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NO2 and PM10 concentration reduction potential in Berlin

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Urban emissions of particulate matter < 10 μm (PM10) and ozone precursors are very important in relation to air pollution reduction strategies. The aim of this work is to investigate the air pollution reduction potential of the city of Berlin in controlling air quality standards. The aerosol chemistry transport model REM_Calgrid (RCG) has been used to calculate the NO2 and PM10 concentrations over Berlin. The model was run for the whole year 2002 over Europe (horizontal resolution ca. 25 km) with a nest over the Berlin-Brandenburg area with a 4 km horizontal resolution and with a second nest over Berlin Greater Area with a 1 km horizontal resolution. The same model set-up has been used in calculating different emission scenarios which have been proposed by the Berlin Senate Department of Urban Development. Comparisons between simulated and measured data 2002 have shown the ability of the model to reproduce background NO2-concentrations within a 30% confidence level. Comparisons for aerosol-phase sulphate, nitrate and ammonium ions and for PM10 showed satisfying results on the average (between 35%). The calculated 2010 emission scenario has shown a possible 20% NO2 reduction for the urbanised Berlin area, while PM10 concentrations are reduced by ca. 3.5 μg/m3 in the city-centre. Effective reduction the of primary fine and coarse aerosol burden is more likely in the inner city (-35%), while the reduction potential for secondary inorganic and organic aerosol components is negligible. In order to determine the maximum reduction potential of the city of Berlin a separate model run without Berlin emissions has been carried out for the year 2002. NO2 and primary PM10 components show strong gradients between the inner city or Berlin and the outskirts. 2/3 in the centre and 1/3 in the suburbs of the local concentrations are due to Berlin-specific emissions. 1/3 of total PM10 concentrations in the city-centre and only 1/10 in the outskirts are due to local pollutant injections, while only 1/20 of secondary PM10-components are due to local emissions.