

Review of “5 year radar-based rainfall statistics: disturbances analysis and development of a post-correction scheme for the German radar composite” by A. Wagner, J. Seltmann, and H. Kunstmann, Hydrol. Earth Syst. Sci. Discuss., 12, 1765–1808, 2015

By Remko Uijlenhoet

General remarks

The authors present a statistical post-processing scheme for rainfall estimation from weather radar networks. As such, this paper contributes to accurate and robust measurement of the space-time variability of precipitation, which is generally the starting point for rainfall-runoff modelling, flood forecasting and hydrologic design. The paper therefore fits the scope of HESS(D).

The proposed correction scheme is largely statistical and empirical in nature. This begs the question: how generalizable are its results, beyond the reported improvements for the German radar composite? I have the impression that the presented outcome strongly depends on the specific aspects of the DWD radar processing algorithms (not taking into account VPR correction for instance), the specific character of precipitation systems in this part of Europe as compared to other parts of the world, as well as on the (tacit) assumption that rainfall estimates from rain gauges provide the “ground truth”. A thorough discussion of these aspects, preferably in a discussion section preceding the conclusions, is important before the radar hydro-meteorological community would start using the presented methodology.

Finally, I feel the style of the manuscript, in particular the order in which the various aspects are being presented, requires a thorough round of editing. At certain moments, the paper reads more like a technical report than like a scientific publication, with relatively short sections and quite a number of repetitions. I am sure that with the experience of both co-authors, a significant improvement of the readability of the manuscript should definitely be achievable.

Specific remarks

- P.1766, l.4: I find the term “post-correction scheme” confusing. The term suggests that the authors have developed a scheme that works after the correction. I think what the authors mean is “a posteriori correction scheme”, namely a correction scheme that works after the operational radar products have been produced.
- P.1769, l.15-17: “some corrections are not applied in DWD, e.g. VPR-correction algorithms for single radar data or composite data” – why are such algorithms, which are known to provide significant improvement (e.g. Hazenberg et al., 2011; 2013), not applied by DWD?
- P.1770, l.24-25: So the last two columns of Table 1 represent “the minimum and maximum radar elevation at a distance of 128 km from the radar site”. Given the small numbers, I doubt if these elevations are really expressed in meters. Shouldn’t the indicated units be kilometers?
- P.1772, l.20: “a three-part Z/R relationship” – this relationship seems to be taken for granted. Can the authors provide any assessment of the appropriateness of this relationship and the systematic rainfall estimation errors that may be associated with it (e.g. Hazenberg et al., 2011; 2014)?
- P.1774, l.2: “frequencies of occurrence” – I presume these are actually frequencies of *exceedance*?
- P.1774, l.22-23: “the preferred allocation of pixels to one radar system within overlapping areas” – hence, in regions where two (or more) radars overlap, individual pixels area assigned to one radar only, not allowing for a weighted influence of individual radar systems?
- P.1776, l.17-18: “a differentiation between spokes with or without rain patterns is useful. This is done visually.” What do you mean with “visually”? Is this an automatic or a manual procedure?
- P.1787, l.13-15: “A significant overestimation of annual rain amounts based on the radar data compared to rain gauge data becomes apparent.” – a RMSE of nearly 1200 mm per year is enormous. Please explain.

Editorial remarks

- P.1765, title: "disturbances analysis" --> "disturbance analysis" / "analysis of disturbances".
- P.1770, l.22, ref. to Table 1: I find the caption of this table (P.1794) too concise. Please explicitly explain the meaning of the numbers in all columns.
- P.1771, l.1: "Each weather radar run" --> "Each weather radar runs".
- P.1771, l.8, ref. to Fig.1: I find the figure captions in general too concise – as far as I am concerned figures plus captions should be self-explanatory.
- P.1771, l.25: "16 weather radar" --> "16 weather radars".
- P.1773, l.23: "are inspected whether" --> "are inspected to investigate whether".
- P.1778, l.8: Insert comma after "Adjacent radar systems".
- P.1786, l.23: "splitted" --> "split".
- P.1877, l.22: You cannot start a sentence with "Whereas". This has to follow from the previous sentence: ", whereas".

References

Hazenberg, P., H. Leijnse, and R. Uijlenhoet, 2014: The impact of reflectivity correction and accounting for raindrop size distribution variability to improve precipitation estimation by weather radar for an extreme low-land Mesoscale Convective System. *J. Hydrol.*, 519, 3410–3425, doi: 10.1016/j.jhydrol.2014.09.057.

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Hazenberg, P., Y. Nan, B. Boudevillain, G. Delrieu, and R. Uijlenhoet, 2011: Scaling of raindrop size distributions and classification of radar reflectivity – rain rate relations in intense Mediterranean precipitation. *J. Hydrol.*, 402, 179–192, doi:10.1016/j.jhydrol.2011.01.015.

Hazenberg, P., H. Leijnse, and R. Uijlenhoet, 2011: Radar rainfall estimation of stratiform winter precipitation in the Belgian Ardennes. *Water Resour. Res.*, 47, W02507, doi:10.1029/2010WR009068.