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The Contribution of Urbanization to the Current Temperature Trend in Türkiye

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The expansion of urban areas significantly modulates the local climate in cities. In this regard, in the last few decades, there has been a non-negligible increase in the urban areas and the urban population of Türkiye. This study aims to assess the impact of increasing urbanization on the current warming trend which is highly dominated by human-induced climate change. The findings of this study are substantial for sustainable urban planning and future climate studies using temperature observation data. The urban-minus-rural (UMR) method, which has been widely used in urban heat island (UHI) studies, is applied to determine the effect of urbanization on temperature change. In the UMR method, in order to detect the urbanization effect more precisely, the meteorological stations should be properly classified into urban stations and rural stations that have been used as reference stations. In previous studies conducted in Türkiye to determine the impact of urbanization on the warming trend, station classification was done with population data. However, population information does not provide direct information about the extent of urban areas around the stations. Thus, the CORINE (Coordination of Information on the Environment) dataset from 1990 to 2018 was used to directly determine land cover information around the stations. Compared to average temperatures and maximum temperatures, minimum temperatures are more sensitive to the urban heat island effect. Therefore, the daily minimum temperature data of the stations in Türkiye between 1980 and 2022 was used as temperature data. The determination of the change in urban areas around the station was done by placing circular buffers on each station. The correlation coefficient between the change in the urban area within the buffer placed over the stations and the temperature trend of the stations was examined with increasing buffer radii. The radius where the urbanization effect is most pronounced was determined to be 8 km. As a result, statistically significant trends were detected in urban stations in the specified period interval; also, these stations showed a large urbanization effect and urbanization contribution, reaching 0.57°C per decade and 85%, respectively.