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Atmospheric Measurement Techniques Discussions

Interactive comment on "Data driven clustering of rain events: microphysics information derived from macro scale observations" *by* M. D. Dilmi et al.

Anonymous Referee #4

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Brief Summary/General Comments:

This manuscript develops an approach to analyze and interpret rain disdrometer data by using statistical and analytical tools common in other scientific communities, but relatively unknown within the hydrological and rain microphysical communities.

As a frequent user of disdrometric data, I find the analysis presented in this paper to be fascinating and potentially transformative to future work in hydrology and rain microphysics. It is clear the methods presented here are extremely novel within this community, and it appears that there is a lot of valuable information that can possibly be gained by conducting analyses in the ways described within the text.

However, as other referees have noted, the entire manuscript needs a thorough revision by native English speakers in the interest of readability. Since the analytical methods used here are expected to be new to most of the intended readership, it is vitally important that the exposition is clear, unambiguous, and complete enough so that others can follow in the footsteps of these investigators; the tone of these sections would be most useful to the reader if they were very tutorial in nature. In particular, sections 3 and 4 (which involved fundamentally new ideas for me) require more detail and clarity to allow a reader to reproduce and/or mimic the work with similar data-sets.

As it stands, I only have a vague understanding of the details of the process that was undertaken – but the results and methods are intriguing enough that I desperately wish the manuscript could be rewritten in such a way that a diligent reader could reproduce the results. The text is currently opaque enough that it is difficult for me to determine whether or not there are technical issues related to the work.

Specific Comments:

In addition to the presentation concerns outlined above (and by the other reviewers), I do have some basic scientific questions to add to the discussion.

1. As noted by other reviewers, I am curious as to how much the choice of a 30-minute MIT interval used to define a rain event effects the results. Similarly, how much does the minimum detection thresh-hold influence the results?

2. Given that this method is new to some readers, could it briefly be described what happens with this method if it is employed with non-transformed data? The normalization method used to make each of the variables pseudo-normal sounds quite practical, but I always wonder what biases this can introduce in fundamental non-linear processes like rainfall. What would happen if such a transformation is not utilized?

3. The instrument you utilized had a 1-minute integration time. There are other detectors with sub-second integration times, and one can always coarsen data. What in-

fluence does integration time have on the method proposed? Does one find the same basic results (for the entire process if the full analysis is done with a different integration time-scale? This is not merely of academic interest here, since scale-matching is of vital importance within the hydrological community where instruments with very coarse resolution (e.g. radar) are often "ground-truthed" with point-detector measurements that can have sub-millisecond resolutions.

4. As noted by other reviewers, the conclusions seem a bit of an over-reach for a study done using one type of instrument, with one type of MIT choice, one minimum detection threshhold, at one location, with one integration time. I believe that if this approach was applied by a number of investigators at different locations using data from a number of different instruments and a variety of parameter choices it is possible that a very powerful result could be attained. I would love to work on such a study, but – due to the quality of written English in this paper – I can't follow the method closely enough to do so at this time.

I would like to petition the authors to give this paper a substantial re-write and have native English speakers edit it. In the interest of readability, I would encourage figure captions to be more descriptive. Finally, I would love to have access to either code or other materials necessary to replicate the work (so, as other reviewers have pointed out, unspecified details like the choices made in te(xˆk) are known to a practitioner).

If these changes could be implemented, I would promise the authors that not only will this paper be read, but some of us will use the results in their own work – myself included.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2016-389, 2016.