



## Compound impact of extreme summer heat waves and droughts on surface urban heat island in Budapest

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The aim of our research is to investigate how heat waves affect the surface urban heat island (SUHI) phenomenon in Budapest, a mid-latitude city with significant year-to-year differences in temperature and precipitation. A unique, 22-year long time series of continuous measurements from the MODIS instrument on NASA's Terra and Aqua satellites was used to study the SUHI pattern, surface temperature and humidity in detail. The two decades of surface temperature data show a significant warming trend. Analysis of the summers shows that the SUHI intensity decreases as the rural area around the city becomes warmer, especially in July and August, as the less moisture available in the rural area is unable to reduce the surface temperature, similar to the urban area. Thus, the SUHI intensity is mainly determined by the rural surface temperature. During summers with frequent and intense heat waves and droughts, the SUHI is very weak because the land surface temperatures are very high in both urban and rural areas resulting in very little difference between the built-up area and the vegetation-covered surrounding. In our research, we analyse this phenomenon in detail for the years 2003, 2007 and 2022, when intense heat waves occurred in the region. Due to climate change, heat waves and droughts are projected to become more frequent, more intense and more persistent in the future, which is likely to result in adverse effects to the quality of life of urban populations. A detailed analysis aiming to understand the complex environmental processes in the urban environment is essential to develop effective adaptation strategies to the upcoming challenges of climate change.

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