



Assessment of urban heat island changes in Bratislava between years 1998 and 2016 using MUKLIMO model

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Urban heat island (UHI) is local climatic phenomena with negative impact on public health mainly during summer months. Its research becomes more important with global warming and with the continuous global increase of urban population which share exceeded 54% in 2016. In this study we present the comparison of the UHI intensity in capital of Slovakia, Bratislava (422000 inhabitants), during heat wave in the summer 2015 using MUKLIMO_3 model. Modelled area of 16*16 km (256 km²) covering the main part of Bratislava capital was selected, the marginal and spatially separated parts of the city were excluded from the study area. Three years - 1998, 2007 and 2016, were selected for modelling and necessary input of land cover / land use (LC/LU) classes was constructed for these years using the Urban Atlas 2012, satellite images SPOT 4/1998, SPOT 5/2007, Sentinel 2/2016 and information from ZB GIS (official electronic base map of Slovakia). Minimal identified area was 1 ha, the minimal identified width was 250 meters in the case of roads and railways. The number of 1359 to 1422 unique polygons were identified for each of the years and subsequently reclassified into 44 LC/LU classes. The main dividing criterion in built-up areas was percentage of imperviousness and height of buildings. Due to intensive building boom in the two decades, about 200 areas with change of LC/LU class can be observed in the study area between 1998 and 2016. The same meteorological situation from the heatwave in 2015 was simulated using MUKLIMO_3 model for the area with LC/LU class from 1998, 2007 and 2016. Generally, temperature increase can be observed between 1998 and 2016. Differences up to more than 1°C can be observed in the areas with change into artificial surfaces. On the other hand the decrease of temperature can be seen where built-up areas changed into areas without current land use (often covered by young woody plants). Model outputs were compared with field measurements from 2015 showing mean difference of 0.56 °C for the city centre.