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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Investigation of diurnal patterns in vertical distributions of pollen in the lower troposphere using LIDAR technique" *by* Y. M. Noh et al.

Anonymous Referee #3

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The paper by Noh et al reports lidar backscatter and depolarization measurements in Gwagnju, Korea, in conjunction with co-located AERONET, PM10 concentration, and pollen count distributions. A diurnal pattern in depolarization measurements is interpreted as pollen observations.

Whereas I think that it is worth it to do the best possible research on this dataset, with an eventual publication, I am not convinced by the interpretation given by the authors. I am unfamiliar with pollen observations by lidar and their depolarization properties; however the depolarization signal observed could be interpreted differently whereas the authors have not investigated other possibilities.

I believe that it cannot be excluded that the depolarization signal is due to locally wind-blown dust. As the authors point out, this signal is observed in conjunction with a daily pattern of larger temperatures and stronger winds. Winds may cause more pollen to be released, but also more dust to be lifted in the surrounding areas.

1) Please give more details on how you convert lidar signals to geophysically relevant quantities. Retrievals of extinction coefficient will require assumptions on backscatter/extinction ratio and reference height (see Klett, AO, 1985). Depolarization will require a good calibration and rigorous treatment (see Freudenthaler et al, Tellus, 2009).

2) Please specify if you are using volume or particle depolarization ratios (I believe that you are using volume, but it needs to be specified).

3) You observe a statistical correlation between lidar depolarization in the boundary layer and surface pollen concentrations. This does not imply at all that depolarization is caused by pollen, but rather it suggests that both observables are driven by a common driver (e.g. wind).

4) Have you investigated the possibilities that you observe wind blown dust instead? Any information on composition from filter samples? Can you describe the surrounding area to exclude any terrain where dust could be blown into the atmosphere?

5) When talking of pollen, could you give an idea of how large these particles are meant to be?

6) Can you give references from the literature to studies linking lidar depolarization to pollen? What is the particle depolarization ratio expected for this aerosol?

7) By assuming a particle depolarization ratio for your depolarizing aerosols (whether dust or pollen), you should be able to use the signal in volume depolarization to quantify which fraction of the extinction and aerosol optical depth are due to it and which fraction is due to the background urban aerosol (see Marenco and Hogan, JGR, 2011).

8) You describe pollen as a form of pollution. Are we sure that this classification is

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correct? This term is usually used for anthropogenic emissions.

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