EMS Annual Meeting Abstracts
Vol. 11, EMS2014-389, 2014
14th EMS / 10th ECAC

Relation between nocturnal winter Surface Urban Heat Island in cities in Poland, population density, night lighting and energy usage

Lech Gawuć and Joanna Struzewska
Warsaw University of Technology, Poland (lech.gawuc@is.pw.edu.pl)

According to current estimates, half of world's population live in urban areas. That makes the phenomenon of urbanization one of the most important issues that modern society and science have to face. Consequently, there is a growing need for studies of all aspects of urban climate.
One of the most frequently examined issues related to growing cities is the urban heat island (UHI). In spite of the fact that UHI has been relatively well specified in qualitative terms, the quantitative estimates of this phenomenon need considerable enhancement (Fortuniak, 2003). Numerous research in the field of anthropogenic heat flux (AHF) prove that it is one of the most important components of UHI (Sailor and Lu, 2004).

Assuming that the majority of temperature surplus observed in the winter period at nighttime in cities (surface urban heat island - SUHI) is mainly due to the anthropogenic heat flux (especially buildings heating), we will present analyses of spatial agreement between surface temperature, population density and night lighting. The analyses will be done for night cases only, when there is no sun exposure, and when the impact of AHF on temperatures is expected to be the most apparent. Also, we will discuss the relationship between energy usage, density of population for selected cities in Poland and its influence on SUHI formulation in the aspect of meteorological conditions.

The aim of this study is to investigate spatial agreements of parameters that will be considered as an input for the AHF estimation model.
The analyses will be based on MODIS land surface temperature data collected for selected winter cases from years 2004-2014, when very low temperatures were observed. In addition, air temperature from automatic urban monitoring stations maintained by Voivodeship Inspectorate of Environmental Protection for periods coinciding with satellite observations will be collected.