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Discussions

Interactive comment on "Spatial distribution of cloud droplet size properties from Airborne Hyper-Angular Rainbow Polarimeter (AirHARP) measurements" *by* Brent A. McBride et al.

Anonymous Referee #2

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This paper discusses the use of the recently developed polarimeter AirHARP to obtain spatially resolved information about cloud droplet size distributions. First, the instrumental concept and the retrieval approach are described, then a case study is shown, in which AirHARP measurements are used to infer the spatial distribution of cloud effective radius and effective variance over a heterogeneous stratocumulus cloud field observed in 2017. The paper is very well written and shows interesting and novel science, as AirHARP appears capable of producing unique insight on the spatial variability of cloud effective radius and especially effective variance. I fully recommend publication of this paper on AMT, and I think the manuscript really does not need any major changes before publication. Below are a few comments, mostly aimed at improving the

clarity of a few sentences and correcting a few typos.

MINOR COMMENTS

- P1, L13, "uncertainties" -> "sources of uncertainty"

- P2, L7, "depend" -> "depends"

- P2, L10, "are" -> "is"

- P3, L33 (and other instances). I would suggest replacing "confident" with some more specific terms ("precise"? "accurate"?)

- P3, L42. Here, are you referring to retrievals only using one wavelength? What about using multiple wavelengths in order to partially compensate for the lack of angular resolution, exploiting the spectral shift in polarization features?

- P6, L23. Replace "will be launched in 2019" with the actual launch date (it has been recently launched, right?).

- P8, L10. Replace ">" with "<".

- P8, L33-34. "The physics . . . beyond 1.5". Why is it so? Please explain better.

- P8, L37. Add "ratio" after "signal-to-noise"

- P8, L38. Can you briefly explain what optical etaloning is? As a non-instrument person, I don't understand this sentence.

- P9, L30. Add "because" before "the solar geometry"

- P9, L37, "image-to-image" -> "from image to image"

- P10, L2. Do you mean that they tend to miss the angles near the upper end of the cloudbow range? Emphasize this a bit more in the sentence.

- P10, L10. "the actual" -> "RGB composite images of the total and polarized reflectance measured"

- P10, L12. By "the actual image" do you mean the polarized reflectance composite?

- P10, L13-14. "The RGB composite". Isn't the total reflectance image also a RGB composite? If so, I would suggest to say "the polarized reflectance RGB composite" at the beginning of the sentence. Furthermore, does the lower panel of Fig. 5 only shows polarized reflectance, or is also total reflectance superimposed?

- P10, L22. By "standard deviation of the pixels" do you mean the standard deviation of their polarized reflectance?

- P10, L25, "forces a shift to" -> "causes a shift in"

- P13, L12, "the red line" -> "which is shown as a red line"

- P13, L11-13. What about the right hand sides?

- P13, L15. "Mischenko" -> "Mishchenko"

- P13, L27. At least "Fourier" should start in uppercase.

- P13, L30-31. By "well-mixed in CDV" do you mean that they reflect a more heterogeneous distribution of CDV values (I see values ranging from ∼0.015 to ∼0.15)? Say that a bit more clearly.

- P14, L10-11, "angle-to-angle" -> "from angle to angle"