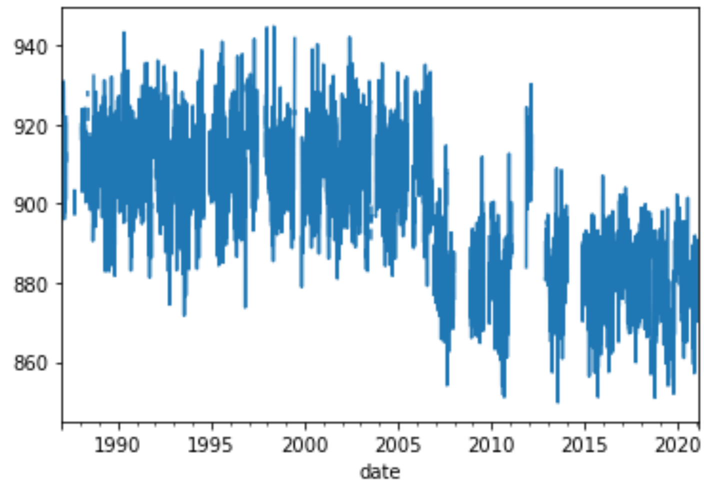
Review of The AntAWS dataset: a compilation of Antarctic automatic weather station observations by Wang et al., 2022

Wang and al. present a dataset of compiled AWS data over the Antarctic Ice Sheet. Data include near-surface temperature, humidity, wind speed and pressure. Quality checks have been performed on the data to remove outliers. In general, the original data set (3h) was already directly accessible in open access (https://amrc.ssec.wisc.edu/data/ftp/pub/aws/antrdr/) with for some already remarks on the quality of the measurements. The addition here then consists in a more thorough treatment of the reliability of the data.

Major comment

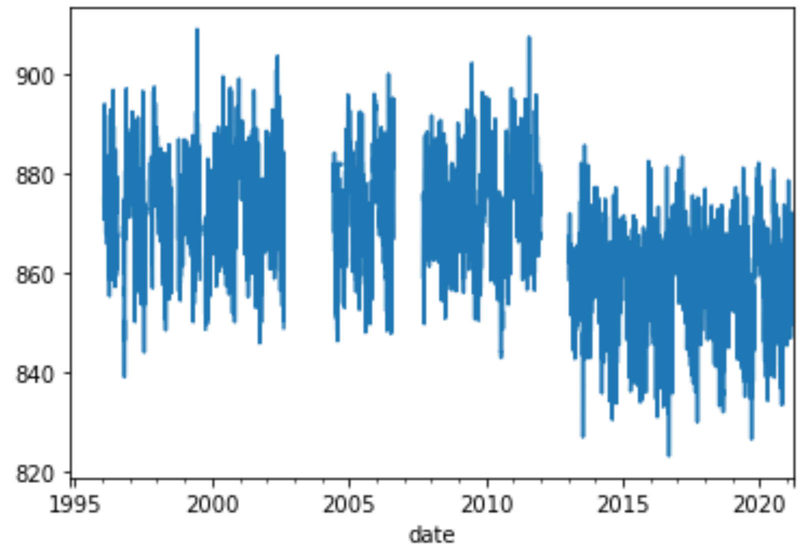
I have already used the original raw dataset to evaluate climate models (see remark further about the introduction) and create a compiled dataset. The quality controls I made were only visual when the comparison with both RACMO and MAR (often-used regional climate models) revealed strong disagreement with the data. If nothing looked wrong, I concluded that it was simply the models that were wrong. However, this simple method allowed me to detect many outliers and remove data while giving greater confidence in the observations. Therefore, a better outlier evaluation technique applied to these data could allow to build a very useful dataset. This is what I expected from the data. I didn't take the time to double check every data, but only a few stations for which outliers seemed to be present when I firstly used these data. I then did a quick comparison with the latest MAR results.

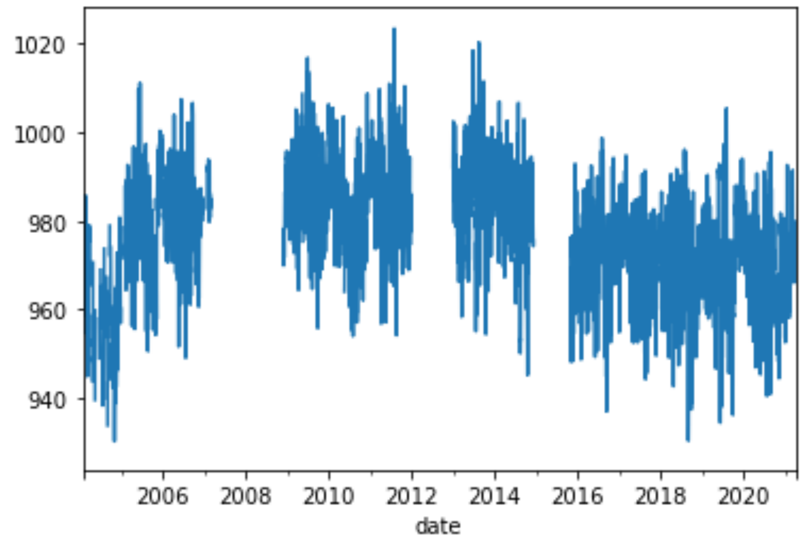
These values do not seem to have been removed in the AntAWS dataset. Here are some examples:
Zoraida, after 2007 the pressure decreases which seems unrealistic.



