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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.

B. Hennemuth et al.

barbara.hennemuth@zmaw.de

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Reply to remarks of reviewer H. Klein Baltink

General comments:
... The set-up and methods applied are sound.
However especially under unstable conditions there remains a small mismatch between the corrected potential virtual temperature profiles and the surface measurements. The authors do not assess the errors in the observations, nor do they show corrected profiles for different values of the effective diameter Ae in comparison to the surface observations. Therefore it is not clear if the corrected profiles shown are the best fit to the surface observations or have been optimised in some other way.

I would suggest that the authors describe in more detail how they arrived at the applied value of Ae = 0.8 and how this affects the observed differences with the surface measurements.

We did not try to fit the RASS profile to surface observations due to the large height gap between the lowest RASS level and in-situ sensors. Instead of this we used temperature profiles in conditions where neutral stability is expected. The choice of a_e = 0.8 is justified by analysing the the relation between the corrected temperature gradient and the value of a_e (see new figure 6 and discussion).
The structure of the paper has been changed in order to clarify the procedure of empirical bi-static correction by means of adjustment of near-neutral potential temperature profiles to zero gradient.

In see fig. 7 the profiles in unstable conditions seem to have a small offset over the full range compared to the measurement at 10 m. Whereas in fig 9 it seems more like the lowest gate is more deviating than the other gates. It is not clear from the paper if these differences fall within the expected errors (not discussed) or that further investigation to optimise the bias correction is necessary.

It is right that unstable profiles show some unexplained deficiencies in the lowest height levels. This feature is now discussed after Fig. 8 and Fig. 10 (former Fig. 7 and Fig. 9) and in the conclusions.

A direct comparison of measured (virtual) temperatures at the same height as the lowest gates of Doppler-RASS in e.g. a meteorological tower of sufficient height could help to investigate the observed differences in more detail. This would give the method a more firm base than the assessment based on comparison with mainly surface measurements.

We agree that the comparison of RASS temperature profiles with mast profiles would be much better. But unfortunately no simultaneous measuring campaigns were

available.

Specific comments:
1) Eq. 1: Units should not be included in the equation in this way. It would be better to explain the units in the text below, or otherwise the units and variables should be clearly distinguished in the equation itself

Equation 1 is a numerical value equation. In response to an earlier editor's comment on the intial format of equation 1 we decided to rewrite the equation in conformity with

NIST Guide to SI (http://www.nist.gov/pml/pubs/sp811/index.cfm)
Chapter 7.11 Quantity and numerical value equations.

Citation: 'Because a quantity equation such as l = v t is independent of the units used to express the values of the quantities that compose the equation, and because l, v, and t represent quantities and not numerical values of quantities, it is incorrect to associate the equation with a statement such as 'where l is in meters, v is in meters per second, and t is in seconds.
On the other hand, a numerical value equation expresses a relation among numerical values of quantities and therefore does depend on the units used to express the values of the quantities.')

2) par. 4.2: in the comparison with a simple empirical correction the reference height for the simple correction is chosen at 100 m while the empirical correction nearly vanishes at 150 m. Why is the reference height not chosen at 150 m?

The reference height has now changed to 140 m (150 m is no measuring height), see changed Fig. 7 (former Fig. 6) and corresponding text.

Technical correction:

Abstract, line 6: 'efficient', the term 'effective' seems more appropriate

has been changed.