Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., referee comment RC1
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Comment on amt-2022-196

Anonymous Referee #1

Referee comment on "Estimation of raindrop size distribution and rain rate with infrared surveillance camera in dark conditions" by Jinwook Lee et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2022-196-RC1, 2022

This manuscript provides an interesting new method to estimate microstructural and bulk rainfall properties from a CCTV camera. The idea is intriguing and the topic is fully appropriate for the journal. The manuscript needs overall a major and mandatory revision, as detailed in the following comments.

Methodology section: the authors move forward to directly discuss and describe the algorithm. Important information on the measurement device is missing at this point, crucial for the scope of this journal. The reader at this point has the following questions: what are the technical characteristics of the camera? What are the actual input data? (description of the images, their resolution, acquisition rate, discussion of possible artifacts/issues…). Figure 1 is rather generic, it would be good to see visually step by step the data processing in a similar sequential order. I recommend then to anticipate the description of the devices at the beginning of the methodology section.

I would like to better understand t**he concept of "dark conditions"**. I invite the authors to elaborate more and discuss accordingly the perspectives of this type of measurements. How does the performance continuously evolve in the transitions from dark to light and vice versa?

The **evaluation** needs more data (more precipitation events). This will also help to better understand the differences at the tail of the distribution illustrated in the manuscript. At the present stage it is very hard to understand the potential and the error structure of this new measurement principle.

I do not see any statement about **data and code availability**. I strongly recommend to provide the data as well as the code in an appropriate repository. I consider it almost mandatory for this type of papers describing new methods.

- L12: please quantify “similar”
- L13: it is not clear why you focus here only on the 0.5 to 1.5 mm interval
- L20-25: please note that weighing gauges are nowadays used very often instead of tipping bucket
- L63: provide a reference for the PARSIVEL instrument
- Equation 5: please note that there may be significant uncertainties to this relation. I suggest a discussion about it after revisiting the relevant literature on the subject.
- Equation 8 (and discussion): is it possible also to obtain non-parametric (histograms) DSDs with this instrument? I would be curious to see how such histograms would look like.
- L108: here the depth of field is mentioned. However, it was not previously introduced and discussed. See my larger comment on the methodology section.
- Table 2 and Table 3: I would recommend to move this information to the Appendix.
- Figure 5: OK to show the data with different granularity, but I would like to see also the two time series with the same temporal resolution (by aggregating PARSIVEL data) as well as their cumulative curves, to understand if the Parsivel and the gauge are in decent agreement. Also, Figure 10 later on should be replicated to compare, at 15 minutes, the CCTV and the rain gauge which remains the real reference for rainfall amounts.
- Figure 8: the labels (a) and (b) are missing
- Figure 9 (and discussion): why do you need to fit a gamma distribution for the Parsivel? Could you just use the non parametric form from the measurements?
- Table 5 (and discussion): I believe you should increase the size of your side-by-side comparison dataset. One rainfall event is not enough in my opinion.
- The Parsivel has its own limitations. How were the data corrected or processed in order to be sure of its measurements to be taken as reference? (example https://doi.org/10.5194/amt-8-343-2015 but other relevant literature on Parsivel data processing is available)

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  Figure 10 (and discussion): please comment more in -depth about the origin of the extremely large overestimations around 20 LST and 06 LST. I am interested to see exactly how the transition from light to dark affects the data.