

Response to anonymous referee comments

The authors thank the two referees for taking the time to review this manuscript and for their helpful comments, which have improved the manuscript. The text in the updated manuscript reflecting the changes made in this document is included below each response in quotation marks. Responses to referee comments are in *italics*. In areas where the response to the referee includes a specific edit or addition to text in the manuscript, these edits are noted in **highlighted yellow**. Line numbers referencing a change are those in the clean revised manuscript.

1. Lines 104-105, "Data" section: The paper now includes an analysis of shortwave radiation data, which should be mentioned in the "Data" section.

This addition has been made in line 105 of the revised manuscript:

*“Radiosonde data from two continental interior sites (South Pole and Dome C) and three coastal sites (McMurdo, Neumayer, and Syowa) (Figure 1, Table 1) as well as corresponding downwelling longwave **and shortwave** radiation data at the time the radiosonde launches occurred are included in this analysis.”*

2. Table 1: The column "Radiation Instrument and Accuracy" only lists the longwave instrument (pyrgeometer) used at each station. Now that shortwave radiation is also analysed, the shortwave instruments (pyranometers) should also be listed.

Information regarding the pyranometers for each of the study sites has been added to Table 1.

3. Figure 2: State in the caption that these profiles are for Dome C.

The figure caption has been updated:

*“Figure 2: Examples **(from Dome C)** of the vertical profile structure of the regimes listed in Table 3. The potential temperature gradient is shown in pink (top axis), the potential temperature anomaly (with respect to the 20 m potential temperature from the radiosonde) is shown in blue (bottom axis). The stability regime acronym is given above the top left corner of each subplot and is also indicated by the colored outline around each plot, according to the key in the bottom right of the figure.”*

4. Figure 13: I'm still unhappy about the lines joining the points on this figure - the second referee also raised the same concern. I'm happy to leave it to the Editor to rule on this point.

The editor has suggested the remove of lines joining the points in Figure 13. The lines have been removed. The same has been done for Figure S6.