EMS Annual Meeting Abstracts
Vol. 13, EMS2016-47-1, 2016
16th EMS / 11th ECAC


# Urban heat island and outdoor thermal comfort indices in extreme continental climate zone (Astana case-study)

Pavel Konstantinov (1), Alina Akhmetova (2), and Diana Tattimambetova (2)

(1) Lomonosov Moscow State University, Faculty of Geography, Meteorology and climatology, Moscow, Russian Federation (kostadini@mail.ru), (2) Kazakhstan Branch of Lomonosov Moscow State University, Astana, Kazakhstan

This work presents research of UHI phenomenon and outdoor thermal comfort indices, calculated with Rayman model (Matzarakis et al.,2010) in the steppe zone on the example of Astana (Kazakhstan). Current investigation covers the ten-year period from 2003 to 2012. This period is representative for the study because during this short time the city area and its population rapidly increased (from 250 000 to 835 000 within the city). This study is the first research of UHI phenomenon in Kazakhstan and also is the first related to the steppe zone in the world.
This city is quite interesting domain because Now (since 1998) Astana is the second coldest capital city in the world after Ulaanbaatar, Mongolia. So, the main purpose of the research is to study the UHI phenomenon in Astana and the surrounding steppe areas. To achieve this goal the following tasks were set: to identify a typical diurnal variation of UHI, the seasonal variability of UHI intensity, the typical distribution of the extreme values of UHI intensity during the day and on seasons, and to identify an average and extreme values trends.
The average annual value of the UHI intensity (approximately 1,26°C) is the indicator of high-intensity urban heat island for the steppe zone, and detected the positive trend of UHI intensity. The population growth of the Astana (mainly due to labor migration) raises the question of the expansion of the area of the city and the construction of new buildings.
Also analysis of several biometeorological indices, particularly PET (physiological equivalent temperature) and WBGT during summer heat waves showed significant differences between urban and rural outdoor thermal comfort conditions.

References:
1.Matzarakis, A., Rutz, F., Mayer, H., 2010: Modelling Radiation fluxes in simple and complex environments – Basics of the RayMan model. International Journal of Biometeorology 54, 131-139.
Acknowledgements:
The study was supported by grant of the Russian Science Foundation (14-14-00956)