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Atmospheric Measurement Techniques Discussions

Interactive comment on "Retrieval of Lower-Order Moments of the Drop Size Distribution using CSU-CHILL X-band Polarimetric Radar: A Case Study" *by* Viswanathan Bringi et al.

Anonymous Referee #2

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This manuscript presents a very interesting new technique with promising results for improving the DSD retrieval from microwave remote sensing measurements. I find no fatal flaws in this study, but do have some minor comments, which are listed below.

Biggest, minor concern: There is a notion that attenuation at low rainfall intensity is not significant enough to allow retrieval of lower order moments with acceptable uncertainty (i.e., measurement error is too large due to relatively lower signals). The DSDs presented in Fig 8c are an example of this. Also, early in the case study (<2030 UTC) when the precipitation is relatively light, the M3 and M6 retrievals are not in very good agreement with that observed. The authors do allude to Kdp being too noisy,

which is well known at low rainfall intensities, but Ah is also derived from filtered psi-dp measurements. So it is not clear how Ah should be any better than Kdp.

Other, less minor comments:

Line 128...reference to Huntsville site in this context is irrelevant. Suggest re-wording this sentence to better clarify that the same disdrometer and wind shield configuration was used in both Greeley and Huntsville, but this case study is focused on an event captured in Greeley when there was coincident X-band radar data collected.

Fig 1a and references in the text would benefit from plotting exponential and gamma DSD to show comparison with G-G, especially since the text mentions exponential in lines 168-169.

Lines 201-203: "...good time resolution enabled validation..." could use some more theoretical elaboration or a citation that has results on the decorrelation of convective rain.

Lines 211-212: RHI first mentioned on line 211 and not defined until line 212.

Fig 3. The X- and S-band RHI scans are offset by 1-min. Aren't they obtained at the same time? Line 243: the term "meteo" is not widely known...is this referring to meteorological? Perhaps hydrometeor would be more appropriate since that is what is largely contributing to the backscatter at X-band.

Line 267: "...shifted by 60 sec as is common practice..." a few citations are warranted here.

Fig 6a...early during the event (<2030UTC) the reflectivity simulated from the DSDs is 3-6 dB lower than that measured by CHILL and yet there is no mention of this rather large discrepancy. This should be mentioned in lines 280-285 and a possible explanation provided.

Lines 313-318...concerning the optimized values of mu and c...how do the distributions

of mu and c for the climatological database in this study compare to those reported by Raupach et al. (2019), which used different case studies? In other words, we need more evidence showing the variability of the shape parameter c.

Fig 13: This is a great way to represent this data and a good tool to use for better understanding the microphysical processes at work. However, I have a minor suggestion...The color scale is not very discrete. So the plots would benefit from annotations of numbering the points sequentially to better match the reference to certain features described in the text.

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