EGU24-18972, updated on 20 May 2024
https://doi.org/10.5194/egusphere-egu24-18972
EGU General Assembly 2024

Extreme heat hazard in the urban areas of Romania in a changing climate

Dana Magdalena Micu, Sorin Cheval, Alexandru Dumitrescu, Raluca Smău, and Vlad Amihăesei
National Meteorological Administration, Climatology, Bucharest, Romania (dana.micu@meteoromania.ro)

Cities emerge as particularly vulnerable environments to climate extremes, exacerbated by the observed climate change These environments are human heat stress hotspots due to the amplified contribution of the urban heat island effect and joint action of extreme weather events The study aims to detect and quantify the changing signals in the combined heat hazard (CHH), associated with concurrent hot days (HD - maximum temperature above 30˚C) and nights (HN - minimum temperature above 20˚C) in 40 large cities of Romania (>100,000 inhabitants), including the capital city. CHH is highly relevant in the assessment of heat-health risk through its inhibiting influence on the recovery from daytime heat stress and exacerbation of the extreme heat impact through sleep deprivation at night. We use homogenized climate observations (1961-2021) and ensemble EUROCORDEX simulations (RCP4.5, RCP8.5), for the near future (2021-2050) and far-future (2071-2100), to analyse the temporal changes in two CHH metrics: CHHf - frequency (number of co-occurrences of HD and HN), and CHHl - length (the maximum number of consecutive co-occurrences of HD and HN). The results show consistent geographical patterns in the change signals of the CHH metrics, over both present and future climates. The strongest change signals in CHH, as well as the most pronounced projected changes, especially in the far-future under RCP8.5 are found in the cities located in the southern, eastern and western lowlands of the country (i.e., Bucharest, Giurgiu, Iasi, Timisoara).

These cities show strong increases in both frequency and duration of CHH, almost doubling by 2050 and even more by 2100. These results are suggestive of a consistent amplification and northward expansion of the areas prone to CHH (i.e., cities located in the central and northern parts of the country).

The correlations between the temporal variability of CHH and the cooling degree days provide an improved understanding of the relationship between energy consumption and prevailing climatic conditions during the extreme heat episodes in urban areas, under both present and future climate warming. The study provides valuable insights into the urban heat hazard and provides science-based evidence that could be used for assessing the heat-health risk at the city scale and optimisation of decision-making for climate change adaptation.

This study has been funded by the project Synergies between Urban Heat Island and Heat Wave Risks in Romania: Climate Change Challenges and Adaptation Options (SynUHI) PN-III-P4-PCE-2021-1695