

Earth Syst. Sci. Data Discuss., author comment AC1
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Reply on RC1

Christophe Genthon et al.

Author comment on "10 years of temperature and wind observation on a 45 m tower at Dome C, East Antarctic plateau" by Christophe Genthon et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2021-204-AC1>, 2021

Thanks for this paper that describes a 10 year observational dataset from a tall tower instrumented at 6 levels at Dome Concordia Antarctica. Here are the comments, suggestions and recommends I have for this manuscript:

=> We thank the reviewer for insightful and very pertinent comments to improve the paper. Here is how we have taken comments into account and thus hopefully fulfilled the reviewer's requirements. Please note, line numbering is that of the original manuscript, obviously changed in the new manuscript. The new manuscript also accounts for comments by the other reviewer and changes made in response to these comments.

A minor point, ten years does not quite make a climatology which should be 30 years, but it is understood this all the data you have. (see below for comment on wind data amount...)

=> Yes, we are short of the standard 30-year climatology and although we make parsimonious use of the word "climatology" this is stricto sensu inappropriate. Our series is only 10 years long. We have changes "climatology" where appropriate, into time series or equivalent formulations.

Line 25 - "See data availability section" is not needed in the abstract.

=> In fact, the abstract should even mention the data link. Citing ESSD's "User guidance in a data availability section" » <https://essd.copernicus.org/articles/10/2275/2018/>):

"All *ESSD* papers should have included their specific data link as the final sentence of the abstract and should repeat those links accompanied by all necessary explanation and assistance in the data availability section."

The abstract is modified to include the data link.

Line 37 - Please consider adding a reference to Lazzara et al paper and use more recent State of the Climate reference:

Lazzara, M.A., G.A. Weidner, L.M. Keller, J.E. Thom, J.J. Cassano, 2012: Antarctic automatic weather station program: 30 years of polar observations. *Bull. Amer. Meteor. Soc.*, **93**, 1519-1537,.

Clem, K. R., S. Barreira, R. L. Fogt, S. Colwell, L. M. Keller, M. A. Lazzara, and D. Mikolajczyk, 2020 (in review): Atmospheric Circulation and surface observations [in "State of the climate in 2019"]. *Bull. Amer. Meteor. Soc.*, 101, S293-W296, doi: 10.1175/BAMS-D-20-0090.1

=> Done

Line 30-33 - add e.g. to the references- as there are many more...

=> Yes there are more, yet this is a data paper, not a review paper. We already cite 8 references here, we think we should not expand this further.

Change "manned" to "staffed" in line 42

=> Done

Line 43 - Why is the Ricaud referenced as 2020b when you haven't reference a 2020a?

=> Ricaud et al. (2020a) is cited lines 51, 462 and 501, then referenced line 644

Line 51 - Capitalization of Layer before ABL

=> Done

Line 76 - Add the word "since" before "grown..."

=> Done

Line 87 has unclear English awkward phrasing

=> This is tentatively rephrased to make it clearer

Minor note to the authors, British Antarctic Survey testing shows less frosting on the non-marine version of the RM Young than the marine version of the RM Young. This is the sensor used successfully in other AWS networks in Antarctica, with less frosting than the marine version. It is true frosting will continue to happen, but there is little that can be done at remote AWS sites for this problem.

=> Thank you for the note, not sure what to do with it in the paper. In our experience marine and non-marine have the same frosting problems at Dome C, the difference between the 2 models is with the bearings getting stuck at cold temperature in the marine version.

Line 122 - add "radiation" before "shielding"

=> Done

The averaging of data over 30 minutes does not match WMO standards (see WMO publication #8 for the standards outlined there). This is unfortunate as it can overly smooth out the wind observations and temperature and pressure less so. However, being on the Antarctic plateau, at the top of Dome Concordia, it is likely the data is not overly impacted, however it should be noted some place (in the metadata especially!) that this is 30 minute-averaged data and it is not standard practice, as data rarely is averaged over a such a long period.

=> It is now reported that the 30-min average and statistics is not WMO standard

practice. The observing system was fully developed by (and for) researchers, and unfortunately did not benefit experienced data / technical support. Following reviewer comment, we will consider adding new data tables to better fit WMO requirements in the future. Please note that 1 minute samples are available but only over 3 years.

