



Study specifics of the meso-scale circulation under different large-scale conditions for Sofia region

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Continued development and growth of urban areas leads to intense modifications of the weather conditions compared to rural areas. Since 1950s the population of the city of Sofia has doubled in size. More than 1.2 million people now live in the capital of Bulgaria which is also the biggest city in the country. The permanent development of the city has continuously resulted in the increase of emissions, constituting a negative impact on human health. Improved knowledge of weather conditions would be very useful for air quality studies and in helping mediate these risks. Sofia is located in very complex terrain and events such as heavy rain and snow, fog, frost, strong winds and foehn are observed.

The purpose of this work is to study the specifics of meso-scale circulation under various large-scale (synoptic) conditions for the Sofia city region in order to increase our knowledge of these fundamental physical phenomena and the processes directly related to local urban microclimate. The well-known Weather Research and Forecasting (WRF) model, version 3.7 was used for the numerical experiments, with fine horizontal resolution of 500 meters and detailed representation of the orography and land surface parameters. Different model options were tested to determine the optimal configuration. Several cases were selected for comprehensive verification of model results for various typical and extreme conditions of the main meteorological characteristics against the available experimental data. The best model configurations were selected based on comparisons and performed statistics. Analysis of the results obtained in the numerical experiments lead to determining the basic meso-meteorological phenomena and assessing the extent of the impact they have on the modification of the large-scale flows compared to imperturbable synoptic flow.