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Atmospheric Measurement Techniques Discussions
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Interactive comment on "Hydrometeor classification from polarimetric radar measurements: a clustering approach" *by* J. Grazioli et al.

Anonymous Referee #1

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Referee Comments AMT MS # amt-2014-238 by J. Grazioli et al. Hydrometeor classification from polarimetric radar measurements: a clustering approach

GENERAL COMMENTS: 1) Substantial contribution to scientific progress? i.e. concepts, ideas, methods, data

This paper presents a very well-described, well-executed hydrometeor classification method. They compare their methods to Dolan and Rutledge (2009) and found good agreement. They also used a comparison to 2DVD data that was informative, although the presentation of this comparison was quite confusing and needs to be revised.

2) Are the results within the scope of AMT? i.e. remote sensing, laboratory and in-situ measurement techniques for constituents and properties of Earth's atmosphere, i.e. development, intercomparison, and validation of measurement instruments and techniques of data processing and information retrieval for gases, aerosols, and clouds.

Yes.

3) Are scientific approach and methods valid?

Yes, except for the 2DVD and BD2009 comparison, which was not presented or discussed well. The graphs and text were very unclear and definitely need revising.

4) Is the experiment reproducible?

It would be much more reproducible and comparable to future/past studies if the author's new clusters for various hydrometeor types were outlined in such a way that shows each category's polarimetric variable ranges: max, min, mean, median, etc. You say your algorithm works, but how can I compare it to mine if I don't know your ranges of expected values that result from the cluster analysis? Furthermore, a primary contribution of the paper is to establish the expected value ranges or membership beta functions of various hydrometeor types from a large European X-band radar dataset. You should provide this to readers! They could use the data and implement it in whatever algorithm they have. Your algorithm goes on to use some other methods of final classification, but as you say in the conclusions, your expected value ranges could be of use in any algorithm design.

5) Are results discussed in an appropriate and balanced way?

Yes.

6) Consideration of related work and appropriate references?

Yes.

7) Are scientific results and conclusions presented in a clear, concise, well-structured

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way? i.e. number and quality of figures/tables, appropriate use of English language?

The grammar and writing style of the paper started out fantastic, but greatly degraded as the paper went on. I would gauge the writing quality as poor for all sections but the 1st and 2nd. To complicate things further, the paper was VERY LONG. The major problems with writing and use of the English language were: the very frequent misuse of commas; placement of prepositional phrases in the sentence structure; misuse of dataset/data set/dataset; using dual polarized radar (incorrect) instead of dual-polarization radar (correct); overusing the words “employ,” “following,” “present study,” “here”; unnecessarily using [-] to denote unitless variables – this is confusing; beginning too many sentences with extraneous prepositional phrases that make the sentences very awkward and hard to read like “In this way, At first, In the following, Additionally, Eventually, etc. etc – these can be great ways to start sentences but they are very commonly misused and misplaced in this paper; the misuse/mixture of present and past verb tenses when it should be past tense in most cases.

In addition, some figures need to be improved and some need much more clarification so the reader can easily understand them. Many figures rely on the reader to know acronyms and methods from the text, but these details should be reiterated in clear legends with real words (not acronyms!) and the same pertinent information should be clearly stated in the figure caption. The figures and their captions are incomplete and not understandable in the current state.

TECHNICAL CORRECTIONS: TOO MANY corrections - will take more time to denote these, trying to figure out a proper format to do so. I will probably annotate a PDF and attach it.

SPECIFIC COMMENTS: section addressing individual scientific questions/issues

I think the paper could have a greater impact and be much more reproducible and be more comparable to future/past studies if the author’s new clusters for various hydrometeor types were outlined in such a way that shows each category’s polarimetric

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variable ranges: max, min, mean, median, etc. You say your algorithm works, but how can I compare it to mine if I don't know your ranges of expected values that result from the cluster analysis? Furthermore, a primary contribution of the paper is to establish the expected value ranges or membership beta functions of various hydrometeor types from a large European X-band radar dataset. You should provide this to readers! They could use the data and implement it in whatever algorithm they have. Your algorithm goes on to use some other methods of final classification, but as you say in the conclusions, your expected value ranges could be of use in any algorithm design.

The other scientific problem I noticed in this paper was the presentation and discussion of HC-2DVD and BD2009 comparisons with your proposed method. The text, figures, and figure captions need to be revised.

There was a confusing mix of the words "index" and "score" in section 5.1

I think "spatial smoothness" makes sense to me, but you mention "data-wise" similarity or "data similarity" many times. It is less clear what this means, perhaps using more physical words to describe what you mean in the beginning could help.

The introduction section (1) was very well-written. A few changes (listed below) need to be made for the purposes of correctness and to improve the writing style, grammar, and readability.

The background and clustering techniques section (2) was well-written with minor errors in writing style and word choice. It was very well-explained. I do not have a statistics background but I learned a lot and could understand most of this, thank you!

The data and processing (3), clustering of polarimetric radar data (4), and selection of the optimal cluster partition (5) sections had many more technical writing errors related to word choice, grammar, and sentence structure that should be rewritten for clarity.

Section 6 "from unlabeled clusters to hydrometeor classes" had great scientific content but needs major revisions in order to better understand the comparisons made between

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your proposed method, BD2009, and the 2DVD.

The conclusions section (7) contained technical writing errors.

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 8465, 2014.