

Interactive comment on “Using depolarization to quantify ice nucleating particle concentrations: a new method” by Jake Zenker et al.

Anonymous Referee #2

Received and published: 9 August 2017

The paper reports a new method, based on depolarization ratio, to enhance the calculation of ice nuclei concentrations in the occurrence of water droplet breakthrough. The method seems to be specific to the CFDC at Texas A&M University and to be applicable only in laboratory settings. For this reason, the wide applicability of the method might be limited. Despite that though, the issue to solve is an important one, especially considering the large uncertainties in the field of ice nucleation research. In addition, the technical work done for this comparison is considerable and involved also a modeling aspect. Therefore, I think the paper should be published. Overall the approach seems sound and well developed. Some clarification would be helpful in some instances, but overall the paper is well written. Some specific, rather minor comments:

1. Maybe I missed it, but I do not recall seeing mention of the specifications of the light

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source in the CASPOL (wavelength, polarization, source, e.g. laser etc.). 2. On page 5 the authors describe the APC chamber, how are clouds produced in it, also through adiabatic expansion? 3. It would help to have some more detail on what causes the water droplet breakthrough, in what conditions, why it happens at different conditions in different instrument etc. For example around page 8 or so. 4. On page 9 on the first line: "precisely" seems a bit too strong; also LIDARs will have some finite field of view. 5. Still on page 9, the authors mention oil as having a similar real part of the imaginary index of refraction. I would think oil might have a different imaginary part of the index of refraction, with respect to water (also depending on the wavelength of the CASPOL). Maybe this is completely negligible, but could the absorption make any difference in the measurements or numerical simulations? 6. Page 10, line 7: remove "both" 7. Page 11, line 9 to 12. This sentence is not very clear to me. 8. Referring to figure 1, it seems like the total backscatter signal should have parenthesis in the label of the y axis. 9. Page 13, line 12, why is 1.75 μm an upper limit for the CFDC? Are there some data on this item, or some published values? 10. Page 13, lines 24-26 and related figures: maybe I missed it, but how were the size distributions measured? 11. Page 16, line 24, I think "large" should be "larger". 12. Page 17, line 3, it seems like a "different" is missing when discussing the "statistically significant..." 13. Page 18, line 7, "like" should be "likely" 14. I found the section 3.7 hard to read and to follow. I am not sure what to suggest. Maybe a schematic of the algorithm would help, but as is, for me, it is very difficult to follow.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2017-166, 2017.

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