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Atmospheric
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Discussions

Interactive comment on "Emissions of primary aerosol and precursor gases in the years 2000 and 1750, prescribed data-sets for AeroCom" *by* F. Dentener et al.

Anonymous Referee #1

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General comments:

The paper describes a global inventory of aerosol and aerosol precursor emissions. Emission rates for atmospheric aerosol compounds considered in current state-of-the-art global aerosol models (dust, sea salt, sulfate, organic matter and soot) are assessed for the year 2000 and for pre-industrial conditions (1750). The inventory appears to be of high technical quality and represents the current knowledge about emissions of atmospheric aerosols. It is unprecedented with respect to comprehensiveness and information content.

The inventory was compiled in order to provide a consistent emission data base for global aerosol models applied in the global aerosol model intercomparison project AeroCom which aims at identifying uncertainties in global aerosol modelling, especially with respect to aerosol properties relevant to climate and climate change. Since high quality emission data, for consistent use in all participating models, is essential for evaluating model uncertainties by intercomparison of model results among themselves and with observations, the presented data base is of high importance for climate research.

The applied methods seem to be sound and are clearly explained in most cases. The paper is clearly written and well structured. I would recommend publication after some minor modifications outlined below.

Specific comments:

1) Introduction: The authors should give more credit to existing aerosol emission inventories and should clearly indicate their own new contribution. Are there any other inventories which could have been used for AeroCom?

2) Page 2707, line 20 and page 2708, line 22: The meaning of ‘characteristic size’ is not clear at this stage of the manuscript. It should be defined here rather than in Sect. 9.

3) Sections 3.1 and 3.2: The consequences of using different wind data to calculate sea salt and dust emissions should be discussed.

4) Page 2708, line 5: It should be discussed why emissions of particles larger than 10 μm can be ignored.

5) Page 2709, line 23: replace ‘continuous’ by ‘continuously’

6) Page 2709, line 24: replace ‘phases and’ by ‘phases. The emissions are’ (or similar).

7) Page 2711, lines 2-6: domestic fuel burning should also be mentioned.

8) Page 2712, line 16: It should be discussed why the Bond et al. inventory can be

applied without changes.

9) Page 2713, line 17: The acronym HYDE should be explained.

10) Page 2713, line 18: Replace ‘C3 in Appendix C’ by ‘B3 in Appendix B’.

11) Page 2713, line 20: Replace ‘scale’ by ‘scaled’.

12) Page 2714, line 10: Replace ‘an’ by ‘and’.

13) Page 2714, line 12: The HYDE data set described in Appendix B shows the 1750-to-2000 ratio, rather than 1750-to-1890. Please clarify!

14) Page 2714, line 13: Replace ‘Appendix C’ by ‘Appendix B’.

15) Page 2714, line 18: Skip ‘annual’ at end of line.

16) Page 2716, line 5: Replace ‘1.6’ by ‘1.7’.

17) Page2719, line 22: Replace ‘2000’ by ‘1750’.

18) Page 2720, line 21: It is not necessary to combine log with ln expressions. The authors may skip ln10 and replace dlogr by dlnr.

19) Table 1: v_T should be explained and denoted as v_{TOP} as in the text. The accumulation modes (SS, DU) and the Aitken mode (SS) should also be described or it should be explained why they are omitted. It should be explained that the ‘50%’ (in r_m column) refer to mass.

20) Tables 1-3: Is the median radius really expressed as $\ln(r_m)$. If so, it should be changed since such a description of this lognormal parameter would be uncommon and uncomfortable. In the text (e.g., page 2707, line 21), the median radius values are expressed as r_m rather than $\ln(r_m)$. The DU r_m value discussed in the text differs from that mentioned in table 1.

21) Tables 1-3: The relations between S and SO_2/SO_4 or OC and POM should be expressed in terms of mass, e.g., m(S)=0.5 x m(SO_2). It should be explained clearly

whether the sulphur emission rate refers to S or the molecular mass.

22) Table 4: Insert ‘surface’ between ‘actual’ and ‘altitude’.

23) Tables B1-B2: OM should be called POM, as in the rest of the manuscript. The units should be included (Tg/yr) and all sulphur related values should be expressed in units consistent with Tables 1-3 (Tg S ?, see 21).

24) Table B2: domestic SO_2 is discussed as biofuel in the text. It should be expressed consistently in the table and text.

25) The numbers should be rounded off consistently in the manuscript. There are some inconsistencies (e.g. total BC wildfire = 1.03 in Table B2, but 1.02 in Table 3).

26) Figures 1-3: The unit ‘kg/m^2’ refers to a column mass but not to an emission rate (use kg/m^2/yr or kg/m^2/month as in Figs.4-8). A log-type scaling as in Figs. 4-8 may enable to distinguish more details. It should be noted that the scaling is different in the top and bottom plots.

27) Figures 4-8: It should be noted whether the sulfate emissions are expressed in terms of mass S or mass SO_2 (see 23). These fluxes should expressed in units consistent with the rest of the paper.

28) Figure 4: The emission rates are hardly distinguishable. Enlarged coloured dot (or similar) symbols should be used rather than the coloured 1x1 degree pixels.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 2703, 2006.