Hydrol. Earth Syst. Sci. Discuss.,
doi:10.5194/hess-2015-515-RC2, 2016

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 #2

Received and published: 23 February 2016

Overview

The aim of the authors is to find the optimum quantitative precipitation estimation method for the first dual-pol S-Band radar in Korea. To this end they search for the best method to remove biases in (horizontally polarized) reflectivity measurements (Z_h) and in differential reflectivity (Z_{DR}). They test mainly $R(Z_h, Z_{DR})$ and $R(Z_h, Z_{DR}, K_{DP}, A_h)$, the later one proves to provide quite stable and reliable estimates of the rain intensity.

A basic requirement for a publication is, that an (educated) reader is able to comprehend what was done and that she/he is able to repeat the investigation, based on the

information of the publication. This goal is not met by this manuscript.

I did not find a clear structure within the paper. It should be stated clearly, that different approaches to determine the biases in Z_h and Z_{DR} will be discussed in advance of describing the first approach. The abstract does not describe what is done in this investigation.

The paper contains a large amount of oversight, reducing the confidence in the care the authors took.

The scientific innovation within this paper is quite limited. Known QPE approaches are tested and the results gathered during a strong precipitation event are presented. It is questionable if this is innovative enough to justify publication. Because of the limited quality in presentation I would reject the paper in the present form.

Specific Notes

- p2, l16: "different drop shape", different from what?
- p2, l28: KMA installed an S-Band polarimetric radar in the fare northwest of Korea. Later in the text, the Bislsan radar was the first polarimetric radar in Korea. Bislsan is in the southeast of Korea. Is this a contradiction or are there at least two polarimetric radars in Korea?
- p3, l26: Fig. 1 show the location of all instruments? Where are the rain gages mentioned at the beginning of chapter 2.3?
- p4, l2: Radar Bislsan is (according to my digital elevation model) at a height of more than 1 km asl. The distrometers are quite close to see level. In 82 km from radar the 0.5° beam is 1.1 km above radar height. There is nearly 2 km separation between radar and distrometer measurements? Are these data comparable? You should at least discuss this problem.

- p4, l12f: Drop numbers count only in the lower channels leads to an removal of the data. In the next step you remove drop size spectra with drop number counted only in the lower 5 channels? This is done twice.
- p4, l25: The prefactor of D is 0.00057, not 0.5. . . .
- p5, l24f: What is N? N is the number of rain gages (121) or the number of hourly measurements (7×121)?
- p6, l20: There is no Bringi and Chandrasekar (2003). You assumably meant 2001, or did you mean Bringi et al. 2003?
- p6, l21: At least in Bringi and Chandrasekar (2001) I did not find this equation. Please give a more precise citation.

  What is ρ_{co}, what is $\rho_{co}(l)$? Is $\rho_{co} = \rho_{co}(0)$?

  You call the the correlation at different places ρ_{co}, $\rho_{co}(l)$, $\rho[n]$ and ρ_{hv}. Is it all the same thing? So please use the same notation. Are these different terms? So please indicate what is meant by which term.
- p7, l6: With equation 8, an L of over 3 (line 11) is reached by $\rho_{hv} > 0.5$ and an L of 1.7 (line 14) needs $\rho_{hv} = .32$. Probably the prefactor 10 is wrong in equation 8.
- p8, l2: Ryzhkov et al. (2005a)
- p8, l19: Why do you have problems to detect the melting layer by a 6 elevation volume scan? There are approaches to determin the melting layer from an individual elevation.
- p10, l24: Table 3 contains the results from chapter 3.3. The results from chapter 4.1 are not given.

- p11, l5: As far as I got it, you never introduced A_h, although that term is already used in the title. I asume, A_h is the path integrated attenuation for the horizontally polarized wave. This should be measured in dB/km but not in degrees/km.
- p11, l18: What is an error step? You do not describe what you really did. I reconstruct, you increased added errors in Z_h, Z_{DR}, K_{DP}, and A_h simultaneously. How did you control the error covariances? How did you distribute the errors?
- p13, l3, and l 14: No "
- p14, l28: Malte Diederich
- p17, table1: Give citations for the applied relations.
- p17, table3: The exponent of Z_{DR} is in the wrong line.
- p20, figure3c: Average of ρ, not STD_ZDR.
- p22, figure5c: (same error)
- figures 6, 7, 10, 11: Most data are ploted in the lower left corner. I propose to use double logarithmic scales or to add an enlarged version additionally to show the data up to 20 mm rainfall.
- figure 9: It should be "range" not "Gate".
- figure 12: Specific attenuation in dB/km, not degrees/km.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2015-515, 2016.