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Air quality and aerosols in the Rhine-Main region using MECO(2)

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The problem of health risks associated with poor air quality in cities and metropolitan areas is rising in the perception of society. In order to improve air quality, a thorough understanding of the role of different emissions as well as the physical and chemical processes involved is of crucial importance, e.g. for traffic related emissions and vehicle driving restrictions in major German cities.

To asses whether certain measures are suitable to improve air quality we set up a simulation using MECO(n), a global to regional chemistry climate model.

As the issue of air quality can not be reduced to a gas phase problem, a comprehensive, seven modular, aerosol module (GMXe) is used in addition to the gas phase mechanism. So we can investigate the influence of different aerosol processes on the model results. To evaluate the simulation set-up, the model results are compared to local, ground based measurements of particulate matter PM_{10} and $PM_{2.5}$, nitrogen oxides NO_X and Ozone O_3. The measurements are taken from the monitoring database of the Landesumweltamt of Rhineland-Palatinate, namely key species connected with health risks like particulate matter, ozone and nitrogen oxides.

This work focuses on a better understanding of the representation of aerosol processes within the model and its influence on a regional scale. Furthermore, we investigate the influence of the spatial and temporal resolution of (anthropogenic) emissions on the model results. In the end we obtain a model set-up with which we are able to conduct simulations with different emission scenarios, so that we can evaluate the impact of different policy measures on air quality in Mainz and the Rhine-Main region.