For instance, while RCM like MAR represent very well the pressure (eg., Motram et al., 2021, Kittel et al., 2021; Kittel 2021), the temporal correlation is very bad for the whole series (r=0.55). If I cross-check before 2007, the statistics become better (r>0.9).

Similarly, Erin and Emilia's measurements of surface pressure does not seem reliable which spurious trends.





I refer to Kittel, 2021 Appendix A, Table A.1 (https://orbi.uliege.be/handle/2268/258491) for the list of AWS I found.

I strongly recommend the authors to visually inspect each time series of each data before considering any publication of this database even after their statistical check. I hope that combination of several methods (statistically, physically-based methods from Wang et al., with crossed comparisons with models) would improve the reliability of the dataset. I would also suggest the authors to rewrite their introduction P1L94-96, as the same dataset has been already checked, compiled and used in several studies (eg., Mottram et al., 2021; Kittel et al., 2021; Kittel, 2021; Donat-Magnin et al., 2020; Wille et al., 2021). Consider to only insist on the availability of quality-controlled data?

Minor comments

It is hard to find the station location. People, when downloading the data, don't start with checking the supplement. I'd suggest to add each station location directly in the files, as well as a file with all the locations that can be directly downloaded. Section 6: L394-L395: Unless I'm mistaken, I only found the .csv files in the download link.

Section 3.3 L237-245: 25% of data availability seems really low. What is the impact of different threshold (this could be tested with correlation and rmse between the 25%dataset and X%dataset). Turner et al., 2004 used 90% (rmse of 0.1%). What is the reliability of a monthly value based on only 25% of a month? In the worst case you presented, the monthly mean value would only represent the ~first week. It is much better to have fewer reliable values than a lot of non-consistent values.

Section 4.3 L286 – 297 : Is the relatively humidity corrected for negative temperature? According to Amory (2020), the thermo-hygrometers are calibrated to measure relative humidity with respect to liquid water. Goff and Gratch (1945) formulae should then be used to convert it with respect to ice for temperature below 0°C.

Specific remarks

P1L29: replace estimating by evaluating

P1L35: impact<u>s</u>

P1L100-101: Consider to document while /where you flagged and removed some data

L137-139: 1cm is low considering the presence of moving sastrugi. Furthermore, strong temperature inversions have been found over the Antarctic Plateau (Genthon et al., 2013) which highlights the importance of this parameter.

Fig 3: What are the numbers on the map?(I guess the id of the station, but this is not mentioned in the caption)

Fig6: Why are AWS from permanent research stations like Amundsen-Scott, Dumont d'Urville, Vostok, Halley, Mc Murdo, …) not included in the data set? This strongly misleads the idea of Antarctic coverage in terms of weather stations. Furthermore, one could argue than permanent staffed stations could give more reliable data as people can check the instruments more frequently. These data could then be a significant contribution to the dataset.

Fig 8: Why do they authors use a rainbow color map?

If authors would like, I would be happy to share MAR outputs to help with outlier scan.

Sincerely,
C. Kittel

Amory, C.: Drifting-snow statistics from multiple-year autonomous measurements in Adélie Land, East Antarctica, The Cryosphere, 14, 1713–1725, https://doi.org/10.5194/tc-14-1713-2020, 2020.

Donat-Magnin, M., Jourdain, N. C., Gallée, H., Amory, C., Kittel, C., Fettweis, X., Wille, J. D., Favier, V., Drira, A., and Agosta, C.: Interannual variability of summer surface mass balance and surface melting in the Amundsen sector, West Antarctica, The Cryosphere, 14, 229–249, https://doi.org/10.5194/tc-14-229-2020, 2020.

Genthon, C., Six, D., Gallée, H., Grigioni, P., and Pellegrini, A.: Two years of atmospheric boundary layer observations on a 45-m tower at Dome C on the Antarctic plateau, J. Geophys. Res. Atmos., 118, 3218– 3232, doi:10.1002/jgrd.50128, 2013.

Goff, J. A. and Gratch, S.: Thermodynamic properties of moist air, Trans. ASHVE, 51, 125, 1945

Kittel, C.: Present and future sensitivity of the Antarctic surface mass balance to oceanic and atmospheric forcings: insights with the regional climate model MAR, PhD thesis, University of Liège, Liège, http://hdl.handle.net/2268/258491 (last access: 28 May 2022), 2021

Kittel, C., Amory, C., Agosta, C., Jourdain, N. C., Hofer, S., Delhasse, A., Doutreloup, S., Huot, P.-V., Lang, C., Fichefet, T., and Fettweis, X.: Diverging future surface mass balance between the Antarctic ice shelves and grounded ice sheet, The Cryosphere, 15, 1215–1236, https://doi.org/10.5194/tc-15-1215-2021, 2021.

Mottram, R., Hansen, N., Kittel, C., van Wessem, J. M., Agosta, C., Amory, C., Boberg, F., van de Berg, W. J., Fettweis, X., Gossart, A., van Lipzig, N. P. M., van Meijgaard, E., Orr, A., Phillips, T., Webster, S., Simonsen, S. B., and Souverijns, N.: What is the surface mass balance of Antarctica? An intercomparison of regional climate model estimates, The Cryosphere, 15, 3751–3784, https://doi.org/10.5194/tc-15-3751-2021, 2021.

Wille, J.D., Favier, V., Jourdain, N.C. et al. Intense atmospheric rivers can weaken ice shelf stability at the Antarctic Peninsula. Commun Earth Environ 3, 90. https://doi.org/10.1038/s43247-022-00422-9. 2022