Comment on amt-2021-318
Anonymous Referee #1

Referee comment on "Horizontal geometry of trade-wind cumuli – aircraft observations from shortwave infrared imager versus radar profiler" by Henning Dorff et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-318-RC1, 2021

Review of “Horizontal geometry of trade-wind cumuli” by Dorff et al

This paper contrasts 1D and 2D observations of cloud (size) during the NARVAL campaign. In general, I think the paper is great, and should be published quickly. Many of the questions I had while reading it were actually answered a section later. I do have a few suggestions for the authors:

- Is AMT the best venue for this paper? Sure, it is nominally about comparing different observational techniques, but the results are much more broadly applicable to the cloud physics community. I feel ACP would be the more appropriate journal in the EGU stable. I therefore would suggest moving to a different journal, but otherwise minor revisions.
- In Section 4.1, I would like to see a few more statistics about the compatibility between radar and imager. For instance, what is the % agreement between the two on clear/cloudy pixels (false positive/negative rate, if you will). Is this a function of certain parameters and choices of thresholds? Do the 1D CSDs from both instruments pass a KS test for certain sets of parameters?
- I noticed some choices of words where I am not sure I would have given those words the same meaning. Some suggestions for alternatives are below whenever I found them – not exhaustive, and maybe not always what you intended to say. It would be good to go through the paper with a non-native reader in mind with a somewhat limited English vocabulary, and when in doubt just use the simplest words possible. Otherwise the paper is written in a very clear language.

Minor comments and word suggestions:

L 14: While-> Since
L15: Do clouds become invisible, or simply gridpoint? The lower end of your CSDs is not much discussed, other than by the scale break. I can see several different mechanisms at play here.

L42: Why is that a challenge? If anything, perhaps “2D imagers are better equipped to address the challenge...” or so.

L50 barely -> rarely.

L56 LES has been able to do this for a while, but now also for large domains (>100km).

L73: How collocated are the instruments? How many meters away in spanwise and streamwise direction? I doubt that at least the streamwise direction is going to matter much (after the correction you talk about later), but good to mention here either way.

L99: How much is this FOV in practice in meters? and what is the typical resolution in meters? I’m not a fan of pixel# as a unit. Perhaps the spatial equivalents of Time and Pixel units can be put on secondary x/y axes in figs2,4,7,9?

L102: pronounce -> result.

L105 non-zero reflectivity.

L143: Is CTH the correct metric? Since you’re integrating over the entire depth of the cloud, mid-cloud level would be more precise, I guess. Again, shouldn’t matter much in practice for these shallow clouds.

L143: “lower and further to the aircraft“ not sure what that means exactly.

L149: Emphasize 2D connectivity.

L174: dammed -> limited.

L183: This does introduce the bias that cloud size is artificially limited by the FOV size.

L240: This may be cloud misrepresentation, but it is the fair comparison between the two instruments. This is an important part, because it validates the radar for use in the (extremely common) situation that no imager is available.

L281: I would be interested in a bit more discussion of the scale break, as it is located much sooner than often reported for shallow Cu (1km+). Are the authors sure that this is not an artifact of the observational strategies/instrument resolution?

L298: Could be interest to compare the overlap corrections from Sulak et al (JGR, 2020).