

***Interactive comment on* “Evaluation of black carbon estimations in global aerosol models” by D. Koch et al.**

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We have revised the manuscript “Evaluation of Black Carbon Estimations in Global Models” as requested by the reviewers. Detailed responses are provided below, with each reviewer comment marked with a bullet, and each response with DK. Best Regards, Dorothy Koch

Reviewer 1.

Specific comments

p. 15773, 1st paragraph of Sect. 1: Please give references.

DK: Seven references were added to this paragraph.

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p. 15777, l. 11: EDGAR has not been explained.

DK: EDGAR is now explained.

p. 15777, l. 12: IIASA has not been explained.

DK: IIASA is now explained.

p. 15778, Sect. 3.1: Surface BC measurements depend strongly on the location (remote, rural, curbside, etc.). Please give more details on how you selected measurement sites and how you prepared the data for comparison with the global models.

DK: The following is added: “The data were not screened according to urban, rural or remote environment, all available data were used; however the IMPROVE sites are generally in rural or remote locations.”

p. 15778, l. 23, EDGAR: Do you mean EDGAR4 (Sect. 2.2.1)? If not, please explain or give a reference.

DK: Actually we mean EDGAR 32FT2000 with Bond et al. (2004) emission factors. This is now specified and shortened to EDGAR32 throughout.

p. 15779, Sect. 3.1: What is the modeled BC surface concentration? Lowest model layer? Interpolated to 2(?) m? Please be more specific.

DK: The following phrase is added: “using model layer one from each model”

p. 15780, l. 5: Please give references for AERONET and OMI.

DK: these have been added.

p. 15783, l. 22, Bond: Do you mean Bond et al. (2007)?

DK: We mean Bond et al. (2004), as given in section 2.2.1, now added again here.

p. 15783, l. 22, EDGAR: Again, do you mean EDGAR4?

DK: EDGAR32, now specified.

p. 15783, l. 26-27, “The reduced ice-out case has somewhat smaller impact on the column than at the surface, especially for some parts of the Arctic.”: Why? Wouldn't we expect this the other way round as most BC in the Arctic stems from long-range transport and not from local sources at the surface? Please explain.

DK: The ice-out effect would be relatively local to the Arctic, and would impact low-level BC more relative to the column. The following sentence is added: “The reduced ice-out thus has an enhanced effect at low levels, below ice-clouds, in the Arctic, while having a relatively small impact on the column.”

p. 15789, l. 28, Bond and Bergstrom: Please give a complete reference by adding the year of publication.

DK: (2006) has been added.

p. 15793, l. 18: Change measurments to measurements.

DK: corrected

p. 15794, l.1: measurements and observations ! models and observations?

DK: Oops, yes, thanks.

p. 15807, footnotes of Tab. 1: Add semicolon after “% is relative to water”; FF has not been explained; although given by Textor et al. (2006), I suggest to add a column specifying wether the model treats BC as internal or external mixture as this is important for many aspects of BC such as its aerosol optical properties.

DK: All this has been fixed. I have added in the table footnote that “I” under the Aging column indicates internal mixture. For models with “I#” the internal mixture also affects the optical properties, “BCOC” assumes that BC and OC are mixed.

p. 15809, Tab. 3: Particularly for North America and Europe the ratio between model and observed BC varies by more than an order of magnitude. I therefore suggest to add a row “AeroCom median” to the table.

DK: Good idea, this was added. Actually in most cases the median and mean were quite similar.

p. 15810, Tab. 4: AA has not been explained. DK: Annual Average is now written out

p. 15813, Tab. 7, CARB campaign: What do you mean by "number of flights: 5+"? Is the exact number of flights unknown? DK: the + is removed

p. 15809, Tab. 3 and p. 15817, Fig. 2: Why are the models ARQM99, DLR and MIRAGE not shown? Surface BC concentrations from these models seem to be available from the AeroCom website.

DK: These models are now included, Figure 2 and Table 3 were updated. We split Figure 2 into 2 parts (Fig 2a and Fig 2b) since the panels would otherwise be quite small.

p. 15818, Fig. 3: Please specify the wavelength for which the GISS results given. DK: Wavelength is now provided in the figure caption.

p. 15822, Fig. 7: The figure is too small and should be enlarged. Particularly the subfigure "Schuster BC load" is too small and basically indiscernible.

DK: This figure has also now been split into 2 parts, so now there are two larger Fig. 7a and Fig 7b.

p. 15824, Fig. 9 and p. 15825, Fig. 10: The standard deviation of the measurements is huge suggesting that the observed BC distribution is strongly skewed. I therefore suggest to also include median values for all cases.

DK: We have now done this for all the recent campaigns where the data was available, except for the spring ARCPAC data (Fig. 10c) where the NOAA investigators separate their data as mean profiles representative of biomass burning and background air since the NOAA WP-3D largely sampled biomass burning plumes (4 flights, 15-21 April 2008) except for 1 flight (12 April). The median for all the flights is very close to the mean and

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does not show the distinction between background conditions and the strong influence from biomass burning. We have also dropped panel 9d from Fig. 9, since the data there is sparse and not representative of typical conditions.

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