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# Investigation of urban-caused mesoclimatic features of Moscow megacity

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It is well known that features of urbanized surface strongly influences the atmospheric boundary layer and determine the microclimatic features of the local environment, such as urban heat island (UHI). Climatology and physical mechanisms of urban heat island in surface layer are studied rather good as well as approaches of modelling of this phenomenon at different spatial and temporal scales. Within the big cities urbanized area extends for tens of kilometers, and it is clear that thermal anomalies of such size should make an effect not only on microclimatic features of certain street or park, but also on mesoscale processes in the atmosphere, changing thermal stratification, local circulations and precipitation regime. Hover, understanding of such effects is complicated because they are influenced by plenty of other factors, such as water bodies, orography, weather conditions and wind direction. The number of studies, devoted to urban-cause mesoscale effects in boundary layer and lower troposphere is much lower than number of studies, devoted to surface layer and canopy layer urban heat islands, and some of results are contradictory: for example, existing estimates of the vertical extent of the urban heat island or its influence on precipitation vary significantly.

Moscow megacity, forming the biggest agglomeration of Europe with population more than 15 million people, is a prospective site for study such urban-cased mesoscale effects because of the city size, is compact and symmetric shape and relatively flat and homogeneous surrounding terrain. The city forms strong urban heat island with mean intensity of 2 °C and its maximum values exceeding 10 °C (Lokoshchenko, 2014). In this study we analyze Moscow urban heat island as three-dimensional mesoscale phenomenon and focus on its several features, including the dependence of is shape on wind direction, its vertical extent and its influence on precipitation regime and local circulations. To investigate this effects, we use the data of observations in Moscow region, including vertical microwave temperature profilers MTP-5, and results of sensitivity numerical experiments with regional climate model COSMO-CLM, extended by bulk urban canopy model TERRA_URB (Wouters et al., 2016), adopted for Moscow region and supplied by realistic urban morphology parameters, calculated from OpenStreetMap data with application of original GIS-based technology (Samsonov et al., 2015).

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