Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., author comment AC1
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Reply on RC1

Balint Alfoldy et al.

Author comment on "Source apportionment of black carbon and combustion-related CO_2 for the determination of source-specific emission factors" by Balint Alfoldy et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2022-53-AC1, 2022

The authors thank for the anonymous referees their valuable comments and ideas. We did our best to answer the questions and improve the quality of the manuscript. Please find our responses below.

RC: Line 172: Is all that burns pine tree? If not, I suggest including variability in the CC for other species.

AC: We added a sentence and a reference about the variability of CC of wood (lines 191-194 in the revised manuscript). Also, we justified why we used 0.45 that value is representing the most frequently used pine and oak trees.

RC: Line 172: "the source-specific AAE pair of 1.15 and 2.1 was used for the FF- and BB-related BC components respectively" Why these values? Justify them.

AC: The default AAE values set by the manufacturer are 1 and 2 for FF and BB, respectively. However, as presented in the literature, specific source related AAE values can vary with measurement location, since they reflect the characteristics of vehicle fleet and wood burning source and burning conditions (Zotter et al., 2017). We revised these default parameters based on our dataset. Regarding the FF component, we measured AAE of 1.15 during the summer campaign where the contribution of biomass burning was negligible. The BB-related AAE was chosen as the maximal AAE measured at TRO location during night, when the BB related BC was maximal, and contribution of fossil fuel combustion is supposed to be minimal. We added an explanation to the relevant section (line 210).

RC: Line 232: Do you think the model is applicable to other cases? I think there are a lot of discards, for example a city with gasoil and biomass heating. I like the approach of the study very much, but I think it is applicable to few cases, so I think it should be commented on.

AC: We agree with the Reviewer. The high number of oil stove emission would make the model fail since we cannot distinguish between the FF component used as car fuel or heating purposes. We add a sentence that describes the limitation of the model (see lines 239-241). The interference of gas heating was considered and discussed in lines 357-359, and lines 474-482.

RC: Line 277: Add refs with same pattern, e.g.

https://www.sciencedirect.com/science/article/pii/S0169809521005366

AC: The Authors thank for the recommendation; the relevant reference has been added (line 243).

RC: Figure 3: Change the CO2 dashed lines to make the figures easier to read.

AC: Done.

RC: Line 345: ABL data available? I believe that obtaining the ventilation coefficient (indicated in the previous ref) would provide information about pollutant dispersion. A model to obtain ABL is available at: https://www.ready.noaa.gov/READYamet.php

AC: The Authors thank the idea. The ABL data and the wind speed have been taken from the NOAA database and the corresponding ventilation coefficient (VC) has been taken into consideration. A new figure has been added to the manuscript (Figure 3), where the distribution of VC data and the corresponding BC concentrations are presented. Based on Figure 3 two sub-dataset can be defined, 1) when VC < 3200 m^2s^{-1} considered as low ventilation, and 2) VC > 4600 m^2s^{-1} considered as well-ventilated case, when the atmospheric dynamics (advection and vertical convection) dilute the concentration of the pollution. The EF values were separated according to these sub-cases. Figure 6 has been replaced by EF distribution plots regarding the two ventilation cases for both components and all locations. In the same time Figure 5 in the old version has been discarded since it does not represent new information.