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Hydrology and Earth System Sciences
Discussions

Interactive comment on "The possibility of rainfall estimation using R(Z,Z_{DR},K_{DP},A_H): A case study of heavy rainfall on 25 August 2014 in Korea" *by* C.-H. You et al.

Anonymous Referee #1

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Title: The possibility of rainfall estimation using R(Z,ZDR,KDP,AH) : A case study of heavy rainfall on 25 August 2014 in Korea Author(s): C.-H. You et al. MS No.: hess-2015-515 MS Type: Research article

General Comments The authors attempt to validate a dualpol rain rate estimator. This should be stated in the title. To use "possibility" is the wrong term. The authors touch important aspects and have some interesting ideas: finding a correct rr estimator, addressing the sampling issues for dualpol data, but in my view none of the issues are analyzed to an extent that is needed. For example ZDR. A method to derive the ZDR bias from disdrometer data is suggested. But I cannot find a verification of this approach. Also, the paper needs to be restructured. As such, the ZDR aspects are

spread throughout the paper. So everything related to data quality should be one section (especially with respect to ZDR). Once this is handled, one can focus on the rain rate estimator, where the proposed one is compared to the ones that are typically used. In the current form it is really hard to collect all the pieces of information. The authors just state that there is no birdbath Data available for this event. The way they write the paper, it appears that the system is capable doing so. Then it should be an easy task to assess the proposal with a different set of data. I think there is material for a paper but the current form is not sufficient for publication.

Specific comments: The authors suggest that ZDR from a disdrometer might be used for calibration. This implies that ZDR is constant with height, so that such an estimate can be related to the radar height. This might be true to some extent in an stratified rain situation, but the rain rates considered here are certainly beyond a stratiformed rain situation. In other words the argument here is missing a proof, at least a discussion of possible limitations is needed. The authors do not attempt to make an recommendation which rr to use now. Or is there further research needed? What about the "robustness" of the approach, s.th. the authors state in the introduction? This is not addressed.

What is the accuracy goals for the estimator. How did the rr estimator work for other data sets? Anyone else is using it? What accuracy is achieved there? Ah (I assume the path integrated attenuation) is not introduced. How is it computed, quality control, formula. Also the rr estimators should be introduced in more detail. For some of the estimators recommendations can be found in literature. Why not using a R(kdp) relationship.? The rr estimators need to be introduced in the text (not just in a table) with references.

Did the authors verify the result with an other data set? Section 2.1.

Quality control of disdrometer: very crude. It is well known that wind effects can bias disdrometer measurements. Did the authors check for this? If not, they should do this and figure out how the conclusions may change in their study.

Section 3.1

SD (ZDR): here terms accuracy and bias seem not properly separated. What a bias/ uncertainty is should clearly separated.

Error propagation (4.2):

not really introduced here. How are the distributions used? Independently (like a Monte-Carlo simulation). Here, suddenly other estimators are discussed here (R(Kdp) for example). For the real world comparision, these are not discussed. Why? If you want focus on R(Z/ZDR) and the proposed one here, you focus on these here as well. Or you say s.th abouth the performance (statistically) in section 3.3.

p 12/ l. 12 ff: So if you have a HMC, you will abandon your proposed rain estimator? Really? So you implicitely state here, that it is not the best choice. What is a better choice??

Technical correction a more detailed review is need after the paper is fully revised.

p157/l. 28: Diederich

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