

Supporting Information for “Quantification of Boundary Layer Mixing over the Southern Ocean Using In-Situ and Remotely Sensed Measurements”

S. Hartery¹, P. Kuma¹, M. J. Harvey², A. J. McDonald¹

¹School of Physical and Chemical Sciences, University of Canterbury, Christchurch, New Zealand

²National Institute of Water & Atmospheric Research, Wellington, New Zealand

Text S1. To evaluate whether or not Figs. 3b & c (Main Text) were representative of the true boundary layer, we calculated several statistics comparing forecasts from the Antarctic Mesoscale Prediction System (AMPS) and measurements from the radiosondes. The statistics were only calculated below 3 km to restrict the comparison to relevant planetary boundary layer (PBL) and lifted condensation level (LCL) heights. These are presented in Table S1.

Overall, all of the selected variables were reasonably well correlated. However there were minor biases worth mentioning. In Table S1, statistically significant biases between modeled and measured values of pressure, dew point temperature, and wind speed were observed ($p < 0.001$). Since AMPS determines the height of the PBL according to the

Corresponding author: S. Hartery, (hartery.s.p@gmail.com)

turbulent kinetic energy profile (Janjić, 2001), this implies that the height of the PBL may have been under-estimated. The dew point temperature was also negatively biased as a result of the overabundance of water vapour in the AMPS boundary layer relative to observations, leading to under-predictions of the LCL.

References

- Janjić, Z. I. (2001). *Nonsingular implementation of the Mellor-Yamada level 2.5 scheme in the NCEP Meso model* (Office Note No. 437). NOAA Institutional Repository: National Center for Environmental Prediction (NCEP).

Table S1. This table summarizes statistics comparing measurements from radiosondes launched throughout the voyage and predictions from AMPS below 3 km (a.s.l.).

| Statistic | P (hPa) | T (K) | T_d (K) | U (m s^{-1}) |
|-----------|---------|-------|-----------|-------------------------|
| RMSE | 2.0 | 1.2 | 3.2 | 2.7 |
| Bias | 0.3 | – | -0.8 | 0.7 |
| R^2 | 1 | 0.96 | 0.87 | 0.74 |

Note: Root Mean Squared Deviation (RMSE), Pearson Correlation Coefficient (R^2).