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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Source-specific light absorption by carbonaceous components in the complex aerosol matrix from yearly filter-based measurements" *by* Vaios Moschos et al.

Anonymous Referee #3

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The manuscript attempts to resolve almost all issues of carbonaceous light absorption based on annual filter-based measurements at two locations. It relies an immense number of references just as a review paper, but in this case the references are actively engaged in the discussion of the methodology applied. That makes the manuscript extremely difficult to follow and understand. Despite its complexity, the manuscript has little if any novelty, it is like a demonstration of all techniques related to filter-based absorption measurements over the past 20 years. Instead of using the more accepted concept of light absorbing carbon continuum, the manuscript relies on the simplified concept of BrC vs BC with spectrally resolvable absorption properties. This is a simple yet quite an established methodology for estimating BB vs FF contributions to PM with

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Discussion paper

all its inherent biases and uncertainties. Due to the latter, this filter-based approach can by no means yield results that may be used for proving a hypothesis regarding aerosol mixing state and morphology. The statement that the 'first experimental evidence is provided for the suppression of lensing effect by BrC' is simply not supported by the optical closure calculations at shorter wavelength between solvent-based and filter-based optical measurements. Both techniques have a number of limitations and uncertainties exhaustively discussed in the scientific literature, and both are based on several simplifying assumptions which may not necessarily be valid. In the light of these facts, the residual term of optical closure calculations between two fundamentally different measurement methods can by no means signify any 'lensing effect'. The authors themselves devote detailed discussions to (even non-quantifiable) uncertainties and simplifying assumptions (some of them can equally be biases), yet they do not come to the conclusion that a small residual term in closure calculations is well within the range of uncertainties and should not be over-interpreted. Optical closure calculations are based on the assumption that total filter absorption, absorptions in methanol and water extract, and residual absorption on filter (after solvent extraction) are all additive. Is it possible that solvent extraction changes some properties on filter that affect absorption measurements (e.g. scattering effect)? Is there any hysteresis of solvent extraction (e.g. residual water that affects measurements)? Additivity means that if a spot of a loaded filter is measured for absorption, then extracted in water and methanol, then the extracts are uniformly redispersed on the residual filter spot and the solvents are evaporated, and the filter spot is again measured for absorption, we get exactly the same absorption as for the untreated filter. I never did such a simple experiment but I would seriously doubt that the two values would be identical.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2020-1293, 2020.