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Urban heat trends across global cities

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Urban heat is characterised by elevated temperatures in cities, resulting not only from global climate change but also from urban development and human activities. Previous research on urban heat has predominantly relied on satellite-derived land surface temperature (LST) data to investigate the changes in near-surface thermal environments. However, the applicability of LST for examining the temporal variation of air temperature is still not well understood. Using crowdsourced air temperature observations and satellite imagery, we explore the temporal variation of air temperature and its relationship with LST in more than 50 populated cities worldwide. Results show that city-average air temperature values are highly correlated with LST. However, the intensity of this correlation differs by season, day/night cycle, and is further influenced by background climate. Using satellite LST data, we expanded our analysis to include over 1500 urban areas and evaluated temperature changes in the past two decades. We observed a general trend of increasing temperatures in cities globally, although the rates of warming vary. The highest rate of temperature change was found in cold climate cities, with a more rapid increase during winter days. These cities are predominantly located in Eastern Europe, extending into parts of Western Asia. These findings provide new insights into the application of satellite-based LST for predicting future air temperature changes and identifying areas most vulnerable to urban overheating.