

## ***Interactive comment on “On-flight intercomparison of three miniature aerosol absorption sensors using Unmanned Aerial Systems (UAS)” by Michael Pikridas et al.***

### **Anonymous Referee #2**

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The manuscript fits within the scope of Atmospheric Measurement Techniques and the insights are novel enough to justify publication. There are though a number of details that should be addressed before the publication and the manuscript should be thoroughly checked.

The authors use an atypical structure (sections) for AMT, or any journal for that matter. This is fine but it would be critical to detail in the text when something gets explained in a later section. e.g. The field campaigns should somehow mention that the UAS will be discussed later as one expects to read details when something like multicopter comes up. Alternatively maybe the authors should consider to first discuss the tools, then the

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platforms before discussing the field campaigns as the primary focus here should be on tools, platforms and measurements not on the field campaigns.

The current state of the art and background are extremely poorly described in the introduction. The paper is very misleading on how novel BC measurements by UAV are. It gives an impression that this is very novel when in reality BC has been measured on UAVs for more than 10 years (see Corrigan et al., 2008). This is just not proper. You mention Bates for the STAB but fail to mention that the Bates paper is not only this instrument but this instrument on a UAV. Your paper has to acknowledge what is out there, what instruments flew on what platforms etc.. Also in regards to the discussion of the vertical profile observations, there are studies to compare to, both UAV and balloon (besides Bates, Corrigan, there Po Valley Ferrero et al., 2014).

Some statements are misleading and/or too qualitative in the discussion. The authors confuse correlation with agreement (Line 513 discussion figure 4), MAAP and AE33 are not in agreement if there is a 20% bias. The measurements are well correlated but the values are substantially off, systematically yes but still the values are not in agreement at all. Also, the authors use too many qualitative statements like “excellent” when it is unclear what excellent means. Things are statistically significant or not.

Finally, one has to hope that the authors were more careful in their experiments than in the preparation of the manuscript. The manuscript needs a serious re-read with attention to detail for text formatting, typos, format of references and completeness of references cited. A few items are in details but the list is not certainly exhaustive.

#### Details

L29-31 “the measured signal of the three sensors was converted into absorption coefficient, . . . and, when applicable, to signal saturation corrections following the suggestions of the manufacturers.” Please reformulate, the signal was not converted to corrections but you applied corrections

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L58 redefine abbreviations at first use in the main text (here BC)

L64-69 This is a poor representation of the existing methods and partly misleading. . . The sunset is thermal AND optical and there are thermal optical transmission and thermal optical reflection. . . see AMT papers on the subjects. For just evolved gas phase there are the old commercial systems such as the R&P analyzer, there is the DRI analyzer. You only give 2 Sunset papers. This is not critical but just weird and actually wrong.

L68 Please check also all your references throughout the manuscript. Here the Petzold and Moosmueller refs are both missing in the literature cited.

L123 Athens campaign. If you keep the structure with first field campaigns then instruments then please reference at the mention of multicopter that you will provide details later, idem later on for the Cyprus study UAS.

L128 The 2kg payload limitation is confusing as the Table says different. Please elaborate and please elaborate and clarify which instrument this refers to.

L371 section on miniature monitor descriptions. Please discuss them all 3 Currently hardly any description is here on the DWP and please be consistent by providing/discussing weight of all 3 of them. Essentially give the same information and same level of detail for all 3 consistently. This would be most useful.

The UAS platforms in Table 1 should include manufacturer.

Table 1: typo km not k, formatting: align text to center of pictures

Table 1. define abbreviations at first use

Figure 1: provide the source of the maps and pictures and ensure you have the rights

Figures 4,5,6,7: could you provide error bars on the values. If they are smaller than the symbols used then please state so in the legend.

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Figure 7 Why do the x and y axis extend to negative values?

Literature cited:

Please check all references are included

Please format uniformly, especially year, some years are missing sometimes year is after the author, sometimes year is at the end

Curious that besides the author's own papers there is no citation more recent than 2016. There seem to be relevant literature out there.. e.g. Saturno et al., 2017 on aethalometer correction schemes

References mentioned in this review

Bates, T. S., Quinn, P. K., Johnson, J. E., Corless, A., Brechtel, F. J., Stalin, S. E., Meinig, C., and Burkhardt, J. F.: Measurements of atmospheric aerosol vertical distributions above Svalbard, Norway, using unmanned aerial systems (UAS), *Atmos. Meas. Tech.*, 6, 2115-2120, <https://doi.org/10.5194/amt-6-2115-2013>, 2013.

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Ferrero, L., Castelli, M., Ferrini, B. S., Moscatelli, M., Perrone, M. G., Sangiorgi, G., D'Angelo, L., Rovelli, G., Moroni, B., Scardazza, F., Močnik, G., Bolzacchini, E., Petitta, M., and Cappelletti, D.: Impact of black carbon aerosol over Italian basin valleys: high-resolution measurements along vertical profiles, radiative forcing and heating rate, *Atmos. Chem. Phys.*, 14, 9641-9664, <https://doi.org/10.5194/acp-14-9641-2014>, 2014.

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ter correction schemes and a reference multi-wavelength absorption technique for ambient aerosol data, *Atmos. Meas. Tech.*, 10, 2837-2850, <https://doi.org/10.5194/amt-10-2837-2017>, 2017.

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