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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Near-surface and columnar measurements with a Micro Pulse Lidar of atmospheric pollen in Barcelona, Spain" *by* M. Sicard et al.

Anonymous Referee #2

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Comment on "Near-surface and columnar measurements with a Micro Pulse Lidar of atmospheric pollen in Barcelona, Spain" by M. Sicard et al.

More and more attentions have been paid on biological aerosols due to their significant impacts on environment and climate. The article presents an investigation of near-surface and column characterization of atmospheric pollen in Barcelona, Spain, mainly by use of lidar measurements and sampling analysis. Moreover, impact of meteorological elements (e.g., RH, T and wind speed) and solar flux on atmospheric pollen load in the atmosphere was discussed in detail. The topic is of sufficient interest to the communities of study of atmospheric aerosol (especially bioaerosols), climate as well as human health. In general, I find this manuscript to be of interest for publication

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Discussion paper

and appropriate for this journal. There are several suggestions for improvement listed below that should be considered by the authors and the editors before publication.

1. In fact, there is uncertainty during measurements of atmospheric pollen and spores. As introduced by the authors, pollen and spores was identified using a fluorescent microscope. However, the results should be affected by other fluorescent particles. It will be easier for readers to understand if the authors briefly introduce how to identify pollen and spores, obtain their concentration as well as discuss its uncertainty.

2. In spring, dust aerosols could be long-range transported to Barcelona. And pollen, like dust aerosols, are coarse particles and shows strong backscatter signal and large depolarization ratio from lidar measurements. Even high mass concentration of PM10 also could be seen during dust events. So the authors should explain why this is a pollination event, not a dust event. How to distinguish dust particles from pollen and spores?

3. Page 4 line 24: incomplete sentence, "PâŤť and P|| represent the perpendicular and parallel backscatter powers respectively".

4. Page 4 line 30: please delete "linear". Strictly speaking, MPL depolarization ratio is not linear depolarization ratio.

5. Page 6 line 20: the authors should explain how to decide a threshold for estimating the vertical height of pollen plume. There will be better if the vertical height is estimated based on particle backscatter coefficient and depolarization ratio simultaneously.

6. A peak of particle backscatter coefficient is always found at near surface (∼300m), but not for depolarization ratio profiles. Overlap correction is very important before retrieval of lidar observation data, especially within boundary layer. So probably the correction is not proper, then cause this problem. Please carefully check processing of lidar data.

7. Page 7 line 3: add "a day" to the end of ". . .pollen and fungal spore per cubic".

8. Page 8 line 15: use abbreviation at the first time, “relative humidity (RH) and temperature (T)”.

9. Figure 3: why does the total pollen concentration peak precede the AOD peak of pollen? In general, high particle concentration and RH cause large AOD. However, on 31 March maximum pollen concentration and AOD were found at 3 UT and 15 UT, respectively. RH is very close but large differences between total pollen concentration ($\sim$ 2 times). Please explain the reason.

10. Section 4: It is very important to fix a depolarization ratio of pollen when estimate its contribution ratio and backscatter coefficient. The authors reference results reported by other researchers. However, depolarization ratios are also affected by ambient RH. So please consider the factor and discuss uncertainty of contribution ratio and backscatter coefficient caused by artificially decided depolarization ratio.

11. Page 11 line 21: The AOD is not reliable from lidar data, by integrating the profile of backscatter coefficient in the whole column and multiplying the assumed lidar ratio. Why do not use AOD from co-located AERONET sun-photometer?

12. Page 17 line 31: add “are” to “. . .lidar systems (with at least two channels) are able to produce continuously profiles. . .”.

13. Figure 2: please use particle depolarization ratio rather than volume depolarization ratio.

14. Figure 4: Too many, hard to get the points. Please 1) remove all total backscatter coefficient and volume depolarization ratio, just keep pollen backscatter coefficient and particle depolarization ratio; 2) only plot 3-4 panels per day, 9 panels are too many.

15. Figure 5: Same problem as fig 4, please remove panels of total AOD and volume depolarization ratio, and re-arrange the figure side by side. 16. Figure 6: Remove the upper panels (pollen concentration vs. volume depolarization ratio).

17. Figure 8: Depolarization ratio is used in the figure, but why do not use pollen

concentration or backscatter coefficients?

18. A paper about the vertical distribution of Asian dust measured by three MPL Lidars over Northwest China (Huang Z. et al., 2010) was published in JGR. Please reference this paper to increase reader understanding of lidar data retrieval and MPL performance. Furthermore, studies of fluorescent spectrum of atmospheric aerosols from a lidar spectrometer system with high spectral resolution (Sugimoto N. et al., 2012, OE) provides a new tools for investigating vertical structure of biological particles, which will be very useful for readers to understand remote sensing of bioaerosols.

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