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Comment on amt-2021-272

Anonymous Referee #2

Referee comment on "Laboratory evaluation of the scattering matrix of ragweed, ash, birch and pine pollen towards pollen classification" by Danaël Cholleton et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-272-RC2, 2021

In the submitted work a laboratory evaluation of light scattering by four of the most common pollen taxa, namely ragweed, birch, pine, and ash, is provided for the purpose of pollen classification. The authors conduct the experiment of light scattering by grains of mentioned pollen taxa and represent it through scattering matrix formalism at two different wavelengths (532 and 1064nm) of incident radiation. Elements of a scattering matrix describe how the polarization state of the incident radiation has changed by light scattering of the studied pollen grains. A Principal component analysis (PCA) is applied on estimated ten scattering elements (five per wavelength) to reduce the dimensionality of the feature space to two by explaining 99% of the variance in the data. In the transformed domain, defined by the range of PC1 and PC2 components, a pollen identification is performed based on the area size of cluster regions of projected scattering matrix elements.

The methodology is well explained within the manuscript, and the results are clearly represented. However, there is space for the manuscript improvement if the following remarks are addressed:

Line 35 -40 A recent work of Sauliene at el. 2019 https://doi.org/10.5194/amt-12-3435-2019 , considers different modalities of data (among them light scattering data) for real-time pollen identification.

Line 225-230 Normalization of the detected intensity by that of a photodetector placed at 170 degrees scattering angle is motivated by its dependency on the pollen grains number concentration. Can the authors provide a more informative explanation on this, concretely how pollen grains number influence the measured intensity of the photodetector at 170 degrees?

Line 245 -250 In the (45+)-polarization curve two successive local minima are not equal at wavelength… Some annotation on Figure 4 will be helpful for understanding which exactly two. (optional)

Line 290-325 The Figure of PC components obtained from five scattering elements (separately for VIS and IR) would clarify the influence of wavelength selection on pollen identification. It is well known that PCA is the standard method mostly used for compact data representation while Linear discriminant analysis (LDA) is the standard method used when the discriminant features are needed for classification purposes when the class labels are known. From that perspective, an LDA is more suitable for the considered problem. Therefore I strongly advise authors to consider LDA in the part of data analysis.