Urban amplification of the global warming in Moscow megacity

Alexander Kislov (1), Pavel Konstantinov (1), Mikhail Varentsov (1), Timofey Samsonov (2), Irina Gorlach (1,3), and Kristina Trusilova (4)

(1) Lomonosov Moscow State University, Dpt. of Meteorology & Climatology, Moscow, Russian Federation, (2) Lomonosov Moscow State University, Dpt. of Cartography and Geoinformatics, Moscow, Russian Federation , (3) Hydrometeorological Centre of Russia, Moscow, Russian Federation, (4) Deutscher Wetterdienst, Department Climate and Environment Consultancy, Offenbach, Germany

Climate changes in the large cities are very important and requires better understanding. The focus of this paper is climate change of the Moscow megacity. Its urban features strongly influence the atmospheric boundary layer above the Moscow agglomeration area and determine the microclimatic features of the local environment, such as urban heat island (UHI).

Available meteorological observations within the Moscow urban area and surrounding territory allow us to assess the natural climate variations and human-induced climate warming separately. To obtain more precisely viewing on the UHI structure we have included into the analysis the satellite data (Meteosat-10), providing temperature and humidity profiles with high resolution.

To investigate the mechanism of the urban amplification we realized the regional climate model COSMO-CLM+TEB. Apart from detailed climate research the model runs will be planned for climate projecting of Moscow agglomeration area. Climate change differences between urban and rural areas are determined by changes of the shape of the UHI and their relationships with changes of building height and density. Therefore, the urban module of COSMO-CLM+TEB model is fed by information from special GIS database contenting both geometric characteristics of the urban canyons and other characteristics of the urban surface. The sources of information were maps belonging to the OpenStreetMap, and digital elevation models SRTM90 and ASTER GDEM v.2 as well. The multiscale GIS database allows us to generate such kind of information with different spatial resolution (200, 500 and 1000 meters).