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Enhanced cooling efficiency of urban trees on hotter summer days in 70 cities of China

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Increasing the urban tree cover percent (TCP) is widely recognized as an efficient way to mitigate urban heat. However, in the context of global warming, the response of urban trees' cooling efficiency to ambient temperature remains largely unknown due to the complicated influences of ambient temperature on the physiological state of urban trees. In this study, we quantify the response of urban trees' cooling efficiency to ambient temperature in 17 summers from 2003–2019 in 70 economically developed cities of China. The results show that the cooling efficiency of urban trees is enhanced with increasing ambient temperature, with values ranging from 0.002 to 0.055 per 1 °C increase in ambient temperature across the selected cities. This suggests additional cooling benefits provided by urban trees on hotter days, especially in cities with lower TCP levels. In addition, under the same TCP level, the additional cooling benefits are larger in warmer and wetter cities, as these cities have a sufficient water supply for urban tree transpiration. Finally, this study further confirmed that the enhanced cooling efficiency of urban trees on hotter days can additionally mitigate 3.64% of population exposure to urban heat stress. These results are expected to provide guidance for urban planners to alleviate urban heat risk by utilizing urban trees in a warming world.