

Comment on «Temperature profiles with bi-static Doppler-RASS and their accuracy» by B. Hennemuth et al.

## Overall comments

The paper describes a way of correcting the values of the air temperature and its gradient at altitudes up to  $\sim 100$  m, which are measured by Sodar/RASS, manufactured by METEK Ltd (so-called MERASS). To this end the authors use a well-known formula of A.I. Kon (1981), which takes into account the geometrical factor (i.e., the bistatic configuration of RASS at low altitudes), caused by a horizontal separation of receiving and transmitting radio antennas. To correct the values measured, a certain effective radius of the antenna, which was determined empirically, was used instead of a physical radius of the aperture. A lack of concurrent *in situ* measurements at the same altitudes is a basic shortcoming of the study. However, the authors quite cleverly and skillfully overcome this shortcoming by a detail analysis of distributions of the measured and adjusted variables, as well as by analysis of a large number of interpolated profiles obtained under different environmental conditions.

This article can be very useful for consumers of MERASS.

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.

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.

3) In some cases of the comparisons (eg, 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.

## Specific comments

Page1079, L21: «shift  $\delta f$  is given».

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

P1082, L5: from; L16: reasonable.

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

