



Modelling the Impact of Urbanization on Local Meteorological Conditions of the Sofia valley, Bulgaria

Evgenia Egova (1,2), Reneta Dimitrova (1), and Ventsislav Danchevski (1)

(1) Sofia University "St. Kliment Ohridski", Faculty of Physics, Meteorology and Geophysics, Sofia, Bulgaria (evgenia.egova@meteo.bg), (2) National Institute of Meteorology and Hydrology - Bulgarian Academy of Sciences, Sofia, Bulgaria

The impact of the urban area and its dynamic growth on the quality of life, the environment and local meteorological conditions in recent years is an up-to-date topic. The underlying surface changes and anthropogenic heat release due to urbanization, lead to effects such as urban heat island, local meso-scale circulation and precipitation alteration, and amendment of the local fluxes, which have direct effect on life and health of habitants. The Advanced Research version of the Weather Research and Forecasting model (ARW-WRFv3.8.1.) is employed to simulate the local meteorological conditions. Four nested domains with 32, 8, 2 and 0.5 km grid resolution are explored to perform meso-scale simulations, with the smallest one covers the Sofia valley. The orography and land cover data are represented with very high resolution – 1 arcsec (30 meters) for the orography and 3 arcsec (90 meters) for land-cover data. The WRF model performance is evaluated against available surface and upper air observations. Different land categories have diverse surface thermal properties such as thermal inertia, surface heat capacity, surface emissivity and albedo. An experiment with substitution of the urban area with most representative rural land cover shows significant variances in the surface fluxes. The difference in meteorological conditions between both model runs – with real land cover and substituted urban area, is useful indicator of the impact of urbanization for the specific region. The influence of the city environment on the local meteorological conditions in combination with the presence of the complex terrain in the Sofia valley make this study a challenge.