

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

Anonymous Referee #1

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General comments

The authors present a comparison BC mass concentrations and aerosol absorption optical depths from a number of global aerosol models from the AeroCom aerosol model intercomparison with various kinds of measurements.

The manuscript is well written and gives valuable suggestions that may help to reduce current gaps between BC measurements and the results from global aerosol models. I suggest publishing in *Atmospheric Chemistry and Physics* after addressing the minor comments and suggestions given below.

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Specific comments

- p. 15773, 1st paragraph of Sect. 1: Please give references.
- p. 15777, l. 11: "EDGAR" has not been explained.
- p. 15777, l. 12: "IIASA" has not been 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.
- p. 15778, l. 23, "EDGAR": Do you mean "EDGAR4" (Sect. 2.2.1)? If not, please explain or give a reference.
- p. 15779, Sect. 3.1: What is the modeled BC surface concentration? Lowest model layer? Interpolated to 2(?) m? Please be more specific.
- p. 15780, l. 5: Please give references for AERONET and OMI.
- p. 15783, l. 22, "Bond": Do you mean "Bond et al. (2007)?"
- p. 15783, l. 22, "EDGAR": Again, do you mean EDGAR4?
- 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.
- p. 15789, l. 28, "Bond and Bergstrom": Please give a complete reference by adding the year of publication.

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- p. 15793, l. 18: Change "measurments" to "measurements".
- p. 15794, l.1: "measurements and observations" → "models and observations"?
- 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.
- 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.
- p. 15810, Tab. 4: "AA" has not been explained.
- p. 15813, Tab. 7, CARB campaign: What do you mean by "number of flights: 5+"? Is the exact number of flights unknown?
- 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.
- p. 15818, Fig. 3: Please specify the wavelength for which the GISS results given.
- 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.
- 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.