Response to the Editor on the comments on the revised version of the manuscript AMT-2021-187

We want to thank the Editor, Referee #1 and Kim Young-Gyoo (Referee #2) for their constructive comments and suggestions.

Editor:

Technical corrections:

"Eq. (1): Units are missing. Please specfiy the units for v, f, and p."

Units added to the sentence introducing Eq. (1), and in addition after Eq. (5).

"Table 3: "Sonde rotation" should be "Sonde rotation period"."

Changed to 'Rotation period'

"Eq. (5) and Figs. 13/14: The authors motivate their polynomial fit based on the inverse square root of both p and v.

In order to have a better link to the fit shown in Figs. 13/14, I propose to change v axis (currently linear) and p axis (currently log) into nonlinear axes which are linear in terms of 1/sqrt(p) and 1/sqrt(v)."

The main purpose of Figs 13 and 14 is to show the non-linear dependence of the temperature effect on the parameters p and v. Following the editor's recommendation, we have added in the Figures a version of the plots with the abscissa representing the reciproke of the square root of p or v. These additional plots show that the temperature effect cannot solely be described by a linear dependence on 1/sqrt{p} (or 1/sqrt{v}), but that additional polynomial terms are necessary, resulting in Eq. 5.

The caption of Fig. 14 is modified accordingly, and a short paragraph referring to the new panels in Fig. 14 is added at the end of Section 4.2.

"Figures: Copernicus now demands that color schemes are used which are clear for readers with colour vision deficiencies, see

https://www.atmospheric-measurement-techniques.net/submission.html#figurestables

Several of the color schemes used in this study do not fulfill this criterion; in particular the simultaneous use of green and red is problematic.

Please modify; you might also use different linestyles/markers for clarity."

Figures 3, 11, 14, 15, 16, 18 are adjusted to correspond to the guidelines. In Figs. 14 and 15 also various line styles are used.

Figure 19 has been tested with the Coblis color blindness simulator tool. For all the various filter settings it remained clear und unambiguous what the plot was displaying. Therefore, we have left the plot in this figure unchanged.

Referee #1:

Line 328: Better: “Here t is the time since opening the shutter and c0, c1, and c2 are fit parameters, where c0 represents the new equilibrium temperature, which is represented by the horizontal green line in Fig. 11.

Legend for Figure 13: Delete “exemplary”

Legend for Figure 13: “ … an overview over the magnitude and the distribution …”

Line 398: Better: “Of these four components, the uncertainty of ventilation speed is contributing most to the combined uncertainty u(DT).”

Line 401: Change the last word “that” to “which” preceded by a comma.

Line 403: Change “well” to “easily”

Line 404: Change “on” to “onto”

Lines 404f: Delete “beforehand defined”

Line 405: Change “linear” to “linearly”

Line 407: Remove the round brackets around “21x21” and add a comma in front of “which”

Line 408: Change “creation of” to “creating”, change “are” to “is”

Line 430: Better “The Streamer model was used in the GRUAN processing of the Vaisala RS92 radiosonde data to estimate the radiation fluxes …”

Line 431: Better: “… in the data processing of the RS41 radiosonde data …”

Line 435: Better: “… the use of actual the measured position, pressure, temperature and humidity data and the use of representative values …”

Line 438: Better: “… of low solar elevation angles to improve the handling of the Earth’s curvature …“

Line 554: Remove the round brackets around “2 to 3”

Line 588: Remove “then”

Lines 648f: Better: “of 3 m s-1 to 7 m s-1.”

Line 675: Better: “… it does not have the option to cool the radiosonde …”

Line 682: Better: “…low temperatures. However, these experiments …”””

All linguistic changes are included in the text as proposed.

Referee #2 (Yong-Gyoo Kim):

Through personal communication and through the Referee comments from Dr. Yong-Gyoo Kim at KRISS on the revised version of our manuscript, we have learned that recent findings by the Korea Research Institute of Standard and Science (KRISS) confirm an increase of the radiative sensor heating at low temperature (−67 °C) and pressure (<30 hPa), which is mainly caused by the reduction of the convective heat transfer by air at low temperatures. We were not able to measure this effect in our setup, since SISTER is operated at room temperature.

Recently, colleagues from KRISS submitted a manuscript to AMT (Lee et al., AMT-2021-246), reporting on the increased sensor heating by solar radiation at low temperatures. However, since these new findings only become known to us during the second review of our manuscript, we prefer not to include a thorough discussion of this effect in our manuscript. Firstly, this would mean, in our estimate, a major revision of our manuscript, and secondly because the manuscript AMT-2021-246 still is under review. Furthermore, a major part of our manuscript (AMT-2021-187) is devoted to the description of the current correction algorithm in the GRUAN data processing for the RS41. If corroborated and published, the low temperature effect on the radiative sensor heating described in AMT-2021-246 will be accounted for in the next version of the GRUAN data processing for the RS41.