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Atmospheric Measurement Techniques Discussions

Interactive comment on "Structural changes of CAST soot during a thermal-optical measurement protocol" *by* Theresa Haller et al.

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Before posting my limited remarks, I would like to congratulate the authors on a beautifully executed and documented study. The clarity of presentation, and the completeness of the analysis using multiple technique make this paper one that I plan to use to show students as a shining example of how to approach a problem, plan and execute the experiment, then document the results. In addition, the description of the different measurement techniques and the accompanying figures make these methodology sections ideal for educating the technically competent reader who does not have

knowledge about these techniques.

Thank you for the appreciation of our work.

One very minor suggestion concerning Fig. 4. Neither in the text or figure caption are the two types of Brown carbon described that are shown by the brown lines. It took me a couple of minutes before I understood the difference.

We added a brief explanation in the figure caption describing the unclear abbreviations:

"BC "brown" and BrC "brown" refer to the amount of BC and BrC in the "brown" sample, BC "black" to the amount of BC of the "black" sample. BrC of the "black" sample is below detection limit for the original and the heated samples, respectively."

A more substantive comment concerns the conclusions. I was expecting a summary discussion that would tie the results to the introductory problem statement, i.e. the difficulty in determining brown and black carbon concentrations when there are mixtures. Given the different measurement technique that were used to show how the brown carbon evolved as it was heated, if there potential for combining two or more of these technique to better improve the accuracy and decrease the uncertainty? Or is this group already working on that concept for a followup paper?

Our main aim was to investigate the physical basis of the behavior of carbonaceous samples during the heating procedure of thermal-optical methods. We therefore used a soot generator which is widely used and produces samples that are rather well defined from a chemical point of view, i.e. that contain only carbonaceous material. This way we excluded the possible oxidizing effects of K+ and Na+ as well as sulfates which could occur in the He phase of the protocols. The paper shows the results of this investigation – the structural changes of the different samples are shown to our knowledge for the first time. These structural changes can, however, only be seen from TEM and Raman measurements, which are extremely time consuming and highly expensive both from the point of view of instrumentation and manpower.

Using these techniques routinely on the huge volume of filter samples produced in the measurement networks would be unfeasible.

Please also note the supplement to this comment:
https://www.atmos-meas-tech-discuss.net/amt-2019-10/amt-2019-10-AC1-supplement.pdf

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