This manuscript presents the results of fluorescence lidar measurements conducted over Thessaloniki. The fluorescence capacity and depolarization ratio are used as the basis for aerosol typing. Applying this classification scheme, the occurrence of different aerosol types at various altitudes during the 2024–2025 period is analyzed. The results of the fluorescence-based typing are also compared with those obtained using the EMD algorithm.

Overall, the manuscript is well written and suitable for publication in ACP, but several revisions are needed to address specific technical points and improve clarity.

Detailed comments

Table 1. The filter width at 466 nm is likely 44 nm, not 50 nm—please verify and correct.

Line 147. The text mentions “different PMT sensitivity, detector efficiency…”. Does the calibration constant account for both of these factors?

Table 2. The systematic biases are very low. However, it should be kept in mind that the smoke fluorescence spectrum depends on factors such as origin, altitude, etc. It is not entirely clear whether the authors corrected for differential Rayleigh extinction at the central wavelengths of the filters, or whether they accounted for spectral dependence within the filter transmission band. Ignoring this spectral dependence, especially for a 100 nm filter, could introduce a significant bias—this issue should be addressed.

Fig. 1. The labels in the figure also indicate the wavelengths corresponding to the spectral maxima. This information should be mentioned in the figure caption.

Fig. 3g. Showing the fluorescence lidar signal is not very informative. Would it be possible to present the fluorescence backscattering coefficient instead?

Table 5. The values LR_{355} = 86 sr and LR_{532} = 91 sr are quite unusual for long-range transported smoke. Typically, such values are lower, and LR_{532} is usually greater than LR_{355}. This discrepancy should be discussed in the text.

Moreover, reporting values such as 85.99 ± 32 is unnecessarily precise; it would be more appropriate to present them as 86 ± 32.

Fig. 4e. Why the lidar ratio plot starts from –50 sr? Additionally, the uncertainty is not clear for me. For example, in the middle of the dust layer the lidar ratio appears to be about 20 sr—this is a very low value and needs explanation.

Table 6. The depolarization ratio is 18%, which strongly suggests a mixture of dust with other aerosol types.

Fig. 5c. A characteristic signature of pollen is a high depolarization ratio. However, the value shown in this figure is only about 2%, which is far too low. How can this be interpreted as pollen? The authors should justify this classification.

Fig. 7. The dashed boxes are said to indicate results from Veselovskii et al. (2022b). However, the values shown in this figure do not appear to match those from the cited reference. For instance, dust depolarization should reach up to 35%, the maximum pollen capacity should be of 3×10^{-4}, etc.

Finally, it should also be mentioned that the proposed typing scheme may be influenced by particle hygroscopic growth.