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Interactive Comment

Interactive comment on "Multi-wavelength optical measurement to enhance thermal/optical analysis for carbonaceous aerosol" *by* L.-W. A. Chen et al.

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We thanks for the reviewer's comments. In the abstract, we have mentioned that optical measurements were adjusted for loading effects to infer aerosol light absorption. All other suggested technical corrections will also be made in the revised manuscript. Regarding the wavelength-dependent OC-EC split, it would facilitate the discussion by treating two cases, i.e., samples without and with BrC, separately. Without BrC, the split is influenced by POC, which can both be on the filter surface and within the filter. Assuming that POC has an intrinsic refractive index the same as EC and R is affected only by EC and POC on the surface, ECR should be insensitive to wavelength with which the split is made. This is the first principle of the TOR method (Chow et al.,

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1993). For T, the within-filter POC becomes important, and the apparent absorption of within-filter POC is larger than EC (Chow et al., 2004; Subramanian et al., 2006) leading to ECT $<$ ECR. The apparent absorption of within-filter POC is enhanced by multiple scattering, which increases with decreasing wavelength. Therefore, ECT tends to decrease with wavelength, so does the spread between ECR and ECT.

BrC, when exists, is part of OC and on the filter surface. If a wavelength is sensitive to BrC, its baseline (before thermal analysis) would be lower than if it does not respond to BrC (i.e., the TOR hypothesis). The lowered baseline leads to an earlier spit since the laser would return to this baseline earlier than expected for non-absorbing OC. One should note that BrC should be entirely removed from the filter by the split point, leaving only POC and EC on the filter. The lower the wavelength, the more sensitive it is to BrC and the earlier split it causes. Both ECR and ECT will increase with decreasing wavelength due to the BrC effect.

Ideally, wavelength influences ECR through BrC but influences ECT through both BrC and POC. The effects of BrC and POC on ECT are opposite in direction. The fact that ECR_{635nm}~ ECR_{808nm} and $\text{ECT}_{635nm} < \text{ECT}_{808nm}$ in this study is explained by weak BrC absorption compared to EC at both wavelengths (thus ECT showing only the POC effect). On the other hand, $\text{ECR}_{455nm} > \text{ECR}_{635nm}$ is attributable to significant BrC absorption at 455 nm. For ECT_{455nm} and ECT_{635nm}, the comparisons are inconclusive since both BrC and POC contribute. Some of these discussions have been included in the paper to clarify the concept.

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