

Interactive comment on “Weather radar rainfall data in urban hydrology” by Søren Thorndahl et al.

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Review of HESS-2016-517: “Weather Radar Data in Urban Hydrology” by Thorndahl et al.

The authors present a review of weather radar technological and methodological advances in light of more than a decade of progress since the well-known Einfalt et al. (2004) review. The paper is a pleasure to read and represents a useful update on the state of the knowledge. I have only minor comments, mainly grammatical, that the authors should address prior to publication.

Pg. 1 Line 14: delete the comma after “hydrology”

Introduction: I do think it would be useful to mention what “urban hydrology” means, though perhaps the authors think it is self-evident. Later in the paper, a number of specific application topics are mentioned, but perhaps a brief list belongs in the intro-

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duction.

Pg.2 Line 24: delete “of” after “many”

Pg.2 line 31: delete comma after “models”

Pg.3 lines 3-4: this sentence structure is awkward

Pg.3 lines 10-12: This may be nitpicking, but the principles of precipitation measurement using radar should not change-at least if “principles” refers to the underlying physics of both radar and precipitation. I’d suggest changing this sentence.

Pg.5 line 5: In my mind, this should say “down to a minimum of 500 m” rather than “up to a maximum of 500 m.”

Pg.6 line 17-18: I understand this “fishbone” idea, but if the authors have a figure available that demonstrates it, they could consider including it in the paper.

Pg.6 line 19: See later comment on usage of term “commercial radar rainfall products”

Pg.9 line 31-Pg.10 line 1: Wright et al. (JAWRA 2014) also examined the role of gage density in MFB estimation.

Sections 3.2.2 and 3.2.3: It seems strange that these are separate sections-the content of section 3.2.3 seems to naturally fit within the scope of Section 3.2.2. I am also surprised that range effects don’t appear in this discussion, and possible solutions such as approaches based on the vertical reflectivity profile. In addition, it is perhaps worth noting that MFB has an implicit range adjustment feature, in that, at least for storms that don’t cover a large portion of the radar coverage, the gages reporting positive rain will be spatially close to each other, i.e. at similar distance from the radar, and thus the computed MFB will be in some sense “tailored” to compensate for range dependent bias. This could be worth mentioning, as MFB is sometimes viewed as being overly simplistic when in fact, for this reason and others, it works quite well.

Section 3.2.4: I object to the wording “commercial radar rainfall products.” Perhaps

“commercial” has a different implication in Europe but in North America it implies that the product would be available for purchase from some private-sector. While such products certainly exist, the authors refer to products produced by government agencies that, at least in the United States, are available free of charge.

Pg. 13 line 13: Consider changing “cases” to “cells” or “elements”

Section 4.1: The first paragraph of this section is at times hard to follow. I’m not sure what the sentence on pg.14 lines 20-22 is trying to say. Is it that climate projections from GCMs are “spatially distributed”? Or that we need to understand the spatial nature of precipitation extremes in a changing climate? Please reword as needed. If the intended meaning is that GCM outputs are spatially distributed, I would argue that this isn’t the case, due to their coarse resolution. Instead, I would argue that they are “spatially averaged,” and so the relevant methods needed to use such information revolve around using radar (or other methods) to disaggregate these coarse spatial averages to finer scales. I’m also having a hard time understand the sentences on pg.14 lines 22-29, regarding the connection between Area Reduction Factors (ARF) and GCM outputs, point-based historical data, etc. These are all relevant issues, but the connections need to be clearer. If the authors wish to mention work related to ARF estimation using radar, they could consider the work of Durrans et al., (2002) and Wright et al. (2014).

Pg.15 line 1: Multiple Wright et al. 2014 papers are included in the bibliography-which is referred to here?

Section 4.4: I think it is worth mentioning past work and future potential for assimilation of radar data into short-term numerical weather forecasts. Great potential here, I recently reviewed a paper (not yet published) with an urban application using NCAR’s DART system that showed excellent results in an urban setting.

The authors don’t say a lot in the review about the future: data assimilation, refinement of dual-polarization algorithms, phased array technology, etc. Consider including a

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brief mention and references.

The authors could mention more specific research efforts, such as the CASA network (<http://www.casa.umass.edu/index.php>).

References: Durrans, S.R., Julian, L.T., Yekta, M., 2002. Estimation of Depth-Area Relationships using Radar-Rainfall Data. *J. Hydrol. Eng.* 7, 356–367.

Wright, D.B., Smith, J.A., Baeck, M.L., 2014. Critical Examination of Area Reduction Factors. *J. Hydrol. Eng.* 19, 769–776.

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