

Interactive comment on “Application of a diode array spectroradiometer to measuring the spectral scattering properties of cloud types in a laboratory” by A. R. D. Smedley et al.

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Editor, The article describes a set of unique multi-spectral polar nephelometer measurements of water and mixed phase ice clouds. Although a novel contribution to the science, I have reservations about it's acceptability for publication due to the numerous shortcomings in the description, particularly as many of the descriptions of the setup and analysis are lacking or incomplete. Reproducibility of the experiment is not possible with this description.

I hope my line descriptions are sufficient. My PDF copy has the page numbers in the middle of the page

Abstract Line 8-9; “dynamic range” refers to the difference in max/min intensity that can be detected. I think the term required here is limited sensitivity as the instrument can’t sense thin clouds.

Section 2.1, line 15. External Vacuum and the steady state environment. I’m assuming that the vacuum pulls the save volume as the steam generator puts in. Is this the “steady state”? Does the temperature humidity/ concentration/ habit of the cloud remain constant?

Section 2.3, line 12-13. “ \ddot{E} and hence \dot{E} measurements.” Seems extraneous.

Section 2.3, line 10 (page 10774) aligning the light from the LLG . “marginal radiance distribution: Does this mean centering the light source?

Section 2.3, line 13 (page 10774) Did you measure or infer the intensity of the light (5W) at the scattering volume?

Section 2.4, line 28. “ \ddot{E} intensity of the DASR . . . ” should be “ \dot{E} intensity response of the DASR . . . ”

Section 2.4, line 11-15 (Page 10776) Checking stray light response. Does this mean the high pass filters remove some of the wavelengths and then the DASR response is checked to see if there is a response above and below the high pass wavelength? Does the filter cause other reflections? Please clarify,

Section 3.1, line 20, This text is unclear. I think you mean to say that the measurement must be calibrated / adjusted by the intensity measurement of the forward detector as well as other considerations.

Section 3.1, line 1, Page 10778. The unscattered component. Does this mean a correction to the light intensity seen by the detector at the beam dump? Isn’t this effect relatively small (optical depth = 0.1). Is it significant? Or is this something else?

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Section 3.2 Is the ray tracing method applicable for all wavelengths and observed particle sizes?

Section 3.3 line 2-3 Page 10780, 1 sec only fig 2 with a PSD.

Section 3.3 line 16 Page 10780 “. . . most resemblance to natural cloud PSDs. Needs to be backed up by a reference.

Section 3.3 line 23 Page 10780, Fig. 4 only?

Section 3.3 line 1-2 Page 10780, contrail type of cloud (reference needed)

Section 3.3 line 5-6 Page 10780, fig 2-3/4-6 confusion again .

Section 3.3, line 7-8, The “obvious difference at 1° “ is not obvious to me on the plot presented in the paper. It is also difficult if not impossible to determine which lines are theory and which are measurements and for which wavelength band.

Section 3.3 line 15 Page 10780 ‘Error in units of ”P11” are not intuitive. First, there is considerable difference between the phase function value between the forward and side scattering. Even between 0° and 10° the intensity varies 4 decades, (30 P11 ‘units’ is very different at 104° than at 101°). I’m not even sure ‘units’ is a proper term here, as the phase function is a non-dimensional relative intensity measure.

Section 3.3, line 8, page 10782. Where is the term ‘NO’ defined?

Section 3.3, line 9-20, page 10782. 1st, besides the discrepancy in the scattering plot for cloud 17, what other evidence is there for the enhanced scattering? Was fogging observed? Did more/less heating of the lens enhance/reduce this effect? Also, the description of the lens interior is confusing. Does this mean the effect changes when the field of view of the receiving optics is changed? Fig 5 is mislabeled and what corroboration is shown?

Section 3.4, 2nd paragraph, Where does the ‘30% reduction for plates’ come from (reference?) is there a similar value for the effect of diffraction? Do the two factors

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actually balance out?

Section 3.4, 3rd paragraph, line 12,. What does it mean 'degree of scintillation'? Does the cloud sparkle more if crystals are present? Is this in comparison to water clouds?

Section 3.4, paragraph 4, line 17. The pop gun nucleator was replaced with a rubber tube. I'm assuming that a flow of air was maintained through it and throttled. Or was the pulsing action maintained? Why is a greater air flow needed?

Section 3.4 Figure numbers are wrong again.

Section 3.4, paragraph 6. Why is there an almost 'cyclic' behaviour to the noise in the measurements of Figure 5 (mixed cloud) Is this due to bending in the sensing fiber? Particle concentration changes due to turbulence?

Section 3.4, Figure numbers are off again. Regarding the 2-D probe images. Most look round to me,. Perhaps a sample spherical water drop for comparison?

Conclusion: I could only see the spectral variation of the measured rainbow peak in Fig. 3 by magnifying my PDF file considerably. This needs to be amplified in the picture (an inset?) to make the phenomena visible in publication.

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