

Review 2

I would like to compliment the authors on their efforts to improve the manuscript. I think that the additional validation adds to the credibility of the proposed retrieval. Especially the good agreement with the 2C-ICE dataset is encouraging.

However, I think that the manuscript can still be improved in terms of scientific novelty and clarity of the presentation.

General comments

In terms of focus, I think the authors need to make their conclusions more specific. Currently, their main conclusion is that adding the 150 GHz channels to the retrieval improves its accuracy, which is not very informative. I therefore suggest to include the retrievals which use only channels around 183 GHz and retrieval using Ch. 2-5 in the results in section 4.3. This would allow the authors to quantify the effects of using one or two 150 GHz channels on the instantaneous accuracy (using the tropical cyclone case) as well as the climatological accuracy (using the comparison of the yearly means). This would put the results into a more practical context and provide the novelty required for publication in AMT.

I would also like to encourage the authors to publish their code and include a reference to it in the manuscript.

Specific comments

- l. 32: get microphysical of clouds -> determine the bulk and microphysical properties of clouds
- l. 48: microphysical -> microphysical properties
- l. 67: The name of the sensor is Cloud Profiling Radar. I added the capitalization just to emphasize the difference. I am sorry if this caused confusion.
- l. 74: ... based on the deep neural network -> ... based on a deep neural network
- l. 128: Ice clouds are ...
- l. 129: I would suggest using phenomenon or component instead of parameter
- l. 177: Why would the PD at similar incidence angles as that of conical scanners be lower? Isn't that rather an effect of the much larger footprint?
- Fig. 4 (c) and (d): Please reduce the bin size of for these plots or smooth the results to make the contours less noisy.
- l. 193: ... a nonlinear mapping from the input to the output data

- 1. 250: If I understand you correctly, the conclusion that Ch. 4 is the best for cloud detection is based on it adding the largest improvement in Tab. 2. I don't think that this is a valid conclusion as it may just be that only Ch. 5 and Ch. 3 together work better than Ch. 4 - 5.
- 1. 259: ... five channels are all used -> ... all five channels are used
- 1. 276: ... focused on here.
- 1. 309: The PDs at ...: Some text seems to be missing here.
- 1. 309: The PDs do not share the distribution characteristics of the low TBs. That would be in contradiction of PDs occurring mostly in warmer ice clouds and outflow regions.
- 1. 379: Refine conclusions to assess effects of a single 150 GHz channels as well as both 150 Ghz in terms of instantaneous estimates as well as annual means.
- Fig. 10: Please change the comparison to 2C-ICE to a line plot include this as an additional figure. I suggest you also add results from a retrieval using only channels around 183 as well as a retrieval using Ch. 2 - 5.
- Fig. 12: Here I suggest you also include results from a retrieval using only the channels around 183 as well as a retrieval using Ch. 2 - 5.
- 1. 361: If you mention quantile regression neural networks, please cite Pfreundschuh et al. 2018.
- 1. 376: See comment above on impact of Ch. 4
- 1. 379: Refine conclusions to assess effects of a single 150 GHz channels as well as both 150 Ghz in terms of instantaneous estimates as well as annual means.