

Atmos. Meas. Tech. Discuss., referee comment RC1
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Comment on amt-2022-165

Francisco Molero (Referee)

Referee comment on "Algorithm for vertical distribution of boundary layer aerosol components in remote-sensing data" by Futing Wang et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2022-165-RC1>, 2022

The manuscript titled "Algorithm for vertical distribution of boundary layer aerosol components in remote sensing data" by Wang et al., presents a new algorithm to derive vertical mass concentration profiles of fine aerosol components from ground-based lidar and sun-photometer data. The methodology is well-explained, providing details of the different steps of the process and the results are validated using experimental data (AERONET products and surface observations) and model results (NAQPMS components profiles). The manuscript is well-written and it presents a substantial contribution to scientific progress within the scope of Atmospheric Measurement Techniques. There are several issues and technical comments that can be improved, and some minor issues and typos to correct, highlighted in the attached file.

Firstly, the relationships among the different components (section 2.1.4) are not clearly explained, further details must be provided about the deduction of the AN, AW and BC components from the WIOM and WSOM (line 185 – 190), as well as the constraints applied to the WSOM and WIOM components. Also, these details must be included in Fig. 1, where the initial guess seems to apply to the five components. The manipulations required to compare these components with surface measurements and model products, mentioned in lines 262 – 266 and lines 288 – 289, must be commented as well in this section, including some estimations of the errors produced by the conversions.

Secondly, the limitation to the fine mode must be better established. It seems that the authors don't consider contribution of dust to the fine mode and it isn't clear if the components cover all possible type of aerosols naturally found in the atmosphere?. Or at least those that can appear in the fine mode?. A better description of the components considered and how they compare with those provided by surface measurements and NAQPMS model products must be included in section 2.2.3 and relevant parts of the manuscript.

Finally, some technical issues:

Figure 1 must be revised to follow standard flowchart rules and include all relevant information of the procedure

Figure 4 & 5 X-axis labels are hard to read, please provide better labeling. Also Fig4 c Y-axis is wrong, values should be 0-100 %, not 0-1.

Please also note the supplement to this comment:

<https://amt.copernicus.org/preprints/amt-2022-165/amt-2022-165-RC1-supplement.pdf>