Comment on egusphere-2022-544
Anonymous Referee #2

Referee comment on "Ice fog observed at cirrus temperatures at Dome C, Antarctic Plateau" by Étienne Vignon et al., EGUsphere,

This paper reviews two fog cases that illustrate some unique fog formation means that have likely not been observed or well studied to date. This research is worthy of publication. There are a few key elements that of which some are critical to denote:

Review:

Line 35 - Supercooled liquid has been observed to 240 K at South Pole Station during the SPARCLE experiment (see https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2021JD035182)...While this was at a higher altitude above the ground, it is possible to have cold temperatures and still have liquid... Hence, this should be considered in what is written here to denote this. Please revise the temperature values at which liquid water can and does exist.

Line 70 - Averaging data over 30 minutes is a long time. This reviewer is not in favor of this practice as you are smoothing out the data before analysis....which this is less of an issue with slower changing parameters like pressure (not used in this study) but it has a larger impact on faster moving variables such as temperature and wind. As a note, 30 minute averaging is at least 3 times beyond the WMO recommendations which recommend averaging over small time frames (1 minute for temperature, 2 minute or 10 minute for wind) see WMO Publication #8). While we can debate the merits of this, I wonder the impact it would have in interpreting the 25 August case between 6 and 15 LT when the RH is goes above the Koop et al (2000) value. How might the data observations look in this time period without the 30 minute averaging, but instead 10 minute averaging? This non-standard method for handling the data impacts future comparisons likely to be made by others and other observational datasets that do not do this. This contributes to the heterogeneous observing network Antarctic suffers from, and it is not getting any better with divergent observing schemes that are in place.
As I read through the cases, I wonder if it would help the reader to know more about the Murphy and Koop methodology, as seeing an RH value of over 100% seems unexpected (but it is fine, correct?). Also, the RHI vs. RHl seem to be the same curves with an offset (?) Using RH overall is a terrible measure of actual moisture anyways... and RHI clearly shows that you are saturated or supersaturated with respect to ice.

Figure 2 - Is this for the March 8th case? Some indication of dates/times in the caption would be helpful.

Figure 3 - So this case, you have wind speeds clearly over the threshold for blowing snow, yet it is not reported nor happening? (Also see lines 125 through 130...)

Line 120 - Reference Figure 4 here with the RHI value referenced...

Line 150-155 Is it fluxing downward and the atmosphere is not decoupled at all above?? *** Unlikely there is decoupling??

Line 205 - Is the 20 meters from human observation?

Line 217 - This stray sentence should be combined with the paragraph above.

Line 243 - This stray sentence should be combined with the paragraph above.

Figure 10 is really helpful - just too small. Is there anyway it can be published to be larger to see the red text??

Figure B2 is too small to see - hopefully this can be improved in publication

Minor language/English:

Line 5 - Remove “To our knowledge” is not really needed... Just say “This is the first time...”
Line 40 - Remove “hitherto” as it is not needed

Line 256 - Correct the line “To our knowledge, this our study presents…” to simply say “This study presents…”

Line 262 - Remove “we raised in the Introduction” as it is not needed

Line 285 - Add “thermometer” at the end of this bullet point.