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Atmospheric Measurement Techniques Discussions

Interactive comment on "Temperature profiles with bi-static Doppler-RASS and their accuracy" *by* B. Hennemuth et al.

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Reply to comments of M. Kallistratova

Some remarks need to be addressed.

1) The title and abstract of the paper are wider than its content. The effective radius of antenna equal to 0.8 m, which was found by the authors for the best adjustment, refers to MERASS only, and is not suitable for RASS with other technical parameters; no any objective method of selecting the effective radius for an arbitrary RASS is given in the paper. Thus, these results are not universal, and a title of the paper should reflect the focus of the work on MERASS.

We agree that the title raises expectations for firm statements on the accuracy of temperature profiles. Therefore we replaced ”accuracy” by ”correction” in the title. Concerning the missing universality we hope that this point of critique is dissolved by adding a description, how we obtained the optimum value for a_e. Of course the actual value depends on details of the antenna, but the method is generally applicable.

2) Earlier the geometric correction of MERASS data was made in the paper: Argentini S., Pietroni I., Gariazzo C., Amicarelli A., et al. 2009: Boundary layer temperature profiles by a RASS and a microwave radiometer: Differences, limits and advantages, Il Nuovo Cimento B (2009) vol. 124, Issue 05, p.549-564 (DOI: 10.1393/ncb/i2009-10791-9). The same formula (9) have been used there to calculate the correction. The temperature profiles by MERASS were compared with concurrent in situ measurements by PT100 sensor at tethersonde. The good agreement was obtained for the effective radius equal to 0.6 m (see Figs. 3 and 10 there). This work need to be cited, and a short discussion on the difference in the values of the effective radius for MERASS in two analogous investigations is desirable.

The paper of Argentini et al., 2009 is now cited in Section 4.1.

3) In some cases of the comparisons (e.g., daytime profiles in Figs. 7 and 9) the adjusted MERASS profiles clearly do not match the in situ temperature at 10 m. Apparently, the discrepancy is caused by a strong temperature gradient, which leads to a violation of the Bragg condition and distorts a measurement of the air temperature by RASS analogously to the geometric factor. A general physical mechanism of these both distortions (namely the presence of a phase shift of waves with different amplitude) was explained in detail on pages 26 and 79-81 of the monograph Kallistratova MA, and Kon AI 1985 : Radio-Acoustic Sounding of Atmosphere. Moscow, Nauka, 198 pp (In Russian). This monograph deserves to be cited, and a short discussion on the above discrepancy is desirable.

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The acoustic sound of the RASS is frequency modulated. Its spectrum is flat in a band corresponding to a temperature interval of 20 K. The centerfrequency is adjusted automatically according to the (Pt100-measured) temperature at the surface. Therefore we can exclude safely effects related to violation of the Bragg-condition. We added a short historical discussion of these important effects in the introduction.

Specific comments

Page1079, L21: «shift δf is given»

has been added

P 1081, just before Eq. (9): Some words are need to introduce the Eq. (9); L13: which. P1082, L5: from; L16: reasonable.

have been added

P1084, L2-3: More appropriate: We give here examples of comparison of the corrected ...

We agree that "boundary layer studies" is too far reaching. On the other hand the presented material is not just comparison. So we decided for the more neutral wording: "We discuss here the physical plausibility of examples of corrected RASS temperature profiles together with supplementary near-surface in-situ measurements."

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