

Independent scientific review of "Source apportionment of black carbon aerosols from light absorption observation and source-oriented modeling: An implication in a coastal city in China" by Deng et al. 2020.

General

This paper presents a comparison and analysis of BC in the Xiamen region in China, a cleaner region than others from what I understand. The region is mostly affected by long range transport of pollutants. The authors have utilized light absorption measurements from the aethalometer (AE31-model) and further applied the source apportionment method denoted as the aethalometer model. Two BC fractions originating from biomass burning (bb) and fossil fuel (ff) combustion were derived from the model and further compared with data from trajectory analysis, satellite observations and emission inventory modelling.

The novelty of the paper lies in the methodology, i.e. the comparison of the emission inventory model data to observations. Although, I don't agree with the authors that the model were in agreement with the observations, the chosen methodology is conducted in a relatively clean region in China and pin-points the importance of comprehensive and correct emission inventories.

The written language is on an average level. Some small errors occur occasionally which I haven't bothered to comment on.

I would recommend this manuscript for publication in ACP after the following comments have been considered.

Major comments

My largest concern with this paper is that the BC_{ff} analysis and comparison to the CMAQ-model is lacking. A long piece of text is written to compare the BC_{bb} to the CMAQ-model results, why is the BC_{ff}-comparison omitted?

The chosen AAE for the aethalometer model is very arbitrarily selected. A lot has happened since the Sandradewi paper from 2008. Zotter et al. (2017) gave a comprehensive analysis of AAE selection. The authors may also consider conducting their own selection, perhaps based on a literature review.

The authors claim that the CMAQ-model performed well and where in good agreement with the BC observations. How is this even possible to say? Studying Fig. 10, there is a considerable difference between the observations of BC_{bb} and modeled BC_{bb}, especially during winter and spring. A statistical test, i.e. t-test or similar, would enable the authors to make a justified statement regarding the agreement. And, again the comparison to observed BC_{ff} is lacking in Fig. 10 and totally omitted in the text.

Minor comments

L. 103. Please state the inlet of the AE31 as well as meters above sea level for the station.

L. 115. Which MAC-values were used for the BC calculation?

L. 130-132. Selection of AAE, please see my comment above.

L. 174. CMAQ is an abbreviation I suppose, for what?

L. 216-218. The PM_{2.5} was measured with which instrument?

L. 216-219. This is a very strange sentence, which I don't understand with all these parentheses and all. Please rewrite.

L. 215-225. Please explain clearly what you mean with high- and low-BC episodes.

L. 220-225. Why not include Fig. S2 in the main manuscript?

L. 239. How can BC_{bb} be influenced by traffic?

L. 241. How can the ratio be maximized when there is an evening rush-hour? I guess it is maximized due to increases in BB activity.

L. 253. I do understand that there is increased activity of domestic burning during winter. But why an increase in open-field biomass burning?

L. 257. Monsoon means more rain, how can there be increased burnings?

L. 310. BC_{bb} from the sea? Please explain this.

L. 318. Please explain the open burning activity.

L. 329. Why does this activity exist in this region during this period of time?

L. 345-350. I would also like to see a similar analysis and comparison for the BC_{ff} and its potential sources. Why omitting it?

Figure 5. Please add more information in the Figure caption. The pie charts represents what? Why are there four trajectories. The four-coloured legend represents what? The percentage along the trajectories represents what?

Figure 6. Fig. 6. c and d should have the same scale on the legend for visual comparison.

Figure 10. Please include the fossil fuel combustion observations in this graph (i.e. BC_{ff}). There are no figure 10 b as stated in the figure caption.