Reviewer #1 (R1):

We would like to thank the reviewer for the insightful review and constructive comments on our manuscript. The time taken by the Reviewer to review and evaluate the manuscript is highly appreciated. We have considered all comments and suggestions and incorporated them into the revised manuscript which have improved the quality of the revised manuscript. The point by point response to all the comments and suggestions of reviewer #1 (R1) is provided in the following sections. For clarity, the reviewer's comments are provided in blue, the author's response (AR) is in black, and the revised parts of the manuscript are highlighted in red in the revised manuscript.

General comments (GC):

R1 GC1: The manuscript compares the optical properties of laboratory generated soot particles with those obtained from model calculations. The paper is generally well written and worth to be published after minor modifications.

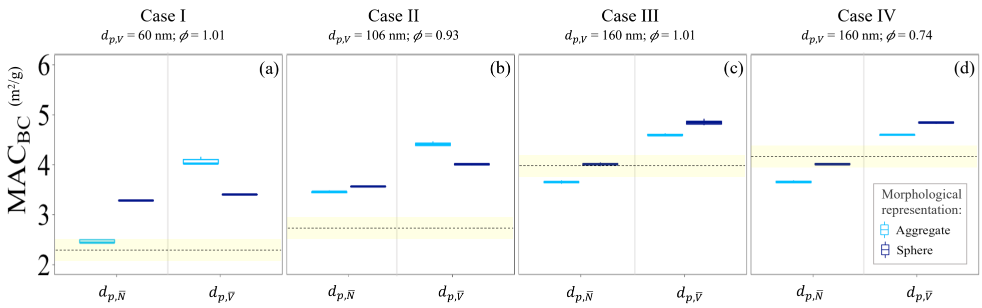
The authors run model calculations and perform laboratory measurements for bare (or half-bare) soot particles and for soot particles with organics. These two types of particles were generated in two separate experiments E1 and E2.

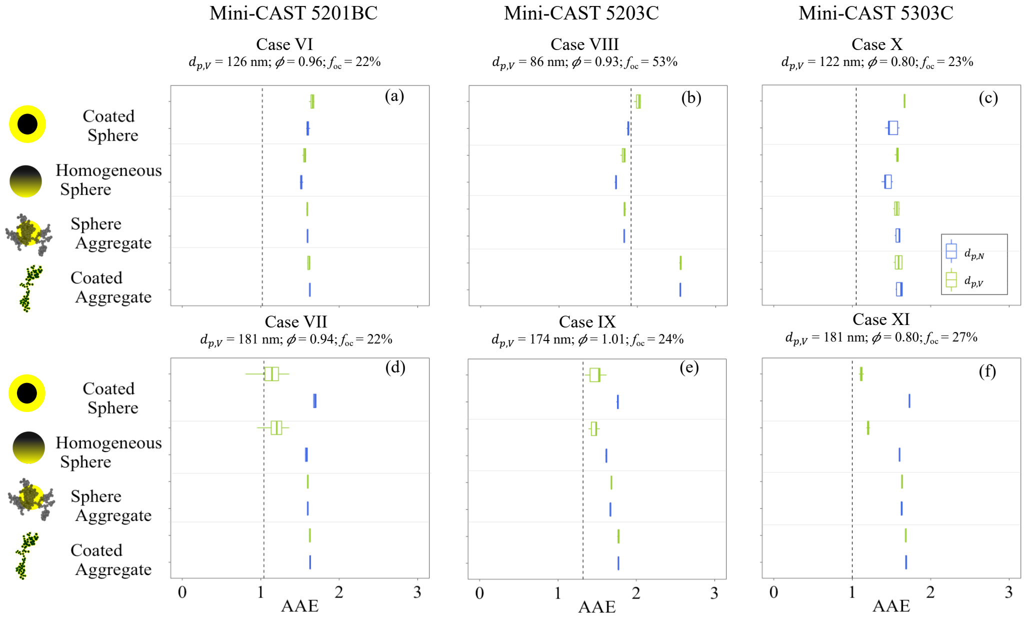
AR: The authors thank the reviewer for the constructive general remarks.

