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Interactive comment on "Performance of high-resolution X-band radar for rainfall measurement in The Netherlands" *by* C. Z. van de Beek et al.

C. Z. van de Beek et al.

remco.vandebeek@wur.nl

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Reply to Comments on: Performance of high-resolution X-band radar for rainfall measurement in The Netherlands

C. Z. van de Beek[1], H. Leijnse[1], J. N. M. Stricker[1], R. Uijlenhoet[1] and H. W. J. Russchenberg[2]

[1]Hydrology and Quantitative Water Management Group, Department of Environmental

Sciences, Wageningen University, The Netherlands
[2]Remote Sensing of Environment Group, IRCTR, Delft University of Technology, The Netherlands

The authors would like to thank the reviewer for his comments. Our comments are listed below.

PAGE 6039, LINE 20: The authors write about major upgrades to the SOLIDAR radar. Is there any information on the character of those updates? What is the possible effect on the quality of data presented in this study?

As mentioned there is no documentation left of the changes applied to the radar. The changes applied at the time concerned the updating of the radar retrieval algorithm and an addition of 8 dBZ to radar reflectivity maps. The exact changes in the algorithm are not known anymore, but the image quality has been improved dramatically.

PAGE 6044, SECTION 3.2: a) Is the ground clutter correction performed on a polar grid, or is the data converted to some kind of a Cartesian grid?'

It is applied to the polar grid because the local deformation of the polar grid with respect to the cartesian grid is minor. We do realize that the size of the pixels varies with the range on a polar grid. However, due to the large amount of data this straightforward method was selected to reduce computer processing time.

b) For the nearest neighbor method, the authors average surrounding non-clutter pixels to obtain the value for the cluttered pixel. Which quantity is averaged and in what units?

For the analysis in Fig. 4 this was done in dBZ and for Fig. 5 in R [mm h^{-1}].

PAGE 6051, LINE 6: The authors claim that only forward method is used to correct for attenuation in all precipitation events. Is this statement relevant to Z-R parameter estimation section (3.3) only? I am asking because later in the document results from both forward and backward methods are compared.

Using the furthest rain gauge as a reference it was possible to perform a backward attenuation correction along the gauge array nearly due west from the radar. This was only done for the few selected gauges. For the other analyzed data it was not possible to correct entire the entire rainfall maps without using very inaccurate extrapolation of this furthest gauge. Therefore it is indeed correct to note that the backward method was only relevant for the case studies.

PAGE 6055, LINE 8: The paper reads: "The significant overestimation is not trivial to explain, but a reason could be found in the fact that in this special case no wet radome attenuation occurs, as well as highly localized convective cells that might have been present at the gauge but not completely within the radar bin associated with the gauge." I am not sure if the later can be used as explanation to an overestimation problem. Partial beam filling can lead to underestimation, rather than overestimation. Is it possible that in this case overestimation is due to the bright band phenomenon?

We can understand your confusion as this statement was unfortunately stated the wrong way around. It should have read:

"The significant overestimation is not trivial to explain, but a reason could be found in the fact that in this special case no wet radome attenuation occurs, as well as highly localized convective cells that may not have been present at the gauge but partially within the radar bin associated with the gauge."

This will be corrected.

As for bright band effect the measurement height of this radar was well below the bright band level so this would be no explanation.

My last question is related to the analysis method used in all of the case studies (Section 4). The authors are using mean rain rate [mm/h] as a way of comparing radar performance with rain gauges performance. Why mean rain rate? It is the best? Have you considered rainfall totals [mm]?

Changing the unit from [mm h^{-1}] to [mm] would have no impact on the ration between radar and gauge values in the tables, but it is indeed correct to be note the unit mentioned at the tables as indeed the values are actually the accumulated values and not mean values. The accumulated rainfall in [mm] is also found in panels j of Figs 11,12,14,15 and 16.

Would it be possible to have Figures 6, 11, 12, 14, 15 and 16 in color for the on-line version of the paper?

Certainly possible and will be changed.

Instead of time evolution type, the Figure 2 could be better represented as simple radar vs. rain gauge scatter plot.

This figure was made to illustrate the possible calibration drift as well as compare rain gauge data to radar data. The mentioned scatterplot can be found in Figure 10.

Figure 4: In the description, words 'rows' and 'columns' should be switched with each other.

Corrected

PAGE 6047, LINE 20. ": : :carried outperformed: : :". I am not sure if this is an intended expression.

Corrected

PAGE 6049, LINE 11. The statement of the Hitschfeld and Bordan method being the most common is unfortunate. It is common for non-polarimetric radars only.

It could indeed be expressed more clearly that it is the most common method for non-polarimetric radars only and will be changed.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 6035, 2009.