Surface urban heat island variation over major Indian cities across different climatic zone

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Surface urban heat island (SUHI) is a major anthropogenic alteration of the urban environment, and its geospatial pattern remains poorly understand over a larger area. SUHI has been investigated in many regions of the world, but the complete understanding of its dynamics over a large area, across different climatic regime is missing, especially in India. In this study, Moderate Resolution Imaging Spectroradiometer (MODIS), land surface temperature (LST) data from 2003 to 2018 is used to investigate the diurnal, seasonal, and interannual variations in the SUHI intensity, difference in urban and rural LST, across 150 major Indian cities situated over different climatic zones. The result shows the presence of surface urban heat/cool island depending upon climatic zones and seasons. The general sequence of mean SUHI intensity observed over different climatic zones is winter nighttime>summer nighttime>winter daytime>summer daytime. During the daytime, the cities situated in tropical monsoon (Am) (coastal cities), hot steppe (BSh), and hot desert (BWh) climatic zone shows a cool urban island, especially in summer. The nighttime SUHI intensity showed less obvious seasonal variations and always showed positive heat intensity. The cities situated in the humid subtropical (Cwa) zone, which is mainly Indo-Gangetic plain and a major hub of the Indian population, shows strong daytime as well as nighttime SUHI intensity.

Mann-Kendall and Sen's slope estimator test are used to detect the long-term trend of SUHI intensity in different climatic zones. The results show the presence of a decreasing trend in most of the cities during the daytime as compared to nighttime in both the summer/winter season.