R1 GC2: In the results section, several optical parameters obtained from the model runs are discussed and compared with the measured values. It would be useful for the readers, if the same optical parameters (including the concentration dependent parameters :absorption and scattering coefficient) would have been discussed for bare and undenuded soot particles. For example AAE from the 2nd experiment is not mentioned and MAC is discussed only for the E2 experiment.

AR: We thank the reviewer for the comment. We agree with the reviewer that it is important to discuss and make these results available to readers for their better understanding and interpretation. As suggested, the mass absorption cross-section (MAC_{BC}) was calculated for the four cases of the experiment E1. Modelled values of MAC_{BC} ranged from 2.44 to 4.66 m^2/g when using pure BC. Because of the unavailability of an instrument directly measuring the mass in E1, the mass was calculated assuming a density of 1.8 g cm^{-3} (Park et al., 2004). In smaller BC particles ($d_{p,\bar{V}}$ of 60 and 106 nm), the modelled MAC_{BC} is larger than the measured MAC_{BC}. This may be because of the reason that the smaller particles contain higher residual organic matter (Zhang et al., 2020), which results in an underestimation of the measured MAC_{BC} when a density of 1.8 g cm^{-3} is used.
Additionally, the absorption ångström exponent (AAE) was calculated for the experiment E2. As also shown in experiment E1, the modelled AAE values matched the measurements more closely when a spherical representation for BC is used.

The above mentioned results have been incorporated in the revised manuscript as supplementary material and will be also graphically represented as shown below:





R1 GC3: Although the authors mention in the paper that the resmallader should keep in mind that for smaller particles the Catalytic Stripper was less effective, thus the particles cannot be considered bare soot particles this introduces some uncertainty in the comparison of model and measured data. Unfortunately there is no EC/TC measurements for denuded particles, but the authors should give an estimation for the uncertainty of the measured data caused by the residue of the organic material.

AR: We thank the reviewer for this comment. The efficiency of the Catalytic Stripper depends on the volatility of the organic matter present in the aerosol particles. The uncertainty associated with the Catalytic Stripper in removing the organic matter was studied by Mamakos et al., 2013. They reported that in the 21–250◦C temperature range, the Catalytic Stripper is able to remove up to 96% of the more volatile fraction of organic matter. However, the Catalytic Stripper removes 30–60% of the less volatile organic matter in the 250–500◦C temperature range. For experiment E1 of our study, we modelled the optical properties of particles passing through a Catalytic Stripper at 350°C, so we may expect that 40-70% of less volatile organic matter residues will still be present.
The future possibility of having EC/TC measurements in such an experiment will be useful to report the absolute uncertainty in terms of residual organic matter when using a Catalytic Stripper with optical instruments.

The above points have been summarized under the methods section of the revised manuscript as follows:

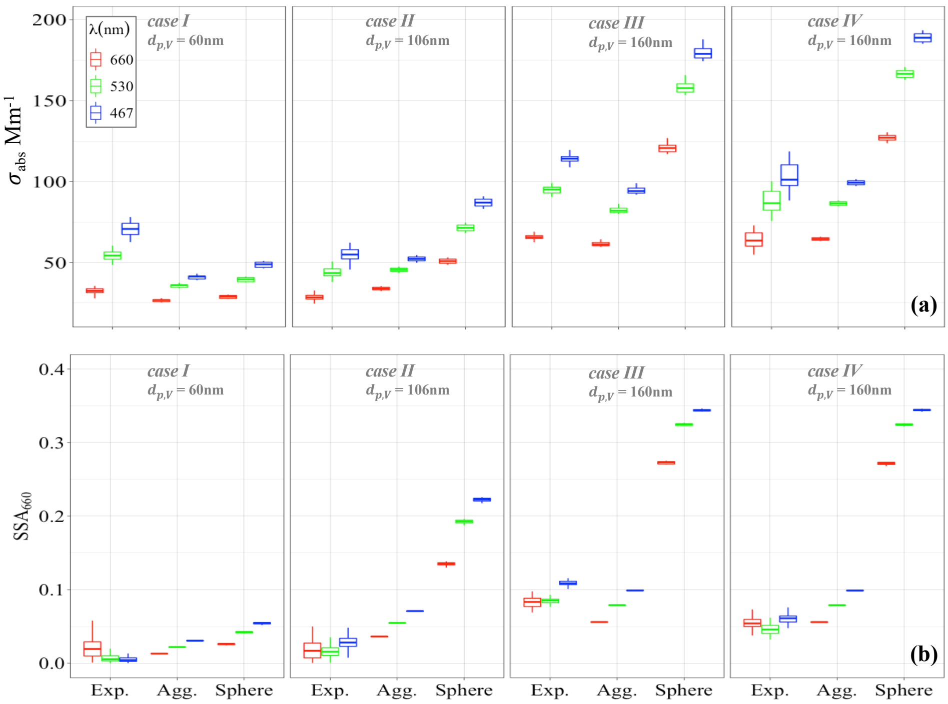
For modelling the particles from the denuding experiment E1, the simulated particles are assumed to be bare black carbon, since a Catalytic Stripper was used to remove the volatile organic matter. Some residuals, however, are left behind by the Catalytic Strippers, depending on the volatility of the organic matter. Mamakos et al. (2013) reported that in the 21–250◦C temperature range, the Catalytic Stripper is able to remove up to 96% of the more volatile fraction of organic matter. However, in the 250–500◦C temperature range, the Catalytic Stripper removes 30–60% of the less volatile organic matter. This must be noted when comparing the modelled optical results with their equivalent laboratory measurements.

