



Creating of local climate zones and verification of urban heat island in Bratislava during four days in June 2016

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Urban heat island (UHI) became important topic during last decades due to intensive growth of urban population as well as climate changes. In urban areas it represents climatic hazard with negative impact on public health. The concept of local climate zones (LCZ) as quasi homogenous climate units for the study of UHI has been introduced to the literature recently. The number of 1012 LCZ based on expert mapping were created in the area of Bratislava. Gathering of the information for reclassification into LCZ types was carried out using imperviousness data from EEA Copernicus project and data from OpenStreetMap for assessment of built-up area. The data about building heights were taken from official electronic basemap of Slovakia. Consequently reclassification of LCZ into LCZ types based on methodology proposed by Stewart and Oke (2012) with the adjustments on Bratislava conditions was carried out. In the next step, 34 of LCZ types were further used for Bratislava region. The MUKLIMO model has been run for the period of four days during June 2016. The mean value of temperature in 2 meters height was assessed for each day at 7 a.m., 2 p.m. and 9 p.m. Difference from the four days mean temperature was calculated for every grid of the area of Bratislava. The raster layers of temperature differences were averaged at selected time, so that the mean difference from the mean temperature was assessed at 7 a.m., 2 p.m. and 9 p.m. in raster form. Relatively high range of temperature differences can be observed in Bratislava. The cause is complex topography of the city placed between hills and lowland and the heterogeneous land use as well. Average amplitude of differences between coldest and warmest part of the area can exceed 7°C. The most distinct UHI at 2p.m. and 9p.m. was localised in the central part of the city and in the largest housing estate Petržalka, as well as in the industrial zones of eastern Bratislava. UHI was incompact in the western part of the city due to more disperse housing estates divided by bigger areas without buildings and with higher percentage of tree cover. The colder parts of the city were presented by large forest area in the northern part of its cadastre and by alluvial forests surrounding the river Danube. The results were compared with temperature measurements from three meteorological stations showing satisfactory results. Smaller differences between model and measurements occur during day hours, bigger differences can be seen during night.

References:

Stewart I.D. and Oke T. R., 2012, Local climate zones for urban temperature studies. Bulletin of American Meteorological Society, 12/2012