

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

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

1. Despite the good structure of the manuscript, the scientific objectives are not very clear. The authors should highlight what is new and what is simply the application of existing algorithms or approaches. In the introduction, it is stated "The aim is to find the strengths and weaknesses of X-band radar under conditions typical for the

Netherlands and try to deal with the weaknesses in the best way possible". The authors should emphasize which of their results could be transferred to other configuration (with a different radar, in a different regions,...), otherwise this contribution may appear to specific to SOLIDAR and its vicinity.

The objective of this paper can be found in the second sentence of the abstract: "The high spatial (120 m) and temporal (16 s) resolution of the radar combined with the extent of the database make this study a climatological analysis of the potential for high-resolution rainfall measurement with non-polarimetric X-band radar over completely flat terrain". Even though the methods were applied to a non-polarimetric X-band radar in the Netherlands, these mentioned methods are with minor modifications easily transferable to (non-polarimetric) radar systems in other areas.

2. If the proposed methods to calibrate the radar, to correct for ground clutter and attenuation effects are new, they must be evaluated and compared with previously proposed techniques.

Our aim was not to introduce new techniques, but to correct and evaluate a high resolution X-band radar using a large number (195) events and therefore we did not include a comparison with other existing techniques.

3. There is no references to existing methods or techniques from the literature in Section 3.1-2-3! This must be modified, as there is significant work published about radar calibration (e.g., Joss and Lee, JAM, 1995), ground clutter identification and correction (e.g., Cho et al., JTech, 2006) and Z-R relationships derivation (e.g., Battan, 1973), just to give a few examples.

While references on these topics were already given in the introduction, additional references will be added in Section 3.

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Specific comments 1. *p.6036, Abstract, l.17: I would add "what" between "than" and "can".*

Changed

2. *p.6036, Abstract, l.18-20: the list of sources of error for SOLIDAR should include VPR effects and maybe melting layer also...*

Because of SOLIDAR is very close to the ground for all ranges (in order of 500m at maximum range) it measured well below melting layer level and the effect of VPR will be minor. This is the reason why the VPR has not been considered as a source of error.

3. *p.6037, Introduction, l.17: attenuation can be severe even at C-band (e.g., Tabary et al., JAMC, 2009).*

True, even though it is to a much lesser degree than X-band. We will change the text.

4. *p.6037, Introduction: polarimetry should be mentioned.*

While it was already mentioned in the abstract that SOLIDAR was a non-polarimetric radar it is indeed a good idea to mention polarimetric weather radars for sake of completeness in the introduction. This will be added.

5. *p.6040, l.24: insert a space between "rain" and "gauges".*

Done

6. *p.6041, l.1: I am bit surprised by this threshold of 2 mm/h at 1 min. If one tip corresponds to 0.2 mm, then the first non-zero rain rate value measured by such a rain gauge should be $0.2 \cdot 60 = 12$ mm/h. Maybe I am wrong...*

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The four gauges that were used for this criterium were not part of the gauge array used in this research. The data from these four gauges has unfortunately not been saved and it is not clear which type of gauges were used.

7. p.6041, l.10: the criteria on which is based the classification in convective/stratiform events should be mentioned.

The sentence will be modified to: The selection was based on visual inspection of both strength and shape of the measured reflectivity. For some unclear cases weather station data was used to make a final decision.

8. p.6041, l.12: what is the temporal resolution of the collected DSD spectra?

The DSD dataset was collected with a filter paper technique with an exposure surface of 20 mm² (Wessels, 1972). The exposure time was dependent on the period over which Wessels judged the rain constant, e.g. rain drop distribution and intensity. Time intervals are between 1 and 50 mins. The text is modified to explain this more clearly.

9. p. 6044, l.11-15: in the end, there is a calibration drift, but it is not corrected? This paragraph is a bit confusing...

There appears to be a fairly linear calibration drift over the full range of the data between May 1993 and October 1996. However, if a correction for this is applied to the data that was used in this study (between May 1993 and May 1994), a too strong correction can be observed (see Fig. 2c). A likely scenario is that the calibration monitored until early May 1994 and that calibration drift truly started beyond the selected cases in this study. Unfortunately, documentation regarding the monitoring of calibration is missing.

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10. Section 3.2 Ground clutter correction: *just out of curiosity, is anaprop frequent and visible in SOLIDAR data?*

Ground clutter can be seen to change in both size and intensity between images suggesting a fairly strong influence of atmospheric conditions. Anaprop was not seen to be so strong that new strong clutter locations appeared where previously none were located.

11. p.6047, l.21: *I think it should be "carried out" instead of "carried outperformed".*

Changed

12. p.6050, l.15: *"rain gauges".*

Changed

13. p.6051, l.8-20: *why illustrating the influence of attenuation correction with a rain event for which attenuation is limited?*

This was mostly done for the sake of completeness. As it was discussed for each individual case it was also included for this case. Of course the effect was minimal.

14. p.6056, l.5: *please give the date of this squall line.*

The date was September 21st, 1993 and is added to the text.

15. p.6071, fig.2a: *y-axis is rain rate (mm/h) or rain accumulation (mm)?*

This was indeed labeled erroneously. It is in rain accumulation [mm] and will be changed

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16. p.6075, fig.6: l.5: one of the 2 "the" should be removed.

Changed

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