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Hot and Cold spots identification through mobile measurements during warm season in main urban areas from North-Eastern Romania

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This study aims to identify hot and cold spots in the distribution of air temperature for the most important six cities from the north-eastern Romania (Iaşi, Bacău, Botoşani, Suceava, Piatra-Neamţ and Vaslui), during the warm semester of the year. The analysis of hot and cold spots in the analyzed cities was conducted on data resulted from mobile measurements performed with Meteotracker (MT) mini weather station.

The mobile measurements were carried out under calm atmospheric conditions, with clear or partly cloudy skies, and moderate wind at three moments during the day (morning - before sunrise, noon, and evening - immediately after sunset). From May to September 2022, 80 mobile measurements were made summing up 160 hours of observation. The methodological approach involved conducting mobile measurements that cross both the central area of the cities and the peri-urban and rural areas that are not influenced by urban climate conditions. All mobile measurements started and ended in the same point so that the thermal gradient per minute could be calculated. For hot and cold spots identification, the global autocorrelation analysis method (Moran Index) was used. This analysis aims to identify areas with values that are much warmer (hot spots)/colder (cold spots) than those in neighbouring areas. The relationship between the identified hot and cold spots and imperviousness ratio (IMD) and morphometric conditions was also analysed for each city.

From this analysis, it can be observed that the occurrence of hot spots is more related to high IMD ratios, while cold spots are shaped mainly by topographic conditions. Moreover, hot spots - with a confidence level of 99% - are more frequent in the morning and evening in specific urban regions with IMD values greater than 80%. The analysis results could be useful for stakeholders involved in the mitigation of the urban heat island effect, helping them to identify the regions that risk to be excessively warm during summer in the city.

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