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Differences in the intra-urban temperature reactions of similar size cities in distinct climatic regions using Local Climate Zone approach

Cathy Fricke (1), Omer Ben-Nun (3), Rita Pongrácz (2), Oded Potchter (4), Itzhak Omer (4), and János Unger (1)

(1) Department of Climatology and Landscape Ecology, University of Szeged, Szeged, Hungary (frcsaat@gmail.com), (2) Department of Meteorology, Eötvös Loránd University, Budapest, Hungary, (3) Porter School of Environmental Studies, Tel Aviv University, Israel, (4) Department of Geography and Human Environment, Tel Aviv University, Israel

While urban and rural thermal properties mainly depend on surface cover features, the classification of surfaces using local climate zone system (LCZ) provides an appropriate approach to distinguish and compare the thermal features of different local regions.
In this paper we intend to give a comprehensive picture on the thermal reactions in different urban quarters based on surface and air temperature data from the LCZ classes in urban (and rural) areas of similar sized cities of Szeged, Hungary and Beer Sheva, Israel located in different climatic regions (moderate continental and desert, respectively).
The LCZ classification was completed with Bechtel's methodology, which provides a simple and objective workflow for LCZ mapping. The method uses all the spectral bands of Landsat 8 images, i. e. the dataset is open-accessed and available globally. Urban areas were defined as coherent built-up type LCZs, while their rural surroundings as nearby land cover type LCZs have moderate relief.
Firstly, we analyzed the UHI ont he basis of the satellite-derived land surface temperature data of sensor MODIS in a four-year-long period. Since anticyclonal situation with clear sky and slight air movement is the ideal weather condition to examine the local-scale thermal features, we selected all clear parts of the days in 2014–2018. According to the preliminary results the surface UHI effect is stronger in the daytime than at night and this difference is the most obvious during summer. Furthermore, in order to reveal the effect of climate on urban quarters with similar structures in the two cities, we investigated the thermal differences of each common LCZ classes between Szeged and Beer Sheva.
Then, we analysed the air temperature-based UHI according to LCZ map for each city. In Szeged and Novi Sad two urban monitoring systems have been collecting data since 2014. In Beer-Sheva air temperature was collected by two methods; (1) Net of fix meteorological stations measured climatic variables during calm winter and summer weather conditions in eight periods, and (2) mobile traverse measurements were conducted dawn and in early-afternoon in five periods. The preliminary results show that UHI is more significant in winter than in summer. However, in winter pre-dawn UHI is more dominant than in the afternoon and during the summer UHI is more intense in the afternoon.
These types of long-term studies based on LCZ classification also could locate the thermally stressful areas within the cities providing valuable information for urban planners and decision-makers to develop strategies against the adverse effects of urban climate and climate change in order to create more livable urban areas in the future.