in daily minimum temperature and the daily maximum temperature as observed in 70% and 55% of the stations, respectively. In the wet and dry zones, the decreasing trends in the daily temperature range (DTR) were most evident in the southwestern part of Sri Lanka while increasing DTR became more common in the dry zone. While most of the wet zone stations show a decreasing trend in the annual maximum runoff, at least 21% of the stations demonstrate a statistically significant decline during June and July, coinciding with the period of significant SWM rainfall. The research demonstrates evident patterns in the averages and extremes of rainfall, temperature, and runoff. Nonetheless, these patterns are not consistent throughout the entire country, emphasizing the requirement for region-specific adaptation strategies to address the evolving climate.

**Keywords:** Mann–Kendall test, nonparametric regression, rainfall extremes, runoff trends, Sen–Theil regression, temperature extremes.