

REVIEW REPORT

Review of amt-2017-401

By Viswanathan Bringi, Merhala Thurai and Darrel Baumgardner

Manuscript Title – Raindrop Fall Velocities from an Optical Array Probe and 2D-Video Disdrometer

GENERAL COMMENTS

In the manuscript the Authors analyzed three precipitation events occurred in USA (Colorado and Alabama) that differs for the climatology of the colocations and for the wind conditions. The aim of the study is to evaluate the wind influence on the raindrops terminal fall speed measured by two different type of devices, namely the Meteorological Particle Spectrometer (MPS) and the 2D video disdrometer (2DVD). The manuscript is well organized however I think that the aim of the study and in particular its practical applications should be specified in the Introduction section. As stated also by the Authors more case studies should be added or at least the analysis should be extended to larger drops (see for example comment 6 and 9 below). Furthermore section 2 need to be enlarged with information regarding the data processing (see comment 3 below) and more analytical comparison should be done to confirm the consistency of fall speed measurements from the two devices (see comment 1 below). Finally I have some specific comments, that are shown below.

SPECIFIC COMMENTS

1. Line 24-25: in the manuscript the consistency of fall speed measurements from the two devices is provided only qualitatively (i.e. “excellent visual agreement”) some quantitative results should be provided for all the diameters in the overlapping region.
2. Line 109: please clarify which are the “other factors” that gives the threshold of 0.7 mm for the drop diameter. The 2DVD is able to measures drops with $D < 0.7$ mm. Usually the minimum detectable diameter for 2DVD is considered 0.2 mm or 0.3 mm. In this case the overlapping between the two instruments can be enlarged. Please provide a clarification of this threshold or consider the option of enlarging the overlapping region.
3. Line 114-115: As reported in numerous papers in the literature, the 2DVD measures a number of spurious drops that can are usually removed from the data using proper filter criterion, such as the one based on the relation between measured and theoretical fall velocities. Please note that in my experience most of the spurious drops have small diameters ($D < 2$ mm) and therefore are within the range of diameters analyzed in this study. Did the Authors use any kind of criterion to filter out these drops? If yes which is the impact of the filtering on the results. If not, how can the Authors be sure that those drops are real drops and not spurious ones? I think that the Authors should clarify this point in the manuscript because it is crucial for the validity on the results obtained in the study.
4. Line 119: How do the Authors identify the different rain types?
5. Line 131: I suggest to change the word “excellent” with the word “good”. The MPS underestimates the fall velocities for $0.7 \text{ mm} < D < 1 \text{ mm}$ with respect to 2DVD, while the 2DVD

overestimates the fall velocities for $1 \text{ mm} < D < 2 \text{ mm}$ with respect to the Gunn and Kinzer fit. Furthermore a more quantitative agreement should be performed.

6. Figure 1b and Figure 2b: I suggest to plot the fall velocity histogram also for other drop diameters (let say 0.7 mm and 1.5 mm for example) so the readers can have more cases to evaluate the agreements between 2DVD and MPS.

7. Line 187: similarly to comment 5, also here the word “excellent” is not appropriate due to the overestimation of MPS with respect to Gunn and Kinzer fit for $D < 0.5 \text{ mm}$.

8. Figure 3a: can the Authors provide an explanation of the differences in the mean fall velocity between Gunn and Kinzer fit and MPS measurements for $D > 1.5 \text{ mm}$?

9. Figure 5: what about large drops? Which is the effect of wind on large drops? I suggest to use the 2DVD data to made the same analysis for larger D.

TECHNICAL CORRECTIONS

1. Line 286: probably “wind range” should be “wide range”.