Line 163 - Dome C AWS data is available before 1984 (albeit with gaps)...starting as early as 1980.

=> OK corrected

Lines 170- 175 - other AWS are located in this area over the years per poster by Fons et al.. and these other AWS did exist at some point during this time frame....

<http://amrc.ssec.wisc.edu/outreach/posters/images/fonsAMOMFWposter.pdf>

=> Right, the italian AWS is already mentioned and data discussed in the present paper. Some of the authors deployed and operated ,then decommissioned (servicing was too difficult) the 2 stations north and south of Concordia station, which thus no longer operated in the period considered here. Some of the results by these 2 stations, compared with data from the tower, were presented in Genthon et al., 2015. Meteorological and snow accumulation gradients across dome C, east Antarctic plateau, Int. J. Clim.,36, 455-466, DOI: 10.1002/joc.4362.

Line 203-204 - Is this the warmest ever at every level all on the same day? Would it be over different days for different levels? Perhaps a table of extremes, means, etc with dates would be helpful? This is different than the Appendix table 1 and maybe just a nicety, but would be interesting to document?

=> Not sure how to handle this comment. Lines 203-204 refer to temperature inversion and coldest surface temperature, there is no mention of anything "warmest".

=> Not sure what exactly the suggested additional table should be.

Figure 5 could use some clarification in title/legend... description is ok...but something that denotes these are differences from the lowest level of the tall tower and these other AWS.

=> Legend tentatively improved

In Figure 7 - am I correct that this is not "model" but observation levels ?

=> Right! Corrected.

Line 299 - How is any of the data quality controlled? (beyond the winds listed here) This is not addressed.

=> Quality control is addressed lines 148 - 158. This is admittedly fairly limited but we do not know of a more systematic / automatized method to apply. These are research data and we do not think that a "quality disclaimer" is necessary. On the other hand, we expect that any user having doubts on the quality of parts of the data set will raise the issue and we will look into it. Also, see reply on comment by reviewer 2 and corresponding additions in the text.

So wind is less than ten years....making only temperature a 10 year record (?)

=> Right, so we change the title to: Temperature and wind observations over 10 years on a 45-m tower at Dome C, East Antarctic plateau.

Line 362 - English phrasing?? Perhaps this sentence needs to be broken up into two different ones to better explain what is happening here. I get the gist of it, but it wasn't clear to me, and I ended up re-reading it several times.

=> Phrase broken into 2 sentences

Line 396 - say "respectively " at the end of the sentence.

=> Done

Line 430-435: What is the possibility of the ERA5 assimilating Dome C II AWS? (Likely high given it has been used in ERA-I and other reanalysis models...)

=> Not sure we understand. In principle it does, although the analysis procedure may decide to reject some data. Experience suggests that pressure is mostly assimilated but not necessarily wind or temperature.

Line 470-475 - Minor note - why the funny marks around "coreless", etc.?

=> The funny marks were supposed to be quotes. Corrected. Similar "funny marks" also corrected elsewhere in the text.

Line 493 - spelling error "tosoverestimate"

=> Corrected

Line 496 - replace "less good agreement" and just say "less agreement"

=> Done

Line 532 - Was the AMRC data collected quality controlled data used?

=> We understand that these are the quality controlled data. Anyway, the acknowledgments section has been reformulated using phrasing specifically recommended by AMRC and PNRA when using their data.

Minor note, some references doubled spaced others not ?

=> Right. We use EGU Copernicus template for Microsoft Word to format the paper but actually use Open Office word processor. May be this results from some inconsistency between the 2 word processors, hopefully corrected the at the editing step - if this paper proceeds to editing.

As a general question - How are the different levels cross calibrated or was that not done for this instrumentation set?

=> There is no cross calibration between levels, only cross checks such as described in the Setting, instruments, data and methods section

Why talk about other papers not written yet?? Just say what is covered in this paper??

=> We assume that this comment refers to forthcoming papers about atmospheric moisture. The point is to explain and support why we do not report moisture observations in the present paper, although we report that we use thermometer devices that also (tentatively) measure moisture. Moisture measurement need specially adapted sensors which we do not have at 6 levels and over 10 years of observation, thus a specific paper is needed for moisture.