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## MODELING URBAN HEAT IN CHICAGO

**Abstract**

In the coming decades, the number of cities exposed to extreme heat will nearly triple, causing thousands of premature deaths, stress on infrastructure systems, and economic losses (C40, 2018). While the entire planet is experiencing this warming trend, cities will see greater temperature gains in comparison to outlying suburban and rural regions. Facing this challenge, planners and policymakers are attempting to reduce urban heat through the implementation of green infrastructure projects such as tree planting and reflective roofing. While these strategies are grounded in sound scientific theory, their real-world effects on temperature have not been thoroughly evaluated. We draw on Earth observations to evaluate whether green infrastructure interventions are successful at reducing urban heat stress in the City of Chicago.

Historically, temperature has been measured in cities through ground-based physical measurements, but this approach is not always feasible in resource-limited settings, and may not offer sufficient coverage of intra-urban temperature variation (Hu and Brunsell, 2015). An alternative approach to analyzing urban heat stress is through the use of satellite-based remote sensing imagery. Utilizing data from Landsat and MODIS satellites, we model land surface temperatures (LST) in the City of Chicago over the past twenty years.

Characterizing changes in temperature over time and between neighborhoods is crucial for identifying vulnerable populations who may be disproportionately affected by high temperatures, and targeting interventions to mitigate morbidity and mortality associated with extreme heat. After a heat wave in the summer of 1995 resulted in more than 700 deaths, the City began making significant efforts to mitigate extreme heat (Angel, 2019). By mapping the temporal and spatial variation in LST, we can evaluate the effects of these city-led green infrastructure policies on urban heat stress.

**Citations**

Angel, Jim. "Summer Heat in Illinois." *State Climatologist Office for Illinois*. Accessed 27 February, 2019. <https://www.isws.illinois.edu/statecli/General/heat.htm>

C40 Cities. 2018. "For Cities, the Heat is On." <https://www.c40.org/other/the-future-we-don-t-want-for-cities-the-heat-is-on>

Hu, Leiqiu, and Nathaniel A. Brunsell. "A new perspective to assess the urban heat island through remotely sensed atmospheric profiles." *Remote Sensing of Environment* 158 (2015): 393-406.