

Atmos. Meas. Tech. Discuss., referee comment RC2
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Comment on amt-2020-448

Anonymous Referee #4

Referee comment on "Why we need radar, lidar, and solar radiance observations to constrain ice cloud microphysics" by Florian Ewald et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2020-448-RC2>, 2021

The Authors discuss the use of passive measurements in the shortwave infrared to provide radiative closure to synergistic retrievals of cirrus cloud microphysical properties utilizing co-located airborne lidar and radar measurements. They discuss two test cases, one where passive measurements show evidence of a good radiative closure and one where they do not. For the latter case, they use co-located in situ observations to relate the lack of radiative closure to an exceptionally high ice crystal number concentration at an altitude of about 7.5 km, which poses challenges to both lidar and radar retrievals.

Overall, I found this paper very interesting and clearly written, and therefore I recommend publication with only minor technical corrections. Specific comments are below:

- Abstract, L19-20. The last sentence was not immediately clear to me when I first read the paper. You may want to replace "narrow" with "attribute" or "relate".

- P2, L56. Do you actually mean "overlapping radar and lidar measurements"?

- P125, Section 2.1. At what altitudes did the aircrafts fly?

- P5, L127, "aircraft" -> "aircrafts"

- P6, L151, "spectroradiometer" -> "spectroradiometers"

- P7, P179, consider replacing "convergence with the actual measurements" with "convergence of the simulated measurements to the actual ones"

- P10, L243, "missing" -> "lack of"

- P10, L244, "can be reflected by all atmospheric constituents" -> "can also be reflected by liquid water clouds and aerosols".

- P18, last line. Do you mean Fig. 9d instead of 9c?