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Synergistic effects between urban heat island and heat waves in China

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Under the background of climate change and fast urbanization, climate extremes such as heat waves tend to be more frequent, more severe, and longer-lasting. Cities face a greater risk of heat waves due to population growth, industry concentration, and the superposition of their unique climate effects. Quantitative analysis of the combined effects of regional-scale heat waves and local-scale urban heat islands is important for urban adaptation to climate change and for urban disaster prevention and mitigation. On one hand, urban expansion, causing reduced evapotranspiration and weakened wind speed that normally cools the lower atmosphere by turbulent heat loss and cooled air advection, led to magnified heat extremes. On the other hand, synergistic effects between urban heat island and heat waves were found in most cities in China. Given this synergistic interaction between urban heat islands and heat waves, collaborative efforts will be necessary to implement climate adaptation and mitigation strategies aimed at reducing the serious heat-related health risks faced by urban residents.