

Interactive comment on “Performance of high-resolution X-band weather radar networks – the PATTERN example” by K. Lengfeld et al.

Anonymous Referee #1

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This paper presents a network of inexpensive incoherent X-band radars scanning fast and a low elevation angle to provide high resolution rainfall estimate. Networking of X-band radars (non necessarily dual-polarized) has been the subject of many publications in the recent years. To publish a new paper on this subject, very innovative contents must be provided. In this paper some techniques adopted in a network of 4 radars are shown. Main result is maybe the comparison of reconstructed reflectivity field with the corresponding one collected by a C-band radar of the DWD network in convenient location for comparison. Result is encouraging. However, several issues concerning X-band networking, including radome attenuation or the incidence of signal extinction during intense event. The dataset is limited to events with $Z < 40$ dBZ which I think is too low to proof the concept. The presented setup uses MRR

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and raingauge in addition to radar. It is not clear whether such ancillary systems are required to properly use the radar network. In the introduction “LAWR” systems are considered to be in completion with dual-polarization systems at the same frequency. Authors could try to highlight better the advantages of their network with respect dual-polarization systems. Summarizing, although encouraging aspects have been noticed, further work (including activities prospected by the authors, particularly those relate to hydrological validation) should be done to reach the level of a publishable paper. Minor issues and inaccuracies found in the paper are listed below: 8235-3: I was not aware of Einfalt (2003). Interesting is that figures of requirements of rainfall data for specific applications. Often I have heard very vague requirements from hydrologists. Are authors aware of different views within hydrologists ? (this is just a point for discussion) 8235-18: Bringi et al., 1990 is a highly cited paper, but it is typically for PHIdp-based correction and not for X-band radar. 8236-24: Describing a dual-polarization system, it seems that authors have a specific one and a specific configuration in mind. I heard about lower-power dual polarization systems. Since price is an issue, what is the saving of a LAWR with respect to a dual-polarization system ? 8237-8: “low-cost radar systems are a scientifically valuable tool to investigate spatial structure” From the incipit of the paper, it seems the goal had to be to provide data with high quality and resolution rainfall-runoff applications.

8237-15: “repetition” -> repetition

8237-20: I think authors are saying something misleading: “In addition, the X-band radars provide precipitation estimates near the ground (McLaughlin et al., 2009) due to their relatively short maximum range”: actually within the same range, even S band systems using same elevation angle provide estimates close to the ground.

8239-15: Uncertainty in reflectivity estimation due to fluctuation is more than 1 dB. Why reflectivity is provided every 30 seconds and not every sweep ? Moreover, how do authors define “resolution” ?. To me, azimuth resolution is at least 2.8° , not 1° .

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8239-18: "Observe"-> measure; this sentence let understand that reflectivity is a path measurement.

8239-20: Can authors provide a reference or an example of "filtering peaks within adjacent pulses" ?

8240- 22: "inertial guess" ? Does this method always find a reliable noise level ? Would it be possible to know the stability in time of the noise level of these systems ?

8241- 14: "Static clutter is caused e.g. by trees and houses": do not forget natural reliefs.

8241- 16: Signals from other radars are typically referred to as interferences. A more clearer distinction of clutter and the suitability of filtering methods for a specific clutter is suggested.

8242-3: "combinig" -> combining

8242-24: I had difficulties in understanding the sentence starting with "In some images ..."

8243-8: Maybe there is some confusion between beams and gates in explanation of (2).

8244,end of section: It is not clear to me whether identified cluttered radar cells are reconstructed or not at the end of the process.

8245,calibration with MRR: Several questions: It seems that maximum measured reflectivity is 40 dBZ. Is there a threshold applied or not ? Are differences of frequencies of the two radars accounted for ? Is a 4 dB RMSE acceptable for calibration ? Are MRR data corrected from attenuation ?

8245,5: Explanation of "oversampling" is not convincing. How can be that grid pixels are not covered by beams that are contiguous. Maybe authors are referring to centers of "radar pixels".

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8245,8: Where do these coefficients comes from (guess they are for X band) and how they are selected based on rain.

8248,16: What is the elevation angle of the Fuhlsbüttel radar used for this comparison ?

8248,25: Could authors speculate about the reason of relative bias ?

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