Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2016-36-RC3, 2016

Atmospheric Measurement Techniques Discussions

Interactive comment on "An integrated approach to monitor the calibration stability of operational dual-polarization radars" *by* M. Vaccarono et al.

Anonymous Referee #3

Received and published: 15 March 2016

The authors present a method by which they combine radar calibration results obtained in several different ways, with the aim of providing an on line tool for the monitoring of radar calibration. The work relies on existing methods for the base methods, and the new contribution is the combination of the methods to a single tool. This is a good approach, but the authors are not reaching to the level they are aiming at. Instead of a new tool the final result comes in a form of presenting the methods of the original methods in a single figure. The paper is generally well written and the methods and results clearly presented. The authors should consider the following comments to improve the manuscript

General comments

1) No effort is made to combine the calibration data of the methods into a single quan-

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Discussion paper

tity, or even to present the results in a graphical form in a way that the observer can combine the results visually. Hence the outcome if far from a "robust online tool to monitor the stability of the radar calibration", as stated in the abstract. It would help to see a plot of the x-mean(x) (x is here ground clutter or sun calibration subtracted by the observatory flux) in a single plot. Maybe one could add the self-consistency results to the plot as well. After that it will be possible to judge whether joining the two datasets provides information beyond any one dataset.

2) The method used to calibrate the differential reflectivity is not well presented. Obviously the standard zenith scan calibration was not done. At the end of section 4.2.3 it is stated that the solar Zdr bias is "considered to correct the Zdr measurement in the radar post-processing chain. The solar analysis monitors only the receiver part and hence no transmitter chain effects are included. Hence solar analysis is not sufficient for Zdr calibration, and correct calibration is coincidental. In Section 4.1 observations in drizzle are used. Please clarify.

Specific comments:

Page 1, L2 and L 22: Is "short-term weather prediction" really a quantitative application?

Page 1, L4: the methods are not yet really "integrated", but presented together

Page 7, L6: References to Huuskonen and Holleman (JTECH, 2007,pp 476-483), Hollman et al (JTECH, 2010, pp 881-887) and Huuskonen et al (JTECH, 2013, pp 1704-1712) missing on the list.

Page 2, L11: The intercalibration method is obvious, but yet one could add reference to some recent papers.

Page 2, L12-14: This describes authors' own practices, please place in the data section

Page 3, L1: Is the subsection header necessary, what about replacing section header "Data" with this.

Page3, L2-29: Information is presented both in text and the table (altitude, parameters, parameters). Duplicated information should be removed.

Page 4, L29: notation z_dr (lower case) is fully unnecessary, as it appears only here.

Page 6, L1: Which distance is 40 km, distance between a radar and the cell or what? Please clarify.

Page 7, L15-16: Holleman et al (2010, pp 159-166) shows that the gain is determined within 0.2 dB (not 1.3 dB). They do not show results on pointing. Huuskonen and Holleman (JTECH, 2007) shows that the elevation angle is determined within 0.05 deg (not 0.2 deg).

Page 7, L17: The radio sun is typically estimated at 0.57 deg, i.e. slightly larger than the optical sun

Page 7, L16: The width Delta_r is only defined in table 3. It is assumed to be the same for elevation and azimuth, which is not correct, as pointed out in the prior literature.

Page 7, L18: The authors have used a three parameter model, i.e. assumed the width values in Eq.(9). There is no information given which values have been used and how they were obtained. The width values are not important for pointing studies, but crucial for the power determination. Hence very relevant for the present paper. Using the antenna width is not correct.

Page 9, L7-10: The authors apparently use the observations in the drizzle to check the calibration of the differential reflectivity. The standard deviations of the drizzle observations are about 0.5 dB. Was this uncertainty taken into account in the analysis? (See also general comments)

Page 11, L14: and elsewhere: 95th percentile (or .95 quantile). This is correct in places!

Page 12, L14: How is differential reflectivity determined? Is the method presented by

Holleman et al (JTECH 2010b, pp 881-887) used are something else. Please clarify.

Page 12, L19: Here it looks as if the Zdr bias determined from the solar signal is used as the Zdr calibration. As mentioned in the general comment 2) a correct calibration is coincidental, which ought to be mentioned here.

Page 12, L25: Please see the general comment 1)

Page 12, L28: The ground clutter calibration shows significant level increases (e.g. Bric della Croce, end of September) which the authors apparently do not interpret as changes in the calibration level. Please specify the method used to determine which points are trusted upon.

Page 13, L3: The prior papers on the solar method describe various methods to prevent the radio interferences from affecting the solar analysis. These data should be reanalyzed which would increase the number of results considerably.

Page 13, L32-35: The final conclusions are well written, and in agreement with the contents of the paper (as compared to the conclusions in the abstract).

Table 2: Could be combined with table 1 and many entries are not relevant to the paper (sidelobe, gain, transmitter, frequency, peak power, PRF)

Table 3: Please specify if "a" is one- or two-way attenuation.

Figure 3: The panels are small and difficult to read

Figure 12: Good figure, but labels on the insert are small. Maybe put only few but with a larger font size

Figure 13: Please zoom a little to show the data better

Figure 16: What about putting elevation and azimuth data to the same axis and Zdr (Fig. 17) as the second panel

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