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Atmospheric Measurement Techniques Discussions

Interactive comment on "Quality-based generation of weather radar Cartesian products" *by* K. Ośródka and J. Szturc

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We would like to thank Referee #1 for so thorough and detailed review of our paper!

We have prepared new version, but due to a high number of corrections we are attaching it in the two forms: (i) the old text with marked all changes, (ii) the new text only, as both WORD and PDF files.

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General comment:

The authors claim that the algorithm is novel since it uses the information from the polar coordinate system and apply those to the Cartesian. However, the authors fail to

show (in section 6) that their approach is better than traditional approaches using the QI reflectivity information from Cartesian grid to determine QI fields for radar products

Answer: New Section "Validation" has been added, in which selected criteria of the 2D data improvement are analyzed for MAX product generated for two-month period. The MAX data generated from quality-based vs. standard PPIs have been compared.

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Major comments:

For instance, there is a wide scope of literature about how various error fields are added or multiplied with setting different weights. The authors are not the first to deal with the polar-Cartesian conversion problem, so a little bit more background information would be helpful to the reader and also underline the uniqueness of this work.

Answer: Sect. 1 has been supplemented with more references to error estimation for weather radar 3D volumes and polar-Cartesian conversion.

The purpose of section 4 is confusing. These products (echo top, VIL, MAX, Convection) are standard products that have been explained in many research publications and books. I assume that the authors want to explain the parameters before they explain the QI algorithm in section 5. However, when reading section 4, I am not sure if the authors present 'new' parameters or if they just want to explain the parameters. I would suggest merging sections 4 and 5 (in particular Fig. 6) and that the authors focus on the QI part. Section 4 can also be moved to an appendix since there is really nothing now about those parameters.

Answer: Yes, the Reviewer is right. The following changes have been introduced: (i) we have stressed that the VIL, ETOP, and MAX are generated using standard algorithms, (ii) new approach in the product generation (using quality-based input) has been described, (iii) the sub-sections with descriptions of the algorithm are significantly shortened, (iv) Sections 4 and 5 have been merged.

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Section 5 is also confusing. Where are QI_source and QI_scope defined? How do Eqs 4 and 5 fit into the overall QI field? I assume that QI from Eqs 4 and 5 = QI_source but this needs to be better explained in section 5.

Answer: The denotation has been changed to differentiate between QI related to polar gates and related to 2D products (QI_X). In details: (i) the QI_source and QI_scope are defined in Sect. 4.3, (ii) eqs. 4 and 5 are related to QI_PPI computed from total QIs for polar gates, whereas QI_source is determined from the QI_PPI as described in Sect. 4.3.

Section 6: Figures 5 and 6 need more discussion. I am not convinced the QI algorithm actually works well. I am also confused about the Fig. 5c, is that QI derived from Eqs. 4 and 5? Is that on polar coordinates? It also seems that Fig. 5c is the QI field for Fig. 5a and not for the corrected data. However, I assume when calculating all QI fields that the authors use the corrected data. Is Fig. 5c even relevant for the QI products shown in Fig. 6.

Answer: (i) Fig. 4 (formerly 5) depicts polar, not Cartesian data, whereas QI derived from Eqs. 4 and 5 (now: QI_PPI) is for Cartesian PPI (depicted in Fig. 5a), (ii) The QI in Fig. 4c (formerly 5c) is for corrected data (quality index for corrected data is reduced even though the reflectivity value is improved, because each correction algorithm introduces some uncertainty in the data), (iii) yes, Figs 4 and 5 (formerly 5 and 6) are for the same event.

In the introduction, the authors highlight the importance of using the radar information from the polar coordinate system. However, they lack to show that their approach is better than traditional approaches using QI information from Cartesian reflectivity fields.

Answer: We have added Section with evaluation of the proposed methodology into the new version of the paper.

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Minor comments:

Throughout the paper: Please spell out acronyms like COST, BALTRAD, EUMETNET OPERA etc. Make sure the word “data” is followed by plural.

Answer: It has been checked and supplemented.

Page 11712, Lines 4-7: Clarify this sentence. Page 11712, Line 24: Clarify “related problems”.

Answer: The passages have been significantly changed.

Page 11713, Line 18: Most readers might not be familiar with the RADVOL-QC package. Is this software available to a broader community? Maybe some information about who is using it might also be helpful. Some of the information is given in section 2.3 so either refer to section 2.3 here or provide some information.

Answer: We added reference to Sect. 2.3.

Page 11714, Lines 6-7: Change kilometre to kilometer; Change 360 azimuths to of 360deg in azimuth.

Answer: We have checked the whole text and introduced British spelling.

Page 11714, line 16: What are those “other definitions”? Why do those definitions are better/different than 0 to 1?

Answer: the passage is rewritten.

Page 11715, lines 21-22: “estimation of the data quality”. First the authors should point out that the data control is done on polar coordinates – I assume. Second is QI field generated for each error source or/and an accumulative QI fields.

Answer: Yes. We complemented the information.

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Page 11716, Lines 16-19: Each PPI is at a certain height, so the interpolation is to (x, y, z). Please clarify that.

Answer: The PPI product is treated as 2D one. The height is not incorporated into the product: in our algorithm for a given (x,y) we search for relevant gates in input scan and on this basis a corresponding dBZ, QI and height may be estimated.

Page 11716: Lines 23-26: Clarify that inside means close to the radar and outside means farther away from the radar. Maybe near-field and far-field would be a better description. When I first read it, I was confused about inside vs outside.

Answer: Yes, thank you for the suggestion! We significantly improved the Section.

Page 11717: Equation 1 – where does that empirical function come from? What are the numbers 9500, 1.3, 1.6, 39000?

Answer: We have explained in Sect. 3.1 how the Eq. 1 was determined.

Page 11718, Lines 5-8: In this equation, all error sources are weighted equally. What is the justification for that?

Answer: The QI_i means total QI for i-gate, not for i-error source.

Figure 2: Can you show the differences?

Answer: We have withdrawn the Fig. 2 from the paper as it really was not informative.

Figure 3c-d: the terms hmax, hmin, hlowest, hhighest are used multiple times with different meanings. Please change to nomenclature to avoid confusion. In figure caption, change (a and d) to (c and d) and please explain what the differences are between c and d.

Answer: (i) We have added exact explanations in caption, (ii) the captions are corrected, (iii) the differences between c and d are explained as well.

OK Figure 5: please provide scales for distance and azimuth. Please enlarge the

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figure.

Answer: OK.

OK Figure 6: Breaking up the figure into two figures allows for enlarging the figure. As it is now,

Answer: OK

Please also note the supplement to this comment:
http://www.atmos-meas-tech-discuss.net/7/C4983/2015/amtd-7-C4983-2015-supplement.zip

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Interactive comment on Atmos. Meas. Tech. Discuss., 7, 11711, 2014.