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Modeling urban air pollution in Budapest using WRF-Chem model

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Air pollution is a major problem for urban areas since the industrial revolution, including Budapest, the capital and largest city of Hungary. The main anthropogenic sources of air pollutants are industry, traffic and residential heating. In this study, we investigated the contribution of major industrial point sources to the urban air pollution in Budapest. We used the WRF (Weather Research and Forecasting) nonhydrostatic mesoscale numerical weather prediction system online coupled with chemistry (WRF-Chem, version 3.6).The model was configured with three nested domains with grid spacings of 15, 5 and 1 km, representing Central Europe, the Carpathian Basin and Budapest with its surrounding area. Emission data was obtained from the National Environmental Information System. The point source emissions were summed in their respective cells in the second nested domain according to latitude-longitude coordinates. The main examined air pollutants were carbon monoxide (CO) and nitrogen oxides (NO_x), from which the secondary compound, ozone (O_3) forms through chemical reactions. Simulations were performed under different weather conditions and compared to observations from the automatic monitoring site of the Hungarian Air Quality Network. Our results show that the industrial emissions have a relatively weak role in the urban background air pollution, confirming the effect of industrial developments and regulations in the recent decades. However, a few significant industrial sources and their impact area has been demonstrated.