Revision of the paper

Performance of high-resolution X-band weather radar networks – the PATTERN example

by

K. Lengfeld, M. Clemens, H. Münster, and F. Ament

The manuscript offers the opportunity to understand the benefits and drawbacks of a network of X band radars in Germany, which is composed by single systems that have the advantage to be compact, easily managed and in principle low cost. For this reasons I think that the subject presented by the Authors deserves the proper attention. However, in my opinion, the results presented are not adequately supported by a rigorous description of the methodology used. In addition, the two concepts of "high resolution" and "low cost", highlighted by the Authors, seem to me misleading or not covered at all. For the above-mentioned reasons I would suggest rejecting the paper but I strongly encourage the Authors to resubmit it again following the reviewer's suggestions.

Main criticisms

1. Resolution Abstract line 5-10. "The spatial and temporal resolution is 1 deg and 30 s" but in table 1 the beam width is 2.8 deg and the range resolution is 60 m. This means that at 20 km we have thin slices of approximately 60m long x 1000m wide x 1000 high. In section 2, line 5-10, an "oversampling" procedure is applied to "achieve an angular resolution of 1 deg". Is not explained the meaning of the oversampling performed by the Authors. I assume that the Authors just averaged the received samples in 1 deg interval for 30 s. Actually, this does not lead to an increase of the angular (only in azimuth) resolution. One way to do that is apply a deconvolution technique that is based on the oversampling of range gates plus an inversion strategy. I strongly suggest the Authors to check one of the references below to properly address this important issue:

[1] David G. Long, Member, IEEE, and Douglas L. Daum, "Spatial Resolution Enhancement of SSM/I Data ", IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING, VOL. 36, NO. 2, MARCH 1998 407
[2] Stogryn A. Estimates of brightness temperatures from scanning radiometer data. IEEE Trans Geosci Remote Sens, 1978, AP-26: 720–726
[3] Science China Earth Sciences March 2011, Volume 54, Issue 3, pp 410-419
Date: 15 Oct 2010 The development of an algorithm to enhance and match the resolution of satellite measurements from AMSR-E YongQian Wang, JianCheng Shi, LingMei Jiang, JinYang Du, BangSen Tian

2. Costs. The paper highlights the concept of "Low cost" with respect to more performing systems. This is too generic statement. A detailed analysis of costs including maintance and probability of failure should be addresses. While it appears reasonable a lower cost for one miniradar, it less intuitive the lower cost for a network of miniradars as those described by the Authors.

3. Clutter removal. The clutter removal chain seems to perform very well in the cases showed by the Authors. This is an interesting subject. However, the description

of the clutter removal modules is too generic. The thresholds used in the various algorithms seem to be subjectively fixed. An explanation of their derivations would benefit the reader.

3. Calibration. Reflectivity form MRR is used for calibrating that at X band. Here my main concerns are about the methodology of comparisons between the two sources. MRR is probably working at 24 GHz (please confirm it) while X band radar is working at ~ 10 GHz. I guess that the two frequency bands experiments different resonant effects when observing rain precipitation. Thus, I am wondering if a better comparison should include a proper frequency scaling to make the two reflectivity comparable each other before proceeding with the calibration.
Another aspect that is not mentioned in the paper is how the Authors have dealt with the different resolution and viewing geometry of MRR and X-band radar. More than one MRR range gate is within a single X-band radar range gate. Which is the MRR range gate chosen by the Authors to make the comparison? Do they apply some averages?

Minor comments
- Abstract lines 20 – 25. The phrase is misleading. Considering only a standard deviation of 3 dB is not the only parameter indicating an improvement spatial resolution.
- pag. 8236, lines 25. In my knowledge, there exists a third approach. Doppler, dual pol. X band miniradar:
Look at:
http://www.pa.op.dlr.de/erad2014/programme/ExtendedAbstracts/223_Barbieri.pdf
- pag. 8237, line 19. Change “approvements” into “improvements”.
- pag. 8240, line 31. At this point of the reading is not clear what Fig 3a should explain.
- pag. 8243, eq (2) Why this formula is calculated only in range direction?
- pag. 8244, line 20 – 23. At this point of the reading SPK method seems working best.
- pag. 8245, line 11. Are the other clutter algorithms compared on the same overlapping areas.
- pag 8246, eq.5. How dBR_{MRR} is obtained in detail?
- pag 8246, eq.7. Is it “$(dBZ_X\text{-}dBZ_{MRR})$” or $(dBZ_{MRR}\text{- }dBZ_X)$?
- pag. 8246 eq 8. How is the value of “δC”?
- pag 8247, line 19, Do you have a statistic of A(r) for your radars?
- pag. 8268, fig 11. I would change the title on the right panel b.