

Interactive comment on “On the fine vertical structure of the low troposphere over the coastal margins of East Antarctica” by Étienne Vignon et al.

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There are quite a few papers that assess boundary layer climatology at one or a couple radiosonde sites at coastal stations around Antarctica, but never a full utilization and comparison. This paper offers the first comprehensive low troposphere climatology of the Antarctic coastal regions along with an in-depth analysis of reanalyses and Polar-WRF. The comparison between ERA-Interim and ERA40 provides a helpful guide for all future research on Antarctic atmospheric science when transitioning to the higher resolution ERA40. The analysis of the AMPS Polar-WRF deserves a separate paper given the extensiveness of the model assessment. This paper alluded to weaknesses

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in the Polar-WRF that have been noticed in various locations around Antarctica, but this paper demonstrates that the boundary layer issues in regard to the depth and strength of the katabatic flow are an Antarctic-wide problem. This will provide a useful tool for Antarctic weather forecasters who adjust their aviation forecast according to known Polar-WRF biases. In addition, the analysis of the observed and simulate boundary layer provides good insight to those who would like to examine the coastal boundary layer in long-term climate simulations.

I made some specific comments about details I found compelling

Section 2.1 A very well detailed section with an in-depth explanation of station geography and a diligent description of the quality control processes.

Section 2.4. I appreciate the explanation for choosing relative humidity.

Section 3.2.1 I noticed Polar-WRF overestimated the katabatic winds at the Alexander Tall Tower so it's very interesting to see this trend continue across Antarctica. Also the difference in reanalysis performance from not assimilating the Princess Elizabeth data is intriguing.

Section 4.1 I expected the radiosondes from Halley and Neumayer to be representative of a larger footprint than like McMurdo, but it is really impressive and surprising to see just how homogenous the coastal Antarctic climate really is.

The manuscript is clearly organized, and the reader should have no problem finding the specific information they are interested in (i.e. Observed climatology, Polar-WRF performance). The figures are easy to read while the methodology is sound. I find the paper is nearly ready for publication after some technical corrections are made in regard to grammar.

Major Points

1. I would like to see more of an explanation for the motivation of this research in the introduction and some comments about the applicability of the results to climate research

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and weather forecasting in the conclusion. The literature review is extensive, but the introduction could benefit from a couple sentences stating what knowledge gaps are to be filled and who could benefit from this research. And the conclusion summarizes the main results of the research well, but could use again a couple sentences describing future direction and how your results could benefit the scientific and weather forecast community.

2. Figure 2 appears to be rotated in the wrong direction. Please discuss with the editor for a solution.

Minor Points

1. I don't mean to self-advertise, but I recommend referring to the boundary layer case studies using SUMO UAV measurements compared against Polar-WRF. I examined the performance of the Polar-WRF up to 800 m next to the Alexander Tall Tower! which is near the Ross Sea. The Polar-WRF wind speed and relative humidity at radiosonde sites affected by the katabatic wind were similar to what I noticed in this study. Wille, J.D., D.H. Bromwich, J.J. Cassano, M.A. Nigro, M.E. Mateling, and M.A. Lazzara, 2017: Evaluation of the AMPS Boundary Layer Simulations on the Ross Ice Shelf, Antarctica, with Unmanned Aircraft Observations. *J. Appl. Meteor. Climatol.*, 56, 2239–2258, <https://doi.org/10.1175/JAMC-D-16-0339.1>.

2. Please change “Mc Murdo” to “McMurdo” throughout the manuscript.

3. Please find the attached document that contains my corrections for grammar and sentence structure.

Please also note the supplement to this comment:

<https://www.atmos-chem-phys-discuss.net/acp-2018-1197/acp-2018-1197-RC2-supplement.pdf>

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-1197>,

2019.

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