



Supplement of

On the fine vertical structure of the low troposphere over the coastal margins of East Antarctica

Étienne Vignon et al.

Correspondence to: Étienne Vignon (etienne.vignon@epfl.ch)

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Figure S1. Top row: vertical profiles of the annual specific humidity q from radiosonde data at nine Antarctic stations. Black lines are the medians, colored lines refer to the 10th, 20th, 30th, 40th, 60th, 70th, 80th and 90th percentiles. In the legend, 'Pctx' refers to the shaded area that covers x percents of the data greater than the median and x percents of the data lower than it. Bottom row: median differences (solid lines), 80-20th interquantile difference (dashed lines) and 95-5th interquantile difference (dotted lines) with respect to radiosoundings for specific humidity at nine Antarctic stations. Red, green and cyan lines refer to Polar WRF, ERA5 and ERA-I respectively. Grey strips delimit the first 100 m above the ground surface. In all panels, the altitude z is above ground level. Numbers in exponent near station names in title indicate the number of radiosounding per day at the corresponding station. '*' symbol labels the two stations for which only data from December to February are shown.



Figure S2. Top (resp. bottom) row: vertical profiles of the annual zonal (resp. meridional) wind from radiosonde data at nine Antarctic stations. Black lines are the medians, colored lines refer to the 10th, 20th, 30th, 40th, 60th, 70th, 80th and 90th percentiles. The red line is the zero line. In the legend, 'Pctx' refers to the shaded area that covers x percents of the data greater than the median and x percents of the data lower than it. In all panels, the altitude z is above ground level. Numbers in exponent near station names in title indicate the number of radiosounding per day at the corresponding station. '*' symbol labels the two stations for which only data from December to February are shown.



Figure S3. Vertical profiles of the annual wind speed (top row), temperature (middle row) and relative humidity with respect to ice (bottom row) from ERA-Interim (conditioned to radiosonde times) at nine Antarctic stations. Black lines are the medians, colored lines refer to the 10th, 20th, 30th, 40th, 60th, 70th, 80th and 90th percentiles. In the legend, 'Pctx' refers to the shaded area that covers x percents of the data greater than the median and x percents of the data lower than it. The altitude z is above ground level. Numbers in exponent near station names in title indicate the number of radiosounding per day at the corresponding station. '*' symbol labels the two stations for which only data from December to February are shown.



Figure S4. Vertical profiles of the annual wind speed (top row), temperature (middle row) and relative humidity with respect to ice (bottom row) from ERA5 (conditioned to radiosonde times) at nine Antarctic stations. Black lines are the medians, colored lines refer to the 10th, 20th, 30th, 40th, 60th, 70th, 80th and 90th percentiles. In the legend, 'Pctx' refers to the shaded area that covers x percents of the data greater than the median and x percents of the data lower than it. The altitude z is above ground level. Numbers in exponent near station names in title indicate the number of radiosounding per day at the corresponding station. '*' symbol labels the two stations for which only data from December to February are shown.



Figure S5. Vertical profiles of the annual wind speed (top row), temperature (middle row) and relative humidity with respect to ice (bottom row) from Polar-WRF (conditioned to radiosonde times) at nine Antarctic stations. Black lines are the medians, colored lines refer to the 10th, 20th, 30th, 40th, 60th, 70th, 80th and 90th percentiles. In the legend, 'Pctx' refers to the shaded area that covers x percents of the data greater than the median and x percents of the data lower than it. The altitude z is above ground level. Numbers in exponent near station names in title indicate the number of radiosounding per day at the corresponding station. '*' symbol labels the two stations for which only data from December to February are shown.



Figure S6. Median differences (solid lines), 80-20th interquantile difference (dashed lines) and 95-5th interquantile difference (dotted lines) with respect to radiosoundings for the zonal wind component (top row), and for the meridional wind component (bottom row) at nine Antarctic stations. Red, green and cyan lines refer to Polar WRF, ERA5 and ERA-I respectively. Grey strips delimit the first 100 m above the ground surface. Polar WRF and ERA reanalyses are conditioned to radiosounding times. Numbers in exponent near station names in title indicate the number of radiosounding per day at the corresponding station. '*' symbol labels the two stations for which only data from December to February are shown.



Figure S7. Median differences (solid lines), 80-20th interquantile difference (dashed lines) and 95-5th interquantile difference (dotted lines) with respect to radiosoundings for the wind speed (top row), temperature (middle row) and relative humidity with respect to ice (bottom row) at nine Antarctic stations. Red, green and cyan lines refer to Polar WRF, ERA5 and ERA-I respectively. Grey strips delimit the first 100 m above the ground surface. Polar WRF and ERA reanalyses are conditioned to radiosounding times. Numbers in exponent near station names in title indicate the number of radiosounding per day at the corresponding station. '*' symbol labels the two stations for which only data from December to February are shown.

Table S1. Geographical characteristics of the stations (indications in black font). Green, cyan and red indications correspond to the location and mean altitude of the nearest grid point in ERA5, ERA-I and in the Polar WRF simulation respectively. In the last column, the distance from the station to the nearest coast is indicated in black font and the percentage of 'land-type' surface (excluding sea-ice) is indicated for the nearest mesh in ERA5, ERA-I and Polar WRF.

station name	longitude (°)	latitude (°)	altitude (m)	distance to the coast (km) or $\%$ of land
Halley	-25.80, -25.8, -25.5, -26.00	-75.61, -75.5, -75.8, -75.68	30, 25, 207, 74	15, 76 %, 77 %, <mark>91%</mark>
DDU	140.00, 140.0, 140.3, 139.9	-66.66, -66.8, -66.8, -66.67	41, 302, 532, 260	0, 75%, 59%, 56%
McMurdo	166.67, 166.8, 166.5, 166.6	-77.85, -77.8, -78.0, -75.74	10, 138, 239, 1	0 , 48%, 84% , 29%
Neumayer	-7.74, -7.8, -7.5, -8.00	-70.63, -70.8, -70.5, -70.82	17, 58.18, 7, <mark>86</mark>	5, 75%, 43%, 100%
Mawson	62.87, 62.8, 63.0, 62.75	-67.60, -67.5, -67.5, -67.62	15, 91.25, 383.4, 313	0 , 21%, 52% , 69%
Casey	110.52, 110.5, 110.3, 110.7	-66.28, -66.3, -66.0, -66.32	30, 100, 109, 249	0, 36%, 22%, 73%
Davis	77.97, 78.0, 78.0, 78.42	-68.58, -68.5, -68.3, -68.47	18, 45, 142, 200	0, 27%, 24%, 69%
MZ	164.11, 164.0, 164.3, 164.40	-74.39, -74.5, -74.3, -74.67	15, 531, <mark>828</mark> , 163	0, 88%, 81%, 62%
PE	23.35, 23.3, 23.3, 23.33	-71.95, -72.0, -72.0, -71.86	1382, 1515, 1518, <mark>1269</mark>	220, 100%, 100%, 100%