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

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The problem of poor air quality in cities and metropolitan areas is rising in the perception of society. A thorough understanding of the influence of emissions and different processes on air quality is necessary, as poor air quality not only implies lower living qualities but also negatively influences human health.

In October 2018 the administrative court in Mainz ruled in favour of possible driving bans for older Diesel vehicles in order to reduce traffic $NO_x$ emissions and improve air quality. To assess the question whether such measures are suited, we set up a simulation using the MECO(n) system based on MESSy, an earth system model with its roots in ECHAM, with two COSMO nests. In the end we obtain a grid resolution of about 7 km over the Rhine-Main region. As the issue of air quality can not be reduced to a gas phase problem, a comprehensive, seven modular, aerosol module (GMXe) is used to include aerosol processes and investigate the influence of heterogeneous reactions on the simulation result. To evaluate the simulation set-up, the model results are compared to local, ground based measurements of $NO_x$ and particulate matter $PM_{10}$ and $PM_{2.5}$.

This work focuses on a better understanding of the representation of aerosol processes within the model and its influence on a regional scale. In this context we investigate the influence of the spatial and temporal resolution of (anthropogenic) emissions on the model results. In the end we aim for 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 policies on air quality in Mainz and the Rhine-Main region.