Further, the following relevant text was added in the discussion section of the revised manuscript:

Furthermore, smaller particles contain more organic content than larger ones (Zhang et al., 2020), leading to a less effective removal by Catalytic Stripper. In case the smaller particles were immature solid soot with embedded organic content, the assumption that they are bare may account for the underestimation of the modelled AAE in comparison to the measured values. In future, it will be useful to have EC/TC measurements in such an experiment in order to determine the absolute uncertainty in terms of the residual organic matter when the Stripper is used with optical instruments.

R1 GC4: Fig. S2 indicates that the modeled absorption coefficient of the fractal bare BC using polydisperse method is smaller for larger particles (160 nm) than the experimentally determined value. Might this indicate the presence of organic residue for larger particles?

AR: We thank the reviewer for highlighting this point. In the Fig. S2, in the aggregate representation, we had by mistake shown the results for all the other three operating points of Catalytic Stripper. It is for this reason that the modelled results using the aggregate were shown lower than the measured values. It has been corrected in order to display the modelled results at 350°C condition (BC particles pass through the Catalytic Stripper at 350°C). In all sized particles, the modelled absorption coefficient (σ_{abs}) matches the measured σ_{abs} when using an aggregate morphological representation. However, in larger particle (> 150 nm), the accuracy in the modelled σ_{abs} was comparatively higher. This is because in larger particles, the organic matter residues are lower, making the assumption of pure BC more suitable. This can also be seen in the results of modelled AAE, where the discrepancy is higher for smaller particles indicating the presence of more residual organic matter in smaller particles.



The above figure is updated in the revised version of the manuscript.

Specific comments:

1) Line 311: the word modeled should be modelled

   AR: Thank you for the correction. The change has been made in the revised manuscript.

2) Line 356: the density is not mentioned in the equation

   AR: Thank you for the correction. The density is included in eq. (6) in the revised manuscript as follows:

$$MAC_{BC} = \frac{C_{abs}}{m_{BC}} = \frac{C_{abs}}{\frac{1}{6}\pi d^3 \cdot \rho_{BC}} , \quad (6)$$

   where ρ_{BC} is the density of black carbon and taken in this study to be 1.8 g cm^{-3} (Park et al., 2004).

3) The yellow band of the measured data in figure 7, 8 and 9 is hardly visible.

   AR: Thank you for highlighting this point. The measured data is highlighted better for Fig. 7 to Fig. 9 in the revised manuscript.

4) Figure S1: the "blue stars" appear green because of the green edge of the symbol.

AR: Thank you for highlighting this point. For better visibility, the color of the star is changed to green.

5) For which wavelength was the MAC calculated?

AR: The MAC_{BC} was calculated at 660 nm. The following sentence has been added in the revised manuscript:

The MAC_{BC} was calculated using the C_{abs} at a wavelength of 660 nm.