



The spatial patterns of satellite-derived land surface temperature and modelled air temperature in the summer night in Krakow, Poland

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The urban atmosphere is commonly warmer than the rural one, especially at night, which is known as urban heat island (UHI) phenomenon. During hot weather days in summer months the UHI effect may increase the heat load, which is dangerous to health and comfort of people staying in the city. The detailed characterisation of air temperature spatial pattern in urban areas is required to indicate the parts of the city with the warmest air. Spatially continuous air temperature data may be acquired either through interpolation of point-measured data or modelling approach. Since air temperature is modulated by land surface temperature the remotely-sensed thermal data may be used as input of a model or for comparison with the modelled data. The aim of the study is to assess the correspondence of the night-time modelled air temperature to the satellite-derived land surface temperature in the local climate zones in the city of Krakow and its vicinities. Air temperature is modelled with the use of the urban climate model MUKLIMO_3 and the output data of 100 m spatial resolution are validated using the measurement network data. Land surface temperature data are derived from Terra/ASTER and Terra/MODIS thermal images, of 100-m and 1-km spatial resolution respectively, acquired around 21 UTC on 6th June 2015. That night was cloudless and followed mainly cloudless day, maximum air temperature outside the city exceeded 25 °C, and all day and night there were silence/weak wind conditions. A comparative analysis is based on the statistics calculated for particular local climate zones. The study presents the differences between air temperature and land surface temperature at night in each local climate zone in the urban area and the rural surroundings in order to assess the relationship between both temperatures mostly depending on land use/land cover. Additional examinations include the impact of relief due to Kraków is located in the concave terrain.