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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aerosol distribution over Europe: a model evaluation study withdetailed aerosol microphysics" *by* B. Langmann et al.

Anonymous Referee #1

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General Comments

The paper describes the results obtained with a regional-scale atmospheric climate-chemistry model which has been extended by the addition of a microphysical aerosol module.

The paper addresses relevant scientific questions which are clearly within the scope of ACP. The paper is an interesting contribution to the treatment and evaluation of aerosol processes in regional atmospheric modeling. Aerosol components considered, using the M7 module, are SO4, BC, OC, sea salt and mineral dust. The formation of nitrate, ammonium and the formation of secondary organic particles from gaseous precursors is not included in the modeling exercise. The importance of nitrate and ammonium for

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Discussion Paper

particle mass concentration is not mentioned in the text. I suggest to include some remarks on the role of nitrate and ammonium into the paper, just for completeness.

The paper is clearly written and well structured. Specific scientific questions in the complex field of aerosol modeling are well adressed. The importance of secondary organic aerosols is discussed as well as the impact of increasing residential wood burning and vegetation fires. This lead to the important point of further improvement of emission data bases, in particular needed for aerosol modeling. This is also an important point for further application of air quality models with respect to air pollution abatement strategies.

The results are an valuable contribution to the field of regional aerosol modeling. The paper shows that there are still considerable gaps in the available knowledge of processes leading to the observed aerosol concentrations. It shows that modeling of aerosols in the atmosphere still remains a challenge for process modelling and three-diemnsional modeling on all scales.

I recommend to publish the paper without major changes.

Specific Comments

What is the horizontal resolution of the model ? (0.5 degrees as specified on page 17899, it might be better to mention that in section 2 "Model setup")

What is the thickness of the lowest layer ?

With respect to fig. 4:

EMEP emissions have, as far as I know, still the tendency to overestimate SO2-Emissions in the eastern part of the modeling domain. Is there a tendency in the comparison of observations with model results to overestimate SO2 in the eastern part of the modeling domain ?

Usually it is assumed that SO2-emissions during summer are considerably lower than

ACPD

7, S9021–S9023, 2008

Interactive Comment

during winter. Does the emission rates used in the model show strong seasonal variations of sulfur emissions ?

Fig. 5 / p. 17901, 17902:

The simulation of ozone in summer shows strong deficiencies, in particular for values higher than 140 - 150 ppb. The daily variation of emissions does not change this results considerably (5% change), an increase of biogenic emissions by a factor of 5 increases ozone up to 20 %.

How are the biogenic emissions determined ?

What kind of photochemical model is used ?

Has the photochemical model evaluated before ? With better results ?

Technical corrections:

The 1:1 line is missing in fig.7, left

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 17893, 2007.

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7, S9021–S9023, 2008

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