EMS Annual Meeting Abstracts
Vol. 15, EMS2018-637, 2018

The dependence of ozone concentration on model schemes of WRF-Chem (v3.6)

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Near surface ozone (O_3) is an important secondary air pollutant in urban environments which significantly and harmfully affects both human and plant health as well as the built environment. Our study focuses on the simulated formation of the ozone in urban area and its chemical mechanisms with pollutants emitted mainly from urban traffic, like nitric oxide (NO), nitrogen dioxide (NO_2) and carbon monoxide (CO). The simulated air quality forecasts were achieved by applying the numerical online coupled meteorological and chemical forecast model WRF-Chem (Weather Research and Forecasting Model - Advanced Research WRF, version 3.6, 2014.) which can calculate the emission, the transport, and the deposition processes as well as the chemical reactions of these gas species. Two nested model domains were used representing Central Europe and the Carpathian Basin including the city of Budapest and its surrounding area with horizontal resolutions 15 km and 5 km, respectively. Our simulations were carried out in a few sunny days, when the ozone formation is more significant. The model sensitivity on different chemical model schemes was investigated by running simulations with different model setups regarding mainly the applied chemical mechanism and the photolysis scheme. The horizontally interpolated emission field of the air pollutants used in the WRF-Chem model were static due to the low temporal resolution of the applied annual emission inventory. The model concentration data (both ozone, nitric oxide, nitrogen dioxide and carbon monoxide) were evaluated with the automatic monitoring sites of the Hungarian Air Quality Network (urban traffic, and urban background stations in Budapest) for the corresponding model grid points.