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> Interactive Comment

## Interactive comment on "A global emission inventory of carbonaceous aerosol from historic records of fossil fuel and biofuel consumption for the period 1860–1997" by C. Junker and C. Liousse

## C. Junker

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We would like to express our sincere thanks to all of the reviewers, who with their detailed comments and suggestions significantly contributed to the improvement of our work. The subject of the article, our historic BC/OC emission inventory 1860 1997, has also been improved and updated since the time of the review. In the following we quote the original comments of the three reviewers, each one followed by a brief description of how we addressed the respective issue. In some cases one response is given of a group of similar comments. Carsten Junker & Cathy Liousse

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Comments to Anonymous Referee #1; (Received and published: 11 July 2006)

The present paper presents historical emissions of carbonaceous aerosols from fossil fuel and biofuel sources. Although historical emissions do exist in the literature for the same period (1860-present; Novakov et al., 2003; Ito and Penner, 2005), the present approach uses varying emission factors with time, which is an important improvement since the previous studies. The approach used is well presented and the results will be useful to the modeling community. I therefore suggest to publish the paper in ACP, after applying the minor corrections listed below.

1. Page 4902, lines 15-16: The good agreement is better to be quantified, for example S1697, by giving {data}.

\_\_\_\_The good agreement is quantified in the revised text.

2. Page 4903, line 7: Liousse et al. (2004) is a reference hard to find, you should either give an additional one or say a couple of sentences more to support the reduction of the emission factor of traffic; 3. Page 4903, lines 8-9 and 11: As in comment 2, You should say a couple more sentences about the decrease of the emission factor of domestic use, since Guillaume and Liousse (2006) is not available yet; 4. Page 4903, line 10: If I understood correct, you increased the emission factor of refinery oil from 0.025 g/kg to 1 g/kg? This is a rather huge increase and has to be supported by evidence, rather with a paper in preparation. This increase is for all 3 country types?

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\_The revised version of the manuscript contains now a detailed

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\_explanation of our choices concerning the emission factors.

5. Page 4905, line 11 and also in other places in the manuscript: Pertuisot (1993) was the first to use the approach described there, but there are no future uses of it? Please refer to more papers there, and again they should preferably be widely accesible to everyone. If there are no other works using this approach, maybe it is obsolete and shouldn't be used?

\_\_\_The reference to Pertuisot (1993) has been removed since this approach is

- \_\_\_\_the result of teamwork in our research group in which one of the authors
- \_\_was also involved. Our article here represents the first publication of
- \_\_\_this approach in an international, refereed journal, and we are open
- \_\_to criticism of this approach by the scientific community.

6. Page 4907, lines 13-14: "available upon request" is what the scientific community expects, and not only for the 4 years mentioned here but for all years mentioned in page 4900, lines 4-5. You should better mention this in page 4900, if you think that there is a need to say it at all.

\_\_Of course, all our results are available upon request.

- \_\_The note mentioned above was only inserted because the results for
- \_\_the years 1946 to 1949 are not shown in the manuscript.
- \_This is clarified in the revised text.

7. Page 4908, lines 4-5: Did you assume that the population density per country is

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constant since 1860, or changes with time? You should mention this in the manuscript. On top of that, my guess is that as we move from the preindustrial to the modern era, industrial activities (and especially, power plants) move away from the dense populated areas. This will change (perhaps only slightly) the spatial distribution of the emissions. Please make a short comment on the uncertainties that this assumption might introduce to your results.

\_\_The criticism of the reviewer is justified, and the possible error

\_\_introduced by using population density data from 1984 for our calculations

\_\_is mentioned in the new text.

8. Figure 8: It would be very interesting to have a graphical representation of OC too, additionally to BC, together with the corresponding comparison with previous works. Further, Ito and Penner (2005) do not have data before 1950? It should be included in the figure.

\_\_\_A graphical representation of OC as well as the complete results

\_\_of Ito and Penner have been included in Figure 7.

Technical corrections: - Page 4909, line 5: Instead of 2000, write 1997. - References:Etemad et al.(lines 6-7 of page 4910) is not in alphabetical order. - The authors should use the same nomenclature at all times. Although clear to common sense, they should refer to the country types with the same name in tables/figures. For example, table 1a has once the term "developed" and once "industrialized". Although the same, one of the two should be used. - Table 2 legent, line 2: "or OC a factors" eliminate "a". Additionally, many references mentioned there are not listed in the references list, although they should. - Figure 1: a/b notation is mixed. Additionally, in a (correct-b)

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in the second box from the end, the word "country" is missing. Finally, in b (correct-a) industrialized (or developed) period should be 1939-1949, since 1950 belongs to the other tree diagram. - Figures 10 and 11 will become easier to read if they will be in color.

\_\_\_\_The authors thank the reviewer for the detailed suggestions for technical

\_\_\_\_corrections all of which have been considered for the revised version of our

\_\_\_manuscript. The reference list has been completed, the terminology used in

\_\_the manuscript has been homogenised, and Figures 10 and 11 are coloured now.

Comments to Anonymous Referee #2, (Received and published: 10 August 2006)

General Comments This paper describes estimates of carbonaceous aerosol missions from fossil fuel and biofuel sources from 1860-1997. Similar data sets exist in the literature for the same period (1860-present; Novakov et al., 2003; Ito and Penner, 2005), but the novelty of this paper is that historical fuel consumption data and time varying emission factors are used to derive the emissions. Determination of emission factors for countrywide emission inventory analysis is a notoriously uncertain art however in this case the approach used is reasonably well described, apart from some additional information on comparisons with other data sets. The paper certainly merits publication in ACP, after the comments below have been addressed.

Specific Comments.

1. Emission factors. a) The authors should provide tables of all the emission factors

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used in the inventory, for key years in the time series (eg. 1860, 1900, 1950,1997) and not just those for current valued for hard coal and diesel and biofuel in tables 1&2.

\_All important emission factors are now given in Table 1.

b) In order to better understand the impacts of the different emission factors used in Bond et al. (2004) Novakov et al. (2003) and Ito et al. (2005) and the current study it would be very helpful to have an overview table of the comparable global and or regional emissions of BC OC for the main sectors and fuel types for the current day from each study. This would both highlight any 'structural' differences in how the different inventories distribute their total emissions across activities and fuels, and also provide a point of reference for the extrapolation backwards in time of the simplified approach used here, relative to Bond et al. (2004).

\_\_Figure 9 has been added to the manuscript

\_\_containing the requested information.

2. Fuel consumption data. There appears to be consistent c 200mt/a of hard coal and c20 mt/a of brown coal missing from Eternad et al. in comparison to UNSTAT. For hard coal this is c10

\_\_This issue is now acknowledged and discussed in the manuscript.

3. Graphs. I would include a break in all the graphs, not just figure 8 to cover the period of WW2, as the extrapolation of trends between the pre- and postwar worlds is very misleading, as the authors note on p4907

\_\_\_The graphs have been changed.

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Interactive comment on Atmos. Chem. Phys. Discuss., 6, 4897, 2006.