

Interactive comment on “Measuring Light Absorption by Organic Aerosols: Correction Factors for Solvent Extraction-Based Photometry Techniques” by Nishit Shetty et al.

Anonymous Referee #3

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Anonymous Referee #1 has already submitted a review that articulates very clearly the overall discomforts I have with this manuscript. To avoid repeating that excellent discussion, I will simply propose this alternative title for the work:

Measuring Light Absorption by Organic Aerosols: Observed Total Error in an Illustrative Technique Using Extraction-Based Photometry

I am not sufficiently familiar with the literature of extraction-based absorption photometry to judge whether the accuracy of similar techniques is widely over-rated. If that is the case, then a revised version of this discussion paper could provide the convincing and well-documented critique that the field then needs. Otherwise, I would not recommend

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publication.

Specific Comments

(1) The authors effectively define the in-situ shortwave absorption coefficient for organic aerosol, $b_{abs,OA}$, as the excess of the PAS-measured total over the BC contribution. They extrapolate the necessary shortwave BC value from a longwave PAS measurement, via an assumed unit AAE. This BC contribution is the proverbial ‘elephant in the room’, appearing nowhere in the results but providing essential context for their interpretation. What are the relative contributions of OA to total absorption at short wavelengths, and how do they vary with fuel type and burn conditions? Extended AAEs (AAE₄₀₅₋₁₀₄₇ or AAE₃₇₅₋₁₀₄₇), from which a curious reader could derive an answer, are nowhere indicated. A related question is how longwave absorption and TOR EC relate to each other, since they are independent proxies for the same BC. Figure 3 plots only ratios against ratios, shortwave $b_{scat}/(b_{scat}+b_{abs})$ from the in-situ IPN measurement against OC/TC from the filter TOR analysis. It would seem at least equally instructive to compare the concentration values directly, longwave b_{abs} against TOR EC.

(2) Two SVOC denuders sit between the burn chamber and the holding tank (Figure 1), but we can expect some phase re-equilibration to occur within the holding tank before samples are drawn. Adsorption of re-volatilized organic species by the quartz sampling filters will then generate artifacts in the TOR and extraction measurements that are not present in the IPN optics measurements. Did the authors collect and analyze quartz blanks to quantify these artifacts, using a (non-adsorbing) PTFE filter between the smoke-filled holding tank and sampling port to exclude the particle phase?

(3) It is hard to relate and reconcile the experimental data shown or listed in the different figures and tables. Not all IPN- and TOR-characterized burn samples were filter-extracted for OA, and not all water extracts were analyzed for TOC. It would be helpful to make these experimental layers clearer to the reader, along with some indication of

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criteria for inclusion/exclusion. For example, Table S1 lists 53 filters collected from 28 burns. I infer that this (53) counts just the filters consumed for TOR OC/TC analysis, each paired with another filter collected for extraction (lines 133-134). (If the 7 filters from dung burns instead represented all TOR and extraction filters together, then we would have at most 3 pairs yielding complete records, contra the 4 observations listed in Table 4.) It appears from Table 4 that only 21/53 \sim 40% of the other filters were selected for quartering and extraction. Does Figure 3 show all 53 observations from Table S1? Do Figures 2 and 4 show those 21 observations from Table 4? It would be helpful to be told the total number of observations appearing in each figure and table.

(4) Is it true that the TOR analyses were performed AT Sunset Laboratories (line 238), and not locally with an instrument manufactured BY Sunset Laboratories?

(5) In addition to flowrate and sampling time (line 133), filter area is a relevant experimental factor and should be specified.

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