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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Joint Cloud Water Path and Rain Water Path Retrievals from ORACLES Observations" *by* Andrew M. Dzambo et al.

Anonymous Referee #1

Received and published: 2 September 2020

Dzambo et al. 2020 Oracles CWP/RWP, Review

The authors have developed a routine that uses multiple aircraft-borne instruments to discern cloud properties in the SE Atlantic Stratocumulus deck, with a focus on partitioning cloud liquid water and rain water. The routine is mostly sensitive for thicker, drizzling stratocumulus, but has a greater amount of uncertainty for more heavily precipitating convective-type clouds. Case studies show reasonable performance, with drizzling stratocumulus clouds containing far more cloud water than rain water, but heavier raining clouds containing more rain water (though results are less uncertain). The routine is stated to be insensitive to aerosols in the environment, making retrievals from this platform ideal for studying the aerosol-cloud interactions in the SE Atlantic.

The manuscript is well explained, cleanly presented, and results are well supported by

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the material and figures presented. The RWP/CWP data from ORACLES will provide significant scientific value for the community. The paper is in no need of significant revisions and the routine presented is not particularly controversial as it relies on a great deal of established science. Given the purposes of ORACLES, to specifically study aerosol/cloud interactions, I would like to see a more detailed assurance that the routine is insensitive environmental aerosols. I recommend that the article be accepted in its present form, but with a few small details addressed.

Comment:

Parts of this routine (not the radar part) rely on optical properties of cloud tops. I'm somewhat surprised that overlying aerosols have no effect on cloud bow properties and reflectances. It would benefit the paper to state directly how we can be certain that the routine is insensitive to overlying scattering aerosols, and whether this has been tested. It's possible that this is explained in the referenced material, but a quick explanation here would be beneficial.

Minor Fixes:

For stratocumulus, use the 'Sc' abbreviation.

Page 6: were there any limitations or changes in results when CAS wasn't available and CDP was the only option for n(D)?

At some point around page 7, mu is replaced by u

Line 20/21, page 10, not sure what you mean concerning RWP and CWP, are you implying that the a-priori rate keeps the algorithm from returning unrealistic RWP and CWP?

CWP is basically invisible in Figure 2. This could be by design to highlight how little RWP exists in the cloud compared to CWP, but maybe you could find a way to plot the lines in a semi-transparent way to highlight the overlap?

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Line 21 The 2016 ORACLES campaign... Were there any other reasons that the RWP could be lower? Differences in EIS or other environmental variables? This isn't really important for the results, but may be worth looking into.

Figure 8: The text makes it clear, but can you mention in the caption that the obs are quasi-simultaneous?

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