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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Detection and characterization of birch pollen in the atmosphere using multi-wavelength Raman lidar in Finland" *by* Stephanie Bohlmann et al.

Holger Baars

baars@tropos.de

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Methodology:

-If you speak about concentration of Pollen you refer to the number concentration, but what does this means in terms of the surface concentration and the volume concentration which are the important parameter for backscatter and extinction of light ? Can you clarify with typical sizes from the detected Pollen?

-Furthermore, can you provide a table with the optical and microphysical properties of the different Pollen types you analyse as detected in the laboratory, e.g. the depolar-

ization ratio (Cao et al.), average density of Pollen, refractive index, and fall velocity (would be interesting as most Pollen have good flight behaviour.)

-A discussion on the flight behaviour would be beneficial to relate the lidar measurements to the surface measurements. One could imagine that if particles are to large and to heavy and have thus a high fall velocity they would not make it up to the heights of the lidar observations (this could, e.g. another reason for your changing particle depolarization with height: Is the size distribution of the observed Pollen types nearly one size or can they change?).

-You state that during your observations the lidar ratio of Pollen stays the same while depolarization changes. What theoretical optical properties do you expect from, e.g., scattering calculations? Is there any literature available? Can you explain how the depolarization of the laser light is working at this size range?

Case studies:

-Line 15ff: you state that birch Pollen (20-30 mum) are smaller than spruce (70-100 mum) and therefore the Ångström exponent is higher when only birch is prevailing. However, considering the laser wavelength and the size of the particles, I would expect an Ångström exponent of 0 for all particles (size parameter well above on). Can you state on this?

-Derived optical parameters: Are the Pollen probably aligned in a certain way that they can fly better and might therefore a difference in the observed optical properties in comparison to laboratory measurements occur?

Idea:

-As you have determined the particle depolarization ratio of pure birch and you know the contribution of both constituents during the mixed birch/spruce period, couldn't you calculate the theoretical depolarization ratio of pure spruce by applying the depolarization separation formula of Tesche, 2009, JGR . If I am right, you will need to convert

your number concentrations to surface concentrations to obtain the backscatter fraction.

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