

Title: Title: The disdrometer verification network (DiVeN): A UK network of laser precipitation instruments

Authors: B. S. Pickering, R. R. Neely III, and D. Harrison

Journal: Atmos. Measurement Tech. Discuss (amt-2018-302)

General Comments:

The reviewer first thought that the purpose of the paper is to use Theis Laser Precipitation Monitor (LPM) to evaluate the radar-based precipitation phase algorithm over United Kingdom. The manuscript is actually evaluated Their LPM phase algorithm with human observer. The manuscript also deals with the technical aspects of the data collection process from Theis LPM in near real time. The manuscript includes quite a bit information regarding precipitation measurements which are not relevant to this study. What is the relevance of tipping bucket gauges if the main purpose is related to the precipitation phase. The authors mentioned about dual-pol radar-based hydrometeor classification algorithm which was not used in this study. The section 1.1 is misleading regarding the main content/purpose of the study.

Perhaps, the key issue of the study is the Theis LPM precipitation phase algorithm which was disclosed by the manufacturer. As expected Theis LPM uses fall velocity versus particle size to determine the phase of the hydrometeor. In that regard, what is the accuracy of size and fall velocity. Is there any literature where the fall velocity has been presented? Even accurate fall velocity measurements, the study cannot comment on the error sources on the precipitation phase algorithm since this is not available.

The title of the manuscript is quite general and it is hard to extract the content of the paper from the title.

The authors dedicated a section on the installation and cost of DiVeN. The text is written in quite detail and perhaps too much detail information. The price of the each element of the network is given in pounds. It is expected that the price is fluid, changes with time and should not be included in peer-reviewed journal.

Section 4.2 describes the second case study. Unlike 4.1 and 4.3, this section deals with the size distribution measurements and rain intensity. The reader is get confused since this is not expected in this study. The reader would like to know more about the performance of Theis for precipitation phase. Section 4.3 was quite useful. It is understandable that the Theis and similar instruments can confuse light snow from drizzle since the fall speed are similar in this size regime. Going back to section 4.2, what is the purpose of presenting raindrop size distribution comparison. It is feasible that Theis may have splash drops but Joss-Waldvogel disdrometer and PWS100 are not standard and cannot be used as a reference. It is likely that they both underestimate small drops severely. Thurai and Bringi (2018, Journal of Applied Meteorology and Climatology) introduced Meteorological Particle Spectrometer which is sensitive to the small drops. The author should consider this study as a reference.

The manuscript is well written and has original aspects. Sections 2.2, 4.1, and 4.3 have useful information for future Theis LPM users. With a major revision, basically shortening the manuscript, the study has a potential to be published.

Special Comments:

- 1) Page 2, line 6, what is the reference for moderate rainfall? The Glossary of American Meteorological Society defines the boundaries of rain intensities.
- 2) Page 2, line 17, single polarization radar may or may not have the Doppler capability. Please clarify.
- 3) Page 2, line 20, what does it mean for composition?
- 4) Page 2, line 21, The manuscript quotes hydrometeor or precipitation type. Perhaps, phase rather than type is more suitable. Folks use type for stratiform and convective rainfall in the literature.
- 5) Page 3, line 5, what is FAAM stands for?
- 6) Page 3, line 15, the bin width is related to the accuracy of particle size not resolve differences between smaller drops.
- 7) Page 3, lines 27-28, Please specify Parsivel as Parsivel-1. MC3E was for two months not two weeks. Also, please use a bigger city name (e.g. Ponca City, Oklahoma) rather than Tonkawa. Despite the fact that I participated the field campaign, I never heard Tonkawa.
- 8) Page 4, line 14, Perhaps the sentence needs to be modified since Löffler-Mang and Joss (2000) paper describes Parsivel not Theis. While they are sister instruments, there are differences in their operation.
- 9) Page 4, line 30, the authors says that the exact method of derivation does not need to be known. I disagree with this statement. This is one of the deficiencies of the study.
- 10) Page 5, lines 1-2, Personal communication should be more explicit. Who is the person to be communicated with and what is his/her affiliation? Also, please correct Section 4.1 to 4.1
- 11) Page 5, lines 4-7, the paragraph talks about the aircraft probes. What is the relevance? The aircraft probes are the sole source for the hydrometeor phase aloft but cannot be observed continuously. They are research instrument, not operational.
- 12) Page 6, section 3.1. While it is important to report the challenges of the DiVeN sites, the section is quite long. For somebody who is not familiar with UK geography, it is easy to get lost. This section is subject to be shortened.

13) Page 7, section 3.3 is perhaps the least favorite section of the manuscript. I am not frequent reviewer of the Atmospheric Measurement Techniques, so I am not sure if the detailed information on DiVeN costs are welcome. For a science paper, it is not. Before reading the manuscript, I could never imagine to read this kind of detailed information in the paper. Specifically, I am not sure what is the relevance of electricity cost in UK for a reader outside the country. I would say nearly 2/3 of the manuscript does not related to evaluation of the Theis LPM hydrometeor phase algorithm.

14) Page 11, last line, gauge resolution should be 0.01 mm.

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