

Atmos. Meas. Tech. Discuss., referee comment RC3
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review of paper amt-2021-80

Anonymous Referee #3

Referee comment on "Mie–Raman–fluorescence lidar observations of aerosols during pollen season in the north of France" by Igor Veselovskii et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-80-RC3>, 2021

The paper contains new and complex lidar observations of pollen. A triple-wavelength polarization Raman lidar with aerosol fluorescence channel is built up and mixtures of pollen and anthropogenic pollution are measured, as well wildfire smoke and dust outbreak events.

The paper is well written and clearly worthwhile to be published.

I have only minor comments.

P2, L45-49: The Finnish group only measured lidar ratios? No depolarization ratios?

P3, L63: LILAS is the abbreviation for...? Lille lidar for atmospheric studies ...?

P4, L95: How do you overcome the problem with the 1064 nm backscatter reference value? Are you using cirrus backscatter and set $\beta_{532} = \beta_{1064}$? Otherwise, β_{1064} is rather uncertain! Please comment on that!

P4, L106: It is a pity that you had to remove the water vapor channel, and at the same time, RH is an important parameter in your study... , and you have to make use of radiosonde observations far away. In case of good observations of water vapor mixing ratio profiles, one can easily and accurately derive RH profiles by using weather model temperatures in addition.

P5, L125-138: I would prefer a table (maybe even in Figure1) with all the specific names for the substances (betula, ..., poaceae...) and the translations in addition Quercus (oak) , Poaceae (grass), betula (birch) and so on, if that is possible...

P7, L194: I find that depolarization ratios of 5-7% are quite high! What is the reason, is that specific for Lille? Is that the remaining pollen impact.

P8, L215-217: But usually smoke layers show low depol ratios of <0.05 at all wavelengths in the lower troposphere as the example in Haarig et al., Canadian smoke paper in ACP, 2018, shows. An exception is the observation shown in Burton et al. 2015, not the rule.

P10, L289: BAE strongly depends on particle refractive index and shape, and EAE? only weak dependence , or even no dependence?... what do you mean here... ?

P14, L398: smoke – low depol ... high GF

P26, Fig 5: more than four hours of signal averaging! How sensitive are the results to changes in the aerosol conditions?

P27, Fig 6: x-axis text starts with beta-1064, but shown is the beta-532 backscatter (in green)

P29, Fig 8, again 5 hours of signal averaging! Please comment on signal averaging, and that you need stable conditions.

P31, in Fig.9 very variable aerosol structures are visible, but in Fig.10 all nine hours are averaged. Please provide a comment on the impact of aerosol variability on the retrieval products.