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Observed climate extreme indices trends and variation in Gandhinagar, Gujarat

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Climate change is very evident and transformative in the 21st century. Variations in rainfall and temperature define the ecosystem services, extreme events (flood, drought, heatwave etc.) and agricultural activities, especially in developing countries such as India where the majority of the population is agricultural dependent. Apart from global variability in rainfall and temperature, a significant change has been also observed at the regional level. Thus it's also very important to study regional variation in climate extreme indices. In this paper historical variation (1991-2022) in rainfall and temperature extreme indices has been computed over the Gandhinagar district, Gujarat. Daily rainfall and temperature gridded data from the Indian Meteorological Department (IMD) have been acquired and used for the Expert Team on Climate Change Detection and Indices (ETCCDI) extreme indices calculation. A data homogenization technique was applied for the quality control and outliers were removed. As recommended by ETCCDI core rainfall (CDD, CWD, PRCPTOT, R30mm) and temperature (CSDI, WSDI, DTR) extreme indices were calculated. The trend was calculated using Mann-Kendall (M-K) and Sen's slope estimator. It was observed that Consecutive Dry Days (CDD) are decreasing ($R^2 = 0.05$) as the days having a minimum rainfall of 10mm are increasing ($R^2 = 0.02$). Cold Spell Duration Indicator (CSDI) suggests that the period having minimum temperature is decreasing ($R^2 = 0.3$) which is also supported by the decreasing Diurnal Temperature Range (DTR) ($R^2 = 0.25$). The observed change in CSDI and DTR is more influenced by the minimum rather than maximum temperature as a continuous rise in minimum temperature has been observed since 1991. Since Gandhinagar district is developing at a very rapid pace the results of this study could be used for the climate change policy framework and better sustainable developmental strategies for the region.