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The ability of mesoscale meteorological models - driving chemical transport models - to predict the vertical profiles of meteorological parameters COST728 evaluation study

Ekaterina Batchvarova and Sven-Erik Gryning

As part of the COST 728 action (Enhancing Mesoscale Meteorological Modelling Capabilities for Air Pollution and Dispersion Applications) a major model comparison and evaluation exercise is carried out.

The model domain covers Central and Northern Europe. The modeling period is February-March 2003, when several PM₁₀ episodes were observed. The participating models differ widely in their ability to simulate the PM₁₀ concentrations. In order to highlight the influence on meteorology the model meteorological parameters crucial for the prediction of air pollution concentrations are evaluated against measurements of vertical profiles derived from radiosoundings, wind profilers, tall masts.

Although the boundary-layer height plays a central role for the PM₁₀ predictions by chemical transport models and is often an output parameter from mesoscale meteorological models, the way it is obtained is not transparent. Therefore when modeled and measured heights of the boundary layer are compared it is not clear if the values are based on the same definitions. This problem can be overcome by evaluating the vertical profiles of meteorological parameters, such as wind speed and direction, humidity, temperature, TKE.

Data from the so called Lindenberg column comprising the 92-meter mast, radiosoundings and wind profiler data at Lindenberg (DWD, Germany), the 250 meter tower turbulence measurements at Hamburg (University of Hamburg) and 200 meter mast at Cabauw (KNMI) are analyzed in the study and compared to different models output.

The ability of the models to simulate the height of the boundary layer is crucial in an episode situation. The datasets behind the evaluation will be described with special emphasis on the profiles of wind, temperature and humidity and turbulence in the lowest few hundreds of meters. Experience on advantages and limitations from the data evaluation will be discussed with main emphasis on the meteorology.

