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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aerosol modelling in Europe with a focus on Switzerland during summer and winter episodes" *by* S. Aksoyoglu et al.

S. Aksoyoglu et al.

sebnem.aksoyoglu@psi.ch

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We would like to thank Referee 1 for the comments that helped improving the manuscript. The replies to specific comments are given below.

P. 10801, lines 21-24: We agree that VBS is not the only way to improve organic PM modelling, therefore we extended the introduction by referring to the other approaches and references.

P. 10803, line 16-18: It is true that the treatment of oligomerization in CAMx is rather simple at the moment. It is based on a few available experiments. In order to simulate this process correctly more research is needed. We added a sentence in the revised

version to clarify this point (section 2.1).

P. 10803, line 18: Aqueous chemistry of SOA is not treated yet in CAMx (added in section 2.1).

P. 10804, lines 20-21: The reference for EC/OA split is provided (section 2.2).

P. 10808, last paragraph: We are aware that wind speeds are related to other variables. However, comparison of meteorological variables with measurements indicated that in general the performance of MM5 for humidity, solar irradiance, temperature, wind direction and precipitation was satisfactory. On the other hand, wind speeds were overestimated during the low-wind conditions. Our focus is on the photochemical model and the meteorological fields are very important input parameters. We think that input should be as realistic as possible in order to get a reasonable model performance. The wind speed is very important for the photochemical model to get correct position and magnitude of the chemical species concentrations. Otherwise, too high wind speeds would change the location and concentrations of pollutants in the model domain significantly. Therefore we calibrated the MM5 wind speeds with measurements -only during the low-wind periods. In all simulations, the original MM5 fields were used as input for CAMx model except wind speeds in the low-wind periods. The modifications were done on a daily basis. Only horizontal wind fields were transferred to CAMx where the vertical component is calculated internally, so the mass conservation is fulfilled. We modified the abstract as recommended.

P. 10810, line 5: PM1 concentrations refer to AMS measurements whereas PM10 data come from filter measurements. A collection efficiency (CE) of 0.5 for AMS was used for the measurement campaign in January 2006 in Zurich, assuming that CE was approximately constant during the whole campaign (Lanz et al., 2010). CE=0.5 represents the default value. However, CEs up to 1 have been reported in literature for ambient particles. Therefore, PM1 (AMS) concentrations higher than PM10 levels on 24 January (in Fig. 14) might be due to too high AMS data. On the other hand, some

loss on PM10 filter measurements cannot be ruled out.

P. 10810, line 16: The model results refer to PM2.5. The monthly average model results for each period are given together with average measured PM2.5 (daily) and PM1 (hourly) measurements in section 3.1 of the revised version.

P. 10811, line 7: Although the definition of MFB is given in the original reference by Boylan and Russell 2006, as MFB $\leq \pm$60%, we agree that it should be -60% < MFB < +60%. We changed it in the revised version of manuscript (section 3.2).

P. 10811, lines 6-9: We added some more evaluation of model performance criteria and goals in section 3.2.

P. 10812, lines 27-28: We looked at the changes in all species in sensitivity tests with temperature. The highest effect was predicted for nitrate. SOA was also affected by temperature change, much less though (between 0.1-0.2 microg/m3). We included a short comment about it in the revised manuscript.

P. 10813, first full paragraph: Yes, dry deposition for each gas-phase species including oxidized gas-phase precursors for SOA is included. This point is now mentioned in the manuscript.

P. 10813, line 15: We agree that 50% change in emissions is rather high. We performed the simulations with smaller changes (15%) as well. The maps look very similar to the case with 50% changes. On the other hand, the absolute changes are smaller as it would be expected. We added 2 supplementary figures with 15% changes in winter and summer 2006 in Europe.

Editorial comments P. 10801, line 20; “several factors” was replaced by “a large amount”.

p. 10803,line 20; p. 10812, line 17. We replaced “aerosol phase” by “particulate phase”.

P. 10808, line 12: “vertical layers” were replaced by “vertical levels”.

P. 10810, line 12: subscript for PM1.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/11/C5804/2011/acpd-11-C5804-2011-supplement.pdf

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Interactive comment on Atmos. Chem. Phys. Discuss., 11, 10799, 2011.

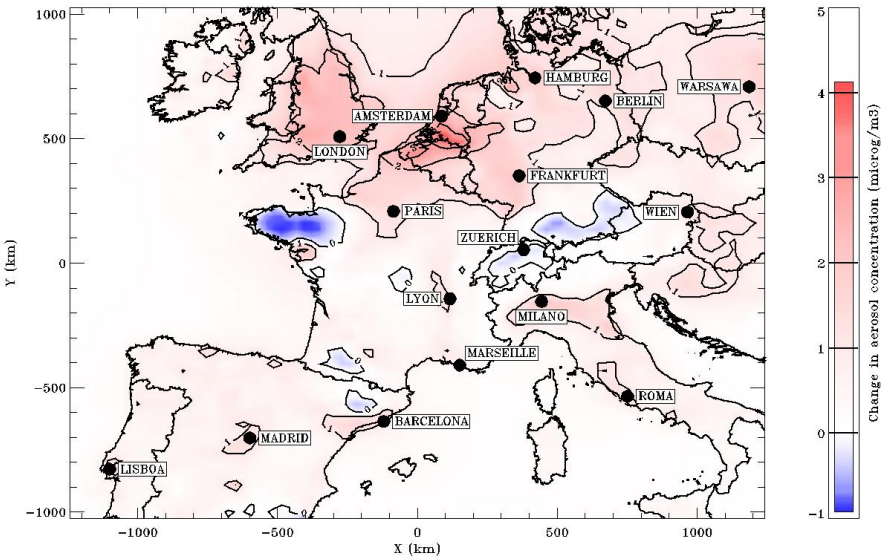

Fig. 1. Difference in monthly average aerosol concentration (μg m-3) between two simulations with a 15% emission reduction of either NOx or NH3 in January 2006 for the European domain.

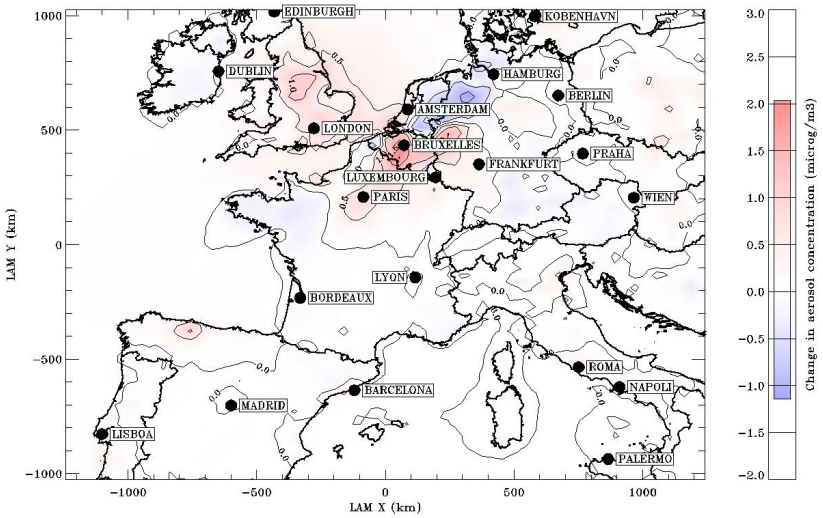

Fig. 2. Difference in monthly average aerosol concentration (μg m-3) between two simulations with a 15% emission reduction of either NOx or NH3 in June 2006 for the European domain