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Atmospheric Measurement Techniques Discussions

Interactive comment on "Raindrop Fall Velocities from an Optical Array Probe and 2D-video Disdrometer" *by* Viswanathan Bringi et al.

Anonymous Referee #4

Received and published: 18 December 2017

1. Does the paper address relevant scientific questions within the scope of AMT? YES
2. Does the paper present novel concepts, ideas, tools, or data? YES
3. Are substantial conclusions reached? YES
4. Are the scientific methods and assumptions valid and clearly outlined? YES
5. Are the results sufficient to support the interpretations and conclusions? YES
6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? YES, with a few additions requested in below remarks.
7. Do the authors give proper credit to related work and clearly indicate their own

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Discussion paper

new/original contribution? YES

8. Does the title clearly reflect the contents of the paper? YES

9. Does the abstract provide a concise and complete summary? YES

10. Is the overall presentation well structured and clear? YES

11. Is the language fluent and precise? YES

12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? YES

13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? Minor, as requested in below comments

14. Are the number and quality of references appropriate? YES

15. Is the amount and quality of supplementary material appropriate? YES

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GERNERAL COMMENTS

This is an excellent paper, addressing the issue of in-situ measurements of rain drops over their full size range, with focus on the drops' fall velocities. Especially the characteristics of very small drops still are not investigated thoroughly up to here. The investigation of the relationship between wind turbulence and rain drops' fall velocity is convincing and in the future will allow new refinements in the related remote sensing algorithms. The study is presented in a clear and concise way. The reviewer likes to point out, that such work does not only address academic interests, but points to a number of applications, like remote sensing of the atmosphere, as the authors shortly mention in their introduction. Other applications include knowledge of channel characteristics for satellite communications at EHF frequency bands. Thus the study is very relevant for these fields of science and applications. The work is based on the com-

bined analyses of data from 2 instruments at same site, the Meteorological Particle Spectrometer (MPS) and the 2D-video disdrometer (2DVD). Field measurement of rain drops still may be considered as challenge, with quite a few solutions being around, but none of the instruments may claim to be perfect. The presented results do rise a few relevant questions, which are given in below specific comments. Summarizing it is said, that this paper gives an excellent contribution, bringing new aspects for the relevant fields of science and applications.

SPECIFIC COMMENTS

*** Line 98 / 99: “All possible corrections have been applied, including the removal of artifacts due to splashing,. . .” Careful preprocessing, verification and validation of data is of utmost importance for the present study. The results presented require correctness of challenging measurement processes. Some of the results given actually leave a few questions open, as addressed in below comment to Fig 1a and Fig 3a., To be sufficiently self-contained, thus the paper might shortly describe the mentioned correction algorithms.

*** Line 157: “The histogram from MPS for the 0.5 mm sizes shows positive skewness” Can the authors give an explanation / discussion / assumption?

*** Fig. 1a and Fig. 3a: Mean fall velocities from the MPS are read from these figures approximately as:

Fig. 1a: D = 0,7 mm, v = 2.55 m/s

Fig. 3a: D = 0.7 mm, v = 3.05 m/s

That represents an exceedance by more than 16 % (Fig. 3a over Fig. 1a), in spite of the lower pressure in Greely (Fig 1a) leading to the expectation of faster drops than in Huntsville (Fig 3a). The authors please could discuss this.

*** Fig. 3a: Mean fall velocities from the MPS are read from this figure approximately as:

D = 1.5 mm, v = 5.28 m/s

D = 1.6 mm, v = 6.31 m/s

D = 1.7 mm, v = 6.5 m/s

D = 1.8 mm, v = 5.93 m/s

These values differ significantly from the fit to Gunn-Kinzer, further from the expected monotonic behaviour. The authors please could discuss this.

TECHNICAL COMMENTS:

*** Line 230: "(σf) versus E is shown in panels 6 (b,d)." It probabaly should read as "(σf) versus E is shown in panels (b,d) of Fig 5."

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